



# HARTNER

Precision Cutting Tools



HERRAMIENTAS DE **TALADRAR**





**HARTNER**

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Precision Cutting Tools



## Descripción

Tipo	Aplicación	Ángulo de corte lateral	Ángulo de punta	Afilado de punta	
<b>N</b>	para materiales de normal mecanizado (p.ej. acero, GS, GG)	20°-30°	118°	Entrada cónica Punta estándar	Brocas en acero rápido
<b>H</b>	para materiales de viruta corta (p.ej. MS, bronzes, Elektron)	12°-16°	118°	Entrada cónica Punta estándar	
<b>W</b>	para mat. blandos y de viruta larga (p.ej. aleaciones de aluminio, cobre)	35°-40°	130°	Entrada cónica Punta estándar	
<b>FN</b>	para materiales de normal mecanizado para taladros muy profundos	35°	130°	Entrada cónica Punta estándar	
<b>FN 500</b>	para materiales de viruta larga (p.ej. aceros altamente aleados, aceros de cementación, de bonificación)	20°-30°	130°	Entrada cónica Punta estándar	
<b>FU 500 FU 500 DZ</b>	para aplicación universal (p.ej. aceros aleados y no aleados hasta 800 mm <sup>2</sup> ) DZ = mango cilíndrico	35°	118°	Afilado plano afilado especial	
<b>FW</b>	para mat. blandos y de viruta larga para taladros muy profundos	35°-40°	130°	Entrada cónica Punta estándar	
<b>S</b>	para materiales de difícil mecanizado (p.ej. aceros inoxidable y resistentes al calor)	35°	130°	Entrada cónica Punta estándar	
<b>IS</b>	para aceros inoxidable y resistentes al ácido y al calor	40°	130°	Entrada cónica Punta estándar	
<b>HX500</b>	para materiales resistentes al desgaste como el Hardox	22°	135°	Afilado especial de dos caras	
<b>V</b>	para materiales de difícil mecanizado (p.ej. aceros de muelles)	20°-30°	130°	Entrada cónica Punta estándar	Brocas en metal duro
<b>TS 3 G</b>	para un centrado preciso y un taladro apurado, incluido centrados obliquos o taladros interrumpidos	28°	150°	Afilado especial	
<b>TS 80 U</b>	para aplicación universal (p.ej. GG, GGG, aceros hasta 1000 N/mm <sup>2</sup> )	20°-30°	140°	Entrada cónica Vaciado especial tipo U	
<b>TS 100 U</b>	para aceros hasta 1000 N/mm <sup>2</sup> , para aplicación universal	25°-35°	140°	Afilado plano	
<b>TS 100 HPC</b>	para el mecanizado de alto rendimiento en aceros de constr. y generales hasta 1400N/mm <sup>2</sup> , aceros inox., titanio y aleaciones especiales	25°-30°	140°	Afilado al cono optimizado	
<b>TS 150 GG</b>	para fundición de viruta corta, aluminio y sus aleaciones con alto contenido de Si	0° (afilado plano)	120°	Afilado plano Vaciado especial tipo GG	
<b>TS 100 R</b>	para fundición GGV y ADI, fundición gris, nodular, grafito	30°	-	Afilado radio	
<b>TS 100 T</b>	para taladros profundos en acero y fundición	30°	135°	Entrada cónica	
<b>TS 100 INOX</b>	para aceros inoxidable	30°	140°	Afilado plano	
<b>TS 100 H</b>	para aceros de alta dureza, aceros templados y aleaciones especiales	30°	140°	Entrada cónica	
<b>TS 100 EG</b>	Desbarbadores de metal duro				Rebarbadores
<b>TS 100 VR</b>	Rebarbadores 90°				
<b>TLB E80</b>	Brocas cañones monolabio, cabeza MD				Brocas cañones
<b>TLB E100</b>	Brocas cañones monolabio en metal duro				
<b>TLB E800</b>	Brocas cañones monolabio con plaquitas				
<b>TLB Z80</b>	Brocas cañones con dos labios, cabeza MD				



# Código ISO

<b>P</b>	Acero, acero alta aleación
<b>M</b>	Acero inoxidable
<b>K</b>	Fundición gris, fundición perlítica y fundición maleable
<b>N</b>	Aluminio y otros metales no ferríticos
<b>S</b>	Aleaciones especiales, super-especiales y de Ti
<b>H</b>	Acero endurecido y fundición dura

# Pictogramas

Material de corte	<b>HSS</b>	<b>HSS-E</b>	<b>M42</b>	<b>HSS-E-PM</b>	<b>VHM</b>	<b>HM</b>				
	acero rápido				metal duro integral		placa MD soldada			
Superficie										
Tipo	<b>N</b>	<b>H</b>	<b>W</b>	<b>FN</b>	<b>FN500</b>	<b>FU500</b>	<b>FU500 DZ</b>	<b>FW</b>	<b>S</b>	<b>IS</b>
Explicación para nombres de tipo véase contraportada de la página plegable	<b>HX500</b>	<b>V</b>	<b>TS3G</b>	<b>TS80 U</b>	<b>TS100 U</b>	<b>TS100 HPC</b>	<b>TS150 GG</b>	<b>TS100 R</b>	<b>TS100 T</b>	<b>TS100 INOX</b>
	<b>TS100 H</b>	<b>TS100 EG</b>	<b>TS100 VR</b>	<b>TLB E 80</b>	<b>TLB E 100</b>	<b>TLB E 800</b>	<b>TLB Z 80</b>			
Forma	<b>R</b>	<b>A</b>	<b>B</b>	<b>C</b>						
Profundidad	<b>3xD</b>	<b>5xD</b>	....	<b>~3xD</b>	<b>~5xD</b>	....	<b>SPL 45,00</b>	<b>SPL 80,00</b>	....	
							mm	mm		
Norma	<b>DIN 333</b>	<b>DIN 338</b>	<b>DIN 339</b>	<b>DIN 340</b>	<b>DIN 343</b>	<b>DIN 344</b>	<b>DIN 345</b>	<b>DIN 1869</b>	<b>DIN 1897</b>	....
	<b>DIN 8374</b>	<b>DIN 8375</b>	<b>DIN 8376</b>	<b>DIN 8377</b>	<b>DIN 8378</b>	<b>DIN 8379</b>	<b>DIN 6537K</b>	<b>DIN 6537L</b>	<b>DIN 6527K</b>	según DIN
		según Hartner estándar								
Angulo de punta										
Ø-Tolerancia	<b>m7</b>	<b>h5</b>	<b>h6</b>	<b>h7</b>	<b>h8</b>	<b>0/-0,004</b>				
Dirección de corte										
	derecha	izquierda								
Forma del mango										
	según DIN 6535				cilíndrico	cono morse	cono SK			
Vaciado de punta										
	Con vaciado de punta									
Refrigeración interna										
	con RI	sin RI								



## Posibilidades al pedir

Por favor indique en su pedido siempre

**el artículo no. con el diámetro nominal** como por ejemplo:

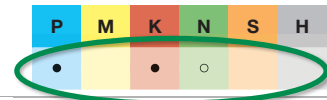
„Brocas espirales, cortas, para diámetro nominal 0,20 mm“

= **81010 0,200**

Artículo no.

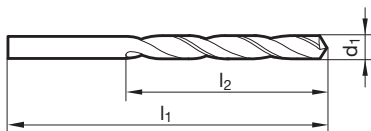
### Brocas espirales cil., cortas

Artículo no. 81010



vaciado de punta  $\geq \varnothing 1,000$  • entrada cónica

aceros y fundición de aceros (aleados y sin alea) • fundición gris, fundición maleable, fundición esferica • hierro sinterizado y grafito



d1 mm	inch	l1 mm	l2 mm	d1 mm	inch	l1 mm	l2 mm
0,200		19,000	2,500	0,640		26,000	8,000
0,220		19,000	2,500	0,650		26,000	8,000
0,230		19,000	2,500	0,660		26,000	8,000
0,240		19,000	2,500	0,670		26,000	8,000
0,250		19,000	3,000	0,680		28,000	9,000
0,260		19,000	3,000	0,690		28,000	9,000
0,270		19,000	3,000	0,700		28,000	9,000

Diámetro nominal

En las páginas de programa encontrará para cada herramienta recomendaciones de aplicación por los grupos contiguos:

- muy adecuado
- adecuado con limitaciones



## Consejos importantes

### Condiciones de venta

Artículos disponibles sujetos a nuestras condiciones de ventas  
Disponibles bajo demanda.

Para la fabricación de herramientas especiales, la cantidad suministrada puede variar sobre el 10% (mínimo 2 unidades) del pedido original. El pago es por la cantidad suministrada.

### Condiciones de venta para pequeñas partidas

Para pedidos de poco valor, puede ser aplicado un cargo.

Grupo de herramientas	Norma	Unidades por paquete
Mango cilíndrico en HSS Broca helicoidales	DIN 338 DIN 1897 y procesos similares	≤ Ø 7.50 mm en paquetes de 10 unidades > Ø 7.50 ... Ø 10.60 mm en paquetes de 5 unidades > Ø 10.60 mm empaquetadas unitariamente
	DIN 339 DIN 340 y procesos similares	≤ Ø 6.70 mm en paquetes de 10 unidades > Ø 6.70 ... Ø 10.60 mm en paquetes de 5 unidades > Ø 10.60 mm empaquetadas unitariamente
	DIN 1869	≤ Ø 7.50 mm en paquetes de 10 unidades > Ø 7.50 ... Ø 10.60 mm en paquetes de 5 unidades > Ø 10.60 mm empaquetadas unitariamente
Mango cónico en HSS Broca helicoidales	Todas normas DIN estándar y trabajos estándar	todas las medidas se suministran unitariamente
Metal duro y tipo de metal duro Broca helicoidales	Todas normas DIN estándar y trabajos estándar	todas las medidas se suministran unitariamente
Micro brocas de precisión	DIN 1899	Todas las medidas se suministran en paquetes de 10 unidades
Brocas de centro	DIN 333 forma A, forma R	≤ Ø 4.00 mm en paquetes de 10 unidades > Ø 4.00 mm en estuches unitarios
	DIN 333 forma B	≤ Ø 2.50 mm en paquetes de 10 unidades > Ø 2.50 mm en estuches unitarios

### Cuentas bancarias

Deutsche Bank AG  
IBAN DE74 6537 0075 0014 6415 00  
BIC DEUTDESS653

BW Bank  
IBAN DE45 6005 0101 0002 5924 44  
BIC SOLADEST600





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N° artículo	Página	Profundidad	Norma	Acabado	Descripción	Material de corte Tipo	
<b>80495</b>	388		Norma de fáb.	AlTiN nano	Rebarbadores 90°	MDI	TS 100 VR
<b>81000</b>	104	3xD	Norma de fáb.	TiAlZrN	HX 500	M42	HX 500
<b>81010</b>	53	~5xD	DIN 338	vaporizado	Brocas espirales cil., cortas	HSS	N
<b>81011</b>	83	~5xD	DIN 338	vaporizado	Brocas espirales cil., cortas	HSS-E	N
<b>81012</b>	77	~5xD	DIN 338	blanca	Brocas espirales cil., cortas	M42	N
<b>81013</b>	85	~5xD	DIN 338	blanca	Brocas espirales cil., cortas	HSS-E	IS
<b>81015</b>	57	~5xD	DIN 338	vaporizado	Brocas espirales cil., cortas	HSS	N
<b>81017</b>	59	~5xD	DIN 338	vaporizado	Brocas espirales cil., cortas	HSS	N
<b>81018</b>	79	~5xD	DIN 338	Óxido de bronce	Brocas espirales cil., cortas	M42	N
<b>81019</b>	81	~5xD	DIN 338	nanoFIRE	Brocas espirales cil., cortas	M42	N
<b>81020</b>	60	~5xD	DIN 338	blanca	Brocas espirales cil., cortas	HSS	H
<b>81025</b>	62	~5xD	DIN 338	blanca	Brocas espirales cil., cortas	HSS	H
<b>81030</b>	64	~5xD	DIN 338	blanca	Brocas espirales cil., cortas	HSS	W
<b>81035</b>	66	~5xD	DIN 338	blanca	Brocas espirales cil., cortas	HSS	W
<b>81040</b>	67	~5xD	DIN 338	faces nitruadas	Brocas espirales cil., cortas	HSS	FN
<b>81041</b>	87	~5xD	DIN 338	faces nitruadas	Brocas espirales cil., cortas	HSS-E	FN
<b>81045</b>	69	~5xD	DIN 338	faces nitruadas	Brocas espirales cil., cortas	HSS	FN
<b>81061</b>	89	~5xD	DIN 338	blanca	Brocas espirales cil., cortas	HSS-E	S
<b>81078</b>	97	~5xD	DIN 338	AlTiZrN	Brocas espirales cil., cortas	HSS-E	IS
<b>81110</b>	24	~3xD	DIN 1897	vaporizado	Brocas espirales extra cortas	HSS	N
<b>81112</b>	35	~3xD	DIN 1897	blanca	Brocas espirales extra cortas	M42	N
<b>81115</b>	26	~3xD	DIN 1897	blanca	Brocas espirales extra cortas	HSS	N
<b>81120</b>	28	~3xD	DIN 1897	blanca	Brocas espirales extra cortas	HSS	H
<b>81130</b>	29	~3xD	DIN 1897	blanca	Brocas espirales extra cortas	HSS	W
<b>81140</b>	30	~3xD	DIN 1897	faces nitruadas	Brocas espirales extra cortas	HSS	FN
<b>81145</b>	31	~3xD	DIN 1897	faces nitruadas	Brocas espirales extra cortas	HSS	FN
<b>81171</b>	37	~3xD	DIN 1897	vaporizado	Brocas espirales extra cortas	HSS-E	V
<b>81173</b>	39	~3xD	DIN 1897	blanca	Brocas espirales extra cortas	HSS-E	IS
<b>81178</b>	44	~3xD	DIN 1897	AlTiZrN	Brocas espirales extra cortas	HSS-E	IS
<b>81190</b>	119		Norma de fáb.	vaporizado	Brocas para carrocería	HSS	N
<b>81191</b>	115		Norma de fáb.	blanca	Brocas de puntear NC	HSS	N
<b>81192</b>	116		Norma de fáb.	blanca	Brocas de puntear NC	HSS	N
<b>81210</b>	122	~10xD	DIN 339	vaporizado	Brocas para casquillos	HSS	N
<b>81310</b>	124	~10xD	DIN 340	vaporizado	Brocas espirales cil., largas	HSS	N
<b>81311</b>	138	~10xD	DIN 340	vaporizado	Brocas espirales cil., largas	HSS-E	N
<b>81315</b>	126	~10xD	DIN 340	vaporizado	Brocas espirales cil., largas	HSS	N
<b>81317</b>	127	~10xD	DIN 340	vaporizado	Brocas espirales cil., largas	HSS	N
<b>81320</b>	128	~10xD	DIN 340	blanca	Brocas espirales cil., largas	HSS	H
<b>81330</b>	129	~10xD	DIN 340	blanca	Brocas espirales cil., largas	HSS	W
<b>81340</b>	131	~10xD	DIN 340	faces nitruadas	Brocas espirales cil., largas	HSS	FN
<b>81341</b>	139	~10xD	DIN 340	faces nitruadas	Brocas espirales cil., largas	HSS-E	FN
<b>81350</b>	133	~10xD	DIN 340	blanca	Brocas espirales cil., largas	HSS	FW
<b>81361</b>	141	~10xD	DIN 340	blanca	Brocas espirales cil., largas	HSS-E	S
<b>81362</b>	141	~10xD	DIN 340	TiN	Brocas espirales cil., largas	HSS-E	S
<b>81410</b>	147	~15xD	DIN 1869	vaporizado	Brocas espirales, extra largas, serie 1	HSS	N
<b>81440</b>	148	~15xD	DIN 1869	faces nitruadas	Brocas espirales, extra largas, serie 1	HSS	FN
<b>81441</b>	151	~15xD	DIN 1869	faces nitruadas	Brocas espirales, extra largas, serie 1	HSS-E	FN
<b>81450</b>	149	~15xD	DIN 1869	blanca	Brocas espirales, extra largas, serie 1	HSS	FW
<b>81510</b>	152	~20xD	DIN 1869	vaporizado	Brocas espirales, extra largas, serie 2	HSS	N
<b>81540</b>	153	~20xD	DIN 1869	faces nitruadas	Brocas espirales, extra largas, serie 2	HSS	FN
<b>81541</b>	155	~20xD	DIN 1869	faces nitruadas	Brocas espirales, extra largas, serie 2	HSS-E	FN
<b>81610</b>	156	~25xD	DIN 1869	vaporizado	Brocas espirales, extra largas, serie 3	HSS	N
<b>81640</b>	157	~25xD	DIN 1869	faces nitruadas	Brocas espirales, extra largas, serie 3	HSS	FN
<b>81641</b>	158	~25xD	DIN 1869	faces nitruadas	Brocas espirales, extra largas, serie 3	HSS-E	FN
<b>81740</b>	159	>25xD	Norma de fáb.	faces nitruadas	Brocas espirales, largo especial	HSS	FN
<b>81750</b>	160	>25xD	Norma de fáb.	blanca	Brocas espirales, largo especial	HSS	FN
<b>81760</b>	161	>25xD	Norma de fáb.	blanca	Brocas espirales, largo especial	HSS	FN
<b>81810</b>	162		DIN 1898	vaporizado	Brocas para pasadores cónicos	HSS	N
<b>82010</b>	173	~5xD	DIN 345	vaporizado	Brocas espirales	HSS	N
<b>82011</b>	177	~5xD	DIN 345	vaporizado	Brocas espirales	HSS-E	N
<b>82012</b>	178	~5xD	DIN 345	blanca	Brocas con cono morse	HSS-E	IS
<b>82030</b>	175	~5xD	DIN 345	blanca	Brocas espirales	HSS	W
<b>82191</b>	183		Norma de fáb.	vaporizado	Brocas de puntear NC	HSS	N
<b>82192</b>	183		Norma de fáb.	vaporizado	Brocas de puntear NC	HSS	N
<b>82210</b>	184	~10xD	DIN 341	vaporizado	Brocas espirales cil., largas	HSS	N
<b>82211</b>	185	~10xD	DIN 341	vaporizado	Brocas espirales cil., largas	HSS-E	N



N° artículo	Página	Profundidad	Norma	Acabado	Descripción	Material de corte Tipo	
<b>82310</b>	186	~15xD	DIN 1870	vaporizado	Brocas espirales, extra largas, serie 1	HSS	N
<b>82340</b>	187	~15xD	DIN 1870	faces nitruadas	Brocas espirales, extra largas, serie 1	HSS	FN
<b>82341</b>	188	~15xD	DIN 1870	faces nitruadas	Brocas espirales, extra largas, serie 1	HSS-E	FN
<b>82410</b>	189	~20xD	DIN 1870	vaporizado	Brocas espirales, extra largas, serie 2	HSS	N
<b>82440</b>	190	~20xD	DIN 1870	faces nitruadas	Brocas espirales, extra largas, serie 2	HSS	FN
<b>82466</b>	191	>20xD	Norma de fáb.	faces nitruadas	Brocas espirales, largo especial	HSS	FN
<b>82467</b>	192	20xD	Norma de fáb.	faces nitruadas	Brocas espirales, largo especial	HSS	FN
<b>82468</b>	193	>20xD	Norma de fáb.	blanca	Brocas espirales, largo especial	HSS	FN
<b>82469</b>	194	>20xD	Norma de fáb.	blanca	Brocas espirales, largo especial	HSS	FN
<b>82515</b>	198	~15xD	Norma de fáb.	vaporizado	Brocas de refrigeración, serie extra larga	HSS-E	FN
<b>82521</b>	195	~10xD	Norma de fáb.	vaporizado	Brocas de refrigeración, serie larga	HSS	N
<b>82525</b>	197	~10xD	Norma de fáb.	vaporizado	Brocas de refrigeración, serie larga	HSS-E	FN
<b>82535</b>	196	~10xD	Norma de fáb.	vaporizado	Brocas de refrigeración, serie larga	HSS	FN
<b>82571</b>	423		Norma de fáb.	vaporizado	Tube alimentador para refrigerante		
<b>82578</b>	424		Norma de fáb.		acoplamientos de cierre rápido		
<b>82710</b>	121	~10xD	Norma de fáb.	blanca	Brocas con canal de refrigeración	HSS	FN
<b>82761</b>	120	~5xD	Norma de fáb.	blanca	Brocas con canal de refrigeración	HSS-E	FN
<b>82810</b>	202		DIN 1898	vaporizado	Brocas para pasadores cónicos	HSS	N
<b>82971</b>	181	~3xD	Norma de fáb.	vaporizado	Brocas espirales cil., cortas	HSS-E	V
<b>82972</b>	182	~3xD	Norma de fáb.	blanca	Brocas con cono morse	HSS-E	IS
<b>83000</b>	368		DIN 333	blanca	Brocas de centrar sin plano	HSS	N
<b>83005</b>	371		DIN 333	blanca	Brocas de centrar sin plano	HSS	N
<b>83100</b>	366		DIN 333	blanca	Brocas de centrar sin plano	HSS	N
<b>83101</b>	373		DIN 333	blanca	Brocas de centrar sin plano	HSS-E	N
<b>83102</b>	374		DIN 333	nanoFIRE	Brocas de centrar sin plano	HSS-E	N
<b>83105</b>	367		DIN 333	blanca	Brocas de centrar sin plano	HSS	N
<b>83110</b>	372		Norma de fáb.	blanca	Brocas de centrar sin plano	HSS	N
<b>83200</b>	370		DIN 333	blanca	Brocas de centrar sin plano	HSS	N
<b>83300</b>	369		DIN 333	blanca	Brocas de centrar sin plano	HSS	N
<b>83370</b>	375		Norma de fáb.	blanca	Brocas de centrar sin plano	MDI	N
<b>83500</b>	376		DIN 333	blanca	Brocas de centrar con plano	HSS	N
<b>83600</b>	376		DIN 333	blanca	Brocas de centrar con plano	HSS	N
<b>83700</b>	377		DIN 333	blanca	Brocas de centrar con plano	HSS	N
<b>84100</b>	386		Norma de fáb.	blanca	Desbarbador	MDI	TS 100 EG
<b>84101</b>	387		Norma de fáb.	blanca	Desbarbador	MDI	TS 100 EG
<b>84400</b>	33	~3xD	DIN 1897	TiN	Brocas espirales extra cortas	HSS	N
<b>84405</b>	71	~5xD	DIN 338	TiN	Brocas espirales cil., cortas	HSS	N
<b>84406</b>	73	~5xD	DIN 338	punta TiN	Brocas espirales cil., cortas	HSS	N
<b>84415</b>	75	~5xD	DIN 338	TiN	Brocas espirales cil., cortas	HSS	FN
<b>84418</b>	135	~10xD	DIN 340	TiN	Brocas espirales cil., largas	HSS	N
<b>84423</b>	136	~10xD	DIN 340	TiN	Brocas espirales cil., largas	HSS	FN
<b>84425</b>	150	~15xD	DIN 1869	TiN	Brocas espirales, extra largas, serie 1	HSS	FN
<b>84426</b>	154	~20xD	DIN 1869	TiN	Brocas espirales, extra largas, serie 2	HSS	FN
<b>84434</b>	115		Norma de fáb.	TiN	Brocas de puntar NC	HSS	N
<b>84435</b>	116		Norma de fáb.	TiN	Brocas de puntar NC	HSS	N
<b>84445</b>	348		Norma de fáb.	TiN	Brocas escalonadas cortas con mango cil.	HSS	N
<b>84448</b>	368		DIN 333	TiN	Brocas de centrar sin plano	HSS	N
<b>84450</b>	366		DIN 333	TiN	Brocas de centrar sin plano	HSS	N
<b>84460</b>	176	~5xD	DIN 345	TiN	Brocas espirales	HSS	N
<b>84461</b>	120	~5xD	Norma de fáb.	TiN	Brocas con canal de refrigeración	HSS-E	FN
<b>84501</b>	33	~3xD	DIN 1897	nanoFIRE	Brocas espirales extra cortas	HSS	N
<b>84502</b>	75	~5xD	DIN 338	nanoFIRE	Brocas espirales cil., cortas	HSS	FN
<b>84503</b>	40	~3xD	DIN 1897	nanoFIRE	Brocas espirales extra cortas	HSS-E	V
<b>84504</b>	91	~5xD	DIN 338	nanoFIRE	Brocas espirales cil., cortas	HSS-E	FN
<b>84505</b>	95	~5xD	DIN 338	nanoFIRE	Brocas espirales cil., cortas	HSS-E	S
<b>84506</b>	136	~10xD	DIN 340	nanoFIRE	Brocas espirales cil., largas	HSS	FN
<b>84507</b>	109	~5xD	Norma de fáb.	nanoFIRE	Brocas espirales con mango cil. reforzado	HSS-E-PM	FN 500
<b>84508</b>	145	~10xD	DIN 340	nanoFIRE	Brocas espirales cil., largas	HSS-E	FN
<b>84511</b>	46	~3xD	DIN 1897	nanoFIRE	Brocas espirales extra cortas	HSS-E-PM	FN 500
<b>84660</b>	179	~5xD	DIN 345	TiAIN	Brocas espirales	HSS-E	FN
<b>84800</b>	91	~5xD	DIN 338	TiN	Brocas espirales cil., cortas	HSS-E	FN
<b>84801</b>	107	~5xD	Norma de fáb.	nanoFIRE	Brocas espirales con mango cil. reforzado	HSS-E-PM	FU 500
<b>84802</b>	93	~5xD	DIN 338	TiN	Brocas espirales cil., cortas	HSS-E	FU 500 DZ
<b>84803</b>	40	~3xD	DIN 1897	TiN	Brocas espirales extra cortas	HSS-E	V
<b>84804</b>	93	~5xD	DIN 338	blanca	Brocas espirales cil., cortas	HSS-E	FU 500 DZ
<b>84805</b>	105	~3xD	Norma de fáb.	nanoFIRE	Brocas espirales con mango cil. reforzado	HSS-E-PM	FU 500



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84806	42	~3xD	DIN 1897	TiN	Brocas espirales extra cortas	HSS-E	FU 500 DZ
84807	95	~5xD	DIN 338	TiN	Brocas espirales cil., cortas	HSS-E	S
84808	42	~3xD	DIN 1897	blanca	Brocas espirales extra cortas	HSS-E	FU 500 DZ
84810	332	~5xD	DIN 1899	TiN	Microbrocas sin refrigeración interior	HSS-E-PM	N
84811	99	~5xD	DIN 338	TiN	Brocas espirales cil., cortas	HSS-E-PM	FN 500 DZ
84812	143	~10xD	DIN 340	TiN	Brocas espirales cil., largas	HSS-E	FU 500 DZ
84814	143	~10xD	DIN 340	blanca	Brocas espirales cil., largas	HSS-E	FU 500 DZ
84859	180	~5xD	DIN 345	TiN	Brocas espirales	HSS-E	N
85010	354		DIN 8374	vaporizado	Brocas bidiametrales cil.	HSS	N
85110	358		Norma de fáb.	vaporizado	Brocas bidiametrales cil.	HSS	N
85210	356		DIN 8376	vaporizado	Brocas bidiametrales cil.	HSS	N
85216	359		Norma de fáb.	vaporizado	Brocas bidiametrales cil.	HSS	N
85218	355		DIN 8374	vaporizado	Brocas bidiametrales cil.	HSS	N
85310	357		DIN 8378	vaporizado	Brocas bidiametrales cil.	HSS	N
85510	364		Norma de fáb.	vaporizado	Brocas bidiametrales, CM	HSS	N
85610	362		DIN 8377	vaporizado	Brocas bidiametrales, CM	HSS	N
85616	365		Norma de fáb.	vaporizado	Brocas bidiametrales, CM	HSS	N
85619	361		DIN 8375	vaporizado	Brocas bidiametrales, CM	HSS	N
85710	363		DIN 8379	vaporizado	Brocas bidiametrales, CM	HSS	N
85910	345		Norma de fáb.	vaporizado	Brocas escalonadas DIN 332	HSS	N
85911	345		Norma de fáb.	vaporizado	Brocas escalonadas DIN 332	HSS	N
85912	346		Norma de fáb.	vaporizado	Brocas escalonadas DIN 332	HSS	N
85914	347		Norma de fáb.	vaporizado	Brocas escalonadas DIN 332	HSS	N
85916	349		Norma de fáb.	blanca	Brocas escalonadas cortas con mango cil.	HSS	N
85917	350		Norma de fáb.	blanca	Brocas escalonadas cortas con mango cil.	HSS	N
85918	351		Norma de fáb.	blanca	Brocas escalonadas cortas con mango cil.	HSS	N
85920	352		Norma de fáb.	blanca	Brocas escalonadas cortas con mango cil.	HSS	N
86010	165		DIN 344	vaporizado	Brocas escariadoras, cil.	HSS	N
86110	200		DIN 343	vaporizado	Brocas escariadoras, CM	HSS	N
86111	201		DIN 343	vaporizado	Brocas escariadoras, CM	HSS-E	N
86400	334	4xD	Norma de fáb.	AlTiN	Microbrocas sin refrigeración interior	MDI	N
86401	336	7xD	Norma de fáb.	AlTiN	Microbrocas sin refrigeración interior	MDI	N
86402	333		Norma de fáb.	TiAlN	Microbrocas sin refrigeración interior	MDI	N
86405	337	5xD	Norma de fáb.	TiAlN	Microbrocas con refrigeración interior	MDI	N
86408	338	8xD	Norma de fáb.	TiAlN	Microbrocas con refrigeración interior	MDI	N
86412	339	15xD	Norma de fáb.	punta TiAlN	Microbrocas con refrigeración interior	MDI	N
86509	257	15xD	Norma de fáb.	TiAlN	TS-Drills con refrigeración interna	MDI	TS 100 T
86511	258	20xD	Norma de fáb.	punta TiAlN	TS-Drills con refrigeración interna	MDI	TS 100 T
86512	259	25xD	Norma de fáb.	punta TiAlN	TS-Drills con refrigeración interna	MDI	TS 100 T
86513	260	30xD	Norma de fáb.	punta TiAlN	TS-Drills con refrigeración interna	MDI	TS 100 T
86514	261	40xD	Norma de fáb.	punta TiAlN	TS-Drills con refrigeración interna	MDI	TS 100 T
86602	411		Norma de fáb.	TiN	Placas intercambiales	HSS-E-PM	
86605	412		Norma de fáb.	TiN	Placas intercambiales	HSS-E	
86608	413		Norma de fáb.	FIRE	Placas intercambiales	HSS-E-PM	
86609	414		Norma de fáb.	AlTiN	Placas intercambiales	HSS-E-PM	
86611	415		Norma de fáb.	AlTiN	Placas intercambiales	HSS-E-PM	
86612	399	3xD	Norma de fáb.	niquelado	Soporte Multiplex con mango cilíndrico		
86622	400	5xD	Norma de fáb.	niquelado	Soporte Multiplex con mango cilíndrico		
86624	401	7xD	Norma de fáb.	niquelado	Soporte Multiplex con mango cilíndrico		
86628	402		Norma de fáb.	niquelado	Soporte Multiplex con mango cilíndrico		
86630	404		Norma de fáb.	niquelado	Soporte Multiplex con cono de compensación cónico		
86650	405		Norma de fáb.	niquelado	Soporte Multiplex con cono de compensación cónico		
86670	406		Norma de fáb.	bruñido	Soporte Multiplex con cono de compensación cónico		
86678	408		Norma de fáb.	niquelado	Soporte Multiplex con cono de compensación cónico		
86680	407		Norma de fáb.	bruñido	Soporte Multiplex con cono de compensación cónico		
86681	432	1xD	Norma de fáb.	niquelado	Soporte Multiplex HPC		
86682	433	1,5xD	Norma de fáb.	niquelado	Soporte Multiplex HPC		HPC
86683	435	3xD	Norma de fáb.	niquelado	Soporte Multiplex HPC		HPC
86684	437	5xD	Norma de fáb.	niquelado	Soporte Multiplex HPC		HPC
86685	439	7xD	Norma de fáb.	niquelado	Soporte Multiplex HPC		HPC
86686	441	10xD	Norma de fáb.	niquelado	Soporte Multiplex HPC		HPC
86690	422		Norma de fáb.		Alimentadores de refrigeración		
86691	426		Norma de fáb.	bruñido	Transportador de refrigerante para Multiplex		
86692	427		Norma de fáb.	bruñido	Transportador de refrigerante para Multiplex		
86693	428		Norma de fáb.	bruñido	Transportador de refrigerante para Multiplex		
86694	429		Norma de fáb.	bruñido	Transportador de refrigerante para Multiplex		



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<b>86699</b>	430		Norma de fáb.	bruñido	Union para mandril de refrigeracion		
<b>86701</b>	417		Norma de fáb.	FIRE	Placas intercambiables	MDI	
<b>86702</b>	418		Norma de fáb.	FIRE	Placas intercambiables	MDI	
<b>86708</b>	419		Norma de fáb.	TiN	Placas intercambiables	MDI	
<b>86709</b>	420		Norma de fáb.	TiN	Placas intercambiables	MDI	
<b>86711</b>	421		Norma de fáb.	blanca	Placas intercambiables	MDI	
<b>86721</b>	443		Norma de fáb.	AlTiN nano	Plaquetas intercambiables Multiplex HPC	MDI	HPC
<b>86722</b>	446		Norma de fáb.	nanoFIRE	Plaquetas intercambiables Multiplex HPC	MDI	HPC
<b>86723</b>	449		Norma de fáb.	TiAlSiN	Plaquetas intercambiables Multiplex HPC	MDI	HPC
<b>86724</b>	452		Norma de fáb.	blanca	Plaquetas intercambiables Multiplex HPC	MDI	HPC
<b>86725</b>	455		Norma de fáb.	AlTiN nano	Plaquetas intercambiables Multiplex HPC	MDI	HPC
<b>86726</b>	459		Norma de fáb.	TiAlN	Plaquetas para avellanar Multiplex HPC	MDI	
<b>86727</b>	459		Norma de fáb.	blanca	Plaquetas para avellanar Multiplex HPC	MDI	
<b>86728</b>	460		Norma de fáb.	TiN	Plaquetas para avellanar Multiplex HPC	MDI	
<b>86729</b>	458		Norma de fáb.	nanoFIRE	Plaquetas intercambiables Multiplex HPC	MDI	
<b>86842</b>	425		Norma de fáb.		Atomillador Torx		
<b>86843</b>	461		Norma de fáb.		Tornillos tensores para porta Multiplex HPC 1,5-10xD		
<b>86844</b>	462		Norma de fáb.		Llave dinamométrica		
<b>86845</b>	463		Norma de fáb.		Adaptador hexagonal		
<b>86846</b>	464		Norma de fáb.		Tornillos tensores para porta de avellanar Multiplex HPC		
<b>87011</b>	329	~5xD	DIN 1899	blanca	Microbrocas sin refrigeración interior	HSS-E-PM	N
<b>87016</b>	331	~5xD	DIN 1899	blanca	Microbrocas sin refrigeración interior	HSS-E-PM	N
<b>88013</b>	112	~5xD	DIN 338	vaporizado	Juegos de brocas helicoidales	HSS	N
<b>88014</b>	113	~5xD	DIN 338	blanca	Juegos de brocas helicoidales	HSS-E	S
<b>88015</b>	112	~3xD	DIN 1897	MolyGlide	Juegos de brocas helicoidales	HSS-E	P2000
<b>88016</b>	113	~5xD	DIN 338	punta TiN	Juegos de brocas helicoidales	HSS	N
<b>88018</b>	114	~5xD	DIN 338	Óxido de bronce	Juegos de brocas helicoidales	M42	N
<b>88021</b>	384		DIN 335	blanca	Juegos de avellanadores cónicos 90°	HSS	
<b>88022</b>	385		DIN 335	TiAlN	Juegos de avellanadores cónicos 90°, en espiral	HSS-E	
<b>88026</b>	114	~5xD	DIN 338	vaporizado	Juegos de brocas helicoidales	HSS-E	N
<b>88200</b>	382		DIN 335	blanca	Avellanadores cónicos 90°	HSS	
<b>88201</b>	383		DIN 335	TiAlN	Avellanadores cónicos 90°, en espiral	HSS-E	
<b>88303</b>	111		Norma de fáb.		Juegos de brocas helicoidales		
<b>89235</b>	48	~3xD	DIN 6539	blanca	Brocas espirales extra cortas	MDI	N
<b>89237</b>	216	3xD	DIN 6539	TiN	TS-Drills sin refrigeración interna	MDI	TS 100 U
<b>89239</b>	263	5xD	DIN 6539	blanca	Brocas-TS, 3 cortes	MDI	TS 3 G
<b>89242</b>	117		Norma de fáb.	blanca	Brocas de puntar NC	MDI	N
<b>89243</b>	118		Norma de fáb.	blanca	Brocas de puntar NC	MDI	N
<b>89244</b>	100	~5xD	Norma de fáb.	blanca	Brocas espirales cil., cortas	MDI	N
<b>89246</b>	52	~3xD	Norma de fáb.	blanca	Brocas espirales extra cortas	MDI	N
<b>89247</b>	262	5xD	DIN 6537L	blanca	Brocas-TS, 3 cortes	MDI	TS 3 G
<b>89249</b>	117		Norma de fáb.	blanca	Brocas de puntar NC	MDI	N
<b>89252</b>	360			blanca	Brocas bidiametrales cil.	MDI	N
<b>89253</b>	50	~3xD	Norma de fáb.	nanoFIRE	Brocas espirales extra cortas	MDI	N
<b>89254</b>	353		Norma de fáb.	blanca	Brocas escalonadas cortas con mango cil.	MDI	N
<b>89261</b>	102	~5xD	Norma de fáb.	nanoFIRE	Brocas espirales cil., cortas	MDI	N
<b>89264</b>	210	3xD	DIN 6537K	TiN	TS-Drills sin refrigeración interna	MDI	TS 100 U
<b>89266</b>	222	3xD	DIN 6537K	TiN	TS-Drills con refrigeración interna	MDI	TS 100 U
<b>89272</b>	231	5xD	DIN 6537L	TiN	TS-Drills con refrigeración interna	MDI	TS 100 U
<b>89275</b>	220	5xD	Norma de fáb.	TiN	TS-Drills sin refrigeración interna	MDI	TS 100 U
<b>89281</b>	335	~5xD	Norma de fáb.	blanca	Microbrocas sin refrigeración interior	MDI	N
<b>89286</b>	146	~10xD	Norma de fáb.	blanca	Brocas espirales cil., largas	MDI	N
<b>89292</b>	229	4xD	Norma de fáb.	blanca	TS-Drills con refrigeración interna	MDI	TS 150 GG
<b>89293</b>	253	10xD	Norma de fáb.	blanca	TS-Drills con refrigeración interna	MDI	TS 150 GG
<b>89294</b>	245	7xD	Norma de fáb.	blanca	TS-Drills con refrigeración interna	MDI	TS 150 GG
<b>89295</b>	253	10xD	Norma de fáb.	blanca	TS-Drills con refrigeración interna	MDI	TS 150 GG
<b>89301</b>	163		DIN 8037	blanca	Brocas espirales, placa MD soldada	MD	N
<b>89302</b>	199		DIN 8041	blanca	Brocas espirales, placa MD soldada	MD	N
<b>89303</b>	164		DIN 8038	blanca	Brocas espirales, placa MD soldada	MD	N
<b>89306</b>	221	3xD	DIN 6538K	TiN	TS-Drills con refrigeración interna	MD	TS 80 U
<b>89307</b>	230	5xD	DIN 6538M	TiN	TS-Drills con refrigeración interna	MD	TS 80 U
<b>89308</b>	244	7xD	DIN 6538L	TiN	TS-Drills con refrigeración interna	MD	TS 80 U
<b>89401</b>	216	3xD	DIN 6539	nanoFIRE	TS-Drills sin refrigeración interna	MDI	TS 100 U
<b>89402</b>	212	3xD	DIN 6537K	nanoFIRE	TS-Drills sin refrigeración interna	MDI	TS 100 U
<b>89408</b>	232	5xD	DIN 6537L	nanoFIRE	TS-Drills con refrigeración interna	MDI	TS 100 U
<b>89410</b>	223	3xD	DIN 6537K	nanoFIRE	TS-Drills con refrigeración interna	MDI	TS 100 U

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89411	232	5xD	DIN 6537L	nanoFIRE	TS-Drills con refrigeración interna	MDI	TS 100 U
89412	246	7xD	Norma de fáb.	nanoFIRE	TS-Drills con refrigeración interna	MDI	TS 100 U
89413	212	3xD	DIN 6537K	nanoFIRE	TS-Drills sin refrigeración interna	MDI	TS 100 U
89414	218	5xD	DIN 6537L	nanoFIRE	TS-Drills sin refrigeración interna	MDI	TS 100 U
89415	223	3xD	DIN 6537K	nanoFIRE	TS-Drills con refrigeración interna	MDI	TS 100 U
89416	246	7xD	Norma de fáb.	nanoFIRE	TS-Drills con refrigeración interna	MDI	TS 100 U
89417	218	5xD	DIN 6537L	nanoFIRE	TS-Drills sin refrigeración interna	MDI	TS 100 U
89418	255	12xD	Norma de fáb.	punta nanoFIRE	TS-Drills con refrigeración interna	MDI	TS 100 U
89420	234	5xD	DIN 6537L	FIRE	TS-Drills con refrigeración interna	MDI	TS 100 R
89421	248	7xD	Norma de fáb.	FIRE	TS-Drills con refrigeración interna	MDI	TS 100 R
89422	214	3xD	DIN 6537K	TiAlSiN	TS-Drills sin refrigeración interna	MDI	TS 100 H
89423	225	3xD	DIN 6537K	TiAlSiN	TS-Drills con refrigeración interna	MDI	TS 100 H
89424	225	3xD	DIN 6537K	TiAlSiN	TS-Drills con refrigeración interna	MDI	TS 100 H
89425	236	5xD	DIN 6537L	TiAlSiN	TS-Drills con refrigeración interna	MDI	TS 100 H
89426	236	5xD	DIN 6537L	TiAlSiN	TS-Drills con refrigeración interna	MDI	TS 100 H
89427	250	7xD	Norma de fáb.	TiAlSiN	TS-Drills con refrigeración interna	MDI	TS 100 H
89450	227	3xD	DIN 6537K	AlTiN nano	TS-Drills con refrigeración interna	MDI	TS 100 INOX
89451	238	5xD	DIN 6537L	AlTiN nano	TS-Drills con refrigeración interna	MDI	TS 100 INOX
89460	242	5xD	DIN 6537L	nanoFIRE	TS 100 HPC	MDI	TS 100 HPC
89461	251	7xD	Norma de fáb.	nanoFIRE	TS 100 HPC	MDI	TS 100 HPC
89501	277	80.000	Norma de fáb.	blanca	Broca monolabio E 100	MDI	TLB E 100
89502	279	160.000	Norma de fáb.	blanca	Broca monolabio E 100	MDI	TLB E 100
89503	276	45.000	Norma de fáb.	blanca	Broca monolabio E 100	MDI	TLB E 100
89504	278	120.000	Norma de fáb.	blanca	Broca monolabio E 100	MDI	TLB E 100
89505	280	20xD	Norma de fáb.	TiN	Broca monolabio E 80	MD	TLB E 80
89506	282	40xD	Norma de fáb.	TiN	Broca monolabio E 80	MD	TLB E 80
89507	283	80xD	Norma de fáb.	TiN	Broca monolabio E 80	MD	TLB E 80
89508	295	30xD	Norma de fáb.	blanca	Brocas cañon con 2 labios de corte Z 80	MD	TLB Z 80
89509	281	30xD	Norma de fáb.	TiN	Broca monolabio E 80	MD	TLB E 80
89510	276	45.000	Norma de fáb.	AlTiN	Broca monolabio E 100	MDI	TLB E 100
89511	277	80.000	Norma de fáb.	AlTiN	Broca monolabio E 100	MDI	TLB E 100
89512	278	120.000	Norma de fáb.	AlTiN	Broca monolabio E 100	MDI	TLB E 100
89513	279	160.000	Norma de fáb.	AlTiN	Broca monolabio E 100	MDI	TLB E 100
89514	280	20xD	Norma de fáb.	TiCN	Broca monolabio E 80	MD	TLB E 80
89515	281	30xD	Norma de fáb.	TiCN	Broca monolabio E 80	MD	TLB E 80
89516	282	40xD	Norma de fáb.	TiCN	Broca monolabio E 80	MD	TLB E 80
89517	283	80xD	Norma de fáb.	TiCN	Broca monolabio E 80	MD	TLB E 80
89518	295	30xD	Norma de fáb.	blanca	Brocas cañon con 2 labios de corte Z 80	MD	TLB Z 80
89520	271	25xD	Norma de fáb.	AlTiN nano	Broca monolabio E 100	MDI	TLB E 100
89521	273	50xD	Norma de fáb.	AlTiN nano	Broca monolabio E 100	MDI	TLB E 100
89522	275	75xD	Norma de fáb.	AlTiN nano	Broca monolabio E 100	MDI	TLB E 100
89523	271	25xD	Norma de fáb.	blanca	Broca monolabio E 100	MDI	TLB E 100
89524	273	50xD	Norma de fáb.	blanca	Broca monolabio E 100	MDI	TLB E 100
89525	275	75xD	Norma de fáb.	blanca	Broca monolabio E 100	MDI	TLB E 100
89530	292	30xD	Norma de fáb.	TiN	Broca monolabio con plaquita E 800	MD	TLB E 800
89535	293		Norma de fáb.	TiN	Plaquetas de corte para brocas monolabio E 800	MDI	
89536	294		Norma de fáb.	TiN	Patines guía per brocas monolabio E 800	MDI	
89539	284	GL 600	Norma de fáb.	TiN	Broca monolabio E 80 XXL	MD	TLB E 80
89540	285	GL 800	Norma de fáb.	TiN	Broca monolabio E 80 XXL	MD	TLB E 80
89541	287	GL1200	Norma de fáb.	TiN	Broca monolabio E 80 XXL	MD	TLB E 80
89542	289	GL1600	Norma de fáb.	TiN	Broca monolabio E 80 XXL	MD	TLB E 80
89543	291	GL2000	Norma de fáb.	TiN	Broca monolabio E 80 XXL	MD	TLB E 80
89544	286	GL1000	Norma de fáb.	TiN	Broca monolabio E 80 XXL	MD	TLB E 80
89545	288	GL1400	Norma de fáb.	TiN	Broca monolabio E 80 XXL	MD	TLB E 80
89546	290	GL1800	Norma de fáb.	TiN	Broca monolabio E 80 XXL	MD	TLB E 80
89550	227	3xD	DIN 6537K	AlTiN nano	TS-Drills con refrigeración interna	MDI	TS 100 INOX
89551	238	5xD	DIN 6537L	AlTiN nano	TS-Drills con refrigeración interna	MDI	TS 100 INOX
89560	240	5xD	DIN 6537L	blanca	TS-Drills con refrigeración interna	MDI	TS 100 ALU

# SISTEMAS DE EXTRACCIÓN DE HERRAMIENTAS HARTNER

Las máquinas expendedoras y los armarios

TM 326



TM 426



TM 826

TM 626

NEW

TM 526



## Soluciones individuales para el almacenamiento y la gestión eficaz de las herramientas.

Los cuatro sistemas de extracción de herramientas TM 326, TM 426, TM 526 y TM 626 ofrecen opciones flexibles para el almacenamiento de herramientas a medida. En función de sus necesidades y del tamaño de su empresa, puede elegir entre distintos niveles de automatización. Existen opciones de extracción individuales, como cajones o sistemas en espiral.

Adaptamos el sistema de extracción de herramientas Hartner individualmente a sus preferencias y a las necesidades de su empresa. Así se aprovechan al máximo las posibilidades. Esto también lo confirman numerosos clientes satisfechos.



# EL SOFTWARE DE GESTIÓN DE HERRAMIENTAS

## Inteligencia integrada

Todos los sistemas de extracción de herramientas Hartner se controlan mediante el intuitivo software TM. Permite un manejo sencillo, rápido e intuitivo a través de la pantalla táctil integrada.

El software ofrece al cliente opciones de aplicación y ajuste individual en todos los ámbitos de la producción.

Gracias a su estructura modular, los procesos de producción pueden trazarse con precisión y todas las subáreas del ciclo de la herramienta, desde el almacenamiento hasta el aprovisionamiento y la eliminación, pueden visualizarse de forma transparente.

El software documenta todos los datos de movimiento relevantes de las existencias del almacén, activa las sugerencias de pedidos y permite realizar evaluaciones según diversos criterios.

Este informe completo y detallado ofrece a su empresa una multitud de potenciales de optimización en el circuito de las herramientas.

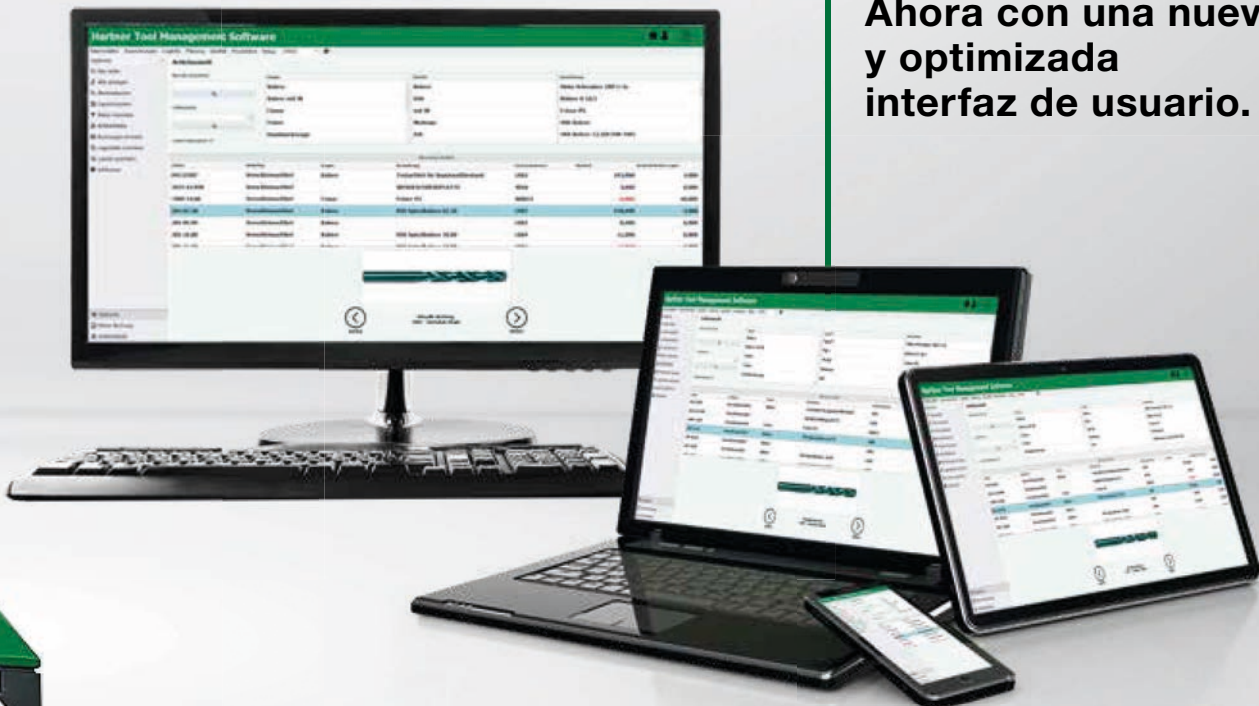
Además, las interfaces permiten la conexión con una amplia gama de sistemas de gestión de mercancías, así como la conexión en línea de sus proveedores mediante procesos de pedido automatizados.



# EL SOFTWARE DE GESTIÓN DE HERRAMIENTAS

## Servicios y ventajas para el cliente

- ▼ Interfaz de usuario y menú de navegación sencillos e intuitivos
- ▼ Creación de un panel de mando personalizado
- ▼ Creación de listas de herramientas
- ▼ Llamada directa a los sistemas CAD y a los programas gráficos para editar y visualizar los dibujos de las herramientas
- ▼ Amplias funciones de gestión del almacén con las que también se controlan las máquinas automáticas de herramientas Hartner TM
- ▼ Mapeo de la organización del cliente para una clara asignación de los costes de las retiradas de herramientas
- ▼ Análisis precisos del consumo según una amplia gama de criterios, por ejemplo, el consumo de herramientas por componente, máquina o área de producción
- ▼ Se pueden programar soluciones personalizadas según las necesidades del cliente
- ▼ Conexión a todos los sistemas comunes de ERP/PPS, gestión de herramientas y sistemas de elevación mediante la programación de las interfaces correspondientes
- ▼ Software multilingüe
- ▼ Creación de formularios individuales para clientes



**Ahora con una nueva y optimizada interfaz de usuario.**







# HARTNER














Precision Cutting Tools

Brocas de  
mango cilíndrico

## BROCAS DE MANGO CILÍNDRICO







fabricada en HSS, HSS-E, HSS-E-PM, metal duro  
brillante y recubierta










P	M	K	N	S	H	Norma	Tipo	Material de corte	Acabado	Dirección de corte	Forma del mango	Profundidad	d1/mm	Nº artículo	Página
						DIN 1897	N	HSS		derecha	cil.	~3xD	0,500 - 39,500	81110	24
						DIN 1897	N	HSS		izquierda	cil.	~3xD	0,500 - 36,500	81115	26
						DIN 1897	H	HSS		derecha	cil.	~3xD	1,200 - 16,000	81120	28
						DIN 1897	W	HSS		derecha	cil.	~3xD	1,500 - 16,000	81130	29
						DIN 1897	FN	HSS		derecha	cil.	~3xD	1,500 - 15,500	81140	30
						DIN 1897	FN	HSS		izquierda	cil.	~3xD	1,000 - 12,500	81145	31
						DIN 1897	N	HSS		derecha	cil.	~3xD	1,000 - 25,000	84400	33
						DIN 1897	N	HSS		derecha	cil.	~3xD	1,000 - 25,000	84501	33
						DIN 1897	N	M42		derecha	cil.	~3xD	1,000 - 15,000	81112	35
						DIN 1897	V	HSS-E		derecha	cil.	~3xD	0,400 - 25,000	81171	37
						DIN 1897	IS	HSS-E		derecha	cil.	~3xD	1,000 - 12,000	81173	39
						DIN 1897	V	HSS-E		derecha	cil.	~3xD	0,500 - 15,000	84503	40
						DIN 1897	V	HSS-E		derecha	cil.	~3xD	0,500 - 15,000	84803	40
						DIN 1897	FU 500 DZ	HSS-E		derecha	cil.	~3xD	1,000 - 14,000	84806	42

P	M	K	N	S	H	Norma	Tipo	Material de corte	Acabado	Dirección de corte	Forma del mango	Profundidad	d1/mm	Nº artículo	Página
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## Brocas espirales extra cortas

	•	•	•	•		DIN 1897	FU 500 DZ	HSS-E	○	derecha	cil.	~3xD	1,000 - 14,000	84808	42
	○	•	○	○	•	DIN 1897	IS	HSS-E	Ⓢ	derecha	cil.	~3xD	1,000 - 13,000	81178	44
	•	○	•	○	○	DIN 1897	FN 500	HSS-E-PM	Ⓡ	derecha	cil.	~3xD	1,000 - 13,500	84511	46
	○	○	○	•	○	DIN 6539	N	MDI	○	derecha	cil.	~3xD	0,800 - 16,000	89235	48
	○	○	○	•	○	Norma de fáb.	N	MDI	Ⓡ	derecha	cil.	~3xD	1,000 - 16,000	89253	50
	○	○	○	○	○	Norma de fáb.	N	MDI	○	derecha	cil.	~3xD	0,500 - 6,100	89246	52



















## Brocas espirales cil., cortas

	•	•	○	○		DIN 338	N	HSS	○ <sub>z,36</sub> <sup>-0</sup>	derecha	cil.	~5xD	0,200 - 20,000	81010	53
	•	•	○	○		DIN 338	N	HSS	○ <sub>6,00</sub> <sup>-0</sup>	izquierda	cil.	~5xD	0,250 - 17,000	81015	57
	•	•	○	○		DIN 338	N	HSS	●	derecha	cil.	~5xD	3,000 - 13,000	81017	59
			•	○		DIN 338	H	HSS	○	derecha	cil.	~5xD	0,300 - 20,000	81020	60
			•	○		DIN 338	H	HSS	○	izquierda	cil.	~5xD	0,500 - 16,000	81025	62
			•	○		DIN 338	W	HSS	○	derecha	cil.	~5xD	0,250 - 16,500	81030	64
			•	○		DIN 338	W	HSS	○	izquierda	cil.	~5xD	0,500 - 15,000	81035	66



P	M	K	N	S	H	Norma	Tipo	Material de corte	Acabado	Dirección de corte	Forma del mango	Profundidad	d1/mm	Nº artículo	Página
						DIN 338	FN	HSS		derecha	cil.	~5xD	0,800 - 16,000	81040	67
						DIN 338	FN	HSS		izquierda	cil.	~5xD	1,400 - 16,000	81045	69
						DIN 338	N	HSS		derecha	cil.	~5xD	0,400 - 19,500	84405	71
						DIN 338	N	HSS		derecha	cil.	~5xD	1,000 - 16,000	84406	73
						DIN 338	FN	HSS		derecha	cil.	~5xD	1,000 - 16,000	84415	75
						DIN 338	FN	HSS		derecha	cil.	~5xD	1,000 - 16,000	84502	75
						DIN 338	N	M42		derecha	cil.	~5xD	1,000 - 14,000	81012	77
						DIN 338	N	M42		derecha	cil.	~5xD	1,000 - 13,000	81018	79
						DIN 338	N	M42		derecha	cil.	~5xD	1,000 - 16,000	81019	81
						DIN 338	N	HSS-E		derecha	cil.	~5xD	0,200 - 20,000	81011	83
						DIN 338	IS	HSS-E		derecha	cil.	~5xD	1,000 - 13,000	81013	85
						DIN 338	FN	HSS-E		derecha	cil.	~5xD	1,000 - 13,000	81041	87
						DIN 338	S	HSS-E		derecha	cil.	~5xD	0,200 - 17,500	81061	89
						DIN 338	FN	HSS-E		derecha	cil.	~5xD	1,000 - 13,000	84800	91

P	M	K	N	S	H	Norma	Tipo	Material de corte	Acabado	Dirección de corte	Forma del mango	Profundidad	d1/mm	Nº artículo	Página
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## Brocas espirales cil., cortas

	•	○	•	•	○	DIN 338	FN	HSS-E		derecha	cil.	~5xD	1,000 - 13,000	84504	91
	•	•	•	•	○	DIN 338	FU 500 DZ	HSS-E		derecha	cil.	~5xD	1,000 - 14,000	84804	93
	•	•	•	•	○	DIN 338	FU 500 DZ	HSS-E		derecha	cil.	~5xD	1,000 - 14,000	84802	93
	○	•	•	•	○	DIN 338	S	HSS-E		derecha	cil.	~5xD	0,500 - 13,000	84807	95
	○	•	•	•	○	DIN 338	S	HSS-E		derecha	cil.	~5xD	0,500 - 13,000	84505	95
	○	•	○	○	○	DIN 338	IS	HSS-E		derecha	cil.	~5xD	1,000 - 13,000	81078	97
	•	○	•	○	○	DIN 338	FN 500 DZ	HSS-E-PM		derecha	cil.	~5xD	1,000 - 14,000	84811	99
	○	○	○	•	○	Norma de fáb.	N	MDI		derecha	cil.	~5xD	1,000 - 12,000	89244	100
	○	○	○	•	○	Norma de fáb.	N	MDI		derecha	cil.	~5xD	1,000 - 12,000	89261	102

## HX 500

	•	○	•	○	○	Norma de fáb.	HX 500	M42		derecha	cil.	3xD	1,000 - 13,000	81000	104
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## Brocas espirales con mango cil. reforzado

	•	•	•	•	○	Norma de fáb.	FU 500	HSS-E-PM		derecha	HA	~3xD	1,000 - 20,000	84805	105
	•	•	•	•	○	Norma de fáb.	FU 500	HSS-E-PM		derecha	HA	~5xD	2,000 - 20,000	84801	107

P	M	K	N	S	H	Norma	Tipo	Material de corte	Acabado	Dirección de corte	Forma del mango	Profundidad	d1/mm	Nº artículo	Página
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## Brocas espirales con mango cil. reforzado



•	○	•	○	○	○	Norma de fáb.	FN 500	HSS-E-PM	Ⓡ	derecha	HA	~5xD	2,000 - 13,000	84507	109
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## Juegos de brocas helicoidales



•	○	•	○	○	○	Norma de fáb.								88303	111
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•	○	•	○	○	○	DIN 1897	P2000	HSS-E	Ⓜ	derecha	cil.	~3xD		88015	112
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•	○	•	○	○	○	DIN 338	N	HSS	Ⓢ	derecha	cil.	~5xD		88013	112
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•	○	•	○	○	○	DIN 338	N	HSS	Ⓣ	derecha	cil.	~5xD		88016	113
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P	M	K	N	S	H	Norma	Tipo	Material de corte	Acabado	Dirección de corte	Forma del mango	Profundidad	d1/mm	Nº artículo	Página
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## Juegos de brocas helicoidales



○	●			●		DIN 338	S	HSS-E	○	derecha	cil.	~5xD		<b>88014</b>	113
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●		●	○			DIN 338	N	HSS-E	●	derecha	cil.	~5xD		<b>88026</b>	114
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●	●	●	●	●	○	DIN 338	N	M42	●	derecha	cil.	~5xD		<b>88018</b>	114
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## Brocas de puntear NC



●	○	●	●	○		Norma de fáb.	N	HSS	○	derecha	cil.	3,000 - 25,000		<b>81191</b>	115
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●	○	●	●	○		Norma de fáb.	N	HSS	T	derecha	cil.	3,000 - 25,000		<b>84434</b>	115
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●	○	●	●	●		Norma de fáb.	N	HSS	○	derecha	cil.	3,000 - 25,000		<b>81192</b>	116
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●	○	●	●	○		Norma de fáb.	N	HSS	T	derecha	cil.	3,000 - 25,000		<b>84435</b>	116
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○	○	○	○	○	○	Norma de fáb.	N	MDI	○	derecha	cil.	4,000 - 20,000		<b>89242</b>	117
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P	M	K	N	S	H	Norma	Tipo	Material de corte	Acabado	Dirección de corte	Forma del mango	Profundidad	d1/mm	Nº artículo	Página
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## Brocas de puntear NC



○	○	○	○	○	○	Norma de fáb.	N	<b>MDI</b>	○	derecha	HB		4,000 - 20,000	<b>89249</b>	117
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○	○	○	○	○	○	Norma de fáb.	N	<b>MDI</b>	○	derecha	HA		4,000 - 20,000	<b>89243</b>	118
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## Brocas para carrocería



●	○	●	●	●	○	Norma de fáb.	N	<b>HSS</b>	○ <sub>2,36</sub> <sup>-0</sup>	derecha	cil.		2,000 - 10,000	<b>81190</b>	119
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## Brocas con canal de refrigeración



●	●	●	●	●	○	Norma de fáb.	FN	<b>HSS-E</b>	○	derecha	HE	~5xD	5,000 - 20,000	<b>82761</b>	120
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●	●	●	●	●	○	Norma de fáb.	FN	<b>HSS-E</b>	Ⓡ	derecha	HE	~5xD	5,000 - 20,000	<b>84461</b>	120
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●	○	●	●	○	○	Norma de fáb.	FN	<b>HSS</b>	○	derecha	cil.	~10xD	3,000 - 13,000	<b>82710</b>	121
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## Brocas para casquillos



●	○	○	○	○	○	DIN 339	N	<b>HSS</b>	○ <sub>2,36</sub> <sup>-0</sup>	derecha	cil.	~10xD	0,800 - 19,000	<b>81210</b>	122
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## Brocas espirales cil., largas



●	○	○	○	○	○	DIN 340	N	<b>HSS</b>	○ <sub>2,36</sub> <sup>-0</sup>	derecha	cil.	~10xD	0,400 - 22,000	<b>81310</b>	124
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●	○	○	○	○	○	DIN 340	N	<b>HSS</b>	○ <sub>6,00</sub> <sup>-0</sup>	izquierda	cil.	~10xD	0,900 - 12,000	<b>81315</b>	126
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●	○	○	○	○	○	DIN 340	N	<b>HSS</b>	○	derecha	cil.	~10xD	3,100 - 12,200	<b>81317</b>	127
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P	M	K	N	S	H	Norma	Tipo	Material de corte	Acabado	Dirección de corte	Forma del mango	Profundidad	d1/mm	Nº artículo	Página
						DIN 340	H	HSS	○	derecha	cil.	~10xD	0,500 - 14,500	81320	128
						DIN 340	W	HSS	○	derecha	cil.	~10xD	0,500 - 17,000	81330	129
						DIN 340	FN	HSS	⊖ <sup>+0</sup> <sub>2,36</sub>	derecha	cil.	~10xD	0,900 - 14,000	81340	131
						DIN 340	FW	HSS	○	derecha	cil.	~10xD	1,000 - 14,000	81350	133
						DIN 340	N	HSS	Ⓣ	derecha	cil.	~10xD	0,500 - 16,000	84418	135
						DIN 340	FN	HSS	Ⓣ	derecha	cil.	~10xD	1,000 - 14,000	84423	136
						DIN 340	FN	HSS	Ⓣ	derecha	cil.	~10xD	1,000 - 14,000	84506	136
						DIN 340	N	HSS-E	⊖ <sup>+0</sup> <sub>2,36</sub>	derecha	cil.	~10xD	0,500 - 12,500	81311	138
						DIN 340	FN	HSS-E	⊖ <sup>+0</sup> <sub>2,36</sub>	derecha	cil.	~10xD	1,000 - 16,000	81341	139
						DIN 340	S	HSS-E	○	derecha	cil.	~10xD	1,000 - 13,000	81361	141
						DIN 340	S	HSS-E	Ⓣ	derecha	cil.	~10xD	1,000 - 13,000	81362	141
						DIN 340	FU 500 DZ	HSS-E	○	derecha	cil.	~10xD	1,000 - 14,000	84814	143
						DIN 340	FU 500 DZ	HSS-E	Ⓣ	derecha	cil.	~10xD	1,000 - 14,000	84812	143
						DIN 340	FN	HSS-E	Ⓣ	derecha	cil.	~10xD	1,000 - 12,000	84508	145

P	M	K	N	S	H	Norma	Tipo	Material de corte	Acabado	Dirección de corte	Forma del mango	Profundidad	d1/mm	Nº artículo	Página
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## Brocas espirales cil., largas



○		○				Norma de fáb.	N	MDI	○	derecha	cil.	~10xD	0,500 - 1,500	89286	146
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## Brocas espirales, extra largas, serie 1



●		●	○			DIN 1869	N	HSS		derecha	cil.	~15xD	1,600 - 13,000	81410	147
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●		●	●			DIN 1869	FN	HSS		derecha	cil.	~15xD	2,000 - 13,000	81440	148
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○			●			DIN 1869	FW	HSS	○	derecha	cil.	~15xD	2,000 - 9,500	81450	149
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●		●	●			DIN 1869	FN	HSS		derecha	cil.	~15xD	2,000 - 12,000	84425	150
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●	●	●	●	○		DIN 1869	FN	HSS-E		derecha	cil.	~15xD	3,000 - 10,000	81441	151
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## Brocas espirales, extra largas, serie 2



●		●	○			DIN 1869	N	HSS	●	derecha	cil.	~20xD	3,000 - 12,000	81510	152
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●		●	●			DIN 1869	FN	HSS		derecha	cil.	~20xD	2,000 - 13,000	81540	153
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●		●	●	○		DIN 1869	FN	HSS		derecha	cil.	~20xD	3,000 - 8,500	84426	154
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●	●	●	●	○		DIN 1869	FN	HSS-E		derecha	cil.	~20xD	3,000 - 10,000	81541	155
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## Brocas espirales, extra largas, serie 3



●		●	○			DIN 1869	N	HSS	●	derecha	cil.	~25xD	3,500 - 12,000	81610	156
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P	M	K	N	S	H	Norma	Tipo	Material de corte	Acabado	Dirección de corte	Forma del mango	Profundidad	d1/mm	Nº artículo	Página
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## Brocas espirales, extra largas, serie 3



•	•	•	•	•		DIN 1869	FN	HSS	☉	derecha	cil.	~25xD	2,500 - 13,000	81640	157
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•	•	•	•	•		DIN 1869	FN	HSS-E	☉	derecha	cil.	~25xD	2,500 - 13,000	81641	158
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## Brocas espirales, largo especial



•	•	•	•	•		Norma de fáb.	FN	HSS	☉	derecha	cil.	>25xD	6,000 - 12,000	81740	159
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•	•	•	•	•		Norma de fáb.	FN	HSS	○	derecha	cil.	>25xD	8,000 - 12,000	81750	160
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•	•	•	•	•		Norma de fáb.	FN	HSS	○	derecha	cil.	>25xD	10,000 - 12,000	81760	161
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## Brocas para pasadores cónicos



•	○	•	○	•		DIN 1898	N	HSS	☉ <sub>2,36</sub>	derecha	cil.		2,000 - 12,000	81810	162
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## Brocas espirales, placa MD soldada



○	•	○	•	○		DIN 8037	N	placa MD soldada	○	derecha	cil.		2,600 - 20,000	89301	163
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○	•	○	•	○		DIN 8038	N	placa MD soldada	○	derecha	cil.		3,100 - 19,000	89303	164
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## Brocas escariadoras, cil.



•	○	•	○	•		DIN 344	N	HSS	☉	derecha	cil.		3,800 - 15,000	86010	165
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## Brocas espirales extra cortas

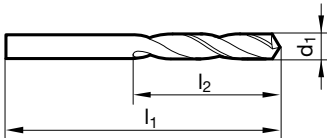
Nº artículo 81110



P	M	K	N	S	H
•		•	○		



vaciado de punta  $\geq \varnothing 1,000$  • entrada cónica • para aplic. en tornos autom./revolver • para máquinas de taladrar manuales  
 secciones delgadas • aceros y fundición de aceros (aleados y sin alear) • fundición gris, fundición maleable, fundición esférica • hierro  
 sinterizado, argentón y grafito



d1	inch	l1	l2	d1	inch	l1	l2
mm		mm	mm	mm		mm	mm
0,500		20,000	3,000	3,250		49,000	18,000
0,600		21,000	3,500	3,300		49,000	18,000
0,700		23,000	4,500	3,350		49,000	18,000
0,800		24,000	5,000	3,400		52,000	20,000
0,850		24,000	5,000	3,500		52,000	20,000
0,900		25,000	5,500	3,600		52,000	20,000
1,000		26,000	6,000	3,650		52,000	20,000
1,050		26,000	6,000	3,700		52,000	20,000
1,100		28,000	7,000	3,750		52,000	20,000
1,200		30,000	8,000	3,800		55,000	22,000
1,250		30,000	8,000	3,850		55,000	22,000
1,300		30,000	8,000	3,900		55,000	22,000
1,350		32,000	9,000	4,000		55,000	22,000
1,400		32,000	9,000	4,100		55,000	22,000
1,500		32,000	9,000	4,200		55,000	22,000
1,550		34,000	10,000	4,250		55,000	22,000
1,600		34,000	10,000	4,300		58,000	24,000
1,650		34,000	10,000	4,450		58,000	24,000
1,700		34,000	10,000	4,500		58,000	24,000
1,750		36,000	11,000	4,600		58,000	24,000
1,800		36,000	11,000	4,650		58,000	24,000
1,900		36,000	11,000	4,700		58,000	24,000
1,950		38,000	12,000	4,750		58,000	24,000
2,000		38,000	12,000	4,800		62,000	26,000
2,050		38,000	12,000	4,850		62,000	26,000
2,100		38,000	12,000	4,900		62,000	26,000
2,200		40,000	13,000	4,950		62,000	26,000
2,250		40,000	13,000	5,000		62,000	26,000
2,300		40,000	13,000	5,050		62,000	26,000
2,400		43,000	14,000	5,100		62,000	26,000
2,500		43,000	14,000	5,200		62,000	26,000
2,550		43,000	14,000	5,250		62,000	26,000
2,600		43,000	14,000	5,300		62,000	26,000
2,700		46,000	16,000	5,400		66,000	28,000
2,750		46,000	16,000	5,500		66,000	28,000
2,800		46,000	16,000	5,600		66,000	28,000
2,900		46,000	16,000	5,700		66,000	28,000
2,950		46,000	16,000	5,750		66,000	28,000
3,000		46,000	16,000	5,800		66,000	28,000
3,050		49,000	18,000	5,850		66,000	28,000
3,100		49,000	18,000	5,900		66,000	28,000
3,200		49,000	18,000	6,000		66,000	28,000



## Brocas espirales extra cortas

d1 mm	inch	l1 mm	l2 mm	d1 mm	inch	l1 mm	l2 mm
6,100		70,000	31,000	12,000		102,000	51,000
6,150		70,000	31,000	12,050		102,000	51,000
6,200		70,000	31,000	12,200		102,000	51,000
6,250		70,000	31,000	12,300	31/64	102,000	51,000
6,300		70,000	31,000	12,500		102,000	51,000
6,350	1/4	70,000	31,000	12,600		102,000	51,000
6,500		70,000	31,000	12,700	1/2	102,000	51,000
6,600		70,000	31,000	12,750		102,000	51,000
6,700		70,000	31,000	12,900		102,000	51,000
6,750	17/64	74,000	34,000	13,000		102,000	51,000
6,800		74,000	34,000	13,100	33/64	102,000	51,000
6,900		74,000	34,000	13,200		102,000	51,000
7,000		74,000	34,000	13,500		107,000	54,000
7,100		74,000	34,000	13,600		107,000	54,000
7,400		74,000	34,000	13,750		107,000	54,000
7,500		74,000	34,000	14,000		107,000	54,000
7,600		79,000	37,000	14,200		111,000	56,000
7,700		79,000	37,000	14,250		111,000	56,000
7,750		79,000	37,000	14,300		111,000	56,000
7,800		79,000	37,000	14,500		111,000	56,000
7,900		79,000	37,000	14,750		111,000	56,000
8,000		79,000	37,000	15,000		111,000	56,000
8,100		79,000	37,000	15,100		115,000	58,000
8,200		79,000	37,000	15,250		115,000	58,000
8,250		79,000	37,000	15,500		115,000	58,000
8,300		79,000	37,000	15,750		115,000	58,000
8,350		79,000	37,000	16,000		115,000	58,000
8,400		79,000	37,000	16,250		119,000	60,000
8,500		79,000	37,000	16,270	41/64	119,000	60,000
8,600		84,000	40,000	16,500		119,000	60,000
8,700		84,000	40,000	17,000		119,000	60,000
8,750		84,000	40,000	17,500		123,000	62,000
8,800		84,000	40,000	18,000		123,000	62,000
8,900		84,000	40,000	18,200		127,000	64,000
9,000		84,000	40,000	18,500		127,000	64,000
9,100		84,000	40,000	18,750		127,000	64,000
9,200		84,000	40,000	19,000		127,000	64,000
9,250		84,000	40,000	19,100		131,000	66,000
9,300		84,000	40,000	19,500		131,000	66,000
9,500		84,000	40,000	20,000		131,000	66,000
9,600		89,000	43,000	20,500		136,000	68,000
9,700		89,000	43,000	21,000		136,000	68,000
9,750		89,000	43,000	21,500		141,000	70,000
9,800		89,000	43,000	22,000		141,000	70,000
9,900		89,000	43,000	22,500		146,000	72,000
10,000		89,000	43,000	23,000		146,000	72,000
10,050		89,000	43,000	23,500		146,000	72,000
10,100		89,000	43,000	24,000		151,000	75,000
10,200		89,000	43,000	24,500		151,000	75,000
10,250		89,000	43,000	25,000	63/64	151,000	75,000
10,300		89,000	43,000	26,000		156,000	78,000
10,400		89,000	43,000	26,500		156,000	78,000
10,500		89,000	43,000	27,000		162,000	81,000
10,600		89,000	43,000	27,500		162,000	81,000
10,700		95,000	47,000	28,000		162,000	81,000
10,750		95,000	47,000	28,750		168,000	84,000
10,800		95,000	47,000	29,000		168,000	84,000
10,900		95,000	47,000	30,000		168,000	84,000
11,000		95,000	47,000	31,000		174,000	87,000
11,100		95,000	47,000	32,000		180,000	90,000
11,200		95,000	47,000	39,500		200,000	100,000
11,400		95,000	47,000				
11,500		95,000	47,000				
11,700		95,000	47,000				
11,750		95,000	47,000				
11,800		95,000	47,000				



## Brocas espirales extra cortas

Nº artículo 81115

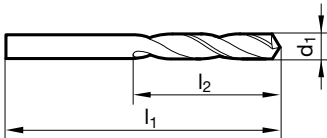


P	M	K	N	S	H
•		•	○		



vaciado de punta  $\geq \varnothing 14,200$  • entrada cónica • para aplic. en tornos autom./revolver

secciones delgadas • aceros y fundición de aceros (aleados y sin alea) • fundición gris, fundición maleable, fundición esférica • hierro sinterizado, argentón y grafito



d1		l1	l2	d1		l1	l2
mm	inch	mm	mm	mm	inch	mm	mm
0,500		20,000	3,000	3,500		52,000	20,000
0,550		21,000	3,500	3,700		52,000	20,000
0,700		23,000	4,500	3,750		52,000	20,000
0,750		23,000	4,500	3,800		55,000	22,000
0,800		24,000	5,000	3,900		55,000	22,000
0,850		24,000	5,000	4,000		55,000	22,000
0,950		25,000	5,500	4,100		55,000	22,000
1,000		26,000	6,000	4,250		55,000	22,000
1,150		28,000	7,000	4,300		58,000	24,000
1,250		30,000	8,000	4,400		58,000	24,000
1,330		32,000	9,000	4,500		58,000	24,000
1,350		32,000	9,000	4,600		58,000	24,000
1,500		32,000	9,000	4,700		58,000	24,000
1,550		34,000	10,000	4,750		58,000	24,000
1,600		34,000	10,000	4,800		62,000	26,000
1,710		36,000	11,000	4,900		62,000	26,000
1,800		36,000	11,000	5,000		62,000	26,000
1,830		36,000	11,000	5,100		62,000	26,000
1,900		36,000	11,000	5,200		62,000	26,000
1,980	5/64	38,000	12,000	5,300		62,000	26,000
2,000		38,000	12,000	5,400		66,000	28,000
2,100		38,000	12,000	5,500		66,000	28,000
2,200		40,000	13,000	5,600		66,000	28,000
2,400		43,000	14,000	5,700		66,000	28,000
2,420		43,000	14,000	5,750		66,000	28,000
2,500		43,000	14,000	5,800		66,000	28,000
2,550		43,000	14,000	5,900		66,000	28,000
2,600		43,000	14,000	6,000		66,000	28,000
2,720		46,000	16,000	6,100		70,000	31,000
2,750		46,000	16,000	6,150		70,000	31,000
2,820		46,000	16,000	6,200		70,000	31,000
2,850		46,000	16,000	6,400		70,000	31,000
2,900		46,000	16,000	6,600		70,000	31,000
2,950		46,000	16,000	6,700		70,000	31,000
3,000		46,000	16,000	6,750	17/64	74,000	34,000
3,010		49,000	18,000	6,800		74,000	34,000
3,050		49,000	18,000	6,900		74,000	34,000
3,100		49,000	18,000	7,000		74,000	34,000
3,200		49,000	18,000	7,100		74,000	34,000
3,350		49,000	18,000	7,200		74,000	34,000
3,400		52,000	20,000	7,300		74,000	34,000
3,450		52,000	20,000	7,400		74,000	34,000



## Brocas espirales extra cortas

d1 mm	inch	l1 mm	l2 mm	d1 mm	inch	l1 mm	l2 mm
7,600		79,000	37,000	11,800		95,000	47,000
7,700		79,000	37,000	11,900		102,000	51,000
7,750		79,000	37,000	12,000		102,000	51,000
7,900		79,000	37,000	12,100		102,000	51,000
8,000		79,000	37,000	12,250		102,000	51,000
8,100		79,000	37,000	12,400		102,000	51,000
8,200		79,000	37,000	12,500		102,000	51,000
8,250		79,000	37,000	12,600		102,000	51,000
8,300		79,000	37,000	12,750		102,000	51,000
8,400		79,000	37,000	12,800		102,000	51,000
8,500		79,000	37,000	12,900		102,000	51,000
8,600		84,000	40,000	13,000		102,000	51,000
8,700		84,000	40,000	13,200		102,000	51,000
8,750		84,000	40,000	13,250		107,000	54,000
8,800		84,000	40,000	13,400		107,000	54,000
8,900		84,000	40,000	13,500		107,000	54,000
9,000		84,000	40,000	13,600		107,000	54,000
9,100		84,000	40,000	13,750		107,000	54,000
9,200		84,000	40,000	13,800		107,000	54,000
9,250		84,000	40,000	14,000		107,000	54,000
9,400		84,000	40,000	14,200		111,000	56,000
9,500		84,000	40,000	14,300		111,000	56,000
9,600		89,000	43,000	14,400		111,000	56,000
9,700		89,000	43,000	14,500		111,000	56,000
9,750		89,000	43,000	14,700		111,000	56,000
10,000		89,000	43,000	14,750		111,000	56,000
10,100		89,000	43,000	15,000		111,000	56,000
10,200		89,000	43,000	15,500		115,000	58,000
10,300		89,000	43,000	16,000		115,000	58,000
10,500		89,000	43,000	16,500		119,000	60,000
10,600		89,000	43,000	17,000		119,000	60,000
10,700		95,000	47,000	18,000		123,000	62,000
10,750		95,000	47,000	19,000		127,000	64,000
10,800		95,000	47,000	20,000		131,000	66,000
11,000		95,000	47,000	21,000		136,000	68,000
11,100		95,000	47,000	22,000		141,000	70,000
11,200		95,000	47,000	29,750		168,000	84,000
11,250		95,000	47,000	30,000		168,000	84,000
11,300		95,000	47,000	31,500		174,000	87,000
11,400		95,000	47,000	36,000		193,000	96,000
11,500		95,000	47,000	36,500		193,000	96,000
11,750		95,000	47,000				

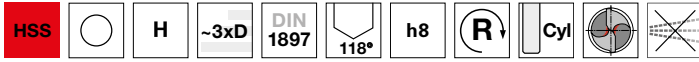


## Brocas espirales extra cortas

Nº artículo 81120

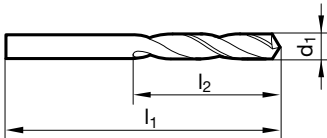


P	M	K	N	S	H
			•		



vaciado de punta  $\geq \varnothing 15,000$  • entrada cónica

materiales duros y quebradizos • latón, aleaciones de magnesio • bronce y bronce al fósforo • pizarra, mica, Pertinax



d1		l1	l2	d1		l1	l2
mm	inch	mm	mm	mm	inch	mm	mm
1,200		30,000	8,000	5,000		62,000	26,000
1,400		32,000	9,000	5,100		62,000	26,000
1,500		32,000	9,000	5,200		62,000	26,000
1,600		34,000	10,000	5,300		62,000	26,000
1,700		34,000	10,000	5,400		66,000	28,000
1,900		36,000	11,000	5,500		66,000	28,000
2,000		38,000	12,000	5,600		66,000	28,000
2,350		40,000	13,000	5,700		66,000	28,000
2,380	3/32	43,000	14,000	5,800		66,000	28,000
2,400		43,000	14,000	6,000		66,000	28,000
2,500		43,000	14,000	6,100		70,000	31,000
2,600		43,000	14,000	6,200		70,000	31,000
2,700		46,000	16,000	6,500		70,000	31,000
2,800		46,000	16,000	7,000		74,000	34,000
2,900		46,000	16,000	7,500		74,000	34,000
2,950		46,000	16,000	8,000		79,000	37,000
3,000		46,000	16,000	8,500		79,000	37,000
3,100		49,000	18,000	8,600		84,000	40,000
3,200		49,000	18,000	8,700		84,000	40,000
3,250		49,000	18,000	9,000		84,000	40,000
3,300		49,000	18,000	10,000		89,000	43,000
3,400		52,000	20,000	10,200		89,000	43,000
3,500		52,000	20,000	10,500		89,000	43,000
3,600		52,000	20,000	12,000		102,000	51,000
3,800		55,000	22,000	13,000		102,000	51,000
3,900		55,000	22,000	14,000		107,000	54,000
4,000		55,000	22,000	15,000		111,000	56,000
4,100		55,000	22,000	16,000		115,000	58,000
4,200		55,000	22,000				
4,300		58,000	24,000				
4,400		58,000	24,000				
4,500		58,000	24,000				
4,600		58,000	24,000				
4,700		58,000	24,000				
4,800		62,000	26,000				
4,900		62,000	26,000				



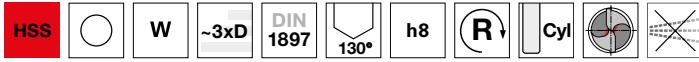


## Brocas espirales extra cortas

Nº artículo 81130

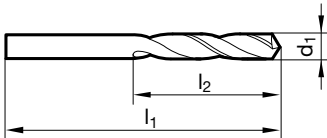


P	M	K	N	S	H
			•		



vaciado de punta  $\geq \varnothing 2,500$  • entrada cónica

mat. blandos y de viruta larga • aluminio, alea. de alum. (de vir. larga) • zink, cobre fino, siluminio, electrón • plásticos (blandos), madera



d1 mm	l1 mm	l2 mm	d1 mm	l1 mm	l2 mm
1,500	32,000	9,000	5,200	62,000	26,000
2,000	38,000	12,000	5,300	62,000	26,000
2,200	40,000	13,000	5,400	66,000	28,000
2,300	40,000	13,000	5,700	66,000	28,000
2,500	43,000	14,000	5,800	66,000	28,000
2,600	43,000	14,000	6,000	66,000	28,000
2,800	46,000	16,000	6,400	70,000	31,000
2,900	46,000	16,000	6,500	70,000	31,000
3,000	46,000	16,000	6,800	74,000	34,000
3,200	49,000	18,000	7,000	74,000	34,000
3,300	49,000	18,000	7,500	74,000	34,000
3,400	52,000	20,000	7,800	79,000	37,000
3,500	52,000	20,000	8,000	79,000	37,000
3,600	52,000	20,000	8,500	79,000	37,000
3,800	55,000	22,000	9,000	84,000	40,000
3,900	55,000	22,000	10,000	89,000	43,000
4,000	55,000	22,000	10,500	89,000	43,000
4,100	55,000	22,000	11,000	95,000	47,000
4,200	55,000	22,000	12,000	102,000	51,000
4,300	58,000	24,000	13,000	102,000	51,000
4,500	58,000	24,000	15,000	111,000	56,000
4,900	62,000	26,000	16,000	115,000	58,000
5,000	62,000	26,000			
5,100	62,000	26,000			



# HARTNER

## Brocas espirales extra cortas

Nº artículo 81140

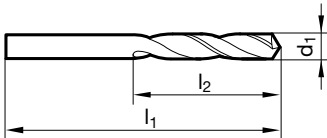


P	M	K	N	S	H
•	○	○	•		



vaciado de punta  $\geq \phi 1,500$  • entrada cónica • para aceros muy duros

aceros para tornos automáticos • aceros inoxidables y resistentes al ácido • aceros templados y revenidos de dureza hasta aprox. 800 N/mm<sup>2</sup> • aleaciones de cobre y de Al de virutas cortas o semilargas



d1	inch	l1	l2	d1	inch	l1	l2
mm		mm	mm	mm		mm	mm
1,500		32,000	9,000	6,600		70,000	31,000
1,600		34,000	10,000	6,700		70,000	31,000
1,800		36,000	11,000	6,800		74,000	34,000
2,000		38,000	12,000	7,000		74,000	34,000
2,100		38,000	12,000	7,100		74,000	34,000
2,200		40,000	13,000	7,300		74,000	34,000
2,350		40,000	13,000	7,400		74,000	34,000
2,400		43,000	14,000	7,800		79,000	37,000
2,500		43,000	14,000	8,000		79,000	37,000
2,600		43,000	14,000	8,100		79,000	37,000
2,700		46,000	16,000	8,300		79,000	37,000
2,800		46,000	16,000	8,400		79,000	37,000
2,900		46,000	16,000	8,500		79,000	37,000
3,000		46,000	16,000	8,600		84,000	40,000
3,100		49,000	18,000	8,800		84,000	40,000
3,150		49,000	18,000	9,000		84,000	40,000
3,300		49,000	18,000	9,100		84,000	40,000
3,500		52,000	20,000	9,200		84,000	40,000
3,700		52,000	20,000	9,300		84,000	40,000
4,000		55,000	22,000	9,400		84,000	40,000
4,100		55,000	22,000	9,500		84,000	40,000
4,200		55,000	22,000	9,600		89,000	43,000
4,300		58,000	24,000	9,700		89,000	43,000
4,600		58,000	24,000	9,800		89,000	43,000
4,700		58,000	24,000	10,000		89,000	43,000
4,800		62,000	26,000	10,500		89,000	43,000
4,900		62,000	26,000	11,000		95,000	47,000
5,000		62,000	26,000	11,500		95,000	47,000
5,100		62,000	26,000	12,000		102,000	51,000
5,200		62,000	26,000	12,300	31/64	102,000	51,000
5,300		62,000	26,000	12,500		102,000	51,000
5,400		66,000	28,000	13,000		102,000	51,000
5,500		66,000	28,000	15,000		111,000	56,000
5,600		66,000	28,000	15,500		115,000	58,000
5,700		66,000	28,000				
5,800		66,000	28,000				
5,900		66,000	28,000				
6,000		66,000	28,000				
6,200		70,000	31,000				
6,300		70,000	31,000				
6,400		70,000	31,000				
6,500		70,000	31,000				



## Brocas espirales extra cortas

Nº artículo 81145

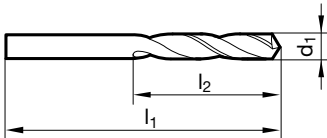


P	M	K	N	S	H
•	○	○	•		



vaciado de punta  $\geq \phi 1,000$  • entrada cónica • para aceros muy duros

aceros para tornos automáticos • aceros inoxidables y resistentes al ácido • aceros templados y revenidos de dureza hasta aprox. 800 N/mm<sup>2</sup> • aleaciones de cobre y de Al de virutas cortas o semilargas



d1		l1	l2	d1		l1	l2
mm	inch	mm	mm	mm	inch	mm	mm
1,000		26,000	6,000	4,300		58,000	24,000
1,100		28,000	7,000	4,400		58,000	24,000
1,250		30,000	8,000	4,500		58,000	24,000
1,300		30,000	8,000	4,600		58,000	24,000
1,400		32,000	9,000	4,650		58,000	24,000
1,500		32,000	9,000	4,700		58,000	24,000
1,600		34,000	10,000	4,800		62,000	26,000
1,650		34,000	10,000	4,900		62,000	26,000
1,700		34,000	10,000	5,000		62,000	26,000
1,800		36,000	11,000	5,100		62,000	26,000
1,850		36,000	11,000	5,200		62,000	26,000
1,900		36,000	11,000	5,300		62,000	26,000
2,100		38,000	12,000	5,500		66,000	28,000
2,200		40,000	13,000	5,600		66,000	28,000
2,250		40,000	13,000	5,700		66,000	28,000
2,300		40,000	13,000	5,800		66,000	28,000
2,350		40,000	13,000	5,900		66,000	28,000
2,400		43,000	14,000	6,000		66,000	28,000
2,500		43,000	14,000	6,200		70,000	31,000
2,550		43,000	14,000	6,300		70,000	31,000
2,600		43,000	14,000	6,500		70,000	31,000
2,650		43,000	14,000	6,600		70,000	31,000
2,700		46,000	16,000	6,700		70,000	31,000
2,780	7/64	46,000	16,000	6,800		74,000	34,000
2,800		46,000	16,000	6,900		74,000	34,000
2,850		46,000	16,000	7,000		74,000	34,000
2,900		46,000	16,000	7,500		74,000	34,000
2,950		46,000	16,000	7,800		79,000	37,000
3,000		46,000	16,000	7,900		79,000	37,000
3,150		49,000	18,000	8,000		79,000	37,000
3,170	1/8	49,000	18,000	8,100		79,000	37,000
3,250		49,000	18,000	8,200		79,000	37,000
3,300		49,000	18,000	8,300		79,000	37,000
3,500		52,000	20,000	8,400		79,000	37,000
3,650		52,000	20,000	8,500		79,000	37,000
3,680		52,000	20,000	8,600		84,000	40,000
3,700		52,000	20,000	8,700		84,000	40,000
3,800		55,000	22,000	8,800		84,000	40,000
3,900		55,000	22,000	9,000		84,000	40,000
4,000		55,000	22,000	9,200		84,000	40,000
4,100		55,000	22,000	9,500		84,000	40,000
4,200		55,000	22,000	9,700		89,000	43,000



## Brocas espirales extra cortas

d1 mm	inch	l1 mm	l2 mm	d1 mm	inch	l1 mm	l2 mm
10,000		89,000	43,000				
10,500		89,000	43,000				
11,000		95,000	47,000				
11,500		95,000	47,000				
12,500		102,000	51,000				

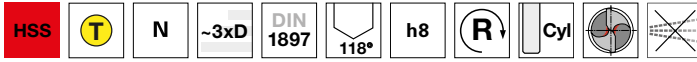


## Brocas espirales extra cortas

### Nº artículo 84400



P	M	K	N	S	H
•		•	○		



vaciado de punta  $\geq \varnothing 1,000$  • entrada cónica • para aplic. en tornos autom./revolver • para máquinas de taladrar manuales  
secciones delgadas • aceros y fundición de aceros (aleados y sin alear) • fundición gris, fundición maleable, fundición esférica • hierro sinterizado, argentón y grafito

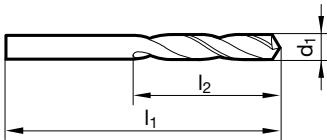
### Nº artículo 84501



P	M	K	N	S	H
•		•	•		



vaciado de punta  $\geq \varnothing 1,000$  • entrada cónica • para aplic. en tornos autom./revolver • para máquinas de taladrar manuales  
secciones delgadas • aceros y fundición de aceros (aleados y sin alear) • fundición gris, fundición maleable, fundición esférica • hierro sinterizado, argentón y grafito



d1		l1	l2	d1		l1	l2
mm	inch	mm	mm	mm	inch	mm	mm
1,000		26,000	6,000	3,700		52,000	20,000
1,100		28,000	7,000	3,800		55,000	22,000
1,200		30,000	8,000	3,900		55,000	22,000
1,300		30,000	8,000	4,000		55,000	22,000
1,350		32,000	9,000	4,100		55,000	22,000
1,400		32,000	9,000	4,200		55,000	22,000
1,450		32,000	9,000	4,300		58,000	24,000
1,500		32,000	9,000	4,400		58,000	24,000
1,600		34,000	10,000	4,500		58,000	24,000
1,700		34,000	10,000	4,600		58,000	24,000
1,800		36,000	11,000	4,700		58,000	24,000
1,900		36,000	11,000	4,800		62,000	26,000
2,000		38,000	12,000	4,900		62,000	26,000
2,100		38,000	12,000	5,000		62,000	26,000
2,200		40,000	13,000	5,100		62,000	26,000
2,300		40,000	13,000	5,200		62,000	26,000
2,400		43,000	14,000	5,300		62,000	26,000
2,500		43,000	14,000	5,400		66,000	28,000
2,600		43,000	14,000	5,500		66,000	28,000
2,700		46,000	16,000	5,600		66,000	28,000
2,800		46,000	16,000	5,700		66,000	28,000
2,900		46,000	16,000	5,800		66,000	28,000
3,000		46,000	16,000	5,900		66,000	28,000
3,100		49,000	18,000	6,000		66,000	28,000
3,200		49,000	18,000	6,100		70,000	31,000
3,300		49,000	18,000	6,200		70,000	31,000
3,400		52,000	20,000	6,300		70,000	31,000
3,450		52,000	20,000	6,400		70,000	31,000
3,500		52,000	20,000	6,500		70,000	31,000
3,600		52,000	20,000	6,600		70,000	31,000



## Brocas espirales extra cortas

d1 mm	inch	l1 mm	l2 mm	d1 mm	inch	l1 mm	l2 mm
6,700		70,000	31,000	11,000		95,000	47,000
6,800		74,000	34,000	11,200		95,000	47,000
6,900		74,000	34,000	11,300		95,000	47,000
7,000		74,000	34,000	11,400		95,000	47,000
7,100		74,000	34,000	11,500		95,000	47,000
7,200		74,000	34,000	11,700		95,000	47,000
7,300		74,000	34,000	11,800		95,000	47,000
7,400		74,000	34,000	11,900		102,000	51,000
7,500		74,000	34,000	12,000		102,000	51,000
7,600		79,000	37,000	12,100		102,000	51,000
7,700		79,000	37,000	12,200		102,000	51,000
7,800		79,000	37,000	12,300	31/64	102,000	51,000
7,900		79,000	37,000	12,500		102,000	51,000
8,000		79,000	37,000	12,700	1/2	102,000	51,000
8,100		79,000	37,000	12,800		102,000	51,000
8,200		79,000	37,000	13,000		102,000	51,000
8,300		79,000	37,000	13,200		102,000	51,000
8,400		79,000	37,000	13,500		107,000	54,000
8,500		79,000	37,000	13,800		107,000	54,000
8,600		84,000	40,000	14,000		107,000	54,000
8,700		84,000	40,000	14,200		111,000	56,000
8,800		84,000	40,000	14,800		111,000	56,000
8,900		84,000	40,000	15,000		111,000	56,000
9,000		84,000	40,000	15,300		115,000	58,000
9,100		84,000	40,000	15,500		115,000	58,000
9,200		84,000	40,000	16,000		115,000	58,000
9,300		84,000	40,000	17,000		119,000	60,000
9,400		84,000	40,000	17,500		123,000	62,000
9,500		84,000	40,000	18,000		123,000	62,000
9,600		89,000	43,000	18,500		127,000	64,000
9,700		89,000	43,000	19,500		131,000	66,000
9,800		89,000	43,000	20,000		131,000	66,000
9,900		89,000	43,000	25,000	63/64	151,000	75,000
10,000		89,000	43,000				
10,100		89,000	43,000				
10,200		89,000	43,000				
10,300		89,000	43,000				
10,400		89,000	43,000				
10,500		89,000	43,000				
10,600		89,000	43,000				
10,720	27/64	95,000	47,000				
10,800		95,000	47,000				

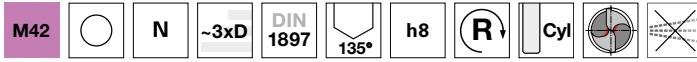


## Brocas espirales extra cortas

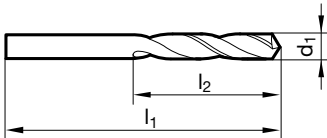
Nº artículo 81112



P	M	K	N	S	H
•	○	○	•	•	○



vaciado de punta  $\geq \varnothing 1,000$  • entrada cónica • acero altamente aleado CoMo • alta resistencia al desgaste  
 aleación dura o muy dura con una base de CrNi • Hastelloy, Inconel, Nimonic • aceros inoxidable y resistentes al ácido y al calor  
 • chapas resistentes al desgaste • aceros o bronce con una resistencia de hasta 1400 N/mm<sup>2</sup>



d1 mm	inch	l1 mm	l2 mm	d1 mm	inch	l1 mm	l2 mm
1,000		26,000	6,000	4,800		62,000	26,000
1,100		28,000	7,000	4,900		62,000	26,000
1,200		30,000	8,000	5,000		62,000	26,000
1,300		30,000	8,000	5,100		62,000	26,000
1,400		32,000	9,000	5,200		62,000	26,000
1,500		32,000	9,000	5,300		62,000	26,000
1,600		34,000	10,000	5,400		66,000	28,000
1,700		34,000	10,000	5,500		66,000	28,000
1,800		36,000	11,000	5,560	7/32	66,000	28,000
1,900		36,000	11,000	5,600		66,000	28,000
2,000		38,000	12,000	5,800		66,000	28,000
2,100		38,000	12,000	6,000		66,000	28,000
2,200		40,000	13,000	6,100		70,000	31,000
2,300		40,000	13,000	6,200		70,000	31,000
2,380	3/32	43,000	14,000	6,300		70,000	31,000
2,400		43,000	14,000	6,350	1/4	70,000	31,000
2,500		43,000	14,000	6,400		70,000	31,000
2,600		43,000	14,000	6,500		70,000	31,000
2,700		46,000	16,000	6,600		70,000	31,000
2,780	7/64	46,000	16,000	6,800		74,000	34,000
2,800		46,000	16,000	6,900		74,000	34,000
2,900		46,000	16,000	7,000		74,000	34,000
3,000		46,000	16,000	7,100		74,000	34,000
3,100		49,000	18,000	7,200		74,000	34,000
3,170	1/8	49,000	18,000	7,300		74,000	34,000
3,200		49,000	18,000	7,400		74,000	34,000
3,300		49,000	18,000	7,500		74,000	34,000
3,400		52,000	20,000	7,540	19/64	79,000	37,000
3,500		52,000	20,000	7,600		79,000	37,000
3,600		52,000	20,000	7,700		79,000	37,000
3,700		52,000	20,000	7,800		79,000	37,000
3,800		55,000	22,000	7,900		79,000	37,000
3,900		55,000	22,000	8,000		79,000	37,000
3,970	5/32	55,000	22,000	8,100		79,000	37,000
4,000		55,000	22,000	8,200		79,000	37,000
4,100		55,000	22,000	8,300		79,000	37,000
4,200		55,000	22,000	8,500		79,000	37,000
4,300		58,000	24,000	8,600		84,000	40,000
4,400		58,000	24,000	8,700		84,000	40,000
4,500		58,000	24,000	9,000		84,000	40,000
4,600		58,000	24,000	9,200		84,000	40,000
4,700		58,000	24,000	9,300		84,000	40,000



## Brocas espirales extra cortas

d1 mm	inch	l1 mm	l2 mm	d1 mm	inch	l1 mm	l2 mm
9,500		84,000	40,000	13,500		107,000	54,000
9,700		89,000	43,000	14,000		107,000	54,000
9,800		89,000	43,000	14,500		111,000	56,000
9,900		89,000	43,000	15,000		111,000	56,000
10,000		89,000	43,000				
10,500		89,000	43,000				
11,000		95,000	47,000				
11,500		95,000	47,000				
12,000		102,000	51,000				
12,500		102,000	51,000				
12,700	1/2	102,000	51,000				
13,000		102,000	51,000				





## Brocas espirales extra cortas

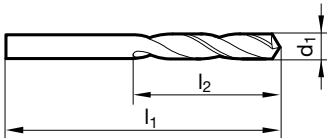
Nº artículo 81171



P	M	K	N	S	H
•	•	•	○	•	○



vaciado de punta  $\geq \varnothing 1,000$  • entrada cónica • acero rápido al cobalto • más resistencia al desgaste  
 aceros inoxidables y resistentes al ácido • aceros de muelles • aceros austeníticos • Hastelloy, Inconel, Nimonic



d1		l1	l2	d1		l1	l2
mm	inch	mm	mm	mm	inch	mm	mm
0,400		19,000	2,500	2,500		43,000	14,000
0,500		20,000	3,000	2,550		43,000	14,000
0,600		21,000	3,500	2,600		43,000	14,000
0,650		22,000	4,000	2,650		43,000	14,000
0,750		23,000	4,500	2,700		46,000	16,000
0,800		24,000	5,000	2,800		46,000	16,000
0,860		25,000	5,500	2,900		46,000	16,000
0,870		25,000	5,500	3,000		46,000	16,000
0,900		25,000	5,500	3,050		49,000	18,000
0,950		25,000	5,500	3,100		49,000	18,000
1,000		26,000	6,000	3,200		49,000	18,000
1,030		26,000	6,000	3,250		49,000	18,000
1,100		28,000	7,000	3,300		49,000	18,000
1,150		28,000	7,000	3,400		52,000	20,000
1,200		30,000	8,000	3,500		52,000	20,000
1,250		30,000	8,000	3,550		52,000	20,000
1,300		30,000	8,000	3,600		52,000	20,000
1,350		32,000	9,000	3,700		52,000	20,000
1,400		32,000	9,000	3,750		52,000	20,000
1,450		32,000	9,000	3,800		55,000	22,000
1,500		32,000	9,000	3,900		55,000	22,000
1,550		34,000	10,000	4,000		55,000	22,000
1,600		34,000	10,000	4,100		55,000	22,000
1,650		34,000	10,000	4,200		55,000	22,000
1,700		34,000	10,000	4,250		55,000	22,000
1,750		36,000	11,000	4,300		58,000	24,000
1,800		36,000	11,000	4,500		58,000	24,000
1,850		36,000	11,000	4,600		58,000	24,000
1,900		36,000	11,000	4,650		58,000	24,000
1,950		38,000	12,000	4,800		62,000	26,000
1,970		38,000	12,000	4,900		62,000	26,000
1,980	5/64	38,000	12,000	5,000		62,000	26,000
2,000		38,000	12,000	5,050		62,000	26,000
2,030		38,000	12,000	5,100		62,000	26,000
2,050		38,000	12,000	5,200		62,000	26,000
2,100		38,000	12,000	5,300		62,000	26,000
2,200		40,000	13,000	5,400		66,000	28,000
2,250		40,000	13,000	5,500		66,000	28,000
2,300		40,000	13,000	5,550		66,000	28,000
2,400		43,000	14,000	5,600		66,000	28,000
2,450		43,000	14,000	5,700		66,000	28,000
2,470		43,000	14,000	5,800		66,000	28,000



## Brocas espirales extra cortas

d1 mm	inch	l1 mm	l2 mm	d1 mm	inch	l1 mm	l2 mm
5,900		66,000	28,000	10,600		89,000	43,000
5,950	15/64	66,000	28,000	10,800		95,000	47,000
6,000		66,000	28,000	10,900		95,000	47,000
6,100		70,000	31,000	11,000		95,000	47,000
6,200		70,000	31,000	11,100		95,000	47,000
6,250		70,000	31,000	11,200		95,000	47,000
6,300		70,000	31,000	11,500		95,000	47,000
6,400		70,000	31,000	11,750		95,000	47,000
6,500		70,000	31,000	11,800		95,000	47,000
6,600		70,000	31,000	12,000		102,000	51,000
6,700		70,000	31,000	12,200		102,000	51,000
6,750	17/64	74,000	34,000	12,250		102,000	51,000
6,800		74,000	34,000	12,300	31/64	102,000	51,000
6,900		74,000	34,000	12,400		102,000	51,000
7,000		74,000	34,000	12,500		102,000	51,000
7,100		74,000	34,000	12,600		102,000	51,000
7,200		74,000	34,000	12,800		102,000	51,000
7,300		74,000	34,000	12,900		102,000	51,000
7,400		74,000	34,000	13,000		102,000	51,000
7,500		74,000	34,000	13,300		107,000	54,000
7,600		79,000	37,000	13,500		107,000	54,000
7,700		79,000	37,000	13,750		107,000	54,000
7,800		79,000	37,000	13,800		107,000	54,000
7,900		79,000	37,000	14,000		107,000	54,000
8,000		79,000	37,000	14,500		111,000	56,000
8,100		79,000	37,000	15,000		111,000	56,000
8,200		79,000	37,000	15,500		115,000	58,000
8,250		79,000	37,000	15,750		115,000	58,000
8,300		79,000	37,000	16,000		115,000	58,000
8,400		79,000	37,000	16,500		119,000	60,000
8,500		79,000	37,000	17,000		119,000	60,000
8,800		84,000	40,000	17,500		123,000	62,000
8,900		84,000	40,000	18,500		127,000	64,000
9,000		84,000	40,000	19,000		127,000	64,000
9,100		84,000	40,000	19,500		131,000	66,000
9,200		84,000	40,000	20,000		131,000	66,000
9,400		84,000	40,000	20,500		136,000	68,000
9,500		84,000	40,000	21,000		136,000	68,000
9,600		89,000	43,000	22,000		141,000	70,000
9,750		89,000	43,000	22,200		141,000	70,000
9,800		89,000	43,000	23,000		146,000	72,000
9,900		89,000	43,000	25,000	63/64	151,000	75,000
10,000		89,000	43,000				
10,050		89,000	43,000				
10,100		89,000	43,000				
10,200		89,000	43,000				
10,400		89,000	43,000				
10,500		89,000	43,000				

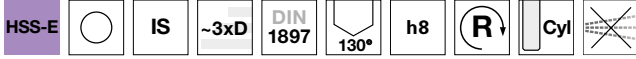


## Brocas espirales extra cortas

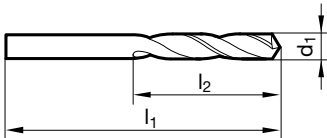
Nº artículo 81173



P	M	K	N	S	H
○	●	○	○	○	○



broca INOX • entrada cónica • acero rápido al cobalto • más resistencia al desgaste  
aceros austeníticos inoxidables y resistentes a los ácidos y al calor (V2A y V4A)



d1 mm	l1 mm	l2 mm	d1 mm	l1 mm	l2 mm
1,000	26,000	6,000	5,000	62,000	26,000
1,100	28,000	7,000	5,100	62,000	26,000
1,300	30,000	8,000	5,200	62,000	26,000
1,400	32,000	9,000	5,300	62,000	26,000
1,500	32,000	9,000	5,500	66,000	28,000
1,600	34,000	10,000	5,600	66,000	28,000
1,700	34,000	10,000	5,800	66,000	28,000
1,800	36,000	11,000	5,900	66,000	28,000
2,000	38,000	12,000	6,000	66,000	28,000
2,100	38,000	12,000	6,300	70,000	31,000
2,200	40,000	13,000	6,500	70,000	31,000
2,300	40,000	13,000	6,700	70,000	31,000
2,400	43,000	14,000	6,800	74,000	34,000
2,500	43,000	14,000	6,900	74,000	34,000
2,600	43,000	14,000	7,000	74,000	34,000
2,700	46,000	16,000	7,100	74,000	34,000
2,800	46,000	16,000	7,400	74,000	34,000
2,900	46,000	16,000	7,500	74,000	34,000
3,000	46,000	16,000	7,600	79,000	37,000
3,100	49,000	18,000	7,800	79,000	37,000
3,200	49,000	18,000	7,900	79,000	37,000
3,300	49,000	18,000	8,000	79,000	37,000
3,400	52,000	20,000	8,100	79,000	37,000
3,500	52,000	20,000	8,200	79,000	37,000
3,600	52,000	20,000	8,500	79,000	37,000
3,800	55,000	22,000	8,700	84,000	40,000
3,900	55,000	22,000	9,000	84,000	40,000
4,000	55,000	22,000	9,200	84,000	40,000
4,100	55,000	22,000	9,500	84,000	40,000
4,200	55,000	22,000	10,000	89,000	43,000
4,300	58,000	24,000	10,200	89,000	43,000
4,500	58,000	24,000	10,500	89,000	43,000
4,600	58,000	24,000	11,000	95,000	47,000
4,700	58,000	24,000	11,500	95,000	47,000
4,800	62,000	26,000	11,700	95,000	47,000
4,900	62,000	26,000	12,000	102,000	51,000

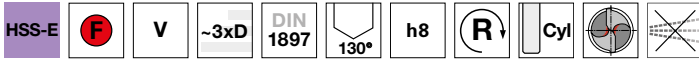


## Brocas espirales extra cortas

### Nº artículo 84503



P	M	K	N	S	H
•	•	•	○	•	○

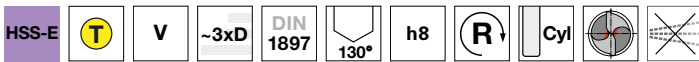


vaciado de punta  $\geq \varnothing 1,000$  • entrada cónica • acero rápido al cobalto • más resistencia al desgaste  
aceros inoxidable y resistentes al ácido • aceros de muelles • aceros austeníticos • Hastelloy, Inconel, Nimonic

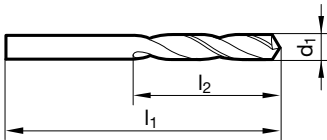
### Nº artículo 84803



P	M	K	N	S	H
•	•	•	○	•	○



vaciado de punta  $\geq \varnothing 1,000$  • entrada cónica • acero rápido al cobalto • más resistencia al desgaste  
aceros inoxidable y resistentes al ácido • aceros de muelles • aceros austeníticos • Hastelloy, Inconel, Nimonic



d1		l1	l2	d1		l1	l2
mm	inch	mm	mm	mm	inch	mm	mm
0,500		20,000	3,000	3,050		49,000	18,000
0,700		23,000	4,500	3,100		49,000	18,000
0,900		25,000	5,500	3,200		49,000	18,000
1,000		26,000	6,000	3,250		49,000	18,000
1,100		28,000	7,000	3,300		49,000	18,000
1,200		30,000	8,000	3,350		49,000	18,000
1,300		30,000	8,000	3,400		52,000	20,000
1,400		32,000	9,000	3,450		52,000	20,000
1,500		32,000	9,000	3,500		52,000	20,000
1,600		34,000	10,000	3,600		52,000	20,000
1,700		34,000	10,000	3,700		52,000	20,000
1,800		36,000	11,000	3,800		55,000	22,000
1,850		36,000	11,000	3,900		55,000	22,000
1,900		36,000	11,000	4,000		55,000	22,000
2,000		38,000	12,000	4,100		55,000	22,000
2,050		38,000	12,000	4,200		55,000	22,000
2,100		38,000	12,000	4,300		58,000	24,000
2,200		40,000	13,000	4,400		58,000	24,000
2,300		40,000	13,000	4,500		58,000	24,000
2,350		40,000	13,000	4,600		58,000	24,000
2,400		43,000	14,000	4,700		58,000	24,000
2,450		43,000	14,000	4,800		62,000	26,000
2,500		43,000	14,000	4,900		62,000	26,000
2,550		43,000	14,000	5,000		62,000	26,000
2,600		43,000	14,000	5,100		62,000	26,000
2,700		46,000	16,000	5,200		62,000	26,000
2,800		46,000	16,000	5,300		62,000	26,000
2,900		46,000	16,000	5,400		66,000	28,000
2,950		46,000	16,000	5,500		66,000	28,000
3,000		46,000	16,000	5,600		66,000	28,000



## Brocas espirales extra cortas

d1 mm	inch	l1 mm	l2 mm	d1 mm	inch	l1 mm	l2 mm
5,700		66,000	28,000	8,600		84,000	40,000
5,800		66,000	28,000	8,700		84,000	40,000
5,900		66,000	28,000	8,800		84,000	40,000
6,000		66,000	28,000	9,000		84,000	40,000
6,050		70,000	31,000	9,100		84,000	40,000
6,100		70,000	31,000	9,200		84,000	40,000
6,200		70,000	31,000	9,300		84,000	40,000
6,300		70,000	31,000	9,500		84,000	40,000
6,350	1/4	70,000	31,000	9,600		89,000	43,000
6,400		70,000	31,000	9,700		89,000	43,000
6,500		70,000	31,000	9,800		89,000	43,000
6,600		70,000	31,000	9,900		89,000	43,000
6,700		70,000	31,000	10,000		89,000	43,000
6,800		74,000	34,000	10,200		89,000	43,000
6,900		74,000	34,000	10,500		89,000	43,000
7,000		74,000	34,000	11,000		95,000	47,000
7,100		74,000	34,000	11,500		95,000	47,000
7,200		74,000	34,000	12,000		102,000	51,000
7,300		74,000	34,000	12,500		102,000	51,000
7,400		74,000	34,000	13,000		102,000	51,000
7,500		74,000	34,000	14,000		107,000	54,000
7,700		79,000	37,000	14,500		111,000	56,000
7,800		79,000	37,000	15,000		111,000	56,000
7,900		79,000	37,000				
8,000		79,000	37,000				
8,100		79,000	37,000				
8,200		79,000	37,000				
8,300		79,000	37,000				
8,400		79,000	37,000				
8,500		79,000	37,000				

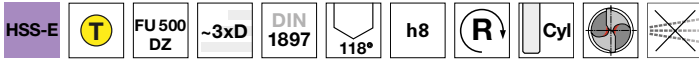


## Brocas espirales extra cortas

### Nº artículo 84806



P	M	K	N	S	H
•	•	•	•		



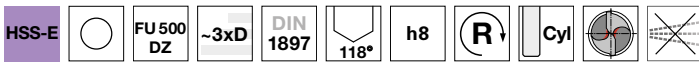
vaciado de punta  $\geq \varnothing 1,000$  • afilado plano • acero rápido al cobalto • se requiere poca fuerza de avance • se requiere poco par • aplicación universal

aceros aleados y no aleados fundición de dureza hasta a 800 N/mm<sup>2</sup> • aceros para trab. en frío y en caliente • aceros para rodamientos • metales no ferríticos • fundición • aceros inoxidables • plásticos

### Nº artículo 84808

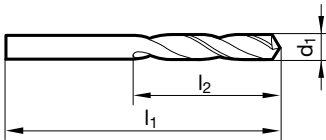


P	M	K	N	S	H
•	•	•	•		



vaciado de punta  $\geq \varnothing 1,000$  • afilado plano • acero rápido al cobalto • se requiere poca fuerza de avance • se requiere poco par • aplicación universal

aceros aleados y no aleados fundición de dureza hasta a 800 N/mm<sup>2</sup> • aceros para trab. en frío y en caliente • aceros para rodamientos • metales no ferríticos • fundición • aceros inoxidables • plásticos



d1		l1	l2	d1		l1	l2
mm	inch	mm	mm	mm	inch	mm	mm
1,000		26,000	6,000	3,600		52,000	20,000
1,100		28,000	7,000	3,700		52,000	20,000
1,200		30,000	8,000	3,800		55,000	22,000
1,300		30,000	8,000	3,900		55,000	22,000
1,400		32,000	9,000	3,970	5/32	55,000	22,000
1,500		32,000	9,000	4,000		55,000	22,000
1,600		34,000	10,000	4,100		55,000	22,000
1,700		34,000	10,000	4,200		55,000	22,000
1,800		36,000	11,000	4,300		58,000	24,000
1,900		36,000	11,000	4,370	11/64	58,000	24,000
2,000		38,000	12,000	4,400		58,000	24,000
2,100		38,000	12,000	4,500		58,000	24,000
2,200		40,000	13,000	4,600		58,000	24,000
2,300		40,000	13,000	4,700		58,000	24,000
2,380	3/32	43,000	14,000	4,760	3/16	62,000	26,000
2,400		43,000	14,000	4,800		62,000	26,000
2,500		43,000	14,000	4,900		62,000	26,000
2,600		43,000	14,000	5,000		62,000	26,000
2,700		46,000	16,000	5,100		62,000	26,000
2,780	7/64	46,000	16,000	5,160	13/64	62,000	26,000
2,800		46,000	16,000	5,200		62,000	26,000
2,900		46,000	16,000	5,300		62,000	26,000
3,000		46,000	16,000	5,400		66,000	28,000
3,100		49,000	18,000	5,500		66,000	28,000
3,170	1/8	49,000	18,000	5,560	7/32	66,000	28,000
3,200		49,000	18,000	5,600		66,000	28,000
3,300		49,000	18,000	5,700		66,000	28,000
3,400		52,000	20,000	5,800		66,000	28,000
3,500		52,000	20,000	5,900		66,000	28,000
3,570	9/64	52,000	20,000	5,950	15/64	66,000	28,000



## Brocas espirales extra cortas

d1 mm	inch	l1 mm	l2 mm	d1 mm	inch	l1 mm	l2 mm
6,000		66,000	28,000	8,700		84,000	40,000
6,100		70,000	31,000	8,730	11/32	84,000	40,000
6,200		70,000	31,000	8,800		84,000	40,000
6,300		70,000	31,000	8,900		84,000	40,000
6,350	1/4	70,000	31,000	9,000		84,000	40,000
6,400		70,000	31,000	9,100		84,000	40,000
6,500		70,000	31,000	9,200		84,000	40,000
6,600		70,000	31,000	9,300		84,000	40,000
6,700		70,000	31,000	9,400		84,000	40,000
6,800		74,000	34,000	9,500		84,000	40,000
6,900		74,000	34,000	9,600		89,000	43,000
7,000		74,000	34,000	9,700		89,000	43,000
7,100		74,000	34,000	9,800		89,000	43,000
7,140	9/32	74,000	34,000	9,900		89,000	43,000
7,200		74,000	34,000	10,000		89,000	43,000
7,300		74,000	34,000	10,100		89,000	43,000
7,400		74,000	34,000	10,200		89,000	43,000
7,500		74,000	34,000	10,300		89,000	43,000
7,600		79,000	37,000	10,400		89,000	43,000
7,700		79,000	37,000	10,500		89,000	43,000
7,800		79,000	37,000	11,000		95,000	47,000
7,900		79,000	37,000	11,110	7/16	95,000	47,000
7,940	5/16	79,000	37,000	11,500		95,000	47,000
8,000		79,000	37,000	12,000		102,000	51,000
8,100		79,000	37,000	12,500		102,000	51,000
8,200		79,000	37,000	13,000		102,000	51,000
8,300		79,000	37,000	13,500		107,000	54,000
8,400		79,000	37,000	14,000		107,000	54,000
8,500		79,000	37,000				
8,600		84,000	40,000				

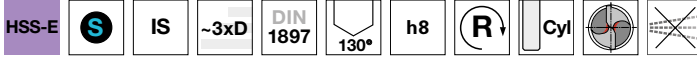


## Brocas espirales extra cortas

Nº artículo 81178

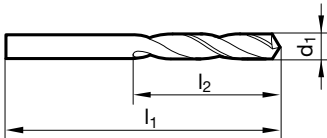


P	M	K	N	S	H
○	●	○	○	●	



vaciado de punta  $\geq \varnothing 1,000$  • afilado al cono con vaciado de núcleo en cruz optimizado • acero rápido al cobalto • más resistencia al desgaste

aceros austeníticos inoxidables y resistentes a los ácidos y al calor (V2A y V4A) • aleaciones especiales



d1	inch	l1	l2	d1	inch	l1	l2
mm		mm	mm	mm		mm	mm
1,000		26,000	6,000	5,100		62,000	26,000
1,100		28,000	7,000	5,200		62,000	26,000
1,200		30,000	8,000	5,300		62,000	26,000
1,300		30,000	8,000	5,400		66,000	28,000
1,400		32,000	9,000	5,500		66,000	28,000
1,500		32,000	9,000	5,550		66,000	28,000
1,600		34,000	10,000	5,600		66,000	28,000
1,700		34,000	10,000	5,700		66,000	28,000
1,800		36,000	11,000	5,800		66,000	28,000
1,900		36,000	11,000	5,900		66,000	28,000
2,000		38,000	12,000	6,000		66,000	28,000
2,100		38,000	12,000	6,100		70,000	31,000
2,200		40,000	13,000	6,200		70,000	31,000
2,300		40,000	13,000	6,300		70,000	31,000
2,400		43,000	14,000	6,400		70,000	31,000
2,500		43,000	14,000	6,500		70,000	31,000
2,600		43,000	14,000	6,600		70,000	31,000
2,700		46,000	16,000	6,700		70,000	31,000
2,800		46,000	16,000	6,800		74,000	34,000
2,900		46,000	16,000	6,900		74,000	34,000
3,000		46,000	16,000	7,000		74,000	34,000
3,100		49,000	18,000	7,100		74,000	34,000
3,200		49,000	18,000	7,200		74,000	34,000
3,300		49,000	18,000	7,300		74,000	34,000
3,400		52,000	20,000	7,400		74,000	34,000
3,500		52,000	20,000	7,450		74,000	34,000
3,600		52,000	20,000	7,500		74,000	34,000
3,700		52,000	20,000	7,600		79,000	37,000
3,800		55,000	22,000	7,700		79,000	37,000
3,900		55,000	22,000	7,800		79,000	37,000
4,000		55,000	22,000	7,900		79,000	37,000
4,100		55,000	22,000	8,000		79,000	37,000
4,200		55,000	22,000	8,100		79,000	37,000
4,300		58,000	24,000	8,200		79,000	37,000
4,400		58,000	24,000	8,300		79,000	37,000
4,500		58,000	24,000	8,400		79,000	37,000
4,600		58,000	24,000	8,500		79,000	37,000
4,650		58,000	24,000	8,600		84,000	40,000
4,700		58,000	24,000	8,700		84,000	40,000
4,800		62,000	26,000	8,800		84,000	40,000
4,900		62,000	26,000	8,900		84,000	40,000
5,000		62,000	26,000	9,000		84,000	40,000





## Brocas espirales extra cortas

d1 mm	inch	l1 mm	l2 mm	d1 mm	inch	l1 mm	l2 mm
9,100		84,000	40,000	10,500		89,000	43,000
9,200		84,000	40,000	11,000		95,000	47,000
9,250		84,000	40,000	11,200		95,000	47,000
9,300		84,000	40,000	11,500		95,000	47,000
9,400		84,000	40,000	11,800		95,000	47,000
9,500		84,000	40,000	12,000		102,000	51,000
9,600		89,000	43,000	12,500		102,000	51,000
9,700		89,000	43,000	13,000		102,000	51,000
9,800		89,000	43,000				
9,900		89,000	43,000				
10,000		89,000	43,000				
10,200		89,000	43,000				

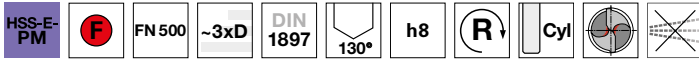


## Brocas espirales extra cortas

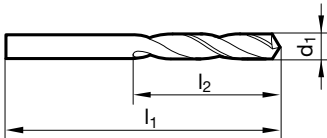
Nº artículo 84511



P	M	K	N	S	H
●	○	●	○	○	○



vaciado de punta  $\geq \varnothing 1,000$  • entrada cónica • PM acero rápido al cobalto • estabilidad muy buena • alta resistencia al desgaste  
 materiales más duros, aceros de aleación alta • aceros de cementación, de bonificación • hierro fundido, latón y bronce



d1		l1	l2	d1		l1	l2
mm	inch	mm	mm	mm	inch	mm	mm
1,000		26,000	6,000	5,560	7/32	66,000	28,000
1,200		30,000	8,000	5,700		66,000	28,000
1,500		32,000	9,000	5,800		66,000	28,000
2,000		38,000	12,000	5,900		66,000	28,000
2,200		40,000	13,000	6,000		66,000	28,000
2,300		40,000	13,000	6,200		70,000	31,000
2,400		43,000	14,000	6,300		70,000	31,000
2,500		43,000	14,000	6,350	1/4	70,000	31,000
2,600		43,000	14,000	6,400		70,000	31,000
2,700		46,000	16,000	6,500		70,000	31,000
2,780	7/64	46,000	16,000	6,600		70,000	31,000
3,000		46,000	16,000	6,700		70,000	31,000
3,100		49,000	18,000	6,750	17/64	74,000	34,000
3,170	1/8	49,000	18,000	6,800		74,000	34,000
3,200		49,000	18,000	6,900		74,000	34,000
3,260		49,000	18,000	7,100		74,000	34,000
3,300		49,000	18,000	7,140	9/32	74,000	34,000
3,500		52,000	20,000	7,200		74,000	34,000
3,570	9/64	52,000	20,000	7,300		74,000	34,000
3,600		52,000	20,000	7,370		74,000	34,000
3,700		52,000	20,000	7,400		74,000	34,000
3,800		55,000	22,000	7,500		74,000	34,000
3,900		55,000	22,000	7,540	19/64	79,000	37,000
4,000		55,000	22,000	7,600		79,000	37,000
4,090		55,000	22,000	7,700		79,000	37,000
4,100		55,000	22,000	7,900		79,000	37,000
4,200		55,000	22,000	7,940	5/16	79,000	37,000
4,370	11/64	58,000	24,000	8,000		79,000	37,000
4,400		58,000	24,000	8,100		79,000	37,000
4,500		58,000	24,000	8,200		79,000	37,000
4,650		58,000	24,000	8,300		79,000	37,000
4,700		58,000	24,000	8,500		79,000	37,000
4,760	3/16	62,000	26,000	8,600		84,000	40,000
4,800		62,000	26,000	8,700		84,000	40,000
4,980		62,000	26,000	8,730	11/32	84,000	40,000
5,000		62,000	26,000	8,800		84,000	40,000
5,100		62,000	26,000	9,100		84,000	40,000
5,160	13/64	62,000	26,000	9,130	23/64	84,000	40,000
5,300		62,000	26,000	9,200		84,000	40,000
5,400		66,000	28,000	9,300		84,000	40,000
5,410		66,000	28,000	9,350		84,000	40,000
5,500		66,000	28,000	9,500		84,000	40,000



## Brocas espirales extra cortas

d1 mm	inch	l1 mm	l2 mm	d1 mm	inch	l1 mm	l2 mm
9,520	3/8	89,000	43,000	11,510	29/64	95,000	47,000
9,600		89,000	43,000	11,910	15/32	102,000	51,000
9,800		89,000	43,000	12,000		102,000	51,000
9,900		89,000	43,000	12,500		102,000	51,000
9,920	25/64	89,000	43,000	12,700	1/2	102,000	51,000
10,000		89,000	43,000	13,000		102,000	51,000
10,200		89,000	43,000	13,500		107,000	54,000
10,320	13/32	89,000	43,000				
10,500		89,000	43,000				
10,720	27/64	95,000	47,000				
11,000		95,000	47,000				
11,110	7/16	95,000	47,000				

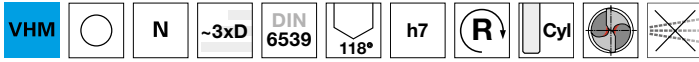


## Brocas espirales extra cortas

Nº artículo 89235

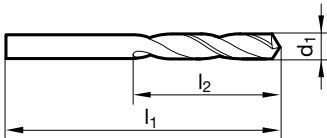


P	M	K	N	S	H
○	○	○	●	○	



vaciado de punta  $\geq \varnothing 3,000$  • afilado plano • forma recta del corte principal

aceros de construcción y de cementación • aceros para tornos automáticos, aceros de bonificación • fundición gris • bronce, latón  
• aluminio y sus aleaciones • magnesio y sus aleaciones • plásticos y plásticos con refuerzo de fibras



d1		l1	l2	d1		l1	l2
mm	inch	mm	mm	mm	inch	mm	mm
0,800		24,000	5,000	4,200		55,000	22,000
0,900		25,000	5,500	4,300		58,000	24,000
1,000		26,000	6,000	4,370	11/64	58,000	24,000
1,100		28,000	7,000	4,400		58,000	24,000
1,200		30,000	8,000	4,500		58,000	24,000
1,300		30,000	8,000	4,600		58,000	24,000
1,400		32,000	9,000	4,700		58,000	24,000
1,500		32,000	9,000	4,760	3/16	62,000	26,000
1,600		34,000	10,000	4,800		62,000	26,000
1,700		34,000	10,000	4,850		62,000	26,000
1,800		36,000	11,000	4,900		62,000	26,000
1,900		36,000	11,000	5,000		62,000	26,000
1,980	5/64	38,000	12,000	5,100		62,000	26,000
2,000		38,000	12,000	5,200		62,000	26,000
2,100		38,000	12,000	5,300		62,000	26,000
2,200		40,000	13,000	5,400		66,000	28,000
2,300		40,000	13,000	5,500		66,000	28,000
2,380	3/32	43,000	14,000	5,560	7/32	66,000	28,000
2,400		43,000	14,000	5,600		66,000	28,000
2,500		43,000	14,000	5,700		66,000	28,000
2,600		43,000	14,000	5,800		66,000	28,000
2,700		46,000	16,000	5,900		66,000	28,000
2,780	7/64	46,000	16,000	6,000		66,000	28,000
2,800		46,000	16,000	6,100		70,000	31,000
2,900		46,000	16,000	6,200		70,000	31,000
3,000		46,000	16,000	6,300		70,000	31,000
3,050		49,000	18,000	6,350	1/4	70,000	31,000
3,100		49,000	18,000	6,400		70,000	31,000
3,170	1/8	49,000	18,000	6,500		70,000	31,000
3,200		49,000	18,000	6,600		70,000	31,000
3,300		49,000	18,000	6,700		70,000	31,000
3,400		52,000	20,000	6,800		74,000	34,000
3,500		52,000	20,000	6,900		74,000	34,000
3,570	9/64	52,000	20,000	7,000		74,000	34,000
3,600		52,000	20,000	7,100		74,000	34,000
3,700		52,000	20,000	7,140	9/32	74,000	34,000
3,800		55,000	22,000	7,200		74,000	34,000
3,900		55,000	22,000	7,300		74,000	34,000
3,970	5/32	55,000	22,000	7,400		74,000	34,000
4,000		55,000	22,000	7,500		74,000	34,000
4,040		55,000	22,000	7,600		79,000	37,000
4,100		55,000	22,000	7,700		79,000	37,000



## Brocas espirales extra cortas

d1 mm	inch	l1 mm	l2 mm	d1 mm	inch	l1 mm	l2 mm
7,800		79,000	37,000	10,200		89,000	43,000
7,900		79,000	37,000	10,300		89,000	43,000
7,940	5/16	79,000	37,000	10,500		89,000	43,000
8,000		79,000	37,000	10,800		95,000	47,000
8,100		79,000	37,000	11,000		95,000	47,000
8,200		79,000	37,000	11,110	7/16	95,000	47,000
8,300		79,000	37,000	11,400		95,000	47,000
8,400		79,000	37,000	11,500		95,000	47,000
8,500		79,000	37,000	12,000		102,000	51,000
8,600		84,000	40,000	12,300	31/64	102,000	51,000
8,700		84,000	40,000	12,400		102,000	51,000
8,730	11/32	84,000	40,000	13,000		102,000	51,000
8,800		84,000	40,000	13,200		102,000	51,000
8,900		84,000	40,000	14,000		107,000	54,000
9,000		84,000	40,000	15,000		111,000	56,000
9,100		84,000	40,000	16,000		115,000	58,000
9,300		84,000	40,000				
9,400		84,000	40,000				
9,500		84,000	40,000				
9,600		89,000	43,000				
9,700		89,000	43,000				
9,800		89,000	43,000				
9,900		89,000	43,000				
10,000		89,000	43,000				

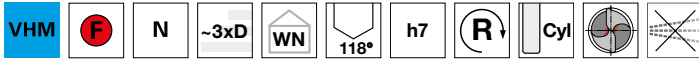


## Brocas espirales extra cortas

Nº artículo 89253

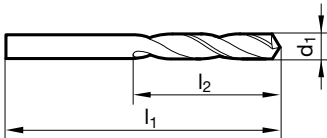


P	M	K	N	S	H
○	○	○	●	○	



vaciado de punta  $\geq \varnothing 2,060$  • afilado plano • forma recta del corte principal

aluminios con alto porcentaje de Si • aceros para tornos automáticos, aceros de bonificación • aceros de construcción y de cementación • fundición • plásticos y plásticos con refuerzo de fibras • magnesio y sus aleaciones • latón



d1		l1	l2	d1		l1	l2
mm	inch	mm	mm	mm	inch	mm	mm
1,000		26,000	6,000	3,800		55,000	22,000
1,100		28,000	7,000	3,900		55,000	22,000
1,190	3/64	30,000	8,000	3,970	5/32	55,000	22,000
1,200		30,000	8,000	4,000		55,000	22,000
1,300		30,000	8,000	4,040		55,000	22,000
1,400		32,000	9,000	4,100		55,000	22,000
1,500		32,000	9,000	4,200		55,000	22,000
1,590	1/16	34,000	10,000	4,300		58,000	24,000
1,600		34,000	10,000	4,370	11/64	58,000	24,000
1,700		34,000	10,000	4,400		58,000	24,000
1,800		36,000	11,000	4,500		58,000	24,000
1,850		36,000	11,000	4,570		58,000	24,000
1,900		36,000	11,000	4,600		58,000	24,000
1,980	5/64	38,000	12,000	4,700		58,000	24,000
2,000		38,000	12,000	4,760	3/16	62,000	26,000
2,060		38,000	12,000	4,800		62,000	26,000
2,100		38,000	12,000	4,900		62,000	26,000
2,200		40,000	13,000	4,980		62,000	26,000
2,250		40,000	13,000	5,000		62,000	26,000
2,300		40,000	13,000	5,060		62,000	26,000
2,380	3/32	43,000	14,000	5,100		62,000	26,000
2,400		43,000	14,000	5,160	13/64	62,000	26,000
2,500		43,000	14,000	5,200		62,000	26,000
2,530		43,000	14,000	5,300		62,000	26,000
2,600		43,000	14,000	5,400		66,000	28,000
2,700		46,000	16,000	5,500		66,000	28,000
2,780	7/64	46,000	16,000	5,560	7/32	66,000	28,000
2,800		46,000	16,000	5,600		66,000	28,000
2,900		46,000	16,000	5,700		66,000	28,000
2,950		46,000	16,000	5,800		66,000	28,000
3,000		46,000	16,000	5,900		66,000	28,000
3,050		49,000	18,000	5,950	15/64	66,000	28,000
3,100		49,000	18,000	6,000		66,000	28,000
3,170	1/8	49,000	18,000	6,040		70,000	31,000
3,200		49,000	18,000	6,100		70,000	31,000
3,300		49,000	18,000	6,150		70,000	31,000
3,400		52,000	20,000	6,200		70,000	31,000
3,450		52,000	20,000	6,250		70,000	31,000
3,500		52,000	20,000	6,300		70,000	31,000
3,570	9/64	52,000	20,000	6,350	1/4	70,000	31,000
3,600		52,000	20,000	6,400		70,000	31,000
3,700		52,000	20,000	6,500		70,000	31,000



## Brocas espirales extra cortas

d1 mm	inch	l1 mm	l2 mm	d1 mm	inch	l1 mm	l2 mm
6,600		70,000	31,000	9,000		84,000	40,000
6,700		70,000	31,000	9,130	23/64	84,000	40,000
6,800		74,000	34,000	9,300		84,000	40,000
6,900		74,000	34,000	9,500		84,000	40,000
7,000		74,000	34,000	9,520	3/8	89,000	43,000
7,030		74,000	34,000	9,600		89,000	43,000
7,100		74,000	34,000	9,700		89,000	43,000
7,140	9/32	74,000	34,000	9,800		89,000	43,000
7,200		74,000	34,000	9,920	25/64	89,000	43,000
7,300		74,000	34,000	10,000		89,000	43,000
7,400		74,000	34,000	10,080		89,000	43,000
7,500		74,000	34,000	10,200		89,000	43,000
7,540	19/64	79,000	37,000	10,320	13/32	89,000	43,000
7,600		79,000	37,000	10,500		89,000	43,000
7,800		79,000	37,000	10,720	27/64	95,000	47,000
7,900		79,000	37,000	11,000		95,000	47,000
7,940	5/16	79,000	37,000	11,110	7/16	95,000	47,000
8,000		79,000	37,000	11,500		95,000	47,000
8,030		79,000	37,000	11,510	29/64	95,000	47,000
8,100		79,000	37,000	11,910	15/32	102,000	51,000
8,200		79,000	37,000	12,000		102,000	51,000
8,300		79,000	37,000	12,300	31/64	102,000	51,000
8,330	21/64	79,000	37,000	12,700	1/2	102,000	51,000
8,400		79,000	37,000	13,000		102,000	51,000
8,500		79,000	37,000	13,500		107,000	54,000
8,600		84,000	40,000	14,000		107,000	54,000
8,700		84,000	40,000	14,290	9/16	111,000	56,000
8,730	11/32	84,000	40,000	14,500		111,000	56,000
8,800		84,000	40,000	15,000		111,000	56,000
8,900		84,000	40,000	16,000		115,000	58,000



## Brocas espirales extra cortas

Nº artículo 89246

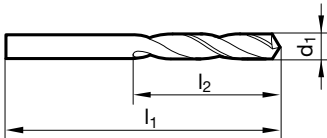


<b>P</b>	<b>M</b>	<b>K</b>	<b>N</b>	<b>S</b>	<b>H</b>
○	○	○	○	○	○



afilado plano • forma recta del corte principal

plásticos reforzados con fibra de vidrio • placas de circ. impresos que pueden ocasionar un rápido desgaste en las superficies y bordes de corte de la broca



d1 mm	l1 mm	l2 mm	d1 mm	l1 mm	l2 mm
0,500	30,000	6,500	4,000	50,000	22,000
0,900	30,000	9,500	4,100	50,000	25,000
1,000	30,000	11,000	4,200	50,000	25,000
1,200	30,000	13,000	4,600	50,000	25,000
1,400	30,000	13,000	4,700	50,000	25,000
2,000	40,000	17,500	5,000	50,000	25,000
2,500	40,000	17,500	5,200	50,000	25,000
3,000	45,000	20,000	5,300	50,000	25,000
3,100	50,000	22,000	5,600	50,000	25,000
3,200	50,000	22,000	5,800	50,000	25,000
3,400	50,000	22,000	5,900	50,000	25,000
3,600	50,000	22,000	6,100	65,000	30,000



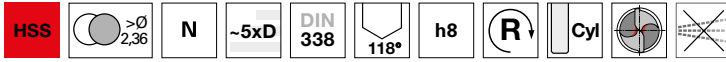


## Brocas espirales cil., cortas

Nº artículo 81010

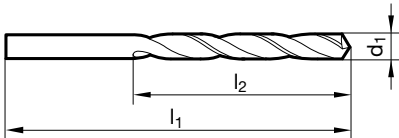


P	M	K	N	S	H
•		•	○		



vaciado de punta  $\geq \varnothing 1,000$  • entrada cónica

aceros y fundición de aceros (aleados y sin alea) • fundición gris, fundición maleable, fundición esferica • hierro sinterizado y grafito



d1	inch	l1	l2	d1	inch	l1	l2
mm		mm	mm	mm		mm	mm
0,200		19,000	2,500	0,650		26,000	8,000
0,220		19,000	2,500	0,670		26,000	8,000
0,230		19,000	2,500	0,690		28,000	9,000
0,240		19,000	2,500	0,700		28,000	9,000
0,250		19,000	3,000	0,710		28,000	9,000
0,260		19,000	3,000	0,720		28,000	9,000
0,270		19,000	3,000	0,730		28,000	9,000
0,280		19,000	3,000	0,740		28,000	9,000
0,290		19,000	3,000	0,750		28,000	9,000
0,300		19,000	3,000	0,760		30,000	10,000
0,310		19,000	4,000	0,770		30,000	10,000
0,320		19,000	4,000	0,780		30,000	10,000
0,330		19,000	4,000	0,790	1/32	30,000	10,000
0,350		19,000	4,000	0,800		30,000	10,000
0,370		19,000	4,000	0,810		30,000	10,000
0,380		19,000	4,000	0,820		30,000	10,000
0,390		20,000	5,000	0,830		30,000	10,000
0,400		20,000	5,000	0,850		30,000	10,000
0,410		20,000	5,000	0,860		32,000	11,000
0,420		20,000	5,000	0,870		32,000	11,000
0,430		20,000	5,000	0,880		32,000	11,000
0,440		20,000	5,000	0,890		32,000	11,000
0,450		20,000	5,000	0,900		32,000	11,000
0,460		20,000	5,000	0,910		32,000	11,000
0,470		20,000	5,000	0,940		32,000	11,000
0,480		20,000	5,000	0,950		32,000	11,000
0,490		22,000	6,000	0,960		34,000	12,000
0,500		22,000	6,000	0,970		34,000	12,000
0,510		22,000	6,000	0,980		34,000	12,000
0,520		22,000	6,000	0,990		34,000	12,000
0,530		22,000	6,000	1,000		34,000	12,000
0,540		24,000	7,000	1,010		34,000	12,000
0,550		24,000	7,000	1,020		34,000	12,000
0,560		24,000	7,000	1,030		34,000	12,000
0,570		24,000	7,000	1,040		34,000	12,000
0,580		24,000	7,000	1,050		34,000	12,000
0,590		24,000	7,000	1,070		36,000	14,000
0,600		24,000	7,000	1,100		36,000	14,000
0,610		26,000	8,000	1,110		36,000	14,000
0,620		26,000	8,000	1,120		36,000	14,000
0,630		26,000	8,000	1,130		36,000	14,000
0,640		26,000	8,000	1,150		36,000	14,000



## Brocas espirales cil., cortas

d1 mm	inch	l1 mm	l2 mm	d1 mm	inch	l1 mm	l2 mm
1,160		36,000	14,000	2,440		57,000	30,000
1,180		36,000	14,000	2,450		57,000	30,000
1,190	3/64	38,000	16,000	2,460		57,000	30,000
1,200		38,000	16,000	2,500		57,000	30,000
1,210		38,000	16,000	2,510		57,000	30,000
1,220		38,000	16,000	2,520		57,000	30,000
1,250		38,000	16,000	2,530		57,000	30,000
1,260		38,000	16,000	2,550		57,000	30,000
1,270		38,000	16,000	2,570		57,000	30,000
1,300		38,000	16,000	2,600		57,000	30,000
1,310		38,000	16,000	2,640		57,000	30,000
1,350		40,000	18,000	2,650		57,000	30,000
1,360		40,000	18,000	2,700		61,000	33,000
1,400		40,000	18,000	2,750		61,000	33,000
1,410		40,000	18,000	2,780	7/64	61,000	33,000
1,420		40,000	18,000	2,800		61,000	33,000
1,430		40,000	18,000	2,850		61,000	33,000
1,440		40,000	18,000	2,880		61,000	33,000
1,450		40,000	18,000	2,900		61,000	33,000
1,460		40,000	18,000	2,940		61,000	33,000
1,480		40,000	18,000	2,950		61,000	33,000
1,490		40,000	18,000	2,970		61,000	33,000
1,500		40,000	18,000	3,000		61,000	33,000
1,520		43,000	20,000	3,010		65,000	36,000
1,550		43,000	20,000	3,020		65,000	36,000
1,560		43,000	20,000	3,050		65,000	36,000
1,580		43,000	20,000	3,070		65,000	36,000
1,590	1/16	43,000	20,000	3,100		65,000	36,000
1,600		43,000	20,000	3,150		65,000	36,000
1,620		43,000	20,000	3,160		65,000	36,000
1,650		43,000	20,000	3,170	1/8	65,000	36,000
1,700		43,000	20,000	3,200		65,000	36,000
1,720		46,000	22,000	3,250		65,000	36,000
1,730		46,000	22,000	3,260		65,000	36,000
1,740		46,000	22,000	3,300		65,000	36,000
1,750		46,000	22,000	3,350		65,000	36,000
1,760		46,000	22,000	3,400		70,000	39,000
1,800		46,000	22,000	3,450		70,000	39,000
1,820		46,000	22,000	3,500		70,000	39,000
1,830		46,000	22,000	3,550		70,000	39,000
1,840		46,000	22,000	3,600		70,000	39,000
1,850		46,000	22,000	3,650		70,000	39,000
1,890		46,000	22,000	3,670		70,000	39,000
1,900		46,000	22,000	3,680		70,000	39,000
1,910		49,000	24,000	3,700		70,000	39,000
1,920		49,000	24,000	3,750		70,000	39,000
1,930		49,000	24,000	3,800		75,000	43,000
1,950		49,000	24,000	3,850		75,000	43,000
1,980	5/64	49,000	24,000	3,900		75,000	43,000
1,990		49,000	24,000	3,930		75,000	43,000
2,000		49,000	24,000	3,950		75,000	43,000
2,010		49,000	24,000	3,970	5/32	75,000	43,000
2,020		49,000	24,000	3,990		75,000	43,000
2,030		49,000	24,000	4,000		75,000	43,000
2,040		49,000	24,000	4,030		75,000	43,000
2,050		49,000	24,000	4,040		75,000	43,000
2,100		49,000	24,000	4,050		75,000	43,000
2,110		49,000	24,000	4,060		75,000	43,000
2,120		49,000	24,000	4,100		75,000	43,000
2,150		53,000	27,000	4,150		75,000	43,000
2,170		53,000	27,000	4,200		75,000	43,000
2,200		53,000	27,000	4,220		75,000	43,000
2,220		53,000	27,000	4,250		75,000	43,000
2,250		53,000	27,000	4,300		80,000	47,000
2,270		53,000	27,000	4,320		80,000	47,000
2,300		53,000	27,000	4,350		80,000	47,000
2,330		53,000	27,000	4,370	11/64	80,000	47,000
2,350		53,000	27,000	4,390		80,000	47,000
2,360		53,000	27,000	4,400		80,000	47,000
2,370		57,000	30,000	4,450		80,000	47,000
2,380	3/32	57,000	30,000	4,500		80,000	47,000
2,400		57,000	30,000	4,530		80,000	47,000



## Brocas espirales cil., cortas

d1 mm	inch	l1 mm	l2 mm	d1 mm	inch	l1 mm	l2 mm
4,550		80,000	47,000	7,250		109,000	69,000
4,570		80,000	47,000	7,300		109,000	69,000
4,600		80,000	47,000	7,350		109,000	69,000
4,650		80,000	47,000	7,400		109,000	69,000
4,700		80,000	47,000	7,450		109,000	69,000
4,750		80,000	47,000	7,500		109,000	69,000
4,760	3/16	86,000	52,000	7,540	19/64	117,000	75,000
4,780		86,000	52,000	7,600		117,000	75,000
4,800		86,000	52,000	7,700		117,000	75,000
4,830		86,000	52,000	7,750		117,000	75,000
4,850		86,000	52,000	7,800		117,000	75,000
4,900		86,000	52,000	7,850		117,000	75,000
4,920		86,000	52,000	7,900		117,000	75,000
4,950		86,000	52,000	7,940	5/16	117,000	75,000
5,000		86,000	52,000	7,950		117,000	75,000
5,050		86,000	52,000	8,000		117,000	75,000
5,060		86,000	52,000	8,050		117,000	75,000
5,100		86,000	52,000	8,100		117,000	75,000
5,110		86,000	52,000	8,200		117,000	75,000
5,150		86,000	52,000	8,250		117,000	75,000
5,160	13/64	86,000	52,000	8,300		117,000	75,000
5,200		86,000	52,000	8,330	21/64	117,000	75,000
5,250		86,000	52,000	8,400		117,000	75,000
5,300		86,000	52,000	8,450		117,000	75,000
5,310		93,000	57,000	8,500		117,000	75,000
5,350		93,000	57,000	8,550		125,000	81,000
5,400		93,000	57,000	8,600		125,000	81,000
5,410		93,000	57,000	8,700		125,000	81,000
5,450		93,000	57,000	8,730	11/32	125,000	81,000
5,500		93,000	57,000	8,750		125,000	81,000
5,530		93,000	57,000	8,800		125,000	81,000
5,550		93,000	57,000	8,850		125,000	81,000
5,560	7/32	93,000	57,000	8,900		125,000	81,000
5,600		93,000	57,000	9,000		125,000	81,000
5,610		93,000	57,000	9,100		125,000	81,000
5,620		93,000	57,000	9,130	23/64	125,000	81,000
5,650		93,000	57,000	9,150		125,000	81,000
5,700		93,000	57,000	9,200		125,000	81,000
5,750		93,000	57,000	9,250		125,000	81,000
5,790		93,000	57,000	9,300		125,000	81,000
5,800		93,000	57,000	9,350		125,000	81,000
5,850		93,000	57,000	9,400		125,000	81,000
5,900		93,000	57,000	9,500		125,000	81,000
5,950	15/64	93,000	57,000	9,520	3/8	133,000	87,000
5,970		93,000	57,000	9,550		133,000	87,000
6,000		93,000	57,000	9,600		133,000	87,000
6,030		101,000	63,000	9,650		133,000	87,000
6,040		101,000	63,000	9,700		133,000	87,000
6,050		101,000	63,000	9,750		133,000	87,000
6,100		101,000	63,000	9,800		133,000	87,000
6,150		101,000	63,000	9,900		133,000	87,000
6,200		101,000	63,000	9,920	25/64	133,000	87,000
6,250		101,000	63,000	9,950		133,000	87,000
6,300		101,000	63,000	10,000		133,000	87,000
6,350	1/4	101,000	63,000	10,050		133,000	87,000
6,400		101,000	63,000	10,080		133,000	87,000
6,450		101,000	63,000	10,100		133,000	87,000
6,500		101,000	63,000	10,200		133,000	87,000
6,550		101,000	63,000	10,250		133,000	87,000
6,600		101,000	63,000	10,300		133,000	87,000
6,650		101,000	63,000	10,320	13/32	133,000	87,000
6,700		101,000	63,000	10,400		133,000	87,000
6,750	17/64	109,000	69,000	10,500		133,000	87,000
6,800		109,000	69,000	10,600		133,000	87,000
6,850		109,000	69,000	10,700		142,000	94,000
6,900		109,000	69,000	10,720	27/64	142,000	94,000
6,950		109,000	69,000	10,750		142,000	94,000
7,000		109,000	69,000	10,800		142,000	94,000
7,050		109,000	69,000	10,900		142,000	94,000
7,100		109,000	69,000	11,000		142,000	94,000
7,140	9/32	109,000	69,000	11,100		142,000	94,000
7,200		109,000	69,000	11,110	7/16	142,000	94,000



## Brocas espirales cil., cortas

d1 mm	inch	l1 mm	l2 mm	d1 mm	inch	l1 mm	l2 mm
11,200		142,000	94,000	14,250		169,000	114,000
11,250		142,000	94,000	14,300		169,000	114,000
11,300		142,000	94,000	14,400		169,000	114,000
11,400		142,000	94,000	14,500		169,000	114,000
11,500		142,000	94,000	14,600		169,000	114,000
11,510	29/64	142,000	94,000	14,700		169,000	114,000
11,600		142,000	94,000	14,750		169,000	114,000
11,700		142,000	94,000	14,800		169,000	114,000
11,750		142,000	94,000	14,900		169,000	114,000
11,800		142,000	94,000	15,000		169,000	114,000
11,900		151,000	101,000	15,080	19/32	178,000	120,000
11,910	15/32	151,000	101,000	15,100		178,000	120,000
12,000		151,000	101,000	15,250		178,000	120,000
12,050		151,000	101,000	15,400		178,000	120,000
12,100		151,000	101,000	15,500		178,000	120,000
12,200		151,000	101,000	15,700		178,000	120,000
12,250		151,000	101,000	15,750		178,000	120,000
12,300	31/64	151,000	101,000	15,800		178,000	120,000
12,400		151,000	101,000	15,870	5/8	178,000	120,000
12,500		151,000	101,000	16,000		178,000	120,000
12,600		151,000	101,000	16,100		184,000	125,000
12,700	1/2	151,000	101,000	16,200		184,000	125,000
12,750		151,000	101,000	16,250		184,000	125,000
12,800		151,000	101,000	16,270	41/64	184,000	125,000
12,850		151,000	101,000	16,500		184,000	125,000
12,900		151,000	101,000	16,600		184,000	125,000
13,000		151,000	101,000	16,700		184,000	125,000
13,100	33/64	151,000	101,000	17,000		184,000	125,000
13,200		151,000	101,000	17,250		191,000	130,000
13,250		160,000	108,000	17,500		191,000	130,000
13,300		160,000	108,000	17,750		191,000	130,000
13,400		160,000	108,000	17,800		191,000	130,000
13,490	17/32	160,000	108,000	18,000		191,000	130,000
13,500		160,000	108,000	18,500		198,000	135,000
13,600		160,000	108,000	18,750		198,000	135,000
13,700		160,000	108,000	19,000		198,000	135,000
13,750		160,000	108,000	19,250		205,000	140,000
13,800		160,000	108,000	19,500		205,000	140,000
13,900		160,000	108,000	20,000		205,000	140,000
14,000		160,000	108,000				
14,100		169,000	114,000				
14,200		169,000	114,000				



## Brocas espirales cil., cortas

Nº artículo 81015

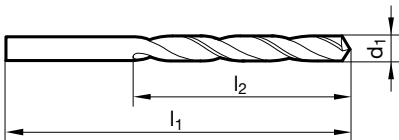


P	M	K	N	S	H
•		•	○		



vaciado de punta  $\geq \varnothing 15,000$  • entrada cónica

aceros y fundición de aceros (aleados y sin alea) • fundición gris, fundición maleable, fundición esferica • hierro sinterizado y grafito



d1	inch	l1	l2	d1	inch	l1	l2
mm		mm	mm	mm		mm	mm
0,250		19,000	3,000	3,150		65,000	36,000
0,300		19,000	3,000	3,200		65,000	36,000
0,370		19,000	4,000	3,250		65,000	36,000
0,400		20,000	5,000	3,300		65,000	36,000
0,500		22,000	6,000	3,350		65,000	36,000
0,650		26,000	8,000	3,400		70,000	39,000
0,700		28,000	9,000	3,450		70,000	39,000
0,800		30,000	10,000	3,500		70,000	39,000
0,900		32,000	11,000	3,550		70,000	39,000
0,950		32,000	11,000	3,600		70,000	39,000
1,000		34,000	12,000	3,650		70,000	39,000
1,050		34,000	12,000	3,700		70,000	39,000
1,100		36,000	14,000	3,750		70,000	39,000
1,150		36,000	14,000	3,800		75,000	43,000
1,170		36,000	14,000	3,850		75,000	43,000
1,200		38,000	16,000	3,900		75,000	43,000
1,250		38,000	16,000	3,950		75,000	43,000
1,300		38,000	16,000	4,000		75,000	43,000
1,350		40,000	18,000	4,100		75,000	43,000
1,400		40,000	18,000	4,150		75,000	43,000
1,450		40,000	18,000	4,200		75,000	43,000
1,500		40,000	18,000	4,250		75,000	43,000
1,550		43,000	20,000	4,350		80,000	47,000
1,560		43,000	20,000	4,400		80,000	47,000
1,600		43,000	20,000	4,450		80,000	47,000
1,700		43,000	20,000	4,500		80,000	47,000
1,800		46,000	22,000	4,550		80,000	47,000
2,000		49,000	24,000	4,600		80,000	47,000
2,050		49,000	24,000	4,650		80,000	47,000
2,100		49,000	24,000	4,700		80,000	47,000
2,200		53,000	27,000	4,750		80,000	47,000
2,250		53,000	27,000	4,850		86,000	52,000
2,400		57,000	30,000	4,900		86,000	52,000
2,500		57,000	30,000	5,000		86,000	52,000
2,550		57,000	30,000	5,200		86,000	52,000
2,600		57,000	30,000	5,300		86,000	52,000
2,700		61,000	33,000	5,400		93,000	57,000
2,750		61,000	33,000	5,500		93,000	57,000
2,800		61,000	33,000	5,600		93,000	57,000
3,000		61,000	33,000	5,700		93,000	57,000
3,050		65,000	36,000	5,750		93,000	57,000
3,100		65,000	36,000	5,800		93,000	57,000



## Brocas espirales cil., cortas

d1 mm	inch	l1 mm	l2 mm	d1 mm	inch	l1 mm	l2 mm
5,900		93,000	57,000	9,500		125,000	81,000
6,000		93,000	57,000	9,600		133,000	87,000
6,100		101,000	63,000	9,700		133,000	87,000
6,200		101,000	63,000	9,750		133,000	87,000
6,250		101,000	63,000	9,800		133,000	87,000
6,300		101,000	63,000	9,900		133,000	87,000
6,400		101,000	63,000	10,000		133,000	87,000
6,500		101,000	63,000	10,100		133,000	87,000
6,600		101,000	63,000	10,200		133,000	87,000
6,650		101,000	63,000	10,300		133,000	87,000
6,750	17/64	109,000	69,000	10,400		133,000	87,000
6,800		109,000	69,000	10,500		133,000	87,000
6,900		109,000	69,000	10,600		133,000	87,000
7,000		109,000	69,000	10,750		142,000	94,000
7,100		109,000	69,000	10,800		142,000	94,000
7,200		109,000	69,000	10,900		142,000	94,000
7,250		109,000	69,000	11,000		142,000	94,000
7,300		109,000	69,000	11,100		142,000	94,000
7,400		109,000	69,000	11,250		142,000	94,000
7,500		109,000	69,000	11,500		142,000	94,000
7,600		117,000	75,000	11,600		142,000	94,000
7,700		117,000	75,000	11,750		142,000	94,000
7,800		117,000	75,000	11,800		142,000	94,000
8,000		117,000	75,000	12,000		151,000	101,000
8,100		117,000	75,000	12,100		151,000	101,000
8,250		117,000	75,000	12,200		151,000	101,000
8,300		117,000	75,000	12,250		151,000	101,000
8,400		117,000	75,000	12,500		151,000	101,000
8,500		117,000	75,000	12,750		151,000	101,000
8,600		125,000	81,000	13,000		151,000	101,000
8,800		125,000	81,000	13,500		160,000	108,000
8,900		125,000	81,000	14,000		160,000	108,000
9,000		125,000	81,000	14,500		169,000	114,000
9,100		125,000	81,000	15,000		169,000	114,000
9,300		125,000	81,000	15,500		178,000	120,000
9,400		125,000	81,000	17,000		184,000	125,000

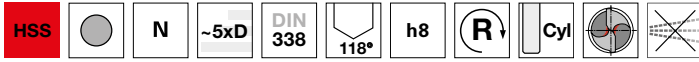


## Brocas espirales cil., cortas

Nº artículo 81017

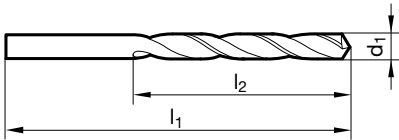


P	M	K	N	S	H
•		•	○		



vaciado de punta  $\geq \varnothing 3,000$  • entrada cónica • con arrastre según DIN 1809

aceros y fundición de aceros (aleados y sin alea) • fundición gris, fundición maleable, fundición esferica • hierro sinterizado y grafito



d1 mm	inch	l1 mm	l2 mm	d1 mm	inch	l1 mm	l2 mm
3,000		61,000	33,000	7,600		117,000	75,000
3,100		65,000	36,000	7,700		117,000	75,000
3,200		65,000	36,000	7,750		117,000	75,000
3,300		65,000	36,000	7,800		117,000	75,000
3,400		70,000	39,000	7,900		117,000	75,000
3,500		70,000	39,000	8,000		117,000	75,000
3,600		70,000	39,000	8,500		117,000	75,000
3,700		70,000	39,000	8,700		125,000	81,000
3,800		75,000	43,000	8,800		125,000	81,000
4,000		75,000	43,000	8,900		125,000	81,000
4,200		75,000	43,000	9,000		125,000	81,000
4,500		80,000	47,000	9,100		125,000	81,000
4,600		80,000	47,000	9,500		125,000	81,000
5,000		86,000	52,000	9,800		133,000	87,000
5,100		86,000	52,000	10,000		133,000	87,000
5,200		86,000	52,000	10,200		133,000	87,000
5,500		93,000	57,000	10,500		133,000	87,000
5,600		93,000	57,000	11,000		142,000	94,000
5,750		93,000	57,000	11,500		142,000	94,000
5,800		93,000	57,000	12,000		151,000	101,000
6,000		93,000	57,000	13,000		151,000	101,000
6,100		101,000	63,000				
6,200		101,000	63,000				
6,300		101,000	63,000				
6,400		101,000	63,000				
6,500		101,000	63,000				
6,800		109,000	69,000				
7,000		109,000	69,000				
7,200		109,000	69,000				
7,500		109,000	69,000				

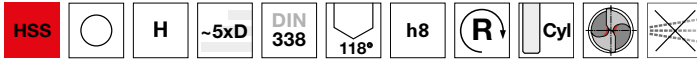


## Brocas espirales cil., cortas

Nº artículo 81020

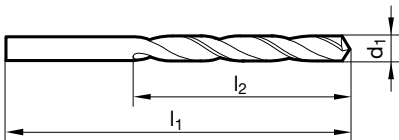


P	M	K	N	S	H
			•		



vaciado de punta  $\geq \varnothing 14,500$  • entrada cónica

materiales duros y quebradizos • latón, aleaciones de magnesio • bronce y bronce al fósforo • pizarra, mica, Pertinax



d1 mm	inch	l1 mm	l2 mm	d1 mm	inch	l1 mm	l2 mm
0,300		19,000	3,000	2,100		49,000	24,000
0,320		19,000	4,000	2,200		53,000	27,000
0,400		20,000	5,000	2,250		53,000	27,000
0,450		20,000	5,000	2,300		53,000	27,000
0,480		20,000	5,000	2,400		57,000	30,000
0,500		22,000	6,000	2,450		57,000	30,000
0,510		22,000	6,000	2,500		57,000	30,000
0,560		24,000	7,000	2,550		57,000	30,000
0,600		24,000	7,000	2,600		57,000	30,000
0,650		26,000	8,000	2,630		57,000	30,000
0,700		28,000	9,000	2,700		61,000	33,000
0,750		28,000	9,000	2,780	7/64	61,000	33,000
0,800		30,000	10,000	2,800		61,000	33,000
0,810		30,000	10,000	2,900		61,000	33,000
0,840		30,000	10,000	2,950		61,000	33,000
0,900		32,000	11,000	3,000		61,000	33,000
0,910		32,000	11,000	3,020		65,000	36,000
0,950		32,000	11,000	3,050		65,000	36,000
1,000		34,000	12,000	3,100		65,000	36,000
1,050		34,000	12,000	3,150		65,000	36,000
1,100		36,000	14,000	3,200		65,000	36,000
1,150		36,000	14,000	3,250		65,000	36,000
1,200		38,000	16,000	3,300		65,000	36,000
1,250		38,000	16,000	3,350		65,000	36,000
1,280		38,000	16,000	3,400		70,000	39,000
1,300		38,000	16,000	3,500		70,000	39,000
1,310		38,000	16,000	3,550		70,000	39,000
1,400		40,000	18,000	3,600		70,000	39,000
1,420		40,000	18,000	3,650		70,000	39,000
1,450		40,000	18,000	3,700		70,000	39,000
1,500		40,000	18,000	3,750		70,000	39,000
1,510		43,000	20,000	3,800		75,000	43,000
1,550		43,000	20,000	3,850		75,000	43,000
1,600		43,000	20,000	3,900		75,000	43,000
1,650		43,000	20,000	4,000		75,000	43,000
1,700		43,000	20,000	4,050		75,000	43,000
1,800		46,000	22,000	4,100		75,000	43,000
1,850		46,000	22,000	4,200		75,000	43,000
1,900		46,000	22,000	4,250		75,000	43,000
1,950		49,000	24,000	4,300		80,000	47,000
2,000		49,000	24,000	4,400		80,000	47,000
2,050		49,000	24,000	4,500		80,000	47,000





## Brocas espirales cil., cortas

d1 mm	inch	l1 mm	l2 mm	d1 mm	inch	l1 mm	l2 mm
4,600		80,000	47,000	8,400		117,000	75,000
4,700		80,000	47,000	8,500		117,000	75,000
4,750		80,000	47,000	8,600		125,000	81,000
4,800		86,000	52,000	8,700		125,000	81,000
4,900		86,000	52,000	8,800		125,000	81,000
5,000		86,000	52,000	8,900		125,000	81,000
5,100		86,000	52,000	9,000		125,000	81,000
5,200		86,000	52,000	9,100		125,000	81,000
5,300		86,000	52,000	9,200		125,000	81,000
5,400		93,000	57,000	9,250		125,000	81,000
5,500		93,000	57,000	9,300		125,000	81,000
5,600		93,000	57,000	9,400		125,000	81,000
5,700		93,000	57,000	9,500		125,000	81,000
5,750		93,000	57,000	9,600		133,000	87,000
5,800		93,000	57,000	9,700		133,000	87,000
5,900		93,000	57,000	9,750		133,000	87,000
6,000		93,000	57,000	9,800		133,000	87,000
6,100		101,000	63,000	9,900		133,000	87,000
6,200		101,000	63,000	10,000		133,000	87,000
6,250		101,000	63,000	10,100		133,000	87,000
6,300		101,000	63,000	10,200		133,000	87,000
6,400		101,000	63,000	10,500		133,000	87,000
6,500		101,000	63,000	10,600		133,000	87,000
6,600		101,000	63,000	10,800		142,000	94,000
6,700		101,000	63,000	11,000		142,000	94,000
6,800		109,000	69,000	11,200		142,000	94,000
6,900		109,000	69,000	11,500		142,000	94,000
7,000		109,000	69,000	12,000		151,000	101,000
7,050		109,000	69,000	12,100		151,000	101,000
7,100		109,000	69,000	12,500		151,000	101,000
7,200		109,000	69,000	12,700	1/2	151,000	101,000
7,250		109,000	69,000	13,000		151,000	101,000
7,300		109,000	69,000	13,800		160,000	108,000
7,500		109,000	69,000	14,000		160,000	108,000
7,600		117,000	75,000	14,500		169,000	114,000
7,700		117,000	75,000	15,000		169,000	114,000
7,750		117,000	75,000	15,100		178,000	120,000
7,800		117,000	75,000	15,500		178,000	120,000
7,900		117,000	75,000	16,000		178,000	120,000
8,000		117,000	75,000	18,000		191,000	130,000
8,100		117,000	75,000	19,000		198,000	135,000
8,200		117,000	75,000	20,000		205,000	140,000

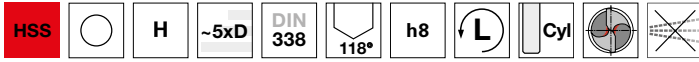


## Brocas espirales cil., cortas

Nº artículo 81025

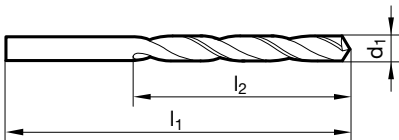


P	M	K	N	S	H
			•		



vaciado de punta  $\geq \varnothing 14,500$  • entrada cónica

materiales duros y quebradizos • latón, aleaciones de magnesio • bronce y bronce al fósforo • pizarra, mica, Pertinax



d1	inch	l1	l2	d1	inch	l1	l2
mm		mm	mm	mm		mm	mm
0,500		22,000	6,000	2,900		61,000	33,000
0,580		24,000	7,000	2,950		61,000	33,000
0,670		26,000	8,000	3,000		61,000	33,000
0,690		28,000	9,000	3,100		65,000	36,000
0,700		28,000	9,000	3,150		65,000	36,000
0,750		28,000	9,000	3,200		65,000	36,000
0,800		30,000	10,000	3,250		65,000	36,000
0,900		32,000	11,000	3,300		65,000	36,000
0,950		32,000	11,000	3,400		70,000	39,000
1,000		34,000	12,000	3,500		70,000	39,000
1,050		34,000	12,000	3,700		70,000	39,000
1,100		36,000	14,000	3,750		70,000	39,000
1,150		36,000	14,000	3,800		75,000	43,000
1,160		36,000	14,000	3,850		75,000	43,000
1,180		36,000	14,000	3,900		75,000	43,000
1,200		38,000	16,000	4,000		75,000	43,000
1,240		38,000	16,000	4,100		75,000	43,000
1,290		38,000	16,000	4,300		80,000	47,000
1,400		40,000	18,000	4,400		80,000	47,000
1,460		40,000	18,000	4,500		80,000	47,000
1,470		40,000	18,000	4,600		80,000	47,000
1,480		40,000	18,000	4,700		80,000	47,000
1,500		40,000	18,000	4,750		80,000	47,000
1,600		43,000	20,000	4,800		86,000	52,000
1,660		43,000	20,000	4,950		86,000	52,000
1,710		46,000	22,000	5,000		86,000	52,000
1,730		46,000	22,000	5,200		86,000	52,000
1,800		46,000	22,000	5,300		86,000	52,000
1,900		46,000	22,000	5,400		93,000	57,000
1,920		49,000	24,000	5,500		93,000	57,000
1,950		49,000	24,000	5,600		93,000	57,000
2,000		49,000	24,000	5,750		93,000	57,000
2,050		49,000	24,000	5,800		93,000	57,000
2,100		49,000	24,000	5,900		93,000	57,000
2,250		53,000	27,000	6,000		93,000	57,000
2,350		53,000	27,000	6,100		101,000	63,000
2,400		57,000	30,000	6,250		101,000	63,000
2,430		57,000	30,000	6,400		101,000	63,000
2,500		57,000	30,000	6,500		101,000	63,000
2,700		61,000	33,000	6,600		101,000	63,000
2,750		61,000	33,000	6,800		109,000	69,000
2,800		61,000	33,000	6,900		109,000	69,000



## Brocas espirales cil., cortas

d1 mm	inch	l1 mm	l2 mm	d1 mm	inch	l1 mm	l2 mm
7,000		109,000	69,000	9,800		133,000	87,000
7,100		109,000	69,000	10,000		133,000	87,000
7,200		109,000	69,000	11,000		142,000	94,000
7,300		109,000	69,000	11,500		142,000	94,000
7,500		109,000	69,000	12,000		151,000	101,000
7,700		117,000	75,000	13,000		151,000	101,000
7,750		117,000	75,000	13,500		160,000	108,000
7,800		117,000	75,000	14,000		160,000	108,000
8,000		117,000	75,000	14,500		169,000	114,000
8,100		117,000	75,000	15,500		178,000	120,000
8,500		117,000	75,000	16,000		178,000	120,000
8,600		125,000	81,000				
8,700		125,000	81,000				
8,900		125,000	81,000				
9,000		125,000	81,000				
9,200		125,000	81,000				
9,400		125,000	81,000				
9,500		125,000	81,000				

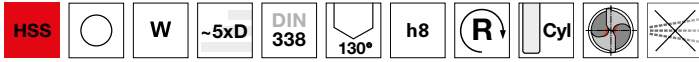


## Brocas espirales cil., cortas

Nº artículo 81030

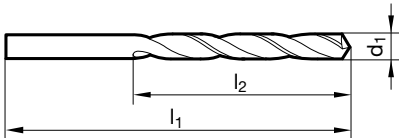


P	M	K	N	S	H
			•		



vaciado de punta  $\geq \varnothing 14,500$  • entrada cónica

mat. blandos y de viruta larga • aluminio, alea. de alum. (de vir. larga) • zink, cobre fino, siluminio, electrón • plásticos (blandos)  
• madera



d1	inch	l1	l2	d1	inch	l1	l2
mm		mm	mm	mm		mm	mm
0,250		19,000	3,000	2,450		57,000	30,000
0,300		19,000	3,000	2,500		57,000	30,000
0,400		20,000	5,000	2,550		57,000	30,000
0,500		22,000	6,000	2,600		57,000	30,000
0,550		24,000	7,000	2,700		61,000	33,000
0,600		24,000	7,000	2,750		61,000	33,000
0,700		28,000	9,000	2,800		61,000	33,000
0,800		30,000	10,000	2,850		61,000	33,000
0,850		30,000	10,000	2,900		61,000	33,000
0,900		32,000	11,000	2,950		61,000	33,000
0,950		32,000	11,000	3,000		61,000	33,000
0,970		34,000	12,000	3,050		65,000	36,000
1,000		34,000	12,000	3,100		65,000	36,000
1,050		34,000	12,000	3,150		65,000	36,000
1,070		36,000	14,000	3,200		65,000	36,000
1,100		36,000	14,000	3,250		65,000	36,000
1,150		36,000	14,000	3,300		65,000	36,000
1,200		38,000	16,000	3,400		70,000	39,000
1,240		38,000	16,000	3,450		70,000	39,000
1,250		38,000	16,000	3,500		70,000	39,000
1,280		38,000	16,000	3,600		70,000	39,000
1,300		38,000	16,000	3,650		70,000	39,000
1,400		40,000	18,000	3,700		70,000	39,000
1,450		40,000	18,000	3,750		70,000	39,000
1,500		40,000	18,000	3,800		75,000	43,000
1,530		43,000	20,000	3,850		75,000	43,000
1,550		43,000	20,000	3,900		75,000	43,000
1,600		43,000	20,000	3,950		75,000	43,000
1,650		43,000	20,000	4,000		75,000	43,000
1,700		43,000	20,000	4,040		75,000	43,000
1,750		46,000	22,000	4,100		75,000	43,000
1,800		46,000	22,000	4,150		75,000	43,000
1,900		46,000	22,000	4,200		75,000	43,000
1,950		49,000	24,000	4,250		75,000	43,000
2,000		49,000	24,000	4,300		80,000	47,000
2,050		49,000	24,000	4,400		80,000	47,000
2,100		49,000	24,000	4,500		80,000	47,000
2,150		53,000	27,000	4,600		80,000	47,000
2,200		53,000	27,000	4,700		80,000	47,000
2,250		53,000	27,000	4,750		80,000	47,000
2,300		53,000	27,000	4,800		86,000	52,000
2,400		57,000	30,000	4,850		86,000	52,000



## Brocas espirales cil., cortas

d1 mm	inch	l1 mm	l2 mm	d1 mm	inch	l1 mm	l2 mm
4,900		86,000	52,000	9,100		125,000	81,000
4,950		86,000	52,000	9,200		125,000	81,000
5,000		86,000	52,000	9,250		125,000	81,000
5,050		86,000	52,000	9,300		125,000	81,000
5,100		86,000	52,000	9,500		125,000	81,000
5,200		86,000	52,000	9,600		133,000	87,000
5,250		86,000	52,000	9,700		133,000	87,000
5,300		86,000	52,000	9,800		133,000	87,000
5,400		93,000	57,000	9,900		133,000	87,000
5,500		93,000	57,000	10,000		133,000	87,000
5,550		93,000	57,000	10,100		133,000	87,000
5,600		93,000	57,000	10,200		133,000	87,000
5,700		93,000	57,000	10,250		133,000	87,000
5,750		93,000	57,000	10,300		133,000	87,000
5,800		93,000	57,000	10,400		133,000	87,000
5,900		93,000	57,000	10,500		133,000	87,000
5,950	15/64	93,000	57,000	10,600		133,000	87,000
6,000		93,000	57,000	10,800		142,000	94,000
6,100		101,000	63,000	10,900		142,000	94,000
6,150		101,000	63,000	10,950		142,000	94,000
6,200		101,000	63,000	11,000		142,000	94,000
6,250		101,000	63,000	11,100		142,000	94,000
6,300		101,000	63,000	11,200		142,000	94,000
6,350	1/4	101,000	63,000	11,500		142,000	94,000
6,400		101,000	63,000	11,600		142,000	94,000
6,500		101,000	63,000	11,700		142,000	94,000
6,600		101,000	63,000	11,800		142,000	94,000
6,700		101,000	63,000	12,000		151,000	101,000
6,750	17/64	109,000	69,000	12,100		151,000	101,000
6,800		109,000	69,000	12,200		151,000	101,000
6,900		109,000	69,000	12,500		151,000	101,000
7,000		109,000	69,000	12,600		151,000	101,000
7,100		109,000	69,000	12,700	1/2	151,000	101,000
7,200		109,000	69,000	13,000		151,000	101,000
7,250		109,000	69,000	13,200		151,000	101,000
7,300		109,000	69,000	13,500		160,000	108,000
7,400		109,000	69,000	14,000		160,000	108,000
7,500		109,000	69,000	14,400		169,000	114,000
7,600		117,000	75,000	14,500		169,000	114,000
7,700		117,000	75,000	15,000		169,000	114,000
7,750		117,000	75,000	15,500		178,000	120,000
7,800		117,000	75,000	16,000		178,000	120,000
7,900		117,000	75,000	16,500		184,000	125,000
8,000		117,000	75,000				
8,100		117,000	75,000				
8,300		117,000	75,000				
8,400		117,000	75,000				
8,500		117,000	75,000				
8,600		125,000	81,000				
8,700		125,000	81,000				
8,750		125,000	81,000				
8,800		125,000	81,000				
8,900		125,000	81,000				
9,000		125,000	81,000				

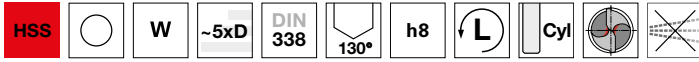


## Brocas espirales cil., cortas

Nº artículo 81035

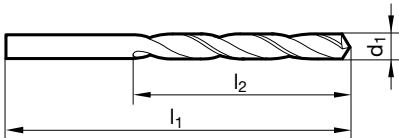


P	M	K	N	S	H
			•		



vaciado de punta  $\geq \varnothing 15,000$  • entrada cónica

mat. blandos y de viruta larga • aluminio, alea. de alum. (de vir. larga) • zink, cobre fino, siluminio, electrón • plásticos (blandos)  
• madera



d1	inch	l1	l2	d1	inch	l1	l2
mm		mm	mm	mm		mm	mm
0,500		22,000	6,000	4,900		86,000	52,000
0,600		24,000	7,000	5,100		86,000	52,000
0,750		28,000	9,000	5,250		86,000	52,000
1,000		34,000	12,000	5,400		93,000	57,000
1,050		34,000	12,000	5,500		93,000	57,000
1,100		36,000	14,000	5,600		93,000	57,000
1,200		38,000	16,000	5,800		93,000	57,000
1,550		43,000	20,000	6,000		93,000	57,000
1,750		46,000	22,000	6,200		101,000	63,000
1,800		46,000	22,000	6,300		101,000	63,000
1,850		46,000	22,000	6,400		101,000	63,000
1,900		46,000	22,000	6,800		109,000	69,000
2,000		49,000	24,000	6,900		109,000	69,000
2,250		53,000	27,000	7,000		109,000	69,000
2,300		53,000	27,000	7,400		109,000	69,000
2,350		53,000	27,000	7,500		109,000	69,000
2,400		57,000	30,000	7,600		117,000	75,000
2,500		57,000	30,000	7,700		117,000	75,000
2,600		57,000	30,000	7,900		117,000	75,000
2,650		57,000	30,000	9,100		125,000	81,000
2,700		61,000	33,000	9,300		125,000	81,000
2,900		61,000	33,000	9,400		125,000	81,000
3,000		61,000	33,000	9,500		125,000	81,000
3,100		65,000	36,000	10,500		133,000	87,000
3,200		65,000	36,000	11,500		142,000	94,000
3,500		70,000	39,000	12,500		151,000	101,000
3,700		70,000	39,000	13,000		151,000	101,000
3,800		75,000	43,000	13,500		160,000	108,000
3,850		75,000	43,000	14,000		160,000	108,000
3,900		75,000	43,000	15,000		169,000	114,000
3,950		75,000	43,000				
4,100		75,000	43,000				
4,200		75,000	43,000				
4,500		80,000	47,000				
4,600		80,000	47,000				
4,700		80,000	47,000				



## Brocas espirales cil., cortas

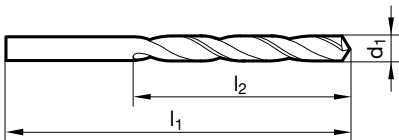
Nº artículo 81040



P	M	K	N	S	H
•		•	•		



vaciado de punta  $\geq \varnothing 1,000$  • entrada cónica • ranuras amplias • ideal para prof. de taladro sup. a 3xD  
 fundición gris • aceros de hasta 1000 N/mm<sup>2</sup> • Excepción: aceros CrNi, aceros VA y materiales similares



d1	inch	l1	l2	d1	inch	l1	l2
mm		mm	mm	mm		mm	mm
0,800		30,000	10,000	3,550		70,000	39,000
1,000		34,000	12,000	3,600		70,000	39,000
1,100		36,000	14,000	3,700		70,000	39,000
1,200		38,000	16,000	3,800		75,000	43,000
1,300		38,000	16,000	3,900		75,000	43,000
1,350		40,000	18,000	3,950		75,000	43,000
1,400		40,000	18,000	4,000		75,000	43,000
1,450		40,000	18,000	4,050		75,000	43,000
1,500		40,000	18,000	4,100		75,000	43,000
1,550		43,000	20,000	4,200		75,000	43,000
1,570		43,000	20,000	4,250		75,000	43,000
1,600		43,000	20,000	4,400		80,000	47,000
1,650		43,000	20,000	4,500		80,000	47,000
1,700		43,000	20,000	4,600		80,000	47,000
1,800		46,000	22,000	4,700		80,000	47,000
1,850		46,000	22,000	4,800		86,000	52,000
1,900		46,000	22,000	4,900		86,000	52,000
1,950		49,000	24,000	4,950		86,000	52,000
2,000		49,000	24,000	5,000		86,000	52,000
2,050		49,000	24,000	5,030		86,000	52,000
2,100		49,000	24,000	5,100		86,000	52,000
2,150		53,000	27,000	5,200		86,000	52,000
2,200		53,000	27,000	5,300		86,000	52,000
2,300		53,000	27,000	5,400		93,000	57,000
2,350		53,000	27,000	5,500		93,000	57,000
2,500		57,000	30,000	5,600		93,000	57,000
2,550		57,000	30,000	5,700		93,000	57,000
2,600		57,000	30,000	5,800		93,000	57,000
2,700		61,000	33,000	5,900		93,000	57,000
2,800		61,000	33,000	5,950	15/64	93,000	57,000
2,850		61,000	33,000	6,000		93,000	57,000
2,900		61,000	33,000	6,100		101,000	63,000
3,000		61,000	33,000	6,300		101,000	63,000
3,050		65,000	36,000	6,400		101,000	63,000
3,100		65,000	36,000	6,450		101,000	63,000
3,150		65,000	36,000	6,500		101,000	63,000
3,200		65,000	36,000	6,600		101,000	63,000
3,250		65,000	36,000	6,800		109,000	69,000
3,300		65,000	36,000	6,900		109,000	69,000
3,350		65,000	36,000	7,000		109,000	69,000
3,400		70,000	39,000	7,100		109,000	69,000
3,500		70,000	39,000	7,300		109,000	69,000



## Brocas espirales cil., cortas

d1 mm	inch	l1 mm	l2 mm	d1 mm	inch	l1 mm	l2 mm
7,400		109,000	69,000	10,300		133,000	87,000
7,500		109,000	69,000	10,400		133,000	87,000
7,600		117,000	75,000	10,500		133,000	87,000
7,750		117,000	75,000	10,800		142,000	94,000
7,800		117,000	75,000	10,900		142,000	94,000
7,900		117,000	75,000	11,000		142,000	94,000
8,000		117,000	75,000	11,100		142,000	94,000
8,100		117,000	75,000	11,400		142,000	94,000
8,250		117,000	75,000	11,600		142,000	94,000
8,300		117,000	75,000	12,000		151,000	101,000
8,500		117,000	75,000	12,200		151,000	101,000
8,800		125,000	81,000	12,400		151,000	101,000
8,900		125,000	81,000	12,500		151,000	101,000
9,000		125,000	81,000	13,000		151,000	101,000
9,100		125,000	81,000	14,000		160,000	108,000
9,200		125,000	81,000	14,500		169,000	114,000
9,400		125,000	81,000	15,000		169,000	114,000
9,500		125,000	81,000	15,400		178,000	120,000
9,600		133,000	87,000	15,500		178,000	120,000
9,700		133,000	87,000	16,000		178,000	120,000
9,800		133,000	87,000				
9,900		133,000	87,000				
10,000		133,000	87,000				
10,200		133,000	87,000				



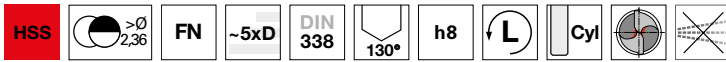


## Brocas espirales cil., cortas

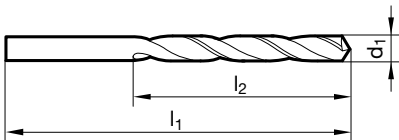
Nº artículo 81045



P	M	K	N	S	H
•		•	•		



vaciado de punta  $\geq \varnothing 1,400$  • entrada cónica • ranuras amplias • ideal para prof. de taladro sup. a 3xD  
 fundición gris • aceros de hasta 1000 N/mm<sup>2</sup> • Excepción: aceros CrNi, aceros VA y materiales similares



d1		l1	l2	d1		l1	l2
mm	inch	mm	mm	mm	inch	mm	mm
1,400		40,000	18,000	5,300		86,000	52,000
1,500		40,000	18,000	5,400		93,000	57,000
1,600		43,000	20,000	5,500		93,000	57,000
1,700		43,000	20,000	5,600		93,000	57,000
1,800		46,000	22,000	5,700		93,000	57,000
1,900		46,000	22,000	5,800		93,000	57,000
2,000		49,000	24,000	5,900		93,000	57,000
2,100		49,000	24,000	6,000		93,000	57,000
2,200		53,000	27,000	6,100		101,000	63,000
2,300		53,000	27,000	6,200		101,000	63,000
2,400		57,000	30,000	6,300		101,000	63,000
2,500		57,000	30,000	6,600		101,000	63,000
2,550		57,000	30,000	6,700		101,000	63,000
2,700		61,000	33,000	6,800		109,000	69,000
2,750		61,000	33,000	6,900		109,000	69,000
2,780	7/64	61,000	33,000	7,000		109,000	69,000
2,800		61,000	33,000	7,100		109,000	69,000
2,900		61,000	33,000	7,200		109,000	69,000
3,000		61,000	33,000	7,300		109,000	69,000
3,100		65,000	36,000	7,400		109,000	69,000
3,150		65,000	36,000	7,500		109,000	69,000
3,170	1/8	65,000	36,000	7,700		117,000	75,000
3,200		65,000	36,000	7,800		117,000	75,000
3,250		65,000	36,000	7,900		117,000	75,000
3,300		65,000	36,000	8,000		117,000	75,000
3,400		70,000	39,000	8,400		117,000	75,000
3,500		70,000	39,000	8,500		117,000	75,000
3,650		70,000	39,000	8,600		125,000	81,000
3,700		70,000	39,000	8,700		125,000	81,000
3,800		75,000	43,000	8,800		125,000	81,000
3,900		75,000	43,000	8,900		125,000	81,000
4,000		75,000	43,000	9,000		125,000	81,000
4,100		75,000	43,000	9,200		125,000	81,000
4,200		75,000	43,000	9,300		125,000	81,000
4,300		80,000	47,000	9,500		125,000	81,000
4,400		80,000	47,000	9,600		133,000	87,000
4,500		80,000	47,000	9,700		133,000	87,000
4,600		80,000	47,000	9,900		133,000	87,000
4,800		86,000	52,000	10,000		133,000	87,000
4,900		86,000	52,000	10,100		133,000	87,000
5,000		86,000	52,000	10,300		133,000	87,000
5,200		86,000	52,000	10,400		133,000	87,000



## Brocas espirales cil., cortas

d1 mm	inch	l1 mm	l2 mm	d1 mm	inch	l1 mm	l2 mm
10,500		133,000	87,000	15,500		178,000	120,000
10,800		142,000	94,000	16,000		178,000	120,000
11,000		142,000	94,000				
11,300		142,000	94,000				
11,500		142,000	94,000				
11,700		142,000	94,000				
11,900		151,000	101,000				
13,000		151,000	101,000				
13,500		160,000	108,000				
14,000		160,000	108,000				
14,500		169,000	114,000				
15,000		169,000	114,000				

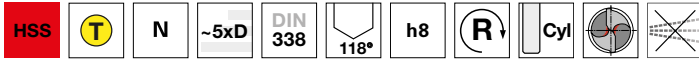


## Brocas espirales cil., cortas

Nº artículo 84405

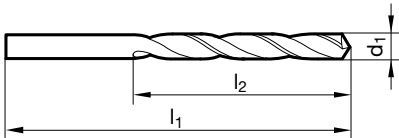


P	M	K	N	S	H
•		•	•		



vaciado de punta  $\geq \varnothing 1,000$  • entrada cónica

aceros y fundición de aceros (aleados y sin alea) • fundición gris, fundición maleable, fundición esferica • hierro sinterizado y grafito



d1	inch	l1	l2	d1	inch	l1	l2
mm		mm	mm	mm		mm	mm
0,400		20,000	5,000	2,750		61,000	33,000
0,500		22,000	6,000	2,800		61,000	33,000
0,600		24,000	7,000	2,850		61,000	33,000
0,610		26,000	8,000	2,900		61,000	33,000
0,700		28,000	9,000	2,950		61,000	33,000
0,800		30,000	10,000	3,000		61,000	33,000
0,820		30,000	10,000	3,050		65,000	36,000
0,900		32,000	11,000	3,100		65,000	36,000
1,000		34,000	12,000	3,150		65,000	36,000
1,020		34,000	12,000	3,200		65,000	36,000
1,100		36,000	14,000	3,250		65,000	36,000
1,150		36,000	14,000	3,300		65,000	36,000
1,200		38,000	16,000	3,400		70,000	39,000
1,250		38,000	16,000	3,450		70,000	39,000
1,300		38,000	16,000	3,500		70,000	39,000
1,350		40,000	18,000	3,600		70,000	39,000
1,400		40,000	18,000	3,650		70,000	39,000
1,450		40,000	18,000	3,700		70,000	39,000
1,500		40,000	18,000	3,750		70,000	39,000
1,550		43,000	20,000	3,800		75,000	43,000
1,600		43,000	20,000	3,900		75,000	43,000
1,650		43,000	20,000	3,950		75,000	43,000
1,700		43,000	20,000	4,000		75,000	43,000
1,750		46,000	22,000	4,100		75,000	43,000
1,800		46,000	22,000	4,150		75,000	43,000
1,820		46,000	22,000	4,200		75,000	43,000
1,900		46,000	22,000	4,250		75,000	43,000
2,000		49,000	24,000	4,300		80,000	47,000
2,050		49,000	24,000	4,400		80,000	47,000
2,100		49,000	24,000	4,500		80,000	47,000
2,150		53,000	27,000	4,600		80,000	47,000
2,200		53,000	27,000	4,700		80,000	47,000
2,300		53,000	27,000	4,800		86,000	52,000
2,400		57,000	30,000	4,900		86,000	52,000
2,450		57,000	30,000	5,000		86,000	52,000
2,500		57,000	30,000	5,100		86,000	52,000
2,520		57,000	30,000	5,150		86,000	52,000
2,530		57,000	30,000	5,200		86,000	52,000
2,550		57,000	30,000	5,250		86,000	52,000
2,600		57,000	30,000	5,300		86,000	52,000
2,650		57,000	30,000	5,400		93,000	57,000
2,700		61,000	33,000	5,500		93,000	57,000



## Brocas espirales cil., cortas

d1 mm	inch	l1 mm	l2 mm	d1 mm	inch	l1 mm	l2 mm
5,600		93,000	57,000	9,900		133,000	87,000
5,700		93,000	57,000	10,000		133,000	87,000
5,800		93,000	57,000	10,100		133,000	87,000
5,900		93,000	57,000	10,200		133,000	87,000
6,000		93,000	57,000	10,250		133,000	87,000
6,040		101,000	63,000	10,300		133,000	87,000
6,100		101,000	63,000	10,500		133,000	87,000
6,200		101,000	63,000	10,600		133,000	87,000
6,300		101,000	63,000	10,700		142,000	94,000
6,350	1/4	101,000	63,000	10,750		142,000	94,000
6,400		101,000	63,000	10,800		142,000	94,000
6,500		101,000	63,000	11,000		142,000	94,000
6,550		101,000	63,000	11,200		142,000	94,000
6,600		101,000	63,000	11,250		142,000	94,000
6,700		101,000	63,000	11,300		142,000	94,000
6,750	17/64	109,000	69,000	11,500		142,000	94,000
6,800		109,000	69,000	11,600		142,000	94,000
6,900		109,000	69,000	11,700		142,000	94,000
7,000		109,000	69,000	11,750		142,000	94,000
7,100		109,000	69,000	11,800		142,000	94,000
7,200		109,000	69,000	12,000		151,000	101,000
7,300		109,000	69,000	12,200		151,000	101,000
7,400		109,000	69,000	12,500		151,000	101,000
7,500		109,000	69,000	12,700	1/2	151,000	101,000
7,600		117,000	75,000	12,800		151,000	101,000
7,700		117,000	75,000	12,900		151,000	101,000
7,750		117,000	75,000	13,000		151,000	101,000
7,800		117,000	75,000	13,100	33/64	151,000	101,000
7,900		117,000	75,000	13,250		160,000	108,000
8,000		117,000	75,000	13,500		160,000	108,000
8,100		117,000	75,000	14,000		160,000	108,000
8,200		117,000	75,000	14,200		169,000	114,000
8,300		117,000	75,000	14,250		169,000	114,000
8,400		117,000	75,000	14,500		169,000	114,000
8,500		117,000	75,000	14,750		169,000	114,000
8,600		125,000	81,000	15,000		169,000	114,000
8,700		125,000	81,000	15,250		178,000	120,000
8,750		125,000	81,000	15,500		178,000	120,000
8,900		125,000	81,000	15,800		178,000	120,000
9,000		125,000	81,000	16,000		178,000	120,000
9,100		125,000	81,000	16,500		184,000	125,000
9,200		125,000	81,000	17,000		184,000	125,000
9,300		125,000	81,000	17,500		191,000	130,000
9,400		125,000	81,000	18,000		191,000	130,000
9,500		125,000	81,000	18,500		198,000	135,000
9,600		133,000	87,000	19,000		198,000	135,000
9,700		133,000	87,000	19,500		205,000	140,000
9,800		133,000	87,000				

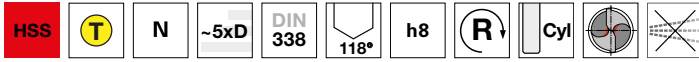


## Brocas espirales cil., cortas

Nº artículo 84406

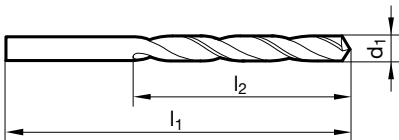


P	M	K	N	S	H
•		•	○		



vaciado de punta  $\geq \varnothing 1,000$  • entrada cónica • recubrimiento de la punta

aceros y fundición de aceros (aleados y sin alea) • fundición gris, fundición maleable, fundición esferica • hierro sinterizado y grafito



d1		l1	l2	d1		l1	l2
mm	inch	mm	mm	mm	inch	mm	mm
1,000		34,000	12,000	4,300		80,000	47,000
1,100		36,000	14,000	4,370	11/64	80,000	47,000
1,190	3/64	38,000	16,000	4,400		80,000	47,000
1,200		38,000	16,000	4,500		80,000	47,000
1,300		38,000	16,000	4,600		80,000	47,000
1,400		40,000	18,000	4,700		80,000	47,000
1,500		40,000	18,000	4,760	3/16	86,000	52,000
1,590	1/16	43,000	20,000	4,800		86,000	52,000
1,600		43,000	20,000	4,900		86,000	52,000
1,700		43,000	20,000	5,000		86,000	52,000
1,800		46,000	22,000	5,100		86,000	52,000
1,900		46,000	22,000	5,160	13/64	86,000	52,000
1,980	5/64	49,000	24,000	5,200		86,000	52,000
2,000		49,000	24,000	5,300		86,000	52,000
2,100		49,000	24,000	5,400		93,000	57,000
2,200		53,000	27,000	5,500		93,000	57,000
2,300		53,000	27,000	5,560	7/32	93,000	57,000
2,380	3/32	57,000	30,000	5,600		93,000	57,000
2,400		57,000	30,000	5,700		93,000	57,000
2,440		57,000	30,000	5,800		93,000	57,000
2,500		57,000	30,000	5,900		93,000	57,000
2,600		57,000	30,000	5,950	15/64	93,000	57,000
2,700		61,000	33,000	6,000		93,000	57,000
2,780	7/64	61,000	33,000	6,100		101,000	63,000
2,800		61,000	33,000	6,200		101,000	63,000
2,900		61,000	33,000	6,300		101,000	63,000
3,000		61,000	33,000	6,350	1/4	101,000	63,000
3,100		65,000	36,000	6,400		101,000	63,000
3,170	1/8	65,000	36,000	6,500		101,000	63,000
3,200		65,000	36,000	6,600		101,000	63,000
3,300		65,000	36,000	6,700		101,000	63,000
3,400		70,000	39,000	6,750	17/64	109,000	69,000
3,500		70,000	39,000	6,800		109,000	69,000
3,570	9/64	70,000	39,000	6,900		109,000	69,000
3,600		70,000	39,000	7,000		109,000	69,000
3,700		70,000	39,000	7,100		109,000	69,000
3,800		75,000	43,000	7,140	9/32	109,000	69,000
3,900		75,000	43,000	7,200		109,000	69,000
3,970	5/32	75,000	43,000	7,300		109,000	69,000
4,000		75,000	43,000	7,400		109,000	69,000
4,100		75,000	43,000	7,500		109,000	69,000
4,200		75,000	43,000	7,540	19/64	117,000	75,000



## Brocas espirales cil., cortas

d1 mm	inch	l1 mm	l2 mm	d1 mm	inch	l1 mm	l2 mm
7,600		117,000	75,000	11,500		142,000	94,000
7,700		117,000	75,000	11,510	29/64	142,000	94,000
7,800		117,000	75,000	11,600		142,000	94,000
7,900		117,000	75,000	11,700		142,000	94,000
7,940	5/16	117,000	75,000	11,800		142,000	94,000
8,000		117,000	75,000	11,900		151,000	101,000
8,100		117,000	75,000	11,910	15/32	151,000	101,000
8,200		117,000	75,000	12,000		151,000	101,000
8,300		117,000	75,000	12,100		151,000	101,000
8,330	21/64	117,000	75,000	12,200		151,000	101,000
8,400		117,000	75,000	12,300	31/64	151,000	101,000
8,500		117,000	75,000	12,400		151,000	101,000
8,600		125,000	81,000	12,500		151,000	101,000
8,700		125,000	81,000	12,600		151,000	101,000
8,730	11/32	125,000	81,000	12,700	1/2	151,000	101,000
8,800		125,000	81,000	12,800		151,000	101,000
8,900		125,000	81,000	12,900		151,000	101,000
9,000		125,000	81,000	13,000		151,000	101,000
9,100		125,000	81,000	13,100	33/64	151,000	101,000
9,130	23/64	125,000	81,000	13,200		151,000	101,000
9,200		125,000	81,000	13,250		160,000	108,000
9,300		125,000	81,000	13,300		160,000	108,000
9,400		125,000	81,000	13,400		160,000	108,000
9,500		125,000	81,000	13,490	17/32	160,000	108,000
9,520	3/8	133,000	87,000	13,500		160,000	108,000
9,600		133,000	87,000	13,600		160,000	108,000
9,700		133,000	87,000	13,700		160,000	108,000
9,800		133,000	87,000	13,750		160,000	108,000
9,900		133,000	87,000	13,800		160,000	108,000
9,920	25/64	133,000	87,000	13,890	35/64	160,000	108,000
10,000		133,000	87,000	13,900		160,000	108,000
10,100		133,000	87,000	14,000		160,000	108,000
10,200		133,000	87,000	14,250		169,000	114,000
10,300		133,000	87,000	14,290	9/16	169,000	114,000
10,320	13/32	133,000	87,000	14,500		169,000	114,000
10,400		133,000	87,000	14,680	37/64	169,000	114,000
10,500		133,000	87,000	14,750		169,000	114,000
10,600		133,000	87,000	15,000		169,000	114,000
10,700		142,000	94,000	15,080	19/32	178,000	120,000
10,720	27/64	142,000	94,000	15,250		178,000	120,000
10,800		142,000	94,000	15,480	39/64	178,000	120,000
10,900		142,000	94,000	15,500		178,000	120,000
11,000		142,000	94,000	15,750		178,000	120,000
11,100		142,000	94,000	16,000		178,000	120,000
11,110	7/16	142,000	94,000				
11,200		142,000	94,000				
11,300		142,000	94,000				
11,400		142,000	94,000				

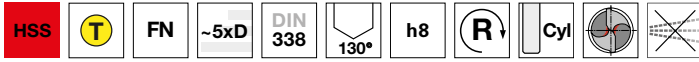


## Brocas espirales cil., cortas

### Nº artículo 84415



P	M	K	N	S	H
•		•	•		

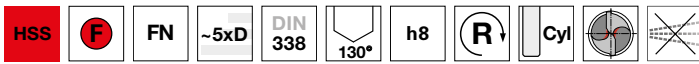


vaciado de punta  $\geq \varnothing 1,000$  • entrada cónica • ranuras amplias • ideal para prof. de taladro sup. a 3xD  
 fundición gris • aceros de hasta 1000 N/mm<sup>2</sup> • Excepción: aceros CrNi, aceros VA y materiales similares

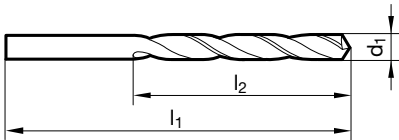
### Nº artículo 84502



P	M	K	N	S	H
•		•	•		



vaciado de punta  $\geq \varnothing 1,000$  • entrada cónica • ranuras amplias • ideal para prof. de taladro sup. a 3xD  
 fundición gris • aceros de hasta 1000 N/mm<sup>2</sup> • Excepción: aceros CrNi, aceros VA y materiales similares



d1		l1	l2	d1		l1	l2
mm	inch	mm	mm	mm	inch	mm	mm
1,000		34,000	12,000	3,900		75,000	43,000
1,100		36,000	14,000	4,000		75,000	43,000
1,200		38,000	16,000	4,100		75,000	43,000
1,300		38,000	16,000	4,200		75,000	43,000
1,400		40,000	18,000	4,300		80,000	47,000
1,500		40,000	18,000	4,400		80,000	47,000
1,600		43,000	20,000	4,500		80,000	47,000
1,700		43,000	20,000	4,600		80,000	47,000
1,800		46,000	22,000	4,700		80,000	47,000
1,900		46,000	22,000	4,800		86,000	52,000
2,000		49,000	24,000	4,900		86,000	52,000
2,100		49,000	24,000	5,000		86,000	52,000
2,200		53,000	27,000	5,100		86,000	52,000
2,300		53,000	27,000	5,200		86,000	52,000
2,400		57,000	30,000	5,300		86,000	52,000
2,500		57,000	30,000	5,400		93,000	57,000
2,600		57,000	30,000	5,500		93,000	57,000
2,700		61,000	33,000	5,600		93,000	57,000
2,800		61,000	33,000	5,700		93,000	57,000
2,900		61,000	33,000	5,800		93,000	57,000
3,000		61,000	33,000	5,900		93,000	57,000
3,100		65,000	36,000	6,000		93,000	57,000
3,170	1/8	65,000	36,000	6,200		101,000	63,000
3,200		65,000	36,000	6,300		101,000	63,000
3,300		65,000	36,000	6,400		101,000	63,000
3,400		70,000	39,000	6,500		101,000	63,000
3,500		70,000	39,000	6,600		101,000	63,000
3,600		70,000	39,000	6,700		101,000	63,000
3,700		70,000	39,000	6,800		109,000	69,000
3,800		75,000	43,000	6,900		109,000	69,000



## Brocas espirales cil., cortas

d1 mm	inch	l1 mm	l2 mm	d1 mm	inch	l1 mm	l2 mm
7,000		109,000	69,000	10,000		133,000	87,000
7,100		109,000	69,000	10,100		133,000	87,000
7,200		109,000	69,000	10,200		133,000	87,000
7,300		109,000	69,000	10,300		133,000	87,000
7,400		109,000	69,000	10,500		133,000	87,000
7,500		109,000	69,000	10,700		142,000	94,000
7,600		117,000	75,000	11,000		142,000	94,000
7,700		117,000	75,000	11,400		142,000	94,000
7,800		117,000	75,000	11,500		142,000	94,000
7,900		117,000	75,000	11,600		142,000	94,000
8,000		117,000	75,000	11,700		142,000	94,000
8,100		117,000	75,000	11,800		142,000	94,000
8,200		117,000	75,000	12,000		151,000	101,000
8,300		117,000	75,000	12,100		151,000	101,000
8,400		117,000	75,000	12,200		151,000	101,000
8,500		117,000	75,000	12,300	31/64	151,000	101,000
8,600		125,000	81,000	12,500		151,000	101,000
8,700		125,000	81,000	12,700	1/2	151,000	101,000
8,800		125,000	81,000	12,800		151,000	101,000
8,900		125,000	81,000	13,000		151,000	101,000
9,000		125,000	81,000	13,500		160,000	108,000
9,100		125,000	81,000	14,000		160,000	108,000
9,200		125,000	81,000	15,000		169,000	114,000
9,300		125,000	81,000	16,000		178,000	120,000
9,400		125,000	81,000				
9,500		125,000	81,000				
9,600		133,000	87,000				
9,700		133,000	87,000				
9,800		133,000	87,000				
9,900		133,000	87,000				



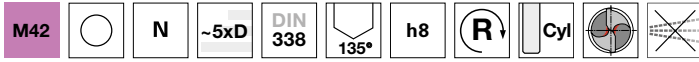


## Brocas espirales cil., cortas

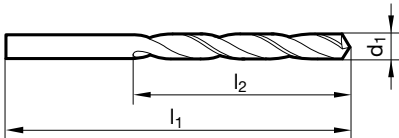
Nº artículo 81012



P	M	K	N	S	H
●	○	○	●	○	○



vaciado de punta  $\geq \varnothing 1,000$  • afilado al cono con vaciado de núcleo en cruz según NAS 907 • acero altamente aleado CoMo • alta resistencia al desgaste



d1 mm	l1 mm	l2 mm	d1 mm	l1 mm	l2 mm
1,000	34,000	12,000	5,200	86,000	52,000
1,100	36,000	14,000	5,300	86,000	52,000
1,200	38,000	16,000	5,400	93,000	57,000
1,300	38,000	16,000	5,500	93,000	57,000
1,400	40,000	18,000	5,600	93,000	57,000
1,500	40,000	18,000	5,700	93,000	57,000
1,600	43,000	20,000	5,800	93,000	57,000
1,700	43,000	20,000	5,900	93,000	57,000
1,800	46,000	22,000	6,000	93,000	57,000
1,900	46,000	22,000	6,100	101,000	63,000
2,000	49,000	24,000	6,200	101,000	63,000
2,100	49,000	24,000	6,300	101,000	63,000
2,200	53,000	27,000	6,400	101,000	63,000
2,300	53,000	27,000	6,500	101,000	63,000
2,400	57,000	30,000	6,600	101,000	63,000
2,500	57,000	30,000	6,700	101,000	63,000
2,600	57,000	30,000	6,800	109,000	69,000
2,700	61,000	33,000	6,900	109,000	69,000
2,800	61,000	33,000	7,000	109,000	69,000
2,900	61,000	33,000	7,100	109,000	69,000
3,000	61,000	33,000	7,200	109,000	69,000
3,100	65,000	36,000	7,300	109,000	69,000
3,200	65,000	36,000	7,400	109,000	69,000
3,300	65,000	36,000	7,500	109,000	69,000
3,400	70,000	39,000	7,600	117,000	75,000
3,500	70,000	39,000	7,700	117,000	75,000
3,600	70,000	39,000	7,800	117,000	75,000
3,700	70,000	39,000	7,900	117,000	75,000
3,800	75,000	43,000	8,000	117,000	75,000
3,900	75,000	43,000	8,100	117,000	75,000
4,000	75,000	43,000	8,200	117,000	75,000
4,100	75,000	43,000	8,300	117,000	75,000
4,200	75,000	43,000	8,400	117,000	75,000
4,300	80,000	47,000	8,500	117,000	75,000
4,400	80,000	47,000	8,600	125,000	81,000
4,500	80,000	47,000	8,700	125,000	81,000
4,600	80,000	47,000	8,800	125,000	81,000
4,700	80,000	47,000	8,900	125,000	81,000
4,800	86,000	52,000	9,000	125,000	81,000
4,900	86,000	52,000	9,100	125,000	81,000
5,000	86,000	52,000	9,200	125,000	81,000
5,100	86,000	52,000	9,300	125,000	81,000



## Brocas espirales cil., cortas

d1 mm	l1 mm	l2 mm	d1 mm	l1 mm	l2 mm
9,400	125,000	81,000	12,500	151,000	101,000
9,500	125,000	81,000	13,000	151,000	101,000
9,600	133,000	87,000	14,000	160,000	108,000
9,700	133,000	87,000			
9,800	133,000	87,000			
9,900	133,000	87,000			
10,000	133,000	87,000			
10,200	133,000	87,000			
10,500	133,000	87,000			
11,000	142,000	94,000			
11,500	142,000	94,000			
12,000	151,000	101,000			

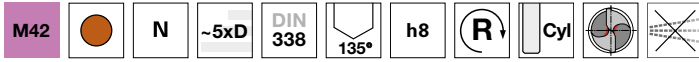


## Brocas espirales cil., cortas

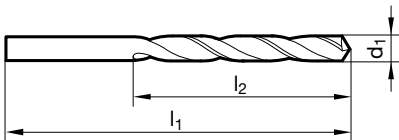
Nº artículo 81018



P	M	K	N	S	H
•	•	•	•	•	○



vaciado de punta  $\geq \varnothing 1,000$  • afilado al cono con vaciado de núcleo en cruz según NAS 907 • acero altamente aleado CoMo • alta resistencia al desgaste • núcleo ascendente muy reducido



d1 mm	inch	l1 mm	l2 mm	d1 mm	inch	l1 mm	l2 mm
1,000		34,000	12,000	4,400		80,000	47,000
1,100		36,000	14,000	4,500		80,000	47,000
1,200		38,000	16,000	4,600		80,000	47,000
1,300		38,000	16,000	4,700		80,000	47,000
1,400		40,000	18,000	4,760	3/16	86,000	52,000
1,500		40,000	18,000	4,800		86,000	52,000
1,590	1/16	43,000	20,000	4,900		86,000	52,000
1,600		43,000	20,000	5,000		86,000	52,000
1,700		43,000	20,000	5,100		86,000	52,000
1,800		46,000	22,000	5,160	13/64	86,000	52,000
1,900		46,000	22,000	5,200		86,000	52,000
1,980	5/64	49,000	24,000	5,300		86,000	52,000
2,000		49,000	24,000	5,400		93,000	57,000
2,100		49,000	24,000	5,500		93,000	57,000
2,200		53,000	27,000	5,560	7/32	93,000	57,000
2,300		53,000	27,000	5,600		93,000	57,000
2,380	3/32	57,000	30,000	5,700		93,000	57,000
2,400		57,000	30,000	5,800		93,000	57,000
2,500		57,000	30,000	5,900		93,000	57,000
2,600		57,000	30,000	5,950	15/64	93,000	57,000
2,700		61,000	33,000	6,000		93,000	57,000
2,780	7/64	61,000	33,000	6,100		101,000	63,000
2,800		61,000	33,000	6,200		101,000	63,000
2,900		61,000	33,000	6,300		101,000	63,000
3,000		61,000	33,000	6,350	1/4	101,000	63,000
3,100		65,000	36,000	6,400		101,000	63,000
3,170	1/8	65,000	36,000	6,500		101,000	63,000
3,200		65,000	36,000	6,600		101,000	63,000
3,250		65,000	36,000	6,700		101,000	63,000
3,300		65,000	36,000	6,800		109,000	69,000
3,400		70,000	39,000	6,900		109,000	69,000
3,500		70,000	39,000	7,000		109,000	69,000
3,570	9/64	70,000	39,000	7,100		109,000	69,000
3,600		70,000	39,000	7,140	9/32	109,000	69,000
3,700		70,000	39,000	7,200		109,000	69,000
3,800		75,000	43,000	7,300		109,000	69,000
3,900		75,000	43,000	7,400		109,000	69,000
3,970	5/32	75,000	43,000	7,500		109,000	69,000
4,000		75,000	43,000	7,540	19/64	117,000	75,000
4,100		75,000	43,000	7,600		117,000	75,000
4,200		75,000	43,000	7,700		117,000	75,000
4,300		80,000	47,000	7,800		117,000	75,000



## Brocas espirales cil., cortas

d1 mm	inch	l1 mm	l2 mm	d1 mm	inch	l1 mm	l2 mm
7,900		117,000	75,000	9,900		133,000	87,000
7,940	5/16	117,000	75,000	9,920	25/64	133,000	87,000
8,000		117,000	75,000	10,000		133,000	87,000
8,100		117,000	75,000	10,100		133,000	87,000
8,200		117,000	75,000	10,200		133,000	87,000
8,300		117,000	75,000	10,300		133,000	87,000
8,330	21/64	117,000	75,000	10,320	13/32	133,000	87,000
8,400		117,000	75,000	10,500		133,000	87,000
8,500		117,000	75,000	10,720	27/64	142,000	94,000
8,600		125,000	81,000	10,800		142,000	94,000
8,700		125,000	81,000	11,000		142,000	94,000
8,730	11/32	125,000	81,000	11,110	7/16	142,000	94,000
8,800		125,000	81,000	11,500		142,000	94,000
8,900		125,000	81,000	11,510	29/64	142,000	94,000
9,000		125,000	81,000	11,910	15/32	151,000	101,000
9,100		125,000	81,000	12,000		151,000	101,000
9,130	23/64	125,000	81,000	12,200		151,000	101,000
9,200		125,000	81,000	12,300	31/64	151,000	101,000
9,300		125,000	81,000	12,500		151,000	101,000
9,500		125,000	81,000	12,700	1/2	151,000	101,000
9,520	3/8	133,000	87,000	12,800		151,000	101,000
9,600		133,000	87,000	13,000		151,000	101,000
9,700		133,000	87,000				
9,800		133,000	87,000				

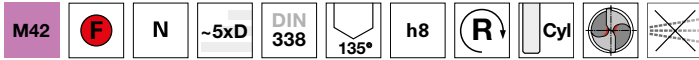


## Brocas espirales cil., cortas

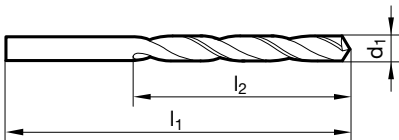
Nº artículo 81019



P	M	K	N	S	H
•	•	•	○	•	○



vaciado de punta  $\geq \varnothing 1,000$  • afilado al cono con vaciado de núcleo en cruz según NAS 907 • acero altamente aleado CoMo • alta resistencia al desgaste



d1		l1	l2	d1		l1	l2
mm	inch	mm	mm	mm	inch	mm	mm
1,000		34,000	12,000	4,760	3/16	86,000	52,000
1,100		36,000	14,000	4,800		86,000	52,000
1,200		38,000	16,000	4,900		86,000	52,000
1,300		38,000	16,000	5,000		86,000	52,000
1,400		40,000	18,000	5,100		86,000	52,000
1,500		40,000	18,000	5,160	13/64	86,000	52,000
1,590	1/16	43,000	20,000	5,200		86,000	52,000
1,600		43,000	20,000	5,300		86,000	52,000
1,700		43,000	20,000	5,400		93,000	57,000
1,800		46,000	22,000	5,500		93,000	57,000
1,900		46,000	22,000	5,600		93,000	57,000
2,000		49,000	24,000	5,700		93,000	57,000
2,100		49,000	24,000	5,800		93,000	57,000
2,200		53,000	27,000	5,900		93,000	57,000
2,300		53,000	27,000	5,950	15/64	93,000	57,000
2,380	3/32	57,000	30,000	6,000		93,000	57,000
2,400		57,000	30,000	6,100		101,000	63,000
2,500		57,000	30,000	6,200		101,000	63,000
2,600		57,000	30,000	6,300		101,000	63,000
2,700		61,000	33,000	6,350	1/4	101,000	63,000
2,800		61,000	33,000	6,400		101,000	63,000
2,900		61,000	33,000	6,500		101,000	63,000
3,000		61,000	33,000	6,600		101,000	63,000
3,100		65,000	36,000	6,700		101,000	63,000
3,170	1/8	65,000	36,000	6,750	17/64	109,000	69,000
3,200		65,000	36,000	6,800		109,000	69,000
3,300		65,000	36,000	6,900		109,000	69,000
3,400		70,000	39,000	7,000		109,000	69,000
3,500		70,000	39,000	7,100		109,000	69,000
3,600		70,000	39,000	7,200		109,000	69,000
3,700		70,000	39,000	7,300		109,000	69,000
3,800		75,000	43,000	7,400		109,000	69,000
3,900		75,000	43,000	7,500		109,000	69,000
3,970	5/32	75,000	43,000	7,600		117,000	75,000
4,000		75,000	43,000	7,700		117,000	75,000
4,100		75,000	43,000	7,800		117,000	75,000
4,200		75,000	43,000	7,900		117,000	75,000
4,300		80,000	47,000	8,000		117,000	75,000
4,400		80,000	47,000	8,100		117,000	75,000
4,500		80,000	47,000	8,200		117,000	75,000
4,600		80,000	47,000	8,300		117,000	75,000
4,700		80,000	47,000	8,400		117,000	75,000



## Brocas espirales cil., cortas

d1 mm	inch	l1 mm	l2 mm	d1 mm	inch	l1 mm	l2 mm
8,500		117,000	75,000	10,100		133,000	87,000
8,600		125,000	81,000	10,200		133,000	87,000
8,700		125,000	81,000	10,500		133,000	87,000
8,730	11/32	125,000	81,000	10,800		142,000	94,000
8,800		125,000	81,000	11,000		142,000	94,000
8,900		125,000	81,000	11,200		142,000	94,000
9,000		125,000	81,000	11,500		142,000	94,000
9,100		125,000	81,000	11,800		142,000	94,000
9,200		125,000	81,000	11,910	15/32	151,000	101,000
9,300		125,000	81,000	12,000		151,000	101,000
9,400		125,000	81,000	12,200		151,000	101,000
9,500		125,000	81,000	12,500		151,000	101,000
9,600		133,000	87,000	13,000		151,000	101,000
9,700		133,000	87,000	14,000		160,000	108,000
9,800		133,000	87,000	15,000		169,000	114,000
9,900		133,000	87,000	16,000		178,000	120,000
9,920	25/64	133,000	87,000				
10,000		133,000	87,000				

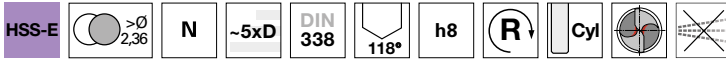


## Brocas espirales cil., cortas

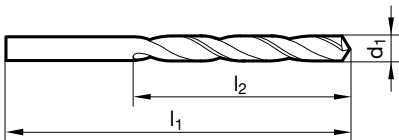
Nº artículo 81011



P	M	K	N	S	H
●	○	●	○		



vaciado de punta  $\geq \varnothing 1,000$  • entrada cónica • acero rápido al cobalto • más resistencia al desgaste  
 aceros y fundición de aceros (aleados y sin alea) • fundición de dureza sup. a 800 N/mm<sup>2</sup> • aceros para trab. en frío y en caliente  
 • aceros para rodamientos • aceros altamente aleados • aceros de cementación, de bonificación



d1	inch	l1	l2	d1	inch	l1	l2
mm		mm	mm	mm		mm	mm
0,200		19,000	2,500	1,900		46,000	22,000
0,250		19,000	3,000	1,950		49,000	24,000
0,300		19,000	3,000	2,000		49,000	24,000
0,350		19,000	4,000	2,030		49,000	24,000
0,400		20,000	5,000	2,050		49,000	24,000
0,430		20,000	5,000	2,100		49,000	24,000
0,450		20,000	5,000	2,150		53,000	27,000
0,500		22,000	6,000	2,200		53,000	27,000
0,550		24,000	7,000	2,250		53,000	27,000
0,600		24,000	7,000	2,300		53,000	27,000
0,650		26,000	8,000	2,400		57,000	30,000
0,680		28,000	9,000	2,450		57,000	30,000
0,700		28,000	9,000	2,500		57,000	30,000
0,750		28,000	9,000	2,550		57,000	30,000
0,800		30,000	10,000	2,600		57,000	30,000
0,860		32,000	11,000	2,650		57,000	30,000
0,870		32,000	11,000	2,700		61,000	33,000
0,900		32,000	11,000	2,750		61,000	33,000
0,950		32,000	11,000	2,800		61,000	33,000
0,980		34,000	12,000	2,850		61,000	33,000
1,000		34,000	12,000	2,900		61,000	33,000
1,050		34,000	12,000	2,950		61,000	33,000
1,100		36,000	14,000	3,000		61,000	33,000
1,150		36,000	14,000	3,050		65,000	36,000
1,170		36,000	14,000	3,100		65,000	36,000
1,200		38,000	16,000	3,150		65,000	36,000
1,230		38,000	16,000	3,200		65,000	36,000
1,250		38,000	16,000	3,250		65,000	36,000
1,300		38,000	16,000	3,300		65,000	36,000
1,350		40,000	18,000	3,400		70,000	39,000
1,370		40,000	18,000	3,500		70,000	39,000
1,400		40,000	18,000	3,600		70,000	39,000
1,450		40,000	18,000	3,700		70,000	39,000
1,500		40,000	18,000	3,750		70,000	39,000
1,550		43,000	20,000	3,800		75,000	43,000
1,600		43,000	20,000	3,900		75,000	43,000
1,650		43,000	20,000	4,000		75,000	43,000
1,700		43,000	20,000	4,100		75,000	43,000
1,750		46,000	22,000	4,200		75,000	43,000
1,800		46,000	22,000	4,250		75,000	43,000
1,820		46,000	22,000	4,300		80,000	47,000
1,860		46,000	22,000	4,400		80,000	47,000



## Brocas espirales cil., cortas

d1 mm	inch	l1 mm	l2 mm	d1 mm	inch	l1 mm	l2 mm
4,500		80,000	47,000	9,400		125,000	81,000
4,550		80,000	47,000	9,500		125,000	81,000
4,600		80,000	47,000	9,520	3/8	133,000	87,000
4,650		80,000	47,000	9,600		133,000	87,000
4,700		80,000	47,000	9,700		133,000	87,000
4,800		86,000	52,000	9,800		133,000	87,000
4,900		86,000	52,000	9,900		133,000	87,000
5,000		86,000	52,000	10,000		133,000	87,000
5,020		86,000	52,000	10,050		133,000	87,000
5,050		86,000	52,000	10,200		133,000	87,000
5,100		86,000	52,000	10,250		133,000	87,000
5,150		86,000	52,000	10,300		133,000	87,000
5,200		86,000	52,000	10,400		133,000	87,000
5,250		86,000	52,000	10,500		133,000	87,000
5,300		86,000	52,000	10,600		133,000	87,000
5,400		93,000	57,000	10,720	27/64	142,000	94,000
5,500		93,000	57,000	10,800		142,000	94,000
5,600		93,000	57,000	10,900		142,000	94,000
5,700		93,000	57,000	11,000		142,000	94,000
5,750		93,000	57,000	11,100		142,000	94,000
5,800		93,000	57,000	11,200		142,000	94,000
5,900		93,000	57,000	11,300		142,000	94,000
6,000		93,000	57,000	11,500		142,000	94,000
6,050		101,000	63,000	11,700		142,000	94,000
6,100		101,000	63,000	11,750		142,000	94,000
6,150		101,000	63,000	11,800		142,000	94,000
6,200		101,000	63,000	12,000		151,000	101,000
6,300		101,000	63,000	12,200		151,000	101,000
6,350	1/4	101,000	63,000	12,250		151,000	101,000
6,400		101,000	63,000	12,400		151,000	101,000
6,500		101,000	63,000	12,500		151,000	101,000
6,600		101,000	63,000	12,600		151,000	101,000
6,750	17/64	109,000	69,000	12,700	1/2	151,000	101,000
6,800		109,000	69,000	12,800		151,000	101,000
7,000		109,000	69,000	12,900		151,000	101,000
7,100		109,000	69,000	13,000		151,000	101,000
7,140	9/32	109,000	69,000	13,200		151,000	101,000
7,200		109,000	69,000	13,300		160,000	108,000
7,300		109,000	69,000	13,400		160,000	108,000
7,400		109,000	69,000	13,500		160,000	108,000
7,500		109,000	69,000	13,600		160,000	108,000
7,600		117,000	75,000	13,700		160,000	108,000
7,700		117,000	75,000	13,800		160,000	108,000
7,900		117,000	75,000	14,000		160,000	108,000
8,000		117,000	75,000	14,200		169,000	114,000
8,100		117,000	75,000	14,400		169,000	114,000
8,200		117,000	75,000	14,500		169,000	114,000
8,300		117,000	75,000	15,000		169,000	114,000
8,500		117,000	75,000	15,250		178,000	120,000
8,600		125,000	81,000	15,500		178,000	120,000
8,700		125,000	81,000	15,870	5/8	178,000	120,000
8,730	11/32	125,000	81,000	16,000		178,000	120,000
8,750		125,000	81,000	16,500		184,000	125,000
8,800		125,000	81,000	17,000		184,000	125,000
8,900		125,000	81,000	17,500		191,000	130,000
9,000		125,000	81,000	19,000		198,000	135,000
9,100		125,000	81,000	20,000		205,000	140,000
9,200		125,000	81,000				
9,250		125,000	81,000				
9,300		125,000	81,000				



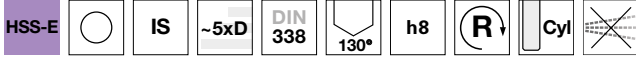


## Brocas espirales cil., cortas

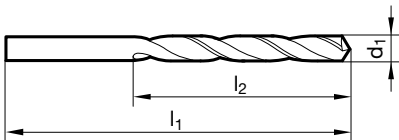
Nº artículo 81013



P	M	K	N	S	H
○	●	○	○	○	○



broca INOX • entrada cónica • acero rápido al cobalto • más resistencia al desgaste  
aceros austeníticos inoxidables y resistentes a los ácidos y al calor (V2A y V4A)



d1		l1	l2	d1		l1	l2
mm	inch	mm	mm	mm	inch	mm	mm
1,000		34,000	12,000	5,100		86,000	52,000
1,100		36,000	14,000	5,200		86,000	52,000
1,200		38,000	16,000	5,300		86,000	52,000
1,300		38,000	16,000	5,400		93,000	57,000
1,400		40,000	18,000	5,500		93,000	57,000
1,500		40,000	18,000	5,600		93,000	57,000
1,600		43,000	20,000	5,700		93,000	57,000
1,700		43,000	20,000	5,800		93,000	57,000
1,800		46,000	22,000	5,900		93,000	57,000
1,900		46,000	22,000	6,000		93,000	57,000
2,000		49,000	24,000	6,100		101,000	63,000
2,100		49,000	24,000	6,200		101,000	63,000
2,200		53,000	27,000	6,300		101,000	63,000
2,300		53,000	27,000	6,400		101,000	63,000
2,400		57,000	30,000	6,500		101,000	63,000
2,500		57,000	30,000	6,600		101,000	63,000
2,600		57,000	30,000	6,700		101,000	63,000
2,700		61,000	33,000	6,800		109,000	69,000
2,800		61,000	33,000	6,900		109,000	69,000
2,900		61,000	33,000	7,000		109,000	69,000
3,000		61,000	33,000	7,100		109,000	69,000
3,100		65,000	36,000	7,200		109,000	69,000
3,200		65,000	36,000	7,300		109,000	69,000
3,300		65,000	36,000	7,400		109,000	69,000
3,400		70,000	39,000	7,500		109,000	69,000
3,500		70,000	39,000	7,600		117,000	75,000
3,570	9/64	70,000	39,000	7,700		117,000	75,000
3,600		70,000	39,000	7,800		117,000	75,000
3,700		70,000	39,000	7,900		117,000	75,000
3,800		75,000	43,000	8,000		117,000	75,000
3,900		75,000	43,000	8,100		117,000	75,000
4,000		75,000	43,000	8,200		117,000	75,000
4,100		75,000	43,000	8,300		117,000	75,000
4,200		75,000	43,000	8,400		117,000	75,000
4,300		80,000	47,000	8,500		117,000	75,000
4,400		80,000	47,000	8,600		125,000	81,000
4,500		80,000	47,000	8,700		125,000	81,000
4,600		80,000	47,000	8,800		125,000	81,000
4,700		80,000	47,000	8,900		125,000	81,000
4,800		86,000	52,000	9,000		125,000	81,000
4,900		86,000	52,000	9,100		125,000	81,000
5,000		86,000	52,000	9,200		125,000	81,000



## Brocas espirales cil., cortas

d1 mm	inch	l1 mm	l2 mm	d1 mm	inch	l1 mm	l2 mm
9,300		125,000	81,000	11,100		142,000	94,000
9,400		125,000	81,000	11,400		142,000	94,000
9,500		125,000	81,000	11,500		142,000	94,000
9,600		133,000	87,000	11,600		142,000	94,000
9,700		133,000	87,000	11,800		142,000	94,000
9,800		133,000	87,000	12,000		151,000	101,000
9,900		133,000	87,000	12,500		151,000	101,000
10,000		133,000	87,000	13,000		151,000	101,000
10,100		133,000	87,000				
10,200		133,000	87,000				
10,300		133,000	87,000				
10,400		133,000	87,000				
10,500		133,000	87,000				
10,600		133,000	87,000				
10,700		142,000	94,000				
10,800		142,000	94,000				
10,900		142,000	94,000				
11,000		142,000	94,000				



## Brocas espirales cil., cortas

Nº artículo 81041

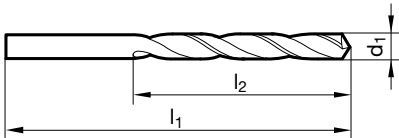


P	M	K	N	S	H
•	○	•	•		



vaciado de punta  $\geq \varnothing 1,000$  • entrada cónica • acero rápido al cobalto • más resistencia al desgaste • ranuras amplias • ideal para prof. de taladro sup. a 3xD

fundición gris y aceros de más de 80 N/mm<sup>2</sup> • aceros para trab. en frío y en caliente • aceros para rodamientos • aceros altamente aleados • aceros de cementación, de bonificación



d1		l1	l2	d1		l1	l2
mm	inch	mm	mm	mm	inch	mm	mm
1,000		34,000	12,000	3,900		75,000	43,000
1,100		36,000	14,000	4,000		75,000	43,000
1,200		38,000	16,000	4,050		75,000	43,000
1,250		38,000	16,000	4,100		75,000	43,000
1,300		38,000	16,000	4,200		75,000	43,000
1,400		40,000	18,000	4,300		80,000	47,000
1,500		40,000	18,000	4,400		80,000	47,000
1,550		43,000	20,000	4,500		80,000	47,000
1,600		43,000	20,000	4,600		80,000	47,000
1,650		43,000	20,000	4,700		80,000	47,000
1,700		43,000	20,000	4,900		86,000	52,000
1,800		46,000	22,000	5,000		86,000	52,000
1,850		46,000	22,000	5,100		86,000	52,000
1,900		46,000	22,000	5,200		86,000	52,000
2,000		49,000	24,000	5,300		86,000	52,000
2,050		49,000	24,000	5,400		93,000	57,000
2,100		49,000	24,000	5,500		93,000	57,000
2,200		53,000	27,000	5,600		93,000	57,000
2,300		53,000	27,000	5,700		93,000	57,000
2,350		53,000	27,000	5,800		93,000	57,000
2,400		57,000	30,000	5,900		93,000	57,000
2,450		57,000	30,000	6,000		93,000	57,000
2,500		57,000	30,000	6,100		101,000	63,000
2,550		57,000	30,000	6,200		101,000	63,000
2,600		57,000	30,000	6,300		101,000	63,000
2,650		57,000	30,000	6,400		101,000	63,000
2,700		61,000	33,000	6,500		101,000	63,000
2,750		61,000	33,000	6,600		101,000	63,000
2,780	7/64	61,000	33,000	6,700		101,000	63,000
2,800		61,000	33,000	6,750	17/64	109,000	69,000
2,900		61,000	33,000	6,800		109,000	69,000
3,000		61,000	33,000	6,900		109,000	69,000
3,050		65,000	36,000	7,000		109,000	69,000
3,100		65,000	36,000	7,100		109,000	69,000
3,200		65,000	36,000	7,200		109,000	69,000
3,250		65,000	36,000	7,300		109,000	69,000
3,300		65,000	36,000	7,500		109,000	69,000
3,400		70,000	39,000	7,600		117,000	75,000
3,450		70,000	39,000	7,700		117,000	75,000
3,500		70,000	39,000	7,800		117,000	75,000
3,700		70,000	39,000	7,900		117,000	75,000
3,800		75,000	43,000	8,000		117,000	75,000



## Brocas espirales cil., cortas

d1 mm	inch	l1 mm	l2 mm	d1 mm	inch	l1 mm	l2 mm
8,100		117,000	75,000	10,200		133,000	87,000
8,200		117,000	75,000	10,300		133,000	87,000
8,300		117,000	75,000	10,500		133,000	87,000
8,400		117,000	75,000	10,700		142,000	94,000
8,500		117,000	75,000	10,800		142,000	94,000
8,600		125,000	81,000	11,000		142,000	94,000
8,700		125,000	81,000	11,100		142,000	94,000
8,800		125,000	81,000	11,200		142,000	94,000
8,900		125,000	81,000	11,600		142,000	94,000
9,000		125,000	81,000	11,700		142,000	94,000
9,100		125,000	81,000	11,800		142,000	94,000
9,200		125,000	81,000	12,000		151,000	101,000
9,300		125,000	81,000	12,500		151,000	101,000
9,500		125,000	81,000	12,700	1/2	151,000	101,000
9,700		133,000	87,000	13,000		151,000	101,000
9,800		133,000	87,000				
9,900		133,000	87,000				
10,000		133,000	87,000				

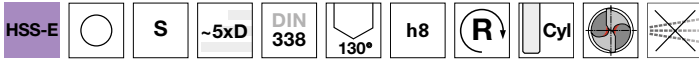


## Brocas espirales cil., cortas

Nº artículo 81061

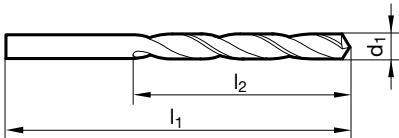


P	M	K	N	S	H
○	●			●	



vaciado de punta  $\geq \varnothing 1,000$  • entrada cónica • acero rápido al cobalto • más resistencia al desgaste

titanio y aleaciones de titanio • aceros austeníticos inoxidables y resistentes a los ácidos y al calor • aceros de gran resistencia a partir de 900 N/mm<sup>2</sup> y cifras más elevadas • Hastelloy, Inconel, Nimonic



d1		l1	l2	d1		l1	l2
mm	inch	mm	mm	mm	inch	mm	mm
0,200		19,000	2,500	1,820		46,000	22,000
0,300		19,000	3,000	1,850		46,000	22,000
0,400		20,000	5,000	1,900		46,000	22,000
0,500		22,000	6,000	1,950		49,000	24,000
0,550		24,000	7,000	1,990		49,000	24,000
0,580		24,000	7,000	2,000		49,000	24,000
0,600		24,000	7,000	2,030		49,000	24,000
0,650		26,000	8,000	2,050		49,000	24,000
0,700		28,000	9,000	2,080		49,000	24,000
0,750		28,000	9,000	2,100		49,000	24,000
0,800		30,000	10,000	2,200		53,000	27,000
0,820		30,000	10,000	2,250		53,000	27,000
0,840		30,000	10,000	2,300		53,000	27,000
0,850		30,000	10,000	2,350		53,000	27,000
0,900		32,000	11,000	2,380	3/32	57,000	30,000
0,950		32,000	11,000	2,400		57,000	30,000
1,000		34,000	12,000	2,450		57,000	30,000
1,040		34,000	12,000	2,500		57,000	30,000
1,050		34,000	12,000	2,550		57,000	30,000
1,100		36,000	14,000	2,600		57,000	30,000
1,150		36,000	14,000	2,700		61,000	33,000
1,180		36,000	14,000	2,750		61,000	33,000
1,190	3/64	38,000	16,000	2,800		61,000	33,000
1,200		38,000	16,000	2,850		61,000	33,000
1,210		38,000	16,000	2,900		61,000	33,000
1,250		38,000	16,000	2,950		61,000	33,000
1,300		38,000	16,000	3,000		61,000	33,000
1,350		40,000	18,000	3,050		65,000	36,000
1,400		40,000	18,000	3,100		65,000	36,000
1,450		40,000	18,000	3,200		65,000	36,000
1,500		40,000	18,000	3,250		65,000	36,000
1,510		43,000	20,000	3,300		65,000	36,000
1,520		43,000	20,000	3,350		65,000	36,000
1,530		43,000	20,000	3,400		70,000	39,000
1,550		43,000	20,000	3,450		70,000	39,000
1,600		43,000	20,000	3,500		70,000	39,000
1,630		43,000	20,000	3,600		70,000	39,000
1,650		43,000	20,000	3,650		70,000	39,000
1,700		43,000	20,000	3,700		70,000	39,000
1,730		46,000	22,000	3,800		75,000	43,000
1,750		46,000	22,000	3,900		75,000	43,000
1,800		46,000	22,000	4,000		75,000	43,000



## Brocas espirales cil., cortas

d1 mm	inch	l1 mm	l2 mm	d1 mm	inch	l1 mm	l2 mm
4,050		75,000	43,000	9,000		125,000	81,000
4,100		75,000	43,000	9,100		125,000	81,000
4,200		75,000	43,000	9,200		125,000	81,000
4,250		75,000	43,000	9,300		125,000	81,000
4,300		80,000	47,000	9,400		125,000	81,000
4,400		80,000	47,000	9,500		125,000	81,000
4,500		80,000	47,000	9,600		133,000	87,000
4,600		80,000	47,000	9,700		133,000	87,000
4,700		80,000	47,000	9,800		133,000	87,000
4,750		80,000	47,000	9,900		133,000	87,000
4,800		86,000	52,000	10,000		133,000	87,000
4,850		86,000	52,000	10,100		133,000	87,000
4,900		86,000	52,000	10,200		133,000	87,000
5,000		86,000	52,000	10,300		133,000	87,000
5,100		86,000	52,000	10,400		133,000	87,000
5,200		86,000	52,000	10,500		133,000	87,000
5,300		86,000	52,000	10,600		133,000	87,000
5,400		93,000	57,000	10,700		142,000	94,000
5,500		93,000	57,000	10,750		142,000	94,000
5,600		93,000	57,000	10,800		142,000	94,000
5,700		93,000	57,000	10,900		142,000	94,000
5,800		93,000	57,000	11,000		142,000	94,000
5,900		93,000	57,000	11,100		142,000	94,000
6,000		93,000	57,000	11,200		142,000	94,000
6,100		101,000	63,000	11,300		142,000	94,000
6,200		101,000	63,000	11,500		142,000	94,000
6,300		101,000	63,000	11,700		142,000	94,000
6,400		101,000	63,000	11,800		142,000	94,000
6,500		101,000	63,000	12,000		151,000	101,000
6,600		101,000	63,000	12,100		151,000	101,000
6,700		101,000	63,000	12,200		151,000	101,000
6,750	17/64	109,000	69,000	12,300	31/64	151,000	101,000
6,800		109,000	69,000	12,400		151,000	101,000
6,900		109,000	69,000	12,500		151,000	101,000
7,000		109,000	69,000	12,700	1/2	151,000	101,000
7,100		109,000	69,000	13,000		151,000	101,000
7,200		109,000	69,000	13,500		160,000	108,000
7,300		109,000	69,000	14,000		160,000	108,000
7,400		109,000	69,000	14,500		169,000	114,000
7,500		109,000	69,000	15,000		169,000	114,000
7,600		117,000	75,000	15,500		178,000	120,000
7,700		117,000	75,000	16,000		178,000	120,000
7,800		117,000	75,000	16,500		184,000	125,000
7,900		117,000	75,000	17,000		184,000	125,000
8,000		117,000	75,000	17,500		191,000	130,000
8,100		117,000	75,000				
8,200		117,000	75,000				
8,300		117,000	75,000				
8,400		117,000	75,000				
8,500		117,000	75,000				
8,600		125,000	81,000				
8,700		125,000	81,000				
8,800		125,000	81,000				
8,900		125,000	81,000				

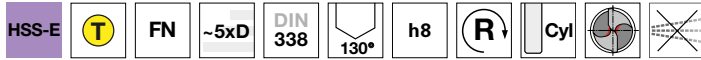


## Brocas espirales cil., cortas

### Nº artículo 84800



P	M	K	N	S	H
•	○	•	○		



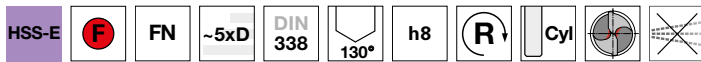
vaciado de punta  $\geq \varnothing 1,000$  • entrada cónica • acero rápido al cobalto • más resistencia al desgaste • ranuras amplias • ideal para prof. de taladro sup. a 3xD

fundición gris y aceros de más de 80 N/mm<sup>2</sup> • aceros para trab. en frío y en caliente • aceros para rodamientos • aceros altamente aleados • aceros de cementación, de bonificación

### Nº artículo 84504

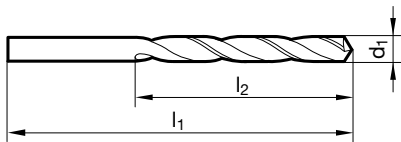


P	M	K	N	S	H
•	○	•	•		○



vaciado de punta  $\geq \varnothing 1,000$  • entrada cónica • acero rápido al cobalto • ranuras amplias • más resistencia al desgaste • ideal para prof. de taladro sup. a 3xD

fundición gris y aceros de más de 80 N/mm<sup>2</sup> • aceros para trab. en frío y en caliente • aceros para rodamientos • aceros altamente aleados • aceros de cementación, de bonificación



d1		l1	l2	d1		l1	l2
mm	inch	mm	mm	mm	inch	mm	mm
1,000		34,000	12,000	3,400		70,000	39,000
1,100		36,000	14,000	3,500		70,000	39,000
1,200		38,000	16,000	3,600		70,000	39,000
1,300		38,000	16,000	3,700		70,000	39,000
1,400		40,000	18,000	3,800		75,000	43,000
1,450		40,000	18,000	3,900		75,000	43,000
1,500		40,000	18,000	4,000		75,000	43,000
1,600		43,000	20,000	4,100		75,000	43,000
1,700		43,000	20,000	4,200		75,000	43,000
1,800		46,000	22,000	4,300		80,000	47,000
1,900		46,000	22,000	4,400		80,000	47,000
1,930		49,000	24,000	4,500		80,000	47,000
2,000		49,000	24,000	4,600		80,000	47,000
2,100		49,000	24,000	4,700		80,000	47,000
2,200		53,000	27,000	4,800		86,000	52,000
2,250		53,000	27,000	4,900		86,000	52,000
2,300		53,000	27,000	5,000		86,000	52,000
2,400		57,000	30,000	5,100		86,000	52,000
2,450		57,000	30,000	5,200		86,000	52,000
2,500		57,000	30,000	5,300		86,000	52,000
2,550		57,000	30,000	5,400		93,000	57,000
2,600		57,000	30,000	5,500		93,000	57,000
2,700		61,000	33,000	5,560	7/32	93,000	57,000
2,800		61,000	33,000	5,600		93,000	57,000
2,900		61,000	33,000	5,700		93,000	57,000
3,000		61,000	33,000	5,800		93,000	57,000
3,100		65,000	36,000	6,000		93,000	57,000
3,200		65,000	36,000	6,100		101,000	63,000
3,250		65,000	36,000	6,200		101,000	63,000
3,300		65,000	36,000	6,300		101,000	63,000



## Brocas espirales cil., cortas

d1 mm	inch	l1 mm	l2 mm	d1 mm	inch	l1 mm	l2 mm
6,400		101,000	63,000	9,100		125,000	81,000
6,500		101,000	63,000	9,200		125,000	81,000
6,600		101,000	63,000	9,300		125,000	81,000
6,700		101,000	63,000	9,500		125,000	81,000
6,800		109,000	69,000	9,700		133,000	87,000
6,900		109,000	69,000	9,800		133,000	87,000
7,000		109,000	69,000	9,900		133,000	87,000
7,100		109,000	69,000	10,000		133,000	87,000
7,200		109,000	69,000	10,100		133,000	87,000
7,400		109,000	69,000	10,200		133,000	87,000
7,500		109,000	69,000	10,300		133,000	87,000
7,700		117,000	75,000	10,500		133,000	87,000
7,800		117,000	75,000	10,700		142,000	94,000
7,900		117,000	75,000	10,800		142,000	94,000
8,000		117,000	75,000	11,000		142,000	94,000
8,100		117,000	75,000	11,500		142,000	94,000
8,200		117,000	75,000	11,700		142,000	94,000
8,400		117,000	75,000	12,000		151,000	101,000
8,500		117,000	75,000	12,500		151,000	101,000
8,600		125,000	81,000	13,000		151,000	101,000
8,700		125,000	81,000				
8,800		125,000	81,000				
8,900		125,000	81,000				
9,000		125,000	81,000				



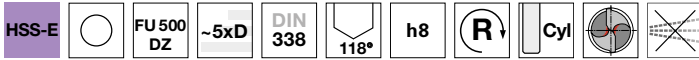


## Brocas espirales cil., cortas

### Nº artículo 84804



P	M	K	N	S	H
•	•	•	•		



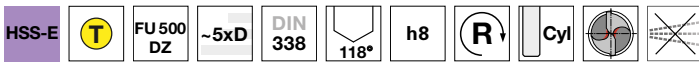
vaciado de punta  $\geq \varnothing 1,000$  • afilado plano • acero rápido al cobalto • se requiere poca fuerza de avance • se requiere poco par • aplicación universal

aceros aleados y no aleados fundición de dureza hasta a 800 N/mm<sup>2</sup> • aceros para trab. en frío y en caliente • aceros para rodamientos • metales no ferríticos • fundición • aceros inoxidable • plásticos

### Nº artículo 84802

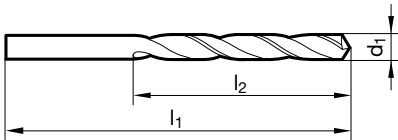


P	M	K	N	S	H
•	•	•	•		



vaciado de punta  $\geq \varnothing 1,000$  • afilado plano • acero rápido al cobalto • se requiere poca fuerza de avance • se requiere poco par • más resistencia al desgaste • aplicación universal

aceros aleados y no aleados fundición de dureza hasta a 800 N/mm<sup>2</sup> • aceros para trab. en frío y en caliente • aceros para rodamientos • metales no ferríticos • fundición • aceros inoxidable • plásticos



d1		l1	l2	d1		l1	l2
mm	inch	mm	mm	mm	inch	mm	mm
1,000		34,000	12,000	3,600		70,000	39,000
1,100		36,000	14,000	3,700		70,000	39,000
1,200		38,000	16,000	3,800		75,000	43,000
1,300		38,000	16,000	3,900		75,000	43,000
1,400		40,000	18,000	3,970	5/32	75,000	43,000
1,500		40,000	18,000	4,000		75,000	43,000
1,600		43,000	20,000	4,100		75,000	43,000
1,700		43,000	20,000	4,200		75,000	43,000
1,800		46,000	22,000	4,300		80,000	47,000
1,900		46,000	22,000	4,370	11/64	80,000	47,000
2,000		49,000	24,000	4,400		80,000	47,000
2,100		49,000	24,000	4,500		80,000	47,000
2,200		53,000	27,000	4,600		80,000	47,000
2,300		53,000	27,000	4,650		80,000	47,000
2,380	3/32	57,000	30,000	4,700		80,000	47,000
2,400		57,000	30,000	4,760	3/16	86,000	52,000
2,500		57,000	30,000	4,800		86,000	52,000
2,600		57,000	30,000	4,900		86,000	52,000
2,700		61,000	33,000	5,000		86,000	52,000
2,780	7/64	61,000	33,000	5,100		86,000	52,000
2,800		61,000	33,000	5,160	13/64	86,000	52,000
2,900		61,000	33,000	5,200		86,000	52,000
3,000		61,000	33,000	5,300		86,000	52,000
3,100		65,000	36,000	5,400		93,000	57,000
3,170	1/8	65,000	36,000	5,500		93,000	57,000
3,200		65,000	36,000	5,550		93,000	57,000
3,300		65,000	36,000	5,560	7/32	93,000	57,000
3,400		70,000	39,000	5,600		93,000	57,000
3,500		70,000	39,000	5,700		93,000	57,000
3,570	9/64	70,000	39,000	5,800		93,000	57,000



## Brocas espirales cil., cortas

d1 mm	inch	l1 mm	l2 mm	d1 mm	inch	l1 mm	l2 mm
5,900		93,000	57,000	8,500		117,000	75,000
5,950	15/64	93,000	57,000	8,600		125,000	81,000
6,000		93,000	57,000	8,700		125,000	81,000
6,100		101,000	63,000	8,730	11/32	125,000	81,000
6,200		101,000	63,000	8,800		125,000	81,000
6,300		101,000	63,000	8,900		125,000	81,000
6,350	1/4	101,000	63,000	9,000		125,000	81,000
6,400		101,000	63,000	9,100		125,000	81,000
6,500		101,000	63,000	9,200		125,000	81,000
6,600		101,000	63,000	9,300		125,000	81,000
6,700		101,000	63,000	9,400		125,000	81,000
6,800		109,000	69,000	9,500		125,000	81,000
6,900		109,000	69,000	9,600		133,000	87,000
7,000		109,000	69,000	9,700		133,000	87,000
7,100		109,000	69,000	9,800		133,000	87,000
7,140	9/32	109,000	69,000	9,900		133,000	87,000
7,200		109,000	69,000	10,000		133,000	87,000
7,300		109,000	69,000	10,100		133,000	87,000
7,400		109,000	69,000	10,200		133,000	87,000
7,500		109,000	69,000	10,300		133,000	87,000
7,600		117,000	75,000	10,500		133,000	87,000
7,700		117,000	75,000	11,000		142,000	94,000
7,800		117,000	75,000	11,110	7/16	142,000	94,000
7,900		117,000	75,000	11,200		142,000	94,000
7,940	5/16	117,000	75,000	11,500		142,000	94,000
8,000		117,000	75,000	12,000		151,000	101,000
8,100		117,000	75,000	12,500		151,000	101,000
8,200		117,000	75,000	13,000		151,000	101,000
8,300		117,000	75,000	13,500		160,000	108,000
8,400		117,000	75,000	14,000		160,000	108,000

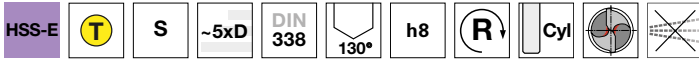


## Brocas espirales cil., cortas

### Nº artículo 84807



P	M	K	N	S	H
○	●			●	



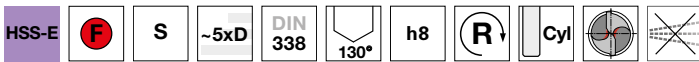
vaciado de punta  $\geq \varnothing 1,000$  • entrada cónica • acero rápido al cobalto • más resistencia al desgaste

titanio y aleaciones de titanio • aceros austeníticos inoxidables y resistentes a los ácidos y al calor • aceros de gran resistencia a partir de 900 N/mm<sup>2</sup> y cifras más elevadas • Hastelloy, Inconel, Nimonic

### Nº artículo 84505

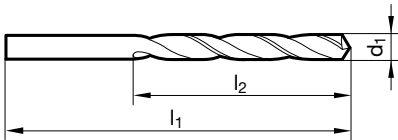


P	M	K	N	S	H
○	●			●	



vaciado de punta  $\geq \varnothing 1,000$  • entrada cónica • acero rápido al cobalto • más resistencia al desgaste

titanio y aleaciones de titanio • aceros austeníticos inoxidables y resistentes a los ácidos y al calor • aceros de gran resistencia a partir de 900 N/mm<sup>2</sup> y cifras más elevadas • Hastelloy, Inconel, Nimonic



d1	inch	l1	l2	d1	inch	l1	l2
mm		mm	mm	mm		mm	mm
0,500		22,000	6,000	2,500		57,000	30,000
0,600		24,000	7,000	2,550		57,000	30,000
0,650		26,000	8,000	2,600		57,000	30,000
0,700		28,000	9,000	2,700		61,000	33,000
0,750		28,000	9,000	2,800		61,000	33,000
0,800		30,000	10,000	2,900		61,000	33,000
0,850		30,000	10,000	3,000		61,000	33,000
0,900		32,000	11,000	3,100		65,000	36,000
0,950		32,000	11,000	3,200		65,000	36,000
1,000		34,000	12,000	3,300		65,000	36,000
1,050		34,000	12,000	3,350		65,000	36,000
1,100		36,000	14,000	3,400		70,000	39,000
1,200		38,000	16,000	3,500		70,000	39,000
1,250		38,000	16,000	3,600		70,000	39,000
1,300		38,000	16,000	3,700		70,000	39,000
1,350		40,000	18,000	3,800		75,000	43,000
1,400		40,000	18,000	3,900		75,000	43,000
1,500		40,000	18,000	4,000		75,000	43,000
1,550		43,000	20,000	4,100		75,000	43,000
1,600		43,000	20,000	4,200		75,000	43,000
1,700		43,000	20,000	4,300		80,000	47,000
1,800		46,000	22,000	4,400		80,000	47,000
1,850		46,000	22,000	4,500		80,000	47,000
1,900		46,000	22,000	4,600		80,000	47,000
2,000		49,000	24,000	4,700		80,000	47,000
2,050		49,000	24,000	4,800		86,000	52,000
2,100		49,000	24,000	4,900		86,000	52,000
2,200		53,000	27,000	5,000		86,000	52,000
2,300		53,000	27,000	5,050		86,000	52,000
2,400		57,000	30,000	5,100		86,000	52,000



## Brocas espirales cil., cortas

d1 mm	inch	l1 mm	l2 mm	d1 mm	inch	l1 mm	l2 mm
5,200		86,000	52,000	8,800		125,000	81,000
5,300		86,000	52,000	8,900		125,000	81,000
5,400		93,000	57,000	9,000		125,000	81,000
5,500		93,000	57,000	9,100		125,000	81,000
5,600		93,000	57,000	9,200		125,000	81,000
5,700		93,000	57,000	9,300		125,000	81,000
5,800		93,000	57,000	9,400		125,000	81,000
5,900		93,000	57,000	9,500		125,000	81,000
6,000		93,000	57,000	9,600		133,000	87,000
6,100		101,000	63,000	9,700		133,000	87,000
6,200		101,000	63,000	9,800		133,000	87,000
6,300		101,000	63,000	9,900		133,000	87,000
6,400		101,000	63,000	10,000		133,000	87,000
6,500		101,000	63,000	10,100		133,000	87,000
6,600		101,000	63,000	10,200		133,000	87,000
6,700		101,000	63,000	10,300		133,000	87,000
6,800		109,000	69,000	10,500		133,000	87,000
6,900		109,000	69,000	10,800		142,000	94,000
7,000		109,000	69,000	11,000		142,000	94,000
7,100		109,000	69,000	11,500		142,000	94,000
7,200		109,000	69,000	12,000		151,000	101,000
7,300		109,000	69,000	12,300	31/64	151,000	101,000
7,400		109,000	69,000	12,500		151,000	101,000
7,500		109,000	69,000	12,700	1/2	151,000	101,000
7,600		117,000	75,000	13,000		151,000	101,000
7,700		117,000	75,000				
7,800		117,000	75,000				
7,900		117,000	75,000				
8,000		117,000	75,000				
8,100		117,000	75,000				
8,200		117,000	75,000				
8,300		117,000	75,000				
8,400		117,000	75,000				
8,500		117,000	75,000				
8,600		125,000	81,000				
8,700		125,000	81,000				

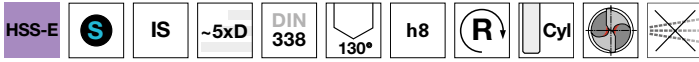


## Brocas espirales cil., cortas

Nº artículo 81078

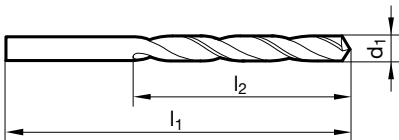


P	M	K	N	S	H
○	●	○	○	○	○



vaciado de punta  $\geq \varnothing 1,000$  • afilado al cono con vaciado de núcleo en cruz optimizado • acero rápido al cobalto • más resistencia al desgaste

aceros austeníticos inoxidables y resistentes a los ácidos y al calor (V2A y V4A) • aleaciones especiales



d1 mm	inch	l1 mm	l2 mm	d1 mm	inch	l1 mm	l2 mm
1,000		34,000	12,000	5,200		86,000	52,000
1,100		36,000	14,000	5,300		86,000	52,000
1,200		38,000	16,000	5,400		93,000	57,000
1,300		38,000	16,000	5,500		93,000	57,000
1,400		40,000	18,000	5,600		93,000	57,000
1,500		40,000	18,000	5,700		93,000	57,000
1,600		43,000	20,000	5,800		93,000	57,000
1,700		43,000	20,000	5,900		93,000	57,000
1,800		46,000	22,000	6,000		93,000	57,000
1,900		46,000	22,000	6,100		101,000	63,000
2,000		49,000	24,000	6,200		101,000	63,000
2,100		49,000	24,000	6,300		101,000	63,000
2,200		53,000	27,000	6,400		101,000	63,000
2,300		53,000	27,000	6,500		101,000	63,000
2,400		57,000	30,000	6,600		101,000	63,000
2,500		57,000	30,000	6,700		101,000	63,000
2,600		57,000	30,000	6,800		109,000	69,000
2,700		61,000	33,000	6,900		109,000	69,000
2,800		61,000	33,000	7,000		109,000	69,000
2,900		61,000	33,000	7,100		109,000	69,000
3,000		61,000	33,000	7,200		109,000	69,000
3,100		65,000	36,000	7,300		109,000	69,000
3,200		65,000	36,000	7,400		109,000	69,000
3,300		65,000	36,000	7,500		109,000	69,000
3,400		70,000	39,000	7,600		117,000	75,000
3,500		70,000	39,000	7,700		117,000	75,000
3,600		70,000	39,000	7,800		117,000	75,000
3,700		70,000	39,000	7,900		117,000	75,000
3,800		75,000	43,000	8,000		117,000	75,000
3,900		75,000	43,000	8,100		117,000	75,000
4,000		75,000	43,000	8,200		117,000	75,000
4,100		75,000	43,000	8,300		117,000	75,000
4,200		75,000	43,000	8,400		117,000	75,000
4,300		80,000	47,000	8,500		117,000	75,000
4,400		80,000	47,000	8,600		125,000	81,000
4,500		80,000	47,000	8,700		125,000	81,000
4,600		80,000	47,000	8,800		125,000	81,000
4,700		80,000	47,000	8,900		125,000	81,000
4,800		86,000	52,000	9,000		125,000	81,000
4,900		86,000	52,000	9,100		125,000	81,000
5,000		86,000	52,000	9,200		125,000	81,000
5,100		86,000	52,000	9,300		125,000	81,000



## Brocas espirales cil., cortas

d1 mm	inch	l1 mm	l2 mm	d1 mm	inch	l1 mm	l2 mm
9,400		125,000	81,000	11,800		142,000	94,000
9,500		125,000	81,000	12,000		151,000	101,000
9,600		133,000	87,000	12,500		151,000	101,000
9,700		133,000	87,000	13,000		151,000	101,000
9,800		133,000	87,000				
9,900		133,000	87,000				
10,000		133,000	87,000				
10,200		133,000	87,000				
10,500		133,000	87,000				
11,000		142,000	94,000				
11,200		142,000	94,000				
11,500		142,000	94,000				

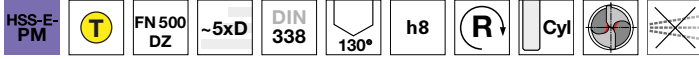


## Brocas espirales cil., cortas

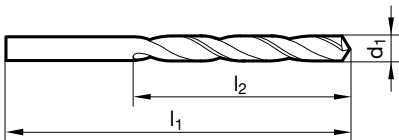
Nº artículo 84811



P	M	K	N	S	H
●	○	●	○	○	○



vaciado de punta  $\geq \varnothing 1,000$  • entrada cónica • PM acero rápido al cobalto • estabilidad muy buena • alta resistencia al desgaste  
 aceros altamente aleados • aceros de cementación, de bonificación • hierro fundido, latón y bronce



d1 mm	inch	l1 mm	l2 mm	d1 mm	inch	l1 mm	l2 mm
1,000		34,000	12,000	6,300		101,000	63,000
1,200		38,000	16,000	6,350	1/4	101,000	63,000
1,300		38,000	16,000	6,700		101,000	63,000
1,400		40,000	18,000	6,800		109,000	69,000
1,500		40,000	18,000	7,000		109,000	69,000
1,600		43,000	20,000	7,140	9/32	109,000	69,000
1,700		43,000	20,000	7,400		109,000	69,000
2,000		49,000	24,000	7,900		117,000	75,000
2,100		49,000	24,000	7,940	5/16	117,000	75,000
2,200		53,000	27,000	8,000		117,000	75,000
2,300		53,000	27,000	8,500		117,000	75,000
2,380	3/32	57,000	30,000	8,730	11/32	125,000	81,000
2,500		57,000	30,000	9,000		125,000	81,000
2,600		57,000	30,000	9,300		125,000	81,000
2,780	7/64	61,000	33,000	9,500		125,000	81,000
2,900		61,000	33,000	9,800		133,000	87,000
3,000		61,000	33,000	10,000		133,000	87,000
3,100		65,000	36,000	10,200		133,000	87,000
3,170	1/8	65,000	36,000	10,500		133,000	87,000
3,300		65,000	36,000	11,000		142,000	94,000
3,500		70,000	39,000	11,110	7/16	142,000	94,000
3,570	9/64	70,000	39,000	11,500		142,000	94,000
3,600		70,000	39,000	12,000		151,000	101,000
3,700		70,000	39,000	12,500		151,000	101,000
4,000		75,000	43,000	13,000		151,000	101,000
4,100		75,000	43,000	13,500		160,000	108,000
4,200		75,000	43,000	14,000		160,000	108,000
4,760	3/16	86,000	52,000				
4,800		86,000	52,000				
5,000		86,000	52,000				
5,160	13/64	86,000	52,000				
5,400		93,000	57,000				
5,500		93,000	57,000				
5,560	7/32	93,000	57,000				
5,950	15/64	93,000	57,000				
6,000		93,000	57,000				

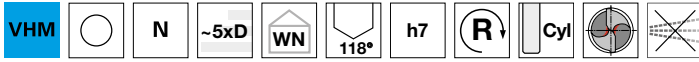


## Brocas espirales cil., cortas

Nº artículo 89244

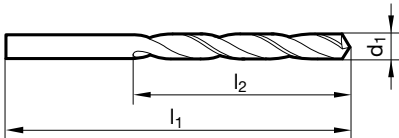


P	M	K	N	S	H
○	○	○	●	○	



vaciado de punta  $\geq \varnothing 3,000$  • afilado plano • forma recta del corte principal

aceros de construcción y de cementación • aceros para tornos automáticos, aceros de bonificación • fundición gris • bronce, latón  
• aluminio y sus aleaciones • magnesio y sus aleaciones • plásticos y plásticos con refuerzo de fibras



d1		l1	l2	d1		l1	l2
mm	inch	mm	mm	mm	inch	mm	mm
1,000		34,000	12,000	4,600		80,000	47,000
1,100		36,000	14,000	4,700		80,000	47,000
1,200		38,000	16,000	4,760	3/16	86,000	52,000
1,300		38,000	16,000	4,800		86,000	52,000
1,400		40,000	18,000	4,900		86,000	52,000
1,500		40,000	18,000	5,000		86,000	52,000
1,600		43,000	20,000	5,100		86,000	52,000
1,700		43,000	20,000	5,160	13/64	86,000	52,000
1,800		46,000	22,000	5,200		86,000	52,000
1,900		46,000	22,000	5,300		86,000	52,000
2,000		49,000	24,000	5,400		93,000	57,000
2,100		49,000	24,000	5,500		93,000	57,000
2,200		53,000	27,000	5,560	7/32	93,000	57,000
2,300		53,000	27,000	5,600		93,000	57,000
2,380	3/32	57,000	30,000	5,700		93,000	57,000
2,400		57,000	30,000	5,800		93,000	57,000
2,500		57,000	30,000	5,900		93,000	57,000
2,600		57,000	30,000	5,950	15/64	93,000	57,000
2,700		61,000	33,000	6,000		93,000	57,000
2,780	7/64	61,000	33,000	6,100		101,000	63,000
2,800		61,000	33,000	6,200		101,000	63,000
2,900		61,000	33,000	6,300		101,000	63,000
3,000		61,000	33,000	6,350	1/4	101,000	63,000
3,100		65,000	36,000	6,400		101,000	63,000
3,170	1/8	65,000	36,000	6,500		101,000	63,000
3,200		65,000	36,000	6,600		101,000	63,000
3,300		65,000	36,000	6,700		101,000	63,000
3,400		70,000	39,000	6,800		109,000	69,000
3,500		70,000	39,000	6,900		109,000	69,000
3,570	9/64	70,000	39,000	7,000		109,000	69,000
3,600		70,000	39,000	7,100		109,000	69,000
3,700		70,000	39,000	7,140	9/32	109,000	69,000
3,800		75,000	43,000	7,200		109,000	69,000
3,900		75,000	43,000	7,300		109,000	69,000
3,970	5/32	75,000	43,000	7,400		109,000	69,000
4,000		75,000	43,000	7,500		109,000	69,000
4,100		75,000	43,000	7,600		117,000	75,000
4,200		75,000	43,000	7,700		117,000	75,000
4,300		80,000	47,000	7,800		117,000	75,000
4,370	11/64	80,000	47,000	7,900		117,000	75,000
4,400		80,000	47,000	7,940	5/16	117,000	75,000
4,500		80,000	47,000	8,000		117,000	75,000





## Brocas espirales cil., cortas

d1 mm	inch	l1 mm	l2 mm	d1 mm	inch	l1 mm	l2 mm
8,200		117,000	75,000	9,900		133,000	87,000
8,300		117,000	75,000	10,000		133,000	87,000
8,400		117,000	75,000	10,200		133,000	87,000
8,500		117,000	75,000	10,300		133,000	87,000
8,600		125,000	81,000	10,500		133,000	87,000
8,700		125,000	81,000	10,720	27/64	142,000	94,000
8,730	11/32	125,000	81,000	11,000		142,000	94,000
8,800		125,000	81,000	11,110	7/16	142,000	94,000
8,900		125,000	81,000	11,500		142,000	94,000
9,000		125,000	81,000	11,910	15/32	151,000	101,000
9,100		125,000	81,000	12,000		151,000	101,000
9,200		125,000	81,000				
9,300		125,000	81,000				
9,400		125,000	81,000				
9,500		125,000	81,000				
9,600		133,000	87,000				
9,700		133,000	87,000				
9,800		133,000	87,000				

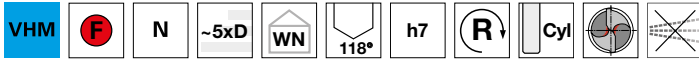


## Brocas espirales cil., cortas

N° artículo 89261

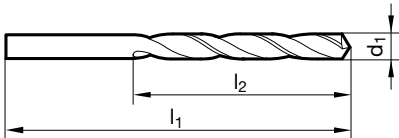


P	M	K	N	S	H
○	○	○	●	○	



vaciado de punta  $\geq \varnothing 2,060$  • afilado plano • forma recta del corte principal

aluminios con alto porcentaje de Si • aceros para tornos automáticos, aceros de bonificación • aceros de construcción y de cementación • fundición • plásticos y plásticos con refuerzo de fibras • magnesio y sus aleaciones • latón



d1		l1	l2	d1		l1	l2
mm	inch	mm	mm	mm	inch	mm	mm
1,000		34,000	12,000	3,800		75,000	43,000
1,100		36,000	14,000	3,900		75,000	43,000
1,190	3/64	38,000	16,000	3,970	5/32	75,000	43,000
1,200		38,000	16,000	4,000		75,000	43,000
1,300		38,000	16,000	4,040		75,000	43,000
1,400		40,000	18,000	4,100		75,000	43,000
1,500		40,000	18,000	4,200		75,000	43,000
1,590	1/16	43,000	20,000	4,300		80,000	47,000
1,600		43,000	20,000	4,370	11/64	80,000	47,000
1,700		43,000	20,000	4,400		80,000	47,000
1,780		46,000	22,000	4,500		80,000	47,000
1,800		46,000	22,000	4,600		80,000	47,000
1,850		46,000	22,000	4,700		80,000	47,000
1,900		46,000	22,000	4,760	3/16	86,000	52,000
1,980	5/64	49,000	24,000	4,800		86,000	52,000
2,000		49,000	24,000	4,850		86,000	52,000
2,060		49,000	24,000	4,900		86,000	52,000
2,100		49,000	24,000	5,000		86,000	52,000
2,200		53,000	27,000	5,060		86,000	52,000
2,300		53,000	27,000	5,100		86,000	52,000
2,380	3/32	57,000	30,000	5,160	13/64	86,000	52,000
2,400		57,000	30,000	5,200		86,000	52,000
2,500		57,000	30,000	5,300		86,000	52,000
2,530		57,000	30,000	5,400		93,000	57,000
2,600		57,000	30,000	5,500		93,000	57,000
2,700		61,000	33,000	5,560	7/32	93,000	57,000
2,780	7/64	61,000	33,000	5,600		93,000	57,000
2,800		61,000	33,000	5,700		93,000	57,000
2,900		61,000	33,000	5,800		93,000	57,000
2,950		61,000	33,000	5,900		93,000	57,000
3,000		61,000	33,000	5,950	15/64	93,000	57,000
3,050		65,000	36,000	6,000		93,000	57,000
3,100		65,000	36,000	6,100		101,000	63,000
3,170	1/8	65,000	36,000	6,200		101,000	63,000
3,200		65,000	36,000	6,300		101,000	63,000
3,300		65,000	36,000	6,350	1/4	101,000	63,000
3,400		70,000	39,000	6,400		101,000	63,000
3,450		70,000	39,000	6,500		101,000	63,000
3,500		70,000	39,000	6,600		101,000	63,000
3,570	9/64	70,000	39,000	6,700		101,000	63,000
3,600		70,000	39,000	6,750	17/64	109,000	69,000
3,700		70,000	39,000	6,800		109,000	69,000



## Brocas espirales cil., cortas

d1 mm	inch	l1 mm	l2 mm	d1 mm	inch	l1 mm	l2 mm
6,900		109,000	69,000	9,130	23/64	125,000	81,000
7,000		109,000	69,000	9,200		125,000	81,000
7,100		109,000	69,000	9,500		125,000	81,000
7,140	9/32	109,000	69,000	9,520	3/8	133,000	87,000
7,300		109,000	69,000	9,600		133,000	87,000
7,400		109,000	69,000	9,800		133,000	87,000
7,500		109,000	69,000	9,920	25/64	133,000	87,000
7,540	19/64	117,000	75,000	10,000		133,000	87,000
7,600		117,000	75,000	10,200		133,000	87,000
7,800		117,000	75,000	10,300		133,000	87,000
7,900		117,000	75,000	10,320	13/32	133,000	87,000
7,940	5/16	117,000	75,000	10,500		133,000	87,000
8,000		117,000	75,000	10,720	27/64	142,000	94,000
8,030		117,000	75,000	11,000		142,000	94,000
8,100		117,000	75,000	11,110	7/16	142,000	94,000
8,200		117,000	75,000	11,500		142,000	94,000
8,330	21/64	117,000	75,000	12,000		151,000	101,000
8,400		117,000	75,000				
8,500		117,000	75,000				
8,600		125,000	81,000				
8,700		125,000	81,000				
8,730	11/32	125,000	81,000				
9,000		125,000	81,000				
9,100		125,000	81,000				



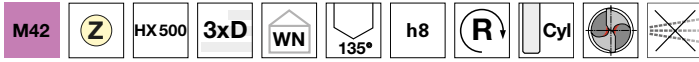
# HARTNER

## Broca de ranura corta

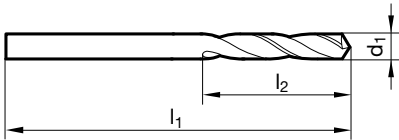
Nº artículo 81000



P	M	K	N	S	H
●	○	●	○	●	○



vaciado de punta  $\geq \varnothing 1,000$  • alta resistencia al desgaste • afilado en cruz optimizado • acero rápido HSCO con un 8% de cobalto para el mecanizado de alto rendimiento en aceros estructurales y cementados • chapas resistentes al desgaste • Hardox



d1 mm	l1 mm	l2 mm	d1 mm	l1 mm	l2 mm
1,000	34,000	6,000	8,000	117,000	37,000
1,500	40,000	9,000	8,500	117,000	37,000
2,000	49,000	12,000	9,000	125,000	40,000
2,500	57,000	14,000	9,500	125,000	40,000
3,000	61,000	16,000	10,000	133,000	43,000
3,200	65,000	18,000	10,200	133,000	43,000
3,300	65,000	18,000	10,500	133,000	43,000
3,500	70,000	20,000	11,000	142,000	47,000
4,000	75,000	22,000	11,500	142,000	47,000
4,200	75,000	22,000	12,000	151,000	51,000
4,500	80,000	24,000	12,500	151,000	51,000
5,000	86,000	26,000	13,000	151,000	51,000
5,500	93,000	28,000			
6,000	93,000	28,000			
6,500	101,000	31,000			
6,800	109,000	34,000			
7,000	109,000	34,000			
7,500	109,000	34,000			

	Hardox HiTuf	Hardox 400	Hardox 450	Hardox 500
$v_c$ (m/min)	~11	~8	~6	~4
vrc	~3	~2	~1	
$\varnothing$	f/rpm			
2.5	0.035/1400	0.025/1000	0.015/770	0.005/500
3	0.04/1200	0.03/850	0.02/640	0.01/430
4	0.05/900	0.04/650	0.03/480	0.02/320
5	0.06/700	0.05/510	0.04/400	0.03/255
6	0.07/590	0.06/430	0.05/320	0.04/220
7	0.08/500	0.07/370	0.06/280	0.05/190
8	0.09/440	0.08/320	0.07/240	0.06/160
10	0.11/350	0.10/260	0.09/200	0.08/130
13	0.14/270	0.13/200	0.12/150	0.1/100

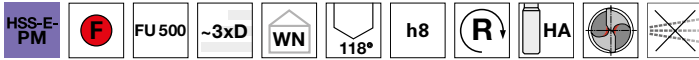


## Brocas espirales con mango cil. reforzado

Nº artículo 84805

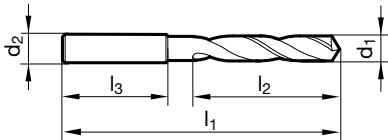


P	M	K	N	S	H
•	•	•	•		



vaciado de punta  $\geq \varnothing 2,000$  • afilado plano • se requiere poca fuerza de avance • PM acero rápido al cobalto • se requiere poco par  
 • más resistencia al desgaste • aplicación universal

aceros aleados y no aleados fundición de dureza hasta a 800 N/mm<sup>2</sup> • aceros para trab. en frío y en caliente • aceros inoxidables  
 • metales no ferríticos • fundición • plásticos • aceros para rodamientos



d1		d2 h6	l1	l2	l3	d1		d2 h6	l1	l2	l3
mm	inch	mm	mm	mm	mm	mm	inch	mm	mm	mm	mm
1,000		3,000	38,000	6,000	28,000	4,600		6,000	68,000	24,000	36,000
1,100		3,000	39,000	7,000	28,000	4,650		6,000	68,000	24,000	36,000
1,200		3,000	40,000	8,000	28,000	4,700		6,000	68,000	24,000	36,000
1,300		3,000	40,000	8,000	28,000	4,760	3/16	6,000	70,000	26,000	36,000
1,400		3,000	41,000	9,000	28,000	4,800		6,000	70,000	26,000	36,000
1,500		3,000	41,000	9,000	28,000	4,900		6,000	70,000	26,000	36,000
1,600		3,000	42,000	10,000	28,000	5,000		6,000	70,000	26,000	36,000
1,700		3,000	42,000	10,000	28,000	5,100		6,000	70,000	26,000	36,000
1,800		3,000	43,000	11,000	28,000	5,160	13/64	6,000	70,000	26,000	36,000
1,900		3,000	43,000	11,000	28,000	5,200		6,000	70,000	26,000	36,000
2,000		3,000	44,000	12,000	28,000	5,300		6,000	70,000	26,000	36,000
2,100		3,000	44,000	12,000	28,000	5,400		6,000	72,000	28,000	36,000
2,200		3,000	45,000	13,000	28,000	5,500		6,000	72,000	28,000	36,000
2,300		3,000	45,000	13,000	28,000	5,550		6,000	72,000	28,000	36,000
2,380	3/32	3,000	46,000	14,000	28,000	5,560	7/32	6,000	72,000	28,000	36,000
2,400		3,000	46,000	14,000	28,000	5,600		6,000	72,000	28,000	36,000
2,500		3,000	46,000	14,000	28,000	5,700		6,000	72,000	28,000	36,000
2,600		3,000	46,000	14,000	28,000	5,800		6,000	72,000	28,000	36,000
2,700		3,000	48,000	16,000	28,000	5,900		6,000	72,000	28,000	36,000
2,780	7/64	3,000	48,000	16,000	28,000	5,950	15/64	6,000	72,000	28,000	36,000
2,800		3,000	48,000	16,000	28,000	6,000		6,000	72,000	28,000	36,000
2,900		3,000	48,000	16,000	28,000	6,100		8,000	75,000	31,000	36,000
3,000		3,000	48,000	16,000	28,000	6,200		8,000	75,000	31,000	36,000
3,100		4,000	50,000	18,000	28,000	6,300		8,000	75,000	31,000	36,000
3,170	1/8	4,000	50,000	18,000	28,000	6,350	1/4	8,000	75,000	31,000	36,000
3,200		4,000	50,000	18,000	28,000	6,400		8,000	75,000	31,000	36,000
3,300		4,000	50,000	18,000	28,000	6,500		8,000	75,000	31,000	36,000
3,400		4,000	52,000	20,000	28,000	6,600		8,000	75,000	31,000	36,000
3,500		4,000	52,000	20,000	28,000	6,700		8,000	75,000	31,000	36,000
3,570	9/64	4,000	52,000	20,000	28,000	6,750	17/64	8,000	78,000	34,000	36,000
3,600		4,000	52,000	20,000	28,000	6,800		8,000	78,000	34,000	36,000
3,700		4,000	52,000	20,000	28,000	6,900		8,000	78,000	34,000	36,000
3,800		4,000	54,000	22,000	28,000	7,000		8,000	78,000	34,000	36,000
3,900		4,000	54,000	22,000	28,000	7,100		8,000	78,000	34,000	36,000
3,970	5/32	4,000	54,000	22,000	28,000	7,140	9/32	8,000	78,000	34,000	36,000
4,000		4,000	54,000	22,000	28,000	7,200		8,000	78,000	34,000	36,000
4,100		6,000	66,000	22,000	36,000	7,300		8,000	78,000	34,000	36,000
4,200		6,000	66,000	22,000	36,000	7,400		8,000	78,000	34,000	36,000
4,300		6,000	68,000	24,000	36,000	7,500		8,000	78,000	34,000	36,000
4,370	11/64	6,000	68,000	24,000	36,000	7,540	19/64	8,000	81,000	37,000	36,000
4,400		6,000	68,000	24,000	36,000	7,550		8,000	81,000	37,000	36,000
4,500		6,000	68,000	24,000	36,000	7,600		8,000	81,000	37,000	36,000



## Brocas espirales con mango cil. reforzado

d1 mm	inch	d2 h6 mm	l1 mm	l2 mm	l3 mm	d1 mm	inch	d2 h6 mm	l1 mm	l2 mm	l3 mm
7,700		8,000	81,000	37,000	36,000	11,500		12,000	104,000	47,000	45,000
7,800		8,000	81,000	37,000	36,000	11,510	29/64	12,000	104,000	47,000	45,000
7,900		8,000	81,000	37,000	36,000	11,600		12,000	104,000	47,000	45,000
7,940	5/16	8,000	81,000	37,000	36,000	11,700		12,000	104,000	47,000	45,000
8,000		8,000	81,000	37,000	36,000	11,800		12,000	104,000	47,000	45,000
8,100		10,000	87,000	37,000	40,000	11,900		12,000	108,000	51,000	45,000
8,200		10,000	87,000	37,000	40,000	11,910	15/32	12,000	108,000	51,000	45,000
8,300		10,000	87,000	37,000	40,000	12,000		12,000	108,000	51,000	45,000
8,330	21/64	10,000	87,000	37,000	40,000	12,100		16,000	111,000	51,000	48,000
8,400		10,000	87,000	37,000	40,000	12,200		16,000	111,000	51,000	48,000
8,500		10,000	87,000	37,000	40,000	12,300	31/64	16,000	111,000	51,000	48,000
8,600		10,000	91,000	40,000	40,000	12,400		16,000	111,000	51,000	48,000
8,700		10,000	91,000	40,000	40,000	12,500		16,000	111,000	51,000	48,000
8,730	11/32	10,000	91,000	40,000	40,000	12,600		16,000	111,000	51,000	48,000
8,800		10,000	91,000	40,000	40,000	12,700	1/2	16,000	111,000	51,000	48,000
8,900		10,000	91,000	40,000	40,000	12,800		16,000	111,000	51,000	48,000
9,000		10,000	91,000	40,000	40,000	12,900		16,000	111,000	51,000	48,000
9,100		10,000	91,000	40,000	40,000	13,000		16,000	111,000	51,000	48,000
9,130	23/64	10,000	91,000	40,000	40,000	13,100	33/64	16,000	111,000	51,000	48,000
9,200		10,000	91,000	40,000	40,000	13,490	17/32	16,000	114,000	54,000	48,000
9,300		10,000	91,000	40,000	40,000	13,500		16,000	114,000	54,000	48,000
9,400		10,000	91,000	40,000	40,000	13,890	35/64	16,000	114,000	54,000	48,000
9,500		10,000	91,000	40,000	40,000	14,000		16,000	114,000	54,000	48,000
9,520	3/8	10,000	93,000	43,000	40,000	14,290	9/16	16,000	116,000	56,000	48,000
9,550		10,000	93,000	43,000	40,000	14,500		16,000	116,000	56,000	48,000
9,600		10,000	93,000	43,000	40,000	15,000		16,000	116,000	56,000	48,000
9,700		10,000	93,000	43,000	40,000	15,500		16,000	118,000	58,000	48,000
9,800		10,000	93,000	43,000	40,000	15,870	5/8	16,000	118,000	58,000	48,000
9,900		10,000	93,000	43,000	40,000	16,000		16,000	118,000	58,000	48,000
9,920	25/64	10,000	93,000	43,000	40,000	16,500		20,000	126,000	60,000	50,000
10,000		10,000	93,000	43,000	40,000	16,670	21/32	20,000	126,000	60,000	50,000
10,100		12,000	100,000	43,000	45,000	17,000		20,000	126,000	60,000	50,000
10,200		12,000	100,000	43,000	45,000	17,500		20,000	128,000	62,000	50,000
10,300		12,000	100,000	43,000	45,000	18,000		20,000	128,000	62,000	50,000
10,320	13/32	12,000	100,000	43,000	45,000	18,500		20,000	130,000	64,000	50,000
10,400		12,000	100,000	43,000	45,000	19,000		20,000	130,000	64,000	50,000
10,500		12,000	100,000	43,000	45,000	19,500		20,000	132,000	66,000	50,000
10,600		12,000	100,000	43,000	45,000	20,000		20,000	132,000	66,000	50,000
10,700		12,000	104,000	47,000	45,000						
10,720	27/64	12,000	104,000	47,000	45,000						
10,800		12,000	104,000	47,000	45,000						
10,900		12,000	104,000	47,000	45,000						
11,000		12,000	104,000	47,000	45,000						
11,100		12,000	104,000	47,000	45,000						
11,110	7/16	12,000	104,000	47,000	45,000						
11,200		12,000	104,000	47,000	45,000						
11,300		12,000	104,000	47,000	45,000						
11,400		12,000	104,000	47,000	45,000						

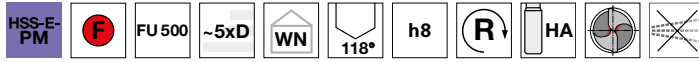


## Brocas espirales con mango cil. reforzado

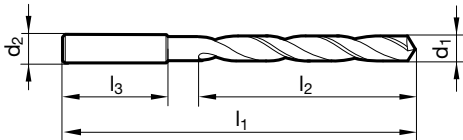
Nº artículo 84801



P	M	K	N	S	H
•	•	•	•		



vaciado de punta  $\geq \varnothing 2,000$  • afilado plano • se requiere poca fuerza de avance • se requiere poco par • PM acero rápido al cobalto  
 • más resistencia al desgaste • aplicación universal  
 aceros aleados y no aleados fundición de dureza hasta a 800 N/mm<sup>2</sup> • aceros para trab. en frío y en caliente • aceros inoxidables  
 • metales no ferríticos • fundición • plásticos



d1		d2 h6	l1	l2	l3	d1		d2 h6	l1	l2	l3
mm	inch	mm	mm	mm	mm	mm	inch	mm	mm	mm	mm
2,000		3,000	56,000	24,000	28,000	5,300		6,000	96,000	52,000	36,000
2,100		3,000	56,000	24,000	28,000	5,400		6,000	101,000	57,000	36,000
2,200		3,000	59,000	27,000	28,000	5,500		6,000	101,000	57,000	36,000
2,300		3,000	59,000	27,000	28,000	5,550		6,000	101,000	57,000	36,000
2,380	3/32	3,000	62,000	30,000	28,000	5,560	7/32	6,000	101,000	57,000	36,000
2,400		3,000	62,000	30,000	28,000	5,600		6,000	101,000	57,000	36,000
2,500		3,000	62,000	30,000	28,000	5,700		6,000	101,000	57,000	36,000
2,600		3,000	62,000	30,000	28,000	5,800		6,000	101,000	57,000	36,000
2,700		3,000	65,000	33,000	28,000	5,900		6,000	101,000	57,000	36,000
2,780	7/64	3,000	65,000	33,000	28,000	5,950	15/64	6,000	101,000	57,000	36,000
2,800		3,000	65,000	33,000	28,000	6,000		6,000	101,000	57,000	36,000
2,900		3,000	65,000	33,000	28,000	6,100		8,000	107,000	63,000	36,000
3,000		3,000	65,000	33,000	28,000	6,200		8,000	107,000	63,000	36,000
3,100		4,000	68,000	36,000	28,000	6,300		8,000	107,000	63,000	36,000
3,170	1/8	4,000	68,000	36,000	28,000	6,350	1/4	8,000	107,000	63,000	36,000
3,200		4,000	68,000	36,000	28,000	6,400		8,000	107,000	63,000	36,000
3,300		4,000	68,000	36,000	28,000	6,500		8,000	107,000	63,000	36,000
3,400		4,000	71,000	39,000	28,000	6,600		8,000	107,000	63,000	36,000
3,500		4,000	71,000	39,000	28,000	6,700		8,000	107,000	63,000	36,000
3,570	9/64	4,000	71,000	39,000	28,000	6,750	17/64	8,000	113,000	69,000	36,000
3,600		4,000	71,000	39,000	28,000	6,800		8,000	113,000	69,000	36,000
3,700		4,000	71,000	39,000	28,000	6,900		8,000	113,000	69,000	36,000
3,800		4,000	75,000	43,000	28,000	7,000		8,000	113,000	69,000	36,000
3,900		4,000	75,000	43,000	28,000	7,100		8,000	113,000	69,000	36,000
3,970	5/32	4,000	75,000	43,000	28,000	7,140	9/32	8,000	113,000	69,000	36,000
4,000		4,000	75,000	43,000	28,000	7,200		8,000	113,000	69,000	36,000
4,100		6,000	87,000	43,000	36,000	7,300		8,000	113,000	69,000	36,000
4,200		6,000	87,000	43,000	36,000	7,400		8,000	113,000	69,000	36,000
4,300		6,000	91,000	47,000	36,000	7,500		8,000	113,000	69,000	36,000
4,370	11/64	6,000	91,000	47,000	36,000	7,540	19/64	8,000	119,000	75,000	36,000
4,400		6,000	91,000	47,000	36,000	7,550		8,000	119,000	75,000	36,000
4,500		6,000	91,000	47,000	36,000	7,600		8,000	119,000	75,000	36,000
4,600		6,000	91,000	47,000	36,000	7,700		8,000	119,000	75,000	36,000
4,650		6,000	91,000	47,000	36,000	7,800		8,000	119,000	75,000	36,000
4,700		6,000	91,000	47,000	36,000	7,900		8,000	119,000	75,000	36,000
4,760	3/16	6,000	96,000	52,000	36,000	7,940	5/16	8,000	119,000	75,000	36,000
4,800		6,000	96,000	52,000	36,000	8,000		8,000	119,000	75,000	36,000
4,900		6,000	96,000	52,000	36,000	8,100		10,000	125,000	75,000	40,000
5,000		6,000	96,000	52,000	36,000	8,200		10,000	125,000	75,000	40,000
5,100		6,000	96,000	52,000	36,000	8,300		10,000	125,000	75,000	40,000
5,160	13/64	6,000	96,000	52,000	36,000	8,330	21/64	10,000	125,000	75,000	40,000
5,200		6,000	96,000	52,000	36,000	8,400		10,000	125,000	75,000	40,000



## Brocas espirales con mango cil. reforzado

d1 mm	inch	d2 h6 mm	l1 mm	l2 mm	l3 mm	d1 mm	inch	d2 h6 mm	l1 mm	l2 mm	l3 mm
8,500		10,000	125,000	75,000	40,000	11,800		12,000	151,000	94,000	45,000
8,600		10,000	131,000	81,000	40,000	11,900		12,000	158,000	101,000	45,000
8,700		10,000	131,000	81,000	40,000	11,910	15/32	12,000	158,000	101,000	45,000
8,730	11/32	10,000	131,000	81,000	40,000	12,000		12,000	158,000	101,000	45,000
8,800		10,000	131,000	81,000	40,000	12,100		16,000	161,000	101,000	48,000
8,900		10,000	131,000	81,000	40,000	12,200		16,000	161,000	101,000	48,000
9,000		10,000	131,000	81,000	40,000	12,300	31/64	16,000	161,000	101,000	48,000
9,100		10,000	131,000	81,000	40,000	12,400		16,000	161,000	101,000	48,000
9,130	23/64	10,000	131,000	81,000	40,000	12,500		16,000	161,000	101,000	48,000
9,200		10,000	131,000	81,000	40,000	12,600		16,000	161,000	101,000	48,000
9,300		10,000	131,000	81,000	40,000	12,700	1/2	16,000	161,000	101,000	48,000
9,400		10,000	131,000	81,000	40,000	12,800		16,000	161,000	101,000	48,000
9,500		10,000	131,000	81,000	40,000	12,900		16,000	161,000	101,000	48,000
9,520	3/8	10,000	137,000	87,000	40,000	13,000		16,000	161,000	101,000	48,000
9,550		10,000	137,000	87,000	40,000	13,100	33/64	16,000	161,000	101,000	48,000
9,600		10,000	137,000	87,000	40,000	13,490	17/32	16,000	166,000	106,000	48,000
9,700		10,000	137,000	87,000	40,000	13,500		16,000	166,000	106,000	48,000
9,800		10,000	137,000	87,000	40,000	13,890	35/64	16,000	166,000	106,000	48,000
9,900		10,000	137,000	87,000	40,000	14,000		16,000	166,000	106,000	48,000
9,920	25/64	10,000	137,000	87,000	40,000	14,290	9/16	16,000	169,000	109,000	48,000
10,000		10,000	137,000	87,000	40,000	14,500		16,000	169,000	109,000	48,000
10,100		12,000	144,000	87,000	45,000	15,000		16,000	169,000	109,000	48,000
10,200		12,000	144,000	87,000	45,000	15,500		16,000	172,000	112,000	48,000
10,300		12,000	144,000	87,000	45,000	15,870	5/8	16,000	172,000	112,000	48,000
10,320	13/32	12,000	144,000	87,000	45,000	16,000		16,000	172,000	112,000	48,000
10,400		12,000	144,000	87,000	45,000	16,500		20,000	181,000	115,000	50,000
10,500		12,000	144,000	87,000	45,000	16,670	21/32	20,000	181,000	115,000	50,000
10,600		12,000	144,000	87,000	45,000	17,000		20,000	181,000	115,000	50,000
10,700		12,000	151,000	94,000	45,000	17,460	11/16	20,000	184,000	118,000	50,000
10,720	27/64	12,000	151,000	94,000	45,000	17,500		20,000	184,000	118,000	50,000
10,800		12,000	151,000	94,000	45,000	18,000		20,000	184,000	118,000	50,000
10,900		12,000	151,000	94,000	45,000	18,500		20,000	188,000	122,000	50,000
11,000		12,000	151,000	94,000	45,000	19,000		20,000	188,000	122,000	50,000
11,100		12,000	151,000	94,000	45,000	19,500		20,000	191,000	125,000	50,000
11,110	7/16	12,000	151,000	94,000	45,000	20,000		20,000	191,000	125,000	50,000
11,200		12,000	151,000	94,000	45,000						
11,300		12,000	151,000	94,000	45,000						
11,400		12,000	151,000	94,000	45,000						
11,500		12,000	151,000	94,000	45,000						
11,510	29/64	12,000	151,000	94,000	45,000						
11,600		12,000	151,000	94,000	45,000						
11,700		12,000	151,000	94,000	45,000						



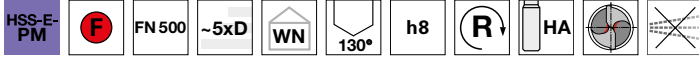


## Brocas espirales con mango cil. reforzado

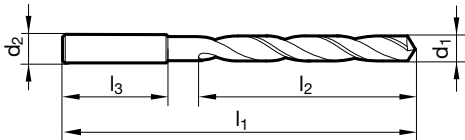
Nº artículo 84507



P	M	K	N	S	H
●	○	●	○	○	○



vaciado de punta  $\geq \varnothing 2,000$  • entrada cónica • PM acero rápido al cobalto • alta resistencia al desgaste • estabilidad muy buena  
 materiales más duros, aceros de aleación alta • aceros de cementación, de bonificación • hierro fundido, latón y bronce



d1		d2 h6	l1	l2	l3	d1		d2 h6	l1	l2	l3
mm	inch	mm	mm	mm	mm	mm	inch	mm	mm	mm	mm
2,000		3,000	56,000	24,000	28,000	6,000		6,000	101,000	57,000	36,000
2,100		3,000	56,000	24,000	28,000	6,100		8,000	107,000	63,000	36,000
2,200		3,000	59,000	27,000	28,000	6,200		8,000	107,000	63,000	36,000
2,300		3,000	59,000	27,000	28,000	6,300		8,000	107,000	63,000	36,000
2,380	3/32	3,000	62,000	30,000	28,000	6,400		8,000	107,000	63,000	36,000
2,400		3,000	62,000	30,000	28,000	6,500		8,000	107,000	63,000	36,000
2,500		3,000	62,000	30,000	28,000	6,600		8,000	107,000	63,000	36,000
2,600		3,000	62,000	30,000	28,000	6,700		8,000	107,000	63,000	36,000
2,700		3,000	65,000	33,000	28,000	6,750	17/64	8,000	113,000	69,000	36,000
2,800		3,000	65,000	33,000	28,000	6,800		8,000	113,000	69,000	36,000
2,900		3,000	65,000	33,000	28,000	6,900		8,000	113,000	69,000	36,000
3,000		3,000	65,000	33,000	28,000	7,000		8,000	113,000	69,000	36,000
3,100		4,000	68,000	36,000	28,000	7,100		8,000	113,000	69,000	36,000
3,170	1/8	4,000	68,000	36,000	28,000	7,200		8,000	113,000	69,000	36,000
3,200		4,000	68,000	36,000	28,000	7,300		8,000	113,000	69,000	36,000
3,300		4,000	68,000	36,000	28,000	7,400		8,000	113,000	69,000	36,000
3,400		4,000	71,000	39,000	28,000	7,500		8,000	113,000	69,000	36,000
3,500		4,000	71,000	39,000	28,000	7,700		8,000	119,000	75,000	36,000
3,600		4,000	71,000	39,000	28,000	7,800		8,000	119,000	75,000	36,000
3,700		4,000	71,000	39,000	28,000	8,000		8,000	119,000	75,000	36,000
3,800		4,000	75,000	43,000	28,000	8,100		10,000	125,000	75,000	40,000
3,900		4,000	75,000	43,000	28,000	8,200		10,000	125,000	75,000	40,000
4,000		4,000	75,000	43,000	28,000	8,300		10,000	125,000	75,000	40,000
4,100		6,000	87,000	43,000	36,000	8,400		10,000	125,000	75,000	40,000
4,200		6,000	87,000	43,000	36,000	8,500		10,000	125,000	75,000	40,000
4,300		6,000	91,000	47,000	36,000	8,600		10,000	131,000	81,000	40,000
4,400		6,000	91,000	47,000	36,000	8,700		10,000	131,000	81,000	40,000
4,500		6,000	91,000	47,000	36,000	8,730	11/32	10,000	131,000	81,000	40,000
4,600		6,000	91,000	47,000	36,000	8,800		10,000	131,000	81,000	40,000
4,650		6,000	91,000	47,000	36,000	9,000		10,000	131,000	81,000	40,000
4,700		6,000	91,000	47,000	36,000	9,300		10,000	131,000	81,000	40,000
4,800		6,000	96,000	52,000	36,000	9,500		10,000	131,000	81,000	40,000
4,900		6,000	96,000	52,000	36,000	9,700		10,000	137,000	87,000	40,000
5,000		6,000	96,000	52,000	36,000	9,800		10,000	137,000	87,000	40,000
5,100		6,000	96,000	52,000	36,000	9,900		10,000	137,000	87,000	40,000
5,160	13/64	6,000	96,000	52,000	36,000	10,000		10,000	137,000	87,000	40,000
5,300		6,000	96,000	52,000	36,000	10,200		12,000	144,000	87,000	45,000
5,400		6,000	101,000	57,000	36,000	10,300		12,000	144,000	87,000	45,000
5,500		6,000	101,000	57,000	36,000	10,400		12,000	144,000	87,000	45,000
5,550		6,000	101,000	57,000	36,000	10,500		12,000	144,000	87,000	45,000
5,600		6,000	101,000	57,000	36,000	10,600		12,000	144,000	87,000	45,000
5,950	15/64	6,000	101,000	57,000	36,000	11,000		12,000	151,000	94,000	45,000



## Brocas espirales con mango cil. reforzado

d1 mm	inch	d2 h6 mm	l1 mm	l2 mm	l3 mm	d1 mm	inch	d2 h6 mm	l1 mm	l2 mm	l3 mm
11,300		12,000	151,000	94,000	45,000	12,100		14,000	161,000	101,000	45,000
11,400		12,000	151,000	94,000	45,000	12,400		14,000	161,000	101,000	45,000
11,500		12,000	151,000	94,000	45,000	12,500		14,000	161,000	101,000	45,000
11,700		12,000	151,000	94,000	45,000	12,800		14,000	161,000	101,000	45,000
11,800		12,000	151,000	94,000	45,000	13,000		14,000	161,000	101,000	45,000
12,000		12,000	158,000	101,000	45,000						



# HARTNER

## Juegos de brocas helicoidales

Nº artículo 88303



Cajita vacía

d1 mm	ascendente en mm	Cantidad/juego	Código Nº
1,0-5,0	0,1	41	0,111
5,1-10,0	0,1	50	0,112
1,0-10,0	0,5	19	0,113
1,0-13,0	0,5	25	0,114
1,0-5,9	0,1	50	0,115
1,0-10,0	0,5	19	0,213
1,0-13,0	0,5	25	0,214
1,0-5,9	0,1	50	0,215
6,0-10,0	0,1	41	0,216
1,0-10,5	0,5	32	0,219

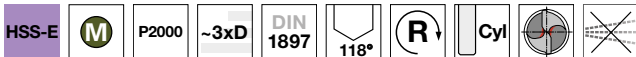


## Juegos de brocas helicoidales

### Nº artículo 88015



P	M	K	N	S	H
•	○	○	○		



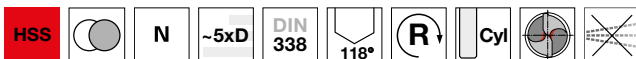
vaciado de punta  $\geq \varnothing 1,000$  • Set en cajita metálica • entrada cónica

d1 mm	ascendente en mm	Cantidad/juego	Código Nº
1,0-5,0	0,1	41	0,011
5,1-10,0	0,1	50	0,012
1,0-13,0	0,5	25	0,014
1,0-10,5	0,5	24	0,018

### Nº artículo 88013



P	M	K	N	S	H
•		•	○		



vaciado de punta  $\geq \varnothing 1,000$  • Set en cajita de plástico • entrada cónica

aceros y fundición de aceros (aleados y sin alear) • fundición gris, fundición maleable, fundición esférica • hierro sinterizado, argentón y grafito

d1 mm	ascendente en mm	Cantidad/juego	Código Nº
1,0-10,0	0,5	19	0,013
1,0-13,0	0,5	25	0,014
1,0-5,9	0,1	50	0,015
6,0-10,0	0,1	41	0,016
1,0-10,5	0,5	32	0,019
1,0-5,0	0,1	41	0,311
1,0-13,0	0,5	25	0,314
1,0-5,9	0,1	50	0,315

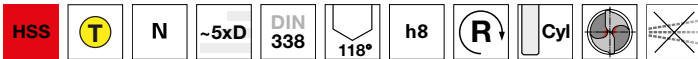


## Juegos de brocas helicoidales

### Nº artículo 88016



P	M	K	N	S	H
•		•	○		



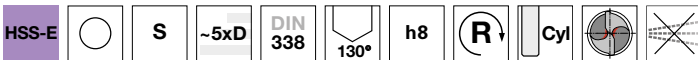
vaciado de punta  $\geq \varnothing 1,000$  • Set en cajita de plástico • entrada cónica • recubrimiento de la punta aceros y fundición de aceros (aleados y sin alea) • fundición gris, fundición maleable, fundición esférica • hierro sinterizado y grafito

d1 mm	ascendente en mm	Cantidad/juego	Código Nº
1,0-13,0	0,5	25	6,014
1,0-5,9	0,1	50	6,015
6,0-10,0	0,1	41	6,016
1,0-10,5	0,5	24	6,018

### Nº artículo 88014



P	M	K	N	S	H
○	•			•	



vaciado de punta  $\geq \varnothing 0,970$  • Set en cajita de plástico • entrada cónica  
titanio y aleaciones de titanio • aceros austeníticos inoxidables y resistentes a los ácidos y al calor • aceros de gran resistencia a partir de 900 N/mm<sup>2</sup> y cifras más elevadas • Hastelloy, Inconel, Nimonic

d1 mm	ascendente en mm	Cantidad/juego	Código Nº
1,0-5,0	0,1	41	8,011
5,1-10,0	0,1	50	8,012
1,0-10,0	0,5	19	8,013
1,0-13,0	0,5	25	8,014
1,0-10,5	0,5	24	8,018

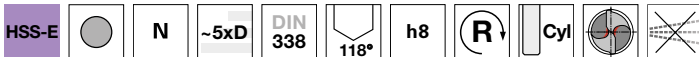


## Juegos de brocas helicoidales

### Nº artículo 88026



P	M	K	N	S	H
•		•	○		



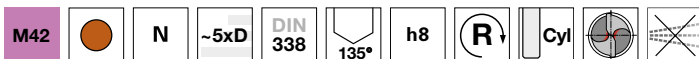
vaciado de punta  $\geq \varnothing 1,000$  • Set en cajita de plástico • entrada cónica  
 aceros y fundición de aceros (aleados y sin alear) • fundición de dureza sup. a 800 N/mm<sup>2</sup> • aceros para trab. en frío y en caliente  
 • aceros para rodamientos • aceros altamente aleados • aceros de cementación, de bonificación

d1 mm	ascendente en mm	Cantidad/juego	Código Nº
1,0-10,0	0,5	19	3,013
1,0-13,0	0,5	25	3,014

### Nº artículo 88018



P	M	K	N	S	H
•	•	•	•	•	○



vaciado de punta  $\geq \varnothing 1,000$  • dotado con brocas en M42 art. nº. 81018

d1 mm	ascendente en mm	Cantidad/juego	Código Nº
1,0-10,0	0,5	19	0,013
1,0-13,0	0,5	25	0,014

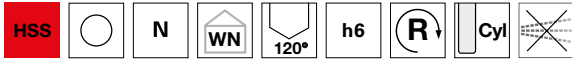


## Brocas de puntear NC

### Nº artículo 81191



P	M	K	N	S	H
•	○	•	•	○	

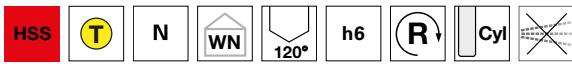


entrada cónica • solo para puntear  
aplicación universal

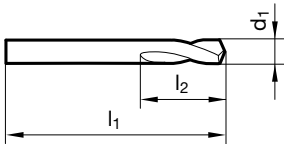
### Nº artículo 84434



P	M	K	N	S	H
•	○	•	•	○	



entrada cónica • solo para puntear  
aplicación universal



d1		l1	l2	d1		l1	l2
mm	inch	mm	mm	mm	inch	mm	mm
3,000		46,000	12,000	12,000		102,000	30,000
4,000		55,000	12,000	14,000		107,000	33,500
5,000		62,000	14,000	15,000		111,000	33,500
6,000		66,000	16,000	16,000		115,000	37,500
8,000		79,000	21,000	20,000		131,000	45,000
10,000		89,000	25,000	25,000	63/64	151,000	53,000

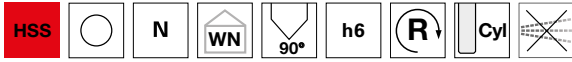


## Brocas de puntear NC

### Nº artículo 81192



P	M	K	N	S	H
•	○	•	•	•	

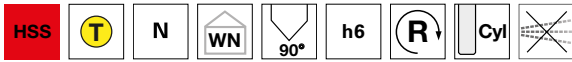


entrada cónica • solo para puntear  
aplicación universal

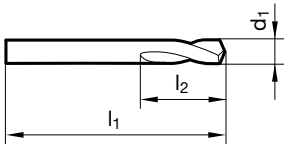
### Nº artículo 84435



P	M	K	N	S	H
•	○	•	•	○	



entrada cónica • solo para puntear  
aplicación universal



d1		l1	l2	d1		l1	l2
mm	inch	mm	mm	mm	inch	mm	mm
3,000		46,000	12,000	12,000		102,000	30,000
4,000		55,000	12,000	14,000		107,000	33,500
5,000		62,000	14,000	16,000		115,000	37,500
6,000		66,000	16,000	20,000		131,000	45,000
8,000		79,000	21,000	25,000	63/64	151,000	53,000
10,000		89,000	25,000				



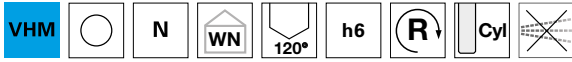


## Brocas de puntear NC

### Nº artículo 89242



<b>P</b>	<b>M</b>	<b>K</b>	<b>N</b>	<b>S</b>	<b>H</b>
○	○	○	○	○	○

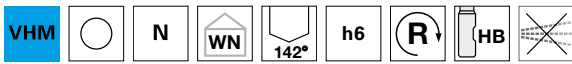


afilado plano • solo para puntear  
**aplicación universal**

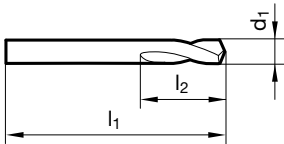
### Nº artículo 89249



<b>P</b>	<b>M</b>	<b>K</b>	<b>N</b>	<b>S</b>	<b>H</b>
○	○	○	○	○	○



afilado plano • solo para puntear  
**aplicación universal**



d1		l1	l2	d1		l1	l2
mm	inch	mm	mm	mm	inch	mm	mm
4,000		55,000	12,000	12,700	1/2	102,000	30,000
5,000		62,000	14,000	16,000		115,000	37,500
6,000		66,000	16,000	20,000		131,000	45,000
8,000		79,000	21,000				
10,000		89,000	25,000				
12,000		102,000	30,000				

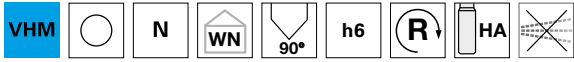


## Brocas de puntear NC

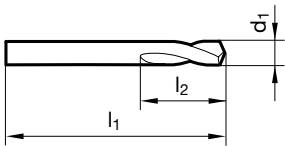
Nº artículo 89243



<b>P</b>	<b>M</b>	<b>K</b>	<b>N</b>	<b>S</b>	<b>H</b>
○	○	○	○	○	○



afilado plano • solo para puntear  
**aplicación universal**



d1 mm	l1 mm	l2 mm	d1 mm	l1 mm	l2 mm
4,000	55,000	12,000	16,000	115,000	37,500
5,000	62,000	14,000	20,000	131,000	45,000
6,000	66,000	16,000			
8,000	79,000	21,000			
10,000	89,000	25,000			
12,000	102,000	30,000			

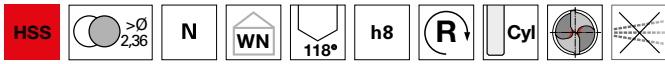


## Brocas para carrocería

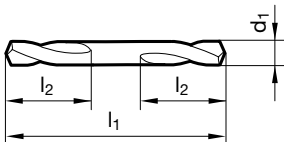
Nº artículo 81190



P	M	K	N	S	H
•	○	•	•	•	



vaciado de punta  $\geq \varnothing 2,000$  • entrada cónica • para uso por los dos lados • en taladradoras de mano para carrocerías  
secciones delgadas



d1 mm	l1 mm	l2 mm	d1 mm	l1 mm	l2 mm
2,000	38,000	7,500	5,100	62,000	17,000
2,100	38,000	7,500	5,200	62,000	17,000
2,400	43,000	9,500	5,300	62,000	17,000
2,500	43,000	9,500	5,400	66,000	19,000
2,600	43,000	9,500	5,500	66,000	19,000
2,700	46,000	10,600	5,700	66,000	19,000
2,800	46,000	10,600	5,900	66,000	19,000
2,900	46,000	10,600	6,000	66,000	19,000
3,000	46,000	10,600	6,300	70,000	21,200
3,100	49,000	11,200	6,500	70,000	21,200
3,200	49,000	11,200	7,500	74,000	23,600
3,300	49,000	11,200	8,000	79,000	25,000
3,400	52,000	12,500	9,000	84,000	25,000
3,500	52,000	12,500	9,500	84,000	25,000
3,800	55,000	14,000	10,000	89,000	25,000
3,900	55,000	14,000			
4,000	55,000	14,000			
4,100	55,000	14,000			
4,200	55,000	14,000			
4,500	58,000	15,500			
4,700	58,000	15,500			
4,800	62,000	17,000			
4,900	62,000	17,000			
5,000	62,000	17,000			

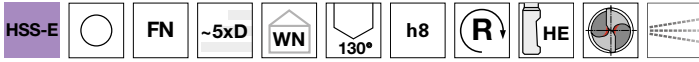


## Brocas con canal de refrigeración

### Nº artículo 82761



P	M	K	N	S	H
•	•	•	•	•	



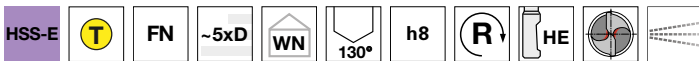
vaciado de punta  $\geq \varnothing 5,000$  • entrada cónica • acero rápido al cobalto

materiales de viruta larga de hasta 1000 N/mm<sup>2</sup> • aceros inoxidables • fundición • metales no ferríticos

### Nº artículo 84461

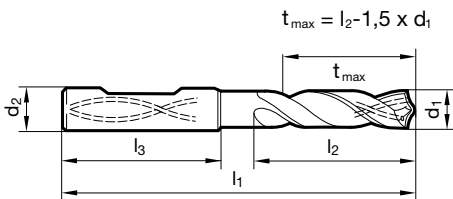


P	M	K	N	S	H
•	•	•	•	•	○



vaciado de punta  $\geq \varnothing 5,000$  • entrada cónica • acero rápido al cobalto • más resistencia al desgaste

materiales de viruta larga de hasta 1000 N/mm<sup>2</sup> • aceros inoxidables • fundición • metales no ferríticos



d1	d2 h6	l1	l2	l3	d1	d2 h6	l1	l2	l3
mm	mm	mm	mm	mm	mm	mm	mm	mm	mm
5,000	6,000	82,000	44,000	36,000	13,000	14,000	124,000	77,000	45,000
5,500	6,000	82,000	44,000	36,000	13,500	14,000	124,000	77,000	45,000
6,000	6,000	82,000	44,000	36,000	14,000	14,000	124,000	77,000	45,000
6,500	8,000	91,000	53,000	36,000	14,500	16,000	133,000	83,000	48,000
7,000	8,000	91,000	53,000	36,000	15,000	16,000	133,000	83,000	48,000
7,500	8,000	91,000	53,000	36,000	15,500	16,000	133,000	83,000	48,000
7,800	8,000	91,000	53,000	36,000	16,000	16,000	133,000	83,000	48,000
8,000	8,000	91,000	53,000	36,000	16,500	18,000	143,000	93,000	48,000
8,500	10,000	103,000	61,000	40,000	17,000	18,000	143,000	93,000	48,000
9,000	10,000	103,000	61,000	40,000	17,500	18,000	143,000	93,000	48,000
9,500	10,000	103,000	61,000	40,000	18,000	18,000	143,000	93,000	48,000
10,000	10,000	103,000	61,000	40,000	18,500	20,000	153,000	101,000	50,000
10,200	12,000	118,000	71,000	45,000	19,000	20,000	153,000	101,000	50,000
10,500	12,000	118,000	71,000	45,000	19,500	20,000	153,000	101,000	50,000
11,000	12,000	118,000	71,000	45,000	20,000	20,000	153,000	101,000	50,000
11,500	12,000	118,000	71,000	45,000					
12,000	12,000	118,000	71,000	45,000					
12,500	14,000	124,000	77,000	45,000					

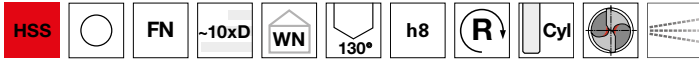


## Brocas con canal de refrigeración

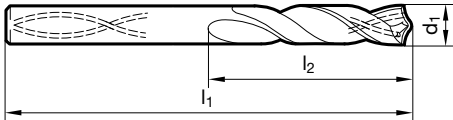
Nº artículo 82710



P	M	K	N	S	H
•	○	•	•	○	



vaciado de punta  $\geq \varnothing 3,000$  • entrada cónica • para taladrar casquillos • ideal para prof. de taladro sup. a 5xD  
 paquetes de chapas • aceros y fundición de aceros, fundición gris • aceros austeníticos hasta aprox. 800 N/mm<sup>2</sup>



d1 mm	d2 h6 mm	l1 mm	l2 mm	l3 mm	d1 mm	d2 h6 mm	l1 mm	l2 mm	l3 mm
3,000	3,000	100,000	66,000	34,000	9,000	9,000	175,000	115,000	60,000
3,300	3,300	106,000	69,000	37,000	9,500	9,500	175,000	115,000	60,000
4,000	4,000	119,000	78,000	41,000	10,000	10,000	184,000	121,000	63,000
5,000	5,000	132,000	87,000	45,000	10,200	10,200	184,000	121,000	63,000
5,500	5,500	139,000	91,000	48,000	10,500	10,500	184,000	121,000	63,000
6,000	6,000	139,000	91,000	48,000	11,000	11,000	195,000	128,000	67,000
6,500	6,500	148,000	97,000	51,000	11,500	11,500	195,000	128,000	67,000
6,800	6,800	156,000	102,000	54,000	12,000	12,000	205,000	134,000	71,000
7,000	7,000	156,000	102,000	54,000	13,000	13,000	205,000	134,000	71,000
7,500	7,500	156,000	102,000	54,000					
8,000	8,000	165,000	109,000	56,000					
8,500	8,500	165,000	109,000	56,000					



## Brocas para casquillos

Nº artículo 81210

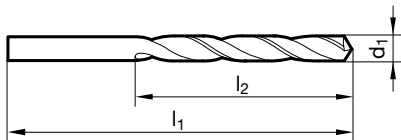


P	M	K	N	S	H
•		•	○		



vaciado de punta  $\geq \varnothing 1,000$  • entrada cónica • para taladrar casquillos • con arrastre según DIN 1809

aceros y fundición de aceros (aleados y sin alea) • fundición gris, fundición maleable, fundición esferica • hierro sinterizado, argentón y grafito



d1	inch	l1	l2	d1	inch	l1	l2
mm		mm	mm	mm		mm	mm
0,800		42,000	22,000	4,900		108,000	74,000
0,950		45,000	24,000	5,000		108,000	74,000
1,000		48,000	26,000	5,100		108,000	74,000
1,200		52,000	30,000	5,200		108,000	74,000
1,250		52,000	30,000	5,300		108,000	74,000
1,350		55,000	33,000	5,350		116,000	80,000
1,400		55,000	33,000	5,400		116,000	80,000
1,450		55,000	33,000	5,500		116,000	80,000
1,500		55,000	33,000	5,550		116,000	80,000
1,700		58,000	35,000	5,600		116,000	80,000
1,800		62,000	38,000	5,700		116,000	80,000
1,900		62,000	38,000	5,750		116,000	80,000
2,000		66,000	41,000	5,800		116,000	80,000
2,300		70,000	44,000	5,900		116,000	80,000
2,350		70,000	44,000	5,950	15/64	116,000	80,000
2,400		74,000	47,000	6,000		116,000	80,000
2,450		74,000	47,000	6,200		124,000	86,000
2,500		74,000	47,000	6,400		124,000	86,000
2,600		74,000	47,000	6,500		124,000	86,000
2,900		79,000	51,000	6,600		124,000	86,000
3,000		79,000	51,000	6,700		124,000	86,000
3,050		84,000	55,000	6,750	17/64	133,000	93,000
3,100		84,000	55,000	6,900		133,000	93,000
3,200		84,000	55,000	7,000		133,000	93,000
3,250		84,000	55,000	7,100		133,000	93,000
3,300		84,000	55,000	7,200		133,000	93,000
3,400		91,000	60,000	7,400		133,000	93,000
3,500		91,000	60,000	7,500		133,000	93,000
3,600		91,000	60,000	7,600		142,000	100,000
3,700		91,000	60,000	7,700		142,000	100,000
3,750		91,000	60,000	7,800		142,000	100,000
3,800		96,000	64,000	8,000		142,000	100,000
3,900		96,000	64,000	8,200		142,000	100,000
4,000		96,000	64,000	8,250		142,000	100,000
4,050		96,000	64,000	8,500		142,000	100,000
4,200		96,000	64,000	8,600		151,000	107,000
4,300		102,000	69,000	8,700		151,000	107,000
4,400		102,000	69,000	8,800		151,000	107,000
4,500		102,000	69,000	9,000		151,000	107,000
4,600		102,000	69,000	9,100		151,000	107,000
4,700		102,000	69,000	9,400		151,000	107,000
4,800		108,000	74,000	9,500		151,000	107,000



## Brocas para casquillos

d1 mm	inch	l1 mm	l2 mm	d1 mm	inch	l1 mm	l2 mm
9,600		162,100	116,000	12,500		184,000	134,000
9,800		162,100	116,000	13,000		184,000	134,000
10,000		162,100	116,000	13,500		194,000	142,000
10,200		162,100	116,000	14,000		194,000	142,000
10,500		162,100	116,000	14,200		202,000	147,000
10,600		162,100	116,000	14,500		202,000	147,000
10,800		173,000	125,000	15,500		211,000	153,000
11,000		173,000	125,000	16,500		218,000	159,000
11,500		173,000	125,000	18,000		226,000	165,000
11,750		173,000	125,000	19,000		234,000	171,000
12,000		184,000	134,000				
12,200		184,000	134,000				

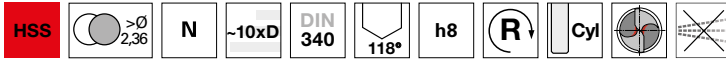


## Brocas espirales cil., largas

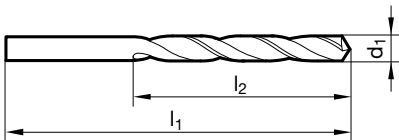
Nº artículo 81310



P	M	K	N	S	H
•		•	○		



vaciado de punta  $\geq \varnothing 1,000$  • entrada cónica • para taladros profundos  
 aceros y fundición de aceros (aleados y sin alea) • fundición gris, fundición maleable, fundición esferica • hierro sinterizado, argentón y grafito



d1	inch	l1	l2	d1	inch	l1	l2
mm		mm	mm	mm		mm	mm
0,400		30,000	10,000	2,900		100,000	66,000
0,500		32,000	12,000	2,950		100,000	66,000
0,600		35,000	15,000	3,000		100,000	66,000
0,700		42,000	21,000	3,050		106,000	69,000
0,750		42,000	21,000	3,100		106,000	69,000
0,800		46,000	25,000	3,150		106,000	69,000
0,850		46,000	25,000	3,200		106,000	69,000
0,900		51,000	29,000	3,250		106,000	69,000
0,910		51,000	29,000	3,300		106,000	69,000
0,950		51,000	29,000	3,350		106,000	69,000
1,000		56,000	33,000	3,400		112,000	73,000
1,050		56,000	33,000	3,450		112,000	73,000
1,100		60,000	37,000	3,500		112,000	73,000
1,200		65,000	41,000	3,550		112,000	73,000
1,250		65,000	41,000	3,600		112,000	73,000
1,300		65,000	41,000	3,650		112,000	73,000
1,350		70,000	45,000	3,700		112,000	73,000
1,400		70,000	45,000	3,750		112,000	73,000
1,500		70,000	45,000	3,800		119,000	78,000
1,550		76,000	50,000	3,900		119,000	78,000
1,600		76,000	50,000	3,950		119,000	78,000
1,700		76,000	50,000	4,000		119,000	78,000
1,750		80,000	53,000	4,040		119,000	78,000
1,800		80,000	53,000	4,050		119,000	78,000
1,850		80,000	53,000	4,100		119,000	78,000
1,900		80,000	53,000	4,150		119,000	78,000
1,950		85,000	56,000	4,200		119,000	78,000
2,000		85,000	56,000	4,250		119,000	78,000
2,050		85,000	56,000	4,300		126,000	82,000
2,100		85,000	56,000	4,400		126,000	82,000
2,150		90,000	59,000	4,450		126,000	82,000
2,200		90,000	59,000	4,500		126,000	82,000
2,250		90,000	59,000	4,550		126,000	82,000
2,400		95,000	62,000	4,600		126,000	82,000
2,450		95,000	62,000	4,650		126,000	82,000
2,500		95,000	62,000	4,700		126,000	82,000
2,550		95,000	62,000	4,750		126,000	82,000
2,600		95,000	62,000	4,760	3/16	132,000	87,000
2,700		100,000	66,000	4,800		132,000	87,000
2,750		100,000	66,000	4,850		132,000	87,000
2,800		100,000	66,000	4,900		132,000	87,000
2,850		100,000	66,000	4,950		132,000	87,000





## Brocas espirales cil., largas

d1 mm	inch	l1 mm	l2 mm	d1 mm	inch	l1 mm	l2 mm
5,000		132,000	87,000	9,700		184,000	121,000
5,050		132,000	87,000	9,750		184,000	121,000
5,100		132,000	87,000	9,800		184,000	121,000
5,150		132,000	87,000	9,900		184,000	121,000
5,200		132,000	87,000	9,920	25/64	184,000	121,000
5,250		132,000	87,000	10,000		184,000	121,000
5,300		132,000	87,000	10,100		184,000	121,000
5,350		139,000	91,000	10,200		184,000	121,000
5,400		139,000	91,000	10,250		184,000	121,000
5,450		139,000	91,000	10,500		184,000	121,000
5,500		139,000	91,000	10,700		195,000	128,000
5,600		139,000	91,000	10,720	27/64	195,000	128,000
5,700		139,000	91,000	10,750		195,000	128,000
5,750		139,000	91,000	11,000		195,000	128,000
5,800		139,000	91,000	11,200		195,000	128,000
5,850		139,000	91,000	11,250		195,000	128,000
5,900		139,000	91,000	11,300		195,000	128,000
5,950	15/64	139,000	91,000	11,500		195,000	128,000
6,000		139,000	91,000	11,700		195,000	128,000
6,100		148,000	97,000	11,750		195,000	128,000
6,150		148,000	97,000	11,800		195,000	128,000
6,200		148,000	97,000	12,000		205,000	134,000
6,250		148,000	97,000	12,100		205,000	134,000
6,300		148,000	97,000	12,200		205,000	134,000
6,350	1/4	148,000	97,000	12,300	31/64	205,000	134,000
6,400		148,000	97,000	12,500		205,000	134,000
6,500		148,000	97,000	12,700	1/2	205,000	134,000
6,600		148,000	97,000	12,800		205,000	134,000
6,700		148,000	97,000	13,000		205,000	134,000
6,750	17/64	156,000	102,000	13,490	17/32	214,000	140,000
6,800		156,000	102,000	13,500		214,000	140,000
6,900		156,000	102,000	14,000		214,000	140,000
7,000		156,000	102,000	14,200		220,000	144,000
7,100		156,000	102,000	14,250		220,000	144,000
7,200		156,000	102,000	14,500		220,000	144,000
7,250		156,000	102,000	14,800		220,000	144,000
7,300		156,000	102,000	14,900		220,000	144,000
7,400		156,000	102,000	15,000		220,000	144,000
7,500		156,000	102,000	15,100		227,000	149,000
7,700		165,000	109,000	15,200		227,000	149,000
7,800		165,000	109,000	15,250		227,000	149,000
7,900		165,000	109,000	15,500		227,000	149,000
7,940	5/16	165,000	109,000	15,600		227,000	149,000
8,000		165,000	109,000	16,000		227,000	149,000
8,100		165,000	109,000	16,500		235,000	154,000
8,200		165,000	109,000	17,000		235,000	154,000
8,250		165,000	109,000	17,500		241,000	158,000
8,300		165,000	109,000	18,000		241,000	158,000
8,400		165,000	109,000	18,500		247,000	162,000
8,500		165,000	109,000	19,000		247,000	162,000
8,600		175,000	115,000	20,000		254,000	166,000
8,700		175,000	115,000	21,000		261,000	171,000
8,800		175,000	115,000	22,000		268,000	176,000
8,900		175,000	115,000				
9,000		175,000	115,000				
9,200		175,000	115,000				
9,300		175,000	115,000				
9,400		175,000	115,000				
9,500		175,000	115,000				
9,600		184,000	121,000				

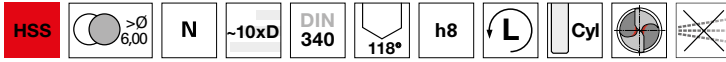


## Brocas espirales cil., largas

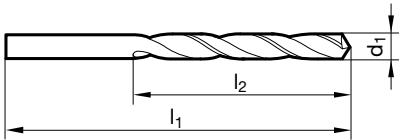
Nº artículo 81315



P	M	K	N	S	H
•		•	○		



vaciado de punta  $\geq \varnothing 15,000$  • entrada cónica • para taladros profundos • para taladrar casquillos  
 aceros y fundición de aceros (aleados y sin alea) • fundición gris, fundición maleable, fundición esferica • hierro sinterizado, argentón y grafito



d1 mm	l1 mm	l2 mm	d1 mm	l1 mm	l2 mm
0,900	51,000	29,000	7,900	165,000	109,000
1,200	65,000	41,000	8,000	165,000	109,000
1,250	65,000	41,000	8,500	165,000	109,000
1,500	70,000	45,000	9,000	175,000	115,000
1,550	76,000	50,000	10,000	184,000	121,000
2,800	100,000	66,000	11,000	195,000	128,000
2,900	100,000	66,000	12,000	205,000	134,000
3,000	100,000	66,000			
3,800	119,000	78,000			
4,000	119,000	78,000			
4,200	119,000	78,000			
4,500	126,000	82,000			
5,000	132,000	87,000			
5,700	139,000	91,000			
5,800	139,000	91,000			
6,000	139,000	91,000			
6,500	148,000	97,000			
7,500	156,000	102,000			



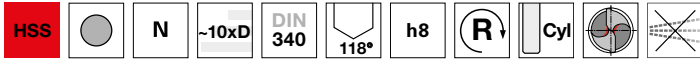
# HARTNER

## Brocas espirales cil., largas

Nº artículo 81317

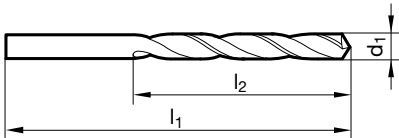


P	M	K	N	S	H
•		•	○		



vaciado de punta  $\geq \varnothing 3,100$  • entrada cónica • con arrastre

aceros y fundición de aceros (aleados y sin alea) • fundición gris, fundición maleable, fundición esferica • hierro sinterizado, argentón y grafito



d1 mm	l1 mm	l2 mm	d1 mm	l1 mm	l2 mm
3,100	106,000	69,000	6,600	148,000	97,000
3,400	112,000	73,000	7,000	156,000	102,000
3,600	112,000	73,000	7,300	156,000	102,000
3,700	112,000	73,000	7,400	156,000	102,000
4,000	119,000	78,000	7,500	156,000	102,000
4,300	126,000	82,000	7,900	165,000	109,000
4,500	126,000	82,000	8,000	165,000	109,000
4,900	132,000	87,000	8,250	165,000	109,000
5,000	132,000	87,000	8,400	165,000	109,000
5,500	139,000	91,000	8,700	175,000	115,000
5,700	139,000	91,000	10,000	184,000	121,000
6,100	148,000	97,000	12,200	205,000	134,000



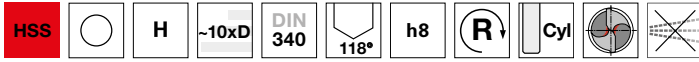
# HARTNER

## Brocas espirales cil., largas

Nº artículo 81320

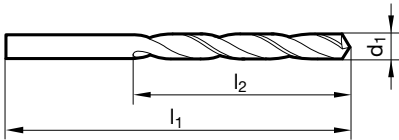


P	M	K	N	S	H
			•		



vaciado de punta  $\geq \varnothing 14,500$  • entrada cónica • para taladros profundos

materiales duros y quebradizos • latón, aleaciones de magnesio • bronce y bronce al fósforo • pizarra, mica, Pertinax



d1 mm	l1 mm	l2 mm	d1 mm	l1 mm	l2 mm
0,500	32,000	12,000	4,000	119,000	78,000
0,600	35,000	15,000	4,100	119,000	78,000
0,700	42,000	21,000	4,200	119,000	78,000
0,750	42,000	21,000	4,400	126,000	82,000
0,800	46,000	25,000	4,500	126,000	82,000
0,900	51,000	29,000	4,700	126,000	82,000
1,000	56,000	33,000	4,900	132,000	87,000
1,050	56,000	33,000	5,000	132,000	87,000
1,100	60,000	37,000	5,200	132,000	87,000
1,150	60,000	37,000	5,300	132,000	87,000
1,200	65,000	41,000	5,400	139,000	91,000
1,300	65,000	41,000	5,500	139,000	91,000
1,400	70,000	45,000	5,700	139,000	91,000
1,450	70,000	45,000	5,800	139,000	91,000
1,500	70,000	45,000	5,900	139,000	91,000
1,600	76,000	50,000	6,000	139,000	91,000
1,700	76,000	50,000	6,300	148,000	97,000
1,800	80,000	53,000	6,500	148,000	97,000
1,850	80,000	53,000	6,600	148,000	97,000
1,900	80,000	53,000	6,700	148,000	97,000
2,000	85,000	56,000	6,800	156,000	102,000
2,200	90,000	59,000	7,000	156,000	102,000
2,300	90,000	59,000	7,500	156,000	102,000
2,500	95,000	62,000	8,000	165,000	109,000
2,600	95,000	62,000	8,250	165,000	109,000
2,700	100,000	66,000	9,000	175,000	115,000
2,900	100,000	66,000	9,250	175,000	115,000
3,000	100,000	66,000	10,000	184,000	121,000
3,100	106,000	69,000	14,000	214,000	140,000
3,200	106,000	69,000	14,500	220,000	144,000
3,250	106,000	69,000			
3,300	106,000	69,000			
3,400	112,000	73,000			
3,500	112,000	73,000			
3,600	112,000	73,000			
3,900	119,000	78,000			



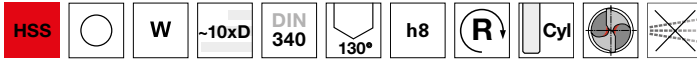
# HARTNER

## Brocas espirales cil., largas

Nº artículo 81330

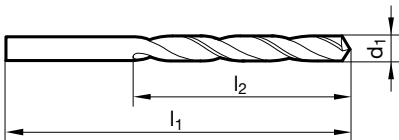


P	M	K	N	S	H
			•		



vaciado de punta  $\geq \varnothing 14,250$  • entrada cónica • para taladros profundos

mat. blandos y de viruta larga • aluminio, alea. de alum. (de vir. larga) • zink, cobre fino, siluminio, electrón • plásticos (blandos), madera



d1	inch	l1	l2	d1	inch	l1	l2
mm		mm	mm	mm		mm	mm
0,500		32,000	12,000	3,750		112,000	73,000
0,600		35,000	15,000	3,800		119,000	78,000
0,700		42,000	21,000	3,900		119,000	78,000
0,800		46,000	25,000	4,000		119,000	78,000
0,850		46,000	25,000	4,100		119,000	78,000
0,900		51,000	29,000	4,200		119,000	78,000
0,950		51,000	29,000	4,250		119,000	78,000
1,000		56,000	33,000	4,300		126,000	82,000
1,050		56,000	33,000	4,500		126,000	82,000
1,200		65,000	41,000	4,600		126,000	82,000
1,250		65,000	41,000	4,700		126,000	82,000
1,300		65,000	41,000	4,900		132,000	87,000
1,350		70,000	45,000	5,000		132,000	87,000
1,400		70,000	45,000	5,100		132,000	87,000
1,500		70,000	45,000	5,250		132,000	87,000
1,600		76,000	50,000	5,300		132,000	87,000
1,780		80,000	53,000	5,400		139,000	91,000
1,800		80,000	53,000	5,500		139,000	91,000
1,850		80,000	53,000	5,700		139,000	91,000
1,900		80,000	53,000	5,800		139,000	91,000
2,000		85,000	56,000	6,000		139,000	91,000
2,100		85,000	56,000	6,100		148,000	97,000
2,150		90,000	59,000	6,200		148,000	97,000
2,200		90,000	59,000	6,300		148,000	97,000
2,250		90,000	59,000	6,400		148,000	97,000
2,500		95,000	62,000	6,500		148,000	97,000
2,550		95,000	62,000	6,600		148,000	97,000
2,700		100,000	66,000	6,700		148,000	97,000
2,850		100,000	66,000	6,750	17/64	156,000	102,000
2,900		100,000	66,000	6,800		156,000	102,000
3,000		100,000	66,000	6,900		156,000	102,000
3,050		106,000	69,000	7,000		156,000	102,000
3,200		106,000	69,000	7,100		156,000	102,000
3,250		106,000	69,000	7,200		156,000	102,000
3,300		106,000	69,000	7,300		156,000	102,000
3,350		106,000	69,000	7,400		156,000	102,000
3,400		112,000	73,000	7,500		156,000	102,000
3,450		112,000	73,000	7,600		165,000	109,000
3,500		112,000	73,000	7,700		165,000	109,000
3,600		112,000	73,000	7,750		165,000	109,000
3,650		112,000	73,000	7,800		165,000	109,000
3,700		112,000	73,000	7,900		165,000	109,000



## Brocas espirales cil., largas

d1 mm	inch	l1 mm	l2 mm	d1 mm	inch	l1 mm	l2 mm
8,000		165,000	109,000	9,750		184,000	121,000
8,100		165,000	109,000	10,200		184,000	121,000
8,200		165,000	109,000	10,500		184,000	121,000
8,300		165,000	109,000	11,000		195,000	128,000
8,400		165,000	109,000	11,300		195,000	128,000
8,500		165,000	109,000	11,500		195,000	128,000
8,600		175,000	115,000	12,000		205,000	134,000
8,800		175,000	115,000	13,000		205,000	134,000
9,000		175,000	115,000	13,500		214,000	140,000
9,100		175,000	115,000	14,500		220,000	144,000
9,200		175,000	115,000	17,000		235,000	154,000
9,300		175,000	115,000				



## Brocas espirales cil., largas

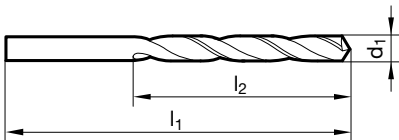
Nº artículo 81340



P	M	K	N	S	H
•		•	•		



vaciado de punta  $\geq \varnothing 1,000$  • entrada cónica • ranuras amplias • con desalajo de viruta difícil  
 fundición gris y aceros hasta máx. 1000 N/mm<sup>2</sup> • Excepción: aceros CrNi, aceros VA y materiales similares



d1		l1	l2	d1		l1	l2
mm	inch	mm	mm	mm	inch	mm	mm
0,900		51,000	29,000	4,750		126,000	82,000
1,000		56,000	33,000	4,800		132,000	87,000
1,100		60,000	37,000	5,000		132,000	87,000
1,200		65,000	41,000	5,100		132,000	87,000
1,300		65,000	41,000	5,200		132,000	87,000
1,400		70,000	45,000	5,400		139,000	91,000
1,500		70,000	45,000	5,500		139,000	91,000
1,600		76,000	50,000	5,900		139,000	91,000
1,700		76,000	50,000	6,000		139,000	91,000
1,800		80,000	53,000	6,100		148,000	97,000
1,900		80,000	53,000	6,200		148,000	97,000
2,000		85,000	56,000	6,300		148,000	97,000
2,100		85,000	56,000	6,500		148,000	97,000
2,200		90,000	59,000	6,600		148,000	97,000
2,300		90,000	59,000	6,800		156,000	102,000
2,400		95,000	62,000	6,900		156,000	102,000
2,500		95,000	62,000	7,000		156,000	102,000
2,600		95,000	62,000	7,100		156,000	102,000
2,700		100,000	66,000	7,300		156,000	102,000
2,800		100,000	66,000	7,500		156,000	102,000
2,900		100,000	66,000	7,600		165,000	109,000
3,000		100,000	66,000	7,800		165,000	109,000
3,100		106,000	69,000	8,000		165,000	109,000
3,170	1/8	106,000	69,000	8,400		165,000	109,000
3,200		106,000	69,000	8,500		165,000	109,000
3,250		106,000	69,000	8,600		175,000	115,000
3,300		106,000	69,000	8,700		175,000	115,000
3,400		112,000	73,000	8,800		175,000	115,000
3,500		112,000	73,000	9,000		175,000	115,000
3,600		112,000	73,000	9,100		175,000	115,000
3,700		112,000	73,000	9,200		175,000	115,000
3,750		112,000	73,000	9,400		175,000	115,000
3,800		119,000	78,000	9,500		175,000	115,000
3,900		119,000	78,000	9,800		184,000	121,000
4,000		119,000	78,000	9,900		184,000	121,000
4,100		119,000	78,000	10,000		184,000	121,000
4,200		119,000	78,000	10,300		184,000	121,000
4,250		119,000	78,000	10,500		184,000	121,000
4,300		126,000	82,000	10,800		195,000	128,000
4,400		126,000	82,000	11,000		195,000	128,000
4,500		126,000	82,000	11,200		195,000	128,000
4,700		126,000	82,000	11,250		195,000	128,000



## Brocas espirales cil., largas

d1 mm	inch	l1 mm	l2 mm	d1 mm	inch	l1 mm	l2 mm
11,500		195,000	128,000	14,000		214,000	140,000
11,800		195,000	128,000				
12,000		205,000	134,000				
12,500		205,000	134,000				
12,800		205,000	134,000				
13,000		205,000	134,000				



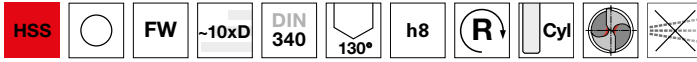


## Brocas espirales cil., largas

Nº artículo 81350

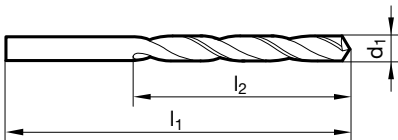


P	M	K	N	S	H
○			●		



vaciado de punta  $\geq \varnothing 2,400$  • entrada cónica • ranura muy grande

mat. blandos y de viruta larga • hasta 500 N/mm<sup>2</sup> • aceros blandos para automáticos • aluminio, alea. de alum. (de vir. larga) • zink, cobre fino, siluminio, electrón • zamak, argalio, plásticos (blandos) y madera



d1	inch	l1	l2	d1	inch	l1	l2
mm		mm	mm	mm		mm	mm
1,000		56,000	33,000	6,600		148,000	97,000
1,100		60,000	37,000	6,700		148,000	97,000
1,500		70,000	45,000	6,900		156,000	102,000
2,000		85,000	56,000	7,000		156,000	102,000
2,100		85,000	56,000	7,100		156,000	102,000
2,200		90,000	59,000	7,200		156,000	102,000
2,400		95,000	62,000	7,500		156,000	102,000
2,500		95,000	62,000	7,600		165,000	109,000
2,700		100,000	66,000	7,700		165,000	109,000
2,800		100,000	66,000	7,800		165,000	109,000
2,900		100,000	66,000	7,900		165,000	109,000
3,000		100,000	66,000	8,000		165,000	109,000
3,100		106,000	69,000	8,100		165,000	109,000
3,200		106,000	69,000	8,300		165,000	109,000
3,250		106,000	69,000	8,400		165,000	109,000
3,300		106,000	69,000	8,500		165,000	109,000
3,400		112,000	73,000	8,600		175,000	115,000
3,500		112,000	73,000	8,800		175,000	115,000
3,600		112,000	73,000	8,900		175,000	115,000
3,700		112,000	73,000	9,000		175,000	115,000
3,800		119,000	78,000	9,100		175,000	115,000
3,900		119,000	78,000	9,200		175,000	115,000
4,000		119,000	78,000	9,300		175,000	115,000
4,100		119,000	78,000	9,400		175,000	115,000
4,200		119,000	78,000	9,600		184,000	121,000
4,400		126,000	82,000	9,700		184,000	121,000
4,500		126,000	82,000	9,800		184,000	121,000
4,700		126,000	82,000	10,000		184,000	121,000
4,800		132,000	87,000	10,100		184,000	121,000
4,900		132,000	87,000	10,500		184,000	121,000
5,000		132,000	87,000	10,700		195,000	128,000
5,400		139,000	91,000	10,800		195,000	128,000
5,500		139,000	91,000	11,200		195,000	128,000
5,600		139,000	91,000	11,500		195,000	128,000
5,700		139,000	91,000	11,600		195,000	128,000
5,800		139,000	91,000	11,800		195,000	128,000
5,900		139,000	91,000	12,000		205,000	134,000
6,000		139,000	91,000	12,200		205,000	134,000
6,100		148,000	97,000	12,300	31/64	205,000	134,000
6,200		148,000	97,000	12,400		205,000	134,000
6,300		148,000	97,000	12,500		205,000	134,000
6,500		148,000	97,000	12,800		205,000	134,000



## Brocas espirales cil., largas

d1 mm	inch	l1 mm	l2 mm	d1 mm	inch	l1 mm	l2 mm
13,000		205,000	134,000				
13,500		214,000	140,000				
14,000		214,000	140,000				

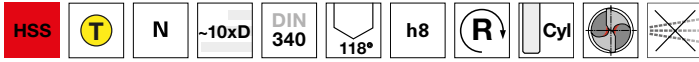


## Brocas espirales cil., largas

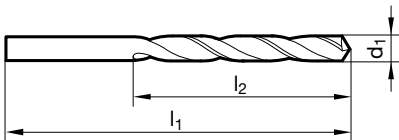
N° artículo 84418



P	M	K	N	S	H
•		•	○		



vaciado de punta  $\geq \varnothing 1,000$  • entrada cónica • para taladros profundos • para taladrar casquillos  
 aceros y fundición de aceros (aleados y sin alea) • fundición gris, fundición maleable, fundición esferica • hierro sinterizado, argentón y grafito



d1	inch	l1	l2	d1	inch	l1	l2
mm		mm	mm	mm		mm	mm
0,500		32,000	12,000	6,800		156,000	102,000
0,700		42,000	21,000	6,900		156,000	102,000
1,000		56,000	33,000	7,000		156,000	102,000
1,200		65,000	41,000	7,200		156,000	102,000
1,500		70,000	45,000	7,300		156,000	102,000
1,600		76,000	50,000	7,500		156,000	102,000
1,700		76,000	50,000	7,600		165,000	109,000
1,900		80,000	53,000	7,700		165,000	109,000
2,000		85,000	56,000	7,800		165,000	109,000
2,200		90,000	59,000	7,900		165,000	109,000
2,400		95,000	62,000	8,000		165,000	109,000
2,500		95,000	62,000	8,100		165,000	109,000
2,700		100,000	66,000	8,200		165,000	109,000
2,800		100,000	66,000	8,500		165,000	109,000
2,900		100,000	66,000	8,700		175,000	115,000
3,000		100,000	66,000	8,800		175,000	115,000
3,100		106,000	69,000	8,900		175,000	115,000
3,300		106,000	69,000	9,000		175,000	115,000
3,400		112,000	73,000	9,400		175,000	115,000
3,500		112,000	73,000	9,800		184,000	121,000
3,800		119,000	78,000	9,900		184,000	121,000
3,900		119,000	78,000	10,000		184,000	121,000
4,000		119,000	78,000	10,200		184,000	121,000
4,100		119,000	78,000	10,800		195,000	128,000
4,200		119,000	78,000	11,000		195,000	128,000
4,300		126,000	82,000	11,500		195,000	128,000
4,500		126,000	82,000	12,000		205,000	134,000
4,600		126,000	82,000	12,500		205,000	134,000
4,800		132,000	87,000	12,700	1/2	205,000	134,000
4,900		132,000	87,000	13,000		205,000	134,000
5,000		132,000	87,000	14,000		214,000	140,000
5,300		132,000	87,000	14,500		220,000	144,000
5,500		139,000	91,000	14,800		220,000	144,000
5,700		139,000	91,000	15,000		220,000	144,000
5,800		139,000	91,000	16,000		227,000	149,000
5,900		139,000	91,000				
6,000		139,000	91,000				
6,100		148,000	97,000				
6,200		148,000	97,000				
6,400		148,000	97,000				
6,500		148,000	97,000				
6,600		148,000	97,000				

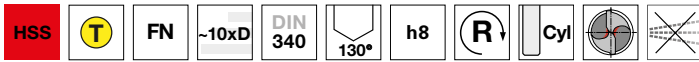


## Brocas espirales cil., largas

### Nº artículo 84423



P	M	K	N	S	H
•		•	•		

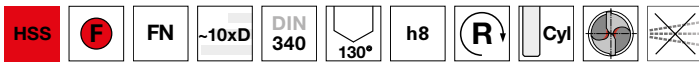


vaciado de punta  $\geq \varnothing 1,000$  • entrada cónica • ranuras amplias • con desalajo de viruta difícil  
fundición gris y aceros hasta máx. 1000 N/mm<sup>2</sup> • Excepción: aceros CrNi, aceros VA y materiales similares

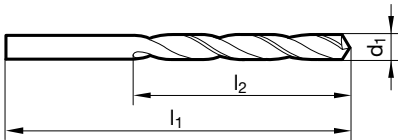
### Nº artículo 84506



P	M	K	N	S	H
•		•	•		



vaciado de punta  $\geq \varnothing 1,000$  • entrada cónica • ranuras amplias • con desalajo de viruta difícil  
fundición gris y aceros hasta máx. 1000 N/mm<sup>2</sup> • Excepción: aceros CrNi, aceros VA y materiales similares



d1 mm	l1 mm	l2 mm	d1 mm	l1 mm	l2 mm
1,000	56,000	33,000	5,200	132,000	87,000
1,100	60,000	37,000	5,400	139,000	91,000
1,500	70,000	45,000	5,500	139,000	91,000
1,600	76,000	50,000	5,800	139,000	91,000
1,700	76,000	50,000	5,900	139,000	91,000
1,800	80,000	53,000	6,000	139,000	91,000
1,900	80,000	53,000	6,100	148,000	97,000
2,000	85,000	56,000	6,200	148,000	97,000
2,100	85,000	56,000	6,300	148,000	97,000
2,300	90,000	59,000	6,500	148,000	97,000
2,400	95,000	62,000	6,800	156,000	102,000
2,500	95,000	62,000	6,900	156,000	102,000
2,600	95,000	62,000	7,000	156,000	102,000
2,700	100,000	66,000	7,200	156,000	102,000
2,800	100,000	66,000	7,300	156,000	102,000
2,900	100,000	66,000	7,400	156,000	102,000
3,000	100,000	66,000	7,600	165,000	109,000
3,100	106,000	69,000	7,900	165,000	109,000
3,200	106,000	69,000	8,000	165,000	109,000
3,300	106,000	69,000	8,100	165,000	109,000
3,400	112,000	73,000	8,200	165,000	109,000
3,500	112,000	73,000	8,500	165,000	109,000
3,800	119,000	78,000	8,700	175,000	115,000
4,000	119,000	78,000	9,000	175,000	115,000
4,200	119,000	78,000	9,800	184,000	121,000
4,500	126,000	82,000	10,000	184,000	121,000
4,600	126,000	82,000	11,000	195,000	128,000
4,800	132,000	87,000	11,500	195,000	128,000
4,900	132,000	87,000	12,000	205,000	134,000
5,000	132,000	87,000	12,700	205,000	134,000



## Brocas espirales cil., largas

d1 mm	l1 mm	l2 mm	d1 mm	l1 mm	l2 mm
14,000	214,000	140,000			

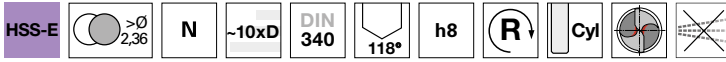


## Brocas espirales cil., largas

Nº artículo 81311

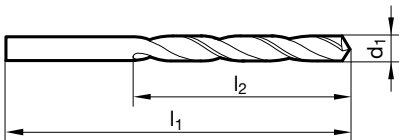


P	M	K	N	S	H
•	○	•	•	○	



vaciado de punta  $\geq \varnothing 1,000$  • entrada cónica • acero rápido al cobalto • más resistencia al desgaste

aceros aleados y no aleados y fundición de dureza sup. a 800 N/mm<sup>2</sup> • aceros para trab. en frío y en caliente • aceros para rodamientos  
• aceros altamente aleados • aceros de cementación, de bonificación



d1 mm	l1 mm	l2 mm	d1 mm	l1 mm	l2 mm
0,500	32,000	12,000	6,000	139,000	91,000
0,600	35,000	15,000	6,300	148,000	97,000
0,700	42,000	21,000	6,400	148,000	97,000
0,800	46,000	25,000	6,500	148,000	97,000
0,900	51,000	29,000	6,600	148,000	97,000
1,000	56,000	33,000	6,900	156,000	102,000
1,100	60,000	37,000	7,200	156,000	102,000
1,200	65,000	41,000	7,300	156,000	102,000
1,400	70,000	45,000	7,600	165,000	109,000
1,500	70,000	45,000	7,800	165,000	109,000
1,900	80,000	53,000	7,900	165,000	109,000
2,000	85,000	56,000	8,000	165,000	109,000
2,200	90,000	59,000	8,400	165,000	109,000
3,000	100,000	66,000	8,700	175,000	115,000
3,100	106,000	69,000	8,800	175,000	115,000
3,200	106,000	69,000	8,900	175,000	115,000
3,300	106,000	69,000	9,000	175,000	115,000
3,400	112,000	73,000	9,100	175,000	115,000
3,500	112,000	73,000	9,300	175,000	115,000
3,900	119,000	78,000	9,400	175,000	115,000
4,000	119,000	78,000	9,500	175,000	115,000
4,100	119,000	78,000	9,600	184,000	121,000
4,200	119,000	78,000	9,800	184,000	121,000
4,300	126,000	82,000	9,900	184,000	121,000
4,400	126,000	82,000	10,000	184,000	121,000
4,500	126,000	82,000	10,500	184,000	121,000
4,600	126,000	82,000	10,800	195,000	128,000
4,700	126,000	82,000	11,000	195,000	128,000
4,800	132,000	87,000	11,200	195,000	128,000
4,900	132,000	87,000	12,000	205,000	134,000
5,000	132,000	87,000	12,500	205,000	134,000
5,300	132,000	87,000			
5,500	139,000	91,000			
5,600	139,000	91,000			
5,700	139,000	91,000			
5,900	139,000	91,000			

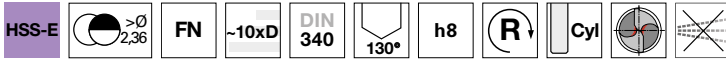


## Brocas espirales cil., largas

Nº artículo 81341

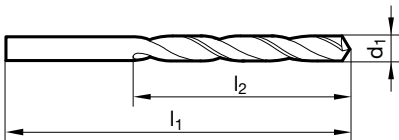


P	M	K	N	S	H
•	•	•	•		○



vaciado de punta  $\geq \varnothing 1,100$  • entrada cónica • acero rápido al cobalto • ranuras amplias • más resistencia al desgaste • con desalajo de viruta difícil

aceros aleados y no aleados y fundición de dureza sup. a 800 N/mm<sup>2</sup> • aceros para trab. en frío y en caliente • aceros para rodamientos • aceros altamente aleados • aceros de cementación, de bonificación



d1	inch	l1	l2	d1	inch	l1	l2
mm		mm	mm	mm		mm	mm
1,000		56,000	33,000	5,200		132,000	87,000
1,200		65,000	41,000	5,300		132,000	87,000
1,250		65,000	41,000	5,400		139,000	91,000
1,300		65,000	41,000	5,500		139,000	91,000
1,400		70,000	45,000	5,600		139,000	91,000
1,500		70,000	45,000	5,700		139,000	91,000
1,600		76,000	50,000	5,800		139,000	91,000
1,700		76,000	50,000	5,900		139,000	91,000
1,800		80,000	53,000	6,000		139,000	91,000
1,900		80,000	53,000	6,100		148,000	97,000
2,000		85,000	56,000	6,150		148,000	97,000
2,100		85,000	56,000	6,200		148,000	97,000
2,200		90,000	59,000	6,250		148,000	97,000
2,400		95,000	62,000	6,300		148,000	97,000
2,440		95,000	62,000	6,350	1/4	148,000	97,000
2,500		95,000	62,000	6,400		148,000	97,000
2,600		95,000	62,000	6,500		148,000	97,000
2,700		100,000	66,000	6,600		148,000	97,000
2,800		100,000	66,000	6,700		148,000	97,000
2,900		100,000	66,000	6,800		156,000	102,000
3,000		100,000	66,000	6,900		156,000	102,000
3,050		106,000	69,000	7,000		156,000	102,000
3,100		106,000	69,000	7,200		156,000	102,000
3,200		106,000	69,000	7,300		156,000	102,000
3,300		106,000	69,000	7,400		156,000	102,000
3,400		112,000	73,000	7,500		156,000	102,000
3,500		112,000	73,000	7,600		165,000	109,000
3,700		112,000	73,000	7,700		165,000	109,000
3,800		119,000	78,000	7,800		165,000	109,000
3,900		119,000	78,000	7,900		165,000	109,000
4,000		119,000	78,000	8,000		165,000	109,000
4,050		119,000	78,000	8,100		165,000	109,000
4,100		119,000	78,000	8,200		165,000	109,000
4,200		119,000	78,000	8,300		165,000	109,000
4,300		126,000	82,000	8,400		165,000	109,000
4,400		126,000	82,000	8,500		165,000	109,000
4,500		126,000	82,000	8,600		175,000	115,000
4,700		126,000	82,000	8,700		175,000	115,000
4,800		132,000	87,000	8,800		175,000	115,000
4,900		132,000	87,000	8,900		175,000	115,000
5,000		132,000	87,000	9,000		175,000	115,000
5,100		132,000	87,000	9,100		175,000	115,000



## Brocas espirales cil., largas

d1 mm	inch	l1 mm	l2 mm	d1 mm	inch	l1 mm	l2 mm
9,200		175,000	115,000	11,000		195,000	128,000
9,300		175,000	115,000	11,500		195,000	128,000
9,500		175,000	115,000	11,800		195,000	128,000
9,600		184,000	121,000	11,910	15/32	205,000	134,000
9,700		184,000	121,000	12,000		205,000	134,000
9,800		184,000	121,000	12,500		205,000	134,000
9,900		184,000	121,000	12,700	1/2	205,000	134,000
10,000		184,000	121,000	13,000		205,000	134,000
10,200		184,000	121,000	16,000		227,000	149,000
10,500		184,000	121,000				
10,800		195,000	128,000				
10,900		195,000	128,000				



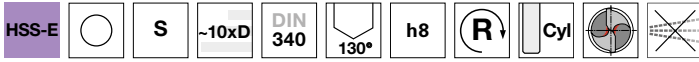


## Brocas espirales cil., largas

### Nº artículo 81361



P	M	K	N	S	H
○	●			●	



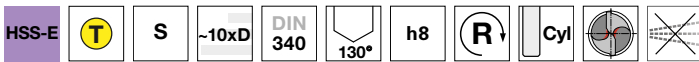
vaciado de punta  $\geq \varnothing 1,400$  • entrada cónica • acero rápido al cobalto • más resistencia al desgaste

titanio y aleaciones de titanio • aceros austeníticos inoxidables y resistentes a los ácidos y al calor • aceros de gran resistencia a partir de 900 N/mm<sup>2</sup> y cifras más elevadas • aceros para rodamientos • Hastelloy, Inconel, Nimonic

### Nº artículo 81362

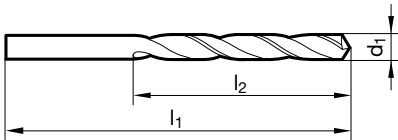


P	M	K	N	S	H
○	●			●	



vaciado de punta  $\geq \varnothing 1,000$  • entrada cónica • acero rápido al cobalto • más resistencia al desgaste

titanio y aleaciones de titanio • aceros austeníticos inoxidables y resistentes a los ácidos y al calor • aceros de gran resistencia a partir de 900 N/mm<sup>2</sup> y cifras más elevadas • aceros para rodamientos • Hastelloy, Inconel, Nimonic



d1 mm	l1 mm	l2 mm	d1 mm	l1 mm	l2 mm
1,000	56,000	33,000	4,000	119,000	78,000
1,100	60,000	37,000	4,100	119,000	78,000
1,200	65,000	41,000	4,200	119,000	78,000
1,300	65,000	41,000	4,300	126,000	82,000
1,400	70,000	45,000	4,400	126,000	82,000
1,500	70,000	45,000	4,500	126,000	82,000
1,600	76,000	50,000	4,600	126,000	82,000
1,700	76,000	50,000	4,700	126,000	82,000
1,800	80,000	53,000	4,800	132,000	87,000
1,900	80,000	53,000	4,900	132,000	87,000
2,000	85,000	56,000	5,000	132,000	87,000
2,100	85,000	56,000	5,100	132,000	87,000
2,200	90,000	59,000	5,200	132,000	87,000
2,300	90,000	59,000	5,300	132,000	87,000
2,400	95,000	62,000	5,400	139,000	91,000
2,500	95,000	62,000	5,500	139,000	91,000
2,600	95,000	62,000	5,600	139,000	91,000
2,700	100,000	66,000	5,700	139,000	91,000
2,800	100,000	66,000	5,800	139,000	91,000
2,900	100,000	66,000	5,900	139,000	91,000
3,000	100,000	66,000	6,000	139,000	91,000
3,100	106,000	69,000	6,100	148,000	97,000
3,200	106,000	69,000	6,200	148,000	97,000
3,300	106,000	69,000	6,300	148,000	97,000
3,400	112,000	73,000	6,400	148,000	97,000
3,500	112,000	73,000	6,500	148,000	97,000
3,600	112,000	73,000	6,600	148,000	97,000
3,700	112,000	73,000	6,700	148,000	97,000
3,800	119,000	78,000	6,800	156,000	102,000
3,900	119,000	78,000	6,900	156,000	102,000



## Brocas espirales cil., largas

d1 mm	l1 mm	l2 mm	d1 mm	l1 mm	l2 mm
7,000	156,000	102,000	8,500	165,000	109,000
7,100	156,000	102,000	8,700	175,000	115,000
7,200	156,000	102,000	8,800	175,000	115,000
7,300	156,000	102,000	9,000	175,000	115,000
7,500	156,000	102,000	9,500	175,000	115,000
7,700	165,000	109,000	10,000	184,000	121,000
7,800	165,000	109,000	10,500	184,000	121,000
8,000	165,000	109,000	11,000	195,000	128,000
8,100	165,000	109,000	11,500	195,000	128,000
8,200	165,000	109,000	12,000	205,000	134,000
8,300	165,000	109,000	12,500	205,000	134,000
8,400	165,000	109,000	13,000	205,000	134,000

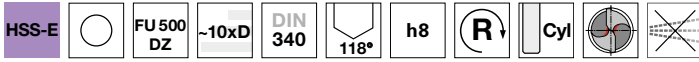


## Brocas espirales cil., largas

### Nº artículo 84814



P	M	K	N	S	H
•	•	•	•		



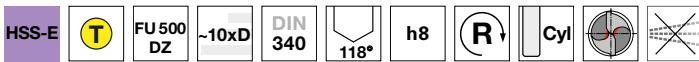
vaciado de punta  $\geq \varnothing 1,000$  • afilado plano • acero rápido al cobalto • se requiere poca fuerza de avance • se requiere poco par • más resistencia al desgaste • aplicación universal

aceros aleados y no aleados fundición de dureza hasta a 800 N/mm<sup>2</sup> • aceros para trab. en frío y en caliente • aceros para rodamientos • metales no ferríticos • fundición • aceros inoxidables • plásticos

### Nº artículo 84812

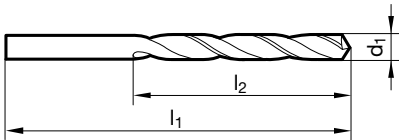


P	M	K	N	S	H
•	•	•	•		



vaciado de punta  $\geq \varnothing 1,000$  • afilado plano • acero rápido al cobalto • se requiere poco par • se requiere poca fuerza de avance • más resistencia al desgaste • aplicación universal

aceros aleados y no aleados fundición de dureza hasta a 800 N/mm<sup>2</sup> • aceros para trab. en frío y en caliente • aceros para rodamientos • metales no ferríticos • fundición • plásticos • aceros inoxidables



d1 mm	l1 mm	l2 mm	d1 mm	l1 mm	l2 mm
1,000	56,000	33,000	4,000	119,000	78,000
1,100	60,000	37,000	4,100	119,000	78,000
1,200	65,000	41,000	4,200	119,000	78,000
1,300	65,000	41,000	4,300	126,000	82,000
1,400	70,000	45,000	4,400	126,000	82,000
1,500	70,000	45,000	4,500	126,000	82,000
1,600	76,000	50,000	4,600	126,000	82,000
1,700	76,000	50,000	4,700	126,000	82,000
1,800	80,000	53,000	4,800	132,000	87,000
1,900	80,000	53,000	4,900	132,000	87,000
2,000	85,000	56,000	5,000	132,000	87,000
2,100	85,000	56,000	5,100	132,000	87,000
2,200	90,000	59,000	5,200	132,000	87,000
2,300	90,000	59,000	5,300	132,000	87,000
2,400	95,000	62,000	5,400	139,000	91,000
2,500	95,000	62,000	5,500	139,000	91,000
2,600	95,000	62,000	5,600	139,000	91,000
2,700	100,000	66,000	5,700	139,000	91,000
2,800	100,000	66,000	5,800	139,000	91,000
2,900	100,000	66,000	5,900	139,000	91,000
3,000	100,000	66,000	6,000	139,000	91,000
3,100	106,000	69,000	6,100	148,000	97,000
3,200	106,000	69,000	6,200	148,000	97,000
3,300	106,000	69,000	6,300	148,000	97,000
3,400	112,000	73,000	6,400	148,000	97,000
3,500	112,000	73,000	6,500	148,000	97,000
3,600	112,000	73,000	6,600	148,000	97,000
3,700	112,000	73,000	6,700	148,000	97,000
3,800	119,000	78,000	6,800	156,000	102,000
3,900	119,000	78,000	6,900	156,000	102,000



## Brocas espirales cil., largas

d1 mm	l1 mm	l2 mm	d1 mm	l1 mm	l2 mm
7,000	156,000	102,000	9,500	175,000	115,000
7,100	156,000	102,000	9,600	184,000	121,000
7,200	156,000	102,000	9,700	184,000	121,000
7,300	156,000	102,000	9,800	184,000	121,000
7,400	156,000	102,000	9,900	184,000	121,000
7,500	156,000	102,000	10,000	184,000	121,000
7,600	165,000	109,000	10,100	184,000	121,000
7,700	165,000	109,000	10,200	184,000	121,000
7,800	165,000	109,000	10,300	184,000	121,000
7,900	165,000	109,000	10,400	184,000	121,000
8,000	165,000	109,000	10,500	184,000	121,000
8,100	165,000	109,000	11,000	195,000	128,000
8,200	165,000	109,000	11,500	195,000	128,000
8,300	165,000	109,000	12,000	205,000	134,000
8,400	165,000	109,000	12,500	205,000	134,000
8,500	165,000	109,000	13,000	205,000	134,000
8,600	175,000	115,000	13,500	214,000	140,000
8,700	175,000	115,000	14,000	214,000	140,000
8,800	175,000	115,000			
9,000	175,000	115,000			
9,100	175,000	115,000			
9,200	175,000	115,000			
9,300	175,000	115,000			
9,400	175,000	115,000			

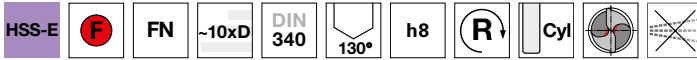


## Brocas espirales cil., largas

Nº artículo 84508

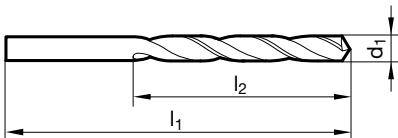


P	M	K	N	S	H
•	•	•	•		○



vaciado de punta  $\geq \varnothing 1,000$  • entrada cónica • acero rápido al cobalto • ranuras amplias • alta resistencia al desgaste • con desalajo de viruta difícil

aceros aleados y no aleados fundición de dureza sup. a 800 N/mm<sup>2</sup> • aceros para trab. en frío y en caliente • aceros para rodamientos  
• aceros altamente aleados • aceros de cementación, de bonificación



d1 mm	l1 mm	l2 mm	d1 mm	l1 mm	l2 mm
1,000	56,000	33,000	5,800	139,000	91,000
1,100	60,000	37,000	6,000	139,000	91,000
1,200	65,000	41,000	6,100	148,000	97,000
1,300	65,000	41,000	6,200	148,000	97,000
1,400	70,000	45,000	6,500	148,000	97,000
1,500	70,000	45,000	6,600	148,000	97,000
1,600	76,000	50,000	6,700	148,000	97,000
1,700	76,000	50,000	6,800	156,000	102,000
1,800	80,000	53,000	6,900	156,000	102,000
2,000	85,000	56,000	7,000	156,000	102,000
2,100	85,000	56,000	7,200	156,000	102,000
2,200	90,000	59,000	7,400	156,000	102,000
2,300	90,000	59,000	7,500	156,000	102,000
2,400	95,000	62,000	7,600	165,000	109,000
2,500	95,000	62,000	7,800	165,000	109,000
2,600	95,000	62,000	8,000	165,000	109,000
2,800	100,000	66,000	8,100	165,000	109,000
2,900	100,000	66,000	8,200	165,000	109,000
3,000	100,000	66,000	8,400	165,000	109,000
3,100	106,000	69,000	8,500	165,000	109,000
3,200	106,000	69,000	8,600	175,000	115,000
3,300	106,000	69,000	8,800	175,000	115,000
3,400	112,000	73,000	8,900	175,000	115,000
3,500	112,000	73,000	9,000	175,000	115,000
3,600	112,000	73,000	9,300	175,000	115,000
3,700	112,000	73,000	9,400	175,000	115,000
3,800	119,000	78,000	9,500	175,000	115,000
3,900	119,000	78,000	9,600	184,000	121,000
4,000	119,000	78,000	9,700	184,000	121,000
4,100	119,000	78,000	9,800	184,000	121,000
4,200	119,000	78,000	10,000	184,000	121,000
4,300	126,000	82,000	10,200	184,000	121,000
4,500	126,000	82,000	10,500	184,000	121,000
4,700	126,000	82,000	11,000	195,000	128,000
4,800	132,000	87,000	11,500	195,000	128,000
5,000	132,000	87,000	12,000	205,000	134,000
5,100	132,000	87,000			
5,200	132,000	87,000			
5,300	132,000	87,000			
5,400	139,000	91,000			
5,500	139,000	91,000			
5,600	139,000	91,000			



## Brocas espirales cil., largas

N° artículo 89286

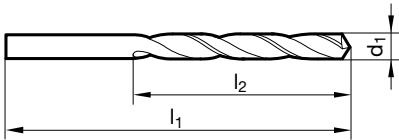


P	M	K	N	S	H
○		○			○



afilado plano • forma recta del corte principal

plásticos reforzados con fibra de vidrio • placas de circ. impresos que pueden ocasionar un rápido desgaste en las superficies y bordes de corte de la broca



d1 mm	l1 mm	l2 mm	d1 mm	l1 mm	l2 mm
0,500	38,000	8,500	1,300	38,000	17,000
0,600	38,000	9,500	1,400	38,000	17,000
0,650	38,000	10,500	1,450	38,000	17,000
0,700	38,000	10,500	1,500	38,000	17,000
0,750	38,000	12,500			
0,800	38,000	12,500			
0,850	38,000	14,500			
0,900	38,000	14,500			
1,000	38,000	17,000			
1,050	38,000	17,000			
1,100	38,000	17,000			
1,200	38,000	17,000			



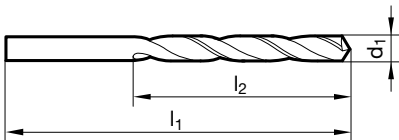
## Brocas espirales, extra largas, serie 1

Nº artículo 81410

P	M	K	N	S	H
•		•	○		



vaciado de punta  $\geq \varnothing 2,400$  • entrada cónica • para taladros muy profundos  
 aceros y fundición de aceros (aleados y sin alea) • fundición gris, fundición maleable, fundición esferica • hierro sinterizado, argentón y grafito



d1 mm	l1 mm	l2 mm	d1 mm	l1 mm	l2 mm
1,600	115,000	75,000	5,800	205,000	140,000
1,800	120,000	80,000	5,900	205,000	140,000
1,900	120,000	80,000	6,000	205,000	140,000
2,000	125,000	85,000	6,200	215,000	150,000
2,200	135,000	90,000	6,300	215,000	150,000
2,300	135,000	90,000	6,400	215,000	150,000
2,400	140,000	95,000	6,500	215,000	150,000
2,500	140,000	95,000	6,600	215,000	150,000
2,700	150,000	100,000	6,700	215,000	150,000
2,800	150,000	100,000	6,800	225,000	155,000
3,000	150,000	100,000	7,000	225,000	155,000
3,100	155,000	105,000	7,500	225,000	155,000
3,200	155,000	105,000	7,600	240,000	165,000
3,250	155,000	105,000	7,700	240,000	165,000
3,300	155,000	105,000	7,800	240,000	165,000
3,400	165,000	115,000	8,000	240,000	165,000
3,500	165,000	115,000	8,100	240,000	165,000
3,700	165,000	115,000	8,200	240,000	165,000
3,800	175,000	120,000	8,500	240,000	165,000
3,900	175,000	120,000	8,800	250,000	175,000
4,000	175,000	120,000	9,000	250,000	175,000
4,100	175,000	120,000	9,400	250,000	175,000
4,200	175,000	120,000	9,500	250,000	175,000
4,300	185,000	125,000	10,000	265,000	185,000
4,500	185,000	125,000	10,200	265,000	185,000
4,600	185,000	125,000	10,500	265,000	185,000
4,700	185,000	125,000	11,000	280,000	195,000
4,800	195,000	135,000	11,500	280,000	195,000
4,900	195,000	135,000	11,800	280,000	195,000
5,000	195,000	135,000	12,000	295,000	205,000
5,100	195,000	135,000	12,500	295,000	205,000
5,200	195,000	135,000	13,000	295,000	205,000
5,300	195,000	135,000			
5,400	205,000	140,000			
5,500	205,000	140,000			
5,700	205,000	140,000			



## Brocas espirales, extra largas, serie 1

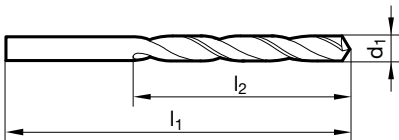
Nº artículo 81440



P	M	K	N	S	H
•		•	•		



vaciado de punta  $\geq \varnothing 2,000$  • entrada cónica • ranuras amplias • para taladros muy profundos • con desalojo de viruta difícil  
 fundición gris y aceros hasta máx. 1000 N/mm<sup>2</sup> • Excepción: aceros CrNi, aceros VA y materiales similares



d1 mm	inch	l1 mm	l2 mm	d1 mm	inch	l1 mm	l2 mm
2,000		125,000	85,000	6,500		215,000	150,000
2,200		135,000	90,000	6,600		215,000	150,000
2,300		135,000	90,000	6,700		215,000	150,000
2,400		140,000	95,000	6,800		225,000	155,000
2,500		140,000	95,000	7,000		225,000	155,000
2,600		140,000	95,000	7,100		225,000	155,000
2,700		150,000	100,000	7,400		225,000	155,000
2,850		150,000	100,000	7,500		225,000	155,000
2,900		150,000	100,000	7,600		240,000	165,000
2,950		150,000	100,000	7,800		240,000	165,000
3,000		150,000	100,000	8,000		240,000	165,000
3,100		155,000	105,000	8,100		240,000	165,000
3,170	1/8	155,000	105,000	8,200		240,000	165,000
3,200		155,000	105,000	8,300		240,000	165,000
3,300		155,000	105,000	8,400		240,000	165,000
3,400		165,000	115,000	8,500		240,000	165,000
3,500		165,000	115,000	8,600		250,000	175,000
3,600		165,000	115,000	8,800		250,000	175,000
3,700		165,000	115,000	9,000		250,000	175,000
3,750		165,000	115,000	9,200		250,000	175,000
3,800		175,000	120,000	9,300		250,000	175,000
3,900		175,000	120,000	9,400		250,000	175,000
4,000		175,000	120,000	9,500		250,000	175,000
4,100		175,000	120,000	9,600		265,000	185,000
4,200		175,000	120,000	9,700		265,000	185,000
4,500		185,000	125,000	9,800		265,000	185,000
4,700		185,000	125,000	9,900		265,000	185,000
4,800		195,000	135,000	10,000		265,000	185,000
5,000		195,000	135,000	10,200		265,000	185,000
5,100		195,000	135,000	10,500		265,000	185,000
5,200		195,000	135,000	11,000		280,000	195,000
5,300		195,000	135,000	11,500		280,000	195,000
5,400		205,000	140,000	11,750		280,000	195,000
5,500		205,000	140,000	11,800		280,000	195,000
5,600		205,000	140,000	12,000		295,000	205,000
5,700		205,000	140,000	12,500		295,000	205,000
5,800		205,000	140,000	12,700	1/2	295,000	205,000
5,900		205,000	140,000	13,000		295,000	205,000
6,000		205,000	140,000				
6,200		215,000	150,000				
6,300		215,000	150,000				
6,400		215,000	150,000				



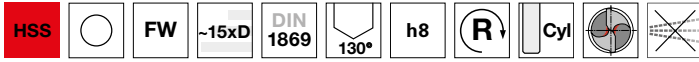


## Brocas espirales, extra largas, serie 1

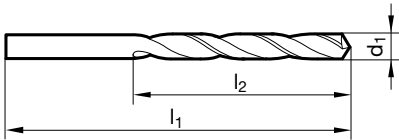
Nº artículo 81450



P	M	K	N	S	H
○			●		



vaciado de punta  $\geq \varnothing 2,500$  • entrada cónica • para taladros muy profundos  
 mat. blandos y de viruta larga de hasta a  $500 \text{ N/mm}^2$  • aceros blandos para automáticos • aluminio, alea. de alum. (de vir. larga) • zink, cobre fino, siluminio, electrón • zamak, argalio, plásticos (blandos) y madera



d1 mm	l1 mm	l2 mm	d1 mm	l1 mm	l2 mm
2,000	125,000	85,000	9,500	250,000	175,000
2,500	140,000	95,000			
2,600	140,000	95,000			
3,000	150,000	100,000			
3,200	155,000	105,000			
4,000	175,000	120,000			
5,000	195,000	135,000			
6,000	205,000	140,000			
6,500	215,000	150,000			
7,000	225,000	155,000			
8,000	240,000	165,000			
9,000	250,000	175,000			

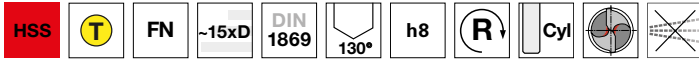


## Brocas espirales, extra largas, serie 1

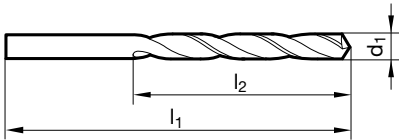
Nº artículo 84425



P	M	K	N	S	H
•		•	•		



vaciado de punta  $\geq \varnothing 2,000$  • entrada cónica • ranuras amplias • para taladros muy profundos • con desalajo de viruta difícil  
 fundición gris y aceros hasta máx. 1000 N/mm<sup>2</sup> • Excepción: aceros CrNi, aceros VA y materiales similares



d1 mm	l1 mm	l2 mm	d1 mm	l1 mm	l2 mm
2,000	125,000	85,000	6,000	205,000	140,000
2,100	125,000	85,000	7,000	225,000	155,000
2,500	140,000	95,000	8,000	240,000	165,000
3,000	150,000	100,000	9,000	250,000	175,000
3,200	155,000	105,000	10,000	265,000	185,000
3,500	165,000	115,000	11,000	280,000	195,000
4,000	175,000	120,000	12,000	295,000	205,000
4,200	175,000	120,000			
4,500	185,000	125,000			
4,600	185,000	125,000			
5,000	195,000	135,000			
5,500	205,000	140,000			

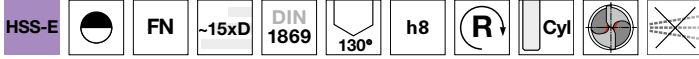


## Brocas espirales, extra largas, serie 1

Nº artículo 81441

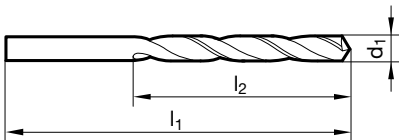


P	M	K	N	S	H
•	•	•	•	•	○



vaciado de punta  $\geq \varnothing 3,000$  • entrada cónica • acero rápido al cobalto • ranuras amplias • más resistencia al desgaste • para taladros muy profundos • con desalajo de viruta difícil

aceros aleados y no aleados fundición de dureza sup. a 800 N/mm<sup>2</sup> • aceros para trab. en frío y en caliente • aceros para rodamientos • aceros altamente aleados • aceros de cementación, de bonificación



d1		l1	l2	d1		l1	l2
mm	inch	mm	mm	mm	inch	mm	mm
3,000		150,000	100,000	7,000		225,000	155,000
3,500		165,000	115,000	8,000		240,000	165,000
4,000		175,000	120,000	8,200		240,000	165,000
4,300		185,000	125,000	8,500		240,000	165,000
4,500		185,000	125,000	9,000		250,000	175,000
4,760	3/16	195,000	135,000	9,500		250,000	175,000
4,800		195,000	135,000	10,000		265,000	185,000
5,000		195,000	135,000				
5,400		205,000	140,000				
5,500		205,000	140,000				
6,000		205,000	140,000				
6,500		215,000	150,000				

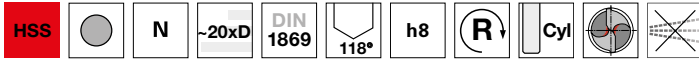


## Brocas espirales, extra largas, serie 2

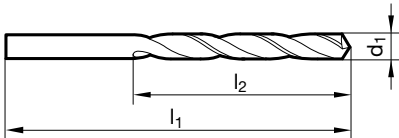
Nº artículo 81510



P	M	K	N	S	H
•		•	○		



vaciado de punta  $\geq \varnothing 3,000$  • entrada cónica • para taladros muy profundos  
 aceros y fundición de aceros (aleados y sin alea) • fundición gris, fundición maleable, fundición esferica • hierro sinterizado, argentón y grafito



d1 mm	inch	l1 mm	l2 mm	d1 mm	inch	l1 mm	l2 mm
3,000		190,000	130,000	8,500		305,000	210,000
3,170	1/8	200,000	135,000	9,000		320,000	220,000
3,300		200,000	135,000	9,500		320,000	220,000
3,500		210,000	145,000	10,000		340,000	235,000
4,000		220,000	150,000	10,500		340,000	235,000
4,200		220,000	150,000	11,000		365,000	250,000
4,500		235,000	160,000	11,500		365,000	250,000
4,800		245,000	170,000	12,000		375,000	260,000
5,000		245,000	170,000				
5,200		245,000	170,000				
5,500		260,000	180,000				
5,800		260,000	180,000				
6,000		260,000	180,000				
6,500		275,000	190,000				
6,800		290,000	200,000				
7,000		290,000	200,000				
7,500		290,000	200,000				
8,000		305,000	210,000				



## Brocas espirales, extra largas, serie 2

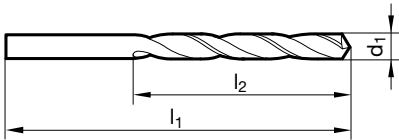
Nº artículo 81540



P	M	K	N	S	H
•		•	•		



vaciado de punta  $\geq \varnothing 2,000$  • entrada cónica • ranuras amplias • para taladros muy profundos • con desalojo de viruta difícil  
fundición gris y aceros hasta máx. 1000 N/mm<sup>2</sup> • Excepción: aceros CrNi, aceros VA y materiales similares



d1 mm	inch	l1 mm	l2 mm	d1 mm	inch	l1 mm	l2 mm
2,000		160,000	110,000	8,200		305,000	210,000
2,500		180,000	120,000	8,500		305,000	210,000
2,800		190,000	130,000	9,000		320,000	220,000
3,000		190,000	130,000	9,500		320,000	220,000
3,200		200,000	135,000	9,800		340,000	235,000
3,300		200,000	135,000	10,000		340,000	235,000
3,500		210,000	145,000	10,200		340,000	235,000
4,000		220,000	150,000	10,500		340,000	235,000
4,100		220,000	150,000	10,720	27/64	365,000	250,000
4,200		220,000	150,000	11,000		365,000	250,000
4,500		235,000	160,000	11,500		365,000	250,000
5,000		245,000	170,000	12,000		375,000	260,000
5,500		260,000	180,000	12,500		375,000	260,000
6,000		260,000	180,000	12,700	1/2	375,000	260,000
6,500		275,000	190,000	13,000		375,000	260,000
7,000		290,000	200,000				
7,500		290,000	200,000				
8,000		305,000	210,000				

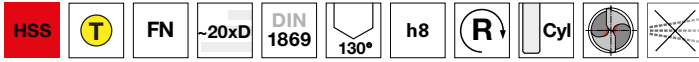


## Brocas espirales, extra largas, serie 2

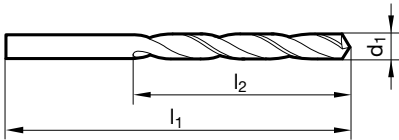
Nº artículo 84426



P	M	K	N	S	H
•		•	•	○	



vaciado de punta  $\geq \varnothing 3,000$  • entrada cónica • ranuras amplias • para taladros muy profundos • con desalojo de viruta difícil  
 fundición gris y aceros hasta máx. 1000 N/mm<sup>2</sup> • Excepción: aceros CrNi, aceros VA y materiales similares



d1 mm	l1 mm	l2 mm	d1 mm	l1 mm	l2 mm
3,000	190,000	130,000	8,000	305,000	210,000
4,000	220,000	150,000	8,500	305,000	210,000
5,000	245,000	170,000			
6,000	260,000	180,000			
6,800	290,000	200,000			
7,000	290,000	200,000			

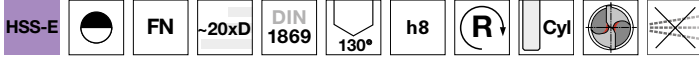


## Brocas espirales, extra largas, serie 2

Nº artículo 81541

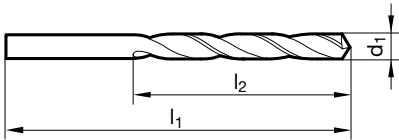


P	M	K	N	S	H
•	•	•	•		○



vaciado de punta  $\geq \varnothing 3,000$  • entrada cónica • acero rápido al cobalto • más resistencia al desgaste • ranuras amplias • para taladros muy profundos • con desalajo de viruta difícil

aceros aleados y no aleados y fundición de dureza sup. a 800 N/mm<sup>2</sup> • aceros para trab. en frío y en caliente • aceros para rodamientos • aceros altamente aleados • aceros de cementación, de bonificación



d1 mm	inch	l1 mm	l2 mm	d1 mm	inch	l1 mm	l2 mm
3,000		190,000	130,000	7,500		290,000	200,000
3,170	1/8	200,000	135,000	8,000		305,000	210,000
3,200		200,000	135,000	8,500		305,000	210,000
3,500		210,000	145,000	9,000		320,000	220,000
4,000		220,000	150,000	10,000		340,000	235,000
4,200		220,000	150,000				
5,000		245,000	170,000				
6,000		260,000	180,000				
6,200		275,000	190,000				
6,350	1/4	275,000	190,000				
6,500		275,000	190,000				
7,000		290,000	200,000				



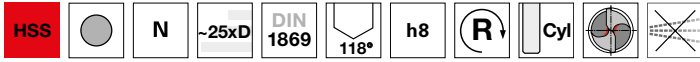
# HARTNER

## Brocas espirales, extra largas, serie 3

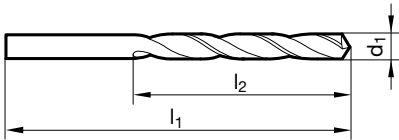
Nº artículo 81610



P	M	K	N	S	H
•		•	○		



vaciado de punta  $\geq \varnothing 4,000$  • entrada cónica • para taladros muy profundos  
 aceros y fundición de aceros (aleados y sin alear) • fundición gris, fundición maleable, fundición esferica • hierro sinterizado y grafito



d1 mm	l1 mm	l2 mm	d1 mm	l1 mm	l2 mm
3,500	265,000	180,000	10,000	430,000	295,000
4,000	280,000	190,000	11,000	455,000	310,000
5,000	315,000	210,000	12,000	480,000	330,000
5,500	330,000	225,000			
5,800	330,000	225,000			
5,900	330,000	225,000			
6,000	330,000	225,000			
7,000	370,000	250,000			
7,800	390,000	265,000			
8,000	390,000	265,000			
9,000	410,000	280,000			
9,500	410,000	280,000			



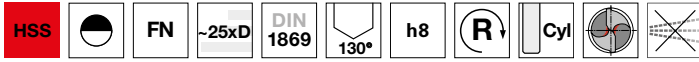


## Brocas espirales, extra largas, serie 3

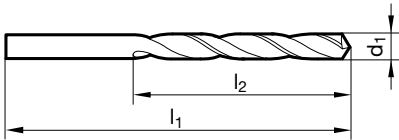
Nº artículo 81640



P	M	K	N	S	H
•		•	•		



vaciado de punta  $\geq \varnothing 3,000$  • entrada cónica • ranuras amplias • para taladros muy profundos • con desalojo de viruta difícil  
fundición gris y aceros hasta máx. 1000 N/mm<sup>2</sup> • Excepción: aceros CrNi, aceros VA y materiales similares



d1 mm	inch	l1 mm	l2 mm	d1 mm	inch	l1 mm	l2 mm
2,500		225,000	150,000	8,200		390,000	265,000
3,000		240,000	160,000	8,500		390,000	265,000
3,170	1/8	250,000	170,000	9,000		410,000	280,000
3,500		265,000	180,000	9,500		410,000	280,000
3,700		265,000	180,000	9,520	3/8	430,000	295,000
4,000		280,000	190,000	10,000		430,000	295,000
4,200		280,000	190,000	10,500		430,000	295,000
4,500		295,000	200,000	11,000		455,000	310,000
5,000		315,000	210,000	11,500		455,000	310,000
5,100		315,000	210,000	12,000		480,000	330,000
5,500		330,000	225,000	12,500		480,000	330,000
6,000		330,000	225,000	13,000		480,000	330,000
6,350	1/4	350,000	235,000				
6,500		350,000	235,000				
6,800		370,000	250,000				
7,000		370,000	250,000				
7,500		370,000	250,000				
8,000		390,000	265,000				

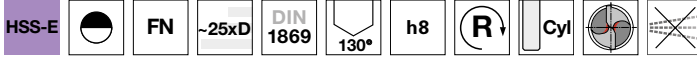


## Brocas espirales, extra largas, serie 3

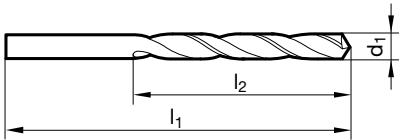
Nº artículo 81641



P	M	K	N	S	H
•	•		•	•	



vaciado de punta  $\geq \varnothing 2,500$  • entrada cónica • acero rápido al cobalto • ranuras amplias • resistencia más alta al desgaste  
 • para taladros muy profundos • con desalajo de viruta difícil  
 aceros y fundición de acero de gran dureza • fundición gris, fundición maleable, fundición esferica



d1 mm	inch	l1 mm	l2 mm	d1 mm	inch	l1 mm	l2 mm
2,500		225,000	150,000	6,300		350,000	235,000
3,000		240,000	160,000	6,350	1/4	350,000	235,000
3,100		250,000	170,000	6,400		350,000	235,000
3,170	1/8	250,000	170,000	6,500		350,000	235,000
3,200		250,000	170,000	6,700		350,000	235,000
3,300		250,000	170,000	6,800		370,000	250,000
3,400		265,000	180,000	7,000		370,000	250,000
3,500		265,000	180,000	7,200		370,000	250,000
3,700		265,000	180,000	7,500		370,000	250,000
3,800		280,000	190,000	7,800		390,000	265,000
3,900		280,000	190,000	7,940	5/16	390,000	265,000
3,970	5/32	280,000	190,000	8,000		390,000	265,000
4,000		280,000	190,000	8,200		390,000	265,000
4,200		280,000	190,000	8,500		390,000	265,000
4,300		295,000	200,000	8,600		410,000	280,000
4,500		295,000	200,000	8,730	11/32	410,000	280,000
4,600		295,000	200,000	8,800		410,000	280,000
4,760	3/16	315,000	210,000	9,000		410,000	280,000
4,800		315,000	210,000	9,500		410,000	280,000
4,900		315,000	210,000	9,520	3/8	430,000	295,000
5,000		315,000	210,000	10,000		430,000	295,000
5,100		315,000	210,000	10,320	13/32	430,000	295,000
5,200		315,000	210,000	10,500		430,000	295,000
5,500		330,000	225,000	11,000		455,000	310,000
5,560	7/32	330,000	225,000	11,110	7/16	455,000	310,000
5,800		330,000	225,000	11,500		455,000	310,000
5,950	15/64	330,000	225,000	12,000		480,000	330,000
6,000		330,000	225,000	12,200		480,000	330,000
6,100		350,000	235,000	12,500		480,000	330,000
6,200		350,000	235,000	13,000		480,000	330,000

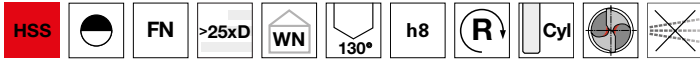


## Brocas espirales, largo especial

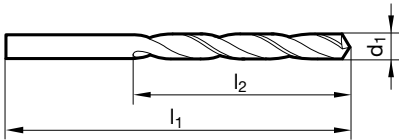
Nº artículo 81740



P	M	K	N	S	H
•		•	•		



vaciado de punta  $\geq \varnothing 6,000$  • entrada cónica • ranuras amplias • para taladros muy profundos • con desalojo de viruta difícil  
 fundición gris y aceros hasta máx. 1000 N/mm<sup>2</sup> • Excepción: aceros CrNi, aceros VA y materiales similares



d1 mm	l1 mm	l2 mm	d1 mm	l1 mm	l2 mm
6,000	500,000	400,000			
8,000	500,000	400,000			
10,000	600,000	500,000			
11,000	600,000	500,000			
12,000	600,000	500,000			

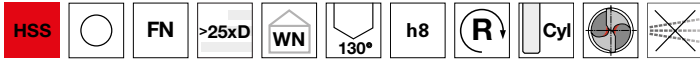


## Brocas espirales, largo especial

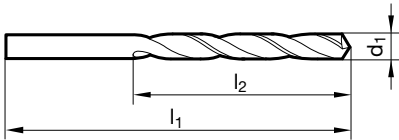
Nº artículo 81750



P	M	K	N	S	H
•		•	•		



vaciado de punta  $\geq \varnothing 8,000$  • entrada cónica • ranuras amplias • para taladros muy profundos • con desalojo de viruta difícil  
 fundición gris y aceros hasta máx. 1000 N/mm<sup>2</sup> • Excepción: aceros CrNi, aceros VA y materiales similares



d1 mm	l1 mm	l2 mm	d1 mm	l1 mm	l2 mm
8,000	750,000	650,000			
10,000	750,000	650,000			
11,000	750,000	650,000			
12,000	750,000	650,000			

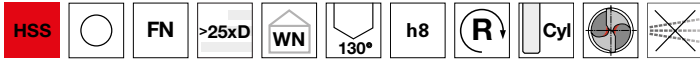


## Brocas espirales, largo especial

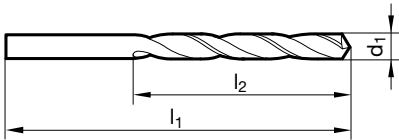
Nº artículo 81760



P	M	K	N	S	H
•		•	•		



vaciado de punta  $\geq \varnothing 10,000$  • entrada cónica • ranuras amplias • para taladros muy profundos • con desalajo de viruta difícil  
 fundición gris y aceros hasta máx. 1000 N/mm<sup>2</sup> • Excepción: aceros CrNi, aceros VA y materiales similares



d1 mm	l1 mm	l2 mm	d1 mm	l1 mm	l2 mm
10,000	1000,000	850,000			
12,000	1000,000	850,000			



## Brocas para pasadores cónicos

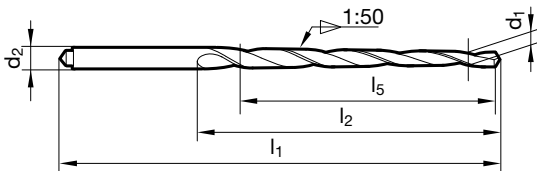
Nº artículo 81810



P	M	K	N	S	H
•	○	•	○		



vaciado de punta  $\geq \varnothing 2,000$  • entrada cónica • para taladros cónicos para punzones cónicos según DIN 1 (nuevo: DIN EN 22339) y DIN 7978 (nuevo: DIN EN 28736) • con arrastre según DIN 1809



d1 mm	d2 mm	l1 mm	l2 mm	l5 mm	d1 mm	d2 mm	l1 mm	l2 mm	l5 mm
2,000	3,150	86,000	52,000	48,000	10,000	12,500	245,000	190,000	175,000
3,000	4,000	100,000	63,000	58,000	12,000	16,000	290,000	228,000	228,500
4,000	5,000	112,000	74,000	68,000					
5,000	6,300	122,000	81,000	73,000					
6,000	8,000	160,000	114,000	105,000					
8,000	10,000	207,000	157,000	145,000					



## Brocas espirales, placa MD soldada

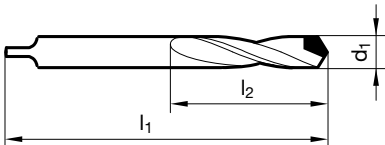
Nº artículo 89301



P	M	K	N	S	H
○		○			○



vaciado de punta  $\geq \varnothing 2,600$  • afilado plano • placa MD soldada • con arrastre según DIN 1809  
 acero de muelles • fundición dura con más de 300 HB • molibdeno puro • bronce duro y tenaz



d1 mm	l1 mm	l2 mm	d1 mm	l1 mm	l2 mm
2,600	50,000	20,000	7,800	80,000	40,000
3,000	50,000	20,000	8,000	80,000	40,000
3,100	56,000	25,000	8,200	90,000	50,000
3,200	56,000	25,000	8,400	90,000	50,000
3,300	56,000	25,000	8,500	90,000	50,000
3,400	56,000	25,000	8,600	90,000	50,000
3,500	56,000	25,000	8,800	90,000	50,000
3,600	56,000	25,000	9,000	90,000	50,000
3,700	56,000	25,000	9,100	90,000	50,000
3,800	56,000	25,000	9,500	90,000	50,000
3,900	56,000	25,000	9,700	100,000	56,000
4,000	56,000	25,000	9,800	100,000	56,000
4,100	63,000	28,000	10,000	100,000	56,000
4,200	63,000	28,000	10,200	100,000	56,000
4,300	63,000	28,000	10,500	100,000	56,000
4,400	63,000	28,000	11,000	100,000	56,000
4,500	63,000	28,000	11,500	112,000	63,000
4,800	63,000	28,000	12,000	112,000	63,000
4,900	63,000	28,000	12,500	112,000	63,000
5,000	63,000	28,000	13,000	112,000	63,000
5,100	71,000	32,000	13,500	125,000	71,000
5,200	71,000	32,000	14,000	125,000	71,000
5,400	71,000	32,000	14,500	125,000	71,000
5,500	71,000	32,000	15,000	125,000	71,000
5,600	71,000	32,000	15,500	140,000	80,000
5,700	71,000	32,000	16,000	140,000	80,000
5,800	71,000	32,000	16,500	140,000	80,000
6,000	71,000	32,000	17,000	140,000	80,000
6,100	71,000	32,000	17,500	160,000	90,000
6,200	71,000	32,000	18,000	160,000	90,000
6,300	71,000	32,000	18,500	160,000	90,000
6,400	71,000	32,000	19,000	160,000	90,000
6,500	71,000	32,000	19,500	160,000	90,000
6,700	80,000	40,000	20,000	160,000	90,000
6,800	80,000	40,000			
7,000	80,000	40,000			
7,100	80,000	40,000			
7,200	80,000	40,000			
7,400	80,000	40,000			
7,500	80,000	40,000			
7,600	80,000	40,000			
7,700	80,000	40,000			



## Brocas espirales, placa MD soldada

Nº artículo 89303

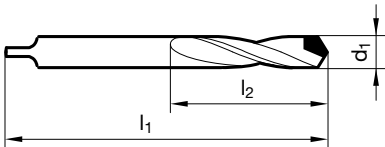


P	M	K	N	S	H
○		○			○



vaciado de punta  $\geq \varnothing 3,100$  • afilado plano • placa MD soldada • con arrastre según DIN 1809

plásticos reforzados con fibra de vidrio • placas de circ. impresos que pueden ocasionar un rápido desgaste en las superficies y bordes de corte de la broca



d1 mm	l1 mm	l2 mm	d1 mm	l1 mm	l2 mm
3,100	56,000	25,000	6,900	80,000	40,000
3,200	56,000	25,000	7,000	80,000	40,000
4,100	63,000	28,000	7,500	80,000	40,000
4,200	63,000	28,000	8,000	80,000	40,000
4,600	63,000	28,000	8,300	90,000	50,000
5,000	63,000	28,000	8,500	90,000	50,000
5,100	71,000	32,000	9,000	90,000	50,000
5,200	71,000	32,000	10,000	100,000	56,000
5,300	71,000	32,000	10,500	100,000	56,000
5,800	71,000	32,000	11,500	112,000	63,000
6,100	71,000	32,000	13,000	112,000	63,000
6,400	71,000	32,000	19,000	160,000	90,000



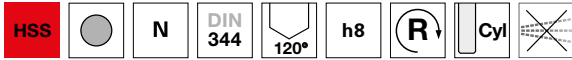


## Brocas escariadoras, cil.

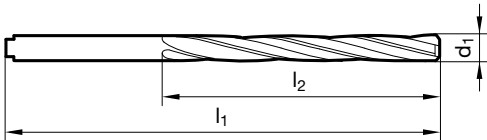
Nº artículo 86010



P	M	K	N	S	H
●	○	●	○		



entrada cónica • estabilidad muy buena • con arrastre según DIN 1809 • para pretal. de fund./estampados/broca • desvío corregido  
 • excéntrica corregida • mejora calidad superficial del taladro • diámetro de entrada < que el pretaladro para roscar • ten. en cuenta dia. más pequ. d. pretal. "d0"



d1	inch	d0	l1	l2	d1	inch	d0	l1	l2
mm		mm	mm	mm	mm		mm	mm	mm
3,800		2,8	96,000	64,000	10,200		7,0	162,000	116,000
4,000		2,8	96,000	64,000	10,500		7,0	162,000	116,000
4,750		3,2	102,000	69,000	10,600		7,0	162,000	116,000
4,800		3,5	108,000	74,000	11,000		7,7	173,000	125,000
4,900		3,5	108,000	74,000	11,300		7,7	173,000	125,000
5,000		3,5	108,000	74,000	11,750		8,4	184,000	134,000
5,800		4,2	116,000	80,000	12,000		8,4	184,000	134,000
6,000		4,2	116,000	80,000	12,750		9,1	184,000	134,000
6,200		4,2	124,000	86,000	13,000		9,1	184,000	134,000
6,400		4,2	124,000	86,000	13,750		9,8	194,000	142,000
6,800		4,9	133,000	93,000	14,000		9,8	194,000	142,000
7,500		4,9	133,000	93,000	14,750		10,5	202,000	147,000
7,700		5,6	142,000	100,000	15,000		10,5	202,000	147,000
7,800		5,6	142,000	100,000					
8,000		5,6	142,000	100,000					
8,200		5,6	142,000	100,000					
9,800		7,0	162,000	116,000					
10,000		7,0	162,000	116,000					

# MÁXIMA VARIABILIDAD Y FLEXIBILIDAD

## Propiedades del sistema

- ▼ sistema de armario giratorio con persiana de apertura automática
- ▼ control del 100 % de los artículos emitidos
- ▼ configuración rápida de bandejas individuales
- ▼ posibilidad de compartimentos de diferentes dimensiones
- ▼ a partir de un único WSP, de más de Ø 6 mm las brocas helicoidales, los guantes e incluso las brocas para agujeros profundos pueden almacenarse en la máquina y gestionarse y dispensarse a través del software Hartner TM
- ▼ proceso de pedido automático en el software Hartner TM programado por la empresa“
- ▼ alturas variables de los compartimentos de almacenamiento desde 25 mm hasta 1525 mm posibles en un paso de 25 mm
- ▼ máximo 987 compartimentos (en la configuración más pequeña)
- ▼ tiempo de extracción inferior a 10 s
- ▼ disponibilidad 24/7
- ▼ carga máxima alcanzable de 544 kg
- ▼ diseño de bajo mantenimiento





# HARTNER

Precision Cutting Tools



## **TOOL MANAGEMENT**

TM 826





# HARTNER

Precision Cutting Tools

Brocas de  
mango cónico








## BROCAS DE MANGO CÓNICO

fabricada en HSS, HSS-E, placa MD soldada  
brillante y recubierta





P	M	K	N	S	H	Norma	Tipo	Material de corte	Acabado	Dirección de corte	Forma del mango	Profundidad	d1/mm	Nº artículo	Página
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## Brocas espirales

	•	•	○			DIN 345	N	HSS	○	derecha	MK	~5xD	3,000 - 75,000	82010	173
			•			DIN 345	W	HSS	○	derecha	MK	~5xD	6,800 - 30,500	82030	175
	•	•	○			DIN 345	N	HSS	ⓧ	derecha	MK	~5xD	8,000 - 30,000	84460	176
	•	○	•	○		DIN 345	N	HSS-E	○	derecha	MK	~5xD	5,000 - 50,000	82011	177
	○	•	○	•		DIN 345	IS	HSS-E	○	derecha	MK	~5xD	11,500 - 32,000	82012	178
	○	•	○			DIN 345	FN	HSS-E	ⓧ	derecha	MK	~5xD	19,000 - 19,500	84660	179
	•	○	•	○		DIN 345	N	HSS-E	ⓧ	derecha	MK	~5xD	8,000 - 23,000	84859	180

## Brocas espirales cil., cortas



	•	•	•	○	○	Norma de fáb.	V	HSS-E	○	derecha	MK	~3xD	10,000 - 28,000	82971	181
	○	•	○	○		Norma de fáb.	IS	HSS-E	○	derecha	MK	~3xD	10,000 - 31,000	82972	182

## Brocas de puntear NC




	•	○	•	•	○	Norma de fáb.	N	HSS	○	derecha	MK		12,000 - 25,000	82191	183
	•	○	•	•	○	Norma de fáb.	N	HSS	○	derecha	MK		12,000 - 25,000	82192	183

P	M	K	N	S	H	Norma	Tipo	Material de corte	Acabado	Dirección de corte	Forma del mango	Profundidad	d1/mm	Nº artículo	Página
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## Brocas espirales cil., largas

	•	•	○			DIN 341	N	HSS	○	derecha	MK	~10xD	4,000 - 50,000	82210	184
	•	○	•	•	○	DIN 341	N	HSS-E	○	derecha	MK	~10xD	5,000 - 30,000	82211	185





## Brocas espirales, extra largas, serie 1

	•	•	○			DIN 1870	N	HSS	○	derecha	MK	~15xD	8,500 - 38,000	82310	186
	•	•	•			DIN 1870	FN	HSS	○ <sup>+0</sup> / <sub>16,0</sub>	derecha	MK	~15xD	8,000 - 30,000	82340	187
	•	•	•	•	○	DIN 1870	FN	HSS-E	○ <sup>+0</sup> / <sub>16,0</sub>	derecha	MK	~15xD	10,000 - 20,000	82341	188

## Brocas espirales, extra largas, serie 2




	•	•	○			DIN 1870	N	HSS	○	derecha	MK	~20xD	8,500 - 30,000	82410	189
	•	•	•			DIN 1870	FN	HSS	○ <sup>+0</sup> / <sub>16,0</sub>	derecha	MK	~20xD	8,000 - 30,000	82440	190

## Brocas espirales, largo especial


	•	•	•			Norma de fáb.	FN	HSS	○ <sup>+0</sup> / <sub>16,0</sub>	derecha	MK	>20xD	8,000 - 20,000	82466	191
	•	•	•			Norma de fáb.	FN	HSS	○ <sup>+0</sup> / <sub>16,0</sub>	derecha	MK	20xD	14,000 - 38,000	82467	192
	•	•	•			Norma de fáb.	FN	HSS	○	derecha	MK	>20xD	14,000 - 18,000	82468	193
	•	•	•			Norma de fáb.	FN	HSS	○	derecha	MK	>20xD	15,000 - 18,000	82469	194

P	M	K	N	S	H	Norma	Tipo	Material de corte	Acabado	Dirección de corte	Forma del mango	Profundidad	d1/mm	Nº artículo	Página
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## Brocas de refrigeración, serie larga

	•	○	•	○	○	Norma de fáb.	N	HSS	○	derecha	MK	~10xD	10,000 - 40,000	82521	195
	•	○	•	○	○	Norma de fáb.	FN	HSS	○	derecha	MK	~10xD	10,000 - 20,000	82535	196
	•	•	•	•	○	Norma de fáb.	FN	HSS-E	○	derecha	MK	~10xD	15,000 - 32,500	82525	197



## Brocas de refrigeración, serie extra larga

	•	•	•	•	○	Norma de fáb.	FN	HSS-E	○	derecha	MK	~15xD	14,000 - 20,000	82515	198
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## Brocas espirales, placa MD soldada

	○	○	○	○	○	DIN 8041	N	placa MD soldada	○	derecha	MK		8,500 - 40,000	89302	199
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## Brocas escariadoras, CM

	•	○	•	○	○	DIN 343	N	HSS	○	derecha	MK		8,000 - 40,000	86110	200
	•	○	•	○	○	DIN 343	N	HSS-E	○	derecha	MK		12,000 - 22,000	86111	201

## Brocas para pasadores cónicos

	•	○	•	○	○	DIN 1898	N	HSS	○	derecha	MK		5,000 - 20,000	82810	202
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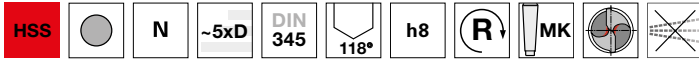


## Brocas espirales

Nº artículo 82010

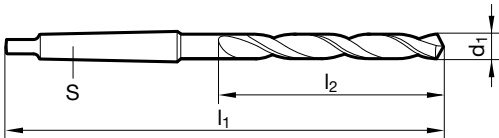


P	M	K	N	S	H
•		•	○		



vaciado de punta  $\geq \varnothing 14,100$  • entrada cónica

aceros y fundición de aceros (aleados y sin alea) • fundición gris, fundición maleable, fundición esférica • hierro sinterizado, argentón y grafito



d1		S	l1	l2	d1		S	l1	l2
mm	inch		mm	mm	mm	inch		mm	mm
3,000		MK-1	114,000	33,000	10,250		MK-1	168,000	87,000
3,300		MK-1	117,000	36,000	10,300		MK-1	168,000	87,000
3,600		MK-1	120,000	39,000	10,500		MK-1	168,000	87,000
3,750		MK-1	120,000	39,000	10,600		MK-1	168,000	87,000
4,000		MK-1	124,000	43,000	10,700		MK-1	175,000	94,000
4,200		MK-1	124,000	43,000	10,750		MK-1	175,000	94,000
4,250		MK-1	124,000	43,000	10,800		MK-1	175,000	94,000
4,500		MK-1	128,000	47,000	11,000		MK-1	175,000	94,000
4,900		MK-1	133,000	52,000	11,100		MK-1	175,000	94,000
5,000		MK-1	133,000	52,000	11,200		MK-1	175,000	94,000
5,200		MK-1	133,000	52,000	11,250		MK-1	175,000	94,000
5,500		MK-1	138,000	57,000	11,500		MK-1	175,000	94,000
5,700		MK-1	138,000	57,000	11,750		MK-1	175,000	94,000
6,000		MK-1	138,000	57,000	11,800		MK-1	175,000	94,000
6,200		MK-1	144,000	63,000	12,000		MK-1	182,000	101,000
6,500		MK-1	144,000	63,000	12,100		MK-1	182,000	101,000
6,700		MK-1	144,000	63,000	12,200		MK-1	182,000	101,000
6,750	17/64	MK-1	150,000	69,000	12,250		MK-1	182,000	101,000
6,800		MK-1	150,000	69,000	12,300	31/64	MK-1	182,000	101,000
7,000		MK-1	150,000	69,000	12,500		MK-1	182,000	101,000
7,250		MK-1	150,000	69,000	12,750		MK-1	182,000	101,000
7,500		MK-1	150,000	69,000	12,800		MK-1	182,000	101,000
7,900		MK-1	156,000	75,000	13,000		MK-1	182,000	101,000
8,000		MK-1	156,000	75,000	13,200		MK-1	182,000	101,000
8,100		MK-1	156,000	75,000	13,250		MK-1	189,000	108,000
8,200		MK-1	156,000	75,000	13,490	17/32	MK-1	189,000	108,000
8,250		MK-1	156,000	75,000	13,500		MK-1	189,000	108,000
8,400		MK-1	156,000	75,000	13,750		MK-1	189,000	108,000
8,500		MK-1	156,000	75,000	13,800		MK-1	189,000	108,000
8,700		MK-1	162,000	81,000	14,000		MK-1	189,000	108,000
8,750		MK-1	162,000	81,000	14,100		MK-2	212,000	114,000
8,800		MK-1	162,000	81,000	14,200		MK-2	212,000	114,000
9,000		MK-1	162,000	81,000	14,250		MK-2	212,000	114,000
9,200		MK-1	162,000	81,000	14,300		MK-2	212,000	114,000
9,250		MK-1	162,000	81,000	14,500		MK-2	212,000	114,000
9,500		MK-1	162,000	81,000	14,600		MK-2	212,000	114,000
9,700		MK-1	168,000	87,000	14,750		MK-2	212,000	114,000
9,750		MK-1	168,000	87,000	15,000		MK-2	212,000	114,000
9,800		MK-1	168,000	87,000	15,250		MK-2	218,000	120,000
10,000		MK-1	168,000	87,000	15,500		MK-2	218,000	120,000
10,100		MK-1	168,000	87,000	15,750		MK-2	218,000	120,000
10,200		MK-1	168,000	87,000	15,800		MK-2	218,000	120,000



## Brocas espirales

d1		S	l1	l2	d1		S	l1	l2
mm	inch		mm	mm	mm	inch		mm	mm
16,000		MK-2	218,000	120,000	29,750		MK-3	296,000	175,000
16,100		MK-2	223,000	125,000	30,000		MK-3	296,000	175,000
16,200		MK-2	223,000	125,000	30,250		MK-3	301,000	180,000
16,250		MK-2	223,000	125,000	30,500		MK-3	301,000	180,000
16,500		MK-2	223,000	125,000	30,600		MK-3	301,000	180,000
16,750		MK-2	223,000	125,000	30,750		MK-3	301,000	180,000
17,000		MK-2	223,000	125,000	31,000		MK-3	301,000	180,000
17,250		MK-2	228,000	130,000	31,250		MK-3	301,000	180,000
17,500		MK-2	228,000	130,000	31,500		MK-3	301,000	180,000
17,750		MK-2	228,000	130,000	31,750	1 1/4	MK-3	306,000	185,000
18,000		MK-2	228,000	130,000	32,000		MK-4	334,000	185,000
18,200		MK-2	233,000	135,000	32,500		MK-4	334,000	185,000
18,250		MK-2	233,000	135,000	33,000		MK-4	334,000	185,000
18,500		MK-2	233,000	135,000	33,500		MK-4	334,000	185,000
18,750		MK-2	233,000	135,000	34,000		MK-4	339,000	190,000
19,000		MK-2	233,000	135,000	34,500		MK-4	339,000	190,000
19,250		MK-2	238,000	140,000	35,000		MK-4	339,000	190,000
19,500		MK-2	238,000	140,000	35,500		MK-4	339,000	190,000
19,700		MK-2	238,000	140,000	36,000		MK-4	344,000	195,000
19,750		MK-2	238,000	140,000	36,500		MK-4	344,000	195,000
20,000		MK-2	238,000	140,000	37,000		MK-4	344,000	195,000
20,100		MK-2	243,000	145,000	37,500		MK-4	344,000	195,000
20,200		MK-2	243,000	145,000	38,000		MK-4	349,000	200,000
20,250		MK-2	243,000	145,000	38,500	1 33/64	MK-4	349,000	200,000
20,400		MK-2	243,000	145,000	39,000		MK-4	349,000	200,000
20,500		MK-2	243,000	145,000	39,500		MK-4	349,000	200,000
20,750		MK-2	243,000	145,000	40,000		MK-4	349,000	200,000
21,000		MK-2	243,000	145,000	40,500		MK-4	354,000	205,000
21,250		MK-2	248,000	150,000	41,000		MK-4	354,000	205,000
21,500		MK-2	248,000	150,000	41,500		MK-4	354,000	205,000
21,750		MK-2	248,000	150,000	42,000		MK-4	354,000	205,000
22,000		MK-2	248,000	150,000	42,500		MK-4	354,000	205,000
22,100		MK-2	248,000	150,000	43,000		MK-4	359,000	210,000
22,200		MK-2	248,000	150,000	43,500		MK-4	359,000	210,000
22,250		MK-2	248,000	150,000	44,000		MK-4	359,000	210,000
22,500		MK-2	253,000	155,000	44,500		MK-4	359,000	210,000
22,750		MK-2	253,000	155,000	45,000		MK-4	359,000	210,000
23,000		MK-2	253,000	155,000	45,500		MK-4	364,000	215,000
23,250		MK-3	276,000	155,000	46,000		MK-4	364,000	215,000
23,500		MK-3	276,000	155,000	46,500		MK-4	364,000	215,000
23,750		MK-3	281,000	160,000	47,000		MK-4	364,000	215,000
24,000		MK-3	281,000	160,000	47,500		MK-4	364,000	215,000
24,250		MK-3	281,000	160,000	48,000		MK-4	369,000	220,000
24,500		MK-3	281,000	160,000	48,500		MK-4	369,000	220,000
24,750		MK-3	281,000	160,000	49,000		MK-4	369,000	220,000
25,000	63/64	MK-3	281,000	160,000	49,500		MK-4	369,000	220,000
25,200		MK-3	286,000	165,000	50,000		MK-4	369,000	220,000
25,250		MK-3	286,000	165,000	50,500		MK-4	374,000	225,000
25,400	1	MK-3	286,000	165,000	51,000		MK-5	412,000	225,000
25,500		MK-3	286,000	165,000	52,000		MK-5	412,000	225,000
25,750		MK-3	286,000	165,000	53,000		MK-5	412,000	225,000
25,800	1 1/64	MK-3	286,000	165,000	54,000		MK-5	417,000	230,000
26,000		MK-3	286,000	165,000	55,000		MK-5	417,000	230,000
26,250		MK-3	286,000	165,000	56,000		MK-5	417,000	230,000
26,500		MK-3	286,000	165,000	56,500		MK-5	422,000	235,000
27,000		MK-3	291,000	170,000	57,000		MK-5	422,000	235,000
27,250		MK-3	291,000	170,000	58,000		MK-5	422,000	235,000
27,500		MK-3	291,000	170,000	59,000		MK-5	422,000	235,000
27,750		MK-3	291,000	170,000	60,000		MK-5	422,000	235,000
28,000		MK-3	291,000	170,000	62,000		MK-5	427,000	240,000
28,250		MK-3	296,000	175,000	63,000		MK-5	427,000	240,000
28,500		MK-3	296,000	175,000	65,000		MK-5	432,000	245,000
28,750		MK-3	296,000	175,000	70,000		MK-5	437,000	250,000
29,000		MK-3	296,000	175,000	75,000		MK-5	442,000	255,000
29,250		MK-3	296,000	175,000					
29,500		MK-3	296,000	175,000					



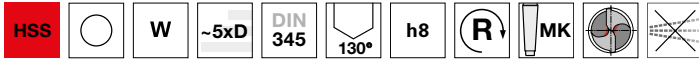
# HARTNER

## Brocas espirales

Nº artículo 82030

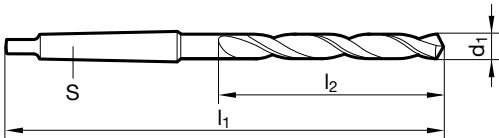


P	M	K	N	S	H
			•		



vaciado de punta  $\geq \varnothing 15,000$  • entrada cónica

mat. blandos y de viruta larga • aluminio, alea. de alum. (de vir. larga) • zink, cobre fino, siluminio, electrón



d1 mm	S	l1 mm	l2 mm	d1 mm	S	l1 mm	l2 mm
6,800	MK-1	150,000	69,000	15,000	MK-2	212,000	114,000
8,500	MK-1	156,000	75,000	24,300	MK-3	281,000	160,000
9,000	MK-1	162,000	81,000	30,500	MK-3	301,000	180,000
9,500	MK-1	162,000	81,000				
10,000	MK-1	168,000	87,000				
12,000	MK-1	182,000	101,000				

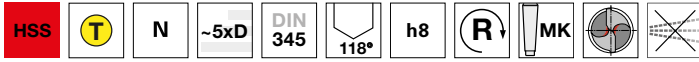


## Brocas espirales

Nº artículo 84460

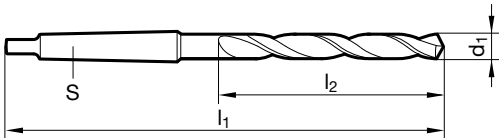


P	M	K	N	S	H
•		•	○		



vaciado de punta  $\geq \varnothing 5,500$  • entrada cónica

aceros y fundición de aceros (aleados y sin alea) • fundición gris, fundición maleable, fundición esférica • hierro sinterizado y grafito



d1 mm	inch	S	l1 mm	l2 mm	d1 mm	inch	S	l1 mm	l2 mm
8,000		MK-1	156,000	75,000	18,000		MK-2	228,000	130,000
8,500		MK-1	156,000	75,000	18,500		MK-2	233,000	135,000
9,000		MK-1	162,000	81,000	19,000		MK-2	233,000	135,000
9,500		MK-1	162,000	81,000	19,500		MK-2	238,000	140,000
10,000		MK-1	168,000	87,000	20,000		MK-2	238,000	140,000
10,200		MK-1	168,000	87,000	20,500		MK-2	243,000	145,000
10,250		MK-1	168,000	87,000	21,000		MK-2	243,000	145,000
10,500		MK-1	168,000	87,000	22,000		MK-2	248,000	150,000
10,750		MK-1	175,000	94,000	22,500		MK-2	253,000	155,000
11,000		MK-1	175,000	94,000	23,000		MK-2	253,000	155,000
11,250		MK-1	175,000	94,000	24,000		MK-3	281,000	160,000
11,500		MK-1	175,000	94,000	24,500		MK-3	281,000	160,000
12,000		MK-1	182,000	101,000	25,000	63/64	MK-3	281,000	160,000
12,500		MK-1	182,000	101,000	25,500		MK-3	286,000	165,000
12,750		MK-1	182,000	101,000	26,000		MK-3	286,000	165,000
13,000		MK-1	182,000	101,000	26,500		MK-3	286,000	165,000
13,250		MK-1	189,000	108,000	27,000		MK-3	291,000	170,000
13,500		MK-1	189,000	108,000	28,000		MK-3	291,000	170,000
13,750		MK-1	189,000	108,000	28,500		MK-3	296,000	175,000
14,000		MK-1	189,000	108,000	29,000		MK-3	296,000	175,000
14,250		MK-2	212,000	114,000	29,500		MK-3	296,000	175,000
14,500		MK-2	212,000	114,000	30,000		MK-3	296,000	175,000
14,750		MK-2	212,000	114,000					
15,000		MK-2	212,000	114,000					
15,500		MK-2	218,000	120,000					
16,000		MK-2	218,000	120,000					
16,250		MK-2	223,000	125,000					
16,500		MK-2	223,000	125,000					
17,000		MK-2	223,000	125,000					
17,500		MK-2	228,000	130,000					

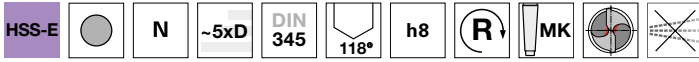


## Brocas espirales

Nº artículo 82011

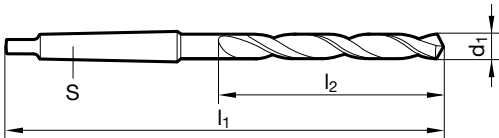


P	M	K	N	S	H
●	○	●	○		



vaciado de punta  $\geq \varnothing 5,000$  • entrada cónica • acero rápido al cobalto • más resistencia al desgaste

aceros aleados y no aleados y fundición de dureza sup. a 800 N/mm<sup>2</sup> • aceros para trab. en frío y en caliente • aceros para rodamientos  
• aceros altamente aleados • aceros de cementación, de bonificación



d1		S	l1	l2	d1		S	l1	l2
mm	inch		mm	mm	mm	inch		mm	mm
5,000		MK-1	133,000	52,000	18,500		MK-2	233,000	135,000
6,000		MK-1	138,000	57,000	19,000		MK-2	233,000	135,000
7,000		MK-1	150,000	69,000	19,050	3/4	MK-2	238,000	140,000
7,500		MK-1	150,000	69,000	19,500		MK-2	238,000	140,000
8,000		MK-1	156,000	75,000	20,000		MK-2	238,000	140,000
8,500		MK-1	156,000	75,000	20,500		MK-2	243,000	145,000
9,000		MK-1	162,000	81,000	20,750		MK-2	243,000	145,000
9,500		MK-1	162,000	81,000	21,000		MK-2	243,000	145,000
10,000		MK-1	168,000	87,000	21,500		MK-2	248,000	150,000
10,250		MK-1	168,000	87,000	22,000		MK-2	248,000	150,000
10,500		MK-1	168,000	87,000	22,500		MK-2	253,000	155,000
11,000		MK-1	175,000	94,000	23,000		MK-2	253,000	155,000
11,500		MK-1	175,000	94,000	23,500		MK-3	276,000	155,000
12,000		MK-1	182,000	101,000	24,000		MK-3	281,000	160,000
12,200		MK-1	182,000	101,000	24,500		MK-3	281,000	160,000
12,250		MK-1	182,000	101,000	25,000	63/64	MK-3	281,000	160,000
12,500		MK-1	182,000	101,000	25,250		MK-3	286,000	165,000
12,750		MK-1	182,000	101,000	25,500		MK-3	286,000	165,000
13,000		MK-1	182,000	101,000	26,000		MK-3	286,000	165,000
13,200		MK-1	182,000	101,000	26,500		MK-3	286,000	165,000
13,500		MK-1	189,000	108,000	27,000		MK-3	291,000	170,000
13,800		MK-1	189,000	108,000	27,500		MK-3	291,000	170,000
14,000		MK-1	189,000	108,000	28,000		MK-3	291,000	170,000
14,200		MK-2	212,000	114,000	28,500		MK-3	296,000	175,000
14,290	9/16	MK-2	212,000	114,000	28,570	1 1/8	MK-3	296,000	175,000
14,500		MK-2	212,000	114,000	29,000		MK-3	296,000	175,000
14,750		MK-2	212,000	114,000	29,500		MK-3	296,000	175,000
15,000		MK-2	212,000	114,000	30,000		MK-3	296,000	175,000
15,250		MK-2	218,000	120,000	31,000		MK-3	301,000	180,000
15,500		MK-2	218,000	120,000	31,500		MK-3	301,000	180,000
15,750		MK-2	218,000	120,000	32,000		MK-4	334,000	185,000
16,000		MK-2	218,000	120,000	33,000		MK-4	334,000	185,000
16,250		MK-2	223,000	125,000	34,000		MK-4	339,000	190,000
16,500		MK-2	223,000	125,000	35,000		MK-4	339,000	190,000
16,750		MK-2	223,000	125,000	36,000		MK-4	344,000	195,000
17,000		MK-2	223,000	125,000	38,000		MK-4	349,000	200,000
17,250		MK-2	228,000	130,000	40,000		MK-4	349,000	200,000
17,460	11/16	MK-2	228,000	130,000	50,000		MK-4	369,000	220,000
17,500		MK-2	228,000	130,000					
17,750		MK-2	228,000	130,000					
18,000		MK-2	228,000	130,000					
18,200		MK-2	233,000	135,000					



# HARTNER

## Brocas espirales

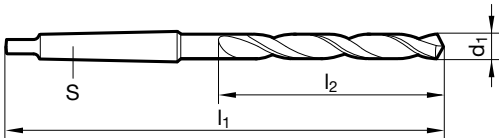
Nº artículo 82012



P	M	K	N	S	H
○	●		○	●	



broca INOX • entrada cónica • acero rápido al cobalto • más resistencia al desgaste  
aceros austeníticos inoxidables y resistentes a los ácidos y al calor (V2A y V4A)



d1 mm	S	l1 mm	l2 mm	d1 mm	S	l1 mm	l2 mm
11,500	MK-1	175,000	94,000	20,000	MK-2	238,000	140,000
12,000	MK-1	182,000	101,000	20,500	MK-2	243,000	145,000
14,000	MK-1	189,000	108,000	21,000	MK-2	243,000	145,000
15,000	MK-2	212,000	114,000	22,000	MK-2	248,000	150,000
15,500	MK-2	218,000	120,000	22,500	MK-2	253,000	155,000
16,000	MK-2	218,000	120,000	23,000	MK-2	253,000	155,000
16,500	MK-2	223,000	125,000	26,000	MK-3	286,000	165,000
17,000	MK-2	223,000	125,000	27,500	MK-3	291,000	170,000
17,250	MK-2	228,000	130,000	28,000	MK-3	291,000	170,000
17,500	MK-2	228,000	130,000	31,500	MK-3	301,000	180,000
18,000	MK-2	228,000	130,000	32,000	MK-4	334,000	185,000
19,500	MK-2	238,000	140,000				

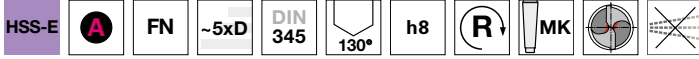


## Brocas espirales

Nº artículo 84660

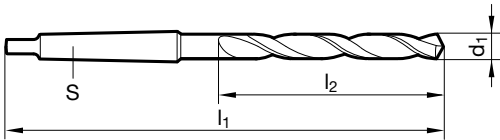


P	M	K	N	S	H
○		●	○		

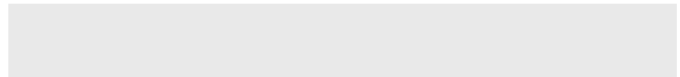
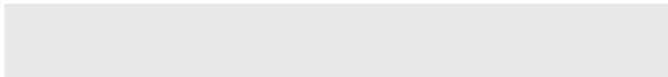


vaciado de punta  $\geq \varnothing 14,200$  • entrada cónica • ranuras amplias • acero rápido al cobalto • resistencia más alta al desgaste • ideal para prof. de taladro sup. a 3xD

aceros aleados y no aleados fundición de dureza sup. a 1000 N/mm<sup>2</sup> • aceros para trab. en frío y en caliente • aceros para rodamientos • aceros altamente aleados • aceros de cementación, de bonificación



d1 mm	S	l1 mm	l2 mm	d1 mm	S	l1 mm	l2 mm
19,000	MK-2	233,000	135,000				
19,500	MK-2	238,000	140,000				





# HARTNER

## Brocas espirales

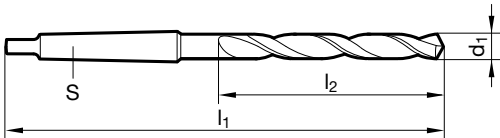
Nº artículo 84859



P	M	K	N	S	H
•	○	•	○		



vaciado de punta  $\geq \varnothing 8,000$  • entrada cónica • acero rápido al cobalto • resistencia más alta al desgaste  
 aceros aleados y no aleados y fundición de dureza sup. a 800 N/mm<sup>2</sup> • aceros para trab. en frío y en caliente • aceros para rodamientos  
 • aceros altamente aleados • aceros de cementación, de bonificación



d1 mm	S	l1 mm	l2 mm	d1 mm	S	l1 mm	l2 mm
8,000	MK-1	156,000	75,000	15,000	MK-2	212,000	114,000
10,000	MK-1	168,000	87,000	23,000	MK-2	253,000	155,000
11,000	MK-1	175,000	94,000				
12,000	MK-1	182,000	101,000				
13,000	MK-1	182,000	101,000				
14,000	MK-1	189,000	108,000				



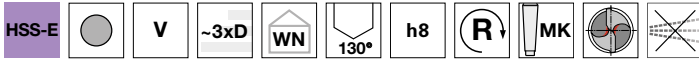


## Brocas espirales cil., cortas

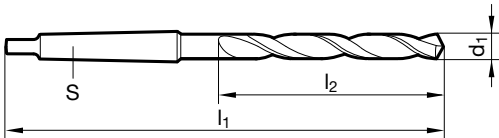
Nº artículo 82971



P	M	K	N	S	H
•	•	•	○	•	○



vaciado de punta  $\geq \varnothing 10,000$  • entrada cónica • acero rápido al cobalto • más resistencia al desgaste  
 materiales difíciles • aceros inoxidable y resistentes al ácido • aceros de muelles, aceros austeníticos



d1 mm	S	l1 mm	l2 mm	d1 mm	S	l1 mm	l2 mm
10,000	MK-1	138,000	57,000	20,000	MK-3	212,000	91,000
10,200	MK-1	138,000	57,000	21,000	MK-3	216,000	95,000
10,500	MK-1	138,000	57,000	21,500	MK-3	219,000	98,000
11,500	MK-1	142,000	61,000	22,000	MK-3	219,000	98,000
12,000	MK-1	147,000	66,000	23,000	MK-3	222,000	101,000
12,500	MK-1	147,000	66,000	24,000	MK-3	225,000	104,000
13,000	MK-1	147,000	66,000	25,000	MK-3	225,000	104,000
13,500	MK-2	168,000	70,000	26,000	MK-4	256,000	107,000
14,000	MK-2	168,000	70,000	27,000	MK-4	259,000	110,000
14,500	MK-2	172,000	74,000	28,000	MK-4	259,000	110,000
15,000	MK-2	172,000	74,000				
15,500	MK-2	176,000	78,000				
16,000	MK-2	176,000	78,000				
17,000	MK-2	179,000	81,000				
17,500	MK-2	183,000	85,000				
18,000	MK-2	183,000	85,000				
18,500	MK-2	186,000	88,000				
19,000	MK-2	186,000	88,000				



# HARTNER

## Brocas espirales cil., cortas

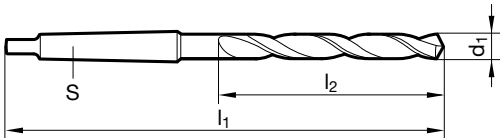
Nº artículo 82972



P	M	K	N	S	H
○	●	○	○	○	○



broca INOX • entrada cónica • acero rápido al cobalto • más resistencia al desgaste  
aceros austeníticos inoxidables y resistentes a los ácidos y al calor (V2A y V4A)



d1 mm	S	l1 mm	l2 mm	d1 mm	S	l1 mm	l2 mm
10,000	MK-1	138,000	57,000	27,500	MK-4	259,000	110,000
10,500	MK-1	138,000	57,000	28,500	MK-4	263,000	114,000
10,800	MK-1	142,000	61,000	29,000	MK-4	263,000	114,000
11,500	MK-1	142,000	61,000	29,500	MK-4	263,000	114,000
11,800	MK-1	142,000	61,000	30,500	MK-4	266,000	117,000
12,000	MK-1	147,000	66,000	31,000	MK-4	266,000	117,000
15,000	MK-2	172,000	74,000				
19,750	MK-3	212,000	91,000				
21,750	MK-3	219,000	98,000				
22,750	MK-3	222,000	101,000				
26,000	MK-4	256,000	107,000				
27,000	MK-4	259,000	110,000				

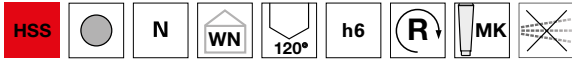


## Brocas de puntear NC

### Nº artículo 82191



P	M	K	N	S	H
•	○	•	•	○	

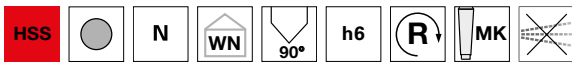


entrada cónica • solo para puntear • estabilidad muy buena

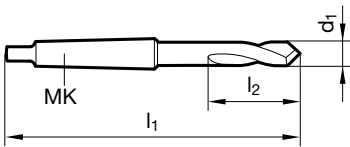
### Nº artículo 82192



P	M	K	N	S	H
•	○	•	•	○	



entrada cónica • solo para puntear • estabilidad muy buena



d1 mm	inch	S	l1 mm	l2 mm	d1 mm	inch	S	l1 mm	l2 mm
12,000		MK-1	122,000	30,000					
16,000		MK-2	148,000	37,500					
20,000		MK-2	148,000	45,000					
25,000		MK-3	171,000	53,000					

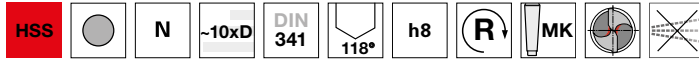


## Brocas espirales cil., largas

Nº artículo 82210

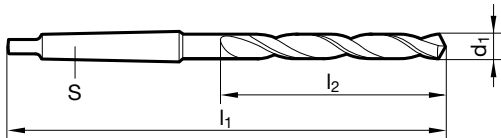


P	M	K	N	S	H
•		•	○		



vaciado de punta  $\geq \varnothing 14,500$  • entrada cónica • para taladrar casquillos

aceros y fundición de aceros (aleados y sin alea) • fundición gris, fundición maleable, fundición esférica • hierro sinterizado, argentón y grafito



d1 mm	inch	S	l1 mm	l2 mm	d1 mm	inch	S	l1 mm	l2 mm
4,000		MK-1	145,000	64,000	21,000		MK-2	282,000	184,000
4,200		MK-1	145,000	64,000	21,400		MK-2	289,000	191,000
5,000		MK-1	155,000	74,000	21,500		MK-2	289,000	191,000
5,200		MK-1	155,000	74,000	22,000		MK-2	289,000	191,000
5,500		MK-1	161,000	80,000	22,500		MK-2	296,000	198,000
6,000		MK-1	161,000	80,000	23,000		MK-2	296,000	198,000
6,500		MK-1	167,000	86,000	23,250		MK-3	319,000	198,000
6,800		MK-1	174,000	93,000	24,000		MK-3	327,000	206,000
7,800		MK-1	181,000	100,000	24,500		MK-3	327,000	206,000
8,000		MK-1	181,000	100,000	25,000	63/64	MK-3	327,000	206,000
8,200		MK-1	181,000	100,000	25,500		MK-3	335,000	214,000
8,500		MK-1	181,000	100,000	26,000		MK-3	335,000	214,000
9,000		MK-1	188,000	107,000	26,500		MK-3	335,000	214,000
9,900		MK-1	197,000	116,000	27,000		MK-3	343,000	222,000
10,000		MK-1	197,000	116,000	27,500		MK-3	343,000	222,000
10,200		MK-1	197,000	116,000	28,000		MK-3	343,000	222,000
10,500		MK-1	197,000	116,000	29,000		MK-3	351,000	230,000
11,000		MK-1	206,000	125,000	29,500		MK-3	351,000	230,000
11,500		MK-1	206,000	125,000	30,000		MK-3	351,000	230,000
11,800		MK-1	206,000	125,000	31,000		MK-3	360,000	239,000
12,000		MK-1	215,000	134,000	32,000		MK-4	397,000	248,000
12,500		MK-1	215,000	134,000	33,000		MK-4	397,000	248,000
13,000		MK-1	215,000	134,000	34,000		MK-4	406,000	257,000
13,500		MK-1	223,000	142,000	35,000		MK-4	406,000	257,000
13,750		MK-1	223,000	142,000	36,000		MK-4	416,000	267,000
14,000		MK-1	223,000	142,000	37,000		MK-4	416,000	267,000
14,500		MK-2	245,000	147,000	38,000		MK-4	426,000	277,000
14,750		MK-2	245,000	147,000	39,000		MK-4	426,000	277,000
15,000		MK-2	245,000	147,000	39,500		MK-4	426,000	277,000
15,500		MK-2	251,000	153,000	40,000		MK-4	426,000	277,000
15,750		MK-2	251,000	153,000	41,000		MK-4	436,000	287,000
16,000		MK-2	251,000	153,000	42,000		MK-4	436,000	287,000
16,500		MK-2	257,000	159,000	44,000		MK-4	447,000	298,000
17,000		MK-2	257,000	159,000	45,000		MK-4	447,000	298,000
17,250		MK-2	263,000	165,000	48,000		MK-4	470,000	321,000
17,500		MK-2	263,000	165,000	49,000		MK-4	470,000	321,000
18,000		MK-2	263,000	165,000	50,000		MK-4	470,000	321,000
18,750		MK-2	269,000	171,000					
19,000		MK-2	269,000	171,000					
19,500		MK-2	275,000	177,000					
20,000		MK-2	275,000	177,000					
20,500		MK-2	282,000	184,000					

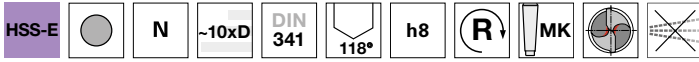


## Brocas espirales cil., largas

Nº artículo 82211

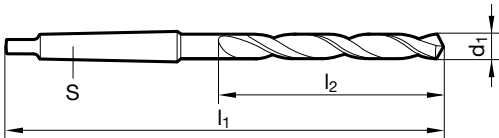


P	M	K	N	S	H
•	○	•	•	○	



vaciado de punta  $\geq \varnothing 5,000$  • entrada cónica • acero rápido al cobalto • más resistencia al desgaste • para taladrar casquillos

aceros aleados y no aleados fundición de dureza sup. a 800 N/mm<sup>2</sup> • aceros para trab. en frío y en caliente • aceros para rodamientos  
• aceros altamente aleados • aceros de cementación, de bonificación



d1 mm	inch	S	l1 mm	l2 mm	d1 mm	inch	S	l1 mm	l2 mm
5,000		MK-1	155,000	74,000	20,000		MK-2	275,000	177,000
6,800		MK-1	174,000	93,000	25,000	63/64	MK-3	327,000	206,000
8,500		MK-1	181,000	100,000	30,000		MK-3	351,000	230,000
10,000		MK-1	197,000	116,000					
10,200		MK-1	197,000	116,000					
11,500		MK-1	206,000	125,000					
12,000		MK-1	215,000	134,000					
13,000		MK-1	215,000	134,000					
14,000		MK-1	223,000	142,000					
14,500		MK-2	245,000	147,000					
16,000		MK-2	251,000	153,000					
18,000		MK-2	263,000	165,000					

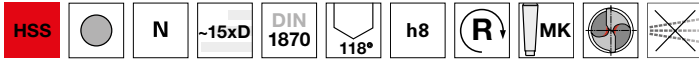


## Brocas espirales, extra largas, serie 1

Nº artículo 82310

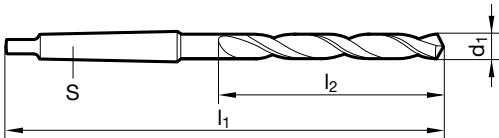


P	M	K	N	S	H
•		•	○		



vaciado de punta  $\geq \varnothing 8,500$  • entrada cónica • para taladros muy profundos

aceros y fundición de aceros (aleados y sin alea) • fundición gris, fundición maleable, fundición esferica • hierro sinterizado y grafito



d1 mm	S	l1 mm	l2 mm	d1 mm	S	l1 mm	l2 mm
8,500	MK-1	265,000	165,000	22,000	MK-2	405,000	270,000
9,000	MK-1	275,000	175,000	22,500	MK-2	405,000	270,000
9,500	MK-1	275,000	175,000	23,000	MK-2	405,000	270,000
10,000	MK-1	285,000	185,000	23,500	MK-3	425,000	270,000
10,200	MK-1	285,000	185,000	24,000	MK-3	440,000	290,000
11,000	MK-1	300,000	195,000	24,500	MK-3	440,000	290,000
11,800	MK-1	300,000	195,000	25,000	MK-3	440,000	290,000
12,500	MK-1	310,000	205,000	26,000	MK-3	440,000	290,000
13,000	MK-1	310,000	205,000	26,500	MK-3	440,000	290,000
14,000	MK-1	325,000	220,000	30,000	MK-3	460,000	305,000
14,500	MK-2	340,000	220,000	30,500	MK-3	480,000	320,000
15,000	MK-2	340,000	220,000	33,000	MK-4	505,000	320,000
15,750	MK-2	355,000	230,000	38,000	MK-4	555,000	360,000
15,800	MK-2	355,000	230,000				
16,000	MK-2	355,000	230,000				
16,250	MK-2	355,000	230,000				
17,000	MK-2	355,000	230,000				
17,500	MK-2	370,000	245,000				
17,750	MK-2	370,000	245,000				
18,000	MK-2	370,000	245,000				
18,500	MK-2	370,000	245,000				
19,000	MK-2	370,000	245,000				
20,000	MK-2	385,000	260,000				
21,000	MK-2	385,000	260,000				

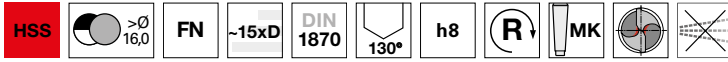


## Brocas espirales, extra largas, serie 1

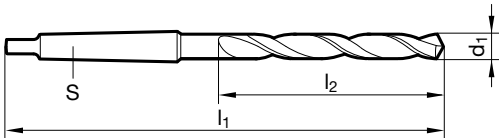
Nº artículo 82340



P	M	K	N	S	H
•		•	•		



vaciado de punta  $\geq \varnothing 8,000$  • entrada cónica • ranuras amplias • para taladros muy profundos • con desalajo de viruta difícil  
fundición gris y aceros hasta máx. 1000 N/mm<sup>2</sup> • Excepción: aceros CrNi, aceros VA y materiales similares



d1 mm	inch	S	l1 mm	l2 mm	d1 mm	inch	S	l1 mm	l2 mm
8,000		MK-1	265,000	165,000	17,500		MK-2	370,000	245,000
8,500		MK-1	265,000	165,000	18,000		MK-2	370,000	245,000
9,000		MK-1	275,000	175,000	19,000		MK-2	370,000	245,000
10,000		MK-1	285,000	185,000	19,500		MK-2	385,000	260,000
10,500		MK-1	285,000	185,000	20,000		MK-2	385,000	260,000
11,000		MK-1	300,000	195,000	20,500		MK-2	385,000	260,000
11,500		MK-1	300,000	195,000	21,000		MK-2	385,000	260,000
12,000		MK-1	310,000	205,000	22,000		MK-2	405,000	270,000
12,500		MK-1	310,000	205,000	23,000		MK-2	405,000	270,000
13,000		MK-1	310,000	205,000	24,000		MK-3	440,000	290,000
13,500		MK-1	325,000	220,000	25,000	63/64	MK-3	440,000	290,000
14,000		MK-1	325,000	220,000	26,000		MK-3	440,000	290,000
14,500		MK-2	340,000	220,000	28,000		MK-3	460,000	305,000
15,000		MK-2	340,000	220,000	29,000		MK-3	460,000	305,000
15,500		MK-2	355,000	230,000	30,000		MK-3	460,000	305,000
16,000		MK-2	355,000	230,000					
16,500		MK-2	355,000	230,000					
17,000		MK-2	355,000	230,000					



## Brocas espirales, extra largas, serie 1

Nº artículo 82341

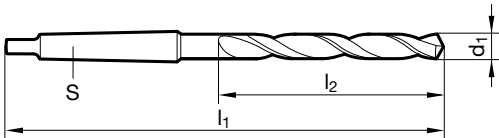


P	M	K	N	S	H
•	•	•	•	•	○



vaciado de punta  $\geq \varnothing 10,000$  • entrada cónica • ranuras amplias • más resistencia al desgaste • acero rápido al cobalto • para taladros muy profundos • con desalajo de viruta difícil

aceros y fundición de acero de gran dureza • fundición gris, fundición maleable, fundición esferica



d1 mm	S	l1 mm	l2 mm	d1 mm	S	l1 mm	l2 mm
10,000	MK-1	285,000	185,000	16,000	MK-2	355,000	230,000
12,000	MK-1	310,000	205,000	16,500	MK-2	355,000	230,000
12,500	MK-1	310,000	205,000	17,000	MK-2	355,000	230,000
13,000	MK-1	310,000	205,000	18,000	MK-2	370,000	245,000
14,000	MK-1	325,000	220,000	19,000	MK-2	370,000	245,000
15,000	MK-2	340,000	220,000	20,000	MK-2	385,000	260,000

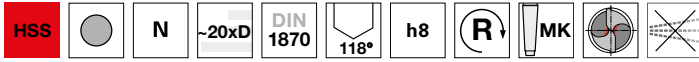


## Brocas espirales, extra largas, serie 2

Nº artículo 82410

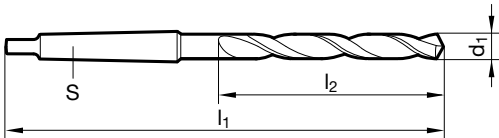


P	M	K	N	S	H
•		•	○		



vaciado de punta  $\geq \varnothing 8,500$  • entrada cónica • para taladros muy profundos

aceros y fundición de aceros (aleados y sin alea) • fundición gris, fundición maleable, fundición esférica • hierro sinterizado y grafito



d1 mm	inch	S	l1 mm	l2 mm	d1 mm	inch	S	l1 mm	l2 mm
8,500		MK-1	330,000	210,000	19,000		MK-2	465,000	310,000
9,000		MK-1	345,000	220,000	20,000		MK-2	490,000	325,000
9,500		MK-1	345,000	220,000	21,000		MK-2	490,000	325,000
10,000		MK-1	360,000	235,000	22,000		MK-2	515,000	345,000
10,500		MK-1	360,000	235,000	23,000		MK-2	515,000	345,000
11,000		MK-1	375,000	250,000	25,000	63/64	MK-3	555,000	365,000
11,750		MK-1	375,000	250,000	28,000		MK-3	580,000	385,000
11,800		MK-1	375,000	250,000	30,000		MK-3	580,000	385,000
13,000		MK-1	395,000	260,000					
13,500		MK-1	410,000	275,000					
14,000		MK-1	410,000	275,000					
14,500		MK-2	425,000	275,000					
15,000		MK-2	425,000	275,000					
15,500		MK-2	445,000	295,000					
15,750		MK-2	445,000	295,000					
16,000		MK-2	445,000	295,000					
16,250		MK-2	445,000	295,000					
18,000		MK-2	465,000	310,000					

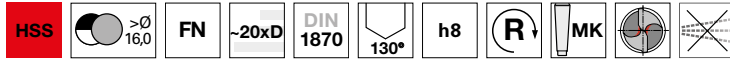


## Brocas espirales, extra largas, serie 2

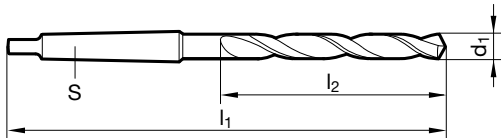
Nº artículo 82440



P	M	K	N	S	H
•		•	•		



vaciado de punta  $\geq \varnothing 8,000$  • entrada cónica • ranuras amplias • para taladros muy profundos • con desalajo de viruta difícil  
fundición gris y aceros hasta máx. 1000 N/mm<sup>2</sup> • Excepción: aceros CrNi, aceros VA y materiales similares



d1 mm	inch	S	l1 mm	l2 mm	d1 mm	inch	S	l1 mm	l2 mm
8,000		MK-1	330,000	210,000	18,000		MK-2	465,000	310,000
8,500		MK-1	330,000	210,000	18,500		MK-2	465,000	310,000
9,500		MK-1	345,000	220,000	19,000		MK-2	465,000	310,000
10,000		MK-1	360,000	235,000	19,500		MK-2	490,000	325,000
10,500		MK-1	360,000	235,000	20,000		MK-2	490,000	325,000
11,000		MK-1	375,000	250,000	20,500		MK-2	490,000	325,000
12,000		MK-1	395,000	260,000	21,000		MK-2	490,000	325,000
12,500		MK-1	395,000	260,000	21,500		MK-2	515,000	345,000
13,000		MK-1	395,000	260,000	22,000		MK-2	515,000	345,000
13,500		MK-1	410,000	275,000	23,000		MK-2	515,000	345,000
14,000		MK-1	410,000	275,000	24,000		MK-3	555,000	365,000
14,500		MK-2	425,000	275,000	25,000	63/64	MK-3	555,000	365,000
15,000		MK-2	425,000	275,000	26,000		MK-3	555,000	365,000
15,500		MK-2	445,000	295,000	28,000		MK-3	580,000	385,000
16,000		MK-2	445,000	295,000	29,000		MK-3	580,000	385,000
16,500		MK-2	445,000	295,000	30,000		MK-3	580,000	385,000
17,000		MK-2	445,000	295,000					
17,500		MK-2	465,000	310,000					



## Brocas espirales, largo especial

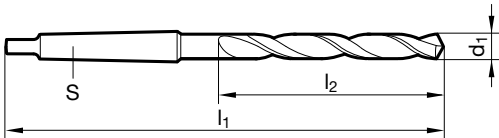
Nº artículo 82466



P	M	K	N	S	H
•		•	•		



vaciado de punta  $\geq \varnothing 8,000$  • entrada cónica • ranuras amplias • para taladros muy profundos • con desalojo de viruta difícil  
fundición gris y aceros hasta máx. 1000 N/mm<sup>2</sup> • Excepción: aceros CrNi, aceros VA y materiales similares



d1 mm	S	l1 mm	l2 mm	d1 mm	S	l1 mm	l2 mm
8,000	MK-1	500,000	420,000	20,000	MK-2	500,000	400,000
8,500	MK-1	500,000	420,000				
9,000	MK-1	500,000	420,000				
10,000	MK-1	500,000	420,000				
12,000	MK-1	500,000	420,000				
13,000	MK-1	500,000	420,000				
14,000	MK-1	500,000	420,000				
15,000	MK-2	500,000	400,000				
16,000	MK-2	500,000	400,000				
17,000	MK-2	500,000	400,000				
18,000	MK-2	500,000	400,000				
19,000	MK-2	500,000	400,000				



## Brocas espirales, largo especial

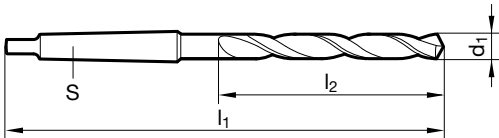
Nº artículo 82467



P	M	K	N	S	H
•		•	•		



vaciado de punta  $\geq \varnothing 14,000$  • entrada cónica • ranuras amplias • para taladros muy profundos • con desalajo de viruta difícil  
fundición gris y aceros hasta máx. 1000 N/mm<sup>2</sup> • Excepción: aceros CrNi, aceros VA y materiales similares



d1 mm	S	l1 mm	l2 mm	d1 mm	S	l1 mm	l2 mm
14,000	MK-1	600,000	500,000	32,000	MK-4	600,000	450,000
15,000	MK-2	600,000	500,000	35,000	MK-4	600,000	450,000
16,000	MK-2	600,000	500,000	38,000	MK-4	600,000	450,000
18,000	MK-2	600,000	500,000				
19,000	MK-2	600,000	500,000				
20,000	MK-2	600,000	500,000				
21,000	MK-2	600,000	500,000				
22,000	MK-2	600,000	500,000				
23,000	MK-2	600,000	500,000				
24,000	MK-3	600,000	475,000				
25,000	MK-3	600,000	475,000				
30,000	MK-3	600,000	475,000				

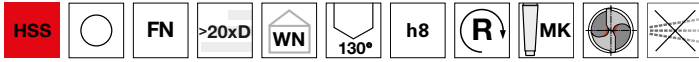


## Brocas espirales, largo especial

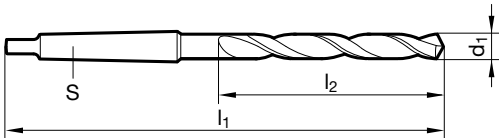
Nº artículo 82468



P	M	K	N	S	H
•		•	•		



vaciado de punta  $\geq \varnothing 14,000$  • entrada cónica • ranuras amplias • para taladros muy profundos • con desalajo de viruta difícil  
fundición gris y aceros hasta máx. 1000 N/mm<sup>2</sup> • Excepción: aceros CrNi, aceros VA y materiales similares



d1 mm	S	l1 mm	l2 mm	d1 mm	S	l1 mm	l2 mm
14,000	MK-1	750,000	650,000				
15,000	MK-2	750,000	650,000				
16,000	MK-2	750,000	650,000				
18,000	MK-2	750,000	650,000				

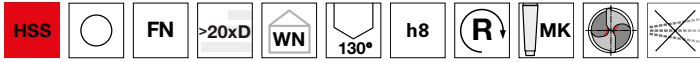


## Brocas espirales, largo especial

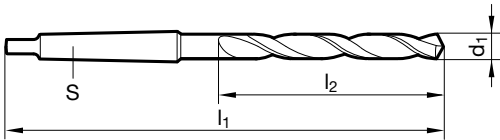
Nº artículo 82469



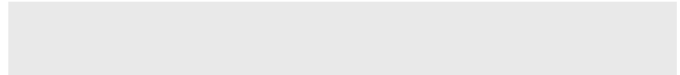
P	M	K	N	S	H
•		•	•		



vaciado de punta  $\geq \varnothing 15,000$  • entrada cónica • ranuras amplias • para taladros muy profundos • con desalajo de viruta difícil  
fundición gris y aceros hasta máx. 1000 N/mm<sup>2</sup> • Excepción: aceros CrNi, aceros VA y materiales similares



d1 mm	S	l1 mm	l2 mm	d1 mm	S	l1 mm	l2 mm
15,000	MK-2	1000,000	850,000				
18,000	MK-2	1000,000	850,000				



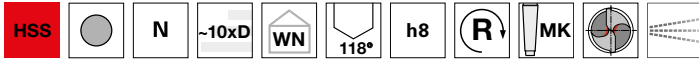


## Brocas de refrigeración, serie larga

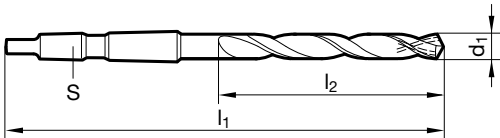
Nº artículo 82521



P	M	K	N	S	H
•	○	•	•	○	



vaciado de punta  $\geq \varnothing 10,000$  • entrada cónica • transmisión de refrigerante axial por el cono morse • para taladrar casquillos paquetes de chapas • aceros y fundición de aceros, fundición gris • aceros austeníticos hasta aprox. 800 N/mm<sup>2</sup>



d1 mm	S	l1 mm	l2 mm	d1 mm	S	l1 mm	l2 mm
10,000	MK-2	233,000	116,000	22,000	MK-3	327,000	191,000
11,000	MK-2	242,000	125,000	23,000	MK-3	334,000	198,000
12,000	MK-2	251,000	134,000	24,000	MK-3	342,000	206,000
13,000	MK-2	251,000	134,000	25,000	MK-3	342,000	206,000
13,200	MK-2	251,000	134,000	26,000	MK-3	350,000	214,000
13,500	MK-2	259,000	142,000	26,500	MK-3	350,000	214,000
13,800	MK-2	259,000	142,000	27,000	MK-4	385,000	222,000
14,000	MK-2	259,000	142,000	28,000	MK-4	385,000	222,000
15,000	MK-2	264,000	147,000	29,000	MK-4	393,000	230,000
16,000	MK-2	270,000	153,000	30,000	MK-4	393,000	230,000
17,000	MK-2	276,000	159,000	32,000	MK-4	421,000	248,000
18,000	MK-2	282,000	165,000	34,000	MK-4	430,000	257,000
18,500	MK-3	307,000	171,000	35,000	MK-4	430,000	257,000
18,750	MK-3	307,000	171,000	40,000	MK-4	450,000	277,000
19,000	MK-3	307,000	171,000				
19,500	MK-3	313,000	177,000				
20,000	MK-3	313,000	177,000				
21,000	MK-3	320,000	184,000				

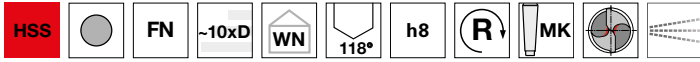


## Brocas de refrigeración, serie larga

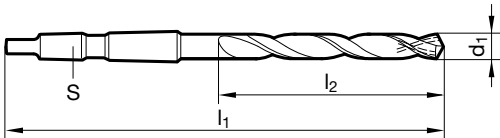
Nº artículo 82535



P	M	K	N	S	H
•	○	•	•		



vaciado de punta  $\geq \varnothing 10,000$  • entrada cónica • transmisión de refrigerante axial por el cono morse • para taladrar casquillos paquetes de chapas • aceros y fundición de aceros, fundición gris • aceros austeníticos hasta aprox. 800 N/mm<sup>2</sup>



d1 mm	S	l1 mm	l2 mm	d1 mm	S	l1 mm	l2 mm
10,000	MK-2	224,000	116,000	18,500	MK-3	303,000	171,000
10,500	MK-2	224,000	116,000	19,000	MK-3	303,000	171,000
11,000	MK-2	233,000	125,000	19,500	MK-3	309,000	177,000
11,500	MK-2	233,000	125,000	20,000	MK-3	309,000	177,000
12,000	MK-2	242,000	134,000				
12,500	MK-2	242,000	134,000				
15,000	MK-2	255,000	147,000				
16,000	MK-2	261,000	153,000				
16,500	MK-2	267,000	159,000				
17,000	MK-2	267,000	159,000				
17,500	MK-2	273,000	165,000				
18,000	MK-2	273,000	165,000				



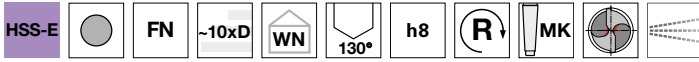


## Brocas de refrigeración, serie larga

Nº artículo 82525

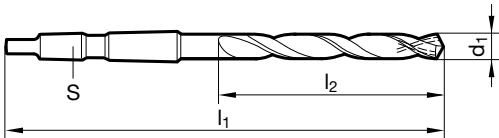


P	M	K	N	S	H
•	•	•	•	•	○



vaciado de punta  $\geq \varnothing 15,000$  • entrada cónica • transmisión de refrigerante axial por el cono morse • acero rápido al cobalto • más resistencia al desgaste • para taladrar casquillos

aceros templados • aceros aleados, fundición gris • aceros inoxidables y resistentes al ácido y al calor • dureza con una resistencia de hasta 1400 N/mm<sup>2</sup>



d1 mm	S	l1 mm	l2 mm	d1 mm	S	l1 mm	l2 mm
15,000	MK-2	264,000	147,000				
17,000	MK-2	276,000	159,000				
18,000	MK-2	282,000	165,000				
21,000	MK-3	320,000	184,000				
22,000	MK-3	327,000	191,000				
32,500	MK-4	421,000	248,000				

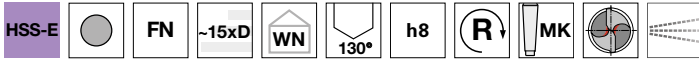


## Brocas de refrigeración, serie extra larga

Nº artículo 82515

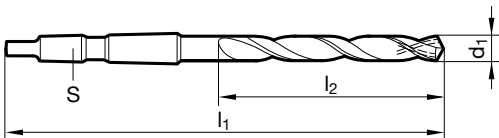


P	M	K	N	S	H
•	•	•	•	•	○



vaciado de punta  $\geq \varnothing 14,000$  • entrada cónica • transmisión de refrigerante axial por el cono morse • acero rápido al cobalto • más resistencia al desgaste • para taladrar casquillos

aceros templados • aceros aleados, fundición gris • aceros inoxidables y resistentes al ácido y al calor • dureza con una resistencia de hasta 1400 N/mm<sup>2</sup>



d1 mm	S	l1 mm	l2 mm	d1 mm	S	l1 mm	l2 mm
14,000	MK-2	337,000	220,000				
16,000	MK-2	347,000	230,000				
18,000	MK-2	362,000	245,000				
20,000	MK-3	396,000	260,000				

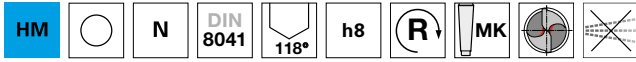


## Brocas espirales, placa MD soldada

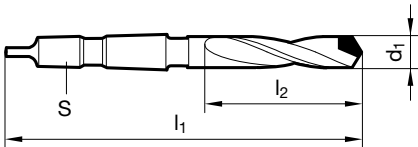
Nº artículo 89302



P	M	K	N	S	H
○		○			○



vaciado de punta  $\geq \varnothing 8,500$  • afilado plano • placa MD soldada  
 acero de muelles • fundición dura con más de 300 HB • molibdeno puro • bronce duro y tenaz



d1 mm	S	l1 mm	l2 mm	d1 mm	S	l1 mm	l2 mm
8,500	MK-1	135,000	45,000	18,000	MK-2	185,000	80,000
10,000	MK-1	140,000	50,000	19,000	MK-2	185,000	80,000
10,200	MK-1	140,000	50,000	20,000	MK-3	215,000	90,000
10,500	MK-1	140,000	50,000	21,500	MK-3	215,000	90,000
11,000	MK-1	140,000	50,000	22,000	MK-3	215,000	90,000
11,500	MK-1	146,000	56,000	25,000	MK-3	225,000	100,000
12,000	MK-1	146,000	56,000	26,500	MK-4	260,000	110,000
12,500	MK-1	146,000	56,000	27,000	MK-4	260,000	110,000
13,000	MK-1	146,000	56,000	29,000	MK-4	275,000	125,000
13,500	MK-2	168,000	63,000	30,000	MK-4	275,000	125,000
14,000	MK-2	168,000	63,000	32,000	MK-4	275,000	125,000
14,500	MK-2	168,000	63,000	33,000	MK-4	290,000	140,000
15,000	MK-2	168,000	63,000	40,000	MK-4	310,000	160,000
15,500	MK-2	175,000	70,000				
16,000	MK-2	175,000	70,000				
16,500	MK-2	175,000	70,000				
17,000	MK-2	175,000	70,000				
17,500	MK-2	185,000	80,000				



## Brocas escariadoras, CM

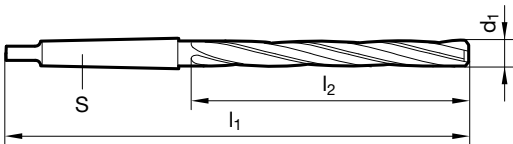
N° artículo 86110



P	M	K	N	S	H
●	○	●	○		



entrada cónica • 3 cortes • estabilidad muy buena • para pretal. de fund./estampados/broca • desvío corregido • excéntrica corregida • mejora calidad superficial del taladro • diámetro de entrada < que el pretaladro para roscar • ten. en cuenta dia. más pequ. d. pretal. "d0" • escariar perfect. después del desbaste



d1 mm	d0 mm	S	l1 mm	l2 mm	d1 mm	d0 mm	S	l1 mm	l2 mm
8,000	5,6	MK-1	156,000	75,000	22,700	16,0	MK-2	253,000	155,000
9,000	6,3	MK-1	162,000	81,000	23,000	16,0	MK-2	253,000	155,000
9,800	7,0	MK-1	168,000	87,000	24,000	16,6	MK-3	281,000	160,000
10,000	7,0	MK-1	168,000	87,000	25,000	17,3	MK-3	281,000	160,000
10,100	7,0	MK-1	168,000	87,000	25,700	18,0	MK-3	286,000	165,000
11,000	7,7	MK-1	175,000	94,000	26,000	18,0	MK-3	286,000	165,000
11,500	7,7	MK-1	175,000	94,000	26,700	18,6	MK-3	291,000	170,000
11,750	8,4	MK-1	182,000	101,000	27,000	18,6	MK-3	291,000	170,000
13,000	9,1	MK-1	182,000	101,000	27,700	19,3	MK-3	291,000	170,000
13,750	9,8	MK-1	189,000	108,000	28,000	19,3	MK-3	291,000	170,000
14,000	9,8	MK-1	189,000	108,000	29,000	20,0	MK-3	296,000	175,000
14,100	10,5	MK-2	212,000	114,000	29,700	20,5	MK-3	296,000	175,000
14,750	10,5	MK-2	212,000	114,000	30,000	20,5	MK-3	296,000	175,000
15,000	10,5	MK-2	212,000	114,000	31,000	21,0	MK-3	301,000	180,000
15,750	11,2	MK-2	218,000	120,000	31,600	22,0	MK-4	334,000	185,000
16,000	11,2	MK-2	218,000	120,000	32,000	22,0	MK-4	334,000	185,000
16,250	11,9	MK-2	223,000	125,000	32,600	23,0	MK-4	334,000	185,000
16,750	11,9	MK-2	223,000	125,000	33,000	23,0	MK-4	334,000	185,000
17,000	11,9	MK-2	223,000	125,000	34,000	24,0	MK-4	339,000	190,000
17,750	12,6	MK-2	228,000	130,000	35,000	25,0	MK-4	339,000	190,000
18,000	12,6	MK-2	228,000	130,000	35,600	25,5	MK-4	344,000	195,000
18,700	13,3	MK-2	233,000	135,000	36,000	25,5	MK-4	344,000	195,000
19,000	13,3	MK-2	233,000	135,000	36,600	26,0	MK-4	344,000	195,000
19,700	14,0	MK-2	238,000	140,000	37,600	26,5	MK-4	349,000	200,000
19,750	14,0	MK-2	238,000	140,000	38,000	26,5	MK-4	349,000	200,000
20,000	14,0	MK-2	238,000	140,000	39,000	27,0	MK-4	349,000	200,000
20,700	14,6	MK-2	243,000	145,000	40,000	28,0	MK-4	349,000	200,000
21,000	14,6	MK-2	243,000	145,000					
21,700	15,3	MK-2	248,000	150,000					
22,000	15,3	MK-2	248,000	150,000					

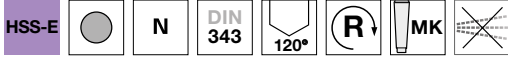


## Brocas escariadoras, CM

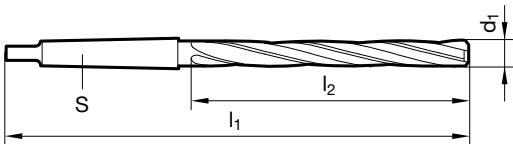
Nº artículo 86111



P	M	K	N	S	H
•	○	•	•	○	



entrada cónica • 3 cortes • estabilidad muy buena • para pretal. de fund./estampados/broca • desvío corregido • excéntrica corregida • mejora calidad superficial del taladro • diámetro de entrada < que el pretaladro para roscar • ten. en cuenta dia. más pequ. d. pretal. "d0" • escariar perfect. después del desbaste



d1 mm	d0 mm	S	l1 mm	l2 mm
12,000	8,400	MK-1	182,000	101,000
14,000	9,800	MK-1	189,000	108,000
22,000	15,300	MK-2	248,000	150,000

d1 mm	d0 mm	S	l1 mm	l2 mm
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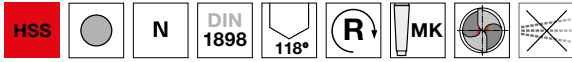


## Brocas para pasadores cónicos

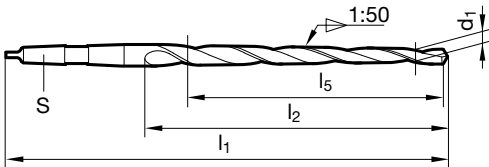
Nº artículo 82810



P	M	K	N	S	H
•	○	•	○		



vaciado de punta  $\geq \varnothing 13,000$  • entrada cónica • para taladros cónicos para pasadores según DIN 1 (nuevo: DIN EN 22339), DIN EN 28736), DIN 7977 (nuevo: DIN EN 28737) y DIN 258



d1 mm	S	l1 mm	l2 mm	l5 mm	d1 mm	S	l1 mm	l2 mm	l5 mm
5,000	MK-1	155,000	81,000	75,000	14,000	MK-2	325,000	229,000	220,000
6,000	MK-1	187,000	108,000	105,000	16,000	MK-2	335,000	239,000	230,000
8,000	MK-1	227,000	149,000	145,000	20,000	MK-3	377,000	263,000	250,000
10,000	MK-1	257,000	180,000	175,000					
12,000	MK-2	315,000	219,000	210,000					
13,000	MK-2	325,000	229,000	220,000					



# HARTNER

Precision Cutting Tools

## Ranura pulida con superficie de la mejor calidad

- ▼ Transporte de virutas óptimo
- ▼ Reducción de las fuerzas de proceso gracias a la reducción de la fricción entre la viruta y la herramienta

## Afilado de punta

- ▼ Afilado al cono con filo cóncavo – rotura de virutas corta
- ▼ Forma de filo robusta con protección de ángulo de corte (fresa negativa)

NEW

## Microgeometría

- ▼ Preparación del filo de corte mediante chorreado en húmedo y pulido
- ▼ Reducción de las fuerzas de corte y las temperaturas de proceso

## Cuatro fases de guía

para una excelente calidad de perforación y un funcionamiento muy silencioso

# TS 100 HPC







# HARTNER

Precision Cutting Tools

Brocas de metal  
duro tipo TS





## BROCAS DE METAL DURO TIPO TS

Herramientas de alta tecnología fabricadas en  
metal duro  
brillante y recubierta











P	M	K	N	S	H	Norma	Tipo	Material de corte	Acabado	Dirección de corte	Forma del mango	Profundidad	d1/mm	Nº artículo	Página
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## TS-Drills sin refrigeración interna









	•	○	•	○	○	DIN 6537K	TS 100 U	MDI		derecha	HE	3xD	3,000 - 19,500	<b>89264</b>	210
	•	○	•	○	○	DIN 6537K	TS 100 U	MDI		derecha	HA	3xD	3,000 - 20,000	<b>89413</b>	212
	•	○	•	○	○	DIN 6537K	TS 100 U	MDI		derecha	HE	3xD	3,000 - 20,000	<b>89402</b>	212
	•	○	○	○	○	DIN 6537K	TS 100 H	MDI		derecha	HA	3xD	3,000 - 20,000	<b>89422</b>	214
	•	○	•	○	○	DIN 6539	TS 100 U	MDI		derecha	cil.	3xD	3,000 - 16,000	<b>89237</b>	216
	•	○	•	○	○	DIN 6539	TS 100 U	MDI		derecha	cil.	3xD	3,000 - 16,000	<b>89401</b>	216
	•	○	•	○	○	DIN 6537L	TS 100 U	MDI		derecha	HA	5xD	3,000 - 20,000	<b>89414</b>	218
	•	○	•	○	○	DIN 6537L	TS 100 U	MDI		derecha	HE	5xD	3,000 - 20,000	<b>89417</b>	218
	•	○	•	○	○	Norma de fáb.	TS 100 U	MDI		derecha	cil.	5xD	5,160 - 16,000	<b>89275</b>	220

## TS-Drills con refrigeración interna

	•	○	○	○	○	DIN 6538K	TS 80 U	placa MD soldada		derecha	HE	3xD	10,000 - 25,000	<b>89306</b>	221
	•	○	•	○	○	DIN 6537K	TS 100 U	MDI		derecha	HE	3xD	3,000 - 20,000	<b>89266</b>	222
	•	○	•	○	○	DIN 6537K	TS 100 U	MDI		derecha	HA	3xD	3,000 - 20,000	<b>89410</b>	223
	•	○	•	○	○	DIN 6537K	TS 100 U	MDI		derecha	HE	3xD	3,000 - 20,000	<b>89415</b>	223

P	M	K	N	S	H	Norma	Tipo	Material de corte	Acabado	Dirección de corte	Forma del mango	Profundidad	d1/mm	Nº artículo	Página
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## TS-Drills con refrigeración interna

	•				○	DIN 6537K	TS 100 H	MDI	Y	derecha	HA	3xD	3,000 - 20,000	89423	225
	•				○	DIN 6537K	TS 100 H	MDI	Y	derecha	HE	3xD	3,000 - 20,000	89424	225
	○	•			○	DIN 6537K	TS 100 INOX	MDI	a	derecha	HA	3xD	3,000 - 20,000	89450	227
	○	•			○	DIN 6537K	TS 100 INOX	MDI	a	derecha	HE	3xD	3,000 - 20,000	89550	227
			•		○	Norma de fáb.	TS 150 GG	MDI	○	derecha	HA	4xD	3,000 - 20,000	89292	229
	•	○	○	○		DIN 6538M	TS 80 U	placa MD soldada	T	derecha	HE	5xD	9,800 - 25,000	89307	230
	•	○	•	○	○	DIN 6537L	TS 100 U	MDI	T	derecha	HE	5xD	3,000 - 19,500	89272	231
	•	○	•	○	○	DIN 6537L	TS 100 U	MDI	F	derecha	HA	5xD	3,000 - 20,000	89411	232
	•	○	•	○	○	DIN 6537L	TS 100 U	MDI	F	derecha	HE	5xD	3,000 - 20,000	89408	232
			•			DIN 6537L	TS 100 R	MDI	F	derecha	HA	5xD	3,000 - 20,000	89420	234
	•				○	DIN 6537L	TS 100 H	MDI	Y	derecha	HA	5xD	3,000 - 20,000	89425	236
	•				○	DIN 6537L	TS 100 H	MDI	Y	derecha	HE	5xD	3,000 - 20,000	89426	236
	○	•			○	DIN 6537L	TS 100 INOX	MDI	a	derecha	HA	5xD	3,000 - 20,000	89451	238
	○	•			○	DIN 6537L	TS 100 INOX	MDI	a	derecha	HE	5xD	3,000 - 20,000	89551	238

P	M	K	N	S	H	Norma	Tipo	Material de corte	Acabado	Dirección de corte	Forma del mango	Profundidad	d1/mm	Nº artículo	Página
			•			DIN 6537L	TS 100 ALU	MDI	○	derecha	HA	5xD	3,000 - 20,000	89560	240
			○	○	○	DIN 6537L	TS 100 HPC	MDI	Ⓡ	derecha	HA	5xD	3,000 - 20,000	89460	242
			○	○	○	DIN 6538L	TS 80 U	placa MD soldada	Ⓡ	derecha	HE	7xD	10,000 - 22,000	89308	244
			○			Norma de fáb.	TS 150 GG	MDI	○	derecha	HA	7xD	3,000 - 20,000	89294	245
			○	○	○	Norma de fáb.	TS 100 U	MDI	Ⓡ	derecha	HA	7xD	3,000 - 20,000	89412	246
			○	○	○	Norma de fáb.	TS 100 U	MDI	Ⓡ	derecha	HE	7xD	3,000 - 20,000	89416	246
			○			Norma de fáb.	TS 100 R	MDI	Ⓡ	derecha	HA	7xD	4,000 - 20,000	89421	248
			○	○	○	Norma de fáb.	TS 100 H	MDI	Ⓡ	derecha	HA	7xD	3,000 - 16,000	89427	250
			○	○	○	Norma de fáb.	TS 100 HPC	MDI	Ⓡ	derecha	HA	7xD	3,000 - 20,000	89461	251
			○			Norma de fáb.	TS 150 GG	MDI	○	derecha	HA	10xD	3,000 - 20,000	89293	253
			○	○		Norma de fáb.	TS 150 GG	MDI	○	derecha	HA	10xD	3,000 - 20,000	89295	253
			○	○	○	Norma de fáb.	TS 100 U	MDI	Ⓡ	derecha	HA	12xD	3,000 - 20,000	89418	255
			○	○	○	Norma de fáb.	TS 100 T	MDI	Ⓡ	derecha	HA	15xD	3,000 - 16,000	86509	257
			○	○	○	Norma de fáb.	TS 100 T	MDI	Ⓡ	derecha	HA	20xD	3,000 - 16,000	86511	258

P	M	K	N	S	H	Norma	Tipo	Material de corte	Acabado	Dirección de corte	Forma del mango	Profundidad	d1/mm	Nº artículo	Página
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## TS-Drills con refrigeración interna



•	•	•	○	○	Norma de fáb.	TS 100 T	<b>MDI</b>	ⓐ	derecha	HA	25xD	3,000 - 16,000	<b>86512</b>	259
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•	•	•	○	○	Norma de fáb.	TS 100 T	<b>MDI</b>	ⓐ	derecha	HA	30xD	3,000 - 14,000	<b>86513</b>	260
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•	•	•	○	○	Norma de fáb.	TS 100 T	<b>MDI</b>	ⓐ	derecha	HA	40xD	3,000 - 10,000	<b>86514</b>	261
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## Brocas-TS, 3 cortes



	•	•			DIN 6537L	TS 3 G	<b>MDI</b>	○	derecha	HA	5xD	3,000 - 20,000	<b>89247</b>	262
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	○	○			DIN 6539	TS 3 G	<b>MDI</b>	○	derecha	cil.	5xD	3,000 - 20,000	<b>89239</b>	263
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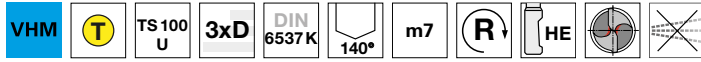


## TS-Drills sin refrigeración interna

Nº artículo 89264

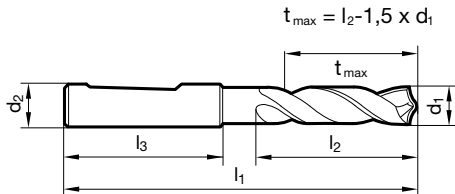


P	M	K	N	S	H
●	○	●	○	○	○



vaciado de punta  $\geq \varnothing 3,000$  • afilado plano • forma recta del corte principal • geometría de corte optimizada

aceros de construcción y de cementación • aceros para tornos automáticos, aceros de bonificación • aceros (aleados/no aleados) hasta 1200 N/mm<sup>2</sup> • fundición • bronce, latón • aleaciones de AlSi altamente aleables



d1		d2 h6	l1	l2	l3	d1		d2 h6	l1	l2	l3
mm	inch	mm	mm	mm	mm	mm	inch	mm	mm	mm	mm
3,000		6,000	62,000	20,000	36,000	7,800		8,000	79,000	41,000	36,000
3,170	1/8	6,000	62,000	20,000	36,000	7,900		8,000	79,000	41,000	36,000
3,200		6,000	62,000	20,000	36,000	8,000		8,000	79,000	41,000	36,000
3,300		6,000	62,000	20,000	36,000	8,100		10,000	89,000	47,000	40,000
3,400		6,000	62,000	20,000	36,000	8,200		10,000	89,000	47,000	40,000
3,500		6,000	62,000	20,000	36,000	8,300		10,000	89,000	47,000	40,000
3,600		6,000	62,000	20,000	36,000	8,400		10,000	89,000	47,000	40,000
3,700		6,000	62,000	20,000	36,000	8,500		10,000	89,000	47,000	40,000
3,900		6,000	66,000	24,000	36,000	8,600		10,000	89,000	47,000	40,000
4,000		6,000	66,000	24,000	36,000	8,700		10,000	89,000	47,000	40,000
4,100		6,000	66,000	24,000	36,000	8,800		10,000	89,000	47,000	40,000
4,200		6,000	66,000	24,000	36,000	8,900		10,000	89,000	47,000	40,000
4,300		6,000	66,000	24,000	36,000	9,000		10,000	89,000	47,000	40,000
4,500		6,000	66,000	24,000	36,000	9,100		10,000	89,000	47,000	40,000
4,600		6,000	66,000	24,000	36,000	9,300		10,000	89,000	47,000	40,000
4,700		6,000	66,000	24,000	36,000	9,400		10,000	89,000	47,000	40,000
4,760	3/16	6,000	66,000	28,000	36,000	9,500		10,000	89,000	47,000	40,000
4,800		6,000	66,000	28,000	36,000	9,600		10,000	89,000	47,000	40,000
4,900		6,000	66,000	28,000	36,000	9,700		10,000	89,000	47,000	40,000
5,000		6,000	66,000	28,000	36,000	9,800		10,000	89,000	47,000	40,000
5,100		6,000	66,000	28,000	36,000	9,900		10,000	89,000	47,000	40,000
5,200		6,000	66,000	28,000	36,000	10,000		10,000	89,000	47,000	40,000
5,300		6,000	66,000	28,000	36,000	10,100		12,000	102,000	55,000	45,000
5,400		6,000	66,000	28,000	36,000	10,200		12,000	102,000	55,000	45,000
5,500		6,000	66,000	28,000	36,000	10,300		12,000	102,000	55,000	45,000
5,560	7/32	6,000	66,000	28,000	36,000	10,500		12,000	102,000	55,000	45,000
5,700		6,000	66,000	28,000	36,000	10,600		12,000	102,000	55,000	45,000
5,800		6,000	66,000	28,000	36,000	10,800		12,000	102,000	55,000	45,000
5,900		6,000	66,000	28,000	36,000	11,000		12,000	102,000	55,000	45,000
6,000		6,000	66,000	28,000	36,000	11,100		12,000	102,000	55,000	45,000
6,100		8,000	79,000	34,000	36,000	11,200		12,000	102,000	55,000	45,000
6,200		8,000	79,000	34,000	36,000	11,400		12,000	102,000	55,000	45,000
6,300		8,000	79,000	34,000	36,000	11,500		12,000	102,000	55,000	45,000
6,400		8,000	79,000	34,000	36,000	11,600		12,000	102,000	55,000	45,000
6,500		8,000	79,000	34,000	36,000	11,700		12,000	102,000	55,000	45,000
6,600		8,000	79,000	34,000	36,000	11,800		12,000	102,000	55,000	45,000
6,800		8,000	79,000	34,000	36,000	11,900		12,000	102,000	55,000	45,000
7,000		8,000	79,000	34,000	36,000	12,000		12,000	102,000	55,000	45,000
7,400		8,000	79,000	41,000	36,000	12,200		14,000	107,000	60,000	45,000
7,500		8,000	79,000	41,000	36,000	12,300	31/64	14,000	107,000	60,000	45,000
7,600		8,000	79,000	41,000	36,000	12,500		14,000	107,000	60,000	45,000
7,700		8,000	79,000	41,000	36,000	13,000		14,000	107,000	60,000	45,000



## TS-Drills sin refrigeración interna

d1 mm	inch	d2 h6 mm	l1 mm	l2 mm	l3 mm	d1 mm	inch	d2 h6 mm	l1 mm	l2 mm	l3 mm
13,200		14,000	107,000	60,000	45,000	16,200		18,000	123,000	73,000	48,000
13,300		14,000	107,000	60,000	45,000	16,300		18,000	123,000	73,000	48,000
13,500		14,000	107,000	60,000	45,000	16,500		18,000	123,000	73,000	48,000
14,000		14,000	107,000	60,000	45,000	17,000		18,000	123,000	73,000	48,000
14,200		16,000	115,000	65,000	48,000	17,500		18,000	123,000	73,000	48,000
14,300		16,000	115,000	65,000	48,000	18,000		18,000	123,000	73,000	48,000
14,500		16,000	115,000	65,000	48,000	19,000		20,000	131,000	79,000	50,000
15,000		16,000	115,000	65,000	48,000	19,200		20,000	131,000	79,000	50,000
15,800		16,000	115,000	65,000	48,000	19,500		20,000	131,000	79,000	50,000
15,870	5/8	16,000	115,000	65,000	48,000						
16,000		16,000	115,000	65,000	48,000						
16,100		18,000	123,000	73,000	48,000						

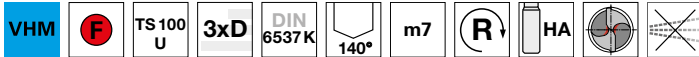


## TS-Drills sin refrigeración interna

### Nº artículo 89413



P	M	K	N	S	H
●	○	●	○	○	○

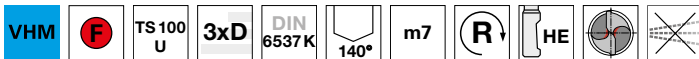


vaciado de punta  $\geq \varnothing 3,000$  • afilado plano • forma recta del corte principal • geometría de corte optimizada  
 aceros de construcción y de cementación • aceros para tornos automáticos, aceros de bonificación • aceros (aleados/no aleados) hasta 1200 N/mm<sup>2</sup> • fundición • bronce, latón • aleaciones de AISi altamente aleables

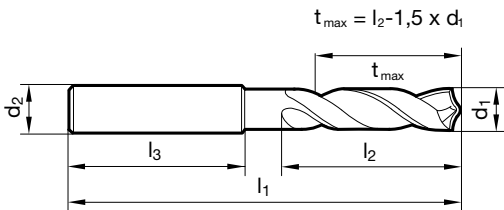
### Nº artículo 89402



P	M	K	N	S	H
●	○	●	○	○	○



vaciado de punta  $\geq \varnothing 3,000$  • afilado plano • forma recta del corte principal • geometría de corte optimizada  
 aceros de construcción y de cementación • aceros para tornos automáticos, aceros de bonificación • aceros (aleados/no aleados) hasta 1200 N/mm<sup>2</sup> • fundición • bronce, latón • aleaciones de AISi altamente aleables



d1 mm	inch	d2 h6 mm	l1 mm	l2 mm	l3 mm	d1 mm	inch	d2 h6 mm	l1 mm	l2 mm	l3 mm
3,000		6,000	62,000	20,000	36,000	4,760	3/16	6,000	66,000	28,000	36,000
3,100		6,000	62,000	20,000	36,000	4,800		6,000	66,000	28,000	36,000
3,170	1/8	6,000	62,000	20,000	36,000	4,900		6,000	66,000	28,000	36,000
3,200		6,000	62,000	20,000	36,000	5,000		6,000	66,000	28,000	36,000
3,250		6,000	62,000	20,000	36,000	5,100		6,000	66,000	28,000	36,000
3,300		6,000	62,000	20,000	36,000	5,160	13/64	6,000	66,000	28,000	36,000
3,400		6,000	62,000	20,000	36,000	5,200		6,000	66,000	28,000	36,000
3,500		6,000	62,000	20,000	36,000	5,300		6,000	66,000	28,000	36,000
3,570	9/64	6,000	62,000	20,000	36,000	5,400		6,000	66,000	28,000	36,000
3,600		6,000	62,000	20,000	36,000	5,500		6,000	66,000	28,000	36,000
3,700		6,000	62,000	20,000	36,000	5,550		6,000	66,000	28,000	36,000
3,800		6,000	66,000	24,000	36,000	5,560	7/32	6,000	66,000	28,000	36,000
3,900		6,000	66,000	24,000	36,000	5,600		6,000	66,000	28,000	36,000
3,970	5/32	6,000	66,000	24,000	36,000	5,700		6,000	66,000	28,000	36,000
4,000		6,000	66,000	24,000	36,000	5,800		6,000	66,000	28,000	36,000
4,100		6,000	66,000	24,000	36,000	5,900		6,000	66,000	28,000	36,000
4,200		6,000	66,000	24,000	36,000	5,950	15/64	6,000	66,000	28,000	36,000
4,300		6,000	66,000	24,000	36,000	6,000		6,000	66,000	28,000	36,000
4,370	11/64	6,000	66,000	24,000	36,000	6,100		8,000	79,000	34,000	36,000
4,400		6,000	66,000	24,000	36,000	6,200		8,000	79,000	34,000	36,000
4,500		6,000	66,000	24,000	36,000	6,300		8,000	79,000	34,000	36,000
4,600		6,000	66,000	24,000	36,000	6,350	1/4	8,000	79,000	34,000	36,000
4,650		6,000	66,000	24,000	36,000	6,400		8,000	79,000	34,000	36,000
4,700		6,000	66,000	24,000	36,000	6,500		8,000	79,000	34,000	36,000





## TS-Drills sin refrigeración interna

d1 mm	inch	d2 h6 mm	l1 mm	l2 mm	l3 mm	d1 mm	inch	d2 h6 mm	l1 mm	l2 mm	l3 mm
6,600		8,000	79,000	34,000	36,000	11,400		12,000	102,000	55,000	45,000
6,700		8,000	79,000	34,000	36,000	11,500		12,000	102,000	55,000	45,000
6,750	17/64	8,000	79,000	34,000	36,000	11,600		12,000	102,000	55,000	45,000
6,800		8,000	79,000	34,000	36,000	11,700		12,000	102,000	55,000	45,000
6,900		8,000	79,000	34,000	36,000	11,800		12,000	102,000	55,000	45,000
7,000		8,000	79,000	34,000	36,000	11,900		12,000	102,000	55,000	45,000
7,100		8,000	79,000	41,000	36,000	11,910	15/32	12,000	102,000	55,000	45,000
7,140	9/32	8,000	79,000	41,000	36,000	12,000		12,000	102,000	55,000	45,000
7,200		8,000	79,000	41,000	36,000	12,100		14,000	107,000	60,000	45,000
7,300		8,000	79,000	41,000	36,000	12,200		14,000	107,000	60,000	45,000
7,400		8,000	79,000	41,000	36,000	12,300	31/64	14,000	107,000	60,000	45,000
7,500		8,000	79,000	41,000	36,000	12,400		14,000	107,000	60,000	45,000
7,540	19/64	8,000	79,000	41,000	36,000	12,500		14,000	107,000	60,000	45,000
7,600		8,000	79,000	41,000	36,000	12,600		14,000	107,000	60,000	45,000
7,700		8,000	79,000	41,000	36,000	12,700	1/2	14,000	107,000	60,000	45,000
7,800		8,000	79,000	41,000	36,000	12,800		14,000	107,000	60,000	45,000
7,900		8,000	79,000	41,000	36,000	12,900		14,000	107,000	60,000	45,000
7,940	5/16	8,000	79,000	41,000	36,000	13,000		14,000	107,000	60,000	45,000
8,000		8,000	79,000	41,000	36,000	13,100	33/64	14,000	107,000	60,000	45,000
8,100		10,000	89,000	47,000	40,000	13,200		14,000	107,000	60,000	45,000
8,200		10,000	89,000	47,000	40,000	13,300		14,000	107,000	60,000	45,000
8,300		10,000	89,000	47,000	40,000	13,500		14,000	107,000	60,000	45,000
8,330	21/64	10,000	89,000	47,000	40,000	13,600		14,000	107,000	60,000	45,000
8,400		10,000	89,000	47,000	40,000	13,700		14,000	107,000	60,000	45,000
8,500		10,000	89,000	47,000	40,000	13,800		14,000	107,000	60,000	45,000
8,600		10,000	89,000	47,000	40,000	13,900		14,000	107,000	60,000	45,000
8,700		10,000	89,000	47,000	40,000	14,000		14,000	107,000	60,000	45,000
8,730	11/32	10,000	89,000	47,000	40,000	14,100		16,000	115,000	65,000	48,000
8,800		10,000	89,000	47,000	40,000	14,200		16,000	115,000	65,000	48,000
8,900		10,000	89,000	47,000	40,000	14,290	9/16	16,000	115,000	65,000	48,000
9,000		10,000	89,000	47,000	40,000	14,300		16,000	115,000	65,000	48,000
9,100		10,000	89,000	47,000	40,000	14,500		16,000	115,000	65,000	48,000
9,130	23/64	10,000	89,000	47,000	40,000	14,700		16,000	115,000	65,000	48,000
9,200		10,000	89,000	47,000	40,000	14,900		16,000	115,000	65,000	48,000
9,250		10,000	89,000	47,000	40,000	15,000		16,000	115,000	65,000	48,000
9,300		10,000	89,000	47,000	40,000	15,100		16,000	115,000	65,000	48,000
9,400		10,000	89,000	47,000	40,000	15,200		16,000	115,000	65,000	48,000
9,500		10,000	89,000	47,000	40,000	15,300		16,000	115,000	65,000	48,000
9,520	3/8	10,000	89,000	47,000	40,000	15,500		16,000	115,000	65,000	48,000
9,600		10,000	89,000	47,000	40,000	15,700		16,000	115,000	65,000	48,000
9,700		10,000	89,000	47,000	40,000	15,800		16,000	115,000	65,000	48,000
9,800		10,000	89,000	47,000	40,000	16,000		16,000	115,000	65,000	48,000
9,900		10,000	89,000	47,000	40,000	16,200		18,000	123,000	73,000	48,000
9,920	25/64	10,000	89,000	47,000	40,000	16,500		18,000	123,000	73,000	48,000
10,000		10,000	89,000	47,000	40,000	17,000		18,000	123,000	73,000	48,000
10,100		12,000	102,000	55,000	45,000	17,500		18,000	123,000	73,000	48,000
10,200		12,000	102,000	55,000	45,000	18,000		18,000	123,000	73,000	48,000
10,300		12,000	102,000	55,000	45,000	18,500		20,000	131,000	79,000	50,000
10,320	13/32	12,000	102,000	55,000	45,000	19,000		20,000	131,000	79,000	50,000
10,400		12,000	102,000	55,000	45,000	19,500		20,000	131,000	79,000	50,000
10,500		12,000	102,000	55,000	45,000	20,000		20,000	131,000	79,000	50,000
10,600		12,000	102,000	55,000	45,000						
10,700		12,000	102,000	55,000	45,000						
10,800		12,000	102,000	55,000	45,000						
10,900		12,000	102,000	55,000	45,000						
11,000		12,000	102,000	55,000	45,000						
11,100		12,000	102,000	55,000	45,000						
11,110	7/16	12,000	102,000	55,000	45,000						
11,200		12,000	102,000	55,000	45,000						
11,300		12,000	102,000	55,000	45,000						

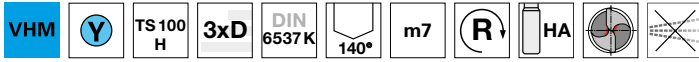


## TS-Drills sin refrigeración interna

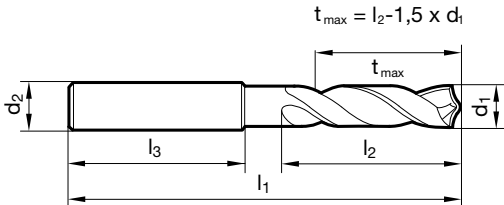
Nº artículo 89422



P	M	K	N	S	H
•				•	○



vaciado de punta  $\geq \varnothing 3,000$  • entrada cónica • forma del corte principal ligeramente cóncava • geometría de corte optimizada  
 aceros aleados y templados hasta a 1400 N/mm<sup>2</sup> • Inconel, Hastelloy, Monel • titanio y aleaciones de titanio



d1		d2 h6	l1	l2	l3	d1		d2 h6	l1	l2	l3
mm	inch	mm	mm	mm	mm	mm	inch	mm	mm	mm	mm
3,000		6,000	62,000	20,000	36,000	6,100		8,000	79,000	34,000	36,000
3,100		6,000	62,000	20,000	36,000	6,200		8,000	79,000	34,000	36,000
3,170	1/8	6,000	62,000	20,000	36,000	6,300		8,000	79,000	34,000	36,000
3,200		6,000	62,000	20,000	36,000	6,350	1/4	8,000	79,000	34,000	36,000
3,250		6,000	62,000	20,000	36,000	6,400		8,000	79,000	34,000	36,000
3,300		6,000	62,000	20,000	36,000	6,500		8,000	79,000	34,000	36,000
3,400		6,000	62,000	20,000	36,000	6,600		8,000	79,000	34,000	36,000
3,500		6,000	62,000	20,000	36,000	6,700		8,000	79,000	34,000	36,000
3,570	9/64	6,000	62,000	20,000	36,000	6,750	17/64	8,000	79,000	34,000	36,000
3,600		6,000	62,000	20,000	36,000	6,800		8,000	79,000	34,000	36,000
3,700		6,000	62,000	20,000	36,000	6,900		8,000	79,000	34,000	36,000
3,800		6,000	66,000	24,000	36,000	7,000		8,000	79,000	34,000	36,000
3,900		6,000	66,000	24,000	36,000	7,100		8,000	79,000	41,000	36,000
3,970	5/32	6,000	66,000	24,000	36,000	7,140	9/32	8,000	79,000	41,000	36,000
4,000		6,000	66,000	24,000	36,000	7,200		8,000	79,000	41,000	36,000
4,100		6,000	66,000	24,000	36,000	7,300		8,000	79,000	41,000	36,000
4,200		6,000	66,000	24,000	36,000	7,400		8,000	79,000	41,000	36,000
4,300		6,000	66,000	24,000	36,000	7,500		8,000	79,000	41,000	36,000
4,370	11/64	6,000	66,000	24,000	36,000	7,540	19/64	8,000	79,000	41,000	36,000
4,400		6,000	66,000	24,000	36,000	7,600		8,000	79,000	41,000	36,000
4,500		6,000	66,000	24,000	36,000	7,700		8,000	79,000	41,000	36,000
4,600		6,000	66,000	24,000	36,000	7,800		8,000	79,000	41,000	36,000
4,650		6,000	66,000	24,000	36,000	7,900		8,000	79,000	41,000	36,000
4,700		6,000	66,000	24,000	36,000	7,940	5/16	8,000	79,000	41,000	36,000
4,760	3/16	6,000	66,000	28,000	36,000	8,000		8,000	79,000	41,000	36,000
4,800		6,000	66,000	28,000	36,000	8,100		10,000	89,000	47,000	40,000
4,900		6,000	66,000	28,000	36,000	8,200		10,000	89,000	47,000	40,000
5,000		6,000	66,000	28,000	36,000	8,300		10,000	89,000	47,000	40,000
5,100		6,000	66,000	28,000	36,000	8,330	21/64	10,000	89,000	47,000	40,000
5,160	13/64	6,000	66,000	28,000	36,000	8,400		10,000	89,000	47,000	40,000
5,200		6,000	66,000	28,000	36,000	8,500		10,000	89,000	47,000	40,000
5,300		6,000	66,000	28,000	36,000	8,600		10,000	89,000	47,000	40,000
5,400		6,000	66,000	28,000	36,000	8,700		10,000	89,000	47,000	40,000
5,500		6,000	66,000	28,000	36,000	8,730	11/32	10,000	89,000	47,000	40,000
5,550		6,000	66,000	28,000	36,000	8,800		10,000	89,000	47,000	40,000
5,560	7/32	6,000	66,000	28,000	36,000	8,900		10,000	89,000	47,000	40,000
5,600		6,000	66,000	28,000	36,000	9,000		10,000	89,000	47,000	40,000
5,700		6,000	66,000	28,000	36,000	9,100		10,000	89,000	47,000	40,000
5,800		6,000	66,000	28,000	36,000	9,130	23/64	10,000	89,000	47,000	40,000
5,900		6,000	66,000	28,000	36,000	9,200		10,000	89,000	47,000	40,000
5,950	15/64	6,000	66,000	28,000	36,000	9,250		10,000	89,000	47,000	40,000
6,000		6,000	66,000	28,000	36,000	9,300		10,000	89,000	47,000	40,000



## TS-Drills sin refrigeración interna

d1 mm	inch	d2 h6 mm	l1 mm	l2 mm	l3 mm	d1 mm	inch	d2 h6 mm	l1 mm	l2 mm	l3 mm
9,400		10,000	89,000	47,000	40,000	13,000		14,000	107,000	60,000	45,000
9,500		10,000	89,000	47,000	40,000	13,300		14,000	107,000	60,000	45,000
9,520	3/8	10,000	89,000	47,000	40,000	13,500		14,000	107,000	60,000	45,000
9,600		10,000	89,000	47,000	40,000	13,700		14,000	107,000	60,000	45,000
9,700		10,000	89,000	47,000	40,000	14,000		14,000	107,000	60,000	45,000
9,800		10,000	89,000	47,000	40,000	14,200		16,000	115,000	65,000	48,000
9,900		10,000	89,000	47,000	40,000	14,290	9/16	16,000	115,000	65,000	48,000
9,920	25/64	10,000	89,000	47,000	40,000	14,300		16,000	115,000	65,000	48,000
10,000		10,000	89,000	47,000	40,000	14,500		16,000	115,000	65,000	48,000
10,100		12,000	102,000	55,000	45,000	14,700		16,000	115,000	65,000	48,000
10,200		12,000	102,000	55,000	45,000	15,000		16,000	115,000	65,000	48,000
10,300		12,000	102,000	55,000	45,000	15,200		16,000	115,000	65,000	48,000
10,320	13/32	12,000	102,000	55,000	45,000	15,300		16,000	115,000	65,000	48,000
10,400		12,000	102,000	55,000	45,000	15,500		16,000	115,000	65,000	48,000
10,500		12,000	102,000	55,000	45,000	15,700		16,000	115,000	65,000	48,000
10,600		12,000	102,000	55,000	45,000	16,000		16,000	115,000	65,000	48,000
10,700		12,000	102,000	55,000	45,000	16,300		18,000	123,000	73,000	48,000
10,800		12,000	102,000	55,000	45,000	16,500		18,000	123,000	73,000	48,000
10,900		12,000	102,000	55,000	45,000	16,900		18,000	123,000	73,000	48,000
11,000		12,000	102,000	55,000	45,000	17,000		18,000	123,000	73,000	48,000
11,100		12,000	102,000	55,000	45,000	17,300		18,000	123,000	73,000	48,000
11,110	7/16	12,000	102,000	55,000	45,000	17,500		18,000	123,000	73,000	48,000
11,200		12,000	102,000	55,000	45,000	18,000		18,000	123,000	73,000	48,000
11,300		12,000	102,000	55,000	45,000	18,500		20,000	131,000	79,000	50,000
11,400		12,000	102,000	55,000	45,000	18,900		20,000	131,000	79,000	50,000
11,500		12,000	102,000	55,000	45,000	19,000		20,000	131,000	79,000	50,000
11,600		12,000	102,000	55,000	45,000	19,050	3/4	20,000	131,000	79,000	50,000
11,700		12,000	102,000	55,000	45,000	19,300		20,000	131,000	79,000	50,000
11,800		12,000	102,000	55,000	45,000	19,500		20,000	131,000	79,000	50,000
11,900		12,000	102,000	55,000	45,000	20,000		20,000	131,000	79,000	50,000
11,910	15/32	12,000	102,000	55,000	45,000						
12,000		12,000	102,000	55,000	45,000						
12,200		14,000	107,000	60,000	45,000						
12,500		14,000	107,000	60,000	45,000						
12,700	1/2	14,000	107,000	60,000	45,000						
12,800		14,000	107,000	60,000	45,000						

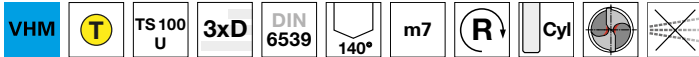


## TS-Drills sin refrigeración interna

### Nº artículo 89237



P	M	K	N	S	H
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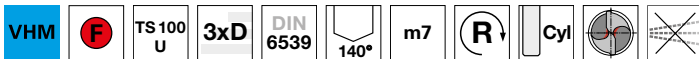


vaciado de punta  $\geq \varnothing 3,000$  • afilado plano • forma recta del corte principal • geometría de corte optimizada  
 aceros de construcción y de cementación • aceros para tornos automáticos, aceros de bonificación • aceros (aleados/no aleados) hasta 1200 N/mm<sup>2</sup> • fundición • bronce, latón • aleaciones de AISi altamente aleables

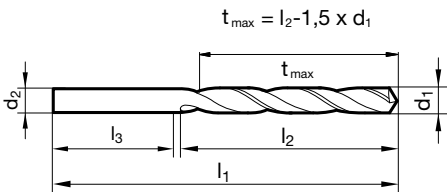
### Nº artículo 89401



P	M	K	N	S	H
●	○	●	○	○	○



vaciado de punta  $\geq \varnothing 3,000$  • afilado plano • forma recta del corte principal • geometría de corte optimizada  
 aceros de construcción y de cementación • aceros para tornos automáticos, aceros de bonificación • aceros (aleados/no aleados) hasta 1200 N/mm<sup>2</sup> • fundición • bronce, latón • aleaciones de AISi altamente aleables



d1	inch	d2 h6	l1	l2	l3	d1	inch	d2 h6	l1	l2	l3
mm		mm	mm	mm	mm	mm		mm	mm	mm	mm
3,000		3,000	46,000	16,000	30,000	6,700		6,700	70,000	31,000	39,000
3,100		3,100	49,000	18,000	31,000	6,800		6,800	74,000	34,000	40,000
3,200		3,200	49,000	18,000	31,000	7,000		7,000	74,000	34,000	40,000
3,300		3,300	49,000	18,000	31,000	7,100		7,100	74,000	34,000	40,000
3,500		3,500	52,000	20,000	32,000	7,140	9/32	7,140	74,000	34,000	40,000
3,600		3,600	52,000	20,000	32,000	7,500		7,500	74,000	34,000	40,000
3,700		3,700	52,000	20,000	32,000	7,800		7,800	79,000	37,000	42,000
3,800		3,800	55,000	22,000	33,000	8,000		8,000	79,000	37,000	42,000
3,900		3,900	55,000	22,000	33,000	8,200		8,200	79,000	37,000	42,000
4,000		4,000	55,000	22,000	33,000	8,400		8,400	79,000	37,000	42,000
4,100		4,100	55,000	22,000	33,000	8,500		8,500	79,000	37,000	42,000
4,200		4,200	55,000	22,000	33,000	8,600		8,600	84,000	40,000	44,000
4,500		4,500	58,000	24,000	34,000	8,700		8,700	84,000	40,000	44,000
5,000		5,000	62,000	26,000	36,000	8,800		8,800	84,000	40,000	44,000
5,100		5,100	62,000	26,000	36,000	9,000		9,000	84,000	40,000	44,000
5,200		5,200	62,000	26,000	36,000	9,500		9,500	84,000	40,000	44,000
5,500		5,500	66,000	28,000	38,000	9,800		9,800	89,000	43,000	46,000
5,600		5,600	66,000	28,000	38,000	10,000		10,000	89,000	43,000	46,000
5,700		5,700	66,000	28,000	38,000	10,100		10,100	89,000	43,000	46,000
5,800		5,800	66,000	28,000	38,000	10,200		10,200	89,000	43,000	46,000
6,000		6,000	66,000	28,000	38,000	10,300		10,300	89,000	43,000	46,000
6,100		6,100	70,000	31,000	39,000	10,500		10,500	89,000	43,000	46,000
6,400		6,400	70,000	31,000	39,000	10,600		10,600	89,000	43,000	46,000
6,500		6,500	70,000	31,000	39,000	10,800		10,800	95,000	47,000	48,000



## TS-Drills sin refrigeración interna

d1 mm	inch	d2 h6 mm	l1 mm	l2 mm	l3 mm	d1 mm	inch	d2 h6 mm	l1 mm	l2 mm	l3 mm
11,000		11,000	95,000	47,000	48,000	15,500		15,500	115,000	58,000	57,000
11,110	7/16	11,110	95,000	47,000	48,000	16,000		16,000	115,000	58,000	57,000
11,500		11,500	95,000	47,000	48,000						
11,800		11,800	95,000	47,000	48,000						
12,000		12,000	102,000	51,000	51,000						
12,500		12,500	102,000	51,000	51,000						
12,700	1/2	12,700	102,000	51,000	51,000						
13,000		13,000	102,000	51,000	51,000						
13,500		13,500	107,000	54,000	53,000						
14,000		14,000	107,000	54,000	53,000						
14,500		14,500	111,000	56,000	55,000						
15,000		15,000	111,000	56,000	55,000						

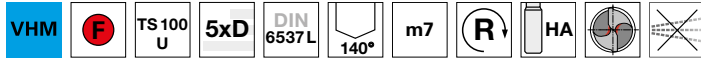


## TS-Drills sin refrigeración interna

### Nº artículo 89414



P	M	K	N	S	H
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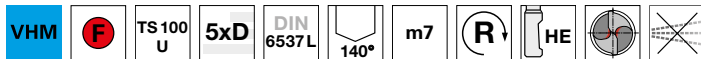


vaciado de punta  $\geq \varnothing 3,000$  • afilado plano • forma recta del corte principal • geometría de corte optimizada  
 aceros de construcción y de cementación • aceros para tornos automáticos, aceros de bonificación • aceros (aleados/no aleados) hasta 1200 N/mm<sup>2</sup> • fundición • bronce, latón • aleaciones de AISi altamente aleables

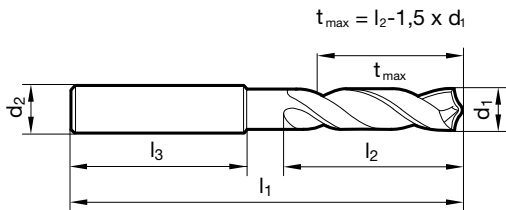
### Nº artículo 89417



P	M	K	N	S	H
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vaciado de punta  $\geq \varnothing 3,000$  • afilado plano • forma recta del corte principal • geometría de corte optimizada  
 aceros de construcción y de cementación • aceros para tornos automáticos, aceros de bonificación • aceros (aleados/no aleados) hasta 1200 N/mm<sup>2</sup> • fundición • bronce, latón • aleaciones de AISi altamente aleables



d1 mm	inch	d2 h6 mm	l1 mm	l2 mm	l3 mm	d1 mm	inch	d2 h6 mm	l1 mm	l2 mm	l3 mm
3,000		6,000	66,000	28,000	36,000	4,760	3/16	6,000	82,000	44,000	36,000
3,100		6,000	66,000	28,000	36,000	4,800		6,000	82,000	44,000	36,000
3,170	1/8	6,000	66,000	28,000	36,000	4,900		6,000	82,000	44,000	36,000
3,200		6,000	66,000	28,000	36,000	5,000		6,000	82,000	44,000	36,000
3,250		6,000	66,000	28,000	36,000	5,100		6,000	82,000	44,000	36,000
3,300		6,000	66,000	28,000	36,000	5,160	13/64	6,000	82,000	44,000	36,000
3,400		6,000	66,000	28,000	36,000	5,200		6,000	82,000	44,000	36,000
3,500		6,000	66,000	28,000	36,000	5,300		6,000	82,000	44,000	36,000
3,570	9/64	6,000	66,000	28,000	36,000	5,400		6,000	82,000	44,000	36,000
3,600		6,000	66,000	28,000	36,000	5,500		6,000	82,000	44,000	36,000
3,700		6,000	66,000	28,000	36,000	5,550		6,000	82,000	44,000	36,000
3,800		6,000	74,000	36,000	36,000	5,560	7/32	6,000	82,000	44,000	36,000
3,900		6,000	74,000	36,000	36,000	5,600		6,000	82,000	44,000	36,000
3,970	5/32	6,000	74,000	36,000	36,000	5,700		6,000	82,000	44,000	36,000
4,000		6,000	74,000	36,000	36,000	5,800		6,000	82,000	44,000	36,000
4,100		6,000	74,000	36,000	36,000	5,900		6,000	82,000	44,000	36,000
4,200		6,000	74,000	36,000	36,000	5,950	15/64	6,000	82,000	44,000	36,000
4,300		6,000	74,000	36,000	36,000	6,000		6,000	82,000	44,000	36,000
4,370	11/64	6,000	74,000	36,000	36,000	6,100		8,000	91,000	53,000	36,000
4,400		6,000	74,000	36,000	36,000	6,200		8,000	91,000	53,000	36,000
4,500		6,000	74,000	36,000	36,000	6,300		8,000	91,000	53,000	36,000
4,600		6,000	74,000	36,000	36,000	6,350	1/4	8,000	91,000	53,000	36,000
4,650		6,000	74,000	36,000	36,000	6,400		8,000	91,000	53,000	36,000
4,700		6,000	74,000	36,000	36,000	6,500		8,000	91,000	53,000	36,000



## TS-Drills sin refrigeración interna

d1 mm	inch	d2 h6 mm	l1 mm	l2 mm	l3 mm	d1 mm	inch	d2 h6 mm	l1 mm	l2 mm	l3 mm
6,600		8,000	91,000	53,000	36,000	10,900		12,000	118,000	71,000	45,000
6,700		8,000	91,000	53,000	36,000	11,000		12,000	118,000	71,000	45,000
6,750	17/64	8,000	91,000	53,000	36,000	11,100		12,000	118,000	71,000	45,000
6,800		8,000	91,000	53,000	36,000	11,110	7/16	12,000	118,000	71,000	45,000
6,900		8,000	91,000	53,000	36,000	11,200		12,000	118,000	71,000	45,000
7,000		8,000	91,000	53,000	36,000	11,300		12,000	118,000	71,000	45,000
7,100		8,000	91,000	53,000	36,000	11,400		12,000	118,000	71,000	45,000
7,140	9/32	8,000	91,000	53,000	36,000	11,500		12,000	118,000	71,000	45,000
7,200		8,000	91,000	53,000	36,000	11,600		12,000	118,000	71,000	45,000
7,300		8,000	91,000	53,000	36,000	11,700		12,000	118,000	71,000	45,000
7,400		8,000	91,000	53,000	36,000	11,800		12,000	118,000	71,000	45,000
7,500		8,000	91,000	53,000	36,000	11,900		12,000	118,000	71,000	45,000
7,540	19/64	8,000	91,000	53,000	36,000	11,910	15/32	12,000	118,000	71,000	45,000
7,600		8,000	91,000	53,000	36,000	12,000		12,000	118,000	71,000	45,000
7,700		8,000	91,000	53,000	36,000	12,100		14,000	124,000	77,000	45,000
7,800		8,000	91,000	53,000	36,000	12,200		14,000	124,000	77,000	45,000
7,900		8,000	91,000	53,000	36,000	12,500		14,000	124,000	77,000	45,000
7,940	5/16	8,000	91,000	53,000	36,000	12,700	1/2	14,000	124,000	77,000	45,000
8,000		8,000	91,000	53,000	36,000	13,000		14,000	124,000	77,000	45,000
8,100		10,000	103,000	61,000	40,000	13,100	33/64	14,000	124,000	77,000	45,000
8,200		10,000	103,000	61,000	40,000	13,500		14,000	124,000	77,000	45,000
8,300		10,000	103,000	61,000	40,000	13,700		14,000	124,000	77,000	45,000
8,330	21/64	10,000	103,000	61,000	40,000	13,800		14,000	124,000	77,000	45,000
8,400		10,000	103,000	61,000	40,000	14,000		14,000	124,000	77,000	45,000
8,500		10,000	103,000	61,000	40,000	14,100		16,000	133,000	83,000	48,000
8,600		10,000	103,000	61,000	40,000	14,200		16,000	133,000	83,000	48,000
8,700		10,000	103,000	61,000	40,000	14,290	9/16	16,000	133,000	83,000	48,000
8,730	11/32	10,000	103,000	61,000	40,000	14,500		16,000	133,000	83,000	48,000
8,800		10,000	103,000	61,000	40,000	14,700		16,000	133,000	83,000	48,000
8,900		10,000	103,000	61,000	40,000	15,000		16,000	133,000	83,000	48,000
9,000		10,000	103,000	61,000	40,000	15,100		16,000	133,000	83,000	48,000
9,100		10,000	103,000	61,000	40,000	15,200		16,000	133,000	83,000	48,000
9,130	23/64	10,000	103,000	61,000	40,000	15,500		16,000	133,000	83,000	48,000
9,200		10,000	103,000	61,000	40,000	15,700		16,000	133,000	83,000	48,000
9,250		10,000	103,000	61,000	40,000	16,000		16,000	133,000	83,000	48,000
9,300		10,000	103,000	61,000	40,000	16,500		18,000	143,000	93,000	48,000
9,400		10,000	103,000	61,000	40,000	17,000		18,000	143,000	93,000	48,000
9,500		10,000	103,000	61,000	40,000	17,500		18,000	143,000	93,000	48,000
9,520	3/8	10,000	103,000	61,000	40,000	18,000		18,000	143,000	93,000	48,000
9,600		10,000	103,000	61,000	40,000	18,500		20,000	153,000	101,000	50,000
9,700		10,000	103,000	61,000	40,000	19,000		20,000	153,000	101,000	50,000
9,800		10,000	103,000	61,000	40,000	19,500		20,000	153,000	101,000	50,000
9,900		10,000	103,000	61,000	40,000	20,000		20,000	153,000	101,000	50,000
9,920	25/64	10,000	103,000	61,000	40,000						
10,000		10,000	103,000	61,000	40,000						
10,100		12,000	118,000	71,000	45,000						
10,200		12,000	118,000	71,000	45,000						
10,300		12,000	118,000	71,000	45,000						
10,320	13/32	12,000	118,000	71,000	45,000						
10,400		12,000	118,000	71,000	45,000						
10,500		12,000	118,000	71,000	45,000						
10,600		12,000	118,000	71,000	45,000						
10,700		12,000	118,000	71,000	45,000						
10,800		12,000	118,000	71,000	45,000						

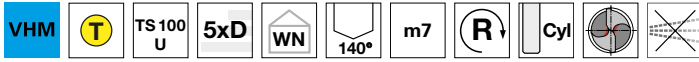


## TS-Drills sin refrigeración interna

Nº artículo 89275

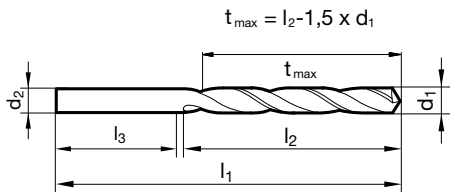


P	M	K	N	S	H
●	○	●	○	○	○



vaciado de punta  $\geq \varnothing 5,000$  • afilado plano • forma recta del corte principal • geometría de corte optimizada

aceros de construcción y de cementación • aceros para tornos automáticos, aceros de bonificación • aceros (aleados/no aleados) hasta 1200 N/mm<sup>2</sup> • fundición • bronce, latón • aleaciones de AlSi altamente aleables



d1		d2 h6	l1	l2	l3	d1		d2 h6	l1	l2	l3
mm	inch	mm	mm	mm	mm	mm	inch	mm	mm	mm	mm
5,160	13/64	5,160	76,000	38,000	38,000	9,520	3/8	9,520	105,000	60,000	45,000
5,560	7/32	5,560	81,000	41,000	40,000	9,800		9,800	105,000	60,000	45,000
5,700		5,700	81,000	41,000	40,000	10,000		10,000	105,000	60,000	45,000
5,800		5,800	81,000	41,000	40,000	10,200		10,200	112,000	66,000	46,000
6,350	1/4	6,350	81,000	41,000	40,000	10,300		10,300	112,000	66,000	46,000
6,400		6,400	81,000	41,000	40,000	10,320	13/32	10,320	112,000	66,000	46,000
6,500		6,500	81,000	41,000	40,000	10,500		10,500	112,000	66,000	46,000
6,750	17/64	6,750	83,000	43,000	40,000	10,720	27/64	10,720	114,000	68,000	46,000
6,800		6,800	83,000	43,000	40,000	10,800		10,800	114,000	68,000	46,000
7,000		7,000	83,000	43,000	40,000	11,110	7/16	11,110	118,000	71,000	47,000
7,500		7,500	87,000	45,000	42,000	11,500		11,500	118,000	71,000	47,000
7,800		7,800	90,000	48,000	42,000	11,800		11,800	121,000	73,000	48,000
7,940	5/16	7,940	90,000	48,000	42,000	11,910	15/32	11,910	121,000	73,000	48,000
8,000		8,000	90,000	48,000	42,000	12,000		12,000	121,000	73,000	48,000
8,100		8,100	96,000	53,000	43,000	12,700	1/2	12,700	137,000	78,000	59,000
8,330	21/64	8,330	96,000	53,000	43,000	13,000		13,000	137,000	78,000	59,000
8,400		8,400	96,000	53,000	43,000	13,500		13,500	144,000	84,000	60,000
8,500		8,500	96,000	53,000	43,000	14,000		14,000	147,000	86,000	61,000
8,600		8,600	98,000	55,000	43,000	14,500		14,500	151,000	89,000	62,000
8,730	11/32	8,730	98,000	55,000	43,000	15,000		15,000	153,000	91,000	62,000
8,800		8,800	98,000	55,000	43,000	15,500		15,500	157,000	94,000	63,000
9,000		9,000	98,000	55,000	43,000	16,000		16,000	160,000	96,000	64,000
9,130	23/64	9,130	102,000	58,000	44,000						
9,500		9,500	102,000	58,000	44,000						



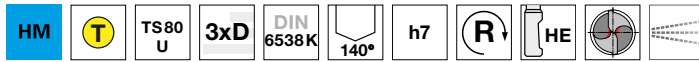


## TS-Drills con refrigeración interna

Nº artículo 89306

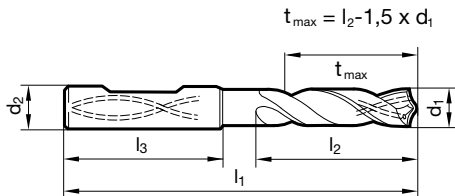


P	M	K	N	S	H
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vaciado de punta  $\geq \varnothing 10,000$  • entrada cónica • amortigua oscilaciones y golpes • portaherr. HSS con plaquita HM soldada • afilado plano • placa MD soldada • con arrastre según DIN 1809

aceros no aleados y de baja aleación • fundición gris, fundición de grafito • latón, bronce, plásticos y grafitos



d1 mm	d2 h6 mm	l1 mm	l2 mm	l3 mm	d1 mm	d2 h6 mm	l1 mm	l2 mm	l3 mm
10,000	16,000	103,000	51,000	48,000	17,500	20,000	130,000	76,000	50,000
10,500	16,000	103,000	51,000	48,000	18,500	25,000	144,000	84,000	56,000
10,600	16,000	103,000	51,000	48,000	19,000	25,000	144,000	84,000	56,000
11,000	16,000	103,000	51,000	48,000	19,100	25,000	144,000	84,000	56,000
12,000	16,000	103,000	51,000	48,000	19,700	25,000	144,000	84,000	56,000
12,200	16,000	111,000	59,000	48,000	20,000	25,000	144,000	84,000	56,000
12,500	16,000	111,000	59,000	48,000	20,500	25,000	153,000	93,000	56,000
13,000	16,000	111,000	59,000	48,000	21,000	25,000	153,000	93,000	56,000
13,700	16,000	111,000	59,000	48,000	21,500	25,000	153,000	93,000	56,000
14,000	16,000	111,000	59,000	48,000	22,000	25,000	153,000	93,000	56,000
14,200	20,000	122,000	68,000	50,000	22,500	25,000	161,000	101,000	56,000
14,500	20,000	122,000	68,000	50,000	23,500	25,000	161,000	101,000	56,000
14,600	20,000	122,000	68,000	50,000	25,000	32,000	174,000	110,000	60,000
15,000	20,000	122,000	68,000	50,000					
15,300	20,000	122,000	68,000	50,000					
16,000	20,000	122,000	68,000	50,000					
16,500	20,000	130,000	76,000	50,000					
17,000	20,000	130,000	76,000	50,000					



## TS-Drills con refrigeración interna

Nº artículo 89266

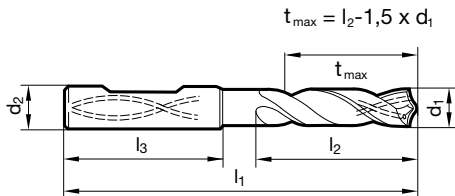


P	M	K	N	S	H
●	○	●	○	○	○



vaciado de punta  $\geq \varnothing 4,000$  • afilado plano • forma recta del corte principal • geometría de corte optimizada

aceros de construcción y de cementación • aceros para tornos automáticos, aceros de bonificación • aceros (aleados/no aleados) hasta 1200 N/mm<sup>2</sup> • fundición • bronce, latón • aleaciones de AlSi altamente aleables



d1		d2 h6	l1	l2	l3	d1		d2 h6	l1	l2	l3
mm	inch	mm	mm	mm	mm	mm	inch	mm	mm	mm	mm
3,000		6,000	62,000	20,000	36,000	9,300		10,000	89,000	47,000	40,000
3,100		6,000	62,000	20,000	36,000	9,500		10,000	89,000	47,000	40,000
3,200		6,000	62,000	20,000	36,000	9,700		10,000	89,000	47,000	40,000
3,300		6,000	62,000	20,000	36,000	9,800		10,000	89,000	47,000	40,000
3,400		6,000	62,000	20,000	36,000	10,000		10,000	89,000	47,000	40,000
3,500		6,000	62,000	20,000	36,000	10,200		12,000	102,000	55,000	45,000
3,600		6,000	62,000	20,000	36,000	10,300		12,000	102,000	55,000	45,000
3,700		6,000	62,000	20,000	36,000	10,500		12,000	102,000	55,000	45,000
3,800		6,000	66,000	24,000	36,000	10,700		12,000	102,000	55,000	45,000
4,000		6,000	66,000	24,000	36,000	10,800		12,000	102,000	55,000	45,000
4,200		6,000	66,000	24,000	36,000	11,000		12,000	102,000	55,000	45,000
4,500		6,000	66,000	24,000	36,000	11,100		12,000	102,000	55,000	45,000
4,800		6,000	66,000	28,000	36,000	11,500		12,000	102,000	55,000	45,000
5,000		6,000	66,000	28,000	36,000	11,700		12,000	102,000	55,000	45,000
5,100		6,000	66,000	28,000	36,000	11,800		12,000	102,000	55,000	45,000
5,200		6,000	66,000	28,000	36,000	12,000		12,000	102,000	55,000	45,000
5,500		6,000	66,000	28,000	36,000	12,100		14,000	107,000	60,000	45,000
5,800		6,000	66,000	28,000	36,000	12,300	31/64	14,000	107,000	60,000	45,000
6,000		6,000	66,000	28,000	36,000	12,500		14,000	107,000	60,000	45,000
6,400		8,000	79,000	34,000	36,000	13,000		14,000	107,000	60,000	45,000
6,500		8,000	79,000	34,000	36,000	13,500		14,000	107,000	60,000	45,000
6,600		8,000	79,000	34,000	36,000	14,000		14,000	107,000	60,000	45,000
6,800		8,000	79,000	34,000	36,000	14,500		16,000	115,000	65,000	48,000
6,900		8,000	79,000	34,000	36,000	15,200		16,000	115,000	65,000	48,000
7,000		8,000	79,000	34,000	36,000	15,500		16,000	115,000	65,000	48,000
7,400		8,000	79,000	41,000	36,000	16,000		16,000	115,000	65,000	48,000
7,500		8,000	79,000	41,000	36,000	16,500		18,000	123,000	73,000	48,000
7,800		8,000	79,000	41,000	36,000	17,500		18,000	123,000	73,000	48,000
8,000		8,000	79,000	41,000	36,000	18,000		18,000	123,000	73,000	48,000
8,100		10,000	89,000	47,000	40,000	18,500		20,000	131,000	79,000	50,000
8,400		10,000	89,000	47,000	40,000	19,000		20,000	131,000	79,000	50,000
8,500		10,000	89,000	47,000	40,000	20,000		20,000	131,000	79,000	50,000
8,600		10,000	89,000	47,000	40,000						
8,700		10,000	89,000	47,000	40,000						
8,800		10,000	89,000	47,000	40,000						
9,000		10,000	89,000	47,000	40,000						

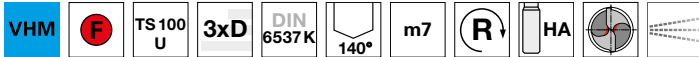


## TS-Drills con refrigeración interna

### Nº artículo 89410



P	M	K	N	S	H
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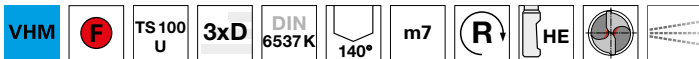


vaciado de punta  $\geq \varnothing 3,000$  • afilado plano • forma recta del corte principal • geometría de corte optimizada  
 aceros de construcción y de cementación • aceros para tornos automáticos, aceros de bonificación • aceros (aleados/no aleados) hasta 1200 N/mm<sup>2</sup> • fundición • bronce, latón • aleaciones de AISi altamente aleables

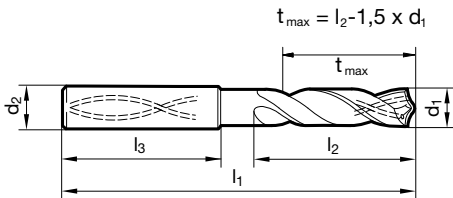
### Nº artículo 89415



P	M	K	N	S	H
●	○	●	○	○	○



vaciado de punta  $\geq \varnothing 3,000$  • afilado plano • forma recta del corte principal • geometría de corte optimizada  
 aceros de construcción y de cementación • aceros para tornos automáticos, aceros de bonificación • aceros (aleados/no aleados) hasta 1200 N/mm<sup>2</sup> • fundición • bronce, latón • aleaciones de AISi altamente aleables



d1 mm	inch	d2 h6 mm	l1 mm	l2 mm	l3 mm	d1 mm	inch	d2 h6 mm	l1 mm	l2 mm	l3 mm
3,000		6,000	62,000	20,000	36,000	4,760	3/16	6,000	66,000	28,000	36,000
3,100		6,000	62,000	20,000	36,000	4,800		6,000	66,000	28,000	36,000
3,170	1/8	6,000	62,000	20,000	36,000	4,900		6,000	66,000	28,000	36,000
3,200		6,000	62,000	20,000	36,000	5,000		6,000	66,000	28,000	36,000
3,250		6,000	62,000	20,000	36,000	5,100		6,000	66,000	28,000	36,000
3,300		6,000	62,000	20,000	36,000	5,160	13/64	6,000	66,000	28,000	36,000
3,400		6,000	62,000	20,000	36,000	5,200		6,000	66,000	28,000	36,000
3,500		6,000	62,000	20,000	36,000	5,300		6,000	66,000	28,000	36,000
3,570	9/64	6,000	62,000	20,000	36,000	5,400		6,000	66,000	28,000	36,000
3,600		6,000	62,000	20,000	36,000	5,500		6,000	66,000	28,000	36,000
3,700		6,000	62,000	20,000	36,000	5,550		6,000	66,000	28,000	36,000
3,800		6,000	66,000	24,000	36,000	5,560	7/32	6,000	66,000	28,000	36,000
3,900		6,000	66,000	24,000	36,000	5,600		6,000	66,000	28,000	36,000
3,970	5/32	6,000	66,000	24,000	36,000	5,700		6,000	66,000	28,000	36,000
4,000		6,000	66,000	24,000	36,000	5,800		6,000	66,000	28,000	36,000
4,100		6,000	66,000	24,000	36,000	5,900		6,000	66,000	28,000	36,000
4,200		6,000	66,000	24,000	36,000	5,950	15/64	6,000	66,000	28,000	36,000
4,300		6,000	66,000	24,000	36,000	6,000		6,000	66,000	28,000	36,000
4,370	11/64	6,000	66,000	24,000	36,000	6,100		8,000	79,000	34,000	36,000
4,400		6,000	66,000	24,000	36,000	6,200		8,000	79,000	34,000	36,000
4,500		6,000	66,000	24,000	36,000	6,300		8,000	79,000	34,000	36,000
4,600		6,000	66,000	24,000	36,000	6,350	1/4	8,000	79,000	34,000	36,000
4,650		6,000	66,000	24,000	36,000	6,400		8,000	79,000	34,000	36,000
4,700		6,000	66,000	24,000	36,000	6,500		8,000	79,000	34,000	36,000



## TS-Drills con refrigeración interna

d1 mm	inch	d2 h6 mm	l1 mm	l2 mm	l3 mm	d1 mm	inch	d2 h6 mm	l1 mm	l2 mm	l3 mm
6,600		8,000	79,000	34,000	36,000	10,900		12,000	102,000	55,000	45,000
6,700		8,000	79,000	34,000	36,000	11,000		12,000	102,000	55,000	45,000
6,750	17/64	8,000	79,000	34,000	36,000	11,100		12,000	102,000	55,000	45,000
6,800		8,000	79,000	34,000	36,000	11,110	7/16	12,000	102,000	55,000	45,000
6,900		8,000	79,000	34,000	36,000	11,200		12,000	102,000	55,000	45,000
7,000		8,000	79,000	34,000	36,000	11,300		12,000	102,000	55,000	45,000
7,100		8,000	79,000	41,000	36,000	11,400		12,000	102,000	55,000	45,000
7,140	9/32	8,000	79,000	41,000	36,000	11,500		12,000	102,000	55,000	45,000
7,200		8,000	79,000	41,000	36,000	11,600		12,000	102,000	55,000	45,000
7,300		8,000	79,000	41,000	36,000	11,700		12,000	102,000	55,000	45,000
7,400		8,000	79,000	41,000	36,000	11,800		12,000	102,000	55,000	45,000
7,500		8,000	79,000	41,000	36,000	11,900		12,000	102,000	55,000	45,000
7,540	19/64	8,000	79,000	41,000	36,000	11,910	15/32	12,000	102,000	55,000	45,000
7,600		8,000	79,000	41,000	36,000	12,000		12,000	102,000	55,000	45,000
7,700		8,000	79,000	41,000	36,000	12,100		14,000	107,000	60,000	45,000
7,800		8,000	79,000	41,000	36,000	12,200		14,000	107,000	60,000	45,000
7,900		8,000	79,000	41,000	36,000	12,300	31/64	14,000	107,000	60,000	45,000
7,940	5/16	8,000	79,000	41,000	36,000	12,500		14,000	107,000	60,000	45,000
8,000		8,000	79,000	41,000	36,000	12,700	1/2	14,000	107,000	60,000	45,000
8,100		10,000	89,000	47,000	40,000	13,000		14,000	107,000	60,000	45,000
8,200		10,000	89,000	47,000	40,000	13,100	33/64	14,000	107,000	60,000	45,000
8,300		10,000	89,000	47,000	40,000	13,200		14,000	107,000	60,000	45,000
8,330	21/64	10,000	89,000	47,000	40,000	13,300		14,000	107,000	60,000	45,000
8,400		10,000	89,000	47,000	40,000	13,500		14,000	107,000	60,000	45,000
8,500		10,000	89,000	47,000	40,000	13,700		14,000	107,000	60,000	45,000
8,600		10,000	89,000	47,000	40,000	14,000		14,000	107,000	60,000	45,000
8,700		10,000	89,000	47,000	40,000	14,100		16,000	115,000	65,000	48,000
8,730	11/32	10,000	89,000	47,000	40,000	14,200		16,000	115,000	65,000	48,000
8,800		10,000	89,000	47,000	40,000	14,290	9/16	16,000	115,000	65,000	48,000
8,900		10,000	89,000	47,000	40,000	14,400		16,000	115,000	65,000	48,000
9,000		10,000	89,000	47,000	40,000	14,500		16,000	115,000	65,000	48,000
9,100		10,000	89,000	47,000	40,000	14,600		16,000	115,000	65,000	48,000
9,130	23/64	10,000	89,000	47,000	40,000	14,700		16,000	115,000	65,000	48,000
9,200		10,000	89,000	47,000	40,000	15,000		16,000	115,000	65,000	48,000
9,250		10,000	89,000	47,000	40,000	15,200		16,000	115,000	65,000	48,000
9,300		10,000	89,000	47,000	40,000	15,500		16,000	115,000	65,000	48,000
9,400		10,000	89,000	47,000	40,000	15,700		16,000	115,000	65,000	48,000
9,500		10,000	89,000	47,000	40,000	16,000		16,000	115,000	65,000	48,000
9,520	3/8	10,000	89,000	47,000	40,000	16,100		18,000	123,000	73,000	48,000
9,600		10,000	89,000	47,000	40,000	16,500		18,000	123,000	73,000	48,000
9,700		10,000	89,000	47,000	40,000	16,900		18,000	123,000	73,000	48,000
9,800		10,000	89,000	47,000	40,000	17,000		18,000	123,000	73,000	48,000
9,900		10,000	89,000	47,000	40,000	17,300		18,000	123,000	73,000	48,000
9,920	25/64	10,000	89,000	47,000	40,000	17,500		18,000	123,000	73,000	48,000
10,000		10,000	89,000	47,000	40,000	17,700		18,000	123,000	73,000	48,000
10,100		12,000	102,000	55,000	45,000	18,000		18,000	123,000	73,000	48,000
10,200		12,000	102,000	55,000	45,000	18,500		20,000	131,000	79,000	50,000
10,300		12,000	102,000	55,000	45,000	18,900		20,000	131,000	79,000	50,000
10,320	13/32	12,000	102,000	55,000	45,000	19,000		20,000	131,000	79,000	50,000
10,400		12,000	102,000	55,000	45,000	19,500		20,000	131,000	79,000	50,000
10,500		12,000	102,000	55,000	45,000	20,000		20,000	131,000	79,000	50,000
10,600		12,000	102,000	55,000	45,000						
10,700		12,000	102,000	55,000	45,000						
10,800		12,000	102,000	55,000	45,000						

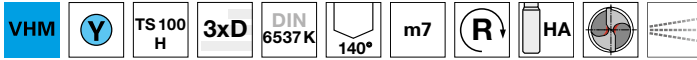


## TS-Drills con refrigeración interna

### Nº artículo 89423



P	M	K	N	S	H
•				•	○

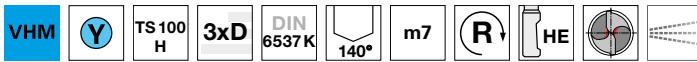


vaciado de punta  $\geq \varnothing 3,000$  • entrada cónica • forma del corte principal ligeramente cóncava • geometría de corte optimizada  
aceros aleados y templados hasta a 1400 N/mm<sup>2</sup> • Inconel, Hastelloy, Monel • titanio y aleaciones de titanio

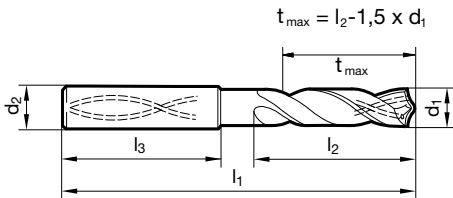
### Nº artículo 89424



P	M	K	N	S	H
•				•	○



vaciado de punta  $\geq \varnothing 3,000$  • entrada cónica • forma del corte principal ligeramente cóncava • geometría de corte optimizada  
aceros aleados y templados hasta a 1400 N/mm<sup>2</sup> • Inconel, Hastelloy, Monel • titanio y aleaciones de titanio



d1 mm	inch	d2 h6 mm	l1 mm	l2 mm	l3 mm	d1 mm	inch	d2 h6 mm	l1 mm	l2 mm	l3 mm
3,000		6,000	62,000	20,000	36,000	4,760	3/16	6,000	66,000	28,000	36,000
3,100		6,000	62,000	20,000	36,000	4,800		6,000	66,000	28,000	36,000
3,170	1/8	6,000	62,000	20,000	36,000	4,900		6,000	66,000	28,000	36,000
3,200		6,000	62,000	20,000	36,000	5,000		6,000	66,000	28,000	36,000
3,250		6,000	62,000	20,000	36,000	5,100		6,000	66,000	28,000	36,000
3,300		6,000	62,000	20,000	36,000	5,160	13/64	6,000	66,000	28,000	36,000
3,400		6,000	62,000	20,000	36,000	5,200		6,000	66,000	28,000	36,000
3,500		6,000	62,000	20,000	36,000	5,300		6,000	66,000	28,000	36,000
3,570	9/64	6,000	62,000	20,000	36,000	5,400		6,000	66,000	28,000	36,000
3,600		6,000	62,000	20,000	36,000	5,500		6,000	66,000	28,000	36,000
3,700		6,000	62,000	20,000	36,000	5,550		6,000	66,000	28,000	36,000
3,800		6,000	66,000	24,000	36,000	5,560	7/32	6,000	66,000	28,000	36,000
3,900		6,000	66,000	24,000	36,000	5,600		6,000	66,000	28,000	36,000
3,970	5/32	6,000	66,000	24,000	36,000	5,700		6,000	66,000	28,000	36,000
4,000		6,000	66,000	24,000	36,000	5,800		6,000	66,000	28,000	36,000
4,100		6,000	66,000	24,000	36,000	5,900		6,000	66,000	28,000	36,000
4,200		6,000	66,000	24,000	36,000	5,950	15/64	6,000	66,000	28,000	36,000
4,300		6,000	66,000	24,000	36,000	6,000		6,000	66,000	28,000	36,000
4,370	11/64	6,000	66,000	24,000	36,000	6,100		8,000	79,000	34,000	36,000
4,400		6,000	66,000	24,000	36,000	6,200		8,000	79,000	34,000	36,000
4,500		6,000	66,000	24,000	36,000	6,300		8,000	79,000	34,000	36,000
4,600		6,000	66,000	24,000	36,000	6,350	1/4	8,000	79,000	34,000	36,000
4,650		6,000	66,000	24,000	36,000	6,400		8,000	79,000	34,000	36,000
4,700		6,000	66,000	24,000	36,000	6,500		8,000	79,000	34,000	36,000



## TS-Drills con refrigeración interna

d1 mm	inch	d2 h6 mm	l1 mm	l2 mm	l3 mm	d1 mm	inch	d2 h6 mm	l1 mm	l2 mm	l3 mm
6,600		8,000	79,000	34,000	36,000	10,900		12,000	102,000	55,000	45,000
6,700		8,000	79,000	34,000	36,000	11,000		12,000	102,000	55,000	45,000
6,750	17/64	8,000	79,000	34,000	36,000	11,100		12,000	102,000	55,000	45,000
6,800		8,000	79,000	34,000	36,000	11,110	7/16	12,000	102,000	55,000	45,000
6,900		8,000	79,000	34,000	36,000	11,200		12,000	102,000	55,000	45,000
7,000		8,000	79,000	34,000	36,000	11,300		12,000	102,000	55,000	45,000
7,100		8,000	79,000	41,000	36,000	11,400		12,000	102,000	55,000	45,000
7,140	9/32	8,000	79,000	41,000	36,000	11,500		12,000	102,000	55,000	45,000
7,200		8,000	79,000	41,000	36,000	11,600		12,000	102,000	55,000	45,000
7,300		8,000	79,000	41,000	36,000	11,700		12,000	102,000	55,000	45,000
7,400		8,000	79,000	41,000	36,000	11,800		12,000	102,000	55,000	45,000
7,500		8,000	79,000	41,000	36,000	11,900		12,000	102,000	55,000	45,000
7,540	19/64	8,000	79,000	41,000	36,000	11,910	15/32	12,000	102,000	55,000	45,000
7,600		8,000	79,000	41,000	36,000	12,000		12,000	102,000	55,000	45,000
7,700		8,000	79,000	41,000	36,000	12,200		14,000	107,000	60,000	45,000
7,800		8,000	79,000	41,000	36,000	12,500		14,000	107,000	60,000	45,000
7,900		8,000	79,000	41,000	36,000	12,700	1/2	14,000	107,000	60,000	45,000
7,940	5/16	8,000	79,000	41,000	36,000	12,800		14,000	107,000	60,000	45,000
8,000		8,000	79,000	41,000	36,000	13,000		14,000	107,000	60,000	45,000
8,100		10,000	89,000	47,000	40,000	13,300		14,000	107,000	60,000	45,000
8,200		10,000	89,000	47,000	40,000	13,500		14,000	107,000	60,000	45,000
8,300		10,000	89,000	47,000	40,000	13,700		14,000	107,000	60,000	45,000
8,330	21/64	10,000	89,000	47,000	40,000	14,000		14,000	107,000	60,000	45,000
8,400		10,000	89,000	47,000	40,000	14,200		16,000	115,000	65,000	48,000
8,500		10,000	89,000	47,000	40,000	14,290	9/16	16,000	115,000	65,000	48,000
8,600		10,000	89,000	47,000	40,000	14,300		16,000	115,000	65,000	48,000
8,700		10,000	89,000	47,000	40,000	14,500		16,000	115,000	65,000	48,000
8,730	11/32	10,000	89,000	47,000	40,000	14,700		16,000	115,000	65,000	48,000
8,800		10,000	89,000	47,000	40,000	15,000		16,000	115,000	65,000	48,000
8,900		10,000	89,000	47,000	40,000	15,200		16,000	115,000	65,000	48,000
9,000		10,000	89,000	47,000	40,000	15,300		16,000	115,000	65,000	48,000
9,100		10,000	89,000	47,000	40,000	15,500		16,000	115,000	65,000	48,000
9,130	23/64	10,000	89,000	47,000	40,000	15,700		16,000	115,000	65,000	48,000
9,200		10,000	89,000	47,000	40,000	16,000		16,000	115,000	65,000	48,000
9,250		10,000	89,000	47,000	40,000	16,300		18,000	123,000	73,000	48,000
9,300		10,000	89,000	47,000	40,000	16,500		18,000	123,000	73,000	48,000
9,400		10,000	89,000	47,000	40,000	16,900		18,000	123,000	73,000	48,000
9,500		10,000	89,000	47,000	40,000	17,000		18,000	123,000	73,000	48,000
9,520	3/8	10,000	89,000	47,000	40,000	17,300		18,000	123,000	73,000	48,000
9,600		10,000	89,000	47,000	40,000	17,500		18,000	123,000	73,000	48,000
9,700		10,000	89,000	47,000	40,000	18,000		18,000	123,000	73,000	48,000
9,800		10,000	89,000	47,000	40,000	18,500		20,000	131,000	79,000	50,000
9,900		10,000	89,000	47,000	40,000	18,900		20,000	131,000	79,000	50,000
9,920	25/64	10,000	89,000	47,000	40,000	19,000		20,000	131,000	79,000	50,000
10,000		10,000	89,000	47,000	40,000	19,050	3/4	20,000	131,000	79,000	50,000
10,100		12,000	102,000	55,000	45,000	19,300		20,000	131,000	79,000	50,000
10,200		12,000	102,000	55,000	45,000	19,500		20,000	131,000	79,000	50,000
10,300		12,000	102,000	55,000	45,000	20,000		20,000	131,000	79,000	50,000
10,320	13/32	12,000	102,000	55,000	45,000						
10,400		12,000	102,000	55,000	45,000						
10,500		12,000	102,000	55,000	45,000						
10,600		12,000	102,000	55,000	45,000						
10,700		12,000	102,000	55,000	45,000						
10,800		12,000	102,000	55,000	45,000						

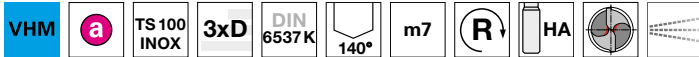


## TS-Drills con refrigeración interna

### Nº artículo 89450



P	M	K	N	S	H
○	●			○	

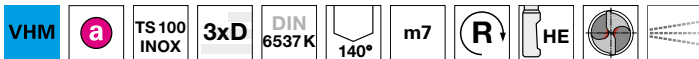


vaciado de punta  $\geq \varnothing 3,000$  • afilado plano • forma recta del corte principal • geometría de corte optimizada  
aceros inoxidables y resistentes al ácido y al calor • titanio y aleaciones de titanio • Inconel, Hastelloy, Monel

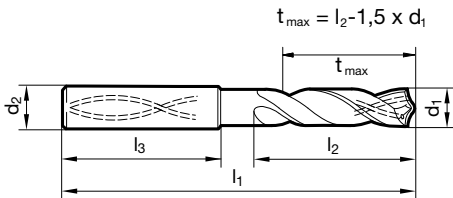
### Nº artículo 89550



P	M	K	N	S	H
○	●			○	



vaciado de punta  $\geq \varnothing 3,000$  • afilado plano • forma recta del corte principal • geometría de corte optimizada  
aceros inoxidables y resistentes al ácido y al calor • titanio y aleaciones de titanio • Inconel, Hastelloy, Monel



d1 mm	inch	d2 h6 mm	l1 mm	l2 mm	l3 mm	d1 mm	inch	d2 h6 mm	l1 mm	l2 mm	l3 mm
3,000		6,000	62,000	20,000	36,000	4,760	3/16	6,000	66,000	28,000	36,000
3,100		6,000	62,000	20,000	36,000	4,800		6,000	66,000	28,000	36,000
3,170	1/8	6,000	62,000	20,000	36,000	4,900		6,000	66,000	28,000	36,000
3,200		6,000	62,000	20,000	36,000	5,000		6,000	66,000	28,000	36,000
3,250		6,000	62,000	20,000	36,000	5,100		6,000	66,000	28,000	36,000
3,300		6,000	62,000	20,000	36,000	5,160	13/64	6,000	66,000	28,000	36,000
3,400		6,000	62,000	20,000	36,000	5,200		6,000	66,000	28,000	36,000
3,500		6,000	62,000	20,000	36,000	5,300		6,000	66,000	28,000	36,000
3,570	9/64	6,000	62,000	20,000	36,000	5,400		6,000	66,000	28,000	36,000
3,600		6,000	62,000	20,000	36,000	5,500		6,000	66,000	28,000	36,000
3,700		6,000	62,000	20,000	36,000	5,550		6,000	66,000	28,000	36,000
3,800		6,000	66,000	24,000	36,000	5,560	7/32	6,000	66,000	28,000	36,000
3,900		6,000	66,000	24,000	36,000	5,600		6,000	66,000	28,000	36,000
3,970	5/32	6,000	66,000	24,000	36,000	5,700		6,000	66,000	28,000	36,000
4,000		6,000	66,000	24,000	36,000	5,800		6,000	66,000	28,000	36,000
4,100		6,000	66,000	24,000	36,000	5,900		6,000	66,000	28,000	36,000
4,200		6,000	66,000	24,000	36,000	5,950	15/64	6,000	66,000	28,000	36,000
4,300		6,000	66,000	24,000	36,000	6,000		6,000	66,000	28,000	36,000
4,370	11/64	6,000	66,000	24,000	36,000	6,100		8,000	79,000	34,000	36,000
4,400		6,000	66,000	24,000	36,000	6,200		8,000	79,000	34,000	36,000
4,500		6,000	66,000	24,000	36,000	6,300		8,000	79,000	34,000	36,000
4,600		6,000	66,000	24,000	36,000	6,350	1/4	8,000	79,000	34,000	36,000
4,650		6,000	66,000	24,000	36,000	6,400		8,000	79,000	34,000	36,000
4,700		6,000	66,000	24,000	36,000	6,500		8,000	79,000	34,000	36,000



## TS-Drills con refrigeración interna

d1 mm	inch	d2 h6 mm	l1 mm	l2 mm	l3 mm	d1 mm	inch	d2 h6 mm	l1 mm	l2 mm	l3 mm
6,600		8,000	79,000	34,000	36,000	10,900		12,000	102,000	55,000	45,000
6,700		8,000	79,000	34,000	36,000	11,000		12,000	102,000	55,000	45,000
6,750	17/64	8,000	79,000	34,000	36,000	11,100		12,000	102,000	55,000	45,000
6,800		8,000	79,000	34,000	36,000	11,110	7/16	12,000	102,000	55,000	45,000
6,900		8,000	79,000	34,000	36,000	11,200		12,000	102,000	55,000	45,000
7,000		8,000	79,000	34,000	36,000	11,300		12,000	102,000	55,000	45,000
7,100		8,000	79,000	41,000	36,000	11,400		12,000	102,000	55,000	45,000
7,140	9/32	8,000	79,000	41,000	36,000	11,500		12,000	102,000	55,000	45,000
7,200		8,000	79,000	41,000	36,000	11,600		12,000	102,000	55,000	45,000
7,300		8,000	79,000	41,000	36,000	11,700		12,000	102,000	55,000	45,000
7,400		8,000	79,000	41,000	36,000	11,800		12,000	102,000	55,000	45,000
7,500		8,000	79,000	41,000	36,000	11,900		12,000	102,000	55,000	45,000
7,540	19/64	8,000	79,000	41,000	36,000	11,910	15/32	12,000	102,000	55,000	45,000
7,600		8,000	79,000	41,000	36,000	12,000		12,000	102,000	55,000	45,000
7,700		8,000	79,000	41,000	36,000	12,200		14,000	107,000	60,000	45,000
7,800		8,000	79,000	41,000	36,000	12,500		14,000	107,000	60,000	45,000
7,900		8,000	79,000	41,000	36,000	12,700	1/2	14,000	107,000	60,000	45,000
7,940	5/16	8,000	79,000	41,000	36,000	12,800		14,000	107,000	60,000	45,000
8,000		8,000	79,000	41,000	36,000	13,000		14,000	107,000	60,000	45,000
8,100		10,000	89,000	47,000	40,000	13,300		14,000	107,000	60,000	45,000
8,200		10,000	89,000	47,000	40,000	13,500		14,000	107,000	60,000	45,000
8,300		10,000	89,000	47,000	40,000	13,700		14,000	107,000	60,000	45,000
8,330	21/64	10,000	89,000	47,000	40,000	14,000		14,000	107,000	60,000	45,000
8,400		10,000	89,000	47,000	40,000	14,200		16,000	115,000	65,000	48,000
8,500		10,000	89,000	47,000	40,000	14,290	9/16	16,000	115,000	65,000	48,000
8,600		10,000	89,000	47,000	40,000	14,300		16,000	115,000	65,000	48,000
8,700		10,000	89,000	47,000	40,000	14,500		16,000	115,000	65,000	48,000
8,730	11/32	10,000	89,000	47,000	40,000	14,700		16,000	115,000	65,000	48,000
8,800		10,000	89,000	47,000	40,000	15,000		16,000	115,000	65,000	48,000
8,900		10,000	89,000	47,000	40,000	15,200		16,000	115,000	65,000	48,000
9,000		10,000	89,000	47,000	40,000	15,300		16,000	115,000	65,000	48,000
9,100		10,000	89,000	47,000	40,000	15,500		16,000	115,000	65,000	48,000
9,130	23/64	10,000	89,000	47,000	40,000	15,700		16,000	115,000	65,000	48,000
9,200		10,000	89,000	47,000	40,000	16,000		16,000	115,000	65,000	48,000
9,250		10,000	89,000	47,000	40,000	16,300		18,000	123,000	73,000	48,000
9,300		10,000	89,000	47,000	40,000	16,500		18,000	123,000	73,000	48,000
9,400		10,000	89,000	47,000	40,000	16,900		18,000	123,000	73,000	48,000
9,500		10,000	89,000	47,000	40,000	17,000		18,000	123,000	73,000	48,000
9,520	3/8	10,000	89,000	47,000	40,000	17,300		18,000	123,000	73,000	48,000
9,600		10,000	89,000	47,000	40,000	17,500		18,000	123,000	73,000	48,000
9,700		10,000	89,000	47,000	40,000	18,000		18,000	123,000	73,000	48,000
9,800		10,000	89,000	47,000	40,000	18,500		20,000	131,000	79,000	50,000
9,900		10,000	89,000	47,000	40,000	18,900		20,000	131,000	79,000	50,000
9,920	25/64	10,000	89,000	47,000	40,000	19,000		20,000	131,000	79,000	50,000
10,000		10,000	89,000	47,000	40,000	19,300		20,000	131,000	79,000	50,000
10,100		12,000	102,000	55,000	45,000	19,500		20,000	131,000	79,000	50,000
10,200		12,000	102,000	55,000	45,000	20,000		20,000	131,000	79,000	50,000
10,300		12,000	102,000	55,000	45,000						
10,320	13/32	12,000	102,000	55,000	45,000						
10,400		12,000	102,000	55,000	45,000						
10,500		12,000	102,000	55,000	45,000						
10,600		12,000	102,000	55,000	45,000						
10,700		12,000	102,000	55,000	45,000						
10,800		12,000	102,000	55,000	45,000						



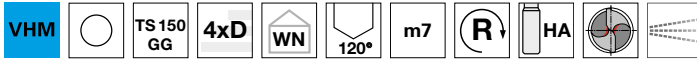


## TS-Drills con refrigeración interna

Nº artículo 89292

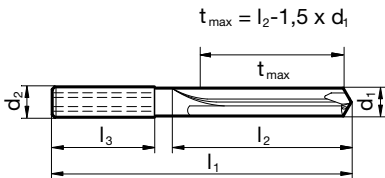


P	M	K	N	S	H
		•	○		



vaciado de punta  $\geq \varnothing 3,000$  • afilado plano • tolerancias en diámetro estrechas • calidad superficial del taladro muy buena • vigilar presión del refrigerante

aluminio y sus aleaciones • aluminios con alto porcentaje de Si



d1		d2 h6	l1	l2	l3	d1		d2 h6	l1	l2	l3
mm	inch	mm	mm	mm	mm	mm	inch	mm	mm	mm	mm
3,000		6,000	66,000	24,000	36,000	8,700		10,000	103,000	61,000	40,000
3,100		6,000	66,000	24,000	36,000	9,000		10,000	103,000	61,000	40,000
3,200		6,000	66,000	24,000	36,000	9,400		10,000	103,000	61,000	40,000
3,300		6,000	66,000	24,000	36,000	10,000		10,000	103,000	61,000	40,000
3,400		6,000	66,000	24,000	36,000	10,200		12,000	118,000	71,000	45,000
3,500		6,000	66,000	24,000	36,000	10,500		12,000	118,000	71,000	45,000
3,700		6,000	66,000	24,000	36,000	11,000		12,000	118,000	71,000	45,000
4,000		6,000	74,000	30,000	36,000	11,500		12,000	118,000	71,000	45,000
4,200		6,000	74,000	30,000	36,000	12,000		12,000	118,000	71,000	45,000
5,000		6,000	74,000	36,000	36,000	12,300	31/64	14,000	124,000	74,000	45,000
5,100		6,000	74,000	36,000	36,000	12,500		14,000	124,000	74,000	45,000
5,300		6,000	74,000	36,000	36,000	12,700	1/2	14,000	124,000	74,000	45,000
5,400		6,000	74,000	36,000	36,000	13,000		14,000	124,000	74,000	45,000
5,900		6,000	74,000	36,000	36,000	14,000		14,000	124,000	74,000	45,000
6,000		6,000	74,000	36,000	36,000	15,000		16,000	133,000	83,000	48,000
6,200		8,000	91,000	53,000	36,000	16,000		16,000	133,000	83,000	48,000
6,300		8,000	91,000	53,000	36,000	16,500		18,000	143,000	93,000	48,000
6,400		8,000	91,000	53,000	36,000	17,000		18,000	143,000	93,000	48,000
6,600		8,000	91,000	53,000	36,000	17,500		18,000	143,000	93,000	48,000
6,700		8,000	91,000	53,000	36,000	19,000		20,000	153,000	101,000	50,000
6,800		8,000	91,000	53,000	36,000	20,000		20,000	153,000	101,000	50,000
7,000		8,000	91,000	53,000	36,000						
7,400		8,000	91,000	53,000	36,000						
7,500		8,000	91,000	53,000	36,000						
8,000		8,000	91,000	53,000	36,000						
8,100		10,000	103,000	61,000	40,000						
8,200		10,000	103,000	61,000	40,000						
8,300		10,000	103,000	61,000	40,000						
8,400		10,000	103,000	61,000	40,000						
8,500		10,000	103,000	61,000	40,000						

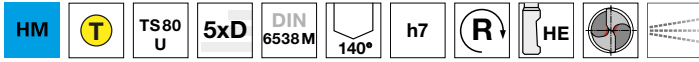


## TS-Drills con refrigeración interna

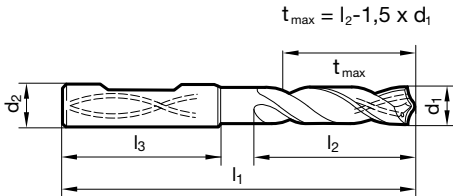
Nº artículo 89307



P	M	K	N	S	H
●	○	○	○		



vaciado de punta  $\geq \varnothing 9,800$  • entrada cónica • portaherr. HSS con plaquita HM soldada • amortigua oscilaciones y golpes  
 aceros no aleados y de baja aleación • fundición gris, fundición de grafito • latón, bronce, plásticos y grafitos



d1 mm	d2 h6 mm	l1 mm	l2 mm	l3 mm	d1 mm	d2 h6 mm	l1 mm	l2 mm	l3 mm
9,800	16,000	127,000	75,000	48,000	17,200	20,000	166,000	112,000	50,000
10,000	16,000	127,000	75,000	48,000	17,300	20,000	166,000	112,000	50,000
10,200	16,000	127,000	75,000	48,000	17,500	20,000	166,000	112,000	50,000
10,500	16,000	127,000	75,000	48,000	18,000	20,000	166,000	112,000	50,000
10,600	16,000	127,000	75,000	48,000	18,300	25,000	184,000	124,000	56,000
10,800	16,000	127,000	75,000	48,000	19,000	25,000	184,000	124,000	56,000
11,000	16,000	127,000	75,000	48,000	19,500	25,000	184,000	124,000	56,000
11,800	16,000	127,000	75,000	48,000	19,700	25,000	184,000	124,000	56,000
12,000	16,000	127,000	75,000	48,000	20,000	25,000	184,000	124,000	56,000
12,200	16,000	139,000	87,000	48,000	20,500	25,000	197,000	137,000	56,000
12,300	16,000	139,000	87,000	48,000	21,000	25,000	197,000	137,000	56,000
12,500	16,000	139,000	87,000	48,000	22,000	25,000	197,000	137,000	56,000
12,700	16,000	139,000	87,000	48,000	22,220	25,000	209,000	149,000	56,000
12,900	16,000	139,000	87,000	48,000	22,500	25,000	209,000	149,000	56,000
13,000	16,000	139,000	87,000	48,000	23,000	25,000	209,000	149,000	56,000
13,100	16,000	139,000	87,000	48,000	23,500	25,000	209,000	149,000	56,000
13,500	16,000	139,000	87,000	48,000	24,000	25,000	209,000	149,000	56,000
13,600	16,000	139,000	87,000	48,000	24,500	32,000	226,000	162,000	60,000
13,700	16,000	139,000	87,000	48,000	25,000	32,000	226,000	162,000	60,000
14,000	16,000	139,000	87,000	48,000					
14,500	20,000	154,000	100,000	50,000					
14,800	20,000	154,000	100,000	50,000					
15,000	20,000	154,000	100,000	50,000					
15,100	20,000	154,000	100,000	50,000					
15,500	20,000	154,000	100,000	50,000					
15,700	20,000	154,000	100,000	50,000					
16,000	20,000	154,000	100,000	50,000					
16,200	20,000	166,000	112,000	50,000					
16,500	20,000	166,000	112,000	50,000					
17,000	20,000	166,000	112,000	50,000					

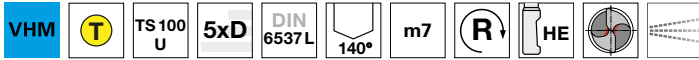


## TS-Drills con refrigeración interna

Nº artículo 89272

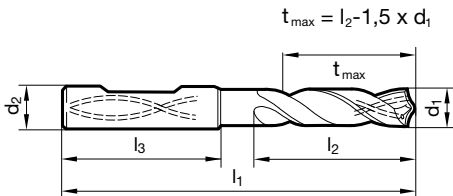


P	M	K	N	S	H
●	○	●	○	○	○



vaciado de punta  $\geq \varnothing 3,700$  • afilado plano • forma recta del corte principal • geometría de corte optimizada

aceros de construcción y de cementación • aceros para tornos automáticos, aceros de bonificación • aceros (aleados/no aleados) hasta 1200 N/mm<sup>2</sup> • fundición • bronce, latón • aleaciones de AlSi altamente aleables



d1		d2 h6	l1	l2	l3	d1		d2 h6	l1	l2	l3
mm	inch	mm	mm	mm	mm	mm	inch	mm	mm	mm	mm
3,000		6,000	66,000	28,000	36,000	9,520	3/8	10,000	103,000	61,000	40,000
3,100		6,000	66,000	28,000	36,000	9,700		10,000	103,000	61,000	40,000
3,200		6,000	66,000	28,000	36,000	9,800		10,000	103,000	61,000	40,000
3,300		6,000	66,000	28,000	36,000	10,000		10,000	103,000	61,000	40,000
3,400		6,000	66,000	28,000	36,000	10,200		12,000	118,000	71,000	45,000
3,500		6,000	66,000	28,000	36,000	10,500		12,000	118,000	71,000	45,000
3,600		6,000	66,000	28,000	36,000	10,800		12,000	118,000	71,000	45,000
3,700		6,000	66,000	28,000	36,000	11,000		12,000	118,000	71,000	45,000
3,800		6,000	74,000	36,000	36,000	11,110	7/16	12,000	118,000	71,000	45,000
3,900		6,000	74,000	36,000	36,000	11,200		12,000	118,000	71,000	45,000
5,000		6,000	82,000	44,000	36,000	11,500		12,000	118,000	71,000	45,000
5,500		6,000	82,000	44,000	36,000	11,800		12,000	118,000	71,000	45,000
5,800		6,000	82,000	44,000	36,000	12,000		12,000	118,000	71,000	45,000
5,950	15/64	6,000	82,000	44,000	36,000	12,500		14,000	124,000	77,000	45,000
6,000		6,000	82,000	44,000	36,000	13,000		14,000	124,000	77,000	45,000
6,400		8,000	91,000	53,000	36,000	13,500		14,000	124,000	77,000	45,000
6,500		8,000	91,000	53,000	36,000	14,000		14,000	124,000	77,000	45,000
6,750	17/64	8,000	91,000	53,000	36,000	14,500		16,000	133,000	83,000	48,000
6,800		8,000	91,000	53,000	36,000	15,000		16,000	133,000	83,000	48,000
7,000		8,000	91,000	53,000	36,000	15,500		16,000	133,000	83,000	48,000
7,140	9/32	8,000	91,000	53,000	36,000	15,870	5/8	16,000	133,000	83,000	48,000
7,500		8,000	91,000	53,000	36,000	16,000		16,000	133,000	83,000	48,000
7,800		8,000	91,000	53,000	36,000	16,500		18,000	143,000	93,000	48,000
8,000		8,000	91,000	53,000	36,000	17,000		18,000	143,000	93,000	48,000
8,500		10,000	103,000	61,000	40,000	17,500		18,000	143,000	93,000	48,000
8,600		10,000	103,000	61,000	40,000	18,000		18,000	143,000	93,000	48,000
8,800		10,000	103,000	61,000	40,000	19,000		20,000	153,000	101,000	50,000
9,000		10,000	103,000	61,000	40,000	19,500		20,000	153,000	101,000	50,000
9,300		10,000	103,000	61,000	40,000						
9,500		10,000	103,000	61,000	40,000						



## TS-Drills con refrigeración interna

### Nº artículo 89411



P	M	K	N	S	H
●	○	●	○	○	○

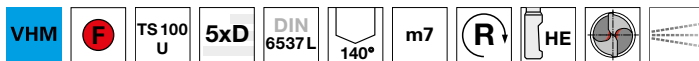


vaciado de punta  $\geq \varnothing 3,000$  • afilado plano • forma recta del corte principal • geometría de corte optimizada  
 aceros de construcción y de cementación • aceros para tornos automáticos, aceros de bonificación • aceros (aleados/no aleados) hasta 1200 N/mm<sup>2</sup> • fundición • bronce, latón • aleaciones de AISi altamente aleables

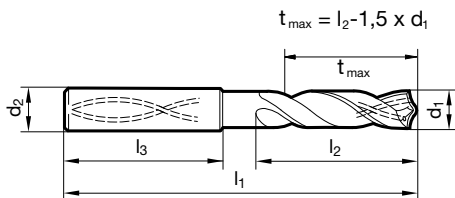
### Nº artículo 89408



P	M	K	N	S	H
●	○	●	○	○	○



vaciado de punta  $\geq \varnothing 3,000$  • afilado plano • forma recta del corte principal • geometría de corte optimizada  
 aceros de construcción y de cementación • aceros para tornos automáticos, aceros de bonificación • aceros (aleados/no aleados) hasta 1200 N/mm<sup>2</sup> • fundición • bronce, latón • aleaciones de AISi altamente aleables



d1 mm	inch	d2 h6 mm	l1 mm	l2 mm	l3 mm	d1 mm	inch	d2 h6 mm	l1 mm	l2 mm	l3 mm
3,000		6,000	66,000	28,000	36,000	4,760	3/16	6,000	82,000	44,000	36,000
3,100		6,000	66,000	28,000	36,000	4,800		6,000	82,000	44,000	36,000
3,170	1/8	6,000	66,000	28,000	36,000	4,900		6,000	82,000	44,000	36,000
3,200		6,000	66,000	28,000	36,000	5,000		6,000	82,000	44,000	36,000
3,250		6,000	66,000	28,000	36,000	5,100		6,000	82,000	44,000	36,000
3,300		6,000	66,000	28,000	36,000	5,160	13/64	6,000	82,000	44,000	36,000
3,400		6,000	66,000	28,000	36,000	5,200		6,000	82,000	44,000	36,000
3,500		6,000	66,000	28,000	36,000	5,300		6,000	82,000	44,000	36,000
3,570	9/64	6,000	66,000	28,000	36,000	5,400		6,000	82,000	44,000	36,000
3,600		6,000	66,000	28,000	36,000	5,500		6,000	82,000	44,000	36,000
3,700		6,000	66,000	28,000	36,000	5,550		6,000	82,000	44,000	36,000
3,800		6,000	74,000	36,000	36,000	5,560	7/32	6,000	82,000	44,000	36,000
3,900		6,000	74,000	36,000	36,000	5,600		6,000	82,000	44,000	36,000
3,970	5/32	6,000	74,000	36,000	36,000	5,700		6,000	82,000	44,000	36,000
4,000		6,000	74,000	36,000	36,000	5,800		6,000	82,000	44,000	36,000
4,100		6,000	74,000	36,000	36,000	5,900		6,000	82,000	44,000	36,000
4,200		6,000	74,000	36,000	36,000	5,950	15/64	6,000	82,000	44,000	36,000
4,300		6,000	74,000	36,000	36,000	6,000		6,000	82,000	44,000	36,000
4,370	11/64	6,000	74,000	36,000	36,000	6,100		8,000	91,000	53,000	36,000
4,400		6,000	74,000	36,000	36,000	6,200		8,000	91,000	53,000	36,000
4,500		6,000	74,000	36,000	36,000	6,300		8,000	91,000	53,000	36,000
4,600		6,000	74,000	36,000	36,000	6,350	1/4	8,000	91,000	53,000	36,000
4,650		6,000	74,000	36,000	36,000	6,400		8,000	91,000	53,000	36,000
4,700		6,000	74,000	36,000	36,000	6,500		8,000	91,000	53,000	36,000



## TS-Drills con refrigeración interna

d1 mm	inch	d2 h6 mm	l1 mm	l2 mm	l3 mm	d1 mm	inch	d2 h6 mm	l1 mm	l2 mm	l3 mm
6,600		8,000	91,000	53,000	36,000	11,400		12,000	118,000	71,000	45,000
6,700		8,000	91,000	53,000	36,000	11,500		12,000	118,000	71,000	45,000
6,750	17/64	8,000	91,000	53,000	36,000	11,600		12,000	118,000	71,000	45,000
6,800		8,000	91,000	53,000	36,000	11,700		12,000	118,000	71,000	45,000
6,900		8,000	91,000	53,000	36,000	11,800		12,000	118,000	71,000	45,000
7,000		8,000	91,000	53,000	36,000	11,900		12,000	118,000	71,000	45,000
7,100		8,000	91,000	53,000	36,000	11,910	15/32	12,000	118,000	71,000	45,000
7,140	9/32	8,000	91,000	53,000	36,000	12,000		12,000	118,000	71,000	45,000
7,200		8,000	91,000	53,000	36,000	12,100		14,000	124,000	77,000	45,000
7,300		8,000	91,000	53,000	36,000	12,200		14,000	124,000	77,000	45,000
7,400		8,000	91,000	53,000	36,000	12,300	31/64	14,000	124,000	77,000	45,000
7,500		8,000	91,000	53,000	36,000	12,400		14,000	124,000	77,000	45,000
7,540	19/64	8,000	91,000	53,000	36,000	12,500		14,000	124,000	77,000	45,000
7,600		8,000	91,000	53,000	36,000	12,600		14,000	124,000	77,000	45,000
7,700		8,000	91,000	53,000	36,000	12,700	1/2	14,000	124,000	77,000	45,000
7,800		8,000	91,000	53,000	36,000	12,800		14,000	124,000	77,000	45,000
7,900		8,000	91,000	53,000	36,000	13,000		14,000	124,000	77,000	45,000
7,940	5/16	8,000	91,000	53,000	36,000	13,100	33/64	14,000	124,000	77,000	45,000
8,000		8,000	91,000	53,000	36,000	13,300		14,000	124,000	77,000	45,000
8,100		10,000	103,000	61,000	40,000	13,500		14,000	124,000	77,000	45,000
8,200		10,000	103,000	61,000	40,000	13,700		14,000	124,000	77,000	45,000
8,300		10,000	103,000	61,000	40,000	13,800		14,000	124,000	77,000	45,000
8,330	21/64	10,000	103,000	61,000	40,000	14,000		14,000	124,000	77,000	45,000
8,400		10,000	103,000	61,000	40,000	14,100		16,000	133,000	83,000	48,000
8,500		10,000	103,000	61,000	40,000	14,200		16,000	133,000	83,000	48,000
8,600		10,000	103,000	61,000	40,000	14,290	9/16	16,000	133,000	83,000	48,000
8,700		10,000	103,000	61,000	40,000	14,500		16,000	133,000	83,000	48,000
8,730	11/32	10,000	103,000	61,000	40,000	14,600		16,000	133,000	83,000	48,000
8,800		10,000	103,000	61,000	40,000	14,700		16,000	133,000	83,000	48,000
8,900		10,000	103,000	61,000	40,000	14,800		16,000	133,000	83,000	48,000
9,000		10,000	103,000	61,000	40,000	15,000		16,000	133,000	83,000	48,000
9,100		10,000	103,000	61,000	40,000	15,100		16,000	133,000	83,000	48,000
9,130	23/64	10,000	103,000	61,000	40,000	15,200		16,000	133,000	83,000	48,000
9,200		10,000	103,000	61,000	40,000	15,300		16,000	133,000	83,000	48,000
9,250		10,000	103,000	61,000	40,000	15,500		16,000	133,000	83,000	48,000
9,300		10,000	103,000	61,000	40,000	15,700		16,000	133,000	83,000	48,000
9,400		10,000	103,000	61,000	40,000	15,800		16,000	133,000	83,000	48,000
9,500		10,000	103,000	61,000	40,000	16,000		16,000	133,000	83,000	48,000
9,520	3/8	10,000	103,000	61,000	40,000	16,500		18,000	143,000	93,000	48,000
9,600		10,000	103,000	61,000	40,000	16,900		18,000	143,000	93,000	48,000
9,700		10,000	103,000	61,000	40,000	17,000		18,000	143,000	93,000	48,000
9,800		10,000	103,000	61,000	40,000	17,500		18,000	143,000	93,000	48,000
9,900		10,000	103,000	61,000	40,000	18,000		18,000	143,000	93,000	48,000
9,920	25/64	10,000	103,000	61,000	40,000	18,500		20,000	153,000	101,000	50,000
10,000		10,000	103,000	61,000	40,000	18,900		20,000	153,000	101,000	50,000
10,100		12,000	118,000	71,000	45,000	19,000		20,000	153,000	101,000	50,000
10,200		12,000	118,000	71,000	45,000	19,050	3/4	20,000	153,000	101,000	50,000
10,300		12,000	118,000	71,000	45,000	19,500		20,000	153,000	101,000	50,000
10,320	13/32	12,000	118,000	71,000	45,000	20,000		20,000	153,000	101,000	50,000
10,400		12,000	118,000	71,000	45,000						
10,500		12,000	118,000	71,000	45,000						
10,600		12,000	118,000	71,000	45,000						
10,700		12,000	118,000	71,000	45,000						
10,800		12,000	118,000	71,000	45,000						
10,900		12,000	118,000	71,000	45,000						
11,000		12,000	118,000	71,000	45,000						
11,100		12,000	118,000	71,000	45,000						
11,110	7/16	12,000	118,000	71,000	45,000						
11,200		12,000	118,000	71,000	45,000						
11,300		12,000	118,000	71,000	45,000						

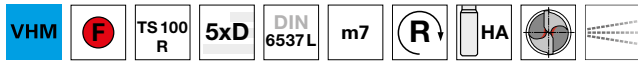


## TS-Drills con refrigeración interna

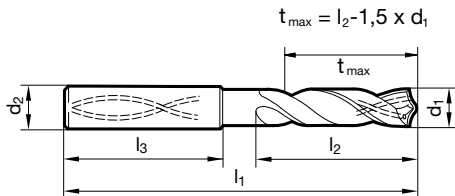
Nº artículo 89420



P	M	K	N	S	H
		•			



vaciado de punta  $\geq \varnothing 3,000$  • afilado con radios patentado • forma del corte recta (por corrección)  
 fundición vermicular GGV y ADI, CDI • fundición gris, fundición maleable, fundición esférica



d1		d2 h6	l1	l2	l3	d1		d2 h6	l1	l2	l3
mm	inch	mm	mm	mm	mm	mm	inch	mm	mm	mm	mm
3,000		6,000	66,000	28,000	36,000	6,100		8,000	91,000	53,000	36,000
3,100		6,000	66,000	28,000	36,000	6,200		8,000	91,000	53,000	36,000
3,170	1/8	6,000	66,000	28,000	36,000	6,300		8,000	91,000	53,000	36,000
3,200		6,000	66,000	28,000	36,000	6,350	1/4	8,000	91,000	53,000	36,000
3,250		6,000	66,000	28,000	36,000	6,400		8,000	91,000	53,000	36,000
3,300		6,000	66,000	28,000	36,000	6,500		8,000	91,000	53,000	36,000
3,400		6,000	66,000	28,000	36,000	6,600		8,000	91,000	53,000	36,000
3,500		6,000	66,000	28,000	36,000	6,700		8,000	91,000	53,000	36,000
3,570	9/64	6,000	66,000	28,000	36,000	6,750	17/64	8,000	91,000	53,000	36,000
3,600		6,000	66,000	28,000	36,000	6,800		8,000	91,000	53,000	36,000
3,700		6,000	66,000	28,000	36,000	6,900		8,000	91,000	53,000	36,000
3,800		6,000	74,000	36,000	36,000	7,000		8,000	91,000	53,000	36,000
3,900		6,000	74,000	36,000	36,000	7,100		8,000	91,000	53,000	36,000
3,970	5/32	6,000	74,000	36,000	36,000	7,140	9/32	8,000	91,000	53,000	36,000
4,000		6,000	74,000	36,000	36,000	7,200		8,000	91,000	53,000	36,000
4,100		6,000	74,000	36,000	36,000	7,300		8,000	91,000	53,000	36,000
4,200		6,000	74,000	36,000	36,000	7,400		8,000	91,000	53,000	36,000
4,300		6,000	74,000	36,000	36,000	7,500		8,000	91,000	53,000	36,000
4,370	11/64	6,000	74,000	36,000	36,000	7,540	19/64	8,000	91,000	53,000	36,000
4,400		6,000	74,000	36,000	36,000	7,600		8,000	91,000	53,000	36,000
4,500		6,000	74,000	36,000	36,000	7,700		8,000	91,000	53,000	36,000
4,600		6,000	74,000	36,000	36,000	7,800		8,000	91,000	53,000	36,000
4,650		6,000	74,000	36,000	36,000	7,900		8,000	91,000	53,000	36,000
4,700		6,000	74,000	36,000	36,000	7,940	5/16	8,000	91,000	53,000	36,000
4,760	3/16	6,000	82,000	44,000	36,000	8,000		8,000	91,000	53,000	36,000
4,800		6,000	82,000	44,000	36,000	8,100		10,000	103,000	61,000	40,000
4,900		6,000	82,000	44,000	36,000	8,200		10,000	103,000	61,000	40,000
5,000		6,000	82,000	44,000	36,000	8,300		10,000	103,000	61,000	40,000
5,100		6,000	82,000	44,000	36,000	8,330	21/64	10,000	103,000	61,000	40,000
5,160	13/64	6,000	82,000	44,000	36,000	8,400		10,000	103,000	61,000	40,000
5,200		6,000	82,000	44,000	36,000	8,500		10,000	103,000	61,000	40,000
5,300		6,000	82,000	44,000	36,000	8,600		10,000	103,000	61,000	40,000
5,400		6,000	82,000	44,000	36,000	8,700		10,000	103,000	61,000	40,000
5,500		6,000	82,000	44,000	36,000	8,730	11/32	10,000	103,000	61,000	40,000
5,550		6,000	82,000	44,000	36,000	8,800		10,000	103,000	61,000	40,000
5,560	7/32	6,000	82,000	44,000	36,000	8,900		10,000	103,000	61,000	40,000
5,600		6,000	82,000	44,000	36,000	9,000		10,000	103,000	61,000	40,000
5,700		6,000	82,000	44,000	36,000	9,100		10,000	103,000	61,000	40,000
5,800		6,000	82,000	44,000	36,000	9,130	23/64	10,000	103,000	61,000	40,000
5,900		6,000	82,000	44,000	36,000	9,200		10,000	103,000	61,000	40,000
5,950	15/64	6,000	82,000	44,000	36,000	9,250		10,000	103,000	61,000	40,000
6,000		6,000	82,000	44,000	36,000	9,300		10,000	103,000	61,000	40,000



## TS-Drills con refrigeración interna

d1 mm	inch	d2 h6 mm	l1 mm	l2 mm	l3 mm	d1 mm	inch	d2 h6 mm	l1 mm	l2 mm	l3 mm
9,400		10,000	103,000	61,000	40,000	13,000		14,000	124,000	77,000	45,000
9,500		10,000	103,000	61,000	40,000	13,100	33/64	14,000	124,000	77,000	45,000
9,520	3/8	10,000	103,000	61,000	40,000	13,300		14,000	124,000	77,000	45,000
9,600		10,000	103,000	61,000	40,000	13,400		14,000	124,000	77,000	45,000
9,700		10,000	103,000	61,000	40,000	13,500		14,000	124,000	77,000	45,000
9,800		10,000	103,000	61,000	40,000	13,700		14,000	124,000	77,000	45,000
9,900		10,000	103,000	61,000	40,000	13,800		14,000	124,000	77,000	45,000
9,920	25/64	10,000	103,000	61,000	40,000	13,900		14,000	124,000	77,000	45,000
10,000		10,000	103,000	61,000	40,000	14,000		14,000	124,000	77,000	45,000
10,100		12,000	118,000	71,000	45,000	14,100		16,000	133,000	83,000	48,000
10,200		12,000	118,000	71,000	45,000	14,200		16,000	133,000	83,000	48,000
10,300		12,000	118,000	71,000	45,000	14,290	9/16	16,000	133,000	83,000	48,000
10,320	13/32	12,000	118,000	71,000	45,000	14,300		16,000	133,000	83,000	48,000
10,400		12,000	118,000	71,000	45,000	14,400		16,000	133,000	83,000	48,000
10,500		12,000	118,000	71,000	45,000	14,500		16,000	133,000	83,000	48,000
10,600		12,000	118,000	71,000	45,000	14,600		16,000	133,000	83,000	48,000
10,700		12,000	118,000	71,000	45,000	14,700		16,000	133,000	83,000	48,000
10,720	27/64	12,000	118,000	71,000	45,000	14,900		16,000	133,000	83,000	48,000
10,800		12,000	118,000	71,000	45,000	15,000		16,000	133,000	83,000	48,000
10,900		12,000	118,000	71,000	45,000	15,100		16,000	133,000	83,000	48,000
11,000		12,000	118,000	71,000	45,000	15,200		16,000	133,000	83,000	48,000
11,100		12,000	118,000	71,000	45,000	15,300		16,000	133,000	83,000	48,000
11,110	7/16	12,000	118,000	71,000	45,000	15,400		16,000	133,000	83,000	48,000
11,200		12,000	118,000	71,000	45,000	15,500		16,000	133,000	83,000	48,000
11,300		12,000	118,000	71,000	45,000	15,600		16,000	133,000	83,000	48,000
11,400		12,000	118,000	71,000	45,000	15,700		16,000	133,000	83,000	48,000
11,500		12,000	118,000	71,000	45,000	15,800		16,000	133,000	83,000	48,000
11,600		12,000	118,000	71,000	45,000	15,870	5/8	16,000	133,000	83,000	48,000
11,700		12,000	118,000	71,000	45,000	15,900		16,000	133,000	83,000	48,000
11,800		12,000	118,000	71,000	45,000	16,000		16,000	133,000	83,000	48,000
11,900		12,000	118,000	71,000	45,000	16,500		18,000	143,000	93,000	48,000
11,910	15/32	12,000	118,000	71,000	45,000	16,670	21/32	18,000	143,000	93,000	48,000
12,000		12,000	118,000	71,000	45,000	17,000		18,000	143,000	93,000	48,000
12,100		14,000	124,000	77,000	45,000	17,500		18,000	143,000	93,000	48,000
12,200		14,000	124,000	77,000	45,000	18,000		18,000	143,000	93,000	48,000
12,300	31/64	14,000	124,000	77,000	45,000	18,500		20,000	153,000	101,000	50,000
12,400		14,000	124,000	77,000	45,000	19,000		20,000	153,000	101,000	50,000
12,500		14,000	124,000	77,000	45,000	19,500		20,000	153,000	101,000	50,000
12,600		14,000	124,000	77,000	45,000	20,000		20,000	153,000	101,000	50,000
12,700	1/2	14,000	124,000	77,000	45,000						
12,800		14,000	124,000	77,000	45,000						
12,900		14,000	124,000	77,000	45,000						

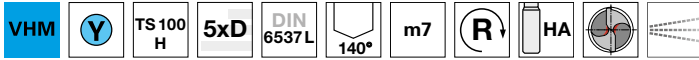


## TS-Drills con refrigeración interna

### Nº artículo 89425



P	M	K	N	S	H
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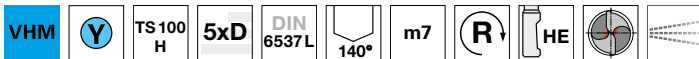


vaciado de punta  $\geq \varnothing 3,000$  • entrada cónica • forma del corte principal ligeramente cóncava • geometría de corte optimizada  
aceros aleados y templados hasta a 1400 N/mm<sup>2</sup> • Inconel, Hastelloy, Monel • titanio y aleaciones de titanio

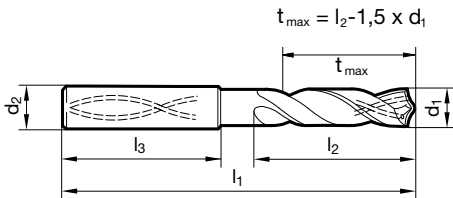
### Nº artículo 89426



P	M	K	N	S	H
•				•	○



vaciado de punta  $\geq \varnothing 3,000$  • entrada cónica • forma del corte principal ligeramente cóncava • geometría de corte optimizada  
aceros aleados y templados hasta a 1400 N/mm<sup>2</sup> • Inconel, Hastelloy, Monel • titanio y aleaciones de titanio



d1 mm	inch	d2 h6 mm	l1 mm	l2 mm	l3 mm	d1 mm	inch	d2 h6 mm	l1 mm	l2 mm	l3 mm
3,000		6,000	66,000	28,000	36,000	4,760	3/16	6,000	82,000	44,000	36,000
3,100		6,000	66,000	28,000	36,000	4,800		6,000	82,000	44,000	36,000
3,170	1/8	6,000	66,000	28,000	36,000	4,900		6,000	82,000	44,000	36,000
3,200		6,000	66,000	28,000	36,000	5,000		6,000	82,000	44,000	36,000
3,250		6,000	66,000	28,000	36,000	5,100		6,000	82,000	44,000	36,000
3,300		6,000	66,000	28,000	36,000	5,160	13/64	6,000	82,000	44,000	36,000
3,400		6,000	66,000	28,000	36,000	5,200		6,000	82,000	44,000	36,000
3,500		6,000	66,000	28,000	36,000	5,300		6,000	82,000	44,000	36,000
3,570	9/64	6,000	66,000	28,000	36,000	5,400		6,000	82,000	44,000	36,000
3,600		6,000	66,000	28,000	36,000	5,500		6,000	82,000	44,000	36,000
3,700		6,000	66,000	28,000	36,000	5,550		6,000	82,000	44,000	36,000
3,800		6,000	74,000	36,000	36,000	5,560	7/32	6,000	82,000	44,000	36,000
3,900		6,000	74,000	36,000	36,000	5,600		6,000	82,000	44,000	36,000
3,970	5/32	6,000	74,000	36,000	36,000	5,700		6,000	82,000	44,000	36,000
4,000		6,000	74,000	36,000	36,000	5,800		6,000	82,000	44,000	36,000
4,100		6,000	74,000	36,000	36,000	5,900		6,000	82,000	44,000	36,000
4,200		6,000	74,000	36,000	36,000	5,950	15/64	6,000	82,000	44,000	36,000
4,300		6,000	74,000	36,000	36,000	6,000		6,000	82,000	44,000	36,000
4,370	11/64	6,000	74,000	36,000	36,000	6,100		8,000	91,000	53,000	36,000
4,400		6,000	74,000	36,000	36,000	6,200		8,000	91,000	53,000	36,000
4,500		6,000	74,000	36,000	36,000	6,300		8,000	91,000	53,000	36,000
4,600		6,000	74,000	36,000	36,000	6,350	1/4	8,000	91,000	53,000	36,000
4,650		6,000	74,000	36,000	36,000	6,400		8,000	91,000	53,000	36,000
4,700		6,000	74,000	36,000	36,000	6,500		8,000	91,000	53,000	36,000





## TS-Drills con refrigeración interna

d1 mm	inch	d2 h6 mm	l1 mm	l2 mm	l3 mm	d1 mm	inch	d2 h6 mm	l1 mm	l2 mm	l3 mm
6,600		8,000	91,000	53,000	36,000	10,900		12,000	118,000	71,000	45,000
6,700		8,000	91,000	53,000	36,000	11,000		12,000	118,000	71,000	45,000
6,750	17/64	8,000	91,000	53,000	36,000	11,100		12,000	118,000	71,000	45,000
6,800		8,000	91,000	53,000	36,000	11,110	7/16	12,000	118,000	71,000	45,000
6,900		8,000	91,000	53,000	36,000	11,200		12,000	118,000	71,000	45,000
7,000		8,000	91,000	53,000	36,000	11,300		12,000	118,000	71,000	45,000
7,100		8,000	91,000	53,000	36,000	11,400		12,000	118,000	71,000	45,000
7,140	9/32	8,000	91,000	53,000	36,000	11,500		12,000	118,000	71,000	45,000
7,200		8,000	91,000	53,000	36,000	11,600		12,000	118,000	71,000	45,000
7,300		8,000	91,000	53,000	36,000	11,700		12,000	118,000	71,000	45,000
7,400		8,000	91,000	53,000	36,000	11,800		12,000	118,000	71,000	45,000
7,500		8,000	91,000	53,000	36,000	11,900		12,000	118,000	71,000	45,000
7,540	19/64	8,000	91,000	53,000	36,000	11,910	15/32	12,000	118,000	71,000	45,000
7,600		8,000	91,000	53,000	36,000	12,000		12,000	118,000	71,000	45,000
7,700		8,000	91,000	53,000	36,000	12,200		14,000	124,000	77,000	45,000
7,800		8,000	91,000	53,000	36,000	12,500		14,000	124,000	77,000	45,000
7,900		8,000	91,000	53,000	36,000	12,700	1/2	14,000	124,000	77,000	45,000
7,940	5/16	8,000	91,000	53,000	36,000	12,800		14,000	124,000	77,000	45,000
8,000		8,000	91,000	53,000	36,000	13,000		14,000	124,000	77,000	45,000
8,100		10,000	103,000	61,000	40,000	13,300		14,000	124,000	77,000	45,000
8,200		10,000	103,000	61,000	40,000	13,500		14,000	124,000	77,000	45,000
8,300		10,000	103,000	61,000	40,000	13,700		14,000	124,000	77,000	45,000
8,330	21/64	10,000	103,000	61,000	40,000	14,000		14,000	124,000	77,000	45,000
8,400		10,000	103,000	61,000	40,000	14,200		16,000	133,000	83,000	48,000
8,500		10,000	103,000	61,000	40,000	14,290	9/16	16,000	133,000	83,000	48,000
8,600		10,000	103,000	61,000	40,000	14,300		16,000	133,000	83,000	48,000
8,700		10,000	103,000	61,000	40,000	14,500		16,000	133,000	83,000	48,000
8,730	11/32	10,000	103,000	61,000	40,000	14,700		16,000	133,000	83,000	48,000
8,800		10,000	103,000	61,000	40,000	15,000		16,000	133,000	83,000	48,000
8,900		10,000	103,000	61,000	40,000	15,200		16,000	133,000	83,000	48,000
9,000		10,000	103,000	61,000	40,000	15,300		16,000	133,000	83,000	48,000
9,100		10,000	103,000	61,000	40,000	15,500		16,000	133,000	83,000	48,000
9,130	23/64	10,000	103,000	61,000	40,000	15,700		16,000	133,000	83,000	48,000
9,200		10,000	103,000	61,000	40,000	16,000		16,000	133,000	83,000	48,000
9,250		10,000	103,000	61,000	40,000	16,300		18,000	143,000	93,000	48,000
9,300		10,000	103,000	61,000	40,000	16,500		18,000	143,000	93,000	48,000
9,400		10,000	103,000	61,000	40,000	16,900		18,000	143,000	93,000	48,000
9,500		10,000	103,000	61,000	40,000	17,000		18,000	143,000	93,000	48,000
9,520	3/8	10,000	103,000	61,000	40,000	17,300		18,000	143,000	93,000	48,000
9,600		10,000	103,000	61,000	40,000	17,500		18,000	143,000	93,000	48,000
9,700		10,000	103,000	61,000	40,000	18,000		18,000	143,000	93,000	48,000
9,800		10,000	103,000	61,000	40,000	18,500		20,000	153,000	101,000	50,000
9,900		10,000	103,000	61,000	40,000	18,900		20,000	153,000	101,000	50,000
9,920	25/64	10,000	103,000	61,000	40,000	19,000		20,000	153,000	101,000	50,000
10,000		10,000	103,000	61,000	40,000	19,050	3/4	20,000	153,000	101,000	50,000
10,100		12,000	118,000	71,000	45,000	19,300		20,000	153,000	101,000	50,000
10,200		12,000	118,000	71,000	45,000	19,500		20,000	153,000	101,000	50,000
10,300		12,000	118,000	71,000	45,000	20,000		20,000	153,000	101,000	50,000
10,320	13/32	12,000	118,000	71,000	45,000						
10,400		12,000	118,000	71,000	45,000						
10,500		12,000	118,000	71,000	45,000						
10,600		12,000	118,000	71,000	45,000						
10,700		12,000	118,000	71,000	45,000						
10,800		12,000	118,000	71,000	45,000						

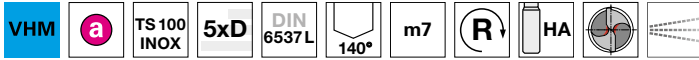


## TS-Drills con refrigeración interna

### Nº artículo 89451



P	M	K	N	S	H
○	●			○	

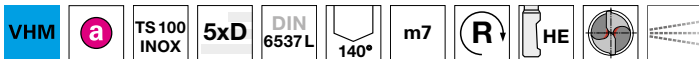


vaciado de punta  $\geq \varnothing 3,000$  • afilado plano • forma recta del corte principal • geometría de corte optimizada  
aceros inoxidables y resistentes al ácido y al calor • titanio y aleaciones de titanio • Inconel, Hastelloy, Monel

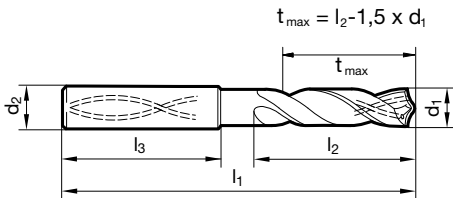
### Nº artículo 89551



P	M	K	N	S	H
○	●			○	



vaciado de punta  $\geq \varnothing 3,000$  • afilado plano • forma recta del corte principal • geometría de corte optimizada  
aceros inoxidables y resistentes al ácido y al calor • titanio y aleaciones de titanio • Inconel, Hastelloy, Monel



d1 mm	inch	d2 h6 mm	l1 mm	l2 mm	l3 mm	d1 mm	inch	d2 h6 mm	l1 mm	l2 mm	l3 mm
3,000		6,000	66,000	28,000	36,000	4,760	3/16	6,000	82,000	44,000	36,000
3,100		6,000	66,000	28,000	36,000	4,800		6,000	82,000	44,000	36,000
3,170	1/8	6,000	66,000	28,000	36,000	4,900		6,000	82,000	44,000	36,000
3,200		6,000	66,000	28,000	36,000	5,000		6,000	82,000	44,000	36,000
3,250		6,000	66,000	28,000	36,000	5,100		6,000	82,000	44,000	36,000
3,300		6,000	66,000	28,000	36,000	5,160	13/64	6,000	82,000	44,000	36,000
3,400		6,000	66,000	28,000	36,000	5,200		6,000	82,000	44,000	36,000
3,500		6,000	66,000	28,000	36,000	5,300		6,000	82,000	44,000	36,000
3,570	9/64	6,000	66,000	28,000	36,000	5,400		6,000	82,000	44,000	36,000
3,600		6,000	66,000	28,000	36,000	5,500		6,000	82,000	44,000	36,000
3,700		6,000	66,000	28,000	36,000	5,550		6,000	82,000	44,000	36,000
3,800		6,000	74,000	36,000	36,000	5,560	7/32	6,000	82,000	44,000	36,000
3,900		6,000	74,000	36,000	36,000	5,600		6,000	82,000	44,000	36,000
3,970	5/32	6,000	74,000	36,000	36,000	5,700		6,000	82,000	44,000	36,000
4,000		6,000	74,000	36,000	36,000	5,800		6,000	82,000	44,000	36,000
4,100		6,000	74,000	36,000	36,000	5,900		6,000	82,000	44,000	36,000
4,200		6,000	74,000	36,000	36,000	5,950	15/64	6,000	82,000	44,000	36,000
4,300		6,000	74,000	36,000	36,000	6,000		6,000	82,000	44,000	36,000
4,370	11/64	6,000	74,000	36,000	36,000	6,100		8,000	91,000	53,000	36,000
4,400		6,000	74,000	36,000	36,000	6,200		8,000	91,000	53,000	36,000
4,500		6,000	74,000	36,000	36,000	6,300		8,000	91,000	53,000	36,000
4,600		6,000	74,000	36,000	36,000	6,350	1/4	8,000	91,000	53,000	36,000
4,650		6,000	74,000	36,000	36,000	6,400		8,000	91,000	53,000	36,000
4,700		6,000	74,000	36,000	36,000	6,500		8,000	91,000	53,000	36,000



## TS-Drills con refrigeración interna

d1 mm	inch	d2 h6 mm	l1 mm	l2 mm	l3 mm	d1 mm	inch	d2 h6 mm	l1 mm	l2 mm	l3 mm
6,600		8,000	91,000	53,000	36,000	10,900		12,000	118,000	71,000	45,000
6,700		8,000	91,000	53,000	36,000	11,000		12,000	118,000	71,000	45,000
6,750	17/64	8,000	91,000	53,000	36,000	11,100		12,000	118,000	71,000	45,000
6,800		8,000	91,000	53,000	36,000	11,110	7/16	12,000	118,000	71,000	45,000
6,900		8,000	91,000	53,000	36,000	11,200		12,000	118,000	71,000	45,000
7,000		8,000	91,000	53,000	36,000	11,300		12,000	118,000	71,000	45,000
7,100		8,000	91,000	53,000	36,000	11,400		12,000	118,000	71,000	45,000
7,140	9/32	8,000	91,000	53,000	36,000	11,500		12,000	118,000	71,000	45,000
7,200		8,000	91,000	53,000	36,000	11,600		12,000	118,000	71,000	45,000
7,300		8,000	91,000	53,000	36,000	11,700		12,000	118,000	71,000	45,000
7,400		8,000	91,000	53,000	36,000	11,800		12,000	118,000	71,000	45,000
7,500		8,000	91,000	53,000	36,000	11,900		12,000	118,000	71,000	45,000
7,540	19/64	8,000	91,000	53,000	36,000	11,910	15/32	12,000	118,000	71,000	45,000
7,600		8,000	91,000	53,000	36,000	12,000		12,000	118,000	71,000	45,000
7,700		8,000	91,000	53,000	36,000	12,200		14,000	124,000	77,000	45,000
7,800		8,000	91,000	53,000	36,000	12,500		14,000	124,000	77,000	45,000
7,900		8,000	91,000	53,000	36,000	12,700	1/2	14,000	124,000	77,000	45,000
7,940	5/16	8,000	91,000	53,000	36,000	12,800		14,000	124,000	77,000	45,000
8,000		8,000	91,000	53,000	36,000	13,000		14,000	124,000	77,000	45,000
8,100		10,000	103,000	61,000	40,000	13,300		14,000	124,000	77,000	45,000
8,200		10,000	103,000	61,000	40,000	13,500		14,000	124,000	77,000	45,000
8,300		10,000	103,000	61,000	40,000	13,700		14,000	124,000	77,000	45,000
8,330	21/64	10,000	103,000	61,000	40,000	14,000		14,000	124,000	77,000	45,000
8,400		10,000	103,000	61,000	40,000	14,200		16,000	133,000	83,000	48,000
8,500		10,000	103,000	61,000	40,000	14,290	9/16	16,000	133,000	83,000	48,000
8,600		10,000	103,000	61,000	40,000	14,300		16,000	133,000	83,000	48,000
8,700		10,000	103,000	61,000	40,000	14,500		16,000	133,000	83,000	48,000
8,730	11/32	10,000	103,000	61,000	40,000	14,700		16,000	133,000	83,000	48,000
8,800		10,000	103,000	61,000	40,000	15,000		16,000	133,000	83,000	48,000
8,900		10,000	103,000	61,000	40,000	15,200		16,000	133,000	83,000	48,000
9,000		10,000	103,000	61,000	40,000	15,300		16,000	133,000	83,000	48,000
9,100		10,000	103,000	61,000	40,000	15,500		16,000	133,000	83,000	48,000
9,130	23/64	10,000	103,000	61,000	40,000	15,700		16,000	133,000	83,000	48,000
9,200		10,000	103,000	61,000	40,000	16,000		16,000	133,000	83,000	48,000
9,250		10,000	103,000	61,000	40,000	16,300		18,000	143,000	93,000	48,000
9,300		10,000	103,000	61,000	40,000	16,500		18,000	143,000	93,000	48,000
9,400		10,000	103,000	61,000	40,000	16,900		18,000	143,000	93,000	48,000
9,500		10,000	103,000	61,000	40,000	17,000		18,000	143,000	93,000	48,000
9,520	3/8	10,000	103,000	61,000	40,000	17,300		18,000	143,000	93,000	48,000
9,600		10,000	103,000	61,000	40,000	17,500		18,000	143,000	93,000	48,000
9,700		10,000	103,000	61,000	40,000	18,000		18,000	143,000	93,000	48,000
9,800		10,000	103,000	61,000	40,000	18,500		20,000	153,000	101,000	50,000
9,900		10,000	103,000	61,000	40,000	18,900		20,000	153,000	101,000	50,000
9,920	25/64	10,000	103,000	61,000	40,000	19,000		20,000	153,000	101,000	50,000
10,000		10,000	103,000	61,000	40,000	19,050	3/4	20,000	153,000	101,000	50,000
10,100		12,000	118,000	71,000	45,000	19,300		20,000	153,000	101,000	50,000
10,200		12,000	118,000	71,000	45,000	19,500		20,000	153,000	101,000	50,000
10,300		12,000	118,000	71,000	45,000	20,000		20,000	153,000	101,000	50,000
10,320	13/32	12,000	118,000	71,000	45,000						
10,400		12,000	118,000	71,000	45,000						
10,500		12,000	118,000	71,000	45,000						
10,600		12,000	118,000	71,000	45,000						
10,700		12,000	118,000	71,000	45,000						
10,800		12,000	118,000	71,000	45,000						

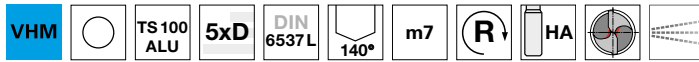


## TS-Drills con refrigeración interna

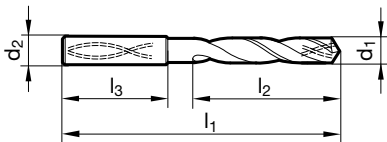
Nº artículo 89560



P	M	K	N	S	H
			•		



vaciado de punta  $\geq \varnothing 3,000$  • entrada cónica • forma cóncava del corte principal • geometría de corte optimizada  
 aluminio y sus aleaciones • aluminios con alto porcentaje de Si



d1		d2 h6	l1	l2	l3	d1		d2 h6	l1	l2	l3
mm	inch	mm	mm	mm	mm	mm	inch	mm	mm	mm	mm
3,000		6,000	66,000	28,000	36,000	6,100		8,000	91,000	53,000	36,000
3,100		6,000	66,000	28,000	36,000	6,200		8,000	91,000	53,000	36,000
3,170	1/8	6,000	66,000	28,000	36,000	6,300		8,000	91,000	53,000	36,000
3,200		6,000	66,000	28,000	36,000	6,350	1/4	8,000	91,000	53,000	36,000
3,250		6,000	66,000	28,000	36,000	6,400		8,000	91,000	53,000	36,000
3,300		6,000	66,000	28,000	36,000	6,500		8,000	91,000	53,000	36,000
3,400		6,000	66,000	28,000	36,000	6,600		8,000	91,000	53,000	36,000
3,500		6,000	66,000	28,000	36,000	6,700		8,000	91,000	53,000	36,000
3,570	9/64	6,000	66,000	28,000	36,000	6,750	17/64	8,000	91,000	53,000	36,000
3,600		6,000	66,000	28,000	36,000	6,800		8,000	91,000	53,000	36,000
3,700		6,000	66,000	28,000	36,000	6,900		8,000	91,000	53,000	36,000
3,800		6,000	74,000	36,000	36,000	7,000		8,000	91,000	53,000	36,000
3,900		6,000	74,000	36,000	36,000	7,100		8,000	91,000	53,000	36,000
3,970	5/32	6,000	74,000	36,000	36,000	7,140	9/32	8,000	91,000	53,000	36,000
4,000		6,000	74,000	36,000	36,000	7,200		8,000	91,000	53,000	36,000
4,100		6,000	74,000	36,000	36,000	7,300		8,000	91,000	53,000	36,000
4,200		6,000	74,000	36,000	36,000	7,400		8,000	91,000	53,000	36,000
4,300		6,000	74,000	36,000	36,000	7,500		8,000	91,000	53,000	36,000
4,370	11/64	6,000	74,000	36,000	36,000	7,540	19/64	8,000	91,000	53,000	36,000
4,400		6,000	74,000	36,000	36,000	7,600		8,000	91,000	53,000	36,000
4,500		6,000	74,000	36,000	36,000	7,700		8,000	91,000	53,000	36,000
4,600		6,000	74,000	36,000	36,000	7,800		8,000	91,000	53,000	36,000
4,650		6,000	74,000	36,000	36,000	7,900		8,000	91,000	53,000	36,000
4,700		6,000	74,000	36,000	36,000	7,940	5/16	8,000	91,000	53,000	36,000
4,760	3/16	6,000	82,000	44,000	36,000	8,000		8,000	91,000	53,000	36,000
4,800		6,000	82,000	44,000	36,000	8,100		10,000	103,000	61,000	40,000
4,900		6,000	82,000	44,000	36,000	8,200		10,000	103,000	61,000	40,000
5,000		6,000	82,000	44,000	36,000	8,300		10,000	103,000	61,000	40,000
5,100		6,000	82,000	44,000	36,000	8,330	21/64	10,000	103,000	61,000	40,000
5,160	13/64	6,000	82,000	44,000	36,000	8,400		10,000	103,000	61,000	40,000
5,200		6,000	82,000	44,000	36,000	8,500		10,000	103,000	61,000	40,000
5,300		6,000	82,000	44,000	36,000	8,600		10,000	103,000	61,000	40,000
5,400		6,000	82,000	44,000	36,000	8,700		10,000	103,000	61,000	40,000
5,500		6,000	82,000	44,000	36,000	8,730	11/32	10,000	103,000	61,000	40,000
5,550		6,000	82,000	44,000	36,000	8,800		10,000	103,000	61,000	40,000
5,560	7/32	6,000	82,000	44,000	36,000	8,900		10,000	103,000	61,000	40,000
5,600		6,000	82,000	44,000	36,000	9,000		10,000	103,000	61,000	40,000
5,700		6,000	82,000	44,000	36,000	9,100		10,000	103,000	61,000	40,000
5,800		6,000	82,000	44,000	36,000	9,130	23/64	10,000	103,000	61,000	40,000
5,900		6,000	82,000	44,000	36,000	9,200		10,000	103,000	61,000	40,000
5,950	15/64	6,000	82,000	44,000	36,000	9,250		10,000	103,000	61,000	40,000
6,000		6,000	82,000	44,000	36,000	9,300		10,000	103,000	61,000	40,000



## TS-Drills con refrigeración interna

d1 mm	inch	d2 h6 mm	l1 mm	l2 mm	l3 mm	d1 mm	inch	d2 h6 mm	l1 mm	l2 mm	l3 mm
9,340		10,000	103,000	61,000	40,000	13,300		14,000	124,000	77,000	45,000
9,400		10,000	103,000	61,000	40,000	13,400		14,000	124,000	77,000	45,000
9,500		10,000	103,000	61,000	40,000	13,500		14,000	124,000	77,000	45,000
9,520	3/8	10,000	103,000	61,000	40,000	13,700		14,000	124,000	77,000	45,000
9,600		10,000	103,000	61,000	40,000	13,800		14,000	124,000	77,000	45,000
9,700		10,000	103,000	61,000	40,000	14,000		14,000	124,000	77,000	45,000
9,800		10,000	103,000	61,000	40,000	14,100		16,000	133,000	83,000	48,000
9,900		10,000	103,000	61,000	40,000	14,200		16,000	133,000	83,000	48,000
9,920	25/64	10,000	103,000	61,000	40,000	14,290	9/16	16,000	133,000	83,000	48,000
10,000		10,000	103,000	61,000	40,000	14,300		16,000	133,000	83,000	48,000
10,100		12,000	118,000	71,000	45,000	14,400		16,000	133,000	83,000	48,000
10,200		12,000	118,000	71,000	45,000	14,500		16,000	133,000	83,000	48,000
10,300		12,000	118,000	71,000	45,000	14,700		16,000	133,000	83,000	48,000
10,320	13/32	12,000	118,000	71,000	45,000	14,800		16,000	133,000	83,000	48,000
10,400		12,000	118,000	71,000	45,000	15,000		16,000	133,000	83,000	48,000
10,500		12,000	118,000	71,000	45,000	15,100		16,000	133,000	83,000	48,000
10,600		12,000	118,000	71,000	45,000	15,200		16,000	133,000	83,000	48,000
10,700		12,000	118,000	71,000	45,000	15,300		16,000	133,000	83,000	48,000
10,800		12,000	118,000	71,000	45,000	15,500		16,000	133,000	83,000	48,000
10,900		12,000	118,000	71,000	45,000	15,700		16,000	133,000	83,000	48,000
11,000		12,000	118,000	71,000	45,000	15,800		16,000	133,000	83,000	48,000
11,100		12,000	118,000	71,000	45,000	16,000		16,000	133,000	83,000	48,000
11,110	7/16	12,000	118,000	71,000	45,000	16,500		18,000	143,000	93,000	48,000
11,200		12,000	118,000	71,000	45,000	16,700		18,000	143,000	93,000	48,000
11,300		12,000	118,000	71,000	45,000	16,900		18,000	143,000	93,000	48,000
11,400		12,000	118,000	71,000	45,000	17,000		18,000	143,000	93,000	48,000
11,500		12,000	118,000	71,000	45,000	17,500		18,000	143,000	93,000	48,000
11,600		12,000	118,000	71,000	45,000	17,700		18,000	143,000	93,000	48,000
11,700		12,000	118,000	71,000	45,000	18,000		18,000	143,000	93,000	48,000
11,800		12,000	118,000	71,000	45,000	18,500		20,000	153,000	101,000	50,000
11,900		12,000	118,000	71,000	45,000	18,900		20,000	153,000	101,000	50,000
11,910	15/32	12,000	118,000	71,000	45,000	19,000		20,000	153,000	101,000	50,000
12,000		12,000	118,000	71,000	45,000	19,050	3/4	20,000	153,000	101,000	50,000
12,100		14,000	124,000	77,000	45,000	19,300		20,000	153,000	101,000	50,000
12,200		14,000	124,000	77,000	45,000	19,500		20,000	153,000	101,000	50,000
12,500		14,000	124,000	77,000	45,000	20,000		20,000	153,000	101,000	50,000
12,600		14,000	124,000	77,000	45,000						
12,700	1/2	14,000	124,000	77,000	45,000						
12,800		14,000	124,000	77,000	45,000						
12,900		14,000	124,000	77,000	45,000						
13,000		14,000	124,000	77,000	45,000						
13,100	33/64	14,000	124,000	77,000	45,000						

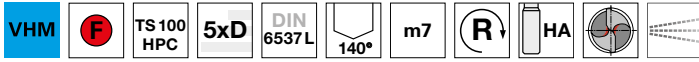


## TS-Drills con refrigeración interna

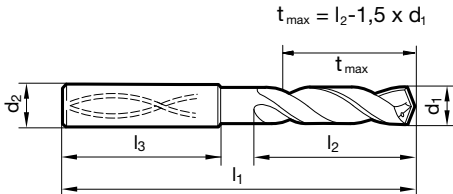
Nº artículo 89460



P	M	K	N	S	H
●	○	○	○	○	○



vaciado de punta  $\geq \varnothing 3,000$  • entrada cónica • corte principal cóncavo • geometría de corte optimizada • máximo rendimiento para el mecanizado de alto rendimiento en aceros estructurales y cementados • aceros para tornos automáticos, aceros de bonificación • aceros (aleados/no aleados) hasta 1400 N/mm<sup>2</sup> • aceros inoxidables y resistentes al ácido y al calor • titanio y aleaciones de titanio • aleaciones especiales



d1		d2 h6	l1	l2	l3	d1		d2 h6	l1	l2	l3
mm	inch	mm	mm	mm	mm	mm	inch	mm	mm	mm	mm
3,000		6,000	66,000	28,000	36,000	5,900		6,000	82,000	44,000	36,000
3,100		6,000	66,000	28,000	36,000	5,950	15/64	6,000	82,000	44,000	36,000
3,170	1/8	6,000	66,000	28,000	36,000	6,000		6,000	82,000	44,000	36,000
3,200		6,000	66,000	28,000	36,000	6,100		8,000	91,000	53,000	36,000
3,250		6,000	66,000	28,000	36,000	6,200		8,000	91,000	53,000	36,000
3,300		6,000	66,000	28,000	36,000	6,300		8,000	91,000	53,000	36,000
3,400		6,000	66,000	28,000	36,000	6,350	1/4	8,000	91,000	53,000	36,000
3,500		6,000	66,000	28,000	36,000	6,400		8,000	91,000	53,000	36,000
3,570	9/64	6,000	66,000	28,000	36,000	6,500		8,000	91,000	53,000	36,000
3,600		6,000	66,000	28,000	36,000	6,530		8,000	91,000	53,000	36,000
3,700		6,000	66,000	28,000	36,000	6,550		8,000	91,000	53,000	36,000
3,800		6,000	74,000	36,000	36,000	6,600		8,000	91,000	53,000	36,000
3,900		6,000	74,000	36,000	36,000	6,700		8,000	91,000	53,000	36,000
3,970	5/32	6,000	74,000	36,000	36,000	6,750	17/64	8,000	91,000	53,000	36,000
4,000		6,000	74,000	36,000	36,000	6,800		8,000	91,000	53,000	36,000
4,040		6,000	74,000	36,000	36,000	6,900		8,000	91,000	53,000	36,000
4,100		6,000	74,000	36,000	36,000	7,000		8,000	91,000	53,000	36,000
4,200		6,000	74,000	36,000	36,000	7,100		8,000	91,000	53,000	36,000
4,300		6,000	74,000	36,000	36,000	7,140	9/32	8,000	91,000	53,000	36,000
4,370	11/64	6,000	74,000	36,000	36,000	7,200		8,000	91,000	53,000	36,000
4,400		6,000	74,000	36,000	36,000	7,300		8,000	91,000	53,000	36,000
4,500		6,000	74,000	36,000	36,000	7,400		8,000	91,000	53,000	36,000
4,600		6,000	74,000	36,000	36,000	7,500		8,000	91,000	53,000	36,000
4,650		6,000	74,000	36,000	36,000	7,540	19/64	8,000	91,000	53,000	36,000
4,700		6,000	74,000	36,000	36,000	7,550		8,000	91,000	53,000	36,000
4,760	3/16	6,000	82,000	44,000	36,000	7,600		8,000	91,000	53,000	36,000
4,800		6,000	82,000	44,000	36,000	7,650		8,000	91,000	53,000	36,000
4,900		6,000	82,000	44,000	36,000	7,700		8,000	91,000	53,000	36,000
5,000		6,000	82,000	44,000	36,000	7,800		8,000	91,000	53,000	36,000
5,100		6,000	82,000	44,000	36,000	7,900		8,000	91,000	53,000	36,000
5,110		6,000	82,000	44,000	36,000	7,940	5/16	8,000	91,000	53,000	36,000
5,160	13/64	6,000	82,000	44,000	36,000	8,000		8,000	91,000	53,000	36,000
5,200		6,000	82,000	44,000	36,000	8,100		10,000	103,000	61,000	40,000
5,300		6,000	82,000	44,000	36,000	8,200		10,000	103,000	61,000	40,000
5,400		6,000	82,000	44,000	36,000	8,300		10,000	103,000	61,000	40,000
5,410		6,000	82,000	44,000	36,000	8,330	21/64	10,000	103,000	61,000	40,000
5,500		6,000	82,000	44,000	36,000	8,400		10,000	103,000	61,000	40,000
5,550		6,000	82,000	44,000	36,000	8,500		10,000	103,000	61,000	40,000
5,560	7/32	6,000	82,000	44,000	36,000	8,600		10,000	103,000	61,000	40,000
5,600		6,000	82,000	44,000	36,000	8,700		10,000	103,000	61,000	40,000
5,700		6,000	82,000	44,000	36,000	8,730	11/32	10,000	103,000	61,000	40,000
5,800		6,000	82,000	44,000	36,000	8,800		10,000	103,000	61,000	40,000



## TS-Drills con refrigeración interna

d1 mm	inch	d2 h6 mm	l1 mm	l2 mm	l3 mm	d1 mm	inch	d2 h6 mm	l1 mm	l2 mm	l3 mm
8,900		10,000	103,000	61,000	40,000	14,100		16,000	133,000	83,000	48,000
9,000		10,000	103,000	61,000	40,000	14,200		16,000	133,000	83,000	48,000
9,100		10,000	103,000	61,000	40,000	14,290	9/16	16,000	133,000	83,000	48,000
9,130	23/64	10,000	103,000	61,000	40,000	14,300		16,000	133,000	83,000	48,000
9,200		10,000	103,000	61,000	40,000	14,400		16,000	133,000	83,000	48,000
9,250		10,000	103,000	61,000	40,000	14,500		16,000	133,000	83,000	48,000
9,300		10,000	103,000	61,000	40,000	14,600		16,000	133,000	83,000	48,000
9,340		10,000	103,000	61,000	40,000	14,680	37/64	16,000	133,000	83,000	48,000
9,400		10,000	103,000	61,000	40,000	14,700		16,000	133,000	83,000	48,000
9,500		10,000	103,000	61,000	40,000	14,800		16,000	133,000	83,000	48,000
9,520	3/8	10,000	103,000	61,000	40,000	14,900		16,000	133,000	83,000	48,000
9,550		10,000	103,000	61,000	40,000	15,000		16,000	133,000	83,000	48,000
9,600		10,000	103,000	61,000	40,000	15,080	19/32	16,000	133,000	83,000	48,000
9,700		10,000	103,000	61,000	40,000	15,100		16,000	133,000	83,000	48,000
9,800		10,000	103,000	61,000	40,000	15,200		16,000	133,000	83,000	48,000
9,900		10,000	103,000	61,000	40,000	15,300		16,000	133,000	83,000	48,000
9,920	25/64	10,000	103,000	61,000	40,000	15,400		16,000	133,000	83,000	48,000
10,000		10,000	103,000	61,000	40,000	15,480	39/64	16,000	133,000	83,000	48,000
10,100		12,000	118,000	71,000	45,000	15,500		16,000	133,000	83,000	48,000
10,200		12,000	118,000	71,000	45,000	15,550		16,000	133,000	83,000	48,000
10,300		12,000	118,000	71,000	45,000	15,600		16,000	133,000	83,000	48,000
10,320	13/32	12,000	118,000	71,000	45,000	15,700		16,000	133,000	83,000	48,000
10,400		12,000	118,000	71,000	45,000	15,800		16,000	133,000	83,000	48,000
10,500		12,000	118,000	71,000	45,000	15,870	5/8	16,000	133,000	83,000	48,000
10,600		12,000	118,000	71,000	45,000	15,900		16,000	133,000	83,000	48,000
10,700		12,000	118,000	71,000	45,000	16,000		16,000	133,000	83,000	48,000
10,720	27/64	12,000	118,000	71,000	45,000	16,270	41/64	18,000	143,000	93,000	48,000
10,800		12,000	118,000	71,000	45,000	16,300		18,000	143,000	93,000	48,000
10,900		12,000	118,000	71,000	45,000	16,500		18,000	143,000	93,000	48,000
11,000		12,000	118,000	71,000	45,000	16,670	21/32	18,000	143,000	93,000	48,000
11,100		12,000	118,000	71,000	45,000	16,700		18,000	143,000	93,000	48,000
11,110	7/16	12,000	118,000	71,000	45,000	16,900		18,000	143,000	93,000	48,000
11,200		12,000	118,000	71,000	45,000	17,000		18,000	143,000	93,000	48,000
11,300		12,000	118,000	71,000	45,000	17,070	43/64	18,000	143,000	93,000	48,000
11,400		12,000	118,000	71,000	45,000	17,460	11/16	18,000	143,000	93,000	48,000
11,500		12,000	118,000	71,000	45,000	17,500		18,000	143,000	93,000	48,000
11,510	29/64	12,000	118,000	71,000	45,000	17,550		18,000	143,000	93,000	48,000
11,550		12,000	118,000	71,000	45,000	17,700		18,000	143,000	93,000	48,000
11,600		12,000	118,000	71,000	45,000	17,860	45/64	18,000	143,000	93,000	48,000
11,700		12,000	118,000	71,000	45,000	18,000		18,000	143,000	93,000	48,000
11,800		12,000	118,000	71,000	45,000	18,260	23/32	20,000	153,000	101,000	50,000
11,900		12,000	118,000	71,000	45,000	18,500		20,000	153,000	101,000	50,000
11,910	15/32	12,000	118,000	71,000	45,000	18,700		20,000	153,000	101,000	50,000
12,000		12,000	118,000	71,000	45,000	18,900		20,000	153,000	101,000	50,000
12,100		14,000	124,000	77,000	45,000	19,000		20,000	153,000	101,000	50,000
12,200		14,000	124,000	77,000	45,000	19,050	3/4	20,000	153,000	101,000	50,000
12,300	31/64	14,000	124,000	77,000	45,000	19,250		20,000	153,000	101,000	50,000
12,400		14,000	124,000	77,000	45,000	19,300		20,000	153,000	101,000	50,000
12,500		14,000	124,000	77,000	45,000	19,450	49/64	20,000	153,000	101,000	50,000
12,600		14,000	124,000	77,000	45,000	19,500		20,000	153,000	101,000	50,000
12,700	1/2	14,000	124,000	77,000	45,000	19,550		20,000	153,000	101,000	50,000
12,800		14,000	124,000	77,000	45,000	19,700		20,000	153,000	101,000	50,000
12,900		14,000	124,000	77,000	45,000	19,800		20,000	153,000	101,000	50,000
13,000		14,000	124,000	77,000	45,000	19,840	25/32	20,000	153,000	101,000	50,000
13,100	33/64	14,000	124,000	77,000	45,000	20,000		20,000	153,000	101,000	50,000
13,200		14,000	124,000	77,000	45,000						
13,300		14,000	124,000	77,000	45,000						
13,400		14,000	124,000	77,000	45,000						
13,490	17/32	14,000	124,000	77,000	45,000						
13,500		14,000	124,000	77,000	45,000						
13,600		14,000	124,000	77,000	45,000						
13,700		14,000	124,000	77,000	45,000						
13,800		14,000	124,000	77,000	45,000						
13,890	35/64	14,000	124,000	77,000	45,000						
13,900		14,000	124,000	77,000	45,000						
14,000		14,000	124,000	77,000	45,000						

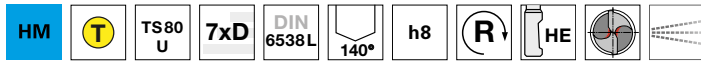


## TS-Drills con refrigeración interna

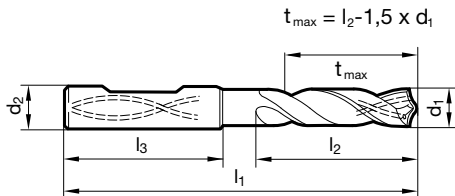
Nº artículo 89308



P	M	K	N	S	H
•	○	○	○		



vaciado de punta  $\geq \varnothing 10,000$  • entrada cónica • amortigua oscilaciones y golpes • portaherr. HSS con plaquita HM soldada  
 aceros no aleados y de baja aleación • fundición gris, fundición de grafito • latón, bronce, plásticos y grafitos



d1 mm	d2 h6 mm	l1 mm	l2 mm	l3 mm	d1 mm	d2 h6 mm	l1 mm	l2 mm	l3 mm
10,000	16,000	151,000	99,000	48,000	16,500	20,000	202,000	148,000	50,000
13,000	16,000	167,000	115,000	48,000	17,000	20,000	202,000	148,000	50,000
13,500	16,000	167,000	115,000	48,000	18,000	20,000	202,000	148,000	50,000
14,000	16,000	167,000	115,000	48,000	19,000	25,000	224,000	164,000	56,000
15,000	20,000	186,000	132,000	50,000	20,000	25,000	224,000	164,000	56,000
16,000	20,000	186,000	132,000	50,000	22,000	25,000	241,000	181,000	56,000



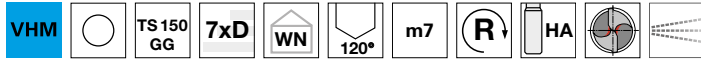


## TS-Drills con refrigeración interna

Nº artículo 89294

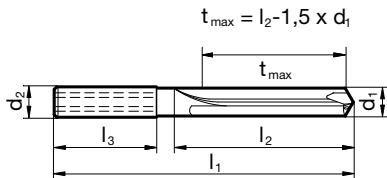


P	M	K	N	S	H
		•	○		



vaciado de punta  $\geq \varnothing 3,000$  • entrada cónica • tolerancias en diámetro estrechas • calidad superficial del taladro muy buena • vigilar presión óptima del refrigerante

aluminio y sus aleaciones • aluminios con alto porcentaje de Si



d1	inch	d2 h6	l1	l2	l3	d1	inch	d2 h6	l1	l2	l3
mm		mm	mm	mm	mm	mm		mm	mm	mm	mm
3,000		6,000	74,000	32,000	36,000	11,500		12,000	163,000	114,000	45,000
3,100		6,000	74,000	32,000	36,000	12,000		12,000	163,000	114,000	45,000
3,200		6,000	74,000	32,000	36,000	12,300	31/64	14,000	182,000	133,000	45,000
3,500		6,000	74,000	34,000	36,000	12,500		14,000	182,000	133,000	45,000
3,600		6,000	74,000	34,000	36,000	12,700	1/2	14,000	182,000	133,000	45,000
3,700		6,000	74,000	34,000	36,000	13,000		14,000	182,000	133,000	45,000
3,800		6,000	97,000	45,000	36,000	13,500		14,000	182,000	133,000	45,000
4,000		6,000	97,000	45,000	36,000	14,000		14,000	182,000	133,000	45,000
4,100		6,000	97,000	45,000	36,000	14,500		16,000	204,000	152,000	48,000
4,200		6,000	97,000	45,000	36,000	15,000		16,000	204,000	152,000	48,000
4,300		6,000	97,000	45,000	36,000	15,500		16,000	204,000	152,000	48,000
4,400		6,000	97,000	45,000	36,000	16,000		16,000	204,000	152,000	48,000
4,500		6,000	97,000	45,000	36,000	16,500		18,000	223,000	171,000	48,000
4,700		6,000	97,000	45,000	36,000	17,000		18,000	223,000	171,000	48,000
4,800		6,000	97,000	57,000	36,000	17,500		18,000	223,000	171,000	48,000
4,900		6,000	97,000	57,000	36,000	18,000		18,000	223,000	171,000	48,000
5,000		6,000	97,000	57,000	36,000	18,500		20,000	244,000	190,000	50,000
5,500		6,000	97,000	57,000	36,000	19,000		20,000	244,000	190,000	50,000
6,000		6,000	97,000	57,000	36,000	19,500		20,000	244,000	190,000	50,000
6,500		8,000	116,000	76,000	36,000	20,000		20,000	244,000	190,000	50,000
6,800		8,000	116,000	76,000	36,000						
7,000		8,000	116,000	76,000	36,000						
7,800		8,000	116,000	76,000	36,000						
8,000		8,000	116,000	76,000	36,000						
8,500		10,000	139,000	95,000	40,000						
9,000		10,000	139,000	95,000	40,000						
10,000		10,000	139,000	95,000	40,000						
10,200		12,000	163,000	114,000	45,000						
10,500		12,000	163,000	114,000	45,000						
11,000		12,000	163,000	114,000	45,000						

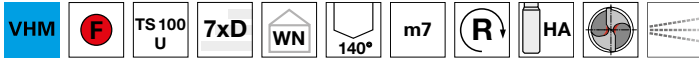


## TS-Drills con refrigeración interna

### Nº artículo 89412



P	M	K	N	S	H
●	○	●	○	○	○

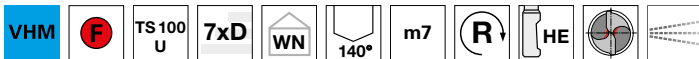


vaciado de punta  $\geq \varnothing 3,000$  • afilado plano • forma recta del corte principal • geometría de corte optimizada  
 aceros de construcción y de cementación • aceros para tornos automáticos, aceros de bonificación • aceros (aleados/no aleados) hasta 1200 N/mm<sup>2</sup> • fundición • bronce, latón • aleaciones de AISi altamente aleables

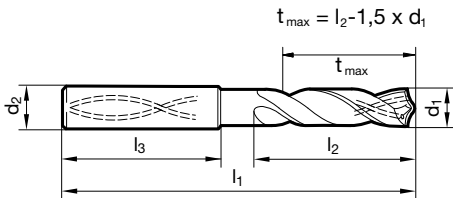
### Nº artículo 89416



P	M	K	N	S	H
●	○	●	○	○	○



vaciado de punta  $\geq \varnothing 3,000$  • afilado plano • forma recta del corte principal • geometría de corte optimizada  
 aceros de construcción y de cementación • aceros para tornos automáticos, aceros de bonificación • aceros (aleados/no aleados) hasta 1200 N/mm<sup>2</sup> • fundición • bronce, latón • aleaciones de AISi altamente aleables



d1	inch	d2 h6	l1	l2	l3	d1	inch	d2 h6	l1	l2	l3
mm		mm	mm	mm	mm	mm		mm	mm	mm	mm
3,000		6,000	70,000	30,000	36,000	4,760	3/16	6,000	90,000	50,000	36,000
3,100		6,000	70,000	30,000	36,000	4,800		6,000	90,000	50,000	36,000
3,170	1/8	6,000	70,000	30,000	36,000	4,900		6,000	90,000	50,000	36,000
3,200		6,000	70,000	30,000	36,000	5,000		6,000	90,000	50,000	36,000
3,250		6,000	70,000	30,000	36,000	5,100		6,000	90,000	50,000	36,000
3,300		6,000	70,000	30,000	36,000	5,160	13/64	6,000	90,000	50,000	36,000
3,400		6,000	75,000	35,500	36,000	5,200		6,000	90,000	50,000	36,000
3,500		6,000	75,000	35,500	36,000	5,300		6,000	90,000	50,000	36,000
3,570	9/64	6,000	75,000	35,500	36,000	5,400		6,000	97,000	57,000	36,000
3,600		6,000	75,000	35,500	36,000	5,500		6,000	97,000	57,000	36,000
3,700		6,000	75,000	35,500	36,000	5,560	7/32	6,000	97,000	57,000	36,000
3,800		6,000	75,000	37,500	36,000	5,600		6,000	97,000	57,000	36,000
3,900		6,000	75,000	37,500	36,000	5,700		6,000	97,000	57,000	36,000
3,970	5/32	6,000	75,000	37,500	36,000	5,800		6,000	97,000	57,000	36,000
4,000		6,000	75,000	37,500	36,000	5,900		6,000	97,000	57,000	36,000
4,100		6,000	75,000	37,500	36,000	5,950	15/64	6,000	97,000	57,000	36,000
4,200		6,000	75,000	37,500	36,000	6,000		6,000	97,000	57,000	36,000
4,300		6,000	85,000	45,000	36,000	6,100		8,000	106,000	66,000	36,000
4,370	11/64	6,000	85,000	45,000	36,000	6,200		8,000	106,000	66,000	36,000
4,400		6,000	85,000	45,000	36,000	6,300		8,000	106,000	66,000	36,000
4,500		6,000	85,000	45,000	36,000	6,350	1/4	8,000	106,000	66,000	36,000
4,600		6,000	85,000	45,000	36,000	6,400		8,000	106,000	66,000	36,000
4,650		6,000	85,000	45,000	36,000	6,500		8,000	106,000	66,000	36,000
4,700		6,000	85,000	45,000	36,000	6,600		8,000	106,000	66,000	36,000



## TS-Drills con refrigeración interna

d1 mm	inch	d2 h6 mm	l1 mm	l2 mm	l3 mm	d1 mm	inch	d2 h6 mm	l1 mm	l2 mm	l3 mm
6,700		8,000	106,000	66,000	36,000	10,600		12,000	155,000	106,000	45,000
6,800		8,000	106,000	66,000	36,000	10,700		12,000	155,000	106,000	45,000
6,900		8,000	116,000	76,000	36,000	10,800		12,000	155,000	106,000	45,000
7,000		8,000	116,000	76,000	36,000	10,900		12,000	155,000	106,000	45,000
7,100		8,000	116,000	76,000	36,000	11,000		12,000	155,000	106,000	45,000
7,140	9/32	8,000	116,000	76,000	36,000	11,110	7/16	12,000	163,000	114,000	45,000
7,200		8,000	116,000	76,000	36,000	11,200		12,000	163,000	114,000	45,000
7,300		8,000	116,000	76,000	36,000	11,300		12,000	163,000	114,000	45,000
7,400		8,000	116,000	76,000	36,000	11,400		12,000	163,000	114,000	45,000
7,500		8,000	116,000	76,000	36,000	11,500		12,000	163,000	114,000	45,000
7,540	19/64	8,000	116,000	76,000	36,000	11,600		12,000	163,000	114,000	45,000
7,600		8,000	116,000	76,000	36,000	11,700		12,000	163,000	114,000	45,000
7,700		8,000	116,000	76,000	36,000	11,800		12,000	163,000	114,000	45,000
7,800		8,000	116,000	76,000	36,000	11,900		12,000	163,000	114,000	45,000
7,900		8,000	116,000	76,000	36,000	12,000		12,000	163,000	114,000	45,000
7,940	5/16	8,000	116,000	76,000	36,000	12,100		14,000	182,000	133,000	45,000
8,000		8,000	116,000	76,000	36,000	12,200		14,000	182,000	133,000	45,000
8,100		10,000	131,000	87,000	40,000	12,300	31/64	14,000	182,000	133,000	45,000
8,200		10,000	131,000	87,000	40,000	12,500		14,000	182,000	133,000	45,000
8,300		10,000	131,000	87,000	40,000	12,700	1/2	14,000	182,000	133,000	45,000
8,330	21/64	10,000	131,000	87,000	40,000	13,000		14,000	182,000	133,000	45,000
8,400		10,000	131,000	87,000	40,000	13,100	33/64	14,000	182,000	133,000	45,000
8,500		10,000	131,000	87,000	40,000	13,500		14,000	182,000	133,000	45,000
8,600		10,000	131,000	87,000	40,000	14,000		14,000	182,000	133,000	45,000
8,700		10,000	131,000	87,000	40,000	14,100		16,000	204,000	152,000	48,000
8,730	11/32	10,000	131,000	87,000	40,000	14,200		16,000	204,000	152,000	48,000
8,800		10,000	131,000	87,000	40,000	14,290	9/16	16,000	204,000	152,000	48,000
8,900		10,000	131,000	87,000	40,000	14,500		16,000	204,000	152,000	48,000
9,000		10,000	131,000	87,000	40,000	15,000		16,000	204,000	152,000	48,000
9,100		10,000	139,000	95,000	40,000	15,100		16,000	204,000	152,000	48,000
9,130	23/64	10,000	139,000	95,000	40,000	15,500		16,000	204,000	152,000	48,000
9,200		10,000	139,000	95,000	40,000	16,000		16,000	204,000	152,000	48,000
9,250		10,000	139,000	95,000	40,000	16,500		18,000	223,000	171,000	48,000
9,300		10,000	139,000	95,000	40,000	16,900		18,000	223,000	171,000	48,000
9,400		10,000	139,000	95,000	40,000	17,000		18,000	223,000	171,000	48,000
9,500		10,000	139,000	95,000	40,000	17,500		18,000	223,000	171,000	48,000
9,520	3/8	10,000	139,000	95,000	40,000	18,000		18,000	223,000	171,000	48,000
9,600		10,000	139,000	95,000	40,000	18,500		20,000	244,000	190,000	50,000
9,700		10,000	139,000	95,000	40,000	18,900		20,000	244,000	190,000	50,000
9,800		10,000	139,000	95,000	40,000	19,000		20,000	244,000	190,000	50,000
9,900		10,000	139,000	95,000	40,000	19,050	3/4	20,000	244,000	190,000	50,000
9,920	25/64	10,000	139,000	95,000	40,000	19,500		20,000	244,000	190,000	50,000
10,000		10,000	139,000	95,000	40,000	20,000		20,000	244,000	190,000	50,000
10,100		12,000	155,000	106,000	45,000						
10,200		12,000	155,000	106,000	45,000						
10,300		12,000	155,000	106,000	45,000						
10,400		12,000	155,000	106,000	45,000						
10,500		12,000	155,000	106,000	45,000						



## TS-Drills con refrigeración interna

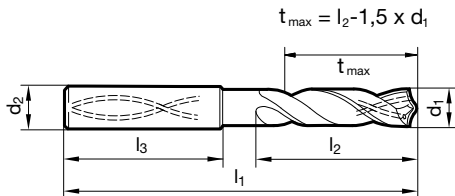
Nº artículo 89421



P	M	K	N	S	H
		•			



vaciado de punta  $\geq \varnothing 4,000$  • afilado con radios patentado • forma del corte recta (por corrección)  
fundición vermicular GGV y ADI, CDI • fundición gris, fundición maleable, fundición esferica



d1		d2 h6	l1	l2	l3	d1		d2 h6	l1	l2	l3
mm	inch	mm	mm	mm	mm	mm	inch	mm	mm	mm	mm
4,000		6,000	75,000	37,500	36,000	7,200		8,000	116,000	76,000	36,000
4,100		6,000	75,000	37,500	36,000	7,300		8,000	116,000	76,000	36,000
4,200		6,000	75,000	37,500	36,000	7,400		8,000	116,000	76,000	36,000
4,300		6,000	85,000	45,000	36,000	7,500		8,000	116,000	76,000	36,000
4,370	11/64	6,000	85,000	45,000	36,000	7,540	19/64	8,000	116,000	76,000	36,000
4,400		6,000	85,000	45,000	36,000	7,600		8,000	116,000	76,000	36,000
4,500		6,000	85,000	45,000	36,000	7,700		8,000	116,000	76,000	36,000
4,600		6,000	85,000	45,000	36,000	7,800		8,000	116,000	76,000	36,000
4,650		6,000	85,000	45,000	36,000	7,900		8,000	116,000	76,000	36,000
4,700		6,000	85,000	45,000	36,000	7,940	5/16	8,000	116,000	76,000	36,000
4,760	3/16	6,000	90,000	50,000	36,000	8,000		8,000	116,000	76,000	36,000
4,800		6,000	90,000	50,000	36,000	8,100		10,000	131,000	87,000	40,000
4,900		6,000	90,000	50,000	36,000	8,200		10,000	131,000	87,000	40,000
5,000		6,000	90,000	50,000	36,000	8,300		10,000	131,000	87,000	40,000
5,100		6,000	90,000	50,000	36,000	8,330	21/64	10,000	131,000	87,000	40,000
5,160	13/64	6,000	90,000	50,000	36,000	8,400		10,000	131,000	87,000	40,000
5,200		6,000	90,000	50,000	36,000	8,500		10,000	131,000	87,000	40,000
5,300		6,000	90,000	50,000	36,000	8,600		10,000	131,000	87,000	40,000
5,400		6,000	97,000	57,000	36,000	8,700		10,000	131,000	87,000	40,000
5,500		6,000	97,000	57,000	36,000	8,730	11/32	10,000	131,000	87,000	40,000
5,550		6,000	97,000	57,000	36,000	8,800		10,000	131,000	87,000	40,000
5,560	7/32	6,000	97,000	57,000	36,000	8,900		10,000	131,000	87,000	40,000
5,600		6,000	97,000	57,000	36,000	9,000		10,000	131,000	87,000	40,000
5,700		6,000	97,000	57,000	36,000	9,100		10,000	139,000	95,000	40,000
5,800		6,000	97,000	57,000	36,000	9,130	23/64	10,000	139,000	95,000	40,000
5,900		6,000	97,000	57,000	36,000	9,200		10,000	139,000	95,000	40,000
5,950	15/64	6,000	97,000	57,000	36,000	9,250		10,000	139,000	95,000	40,000
6,000		6,000	97,000	57,000	36,000	9,300		10,000	139,000	95,000	40,000
6,100		8,000	106,000	66,000	36,000	9,400		10,000	139,000	95,000	40,000
6,200		8,000	106,000	66,000	36,000	9,500		10,000	139,000	95,000	40,000
6,300		8,000	106,000	66,000	36,000	9,520	3/8	10,000	139,000	95,000	40,000
6,350	1/4	8,000	106,000	66,000	36,000	9,600		10,000	139,000	95,000	40,000
6,400		8,000	106,000	66,000	36,000	9,700		10,000	139,000	95,000	40,000
6,500		8,000	106,000	66,000	36,000	9,800		10,000	139,000	95,000	40,000
6,600		8,000	106,000	66,000	36,000	9,900		10,000	139,000	95,000	40,000
6,700		8,000	106,000	66,000	36,000	9,920	25/64	10,000	139,000	95,000	40,000
6,750	17/64	8,000	106,000	66,000	36,000	10,000		10,000	139,000	95,000	40,000
6,800		8,000	106,000	66,000	36,000	10,100		12,000	155,000	106,000	45,000
6,900		8,000	116,000	76,000	36,000	10,200		12,000	155,000	106,000	45,000
7,000		8,000	116,000	76,000	36,000	10,300		12,000	155,000	106,000	45,000
7,100		8,000	116,000	76,000	36,000	10,320	13/32	12,000	155,000	106,000	45,000
7,140	9/32	8,000	116,000	76,000	36,000	10,400		12,000	155,000	106,000	45,000



## TS-Drills con refrigeración interna

d1 mm	inch	d2 h6 mm	l1 mm	l2 mm	l3 mm	d1 mm	inch	d2 h6 mm	l1 mm	l2 mm	l3 mm
10,500		12,000	155,000	106,000	45,000	14,000		14,000	182,000	133,000	45,000
10,600		12,000	155,000	106,000	45,000	14,100		16,000	204,000	152,000	48,000
10,700		12,000	155,000	106,000	45,000	14,200		16,000	204,000	152,000	48,000
10,720	27/64	12,000	155,000	106,000	45,000	14,290	9/16	16,000	204,000	152,000	48,000
10,800		12,000	155,000	106,000	45,000	14,300		16,000	204,000	152,000	48,000
10,900		12,000	155,000	106,000	45,000	14,400		16,000	204,000	152,000	48,000
11,000		12,000	155,000	106,000	45,000	14,500		16,000	204,000	152,000	48,000
11,100		12,000	163,000	114,000	45,000	14,600		16,000	204,000	152,000	48,000
11,110	7/16	12,000	163,000	114,000	45,000	14,700		16,000	204,000	152,000	48,000
11,200		12,000	163,000	114,000	45,000	14,900		16,000	204,000	152,000	48,000
11,300		12,000	163,000	114,000	45,000	15,000		16,000	204,000	152,000	48,000
11,400		12,000	163,000	114,000	45,000	15,100		16,000	204,000	152,000	48,000
11,500		12,000	163,000	114,000	45,000	15,200		16,000	204,000	152,000	48,000
11,600		12,000	163,000	114,000	45,000	15,300		16,000	204,000	152,000	48,000
11,700		12,000	163,000	114,000	45,000	15,400		16,000	204,000	152,000	48,000
11,800		12,000	163,000	114,000	45,000	15,500		16,000	204,000	152,000	48,000
11,900		12,000	163,000	114,000	45,000	15,600		16,000	204,000	152,000	48,000
11,910	15/32	12,000	163,000	114,000	45,000	15,700		16,000	204,000	152,000	48,000
12,000		12,000	163,000	114,000	45,000	15,800		16,000	204,000	152,000	48,000
12,100		14,000	182,000	133,000	45,000	15,870	5/8	16,000	204,000	152,000	48,000
12,200		14,000	182,000	133,000	45,000	15,900		16,000	204,000	152,000	48,000
12,300	31/64	14,000	182,000	133,000	45,000	16,000		16,000	204,000	152,000	48,000
12,400		14,000	182,000	133,000	45,000	16,500		18,000	223,000	171,000	48,000
12,500		14,000	182,000	133,000	45,000	16,670	21/32	18,000	223,000	171,000	48,000
12,600		14,000	182,000	133,000	45,000	17,000		18,000	223,000	171,000	48,000
12,700	1/2	14,000	182,000	133,000	45,000	17,500		18,000	223,000	171,000	48,000
12,800		14,000	182,000	133,000	45,000	18,000		18,000	223,000	171,000	48,000
12,900		14,000	182,000	133,000	45,000	18,500		20,000	244,000	190,000	50,000
13,000		14,000	182,000	133,000	45,000	19,000		20,000	244,000	190,000	50,000
13,100	33/64	14,000	182,000	133,000	45,000	19,500		20,000	244,000	190,000	50,000
13,300		14,000	182,000	133,000	45,000	20,000		20,000	244,000	190,000	50,000
13,400		14,000	182,000	133,000	45,000						
13,500		14,000	182,000	133,000	45,000						
13,700		14,000	182,000	133,000	45,000						
13,800		14,000	182,000	133,000	45,000						
13,900		14,000	182,000	133,000	45,000						

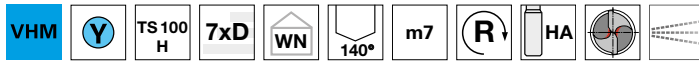


## TS-Drills con refrigeración interna

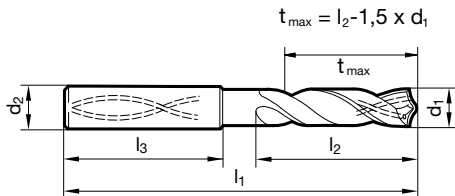
Nº artículo 89427



P	M	K	N	S	H
•				•	○



vaciado de punta  $\geq \varnothing 3,000$  • entrada cónica • forma del corte principal ligeramente cóncava • geometría de corte optimizada  
 aceros aleados y templados hasta a 1400 N/mm<sup>2</sup> • Inconel, Hastelloy, Monel • titanio y aleaciones de titanio



d1		d2 h6	l1	l2	l3	d1		d2 h6	l1	l2	l3
mm	inch	mm	mm	mm	mm	mm	inch	mm	mm	mm	mm
3,000		6,000	70,000	30,000	36,000	9,250		10,000	139,000	95,000	40,000
3,250		6,000	70,000	30,000	36,000	9,400		10,000	139,000	95,000	40,000
3,300		6,000	70,000	30,000	36,000	9,500		10,000	139,000	95,000	40,000
3,400		6,000	75,000	35,500	36,000	10,000		10,000	139,000	95,000	40,000
3,500		6,000	75,000	35,500	36,000	10,200		12,000	155,000	106,000	45,000
3,700		6,000	75,000	35,500	36,000	10,400		12,000	155,000	106,000	45,000
4,000		6,000	75,000	37,500	36,000	10,500		12,000	155,000	106,000	45,000
4,200		6,000	75,000	37,500	36,000	10,800		12,000	155,000	106,000	45,000
4,300		6,000	85,000	45,000	36,000	11,000		12,000	155,000	106,000	45,000
4,500		6,000	85,000	45,000	36,000	11,300		12,000	163,000	114,000	45,000
4,650		6,000	85,000	45,000	36,000	11,400		12,000	163,000	114,000	45,000
5,000		6,000	90,000	50,000	36,000	11,500		12,000	163,000	114,000	45,000
5,100		6,000	90,000	50,000	36,000	12,000		12,000	163,000	114,000	45,000
5,200		6,000	90,000	50,000	36,000	12,500		14,000	182,000	133,000	45,000
5,500		6,000	97,000	57,000	36,000	13,000		14,000	182,000	133,000	45,000
5,550		6,000	97,000	57,000	36,000	13,100	33/64	14,000	182,000	133,000	45,000
6,000		6,000	97,000	57,000	36,000	13,500		14,000	182,000	133,000	45,000
6,500		8,000	106,000	66,000	36,000	14,000		14,000	182,000	133,000	45,000
6,750	17/64	8,000	106,000	66,000	36,000	14,500		16,000	204,000	152,000	48,000
6,800		8,000	106,000	66,000	36,000	15,000		16,000	204,000	152,000	48,000
6,900		8,000	116,000	76,000	36,000	15,100		16,000	204,000	152,000	48,000
7,000		8,000	116,000	76,000	36,000	15,500		16,000	204,000	152,000	48,000
7,400		8,000	116,000	76,000	36,000	16,000		16,000	204,000	152,000	48,000
7,500		8,000	116,000	76,000	36,000						
7,800		8,000	116,000	76,000	36,000						
8,000		8,000	116,000	76,000	36,000						
8,500		10,000	131,000	87,000	40,000						
8,600		10,000	131,000	87,000	40,000						
8,800		10,000	131,000	87,000	40,000						
9,000		10,000	131,000	87,000	40,000						

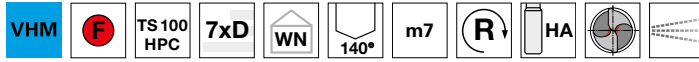


## TS-Drills con refrigeración interna

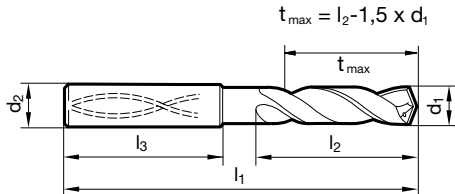
Nº artículo 89461



P	M	K	N	S	H
●	○	○	○	○	○



vaciado de punta  $\geq \varnothing 3,000$  • corte principal cóncavo • entrada cónica • geometría de corte optimizada • máximo rendimiento  
 aceros para tornos automáticos, aceros de bonificación • aceros inoxidables y resistentes al ácido y al calor • titanio y aleaciones de titanio • aceros (aleados/no aleados) hasta 1400 N/mm<sup>2</sup> • para el mecanizado de alto rendimiento en aceros estructurales y cementados  
 • aleaciones especiales



d1		d2 h6	l1	l2	l3	d1		d2 h6	l1	l2	l3
mm	inch	mm	mm	mm	mm	mm	inch	mm	mm	mm	mm
3,000		6,000	70,000	30,000	36,000	5,900		6,000	97,000	57,000	36,000
3,100		6,000	70,000	30,000	36,000	5,950	15/64	6,000	97,000	57,000	36,000
3,170	1/8	6,000	70,000	30,000	36,000	6,000		6,000	97,000	57,000	36,000
3,200		6,000	70,000	30,000	36,000	6,100		8,000	106,000	66,000	36,000
3,250		6,000	70,000	30,000	36,000	6,200		8,000	106,000	66,000	36,000
3,300		6,000	70,000	30,000	36,000	6,300		8,000	106,000	66,000	36,000
3,400		6,000	75,000	35,500	36,000	6,350	1/4	8,000	106,000	66,000	36,000
3,500		6,000	75,000	35,500	36,000	6,400		8,000	106,000	66,000	36,000
3,570	9/64	6,000	75,000	35,500	36,000	6,500		8,000	106,000	66,000	36,000
3,600		6,000	75,000	35,500	36,000	6,530		8,000	106,000	66,000	36,000
3,700		6,000	75,000	35,500	36,000	6,550		8,000	106,000	66,000	36,000
3,800		6,000	75,000	37,500	36,000	6,600		8,000	106,000	66,000	36,000
3,900		6,000	75,000	37,500	36,000	6,700		8,000	106,000	66,000	36,000
3,970	5/32	6,000	75,000	37,500	36,000	6,750	17/64	8,000	106,000	66,000	36,000
4,000		6,000	75,000	37,500	36,000	6,800		8,000	106,000	66,000	36,000
4,040		6,000	75,000	37,500	36,000	6,900		8,000	116,000	76,000	36,000
4,100		6,000	75,000	37,500	36,000	7,000		8,000	116,000	76,000	36,000
4,200		6,000	75,000	37,500	36,000	7,100		8,000	116,000	76,000	36,000
4,300		6,000	85,000	45,000	36,000	7,140	9/32	8,000	116,000	76,000	36,000
4,370	11/64	6,000	85,000	45,000	36,000	7,200		8,000	116,000	76,000	36,000
4,400		6,000	85,000	45,000	36,000	7,300		8,000	116,000	76,000	36,000
4,500		6,000	85,000	45,000	36,000	7,400		8,000	116,000	76,000	36,000
4,600		6,000	85,000	45,000	36,000	7,500		8,000	116,000	76,000	36,000
4,650		6,000	85,000	45,000	36,000	7,540	19/64	8,000	116,000	76,000	36,000
4,700		6,000	85,000	45,000	36,000	7,600		8,000	116,000	76,000	36,000
4,760	3/16	6,000	90,000	50,000	36,000	7,700		8,000	116,000	76,000	36,000
4,800		6,000	90,000	50,000	36,000	7,800		8,000	116,000	76,000	36,000
4,900		6,000	90,000	50,000	36,000	7,900		8,000	116,000	76,000	36,000
5,000		6,000	90,000	50,000	36,000	7,940	5/16	8,000	116,000	76,000	36,000
5,100		6,000	90,000	50,000	36,000	8,000		8,000	116,000	76,000	36,000
5,110		6,000	90,000	50,000	36,000	8,100		10,000	131,000	87,000	40,000
5,160	13/64	6,000	90,000	50,000	36,000	8,200		10,000	131,000	87,000	40,000
5,200		6,000	90,000	50,000	36,000	8,300		10,000	131,000	87,000	40,000
5,300		6,000	90,000	50,000	36,000	8,330	21/64	10,000	131,000	87,000	40,000
5,400		6,000	97,000	57,000	36,000	8,400		10,000	131,000	87,000	40,000
5,410		6,000	97,000	57,000	36,000	8,500		10,000	131,000	87,000	40,000
5,500		6,000	97,000	57,000	36,000	8,600		10,000	131,000	87,000	40,000
5,550		6,000	97,000	57,000	36,000	8,700		10,000	131,000	87,000	40,000
5,560	7/32	6,000	97,000	57,000	36,000	8,730	11/32	10,000	131,000	87,000	40,000
5,600		6,000	97,000	57,000	36,000	8,800		10,000	131,000	87,000	40,000
5,700		6,000	97,000	57,000	36,000	8,900		10,000	131,000	87,000	40,000
5,800		6,000	97,000	57,000	36,000	9,000		10,000	131,000	87,000	40,000



## TS-Drills con refrigeración interna

d1 mm	inch	d2 h6 mm	l1 mm	l2 mm	l3 mm	d1 mm	inch	d2 h6 mm	l1 mm	l2 mm	l3 mm
9,100		10,000	139,000	95,000	40,000	12,900		14,000	182,000	133,000	45,000
9,130	23/64	10,000	139,000	95,000	40,000	13,000		14,000	182,000	133,000	45,000
9,200		10,000	139,000	95,000	40,000	13,100	33/64	14,000	182,000	133,000	45,000
9,250		10,000	139,000	95,000	40,000	13,490	17/32	14,000	182,000	133,000	45,000
9,300		10,000	139,000	95,000	40,000	13,500		14,000	182,000	133,000	45,000
9,340		10,000	139,000	95,000	40,000	13,700		14,000	182,000	133,000	45,000
9,400		10,000	139,000	95,000	40,000	13,890	35/64	14,000	182,000	133,000	45,000
9,500		10,000	139,000	95,000	40,000	14,000		14,000	182,000	133,000	45,000
9,520	3/8	10,000	139,000	95,000	40,000	14,100		16,000	204,000	152,000	48,000
9,600		10,000	139,000	95,000	40,000	14,200		16,000	204,000	152,000	48,000
9,700		10,000	139,000	95,000	40,000	14,290	9/16	16,000	204,000	152,000	48,000
9,800		10,000	139,000	95,000	40,000	14,300		16,000	204,000	152,000	48,000
9,900		10,000	139,000	95,000	40,000	14,500		16,000	204,000	152,000	48,000
9,920	25/64	10,000	139,000	95,000	40,000	14,700		16,000	204,000	152,000	48,000
10,000		10,000	139,000	95,000	40,000	14,800		16,000	204,000	152,000	48,000
10,100		12,000	155,000	106,000	45,000	15,000		16,000	204,000	152,000	48,000
10,200		12,000	155,000	106,000	45,000	15,100		16,000	204,000	152,000	48,000
10,300		12,000	155,000	106,000	45,000	15,300		16,000	204,000	152,000	48,000
10,320	13/32	12,000	155,000	106,000	45,000	15,480	39/64	16,000	204,000	152,000	48,000
10,400		12,000	155,000	106,000	45,000	15,500		16,000	204,000	152,000	48,000
10,500		12,000	155,000	106,000	45,000	15,700		16,000	204,000	152,000	48,000
10,600		12,000	155,000	106,000	45,000	15,800		16,000	204,000	152,000	48,000
10,700		12,000	155,000	106,000	45,000	15,870	5/8	16,000	204,000	152,000	48,000
10,720	27/64	12,000	155,000	106,000	45,000	16,000		16,000	204,000	152,000	48,000
10,800		12,000	155,000	106,000	45,000	16,300		18,000	223,000	171,000	48,000
10,900		12,000	155,000	106,000	45,000	16,500		18,000	223,000	171,000	48,000
11,000		12,000	155,000	106,000	45,000	16,700		18,000	223,000	171,000	48,000
11,100		12,000	163,000	114,000	45,000	16,900		18,000	223,000	171,000	48,000
11,110	7/16	12,000	163,000	114,000	45,000	17,000		18,000	223,000	171,000	48,000
11,200		12,000	163,000	114,000	45,000	17,500		18,000	223,000	171,000	48,000
11,300		12,000	163,000	114,000	45,000	17,700		18,000	223,000	171,000	48,000
11,400		12,000	163,000	114,000	45,000	18,000		18,000	223,000	171,000	48,000
11,500		12,000	163,000	114,000	45,000	18,500		20,000	244,000	190,000	50,000
11,510	29/64	12,000	163,000	114,000	45,000	18,900		20,000	244,000	190,000	50,000
11,600		12,000	163,000	114,000	45,000	19,000		20,000	244,000	190,000	50,000
11,700		12,000	163,000	114,000	45,000	19,050	3/4	20,000	244,000	190,000	50,000
11,800		12,000	163,000	114,000	45,000	19,500		20,000	244,000	190,000	50,000
11,900		12,000	163,000	114,000	45,000	19,800		20,000	244,000	190,000	50,000
11,910	15/32	12,000	163,000	114,000	45,000	20,000		20,000	244,000	190,000	50,000
12,000		12,000	163,000	114,000	45,000						
12,100		14,000	182,000	133,000	45,000						
12,200		14,000	182,000	133,000	45,000						
12,300	31/64	14,000	182,000	133,000	45,000						
12,400		14,000	182,000	133,000	45,000						
12,500		14,000	182,000	133,000	45,000						
12,600		14,000	182,000	133,000	45,000						
12,700	1/2	14,000	182,000	133,000	45,000						
12,800		14,000	182,000	133,000	45,000						



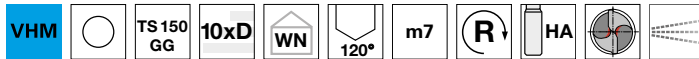


## TS-Drills con refrigeración interna

### Nº artículo 89293



P	M	K	N	S	H
		•	○		



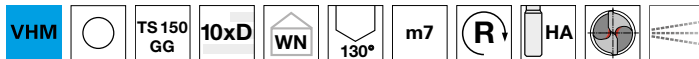
vaciado de punta  $\geq \varnothing 3,000$  • entrada cónica • tolerancias en diámetro estrechas • calidad superficial del taladro muy buena • vigilar presión óptima del refrigerante

aluminio y sus aleaciones • aluminios con alto porcentaje de Si

### Nº artículo 89295

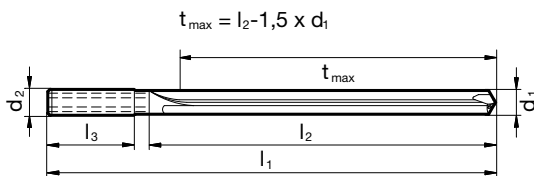


P	M	K	N	S	H
		○	•		



vaciado de punta  $\geq \varnothing 3,000$  • afilado plano • tolerancias en diámetro estrechas • calidad superficial del taladro muy buena • vigilar presión óptima del refrigerante

fundición gris, fundición maleable, fundición esferica



d1	inch	d2 h6	l1	l2	l3	d1	inch	d2 h6	l1	l2	l3
mm		mm	mm	mm	mm	mm		mm	mm	mm	mm
3,000		6,000	91,000	42,000	36,000	6,000		6,000	121,000	82,000	36,000
3,100		6,000	91,000	42,000	36,000	6,350	1/4	8,000	146,000	106,000	36,000
3,170	1/8	6,000	91,000	42,000	36,000	6,500		8,000	146,000	106,000	36,000
3,200		6,000	91,000	42,000	36,000	6,800		8,000	146,000	106,000	36,000
3,250		6,000	91,000	42,000	36,000	7,000		8,000	146,000	106,000	36,000
3,300		6,000	91,000	42,000	36,000	7,140	9/32	8,000	146,000	106,000	36,000
3,400		6,000	91,000	48,000	36,000	7,500		8,000	146,000	106,000	36,000
3,500		6,000	91,000	48,000	36,000	7,800		8,000	146,000	106,000	36,000
3,570	9/64	6,000	91,000	48,000	36,000	7,940	5/16	8,000	146,000	106,000	36,000
3,600		6,000	91,000	48,000	36,000	8,000		8,000	146,000	106,000	36,000
3,700		6,000	91,000	48,000	36,000	8,500		10,000	175,000	130,000	40,000
3,800		6,000	121,000	77,000	36,000	8,730	11/32	10,000	175,000	130,000	40,000
3,900		6,000	121,000	77,000	36,000	9,000		10,000	175,000	130,000	40,000
3,970	5/32	6,000	121,000	77,000	36,000	9,500		10,000	175,000	130,000	40,000
4,000		6,000	121,000	77,000	36,000	9,520	3/8	10,000	175,000	130,000	40,000
4,200		6,000	121,000	77,000	36,000	10,000		10,000	175,000	130,000	40,000
4,300		6,000	121,000	77,000	36,000	10,200		12,000	209,000	159,000	45,000
4,400		6,000	121,000	77,000	36,000	10,500		12,000	209,000	159,000	45,000
4,500		6,000	121,000	77,000	36,000	10,720	27/64	12,000	209,000	159,000	45,000
4,700		6,000	121,000	77,000	36,000	11,000		12,000	209,000	159,000	45,000
4,800		6,000	121,000	82,000	36,000	11,110	7/16	12,000	209,000	159,000	45,000
5,000		6,000	121,000	82,000	36,000	11,500		12,000	209,000	159,000	45,000
5,160	13/64	6,000	121,000	82,000	36,000	12,000		12,000	209,000	159,000	45,000
5,500		6,000	121,000	82,000	36,000	12,500		14,000	233,000	183,000	45,000



## TS-Drills con refrigeración interna

d1 mm	inch	d2 h6 mm	l1 mm	l2 mm	l3 mm	d1 mm	inch	d2 h6 mm	l1 mm	l2 mm	l3 mm
12,700	1/2	14,000	233,000	183,000	45,000	18,500		20,000	308,000	255,000	50,000
13,000		14,000	233,000	183,000	45,000	20,000		20,000	308,000	255,000	50,000
13,500		14,000	233,000	183,000	45,000						
14,000		14,000	233,000	183,000	45,000						
14,500		16,000	260,000	207,000	48,000						
15,000		16,000	260,000	207,000	48,000						
15,500		16,000	260,000	207,000	48,000						
16,000		16,000	260,000	207,000	48,000						
16,500		18,000	284,000	231,000	48,000						
17,000		18,000	284,000	231,000	48,000						
17,500		18,000	284,000	231,000	48,000						
18,000		18,000	284,000	231,000	48,000						

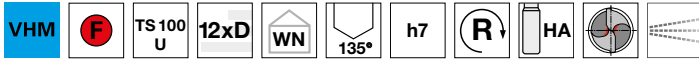


## TS-Drills con refrigeración interna

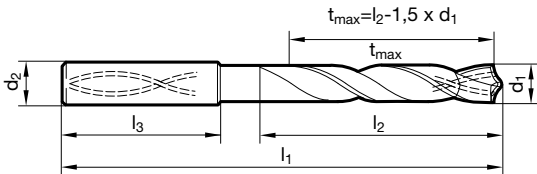
Nº artículo 89418



P	M	K	N	S	H
●	○	●	○	○	○



vaciado de punta  $\geq \varnothing 3,000$  • afilado plano • recubrimiento de la punta • forma recta del corte principal • geometría de corte optimizada  
 aceros de construcción y de cementación • aceros para tornos automáticos, aceros de bonificación • aceros (aleados/no aleados) hasta 1200 N/mm<sup>2</sup> • fundición • bronce, latón • aleaciones de AlSi altamente aleables



d1		d2 h6	l1	l2	l3	d1		d2 h6	l1	l2	l3
mm	inch	mm	mm	mm	mm	mm	inch	mm	mm	mm	mm
3,000		6,000	90,000	50,000	36,000	6,350	1/4	8,000	146,000	108,000	36,000
3,100		6,000	90,000	50,000	36,000	6,400		8,000	146,000	108,000	36,000
3,170	1/8	6,000	90,000	50,000	36,000	6,500		8,000	146,000	108,000	36,000
3,200		6,000	90,000	50,000	36,000	6,600		8,000	146,000	108,000	36,000
3,300		6,000	90,000	50,000	36,000	6,700		8,000	146,000	108,000	36,000
3,400		6,000	90,000	50,000	36,000	6,750	17/64	8,000	146,000	108,000	36,000
3,500		6,000	90,000	50,000	36,000	6,800		8,000	146,000	108,000	36,000
3,570	9/64	6,000	90,000	50,000	36,000	6,900		8,000	146,000	108,000	36,000
3,600		6,000	90,000	50,000	36,000	7,000		8,000	146,000	108,000	36,000
3,700		6,000	90,000	50,000	36,000	7,100		8,000	146,000	108,000	36,000
3,800		6,000	102,000	64,000	36,000	7,140	9/32	8,000	146,000	108,000	36,000
3,900		6,000	102,000	64,000	36,000	7,200		8,000	146,000	108,000	36,000
3,970	5/32	6,000	102,000	64,000	36,000	7,300		8,000	146,000	108,000	36,000
4,000		6,000	102,000	64,000	36,000	7,400		8,000	146,000	108,000	36,000
4,100		6,000	102,000	64,000	36,000	7,500		8,000	146,000	108,000	36,000
4,200		6,000	102,000	64,000	36,000	7,540	19/64	8,000	146,000	108,000	36,000
4,300		6,000	102,000	64,000	36,000	7,600		8,000	146,000	108,000	36,000
4,370	11/64	6,000	102,000	64,000	36,000	7,700		8,000	146,000	108,000	36,000
4,400		6,000	102,000	64,000	36,000	7,800		8,000	146,000	108,000	36,000
4,500		6,000	102,000	64,000	36,000	7,900		8,000	146,000	108,000	36,000
4,600		6,000	102,000	64,000	36,000	7,940	5/16	8,000	146,000	108,000	36,000
4,700		6,000	102,000	64,000	36,000	8,000		8,000	146,000	108,000	36,000
4,760	3/16	6,000	116,000	78,000	36,000	8,100		10,000	162,000	120,000	40,000
4,800		6,000	116,000	78,000	36,000	8,200		10,000	162,000	120,000	40,000
4,900		6,000	116,000	78,000	36,000	8,300		10,000	162,000	120,000	40,000
5,000		6,000	116,000	78,000	36,000	8,330	21/64	10,000	162,000	120,000	40,000
5,100		6,000	116,000	78,000	36,000	8,400		10,000	162,000	120,000	40,000
5,160	13/64	6,000	116,000	78,000	36,000	8,500		10,000	162,000	120,000	40,000
5,200		6,000	116,000	78,000	36,000	8,600		10,000	162,000	120,000	40,000
5,300		6,000	116,000	78,000	36,000	8,700		10,000	162,000	120,000	40,000
5,400		6,000	116,000	78,000	36,000	8,730	11/32	10,000	162,000	120,000	40,000
5,500		6,000	116,000	78,000	36,000	8,800		10,000	162,000	120,000	40,000
5,560	7/32	6,000	116,000	78,000	36,000	8,900		10,000	162,000	120,000	40,000
5,600		6,000	116,000	78,000	36,000	9,000		10,000	162,000	120,000	40,000
5,700		6,000	116,000	78,000	36,000	9,100		10,000	162,000	120,000	40,000
5,800		6,000	116,000	78,000	36,000	9,130	23/64	10,000	162,000	120,000	40,000
5,900		6,000	116,000	78,000	36,000	9,200		10,000	162,000	120,000	40,000
5,950	15/64	6,000	116,000	78,000	36,000	9,300		10,000	162,000	120,000	40,000
6,000		6,000	116,000	78,000	36,000	9,400		10,000	162,000	120,000	40,000
6,100		8,000	146,000	108,000	36,000	9,500		10,000	162,000	120,000	40,000
6,200		8,000	146,000	108,000	36,000	9,520	3/8	10,000	162,000	120,000	40,000
6,300		8,000	146,000	108,000	36,000	9,600		10,000	162,000	120,000	40,000



## TS-Drills con refrigeración interna

d1 mm	inch	d2 h6 mm	l1 mm	l2 mm	l3 mm	d1 mm	inch	d2 h6 mm	l1 mm	l2 mm	l3 mm
9,700		10,000	162,000	120,000	40,000	13,000		14,000	230,000	182,000	45,000
9,800		10,000	162,000	120,000	40,000	13,500		14,000	230,000	182,000	45,000
9,900		10,000	162,000	120,000	40,000	13,890	35/64	14,000	230,000	182,000	45,000
9,920	25/64	10,000	162,000	120,000	40,000	14,000		14,000	230,000	182,000	45,000
10,000		10,000	162,000	120,000	40,000	14,500		16,000	260,000	208,000	48,000
10,100		12,000	204,000	156,000	45,000	15,000		16,000	260,000	208,000	48,000
10,200		12,000	204,000	156,000	45,000	15,500		16,000	260,000	208,000	48,000
10,300		12,000	204,000	156,000	45,000	16,000		16,000	260,000	208,000	48,000
10,320	13/32	12,000	204,000	156,000	45,000	16,500		18,000	285,000	234,000	48,000
10,500		12,000	204,000	156,000	45,000	17,000		18,000	285,000	234,000	48,000
10,600		12,000	204,000	156,000	45,000	17,500		18,000	285,000	234,000	48,000
10,700		12,000	204,000	156,000	45,000	18,000		18,000	285,000	234,000	48,000
10,720	27/64	12,000	204,000	156,000	45,000	18,500		20,000	310,000	258,000	50,000
10,800		12,000	204,000	156,000	45,000	19,000		20,000	310,000	258,000	50,000
10,900		12,000	204,000	156,000	45,000	19,050	3/4	20,000	310,000	258,000	50,000
11,000		12,000	204,000	156,000	45,000	19,500		20,000	310,000	258,000	50,000
11,110	7/16	12,000	204,000	156,000	45,000	20,000		20,000	310,000	258,000	50,000
11,500		12,000	204,000	156,000	45,000						
11,510	29/64	12,000	204,000	156,000	45,000						
11,910	15/32	12,000	204,000	156,000	45,000						
12,000		12,000	204,000	156,000	45,000						
12,300	31/64	14,000	230,000	182,000	45,000						
12,500		14,000	230,000	182,000	45,000						
12,700	1/2	14,000	230,000	182,000	45,000						

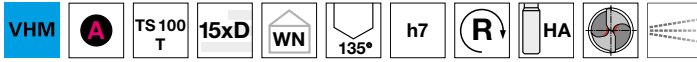


## TS-Drills con refrigeración interna

Nº artículo 86509

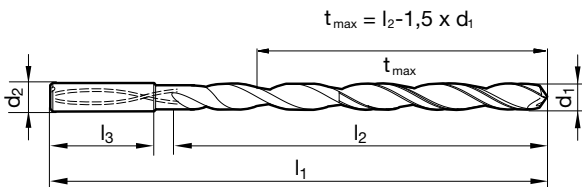


P	M	K	N	S	H
•	•	•	○	○	○



vaciado de punta  $\geq \varnothing 3,000$  • entrada cónica • recubrimiento de la punta • forma cóncava del corte principal • sección de ranura optimizada • sección máxima del canal de lubricación • vigilar presión del refrigerante

aceros de construcción y de cementación • aceros para tornos automáticos, aceros de bonificación • aceros aleados con una resistencia de hasta a 1200 N/mm<sup>2</sup> • aceros inoxidables • fundición



d1		d2 h6	l1	l2	l3	d1		d2 h6	l1	l2	l3
mm	inch	mm	mm	mm	mm	mm	inch	mm	mm	mm	mm
3,000		6,000	95,000	55,000	36,000	7,540	19/64	8,000	183,000	143,000	36,000
3,100		6,000	106,000	66,000	36,000	7,800		8,000	183,000	143,000	36,000
3,170	1/8	6,000	106,000	66,000	36,000	7,940	5/16	8,000	183,000	143,000	36,000
3,200		6,000	106,000	66,000	36,000	8,000		8,000	183,000	143,000	36,000
3,300		6,000	106,000	66,000	36,000	8,330	21/64	10,000	204,000	160,000	40,000
3,500		6,000	116,000	76,000	36,000	8,500		10,000	204,000	160,000	40,000
3,570	9/64	6,000	116,000	76,000	36,000	8,730	11/32	10,000	204,000	160,000	40,000
3,700		6,000	116,000	76,000	36,000	8,800		10,000	204,000	160,000	40,000
3,800		6,000	116,000	76,000	36,000	9,000		10,000	204,000	160,000	40,000
3,970	5/32	6,000	116,000	76,000	36,000	9,130	23/64	10,000	221,000	177,000	40,000
4,000		6,000	116,000	76,000	36,000	9,500		10,000	221,000	177,000	40,000
4,200		6,000	133,000	93,000	36,000	9,520	3/8	10,000	221,000	177,000	40,000
4,300		6,000	133,000	93,000	36,000	9,800		10,000	221,000	177,000	40,000
4,370	11/64	6,000	133,000	93,000	36,000	9,920	25/64	10,000	221,000	177,000	40,000
4,500		6,000	133,000	93,000	36,000	10,000		10,000	221,000	177,000	40,000
4,600		6,000	133,000	93,000	36,000	10,320	13/32	12,000	247,000	198,000	45,000
4,760	3/16	6,000	133,000	93,000	36,000	10,500		12,000	247,000	198,000	45,000
4,800		6,000	133,000	93,000	36,000	10,720	27/64	12,000	247,000	198,000	45,000
5,000		6,000	133,000	93,000	36,000	11,000		12,000	247,000	198,000	45,000
5,100		6,000	150,000	110,000	36,000	11,110	7/16	12,000	263,000	214,000	45,000
5,160	13/64	6,000	150,000	110,000	36,000	11,510	29/64	12,000	263,000	214,000	45,000
5,410		6,000	150,000	110,000	36,000	11,800		12,000	263,000	214,000	45,000
5,500		6,000	150,000	110,000	36,000	11,910	15/32	12,000	263,000	214,000	45,000
5,560	7/32	6,000	150,000	110,000	36,000	12,000		12,000	263,000	214,000	45,000
5,600		6,000	150,000	110,000	36,000	12,300	31/64	14,000	297,000	248,000	45,000
5,800		6,000	150,000	110,000	36,000	12,500		14,000	297,000	248,000	45,000
5,950	15/64	6,000	150,000	110,000	36,000	12,700	1/2	14,000	297,000	248,000	45,000
6,000		6,000	150,000	110,000	36,000	13,000		14,000	297,000	248,000	45,000
6,300		8,000	167,000	127,000	36,000	13,100	33/64	14,000	297,000	248,000	45,000
6,350	1/4	8,000	167,000	127,000	36,000	13,490	17/32	14,000	297,000	248,000	45,000
6,500		8,000	167,000	127,000	36,000	13,890	35/64	14,000	297,000	248,000	45,000
6,750	17/64	8,000	167,000	127,000	36,000	14,000		14,000	297,000	248,000	45,000
6,800		8,000	167,000	127,000	36,000	14,290	9/16	16,000	333,000	281,000	48,000
7,000		8,000	167,000	127,000	36,000	15,000		16,000	333,000	281,000	48,000
7,140	9/32	8,000	183,000	143,000	36,000	15,870	5/8	16,000	333,000	281,000	48,000
7,500		8,000	183,000	143,000	36,000	16,000		16,000	333,000	281,000	48,000

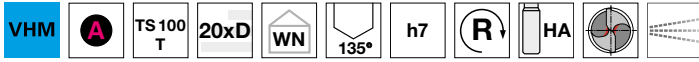


## TS-Drills con refrigeración interna

Nº artículo 86511

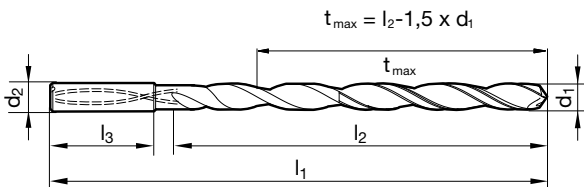


P	M	K	N	S	H
•	•	•	○	○	○



vaciado de punta  $\geq \varnothing 3,000$  • entrada cónica • recubrimiento de la punta • forma cóncava del corte principal • sección de ranura optimizada • sección máxima del canal de lubricación • vigilar presión del refrigerante

aceros de construcción y de cementación • aceros para tornos automáticos, aceros de bonificación • aceros aleados con una resistencia de hasta a 1200 N/mm<sup>2</sup> • aceros inoxidables • fundición



d1		d2 h6	l1	l2	l3	d1		d2 h6	l1	l2	l3
mm	inch	mm	mm	mm	mm	mm	inch	mm	mm	mm	mm
3,000		6,000	110,000	70,000	36,000	7,940	5/16	8,000	223,000	183,000	36,000
3,100		6,000	123,000	83,000	36,000	8,000		8,000	223,000	183,000	36,000
3,170	1/8	6,000	123,000	83,000	36,000	8,330	21/64	10,000	249,000	205,000	40,000
3,200		6,000	123,000	83,000	36,000	8,500		10,000	249,000	205,000	40,000
3,300		6,000	123,000	83,000	36,000	8,730	11/32	10,000	249,000	205,000	40,000
3,500		6,000	136,000	96,000	36,000	8,800		10,000	249,000	205,000	40,000
3,570	9/64	6,000	136,000	96,000	36,000	9,000		10,000	249,000	205,000	40,000
3,700		6,000	136,000	96,000	36,000	9,130	23/64	10,000	271,000	227,000	40,000
3,800		6,000	136,000	96,000	36,000	9,520	3/8	10,000	271,000	227,000	40,000
3,970	5/32	6,000	136,000	96,000	36,000	9,920	25/64	10,000	271,000	227,000	40,000
4,000		6,000	136,000	96,000	36,000	10,000		10,000	271,000	227,000	40,000
4,200		6,000	158,000	118,000	36,000	10,200		12,000	302,000	253,000	45,000
4,300		6,000	158,000	118,000	36,000	10,320	13/32	12,000	302,000	253,000	45,000
4,370	11/64	6,000	158,000	118,000	36,000	10,500		12,000	302,000	253,000	45,000
4,500		6,000	158,000	118,000	36,000	10,720	27/64	12,000	302,000	253,000	45,000
4,600		6,000	158,000	118,000	36,000	11,000		12,000	302,000	253,000	45,000
4,760	3/16	6,000	158,000	118,000	36,000	11,110	7/16	12,000	323,000	274,000	45,000
4,800		6,000	158,000	118,000	36,000	11,510	29/64	12,000	323,000	274,000	45,000
5,000		6,000	158,000	118,000	36,000	11,800		12,000	323,000	274,000	45,000
5,100		6,000	180,000	140,000	36,000	11,910	15/32	12,000	323,000	274,000	45,000
5,160	13/64	6,000	180,000	140,000	36,000	12,000		12,000	323,000	274,000	45,000
5,410		6,000	180,000	140,000	36,000	12,300	31/64	14,000	367,000	318,000	45,000
5,500		6,000	180,000	140,000	36,000	12,500		14,000	367,000	318,000	45,000
5,560	7/32	6,000	180,000	140,000	36,000	12,700	1/2	14,000	367,000	318,000	45,000
5,800		6,000	180,000	140,000	36,000	13,000		14,000	367,000	318,000	45,000
5,950	15/64	6,000	180,000	140,000	36,000	13,100	33/64	14,000	367,000	318,000	45,000
6,000		6,000	180,000	140,000	36,000	13,490	17/32	14,000	367,000	318,000	45,000
6,350	1/4	8,000	202,000	162,000	36,000	13,890	35/64	14,000	367,000	318,000	45,000
6,500		8,000	202,000	162,000	36,000	14,000		14,000	367,000	318,000	45,000
6,750	17/64	8,000	202,000	162,000	36,000	14,290	9/16	16,000	413,000	361,000	48,000
6,800		8,000	202,000	162,000	36,000	15,000		16,000	413,000	361,000	48,000
7,000		8,000	202,000	162,000	36,000	15,870	5/8	16,000	413,000	361,000	48,000
7,140	9/32	8,000	223,000	183,000	36,000	16,000		16,000	413,000	361,000	48,000
7,500		8,000	223,000	183,000	36,000						
7,540	19/64	8,000	223,000	183,000	36,000						
7,800		8,000	223,000	183,000	36,000						

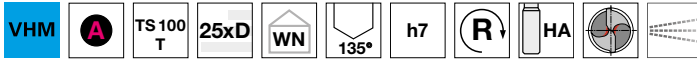


## TS-Drills con refrigeración interna

Nº artículo 86512

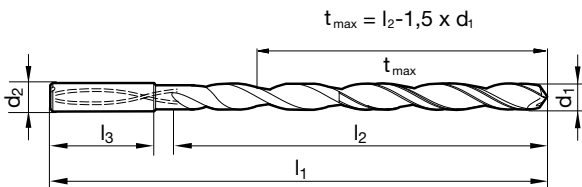


P	M	K	N	S	H
•	•	•	○	○	○



vaciado de punta  $\geq \varnothing 3,000$  • entrada cónica • recubrimiento de la punta • forma cóncava del corte principal • sección de ranura optimizada • sección máxima del canal de lubricación • vigilar presión del refrigerante

aceros de construcción y de cementación • aceros para tornos automáticos, aceros de bonificación • aceros aleados con una resistencia de hasta a 1200 N/mm<sup>2</sup> • aceros inoxidables • fundición



d1		d2 h6	l1	l2	l3	d1		d2 h6	l1	l2	l3
mm	inch	mm	mm	mm	mm	mm	inch	mm	mm	mm	mm
3,000		6,000	125,000	85,000	36,000	7,940	5/16	8,000	263,000	223,000	36,000
3,100		6,000	141,000	101,000	36,000	8,000		8,000	263,000	223,000	36,000
3,170	1/8	6,000	141,000	101,000	36,000	8,330	21/64	10,000	294,000	250,000	40,000
3,200		6,000	141,000	101,000	36,000	8,500		10,000	294,000	250,000	40,000
3,300		6,000	141,000	101,000	36,000	8,730	11/32	10,000	294,000	250,000	40,000
3,500		6,000	156,000	116,000	36,000	8,800		10,000	294,000	250,000	40,000
3,570	9/64	6,000	156,000	116,000	36,000	9,000		10,000	294,000	250,000	40,000
3,700		6,000	156,000	116,000	36,000	9,130	23/64	10,000	321,000	277,000	40,000
3,800		6,000	156,000	116,000	36,000	9,520	3/8	10,000	321,000	277,000	40,000
3,970	5/32	6,000	156,000	116,000	36,000	9,920	25/64	10,000	321,000	277,000	40,000
4,000		6,000	156,000	116,000	36,000	10,000		10,000	321,000	277,000	40,000
4,200		6,000	183,000	143,000	36,000	10,320	13/32	12,000	359,000	310,000	45,000
4,300		6,000	183,000	143,000	36,000	10,720	27/64	12,000	359,000	310,000	45,000
4,370	11/64	6,000	183,000	143,000	36,000	11,000		12,000	359,000	310,000	45,000
4,500		6,000	183,000	143,000	36,000	11,110	7/16	12,000	386,000	337,000	45,000
4,600		6,000	183,000	143,000	36,000	11,510	29/64	12,000	386,000	337,000	45,000
4,760	3/16	6,000	183,000	143,000	36,000	11,910	15/32	12,000	386,000	337,000	45,000
4,800		6,000	183,000	143,000	36,000	12,000		12,000	386,000	337,000	45,000
5,000		6,000	183,000	143,000	36,000	12,300	31/64	14,000	437,000	388,000	45,000
5,100		6,000	210,000	170,000	36,000	12,700	1/2	14,000	437,000	388,000	45,000
5,160	13/64	6,000	210,000	170,000	36,000	13,000		14,000	437,000	388,000	45,000
5,410		6,000	210,000	170,000	36,000	13,100	33/64	14,000	437,000	388,000	45,000
5,500		6,000	210,000	170,000	36,000	13,490	17/32	14,000	437,000	388,000	45,000
5,560	7/32	6,000	210,000	170,000	36,000	13,890	35/64	14,000	437,000	388,000	45,000
5,800		6,000	210,000	170,000	36,000	14,000		14,000	437,000	388,000	45,000
5,950	15/64	6,000	210,000	170,000	36,000	14,290	9/16	16,000	493,000	441,000	48,000
6,000		6,000	210,000	170,000	36,000	15,000		16,000	493,000	441,000	48,000
6,300		8,000	237,000	197,000	36,000	15,870	5/8	16,000	493,000	441,000	48,000
6,350	1/4	8,000	237,000	197,000	36,000	16,000		16,000	493,000	441,000	48,000
6,500		8,000	237,000	197,000	36,000						
6,750	17/64	8,000	237,000	197,000	36,000						
6,800		8,000	237,000	197,000	36,000						
7,000		8,000	237,000	197,000	36,000						
7,140	9/32	8,000	263,000	223,000	36,000						
7,500		8,000	263,000	223,000	36,000						
7,540	19/64	8,000	263,000	223,000	36,000						

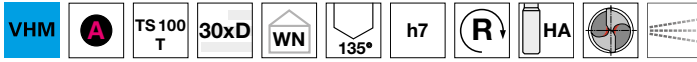


## TS-Drills con refrigeración interna

Nº artículo 86513

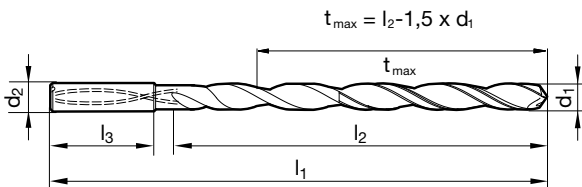


P	M	K	N	S	H
•	•	•	○	○	○



vaciado de punta  $\geq \varnothing 3,000$  • entrada cónica • recubrimiento de la punta • forma cóncava del corte principal • sección de ranura optimizada • sección máxima del canal de lubricación • vigilar presión del refrigerante

aceros de construcción y de cementación • aceros para tornos automáticos, aceros de bonificación • aceros aleados con una resistencia de hasta a 1200 N/mm<sup>2</sup> • aceros inoxidables • fundición



d1		d2 h6	l1	l2	l3	d1		d2 h6	l1	l2	l3
mm	inch	mm	mm	mm	mm	mm	inch	mm	mm	mm	mm
3,000		6,000	140,000	100,000	36,000	7,500		8,000	303,000	263,000	36,000
3,100		6,000	158,000	118,000	36,000	7,540	19/64	8,000	303,000	263,000	36,000
3,170	1/8	6,000	158,000	118,000	36,000	7,940	5/16	8,000	303,000	263,000	36,000
3,200		6,000	158,000	118,000	36,000	8,000		8,000	303,000	263,000	36,000
3,300		6,000	158,000	118,000	36,000	8,330	21/64	10,000	339,000	295,000	40,000
3,500		6,000	176,000	136,000	36,000	8,500		10,000	339,000	295,000	40,000
3,570	9/64	6,000	176,000	136,000	36,000	8,730	11/32	10,000	339,000	295,000	40,000
3,700		6,000	176,000	136,000	36,000	8,800		10,000	339,000	295,000	40,000
3,800		6,000	176,000	136,000	36,000	9,000		10,000	339,000	295,000	40,000
3,970	5/32	6,000	176,000	136,000	36,000	9,130	23/64	10,000	371,000	327,000	40,000
4,000		6,000	176,000	136,000	36,000	9,520	3/8	10,000	371,000	327,000	40,000
4,200		6,000	208,000	168,000	36,000	9,920	25/64	10,000	371,000	327,000	40,000
4,370	11/64	6,000	208,000	168,000	36,000	10,000		10,000	371,000	327,000	40,000
4,500		6,000	208,000	168,000	36,000	10,320	13/32	12,000	412,000	363,000	45,000
4,760	3/16	6,000	208,000	168,000	36,000	10,720	27/64	12,000	412,000	363,000	45,000
5,000		6,000	208,000	168,000	36,000	11,000		12,000	412,000	363,000	45,000
5,100		6,000	240,000	200,000	36,000	11,110	7/16	12,000	443,000	394,000	45,000
5,160	13/64	6,000	240,000	200,000	36,000	11,510	29/64	12,000	443,000	394,000	45,000
5,410		6,000	240,000	200,000	36,000	11,910	15/32	12,000	443,000	394,000	45,000
5,500		6,000	240,000	200,000	36,000	12,000		12,000	443,000	394,000	45,000
5,560	7/32	6,000	240,000	200,000	36,000	12,300	31/64	14,000	507,000	458,000	45,000
5,950	15/64	6,000	240,000	200,000	36,000	12,700	1/2	14,000	507,000	458,000	45,000
6,000		6,000	240,000	200,000	36,000	13,000		14,000	507,000	458,000	45,000
6,300		8,000	272,000	232,000	36,000	13,100	33/64	14,000	507,000	458,000	45,000
6,350	1/4	8,000	272,000	232,000	36,000	13,490	17/32	14,000	507,000	458,000	45,000
6,500		8,000	272,000	232,000	36,000	13,890	35/64	14,000	507,000	458,000	45,000
6,750	17/64	8,000	272,000	232,000	36,000	14,000		14,000	507,000	458,000	45,000
6,800		8,000	272,000	232,000	36,000						
7,000		8,000	272,000	232,000	36,000						
7,140	9/32	8,000	303,000	263,000	36,000						



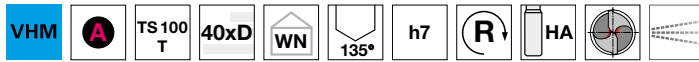


## TS-Drills con refrigeración interna

Nº artículo 86514

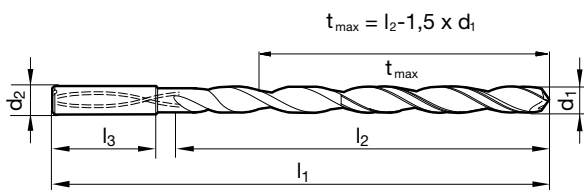


P	M	K	N	S	H
•	•	•	○	○	○



vaciado de punta  $\geq \varnothing 3,000$  • entrada cónica • recubrimiento de la punta • forma cóncava del corte principal • sección de ranura optimizada • sección máxima del canal de lubricación • vigilar presión del refrigerante

aceros de construcción y de cementación • aceros para tornos automáticos, aceros de bonificación • aceros aleados con una resistencia de hasta a 1200 N/mm<sup>2</sup> • aceros inoxidables • fundición



d1		d2 h6	l1	l2	l3	d1		d2 h6	l1	l2	l3
mm	inch	mm	mm	mm	mm	mm	inch	mm	mm	mm	mm
3,000		6,000	170,000	130,000	36,000	5,500		6,000	280,000	240,000	36,000
3,100		6,000	193,000	153,000	36,000	5,560	7/32	6,000	300,000	260,000	36,000
3,170	1/8	6,000	193,000	153,000	36,000	5,950	15/64	6,000	300,000	260,000	36,000
3,200		6,000	193,000	153,000	36,000	6,000		6,000	300,000	260,000	36,000
3,300		6,000	193,000	153,000	36,000	6,300		8,000	322,000	282,000	36,000
3,500		6,000	193,000	153,000	36,000	6,350	1/4	8,000	322,000	282,000	36,000
3,570	9/64	6,000	216,000	176,000	36,000	6,500		8,000	322,000	282,000	36,000
3,800		6,000	216,000	176,000	36,000	6,750	17/64	8,000	342,000	302,000	36,000
3,970	5/32	6,000	216,000	176,000	36,000	6,800		8,000	342,000	302,000	36,000
4,000		6,000	216,000	176,000	36,000	7,000		8,000	342,000	302,000	36,000
4,200		6,000	238,000	198,000	36,000	7,140	9/32	8,000	363,000	323,000	36,000
4,370	11/64	6,000	238,000	198,000	36,000	7,500		8,000	363,000	323,000	36,000
4,500		6,000	238,000	198,000	36,000	7,540	19/64	8,000	383,000	343,000	36,000
4,760	3/16	6,000	258,000	218,000	36,000	7,940	5/16	8,000	383,000	343,000	36,000
5,000		6,000	258,000	218,000	36,000	8,000		8,000	383,000	343,000	36,000
5,100		6,000	280,000	240,000	36,000	8,500		10,000	409,000	365,000	40,000
5,160	13/64	6,000	280,000	240,000	36,000	9,000		10,000	429,000	386,000	40,000
5,410		6,000	280,000	240,000	36,000	10,000		10,000	471,000	427,000	40,000

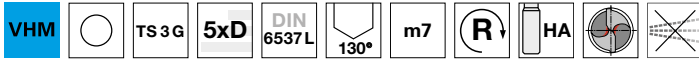


## Brocas-TS, 3 cortes

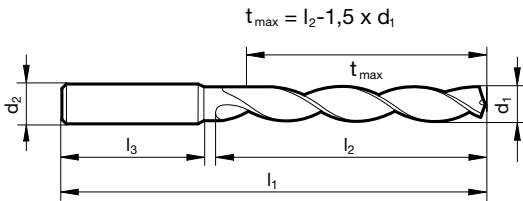
Nº artículo 89247



P	M	K	N	S	H
		•	•		



vaciado de punta  $\geq \varnothing 3,000$  • afilado spiropoint • ranuras amplias • centraje óptimo • adecuado para corte interrumpido fundición • aleaciones de aluminio de viruta larga • latón, bronce



d1	d2	l1	l2	l3	d1	d2	l1	l2	l3
mm	mm	mm	mm	mm	mm	mm	mm	mm	mm
3,000	6,000	66,000	28,000	36,000	8,600	10,000	103,000	61,000	40,000
3,100	6,000	66,000	28,000	36,000	8,700	10,000	103,000	61,000	40,000
3,200	6,000	66,000	28,000	36,000	8,800	10,000	103,000	61,000	40,000
3,300	6,000	66,000	28,000	36,000	9,000	10,000	103,000	61,000	40,000
3,500	6,000	66,000	28,000	36,000	9,100	10,000	103,000	61,000	40,000
3,700	6,000	66,000	28,000	36,000	9,500	10,000	103,000	61,000	40,000
3,800	6,000	74,000	36,000	36,000	9,800	10,000	103,000	61,000	40,000
4,000	6,000	74,000	36,000	36,000	10,000	10,000	103,000	61,000	40,000
4,100	6,000	74,000	36,000	36,000	10,100	12,000	118,000	71,000	45,000
4,200	6,000	74,000	36,000	36,000	10,200	12,000	118,000	71,000	45,000
4,500	6,000	74,000	36,000	36,000	10,300	12,000	118,000	71,000	45,000
4,800	6,000	82,000	44,000	36,000	10,500	12,000	118,000	71,000	45,000
5,000	6,000	82,000	44,000	36,000	11,000	12,000	118,000	71,000	45,000
5,100	6,000	82,000	44,000	36,000	11,200	12,000	118,000	71,000	45,000
5,200	6,000	82,000	44,000	36,000	11,500	12,000	118,000	71,000	45,000
5,300	6,000	82,000	44,000	36,000	11,800	12,000	118,000	71,000	45,000
5,500	6,000	82,000	44,000	36,000	12,000	12,000	118,000	71,000	45,000
5,800	6,000	82,000	44,000	36,000	12,100	14,000	124,000	77,000	45,000
6,000	6,000	82,000	44,000	36,000	12,500	14,000	124,000	77,000	45,000
6,100	8,000	91,000	53,000	36,000	13,000	14,000	124,000	77,000	45,000
6,200	8,000	91,000	53,000	36,000	13,500	14,000	124,000	77,000	45,000
6,400	8,000	91,000	53,000	36,000	14,000	14,000	124,000	77,000	45,000
6,500	8,000	91,000	53,000	36,000	14,100	16,000	133,000	83,000	48,000
6,700	8,000	91,000	53,000	36,000	14,500	16,000	133,000	83,000	48,000
6,800	8,000	91,000	53,000	36,000	15,000	16,000	133,000	83,000	48,000
6,900	8,000	91,000	53,000	36,000	15,500	16,000	133,000	83,000	48,000
7,000	8,000	91,000	53,000	36,000	16,000	16,000	133,000	83,000	48,000
7,100	8,000	91,000	53,000	36,000	16,500	18,000	143,000	93,000	48,000
7,400	8,000	91,000	53,000	36,000	17,000	18,000	143,000	93,000	48,000
7,500	8,000	91,000	53,000	36,000	17,500	18,000	143,000	93,000	48,000
7,800	8,000	91,000	53,000	36,000	18,000	18,000	143,000	93,000	48,000
8,000	8,000	91,000	53,000	36,000	18,500	20,000	153,000	101,000	50,000
8,100	10,000	103,000	61,000	40,000	19,000	20,000	153,000	101,000	50,000
8,200	10,000	103,000	61,000	40,000	19,500	20,000	153,000	101,000	50,000
8,400	10,000	103,000	61,000	40,000	20,000	20,000	153,000	101,000	50,000
8,500	10,000	103,000	61,000	40,000					

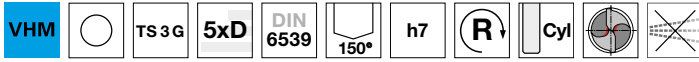


## Brocas-TS, 3 cortes

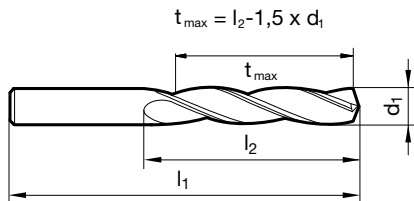
Nº artículo 89239



P	M	K	N	S	H
		○	○		



vaciado de punta  $\geq \varnothing 3,000$  • afilado plano • para taladros muy precisos en medida • calidad superficial del taladro muy buena  
 • adecuado para corte interrumpido  
 fundición • aleaciones de aluminio y fundición



d1 mm	l1 mm	l2 mm	d1 mm	l1 mm	l2 mm
3,000	46,000	22,000	7,900	79,000	48,000
3,100	49,000	24,000	8,000	79,000	48,000
3,200	49,000	24,000	8,100	79,000	48,000
3,300	49,000	24,000	8,200	79,000	48,000
3,400	52,000	27,000	8,300	79,000	48,000
3,500	52,000	27,000	8,400	79,000	48,000
3,600	52,000	27,000	8,500	79,000	48,000
3,800	55,000	30,000	8,700	84,000	52,000
3,900	55,000	30,000	8,800	84,000	52,000
4,000	55,000	30,000	9,000	84,000	52,000
4,100	55,000	30,000	9,100	84,000	52,000
4,200	55,000	30,000	9,200	84,000	52,000
4,300	58,000	32,000	9,300	84,000	52,000
4,500	58,000	32,000	9,500	84,000	52,000
4,600	58,000	32,000	9,700	89,000	55,000
4,800	62,000	35,000	9,800	89,000	55,000
4,900	62,000	35,000	10,000	89,000	55,000
5,000	62,000	35,000	10,100	89,000	55,000
5,100	62,000	35,000	10,200	89,000	55,000
5,200	62,000	35,000	10,300	89,000	55,000
5,400	66,000	39,000	10,400	89,000	55,000
5,500	66,000	39,000	10,500	89,000	55,000
5,600	66,000	39,000	10,700	95,000	60,000
5,700	66,000	39,000	11,000	95,000	60,000
5,800	66,000	39,000	11,110	95,000	60,000
5,900	66,000	39,000	11,200	95,000	60,000
6,000	66,000	39,000	11,500	95,000	60,000
6,100	70,000	42,000	11,700	95,000	60,000
6,200	70,000	42,000	11,800	95,000	60,000
6,300	70,000	42,000	12,000	102,000	65,000
6,400	70,000	42,000	12,500	102,000	65,000
6,500	70,000	42,000	12,700	102,000	65,000
6,600	70,000	42,000	13,000	102,000	65,000
6,700	70,000	42,000	13,500	107,000	66,000
6,800	74,000	45,000	13,600	107,000	66,000
7,000	74,000	45,000	13,800	107,000	66,000
7,100	74,000	45,000	14,000	107,000	66,000
7,200	74,000	45,000	14,300	111,000	70,000
7,400	74,000	45,000	14,500	111,000	70,000
7,500	74,000	45,000	14,700	111,000	70,000
7,600	79,000	48,000	15,000	111,000	70,000
7,800	79,000	48,000	15,500	115,000	73,000



HARTNER

### Brocas-TS, 3 cortes

d1 mm	l1 mm	l2 mm	d1 mm	l1 mm	l2 mm
16,000	115,000	73,000			
16,500	119,000	73,000			
17,000	119,000	73,000			
18,500	127,000	76,000			
19,000	127,000	76,000			
20,000	131,000	79,000			



# HARTNER

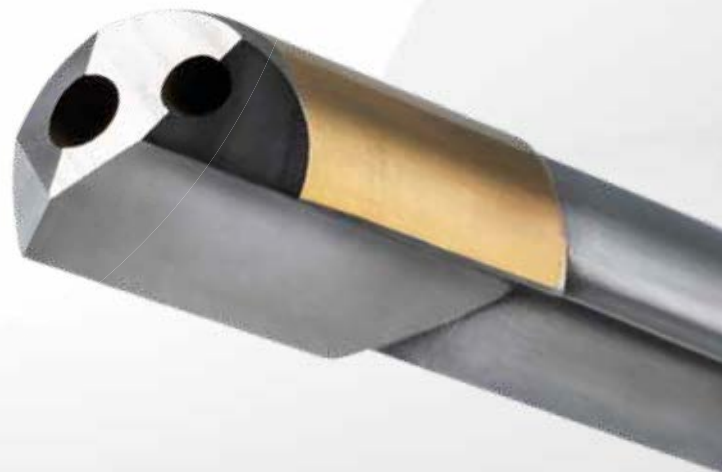
Precision Cutting Tools



**MULTIPLIX**

# E 80 XXL

- ▼ ideal para máquinas para broca cañón
- ▼ longitudes totales 800 mm / 1.200 mm / 1.600 mm / 2.000 mm
- ▼ uso no sólo en la fabricación de moldes y matrices
- ▼ estría pulida para un excelente control de las virutas
- ▼ recubrimiento TiN para aplicación universal
- ▼ mango T 3.1





# HARTNER

Precision Cutting Tools

## **BROCAS PARA AGUJEROS PROFUNDOS**

fabricada en metal duro, con cabeza de metal duro soldada  
o con plaquita intercambiable,  
brillante y con recubrimiento

Brocas para agujeros profundos



P	M	K	N	S	H	Norma	Tipo	Material de corte	Acabado	Dirección de corte	Forma del mango	Profundidad	d1/mm	Nº artículo	Página
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## Broca monolabio E 100

	○	○	○	●	●	○	Norma de fáb.	TLB E 100	MDI	○	derecha	HA	25xD	1,000 - 16,000	<b>89523</b>	271
	●	●	○	●	○	○	Norma de fáb.	TLB E 100	MDI	ⓐ	derecha	HA	25xD	1,000 - 16,000	<b>89520</b>	271
	○	○	○	●	●	○	Norma de fáb.	TLB E 100	MDI	○	derecha	HA	50xD	1,000 - 10,000	<b>89524</b>	273
	●	●	○	●	○	○	Norma de fáb.	TLB E 100	MDI	ⓐ	derecha	HA	50xD	1,000 - 10,000	<b>89521</b>	273
	○	○	○	●	●	○	Norma de fáb.	TLB E 100	MDI	○	derecha	HA	75xD	1,000 - 7,144	<b>89525</b>	275
	●	●	○	●	○	○	Norma de fáb.	TLB E 100	MDI	ⓐ	derecha	HA	75xD	1,000 - 7,144	<b>89522</b>	275
	○	○	○	●	●	○	Norma de fáb.	TLB E 100	MDI	○	derecha	HA	45.000	1,200 - 3,200	<b>89503</b>	276
	●	○	●	○	○	○	Norma de fáb.	TLB E 100	MDI	ⓐ	derecha	HA	45.000	1,200 - 3,200	<b>89510</b>	276
	○	○	○	●	●	○	Norma de fáb.	TLB E 100	MDI	○	derecha	HA	80.000	1,200 - 5,000	<b>89501</b>	277
	●	○	●	○	○	○	Norma de fáb.	TLB E 100	MDI	ⓐ	derecha	HA	80.000	1,200 - 5,000	<b>89511</b>	277
	○	○	○	●	●	○	Norma de fáb.	TLB E 100	MDI	○	derecha	HA	120.000	1,500 - 5,000	<b>89504</b>	278
	●	○	●	○	○	○	Norma de fáb.	TLB E 100	MDI	ⓐ	derecha	HA	120.000	1,500 - 5,000	<b>89512</b>	278
	○	○	○	●	●	○	Norma de fáb.	TLB E 100	MDI	○	derecha	HA	160.000	1,500 - 8,000	<b>89502</b>	279
	●	○	●	○	○	○	Norma de fáb.	TLB E 100	MDI	ⓐ	derecha	HA	160.000	1,500 - 8,000	<b>89513</b>	279



P	M	K	N	S	H	Norma	Tipo	Material de corte	Acabado	Dirección de corte	Forma del mango	Profundidad	d1/mm	Nº artículo	Página
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## Broca monolabio E 80




						Norma de fáb.	TLB E 80	placa MD soldada		derecha	HA	20xD	3,970 - 12,700	<b>89505</b>	280
						Norma de fáb.	TLB E 80	placa MD soldada		derecha	HA	20xD	3,970 - 12,700	<b>89514</b>	280
						Norma de fáb.	TLB E 80	placa MD soldada		derecha	HA	30xD	3,970 - 12,700	<b>89509</b>	281
						Norma de fáb.	TLB E 80	placa MD soldada		derecha	HA	30xD	3,970 - 12,700	<b>89515</b>	281
						Norma de fáb.	TLB E 80	placa MD soldada		derecha	HA	40xD	3,970 - 12,700	<b>89506</b>	282
						Norma de fáb.	TLB E 80	placa MD soldada		derecha	HA	40xD	3,970 - 12,700	<b>89516</b>	282
						Norma de fáb.	TLB E 80	placa MD soldada		derecha	HA	80xD	4,950 - 12,650	<b>89507</b>	283
						Norma de fáb.	TLB E 80	placa MD soldada		derecha	HA	80xD	4,950 - 12,650	<b>89517</b>	283

## Broca monolabio E 80 XXL

						Norma de fáb.	TLB E 80	placa MD soldada		derecha	T 3.1	GL 600	3,000 - 25,000	<b>89539</b>	284
						Norma de fáb.	TLB E 80	placa MD soldada		derecha	T 3.1	GL 800	3,000 - 25,000	<b>89540</b>	285
						Norma de fáb.	TLB E 80	placa MD soldada		derecha	T 3.1	GL1000	3,000 - 25,000	<b>89544</b>	286
						Norma de fáb.	TLB E 80	placa MD soldada		derecha	T 3.1	GL1200	3,000 - 25,000	<b>89541</b>	287
						Norma de fáb.	TLB E 80	placa MD soldada		derecha	T 3.1	GL1400	4,000 - 25,000	<b>89545</b>	288

P	M	K	N	S	H	Norma	Tipo	Material de corte	Acabado	Dirección de corte	Forma del mango	Profundidad	d1/mm	Nº artículo	Página
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## Broca monolabio E 80 XXL

	•	○	•	○	○	Norma de fáb.	TLB E 80	placa MD soldada		derecha	T 3.1	GL1600	4,000 - 25,000	<b>89542</b>	289
	•	○	•	○	○	Norma de fáb.	TLB E 80	placa MD soldada		derecha	T 3.1	GL1800	4,000 - 32,000	<b>89546</b>	290
	•	○	•	○	○	Norma de fáb.	TLB E 80	placa MD soldada		derecha	T 3.1	GL2000	4,000 - 32,000	<b>89543</b>	291

## Broca monolabio con plaquita E 800

	•	○	•	○		Norma de fáb.	TLB E 800	placa MD soldada		derecha	HB	30xD	12,000 - 24,000	<b>89530</b>	292
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## Plaquetas de corte para brocas monolabio E 800

	•	○	•	○		Norma de fáb.		MDI		derecha			12,000 - 40,000	<b>89535</b>	293
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## Patines guía per brocas monolabio E 800

	•	○	•	○		Norma de fáb.		MDI					12,000 - 40,000	<b>89536</b>	294
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## Brocas cañon con 2 labios de corte Z 80

			•			Norma de fáb.	TLB Z 80	placa MD soldada	○	derecha	HA	30xD	8,000 - 12,000	<b>89508</b>	295
			•			Norma de fáb.	TLB Z 80	placa MD soldada	○	derecha	HA	30xD	8,000 - 12,000	<b>89518</b>	295



# HARTNER

## Broca monolabio E 100

N° artículo 89523

P	M	K	N	S	H
○	○	○	●	●	○



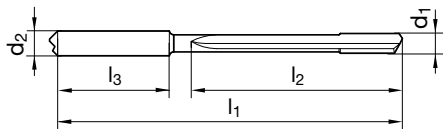
profundidad hasta 25xD • forma de circunferencia G • mango MQL con final cónico

N° artículo 89520

P	M	K	N	S	H
●	●	○	●	○	○



profundidad hasta 25xD • forma de circunferencia G • mango MQL con final cónico



d1		d2 h6	l1	l2	l3
mm	inch	mm	mm	mm	mm
1,000		3,000	65,000	32,000	28,000
1,191	3/64	3,000	70,000	39,000	28,000
1,500		4,000	80,000	49,000	28,000
1,588	1/16	4,000	85,000	51,000	28,000
1,984	5/64	4,000	95,000	64,000	28,000
2,000		4,000	95,000	65,000	28,000
2,381	3/32	4,000	100,000	70,000	28,000
2,500		4,000	115,000	85,000	28,000
2,778	7/64	4,000	115,000	85,000	28,000
3,000		6,000	145,000	105,000	36,000
3,175	1/8	6,000	145,000	105,000	36,000
3,500		6,000	145,000	105,000	36,000
3,572	9/64	6,000	160,000	120,000	36,000
3,969	5/32	6,000	160,000	120,000	36,000
4,000		6,000	160,000	120,000	36,000
4,366	11/64	6,000	220,000	180,000	36,000
4,763	3/16	6,000	220,000	180,000	36,000
5,000		6,000	220,000	180,000	36,000
5,159	13/64	6,000	220,000	180,000	36,000
5,556	7/32	6,000	220,000	180,000	36,000
5,953	15/64	6,000	220,000	180,000	36,000
6,000		6,000	220,000	180,000	36,000
6,350	1/4	8,000	260,000	210,000	36,000
6,500		8,000	260,000	210,000	36,000
6,747	17/64	8,000	260,000	210,000	36,000
7,000		8,000	260,000	210,000	36,000
7,144	9/32	8,000	285,000	240,000	36,000
7,541	19/64	8,000	285,000	240,000	36,000
7,938	5/16	8,000	285,000	240,000	36,000
8,000		8,000	285,000	240,000	36,000



HARTNER

## Broca monolabio E 100

d1 mm	inch	d2 h6 mm	l1 mm	l2 mm	l3 mm
9,000		10,000	350,000	300,000	40,000
10,000		10,000	350,000	300,000	40,000
11,000		12,000	420,000	360,000	45,000
11,113	7/16	12,000	420,000	360,000	45,000
12,000		12,000	420,000	360,000	45,000
12,700	1/2	14,000	455,000	396,000	45,000
14,000		14,000	500,000	437,000	45,000
15,000		16,000	535,000	468,000	48,000
15,875	5/8	16,000	560,000	495,000	48,000
16,000		16,000	565,000	499,000	48,000



# HARTNER

## Broca monolabio E 100

Nº artículo 89524

P	M	K	N	S	H
○	○	○	●	●	○



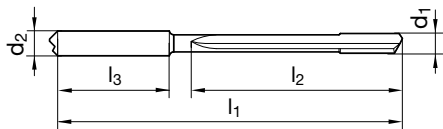
profundidad hasta 50xD • forma de circunferencia G • mango MQL con final cónico

Nº artículo 89521

P	M	K	N	S	H
●	●	○	●	○	○



profundidad hasta 50xD • forma de circunferencia G • mango MQL con final cónico



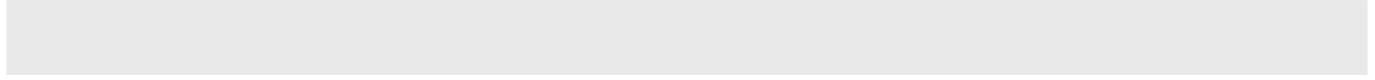
d1		d2 h6	l1	l2	l3
mm	inch	mm	mm	mm	mm
1,000		3,000	90,000	57,000	28,000
1,191	3/64	3,000	100,000	68,000	28,000
1,500		4,000	120,000	86,000	28,000
1,588	1/16	4,000	125,000	91,000	28,000
1,984	5/64	4,000	145,000	114,000	28,000
2,000		4,000	145,000	115,000	28,000
2,381	3/32	4,000	160,000	130,000	28,000
2,500		4,000	185,000	155,000	28,000
2,778	7/64	4,000	185,000	155,000	28,000
3,000		6,000	230,000	190,000	36,000
3,175	1/8	6,000	230,000	190,000	36,000
3,500		6,000	230,000	190,000	36,000
3,572	9/64	6,000	260,000	220,000	36,000
3,969	5/32	6,000	260,000	220,000	36,000
4,000		6,000	260,000	220,000	36,000
4,366	11/64	6,000	290,000	245,000	36,000
4,763	3/16	6,000	310,000	268,000	36,000
5,000		6,000	370,000	330,000	36,000
5,159	13/64	6,000	370,000	330,000	36,000
5,556	7/32	6,000	370,000	330,000	36,000
5,953	15/64	6,000	370,000	330,000	36,000
6,000		6,000	370,000	330,000	36,000
6,350	1/4	8,000	430,000	385,000	36,000
6,500		8,000	430,000	385,000	36,000
6,747	17/64	8,000	430,000	385,000	36,000
7,000		8,000	430,000	385,000	36,000
7,144	9/32	8,000	485,000	440,000	36,000
7,541	19/64	8,000	485,000	440,000	36,000
7,938	5/16	8,000	485,000	440,000	36,000
8,000		8,000	485,000	440,000	36,000



HARTNER

### Broca monolabio E 100

d1 mm	inch	d2 h6 mm	l1 mm	l2 mm	l3 mm
9,000		10,000	555,000	506,000	40,000
10,000		10,000	615,000	562,000	40,000





# HARTNER

## Broca monolabio E 100

### Nº artículo 89525

P	M	K	N	S	H
○	○	○	●	●	○



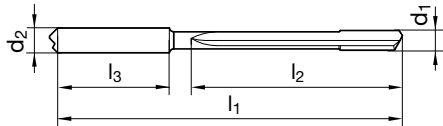
profundidad hasta 75xD • forma de circunferencia G • mango MQL con final cónico

### Nº artículo 89522

P	M	K	N	S	H
●	●	○	●	○	○



profundidad hasta 75xD • forma de circunferencia G • mango MQL con final cónico



d1		d2 h6	l1	l2	l3
mm	inch	mm	mm	mm	mm
1,000		3,000	115,000	82,000	28,000
1,191	3/64	3,000	130,000	98,000	28,000
1,500		4,000	155,000	124,000	28,000
1,588	1/16	4,000	165,000	131,000	28,000
1,984	5/64	4,000	195,000	163,000	28,000
2,000		4,000	195,000	165,000	28,000
2,381	3/32	4,000	220,000	190,000	28,000
2,500		4,000	255,000	220,000	28,000
2,778	7/64	4,000	255,000	220,000	28,000
3,000		6,000	290,000	274,000	36,000
3,175	1/8	6,000	320,000	280,000	36,000
3,500		6,000	320,000	280,000	36,000
3,572	9/64	6,000	360,000	320,000	36,000
3,969	5/32	6,000	360,000	320,000	36,000
4,000		6,000	360,000	320,000	36,000
4,366	11/64	6,000	395,000	355,000	36,000
4,763	3/16	6,000	430,000	387,000	36,000
5,000		6,000	450,000	406,000	36,000
5,159	13/64	6,000	465,000	419,000	36,000
5,556	7/32	6,000	525,000	485,000	36,000
5,953	15/64	6,000	525,000	485,000	36,000
6,000		6,000	525,000	485,000	36,000
6,350	1/4	8,000	560,000	516,000	36,000
6,500		8,000	575,000	528,000	36,000
6,747	17/64	8,000	595,000	548,000	36,000
7,000		8,000	615,000	568,000	36,000
7,144	9/32	8,000	625,000	580,000	36,000



## Broca monolabio E 100

### N° artículo 89503



<b>P</b>	<b>M</b>	<b>K</b>	<b>N</b>	<b>S</b>	<b>H</b>
○	○	○	●	○	○



longitud de corte 45 mm • forma de circunferencia G

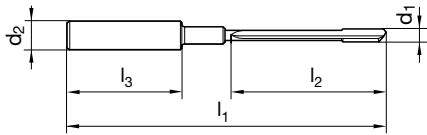
### N° artículo 89510



<b>P</b>	<b>M</b>	<b>K</b>	<b>N</b>	<b>S</b>	<b>H</b>
●	○	●	○	○	○



longitud de corte 45 mm • forma de circunferencia G



d1		d2 h6	l1	l2	l3
mm	inch	mm	mm	mm	mm
1,200		4,000	90,000	45,000	28,000
1,500		4,000	90,000	45,000	28,000
1,590	1/16	4,000	90,000	45,000	28,000
1,600		4,000	90,000	45,000	28,000
1,980	5/64	4,000	90,000	45,000	28,000
2,000		4,000	90,000	45,000	28,000
2,500		10,000	100,000	45,000	40,000
2,700		10,000	100,000	45,000	40,000
3,000		10,000	100,000	45,000	40,000
3,200		10,000	100,000	45,000	40,000





## Broca monolabio E 100

### N° artículo 89501



P	M	K	N	S	H
○	○	○	●	○	○



longitud de corte 80 mm • forma de circunferencia G

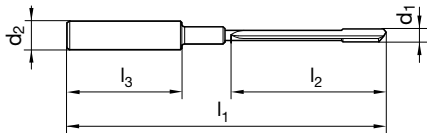
### N° artículo 89511



P	M	K	N	S	H
●	○	●	○	○	○



longitud de corte 80 mm • forma de circunferencia G



d1		d2 h6	l1	l2	l3
mm	inch	mm	mm	mm	mm
1,200		4,000	125,000	80,000	28,000
1,500		4,000	125,000	80,000	28,000
1,590	1/16	4,000	125,000	80,000	28,000
1,600		4,000	125,000	80,000	28,000
1,980	5/64	4,000	125,000	80,000	28,000
2,000		4,000	125,000	80,000	28,000
2,500		10,000	135,000	80,000	40,000
2,700		10,000	135,000	80,000	40,000
3,000		10,000	135,000	80,000	40,000
3,200		10,000	135,000	80,000	40,000
3,500		10,000	135,000	80,000	40,000
4,000		10,000	135,000	80,000	40,000
4,200		10,000	135,000	80,000	40,000
4,500		10,000	135,000	80,000	40,000
5,000		10,000	135,000	80,000	40,000



# HARTNER

## Broca monolabio E 100

### Nº artículo 89504



P	M	K	N	S	H
○	○	○	●	○	○



longitud de corte 120 mm • forma de circunferencia G

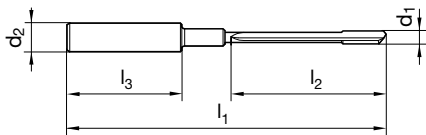
### Nº artículo 89512



P	M	K	N	S	H
●	○	●	○	○	○



longitud de corte 120 mm • forma de circunferencia G



d1		d2 h6	l1	l2	l3
mm	inch	mm	mm	mm	mm
1,500		4,000	165,000	120,000	28,000
1,590	1/16	4,000	165,000	120,000	28,000
1,600		4,000	165,000	120,000	28,000
1,980	5/64	4,000	165,000	120,000	28,000
2,000		4,000	165,000	120,000	28,000
2,500		10,000	175,000	120,000	40,000
2,700		10,000	175,000	120,000	40,000
3,000		10,000	175,000	120,000	40,000
3,200		10,000	175,000	120,000	40,000
3,500		10,000	175,000	120,000	40,000
4,000		10,000	175,000	120,000	40,000
4,200		10,000	175,000	120,000	40,000
4,500		10,000	175,000	120,000	40,000
5,000		10,000	175,000	120,000	40,000



## Broca monolabio E 100

### Nº artículo 89502



P	M	K	N	S	H
○	○	○	●	○	○



longitud de corte 160 mm • forma de circunferencia G

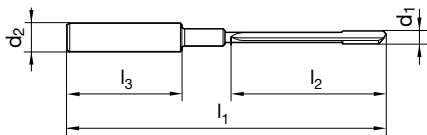
### Nº artículo 89513



P	M	K	N	S	H
●	○	●	○	○	○



longitud de corte 160 mm • forma de circunferencia G



d1		d2 h6	l1	l2	l3
mm	inch	mm	mm	mm	mm
1,500		4,000	205,000	160,000	28,000
1,590	1/16	4,000	205,000	160,000	28,000
1,600		4,000	205,000	160,000	28,000
1,980	5/64	4,000	205,000	160,000	28,000
2,000		4,000	205,000	160,000	28,000
2,500		10,000	215,000	160,000	40,000
2,700		10,000	215,000	160,000	40,000
3,000		10,000	215,000	160,000	40,000
3,200		10,000	215,000	160,000	40,000
3,500		10,000	215,000	160,000	40,000
4,000		10,000	215,000	160,000	40,000
4,200		10,000	215,000	160,000	40,000
4,500		10,000	215,000	160,000	40,000
5,000		10,000	215,000	160,000	40,000
6,000		16,000	225,000	160,000	48,000
8,000		16,000	225,000	160,000	48,000



## Broca monolabio E 80

### N° artículo 89505



P	M	K	N	S	H
●	○	●	○	○	○



profundidad hasta 20xD • forma de circunferencia G • con rompevirutas longitudinal

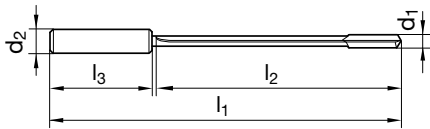
### N° artículo 89514



P	M	K	N	S	H
●	●	○	○	●	○



profundidad hasta 20xD • forma de circunferencia G • para aceros aleados y altamente aleables



d1		d2 h6	l1	l2	l3
mm	inch	mm	mm	mm	mm
3,970	5/32	10,000	150,000	100,000	40,000
4,000		12,000	150,000	100,000	45,000
4,200		12,000	160,000	110,000	45,000
4,500		12,000	170,000	120,000	45,000
5,000		16,000	180,000	130,000	48,000
5,156		16,000	180,000	130,000	48,000
5,500		16,000	190,000	140,000	48,000
6,000		16,000	210,000	160,000	48,000
6,350	1/4	16,000	220,000	170,000	48,000
6,500		16,000	220,000	170,000	48,000
7,000		16,000	235,000	185,000	48,000
7,938	5/16	16,000	260,000	210,000	48,000
8,000		16,000	260,000	210,000	48,000
9,000		16,000	280,000	230,000	48,000
9,525	3/8	16,000	290,000	240,000	48,000
10,000		20,000	320,000	260,000	50,000
11,000		20,000	340,000	290,000	50,000
11,113	7/16	20,000	340,000	290,000	50,000
12,000		20,000	370,000	310,000	50,000
12,700	1/2	20,000	385,000	330,000	50,000



# HARTNER

## Broca monolabio E 80

N° artículo 89509



P	M	K	N	S	H
●	○	●	○	○	○



profundidad hasta 30xD • forma de circunferencia G • con rompevirutas longitudinal

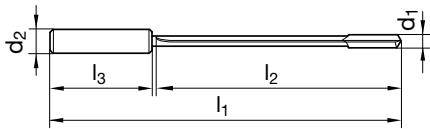
N° artículo 89515



P	M	K	N	S	H
●	●	○	○	●	○



profundidad hasta 30xD • forma de circunferencia G • para aceros aleados y altamente aleables



d1		d2 h6	l1	l2	l3
mm	inch	mm	mm	mm	mm
3,970	5/32	10,000	200,000	155,000	40,000
4,000		12,000	200,000	155,000	45,000
4,200		12,000	210,000	165,000	45,000
4,500		12,000	220,000	175,000	45,000
5,000		16,000	230,000	182,000	48,000
5,156		16,000	230,000	182,000	48,000
5,500		16,000	245,000	197,000	48,000
6,000		16,000	260,000	212,000	48,000
6,350	1/4	16,000	275,000	227,000	48,000
6,500		16,000	275,000	227,000	48,000
7,000		16,000	290,000	242,000	48,000
7,938	5/16	16,000	320,000	272,000	48,000
8,000		16,000	320,000	272,000	48,000
9,000		16,000	350,000	302,000	48,000
9,525	3/8	16,000	380,000	330,000	48,000
10,000		20,000	400,000	350,000	50,000
11,000		20,000	430,000	380,000	50,000
11,113	7/16	20,000	430,000	380,000	50,000
12,000		20,000	450,000	400,000	50,000
12,700	1/2	20,000	500,000	450,000	50,000



## Broca monolabio E 80

### Nº artículo 89506



P	M	K	N	S	H
●	○	●	○	○	○



profundidad hasta 40xD • forma de circunferencia G • con rompevirutas longitudinal

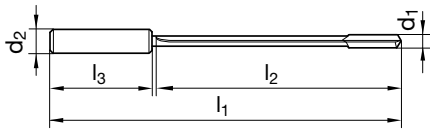
### Nº artículo 89516



P	M	K	N	S	H
●	●	○	○	●	○



profundidad hasta 40xD • forma de circunferencia G • para aceros aleados y altamente aleables



d1		d2 h6	l1	l2	l3
mm	inch	mm	mm	mm	mm
3,970	5/32	10,000	230,000	185,000	40,000
4,000		12,000	230,000	185,000	45,000
4,200		12,000	240,000	195,000	45,000
4,500		12,000	250,000	205,000	45,000
5,000		16,000	280,000	232,000	48,000
5,156		16,000	280,000	232,000	48,000
5,500		16,000	300,000	252,000	48,000
6,000		16,000	320,000	272,000	48,000
6,350	1/4	16,000	340,000	292,000	48,000
6,500		16,000	340,000	292,000	48,000
7,000		16,000	370,000	322,000	48,000
7,938	5/16	16,000	420,000	372,000	48,000
8,000		16,000	420,000	372,000	48,000
9,000		16,000	450,000	402,000	48,000
9,525	3/8	16,000	480,000	432,000	48,000
10,000		20,000	510,000	460,000	50,000
11,000		20,000	550,000	500,000	50,000
11,113	7/16	20,000	550,000	500,000	50,000
12,000		20,000	600,000	550,000	50,000
12,700	1/2	20,000	635,000	585,000	50,000



# HARTNER

## Broca monolabio E 80

### Nº artículo 89507



P	M	K	N	S	H
●	○	●	○	○	○



profundidad hasta 80xD • forma de circunferencia G • con rompevirutas longitudinal • para materiales de viruta larga • profundidad máxima de taladrado por herramienta 40xD, para profundidades más grandes utilizar art.nº. 89506

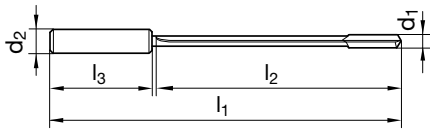
### Nº artículo 89517



P	M	K	N	S	H
●	●	○	○	●	○



profundidad hasta 80xD • forma de circunferencia G • taladrado máximo por herramienta 40xD, en mayores profundidades de taladrado antes utilizar broca art.nº 89516



d1		d2 h6	l1	l2	l3
mm	inch	mm	mm	mm	mm
4,950		16,000	480,000	432,000	48,000
5,106		16,000	480,000	432,000	48,000
5,950	15/64	16,000	560,000	512,000	48,000
6,300		16,000	590,000	542,000	48,000
6,950		16,000	650,000	602,000	48,000
7,888		16,000	740,000	692,000	48,000
7,950		16,000	740,000	692,000	48,000
8,950		16,000	820,000	772,000	48,000
9,475		16,000	870,000	822,000	48,000
9,950		20,000	910,000	860,000	50,000
10,950		20,000	995,000	945,000	50,000
11,063		20,000	995,000	945,000	50,000
11,950		20,000	1080,000	1030,000	50,000
12,650		20,000	1140,000	1090,000	50,000



# HARTNER

## Broca monolabio E 80 XXL

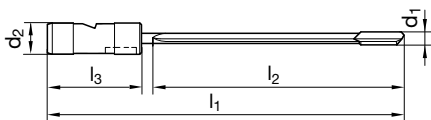
N° artículo 89539



P	M	K	N	S	H
●	○	●	○	○	○



para la aplicación en máquinas de taladro profundo • artículos estándar con longitud total fija para máquinas de broca cañón • ranuras pulidas • cabeza de metal duro soldada con forma periférica G



d1 mm	inch	d2 h6 mm	l1 mm	l2 mm	l3 mm
3,000		25,000	600,000	500,000	70,000
4,000		25,000	600,000	500,000	70,000
5,000		25,000	600,000	500,000	70,000
6,000		25,000	600,000	500,000	70,000
7,000		25,000	600,000	500,000	70,000
8,000		25,000	600,000	500,000	70,000
9,000		25,000	600,000	500,000	70,000
10,000		25,000	600,000	500,000	70,000
11,000		25,000	600,000	500,000	70,000
11,500		25,000	600,000	500,000	70,000
12,000		25,000	600,000	500,000	70,000
13,000		25,000	600,000	500,000	70,000
14,000		25,000	600,000	500,000	70,000
15,000		25,000	600,000	500,000	70,000
16,000		25,000	600,000	500,000	70,000
17,000		25,000	600,000	500,000	70,000
18,000		25,000	600,000	500,000	70,000
19,000		25,000	600,000	500,000	70,000
20,000		25,000	600,000	500,000	70,000
21,000		25,000	600,000	500,000	70,000
22,000		25,000	600,000	500,000	70,000
23,000		25,000	600,000	500,000	70,000
24,000		25,000	600,000	500,000	70,000
25,000	63/64	25,000	600,000	500,000	70,000





# HARTNER

## Broca monolabio E 80 XXL

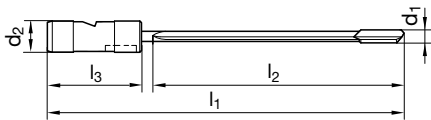
N° artículo 89540



P	M	K	N	S	H
●	○	●	○	○	○



para la aplicación en máquinas de taladro profundo • artículos estándar con longitud total fija para máquinas de broca cañón • ranuras pulidas • cabeza de metal duro soldada con forma periférica G



d1 mm	inch	d2 h6 mm	l1 mm	l2 mm	l3 mm
3,000		25,000	800,000	700,000	70,000
4,000		25,000	800,000	700,000	70,000
5,000		25,000	800,000	700,000	70,000
6,000		25,000	800,000	700,000	70,000
7,000		25,000	800,000	700,000	70,000
8,000		25,000	800,000	700,000	70,000
9,000		25,000	800,000	700,000	70,000
10,000		25,000	800,000	700,000	70,000
11,000		25,000	800,000	700,000	70,000
11,500		25,000	800,000	700,000	70,000
12,000		25,000	800,000	700,000	70,000
13,000		25,000	800,000	700,000	70,000
14,000		25,000	800,000	700,000	70,000
15,000		25,000	800,000	700,000	70,000
16,000		25,000	800,000	700,000	70,000
17,000		25,000	800,000	700,000	70,000
18,000		25,000	800,000	700,000	70,000
19,000		25,000	800,000	700,000	70,000
20,000		25,000	800,000	700,000	70,000
21,000		25,000	800,000	700,000	70,000
22,000		25,000	800,000	700,000	70,000
23,000		25,000	800,000	700,000	70,000
24,000		25,000	800,000	700,000	70,000
25,000	63/64	25,000	800,000	700,000	70,000



# HARTNER

## Broca monolabio E 80 XXL

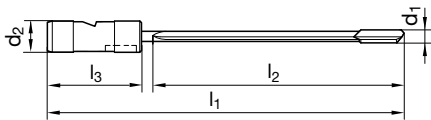
N° artículo 89544



P	M	K	N	S	H
●	○	●	○	○	○



para la aplicación en máquinas de taladro profundo • artículos estándar con longitud total fija para máquinas de broca cañón • ranuras pulidas • cabeza de metal duro soldada con forma periférica G



d1 mm	inch	d2 h6 mm	l1 mm	l2 mm	l3 mm
3,000		25,000	1000,000	900,000	70,000
4,000		25,000	1000,000	900,000	70,000
5,000		25,000	1000,000	900,000	70,000
6,000		25,000	1000,000	900,000	70,000
7,000		25,000	1000,000	900,000	70,000
8,000		25,000	1000,000	900,000	70,000
9,000		25,000	1000,000	900,000	70,000
10,000		25,000	1000,000	900,000	70,000
11,000		25,000	1000,000	900,000	70,000
11,500		25,000	1000,000	900,000	70,000
12,000		25,000	1000,000	900,000	70,000
13,000		25,000	1000,000	900,000	70,000
14,000		25,000	1000,000	900,000	70,000
15,000		25,000	1000,000	900,000	70,000
16,000		25,000	1000,000	900,000	70,000
17,000		25,000	1000,000	900,000	70,000
18,000		25,000	1000,000	900,000	70,000
19,000		25,000	1000,000	900,000	70,000
20,000		25,000	1000,000	900,000	70,000
21,000		25,000	1000,000	900,000	70,000
22,000		25,000	1000,000	900,000	70,000
23,000		25,000	1000,000	900,000	70,000
24,000		25,000	1000,000	900,000	70,000
25,000	63/64	25,000	1000,000	900,000	70,000



# HARTNER

## Broca monolabio E 80 XXL

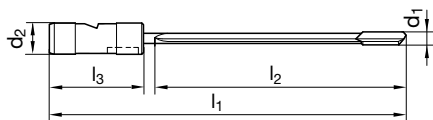
N° artículo 89541



P	M	K	N	S	H
●	○	●	○	○	○



para la aplicación en máquinas de taladro profundo • artículos estándar con longitud total fija para máquinas de broca cañón • ranuras pulidas • cabeza de metal duro soldada con forma periférica G



d1 mm	inch	d2 h6 mm	l1 mm	l2 mm	l3 mm
3,000		25,000	1200,000	1100,000	70,000
4,000		25,000	1200,000	1100,000	70,000
5,000		25,000	1200,000	1100,000	70,000
6,000		25,000	1200,000	1100,000	70,000
7,000		25,000	1200,000	1100,000	70,000
8,000		25,000	1200,000	1100,000	70,000
9,000		25,000	1200,000	1100,000	70,000
10,000		25,000	1200,000	1100,000	70,000
11,000		25,000	1200,000	1100,000	70,000
11,500		25,000	1200,000	1100,000	70,000
12,000		25,000	1200,000	1100,000	70,000
13,000		25,000	1200,000	1100,000	70,000
14,000		25,000	1200,000	1100,000	70,000
15,000		25,000	1200,000	1100,000	70,000
16,000		25,000	1200,000	1100,000	70,000
17,000		25,000	1200,000	1100,000	70,000
18,000		25,000	1200,000	1100,000	70,000
19,000		25,000	1200,000	1100,000	70,000
20,000		25,000	1200,000	1100,000	70,000
21,000		25,000	1200,000	1100,000	70,000
22,000		25,000	1200,000	1100,000	70,000
23,000		25,000	1200,000	1100,000	70,000
24,000		25,000	1200,000	1100,000	70,000
25,000	63/64	25,000	1200,000	1100,000	70,000



# HARTNER

## Broca monolabio E 80 XXL

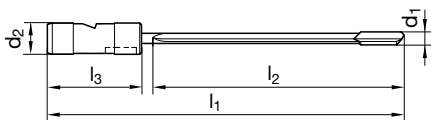
Nº artículo 89545



P	M	K	N	S	H
●	○	●	○	○	○



para la aplicación en máquinas de taladro profundo • artículos estándar con longitud total fija para máquinas de broca cañón • ranuras pulidas • cabeza de metal duro soldada con forma periférica G



d1 mm	inch	d2 h6 mm	l1 mm	l2 mm	l3 mm
4,000		25,000	1400,000	1300,000	70,000
5,000		25,000	1400,000	1300,000	70,000
6,000		25,000	1400,000	1300,000	70,000
7,000		25,000	1400,000	1300,000	70,000
8,000		25,000	1400,000	1300,000	70,000
9,000		25,000	1400,000	1300,000	70,000
10,000		25,000	1400,000	1300,000	70,000
11,000		25,000	1400,000	1300,000	70,000
11,500		25,000	1400,000	1300,000	70,000
12,000		25,000	1400,000	1300,000	70,000
13,000		25,000	1400,000	1300,000	70,000
14,000		25,000	1400,000	1300,000	70,000
15,000		25,000	1400,000	1300,000	70,000
16,000		25,000	1400,000	1300,000	70,000
17,000		25,000	1400,000	1300,000	70,000
18,000		25,000	1400,000	1300,000	70,000
19,000		25,000	1400,000	1300,000	70,000
20,000		25,000	1400,000	1300,000	70,000
21,000		25,000	1400,000	1300,000	70,000
22,000		25,000	1400,000	1300,000	70,000
23,000		25,000	1400,000	1300,000	70,000
24,000		25,000	1400,000	1300,000	70,000
25,000	63/64	25,000	1400,000	1300,000	70,000



# HARTNER

## Broca monolabio E 80 XXL

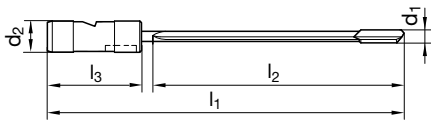
N° artículo 89542



P	M	K	N	S	H
●	○	●	○	○	○



para la aplicación en máquinas de taladro profundo • artículos estándar con longitud total fija para máquinas de broca cañón • ranuras pulidas • cabeza de metal duro soldada con forma periférica G



d1 mm	inch	d2 h6 mm	l1 mm	l2 mm	l3 mm
4,000		25,000	1600,000	1500,000	70,000
5,000		25,000	1600,000	1500,000	70,000
5,500		25,000	1600,000	1500,000	70,000
6,000		25,000	1600,000	1500,000	70,000
6,500		25,000	1600,000	1500,000	70,000
7,000		25,000	1600,000	1500,000	70,000
7,500		25,000	1600,000	1500,000	70,000
8,000		25,000	1600,000	1500,000	70,000
9,000		25,000	1600,000	1500,000	70,000
9,500		25,000	1600,000	1500,000	70,000
10,000		25,000	1600,000	1500,000	70,000
11,000		25,000	1600,000	1500,000	70,000
11,500		25,000	1600,000	1500,000	70,000
12,000		25,000	1600,000	1500,000	70,000
13,000		25,000	1600,000	1500,000	70,000
14,000		25,000	1600,000	1500,000	70,000
15,000		25,000	1600,000	1500,000	70,000
16,000		25,000	1600,000	1500,000	70,000
17,000		25,000	1600,000	1500,000	70,000
18,000		25,000	1600,000	1500,000	70,000
19,000		25,000	1600,000	1500,000	70,000
20,000		25,000	1600,000	1500,000	70,000
21,000		25,000	1600,000	1500,000	70,000
22,000		25,000	1600,000	1500,000	70,000
23,000		25,000	1600,000	1500,000	70,000
24,000		25,000	1600,000	1500,000	70,000
25,000	63/64	25,000	1600,000	1500,000	70,000



# HARTNER

## Broca monolabio E 80 XXL

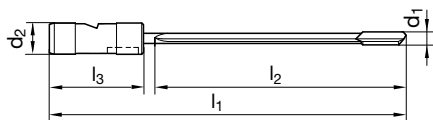
N° artículo 89546



P	M	K	N	S	H
●	○	●	○	○	○



para la aplicación en máquinas de taladro profundo • artículos estándar con longitud total fija para máquinas de broca cañón • ranuras pulidas • cabeza de metal duro soldada con forma periférica G



d1 mm	inch	d2 h6 mm	l1 mm	l2 mm	l3 mm
4,000		25,000	1800,000	1700,000	70,000
5,000		25,000	1800,000	1700,000	70,000
6,000		25,000	1800,000	1700,000	70,000
7,000		25,000	1800,000	1700,000	70,000
8,000		25,000	1800,000	1700,000	70,000
9,000		25,000	1800,000	1700,000	70,000
10,000		25,000	1800,000	1700,000	70,000
11,000		25,000	1800,000	1700,000	70,000
11,500		25,000	1800,000	1700,000	70,000
12,000		25,000	1800,000	1700,000	70,000
13,000		25,000	1800,000	1700,000	70,000
14,000		25,000	1800,000	1700,000	70,000
15,000		25,000	1800,000	1700,000	70,000
16,000		25,000	1800,000	1700,000	70,000
17,000		25,000	1800,000	1700,000	70,000
18,000		25,000	1800,000	1700,000	70,000
19,000		25,000	1800,000	1700,000	70,000
20,000		25,000	1800,000	1700,000	70,000
21,000		25,000	1800,000	1700,000	70,000
22,000		25,000	1800,000	1700,000	70,000
23,000		25,000	1800,000	1700,000	70,000
24,000		25,000	1800,000	1700,000	70,000
25,000	63/64	25,000	1800,000	1700,000	70,000
26,000		25,000	1800,000	1695,000	75,000
27,000		25,000	1800,000	1695,000	75,000
28,000		25,000	1800,000	1695,000	75,000
29,000		25,000	1800,000	1695,000	75,000
30,000		25,000	1800,000	1695,000	75,000
31,000		25,000	1800,000	1695,000	75,000
32,000		25,000	1800,000	1695,000	75,000



# HARTNER

## Broca monolabio E 80 XXL

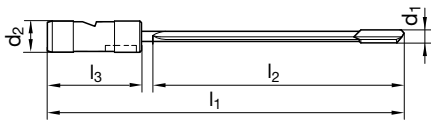
Nº artículo 89543



P	M	K	N	S	H
●	○	●	○	○	○



para la aplicación en máquinas de taladro profundo • artículos estándar con longitud total fija para máquinas de broca cañón • ranuras pulidas • cabeza de metal duro soldada con forma periférica G



d1 mm	inch	d2 h6 mm	l1 mm	l2 mm	l3 mm
4,000		25,000	2000,000	1900,000	70,000
5,000		25,000	2000,000	1900,000	70,000
6,000		25,000	2000,000	1900,000	70,000
7,000		25,000	2000,000	1900,000	70,000
8,000		25,000	2000,000	1900,000	70,000
9,000		25,000	2000,000	1900,000	70,000
10,000		25,000	2000,000	1900,000	70,000
11,000		25,000	2000,000	1900,000	70,000
11,500		25,000	2000,000	1900,000	70,000
12,000		25,000	2000,000	1900,000	70,000
13,000		25,000	2000,000	1900,000	70,000
14,000		25,000	2000,000	1900,000	70,000
15,000		25,000	2000,000	1900,000	70,000
16,000		25,000	2000,000	1900,000	70,000
17,000		25,000	2000,000	1900,000	70,000
18,000		25,000	2000,000	1900,000	70,000
19,000		25,000	2000,000	1900,000	70,000
20,000		25,000	2000,000	1900,000	70,000
21,000		25,000	2000,000	1900,000	70,000
22,000		25,000	2000,000	1900,000	70,000
23,000		25,000	2000,000	1900,000	70,000
24,000		25,000	2000,000	1900,000	70,000
25,000	63/64	25,000	2000,000	1900,000	70,000
26,000		25,000	2000,000	1895,000	75,000
27,000		25,000	2000,000	1895,000	75,000
28,000		25,000	2000,000	1895,000	75,000
29,000		25,000	2000,000	1895,000	75,000
30,000		25,000	2000,000	1895,000	75,000
31,000		25,000	2000,000	1895,000	75,000
32,000		25,000	2000,000	1895,000	75,000



## Broca monolabio con plaquita E 800

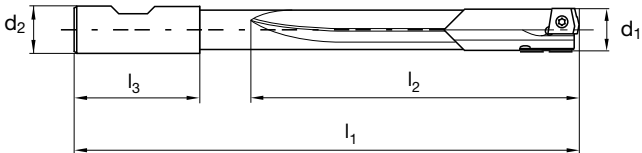
Nº artículo 89530



P	M	K	N	S	H
•	○	○	•	○	



profundidad hasta 30xD • con placa intercambiable • con patines de guía intercambiables • con atornillador • con tornillos • aplicación universal



d1 mm	inch	d2 h6 mm	l1 mm	l2 mm	l3 mm
12,000		20,000	446,000	384,000	50,000
12,700	1/2	20,000	468,000	406,000	50,000
14,000		20,000	510,000	448,000	50,000
15,000		25,000	548,000	480,000	56,000
16,000		25,000	580,000	512,000	56,000
18,000		25,000	644,000	576,000	56,000
20,000		32,000	712,000	640,000	60,000
24,000		32,000	840,000	768,000	60,000





## Plaquitas de corte para brocas monolabio E 800

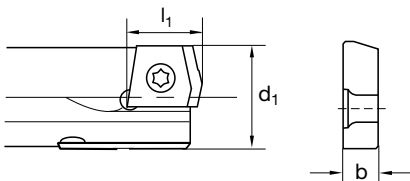
Nº artículo 89535



P	M	K	N	S	H
●	○	○	●	○	



aplicación universal



d1 mm	l1 mm	b mm	Código Nº	d1 mm	l1 mm	b mm	Código Nº
12,000	10,000	2,800	12,000	25,500	15,000	4,000	25,500
12,500	10,000	2,800	12,500	25,800	15,000	4,000	25,800
12,700	10,000	2,800	12,700	26,000	16,000	5,000	26,000
13,000	10,000	2,800	13,000	26,500	16,000	5,000	26,500
13,500	10,000	2,800	13,500	27,000	16,000	5,000	27,000
14,000	10,000	2,800	14,000	27,500	16,000	5,000	27,500
14,500	10,000	2,800	14,500	28,000	16,000	5,000	28,000
15,000	10,000	2,800	15,000	28,100	16,000	5,000	28,100
16,000	12,000	3,000	16,000	28,500	16,000	5,000	28,500
16,100	12,000	3,000	16,100	29,000	16,000	5,000	29,000
16,300	12,000	3,000	16,300	29,500	16,000	5,000	29,500
16,500	12,000	3,000	16,500	29,700	16,000	5,000	29,700
17,000	12,000	3,000	17,000	30,000	18,000	6,000	30,000
17,500	12,000	3,000	17,500	30,100	18,000	6,000	30,100
18,000	12,000	3,000	18,000	30,500	18,000	6,000	30,500
18,400	12,000	3,000	18,400	31,000	18,000	6,000	31,000
18,500	12,000	3,000	18,500	31,500	18,000	6,000	31,500
19,000	12,000	3,000	19,000	32,000	18,000	6,000	32,000
19,300	12,000	3,000	19,300	32,500	18,000	6,000	32,500
19,500	12,000	3,000	19,500	33,000	18,000	6,000	33,000
19,800	12,000	3,000	19,800	33,500	18,000	6,000	33,500
20,000	15,000	4,000	20,000	34,000	19,000	6,500	34,000
20,200	15,000	4,000	20,200	34,500	19,000	6,500	34,500
20,500	15,000	4,000	20,500	35,000	19,000	6,500	35,000
21,000	15,000	4,000	21,000	35,500	19,000	6,500	35,500
21,500	15,000	4,000	21,500	36,000	19,000	6,500	36,000
22,000	15,000	4,000	22,000	36,500	19,000	6,500	36,500
22,200	15,000	4,000	22,200	37,000	19,000	6,500	37,000
22,500	15,000	4,000	22,500	37,500	19,000	6,500	37,500
23,000	15,000	4,000	23,000	37,700	19,000	6,500	37,700
23,500	15,000	4,000	23,500	38,000	20,000	7,000	38,000
24,000	15,000	4,000	24,000	38,100	20,000	7,000	38,100
24,500	15,000	4,000	24,500	38,500	20,000	7,000	38,500
25,000	15,000	4,000	25,000	39,000	20,000	7,000	39,000
25,100	15,000	4,000	25,100	39,500	20,000	7,000	39,500
25,400	15,000	4,000	25,400	40,000	20,000	7,000	40,000



## Patines guía per brocas monolabio E 800

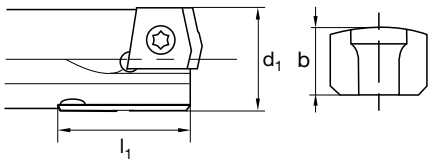
Nº artículo 89536



P	M	K	N	S	H
●	○	○	●	○	



aplicación universal



d1 mm	l1 mm	b mm	Código Nº	d1 mm	l1 mm	b mm	Código Nº
12,000	19,950	2,150	12,000	25,500	25,000	3,350	25,500
12,500	19,950	2,150	12,500	25,800	25,000	3,500	25,800
12,700	19,950	2,250	12,700	26,000	25,000	3,850	26,000
13,000	19,950	2,150	13,000	26,500	25,000	3,850	26,500
13,500	19,950	2,150	13,500	27,000	25,000	3,850	27,000
14,000	19,950	2,150	14,000	27,500	25,000	3,850	27,500
14,500	19,950	2,150	14,500	28,000	25,000	3,850	28,000
15,000	19,950	2,150	15,000	28,100	25,000	3,900	28,100
16,000	20,000	2,850	16,000	28,500	25,000	3,850	28,500
16,100	20,000	2,900	16,100	29,000	25,000	3,850	29,000
16,300	20,000	3,000	16,300	29,500	25,000	3,850	29,500
16,500	20,000	2,850	16,500	29,700	25,000	3,950	29,700
17,000	20,000	2,850	17,000	30,000	30,000	4,350	30,000
17,500	20,000	2,850	17,500	30,100	30,000	4,400	30,100
18,000	20,000	2,850	18,000	30,500	30,000	4,350	30,500
18,400	20,000	3,050	18,400	31,000	30,000	4,350	31,000
18,500	20,000	2,850	18,500	31,500	30,000	4,350	31,500
19,000	20,000	2,850	19,000	32,000	30,000	4,350	32,000
19,300	20,000	3,000	19,300	32,500	30,000	4,350	32,500
19,500	20,000	2,850	19,500	33,000	30,000	4,350	33,000
19,800	20,000	3,000	19,800	33,500	30,000	4,350	33,500
20,000	25,000	3,350	20,000	34,000	30,000	4,850	34,000
20,200	25,000	3,450	20,200	34,500	30,000	4,850	34,500
20,500	25,000	3,350	20,500	35,000	30,000	4,850	35,000
21,000	25,000	3,350	21,000	35,500	30,000	4,850	35,500
21,500	25,000	3,350	21,500	36,000	30,000	4,850	36,000
22,000	25,000	3,350	22,000	36,500	30,000	4,850	36,500
22,200	25,000	3,450	22,200	37,000	30,000	4,850	37,000
22,500	25,000	3,350	22,500	37,500	30,000	4,850	37,500
23,000	25,000	3,350	23,000	37,700	30,000	4,950	37,700
23,500	25,000	3,350	23,500	38,000	30,000	5,350	38,000
24,000	25,000	3,350	24,000	38,100	30,000	5,400	38,100
24,500	25,000	3,350	24,500	38,500	30,000	5,350	38,500
25,000	25,000	3,350	25,000	39,000	30,000	5,350	39,000
25,100	25,000	3,400	25,100	39,500	30,000	5,350	39,500
25,400	25,000	3,550	25,400	40,000	30,000	5,600	40,000



## Brocas cañon con 2 labios de corte Z 80

Nº artículo 89508



P	M	K	N	S	H
			•		



profundidad hasta 30xD • brocas cañón de 4 facetas • para aluminio

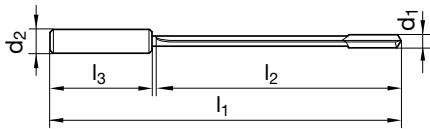
Nº artículo 89518



P	M	K	N	S	H
		•			



profundidad hasta 30xD • brocas cañón de 4 facetas • para fundición



d1		d2 h6	l1	l2	l3
mm	inch	mm	mm	mm	mm
8,000		16,000	330,000	280,000	48,000
10,000		20,000	390,000	340,000	50,000
12,000		20,000	450,000	400,000	50,000



## Características de calidad

En el sector del mecanizado, el término «taladro profundo» se utiliza para perforar a profundidades de 15xD y superiores.

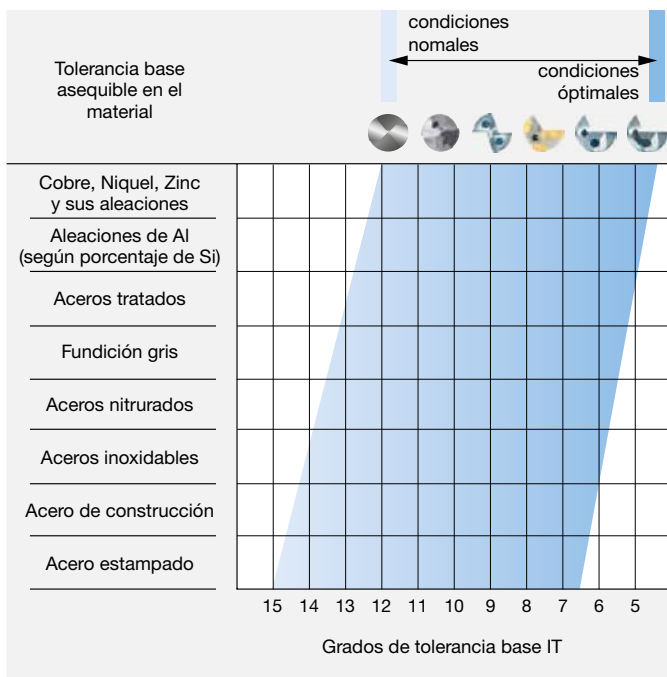
- Clásicas brocas cañón monolabio en MDI o con cabeza de metal duro soldada
- Clásicas brocas cañón de dos labios en MDI o con cabeza de metal duro soldada
- Sistema de cambio con cortes y patines intercambiables en MDI
- Brocas cañón espirales en MDI o HSS / HSS-E

Se debe seleccionar la herramienta adecuada en función de la aplicación y los requisitos de calidad de la broca.

Los siguientes diagramas proporcionan ayuda para la selección de herramientas:

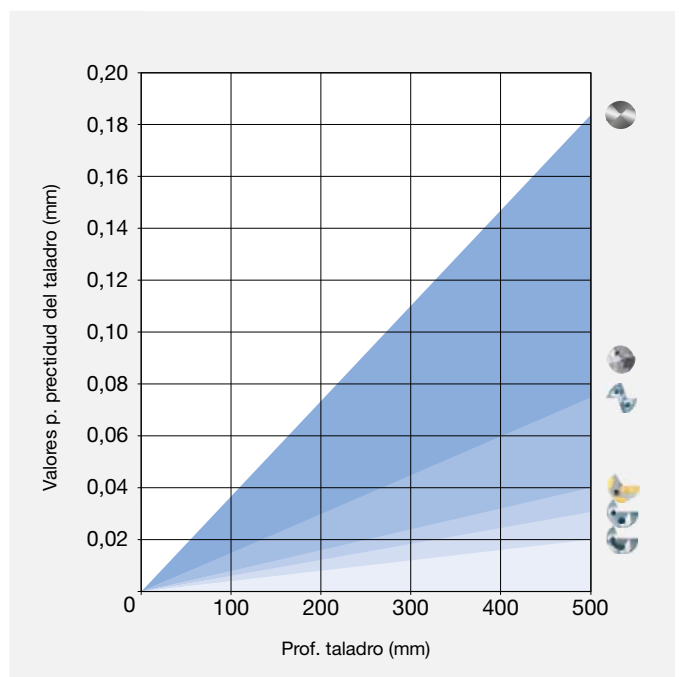
### Tolerancias básicas

Los diferentes tipos de herramientas producen diferentes tolerancias básicas en función de su diseño. La broca monolabio produce taladros extremadamente precisos. Con una broca monolabio, se pueden alcanzar tolerancias de hasta IT5 en las mejores condiciones.



### Rectitud del taladro

La rectitud de la broca indica una desviación de la dirección. En ello influye el centrado de la herramienta durante el taladrado piloto, según la forma y la posición del piloto o del casquillo. Las propiedades del material o de la pieza de trabajo, además de la estabilidad de la herramienta y de la máquina también influyen en el resultado de la rectitud.



Tipos de granulado		N12	N11	N10	N9	N8	N7	N6	N5	N4	N3
E 100/E 80 Taladrado profundo											
E 800 Taladrado profundo											
Z 80/TS 100 T Taladrado profundo											
HSS/HSS-E Taladrado profundo											
E 100/80/800 Pretaladrar											
Valores de la superficie	Rz (µm)	160	100	63	40	15,6	7,87	4,65	2,60	1,74	0,81
Valores de rugosidad	Ra (µm)	50	25	12,5	6,3	3,2	1,6	0,8	0,4	0,2	0,1

condiciones normales (valores)
  condiciones ideales

### Calidad de superficie

La rugosidad de la broca se ve influenciada por multitud de factores. Los más determinantes son el tipo de herramienta y su geometría, el material y el refrigerante. A diferencia de las herramientas de hojas múltiples, la pared perforada se alisa adicionalmente con los patines de guía al realizar taladros con brocas monolabio. Las superficies de la herramienta (por ejemplo, el recubrimiento) o el estado de los bordes (desgaste) de los cortes laterales principales y laterales determinan la calidad de la superficie.

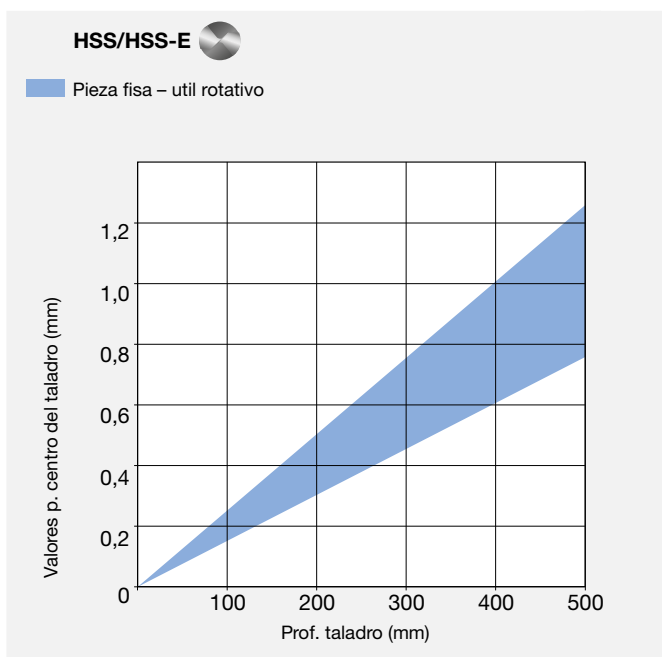
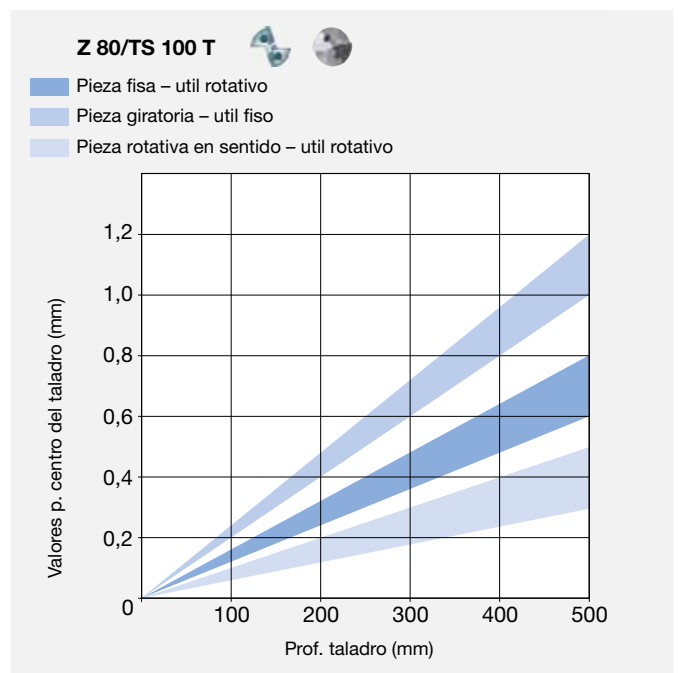
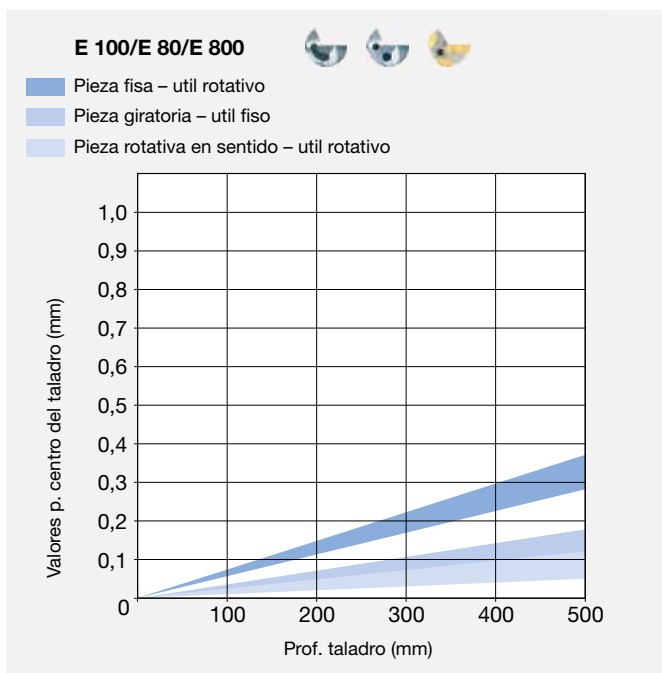


## Características de calidad

### Continuidad del centro del taladro

Un desplazamiento continuo de la herramienta con una profundidad de taladrado creciente describe el desvío central del agujero. Además de las propiedades geométricas de la broca, las condiciones de corte, la estructura del material y las temperaturas también influyen en el desvío de taladro. Se obtienen

resultados óptimos cuando se mecaniza a velocidades opuestas de la pieza y la herramienta. La broca monolabial produce desviaciones mínimas con respecto al centro en comparación con las brocas de múltiples filos.





## Aplicación de los recubrimientos Hartner

Material	Grupos ISO	E/Z	TS 100 T	HSS
<b>aceros C, aceros para tornos automáticos, aceros Mn</b>		TiN TiSiN TiAlSiN	TiSiN TiAlZrN FIRE	FIRE - -
<b>acero, aleado de baja aleación</b>		blanca TiN FIRE	FIRE TiSiN TiAlZrN	FIRE TiN -
<b>acero, aleado</b>		FIRE TiAlSiN	FIRE TiAlSiN AlTiN nano	FIRE TiN -
<b>acero, endurecido, &lt;55 HRC</b>		TiAlSiN FIRE TiAlN	TiAlSiN FIRE TiAlN	- - -
<b>acero, endurecido, 55-65 HRC</b>		TiAlSiN FIRE TiAlN	TiAlSiN FIRE TiAlN	- - -
<b>acero, inoxidable, resistente al ácido</b>		SuperA AlTiZrN TiAlSiN	AlTiN nano AlTiZrN TiSiN	AlTiZrN FIRE TiN
<b>hierro fundido</b>		TiAlSiN TiSiN FIRE	TiAlSiN FIRE AlTiN nano	FIRE - -
<b>aleaciones básicas Ni (z.B. Inconel)</b>		AlTiN nano AlTiZrN TiSiN	AlTiN nano TiAlSiN FIRE	FIRE - -
<b>titanio/aleaciones de titanio</b>		blanca ZrN AlTiN nano	ZrN AlTiN nano	FIRE -
<b>aleaciones de cobalto-cromo</b>		AlTiN nano FIRE TiAlSiN	AlTiN nano TiAlSiN FIRE	- - -
<b>metales preciosos</b>		AlTiN nano DLC	AlTiN nano	-
<b>aleaciones maleables de Al</b>		blanca DLC -	blanca DLC Diamant	blanca DLC -
<b>aleaciones de aluminio y fundición (&lt;12% silicio)</b>		blanca ZrN DLC	blanca ZrN DLC	blanca ZrN DLC
<b>aleaciones de aluminio y fundición (≥12% silicio)</b>		Diamant TiAlSiN -	Diamant - -	- - -
<b>cobre / bronce / latón</b>		blanca DLC CrN	CrN DLC	TiN -
<b>cerámica</b>		Diamant TiAlSiN	Diamant	-
<b>plásticos,, sin refuerzo de fibras</b>		blanca	DLC	-
<b>plásticos,, con refuerzo de fibras</b>		Diamant TiAlSiN	Diamant TiAlSiN	- -
<b>grafitos</b>		blanca	-	-

**Nota: El resumen muestra las recomendaciones generales de aplicación de los recubrimientos Hartner. El orden de prioridad es descendente.**



## Introducción al taladrado profundo

En la tecnología del mecanizado a partir de una profundidad de 15xD y más se habla de taladrado profundo, pero naturalmente también se pueden realizar taladros más cortos con brocas cañón. Así se utilizan las características buenas como la gran calidad superficial, la concentricidad de los taladros y la exactitud en diámetro.

### Refrigeración por alta presión – hoy en día completamente normal.

Como en los últimos años se ha impuesto la refrigeración interna en todas las herramientas, el refrigerante lubricante se guía exactamente a las zonas en las que más hace falta. Con esta medida se consiguió mejoras de rendimiento y menos roturas también en brocas espirales, machos de roscar, etc. Todas las máquinas-herramientas de hoy en día se ofrecen con refrigeración interna de alta presión y son así apropiadas para realizar taladros profundos. La cantidad de brocas cañón en centros de mecanizado y tornos crece cada vez más. Este proceso cada vez es más popular en la técnica de desbaste.

### Consejos y trucos

- Para profundidades superiores a 40xD, se recomienda el uso de dos o más brocas cañón, por ejemplo, Ø 10x400mm y Ø 9,95x800mm, al utilizar brocas clásicas cañón con mango de acero E 80, E 800 y Z 80.
- Las brocas cañón en MDI E 100 M y E 100 soldada pueden alcanzar una profundidad máxima de 80xD con una sola herramienta.
- Las brocas cañón superiores a 40xD deben aplicarse en el taladro piloto en sentido antihorario.
- Al cambiar de herramientas a partir de 40xD, la herramienta se puede apagar durante aprox. 1 segundo conectando la refrigeración interna de alta presión.
- Para el mecanizado de materiales de estriado largo se recomienda la solicitud de brocas cañón con estrías pulidas.
- En general, se recomienda ajustar el contenido de grasa de la emulsión a un mínimo del 8%.
- Las brocas monolabio para aluminio de estriado largo deben solicitarse con un bisel de 180° y un espacio para la cámara de aceite.
- Mediante el ajuste de los casquillos se detiene el proceso de taladro y se aumenta la calidad de taladro
- Para evitar el espacio entre el taladro piloto y el taladro profundo, se puede lograr una transición suave con la forma circunferencial G y un piloto con un ligero rebaje dimensional.
- En caso de formación de virutas largas, interrumpir de manera periódica la alimentación (sin retroceso) puede favorecer el proceso de mecanizado.



Todas las brocas cañón deben ser guiadas en la entrada del taladro. Brocas cañón nunca deben girar libres en el interior de la máquina a toda velocidad.

El taladrado profundo no es imposible, pero puede controlarse si se cumplen ciertas condiciones. Los valores orientativos para el uso de las brocas cañón Hartner se pueden encontrar en el capítulo condiciones recomendadas.



## El método de taladrado con máquinas convencionales (centros de mecanizado)

### Los pasos de trabajo para el taladrado profundo

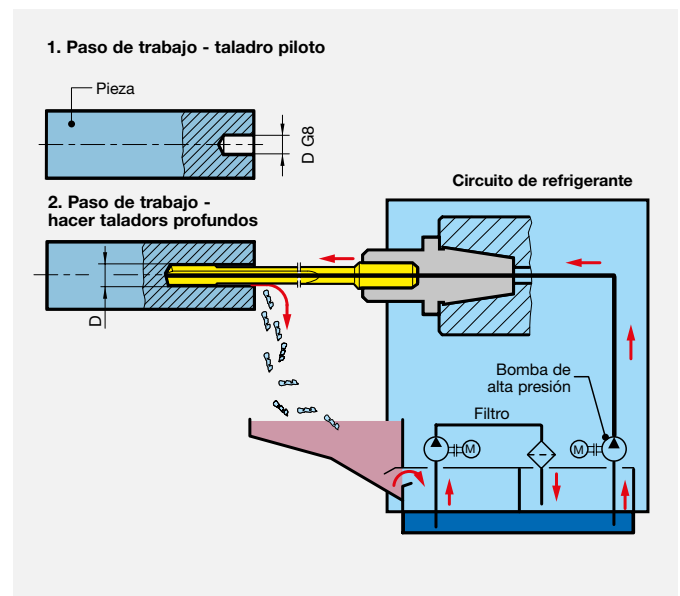
- Crear un taladro piloto
- Inserción a baja velocidad
- Regular la presión del lubricante y las revoluciones
- Taladrar continuamente hasta abajo sin parar para evacuar viruta
- Cortar el suministro de refrigerante al llegar al fondo del taladro
- Retroceso de la herramienta de taladro

**En el caso de no tener suficiente refrigeración se puede trabajar con parámetros más bajos. También se permiten métodos de mejora de la presión.**

### Procedimiento

Para conseguir en un taladro profundo resultados óptimos sobre todo taladrando sobre radios o superficies desiguales recomendamos los siguientes pasos en el proceso:

1. Fresado de una superficie, por ejemplo, con la TF 100 MULTI-MILL. La superficie debe estar en ángulo recto con respecto al ángulo de entrada de la operación de taladro.
2. Al realizar un taladro piloto cilíndrico, por ejemplo con la TS 100 U, gracias al ángulo de su punta de 140° y su tolerancia de  $\varnothing$  m7, estas brocas son ideales para este paso de mecanizado.
3. Inserción en el agujero piloto a una velocidad de aproximadamente 200 rpm con una velocidad de avance de aproximadamente 500 mm/min en rotación antihoraria.
4. Ajuste de la presión y la velocidad del lubricante refrigerante.
5. Taladro continuo a la profundidad sin retirar la viruta. Cuando se utilizan brocas cañón con una relación longitud-diámetro muy amplia (por ejemplo, brocas monolabio en MDI de 160 mm de estrías largas), se recomienda trabajar con parámetros de corte reducidos (aprox. 75% de la velocidad de corte óptima) hasta una profundidad de aprox. 25 mm.
6. Para los taladros pasantes con salida recta, es decir, de 90°, se debe reducir al 50% la velocidad de avance a aprox. 1 mm antes de atravesarlas.
7. En el caso de los taladros pasantes con salida oblicua, se debe reducir al 40% la velocidad de avance a aprox. 1 mm antes de atravesarlas.
8. Después de alcanzar la profundidad, desconecte el avance y el lubricante refrigerante y proceda a la retirada a un máximo de 5000 mm/min.



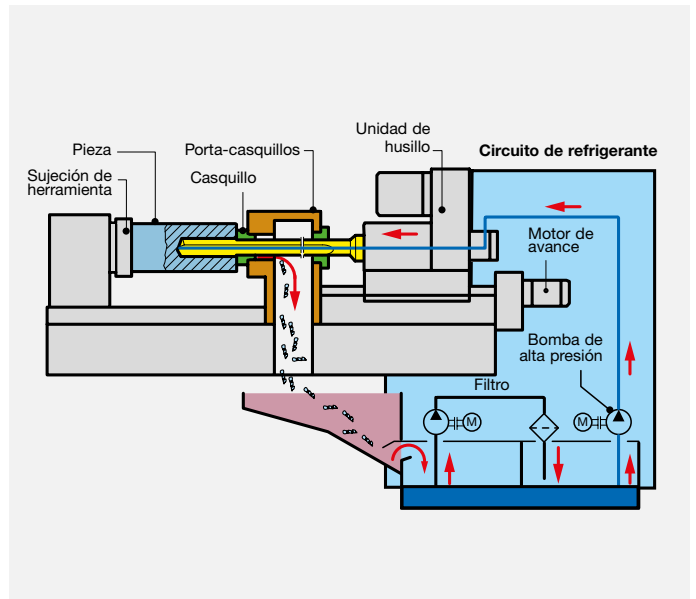




## Brocas cañón clásicas de taladrado profundo

Una máquina de taladrado profundo se utiliza generalmente para realizar taladros muy profundos en producciones a gran escala o si se plantean exigencias muy elevadas en cuanto a la superficie, la precisión dimensional y la rectitud. La profundidad es prácticamente ilimitada, dado que la herramienta de taladrado está dirigida por los denominados casquillos, que se empujan entre sí como un acordeón durante el proceso de taladro. Los taladros piloto no son necesarios, ya que el casquillo guía la herramienta durante el proceso de taladro. El taladro se puede llevar a cabo a la profundidad deseada sin necesidad de extraer la broca.

La máquina de taladrado profundo tiene varias ventajas sobre la máquina herramienta convencional: No se requiere realizar un taladro piloto, de manera que se ahorra tiempo de mecanizado y cambio de herramientas. La profundidad puede ser de varios metros con una calidad de taladro extraordinaria. Las bombas de alta presión y los filtros para el refrigerante se adaptan a grandes profundidades de taladrado y también contribuyen a que el proceso se desarrolle con gran fiabilidad. La longitud total de los casquillos y el soporte para casquillos da como resultado la llamada longitud de pérdida, que es fundamental para el cálculo de la longitud de la herramienta.



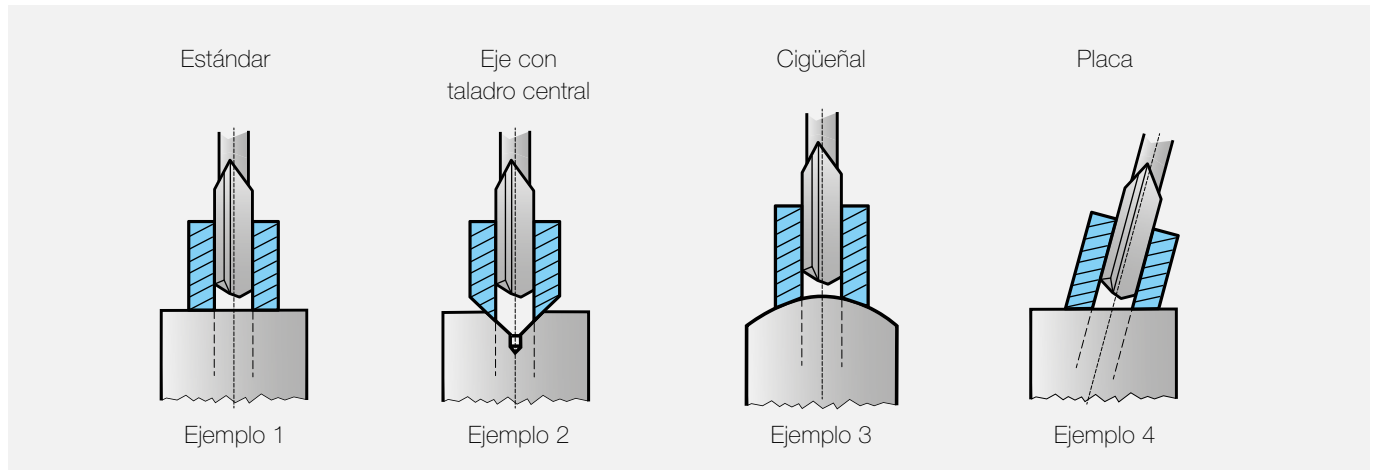


## Piloto y casquillo de taladrar

Como la broca monolabio es una herramienta de un solo corte y no puede centrarse de forma independiente, la herramienta debe estar dirigida por un casquillo de de taladrar o un taladro piloto.

Sin embargo, las brocas de dos labios autocentrantes también deben estar dirigidas por los casquillos de de taladrar o los taladros piloto, ya que de lo contrario podrían oscilar hacia arriba.

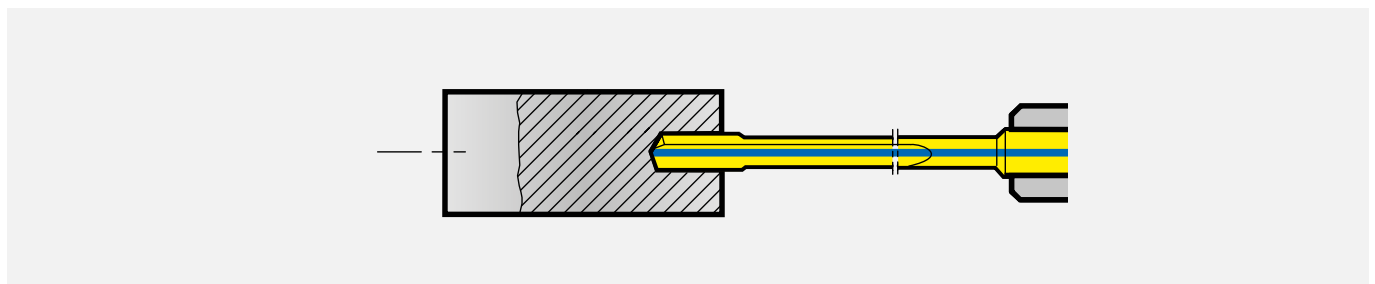
**Ejemplo casquillo** con N° art. 89600 (HSS) / 89601 (MDI)



### Cuando se manipulan los casquillos, se debe observar lo siguiente:

- El casquillo debe mantener un contacto óptimo con el contorno de punteado.
- El recorrido entre el casquillo y la herramienta debe ser lo más pequeño posible.
- Si la broca cañón tiene un diámetro de guía, el casquillo debe ser al menos lo suficientemente largo para dirigir ambas formas periféricas durante el punteado.
- Inspección frecuente del estado del casquillo para evitar influencias negativas en la herramienta.
- Se recomiendan casquillos de acero rápido para las series pequeñas y casquillos de carburo para las series grandes.

### Ejemplo Pilotar



### Valores guía para la profundidad del piloto

Brocas clásicas profunda	Ø nominal Troquel progresivo				
	Ø 0,900-1,799	Ø 1,800-3,999	Ø 4,000-7,999	Ø 8,000-11,999	Ø 12,000-52,000
Profundidad hasta 20xD	3,0xD	2,5xD	2,0xD	1,5xD	1,5xD
hasta 30xD		3,0xD	2,5xD	2,0xD	
hasta 40xD		4,0xD	3,0xD	2,5xD	



## Piloto y casquillo de taladrar

### Herramientas piloto del espectro de aplicación

	Campo de dia. [mm]																		
	0,9	1,0	1,4	2,0	3,0	6,0	8,0	11,0	12,0	15,5	16,0	19,5	20,0	25,0	30,0	35,0	40,0	45,0	50,0
Microbrocas	N° art. 86400 sin ref. int. 86405 con r.i.																		
TS 100 U	N° art. 89413 sin ref. int. N° art. 89410 con ref. int.																		
Multiplex HPC	N° art. 86721 placa per pilotar																		
TF 100 Pilot	N° art. 85000 4 cortes sin ref. int.																		
TF 100 MULTI-MILL	N° art. 84951 4 cortes sin ref. int.																		
Typ V	N° art. 84803 HSS-E sin ref. int.																		

#### Microbrocas

- Para taladros piloto <math>\varnothing</math>3,000/E 100, E 80
- Para situaciones estándar/superficie de punteado plana

#### TS 100 U

- Herramienta piloto universal  $\varnothing$ 3,000-19,500/E 100, E 80, Z 80, E 800, TS 100 T
- Para situaciones estándar/superficie de punteado plana

#### Multiplex HPC

- Herramienta piloto WP  $\varnothing$ 11,000-40,000/E 100, E 80, Z 80, E 800, TS 100 T
- Para situaciones estándar/superficie de punteado plana

#### TF 100 Pilot

- Fresa para piloto de alta precisión  $\varnothing$ 1,400-12,000/E 100, E 80, Z 80, E 800, TS 100 T
- Para situaciones estándar y especiales/superficies de punteado planas, angulares, cúbicas y otras superficies de punteado

#### TF 100 MULTI-MILL

- Fresa para piloto de alta precisión  $\varnothing$ 4,000-52,000/E 100, E 80, Z 80, E 800, TS 100 T
- Para situaciones estándar y especiales/superficies de punteado planas, angulares, cúbicas y otras superficies de punteado

#### Typ V

- Taladro piloto de acero rápido de  $\varnothing$ 0,900-15,500/broca cañón de acero rápido
- Para situaciones estándar/superficie de punteado plana

### Cuando se manipulan los taladros piloto, se debe observar lo siguiente

- El diámetro del piloto y las herramientas deben presentar una tolerancia de hasta G8 y hasta un  $\varnothing$  nominal de **m7**, respectivamente.
- Si la broca monolabio tiene un diámetro de guía, el taladro piloto debe ser al menos lo suficientemente profundo para dirigir ambas formas periféricas durante el punteado.
- En función de la aplicación, suele resultar adecuado que el taladro piloto cuente con una faceta de inserción.
- Si se imponen grandes exigencias a la posición y el desvío de la broca cañón, el taladro piloto debe fresarse o girarse en un torno de ser posible.

#### Importante:

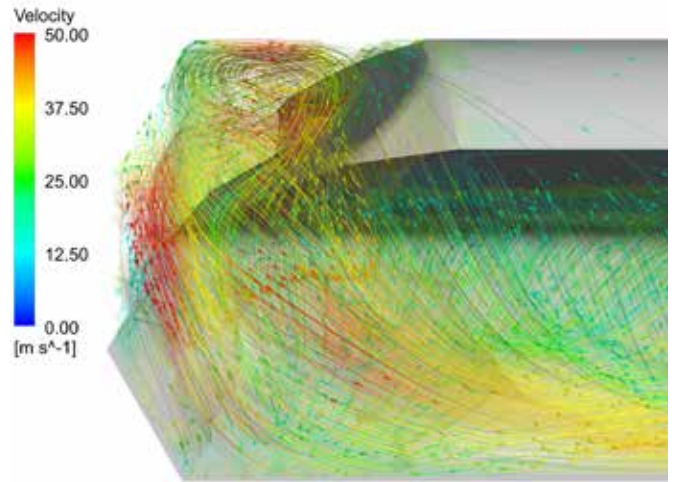
La calidad del casquillo y del taladro piloto influyen enormemente sobre el desvío central del agujero y el recorrido del troquel progresivo.



## Lubricante refrigerante

### Introducción

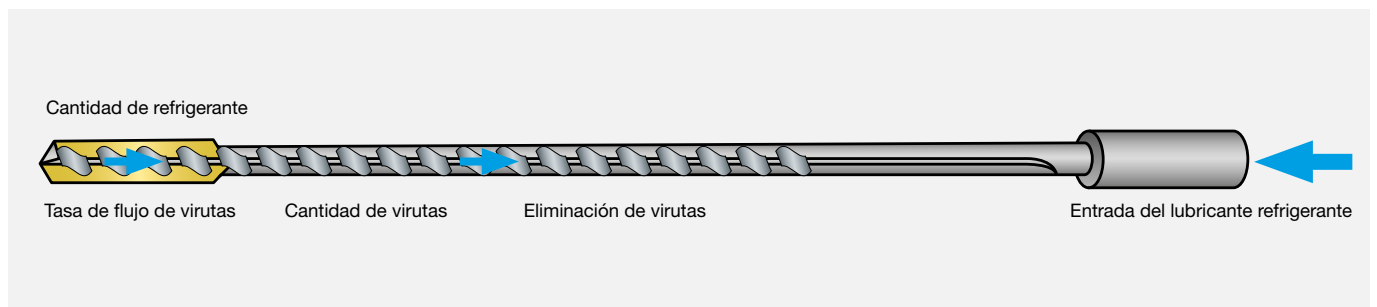
El lubricante refrigerante es uno de los componentes más importantes para taladrar relaciones de LxD superiores a 15xD o, especialmente, para brocas cañón. La selección del suministro del lubricante refrigerante, sus propiedades y su rendimiento, así como la presión y el flujo de volumen son decisivos para el rendimiento del proceso y, en consecuencia, también para la calidad del taladro. Una presión excesiva del lubricante refrigerante puede causar ondulaciones y un desvío de taladro mayor.



### Función

Principalmente, el lubricante refrigerante (aceite, emulsión, MQL, aire) limpia las virutas del taladro y lubrica todos los segmentos de la herramienta (circunferencia y cortes) que entran en contacto con la pieza de trabajo. El taladro se lleva a cabo bajo alta presión. Sin embargo, la presión es «sólo» la suma de la cantidad de lubricante refrigerante generada y las resistencias existentes, como la sección transversal del canal de refrigeración o la longitud de la herramienta y la masa de la viruta. Desde el punto de vista hidráulico, la cantidad de lubricante refrigerante y las resistencias mencionadas generan una velocidad de flujo que, si se aplica correctamente, mantiene al mínimo el tiempo de contacto

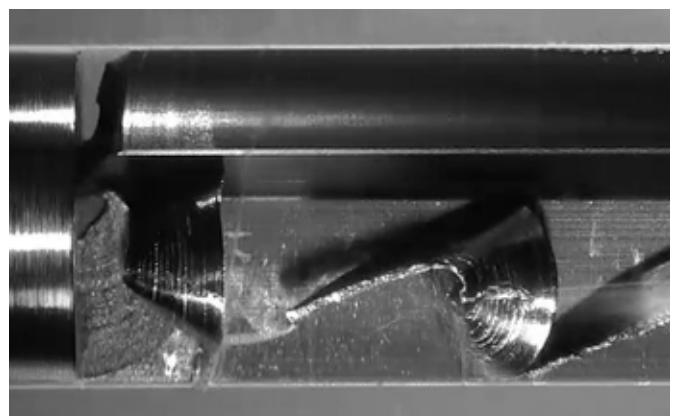
de la viruta con el filo, evita que la broca se obstruya y, por lo tanto, influye directamente sobre el proceso de mecanizado. Las propiedades lubricantes del lubricante refrigerante tienen una influencia decisiva en la formación de viruta y el resultado de la superficie. Los aditivos correspondientes, como los aditivos EP (presión extrema) garantizan el deslizamiento de los patines de guía, que pueden estar expuestos a una gran presión superficial y a fuerzas de rodadura.



### Filtración

Para poder garantizar la seguridad de los procesos de taladro, es fundamental proporcionar una limpieza de lubricante refrigerante en función del diámetro de la herramienta:

- <math>\varnothing</math> 2,000 max. 15  $\mu\text{m}$
- $\varnothing$  2,000 hasta  $\leq \varnothing$  6,000 max. 40  $\mu\text{m}$
- >  $\varnothing$  6,000 hasta 100  $\mu\text{m}$





## Tipos de lubricantes refrigerantes

### Emulsión

Los diferentes tipos de refrigerantes solubles en agua, como composiciones minerales, sintéticas o naturales, influyen de manera decisiva sobre el proceso de taladro, junto con el contenido de grasa seleccionado. El contenido de grasa para brocas cañón se

sitúa idealmente entre el 8-12%. Los valores más bajos derivan en pérdidas de rendimiento o incluso a fallos de funcionamiento.



#### Propiedades de la emulsión\*

- A altas presiones, deben utilizarse aditivos EP (presión extrema) en la emulsión, ya que de lo contrario puede generarse espuma y, como consecuencia, perderse las propiedades lubricantes.
- En el caso de la emulsión, las presiones pueden reducirse aproximadamente un 15% debido a la viscosidad inferior en comparación con el aceite, para obtener un comportamiento de limpieza comparable.
- Para los tipos de materiales con un contenido de cromo superior al 12%, cabe esperar un recorrido de menos de 1,5 m.

### Aceite

Al igual que la emulsión, el aceite de la broca cañón se distingue por su composición mineral, sintética y natural. La viscosidad superior de los aceites de las brocas cañón n comparación con la emulsión determina en parte la mayor resistencia del refrigerante, que en el caso de los aceites de baja viscosidad conduce o bien a altas velocidades de flujo (diámetros pequeños) o bien, en el caso de los aceites de alta viscosidad, a mayores fuerzas hidráulicas (decisivas para diámetros más grandes). La viscosidad y las propiedades lubricantes de los aceites reaccionan fuertemente a la temperatura. El sobrecalentamiento > 50 °C debe evitarse para poder taladrar de forma fiable.

#### Propiedades del aceite\*

- <math>\varnothing</math> 2mm 7-10mm<sup>2</sup>/s
- >  $\varnothing$  2mm 10-20mm<sup>2</sup>/s

### MQL / Seco

Las brocas cañón puede utilizarse en seco o con MQL. Se pueden llevar a cabo los procesos adecuados en función del material, el diámetro y la profundidad del taladro. La forma, el tamaño y la masa de las virutas son decisivos. La mecanización en seco solo es posible si se producen virutas parecidas al polvo (por ejemplo, piezas de grafito o piezas de metal duro no sinterizadas).



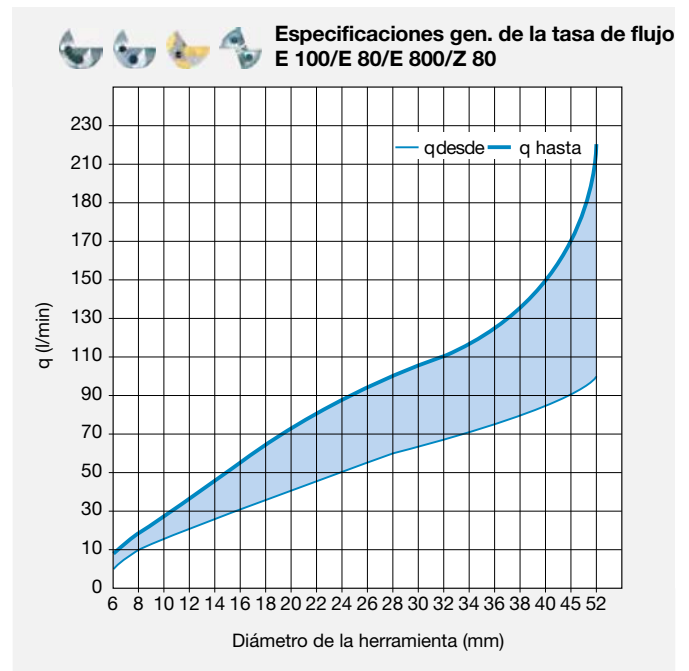
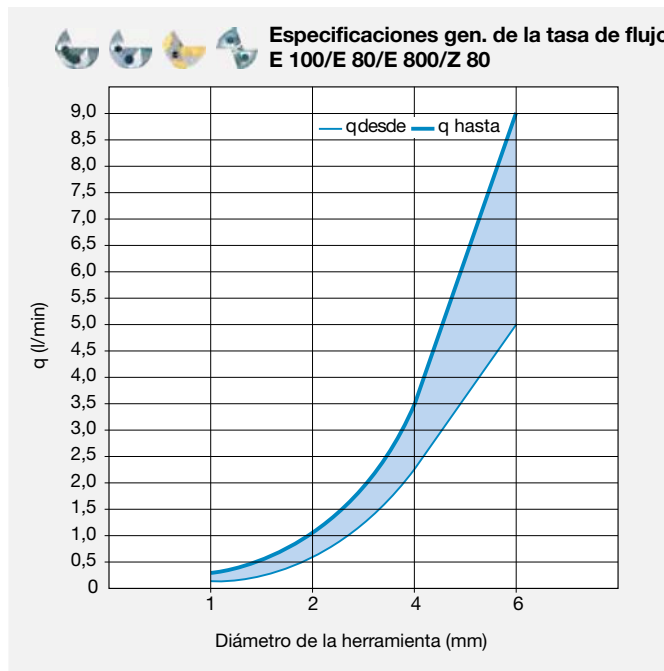
\*No se aceptará ninguna responsabilidad en caso de variación de las especificaciones del fabricante



## Especificaciones del lubricante refrigerante

### Por favor tenga en cuenta:

- Todas las brocas cañón únicamente se deben utilizar con refrigeración interna, sea aire, agua o aceite. Con la refrigeración interna se garantiza en mayor medida la eliminación de las virutas.
- Todas las brocas cañón también se pueden utilizar con aceite para su refrigeración interna. En este caso se requiere un 30% más de presión para conseguir la misma cantidad de refrigerante.
- Si se utilizan brocas cañón con MQL, podría ser necesario aumentar la presión en diámetros nominales más pequeñas según el dispositivo MQL del que se disponga.
- Si las condiciones de refrigerante no son idóneas se puede trabajar con parámetros reducidos. También hay sistemas para aumentar la presión.
- Cuanto más larga es la broca cañón más alta debe ser la presión para conseguir el caudal óptimo en los canales de refrigeración.

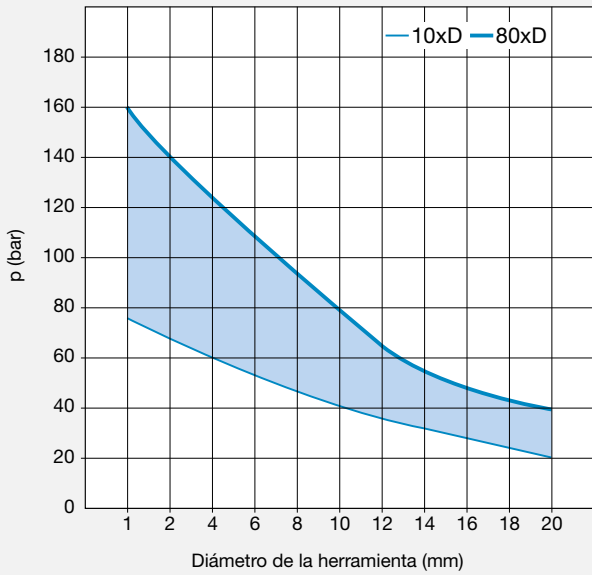




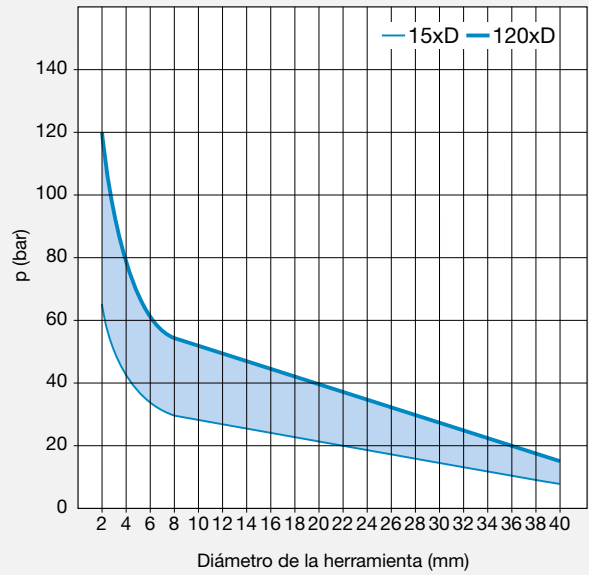
## Especificaciones del lubricante refrigerante



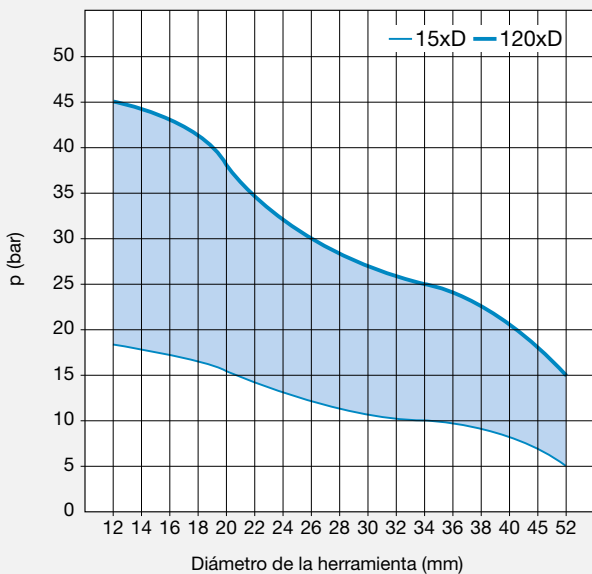
**E 100 Especificaciones de presión**  
en función de la longitud de la herramienta



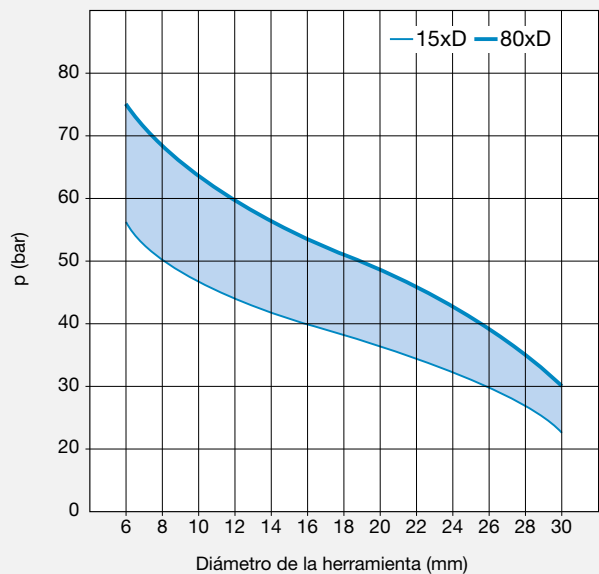
**E 80 Especificaciones de presión**  
en función de la longitud de la herramienta



**E 800 Especificaciones de presión**  
en función de la longitud de la herramienta



**Z 80 Especificaciones de presión**  
en función de la longitud de la herramienta



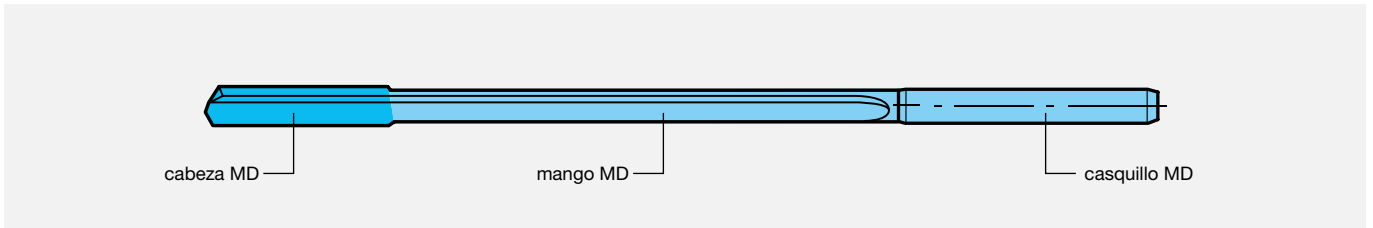


## Características

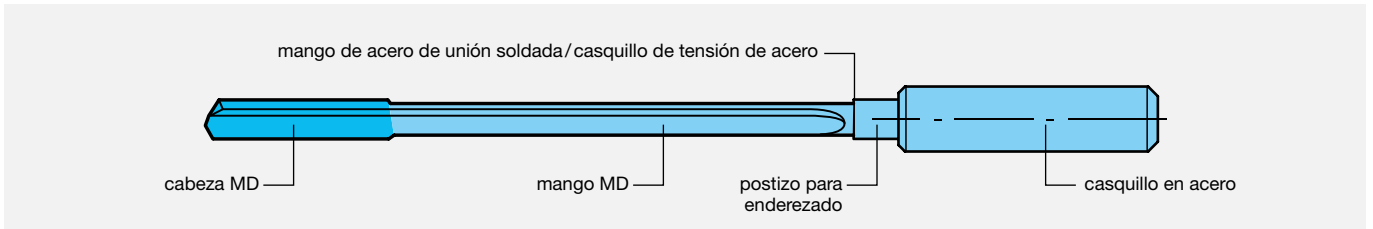
### Espectro de aplicaciones

	Campo de día.																	
	0,9	1,0	2,0	4,0	6,0	8,0	10,0	12,0	14,0	16,0	18,0	20,0	25,0	30,0	35,0	40,0	45,0	50,0
E 100 M	max. longitud total 615mm																	
E 100	max. longitud total 615mm																	
E 80	max. longitud total 3.600mm																	
Z 80	max. longitud total 1.000mm																	
E 800	max. longitud total 3.600mm																	

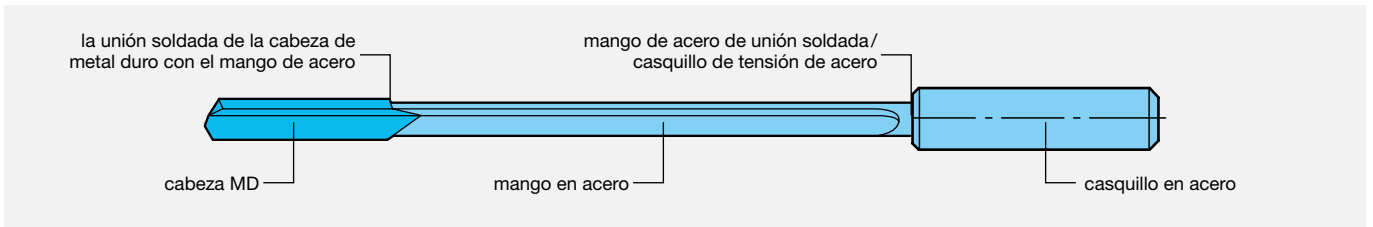
### E 100 M



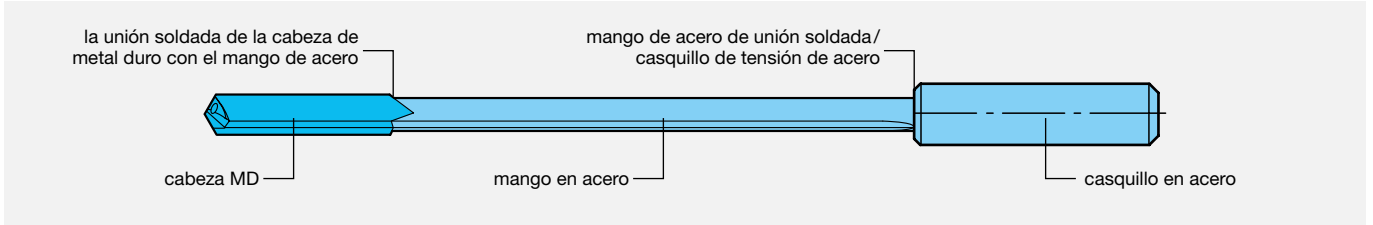
### E 100



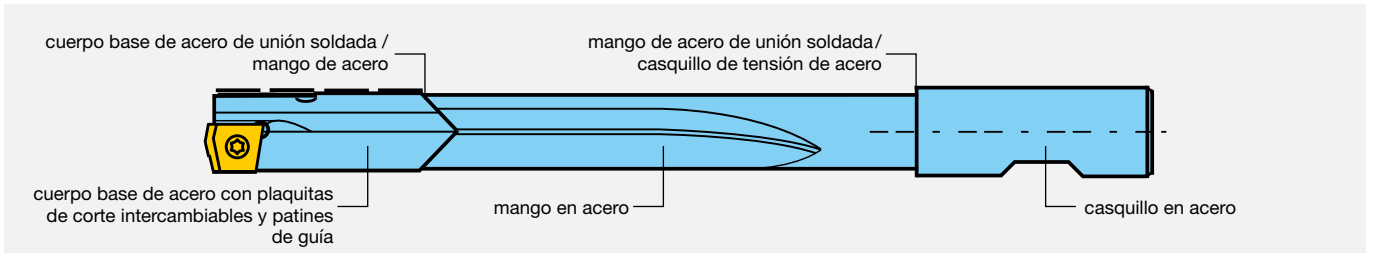
### E 80



### Z 80



### E 800

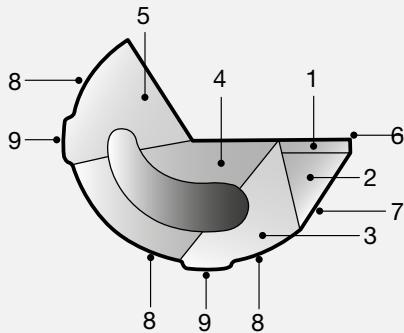




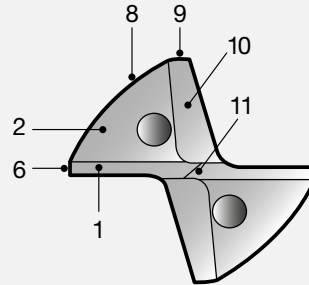


## Características

### Características – Afilado E



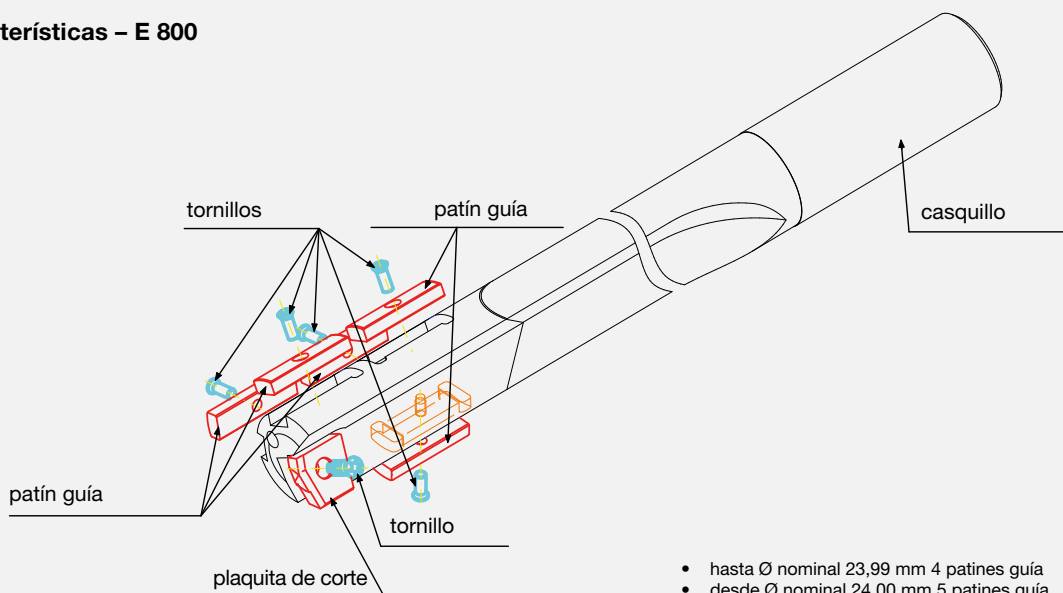
### Características – Afilado Z



#### Definición:

- 1 - Corte exterior 1. Espacio abierto
- 2 - Corte exterior 2. Espacio abierto
- 3 - Punta del espacio abierto
- 4 - Corte interno
- 5 - Espacio para aceite
- 6 - Corte secundario (faceta circular)
- 7 - Afilado posterior (bolsa de aceite)
- 8 - Diámetro posterior
- 9 - Barras de soporte (forma periférica)
- 10 - Corte en punta
- 11 - Corte transversal

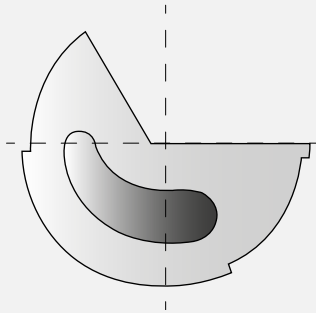
### Características – E 800



- hasta Ø nominal 23,99 mm 4 patines guía
- desde Ø nominal 24,00 mm 5 patines guía



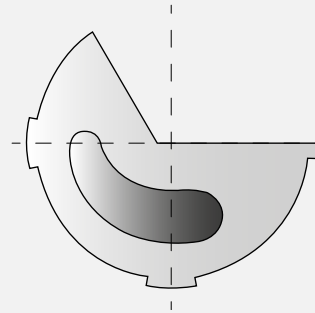
## Formas de circunferencia estándar



### Forma de circunferencia G

Formas de circunferencia estándar. Adecuado para la mayoría de los materiales y tareas de taladrado. El diámetro de la herramienta no puede medirse después de la fabricación con esta forma.

- adecuado para casi todas las tareas de taladrado
- para todos los materiales
- poco desvío de taladro
- baja tendencia a atascarse
- tolerancia de taladrado reducida



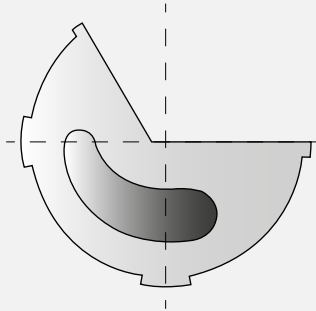
### Forma de circunferencia C

Esta forma periférica se utiliza preferentemente para tolerancias de diámetro y superficies reducidas.

- para todos los materiales
- acero, acero inoxidable, aluminio
- poco desvío de taladro
- baja tendencia a atascarse



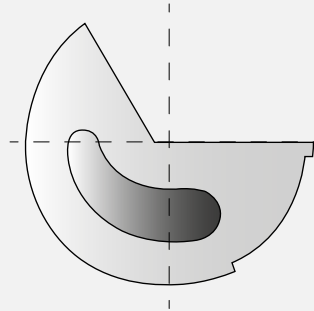
## Formas de circunferencia especiales



### Forma de circunferencia A

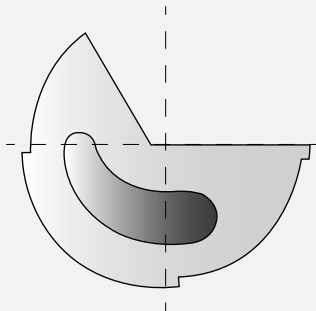
Forma periférica para condiciones de taladrado desfavorables para punteados o taladros cruzados. Mecanizado de materiales blandos y/o rendimiento de lubricación pobre del lubricante refrigerante. Se utiliza para tolerancias de diámetro reducidas, así como para piezas de guía para cabezas de corte demasiado largas.

- aluminio
- cobre



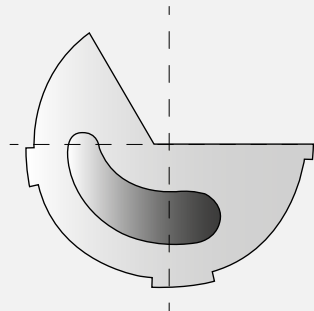
### Forma de circunferencia D

Esta forma periférica se utiliza casi exclusivamente para materiales blandos como hierro gris, grafito, etc., especialmente en relación con tolerancias de diámetro reducido.



### Forma de circunferencia E

Adecuado para todos los materiales, pero para tolerancias de diámetro superior.



### Forma de circunferencia F

Forma periférica para materiales más blandos, menor fricción y guía estable, como, por ejemplo, el aluminio.

Esta es solo una pequeña selección de nuestras formas periféricas especiales. Disponemos de otras formas periféricas especiales para su aplicación bajo petición.



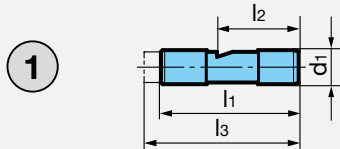
## Brocas cañón clásicas de taladrado profundo

El programa de mangos aquí presentado lo tenemos en existencias pero solamente representa una cantidad de mangos a elegir. También fabricamos mangos de máxima precisión según plano de nuestros clientes.

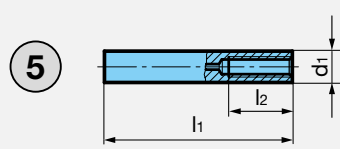
¡Atención! En el caso de E100 los mangos deben tener el refuerzo de ajuste. Información sobre demanda.

### Casquillos de sujeción para E 80

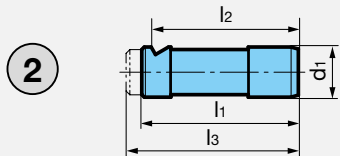
#### Casquillos para máquinas de taladros prof.



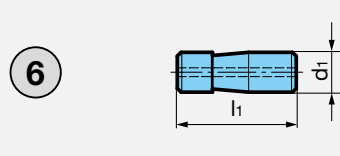
Cód. n°	d <sub>1</sub>	l <sub>1</sub>	l <sub>2</sub>	l <sub>3</sub>
1.1	10	40	24	-
1.2	10	40	24	45
1.3	10	40	24	55
1.4	16	45	31,2	-
1.5	25	70	34	-
1.6	25	70	34	78



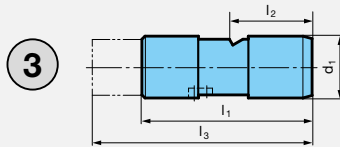
Cód. n°	d <sub>1</sub>	l <sub>1</sub>	l <sub>2</sub>
5.1	10	60	20
5.2	16	80	28
5.3	25	100	50
5.4	10	100	20
5.5	10	110	24



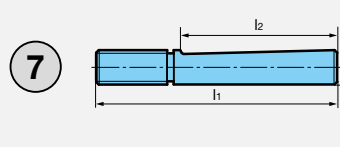
Cód. n°	d <sub>1</sub>	l <sub>1</sub>	l <sub>2</sub>	l <sub>3</sub>
2.1	16	50	47	-
2.2	16	50	47	55
2.3	16	50	47	70



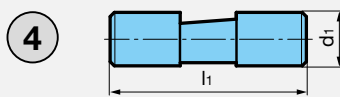
Cód. n°	d <sub>1</sub>	l <sub>1</sub>
6.1	12,7	38
6.2	19,05	70
6.3	38,1	70



Cód. n°	d <sub>1</sub>	l <sub>1</sub>	l <sub>2</sub>	l <sub>3</sub>
3.1	25	70	34	-
3.2	25	70	34	100
3.3	25	70	34	105



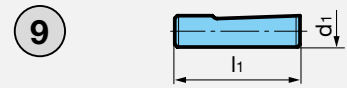
Cód. n°	d <sub>1</sub>	l <sub>1</sub>	l <sub>2</sub>
7.1	16	112	73
7.2	20	126	82



Cód. n°	d <sub>1</sub>	l <sub>1</sub>
4.1	19,05	70
4.2	12,7	70
4.3	25,4	70
4.4	31,75	70
4.5	38,1	70

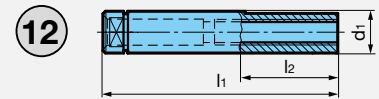
#### Casquillos según DIN 1835

Forma HE



Cód. n°	d <sub>1</sub>	l <sub>1</sub>
9.1	8	36
9.2	10	40
9.3	12	45
9.4	16	48
9.5	20	50
9.6	25	56
9.7	32	60
9.8	31,75	70
9.9	38,1	70
9.10	40	70

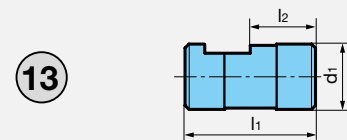
#### Casquillos según proyecto VDI



Cód. n°	d <sub>1</sub>	l <sub>1</sub>	l <sub>2</sub>
12.1	10	68	40
12.2	16	90	40
12.3	25	112	50

también aplicable en máquinas de taladrado profundo

#### Casquillos según Speed-Bit-System



Cód. n°	d <sub>1</sub>	l <sub>1</sub>	l <sub>2</sub>
13.1	16	40	14
13.2	25	50	25
13.3	35	60	20

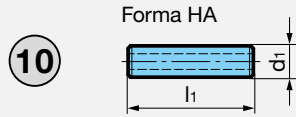
también aplicable en máquinas de taladrado profundo



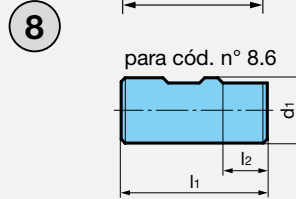
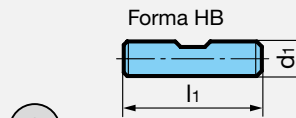
## Brocas cañón clásicas de taladrado profundo

### Casquillos de sujeción para E 80

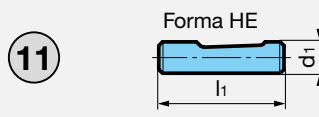
#### Casquillos según DIN 6535



Cód. nº	d <sub>1</sub>	l <sub>1</sub>
10.1	8	36
10.2	10	40
10.3	12	45
10.4	16	48
10.5	20	50
10.6	25	56
10.7	32	60
10.8	25	70
10.9	40	70

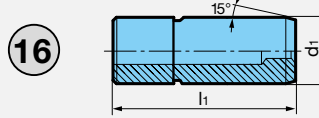


Cód. nº	d <sub>1</sub>	l <sub>1</sub>	l <sub>2</sub>
8.1	8	36	-
8.2	10	40	-
8.3	12	45	-
8.4	16	48	-
8.5	20	50	-
8.6	25	56	17
8.7	32	60	19
8.8	40	70	19
8.9	50	80	23
8.10	63	90	23



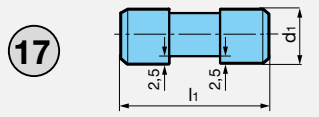
Cód. nº	d <sub>1</sub>	l <sub>1</sub>
11.1	8	36
11.2	10	40
11.3	12	45
11.4	16	48
11.5	20	50
11.6	25,4	70
11.7	25	56
11.8	32	60
11.9	40	70

sim. forma HA (inducible)



Cód. nº	d <sub>1</sub>	l <sub>1</sub>
16.1	10	50
16.2	16	64
16.3	20	70
16.4	25	81
16.5	32	92

sim. forma HE

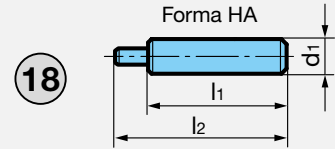


Cód. nº	d <sub>1</sub>	l <sub>1</sub>
17.1	19,05	70
17.2	25,4	70
17.3	31,75	70
17.4	38,1	70

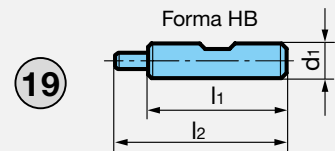
también aplicable en máquinas de taladrado profundo

### Casquillos de sujeción para E 100

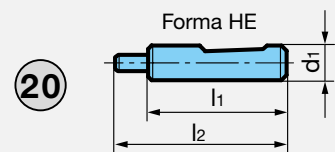
#### Casquillos con postizo para enderezado según DIN 6535



Cód. nº	d <sub>1</sub>	l <sub>1</sub>	l <sub>2</sub>
4	4	28	40
6	6	36	51
10	10	40	55
12	12	45	60
16	16	48	63



Cód. nº	d <sub>1</sub>	l <sub>1</sub>	l <sub>2</sub>
4	4	28	40
6	6	36	51
10	10	40	55
12	12	45	60
16	16	48	63



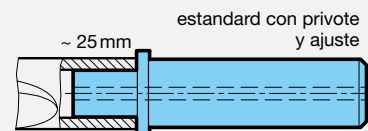
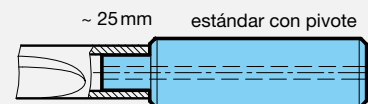
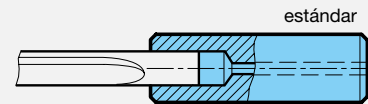
Cód. nº	d <sub>1</sub>	l <sub>1</sub>	l <sub>2</sub>
4	4	28	40
6	6	36	51
10	10	40	55
12	12	45	60
16	16	48	63

### Variantes de fabricación en los mangos de las brocas de taladrado prof. con mango redondos de tubo

Proceder para Ø nominal < Ø mango (la diferencia debe ser aprox. 6 mm): El mango redondo está en el portabrocas.

Proceder para Ø nominal ≠ mango nominal (max. hasta): El mango redondo está sobre el muñón

Proceder para Ø nominal > Ø mango: El mango redondo está sobre el pivote cuyo Ø nominal es > Ø mango y ajusta perfectamente.





## Reafilado y ensamblaje de piezas

Incluso las herramientas modernas de alto rendimiento se desgastan debido a las enormes cargas que tienen que soportar en determinados momentos. Hartner restaura el rendimiento de las herramientas mediante el reafilado profesional.

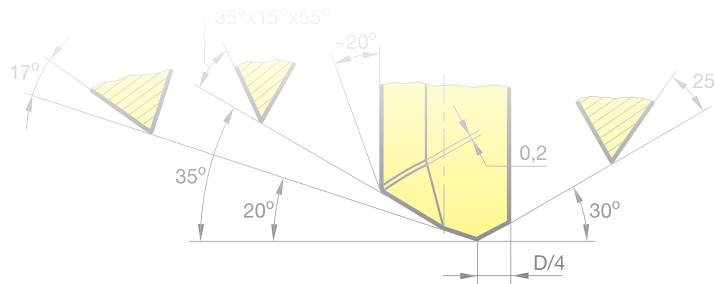
Al utilizar la misma maquinaria en todos los centros de reafilado, se garantiza un estándar de calidad uniforme.

Brocas en MDI o brocas con cabeza soldada pueden reafilarse hasta 10 veces en función de la longitud de la cabeza y la anchura de la marca de desgaste.

Deben tenerse en cuenta los siguientes puntos:

- La herramienta debe reafilarse de forma limpia durante el reafilado, es decir, libre de cualquier marca de desgaste.
- Después del reafilado, la herramienta brilla por la cara lisa.
- Es posible aplicar un recubrimiento a las hts. por un suplemento.
- Puede aplicarse un recubrimiento a las brocas cañón con cabeza soldada en caso de desgaste o daño extremo.
- Debe comprobarse la concentricidad de las brocas cañón con postizo para enderezado tras su reafilado y enderezarse en caso necesario.
- Valores estándar de longitud mínima de la cabeza al reafilarse para garantizar los requisitos de calidad del taladro:



Campo de dia.	min. longitud cabeza
Ø0,900 - Ø1,999	5 - 7 mm
Ø2,000 - Ø3,999	8 - 10 mm
Ø4,000 - Ø16,999	10 - 14 mm
Ø17,000 - Ø25,999	14 - 16 mm
Ø26,000 - Ø40,000	16 - 18 mm



	- 25°	+ 30°	0°	
	+ 20°	+ 17°	0°	D/4
	+ 35°	+ 15°	+ 55°	


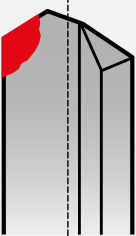
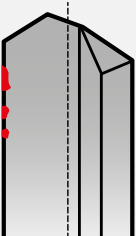


## Notas de aplicaciones/solucionador de problemas

Error	Causas	Soluciones
<b>1. Rotura de la herramienta al pretaladrar</b>  	<b>Útil</b> <ul style="list-style-type: none"> <li>- Corte desafilado</li> <li>- Afilado incorrecto</li> <li>- Avance excesivo</li> <li>- Puntear en marcha rápida</li> <li>- Herramienta previamente dañadas (roturas, etc.)</li> <li>- Relación de longitud y diámetro demasiado elevada (LxD)</li> </ul>	<ul style="list-style-type: none"> <li>- Reafilar</li> <li>- Corregir afilado</li> <li>- Reducir la velocidad de avance</li> <li>- Seleccionar la velocidad de avance para puntear</li> <li>- Reafilar la nueva herramienta si procede</li> <li>- Usar/apoyar varias herramientas</li> </ul>
	<b>Taladro piloto</b> <ul style="list-style-type: none"> <li>- Diámetro demasiado pequeño</li> <li>- Diámetro demasiado grande</li> <li>- Baja calidad del taladro (herramienta desgastada)</li> <li>- Roscado defectuoso</li> </ul>	<ul style="list-style-type: none"> <li>- Otra herramienta (mayor Ø)</li> <li>- Otra herramienta (menor Ø)</li> <li>- Usar la nueva herramienta</li> <li>- Corregir programa</li> </ul>
	<b>Casquillo</b> <ul style="list-style-type: none"> <li>- Desgastado</li> <li>- Estallado</li> <li>- La presión de contacto es demasiado débil / aumenta durante el punteado y las virutas se atascan</li> <li>- La hendidura entre el casquillo y la pieza de trabajo / las virutas se acumulan, atasco por acumulación de virutas</li> </ul>	<ul style="list-style-type: none"> <li>- Nuevo casquillo</li> <li>- Nuevo casquillo</li> <li>- Aumentar la presión de contacto</li> <li>- Posición correcta del casquillo</li> </ul>
	<b>Pieza</b> <ul style="list-style-type: none"> <li>- Fijación inadecuada</li> </ul>	<ul style="list-style-type: none"> <li>- Fijación correcta de la pieza de trabajo</li> </ul>
	<b>KSS</b> <ul style="list-style-type: none"> <li>- Presión del lubricante refrigerante demasiado baja, atasco por acumulación de virutas</li> <li>- Medio demasiado contaminado --&gt; Obstrucción</li> </ul>	<ul style="list-style-type: none"> <li>- Aumentar la presión de lubricante refrigerante</li> <li>- Supervisar la filtración</li> </ul>
<b>2. La herramienta se rompe por el mango (casquillo de tensión)</b>  	<b>Útil</b> <ul style="list-style-type: none"> <li>- Relación de longitud y diámetro demasiado elevada (LxD)</li> </ul>	<ul style="list-style-type: none"> <li>- Usar/apoyar varias herramientas</li> </ul>
	<b>Pieza</b> <ul style="list-style-type: none"> <li>- Posición del taladro incorrecta</li> </ul>	<ul style="list-style-type: none"> <li>- Comprobar la sujeción de la pieza de trabajo</li> </ul>
	<b>Máquina</b> <ul style="list-style-type: none"> <li>- Desalineación de la máquina y la pieza de trabajo</li> <li>- Distancia de taladrado demasiado profunda (error de programación)</li> </ul>	<ul style="list-style-type: none"> <li>- Comprobar la desalineación y corregirla si procede</li> <li>- Supervisar la programación</li> </ul>



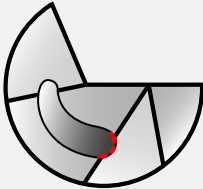
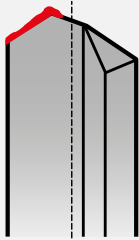
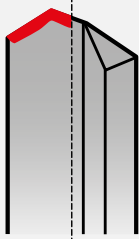
## Notas de aplicaciones/solucionador de problemas

Error	Causas	Soluciones	
<b>3. Tubo doblado/retorcido</b> 	<ul style="list-style-type: none"> <li>Útil</li> <li>KSS</li> </ul>	<ul style="list-style-type: none"> <li>- Relación de longitud y diámetro demasiado elevada (LxD)</li> <li>- Fuerzas de corte demasiado elevadas (espec. par de torsión)</li> <li>- Presión del lubricante refrigerante escasa, atasco por acumulación de virutas</li> </ul>	<ul style="list-style-type: none"> <li>- Usar/apoyar varias herramientas</li> <li>- Reducir datos de corte</li> <li>- Aumentar la presión del lubricante refrigerante</li> </ul>
<b>4. La herramienta se rompe/desplaza</b> 	<ul style="list-style-type: none"> <li>Útil</li> <li>Taladro piloto</li> <li>Casquillo</li> <li>Pieza</li> </ul>	<ul style="list-style-type: none"> <li>- Se sobrecalienta durante el afilado</li> <li>- Canto de corte del filo secundario (Faceta circular) demasiado desafilado</li> <li>- La herramienta no está firmemente sujeta, vibración axial</li> <li>- La herramienta se atasca, se desplaza en el retroceso</li> <li>- Duración máxima del recorrido superada</li> <li>- Rendimiento de corte demasiado elevado</li> <li>- Corte interrumpido</li> <li>- Error de concentricidad demasiado grande</li> <li>- Diámetro demasiado grande (recorrido demasiado grande)</li> <li>- Diámetro demasiado grande (recorrido demasiado grande)</li> <li>- Fijación inadecuada</li> </ul>	<ul style="list-style-type: none"> <li>- Corregir los parámetros durante el afilado</li> <li>- Comprobar el redondeo de los filos secundarios</li> <li>- Optimizar la fijación de la herramienta</li> <li>- Cambiar la geometría de corte o la forma periférica</li> <li>- Acortar los intervalos de cambio de herramientas</li> <li>- Deshacer datos de corte</li> <li>- Reducir valores de avance</li> <li>- Supervisar la concentricidad / corregirla si procede</li> <li>- Otra herramienta (Ø menor)</li> <li>- Otro casquillo (Ø menor)</li> <li>- Fijación correcta de la pieza de trabajo</li> </ul>
<b>5. Roturas en la faceta circular</b> 	<ul style="list-style-type: none"> <li>Útil</li> <li>Taladro piloto</li> <li>Casquillo</li> <li>Pieza</li> <li>KSS</li> </ul>	<ul style="list-style-type: none"> <li>- Corte interrumpido</li> <li>- Diámetro demasiado grande (recorrido demasiado grande)</li> <li>- Diámetro demasiado grande (recorrido demasiado grande)</li> <li>- La hendidura entre el casquillo y la pieza de trabajo es demasiado amplia</li> <li>- Condiciones inestables / sujeción insuficiente de la pieza de trabajo</li> <li>- Taladros transversales no obstruidos (pérdida de lubricante refrigerante)</li> <li>- Lubricante refrigerante inadecuado para el material abrasivo</li> </ul>	<ul style="list-style-type: none"> <li>- Reducir valores de avance</li> <li>- Otra herramienta (Ø menor)</li> <li>- Otro casquillo (Ø menor)</li> <li>- Reducir la hendidura (el casquillo debería encajar perfectamente)</li> <li>- Fijación correcta de la pieza de trabajo</li> <li>- Obstruir las perforaciones transversales (tapón de obstrucción Hartner)</li> <li>- Seleccionar el lubricante refrigerante adecuado, aumentar el contenido de aceite de la emulsión / utilizar el aceite</li> </ul>



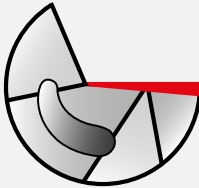
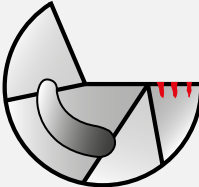
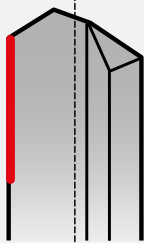


## Notas de aplicaciones/solucionador de problemas

Error	Causas	Soluciones	
<b>6. Roturas en el canal de refrigeración</b>  	<p>Útil</p>	<ul style="list-style-type: none"> <li>- Ángulo de incisión demasiado pequeño</li> <li>- Ángulo de la cámara de aceite escaso (flujo de aceite escaso)</li> <li>- Acumulación de material en la parte delantera</li> </ul>	<ul style="list-style-type: none"> <li>- Aumentar el ángulo de incidencia</li> <li>- Aumentar / ajustar el ángulo de la cámara de aceite</li> <li>- Recubrimiento de la herramienta si procede</li> </ul>
	<p>KSS</p>	<ul style="list-style-type: none"> <li>- Lubricante refrigerante inadecuado, aceite inapropiado (viscosidad) o emulsión pobre (acumulación de material)</li> <li>- Lubricante refrigerante impuro debido a pequeñas virutas u otra contaminación</li> </ul>	<ul style="list-style-type: none"> <li>- Seleccionar el lubricante refrigerante adecuado, aumentar el contenido de aceite de la emulsión / utilizar el aceite</li> <li>- Comprobar el filtrado del lubricante refrigerante, mejorar / refinar si procede</li> </ul>
<b>7. Soldaduras en los cortes</b>  	<p>Útil</p>	<ul style="list-style-type: none"> <li>- Velocidad de corte demasiado baja</li> <li>- Corte demasiado redondo</li> <li>- Filo blanco</li> <li>- Material de corte inadecuado</li> <li>- Recubrimiento inadecuado</li> </ul>	<ul style="list-style-type: none"> <li>- Aumentar la velocidad de corte</li> <li>- Reducir el redondeo del corte</li> <li>- Permitir el recubrimiento de la herramienta, si procede</li> <li>- Material de corte adecuado</li> <li>- Seleccionar otro recubrimiento</li> </ul>
	<p>KSS</p>	<ul style="list-style-type: none"> <li>- Lubricante refrigerante inadecuado, aceite inapropiado (viscosidad) o emulsión pobre</li> </ul>	<ul style="list-style-type: none"> <li>- Seleccionar el lubricante refrigerante adecuado, aumentar el contenido de aceite de la emulsión / utilizar el aceite</li> </ul>
<b>8. Fuerte desgaste en cráter</b>  	<p>Útil</p>	<ul style="list-style-type: none"> <li>- Velocidad de corte demasiado elevada</li> <li>- Forma de viruta inadecuada</li> <li>- Material de corte inadecuado</li> </ul>	<ul style="list-style-type: none"> <li>- Reducir la velocidad de corte</li> <li>- Adaptar el afilado</li> <li>- Seleccionar el material de corte adecuado con recubrimiento si procede</li> </ul>
	<p>KSS</p>	<ul style="list-style-type: none"> <li>- Lubricante refrigerante inadecuado, aceite inapropiado (viscosidad) o emulsión pobre</li> <li>- Presión/flujo del lubricante refrigerante demasiado bajo</li> </ul>	<ul style="list-style-type: none"> <li>- Seleccionar el lubricante refrigerante adecuado, aumentar el contenido de aceite de la emulsión / utilizar el aceite</li> <li>- Aumentar la presión/flujo del lubricante refrigerante</li> </ul>

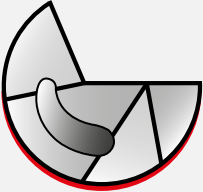
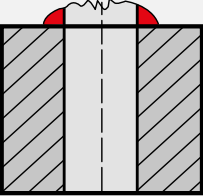
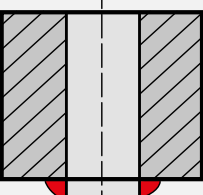


## Notas de aplicaciones/solucionador de problemas

Error	Causas	Soluciones	
<b>9. Desgaste en el plano de incidencia</b>  	<p>Útil</p> <p>KSS</p>	<ul style="list-style-type: none"> <li>- Velocidad de corte demasiado elevada</li> <li>- La viruta frena con demasiada potencia contra la superficie de fijación</li> <li>- Avance demasiado bajo</li> <li>- Ángulo de incisión demasiado pequeño</li> </ul> <ul style="list-style-type: none"> <li>- Lubricante refrigerante inadecuado, aceite inapropiado (viscosidad) o emulsión pobre</li> </ul>	<ul style="list-style-type: none"> <li>- Reducir la velocidad de corte</li> <li>- Retirar el recubrimiento de la superficie de fijación</li> <li>- Aumentar la velocidad de avance</li> <li>- Aumentar el ángulo de incisión</li> </ul> <ul style="list-style-type: none"> <li>- Seleccionar el lubricante refrigerante adecuado, aumentar el contenido de aceite de la emulsión / utilizar el aceite</li> </ul>
<b>10. Desgaste/astillamiento del filo</b>  	<p>Útil</p> <p>KSS</p>	<ul style="list-style-type: none"> <li>- Fuerzas de corte excesivas</li> <li>- Corte interrumpido</li> <li>- Metal duro seleccionado inadecuado</li> <li>- Temperaturas de mecanizado demasiado elevadas</li> </ul> <ul style="list-style-type: none"> <li>- Lubricante refrigerante inadecuado, aceite inapropiado (viscosidad) o emulsión pobre (temperaturas demasiado elevadas debido a una lubricación insuficiente)</li> </ul>	<ul style="list-style-type: none"> <li>- Reducir datos de corte</li> <li>- Reducir la velocidad de avance</li> <li>- Seleccionar otro metal duro</li> <li>- Reducir los datos de corte / cambiar la geometría de afilado (ángulo de la cámara de aceite)</li> </ul> <ul style="list-style-type: none"> <li>- Seleccionar el lubricante refrigerante adecuado, aumentar el contenido de aceite de la emulsión / utilizar el aceite</li> </ul>
<b>11. Desgaste de la fase circular</b>  	<p>Útil</p> <p>Pieza</p> <p>KSS</p>	<ul style="list-style-type: none"> <li>- Error de concentricidad demasiado grande</li> <li>- Conicidad demasiado pequeña</li> <li>- Corte demasiado redondo</li> <li>- Afilado de la cámara de aceite inadecuado (flujo insuficiente)</li> </ul> <ul style="list-style-type: none"> <li>- Condiciones inestables / sujeción insuficiente de la pieza de trabajo</li> </ul> <ul style="list-style-type: none"> <li>- Lubricante refrigerante inadecuado, aceite inapropiado (viscosidad) o emulsión pobre</li> </ul>	<ul style="list-style-type: none"> <li>- Supervisar la concentricidad / corregirla si procede</li> <li>- Aumentar la conicidad</li> <li>- Reducir la retirada / redondeo del corte</li> <li>- Adaptar el afilado de la cámara de aceite (ángulo / retirada / ranura / 2.ª superficie)</li> </ul> <ul style="list-style-type: none"> <li>- Fijación correcta de la pieza de trabajo</li> </ul> <ul style="list-style-type: none"> <li>- Seleccionar el lubricante refrigerante adecuado, aumentar el contenido de aceite de la emulsión / utilizar el aceite</li> </ul>

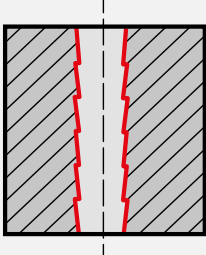
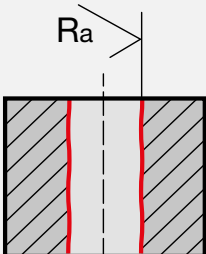
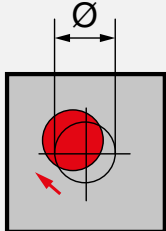


## Notas de aplicaciones/solucionador de problemas

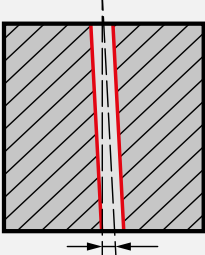
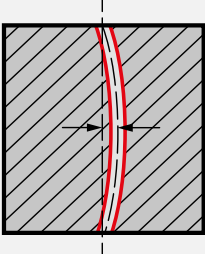
Error	Causas	Soluciones	
<b>12. Desgaste de la forma periférica</b> 	<ul style="list-style-type: none"> <li>■ Útil</li> <li>■ Pieza</li> <li>■ KSS</li> </ul>	<ul style="list-style-type: none"> <li>■ - Error de concentricidad demasiado grande</li> <li>■ - Corte interrumpido</li> <li>■ - Metal duro inadecuado seleccionado</li> <li>■ - Conicidad demasiado pequeña</li> <li>■ - Recubrimiento inadecuado seleccionado</li> <li>■ - Condiciones inestables / sujeción insuficiente de la pieza de trabajo</li> <li>■ - Lubricante refrigerante inadecuado para el material abrasivo</li> </ul>	<ul style="list-style-type: none"> <li>■ - Supervisar la concentricidad / corregirla si procede</li> <li>■ - Reducir valores de avance</li> <li>■ - Corregir la selección del metal duro</li> <li>■ - Aumentar la conicidad</li> <li>■ - Corregir la selección del recubrimiento</li> <li>■ - Fijación correcta de la pieza de trabajo</li> <li>■ - Seleccionar el lubricante refrigerante adecuado, aumentar el contenido de aceite de la emulsión / utilizar el aceite</li> </ul>
<b>13. Fuerte rebaba</b> 	<ul style="list-style-type: none"> <li>■ Útil</li> <li>■ Taladro piloto</li> <li>■ Casquillo</li> </ul>	<ul style="list-style-type: none"> <li>■ - Velocidad de avance excesiva al perforar</li> <li>■ - Duración máxima del recorrido superada (herramienta desafilada)</li> <li>■ - Corte demasiado redondo</li> <li>■ - Ángulo de incisión demasiado pequeño</li> <li>■ - Diámetro demasiado grande (recorrido demasiado grande)</li> <li>■ - Diámetro demasiado grande (recorrido demasiado grande)</li> </ul>	<ul style="list-style-type: none"> <li>■ - Reducir la velocidad de avance durante el taladrado</li> <li>■ - Acortar los intervalos de cambio de herramientas</li> <li>■ - Reducir la retirada/redondeo del corte</li> <li>■ - Aumentar el ángulo de incisión</li> <li>■ - Otra herramienta (menor Ø)</li> <li>■ - Otro casquillo (menor Ø)</li> </ul>
<b>14. Fuerte rebaba de escariado</b> 	<ul style="list-style-type: none"> <li>■ Útil</li> </ul>	<ul style="list-style-type: none"> <li>■ - Velocidad de avance excesiva al escariar</li> <li>■ - Duración máxima del recorrido superada (herramienta desafilada)</li> <li>■ - Corte demasiado redondo</li> </ul>	<ul style="list-style-type: none"> <li>■ - Reducir el avance durante el escariado</li> <li>■ - Acortar los intervalos de cambio de herramientas</li> <li>■ - Reducir la retirada/redondeo del corte</li> </ul>



## Notas de aplicaciones/solucionador de problemas

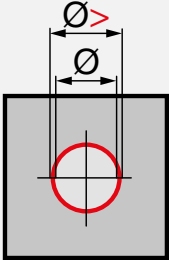
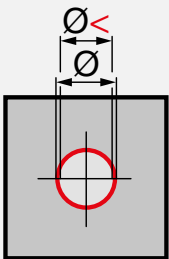

Error	Causas	Soluciones
<b>15. Herramienta con taladrado por niveles</b> 	<ul style="list-style-type: none"> <li>Útil</li> <li>Taladro piloto</li> <li>KSS</li> </ul>	<ul style="list-style-type: none"> <li>- La cabeza de taladrado no se alinea con el tubo de taladrado (E 80/E 800)</li> <li>- Coaxialidad cabeza-vástago demasiado grande</li> <li>- Desalineación demasiado grande entre la montura del eje y los casquillos o el taladro piloto</li> <li>- Presión del lubricante refrigerante demasiado elevada</li> </ul>
		<ul style="list-style-type: none"> <li>- Volver a soldar la cabeza / nueva herramienta</li> <li>- Comprobar la coaxialidad / utilizar la nueva herramienta</li> <li>- Corregir la desalineación del eje. La desalineación óptima es de 0,02 mm</li> <li>- Reducir la presión del lubricante refrigerante</li> </ul>
<b>16. Superficie escasa</b> 	<ul style="list-style-type: none"> <li>Útil</li> <li>Pieza</li> <li>KSS</li> </ul>	<ul style="list-style-type: none"> <li>- Ángulo de corte roto</li> <li>- Faceta del filo secundario (Faceta circular) demasiado ancho</li> <li>- Fase circular del perímetro poco marcada</li> <li>- Escasa presión en el patín de guía trasero</li> <li>- Error de concentricidad demasiado grande</li> <li>- Recubrimiento inadecuado seleccionado</li> <li>- Condiciones inestables / sujeción insuficiente de la pieza de trabajo</li> <li>- Tipo de lubricante refrigerante / emulsión insuficiente</li> <li>- Cantidad de refrigerante insuficiente</li> </ul>
		<ul style="list-style-type: none"> <li>- Reafilar la herramienta</li> <li>- Corregir el diseño de la herramienta</li> <li>- Mejorar la fase circular del perímetro</li> <li>- Aumentar la presión mediante la geometría de afilado o de la fase de entrada / radio de las esquinas</li> <li>- Comprobar/corregir la concentricidad</li> <li>- Corregir la selección del recubrimiento</li> <li>- Fijación correcta de la pieza de trabajo</li> <li>- Usar aceite si es posible</li> <li>- Aumentar la cantidad de lubricante refrigerante (volumen/presión)</li> </ul>
<b>17. Desvío de centro</b> 	<ul style="list-style-type: none"> <li>Útil</li> <li>Taladro piloto</li> <li>Casquillo</li> <li>Pieza</li> <li>Máquina</li> </ul>	<ul style="list-style-type: none"> <li>- Error de concentricidad demasiado grande</li> <li>- Puntear en un campo inclinado</li> <li>- Diseño de la herramienta inadecuado</li> <li>- Puntear en un campo inclinado</li> <li>- Casquillo desgastado (<math>\emptyset</math> interior demasiado grande)</li> <li>- Condiciones inestables / sujeción insuficiente de la pieza de trabajo</li> <li>- Desalineación demasiado grande entre la montura del eje y los casquillos / el taladro piloto</li> </ul>
		<ul style="list-style-type: none"> <li>- Supervisar la concentricidad / corregirla si procede</li> <li>- Fijar la broca piloto con la fresa</li> <li>- Optimizar LxD / comprobar el diámetro de la herramienta</li> <li>- Usar un casquillo adaptado</li> <li>- Usar un nuevo casquillo</li> <li>- Fijación correcta de la pieza de trabajo</li> <li>- Corregir la desalineación del eje. La desalineación óptima es de 0,02 mm</li> </ul>

## Notas de aplicaciones/solucionador de problemas

Error	Causas	Soluciones
<b>18. Desvío de taladro grande</b>  	<b>Útil</b> <ul style="list-style-type: none"> <li>- Corte desafilado</li> <li>- Afilado incorrecto</li> <li>- Forma periférica incorrecta</li> <li>- Avance excesivo</li> <li>- Guía muy escasa</li> <li>- Error de concentricidad demasiado grande</li> </ul>	<ul style="list-style-type: none"> <li>- Reafilar</li> <li>- Corregir afilado</li> <li>- Corregir la forma periférica</li> <li>- Reducir la velocidad de avance</li> <li>- Usar una cabeza larga</li> <li>- Supervisar la concentricidad / corregirla si procede</li> </ul>
	<b>Taladro piloto</b> <ul style="list-style-type: none"> <li>- El taladro piloto se desvía</li> <li>- Taladro piloto irregular</li> </ul>	<ul style="list-style-type: none"> <li>- Comprobar el taladro piloto y otras herramientas si procede</li> <li>- Adaptar la herramienta piloto</li> </ul>
	<b>Casquillo</b> <ul style="list-style-type: none"> <li>- Casquillo inadecuado / casquillo con respecto a la montura del casquillo incorrecto</li> </ul>	<ul style="list-style-type: none"> <li>- Cambiar el casquillo y la montura del casquillo si procede</li> </ul>
	<b>Pieza</b> <ul style="list-style-type: none"> <li>- Condiciones inestables / sujeción insuficiente de la pieza de trabajo</li> <li>- Posición de taladrado desfavorable / paredes muy escasas</li> <li>- Pieza sobrecalentada (fuerte aumento de la temperatura)</li> </ul>	<ul style="list-style-type: none"> <li>- Fijación correcta de la pieza de trabajo</li> <li>- Valorar la posición de taladrado / cambiarla si procede</li> <li>- Reducir datos de corte</li> </ul>
	<b>Máquina</b> <ul style="list-style-type: none"> <li>- Desalineación demasiado grande entre la montura del eje y los casquillos / el taladro piloto</li> </ul>	<ul style="list-style-type: none"> <li>- Corregir la desalineación del eje. La desalineación óptima es de 0,02 mm</li> </ul>
<b>19. Rectitud del taladro inadecuada</b>  	<b>Útil</b> <ul style="list-style-type: none"> <li>- Corte desafilado</li> <li>- Afilado incorrecto</li> <li>- Forma periférica incorrecta</li> <li>- Avance excesivo</li> <li>- Guía muy escasa</li> <li>- Error de concentricidad demasiado grande</li> <li>- Recubrimiento inadecuado seleccionado</li> <li>- Relación de longitud y diámetro demasiado elevada (LxD)</li> </ul>	<ul style="list-style-type: none"> <li>- Reafilar</li> <li>- Corregir afilado</li> <li>- Corregir la forma periférica</li> <li>- Reducir la velocidad de avance</li> <li>- Usar una cabeza larga</li> <li>- Supervisar la concentricidad / corregirla si procede</li> <li>- Corregir la selección del recubrimiento</li> <li>- Usar/apoyar varias herramientas</li> </ul>
	<b>Pieza</b> <ul style="list-style-type: none"> <li>- Condiciones inestables / sujeción insuficiente de la pieza de trabajo</li> <li>- Posición de taladrado desfavorable / paredes muy escasas</li> <li>- Pieza sobrecalentada (fuerte aumento de la temperatura)</li> </ul>	<ul style="list-style-type: none"> <li>- Fijación correcta de la pieza de trabajo</li> <li>- Valorar la posición de taladrado / cambiarla si procede</li> <li>- Reducir datos de corte</li> </ul>
	<b>Máquina</b> <ul style="list-style-type: none"> <li>- Pieza de trabajo sin marcha opuesta</li> <li>- Desalineación demasiado grande entre la montura del eje y los casquillos / el taladro piloto es demasiado grande</li> </ul>	<ul style="list-style-type: none"> <li>- si es posible a nivel mecánico, con taladrado contramarcha</li> <li>- Corregir la desalineación del eje. La desalineación óptima es de 0,02 mm</li> </ul>

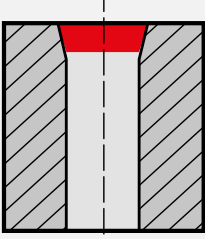
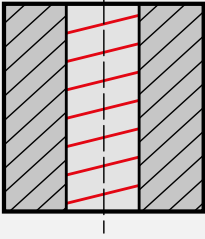
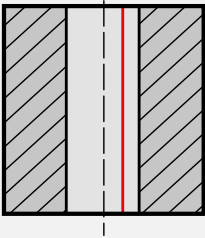


## Notas de aplicaciones/solucionador de problemas

Error	Causas	Soluciones	
<p><b>20. Taladrado demasiado grande</b></p> 	<p>Útil</p> <p>KSS</p>	<ul style="list-style-type: none"> <li>- Demasiada presión en el corte lateral</li> <li>- Error de concentricidad demasiado grande</li> <li>- Presión del lubricante refrigerante demasiado elevada</li> </ul>	<ul style="list-style-type: none"> <li>- Cambiar la geometría de afilado / eliminar la presión en el filo secundario (cambiar de D/4 a D/3)</li> <li>- Supervisar la concentricidad / corregirla si procede</li> <li>- Reducir la presión del lubricante refrigerante</li> </ul>
<p><b>21. Perforación demasiado estrecha</b></p> 	<p>Útil</p>	<ul style="list-style-type: none"> <li>- Muy poca presión en el corte secundario</li> <li>- Forma periférica incorrecta</li> <li>- La herramienta se afila demasiado (a menudo) (rejuvenecimiento)</li> </ul>	<ul style="list-style-type: none"> <li>- Cambiar la geometría de afilado / aumentar la presión en el filo secundario (cambiar de D/3 a D/4)</li> <li>- Corregir la forma periférica (forma en «C»)</li> <li>- Usar la nueva herramienta</li> </ul>
<p><b>22. Acumulación de virutas/ herramienta obstruida</b></p> 	<p>Útil</p> <p>KSS</p>	<ul style="list-style-type: none"> <li>- La relación entre la velocidad de corte y la de avance no coincide</li> <li>- Geometría de afilado inadecuada</li> <li>- Virutas de fluido</li> <li>- Virutas de fluido con herramienta con recubrimiento</li> <li>- Afilado de la cámara de aceite inadecuado (flujo insuficiente)</li> <li>- Fuga en la fijación de la herramienta (pérdida de lubricante refrigerante)</li> <li>- Cantidad de refrigerante insuficiente</li> </ul>	<ul style="list-style-type: none"> <li>- Corregir/ajustar la relación entre la velocidad de corte y la de avance</li> <li>- Ajustar la geometría de afilado para favorecer la rotura de las virutas</li> <li>- Programar la velocidad de avance escalonado si procede</li> <li>- Retirar el recubrimiento de la superficie de fijación</li> <li>- Adaptar el afilado de la cámara de aceite (ángulo/retirada/ranura/2.ª superficie)</li> <li>- Optimizar la fijación de la herramienta</li> <li>- Aumentar la cantidad de lubricante refrigerante (volumen/presión)</li> </ul>



## Notas de aplicaciones/solucionador de problemas

Error	Causas	Soluciones	
<b>23. Gran ancho de taladrado</b> 	<ul style="list-style-type: none"> <li>■ Útil</li> <li>■ Taladro piloto</li> <li>■ Casquillo</li> <li>■ Pieza</li> </ul>	<ul style="list-style-type: none"> <li>■ - Velocidad de avance excesiva al perforar</li> <li>■ - Taladro piloto progresa / es irregular</li> <li>■ - Casquillo inadecuado / casquillo con respecto a la montura del casquillo incorrecto</li> <li>■ - Condiciones inestables / sujeción insuficiente de la pieza de trabajo, vibraciones durante la perforación</li> </ul>	<ul style="list-style-type: none"> <li>■ - Reducir la velocidad de avance durante el taladrado</li> <li>■ - Comprobar el taladro piloto y otras herramientas si procede</li> <li>■ - Cambiar el casquillo y la montura del casquillo si procede</li> <li>■ - Fijación correcta de la pieza de trabajo</li> </ul>
<b>24. Torsión del taladrado por parte de la herramienta</b> 	<ul style="list-style-type: none"> <li>■ Útil</li> <li>■ Pieza</li> </ul>	<ul style="list-style-type: none"> <li>■ - Rendimiento de corte demasiado elevado</li> <li>■ - Corte desafilado</li> <li>■ - La cabeza de taladrado no se alinea con el tubo de taladrado (E 80/E 800)</li> <li>■ - Coaxialidad cabeza-vástago demasiado grande</li> <li>■ - Forma periférica incorrecta</li> <li>■ - Condiciones inestables / sujeción insuficiente de la pieza de trabajo, vibraciones durante el taladrado</li> </ul>	<ul style="list-style-type: none"> <li>■ - Deshacer datos de corte</li> <li>■ - Reafilarse la herramienta / cambiarla si procede</li> <li>■ - Volver a soldar la cabeza / nueva herramienta</li> <li>■ - Comprobar la coaxialidad / utilizar la nueva herramienta</li> <li>■ - Corregir la forma periférica</li> <li>■ - Fijación correcta de la pieza de trabajo / instalar un amortiguador de vibración</li> </ul>
<b>25. La herramienta marca estrías de retroceso</b> 	<ul style="list-style-type: none"> <li>■ Útil</li> <li>■ Pieza</li> <li>■ Máquina</li> </ul>	<ul style="list-style-type: none"> <li>■ - Velocidad de avance demasiado elevada durante la extracción</li> <li>■ - Bordes de corte demasiado afilados</li> <li>■ - Error de concentricidad demasiado grande</li> <li>■ - Forma periférica incorrecta</li> <li>■ - Condiciones inestables / sujeción insuficiente de la pieza de trabajo</li> <li>■ - Desalineación demasiado grande entre la montura del eje y los casquillos / el taladro piloto</li> </ul>	<ul style="list-style-type: none"> <li>■ - Reducir la velocidad de avance</li> <li>■ - Redondear bordes de corte</li> <li>■ - Supervisar la concentricidad / corregirla si procede</li> <li>■ - Corregir la forma periférica</li> <li>■ - Fijación correcta de la pieza de trabajo</li> <li>■ - Corregir la desalineación del eje. La desalineación óptima es de 0,02 mm</li> </ul>

HARTNER











# HARTNER

Precision Cutting Tools

## MICROBROCAS

fabricada en metal duro y HSS-E-PM  
brillante y recubierta

Microbrocas



P	M	K	N	S	H	Norma	Tipo	Material de corte	Acabado	Dirección de corte	Forma del mango	Profundidad	d1/mm	Nº artículo	Página
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## Microbrocas sin refrigeración interior

	•	•	•	•	○	DIN 1899	N	HSS-E-PM	○	derecha	cil.	~5xD	0,050 - 1,900	<b>87011</b>	329
	•	•	•	•	○	DIN 1899	N	HSS-E-PM	○	izquierda	cil.	~5xD	0,160 - 1,450	<b>87016</b>	331
	•	•	•	•	○	DIN 1899	N	HSS-E-PM	Ⓡ	derecha	cil.	~5xD	0,200 - 1,500	<b>84810</b>	332
	•	•	•	•	○	Norma de fáb.	N	MDI	Ⓡ	derecha	cil.		0,100 - 3,000	<b>86402</b>	333
	•	•	•	•	○	Norma de fáb.	N	MDI	Ⓡ	derecha	cil.	4xD	0,500 - 3,000	<b>86400</b>	334
	•	○	•	○	○	Norma de fáb.	N	MDI	○	derecha	cil.	~5xD	0,200 - 1,300	<b>89281</b>	335
	•	•	•	•	○	Norma de fáb.	N	MDI	Ⓡ	derecha	cil.	7xD	0,500 - 3,000	<b>86401</b>	336

## Microbrocas con refrigeración interior

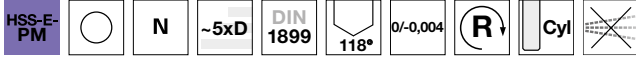
	•	•	•	○	○	Norma de fáb.	N	MDI	Ⓡ	derecha	cil.	5xD	1,400 - 3,000	<b>86405</b>	337
	•	•	•	○	○	Norma de fáb.	N	MDI	Ⓡ	derecha	cil.	8xD	1,400 - 3,000	<b>86408</b>	338
	•	•	•	○	○	Norma de fáb.	N	MDI	Ⓡ	derecha	cil.	15xD	1,400 - 3,000	<b>86412</b>	339



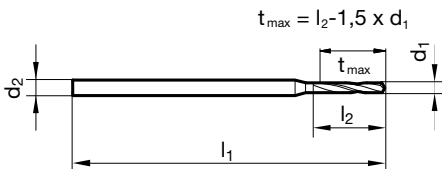
## Microbrocas sin refrigeración interior

Nº artículo 87011

P	M	K	N	S	H
•	•	•	•	○	



afilado plano • <math>\varnothing</math> 0,15 mm acero rápido al cobalto • con mango reforzado  
aceros altamente aleados



d1 mm	d2 mm	l1 mm	l2 mm	d1 mm	d2 mm	l1 mm	l2 mm
0,050	1,000	25,000	0,400	0,355	1,000	25,000	2,400
0,060	1,000	25,000	0,400	0,360	1,000	25,000	2,400
0,080	1,000	25,000	0,500	0,365	1,000	25,000	2,400
0,090	1,000	25,000	0,500	0,370	1,000	25,000	2,400
0,100	1,000	25,000	0,500	0,375	1,000	25,000	2,400
0,110	1,000	25,000	0,500	0,380	1,000	25,000	2,400
0,120	1,000	25,000	0,500	0,390	1,000	25,000	3,000
0,130	1,000	25,000	0,800	0,400	1,000	25,000	3,000
0,140	1,000	25,000	0,800	0,405	1,000	25,000	3,000
0,150	1,000	25,000	0,800	0,410	1,000	25,000	3,000
0,160	1,000	25,000	1,100	0,415	1,000	25,000	3,000
0,170	1,000	25,000	1,100	0,420	1,000	25,000	3,000
0,180	1,000	25,000	1,100	0,425	1,000	25,000	3,000
0,190	1,000	25,000	1,100	0,430	1,000	25,000	3,000
0,200	1,000	25,000	1,500	0,440	1,000	25,000	3,000
0,205	1,000	25,000	1,500	0,450	1,000	25,000	3,000
0,210	1,000	25,000	1,500	0,455	1,000	25,000	3,000
0,215	1,000	25,000	1,500	0,460	1,000	25,000	3,000
0,220	1,000	25,000	1,500	0,470	1,000	25,000	3,000
0,225	1,000	25,000	1,500	0,480	1,000	25,000	3,000
0,230	1,000	25,000	1,500	0,485	1,000	25,000	3,400
0,235	1,000	25,000	1,500	0,490	1,000	25,000	3,400
0,240	1,000	25,000	1,500	0,495	1,000	25,000	3,400
0,245	1,000	25,000	1,900	0,500	1,000	25,000	3,400
0,250	1,000	25,000	1,900	0,510	1,000	25,000	3,400
0,255	1,000	25,000	1,900	0,520	1,000	25,000	3,400
0,260	1,000	25,000	1,900	0,530	1,000	25,000	3,400
0,265	1,000	25,000	1,900	0,540	1,000	25,000	3,900
0,270	1,000	25,000	1,900	0,550	1,000	25,000	3,900
0,275	1,000	25,000	1,900	0,555	1,000	25,000	3,900
0,280	1,000	25,000	1,900	0,560	1,000	25,000	3,900
0,285	1,000	25,000	1,900	0,570	1,000	25,000	3,900
0,290	1,000	25,000	1,900	0,580	1,000	25,000	3,900
0,300	1,000	25,000	1,900	0,585	1,000	25,000	3,900
0,310	1,000	25,000	2,400	0,590	1,000	25,000	3,900
0,315	1,000	25,000	2,400	0,600	1,000	25,000	3,900
0,320	1,000	25,000	2,400	0,610	1,000	25,000	4,200
0,325	1,000	25,000	2,400	0,620	1,000	25,000	4,200
0,330	1,000	25,000	2,400	0,630	1,000	25,000	4,200
0,335	1,000	25,000	2,400	0,640	1,000	25,000	4,200
0,340	1,000	25,000	2,400	0,650	1,000	25,000	4,200
0,350	1,000	25,000	2,400	0,660	1,000	25,000	4,200



## Microbrocas sin refrigeración interior

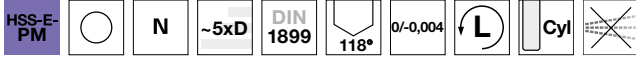
d1 mm	d2 mm	l1 mm	l2 mm	d1 mm	d2 mm	l1 mm	l2 mm
0,665	1,000	25,000	4,200	1,040	1,500	25,000	6,800
0,670	1,000	25,000	4,200	1,050	1,500	25,000	6,800
0,680	1,000	25,000	4,800	1,060	1,500	25,000	6,800
0,690	1,000	25,000	4,800	1,070	1,500	25,000	7,600
0,700	1,000	25,000	4,800	1,080	1,500	25,000	7,600
0,710	1,000	25,000	4,800	1,100	1,500	25,000	7,600
0,720	1,000	25,000	4,800	1,110	1,500	25,000	7,600
0,730	1,000	25,000	4,800	1,120	1,500	25,000	7,600
0,740	1,000	25,000	4,800	1,140	1,500	25,000	7,600
0,750	1,000	25,000	4,800	1,150	1,500	25,000	7,600
0,760	1,000	25,000	5,300	1,180	1,500	25,000	7,600
0,770	1,000	25,000	5,300	1,190	1,500	25,000	8,500
0,790	1,000	25,000	5,300	1,200	1,500	25,000	8,500
0,800	1,500	25,000	5,300	1,210	1,500	25,000	8,500
0,810	1,500	25,000	5,300	1,240	1,500	25,000	8,500
0,820	1,500	25,000	5,300	1,250	1,500	25,000	8,500
0,830	1,500	25,000	5,300	1,270	1,500	25,000	8,500
0,840	1,500	25,000	5,300	1,300	1,500	25,000	8,500
0,850	1,500	25,000	5,300	1,310	1,500	25,000	8,500
0,860	1,500	25,000	6,000	1,320	1,500	25,000	8,500
0,870	1,500	25,000	6,000	1,340	1,500	25,000	9,500
0,880	1,500	25,000	6,000	1,350	1,500	25,000	9,500
0,890	1,500	25,000	6,000	1,380	1,500	25,000	9,500
0,900	1,500	25,000	6,000	1,400	1,500	25,000	9,500
0,910	1,500	25,000	6,000	1,410	1,500	25,000	9,500
0,930	1,500	25,000	6,000	1,420	1,500	25,000	9,500
0,940	1,500	25,000	6,000	1,450	1,500	25,000	9,500
0,950	1,500	25,000	6,000	1,500	2,000	30,000	9,500
0,960	1,500	25,000	6,800	1,600	2,000	30,000	10,600
0,970	1,500	25,000	6,800	1,630	2,000	30,000	10,600
0,980	1,500	25,000	6,800	1,700	2,000	30,000	10,600
0,990	1,500	25,000	6,800	1,800	2,000	30,000	11,800
1,000	1,500	25,000	6,800	1,850	2,000	30,000	11,800
1,010	1,500	25,000	6,800	1,900	2,000	30,000	11,800
1,020	1,500	25,000	6,800				
1,030	1,500	25,000	6,800				



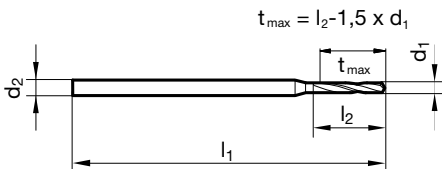
## Microbrocas sin refrigeración interior

Nº artículo 87016

P	M	K	N	S	H
•	•	•	•	○	



afilado plano • <math>\varnothing 0,15\text{ mm}</math> acero rápido al cobalto • con mango reforzado  
aceros altamente aleados



d1 mm	d2 mm	l1 mm	l2 mm	d1 mm	d2 mm	l1 mm	l2 mm
0,160	1,000	25,000	1,100	0,710	1,000	25,000	4,800
0,200	1,000	25,000	1,500	0,740	1,000	25,000	4,800
0,210	1,000	25,000	1,500	0,750	1,000	25,000	4,800
0,220	1,000	25,000	1,500	0,760	1,000	25,000	5,300
0,230	1,000	25,000	1,500	0,780	1,000	25,000	5,300
0,240	1,000	25,000	1,500	0,820	1,500	25,000	5,300
0,280	1,000	25,000	1,900	0,830	1,500	25,000	5,300
0,300	1,000	25,000	1,900	0,840	1,500	25,000	5,300
0,310	1,000	25,000	2,400	0,870	1,500	25,000	6,000
0,330	1,000	25,000	2,400	0,890	1,500	25,000	6,000
0,350	1,000	25,000	2,400	0,900	1,500	25,000	6,000
0,360	1,000	25,000	2,400	0,910	1,500	25,000	6,000
0,370	1,000	25,000	2,400	0,920	1,500	25,000	6,000
0,380	1,000	25,000	2,400	0,930	1,500	25,000	6,000
0,390	1,000	25,000	3,000	0,940	1,500	25,000	6,000
0,400	1,000	25,000	3,000	0,950	1,500	25,000	6,000
0,410	1,000	25,000	3,000	0,970	1,500	25,000	6,800
0,420	1,000	25,000	3,000	0,980	1,500	25,000	6,800
0,440	1,000	25,000	3,000	0,990	1,500	25,000	6,800
0,450	1,000	25,000	3,000	1,000	1,500	25,000	6,800
0,460	1,000	25,000	3,000	1,010	1,500	25,000	6,800
0,470	1,000	25,000	3,000	1,050	1,500	25,000	6,800
0,480	1,000	25,000	3,000	1,080	1,500	25,000	7,600
0,490	1,000	25,000	3,400	1,100	1,500	25,000	7,600
0,500	1,000	25,000	3,400	1,150	1,500	25,000	7,600
0,510	1,000	25,000	3,400	1,250	1,500	25,000	8,500
0,520	1,000	25,000	3,400	1,300	1,500	25,000	8,500
0,540	1,000	25,000	3,900	1,340	1,500	25,000	9,500
0,550	1,000	25,000	3,900	1,350	1,500	25,000	9,500
0,570	1,000	25,000	3,900				
0,600	1,000	25,000	3,900				
0,610	1,000	25,000	4,200				
0,660	1,000	25,000	4,200				
0,670	1,000	25,000	4,200				
0,680	1,000	25,000	4,800				
0,700	1,000	25,000	4,800				

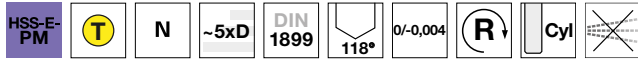


## Microbrocas sin refrigeración interior

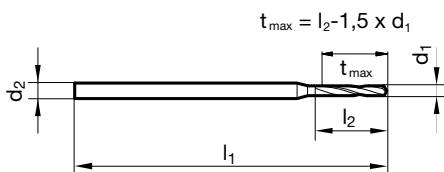
Nº artículo 84810



P	M	K	N	S	H
•	•	•	•	○	



afilado plano • con mango reforzado • más resistencia al desgaste  
aceros altamente aleados



d1 mm	d2 mm	l1 mm	l2 mm	d1 mm	d2 mm	l1 mm	l2 mm
0,200	1,000	25,000	1,500	1,050	1,500	25,000	6,800
0,300	1,000	25,000	1,900	1,100	1,500	25,000	7,600
0,450	1,000	25,000	3,000	1,150	1,500	25,000	7,600
0,490	1,000	25,000	3,400	1,180	1,500	25,000	7,600
0,500	1,000	25,000	3,400	1,200	1,500	25,000	8,500
0,510	1,000	25,000	3,400	1,250	1,500	25,000	8,500
0,520	1,000	25,000	3,400	1,300	1,500	25,000	8,500
0,590	1,000	25,000	3,900	1,400	1,500	25,000	9,500
0,600	1,000	25,000	3,900	1,450	1,500	25,000	9,500
0,700	1,000	25,000	4,800	1,500	2,000	30,000	9,500
0,760	1,000	25,000	5,300				
0,800	1,500	25,000	5,300				
0,880	1,500	25,000	6,000				
0,900	1,500	25,000	6,000				
0,920	1,500	25,000	6,000				
0,950	1,500	25,000	6,000				
0,980	1,500	25,000	6,800				
1,000	1,500	25,000	6,800				



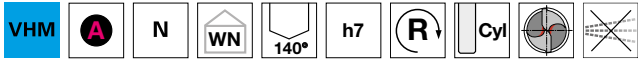


## Microbrocas sin refrigeración interior

Nº artículo 86402

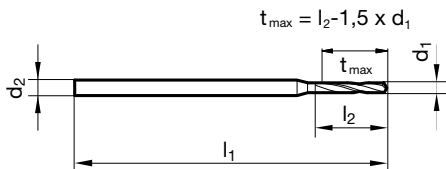


P	M	K	N	S	H
•		•			



vaciado de punta  $\geq \varnothing 0,800$  • afilado plano • mango unificado de 3 mm • longitud unificada de 38 mm

aceros de construcción y de cementación • aceros para tornos automáticos, aceros de bonificación • aceros aleados con una resistencia de hasta a 1200 N/mm<sup>2</sup> • fundición • mecanizado de platinas



d1	inch	d2 h6	l1	l2	d1	inch	d2 h6	l1	l2
mm		mm	mm	mm	mm		mm	mm	mm
0,100		3,000	38,000	1,200	0,980		3,000	38,000	10,000
0,150		3,000	38,000	2,000	0,990		3,000	38,000	10,000
0,200		3,000	38,000	2,500	1,000		3,000	38,000	10,000
0,250		3,000	38,000	3,000	1,100		3,000	38,000	10,000
0,300		3,000	38,000	5,000	1,110		3,000	38,000	10,000
0,310		3,000	38,000	5,000	1,150		3,000	38,000	10,000
0,350		3,000	38,000	6,000	1,200		3,000	38,000	10,000
0,370		3,000	38,000	6,000	1,210		3,000	38,000	10,000
0,400		3,000	38,000	7,000	1,400		3,000	38,000	10,000
0,450		3,000	38,000	7,000	1,450		3,000	38,000	10,000
0,500		3,000	38,000	7,000	1,500		3,000	38,000	10,000
0,550		3,000	38,000	7,000	1,510		3,000	38,000	10,000
0,600		3,000	38,000	7,000	1,520		3,000	38,000	10,000
0,640		3,000	38,000	7,000	1,550		3,000	38,000	10,000
0,650		3,000	38,000	7,000	1,600		3,000	38,000	12,000
0,700		3,000	38,000	8,000	1,650		3,000	38,000	12,000
0,710		3,000	38,000	8,000	1,700		3,000	38,000	12,000
0,720		3,000	38,000	8,000	1,800		3,000	38,000	12,000
0,740		3,000	38,000	8,000	1,810		3,000	38,000	12,000
0,750		3,000	38,000	8,000	1,830		3,000	38,000	12,000
0,760		3,000	38,000	8,000	1,850		3,000	38,000	12,000
0,770		3,000	38,000	8,000	1,900		3,000	38,000	12,000
0,780		3,000	38,000	8,000	1,920		3,000	38,000	12,000
0,790		3,000	38,000	8,000	1,950		3,000	38,000	12,000
0,800		3,000	38,000	10,000	1,980		3,000	38,000	12,000
0,810		3,000	38,000	10,000	2,000		3,000	38,000	12,000
0,820		3,000	38,000	10,000	2,050		3,000	38,000	12,000
0,830		3,000	38,000	10,000	2,100		3,000	38,000	12,000
0,840		3,000	38,000	10,000	2,400		3,000	38,000	12,000
0,850		3,000	38,000	10,000	2,500		3,000	38,000	12,000
0,860		3,000	38,000	10,000	2,600		3,000	38,000	12,000
0,870		3,000	38,000	10,000	2,750		3,000	38,000	12,000
0,880		3,000	38,000	10,000	2,950		3,000	38,000	12,000
0,890		3,000	38,000	10,000	3,000		3,000	38,000	12,000
0,900		3,000	38,000	10,000					
0,910		3,000	38,000	10,000					
0,920		3,000	38,000	10,000					
0,930		3,000	38,000	10,000					
0,940		3,000	38,000	10,000					
0,950		3,000	38,000	10,000					
0,960		3,000	38,000	10,000					
0,970		3,000	38,000	10,000					

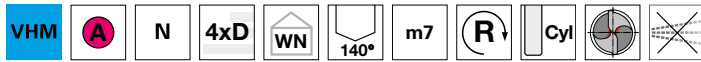


## Microbrocas sin refrigeración interior

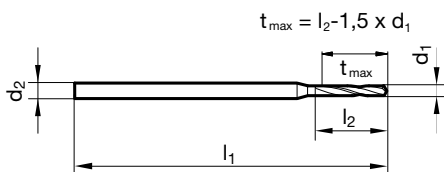
Nº artículo 86400



P	M	K	N	S	H
•	•	•	○	○	



vaciado de punta  $\geq \varnothing 0,500$  • afilado plano • forma recta del corte principal • corrección de cantos rectificada  
 aceros de construcción y de cementación • aceros para tornos automáticos, aceros de bonificación • aceros aleados con una resistencia de hasta a 1200 N/mm<sup>2</sup> • aceros inoxidables • fundición



d1	inch	d2 h6	l1	l2	d1	inch	d2 h6	l1	l2
mm		mm	mm	mm	mm		mm	mm	mm
0,500		3,000	47,000	3,000	1,950		3,000	52,000	11,700
0,550		3,000	47,000	3,300	1,980		4,000	59,000	12,000
0,600		3,000	47,000	3,600	2,000		4,000	59,000	12,000
0,650		3,000	47,000	3,900	2,050		4,000	59,000	12,300
0,700		3,000	47,000	4,200	2,100		4,000	59,000	12,600
0,750		3,000	47,000	4,500	2,150		4,000	59,000	12,900
0,800		3,000	47,000	4,800	2,200		4,000	59,000	13,200
0,850		3,000	47,000	5,100	2,250		4,000	59,000	13,500
0,900		3,000	47,000	5,400	2,300		4,000	59,000	13,800
0,950		3,000	47,000	5,700	2,350		4,000	59,000	14,100
1,000		3,000	47,000	6,000	2,380		4,000	59,000	14,400
1,050		3,000	47,000	6,300	2,400		4,000	59,000	14,400
1,100		3,000	47,000	6,600	2,450		4,000	59,000	14,700
1,150		3,000	47,000	6,900	2,500		4,000	59,000	15,000
1,200		3,000	47,000	7,200	2,550		4,000	59,000	15,300
1,250		3,000	47,000	7,500	2,600		4,000	59,000	15,600
1,300		3,000	47,000	7,800	2,650		4,000	59,000	15,900
1,350		3,000	47,000	8,100	2,700		4,000	59,000	16,200
1,400		3,000	47,000	8,400	2,750		4,000	59,000	16,500
1,450		3,000	47,000	8,700	2,780		4,000	59,000	16,800
1,500		3,000	47,000	9,000	2,800		4,000	59,000	16,800
1,550		3,000	47,000	9,300	2,850		4,000	59,000	17,100
1,590		3,000	47,000	9,600	2,900		4,000	59,000	17,400
1,600		3,000	47,000	9,600	2,950		4,000	59,000	17,700
1,650		3,000	47,000	9,900	3,000		4,000	59,000	18,000
1,700		3,000	47,000	10,200					
1,750		3,000	47,000	10,500					
1,800		3,000	52,000	10,800					
1,850		3,000	52,000	11,100					
1,900		3,000	52,000	11,400					

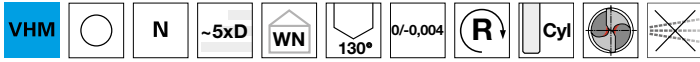


## Microbrocas sin refrigeración interior

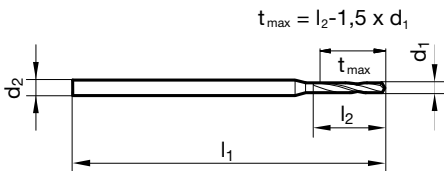
Nº artículo 89281



P	M	K	N	S	H
•	○	•	○	○	○



vaciado de punta  $\geq \varnothing 0,800$  • afilado plano • forma recta del corte principal  
 aceros de construcción y de cementación • fundición • bronce, latón • aluminio y sus aleaciones • magnesio y sus aleaciones  
 • plásticos y plásticos con refuerzo de fibras



d1 mm	d2 mm	l1 mm	l2 mm	d1 mm	d2 mm	l1 mm	l2 mm
0,200	1,000	25,000	1,500	0,800	1,500	25,000	5,300
0,300	1,000	25,000	1,900	1,000	1,500	25,000	6,800
0,400	1,000	25,000	3,000	1,100	1,500	25,000	7,600
0,500	1,000	25,000	3,400	1,250	1,500	25,000	8,500
0,600	1,000	25,000	3,900	1,300	1,500	25,000	8,500
0,700	1,000	25,000	4,800				

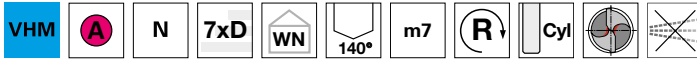


## Microbrocas sin refrigeración interior

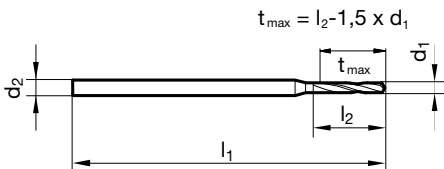
Nº artículo 86401



P	M	K	N	S	H
•	•	•	○	○	



vaciado de punta  $\geq \varnothing 0,500$  • afilado plano • forma recta del corte principal • corrección de cantos rectificada  
 aceros de construcción y de cementación • aceros para tornos automáticos, aceros de bonificación • aceros aleados con una resistencia de hasta a 1200 N/mm<sup>2</sup> • aceros inoxidables • fundición



d1	inch	d2 h6	l1	l2	d1	inch	d2 h6	l1	l2
mm		mm	mm	mm	mm		mm	mm	mm
0,500		3,000	47,000	4,000	1,950		3,000	52,000	17,600
0,550		3,000	47,000	4,400	1,980		4,000	63,000	18,000
0,600		3,000	47,000	4,800	2,000		4,000	63,000	18,000
0,650		3,000	47,000	5,200	2,050		4,000	63,000	18,500
0,700		3,000	47,000	5,600	2,100		4,000	63,000	18,900
0,750		3,000	47,000	6,000	2,150		4,000	63,000	19,400
0,800		3,000	47,000	6,400	2,200		4,000	63,000	19,800
0,850		3,000	47,000	6,800	2,250		4,000	63,000	20,300
0,900		3,000	47,000	7,200	2,300		4,000	63,000	20,700
0,950		3,000	47,000	7,600	2,350		4,000	63,000	21,200
1,000		3,000	47,000	8,000	2,380		4,000	63,000	21,600
1,050		3,000	47,000	8,400	2,400		4,000	63,000	21,600
1,100		3,000	47,000	8,800	2,450		4,000	63,000	22,100
1,150		3,000	47,000	9,200	2,500		4,000	63,000	22,500
1,200		3,000	52,000	10,800	2,550		4,000	63,000	23,000
1,250		3,000	52,000	11,300	2,600		4,000	67,000	23,400
1,300		3,000	52,000	11,700	2,650		4,000	67,000	23,900
1,350		3,000	52,000	12,200	2,700		4,000	67,000	24,300
1,400		3,000	52,000	12,600	2,750		4,000	67,000	24,800
1,450		3,000	52,000	13,100	2,780		4,000	67,000	25,200
1,500		3,000	52,000	13,500	2,800		4,000	67,000	25,200
1,550		3,000	52,000	14,000	2,850		4,000	67,000	25,700
1,590		3,000	52,000	14,400	2,900		4,000	67,000	26,100
1,600		3,000	52,000	14,400	2,950		4,000	67,000	26,600
1,650		3,000	52,000	14,900	3,000		4,000	67,000	27,000
1,700		3,000	52,000	15,300					
1,750		3,000	52,000	15,800					
1,800		3,000	52,000	16,200					
1,850		3,000	52,000	16,700					
1,900		3,000	52,000	17,100					

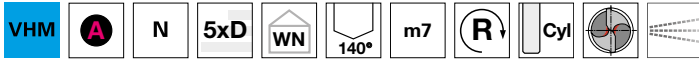


## Microbrocas con refrigeración interior

Nº artículo 86405

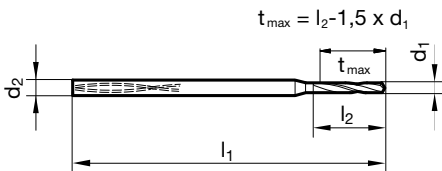


P	M	K	N	S	H
•	•	•	○	○	



vaciado de punta  $\geq \varnothing 1,400$  • afilado plano • forma recta del corte principal • corrección de cantos rectificada

aceros de construcción y de cementación • aceros para tornos automáticos, aceros de bonificación • aceros aleados con una resistencia de hasta a 1200 N/mm<sup>2</sup> • aceros inoxidables • fundición



d1	inch	d2 h6	l1	l2	d1	inch	d2 h6	l1	l2
mm		mm	mm	mm	mm		mm	mm	mm
1,400		4,000	52,000	11,000	2,450		4,000	62,000	20,000
1,450		4,000	52,000	12,000	2,500		4,000	62,000	20,000
1,500		4,000	52,000	12,000	2,550		4,000	62,000	20,000
1,550		4,000	52,000	12,000	2,600		4,000	66,000	21,000
1,590		4,000	52,000	13,000	2,650		4,000	66,000	21,000
1,600		4,000	52,000	13,000	2,700		4,000	66,000	22,000
1,650		4,000	52,000	13,000	2,750		4,000	66,000	22,000
1,700		4,000	56,000	14,000	2,780		4,000	66,000	22,000
1,750		4,000	56,000	14,000	2,800		4,000	66,000	22,000
1,800		4,000	56,000	14,000	2,850		4,000	66,000	23,000
1,850		4,000	56,000	15,000	2,900		4,000	66,000	23,000
1,900		4,000	56,000	15,000	2,950		4,000	66,000	24,000
1,950		4,000	56,000	16,000	3,000		4,000	66,000	24,000
1,980		4,000	56,000	16,000					
2,000		4,000	56,000	16,000					
2,050		4,000	56,000	16,000					
2,100		4,000	62,000	17,000					
2,150		4,000	62,000	17,000					
2,200		4,000	62,000	18,000					
2,250		4,000	62,000	18,000					
2,300		4,000	62,000	18,000					
2,350		4,000	62,000	19,000					
2,380		4,000	62,000	19,000					
2,400		4,000	62,000	19,000					

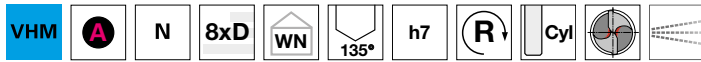


## Microbrocas con refrigeración interior

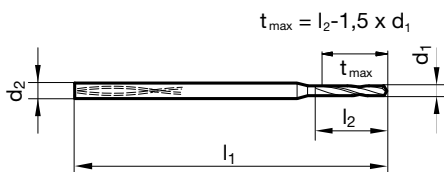
Nº artículo 86408



P	M	K	N	S	H
•	•	•	○	○	



vaciado de punta  $\geq \varnothing 1,400$  • afilado plano • forma recta del corte principal • corrección de cantos rectificada  
 aceros de construcción y de cementación • aceros para tornos automáticos, aceros de bonificación • aceros aleados con una resistencia de hasta a 1200 N/mm<sup>2</sup> • aceros inoxidables • fundición



d1 mm	d2 h6 mm	l1 mm	l2 mm	d1 mm	d2 h6 mm	l1 mm	l2 mm
1,400	4,000	52,000	15,000	2,600	4,000	66,000	29,000
1,500	4,000	52,000	17,000	2,700	4,000	66,000	30,000
1,600	4,000	52,000	18,000	2,800	4,000	66,000	31,000
1,700	4,000	56,000	19,000	2,900	4,000	66,000	32,000
1,800	4,000	56,000	20,000	3,000	4,000	66,000	33,000
1,900	4,000	56,000	21,000				
2,000	4,000	56,000	22,000				
2,100	4,000	62,000	23,000				
2,200	4,000	62,000	24,000				
2,300	4,000	62,000	25,000				
2,400	4,000	62,000	26,000				
2,500	4,000	62,000	28,000				

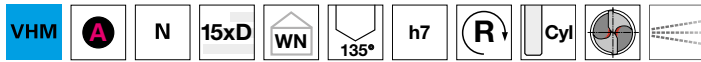


## Microbrocas con refrigeración interior

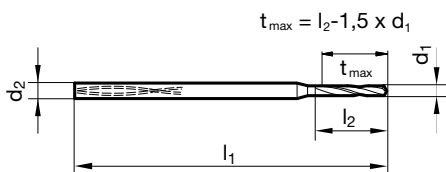
Nº artículo 86412



P	M	K	N	S	H
•	•	•	○	○	



vaciado de punta  $\geq \varnothing 1,400$  • afilado plano • forma recta del corte principal • corrección de cantos rectificada  
 aceros de construcción y de cementación • aceros para tornos automáticos, aceros de bonificación • aceros aleados con una resistencia de hasta a 1200 N/mm<sup>2</sup> • aceros inoxidables • fundición



d1 mm	d2 h6 mm	l1 mm	l2 mm	d1 mm	d2 h6 mm	l1 mm	l2 mm
1,400	4,000	62,000	25,000	2,600	4,000	87,000	47,000
1,500	4,000	62,000	27,000	2,700	4,000	87,000	48,000
1,600	4,000	62,000	29,000	2,800	4,000	87,000	50,000
1,700	4,000	70,000	31,000	2,900	4,000	87,000	52,000
1,800	4,000	70,000	32,000	3,000	4,000	87,000	54,000
1,900	4,000	70,000	34,000				
2,000	4,000	70,000	36,000				
2,100	4,000	78,000	38,000				
2,200	4,000	78,000	40,000				
2,300	4,000	78,000	42,000				
2,400	4,000	78,000	44,000				
2,500	4,000	78,000	45,000				







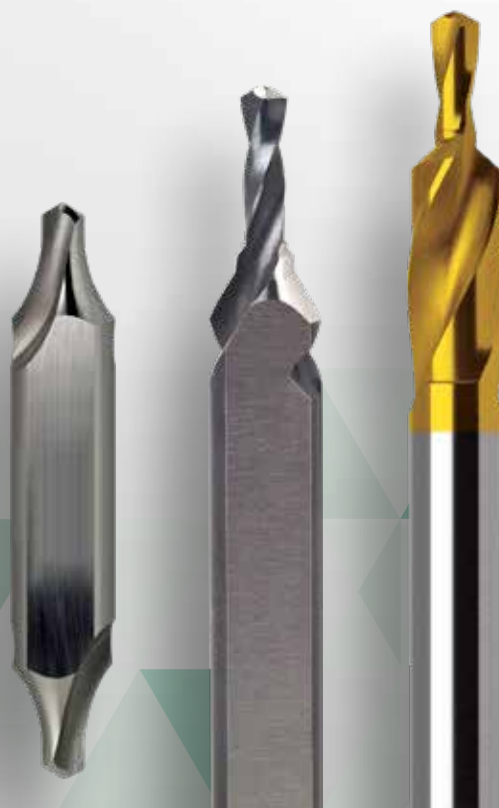
# HARTNER

Precision Cutting Tools

## **BROCAS ESCALONADAS / BROCAS DE CENTRAR**

Brocas escalonadas cortas, brocas bidiametrales,  
fabricada de HSS y metal duro, con mango cil. o CM





Brocas de centrar fabricada de HSS, HSS-E y metal duro  
brillante y recubierta









Brocas escalonad.  
Brocas de centrar

P	M	K	N	S	H	Norma	Tipo	Material de corte	Acabado	Dirección de corte	Forma del mango	Angulo / forma	d1/mm	Nº artículo	Página
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## Brocas escalonadas DIN 332

	•	○	•	•	○	Norma de fáb.	N	HSS	●	derecha	cil.	90	8,000 - 40,000	85910	345
	•	○	•	•	○	Norma de fáb.	N	HSS	●	derecha	cil.	90	8,000 - 40,000	85911	345
	•	○	•	•	○	Norma de fáb.	N	HSS	●	derecha	cil.	90	8,000 - 20,000	85912	346
	•	○	•	•	○	Norma de fáb.	N	HSS	●	derecha	MK	90	14,000 - 40,000	85914	347

## Brocas escalonadas cortas con mango cil.






	•	○	•	•	○	Norma de fáb.	N	HSS	Ⓣ	derecha	cil.	90	3,400 - 13,500	84445	348
	•	○	•	•	○	Norma de fáb.	N	HSS	○	derecha	cil.	90	6,000 - 19,000	85916	349
	•	○	•	•	○	Norma de fáb.	N	HSS	○	derecha	cil.	90	6,600 - 21,500	85917	350
	•	○	•	•	○	Norma de fáb.	N	HSS	○	derecha	cil.	180	6,000 - 18,000	85918	351
	•	○	•	•	○	Norma de fáb.	N	HSS	○	derecha	cil.	90	3,400 - 13,500	85920	352
	○	○	○	•	○	Norma de fáb.	N	MDI	○	derecha	HE	90	5,500 - 9,000	89254	353

## Brocas bidiametrales cil.






	•	○	•	○	○	DIN 8374	N	HSS	●	derecha	cil.	90	6,000 - 19,000	85010	354
	•	○	•	○	○	DIN 8374	N	HSS	●	derecha	cil.	90	7,500 - 19,000	85218	355

P	M	K	N	S	H	Norma	Tipo	Material de corte	Acabado	Dirección de corte	Forma del mango	Angulo / forma	d1/mm	Nº artículo	Página
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## Brocas bidiametrales cil.

	•	○	•	○		DIN 8376	N	HSS	○	derecha	cil.	180	6,000 - 18,000	85210	356
	•	○	•	○		DIN 8378	N	HSS	○	derecha	cil.	90	3,400 - 13,500	85310	357
	•	○	•	○		Norma de fáb.	N	HSS	○	derecha	cil.	90	6,600 - 17,200	85110	358
	•	○	•	○		Norma de fáb.	N	HSS	○	derecha	cil.	180	5,900 - 16,500	85216	359
	○	○	○	○	•		N	MDI	○	derecha	cil.	180	6,000 - 11,000	89252	360

## Brocas bidiametrales, CM











	•	○	•	○		DIN 8375	N	HSS	○	derecha	MK	90	12,000 - 23,000	85619	361
	•	○	•	○		DIN 8377	N	HSS	○	derecha	MK	180	10,000 - 33,000	85610	362
	•	○	•	○		DIN 8379	N	HSS	○	derecha	MK	90	9,000 - 22,000	85710	363
	•	○	•	○		Norma de fáb.	N	HSS	○	derecha	MK	90	11,000 - 26,000	85510	364
	•	○	•	○		Norma de fáb.	N	HSS	○	derecha	MK	180	9,400 - 33,000	85616	365

## Brocas de centrar sin plano




	•	○	•	○		DIN 333	N	HSS	○	derecha	cil.	A	0,500 - 12,500	83100	366
	•	○	•	○		DIN 333	N	HSS	T	derecha	cil.	A	0,500 - 12,500	84450	366

P	M	K	N	S	H	Norma	Tipo	Material de corte	Acabado	Dirección de corte	Forma del mango	Angulo / forma	d1/mm	Nº artículo	Página
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## Brocas de centrar sin plano

	•	○	•	•	○	DIN 333	N	HSS	○	izquierda	cil.	A	0,500 - 4,000	83105	367
	•	○	•	•	○	DIN 333	N	HSS	○	derecha	cil.	R	0,500 - 10,000	83000	368
	•	○	•	•	○	DIN 333	N	HSS	Ⓜ	derecha	cil.	R	0,500 - 10,000	84448	368
	•	○	•	•	○	DIN 333	N	HSS	○	derecha	cil.	A	1,000 - 10,000	83300	369
	•	○	•	•	○	DIN 333	N	HSS	○	derecha	cil.	B	1,000 - 10,000	83200	370
	•	○	•	•	○	DIN 333	N	HSS	○	izquierda	cil.	R	1,000 - 4,000	83005	371
	•	○	•	•	○	Norma de fáb.	N	HSS	○	derecha	cil.	A	1,000 - 3,150	83110	372
	•	•	•	•	○	DIN 333	N	HSS-E	○	derecha	cil.	A	1,000 - 4,000	83101	373
	•	•	•	○	•	DIN 333	N	HSS-E	Ⓜ	derecha	cil.	A	0,500 - 4,000	83102	374
	○	○	○	○	○	Norma de fáb.	N	MDI	○	derecha	cil.	A	0,500 - 6,300	83370	375

## Brocas de centrar con plano

	•	○	•	•	○	DIN 333	N	HSS	○	derecha	cil.	A	1,600 - 10,000	83600	376
	•	○	•	•	○	DIN 333	N	HSS	○	derecha	cil.	R	1,600 - 10,000	83500	376
	•	○	•	•	○	DIN 333	N	HSS	○	derecha	cil.	B	1,600 - 8,000	83700	377

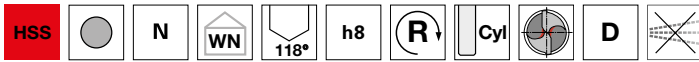


## Brocas escalonadas DIN 332

### Nº artículo 85910



P	M	K	N	S	H
•	○	•	•	○	

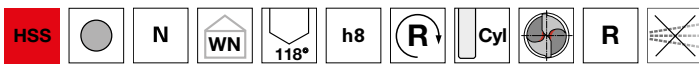


vaciado de punta  $\geq \varnothing 8,000$  • entrada cónica • con plano en el mango • ángulo 60° • para pretaladros de rosca según DIN 332, página 2, forma D • para maquinas de tronzar y centrar

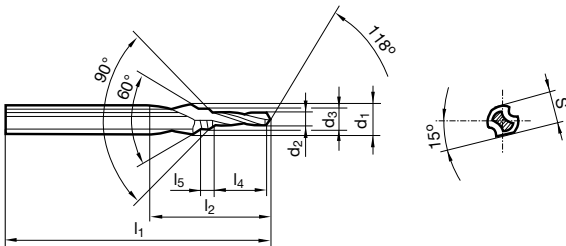
### Nº artículo 85911



P	M	K	N	S	H
•	○	•	•	○	



vaciado de punta  $\geq \varnothing 8,000$  • entrada cónica • con plano en el mango • ángulo 60° • según DIN 332, página 2, forma DR • para maquinas de tronzar y centrar



d1 h7 mm	d3 h11 mm	d2 h8 mm	S mm	l1 mm	l2 mm	l4 mm	l5 mm	para rosca
8,000	4,300	3,300	6,750	63,000	23,000	1,600	11,000	M 4
10,000	5,300	4,200	8,450	67,000	27,000	2,150	13,000	M 5
12,500	6,400	5,000	10,450	71,000	33,000	2,900	16,000	M 6
14,000	8,400	6,800	12,500	88,000	41,000	3,500	19,500	M 8
16,000	10,500	8,500	14,850	94,000	47,000	4,700	23,000	M10
20,000	13,000	10,200	18,450	105,000	59,000	6,500	28,000	M12
25,000	17,000	14,000	23,400	132,000	67,000	8,300	33,000	M16
31,500	21,000	17,500	29,350	145,000	76,500	10,350	38,000	M20
40,000	25,000	21,000	36,500	160,000	90,000	12,000	45,000	M24

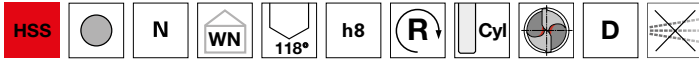


## Brocas escalonadas DIN 332

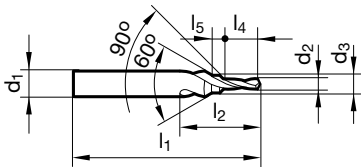
Nº artículo 85912



P	M	K	N	S	H
•	○	•	•		



vaciado de punta  $\geq \varnothing 8,000$  • entrada cónica • ángulo  $60^\circ$  • para pretaladros de rosca según DIN 332, página 2, forma D



d1 h7 mm	d3 h11 mm	d2 h8 mm	l1 mm	l2 mm	l4 mm	l5 mm	para rosca
8,000	4,300	3,300	63,000	23,000	11,000	1,600	M 4
10,000	5,300	4,200	67,000	27,000	13,000	2,150	M 5
12,500	6,400	5,000	71,000	33,000	16,000	2,900	M 6
14,000	8,400	6,800	88,000	41,000	19,500	3,500	M 8
16,000	10,500	8,500	94,000	47,000	23,000	4,700	M10
20,000	13,000	10,200	105,000	59,000	28,000	6,500	M12



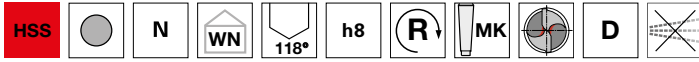
# HARTNER

## Brocas escalonadas DIN 332

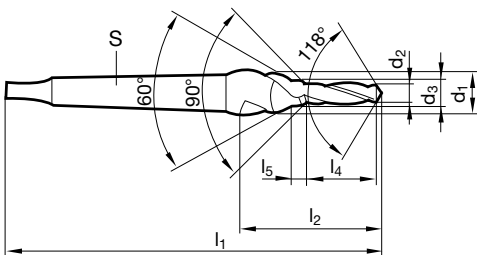
Nº artículo 85914



P	M	K	N	S	H
•	○	•	•	•	



vaciado de punta  $\geq \varnothing 14,000$  • entrada cónica • ángulo  $60^\circ$  • para pretaladros de rosca según DIN 332, página 2, forma D



d1 h7 mm	d3 h11 mm	d2 h8 mm	S	l1 mm	l2 mm	l4 mm	l5 mm	para rosca
14,000	8,400	6,800	MK-1	110,000	41,000	3,500	19,500	M 8
16,000	10,500	8,500	MK-2	131,000	47,000	4,700	23,000	M10
20,000	13,000	10,200	MK-2	145,000	59,000	6,500	28,000	M12
25,000	17,000	14,000	MK-3	172,000	67,000	8,300	33,000	M16
31,500	21,000	17,500	MK-3	184,000	76,500	10,350	38,000	M20
40,000	25,000	21,000	MK-4	222,000	90,000	12,000	45,000	M24



## Brocas escalonadas cortas con mango cil.

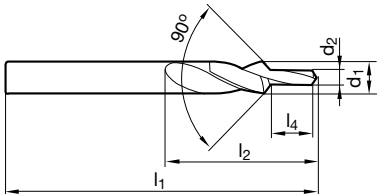
Nº artículo 84445



P	M	K	N	S	H
•	○	•	•		



vaciado de punta  $\geq \varnothing 3,400$  • entrada cónica • muy resistente a la torsión • para máquinas CNC y NC • para pretaladros de rosca según DIN 336 • para avellanados de desalajo  $90^\circ$  correspondientes a taladros pasantes según norma DIN EN 20273, serie medium • f se rige por el dia. pequeño • vc se basa en el diámetro grande



d1 h6 mm	d2 h9 mm	l1 mm	l2 mm	l4 mm	para rosca
3,400	2,500	52,000	20,000	8,800	M 3
6,600	5,000	70,000	31,000	16,500	M 6
9,000	6,800	84,000	40,000	21,000	M 8
11,000	8,500	95,000	47,000	25,500	M10
13,500	10,200	107,000	54,000	30,000	M12



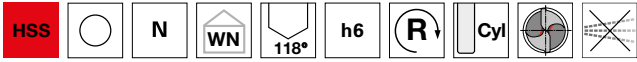


## Brocas escalonadas cortas con mango cil.

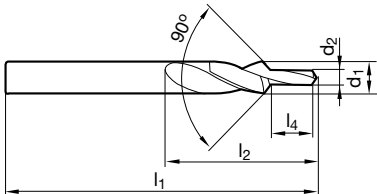
Nº artículo 85916



P	M	K	N	S	H
•	○	•	•	•	



vaciado de punta  $\geq \varnothing 6,000$  • entrada cónica • muy resistente a la torsión • para máquinas CNC y NC • para taladros pasantes según DIN EN 20273, serie fino • para avell. para cabeza de tornillos 90° • f se rige por el dia. pequeño • vc se basa en el diámetro grande



d1 h6 mm	d2 h9 mm	l1 mm	l2 mm	l4 mm	para rosca
6,000	3,200	66,000	28,000	9,000	M 3
8,000	4,300	79,000	37,000	11,000	M 4
10,000	5,300	89,000	43,000	13,000	M 5
11,500	6,400	95,000	47,000	15,000	M 6
15,000	8,400	111,000	56,000	19,000	M 8
19,000	10,500	127,000	64,000	23,000	M10

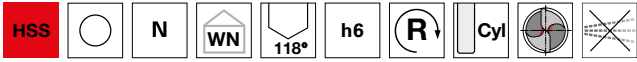


## Brocas escalonadas cortas con mango cil.

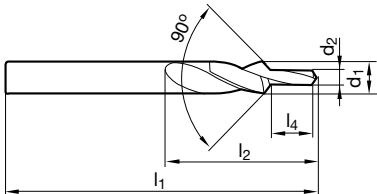
Nº artículo 85917



P	M	K	N	S	H
•	○	•	•	•	



vaciado de punta  $\geq \varnothing 6,600$  • entrada cónica • muy resistente a la torsión • para máquinas CNC y NC • para taladros pasantes según DIN EN 20273, fila medio • para avellanados de ocultación de cabez de tornillo 90° según DIN 74, Forma A • f se rige por el día. pequeño • vc se basa en el diámetro grande



d1 h6 mm	d2 h9 mm	l1 mm	l2 mm	l4 mm	para rosca
6,600	3,400	70,000	31,000	9,000	M 3
9,000	4,500	84,000	40,000	11,000	M 4
11,000	5,500	95,000	47,000	13,000	M 5
13,000	6,600	102,000	51,000	15,000	M 6
17,200	9,000	123,000	62,000	19,000	M 8
21,500	11,000	141,000	70,000	23,000	M10

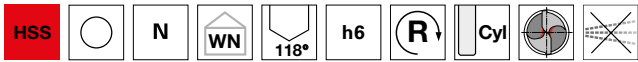


## Brocas escalonadas cortas con mango cil.

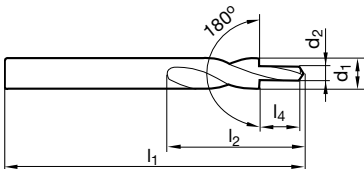
Nº artículo 85918



P	M	K	N	S	H
•	○	•	•	•	



vaciado de punta  $\geq \varnothing 6,000$  • entrada cónica • muy resistente a la torsión • para máquinas CNC y NC • para taladros pasantes según DIN EN 20273, fila medio • para avell. para cabeza de tornillos 180° según DIN 974-1 fila 1 • para tornillos según DIN 6912, 7984, 34821, DIN EN ISO 1207, 4762, 14579, 14580 • f se rige por el dia. pequeño • vc se basa en el diámetro grande



d1 h6 mm	d2 h9 mm	l1 mm	l2 mm	l4 mm	para rosca
6,000	3,400	66,000	28,000	9,000	M 3
8,000	4,500	79,000	37,000	11,000	M 4
10,000	5,500	89,000	43,000	13,000	M 5
11,000	6,600	95,000	47,000	15,000	M 6
15,000	9,000	111,000	56,000	19,000	M 8
18,000	11,000	123,000	62,000	23,000	M10

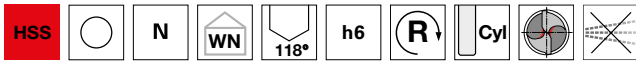


## Brocas escalonadas cortas con mango cil.

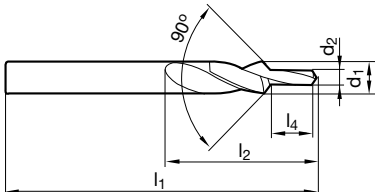
Nº artículo 85920



P	M	K	N	S	H
•	○	•	•	•	



vaciado de punta  $\geq \varnothing 3,400$  • entrada cónica • muy resistente a la torsión • para máquinas CNC y NC • para pretaladros de rosca según DIN 336 • para avellanados de desalajo  $90^\circ$  correspondientes a taladros pasantes según norma DIN EN 20273, serie medium • f se rige por el dia. pequeño • vc se basa en el diámetro grande



d1 h6 mm	d2 h9 mm	l1 mm	l2 mm	l4 mm	para rosca
3,400	2,500	52,000	20,000	8,800	M 3
4,500	3,300	58,000	24,000	11,400	M 4
5,500	4,200	66,000	28,000	13,600	M 5
6,600	5,000	70,000	31,000	16,500	M 6
9,000	6,800	84,000	40,000	21,000	M 8
11,000	8,500	95,000	47,000	25,500	M10
13,500	10,200	107,000	54,000	30,000	M12

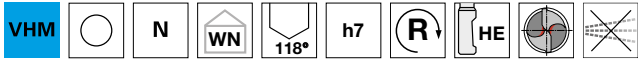


## Brocas escalonadas cortas con mango cil.

Nº artículo 89254

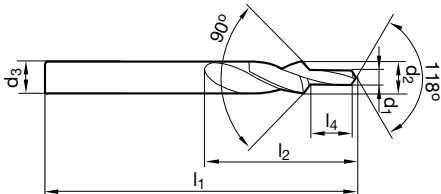


P	M	K	N	S	H
○	○	○	●	○	○



vaciado de punta  $\geq \varnothing 3,400$  • afilado plano • muy resistente a la torsión • para máquinas CNC y NC • para pretaladros de roscar según DIN 336 • para avellanados de desalajo  $90^\circ$  correspondientes a taladros pasantes según norma DIN EN 20273, serie medium • f se rige por el dia. pequeño • vc se basa en el diámetro grande

aceros fundidos, fundición gris, fundición endurecida superficialmente • aceros duros de manganeso, bronces • metales ligeros y metales no ferrosos • materiales abrasivos (aleaciones de AISi) • plásticos con refuerzo de fibras • placas de circ. impresos que pueden ocasionar un rápido desgaste en las superficies y bordes de corte de la broca



d1 h7 mm	d2 h9 mm	d3 mm	l1 mm	l2 mm	l4 mm	para rosca
5,500	4,200	6,000	66,000	28,000	13,600	M 5
6,600	5,000	8,000	70,000	31,000	16,500	M 6
9,000	6,800	10,000	84,000	40,000	21,000	M 8

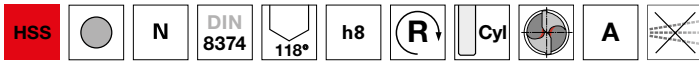


## Brocas bidiametrales cil.

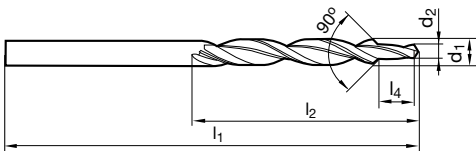
Nº artículo 85010



P	M	K	N	S	H
•	○	•	○		



vaciado de punta  $\geq \varnothing 6,000$  • entrada cónica • para taladros pasantes según DIN EN 20273, serie fino • para avell. para cabeza de tornillos 90° • f se rige por el dia. pequeño • vc se basa en el diámetro grande



d1 h8 mm	d2 h9 mm	l1 mm	l2 mm	l4 mm	para rosca
6,000	3,200	93,000	57,000	9,000	M 3
8,000	4,300	117,000	75,000	11,000	M 4
10,000	5,300	133,000	87,000	13,000	M 5
11,500	6,400	142,000	94,000	15,000	M 6
15,000	8,400	169,000	114,000	19,000	M 8
19,000	10,500	198,000	135,000	23,000	M10

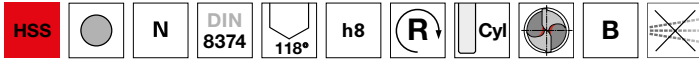


## Brocas bidiametrales cil.

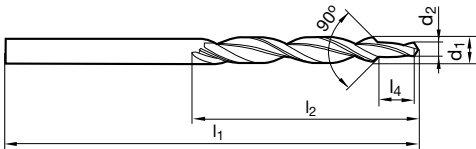
Nº artículo 85218



P	M	K	N	S	H
•	○	•	○		



vaciado de punta  $\geq \varnothing 7,500$  • entrada cónica • para taladros pasantes según DIN EN 20273, fila medio • para avellandos de cabeza de tornillo 90° según DIN 74, formas A y F • f se rige por el dia. pequeño • vc se basa en el diámetro grande



d1 h8 mm	d2 h9 mm	l1 mm	l2 mm	l4 mm	para rosca
7,500	3,400	109,000	69,000	9,000	M 3
9,700	4,500	133,000	87,000	11,000	M 4
12,000	5,500	151,000	101,000	13,000	M 5
14,500	6,600	169,000	114,000	15,000	M 6
19,000	9,000	198,000	135,000	19,000	M 8



## Brocas bidiametrales cil.

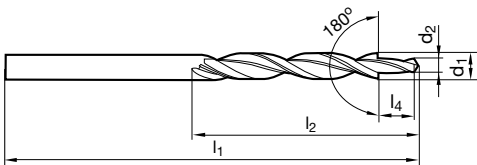
Nº artículo 85210



P	M	K	N	S	H
•	○	•	○		



vaciado de punta  $\geq \varnothing 6,000$  • entrada cónica • para taladros pasantes según DIN EN 20273, fila medio • para avell. para cabeza de tornillos 180° según DIN 974-1 fila 1 • para tornillos según DIN 6912, 7984, 34821, DIN EN ISO 1207, 4762, 14579, 14580 y DIN 7513, 7516, 7500-1 • f se rige por el dia. pequeño • vc se basa en el diámetro grande



d1 h8 mm	d2 h9 mm	l1 mm	l2 mm	l4 mm	para rosca
6,000	3,400	93,000	57,000	9,000	M 3
8,000	4,500	117,000	75,000	11,000	M 4
10,000	5,500	133,000	87,000	13,000	M 5
11,000	6,600	142,000	94,000	15,000	M 6
15,000	9,000	169,000	114,000	19,000	M 8
18,000	11,000	191,000	130,000	23,000	M10



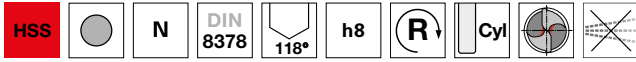


## Brocas bidiametrales cil.

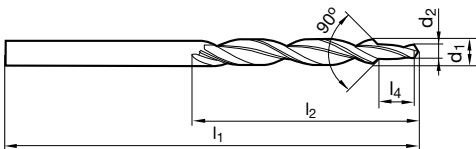
Nº artículo 85310



P	M	K	N	S	H
•	○	•	○		



vaciado de punta  $\geq \varnothing 3,400$  • entrada cónica • para pretaladros de roscar según DIN 336 • para avellanados de desalajo 90° correspondientes a taladros pasantes según norma DIN EN 20273, serie medium • f se rige por el día. pequeño • vc se basa en el diámetro grande



d1 h8 mm	d2 h9 mm	l1 mm	l2 mm	l4 mm	para rosca
3,400	2,500	70,000	39,000	8,800	M 3
4,500	3,300	80,000	47,000	11,400	M 4
5,500	4,200	93,000	57,000	13,600	M 5
6,600	5,000	101,000	63,000	16,500	M 6
9,000	6,800	125,000	81,000	21,000	M 8
11,000	8,500	142,000	94,000	25,500	M10
13,500	10,200	160,000	108,000	30,000	M12

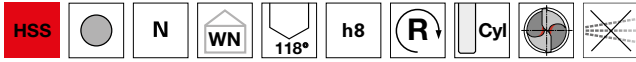


## Brocas bidiametrales cil.

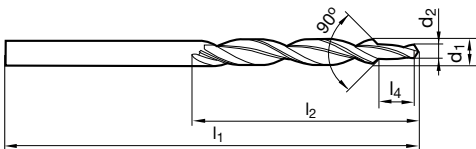
Nº artículo 85110



P	M	K	N	S	H
●	○	●	○		



vaciado de punta  $\geq \varnothing 6,600$  • entrada cónica • para taladros pasantes según DIN EN 20273, fila medio • para avellandos de cabeza de tornillo 90° según DIN 74 parte 1 (edición 12,1980 retrocedida), formas A y B, versión media • f se rige por el dia. pequeño • vc se basa en el diámetro grande



d1 h8 mm	d2 h9 mm	l1 mm	l2 mm	l4 mm	para rosca
6,600	3,400	101,000	63,000	9,000	M 3
9,000	4,500	125,000	81,000	11,000	M 4
11,000	5,500	142,000	94,000	13,000	M 5
13,000	6,600	151,000	101,000	15,000	M 6
17,200	9,000	191,000	130,000	19,000	M 8

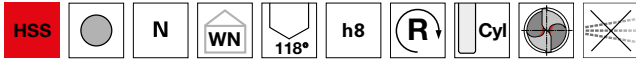


## Brocas bidiametrales cil.

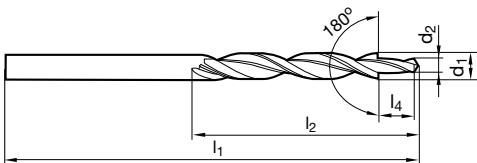
Nº artículo 85216



P	M	K	N	S	H
•	○	•	○		



vaciado de punta  $\geq \varnothing 5,900$  • entrada cónica • para taladros pasantes con avellanados viejos forma H, J, K según DIN 75 Parte 2 (Edición 04, 1968 retrocedida), versión media y fina • para tornillos según DIN 84, 912, 6912 • f se rige por el dia. pequeño • vc se basa en el diámetro grande



d1 h8 mm	d2 h9 mm	l1 mm	l2 mm	l4 mm	para rosca
5,900	3,200	93,000	57,000	11,000	M 3
7,400	4,300	109,000	69,000	13,000	M 4
9,400	5,300	125,000	81,000	16,000	M 5
10,000	5,800	133,000	87,000	16,000	M 5
10,400	6,400	133,000	87,000	19,000	M 6
11,000	7,000	142,000	94,000	19,000	M 6
13,500	8,400	160,000	108,000	22,000	M 8
16,500	10,500	184,000	125,000	25,000	M10

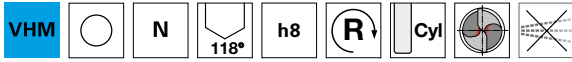


## Brocas bidiametrales cil.

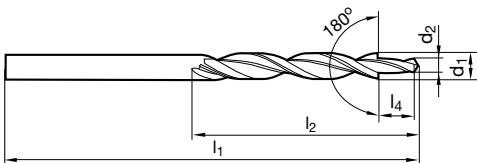
Nº artículo 89252



<b>P</b>	<b>M</b>	<b>K</b>	<b>N</b>	<b>S</b>	<b>H</b>
○	○	○	○	●	○



vaciado de punta  $\geq \varnothing 8,000$  • entrada cónica • para taladros pasantes según DIN EN 20273, fila medio • para avell. para cabeza de tornillos 180° según DIN 974-1 fila 1 • para tornillos según DIN 6912, 7984, 34821, DIN EN ISO 1207, 4762, 14579, 14580 y DIN 7513, 7516, 7500-1 • f se rige por el dia. pequeño • vc se basa en el diámetro grande



d1 h8 mm	d2 h9 mm	l1 mm	l2 mm	l4 mm	para rosca
6,000	3,400	93,000	57,000	9,000	M 3
10,000	5,500	133,000	87,000	13,000	M 5
11,000	6,600	142,000	94,000	15,000	M 6

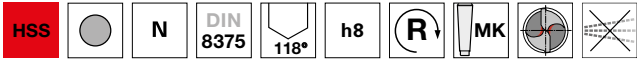


## Brocas bidiametrales, CM

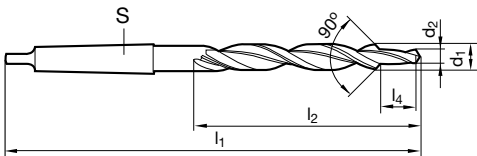
Nº artículo 85619



P	M	K	N	S	H
•	○	•	○		



vaciado de punta  $\geq \varnothing 12,000$  • entrada cónica • para taladros pasantes según DIN EN 20273, serie fino • para avellandos de cabeza de tornillo 90° según DIN 74, formas A y F • f se rige por el dia. pequeño • vc se basa en el diámetro grande



d1 h8 mm	d2 h9 mm	S	l1 mm	l2 mm	l4 mm	para rosca
12,000	5,500	MK-1	182,000	101,000	13,000	M 5
14,500	6,600	MK-2	212,000	114,000	15,000	M 6
19,000	9,000	MK-2	233,000	135,000	19,000	M 8
23,000	11,000	MK-2	253,000	155,000	23,000	M10



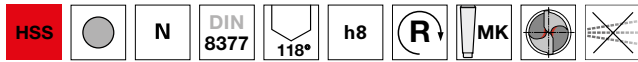
# HARTNER

## Brocas bidiametrales, CM

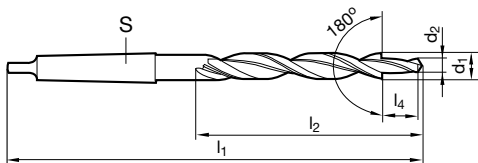
Nº artículo 85610



P	M	K	N	S	H
•	○	•	○		



vaciado de punta  $\geq \varnothing 10,000$  • entrada cónica • para taladros pasantes según DIN EN 20273, fila medio • para avell. para cabeza de tornillos 180° según DIN 974-1 fila 1 • para tornillos según DIN 6912, 7984, 34821, DIN EN ISO 1207, 4762, 14579, 14580 y DIN 7513, 7516, 7500-1 • f se rige por el dia. pequeño • vc se basa en el diámetro grande



d1 h8 mm	d2 h9 mm	S	l1 mm	l2 mm	l4 mm	para rosca
10,000	5,500	MK-1	168,000	87,000	13,000	M 5
11,000	6,600	MK-1	175,000	94,000	15,000	M 6
15,000	9,000	MK-2	212,000	114,000	19,000	M 8
18,000	11,000	MK-2	228,000	130,000	23,000	M10
20,000	13,500	MK-2	238,000	140,000	27,000	M12
24,000	15,500	MK-3	281,000	160,000	31,000	M14
26,000	17,500	MK-3	286,000	165,000	35,000	M16
30,000	20,000	MK-3	296,000	175,000	39,000	M18
33,000	22,000	MK-4	334,000	185,000	43,000	M20



# HARTNER

## Brocas bidiametrales, CM

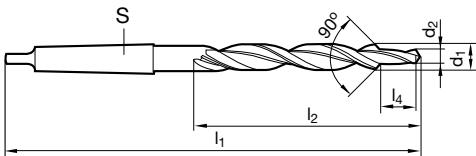
Nº artículo 85710



P	M	K	N	S	H
•	○	•	○		



vaciado de punta  $\geq \varnothing 9,000$  • entrada cónica • para pretaladros de rosca según DIN 336 • para avellanados de desalajo  $90^\circ$  correspondientes a taladros pasantes según norma DIN EN 20273, serie medium • f se rige por el día. pequeño • vc se basa en el diámetro grande



d1 h8 mm	d2 h9 mm	S	l1 mm	l2 mm	l4 mm	para rosca
9,000	6,800	MK-1	162,000	81,000	21,000	M 8
11,000	8,500	MK-1	175,000	94,000	25,500	M10
13,500	10,200	MK-1	189,000	108,000	30,000	M12
15,500	12,000	MK-2	218,000	120,000	34,500	M14
17,500	14,000	MK-2	228,000	130,000	38,500	M16
20,000	15,500	MK-2	238,000	140,000	43,500	M18
22,000	17,500	MK-2	248,000	150,000	47,500	M20

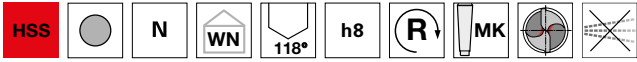


## Brocas bidiametrales, CM

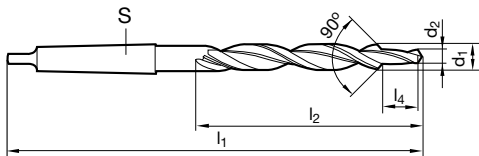
Nº artículo 85510



P	M	K	N	S	H
•	○	•	○		



vaciado de punta  $\geq \varnothing 11,000$  • entrada cónica • para taladros pasantes según DIN EN 20273, fila medio • para avellandos de cabeza de tornillo 90° según DIN 74 parte 1 (edición 12,1980 retrocedida), formas A y B, versión media • f se rige por el dia. pequeño • vc se basa en el diámetro grande



d1 h8 mm	d2 h9 mm	S	l1 mm	l2 mm	l4 mm	para rosca
11,000	5,500	MK-1	175,000	94,000	13,000	M 5
13,000	6,600	MK-1	182,000	101,000	15,000	M 6
17,200	9,000	MK-2	228,000	130,000	19,000	M 8
21,500	11,000	MK-2	248,000	150,000	23,000	M10
26,000	14,000	MK-3	286,000	165,000	27,000	M12



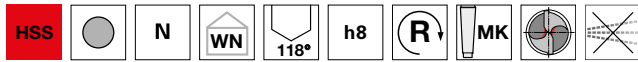


## Brocas bidiametrales, CM

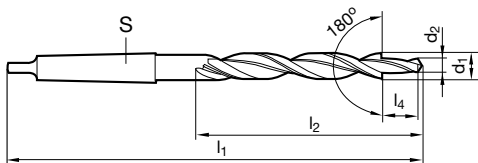
Nº artículo 85616



P	M	K	N	S	H
•	○	•	○		



vaciado de punta  $\geq \varnothing 9,400$  • entrada cónica • para taladros pasantes con avellanados viejos forma H, J, K según DIN 75 Parte 2 (Edición 04, 1968 retrocedida), versión media y fina • para tornillos según DIN 84, 912, 6912 • f se rige por el dia. pequeño • vc se basa en el diámetro grande



d1 h8 mm	d2 h9 mm	S	l1 mm	l2 mm	l4 mm	para rosca
9,400	5,300	MK-1	162,000	81,000	16,000	M 5
14,500	9,500	MK-2	212,000	114,000	22,000	M 8
19,000	13,000	MK-2	233,000	135,000	28,000	M12
20,000	14,000	MK-2	238,000	140,000	28,000	M12
23,000	15,000	MK-2	253,000	155,000	30,000	M14
25,000	17,000	MK-3	281,000	160,000	33,000	M16
28,000	19,000	MK-3	291,000	170,000	36,000	M18
29,000	20,000	MK-3	296,000	175,000	36,000	M18
31,000	21,000	MK-3	301,000	180,000	39,000	M20
33,000	23,000	MK-4	334,000	185,000	39,000	M20



## Brocas de centrar sin plano

### Nº artículo 83100



P	M	K	N	S	H
•	○	•	•	○	



vaciado de punta  $\geq \varnothing 2,000$  • entrada cónica • sin avellanado de protección • para centrajes según DIN 332 parte 1, forma A •  $d1 \leq 0,8$  mm: con una punta

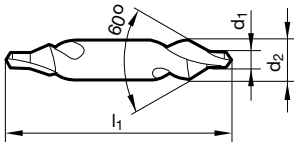
### Nº artículo 84450



P	M	K	N	S	H
•	○	•	•	○	



vaciado de punta  $\geq \varnothing 2,000$  • entrada cónica • sin avellanado de protección • para centrajes según DIN 332 parte 1, forma A •  $d1 \leq 0,8$  mm: con una punta • más resistencia al desgaste



d1 mm	d2 h8 mm	l1 mm	d1 mm	d2 h8 mm	l1 mm
0,500	3,150	25,000	10,000	25,000	100,000
0,800	3,150	25,000	12,500	31,500	125,000
1,000	3,150	31,500			
1,250	3,150	31,500			
1,600	4,000	35,500			
2,000	5,000	40,000			
2,500	6,300	45,000			
3,150	8,000	50,000			
4,000	10,000	56,000			
5,000	12,500	63,000			
6,300	16,000	71,000			
8,000	20,000	80,000			

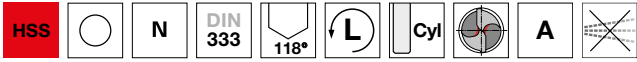


## Brocas de centrar sin plano

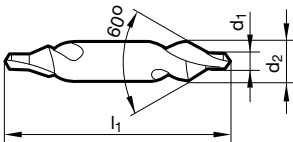
Nº artículo 83105



P	M	K	N	S	H
•	○	•	•	○	



vaciado de punta  $\geq \varnothing 2,000$  • entrada cónica • sin avellanado de protección • para centrados según DIN 332 parte 1, forma A •  $d1 \leq 0,8$  mm: con una punta



d1 mm	d2 h8 mm	l1 mm	d1 mm	d2 h8 mm	l1 mm
0,500	3,150	25,000	2,500	6,300	45,000
0,800	3,150	25,000	3,150	8,000	50,000
1,000	3,150	31,500	4,000	10,000	56,000
1,250	3,150	31,500			
1,600	4,000	35,500			
2,000	5,000	40,000			



## Brocas de centrar sin plano

### Nº artículo 83000



P	M	K	N	S	H
•	○	•	•	○	



vaciado de punta  $\geq \varnothing 2,000$  • entrada cónica • alineación correcta de las puntas de los granos • para taladros de centrado según DIN 332 Parte 1, Forma R •  $d1 \leq 0,8$  mm: con una punta

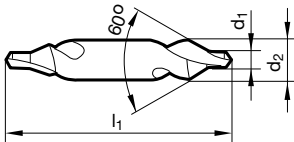
### Nº artículo 84448



P	M	K	N	S	H
•	○	•	•	○	



vaciado de punta  $\geq \varnothing 2,000$  • entrada cónica • alineación correcta de las puntas de los granos • para taladros de centrado según DIN 332 Parte 1, Forma R •  $d1 \leq 0,8$  mm: con una punta • más resistencia al desgaste



d1 mm	d2 h8 mm	l1 mm	d1 mm	d2 h8 mm	l1 mm
0,500	3,150	25,000	10,000	25,000	100,000
0,800	3,150	25,000			
1,000	3,150	31,500			
1,250	3,150	31,500			
1,600	4,000	35,500			
2,000	5,000	40,000			
2,500	6,300	45,000			
3,150	8,000	50,000			
4,000	10,000	56,000			
5,000	12,500	63,000			
6,300	16,000	71,000			
8,000	20,000	80,000			



## Brocas de centrar sin plano

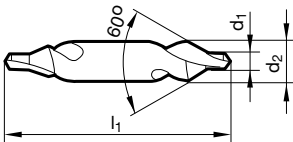
Nº artículo 83300



P	M	K	N	S	H
•	○	•	•	○	



vaciado de punta  $\geq \varnothing 2,000$  • entrada cónica • con refuerzo contra roturas • sin avellanado de protección • hendidura en el paso de avellanado a taladrado para más alojamiento de lubricante • para centrados según DIN 332 parte 1, forma A



d1 mm	d2 h8 mm	l1 mm	d1 mm	d2 h8 mm	l1 mm
1,000	3,150	31,500	4,000	10,000	56,000
1,250	3,150	31,500	5,000	12,500	63,000
1,600	4,000	35,500	6,300	16,000	71,000
2,000	5,000	40,000	8,000	20,000	80,000
2,500	6,300	45,000	10,000	25,000	100,000
3,150	8,000	50,000			



## Brocas de centrar sin plano

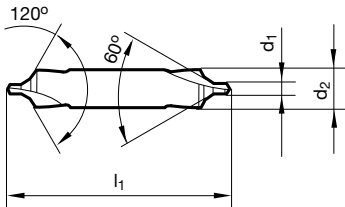
Nº artículo 83200



P	M	K	N	S	H
•	○	•	•	○	



vaciado de punta  $\geq \varnothing 2,000$  • entrada cónica • según DIN 332, página 1, forma B • con avellanado de protección 120°



d1 mm	d2 h8 mm	l1 mm	d1 mm	d2 h8 mm	l1 mm
1,000	4,000	35,500	4,000	14,000	67,000
1,250	5,000	40,000	5,000	18,000	75,000
1,600	6,300	45,000	6,300	20,000	80,000
2,000	8,000	50,000	8,000	25,000	100,000
2,500	10,000	56,000	10,000	31,500	125,000
3,150	11,200	60,000			



## Brocas de centrar sin plano

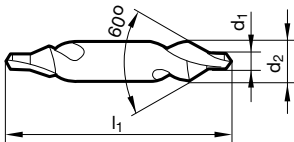
Nº artículo 83005



P	M	K	N	S	H
•	○	•	•	○	



vaciado de punta  $\geq \varnothing 2,000$  • entrada cónica • alineación correcta de las puntas de los granos • para taladros de centrado según DIN 332 Parte 1, Forma R •  $d1 \leq 0,8$  mm: con una punta



d1 mm	d2 h8 mm	l1 mm	d1 mm	d2 h8 mm	l1 mm
1,000	3,150	31,500			
1,250	3,150	31,500			
1,600	4,000	35,500			
2,000	5,000	40,000			
3,150	8,000	50,000			
4,000	10,000	56,000			



## Brocas de centrar sin plano

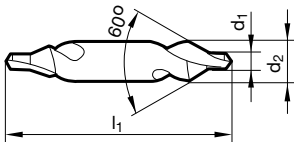
Nº artículo 83110



P	M	K	N	S	H
•	○	•	•	○	



vaciado de punta  $\geq \varnothing 2,000$  • entrada cónica • brocas de centrar, extra largas • sin avellanado de protección • para taladros de centrar similares DIN 332 Hoja 1, Forma A • para puntos de centrar situados más bajos



d1 mm	d2 h8 mm	l1 mm	d1 mm	d2 h8 mm	l1 mm
1,000	4,000	120,000			
1,600	5,000	120,000			
2,000	6,000	120,000			
2,500	8,000	120,000			
3,150	10,000	120,000			





## Brocas de centrar sin plano

Nº artículo 83101

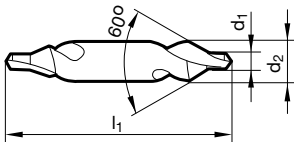


P	M	K	N	S	H
•	•	•	•	○	



vaciado de punta  $\geq \varnothing 2,000$  • entrada cónica • sin avellanado de protección • más resistencia al desgaste • para centrages según DIN 332 parte 1, forma A

materiales con una dureza superior a 800 N/mm<sup>2</sup> • aceros inox y resistentes al ácido y al calor, aceros CrNi



d1 mm	d2 h8 mm	l1 mm	d1 mm	d2 h8 mm	l1 mm
1,000	3,150	31,500			
1,600	4,000	35,500			
2,000	5,000	40,000			
2,500	6,300	45,000			
3,150	8,000	50,000			
4,000	10,000	56,000			



## Brocas de centrar sin plano

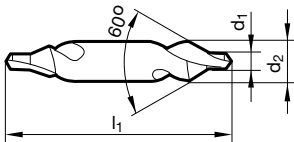
Nº artículo 83102



P	M	K	N	S	H
•	•	•	○	•	



vaciado de punta  $\geq \varnothing 2,000$  • entrada cónica • sin avellanado de protección • para centrajes según DIN 332 parte 1, forma A •  $d1 \leq 0,8$  mm: con una punta



d1 mm	d2 h8 mm	l1 mm	d1 mm	d2 h8 mm	l1 mm
0,500	3,150	25,000	3,150	8,000	50,000
1,000	3,150	31,500	4,000	10,000	56,000
1,250	3,150	31,500			
1,600	4,000	35,500			
2,000	5,000	40,000			
2,500	6,300	45,000			



## Brocas de centrar sin plano

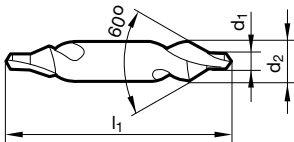
Nº artículo 83370



<b>P</b>	<b>M</b>	<b>K</b>	<b>N</b>	<b>S</b>	<b>H</b>
○	○	○	○	○	○



vaciado de punta  $\geq \varnothing 2,000$  • entrada cónica • sin avellanado de protección • para centrajes según DIN 332 parte 1, forma A  
 •  $d1 \leq 0,8$  mm: con una punta  
 el tipo de material universales



d1 mm	d2 h8 mm	l1 mm	d1 mm	d2 h8 mm	l1 mm
0,500	3,150	25,000	2,500	6,300	45,000
0,800	3,150	25,000	3,150	8,000	50,000
1,000	3,150	31,500	4,000	10,000	56,000
1,250	3,150	31,500	5,000	12,500	63,000
1,600	4,000	35,500	6,300	16,000	71,000
2,000	5,000	40,000			



## Brocas de centrar con plano

### Nº artículo 83600



P	M	K	N	S	H
•	○	•	•	○	



vaciado de punta  $\geq \varnothing 2,000$  • entrada cónica • para centrajes según DIN 332 parte 1, forma A • sin avellanado de protección

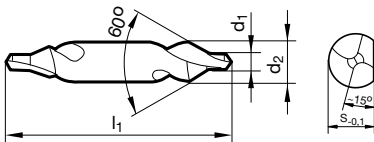
### Nº artículo 83500



P	M	K	N	S	H
•	○	•	•	○	



vaciado de punta  $\geq \varnothing 2,000$  • entrada cónica • alineación correcta de las puntas de los granos • para taladros de centrado según DIN 332 Parte 1, Forma R



d1 mm	d2 h8 mm	l1 mm	S mm	d1 mm	d2 h8 mm	l1 mm	S mm
1,600	4,000	35,500	3,250	6,300	16,000	71,000	14,000
2,000	5,000	40,000	4,200	8,000	20,000	80,000	17,900
2,500	6,300	45,000	5,350	10,000	25,000	100,000	22,500
3,150	8,000	50,000	6,950				
4,000	10,000	56,000	8,400				
5,000	12,500	63,000	10,950				



## Brocas de centrar con plano

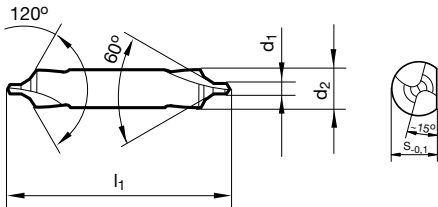
Nº artículo 83700



P	M	K	N	S	H
•	○	•	•	○	



vaciado de punta  $\geq \varnothing 2,000$  • entrada cónica • según DIN 332, página 1, forma B • con avellanado de protección 120°



d1 mm	d2 h8 mm	l1 mm	S mm	d1 mm	d2 h8 mm	l1 mm	S mm
1,600	6,300	45,000	5,350	6,300	20,000	80,000	17,900
2,000	8,000	50,000	6,950	8,000	25,000	100,000	22,500
2,500	10,000	56,000	8,400				
3,150	11,200	60,000	10,000				
4,000	14,000	67,000	12,650				
5,000	18,000	75,000	16,400				





# HARTNER

Precision Cutting Tools

## HTAS. DE AVELLANAR & PARA REBARBAR

fabricada en HSS, HSS-E, metal duro  
brillante y recubierta



Htas. de avellanar  
& para rebarbar

P	M	K	N	S	H	Norma	Tipo	Material de corte	Acabado	Dirección de corte	Forma del mango	Angulo / forma	d1/mm	Nº artículo	Página
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## Avellanadores cónicos 90°



•	○	•	•	○		DIN 335		<b>HSS</b>	○	derecha	cil.	C	4,300 - 31,000	<b>88200</b>	382
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## Avellanadores cónicos 90°, en espiral



•	•	•	○	○		DIN 335		<b>HSS-E</b>	Ⓜ	derecha	cil.	C	6,300 - 31,000	<b>88201</b>	383
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## Juegos de avellanadores cónicos 90°



•	○	•	•	○		DIN 335		<b>HSS</b>	○	derecha	cil.	C		<b>88021</b>	384
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## Juegos de avellanadores cónicos 90°, en espiral



•	•	•	○	○		DIN 335		<b>HSS-E</b>	Ⓜ	derecha	cil.	C		<b>88022</b>	385
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P	M	K	N	S	H	Norma	Tipo	Material de corte	Acabado	Dirección de corte	Forma del mango	Angulo / forma	d1/mm	Nº artículo	Página
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## Desbarbador



•	•	•	○	•	○	Norma de fáb.	TS 100 EG	MDI	○	derecha	cil.			84100	386
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•	•	•	○	•	○	Norma de fáb.	TS 100 EG	MDI	○	derecha	HA			84101	387
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## Rebarbadores 90°



•	•	•	○	•	○	Norma de fáb.	TS 100 VR	MDI	Ⓜ	derecha	HA	3,000 - 12,000		80495	388
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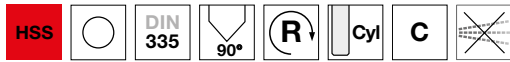


## Avellanadores cónicos 90°

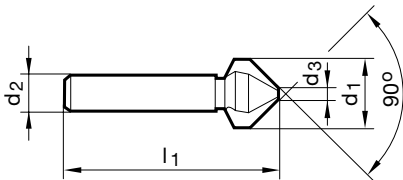
Nº artículo 88200



P	M	K	N	S	H
•	○	•	•	○	



destalonado radialmente • 3 cortes



d1 mm	d2 h9 mm	d3 mm	l1 mm	Z	Código N°
4,300	4,000	1,300	40,000	3	4,300
5,000	4,000	1,500	40,000	3	5,000
5,300	4,000	1,500	40,000	3	5,300
5,800	5,000	1,500	45,000	3	5,800
6,000	5,000	1,500	45,000	3	6,000
6,300	5,000	1,500	45,000	3	6,300
7,000	6,000	1,800	50,000	3	7,000
7,300	6,000	1,800	50,000	3	7,300
8,000	6,000	2,000	50,000	3	8,000
8,300	6,000	2,000	50,000	3	8,300
9,400	6,000	2,200	50,000	3	9,400
10,000	6,000	2,500	50,000	3	10,000
10,400	6,000	2,500	50,000	3	10,400
11,500	8,000	2,800	56,000	3	11,500
12,400	8,000	2,800	56,000	3	12,400
13,400	8,000	2,900	56,000	3	13,400
15,000	10,000	3,200	60,000	3	15,000
16,500	10,000	3,200	60,000	3	16,500
19,000	10,000	3,500	63,000	3	19,000
20,500	10,000	3,500	63,000	3	20,500
23,000	10,000	3,800	67,000	3	23,000
25,000	10,000	3,800	67,000	3	25,000
26,000	10,000	3,800	67,000	3	26,000
28,000	12,000	4,000	71,000	3	28,000
30,000	12,000	4,200	71,000	3	30,000
31,000	12,000	4,200	71,000	3	31,000

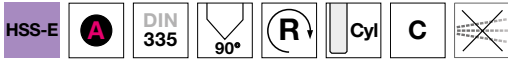


## Avellanadores cónicos 90°

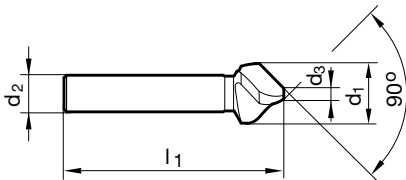
Nº artículo 88201



P	M	K	N	S	H
•	•	•	○	○	



3 cortes convexos desiguales • condiciones de corte con poca vibración • para avellanados redondos y sin vibración • se necesita una fuerza de avance mucho menor • aplicación universal • diám. reclinable más pequeño, véase «Recomendaciones de empleo para avellanador cónico»



d1 mm	d2 h9 mm	d3 mm	l1 mm	Z	Código N°
6,300	5,000	1,500	45,000	3	6,300
8,000	6,000	2,000	50,000	3	8,000
8,300	6,000	2,000	50,000	3	8,300
10,000	6,000	2,500	50,000	3	10,000
10,400	6,000	2,500	50,000	3	10,400
11,500	8,000	2,800	56,000	3	11,500
12,400	8,000	2,800	56,000	3	12,400
15,000	10,000	3,200	60,000	3	15,000
16,500	10,000	3,200	60,000	3	16,500
19,000	10,000	3,500	63,000	3	19,000
20,500	10,000	3,500	63,000	3	20,500
23,000	10,000	3,800	67,000	3	23,000
25,000	10,000	3,800	67,000	3	25,000
31,000	12,000	4,200	71,000	3	31,000



# HARTNER

## Avellanadores cónicos 90°

Nº artículo 88021

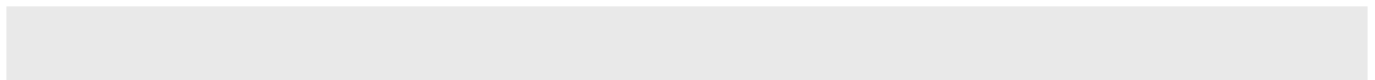


P	M	K	N	S	H
•	○	•	•	○	



juego en caja, compuesto de Nº art. 88200 • destalonado radialmente • 3 cortes

d1 mm	mm	Cantidad/juego	Código Nº
6,30-20,50	6,3/8,3/10,4/12,4/16,5/20,5	6	7,000

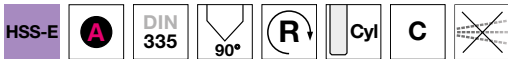




## Avellanadores cónicos 90°

Nº artículo 88022

P	M	K	N	S	H
•	•	•	○	○	



juego en caja, compuesto de Nº art. 88201 • 3 cortes convexos desiguales • condiciones de corte con poca vibración • para avellanados redondos y sin vibración • se necesita una fuerza de avance mucho menor • aplicación universal • diám. reclinable más pequeño, véase «Recomendaciones de empleo para avellanador cónico»

d1 mm	mm	Cantidad/juego	Código Nº
6,30-20,50	6,3/8,3/10,4/12,4/16,5/20,5	6	1,000





## Desbarbador

Nº artículo 84100

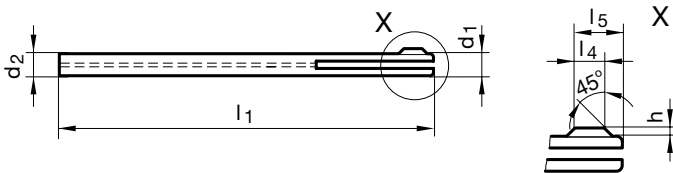


P	M	K	N	S	H
•	•	•	○	•	○



con refrigeración interna • con mango cilíndrico para el agarre con pinzas

rebarbado interno y externo • aplicable universalmente en máquinas herramientas, fresadoras, tornos y robots



Campo de dia.	d1 mm	d2 mm	l1 mm	l4 mm	l5 mm	h mm	Código Nº
1,91-2,15	1,900	1,900	80,000	1,000	2,050	0,350	2,000
2,16-2,40	2,100	2,100	80,000	1,500	2,600	0,400	2,250
2,41-2,70	2,400	2,400	80,000	1,500	2,900	0,400	2,500
2,71 -2,90	2,600	2,600	90,000	1,500	2,950	0,450	2,750
2,91-3,25	2,900	2,900	90,000	2,000	3,650	0,450	3,000
3,26-3,60	3,200	3,200	90,000	2,000	3,800	0,600	3,500
3,61-4,25	3,600	3,600	90,000	2,000	4,100	0,700	4,000
4,26-4,75	4,200	4,200	90,000	2,500	4,600	0,700	4,500
4,76-5,30	4,700	4,700	100,000	2,500	4,850	0,750	5,000
5,31-5,80	5,200	5,200	100,000	2,500	4,850	0,750	5,500
5,81-6,20	5,600	5,600	110,000	3,000	5,800	0,800	6,000
6,21-6,70	6,000	6,000	110,000	3,000	5,900	0,900	6,500
6,71-7,10	6,500	6,500	110,000	3,000	5,850	0,850	7,000
7,11-7,60	6,900	6,900	110,000	3,500	6,950	0,950	7,500
7,61-8,05	7,300	7,300	110,000	3,500	7,000	1,000	8,000



# HARTNER

## Desbarbador

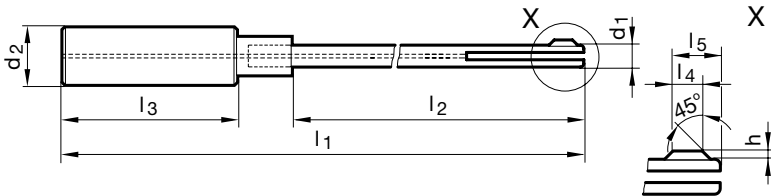
Nº artículo 84101



P	M	K	N	S	H
•	•	•	○	•	○



para portaherramientas hidráulicos y térmicos • con mango según DIN 6535 • con refrigeración interna  
 rebarbado interno y externo • aplicable universalmente en máquinas herramientas, fresadoras, tornos y robots



Campo de dia.	d1 mm	d2 mm	l1 mm	l2 mm	l3 mm	l4 mm	l5 mm	h mm	Código Nº
1,91 -2,15	1,900	6,000	120,000	69,000	36,000	1,000	2,050	0,350	2,000
2,16 -2,40	2,100	6,000	120,000	69,000	36,000	1,500	2,600	0,400	2,250
2,41 -2,70	2,400	6,000	120,000	69,000	36,000	1,500	2,900	0,400	2,500
2,71 -2,90	2,600	6,000	130,000	79,000	36,000	1,500	2,950	0,450	2,750
2,91 -3,25	2,900	6,000	130,000	79,000	36,000	2,000	3,650	0,450	3,000
3,26 -3,60	3,200	10,000	135,000	80,000	40,000	2,000	3,800	0,600	3,500
3,61 -4,25	3,600	10,000	135,000	80,000	40,000	2,000	4,100	0,700	4,000
4,26 -4,75	4,200	10,000	135,000	80,000	40,000	2,500	4,600	0,700	4,500
4,76 -5,30	4,700	10,000	145,000	80,000	40,000	2,500	4,850	0,750	5,000
5,31 -5,80	5,200	10,000	145,000	90,000	40,000	2,500	4,850	0,750	5,500
5,81 -6,20	5,600	10,000	155,000	90,000	40,000	3,000	5,800	0,800	6,000
6,21 -6,70	6,000	16,000	165,000	102,000	48,000	3,000	5,900	0,900	6,500
6,71 -7,10	6,500	16,000	165,000	102,000	48,000	3,000	5,850	0,850	7,000
7,11 -7,60	6,900	16,000	165,000	102,000	48,000	3,500	6,950	0,950	7,500
7,61 -8,05	7,300	16,000	165,000	102,000	48,000	3,500	7,000	1,000	8,000



## Rebarbadores 90°

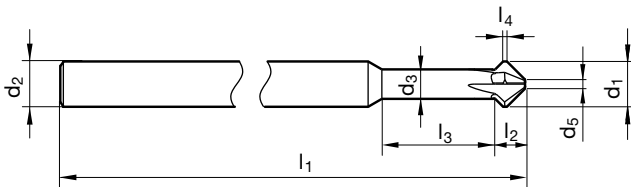
N° artículo 80495



P	M	K	N	S	H
•	•	•	○	•	○



con mango según DIN 6535 • para portaherramientas hidráulicos y térmicos  
 rebarbado interno y externo • rebarbado de taladros y conturas



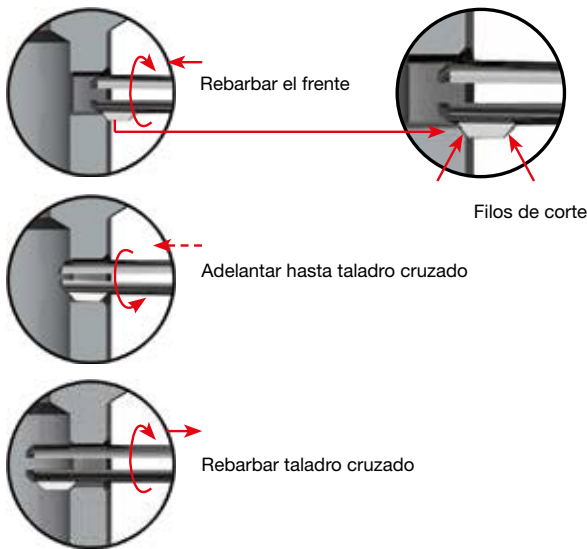
d1 mm	d2 h6 mm	d3 mm	d5 mm	l1 mm	l2 mm	l3 mm	l4 mm	Z	Código N°
3,000	4,000	2,200	0,600	75,000	2,10	11,400	0,500	4	3,000
4,000	4,000	2,900	0,800	75,000	2,70	15,000	0,500	4	4,000
5,000	5,000	3,900	1,000	75,000	3,00	18,000	0,500	4	5,000
6,000	6,000	3,900	1,200	100,000	3,90	18,200	0,500	4	6,000
8,000	6,000	6,000	1,600	100,000	4,70	55,000	0,500	4	8,000
10,000	6,000	6,000	2,000	100,000	6,50	55,000	0,500	4	10,000
12,000	6,000	6,000	2,400	100,000	8,30	55,500	0,500	4	12,000





## Desbarbador en metal duro TS 100 EG

### Operación



### Paso a paso:

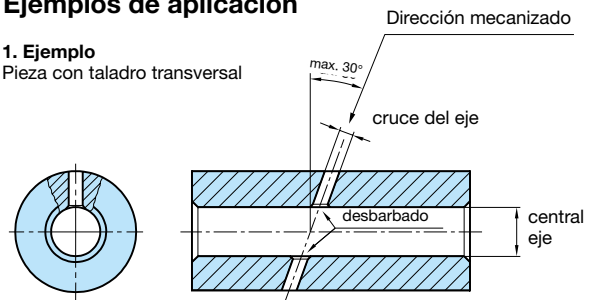
Chaflanderos para interiores y exteriores en metal duro TS 100 EG es una fácil y económica alternativa a las costosas operaciones manuales. Una única herramienta para todos los pasos del mecanizado.

Rango de Ø (mm)	v <sub>c</sub> m/min	f <sub>u</sub> (mm)
< Ø 4	8 - 10	0,1 - 0,2
Ø 4 - < Ø 6	10 - 14	0,1 - 0,2
6 - Ø 8	14 - 20	0,1 - 0,2

### Ejemplos de aplicación

#### 1. Ejemplo

Pieza con taladro transversal

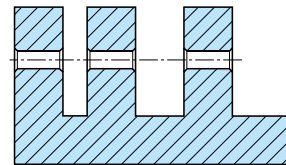


En piezas con taladro transversal tener en cuenta:

- el diámetro del taladro transversal debe ser máximo un 35% del diámetro del taladro central
- El diámetro del agujero cruzado debe ser 40% más largo que la longitud de corte. l<sub>4</sub>

#### 2. Ejemplo

Pieza de trabajo con corte multi-interrumpido



### Aplicación universal:

El nuevo sistema de desbarbadores permiten trabajar tanto en agujeros cruzados al eje como en trabajar con corte multiinterrumpido y produce chaflandos y avellanados de gran calidad tanto en la caras como en el interior de la pieza.

### Importante:

Por favor tenga en cuenta que estos valores son orientativos. Se pueden adaptar en más o menos.

## Rebarbadores de avance y retroceso TS 100 VR

### Valores de corte rebarbadores de avance y retroceso TS 100 VR

Grupo de material	Tenacidad dureza MPa (N/mm <sup>2</sup> )	v <sub>c</sub> (m/min)	Nº de avance
Aceros	< 850	120 - 200	71
	850-1200	100 - 180	71
	> 1200	80 - 140	71
Aceros endurecidos	< 54 HRC	60 - 120	71
	54-60 HRC	40 - 80	71
Aceros inox. y resist. al ácido	< 850	80 - 120	71
Aleaciones de Níquel	< 1300	30 - 60	71
Aleaciones de Titanio	< 1300	50 - 100	71
Fundición	< 240 HB30	120 - 180	72
	> 240 HB30	100 - 160	72
Aleac. past. de Al < 3% Si		150 - 250	72
Aleac. fund. de Al > 3% Si		100 - 200	72
Aleaciones de Magnesio		150 - 250	72
Aleaciones no ferríticas	< 850	30 - 200	72

### Código de avance (mm/rev.)

Ø	71	72
≤ 3,00	0,060	0,080
4,00	0,100	0,125
5,00	0,100	0,125
6,30	0,125	0,160
8,00	0,160	0,200
10,00	0,200	0,250
12,50	0,200	0,250

### Importante:

Por favor tenga en cuenta que estos valores son orientativos. Se pueden adaptar en más o menos.





# HARTNER

Precision Cutting Tools

## MULTIPLEX MULTIPLEX HPC

Broca con placa intercambiable y canal de refrigeración interior  
Placas intercambiables en HSS-E, HSS-E-PM,  
metal duro, con recubrimiento



Multiplex  
Multiplex HPC

P	M	K	N	S	H	Norma	Tipo	Material de corte	Acabado	Dirección de corte	Refrigeración interna	Profundidad	d1/mm	Nº artículo	Página
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## Soporte Multiplex con mango cilíndrico



						Norma de fáb.		Ni		derecha	con	3xD		<b>86612</b>	399
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						Norma de fáb.		Ni		derecha	con	5xD		<b>86622</b>	400
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						Norma de fáb.		Ni		derecha	con	7xD		<b>86624</b>	401
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						Norma de fáb.		Ni		derecha	con			<b>86628</b>	402
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## Soporte Multiplex con cono de compensación cónico



						Norma de fáb.		Ni		derecha	con			<b>86630</b>	404
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						Norma de fáb.		Ni		derecha	con			<b>86650</b>	405
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						Norma de fáb.		B		derecha	con			<b>86670</b>	406
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						Norma de fáb.		B		derecha	con			<b>86680</b>	407
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						Norma de fáb.		Ni		derecha	con			<b>86678</b>	408
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P	M	K	N	S	H	Norma	Tipo	Material de corte	Acabado	Dirección de corte	Refrigeración interna	Profundidad	d1/mm	N° artículo	Página
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## Placas intercambiables

	•	○	•	○		Norma de fáb.		<b>HSS-E-PM</b>	<b>T</b>	derecha		10,000 - 25,000		<b>86602</b>	411
	○	•	○	•		Norma de fáb.		<b>HSS-E</b>	<b>T</b>	derecha		25,000 - 102,000		<b>86605</b>	412
	•	○	•	○		Norma de fáb.		<b>HSS-E-PM</b>	<b>F</b>	derecha		10,000 - 25,000		<b>86608</b>	413
	•	○	•	○		Norma de fáb.		<b>HSS-E-PM</b>	<b>A</b>	derecha		25,000 - 210,000		<b>86609</b>	414
	•	○	•	○		Norma de fáb.		<b>HSS-E-PM</b>	<b>A</b>	derecha		10,000 - 65,000		<b>86611</b>	415
	•	○	•	○		Norma de fáb.		<b>MDI</b>	<b>F</b>	derecha		10,000 - 35,000		<b>86701</b>	417
	•	○	•	○		Norma de fáb.		<b>MDI</b>	<b>F</b>	derecha		10,000 - 35,000		<b>86702</b>	418
	•	○	•	○		Norma de fáb.		<b>MDI</b>	<b>T</b>	derecha		10,000 - 35,000		<b>86708</b>	419
	•	○	•	○		Norma de fáb.		<b>MDI</b>	<b>T</b>	derecha		9,920 - 35,000		<b>86709</b>	420
			•			Norma de fáb.		<b>MDI</b>	○	derecha		10,000 - 65,000		<b>86711</b>	421

P	M	K	N	S	H	Norma	Tipo	Material de corte	Acabado	Dirección de corte	Refrigeración interna	Profundidad	d1/mm	Nº artículo	Página
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## Alimentadores de refrigeración



Norma de fáb.

86690 422

## Tubo alimentador para refrigerante



Norma de fáb.



82571 423

## acoplamientos de cierre rápido



Norma de fáb.

82578 424

## Atornillador Torx



Norma de fáb.

86842 425

P	M	K	N	S	H	Norma	Tipo	Material de corte	Acabado	Dirección de corte	Refrigeración interna	Profundidad	d1/mm	N° artículo	Página
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## Transportador de refrigerante para Multiplex



Norma de fáb.

Ⓑ

86691

426



Norma de fáb.

Ⓑ

86692

427



Norma de fáb.

Ⓑ

86693

428



Norma de fáb.

Ⓑ

86694

429

## Union para mandril de refrigeracion



Norma de fáb.

Ⓑ

86699

430

P	M	K	N	S	H	Norma	Tipo	Material de corte	Acabado	Dirección de corte	Refrigeración interna	Profundidad	d1/mm	N° artículo	Página
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## Soporte Multiplex HPC



						Norma de fáb.	HPC		Ⓝ	derecha	con	1xD	11,000 - 36,005	<b>86681</b>	432
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						Norma de fáb.	HPC		Ⓝ	derecha	con	1,5xD	11,000 - 39,005	<b>86682</b>	433
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						Norma de fáb.	HPC		Ⓝ	derecha	con	3xD	11,000 - 39,005	<b>86683</b>	435
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						Norma de fáb.	HPC		Ⓝ	derecha	con	5xD	11,000 - 39,000	<b>86684</b>	437
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						Norma de fáb.	HPC		Ⓝ	derecha	con	7xD	11,000 - 31,505	<b>86685</b>	439
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						Norma de fáb.	HPC		Ⓝ	derecha	con	10xD	11,000 - 31,505	<b>86686</b>	441
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## Plaquitas intercambiables Multiplex HPC



○	○	○	○	○	○	Norma de fáb.	HPC	<b>MDI</b>	Ⓜ	derecha			11,000 - 40,000	<b>86721</b>	443
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●	○	○	○	○	○	Norma de fáb.	HPC	<b>MDI</b>	Ⓜ	derecha			11,000 - 40,000	<b>86722</b>	446
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○	○	●	○	○	○	Norma de fáb.	HPC	<b>MDI</b>	Ⓜ	derecha			11,000 - 40,000	<b>86723</b>	449
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P	M	K	N	S	H	Norma	Tipo	Material de corte	Acabado	Dirección de corte	Refrigeración interna	Profundidad	d1/mm	Nº artículo	Página
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## Plaquitas intercambiables Multiplex HPC



			•			Norma de fáb.	HPC	MDI	○	derecha			11,000 - 40,000	86724	452
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○	•			○	○	Norma de fáb.	HPC	MDI	Ⓜ	derecha			11,000 - 40,000	86725	455
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•						Norma de fáb.		MDI	Ⓜ	derecha			12,000 - 40,000	86729	458
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## Plaquitas para avellanar Multiplex HPC



○		•				Norma de fáb.		MDI	Ⓜ	neutral			52,020 - 93,080	86726	459
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		•				Norma de fáb.		MDI	○	derecha			52,020 - 93,080	86727	459
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•	○	○		○	○	Norma de fáb.		MDI	Ⓜ	derecha			52,020 - 93,080	86728	460
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## Tornillos tensores para porta Multiplex HPC 1,5-10xD



						Norma de fáb.								86843	461
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## Llave dinamométrica



						Norma de fáb.								86844	462
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P	M	K	N	S	H	Norma	Tipo	Material de corte	Acabado	Dirección de corte	Refrigeración interna	Profundidad	d1/mm	Nº artículo	Página
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## Adaptador hexagonal



Norma de fáb.

**86845** 463

## Tornillos tensores para porta de avellanar Multiplex HPC



Norma de fáb.

**86846** 464

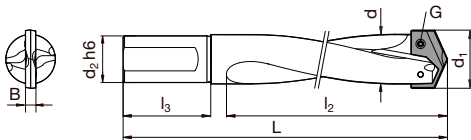


## Soporte Multiplex con mango cilíndrico

Nº artículo 86612



niquelado • Portas para plaquitas intercambiables. El porta con mango cilíndrico tiene refrigeración interna. Amplias ranuras garantizan un desalajo de la viruta óptimo. Fácil cambio de las plaquitas por tornillos tensores. No es necesario ajustar las plaquitas. Con la broca de plaquitas básicamente se debe taladrar en directo. Para retaladrar taladros de fundición y para abrir agujeros pretaladrados, esta herramienta no es adecuada. Tornillos tensores Nº art. 86807 incluidos.



d1 mm	d mm	d2 h6 mm	L mm	l2 mm	l3 mm	B mm	G	Código Nº
10,00-11,7	9,500	20,000	108,000	50,000	40,000	2,500	86807 2.000	<b>9,500</b>
11,71-13,4	11,500	20,000	109,000	53,000	40,000	2,500	86807 2.000	<b>11,500</b>
13,41-16,4	13,000	20,000	116,000	60,000	40,000	3,500	86807 2.500	<b>13,000</b>
16,41-18,9	16,000	20,000	118,000	65,000	40,000	3,500	86807 2.501	<b>16,000</b>
18,91-22,4	18,500	20,000	124,000	73,000	40,000	4,000	86807 3.000	<b>18,500</b>
22,41-25,4	22,000	20,000	127,000	78,000	40,000	4,000	86807 3.001	<b>22,000</b>
25,41-29,0	24,000	32,000	178,000	105,000	60,000	5,000	86807 3.500	<b>24,000</b>
29,01-35,0	28,000	32,000	178,000	108,000	60,000	5,000	86807 3.500	<b>28,000</b>
35,01-45,0	34,000	32,000	223,000	152,000	60,000	7,000	86807 4.001	<b>34,000</b>
45,01-55,0	44,000	40,000	233,000	152,000	70,000	7,000	86807 4.001	<b>44,000</b>
55,01-65,0	54,000	40,000	233,000	152,000	70,000	7,000	86807 4.001	<b>54,000</b>

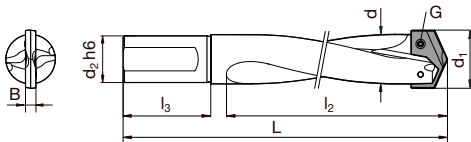


## Soporte Multiplex con mango cilíndrico

Nº artículo 86622



niquelado • Portas para plaquitas intercambiables. El porta con mango cilíndrico tiene refrigeración interna. Amplias ranuras garantizan un desalajo de la viruta óptimo. Fácil cambio de las plaquitas por tornillos tensores. No es necesario ajustar las plaquitas. Con la broca de plaquitas básicamente se debe taladrar en directo. Para retaladrar taladros de fundición y para abrir agujeros pretaladrados, esta herramienta no es adecuada. Tornillos tensores Nº art. 86807 incluidos.



d1 mm	d mm	d2 h6 mm	L mm	l2 mm	l3 mm	B mm	G	Código Nº
10,00-11,7	9,500	20,000	140,000	83,000	40,000	2,500	86807 2.000	<b>9,500</b>
11,71-13,4	11,500	20,000	150,000	94,000	40,000	2,500	86807 2.000	<b>11,500</b>
13,41-16,4	13,000	20,000	160,000	104,000	40,000	3,500	86807 2.500	<b>13,000</b>
16,41-18,9	16,000	20,000	170,000	117,000	40,000	3,500	86807 2.501	<b>16,000</b>
18,91-22,4	18,500	20,000	180,000	129,000	40,000	4,000	86807 3.000	<b>18,500</b>
22,41-25,4	22,000	20,000	180,000	131,000	40,000	4,000	86807 3.001	<b>22,000</b>
25,41-29,0	24,000	32,000	240,000	166,000	60,000	5,000	86807 3.500	<b>24,000</b>
29,01-35,0	28,000	32,000	240,000	170,000	60,000	5,000	86807 3.500	<b>28,000</b>
35,01-45,0	34,000	32,000	280,000	210,000	60,000	7,000	86807 4.001	<b>34,000</b>
45,01-55,0	44,000	40,000	290,000	210,000	70,000	7,000	86807 4.001	<b>44,000</b>
55,01-65,0	54,000	40,000	290,000	210,000	70,000	7,000	86807 4.001	<b>54,000</b>



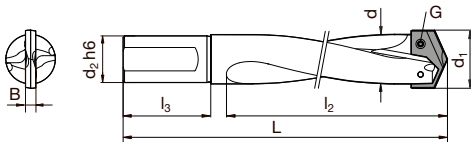
# HARTNER

## Soporte Multiplex con mango cilíndrico

Nº artículo 86624



niquelado • Portas para plaquitas intercambiables. El porta con mango cilíndrico tiene refrigeración interna. Amplias ranuras garantizan un desalajo de la viruta óptimo. Fácil cambio de las plaquitas por tornillos tensores. No es necesario ajustar las plaquitas. Con la broca de plaquitas básicamente se debe taladrar en directo. Para retaladrar taladros de fundición y para abrir agujeros pretaladrados, esta herramienta no es adecuada. Tornillos tensores Nº art. 86807 incluidos.



d1 mm	d mm	d2 h6 mm	L mm	l2 mm	l3 mm	B mm	G	Código Nº
10,00-11,7	9,500	20,000	180,000	123,000	40,000	2,500	86807 2.000	<b>9,500</b>
11,71-13,4	11,500	20,000	190,000	134,000	40,000	2,500	86807 2.000	<b>11,500</b>
13,41-16,4	13,000	20,000	210,000	155,000	40,000	3,500	86807 2.500	<b>13,000</b>
16,41-18,9	16,000	20,000	220,000	168,000	40,000	3,500	86807 2.501	<b>16,000</b>
18,91-22,4	18,500	20,000	250,000	199,000	40,000	4,000	86807 3.000	<b>18,500</b>
22,41-25,4	22,000	20,000	250,000	201,000	40,000	4,000	86807 3.001	<b>22,000</b>
25,41-29,0	24,000	32,000	320,000	246,000	60,000	5,000	86807 3.500	<b>24,000</b>
29,01-35,0	28,000	32,000	320,000	250,000	60,000	5,000	86807 3.500	<b>28,000</b>
35,01-45,0	34,000	32,000	380,000	310,000	60,000	7,000	86807 4.001	<b>34,000</b>
45,01-55,0	44,000	40,000	390,000	310,000	70,000	7,000	86807 4.001	<b>44,000</b>
55,01-65,0	54,000	40,000	390,000	310,000	70,000	7,000	86807 4.001	<b>54,000</b>

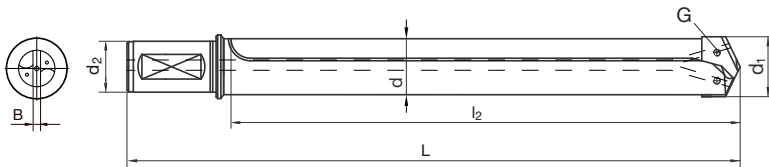


## Soporte Multiplex con mango cilíndrico

Nº artículo 86628



niquelado • Porta para plaquitas intercambiables. El porta extralargo con mango cilíndrico tiene refrigeración interna. Mas ranuras aseguran una evacuación de viruta óptima. Cambio fácil de las plaquitas con tornillos de tensión.No es necesario ajustar las plaquitas. con la broca de plaquitas intercambiables basicamente se debe taladrar en directo. Para abrir taladros de fundición y pretaladrados esta herramienta no es apropiada.  
tornillos tensores Nº art. 86807 incluido



d1 mm	d mm	d2 h6 mm	L mm	l2 mm	B mm	G	Código Nº
13,41-16,4	13,000	20,000	198,500	156,500	3,500	86807 2.500	13,157
13,41-16,4	13,000	20,000	238,500	196,500	3,500	86807 2.500	13,197
13,41-16,4	13,000	20,000	318,500	276,500	3,500	86807 2.500	13,277
15,00-16,4	14,500	20,000	95,000	52,000	3,500	86807 2.500	14,052
15,00-16,4	14,500	20,000	125,000	82,000	3,500	86807 2.500	14,082
15,00-16,4	14,500	20,000	178,500	136,500	3,500	86807 2.500	14,137
15,00-16,4	14,500	20,000	198,500	156,500	3,500	86807 2.500	14,157
15,00-16,4	14,500	20,000	238,500	196,500	3,500	86807 2.500	14,197
15,00-16,4	14,500	20,000	268,500	226,500	3,500	86807 2.500	14,227
15,00-16,4	14,500	20,000	398,500	356,500	3,500	86807 2.500	14,357
16,41-18,9	16,000	20,000	260,500	218,500	3,500	86807 2.500	16,219
16,41-18,9	16,000	20,000	295,500	253,500	3,500	86807 2.500	16,254
16,41-18,9	16,000	20,000	410,500	368,500	3,500	86807 2.501	16,369
18,91-22,4	18,500	20,000	304,000	262,000	4,000	86807 3.000	18,262
18,91-22,4	18,500	20,000	344,000	302,000	4,000	86807 3.000	18,302
18,91-22,4	18,500	20,000	464,000	422,000	4,000	86807 3.000	18,422
22,41-25,4	22,000	20,000	285,000	243,000	4,000	86807 3.001	22,243
22,41-25,4	22,000	20,000	345,000	303,000	4,000	86807 3.001	22,303
22,41-25,4	22,000	20,000	385,000	343,000	4,000	86807 3.001	22,343
22,41-25,4	22,000	20,000	535,000	493,000	4,000	86807 3.001	22,493
25,41-29,0	23,000	32,000	138,000	63,000	5,000	86807 3.500	23,063
25,41-29,0	23,000	32,000	173,000	98,000	5,000	86807 3.500	23,098
25,41-29,0	23,000	32,000	225,000	150,000	5,000	86807 3.500	23,150
25,41-29,0	23,000	32,000	273,000	198,000	5,000	86807 3.500	23,198
25,41-29,0	23,000	32,000	343,000	268,000	5,000	86807 3.500	23,268
25,41-29,0	23,000	32,000	433,000	358,000	5,000	86807 3.500	23,358
25,41-29,0	23,000	32,000	503,000	428,000	5,000	86807 3.500	23,428
25,41-29,0	23,000	32,000	683,000	608,000	5,000	86807 3.500	23,608
29,01-35,0	28,000	32,000	393,000	321,500	5,000	86807 3.500	28,322
29,01-35,0	28,000	32,000	473,000	401,500	5,000	86807 3.500	28,402
29,01-35,0	28,000	32,000	553,000	481,500	5,000	86807 3.500	28,482
29,01-35,0	28,000	32,000	763,000	691,500	5,000	86807 3.500	28,692
33,20-36,0	33,000	32,000	148,000	80,500	5,000	86807 3.500	33,081
33,20-36,0	33,000	32,000	173,000	105,500	5,000	86807 3.500	33,106
33,20-36,0	33,000	32,000	223,000	155,500	5,000	86807 3.500	33,156
33,20-36,0	33,000	32,000	273,000	205,500	5,000	86807 3.500	33,206
33,20-36,0	33,000	32,000	393,000	325,500	5,000	86807 3.500	33,326
33,20-36,0	33,000	32,000	503,000	435,500	5,000	86807 3.500	33,436
33,20-36,0	33,000	32,000	603,000	535,500	5,000	86807 3.500	33,536
33,20-36,0	33,000	32,000	823,000	755,500	5,000	86807 3.500	33,756
35,01-45,0	34,000	32,000	457,000	388,000	7,000	86807 4.001	34,388
35,01-45,0	34,000	32,000	607,000	538,000	7,000	86807 4.001	34,538



## Soporte Multiplex con mango cilíndrico

d1 mm	d mm	d2 h6 mm	L mm	l2 mm	B mm	G	Código N°
<b>35,01-45,0</b>	34,000	32,000	907,000	838,000	7,000	86807 4.001	<b>34,838</b>
<b>45,01-55,0</b>	44,000	40,000	467,000	394,000	7,000	86807 4.001	<b>44,394</b>
<b>45,01-55,0</b>	44,000	40,000	617,000	544,000	7,000	86807 4.001	<b>44,544</b>
<b>45,01-55,0</b>	44,000	40,000	917,000	844,000	7,000	86807 4.001	<b>44,844</b>
<b>55,01-65,0</b>	54,000	40,000	467,000	393,000	7,000	86807 4.001	<b>54,393</b>
<b>55,01-65,0</b>	54,000	40,000	617,000	543,000	7,000	86807 4.001	<b>54,543</b>
<b>55,01-65,0</b>	54,000	40,000	917,000	843,000	7,000	86807 4.001	<b>54,843</b>
<b>65,01-78,0</b>	63,000	40,000	230,000	155,000	9,000	86807 5.000	<b>63,155</b>
<b>65,01-78,0</b>	63,000	40,000	340,000	265,000	9,000	86807 5.000	<b>63,265</b>
<b>65,01-78,0</b>	63,000	40,000	470,000	395,000	9,000	86807 5.000	<b>63,395</b>
<b>65,01-78,0</b>	63,000	40,000	620,000	545,000	9,000	86807 5.000	<b>63,545</b>
<b>65,01-78,0</b>	63,000	40,000	920,000	845,000	9,000	86807 5.000	<b>63,845</b>
<b>78,01-90,0</b>	77,000	50,000	240,000	155,000	9,000	86807 5.000	<b>77,155</b>
<b>78,01-90,0</b>	77,000	50,000	350,000	265,000	9,000	86807 5.000	<b>77,265</b>
<b>78,01-90,0</b>	77,000	50,000	480,000	395,000	9,000	86807 5.000	<b>77,395</b>
<b>78,01-90,0</b>	77,000	50,000	630,000	545,000	9,000	86807 5.000	<b>77,545</b>
<b>78,01-90,0</b>	77,000	50,000	930,000	845,000	9,000	86807 5.000	<b>77,845</b>
<b>90,01-102,0</b>	89,000	50,000	240,000	155,000	9,000	86807 5.000	<b>89,155</b>
<b>90,01-102,0</b>	89,000	50,000	350,000	265,000	9,000	86807 5.000	<b>89,265</b>
<b>90,01-102,0</b>	89,000	50,000	480,000	395,000	9,000	86807 5.000	<b>89,395</b>
<b>90,01-102,0</b>	89,000	50,000	630,000	545,000	9,000	86807 5.000	<b>89,545</b>
<b>90,01-102,0</b>	89,000	50,000	930,000	845,000	9,000	86807 5.000	<b>89,845</b>



## Soporte Multiplex con cono de compensación cónico

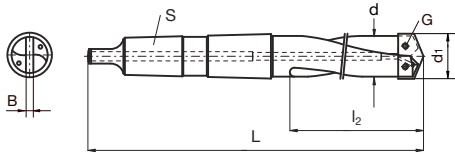
Nº artículo 86630



niquelado • Porta para plaquitas intercambiables en versión corta. El porta con mango cónico tiene refrigeración interna. Ranuras amplias garantizan un desalajo de viruta óptimo. Fácil cambio de las plaquitas por tornillos tensores. No es necesario ajustar las plaquitas intercambiables. Con la broca de plaquitas basicamente se debe taladrar en directo. Para retaladrar taladros de fundición y para abrir agujeros pretaladrados, esta herramienta no es adecuada.

Transmisión de refrigerante: axial (radial sobre oferta)

Tornillos tensores Nº art. 86807 incluidos.



d1 mm	d mm	S	L mm	l2 mm	B mm	G	Código Nº
<b>10,00-11,7</b>	9,500	MK-2	139,000	56,000	2,500	86807 2.000	<b>9,500</b>
<b>11,71-13,4</b>	11,500	MK-2	141,000	58,000	2,500	86807 2.000	<b>11,500</b>
<b>13,41-16,4</b>	13,000	MK-2	148,000	63,000	3,500	86807 2.500	<b>13,000</b>
<b>16,41-18,9</b>	16,000	MK-2	150,000	67,000	3,500	86807 2.501	<b>16,000</b>
<b>18,91-22,4</b>	18,500	MK-3	178,000	76,000	4,000	86807 3.000	<b>18,500</b>
<b>22,41-25,4</b>	22,000	MK-3	181,000	80,000	4,000	86807 3.001	<b>22,000</b>



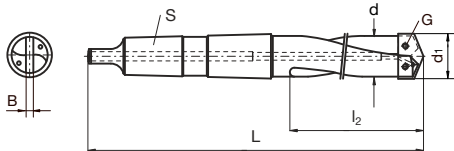


## Soporte Multiplex con cono de compensación cónico

Nº artículo 86650



niquelado • Portas para plaquitas en versión extralarga. El porta con mango cónico tiene refrigeración interna. Ranuras amplias garantizan un de viruta óptimo. Fácil cambio de las plaquitas por tornillos tensores. No es necesario ajustar las plaquitas intercambiables. Con la broca de plaquitas se debe taladrar en directo. Para retaladrar taladros de fundición esta herramienta no es adecuada. Transmisión de refrigeración: axial (radial sobre oferta) Tornillos tensores N° art. 86807 incluidos.



d1 mm	d mm	S	L mm	l <sub>2</sub> mm	B mm	G	Código N°
<b>10,00-11,7</b>	9,500	MK-2	186,000	103,000	2,500	86807 2.000	<b>9,500</b>
<b>11,71-13,4</b>	11,500	MK-2	191,000	108,000	2,500	86807 2.000	<b>11,500</b>
<b>13,41-16,4</b>	13,000	MK-2	210,000	125,000	3,500	86807 2.500	<b>13,000</b>
<b>16,41-18,9</b>	16,000	MK-2	218,000	135,000	3,500	86807 2.501	<b>16,000</b>
<b>18,91-22,4</b>	18,500	MK-3	258,000	156,000	4,000	86807 3.000	<b>18,500</b>
<b>22,41-25,4</b>	22,000	MK-3	266,000	166,000	4,000	86807 3.001	<b>22,000</b>



## Soporte Multiplex con cono de compensación cónico

Nº artículo 86670



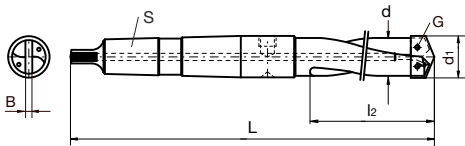
≤ dia. 28mm: niquelado, > dia. 28mm: pavonado • Portas para plaquitas intercambiables en versión corta con ranura para aro de refrigeración. El porta con mango cónico tiene refrigeración interna. Amplias ranuras garantizan un desalojo óptimo. Fácil cambio de las plaquitas por tornillos tensores. No es necesario ajustar las plaquitas intercambiables. Con la broca de plaquitas básicamente se debe taladrar en directo. Para retaladrar taladros de fundición esta herramienta no es adecuada.

Transmisión de refrigerante: radial (axial sobre oferta)

Desde porta-Ø 63,0 mm: con ranuras rectas

Tamaño del mango MK 5: con ranura transversal

Tornillos Nº art. 86807 incluidos



d1 mm	d mm	S	L mm	l2 mm	B mm	G	Código Nº
<b>25.01-29.0</b>	24,000	MK-4	279,000	108,000	5,000	86807 3.500	<b>24,000</b>
<b>29.01-35.0</b>	28,000	MK-4	279,000	108,000	5,000	86807 3.500	<b>28,000</b>
<b>35.01-45.0</b>	34,000	MK-4	324,000	152,000	7,000	86807 4.001	<b>34,000</b>
<b>45.01-55.0</b>	44,000	MK-4	324,000	152,000	7,000	86807 4.001	<b>44,000</b>
<b>55.01-65.0</b>	54,000	MK-4	324,000	152,000	7,000	86807 4.001	<b>54,000</b>
<b>65.01-78.0</b>	63,000	MK-5	436,000	216,000	9,000	86807 5.000	<b>63,000</b>
<b>78.01-90.0</b>	77,000	MK-5	436,000	216,000	9,000	86807 5.000	<b>77,000</b>
<b>90.01-102.0</b>	89,000	MK-5	436,000	216,000	9,000	86807 5.000	<b>89,000</b>



## Soporte Multiplex con cono de compensación cónico

Nº artículo 86680



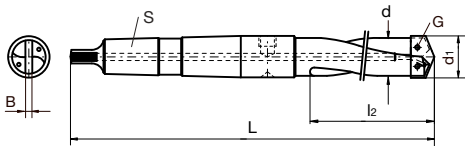
≤ dia. 28mm: niquelado, > dia. 28mm: pavonado • Portas para plaquitas intercambiables en versión extralarga con ranura para aro de refrigeración radial. El porta con mango cónico tiene refrigeración interna. Ranuras amplias garantizan un desalojo de viruta óptimo. Fácil cambio de las plaquitas por tornillos tensores. No es necesario ajustar las plaquitas. Con la broca de plaquitas básicamente se debe taladrar en directo. Para retaladrar taladros de fundición esta herramienta no es adecuada.

Refrigeración interna: radial (axial sobre oferta)

Desde porta-Ø 63,0 mm: ranuras rectas

Tamaño mango MK 5: con ranura transversal

Tornillos tensores Nº art. °86807 incluidos.



d1 mm	d mm	S	L mm	l2 mm	B mm	G	Código Nº
<b>25.01-29.0</b>	24,000	MK-4	379,000	208,000	5,000	86807 3.500	<b>24,000</b>
<b>29.01-35.0</b>	28,000	MK-4	379,000	208,000	5,000	86807 3.500	<b>28,000</b>
<b>35.01-45.0</b>	34,000	MK-4	429,000	257,000	7,000	86807 4.001	<b>34,000</b>
<b>45.01-55.0</b>	44,000	MK-4	429,000	257,000	7,000	86807 4.001	<b>44,000</b>
<b>55.01-65.0</b>	54,000	MK-4	429,000	257,000	7,000	86807 4.001	<b>54,000</b>
<b>65.01-78.0</b>	63,000	MK-5	536,000	316,000	9,000	86807 5.000	<b>63,000</b>
<b>78.01-90.0</b>	77,000	MK-5	536,000	316,000	9,000	86807 5.000	<b>77,000</b>
<b>90.01-102.0</b>	89,000	MK-5	536,000	316,000	9,000	86807 5.000	<b>89,000</b>



## Soporte Multiplex con cono de compensación cónico

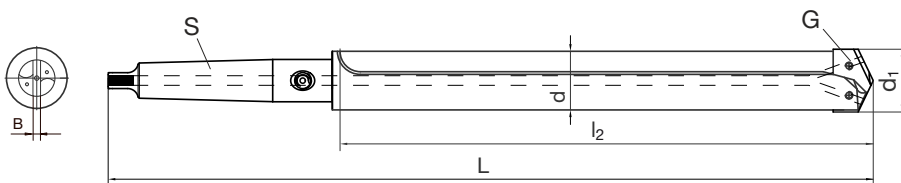
Nº artículo 86678



superficie  $\leq 1000\text{mm}$  de longitud total niquelado,  $> 1000\text{mm}$  pavonado • Portas para plaquitas versión extralarga. El porta con mango cónico tiene refrigeración interna. Ranuras amplias garantizan un desalajo de viruta óptimo. Fácil cambio de plaquitas por tornillos tensores. No es necesario ajustar las plaquitas intercambiables. Con la broca de plaquitas básicamente se debe taladrar en directo. Para abrir taladros pretaladrados de fundición esta herramienta no es adecuada.

Refrigeración interna: radial (axial sobre oferta)

Tornillos tensores Nº art. 86807 incluidos



d1 mm	d mm	S	L mm	l2 mm	B mm	G	Código Nº
35,01-45,0	34,000	MK-4	566,000	393,000	7,000	86807 4.001	<b>34,393</b>
35,01-45,0	34,000	MK-4	716,000	543,000	7,000	86807 4.001	<b>34,543</b>
35,01-45,0	34,000	MK-4	1016,000	843,000	7,000	86807 4.001	<b>34,843</b>
45,01-55,0	44,000	MK-4	566,000	394,500	7,000	86807 4.001	<b>44,395</b>
45,01-55,0	44,000	MK-4	716,000	544,500	7,000	86807 4.001	<b>44,545</b>
45,01-55,0	44,000	MK-4	1016,000	844,500	7,000	86807 4.001	<b>44,845</b>
55,01-65,0	54,000	MK-4	560,000	387,000	7,000	86807 4.001	<b>54,387</b>
55,01-65,0	54,000	MK-4	716,000	543,000	7,000	86807 4.001	<b>54,543</b>
55,01-65,0	54,000	MK-4	1016,000	843,000	7,000	86807 4.001	<b>54,843</b>
65,01-78,0	63,000	MK-5	766,000	547,000	9,000	86807 5.000	<b>63,547</b>
65,01-78,0	63,000	MK-5	1066,000	847,000	9,000	86807 5.000	<b>63,847</b>
78,01-90,0	77,000	MK-5	766,000	544,000	9,000	86807 5.000	<b>77,544</b>
78,01-90,0	77,000	MK-5	1066,000	844,000	9,000	86807 5.000	<b>77,844</b>
90,01-102,0	89,000	MK-5	766,000	544,000	9,000	86807 5.000	<b>89,544</b>
90,01-102,0	89,000	MK-5	1066,000	844,000	9,000	86807 5.000	<b>89,844</b>



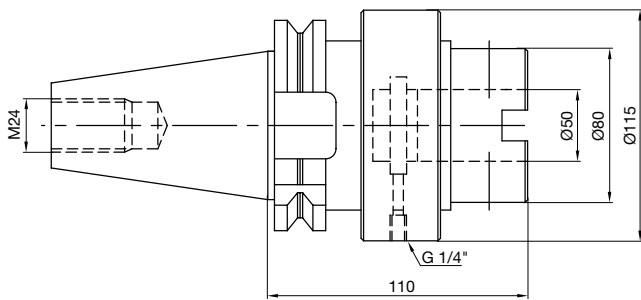
## Gama especial del sistema modular Multiplex Ø 97 mm hasta 210 mm



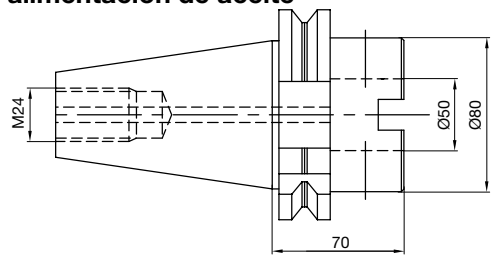
### Adaptadores

Las siguientes versiones están disponibles bajo demanda:

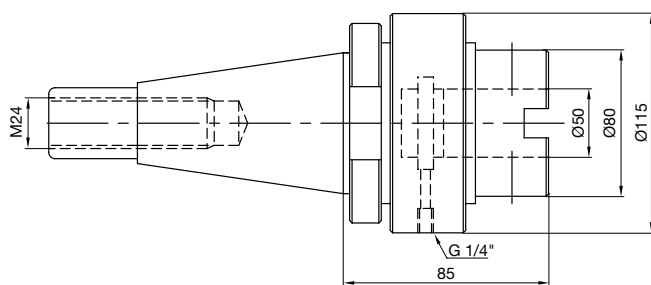
- SK50 DIN 69871 con adaptadores de alimentación de aceite



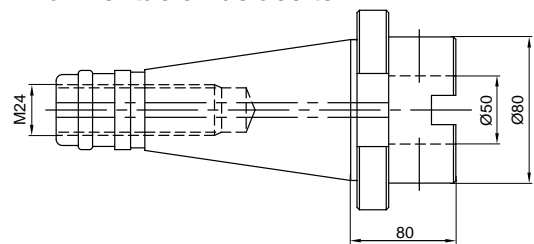
- SK50 DIN 69871 sin adaptadores de alimentación de aceite



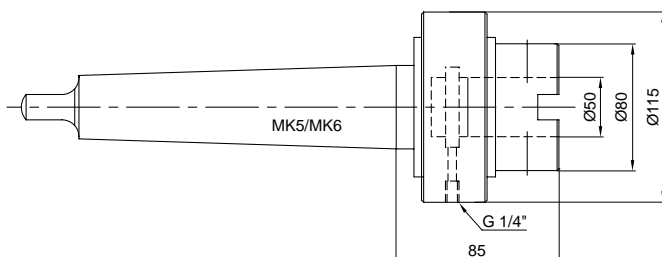
- SK50 DIN 2080 con adaptadores de alimentación de aceite



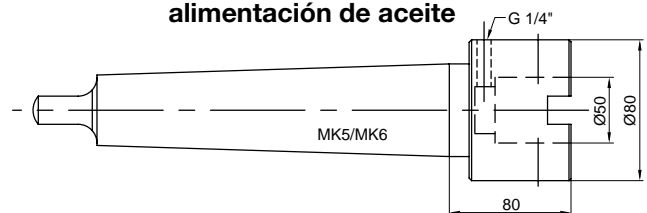
- SK50 DIN 2080 sin adaptadores de alimentación de aceite



- MT 5 /MT 6 con adaptadores de alimentación de aceite



- MT 5 /MT 6 sin adaptadores de alimentación de aceite



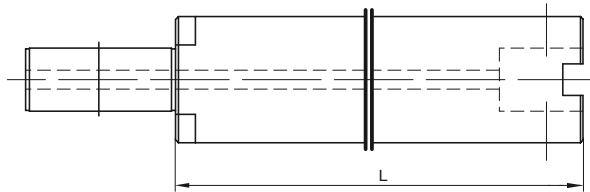


## Gama especial del sistema modular Multiplex Ø 97 mm hasta 210 mm

### Alargo para cabezal de taladrar



Alargo para cabezal de taladrar  
 Ø 97 mm - Ø 130 mm  
 L = 186 mm  
 L = 300 mm



Alargo para cabezal de taladrar  
 Ø 131 mm - Ø 165 mm y Ø 164 mm - Ø 210 mm  
 L = 204 mm  
 L = 300 mm  
 L = 500 mm

### Arrastres



pequeño, para cabezal de taladrar  
 dia. 97 mm - dia. 130 mm,  
 ancho 14 mm



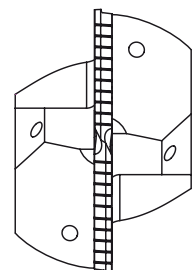
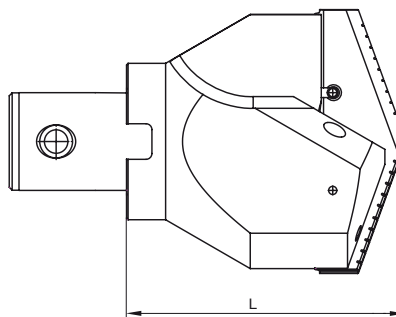
grande, para cabezal de taladrar  
 dia. 131 mm - dia. 165 mm y  
 dia. 164 mm - dia. 210 mm,  
 ancho 16 mm

### Cabezas de taladrar



Las siguientes medidas se suministran sobre  
 petición de oferta:

- Ø 97 mm hasta Ø 130 mm, L = 118,5 mm
- Ø 131 mm hasta Ø 165 mm, L = 142,5 mm
- Ø 164 mm hasta Ø 210 mm, L = 142,5 mm



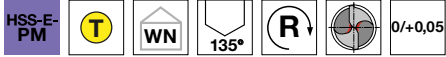


## Placas intercambiables

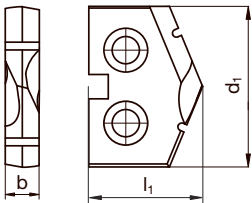
Nº artículo 86602



P	M	K	N	S	H
●	○	●	○		



vaciado de punta  $\geq \varnothing 9,800$  • Plaquita con ranuras de división. Ángulo de la punta 135°. Para aplicación universal.



d1 mm	l1 mm	b mm	Código Nº	d1 mm	l1 mm	b mm	Código Nº
10,000	8,700	2,500	<b>10,000</b>	17,500	11,700	3,500	<b>17,500</b>
10,200	8,700	2,500	<b>10,200</b>	17,750	11,700	3,500	<b>17,750</b>
10,500	8,700	2,500	<b>10,500</b>	18,000	11,700	3,500	<b>18,000</b>
11,000	8,700	2,500	<b>11,000</b>	18,250	11,700	3,500	<b>18,250</b>
11,110	8,700	2,500	<b>11,110</b>	18,500	11,700	3,500	<b>18,500</b>
11,500	8,700	2,500	<b>11,500</b>	18,750	11,700	3,500	<b>18,750</b>
11,750	8,700	2,500	<b>11,750</b>	19,000	13,700	4,000	<b>19,000</b>
12,000	8,700	2,500	<b>12,000</b>	19,500	13,700	4,000	<b>19,500</b>
12,250	8,700	2,500	<b>12,250</b>	19,750	13,700	4,000	<b>19,750</b>
12,400	8,700	2,500	<b>12,400</b>	20,000	13,700	4,000	<b>20,000</b>
12,500	8,700	2,500	<b>12,500</b>	20,250	13,700	4,000	<b>20,250</b>
12,750	8,700	2,500	<b>12,750</b>	20,500	13,700	4,000	<b>20,500</b>
13,000	8,700	2,500	<b>13,000</b>	21,000	13,700	4,000	<b>21,000</b>
13,250	8,700	2,500	<b>13,250</b>	21,250	13,700	4,000	<b>21,250</b>
13,500	11,700	3,500	<b>13,500</b>	21,500	13,700	4,000	<b>21,500</b>
13,750	11,700	3,500	<b>13,750</b>	21,750	13,700	4,000	<b>21,750</b>
14,000	11,700	3,500	<b>14,000</b>	22,000	13,700	4,000	<b>22,000</b>
14,250	11,700	3,500	<b>14,250</b>	22,500	13,700	4,000	<b>22,500</b>
14,500	11,700	3,500	<b>14,500</b>	23,000	13,700	4,000	<b>23,000</b>
14,750	11,700	3,500	<b>14,750</b>	23,500	13,700	4,000	<b>23,500</b>
15,000	11,700	3,500	<b>15,000</b>	24,000	13,700	4,000	<b>24,000</b>
15,250	11,700	3,500	<b>15,250</b>	24,500	13,700	4,000	<b>24,500</b>
15,300	11,700	3,500	<b>15,300</b>	25,000	13,700	4,000	<b>25,000</b>
15,500	11,700	3,500	<b>15,500</b>				
15,750	11,700	3,500	<b>15,750</b>				
16,000	11,700	3,500	<b>16,000</b>				
16,500	11,700	3,500	<b>16,500</b>				
16,750	11,700	3,500	<b>16,750</b>				
17,000	11,700	3,500	<b>17,000</b>				
17,250	11,700	3,500	<b>17,250</b>				

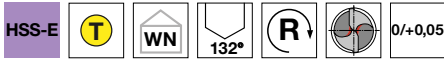


## Placas intercambiables

Nº artículo 86605

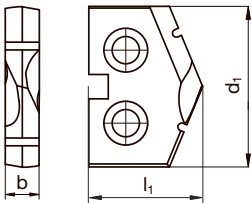


P	M	K	N	S	H
○	●	○	●	●	



vaciado de punta  $\geq \varnothing 25,000$  • Plaquita intercambiable con rompe-virutas. Geometría VA- para aceros inoxidables, aleaciones de aluminio y metales no ferrosos.

Ángulo de la punta:  
 $\geq \varnothing 25,0 \text{ mm} = 132^\circ$   
 $> \varnothing 66,0 \text{ mm} = 140^\circ$



d1 mm	l1 mm	b mm	Código Nº	d1 mm	l1 mm	b mm	Código Nº
25,000	17,300	5,000	<b>25,000</b>	56,000	24,000	7,000	<b>56,000</b>
25,500	17,300	5,000	<b>25,500</b>	57,000	24,000	7,000	<b>57,000</b>
26,000	17,300	5,000	<b>26,000</b>	58,000	24,000	7,000	<b>58,000</b>
26,500	17,300	5,000	<b>26,500</b>	59,000	24,000	7,000	<b>59,000</b>
27,000	17,300	5,000	<b>27,000</b>	60,000	24,000	7,000	<b>60,000</b>
28,000	17,300	5,000	<b>28,000</b>	62,000	24,000	7,000	<b>62,000</b>
29,000	17,300	5,000	<b>29,000</b>	64,000	24,000	7,000	<b>64,000</b>
29,500	17,300	5,000	<b>29,500</b>	65,000	24,000	7,000	<b>65,000</b>
30,000	17,300	5,000	<b>30,000</b>	66,000	37,000	9,000	<b>66,000</b>
31,000	17,300	5,000	<b>31,000</b>	68,000	37,000	9,000	<b>68,000</b>
32,000	17,300	5,000	<b>32,000</b>	70,000	37,000	9,000	<b>70,000</b>
33,000	17,300	5,000	<b>33,000</b>	74,000	37,000	9,000	<b>74,000</b>
34,000	17,300	5,000	<b>34,000</b>	75,000	37,000	9,000	<b>75,000</b>
35,000	17,300	5,000	<b>35,000</b>	78,000	37,000	9,000	<b>78,000</b>
36,000	24,000	7,000	<b>36,000</b>	80,000	37,000	9,000	<b>80,000</b>
37,000	24,000	7,000	<b>37,000</b>	82,000	37,000	9,000	<b>82,000</b>
37,500	24,000	7,000	<b>37,500</b>	84,000	37,000	9,000	<b>84,000</b>
38,000	24,000	7,000	<b>38,000</b>	85,000	37,000	9,000	<b>85,000</b>
39,000	24,000	7,000	<b>39,000</b>	88,000	37,000	9,000	<b>88,000</b>
40,000	24,000	7,000	<b>40,000</b>	90,000	37,000	9,000	<b>90,000</b>
41,000	24,000	7,000	<b>41,000</b>	94,000	37,000	9,000	<b>94,000</b>
42,000	24,000	7,000	<b>42,000</b>	95,000	37,000	9,000	<b>95,000</b>
43,000	24,000	7,000	<b>43,000</b>	96,000	37,000	9,000	<b>96,000</b>
44,000	24,000	7,000	<b>44,000</b>	98,000	37,000	9,000	<b>98,000</b>
45,000	24,000	7,000	<b>45,000</b>	100,000	37,000	9,000	<b>100,000</b>
46,000	24,000	7,000	<b>46,000</b>	102,000	37,000	9,000	<b>102,000</b>
47,000	24,000	7,000	<b>47,000</b>				
48,000	24,000	7,000	<b>48,000</b>				
49,000	24,000	7,000	<b>49,000</b>				
50,000	24,000	7,000	<b>50,000</b>				
50,500	24,000	7,000	<b>50,500</b>				
51,000	24,000	7,000	<b>51,000</b>				
52,000	24,000	7,000	<b>52,000</b>				
53,000	24,000	7,000	<b>53,000</b>				
54,000	24,000	7,000	<b>54,000</b>				
55,000	24,000	7,000	<b>55,000</b>				



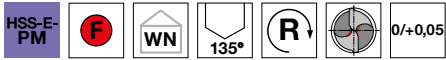


## Placas intercambiables

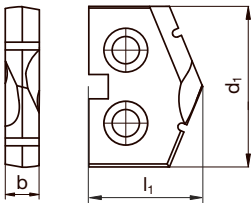
Nº artículo 86608



P	M	K	N	S	H
•	○	•	○		



vaciado de punta  $\geq \varnothing 10,000$  • Plaquita con ranuras de división. Ángulo de la punta 135°. Para aplicación universal.



d1 mm	l1 mm	b mm	Código Nº	d1 mm	l1 mm	b mm	Código Nº
10,000	8,700	2,500	<b>10,000</b>	17,500	11,700	3,500	<b>17,500</b>
10,200	8,700	2,500	<b>10,200</b>	17,750	11,700	3,500	<b>17,750</b>
10,500	8,700	2,500	<b>10,500</b>	18,000	11,700	3,500	<b>18,000</b>
11,000	8,700	2,500	<b>11,000</b>	18,250	11,700	3,500	<b>18,250</b>
11,500	8,700	2,500	<b>11,500</b>	18,500	11,700	3,500	<b>18,500</b>
11,750	8,700	2,500	<b>11,750</b>	18,750	11,700	3,500	<b>18,750</b>
12,000	8,700	2,500	<b>12,000</b>	19,000	13,700	4,000	<b>19,000</b>
12,500	8,700	2,500	<b>12,500</b>	19,500	13,700	4,000	<b>19,500</b>
12,750	8,700	2,500	<b>12,750</b>	19,750	13,700	4,000	<b>19,750</b>
13,000	8,700	2,500	<b>13,000</b>	20,000	13,700	4,000	<b>20,000</b>
13,250	8,700	2,500	<b>13,250</b>	20,500	13,700	4,000	<b>20,500</b>
13,500	11,700	3,500	<b>13,500</b>	21,000	13,700	4,000	<b>21,000</b>
13,750	11,700	3,500	<b>13,750</b>	21,500	13,700	4,000	<b>21,500</b>
14,000	11,700	3,500	<b>14,000</b>	21,750	13,700	4,000	<b>21,750</b>
14,250	11,700	3,500	<b>14,250</b>	22,000	13,700	4,000	<b>22,000</b>
14,500	11,700	3,500	<b>14,500</b>	22,500	13,700	4,000	<b>22,500</b>
14,750	11,700	3,500	<b>14,750</b>	23,000	13,700	4,000	<b>23,000</b>
15,000	11,700	3,500	<b>15,000</b>	23,500	13,700	4,000	<b>23,500</b>
15,250	11,700	3,500	<b>15,250</b>	24,000	13,700	4,000	<b>24,000</b>
15,500	11,700	3,500	<b>15,500</b>	24,500	13,700	4,000	<b>24,500</b>
15,750	11,700	3,500	<b>15,750</b>	24,750	13,700	4,000	<b>24,750</b>
16,000	11,700	3,500	<b>16,000</b>	25,000	13,700	4,000	<b>25,000</b>
16,500	11,700	3,500	<b>16,500</b>				
17,000	11,700	3,500	<b>17,000</b>				

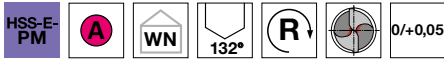


## Placas intercambiables

Nº artículo 86609



P	M	K	N	S	H
•	○	•	○		



vaciado de punta  $\geq \varnothing 25,000$  • Plaquita con ranuras de división de viruta. Para aplicación universal.

Ángulo de la punta:

$\geq \varnothing 25,0$  mm = 132°

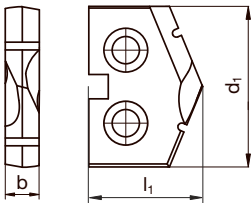
$> \varnothing 66,0$  mm = 140°

$> \varnothing 190,0$  mm = 150°

Material de corte:

$\leq \varnothing 66,0$  mm HSS-E-PM

$> \varnothing 66,0$  mm HSS-E



d1 mm	l1 mm	b mm	Código Nº	d1 mm	l1 mm	b mm	Código Nº
25,000	17,300	5,000	<b>25,000</b>	66,000	37,000	9,000	<b>66,000</b>
25,500	17,300	5,000	<b>25,500</b>	68,000	37,000	9,000	<b>68,000</b>
26,000	17,300	5,000	<b>26,000</b>	70,000	37,000	9,000	<b>70,000</b>
26,500	17,300	5,000	<b>26,500</b>	74,000	37,000	9,000	<b>74,000</b>
27,000	17,300	5,000	<b>27,000</b>	75,000	37,000	9,000	<b>75,000</b>
28,000	17,300	5,000	<b>28,000</b>	78,000	37,000	9,000	<b>78,000</b>
29,000	17,300	5,000	<b>29,000</b>	80,000	37,000	9,000	<b>80,000</b>
29,500	17,300	5,000	<b>29,500</b>	82,000	37,000	9,000	<b>82,000</b>
30,000	17,300	5,000	<b>30,000</b>	84,000	37,000	9,000	<b>84,000</b>
31,000	17,300	5,000	<b>31,000</b>	85,000	37,000	9,000	<b>85,000</b>
32,000	17,300	5,000	<b>32,000</b>	88,000	37,000	9,000	<b>88,000</b>
33,000	17,300	5,000	<b>33,000</b>	90,000	37,000	9,000	<b>90,000</b>
34,000	17,300	5,000	<b>34,000</b>	93,000	37,000	9,000	<b>93,000</b>
35,000	17,300	5,000	<b>35,000</b>	95,000	37,000	9,000	<b>95,000</b>
36,000	24,000	7,000	<b>36,000</b>	96,000	37,000	9,000	<b>96,000</b>
37,000	24,000	7,000	<b>37,000</b>	98,000	37,000	9,000	<b>98,000</b>
38,000	24,000	7,000	<b>38,000</b>	100,000	37,000	9,000	<b>100,000</b>
39,000	24,000	7,000	<b>39,000</b>	102,000	37,000	9,000	<b>102,000</b>
40,000	24,000	7,000	<b>40,000</b>	103,000	37,000	9,000	<b>103,000</b>
41,000	24,000	7,000	<b>41,000</b>	105,000	37,000	9,000	<b>105,000</b>
42,000	24,000	7,000	<b>42,000</b>	110,000	37,000	9,000	<b>110,000</b>
43,000	24,000	7,000	<b>43,000</b>	115,000	37,000	9,000	<b>115,000</b>
44,000	24,000	7,000	<b>44,000</b>	120,000	37,000	9,000	<b>120,000</b>
45,000	24,000	7,000	<b>45,000</b>	125,000	37,000	9,000	<b>125,000</b>
46,000	24,000	7,000	<b>46,000</b>	130,000	37,000	9,000	<b>130,000</b>
47,000	24,000	7,000	<b>47,000</b>	135,000	47,000	9,000	<b>135,000</b>
48,000	24,000	7,000	<b>48,000</b>	140,000	47,000	9,000	<b>140,000</b>
49,000	24,000	7,000	<b>49,000</b>	145,000	47,000	9,000	<b>145,000</b>
50,000	24,000	7,000	<b>50,000</b>	150,000	47,000	9,000	<b>150,000</b>
51,000	24,000	7,000	<b>51,000</b>	155,000	47,000	9,000	<b>155,000</b>
52,000	24,000	7,000	<b>52,000</b>	160,000	47,000	9,000	<b>160,000</b>
53,000	24,000	7,000	<b>53,000</b>	165,000	47,000	9,000	<b>165,000</b>
54,000	24,000	7,000	<b>54,000</b>	170,000	47,000	9,000	<b>170,000</b>
55,000	24,000	7,000	<b>55,000</b>	175,000	47,000	9,000	<b>175,000</b>
56,000	24,000	7,000	<b>56,000</b>	180,000	47,000	9,000	<b>180,000</b>
57,000	24,000	7,000	<b>57,000</b>	185,000	47,000	9,000	<b>185,000</b>
58,000	24,000	7,000	<b>58,000</b>	190,000	47,000	9,000	<b>190,000</b>
59,000	24,000	7,000	<b>59,000</b>	195,000	47,000	9,000	<b>195,000</b>
60,000	24,000	7,000	<b>60,000</b>	200,000	47,000	9,000	<b>200,000</b>
62,000	24,000	7,000	<b>62,000</b>	205,000	47,000	9,000	<b>205,000</b>
64,000	24,000	7,000	<b>64,000</b>	210,000	47,000	9,000	<b>210,000</b>
65,000	24,000	7,000	<b>65,000</b>				

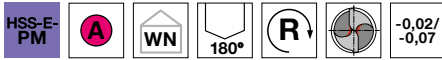


## Placas intercambiables

Nº artículo 86611



P	M	K	N	S	H
•	○	•	○		

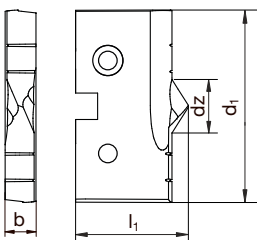


vaciado de punta  $\geq \varnothing 10,000$  • Panel intercambiable con ranuras de aglomerado. Para uso universal.

Ángulo de punta de centrado:

$\leq \varnothing 35,0 \text{ mm} = 120^\circ$

$> \varnothing 35,0 \text{ mm} = 140^\circ$



d1 mm	l1 mm	b mm	Código Nº	d1 mm	l1 mm	b mm	Código Nº
10,000	10,000	2,500	<b>10,000</b>	23,000	15,000	4,000	<b>23,000</b>
10,500	10,000	2,500	<b>10,500</b>	23,500	15,000	4,000	<b>23,500</b>
11,000	10,000	2,500	<b>11,000</b>	24,000	15,000	4,000	<b>24,000</b>
11,500	10,000	2,500	<b>11,500</b>	24,500	15,000	4,000	<b>24,500</b>
11,750	10,000	2,500	<b>11,750</b>	24,750	15,000	4,000	<b>24,750</b>
12,000	10,000	2,500	<b>12,000</b>	25,000	15,000	4,000	<b>25,000</b>
12,500	10,000	2,500	<b>12,500</b>	25,000	18,500	5,000	<b>25,001</b>
12,700	10,000	2,500	<b>12,700</b>	25,400	18,500	5,000	<b>25,400</b>
12,750	10,000	2,500	<b>12,750</b>	25,500	18,500	5,000	<b>25,500</b>
13,000	10,000	2,500	<b>13,000</b>	26,000	18,500	5,000	<b>26,000</b>
13,250	10,000	2,500	<b>13,250</b>	26,500	18,500	5,000	<b>26,500</b>
13,500	13,000	3,500	<b>13,500</b>	27,000	18,500	5,000	<b>27,000</b>
13,750	13,000	3,500	<b>13,750</b>	28,000	18,500	5,000	<b>28,000</b>
14,000	13,000	3,500	<b>14,000</b>	29,000	18,500	5,000	<b>29,000</b>
14,250	13,000	3,500	<b>14,250</b>	29,500	18,500	5,000	<b>29,500</b>
14,500	13,000	3,500	<b>14,500</b>	30,000	18,500	5,000	<b>30,000</b>
14,750	13,000	3,500	<b>14,750</b>	31,000	18,500	5,000	<b>31,000</b>
15,000	13,000	3,500	<b>15,000</b>	32,000	18,500	5,000	<b>32,000</b>
15,250	13,000	3,500	<b>15,250</b>	33,000	18,500	5,000	<b>33,000</b>
15,500	13,000	3,500	<b>15,500</b>	34,000	18,500	5,000	<b>34,000</b>
15,750	13,000	3,500	<b>15,750</b>	35,000	18,500	5,000	<b>35,000</b>
16,000	13,000	3,500	<b>16,000</b>	36,000	25,500	7,000	<b>36,000</b>
16,500	13,000	3,500	<b>16,500</b>	37,000	25,500	7,000	<b>37,000</b>
17,000	13,000	3,500	<b>17,000</b>	38,000	25,500	7,000	<b>38,000</b>
17,500	13,000	3,500	<b>17,500</b>	39,000	25,500	7,000	<b>39,000</b>
17,750	13,000	3,500	<b>17,750</b>	40,000	25,500	7,000	<b>40,000</b>
18,000	13,000	3,500	<b>18,000</b>	41,000	25,500	7,000	<b>41,000</b>
18,250	13,000	3,500	<b>18,250</b>	42,000	25,500	7,000	<b>42,000</b>
18,500	13,000	3,500	<b>18,500</b>	43,000	25,500	7,000	<b>43,000</b>
18,750	13,000	3,500	<b>18,750</b>	44,000	25,500	7,000	<b>44,000</b>
19,000	15,000	4,000	<b>19,000</b>	45,000	25,500	7,000	<b>45,000</b>
19,500	15,000	4,000	<b>19,500</b>	46,000	25,500	7,000	<b>46,000</b>
19,750	15,000	4,000	<b>19,750</b>	47,000	25,500	7,000	<b>47,000</b>
20,000	15,000	4,000	<b>20,000</b>	48,000	25,500	7,000	<b>48,000</b>
20,250	15,000	4,000	<b>20,250</b>	49,000	25,500	7,000	<b>49,000</b>
20,500	15,000	4,000	<b>20,500</b>	50,000	25,500	7,000	<b>50,000</b>
21,000	15,000	4,000	<b>21,000</b>	51,000	25,500	7,000	<b>51,000</b>
21,250	15,000	4,000	<b>21,250</b>	52,000	25,500	7,000	<b>52,000</b>
21,500	15,000	4,000	<b>21,500</b>	53,000	25,500	7,000	<b>53,000</b>
21,750	15,000	4,000	<b>21,750</b>	54,000	25,500	7,000	<b>54,000</b>
22,000	15,000	4,000	<b>22,000</b>	55,000	25,500	7,000	<b>55,000</b>
22,500	15,000	4,000	<b>22,500</b>	56,000	25,500	7,000	<b>56,000</b>



## Placas intercambiables

d1 mm	l1 mm	b mm	Código N°	d1 mm	l1 mm	b mm	Código N°
57,000	25,500	7,000	<b>57,000</b>	65,000	25,500	7,000	<b>65,000</b>
58,000	25,500	7,000	<b>58,000</b>				
59,000	25,500	7,000	<b>59,000</b>				
60,000	25,500	7,000	<b>60,000</b>				
62,000	25,500	7,000	<b>62,000</b>				
64,000	25,500	7,000	<b>64,000</b>				

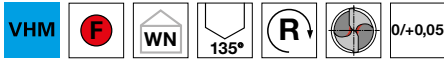


## Placas intercambiables

Nº artículo 86701



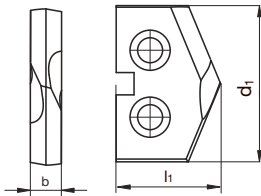
P	M	K	N	S	H
•	○	•	○		



vaciado de punta  $\geq \varnothing 10,000$  • Plaquita intercambiable sin ranuras divisorias. Para materiales hasta 600 N/mm<sup>2</sup>. Para aplicación universal.

ángulo de la punta:  
 $\leq \varnothing 25,4 \text{ mm} = 135^\circ$   
 $> \varnothing 25,4 \text{ mm} = 132^\circ$

Sin faceta (ver "recomendación aplicación Multiplex"/ (Parte técnica).



d1 mm	l1 mm	b mm	Código Nº	d1 mm	l1 mm	b mm	Código Nº
10,000	8,700	2,500	<b>10,000</b>	18,000	11,700	3,500	<b>18,000</b>
10,200	8,700	2,500	<b>10,200</b>	18,250	11,700	3,500	<b>18,250</b>
10,500	8,700	2,500	<b>10,500</b>	18,500	11,700	3,500	<b>18,500</b>
11,000	8,700	2,500	<b>11,000</b>	19,000	13,700	4,000	<b>19,000</b>
11,500	8,700	2,500	<b>11,500</b>	19,500	13,700	4,000	<b>19,500</b>
12,000	8,700	2,500	<b>12,000</b>	20,000	13,700	4,000	<b>20,000</b>
12,500	8,700	2,500	<b>12,500</b>	20,500	13,700	4,000	<b>20,500</b>
12,750	8,700	2,500	<b>12,750</b>	21,000	13,700	4,000	<b>21,000</b>
13,000	8,700	2,500	<b>13,000</b>	21,500	13,700	4,000	<b>21,500</b>
13,500	11,700	3,500	<b>13,500</b>	22,000	13,700	4,000	<b>22,000</b>
13,750	11,700	3,500	<b>13,750</b>	23,000	13,700	4,000	<b>23,000</b>
14,000	11,700	3,500	<b>14,000</b>	24,000	13,700	4,000	<b>24,000</b>
14,500	11,700	3,500	<b>14,500</b>	24,500	13,700	4,000	<b>24,500</b>
14,750	11,700	3,500	<b>14,750</b>	25,000	13,700	4,000	<b>25,000</b>
15,000	11,700	3,500	<b>15,000</b>	26,000	17,300	5,000	<b>26,000</b>
15,500	11,700	3,500	<b>15,500</b>	27,000	17,300	5,000	<b>27,000</b>
15,750	11,700	3,500	<b>15,750</b>	28,000	17,300	5,000	<b>28,000</b>
16,000	11,700	3,500	<b>16,000</b>	29,000	17,300	5,000	<b>29,000</b>
16,250	11,700	3,500	<b>16,250</b>	30,000	17,300	5,000	<b>30,000</b>
16,500	11,700	3,500	<b>16,500</b>	31,000	17,300	5,000	<b>31,000</b>
16,750	11,700	3,500	<b>16,750</b>	32,000	17,300	5,000	<b>32,000</b>
17,000	11,700	3,500	<b>17,000</b>	33,000	17,300	5,000	<b>33,000</b>
17,500	11,700	3,500	<b>17,500</b>	34,000	17,300	5,000	<b>34,000</b>
17,750	11,700	3,500	<b>17,750</b>	35,000	17,300	5,000	<b>35,000</b>

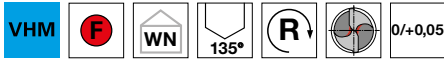


## Placas intercambiables

Nº artículo 86702



P	M	K	N	S	H
•	○	•	○		



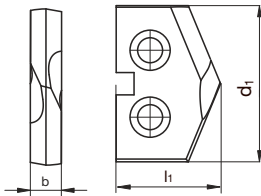
vaciado de punta  $\geq \varnothing 10,000$  • Plaquetas sin divisor de virutas. Para materiales de mas de 600 N/mm<sup>2</sup>. Para aplicaciones universales.

Ángulo de punta:

$\leq \varnothing 25,4$  mm = 135°

$> \varnothing 25,4$  mm = 132°

Con fase (ver "Condiciones recomendadas Multiplex"/ Parte técnica)



d1 mm	l1 mm	b mm	Código Nº	d1 mm	l1 mm	b mm	Código Nº
10,000	8,700	2,500	<b>10,000</b>	21,000	13,700	4,000	<b>21,000</b>
10,200	8,700	2,500	<b>10,200</b>	21,500	13,700	4,000	<b>21,500</b>
10,500	8,700	2,500	<b>10,500</b>	22,000	13,700	4,000	<b>22,000</b>
11,000	8,700	2,500	<b>11,000</b>	22,300	13,700	4,000	<b>22,300</b>
12,000	8,700	2,500	<b>12,000</b>	22,750	13,700	4,000	<b>22,750</b>
12,500	8,700	2,500	<b>12,500</b>	23,000	13,700	4,000	<b>23,000</b>
12,750	8,700	2,500	<b>12,750</b>	24,250	13,700	4,000	<b>24,250</b>
13,000	8,700	2,500	<b>13,000</b>	24,500	13,700	4,000	<b>24,500</b>
13,500	11,700	3,500	<b>13,500</b>	25,000	13,700	4,000	<b>25,000</b>
13,750	11,700	3,500	<b>13,750</b>	26,000	17,300	5,000	<b>26,000</b>
14,000	11,700	3,500	<b>14,000</b>	26,500	17,300	5,000	<b>26,500</b>
14,100	11,700	3,500	<b>14,100</b>	27,000	17,300	5,000	<b>27,000</b>
14,500	11,700	3,500	<b>14,500</b>	28,000	17,300	5,000	<b>28,000</b>
14,750	11,700	3,500	<b>14,750</b>	29,000	17,300	5,000	<b>29,000</b>
15,000	11,700	3,500	<b>15,000</b>	29,800	17,300	5,000	<b>29,800</b>
15,500	11,700	3,500	<b>15,500</b>	30,000	17,300	5,000	<b>30,000</b>
16,000	11,700	3,500	<b>16,000</b>	32,000	17,300	5,000	<b>32,000</b>
16,250	11,700	3,500	<b>16,250</b>	33,000	17,300	5,000	<b>33,000</b>
16,500	11,700	3,500	<b>16,500</b>	34,000	17,300	5,000	<b>34,000</b>
17,000	11,700	3,500	<b>17,000</b>	35,000	17,300	5,000	<b>35,000</b>
17,500	11,700	3,500	<b>17,500</b>				
17,750	11,700	3,500	<b>17,750</b>				
18,000	11,700	3,500	<b>18,000</b>				
18,250	11,700	3,500	<b>18,250</b>				
18,500	11,700	3,500	<b>18,500</b>				
19,000	13,700	4,000	<b>19,000</b>				
19,500	13,700	4,000	<b>19,500</b>				
19,750	13,700	4,000	<b>19,750</b>				
20,000	13,700	4,000	<b>20,000</b>				
20,500	13,700	4,000	<b>20,500</b>				

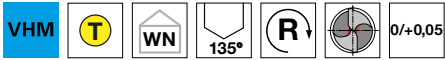


## Placas intercambiables

Nº artículo 86708



P	M	K	N	S	H
•	○	•	○		



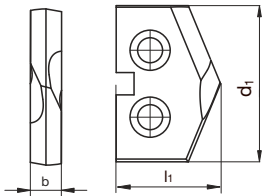
vaciado de punta  $\geq \varnothing 9,800$  • Plaquetas sin divisor de virutas. Para materiales de mas de 600 N/mm<sup>2</sup>. Para aplicaciones universales.

Ángulo de la punta:

$\leq \varnothing 25,4 \text{ mm} = 135^\circ$

$> \varnothing 25,4 \text{ mm} = 132^\circ$

Con fase (ver "Condiciones recomendadas Multiplex"/ Parte técnica)



d1 mm	l1 mm	b mm	Código Nº	d1 mm	l1 mm	b mm	Código Nº
10,000	8,700	2,500	<b>10,000</b>	20,500	13,700	4,000	<b>20,500</b>
10,200	8,700	2,500	<b>10,200</b>	21,000	13,700	4,000	<b>21,000</b>
10,500	8,700	2,500	<b>10,500</b>	21,500	13,700	4,000	<b>21,500</b>
11,000	8,700	2,500	<b>11,000</b>	22,000	13,700	4,000	<b>22,000</b>
11,500	8,700	2,500	<b>11,500</b>	22,500	13,700	4,000	<b>22,500</b>
12,500	8,700	2,500	<b>12,500</b>	22,750	13,700	4,000	<b>22,750</b>
12,750	8,700	2,500	<b>12,750</b>	23,000	13,700	4,000	<b>23,000</b>
13,000	8,700	2,500	<b>13,000</b>	23,500	13,700	4,000	<b>23,500</b>
13,500	11,700	3,500	<b>13,500</b>	24,000	13,700	4,000	<b>24,000</b>
13,750	11,700	3,500	<b>13,750</b>	24,250	13,700	4,000	<b>24,250</b>
14,000	11,700	3,500	<b>14,000</b>	24,500	13,700	4,000	<b>24,500</b>
14,500	11,700	3,500	<b>14,500</b>	25,000	13,700	4,000	<b>25,000</b>
14,750	11,700	3,500	<b>14,750</b>	26,000	17,300	5,000	<b>26,000</b>
15,000	11,700	3,500	<b>15,000</b>	27,000	17,300	5,000	<b>27,000</b>
15,500	11,700	3,500	<b>15,500</b>	28,000	17,300	5,000	<b>28,000</b>
15,750	11,700	3,500	<b>15,750</b>	29,000	17,300	5,000	<b>29,000</b>
16,000	11,700	3,500	<b>16,000</b>	30,000	17,300	5,000	<b>30,000</b>
16,250	11,700	3,500	<b>16,250</b>	31,000	17,300	5,000	<b>31,000</b>
16,500	11,700	3,500	<b>16,500</b>	32,000	17,300	5,000	<b>32,000</b>
16,750	11,700	3,500	<b>16,750</b>	34,000	17,300	5,000	<b>34,000</b>
17,000	11,700	3,500	<b>17,000</b>	35,000	17,300	5,000	<b>35,000</b>
17,500	11,700	3,500	<b>17,500</b>				
17,750	11,700	3,500	<b>17,750</b>				
18,000	11,700	3,500	<b>18,000</b>				
18,250	11,700	3,500	<b>18,250</b>				
18,500	11,700	3,500	<b>18,500</b>				
19,000	13,700	4,000	<b>19,000</b>				
19,500	13,700	4,000	<b>19,500</b>				
19,750	13,700	4,000	<b>19,750</b>				
20,000	13,700	4,000	<b>20,000</b>				



## Placas intercambiables

Nº artículo 86709



P	M	K	N	S	H
•	○	•	○		

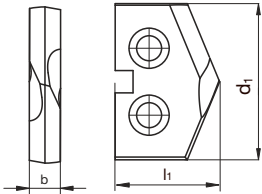


vaciado de punta  $\geq \varnothing 9,800$  • Plaquita intercambiable sin ranuras divisorias. Para materiales hasta 600 N/mm<sup>2</sup>. Para aplicación universal.  
 ángulo de la punta:

$\leq \varnothing 25,4 \text{ mm} = 135^\circ$

$> \varnothing 25,4 \text{ mm} = 132^\circ$

Sin faceta (ver "recomendación aplicación Multiplex"/ (Parte técnica).



d1 mm	l1 mm	b mm	Código Nº	d1 mm	l1 mm	b mm	Código Nº
9,920	8,700	2,500	<b>9,920</b>	18,250	11,700	3,500	<b>18,250</b>
10,000	8,700	2,500	<b>10,000</b>	18,500	11,700	3,500	<b>18,500</b>
10,200	8,700	2,500	<b>10,200</b>	19,000	13,700	4,000	<b>19,000</b>
10,500	8,700	2,500	<b>10,500</b>	19,500	13,700	4,000	<b>19,500</b>
11,000	8,700	2,500	<b>11,000</b>	20,000	13,700	4,000	<b>20,000</b>
11,110	8,700	2,500	<b>11,110</b>	20,500	13,700	4,000	<b>20,500</b>
12,000	8,700	2,500	<b>12,000</b>	21,000	13,700	4,000	<b>21,000</b>
12,500	8,700	2,500	<b>12,500</b>	21,500	13,700	4,000	<b>21,500</b>
12,700	8,700	2,500	<b>12,700</b>	22,000	13,700	4,000	<b>22,000</b>
12,750	8,700	2,500	<b>12,750</b>	23,000	13,700	4,000	<b>23,000</b>
13,000	8,700	2,500	<b>13,000</b>	23,250	13,700	4,000	<b>23,250</b>
13,500	11,700	3,500	<b>13,500</b>	24,500	13,700	4,000	<b>24,500</b>
14,000	11,700	3,500	<b>14,000</b>	25,000	13,700	4,000	<b>25,000</b>
14,500	11,700	3,500	<b>14,500</b>	26,000	17,300	5,000	<b>26,000</b>
15,000	11,700	3,500	<b>15,000</b>	27,000	17,300	5,000	<b>27,000</b>
15,880	11,700	3,500	<b>15,880</b>	28,000	17,300	5,000	<b>28,000</b>
16,250	11,700	3,500	<b>16,250</b>	29,000	17,300	5,000	<b>29,000</b>
16,500	11,700	3,500	<b>16,500</b>	30,000	17,300	5,000	<b>30,000</b>
16,670	11,700	3,500	<b>16,670</b>	33,000	17,300	5,000	<b>33,000</b>
16,750	11,700	3,500	<b>16,750</b>	34,000	17,300	5,000	<b>34,000</b>
17,000	11,700	3,500	<b>17,000</b>	35,000	17,300	5,000	<b>35,000</b>
17,500	11,700	3,500	<b>17,500</b>				
17,750	11,700	3,500	<b>17,750</b>				
18,000	11,700	3,500	<b>18,000</b>				



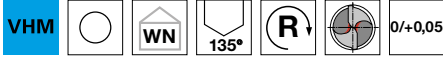


## Placas intercambiables

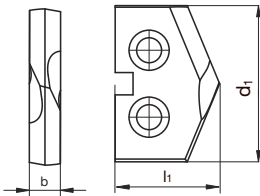
Nº artículo 86711



P	M	K	N	S	H
			•		



vaciado de punta  $\geq \varnothing 10,000$  • Panel intercambiable con ranuras de aglomerado. Geometría de aluminio para aleaciones de aluminio, metales no férricos y plásticos:  
 $\leq \varnothing 25,4 \text{ mm} = 135^\circ$   
 $> \varnothing 25,4 \text{ mm} = 132^\circ$



d1 mm	l1 mm	b mm	Código Nº	d1 mm	l1 mm	b mm	Código Nº
10,000	8,700	2,500	10,000	24,000	13,700	4,000	24,000
10,200	8,700	2,500	10,200	24,250	13,700	4,000	24,250
10,500	8,700	2,500	10,500	24,500	13,700	4,000	24,500
11,000	8,700	2,500	11,000	25,000	13,700	4,000	25,000
11,500	8,700	2,500	11,500	25,400	17,300	5,000	25,400
12,000	8,700	2,500	12,000	26,000	17,300	5,000	26,000
12,250	8,700	2,500	12,250	27,000	17,300	5,000	27,000
12,500	8,700	2,500	12,500	28,000	17,300	5,000	28,000
12,700	8,700	2,500	12,700	29,000	17,300	5,000	29,000
12,750	8,700	2,500	12,750	30,000	17,300	5,000	30,000
13,000	8,700	2,500	13,000	31,000	17,300	5,000	31,000
13,500	11,700	3,500	13,500	32,000	17,300	5,000	32,000
13,750	11,700	3,500	13,750	34,000	17,300	5,000	34,000
14,000	11,700	3,500	14,000	35,000	17,300	5,000	35,000
14,250	11,700	3,500	14,250	36,000	24,000	7,000	36,000
14,500	11,700	3,500	14,500	37,000	24,000	7,000	37,000
14,750	11,700	3,500	14,750	38,000	24,000	7,000	38,000
15,000	11,700	3,500	15,000	39,000	24,000	7,000	39,000
15,500	11,700	3,500	15,500	40,000	24,000	7,000	40,000
15,750	11,700	3,500	15,750	41,000	24,000	7,000	41,000
16,000	11,700	3,500	16,000	42,000	24,000	7,000	42,000
16,250	11,700	3,500	16,250	43,000	24,000	7,000	43,000
16,500	11,700	3,500	16,500	44,000	24,000	7,000	44,000
16,750	11,700	3,500	16,750	45,000	24,000	7,000	45,000
17,000	11,700	3,500	17,000	46,000	24,000	7,000	46,000
17,500	11,700	3,500	17,500	47,000	24,000	7,000	47,000
17,750	11,700	3,500	17,750	48,000	24,000	7,000	48,000
18,000	11,700	3,500	18,000	49,000	24,000	7,000	49,000
18,250	11,700	3,500	18,250	50,000	24,000	7,000	50,000
18,500	11,700	3,500	18,500	51,000	24,000	7,000	51,000
19,000	13,700	4,000	19,000	52,000	24,000	7,000	52,000
19,500	13,700	4,000	19,500	53,000	24,000	7,000	53,000
19,750	13,700	4,000	19,750	54,000	24,000	7,000	54,000
20,000	13,700	4,000	20,000	55,000	24,000	7,000	55,000
20,500	13,700	4,000	20,500	56,000	24,000	7,000	56,000
21,000	13,700	4,000	21,000	57,000	24,000	7,000	57,000
21,500	13,700	4,000	21,500	58,000	24,000	7,000	58,000
22,000	13,700	4,000	22,000	59,000	24,000	7,000	59,000
22,500	13,700	4,000	22,500	60,000	24,000	7,000	60,000
22,750	13,700	4,000	22,750	62,000	24,000	7,000	62,000
23,000	13,700	4,000	23,000	64,000	24,000	7,000	64,000
23,500	13,700	4,000	23,500	65,000	24,000	7,000	65,000

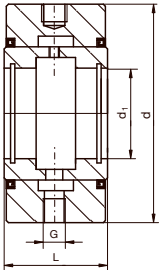


## Alimentadores de refrigeración

N° artículo 86690



Aro transmisor de refrigerante para portas con mango cónico y ranura para Art.n°. 86670 und 86680 (Sin set de atornillado).



para	d1 mm	d mm	G	L mm	Código N°
MK 4	31,750	80,000	G1/4	45,000	<b>31,750</b>
MK 5	63,500	127,000	G1/2	60,000	<b>63,500</b>

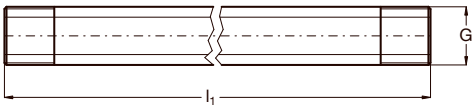


## Tubo alimentador para refrigerante

Nº artículo 82571



Tubo transmisor de refrigerante para aros de transmisión de refrigerante Nº art. 86690



G	l1 mm	Código Nº
G1/4	200,000	13,160
G1/2	200,000	20,960





## Acoplamiento de cierre rápido

Nº artículo 82578



acoplamiento de cierre rápido para tubos transmisores de refrigerante Nº art. 82571

G	d mm	l1 mm	Código Nº
G1/4	9,000	118,000	<b>9,000</b>
G1/2	13,000	118,000	<b>13,000</b>



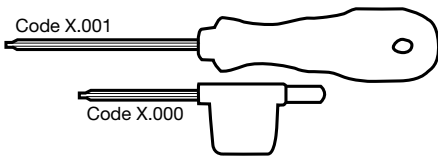
# HARTNER

## Atornillador Torx

Nº artículo 86842



Atornillador Torx



Torx	l1 mm	Código Nº
T5	130,000	5,001
T6	69,000	6,000
T6	150,000	6,001
T7	74,000	7,000
T7	150,000	7,001
T8	150,000	8,001
T9	150,000	9,001
T10	170,000	10,001
T15	80,000	15,000
T15	190,000	15,001
T20	205,000	20,001
T25	207,000	25,001

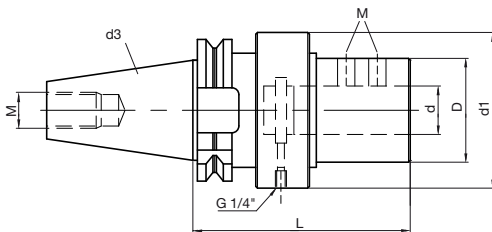


## Transportador de refrigerante para Multiplex

Nº artículo 86691



Tuerca transmisora de refrigerante SK según DIN ISO 7388-1 y taladro cilíndrico. En diámetros más pequeños de mango utilizar casquillo reductor.



d3	d mm	D mm	D1 mm	L mm	M	kg	Código N°
<b>SK 40</b>	32,000	65,000	88,000	130,000	M16	4,000	<b>32,040</b>
<b>SK 50</b>	40,000	65,000	98,000	135,000	M24	5,400	<b>40,050</b>
<b>SK 50</b>	50,000	90,000	123,000	165,000	M24	9,520	<b>50,050</b>

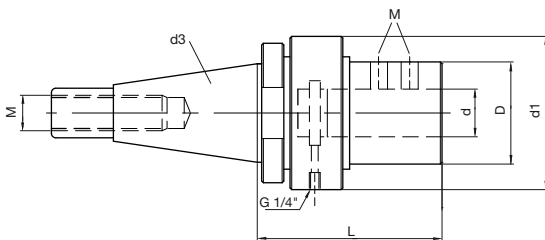


## Transportador de refrigerante para Multiplex

Nº artículo 86692



Tuerca transmisora de refrigerante SK según DIN 2080 y taladro cilíndrico. En diámetros más pequeños de mango utilizar casquillo reductor.



d3	d mm	D mm	D1 mm	L mm	M	kg	Código N°
<b>SK 40</b>	32,000	65,000	88,000	110,000	M16	0,931	<b>32,040</b>
<b>SK 50</b>	40,000	65,000	98,000	120,000	M24	5,825	<b>40,050</b>
<b>SK 50</b>	50,000	90,000	123,000	145,000	M24	9,116	<b>50,050</b>

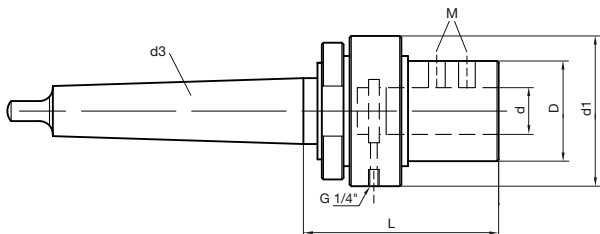


## Transportador de refrigerante para Multiplex

Nº artículo 86693



Tuerca transmisora de refrigerante con mango cónico según DIN 228 B y taladro cilíndrico. En diámetros más pequeños de mango utilizar con casquillo reductor.



d3	d mm	D mm	D1 mm	L mm	M	kg	Código N°
<b>MK-4</b>	32,000	65,000	88,000	100,000	M14	3,498	<b>32,400</b>
<b>MK-5</b>	40,000	75,000	98,000	110,000	M16	7,325	<b>40,500</b>
<b>MK-6</b>	40,000	75,000	98,000	120,000	M16	8,000	<b>40,600</b>
<b>MK-5</b>	50,000	90,000	123,000	140,000	M20	7,278	<b>50,500</b>
<b>MK-6</b>	50,000	90,000	123,000	140,000	M20	3,997	<b>50,600</b>



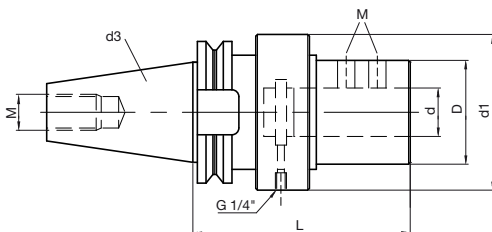


## Transportador de refrigerante para Multiplex

Nº artículo 86694



Tuerca transmisora de refrigerante con MAS BT según DIN ISO 7388-2 y taladro cilíndrico. En diámetros más pequeños de mango utilizar con casquillo reductor.



d3	d mm	D mm	D1 mm	L mm	M	kg	Código N°
<b>BT 40</b>	32,000	65,000	88,000	125,000	M16	0,872	<b>32,040</b>
<b>BT 50</b>	40,000	65,000	98,000	145,000	M24	6,800	<b>40,050</b>
<b>BT 50</b>	50,000	90,000	123,000	170,000	M24	10,183	<b>50,050</b>

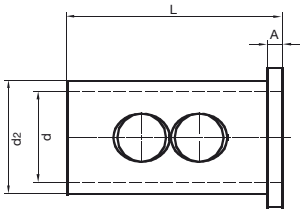


## Union para mandril de refrigeracion

N° artículo 86699



Casquillo reductor para transmisión de refrigerante con taladro de sujeción cilíndrico



d mm	d2 mm	L mm	A mm	Código N°
20,000	32,000	65,000	5,000	20,032
20,000	40,000	75,000	5,000	20,040
25,000	32,000	65,000	5,000	25,032
25,000	40,000	75,000	5,000	25,040
32,000	40,000	75,000	5,000	32,040



# HARTNER

Precision Cutting Tools



**MULTIPLIX HPC**

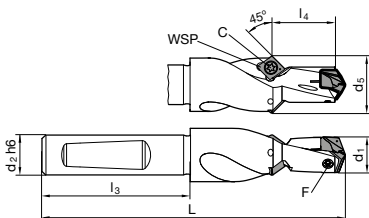


## Soporte Multiplex HPC

Nº artículo 86681



alta resistencia al desgaste • sección de ranura optimizada • salida de refrigerante optimizada • tornillos tensores Art.nº. 86843 y 86846 incluidos • atornillador Art.Nº 86842 incluidos para pilotar y avellanar 45°



Tamaño mm	d1	d2 h6 mm	d5 mm	L mm	l3 mm	l4 mm	F	C	Código Nº
110	11,00-11,99	12,000	17,000	81,000	45,000	12,000	86843 2.200	86846 2.000	11,000
110	11,00-11,99	12,700	17,000	81,000	45,000	12,000	86843 2.200	86846 2.000	11,005
120	12,00-12,99	12,000	18,000	84,000	45,000	13,000	86843 2.201	86846 2.000	12,000
120	12,00-12,99	12,700	18,000	84,000	45,000	13,000	86843 2.201	86846 2.000	12,005
130	13,00-13,99	14,000	18,000	86,000	45,000	14,000	86843 2.500	86846 2.000	13,000
130	13,00-13,99	15,875	18,000	86,000	45,000	14,000	86843 2.500	86846 2.000	13,005
140	14,00-15,99	16,000	18,000	93,000	48,000	16,000	86843 3.000	86846 2.000	14,000
140	14,00-15,99	15,875	18,000	93,000	48,000	16,000	86843 3.000	86846 2.000	14,005
160	16,00-17,99	18,000	20,000	99,000	48,000	18,000	86843 3.500	86846 2.500	16,000
160	16,00-17,99	19,050	20,000	99,000	48,000	18,000	86843 3.500	86846 2.500	16,005
180	18,00-19,99	20,000	22,000	106,000	50,000	20,000	86843 4.000	86846 2.500	18,000
180	18,00-19,99	19,050	22,000	106,000	50,000	20,000	86843 4.000	86846 2.500	18,005
200	20,00-21,99	25,000	25,000	117,000	56,000	22,000	86843 4.500	86846 2.500	20,000
200	20,00-21,99	25,400	25,400	117,000	56,000	22,000	86843 4.500	86846 2.500	20,005
220	22,00-23,99	25,000	26,000	122,000	56,000	24,000	86843 5.000	86846 2.500	22,000
220	22,00-23,99	25,400	26,000	122,000	56,000	24,000	86843 5.000	86846 2.500	22,005
240	24,00-25,99	25,000	28,000	128,000	56,000	26,000	86843 5.001	86846 2.500	24,000
240	24,00-25,99	25,400	28,000	128,000	56,000	26,000	86843 5.001	86846 2.500	24,005
260	26,00-27,99	32,000	32,000	142,000	60,000	28,000	86843 5.003	86846 2.500	26,000
260	26,00-27,99	31,750	32,000	142,000	60,000	28,000	86843 5.003	86846 2.500	26,005
280	28,00-29,99	32,000	34,000	147,000	60,000	30,000	86843 5.003	86846 2.500	28,000
280	28,00-29,99	31,750	34,000	147,000	60,000	30,000	86843 5.003	86846 2.500	28,005
300	30,00-31,99	32,000	38,000	152,000	60,000	32,000	86843 6.000	86846 4.006	30,000
300	30,00-31,99	31,750	38,000	152,000	60,000	32,000	86843 6.000	86846 4.006	30,005
320	32,00-35,99	32,000	42,000	163,000	60,000	36,000	86843 6.001	86846 4.006	32,000
320	32,00-35,99	31,750	42,000	163,000	60,000	36,000	86843 6.001	86846 4.006	32,005
360	36,00-40,00	32,000	46,000	173,000	60,000	40,000	86843 6.002	86846 4.006	36,000
360	36,00-40,00	31,750	46,000	173,000	60,000	40,000	86843 6.002	86846 4.006	36,005



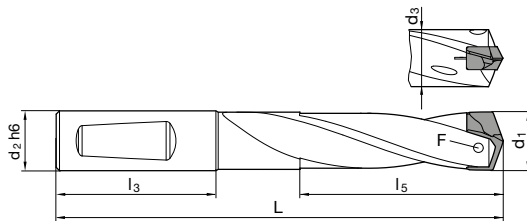
# HARTNER

## Soporte Multiplex HPC

N° artículo 86682



alta resistencia al desgaste • sección de ranura optimizada • salida de refrigerante optimizada • tornillos tensores Art.n°. 86843 incluidos  
• atornillador Art.N° 86842 incluidos



Tamaño mm	d1	d2 h6 mm	d3 mm	L mm	l3 mm	l5 mm	F	Código N°
110	11,00-11,49	12,000	10,700	84,000	45,000	19,300	86843 2.200	11,000
110	11,00-11,49	12,700	10,700	84,000	45,000	19,300	86843 2.200	11,005
115	11,50-11,99	12,000	11,200	85,000	45,000	20,100	86843 2.200	11,500
115	11,50-11,99	12,700	11,200	85,000	45,000	20,100	86843 2.200	11,505
120	12,00-12,49	12,000	11,700	87,000	45,000	21,000	86843 2.201	12,000
120	12,00-12,49	12,700	11,700	87,000	45,000	21,000	86843 2.201	12,005
125	12,50-12,99	14,000	12,200	89,000	45,000	21,900	86843 2.201	12,500
125	12,50-12,99	15,875	12,200	89,000	45,000	21,900	86843 2.201	12,505
130	13,00-13,49	14,000	12,700	90,000	45,000	22,600	86843 2.500	13,000
130	13,00-13,49	15,875	12,700	90,000	45,000	22,600	86843 2.500	13,005
135	13,50-13,99	14,000	13,200	92,000	45,000	23,600	86843 2.500	13,500
135	13,50-13,99	15,875	13,200	92,000	45,000	23,600	86843 2.500	13,505
140	14,00-14,49	14,000	13,700	93,000	45,000	24,500	86843 3.000	14,000
140	14,00-14,49	15,875	13,700	93,000	45,000	24,500	86843 3.000	14,005
145	14,50-14,99	16,000	14,200	98,000	48,000	25,300	86843 3.000	14,500
145	14,50-14,99	15,875	14,200	98,000	48,000	25,300	86843 3.000	14,505
150	15,00-15,49	16,000	14,700	100,000	48,000	26,100	86843 3.001	15,000
150	15,00-15,49	15,875	14,700	100,000	48,000	26,100	86843 3.001	15,005
155	15,50-15,99	16,000	15,200	101,000	48,000	27,000	86843 3.001	15,500
155	15,50-15,99	15,875	15,200	101,000	48,000	27,000	86843 3.001	15,505
160	16,00-16,49	16,000	15,700	102,000	48,000	27,800	86843 3.500	16,000
160	16,00-16,49	15,875	15,700	102,000	48,000	27,800	86843 3.500	16,005
165	16,50-16,99	18,000	16,200	105,000	48,000	28,700	86843 3.500	16,500
165	16,50-16,99	19,050	16,200	105,000	48,000	28,700	86843 3.500	16,505
170	17,00-17,49	18,000	16,700	106,000	48,000	29,600	86843 3.500	17,000
170	17,00-17,49	19,050	16,700	106,000	48,000	29,600	86843 3.500	17,005
175	17,50-17,99	18,000	17,200	107,000	48,000	30,400	86843 3.500	17,500
175	17,50-17,99	19,050	17,200	107,000	48,000	30,400	86843 3.500	17,505
180	18,00-18,49	18,000	17,700	109,000	48,000	31,200	86843 4.000	18,000
180	18,00-18,49	19,050	17,700	109,000	48,000	31,200	86843 4.000	18,005
185	18,50-18,99	20,000	18,200	113,000	50,000	32,100	86843 4.000	18,500
185	18,50-18,99	19,050	18,200	113,000	50,000	32,100	86843 4.000	18,505
190	19,00-19,49	20,000	18,700	114,000	50,000	32,900	86843 4.000	19,000
190	19,00-19,49	19,050	18,700	114,000	50,000	32,900	86843 4.000	19,005
195	19,50-19,99	20,000	19,200	116,000	50,000	33,700	86843 4.000	19,500
195	19,50-19,99	19,050	19,200	116,000	50,000	33,700	86843 4.000	19,505
200	20,00-20,49	20,000	19,700	117,000	50,000	34,600	86843 4.500	20,000
200	20,00-20,49	19,050	19,700	117,000	50,000	34,600	86843 4.500	20,005
205	20,50-20,99	25,000	20,200	128,000	56,000	35,500	86843 4.500	20,500
205	20,50-20,99	25,400	20,200	128,000	56,000	35,500	86843 4.500	20,505
210	21,00-21,49	25,000	20,700	129,000	56,000	36,400	86843 4.500	21,000
210	21,00-21,49	25,400	20,700	129,000	56,000	36,400	86843 4.500	21,005



## Soporte Multiplex HPC

Tamaño mm	d1	d2 h6 mm	d3 mm	L mm	I3 mm	I5 mm	F	Código N°
215	21,50-21,99	25,000	21,200	130,000	56,000	37,200	86843 4.500	21,500
215	21,50-21,99	25,400	21,200	130,000	56,000	37,200	86843 4.500	21,505
220	22,00-22,49	25,000	21,700	131,000	56,000	38,000	86843 5.000	22,000
220	22,00-22,49	25,400	21,700	131,000	56,000	38,000	86843 5.000	22,005
225	22,50-22,99	25,000	22,200	134,000	56,000	38,900	86843 5.000	22,500
225	22,50-22,99	25,400	22,200	134,000	56,000	38,900	86843 5.000	22,505
230	23,00-23,49	25,000	22,700	135,000	56,000	39,800	86843 5.000	23,000
230	23,00-23,49	25,400	22,700	135,000	56,000	39,800	86843 5.000	23,005
235	23,50-23,99	25,000	23,200	137,000	56,000	40,600	86843 5.000	23,500
235	23,50-23,99	25,400	23,200	137,000	56,000	40,600	86843 5.000	23,505
240	24,00-24,49	25,000	23,700	138,000	56,000	41,500	86843 5.001	24,000
240	24,00-24,49	25,400	23,700	138,000	56,000	41,500	86843 5.001	24,005
245	24,50-24,99	25,000	24,200	140,000	56,000	42,300	86843 5.001	24,500
245	24,50-24,99	25,400	24,200	140,000	56,000	42,300	86843 5.001	24,505
250	25,00-25,49	25,000	24,700	142,000	56,000	43,200	86843 5.001	25,000
250	25,00-25,49	25,400	24,700	142,000	56,000	43,200	86843 5.001	25,005
255	25,50-25,99	32,000	25,200	148,000	60,000	44,000	86843 5.001	25,500
255	25,50-25,99	31,750	25,200	148,000	60,000	44,000	86843 5.001	25,505
260	26,00-26,49	32,000	25,700	151,000	60,000	44,300	86843 5.003	26,000
260	26,00-26,49	31,750	25,700	151,000	60,000	44,300	86843 5.003	26,005
265	26,50-26,99	32,000	26,200	153,000	60,000	45,100	86843 5.003	26,500
265	26,50-26,99	31,750	26,200	153,000	60,000	45,100	86843 5.003	26,505
270	27,00-27,49	32,000	26,700	155,000	60,000	46,000	86843 5.003	27,000
270	27,00-27,49	31,750	26,700	155,000	60,000	46,000	86843 5.003	27,005
275	27,50-27,99	32,000	27,200	156,000	60,000	46,800	86843 5.003	27,500
275	27,50-27,99	31,750	27,200	156,000	60,000	46,800	86843 5.003	27,505
280	28,00-28,49	32,000	27,700	157,000	60,000	47,700	86843 5.003	28,000
280	28,00-28,49	31,750	27,700	157,000	60,000	47,700	86843 5.003	28,005
285	28,50-28,99	32,000	28,200	159,000	60,000	48,500	86843 5.003	28,500
285	28,50-28,99	31,750	28,200	159,000	60,000	48,500	86843 5.003	28,505
290	29,00-29,49	32,000	28,700	161,000	60,000	49,400	86843 5.003	29,000
290	29,00-29,49	31,750	28,700	161,000	60,000	49,400	86843 5.003	29,005
295	29,50-29,99	32,000	29,200	162,000	60,000	50,200	86843 5.003	29,500
295	29,50-29,99	31,750	29,200	162,000	60,000	50,200	86843 5.003	29,505
300	30,00-30,49	32,000	29,700	164,000	60,000	50,900	86843 6.000	30,000
300	30,00-30,49	31,750	29,700	164,000	60,000	50,900	86843 6.000	30,005
305	30,50-30,99	32,000	30,200	166,000	60,000	51,700	86843 6.000	30,500
305	30,50-30,99	31,750	30,200	166,000	60,000	51,700	86843 6.000	30,505
310	31,00-31,49	32,000	30,700	167,000	60,000	52,600	86843 6.000	31,000
310	31,00-31,49	31,750	30,700	167,000	60,000	52,600	86843 6.000	31,005
315	31,50-31,99	32,000	31,200	168,000	60,000	53,400	86843 6.000	31,500
315	31,50-31,99	31,750	31,200	168,000	60,000	53,400	86843 6.000	31,505
320	32,00-32,99	32,000	31,700	172,000	60,000	55,100	86843 6.001	32,000
320	32,00-32,99	31,750	31,700	172,000	60,000	55,100	86843 6.001	32,005
330	33,00-33,99	32,000	32,700	175,000	60,000	56,800	86843 6.001	33,000
330	33,00-33,99	31,750	32,700	175,000	60,000	56,800	86843 6.001	33,005
340	34,00-34,99	32,000	33,700	178,000	60,000	58,500	86843 6.001	34,000
340	34,00-34,99	31,750	33,700	178,000	60,000	58,500	86843 6.001	34,005
350	35,00-35,99	32,000	34,700	181,000	60,000	60,200	86843 6.001	35,000
350	35,00-35,99	31,750	34,700	181,000	60,000	60,200	86843 6.001	35,005
360	36,00-36,99	32,000	35,700	184,000	60,000	61,800	86843 6.002	36,000
360	36,00-36,99	31,750	35,700	184,000	60,000	61,800	86843 6.002	36,005
370	37,00-37,99	32,000	36,700	188,000	60,000	63,500	86843 6.002	37,000
370	37,00-37,99	31,750	36,700	188,000	60,000	63,500	86843 6.002	37,005
380	38,00-38,99	32,000	37,700	191,000	60,000	65,200	86843 6.002	38,000
380	38,00-38,99	31,750	37,700	191,000	60,000	65,200	86843 6.002	38,005
390	39,00-40,00	32,000	38,700	194,000	60,000	66,900	86843 6.002	39,000
390	39,00-40,00	31,750	38,700	194,000	60,000	66,900	86843 6.002	39,005



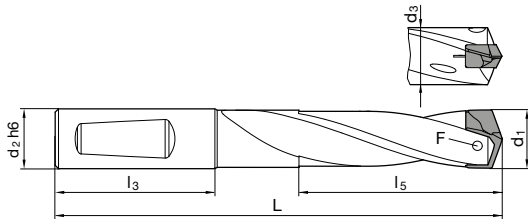
# HARTNER

## Soporte Multiplex HPC

Nº artículo 86683



alta resistencia al desgaste • sección de ranura optimizada • estabilidad muy buena • tornillos tensores Art.nº. 86843 incluidos  
• atornillador Art.Nº 86842 incluidos



Tamaño mm	d1	d2 h6 mm	d3 mm	L mm	l3 mm	l5 mm	F	Código Nº
110	11,00-11,49	12,000	10,700	101,000	45,000	36,600	86843 2.200	11,000
110	11,00-11,49	12,700	10,700	101,000	45,000	36,600	86843 2.200	11,005
115	11,50-11,99	12,000	11,200	103,000	45,000	38,100	86843 2.200	11,500
115	11,50-11,99	12,700	11,200	103,000	45,000	38,100	86843 2.200	11,505
120	12,00-12,49	12,000	11,700	106,000	45,000	39,700	86843 2.201	12,000
120	12,00-12,49	12,700	11,700	106,000	45,000	39,700	86843 2.201	12,005
125	12,50-12,99	14,000	12,200	108,000	45,000	41,300	86843 2.201	12,500
125	12,50-12,99	15,875	12,200	108,000	45,000	41,300	86843 2.201	12,505
130	13,00-13,49	14,000	12,700	110,000	45,000	42,900	86843 2.500	13,000
130	13,00-13,49	15,875	12,700	110,000	45,000	42,900	86843 2.500	13,005
135	13,50-13,99	14,000	13,200	113,000	45,000	44,600	86843 2.500	13,500
135	13,50-13,99	15,875	13,200	113,000	45,000	44,600	86843 2.500	13,505
140	14,00-14,49	14,000	13,700	115,000	45,000	46,200	86843 3.000	14,000
140	14,00-14,49	15,875	13,700	115,000	45,000	46,200	86843 3.000	14,005
145	14,50-14,99	16,000	14,200	120,000	48,000	47,800	86843 3.000	14,500
145	14,50-14,99	15,875	14,200	120,000	48,000	47,800	86843 3.000	14,505
150	15,00-15,49	16,000	14,700	123,000	48,000	49,300	86843 3.001	15,000
150	15,00-15,49	15,875	14,700	123,000	48,000	49,300	86843 3.001	15,005
155	15,50-15,99	16,000	15,200	125,000	48,000	50,900	86843 3.001	15,500
155	15,50-15,99	15,875	15,200	125,000	48,000	50,900	86843 3.001	15,505
160	16,00-16,49	16,000	15,700	127,000	48,000	52,900	86843 3.500	16,000
160	16,00-16,49	15,875	15,700	127,000	48,000	52,900	86843 3.500	16,005
165	16,50-16,99	18,000	16,200	130,000	48,000	54,100	86843 3.500	16,500
165	16,50-16,99	19,050	16,200	130,000	48,000	54,100	86843 3.500	16,505
170	17,00-17,49	18,000	16,700	132,000	48,000	55,800	86843 3.500	17,000
170	17,00-17,49	19,050	16,700	132,000	48,000	55,800	86843 3.500	17,005
175	17,50-17,99	18,000	17,200	134,000	48,000	57,400	86843 3.500	17,500
175	17,50-17,99	19,050	17,200	134,000	48,000	57,400	86843 3.500	17,505
180	18,00-18,49	18,000	17,700	137,000	48,000	58,900	86843 4.000	18,000
180	18,00-18,49	19,050	17,700	137,000	48,000	58,900	86843 4.000	18,005
185	18,50-18,99	20,000	18,200	141,000	50,000	60,500	86843 4.000	18,500
185	18,50-18,99	19,050	18,200	141,000	50,000	60,500	86843 4.000	18,505
190	19,00-19,49	20,000	18,700	143,000	50,000	62,100	86843 4.000	19,000
190	19,00-19,49	19,050	18,700	143,000	50,000	62,100	86843 4.000	19,005
195	19,50-19,99	20,000	19,200	146,000	50,000	63,700	86843 4.000	19,500
195	19,50-19,99	19,050	19,200	146,000	50,000	63,700	86843 4.000	19,505
200	20,00-20,49	20,000	19,700	148,000	50,000	65,300	86843 4.500	20,000
200	20,00-20,49	19,050	19,700	148,000	50,000	65,300	86843 4.500	20,005
205	20,50-20,99	25,000	20,200	159,000	56,000	67,000	86843 4.500	20,500
205	20,50-20,99	25,400	20,200	159,000	56,000	67,000	86843 4.500	20,505
210	21,00-21,49	25,000	20,700	161,000	56,000	68,600	86843 4.500	21,000
210	21,00-21,49	25,400	20,700	161,000	56,000	68,600	86843 4.500	21,005



## Soporte Multiplex HPC

Tamaño mm	d1	d2 h6 mm	d3 mm	L mm	l3 mm	l5 mm	F	Código N°
215	21,50-21,99	25,000	21,200	163,000	56,000	70,100	86843 4.500	21,500
215	21,50-21,99	25,400	21,200	163,000	56,000	70,100	86843 4.500	21,505
220	22,00-22,49	25,000	21,700	165,000	56,000	71,700	86843 5.000	22,000
220	22,00-22,49	25,400	21,700	165,000	56,000	71,700	86843 5.000	22,005
225	22,50-22,99	25,000	22,200	168,000	56,000	73,300	86843 5.000	22,500
225	22,50-22,99	25,400	22,200	168,000	56,000	73,300	86843 5.000	22,505
230	23,00-23,49	25,000	22,700	170,000	56,000	74,900	86843 5.000	23,000
230	23,00-23,49	25,400	22,700	170,000	56,000	74,900	86843 5.000	23,005
235	23,50-23,99	25,000	23,200	173,000	56,000	76,500	86843 5.000	23,500
235	23,50-23,99	25,400	23,200	173,000	56,000	76,500	86843 5.000	23,505
240	24,00-24,49	25,000	23,700	175,000	56,000	78,100	86843 5.001	24,000
240	24,00-24,49	25,400	23,700	175,000	56,000	78,100	86843 5.001	24,005
245	24,50-24,99	25,000	24,200	177,000	56,000	79,700	86843 5.001	24,500
245	24,50-24,99	25,400	24,200	177,000	56,000	79,700	86843 5.001	24,505
250	25,00-25,49	25,000	24,700	180,000	56,000	81,300	86843 5.001	25,000
250	25,00-25,49	25,400	24,700	180,000	56,000	81,300	86843 5.001	25,005
255	25,50-25,99	32,000	25,200	187,000	60,000	82,900	86843 5.001	25,500
255	25,50-25,99	31,750	25,200	187,000	60,000	82,900	86843 5.001	25,505
260	26,00-26,49	32,000	25,700	191,000	60,000	84,000	86843 5.003	26,000
260	26,00-26,49	31,750	25,700	191,000	60,000	84,000	86843 5.003	26,005
265	26,50-26,99	32,000	26,200	193,000	60,000	86,100	86843 5.003	26,500
265	26,50-26,99	31,750	26,200	193,000	60,000	86,100	86843 5.003	26,505
270	27,00-27,49	32,000	26,700	196,000	60,000	87,200	86843 5.003	27,000
270	27,00-27,49	31,750	26,700	196,000	60,000	87,200	86843 5.003	27,005
275	27,50-27,99	32,000	27,200	198,000	60,000	88,900	86843 5.003	27,500
275	27,50-27,99	31,750	27,200	198,000	60,000	88,900	86843 5.003	27,505
280	28,00-28,49	32,000	27,700	200,000	60,000	90,400	86843 5.003	28,000
280	28,00-28,49	31,750	27,700	200,000	60,000	90,400	86843 5.003	28,005
285	28,50-28,99	32,000	28,200	202,000	60,000	92,500	86843 5.003	28,500
285	28,50-28,99	31,750	28,200	202,000	60,000	92,500	86843 5.003	28,505
290	29,00-29,49	32,000	28,700	205,000	60,000	94,600	86843 5.003	29,000
290	29,00-29,49	31,750	28,700	205,000	60,000	94,600	86843 5.003	29,005
295	29,50-29,99	32,000	29,200	207,000	60,000	95,100	86843 5.003	29,500
295	29,50-29,99	31,750	29,200	207,000	60,000	95,100	86843 5.003	29,505
300	30,00-30,49	32,000	29,700	210,000	60,000	96,700	86843 6.000	30,000
300	30,00-30,49	31,750	29,700	210,000	60,000	96,700	86843 6.000	30,005
305	30,50-30,99	32,000	30,200	212,000	60,000	98,300	86843 6.000	30,500
305	30,50-30,99	31,750	30,200	212,000	60,000	98,300	86843 6.000	30,505
310	31,00-31,49	32,000	30,700	214,000	60,000	99,800	86843 6.000	31,000
310	31,00-31,49	31,750	30,700	214,000	60,000	99,800	86843 6.000	31,005
315	31,50-31,99	32,000	31,200	216,000	60,000	101,400	86843 6.000	31,500
315	31,50-31,99	31,750	31,200	216,000	60,000	101,400	86843 6.000	31,505
320	32,00-32,99	32,000	31,700	221,000	60,000	104,600	86843 6.001	32,000
320	32,00-32,99	31,750	31,700	221,000	60,000	104,600	86843 6.001	32,005
330	33,00-33,99	32,000	32,700	226,000	60,000	107,800	86843 6.001	33,000
330	33,00-33,99	31,750	32,700	226,000	60,000	107,800	86843 6.001	33,005
340	34,00-34,99	32,000	33,700	230,000	60,000	111,000	86843 6.001	34,000
340	34,00-34,99	31,750	33,700	230,000	60,000	111,000	86843 6.001	34,005
350	35,00-35,99	32,000	34,700	235,000	60,000	114,200	86843 6.001	35,000
350	35,00-35,99	31,750	34,700	235,000	60,000	114,200	86843 6.001	35,005
360	36,00-36,99	32,000	35,700	240,000	60,000	117,300	86843 6.002	36,000
360	36,00-36,99	31,750	35,700	240,000	60,000	117,300	86843 6.002	36,005
370	37,00-37,99	32,000	36,700	245,000	60,000	120,500	86843 6.002	37,000
370	37,00-37,99	31,750	36,700	245,000	60,000	120,500	86843 6.002	37,005
380	38,00-38,99	32,000	37,700	249,000	60,000	123,700	86843 6.002	38,000
380	38,00-38,99	31,750	37,700	249,000	60,000	123,700	86843 6.002	38,005
390	39,00-40,00	32,000	38,700	254,000	60,000	126,900	86843 6.002	39,000
390	39,00-40,00	31,750	38,700	254,000	60,000	126,900	86843 6.002	39,005





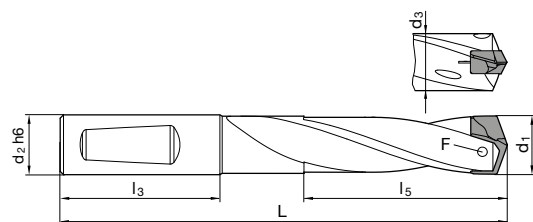
# HARTNER

## Soporte Multiplex HPC

Nº artículo 86684



alta resistencia al desgaste • sección de ranura optimizada • estabilidad muy buena • tornillos tensores Art.nº. 86843 incluidos  
• atornillador Art.Nº 86842 incluidos



Tamaño mm	d1	d2 h6 mm	d3 mm	L mm	l3 mm	l5 mm	F	Código Nº
110	11,00-11,49	12,000	10,700	124,000	45,000	59,600	86843 2.200	11,000
110	11,00-11,49	12,700	10,700	124,000	45,000	59,600	86843 2.200	11,005
115	11,50-11,99	12,000	11,200	127,000	45,000	62,100	86843 2.200	11,500
115	11,50-11,99	12,700	11,200	127,000	45,000	62,100	86843 2.200	11,505
120	12,00-12,49	12,000	11,700	131,000	45,000	64,700	86843 2.201	12,000
120	12,00-12,49	12,700	11,700	131,000	45,000	64,700	86843 2.201	12,005
125	12,50-12,99	14,000	12,200	134,000	45,000	67,300	86843 2.201	12,500
125	12,50-12,99	15,875	12,200	134,000	45,000	67,300	86843 2.201	12,505
130	13,00-13,49	14,000	12,700	137,000	45,000	69,900	86843 2.500	13,000
130	13,00-13,49	15,875	12,700	137,000	45,000	69,900	86843 2.500	13,005
135	13,50-13,99	14,000	13,200	141,000	45,000	72,600	86843 2.500	13,500
135	13,50-13,99	15,875	13,200	141,000	45,000	72,600	86843 2.500	13,505
140	14,00-14,49	14,000	13,700	144,000	45,000	75,200	86843 3.000	14,000
140	14,00-14,49	15,875	13,700	144,000	45,000	75,200	86843 3.000	14,005
145	14,50-14,99	16,000	14,200	150,000	48,000	77,800	86843 3.000	14,500
145	14,50-14,99	15,875	14,200	150,000	48,000	77,800	86843 3.000	14,505
150	15,00-15,49	16,000	14,700	154,000	48,000	80,300	86843 3.001	15,000
150	15,00-15,49	15,875	14,700	154,000	48,000	80,300	86843 3.001	15,005
155	15,50-15,99	16,000	15,200	157,000	48,000	82,900	86843 3.001	15,500
155	15,50-15,99	15,875	15,200	157,000	48,000	82,900	86843 3.001	15,505
160	16,00-16,49	16,000	15,700	160,000	48,000	85,900	86843 3.500	16,000
160	16,00-16,49	15,875	15,700	160,000	48,000	85,900	86843 3.500	16,005
165	16,50-16,99	18,000	16,200	164,000	48,000	88,100	86843 3.500	16,500
165	16,50-16,99	19,050	16,200	164,000	48,000	88,100	86843 3.500	16,505
170	17,00-17,49	18,000	16,700	167,000	48,000	90,800	86843 3.500	17,000
170	17,00-17,49	19,050	16,700	167,000	48,000	90,800	86843 3.500	17,005
175	17,50-17,99	18,000	17,200	170,000	48,000	93,400	86843 3.500	17,500
175	17,50-17,99	19,050	17,200	170,000	48,000	93,400	86843 3.500	17,505
180	18,00-18,49	18,000	17,700	174,000	48,000	95,900	86843 4.000	18,000
180	18,00-18,49	19,050	17,700	174,000	48,000	95,900	86843 4.000	18,005
185	18,50-18,99	20,000	18,200	179,000	50,000	98,500	86843 4.000	18,500
185	18,50-18,99	19,050	18,200	179,000	50,000	98,500	86843 4.000	18,505
190	19,00-19,49	20,000	18,700	182,000	50,000	101,100	86843 4.000	19,000
190	19,00-19,49	19,050	18,700	182,000	50,000	101,100	86843 4.000	19,005
195	19,50-19,99	20,000	19,200	186,000	50,000	103,700	86843 4.000	19,500
195	19,50-19,99	19,050	19,200	186,000	50,000	103,700	86843 4.000	19,505
200	20,00-20,49	20,000	19,700	189,000	50,000	106,300	86843 4.500	20,000
200	20,00-20,49	19,050	19,700	189,000	50,000	106,300	86843 4.500	20,005
205	20,50-20,99	25,000	20,200	201,000	56,000	109,000	86843 4.500	20,500
205	20,50-20,99	25,400	20,200	201,000	56,000	109,000	86843 4.500	20,505
210	21,00-21,49	25,000	20,700	204,000	56,000	111,600	86843 4.500	21,000
210	21,00-21,49	25,400	20,700	204,000	56,000	111,600	86843 4.500	21,005



## Soporte Multiplex HPC

Tamaño mm	d1	d2 h6 mm	d3 mm	L mm	I3 mm	I5 mm	F	Código N°
<b>215</b>	21,50-21,99	25,000	21,200	207,000	56,000	114,100	86843 4.500	<b>21,500</b>
<b>215</b>	21,50-21,99	25,400	21,200	207,000	56,000	114,100	86843 4.500	<b>21,505</b>
<b>220</b>	22,00-22,49	25,000	21,700	210,000	56,000	116,700	86843 5.000	<b>22,000</b>
<b>220</b>	22,00-22,49	25,400	21,700	210,000	56,000	116,700	86843 5.000	<b>22,005</b>
<b>225</b>	22,50-22,99	25,000	22,200	214,000	56,000	119,300	86843 5.000	<b>22,500</b>
<b>225</b>	22,50-22,99	25,400	22,200	214,000	56,000	119,300	86843 5.000	<b>22,505</b>
<b>230</b>	23,00-23,49	25,000	22,700	217,000	56,000	121,900	86843 5.000	<b>23,000</b>
<b>230</b>	23,00-23,49	25,400	22,700	217,000	56,000	121,900	86843 5.000	<b>23,005</b>
<b>235</b>	23,50-23,99	25,000	23,200	221,000	56,000	124,500	86843 5.000	<b>23,500</b>
<b>235</b>	23,50-23,99	25,400	23,200	221,000	56,000	124,500	86843 5.000	<b>23,505</b>
<b>240</b>	24,00-24,49	25,000	23,700	224,000	56,000	127,100	86843 5.001	<b>24,000</b>
<b>240</b>	24,00-24,49	25,400	23,700	224,000	56,000	127,100	86843 5.001	<b>24,005</b>
<b>245</b>	24,50-24,99	25,000	24,200	227,000	56,000	129,700	86843 5.001	<b>24,500</b>
<b>245</b>	24,50-24,99	25,400	24,200	227,000	56,000	129,700	86843 5.001	<b>24,505</b>
<b>250</b>	25,00-25,49	25,000	24,700	231,000	56,000	132,300	86843 5.001	<b>25,000</b>
<b>250</b>	25,00-25,49	25,400	24,700	231,000	56,000	132,300	86843 5.001	<b>25,005</b>
<b>255</b>	25,50-25,99	32,000	25,200	239,000	60,000	134,900	86843 5.001	<b>25,500</b>
<b>255</b>	25,50-25,99	31,750	25,200	239,000	60,000	134,900	86843 5.001	<b>25,505</b>
<b>260</b>	26,00-26,49	32,000	25,700	244,000	60,000	137,000	86843 5.003	<b>26,000</b>
<b>265</b>	26,50-26,99	32,000	26,200	247,000	60,000	140,000	86843 5.003	<b>26,500</b>
<b>270</b>	27,00-27,49	32,000	26,700	251,000	60,000	142,200	86843 5.003	<b>27,000</b>
<b>275</b>	27,50-27,99	32,000	27,200	254,000	60,000	144,800	86843 5.003	<b>27,500</b>
<b>280</b>	28,00-28,49	32,000	27,700	257,000	60,000	147,400	86843 5.003	<b>28,000</b>
<b>285</b>	28,50-28,99	32,000	28,200	260,000	60,000	150,400	86843 5.003	<b>28,500</b>
<b>290</b>	29,00-29,49	32,000	28,700	264,000	60,000	153,500	86843 5.003	<b>29,000</b>
<b>295</b>	29,50-29,99	32,000	29,200	267,000	60,000	155,100	86843 5.003	<b>29,500</b>
<b>300</b>	30,00-30,49	32,000	29,700	271,000	60,000	157,600	86843 6.000	<b>30,000</b>
<b>305</b>	30,50-30,99	32,000	30,200	274,000	60,000	160,200	86843 6.000	<b>30,500</b>
<b>310</b>	31,00-31,49	32,000	30,700	277,000	60,000	162,800	86843 6.000	<b>31,000</b>
<b>315</b>	31,50-31,99	32,000	31,200	280,000	60,000	165,400	86843 6.000	<b>31,500</b>
<b>320</b>	32,00-32,99	32,000	31,700	287,000	60,000	170,600	86843 6.001	<b>32,000</b>
<b>330</b>	33,00-33,99	32,000	32,700	294,000	60,000	175,800	86843 6.001	<b>33,000</b>
<b>340</b>	34,00-34,99	32,000	33,700	300,000	60,000	181,000	86843 6.001	<b>34,000</b>
<b>350</b>	35,00-35,99	32,000	34,700	307,000	60,000	186,200	86843 6.001	<b>35,000</b>
<b>360</b>	36,00-36,99	32,000	35,700	314,000	60,000	191,300	86843 6.002	<b>36,000</b>
<b>370</b>	37,00-37,99	32,000	36,700	321,000	60,000	196,500	86843 6.002	<b>37,000</b>
<b>380</b>	38,00-38,99	32,000	37,700	327,000	60,000	201,700	86843 6.002	<b>38,000</b>
<b>390</b>	39,00-40,00	32,000	38,700	334,000	60,000	206,900	86843 6.002	<b>39,000</b>



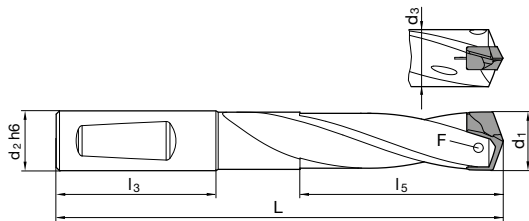
# HARTNER

## Soporte Multiplex HPC

Nº artículo 86685



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• atornillador Art.Nº 86842 incluidos



Tamaño mm	d1	d2 h6 mm	d3 mm	L mm	l3 mm	l5 mm	F	Código Nº
110	11,00-11,49	12,000	10,700	147,000	45,000	82,600	86843 2.200	11,000
110	11,00-11,49	12,700	10,700	147,000	45,000	82,600	86843 2.200	11,005
115	11,50-11,99	12,000	11,200	151,000	45,000	86,100	86843 2.200	11,500
115	11,50-11,99	12,700	11,200	151,000	45,000	86,100	86843 2.200	11,505
120	12,00-12,49	12,000	11,700	156,000	45,000	89,700	86843 2.201	12,000
120	12,00-12,49	12,700	11,700	156,000	45,000	89,700	86843 2.201	12,005
125	12,50-12,99	14,000	12,200	160,000	45,000	93,300	86843 2.201	12,500
125	12,50-12,99	15,875	12,200	160,000	45,000	93,300	86843 2.201	12,505
130	13,00-13,49	14,000	12,700	164,000	45,000	96,900	86843 2.500	13,000
130	13,00-13,49	15,875	12,700	164,000	45,000	96,900	86843 2.500	13,005
135	13,50-13,99	14,000	13,200	169,000	45,000	100,600	86843 2.500	13,500
135	13,50-13,99	15,875	13,200	169,000	45,000	100,600	86843 2.500	13,505
140	14,00-14,49	14,000	13,700	173,000	45,000	104,200	86843 3.000	14,000
140	14,00-14,49	15,875	13,700	173,000	45,000	104,200	86843 3.000	14,005
145	14,50-14,99	16,000	14,200	180,000	48,000	107,800	86843 3.000	14,500
145	14,50-14,99	15,875	14,200	180,000	48,000	107,800	86843 3.000	14,505
150	15,00-15,49	16,000	14,700	185,000	48,000	111,300	86843 3.001	15,000
150	15,00-15,49	15,875	14,700	185,000	48,000	111,300	86843 3.001	15,005
155	15,50-15,99	16,000	15,200	189,000	48,000	114,900	86843 3.001	15,500
155	15,50-15,99	15,875	15,200	189,000	48,000	114,900	86843 3.001	15,505
160	16,00-16,49	16,000	15,700	193,000	48,000	118,900	86843 3.500	16,000
160	16,00-16,49	15,875	15,700	193,000	48,000	118,900	86843 3.500	16,005
165	16,50-16,99	18,000	16,200	198,000	48,000	122,100	86843 3.500	16,500
165	16,50-16,99	19,050	16,200	198,000	48,000	122,100	86843 3.500	16,505
170	17,00-17,49	18,000	16,700	202,000	48,000	125,800	86843 3.500	17,000
170	17,00-17,49	19,050	16,700	202,000	48,000	125,800	86843 3.500	17,005
175	17,50-17,99	18,000	17,200	206,000	48,000	129,400	86843 3.500	17,500
175	17,50-17,99	19,050	17,200	206,000	48,000	129,400	86843 3.500	17,505
180	18,00-18,49	18,000	17,700	211,000	48,000	132,900	86843 4.000	18,000
180	18,00-18,49	19,050	17,700	211,000	48,000	132,900	86843 4.000	18,005
185	18,50-18,99	20,000	18,200	217,000	50,000	136,500	86843 4.000	18,500
185	18,50-18,99	19,050	18,200	217,000	50,000	136,500	86843 4.000	18,505
190	19,00-19,49	20,000	18,700	221,000	50,000	140,100	86843 4.000	19,000
190	19,00-19,49	19,050	18,700	221,000	50,000	140,100	86843 4.000	19,005
195	19,50-19,99	20,000	19,200	226,000	50,000	143,700	86843 4.000	19,500
195	19,50-19,99	19,050	19,200	226,000	50,000	143,700	86843 4.000	19,505
200	20,00-20,49	20,000	19,700	230,000	50,000	147,300	86843 4.500	20,000
200	20,00-20,49	19,050	19,700	230,000	50,000	147,300	86843 4.500	20,005
205	20,50-20,99	25,000	20,200	243,000	56,000	151,000	86843 4.500	20,500
205	20,50-20,99	25,400	20,200	243,000	56,000	151,000	86843 4.500	20,505
210	21,00-21,49	25,000	20,700	247,000	56,000	154,600	86843 4.500	21,000
210	21,00-21,49	25,400	20,700	247,000	56,000	154,600	86843 4.500	21,005



## Soporte Multiplex HPC

Tamaño mm	d1	d2 h6 mm	d3 mm	L mm	I3 mm	I5 mm	F	Código N°
<b>215</b>	21,50-21,99	25,000	21,200	251,000	56,000	158,100	86843 4.500	<b>21,500</b>
<b>215</b>	21,50-21,99	25,400	21,200	251,000	56,000	158,100	86843 4.500	<b>21,505</b>
<b>220</b>	22,00-22,49	25,000	21,700	255,000	56,000	161,700	86843 5.000	<b>22,000</b>
<b>220</b>	22,00-22,49	25,400	21,700	255,000	56,000	161,700	86843 5.000	<b>22,005</b>
<b>225</b>	22,50-22,99	25,000	22,200	260,000	56,000	165,300	86843 5.000	<b>22,500</b>
<b>225</b>	22,50-22,99	25,400	22,200	260,000	56,000	165,300	86843 5.000	<b>22,505</b>
<b>230</b>	23,00-23,49	25,000	22,700	264,000	56,000	168,900	86843 5.000	<b>23,000</b>
<b>230</b>	23,00-23,49	25,400	22,700	264,000	56,000	168,900	86843 5.000	<b>23,005</b>
<b>235</b>	23,50-23,99	25,000	23,200	269,000	56,000	172,500	86843 5.000	<b>23,500</b>
<b>235</b>	23,50-23,99	25,400	23,200	269,000	56,000	172,500	86843 5.000	<b>23,505</b>
<b>240</b>	24,00-24,49	25,000	23,700	273,000	56,000	176,100	86843 5.001	<b>24,000</b>
<b>240</b>	24,00-24,49	25,400	23,700	273,000	56,000	176,100	86843 5.001	<b>24,005</b>
<b>245</b>	24,50-24,99	25,000	24,200	277,000	56,000	179,700	86843 5.001	<b>24,500</b>
<b>245</b>	24,50-24,99	25,400	24,200	277,000	56,000	179,700	86843 5.001	<b>24,505</b>
<b>250</b>	25,00-25,49	25,000	24,700	282,000	56,000	183,300	86843 5.001	<b>25,000</b>
<b>250</b>	25,00-25,49	25,400	24,700	282,000	56,000	183,300	86843 5.001	<b>25,005</b>
<b>255</b>	25,50-25,99	32,000	25,200	291,000	60,000	186,900	86843 5.001	<b>25,500</b>
<b>255</b>	25,50-25,99	31,750	25,200	291,000	60,000	186,900	86843 5.001	<b>25,505</b>
<b>260</b>	26,00-26,49	32,000	25,700	297,000	60,000	190,000	86843 5.003	<b>26,000</b>
<b>260</b>	26,00-26,49	31,750	25,700	297,000	60,000	190,000	86843 5.003	<b>26,005</b>
<b>265</b>	26,50-26,99	32,000	26,200	301,000	60,000	194,000	86843 5.003	<b>26,500</b>
<b>265</b>	26,50-26,99	31,750	26,200	301,000	60,000	194,000	86843 5.003	<b>26,505</b>
<b>270</b>	27,00-27,49	32,000	26,700	306,000	60,000	197,200	86843 5.003	<b>27,000</b>
<b>270</b>	27,00-27,49	31,750	26,700	306,000	60,000	197,200	86843 5.003	<b>27,005</b>
<b>275</b>	27,50-27,99	32,000	27,200	310,000	60,000	200,800	86843 5.003	<b>27,500</b>
<b>275</b>	27,50-27,99	31,750	27,200	310,000	60,000	200,800	86843 5.003	<b>27,505</b>
<b>280</b>	28,00-28,49	32,000	27,700	314,000	60,000	204,400	86843 5.003	<b>28,000</b>
<b>280</b>	28,00-28,49	31,750	27,700	314,000	60,000	204,400	86843 5.003	<b>28,005</b>
<b>285</b>	28,50-28,99	32,000	28,200	318,000	60,000	208,400	86843 5.003	<b>28,500</b>
<b>285</b>	28,50-28,99	31,750	28,200	318,000	60,000	208,400	86843 5.003	<b>28,505</b>
<b>290</b>	29,00-29,49	32,000	28,700	323,000	60,000	212,500	86843 5.003	<b>29,000</b>
<b>290</b>	29,00-29,49	31,750	28,700	323,000	60,000	212,500	86843 5.003	<b>29,005</b>
<b>295</b>	29,50-29,99	32,000	29,200	327,000	60,000	215,100	86843 5.003	<b>29,500</b>
<b>295</b>	29,50-29,99	31,750	29,200	327,000	60,000	215,100	86843 5.003	<b>29,505</b>
<b>300</b>	30,00-30,49	32,000	29,700	332,000	60,000	218,600	86843 6.000	<b>30,000</b>
<b>300</b>	30,00-30,49	31,750	29,700	332,000	60,000	218,600	86843 6.000	<b>30,005</b>
<b>305</b>	30,50-30,99	32,000	30,200	336,000	60,000	222,200	86843 6.000	<b>30,500</b>
<b>305</b>	30,50-30,99	31,750	30,200	336,000	60,000	222,200	86843 6.000	<b>30,505</b>
<b>310</b>	31,00-31,49	32,000	30,700	340,000	60,000	225,800	86843 6.000	<b>31,000</b>
<b>310</b>	31,00-31,49	31,750	30,700	340,000	60,000	225,800	86843 6.000	<b>31,005</b>
<b>315</b>	31,50-31,99	32,000	31,200	344,000	60,000	229,400	86843 6.000	<b>31,500</b>
<b>315</b>	31,50-31,99	31,750	31,200	344,000	60,000	229,400	86843 6.000	<b>31,505</b>



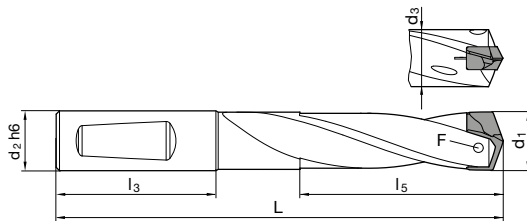
# HARTNER

## Soporte Multiplex HPC

Nº artículo 86686



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• atornillador Art.Nº 86842 incluidos



Tamaño mm	d1	d2 h6 mm	d3 mm	L mm	l3 mm	l5 mm	F	Código Nº
110	11,00-11,49	12,000	10,700	182,000	45,000	117,100	86843 2.200	11,000
110	11,00-11,49	12,700	10,700	182,000	45,000	117,100	86843 2.200	11,005
115	11,50-11,99	12,000	11,200	187,000	45,000	122,100	86843 2.200	11,500
115	11,50-11,99	12,700	11,200	187,000	45,000	122,100	86843 2.200	11,505
120	12,00-12,49	12,000	11,700	194,000	45,000	127,200	86843 2.201	12,000
120	12,00-12,49	12,700	11,700	194,000	45,000	127,200	86843 2.201	12,005
125	12,50-12,99	14,000	12,200	199,000	45,000	132,300	86843 2.201	12,500
125	12,50-12,99	15,875	12,200	199,000	45,000	132,300	86843 2.201	12,505
130	13,00-13,49	14,000	12,700	205,000	45,000	137,500	86843 2.500	13,000
130	13,00-13,49	15,875	12,700	205,000	45,000	137,500	86843 2.500	13,005
135	13,50-13,99	14,000	13,200	211,000	45,000	142,500	86843 2.500	13,500
135	13,50-13,99	15,875	13,200	211,000	45,000	142,500	86843 2.500	13,505
140	14,00-14,49	14,000	13,700	217,000	45,000	147,700	86843 3.000	14,000
140	14,00-14,49	15,875	13,700	217,000	45,000	147,700	86843 3.000	14,005
145	14,50-14,99	16,000	14,200	225,000	48,000	152,800	86843 3.000	14,500
145	14,50-14,99	15,875	14,200	225,000	48,000	152,800	86843 3.000	14,505
150	15,00-15,49	16,000	14,700	232,000	48,000	157,800	86843 3.001	15,000
150	15,00-15,49	15,875	14,700	232,000	48,000	157,800	86843 3.001	15,005
155	15,50-15,99	16,000	15,200	237,000	48,000	162,900	86843 3.001	15,500
155	15,50-15,99	15,875	15,200	237,000	48,000	162,900	86843 3.001	15,505
160	16,00-16,49	16,000	15,700	243,000	48,000	168,000	86843 3.500	16,000
160	16,00-16,49	15,875	15,700	243,000	48,000	168,000	86843 3.500	16,005
165	16,50-16,99	18,000	16,200	249,000	48,000	170,000	86843 3.500	16,500
165	16,50-16,99	19,050	16,200	249,000	48,000	170,000	86843 3.500	16,505
170	17,00-17,49	18,000	16,700	255,000	48,000	178,300	86843 3.500	17,000
170	17,00-17,49	19,050	16,700	255,000	48,000	178,300	86843 3.500	17,005
175	17,50-17,99	18,000	17,200	260,000	48,000	183,500	86843 3.500	17,500
175	17,50-17,99	19,050	17,200	260,000	48,000	183,500	86843 3.500	17,505
180	18,00-18,49	18,000	17,700	267,000	48,000	188,400	86843 4.000	18,000
180	18,00-18,49	19,050	17,700	267,000	48,000	188,400	86843 4.000	18,005
185	18,50-18,99	20,000	18,200	274,000	50,000	193,500	86843 4.000	18,500
185	18,50-18,99	19,050	18,200	274,000	50,000	193,500	86843 4.000	18,505
190	19,00-19,49	20,000	18,700	280,000	50,000	198,700	86843 4.000	19,000
190	19,00-19,49	19,050	18,700	280,000	50,000	198,700	86843 4.000	19,005
195	19,50-19,99	20,000	19,200	286,000	50,000	203,700	86843 4.000	19,500
195	19,50-19,99	19,050	19,200	286,000	50,000	203,700	86843 4.000	19,505
200	20,00-20,49	20,000	19,700	292,000	50,000	208,900	86843 4.500	20,000
200	20,00-20,49	19,050	19,700	292,000	50,000	208,900	86843 4.500	20,005
205	20,50-20,99	25,000	20,200	306,000	56,000	214,000	86843 4.500	20,500
205	20,50-20,99	25,400	20,200	306,000	56,000	214,000	86843 4.500	20,505
210	21,00-21,49	25,000	20,700	312,000	56,000	219,100	86843 4.500	21,000
210	21,00-21,49	25,400	20,700	312,000	56,000	219,100	86843 4.500	21,005



## Soporte Multiplex HPC

Tamaño mm	d1	d2 h6 mm	d3 mm	L mm	I3 mm	I5 mm	F	Código N°
<b>215</b>	21,50-21,99	25,000	21,200	317,000	56,000	224,200	86843 4.500	<b>21,500</b>
<b>215</b>	21,50-21,99	25,400	21,200	317,000	56,000	224,200	86843 4.500	<b>21,505</b>
<b>220</b>	22,00-22,49	25,000	21,700	323,000	56,000	229,300	86843 5.000	<b>22,000</b>
<b>220</b>	22,00-22,49	25,400	21,700	323,000	56,000	229,300	86843 5.000	<b>22,005</b>
<b>225</b>	22,50-22,99	25,000	22,200	329,000	56,000	234,400	86843 5.000	<b>22,500</b>
<b>225</b>	22,50-22,99	25,400	22,200	329,000	56,000	234,400	86843 5.000	<b>22,505</b>
<b>230</b>	23,00-23,49	25,000	22,700	335,000	56,000	239,500	86843 5.000	<b>23,000</b>
<b>230</b>	23,00-23,49	25,400	22,700	335,000	56,000	239,500	86843 5.000	<b>23,005</b>
<b>235</b>	23,50-23,99	25,000	23,200	341,000	56,000	244,600	86843 5.000	<b>23,500</b>
<b>235</b>	23,50-23,99	25,400	23,200	341,000	56,000	244,600	86843 5.000	<b>23,505</b>
<b>240</b>	24,00-24,49	25,000	23,700	347,000	56,000	249,700	86843 5.001	<b>24,000</b>
<b>240</b>	24,00-24,49	25,400	23,700	347,000	56,000	249,700	86843 5.001	<b>24,005</b>
<b>245</b>	24,50-24,99	25,000	24,200	352,000	56,000	254,800	86843 5.001	<b>24,500</b>
<b>245</b>	24,50-24,99	25,400	24,200	352,000	56,000	254,800	86843 5.001	<b>24,505</b>
<b>250</b>	25,00-25,49	25,000	24,700	359,000	56,000	259,900	86843 5.001	<b>25,000</b>
<b>250</b>	25,00-25,49	25,400	24,700	359,000	56,000	259,900	86843 5.001	<b>25,005</b>
<b>255</b>	25,50-25,99	32,000	25,200	369,000	60,000	265,000	86843 5.001	<b>25,500</b>
<b>255</b>	25,50-25,99	31,750	25,200	369,000	60,000	265,000	86843 5.001	<b>25,505</b>
<b>260</b>	26,00-26,49	32,000	25,700	377,000	60,000	270,000	86843 5.003	<b>26,000</b>
<b>260</b>	26,00-26,49	31,750	25,700	377,000	60,000	270,000	86843 5.003	<b>26,005</b>
<b>265</b>	26,50-26,99	32,000	26,200	382,000	60,000	275,000	86843 5.003	<b>26,500</b>
<b>265</b>	26,50-26,99	31,750	26,200	382,000	60,000	275,000	86843 5.003	<b>26,505</b>
<b>270</b>	27,00-27,49	32,000	26,700	388,000	60,000	280,100	86843 5.003	<b>27,000</b>
<b>270</b>	27,00-27,49	31,750	26,700	388,000	60,000	280,100	86843 5.003	<b>27,005</b>
<b>275</b>	27,50-27,99	32,000	27,200	394,000	60,000	285,200	86843 5.003	<b>27,500</b>
<b>275</b>	27,50-27,99	31,750	27,200	394,000	60,000	285,200	86843 5.003	<b>27,505</b>
<b>280</b>	28,00-28,49	32,000	27,700	400,000	60,000	290,300	86843 5.003	<b>28,000</b>
<b>280</b>	28,00-28,49	31,750	27,700	400,000	60,000	290,300	86843 5.003	<b>28,005</b>
<b>285</b>	28,50-28,99	32,000	28,200	405,000	60,000	295,400	86843 5.003	<b>28,500</b>
<b>285</b>	28,50-28,99	31,750	28,200	405,000	60,000	295,400	86843 5.003	<b>28,505</b>
<b>290</b>	29,00-29,49	32,000	28,700	412,000	60,000	300,500	86843 5.003	<b>29,000</b>
<b>290</b>	29,00-29,49	31,750	28,700	412,000	60,000	300,500	86843 5.003	<b>29,005</b>
<b>295</b>	29,50-29,99	32,000	29,200	418,000	60,000	305,600	86843 5.003	<b>29,500</b>
<b>295</b>	29,50-29,99	31,750	29,200	418,000	60,000	305,600	86843 5.003	<b>29,505</b>
<b>300</b>	30,00-30,49	32,000	29,700	424,000	60,000	310,600	86843 6.000	<b>30,000</b>
<b>300</b>	30,00-30,49	31,750	29,700	424,000	60,000	310,600	86843 6.000	<b>30,005</b>
<b>305</b>	30,50-30,99	32,000	30,200	429,000	60,000	315,700	86843 6.000	<b>30,500</b>
<b>305</b>	30,50-30,99	31,750	30,200	429,000	60,000	315,700	86843 6.000	<b>30,505</b>
<b>310</b>	31,00-31,49	32,000	30,700	435,000	60,000	320,800	86843 6.000	<b>31,000</b>
<b>310</b>	31,00-31,49	31,750	30,700	435,000	60,000	320,800	86843 6.000	<b>31,005</b>
<b>315</b>	31,50-31,99	32,000	31,200	441,000	60,000	325,900	86843 6.000	<b>31,500</b>
<b>315</b>	31,50-31,99	31,750	31,200	441,000	60,000	325,900	86843 6.000	<b>31,505</b>



## Plaquitas intercambiables Multiplex HPC

Nº artículo 86721

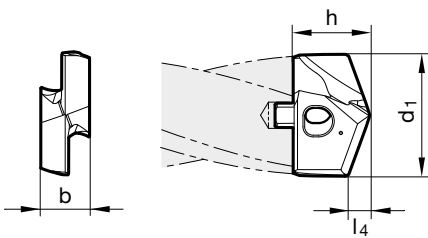


<b>P</b>	<b>M</b>	<b>K</b>	<b>N</b>	<b>S</b>	<b>H</b>
○	○	○	○	○	○



vaciado de punta  $\geq \varnothing 11,000$  • afilado plano • forma recta del corte principal (mediante corrección) • tornillos tensores Art.nº. 86843 incluidos

pilotar en todos los materiales



Tamaño	d1 mm	inch	l4 mm	b mm	h mm	Código Nº
110	11,000		1,800	4,500	7,200	11,000
110	11,200		1,800	4,500	7,200	11,200
110	11,500		1,900	4,500	7,200	11,500
110	11,510	29/64	1,900	4,500	7,200	11,510
110	11,700		1,900	4,500	7,200	11,700
110	11,800		1,900	4,500	7,200	11,800
110	11,910	15/32	1,900	4,500	7,200	11,910
120	12,000		1,900	5,000	7,400	12,000
120	12,100		2,000	5,000	7,400	12,100
120	12,200		2,000	5,000	7,400	12,200
120	12,300	31/64	2,000	5,000	7,400	12,300
120	12,500		2,000	5,000	7,400	12,500
120	12,600		2,000	5,000	7,400	12,600
120	12,700	1/2	2,100	5,000	7,400	12,700
120	12,800		2,100	5,000	7,400	12,800
120	12,900		2,100	5,000	7,400	12,900
130	13,000		2,100	5,500	8,200	13,000
130	13,100	33/64	2,100	5,500	8,200	13,100
130	13,490	17/32	2,200	5,500	8,200	13,490
130	13,500		2,200	5,500	8,200	13,500
130	13,600		2,200	5,500	8,200	13,600
130	13,700		2,200	5,500	8,200	13,700
130	13,800		2,200	5,500	8,200	13,800
130	13,890	35/64	2,200	5,500	8,200	13,890
140	14,000		2,300	6,000	9,400	14,000
140	14,100		2,300	6,000	9,400	14,100
140	14,290	9/16	2,300	6,000	9,400	14,290
140	14,400		2,300	6,000	9,400	14,400
140	14,500		2,300	6,000	9,400	14,500
140	14,600		2,400	6,000	9,400	14,600
140	14,680	37/64	2,400	6,000	9,400	14,680
140	14,700		2,400	6,000	9,400	14,700
140	14,800		2,400	6,000	9,400	14,800
140	15,000		2,400	6,000	9,400	15,000
140	15,080	19/32	2,400	6,000	9,400	15,080
140	15,100		2,400	6,000	9,400	15,100
140	15,200		2,400	6,000	9,400	15,200
140	15,300		2,500	6,000	9,400	15,300
140	15,480	39/64	2,500	6,000	9,400	15,480
140	15,500		2,500	6,000	9,400	15,500
140	15,600		2,500	6,000	9,400	15,600
140	15,700		2,500	6,000	9,400	15,700



## Plaquitas intercambiables Multiplex HPC

Tamaño	d1 mm	inch	l4 mm	b mm	h mm	Código N°
140	15,800		2,500	6,000	9,400	15,800
140	15,870	5/8	2,600	6,000	9,400	15,870
160	16,000		2,600	7,000	10,600	16,000
160	16,270	41/64	2,600	7,000	10,600	16,270
160	16,500		2,700	7,000	10,600	16,500
160	16,670	21/32	2,700	7,000	10,600	16,670
160	17,000		2,700	7,000	10,600	17,000
160	17,070	43/64	2,700	7,000	10,600	17,070
160	17,460	11/16	2,800	7,000	10,600	17,460
160	17,500		2,800	7,000	10,600	17,500
160	17,600		2,800	7,000	10,600	17,600
160	17,860	45/64	2,900	7,000	10,600	17,860
180	18,000		2,900	8,000	12,100	18,000
180	18,260	23/32	2,900	8,000	12,100	18,260
180	18,500		3,000	8,000	12,100	18,500
180	18,650	47/64	3,000	8,000	12,100	18,650
180	19,000		3,000	8,000	12,100	19,000
180	19,050	3/4	3,100	8,000	12,100	19,050
180	19,450	49/64	3,100	8,000	12,100	19,450
180	19,500		3,100	8,000	12,100	19,500
180	19,600		3,100	8,000	12,100	19,600
180	19,840	25/32	3,200	8,000	12,100	19,840
200	20,000		3,200	9,000	13,300	20,000
200	20,240	51/64	3,200	9,000	13,300	20,240
200	20,500		3,300	9,000	13,300	20,500
200	20,640	13/16	3,300	9,000	13,300	20,640
200	21,000		3,400	9,000	13,300	21,000
200	21,030	53/64	3,400	9,000	13,300	21,030
200	21,100		3,400	9,000	13,300	21,100
200	21,430	27/32	3,400	9,000	13,300	21,430
200	21,500		3,400	9,000	13,300	21,500
200	21,830	55/64	3,500	9,000	13,300	21,830
220	22,000		3,500	10,000	14,800	22,000
220	22,220	7/8	3,600	10,000	14,800	22,220
220	22,500		3,600	10,000	14,800	22,500
220	22,620	57/64	3,600	10,000	14,800	22,620
220	23,000		3,700	10,000	14,800	23,000
220	23,020	29/32	3,700	10,000	14,800	23,020
220	23,420	59/64	3,700	10,000	14,800	23,420
220	23,500		3,800	10,000	14,800	23,500
220	23,810	15/16	3,800	10,000	14,800	23,810
240	24,000		3,800	11,000	15,300	24,000
240	24,100		3,800	11,000	15,300	24,100
240	24,210	61/64	3,900	11,000	15,300	24,210
240	24,500		3,900	11,000	15,300	24,500
240	24,610	31/32	3,900	11,000	15,300	24,610
240	25,000	63/64	4,000	11,000	15,300	25,000
240	25,400	1	4,100	11,000	15,300	25,400
240	25,500		4,100	11,000	15,300	25,500
240	25,700		4,100	11,000	15,300	25,700
260	26,000		4,100	12,000	19,400	26,000
260	26,190	1 1/32	4,200	12,000	19,400	26,190
260	26,500		4,200	12,000	19,400	26,500
260	26,590	1 3/64	4,200	12,000	19,400	26,590
260	27,000		4,300	12,000	19,400	27,000
260	27,500		4,400	12,000	19,400	27,500
260	27,700		4,400	12,000	19,400	27,700
260	27,780	1 3/32	4,400	12,000	19,400	27,780
280	28,000		4,500	13,000	20,100	28,000
280	28,180	1 7/64	4,500	13,000	20,100	28,180
280	28,500		4,500	13,000	20,100	28,500
280	28,580		4,600	13,000	20,100	28,580
280	29,000		4,600	13,000	20,100	29,000
280	29,370	1 5/32	4,700	13,000	20,100	29,370
280	29,500		4,700	13,000	20,100	29,500
300	30,000		4,800	14,000	21,700	30,000
300	30,160	1 3/16	4,800	14,000	21,700	30,160
300	30,500		4,900	14,000	21,700	30,500
300	30,960	1 7/32	4,900	14,000	21,700	30,960
300	31,000		4,900	14,000	21,700	31,000
300	31,500		5,000	14,000	21,700	31,500
300	31,750	1 1/4	5,100	14,000	21,700	31,750





## Plaquitas intercambiables Multiplex HPC

Tamaño	d1 mm	inch	l4 mm	b mm	h mm	Código N°
320	32,000		5,100	15,000	22,400	32,000
320	32,500		5,200	15,000	22,400	32,500
320	32,540	1 9/32	5,200	15,000	22,400	32,540
320	33,000		5,300	15,000	22,400	33,000
320	33,340	1 5/16	5,300	15,000	22,400	33,340
320	33,500		5,300	15,000	22,400	33,500
320	34,000		5,400	15,000	22,400	34,000
320	34,130	1 11/32	5,400	15,000	22,400	34,130
320	34,500		5,500	15,000	22,400	34,500
320	34,930		5,600	15,000	22,400	34,930
320	35,000		5,600	15,000	22,400	35,000
320	35,500		5,600	15,000	22,400	35,500
320	35,720	1 13/32	5,700	15,000	22,400	35,720
360	36,000		5,700	16,000	23,200	36,000
360	36,500		5,800	16,000	23,200	36,500
360	36,510	1 7/16	5,800	16,000	23,200	36,510
360	37,000		5,900	16,000	23,200	37,000
360	37,310	1 15/32	5,900	16,000	23,200	37,310
360	37,500		6,000	16,000	23,200	37,500
360	38,000		6,000	16,000	23,200	38,000
360	38,100	1 1/2	6,100	16,000	23,200	38,100
360	38,500	1 33/64	6,100	16,000	23,200	38,500
360	39,000		6,200	16,000	23,200	39,000
360	39,500		6,300	16,000	23,200	39,500
360	40,000		6,400	16,000	23,200	40,000



## Plaquitas intercambiables Multiplex HPC

Nº artículo 86722

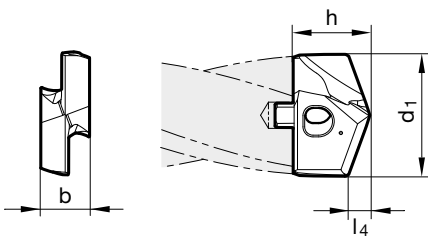


P	M	K	N	S	H
●	○	○			



vaciado de punta  $\geq \varnothing 11,000$  • afilado plano • forma recta del corte principal (mediante corrección) • tornillos tensores Art.nº. 86843 incluidos

aceros de construcción y de cementación • aceros para tornos automáticos, aceros de bonificación • aceros aleados con una resistencia de hasta a 1200 N/mm<sup>2</sup>



Tamaño	d1 mm	inch	l4 mm	b mm	h mm	Código Nº
110	11,000		2,100	4,500	7,500	11,000
110	11,200		2,100	4,500	7,500	11,200
115	11,500		2,100	4,500	7,500	11,500
115	11,510	29/64	2,100	4,500	7,500	11,510
115	11,700		2,200	4,500	7,500	11,700
115	11,800		2,200	4,500	7,500	11,800
115	11,910	15/32	2,200	4,500	7,500	11,910
120	12,000		2,200	5,000	7,700	12,000
120	12,100		2,300	5,000	7,700	12,100
120	12,200		2,300	5,000	7,700	12,200
120	12,300	31/64	2,300	5,000	7,700	12,300
125	12,500		2,300	5,000	7,700	12,500
125	12,600		2,300	5,000	7,700	12,600
125	12,700	1/2	2,400	5,000	7,700	12,700
125	12,800		2,400	5,000	7,700	12,800
125	12,900		2,400	5,000	7,700	12,900
130	13,000		2,400	5,500	8,500	13,000
130	13,100	33/64	2,400	5,500	8,500	13,100
130	13,490	17/32	2,500	5,500	8,500	13,490
135	13,500		2,500	5,500	8,500	13,500
135	13,600		2,500	5,500	8,500	13,600
135	13,700		2,500	5,500	8,500	13,700
135	13,800		2,600	5,500	8,500	13,800
135	13,890	35/64	2,600	5,500	8,500	13,890
140	14,000		2,600	6,000	9,600	14,000
140	14,100		2,600	6,000	9,600	14,100
140	14,290	9/16	2,700	6,000	9,600	14,290
140	14,400		2,700	6,000	9,600	14,400
145	14,500		2,700	6,000	9,600	14,500
145	14,600		2,700	6,000	9,600	14,600
145	14,680	37/64	2,700	6,000	9,600	14,680
145	14,700		2,700	6,000	9,600	14,700
145	14,800		2,700	6,000	9,600	14,800
150	15,000		2,800	6,000	9,800	15,000
150	15,080	19/32	2,800	6,000	9,800	15,080
150	15,100		2,800	6,000	9,800	15,100
150	15,200		2,800	6,000	9,800	15,200
150	15,300		2,800	6,000	9,800	15,300
150	15,480	39/64	2,900	6,000	9,800	15,480
155	15,500		2,900	6,000	9,800	15,500
155	15,600		2,900	6,000	9,800	15,600
155	15,700		2,900	6,000	9,800	15,700



## Plaquitas intercambiables Multiplex HPC

Tamaño	d1 mm	inch	l4 mm	b mm	h mm	Código N°
155	15,800		2,900	6,000	9,800	15,800
155	15,870	5/8	2,900	6,000	9,800	15,870
160	16,000		3,000	7,000	11,000	16,000
160	16,270	41/64	3,000	7,000	11,000	16,270
165	16,500		3,100	7,000	11,000	16,500
165	16,670	21/32	3,100	7,000	11,000	16,670
170	17,000		3,100	7,000	11,000	17,000
170	17,070	43/64	3,200	7,000	11,000	17,070
170	17,460	11/16	3,200	7,000	11,000	17,460
175	17,500		3,200	7,000	11,000	17,500
175	17,600		3,300	7,000	11,000	17,600
175	17,860	45/64	3,300	7,000	11,000	17,860
180	18,000		3,300	8,000	12,600	18,000
180	18,260	23/32	3,400	8,000	12,600	18,260
185	18,500		3,400	8,000	12,600	18,500
185	18,650	47/64	3,400	8,000	12,600	18,650
185	18,900		3,500	8,000	12,600	18,900
190	19,000		3,500	8,000	12,600	19,000
190	19,050	3/4	3,500	8,000	12,600	19,050
190	19,250		3,600	8,000	12,600	19,250
190	19,450	49/64	3,600	8,000	12,600	19,450
195	19,500		3,600	8,000	12,600	19,500
195	19,600		3,600	8,000	12,600	19,600
195	19,840	25/32	3,700	8,000	12,600	19,840
200	20,000		3,700	9,000	13,900	20,000
200	20,240	51/64	3,700	9,000	13,900	20,240
205	20,500		3,800	9,000	13,900	20,500
205	20,640	13/16	3,800	9,000	13,900	20,640
210	21,000		3,900	9,000	13,900	21,000
210	21,030	53/64	3,900	9,000	13,900	21,030
210	21,100		3,900	9,000	13,900	21,100
210	21,430	27/32	3,900	9,000	13,900	21,430
215	21,500		4,000	9,000	13,900	21,500
215	21,830	55/64	4,000	9,000	13,900	21,830
220	22,000		4,100	10,000	15,300	22,000
220	22,220	7/8	4,100	10,000	15,300	22,220
225	22,500		4,100	10,000	15,300	22,500
225	22,620	57/64	4,200	10,000	15,300	22,620
230	23,000		4,200	10,000	15,300	23,000
230	23,020	29/32	4,200	10,000	15,300	23,020
230	23,420	59/64	4,300	10,000	15,300	23,420
235	23,500		4,300	10,000	15,300	23,500
235	23,810	15/16	4,400	10,000	15,300	23,810
240	24,000		4,400	11,000	15,800	24,000
240	24,100		4,400	11,000	15,800	24,100
240	24,210	61/64	4,500	11,000	15,800	24,210
245	24,500		4,500	11,000	15,800	24,500
245	24,610	31/32	4,500	11,000	15,800	24,610
250	25,000	63/64	4,600	11,000	15,800	25,000
250	25,400	1	4,700	11,000	15,800	25,400
255	25,500		4,700	11,000	15,800	25,500
255	25,670		4,700	11,000	15,800	25,670
255	25,700		4,700	11,000	15,800	25,700
255	25,810		4,700	11,000	15,800	25,810
260	26,000		4,800	12,000	20,000	26,000
260	26,190	1 1/32	4,800	12,000	20,000	26,190
265	26,500		4,900	12,000	20,000	26,500
265	26,590	1 3/64	4,900	12,000	20,000	26,590
270	27,000		5,000	12,000	20,000	27,000
275	27,500		5,100	12,000	20,000	27,500
275	27,700		5,100	12,000	20,000	27,700
275	27,780	1 3/32	5,100	12,000	20,000	27,780
280	28,000		5,100	13,000	20,700	28,000
280	28,180	1 7/64	5,200	13,000	20,700	28,180
285	28,500		5,200	13,000	20,700	28,500
285	28,580		5,300	13,000	20,700	28,580
290	29,000		5,300	13,000	20,700	29,000
290	29,370	1 5/32	5,400	13,000	20,700	29,370
295	29,500		5,400	13,000	20,700	29,500
295	29,770	1 11/64	5,500	13,000	20,700	29,770
300	30,000		5,500	14,000	22,300	30,000
300	30,160	1 3/16	5,500	14,000	22,300	30,160



## Plaquitas intercambiables Multiplex HPC

Tamaño	d1 mm	inch	l4 mm	b mm	h mm	Código N°
305	30,500		5,600	14,000	22,300	30,500
305	30,960	1 7/32	5,700	14,000	22,300	30,960
310	31,000		5,700	14,000	22,300	31,000
315	31,500		5,800	14,000	22,300	31,500
315	31,750	1 1/4	5,800	14,000	22,300	31,750
320	32,000		5,900	15,000	23,100	32,000
320	32,500		6,000	15,000	23,100	32,500
320	32,540	1 9/32	6,000	15,000	23,100	32,540
320	32,940	1 19/64	6,000	15,000	23,100	32,940
330	33,000		6,100	15,000	23,100	33,000
330	33,340	1 5/16	6,100	15,000	23,100	33,340
330	33,500		6,100	15,000	23,100	33,500
340	34,000		6,200	15,000	23,100	34,000
340	34,130	1 11/32	6,300	15,000	23,100	34,130
340	34,500		6,300	15,000	23,100	34,500
340	34,930		6,400	15,000	23,100	34,930
350	35,000		6,400	15,000	23,100	35,000
350	35,500		6,500	15,000	23,100	35,500
350	35,720	1 13/32	6,600	15,000	23,100	35,720
360	36,000		6,600	16,000	23,900	36,000
360	36,500		6,700	16,000	23,900	36,500
360	36,510	1 7/16	6,700	16,000	23,900	36,510
370	37,000		6,800	16,000	23,900	37,000
370	37,310	1 15/32	6,800	16,000	23,900	37,310
370	37,500		6,900	16,000	23,900	37,500
380	38,000		7,000	16,000	23,900	38,000
380	38,100	1 1/2	7,000	16,000	23,900	38,100
380	38,500	1 33/64	7,100	16,000	23,900	38,500
390	39,000		7,100	16,000	23,900	39,000
390	39,500		7,200	16,000	23,900	39,500
400	40,000		7,300	16,000	23,900	40,000



## Plaquitas intercambiables Multiplex HPC

Nº artículo 86723

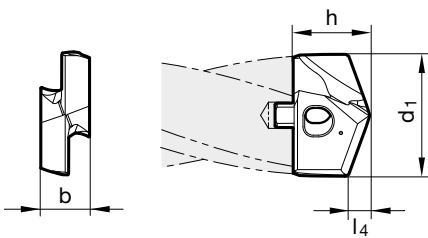


P	M	K	N	S	H
○		●			



vaciado de punta  $\geq \varnothing 11,000$  • afilado plano • forma recta del corte principal (mediante corrección) • tornillos tensores Art.nº. 86843 incluidos

fundición vermicular GGV • fundición gris, fundición maleable, fundición esferica



Tamaño	d1 mm	inch	l4 mm	b mm	h mm	Código Nº
110	11,000		2,600	4,500	7,500	11,000
110	11,200		2,600	4,500	7,500	11,200
115	11,500		2,700	4,500	7,500	11,500
115	11,510	29/64	2,700	4,500	7,500	11,510
115	11,700		2,700	4,500	7,500	11,700
115	11,800		2,700	4,500	7,500	11,800
115	11,910	15/32	2,700	4,500	7,500	11,910
120	12,000		2,900	5,000	7,700	12,000
120	12,100		2,900	5,000	7,700	12,100
120	12,200		2,900	5,000	7,700	12,200
120	12,300	31/64	2,900	5,000	7,700	12,300
125	12,500		3,000	5,000	7,700	12,500
125	12,600		3,000	5,000	7,700	12,600
125	12,700	1/2	3,000	5,000	7,700	12,700
125	12,800		3,000	5,000	7,700	12,800
125	12,900		3,000	5,000	7,700	12,900
130	13,000		3,100	5,500	8,500	13,000
130	13,100	33/64	3,100	5,500	8,500	13,100
130	13,490	17/32	3,100	5,500	8,500	13,490
135	13,500		3,300	5,500	8,500	13,500
135	13,600		3,300	5,500	8,500	13,600
135	13,700		3,300	5,500	8,500	13,700
135	13,800		3,300	5,500	8,500	13,800
135	13,890	35/64	3,300	5,500	8,500	13,890
140	14,000		3,400	6,000	9,600	14,000
140	14,100		3,400	6,000	9,600	14,100
140	14,290	9/16	3,400	6,000	9,600	14,290
140	14,400		3,400	6,000	9,600	14,400
145	14,500		3,500	6,000	9,600	14,500
145	14,600		3,500	6,000	9,600	14,600
145	14,680	37/64	3,500	6,000	9,600	14,680
145	14,700		3,500	6,000	9,600	14,700
145	14,800		3,500	6,000	9,600	14,800
150	15,000		3,600	6,000	9,800	15,000
150	15,080	19/32	3,600	6,000	9,800	15,080
150	15,100		3,600	6,000	9,800	15,100
150	15,200		3,600	6,000	9,800	15,200
150	15,300		3,600	6,000	9,800	15,300
150	15,480	39/64	3,600	6,000	9,800	15,480
155	15,500		3,800	6,000	9,800	15,500
155	15,600		3,800	6,000	9,800	15,600
155	15,700		3,800	6,000	9,800	15,700



## Plaquitas intercambiables Multiplex HPC

Tamaño	d1 mm	inch	l4 mm	b mm	h mm	Código N°
155	15,800		3,800	6,000	9,800	15,800
155	15,870	5/8	3,800	6,000	9,800	15,870
160	16,000		3,800	7,000	11,000	16,000
160	16,270	41/64	3,800	7,000	11,000	16,270
165	16,500		4,000	7,000	11,000	16,500
165	16,670	21/32	4,000	7,000	11,000	16,670
170	17,000		4,100	7,000	11,000	17,000
170	17,070	43/64	4,100	7,000	11,000	17,070
170	17,460	11/16	4,100	7,000	11,000	17,460
175	17,500		4,200	7,000	11,000	17,500
175	17,600		4,200	7,000	11,000	17,600
175	17,860	45/64	4,200	7,000	11,000	17,860
180	18,000		4,300	8,000	12,600	18,000
180	18,260	23/32	4,300	8,000	12,600	18,260
185	18,500		4,400	8,000	12,600	18,500
185	18,650	47/64	4,400	8,000	12,600	18,650
190	19,000		4,600	8,000	12,600	19,000
190	19,050	3/4	4,600	8,000	12,600	19,050
190	19,250		4,600	8,000	12,600	19,250
190	19,450	49/64	4,600	8,000	12,600	19,450
195	19,500		4,700	8,000	12,600	19,500
195	19,600		4,700	8,000	12,600	19,600
195	19,840	25/32	4,700	8,000	12,600	19,840
200	20,000		4,800	9,000	13,900	20,000
200	20,240	51/64	4,800	9,000	13,900	20,240
205	20,500		5,000	9,000	13,900	20,500
205	20,640	13/16	5,000	9,000	13,900	20,640
210	21,000		5,100	9,000	13,900	21,000
210	21,030	53/64	5,100	9,000	13,900	21,030
210	21,100		5,100	9,000	13,900	21,100
210	21,430	27/32	5,100	9,000	13,900	21,430
215	21,500		5,200	9,000	13,900	21,500
215	21,830	55/64	5,200	9,000	13,900	21,830
220	22,000		5,300	10,000	15,300	22,000
220	22,220	7/8	5,300	10,000	15,300	22,220
225	22,500		5,400	10,000	15,300	22,500
225	22,620	57/64	5,400	10,000	15,300	22,620
230	23,000		5,600	10,000	15,300	23,000
230	23,020	29/32	5,600	10,000	15,300	23,020
230	23,420	59/64	5,600	10,000	15,300	23,420
235	23,500		5,700	10,000	15,300	23,500
235	23,810	15/16	5,700	10,000	15,300	23,810
240	24,000		5,800	11,000	15,800	24,000
240	24,100		5,800	11,000	15,800	24,100
240	24,210	61/64	5,800	11,000	15,800	24,210
245	24,500		6,000	11,000	15,800	24,500
245	24,610	31/32	6,000	11,000	15,800	24,610
250	25,000	63/64	6,100	11,000	15,800	25,000
250	25,400	1	6,100	11,000	15,800	25,400
255	25,500		6,200	11,000	15,800	25,500
255	25,670		6,200	11,000	15,800	25,670
255	25,700		6,200	11,000	15,800	25,700
255	25,810		6,200	11,000	15,800	25,810
260	26,000		6,000	12,000	20,000	26,000
260	26,190	1 1/32	6,000	12,000	20,000	26,190
265	26,500		6,100	12,000	20,000	26,500
265	26,590	1 3/64	6,100	12,000	20,000	26,590
270	27,000		6,300	12,000	20,000	27,000
275	27,500		6,400	12,000	20,000	27,500
275	27,700		6,400	12,000	20,000	27,700
275	27,780	1 3/32	6,400	12,000	20,000	27,780
280	28,000		6,600	13,000	20,700	28,000
280	28,180	1 7/64	6,600	13,000	20,700	28,180
285	28,500		6,700	13,000	20,700	28,500
285	28,580		6,700	13,000	20,700	28,580
290	29,000		6,900	13,000	20,700	29,000
290	29,370	1 5/32	6,900	13,000	20,700	29,370
295	29,500		7,000	13,000	20,700	29,500
295	29,770	1 11/64	7,000	13,000	20,700	29,770
300	30,000		6,900	14,000	22,300	30,000
300	30,160	1 3/16	6,900	14,000	22,300	30,160
305	30,500		7,000	14,000	22,300	30,500



## Plaquitas intercambiables Multiplex HPC

Tamaño	d1 mm	inch	l4 mm	b mm	h mm	Código N°
<b>305</b>	30,960	1 7/32	7,000	14,000	22,300	<b>30,960</b>
<b>310</b>	31,000		7,200	14,000	22,300	<b>31,000</b>
<b>315</b>	31,500		7,300	14,000	22,300	<b>31,500</b>
<b>315</b>	31,750	1 1/4	7,300	14,000	22,300	<b>31,750</b>
<b>320</b>	32,000		7,500	15,000	23,100	<b>32,000</b>
<b>320</b>	32,500		7,600	15,000	23,100	<b>32,500</b>
<b>320</b>	32,540	1 9/32	7,600	15,000	23,100	<b>32,540</b>
<b>320</b>	32,940	1 19/64	7,600	15,000	23,100	<b>32,940</b>
<b>330</b>	33,000		7,800	15,000	23,100	<b>33,000</b>
<b>330</b>	33,340	1 5/16	7,800	15,000	23,100	<b>33,340</b>
<b>330</b>	33,500		7,900	15,000	23,100	<b>33,500</b>
<b>340</b>	34,000		8,100	15,000	23,100	<b>34,000</b>
<b>340</b>	34,130	1 11/32	8,100	15,000	23,100	<b>34,130</b>
<b>340</b>	34,500		8,200	15,000	23,100	<b>34,500</b>
<b>340</b>	34,930		8,200	15,000	23,100	<b>34,930</b>
<b>350</b>	35,000		8,300	15,000	23,100	<b>35,000</b>
<b>350</b>	35,500		8,400	15,000	23,100	<b>35,500</b>
<b>350</b>	35,720	1 13/32	8,400	15,000	23,100	<b>35,720</b>
<b>360</b>	36,000		8,500	16,000	23,900	<b>36,000</b>
<b>360</b>	36,500		8,600	16,000	23,900	<b>36,500</b>
<b>360</b>	36,510	1 7/16	8,600	16,000	23,900	<b>36,510</b>
<b>370</b>	37,000		8,800	16,000	23,900	<b>37,000</b>
<b>370</b>	37,310	1 15/32	8,800	16,000	23,900	<b>37,310</b>
<b>370</b>	37,500		8,900	16,000	23,900	<b>37,500</b>
<b>380</b>	38,000		9,000	16,000	23,900	<b>38,000</b>
<b>380</b>	38,100	1 1/2	9,000	16,000	23,900	<b>38,100</b>
<b>380</b>	38,500	1 33/64	9,100	16,000	23,900	<b>38,500</b>
<b>390</b>	39,000		9,300	16,000	23,900	<b>39,000</b>
<b>390</b>	39,500		9,400	16,000	23,900	<b>39,500</b>
<b>400</b>	40,000		9,400	16,000	23,900	<b>40,000</b>

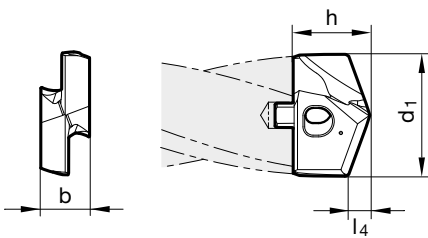


## Plaquitas intercambiables Multiplex HPC

Nº artículo 86724



vaciado de punta  $\geq \varnothing 11,000$  • entrada cónica • tornillos tensores Art.nº. 86843 incluidos • forma cóncava del corte principal  
aluminio y sus aleaciones • metales no ferríticos



Tamaño	d1 mm	inch	l4 mm	b mm	h mm	Código Nº
110	11,000		2,100	4,500	7,500	11,000
110	11,200		2,100	4,500	7,500	11,200
115	11,500		2,100	4,500	7,500	11,500
115	11,510	29/64	2,100	4,500	7,500	11,510
115	11,700		2,200	4,500	7,500	11,700
115	11,800		2,200	4,500	7,500	11,800
115	11,910	15/32	2,200	4,500	7,500	11,910
120	12,000		2,200	5,000	7,700	12,000
120	12,100		2,300	5,000	7,700	12,100
120	12,200		2,300	5,000	7,700	12,200
120	12,300	31/64	2,300	5,000	7,700	12,300
125	12,500		2,300	5,000	7,700	12,500
125	12,600		2,300	5,000	7,700	12,600
125	12,700	1/2	2,400	5,000	7,700	12,700
125	12,800		2,400	5,000	7,700	12,800
125	12,900		2,400	5,000	7,700	12,900
130	13,000		2,400	5,500	8,500	13,000
130	13,100	33/64	2,400	5,500	8,500	13,100
130	13,490	17/32	2,500	5,500	8,500	13,490
135	13,500		2,500	5,500	8,500	13,500
135	13,600		2,500	5,500	8,500	13,600
135	13,700		2,500	5,500	8,500	13,700
135	13,800		2,600	5,500	8,500	13,800
135	13,890	35/64	2,600	5,500	8,500	13,890
140	14,000		2,600	6,000	9,600	14,000
140	14,100		2,600	6,000	9,600	14,100
140	14,290	9/16	2,700	6,000	9,600	14,290
140	14,400		2,700	6,000	9,600	14,400
145	14,500		2,700	6,000	9,600	14,500
145	14,600		2,700	6,000	9,600	14,600
145	14,680	37/64	2,700	6,000	9,600	14,680
145	14,700		2,700	6,000	9,600	14,700
145	14,800		2,700	6,000	9,600	14,800
150	15,000		2,800	6,000	9,800	15,000
150	15,080	19/32	2,800	6,000	9,800	15,080
150	15,100		2,800	6,000	9,800	15,100
150	15,200		2,800	6,000	9,800	15,200
150	15,300		2,800	6,000	9,800	15,300
150	15,480	39/64	2,900	6,000	9,800	15,480
155	15,500		2,900	6,000	9,800	15,500
155	15,600		2,900	6,000	9,800	15,600
155	15,700		2,900	6,000	9,800	15,700





## Plaquitas intercambiables Multiplex HPC

Tamaño	d1 mm	inch	l4 mm	b mm	h mm	Código N°
155	15,800		2,900	6,000	9,800	15,800
155	15,870	5/8	2,900	6,000	9,800	15,870
160	16,000		3,000	7,000	11,000	16,000
160	16,270	41/64	3,000	7,000	11,000	16,270
165	16,500		3,100	7,000	11,000	16,500
165	16,670	21/32	3,100	7,000	11,000	16,670
170	17,000		3,100	7,000	11,000	17,000
170	17,070	43/64	3,200	7,000	11,000	17,070
170	17,460	11/16	3,200	7,000	11,000	17,460
175	17,500		3,200	7,000	11,000	17,500
175	17,600		3,300	7,000	11,000	17,600
175	17,860	45/64	3,300	7,000	11,000	17,860
180	18,000		3,300	8,000	12,600	18,000
180	18,260	23/32	3,400	8,000	12,600	18,260
185	18,500		3,400	8,000	12,600	18,500
185	18,650	47/64	3,400	8,000	12,600	18,650
190	19,000		3,500	8,000	12,600	19,000
190	19,050	3/4	3,500	8,000	12,600	19,050
190	19,250		3,600	8,000	12,600	19,250
190	19,450	49/64	3,600	8,000	12,600	19,450
195	19,500		3,600	8,000	12,600	19,500
195	19,600		3,600	8,000	12,600	19,600
195	19,840	25/32	3,700	8,000	12,600	19,840
200	20,000		3,700	9,000	13,900	20,000
200	20,240	51/64	3,700	9,000	13,900	20,240
205	20,500		3,800	9,000	13,900	20,500
205	20,640	13/16	3,800	9,000	13,900	20,640
210	21,000		3,900	9,000	13,900	21,000
210	21,030	53/64	3,900	9,000	13,900	21,030
210	21,100		3,900	9,000	13,900	21,100
210	21,430	27/32	3,900	9,000	13,900	21,430
215	21,500		4,000	9,000	13,900	21,500
215	21,830	55/64	4,000	9,000	13,900	21,830
220	22,000		4,100	10,000	15,300	22,000
220	22,220	7/8	4,100	10,000	15,300	22,220
225	22,500		4,100	10,000	15,300	22,500
225	22,620	57/64	4,200	10,000	15,300	22,620
230	23,000		4,200	10,000	15,300	23,000
230	23,020	29/32	4,200	10,000	15,300	23,020
230	23,420	59/64	4,300	10,000	15,300	23,420
235	23,500		4,300	10,000	15,300	23,500
235	23,810	15/16	4,400	10,000	15,300	23,810
240	24,000		4,400	11,000	15,800	24,000
240	24,100		4,400	11,000	15,800	24,100
240	24,210	61/64	4,500	11,000	15,800	24,210
245	24,500		4,500	11,000	15,800	24,500
245	24,610	31/32	4,500	11,000	15,800	24,610
250	25,000	63/64	4,600	11,000	15,800	25,000
250	25,400	1	4,700	11,000	15,800	25,400
255	25,500		4,700	11,000	15,800	25,500
255	25,670		4,700	11,000	15,800	25,670
255	25,700		4,700	11,000	15,800	25,700
255	25,810		4,700	11,000	15,800	25,810
260	26,000		4,800	12,000	20,000	26,000
260	26,190	1 1/32	4,800	12,000	20,000	26,190
265	26,500		4,900	12,000	20,000	26,500
265	26,590	1 3/64	4,900	12,000	20,000	26,590
270	27,000		5,000	12,000	20,000	27,000
275	27,500		5,100	12,000	20,000	27,500
275	27,700		5,100	12,000	20,000	27,700
275	27,780	1 3/32	5,100	12,000	20,000	27,780
280	28,000		5,100	13,000	20,700	28,000
280	28,180	1 7/64	5,200	13,000	20,700	28,180
285	28,500		5,200	13,000	20,700	28,500
285	28,580		5,300	13,000	20,700	28,580
290	29,000		5,300	13,000	20,700	29,000
290	29,370	1 5/32	5,400	13,000	20,700	29,370
295	29,500		5,400	13,000	20,700	29,500
295	29,770	1 11/64	5,500	13,000	20,700	29,770
300	30,000		5,500	14,000	22,300	30,000
300	30,160	1 3/16	5,500	14,000	22,300	30,160
305	30,500		5,600	14,000	22,300	30,500



# HARTNER

## Plaquitas intercambiables Multiplex HPC

Tamaño	d1 mm	inch	l4 mm	b mm	h mm	Código N°
305	30,960	1 7/32	5,700	14,000	22,300	30,960
310	31,000		5,700	14,000	22,300	31,000
315	31,500		5,800	14,000	22,300	31,500
315	31,750	1 1/4	5,800	14,000	22,300	31,750
320	32,000		5,900	15,000	23,100	32,000
320	32,500		6,000	15,000	23,100	32,500
320	32,540	1 9/32	6,000	15,000	23,100	32,540
320	32,940	1 19/64	6,000	15,000	23,100	32,940
330	33,000		6,100	15,000	23,100	33,000
330	33,340	1 5/16	6,100	15,000	23,100	33,340
330	33,500		6,100	15,000	23,100	33,500
340	34,000		6,200	15,000	23,100	34,000
340	34,130	1 11/32	6,300	15,000	23,100	34,130
340	34,500		6,300	15,000	23,100	34,500
340	34,930		6,400	15,000	23,100	34,930
350	35,000		6,400	15,000	23,100	35,000
350	35,500		6,500	15,000	23,100	35,500
350	35,720	1 13/32	6,600	15,000	23,100	35,720
360	36,000		6,600	16,000	23,900	36,000
360	36,500		6,700	16,000	23,900	36,500
360	36,510	1 7/16	6,700	16,000	23,900	36,510
370	37,000		6,800	16,000	23,900	37,000
370	37,310	1 15/32	6,800	16,000	23,900	37,310
370	37,500		6,900	16,000	23,900	37,500
380	38,000		7,000	16,000	23,900	38,000
380	38,100	1 1/2	7,000	16,000	23,900	38,100
380	38,500	1 33/64	7,100	16,000	23,900	38,500
390	39,000		7,100	16,000	23,900	39,000
390	39,500		7,200	16,000	23,900	39,500
400	40,000		7,300	16,000	23,900	40,000



## Plaquitas intercambiables Multiplex HPC

Nº artículo 86725

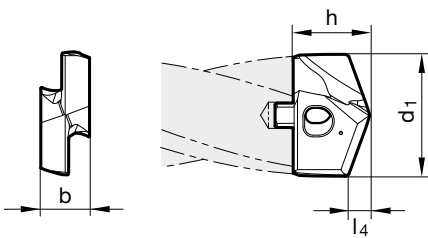


P	M	K	N	S	H
○	●	○	○	○	○



vaciado de punta  $\geq \varnothing 11,000$  • entrada cónica • forma recta del corte principal (mediante corrección) • tornillos tensores Art.nº. 86843 incluidos

aceros inoxidables



Tamaño	d1 mm	inch	l4 mm	b mm	h mm	Código Nº
110	11,000		2,100	4,500	7,500	11,000
110	11,200		2,100	4,500	7,500	11,200
115	11,500		2,100	4,500	7,500	11,500
115	11,510	29/64	2,100	4,500	7,500	11,510
115	11,700		2,200	4,500	7,500	11,700
115	11,800		2,200	4,500	7,500	11,800
115	11,910	15/32	2,200	4,500	7,500	11,910
120	12,000		2,200	5,000	7,700	12,000
120	12,100		2,300	5,000	7,700	12,100
120	12,200		2,300	5,000	7,700	12,200
120	12,300	31/64	2,300	5,000	7,700	12,300
125	12,500		2,300	5,000	7,700	12,500
125	12,600		2,300	5,000	7,700	12,600
125	12,700	1/2	2,400	5,000	7,700	12,700
125	12,800		2,400	5,000	7,700	12,800
125	12,900		2,400	5,000	7,700	12,900
130	13,000		2,400	5,500	8,500	13,000
130	13,100	33/64	2,400	5,500	8,500	13,100
130	13,490	17/32	2,500	5,500	8,500	13,490
135	13,500		2,500	5,500	8,500	13,500
135	13,600		2,500	5,500	8,500	13,600
135	13,700		2,500	5,500	8,500	13,700
135	13,800		2,600	5,500	8,500	13,800
135	13,890	35/64	2,600	5,500	8,500	13,890
140	14,000		2,600	6,000	9,600	14,000
140	14,100		2,600	6,000	9,600	14,100
140	14,290	9/16	2,700	6,000	9,600	14,290
140	14,400		2,700	6,000	9,600	14,400
145	14,500		2,700	6,000	9,600	14,500
145	14,600		2,700	6,000	9,600	14,600
145	14,700		2,700	6,000	9,600	14,700
145	14,800		2,700	6,000	9,600	14,800
150	15,000		2,800	6,000	9,800	15,000
150	15,080	19/32	2,800	6,000	9,800	15,080
150	15,100		2,800	6,000	9,800	15,100
150	15,200		2,800	6,000	9,800	15,200
150	15,300		2,800	6,000	9,800	15,300
155	15,500		2,900	6,000	9,800	15,500
155	15,600		2,900	6,000	9,800	15,600
155	15,700		2,900	6,000	9,800	15,700
155	15,800		2,900	6,000	9,800	15,800
155	15,870	5/8	2,900	6,000	9,800	15,870



## Plaquitas intercambiables Multiplex HPC

Tamaño	d1 mm	inch	l4 mm	b mm	h mm	Código N°
160	16,000		3,000	7,000	11,000	16,000
160	16,270	41/64	3,000	7,000	11,000	16,270
165	16,500		3,100	7,000	11,000	16,500
165	16,670	21/32	3,100	7,000	11,000	16,670
170	17,000		3,100	7,000	11,000	17,000
170	17,070	43/64	3,200	7,000	11,000	17,070
170	17,460	11/16	3,200	7,000	11,000	17,460
175	17,500		3,200	7,000	11,000	17,500
175	17,600		3,300	7,000	11,000	17,600
175	17,860	45/64	3,300	7,000	11,000	17,860
180	18,000		3,300	8,000	12,600	18,000
180	18,260	23/32	3,400	8,000	12,600	18,260
185	18,500		3,400	8,000	12,600	18,500
185	18,650	47/64	3,400	8,000	12,600	18,650
190	19,000		3,500	8,000	12,600	19,000
190	19,050	3/4	3,500	8,000	12,600	19,050
190	19,450	49/64	3,600	8,000	12,600	19,450
195	19,500		3,600	8,000	12,600	19,500
195	19,600		3,600	8,000	12,600	19,600
195	19,840	25/32	3,700	8,000	12,600	19,840
200	20,000		3,700	9,000	13,900	20,000
200	20,240	51/64	3,700	9,000	13,900	20,240
205	20,500		3,800	9,000	13,900	20,500
205	20,640	13/16	3,800	9,000	13,900	20,640
210	21,000		3,900	9,000	13,900	21,000
210	21,030	53/64	3,900	9,000	13,900	21,030
210	21,100		3,900	9,000	13,900	21,100
210	21,430	27/32	3,900	9,000	13,900	21,430
215	21,500		4,000	9,000	13,900	21,500
215	21,830	55/64	4,000	9,000	13,900	21,830
220	22,000		4,100	10,000	15,300	22,000
220	22,220	7/8	4,100	10,000	15,300	22,220
225	22,500		4,100	10,000	15,300	22,500
225	22,620	57/64	4,200	10,000	15,300	22,620
230	23,000		4,200	10,000	15,300	23,000
230	23,020	29/32	4,200	10,000	15,300	23,020
230	23,420	59/64	4,300	10,000	15,300	23,420
235	23,500		4,300	10,000	15,300	23,500
235	23,810	15/16	4,400	10,000	15,300	23,810
240	24,000		4,400	11,000	15,800	24,000
240	24,100		4,400	11,000	15,800	24,100
240	24,210	61/64	4,500	11,000	15,800	24,210
245	24,500		4,500	11,000	15,800	24,500
245	24,610	31/32	4,500	11,000	15,800	24,610
250	25,000	63/64	4,600	11,000	15,800	25,000
250	25,400	1	4,700	11,000	15,800	25,400
255	25,500		4,700	11,000	15,800	25,500
255	25,670		4,700	11,000	15,800	25,670
255	25,700		4,700	11,000	15,800	25,700
260	26,000		4,800	12,000	20,000	26,000
260	26,190	1 1/32	4,800	12,000	20,000	26,190
265	26,500		4,900	12,000	20,000	26,500
265	26,590	1 3/64	4,900	12,000	20,000	26,590
270	27,000		5,000	12,000	20,000	27,000
275	27,500		5,100	12,000	20,000	27,500
275	27,700		5,100	12,000	20,000	27,700
275	27,780	1 3/32	5,100	12,000	20,000	27,780
280	28,000		5,100	13,000	20,700	28,000
280	28,180	1 7/64	5,200	13,000	20,700	28,180
285	28,500		5,200	13,000	20,700	28,500
285	28,580		5,300	13,000	20,700	28,580
290	29,000		5,300	13,000	20,700	29,000
290	29,370	1 5/32	5,400	13,000	20,700	29,370
295	29,500		5,400	13,000	20,700	29,500
295	29,600		5,400	13,000	20,700	29,600
295	29,770	1 11/64	5,500	13,000	20,700	29,770
300	30,000		5,500	14,000	22,300	30,000
300	30,160	1 3/16	5,500	14,000	22,300	30,160
305	30,500		5,600	14,000	22,300	30,500
305	30,960	1 7/32	5,700	14,000	22,300	30,960
310	31,000		5,700	14,000	22,300	31,000
315	31,500		5,800	14,000	22,300	31,500



## Plaquitas intercambiables Multiplex HPC

Tamaño	d1 mm	inch	l4 mm	b mm	h mm	Código N°
<b>315</b>	31,750	1 1/4	5,800	14,000	22,300	<b>31,750</b>
<b>320</b>	32,000		5,900	15,000	23,100	<b>32,000</b>
<b>320</b>	32,500		6,000	15,000	23,100	<b>32,500</b>
<b>320</b>	32,540	1 9/32	6,000	15,000	23,100	<b>32,540</b>
<b>320</b>	32,940	1 19/64	6,000	15,000	23,100	<b>32,940</b>
<b>330</b>	33,000		6,100	15,000	23,100	<b>33,000</b>
<b>330</b>	33,340	1 5/16	6,100	15,000	23,100	<b>33,340</b>
<b>330</b>	33,500		6,100	15,000	23,100	<b>33,500</b>
<b>340</b>	34,000		6,200	15,000	23,100	<b>34,000</b>
<b>340</b>	34,130	1 11/32	6,300	15,000	23,100	<b>34,130</b>
<b>340</b>	34,500		6,300	15,000	23,100	<b>34,500</b>
<b>340</b>	34,930		6,400	15,000	23,100	<b>34,930</b>
<b>350</b>	35,000		6,400	15,000	23,100	<b>35,000</b>
<b>350</b>	35,500		6,500	15,000	23,100	<b>35,500</b>
<b>350</b>	35,720	1 13/32	6,600	15,000	23,100	<b>35,720</b>
<b>360</b>	36,000		6,600	16,000	23,900	<b>36,000</b>
<b>360</b>	36,500		6,700	16,000	23,900	<b>36,500</b>
<b>360</b>	36,510	1 7/16	6,700	16,000	23,900	<b>36,510</b>
<b>370</b>	37,000		6,800	16,000	23,900	<b>37,000</b>
<b>370</b>	37,310	1 15/32	6,800	16,000	23,900	<b>37,310</b>
<b>370</b>	37,500		6,900	16,000	23,900	<b>37,500</b>
<b>380</b>	38,000		7,000	16,000	23,900	<b>38,000</b>
<b>380</b>	38,100	1 1/2	7,000	16,000	23,900	<b>38,100</b>
<b>380</b>	38,500	1 33/64	7,100	16,000	23,900	<b>38,500</b>
<b>390</b>	39,000		7,100	16,000	23,900	<b>39,000</b>
<b>390</b>	39,500		7,200	16,000	23,900	<b>39,500</b>
<b>400</b>	40,000		7,300	16,000	23,900	<b>40,000</b>



## Plaquitas intercambiables Multiplex HPC

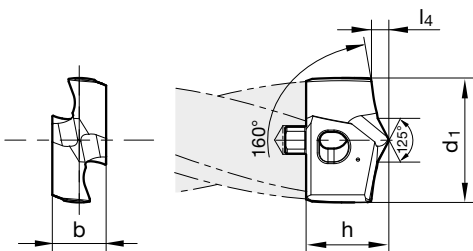
N° artículo 86729



P	M	K	N	S	H
•					



afilado plano • forma cóncava del corte principal • afilado de la punta especial con 160° y 125° en la punta de centrar • tornillos tensores Art.n°. 86843 incluidos



Tamaño	d1 mm	inch	l4 mm	b mm	h mm	Código N°
120	12,000		1,700	5,000	7,500	12,000
140	14,000		2,000	6,000	9,500	14,000
160	16,000		2,300	7,000	10,800	16,000
180	18,000		2,600	8,000	12,300	18,000
200	20,000		2,900	9,000	13,600	20,000
210	21,000		3,000	9,000	13,600	21,000
220	22,000		3,200	10,000	14,900	22,000
240	24,000		3,500	11,000	15,500	24,000
250	25,000	63/64	3,600	11,000	15,500	25,000
260	26,000		3,800	12,000	18,500	26,000
270	27,000		3,900	12,000	18,600	27,000
280	28,000		4,100	13,000	18,600	28,000
290	29,000		4,200	13,000	18,600	29,000
300	30,000		4,400	14,000	19,900	30,000
320	32,000		4,600	15,000	21,300	32,000
330	33,000		4,800	15,000	21,700	33,000
340	34,000		4,900	15,000	22,200	34,000
360	36,000		5,200	16,000	22,500	36,000
380	38,000		5,500	16,000	23,000	38,000
400	40,000		5,800	16,000	23,100	40,000



## Plaquitas para avellanar Multiplex HPC

### Nº artículo 86726



P	M	K	N	S	H
○		●			



fundición gris, fundición maleable, fundición esferica

ISO	Tamaño del porta	Código N°
CPGW050202F N-K	110-140	52,020
CPGW050204F N-K	110-140	52,040
CPGW060202F N-K	160-280	62,020
CPGW060204F N-K	160-280	62,040
CPGW09T308F N-K	300-360	93,080

### Nº artículo 86727



P	M	K	N	S	H
			●		



aluminio y sus aleaciones • metales no ferríticos

ISO	Tamaño del porta	Código N°
CPGT050202F R-AL	110-140	52,020
CPGT050204F R-AL	110-140	52,040
CPGT060202F R-AL	160-280	62,020
CPGT060204F R-AL	160-280	62,040
CPGT09T308F R-AL	300-360	93,080



## Plaquitas para avellanar Multiplex HPC

N° artículo 86728



<b>P</b>	<b>M</b>	<b>K</b>	<b>N</b>	<b>S</b>	<b>H</b>
•	○	○		○	○



aceros y fundición de aceros (aleados y sin alear)

ISO	Tamaño del porta	Código N°
CPGT050202F R-P	110-140	<b>52,020</b>
CPGT050204F R-P	110-140	<b>52,040</b>
CPGT060202F R-P	160-280	<b>62,020</b>
CPGT060204F R-P	160-280	<b>62,040</b>
CPGT09T308F R-P	300-360	<b>93,080</b>



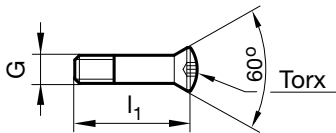


## Tornillos tensores para porta Multiplex HPC 1,5-10xD

Nº artículo 86843



para conocer los pares de apriete de los tornillos Torx, consulte «Multiplex HPC - Tecnología y ventajas»



G	l1 mm	Torx	Código N°
M 2.2	9,500	T7	2,200
M 2.2	10,500	T7	2,201
M 2.5	11,400	T8	2,500
M 3	12,100	T9	3,000
M 3	13,100	T9	3,001
M 3.5	14,250	T10	3,500
M 4	16,000	T15	4,000
M 4.5	18,000	T15	4,500
M 5	19,750	T20	5,000
M 5	21,750	T20	5,001
M 5	23,400	T20	5,003
M 6	27,000	T25	6,000
M 6	28,500	T25	6,001
M 6	32,500	T25	6,002



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## Llave dinamométrica

Nº artículo 86844



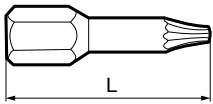
Medida punta	Par de giro Nm	L mm	Tipo	Código Nº
1/4"	0,4-1	100,000	A	1,001
1/4"	0,8-2	160,000	A	2,000
1/4"	0,8-5	160,000	A	5,001
1/4"	2-8	200,000	A	8,000
1/4"	5-14	200,000	E	14,000



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## Adaptador hexagonal

N° artículo 86845



Medida punta		Torx	L mm	Código N°
1/4	hexágono	T5	25,000	5,000
1/4	hexágono	T7	25,000	7,000
1/4	hexágono	T8	25,000	8,000
1/4	hexágono	T9	25,000	9,000
1/4	hexágono	T10	25,000	10,000
1/4	hexágono	T15	25,000	15,000
1/4	hexágono	T20	25,000	20,000
1/4	hexágono	T25	25,000	25,001

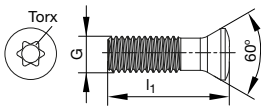


## Tornillos tensores para porta de avellanar Multiplex HPC

Nº artículo 86846



para conocer los pares de apriete de los tornillos Torx, consulte «Multiplex HPC - Tecnología y ventajas»



G	l1 mm	Torx	Código N°
M 2	5,500	T6	2,000
M2,5	5,300	T7	2,500
M4	9,500	T15	4,006

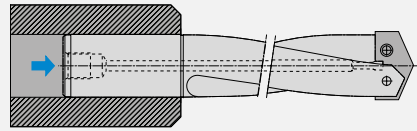


## Multiplex - La alternativa versátil

Todos los mangos multiplex están equipados con un sistema de refrigeración interior que garantiza un suministro óptimo del lubricante en el proceso de corte tanto horizontal como verticalmente y alargan la vida de la herramienta. Además, de una óptima evacuación desde el agujero. El tipo de refrigerante se suministra dependiendo del diseño del mango:

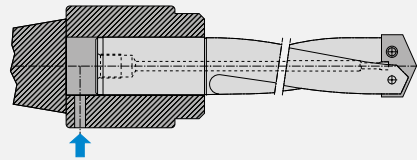
### Entrada del refrigerante al final del mango

Para herramientas tanto **estáticas** como **rotativas**:  
Entrada axial del refrigerante.  
Para mangos cilíndricos y agujeros de  $\varnothing 10$  a 102 mm.  
Referencia del mango 86612/86622/86624/86730/86740/86750  
y mangos con longitudes extra



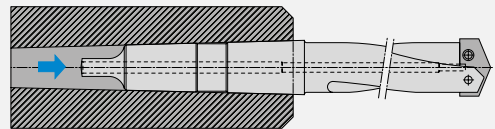
### El suministro de refrigerante en la superficie del mango portabrocas

Para herramientas **rotativas**:  
Suministro radial del refrigerante a través del portabrocas.  
Para mangos cilíndricos y agujeros  $\varnothing 10$  a 102 mm.  
Ref. del mango 86612/86622/86624/86730/86740/86750 y mangos con long. extra  
Mangos SK40/50 con alojamiento cilíndrico y cono Morse 4/5/6 con alojamiento cilíndrico.



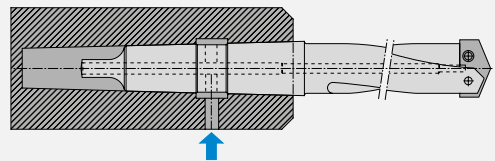
### Suministro del refrigerante en el tallo

Para herramientas tanto **estáticas** como **rotativas**:  
Suministro axial del refrigerante a través del mango.  
Para mangos como Morse y eje  $\varnothing 10$  a 25 mm  
Referencia de mango no. 986630/86650



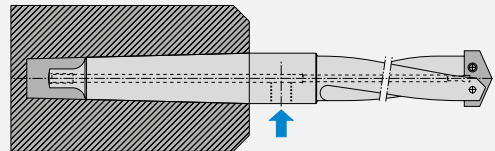
### Suministro lateral del refrigerante en mangos como Morse

Para herramientas **estáticas**:  
Suministro radial del refrigerante a través del mango.  
Para mangos como Morse y eje  $\varnothing 10$  a 25 mm.  
mango bajo demanda



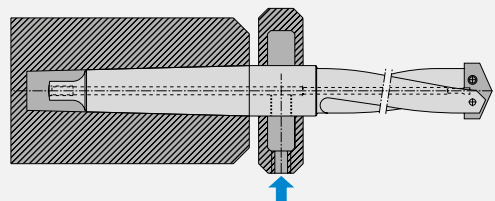
### Entrada lateral del refrigerante en el final del cuello

Para herramientas **estáticas**:  
Suministro del refrigerante vía tubería directa con rosca R 1/4 y R 1/2.  
Para mangos como Morse con asentamiento para suministro de eje  $\varnothing 25$  a 102mm.  
Referencia del mango no. 86670/86680 y longitudes extras de mango



### Entrada lateral del refrigerante en el final del cuello

Para herramientas **rotativas**:  
Entrada radial del refrigerante a través del canal.  
Para mangos como Morse con para agujeros  $\varnothing$  por encima de 25 mm.  
Referencia del mango no. 86670/86680 y longitudes extras de mango

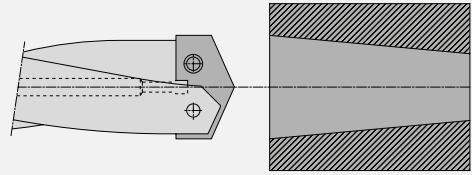




## Multiplex - Consejos y trucos

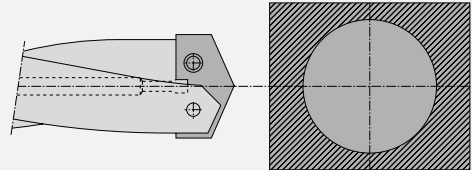
### Taladrando agujeros previos

Debido a que el sistema Multiplex es predominantemente guiado por el cincel, no es recomendable para taladrar agujeros previos. Sin embargo, si el sistema se utiliza bajo las mencionadas condiciones, los parámetros de corte deben ser reducidos.



### Corte interrumpido

El sistema Multiplex no es apto para cortes interrumpidos (por ejemplo, taladros transversales que son más largos que el diámetro).

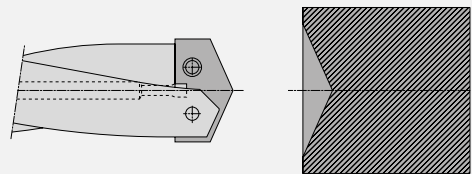


### Centro

Las entradas para el sistema Multiplex son de cuerpo rebajado. Por lo tanto, el centrado es sólo necesario para taladros profundos. Si el centrado es necesario por razones técnicas, el ángulo del punto de centrado debe ser igual o mayor que el ángulo del punto de entrada. Lo siguiente aplica:

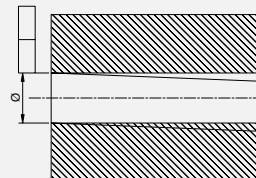
ACE 7 mayor que  $d = 25.4 \text{ mm} = 135^\circ$   
mayor que  $d = 66.0 \text{ mm} = 132^\circ$   
desde  $d = 66.0 \text{ mm} = 140^\circ$

Un mango corto (3xD) debe ser aplicado para centrado



### Descentraje del taladro

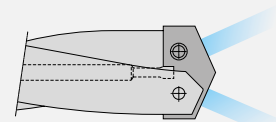
El descentraje del taladro puede ser debido a varios factores. Un valor aproximado de 0.1-0.16 mm para taladros mayores de 7xD está aceptado. En este caso el mango más corto y, por lo tanto, el más rígido debe ser aplicado.



### Presión del lubricante

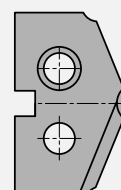
El lubricante utilizado con el sistema Multiplex es extremadamente importante para la evacuación de las virutas. Puede ser introducido a una presión aproximada de 5 bar. Generalmente, la siguiente regla aplica: cuanto mayor refrigerante esté disponible, mejor.

Por el uso de refrigerante o mandriles con refrigerante, el sistema Multiplex puede ser aplicado en máquinas viejas con refrigerante externo. Uno de nuestros ingenieros encontrará una solución a su problema.



### Filo de corte pesado

Si el calor ha erosionado las esquinas, la velocidad de corte es demasiado alta y debe ser reducida. Mida el diámetro no afectado y recalcula la velocidad de corte en base a este nuevo diámetro. Reste un 10% de la velocidad resultante e introduzca el valor en el máquina.

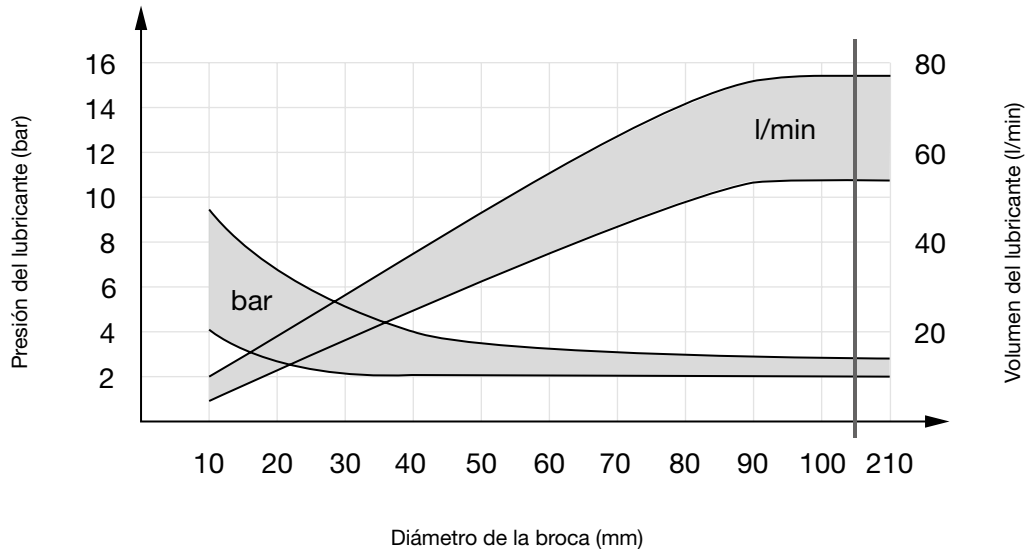




## Multiplex - Tipos de refrigerante

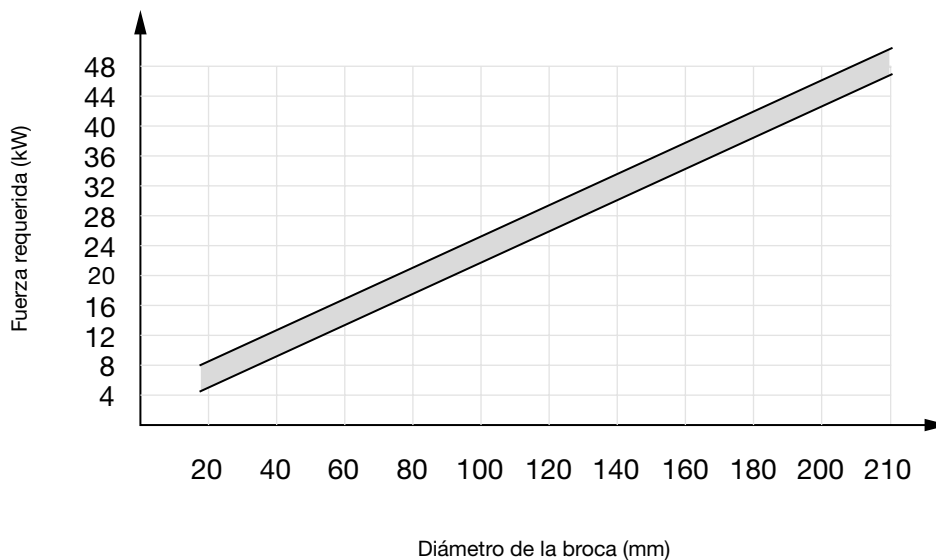
Un agente refrigerante eficaz es de extrema importancia. Insuficiente presión del refrigerante y volumen pueden producir un acabado insatisfactorio o una rotura de la herramienta. Si es posible, la medida de las partículas sólidas en el refrigerante no debe exceder 50  $\mu\text{m}$ .

Para la aplicación de herramientas Multiplex en acero de alta velocidad o metal duro recomendamos utilizar lubricante soluble como refrigerante aplicando el ratio estándar de mezcla 1:20. La presión del refrigerante y el volumen son más importantes que la composición del lubricante soluble. Un eficiente agente refrigerante es un importante prerequisite para una lubricación y refrigeración.



## Máquina y pieza a trabajar

Sólo en una máquina rígida, con husillo, pieza de trabajo con sujeción de abrazaderas hacen posible el uso de metal duro. La rigidez insuficiente conduce a vibraciones rápidas del taladro durante la producción de agujeros cuando el borde del cincel sale de la pieza causando una reducción de la vida de la herramienta o una rotura.





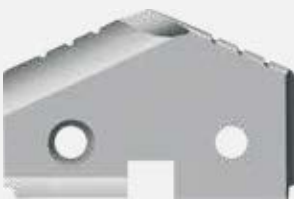
## Multiplex - Geometrías especiales



**Formulario para clientes**  
(HSS-E/HSS-E-PM o metal duro)



**Plaquitas para NC (HSS-E/HSS-E-PM o MD) de 90° o 120°**  
(dependiendo de Ø el ángulo de 90° puede ser distorsionado)



**Plaquitas en radio**  
(HSS-E/HSS-E-PM o metal duro).



**Plaquitas de paso**  
(HSS-E/HSS-E-PM o metal duro).



**Geometría para latón (metal duro)**  
para la aplicación en latón y materiales similares.



**Plaquitas para agujeros ciegos\* sin centraje**  
(HSS-E/HSS-E-PM)



**Afilado de punta para fibras de plástico**  
(metal duro)



**Plaquitas en radio\***  
(HSS-E/HSS-E-PM)

**\* Por favor, cuando utilice agujeros ciegos o contornos:**

- Utilizar sólo mangos cortos.
- Pre-trabajando el calibre del agujero con Multiplex standards ( $\text{Ø del standard} \leq \text{Ø del agujero ciego}$ ).
- Taladrar en materiales sólidos sólo es recomendable bajo condiciones especiales.
- Por favor, mande un dibujo del calibre del agujero a nuestros técnicos, si es posible.

Geometrías especiales en combinación con diferentes cortes de nuestro catálogo están disponibles bajo demanda.  
Por favor, contacte con nosotros, **entrega en aproximadamente 3 semanas.**





## Multiplex HPC - técnica y ventajas

Con el nuevo sistema de taladrar con plaquitas intercambiables Multiplex HPC, Hartner suministra porta-herramientas eficientes en costes para taladros en un campo de diámetros desde 11,00 a 40,00mm y que aporta las siguientes ventajas:

• **Mayor rendimiento**

Gracias a cortes micromecanizados y los recubrimientos según cada aplicación las plaquitas intercambiables para los porta-herramientas Multiplex HPC WP para taladrar, son de gran rendimiento. Esto se basa en el material optimizado de los porta-herramientas con superficies niqueladas y medidas que incrementan en un escalonado de 0,5mm hasta dia. 31,99mm y 1,0mm desde dia. 32,00mm. Esto supone menos esfuerzo en el cuerpo base del porta-herramientas.

• **Transporte optimizado de la viruta**

Gracias a la sección de ranuras los porta-herramientas del sistema de taladrado Multiplex HPC WP aseguran una buena evacuación de viruta fuera del agujero incluso en agujeros de mas profundidad.

• **Lubrificación y refrigeración perfecta**

Los canales de refrigeración con máxima sección garantizan una buena lubricación y refrigeración. Los cortes se lubrican y refrigeran optimamente a la vez que se ayuda así a una buena evacuación de la viruta fuera del agujero.

• **Asientos para las plaquitas exactos y rígidos**

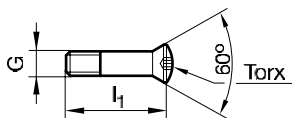
El asiento perfecto de las plaquitas permite cambiarlas dentro de la máquina en pocos y sencillos pasos con un destornillador torx estándar. Gracias al material optimizado de los porta-herramientas Multiplex HPC de taladrar, las plaquitas se pueden cambiar mas amenudo que con los sistemas convencionales en los que había que reemplazar el porta-herramientas por el desgaste del asiento.

Los tornillos de ajuste bloqueantes garantizan una sujeción segura de las plaquitas intercambiables dentro del porta-herramientas incluso en máquinas con altos niveles de vibración.

• **Porta-herramientas rígidos**

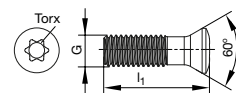
Los saltos pequeños en el escalonado de diámetros de los porta-herramientas no solo reducen el desgaste. Gracias a la mejor guía de la herramienta en el agujero también se aumentan rendimientos de los sistemas de taladrado Multiplex HPC WP. Todo esto aporta mayor rendimiento y mejor calidad superficial en las piezas.

### Tornillos de ajuste para porta-herramientas 1,5 - 10 x D 86843



para porta-herramientas	Torx	Code n°
110/115	T7	2,200
120/125	T7	2,201
130/135	T8	2,500
140/145	T9	3,000
150/155	T9	3,001
160 - 175	T10	3,500
180 - 195	T15	4,000
200 - 215	T15	4,500

### para porta-herramientas de avellanar 86846



para porta-herramientas	Torx	Code n°
220 - 235	T20	5,000
240 - 255	T20	5,001
260 - 295	T20	5,003
300 - 315	T25	6,000
320 - 350	T25	6,001
360 - 390	T25	6,002

para porta-herramientas	Torx	Code n°
110 - 140	T6	2,000
160 - 280	T7	2,500
300 - 360	T15	4,006

¡Recomendamos cambiar los tornillos cada vez que cambiamos las plaquitas!

Cada porta-herramientas se suministra con un tornillo de ajuste art.n° 86843, un destornillador art.n°. 86842.

Cada plaquita intercambiable se suministra con un tornillo de ajuste art.n°. 86843.

### Par de fuerzas para tornillos de ajuste:

Gama Ø	11,0 - 12,99	13,0 - 13,99	14,0 - 15,99	16,0 - 17,99	18,0 - 19,99	20,0 - 21,99	22,0 - 29,99	30,0 - 40,00
Rosca	M2,2	M2,5	M3	M3,5	M4	M4,5	M5	M6
Torx	T7	T8	T9	T10	T15	T15	T20	T25
Par de giro [Nm]	0,8	1,0	1,7	2,7	4,0	6,0	8,0	14,0



ip x

①



# HARTNER

Precision Cutting Tools

## PARTE TÉCNICA

Dimensiones, definiciones, recomendaciones



# HARTNER

## Contenido Dimensiones, definiciones

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## Dimensiones de las brocas de mango cilíndrico

diámetro hasta (incl.) mm	DIN 338		DIN 339		DIN 340		DIN 1897		DIN 1869 Brocas espirales, extra largas					
	long. total mm	long. ranura mm	long. total mm	long. ranura mm	long. total mm	long. ranura mm	long. total mm	long. ranura mm	serie 1		serie 2		serie 3	
									long. total mm	long. ranura mm	long. total mm	long. ranura mm	long. total mm	long. ranura mm
≤ 0,24	19	2,5					19	1,5						
0,30	19	3					19	1,5						
0,38	19	4					19	2						
0,48	20	5			30*	10*	19	2,5						
0,53	22	6			32*	12*	20	3						
0,60	24	7	32*	15*	35*	15*	21	3,5						
0,67	26	8	36*	18*	38*	18*	22	4						
0,75	28	9	39*	20*	42*	21*	23	4,5						
0,85	30	10	42*	22*	46*	25*	24	5						
0,95	32	11	45*	24*	51*	29*	25	5,5						
1,06	34	12	48	26	56	33	26	6						
1,18	36	14	50	28	60	37	28	7						
1,32	38	16	52	30	65	41	30	8						
1,50	40	18	55	33	70	45	32	9						
1,70	43	20	58	35	76	50	34	10	115*	75*				
1,90	46	22	62	38	80	53	36	11	120*	80*				
2,12	49	24	66	41	85	56	38	12	125	85	160*	110*	205*	135*
2,36	53	27	70	44	90	59	40	13	135	90	170*	115*	215*	145*
2,65	57	30	74	47	95	62	43	14	140	95	180*	120*	225*	150*
3,00	61	33	79	51	100	66	46	16	150	100	190	130	240*	160*
3,35	65	36	84	55	106	69	49	18	155	105	200	135	250*	170*
3,75	70	39	91	60	112	73	52	20	165	115	210	145	265	180
4,25	75	43	96	64	119	78	55	22	175	120	220	150	280	190
4,75	80	47	102	69	126	82	58	24	185	125	235	160	295	200
5,30	86	52	108	74	132	87	62	26	195	135	245	170	315	210
6,00	93	57	116	80	139	91	66	28	205	140	260	180	330	225
6,70	101	63	124	86	148	97	70	31	215	150	275	190	350	235
7,50	109	69	133	93	156	102	74	34	225	155	290	200	370	250
8,50	117	75	142	100	165	109	79	37	240	165	305	210	390	265
9,50	125	81	151	107	175	115	84	40	250	175	320	220	410	280
10,60	133	87	162	116	184	121	89	43	265	185	340	235	430	295
11,80	142	94	173	125	195	128	95	47	280*	195*	365*	250*	455*	310*
13,20	151	101	184	134	205	134	102	51	295*	205*	375*	260*	480*	330*
14,00	160	108	194	142	214	140	107	54						
15,00	169	114	202	147	220	144	111	56						
16,00	178	120	211	153	227	149	115	58						
17,00	184	125	218	159	235	154	119	60						
18,00	191	130	226	165	241	158	123	62						
19,00	198	135	234	171	247	162	127	64						
20,00	205	140	242	177	254	166	131	66						
21,20					261	171	136	68						
22,40					268	176	141	70						
23,60					275	180	146	72						
25,00					282	185	151	75						
26,50					290	190	156	78						
28,00					298	195	162	81						
30,00					307	201	168	84						
31,50					316	207	174	87						
33,50							180	90						
35,50							186	93						
37,50							193	96						
40,00							200	100						
42,50							207	104						
45,00							214	108						
47,50							221	112						
50,00							228	116						

Hartner suministra brocas según norma de fábrica hasta 1000 mm de longitud total Art.N° 81740, 81750, 81760

\* Norma Hartner



## Dimensiones de las brocas de mango cónico

diámetro hasta (incl.) mm	DIN 345			DIN 346			DIN 341			Brocas para casquillos con cono reforzado*			Brocas V/IS* para materiales difíciles de mecanizar			DIN 1870 Brocas espirales extra largas					
	long. total	long. ranura	cono Morse	long. total	long. ranura	cono Morse	long. total	long. ranura	cono Morse	long. total	long. ranura	cono Morse	long. total	long. ranura	cono Morse	serie 1			serie 2		
																long. total	long. ranura	cono Morse	long. total	long. ranura	cono Morse
	mm			mm			mm			mm			mm			mm			mm		
2,65	111*	30*	1*																		
3,00	114	33	1																		
3,35	117	36	1																		
3,75	120	39	1																		
4,25	124	43	1				145*	64*	1*												
4,75	128	47	1				150*	69*	1*												
5,30	133	52	1				155	74	1												
6,00	138	57	1				161	80	1												
6,70	144	63	1				167	86	1												
7,50	150	69	1				174	93	1												
8,50	156	75	1				181	100	1				130	49	1	265	165	1	330	210	1
9,50	162	81	1				188	107	1				134	53	1	275	175	1	345	220	1
10,60	168	87	1	185*	87*	2*	197	116	1	214	116	2	138	57	1	285	185	1	360	235	1
11,80	175	94	1	192*	94*	2*	206	125	1	223	125	2	142	61	1	300	195	1	375	250	1
13,20	182	101	1	199	101	2	215	134	1	232	134	2	147	66	1	310	205	1	395	260	1
14,00	189	108	1	206	108	2	223	142	1	240	142	2	168	70	2	325	220	1	410	275	1
15,00	212	114	2	235*	114*	3*	245	147	2	268	147	3	172	74	2	340	220	2	425	275	2
16,00	218	120	2	241*	120*	3*	251	153	2	274	153	3	176	78	2	355	230	2	445	295	2
17,00	223	125	2	246*	125*	3*	257	159	2	280	159	3	179	81	2	355	230	2	445	295	2
18,00	228	130	2	251*	130*	3*	263	165	2	286	165	3	183	85	2	370	245	2	465	310	2
19,00	233	135	2	256	135	3	269	171	2	292	171	3	186	88	2	370	245	2	465	310	2
20,00	238	140	2	261	140	3	275	177	2	298	177	3	212	91	3	385	260	2	490	325	2
21,20	243	145	2	266	145	3	282	184	2	305	184	3	216	95	3	385	260	3	490	325	3
22,40	248	150	2	271	150	3	289	191	2	312	191	3	219	98	3	405	270	3	515	345	3
23,02	253	155	2	276	155	3	296	198	2	319	198	3	222	101	3	405	270	3	515	345	3
23,60	276	155	3	304*	155*	4*	319	198	3	347	198	4	222	101	3	425	270	3	535	345	3
25,00	281	160	3	309*	160*	4*	327	206	3	355	206	4	225	104	3	440	290	3	555	365	3
26,50	286	165	3	314*	165*	4*	335	214	3	363	214	4	256	107	4	440	290	3	555	365	3
28,00	291	170	3	319	170	4	343	222	3	371	222	4	259	110	4	460	305	3	580	385	3
30,00	296	175	3	324	175	4	351	230	3	379	230	4	263	114	4	460	305	3	580	385	3
31,50	301	180	3	329	180	4	360	239	3	388	239	4	266	117	4	480	320	3	610	410	3
31,75	306	185	3	334	185	4	369	248	3	397	248	4	269	120	4	480	320	3	610	410	3
33,50	334	185	4	372*	185*	5*	397	248	4	435	248	5	269	120	4	505	320	4	635	410	4
35,50	339	190	4	377*	190*	5*	406	257	4				272	123	4	530	340	4	665	430	4
37,50	344	195	4	382*	195*	5*	416	267	4				276	127	4	530	340	4	665	430	4
40,00	349	200	4	387*	200*	5*	426	277	4				317	130	5	555	360	4	695	460	4
42,50	354	205	4	392	205	5	436	287	4				320	133	5	555	360	4	695	460	4
45,00	359	210	4	397	210	5	447	298	4				323	136	5	585	385	4	735	490	4
47,50	364	215	4	402	215	5	459	310	4							585	385	4	735	490	4
50,00	369	220	4	407	220	5	470	321	4							605	405	4	765	510	4
50,80	374	225	4	412	225	5	475*	326*	4*												
53,00	412	225	5	479*	225*	6*	513*	326*	5*												
56,00	417	230	5	484*	230*	6*	518*	331*	5*												
60,00	422	235	5	489*	235*	6*	523*	336*	5*												
63,00	427	240	5	494*	240*	6*															
67,00	432	245	5	499	245	6															
71,00	437	250	5	504	250	6															
75,00	442	255	5	509	255	6															
76,50	447	260	5	514	260	6															
80,00	514	260	6																		
85,00	519	265	6																		
90,00	524	270	6																		
95,00	529	275	6																		
100,00	534	280	6																		
106,00	539*	285*	6*																		

Hartner suministra brocas según norma de fábrica hasta 1000 mm de longitud total Art.Nº 82467, 82468, 82469, 82466

\* Norma Hartner



# HARTNER

## Aceros HSS Hartner

Las herramientas de acero rápido únicamente las fabricamos con tipos de acero de alta calidad. Según el tipo de aleación las herramientas adquieren características específicas para cada aplicación:

Wolframio, moliteno: incrementa la resistencia abrasiva y al desgaste.

Vanadio: incrementa la resistencia al desgaste

Cobalto: incrementa la resistencia al desgaste, mejora la dureza.

Descripción Hartner	Tipo	Campo de aplicación, características
<b>HSS</b>	acero rápido convencional	Material de corte para uso universal
<b>HSS-E</b>	acero rápido aleado al cobalto	Material de corte con alta dureza térmica para exigencias altas, muy apropiado en temperaturas altas de corte o con poca refrigeración
<b>M42</b>	Aceros rápidos aleados con un 8% de cobalto	Material de corte con alta dureza térmica adecuado para mecanizados difíciles
<b>HSS-E-PM</b>	Aceros rápidos aleados al cobalto y fabricados con polvo metalúrgico	Material de corte con una textura muy homogénea y alta dureza térmica, gran resistencia al desgaste y mucha estabilidad en los cortes



## Los tipos de metal duro más importantes para herramientas Hartner

La siguiente tabla muestra los tipos de metal duro para aplicaciones de taladrado generales que Hartner lleva en su programa. Otros tipos se pueden suministrar bajo petición de oferta.

En más del 80% de las aplicaciones los resultados de herramientas en DK460UF combinadas con un recubrimiento no se superaron por otro tipo de metal duro. Esto y el gran programa de existencias de este material facilitan la elección de las herramientas. Nuestros técnicos le asesorarán gustosamente en el caso de que convenga cambiar de tipo de metal duro.

Tipo	Contenido-Co [M-%]	W-grano [µm]	Dureza [HV]	Clasificación-ISO [ISO 513]	Características
DK460UF K40UF	10	0,6	1620	K20-K40	Tipo de amplia aplicación, sobre todo con recubrimiento, para mecanizar aleaciones blandas de aluminio, fundición de hierro o aleaciones como inconel 718. Este tipo es la gran base de nuestra producción.
DK500UF K44UF	12	0,5	1690	K20-K30	Tipo desarrollado especialmente para el trabajo en duro. Se distingue frente al DK460UF por su mayor dureza y tolerancia de deformación. Debido al alto contenido de cobalto se recomienda muchísimo aplicarla con recubrimiento.
DK255F	8	0,7	1720	K20	Este tipo se recomienda para el mecanizado en duro, el mecanizado de fundiciones grises muy duras y aleaciones de ALSi duras. Mecanizado en seco es posible. Recomendable el recubrimiento.
DK120	6	1,3	1620	K15-K20	Este tipo es adecuado con recubrimiento de diamante.
DK120UF	7	0,7	1850	K05-K10	Tipo de grano ultrafino con gran resistencia al desgaste, para mecanizados en máquinas completamente estables y sobretodo para escariadores.
K55SF	9	0,2-0,4	1920	K05-K10	Para aplicaciones en materiales muy resistentes al desgaste, aceros inoxidables, materiales de unión como Kevlar y GFK, mecanizados de alta velocidad y en seco.
DK400N	10	0,7	1580	K20-K40	Tipo de alta tenacidad para el mecanizado de materiales muy resistentes a la temperatura.
DK256EH	10	0,6	1750	K20	Este tipo de metal duro es especialmente apropiado para el mecanizado de aleaciones de níquel básicas
K6UF	6	0,6	1870	K05-K10	Tipo ultra-fino con máxima resistencia al desgaste. Muy apropiado para la aplicación en materiales de extrema dureza, tipo sandwich y CFK.
K5UF	5	0,5	2010	K05-K10	Tipo de alta dureza para el taladrado y el escariado. Muy apropiado para la aplicación en materiales de extrema dureza y CFK.





## Recubrimientos y procesos para recubrimientos

### Superficie blanca



Brocas blancas para el mecanizado de fundición de aluminio y aluminios con poco silicio dan un muy buen resultado. Estas brocas se adaptan a sus campos de aplicación gracias a sus geometrías especiales y su gran calidad superficial en el vaciado de núcleo, sus ranuras y planos de incisión.

### Superficie vaporizada / nitrurada



Las superficies vaporizadas muestran por una oxidación controlada en los bordes (aprox. 3 hasta 10 micras) una mejora de la resistencia al desgaste de la superficie de acero como en el comportamiento tribológico de las herramientas. Para aplicaciones abrasivas se recomienda un nitrurado de la superficie con el que la dureza en los bordes se aumenta y así se mejora la resistencia al desgaste de la herramienta. Como los recubrimientos blandos y duros de hoy en día mejoran mucho la calidad superficial, este tipo de tratamientos nombrados anteriormente pierden poco a poco su importancia.

### Recubrimiento TIN



Temperatura máx. de aplicación: < 600°C  
Color: amarillo oro  
Composición: mono – capa  
Dureza: 2300 HV0.05

El recubrimiento TIN introducido ya en los años 1980 por Hartner, encuentra su aplicación en el taladrado con HSS y metal duro.

### Recubrimientos FIRE/ nano FIRE



Temperatura máx. de aplicación: < 800°C  
Color: violeta  
Composición: multi – capa  
Dureza: 3300 HV0.05

Los recubrimientos Fire y nanoFire contienen además de titanio y nitrógeno, aluminio. Estos recubrimientos ya se introdujeron a finales de los años 1990 y representan el desarrollo del recubrimiento TIN. Destacan por su mayor dureza y su resistencia térmica y química y son válidos tanto para HSS como para metal duro.



# HARTNER

## Recubrimientos y procesos para recubrimientos

### Recubrimiento TiAlZrN



Máx. temperatura de aplicación: <900°C  
Color: oro pálido  
Composición: multi-capa  
Dureza: 3300 HV0,05

El recubrimiento multi-capa TiAlZrN aporta la gran calidad superficial en el mecanizado de aceros. Con una capa adicional, antigripante basada en circonio, se consigue mejorar el rendimiento también en materiales adhesivos (p.ej. aceros ferrosos, austeníticos y duplex).

### Recubrimiento TiAlN



Temperatura máx. de aplicación: < 800°C  
Color: violeta  
Composición: mono-capa  
Dureza: 3300 HV0.05

El recubrimiento TiAlN muestra características parecidas al Fire y al nanoFire y encuentra con su mono-capa la mayoría de aplicaciones en las microbrocas.

### Recubrimiento NanoA



Temperatura máx. < 900°C  
Color: azul-violeta  
Composición: multi-capa, nano-estructurada  
Dureza: 3300 HV0.05

El recubrimiento AlTiN nano basado también en el TiAlN ha dado buenos resultados en el mecanizado de aceros inoxidables pero también funciona bien en taladros en fundición, titanio con base de níquel y aleaciones de cromo-cobalto. Mediante su composición de varias capas nano-estructuradas se evita el arrancado del recubrimiento. Además tiene una mayor resistencia térmica que por ejemplo el TiAlN por su especial composición.

### Recubrimiento AlTiZrN



Máx. temperatura de aplicación: <900°C  
Color: oro pálido  
Composición: multi-capa nano-estructurada  
Dureza: 3400 HV0,05

El recubrimiento AlTiZrN basado en AlTiN es muy apropiado para la aplicación en aceros inoxidables. Gracias a su composición nano-estructural demuestra una gran dureza y tenacidad. La capa exterior con circonio elimina reacciones químicas con el material y facilita el desalajo de la viruta.



# HARTNER

## Recubrimientos y procesos para recubrimientos

### Recubrimiento TiAlSiN



Temperatura máx. de aplicación. < 800°C  
Color: bronce  
Composición: nano-composite multi-capa  
Dureza: 5500 HV0.05

El TiAlSiN está catalogado como recubrimiento nano-composite. La microestructura destaca por nano-cristales TiAlN muy finos que están integrados en una matriz de nitruro de silicio vidriosa. De aquí resulta una dureza alta que hace que el recubrimiento TiAlSiN se pueda aplicar sobretodo en aceros endurecidos y materiales de fundición.

### Recubrimiento TiSiN



Temperatura máx. de aplicación: < 800°C  
Color: cobre  
Composición: nano-composite multi-capa  
Dureza: 4000 HV0.05

El recubrimiento TiSiN también es un recubrimiento de la familia de los nano-composites, que se diseñó especialmente para el mecanizado de carbonos, aceros automáticos y aleaciones de manganeso.

### Recubrimiento ZrN



Temperatura máx. de aplicación: < 700°C  
Color: oro pálido  
Composición: multi-capa, nano-estructurada  
Dureza: 2500 HV0.05

El recubrimiento nano-estructurado ZrN se optimizó expresamente para el mecanizado de aleaciones de titanio. Su composición especial reduce significativamente el desgaste triboquímico y hace de este recubrimiento un verdadero especialista. Paralelamente también se obtienen buenos resultados en el taladrado de aleaciones de aluminio con poco contenido de silicio.

### Recubrimiento CrN



Temperatura máx. de aplicación: < 1000°C  
Color: gris metálico  
Composición: multi-capa  
Dureza: 3500 HV0.05

El recubrimiento CrN basado en Titanio, aluminio y cromo está pensado para el mecanizado de metales no ferrosos como p.ej. aleaciones de cobre, bronce y latón.



## Recubrimientos y procesos para recubrimientos

### Recubrimiento DLC



Temperatura máx. de aplicación: < 500° C  
Color: gris-negro  
Composición: mono-capa  
Dureza: 5000 HV0.05

El recubrimiento DLC forma parte de los recubrimientos DLC (DLC-diamond like carbon). Estas capas de nitrógenos tienen características parecidas al diamante. El DLC muestra una gran dureza gracias a su composición 100% de nitrógeno y estructura (ta-C). Así se explica la gran calidad superficial al taladrar metales no ferrosos como p.ej. aleaciones blandas de aluminio y aleaciones de fundición de aluminio (< 12% Si), cobre, latón y bronce. Además encuentra aplicaciones en plásticos no reforzados y madera.

### Recubrimiento: Cristal



Temperatura máx. de aplicación: < 600°C  
Color: gris-negro  
Composición: mono-capa  
Dureza: 8000 HV0.05

El recubrimiento Cristal, una capa de diamante resulta igual que los diamantes naturales. Además de muchas características físicas interesantes convence por su dureza extraordinaria. Debido a esto el recubrimiento micro-cristalino Cristal es muy apropiado para el mecanizado de materiales muy abrasivos como p.ej. plásticos reforzados con fibra, cerámica, grafito y aleaciones de aluminio con un alto contenido de silicio (> 12%). Esta capa solamente se puede aplicar en metales duros específicos por razones del proceso técnico necesario.



## Recomendaciones de aplicación de los recubrimientos Hartner

	Taladrar		
	Metal duro		HSS
	convencional	MQL	
<b>Aceros-C, aceros automáticos, Aceros-Mn</b>	TiSiN	TiSiN	Fire
	TiAlZrN	TiAlZrN	-
	Fire	Fire	-
<b>Acero, bajo aleado</b>	Fire	Fire	Fire
	TiSiN	TiSiN	TiN
	TiAlZrN	TiAlZrN	
<b>Acero aleado</b>	Fire	Fire	Fire
	TiAlSiN	TiAlSiN	TiN
	AlTiN nano	AlTiN nano	
<b>Acero, endurecido &lt;55 HRC</b>	TiAlSiN	TiAlSiN	-
	Fire	Fire	-
	TiAlN	TiAlN	-
<b>Acero, endurecido 55-65 HRC</b>	TiAlSiN	TiAlSiN	-
	Fire	Fire	-
	TiAlN	TiAlN	-
<b>Acero, corrosión y resistente a los ácidos</b>	AlTiN nano	AlTiN nano	AlTiZrN
	AlTiZrN	AlTiZrN	Fire
	TiSiN	TiSiN	TiN
<b>Hierro fundido</b>	TiAlSiN	TiAlSiN	Fire
	Fire	Fire	-
	AlTiN nano	AlTiN nano	-
<b>Aleaciones maleables de aluminio</b>	brillante	brillante	brillante
	DLC	DLC	DLC
	Diamant	Diamant	-
<b>Aleación de aluminio fundido (&lt; 12% silicio)</b>	brillante	brillante	brillante
	ZrN	ZrN	ZrN
	DLC	DLC	DLC
<b>Aleación de aluminio fundido (≥ 12% silicio)</b>	Diamant	Diamant	-
	-	-	-
	-	-	-
<b>Aleaciones de níquel (p.e. Inconel)</b>	AlTiN nano	AlTiN nano	Fire
	TiAlSiN	TiAlSiN	-
	Fire	Fire	-
<b>Titanio y aleaciones de titanio</b>	ZrN	ZrN	Fire
	AlTiN nano	AlTiN nano	-
<b>Cobre/Bronces/Latón</b>	CrN	CrN	TiN
	DLC	DLC	-
<b>Cobalto-cromo aleaciones</b>	AlTiN nano	AlTiN nano	-
	TiAlSiN	TiAlSiN	-
	Fire	Fire	-
<b>Metales preciosos</b>	AlTiN nano	AlTiN nano	-
<b>Cerámica</b>	Diamant	Diamant	-
<b>Materiales sintéticos, no reforzada</b>	DLC	-	-
<b>Materiales sintéticos, reforzado con fibra</b>	Diamant	Diamant	-
	TiAlSiN	TiAlSiN	-

**Nota:**

La tabla muestra las recomendaciones generales de aplicación de los recubrimientos Hartner.  
La prioridad es de arriba hacia abajo.



## Aplicación de los recubrimientos Hartner

		TALADRAR			FRESAR		
		METAL DURO		HSS	METAL DURO		HSS
		conv.	MQL		conv.	MQL	
<b>Aceros al carbono, aceros para tornos automáticos, aceros al manganeso</b>		TiSiN TiAlZrN Fire	TiSiN TiAlZrN Fire	Fire - -	TiSiN Fire TiAlZrN	Fire TiSiN TiAlZrN	Fire - -
<b>Acero, de baja aleación</b>		Fire TiSiN TiAlZrN	Fire TiSiN TiAlZrN	Fire TiN -	Fire TiAlSiN AlTiN nano	Fire TiAlSiN AlTiN nano	Fire TiCN -
<b>Acero, aleados</b>		Fire TiAlSiN AlTiN nano	Fire TiAlSiN AlTiN nano	Fire TiN -	Fire AlTiN nano TiAlSiN	Fire AlTiN nano TiAlSiN	Fire TiCN -
<b>Acero, templado, &lt;55 HRC</b>		TiAlSiN Fire TiAlN	TiAlSiN Fire TiAlN	- - -	TiAlSiN AlTiN nano TiAlN	TiAlSiN AlTiN nano TiAlN	- - -
<b>Acero, templado, 55 – 65 HRC</b>		TiAlSiN Fire TiAlN	TiAlSiN Fire TiAlN	- - -	TiAlSiN SuperA AlTiN nano	TiAlSiN SuperA AlTiN nano	- - -
<b>Acero, inoxidable y resistente a los ácidos</b>		AlTiN nano AlTiZrN TiSiN	AlTiN nano AlTiZrN TiSiN	AlTiZrN Fire TiN	AlTiN nano AlTiZrN Fire	AlTiN nano AlTiZrN Fire	Fire - -
<b>Hierro fundido</b>		TiAlSiN Fire AlTiN nano	TiAlSiN Fire AlTiN nano	Fire - -	TiAlSiN Fire AlTiN nano	TiAlSiN Fire AlTiN nano	Fire TiCN -
<b>Aleaciones básicas Ni (p. ej. Inconel)</b>		AlTiN nano TiAlSiN Fire	AlTiN nano TiAlSiN Fire	Fire - -	AlTiN nano TiAlSiN ZrN	AlTiN nano TiAlSiN -	Fire - -
<b>Titanio/ aleaciones de titanio</b>		ZrN AlTiN nano	ZrN AlTiN nano	Fire -	ZrN SuperA	ZrN SuperA	Fire -
<b>Aleaciones de cobalto y cromo</b>		AlTiN nano TiAlSiN Fire	AlTiN nano TiAlSiN Fire	- - -	AlTiN nano TiAlSiN Fire	AlTiN nano TiAlSiN Fire	- - -
<b>Metales preciosos</b>		AlTiN nano	AlTiN nano	-	AlTiN nano	AlTiN nano	-
<b>Aleaciones de aluminio forjado</b>		blanca DLC Diamante	blanca DLC Diamante	blanca DLC -	blanca DLC ZrN	blanca DLC ZrN	blanca DLC -
<b>Aleaciones de aluminio fundido (&lt;12% de silicio)</b>		blanca ZrN DLC	blanca ZrN DLC	blanca ZrN DLC	ZrN DLC Diamante	ZrN DLC Diamante	blanca DLC -
<b>Aleaciones de aluminio fundido (≥12% de silicio)</b>		Diamante - -	Diamante - -	- - -	Diamante - -	Diamante - -	- - -
<b>Cobre/ bronce/ latón</b>		CrN DLC	CrN DLC	TiN -	CrN DLC	CrN DLC	TiN -
<b>Cerámica</b>		Diamante	Diamante	-	Diamante	Diamante	-
<b>Plásticos, no reforzados</b>		DLC	-	-	DLC	-	-
<b>Plásticos, con refuerzo de fibras</b>		Diamante TiAlSiN	Diamante TiAlSiN	- -	Diamante TiAlSiN	Diamante TiAlSiN	- -
<b>Grafito</b>		-	Diamante	-	-	Diamante	-

**Nota:** El resumen muestra las recomendaciones generales de aplicación de los recubrimientos Hartner. El orden de prioridad es descendente.



## Aplicación de los recubrimientos Hartner

ORIFICIO ROSCADO			FRESADO DE ROSCAS		FORMAS ROSCADAS			ESCARIAR		
METAL DURO		HSS	METAL DURO		METAL DURO		HSS	METAL DURO		HSS
conv.	ML		conv.	ML	conv.	ML		conv.	ML	
-	-	TiCN	TiCN	TiCN	TiCN	TiCN	TiCN	TiSiN	TiSiN	TiN
-	-	TiAlN	-	-	TiN	TiN	TiN	AlTiN nano	AlTiN nano	-
-	-	TiN	-	-	-	-	-	-	-	-
-	-	TiCN	TiCN	TiCN	TiCN	TiCN	TiCN	AlTiN nano	AlTiN nano	TiN
-	-	TiAlN	-	-	TiN	TiN	TiN	TiSiN	TiSiN	-
-	-	TiN	-	-	-	-	AlCrN	-	-	-
-	-	TiCN	TiAlN	TiAlN	-	-	-	AlTiN nano	AlTiN nano	-
-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-
TiCN	-	-	TiAlN	TiAlN	-	-	-	TiAlSiN	-	-
-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-
-	-	AlTiZrN <sup>1</sup> /TiAlN <sup>2</sup>	TiCN	TiCN	TiCN	TiCN	TiCN	AlTiN nano	AlTiN nano	TiN
-	-	TiN	-	-	TiN	TiN	TiN	-	-	-
-	-	-	-	-	-	-	-	-	-	-
TiAlN	TiAlN	TiAlN	TiCN	TiCN	TiCN	TiCN	TiCN	TiAlSiN	TiAlSiN	TiN
TiCN	-	TiCN	-	-	TiN	TiN	TiN	-	-	-
-	-	TiN	-	-	-	-	-	-	-	-
-	-	TiCN	TiCN	TiCN	TiCN	TiCN	TiCN	AlTiN nano	-	TiN
-	-	TiAlN	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-
-	-	TiCN	TiCN	TiCN	TiCN	TiCN	TiCN	ZrN	-	TiN
-	-	TiAlN	-	-	-	-	-	AlTiN nano	-	-
blanca	-	blanca	TiCN	TiCN	-	-	-	AlTiN nano	-	TiN
-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	AlTiN nano	AlTiN nano	TiN
blanca	blanca	blanca	blanca	blanca	DLC	DLC	DLC	DLC	-	-
DLC	DLC	DLC	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-
TiCN	TiCN	TiCN	TiCN	TiCN	TiCN	TiCN	TiCN	DLC	DLC	-
DLC	DLC	DLC	blanca	blanca	DLC	DLC	DLC	-	-	-
-	-	-	-	-	-	-	-	-	-	-
TiCN	TiCN	TiCN	TiCN	TiCN	-	-	-	-	-	-
Diamante	-	-	Diamante	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-
blanca	blanca	blanca	blanca	-	DLC	DLC	DLC	blanca	-	-
DLC	DLC	DLC	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-
blanca	-	blanca	blanca	blanca	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-
TiCN	TiCN	-	TiCN	TiCN	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-

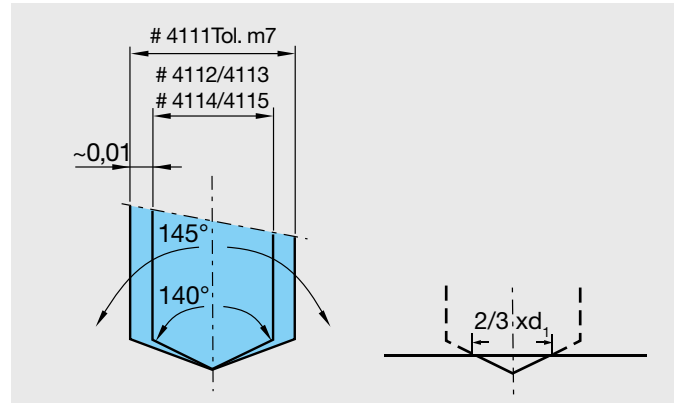
<sup>1</sup> en agujero pasante, <sup>2</sup> en orificio ciego



### Centrar y pilotar para Multiplex HPC

En general recomendamos centrar y pilotar con Multiplex HPC en taladros más profundos que 5xD.

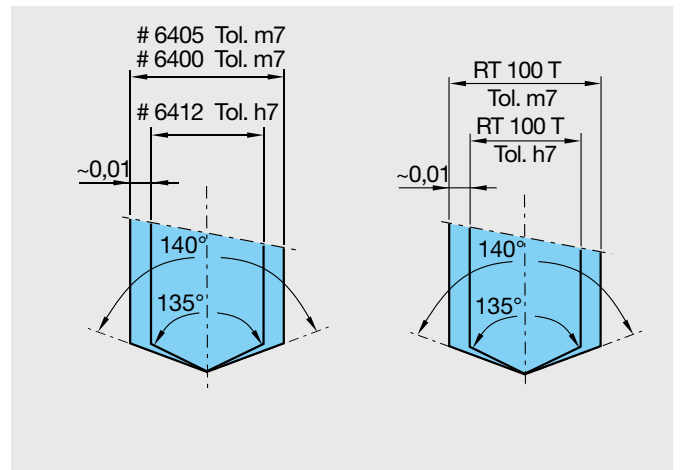
El centrado simple debe ser aprox. 2/3 del diámetro del taladro a realizar. Para pilotar recomendamos una profundidad de 1xD. Además el ángulo de la punta y el diámetro de la herramienta piloto deberían ser mayores que el ángulo de la punta y diámetro de la broca que le sigue. Para asegurar esto recomendamos utilizar las plaquitas especialmente diseñadas para este fin art. n° 86721 con un ángulo de la punta de 145° y tolerancia m7 en diámetro con el porta extra-corto y rígido art. n° 86681.



### Centrar y pilotar con VHM

En la aplicación de brocas VHM para taladros más profundos de 7xD y hasta 12xD recomendamos el centrado o la realización de un taladro piloto de 1xD hasta 2xD de profundidad. En profundidades de más de 12xD el taladro piloto de 1xD hasta 2xD es totalmente imprescindible. Para pilotar las micro-brocas del con 15xD (art.n° 86412) recomendamos utilizar las micro-brocas de 4xD sin refrigeración interna (art.n° 86400) o 5xD con refrigeración interna (art.n° 86405), ya que están perfectamente diseñadas para este fin por su ángulo de la punta y tolerancia en diámetro.

Para pilotar las brocas cañón espirales TS 100 T se puede utilizar p.ej. la broca Ratio TS 100 U con refrigeración interna, 3xD (art.n°. 86410) que por su ángulo de la punta y tolerancia en diámetro es perfectamente adecuada.



### Centrar y pilotar para HSS

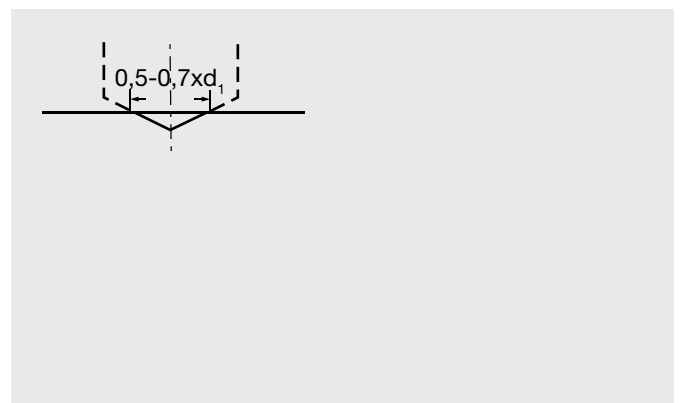
#### Centrar en taladros largos según DIN 340

Para la aplicación de brocas HSS/HSS-E según DIN 340 recomendamos el centrado con un diámetro de centrar de 0.5-0.7 veces del diámetro a taladrar. Las brocas de puntear HSS7HSS-E-NC son óptimas para realizar el centrado. Informaciones detalladas para las brocas de puntear NC los encontrará en el capítulo brocas de puntear NC.

#### Pilotar en taladros largos según DIN 1869

En la aplicación de las brocas HSS/HSS-E-NC extra-largas según DIN 1869 recomendamos realizar un taladro piloto de 1xD hasta 2xD.

Las brocas extra-cortas tipo V según DIN 1897 son ideales para esto.







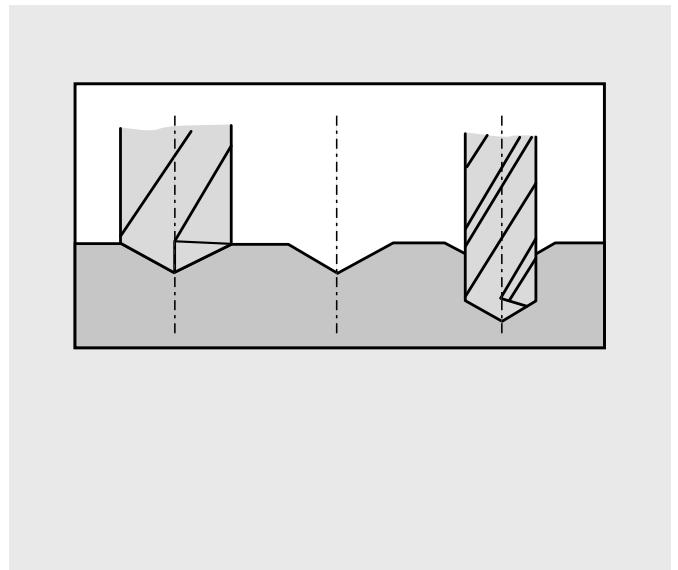
# HARTNER

## Brocas de puntear NC

### Brocas de puntear NC

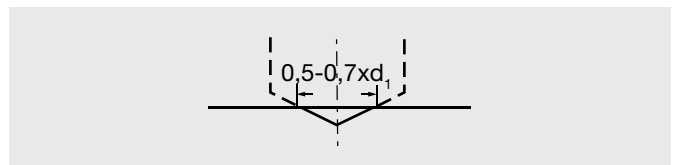
Para conseguir taladros muy exactos, con tolerancias estrechas, taladros profundos o en general con piezas con formas difíciles (redondas, ásperas) se recomienda puntear con una broca de puntear NC antes de iniciar el proceso de taladrado. Esto garantiza que la broca que taladra lo haga con una gran exactitud y así se evita el desvío de la broca al taladrar. También para la producción de fases o avellanados y el punteado de una sola estacada se pueden utilizar brocas de puntear NC si el diámetro de punteado es mayor que el diámetro de taladrado.

Las brocas de puntear NC tienen muy poca longitud de corte y no tienen destalonado guía para garantizar una broca muy estable que consiga un punteado exacto. Por esta razón las brocas de puntear NC solamente son para esta función y no se pueden utilizar para realizar taladros que sean mayores a la longitud del afilado de su punta.



### Elección de la broca de puntear NC

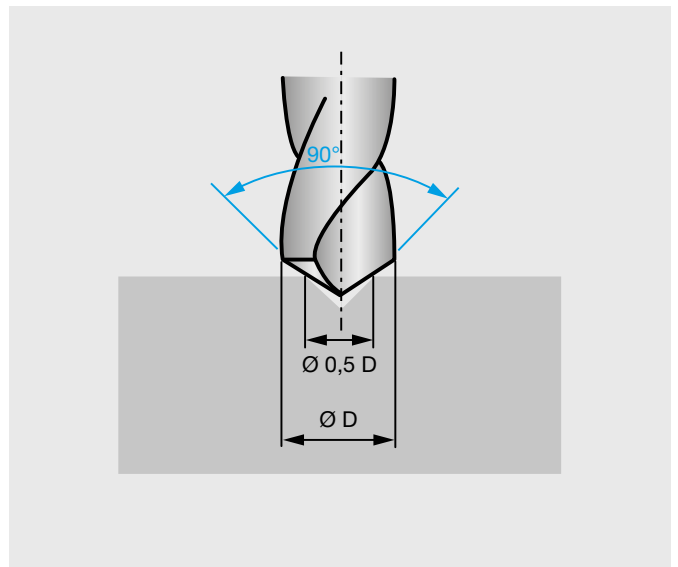
Lo ideal es elegir el diámetro de punteado 0.5-0.7 veces el taladro a realizar.



### Brocas de puntear NC a 90°

Brocas de puntear NC con 90° de ángulo de la punta son especialmente idóneas para puntear cuando después se desea realizar un taladro con brocas HSS/HSS-E que tienen un corte medio relativamente grande. Así se asegura que la broca HSS/HSS-E que le sigue primero taladre con el corte principal y se guíe en la parte más estable de los cantos de corte.

Además las brocas NC de 90° son apropiadas para realizar centrados y avellanados de 90° de una sola estacada si el diámetro de punteado es mayor que el del taladro a realizar.



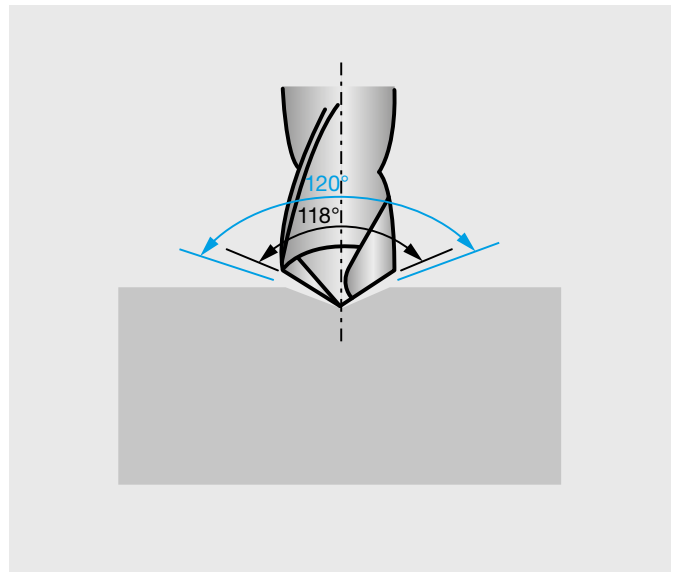


# HARTNER

## Brocas de puntear NC

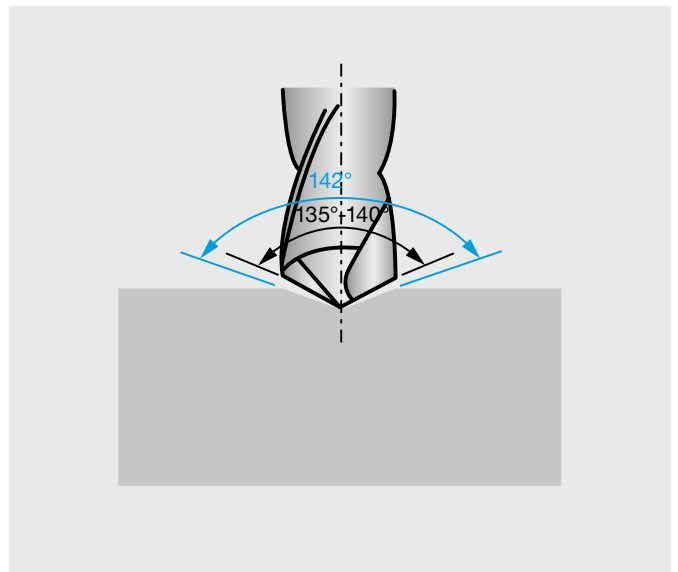
### Brocas de puntear NC a 120°

Las brocas de puntear NC con un ángulo de 120° son especialmente apropiadas cuando el taladro a realizar se hace con brocas HSS/HSS-E con un ángulo de la punta de 118°. Así se consigue que la broca que sigue taladre con gran estabilidad al entrar a taladrar con la punta y luego ser guiada.



### Brocas de puntear NC a 142°

Las brocas de puntear NC con un ángulo de la punta de 142° son especialmente adecuadas cuando la broca que realiza el taladro posteriormente es de metal duro a 135°-140°. Así se asegura que la broca de metal duro que le sigue entre con la punta, se centre y vaya bien guiada. Si las esquinas de corte de la broca de metal duro inciden directamente sobre el material a mecanizar hay peligro de que se produzcan roturas en esas esquinas del corte.



### Brocas de puntear NC

90°



120°



142°





## Tabla de conversión: pulgadas / milímetros desde 1/64 hasta 11 63/64

Medida (Pulgada)	mm	Partes de Pulgada (Decimal)	Medida (Pulgada)	mm	Partes de Pulgada (Decimal)	Medida (Pulgada)	mm	Partes de Pulgada (Decimal)	Medida (Pulgada)	mm	Partes de Pulgada (Decimal)
-	0,10	0,0039	51	1,70	0,0670	4	5,31	0,2090	-	14,00	0,5512
97	0,15	0,0059		1,75	0,0689	3	5,41	0,213	9/16	14,29	0,5625
96	0,16	0,0063	50	1,78	0,0700		5,50	0,2165		14,50	0,5709
95	0,17	0,0067		1,80	0,0709	7/32	5,56	0,2188	37/64	14,68	0,5781
94	0,18	0,0071	49	1,85	0,0730	2	5,61	0,221	-	15,00	0,5906
93	0,19	0,0075		1,90	0,0748	1	5,79	0,228	19/32	15,08	0,5938
92	0,20	0,0079	48	1,93	0,0760	A	5,94	0,234	39/64	15,48	0,6094
91	0,21	0,0083		1,95	0,0768	15/64	5,95	0,2344		15,50	0,6102
90	0,22	0,0087	5/64	1,98	0,0781	-	6,00	0,2362	5/8	15,88	0,625
89	0,23	0,0091	47	1,99	0,0785	B	6,05	0,238	-	16,00	0,6299
88	0,24	0,0095	-	2,00	0,0787	C	6,15	0,242	41/64	16,27	0,6406
-	0,25	0,0098		2,05	0,0807	D	6,25	0,246		16,50	0,6496
87	0,25	0,0100	46	2,06	0,0810	1/4	6,35	0,25	21/32	16,67	0,6562
	0,26	0,0102	45	2,08	0,0820	E	6,35	0,25	-	17,00	0,6693
86	0,27	0,0105		2,15	0,0846		6,50	0,2559	43/64	17,07	0,6719
	0,27	0,0106	44	2,18	0,0860	F	6,53	0,257	11/16	17,46	0,6875
85	0,28	0,0110	43	2,26	0,0890	G	6,63	0,261		17,50	0,689
	0,29	0,0114	42	2,37	0,0935	17/64	6,75	0,2656	45/64	17,86	0,7031
84	0,29	0,0115	3/32	2,38	0,0938		6,75	0,2657	-	18,00	0,7087
-	0,30	0,0118	41	2,44	0,0960	H	6,76	0,266	23/32	18,26	0,7188
83	0,30	0,0120	40	2,50	0,0980	I	6,91	0,272		18,50	0,7283
82	0,32	0,0125	39	2,53	0,0995	-	7,00	0,2756	47/64	18,65	0,7344
	0,32	0,0126	38	2,58	0,1015	J	7,04	0,2772	-	19,00	0,748
81	0,33	0,0130	37	2,64	0,1040	K	7,14	0,281	3/4	19,05	0,75
80	0,34	0,0135	36	2,71	0,1065	9/32	7,14	0,2812	49/64	19,45	0,7656
79	0,37	0,0145	7/64	2,78	0,1094	L	7,37	0,29		19,50	0,7677
1/64	0,40	0,0156	35	2,79	0,11	M	7,49	0,2949	25/32	19,84	0,7812
78	0,41	0,0160	34	2,82	0,111		7,50	0,2953	-	20,00	0,7874
77	0,46	0,0180	33	2,87	0,113	19/64	7,54	0,2969	51/64	20,24	0,7969
-	0,50	0,0197		2,90	0,1142	N	7,67	0,3020		20,50	0,8071
76	0,51	0,0200	32	2,95	0,116		7,75	0,3051	13/16	20,64	0,8125
75	0,53	0,0210	-	3,00	0,1181	5/16	7,94	0,3125	-	21,00	0,8268
74	0,57	0,0225	31	3,05	0,12	-	8,00	0,315	53/64	21,03	0,8281
-	0,60	0,0236	1/8	3,18	0,125	O	8,03	0,316	27/32	21,43	0,8438
73	0,61	0,0240	30	3,26	0,1285	P	8,20	0,323		21,50	0,8465
72	0,64	0,0250		3,30	0,1299	21/64	8,33	0,3281	55/64	21,84	0,8594
71	0,66	0,0260	29	3,45	0,136	Q	8,43	0,332	-	22,00	0,8661
-	0,70	0,0276		3,50	0,1378		8,50	0,3346	7/8	22,23	0,875
70	0,71	0,0280	28	3,57	0,1405	R	8,61	0,339		22,50	0,8858
69	0,74	0,0292	9/64	3,57	0,1406	11/32	8,73	0,3438	57/64	22,62	0,8906
-	0,75	0,0295	27	3,66	0,144		8,75	0,3445	-	23,00	0,9055
68	0,79	0,0310	26	3,73	0,147	S	8,84	0,348	29/32	23,02	0,9062
1/32	0,79	0,0313		3,75	0,1476	-	9,00	0,3543	59/64	23,42	0,9219
-	0,80	0,0315	25	3,80	0,1495	T	9,09	0,358		23,50	0,9252
67	0,81	0,0320	24	3,86	0,152	23/64	9,13	0,3594	15/16	23,81	0,9375
66	0,84	0,0330	23	3,91	0,154	U	9,35	0,368	-	24,00	0,9449
65	0,89	0,0350	5/32	3,97	0,1562		9,50	0,374	61/64	24,21	0,9531
-	0,90	0,0354	22	3,99	0,157	3/8	9,53	0,375		24,50	0,9646
64	0,91	0,0360	-	4,00	0,1575	V	9,56	0,377	31/32	24,61	0,9688
63	0,94	0,0370	21	4,04	0,159	W	9,80	0,386	-	25,00	0,9843
62	0,97	0,0380	20	4,09	0,161	25/64	9,92	0,3906	63/64	25,00	0,9844
61	0,99	0,0390		4,20	0,1654	-	10,00	0,3937	1	25,40	1,00
-	1,00	0,0394	19	4,22	0,166	X	10,08	0,397			
60	1,02	0,0400	18	4,31	0,1695	Y	10,26	0,4040			
59	1,04	0,0410	11/64	4,37	0,1719	13/32	10,32	0,4062			
58	1,07	0,0420	17	4,39	0,173	Z	10,49	0,413			
57	1,09	0,0430	16	4,50	0,177		10,50	0,4134			
56	1,18	0,0465	15	4,57	0,18	27/64	10,72	0,4219			
3/64	1,19	0,0469	14	4,62	0,182	-	11,00	0,4331			
	1,20	0,0472	13	4,70	0,185	7/16	11,11	0,4375			
	1,25	0,0492	3/16	4,76	0,1875		11,50	0,4528			
	1,30	0,0512	12	4,80	0,189	29/64	11,51	0,4531			
55	1,32	0,0520	11	4,85	0,191	15/32	11,91	0,4688			
54	1,40	0,0550	10	4,91	0,1935	-	12,00	0,4724			
	1,45	0,0571	9	4,98	0,196	31/64	12,30	0,4844			
	1,50	0,0591	-	5,00	0,1968		12,50	0,4921			
53	1,51	0,0595	8	5,05	0,199	1/2	12,70	0,50			
	1,55	0,0610	7	5,11	0,2010	-	13,00	0,5118			
1/16	1,59	0,0625	13/64	5,16	0,2031	33/64	13,10	0,5156			
	1,60	0,0630	6	5,18	0,2040	17/32	13,49	0,5312			
52	1,61	0,0635	5	5,22	0,2055		13,50	0,5315			
	1,65	0,0650		5,25	0,2067	35/64	13,89	0,5469			

1 pulgada = 25,400 mm ver DIN 4890 (Edición 2/75)



## Diseño del mango para trabajar a altas velocidades según DIN 1835

### Forma A, plano

Dimensiones en mm	d <sub>1</sub>	l <sub>1</sub>	d <sub>1</sub>	l <sub>1</sub>	d <sub>1</sub>	l <sub>1</sub>
	h8	+2 0	h8	+2 0	h8	+2 0
	3	28	10	40	32	60
	4	28	12	45	40	70
	5	28	16	48	50	80
	6	36	20	50	63	90
	8	36	25	56		

### Forma B, con plano de arrastre

Dimensiones en mm	d <sub>1</sub>	b <sub>1</sub>	e <sub>1</sub>	h <sub>1</sub>	l <sub>1</sub>	l <sub>2</sub>	agujero central forma R DIN 332 sección 1
	h6	+0.05 0	0 -1	h13	+2 0	+1 0	
con un plano para d <sub>1</sub> = 6 ... 20 mm  	6	4,2	18	4,8	36	-	1.6x2.5
	8	5,5	18	6,6	36	-	1.6x3.35
	10	7	20	8,4	40	-	1.6x3.35
	12	8	22,5	10,4	45	-	1.6x3.35
	16	10	24	14,2	48	-	2.0x4.25
	20	11	25	18,2	50	-	2.5x5.3
con dos plano para d <sub>1</sub> = 25 ... 63 mm  	25	12	32	23	56	17	2.5x5.3
	32	14	36	30	60	19	3.15x6.7
	40	14	40	38	70	19	3.15x6.7
	50	18	45	47,8	80	23	3.15x6.7
	63	18	50	60,8	90	23	3.15x6.7

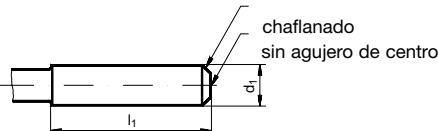
### Forma D, mango atornillado

Dimensiones en mm	d <sub>1</sub>	d <sub>3</sub>	tol. zone	d <sub>2</sub>	tol. zone	l <sub>1</sub>	l <sub>3</sub>	agujero de centro forma R DIN 332 part 1
	h8					+2 0	+2 0	
	6	5,9	0 -0,1	5,087	0 -0,1	36	10	1.6 x 2.5
	10	9,9	0 -0,1	9,087	0 -0,1	40	10	1.6 x 3.35
	12	11,9	0 -0,1	11,087	0 -0,1	45	10	1.6 x 3.35
	16	15,9	0 -0,1	15,087	0 -0,1	48	10	2.0 x 4.25
	20	19,9	0 -0,15	19,087	0 -0,15	50	15	2.5 x 5.3
	25	24,9	0 -0,15	24,087	0 -0,15	56	15	2.5 x 5.3
	32	31,9	0 -0,15	31,087	0 -0,15	60	15	3.15 x 6.7



## Diseño del mango para trabajar a altas velocidades según DIN 6535

### Forma HA, plain

Dimensiones en mm	$d_1$ h6	$l_1$ $+2$ 0	$d_1$ h6	$l_1$ $+2$ 0	$d_1$ h6	$l_1$ $+2$ 0
	2	28	8	36	18	48
	3	28	10	40	20	50
	4	28	12	45	25	56
	5	28	14	45	32	60
	6	36	16	48		

### Forma HB, con plano de arrastre

Dimensiones en mm	$d_1$ h6	$b_1$ $+0,05$ 0	$e_1$ 0 -1	$h_1$ h11	$l_1$ $+2$ 0	$l_2$ $+1$ 0
con un plano para $d_1 = 6 \dots 20$ mm	6	4,2	18	5,1	36	-
	8	5,5	18	6,9	36	-
	10	7	20	8,5	40	-
	12	8	22,5	10,4	45	-
	14	8	22,5	12,7	45	-
	16	10	24	14,2	48	-
	18	10	24	16,2	48	-
	20	11	25	18,2	50	-
con dos plano para $d_1 = 25$ and $32$ mm	25	12	32	23	56	17
	32	14	36	30	60	19

### Forma HE, Forma HE, plano inclinado sin conducto para el refrigerante\*

\* Diseño: Mangos cilíndricos según DIN 6535 están disponibles con o sin conductos para el refrigerante. Aplicaciones y detalles en la sección correspondiente.

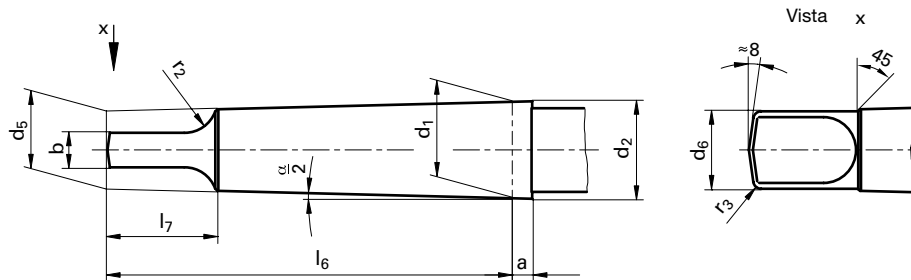
	$d_1$ h6	$(b_2)$ ≈	$(b_3)$	$h_2$ h13	$(h_3)$	$l_1$ $+2$ 0	$l_4$ 0 -1	$l_5$ nom. size	$r_2$ min.
para $d_1 = 6 \dots 20$ mm	6	4,3	-	5,1	-	36	25	18	1,2
	8	5,5	-	6,9	-	36	25	18	1,2
	10	7,1	-	8,5	-	40	28	20	1,2
	12	8,2	-	10,4	-	45	33	22,5	1,2
	14	8,1	-	12,7	-	45	33	22,5	1,2
	16	10,1	-	14,2	-	48	36	24	1,6
	18	10,8	-	16,2	-	48	36	24	1,6
	20	11,4	-	18,2	-	50	38	25	1,6
para $d_1 = 25$ and $32$ mm	25	13,6	9,3	23,0	24,1	56	44	32	1,6
	32	15,5	9,9	30,0	31,2	60	48	35	1,6



# HARTNER

## Diseño en cono morse DIN 228 Parte 1 (extracto)

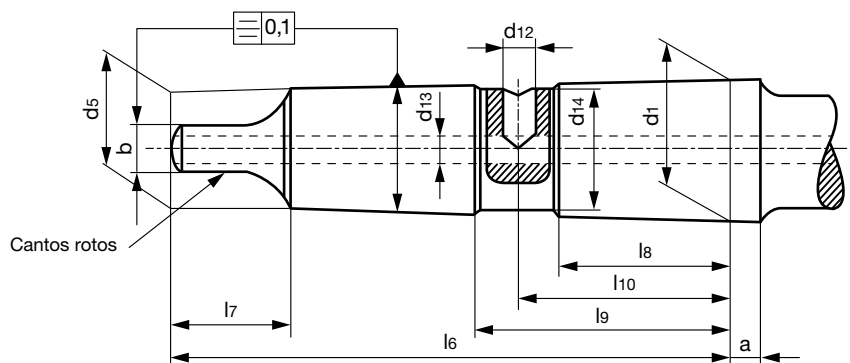
### Firma B, cono morse con tetilla de arrastre



Medidas en mm

mango según DIN 228 Forma B Tamaño	Dimensiones a limite		b h13	d <sub>1</sub>	d <sub>2</sub> ≈	d <sub>5</sub> ≈	d <sub>6</sub> max.	l <sub>6</sub> 0 -1	l <sub>7</sub> max.	r <sub>2</sub> max.	r <sub>3</sub> ≈	$\frac{\alpha}{2}$
<b>MK 1</b>	3,5	+1,4 0	5,2	12,065	12,2	9,0	8,7	62	13,5	5	1,2	1°25'43"
<b>MK 2</b>	5,0	+1,4 0	6,3	17,780	18,0	14,0	13,5	75	16	6	1,6	1°25'50"
<b>MK 3</b>	5,0	+1,7 0	7,9	23,825	24,1	19,1	18,5	94	20	7	2	1°26'16"
<b>MK 4</b>	6,5	+1,9 0	11,9	31,267	31,6	25,2	24,5	117,5	24	8	2,5	1°29'15"
<b>MK 5</b>	6,5	+1,9 0	15,9	44,399	44,7	36,5	35,7	149,5	29	10	3	1°30'26"

### Forma BK, cono morse con tetilla de arrastre y entrada de refrigerante



Medidas en mm

mango según DIN 228 Forma BK Tamaño	a ±0,1	Dimensões limite	b h13	d <sub>1</sub>	d <sub>5</sub> ≈	d <sub>12</sub>	d <sub>13</sub>	d <sub>14</sub> 0 -0,01	l <sub>6</sub> 0 -1	l <sub>7</sub> max.	l <sub>8</sub>	l <sub>9</sub>	l <sub>10</sub>
<b>CM 1</b>	3,5	+1,4 0	5,2	12,065	9,0	-	-	-	62	13,5	-	-	-
<b>CM 2</b>	5	+1,4 0	6,3	17,780	14,0	4,2	4,2	15,0	75	16	20	34	27
<b>CM 3</b>	5	+1,7 0	7,9	23,825	19,1	5,0	5,0	21,0	94	20	29	43	36
<b>CM 4</b>	6,5	+1,9 0	11,9	31,267	25,2	6,8	6,8	28,0	117,5	24	39	55	47
<b>CM 5</b>	6,5	+1,9 0	15,9	44,399	36,5	8,5	8,5	40,0	149,5	29	51	69	60



## Diámetros de pretaladro para el fresado de roscas

Roscas métrica normalizada ISO DIN 13					Roscas métrica fina DIN 13					Roscas UNC ASME B1.1									
Diá. nom.	Paso P	Ø d. pre-tal. roscas p. taladr. DIN 336	Diámetro pretaladro roscas de tuercas 6H*		Diá. x nom.	Paso P	Ø d. pre-tal. roscas p. taladr. DIN 336	Diámetro pretaladro roscas de tuercas 6H		Diá. x nom.	Paso P	Ø d. pre-tal. roscas p. taladr. DIN 336	Diámetro pretaladro roscas de tuercas 2B						
mm	mm	mm	min.	max.	mm	mm	mm	min.	max.	mm	mm	mm	por pulgada	mm	min.	max.			
M 1	0,25	<b>0,75</b>	0,729	0,785	M 2,5 x	0,35	<b>2,15</b>	2,121	2,221	M 22 x	1,00	<b>21,00</b>	20,917	21,153	Nr. 1 -	64	<b>1,55</b>	1,425	1,580
M 1,1	0,25	<b>0,85</b>	0,829	0,885	M 3,0 x	0,35	<b>2,65</b>	2,621	2,721	M 22 x	1,50	<b>20,50</b>	20,376	20,676	Nr. 2 -	56	<b>1,85</b>	1,694	1,872
M 1,2	0,25	<b>0,95</b>	0,929	0,985	M 3,5 x	0,35	<b>3,15</b>	3,121	3,221	M 22 x	2,00	<b>20,00</b>	19,835	20,210	Nr. 3 -	48	<b>2,10</b>	1,941	2,146
M 1,4	0,30	<b>1,10</b>	1,075	1,142	M 4,0 x	0,50	<b>3,50</b>	3,459	3,599	M 24 x	1,00	<b>23,00</b>	22,917	23,153	Nr. 4 -	40	<b>2,35</b>	2,157	2,385
M 1,6	0,35	<b>1,25</b>	1,221	1,321	M 4,5 x	0,50	<b>4,00</b>	3,959	4,099	M 24 x	1,50	<b>22,50</b>	22,376	22,676	Nr. 5 -	40	<b>2,65</b>	2,487	2,698
M 1,8	0,35	<b>1,45</b>	1,421	1,521	M 5,0 x	0,50	<b>4,50</b>	4,459	4,599	M 24 x	2,00	<b>22,00</b>	21,835	22,210	Nr. 6 -	32	<b>2,85</b>	2,642	2,896
M 2	0,40	<b>1,60</b>	1,567	1,679	M 5,5 x	0,50	<b>5,00</b>	4,959	5,099	M 25 x	1,00	<b>24,00</b>	23,917	24,153	Nr. 8 -	32	<b>3,50</b>	3,302	3,531
M 2,2	0,45	<b>1,75</b>	1,713	1,838	M 6,0 x	0,75	<b>5,20</b>	5,188	5,378	M 25 x	1,50	<b>23,50</b>	23,376	23,676	Nr. 10 -	24	<b>3,90</b>	3,683	3,937
M 2,5	0,45	<b>2,05</b>	2,013	2,138	M 7,0 x	0,75	<b>6,20</b>	6,188	6,378	M 25 x	2,00	<b>23,00</b>	22,835	23,210	Nr. 12 -	24	<b>4,50</b>	4,343	4,597
M 3	0,50	<b>2,50</b>	2,459	2,599	M 8,0 x	0,50	<b>7,50</b>	7,459	7,599	M 27 x	1,00	<b>26,00</b>	25,917	26,153	1/4 -	20	<b>5,10</b>	4,978	5,258
M 3,5	0,60	<b>2,90</b>	2,850	3,010	M 8,0 x	0,75	<b>7,20</b>	7,188	7,378	M 27 x	1,50	<b>25,50</b>	25,376	25,676	5/16 -	18	<b>6,60</b>	6,401	6,731
M 4	0,70	<b>3,30</b>	3,242	3,422	M 8,0 x	1,00	<b>7,00</b>	6,917	7,153	M 27 x	2,00	<b>25,00</b>	24,835	25,210	3/8 -	16	<b>8,00</b>	7,798	8,153
M 4,5	0,75	<b>3,70</b>	3,688	3,878	M 9,0 x	0,75	<b>8,20</b>	8,188	8,378	M 28 x	1,00	<b>27,00</b>	26,917	27,153	7/16 -	14	<b>9,40</b>	9,144	9,550
M 5	0,80	<b>4,20</b>	4,134	4,334	M 9,0 x	1,00	<b>8,00</b>	7,917	8,153	M 28 x	1,50	<b>26,50</b>	26,376	26,676	1/2 -	13	<b>10,80</b>	10,592	11,024
M 6	1,00	<b>5,00</b>	4,917	5,153	M 10 x	0,75	<b>9,20</b>	9,188	9,378	M 28 x	2,00	<b>26,00</b>	25,835	26,210	9/16 -	12	<b>12,20</b>	11,989	12,446
M 7	1,00	<b>6,00</b>	5,917	6,153	M 10 x	1,00	<b>9,00</b>	8,917	9,153	M 30 x	1,00	<b>29,00</b>	28,917	29,153	5/8 -	11	<b>13,50</b>	13,386	13,868
M 8	1,25	<b>6,80</b>	6,647	6,912	M 10 x	1,25	<b>8,80</b>	8,647	8,912	M 30 x	1,50	<b>28,50</b>	28,376	28,676	3/4 -	10	<b>16,50</b>	16,307	16,840
M 9	1,25	<b>7,80</b>	7,647	7,912	M 11 x	0,75	<b>10,20</b>	10,188	10,378	M 30 x	2,00	<b>28,00</b>	27,835	28,210	7/8 -	9	<b>19,50</b>	19,177	19,761
M 10	1,50	<b>8,50</b>	8,376	8,676	M 11 x	1,00	<b>10,00</b>	9,917	10,153	M 30 x	3,00	<b>27,00</b>	26,752	27,252	1 -	8	<b>22,25</b>	21,971	22,606
M 11	1,50	<b>9,50</b>	9,376	9,676	M 12 x	1,00	<b>11,00</b>	10,917	11,153	M 32 x	1,50	<b>30,50</b>	30,376	30,676	1 1/8 -	7	<b>25,00</b>	24,638	25,349
M 12	1,75	<b>10,20</b>	10,106	10,441	M 12 x	1,25	<b>10,80</b>	10,647	10,912	M 32 x	2,00	<b>30,00</b>	29,835	30,210	1 1/4 -	7	<b>28,00</b>	27,813	28,524
M 14	2,00	<b>12,00</b>	11,835	12,210	M 12 x	1,50	<b>10,50</b>	10,376	10,676	M 33 x	1,50	<b>31,50</b>	31,376	31,676	1 3/8 -	6	<b>30,75</b>	30,353	31,115
M 16	2,00	<b>14,00</b>	13,835	14,210	M 14 x	1,00	<b>13,00</b>	12,917	13,153	M 33 x	2,00	<b>31,00</b>	30,835	31,210	1 1/2 -	6	<b>34,00</b>	33,528	34,290
M 18	2,50	<b>15,50</b>	15,294	15,744	M 14 x	1,25	<b>12,80</b>	12,647	12,912	M 33 x	3,00	<b>30,00</b>	29,752	30,252	1 3/4 -	5	<b>39,50</b>	38,938	39,802
M 20	2,50	<b>17,50</b>	17,294	17,744	M 14 x	1,50	<b>12,50</b>	12,376	12,676	M 35 x	1,50	<b>33,50</b>	33,376	33,676	2 -	4,5	<b>45,00</b>	44,679	45,593
M 22	2,50	<b>19,50</b>	19,294	19,744	M 15 x	1,00	<b>14,00</b>	13,917	14,153	M 36 x	1,50	<b>34,50</b>	34,376	34,676					
M 24	3,00	<b>21,00</b>	20,752	21,252	M 15 x	1,50	<b>13,50</b>	13,376	13,676										
M 27	3,00	<b>24,00</b>	23,752	24,252	M 16 x	1,00	<b>15,00</b>	14,917	15,153										
M 30	3,50	<b>26,50</b>	26,211	26,771	M 16 x	1,25	<b>14,80</b>	14,647	14,912										
M 33	3,50	<b>29,50</b>	29,211	29,771	M 16 x	1,50	<b>14,50</b>	14,376	14,676										
M 36	4,00	<b>32,00</b>	31,670	32,270	M 17 x	1,00	<b>16,00</b>	15,917	16,153										
M 39	4,00	<b>35,00</b>	34,670	35,270	M 17 x	1,50	<b>15,50</b>	15,376	15,676										
M 42	4,50	<b>37,50</b>	37,129	37,799	M 18 x	1,00	<b>17,00</b>	16,917	17,153										
M 45	4,50	<b>40,50</b>	40,129	40,799	M 18 x	1,50	<b>16,50</b>	16,376	16,676										
M 48	5,00	<b>43,00</b>	42,587	43,297	M 20 x	1,00	<b>19,00</b>	18,917	19,153										
M 52	5,00	<b>47,00</b>	46,587	47,297	M 20 x	1,50	<b>18,50</b>	18,376	18,676										
M 56	5,50	<b>50,50</b>	50,046	50,796	M 20 x	2,00	<b>18,00</b>	17,835	18,210										

\* M 1,1 hasta M 1,4 Ø-pretaladro roscas de tuerca 5 H

Roscas MJ DIN ISO 5855					Roscas UNJC ISO 3161					Roscas UNJF ISO 3161				
Diá. x nom.	Paso P	Ø d. pre-tal. roscas p. taladr. DIN 336	Diámetro pretaladro roscas de tuercas 5H*		Diá. nom.	hilos por pulgada	Ø d. pre-tal. roscas p. taladr. DIN 336	Diámetro pretaladro roscas de tuercas 3B		Diá. nom.	hilos por pulgada	Ø d. pre-tal. roscas p. taladr. DIN 336	Diámetro pretaladro roscas de tuercas 3B	
mm	mm	mm	min.	max.	mm	mm	mm	min.	max.	mm	mm	mm	min.	max.
MJ 3 x	0,50	<b>2,60</b>	2,513	2,653	Nr. 6 -	32	<b>2,85</b>	2,733	2,939	Nr. 6 -	40	<b>3,00</b>	2,888	3,053
MJ 4 x	0,70	<b>3,40</b>	3,318	3,498	Nr. 8 -	32	<b>3,55</b>	3,393	3,599	Nr. 8 -	36	<b>3,60</b>	3,480	3,663
MJ 5 x	0,80	<b>4,30</b>	4,221	4,421	Nr. 10 -	24	<b>4,00</b>	3,795	4,064	Nr. 10 -	32	<b>4,20</b>	4,054	4,255
MJ 6 x	0,50	<b>5,55</b>	5,513	5,625	Nr. 12 -	24	<b>4,60</b>	4,455	4,704	Nr. 12 -	28	<b>4,75</b>	4,602	4,816
MJ 6 x	0,75	<b>5,35</b>	5,269	5,419	1/4 -	20	<b>5,30</b>	5,113	5,387	1/4 -	28	<b>5,60</b>	5,466	5,662
MJ 6 x	1,00	<b>5,10</b>	5,026	5,216	5/16 -	18	<b>6,75</b>	6,563	6,833	5/16 -	24	<b>7,00</b>	6,906	7,109
MJ 8 x	0,50	<b>7,55</b>	7,513	7,625	3/8 -	16	<b>8,20</b>	7,978	8,255	3/8 -	24	<b>8,60</b>	8,494	8,679
MJ 8 x	0,75	<b>7,35</b>	7,269	7,419	7/16 -	14	<b>9,60</b>	9,346	9,639	7/16 -	20	<b>10,00</b>	9,876	10,084
MJ 8 x	1,00	<b>7,10</b>	7,026	7,216	1/2 -	13	<b>11,00</b>	10,798	11,095	1/2 -	20	<b>11,60</b>	11,463	11,661
MJ 8 x	1,25	<b>6,90</b>	6,782	6,994	9/16 -	12	<b>12,40</b>	12,228	12,482	9/16 -	18	<b>13,00</b>	12,913	13,122
MJ 10 x	1,00	<b>9,10</b>	9,026	9,216	5/8 -	11	<b>13,80</b>	13,627	13,904	5/8 -	18	<b>14,60</b>	14,501	14,702
MJ 10 x	1,25	<b>8,90</b>	8,782	8,994										
MJ 10 x	1,50	<b>8,60</b>	8,539	8,775										
MJ 12 x	1,75	<b>10,40</b>	10,295	10,560										
MJ 16 x	2,00	<b>14,20</b>	14,051	14,351										

\* MJ3 x0,50 hasta MJ 5 x 0,80 Ø-pretaladro rosca de tuerca 6H



## Diámetros de pretaladro para el fresado de roscas

Roscas UNF ASME B1.1					Roscas BSW-(Whitworth) BS84					Roscas withworth para tubos (según DIN-ISO 228-1)					Roscas para tubos de blindaje de acero según DIN 4030				
Diá. nom.	hilos por pulgada	Ø d. pre-tal. roscas p. taladr. DIN 336 mm	Diámetro pretaladro roscas de tuercas 2B min. mm	Diámetro roscas de tuercas max. mm	Diá. nom.	hilos por pulgada	Ø d. pre-tal. roscas p. taladr. DIN 336 mm	Diámetro pretaladro roscas de tuercas 2B min. mm	Diámetro roscas de tuercas max. mm	Diá. nom.	hilos por pulgada	Ø d. pre-tal. roscas p. taladr. DIN 336 mm	Diámetro pretaladro roscas de tuercas min. mm	Diámetro roscas de tuercas max. mm	Diá. nom.	hilos por pulgada	Ø d. pre-tal. roscas p. taladr. mm	Diámetro pretaladro roscas de tuercas min. mm	Diámetro roscas de tuercas max. mm
Nr. 1 - 72		<b>1,55</b>	1,473	1,610	W 1/16	60	<b>1,20</b>	1,045	1,230	G 1/16	28	<b>6,80</b>	6,561	6,843	Pg 7	20	<b>11,40</b>	11,280	11,430
Nr. 2 - 64		<b>1,85</b>	1,755	1,910	W 3/32	48	<b>1,80</b>	1,704	1,912	G 1/8	28	<b>8,80</b>	8,566	8,848	Pg 9	18	<b>14,00</b>	13,860	14,010
Nr. 3 - 56		<b>2,15</b>	2,024	2,197	W 1/8	40	<b>2,50</b>	2,362	2,591	G 1/4	19	<b>11,80</b>	11,445	11,890	Pg 11	18	<b>17,30</b>	17,260	17,410
Nr. 4 - 48		<b>2,40</b>	2,271	2,459	W 5/32	32	<b>3,20</b>	2,952	3,214	G 3/8	19	<b>15,25</b>	14,950	15,395	Pg 13,5	18	<b>19,00</b>	19,060	19,210
Nr. 5 - 44		<b>2,70</b>	2,550	2,741	W 3/16	24	<b>3,60</b>	3,407	3,745	G 1/2	14	<b>19,00</b>	18,631	19,172	Pg 16	18	<b>21,30</b>	21,160	21,310
Nr. 6 - 40		<b>2,95</b>	2,819	3,023	W 7/32	24	<b>4,50</b>	4,201	4,539	G 5/8	14	<b>21,00</b>	20,587	21,128	Pg 21	16	<b>26,90</b>	26,780	27,030
Nr. 8 - 36		<b>3,50</b>	3,404	3,607	W 1/4	20	<b>5,10</b>	4,724	5,156	G 3/4	14	<b>24,50</b>	24,117	24,658	Pg 29	16	<b>35,50</b>	35,480	35,730
Nr. 10 - 32		<b>4,10</b>	3,962	4,166	W 5/16	18	<b>6,50</b>	6,130	6,590	G 7/8	14	<b>28,25</b>	27,877	28,418	Pg 36	16	<b>45,50</b>	45,480	45,730
Nr. 12 - 28		<b>4,60</b>	4,496	4,724	W 3/8	16	<b>7,90</b>	7,492	7,987	G 1	11	<b>30,75</b>	30,291	30,931	Pg 42	16	<b>52,50</b>	52,480	52,730
1/4 - 28		<b>5,50</b>	5,359	5,588	W 7/16	14	<b>9,20</b>	8,789	9,330	G 1 1/8	11	<b>35,50</b>	34,939	35,579	Pg 48	16	<b>57,80</b>	57,780	58,030
5/16 - 24		<b>6,90</b>	6,782	7,036	W 1/2	12	<b>10,50</b>	9,989	10,591	G 1 1/4	11	<b>39,50</b>	38,952	39,592					
3/8 - 24		<b>8,50</b>	8,382	8,636	W 9/16	12	<b>12,00</b>	11,577	12,179	G 1 1/2	11	<b>45,25</b>	44,845	45,485					
7/16 - 20		<b>9,90</b>	9,728	10,033	W 5/8	11	<b>13,50</b>	12,918	13,558	G 1 3/4	11	<b>51,00</b>	50,788	51,428					
1/2 - 20		<b>11,50</b>	11,328	11,608	W 3/4	10	<b>16,25</b>	15,797	16,483	G 2	11	<b>57,00</b>	56,656	57,296					
9/16 - 18		<b>12,90</b>	12,751	13,081	W 7/8	9	<b>19,25</b>	18,611	19,353										
5/8 - 18		<b>14,50</b>	14,351	14,681	W 1	8	<b>22,00</b>	21,334	22,147										
3/4 - 16		<b>17,50</b>	17,323	17,678	W 1 1/8	7	<b>24,50</b>	23,928	24,832										
7/8 - 14		<b>20,40</b>	20,269	20,650	W 1 1/4	7	<b>27,75</b>	27,103	28,007										
1 - 12		<b>23,25</b>	23,114	23,571	W 1 3/8	6	<b>30,50</b>	29,504	30,528										
1 1/8 - 12		<b>26,50</b>	26,289	26,746	W 1 1/2	6	<b>33,50</b>	32,679	33,703										
1 1/4 - 12		<b>29,50</b>	29,464	29,921	W 1 5/8	5	<b>35,50</b>	34,769	35,963										
1 3/8 - 12		<b>32,75</b>	32,639	33,096	W 1 3/4	5	<b>39,00</b>	37,944	39,138										
1 1/2 - 12		<b>36,00</b>	35,814	36,271	W 2	4,5	<b>44,50</b>	43,571	44,877										

### NPT ANSI B 2.1 Roscas americana, cónica para tubos 1:16

Diá. nom.	Hilos por pulgada	Pretaladro cilíndr. (A) d <sub>1</sub>	Pretaladro cónico (B) D <sub>1</sub>	Profundidad de entrada ET mm	Profundidad de taladro BT (min) mm
1/16 - 27		<b>6,15</b>	6,39	9,29	10,7
1/8 - 27		<b>8,40</b>	8,74	9,32	10,8
1/4 - 18		<b>11,10</b>	<b>11,36</b>	13,52	15,6
3/8 - 18		<b>14,30</b>	<b>14,80</b>	13,83	16,0
1/2 - 14		<b>17,90</b>	<b>18,32</b>	18,07	20,8
3/4 - 14		<b>23,30</b>	<b>23,67</b>	18,55	21,3
1 - 11,5		<b>29,00</b>	<b>29,69</b>	22,29	25,6
1 1/4 - 11,5		<b>37,70</b>	<b>38,45</b>	22,80	26,1
1 1/2 - 11,5		<b>43,70</b>	<b>44,52</b>	22,80	26,1
2 - 11,5		<b>55,60</b>	<b>56,56</b>	23,20	26,5
2 1/2 - 8		<b>66,30</b>	<b>67,62</b>	31,75	36,3
3 - 8		<b>82,30</b>	<b>83,52</b>	33,74	38,5

### Roscas-EG métr./métr.fino (EG M 14x1,25) para injertos roscados de hilo según DIN 8140

Diá. nom.	x Paso P mm	Ø d. pre-tal. roscas p. taladr. DIN 336 mm	Diámetro pretaladro roscas de tuercas min. mm	Diámetro roscas de tuercas max. mm
EG M 4 x 0,70		<b>4,20</b>	4,152	4,292
EG M 5 x 0,80		<b>5,25</b>	5,174	5,334
EG M 6 x 1,00		<b>6,30</b>	6,217	6,407
EG M 8 x 1,25		<b>8,40</b>	8,271	8,483
EG M10 x 1,50		<b>10,50</b>	10,324	10,560
EG M12 x 1,75		<b>12,50</b>	12,379	12,644
EG M14 x 1,25		<b>14,40</b>	14,271	14,483
EG M16 x 2,00		<b>16,50</b>	16,433	16,733

### Roscas EG UNC (UNC-STI) para injertos roscados de hilo ASME B18.29.1

Diá. nom.	hilos por pulgada	Ø d. pre-tal. roscas p. taladr. mm	Diámetro pretaladro roscas de tuercas min. mm	Diámetro roscas de tuercas max. mm
EG Nr. 6 - 32		<b>3,80</b>	3,678	3,879
EG Nr. 8 - 32		<b>4,40</b>	4,338	4,524
EG Nr. 10 - 24		<b>5,20</b>	5,055	5,283
EG Nr. 12 - 24		<b>5,80</b>	5,715	5,944
EG 1/4 - 20		<b>6,70</b>	6,624	6,868
EG 5/16 - 18		<b>8,40</b>	8,242	8,489
EG 3/8 - 16		<b>10,00</b>	9,868	10,127
EG 7/16 - 14		<b>11,60</b>	11,506	11,783
EG 1/2 - 13		<b>13,30</b>	13,122	13,393
EG 9/16 - 12		<b>14,90</b>	14,747	15,032
EG 5/8 - 11		<b>16,50</b>	16,375	16,673

### Roscas EG UNF (UNF-STI) para injertos roscados de hilo ASME B18.29.1

Diá. nom.	hilos por pulgada	Ø d. pre-tal. roscas p. taladr. mm	Diámetro pretaladro roscas de tuercas min. mm	Diámetro roscas de tuercas max. mm
EG Nr. 6 - 40		<b>3,70</b>	3,644	3,818
EG Nr. 8 - 36		<b>4,40</b>	4,321	4,498
EG Nr. 10 - 32		<b>5,10</b>	4,999	5,184
EG Nr. 12 - 28		<b>5,70</b>	5,682	5,809
EG 1/4 - 28		<b>6,60</b>	6,546	6,721
EG 5/16 - 24		<b>8,25</b>	8,166	8,352
EG 3/8 - 24		<b>9,80</b>	9,754	9,931
EG 7/16 - 20		<b>11,50</b>	11,389	11,585
EG 1/2 - 20		<b>13,10</b>	12,974	13,172
EG 9/16 - 18		<b>14,70</b>	14,592	14,798
EG 5/8 - 18		<b>16,25</b>	16,180	16,386





## Taladros recomendados para la laminación de roscas

Roscas métrica normalizada ISO DIN 13						Roscas métrica fina DIN 13																	
Diá. nom.	Paso P	Diá. taladro	Diá. taladro		Diámetro pretaladro roscas de tuercas 7H*		Diá. nom.	x	Paso P	Diá. taladro	Diá. taladro		Diámetro pretaladro roscas de tuercas 7H*		Diá. nom.	x	Paso P	Diá. taladro	Diá. taladro		Diámetro pretaladro roscas de tuercas 7H*		
			min.	max.	min.	max.					min.	max.	min.	max.					min.	max.	min.	max.	
mm		mm	mm	mm	mm	mm			mm	mm	mm	mm	mm	mm	mm			mm	mm	mm	mm	mm	mm
M 2	0,40	<b>1,85</b>	1,84	1,88	1,567	1,679	M 2,5	x	0,35	<b>2,35</b>	2,35	2,38	2,121	2,221	M 17	x	1,50	<b>16,30</b>	16,26	16,38	15,376	15,751	
M 2,2	0,45	<b>2,00</b>	2,01	2,05	1,713	1,838	M 3	x	0,35	<b>2,85</b>	2,85	2,88	2,621	2,721	M 18	x	1,00	<b>17,55</b>	17,52	17,62	16,917	17,217	
M 2,5	0,45	<b>2,30</b>	2,28	2,32	2,013	2,138	M 4	x	0,35	<b>3,85</b>	3,85	3,88	3,621	3,721	M 18	x	1,50	<b>17,30</b>	17,26	17,38	16,376	16,751	
M 3	0,50	<b>2,80</b>	2,78	2,85	2,459	2,639	M 4	x	0,50	<b>3,80</b>	3,78	3,83	3,459	3,639	M 18	x	2,00	<b>17,10</b>	17,05	17,20	15,835	16,310	
M 3,5	0,60	<b>3,25</b>	3,23	3,30	2,850	3,050	M 5	x	0,50	<b>4,80</b>	4,78	4,83	4,459	4,639	M 20	x	1,00	<b>19,55</b>	19,52	19,62	18,917	19,217	
M 4	0,70	<b>3,70</b>	3,68	3,76	3,242	3,466	M 5,5	x	0,50	<b>5,30</b>	5,28	5,33	4,959	5,139	M 20	x	1,50	<b>19,30</b>	19,26	19,38	18,376	19,751	
M 4,5	0,75	<b>4,20</b>					M 6	x	0,75	<b>5,65</b>	5,62	5,70	5,188	5,424	M 24	x	1,00	<b>23,55</b>	23,52	23,62	22,917	23,217	
M 5	0,80	<b>4,65</b>	4,62	4,71	4,134	4,384	M 7	x	0,75	<b>6,65</b>	6,62	6,70	6,188	6,424	M 24	x	1,50	<b>23,30</b>	23,26	23,38	22,376	22,751	
M 6	1,00	<b>5,55</b>	5,52	5,62	4,917	5,217	M 8	x	0,75	<b>7,65</b>	7,62	7,70	7,188	7,424	M 24	x	2,00	<b>23,10</b>	23,05	23,20	21,835	22,310	
M 7	1,00	<b>6,55</b>	6,52	6,62	5,917	6,217	M 8	x	1,00	<b>7,55</b>	7,52	7,62	6,917	7,217	M 27	x	1,50	<b>26,30</b>	26,26	26,38	25,376	25,751	
M 8	1,25	<b>7,40</b>	7,36	7,47	6,647	6,982	M 9	x	0,75	<b>8,65</b>	8,62	8,70	8,188	8,424	M 30	x	1,50	<b>29,30</b>	29,26	29,38	28,376	28,751	
M 9	1,25	<b>8,40</b>	8,36	8,47	7,647	7,982	M 9	x	1,00	<b>8,55</b>	8,52	8,62	7,917	8,217	M 33	x	1,50	<b>32,30</b>	32,26	32,38	31,376	31,751	
M 10	1,50	<b>9,30</b>	9,26	9,38	8,376	8,751	M 10	x	0,75	<b>9,65</b>	9,62	9,70	9,188	9,424	M 36	x	1,50	<b>35,30</b>	35,26	35,38	34,376	34,751	
M 11	1,50	<b>10,30</b>	10,26	10,38	9,376	9,751	M 10	x	1,00	<b>9,55</b>	9,52	9,62	9,188	9,217	M 39	x	1,50	<b>38,30</b>	38,26	38,38	37,376	37,751	
M 12	1,75	<b>11,20</b>	11,15	11,29	10,106	10,531	M 10	x	1,25	<b>9,40</b>	9,36	9,47	8,647	8,982	M 42	x	1,50	<b>41,30</b>	41,26	41,38	42,376	42,751	
M 14	2,00	<b>13,10</b>	13,05	13,20	11,835	12,310	M 11	x	0,75	<b>10,65</b>	10,62	10,70	10,188	10,424									
M 16	2,00	<b>15,10</b>	15,05	15,20	13,835	14,310	M 11	x	1,00	<b>10,55</b>	10,52	10,62	9,917	10,217									
M 18	2,50	<b>16,90</b>	16,83	17,02	15,294	15,854	M 12	x	1,00	<b>11,55</b>	11,52	11,62	10,917	11,217									
M 20	2,50	<b>18,90</b>	18,83	19,02	17,294	17,854	M 12	x	1,25	<b>11,40</b>	11,36	11,47	10,647	10,982									
M 22	2,50	<b>20,90</b>	20,83	21,02	19,294	19,854	M 12	x	1,50	<b>11,30</b>	11,26	11,38	10,376	10,751									
M 24	3,00	<b>22,70</b>	22,62	22,80	20,752	21,382	M 14	x	1,00	<b>13,55</b>	13,52	13,62	12,917	13,217									
M 27	3,00	<b>25,70</b>	25,62	25,80	23,752	24,382	M 14	x	1,25	<b>13,40</b>	13,36	13,47	12,647	12,982									
M 30	3,50	<b>28,50</b>	28,40	28,60	26,211	26,921	M 14	x	1,50	<b>13,30</b>	13,26	13,38	12,376	12,751									
M 33	3,50	<b>31,50</b>	31,40	31,60	29,211	29,921	M 15	x	1,00	<b>14,55</b>	14,52	14,62	13,917	14,217									
M 36	4,00	<b>34,30</b>	34,17	34,40	31,670	32,420	M 15	x	1,50	<b>14,30</b>	14,26	14,38	13,376	13,751									
M 39	4,00	<b>37,30</b>	37,17	37,40	34,670	35,420	M 16	x	1,00	<b>15,55</b>	15,52	15,62	14,917	15,217									
M 42	4,50	<b>40,10</b>	39,95	40,20	37,129	37,979	M 16	x	1,50	<b>15,30</b>	15,26	15,38	14,376	14,751									
							M 17	x	1,00	<b>16,55</b>	16,52	16,62	15,917	16,217									

\* M 1,1 hasta M 1,4 Ø-pretaladro roscas de tuercas 5 H

\* MJ3 x0,50 hasta MJ 5 x 0,80 Ø-pretaladro rosca de tuercas 6H

### Campo de tolerancias para pretaladros en el laminado de roscas (según DIN 13, Parte 50)

Por razones de tenacidad no es necesario cumplir con las tolerancias de pretaladros de las tolerancias 6H; la tolerancia 7H es suficiente para cumplir el que se compenetren las roscas macho y hembra no menos de 0.32xP. Además las roscas laminadas suelen tener una tenacidad más alta que las roscas cortadas por el fluido del material regular y el endurecimiento térmico.

Roscas UNC ASME B1.1						Roscas UNF ASME B1.1						Roscas withworth para tubos DIN EN ISO 228-1										
Diá. nom.	hilos por pulgada	Diá. taladro	Diá. taladro		Diámetro pretaladro roscas de tuercas 2B		Diá. nom.	hilos por pulgada	Diá. taladro	Diá. taladro		Diámetro pretaladro roscas de tuercas 2B		Diá. nom.	hilos por pulgada	Diá. taladro	Diá. taladro		Diámetro pretaladro roscas de tuercas 2B			
			min.	max.	min.	max.				min.	max.	min.	max.				min.	max.	min.	max.		
		mm	mm	mm	mm	mm			mm	mm	mm	mm	mm			mm	mm	mm	mm	mm	mm	
Nr. 1	- 64	<b>1,68</b>	1,67	1,70	1,425	1,580	Nr. 1	- 72	<b>1,70</b>	1,69	1,72	1,473	1,610	G 1/16	28	<b>7,30</b>	7,28	7,35	6,561	6,843		
Nr. 2	- 56	<b>1,98</b>	1,97	2,01	1,694	1,872	Nr. 2	- 64	<b>2,00</b>	1,99	2,03	1,755	1,910	G 1/8	28	<b>9,30</b>	9,28	9,35	8,566	8,848		
Nr. 3	- 48	<b>2,28</b>	2,27	2,32	1,941	2,146	Nr. 3	- 56	<b>2,30</b>	2,29	2,34	2,024	2,197	G 1/4	19	<b>12,50</b>	12,48	12,55	11,445	11,890		
Nr. 4	- 40	<b>2,55</b>	2,54	2,59	2,157	2,385	Nr. 4	- 48	<b>2,60</b>	2,59	2,63	2,271	2,459	G 3/8	19	<b>16,00</b>	15,98	16,05	14,950	15,395		
Nr. 5	- 40	<b>2,90</b>	2,89	2,94	2,487	2,698	Nr. 5	- 44	<b>2,90</b>	2,89	2,93	2,550	2,741	G 1/2	14	<b>20,00</b>	19,98	20,12	18,631	19,172		
Nr. 6	- 32	<b>3,15</b>	3,14	3,19	2,642	2,896	Nr. 6	- 40	<b>3,20</b>	3,19	3,24	2,819	3,023	G 5/8	14	<b>22,00</b>	21,98	22,12	20,587	21,128		
Nr. 8	- 32	<b>3,80</b>	3,78	3,82	3,302	3,531	Nr. 8	- 36	<b>3,85</b>	3,83	3,88	3,404	3,607	G 3/4	14	<b>25,50</b>	25,48	25,62	24,117	24,658		
Nr. 10	- 24	<b>4,35</b>	4,33	4,39	3,683	3,937	Nr. 10	- 32	<b>4,45</b>	4,43	4,49	3,962	4,166	G 7/8	14	<b>29,25</b>	29,23	29,37	27,877	28,418		
Nr. 12	- 24	<b>5,00</b>	4,97	5,03	4,343	4,597	Nr. 12	- 28	<b>5,10</b>	5,07	5,13	4,496	4,724	G 1	11	<b>32,00</b>	31,98	32,15	30,291	30,931		
1/4	- 20	<b>5,75</b>	5,72	5,80	4,978	5,258	1/4	- 28	<b>5,95</b>	5,92	5,99	5,359	5,588	G 1 1/4	11	<b>40,75</b>	40,70	40,85	38,952	39,592		
5/16	- 18	<b>7,30</b>	7,26	7,37	6,401	6,731	5/16	- 24	<b>7,45</b>	7,42	7,50	6,782	7,036									
3/8	- 16	<b>8,80</b>	8,77	8,88	7,798	8,153	3/8	- 24	<b>9,05</b>	9,02	9,10	8,838	9,136									
7/16	- 14	<b>10,30</b>	10,27	10,37	9,144	9,550	7/16	- 20	<b>10,55</b>	10,48	10,58	9,728	10,033									
1/2	- 13	<b>11,80</b>	11,77	11,88	10,592	11,024	1/2	- 20	<b>12,10</b>	12,08	12,18	11,328	11,608									
9/16	- 12	<b>13,30</b>	13,28	13,39	11,989	12,446	9/16	- 18	<b>13,65</b>	13,61	13,72	12,751	13,081									
5/8	- 11	<b>14,80</b>	14,78	14,90	13,386	13,868	5/8	- 18	<b>15,25</b>	15,21	15,32	14,351	14,681									
3/4	- 10	<b>17,90</b>	17,85	17,97	16,307	16,840	3/4	- 16	<b>18,35</b>	18,30	18,41	17,323	17,678									
7/8	- 9	<b>21,00</b>	20,95	21,10	19,177	19,761	7/8	- 14	<b>21,40</b>	21,35	21,49	20,269	20,650									
1	- 8	<b>24,00</b>	23,95	24,12	21,971	22,606	1	- 12	<b>24,45</b>	24,40	24,54	23,114	23,571									



## Comparativa internacional de materiales

Nº mat.	Alemania	Gran Bretaña		Japón	USA
	DIN	BS	EN	JIS	AISI/SAE/ASTM
1.0711	9 S 20	220 M 07	-	SUM 21	1212
1.0715	9 SMn 28	230 M 07	-	SUM 22	1213
1.0718	9 SMnPb 28	-	-	SUM 22 L	12 L 13
1.0721	10 S 20	210 M 15	-	-	1108
1.0722	10 SPb 20	-	-	-	11 L 08
1.0723	15 S 20	210 A 15	-	SUM 32	-
1.0736	9 SMn 36	240 M 07	1B	-	1215
1.0737	9 SMnPb 36	-	-	-	12 L 14
1.0726	35 S 20	212 M 36	8M	-	1140
1.0727	45 S 20	212 M 44	-	-	1146
1.0728	60 S 20	-	-	-	-
1.0037	St 37-2	-	-	STKM 12 C	-
1.0044	St 44-2	4360-43 B	-	SM 41 B	A 570 Gr. 40
1.0116	St 37-3	4360-40 C	-	-	A 573 Gr. 58
1.0144	St 44-3	4360-43 C	-	SM 41 C	A 573 Gr. 70
1.0050	St 50-2	4360-50 B	-	SS 50	A 570 Gr. 50
1.0570	St 52-3	4360-50 B	-	SM 50 YA	-
1.0060	St 60-2	4360-SSE; SS	-	SM 58	-
1.5415	15 Mo 3	1501-240	-	-	A 204 Gr. A
1.5423	16 Mo 5	1503-245-420	-	-	4520
1.5622	14 Ni 6	-	-	-	A 350-LF 5
1.5680	12 Ni 19	-	-	-	2515
1.7335	13 CrMo 4 4	1501-620 Gr.	-	-	A 182-F11; F12
1.7337	16 CrMo 4 4	1501-620 Gr.	-	-	A 387 Gr. 12 C
1.7380	10 CrMo 9 10	1501-622 Gr.	-	-	A 182-F22
1.7709	21 CrMoV 5 7	-	-	-	-
1.7715	14 MoV 6 3	1503-660-440	-	-	-
1.7735	14 CrMoV 6 9	-	-	-	-
1.0904	55 Si 7	250 A 53	45	-	9255
1.0961	60 SiCr 7	-	-	SUP 7	9262
1.1231	CK 67	060 A 67	-	-	1070
1.1248	CK 75	060 A 78	-	-	1078; 1080
1.1274	CK 101	060 A 96	-	SUP 4	1095
1.7103	67 SiCr 5	-	-	-	-
1.7176	55 Cr 3	527 A 60	48	SUP 9 (A)	5155
1.8159	50 CrV 4	735 A 50	47	SUP 10	6150
1.0301	C 10	045 M 10	-	S 10 C	1010
1.0401	C 15	080 M 15	-	-	1015
1.1121	CK 10	045 M 10	-	S 10 C; S 9 CK	1010
1.1141	CK 15	080 M 15	32C	S 15 C; S 15 CK	1015
1.7012	13 Cr 2	-	-	-	-
1.7015	15 Cr 3	523 M 15	-	SCR 415 (H)	5015
1.5732	14 NiCr 10	-	-	SNC 415 (H)	3415
1.5752	14 NiCr 14	655 M 13	36A	SNC 815 (H)	3310; 9314
1.5860	14 NiCr 18	-	-	-	-
1.5919	15 CrNi 6	S 107	-	-	-
1.5920	18 NiCr 8	-	-	-	-
1.6523	21 NiCrMo 2	805 M 20	362	SNCM 220 (H)	8620
1.6587	17 CrNiMo 6	820 A 16	-	-	-
1.7131	16 MnCr 5	527 M 17	-	SCR 415	5115
1.7139	16 MnCrS 5	-	-	-	-
1.7147	20 MnCr 5	-	-	SMnC 420 (H)	5120
1.7149	20 MnCrS 5	-	-	-	-
1.7262	15 CrMo 5	-	-	SCM 415 (H)	-
1.7264	20 CrMo 5	-	-	SCM 421	-
1.7271	23 CrMoB 3 3	-	-	-	-
1.7311	20 CrMo 2	-	-	-	-
1.7321	20 MoCr 4	-	-	-	-
1.7323	20 MoCrS 4	-	-	-	-
1.7325	25 MoCr 4	-	-	-	-
1.7326	25 MoCrS 4	-	-	-	-
1.8504	34 CrAl 6	-	-	-	-
1.8506	34 CrAlS 5	-	-	-	-
1.8507	34 CrAlMo 5	905 M 31	-	-	A 355 Cl. D
1.0038	RSt37-2	4360 40C	1A	STKM 12A;C	A570.36



## Comparativa internacional de materiales

Nº mat.	Alemania	Gran Bretaña		Japón	USA
	DIN	BS	EN	JIS	AISI/SAE/ASTM
1.0402	C22	050 A 20	2C	-	1020
1.5026	55 Si 7	250 A 53	-	-	9255
1.8509	41 CrAlMo 7	905 M 39	41B	SACM 645	A 355 Cl. A
1.8515	31 CrMo 12	722 M 24	-	-	-
1.8519	31 CrMoV 9	-	-	-	-
1.8521	15 CrMoV 5 9	-	-	-	-
1.8523	39 CrMoV 13 9	897 M 39	40C	-	-
1.8550	34 CrAlNi 7	-	-	-	-
1.0402	C 22	050 A 20	2D	-	1020
1.0406	C 25	070 M 26	-	-	1025
1.0501	C 35	060 A 35	-	-	1035
1.0503	C 45	080 M 46	-	-	1045
1.0511	C 40	-	-	-	1040
1.0528	C 30	-	-	-	-
1.1151	Ck 22	050 A 20	-	S 20 C; S 20 CK	1023
1.1158	Ck 25	070 M 26	-	S 25 C	1025
1.1178	Ck 30	-	-	-	-
1.1181	Ck 35	080 M 36	-	S 35 C	1035
1.1186	Ck 40	080 M 40	-	S 40 C	1040
1.1191	Ck 45	080 M 46	-	S 45 C	1045
1.0535	C 55	070 M 55	-	-	1055
1.0540	C 50	-	-	-	-
1.0601	C 60	080 A 62	43D	-	1060
1.1203	Ck 55	070 M 55	-	S 55 C	1055
1.1206	Ck 50	080 M 50	-	-	1050
1.1221	Ck 60	080 A 62	43D	S 58 C	1060
1.1133	20 Mn 5	120 M 19	-	-	1022; 1518
1.3505	100 Cr 6	534 A 99	31	SUJ 2	52100
1.5120	38 MnSi 4	-	-	-	-
1.5121	46 MnSi 4	-	-	-	-
1.5141	53 MnSi 4	-	-	-	-
1.5710	36 NiCr 6	640 A 35	111A	SNC 236	3135
1.6546	40 NiCrMo	311-Type7	-	SNCM 240	8740
1.6565	40 NiCrMo	311-Type6	-	SNCM 439	4340
1.7003	38 Cr 2	-	-	-	-
1.7006	46 Cr 2	-	-	-	5045
1.7020	32 Cr 2	-	-	-	-
1.7030	28 Cr 4	530 A 30	-	-	5130
1.7033	34 Cr 4	530 A 32	18B	SCr 430 (H)	5132
1.7218	25 CrMo 4	1717 CDS 110	-	SCM 420; SCM	4130
1.7220	34 CrMo 4	708 A 37	19B	SCM 432; SCCrM	4135; 4137
1.7223	41 CrMo 4	708 M 40	19A	SCM 440	4142; 4140
1.7225	42 CrMo 4	708 M 40	19A	SCM 440	4142; 4140
1.7228	50 CrMo 4	708 A 47	-	SCM 445 (H)	4150
1.1157	40 Mn 4	150 M 36	15	-	1039
1.1165	30 Mn 5	120 M 36	-	SMn 433 H; SCMn	1330
1.1167	36 Mn 5	150 M 36	-	SMn 438 H; SCMn	1335
1.1170	28 Mn 5	150 M 28	14A	SCMn 1	1330
1.3561	44 Cr 2	-	-	-	-
1.3563	43 CrMo 4	-	-	-	-
1.3565	48 CrMo 4	817 M 40	-	SNC 836	-
1.5120	38 MnSi 4	-	-	-	-
1.5121	46 MnSi 4	-	-	-	-
1.5122	37 MnSi 4	-	-	-	-
1.5131	50 MnSi4	-	-	-	-
1.5141	53 MnSi 4	-	-	-	-
1.5223	42 MnV 7	-	-	-	-
1.5710	36 NiCr 6	640 A 35	111A	SNC 236	3135
1.5736	36 NiCr 10	-	-	SNC 631 (H)	3435
1.5755	31 NiCr 14	653 M 31	-	SNC 836	-
1.6511	36 CrNiMo	816 M 40	110	SNC 836	9840
1.6513	28 NiCrMo	-	-	-	-
1.7003	38 Cr 2	-	-	-	-
1.7006	46 Cr 2	-	-	-	5045
1.7030	28 Cr 4	530 A 30	-	-	5130



## Comparativa internacional de materiales

Alemania		Gran Bretaña		Japón	USA
Nº mat.	DIN	BS	EN	JIS	AISI/SAE/ASTM
1.7033	34 Cr 4	530 A 32	18B	SCr 430 (H)	5132
1.7034	37 Cr 4	530 A 36	-	SCr 435 (H)	5135
1.7035	41 Cr 4	530 M 40	18	SCr 440 (H)	5140
1.7218	25 CrMo 4	1717 CDS 110	-	SCM 420; SCM 430	4130
1.7220	34 CrMo 4	708 A 37	19B	SCM 432; SCCrM 3	4135; 4137
1.7223	41 CrMo 4	708 M 40	19A	SCM 440	4142; 4140
1.7225	42 CrMo 4	708 M 40	19A	SCM 440	4142; 4140
1.7228	50 CrMo 4	708 A 47	-	SCM 445 (H)	4150
1.7561	42 CrV 6	-	-	-	-
1.7735	14 CrMoV 6 9	-	-	-	-
1.8159	50 CrV 4	735 A 50	47	SUP 10	6150
1.3563	43 CrMo 4	-	-	-	-
1.3565	48 CrMo 4	817 M 40	-	SNC 836	-
1.5120	38 MnSi 4	-	-	-	-
1.5121	46 MnSi 4	-	-	-	-
1.5122	37 MnSi 4	-	-	-	-
1.5223	42 MnV 7	-	-	-	-
1.5710	36 NiCr 6	640 A 35	111A	SNC 236	3135
1.5736	36 NiCr 10	-	-	SNC 631 (H)	3435
1.5864	35 NiCr 18	-	-	-	-
1.6511	36 CrNiMo 4	816 M 40	110	SNC 836	9840
1.6580	30 CrNiMo 8	823 M 30	-	SNM 431	-
1.6582	34 CrNiMo 6	817 M 40	24	SNM 447	4340
1.7033	34 Cr 4	530 A 32	18B	SCr 430 (H)	5132
1.7034	37 Cr 4	530 A 36	-	SCr 435 (H)	5135
1.7035	41 Cr 4	530 M 40	18	-	5140
1.7045	42 Cr 4	530 A 40	-	2245	5140
1.7218	25 CrMo 4	1717 CDS 110	-	2225	4130
1.7220	34 CrMo 4	708 A 37	19B	2234	4135; 4137
1.7223	41 CrMo 4	708 M 40	19A	2244	4142; 4140
1.7225	42 CrMo 4	708 M 40	19A	2244	4142; 4140
1.7228	50 CrMo 4	708 A 47	-	-	4150
1.7361	32 CrMo 12	722 M 24	40B	2240	-
1.7561	42 CrV 6	-	-	-	-
1.7707	30 CrMoV 9	-	-	-	-
1.7735	14 CrMoV 6 9	-	-	-	-
1.8159	50 CrV 4	735 A 50	47	2230	6150
1.8161	58 CrV 4	-	-	-	-
1.1520	C 70 W1	-	-	-	-
1.1525	C 80 W1	-	-	-	W 108
1.1545	C 105 W1	-	-	-	W 110
1.1620	C 70 W2	-	-	-	-
1.1625	C 80 W2	BW 1B	-	-	W 1
1.1645	C105 W2	-	-	-	-
1.1654	C 110 W	-	-	-	-
1.1663	C 125 W	-	-	-	W 112
1.1673	C 135 W	-	-	-	-
1.1730	C 45 W	-	-	-	-
1.1740	C 60 W	-	-	-	-
1.1744	C 67 W	-	-	-	-
1.1750	C 75 W	BW 1A	-	-	W 1
1.1820	C 55 W	-	-	-	-
1.1830	C 85 W	-	-	-	-
1.2067	100 Cr 6	BL 3	-	-	L 3
1.2101	62 SiMnCr 4	-	-	-	-
1.2103	58 SiCr 8	-	-	-	-
1.2108	90 CrSi 5	-	-	-	-
1.2162	21 MnCr 5	-	-	-	-
1.2210	115 CRV 3	-	-	-	L 2
1.2330	35 CrMo 4	708 A 37	-	2234	4135
1.2332	47 CrMo 4	709 M 40	-	2244	4142
1.2419	105 WCr 6	-	-	-	-
1.2510	100 MnCrW 4	BO 1	-	2140	O 1
1.2516	120 W 4	BF 1	-	-	-
1.2542	45 WCrV 7	BS 1	-	2710	S 1



## Comparativa internacional de materiales

Nº mat.	Alemania	Gran Bretaña		Japón	USA
	DIN	BS	EN	JIS	AISI/SAE/ASTM
1.2550	60 WCrV 7	-	-	-	-
1.2721	50 NiCr 13	-	-	-	-
1.2735	15 NiCr 14	-	-	SNC 22	-
1.2762	75 CrMoNiW 6 7	-	-	-	-
1.2826	60 MnSiCr 4	-	-	-	-
1.2833	100 V 1	BW 2	-	SKS 43	W 210
1.2842	90 MnCrV 8	BO 2	-	-	O 2
1.2080	X 210 Cr 12	BD 3	-	SKD 1	D 3
1.2341	X 6 CrMo 4	-	-	-	-
1.2363	X 100 CrMoV 5 1	BA 2	-	SKD 12	A 2
1.2379	X 155 CrVMo12 1	BD 2	-	SKD 11	D 2
1.2436	X 210 CrW 12	-	-	SKD 2	-
1.2601	X 165 CrMoV 12	-	-	-	-
1.2311	40 CrMnMo 7	-	-	-	-
1.2312	40 CrMnMoS 8 6	-	-	-	-
1.2711	54 NiCrMoV 6	-	-	-	-
1.2713	55 NiCrMoV 6	-	-	SKT 4	L 6
1.2738	40 CrMnNiMo 8	-	-	-	-
1.2744	57 NiCrMoV 77	-	-	-	-
1.2764	X 19 NiCrMo 4	-	-	-	-
1.2767	X 45 NiCrMo 4	-	-	-	-
1.2083	X 42 Cr 13	-	-	SUS 420 J 2	-
1.2343	X 38 CrMoV 5 1	BH 11	-	SKD 6	H 11
1.2344	X 40 CrMoV 5 1	BH 13	-	SKD 61	H 13
1.2365	X 32 CrMoV 3 3	BH 10	-	SKD 7	H 10
1.2567	X 30 WCrV 5 3	-	-	SKD 4	-
1.2581	X 30 WCrV 9 3	BH 21	-	SKD 5	H 21
1.2885	X 32 CrMoV 3 3 3	-	-	-	-
1.2316	X 36 CrMo 17	-	-	-	-
1.0420	GS-38	-	-	-	-
1.1118	GS-24 Mn 6	-	-	-	-
1.1120	GS-20 Mn 5	-	-	-	-
1.5419	GS-22 Mo 4	-	-	-	-
1.5633	GS-24 Ni 8	-	-	-	-
1.5681	GS-10 Ni 19	-	-	-	-
1.6309	GS-20 Mn MoNi 5 5	-	-	-	-
1.6582	GS-34 CrNiMo 6	-	24	-	-
1.6748	GS-40 NiCrMo 6 5 6	-	-	-	-
1.4311	X 2 CrNiN 18 10	304 S 62	-	SUS 304 LN	304 LN
1.4401	X 5 CrNiMo 18 10	316 S 16	58J	SUS 316	316
1.4404	X 2 CrNiMo 17 13 2	316 S 11	-	SUS 316 L	316 L
1.4406	X 2 CrNiMoN 17 12 2	316 S 61	58C	SUS 316 LN	316 LN
1.4429	X 2 CrNiMoN 17 13 3	316 S 62	-	SUS 316 LN	316 LN
1.4435	X 2 CrNiMo 18 14 3	317 S 12	-	SCS 16; SUS 316	316 L
1.4436	X 5 CrNiMo 17 13 3	316 S 16	-	SUS 316	316
1.4438	X 2 CrNiMo 18 16 4	317 S 12	-	SUS 317 L	317 L
1.4460	X 8 CrNiMo 27 5	-	-	SUS 329 J 1	329
1.4462	X 2 CrNiMoN 22 5	-	-	-	-
1.4541	X 6 CrNiTi 18 10	321 S 12	58B	SUS 321	321
1.4542	X 5 CrNiCuNb 17 14	-	-	SCS 124; SUS 630	630
1.4546	X 5 CrNiNb 18 10	347 S 18	-	-	348
1.4550	X 6 CrNiNb 18 10	347 S 17	58F	SUS 347	347
1.4571	X 6 CrNiMoTi 17 12 2	320 S 31	58J	-	316 Ti
1.4580	X 6 CrNiMoNb 17 12 2	318 S 17	-	-	316 Cb
1.4301	X 5 CrNi 18 9	304 S 15	58E	SUS 304	304; 304 H
1.4303	X 5 CrNi 18 12	305 S 19	-	SUS 305	308; 305
1.4305	X 10 CrNiS 18 9	303 S 21	58M	SUS 303	303
1.4306	X 2 CrNi 19 11	304 S 12	-	SCS 19	304 L
1.4310	X 12 CrNi 17 7	301 S 21	-	SUS 301	301
1.4350	X 5 CrNi18 9	304 S 31	58E	SUS 302	304
1.4573	X 10 CrNiMoTi 18 12	320 S 33	-	-	316 Ti
1.4583	X 10 CrNiMoNb 18 12	-	-	-	318
1.4000	X 6 Cr 13	403 S 17	-	SUS 403	403
1.4002	X 6 CrAl 13	405 S 17	-	SUS 405	405
1.4016	X 6 Cr 17	430 S 15	960	SUS 430	430



## Comparativa internacional de materiales

Alemania		Gran Bretaña		Japón	USA
Nº mat.	DIN	BS	EN	JIS	AISI/SAE/ASTM
1.4113	X 6 CrMo 17	434 S 17	-	SUS 434	434
1.4313	X 5 CrNi 13 4	425 C 11	-	SCS 5	CA 6-NM
1.4510	X 6 CrTi 17	-	-	SUS 430 LX	XM 8; 430 Ti
1.4512	X 5 CrTi 12	409 S 19	-	SUH 409	409
1.4005	X 12 CrS 13	416 S 21	-	SUS 416	416
1.4006	X 10 Cr 13	410 S 21	56A	SUS 410	410; CA-15
1.4021	X 20 Cr 13	420 S 37	-	SUS 420 J 1	420
1.4028	X 30 Cr 13	420 S 45	-	SUS 420 J 2	-
1.4031	X 38 Cr 13	-	-	SUS 420 J 2	-
1.4034	X 46Cr 13	420 S 45	56D	SUS 420 J 2	-
1.4057	X 20 CrNi 17 2	431 S 29	57	SUS 431	431
1.4104	X 12 CrMoS 17	-	-	SUS 430 F	430 F
1.4125	X 105 CrMo 17	-	-	SUS 440 C	440 C
1.4742	X 10 CrAl 18	430 S 15	60	SUS 430; SUH	430
1.4747	X 80 CrNiSi 20	443 S 65	59	SUH 4	HNv 6
1.4762	X 10 CrAl 24	-	-	-	446
1.4876	X 10 NiCrAlTi 33	NA 15 (H)	-	NCF 800	B 163
0.6010	GG-10	-	-	FC 10	A48-20 B
0.6015	GG-15	Grade 150	-	FC 15	A48-25 B
0.6020	GG-20	Grade 220	-	FC 20	A48-30 B
0.6025	GG-25	Grade 260	-	FC 25	A48-40 B
0.6030	GG-30	Grade 300	-	FC 30	A48-45 B
0.6035	GG-35	Grade 350	-	FC 35	A48-50 B
0.6040	GG-40	Grade 400	-	-	A48-60 B
0.6655	GGL-NiCuCr 15 6	L-NUC 15 6 2	-	-	A-436 Type 1
0.7040	GGG-40	SNG 420/12	-	FCD 40	60-40-18
0.7050	GGG-50	SNG 500/7	-	FCD 50	65-45-12
0.7060	GGG-60	SNG 600/3	-	FCD 60	80-55-06
0.7070	GGG-70	SNG 700/2	-	FCD 70	100-70-03
0.7080	GGG-80	SNG 800/2	-	-	120-90-02
0.7660	GGG-NiCr 20 2	S-NiCr 20 2	-	-	A 439 Type D-2
0.7661	GGG-NiCr 20 3	S-NiCr 20 3	-	-	A 439 Type D-2B
0.7670	GGG-Ni 22	S-Ni 22	-	-	A 439 Type D-2C
0.7673	GGG-NiMn 23 4	S-NiMn 23 4	-	-	A 439 Type D-2M
0.7676	GGG-NiCr 30 3	S-NiCr 30 3	-	-	A 439 Type D-3
0.7677	GGG-NiCr 30 1	S-NiCr 30 1	-	-	A 439 Type D-3A
0.7680	GGG-NiSiCr 30 5	S-NiSiCr 30 5 5	-	-	A 439 Type D-4
0.7683	GGG-Ni 35	S-Ni 35	-	-	A 439 Type D-5
0.7685	GGG-NiCr 35 3	S-NiCr 35 3	-	-	A 439 Type D-5B
0.8135	GTS-35	B340/12	-	-	32510
0.8145	GTS-45	P440/7	-	-	40010
0.8155	GTS-55	P510/4	-	-	50005
0.8165	GTS-65	P570/3	-	-	70003
0.8170	GTS-70	P690/2	-	-	90001
0.8035	GTW-35	W340/3	-	-	-
3.0225	Al99.5	1B	-	A1x1	-
3.0305	Al99.9	-	-	-	-
3.0505	AlMn0.5Mg0.5	N31	-	-	-
3.0515	AlMn1	N3	-	144054	-
3.0525	AlMn1Mg0.5	-	-	-	-
3.3315	AlMg1	N41	-	A2x8	-
3.3535	AlMg3	N5	-	-	-
3.1325	AlCuMg1	H14	-	-	-
3.1355	AlCuMg2	2L97	-	A3x4	-
3.2315	AlMgSi1	H30	-	-	-
3.3206	AlMgSi0.5	H9	-	A2x5	-
3.3211	AlMg1SiCu	-	-	-	-
3.4345	AlZnMgCu0.5	L86	-	-	7050
3.4365	AlZnMgCu1.5	L87	-	-	7175
-	Al1Mg1SiCrTi	-	-	-	6011
-	Al0.3Cu1Mg0.6SiCr	-	-	-	6061
-	Al1Cu1.1Mg1.4Si0.8Mn	-	-	-	6066
3.2134	G-AlSi5Cu1Mg	-	-	-	-
3.3241	G-AlMg3Si	-	-	-	-
3.3292	GD-AlMg9	-	-	-	-





# HARTNER

## Comparativa de durezas

Rm (N/mm <sup>2</sup> )	HRC	HB30	HV10	Rm (N/mm <sup>2</sup> )	HRC	HB30	HV10
240		71	75	1110	35	328	345
255		76	80	1140	36	337	355
270		81	85	1170	37	346	364
285		86	90	1200	38	354	373
305		90	95	1230	39	363	382
320		95	100	1260	40	372	392
335		100	105	1300	41	383	403
350		105	110	1330	42	393	413
370		109	115	1360	43	402	423
385		114	120	1400	44	413	434
400		119	125	1440	45	424	446
415		124	130	1480	46	435	458
430		128	135	1530	47	449	473
450		133	140	1570	48	460	484
465		138	145	1620	49	472	497
480		143	150	1680	50	488	514
495		147	155	1730	51	501	527
510		152	160	1790	52	517	544
530		157	165	1845	53	532	560
545		162	170	1910	54	549	578
560		166	175	1980	55	567	596
575		171	180	2050	56	584	615
595		176	185	2140	57	607	639
610		181	190	2180	58	622	655
625		185	195		59		675
640		190	200		60		698
660		195	205		61		720
675		199	210		62		745
690		204	215		63		773
705		209	220		64		800
720		214	225		65		829
740		219	230		66		864
755		223	235		67		900
770		228	240		68		940
785		233	245				
800	22	238	250				
820	23	242	255				
835	24	247	260				
860	25	255	268				
870	26	258	272				
900	27	266	280				
920	28	273	287				
940	29	278	293				
970	30	287	302				
995	31	295	310				
1020	32	301	317				
1050	33	311	327				
1080	34	319	336				





# HARTNER

## Tolerancias en Ø

### Tolerancias ISO

tolerancias estandar para la producción de brocas DIN 1414 corresponden a las tablas de tolerancias h8 de las normas ISO. Para brocas con tolerancias h7, h6 y h5 ver listas de recargos.

Rango Ø mm		Valores mm (medidas entre fajas diámetros exteriores)				
		h8	h7	h6	h5	m7
de	1,0	0	0	0		
hasta	3,0	-0,014	-0,010	-0,006	-0,004	
encima	3,0	0	0	0	0	+0,016
hasta	6,0	-0,018	-0,012	-0,008	-0,005	+0,004
encima	6,0	0	0	0	0	+0,021
hasta	10,0	-0,022	-0,015	-0,009	-0,006	+0,006
encima	10,0	0	0	0	0	+0,025
hasta	18,0	-0,027	-0,018	-0,011	-0,008	+0,007
encima	18,0	0	0	0	0	+0,029
hasta	30,0	-0,033	-0,021	-0,013	-0,009	+0,008
encima	30,0	0	0	0	0	
hasta	50,0	-0,039	-0,025	-0,016	-0,011	
encima	50,0	0	0	0	0	
hasta	80,0	-0,046	-0,030	-0,019	-0,013	
encima	80,0	0	0	0	0	
hasta	100,0	-0,054	-0,035	-0,022	-0,015	

### Tolerancias de las microbrocas DIN 1899

Las tolerancias de las microbrocas hasta 1,5 de diámetro según DIN 1899

Tolerancia Ø exterior = 0/- 0,004 mm  
Tolerancia Ø del mango h8 = 0/- 0,014 mm

### Variaciones admisibles para dimensiones sin torelancia según DIN-ISO 2768

Valores para largos en mm

grado de exactitud	Gama							
	0,5 hasta 3	por encima 3 hasta 6	por encima 6 hasta 30	por encima 30 hasta 120	p. encima 120 hasta 400	p. encima 400 hasta 1000	p. encima 1000 hasta 2000	p. encima 2000 hasta 4000
fino	± 0,05	± 0,05	± 0,1	± 0,15	± 0,2	± 0,3	± 0,5	-
medio	± 0,1	± 0,1	± 0,2	± 0,3	± 0,5	± 0,8	± 1,2	± 2
basto	± 0,15	± 0,2	± 0,5	± 0,8	± 1,2	± 2	± 3	± 4
muy basto	-	± 0,5	± 1	± 1,5	± 2,5	± 4	± 6	± 8

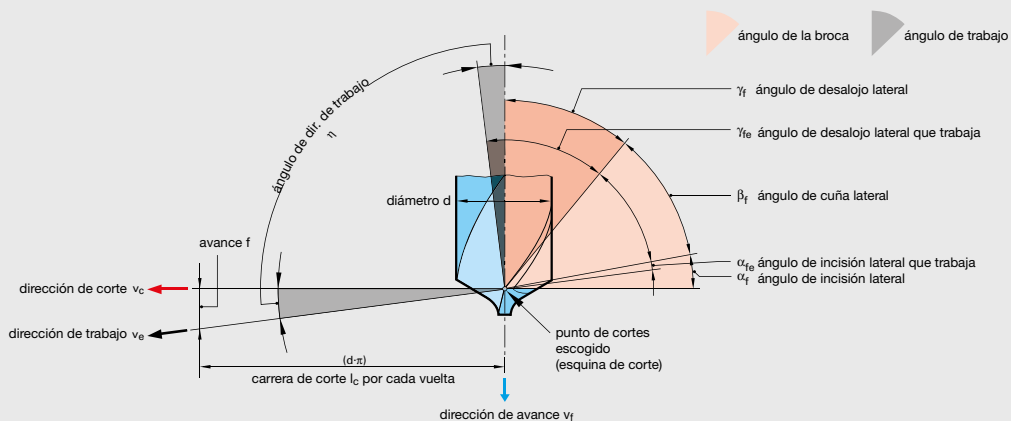
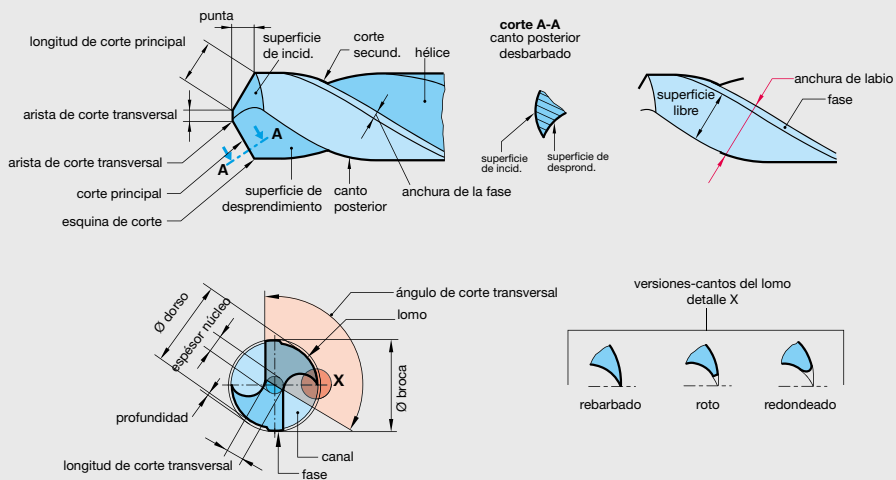
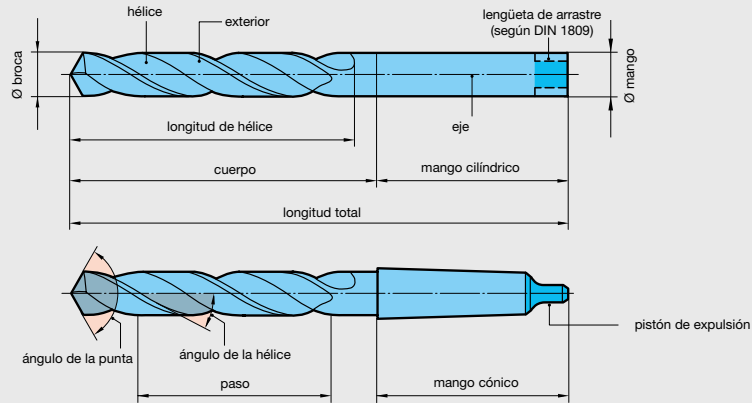
Valores para ángulo (Valores en grados y minutos)

grado de exactitud	Gama				
	hasta 10	por encima 10 hasta 50	por encima 50 hasta 120	p. encima 120 hasta 400	p. encima 400
fino, medio	± 1°	± 0° 30'	± 0° 20'	± 0° 10'	± 0° 5'
basto	± 1°30'	± 1°	± 0° 30'	± 0° 15'	± 0° 10'
muy basto	± 3°	± 2°	± 1°	± 0° 30'	± 0° 20'



## Términos técnicos, dimensiones y ángulos según DIN ISO 5419 (ext. de; edición 06/98)

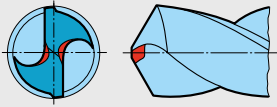
### Broca espiral con mango cilíndrico/cónico



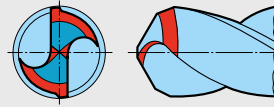


## Formas de afilado y precisión de fabricación

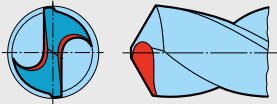
### Formas de afilado DIN 1412 (ext. de; edición 03/01)



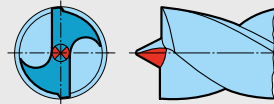
**Forma A**  
Corte transversal  
vaciado de punta



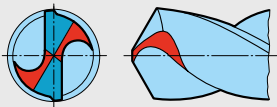
**Forma D**  
Afilado para  
fundición gris



**Forma B**  
Corte transversal  
vaciado de punta  
con corte principal  
corregido



**Forma E**  
Punta centrada



**Forma C**  
Afilado en cruz

### Brocas espirales - precisión de fabricación según DIN ISO 286, parte 2

diámetros (medida nominal) hasta incl. mm	dimensiones $\mu\text{m}$	
	h8	h7
0,38 ... 0,60	10	7
0,95	12	8
3,00	14	10
6,00	18	12
10,00	22	15
18,00	27	18
30,00	33	21
50,00	39	25
80,00	46	30
120,00	54	35

\* Si la precisión de fabricación normal ISO 8 no le es suficiente, rogamos que nos lo indiquen. Suplementos para tolerancias de medidas intermedias ver Lista de Suplementos al final del capítulo herramientas de taladrar.

#### Referencia a otras normas

- DIN 228 Hoja 1 Conos de htas; conos Morse y conos métricos, mangos cónicos
- DIN 1414-1 Condiciones técnicas de suministro para brocas espirales de acero rápido
- DIN 6580 Conceptos de la téc. de extracción de viruta; Movim. y geo. del proceso de extr. de viruta
- DIN 6581 Conceptos de la técnica de virutaje; Sistemas de referencia y ángulos en el corte de la hta.

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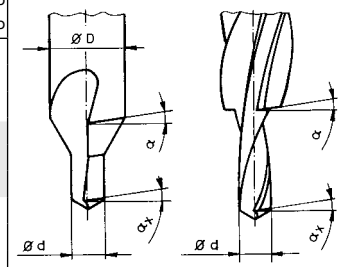
## Ángulo de salida del labio / Frecuencia de desahogo

### Ángulo de salida del labio para brocas HSS y HSS-E

diámetro gama	tipo N, tipo H y brocas de centro		tipo W, tipo FN, tipo FW, tipo S, tipo IS		Tipo V	
Diám. de la broca encima por	ángulo de salida del labio	ángulo de punta	ángulo de salida del labio	ángulo de punta	ángulo de salida del labio	ángulo de punta
0,14 – 0,24	28°	118°	28°	130°	28°	130°
0,24 – 0,48	25°	118°	25°	130°	25°	130°
0,48 – 0,95	23°	118°	23°	130°	23°	130°
0,95 – 2,36	20°	118°	20°	130°	20°	130°
2,36 – 6,00	15°	118°	15°	130°	15°	130°
6,00 – 15,00	13°	118°	13°	130°	13°	130°
15,00 – 37,50	10°	118°	10°	130°	10°	130°
37,50 – 100,00	8°	118°	8°	130°	8°	130°

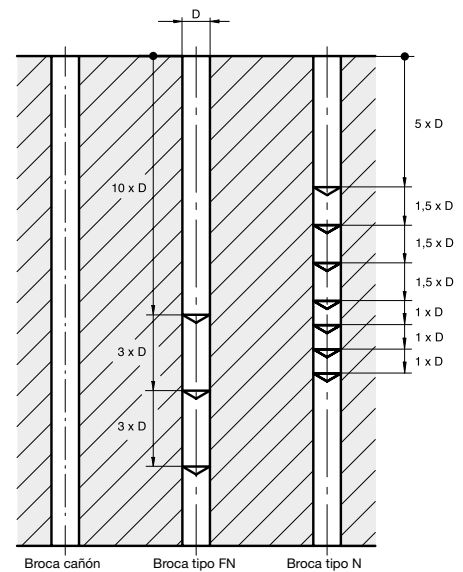
### Ángulo de salida del labio en avellanado para: brocas de paso y brocas de centro

diámetro gama	tipo N, tipo S, ángulo avellanado		tipo W, tipo H, ángulo del avellanado		broca de centro
Diám. de la broca encima por	20 - 160°	161 - 180°	20 - 160°	161 - 180°	
0,48 – 0,95	-	-	-	-	7°
0,95 – 2,36	14,0°	8°	16°	9°	7°
2,36 – 3,75	13,0°	7°	15°	8°	6°
3,75 – 6,00	12,5°	6,5°	14°	7°	5°
6,00 – 9,50	11,0°	6°	13°	7°	4°
9,50 – 15,00	10,0°	5°	12°	6°	4°
15,00 – 23,60	9,5°	5°	11°	6°	-
23,60 – 37,50	9,0°	4,5°	11°	5°	-
37,50 – 60,00	8,0°	4°	10°	5°	-



### Efectuar desahogos con frecuencia cuando se taladre un agujero profundo

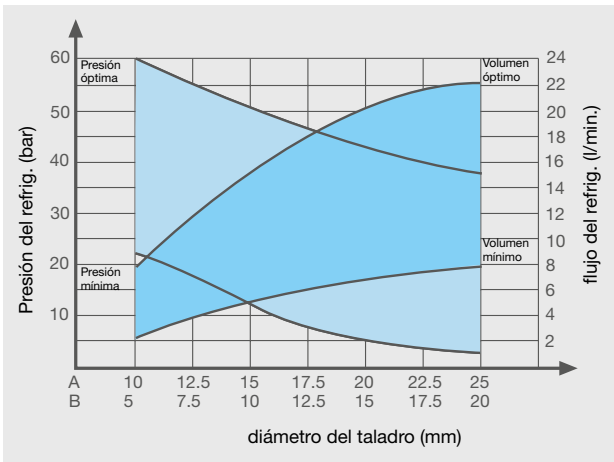
Cuando taladras un agujero profundo, hay que tener especial cuidado para suministrar suficiente refrigerante a la broca. La broca se enfría mediante la eliminación de virutas desahogando varias veces desde el agujero. La frecuencia de eliminación de virutas depende principalmente del material, el taladro y la profundidad del agujero. Existe una reducción considerable en la viruta cuando se utilizan brocas tipo FN para agujeros profundos. En algunos materiales, el ángulo de la punta puede influir en la forma de las virutas. La forma correcta de la viruta mejora su eliminación y la entrada del refrigerante. El uso de petróleo es muy recomendado para agujeros profundos o cuando la perforación es horizontal. Los datos que figuran son orientativos.





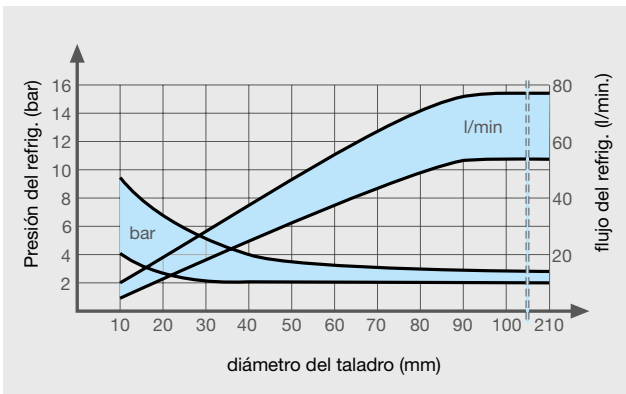
## Diagrama de lubricación presión y flujo

### Para brocas integrales de metal duro con canal de refrigeración interior



A = Gama de diámetros para herramientas con canal central de refrigeración interior  
 B Gama de diámetros para herramientas con canal helicoidal de refrigeración interior

### Para sistema Multiplex con canal de refrigeración interior



Emulsión puede ser utilizado como refrigerante cuando la perforación es con plaquitas intercambiables de HSS-Co y metal duro, que puede ser utilizado en la

habitual proporción de 1:20. Es absolutamente esencial que usted use un alto caudal del refrigerante. Si no hay suficiente presión y cantidad del refrigerante la perfo-

ración de la superficie puede ser pobre o la herramienta puede dañarse. Si es posible, las partículas sólidas en el refrigerante no deben ser mayor de 50 micras.



## Aplicaciones recomendadas brocas espirales

Artículo no.

Artículo no.

Norma/DIN

Material de corte

Superficie

Tipo

Dimens. página

Las herramientas con n° de código de series de avance impreso en negrita (código VR) se deberían elegir con preferencia.

Hta. Ø mm	N° de serie de avance								
	1	2	3	4	5	6	7	8	9
	f (mm/vuelta)								
<b>0,50</b>	0,004	0,006	0,007	0,008	0,010	0,012	0,014	0,016	0,019
<b>1,00</b>	0,006	0,008	0,012	0,014	0,016	0,018	0,020	0,023	0,025
<b>2,00</b>	0,020	0,025	0,032	0,040	0,050	0,063	0,080	0,100	0,125
<b>2,50</b>	0,025	0,032	0,040	0,050	0,063	0,080	0,100	0,125	0,160
<b>3,15</b>	0,032	0,040	0,050	0,063	0,080	0,100	0,125	0,160	0,160
<b>4,00</b>	0,040	0,050	0,063	0,080	0,100	0,125	0,160	0,200	0,200
<b>5,00</b>	0,040	0,050	0,063	0,080	0,100	0,125	0,160	0,200	0,250
<b>6,30</b>	0,050	0,063	0,080	0,100	0,125	0,160	0,200	0,250	0,315
<b>8,00</b>	0,063	0,080	0,100	0,125	0,160	0,200	0,250	0,315	0,315
<b>10,00</b>	0,080	0,100	0,125	0,160	0,200	0,250	0,315	0,400	0,400
<b>12,50</b>	0,080	0,100	0,125	0,160	0,200	0,250	0,315	0,400	0,500
<b>16,00</b>	0,100	0,125	0,160	0,200	0,250	0,315	0,400	0,500	0,630
<b>20,00</b>	0,125	0,160	0,200	0,250	0,315	0,400	0,500	0,630	0,630
<b>25,00</b>	0,160	0,200	0,250	0,315	0,400	0,500	0,630	0,800	0,800
<b>31,50</b>	0,160	0,200	0,250	0,315	0,400	0,500	0,630	0,800	1,000
<b>40,00</b>	0,200	0,250	0,315	0,400	0,500	0,630	0,800	1,000	1,250
<b>50,00</b>	0,250	0,310	0,400	0,500	0,630	0,800	1,000	1,250	1,250
<b>63,00</b>	0,315	0,400	0,500	0,630	0,800	1,000	1,250	1,600	1,600
<b>80,00</b>	0,400	0,500	0,630	0,800	1,000	1,250	1,600	1,600	2,000

Refrigerante según material:

- Aire
- Aceite
- Emulsión

Sentido de corte:

- corte a derechas
- corte a izquierdas

Grupo de materiales	Ejemplos Cifras en negrita = n° de mat. según DIN EN 10 027	Resistencia N/mm <sup>2</sup>	Dureza	Refriger.
Aceros de construcción generales	<b>1.0035</b> S185(St33), <b>1.0486</b> P275N(StE285), <b>1.0345</b> P235GH(H1), <b>1.0425</b> P265GH(H2) <b>1.0050</b> E295 (St50-2), <b>1.0070</b> E360 (St70-2), <b>1.8937</b> P500NH (WStE500)	≤500 ≤1000		<input type="radio"/> <input type="radio"/>
Aceros para autómatas	<b>1.0718</b> 11SMnPb30 (9SMnPb28), <b>1.0736</b> 11SMn37 (9SMn36) <b>1.0727</b> 46S20 (45S20), <b>1.0728</b> (60S20), <b>1.0757</b> 46SPb20 (45SPb20)	≤850 ≤1000		<input type="radio"/> <input type="radio"/>
Aceros de bonificación no aleados	<b>1.0402</b> C22, <b>1.1178</b> C30E (Ck30) <b>1.0503</b> C45, <b>1.1191</b> C45E (Ck45) <b>1.0601</b> C60, <b>1.1221</b> C60E (Ck60)	≤700 ≤850 ≤1000		<input type="radio"/> <input type="radio"/> <input type="radio"/>
Aceros de bonificación aleados	<b>1.5131</b> 50MnSi4, <b>1.7003</b> 38Cr2, <b>1.7030</b> 28Cr4 <b>1.5710</b> 36NiCr6, <b>1.7035</b> 41Cr4, <b>1.7225</b> 42CrMo4	≤1000 ≤1400		<input type="radio"/> <input type="radio"/>
Aceros cementación aleados	<b>1.0301</b> (C10), <b>1.1121</b> C10E (Ck10)	≤850		<input type="radio"/>
Aceros cementación no aleados	<b>1.7276</b> 10CrMo11, <b>1.5125</b> 11MnSi6 <b>1.5752</b> 15NiCr13, <b>1.7131</b> 16MnCr5, <b>1.7264</b> 20CrMo5	≤1000 ≤1400		<input checked="" type="radio"/> <input checked="" type="radio"/>
Aceros de nitruración	<b>1.8504</b> 34CrAl6 <b>1.8519</b> 31CrMoV9, <b>1.8550</b> 34CrAlNi7	≤1000 ≤1400		<input type="radio"/> <input checked="" type="radio"/>
Aceros para herramientas	<b>1.1750</b> C75W, <b>1.2067</b> 102Cr6, <b>1.2307</b> 29CrMoV9 <b>1.2080</b> X210Cr12, <b>1.2083</b> X42Cr13, <b>1.2419</b> 105WCr6, <b>1.2767</b> X45NiCrMo4	≤850 ≤1400		<input type="radio"/> <input checked="" type="radio"/>
Aceros rápidos	<b>1.3243</b> S 6-5-2-5, <b>1.3343</b> S 6-5-2, <b>1.3344</b> S 6-5-3	≤1400		<input checked="" type="radio"/>
Aceros para muelles	<b>1.5026</b> 55Si7, <b>1.7176</b> 55Cr3, <b>1.8159</b> 51CrV4 (51CrV4)		≤350 HB	<input checked="" type="radio"/>
Aceros templados	-		≤48 HRC ≤66 HRC	<input checked="" type="radio"/> <input checked="" type="radio"/>
Aceros inox., sulfurados austeníticos	<b>1.4005</b> X12CrS13, <b>1.4104</b> X14CrMoS17, <b>1.4105</b> X6CrMoS17, <b>1.4305</b> X8CrNiS18-9 <b>1.4301</b> X5CrNi18-10 (V2A), <b>1.4541</b> X6CrNiTi18-10, <b>1.4571</b> X6CrNiMoTi 17-12-2 (V4A)	≤900 ≤1100		<input checked="" type="radio"/> <input checked="" type="radio"/>
Aceros inox., sulfurados martensíticos	<b>1.4057</b> X20CrNi172 (X17CrNi16-2), <b>1.4122</b> X39CrMo17-1, <b>1.4521</b> X2CrMoTi18-2	≤1500		<input checked="" type="radio"/>
Hierro fundido	<b>0.6010</b> EN-GJL-100 (GG10), <b>0.6020</b> EN-GJL-200 (GG20) <b>0.6025</b> EN-GJL-250 (GG25), <b>0.6035</b> EN-GJL-350 (GG35)		≤240 HB ≤350 HB	<input type="radio"/> <input type="radio"/> <input type="radio"/>
Fundición de grafito esférico y fundición maleable	<b>0.7050</b> EN-GJS-500-7 (GGG50), <b>0.8035</b> EN-GJMW-350-4 (GTW35) <b>0.7070</b> EN-GJS-700-2 (GGG70), <b>0.8170</b> EN-GJMB-700-2 (GTS70)		≤240 HB ≤350 HB	<input type="radio"/> <input type="radio"/>
Fundición dura	-		≤350 HB	<input type="radio"/>
Nuevos mat. de fundición GGV	<b>EN-GJV250</b> (GGV25), <b>EN-GJV350</b> (GGV35) <b>EN-GJV400</b> (GGV40), <b>EN-GJV500</b> (GGV50), SiMo 6		≤220 HB ≤300 HB	<input type="radio"/> <input type="radio"/>
Nuevos mat. de fundición ADI	<b>EN-GJS-800-8</b> (ADI800), <b>EN-GJS-1000-5</b> (ADI1000) <b>EN-GJS-1200-2</b> (ADI1200), <b>EN-GJS-1400-1</b> (ADI1400)	≤1000 ≤1400		<input type="radio"/> <input type="radio"/>
Aleaciones especiales	Nimonic, Inconel, Monel, Hastelloy	≤2000		<input checked="" type="radio"/>
Titanio y aleaciones de titanio	<b>3.7024</b> Ti99,5, <b>3.7114</b> TiAl5Sn2,5, <b>3.7124</b> TiCu2 <b>3.7154</b> TiAl6Zr5, <b>3.7165</b> TiAl6V4, <b>3.7184</b> TiAl4Mo4Sn2,5, - TiAl8Mo1V1	≤850 ≤1400		<input checked="" type="radio"/> <input checked="" type="radio"/>
Aluminio y aleaciones de Al	<b>3.0255</b> Al99,5, <b>3.2315</b> AlMgSi1, <b>3.3515</b> AlMg1	≤400		<input type="radio"/>
Aleaciones maleables de Al	<b>3.0615</b> AlMgSiPb, <b>3.1325</b> AlCuMg1, <b>3.3245</b> AlMg3Si, <b>3.4365</b> AlZnMgCu1,5	≤650		<input type="radio"/>
Aleac. fund. de Al ≤ 10 % Si	<b>3.2131</b> G-AlSi5Cu1, <b>3.2153</b> G-AlSi7Cu3, <b>3.2573</b> G-AlSi9	≤600		<input type="radio"/>
Aleac. fund. de Al > 10 % Si	<b>3.2581</b> G-AlSi12, <b>3.2583</b> G-AlSi12Cu, - G-AlSi12CuNiMg	≤600		<input type="radio"/>
Aleaciones de magnesio	<b>3.5200</b> MgMn2, <b>3.5812.05</b> G-MgAl8Zn1, <b>3.5612.05</b> G-MgAl6Zn1	≤400		<input type="radio"/>
Cobre de baja aleación	<b>2.0070</b> SE-Cu, <b>2.1020</b> CuSn6, <b>2.1096</b> G-CuSn5ZnPb	≤500		<input type="radio"/>
Latón, viruta corta	<b>2.0380</b> CuZn39Pb2, <b>2.0401</b> CuZn39Pb3, <b>2.0410</b> CuZn43Pb2	≤600		<input type="radio"/>
viruta larga	<b>2.0250</b> CuZn20, <b>2.0280</b> CuZn33, <b>2.0332</b> CuZn37Pb0,5	≤600		<input type="radio"/>
Bronces, viruta corta	<b>2.1090</b> CuSn7ZnPb, <b>2.1170</b> CuPb5Sn5, <b>2.1176</b> CuPb10Sn <b>2.0790</b> CuNi18Zn19Pb	≤600 ≤850		<input type="radio"/> <input checked="" type="radio"/>
Bronces, viruta larga	<b>2.0916</b> CuAl5, <b>2.0960</b> CuAl9Mn, <b>2.1050</b> CuSn10 <b>2.0980</b> CuAl11Ni, <b>2.1247</b> CuBe2	≤850 ≤1000		<input checked="" type="radio"/> <input checked="" type="radio"/>
Duroplásticos	Resina epoxídica, Resopal, Pertinax, Moltopren	≤150		<input type="radio"/>
Termoplásticos	Plexiglas, Hostalen, Novodur, Makralon	≤100		<input type="radio"/>
Materiales sintéticos	Kevlar	≤1000		<input type="radio"/>
Fibras de vidrio/carbón	GFK/CFK	≤1000		<input type="radio"/>









# HARTNER

≤3xD

81112
1897
<b>M42</b>
○
N
35

81000
Est.
<b>M42</b>
⓪
104

81178
1897
<b>HSS-E</b>
Ⓢ
IS
44

84803
1897
<b>HSS-E</b>
Ⓣ
V
40

84503
1897
<b>HSS-E</b>
Ⓡ
V
40

89253
6539
<b>MD</b>
Ⓡ
N
50



V <sub>c</sub> m/min	N° de serie de avance	V <sub>c</sub> m/min	N° de serie de avance	V <sub>c</sub> m/min	N° de serie de avance	V <sub>c</sub> m/min	N° de serie de avance	V <sub>c</sub> m/min	N° de serie de avance	V <sub>c</sub> m/min	N° de serie de avance
35	5			38	6	38	5	42	6	104	5
30	5			33	5	33	4	36	5	91	5
40	5			44	6	44	5	48	6	104	6
40	5			42	5	38	5	42	6	91	5
40	5			44	5	44	5	48	6	104	5
40	5			44	5	44	5	48	6	91	5
35	4			38	4	38	4	42	5	78	5
20	4					27	4	30	5	78	5
16	3					22	3	24	4		
36	6			40	6	44	4	48	5	104	6
20	3					22	4	24	5	78	5
15	3					18	3	20	4		
16						22	4	24	5	65	5
12	3					18	3	20	4		
15	3					19	4	21	5	65	4
12	3					14	3	16	4		
15	3					14	3	17	4		
8	2					9	2	11	3	32	3
4	1					4	1	5	2	26	4
18	3			20	4	20	4	22	5	32	2
14	3			15	3	15	3	17	4	20	1
16	3			18	3	18	3	20	4	32	2
35	5			30	6	40	6	45	7	117	5
30	5			30	6	35	6	40	7	104	5
30	5					33	6	36	7	91	5
25	5					27	6	29	7	104	5
10	3					12	3	14	4		
8	1			8	1	6	2	7	2	20	2
10	2			12	2	11	2	12	3	15	1
6	2			8	2	7	2	8	3	15	1
90	7			90	7					260	8
90	7			90	7					260	8
80	7			80	7					195	7
70	6			70	6					156	7
70	6			70	6					234	6
40	5			70	5					104	6
60	5			60	5					234	6
40	5			40	5					234	6
35	4			35	4	45	5	50	6	156	6
30	4			33	4	40	4	45	5	156	6
20	4			20	4	23	4	26	5	91	5
15	4			15	4	17	4	20	5	65	4
20										65	5
30	4			30	4					52	4
										104	4



## Aplicaciones recomendadas brocas espirales

Artículo no.

Artículo no.

Norma/DIN

Material de corte

Superficie

Tipo

Dimens. página

Las herramientas con n° de código de series de avance impreso en negrita (código VR) se deberían elegir con preferencia.

Hta. Ø mm	N° de serie de avance								
	1	2	3	4	5	6	7	8	9
	f (mm/vuelta)								
<b>0,50</b>	0,004	0,006	0,007	0,008	0,010	0,012	0,014	0,016	0,019
<b>1,00</b>	0,006	0,008	0,012	0,014	0,016	0,018	0,020	0,023	0,025
<b>2,00</b>	0,020	0,025	0,032	0,040	0,050	0,063	0,080	0,100	0,125
<b>2,50</b>	0,025	0,032	0,040	0,050	0,063	0,080	0,100	0,125	0,160
<b>3,15</b>	0,032	0,040	0,050	0,063	0,080	0,100	0,125	0,160	0,160
<b>4,00</b>	0,040	0,050	0,063	0,080	0,100	0,125	0,160	0,200	0,200
<b>5,00</b>	0,040	0,050	0,063	0,080	0,100	0,125	0,160	0,200	0,250
<b>6,30</b>	0,050	0,063	0,080	0,100	0,125	0,160	0,200	0,250	0,315
<b>8,00</b>	0,063	0,080	0,100	0,125	0,160	0,200	0,250	0,315	0,315
<b>10,00</b>	0,080	0,100	0,125	0,160	0,200	0,250	0,315	0,400	0,400
<b>12,50</b>	0,080	0,100	0,125	0,160	0,200	0,250	0,315	0,400	0,500
<b>16,00</b>	0,100	0,125	0,160	0,200	0,250	0,315	0,400	0,500	0,630
<b>20,00</b>	0,125	0,160	0,200	0,250	0,315	0,400	0,500	0,630	0,630
<b>25,00</b>	0,160	0,200	0,250	0,315	0,400	0,500	0,630	0,800	0,800
<b>31,50</b>	0,160	0,200	0,250	0,315	0,400	0,500	0,630	0,800	1,000
<b>40,00</b>	0,200	0,250	0,315	0,400	0,500	0,630	0,800	1,000	1,250
<b>50,00</b>	0,250	0,310	0,400	0,500	0,630	0,800	1,000	1,250	1,250
<b>63,00</b>	0,315	0,400	0,500	0,630	0,800	1,000	1,250	1,600	1,600
<b>80,00</b>	0,400	0,500	0,630	0,800	1,000	1,250	1,600	1,600	2,000

Refrigerante según material:

- Aire
- Aceite
- Emulsión

Sentido de corte:

- corte a derechas
- corte a izquierdas

Grupo de materiales	Ejemplos Cifras en negrita = n° de mat. según DIN EN 10 027	Resistencia N/mm <sup>2</sup>	Dureza	Refriger.
Aceros de construcción generales	<b>1.0035</b> S185(St33), <b>1.0486</b> P275N(StE285), <b>1.0345</b> P235GH(H1), <b>1.0425</b> P265GH(H2) <b>1.0050</b> E295 (St50-2), <b>1.0070</b> E360 (St70-2), <b>1.8937</b> P500NH (WStE500)	≤500 ≤1000		<input type="radio"/> <input type="radio"/>
Aceros para autómatas	<b>1.0718</b> 11SMnPb30 (9SMnPb28), <b>1.0736</b> 11SMn37 (9SMn36) <b>1.0727</b> 46S20 (45S20), <b>1.0728</b> (60S20), <b>1.0757</b> 46SPb20 (45SPb20)	≤850 ≤1000		<input type="radio"/> <input type="radio"/>
Aceros de bonificación no aleados	<b>1.0402</b> C22, <b>1.1178</b> C30E (Ck30) <b>1.0503</b> C45, <b>1.1191</b> C45E (Ck45) <b>1.0601</b> C60, <b>1.1221</b> C60E (Ck60)	≤700 ≤850 ≤1000		<input type="radio"/> <input type="radio"/> <input type="radio"/>
Aceros de bonificación aleados	<b>1.5131</b> 50MnSi4, <b>1.7003</b> 38Cr2, <b>1.7030</b> 28Cr4 <b>1.5710</b> 36NiCr6, <b>1.7035</b> 41Cr4, <b>1.7225</b> 42CrMo4	≤1000 ≤1400		<input type="radio"/> <input type="radio"/>
Aceros cementación aleados	<b>1.0301</b> (C10), <b>1.1121</b> C10E (Ck10)	≤850		<input type="radio"/>
Aceros cementación no aleados	<b>1.7276</b> 10CrMo11, <b>1.5125</b> 11MnSi6 <b>1.5752</b> 15NiCr13, <b>1.7131</b> 16MnCr5, <b>1.7264</b> 20CrMo5	≤1000 ≤1400		<input checked="" type="radio"/> <input checked="" type="radio"/>
Aceros de nitruración	<b>1.8504</b> 34CrAl6 <b>1.8519</b> 31CrMoV9, <b>1.8550</b> 34CrAlNi7	≤1000 ≤1400		<input type="radio"/> <input checked="" type="radio"/>
Aceros para herramientas	<b>1.1750</b> C75W, <b>1.2067</b> 102Cr6, <b>1.2307</b> 29CrMoV9 <b>1.2080</b> X210Cr12, <b>1.2083</b> X42Cr13, <b>1.2419</b> 105WCr6, <b>1.2767</b> X45NiCrMo4	≤850 ≤1400		<input type="radio"/> <input checked="" type="radio"/>
Aceros rápidos	<b>1.3243</b> S 6-5-2-5, <b>1.3343</b> S 6-5-2, <b>1.3344</b> S 6-5-3	≤1400		<input checked="" type="radio"/>
Aceros para muelles	<b>1.5026</b> 55Si7, <b>1.7176</b> 55Cr3, <b>1.8159</b> 51CrV4 (51CrV4)		≤350 HB	<input checked="" type="radio"/>
Aceros templados	-		≤48 HRC ≤66 HRC	<input checked="" type="radio"/> <input checked="" type="radio"/>
Aceros inox., sulfurados austeníticos	<b>1.4005</b> X12CrS13, <b>1.4104</b> X14CrMoS17, <b>1.4105</b> X6CrMoS17, <b>1.4305</b> X8CrNiS18-9 <b>1.4301</b> X5CrNi18-10 (V2A), <b>1.4541</b> X6CrNiTi18-10, <b>1.4571</b> X6CrNiMoTi 17-12-2 (V4A)	≤900 ≤1100		<input checked="" type="radio"/> <input checked="" type="radio"/>
Aceros inox., sulfurados martensíticos	<b>1.4057</b> X20CrNi172 (X17CrNi16-2), <b>1.4122</b> X39CrMo17-1, <b>1.4521</b> X2CrMoTi18-2	≤1500		<input checked="" type="radio"/>
Hierro fundido	<b>0.6010</b> EN-GJL-100 (GG10), <b>0.6020</b> EN-GJL-200 (GG20) <b>0.6025</b> EN-GJL-250 (GG25), <b>0.6035</b> EN-GJL-350 (GG35)		≤240 HB ≤350 HB	<input type="radio"/> <input type="radio"/> <input type="radio"/>
Fundición de grafito esférico y fundición maleable	<b>0.7050</b> EN-GJS-500-7 (GGG50), <b>0.8035</b> EN-GJMW-350-4 (GTW35) <b>0.7070</b> EN-GJS-700-2 (GGG70), <b>0.8170</b> EN-GJMB-700-2 (GTS70)		≤240 HB ≤350 HB	<input type="radio"/> <input type="radio"/>
Fundición dura	-		≤350 HB	<input type="radio"/>
Nuevos mat. de fundición GGV	<b>EN-GJV250</b> (GGV25), <b>EN-GJV350</b> (GGV35) <b>EN-GJV400</b> (GGV40), <b>EN-GJV500</b> (GGV50), SiMo 6		≤220 HB ≤300 HB	<input type="radio"/> <input type="radio"/>
Nuevos mat. de fundición ADI	<b>EN-GJS-800-8</b> (ADI800), <b>EN-GJS-1000-5</b> (ADI1000) <b>EN-GJS-1200-2</b> (ADI1200), <b>EN-GJS-1400-1</b> (ADI1400)	≤1000 ≤1400		<input type="radio"/> <input type="radio"/>
Aleaciones especiales	Nimonic, Inconel, Monel, Hastelloy	≤2000		<input checked="" type="radio"/>
Titanio y aleaciones de titanio	<b>3.7024</b> Ti99,5, <b>3.7114</b> TiAl5Sn2,5, <b>3.7124</b> TiCu2 <b>3.7154</b> TiAl6Zr5, <b>3.7165</b> TiAl6V4, <b>3.7184</b> TiAl4Mo4Sn2,5, - TiAl8Mo1V1	≤850 ≤1400		<input checked="" type="radio"/> <input checked="" type="radio"/>
Aluminio y aleaciones de Al	<b>3.0255</b> Al99,5, <b>3.2315</b> AlMgSi1, <b>3.3515</b> AlMg1	≤400		<input type="radio"/>
Aleaciones maleables de Al	<b>3.0615</b> AlMgSiPb, <b>3.1325</b> AlCuMg1, <b>3.3245</b> AlMg3Si, <b>3.4365</b> AlZnMgCu1,5	≤650		<input type="radio"/>
Aleac. fund. de Al ≤ 10 % Si	<b>3.2131</b> G-AlSi5Cu1, <b>3.2153</b> G-AlSi7Cu3, <b>3.2573</b> G-AlSi9	≤600		<input type="radio"/>
Aleac. fund. de Al > 10 % Si	<b>3.2581</b> G-AlSi12, <b>3.2583</b> G-AlSi12Cu, - G-AlSi12CuNiMg	≤600		<input type="radio"/>
Aleaciones de magnesio	<b>3.5200</b> MgMn2, <b>3.5812.05</b> G-MgAl8Zn1, <b>3.5612.05</b> G-MgAl6Zn1	≤400		<input type="radio"/>
Cobre de baja aleación	<b>2.0070</b> SE-Cu, <b>2.1020</b> CuSn6, <b>2.1096</b> G-CuSn5ZnPb	≤500		<input type="radio"/>
Latón, viruta corta	<b>2.0380</b> CuZn39Pb2, <b>2.0401</b> CuZn39Pb3, <b>2.0410</b> CuZn43Pb2	≤600		<input type="radio"/>
viruta larga	<b>2.0250</b> CuZn20, <b>2.0280</b> CuZn33, <b>2.0332</b> CuZn37Pb0,5	≤600		<input type="radio"/>
Bronces, viruta corta	<b>2.1090</b> CuSn7ZnPb, <b>2.1170</b> CuPb5Sn5, <b>2.1176</b> CuPb10Sn <b>2.0790</b> CuNi18Zn19Pb	≤600 ≤850		<input type="radio"/> <input checked="" type="radio"/>
Bronces, viruta larga	<b>2.0916</b> CuAl5, <b>2.0960</b> CuAl9Mn, <b>2.1050</b> CuSn10 <b>2.0980</b> CuAl11Ni, <b>2.1247</b> CuBe2	≤850 ≤1000		<input checked="" type="radio"/> <input checked="" type="radio"/>
Duroplásticos	Resina epoxídica, Resopal, Pertinax, Moltopren	≤150		<input type="radio"/>
Termoplásticos	Plexiglas, Hostalen, Novodur, Makralon	≤100		<input type="radio"/>
Materiales sintéticos	Kevlar	≤1000		<input type="radio"/>
Fibras de vidrio/carbón	GFK/CFK	≤1000		<input type="radio"/>





## Aplicaciones recomendadas brocas espirales

Artículo no.

Artículo no.

Norma/DIN

Material de corte

Superficie

Tipo

Dimens. página

Las herramientas con n° de código de series de avance impreso en negrita (código VR) se deberían elegir con preferencia.

Hta. Ø mm	N° de serie de avance								
	1	2	3	4	5	6	7	8	9
	f (mm/vuelta)								
<b>0,50</b>	0,004	0,006	0,007	0,008	0,010	0,012	0,014	0,016	0,019
<b>1,00</b>	0,006	0,008	0,012	0,014	0,016	0,018	0,020	0,023	0,025
<b>2,00</b>	0,020	0,025	0,032	0,040	0,050	0,063	0,080	0,100	0,125
<b>2,50</b>	0,025	0,032	0,040	0,050	0,063	0,080	0,100	0,125	0,160
<b>3,15</b>	0,032	0,040	0,050	0,063	0,080	0,100	0,125	0,160	0,160
<b>4,00</b>	0,040	0,050	0,063	0,080	0,100	0,125	0,160	0,200	0,200
<b>5,00</b>	0,040	0,050	0,063	0,080	0,100	0,125	0,160	0,200	0,250
<b>6,30</b>	0,050	0,063	0,080	0,100	0,125	0,160	0,200	0,250	0,315
<b>8,00</b>	0,063	0,080	0,100	0,125	0,160	0,200	0,250	0,315	0,315
<b>10,00</b>	0,080	0,100	0,125	0,160	0,200	0,250	0,315	0,400	0,400
<b>12,50</b>	0,080	0,100	0,125	0,160	0,200	0,250	0,315	0,400	0,500
<b>16,00</b>	0,100	0,125	0,160	0,200	0,250	0,315	0,400	0,500	0,630
<b>20,00</b>	0,125	0,160	0,200	0,250	0,315	0,400	0,500	0,630	0,630
<b>25,00</b>	0,160	0,200	0,250	0,315	0,400	0,500	0,630	0,800	0,800
<b>31,50</b>	0,160	0,200	0,250	0,315	0,400	0,500	0,630	0,800	1,000
<b>40,00</b>	0,200	0,250	0,315	0,400	0,500	0,630	0,800	1,000	1,250
<b>50,00</b>	0,250	0,310	0,400	0,500	0,630	0,800	1,000	1,250	1,250
<b>63,00</b>	0,315	0,400	0,500	0,630	0,800	1,000	1,250	1,600	1,600
<b>80,00</b>	0,400	0,500	0,630	0,800	1,000	1,250	1,600	1,600	2,000

Refrigerante según material:

- Aire
- Aceite
- Emulsión

Sentido de corte:

- corte a derechas
- corte a izquierdas

Grupo de materiales	Ejemplos Cifras en negrita = n° de mat. según DIN EN 10 027	Resistencia N/mm <sup>2</sup>	Dureza	Refriger.
Aceros de construcción generales	<b>1.0035</b> S185(St33), <b>1.0486</b> P275N(StE285), <b>1.0345</b> P235GH(H1), <b>1.0425</b> P265GH(H2) <b>1.0050</b> E295 (St50-2), <b>1.0070</b> E360 (St70-2), <b>1.8937</b> P500NH (WStE500)	≤500 ≤1000		<input type="radio"/> <input type="radio"/>
Aceros para autómatas	<b>1.0718</b> 11SMnPb30 (9SMnPb28), <b>1.0736</b> 11SMn37 (9SMn36) <b>1.0727</b> 46S20 (45S20), <b>1.0728</b> (60S20), <b>1.0757</b> 46SPb20 (45SPb20)	≤850 ≤1000		<input type="radio"/> <input type="radio"/>
Aceros de bonificación no aleados	<b>1.0402</b> C22, <b>1.1178</b> C30E (Ck30) <b>1.0503</b> C45, <b>1.1191</b> C45E (Ck45) <b>1.0601</b> C60, <b>1.1221</b> C60E (Ck60)	≤700 ≤850 ≤1000		<input type="radio"/> <input type="radio"/> <input type="radio"/>
Aceros de bonificación aleados	<b>1.5131</b> 50MnSi4, <b>1.7003</b> 38Cr2, <b>1.7030</b> 28Cr4 <b>1.5710</b> 36NiCr6, <b>1.7035</b> 41Cr4, <b>1.7225</b> 42CrMo4	≤1000 ≤1400		<input type="radio"/> <input type="radio"/>
Aceros cementación aleados	<b>1.0301</b> (C10), <b>1.1121</b> C10E (Ck10)	≤850		<input type="radio"/>
Aceros cementación no aleados	<b>1.7276</b> 10CrMo11, <b>1.5125</b> 11MnSi6 <b>1.5752</b> 15NiCr13, <b>1.7131</b> 16MnCr5, <b>1.7264</b> 20CrMo5	≤1000 ≤1400		<input checked="" type="radio"/> <input type="radio"/>
Aceros de nitruración	<b>1.8504</b> 34CrAl6 <b>1.8519</b> 31CrMoV9, <b>1.8550</b> 34CrAlNi7	≤1000 ≤1400		<input type="radio"/> <input checked="" type="radio"/>
Aceros para herramientas	<b>1.1750</b> C75W, <b>1.2067</b> 102Cr6, <b>1.2307</b> 29CrMoV9 <b>1.2080</b> X210Cr12, <b>1.2083</b> X42Cr13, <b>1.2419</b> 105WCr6, <b>1.2767</b> X45NiCrMo4	≤850 ≤1400		<input type="radio"/> <input checked="" type="radio"/>
Aceros rápidos	<b>1.3243</b> S 6-5-2-5, <b>1.3343</b> S 6-5-2, <b>1.3344</b> S 6-5-3	≤1400		<input checked="" type="radio"/>
Aceros para muelles	<b>1.5026</b> 55Si7, <b>1.7176</b> 55Cr3, <b>1.8159</b> 51CrV4 (51CrV4)		≤350 HB	<input checked="" type="radio"/>
Aceros templados	-		≤48 HRC ≤66 HRC	<input checked="" type="radio"/> <input checked="" type="radio"/>
Aceros inox., sulfurados austeníticos	<b>1.4005</b> X12CrS13, <b>1.4104</b> X14CrMoS17, <b>1.4105</b> X6CrMoS17, <b>1.4305</b> X8CrNiS18-9 <b>1.4301</b> X5CrNi18-10 (V2A), <b>1.4541</b> X6CrNiTi18-10, <b>1.4571</b> X6CrNiMoTi 17-12-2 (V4A)	≤900 ≤1100		<input checked="" type="radio"/> <input checked="" type="radio"/>
martensíticos	<b>1.4057</b> X20CrNi172 (X17CrNi16-2), <b>1.4122</b> X39CrMo17-1, <b>1.4521</b> X2CrMoTi18-2	≤1500		<input checked="" type="radio"/>
Hierro fundido	<b>0.6010</b> EN-GJL-100 (GG10), <b>0.6020</b> EN-GJL-200 (GG20) <b>0.6025</b> EN-GJL-250 (GG25), <b>0.6035</b> EN-GJL-350 (GG35)		≤240 HB ≤350 HB	<input type="radio"/> <input type="radio"/>
Fundición de grafito esférico y fundición maleable	<b>0.7050</b> EN-GJS-500-7 (GGG50), <b>0.8035</b> EN-GJMW-350-4 (GTW35) <b>0.7070</b> EN-GJS-700-2 (GGG70), <b>0.8170</b> EN-GJMB-700-2 (GTS70)		≤240 HB ≤350 HB	<input type="radio"/> <input type="radio"/>
Fundición dura	-		≤350 HB	<input type="radio"/>
Nuevos mat. de fundición GGV	<b>EN-GJV250</b> (GGV25), <b>EN-GJV350</b> (GGV35) <b>EN-GJV400</b> (GGV40), <b>EN-GJV500</b> (GGV50), SiMo 6		≤220 HB ≤300 HB	<input type="radio"/> <input type="radio"/>
Nuevos mat. de fundición ADI	<b>EN-GJS-800-8</b> (ADI800), <b>EN-GJS-1000-5</b> (ADI1000) <b>EN-GJS-1200-2</b> (ADI1200), <b>EN-GJS-1400-1</b> (ADI1400)	≤1000 ≤1400		<input type="radio"/> <input type="radio"/>
Aleaciones especiales	Nimonic, Inconel, Monel, Hastelloy	≤2000		<input checked="" type="radio"/>
Titanio y aleaciones de titanio	<b>3.7024</b> Ti99,5, <b>3.7114</b> TiAl5Sn2,5, <b>3.7124</b> TiCu2 <b>3.7154</b> TiAl6Zr5, <b>3.7165</b> TiAl6V4, <b>3.7184</b> TiAl4Mo4Sn2,5, - TiAl8Mo1V1	≤850 ≤1400		<input checked="" type="radio"/> <input checked="" type="radio"/>
Aluminio y aleaciones de Al	<b>3.0255</b> Al99,5, <b>3.2315</b> AlMgSi1, <b>3.3515</b> AlMg1	≤400		<input type="radio"/>
Aleaciones maleables de Al	<b>3.0615</b> AlMgSiPb, <b>3.1325</b> AlCuMg1, <b>3.3245</b> AlMg3Si, <b>3.4365</b> AlZnMgCu1,5	≤650		<input type="radio"/>
Aleac. fund. de Al ≤ 10 % Si	<b>3.2131</b> G-AlSi5Cu1, <b>3.2153</b> G-AlSi7Cu3, <b>3.2573</b> G-AlSi9	≤600		<input type="radio"/>
> 10 % Si	<b>3.2581</b> G-AlSi12, <b>3.2583</b> G-AlSi12Cu, - G-AlSi12CuNiMg	≤600		<input type="radio"/>
Aleaciones de magnesio	<b>3.5200</b> MgMn2, <b>3.5812.05</b> G-MgAl8Zn1, <b>3.5612.05</b> G-MgAl6Zn1	≤400		<input type="radio"/>
Cobre de baja aleación	<b>2.0070</b> SE-Cu, <b>2.1020</b> CuSn6, <b>2.1096</b> G-CuSn5ZnPb	≤500		<input type="radio"/>
Latón, viruta corta	<b>2.0380</b> CuZn39Pb2, <b>2.0401</b> CuZn39Pb3, <b>2.0410</b> CuZn43Pb2	≤600		<input type="radio"/>
viruta larga	<b>2.0250</b> CuZn20, <b>2.0280</b> CuZn33, <b>2.0332</b> CuZn37Pb0,5	≤600		<input type="radio"/>
Bronces, viruta corta	<b>2.1090</b> CuSn7ZnPb, <b>2.1170</b> CuPb5Sn5, <b>2.1176</b> CuPb10Sn <b>2.0790</b> CuNi18Zn19Pb	≤600 ≤850		<input type="radio"/> <input checked="" type="radio"/>
Bronces, viruta larga	<b>2.0916</b> CuAl5, <b>2.0960</b> CuAl9Mn, <b>2.1050</b> CuSn10 <b>2.0980</b> CuAl11Ni, <b>2.1247</b> CuBe2	≤850 ≤1000		<input checked="" type="radio"/> <input checked="" type="radio"/>
Duroplásticos	Resina epoxídica, Resopal, Pertinax, Moltopren	≤150		<input type="radio"/>
Termoplásticos	Plexiglas, Hostalen, Novodur, Makralon	≤100		<input type="radio"/>
Materiales sintéticos	Kevlar	≤1000		<input type="radio"/>
Fibras de vidrio/carbón	GFK/CFK	≤1000		<input type="radio"/>





## Aplicaciones recomendadas brocas espirales

Artículo no.

Artículo no.

Norma/DIN

Material de corte

Superficie

Tipo

Dimens. página

Las herramientas con n° de código de series de avance impreso en negrita (código VR) se deberían elegir con preferencia.

Hta. Ø mm	N° de serie de avance								
	1	2	3	4	5	6	7	8	9
	f (mm/vuelta)								
<b>0,50</b>	0,004	0,006	0,007	0,008	0,010	0,012	0,014	0,016	0,019
<b>1,00</b>	0,006	0,008	0,012	0,014	0,016	0,018	0,020	0,023	0,025
<b>2,00</b>	0,020	0,025	0,032	0,040	0,050	0,063	0,080	0,100	0,125
<b>2,50</b>	0,025	0,032	0,040	0,050	0,063	0,080	0,100	0,125	0,160
<b>3,15</b>	0,032	0,040	0,050	0,063	0,080	0,100	0,125	0,160	0,160
<b>4,00</b>	0,040	0,050	0,063	0,080	0,100	0,125	0,160	0,200	0,200
<b>5,00</b>	0,040	0,050	0,063	0,080	0,100	0,125	0,160	0,200	0,250
<b>6,30</b>	0,050	0,063	0,080	0,100	0,125	0,160	0,200	0,250	0,315
<b>8,00</b>	0,063	0,080	0,100	0,125	0,160	0,200	0,250	0,315	0,315
<b>10,00</b>	0,080	0,100	0,125	0,160	0,200	0,250	0,315	0,400	0,400
<b>12,50</b>	0,080	0,100	0,125	0,160	0,200	0,250	0,315	0,400	0,500
<b>16,00</b>	0,100	0,125	0,160	0,200	0,250	0,315	0,400	0,500	0,630
<b>20,00</b>	0,125	0,160	0,200	0,250	0,315	0,400	0,500	0,630	0,630
<b>25,00</b>	0,160	0,200	0,250	0,315	0,400	0,500	0,630	0,800	0,800
<b>31,50</b>	0,160	0,200	0,250	0,315	0,400	0,500	0,630	0,800	1,000
<b>40,00</b>	0,200	0,250	0,315	0,400	0,500	0,630	0,800	1,000	1,250
<b>50,00</b>	0,250	0,310	0,400	0,500	0,630	0,800	1,000	1,250	1,250
<b>63,00</b>	0,315	0,400	0,500	0,630	0,800	1,000	1,250	1,600	1,600
<b>80,00</b>	0,400	0,500	0,630	0,800	1,000	1,250	1,600	1,600	2,000

Refrigerante según material:

- Aire
- Aceite
- Emulsión

Sentido de corte:

- corte a derechas
- corte a izquierdas

Grupo de materiales	Ejemplos Cifras en negrita = n° de mat. según DIN EN 10 027	Resistencia N/mm <sup>2</sup>	Dureza	Refriger.
Aceros de construcción generales	<b>1.0035</b> S185(St33), <b>1.0486</b> P275N(StE285), <b>1.0345</b> P235GH(H1), <b>1.0425</b> P265GH(H2) <b>1.0050</b> E295 (St50-2), <b>1.0070</b> E360 (St70-2), <b>1.8937</b> P500NH (WStE500)	≤500 ≤1000		<input type="radio"/> <input type="radio"/>
Aceros para autómatas	<b>1.0718</b> 11SMnPb30 (9SMnPb28), <b>1.0736</b> 11SMn37 (9SMn36) <b>1.0727</b> 46S20 (45S20), <b>1.0728</b> (60S20), <b>1.0757</b> 46SPb20 (45SPb20)	≤850 ≤1000		<input type="radio"/> <input type="radio"/>
Aceros de bonificación no aleados	<b>1.0402</b> C22, <b>1.1178</b> C30E (Ck30) <b>1.0503</b> C45, <b>1.1191</b> C45E (Ck45) <b>1.0601</b> C60, <b>1.1221</b> C60E (Ck60)	≤700 ≤850 ≤1000		<input type="radio"/> <input type="radio"/> <input type="radio"/>
Aceros de bonificación aleados	<b>1.5131</b> 50MnSi4, <b>1.7003</b> 38Cr2, <b>1.7030</b> 28Cr4 <b>1.5710</b> 36NiCr6, <b>1.7035</b> 41Cr4, <b>1.7225</b> 42CrMo4	≤1000 ≤1400		<input type="radio"/> <input type="radio"/>
Aceros cementación aleados	<b>1.0301</b> (C10), <b>1.1121</b> C10E (Ck10)	≤850		<input type="radio"/>
Aceros cementación no aleados	<b>1.7276</b> 10CrMo11, <b>1.5125</b> 11MnSi6 <b>1.5752</b> 15NiCr13, <b>1.7131</b> 16MnCr5, <b>1.7264</b> 20CrMo5	≤1000 ≤1400		<input checked="" type="radio"/> <input checked="" type="radio"/>
Aceros de nitruración	<b>1.8504</b> 34CrAl6 <b>1.8519</b> 31CrMoV9, <b>1.8550</b> 34CrAlNi7	≤1000 ≤1400		<input type="radio"/> <input checked="" type="radio"/>
Aceros para herramientas	<b>1.1750</b> C75W, <b>1.2067</b> 102Cr6, <b>1.2307</b> 29CrMoV9 <b>1.2080</b> X210Cr12, <b>1.2083</b> X42Cr13, <b>1.2419</b> 105WCr6, <b>1.2767</b> X45NiCrMo4	≤850 ≤1400		<input type="radio"/> <input checked="" type="radio"/>
Aceros rápidos	<b>1.3243</b> S 6-5-2-5, <b>1.3343</b> S 6-5-2, <b>1.3344</b> S 6-5-3	≤1400		<input checked="" type="radio"/>
Aceros para muelles	<b>1.5026</b> 55Si7, <b>1.7176</b> 55Cr3, <b>1.8159</b> 51CrV4 (51CrV4)		≤350 HB	<input checked="" type="radio"/>
Aceros templados	-		≤48 HRC ≤66 HRC	<input checked="" type="radio"/> <input checked="" type="radio"/>
Aceros inox., sulfurados austeníticos	<b>1.4005</b> X12CrS13, <b>1.4104</b> X14CrMoS17, <b>1.4105</b> X6CrMoS17, <b>1.4305</b> X8CrNiS18-9 <b>1.4301</b> X5CrNi18-10 (V2A), <b>1.4541</b> X6CrNiTi18-10, <b>1.4571</b> X6CrNiMoTi 17-12-2 (V4A)	≤900 ≤1100		<input checked="" type="radio"/> <input checked="" type="radio"/>
Aceros inox., sulfurados martensíticos	<b>1.4057</b> X20CrNi172 (X17CrNi16-2), <b>1.4122</b> X39CrMo17-1, <b>1.4521</b> X2CrMoTi18-2	≤1500		<input checked="" type="radio"/>
Hierro fundido	<b>0.6010</b> EN-GJL-100 (GG10), <b>0.6020</b> EN-GJL-200 (GG20) <b>0.6025</b> EN-GJL-250 (GG25), <b>0.6035</b> EN-GJL-350 (GG35)		≤240 HB ≤350 HB	<input type="radio"/> <input type="radio"/>
Fundición de grafito esférico y fundición maleable	<b>0.7050</b> EN-GJS-500-7 (GGG50), <b>0.8035</b> EN-GJMW-350-4 (GTW35) <b>0.7070</b> EN-GJS-700-2 (GGG70), <b>0.8170</b> EN-GJMB-700-2 (GTS70)		≤240 HB ≤350 HB	<input type="radio"/> <input type="radio"/>
Fundición dura	-		≤350 HB	<input type="radio"/>
Nuevos mat. de fundición GGV	<b>EN-GJV250</b> (GGV25), <b>EN-GJV350</b> (GGV35) <b>EN-GJV400</b> (GGV40), <b>EN-GJV500</b> (GGV50), SiMo 6		≤220 HB ≤300 HB	<input type="radio"/> <input type="radio"/>
Nuevos mat. de fundición ADI	<b>EN-GJS-800-8</b> (ADI800), <b>EN-GJS-1000-5</b> (ADI1000) <b>EN-GJS-1200-2</b> (ADI1200), <b>EN-GJS-1400-1</b> (ADI1400)	≤1000 ≤1400		<input type="radio"/> <input type="radio"/>
Aleaciones especiales	Nimonic, Inconel, Monel, Hastelloy	≤2000		<input checked="" type="radio"/>
Titanio y aleaciones de titanio	<b>3.7024</b> Ti99,5, <b>3.7114</b> TiAl5Sn2,5, <b>3.7124</b> TiCu2 <b>3.7154</b> TiAl6Zr5, <b>3.7165</b> TiAl6V4, <b>3.7184</b> TiAl4Mo4Sn2,5, - TiAl8Mo1V1	≤850 ≤1400		<input checked="" type="radio"/> <input checked="" type="radio"/>
Aluminio y aleaciones de Al	<b>3.0255</b> Al99,5, <b>3.2315</b> AlMgSi1, <b>3.3515</b> AlMg1	≤400		<input type="radio"/>
Aleaciones maleables de Al	<b>3.0615</b> AlMgSiPb, <b>3.1325</b> AlCuMg1, <b>3.3245</b> AlMg3Si, <b>3.4365</b> AlZnMgCu1,5	≤650		<input type="radio"/>
Aleac. fund. de Al ≤ 10 % Si	<b>3.2131</b> G-AlSi5Cu1, <b>3.2153</b> G-AlSi7Cu3, <b>3.2573</b> G-AlSi9	≤600		<input type="radio"/>
Aleac. fund. de Al > 10 % Si	<b>3.2581</b> G-AlSi12, <b>3.2583</b> G-AlSi12Cu, - G-AlSi12CuNiMg	≤600		<input type="radio"/>
Aleaciones de magnesio	<b>3.5200</b> MgMn2, <b>3.5812.05</b> G-MgAl8Zn1, <b>3.5612.05</b> G-MgAl6Zn1	≤400		<input type="radio"/>
Cobre de baja aleación	<b>2.0070</b> SE-Cu, <b>2.1020</b> CuSn6, <b>2.1096</b> G-CuSn5ZnPb	≤500		<input type="radio"/>
Latón, viruta corta	<b>2.0380</b> CuZn39Pb2, <b>2.0401</b> CuZn39Pb3, <b>2.0410</b> CuZn43Pb2	≤600		<input type="radio"/>
viruta larga	<b>2.0250</b> CuZn20, <b>2.0280</b> CuZn33, <b>2.0332</b> CuZn37Pb0,5	≤600		<input type="radio"/>
Bronces, viruta corta	<b>2.1090</b> CuSn7ZnPb, <b>2.1170</b> CuPb5Sn5, <b>2.1176</b> CuPb10Sn <b>2.0790</b> CuNi18Zn19Pb	≤600 ≤850		<input type="radio"/> <input checked="" type="radio"/>
Bronces, viruta larga	<b>2.0916</b> CuAl5, <b>2.0960</b> CuAl9Mn, <b>2.1050</b> CuSn10 <b>2.0980</b> CuAl11Ni, <b>2.1247</b> CuBe2	≤850 ≤1000		<input checked="" type="radio"/> <input checked="" type="radio"/>
Duroplásticos	Resina epoxídica, Resopal, Pertinax, Moltopren	≤150		<input type="radio"/>
Termoplásticos	Plexiglas, Hostalen, Novodur, Makralon	≤100		<input type="radio"/>
Materiales sintéticos	Kevlar	≤1000		<input type="radio"/>
Fibras de vidrio/carbón	GFK/CFK	≤1000		<input type="radio"/>



## ≤5xD

81011	82011	81041	81061	81013	82012	81012
338	345	338	338	338	345	338
HSS-E						M42
N	N	FN	S	IS	IS	N
83	177	87	89	85	178	77

84800	84859	84807
338		338
HSS-E		
FN	N	S
91	180	95

84504	84505
338	338
HSS-E	
FN	S
91	95



V <sub>c</sub> m/min	N° de serie de avance					
35	5	5	5	5	5	5
30	5	5	5	5	5	5
40	5	5	5	5	5	5
40	5	5	5	5	5	5
40	5	5	5	5	5	5
40	5	5	5	5	5	5
35	4	4	4	4	4	4
20	4	4	4	4	4	4
16	3	3	3	3	3	3
36	6	6	6	6	6	6
20	4	4	4	4	4	4
15	3	3	3	3	3	3
16	4	4	4	4	4	4
12	3	3	3	3	3	3
15	4	4	4	4	4	4
12	3	3	3	3	3	3
15	3	3	3	3	3	3
8	2	2	2	2	2	2
4						1
18	4	4	4	4	4	3
14	3	3	2	3	3	3
16	3	3	3	3	3	3
35	6	6	6	6	6	5
30	6	6	6	6	6	5
30	6	6	6	6	6	5
28	6	6	6	6	6	5
10	3	3	3	3	3	3
8			1			1
10			2	2	2	2
6			2	2	2	2
90			7	7	7	7
90			7	7	7	7
80		7	7	7	7	7
70		6	6	6	6	6
70			6	6	6	6
40	5	5	5	5	5	5
60			5	5	5	5
40	5	5	4	5	5	5
35	4	4		4	4	4
33	4	4		4	4	4
20	4	4	4	4	4	4
15	4	4	4	1	1	4
20	4	4	4			

V <sub>c</sub> m/min	N° de serie de avance		
38	6	6	6
33	5	5	5
44	5	5	5
38	5	5	5
44	5	5	5
38	4	4	4
27	4	4	4
22	3	3	3
44	4	4	4
22	4	4	4
18	3	3	3
22	4	4	4
18	3	3	3
19	4	4	4
14	3	3	3
14	3	3	3
9		2	2
20	4	4	4
15		3	3
18	3		3
40	6	6	6
35	6	6	6
33	6	6	6
27	6	6	6
12			3
6			2
11			2
7			2
88	5	5	5
40		4	4
22	4	4	4
17	4	4	4
22	4	4	4

V <sub>c</sub> m/min	N° de serie de avance	
42	6	6
36	5	5
48	6	6
42	6	6
48	6	6
42	5	5
30	5	5
34	4	4
48	6	6
24	5	5
20	4	4
24	5	5
20	4	4
21	5	5
16	4	4
17	4	4
11	3	3
6	1	1
22	5	5
17	4	4
20	4	4
45	7	7
40	7	7
36	7	7
29	7	7
14	4	4
7		2
12		2
8		2
85	8	8
72	7	7
96	6	6
25	5	5
20	5	5
24	5	5









# HARTNER

≤5xD

81018	81019	81078	84804	84802	84801	84660
338	338	338	338	338	Est.	345
M42	M42	HSS-E	HSS-E	HSS-E	HSS-E-PM	HSS-E
N	N	IS	FU 500 DZ	FU 500 DZ	FU 500	FN
79	81	97	93	93	107	176



V <sub>c</sub> m/min	N° de serie de avance	V <sub>c</sub> m/min	N° de serie de avance	V <sub>c</sub> m/min	N° de serie de avance	V <sub>c</sub> m/min	N° de serie de avance	V <sub>c</sub> m/min	N° de serie de avance	V <sub>c</sub> m/min	N° de serie de avance	V <sub>c</sub> m/min	N° de serie de avance
35	6	32	7	38	6	35	6	45	6	45	6	42	5
30	5	26	6	33	5	30	5	35	5	35	5		
40	6	36	7	44	6	40	6	50	6	50	6		
40	5	36	6	42	5	30	6	40	6	40	5		
40	5	31	6	44	5	32	6	44	6	44	6		
40	5	31	6	44	5	28	6	44	6	44	6		
35	4	28	5			20	5	40	5	40	5		
20	4	24	5			15	4	27	4	27	4		
16	3					13	3	22	3	22	3		
36	6	36	7	40	6	30	6	44	6	44	6		
20	3	22	5			16	4	22	4	22	4		
15	3					12	3	18	3	18	3		
16	4	16	5			15	4	22	4	22	4		
12	3					10	3	16	3	16	3		
15	3	20	5			15	4	20	4	20	4		
12	3					10	3	15	3	15	3		
15	3					10	3	13	3	13	3		
8	2							9	2	9	2		
4	1												
18	3			20	4	14	4	20	4	20	4	45	7
14	3			15	3	10	4	16	4	16	4		
16	3			18	3	12	4	18	4	18	4		
35	6	36	7	30	6	36	6	45	6	45	6		
30	6	36	7	30	6	30	6	40	6	40	6		
30	6	31	7			30	6	40	6	40	6		
28	6	24	7			22	6	30	6	30	6		
10	3												
8	1			8	1								
10	2			12	2								
6	2			8	2								
90	7	85	8	90	7	50	7	70	7	70	7		
90	7	85	8	90	7	50	7	70	7	70	7		
80	7	60	8	80	7	65	7	85	7	85	7		
70	6	60	8	70	6	60	6	70	6	70	6		
70	6	90	7	70	6	60	6	80	6	80	6		
70	5	70	6	70	5	70	5	80	5	88	5		
60	5	80	6	60	5	45	5	77	5	77	5		
40	5	50	6	40	5	30	5	44	5	44	5		
35	4	36	5	35	4	36	4	50	4	50	4		
33	4	33	5	33	4	30	4	40	4	40	4		
20	4	18	5	20	4	30	4	32	4	32	4		
15	4	18	5	15	4	25	4	28	4	28	4		
20	4	29	5			20	4	25	4	25	4		
30	5			30	4	15	4	27	4	27	4		
												25	5
												20	5
												24	5





# HARTNER

≤5xD

84811
338
HSS-E-PM
<b>T</b>
FN 500 DZ
99

84507
Est.
HSS-E-PM
<b>F</b>
FN 500
107

82761
Est.
HSS-E
○
FN
axial
120

84461
Est.
HSS-E
<b>T</b>
FN
axial
120

89244
Est.
MD
○
N
100

89261
Est.
MD
<b>F</b>
N
102



V <sub>c</sub> m/min	N° de serie de avance	V <sub>c</sub> m/min	N° de serie de avance	V <sub>c</sub> m/min	N° de serie de avance	V <sub>c</sub> m/min	N° de serie de avance	V <sub>c</sub> m/min	N° de serie de avance	V <sub>c</sub> m/min	N° de serie de avance
40	6	42	6	48	7	60	7	80	4	100	5
32	5	37	5	38	6	48	6	70	4	90	5
45	6	47	6	48	7	60	7	80	5	100	6
40	5	44	6	38	6	48	6	70	4	90	4
42	6	47	6	48	6	60	6	80	4	100	5
40	5	47	6	48	6	60	6	70	4	90	5
28	4	44	5	45	5	50	5	60	4	80	5
25	4	30	4	30	5	33	5	60	4	80	5
20	3	25	3	28	4	31	4	80	5	100	6
40	4	47	3	50	7	55	7	60	4	80	5
22	4	25	4	25	5	31	5	60	4	80	5
18	3	20	3	25	4	31	4	50	4	65	5
20	4	25	4	25	5	30	5	50	4	65	5
15	3	18	4	20	4	24	4	50	3	65	3
25	4	22	5	24	5	30	5				
15	3	17	4	17	4	20	4				
15	3	14	4	14	4	18	4				
10	2	12	2	12	3	15	3	25	2	30	3
				4	3	5	3	20	2	20	2
15	4	22	4	20	5	25	5	25	2	30	2
10	3	18	3	14	4	18	4	15	1	20	1
12	3	20	3	16	4	20	4	25	2	30	2
50	6	50	7	48	7	60	7	90	4	115	5
40	6	40	7	38	7	48	7	80	4	100	5
45	6	44	7	42	7	52	7	70	4	90	5
32	6	33	7	35	7	40	7	80	4	80	5
8	3	16	4	12	4	15	4				
5	2	6	2	10	2	12	2	15	2	20	3
				14	3	18	3	15	1	15	1
				10	3	12	3	15	1	15	1
								200	7	260	8
								200	7	260	8
				95	7	120	7	150	6	195	7
				75	8	95	8	120	6	155	7
								180	5	235	6
50	5	50	5	90	6	100	6	80	5	100	6
								180	5	235	6
60	5	60	5	50	6	55	6	180	5	235	6
50	5	50	5					120	5	155	6
45	4	44	5	48	5	60	5	120	5	155	6
40	4	33	5	45	5	55	5	70	4	90	5
32	4	28	5	38	5	45	5	50	3	65	4
25	4	25	4					50	4	50	5
				38	6	48	6	40	3	65	4
								80	3	100	4







## Aplicaciones recomendadas brocas espirales

Artículo no.

Norma/DIN

Material de corte

Superficie

Tipo

Refrigeración

Dimens. página

Las herramientas con n° de código de series de avance impreso en negrita (código VR) se deberían elegir con preferencia.

Hta. Ø mm	N° de serie de avance								
	1	2	3	4	5	6	7	8	9
	f (mm/vuelta)								
<b>0,50</b>	0,004	0,006	0,007	0,008	0,010	0,012	0,014	0,016	0,019
<b>1,00</b>	0,006	0,008	0,012	0,014	0,016	0,018	0,020	0,023	0,025
<b>2,00</b>	0,020	0,025	0,032	0,040	0,050	0,063	0,080	0,100	0,125
<b>2,50</b>	0,025	0,032	0,040	0,050	0,063	0,080	0,100	0,125	0,160
<b>3,15</b>	0,032	0,040	0,050	0,063	0,080	0,100	0,125	0,160	0,160
<b>4,00</b>	0,040	0,050	0,063	0,080	0,100	0,125	0,160	0,200	0,200
<b>5,00</b>	0,040	0,050	0,063	0,080	0,100	0,125	0,160	0,200	0,250
<b>6,30</b>	0,050	0,063	0,080	0,100	0,125	0,160	0,200	0,250	0,315
<b>8,00</b>	0,063	0,080	0,100	0,125	0,160	0,200	0,250	0,315	0,315
<b>10,00</b>	0,080	0,100	0,125	0,160	0,200	0,250	0,315	0,400	0,400
<b>12,50</b>	0,080	0,100	0,125	0,160	0,200	0,250	0,315	0,400	0,500
<b>16,00</b>	0,100	0,125	0,160	0,200	0,250	0,315	0,400	0,500	0,630
<b>20,00</b>	0,125	0,160	0,200	0,250	0,315	0,400	0,500	0,630	0,630
<b>25,00</b>	0,160	0,200	0,250	0,315	0,400	0,500	0,630	0,800	0,800
<b>31,50</b>	0,160	0,200	0,250	0,315	0,400	0,500	0,630	0,800	1,000
<b>40,00</b>	0,200	0,250	0,315	0,400	0,500	0,630	0,800	1,000	1,250
<b>50,00</b>	0,250	0,310	0,400	0,500	0,630	0,800	1,000	1,250	1,250
<b>63,00</b>	0,315	0,400	0,500	0,630	0,800	1,000	1,250	1,600	1,600
<b>80,00</b>	0,400	0,500	0,630	0,800	1,000	1,250	1,600	1,600	2,000

Refrigerante según material:

- Aire
- Aceite
- Emulsión

Sentido de corte:

- corte a derechas
- corte a izquierdas

Grupo de materiales	Ejemplos Cifras en negrita = n° de mat. según DIN EN 10 027	Resistencia N/mm <sup>2</sup>	Dureza	Refriger.
Aceros de construcción generales	<b>1.0035</b> S185(St33), <b>1.0486</b> P275N(StE285), <b>1.0345</b> P235GH(H1), <b>1.0425</b> P265GH(H2) <b>1.0050</b> E295 (St50-2), <b>1.0070</b> E360 (St70-2), <b>1.8937</b> P500NH (WStE500)	≤500 ≤1000		<input type="radio"/> <input type="radio"/>
Aceros para autómatas	<b>1.0718</b> 11SMnPb30 (9SMnPb28), <b>1.0736</b> 11SMn37 (9SMn36) <b>1.0727</b> 46S20 (45S20), <b>1.0728</b> (60S20), <b>1.0757</b> 46SPb20 (45SPb20)	≤850 ≤1000		<input type="radio"/> <input type="radio"/>
Aceros de bonificación no aleados	<b>1.0402</b> C22, <b>1.1178</b> C30E (Ck30) <b>1.0503</b> C45, <b>1.1191</b> C45E (Ck45) <b>1.0601</b> C60, <b>1.1221</b> C60E (Ck60)	≤700 ≤850 ≤1000		<input type="radio"/> <input type="radio"/> <input type="radio"/>
Aceros de bonificación aleados	<b>1.5131</b> 50MnSi4, <b>1.7003</b> 38Cr2, <b>1.7030</b> 28Cr4 <b>1.5710</b> 36NiCr6, <b>1.7035</b> 41Cr4, <b>1.7225</b> 42CrMo4	≤1000 ≤1400		<input type="radio"/> <input type="radio"/>
Aceros cementación aleados	<b>1.0301</b> (C10), <b>1.1121</b> C10E (Ck10)	≤850		<input type="radio"/>
Aceros cementación no aleados	<b>1.7276</b> 10CrMo11, <b>1.5125</b> 11MnSi6 <b>1.5752</b> 15NiCr13, <b>1.7131</b> 16MnCr5, <b>1.7264</b> 20CrMo5	≤1000 ≤1400		<input checked="" type="radio"/> <input checked="" type="radio"/>
Aceros de nitruración	<b>1.8504</b> 34CrAl6 <b>1.8519</b> 31CrMoV9, <b>1.8550</b> 34CrAlNi7	≤1000 ≤1400		<input type="radio"/> <input checked="" type="radio"/>
Aceros para herramientas	<b>1.1750</b> C75W, <b>1.2067</b> 102Cr6, <b>1.2307</b> 29CrMoV9 <b>1.2080</b> X210Cr12, <b>1.2083</b> X42Cr13, <b>1.2419</b> 105WCr6, <b>1.2767</b> X45NiCrMo4	≤850 ≤1400		<input type="radio"/> <input checked="" type="radio"/>
Aceros rápidos	<b>1.3243</b> S 6-5-2-5, <b>1.3343</b> S 6-5-2, <b>1.3344</b> S 6-5-3	≤1400		<input checked="" type="radio"/>
Aceros para muelles	<b>1.5026</b> 55Si7, <b>1.7176</b> 55Cr3, <b>1.8159</b> 51CrV4 (51CrV4)		≤350 HB	<input checked="" type="radio"/>
Aceros templados	-		≤48 HRC ≤66 HRC	<input checked="" type="radio"/> <input checked="" type="radio"/>
Aceros inox., sulfurados austeníticos	<b>1.4005</b> X12CrS13, <b>1.4104</b> X14CrMoS17, <b>1.4105</b> X6CrMoS17, <b>1.4305</b> X8CrNiS18-9 <b>1.4301</b> X5CrNi18-10 (V2A), <b>1.4541</b> X6CrNiTi18-10, <b>1.4571</b> X6CrNiMoTi 17-12-2 (V4A)	≤900 ≤1100		<input checked="" type="radio"/> <input checked="" type="radio"/>
Aceros inox., sulfurados martensíticos	<b>1.4057</b> X20CrNi172 (X17CrNi16-2), <b>1.4122</b> X39CrMo17-1, <b>1.4521</b> X2CrMoTi18-2	≤1500		<input checked="" type="radio"/>
Hierro fundido	<b>0.6010</b> EN-GJL-100 (GG10), <b>0.6020</b> EN-GJL-200 (GG20) <b>0.6025</b> EN-GJL-250 (GG25), <b>0.6035</b> EN-GJL-350 (GG35)		≤240 HB ≤350 HB	<input type="radio"/> <input type="radio"/> <input type="radio"/>
Fundición de grafito esférico y fundición maleable	<b>0.7050</b> EN-GJS-500-7 (GGG50), <b>0.8035</b> EN-GJMW-350-4 (GTW35) <b>0.7070</b> EN-GJS-700-2 (GGG70), <b>0.8170</b> EN-GJMB-700-2 (GTS70)		≤240 HB ≤350 HB	<input type="radio"/> <input type="radio"/>
Fundición dura	-		≤350 HB	<input type="radio"/>
Nuevos mat. de fundición GGV	<b>EN-GJV250</b> (GGV25), <b>EN-GJV350</b> (GGV35) <b>EN-GJV400</b> (GGV40), <b>EN-GJV500</b> (GGV50), SiMo 6		≤220 HB ≤300 HB	<input type="radio"/> <input type="radio"/>
Nuevos mat. de fundición ADI	<b>EN-GJS-800-8</b> (ADI800), <b>EN-GJS-1000-5</b> (ADI1000) <b>EN-GJS-1200-2</b> (ADI1200), <b>EN-GJS-1400-1</b> (ADI1400)	≤1000 ≤1400		<input type="radio"/> <input type="radio"/>
Aleaciones especiales	Nimonic, Inconel, Monel, Hastelloy	≤2000		<input checked="" type="radio"/>
Titanio y aleaciones de titanio	<b>3.7024</b> Ti99,5, <b>3.7114</b> TiAl5Sn2,5, <b>3.7124</b> TiCu2 <b>3.7154</b> TiAl6Zr5, <b>3.7165</b> TiAl6V4, <b>3.7184</b> TiAl4Mo4Sn2,5, - TiAl8Mo1V1	≤850 ≤1400		<input checked="" type="radio"/> <input checked="" type="radio"/>
Aluminio y aleaciones de Al	<b>3.0255</b> Al99,5, <b>3.2315</b> AlMgSi1, <b>3.3515</b> AlMg1	≤400		<input type="radio"/>
Aleaciones maleables de Al	<b>3.0615</b> AlMgSiPb, <b>3.1325</b> AlCuMg1, <b>3.3245</b> AlMg3Si, <b>3.4365</b> AlZnMgCu1,5	≤650		<input type="radio"/>
Aleac. fund. de Al ≤ 10 % Si	<b>3.2131</b> G-AlSi5Cu1, <b>3.2153</b> G-AlSi7Cu3, <b>3.2573</b> G-AlSi9	≤600		<input type="radio"/>
Aleac. fund. de Al > 10 % Si	<b>3.2581</b> G-AlSi12, <b>3.2583</b> G-AlSi12Cu, - G-AlSi12CuNiMg	≤600		<input type="radio"/>
Aleaciones de magnesio	<b>3.5200</b> MgMn2, <b>3.5812.05</b> G-MgAl8Zn1, <b>3.5612.05</b> G-MgAl6Zn1	≤400		<input type="radio"/>
Cobre de baja aleación	<b>2.0070</b> SE-Cu, <b>2.1020</b> CuSn6, <b>2.1096</b> G-CuSn5ZnPb	≤500		<input type="radio"/>
Latón, viruta corta	<b>2.0380</b> CuZn39Pb2, <b>2.0401</b> CuZn39Pb3, <b>2.0410</b> CuZn43Pb2	≤600		<input type="radio"/>
viruta larga	<b>2.0250</b> CuZn20, <b>2.0280</b> CuZn33, <b>2.0332</b> CuZn37Pb0,5	≤600		<input type="radio"/>
Bronces, viruta corta	<b>2.1090</b> CuSn7ZnPb, <b>2.1170</b> CuPb5Sn5, <b>2.1176</b> CuPb10Sn <b>2.0790</b> CuNi18Zn19Pb	≤600 ≤850		<input type="radio"/> <input checked="" type="radio"/>
Bronces, viruta larga	<b>2.0916</b> CuAl5, <b>2.0960</b> CuAl9Mn, <b>2.1050</b> CuSn10 <b>2.0980</b> CuAl11Ni, <b>2.1247</b> CuBe2	≤850 ≤1000		<input checked="" type="radio"/> <input checked="" type="radio"/>
Duroplásticos	Resina epoxídica, Resopal, Pertinax, Moltopren	≤150		<input type="radio"/>
Termoplásticos	Plexiglas, Hostalen, Novodur, Makralon	≤100		<input type="radio"/>
Materiales sintéticos	Kevlar	≤1000		<input type="radio"/>
Fibras de vidrio/carbón	GFK/CFK	≤1000		<input type="radio"/>



≤10xD

81311	82211	81341	81361
340	341	340	340
HSS-E			
N	N	FN	S
138	185	139	141

81362
340
HSS-E
S
141

84508
340
HSS-E
FN
145



V <sub>c</sub> m/min	N° de serie de avance			
33	5	5	5	
27	5	5	5	
36	5	5	5	
32	5	5	5	
36	5	5	5	
36	5	5	5	
22	4	4	4	
18	4	4	4	
14	3	3	3	3
32	5	5	5	
18	4	4	4	
13	3	3	3	
14	4	4	4	
10	3	3	3	
13	4	4	4	
10	3	3	3	
12	3	3	3	
6	2	2	2	
4			1	
12	4	4	4	4
8	3	3	2	3
10	3	3	3	3
32	6	6	6	
27	6	6	6	
26	6	6	6	
24	6	6	6	
6	3	3	3	3
5	1	1		1
8				2
5				2
70			7	
60			6	
60				5
36	5	5	5	
54			5	
36	5	5	5	
30	4	4	5	
24	4	4	5	
18	4	4	4	
13	4	4	4	4
16	4	4	4	
26				4

V <sub>c</sub> m/min	N° de avance
15	3
13	3
10	3
10	3
10	3
10	3
8	2
15	4
10	3
13	3
6	3
6	1
10	2
6	2
25	4

V <sub>c</sub> m/min	N° de avance
36	5
30	4
40	5
36	5
40	5
40	5
26	4
18	4
15	3
32	5
20	4
18	3
18	4
12	3
15	4
12	3
14	3
9	3
5	1
14	4
10	3
12	3
35	6
30	6
30	6
26	6
12	3
77	7
66	6
40	6
40	6
21	5
15	5
30	5





## Aplicaciones recomendadas brocas espirales

Artículo no.

Norma/DIN

Material de corte

Superficie

Tipo

Refrigeración

Dimens. página

Las herramientas con n° de código de series de avance impreso en negrita (código VR) se deberían elegir con preferencia.

Hta. Ø mm	N° de serie de avance								
	1	2	3	4	5	6	7	8	9
	f (mm/vuelta)								
<b>0,50</b>	0,004	0,006	0,007	0,008	0,010	0,012	0,014	0,016	0,019
<b>1,00</b>	0,006	0,008	0,012	0,014	0,016	0,018	0,020	0,023	0,025
<b>2,00</b>	0,020	0,025	0,032	0,040	0,050	0,063	0,080	0,100	0,125
<b>2,50</b>	0,025	0,032	0,040	0,050	0,063	0,080	0,100	0,125	0,160
<b>3,15</b>	0,032	0,040	0,050	0,063	0,080	0,100	0,125	0,160	0,160
<b>4,00</b>	0,040	0,050	0,063	0,080	0,100	0,125	0,160	0,200	0,200
<b>5,00</b>	0,040	0,050	0,063	0,080	0,100	0,125	0,160	0,200	0,250
<b>6,30</b>	0,050	0,063	0,080	0,100	0,125	0,160	0,200	0,250	0,315
<b>8,00</b>	0,063	0,080	0,100	0,125	0,160	0,200	0,250	0,315	0,315
<b>10,00</b>	0,080	0,100	0,125	0,160	0,200	0,250	0,315	0,400	0,400
<b>12,50</b>	0,080	0,100	0,125	0,160	0,200	0,250	0,315	0,400	0,500
<b>16,00</b>	0,100	0,125	0,160	0,200	0,250	0,315	0,400	0,500	0,630
<b>20,00</b>	0,125	0,160	0,200	0,250	0,315	0,400	0,500	0,630	0,630
<b>25,00</b>	0,160	0,200	0,250	0,315	0,400	0,500	0,630	0,800	0,800
<b>31,50</b>	0,160	0,200	0,250	0,315	0,400	0,500	0,630	0,800	1,000
<b>40,00</b>	0,200	0,250	0,315	0,400	0,500	0,630	0,800	1,000	1,250
<b>50,00</b>	0,250	0,310	0,400	0,500	0,630	0,800	1,000	1,250	1,250
<b>63,00</b>	0,315	0,400	0,500	0,630	0,800	1,000	1,250	1,600	1,600
<b>80,00</b>	0,400	0,500	0,630	0,800	1,000	1,250	1,600	1,600	2,000

Refrigerante según material:

- Aire
- Aceite
- Emulsión

Sentido de corte:

- corte a derechas
- corte a izquierdas

Grupo de materiales	Ejemplos Cifras en negrita = n° de mat. según DIN EN 10 027	Resistencia N/mm <sup>2</sup>	Dureza	Refriger.
Aceros de construcción generales	<b>1.0035</b> S185(St33), <b>1.0486</b> P275N(StE285), <b>1.0345</b> P235GH(H1), <b>1.0425</b> P265GH(H2) <b>1.0050</b> E295 (St50-2), <b>1.0070</b> E360 (St70-2), <b>1.8937</b> P500NH (WStE500)	≤500 ≤1000		<input type="radio"/> <input type="radio"/>
Aceros para autómatas	<b>1.0718</b> 11SMnPb30 (9SMnPb28), <b>1.0736</b> 11SMn37 (9SMn36) <b>1.0727</b> 46S20 (45S20), <b>1.0728</b> (60S20), <b>1.0757</b> 46SPb20 (45SPb20)	≤850 ≤1000		<input type="radio"/> <input type="radio"/>
Aceros de bonificación no aleados	<b>1.0402</b> C22, <b>1.1178</b> C30E (Ck30) <b>1.0503</b> C45, <b>1.1191</b> C45E (Ck45) <b>1.0601</b> C60, <b>1.1221</b> C60E (Ck60)	≤700 ≤850 ≤1000		<input type="radio"/> <input type="radio"/> <input type="radio"/>
Aceros de bonificación aleados	<b>1.5131</b> 50MnSi4, <b>1.7003</b> 38Cr2, <b>1.7030</b> 28Cr4 <b>1.5710</b> 36NiCr6, <b>1.7035</b> 41Cr4, <b>1.7225</b> 42CrMo4	≤1000 ≤1400		<input type="radio"/> <input type="radio"/>
Aceros cementación aleados	<b>1.0301</b> (C10), <b>1.1121</b> C10E (Ck10)	≤850		<input type="radio"/>
Aceros cementación no aleados	<b>1.7276</b> 10CrMo11, <b>1.5125</b> 11MnSi6 <b>1.5752</b> 15NiCr13, <b>1.7131</b> 16MnCr5, <b>1.7264</b> 20CrMo5	≤1000 ≤1400		<input checked="" type="radio"/> <input checked="" type="radio"/>
Aceros de nitruración	<b>1.8504</b> 34CrAl6 <b>1.8519</b> 31CrMoV9, <b>1.8550</b> 34CrAlNi7	≤1000 ≤1400		<input type="radio"/> <input checked="" type="radio"/>
Aceros para herramientas	<b>1.1750</b> C75W, <b>1.2067</b> 102Cr6, <b>1.2307</b> 29CrMoV9 <b>1.2080</b> X210Cr12, <b>1.2083</b> X42Cr13, <b>1.2419</b> 105WCr6, <b>1.2767</b> X45NiCrMo4	≤850 ≤1400		<input type="radio"/> <input checked="" type="radio"/>
Aceros rápidos	<b>1.3243</b> S 6-5-2-5, <b>1.3343</b> S 6-5-2, <b>1.3344</b> S 6-5-3	≤1400		<input checked="" type="radio"/>
Aceros para muelles	<b>1.5026</b> 55Si7, <b>1.7176</b> 55Cr3, <b>1.8159</b> 51CrV4 (51CrV4)		≤350 HB	<input checked="" type="radio"/>
Aceros templados	-		≤48 HRC ≤66 HRC	<input checked="" type="radio"/> <input checked="" type="radio"/>
Aceros inox., sulfurados austeníticos	<b>1.4005</b> X12CrS13, <b>1.4104</b> X14CrMoS17, <b>1.4105</b> X6CrMoS17, <b>1.4305</b> X8CrNiS18-9 <b>1.4301</b> X5CrNi18-10 (V2A), <b>1.4541</b> X6CrNiTi18-10, <b>1.4571</b> X6CrNiMoTi 17-12-2 (V4A)	≤900 ≤1100		<input checked="" type="radio"/> <input checked="" type="radio"/>
martensíticos	<b>1.4057</b> X20CrNi172 (X17CrNi16-2), <b>1.4122</b> X39CrMo17-1, <b>1.4521</b> X2CrMoTi18-2	≤1500		<input checked="" type="radio"/>
Hierro fundido	<b>0.6010</b> EN-GJL-100 (GG10), <b>0.6020</b> EN-GJL-200 (GG20) <b>0.6025</b> EN-GJL-250 (GG25), <b>0.6035</b> EN-GJL-350 (GG35)		≤240 HB ≤350 HB	<input type="radio"/> <input type="radio"/>
Fundición de grafito esférico y fundición maleable	<b>0.7050</b> EN-GJS-500-7 (GGG50), <b>0.8035</b> EN-GJMW-350-4 (GTW35) <b>0.7070</b> EN-GJS-700-2 (GGG70), <b>0.8170</b> EN-GJMB-700-2 (GTS70)		≤240 HB ≤350 HB	<input type="radio"/> <input type="radio"/>
Fundición dura	-		≤350 HB	<input type="radio"/>
Nuevos mat. de fundición GGV	<b>EN-GJV250</b> (GGV25), <b>EN-GJV350</b> (GGV35) <b>EN-GJV400</b> (GGV40), <b>EN-GJV500</b> (GGV50), SiMo 6		≤220 HB ≤300 HB	<input type="radio"/> <input type="radio"/>
Nuevos mat. de fundición ADI	<b>EN-GJS-800-8</b> (ADI800), <b>EN-GJS-1000-5</b> (ADI1000) <b>EN-GJS-1200-2</b> (ADI1200), <b>EN-GJS-1400-1</b> (ADI1400)	≤1000 ≤1400		<input type="radio"/> <input type="radio"/>
Aleaciones especiales	Nimonic, Inconel, Monel, Hastelloy	≤2000		<input checked="" type="radio"/>
Titanio y aleaciones de titanio	<b>3.7024</b> Ti99,5, <b>3.7114</b> TiAl5Sn2,5, <b>3.7124</b> TiCu2 <b>3.7154</b> TiAl6Zr5, <b>3.7165</b> TiAl6V4, <b>3.7184</b> TiAl4Mo4Sn2,5, - TiAl8Mo1V1	≤850 ≤1400		<input checked="" type="radio"/> <input checked="" type="radio"/>
Aluminio y aleaciones de Al	<b>3.0255</b> Al99,5, <b>3.2315</b> AlMgSi1, <b>3.3515</b> AlMg1	≤400		<input type="radio"/>
Aleaciones maleables de Al	<b>3.0615</b> AlMgSiPb, <b>3.1325</b> AlCuMg1, <b>3.3245</b> AlMg3Si, <b>3.4365</b> AlZnMgCu1,5	≤650		<input type="radio"/>
Aleac. fund. de Al ≤ 10 % Si	<b>3.2131</b> G-AlSi5Cu1, <b>3.2153</b> G-AlSi7Cu3, <b>3.2573</b> G-AlSi9	≤600		<input type="radio"/>
> 10 % Si	<b>3.2581</b> G-AlSi12, <b>3.2583</b> G-AlSi12Cu, - G-AlSi12CuNiMg	≤600		<input type="radio"/>
Aleaciones de magnesio	<b>3.5200</b> MgMn2, <b>3.5812.05</b> G-MgAl8Zn1, <b>3.5612.05</b> G-MgAl6Zn1	≤400		<input type="radio"/>
Cobre de baja aleación	<b>2.0070</b> SE-Cu, <b>2.1020</b> CuSn6, <b>2.1096</b> G-CuSn5ZnPb	≤500		<input type="radio"/>
Latón, viruta corta	<b>2.0380</b> CuZn39Pb2, <b>2.0401</b> CuZn39Pb3, <b>2.0410</b> CuZn43Pb2	≤600		<input type="radio"/>
viruta larga	<b>2.0250</b> CuZn20, <b>2.0280</b> CuZn33, <b>2.0332</b> CuZn37Pb0,5	≤600		<input type="radio"/>
Bronces, viruta corta	<b>2.1090</b> CuSn7ZnPb, <b>2.1170</b> CuPb5Sn5, <b>2.1176</b> CuPb10Sn <b>2.0790</b> CuNi18Zn19Pb	≤600 ≤850		<input type="radio"/> <input checked="" type="radio"/>
Bronces, viruta larga	<b>2.0916</b> CuAl5, <b>2.0960</b> CuAl9Mn, <b>2.1050</b> CuSn10 <b>2.0980</b> CuAl11Ni, <b>2.1247</b> CuBe2	≤850 ≤1000		<input checked="" type="radio"/> <input checked="" type="radio"/>
Duroplásticos	Resina epoxídica, Resopal, Pertinax, Moltopren	≤150		<input type="radio"/>
Termoplásticos	Plexiglas, Hostalen, Novodur, Makralon	≤100		<input type="radio"/>
Materiales sintéticos	Kevlar	≤1000		<input type="radio"/>
Fibras de vidrio/carbón	GFK/CFK	≤1000		<input type="radio"/>





# HARTNER

## ≤10xD

89286
Est.
<b>MD</b>
N
146

82710	82521	82535
Est.	Est.	Est.
<b>HSS</b>		
FN	N	FN
axial	axial	axial
121	195	196

82525
Est.
<b>HSS-E</b>
FN
axial
197

82515
Est.
<b>HSS-E</b>
FN
axial
198



V <sub>c</sub> m/min	N° de avance	V <sub>c</sub> m/min	N° de serie de avance			V <sub>c</sub> m/min	N° de avance	V <sub>c</sub> m/min	N° de avance
		26	6	6	6	35	6	30	5
		22	5	5	5	30	5	25	4
		30	6	6	6	30	6	30	5
		30	5	5	5	30	5	25	4
		24	5	5	5	35	5	30	4
		24	5	5	5	29	5	25	4
		22	4	4	4	22	4	18	3
		20	4	4	4	18	4	16	3
		14	3	3	3	14	3	12	2
		30	6	6	6	35	6	30	5
		17	4	4	4	18	4	16	3
		12	3	3	3	14	3	12	2
		14	4	4	4	14	4	12	3
		10	3	3	3	12	3	10	2
		15	4	4	4	15	4	13	3
		10	3	3	3	11	3	9	2
		10	3	3	3	11	3	9	2
		7	2	2	2	8	2	6	2
						4	2	4	1
						14	4	12	3
						10	3	8	2
						12	3	12	2
		30	6	6	6	30	6	28	5
		30	6	6	6	24	6	22	5
		24	6	6	6	24	6	22	5
		20	6	6	6	20	6	18	5
		7	3	3	3	8	3	6	2
						8	1	6	1
						10	2	8	2
						8	2	6	2
		80	6						
		50	7	7	7	60	7	55	6
		50	6	6	6	50	6	44	5
		60	5	5	5	38	5	35	4
						55	5	50	4
		40	5	5	5	36	5	33	4
		24	4	4	4	24	4	22	4
		24	4	4	4	20	4	18	4
		22	4	4	4	14	4	12	4
50	4								
40	3	24	5	5	5	25	5	25	4
80	3								



## Aplicaciones recomendadas brocas espirales

Artículo no.

Norma/DIN

Material de corte

Superficie

Tipo

Dimens. página

Las herramientas con n° de código de series de avance impreso en negrita (código VR) se deberían elegir con preferencia.

Hta. Ø mm	N° de serie de avance								
	1	2	3	4	5	6	7	8	9
	f (mm/vuelta)								
<b>0,50</b>	0,004	0,006	0,007	0,008	0,010	0,012	0,014	0,016	0,019
<b>1,00</b>	0,006	0,008	0,012	0,014	0,016	0,018	0,020	0,023	0,025
<b>2,00</b>	0,020	0,025	0,032	0,040	0,050	0,063	0,080	0,100	0,125
<b>2,50</b>	0,025	0,032	0,040	0,050	0,063	0,080	0,100	0,125	0,160
<b>3,15</b>	0,032	0,040	0,050	0,063	0,080	0,100	0,125	0,160	0,160
<b>4,00</b>	0,040	0,050	0,063	0,080	0,100	0,125	0,160	0,200	0,200
<b>5,00</b>	0,040	0,050	0,063	0,080	0,100	0,125	0,160	0,200	0,250
<b>6,30</b>	0,050	0,063	0,080	0,100	0,125	0,160	0,200	0,250	0,315
<b>8,00</b>	0,063	0,080	0,100	0,125	0,160	0,200	0,250	0,315	0,315
<b>10,00</b>	0,080	0,100	0,125	0,160	0,200	0,250	0,315	0,400	0,400
<b>12,50</b>	0,080	0,100	0,125	0,160	0,200	0,250	0,315	0,400	0,500
<b>16,00</b>	0,100	0,125	0,160	0,200	0,250	0,315	0,400	0,500	0,630
<b>20,00</b>	0,125	0,160	0,200	0,250	0,315	0,400	0,500	0,630	0,630
<b>25,00</b>	0,160	0,200	0,250	0,315	0,400	0,500	0,630	0,800	0,800
<b>31,50</b>	0,160	0,200	0,250	0,315	0,400	0,500	0,630	0,800	1,000
<b>40,00</b>	0,200	0,250	0,315	0,400	0,500	0,630	0,800	1,000	1,250
<b>50,00</b>	0,250	0,310	0,400	0,500	0,630	0,800	1,000	1,250	1,250
<b>63,00</b>	0,315	0,400	0,500	0,630	0,800	1,000	1,250	1,600	1,600
<b>80,00</b>	0,400	0,500	0,630	0,800	1,000	1,250	1,600	1,600	2,000

Refrigerante según material:

- Aire
- Aceite
- Emulsión

Sentido de corte:

- corte a derechas
- corte a izquierdas

Grupo de materiales	Ejemplos Cifras en negrita = n° de mat. según DIN EN 10 027	Resistencia N/mm <sup>2</sup>	Dureza	Refriger.
Aceros de construcción generales	<b>1.0035</b> S185(St33), <b>1.0486</b> P275N(StE285), <b>1.0345</b> P235GH(H1), <b>1.0425</b> P265GH(H2)	≤500		<input type="radio"/>
	<b>1.0050</b> E295 (St50-2), <b>1.0070</b> E360 (St70-2), <b>1.8937</b> P500NH (WStE500)	≤1000		<input type="radio"/>
Aceros para autómatas	<b>1.0718</b> 11SMnPb30 (9SMnPb28), <b>1.0736</b> 11SMn37 (9SMn36)	≤850		<input type="radio"/>
	<b>1.0727</b> 46S20 (45S20), <b>1.0728</b> (60S20), <b>1.0757</b> 46SPb20 (45SPb20)	≤1000		<input type="radio"/>
Aceros de bonificación no aleados	<b>1.0402</b> C22, <b>1.1178</b> C30E (Ck30)	≤700		<input type="radio"/>
	<b>1.0503</b> C45, <b>1.1191</b> C45E (Ck45)	≤850		<input type="radio"/>
	<b>1.0601</b> C60, <b>1.1221</b> C60E (Ck60)	≤1000		<input type="radio"/>
Aceros de bonificación aleados	<b>1.5131</b> 50MnSi4, <b>1.7003</b> 38Cr2, <b>1.7030</b> 28Cr4	≤1000		<input type="radio"/>
	<b>1.5710</b> 36NiCr6, <b>1.7035</b> 41Cr4, <b>1.7225</b> 42CrMo4	≤1400		<input type="radio"/>
Aceros cementación aleados	<b>1.0301</b> (C10), <b>1.1121</b> C10E (Ck10)	≤850		<input type="radio"/>
Aceros cementación no aleados	<b>1.7276</b> 10CrMo11, <b>1.5125</b> 11MnSi6	≤1000		<input checked="" type="radio"/>
	<b>1.5752</b> 15NiCr13, <b>1.7131</b> 16MnCr5, <b>1.7264</b> 20CrMo5	≤1400		<input checked="" type="radio"/>
Aceros de nitruración	<b>1.8504</b> 34CrAl6	≤1000		<input type="radio"/>
	<b>1.8519</b> 31CrMoV9, <b>1.8550</b> 34CrAlNi7	≤1400		<input checked="" type="radio"/>
Aceros para herramientas	<b>1.1750</b> C75W, <b>1.2067</b> 102Cr6, <b>1.2307</b> 29CrMoV9	≤850		<input type="radio"/>
	<b>1.2080</b> X210Cr12, <b>1.2083</b> X42Cr13, <b>1.2419</b> 105WCr6, <b>1.2767</b> X45NiCrMo4	≤1400		<input checked="" type="radio"/>
Aceros rápidos	<b>1.3243</b> S 6-5-2-5, <b>1.3343</b> S 6-5-2, <b>1.3344</b> S 6-5-3	≤1400		<input checked="" type="radio"/>
Aceros para muelles	<b>1.5026</b> 55Si7, <b>1.7176</b> 55Cr3, <b>1.8159</b> 51CrV4 (51CrV4)		≤350 HB	<input checked="" type="radio"/>
Aceros templados	-		≤48 HRC	<input checked="" type="radio"/>
			≤66 HRC	<input checked="" type="radio"/>
Aceros inox., sulfurados austeníticos	<b>1.4005</b> X12CrS13, <b>1.4104</b> X14CrMoS17, <b>1.4105</b> X6CrMoS17, <b>1.4305</b> X8CrNiS18-9	≤900		<input checked="" type="radio"/>
	<b>1.4301</b> X5CrNi18-10 (V2A), <b>1.4541</b> X6CrNiTi18-10, <b>1.4571</b> X6CrNiMoTi 17-12-2 (V4A)	≤1100		<input checked="" type="radio"/>
martensíticos	<b>1.4057</b> X20CrNi172 (X17CrNi16-2), <b>1.4122</b> X39CrMo17-1, <b>1.4521</b> X2CrMoTi18-2	≤1500		<input checked="" type="radio"/>
Hierro fundido	<b>0.6010</b> EN-GJL-100 (GG10), <b>0.6020</b> EN-GJL-200 (GG20)		≤240 HB	<input type="radio"/>
	<b>0.6025</b> EN-GJL-250 (GG25), <b>0.6035</b> EN-GJL-350 (GG35)		≤350 HB	<input type="radio"/>
Fundición de grafito esférico y fundición maleable	<b>0.7050</b> EN-GJS-500-7 (GGG50), <b>0.8035</b> EN-GJMW-350-4 (GTW35)		≤240 HB	<input type="radio"/>
	<b>0.7070</b> EN-GJS-700-2 (GGG70), <b>0.8170</b> EN-GJMB-700-2 (GTS70)		≤350 HB	<input type="radio"/>
Fundición dura	-		≤350 HB	<input type="radio"/>
Nuevos mat. de fundición GGV	<b>EN-GJV250</b> (GGV25), <b>EN-GJV350</b> (GGV35)		≤220 HB	<input type="radio"/>
	<b>EN-GJV400</b> (GGV40), <b>EN-GJV500</b> (GGV50), SiMo 6		≤300 HB	<input type="radio"/>
Nuevos mat. de fundición ADI	<b>EN-GJS-800-8</b> (ADI800), <b>EN-GJS-1000-5</b> (ADI1000)	≤1000		<input type="radio"/>
	<b>EN-GJS-1200-2</b> (ADI1200), <b>EN-GJS-1400-1</b> (ADI1400)	≤1400		<input type="radio"/>
Aleaciones especiales	Nimonic, Inconel, Monel, Hastelloy	≤2000		<input checked="" type="radio"/>
Titanio y aleaciones de titanio	<b>3.7024</b> Ti99,5, <b>3.7114</b> TiAl5Sn2,5, <b>3.7124</b> TiCu2	≤850		<input checked="" type="radio"/>
	<b>3.7154</b> TiAl6Zr5, <b>3.7165</b> TiAl6V4, <b>3.7184</b> TiAl4Mo4Sn2,5, - TiAl8Mo1V1	≤1400		<input checked="" type="radio"/>
Aluminio y aleaciones de Al	<b>3.0255</b> Al99,5, <b>3.2315</b> AlMgSi1, <b>3.3515</b> AlMg1	≤400		<input type="radio"/>
Aleaciones maleables de Al	<b>3.0615</b> AlMgSiPb, <b>3.1325</b> AlCuMg1, <b>3.3245</b> AlMg3Si, <b>3.4365</b> AlZnMgCu1,5	≤650		<input type="radio"/>
Aleac. fund. de Al ≤ 10 % Si	<b>3.2131</b> G-AlSi5Cu1, <b>3.2153</b> G-AlSi7Cu3, <b>3.2573</b> G-AlSi9	≤600		<input type="radio"/>
> 10 % Si	<b>3.2581</b> G-AlSi12, <b>3.2583</b> G-AlSi12Cu, - G-AlSi12CuNiMg	≤600		<input type="radio"/>
Aleaciones de magnesio	<b>3.5200</b> MgMn2, <b>3.5812.05</b> G-MgAl8Zn1, <b>3.5612.05</b> G-MgAl6Zn1	≤400		<input type="radio"/>
Cobre de baja aleación	<b>2.0070</b> SE-Cu, <b>2.1020</b> CuSn6, <b>2.1096</b> G-CuSn5ZnPb	≤500		<input type="radio"/>
Latón, viruta corta	<b>2.0380</b> CuZn39Pb2, <b>2.0401</b> CuZn39Pb3, <b>2.0410</b> CuZn43Pb2	≤600		<input type="radio"/>
viruta larga	<b>2.0250</b> CuZn20, <b>2.0280</b> CuZn33, <b>2.0332</b> CuZn37Pb0,5	≤600		<input type="radio"/>
Bronces, viruta corta	<b>2.1090</b> CuSn7ZnPb, <b>2.1170</b> CuPb5Sn5, <b>2.1176</b> CuPb10Sn	≤600		<input type="radio"/>
	<b>2.0790</b> CuNi18Zn19Pb	≤850		<input checked="" type="radio"/>
Bronces, viruta larga	<b>2.0916</b> CuAl5, <b>2.0960</b> CuAl9Mn, <b>2.1050</b> CuSn10	≤850		<input checked="" type="radio"/>
	<b>2.0980</b> CuAl11Ni, <b>2.1247</b> CuBe2	≤1000		<input checked="" type="radio"/>
Duroplásticos	Resina epoxídica, Resopal, Pertinax, Moltopren	≤150		<input type="radio"/>
Termoplásticos	Plexiglas, Hostalen, Novodur, Makralon	≤100		<input type="radio"/>
Materiales sintéticos	Kevlar	≤1000		<input type="radio"/>
Fibras de vidrio/carbón	GFK/CFK	≤1000		<input type="radio"/>



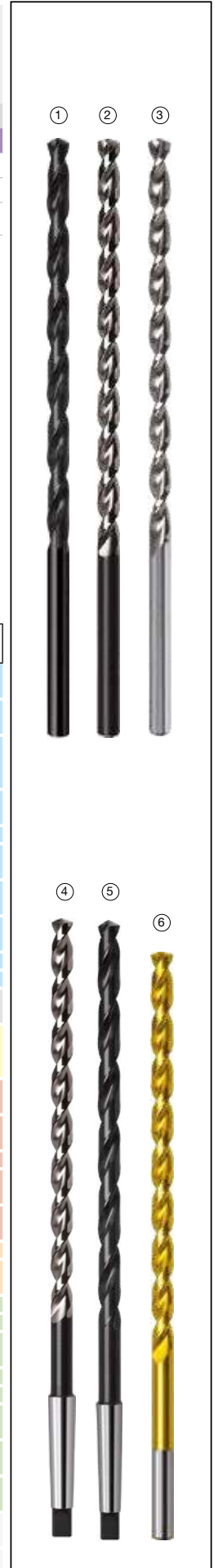
# HARTNER

81410	82310	81450	81440	81740	82340	82466
81510	82410		81540	81750	82440	82467
81610			81640	81760		82468
						82469
1869	1870	1869	1869	Est.	1870	Est.
<b>HSS</b>						
N	N	FW	FN	FN	FN	FN
147/152/ 156	186/189	149	148/153/ 157	159-161	187/190	191-194
①	⑤	③	②	④	④	④

84425
84426
1869
<b>HSS</b>
GT 100
150/154
⑥

81441
81541
81641
1869
<b>HSS-E</b>
FN
151/155/ 158
②

82341
1870
<b>HSS-E</b>
FN
188
④



V <sub>c</sub> m/min	N° de serie de avance					
22	5	5	5	5	5	5
18	4	4	4	4	4	4
20 22	5	5	5	5	5	5
20 18	4	4	4	4	4	4
25 22	4	4	4	4	4	4
25 18	4	4	4	4	4	4
12	3	3				
22	5	5	5	5	5	5
10	3	3				
8	3	3				
12	3	3	3	3	3	3
6	2	2	2	2	2	2
6	2	2				
22	5	5	5	5	5	5
18	5	5	5	5	5	5
20	5	5	5	5	5	5
14	5	5	5	5	5	5
55	6					
55	6					
45	6	6	6	6	6	6
36	5	5	5	5	5	5
55	5	5	5	5	5	5
22	4	4	4	4	4	4
45	4	4				
28	4	4	4	4	4	4
22	3	3	3	3	3	3
20	3	3	3	3	3	3
18	3	3	3	3	3	3
12	3	3	3	3	3	3
18	4	4	4	4	4	4

V <sub>c</sub> m/min	N° de avance	V <sub>c</sub> m/min	N° de avance	V <sub>c</sub> m/min	N° de avance
28	5	30	4	30	4
22	4	25	4	25	4
28	5	33	4	33	4
22	4	30	4	30	4
28	4	33	4	33	4
22	4	33	4	33	4
16	3	20	3	20	3
		14	3	14	3
		10	2	10	2
28	5	29	4	29	4
		14	3	14	3
		10	2	10	2
		10	3	10	3
		8	2	8	2
12	3	11	3	11	3
8	2	8	2	8	2
		8	2	8	2
		5	1	5	1
		3	1	3	1
		10	3	10	3
		8	2	8	2
		10	2	10	2
28	5	20	5	20	5
22	5	16	5	16	5
25	5	5	2	5	2
18	5				
6	1	5	1	5	1
		6	1	6	1
		5	1	5	1
70	6				
70	6				
55	6	50	6	50	6
45	5	40	5	70	5
70	5				
28	4	30	4	30	4
		45	4	45	4
36	4	30	4	30	4
28	3	25	4	25	4
25	3	20	4	20	4
22	3	16	3	16	3
18	3	10	3	10	3
15	3	14	3	14	3
22	4	20	3	20	3

## Aplicaciones recomendadas microbrocas

Artículo no. 

Artículo no. 

Norma/DIN

Material de corte

Calidad de metal duro

Superficie

Tipo

Refrigeración

Dimens. página



Hta. Ø mm	N° de serie de avance								
	101	102	103	104	105	106	107	108	109
	f (mm/vuelta)								
0,10	0,002	0,003	0,003	0,004	0,006	0,007	0,010	0,013	0,016
0,16	0,002	0,003	0,004	0,005	0,007	0,009	0,012	0,016	0,022
0,25	0,003	0,004	0,005	0,007	0,009	0,011	0,014	0,019	0,024
0,30	0,004	0,005	0,007	0,009	0,011	0,015	0,019	0,025	0,033
0,50	0,005	0,007	0,008	0,011	0,014	0,019	0,024	0,031	0,041
0,63	0,007	0,009	0,012	0,015	0,020	0,026	0,034	0,044	0,057
0,80	0,010	0,013	0,016	0,020	0,024	0,031	0,038	0,048	0,060
1,00	0,020	0,024	0,029	0,035	0,041	0,050	0,060	0,072	0,086
1,50	0,030	0,035	0,040	0,046	0,052	0,060	0,069	0,080	0,092
2,00	0,040	0,046	0,053	0,061	0,070	0,080	0,093	0,106	0,122
















































Hta. Ø mm	N° de serie de avance Art.-no. 6400/6401/6408/6412												
	56	57	58	59	60	61	62	63	64	65	66	67	68
	f (mm/vuelta)												
0,80	0,008	0,016	0,024	0,032	0,04	0,05	0,06	0,07	0,08	0,08	0,08	0,09	0,09
1,00	0,012	0,022	0,032	0,042	0,06	0,07	0,08	0,09	0,10	0,10	0,11	0,11	0,12
1,50	0,021	0,036	0,051	0,066	0,09	0,10	0,12	0,13	0,15	0,15	0,16	0,17	0,18
2,00	0,032	0,052	0,072	0,092	0,12	0,14	0,16	0,18	0,20	0,21	0,22	0,23	0,24
2,50	0,045	0,070	0,095	0,120	0,15	0,17	0,20	0,22	0,25	0,26	0,27	0,28	0,30
3,00	0,060	0,090	0,120	0,150	0,18	0,21	0,24	0,27	0,30	0,31	0,33	0,34	0,36

Refrigerante según material:

-  Aire
-  Aceite
-  Emulsión

Sentido de corte:

-  corte a derechas
-  corte a izquierdas

Grupo de materiales	Ejemplos Cifras en negrita = n° de mat. según DIN EN 10 027	Resistencia N/mm <sup>2</sup>	Dureza	Refriger.
Aceros de construcción generales	<b>1.0035</b> S185(St33), <b>1.0486</b> P275N(StE285), <b>1.0345</b> P235GH(H1), <b>1.0425</b> P265GH(H2) <b>1.0050</b> E295 (St50-2), <b>1.0070</b> E360 (St70-2), <b>1.8937</b> P500NH (WStE500)	≤500 ≤1000		 
Aceros para autómatas	<b>1.0718</b> 11SMnPb30 (9SMnPb28), <b>1.0736</b> 11SMn37 (9SMn36) <b>1.0727</b> 46S20 (45S20), <b>1.0728</b> (60S20), <b>1.0757</b> 46SPb20 (45SPb20)	≤850 ≤1000		 
Aceros de bonificación no aleados	<b>1.0402</b> C22, <b>1.1178</b> C30E (Ck30) <b>1.0503</b> C45, <b>1.1191</b> C45E (Ck45) <b>1.0601</b> C60, <b>1.1221</b> C60E (Ck60)	≤700 ≤850 ≤1000		  
Aceros de bonificación aleados	<b>1.5131</b> 50MnSi4, <b>1.7003</b> 38Cr2, <b>1.7030</b> 28Cr4 <b>1.5710</b> 36NiCr6, <b>1.7035</b> 41Cr4, <b>1.7225</b> 42CrMo4	≤1000 ≤1400		 
Aceros cementación aleados	<b>1.0301</b> (C10), <b>1.1121</b> C10E (Ck10)	≤850		
Aceros cementación no aleados	<b>1.7276</b> 10CrMo11, <b>1.5125</b> 11MnSi6 <b>1.5752</b> 15NiCr13, <b>1.7131</b> 16MnCr5, <b>1.7264</b> 20CrMo5	≤1000 ≤1400		 
Aceros de nitruración	<b>1.8504</b> 34CrAl6 <b>1.8519</b> 31CrMoV9, <b>1.8550</b> 34CrAlNi7	≤1000 ≤1400		 
Aceros para herramientas	<b>1.1750</b> C75W, <b>1.2067</b> 102Cr6, <b>1.2307</b> 29CrMoV9 <b>1.2080</b> X210Cr12, <b>1.2083</b> X42Cr13, <b>1.2419</b> 105WCr6, <b>1.2767</b> X45NiCrMo4	≤850 ≤1400		 
Aceros rápidos	<b>1.3243</b> S 6-5-2-5, <b>1.3343</b> S 6-5-2, <b>1.3344</b> S 6-5-3	≤1400		
Aceros para muelles	<b>1.5026</b> 55Si7, <b>1.7176</b> 55Cr3, <b>1.8159</b> 51CrV4 (51CrV4)		≤350 HB	
Aceros templados	-		≤48 HRC ≤66 HRC	 
Aceros inox., sulfurados austeníticos	<b>1.4005</b> X12CrS13, <b>1.4104</b> X14CrMoS17, <b>1.4105</b> X6CrMoS17, <b>1.4305</b> X8CrNiS18-9 <b>1.4301</b> X5CrNi18-10 (V2A), <b>1.4541</b> X6CrNiTi18-10, <b>1.4571</b> X6CrNiMoTi 17-12-2 (V4A)	≤900 ≤1100		 
Aceros inox., sulfurados martensíticos	<b>1.4057</b> X20CrNi172 (X17CrNi16-2), <b>1.4122</b> X39CrMo17-1, <b>1.4521</b> X2CrMoTi18-2	≤1500		
Hierro fundido	<b>0.6010</b> EN-GJL-100 (GG10), <b>0.6020</b> EN-GJL-200 (GG20) <b>0.6025</b> EN-GJL-250 (GG25), <b>0.6035</b> EN-GJL-350 (GG35)		≤240 HB ≤350 HB	 
Fundición de grafito esférico y fundición maleable	<b>0.7050</b> EN-GJS-500-7 (GGG50), <b>0.8035</b> EN-GJMW-350-4 (GTW35) <b>0.7070</b> EN-GJS-700-2 (GGG70), <b>0.8170</b> EN-GJMB-700-2 (GTS70)		≤240 HB ≤350 HB	 
Fundición dura	-		≤350 HB	
Nuevos mat. de fundición GGV	<b>EN-GJV250</b> (GGV25), <b>EN-GJV350</b> (GGV35) <b>EN-GJV400</b> (GGV40), <b>EN-GJV500</b> (GGV50), SiMo 6		≤220 HB ≤300 HB	 
Nuevos mat. de fundición ADI	<b>EN-GJS-800-8</b> (ADI800), <b>EN-GJS-1000-5</b> (ADI1000) <b>EN-GJS-1200-2</b> (ADI1200), <b>EN-GJS-1400-1</b> (ADI1400)	≤1000 ≤1400		 
Aleaciones especiales	Nimonic, Inconel, Monel, Hastelloy	≤2000		
Titanio y aleaciones de titanio	<b>3.7024</b> Ti99,5, <b>3.7114</b> TiAl5Sn2,5, <b>3.7124</b> TiCu2 <b>3.7154</b> TiAl6Zr5, <b>3.7165</b> TiAl6V4, <b>3.7184</b> TiAl4Mo4Sn2,5, - TiAl8Mo1V1	≤850 ≤1400		 
Aluminio y aleaciones de Al	<b>3.0255</b> Al99,5, <b>3.2315</b> AlMgSi1, <b>3.3515</b> AlMg1	≤400		
Aleaciones maleables de Al	<b>3.0615</b> AlMgSiPb, <b>3.1325</b> AlCuMg1, <b>3.3245</b> AlMg3Si, <b>3.4365</b> AlZnMgCu1,5	≤650		
Aleac. fund. de Al ≤ 10 % Si	<b>3.2131</b> G-AlSi5Cu1, <b>3.2153</b> G-AlSi7Cu3, <b>3.2573</b> G-AlSi9	≤600		
Aleac. fund. de Al > 10 % Si	<b>3.2581</b> G-AlSi12, <b>3.2583</b> G-AlSi12Cu, - G-AlSi12CuNiMg	≤600		
Aleaciones de magnesio	<b>3.5200</b> MgMn2, <b>3.5812.05</b> G-MgAl8Zn1, <b>3.5612.05</b> G-MgAl6Zn1	≤400		
Cobre de baja aleación	<b>2.0070</b> SE-Cu, <b>2.1020</b> CuSn6, <b>2.1096</b> G-CuSn5ZnPb	≤500		
Latón, viruta corta	<b>2.0380</b> CuZn39Pb2, <b>2.0401</b> CuZn39Pb3, <b>2.0410</b> CuZn43Pb2	≤600		
viruta larga	<b>2.0250</b> CuZn20, <b>2.0280</b> CuZn33, <b>2.0332</b> CuZn37Pb0,5	≤600		
Bronces, viruta corta	<b>2.1090</b> CuSn7ZnPb, <b>2.1170</b> CuPb5Sn5, <b>2.1176</b> CuPb10Sn <b>2.0790</b> CuNi18Zn19Pb	≤600 ≤850		 
Bronces, viruta larga	<b>2.0916</b> CuAl5, <b>2.0960</b> CuAl9Mn, <b>2.1050</b> CuSn10 <b>2.0980</b> CuAl11Ni, <b>2.1247</b> CuBe2	≤850 ≤1000		 
Duroplásticos	Resina epoxídica, Resopal, Pertinax, Moltopren	≤150		
Termoplásticos	Plexiglas, Hostalen, Novodur, Makralon	≤100		
Materiales sintéticos	Kevlar	≤1000		
Fibras de vidrio/carbón	GFK/CFK	≤1000		





## Aplicaciones recomendadas TS-Drills

Artículo no.

Norma/DIN

Material de corte

Calidad de metal duro

Superficie

Tipo

Forma del mango

Refrigeración

Dimens. página

Las herramientas con n° de código de series de avance impreso en negrita (código VR) se deberían elegir con preferencia.

Hta. Ø mm	N° de serie de avance								
	1	2	3	4	5	6	7	8	9
	f (mm/vuelta)								
<b>0,50</b>	0,004	0,006	0,007	0,008	0,010	0,012	0,014	0,016	0,019
<b>1,00</b>	0,006	0,008	0,012	0,014	0,016	0,018	0,020	0,023	0,025
<b>2,00</b>	0,020	0,025	0,032	0,040	0,050	0,063	0,080	0,100	0,125
<b>2,50</b>	0,025	0,032	0,040	0,050	0,063	0,080	0,100	0,125	0,160
<b>3,15</b>	0,032	0,040	0,050	0,063	0,080	0,100	0,125	0,160	0,160
<b>4,00</b>	0,040	0,050	0,063	0,080	0,100	0,125	0,160	0,200	0,200
<b>5,00</b>	0,040	0,050	0,063	0,080	0,100	0,125	0,160	0,200	0,250
<b>6,30</b>	0,050	0,063	0,080	0,100	0,125	0,160	0,200	0,250	0,315
<b>8,00</b>	0,063	0,080	0,100	0,125	0,160	0,200	0,250	0,315	0,315
<b>10,00</b>	0,080	0,100	0,125	0,160	0,200	0,250	0,315	0,400	0,400
<b>12,50</b>	0,080	0,100	0,125	0,160	0,200	0,250	0,315	0,400	0,500
<b>16,00</b>	0,100	0,125	0,160	0,200	0,250	0,315	0,400	0,500	0,630
<b>20,00</b>	0,125	0,160	0,200	0,250	0,315	0,400	0,500	0,630	0,630
<b>25,00</b>	0,160	0,200	0,250	0,315	0,400	0,500	0,630	0,800	0,800
<b>31,50</b>	0,160	0,200	0,250	0,315	0,400	0,500	0,630	0,800	1,000
<b>40,00</b>	0,200	0,250	0,315	0,400	0,500	0,630	0,800	1,000	1,250
<b>50,00</b>	0,250	0,310	0,400	0,500	0,630	0,800	1,000	1,250	1,250
<b>63,00</b>	0,315	0,400	0,500	0,630	0,800	1,000	1,250	1,600	1,600
<b>80,00</b>	0,400	0,500	0,630	0,800	1,000	1,250	1,600	1,600	2,000

Refrigerante según material:

- Aire
- Aceite
- Emulsión

Sentido de corte:

- corte a derechas
- corte a izquierdas

Grupo de materiales	Ejemplos Cifras en negrita = n° de mat. según DIN EN 10 027	Resistencia N/mm <sup>2</sup>	Dureza	Refriger.
Aceros de construcción generales	<b>1.0035</b> S185(St33), <b>1.0486</b> P275N(StE285), <b>1.0345</b> P235GH(H1), <b>1.0425</b> P265GH(H2) <b>1.0050</b> E295 (St50-2), <b>1.0070</b> E360 (St70-2), <b>1.8937</b> P500NH (WStE500)	≤500 ≤1000		<input type="radio"/> <input type="radio"/>
Aceros para autómatas	<b>1.0718</b> 11SMnPb30 (9SMnPb28), <b>1.0736</b> 11SMn37 (9SMn36) <b>1.0727</b> 46S20 (45S20), <b>1.0728</b> (60S20), <b>1.0757</b> 46SPb20 (45SPb20)	≤850 ≤1000		<input type="radio"/> <input type="radio"/>
Aceros de bonificación no aleados	<b>1.0402</b> C22, <b>1.1178</b> C30E (Ck30) <b>1.0503</b> C45, <b>1.1191</b> C45E (Ck45) <b>1.0601</b> C60, <b>1.1221</b> C60E (Ck60)	≤700 ≤850 ≤1000		<input type="radio"/> <input type="radio"/> <input type="radio"/>
Aceros de bonificación aleados	<b>1.5131</b> 50MnSi4, <b>1.7003</b> 38Cr2, <b>1.7030</b> 28Cr4 <b>1.5710</b> 36NiCr6, <b>1.7035</b> 41Cr4, <b>1.7225</b> 42CrMo4	≤1000 ≤1400		<input type="radio"/> <input type="radio"/>
Aceros cementación aleados	<b>1.0301</b> (C10), <b>1.1121</b> C10E (Ck10)	≤850		<input type="radio"/>
Aceros cementación no aleados	<b>1.7276</b> 10CrMo11, <b>1.5125</b> 11MnSi6 <b>1.5752</b> 15NiCr13, <b>1.7131</b> 16MnCr5, <b>1.7264</b> 20CrMo5	≤1000 ≤1400		<input checked="" type="radio"/> <input checked="" type="radio"/>
Aceros de nitruración	<b>1.8504</b> 34CrAl6 <b>1.8519</b> 31CrMoV9, <b>1.8550</b> 34CrAlNi7	≤1000 ≤1400		<input type="radio"/> <input checked="" type="radio"/>
Aceros para herramientas	<b>1.1750</b> C75W, <b>1.2067</b> 102Cr6, <b>1.2307</b> 29CrMoV9 <b>1.2080</b> X210Cr12, <b>1.2083</b> X42Cr13, <b>1.2419</b> 105WCr6, <b>1.2767</b> X45NiCrMo4	≤850 ≤1400		<input type="radio"/> <input checked="" type="radio"/>
Aceros rápidos	<b>1.3243</b> S 6-5-2-5, <b>1.3343</b> S 6-5-2, <b>1.3344</b> S 6-5-3	≤1400		<input checked="" type="radio"/>
Aceros para muelles	<b>1.5026</b> 55Si7, <b>1.7176</b> 55Cr3, <b>1.8159</b> 51CrV4 (51CrV4)		≤350 HB	<input checked="" type="radio"/>
Aceros templados	-		≤48 HRC ≤66 HRC	<input checked="" type="radio"/> <input checked="" type="radio"/>
Aceros inox., sulfurados austeníticos	<b>1.4005</b> X12CrS13, <b>1.4104</b> X14CrMoS17, <b>1.4105</b> X6CrMoS17, <b>1.4305</b> X8CrNiS18-9 <b>1.4301</b> X5CrNi18-10 (V2A), <b>1.4541</b> X6CrNiTi18-10, <b>1.4571</b> X6CrNiMoTi 17-12-2 (V4A)	≤900 ≤1100		<input checked="" type="radio"/> <input checked="" type="radio"/>
Aceros inox., sulfurados martensíticos	<b>1.4057</b> X20CrNi172 (X17CrNi16-2), <b>1.4122</b> X39CrMo17-1, <b>1.4521</b> X2CrMoTi18-2	≤1500		<input checked="" type="radio"/>
Hierro fundido	<b>0.6010</b> EN-GJL-100 (GG10), <b>0.6020</b> EN-GJL-200 (GG20) <b>0.6025</b> EN-GJL-250 (GG25), <b>0.6035</b> EN-GJL-350 (GG35)		≤240 HB ≤350 HB	<input type="radio"/> <input type="radio"/> <input type="radio"/>
Fundición de grafito esférico y fundición maleable	<b>0.7050</b> EN-GJS-500-7 (GGG50), <b>0.8035</b> EN-GJMW-350-4 (GTW35) <b>0.7070</b> EN-GJS-700-2 (GGG70), <b>0.8170</b> EN-GJMB-700-2 (GTS70)		≤240 HB ≤350 HB	<input type="radio"/> <input type="radio"/>
Fundición dura	-		≤350 HB	<input type="radio"/>
Nuevos mat. de fundición GGV	<b>EN-GJV250</b> (GGV25), <b>EN-GJV350</b> (GGV35) <b>EN-GJV400</b> (GGV40), <b>EN-GJV500</b> (GGV50), SiMo 6		≤220 HB ≤300 HB	<input type="radio"/> <input type="radio"/>
Nuevos mat. de fundición ADI	<b>EN-GJS-800-8</b> (ADI800), <b>EN-GJS-1000-5</b> (ADI1000) <b>EN-GJS-1200-2</b> (ADI1200), <b>EN-GJS-1400-1</b> (ADI1400)	≤1000 ≤1400		<input type="radio"/> <input type="radio"/>
Aleaciones especiales	Nimonic, Inconel, Monel, Hastelloy	≤2000		<input checked="" type="radio"/>
Titanio y aleaciones de titanio	<b>3.7024</b> Ti99,5, <b>3.7114</b> TiAl5Sn2,5, <b>3.7124</b> TiCu2 <b>3.7154</b> TiAl6Zr5, <b>3.7165</b> TiAl6V4, <b>3.7184</b> TiAl4Mo4Sn2,5, - TiAl8Mo1V1	≤850 ≤1400		<input checked="" type="radio"/> <input checked="" type="radio"/>
Aluminio y aleaciones de Al	<b>3.0255</b> Al99,5, <b>3.2315</b> AlMgSi1, <b>3.3515</b> AlMg1	≤400		<input type="radio"/>
Aleaciones maleables de Al	<b>3.0615</b> AlMgSiPb, <b>3.1325</b> AlCuMg1, <b>3.3245</b> AlMg3Si, <b>3.4365</b> AlZnMgCu1,5	≤650		<input type="radio"/>
Aleac. fund. de Al ≤ 10 % Si	<b>3.2131</b> G-AlSi5Cu1, <b>3.2153</b> G-AlSi7Cu3, <b>3.2573</b> G-AlSi9	≤600		<input type="radio"/>
Aleac. fund. de Al > 10 % Si	<b>3.2581</b> G-AlSi12, <b>3.2583</b> G-AlSi12Cu, - G-AlSi12CuNiMg	≤600		<input type="radio"/>
Aleaciones de magnesio	<b>3.5200</b> MgMn2, <b>3.5812.05</b> G-MgAl8Zn1, <b>3.5612.05</b> G-MgAl6Zn1	≤400		<input type="radio"/>
Cobre de baja aleación	<b>2.0070</b> SE-Cu, <b>2.1020</b> CuSn6, <b>2.1096</b> G-CuSn5ZnPb	≤500		<input type="radio"/>
Latón, viruta corta	<b>2.0380</b> CuZn39Pb2, <b>2.0401</b> CuZn39Pb3, <b>2.0410</b> CuZn43Pb2	≤600		<input type="radio"/>
Latón, viruta larga	<b>2.0250</b> CuZn20, <b>2.0280</b> CuZn33, <b>2.0332</b> CuZn37Pb0,5	≤600		<input type="radio"/>
Bronces, viruta corta	<b>2.1090</b> CuSn7ZnPb, <b>2.1170</b> CuPb5Sn5, <b>2.1176</b> CuPb10Sn <b>2.0790</b> CuNi18Zn19Pb	≤600 ≤850		<input type="radio"/> <input checked="" type="radio"/>
Bronces, viruta larga	<b>2.0916</b> CuAl5, <b>2.0960</b> CuAl9Mn, <b>2.1050</b> CuSn10 <b>2.0980</b> CuAl11Ni, <b>2.1247</b> CuBe2	≤850 ≤1000		<input checked="" type="radio"/> <input checked="" type="radio"/>
Duroplásticos	Resina epoxídica, Resopal, Pertinax, Moltopren	≤150		<input type="radio"/>
Termoplásticos	Plexiglas, Hostalen, Novodur, Makralon	≤100		<input type="radio"/>
Materiales sintéticos	Kevlar	≤1000		<input type="radio"/>
Fibras de vidrio/carbón	GFK/CFK	≤1000		<input type="radio"/>







## Aplicaciones recomendadas TS-Drills

Artículo no.

Norma/DIN

Material de corte

Calidad de metal duro

Superficie

Tipo

Forma del mango

Refrigeración

Dimens. página

Las herramientas con n° de código de series de avance impreso en negrita (código VR) se deberían elegir con preferencia.

Hta. Ø mm	N° de serie de avance								
	1	2	3	4	5	6	7	8	9
	f (mm/vuelta)								
<b>0,50</b>	0,004	0,006	0,007	0,008	0,010	0,012	0,014	0,016	0,019
<b>1,00</b>	0,006	0,008	0,012	0,014	0,016	0,018	0,020	0,023	0,025
<b>2,00</b>	0,020	0,025	0,032	0,040	0,050	0,063	0,080	0,100	0,125
<b>2,50</b>	0,025	0,032	0,040	0,050	0,063	0,080	0,100	0,125	0,160
<b>3,15</b>	0,032	0,040	0,050	0,063	0,080	0,100	0,125	0,160	0,160
<b>4,00</b>	0,040	0,050	0,063	0,080	0,100	0,125	0,160	0,200	0,200
<b>5,00</b>	0,040	0,050	0,063	0,080	0,100	0,125	0,160	0,200	0,250
<b>6,30</b>	0,050	0,063	0,080	0,100	0,125	0,160	0,200	0,250	0,315
<b>8,00</b>	0,063	0,080	0,100	0,125	0,160	0,200	0,250	0,315	0,315
<b>10,00</b>	0,080	0,100	0,125	0,160	0,200	0,250	0,315	0,400	0,400
<b>12,50</b>	0,080	0,100	0,125	0,160	0,200	0,250	0,315	0,400	0,500
<b>16,00</b>	0,100	0,125	0,160	0,200	0,250	0,315	0,400	0,500	0,630
<b>20,00</b>	0,125	0,160	0,200	0,250	0,315	0,400	0,500	0,630	0,630
<b>25,00</b>	0,160	0,200	0,250	0,315	0,400	0,500	0,630	0,800	0,800
<b>31,50</b>	0,160	0,200	0,250	0,315	0,400	0,500	0,630	0,800	1,000
<b>40,00</b>	0,200	0,250	0,315	0,400	0,500	0,630	0,800	1,000	1,250
<b>50,00</b>	0,250	0,310	0,400	0,500	0,630	0,800	1,000	1,250	1,250
<b>63,00</b>	0,315	0,400	0,500	0,630	0,800	1,000	1,250	1,600	1,600
<b>80,00</b>	0,400	0,500	0,630	0,800	1,000	1,250	1,600	1,600	2,000

Refrigerante según material:

- Aire
- Aceite
- Emulsión

Sentido de corte:


- corte a derechas
- corte a izquierdas

Grupo de materiales	Ejemplos Cifras en negrita = n° de mat. según DIN EN 10 027	Resistencia N/mm <sup>2</sup>	Dureza	Refriger.
Aceros de construcción generales	<b>1.0035</b> S185(St33), <b>1.0486</b> P275N(StE285), <b>1.0345</b> P235GH(H1), <b>1.0425</b> P265GH(H2) <b>1.0050</b> E295 (St50-2), <b>1.0070</b> E360 (St70-2), <b>1.8937</b> P500NH (WStE500)	≤500 ≤1000		<input type="radio"/> <input type="radio"/>
Aceros para autómatas	<b>1.0718</b> 11SMnPb30 (9SMnPb28), <b>1.0736</b> 11SMn37 (9SMn36) <b>1.0727</b> 46S20 (45S20), <b>1.0728</b> (60S20), <b>1.0757</b> 46SPb20 (45SPb20)	≤850 ≤1000		<input type="radio"/> <input type="radio"/>
Aceros de bonificación no aleados	<b>1.0402</b> C22, <b>1.1178</b> C30E (Ck30) <b>1.0503</b> C45, <b>1.1191</b> C45E (Ck45) <b>1.0601</b> C60, <b>1.1221</b> C60E (Ck60)	≤700 ≤850 ≤1000		<input type="radio"/> <input type="radio"/> <input type="radio"/>
Aceros de bonificación aleados	<b>1.5131</b> 50MnSi4, <b>1.7003</b> 38Cr2, <b>1.7030</b> 28Cr4 <b>1.5710</b> 36NiCr6, <b>1.7035</b> 41Cr4, <b>1.7225</b> 42CrMo4	≤1000 ≤1400		<input type="radio"/> <input type="radio"/>
Aceros cementación aleados	<b>1.0301</b> (C10), <b>1.1121</b> C10E (Ck10)	≤850		<input type="radio"/>
Aceros cementación no aleados	<b>1.7276</b> 10CrMo11, <b>1.5125</b> 11MnSi6 <b>1.5752</b> 15NiCr13, <b>1.7131</b> 16MnCr5, <b>1.7264</b> 20CrMo5	≤1000 ≤1400		<input checked="" type="radio"/> <input checked="" type="radio"/>
Aceros de nitruración	<b>1.8504</b> 34CrAl6 <b>1.8519</b> 31CrMoV9, <b>1.8550</b> 34CrAlNi7	≤1000 ≤1400		<input type="radio"/> <input checked="" type="radio"/>
Aceros para herramientas	<b>1.1750</b> C75W, <b>1.2067</b> 102Cr6, <b>1.2307</b> 29CrMoV9 <b>1.2080</b> X210Cr12, <b>1.2083</b> X42Cr13, <b>1.2419</b> 105WCr6, <b>1.2767</b> X45NiCrMo4	≤850 ≤1400		<input type="radio"/> <input checked="" type="radio"/>
Aceros rápidos	<b>1.3243</b> S 6-5-2-5, <b>1.3343</b> S 6-5-2, <b>1.3344</b> S 6-5-3	≤1400		<input checked="" type="radio"/>
Aceros para muelles	<b>1.5026</b> 55Si7, <b>1.7176</b> 55Cr3, <b>1.8159</b> 51CrV4 (51CrV4)		≤350 HB	<input checked="" type="radio"/>
Aceros templados	-		≤48 HRC ≤66 HRC	<input checked="" type="radio"/> <input checked="" type="radio"/>
Aceros inox., sulfurados austeníticos	<b>1.4005</b> X12CrS13, <b>1.4104</b> X14CrMoS17, <b>1.4105</b> X6CrMoS17, <b>1.4305</b> X8CrNiS18-9 <b>1.4301</b> X5CrNi18-10 (V2A), <b>1.4541</b> X6CrNiTi18-10, <b>1.4571</b> X6CrNiMoTi 17-12-2 (V4A)	≤900 ≤1100		<input checked="" type="radio"/> <input checked="" type="radio"/>
Aceros inox., sulfurados martensíticos	<b>1.4057</b> X20CrNi172 (X17CrNi16-2), <b>1.4122</b> X39CrMo17-1, <b>1.4521</b> X2CrMoTi18-2	≤1500		<input checked="" type="radio"/>
Hierro fundido	<b>0.6010</b> EN-GJL-100 (GG10), <b>0.6020</b> EN-GJL-200 (GG20) <b>0.6025</b> EN-GJL-250 (GG25), <b>0.6035</b> EN-GJL-350 (GG35)		≤240 HB ≤350 HB	<input type="radio"/> <input type="radio"/>
Fundición de grafito esférico y fundición maleable	<b>0.7050</b> EN-GJS-500-7 (GGG50), <b>0.8035</b> EN-GJMW-350-4 (GTW35) <b>0.7070</b> EN-GJS-700-2 (GGG70), <b>0.8170</b> EN-GJMB-700-2 (GTS70)		≤240 HB ≤350 HB	<input type="radio"/> <input type="radio"/>
Fundición dura	-		≤350 HB	<input type="radio"/>
Nuevos mat. de fundición GGV	<b>EN-GJV250</b> (GGV25), <b>EN-GJV350</b> (GGV35) <b>EN-GJV400</b> (GGV40), <b>EN-GJV500</b> (GGV50), SiMo 6		≤220 HB ≤300 HB	<input type="radio"/> <input type="radio"/>
Nuevos mat. de fundición ADI	<b>EN-GJS-800-8</b> (ADI800), <b>EN-GJS-1000-5</b> (ADI1000) <b>EN-GJS-1200-2</b> (ADI1200), <b>EN-GJS-1400-1</b> (ADI1400)	≤1000 ≤1400		<input type="radio"/> <input type="radio"/>
Aleaciones especiales	Nimonic, Inconel, Monel, Hastelloy	≤2000		<input checked="" type="radio"/>
Titanio y aleaciones de titanio	<b>3.7024</b> Ti99,5, <b>3.7114</b> TiAl5Sn2,5, <b>3.7124</b> TiCu2 <b>3.7154</b> TiAl6Zr5, <b>3.7165</b> TiAl6V4, <b>3.7184</b> TiAl4Mo4Sn2,5, - TiAl8Mo1V1	≤850 ≤1400		<input checked="" type="radio"/> <input checked="" type="radio"/>
Aluminio y aleaciones de Al	<b>3.0255</b> Al99,5, <b>3.2315</b> AlMgSi1, <b>3.3515</b> AlMg1	≤400		<input type="radio"/>
Aleaciones maleables de Al	<b>3.0615</b> AlMgSiPb, <b>3.1325</b> AlCuMg1, <b>3.3245</b> AlMg3Si, <b>3.4365</b> AlZnMgCu1,5	≤650		<input type="radio"/>
Aleac. fund. de Al ≤ 10 % Si	<b>3.2131</b> G-AlSi5Cu1, <b>3.2153</b> G-AlSi7Cu3, <b>3.2573</b> G-AlSi9	≤600		<input type="radio"/>
Aleac. fund. de Al > 10 % Si	<b>3.2581</b> G-AlSi12, <b>3.2583</b> G-AlSi12Cu, - G-AlSi12CuNiMg	≤600		<input type="radio"/>
Aleaciones de magnesio	<b>3.5200</b> MgMn2, <b>3.5812.05</b> G-MgAl8Zn1, <b>3.5612.05</b> G-MgAl6Zn1	≤400		<input type="radio"/>
Cobre de baja aleación	<b>2.0070</b> SE-Cu, <b>2.1020</b> CuSn6, <b>2.1096</b> G-CuSn5ZnPb	≤500		<input type="radio"/>
Latón, viruta corta	<b>2.0380</b> CuZn39Pb2, <b>2.0401</b> CuZn39Pb3, <b>2.0410</b> CuZn43Pb2	≤600		<input type="radio"/>
viruta larga	<b>2.0250</b> CuZn20, <b>2.0280</b> CuZn33, <b>2.0332</b> CuZn37Pb0,5	≤600		<input type="radio"/>
Bronces, viruta corta	<b>2.1090</b> CuSn7ZnPb, <b>2.1170</b> CuPb5Sn5, <b>2.1176</b> CuPb10Sn <b>2.0790</b> CuNi18Zn19Pb	≤600 ≤850		<input type="radio"/> <input checked="" type="radio"/>
Bronces, viruta larga	<b>2.0916</b> CuAl5, <b>2.0960</b> CuAl9Mn, <b>2.1050</b> CuSn10 <b>2.0980</b> CuAl11Ni, <b>2.1247</b> CuBe2	≤850 ≤1000		<input checked="" type="radio"/> <input checked="" type="radio"/>
Duroplásticos	Resina epoxídica, Resopal, Pertinax, Moltopren	≤150		<input type="radio"/>
Termoplásticos	Plexiglas, Hostalen, Novodur, Makralon	≤100		<input type="radio"/>
Materiales sintéticos	Kevlar	≤1000		<input type="radio"/>
Fibras de vidrio/carbón	GFK/CFK	≤1000		<input type="radio"/>





## Aplicaciones recomendadas TS-Drills

Artículo no.   
 Norma/DIN  
 Material de corte  
 Calidad de metal duro  
 Superficie  
 Tipo  
 Forma del mango  
 Refrigeración  
 Dimens. página



Las herramientas con n° de código de series de avance impreso en negrita (código VR) se deberían elegir con preferencia.

Hta. Ø mm	N° de serie de avance								
	1	2	3	4	5	6	7	8	9
	f (mm/vuelta)								
<b>0,50</b>	0,004	0,006	0,007	0,008	0,010	0,012	0,014	0,016	0,019
<b>1,00</b>	0,006	0,008	0,012	0,014	0,016	0,018	0,020	0,023	0,025
<b>2,00</b>	0,020	0,025	0,032	0,040	0,050	0,063	0,080	0,100	0,125
<b>2,50</b>	0,025	0,032	0,040	0,050	0,063	0,080	0,100	0,125	0,160
<b>3,15</b>	0,032	0,040	0,050	0,063	0,080	0,100	0,125	0,160	0,160
<b>4,00</b>	0,040	0,050	0,063	0,080	0,100	0,125	0,160	0,200	0,200
<b>5,00</b>	0,040	0,050	0,063	0,080	0,100	0,125	0,160	0,200	0,250
<b>6,30</b>	0,050	0,063	0,080	0,100	0,125	0,160	0,200	0,250	0,315
<b>8,00</b>	0,063	0,080	0,100	0,125	0,160	0,200	0,250	0,315	0,315
<b>10,00</b>	0,080	0,100	0,125	0,160	0,200	0,250	0,315	0,400	0,400
<b>12,50</b>	0,080	0,100	0,125	0,160	0,200	0,250	0,315	0,400	0,500
<b>16,00</b>	0,100	0,125	0,160	0,200	0,250	0,315	0,400	0,500	0,630
<b>20,00</b>	0,125	0,160	0,200	0,250	0,315	0,400	0,500	0,630	0,630
<b>25,00</b>	0,160	0,200	0,250	0,315	0,400	0,500	0,630	0,800	0,800
<b>31,50</b>	0,160	0,200	0,250	0,315	0,400	0,500	0,630	0,800	1,000
<b>40,00</b>	0,200	0,250	0,315	0,400	0,500	0,630	0,800	1,000	1,250
<b>50,00</b>	0,250	0,310	0,400	0,500	0,630	0,800	1,000	1,250	1,250
<b>63,00</b>	0,315	0,400	0,500	0,630	0,800	1,000	1,250	1,600	1,600
<b>80,00</b>	0,400	0,500	0,630	0,800	1,000	1,250	1,600	1,600	2,000

Refrigerante según material:

- Aire
- Aceite
- Emulsión

Sentido de corte:

-  corte a derechas
-  corte a izquierdas

Grupo de materiales	Ejemplos Cifras en negrita = n° de mat. según DIN EN 10 027	Resistencia N/mm <sup>2</sup>	Dureza	Refriger.
Aceros de construcción generales	<b>1.0035</b> S185(St33), <b>1.0486</b> P275N(StE285), <b>1.0345</b> P235GH(H1), <b>1.0425</b> P265GH(H2) <b>1.0050</b> E295 (St50-2), <b>1.0070</b> E360 (St70-2), <b>1.8937</b> P500NH (WStE500)	≤500 ≤1000		<input type="radio"/> <input type="radio"/>
Aceros para autómatas	<b>1.0718</b> 11SMnPb30 (9SMnPb28), <b>1.0736</b> 11SMn37 (9SMn36) <b>1.0727</b> 46S20 (45S20), <b>1.0728</b> (60S20), <b>1.0757</b> 46SPb20 (45SPb20)	≤850 ≤1000		<input type="radio"/> <input type="radio"/>
Aceros de bonificación no aleados	<b>1.0402</b> C22, <b>1.1178</b> C30E (Ck30) <b>1.0503</b> C45, <b>1.1191</b> C45E (Ck45) <b>1.0601</b> C60, <b>1.1221</b> C60E (Ck60)	≤700 ≤850 ≤1000		<input type="radio"/> <input type="radio"/> <input type="radio"/>
Aceros de bonificación aleados	<b>1.5131</b> 50MnSi4, <b>1.7003</b> 38Cr2, <b>1.7030</b> 28Cr4 <b>1.5710</b> 36NiCr6, <b>1.7035</b> 41Cr4, <b>1.7225</b> 42CrMo4	≤1000 ≤1400		<input type="radio"/> <input type="radio"/>
Aceros cementación aleados	<b>1.0301</b> (C10), <b>1.1121</b> C10E (Ck10)	≤850		<input type="radio"/>
Aceros cementación no aleados	<b>1.7276</b> 10CrMo11, <b>1.5125</b> 11MnSi6 <b>1.5752</b> 15NiCr13, <b>1.7131</b> 16MnCr5, <b>1.7264</b> 20CrMo5	≤1000 ≤1400		<input checked="" type="radio"/> <input checked="" type="radio"/>
Aceros de nitruración	<b>1.8504</b> 34CrAl6 <b>1.8519</b> 31CrMoV9, <b>1.8550</b> 34CrAlNi7	≤1000 ≤1400		<input type="radio"/> <input checked="" type="radio"/>
Aceros para herramientas	<b>1.1750</b> C75W, <b>1.2067</b> 102Cr6, <b>1.2307</b> 29CrMoV9 <b>1.2080</b> X210Cr12, <b>1.2083</b> X42Cr13, <b>1.2419</b> 105WCr6, <b>1.2767</b> X45NiCrMo4	≤850 ≤1400		<input type="radio"/> <input checked="" type="radio"/>
Aceros rápidos	<b>1.3243</b> S 6-5-2-5, <b>1.3343</b> S 6-5-2, <b>1.3344</b> S 6-5-3	≤1400		<input checked="" type="radio"/>
Aceros para muelles	<b>1.5026</b> 55Si7, <b>1.7176</b> 55Cr3, <b>1.8159</b> 51CrV4 (51CrV4)		≤350 HB	<input checked="" type="radio"/>
Aceros templados	-		≤48 HRC ≤66 HRC	<input checked="" type="radio"/> <input checked="" type="radio"/>
Aceros inox., sulfurados austeníticos	<b>1.4005</b> X12CrS13, <b>1.4104</b> X14CrMoS17, <b>1.4105</b> X6CrMoS17, <b>1.4305</b> X8CrNiS18-9 <b>1.4301</b> X5CrNi18-10 (V2A), <b>1.4541</b> X6CrNiTi18-10, <b>1.4571</b> X6CrNiMoTi 17-12-2 (V4A)	≤900 ≤1100		<input checked="" type="radio"/> <input checked="" type="radio"/>
Aceros inox., sulfurados martensíticos	<b>1.4057</b> X20CrNi172 (X17CrNi16-2), <b>1.4122</b> X39CrMo17-1, <b>1.4521</b> X2CrMoTi18-2	≤1500		<input checked="" type="radio"/>
Hierro fundido	<b>0.6010</b> EN-GJL-100 (GG10), <b>0.6020</b> EN-GJL-200 (GG20) <b>0.6025</b> EN-GJL-250 (GG25), <b>0.6035</b> EN-GJL-350 (GG35)		≤240 HB ≤350 HB	<input type="radio"/> <input type="radio"/>
Fundición de grafito esférico y fundición maleable	<b>0.7050</b> EN-GJS-500-7 (GGG50), <b>0.8035</b> EN-GJMW-350-4 (GTW35) <b>0.7070</b> EN-GJS-700-2 (GGG70), <b>0.8170</b> EN-GJMB-700-2 (GTS70)		≤240 HB ≤350 HB	<input type="radio"/> <input type="radio"/>
Fundición dura	-		≤350 HB	<input type="radio"/>
Nuevos mat. de fundición GGV	<b>EN-GJV250</b> (GGV25), <b>EN-GJV350</b> (GGV35) <b>EN-GJV400</b> (GGV40), <b>EN-GJV500</b> (GGV50), SiMo 6		≤220 HB ≤300 HB	<input type="radio"/> <input type="radio"/>
Nuevos mat. de fundición ADI	<b>EN-GJS-800-8</b> (ADI800), <b>EN-GJS-1000-5</b> (ADI1000) <b>EN-GJS-1200-2</b> (ADI1200), <b>EN-GJS-1400-1</b> (ADI1400)	≤1000 ≤1400		<input type="radio"/> <input type="radio"/>
Aleaciones especiales	Nimonic, Inconel, Monel, Hastelloy	≤2000		<input checked="" type="radio"/>
Titanio y aleaciones de titanio	<b>3.7024</b> Ti99,5, <b>3.7114</b> TiAl5Sn2,5, <b>3.7124</b> TiCu2 <b>3.7154</b> TiAl6Zr5, <b>3.7165</b> TiAl6V4, <b>3.7184</b> TiAl4Mo4Sn2,5, - TiAl8Mo1V1	≤850 ≤1400		<input checked="" type="radio"/> <input checked="" type="radio"/>
Aluminio y aleaciones de Al	<b>3.0255</b> Al99,5, <b>3.2315</b> AlMgSi1, <b>3.3515</b> AlMg1	≤400		<input type="radio"/>
Aleaciones maleables de Al	<b>3.0615</b> AlMgSiPb, <b>3.1325</b> AlCuMg1, <b>3.3245</b> AlMg3Si, <b>3.4365</b> AlZnMgCu1,5	≤650		<input type="radio"/>
Aleac. fund. de Al ≤ 10 % Si	<b>3.2131</b> G-AlSi5Cu1, <b>3.2153</b> G-AlSi7Cu3, <b>3.2573</b> G-AlSi9	≤600		<input type="radio"/>
Aleac. fund. de Al > 10 % Si	<b>3.2581</b> G-AlSi12, <b>3.2583</b> G-AlSi12Cu, - G-AlSi12CuNiMg	≤600		<input type="radio"/>
Aleaciones de magnesio	<b>3.5200</b> MgMn2, <b>3.5812.05</b> G-MgAl8Zn1, <b>3.5612.05</b> G-MgAl6Zn1	≤400		<input type="radio"/>
Cobre de baja aleación	<b>2.0070</b> SE-Cu, <b>2.1020</b> CuSn6, <b>2.1096</b> G-CuSn5ZnPb	≤500		<input type="radio"/>
Latón, viruta corta	<b>2.0380</b> CuZn39Pb2, <b>2.0401</b> CuZn39Pb3, <b>2.0410</b> CuZn43Pb2	≤600		<input type="radio"/>
viruta larga	<b>2.0250</b> CuZn20, <b>2.0280</b> CuZn33, <b>2.0332</b> CuZn37Pb0,5	≤600		<input type="radio"/>
Bronces, viruta corta	<b>2.1090</b> CuSn7ZnPb, <b>2.1170</b> CuPb5Sn5, <b>2.1176</b> CuPb10Sn <b>2.0790</b> CuNi18Zn19Pb	≤600 ≤850		<input type="radio"/> <input checked="" type="radio"/>
Bronces, viruta larga	<b>2.0916</b> CuAl5, <b>2.0960</b> CuAl9Mn, <b>2.1050</b> CuSn10 <b>2.0980</b> CuAl11Ni, <b>2.1247</b> CuBe2	≤850 ≤1000		<input checked="" type="radio"/> <input checked="" type="radio"/>
Duroplásticos	Resina epoxídica, Resopal, Pertinax, Moltopren	≤150		<input type="radio"/>
Termoplásticos	Plexiglas, Hostalen, Novodur, Makralon	≤100		<input type="radio"/>
Materiales sintéticos	Kevlar	≤1000		<input type="radio"/>
Fibras de vidrio/carbón	GFK/CFK	≤1000		<input type="radio"/>



# HARTNER

≤5xD

89275
WN
MD
K/P
T
100U
DZ
220

89414	89417
6537L	6537L
MD	MD
K/P	K/P
F	F
100U	100U
HA	HE
218	218

89272
6537L
MD
K/P
T
100U
HE
axial
231

89411	89408
6537L	6537L
MD	MD
K/P	K/P
F	F
100U	100U
HA	HE
axial	axial
232	232

89425	89426
6537L	6537L
MD	MD
Y	Y
100H	100H
HA	HE
axial	axial
236	236



V <sub>c</sub> m/min	N° de serie de avance	V <sub>c</sub> m/min	N° de serie de avance		V <sub>c</sub> m/min	N° de serie de avance	V <sub>c</sub> m/min	N° de serie de avance		V <sub>c</sub> m/min	N° de serie de avance	
100	6	130	7	7	110	6	145	7	7	145	7	7
85	5	110	6	6	90	5	120	6	6	120	6	6
110	7	145	8	8	130	7	170	8	8	170	8	8
85	6	110	7	7	110	7	145	8	8	145	8	8
90	6	120	7	7	100	7	130	8	8	130	8	8
85	6	110	7	7	95	6	125	7	7	125	7	7
80	6	105	7	7	90	6	120	7	7	120	7	7
80	6	105	7	7	90	6	120	7	7	120	7	7
75	5	100	6	6	80	6	105	7	7	105	7	7
100	7	130	8	8	110	7	145	8	8	145	8	8
90	6	120	7	7	90	6	120	7	7	120	7	7
65	4	85	5	5	65	4	85	5	5	85	5	5
75	5	100	6	6	85	6	105	7	7	110	7	7
70	4	90	5	5	80	5	100	5	5	105	5	5
50	5	65	6	6	60	5	70	6	6	80	6	6
40	4	55	5	5	50	4	55	5	5	65	5	5
					45	4	60	5	5	60	4	4
35	2	45	3	3	45	2	60	3	3	60	3	3
35	1	35	1	1	40	2	55	2	2	55	3	3
20	1	20	1	1	25	1	35	2	2	35	2	2
40	2	40	2	2	45	4	60	5	5			
15	1	15	1	1	40	2	55	5	5			
35	2	35	2	2	35	4	45	5	5			
160	7	210	8	8	160	8	195	9	9			
120	7	155	8	8	120	8	160	9	9			
120	6	145	7	7	100	8	140	9	9			
95	6	125	7	7	95	7	130	8	8			
25	2	35	3	3	30	2	40	3	3			
20	3	25	4	4	25	3	35	4	4	35	4	4
15	1	15	1	1	35	3	45	4	4	45	4	4
15	1	15	1	1	30	2	40	3	3	40	3	3
200	8	260	9	9	240	8	310	9	9			
200	8	260	9	9	240	8	310	9	9			
170	8	235	9	9	200	8	260	9	9			
140	7	170	8	8	170	8	220	9	9			
200	7	260	8	8	230	7	280	8	8			
80	6	105	7	7	95	6	125	7	7			
210	7	270	8	8	250	7	325	8	8			
140	6	180	7	7	170	6	220	7	7			
80	5	105	6	6	95	6	125	7	7			
65	5	85	6	6	80	5	105	6	6			
60	4	80	5	5	70	5	90	6	6			
45	4	60	5	5	60	5	80	6	6			



## Aplicaciones recomendadas TS-Drills

Artículo no.

Norma/DIN

Material de corte

Calidad de metal duro

Superficie

Tipo

Forma del mango

Refrigeración

Dimens. página

Las herramientas con n° de código de series de avance impreso en negrita (código VR) se deberían elegir con preferencia.

Hta. Ø mm	N° de serie de avance								
	1	2	3	4	5	6	7	8	9
	f (mm/vuelta)								
<b>0,50</b>	0,004	0,006	0,007	0,008	0,010	0,012	0,014	0,016	0,019
<b>1,00</b>	0,006	0,008	0,012	0,014	0,016	0,018	0,020	0,023	0,025
<b>2,00</b>	0,020	0,025	0,032	0,040	0,050	0,063	0,080	0,100	0,125
<b>2,50</b>	0,025	0,032	0,040	0,050	0,063	0,080	0,100	0,125	0,160
<b>3,15</b>	0,032	0,040	0,050	0,063	0,080	0,100	0,125	0,160	0,160
<b>4,00</b>	0,040	0,050	0,063	0,080	0,100	0,125	0,160	0,200	0,200
<b>5,00</b>	0,040	0,050	0,063	0,080	0,100	0,125	0,160	0,200	0,250
<b>6,30</b>	0,050	0,063	0,080	0,100	0,125	0,160	0,200	0,250	0,315
<b>8,00</b>	0,063	0,080	0,100	0,125	0,160	0,200	0,250	0,315	0,315
<b>10,00</b>	0,080	0,100	0,125	0,160	0,200	0,250	0,315	0,400	0,400
<b>12,50</b>	0,080	0,100	0,125	0,160	0,200	0,250	0,315	0,400	0,500
<b>16,00</b>	0,100	0,125	0,160	0,200	0,250	0,315	0,400	0,500	0,630
<b>20,00</b>	0,125	0,160	0,200	0,250	0,315	0,400	0,500	0,630	0,630
<b>25,00</b>	0,160	0,200	0,250	0,315	0,400	0,500	0,630	0,800	0,800
<b>31,50</b>	0,160	0,200	0,250	0,315	0,400	0,500	0,630	0,800	1,000
<b>40,00</b>	0,200	0,250	0,315	0,400	0,500	0,630	0,800	1,000	1,250
<b>50,00</b>	0,250	0,310	0,400	0,500	0,630	0,800	1,000	1,250	1,250
<b>63,00</b>	0,315	0,400	0,500	0,630	0,800	1,000	1,250	1,600	1,600
<b>80,00</b>	0,400	0,500	0,630	0,800	1,000	1,250	1,600	1,600	2,000

Refrigerante según material:

- Aire
- Aceite
- Emulsión

Sentido de corte:

- corte a derechas
- corte a izquierdas

Grupo de materiales	Ejemplos Cifras en negrita = n° de mat. según DIN EN 10 027	Resistencia N/mm <sup>2</sup>	Dureza	Refriger.
Aceros de construcción generales	<b>1.0035</b> S185(St33), <b>1.0486</b> P275N(StE285), <b>1.0345</b> P235GH(H1), <b>1.0425</b> P265GH(H2) <b>1.0050</b> E295 (St50-2), <b>1.0070</b> E360 (St70-2), <b>1.8937</b> P500NH (WStE500)	≤500 ≤1000		<input type="radio"/> <input type="radio"/>
Aceros para autómatas	<b>1.0718</b> 11SMnPb30 (9SMnPb28), <b>1.0736</b> 11SMn37 (9SMn36) <b>1.0727</b> 46S20 (45S20), <b>1.0728</b> (60S20), <b>1.0757</b> 46SPb20 (45SPb20)	≤850 ≤1000		<input type="radio"/> <input type="radio"/>
Aceros de bonificación no aleados	<b>1.0402</b> C22, <b>1.1178</b> C30E (Ck30) <b>1.0503</b> C45, <b>1.1191</b> C45E (Ck45) <b>1.0601</b> C60, <b>1.1221</b> C60E (Ck60)	≤700 ≤850 ≤1000		<input type="radio"/> <input type="radio"/> <input type="radio"/>
Aceros de bonificación aleados	<b>1.5131</b> 50MnSi4, <b>1.7003</b> 38Cr2, <b>1.7030</b> 28Cr4 <b>1.5710</b> 36NiCr6, <b>1.7035</b> 41Cr4, <b>1.7225</b> 42CrMo4	≤1000 ≤1400		<input type="radio"/> <input type="radio"/>
Aceros cementación aleados	<b>1.0301</b> (C10), <b>1.1121</b> C10E (Ck10)	≤850		<input type="radio"/>
Aceros cementación no aleados	<b>1.7276</b> 10CrMo11, <b>1.5125</b> 11MnSi6 <b>1.5752</b> 15NiCr13, <b>1.7131</b> 16MnCr5, <b>1.7264</b> 20CrMo5	≤1000 ≤1400		<input checked="" type="radio"/> <input checked="" type="radio"/>
Aceros de nitruración	<b>1.8504</b> 34CrAl6 <b>1.8519</b> 31CrMoV9, <b>1.8550</b> 34CrAlNi7	≤1000 ≤1400		<input type="radio"/> <input checked="" type="radio"/>
Aceros para herramientas	<b>1.1750</b> C75W, <b>1.2067</b> 102Cr6, <b>1.2307</b> 29CrMoV9 <b>1.2080</b> X210Cr12, <b>1.2083</b> X42Cr13, <b>1.2419</b> 105WCr6, <b>1.2767</b> X45NiCrMo4	≤850 ≤1400		<input type="radio"/> <input checked="" type="radio"/>
Aceros rápidos	<b>1.3243</b> S 6-5-2-5, <b>1.3343</b> S 6-5-2, <b>1.3344</b> S 6-5-3	≤1400		<input checked="" type="radio"/>
Aceros para muelles	<b>1.5026</b> 55Si7, <b>1.7176</b> 55Cr3, <b>1.8159</b> 51CrV4 (51CrV4)		≤350 HB	<input checked="" type="radio"/>
Aceros templados	-		≤48 HRC ≤66 HRC	<input checked="" type="radio"/> <input checked="" type="radio"/>
Aceros inox., sulfurados austeníticos	<b>1.4005</b> X12CrS13, <b>1.4104</b> X14CrMoS17, <b>1.4105</b> X6CrMoS17, <b>1.4305</b> X8CrNiS18-9 <b>1.4301</b> X5CrNi18-10 (V2A), <b>1.4541</b> X6CrNiTi18-10, <b>1.4571</b> X6CrNiMoTi 17-12-2 (V4A)	≤900 ≤1100		<input checked="" type="radio"/> <input checked="" type="radio"/>
Aceros inox., sulfurados martensíticos	<b>1.4057</b> X20CrNi172 (X17CrNi16-2), <b>1.4122</b> X39CrMo17-1, <b>1.4521</b> X2CrMoTi18-2	≤1500		<input checked="" type="radio"/>
Hierro fundido	<b>0.6010</b> EN-GJL-100 (GG10), <b>0.6020</b> EN-GJL-200 (GG20) <b>0.6025</b> EN-GJL-250 (GG25), <b>0.6035</b> EN-GJL-350 (GG35)		≤240 HB ≤350 HB	<input type="radio"/> <input type="radio"/> <input type="radio"/>
Fundición de grafito esférico y fundición maleable	<b>0.7050</b> EN-GJS-500-7 (GGG50), <b>0.8035</b> EN-GJMW-350-4 (GTW35) <b>0.7070</b> EN-GJS-700-2 (GGG70), <b>0.8170</b> EN-GJMB-700-2 (GTS70)		≤240 HB ≤350 HB	<input type="radio"/> <input type="radio"/>
Fundición dura	-		≤350 HB	<input type="radio"/>
Nuevos mat. de fundición GGV	<b>EN-GJV250</b> (GGV25), <b>EN-GJV350</b> (GGV35) <b>EN-GJV400</b> (GGV40), <b>EN-GJV500</b> (GGV50), SiMo 6		≤220 HB ≤300 HB	<input type="radio"/> <input type="radio"/>
Nuevos mat. de fundición ADI	<b>EN-GJS-800-8</b> (ADI800), <b>EN-GJS-1000-5</b> (ADI1000) <b>EN-GJS-1200-2</b> (ADI1200), <b>EN-GJS-1400-1</b> (ADI1400)	≤1000 ≤1400		<input type="radio"/> <input type="radio"/>
Aleaciones especiales	Nimonic, Inconel, Monel, Hastelloy	≤2000		<input checked="" type="radio"/>
Titanio y aleaciones de titanio	<b>3.7024</b> Ti99,5, <b>3.7114</b> TiAl5Sn2,5, <b>3.7124</b> TiCu2 <b>3.7154</b> TiAl6Zr5, <b>3.7165</b> TiAl6V4, <b>3.7184</b> TiAl4Mo4Sn2,5, - TiAl8Mo1V1	≤850 ≤1400		<input checked="" type="radio"/> <input checked="" type="radio"/>
Aluminio y aleaciones de Al	<b>3.0255</b> Al99,5, <b>3.2315</b> AlMgSi1, <b>3.3515</b> AlMg1	≤400		<input type="radio"/>
Aleaciones maleables de Al	<b>3.0615</b> AlMgSiPb, <b>3.1325</b> AlCuMg1, <b>3.3245</b> AlMg3Si, <b>3.4365</b> AlZnMgCu1,5	≤650		<input type="radio"/>
Aleac. fund. de Al ≤ 10 % Si	<b>3.2131</b> G-AlSi5Cu1, <b>3.2153</b> G-AlSi7Cu3, <b>3.2573</b> G-AlSi9	≤600		<input type="radio"/>
Aleac. fund. de Al > 10 % Si	<b>3.2581</b> G-AlSi12, <b>3.2583</b> G-AlSi12Cu, - G-AlSi12CuNiMg	≤600		<input type="radio"/>
Aleaciones de magnesio	<b>3.5200</b> MgMn2, <b>3.5812.05</b> G-MgAl8Zn1, <b>3.5612.05</b> G-MgAl6Zn1	≤400		<input type="radio"/>
Cobre de baja aleación	<b>2.0070</b> SE-Cu, <b>2.1020</b> CuSn6, <b>2.1096</b> G-CuSn5ZnPb	≤500		<input type="radio"/>
Latón, viruta corta	<b>2.0380</b> CuZn39Pb2, <b>2.0401</b> CuZn39Pb3, <b>2.0410</b> CuZn43Pb2	≤600		<input type="radio"/>
viruta larga	<b>2.0250</b> CuZn20, <b>2.0280</b> CuZn33, <b>2.0332</b> CuZn37Pb0,5	≤600		<input type="radio"/>
Bronces, viruta corta	<b>2.1090</b> CuSn7ZnPb, <b>2.1170</b> CuPb5Sn5, <b>2.1176</b> CuPb10Sn <b>2.0790</b> CuNi18Zn19Pb	≤600 ≤850		<input type="radio"/> <input checked="" type="radio"/>
Bronces, viruta larga	<b>2.0916</b> CuAl5, <b>2.0960</b> CuAl9Mn, <b>2.1050</b> CuSn10 <b>2.0980</b> CuAl11Ni, <b>2.1247</b> CuBe2	≤850 ≤1000		<input checked="" type="radio"/> <input checked="" type="radio"/>
Duroplásticos	Resina epoxídica, Resopal, Pertinax, Moltopren	≤150		<input type="radio"/>
Termoplásticos	Plexiglas, Hostalen, Novodur, Makralon	≤100		<input type="radio"/>
Materiales sintéticos	Kevlar	≤1000		<input type="radio"/>
Fibras de vidrio/carbón	GFK/CFK	≤1000		<input type="radio"/>



# HARTNER

## ≤5xD

89560
6537L
<b>MD</b>
K
○
TS 100 ALU
HA
240

89460
6537L
<b>MD</b>
K/P
<b>F</b>
HA
axial
242

89239	89247
6539	6537L
<b>MD</b>	<b>MD</b>
K	K
○	○
TS 3 G	TS 3 G
DZ	HA
263	262

## ≤7xD

89308
6538L
<b>MD</b>
P
<b>T</b>
TS 80 U
HE
244

89294
WN
<b>MD</b>
K
○
TS 150 GG
HA
axial
245

89421
WN
<b>MD</b>
K/P
<b>F</b>
TS 100 R
HA
axial
248



V <sub>c</sub> m/min	N° de serie de avance	V <sub>c</sub> m/min	N° de serie de avance	V <sub>c</sub> m/min	N° de serie de avance	V <sub>c</sub> m/min	N° de serie de avance	V <sub>c</sub> m/min	N° de serie de avance	V <sub>c</sub> m/min	N° de serie de avance
		200	8			95	4				
		200	7			75	3				
		200	8			90	5				
		200	8			75	4				
		180	8			80	4				
		160	8			75	4				
		130	8			60	4				
		120	8			75	4				
		120	7			60	3				
		180	8			90	5				
		120	8			75	4				
		110	7			55	3				
		110	7			75	4				
		100	5			55	3				
		90	7			40	3				
		65	6			35	3				
		60	5			40	2				
		60	5								
		55	3								
		80	5			35	1				
		60	5			33	1				
		180	9	100	6	25	1				
		160	9	80	6	150	5	120	6	210	8
		140	9	80	6	110	5	100	6	160	8
		140	8	80	6	110	5	90	6	160	8
				70	6	90	4	80	6	130	7
					6			40	2		
		140	8							130	7
		140	8							100	7
		80	7							80	7
		80	7							60	7
		30	4								
		40	4								
		35	3								
350	9			180	7	7	180	6	410	8	
350	9			160	7	7	180	6	410	8	
320	8			150	7	7	160	6	380	8	
280	7			120	6	6	130	5	330	8	
320	7			180	6	6					
190	7										
160	6			180	6	6					
160	6								280	7	
160	6										
160	6								110	6	
150	6								80	5	
150	6										
100	3										
100	3										
100	2										



## Aplicaciones recomendadas TS-Drills

Artículo no.

Norma/DIN

Material de corte

Calidad de metal duro

Superficie

Tipo

Forma del mango

Refrigeración

Dimens. página

Las herramientas con n° de código de series de avance impreso en negrita (código VR) se deberían elegir con preferencia.

Hta. Ø mm	N° de serie de avance								
	1	2	3	4	5	6	7	8	9
	f (mm/vuelta)								
<b>0,50</b>	0,004	0,006	0,007	0,008	0,010	0,012	0,014	0,016	0,019
<b>1,00</b>	0,006	0,008	0,012	0,014	0,016	0,018	0,020	0,023	0,025
<b>2,00</b>	0,020	0,025	0,032	0,040	0,050	0,063	0,080	0,100	0,125
<b>2,50</b>	0,025	0,032	0,040	0,050	0,063	0,080	0,100	0,125	0,160
<b>3,15</b>	0,032	0,040	0,050	0,063	0,080	0,100	0,125	0,160	0,160
<b>4,00</b>	0,040	0,050	0,063	0,080	0,100	0,125	0,160	0,200	0,200
<b>5,00</b>	0,040	0,050	0,063	0,080	0,100	0,125	0,160	0,200	0,250
<b>6,30</b>	0,050	0,063	0,080	0,100	0,125	0,160	0,200	0,250	0,315
<b>8,00</b>	0,063	0,080	0,100	0,125	0,160	0,200	0,250	0,315	0,315
<b>10,00</b>	0,080	0,100	0,125	0,160	0,200	0,250	0,315	0,400	0,400
<b>12,50</b>	0,080	0,100	0,125	0,160	0,200	0,250	0,315	0,400	0,500
<b>16,00</b>	0,100	0,125	0,160	0,200	0,250	0,315	0,400	0,500	0,630
<b>20,00</b>	0,125	0,160	0,200	0,250	0,315	0,400	0,500	0,630	0,630
<b>25,00</b>	0,160	0,200	0,250	0,315	0,400	0,500	0,630	0,800	0,800
<b>31,50</b>	0,160	0,200	0,250	0,315	0,400	0,500	0,630	0,800	1,000
<b>40,00</b>	0,200	0,250	0,315	0,400	0,500	0,630	0,800	1,000	1,250
<b>50,00</b>	0,250	0,310	0,400	0,500	0,630	0,800	1,000	1,250	1,250
<b>63,00</b>	0,315	0,400	0,500	0,630	0,800	1,000	1,250	1,600	1,600
<b>80,00</b>	0,400	0,500	0,630	0,800	1,000	1,250	1,600	1,600	2,000

Refrigerante según material:

- Aire
- Aceite
- Emulsión

Sentido de corte:


- corte a derechas
- corte a izquierdas

Grupo de materiales	Ejemplos Cifras en negrita = n° de mat. según DIN EN 10 027	Resistencia N/mm <sup>2</sup>	Dureza	Refriger.
Aceros de construcción generales	<b>1.0035</b> S185(St33), <b>1.0486</b> P275N(StE285), <b>1.0345</b> P235GH(H1), <b>1.0425</b> P265GH(H2) <b>1.0050</b> E295 (St50-2), <b>1.0070</b> E360 (St70-2), <b>1.8937</b> P500NH (WStE500)	≤500 ≤1000		<input type="radio"/> <input type="radio"/>
Aceros para autómatas	<b>1.0718</b> 11SMnPb30 (9SMnPb28), <b>1.0736</b> 11SMn37 (9SMn36) <b>1.0727</b> 46S20 (45S20), <b>1.0728</b> (60S20), <b>1.0757</b> 46SPb20 (45SPb20)	≤850 ≤1000		<input type="radio"/> <input type="radio"/>
Aceros de bonificación no aleados	<b>1.0402</b> C22, <b>1.1178</b> C30E (Ck30) <b>1.0503</b> C45, <b>1.1191</b> C45E (Ck45) <b>1.0601</b> C60, <b>1.1221</b> C60E (Ck60)	≤700 ≤850 ≤1000		<input type="radio"/> <input type="radio"/> <input type="radio"/>
Aceros de bonificación aleados	<b>1.5131</b> 50MnSi4, <b>1.7003</b> 38Cr2, <b>1.7030</b> 28Cr4 <b>1.5710</b> 36NiCr6, <b>1.7035</b> 41Cr4, <b>1.7225</b> 42CrMo4	≤1000 ≤1400		<input type="radio"/> <input type="radio"/>
Aceros cementación aleados	<b>1.0301</b> (C10), <b>1.1121</b> C10E (Ck10)	≤850		<input type="radio"/>
Aceros cementación no aleados	<b>1.7276</b> 10CrMo11, <b>1.5125</b> 11MnSi6 <b>1.5752</b> 15NiCr13, <b>1.7131</b> 16MnCr5, <b>1.7264</b> 20CrMo5	≤1000 ≤1400		<input checked="" type="radio"/> <input checked="" type="radio"/>
Aceros de nitruración	<b>1.8504</b> 34CrAl6 <b>1.8519</b> 31CrMoV9, <b>1.8550</b> 34CrAlNi7	≤1000 ≤1400		<input type="radio"/> <input checked="" type="radio"/>
Aceros para herramientas	<b>1.1750</b> C75W, <b>1.2067</b> 102Cr6, <b>1.2307</b> 29CrMoV9 <b>1.2080</b> X210Cr12, <b>1.2083</b> X42Cr13, <b>1.2419</b> 105WCr6, <b>1.2767</b> X45NiCrMo4	≤850 ≤1400		<input type="radio"/> <input checked="" type="radio"/>
Aceros rápidos	<b>1.3243</b> S 6-5-2-5, <b>1.3343</b> S 6-5-2, <b>1.3344</b> S 6-5-3	≤1400		<input checked="" type="radio"/>
Aceros para muelles	<b>1.5026</b> 55Si7, <b>1.7176</b> 55Cr3, <b>1.8159</b> 51CrV4 (51CrV4)		≤350 HB	<input checked="" type="radio"/>
Aceros templados	-		≤48 HRC ≤66 HRC	<input checked="" type="radio"/> <input checked="" type="radio"/>
Aceros inox., sulfurados austeníticos	<b>1.4005</b> X12CrS13, <b>1.4104</b> X14CrMoS17, <b>1.4105</b> X6CrMoS17, <b>1.4305</b> X8CrNiS18-9 <b>1.4301</b> X5CrNi18-10 (V2A), <b>1.4541</b> X6CrNiTi18-10, <b>1.4571</b> X6CrNiMoTi 17-12-2 (V4A)	≤900 ≤1100		<input checked="" type="radio"/> <input checked="" type="radio"/>
Aceros inox., sulfurados martensíticos	<b>1.4057</b> X20CrNi172 (X17CrNi16-2), <b>1.4122</b> X39CrMo17-1, <b>1.4521</b> X2CrMoTi18-2	≤1500		<input checked="" type="radio"/>
Hierro fundido	<b>0.6010</b> EN-GJL-100 (GG10), <b>0.6020</b> EN-GJL-200 (GG20) <b>0.6025</b> EN-GJL-250 (GG25), <b>0.6035</b> EN-GJL-350 (GG35)		≤240 HB ≤350 HB	<input type="radio"/> <input type="radio"/>
Fundición de grafito esférico y fundición maleable	<b>0.7050</b> EN-GJS-500-7 (GGG50), <b>0.8035</b> EN-GJMW-350-4 (GTW35) <b>0.7070</b> EN-GJS-700-2 (GGG70), <b>0.8170</b> EN-GJMB-700-2 (GTS70)		≤240 HB ≤350 HB	<input type="radio"/> <input type="radio"/>
Fundición dura	-		≤350 HB	<input type="radio"/>
Nuevos mat. de fundición GGV	<b>EN-GJV250</b> (GGV25), <b>EN-GJV350</b> (GGV35) <b>EN-GJV400</b> (GGV40), <b>EN-GJV500</b> (GGV50), SiMo 6		≤220 HB ≤300 HB	<input type="radio"/> <input type="radio"/>
Nuevos mat. de fundición ADI	<b>EN-GJS-800-8</b> (ADI800), <b>EN-GJS-1000-5</b> (ADI1000) <b>EN-GJS-1200-2</b> (ADI1200), <b>EN-GJS-1400-1</b> (ADI1400)	≤1000 ≤1400		<input type="radio"/> <input type="radio"/>
Aleaciones especiales	Nimonic, Inconel, Monel, Hastelloy	≤2000		<input checked="" type="radio"/>
Titanio y aleaciones de titanio	<b>3.7024</b> Ti99,5, <b>3.7114</b> TiAl5Sn2,5, <b>3.7124</b> TiCu2 <b>3.7154</b> TiAl6Zr5, <b>3.7165</b> TiAl6V4, <b>3.7184</b> TiAl4Mo4Sn2,5, - TiAl8Mo1V1	≤850 ≤1400		<input checked="" type="radio"/> <input checked="" type="radio"/>
Aluminio y aleaciones de Al	<b>3.0255</b> Al99,5, <b>3.2315</b> AlMgSi1, <b>3.3515</b> AlMg1	≤400		<input type="radio"/>
Aleaciones maleables de Al	<b>3.0615</b> AlMgSiPb, <b>3.1325</b> AlCuMg1, <b>3.3245</b> AlMg3Si, <b>3.4365</b> AlZnMgCu1,5	≤650		<input type="radio"/>
Aleac. fund. de Al ≤ 10 % Si	<b>3.2131</b> G-AlSi5Cu1, <b>3.2153</b> G-AlSi7Cu3, <b>3.2573</b> G-AlSi9	≤600		<input type="radio"/>
Aleac. fund. de Al > 10 % Si	<b>3.2581</b> G-AlSi12, <b>3.2583</b> G-AlSi12Cu, - G-AlSi12CuNiMg	≤600		<input type="radio"/>
Aleaciones de magnesio	<b>3.5200</b> MgMn2, <b>3.5812.05</b> G-MgAl8Zn1, <b>3.5612.05</b> G-MgAl6Zn1	≤400		<input type="radio"/>
Cobre de baja aleación	<b>2.0070</b> SE-Cu, <b>2.1020</b> CuSn6, <b>2.1096</b> G-CuSn5ZnPb	≤500		<input type="radio"/>
Latón, viruta corta	<b>2.0380</b> CuZn39Pb2, <b>2.0401</b> CuZn39Pb3, <b>2.0410</b> CuZn43Pb2	≤600		<input type="radio"/>
viruta larga	<b>2.0250</b> CuZn20, <b>2.0280</b> CuZn33, <b>2.0332</b> CuZn37Pb0,5	≤600		<input type="radio"/>
Bronces, viruta corta	<b>2.1090</b> CuSn7ZnPb, <b>2.1170</b> CuPb5Sn5, <b>2.1176</b> CuPb10Sn <b>2.0790</b> CuNi18Zn19Pb	≤600 ≤850		<input type="radio"/> <input checked="" type="radio"/>
Bronces, viruta larga	<b>2.0916</b> CuAl5, <b>2.0960</b> CuAl9Mn, <b>2.1050</b> CuSn10 <b>2.0980</b> CuAl11Ni, <b>2.1247</b> CuBe2	≤850 ≤1000		<input checked="" type="radio"/> <input checked="" type="radio"/>
Duroplásticos	Resina epoxídica, Resopal, Pertinax, Moltopren	≤150		<input type="radio"/>
Termoplásticos	Plexiglas, Hostalen, Novodur, Makralon	≤100		<input type="radio"/>
Materiales sintéticos	Kevlar	≤1000		<input type="radio"/>
Fibras de vidrio/carbón	GFK/CFK	≤1000		<input type="radio"/>





## Aplicaciones recomendadas TS-Drills

Artículo no. 

Norma/DIN

Material de corte

Calidad de metal duro

Tipó

Superficie

Refrigeración

Dimens. página

### Procedimiento:

- La superficie debe ser mecanizada para facilitar la operación de taladrado.
- Realizar agujero piloto (Tolerancia F9) con una profundidad de perforación mínima de 1 x D.
- Perforar en el agujero piloto a una velocidad de aprox. 300 rev / min y con una velocidad de avance de aprox. 500 mm / min.
- Ajuste de la presión y velocidad del refrigerante.
- Continuidad de perforación.
- A través de los agujeros con salida oblicua, reducir la velocidad de alimentación vf al 40% aprox. 1 mm antes del desahogo.
- Retirar el anillo tras llegar al tope de profundidad.



Las herramientas con n° de código de series de avance impreso en negrita (código VR) se deberían elegir con preferencia.

Hta. Ø mm	N° de serie de avance								
	1	2	3	4	5	6	7	8	9
	f (mm/vuelta)								
<b>2,50</b>	0,025	0,032	0,040	0,050	0,063	0,080	0,100	0,125	0,160
<b>3,15</b>	0,032	0,040	0,050	0,063	0,080	0,100	0,125	0,160	0,160
<b>4,00</b>	0,040	0,050	0,063	0,080	0,100	0,125	0,160	0,200	0,200
<b>5,00</b>	0,040	0,050	0,063	0,080	0,100	0,125	0,160	0,200	0,250
<b>6,30</b>	0,050	0,063	0,080	0,100	0,125	0,160	0,200	0,250	0,315
<b>8,00</b>	0,063	0,080	0,100	0,125	0,160	0,200	0,250	0,315	0,315
<b>10,00</b>	0,080	0,100	0,125	0,160	0,200	0,250	0,315	0,400	0,400
<b>12,50</b>	0,080	0,100	0,125	0,160	0,200	0,250	0,315	0,400	0,500
<b>16,00</b>	0,100	0,125	0,160	0,200	0,250	0,315	0,400	0,500	0,630

Refrigerante según material:

- Aire
- Aceite
- Emulsión

Sentido de corte:

-  corte a derechas
-  corte a izquierdas

Grupo de materiales	Ejemplos Cifras en negrita = n° de mat. según DIN EN 10 027	Resistencia N/mm <sup>2</sup>	Dureza	Refriger.
Aceros de construcción generales	<b>1.0035</b> S185(St33), <b>1.0486</b> P275N(StE285), <b>1.0345</b> P235GH(H1), <b>1.0425</b> P265GH(H2) <b>1.0050</b> E295 (St50-2), <b>1.0070</b> E360 (St70-2), <b>1.8937</b> P500NH (WStE500)	≤500 ≤1000		<input type="radio"/> <input type="radio"/>
Aceros para autómatas	<b>1.0718</b> 11SMnPb30 (9SMnPb28), <b>1.0736</b> 11SMn37 (9SMn36) <b>1.0727</b> 46S20 (45S20), <b>1.0728</b> (60S20), <b>1.0757</b> 46SPb20 (45SPb20)	≤850 ≤1000		<input type="radio"/> <input type="radio"/>
Aceros de bonificación no aleados	<b>1.0402</b> C22, <b>1.1178</b> C30E (Ck30) <b>1.0503</b> C45, <b>1.1191</b> C45E (Ck45) <b>1.0601</b> C60, <b>1.1221</b> C60E (Ck60)	≤700 ≤850 ≤1000		<input type="radio"/> <input type="radio"/> <input type="radio"/>
Aceros de bonificación aleados	<b>1.5131</b> 50MnSi4, <b>1.7003</b> 38Cr2, <b>1.7030</b> 28Cr4 <b>1.5710</b> 36NiCr6, <b>1.7035</b> 41Cr4, <b>1.7225</b> 42CrMo4	≤1000 ≤1400		<input type="radio"/> <input type="radio"/>
Aceros cementación aleados	<b>1.0301</b> (C10), <b>1.1121</b> C10E (Ck10)	≤850		<input type="radio"/>
Aceros cementación no aleados	<b>1.7276</b> 10CrMo11, <b>1.5125</b> 11MnSi6 <b>1.5752</b> 15NiCr13, <b>1.7131</b> 16MnCr5, <b>1.7264</b> 20CrMo5	≤1000 ≤1400		<input checked="" type="radio"/> <input checked="" type="radio"/>
Aceros de nitruración	<b>1.8504</b> 34CrAl6 <b>1.8519</b> 31CrMoV9, <b>1.8550</b> 34CrAlNi7	≤1000 ≤1400		<input type="radio"/> <input checked="" type="radio"/>
Aceros para herramientas	<b>1.1750</b> C75W, <b>1.2067</b> 102Cr6, <b>1.2307</b> 29CrMoV9 <b>1.2080</b> X210Cr12, <b>1.2083</b> X42Cr13, <b>1.2419</b> 105WCr6, <b>1.2767</b> X45NiCrMo4	≤850 ≤1400		<input type="radio"/> <input checked="" type="radio"/>
Aceros rápidos	<b>1.3243</b> S 6-5-2-5, <b>1.3343</b> S 6-5-2, <b>1.3344</b> S 6-5-3	≤1400		<input checked="" type="radio"/>
Aceros para muelles	<b>1.5026</b> 55Si7, <b>1.7176</b> 55Cr3, <b>1.8159</b> 51CrV4 (51CrV4)		≤350 HB	<input checked="" type="radio"/>
Aceros templados	-		≤48 HRC ≤66 HRC	<input checked="" type="radio"/> <input checked="" type="radio"/>
Aceros inox., sulfurados austeníticos martensíticos	<b>1.4005</b> X12CrS13, <b>1.4104</b> X14CrMoS17, <b>1.4105</b> X6CrMoS17, <b>1.4305</b> X8CrNiS18-9 <b>1.4301</b> X5CrNi18-10 (V2A), <b>1.4541</b> X6CrNiTi18-10, <b>1.4571</b> X6CrNiMoTi17-12-2 (V4A) <b>1.4057</b> X20CrNi172 (X17CrNi16-2), <b>1.4122</b> X39CrMo17-1, <b>1.4521</b> X2CrMoTi18-2	≤900 ≤1100 ≤1500		<input checked="" type="radio"/> <input checked="" type="radio"/> <input checked="" type="radio"/>
Hierro fundido	<b>0.6010</b> EN-GJL-100 (GG10), <b>0.6020</b> EN-GJL-200 (GG20) <b>0.6025</b> EN-GJL-250 (GG25), <b>0.6035</b> EN-GJL-350 (GG35)		≤240 HB ≤350 HB	<input type="radio"/> <input type="radio"/>
Fundición de grafito esférico y fundición maleable	<b>0.7050</b> EN-GJS-500-7 (GGG50), <b>0.8035</b> EN-GJMW-350-4 (GTW35) <b>0.7070</b> EN-GJS-700-2 (GGG70), <b>0.8170</b> EN-GJMB-700-2 (GTS70)		≤240 HB ≤350 HB	<input type="radio"/> <input type="radio"/>
Fundición dura	-		≤350 HB	<input type="radio"/>
Nuevos mat. de fundición GGV	<b>EN-GJV250</b> (GGV25), <b>EN-GJV350</b> (GGV35) <b>EN-GJV400</b> (GGV40), <b>EN-GJV500</b> (GGV50), SiMo 6		≤220 HB ≤300 HB	<input type="radio"/> <input type="radio"/>
Nuevos mat. de fundición ADI	<b>EN-GJS-800-8</b> (ADI800), <b>EN-GJS-1000-5</b> (ADI1000) <b>EN-GJS-1200-2</b> (ADI1200), <b>EN-GJS-1400-1</b> (ADI1400)	≤1000 ≤1400		<input type="radio"/> <input type="radio"/>
Aleaciones especiales	Nimonic, Inconel, Monel, Hastelloy	≤2000		<input checked="" type="radio"/>
Titanio y aleaciones de titanio	<b>3.7024</b> Ti99,5, <b>3.7114</b> TiAl5Sn2,5, <b>3.7124</b> TiCu2 <b>3.7154</b> TiAl6Zr5, <b>3.7165</b> TiAl6V4, <b>3.7184</b> TiAl4Mo4Sn2,5, - TiAl8Mo1V1	≤850 ≤1400		<input checked="" type="radio"/> <input checked="" type="radio"/>
Aluminio y aleaciones de Al	<b>3.0255</b> Al99,5, <b>3.2315</b> AlMgSi1, <b>3.3515</b> AlMg1	≤400		<input type="radio"/>
Aleaciones maleables de Al	<b>3.0615</b> AlMgSiPb, <b>3.1325</b> AlCuMg1, <b>3.3245</b> AlMg3Si, <b>3.4365</b> AlZnMgCu1,5	≤650		<input type="radio"/>
Aleac. fund. de Al ≤ 10 % Si	<b>3.2131</b> G-AlSi5Cu1, <b>3.2153</b> G-AlSi7Cu3, <b>3.2573</b> G-AlSi9	≤600		<input type="radio"/>
> 10 % Si	<b>3.2581</b> G-AlSi12, <b>3.2583</b> G-AlSi12Cu, - G-AlSi12CuNiMg	≤600		<input type="radio"/>
Aleaciones de magnesio	<b>3.5200</b> MgMn2, <b>3.5812.05</b> G-MgAl8Zn1, <b>3.5612.05</b> G-MgAl6Zn1	≤400		<input type="radio"/>
Cobre de baja aleación	<b>2.0070</b> SE-Cu, <b>2.1020</b> CuSn6, <b>2.1096</b> G-CuSn5ZnPb	≤500		<input type="radio"/>
Latón, viruta corta	<b>2.0380</b> CuZn39Pb2, <b>2.0401</b> CuZn39Pb3, <b>2.0410</b> CuZn43Pb2	≤600		<input type="radio"/>
viruta larga	<b>2.0250</b> CuZn20, <b>2.0280</b> CuZn33, <b>2.0332</b> CuZn37Pb0,5	≤600		<input type="radio"/>
Bronces, viruta corta	<b>2.1090</b> CuSn7ZnPb, <b>2.1170</b> CuPb5Sn5, <b>2.1176</b> CuPb10Sn <b>2.0790</b> CuNi18Zn19Pb	≤600 ≤850		<input type="radio"/> <input checked="" type="radio"/>
Bronces, viruta larga	<b>2.0916</b> CuAl5, <b>2.0960</b> CuAl9Mn, <b>2.1050</b> CuSn10 <b>2.0980</b> CuAl11Ni, <b>2.1247</b> CuBe2	≤850 ≤1000		<input checked="" type="radio"/> <input checked="" type="radio"/>
Duroplásticos	Resina epoxídica, Resopal, Pertinax, Moltopren	≤150		<input type="radio"/>
Termoplásticos	Plexiglas, Hostalen, Novodur, Makralon	≤100		<input type="radio"/>
Materiales sintéticos	Kevlar	≤1000		<input type="radio"/>
Fibras de vidrio/carbón	GFK/CFK	≤1000		<input type="radio"/>







## Aplicaciones recomendadas Brocas para agujeros profundos

### Las operaciones para taladrar agujeros profundos

- Ejecución de un taladro piloto (L = 1,5 x D, tolerancia H8)
- Entrada con velocidad baja, aprox. 200 rpm, avance aprox. 500 mm/min
- Ajuste de la presión del lubricante refrigerador y de la velocidad de giro
- Taladrado continuo a la profundidad de taladro sin eliminación de virutas. Para el uso de brocas cañón con una gran proporción largo-diámetro (p. ej. EB 100 longitud de ranura 160 mm) recomendamos trabajar hasta una profundidad de taladro de aprox. 25 mm con parámetros de corte reducidos (aprox. 75% de la velocidad de corte óptima).
- Desconexión de la alimentación de lub. refrigerador al alcanzar la prof. de taladro
- Retirada en marcha rápida con el cabezal parado.

Broca Ø mm	Nº de serie de avance									
	20	19	18	17	16	15	14	13	12	11
	f (mm/rev.)									
1,0	0,050	0,030	0,022	0,015	0,010	0,006	0,004	0,003	0,002	0,001
1,5	0,075	0,050	0,045	0,032	0,020	0,012	0,008	0,006	0,004	0,002
2,0	0,100	0,060	0,055	0,046	0,028	0,016	0,010	0,007	0,005	0,003
2,5	0,125	0,075	0,070	0,054	0,030	0,018	0,012	0,008	0,006	0,004
4,0	0,240	0,120	0,085	0,065	0,043	0,025	0,016	0,010	0,007	0,005
6,0	0,360	0,180	0,120	0,085	0,061	0,035	0,024	0,013	0,009	0,007
8,0	0,480	0,240	0,150	0,100	0,068	0,045	0,032	0,022	0,014	0,010
10,0	0,600	0,300	0,160	0,120	0,075	0,055	0,040	0,028	0,016	0,012
14,0	0,700	0,350	0,180	0,130	0,085	0,065	0,050	0,035	0,025	0,020
20,0	0,800	0,400	0,250	0,180	0,110	0,080	0,060	0,045	0,035	0,026
24,0	0,900	0,450	0,300	0,185	0,130	0,085	0,065	0,047	0,036	0,027
30,0	1,050	0,500	0,400	0,200	0,150	0,100	0,070	0,050	0,040	0,030
35,0	1,100	0,600	0,450	0,250	0,180	0,120	0,075	0,055	0,045	0,035
40,0	1,200	0,700	0,500	0,300	0,200	0,150	0,080	0,060	0,050	0,040
52,0	1,300	0,800	0,550	0,350	0,230	0,180	0,100	0,070	0,060	0,050

Refrigerante:

- Emulsión
- Aceite
- Aire

## E100

Broca de un labio

Enterizo MD

0,9 ... 16,0

271

Dimens. página




\* Los valores de avance se refieren siempre a las herramientas con el recubrimiento recomendado. En algunos casos, el funcionamiento de las herramientas sin recubrimiento no se puede garantizar.

Grupo de materiales	Ejemplos Cifras en negrita = nº de mat. según DIN EN 10 027	Resist. N/mm²	Dureza	Refriger.	capa recom.*	<35xD		>35xD	
						v <sub>c</sub> m/min	Código VR	v <sub>c</sub> m/min	Código VR
Aceros de construcción generales	1.0035 S185, 1.0486 P275N, 1.0345 P235GH, 1.0425	≤500		○	○	100	15	100	15
	1.0050 E295, 1.0070 E360, 1.8937 P500NH	≤1000		○		85	15	85	15
Aceros para autómatas	1.0718 11SMnPb30, 1.0736 11SMn37	≤850		○	○	90	15	90	15
	1.0727 46S20, 1.0728 60S20, 1.0757 46SPb20	≤1000		○		80	15	80	15
Aceros de bonificación no aleados	1.0402 C22, 1.1178 C30E	≤700		○	○	80	14	80	14
	1.0503 C45, 1.1191 C45E	≤850		○		75	14	75	14
	1.0601 C60, 1.1221 C60E	≤1000		○		75	14	75	14
Aceros de bonificación aleados	1.5131 50MnSi4, 1.7003 38Cr2, 1.7030 28Cr4	≤1000		○	○	75	14	75	14
	1.5710 36NiCr6, 1.7035 41Cr4, 1.7225 42CrMo4	≤1400		○		65	14	65	14
Aceros de cementación no aleados	1.0301, 1.1121 C10E	≤850		○	○	80	15	80	15
Aceros de cementación aleados	1.7276 10CrMo11, 1.5125 11MnSi6	≤1000		●	●	75	14	75	14
	1.5752 15NiCr13, 1.7131 16MnCr5, 1.7264 20CrMo5	≤1400		●		65	14	65	14
Aceros de nitruración	1.8504 34CrAl6	≤1000		○	○	75	14	75	14
	1.8519 31CrMoV9, 1.8550 34CrAlNi7	≤1400		○		65	14	65	14
Aceros para herramientas	1.1750 C75W, 1.2067 102Cr6, 1.2307 29CrMoV9	≤850		○	○	75	13	75	13
	1.2080 X210Cr12, 1.2083 X42Cr13, 1.2419, 1.2767	≤1400		○		65	13	65	13
Aceros rápidos	1.3243 S 6-5-2-5, 1.3343 S 6-5-2, 1.3344 S 6-5-3	≤1400		○	○	55	12	55	12
Aceros para muelles	1.5026 55Si7, 1.7176 55Cr3, 1.8159 51CrV4		≤350 HB	●	○	65	13	65	13
Aceros templados	1.4005 X12CrS13, 1.4104 X14CrMoS17, 1.4105		≤48 HRC	●	○	30	13	30	13
	1.4301 X5CrNi18-10, 1.4541 X6CrNiTi18-10, 1.4571		≤66 HRC	●		25	10	25	14
Aceros inox., sulfurados austeníticos martensíticos	1.4057 X20CrNi172, 1.4122 X39CrMo17-1, 1.4521	≤900		●	○	40	14	40	14
	-	≤1100		●		35	14	35	14
	-	≤1500		●		35	14	35	14
Hierro fundido	Nimonic, Inconel, Monel, Hastelloy		≤240 HB	○	○	85	16	85	16
	0.6010 EN-GJL-100, 0.6020 EN-GJL-200		≤350 HB	○		80	16	85	16
Fundición de grafito esférico y fundición maleable	0.6025 EN-GJL-250, 0.6035 EN-GJL-350		≤240 HB	○	○	80	15	80	15
	0.7050 EN-GJS-500-7, 0.8035 EN-GJMW-350-4		≤350 HB	○		70	15	70	15
Fundición dura	0.7070 EN-GJS-700-2, 0.8170 EN-GJMB-700-2		≤350 HB	○	○	55	14	55	14
Nuevos mat. de fundición GGV	-		≤220 HB	○	○				
	3.7024 Ti99,5, 3.7114 TiAl5Sn2,5, 3.7124 TiCu2		≤300 HB	○					
Nuevos mat. de fundición ADI	3.7154 TiAl6Zr5, 3.7165 TiAl6V4, 3.7184	≤1000		○	○				
	3.0255 Al99,5, 3.2315 AlMgSi1, 3.3515 AlMg1	≤1400		○					
Aleaciones especiales	3.0615 AlMgSiPb, 3.1325 AlCuMg1, 3.3245, 3.4365	≤2000		○	○	20	12	20	12
Titanio y aleaciones de titanio	3.2131 G-AlSi5Cu1, 3.2153 G-AlSi7Cu3, 3.2573 G-AlSi9	≤850		○	○	35	12	35	12
	3.2581 G-AlSi12, 3.2583 G-AlSi12Cu, G-AlSi12CuNiMg	≤1400		○		30	12	30	12
Aluminio y aleaciones de Al	3.5200 MgMn2, 3.5812.05 G-MgAl8Zn1, 3.5612.05	≤400		○	○	150	17	150	17
Aleaciones maleables de Al	2.0070 SE-Cu, 2.1020 CuSn6, 2.1096 G-CuSn5ZnPb	≤650		○	○	120	19	120	19
Aleac. fund. de Al ≤ 10 % Si	2.0380 CuZn39Pb2, 2.0401 CuZn39Pb3, 2.0410	≤600		○		120	20	120	20
Aleac. fund. de Al > 10 % Si	2.0250 CuZn20, 2.0280 CuZn33, 2.0332 CuZn37Pb0,5	≤600		○	○	130	18	130	18
Aleaciones de magnesio	2.1090 CuSn7ZnPb, 2.1170 CuPb5Sn5, 2.1176	≤400		○	○	110	17	110	17
Cobre de baja aleación	2.0790 CuNi18Zn19Pb	≤500		○		○	75	15	75
Latón, viruta corta	2.0916 CuAl5, 2.0960 CuAl9Mn, 2.1050 CuSn10	≤600		○	○	120	18	120	18
	2.0980 CuAl11Ni, 2.1247 CuBe2	≤600		○		90	18	90	18
Bronces, viruta larga	Resina epoxidica, Resopal, Pertinax, Moltopren	≤600		○	○	95	17	95	17
	Plexiglas, Hostalen, Novodur, Makralon	≤850		○		75	17	75	17
Bronces, viruta corta	EN-GJV250 (GGV25), EN-GJV350 (GGV35)	≤850		○	○	70	17	70	17
	EN-GJV400 (GGV40), EN-GJV500 (GGV50), SiMo 6	≤1000		○		60	17	60	17
	EN-GJS-800-8 (ADI800), EN-GJS-1000-5 (ADI1000)	≤150		○		75	15	75	15
Duroplásticos	EN-GJS-1200-2 (ADI1200), EN-GJS-1400-1 (ADI1400)	≤100		○	○	70	15	70	15
Termoplásticos	Kevlar	≤1000		○	○	60	14	60	14
Materiales sintéticos	GFK/CFK	≤1000		○	○	50	14	50	14
Fibras de vidrio/carbón				○					



## Aplicaciones recomendadas avellanadores cónicos

Artículo no.   
 Norma/DIN  
 Material de corte  
 Superficie  
 Ángulo cónico  
 Forma del mango  
 Dimens. página

### Nota importante sobre los avellanados cónicos en espiral:

Las herramientas con n° de código de series de avance impreso en negrita (código VR) se deberían elegir con preferencia.

Diámetro de orificio avellanado más pequeño y adecuación para tornillos avellanados en avellanados cónicos en espiral.

Hta. Ø mm	N° de serie de avance					
	81	82	83	84	85	86
	f (mm/vuelta)					
2,00	0,03	0,04	0,06	0,08	0,10	0,13
2,50	0,03	0,05	0,07	0,10	0,13	0,16
3,15	0,03	0,05	0,08	0,11	0,15	0,20
4,00	0,04	0,06	0,09	0,13	0,17	0,22
5,00	0,04	0,07	0,10	0,14	0,18	0,23
6,30	0,04	0,07	0,12	0,15	0,19	0,24
8,00	0,05	0,08	0,13	0,16	0,20	0,25
10,00	0,06	0,09	0,14	0,17	0,22	0,26
12,50	0,06	0,10	0,15	0,19	0,23	0,28
16,00	0,07	0,11	0,17	0,21	0,26	0,31
20,00	0,08	0,13	0,18	0,23	0,28	0,33
25,00	0,09	0,15	0,21	0,26	0,30	0,38
31,50	0,12	0,17	0,24	0,30	0,36	0,42
40,00	0,14	0,21	0,28	0,34	0,40	0,46

d1	Ø mínimo p. avellanar mm	para tornillos avellanados ISO 2009, 2010, 7046, 7047	p. tornillos avellanados DIN 7991
6,30	2,00	-	M3
8,00	2,50	M4	-
8,30	2,50	-	M4
10,00	3,00	M5	-
10,40	3,00	-	M5
11,50	3,30	M6	-
12,40	3,30	-	M6
15,00	3,70	M8	-
16,50	3,70	-	M8
19,00	4,50	M10	-
20,50	4,50	-	M10
23,00	4,80	M12	-
25,00	4,80	-	M12
31,00	5,20	-	M16

Refrigerante según material:  
 ○ Aire  
 ● Aceite  
 ● Emulsión

Grupo de materiales	Ejemplos Cifras en negrita = n° de mat. según DIN EN 10 027	Resistencia N/mm <sup>2</sup>	Dureza	Refriger.
Aceros de construcción generales	<b>1.0035</b> S185(St33), <b>1.0486</b> P275N(StE285), <b>1.0345</b> P235GH(H1), <b>1.0425</b> P265GH(H2) <b>1.0050</b> E295 (St50-2), <b>1.0070</b> E360 (St70-2), <b>1.8937</b> P500NH (WStE500)	≤500 ≤1000		○
Aceros para autómatas	<b>1.0718</b> 11SMnPb30 (9SMnPb28), <b>1.0736</b> 11SMn37 (9SMn36) <b>1.0727</b> 46S20 (45S20), <b>1.0728</b> (60S20), <b>1.0757</b> 46SPb20 (45SPb20)	≤850 ≤1000		○
Aceros de bonificación no aleados	<b>1.0402</b> C22, <b>1.1178</b> C30E (Ck30) <b>1.0503</b> C45, <b>1.1191</b> C45E (Ck45) <b>1.0601</b> C60, <b>1.1221</b> C60E (Ck60)	≤700 ≤850 ≤1000		○
Aceros de bonificación aleados	<b>1.5131</b> 50MnSi4, <b>1.7003</b> 38Cr2, <b>1.7030</b> 28Cr4 <b>1.5710</b> 36NiCr6, <b>1.7035</b> 41Cr4, <b>1.7225</b> 42CrMo4	≤1000 ≤1400		○
Aceros cementación aleados	<b>1.0301</b> (C10), <b>1.1121</b> C10E (Ck10)	≤850		○
Aceros cementación no aleados	<b>1.7276</b> 10CrMo11, <b>1.5125</b> 11MnSi6 <b>1.5752</b> 15NiCr13, <b>1.7131</b> 16MnCr5, <b>1.7264</b> 20CrMo5	≤1000 ≤1400		●
Aceros de nitruración	<b>1.8504</b> 34CrAl6 <b>1.8519</b> 31CrMoV9, <b>1.8550</b> 34CrAlNi7	≤1000 ≤1400		●
Aceros para herramientas	<b>1.1750</b> C75W, <b>1.2067</b> 102Cr6, <b>1.2307</b> 29CrMoV9 <b>1.2080</b> X210Cr12, <b>1.2083</b> X42Cr13, <b>1.2419</b> 105WCr6, <b>1.2767</b> X45NiCrMo4	≤850 ≤1400		●
Aceros rápidos	<b>1.3243</b> S 6-5-2-5, <b>1.3343</b> S 6-5-2, <b>1.3344</b> S 6-5-3	≤1400		●
Aceros para muelles	<b>1.5026</b> 55Si7, <b>1.7176</b> 55Cr3, <b>1.8159</b> 51CrV4 (51CrV4)		≤350 HB	●
Aceros templados	-		≤48 HRC ≤66 HRC	●
Aceros inox., sulfurados austeníticos martensíticos	<b>1.4005</b> X12CrS13, <b>1.4104</b> X14CrMoS17, <b>1.4105</b> X6CrMoS17, <b>1.4305</b> X8CrNiS18-9 <b>1.4301</b> X5CrNi18-10 (V2A), <b>1.4541</b> X6CrNiTi18-10, <b>1.4571</b> X6CrNiMoTi 17-12-2 (V4A) <b>1.4057</b> X20CrNi172 (X17CrNi16-2), <b>1.4122</b> X39CrMo17-1, <b>1.4521</b> X2CrMoTi18-2	≤900 ≤1100 ≤1500		●
Hierro fundido	<b>0.6010</b> EN-GJL-100 (GG10), <b>0.6020</b> EN-GJL-200 (GG20) <b>0.6025</b> EN-GJL-250 (GG25), <b>0.6035</b> EN-GJL-350 (GG35)		≤240 HB ≤350 HB	○
Fundición de grafito esférico y fundición maleable	<b>0.7050</b> EN-GJS-500-7 (GGG50), <b>0.8035</b> EN-GJMW-350-4 (GTW35) <b>0.7070</b> EN-GJS-700-2 (GGG70), <b>0.8170</b> EN-GJMB-700-2 (GTS70)		≤240 HB ≤350 HB	○
Fundición dura	-		≤350 HB	○
Nuevos mat. de fundición GGV	<b>EN-GJV250</b> (GGV25), <b>EN-GJV350</b> (GGV35) <b>EN-GJV400</b> (GGV40), <b>EN-GJV500</b> (GGV50), SiMo 6		≤220 HB ≤300 HB	○
Nuevos mat. de fundición ADI	<b>EN-GJS-800-8</b> (ADI800), <b>EN-GJS-1000-5</b> (ADI1000) <b>EN-GJS-1200-2</b> (ADI1200), <b>EN-GJS-1400-1</b> (ADI1400)	≤1000 ≤1400		○
Aleaciones especiales	Nimonic, Inconel, Monel, Hastelloy	≤2000		●
Titanio y aleaciones de titanio	<b>3.7024</b> Ti99,5, <b>3.7114</b> TiAl5Sn2,5, <b>3.7124</b> TiCu2 <b>3.7154</b> TiAl6Zr5, <b>3.7165</b> TiAl6V4, <b>3.7184</b> TiAl4Mo4Sn2,5, - TiAl8Mo1V1	≤850 ≤1400		●
Aluminio y aleaciones de Al	<b>3.0255</b> Al99,5, <b>3.2315</b> AlMgSi1, <b>3.3515</b> AlMg1	≤400		○
Aleaciones maleables de Al	<b>3.0615</b> AlMgSiPb, <b>3.1325</b> AlCuMg1, <b>3.3245</b> AlMg3Si, <b>3.4365</b> AlZnMgCu1,5	≤650		○
Aleac. fund. de Al ≤ 10 % Si > 10 % Si	<b>3.2131</b> G-AlSi5Cu1, <b>3.2153</b> G-AlSi7Cu3, <b>3.2573</b> G-AlSi9 <b>3.2581</b> G-AlSi12, <b>3.2583</b> G-AlSi12Cu, - G-AlSi12CuNiMg	≤600 ≤600		○
Aleaciones de magnesio	<b>3.5200</b> MgMn2, <b>3.5812.05</b> G-MgAl8Zn1, <b>3.5612.05</b> G-MgAl6Zn1	≤400		○
Cobre de baja aleación	<b>2.0070</b> SE-Cu, <b>2.1020</b> CuSn6, <b>2.1096</b> G-CuSn5ZnPb	≤500		○
Latón, viruta corta viruta larga	<b>2.0380</b> CuZn39Pb2, <b>2.0401</b> CuZn39Pb3, <b>2.0410</b> CuZn43Pb2 <b>2.0250</b> CuZn20, <b>2.0280</b> CuZn33, <b>2.0332</b> CuZn37Pb0,5	≤600 ≤600		○
Bronces, viruta corta	<b>2.1090</b> CuSn7ZnPb, <b>2.1170</b> CuPb5Sn5, <b>2.1176</b> CuPb10Sn <b>2.0790</b> CuNi18Zn19Pb	≤600 ≤850		○
Bronces, viruta larga	<b>2.0916</b> CuAl5, <b>2.0960</b> CuAl9Mn, <b>2.1050</b> CuSn10 <b>2.0980</b> CuAl11Ni, <b>2.1247</b> CuBe2	≤850 ≤1000		○
Duroplásticos	Resina epoxídica, Resopal, Pertinax, Moltopren	≤150		○
Termoplásticos	Plexiglas, Hostalen, Novodur, Makralon	≤100		○
Materiales sintéticos	Kevlar	≤1000		○
Fibras de vidrio/carbón	GFK/CFK	≤1000		○



# HARTNER

88200	88021
335	335
<b>HSS</b>	<b>HSS</b>
90°	90°
cil.	cil.
382	384

88201	88022
335	335
<b>HSS-E</b>	<b>HSS-E</b>
90°	90°
cil.	cil.
383	385



$v_c$ m/min	N° de serie de avance	
32	85	85
30	85	85
32	85	85
30	85	85
32	85	85
30	85	85
20	84	84
15	84	84
12	84	84
25	85	85
15	84	84
10	84	84
15	85	85
12	84	84
17	84	84
15	84	84
15	84	84
10	84	84
16	84	84
12	84	84
14	84	84
25	85	85
16	84	84
22	84	84
20	84	84
8	84	84
25	84	84
16	84	84
8	84	84
15	85	85
10	85	85
90	85	85
70	86	86
40	85	85
30	85	85
100	86	86
60	84	84
80	85	85
50	85	85
30	86	86
26	86	86
24	86	86
20	86	86
30	84	84
40	85	85
70	84	84

$v_c$ m/min	N° de serie de avance	
41	83	83
39	82	82
41	83	83
39	82	82
41	83	83
39	83	83
25	82	82
19	83	83
15	82	82
32	83	83
19	83	83
13	82	82
19	82	82
15	81	81
22	82	82
19	81	81
19	81	81
13	81	81
20	82	82
15	81	81
18	81	81
32	83	83
20	83	83
28	83	83
25	83	83
10	81	81
28	83	83
18	83	83
10	81	81
19	82	82
13	81	81
114	84	84
89	84	84
51	83	83
39	83	83
127	84	84
76	84	84
101	84	84
64	84	84
39	84	84
33	84	84
31	84	84
25	84	84
39	84	84
51	84	84





# HARTNER

86602
10...25
HSS-E-PM
<b>T</b>
411

86608
10...25
HSS-E-PM
<b>F</b>
413

86605
25...102
HSS-E
<b>T</b>
412

86609
10...102
HSS-E-PM
<b>A</b>
414

86611
10...65
HSS-E-PM
<b>A</b>
415



V <sub>c</sub> m/min	N° de serie de avance	V <sub>c</sub> m/min	N° de serie de avance	V <sub>c</sub> m/min	N° de serie de avance	V <sub>c</sub> m/min	N° de serie de avance	V <sub>c</sub> m/min	N° de serie de avance
40	4	48	4	40	4	48	4	25	3
35	4	42	4	35	4	42	4	25	3
50	5	60	5	50	5	60	5	30	3
40	5	50	5	40	5	50	5	25	3
40	4	45	4	40	4	45	4	22	3
35	4	40	4	35	4	40	4	20	3
30	4	35	4	30	4	35	4	20	3
25	3	28	3	25	3	28	3	15	2
22	2	25	2	22	2	25	2	15	2
35	3	40	3	35	3	40	3	20	2
25	3	28	3	25	3	28	3	15	2
22	2	25	2	22	2	25	2	15	2
22	3	25	3	22	3	25	3	15	2
15	2	18	2	15	2	18	2	12	1
26	3	28	3	26	3	28	3	15	2
22	2	25	2	22	2	25	2	15	2
12	2	18	2	12	2	18	2	10	1
10	2	13	2	10	2	13	2	8	1
20	2	23	2	20	2	23	2	10	1
15	2	17	2	15	2	17	2	10	1
15	2	20	2	15	2	20	2	10	1
35	4	40	4	35	4	40	4	20	3
35	4	40	4	35	4	40	4	20	3
35	4	40	4	35	4	40	4	20	3
28	4	33	4	28	4	33	4	20	3
60	5	65	5	60	5	65	5	32	4
80	5	85	5	80	5	85	5	42	4
85	5	85	5	85	5	85	5	42	4
70	5	70	5	70	5	70	5	35	4
45	4	50	4	45	4	50	4	25	3
45	4	50	4	45	4	50	4	25	3
60	5	65	5	60	5	65	5	32	4
45	4	50	4	45	4	50	4	25	3
32	5	35	5	32	5	35	5	20	4
40	3	45	3	40	3	45	3	22	2
36	3	40	3	36	3	40	3	20	2
28	3	32	3	28	3	32	3	15	2
22	3	27	3	22	3	27	3	15	2



## Aplicaciones recomendadas Multiplex

Artículo no.
Gama de diámetros
Material de corte
Clase de metal duro
Calidad de metal duro
Superficie
Dimens. página

Las herramientas con n° de código de series de avance impreso en negrita (código VR) se deberían elegir con preferencia.

Hta. Ø mm	N° de serie de avance					
	1	2	3	4	5	6
	f (mm/vuelta)					
10,00	0,08	0,09	0,11	0,14	0,19	0,24
12,50	0,09	0,11	0,13	0,17	0,22	0,28
16,00	0,11	0,13	0,16	0,21	0,27	0,34
20,00	0,13	0,15	0,19	0,25	0,32	0,40
25,00	0,16	0,18	0,23	0,29	0,38	0,48
31,50	0,19	0,22	0,27	0,35	0,45	0,57
40,00	0,23	0,26	0,33	0,42	0,54	0,69
50,00	0,27	0,31	0,39	0,50	0,64	0,82
63,00	0,32	0,38	0,47	0,60	0,77	0,98
102,00	0,40	0,48	0,59	0,74	0,85	1,20
150,00	0,59	0,70	0,87	1,09	1,25	1,76
100,00	0,78	0,93	1,16	1,45	1,67	2,35

Refrigerante según material:

- Aire
- Aceite
- ◐ Emulsión

Sentido de corte:

- Ⓜ corte a derechas
- Ⓛ corte a izquierdas

Grupo de materiales	Ejemplos Cifras en negrita = n° de mat. según DIN EN 10 027	Resistencia N/mm <sup>2</sup>	Dureza	Refriger.
Aceros de construcción generales	<b>1.0035</b> S185(St33), <b>1.0486</b> P275N(StE285), <b>1.0345</b> P235GH(H1), <b>1.0425</b> P265GH(H2) <b>1.0050</b> E295 (St50-2), <b>1.0070</b> E360 (St70-2), <b>1.8937</b> P500NH (WStE500)	≤500 ≤1000		○
Aceros para autómatas	<b>1.0718</b> 11SMnPb30 (9SMnPb28), <b>1.0736</b> 11SMn37 (9SMn36) <b>1.0727</b> 46S20 (45S20), <b>1.0728</b> (60S20), <b>1.0757</b> 46SPb20 (45SPb20)	≤850 ≤1000		○
Aceros de bonificación no aleados	<b>1.0402</b> C22, <b>1.1178</b> C30E (Ck30) <b>1.0503</b> C45, <b>1.1191</b> C45E (Ck45) <b>1.0601</b> C60, <b>1.1221</b> C60E (Ck60)	≤700 ≤850 ≤1000		○
Aceros de bonificación aleados	<b>1.5131</b> 50MnSi4, <b>1.7003</b> 38Cr2, <b>1.7030</b> 28Cr4 <b>1.5710</b> 36NiCr6, <b>1.7035</b> 41Cr4, <b>1.7225</b> 42CrMo4	≤1000 ≤1400		○
Aceros cementación aleados	<b>1.0301</b> (C10), <b>1.1121</b> C10E (Ck10)	≤850		○
Aceros cementación no aleados	<b>1.7276</b> 10CrMo11, <b>1.5125</b> 11MnSi6 <b>1.5752</b> 15NiCr13, <b>1.7131</b> 16MnCr5, <b>1.7264</b> 20CrMo5	≤1000 ≤1400		●
Aceros de nitruración	<b>1.8504</b> 34CrAl6 <b>1.8519</b> 31CrMoV9, <b>1.8550</b> 34CrAlNi7	≤1000 ≤1400		○
Aceros para herramientas	<b>1.1750</b> C75W, <b>1.2067</b> 102Cr6, <b>1.2307</b> 29CrMoV9 <b>1.2080</b> X210Cr12, <b>1.2083</b> X42Cr13, <b>1.2419</b> 105WCr6, <b>1.2767</b> X45NiCrMo4	≤850 ≤1400		○
Aceros rápidos	<b>1.3243</b> S 6-5-2-5, <b>1.3343</b> S 6-5-2, <b>1.3344</b> S 6-5-3	≤1400		●
Aceros para muelles	<b>1.5026</b> 55Si7, <b>1.7176</b> 55Cr3, <b>1.8159</b> 51CrV4 (51CrV4)		≤350 HB	●
Aceros templados	-		≤48 HRC ≤66 HRC	●
Aceros inox., sulfurados austeníticos	<b>1.4005</b> X12CrS13, <b>1.4104</b> X14CrMoS17, <b>1.4105</b> X6CrMoS17, <b>1.4305</b> X8CrNiS18-9 <b>1.4301</b> X5CrNi18-10 (V2A), <b>1.4541</b> X6CrNiTi18-10, <b>1.4571</b> X6CrNiMoTi 17-12-2 (V4A)	≤900 ≤1100		●
martensíticos	<b>1.4057</b> X20CrNi172 (X17CrNi16-2), <b>1.4122</b> X39CrMo17-1, <b>1.4521</b> X2CrMoTi18-2	≤1500		●
Hierro fundido	<b>0.6010</b> EN-GJL-100 (GG10), <b>0.6020</b> EN-GJL-200 (GG20) <b>0.6025</b> EN-GJL-250 (GG25), <b>0.6035</b> EN-GJL-350 (GG35)		≤240 HB ≤350 HB	○
Fundición de grafito esférico y fundición maleable	<b>0.7050</b> EN-GJS-500-7 (GGG50), <b>0.8035</b> EN-GJMW-350-4 (GTW35) <b>0.7070</b> EN-GJS-700-2 (GGG70), <b>0.8170</b> EN-GJMB-700-2 (GTS70)		≤240 HB ≤350 HB	○
Fundición dura	-		≤350 HB	○
Nuevos mat. de fundición GGV	<b>EN-GJV250</b> (GGV25), <b>EN-GJV350</b> (GGV35) <b>EN-GJV400</b> (GGV40), <b>EN-GJV500</b> (GGV50), SiMo 6		≤220 HB ≤300 HB	○
Nuevos mat. de fundición ADI	<b>EN-GJS-800-8</b> (ADI800), <b>EN-GJS-1000-5</b> (ADI1000) <b>EN-GJS-1200-2</b> (ADI1200), <b>EN-GJS-1400-1</b> (ADI1400)	≤1000 ≤1400		○
Aleaciones especiales	Nimonic, Inconel, Monel, Hastelloy	≤2000		●
Titanio y aleaciones de titanio	<b>3.7024</b> Ti99,5, <b>3.7114</b> TiAl5Sn2,5, <b>3.7124</b> TiCu2 <b>3.7154</b> TiAl6Zr5, <b>3.7165</b> TiAl6V4, <b>3.7184</b> TiAl4Mo4Sn2,5, - TiAl8Mo1V1	≤850 ≤1400		●
Aluminio y aleaciones de Al	<b>3.0255</b> Al99,5, <b>3.2315</b> AlMgSi1, <b>3.3515</b> AlMg1	≤400		○
Aleaciones maleables de Al	<b>3.0615</b> AlMgSiPb, <b>3.1325</b> AlCuMg1, <b>3.3245</b> AlMg3Si, <b>3.4365</b> AlZnMgCu1,5	≤650		○
Aleac. fund. de Al ≤ 10 % Si	<b>3.2131</b> G-AlSi5Cu1, <b>3.2153</b> G-AlSi7Cu3, <b>3.2573</b> G-AlSi9	≤600		○
> 10 % Si	<b>3.2581</b> G-AlSi12, <b>3.2583</b> G-AlSi12Cu, - G-AlSi12CuNiMg	≤600		○
Aleaciones de magnesio	<b>3.5200</b> MgMn2, <b>3.5812.05</b> G-MgAl8Zn1, <b>3.5612.05</b> G-MgAl6Zn1	≤400		○
Cobre de baja aleación	<b>2.0070</b> SE-Cu, <b>2.1020</b> CuSn6, <b>2.1096</b> G-CuSn5ZnPb	≤500		○
Latón, viruta corta	<b>2.0380</b> CuZn39Pb2, <b>2.0401</b> CuZn39Pb3, <b>2.0410</b> CuZn43Pb2	≤600		○
viruta larga	<b>2.0250</b> CuZn20, <b>2.0280</b> CuZn33, <b>2.0332</b> CuZn37Pb0,5	≤600		○
Bronces, viruta corta	<b>2.1090</b> CuSn7ZnPb, <b>2.1170</b> CuPb5Sn5, <b>2.1176</b> CuPb10Sn <b>2.0790</b> CuNi18Zn19Pb	≤600 ≤850		○
Bronces, viruta larga	<b>2.0916</b> CuAl5, <b>2.0960</b> CuAl9Mn, <b>2.1050</b> CuSn10 <b>2.0980</b> CuAl1Ni, <b>2.1247</b> CuBe2	≤850 ≤1000		○
Duroplásticos	Resina epoxídica, Resopal, Pertinax, Moltopren	≤150		○
Termoplásticos	Plexiglas, Hostalen, Novodur, Makralon	≤100		○
Materiales sintéticos	Kevlar	≤1000		○
Fibras de vidrio/carbón	GFK/CFK	≤1000		○





86708	86709
10...35	10...35
<b>MD</b>	<b>MD</b>
H22	H22
K20/K40	K20/K40
419	420

86701	86702
10...35	10...35
<b>MD</b>	<b>MD</b>
H22	H22
K20/K40	K20/K40
417	418

86711
10...65
<b>MD</b>
H22
K20/K40
421

**Artículo no. 86709/86701 sin chaflan**  
Para materiales con resistencia de mas de 600 N/mm<sup>2</sup>

**Artículo no. 86708/86702 con chaflan**  
Para materiales con resistencia sobre de 600 N/mm<sup>2</sup>.



V <sub>c</sub> m/min	Nº de serie de avance	V <sub>c</sub> m/min	Nº de serie de avance	V <sub>c</sub> m/min	Nº de serie de avance
60	5	70	5		
55	4	65	4		
100	4	115	4		
95	4	105	4		
80	4	90	4		
80	4	90	4		
75	3	85	3		
70	4	80	4		
60	3	70	3		
85	4	95	4		
70	4	80	4		
55	3	65	3		
60	3	65	3		
50	2	55	2		
40	3	45	3		
35	2	40	2		
40	2	45	2		
35	2	40	2		
25	1	30	1		
40	2	45	2		
25	2	30	2		
100	5	120	5		
90	4	105	4		
80	4	90	4		
65	3	75	3		
25	1	30	1		
180	5	200	5	180	5
160	5	180	5	160	5
140	5	160	5	140	5
130	5	150	5	130	5
150	5	160	5	150	4
70	4	80	4	70	5
160	5	180	5	160	4
110	4	120	4	110	5
80	5	90	5	80	4
65	4	75	4	65	4
45	4	50	4	45	4
35	4	40	4	35	4
70	3	85	3	70	3
70	3	85	3	70	3
70	3	85	3	70	3
70	3	85	3	70	3

## Aplicaciones recomendadas Multiplex HPC

Artículo no.  
Norma/DIN  
Material de corte  
Calidad de metal duro  
Profundidad  
Superficie  
Tipo  
Dimens. página

Hta. Ø mm	N° de serie de avance								
	1	2	3	4	5	6	7	8	9
	f (mm/vuelta)								
10,00	0,080	0,100	0,125	0,160	0,200	0,250	0,315	0,400	0,400
12,50	0,080	0,100	0,125	0,160	0,200	0,250	0,315	0,400	0,500
16,00	0,100	0,125	0,160	0,200	0,250	0,315	0,400	0,500	0,630
20,00	0,125	0,160	0,200	0,250	0,315	0,400	0,500	0,630	0,630
25,00	0,160	0,200	0,250	0,315	0,400	0,500	0,630	0,800	0,800
31,50	0,160	0,200	0,250	0,315	0,400	0,500	0,630	0,800	1,000
40,00	0,200	0,250	0,315	0,400	0,500	0,630	0,800	1,000	1,250

Refrigerante según material:

- Aire
- Aceite
- ◐ Emulsión

Todas las indicaciones son valores orientativos. Las condiciones de velocidad de corte y avance a conseguir dependerán de las condiciones de trabajo. Recomendamos pruebas de taladrado.

Grupo de materiales	Ejemplos Cifras en negrita = n° de mat. según DIN EN 10 027	Resistencia N/mm <sup>2</sup>	Dureza	Refriger.
Aceros de construcción generales	<b>1.0035</b> S185(St33), <b>1.0486</b> P275N(StE285), <b>1.0345</b> P235GH(H1), <b>1.0425</b> P265GH(H2) <b>1.0050</b> E295 (St50-2), <b>1.0070</b> E360 (St70-2), <b>1.8937</b> P500NH (WStE500)	≤500 ≤1000		○
Aceros para autómatas	<b>1.0718</b> 11SMnPb30 (9SMnPb28), <b>1.0736</b> 11SMn37 (9SMn36) <b>1.0727</b> 46S20 (45S20), <b>1.0728</b> (60S20), <b>1.0757</b> 46SPb20 (45SPb20)	≤850 ≤1000		○
Aceros de bonificación no aleados	<b>1.0402</b> C22, <b>1.1178</b> C30E (Ck30) <b>1.0503</b> C45, <b>1.1191</b> C45E (Ck45) <b>1.0601</b> C60, <b>1.1221</b> C60E (Ck60)	≤700 ≤850 ≤1000		○
Aceros de bonificación aleados	<b>1.5131</b> 50MnSi4, <b>1.7003</b> 38Cr2, <b>1.7030</b> 28Cr4 <b>1.5710</b> 36NiCr6, <b>1.7035</b> 41Cr4, <b>1.7225</b> 42CrMo4	≤1000 ≤1400		○
Aceros cementación aleados	<b>1.0301</b> (C10), <b>1.1121</b> C10E (Ck10)	≤850		○
Aceros cementación no aleados	<b>1.7276</b> 10CrMo11, <b>1.5125</b> 11MnSi6 <b>1.5752</b> 15NiCr13, <b>1.7131</b> 16MnCr5, <b>1.7264</b> 20CrMo5	≤1000 ≤1400		●
Aceros de nitruración	<b>1.8504</b> 34CrAl6 <b>1.8519</b> 31CrMoV9, <b>1.8550</b> 34CrAlNi7	≤1000 ≤1400		○
Aceros para herramientas	<b>1.1750</b> C75W, <b>1.2067</b> 102Cr6, <b>1.2307</b> 29CrMoV9 <b>1.2080</b> X210Cr12, <b>1.2083</b> X42Cr13, <b>1.2419</b> 105WCr6, <b>1.2767</b> X45NiCrMo4	≤850 ≤1400		○
Aceros rápidos	<b>1.3243</b> S 6-5-2-5, <b>1.3343</b> S 6-5-2, <b>1.3344</b> S 6-5-3	≤1400		●
Aceros para muelles	<b>1.5026</b> 55Si7, <b>1.7176</b> 55Cr3, <b>1.8159</b> 51CrV4 (51CrV4)		≤350 HB	●
Aceros templados	-		≤48 HRC ≤66 HRC	●
Aceros inox., sulfurados austeníticos martensíticos	<b>1.4005</b> X12CrS13, <b>1.4104</b> X14CrMoS17, <b>1.86681</b> X6CrMoS17, <b>1.4305</b> X8CrNiS18-9 <b>1.4301</b> X5CrNi18-10 (V2A), <b>1.4541</b> X6CrNiTi18-10, <b>1.4571</b> X6CrNiMoTi 17-12-2 (V4A) <b>1.4057</b> X20CrNi172 (X17CrNi16-2), <b>1.4122</b> X39CrMo17-1, <b>1.4521</b> X2CrMoTi18-2	≤900 ≤1100 ≤1500		●
Hierro fundido	<b>0.6010</b> EN-GJL-100 (GG10), <b>0.6020</b> EN-GJL-200 (GG20) <b>0.6025</b> EN-GJL-250 (GG25), <b>0.6035</b> EN-GJL-350 (GG35)		≤240 HB ≤350 HB	○
Fundición de grafito esférico y fundición maleable	<b>0.7050</b> EN-GJS-500-7 (GGG50), <b>0.8035</b> EN-GJMw-350-4 (GTW35) <b>0.7070</b> EN-GJS-700-2 (GGG70), <b>0.8170</b> EN-GJMB-700-2 (GTS70)		≤240 HB ≤350 HB	○
Fundición dura	-		≤350 HB	○
Nuevos mat. de fundición GGV	<b>EN-GJV250</b> (GGV25), <b>EN-GJV350</b> (GGV35) <b>EN-GJV400</b> (GGV40), <b>EN-GJV500</b> (GGV50), SiMo 6		≤220 HB ≤300 HB	○
Nuevos mat. de fundición ADI	<b>EN-GJS-800-8</b> (ADI800), <b>EN-GJS-1000-5</b> (ADI1000) <b>EN-GJS-1200-2</b> (ADI1200), <b>EN-GJS-1400-1</b> (ADI1400)	≤1000 ≤1400		○
Aleaciones especiales	Nimonic, Inconel, Monel, Hastelloy	≤2000		●
Titanio y aleaciones de titanio	<b>3.7024</b> Ti99,5, <b>3.7114</b> TiAl5Sn2,5, <b>3.7124</b> TiCu2 <b>3.7154</b> TiAl6Zr5, <b>3.7165</b> TiAl6V4, <b>3.7184</b> TiAl4Mo4Sn2,5, - TiAl8Mo1V1	≤850 ≤1400		●
Aluminio y aleaciones de Al	<b>3.0255</b> Al99,5, <b>3.2315</b> AlMgSi1, <b>3.3515</b> AlMg1	≤400		○
Aleaciones maleables de Al	<b>3.0615</b> AlMgSiPb, <b>3.1325</b> AlCuMg1, <b>3.3245</b> AlMg3Si, <b>3.4365</b> AlZnMgCu1,5	≤650		○
Aleac. fund. de Al ≤ 10 % Si > 10 % Si	<b>3.2131</b> G-AlSi5Cu1, <b>3.2153</b> G-AlSi7Cu3, <b>3.2573</b> G-AlSi9 <b>3.2581</b> G-AlSi12, <b>3.2583</b> G-AlSi12Cu, - G-AlSi12CuNiMg	≤600 ≤600		○
Aleaciones de magnesio	<b>3.5200</b> MgMn2, <b>3.5812.05</b> G-MgAl8Zn1, <b>3.5612.05</b> G-MgAl6Zn1	≤400		○
Cobre de baja aleación	<b>2.0070</b> SE-Cu, <b>2.1020</b> CuSn6, <b>2.1096</b> G-CuSn5ZnPb	≤500		○
Latón, viruta corta viruta larga	<b>2.0380</b> CuZn39Pb2, <b>2.0401</b> CuZn39Pb3, <b>2.0410</b> CuZn43Pb2 <b>2.0250</b> CuZn20, <b>2.0280</b> CuZn33, <b>2.0332</b> CuZn37Pb0,5	≤600 ≤600		○
Bronces, viruta corta	<b>2.1090</b> CuSn7ZnPb, <b>2.1170</b> CuPb5Sn5, <b>2.1176</b> CuPb10Sn <b>2.0790</b> CuNi18Zn19Pb	≤600 ≤850		○
Bronces, viruta larga	<b>2.0916</b> CuAl5, <b>2.0960</b> CuAl9Mn, <b>2.1050</b> CuSn10 <b>2.0980</b> CuAl1Ni, <b>2.1247</b> CuBe2	≤850 ≤1000		○
Duroplásticos	Resina epoxídica, Resopal, Pertinax, Moltopren	≤150		○
Termoplásticos	Plexiglas, Hostalen, Novodur, Makralon	≤100		○
Materiales sintéticos	Kevlar	≤1000		○
Fibras de vidrio/carbón	GFK/CFK	≤1000		○



## Aplicaciones recomendadas Multiplex HPC

Artículo no.  
Norma/DIN  
Material de corte  
Calidad de metal duro  
Profundidad  
Superficie  
Tipo  
Dimens. página

Hta. Ø mm	N° de serie de avance								
	1	2	3	4	5	6	7	8	9
	f (mm/vuelta)								
<b>10,00</b>	0,080	0,100	0,125	0,160	0,200	0,250	0,315	0,400	0,400
<b>12,50</b>	0,080	0,100	0,125	0,160	0,200	0,250	0,315	0,400	0,500
<b>16,00</b>	0,100	0,125	0,160	0,200	0,250	0,315	0,400	0,500	0,630
<b>20,00</b>	0,125	0,160	0,200	0,250	0,315	0,400	0,500	0,630	0,630
<b>25,00</b>	0,160	0,200	0,250	0,315	0,400	0,500	0,630	0,800	0,800
<b>31,50</b>	0,160	0,200	0,250	0,315	0,400	0,500	0,630	0,800	1,000
<b>40,00</b>	0,200	0,250	0,315	0,400	0,500	0,630	0,800	1,000	1,250

Refrigerante según material:

- Aire
- Aceite
- ◐ Emulsión

Todas las indicaciones son valores orientativos. Las condiciones de velocidad de corte y avance a conseguir dependerán de las condiciones de trabajo. Recomendamos pruebas de taladrado.

Grupo de materiales	Ejemplos Cifras en negrita = n° de mat. según DIN EN 10 027	Resistencia N/mm <sup>2</sup>	Dureza	Refriger.
Aceros de construcción generales	<b>1.0035</b> S185(St33), <b>1.0486</b> P275N(StE285), <b>1.0345</b> P235GH(H1), <b>1.0425</b> P265GH(H2) <b>1.0050</b> E295 (St50-2), <b>1.0070</b> E360 (St70-2), <b>1.8937</b> P500NH (WStE500)	≤500 ≤1000		○ ○
Aceros para autómatas	<b>1.0718</b> 11SMnPb30 (9SMnPb28), <b>1.0736</b> 11SMn37 (9SMn36) <b>1.0727</b> 46S20 (45S20), <b>1.0728</b> (60S20), <b>1.0757</b> 46SPb20 (45SPb20)	≤850 ≤1000		○ ○
Aceros de bonificación no aleados	<b>1.0402</b> C22, <b>1.1178</b> C30E (Ck30) <b>1.0503</b> C45, <b>1.1191</b> C45E (Ck45) <b>1.0601</b> C60, <b>1.1221</b> C60E (Ck60)	≤700 ≤850 ≤1000		○ ○ ○
Aceros de bonificación aleados	<b>1.5131</b> 50MnSi4, <b>1.7003</b> 38Cr2, <b>1.7030</b> 28Cr4 <b>1.5710</b> 36NiCr6, <b>1.7035</b> 41Cr4, <b>1.7225</b> 42CrMo4	≤1000 ≤1400		○ ○
Aceros cementación aleados	<b>1.0301</b> (C10), <b>1.1121</b> C10E (Ck10)	≤850		○
Aceros cementación no aleados	<b>1.7276</b> 10CrMo11, <b>1.5125</b> 11MnSi6 <b>1.5752</b> 15NiCr13, <b>1.7131</b> 16MnCr5, <b>1.7264</b> 20CrMo5	≤1000 ≤1400		● ●
Aceros de nitruración	<b>1.8504</b> 34CrAl6 <b>1.8519</b> 31CrMoV9, <b>1.8550</b> 34CrAlNi7	≤1000 ≤1400		○ ●
Aceros para herramientas	<b>1.1750</b> C75W, <b>1.2067</b> 102Cr6, <b>1.2307</b> 29CrMoV9 <b>1.2080</b> X210Cr12, <b>1.2083</b> X42Cr13, <b>1.2419</b> 105WCr6, <b>1.2767</b> X45NiCrMo4	≤850 ≤1400		○ ●
Aceros rápidos	<b>1.3243</b> S 6-5-2-5, <b>1.3343</b> S 6-5-2, <b>1.3344</b> S 6-5-3	≤1400		●
Aceros para muelles	<b>1.5026</b> 55Si7, <b>1.7176</b> 55Cr3, <b>1.8159</b> 51CrV4 (51CrV4)		≤350 HB	●
Aceros templados	-		≤48 HRC ≤66 HRC	● ●
Aceros inox., sulfurados austeníticos martensíticos	<b>1.4005</b> X12CrS13, <b>1.4104</b> X14CrMoS17, <b>1.86681</b> X6CrMoS17, <b>1.4305</b> X8CrNiS18-9 <b>1.4301</b> X5CrNi18-10 (V2A), <b>1.4541</b> X6CrNiTi18-10, <b>1.4571</b> X6CrNiMoTi 17-12-2 (V4A) <b>1.4057</b> X20CrNi172 (X17CrNi16-2), <b>1.4122</b> X39CrMo17-1, <b>1.4521</b> X2CrMoTi18-2	≤900 ≤1100 ≤1500		● ● ●
Hierro fundido	<b>0.6010</b> EN-GJL-100 (GG10), <b>0.6020</b> EN-GJL-200 (GG20) <b>0.6025</b> EN-GJL-250 (GG25), <b>0.6035</b> EN-GJL-350 (GG35)		≤240 HB ≤350 HB	○ ○
Fundición de grafito esférico y fundición maleable	<b>0.7050</b> EN-GJS-500-7 (GGG50), <b>0.8035</b> EN-GJMW-350-4 (GTW35) <b>0.7070</b> EN-GJS-700-2 (GGG70), <b>0.8170</b> EN-GJMB-700-2 (GTS70)		≤240 HB ≤350 HB	○ ○
Fundición dura	-		≤350 HB	○
Nuevos mat. de fundición GGV	<b>EN-GJV250</b> (GGV25), <b>EN-GJV350</b> (GGV35) <b>EN-GJV400</b> (GGV40), <b>EN-GJV500</b> (GGV50), SiMo 6		≤220 HB ≤300 HB	○ ○
Nuevos mat. de fundición ADI	<b>EN-GJS-800-8</b> (ADI800), <b>EN-GJS-1000-5</b> (ADI1000) <b>EN-GJS-1200-2</b> (ADI1200), <b>EN-GJS-1400-1</b> (ADI1400)	≤1000 ≤1400		○ ○
Aleaciones especiales	Nimonic, Inconel, Monel, Hastelloy	≤2000		●
Titanio y aleaciones de titanio	<b>3.7024</b> Ti99,5, <b>3.7114</b> TiAl5Sn2,5, <b>3.7124</b> TiCu2 <b>3.7154</b> TiAl6Zr5, <b>3.7165</b> TiAl6V4, <b>3.7184</b> TiAl4Mo4Sn2,5, - TiAl8Mo1V1	≤850 ≤1400		● ●
Aluminio y aleaciones de Al	<b>3.0255</b> Al99,5, <b>3.2315</b> AlMgSi1, <b>3.3515</b> AlMg1	≤400		○
Aleaciones maleables de Al	<b>3.0615</b> AlMgSiPb, <b>3.1325</b> AlCuMg1, <b>3.3245</b> AlMg3Si, <b>3.4365</b> AlZnMgCu1,5	≤650		○
Aleac. fund. de Al ≤ 10 % Si > 10 % Si	<b>3.2131</b> G-AlSi5Cu1, <b>3.2153</b> G-AlSi7Cu3, <b>3.2573</b> G-AlSi9 <b>3.2581</b> G-AlSi12, <b>3.2583</b> G-AlSi12Cu, - G-AlSi12CuNiMg	≤600 ≤600		○ ○
Aleaciones de magnesio	<b>3.5200</b> MgMn2, <b>3.5812.05</b> G-MgAl8Zn1, <b>3.5612.05</b> G-MgAl6Zn1	≤400		○
Cobre de baja aleación	<b>2.0070</b> SE-Cu, <b>2.1020</b> CuSn6, <b>2.1096</b> G-CuSn5ZnPb	≤600		○
Latón, viruta corta viruta larga	<b>2.0380</b> CuZn39Pb2, <b>2.0401</b> CuZn39Pb3, <b>2.0410</b> CuZn43Pb2 <b>2.0250</b> CuZn20, <b>2.0280</b> CuZn33, <b>2.0332</b> CuZn37Pb0,5	≤600 ≤600		○ ○
Bronces, viruta corta	<b>2.1090</b> CuSn7ZnPb, <b>2.1170</b> CuPb5Sn5, <b>2.1176</b> CuPb10Sn <b>2.0790</b> CuNi18Zn19Pb	≤600 ≤850		○ ○
Bronces, viruta larga	<b>2.0916</b> CuAl5, <b>2.0960</b> CuAl9Mn, <b>2.1050</b> CuSn10 <b>2.0980</b> CuAl1Ni, <b>2.1247</b> CuBe2	≤850 ≤1000		○ ○
Duroplásticos	Resina epoxídica, Resopal, Pertinax, Moltopren	≤150		○
Termoplásticos	Plexiglas, Hostalen, Novodur, Makralon	≤100		○
Materiales sintéticos	Kevlar	≤1000		○
Fibras de vidrio/carbón	GFK/CFK	≤1000		○



# HARTNER

## ≤5xD

## ≤7xD

86722
N. d. f.
<b>MD</b>
K/P
1,5xD
<b>F</b>
aceros
446

86725
N. d. f.
<b>MD</b>
K/P
1,5xD
<b>a</b>
ac. inox.
455

86723
N. d. f.
<b>MD</b>
K/P
1,5xD
<b>Y</b>
fundición
449

86724
N. d. f.
<b>MD</b>
K/P
1,5xD
○
Al y aleac.
452

86722
N. d. f.
<b>MD</b>
K/P
3xD
<b>F</b>
aceros
446

86725
N. d. f.
<b>MD</b>
K/P
3xD
<b>a</b>
ac. inox.
455

86723
N. d. f.
<b>MD</b>
K/P
3xD
<b>Y</b>
fundición
449

86724
N. d. f.
<b>MD</b>
K/P
3xD
○
Al y aleac.
452



V <sub>c</sub> m/min	Nº de avance	V <sub>c</sub> m/min	Nº de avance	V <sub>c</sub> m/min	Nº de avance	V <sub>c</sub> m/min	Nº de avance	V <sub>c</sub> m/min	Nº de avance	V <sub>c</sub> m/min	Nº de avance	V <sub>c</sub> m/min	Nº de avance	V <sub>c</sub> m/min	Nº de avance	V <sub>c</sub> m/min	Nº de avance
125	6							120	5								
105	5							105	4								
125	7							120	6								
105	6							105	5								
125	6							120	5								
120	6							110	5								
105	5							100	4								
105	6							100	5								
85	5							85	4								
125	7							120	6								
105	6							100	5								
70	4							70	4								
105	5							105	4								
70	4							70	3								
55	5							55	4								
50	4							50	3								
55	3							55	2								
50	2							50	2								
		25	2							25	1						
		55	3							55	2						
		40	3							40	2						
		35	3							35	2						
				100	6							80	6				
				90	6							70	6				
				120	7							100	7				
				100	6							80	6				
		90	6							70	6						
				80	5							60	5				
				80	5							60	5				
				80	5							60	5				
				80	5							60	5				
		25	2							25	1						
		40	3							40	2						
		35	2							35	1						
								180	7							180	6
								180	7							180	6
								140	7							140	6
								110	7							110	6
								180	7							180	6
								70	6							70	5
								180	7							180	6
								120	6							120	5
								70	6							70	5
								50	6							50	5
								45	6							45	5
								35	5							35	4

## Aplicaciones recomendadas Multiplex HPC

Artículo no.  
Norma/DIN  
Material de corte  
Calidad de metal duro  
Profundidad  
Superficie  
Tipo  
Dimens. página

Hta. Ø mm	N° de serie de avance								
	1	2	3	4	5	6	7	8	9
	f (mm/vuelta)								
10,00	0,080	0,100	0,125	0,160	0,200	0,250	0,315	0,400	0,400
12,50	0,080	0,100	0,125	0,160	0,200	0,250	0,315	0,400	0,500
16,00	0,100	0,125	0,160	0,200	0,250	0,315	0,400	0,500	0,630
20,00	0,125	0,160	0,200	0,250	0,315	0,400	0,500	0,630	0,630
25,00	0,160	0,200	0,250	0,315	0,400	0,500	0,630	0,800	0,800
31,50	0,160	0,200	0,250	0,315	0,400	0,500	0,630	0,800	1,000
40,00	0,200	0,250	0,315	0,400	0,500	0,630	0,800	1,000	1,250

Refrigerante según material:

- Aire
- Aceite
- ◐ Emulsión

Todas las indicaciones son valores orientativos. Las condiciones de velocidad de corte y avance a conseguir dependerán de las condiciones de trabajo. Recomendamos pruebas de taladrado.

Grupo de materiales	Ejemplos Cifras en negrita = n° de mat. según DIN EN 10 027	Resistencia N/mm <sup>2</sup>	Dureza	Refriger.
Aceros de construcción generales	<b>1.0035</b> S185(St33), <b>1.0486</b> P275N(StE285), <b>1.0345</b> P235GH(H1), <b>1.0425</b> P265GH(H2) <b>1.0050</b> E295 (St50-2), <b>1.0070</b> E360 (St70-2), <b>1.8937</b> P500NH (WStE500)	≤500 ≤1000		○
Aceros para autómatas	<b>1.0718</b> 11SMnPb30 (9SMnPb28), <b>1.0736</b> 11SMn37 (9SMn36) <b>1.0727</b> 46S20 (45S20), <b>1.0728</b> (60S20), <b>1.0757</b> 46SPb20 (45SPb20)	≤850 ≤1000		○
Aceros de bonificación no aleados	<b>1.0402</b> C22, <b>1.1178</b> C30E (Ck30) <b>1.0503</b> C45, <b>1.1191</b> C45E (Ck45) <b>1.0601</b> C60, <b>1.1221</b> C60E (Ck60)	≤700 ≤850 ≤1000		○
Aceros de bonificación aleados	<b>1.5131</b> 50MnSi4, <b>1.7003</b> 38Cr2, <b>1.7030</b> 28Cr4 <b>1.5710</b> 36NiCr6, <b>1.7035</b> 41Cr4, <b>1.7225</b> 42CrMo4	≤1000 ≤1400		○
Aceros cementación aleados	<b>1.0301</b> (C10), <b>1.1121</b> C10E (Ck10)	≤850		○
Aceros cementación no aleados	<b>1.7276</b> 10CrMo11, <b>1.5125</b> 11MnSi6 <b>1.5752</b> 15NiCr13, <b>1.7131</b> 16MnCr5, <b>1.7264</b> 20CrMo5	≤1000 ≤1400		●
Aceros de nitruración	<b>1.8504</b> 34CrAl6 <b>1.8519</b> 31CrMoV9, <b>1.8550</b> 34CrAlNi7	≤1000 ≤1400		●
Aceros para herramientas	<b>1.1750</b> C75W, <b>1.2067</b> 102Cr6, <b>1.2307</b> 29CrMoV9 <b>1.2080</b> X210Cr12, <b>1.2083</b> X42Cr13, <b>1.2419</b> 105WCr6, <b>1.2767</b> X45NiCrMo4	≤850 ≤1400		○
Aceros rápidos	<b>1.3243</b> S 6-5-2-5, <b>1.3343</b> S 6-5-2, <b>1.3344</b> S 6-5-3	≤1400		●
Aceros para muelles	<b>1.5026</b> 55Si7, <b>1.7176</b> 55Cr3, <b>1.8159</b> 51CrV4 (51CrV4)		≤350 HB	●
Aceros templados	-		≤48 HRC ≤66 HRC	●
Aceros inox., sulfurados austeníticos martensíticos	<b>1.4005</b> X12CrS13, <b>1.4104</b> X14CrMoS17, <b>1.86681</b> X6CrMoS17, <b>1.4305</b> X8CrNiS18-9 <b>1.4301</b> X5CrNi18-10 (V2A), <b>1.4541</b> X6CrNiTi18-10, <b>1.4571</b> X6CrNiMoTi 17-12-2 (V4A) <b>1.4057</b> X20CrNi172 (X17CrNi16-2), <b>1.4122</b> X39CrMo17-1, <b>1.4521</b> X2CrMoTi18-2	≤900 ≤1100 ≤1500		●
Hierro fundido	<b>0.6010</b> EN-GJL-100 (GG10), <b>0.6020</b> EN-GJL-200 (GG20) <b>0.6025</b> EN-GJL-250 (GG25), <b>0.6035</b> EN-GJL-350 (GG35)		≤240 HB ≤350 HB	○
Fundición de grafito esférico y fundición maleable	<b>0.7050</b> EN-GJS-500-7 (GGG50), <b>0.8035</b> EN-GJMW-350-4 (GTW35) <b>0.7070</b> EN-GJS-700-2 (GGG70), <b>0.8170</b> EN-GJMB-700-2 (GTS70)		≤240 HB ≤350 HB	○
Fundición dura	-		≤350 HB	○
Nuevos mat. de fundición GGV	<b>EN-GJV250</b> (GGV25), <b>EN-GJV350</b> (GGV35) <b>EN-GJV400</b> (GGV40), <b>EN-GJV500</b> (GGV50), SiMo 6		≤220 HB ≤300 HB	○
Nuevos mat. de fundición ADI	<b>EN-GJS-800-8</b> (ADI800), <b>EN-GJS-1000-5</b> (ADI1000) <b>EN-GJS-1200-2</b> (ADI1200), <b>EN-GJS-1400-1</b> (ADI1400)	≤1000 ≤1400		○
Aleaciones especiales	Nimonic, Inconel, Monel, Hastelloy	≤2000		●
Titanio y aleaciones de titanio	<b>3.7024</b> Ti99,5, <b>3.7114</b> TiAl5Sn2,5, <b>3.7124</b> TiCu2 <b>3.7154</b> TiAl6Zr5, <b>3.7165</b> TiAl6V4, <b>3.7184</b> TiAl4Mo4Sn2,5, - TiAl8Mo1V1	≤850 ≤1400		●
Aluminio y aleaciones de Al	<b>3.0255</b> Al99,5, <b>3.2315</b> AlMgSi1, <b>3.3515</b> AlMg1	≤400		○
Aleaciones maleables de Al	<b>3.0615</b> AlMgSiPb, <b>3.1325</b> AlCuMg1, <b>3.3245</b> AlMg3Si, <b>3.4365</b> AlZnMgCu1,5	≤650		○
Aleac. fund. de Al ≤ 10 % Si > 10 % Si	<b>3.2131</b> G-AlSi5Cu1, <b>3.2153</b> G-AlSi7Cu3, <b>3.2573</b> G-AlSi9 <b>3.2581</b> G-AlSi12, <b>3.2583</b> G-AlSi12Cu, - G-AlSi12CuNiMg	≤600 ≤600		○
Aleaciones de magnesio	<b>3.5200</b> MgMn2, <b>3.5812.05</b> G-MgAl8Zn1, <b>3.5612.05</b> G-MgAl6Zn1	≤400		○
Cobre de baja aleación	<b>2.0070</b> SE-Cu, <b>2.1020</b> CuSn6, <b>2.1096</b> G-CuSn5ZnPb	≤500		○
Latón, viruta corta viruta larga	<b>2.0380</b> CuZn39Pb2, <b>2.0401</b> CuZn39Pb3, <b>2.0410</b> CuZn43Pb2 <b>2.0250</b> CuZn20, <b>2.0280</b> CuZn33, <b>2.0332</b> CuZn37Pb0,5	≤600 ≤600		○
Bronces, viruta corta	<b>2.1090</b> CuSn7ZnPb, <b>2.1170</b> CuPb5Sn5, <b>2.1176</b> CuPb10Sn <b>2.0790</b> CuNi18Zn19Pb	≤600 ≤850		○
Bronces, viruta larga	<b>2.0916</b> CuAl5, <b>2.0960</b> CuAl9Mn, <b>2.1050</b> CuSn10 <b>2.0980</b> CuAl1Ni, <b>2.1247</b> CuBe2	≤850 ≤1000		○
Duroplásticos	Resina epoxídica, Resopal, Pertinax, Moltopren	≤150		○
Termoplásticos	Plexiglas, Hostalen, Novodur, Makralon	≤100		○
Materiales sintéticos	Kevlar	≤1000		○
Fibras de vidrio/carbón	GFK/CFK	≤1000		○
















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