



# HARTNER

Präzisionswerkzeuge



**KATALOG**  
Ausgabe 1601





# HARTNER

Präzisionswerkzeuge

# Ausgabe 1601

Baumaßänderungen infolge  
Weiterentwicklung oder Normenänderung  
behalten wir uns vor.

Es gelten unsere Allgemeinen Verkaufsbedingungen.

Druckfehler jeder Art, auch bei technischen Daten  
oder Preisen, berechtigen nicht zu Ansprüchen.

Der Nachdruck, auch auszugsweise, ist verboten.

## Typenbezeichnungen

Typ	Anwendung	Seiten- spanwinkel	Spitzen- winkel	Spitzenanschliff	
<b>N</b>	für normal zerspanbare Werkstoffe (z.B. Stahl, GS, GG)	20°-30°	118°	Kegelmantelanschliff Normalanschliff	Schnellstahl-Bohrer
<b>H</b>	für harte, kurzspanende Werkstoffe (z.B. MS, Bronze, Elektron)	12°-16°	118°	Kegelmantelanschliff Normalanschliff	
<b>W</b>	für weiche, langspanende Werkstoffe (z.B. Al-Legierungen, Kupfer)	35°-40°	130°	Kegelmantelanschliff Normalanschliff	
<b>FN</b>	für normal zerspanbare Werkstoffe für besonders tiefe Bohrungen	35°	130°	Kegelmantelanschliff Normalanschliff	
<b>FN 500</b>	für langspanende, zähe Werkstoffe (z.B. hochlegierte Stähle, Vergütungs - u. Einsatzstähle)	20°-30°	130°	Kegelmantelanschliff Normalanschliff	
<b>FU 500</b> <b>FU 500 DZ</b>	für universelle Anwendungen (z.B. legierte und nicht legierte Stähle bis 800 mm <sup>2</sup> ) DZ = durchgängig zylindrischer Schaft	35°	118°	2-Flächen Spezialanschliff	
<b>FW</b>	für weiche, langspanende Werkstoffe für besonders tiefe Bohrungen	35°-40°	130°	Kegelmantelanschliff Normalanschliff	
<b>S</b>	für schwer zerspanbare Werkstoffe (z.B. rostfreie und hitzebeständige Stähle)	35°	130°	Kegelmantelanschliff Normalanschliff	
<b>IS</b>	für zähe, rost-, säure- und hitzebeständige Stähle	40°	130°	Kegelmantelanschliff Normalanschliff	
<b>V</b>	für harte, schwer zerspanbare Werkstoffe (z.B. Federstähle)	20°-30°	130°	Kegelmantelanschliff Normalanschliff	
<b>TS 3 G</b>	für positions- und formgenaue Bohrungen	28°	150°	Spezialanschliff	
<b>TS 80 U</b>	für universelle Anwendungen (z.B. GG, GGG, Stahl bis ca. 1000 N/mm <sup>2</sup> )	20°-30°	140°	Kegelmantelanschliff Spezialausspitzung Typ U	
<b>TS 100 U</b>	für Stähle bis ca. 1000 N/mm <sup>2</sup> , universelle Anwendung	25°-35°	140°	Flächenanschliff	
<b>TS 150 GG</b>	für kurzspanende Gusswerkstoffe, Aluminium und Al-Legierungen mit hohem Si-Gehalt	0° (gerade genutet)	120°	Flächenanschliff Spezialausspitzung Typ GG	
<b>TS 100 R</b>	für neue Gusswerkstoffe GGV und ADI, Gusseisen und Kugelgraphit-/Temperguss	30°	-	Radiusanschliff	
<b>TS 100 T</b>	für tiefe Bohrungen in Stahl und Guss	30°	135°	Kegelmantelanschliff	
<b>TS 100 INOX</b>	für rostfreie Stähle	30°	140°	Flächenanschliff	
<b>TS 100 H</b>	für hochfeste und gehärtete Stähle sowie Sonderlegierungen	30°	140°	Kegelmantelanschliff	
<b>TS 100 EG</b>	VHM Entgratgabel				Entgrater
<b>TS 100 VR</b>	Vor- und Rückwärtsentgrater 90°				
<b>TLB E80</b>	Einlippen-Tieflochbohrer mit gelötetem HM-Kopf				Tieflochbohrer
<b>TLB E100</b>	Einlippen-Tieflochbohrer aus VHM				
<b>TLB E800</b>	Einlippen-Tieflochbohrer mit Wechselplatten				
<b>TLB Z80</b>	Zweilippen-Tieflochbohrer mit gelötetem HM-Kopf				



# ISO-Code

<b>P</b>	Stahl, hochlegierter Stahl
<b>M</b>	Rostfreier Stahl
<b>K</b>	Grauguss, Sphäroguss und Temperguss
<b>N</b>	Aluminium und andere Nichteisenmetalle
<b>S</b>	Sonder-, Super- und Titanlegierungen
<b>H</b>	Gehärteter Stahl und Hartguss

Auf den folgenden Programmseiten finden Sie zu jedem Werkzeug Empfehlungen zur Eignung für die Anwendungsgruppen:

- optimal geeignet
- bedingt geeignet

# Piktogramme

Schneidstoff	<b>HSS</b>	<b>HSS-E</b>	<b>M42</b>	<b>HSS-E-PM</b>	<b>VHM</b>	<b>HM</b>						
	Schnellstahl				Vollhartmetall				Hartmetall			
Oberfläche												
	blank	dampf-behandelt	Fasen nitriert	goldbraun	TiAlN	AlTiN nano	AlTiN	TiCN	FIRE			
	TiN	MolyGlide	TiAlSiN	vernickelt	brüniert							
Typ	<b>FN</b>	<b>FN 500</b>	<b>FU 500</b>	<b>FU 500 DZ</b>	<b>FW</b>	<b>H</b>	<b>IS</b>	<b>N</b>	<b>V</b>	<b>W</b>		
	<b>P2000</b>	<b>S</b>	<b>TLB E 80</b>	<b>TLB E 100</b>	<b>TLB E 800</b>	<b>TLB Z 80</b>	Erklärung Typenbezeichnungen siehe Rückseite Ausklappseite					
	<b>TS 80 U</b>	<b>TS 100 H</b>	<b>TS 100 INOX</b>	<b>TS 100 R</b>	<b>TS 100 T</b>	<b>TS 100 U</b>	<b>TS 150 GG</b>	<b>TS 3 G</b>	<b>TS 100 EG</b>	<b>TS 100 VR</b>		
Form	<b>R</b>	<b>A</b>	<b>B</b>	<b>C</b>								
Bohrtiefe	<b>3xD</b>	<b>5xD</b>	....	<b>~3xD</b>	<b>~5xD</b>	....	<b>45,00</b>	<b>80,00</b>	....			
							mm	mm				
Norm	<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 6527</b>	nach DIN		
		nach Hartner Standard										
Spitzenwinkel												
Ø-Toleranz	<b>m7</b>	<b>h5</b>	<b>h6</b>	<b>h7</b>	<b>h8</b>	<b>0/-0,004</b>						
Schneidrichtung												
	rechts	links										
Schaftform												
	nach DIN 6535			zylindrisch			Morsekegel	Steilkegel				
Ausspitzung												
	mit Ausspitzung											
Innenkühlung												
	mit IK	ohne IK										



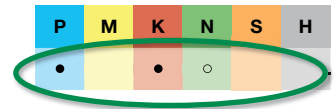
## Bestellmöglichkeiten

Bitte geben Sie bei Ihrer Bestellung immer  
**die Artikel-Nr. und den Nenn-Ø** an, z.B.:  
 „Spiralbohrer kurz, für Nenn-Ø 0,20 mm“  
 = **81010 0,200**

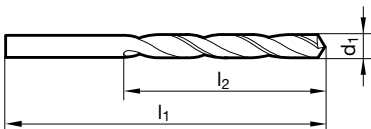
Artikel-Nr.

### Spiralbohrer kurz

Artikel-Nr. 81010



Ausspitzung  $\geq \varnothing 1,000$  • Kegelmantelschliff  
 Stahl und Stahlguss (legiert und unleg.) • Grauguss, Temperguss, Sphäroguss • Sintereisen und Graphit



d1 mm	l1 mm	l2 mm	d1 mm	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

Nenn-Ø

Auf den folgenden Programm-  
 zeug Empfehlungen zur Eignung  
 für die Anwendungsgruppen:  
 ● optimal geeignet  
 ○ bedingt geeignet



## Wichtige Hinweise

### Allgemeine Verkaufsbedingungen

Wir liefern ausschließlich zu unseren allgem. Verkaufsbedingungen.  
Diese können bei uns angefordert werden.

Werden Sonderwerkzeuge in Auftrag gegeben, so darf die Bestellmenge um ca. 10%, mindestens jedoch um 2 Stück, über- oder unterschritten werden. Berechnet wird die Liefermenge.

### Lieferbedingungen für Kleinstmengen

Wir behalten uns vor, bei einem Auftragswert unter € 100,00 netto einen angemessenen Mindermengenzuschlag anzurechnen.

Werkzeuggruppe	Norm	Verpackungseinheit
Spiralbohrer mit Zylinderschaft aus Schnellarbeitsstahl	DIN 338 DIN 1897 und ähnl. Werksnormen	≤ Ø 7,50 mm in Packungen zu 10 Stück > Ø 7,50 ... Ø 10,60 mm in Packungen zu 5 Stück > Ø 10,60 mm in Verpackungen mit 1 Stück
	DIN 339 DIN 340 und ähnl. Werksnormen	≤ Ø 6,70 mm in Packungen zu 10 Stück > Ø 6,70 ... Ø 10,60 mm in Packungen zu 5 Stück > Ø 10,60 mm in Verpackungen mit 1 Stück
	DIN 1869	≤ Ø 7,50 mm in Packungen zu 10 Stück > Ø 7,50 ... Ø 10,60 mm in Packungen zu 5 Stück > Ø 10,60 mm in Verpackungen mit 1 Stück
Spiralbohrer mit Morsekegel aus Schnellarbeitsstahl	alle DIN und Werksnormen	alle Abmessungen in Verpackungen mit 1 Stück
Spiralbohrer aus Hartmetall und hartmetallbestückte Werkzeuge	alle DIN und Werksnormen	alle Abmessungen in Verpackungen mit 1 Stück
Kleinstbohrer	DIN 1899	alle Abmessungen in Verpackungen zu 10 Stück
Zentrierbohrer	DIN 333 Form A, Form R	≤ Ø 4,00 mm in Packungen zu 10 Stück > Ø 4,00 mm in Packungen mit 1 Stück
	DIN 333 Form B	≤ Ø 2,50 mm in Packungen zu 10 Stück > Ø 2,50 mm in Packungen mit 1 Stück

### Bankverbindung

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

BW Bank  
IBAN DE45 6005 0101 0002 5924 44  
BIC SOLADEST600





**HARTNER**

**Registerübersicht**

## **SPIRALBOHRER MIT ZYLINDERSCHAFT**

aus HSS, HSS-E, HSS-E-PM, Vollhartmetall, Hartmetall-bestückt  
blank und beschichtet

## **SPIRALBOHRER MIT MORSEKEGEL**

aus HSS, HSS-E, Hartmetall-bestückt  
blank und beschichtet

## **TS-DRILLS**

High-Tech-Werkzeuge aus Vollhartmetall  
blank und beschichtet

## **EIN- UND ZWEILIPPEN-TIEFLOCHBOHRER**

aus Vollhartmetall, mit HM-Kopf oder mit Wechselplatten  
blank und beschichtet

## **KLEINSTBOHRER**

aus Vollhartmetall und HSS-E-PM  
blank und beschichtet

## **ZENTRIERBOHRER / STUFENBOHRER / KEGELSENKER**

aus HSS und HSS-E  
blank und beschichtet

## **MULTIPLEX / MULTIPLEX HPC**

Wechselplatten-Spiralbohrer mit Innenkühlung  
Wechselplatten aus HSS-E, HSS-E PM, Vollhartmetall  
beschichtet

## **TECHNISCHER TEIL**

Baumaße, Begriffe, Einsatzempfehlungen





Artikel-Nr.	Seite	Bohrtiefe	Norm	Oberfläche	Bezeichnung	Schneidstoff	Typ
<b>80495</b>	245		Werksnorm	AlTiN nano	Vor- und Rückwärtsentgrater 90°	VHM	TS 100 VR
<b>81010</b>	23	~5xD	DIN 338	dampfbehandelt	Spiralbohrer kurz	HSS	N
<b>81011</b>	47	~5xD	DIN 338	dampfbehandelt	Spiralbohrer kurz	HSS-E	N
<b>81012</b>	65	~5xD	DIN 338	blank	Spiralbohrer kurz	M42	N
<b>81013</b>	55	~5xD	DIN 338	blank	Spiralbohrer kurz	HSS-E	IS
<b>81015</b>	27	~5xD	DIN 338	dampfbehandelt	Spiralbohrer kurz	HSS	N
<b>81017</b>	29	~5xD	DIN 338	dampfbehandelt	Spiralbohrer kurz	HSS	N
<b>81020</b>	32	~5xD	DIN 338	blank	Spiralbohrer kurz	HSS	H
<b>81025</b>	34	~5xD	DIN 338	blank	Spiralbohrer kurz	HSS	H
<b>81030</b>	36	~5xD	DIN 338	blank	Spiralbohrer kurz	HSS	W
<b>81035</b>	38	~5xD	DIN 338	blank	Spiralbohrer kurz	HSS	W
<b>81040</b>	39	~5xD	DIN 338	Fasen nitriert	Spiralbohrer kurz	HSS	FN
<b>81041</b>	49	~5xD	DIN 338	Fasen nitriert	Spiralbohrer kurz	HSS-E	FN
<b>81045</b>	41	~5xD	DIN 338	Fasen nitriert	Spiralbohrer kurz	HSS	FN
<b>81061</b>	57	~5xD	DIN 338	blank	Spiralbohrer kurz	HSS-E	S
<b>81062</b>	59	~5xD	DIN 338	goldbraun	Spiralbohrer kurz	HSS-E	P2000
<b>81063</b>	63	~5xD	DIN 338	MolyGlide	Spiralbohrer kurz	HSS-E	P2000
<b>81110</b>	69	~3xD	DIN 1897	dampfbehandelt	Spiralbohrer extra kurz	HSS	N
<b>81115</b>	71	~3xD	DIN 1897	blank	Spiralbohrer extra kurz	HSS	N
<b>81120</b>	75	~3xD	DIN 1897	blank	Spiralbohrer extra kurz	HSS	H
<b>81130</b>	76	~3xD	DIN 1897	blank	Spiralbohrer extra kurz	HSS	W
<b>81140</b>	77	~3xD	DIN 1897	Fasen nitriert	Spiralbohrer extra kurz	HSS	FN
<b>81145</b>	78	~3xD	DIN 1897	Fasen nitriert	Spiralbohrer extra kurz	HSS	FN
<b>81171</b>	81	~3xD	DIN 1897	dampfbehandelt	Spiralbohrer extra kurz	HSS-E	V
<b>81173</b>	80	~3xD	DIN 1897	blank	Spiralbohrer extra kurz	HSS-E	IS
<b>81190</b>	106		Werksnorm	dampfbehandelt	Karosseriebohrer	HSS	N
<b>81191</b>	104		Werksnorm	blank	NC-Anbohrer	HSS	N
<b>81192</b>	102		Werksnorm	blank	NC-Anbohrer	HSS	N
<b>81210</b>	109	~10xD	DIN 339	dampfbehandelt	Bohrbuchsenbohrer	HSS	N
<b>81310</b>	111	~10xD	DIN 340	dampfbehandelt	Spiralbohrer lang	HSS	N
<b>81311</b>	126	~10xD	DIN 340	dampfbehandelt	Spiralbohrer lang	HSS-E	N
<b>81315</b>	113	~10xD	DIN 340	dampfbehandelt	Spiralbohrer lang	HSS	N
<b>81317</b>	114	~10xD	DIN 340	dampfbehandelt	Spiralbohrer lang	HSS	N
<b>81320</b>	117	~10xD	DIN 340	blank	Spiralbohrer lang	HSS	H
<b>81330</b>	118	~10xD	DIN 340	blank	Spiralbohrer lang	HSS	W
<b>81340</b>	120	~10xD	DIN 340	Fasen nitriert	Spiralbohrer lang	HSS	FN
<b>81341</b>	127	~10xD	DIN 340	Fasen nitriert	Spiralbohrer lang	HSS-E	FN
<b>81350</b>	124	~10xD	DIN 340	blank	Spiralbohrer lang	HSS	FW
<b>81361</b>	129	~10xD	DIN 340	blank	Spiralbohrer lang	HSS-E	S
<b>81362</b>	129	~10xD	DIN 340	TiN	Spiralbohrer lang	HSS-E	S
<b>81410</b>	134	~15xD	DIN 1869	dampfbehandelt	Spiralbohrer überlang, Reihe 1	HSS	N
<b>81440</b>	135	~15xD	DIN 1869	Fasen nitriert	Spiralbohrer überlang, Reihe 1	HSS	FN
<b>81441</b>	138	~15xD	DIN 1869	Fasen nitriert	Spiralbohrer überlang, Reihe 1	HSS-E	FN
<b>81450</b>	137	~15xD	DIN 1869	blank	Spiralbohrer überlang, Reihe 1	HSS	FW
<b>81510</b>	139	~20xD	DIN 1869	dampfbehandelt	Spiralbohrer überlang, Reihe 2	HSS	N
<b>81540</b>	140	~20xD	DIN 1869	Fasen nitriert	Spiralbohrer überlang, Reihe 2	HSS	FN
<b>81541</b>	142	~20xD	DIN 1869	Fasen nitriert	Spiralbohrer überlang, Reihe 2	HSS-E	FN
<b>81610</b>	143	~25xD	DIN 1869	dampfbehandelt	Spiralbohrer überlang, Reihe 3	HSS	N
<b>81640</b>	144	~25xD	DIN 1869	Fasen nitriert	Spiralbohrer überlang, Reihe 3	HSS	FN
<b>81740</b>	145	>25xD	Werksnorm	Fasen nitriert	Spiralbohrer extra lang	HSS	FN
<b>81750</b>	146	>25xD	Werksnorm	blank	Spiralbohrer extra lang	HSS	FN
<b>81760</b>	147	>25xD	Werksnorm	blank	Spiralbohrer extra lang	HSS	FN
<b>81810</b>	148		DIN 1898	dampfbehandelt	Stiftlochbohrer	HSS	N
<b>82010</b>	158	~5xD	DIN 345	dampfbehandelt	Spiralbohrer	HSS	N
<b>82011</b>	161	~5xD	DIN 345	dampfbehandelt	Spiralbohrer	HSS-E	N
<b>82012</b>	162	~5xD	DIN 345	blank	Spiralbohrer	HSS-E	IS
<b>82030</b>	157	~5xD	DIN 345	blank	Spiralbohrer	HSS	W
<b>82191</b>	167		Werksnorm	dampfbehandelt	NC-Anbohrer	HSS	N
<b>82192</b>	167		Werksnorm	dampfbehandelt	NC-Anbohrer	HSS	N
<b>82210</b>	168	~10xD	DIN 341	dampfbehandelt	Spiralbohrer lang	HSS	N
<b>82211</b>	169	~10xD	DIN 341	dampfbehandelt	Spiralbohrer lang	HSS-E	N
<b>82310</b>	170	~15xD	DIN 1870	dampfbehandelt	Spiralbohrer überlang, Reihe 1	HSS	N
<b>82340</b>	171	~15xD	DIN 1870	Fasen nitriert	Spiralbohrer überlang, Reihe 1	HSS	FN
<b>82341</b>	172	~15xD	DIN 1870	Fasen nitriert	Spiralbohrer überlang, Reihe 1	HSS-E	FN
<b>82410</b>	173	~20xD	DIN 1870	dampfbehandelt	Spiralbohrer überlang, Reihe 2	HSS	N
<b>82440</b>	174	~20xD	DIN 1870	Fasen nitriert	Spiralbohrer überlang, Reihe 2	HSS	FN

Artikel-Nr.	Seite	Bohrtiefe	Norm	Oberfläche	Bezeichnung	Schneidstoff	Typ
82466	175	>20xD	Werksnorm	Fasen nitriert	Spiralbohrer extra lang	HSS	FN
82467	176	>20xD	Werksnorm	Fasen nitriert	Spiralbohrer extra lang	HSS	FN
82468	177	>20xD	Werksnorm	blank	Spiralbohrer extra lang	HSS	FN
82469	178	>20xD	Werksnorm	blank	Spiralbohrer extra lang	HSS	FN
82515	182	~15xD	Werksnorm	dampfbehandelt	Kühlkanalbohrer überlang	HSS-E	FN
82521	180	~10xD	Werksnorm	dampfbehandelt	Kühlkanalbohrer lang	HSS	N
82525	181	~10xD	Werksnorm	dampfbehandelt	Kühlkanalbohrer lang	HSS-E	FN
82535	179	~10xD	Werksnorm	dampfbehandelt	Kühlkanalbohrer lang	HSS	FN
82571	369		Werksnorm	dampfbehandelt	Kühlmittelzuführrohre		
82578	370		Werksnorm		Schnellverschlusskupplung		
82710	107	~10xD	Werksnorm	blank	Kühlkanalbohrer	HSS	FN
82761	108	~5xD	Werksnorm	blank	Kühlkanalbohrer	HSS-E	FN
82810	186		DIN 1898	dampfbehandelt	Stiftlochbohrer	HSS	N
82971	166	~3xD	Werksnorm	dampfbehandelt	Spiralbohrer kurz	HSS-E	V
82972	165	~3xD	Werksnorm	blank	Spiralbohrer kurz	HSS-E	IS
83000	330		DIN 333	blank	Zentrierbohrer ohne Fläche	HSS	N
83005	331		DIN 333	blank	Zentrierbohrer ohne Fläche	HSS	N
83100	328		DIN 333	blank	Zentrierbohrer ohne Fläche	HSS	N
83101	333		DIN 333	blank	Zentrierbohrer ohne Fläche	HSS-E	N
83105	329		DIN 333	blank	Zentrierbohrer ohne Fläche	HSS	N
83110	334		Werksnorm	blank	Zentrierbohrer ohne Fläche	HSS	N
83200	335		DIN 333	blank	Zentrierbohrer ohne Fläche	HSS	N
83300	332		DIN 333	blank	Zentrierbohrer ohne Fläche	HSS	N
83370	336		Werksnorm	blank	Zentrierbohrer ohne Fläche	VHM	N
83500	337		DIN 333	blank	Zentrierbohrer mit Fläche	HSS	N
83600	337		DIN 333	blank	Zentrierbohrer mit Fläche	HSS	N
83700	338		DIN 333	blank	Zentrierbohrer mit Fläche	HSS	N
84100	243		Werksnorm	blank	Entgratgabeln	VHM	TS 100 EG
84101	244		Werksnorm	blank	Entgratgabeln	VHM	TS 100 EG
84400	73	~3xD	DIN 1897	TiN	Spiralbohrer extra kurz	HSS	N
84405	30	~5xD	DIN 338	TiN	Spiralbohrer kurz	HSS	N
84406	43	~5xD	DIN 338	TiN Kopf	Spiralbohrer kurz	HSS	N
84415	45	~5xD	DIN 338	TiN	Spiralbohrer kurz	HSS	FN
84418	115	~10xD	DIN 340	TiN	Spiralbohrer lang	HSS	N
84423	122	~10xD	DIN 340	TiN	Spiralbohrer lang	HSS	FN
84425	136	~15xD	DIN 1869	TiN	Spiralbohrer überlang, Reihe 1	HSS	FN
84426	141	~20xD	DIN 1869	TiN	Spiralbohrer überlang, Reihe 2	HSS	FN
84434	104		Werksnorm	TiN	NC-Anbohrer	HSS	N
84435	102		Werksnorm	TiN	NC-Anbohrer	HSS	N
84445	313		Werksnorm	TiN	Kurzstufenbohrer mit Zylinderschaft	HSS	N
84448	330		DIN 333	TiN	Zentrierbohrer ohne Fläche	HSS	N
84450	328		DIN 333	TiN	Zentrierbohrer ohne Fläche	HSS	N
84460	160	~5xD	DIN 345	TiN	Spiralbohrer	HSS	N
84461	108	~5xD	Werksnorm	TiN	Kühlkanalbohrer	HSS-E	FN
84501	73	~3xD	DIN 1897	nanoFIRE	Spiralbohrer extra kurz	HSS	N
84502	45	~5xD	DIN 338	nanoFIRE	Spiralbohrer kurz	HSS	FN
84503	83	~3xD	DIN 1897	nanoFIRE	Spiralbohrer extra kurz	HSS-E	V
84504	51	~5xD	DIN 338	nanoFIRE	Spiralbohrer kurz	HSS-E	FN
84505	61	~5xD	DIN 338	nanoFIRE	Spiralbohrer kurz	HSS-E	S
84506	122	~10xD	DIN 340	nanoFIRE	Spiralbohrer lang	HSS	FN
84507	96	~5xD	Werksnorm	nanoFIRE	Spiralbohrer mit verst. Zylinderschaft	HSS-E-PM	FN 500
84511	87	~3xD	DIN 1897	nanoFIRE	Spiralbohrer extra kurz	HSS-E-PM	FN 500
84660	163	~5xD	DIN 345	TiAlN	Spiralbohrer	HSS-E	FN
84800	51	~5xD	DIN 338	TiN	Spiralbohrer kurz	HSS-E	FN
84801	94	~5xD	Werksnorm	TiN	Spiralbohrer mit verst. Zylinderschaft	HSS-E	FU 500
84802	53	~5xD	DIN 338	TiN	Spiralbohrer kurz	HSS-E	FU 500 DZ
84803	83	~3xD	DIN 1897	TiN	Spiralbohrer extra kurz	HSS-E	V
84804	53	~5xD	DIN 338	blank	Spiralbohrer kurz	HSS-E	FU 500 DZ
84805	92	~3xD	Werksnorm	TiN	Spiralbohrer mit verst. Zylinderschaft	HSS-E	FU 500
84806	85	~3xD	DIN 1897	TiN	Spiralbohrer extra kurz	HSS-E	FU 500 DZ
84807	61	~5xD	DIN 338	TiN	Spiralbohrer kurz	HSS-E	S
84808	85	~3xD	DIN 1897	blank	Spiralbohrer extra kurz	HSS-E	FU 500 DZ
84810	292	~5xD	DIN 1899	TiN	Kleinstbohrer ohne Kühlkanäle	HSS-E-PM	N
84811	64	~5xD	DIN 338	TiN	Spiralbohrer kurz	HSS-E-PM	FN 500 DZ
84812	131	~10xD	DIN 340	TiN	Spiralbohrer lang	HSS-E	FU 500 DZ
84814	131	~10xD	DIN 340	blank	Spiralbohrer lang	HSS-E	FU 500 DZ

Artikel-Nr.	Seite	Bohrtiefe	Norm	Oberfläche	Bezeichnung	Schneidstoff	Typ
84859	164	~5xD	DIN 345	TiN	Spiralbohrer	HSS-E	N
85010	315		DIN 8374	dampfbehandelt	Mehrfasenstufenbohrer mit Zylinderschaft	HSS	N
85110	316		Werksnorm	dampfbehandelt	Mehrfasenstufenbohrer mit Zylinderschaft	HSS	N
85210	319		DIN 8376	dampfbehandelt	Mehrfasenstufenbohrer mit Zylinderschaft	HSS	N
85216	320		Werksnorm	dampfbehandelt	Mehrfasenstufenbohrer mit Zylinderschaft	HSS	N
85218	318		DIN 8374	dampfbehandelt	Mehrfasenstufenbohrer mit Zylinderschaft	HSS	N
85310	317		DIN 8378	dampfbehandelt	Mehrfasenstufenbohrer mit Zylinderschaft	HSS	N
85510	322		Werksnorm	dampfbehandelt	Mehrfasenstufenbohrer mit Morsekegel	HSS	N
85610	324		DIN 8377	dampfbehandelt	Mehrfasenstufenbohrer mit Morsekegel	HSS	N
85616	325		Werksnorm	dampfbehandelt	Mehrfasenstufenbohrer mit Morsekegel	HSS	N
85619	326		DIN 8375	dampfbehandelt	Mehrfasenstufenbohrer mit Morsekegel	HSS	N
85710	323		DIN 8379	dampfbehandelt	Mehrfasenstufenbohrer mit Morsekegel	HSS	N
85910	306		Werksnorm	dampfbehandelt	Stufenbohrer für Zentrierungen DIN 332	HSS	N
85911	306		Werksnorm	dampfbehandelt	Stufenbohrer für Zentrierungen DIN 332	HSS	N
85912	307		Werksnorm	dampfbehandelt	Stufenbohrer für Zentrierungen DIN 332	HSS	N
85914	308		Werksnorm	dampfbehandelt	Stufenbohrer für Zentrierungen DIN 332	HSS	N
85916	310		Werksnorm	blank	Kurzstufenbohrer mit Zylinderschaft	HSS	N
85917	311		Werksnorm	blank	Kurzstufenbohrer mit Zylinderschaft	HSS	N
85918	312		Werksnorm	blank	Kurzstufenbohrer mit Zylinderschaft	HSS	N
85920	314		Werksnorm	blank	Kurzstufenbohrer mit Zylinderschaft	HSS	N
86010	151		DIN 344	dampfbehandelt	Aufbohrer mit Zylinderschaft	HSS	N
86110	184		DIN 343	dampfbehandelt	Aufbohrer mit Morsekegel	HSS	N
86111	185		DIN 343	dampfbehandelt	Aufbohrer mit Morsekegel	HSS-E	N
86400	295	4xD	Werksnorm	AlTiN	Kleinstbohrer ohne Kühlkanäle	VHM	N
86401	296	7xD	Werksnorm	AlTiN	Kleinstbohrer ohne Kühlkanäle	VHM	N
86402	294		Werksnorm	TiAlN	Kleinstbohrer ohne Kühlkanäle	VHM	N
86405	297	5xD	Werksnorm	TiAlN	Kleinstbohrer mit Kühlkanälen	VHM	N
86408	298	8xD	Werksnorm	TiAlN	Kleinstbohrer mit Kühlkanälen	VHM	N
86412	299	15xD	Werksnorm	TiAlN Kopf	Kleinstbohrer mit Kühlkanälen	VHM	N
86509	235	15xD	Werksnorm	TiAlN	TS-Drills mit Innenkühlung	VHM	TS 100 T
86511	236	20xD	Werksnorm	TiAlN Kopf	TS-Drills mit Innenkühlung	VHM	TS 100 T
86512	237	25xD	Werksnorm	TiAlN Kopf	TS-Drills mit Innenkühlung	VHM	TS 100 T
86513	238	30xD	Werksnorm	TiAlN Kopf	TS-Drills mit Innenkühlung	VHM	TS 100 T
86514	239	40xD	Werksnorm	TiAlN Kopf	TS-Drills mit Innenkühlung	VHM	TS 100 T
86602	361		Werksnorm	TiN	Wechselplatten	HSS-E-PM	
86608	362		Werksnorm	FiRE	Wechselplatten	HSS-E-PM	
86609	363		Werksnorm	AlTiN	Wechselplatten	HSS-E-PM	
86612	349	<3xD	Werksnorm	vernickelt	Multiplex-Halter mit Zylinderschaft		
86622	350	<5xD	Werksnorm	vernickelt	Multiplex-Halter mit Zylinderschaft		
86624	351	<7xD	Werksnorm	vernickelt	Multiplex-Halter mit Zylinderschaft		
86628	356		Werksnorm	vernickelt	Multiplex-Halter mit Zylinderschaft, Sonderabmessungen		
86630	352		Werksnorm	vernickelt	Multiplex-Halter mit Morsekegel		
86650	354		Werksnorm	vernickelt	Multiplex-Halter mit Morsekegel		
86670	353		Werksnorm	vernickelt	Multiplex-Halter mit Morsekegel		
86678	358		Werksnorm	vernickelt	Multiplex-Halter mit Morsekegel, Sonderabmessungen		
86680	355		Werksnorm	vernickelt	Multiplex-Halter mit Morsekegel		
86681	378	1xD	Werksnorm	vernickelt	Multiplex HPC-Halter		HPC
86682	379	1,5xD	Werksnorm	vernickelt	Multiplex HPC-Halter		HPC
86683	381	3xD	Werksnorm	vernickelt	Multiplex HPC-Halter		HPC
86684	383	5xD	Werksnorm	vernickelt	Multiplex HPC-Halter		HPC
86685	385	7xD	Werksnorm	vernickelt	Multiplex HPC-Halter		HPC
86686	387	10xD	Werksnorm	vernickelt	Multiplex HPC-Halter		HPC
86690	368		Werksnorm		Kühlmittelzuführhinge		
86691	372		Werksnorm	brüniert	Kühlmittelzuführfutter für Multiplex		
86692	373		Werksnorm	brüniert	Kühlmittelzuführfutter für Multiplex		
86693	374		Werksnorm	brüniert	Kühlmittelzuführfutter für Multiplex		
86694	375		Werksnorm	brüniert	Kühlmittelzuführfutter für Multiplex		
86699	376		Werksnorm	brüniert	Reduzierhülse für Kühlmittelzuführfutter		
86701	367		Werksnorm	FiRE	Wechselplatten	VHM	
86702	365		Werksnorm	FiRE	Wechselplatten	VHM	
86708	364		Werksnorm	TiN	Wechselplatten	VHM	
86709	366		Werksnorm	TiN	Wechselplatten	VHM	
86721	389		Werksnorm	AlTiN nano	Multiplex HPC-Wechselplatten	VHM	HPC
86722	392		Werksnorm	nanoFiRE	Multiplex HPC-Wechselplatten	VHM	HPC
86723	395		Werksnorm	FiRE	Multiplex HPC-Wechselplatten	VHM	HPC
86724	398		Werksnorm	blank	Multiplex HPC-Wechselplatten	VHM	HPC

Artikel-Nr.	Seite	Bohrtiefe	Norm	Oberfläche	Bezeichnung	Schneidstoff	Typ
86725	401		Werksnorm	AlTiN nano	Multiplex HPC-Wechselplatten	VHM	HPC
86726	404		Werksnorm	TiAlN	Multiplex HPC-Senkplatten	VHM	
86727	404		Werksnorm	blank	Multiplex HPC-Senkplatten	VHM	
86728	405		Werksnorm	TiN	Multiplex HPC-Senkplatten	VHM	
86842	371		Werksnorm		Torx-Schraubendreher		
86843	406		Werksnorm		Spannschrauben für Multiplex HPC-Halter 1,5-10xD		
86844	407		Werksnorm		Drehmomentschlüssel		
86845	408		Werksnorm		Torx-Einsätze		
86846	409		Werksnorm		Spannschrauben für Multiplex HPC-Senkhalter		
87011	289	~5xD	DIN 1899	blank	Kleinstbohrer ohne Kühlkanäle	HSS-E-PM	N
87016	291	~5xD	DIN 1899	blank	Kleinstbohrer ohne Kühlkanäle	HSS-E-PM	N
88013	98	~5xD	DIN 338	dampfbehandelt	Spiralbohrersätze	HSS	N
88014	98	~5xD	DIN 338	goldbraun	Spiralbohrersätze	HSS-E	P2000
88015	99	~3xD	DIN 1897	MolyGlide	Spiralbohrersätze	HSS-E	P2000
88016	99	~5xD	DIN 338	TiN Kopf	Spiralbohrersätze	HSS	N
88026	100	~5xD	DIN 338	dampfbehandelt	Spiralbohrersätze	HSS-E	N
88200	327		DIN 335	blank	Kegelsenker 90°	HSS	
88303	101		Werksnorm		Spiralbohrersätze		
89235	89	~3xD	DIN 6539	blank	Spiralbohrer extra kurz	VHM	N
89237	200	3xD	DIN 6539	TiN	TS-Drills ohne Innenkühlung	VHM	TS 100 U
89239	241	5xD	DIN 6539	blank	TS-Drills, 3-schneidig	VHM	TS 3 G
89242	105		Werksnorm	blank	NC-Anbohrer	VHM	N
89243	103		Werksnorm	blank	NC-Anbohrer	VHM	N
89244	67	~5xD	Werksnorm	blank	Spiralbohrer kurz	VHM	N
89246	91	~3xD	Werksnorm	blank	Spiralbohrer extra kurz	VHM	N
89247	240	5xD	DIN 6537L	blank	TS-Drills, 3-schneidig	VHM	TS 3 G
89249	105		Werksnorm	blank	NC-Anbohrer	VHM	N
89252	321			blank	Mehrfasenstufenbohrer mit Zylinderschaft	VHM	N
89254	309		Werksnorm	blank	Kurzstufenbohrer mit Zylinderschaft	VHM	N
89264	196	3xD	DIN 6537K	TiN	TS-Drills ohne Innenkühlung	VHM	TS 100 U
89266	207	3xD	DIN 6537K	TiN	TS-Drills mit Innenkühlung	VHM	TS 100 U
89272	214	5xD	DIN 6537L	TiN	TS-Drills mit Innenkühlung	VHM	TS 100 U
89275	204	5xD	Werksnorm	TiN	TS-Drills ohne Innenkühlung	VHM	TS 100 U
89281	293	~5xD	Werksnorm	blank	Kleinstbohrer ohne Kühlkanäle	VHM	N
89286	133	~10xD	Werksnorm	blank	Spiralbohrer lang	VHM	N
89292	213	4xD	Werksnorm	blank	TS-Drills mit Innenkühlung	VHM	TS 150 GG
89293	231	10xD	Werksnorm	blank	TS-Drills mit Innenkühlung	VHM	TS 150 GG
89294	230	7xD	Werksnorm	blank	TS-Drills mit Innenkühlung	VHM	TS 150 GG
89295	231	10xD	Werksnorm	blank	TS-Drills mit Innenkühlung	VHM	TS 150 GG
89301	150		DIN 8037	blank	Spiralbohrer mit HM-Schneiden	HM	N
89302	183		DIN 8041	blank	Spiralbohrer mit HM-Schneiden	HM	N
89303	149		DIN 8038	blank	Spiralbohrer mit HM-Schneiden	HM	N
89306	208	3xD	DIN 6538K	TiN	TS-Drills mit Innenkühlung	HM	TS 80 U
89307	217	5xD	DIN 6538M	TiN	TS-Drills mit Innenkühlung	HM	TS 80 U
89308	226	7xD	DIN 6538L	TiN	TS-Drills mit Innenkühlung	HM	TS 80 U
89401	200	3xD	DIN 6539	nanoFIRE	TS-Drills ohne Innenkühlung	VHM	TS 100 U
89402	194	3xD	DIN 6537K	nanoFIRE	TS-Drills ohne Innenkühlung	VHM	TS 100 U
89408	215	5xD	DIN 6537L	nanoFIRE	TS-Drills mit Innenkühlung	VHM	TS 100 U
89410	205	3xD	DIN 6537K	nanoFIRE	TS-Drills mit Innenkühlung	VHM	TS 100 U
89411	215	5xD	DIN 6537L	nanoFIRE	TS-Drills mit Innenkühlung	VHM	TS 100 U
89412	224	7xD	Werksnorm	nanoFIRE	TS-Drills mit Innenkühlung	VHM	TS 100 U
89413	194	3xD	DIN 6537K	nanoFIRE	TS-Drills ohne Innenkühlung	VHM	TS 100 U
89414	202	5xD	DIN 6537L	nanoFIRE	TS-Drills ohne Innenkühlung	VHM	TS 100 U
89415	205	3xD	DIN 6537K	nanoFIRE	TS-Drills mit Innenkühlung	VHM	TS 100 U
89416	224	7xD	Werksnorm	nanoFIRE	TS-Drills mit Innenkühlung	VHM	TS 100 U
89417	202	5xD	DIN 6537L	nanoFIRE	TS-Drills ohne Innenkühlung	VHM	TS 100 U
89418	233	12xD	Werksnorm	nanoFIRE Kopf	TS-Drills mit Innenkühlung	VHM	TS 100 U
89420	222	5xD	DIN 6537L	FIRE	TS-Drills mit Innenkühlung	VHM	TS 100 R
89421	228	7xD	Werksnorm	FIRE	TS-Drills mit Innenkühlung	VHM	TS 100 R
89422	198	3xD	DIN 6537K	TiAlSiN	TS-Drills ohne Innenkühlung	VHM	TS 100 H
89423	211	3xD	DIN 6537K	TiAlSiN	TS-Drills mit Innenkühlung	VHM	TS 100 H
89424	211	3xD	DIN 6537K	TiAlSiN	TS-Drills mit Innenkühlung	VHM	TS 100 H
89425	220	5xD	DIN 6537L	TiAlSiN	TS-Drills mit Innenkühlung	VHM	TS 100 H
89426	220	5xD	DIN 6537L	TiAlSiN	TS-Drills mit Innenkühlung	VHM	TS 100 H
89427	227	7xD	Werksnorm	TiAlSiN	TS-Drills mit Innenkühlung	VHM	TS 100 H
89450	209	3xD	DIN 6537K	AlTiN nano	TS-Drills mit Innenkühlung	VHM	TS 100 INOX





Artikel-Nr.	Seite	Bohrtiefe	Norm	Oberfläche	Bezeichnung	Schneidstoff	Typ
<b>89451</b>	218	5xD	DIN 6537L	AlTiN nano	TS-Drills mit Innenkühlung	VHM	TS 100 INOX
<b>89501</b>	257	80.000	Werksnorm	blank	Einlippenbohrer E 100	VHM	TLB E 100
<b>89502</b>	259	160.000	Werksnorm	blank	Einlippenbohrer E 100	VHM	TLB E 100
<b>89503</b>	256	45.000	Werksnorm	blank	Einlippenbohrer E 100	VHM	TLB E 100
<b>89504</b>	258	120.000	Werksnorm	blank	Einlippenbohrer E 100	VHM	TLB E 100
<b>89505</b>	260	20xD	Werksnorm	TiN	Einlippenbohrer E 80	HM	TLB E 80
<b>89506</b>	262	40xD	Werksnorm	TiN	Einlippenbohrer E 80	HM	TLB E 80
<b>89507</b>	263	80xD	Werksnorm	TiN	Einlippenbohrer E 80	HM	TLB E 80
<b>89508</b>	267	30xD	Werksnorm	blank	Zweilippenbohrer Z 80	HM	TLB Z 80
<b>89509</b>	261	30xD	Werksnorm	TiN	Einlippenbohrer E 80	HM	TLB E 80
<b>89510</b>	256	45.000	Werksnorm	AlTiN	Einlippenbohrer E 100	VHM	TLB E 100
<b>89511</b>	257	80.000	Werksnorm	AlTiN	Einlippenbohrer E 100	VHM	TLB E 100
<b>89512</b>	258	120.000	Werksnorm	AlTiN	Einlippenbohrer E 100	VHM	TLB E 100
<b>89513</b>	259	160.000	Werksnorm	AlTiN	Einlippenbohrer E 100	VHM	TLB E 100
<b>89514</b>	260	20xD	Werksnorm	TiCN	Einlippenbohrer E 80	HM	TLB E 80
<b>89515</b>	261	30xD	Werksnorm	TiCN	Einlippenbohrer E 80	HM	TLB E 80
<b>89516</b>	262	40xD	Werksnorm	TiCN	Einlippenbohrer E 80	HM	TLB E 80
<b>89517</b>	263	80xD	Werksnorm	TiCN	Einlippenbohrer E 80	HM	TLB E 80
<b>89518</b>	267	30xD	Werksnorm	blank	Zweilippenbohrer Z 80	HM	TLB Z 80
<b>89520</b>	253	25xD	Werksnorm	AlTiN nano	Einlippenbohrer E 100	VHM	TLB E 100
<b>89521</b>	254	50xD	Werksnorm	AlTiN nano	Einlippenbohrer E 100	VHM	TLB E 100
<b>89522</b>	255	75xD	Werksnorm	AlTiN nano	Einlippenbohrer E 100	VHM	TLB E 100
<b>89530</b>	264	30xD	Werksnorm	TiN	Einlippenbohrer E 800 mit Wechselplatten	HM	TLB E 800
<b>89535</b>	265		Werksnorm	TiN	Schneidplatten für Einlippenbohrer E 800	VHM	
<b>89536</b>	266		Werksnorm	TiN	Führungsleisten für Einlippenbohrer E 800	VHM	
<b>89550</b>	209	3xD	DIN 6537K	AlTiN nano	TS-Drills mit Innenkühlung	VHM	TS 100 INOX
<b>89551</b>	218	5xD	DIN 6537L	AlTiN nano	TS-Drills mit Innenkühlung	VHM	TS 100 INOX

# DIE HARTNER WERKZEUG-AUSGABESYSTEME

Die Hartner Werkzeug-Ausgabesysteme TM 326, TM 426 und TM 526 optimieren Ihr Werkzeuglager und Ihre Werkzeugverwaltung. Gewinnen Sie mehr Sicherheit für Ihre Werkzeugbestände und mehr Transparenz in Ihrer Werkzeugverwaltung!



## TM 326

Das modulare  
Baukastensystem

## TM 426

Das Spiralsystem für die  
Lagerung großer Mengen  
kompakter Werkzeuge

## TM 526

Das Schubladensystem mit  
100 % Ausgabekontrolle



# HARTNER

Präzisionswerkzeuge

## MODERNE WERKZEUGAUSGABE

Automatisierung von  
Beschaffungsprozessen



Reporting



Datenbereitstellung



Datenaustausch





# HARTNER

Präzisionswerkzeuge

## LEISTUNGSSTEIGERUNG DURCH OPTIMIERTE VERWALTUNGSPROZESSE

„Hartner Werkzeug-Ausgabesysteme steigern Wirtschaftlichkeit und Arbeitseffizienz in jeder Unternehmensgröße.“



### UNSERE KUNDEN BESTÄTIGEN UNS:

10 Prozent **geringere Werkzeugkosten**

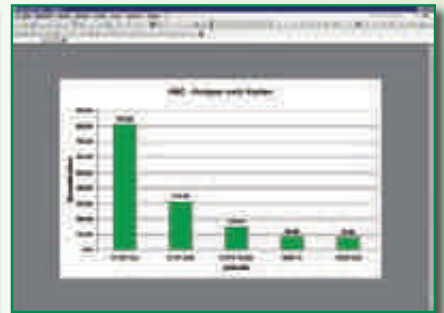
1 Stunde **weniger Verwaltungsaufwand** pro Tag

14 % **weniger Maschinenausfallzeiten**

24 Stunden **kontrollierte Werkzeugführung**



# EINGEBAUTE INTELLIGENZ: TOOL MANAGEMENT SOFTWARE



**Modul Auftragserfassung**  
Planen Sie von A-Z

**Wareneingangsmodul**  
Lieferanten unter Kontrolle

**Lagermodul mit  
Nachschleifverwaltung**  
Alle Daten im Griff

**Modul  
Verschleißfassung**  
Werkzeugleistung  
auf einen Blick

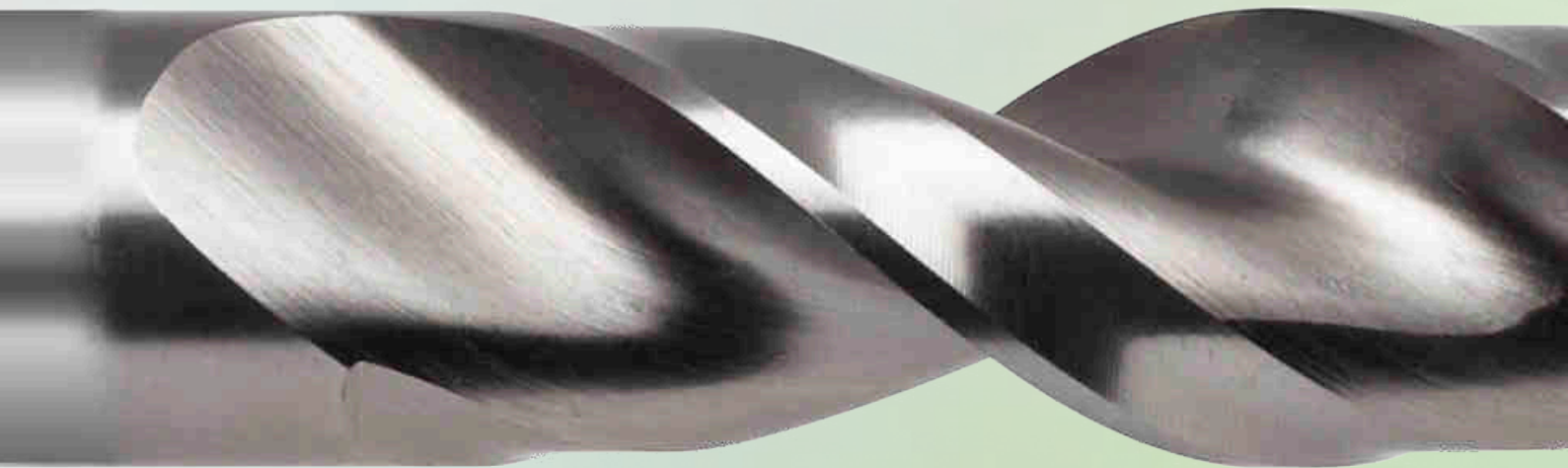
**Artikeldatenbank**  
Der Kern der  
Tool Management Software

**Stücklistenmodul**  
Zusammenhänge  
klar erkennen

**Modul Maschinenstillstand**  
Maschinenstillstand vorbeugen

**Modul Messmittelverwaltung**  
Wissen was ansteht







# HARTNER

















Präzisionswerkzeuge















Spiralbohrer  
mit Zylinderschaft

## SPIRALBOHRER MIT ZYLINDERSCHAFT

aus HSS, HSS-E, HSS-E-PM, Vollhartmetall  
blank und beschichtet

















P	M	K	N	S	H	Norm	Typ	Schneidstoff	Oberfläche	Schneid- richtung	Schaft- form	Bohrtiefe	d1/mm	Artikel-Nr.	Progr. Seite	
<b>Spiralbohrer kurz</b>																
																
•		•	○			DIN 338	N	HSS		rechts	zyl.	~5xD	0,200 - 20,000	<b>81010</b>	23	
																
•		•	○			DIN 338	N	HSS		links	zyl.	~5xD	0,250 - 17,000	<b>81015</b>	27	
																
•		•	○			DIN 338	N	HSS		rechts	zyl.	~5xD	3,000 - 13,000	<b>81017</b>	29	
																
			•			DIN 338	H	HSS		rechts	zyl.	~5xD	0,300 - 19,000	<b>81020</b>	32	
																
			•			DIN 338	H	HSS		links	zyl.	~5xD	0,500 - 16,000	<b>81025</b>	34	
																
			•			DIN 338	W	HSS		rechts	zyl.	~5xD	0,250 - 16,500	<b>81030</b>	36	
																
			•			DIN 338	W	HSS		links	zyl.	~5xD	0,500 - 15,000	<b>81035</b>	38	
																
•		•	•			DIN 338	FN	HSS		rechts	zyl.	~5xD	0,800 - 16,000	<b>81040</b>	39	
																
•		•	•			DIN 338	FN	HSS		links	zyl.	~5xD	1,400 - 16,000	<b>81045</b>	41	
																
•		•	○			DIN 338	N	HSS		rechts	zyl.	~5xD	0,400 - 19,500	<b>84405</b>	30	
																
•		•	○			DIN 338	N	HSS		rechts	zyl.	~5xD	1,000 - 16,000	<b>84406</b>	43	
																
•		•	•			DIN 338	FN	HSS		rechts	zyl.	~5xD	1,000 - 16,000	<b>84415</b>	45	
																
•		•	•			DIN 338	FN	HSS		rechts	zyl.	~5xD	1,000 - 16,000	<b>84502</b>	45	
																
•	○	○	•	•	○	DIN 338	N	M42		rechts	zyl.	~5xD	1,000 - 14,000	<b>81012</b>	65	

P	M	K	N	S	H	Norm	Typ	Schneidstoff	Oberfläche	Schneid- richtung	Schaft- form	Bohrtiefe	d1/mm	Artikel-Nr.	Progr. Seite
<b>Spiralbohrer kurz</b>															
●	○	●	○	○	○	DIN 338	N	HSS-E		rechts	zyl.	~5xD	0,200 - 20,000	81011	47
○	●	○	○	○	○	DIN 338	IS	HSS-E		rechts	zyl.	~5xD	1,000 - 13,000	81013	55
●	○	●	●	○	○	DIN 338	FN	HSS-E		rechts	zyl.	~5xD	1,000 - 12,700	81041	49
○	●	○	○	○	○	DIN 338	S	HSS-E		rechts	zyl.	~5xD	0,200 - 17,500	81061	57
●	○	○	○	○	○	DIN 338	P2000	HSS-E		rechts	zyl.	~5xD	1,000 - 13,000	81062	59
●	○	○	○	○	○	DIN 338	P2000	HSS-E		rechts	zyl.	~5xD	3,300 - 12,000	81063	63
●	○	●	○	○	○	DIN 338	FN	HSS-E		rechts	zyl.	~5xD	1,000 - 13,000	84504	51
○	●	○	○	○	○	DIN 338	S	HSS-E		rechts	zyl.	~5xD	0,500 - 13,000	84505	61
●	○	●	○	○	○	DIN 338	FN	HSS-E		rechts	zyl.	~5xD	1,000 - 13,000	84800	51
●	●	●	●	○	○	DIN 338	FU 500 DZ	HSS-E		rechts	zyl.	~5xD	1,000 - 14,000	84802	53
●	●	●	●	○	○	DIN 338	FU 500 DZ	HSS-E		rechts	zyl.	~5xD	1,000 - 14,000	84804	53
○	●	○	○	○	○	DIN 338	S	HSS-E		rechts	zyl.	~5xD	0,500 - 13,000	84807	61
●	○	●	○	○	○	DIN 338	FN 500 DZ	HSS-E-PM		rechts	zyl.	~5xD	1,000 - 14,000	84811	64
○	○	○	●	○	○	Werksnorm	N	VHM		rechts	zyl.	~5xD	1,000 - 12,000	89244	67

P	M	K	N	S	H	Norm	Typ	Schneidstoff	Oberfläche	Schneid- richtung	Schaft- form	Bohrtiefe	d1/mm	Artikel-Nr.	Progr. Seite
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## Spiralbohrer extra kurz

		DIN 1897	N	<b>HSS</b>		rechts	zyl.	~3xD	0,500 - 39,500	<b>81110</b>	69
		DIN 1897	N	<b>HSS</b>		links	zyl.	~3xD	0,500 - 36,500	<b>81115</b>	71
		DIN 1897	H	<b>HSS</b>		rechts	zyl.	~3xD	1,200 - 15,000	<b>81120</b>	75
		DIN 1897	W	<b>HSS</b>		rechts	zyl.	~3xD	1,500 - 16,000	<b>81130</b>	76
		DIN 1897	FN	<b>HSS</b>		rechts	zyl.	~3xD	1,500 - 15,500	<b>81140</b>	77
		DIN 1897	FN	<b>HSS</b>		links	zyl.	~3xD	1,000 - 16,000	<b>81145</b>	78
		DIN 1897	N	<b>HSS</b>		rechts	zyl.	~3xD	1,000 - 25,000	<b>84400</b>	73
		DIN 1897	N	<b>HSS</b>		rechts	zyl.	~3xD	1,000 - 25,000	<b>84501</b>	73
		DIN 1897	V	<b>HSS-E</b>		rechts	zyl.	~3xD	0,400 - 25,000	<b>81171</b>	81
		DIN 1897	IS	<b>HSS-E</b>		rechts	zyl.	~3xD	1,000 - 12,000	<b>81173</b>	80
		DIN 1897	V	<b>HSS-E</b>		rechts	zyl.	~3xD	0,500 - 15,000	<b>84503</b>	83
		DIN 1897	V	<b>HSS-E</b>		rechts	zyl.	~3xD	0,500 - 15,000	<b>84803</b>	83
		DIN 1897	FU 500 DZ	<b>HSS-E</b>		rechts	zyl.	~3xD	1,000 - 14,000	<b>84806</b>	85
		DIN 1897	FU 500 DZ	<b>HSS-E</b>		rechts	zyl.	~3xD	1,000 - 14,000	<b>84808</b>	85



P	M	K	N	S	H	Norm	Typ	Schneidstoff	Oberfläche	Schneid- richtung	Schaft- form	Bohrtiefe	d1/mm	Artikel-Nr.	Progr. Seite
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## Spiralbohrer extra kurz



●	○	●	○	○	○	DIN 1897	FN 500	HSS-E-PM	F	rechts	zyl.	~3xD	1,000 - 13,500	84511	87
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○	○	○	●	○	○	DIN 6539	N	VHM	○	rechts	zyl.	~3xD	0,800 - 16,000	89235	89
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○	○	○	○	○	○	Werksnorm	N	VHM	○	rechts	zyl.	~3xD	0,500 - 6,500	89246	91
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## Spiralbohrer mit verst. Zylinderschaft



●	●	●	●	○	○	Werksnorm	FU 500	HSS-E	T	rechts	HA	~3xD	2,000 - 20,000	84805	92
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●	●	●	●	○	○	Werksnorm	FU 500	HSS-E	T	rechts	HA	~5xD	2,000 - 20,000	84801	94
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●	○	●	○	○	○	Werksnorm	FN 500	HSS-E-PM	F	rechts	HA	~5xD	2,000 - 13,000	84507	96
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## Spiralbohrersätze



○	○	○	○	○	○	Werksnorm								88303	101
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●	○	○	○	○	○	DIN 1897	P2000	HSS-E	M	rechts	zyl.	~3xD		88015	99
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P	M	K	N	S	H	Norm	Typ	Schneidstoff	Oberfläche	Schneid- richtung	Schaft- form	Bohrtiefe	d1/mm	Artikel-Nr.	Progr. Seite
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## Spiralbohrersätze



•	•	•	○			DIN 338	N	<b>HSS</b>		rechts	zyl.	~5xD		<b>88013</b>	98
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•	•	•	○			DIN 338	N	<b>HSS</b>		rechts	zyl.	~5xD		<b>88016</b>	99
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•	○	○	○			DIN 338	P2000	<b>HSS-E</b>		rechts	zyl.	~5xD		<b>88014</b>	98
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•	•	○				DIN 338	N	<b>HSS-E</b>		rechts	zyl.	~5xD		<b>88026</b>	100
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## NC-Anbohrer













•	○	•	•	○		Werksnorm	N	<b>HSS</b>		rechts	zyl.	3,000 - 25,000		<b>81191</b>	104
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•	○	•	•	○		Werksnorm	N	<b>HSS</b>		rechts	zyl.	3,000 - 25,000		<b>81192</b>	102
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P	M	K	N	S	H	Norm	Typ	Schneidstoff	Oberfläche	Schneid- richtung	Schaft- form	Bohrtiefe	d1/mm	Artikel-Nr.	Progr. Seite
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## NC-Anbohrer

	•	○	•	•	○	Werksnorm	N	HSS		rechts	zyl.	3,000 - 25,000	84434	104
	•	○	•	•	○	Werksnorm	N	HSS		rechts	zyl.	3,000 - 25,000	84435	102
	○	○	○	○	○	Werksnorm	N	VHM		rechts	zyl.	4,000 - 20,000	89242	105
	○	○	○	○	○	Werksnorm	N	VHM		rechts	zyl.	4,000 - 20,000	89243	103
	○	○	○	○	○	Werksnorm	N	VHM		rechts	HB	4,000 - 20,000	89249	105

## Karosseriebohrer

	•	○	•	•	○	Werksnorm	N	HSS		rechts		2,000 - 10,000	81190	106
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## Kühlkanalbohrer


	•	•	•	•	○	Werksnorm	FN	HSS-E		rechts	HE	~5xD	5,000 - 20,000	82761	108
	•	•	•	•	○	Werksnorm	FN	HSS-E		rechts	HE	~5xD	5,000 - 20,000	84461	108
	•	○	•	•	○	Werksnorm	FN	HSS		rechts	zyl.	~10xD	3,000 - 13,000	82710	107

## Bohrbuchsenbohrer

	•	○	•	○	○	DIN 339	N	HSS		rechts	zyl.	~10xD	0,800 - 19,000	81210	109
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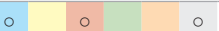

P	M	K	N	S	H	Norm	Typ	Schneidstoff	Oberfläche	Schneid- richtung	Schaft- form	Bohrtiefe	d1/mm	Artikel-Nr.	Progr. Seite
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## Spiralbohrer lang


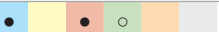











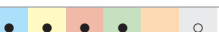

		DIN 340	N	<b>HSS</b>		rechts	zyl.	~10xD	0,400 - 23,500	<b>81310</b>	111
		DIN 340	N	<b>HSS</b>		links	zyl.	~10xD	0,900 - 15,000	<b>81315</b>	113
		DIN 340	N	<b>HSS</b>		rechts	zyl.	~10xD	3,100 - 10,000	<b>81317</b>	114
		DIN 340	H	<b>HSS</b>		rechts	zyl.	~10xD	0,600 - 15,000	<b>81320</b>	117
		DIN 340	W	<b>HSS</b>		rechts	zyl.	~10xD	0,500 - 20,000	<b>81330</b>	118
		DIN 340	FN	<b>HSS</b>		rechts	zyl.	~10xD	0,900 - 14,000	<b>81340</b>	120
		DIN 340	FW	<b>HSS</b>		rechts	zyl.	~10xD	1,000 - 14,000	<b>81350</b>	124
		DIN 340	N	<b>HSS</b>		rechts	zyl.	~10xD	0,500 - 16,000	<b>84418</b>	115
		DIN 340	FN	<b>HSS</b>		rechts	zyl.	~10xD	1,000 - 14,000	<b>84423</b>	122
		DIN 340	FN	<b>HSS</b>		rechts	zyl.	~10xD	1,000 - 14,000	<b>84506</b>	122
		DIN 340	N	<b>HSS-E</b>		rechts	zyl.	~10xD	0,500 - 12,500	<b>81311</b>	126
		DIN 340	FN	<b>HSS-E</b>		rechts	zyl.	~10xD	1,000 - 16,000	<b>81341</b>	127
		DIN 340	S	<b>HSS-E</b>		rechts	zyl.	~10xD	1,000 - 13,000	<b>81361</b>	129
		DIN 340	S	<b>HSS-E</b>		rechts	zyl.	~10xD	1,000 - 13,000	<b>81362</b>	129

P	M	K	N	S	H	Norm	Typ	Schneidstoff	Oberfläche	Schneid- richtung	Schaft- form	Bohrtiefe	d1/mm	Artikel-Nr.	Progr. Seite
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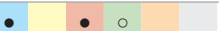


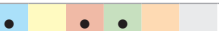





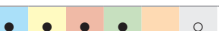

## Spiralbohrer lang

		DIN 340	FU 500 DZ	HSS-E		rechts	zyl.	~10xD	1,000 - 14,000	<b>84812</b>	131
		DIN 340	FU 500 DZ	HSS-E		rechts	zyl.	~10xD	1,000 - 14,000	<b>84814</b>	131
		Werksnorm	N	VHM		rechts	zyl.	~10xD	0,500 - 1,500	<b>89286</b>	133

## Spiralbohrer überlang, Reihe 1



		DIN 1869	N	HSS		rechts	zyl.	~15xD	1,600 - 13,000	<b>81410</b>	134
		DIN 1869	FN	HSS		rechts	zyl.	~15xD	2,000 - 13,000	<b>81440</b>	135
		DIN 1869	FW	HSS		rechts	zyl.	~15xD	2,000 - 9,500	<b>81450</b>	137
		DIN 1869	FN	HSS		rechts	zyl.	~15xD	2,000 - 12,000	<b>84425</b>	136
		DIN 1869	FN	HSS-E		rechts	zyl.	~15xD	3,000 - 10,000	<b>81441</b>	138

## Spiralbohrer überlang, Reihe 2




		DIN 1869	N	HSS		rechts	zyl.	~20xD	3,000 - 12,000	<b>81510</b>	139
		DIN 1869	FN	HSS		rechts	zyl.	~20xD	2,000 - 13,000	<b>81540</b>	140
		DIN 1869	FN	HSS		rechts	zyl.	~20xD	3,000 - 8,500	<b>84426</b>	141
		DIN 1869	FN	HSS-E		rechts	zyl.	~20xD	3,000 - 10,000	<b>81541</b>	142

P	M	K	N	S	H	Norm	Typ	Schneidstoff	Oberfläche	Schneid- richtung	Schaft- form	Bohrtiefe	d1/mm	Artikel-Nr.	Progr. Seite
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## Spiralbohrer überlang, Reihe 3

															
•	•	•	○			DIN 1869	N	HSS	○	rechts	zyl.	~25xD	4,000 - 12,000	81610	143
															
•	•	•	•			DIN 1869	FN	HSS	◐	rechts	zyl.	~25xD	3,000 - 13,000	81640	144



## Spiralbohrer extra lang

															
•	•	•	•			Werknorm	FN	HSS	◐	rechts	zyl.	>25xD	6,000 - 12,000	81740	145
															
•	•	•	•			Werknorm	FN	HSS	○	rechts	zyl.	>25xD	8,000 - 12,000	81750	146
															
•	•	•	•			Werknorm	FN	HSS	○	rechts	zyl.	>25xD	10,000 - 12,000	81760	147


## Stiftlochbohrer

															
•	○	•	○			DIN 1898	N	HSS	◐ <sub>2,36</sub>	rechts	zyl.		2,000 - 12,000	81810	148

## Spiralbohrer mit HM-Schneiden

															
○	•	•	•	○		DIN 8037	N	HM	○	rechts	zyl.		2,600 - 20,000	89301	150
															
○	•	•	•	○		DIN 8038	N	HM	○	rechts	zyl.		3,100 - 8,000	89303	149

## Aufbohrer mit Zylinderschaft

															
•	○	•	○			DIN 344	N	HSS	○	rechts	zyl.		3,800 - 15,000	86010	151



## Spiralbohrer kurz

Artikel-Nr. 81010

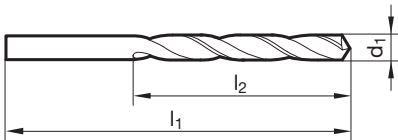


P	M	K	N	S	H
•		•	○		



Ausspitzung  $\geq \varnothing 1,000$  • Kegelmantelschliff

Stahl und Stahlguss (legiert und unleg.) • Grauguss, Temperguss, Sphäroguss • Sinter Eisen und Graphit



d1	inch	l1	l2	d1	inch	l1	l2
mm		mm	mm	mm		mm	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
0,280		19,000	3,000	0,710		28,000	9,000
0,290		19,000	3,000	0,720		28,000	9,000
0,300		19,000	3,000	0,730		28,000	9,000
0,310		19,000	4,000	0,740		28,000	9,000
0,320		19,000	4,000	0,750		28,000	9,000
0,330		19,000	4,000	0,760		30,000	10,000
0,350		19,000	4,000	0,770		30,000	10,000
0,360		19,000	4,000	0,780		30,000	10,000
0,370		19,000	4,000	0,790	1/32	30,000	10,000
0,380		19,000	4,000	0,800		30,000	10,000
0,390		20,000	5,000	0,810		30,000	10,000
0,400		20,000	5,000	0,820		30,000	10,000
0,410		20,000	5,000	0,830		30,000	10,000
0,420		20,000	5,000	0,840		30,000	10,000
0,430		20,000	5,000	0,850		30,000	10,000
0,440		20,000	5,000	0,860		32,000	11,000
0,450		20,000	5,000	0,870		32,000	11,000
0,460		20,000	5,000	0,880		32,000	11,000
0,470		20,000	5,000	0,890		32,000	11,000
0,480		20,000	5,000	0,900		32,000	11,000
0,490		22,000	6,000	0,910		32,000	11,000
0,500		22,000	6,000	0,920		32,000	11,000
0,510		22,000	6,000	0,930		32,000	11,000
0,520		22,000	6,000	0,950		32,000	11,000
0,530		22,000	6,000	0,960		34,000	12,000
0,540		24,000	7,000	0,970		34,000	12,000
0,550		24,000	7,000	0,980		34,000	12,000
0,560		24,000	7,000	0,990		34,000	12,000
0,570		24,000	7,000	1,000		34,000	12,000
0,580		24,000	7,000	1,010		34,000	12,000
0,590		24,000	7,000	1,020		34,000	12,000
0,600		24,000	7,000	1,030		34,000	12,000
0,610		26,000	8,000	1,040		34,000	12,000
0,620		26,000	8,000	1,050		34,000	12,000
0,630		26,000	8,000	1,070		36,000	14,000





## Spiralbohrer kurz

d1 mm	inch	l1 mm	l2 mm	d1 mm	inch	l1 mm	l2 mm
1,100		36,000	14,000	2,050		49,000	24,000
1,110		36,000	14,000	2,100		49,000	24,000
1,120		36,000	14,000	2,110		49,000	24,000
1,130		36,000	14,000	2,120		49,000	24,000
1,140		36,000	14,000	2,140		53,000	27,000
1,150		36,000	14,000	2,150		53,000	27,000
1,160		36,000	14,000	2,170		53,000	27,000
1,170		36,000	14,000	2,200		53,000	27,000
1,180		36,000	14,000	2,210		53,000	27,000
1,190	3/64	38,000	16,000	2,220		53,000	27,000
1,200		38,000	16,000	2,250		53,000	27,000
1,210		38,000	16,000	2,270		53,000	27,000
1,220		38,000	16,000	2,300		53,000	27,000
1,230		38,000	16,000	2,330		53,000	27,000
1,240		38,000	16,000	2,350		53,000	27,000
1,250		38,000	16,000	2,360		53,000	27,000
1,260		38,000	16,000	2,370		57,000	30,000
1,270		38,000	16,000	2,380	3/32	57,000	30,000
1,280		38,000	16,000	2,400		57,000	30,000
1,300		38,000	16,000	2,420		57,000	30,000
1,310		38,000	16,000	2,440		57,000	30,000
1,350		40,000	18,000	2,450		57,000	30,000
1,360		40,000	18,000	2,460		57,000	30,000
1,390		40,000	18,000	2,500		57,000	30,000
1,400		40,000	18,000	2,510		57,000	30,000
1,410		40,000	18,000	2,520		57,000	30,000
1,420		40,000	18,000	2,530		57,000	30,000
1,430		40,000	18,000	2,550		57,000	30,000
1,440		40,000	18,000	2,570		57,000	30,000
1,450		40,000	18,000	2,600		57,000	30,000
1,460		40,000	18,000	2,640		57,000	30,000
1,480		40,000	18,000	2,650		57,000	30,000
1,490		40,000	18,000	2,700		61,000	33,000
1,500		40,000	18,000	2,710		61,000	33,000
1,510		43,000	20,000	2,750		61,000	33,000
1,520		43,000	20,000	2,780	7/64	61,000	33,000
1,550		43,000	20,000	2,800		61,000	33,000
1,560		43,000	20,000	2,820		61,000	33,000
1,570		43,000	20,000	2,850		61,000	33,000
1,580		43,000	20,000	2,880		61,000	33,000
1,590	1/16	43,000	20,000	2,900		61,000	33,000
1,600		43,000	20,000	2,940		61,000	33,000
1,620		43,000	20,000	2,950		61,000	33,000
1,630		43,000	20,000	2,970		61,000	33,000
1,650		43,000	20,000	3,000		61,000	33,000
1,700		43,000	20,000	3,010		65,000	36,000
1,720		46,000	22,000	3,020		65,000	36,000
1,730		46,000	22,000	3,050		65,000	36,000
1,740		46,000	22,000	3,060		65,000	36,000
1,750		46,000	22,000	3,070		65,000	36,000
1,760		46,000	22,000	3,100		65,000	36,000
1,790		46,000	22,000	3,150		65,000	36,000
1,800		46,000	22,000	3,160		65,000	36,000
1,810		46,000	22,000	3,170	1/8	65,000	36,000
1,820		46,000	22,000	3,180		65,000	36,000
1,830		46,000	22,000	3,200		65,000	36,000
1,840		46,000	22,000	3,250		65,000	36,000
1,850		46,000	22,000	3,260		65,000	36,000
1,890		46,000	22,000	3,300		65,000	36,000
1,900		46,000	22,000	3,320		65,000	36,000
1,910		49,000	24,000	3,350		65,000	36,000
1,920		49,000	24,000	3,400		70,000	39,000
1,930		49,000	24,000	3,450		70,000	39,000
1,940		49,000	24,000	3,500		70,000	39,000
1,950		49,000	24,000	3,550		70,000	39,000
1,980	5/64	49,000	24,000	3,600		70,000	39,000
1,990		49,000	24,000	3,620		70,000	39,000
2,000		49,000	24,000	3,650		70,000	39,000
2,010		49,000	24,000	3,670		70,000	39,000
2,020		49,000	24,000	3,680		70,000	39,000
2,030		49,000	24,000	3,700		70,000	39,000
2,040		49,000	24,000	3,740		70,000	39,000



## Spiralbohrer kurz

d1 mm	inch	l1 mm	l2 mm	d1 mm	inch	l1 mm	l2 mm
3,750		70,000	39,000	5,900		93,000	57,000
3,800		75,000	43,000	5,950	15/64	93,000	57,000
3,850		75,000	43,000	6,000		93,000	57,000
3,900		75,000	43,000	6,030		101,000	63,000
3,930		75,000	43,000	6,040		101,000	63,000
3,950		75,000	43,000	6,050		101,000	63,000
3,970	5/32	75,000	43,000	6,100		101,000	63,000
3,990		75,000	43,000	6,150		101,000	63,000
4,000		75,000	43,000	6,200		101,000	63,000
4,030		75,000	43,000	6,250		101,000	63,000
4,040		75,000	43,000	6,260		101,000	63,000
4,050		75,000	43,000	6,300		101,000	63,000
4,060		75,000	43,000	6,350	1/4	101,000	63,000
4,100		75,000	43,000	6,400		101,000	63,000
4,150		75,000	43,000	6,450		101,000	63,000
4,200		75,000	43,000	6,500		101,000	63,000
4,220		75,000	43,000	6,550		101,000	63,000
4,250		75,000	43,000	6,600		101,000	63,000
4,300		80,000	47,000	6,650		101,000	63,000
4,320		80,000	47,000	6,700		101,000	63,000
4,350		80,000	47,000	6,750	17/64	109,000	69,000
4,370	11/64	80,000	47,000	6,800		109,000	69,000
4,390		80,000	47,000	6,850		109,000	69,000
4,400		80,000	47,000	6,900		109,000	69,000
4,450		80,000	47,000	6,950		109,000	69,000
4,500		80,000	47,000	7,000		109,000	69,000
4,520		80,000	47,000	7,050		109,000	69,000
4,530		80,000	47,000	7,100		109,000	69,000
4,550		80,000	47,000	7,140	9/32	109,000	69,000
4,570		80,000	47,000	7,200		109,000	69,000
4,600		80,000	47,000	7,250		109,000	69,000
4,650		80,000	47,000	7,300		109,000	69,000
4,700		80,000	47,000	7,350		109,000	69,000
4,750		80,000	47,000	7,400		109,000	69,000
4,760	3/16	86,000	52,000	7,450		109,000	69,000
4,780		86,000	52,000	7,500		109,000	69,000
4,800		86,000	52,000	7,540	19/64	117,000	75,000
4,830		86,000	52,000	7,600		117,000	75,000
4,850		86,000	52,000	7,700		117,000	75,000
4,900		86,000	52,000	7,750		117,000	75,000
4,920		86,000	52,000	7,800		117,000	75,000
4,950		86,000	52,000	7,850		117,000	75,000
5,000		86,000	52,000	7,900		117,000	75,000
5,050		86,000	52,000	7,940	5/16	117,000	75,000
5,060		86,000	52,000	7,950		117,000	75,000
5,100		86,000	52,000	8,000		117,000	75,000
5,110		86,000	52,000	8,050		117,000	75,000
5,150		86,000	52,000	8,100		117,000	75,000
5,160	13/64	86,000	52,000	8,200		117,000	75,000
5,200		86,000	52,000	8,250		117,000	75,000
5,220		86,000	52,000	8,300		117,000	75,000
5,250		86,000	52,000	8,330	21/64	117,000	75,000
5,300		86,000	52,000	8,400		117,000	75,000
5,310		93,000	57,000	8,450		117,000	75,000
5,350		93,000	57,000	8,500		117,000	75,000
5,400		93,000	57,000	8,550		125,000	81,000
5,410		93,000	57,000	8,600		125,000	81,000
5,420		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	9,050		125,000	81,000
5,620		93,000	57,000	9,100		125,000	81,000
5,650		93,000	57,000	9,130	23/64	125,000	81,000
5,700		93,000	57,000	9,150		125,000	81,000
5,750		93,000	57,000	9,200		125,000	81,000
5,790		93,000	57,000	9,250		125,000	81,000
5,800		93,000	57,000	9,300		125,000	81,000
5,850		93,000	57,000	9,350		125,000	81,000



## Spiralbohrer kurz

d1 mm	inch	l1 mm	l2 mm	d1 mm	inch	l1 mm	l2 mm
9,400		125,000	81,000	13,100	33/64	151,000	101,000
9,500		125,000	81,000	13,200		151,000	101,000
9,520	3/8	133,000	87,000	13,250		160,000	108,000
9,550		133,000	87,000	13,300		160,000	108,000
9,600		133,000	87,000	13,400		160,000	108,000
9,650		133,000	87,000	13,490	17/32	160,000	108,000
9,700		133,000	87,000	13,500		160,000	108,000
9,750		133,000	87,000	13,600		160,000	108,000
9,800		133,000	87,000	13,700		160,000	108,000
9,900		133,000	87,000	13,750		160,000	108,000
9,920	25/64	133,000	87,000	13,800		160,000	108,000
9,950		133,000	87,000	13,900		160,000	108,000
10,000		133,000	87,000	14,000		160,000	108,000
10,050		133,000	87,000	14,100		169,000	114,000
10,080		133,000	87,000	14,200		169,000	114,000
10,100		133,000	87,000	14,250		169,000	114,000
10,200		133,000	87,000	14,300		169,000	114,000
10,250		133,000	87,000	14,400		169,000	114,000
10,300		133,000	87,000	14,500		169,000	114,000
10,320	13/32	133,000	87,000	14,600		169,000	114,000
10,400		133,000	87,000	14,680	37/64	169,000	114,000
10,500		133,000	87,000	14,700		169,000	114,000
10,600		133,000	87,000	14,750		169,000	114,000
10,700		142,000	94,000	14,800		169,000	114,000
10,720	27/64	142,000	94,000	14,900		169,000	114,000
10,750		142,000	94,000	15,000		169,000	114,000
10,800		142,000	94,000	15,080	19/32	178,000	120,000
10,900		142,000	94,000	15,100		178,000	120,000
11,000		142,000	94,000	15,200		178,000	120,000
11,100		142,000	94,000	15,250		178,000	120,000
11,110	7/16	142,000	94,000	15,400		178,000	120,000
11,150		142,000	94,000	15,500		178,000	120,000
11,200		142,000	94,000	15,600		178,000	120,000
11,250		142,000	94,000	15,700		178,000	120,000
11,300		142,000	94,000	15,750		178,000	120,000
11,400		142,000	94,000	15,800		178,000	120,000
11,500		142,000	94,000	15,870	5/8	178,000	120,000
11,510	29/64	142,000	94,000	16,000		178,000	120,000
11,600		142,000	94,000	16,100		184,000	125,000
11,700		142,000	94,000	16,200		184,000	125,000
11,750		142,000	94,000	16,250		184,000	125,000
11,800		142,000	94,000	16,270	41/64	184,000	125,000
11,900		151,000	101,000	16,500		184,000	125,000
11,910	15/32	151,000	101,000	16,700		184,000	125,000
12,000		151,000	101,000	16,900		184,000	125,000
12,050		151,000	101,000	17,000		184,000	125,000
12,100		151,000	101,000	17,250		191,000	130,000
12,200		151,000	101,000	17,500		191,000	130,000
12,250		151,000	101,000	17,750		191,000	130,000
12,300	31/64	151,000	101,000	17,800		191,000	130,000
12,400		151,000	101,000	18,000		191,000	130,000
12,500		151,000	101,000	18,500		198,000	135,000
12,600		151,000	101,000	18,750		198,000	135,000
12,650		151,000	101,000	19,000		198,000	135,000
12,700	1/2	151,000	101,000	19,250		205,000	140,000
12,750		151,000	101,000	19,500		205,000	140,000
12,800		151,000	101,000	20,000		205,000	140,000
12,850		151,000	101,000				
12,900		151,000	101,000				
13,000		151,000	101,000				



## Spiralbohrer kurz

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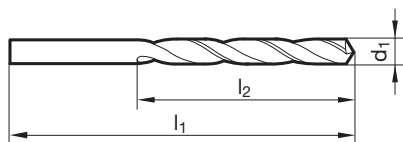


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Ausspitzung  $\geq \text{Ø } 15,000$  • Kegelmantelschliff

Stahl und Stahlguss (legiert und unleg.) • Grauguss, Temperguss, Sphäroguss • Sinterisen und Graphit



d1		l1	l2	d1		l1	l2
mm	inch	mm	mm	mm	inch	mm	mm
0,250		19,000	3,000	2,600		57,000	30,000
0,300		19,000	3,000	2,700		61,000	33,000
0,370		19,000	4,000	2,750		61,000	33,000
0,400		20,000	5,000	2,800		61,000	33,000
0,500		22,000	6,000	2,900		61,000	33,000
0,550		24,000	7,000	3,000		61,000	33,000
0,600		24,000	7,000	3,050		65,000	36,000
0,650		26,000	8,000	3,100		65,000	36,000
0,700		28,000	9,000	3,150		65,000	36,000
0,800		30,000	10,000	3,200		65,000	36,000
0,900		32,000	11,000	3,250		65,000	36,000
0,950		32,000	11,000	3,300		65,000	36,000
1,000		34,000	12,000	3,350		65,000	36,000
1,050		34,000	12,000	3,400		70,000	39,000
1,100		36,000	14,000	3,450		70,000	39,000
1,150		36,000	14,000	3,500		70,000	39,000
1,170		36,000	14,000	3,550		70,000	39,000
1,190	3/64	38,000	16,000	3,600		70,000	39,000
1,200		38,000	16,000	3,650		70,000	39,000
1,250		38,000	16,000	3,700		70,000	39,000
1,300		38,000	16,000	3,750		70,000	39,000
1,350		40,000	18,000	3,800		75,000	43,000
1,400		40,000	18,000	3,850		75,000	43,000
1,450		40,000	18,000	3,900		75,000	43,000
1,500		40,000	18,000	3,950		75,000	43,000
1,550		43,000	20,000	4,000		75,000	43,000
1,560		43,000	20,000	4,100		75,000	43,000
1,600		43,000	20,000	4,150		75,000	43,000
1,700		43,000	20,000	4,200		75,000	43,000
1,800		46,000	22,000	4,250		75,000	43,000
1,850		46,000	22,000	4,300		80,000	47,000
1,900		46,000	22,000	4,350		80,000	47,000
2,000		49,000	24,000	4,400		80,000	47,000
2,050		49,000	24,000	4,450		80,000	47,000
2,100		49,000	24,000	4,500		80,000	47,000
2,150		53,000	27,000	4,550		80,000	47,000
2,200		53,000	27,000	4,600		80,000	47,000
2,250		53,000	27,000	4,650		80,000	47,000
2,300		53,000	27,000	4,700		80,000	47,000
2,400		57,000	30,000	4,750		80,000	47,000
2,500		57,000	30,000	4,800		86,000	52,000
2,550		57,000	30,000	4,850		86,000	52,000



## Spiralbohrer kurz

d1 mm	inch	l1 mm	l2 mm	d1 mm	inch	l1 mm	l2 mm
4,900		86,000	52,000	8,700		125,000	81,000
4,950		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
5,250		86,000	52,000	9,200		125,000	81,000
5,300		86,000	52,000	9,300		125,000	81,000
5,400		93,000	57,000	9,400		125,000	81,000
5,450		93,000	57,000	9,500		125,000	81,000
5,500		93,000	57,000	9,600		133,000	87,000
5,600		93,000	57,000	9,700		133,000	87,000
5,650		93,000	57,000	9,750		133,000	87,000
5,700		93,000	57,000	9,800		133,000	87,000
5,750		93,000	57,000	9,900		133,000	87,000
5,800		93,000	57,000	10,000		133,000	87,000
5,850		93,000	57,000	10,100		133,000	87,000
5,900		93,000	57,000	10,200		133,000	87,000
5,950	15/64	93,000	57,000	10,300		133,000	87,000
6,000		93,000	57,000	10,500		133,000	87,000
6,100		101,000	63,000	10,750		142,000	94,000
6,200		101,000	63,000	10,900		142,000	94,000
6,250		101,000	63,000	11,000		142,000	94,000
6,300		101,000	63,000	11,100		142,000	94,000
6,400		101,000	63,000	11,250		142,000	94,000
6,500		101,000	63,000	11,500		142,000	94,000
6,600		101,000	63,000	11,750		142,000	94,000
6,650		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	12,250		151,000	101,000
6,800		109,000	69,000	12,500		151,000	101,000
6,900		109,000	69,000	12,700	1/2	151,000	101,000
7,000		109,000	69,000	12,750		151,000	101,000
7,100		109,000	69,000	12,800		151,000	101,000
7,200		109,000	69,000	13,000		151,000	101,000
7,250		109,000	69,000	13,800		160,000	108,000
7,300		109,000	69,000	14,000		160,000	108,000
7,400		109,000	69,000	15,000		169,000	114,000
7,500		109,000	69,000	15,500		178,000	120,000
7,600		117,000	75,000	16,000		178,000	120,000
7,700		117,000	75,000	17,000		184,000	125,000
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				
8,400		117,000	75,000				
8,500		117,000	75,000				
8,600		125,000	81,000				



## Spiralbohrer kurz

Artikel-Nr. 81017

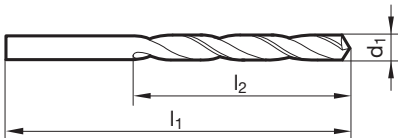


P	M	K	N	S	H
•		•	○		



Ausspitzung  $\geq \varnothing 3,000$  • Kegelmantelschliff • mit Mitnehmer nach DIN 1809

Stahl und Stahlguss (legiert und unleg.) • Grauguss, Temperguss, Sphäroguss • Sintereisen und Graphit



d1	inch	l1	l2	d1	inch	l1	l2
mm		mm	mm	mm		mm	mm
3,000		61,000	33,000	6,750	17/64	109,000	69,000
3,100		65,000	36,000	6,800		109,000	69,000
3,200		65,000	36,000	7,000		109,000	69,000
3,300		65,000	36,000	7,200		109,000	69,000
3,400		70,000	39,000	7,500		109,000	69,000
3,500		70,000	39,000	7,700		117,000	75,000
3,600		70,000	39,000	7,750		117,000	75,000
3,700		70,000	39,000	7,800		117,000	75,000
3,800		75,000	43,000	7,900		117,000	75,000
4,000		75,000	43,000	8,000		117,000	75,000
4,100		75,000	43,000	8,100		117,000	75,000
4,200		75,000	43,000	8,250		117,000	75,000
4,300		80,000	47,000	8,400		117,000	75,000
4,400		80,000	47,000	8,500		117,000	75,000
4,500		80,000	47,000	8,600		125,000	81,000
4,600		80,000	47,000	8,700		125,000	81,000
4,700		80,000	47,000	8,800		125,000	81,000
4,800		86,000	52,000	8,900		125,000	81,000
4,900		86,000	52,000	9,000		125,000	81,000
5,000		86,000	52,000	9,100		125,000	81,000
5,100		86,000	52,000	9,500		125,000	81,000
5,200		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
5,600		93,000	57,000	10,200		133,000	87,000
5,700		93,000	57,000	10,500		133,000	87,000
5,750		93,000	57,000	12,000		151,000	101,000
5,800		93,000	57,000	13,000		151,000	101,000
5,900		93,000	57,000				
6,000		93,000	57,000				
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				
6,700		101,000	63,000				





## Spiralbohrer kurz

Artikel-Nr. 84405

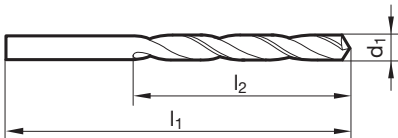


P	M	K	N	S	H
•		•	○		



Ausspitzung  $\geq \varnothing 1,000$  • Kegelmantelanschliff

Stahl und Stahlguss (legiert und unleg.) • Grauguss, Temperguss, Sphäroguss • Sinterisen und Graphit



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



## Spiralbohrer kurz

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



## Spiralbohrer kurz

Artikel-Nr. 81020

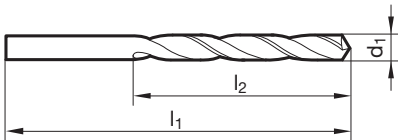


P	M	K	N	S	H
			•		



Ausspitzung  $\geq \varnothing 14,500$  • Kegelmantelschliff

harte und spröde Werkstoffe • Messing, Magnesium-Legierungen • Bronze, Phosphorbronze • Schiefer, Glimmer, Pertinax



d1	inch	l1	l2	d1	inch	l1	l2
mm		mm	mm	mm		mm	mm
0,300		19,000	3,000	2,120		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
0,440		20,000	5,000	2,300		53,000	27,000
0,450		20,000	5,000	2,400		57,000	30,000
0,480		20,000	5,000	2,450		57,000	30,000
0,500		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	2,700		61,000	33,000
0,700		28,000	9,000	2,780	7/64	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
0,810		30,000	10,000	2,950		61,000	33,000
0,840		30,000	10,000	3,000		61,000	33,000
0,900		32,000	11,000	3,020		65,000	36,000
0,910		32,000	11,000	3,050		65,000	36,000
0,950		32,000	11,000	3,070		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	3,700		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
1,510		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	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
2,100		49,000	24,000	4,600		80,000	47,000



## Spiralbohrer kurz

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

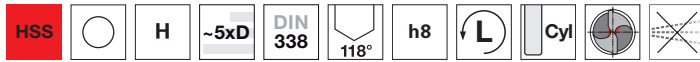


## Spiralbohrer kurz

Artikel-Nr. 81025

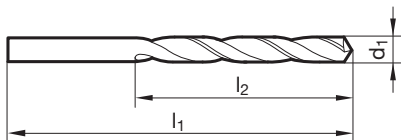


P	M	K	N	S	H
			•		



Ausspitzung  $\geq \varnothing 14,500$  • Kegelmantelschliff

harte und spröde Werkstoffe • Messing, Magnesium-Legierungen • Bronze, Phosphorbronze • Schiefer, Glimmer, Pertinax



d1	inch	l1	l2	d1	inch	l1	l2
mm		mm	mm	mm		mm	mm
0,500		22,000	6,000	2,250		53,000	27,000
0,580		24,000	7,000	2,300		53,000	27,000
0,670		26,000	8,000	2,350		53,000	27,000
0,690		28,000	9,000	2,400		57,000	30,000
0,700		28,000	9,000	2,430		57,000	30,000
0,750		28,000	9,000	2,500		57,000	30,000
0,800		30,000	10,000	2,600		57,000	30,000
0,900		32,000	11,000	2,700		61,000	33,000
0,950		32,000	11,000	2,750		61,000	33,000
1,000		34,000	12,000	2,800		61,000	33,000
1,040		34,000	12,000	2,900		61,000	33,000
1,050		34,000	12,000	3,000		61,000	33,000
1,100		36,000	14,000	3,100		65,000	36,000
1,150		36,000	14,000	3,150		65,000	36,000
1,180		36,000	14,000	3,200		65,000	36,000
1,200		38,000	16,000	3,250		65,000	36,000
1,240		38,000	16,000	3,300		65,000	36,000
1,290		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	3,700		70,000	39,000
1,330		40,000	18,000	3,750		70,000	39,000
1,350		40,000	18,000	3,800		75,000	43,000
1,400		40,000	18,000	3,850		75,000	43,000
1,460		40,000	18,000	3,900		75,000	43,000
1,470		40,000	18,000	4,000		75,000	43,000
1,480		40,000	18,000	4,100		75,000	43,000
1,500		40,000	18,000	4,200		75,000	43,000
1,600		43,000	20,000	4,250		75,000	43,000
1,700		43,000	20,000	4,300		80,000	47,000
1,710		46,000	22,000	4,350		80,000	47,000
1,730		46,000	22,000	4,400		80,000	47,000
1,800		46,000	22,000	4,500		80,000	47,000
1,900		46,000	22,000	4,600		80,000	47,000
1,920		49,000	24,000	4,700		80,000	47,000
1,950		49,000	24,000	4,750		80,000	47,000
2,000		49,000	24,000	4,800		86,000	52,000
2,030		49,000	24,000	4,850		86,000	52,000
2,050		49,000	24,000	4,950		86,000	52,000
2,060		49,000	24,000	5,000		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



## Spiralbohrer kurz

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



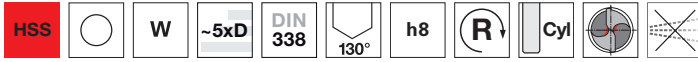


## Spiralbohrer kurz

Artikel-Nr. 81030

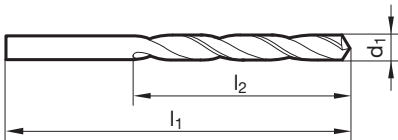


P	M	K	N	S	H
			•		



Ausspitzung  $\geq \varnothing 14,500$  • Kegelmantelschliff

weiche, langspanende Werkstoffe • Aluminium, Al-Legierungen (langspanend) • Zink, Hüttenkupfer, Silumin, Elektron • Kunststoffe (weich) • Holz



d1	inch	l1	l2	d1	inch	l1	l2
mm		mm	mm	mm		mm	mm
0,250		19,000	3,000	2,300		53,000	27,000
0,400		20,000	5,000	2,350		53,000	27,000
0,500		22,000	6,000	2,400		57,000	30,000
0,550		24,000	7,000	2,450		57,000	30,000
0,600		24,000	7,000	2,500		57,000	30,000
0,650		26,000	8,000	2,550		57,000	30,000
0,700		28,000	9,000	2,600		57,000	30,000
0,800		30,000	10,000	2,700		61,000	33,000
0,850		30,000	10,000	2,750		61,000	33,000
0,900		32,000	11,000	2,800		61,000	33,000
0,950		32,000	11,000	2,850		61,000	33,000
0,970		34,000	12,000	2,900		61,000	33,000
1,000		34,000	12,000	2,950		61,000	33,000
1,050		34,000	12,000	3,000		61,000	33,000
1,060		34,000	12,000	3,050		65,000	36,000
1,070		36,000	14,000	3,100		65,000	36,000
1,100		36,000	14,000	3,150		65,000	36,000
1,150		36,000	14,000	3,200		65,000	36,000
1,200		38,000	16,000	3,250		65,000	36,000
1,210		38,000	16,000	3,300		65,000	36,000
1,240		38,000	16,000	3,400		70,000	39,000
1,250		38,000	16,000	3,450		70,000	39,000
1,280		38,000	16,000	3,500		70,000	39,000
1,300		38,000	16,000	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
1,530		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	3,950		75,000	43,000
1,700		43,000	20,000	4,000		75,000	43,000
1,750		46,000	22,000	4,040		75,000	43,000
1,800		46,000	22,000	4,100		75,000	43,000
1,900		46,000	22,000	4,150		75,000	43,000
1,950		49,000	24,000	4,200		75,000	43,000
2,000		49,000	24,000	4,250		75,000	43,000
2,050		49,000	24,000	4,300		80,000	47,000
2,100		49,000	24,000	4,400		80,000	47,000
2,150		53,000	27,000	4,500		80,000	47,000
2,200		53,000	27,000	4,600		80,000	47,000
2,250		53,000	27,000	4,700		80,000	47,000



## Spiralbohrer kurz

d1 mm	inch	l1 mm	l2 mm	d1 mm	inch	l1 mm	l2 mm
4,750		80,000	47,000	8,730	11/32	125,000	81,000
4,800		86,000	52,000	8,750		125,000	81,000
4,850		86,000	52,000	8,800		125,000	81,000
4,900		86,000	52,000	8,900		125,000	81,000
4,950		86,000	52,000	9,000		125,000	81,000
5,000		86,000	52,000	9,100		125,000	81,000
5,050		86,000	52,000	9,200		125,000	81,000
5,100		86,000	52,000	9,250		125,000	81,000
5,200		86,000	52,000	9,300		125,000	81,000
5,250		86,000	52,000	9,400		125,000	81,000
5,300		86,000	52,000	9,500		125,000	81,000
5,400		93,000	57,000	9,600		133,000	87,000
5,500		93,000	57,000	9,700		133,000	87,000
5,550		93,000	57,000	9,800		133,000	87,000
5,600		93,000	57,000	9,900		133,000	87,000
5,700		93,000	57,000	10,000		133,000	87,000
5,750		93,000	57,000	10,100		133,000	87,000
5,800		93,000	57,000	10,200		133,000	87,000
5,900		93,000	57,000	10,250		133,000	87,000
5,950	15/64	93,000	57,000	10,400		133,000	87,000
6,000		93,000	57,000	10,500		133,000	87,000
6,100		101,000	63,000	10,800		142,000	94,000
6,150		101,000	63,000	10,900		142,000	94,000
6,200		101,000	63,000	10,950		142,000	94,000
6,250		101,000	63,000	11,000		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	12,300	31/64	151,000	101,000
7,000		109,000	69,000	12,500		151,000	101,000
7,100		109,000	69,000	12,600		151,000	101,000
7,200		109,000	69,000	12,700	1/2	151,000	101,000
7,250		109,000	69,000	12,800		151,000	101,000
7,300		109,000	69,000	13,000		151,000	101,000
7,400		109,000	69,000	13,200		151,000	101,000
7,500		109,000	69,000	13,500		160,000	108,000
7,600		117,000	75,000	14,000		160,000	108,000
7,700		117,000	75,000	14,500		169,000	114,000
7,750		117,000	75,000	15,000		169,000	114,000
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				
8,200		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				

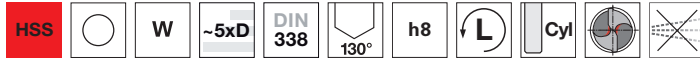


## Spiralbohrer kurz

Artikel-Nr. 81035

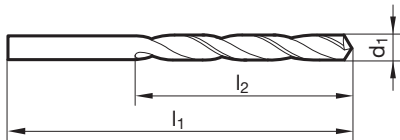


P	M	K	N	S	H
			•		



Ausspitzung  $\geq \varnothing 15,000$  • Kegelmantelschliff

weiche, langspanende Werkstoffe • Aluminium, Al-Legierungen (langspanend) • Zink, Hüttenkupfer, Silumin, Elektron • Kunststoffe (weich) • Holz



d1	inch	l1	l2	d1	inch	l1	l2
mm		mm	mm	mm		mm	mm
0,500		22,000	6,000	5,100		86,000	52,000
0,600		24,000	7,000	5,200		86,000	52,000
0,750		28,000	9,000	5,250		86,000	52,000
1,000		34,000	12,000	5,300		86,000	52,000
1,050		34,000	12,000	5,400		93,000	57,000
1,100		36,000	14,000	5,500		93,000	57,000
1,200		38,000	16,000	5,600		93,000	57,000
1,550		43,000	20,000	5,800		93,000	57,000
1,750		46,000	22,000	5,950	15/64	93,000	57,000
1,800		46,000	22,000	6,000		93,000	57,000
1,850		46,000	22,000	6,200		101,000	63,000
1,900		46,000	22,000	6,300		101,000	63,000
2,000		49,000	24,000	6,400		101,000	63,000
2,300		53,000	27,000	6,700		101,000	63,000
2,350		53,000	27,000	6,800		109,000	69,000
2,400		57,000	30,000	6,900		109,000	69,000
2,500		57,000	30,000	7,000		109,000	69,000
2,600		57,000	30,000	7,100		109,000	69,000
2,650		57,000	30,000	7,400		109,000	69,000
2,700		61,000	33,000	7,500		109,000	69,000
2,800		61,000	33,000	7,600		117,000	75,000
2,900		61,000	33,000	7,700		117,000	75,000
3,000		61,000	33,000	7,900		117,000	75,000
3,100		65,000	36,000	8,000		117,000	75,000
3,200		65,000	36,000	8,600		125,000	81,000
3,500		70,000	39,000	8,700		125,000	81,000
3,600		70,000	39,000	9,100		125,000	81,000
3,700		70,000	39,000	9,200		125,000	81,000
3,800		75,000	43,000	9,300		125,000	81,000
3,850		75,000	43,000	9,400		125,000	81,000
3,900		75,000	43,000	9,500		125,000	81,000
3,950		75,000	43,000	9,800		133,000	87,000
4,000		75,000	43,000	10,000		133,000	87,000
4,200		75,000	43,000	10,500		133,000	87,000
4,300		80,000	47,000	11,500		142,000	94,000
4,400		80,000	47,000	12,000		151,000	101,000
4,500		80,000	47,000	12,500		151,000	101,000
4,600		80,000	47,000	13,000		151,000	101,000
4,700		80,000	47,000	13,500		160,000	108,000
4,800		86,000	52,000	14,000		160,000	108,000
4,900		86,000	52,000	15,000		169,000	114,000
5,000		86,000	52,000				



## Spiralbohrer kurz

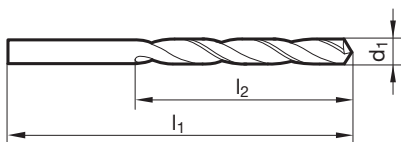
Artikel-Nr. 81040



P	M	K	N	S	H
•		•	•		



Ausspitzung  $\geq \text{Ø } 1,000$  • Kegelmantelschliff • weite Spannuten • besonders für Bohrtiefen über 3xD  
 Grauguss • Stähle bis 1000 N/mm<sup>2</sup> • Ausnahmen: CrNi-Stähle, VA-Stähle u.ä.



d1	inch	l1	l2	d1	inch	l1	l2
mm		mm	mm	mm		mm	mm
0,800		30,000	10,000	3,300		65,000	36,000
1,000		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	3,450		70,000	39,000
1,300		38,000	16,000	3,500		70,000	39,000
1,350		40,000	18,000	3,550		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	3,800		75,000	43,000
1,550		43,000	20,000	3,900		75,000	43,000
1,570		43,000	20,000	3,950		75,000	43,000
1,600		43,000	20,000	4,000		75,000	43,000
1,650		43,000	20,000	4,050		75,000	43,000
1,700		43,000	20,000	4,090		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
2,100		49,000	24,000	4,550		80,000	47,000
2,150		53,000	27,000	4,600		80,000	47,000
2,200		53,000	27,000	4,650		80,000	47,000
2,300		53,000	27,000	4,700		80,000	47,000
2,350		53,000	27,000	4,800		86,000	52,000
2,400		57,000	30,000	4,900		86,000	52,000
2,490		57,000	30,000	4,920		86,000	52,000
2,500		57,000	30,000	5,000		86,000	52,000
2,550		57,000	30,000	5,030		86,000	52,000
2,600		57,000	30,000	5,100		86,000	52,000
2,700		61,000	33,000	5,200		86,000	52,000
2,750		61,000	33,000	5,250		86,000	52,000
2,800		61,000	33,000	5,300		86,000	52,000
2,850		61,000	33,000	5,400		93,000	57,000
2,900		61,000	33,000	5,500		93,000	57,000
3,000		61,000	33,000	5,600		93,000	57,000
3,050		65,000	36,000	5,700		93,000	57,000
3,100		65,000	36,000	5,800		93,000	57,000
3,150		65,000	36,000	5,850		93,000	57,000
3,200		65,000	36,000	5,900		93,000	57,000
3,250		65,000	36,000	5,950	15/64	93,000	57,000
3,260		65,000	36,000	6,000		93,000	57,000



## Spiralbohrer kurz

d1 mm	inch	l1 mm	l2 mm	d1 mm	inch	l1 mm	l2 mm
6,050		101,000	63,000	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
6,300		101,000	63,000	10,200		133,000	87,000
6,400		101,000	63,000	10,300		133,000	87,000
6,450		101,000	63,000	10,400		133,000	87,000
6,500		101,000	63,000	10,500		133,000	87,000
6,600		101,000	63,000	10,600		133,000	87,000
6,700		101,000	63,000	10,700		142,000	94,000
6,750	17/64	109,000	69,000	10,800		142,000	94,000
6,800		109,000	69,000	10,900		142,000	94,000
6,900		109,000	69,000	11,000		142,000	94,000
7,000		109,000	69,000	11,100		142,000	94,000
7,100		109,000	69,000	11,200		142,000	94,000
7,200		109,000	69,000	11,300		142,000	94,000
7,300		109,000	69,000	11,400		142,000	94,000
7,400		109,000	69,000	11,500		142,000	94,000
7,500		109,000	69,000	11,600		142,000	94,000
7,600		117,000	75,000	11,700		142,000	94,000
7,700		117,000	75,000	11,800		142,000	94,000
7,750		117,000	75,000	12,000		151,000	101,000
7,800		117,000	75,000	12,200		151,000	101,000
7,900		117,000	75,000	12,300	31/64	151,000	101,000
8,000		117,000	75,000	12,400		151,000	101,000
8,100		117,000	75,000	12,500		151,000	101,000
8,200		117,000	75,000	12,800		151,000	101,000
8,250		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
8,500		117,000	75,000	14,500		169,000	114,000
8,600		125,000	81,000	15,000		169,000	114,000
8,700		125,000	81,000	15,400		178,000	120,000
8,800		125,000	81,000	15,500		178,000	120,000
8,900		125,000	81,000	16,000		178,000	120,000
9,000		125,000	81,000				
9,100		125,000	81,000				
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				

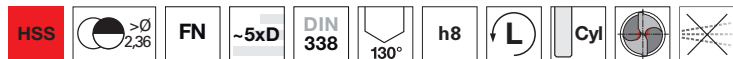


## Spiralbohrer kurz

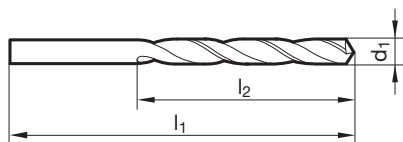
Artikel-Nr. 81045



P	M	K	N	S	H
•		•	•		



Ausspitzung  $\geq \varnothing 1,400$  • Kegelmantelschliff • weite Spannuten • besonders für Bohrtiefen über 3xD  
 Grauguss • Stähle bis 1000 N/mm<sup>2</sup> • Ausnahmen: CrNi-Stähle, VA-Stähle u.ä.



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





## Spiralbohrer kurz

d1 mm	inch	l1 mm	l2 mm	d1 mm	inch	l1 mm	l2 mm
10,100		133,000	87,000	11,900		151,000	101,000
10,300		133,000	87,000	13,500		160,000	108,000
10,400		133,000	87,000	14,500		169,000	114,000
10,500		133,000	87,000	15,000		169,000	114,000
10,600		133,000	87,000	15,500		178,000	120,000
10,700		142,000	94,000	16,000		178,000	120,000
10,800		142,000	94,000				
11,000		142,000	94,000				
11,100		142,000	94,000				
11,300		142,000	94,000				
11,500		142,000	94,000				
11,700		142,000	94,000				



## Spiralbohrer kurz

Artikel-Nr. 84406

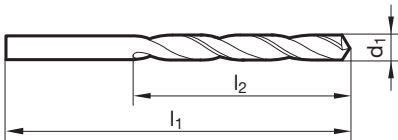


P	M	K	N	S	H
•		•	○		



Ausspitzung  $\geq \text{Ø } 1,000$  • Kegelmantelanschliff • Kopfbeschichtung

Stahl und Stahlguss (legiert und unleg.) • Grauguss, Temperguss, Sphäroguss • Sintereisen und Graphit



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



## Spiralbohrer kurz

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				



## Spiralbohrer kurz

### Artikel-Nr. 84415



P	M	K	N	S	H
•		•	•		

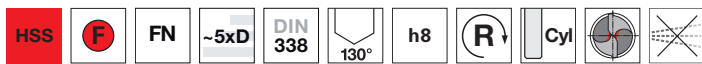


Ausspitzung  $\geq \varnothing 1,000$  • Kegelmantelschliff • weite Spannuten • besonders für Bohrtiefen über 3xD  
 Grauguss • Stähle bis 1000 N/mm<sup>2</sup> • Ausnahmen: CrNi-Stähle, VA-Stähle u.ä.

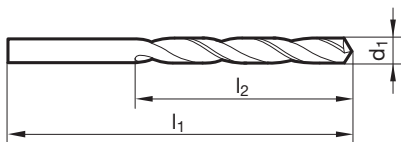
### Artikel-Nr. 84502



P	M	K	N	S	H
•		•	•		



Ausspitzung  $\geq \varnothing 1,000$  • Kegelmantelschliff • weite Spannuten • besonders für Bohrtiefen über 3xD  
 Grauguss • Stähle bis 1000 N/mm<sup>2</sup> • Ausnahmen: CrNi-Stähle, VA-Stähle u.ä.



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	6,100		101,000	63,000
3,200		65,000	36,000	6,200		101,000	63,000
3,300		65,000	36,000	6,300		101,000	63,000
3,400		70,000	39,000	6,400		101,000	63,000
3,500		70,000	39,000	6,500		101,000	63,000
3,600		70,000	39,000	6,600		101,000	63,000
3,700		70,000	39,000	6,700		101,000	63,000
3,800		75,000	43,000	6,800		109,000	69,000



## Spiralbohrer kurz

d1 mm	inch	l1 mm	l2 mm	d1 mm	inch	l1 mm	l2 mm
6,900		109,000	69,000	9,900		133,000	87,000
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	10,400		133,000	87,000
7,500		109,000	69,000	10,500		133,000	87,000
7,600		117,000	75,000	10,700		142,000	94,000
7,700		117,000	75,000	10,800		142,000	94,000
7,800		117,000	75,000	11,000		142,000	94,000
7,900		117,000	75,000	11,400		142,000	94,000
8,000		117,000	75,000	11,500		142,000	94,000
8,100		117,000	75,000	11,600		142,000	94,000
8,200		117,000	75,000	11,700		142,000	94,000
8,300		117,000	75,000	11,800		142,000	94,000
8,400		117,000	75,000	12,000		151,000	101,000
8,500		117,000	75,000	12,100		151,000	101,000
8,600		125,000	81,000	12,200		151,000	101,000
8,700		125,000	81,000	12,300	31/64	151,000	101,000
8,800		125,000	81,000	12,500		151,000	101,000
8,900		125,000	81,000	12,700	1/2	151,000	101,000
9,000		125,000	81,000	12,800		151,000	101,000
9,100		125,000	81,000	13,000		151,000	101,000
9,200		125,000	81,000	13,500		160,000	108,000
9,300		125,000	81,000	14,000		160,000	108,000
9,400		125,000	81,000	15,000		169,000	114,000
9,500		125,000	81,000	16,000		178,000	120,000
9,600		133,000	87,000				
9,700		133,000	87,000				
9,800		133,000	87,000				



## Spiralbohrer kurz

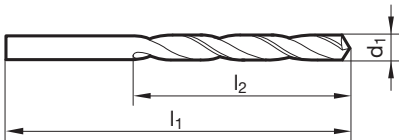
Artikel-Nr. 81011



P	M	K	N	S	H
●	○	●	○		



Ausspitzung  $\geq \text{Ø } 1,000$  • Kegelmantelschliff • Co-legierter HSS-Stahl • höhere Verschleißfestigkeit  
 Stahl und Stahlguss (legiert und unleg.) • Gusswerkstoffe über 800 N/mm<sup>2</sup> • Warm- und Kaltarbeitsstähle • Wälzlagerstähle  
 • hochlegierte Stähle • Vergütungs- und Einsatzstähle



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



## Spiralbohrer kurz

d1 mm	inch	l1 mm	l2 mm	d1 mm	inch	l1 mm	l2 mm
4,250		75,000	43,000	9,400		125,000	81,000
4,300		80,000	47,000	9,500		125,000	81,000
4,400		80,000	47,000	9,520	3/8	133,000	87,000
4,500		80,000	47,000	9,600		133,000	87,000
4,550		80,000	47,000	9,700		133,000	87,000
4,600		80,000	47,000	9,800		133,000	87,000
4,700		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	10,050		133,000	87,000
4,900		86,000	52,000	10,100		133,000	87,000
5,000		86,000	52,000	10,200		133,000	87,000
5,020		86,000	52,000	10,250		133,000	87,000
5,050		86,000	52,000	10,300		133,000	87,000
5,100		86,000	52,000	10,400		133,000	87,000
5,150		86,000	52,000	10,500		133,000	87,000
5,200		86,000	52,000	10,600		133,000	87,000
5,250		86,000	52,000	10,720	27/64	142,000	94,000
5,300		86,000	52,000	10,800		142,000	94,000
5,400		93,000	57,000	10,900		142,000	94,000
5,500		93,000	57,000	11,000		142,000	94,000
5,600		93,000	57,000	11,100		142,000	94,000
5,700		93,000	57,000	11,200		142,000	94,000
5,800		93,000	57,000	11,250		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	12,400		151,000	101,000
6,400		101,000	63,000	12,500		151,000	101,000
6,500		101,000	63,000	12,600		151,000	101,000
6,600		101,000	63,000	12,700	1/2	151,000	101,000
6,700		101,000	63,000	12,800		151,000	101,000
6,750	17/64	109,000	69,000	12,900		151,000	101,000
6,800		109,000	69,000	13,000		151,000	101,000
6,900		109,000	69,000	13,200		151,000	101,000
7,000		109,000	69,000	13,300		160,000	108,000
7,100		109,000	69,000	13,400		160,000	108,000
7,140	9/32	109,000	69,000	13,500		160,000	108,000
7,200		109,000	69,000	13,600		160,000	108,000
7,300		109,000	69,000	13,700		160,000	108,000
7,400		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	14,200		169,000	114,000
7,700		117,000	75,000	14,500		169,000	114,000
7,800		117,000	75,000	15,000		169,000	114,000
7,900		117,000	75,000	15,250		178,000	120,000
8,000		117,000	75,000	15,500		178,000	120,000
8,100		117,000	75,000	15,870	5/8	178,000	120,000
8,200		117,000	75,000	16,000		178,000	120,000
8,300		117,000	75,000	16,500		184,000	125,000
8,400		117,000	75,000	17,000		184,000	125,000
8,500		117,000	75,000	17,500		191,000	130,000
8,600		125,000	81,000	19,000		198,000	135,000
8,700		125,000	81,000	20,000		205,000	140,000
8,730	11/32	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				
9,100		125,000	81,000				
9,200		125,000	81,000				
9,250		125,000	81,000				
9,300		125,000	81,000				





## Spiralbohrer kurz

Artikel-Nr. 81041

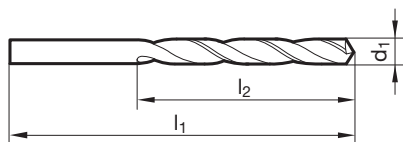


P	M	K	N	S	H
•	○	•	•		



Ausspitzung  $\geq \varnothing 1,000$  • Kegelmantelschliff • Co-legierter HSS-Stahl • höhere Verschleißfestigkeit • weite Spannuten • besonders für Bohrtiefen über 3xD

Grauguss und Stähle über 800 N/mm<sup>2</sup> • Warm- und Kaltarbeitsstähle • Wälzlagerstähle • hochlegierte Stähle • Vergütungs- und Einsatzstähle



d1		l1	l2	d1		l1	l2
mm	inch	mm	mm	mm	inch	mm	mm
1,000		34,000	12,000	3,650		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
1,250		38,000	16,000	3,900		75,000	43,000
1,300		38,000	16,000	4,000		75,000	43,000
1,400		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
1,600		43,000	20,000	4,300		80,000	47,000
1,650		43,000	20,000	4,400		80,000	47,000
1,700		43,000	20,000	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	4,800		86,000	52,000
1,950		49,000	24,000	4,900		86,000	52,000
2,000		49,000	24,000	5,000		86,000	52,000
2,050		49,000	24,000	5,100		86,000	52,000
2,100		49,000	24,000	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
2,400		57,000	30,000	5,600		93,000	57,000
2,500		57,000	30,000	5,700		93,000	57,000
2,550		57,000	30,000	5,800		93,000	57,000
2,600		57,000	30,000	5,900		93,000	57,000
2,650		57,000	30,000	6,000		93,000	57,000
2,700		61,000	33,000	6,100		101,000	63,000
2,750		61,000	33,000	6,200		101,000	63,000
2,780	7/64	61,000	33,000	6,300		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
3,050		65,000	36,000	6,700		101,000	63,000
3,100		65,000	36,000	6,750	17/64	109,000	69,000
3,150		65,000	36,000	6,800		109,000	69,000
3,200		65,000	36,000	6,900		109,000	69,000
3,250		65,000	36,000	7,000		109,000	69,000
3,300		65,000	36,000	7,100		109,000	69,000
3,400		70,000	39,000	7,200		109,000	69,000
3,450		70,000	39,000	7,300		109,000	69,000
3,500		70,000	39,000	7,400		109,000	69,000
3,600		70,000	39,000	7,500		109,000	69,000



## Spiralbohrer kurz

d1 mm	inch	l1 mm	l2 mm	d1 mm	inch	l1 mm	l2 mm
7,600		117,000	75,000	10,200		133,000	87,000
7,700		117,000	75,000	10,300		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	10,900		142,000	94,000
8,100		117,000	75,000	11,000		142,000	94,000
8,200		117,000	75,000	11,100		142,000	94,000
8,300		117,000	75,000	11,200		142,000	94,000
8,400		117,000	75,000	11,400		142,000	94,000
8,500		117,000	75,000	11,600		142,000	94,000
8,600		125,000	81,000	11,700		142,000	94,000
8,700		125,000	81,000	11,800		142,000	94,000
8,800		125,000	81,000	12,000		151,000	101,000
8,900		125,000	81,000	12,500		151,000	101,000
9,000		125,000	81,000	12,700	1/2	151,000	101,000
9,100		125,000	81,000				
9,200		125,000	81,000				
9,300		125,000	81,000				
9,400		125,000	81,000				
9,500		125,000	81,000				
9,700		133,000	87,000				
9,800		133,000	87,000				
9,900		133,000	87,000				
10,000		133,000	87,000				

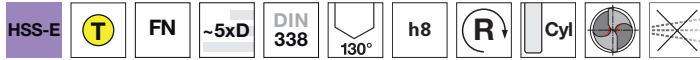


## Spiralbohrer kurz

### Artikel-Nr. 84800



P	M	K	N	S	H
•	○	•	○		



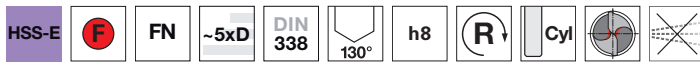
Ausspitzung  $\geq \varnothing 1,000$  • Kegelmantelschliff • Co-legierter HSS-Stahl • höhere Verschleißfestigkeit • weite Spannuten • besonders für Bohrtiefen über  $3xD$

Grauguss und Stähle über  $800 \text{ N/mm}^2$  • Warm- und Kaltarbeitsstähle • Wälzlagerstähle • hochlegierte Stähle • Vergütungs- und Einsatzstähle

### Artikel-Nr. 84504

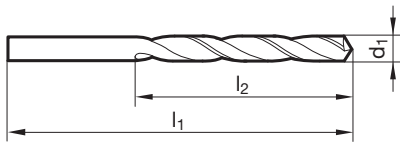


P	M	K	N	S	H
•	○	•	○		



Ausspitzung  $\geq \varnothing 1,000$  • Kegelmantelschliff • Co-legierter HSS-Stahl • weite Spannuten • höhere Verschleißfestigkeit • besonders für Bohrtiefen über  $3xD$

Grauguss und Stähle über  $800 \text{ N/mm}^2$  • Warm- und Kaltarbeitsstähle • Wälzlagerstähle • hochlegierte Stähle • Vergütungs- und Einsatzstähle



d1	inch	l1	l2	d1	inch	l1	l2
mm		mm	mm	mm		mm	mm
1,000		34,000	12,000	3,500		70,000	39,000
1,100		36,000	14,000	3,600		70,000	39,000
1,200		38,000	16,000	3,700		70,000	39,000
1,300		38,000	16,000	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
1,600		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
2,600		57,000	30,000	5,400		93,000	57,000
2,700		61,000	33,000	5,500		93,000	57,000
2,800		61,000	33,000	5,560	7/32	93,000	57,000
2,900		61,000	33,000	5,600		93,000	57,000
2,950		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	5,900		93,000	57,000
3,200		65,000	36,000	6,000		93,000	57,000
3,250		65,000	36,000	6,100		101,000	63,000
3,300		65,000	36,000	6,200		101,000	63,000
3,400		70,000	39,000	6,300		101,000	63,000



## Spiralbohrer kurz

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



## Spiralbohrer kurz

### Artikel-Nr. 84804



P	M	K	N	S	H
•	•	•	•		



Ausspitzung  $\geq \varnothing 1,000$  • Flächenanschliff • Co-legierter HSS-Stahl • geringe Vorschubkraft notwendig • geringes Drehmoment notwendig • universell einsetzbar

Stähle (legiert/unleg.) bis 800 N/mm<sup>2</sup> • Kalt-/Warmarbeitsstähle • Wälzgerstähle • NE-Metalle • Gusswerkstoffe • rostfreie Stähle • Kunststoffe

### Artikel-Nr. 84802

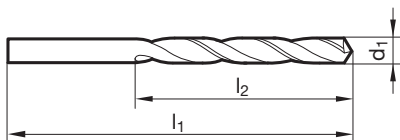


P	M	K	N	S	H
•	•	•	•		



Ausspitzung  $\geq \varnothing 1,000$  • Flächenanschliff • Co-legierter HSS-Stahl • geringe Vorschubkraft notwendig • geringes Drehmoment notwendig • höhere Verschleißfestigkeit • universell einsetzbar

Stähle (legiert/unleg.) bis 800 N/mm<sup>2</sup> • Kalt-/Warmarbeitsstähle • Wälzgerstähle • NE-Metalle • Gusswerkstoffe • rostfreie Stähle • Kunststoffe



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



## Spiralbohrer kurz

d1 mm	inch	l1 mm	l2 mm	d1 mm	inch	l1 mm	l2 mm
5,900		93,000	57,000	9,000		125,000	81,000
5,950	15/64	93,000	57,000	9,100		125,000	81,000
6,000		93,000	57,000	9,200		125,000	81,000
6,100		101,000	63,000	9,250		125,000	81,000
6,200		101,000	63,000	9,300		125,000	81,000
6,300		101,000	63,000	9,400		125,000	81,000
6,350	1/4	101,000	63,000	9,500		125,000	81,000
6,400		101,000	63,000	9,600		133,000	87,000
6,500		101,000	63,000	9,700		133,000	87,000
6,600		101,000	63,000	9,800		133,000	87,000
6,700		101,000	63,000	9,900		133,000	87,000
6,800		109,000	69,000	10,000		133,000	87,000
6,900		109,000	69,000	10,100		133,000	87,000
7,000		109,000	69,000	10,200		133,000	87,000
7,100		109,000	69,000	10,300		133,000	87,000
7,140	9/32	109,000	69,000	10,500		133,000	87,000
7,200		109,000	69,000	11,000		142,000	94,000
7,300		109,000	69,000	11,110	7/16	142,000	94,000
7,400		109,000	69,000	11,200		142,000	94,000
7,500		109,000	69,000	11,500		142,000	94,000
7,600		117,000	75,000	12,000		151,000	101,000
7,700		117,000	75,000	12,500		151,000	101,000
7,800		117,000	75,000	13,000		151,000	101,000
7,900		117,000	75,000	13,500		160,000	108,000
7,940	5/16	117,000	75,000	14,000		160,000	108,000
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				
8,730	11/32	125,000	81,000				
8,800		125,000	81,000				
8,900		125,000	81,000				



## Spiralbohrer kurz

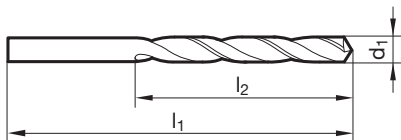
Artikel-Nr. 81013



P	M	K	N	S	H
○	●		○	○	



INOX-Drill • Kegelmantelschliff • Co-legierter HSS-Stahl • höhere Verschleißfestigkeit  
rost-/säure-/hitzebest. austenit. Stähle (V2A und 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





## Spiralbohrer kurz

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



## Spiralbohrer kurz

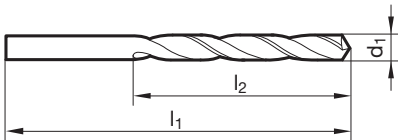
Artikel-Nr. 81061



P	M	K	N	S	H
○	●			●	



Ausspitzung  $\geq \text{Ø } 1,000$  • Kegelmantelschliff • Co-legierter HSS-Stahl • höhere Verschleißfestigkeit  
 Titan und Titanlegierungen • rost-/säure-/hitzebest. austen. Stähle • hochfeste/kurzspan. Stähle ab 900 N/mm<sup>2</sup> • Sonderlegierungen  
 Hastelloy, Inconel, Nimonic



d1		l1	l2	d1		l1	l2
mm	inch	mm	mm	mm	inch	mm	mm
0,200		19,000	2,500	1,850		46,000	22,000
0,300		19,000	3,000	1,900		46,000	22,000
0,400		20,000	5,000	1,950		49,000	24,000
0,500		22,000	6,000	1,990		49,000	24,000
0,550		24,000	7,000	2,000		49,000	24,000
0,580		24,000	7,000	2,030		49,000	24,000
0,600		24,000	7,000	2,050		49,000	24,000
0,650		26,000	8,000	2,080		49,000	24,000
0,700		28,000	9,000	2,100		49,000	24,000
0,750		28,000	9,000	2,200		53,000	27,000
0,800		30,000	10,000	2,250		53,000	27,000
0,820		30,000	10,000	2,300		53,000	27,000
0,840		30,000	10,000	2,350		53,000	27,000
0,850		30,000	10,000	2,380	3/32	57,000	30,000
0,900		32,000	11,000	2,400		57,000	30,000
0,950		32,000	11,000	2,450		57,000	30,000
1,000		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	3,700		70,000	39,000
1,700		43,000	20,000	3,800		75,000	43,000
1,730		46,000	22,000	3,900		75,000	43,000
1,750		46,000	22,000	4,000		75,000	43,000
1,800		46,000	22,000	4,050		75,000	43,000
1,820		46,000	22,000	4,100		75,000	43,000



## Spiralbohrer kurz

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



## Spiralbohrer kurz

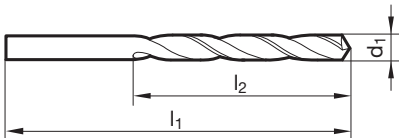
Artikel-Nr. 81062



P	M	K	N	S	H
●	○	○	○		



Kegelmantelanschliff • universell einsetzbar, mit Wellenschliff • Co-legierter HSS-Stahl • höhere Verschleißfestigkeit  
 Stähle bis 1000 N/mm<sup>2</sup> • AISI-Legierungen



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



## Spiralbohrer kurz

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			
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			

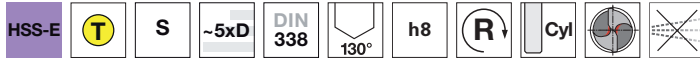


## Spiralbohrer kurz

### Artikel-Nr. 84807



P	M	K	N	S	H
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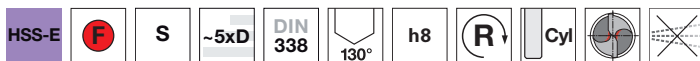


Ausspitzung  $\geq \varnothing 1,000$  • Kegelmantelschliff • Co-legierter HSS-Stahl • höhere Verschleißfestigkeit  
 Titan und Titanlegierungen • rost-/säure-/hitzebest. austen. Stähle • hochfeste/kurzspan. Stähle ab 900 N/mm<sup>2</sup> • Sonderlegierungen  
 Hastelloy, Inconel, Nimonic

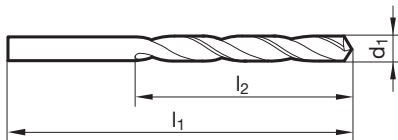
### Artikel-Nr. 84505



P	M	K	N	S	H
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Ausspitzung  $\geq \varnothing 1,000$  • Kegelmantelschliff • Co-legierter HSS-Stahl • höhere Verschleißfestigkeit  
 Titan und Titanlegierungen • rost-/säure-/hitzebest. austen. Stähle • hochfeste/kurzspan. Stähle ab 900 N/mm<sup>2</sup> • Sonderlegierungen  
 Hastelloy, Inconel, Nimonic



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



## Spiralbohrer kurz

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



# HARTNER

## Spiralbohrer kurz

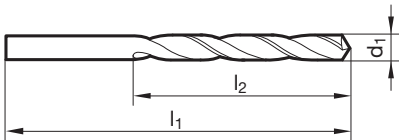
Artikel-Nr. 81063



P	M	K	N	S	H
●	○	○	○		



Kegelmantelschliff • universell einsetzbar, mit Wellenschliff • höhere Verschleißfestigkeit • Co-legierter HSS-Stahl  
 Stähle bis 1000 N/mm<sup>2</sup> • AISi-Legierungen



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



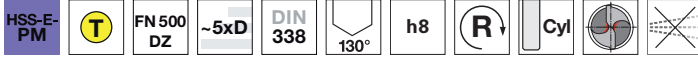


## Spiralbohrer kurz

Artikel-Nr. 84811

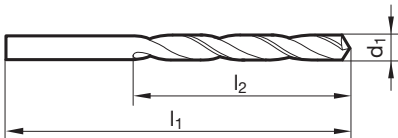


P	M	K	N	S	H
●	○	●	○	○	○



Ausspitzung  $\geq \varnothing 1,000$  • Kegelmantelschliff • PM-Co-legierter HSS-Stahl • besonders hohe Stabilität • besonders hohe Verschleißfestigkeit

hochlegierte Stähle • Vergütungs- und Einsatzstähle • Gusseisen, Messing, Bronze



d1		l1	l2	d1		l1	l2
mm	inch	mm	mm	mm	inch	mm	mm
1,000		34,000	12,000	5,560	7/32	93,000	57,000
1,200		38,000	16,000	5,950	15/64	93,000	57,000
1,300		38,000	16,000	6,000		93,000	57,000
1,400		40,000	18,000	6,300		101,000	63,000
1,500		40,000	18,000	6,350	1/4	101,000	63,000
1,600		43,000	20,000	6,700		101,000	63,000
1,700		43,000	20,000	6,800		109,000	69,000
1,900		46,000	22,000	7,000		109,000	69,000
2,000		49,000	24,000	7,140	9/32	109,000	69,000
2,100		49,000	24,000	7,400		109,000	69,000
2,200		53,000	27,000	7,900		117,000	75,000
2,300		53,000	27,000	7,940	5/16	117,000	75,000
2,380	3/32	57,000	30,000	8,000		117,000	75,000
2,500		57,000	30,000	8,500		117,000	75,000
2,600		57,000	30,000	8,730	11/32	125,000	81,000
2,780	7/64	61,000	33,000	9,000		125,000	81,000
2,800		61,000	33,000	9,300		125,000	81,000
2,900		61,000	33,000	9,500		125,000	81,000
3,000		61,000	33,000	9,800		133,000	87,000
3,100		65,000	36,000	10,000		133,000	87,000
3,170	1/8	65,000	36,000	10,200		133,000	87,000
3,300		65,000	36,000	10,500		133,000	87,000
3,500		70,000	39,000	11,000		142,000	94,000
3,570	9/64	70,000	39,000	11,110	7/16	142,000	94,000
3,600		70,000	39,000	11,500		142,000	94,000
3,700		70,000	39,000	12,000		151,000	101,000
3,900		75,000	43,000	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				



## Spiralbohrer kurz

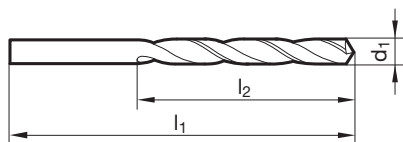
Artikel-Nr. 81012



P	M	K	N	S	H
●	○	○	●	●	○



Ausspitzung  $\geq \varnothing 1,000$  • Kegelmantelschliff • besonders hohe Verschleißfestigkeit • hoher Co- und Mo-Anteil  
 feste/hochfeste Legierung auf CrNi-Basis • rost-/säure-/hitzebeständige Stähle • verschleißfeste Bleche • Stähle/Bronzen bis 1400 N/mm<sup>2</sup> • Sonderlegierungen Hastelloy, Inconel, Nimonic



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



## Spiralbohrer kurz

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			



## Spiralbohrer kurz

Artikel-Nr. 89244

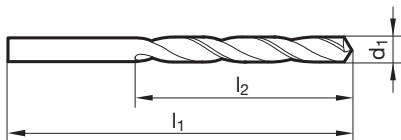


P	M	K	N	S	H
○	○	○	●	○	○



Ausspitzung  $\geq \varnothing 3,000$  • Flächenanschliff • Hauptschneidenform gerade

Bau- und Einsatzstähle • Automatenstähle, Vergütungsstähle • Grauguss • Bronze, Messing • Aluminium und Al-Legierungen  
• Magnesium und Mg-Legierungen • Kunststoffe und faserverstärkte Kunststoffe



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



## Spiralbohrer kurz

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				



## Spiralbohrer extra kurz

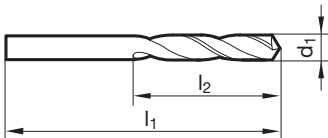
Artikel-Nr. 81110



P	M	K	N	S	H
•		•	○		



Ausspitzung  $\geq \text{Ø } 1,000$  • Kegelmantelanschliff • für Automaten/Revolverbänke • auch für Handbohrmaschinen geeignet  
dünnwandige Materialien • Stahl und Stahlguss (legiert und unleg.) • Grauguss, Temperguss, Sphäroguss • Sintereisen, Neusilber und Graphit



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



## Spiralbohrer extra kurz

d1 mm	inch	l1 mm	l2 mm	d1 mm	inch	l1 mm	l2 mm
5,900		66,000	28,000	11,500		95,000	47,000
6,000		66,000	28,000	11,700		95,000	47,000
6,100		70,000	31,000	11,800		95,000	47,000
6,150		70,000	31,000	12,000		102,000	51,000
6,200		70,000	31,000	12,050		102,000	51,000
6,250		70,000	31,000	12,200		102,000	51,000
6,300		70,000	31,000	12,300	31/64	102,000	51,000
6,350	1/4	70,000	31,000	12,500		102,000	51,000
6,400		70,000	31,000	12,600		102,000	51,000
6,500		70,000	31,000	12,700		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
7,200		74,000	34,000	13,750		107,000	54,000
7,300		74,000	34,000	14,000		107,000	54,000
7,400		74,000	34,000	14,200		111,000	56,000
7,500		74,000	34,000	14,250		111,000	56,000
7,600		79,000	37,000	14,300		111,000	56,000
7,700		79,000	37,000	14,500		111,000	56,000
7,750		79,000	37,000	14,750		111,000	56,000
7,800		79,000	37,000	15,000		111,000	56,000
7,900		79,000	37,000	15,250		115,000	58,000
8,000		79,000	37,000	15,500		115,000	58,000
8,100		79,000	37,000	15,750		115,000	58,000
8,200		79,000	37,000	16,000		115,000	58,000
8,250		79,000	37,000	16,250		119,000	60,000
8,300		79,000	37,000	16,270	41/64	119,000	60,000
8,400		79,000	37,000	16,500		119,000	60,000
8,500		79,000	37,000	17,000		119,000	60,000
8,600		84,000	40,000	17,500		123,000	62,000
8,700		84,000	40,000	18,000		123,000	62,000
8,750		84,000	40,000	18,200		127,000	64,000
8,800		84,000	40,000	18,500		127,000	64,000
8,900		84,000	40,000	18,750		127,000	64,000
9,000		84,000	40,000	19,000		127,000	64,000
9,100		84,000	40,000	19,100		131,000	66,000
9,200		84,000	40,000	19,500		131,000	66,000
9,250		84,000	40,000	20,000		131,000	66,000
9,300		84,000	40,000	20,500		136,000	68,000
9,400		84,000	40,000	21,000		136,000	68,000
9,500		84,000	40,000	21,500		141,000	70,000
9,600		89,000	43,000	22,000		141,000	70,000
9,700		89,000	43,000	22,500		146,000	72,000
9,750		89,000	43,000	23,000		146,000	72,000
9,800		89,000	43,000	23,500		146,000	72,000
9,900		89,000	43,000	24,000		151,000	75,000
10,000		89,000	43,000	24,500		151,000	75,000
10,050		89,000	43,000	25,000	63/64	151,000	75,000
10,100		89,000	43,000	26,000		156,000	78,000
10,200		89,000	43,000	26,500		156,000	78,000
10,250		89,000	43,000	27,000		162,000	81,000
10,300		89,000	43,000	27,500		162,000	81,000
10,400		89,000	43,000	28,000		162,000	81,000
10,500		89,000	43,000	28,750		168,000	84,000
10,700		95,000	47,000	29,000		168,000	84,000
10,750		95,000	47,000	30,000		168,000	84,000
10,800		95,000	47,000	31,000		174,000	87,000
10,900		95,000	47,000	32,000		180,000	90,000
11,000		95,000	47,000	39,500		200,000	100,000
11,100		95,000	47,000				
11,200		95,000	47,000				
11,400		95,000	47,000				



## Spiralbohrer extra kurz

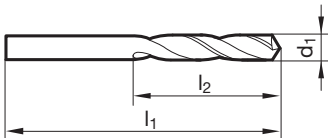
Artikel-Nr. 81115



P	M	K	N	S	H
•		•	○		



Ausspitzung  $\geq \text{Ø } 14,200$  • Kegelmantelanschliff • für Automaten/Revolverbänke  
 dünnwandige Materialien • Stahl und Stahlguss (legiert und unleg.) • Grauguss, Temperguss, Sphäroguss • Sintereisen, Neusilber und Graphit



d1 mm	inch	l1 mm	l2 mm	d1 mm	inch	l1 mm	l2 mm
0,500		20,000	3,000	3,350		49,000	18,000
0,550		21,000	3,500	3,400		52,000	20,000
0,700		23,000	4,500	3,450		52,000	20,000
0,750		23,000	4,500	3,500		52,000	20,000
0,800		24,000	5,000	3,600		52,000	20,000
0,850		24,000	5,000	3,700		52,000	20,000
0,950		25,000	5,500	3,750		52,000	20,000
1,000		26,000	6,000	3,800		55,000	22,000
1,150		28,000	7,000	3,850		55,000	22,000
1,180		28,000	7,000	4,000		55,000	22,000
1,250		30,000	8,000	4,100		55,000	22,000
1,330		32,000	9,000	4,150		55,000	22,000
1,350		32,000	9,000	4,200		55,000	22,000
1,500		32,000	9,000	4,250		55,000	22,000
1,550		34,000	10,000	4,300		58,000	24,000
1,600		34,000	10,000	4,400		58,000	24,000
1,700		34,000	10,000	4,450		58,000	24,000
1,710		36,000	11,000	4,500		58,000	24,000
1,800		36,000	11,000	4,600		58,000	24,000
1,830		36,000	11,000	4,700		58,000	24,000
1,900		36,000	11,000	4,750		58,000	24,000
1,980	5/64	38,000	12,000	4,800		62,000	26,000
2,000		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	5,000		62,000	26,000
2,400		43,000	14,000	5,100		62,000	26,000
2,420		43,000	14,000	5,200		62,000	26,000
2,500		43,000	14,000	5,250		62,000	26,000
2,550		43,000	14,000	5,300		62,000	26,000
2,600		43,000	14,000	5,400		66,000	28,000
2,720		46,000	16,000	5,500		66,000	28,000
2,800		46,000	16,000	5,600		66,000	28,000
2,820		46,000	16,000	5,700		66,000	28,000
2,850		46,000	16,000	5,750		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
3,010		49,000	18,000	5,950	15/64	66,000	28,000
3,050		49,000	18,000	6,000		66,000	28,000
3,100		49,000	18,000	6,100		70,000	31,000
3,200		49,000	18,000	6,150		70,000	31,000
3,250		49,000	18,000	6,200		70,000	31,000
3,300		49,000	18,000	6,400		70,000	31,000





## Spiralbohrer extra kurz

d1 mm	inch	l1 mm	l2 mm	d1 mm	inch	l1 mm	l2 mm
6,500		70,000	31,000	11,250		95,000	47,000
6,600		70,000	31,000	11,300		95,000	47,000
6,700		70,000	31,000	11,500		95,000	47,000
6,750	17/64	74,000	34,000	11,750		95,000	47,000
6,800		74,000	34,000	11,800		95,000	47,000
6,900		74,000	34,000	11,900		102,000	51,000
7,000		74,000	34,000	12,000		102,000	51,000
7,100		74,000	34,000	12,100		102,000	51,000
7,200		74,000	34,000	12,200		102,000	51,000
7,300		74,000	34,000	12,500		102,000	51,000
7,400		74,000	34,000	12,750		102,000	51,000
7,500		74,000	34,000	12,900		102,000	51,000
7,600		79,000	37,000	13,000		102,000	51,000
7,700		79,000	37,000	13,200		102,000	51,000
7,750		79,000	37,000	13,250		107,000	54,000
7,800		79,000	37,000	13,400		107,000	54,000
7,900		79,000	37,000	13,500		107,000	54,000
8,000		79,000	37,000	13,600		107,000	54,000
8,100		79,000	37,000	13,750		107,000	54,000
8,200		79,000	37,000	13,800		107,000	54,000
8,300		79,000	37,000	14,000		107,000	54,000
8,400		79,000	37,000	14,200		111,000	56,000
8,500		79,000	37,000	14,250		111,000	56,000
8,600		84,000	40,000	14,300		111,000	56,000
8,700		84,000	40,000	14,500		111,000	56,000
8,750		84,000	40,000	14,700		111,000	56,000
8,800		84,000	40,000	14,750		111,000	56,000
8,900		84,000	40,000	15,000		111,000	56,000
9,000		84,000	40,000	15,200		115,000	58,000
9,100		84,000	40,000	15,600		115,000	58,000
9,200		84,000	40,000	15,700		115,000	58,000
9,250		84,000	40,000	16,000		115,000	58,000
9,300		84,000	40,000	16,500		119,000	60,000
9,400		84,000	40,000	17,000		119,000	60,000
9,500		84,000	40,000	18,000		123,000	62,000
9,600		89,000	43,000	19,000		127,000	64,000
9,700		89,000	43,000	20,000		131,000	66,000
9,750		89,000	43,000	29,750		168,000	84,000
10,000		89,000	43,000	30,000		168,000	84,000
10,100		89,000	43,000	31,500		174,000	87,000
10,200		89,000	43,000	36,000		193,000	96,000
10,300		89,000	43,000	36,500		193,000	96,000
10,500		89,000	43,000				
10,600		89,000	43,000				
10,700		95,000	47,000				
10,800		95,000	47,000				
11,000		95,000	47,000				
11,200		95,000	47,000				



## Spiralbohrer extra kurz

### Artikel-Nr. 84400



P	M	K	N	S	H
•		•	○		



Ausspitzung  $\geq \varnothing 1,000$  • Kegelmantelschliff • für Automaten/Revolverbänke • auch für Handbohrmaschinen geeignet  
dünnwandige Materialien • Stahl und Stahlguss (legiert und unleg.) • Grauguss, Temperguss, Sphäroguss • Sintereisen, Neusilber und Graphit

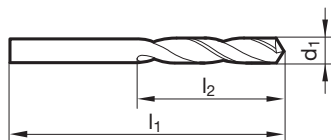
### Artikel-Nr. 84501



P	M	K	N	S	H
•		•	•		



Ausspitzung  $\geq \varnothing 1,000$  • Kegelmantelschliff • für Automaten/Revolverbänke • auch für Handbohrmaschinen geeignet  
dünnwandige Materialien • Stahl und Stahlguss (legiert und unleg.) • Grauguss, Temperguss, Sphäroguss • Sintereisen, Neusilber und Graphit



d1		l1	l2	d1		l1	l2
mm	inch	mm	mm	mm	inch	mm	mm
1,000		26,000	6,000	3,650		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
1,350		32,000	9,000	4,000		55,000	22,000
1,400		32,000	9,000	4,100		55,000	22,000
1,450		32,000	9,000	4,200		55,000	22,000
1,500		32,000	9,000	4,300		58,000	24,000
1,600		34,000	10,000	4,400		58,000	24,000
1,700		34,000	10,000	4,500		58,000	24,000
1,800		36,000	11,000	4,600		58,000	24,000
1,900		36,000	11,000	4,700		58,000	24,000
2,000		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	5,000		62,000	26,000
2,300		40,000	13,000	5,100		62,000	26,000
2,400		43,000	14,000	5,200		62,000	26,000
2,500		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
2,800		46,000	16,000	5,600		66,000	28,000
2,900		46,000	16,000	5,700		66,000	28,000
3,000		46,000	16,000	5,800		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
3,300		49,000	18,000	6,100		70,000	31,000
3,400		52,000	20,000	6,200		70,000	31,000
3,450		52,000	20,000	6,300		70,000	31,000
3,500		52,000	20,000	6,400		70,000	31,000
3,600		52,000	20,000	6,500		70,000	31,000



## Spiralbohrer extra kurz

d1 mm	inch	l1 mm	l2 mm	d1 mm	inch	l1 mm	l2 mm
6,600		70,000	31,000	11,700		95,000	47,000
6,700		70,000	31,000	11,800		95,000	47,000
6,800		74,000	34,000	11,900		102,000	51,000
6,900		74,000	34,000	12,000		102,000	51,000
7,000		74,000	34,000	12,100		102,000	51,000
7,100		74,000	34,000	12,200		102,000	51,000
7,200		74,000	34,000	12,300	31/64	102,000	51,000
7,300		74,000	34,000	12,500		102,000	51,000
7,400		74,000	34,000	12,700	1/2	102,000	51,000
7,500		74,000	34,000	12,800		102,000	51,000
7,600		79,000	37,000	13,000		102,000	51,000
7,700		79,000	37,000	13,200		102,000	51,000
7,800		79,000	37,000	13,500		107,000	54,000
7,900		79,000	37,000	13,800		107,000	54,000
8,000		79,000	37,000	14,000		107,000	54,000
8,100		79,000	37,000	14,200		111,000	56,000
8,200		79,000	37,000	14,500		111,000	56,000
8,300		79,000	37,000	14,800		111,000	56,000
8,400		79,000	37,000	15,000		111,000	56,000
8,500		79,000	37,000	15,300		115,000	58,000
8,600		84,000	40,000	15,500		115,000	58,000
8,700		84,000	40,000	16,000		115,000	58,000
8,800		84,000	40,000	16,500		119,000	60,000
8,900		84,000	40,000	17,000		119,000	60,000
9,000		84,000	40,000	17,500		123,000	62,000
9,100		84,000	40,000	18,000		123,000	62,000
9,200		84,000	40,000	19,000		127,000	64,000
9,300		84,000	40,000	19,500		131,000	66,000
9,400		84,000	40,000	20,000		131,000	66,000
9,500		84,000	40,000	20,500		136,000	68,000
9,600		89,000	43,000	21,000		136,000	68,000
9,700		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
10,100		89,000	43,000	24,000		151,000	75,000
10,200		89,000	43,000	24,500		151,000	75,000
10,300		89,000	43,000	25,000		151,000	75,000
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				
11,000		95,000	47,000				
11,200		95,000	47,000				
11,300		95,000	47,000				
11,400		95,000	47,000				
11,500		95,000	47,000				

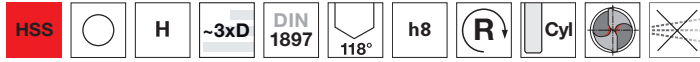


## Spiralbohrer extra kurz

Artikel-Nr. 81120

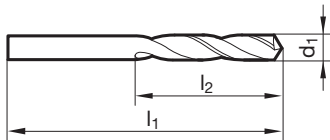


P	M	K	N	S	H
			•		



Ausspitzung  $\geq \text{Ø } 15,000$  • Kegelmantelschliff

harte und spröde Werkstoffe • Messing, Magnesium-Legierungen • Bronze, Phosphorbronze • Schiefer, Glimmer, Pertinax

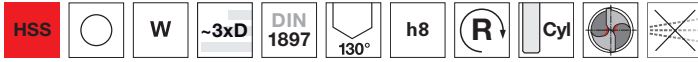


d1 mm	inch	l1 mm	l2 mm	d1 mm	inch	l1 mm	l2 mm
1,200		30,000	8,000	5,000		62,000	26,000
1,400		32,000	9,000	5,200		62,000	26,000
1,500		32,000	9,000	5,300		62,000	26,000
1,600		34,000	10,000	5,400		66,000	28,000
1,700		34,000	10,000	5,500		66,000	28,000
1,900		36,000	11,000	5,600		66,000	28,000
2,000		38,000	12,000	5,700		66,000	28,000
2,350		40,000	13,000	5,800		66,000	28,000
2,380	3/32	43,000	14,000	6,000		66,000	28,000
2,400		43,000	14,000	6,100		70,000	31,000
2,500		43,000	14,000	6,200		70,000	31,000
2,600		43,000	14,000	6,500		70,000	31,000
2,650		43,000	14,000	7,000		74,000	34,000
2,700		46,000	16,000	7,500		74,000	34,000
2,800		46,000	16,000	8,000		79,000	37,000
2,950		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	9,000		84,000	40,000
3,200		49,000	18,000	9,500		84,000	40,000
3,250		49,000	18,000	10,000		89,000	43,000
3,300		49,000	18,000	10,200		89,000	43,000
3,400		52,000	20,000	10,500		89,000	43,000
3,500		52,000	20,000	11,000		95,000	47,000
3,700		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				
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				



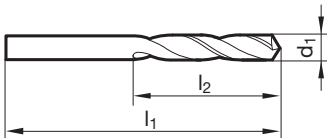
## Spiralbohrer extra kurz

Artikel-Nr. 81130



Ausspitzung  $\geq \varnothing 2,500$  • Kegelmantelschliff

weiche, langspanende Werkstoffe • Aluminium, Al-Legierungen (langspanend) • Zink, Hüttenkupfer, Silumin, Elektron • Kunststoffe (weich), Holz



d1 mm	l1 mm	l2 mm	d1 mm	l1 mm	l2 mm
1,500	32,000	9,000	5,700	66,000	28,000
2,000	38,000	12,000	5,800	66,000	28,000
2,200	40,000	13,000	6,000	66,000	28,000
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	6,800	74,000	34,000
2,800	46,000	16,000	7,000	74,000	34,000
3,000	46,000	16,000	7,500	74,000	34,000
3,100	49,000	18,000	7,800	79,000	37,000
3,200	49,000	18,000	8,000	79,000	37,000
3,300	49,000	18,000	8,500	79,000	37,000
3,400	52,000	20,000	9,000	84,000	40,000
3,500	52,000	20,000	9,500	84,000	40,000
3,800	55,000	22,000	10,000	89,000	43,000
3,900	55,000	22,000	10,500	89,000	43,000
4,000	55,000	22,000	11,000	95,000	47,000
4,100	55,000	22,000	12,000	102,000	51,000
4,200	55,000	22,000	12,500	102,000	51,000
4,300	58,000	24,000	13,000	102,000	51,000
4,500	58,000	24,000	14,000	107,000	54,000
4,900	62,000	26,000	15,000	111,000	56,000
5,000	62,000	26,000	16,000	115,000	58,000
5,100	62,000	26,000			
5,300	62,000	26,000			



## Spiralbohrer extra kurz

Artikel-Nr. 81140

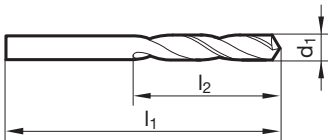


P	M	K	N	S	H
•	○	○	•		



Ausspitzung  $\geq \varnothing 1,500$  • Kegelmantelschliff • für höherfeste Stähle

Automatenstähle • rost-/säurebest. Stähle • Einsatz-/Vergütungsstähle bis 800 N/mm<sup>2</sup> • kurz/mittellang spanende Al- und Cu-Legierungen



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



## Spiralbohrer extra kurz

Artikel-Nr. 81145

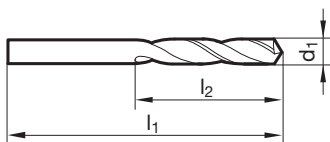


P	M	K	N	S	H
●	○	○	●		



Ausspitzung  $\geq \varnothing 1,000$  • Kegelmantelschliff • für höherfeste Stähle

Automatenstähle • rost-/säurebest. Stähle • Einsatz-/Vergütungsstähle bis 800 N/mm<sup>2</sup> • kurz/mittellang spanende Al- und Cu-Legierungen



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
1,250		30,000	8,000	3,900		55,000	22,000
1,300		30,000	8,000	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
1,600		34,000	10,000	4,300		58,000	24,000
1,650		34,000	10,000	4,400		58,000	24,000
1,700		34,000	10,000	4,500		58,000	24,000
1,800		36,000	11,000	4,600		58,000	24,000
1,850		36,000	11,000	4,650		58,000	24,000
1,900		36,000	11,000	4,700		58,000	24,000
2,000		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	5,000		62,000	26,000
2,250		40,000	13,000	5,100		62,000	26,000
2,300		40,000	13,000	5,200		62,000	26,000
2,350		40,000	13,000	5,300		62,000	26,000
2,400		43,000	14,000	5,400		66,000	28,000
2,500		43,000	14,000	5,500		66,000	28,000
2,550		43,000	14,000	5,600		66,000	28,000
2,600		43,000	14,000	5,700		66,000	28,000
2,650		43,000	14,000	5,800		66,000	28,000
2,700		46,000	16,000	5,900		66,000	28,000
2,750		46,000	16,000	6,000		66,000	28,000
2,780	7/64	46,000	16,000	6,100		70,000	31,000
2,800		46,000	16,000	6,200		70,000	31,000
2,850		46,000	16,000	6,300		70,000	31,000
2,870		46,000	16,000	6,500		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	6,800		74,000	34,000
3,100		49,000	18,000	6,900		74,000	34,000
3,150		49,000	18,000	7,000		74,000	34,000
3,170	1/8	49,000	18,000	7,500		74,000	34,000
3,200		49,000	18,000	7,600		79,000	37,000
3,250		49,000	18,000	7,800		79,000	37,000
3,300		49,000	18,000	7,900		79,000	37,000
3,400		52,000	20,000	8,000		79,000	37,000
3,500		52,000	20,000	8,200		79,000	37,000
3,650		52,000	20,000	8,300		79,000	37,000
3,680		52,000	20,000	8,400		79,000	37,000



## Spiralbohrer extra kurz

d1 mm	inch	l1 mm	l2 mm	d1 mm	inch	l1 mm	l2 mm
8,500		79,000	37,000	12,500		102,000	51,000
8,600		84,000	40,000	16,000		115,000	58,000
8,700		84,000	40,000				
8,800		84,000	40,000				
9,000		84,000	40,000				
9,200		84,000	40,000				
9,500		84,000	40,000				
9,700		89,000	43,000				
10,000		89,000	43,000				
10,500		89,000	43,000				
11,000		95,000	47,000				
11,500		95,000	47,000				





## Spiralbohrer extra kurz

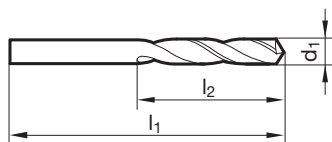
Artikel-Nr. 81173



P	M	K	N	S	H
○	●		○	○	



INOX-Drill • Kegelmantelschliff • Co-legierter HSS-Stahl • höhere Verschleißfestigkeit  
rost-/säure-/hitzebest. austenit. Stähle (V2A und V4A)



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



## Spiralbohrer extra kurz

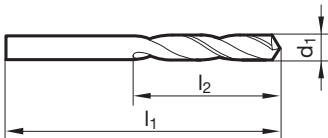
Artikel-Nr. 81171



P	M	K	N	S	H
•	•	•	○	•	○



Ausspitzung  $\geq \varnothing 1,000$  • Kegelmantelschliff • Co-legierter HSS-Stahl • höhere Verschleißfestigkeit  
 rost-/säurebest. Stähle • Federstähle • austenitische Stähle • Sonderlegierungen Hastelloy, Inconel, Nimonic



d1 mm	inch	l1 mm	l2 mm	d1 mm	inch	l1 mm	l2 mm
0,400		19,000	2,500	2,450		43,000	14,000
0,500		20,000	3,000	2,470		43,000	14,000
0,600		21,000	3,500	2,500		43,000	14,000
0,650		22,000	4,000	2,550		43,000	14,000
0,700		23,000	4,500	2,600		43,000	14,000
0,750		23,000	4,500	2,650		43,000	14,000
0,800		24,000	5,000	2,700		46,000	16,000
0,860		25,000	5,500	2,750		46,000	16,000
0,870		25,000	5,500	2,800		46,000	16,000
0,900		25,000	5,500	2,900		46,000	16,000
0,950		25,000	5,500	3,000		46,000	16,000
1,000		26,000	6,000	3,050		49,000	18,000
1,030		26,000	6,000	3,100		49,000	18,000
1,100		28,000	7,000	3,200		49,000	18,000
1,150		28,000	7,000	3,250		49,000	18,000
1,200		30,000	8,000	3,300		49,000	18,000
1,250		30,000	8,000	3,400		52,000	20,000
1,280		30,000	8,000	3,500		52,000	20,000
1,300		30,000	8,000	3,550		52,000	20,000
1,350		32,000	9,000	3,600		52,000	20,000
1,400		32,000	9,000	3,700		52,000	20,000
1,450		32,000	9,000	3,750		52,000	20,000
1,500		32,000	9,000	3,800		55,000	22,000
1,550		34,000	10,000	3,900		55,000	22,000
1,600		34,000	10,000	4,000		55,000	22,000
1,650		34,000	10,000	4,100		55,000	22,000
1,700		34,000	10,000	4,200		55,000	22,000
1,750		36,000	11,000	4,250		55,000	22,000
1,800		36,000	11,000	4,300		58,000	24,000
1,850		36,000	11,000	4,400		58,000	24,000
1,900		36,000	11,000	4,500		58,000	24,000
1,950		38,000	12,000	4,600		58,000	24,000
1,970		38,000	12,000	4,650		58,000	24,000
1,980	5/64	38,000	12,000	4,800		62,000	26,000
2,000		38,000	12,000	4,900		62,000	26,000
2,030		38,000	12,000	5,000		62,000	26,000
2,050		38,000	12,000	5,050		62,000	26,000
2,100		38,000	12,000	5,100		62,000	26,000
2,200		40,000	13,000	5,200		62,000	26,000
2,250		40,000	13,000	5,300		62,000	26,000
2,300		40,000	13,000	5,400		66,000	28,000
2,400		43,000	14,000	5,500		66,000	28,000



## Spiralbohrer extra kurz

d1 mm	inch	l1 mm	l2 mm	d1 mm	inch	l1 mm	l2 mm
5,550		66,000	28,000	10,300		89,000	43,000
5,600		66,000	28,000	10,400		89,000	43,000
5,700		66,000	28,000	10,500		89,000	43,000
5,800		66,000	28,000	10,600		89,000	43,000
5,900		66,000	28,000	10,700		95,000	47,000
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	11,800		95,000	47,000
6,500		70,000	31,000	12,000		102,000	51,000
6,600		70,000	31,000	12,200		102,000	51,000
6,700		70,000	31,000	12,300	31/64	102,000	51,000
6,750	17/64	74,000	34,000	12,400		102,000	51,000
6,800		74,000	34,000	12,500		102,000	51,000
6,900		74,000	34,000	12,600		102,000	51,000
7,000		74,000	34,000	12,800		102,000	51,000
7,100		74,000	34,000	12,900		102,000	51,000
7,200		74,000	34,000	13,000		102,000	51,000
7,300		74,000	34,000	13,500		107,000	54,000
7,400		74,000	34,000	13,750		107,000	54,000
7,500		74,000	34,000	13,800		107,000	54,000
7,600		79,000	37,000	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	15,500		115,000	58,000
8,000		79,000	37,000	15,750		115,000	58,000
8,100		79,000	37,000	16,000		115,000	58,000
8,200		79,000	37,000	16,500		119,000	60,000
8,250		79,000	37,000	17,000		119,000	60,000
8,300		79,000	37,000	17,500		123,000	62,000
8,400		79,000	37,000	18,000		123,000	62,000
8,500		79,000	37,000	18,500		127,000	64,000
8,600		84,000	40,000	19,000		127,000	64,000
8,700		84,000	40,000	19,500		131,000	66,000
8,800		84,000	40,000	20,000		131,000	66,000
8,900		84,000	40,000	20,500		136,000	68,000
9,000		84,000	40,000	21,000		136,000	68,000
9,100		84,000	40,000	22,000		141,000	70,000
9,200		84,000	40,000	22,200		141,000	70,000
9,300		84,000	40,000	23,000		146,000	72,000
9,400		84,000	40,000	24,000		151,000	75,000
9,500		84,000	40,000	25,000	63/64	151,000	75,000
9,600		89,000	43,000				
9,700		89,000	43,000				
9,750		89,000	43,000				
9,800		89,000	43,000				
9,900		89,000	43,000				
10,000		89,000	43,000				
10,050		89,000	43,000				
10,100		89,000	43,000				
10,200		89,000	43,000				



## Spiralbohrer extra kurz

### Artikel-Nr. 84803



P	M	K	N	S	H
•	•	•	○	•	○



Ausspitzung  $\geq \varnothing 1,000$  • Kegelmantelschliff • Co-legierter HSS-Stahl • höhere Verschleißfestigkeit  
rost-/säurebest. Stähle • Federstähle • austenitische Stähle • Sonderlegierungen Hastelloy, Inconel, Nimonic

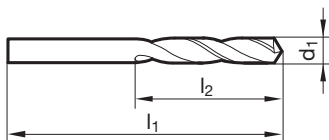
### Artikel-Nr. 84503



P	M	K	N	S	H
•	•	•	○	•	○



Ausspitzung  $\geq \varnothing 1,000$  • Kegelmantelschliff • Co-legierter HSS-Stahl • höhere Verschleißfestigkeit  
rost-/säurebest. Stähle • Federstähle • austenitische Stähle • Sonderlegierungen Hastelloy, Inconel, Nimonic



d1	inch	l1	l2	d1	inch	l1	l2
mm		mm	mm	mm		mm	mm
0,500		20,000	3,000	3,100		49,000	18,000
0,700		23,000	4,500	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
3,050		49,000	18,000	5,700		66,000	28,000



## Spiralbohrer extra kurz

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



## Spiralbohrer extra kurz

### Artikel-Nr. 84806



P	M	K	N	S	H
•	•	•	•		



Ausspitzung  $\geq \varnothing 1,000$  • Flächenanschliff • Co-legierter HSS-Stahl • geringe Vorschubkraft notwendig • geringes Drehmoment notwendig • universell einsetzbar

Stähle (legiert/unleg.) bis 800 N/mm<sup>2</sup> • Kalt-/Warmarbeitsstähle • Wälzlagerstähle • NE-Metalle • Gusswerkstoffe • rostfreie Stähle • Kunststoffe

### Artikel-Nr. 84808

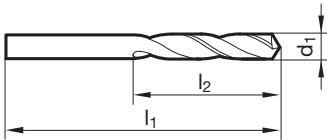


P	M	K	N	S	H
•	•	•	○		



Ausspitzung  $\geq \varnothing 1,000$  • Flächenanschliff • Co-legierter HSS-Stahl • geringe Vorschubkraft notwendig • geringes Drehmoment notwendig • universell einsetzbar

Stähle (legiert/unleg.) bis 800 N/mm<sup>2</sup> • Kalt-/Warmarbeitsstähle • Wälzlagerstähle • NE-Metalle • Gusswerkstoffe • rostfreie Stähle • Kunststoffe



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



## Spiralbohrer extra kurz

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				

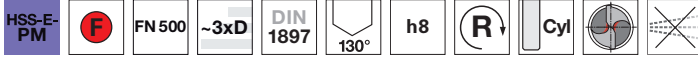


## Spiralbohrer extra kurz

Artikel-Nr. 84511

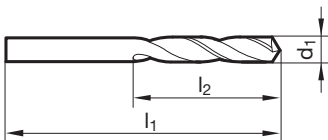


P	M	K	N	S	H
●	○	●	○	○	○



Ausspitzung  $\geq \text{Ø } 1,000$  • Kegelmantelanschliff • PM-Co-legierter HSS-Stahl • besonders hohe Stabilität • besonders hohe Verschleißfestigkeit

höherfeste Materialien, hochlegierte Stähle • Vergütungs- und Einsatzstähle • Gusseisen, Messing, Bronze



d1 mm	inch	l1 mm	l2 mm	d1 mm	inch	l1 mm	l2 mm
1,000		26,000	6,000	4,900		62,000	26,000
1,200		30,000	8,000	4,980		62,000	26,000
1,500		32,000	9,000	5,000		62,000	26,000
2,000		38,000	12,000	5,100		62,000	26,000
2,100		38,000	12,000	5,160	13/64	62,000	26,000
2,200		40,000	13,000	5,200		62,000	26,000
2,300		40,000	13,000	5,300		62,000	26,000
2,380	3/32	43,000	14,000	5,400		66,000	28,000
2,400		43,000	14,000	5,410		66,000	28,000
2,500		43,000	14,000	5,500		66,000	28,000
2,600		43,000	14,000	5,550		66,000	28,000
2,700		46,000	16,000	5,560	7/32	66,000	28,000
2,780	7/64	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	5,950	15/64	66,000	28,000
3,170	1/8	49,000	18,000	6,000		66,000	28,000
3,200		49,000	18,000	6,100		70,000	31,000
3,260		49,000	18,000	6,200		70,000	31,000
3,300		49,000	18,000	6,300		70,000	31,000
3,400		52,000	20,000	6,350	1/4	70,000	31,000
3,500		52,000	20,000	6,400		70,000	31,000
3,570	9/64	52,000	20,000	6,500		70,000	31,000
3,600		52,000	20,000	6,600		70,000	31,000
3,700		52,000	20,000	6,700		70,000	31,000
3,800		55,000	22,000	6,750	17/64	74,000	34,000
3,900		55,000	22,000	6,800		74,000	34,000
3,970	5/32	55,000	22,000	6,900		74,000	34,000
4,000		55,000	22,000	7,000		74,000	34,000
4,090		55,000	22,000	7,100		74,000	34,000
4,100		55,000	22,000	7,140	9/32	74,000	34,000
4,200		55,000	22,000	7,200		74,000	34,000
4,300		58,000	24,000	7,300		74,000	34,000
4,370	11/64	58,000	24,000	7,370		74,000	34,000
4,400		58,000	24,000	7,400		74,000	34,000
4,500		58,000	24,000	7,450		74,000	34,000
4,600		58,000	24,000	7,500		74,000	34,000
4,650		58,000	24,000	7,540	19/64	79,000	37,000
4,700		58,000	24,000	7,600		79,000	37,000
4,760	3/16	62,000	26,000	7,700		79,000	37,000
4,800		62,000	26,000	7,800		79,000	37,000





## Spiralbohrer extra kurz

d1 mm	inch	l1 mm	l2 mm	d1 mm	inch	l1 mm	l2 mm
7,900		79,000	37,000	9,700		89,000	43,000
7,940	5/16	79,000	37,000	9,800		89,000	43,000
8,000		79,000	37,000	9,900		89,000	43,000
8,100		79,000	37,000	9,920	25/64	89,000	43,000
8,200		79,000	37,000	10,000		89,000	43,000
8,300		79,000	37,000	10,200		89,000	43,000
8,330	21/64	79,000	37,000	10,320	13/32	89,000	43,000
8,400		79,000	37,000	10,500		89,000	43,000
8,500		79,000	37,000	10,720	27/64	95,000	47,000
8,600		84,000	40,000	11,000		95,000	47,000
8,700		84,000	40,000	11,110	7/16	95,000	47,000
8,730	11/32	84,000	40,000	11,500		95,000	47,000
8,800		84,000	40,000	11,510	29/64	95,000	47,000
8,900		84,000	40,000	11,800		95,000	47,000
9,000		84,000	40,000	11,910	15/32	102,000	51,000
9,100		84,000	40,000	12,000		102,000	51,000
9,130	23/64	84,000	40,000	12,300	31/64	102,000	51,000
9,200		84,000	40,000	12,500		102,000	51,000
9,300		84,000	40,000	12,700	1/2	102,000	51,000
9,350		84,000	40,000	13,000		102,000	51,000
9,400		84,000	40,000	13,500		107,000	54,000
9,500		84,000	40,000				
9,520	3/8	89,000	43,000				
9,600		89,000	43,000				



## Spiralbohrer extra kurz

Artikel-Nr. 89235

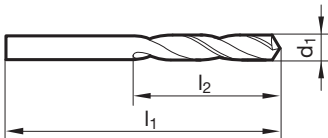


P	M	K	N	S	H
○	○	○	●	○	○



Ausspitzung  $\geq \varnothing 3,000$  • Flächenanschliff • Hauptschneidenform gerade

Bau- und Einsatzstähle • Automatenstähle, Vergütungsstähle • Grauguss • Bronze, Messing • Aluminium und Al-Legierungen  
• Magnesium und Mg-Legierungen • Kunststoffe und faserverstärkte Kunststoffe



d1 mm	inch	l1 mm	l2 mm	d1 mm	inch	l1 mm	l2 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



## Spiralbohrer extra kurz

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	11,000		95,000	47,000
8,100		79,000	37,000	11,110	7/16	95,000	47,000
8,200		79,000	37,000	11,500		95,000	47,000
8,300		79,000	37,000	11,910	15/32	102,000	51,000
8,400		79,000	37,000	12,000		102,000	51,000
8,500		79,000	37,000	12,300	31/64	102,000	51,000
8,600		84,000	40,000	13,000		102,000	51,000
8,700		84,000	40,000	14,000		107,000	54,000
8,730	11/32	84,000	40,000	15,000		111,000	56,000
8,800		84,000	40,000	16,000		115,000	58,000
8,900		84,000	40,000				
9,000		84,000	40,000				
9,100		84,000	40,000				
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				



## Spiralbohrer extra kurz

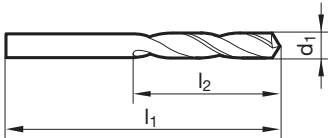
Artikel-Nr. 89246

P	M	K	N	S	H
○	○	○	○	○	○



Flächenanschliff • Hauptschneidenform gerade

glasfaserverstärkte Kunststoffe • Duroplaste mit Schmirgelwirkung auf Schneiden und Fasen



d1 mm	l1 mm	l2 mm	d1 mm	l1 mm	l2 mm
0,500	30,000	6,500	4,600	50,000	25,000
0,800	30,000	8,500	4,700	50,000	25,000
0,900	30,000	9,500	5,000	50,000	25,000
1,000	30,000	11,000	5,200	50,000	25,000
1,200	30,000	13,000	5,300	50,000	25,000
1,400	30,000	13,000	5,600	50,000	25,000
1,700	40,000	17,500	5,800	50,000	25,000
2,000	40,000	17,500	5,900	50,000	25,000
2,500	40,000	17,500	6,100	65,000	30,000
3,000	45,000	20,000	6,500	65,000	30,000
3,100	50,000	22,000			
3,200	50,000	22,000			
3,400	50,000	22,000			
3,600	50,000	22,000			
4,000	50,000	22,000			
4,100	50,000	25,000			
4,200	50,000	25,000			
4,300	50,000	25,000			

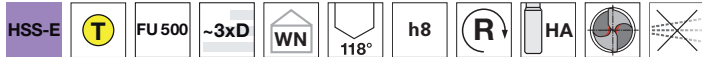


## Spiralbohrer mit verst. Zylinderschaft

Artikel-Nr. 84805

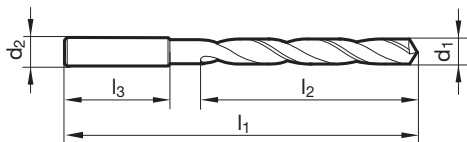


P	M	K	N	S	H
•	•	•	•		



Ausspitzung  $\geq \text{Ø } 2,000$  • Flächenanschliff • Co-legierter HSS-Stahl • geringe Vorschubkraft notwendig • geringes Drehmoment notwendig • höhere Verschleißfestigkeit • universell einsetzbar

Stähle (legiert/unleg.) bis  $800 \text{ N/mm}^2$  • Kalt-/Warmarbeitsstähle • rostfreie Stähle • NE-Metalle • Gusswerkstoffe • Kunststoffe • Wälzlagerstähle



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	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
4,600		6,000	68,000	24,000	36,000	7,700		8,000	81,000	37,000	36,000
4,650		6,000	68,000	24,000	36,000	7,800		8,000	81,000	37,000	36,000
4,700		6,000	68,000	24,000	36,000	7,900		8,000	81,000	37,000	36,000
4,760	3/16	6,000	70,000	26,000	36,000	7,940	5/16	8,000	81,000	37,000	36,000
4,800		6,000	70,000	26,000	36,000	8,000		8,000	81,000	37,000	36,000
4,900		6,000	70,000	26,000	36,000	8,100		10,000	87,000	37,000	40,000
5,000		6,000	70,000	26,000	36,000	8,200		10,000	87,000	37,000	40,000
5,100		6,000	70,000	26,000	36,000	8,300		10,000	87,000	37,000	40,000
5,160	13/64	6,000	70,000	26,000	36,000	8,330	21/64	10,000	87,000	37,000	40,000
5,200		6,000	70,000	26,000	36,000	8,400		10,000	87,000	37,000	40,000



## Spiralbohrer mit verst. Zylinderschaft

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



## Spiralbohrer mit verst. Zylinderschaft

Artikel-Nr. 84801

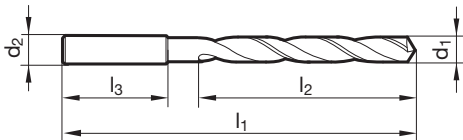


P	M	K	N	S	H
•	•	•	•		



Ausspitzung  $\geq \text{Ø } 2,000$  • Flächenanschliff • Co-legierter HSS-Stahl • geringe Vorschubkraft notwendig • geringes Drehmoment notwendig • höhere Verschleißfestigkeit • universell einsetzbar

Stähle (legiert/unleg.) bis  $800 \text{ N/mm}^2$  • Kalt-/Warmarbeitsstähle • rostfreie Stähle • NE-Metalle • Gusswerkstoffe • Kunststoffe



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



## Spiralbohrer mit verst. Zylinderschaft

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						



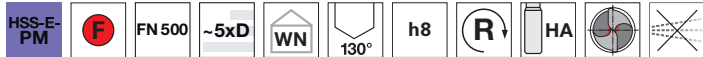


## Spiralbohrer mit verst. Zylinderschaft

Artikel-Nr. 84507

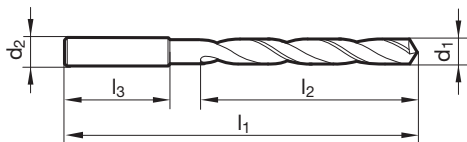


P	M	K	N	S	H
●	○	●	○	○	○



Ausspitzung  $\geq \varnothing 2,000$  • Kegelmantelanschliff • PM-Co-legierter HSS-Stahl • besonders hohe Verschleißfestigkeit • besonders hohe Stabilität

höherfeste Materialien, hochlegierte Stähle • Vergütungs- und Einsatzstähle • Gusseisen, Messing, Bronze



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



## Spiralbohrer mit verst. Zylinderschaft

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	10,800		12,000	151,000	94,000	45,000
8,600		10,000	131,000	81,000	40,000	10,900		12,000	151,000	94,000	45,000
8,700		10,000	131,000	81,000	40,000	11,000		12,000	151,000	94,000	45,000
8,730	11/32	10,000	131,000	81,000	40,000	11,100		12,000	151,000	94,000	45,000
8,800		10,000	131,000	81,000	40,000	11,110	7/16	12,000	151,000	94,000	45,000
8,900		10,000	131,000	81,000	40,000	11,200		12,000	151,000	94,000	45,000
9,000		10,000	131,000	81,000	40,000	11,300		12,000	151,000	94,000	45,000
9,100		10,000	131,000	81,000	40,000	11,400		12,000	151,000	94,000	45,000
9,130	23/64	10,000	131,000	81,000	40,000	11,500		12,000	151,000	94,000	45,000
9,200		10,000	131,000	81,000	40,000	11,510	29/64	12,000	151,000	94,000	45,000
9,300		10,000	131,000	81,000	40,000	11,600		12,000	151,000	94,000	45,000
9,400		10,000	131,000	81,000	40,000	11,700		12,000	151,000	94,000	45,000
9,500		10,000	131,000	81,000	40,000	11,800		12,000	151,000	94,000	45,000
9,520	3/8	10,000	137,000	87,000	40,000	11,900		12,000	158,000	101,000	45,000
9,550		10,000	137,000	87,000	40,000	11,910	15/32	12,000	158,000	101,000	45,000
9,600		10,000	137,000	87,000	40,000	12,000		12,000	158,000	101,000	45,000
9,700		10,000	137,000	87,000	40,000	12,100		14,000	161,000	101,000	45,000
9,800		10,000	137,000	87,000	40,000	12,200		14,000	161,000	101,000	45,000
9,900		10,000	137,000	87,000	40,000	12,300	31/64	14,000	161,000	101,000	45,000
9,920	25/64	10,000	137,000	87,000	40,000	12,400		14,000	161,000	101,000	45,000
10,000		10,000	137,000	87,000	40,000	12,500		14,000	161,000	101,000	45,000
10,100		12,000	144,000	87,000	45,000	12,600		14,000	161,000	101,000	45,000
10,200		12,000	144,000	87,000	45,000	12,700	1/2	14,000	161,000	101,000	45,000
10,300		12,000	144,000	87,000	45,000	12,800		14,000	161,000	101,000	45,000
10,320	13/32	12,000	144,000	87,000	45,000	12,900		14,000	161,000	101,000	45,000
10,400		12,000	144,000	87,000	45,000	13,000		14,000	161,000	101,000	45,000
10,500		12,000	144,000	87,000	45,000						
10,600		12,000	144,000	87,000	45,000						
10,700		12,000	151,000	94,000	45,000						
10,720	27/64	12,000	151,000	94,000	45,000						



# HARTNER

## Spiralbohrersätze

### Artikel-Nr. 88013



P	M	K	N	S	H
•		•	○		



Satz in Kunststoff-Kassette • Kegelmantelschliff

Stahl und Stahlguss (legiert und unleg.) • Grauguss, Temperguss, Sphäroguss • Sinterisen, Neusilber und Graphit

d1	steigend um mm	Stück pro Satz	Code-Nr.
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

### Artikel-Nr. 88014



P	M	K	N	S	H
•	○	○	○		



Satz in Kunststoff-Kassette • Kegelmantelschliff

d1	steigend um mm	Stück pro Satz	Code-Nr.
1,0-5,0	0,1	41	0,011
5,1-10,0	0,1	50	0,012
1,0-10,0	0,5	19	0,013
1,0-13,0	0,5	25	0,014
1,0-10,5	0,5	24	0,018



# HARTNER

## Spiralbohrersätze

### Artikel-Nr. 88015



P	M	K	N	S	H
•	○	○	○		



Satz in Metall-Kassette • Kegelmantelschliff

d1	steigend um mm	Stück pro Satz	Code-Nr.
1,0-5,0	0,1	41	0,011
5,1-10,0	0,1	50	0,012
1,0-10,0	0,5	19	0,013
1,0-13,0	0,5	25	0,014
1,0-10,5	0,5	24	0,018

### Artikel-Nr. 88016



P	M	K	N	S	H
•		•	○		



Satz in Kunststoff-Kassette • Kegelmantelschliff • Kopfbeschichtung  
Stahl und Stahlguss (legiert und unleg.) • Grauguss, Temperguss, Sphäroguss • Sintereisen und Graphit

d1	steigend um mm	Stück pro Satz	Code-Nr.
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



# HARTNER

## Spiralbohrersätze

Artikel-Nr. 88026



P	M	K	N	S	H
•		•	○		

HSS-E
○
N
~5xD
DIN 338
h8
Ⓜ
Cyl
⊗

Satz in Kunststoff-Kassette • Kegelmantelschliff

Stahl und Stahlguss (legiert und unleg.) • Gusswerkstoffe über 800 N/mm<sup>2</sup> • Warm- und Kaltarbeitsstähle • Wälzgerstähle  
• hochlegierte Stähle • Vergütungs- und Einsatzstähle

d1	steigend um mm	Stück pro Satz	Code-Nr.
1,0-10,0	0,5	19	3,013
1,0-13,0	0,5	25	3,014



HARTNER

## Spiralbohrersätze

Artikel-Nr. 88303



Kassette leer

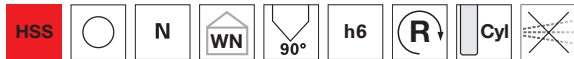
d1	steigend um mm	Stück pro Satz	Code-Nr.
1,0-10,0	0,5	19	0,213
1,0-13,0	0,5	25	0,214
1,0-5,9	0,1	50	0,215
6,0-10,0	0,1	41	0,216

## NC-Anbohrer

### Artikel-Nr. 81192



P	M	K	N	S	H
•	○	•	•	○	

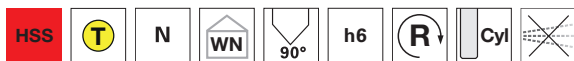


Kegelmantelanschliff • nur zum Anbohren geeignet  
universell einsetzbar

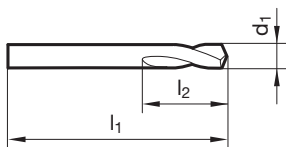
### Artikel-Nr. 84435



P	M	K	N	S	H
•	○	•	•	○	



Kegelmantelanschliff • nur zum Anbohren geeignet  
universell einsetzbar



d1		l1	l2	d1		l1	l2
mm	inch	mm	mm	mm	inch	mm	mm
3,000		46,000	12,000	10,000		89,000	25,000
4,000		55,000	12,000	12,000		102,000	30,000
5,000		62,000	14,000	14,000		107,000	33,500
6,000		66,000	16,000	16,000		115,000	37,500
6,350		70,000	17,000	20,000		131,000	45,000
8,000		79,000	21,000	25,000	63/64	151,000	53,000



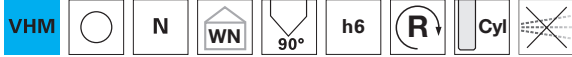
# HARTNER

## NC-Anbohrer

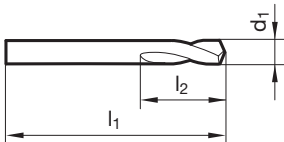
Artikel-Nr. 89243



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



Flächenanschliff • nur zum Anbohren geeignet  
 universell einsetzbar



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			



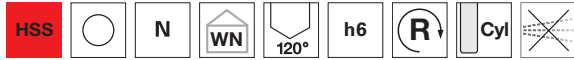


## NC-Anbohrer

### Artikel-Nr. 81191



P	M	K	N	S	H
•	○	•	•	○	

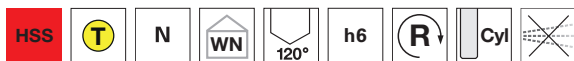


Kegelmantelschliff • nur zum Anbohren geeignet  
universell einsetzbar

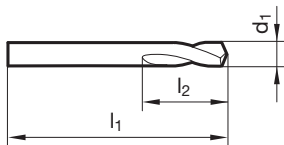
### Artikel-Nr. 84434



P	M	K	N	S	H
•	○	•	•	○	



Kegelmantelschliff • nur zum Anbohren geeignet  
universell einsetzbar



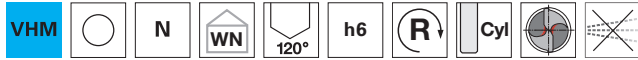
d1	inch	l1	l2	d1	inch	l1	l2
mm		mm	mm	mm		mm	mm
3,000		46,000	12,000	25,000	63/64	151,000	53,000
4,000		55,000	12,000				
5,000		62,000	14,000				
6,000		66,000	16,000				
8,000		79,000	21,000				
10,000		89,000	25,000				
12,000		102,000	30,000				
14,000		107,000	33,500				
15,000		111,000	33,500				
16,000		115,000	37,500				
19,050		131,000	45,000				
20,000		131,000	45,000				

## NC-Anbohrer

### Artikel-Nr. 89242



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



Ausspitzung  $\geq \varnothing 16,000$  • Flächenanschliff • nur zum Anbohren geeignet  
universell einsetzbar

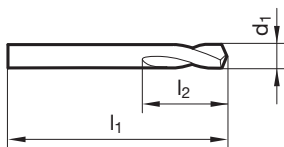
### Artikel-Nr. 89249



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



Flächenanschliff • nur zum Anbohren geeignet  
universell einsetzbar



d1	inch	l1	l2	d1	inch	l1	l2
mm		mm	mm	mm		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				



## Karosseriebohrer

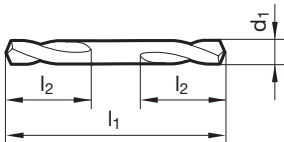
Artikel-Nr. 81190



P	M	K	N	S	H
•	○	•	•	○	



Ausspitzung  $\geq \text{Ø } 2,000$  • Kegelmantelschliff • für beidseitigen Einsatz • in Handbohrmaschinen im Karosseriebau dünnwandige Materialien



d1 mm	l1 mm	l2 mm	d1 mm	l1 mm	l2 mm
2,000	38,000	7,500	4,900	62,000	17,000
2,100	38,000	7,500	5,000	62,000	17,000
2,300	40,000	8,500	5,100	62,000	17,000
2,400	43,000	9,500	5,200	62,000	17,000
2,500	43,000	9,500	5,300	62,000	17,000
2,600	43,000	9,500	5,400	66,000	19,000
2,700	46,000	10,600	5,500	66,000	19,000
2,800	46,000	10,600	5,700	66,000	19,000
2,900	46,000	10,600	5,800	66,000	19,000
3,000	46,000	10,600	5,900	66,000	19,000
3,100	49,000	11,200	6,000	66,000	19,000
3,200	49,000	11,200	6,300	70,000	21,200
3,300	49,000	11,200	6,500	70,000	21,200
3,400	52,000	12,500	7,500	74,000	23,600
3,500	52,000	12,500	8,000	79,000	25,000
3,600	52,000	12,500	8,500	79,000	25,000
3,800	55,000	14,000	9,000	84,000	25,000
3,900	55,000	14,000	9,500	84,000	25,000
4,000	55,000	14,000	10,000	89,000	25,000
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			

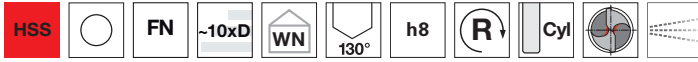


## Kühlkanalbohrer

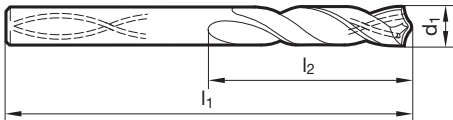
Artikel-Nr. 82710



P	M	K	N	S	H
•	○	•	•	○	



Ausspitzung  $\geq \varnothing 3,000$  • Kegelmantelschliff • auch zum Bohren durch Bohrbuchsen • besonders für Bohrtiefen über 5xD  
 Blechpakete • Stahl und Stahlguss, Grauguss • austenitische Stähle bis 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	8,500	8,500	165,000	109,000	56,000
3,300	3,300	106,000	69,000	37,000	9,000	9,000	175,000	115,000	60,000
4,000	4,000	119,000	78,000	41,000	9,500	9,500	175,000	115,000	60,000
4,500	4,500	126,000	82,000	44,000	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					



## Kühlkanalbohrer

### Artikel-Nr. 82761



P	M	K	N	S	H
•	•	•	•	•	



Ausspitzung  $\geq \varnothing 5,000$  • Kegelmantelschliff • Co-legierter HSS-Stahl  
 langspanende Werkstoffe bis 1000 N/mm<sup>2</sup> • rostfreie Stähle • Gusswerkstoffe • NE-Metalle

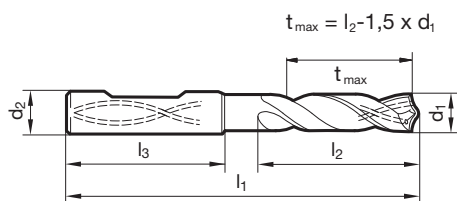
### Artikel-Nr. 84461



P	M	K	N	S	H
•	•	•	•	•	○



Ausspitzung  $\geq \varnothing 5,000$  • Kegelmantelschliff • Co-legierter HSS-Stahl • höhere Verschleißfestigkeit  
 langspanende Werkstoffe bis 1000 N/mm<sup>2</sup> • rostfreie Stähle • Gusswerkstoffe • NE-Metalle



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	12,500	14,000	124,000	77,000	45,000
5,500	6,000	82,000	44,000	36,000	13,000	14,000	124,000	77,000	45,000
6,000	6,000	82,000	44,000	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
6,800	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					



## Bohrbuchsenbohrer

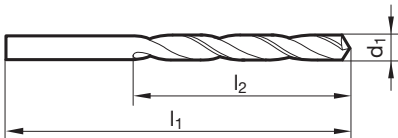
Artikel-Nr. 81210



P	M	K	N	S	H
•		•	○		



Ausspitzung  $\geq \text{Ø } 1,000$  • Kegelmantelschliff • zum Bohren durch Bohrbuchsen • mit Mitnehmer nach DIN 1809  
 Stahl und Stahlguss (legiert und unleg.) • Grauguss, Temperguss, Sphäroguss • Sintereisen, Neusilber und Graphit



d1	inch	l1	l2	d1	inch	l1	l2
mm		mm	mm	mm		mm	mm
0,800		42,000	22,000	4,600		102,000	69,000
0,900		45,000	24,000	4,700		102,000	69,000
0,950		45,000	24,000	4,800		108,000	74,000
1,000		48,000	26,000	4,900		108,000	74,000
1,200		52,000	30,000	5,000		108,000	74,000
1,250		52,000	30,000	5,100		108,000	74,000
1,350		55,000	33,000	5,200		108,000	74,000
1,400		55,000	33,000	5,300		108,000	74,000
1,450		55,000	33,000	5,350		116,000	80,000
1,500		55,000	33,000	5,400		116,000	80,000
1,620		58,000	35,000	5,500		116,000	80,000
1,700		58,000	35,000	5,550		116,000	80,000
1,800		62,000	38,000	5,600		116,000	80,000
1,900		62,000	38,000	5,700		116,000	80,000
1,990		66,000	41,000	5,750		116,000	80,000
2,000		66,000	41,000	5,800		116,000	80,000
2,100		66,000	41,000	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	6,100		124,000	86,000
2,500		74,000	47,000	6,200		124,000	86,000
2,600		74,000	47,000	6,400		124,000	86,000
2,900		79,000	51,000	6,500		124,000	86,000
3,000		79,000	51,000	6,600		124,000	86,000
3,050		84,000	55,000	6,700		124,000	86,000
3,100		84,000	55,000	6,750	17/64	133,000	93,000
3,200		84,000	55,000	6,900		133,000	93,000
3,250		84,000	55,000	7,000		133,000	93,000
3,300		84,000	55,000	7,100		133,000	93,000
3,400		91,000	60,000	7,200		133,000	93,000
3,500		91,000	60,000	7,300		133,000	93,000
3,600		91,000	60,000	7,400		133,000	93,000
3,700		91,000	60,000	7,500		133,000	93,000
3,750		91,000	60,000	7,600		142,000	100,000
3,800		96,000	64,000	7,700		142,000	100,000
3,900		96,000	64,000	7,800		142,000	100,000
4,000		96,000	64,000	7,900		142,000	100,000
4,050		96,000	64,000	8,000		142,000	100,000
4,200		96,000	64,000	8,200		142,000	100,000
4,300		102,000	69,000	8,250		142,000	100,000
4,400		102,000	69,000	8,300		142,000	100,000
4,500		102,000	69,000	8,400		142,000	100,000



## Bohrbuchsenbohrer

d1 mm	inch	l1 mm	l2 mm	d1 mm	inch	l1 mm	l2 mm
8,500		142,000	100,000	10,600		162,000	116,000
8,600		151,000	107,000	10,800		173,000	125,000
8,700		151,000	107,000	11,000		173,000	125,000
8,800		151,000	107,000	11,500		173,000	125,000
8,900		151,000	107,000	11,750		173,000	125,000
9,000		151,000	107,000	12,000		184,000	134,000
9,100		151,000	107,000	12,200		184,000	134,000
9,200		151,000	107,000	12,400		184,000	134,000
9,300		151,000	107,000	12,500		184,000	134,000
9,400		151,000	107,000	13,000		184,000	134,000
9,500		151,000	107,000	13,500		194,000	142,000
9,600		162,000	116,000	14,000		194,000	142,000
9,700		162,000	116,000	14,200		202,000	147,000
9,800		162,000	116,000	14,500		202,000	147,000
9,900		162,000	116,000	15,500		211,000	153,000
10,000		162,000	116,000	16,500		218,000	159,000
10,200		162,000	116,000	18,000		226,000	165,000
10,500		162,000	116,000	19,000		234,000	171,000



## Spiralbohrer lang

Artikel-Nr. 81310

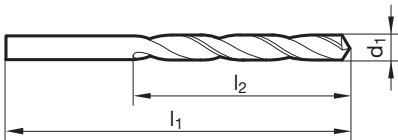


P	M	K	N	S	H
•		•	○		



Ausspitzung  $\geq \text{Ø } 1,000$  • Kegelmantelschliff • für tiefe Bohrungen

Stahl und Stahlguss (legiert und unleg.) • Grauguss, Temperguss, Sphäroguss • Sinter Eisen, Neusilber und Graphit



d1	inch	l1	l2	d1	inch	l1	l2
mm		mm	mm	mm		mm	mm
0,400		30,000	10,000	2,800		100,000	66,000
0,500		32,000	12,000	2,850		100,000	66,000
0,600		35,000	15,000	2,900		100,000	66,000
0,650		38,000	18,000	2,950		100,000	66,000
0,700		42,000	21,000	3,000		100,000	66,000
0,750		42,000	21,000	3,050		106,000	69,000
0,800		46,000	25,000	3,100		106,000	69,000
0,850		46,000	25,000	3,150		106,000	69,000
0,900		51,000	29,000	3,200		106,000	69,000
0,910		51,000	29,000	3,250		106,000	69,000
0,950		51,000	29,000	3,300		106,000	69,000
1,000		56,000	33,000	3,350		106,000	69,000
1,100		60,000	37,000	3,400		112,000	73,000
1,150		60,000	37,000	3,450		112,000	73,000
1,200		65,000	41,000	3,500		112,000	73,000
1,250		65,000	41,000	3,550		112,000	73,000
1,300		65,000	41,000	3,600		112,000	73,000
1,350		70,000	45,000	3,650		112,000	73,000
1,400		70,000	45,000	3,700		112,000	73,000
1,500		70,000	45,000	3,750		112,000	73,000
1,550		76,000	50,000	3,800		119,000	78,000
1,600		76,000	50,000	3,850		119,000	78,000
1,700		76,000	50,000	3,900		119,000	78,000
1,750		80,000	53,000	3,950		119,000	78,000
1,800		80,000	53,000	4,000		119,000	78,000
1,900		80,000	53,000	4,040		119,000	78,000
1,950		85,000	56,000	4,050		119,000	78,000
2,000		85,000	56,000	4,100		119,000	78,000
2,050		85,000	56,000	4,150		119,000	78,000
2,100		85,000	56,000	4,200		119,000	78,000
2,200		90,000	59,000	4,250		119,000	78,000
2,250		90,000	59,000	4,300		126,000	82,000
2,300		90,000	59,000	4,400		126,000	82,000
2,350		90,000	59,000	4,450		126,000	82,000
2,400		95,000	62,000	4,500		126,000	82,000
2,450		95,000	62,000	4,550		126,000	82,000
2,500		95,000	62,000	4,600		126,000	82,000
2,550		95,000	62,000	4,650		126,000	82,000
2,600		95,000	62,000	4,700		126,000	82,000
2,650		95,000	62,000	4,750		126,000	82,000
2,700		100,000	66,000	4,760	3/16	132,000	87,000
2,750		100,000	66,000	4,800		132,000	87,000





## Spiralbohrer lang

d1 mm	inch	l1 mm	l2 mm	d1 mm	inch	l1 mm	l2 mm
4,850		132,000	87,000	9,750		184,000	121,000
4,900		132,000	87,000	9,800		184,000	121,000
4,950		132,000	87,000	9,900		184,000	121,000
5,000		132,000	87,000	9,920	25/64	184,000	121,000
5,050		132,000	87,000	10,000		184,000	121,000
5,100		132,000	87,000	10,100		184,000	121,000
5,150		132,000	87,000	10,200		184,000	121,000
5,200		132,000	87,000	10,250		184,000	121,000
5,250		132,000	87,000	10,400		184,000	121,000
5,300		132,000	87,000	10,500		184,000	121,000
5,350		139,000	91,000	10,600		184,000	121,000
5,400		139,000	91,000	10,700		195,000	128,000
5,450		139,000	91,000	10,720	27/64	195,000	128,000
5,500		139,000	91,000	10,750		195,000	128,000
5,600		139,000	91,000	10,900		195,000	128,000
5,650		139,000	91,000	11,000		195,000	128,000
5,700		139,000	91,000	11,200		195,000	128,000
5,750		139,000	91,000	11,250		195,000	128,000
5,800		139,000	91,000	11,500		195,000	128,000
5,900		139,000	91,000	11,600		195,000	128,000
5,950	15/64	139,000	91,000	11,700		195,000	128,000
6,000		139,000	91,000	11,750		195,000	128,000
6,100		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	12,600		205,000	134,000
6,600		148,000	97,000	12,700	1/2	205,000	134,000
6,700		148,000	97,000	12,800		205,000	134,000
6,750	17/64	156,000	102,000	13,000		205,000	134,000
6,800		156,000	102,000	13,200		205,000	134,000
6,900		156,000	102,000	13,490	17/32	214,000	140,000
7,000		156,000	102,000	13,500		214,000	140,000
7,100		156,000	102,000	14,000		214,000	140,000
7,200		156,000	102,000	14,200		220,000	144,000
7,250		156,000	102,000	14,250		220,000	144,000
7,300		156,000	102,000	14,500		220,000	144,000
7,400		156,000	102,000	14,900		220,000	144,000
7,500		156,000	102,000	15,000		220,000	144,000
7,600		165,000	109,000	15,200		227,000	149,000
7,700		165,000	109,000	15,250		227,000	149,000
7,750		165,000	109,000	15,500		227,000	149,000
7,800		165,000	109,000	15,600		227,000	149,000
7,900		165,000	109,000	16,000		227,000	149,000
7,940	5/16	165,000	109,000	17,000		235,000	154,000
8,000		165,000	109,000	17,500		241,000	158,000
8,100		165,000	109,000	18,000		241,000	158,000
8,200		165,000	109,000	18,500		247,000	162,000
8,250		165,000	109,000	19,000		247,000	162,000
8,300		165,000	109,000	20,000		254,000	166,000
8,400		165,000	109,000	20,500		261,000	171,000
8,500		165,000	109,000	21,000		261,000	171,000
8,600		175,000	115,000	21,500		268,000	176,000
8,700		175,000	115,000	22,000		268,000	176,000
8,800		175,000	115,000	23,500		275,000	180,000
8,900		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				
9,500		175,000	115,000				
9,600		184,000	121,000				
9,700		184,000	121,000				



## Spiralbohrer lang

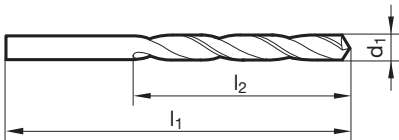
Artikel-Nr. 81315



P	M	K	N	S	H
•		•	○		



Ausspitzung  $\geq \text{Ø } 15,000$  • Kegelmantelschliff • für tiefe Bohrungen • zum Bohren durch Bohrbuchsen  
 Stahl und Stahlguss (legiert und unleg.) • Grauguss, Temperguss, Sphäroguss • Sinterisen, Neusilber und Graphit



d1 mm	l1 mm	l2 mm	d1 mm	l1 mm	l2 mm
0,900	51,000	29,000	5,800	139,000	91,000
1,200	65,000	41,000	6,000	139,000	91,000
1,250	65,000	41,000	6,500	148,000	97,000
1,500	70,000	45,000	7,500	156,000	102,000
1,550	76,000	50,000	7,900	165,000	109,000
1,800	80,000	53,000	8,000	165,000	109,000
2,800	100,000	66,000	8,500	165,000	109,000
2,900	100,000	66,000	9,000	175,000	115,000
3,000	100,000	66,000	10,000	184,000	121,000
3,200	106,000	69,000	11,000	195,000	128,000
3,500	112,000	73,000	12,000	205,000	134,000
3,800	119,000	78,000	15,000	220,000	144,000
4,000	119,000	78,000			
4,200	119,000	78,000			
4,500	126,000	82,000			
5,000	132,000	87,000			
5,200	132,000	87,000			
5,700	139,000	91,000			



# HARTNER

## Spiralbohrer lang

Artikel-Nr. 81317

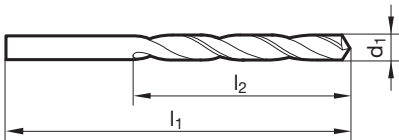


P	M	K	N	S	H
•		•	○		



Ausspitzung  $\geq \varnothing 3,100$  • Kegelmantelschliff • mit Mitnehmer

Stahl und Stahlguss (legiert und unleg.) • Grauguss, Temperguss, Sphäroguss • Sinterisen, Neusilber und Graphit



d1 mm	l1 mm	l2 mm	d1 mm	l1 mm	l2 mm
3,100	106,000	69,000	7,400	156,000	102,000
3,400	112,000	73,000	7,500	156,000	102,000
3,600	112,000	73,000	7,900	165,000	109,000
3,700	112,000	73,000	8,000	165,000	109,000
4,000	119,000	78,000	8,250	165,000	109,000
4,300	126,000	82,000	8,400	165,000	109,000
4,500	126,000	82,000	9,900	184,000	121,000
5,000	132,000	87,000	10,000	184,000	121,000
5,500	139,000	91,000			
6,100	148,000	97,000			
6,600	148,000	97,000			
7,000	156,000	102,000			



## Spiralbohrer lang

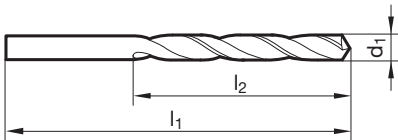
Artikel-Nr. 84418



P	M	K	N	S	H
•		•	○		



Ausspitzung  $\geq \text{Ø } 1,000$  • Kegelmantelanschliff • für tiefe Bohrungen • zum Bohren durch Bohrbuchsen  
 Stahl und Stahlguss (legiert und unleg.) • Grauguss, Temperguss, Sphäroguss • Sintereisen, Neusilber und Graphit



d1	inch	l1	l2	d1	inch	l1	l2
mm		mm	mm	mm		mm	mm
0,500		32,000	12,000	5,800		139,000	91,000
0,700		42,000	21,000	5,900		139,000	91,000
0,800		46,000	25,000	6,000		139,000	91,000
1,000		56,000	33,000	6,100		148,000	97,000
1,100		60,000	37,000	6,200		148,000	97,000
1,200		65,000	41,000	6,300		148,000	97,000
1,400		70,000	45,000	6,400		148,000	97,000
1,500		70,000	45,000	6,500		148,000	97,000
1,600		76,000	50,000	6,600		148,000	97,000
1,700		76,000	50,000	6,700		148,000	97,000
1,800		80,000	53,000	6,800		156,000	102,000
1,900		80,000	53,000	6,900		156,000	102,000
2,000		85,000	56,000	7,000		156,000	102,000
2,200		90,000	59,000	7,200		156,000	102,000
2,400		95,000	62,000	7,300		156,000	102,000
2,500		95,000	62,000	7,500		156,000	102,000
2,700		100,000	66,000	7,600		165,000	109,000
2,800		100,000	66,000	7,700		165,000	109,000
2,900		100,000	66,000	7,800		165,000	109,000
3,000		100,000	66,000	7,900		165,000	109,000
3,100		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	8,600		175,000	115,000
3,900		119,000	78,000	8,700		175,000	115,000
4,000		119,000	78,000	8,800		175,000	115,000
4,100		119,000	78,000	8,900		175,000	115,000
4,200		119,000	78,000	9,000		175,000	115,000
4,300		126,000	82,000	9,100		175,000	115,000
4,500		126,000	82,000	9,200		175,000	115,000
4,600		126,000	82,000	9,400		175,000	115,000
4,700		126,000	82,000	9,500		175,000	115,000
4,800		132,000	87,000	9,800		184,000	121,000
4,900		132,000	87,000	9,900		184,000	121,000
5,000		132,000	87,000	10,000		184,000	121,000
5,200		132,000	87,000	10,200		184,000	121,000
5,300		132,000	87,000	10,800		195,000	128,000
5,400		139,000	91,000	11,000		195,000	128,000
5,500		139,000	91,000	11,500		195,000	128,000
5,600		139,000	91,000	12,000		205,000	134,000
5,700		139,000	91,000	12,500		205,000	134,000



## Spiralbohrer lang

d1 mm	inch	l1 mm	l2 mm	d1 mm	inch	l1 mm	l2 mm
12,700	1/2	205,000	134,000	15,000		220,000	144,000
13,000		205,000	134,000	15,500		227,000	149,000
13,500		214,000	140,000	16,000		227,000	149,000
14,000		214,000	140,000				
14,500		220,000	144,000				
14,800		220,000	144,000				



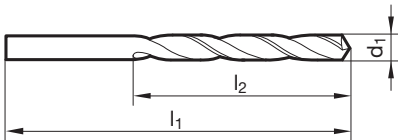
## Spiralbohrer lang

Artikel-Nr. 81320



Ausspitzung  $\geq \text{Ø } 14,500$  • Kegelmantelschliff • für tiefe Bohrungen

harte und spröde Werkstoffe • Messing, Magnesium-Legierungen • Bronze, Phosphorbronze • Schiefer, Glimmer, Pertinax



d1 mm	l1 mm	l2 mm	d1 mm	l1 mm	l2 mm
0,600	35,000	15,000	4,700	126,000	82,000
0,700	42,000	21,000	4,800	132,000	87,000
0,750	42,000	21,000	4,900	132,000	87,000
0,800	46,000	25,000	5,000	132,000	87,000
0,900	51,000	29,000	5,200	132,000	87,000
1,000	56,000	33,000	5,300	132,000	87,000
1,050	56,000	33,000	5,400	139,000	91,000
1,100	60,000	37,000	5,500	139,000	91,000
1,150	60,000	37,000	5,700	139,000	91,000
1,200	65,000	41,000	5,800	139,000	91,000
1,300	65,000	41,000	5,900	139,000	91,000
1,500	70,000	45,000	6,000	139,000	91,000
1,600	76,000	50,000	6,200	148,000	97,000
1,700	76,000	50,000	6,300	148,000	97,000
1,750	80,000	53,000	6,500	148,000	97,000
1,800	80,000	53,000	6,600	148,000	97,000
1,850	80,000	53,000	6,700	148,000	97,000
2,000	85,000	56,000	6,800	156,000	102,000
2,050	85,000	56,000	6,900	156,000	102,000
2,200	90,000	59,000	7,000	156,000	102,000
2,300	90,000	59,000	7,200	156,000	102,000
2,500	95,000	62,000	7,500	156,000	102,000
2,600	95,000	62,000	8,000	165,000	109,000
2,700	100,000	66,000	8,200	165,000	109,000
2,900	100,000	66,000	8,250	165,000	109,000
3,000	100,000	66,000	8,800	175,000	115,000
3,100	106,000	69,000	9,000	175,000	115,000
3,150	106,000	69,000	9,250	175,000	115,000
3,200	106,000	69,000	9,500	175,000	115,000
3,250	106,000	69,000	10,000	184,000	121,000
3,300	106,000	69,000	11,250	195,000	128,000
3,400	112,000	73,000	14,000	214,000	140,000
3,500	112,000	73,000	14,500	220,000	144,000
3,600	112,000	73,000	15,000	220,000	144,000
3,900	119,000	78,000			
4,000	119,000	78,000			
4,100	119,000	78,000			
4,200	119,000	78,000			
4,300	126,000	82,000			
4,400	126,000	82,000			
4,500	126,000	82,000			
4,600	126,000	82,000			

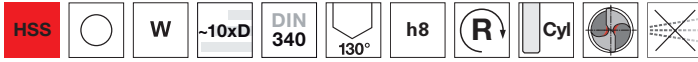


## Spiralbohrer lang

Artikel-Nr. 81330

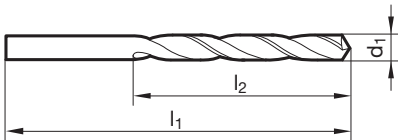


P	M	K	N	S	H
			•		



Ausspitzung  $\geq \text{Ø } 14,250$  • Kegelmantelschliff • für tiefe Bohrungen

weiche, langspannende Werkstoffe • Aluminium, Al-Legierungen (langspanend) • Zink, Hüttenkupfer, Silumin, Elektron • Kunststoffe (weich), Holz



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



## Spiralbohrer lang

d1 mm	inch	l1 mm	l2 mm	d1 mm	inch	l1 mm	l2 mm
7,200		156,000	102,000	9,700		184,000	121,000
7,300		156,000	102,000	9,750		184,000	121,000
7,400		156,000	102,000	9,800		184,000	121,000
7,500		156,000	102,000	10,000		184,000	121,000
7,600		165,000	109,000	10,200		184,000	121,000
7,700		165,000	109,000	10,300		184,000	121,000
7,750		165,000	109,000	11,000		195,000	128,000
7,800		165,000	109,000	11,300		195,000	128,000
7,900		165,000	109,000	11,500		195,000	128,000
8,000		165,000	109,000	12,000		205,000	134,000
8,100		165,000	109,000	13,500		214,000	140,000
8,200		165,000	109,000	14,000		214,000	140,000
8,300		165,000	109,000	14,250		220,000	144,000
8,400		165,000	109,000	14,500		220,000	144,000
8,500		165,000	109,000	15,500		227,000	149,000
8,600		175,000	115,000	17,000		235,000	154,000
8,700		175,000	115,000	20,000		254,000	166,000
8,800		175,000	115,000				
8,900		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				
9,500		175,000	115,000				





## Spiralbohrer lang

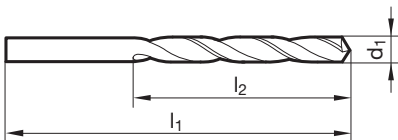
Artikel-Nr. 81340



P	M	K	N	S	H
•		•	•		



Ausspitzung  $\geq \text{Ø } 1,000$  • Kegelmantelschliff • weite Spannuten • bei schlechter Spanabfuhr  
 Grauguss und Stähle bis  $1000 \text{ N/mm}^2$  • Ausnahmen: CrNi-Stähle, VA-Stähle u.ä.



d1		l1	l2	d1		l1	l2
mm	inch	mm	mm	mm	inch	mm	mm
0,900		51,000	29,000	4,300		126,000	82,000
1,000		56,000	33,000	4,400		126,000	82,000
1,100		60,000	37,000	4,500		126,000	82,000
1,200		65,000	41,000	4,600		126,000	82,000
1,300		65,000	41,000	4,700		126,000	82,000
1,400		70,000	45,000	4,750		126,000	82,000
1,500		70,000	45,000	4,800		132,000	87,000
1,600		76,000	50,000	4,900		132,000	87,000
1,700		76,000	50,000	5,000		132,000	87,000
1,800		80,000	53,000	5,100		132,000	87,000
1,900		80,000	53,000	5,200		132,000	87,000
2,000		85,000	56,000	5,400		139,000	91,000
2,100		85,000	56,000	5,500		139,000	91,000
2,200		90,000	59,000	5,600		139,000	91,000
2,300		90,000	59,000	5,700		139,000	91,000
2,400		95,000	62,000	5,800		139,000	91,000
2,500		95,000	62,000	5,900		139,000	91,000
2,600		95,000	62,000	6,000		139,000	91,000
2,650		95,000	62,000	6,100		148,000	97,000
2,700		100,000	66,000	6,200		148,000	97,000
2,750		100,000	66,000	6,300		148,000	97,000
2,800		100,000	66,000	6,500		148,000	97,000
2,850		100,000	66,000	6,600		148,000	97,000
2,900		100,000	66,000	6,700		148,000	97,000
2,950		100,000	66,000	6,800		156,000	102,000
3,000		100,000	66,000	6,900		156,000	102,000
3,100		106,000	69,000	7,000		156,000	102,000
3,170	1/8	106,000	69,000	7,100		156,000	102,000
3,200		106,000	69,000	7,200		156,000	102,000
3,250		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
3,600		112,000	73,000	7,700		165,000	109,000
3,700		112,000	73,000	7,800		165,000	109,000
3,750		112,000	73,000	7,900		165,000	109,000
3,800		119,000	78,000	8,000		165,000	109,000
3,900		119,000	78,000	8,100		165,000	109,000
4,000		119,000	78,000	8,200		165,000	109,000
4,100		119,000	78,000	8,300		165,000	109,000
4,200		119,000	78,000	8,400		165,000	109,000
4,250		119,000	78,000	8,500		165,000	109,000



## Spiralbohrer lang

d1 mm	inch	l1 mm	l2 mm	d1 mm	inch	l1 mm	l2 mm
8,600		175,000	115,000	11,000		195,000	128,000
8,700		175,000	115,000	11,200		195,000	128,000
8,800		175,000	115,000	11,250		195,000	128,000
8,900		175,000	115,000	11,500		195,000	128,000
9,000		175,000	115,000	11,800		195,000	128,000
9,100		175,000	115,000	12,000		205,000	134,000
9,200		175,000	115,000	12,200		205,000	134,000
9,300		175,000	115,000	12,500		205,000	134,000
9,400		175,000	115,000	12,800		205,000	134,000
9,500		175,000	115,000	13,000		205,000	134,000
9,600		184,000	121,000	14,000		214,000	140,000
9,700		184,000	121,000				
9,800		184,000	121,000				
9,900		184,000	121,000				
10,000		184,000	121,000				
10,300		184,000	121,000				
10,500		184,000	121,000				
10,800		195,000	128,000				

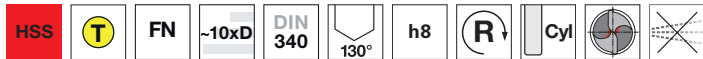


## Spiralbohrer lang

### Artikel-Nr. 84423



P	M	K	N	S	H
•		•	•		

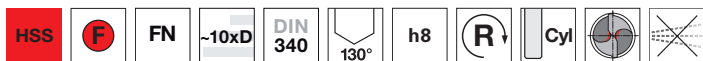


Ausspitzung  $\geq \varnothing 1,000$  • Kegelmantelschliff • weite Spannuten • bei schlechter Spanabfuhr  
 Grauguss und Stähle bis 1000 N/mm<sup>2</sup> • Ausnahmen: CrNi-Stähle, VA-Stähle u.ä.

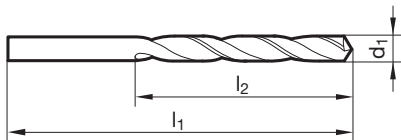
### Artikel-Nr. 84506



P	M	K	N	S	H
•		•	•		



Ausspitzung  $\geq \varnothing 1,000$  • Kegelmantelschliff • weite Spannuten • bei schlechter Spanabfuhr  
 Grauguss und Stähle bis 1000 N/mm<sup>2</sup> • Ausnahmen: CrNi-Stähle, VA-Stähle u.ä.



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



## Spiralbohrer lang

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

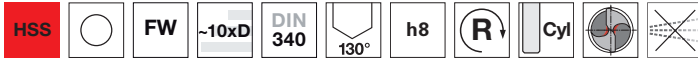


## Spiralbohrer lang

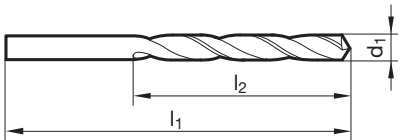
Artikel-Nr. 81350



P	M	K	N	S	H
○			●		



Ausspitzung  $\geq \varnothing 2,400$  • Kegelmantelschliff • besonders große Spannweite  
 weiche, langspannende Werkstoffe • bis 500 N/mm<sup>2</sup> • Automatenweichstähle • Aluminium, Al-Legierungen (langspannend) • Zink,  
 Hüttenkupfer, Silumin, Elektron • Zamak, Argalium, weiche Kunststoffe, Holz



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



## Spiralbohrer lang

d1 mm	inch	l1 mm	l2 mm	d1 mm	inch	l1 mm	l2 mm
11,200		195,000	128,000	12,400		205,000	134,000
11,500		195,000	128,000	12,500		205,000	134,000
11,800		195,000	128,000	12,800		205,000	134,000
12,000		205,000	134,000	13,000		205,000	134,000
12,200		205,000	134,000	13,500		214,000	140,000
12,300	31/64	205,000	134,000	14,000		214,000	140,000

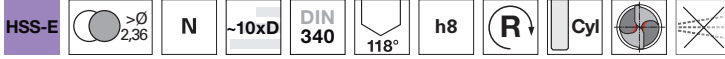


## Spiralbohrer lang

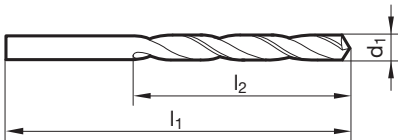
Artikel-Nr. 81311



P	M	K	N	S	H
•	○	•	•	○	



Ausspitzung  $\geq \text{Ø } 1,000$  • Kegelmantelschliff • Co-legierter HSS-Stahl • höhere Verschleißfestigkeit  
 Stähle (legiert/unleg.) und Gussarten über 800 N/mm<sup>2</sup> • Warm- und Kaltarbeitsstähle • Wälzlagerstähle • hochlegierte Stähle  
 • Vergütungs- und Einsatzstähle



d1 mm	l1 mm	l2 mm	d1 mm	l1 mm	l2 mm
0,500	32,000	12,000	6,500	148,000	97,000
0,600	35,000	15,000	6,600	148,000	97,000
0,700	42,000	21,000	6,700	148,000	97,000
0,800	46,000	25,000	6,800	156,000	102,000
0,900	51,000	29,000	6,900	156,000	102,000
1,000	56,000	33,000	7,000	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	7,400	156,000	102,000
1,500	70,000	45,000	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
2,500	95,000	62,000	8,000	165,000	109,000
3,000	100,000	66,000	8,300	165,000	109,000
3,100	106,000	69,000	8,400	165,000	109,000
3,200	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	8,900	175,000	115,000
3,900	119,000	78,000	9,000	175,000	115,000
4,000	119,000	78,000	9,100	175,000	115,000
4,100	119,000	78,000	9,200	175,000	115,000
4,200	119,000	78,000	9,300	175,000	115,000
4,300	126,000	82,000	9,400	175,000	115,000
4,400	126,000	82,000	9,500	175,000	115,000
4,500	126,000	82,000	9,600	184,000	121,000
4,600	126,000	82,000	9,700	184,000	121,000
4,700	126,000	82,000	9,900	184,000	121,000
4,800	132,000	87,000	10,000	184,000	121,000
4,900	132,000	87,000	10,500	184,000	121,000
5,000	132,000	87,000	10,800	195,000	128,000
5,100	132,000	87,000	11,000	195,000	128,000
5,300	132,000	87,000	11,200	195,000	128,000
5,500	139,000	91,000	12,000	205,000	134,000
5,600	139,000	91,000	12,500	205,000	134,000
5,700	139,000	91,000			
5,800	139,000	91,000			
5,900	139,000	91,000			
6,000	139,000	91,000			
6,300	148,000	97,000			
6,400	148,000	97,000			



## Spiralbohrer lang

Artikel-Nr. 81341

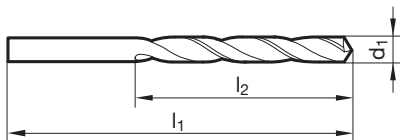


P	M	K	N	S	H
•	•	•	•		



Ausspitzung  $\geq \text{Ø } 1,100$  • Kegelmantelanschliff • Co-legierter HSS-Stahl • weite Spannuten • höhere Verschleißfestigkeit • bei schlechter Spanabfuhr

Stähle (legiert/unleg.) und Gussarten über 800 N/mm<sup>2</sup> • Warm- und Kaltarbeitsstähle • Wälzlagerstähle • hochlegierte Stähle  
• Vergütungs- und Einsatzstähle



d1		l1	l2	d1		l1	l2
mm	inch	mm	mm	mm	inch	mm	mm
1,000		56,000	33,000	4,760	3/16	132,000	87,000
1,100		60,000	37,000	4,800		132,000	87,000
1,200		65,000	41,000	4,900		132,000	87,000
1,250		65,000	41,000	5,000		132,000	87,000
1,300		65,000	41,000	5,100		132,000	87,000
1,400		70,000	45,000	5,200		132,000	87,000
1,500		70,000	45,000	5,300		132,000	87,000
1,600		76,000	50,000	5,400		139,000	91,000
1,700		76,000	50,000	5,500		139,000	91,000
1,800		80,000	53,000	5,600		139,000	91,000
1,900		80,000	53,000	5,700		139,000	91,000
2,000		85,000	56,000	5,800		139,000	91,000
2,100		85,000	56,000	5,900		139,000	91,000
2,200		90,000	59,000	6,000		139,000	91,000
2,300		90,000	59,000	6,100		148,000	97,000
2,400		95,000	62,000	6,150		148,000	97,000
2,440		95,000	62,000	6,200		148,000	97,000
2,500		95,000	62,000	6,250		148,000	97,000
2,600		95,000	62,000	6,300		148,000	97,000
2,700		100,000	66,000	6,350	1/4	148,000	97,000
2,800		100,000	66,000	6,400		148,000	97,000
2,900		100,000	66,000	6,500		148,000	97,000
3,000		100,000	66,000	6,600		148,000	97,000
3,050		106,000	69,000	6,700		148,000	97,000
3,100		106,000	69,000	6,800		156,000	102,000
3,200		106,000	69,000	6,900		156,000	102,000
3,300		106,000	69,000	7,000		156,000	102,000
3,400		112,000	73,000	7,100		156,000	102,000
3,500		112,000	73,000	7,200		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
3,800		119,000	78,000	7,500		156,000	102,000
3,900		119,000	78,000	7,600		165,000	109,000
4,000		119,000	78,000	7,700		165,000	109,000
4,050		119,000	78,000	7,800		165,000	109,000
4,100		119,000	78,000	7,900		165,000	109,000
4,200		119,000	78,000	8,000		165,000	109,000
4,300		126,000	82,000	8,100		165,000	109,000
4,400		126,000	82,000	8,200		165,000	109,000
4,500		126,000	82,000	8,300		165,000	109,000
4,600		126,000	82,000	8,400		165,000	109,000
4,700		126,000	82,000	8,500		165,000	109,000





## Spiralbohrer lang

d1 mm	inch	l1 mm	l2 mm	d1 mm	inch	l1 mm	l2 mm
8,600		175,000	115,000	10,800		195,000	128,000
8,700		175,000	115,000	10,900		195,000	128,000
8,800		175,000	115,000	11,000		195,000	128,000
8,900		175,000	115,000	11,500		195,000	128,000
9,000		175,000	115,000	11,800		195,000	128,000
9,100		175,000	115,000	11,910	15/32	205,000	134,000
9,200		175,000	115,000	12,000		205,000	134,000
9,300		175,000	115,000	12,500		205,000	134,000
9,400		175,000	115,000	13,000		205,000	134,000
9,500		175,000	115,000	16,000		227,000	149,000
9,600		184,000	121,000				
9,700		184,000	121,000				
9,800		184,000	121,000				
9,900		184,000	121,000				
10,000		184,000	121,000				
10,200		184,000	121,000				
10,500		184,000	121,000				
10,700		195,000	128,000				



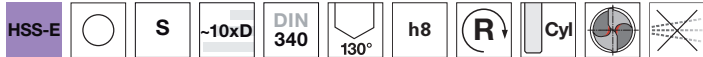
# HARTNER

## Spiralbohrer lang

### Artikel-Nr. 81361



P	M	K	N	S	H
○	●			●	



Ausspitzung  $\geq \varnothing 1,400$  • Kegelmantelschliff • Co-legierter HSS-Stahl • höhere Verschleißfestigkeit

Titan und Titanlegierungen • rost-/säure-/hitzebest. austen. Stähle • hochfeste/kurzspan. Stähle ab 900 N/mm<sup>2</sup> • Wälzlagerstähle

• Sonderlegierungen Hastelloy, Inconel, Nimonic

### Artikel-Nr. 81362



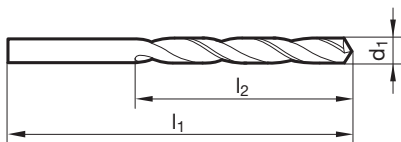
P	M	K	N	S	H
○	●			●	



Ausspitzung  $\geq \varnothing 1,000$  • Kegelmantelschliff • Co-legierter HSS-Stahl • höhere Verschleißfestigkeit

Titan und Titanlegierungen • rost-/säure-/hitzebest. austen. Stähle • hochfeste/kurzspan. Stähle ab 900 N/mm<sup>2</sup> • Wälzlagerstähle

• Sonderlegierungen 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



## Spiralbohrer lang

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
7,300	156,000	102,000	9,000	175,000	115,000
7,400	156,000	102,000	9,500	175,000	115,000
7,500	156,000	102,000	10,000	184,000	121,000
7,600	165,000	109,000	10,500	184,000	121,000
7,700	165,000	109,000	11,000	195,000	128,000
7,800	165,000	109,000	11,500	195,000	128,000
8,000	165,000	109,000	12,000	205,000	134,000
8,200	165,000	109,000	12,500	205,000	134,000
8,300	165,000	109,000	13,000	205,000	134,000
8,400	165,000	109,000			



## Spiralbohrer lang

### Artikel-Nr. 84814



P	M	K	N	S	H
•	•	•	•		



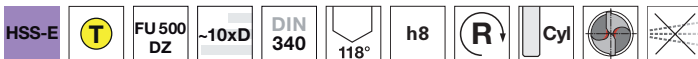
Ausspitzung  $\geq \varnothing 1,000$  • Flächenanschliff • Co-legierter HSS-Stahl • geringe Vorschubkraft notwendig • geringes Drehmoment notwendig • höhere Verschleißfestigkeit • universell einsetzbar

Stähle (legiert/unleg.) bis 800 N/mm<sup>2</sup> • Kalt-/Warmarbeitsstähle • Wälzlagerstähle • NE-Metalle • Gusswerkstoffe • rostfreie Stähle • Kunststoffe

### Artikel-Nr. 84812

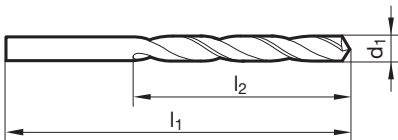


P	M	K	N	S	H
•	•	•	•		



Ausspitzung  $\geq \varnothing 1,000$  • Flächenanschliff • Co-legierter HSS-Stahl • geringes Drehmoment notwendig • geringe Vorschubkraft notwendig • höhere Verschleißfestigkeit • universell einsetzbar

Stähle (legiert/unleg.) bis 800 N/mm<sup>2</sup> • Kalt-/Warmarbeitsstähle • Wälzlagerstähle • NE-Metalle • Gusswerkstoffe • Kunststoffe • rostfreie Stähle



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



## Spiralbohrer lang

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			



# HARTNER

## Spiralbohrer lang

Artikel-Nr. 89286

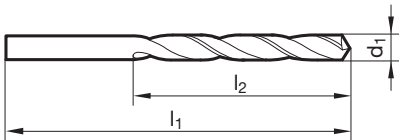


P	M	K	N	S	H
○		○			○



Flächenanschliff • Hauptschneidenform gerade

glasfaserverstärkte Kunststoffe • Duroplaste mit Schmirgelwirkung auf Schneiden und Fasen



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			



## Spiralbohrer überlang, Reihe 1

Artikel-Nr. 81410

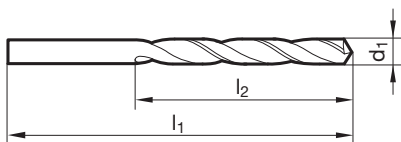


P	M	K	N	S	H
•		•	○		



Ausspitzung ≥ Ø 2,400 • Kegelmantelschliff • für extrem tiefe Bohrungen

Stahl und Stahlguss (legiert und unleg.) • Grauguss, Temperguss, Sphäroguss • Sinter Eisen, Neusilber und Graphit



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



## Spiralbohrer überlang, Reihe 1

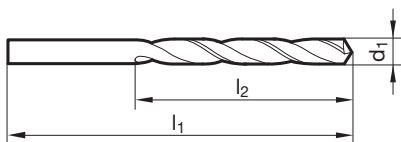
Artikel-Nr. 81440



P	M	K	N	S	H
•		•	•		



Ausspitzung  $\geq \text{Ø } 2,000$  • Kegelmantelanschliff • weite Spannuten • für extrem tiefe Bohrungen • bei schlechter Spanabfuhr  
 Grauguss und Stähle bis  $1000 \text{ N/mm}^2$  • Ausnahmen: CrNi-Stähle, VA-Stähle u.ä.



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



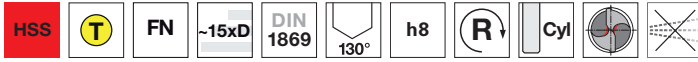


## Spiralbohrer überlang, Reihe 1

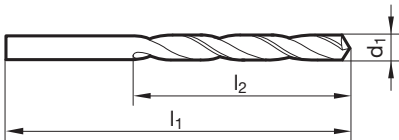
Artikel-Nr. 84425



P	M	K	N	S	H
•		•	•		



Ausspitzung  $\geq \text{Ø } 2,000$  • Kegelmantelschliff • weite Spannuten • für extrem tiefe Bohrungen • bei schlechter Spanabfuhr  
 Grauguss und Stähle bis  $1000 \text{ N/mm}^2$  • Ausnahmen: CrNi-Stähle, VA-Stähle u.ä.



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

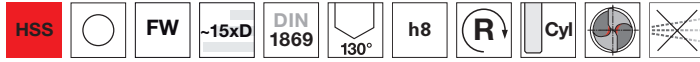


## Spiralbohrer überlang, Reihe 1

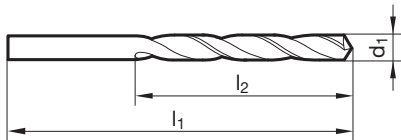
Artikel-Nr. 81450



P	M	K	N	S	H
○			●		



Ausspitzung  $\geq \text{Ø } 2,500$  • Kegelmantelschliff • für extrem tiefe Bohrungen  
 weiche und langspanende Werkstoffe bis  $500 \text{ N/mm}^2$  • Automatenweichstähle • Aluminium, Al-Legierungen (langspanend) • Zink,  
 Hüttenkupfer, Silumin, Elektron • Zamak, Argalium, weiche Kunststoffe, Holz



d1 mm	l1 mm	l2 mm	d1 mm	l1 mm	l2 mm
2,000	125,000	85,000	7,000	225,000	155,000
2,500	140,000	95,000	9,500	250,000	175,000
2,600	140,000	95,000			
3,000	150,000	100,000			
3,200	155,000	105,000			
3,500	165,000	115,000			
4,000	175,000	120,000			
5,000	195,000	135,000			
5,500	205,000	140,000			
5,600	205,000	140,000			
6,000	205,000	140,000			
6,500	215,000	150,000			



## Spiralbohrer überlang, Reihe 1

Artikel-Nr. 81441

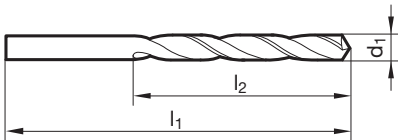


P	M	K	N	S	H
•	•	•	•		○



Ausspitzung  $\geq \varnothing 3,000$  • Kegelmantelanschliff • Co-legierter HSS-Stahl • weite Spannuten • höhere Verschleißfestigkeit • für extrem tiefe Bohrungen • bei schlechter Spanabfuhr

Stähle (legiert und unleg.) und Gussarten über 800 N/mm<sup>2</sup> • Warm- und Kaltarbeitsstähle • Wälzlagerstähle • hochlegierte Stähle • Vergütungs- und Einsatzstähle



d1 mm	inch	l1 mm	l2 mm	d1 mm	inch	l1 mm	l2 mm
3,000		150,000	100,000	8,000		240,000	165,000
3,500		165,000	115,000	8,200		240,000	165,000
4,000		175,000	120,000	8,500		240,000	165,000
4,300		185,000	125,000	9,000		250,000	175,000
4,500		185,000	125,000	9,500		250,000	175,000
4,760	3/16	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				
7,000		225,000	155,000				



## Spiralbohrer überlang, Reihe 2

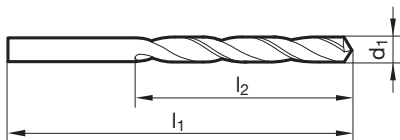
Artikel-Nr. 81510



P	M	K	N	S	H
•		•	○		



Ausspitzung  $\geq \text{Ø } 3,000$  • Kegelmantelschliff • für extrem tiefe Bohrungen  
 Stahl und Stahlguss (legiert und unleg.) • Grauguss, Temperguss, Sphäroguss • Sinter Eisen, Neusilber und Graphit



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



## Spiralbohrer überlang, Reihe 2

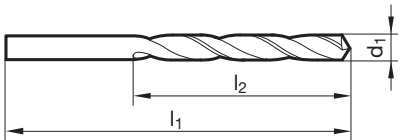
Artikel-Nr. 81540



P	M	K	N	S	H
•		•	•		



Ausspitzung  $\geq \text{Ø } 2,000$  • Kegelmantelanschliff • weite Spannuten • für extrem tiefe Bohrungen • bei schlechter Spanabfuhr  
 Grauguss und Stähle bis  $1000 \text{ N/mm}^2$  • Ausnahmen: CrNi-Stähle, VA-Stähle u.ä.



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				

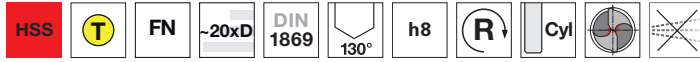


## Spiralbohrer überlang, Reihe 2

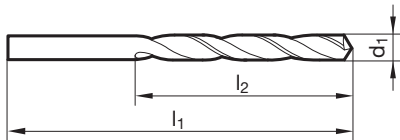
Artikel-Nr. 84426



P	M	K	N	S	H
•		•	•	○	



Ausspitzung  $\geq \text{Ø } 3,000$  • Kegelmantelschliff • weite Spannuten • für extrem tiefe Bohrungen • bei schlechter Spanabfuhr  
 Grauguss und Stähle bis  $1000 \text{ N/mm}^2$  • Ausnahmen: CrNi-Stähle, VA-Stähle u.ä.



d1 mm	l1 mm	l2 mm	d1 mm	l1 mm	l2 mm
3,000	190,000	130,000	6,800	290,000	200,000
4,000	220,000	150,000	7,000	290,000	200,000
4,200	220,000	150,000	8,000	305,000	210,000
4,500	235,000	160,000	8,500	305,000	210,000
5,000	245,000	170,000			
6,000	260,000	180,000			



## Spiralbohrer überlang, Reihe 2

Artikel-Nr. 81541

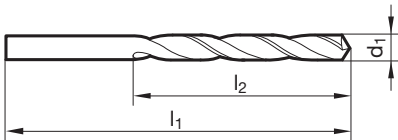


P	M	K	N	S	H
•	•	•	•		○



Ausspitzung  $\geq \varnothing 3,000$  • Kegelmantelanschliff • Co-legierter HSS-Stahl • höhere Verschleißfestigkeit • weite Spannuten • für extrem tiefe Bohrungen • bei schlechter Spanabfuhr

Stähle (legiert/unleg.) und Gussarten über 800 N/mm<sup>2</sup> • Warm- und Kaltarbeitsstähle • Wälzlagerstähle • hochlegierte Stähle • Vergütungs- und Einsatzstähle



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				



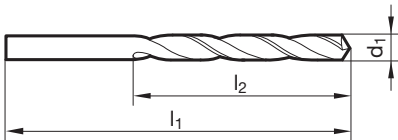
## Spiralbohrer überlang, Reihe 3

Artikel-Nr. 81610

P	M	K	N	S	H
•		•	○		



Ausspitzung  $\geq \text{Ø } 4,000$  • Kegelmantelschliff • für extrem tiefe Bohrungen  
 Stahl und Stahlguss (legiert und unleg.) • Grauguss, Temperguss, Sphäroguss • Sinter Eisen und Graphit



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



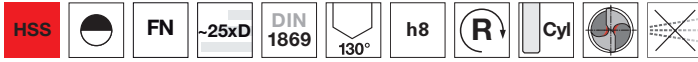


## Spiralbohrer überlang, Reihe 3

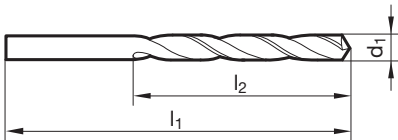
Artikel-Nr. 81640



P	M	K	N	S	H
•		•	•		



Ausspitzung  $\geq \varnothing 3,000$  • Kegelmantelschliff • weite Spannuten • für extrem tiefe Bohrungen • bei schlechter Spanabfuhr  
 Grauguss und Stähle bis 1000 N/mm<sup>2</sup> • Ausnahmen: CrNi-Stähle, VA-Stähle u.ä.



d1 mm	inch	l1 mm	l2 mm	d1 mm	inch	l1 mm	l2 mm
3,000		240,000	160,000	8,200		390,000	265,000
3,170	1/8	250,000	170,000	8,500		390,000	265,000
3,300		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				



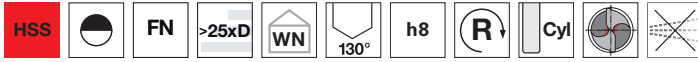
# HARTNER

## Spiralbohrer extra lang

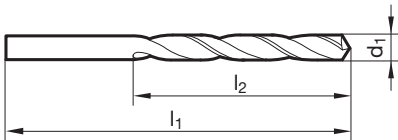
Artikel-Nr. 81740



P	M	K	N	S	H
•		•	•		



Ausspitzung  $\geq \text{Ø } 6,000$  • Kegelmantelschliff • weite Spannuten • für extrem tiefe Bohrungen • bei schlechter Spanabfuhr  
 Grauguss und Stähle bis  $1000 \text{ N/mm}^2$  • Ausnahmen: CrNi-Stähle, VA-Stähle u.ä.



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			

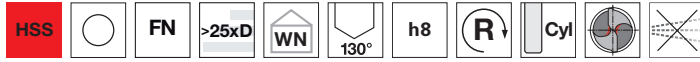


## Spiralbohrer extra lang

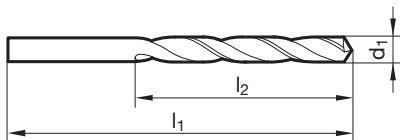
Artikel-Nr. 81750



P	M	K	N	S	H
•		•	•		



Ausspitzung  $\geq \text{Ø } 8,000$  • Kegelmantelschliff • weite Spannuten • für extrem tiefe Bohrungen • bei schlechter Spanabfuhr  
 Grauguss und Stähle bis  $1000 \text{ N/mm}^2$  • Ausnahmen: CrNi-Stähle, VA-Stähle u.ä.



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			



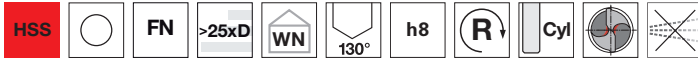
# HARTNER

## Spiralbohrer extra lang

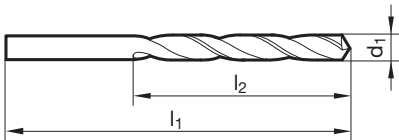
Artikel-Nr. 81760



P	M	K	N	S	H
•		•	•		



Ausspitzung  $\geq \text{Ø } 10,000$  • Kegelmantelschliff • weite Spannuten • für extrem tiefe Bohrungen • bei schlechter Spanabfuhr Grauguss und Stähle bis  $1000 \text{ N/mm}^2$  • Ausnahmen: CrNi-Stähle, VA-Stähle u.ä.



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





## Stiftlochbohrer

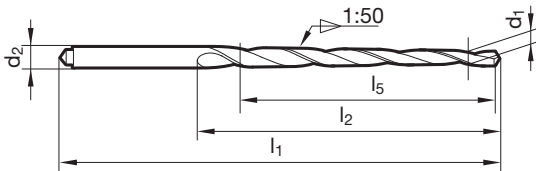
Artikel-Nr. 81810



P	M	K	N	S	H
•	○	•	○		



Ausspitzung  $\geq \text{Ø } 2,000$  • Kegelmantelschliff • für Kegelbohrungen zur Aufnahme von Kegelstiften nach DIN 1 (neu: DIN EN 22339) und DIN 7978 (neu: DIN EN 28736) • mit Mitnehmer nach 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	8,000	10,000	207,000	157,000	145,000
2,500	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					



## Spiralbohrer mit HM-Schneiden

Artikel-Nr. 89303



P	M	K	N	S	H
○		○			○

HM



N

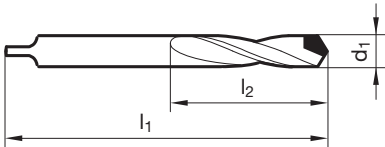
DIN 8038



h8



Ausspitzung  $\geq \varnothing 3,100$  • Flächenanschliff • HM-bestückt • mit Mitnehmer nach DIN 1809  
 glasfaserverstärkte Kunststoffe • Duroplaste mit Schmirgelwirkung auf Schneiden und Fasen



d1 mm	l1 mm	l2 mm	d1 mm	l1 mm	l2 mm
3,100	56,000	25,000	8,000	80,000	40,000
3,200	56,000	25,000			
4,200	63,000	28,000			
5,000	63,000	28,000			
5,500	71,000	32,000			
6,000	71,000	32,000			

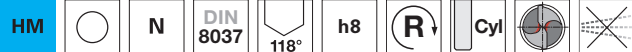


## Spiralbohrer mit HM-Schneiden

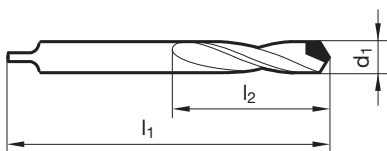
Artikel-Nr. 89301



P	M	K	N	S	H
○		○			○



Ausspitzung  $\geq \varnothing 2,600$  • Flächenanschliff • HM-bestückt • mit Mitnehmer nach DIN 1809  
 Federbandstahl • Hartguss über 300 HB • Reinmolybdän • zähnharte Bronzen



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



## Aufbohrer mit Zylinderschaft

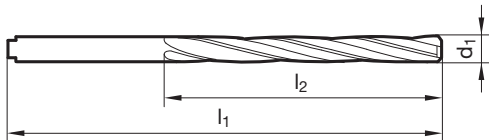
Artikel-Nr. 86010



P	M	K	N	S	H
•	○	•	○		



- Kegelmantelschliff • besonders hohe Stabilität • mit Mitnehmer nach DIN 1809 • für vorgebohrte/vorgelassene/vorgestanzte Löcher
- korrigiert Fluchtungsungenauigkeit • korrigiert Unrundheit • verbessert Bohrungsoberfläche • Anschnitt-Ø < aufzubohrendes Loch
- daher kleinsten Ø „d0“ der vorgefertigten Bohrung beachten



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	12,700		9,1	184,000	134,000
6,200		4,2	124,000	86,000	12,750		9,1	184,000	134,000
6,400		4,2	124,000	86,000	13,000		9,1	184,000	134,000
6,800		4,9	133,000	93,000	13,500		9,8	194,000	142,000
7,500		4,9	133,000	93,000	13,750		9,8	194,000	142,000
7,700		5,6	142,000	100,000	14,000		9,8	194,000	142,000
7,800		5,6	142,000	100,000	14,750		10,5	202,000	147,000
7,850		5,6	142,000	100,000	15,000		10,5	202,000	147,000
8,000		5,6	142,000	100,000					
8,050		5,6	142,000	100,000					
8,200		5,6	142,000	100,000					
8,300		5,6	142,000	100,000					
8,600		6,3	151,000	107,000					
9,400		6,3	151,000	107,000					
9,600		7,0	162,000	116,000					
9,800		7,0	162,000	116,000					
10,000		7,0	162,000	116,000					







# HARTNER

Präzisionswerkzeuge

Spiralbohrer  
mit Morsekegel








## SPIRALBOHRER MIT MORSEKEGEL

aus HSS, HSS-E, Hartmetall-bestückt  
blank und beschichtet





P	M	K	N	S	H	Norm	Typ	Schneidstoff	Oberfläche	Schneid- richtung	Schaft- form	Bohrtiefe	d1/mm	Artikel-Nr.	Progr. Seite
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## Spiralbohrer

	•	•	○	○	○	DIN 345	N	HSS	○	rechts	MK	~5xD	3,000 - 70,000	82010	158
	○	○	○	○	○	DIN 345	W	HSS	○	rechts	MK	~5xD	6,800 - 30,500	82030	157
	•	•	○	○	○	DIN 345	N	HSS	ⓧ	rechts	MK	~5xD	5,500 - 30,000	84460	160
	•	○	•	○	○	DIN 345	N	HSS-E	○	rechts	MK	~5xD	5,000 - 50,000	82011	161
	○	•	○	○	○	DIN 345	IS	HSS-E	○	rechts	MK	~5xD	11,500 - 32,000	82012	162
	○	•	○	○	○	DIN 345	FN	HSS-E	ⓧ	rechts	MK	~5xD	14,200 - 28,000	84660	163
	•	○	•	○	○	DIN 345	N	HSS-E	ⓧ	rechts	MK	~5xD	8,000 - 31,000	84859	164

## Spiralbohrer kurz



	•	•	•	○	○	Werksnorm	V	HSS-E	○	rechts	MK	~3xD	10,000 - 38,000	82971	166
	○	•	○	○	○	Werksnorm	IS	HSS-E	○	rechts	MK	~3xD	10,000 - 29,000	82972	165

## NC-Anbohrer




	•	○	•	•	○	Werksnorm	N	HSS	○	rechts	MK		12,000 - 25,000	82191	167
	•	○	•	○	○	Werksnorm	N	HSS	○	rechts	MK		12,000 - 25,000	82192	167

P	M	K	N	S	H	Norm	Typ	Schneidstoff	Oberfläche	Schneid- richtung	Schaft- form	Bohrtiefe	d1/mm	Artikel-Nr.	Progr. Seite
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## Spiralbohrer lang

		DIN 341	N	HSS		rechts	MK	~10xD	4,000 - 50,000	<b>82210</b>	168
		DIN 341	N	HSS-E		rechts	MK	~10xD	5,000 - 30,000	<b>82211</b>	169





## Spiralbohrer überlang, Reihe 1

		DIN 1870	N	HSS		rechts	MK	~15xD	8,500 - 33,000	<b>82310</b>	170
		DIN 1870	FN	HSS		rechts	MK	~15xD	8,000 - 30,000	<b>82340</b>	171
		DIN 1870	FN	HSS-E		rechts	MK	~15xD	10,000 - 17,000	<b>82341</b>	172

## Spiralbohrer überlang, Reihe 2




		DIN 1870	N	HSS		rechts	MK	~20xD	8,500 - 49,000	<b>82410</b>	173
		DIN 1870	FN	HSS		rechts	MK	~20xD	8,000 - 30,000	<b>82440</b>	174

## Spiralbohrer extra lang

		Werksnorm	FN	HSS		rechts	MK	>20xD	8,000 - 20,000	<b>82466</b>	175
		Werksnorm	FN	HSS		rechts	MK	>20xD	14,000 - 38,000	<b>82467</b>	176
		Werksnorm	FN	HSS		rechts	MK	>20xD	14,000 - 18,000	<b>82468</b>	177
		Werksnorm	FN	HSS		rechts	MK	>20xD	15,000 - 18,000	<b>82469</b>	178

P	M	K	N	S	H	Norm	Typ	Schneidstoff	Oberfläche	Schneid- richtung	Schaft- form	Bohrtiefe	d1/mm	Artikel-Nr.	Progr. Seite
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## Kühlkanalbohrer lang

															
•	○	•	•	○		Werksnorm	N	HSS	○	rechts	MK	~10xD	10,000 - 40,000	82521	180
															
•	○	•	•	○		Werksnorm	FN	HSS	○	rechts	MK	~10xD	10,000 - 20,000	82535	179
															
•	•	•	•	•	○	Werksnorm	FN	HSS-E	○	rechts	MK	~10xD	15,000 - 32,500	82525	181



## Kühlkanalbohrer überlang

															
•	•	•	•	•	○	Werksnorm	FN	HSS-E	○	rechts	MK	~15xD	14,000 - 29,000	82515	182

## Spiralbohrer mit HM-Schneiden

															
○	○	○	○	○		DIN 8041	N	HM	○	rechts	MK		8,500 - 40,000	89302	183

## Aufbohrer mit Morsekegel

															
•	○	•	○	○		DIN 343	N	HSS	○	rechts	MK		8,600 - 40,000	86110	184
															
•	○	•	•	○		DIN 343	N	HSS-E	○	rechts	MK		12,000 - 22,000	86111	185

## Stiftlochbohrer

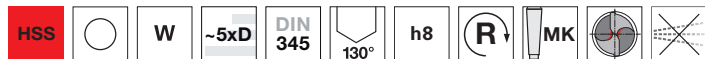
															
•	○	•	○	○		DIN 1898	N	HSS	○	rechts	MK		5,000 - 20,000	82810	186

## Spiralbohrer

Artikel-Nr. 82030

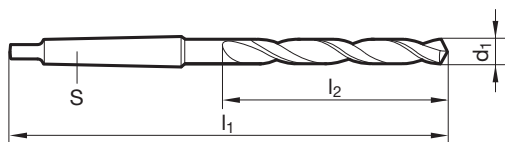


P	M	K	N	S	H
			•		



Ausspitzung  $\geq \text{Ø } 15,000$  • Kegelmantelschliff

weiche, langspanende Werkstoffe • Aluminium, Al-Legierungen (langspanend) • Zink, Hüttenkupfer, Silumin, Elektron



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
9,000	MK-1	162,000	81,000	19,000	MK-2	233,000	135,000
9,500	MK-1	162,000	81,000	24,300	MK-3	281,000	160,000
10,000	MK-1	168,000	87,000	30,500	MK-3	301,000	180,000
10,200	MK-1	168,000	87,000				
12,000	MK-1	182,000	101,000				



## Spiralbohrer

Artikel-Nr. 82010

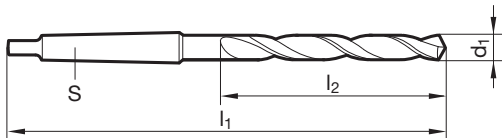


P	M	K	N	S	H
•		•	○		



Ausspitzung ≥ Ø 14,100 • Kegelmantelschliff

Stahl und Stahlguss (legiert und unleg.) • Grauguss, Temperguss, Sphäroguss • Sintereisen, Neusilber und Graphit



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



## Spiralbohrer

d1 mm	inch	S	l1 mm	l2 mm	d1 mm	inch	S	l1 mm	l2 mm
15,800		MK-2	218,000	120,000	29,500		MK-3	296,000	175,000
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	50,800	2	MK-4	374,000	225,000
25,500		MK-3	286,000	165,000	51,000		MK-5	412,000	225,000
25,750		MK-3	286,000	165,000	52,000		MK-5	412,000	225,000
25,800	1 1/64	MK-3	286,000	165,000	53,000		MK-5	412,000	225,000
26,000		MK-3	286,000	165,000	54,000		MK-5	417,000	230,000
26,250		MK-3	286,000	165,000	55,000		MK-5	417,000	230,000
26,500		MK-3	286,000	165,000	56,000		MK-5	417,000	230,000
27,000		MK-3	291,000	170,000	56,500		MK-5	422,000	235,000
27,250		MK-3	291,000	170,000	57,000		MK-5	422,000	235,000
27,500		MK-3	291,000	170,000	58,000		MK-5	422,000	235,000
27,750		MK-3	291,000	170,000	59,000		MK-5	422,000	235,000
28,000		MK-3	291,000	170,000	60,000		MK-5	422,000	235,000
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					
29,250		MK-3	296,000	175,000					





## Spiralbohrer

Artikel-Nr. 84460

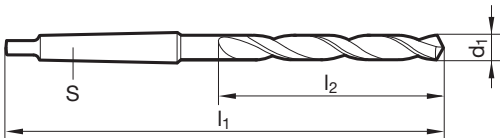


P	M	K	N	S	H
•		•	○		



Ausspitzung  $\geq \text{Ø } 5,500$  • Kegelmantelschliff

Stahl und Stahlguss (legiert und unleg.) • Grauguss, Temperguss, Sphäroguss • Sintereisen und Graphit



d1		S	l1	l2	d1		S	l1	l2
mm	inch		mm	mm	mm	inch		mm	mm
5,500		MK-1	138,000	57,000	15,500		MK-2	218,000	120,000
6,000		MK-1	138,000	57,000	16,000		MK-2	218,000	120,000
6,800		MK-1	150,000	69,000	16,250		MK-2	223,000	125,000
8,000		MK-1	156,000	75,000	16,500		MK-2	223,000	125,000
8,200		MK-1	156,000	75,000	16,750		MK-2	223,000	125,000
8,500		MK-1	156,000	75,000	17,000		MK-2	223,000	125,000
8,800		MK-1	162,000	81,000	17,250		MK-2	228,000	130,000
9,000		MK-1	162,000	81,000	17,500		MK-2	228,000	130,000
9,200		MK-1	162,000	81,000	18,000		MK-2	228,000	130,000
9,500		MK-1	162,000	81,000	18,500		MK-2	233,000	135,000
9,800		MK-1	168,000	87,000	19,000		MK-2	233,000	135,000
10,000		MK-1	168,000	87,000	19,500		MK-2	238,000	140,000
10,200		MK-1	168,000	87,000	20,000		MK-2	238,000	140,000
10,250		MK-1	168,000	87,000	20,400		MK-2	243,000	145,000
10,500		MK-1	168,000	87,000	20,500		MK-2	243,000	145,000
10,750		MK-1	175,000	94,000	20,750		MK-2	243,000	145,000
11,000		MK-1	175,000	94,000	21,000		MK-2	243,000	145,000
11,250		MK-1	175,000	94,000	21,250		MK-2	248,000	150,000
11,500		MK-1	175,000	94,000	21,750		MK-2	248,000	150,000
11,750		MK-1	175,000	94,000	22,000		MK-2	248,000	150,000
12,000		MK-1	182,000	101,000	22,500		MK-2	253,000	155,000
12,250		MK-1	182,000	101,000	23,000		MK-2	253,000	155,000
12,500		MK-1	182,000	101,000	24,000		MK-3	281,000	160,000
12,750		MK-1	182,000	101,000	24,500		MK-3	281,000	160,000
12,800		MK-1	182,000	101,000	25,000	63/64	MK-3	281,000	160,000
13,000		MK-1	182,000	101,000	25,500		MK-3	286,000	165,000
13,250		MK-1	189,000	108,000	26,000		MK-3	286,000	165,000
13,500		MK-1	189,000	108,000	26,500		MK-3	286,000	165,000
13,750		MK-1	189,000	108,000	27,000		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
14,250		MK-2	212,000	114,000	29,000		MK-3	296,000	175,000
14,500		MK-2	212,000	114,000	29,500		MK-3	296,000	175,000
14,750		MK-2	212,000	114,000	30,000		MK-3	296,000	175,000
15,000		MK-2	212,000	114,000					
15,250		MK-2	218,000	120,000					



## Spiralbohrer

Artikel-Nr. 82011

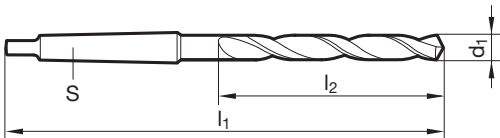


P	M	K	N	S	H
●	○	●	○		



Ausspitzung  $\geq \varnothing 5,000$  • Kegelmantelschliff • Co-legierter HSS-Stahl • höhere Verschleißfestigkeit

Stähle (legiert/unleg.) und Gussarten über 800 N/mm<sup>2</sup> • Warm- und Kaltarbeitsstähle • Wälzlagerstähle • hochlegierte Stähle  
• Vergütungs- und Einsatzstähle



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	20,250		MK-2	243,000	145,000
9,000		MK-1	162,000	81,000	20,500		MK-2	243,000	145,000
9,500		MK-1	162,000	81,000	20,750		MK-2	243,000	145,000
10,000		MK-1	168,000	87,000	21,000		MK-2	243,000	145,000
10,250		MK-1	168,000	87,000	21,500		MK-2	248,000	150,000
10,500		MK-1	168,000	87,000	22,000		MK-2	248,000	150,000
11,000		MK-1	175,000	94,000	22,500		MK-2	253,000	155,000
11,200		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
13,500		MK-1	189,000	108,000	26,500		MK-3	286,000	165,000
13,800		MK-1	189,000	108,000	27,000		MK-3	291,000	170,000
14,000		MK-1	189,000	108,000	27,500		MK-3	291,000	170,000
14,200		MK-2	212,000	114,000	28,000		MK-3	291,000	170,000
14,290	9/16	MK-2	212,000	114,000	28,500		MK-3	296,000	175,000
14,500		MK-2	212,000	114,000	28,570	1 1/8	MK-3	296,000	175,000
14,750		MK-2	212,000	114,000	29,000		MK-3	296,000	175,000
15,000		MK-2	212,000	114,000	29,500		MK-3	296,000	175,000
15,250		MK-2	218,000	120,000	30,000		MK-3	296,000	175,000
15,500		MK-2	218,000	120,000	31,000		MK-3	301,000	180,000
15,750		MK-2	218,000	120,000	31,500		MK-3	301,000	180,000
16,000		MK-2	218,000	120,000	32,000		MK-4	334,000	185,000
16,250		MK-2	223,000	125,000	33,000		MK-4	334,000	185,000
16,500		MK-2	223,000	125,000	34,000		MK-4	339,000	190,000
16,750		MK-2	223,000	125,000	35,000		MK-4	339,000	190,000
17,000		MK-2	223,000	125,000	36,000		MK-4	344,000	195,000
17,250		MK-2	228,000	130,000	38,000		MK-4	349,000	200,000
17,460	11/16	MK-2	228,000	130,000	40,000		MK-4	349,000	200,000
17,500		MK-2	228,000	130,000	50,000		MK-4	369,000	220,000
17,750		MK-2	228,000	130,000					
18,000		MK-2	228,000	130,000					
18,200		MK-2	233,000	135,000					



## Spiralbohrer

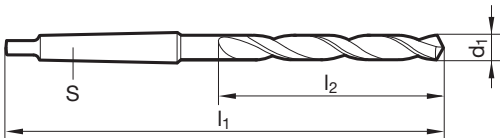
Artikel-Nr. 82012



P	M	K	N	S	H
○	●		○	○	



INOX-Drill • Kegelmantelschliff • Co-legierter HSS-Stahl • höhere Verschleißfestigkeit  
rost-/säure-/hitzebest. austenit. Stähle (V2A und V4A)



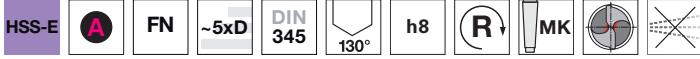
d1 mm	S	l1 mm	l2 mm	d1 mm	S	l1 mm	l2 mm
11,500	MK-1	175,000	94,000	23,000	MK-2	253,000	155,000
12,000	MK-1	182,000	101,000	26,000	MK-3	286,000	165,000
14,000	MK-1	189,000	108,000	27,500	MK-3	291,000	170,000
15,000	MK-2	212,000	114,000	28,000	MK-3	291,000	170,000
15,500	MK-2	218,000	120,000	29,000	MK-3	296,000	175,000
16,000	MK-2	218,000	120,000	29,500	MK-3	296,000	175,000
16,500	MK-2	223,000	125,000	31,500	MK-3	301,000	180,000
17,000	MK-2	223,000	125,000	32,000	MK-4	334,000	185,000
17,250	MK-2	228,000	130,000				
17,500	MK-2	228,000	130,000				
18,000	MK-2	228,000	130,000				
18,500	MK-2	233,000	135,000				
19,500	MK-2	238,000	140,000				
20,000	MK-2	238,000	140,000				
20,500	MK-2	243,000	145,000				
21,000	MK-2	243,000	145,000				
22,000	MK-2	248,000	150,000				
22,500	MK-2	253,000	155,000				

## Spiralbohrer

Artikel-Nr. 84660

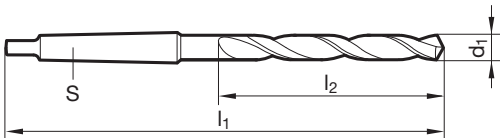


P	M	K	N	S	H
○		●	○		



Ausspitzung  $\geq \text{Ø } 14,200$  • Kegelmantelschliff • weite Spannuten • Co-legierter HSS-Stahl • höhere Verschleißbeständigkeit  
 • besonders für Bohrtiefen über 3xD

Stähle (legiert/unleg.) und Gussarten über 1000 N/mm<sup>2</sup> • Warm- und Kaltarbeitsstähle • Wälzgerstähle • hochlegierte Stähle  
 • Vergütungs- und Einsatzstähle



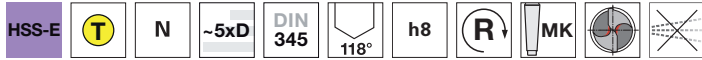
d1 mm	S	l1 mm	l2 mm	d1 mm	S	l1 mm	l2 mm
14,200	MK-2	212,000	114,000				
14,500	MK-2	212,000	114,000				
19,000	MK-2	233,000	135,000				
19,500	MK-2	238,000	140,000				
24,500	MK-3	281,000	160,000				
28,000	MK-3	291,000	170,000				

## Spiralbohrer

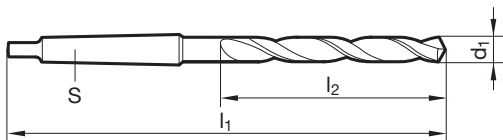
Artikel-Nr. 84859



P	M	K	N	S	H
•	○	•	○		



Ausspitzung  $\geq \text{Ø } 8,000$  • Kegelmantelschliff • Co-legierter HSS-Stahl • höhere Verschleißbeständigkeit  
 Stähle (legiert/unleg.) und Gussarten über  $800 \text{ N/mm}^2$  • Warm- und Kaltarbeitsstähle • Wälzlagerstähle • hochlegierte Stähle  
 • Vergütungs- und Einsatzstähle



d1 mm	S	l1 mm	l2 mm	d1 mm	S	l1 mm	l2 mm
8,000	MK-1	156,000	75,000				
14,000	MK-1	189,000	108,000				
23,000	MK-2	253,000	155,000				
24,500	MK-3	281,000	160,000				
31,000	MK-3	301,000	180,000				



# HARTNER

## Spiralbohrer kurz

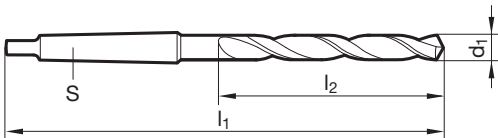
Artikel-Nr. 82972



P	M	K	N	S	H
○	●		○	○	



INOX-Drill • Kegelmantelschliff • Co-legierter HSS-Stahl • höhere Verschleißfestigkeit  
rost-/säure-/hitzebest. austenit. Stähle (V2A und V4A)



d1 mm	S	l1 mm	l2 mm	d1 mm	S	l1 mm	l2 mm
10,000	MK-1	138,000	57,000	21,500	MK-3	219,000	98,000
10,500	MK-1	138,000	57,000	29,000	MK-4	263,000	114,000
10,800	MK-1	142,000	61,000				
11,200	MK-1	142,000	61,000				
12,500	MK-1	147,000	66,000				
13,200	MK-1	147,000	66,000				



## Spiralbohrer kurz

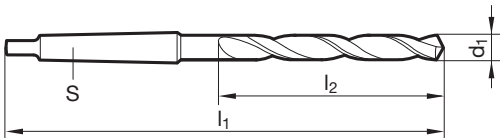
Artikel-Nr. 82971



P	M	K	N	S	H
•	•	•	○	•	○



Ausspitzung  $\geq \text{Ø } 10,000$  • Kegelmantelanschliff • Co-legierter HSS-Stahl • höhere Verschleißfestigkeit  
schwer zu bearbeitende Werkstoffe • rost-/säurebest. Stähle • Federstähle, austenitische Stähle



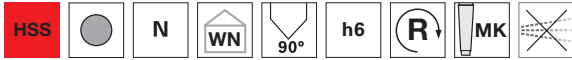
d1 mm	S	l1 mm	l2 mm	d1 mm	S	l1 mm	l2 mm
10,000	MK-1	138,000	57,000	18,500	MK-2	186,000	88,000
10,200	MK-1	138,000	57,000	19,000	MK-2	186,000	88,000
10,500	MK-1	138,000	57,000	20,000	MK-3	212,000	91,000
11,000	MK-1	142,000	61,000	21,000	MK-3	216,000	95,000
11,500	MK-1	142,000	61,000	21,500	MK-3	219,000	98,000
11,800	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	26,500	MK-4	256,000	107,000
14,500	MK-2	172,000	74,000	27,000	MK-4	259,000	110,000
15,000	MK-2	172,000	74,000	28,000	MK-4	259,000	110,000
15,500	MK-2	176,000	78,000	29,000	MK-4	263,000	114,000
16,000	MK-2	176,000	78,000	38,000	MK-5	317,000	130,000
17,000	MK-2	179,000	81,000				
17,500	MK-2	183,000	85,000				
18,000	MK-2	183,000	85,000				

## NC-Anbohrer

### Artikel-Nr. 82192



P	M	K	N	S	H
•	○	•	•	○	

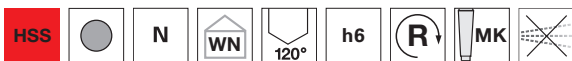


Kegelmantelschliff • nur zum Anbohren geeignet • besonders hohe Stabilität

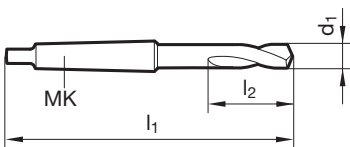
### Artikel-Nr. 82191



P	M	K	N	S	H
•	○	•	•	○	



Kegelmantelschliff • nur zum Anbohren geeignet • besonders hohe Stabilität



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					



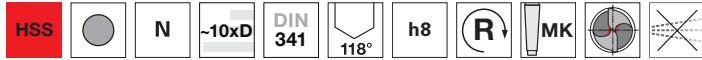


## Spiralbohrer lang

Artikel-Nr. 82210

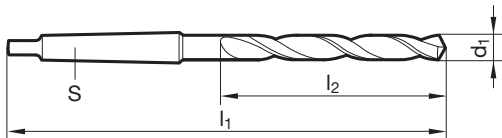


P	M	K	N	S	H
•		•	○		



Ausspitzung  $\geq \text{Ø } 14,500$  • Kegelmantelschliff • zum Bohren durch Bohrbuchsen

Stahl und Stahlguss (legiert und unleg.) • Grauguss, Temperguss, Sphäroguss • Sintereisen, Neusilber und Graphit



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



## Spiralbohrer lang

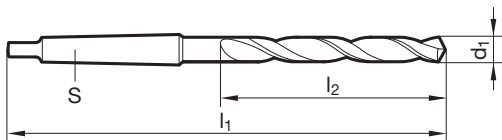
Artikel-Nr. 82211



P	M	K	N	S	H
•	○	•	•	○	



Ausspitzung  $\geq \varnothing 5,000$  • Kegelmantelschliff • Co-legierter HSS-Stahl • höhere Verschleißfestigkeit • zum Bohren durch Bohrbuchsen  
 Stähle (legiert und unleg.) und Gussarten über 800 N/mm<sup>2</sup> • Warm- und Kaltarbeitsstähle • Wälzlagerstähle • hochlegierte Stähle  
 • Vergütungs- und Einsatzstähle



d1 mm	inch	S	l1 mm	l2 mm	d1 mm	inch	S	l1 mm	l2 mm
5,000		MK-1	155,000	74,000	18,000		MK-2	263,000	165,000
6,800		MK-1	174,000	93,000	20,000		MK-2	275,000	177,000
8,500		MK-1	181,000	100,000	22,500		MK-2	296,000	198,000
10,000		MK-1	197,000	116,000	23,000		MK-2	296,000	198,000
10,200		MK-1	197,000	116,000	25,000	63/64	MK-3	327,000	206,000
11,500		MK-1	206,000	125,000	30,000		MK-3	351,000	230,000
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					
17,500		MK-2	263,000	165,000					

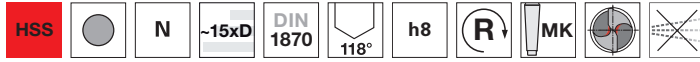


## Spiralbohrer überlang, Reihe 1

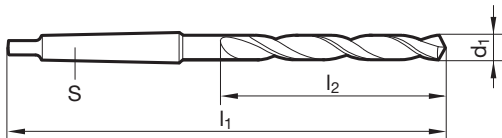
Artikel-Nr. 82310



P	M	K	N	S	H
•		•	○		



Ausspitzung  $\geq \text{Ø } 8,500$  • Kegelmantelschliff • für extrem tiefe Bohrungen  
 Stahl und Stahlguss (legiert und unleg.) • Grauguss, Temperguss, Sphäroguss • Sinterisen und Graphit



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



## Spiralbohrer überlang, Reihe 1

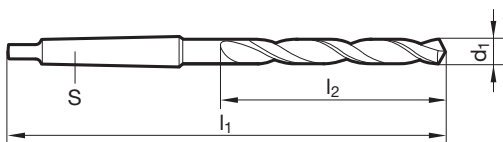
Artikel-Nr. 82340



P	M	K	N	S	H
•		•	•		



Ausspitzung  $\geq \text{Ø } 8,000$  • Kegelmantelschliff • weite Spannuten • für extrem tiefe Bohrungen • bei schlechter Spanabfuhr  
 Grauguss und Stähle bis  $1000 \text{ N/mm}^2$  • Ausnahmen: CrNi-Stähle, VA-Stähle u.ä.



d1 mm	inch	S	l1 mm	l2 mm	d1 mm	inch	S	l1 mm	l2 mm
8,000		MK-1	265,000	165,000	17,000		MK-2	355,000	230,000
8,500		MK-1	265,000	165,000	17,500		MK-2	370,000	245,000
8,700		MK-1	275,000	175,000	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					



## Spiralbohrer überlang, Reihe 1

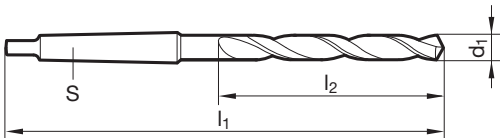
Artikel-Nr. 82341



P	M	K	N	S	H
•	•	•	•	•	○



Ausspitzung  $\geq \text{Ø } 10,000$  • Kegelmantelschliff • weite Spannuten • höhere Verschleißfestigkeit • Co-legierter HSS-Stahl • für extrem tiefe Bohrungen • bei schlechter Spanabfuhr  
 Stähle und Stahlguss hoher Festigkeit • Grauguss, Temperguss, Sphäroguss



d1 mm	S	l1 mm	l2 mm	d1 mm	S	l1 mm	l2 mm
10,000	MK-1	285,000	185,000				
14,000	MK-1	325,000	220,000				
15,000	MK-2	340,000	220,000				
16,500	MK-2	355,000	230,000				
17,000	MK-2	355,000	230,000				

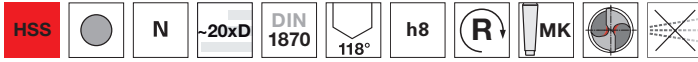


## Spiralbohrer überlang, Reihe 2

Artikel-Nr. 82410

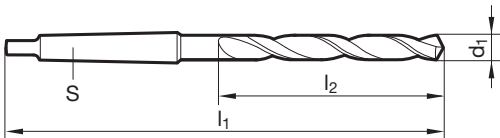


P	M	K	N	S	H
•		•	○		



Ausspitzung  $\geq \text{Ø } 8,500$  • Kegelmantelschliff • für extrem tiefe Bohrungen

Stahl und Stahlguss (legiert und unleg.) • Grauguss, Temperguss, Sphäroguss • Sintereisen und Graphit



d1 mm	inch	S	l1 mm	l2 mm	d1 mm	inch	S	l1 mm	l2 mm
8,500		MK-1	330,000	210,000	16,000		MK-2	445,000	295,000
9,000		MK-1	345,000	220,000	18,000		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	20,000		MK-2	490,000	325,000
10,500		MK-1	360,000	235,000	21,000		MK-2	490,000	325,000
11,000		MK-1	375,000	250,000	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	30,000		MK-3	580,000	385,000
15,500		MK-2	445,000	295,000	49,000		MK-4	765,000	510,000



## Spiralbohrer überlang, Reihe 2

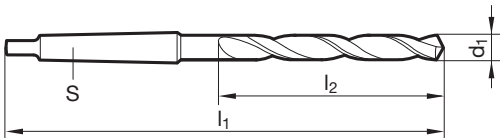
Artikel-Nr. 82440



P	M	K	N	S	H
•		•	•		



Ausspitzung  $\geq \text{Ø } 8,000$  • Kegelmantelschliff • weite Spannuten • für extrem tiefe Bohrungen • bei schlechter Spanabfuhr  
 Grauguss und Stähle bis  $1000 \text{ N/mm}^2$  • Ausnahmen: CrNi-Stähle, VA-Stähle u.ä.



d1 mm	inch	S	l1 mm	l2 mm	d1 mm	inch	S	l1 mm	l2 mm
8,000		MK-1	330,000	210,000	17,000		MK-2	445,000	295,000
8,500		MK-1	330,000	210,000	17,500		MK-2	465,000	310,000
9,000		MK-1	345,000	220,000	18,000		MK-2	465,000	310,000
9,500		MK-1	345,000	220,000	18,500		MK-2	465,000	310,000
9,800		MK-1	360,000	235,000	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	22,000		MK-2	515,000	345,000
13,000		MK-1	395,000	260,000	23,000		MK-2	515,000	345,000
13,500		MK-1	410,000	275,000	24,000		MK-3	555,000	365,000
14,000		MK-1	410,000	275,000	25,000	63/64	MK-3	555,000	365,000
14,500		MK-2	425,000	275,000	26,000		MK-3	555,000	365,000
15,000		MK-2	425,000	275,000	28,000		MK-3	580,000	385,000
15,500		MK-2	445,000	295,000	29,000		MK-3	580,000	385,000
16,000		MK-2	445,000	295,000	30,000		MK-3	580,000	385,000
16,500		MK-2	445,000	295,000					



## Spiralbohrer extra lang

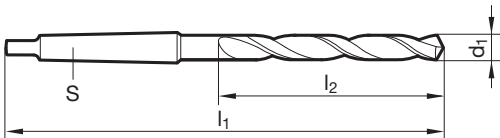
Artikel-Nr. 82466



P	M	K	N	S	H
•		•	•		



Ausspitzung  $\geq \text{Ø } 8,000$  • Kegelmantelschliff • weite Spannuten • für extrem tiefe Bohrungen • bei schlechter Spanabfuhr  
 Grauguss und Stähle bis  $1000 \text{ N/mm}^2$  • Ausnahmen: CrNi-Stähle, VA-Stähle u.ä.



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				





## Spiralbohrer extra lang

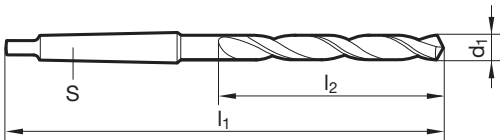
Artikel-Nr. 82467



P	M	K	N	S	H
•		•	•		



Ausspitzung  $\geq \text{Ø } 14,000$  • Kegelmantelanschliff • weite Spannuten • für extrem tiefe Bohrungen • bei schlechter Spanabfuhr Grauguss und Stähle bis  $1000 \text{ N/mm}^2$  • Ausnahmen: CrNi-Stähle, VA-Stähle u.ä.



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	38,000	MK-4	600,000	450,000
16,000	MK-2	600,000	500,000				
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				

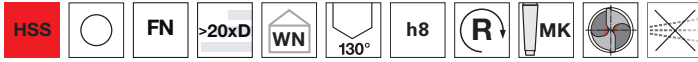


## Spiralbohrer extra lang

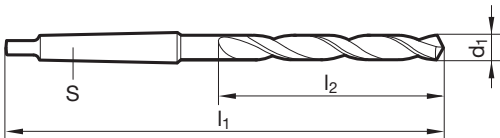
Artikel-Nr. 82468



P	M	K	N	S	H
•		•	•		



Ausspitzung  $\geq \text{Ø } 14,000$  • Kegelmantelanschliff • weite Spannuten • für extrem tiefe Bohrungen • bei schlechter Spanabfuhr Grauguss und Stähle bis  $1000 \text{ N/mm}^2$  • Ausnahmen: CrNi-Stähle, VA-Stähle u.ä.



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				

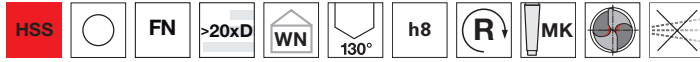


## Spiralbohrer extra lang

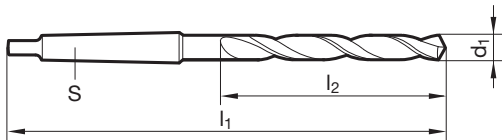
Artikel-Nr. 82469



P	M	K	N	S	H
•		•	•		



Ausspitzung  $\geq \text{Ø } 15,000$  • Kegelmantelschliff • weite Spannuten • für extrem tiefe Bohrungen • bei schlechter Spanabfuhr Grauguss und Stähle bis  $1000 \text{ N/mm}^2$  • Ausnahmen: CrNi-Stähle, VA-Stähle u.ä.



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				





## Kühlkanalbohrer lang

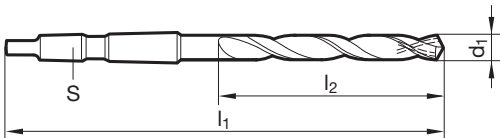
Artikel-Nr. 82535



P	M	K	N	S	H
•		•	•		



Ausspitzung  $\geq \text{Ø } 10,000$  • Kegelmantelanschliff • Kühlmittelzufuhr axial durch den Morsekegel • zum Bohren durch Bohrbuchsen  
Blechpakete • Stahl und Stahlguss, Grauguss • austenitische Stähle bis 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				



## Kühlkanalbohrer lang

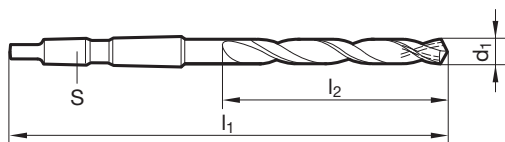
Artikel-Nr. 82521



P	M	K	N	S	H
•	○	•	•	○	



Ausspitzung  $\geq \text{Ø } 10,000$  • Kegelmantelanschliff • Kühlmittelzufuhr axial durch den Morsekegel • zum Bohren durch Bohrbuchsen  
Blechpakete • Stahl und Stahlguss, Grauguss • austenitische Stähle bis 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	21,000	MK-3	320,000	184,000
11,000	MK-2	242,000	125,000	22,000	MK-3	327,000	191,000
12,000	MK-2	251,000	134,000	23,000	MK-3	334,000	198,000
13,000	MK-2	251,000	134,000	24,000	MK-3	342,000	206,000
13,200	MK-2	251,000	134,000	25,000	MK-3	342,000	206,000
13,500	MK-2	259,000	142,000	26,000	MK-3	350,000	214,000
13,800	MK-2	259,000	142,000	26,500	MK-3	350,000	214,000
14,000	MK-2	259,000	142,000	27,000	MK-4	385,000	222,000
15,000	MK-2	264,000	147,000	28,000	MK-4	385,000	222,000
16,000	MK-2	270,000	153,000	29,000	MK-4	393,000	230,000
16,250	MK-2	276,000	159,000	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	33,000	MK-4	421,000	248,000
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				



## Kühlkanalbohrer lang

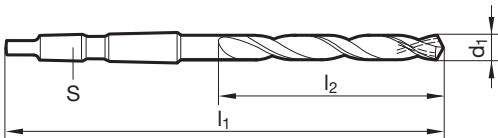
Artikel-Nr. 82525



P	M	K	N	S	H
•	•	•	•	•	○



Ausspitzung  $\geq \text{Ø } 15,000$  • Kegelmantelanschliff • Kühlmittelzufuhr axial durch den Morsekegel • Co-legierter HSS-Stahl • höhere Verschleißfestigkeit • zum Bohren durch Bohrbuchsen  
 feste und hochfeste Stähle • Stahlguss, Grauguss • rost-/säure-/hitzebeständige Stähle • Festigkeiten bis zu 1300 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				



## Kühlkanalbohrer überlang

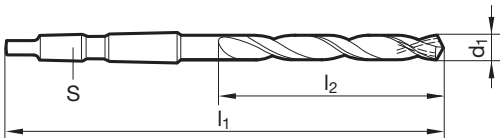
Artikel-Nr. 82515



P	M	K	N	S	H
•	•	•	•	•	○



Ausspitzung  $\geq \text{Ø } 14,000$  • Kegelmantelschliff • Kühlmittelzufuhr axial durch den Morsekegel • Co-legierter HSS-Stahl • höhere Verschleißfestigkeit • zum Bohren durch Bohrbuchsen  
 feste und hochfeste Stähle • Stahlguss, Grauguss • rost-/säure-/hitzebeständige Stähle • Festigkeiten bis zu 1300 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	29,000	MK-4	468,000	305,000
15,000	MK-2	337,000	220,000				
16,000	MK-2	347,000	230,000				
17,500	MK-2	362,000	245,000				
18,000	MK-2	362,000	245,000				
20,000	MK-3	396,000	260,000				

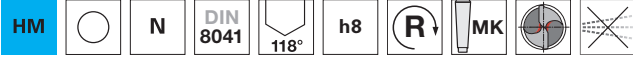


## Spiralbohrer mit HM-Schneiden

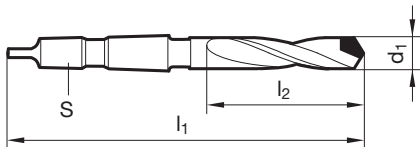
Artikel-Nr. 89302



P	M	K	N	S	H
○		○			○



Ausspitzung  $\geq \varnothing 8,500$  • Flächenanschliff • HM-bestückt  
 Federbandstahl • Hartguss über 300 HB • Reinstmolybdän • zähnharte Bronzen



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	30,000	MK-4	275,000	125,000
13,500	MK-2	168,000	63,000	32,000	MK-4	275,000	125,000
14,000	MK-2	168,000	63,000	33,000	MK-4	290,000	140,000
14,500	MK-2	168,000	63,000	40,000	MK-4	310,000	160,000
15,000	MK-2	168,000	63,000				
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				





## Aufbohrer mit Morsekegel

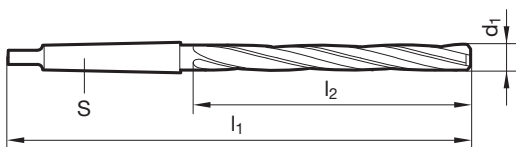
Artikel-Nr. 86110



P	M	K	N	S	H
•	○	•	○		



Kegelmantelanschiff • dreischneidig • besonders hohe Stabilität • für vorgebohrte/vorgegossene/vorgestanzte Löcher • korrigiert Fluchtungsungenauigkeit • korrigiert Unrundheit • verbessert Bohrungsoberfläche • Anschnitt-Ø < aufzubohrendes Loch • daher kleinsten Ø „d0“ der vorgefertigten Bohrung beachten • nach Aufbohren einwandfrei Fertigreiben



d1 mm	d0 mm	S	l1 mm	l2 mm	d1 mm	d0 mm	S	l1 mm	l2 mm
8,600	6,3	MK-1	162,000	81,000	22,000	15,3	MK-2	248,000	150,000
9,000	6,3	MK-1	162,000	81,000	22,700	16,0	MK-2	253,000	155,000
9,800	7,0	MK-1	168,000	87,000	23,000	16,0	MK-2	253,000	155,000
10,000	7,0	MK-1	168,000	87,000	24,000	16,6	MK-3	281,000	160,000
10,100	7,0	MK-1	168,000	87,000	25,000	17,3	MK-3	281,000	160,000
11,000	7,7	MK-1	175,000	94,000	25,700	18,0	MK-3	286,000	165,000
11,500	7,7	MK-1	175,000	94,000	26,000	18,0	MK-3	286,000	165,000
11,600	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					



## Aufbohrer mit Morsekegel

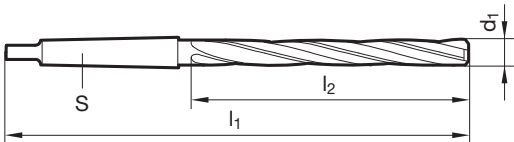
Artikel-Nr. 86111



P	M	K	N	S	H
•	○	•	•	○	



Kegelmantelanschiff • dreischneidig • besonders hohe Stabilität • für vorgebohrte/vorgegossene/vorgestanzte Löcher • korrigiert Fluchtungsungenauigkeit • korrigiert Unrundheit • verbessert Bohrungsoberfläche • Anschnitt-Ø < aufzubohrendes Loch • daher kleinsten Ø „d0“ der vorgefertigten Bohrung beachten • nach Aufbohren einwandfrei Fertigreiben



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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## Stiftlochbohrer

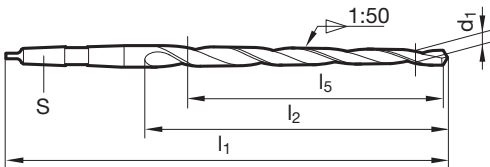
Artikel-Nr. 82810



P	M	K	N	S	H
•	○	•	○		



Ausspitzung  $\geq \varnothing 13,000$  • Kegelmantelanschliff • für Kegelbohrungen zur Aufnahme von Kegelstiften nach DIN 1 (neu: DIN EN 22339), DIN 7978 (neu: DIN EN 28736), DIN 7977 (neu: DIN EN 28737) und 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	20,000	MK-3	377,000	263,000	250,000
6,000	MK-1	187,000	108,000	105,000					
8,000	MK-1	227,000	149,000	145,000					
10,000	MK-1	257,000	180,000	175,000					
13,000	MK-2	325,000	229,000	220,000					
14,000	MK-2	325,000	229,000	220,000					



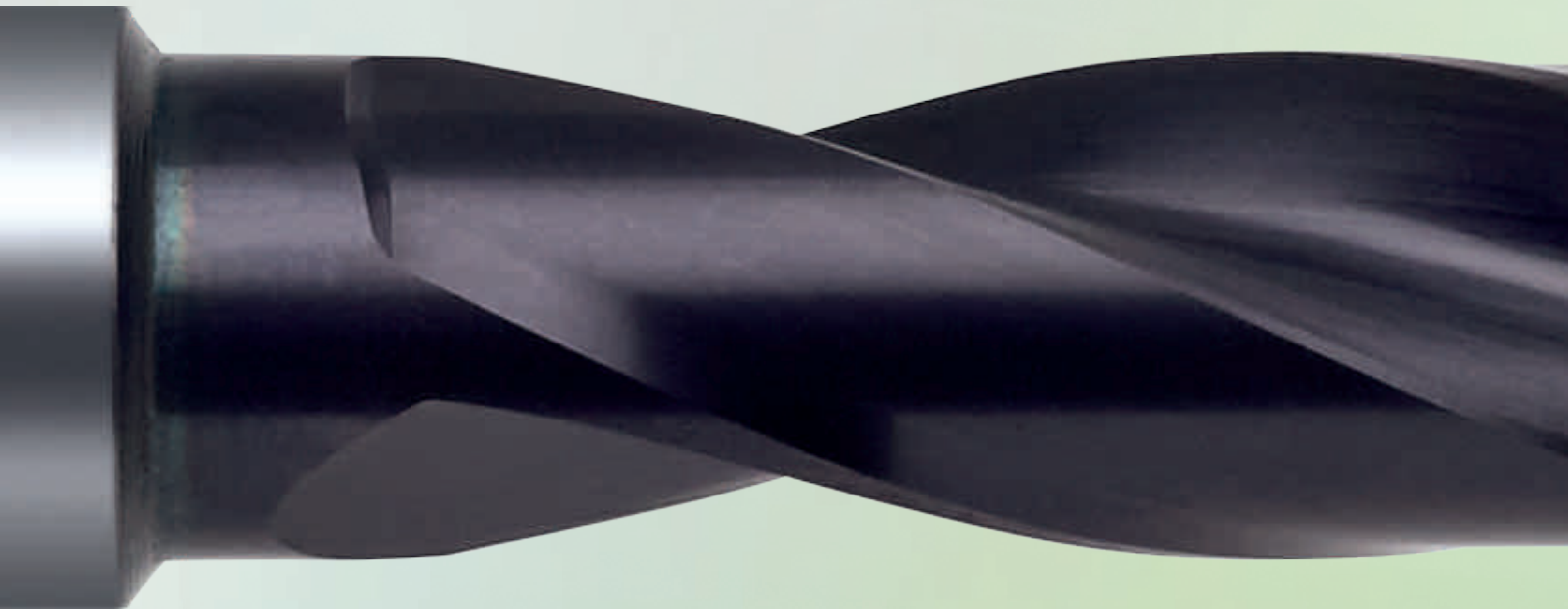
# HARTNER

Präzisionswerkzeuge

15/20/25/30/40xD



# TS-DRILLS





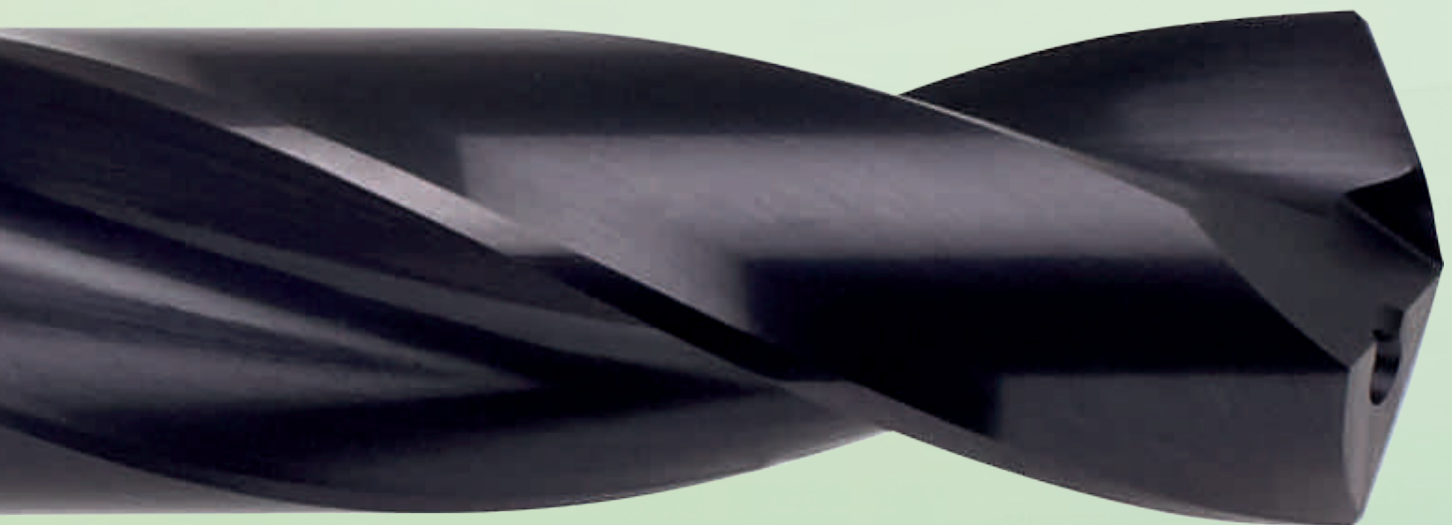
# HARTNER

Präzisionswerkzeuge

TS-Drills









## TS-DRILLS

High-Tech-Werkzeug aus Vollhartmetall  
blank und beschichtet











P	M	K	N	S	H	Norm	Typ	Schneidstoff	Oberfläche	Schneid- richtung	Schaft- form	Bohrtiefe	d1/mm	Artikel-Nr.	Progr. Seite
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## TS-Drills ohne Innenkühlung











	•	○	•	○	○	DIN 6537K	TS 100 U	VHM		rechts	HE	3xD	3,000 - 20,000	89264	196
	•	○	•	○	○	DIN 6537K	TS 100 U	VHM		rechts	HE	3xD	3,000 - 20,000	89402	194
	•	○	•	○	○	DIN 6537K	TS 100 U	VHM		rechts	HA	3xD	3,000 - 20,000	89413	194
	•	○	○	○	○	DIN 6537K	TS 100 H	VHM		rechts	HA	3xD	3,000 - 20,000	89422	198
	•	○	•	○	○	DIN 6539	TS 100 U	VHM		rechts	zyl.	3xD	3,000 - 16,000	89237	200
	•	○	•	○	○	DIN 6539	TS 100 U	VHM		rechts	zyl.	3xD	3,000 - 16,000	89401	200
	•	○	•	○	○	DIN 6537L	TS 100 U	VHM		rechts	HA	5xD	3,000 - 20,000	89414	202
	•	○	•	○	○	DIN 6537L	TS 100 U	VHM		rechts	HE	5xD	3,000 - 20,000	89417	202
	•	○	•	○	○	Werksnorm	TS 100 U	VHM		rechts	zyl.	5xD	5,000 - 16,000	89275	204

## TS-Drills mit Innenkühlung

	•	○	○	○	○	DIN 6538K	TS 80 U	HM		rechts	HE	3xD	10,000 - 25,000	89306	208
	•	○	•	○	○	DIN 6537K	TS 100 U	VHM		rechts	HE	3xD	4,000 - 20,000	89266	207
	•	○	•	○	○	DIN 6537K	TS 100 U	VHM		rechts	HA	3xD	3,000 - 20,000	89410	205
	•	○	•	○	○	DIN 6537K	TS 100 U	VHM		rechts	HE	3xD	3,000 - 20,000	89415	205

P	M	K	N	S	H	Norm	Typ	Schneidstoff	Oberfläche	Schneid- richtung	Schaft- form	Bohrtiefe	d1/mm	Artikel-Nr.	Progr. Seite
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## TS-Drills mit Innenkühlung

	•				○	DIN 6537K	TS 100 H	VHM	Y	rechts	HA	3xD	3,000 - 20,000	89423	211
	•				○	DIN 6537K	TS 100 H	VHM	Y	rechts	HE	3xD	3,000 - 20,000	89424	211
	•					DIN 6537K	TS 100 INOX	VHM	a	rechts	HA	3xD	3,000 - 20,000	89450	209
	•					DIN 6537K	TS 100 INOX	VHM	a	rechts	HE	3xD	3,000 - 20,000	89550	209
						Werksnorm	TS 150 GG	VHM	○	rechts	HA	4xD	3,000 - 20,000	89292	213
	•	○	○	○		DIN 6538M	TS 80 U	HM	T	rechts	HE	5xD	9,800 - 25,500	89307	217
	•	○	○	○	○	DIN 6537L	TS 100 U	VHM	T	rechts	HE	5xD	3,700 - 19,500	89272	214
	•	○	○	○	○	DIN 6537L	TS 100 U	VHM	F	rechts	HE	5xD	3,000 - 20,000	89408	215
	•	○	○	○	○	DIN 6537L	TS 100 U	VHM	F	rechts	HA	5xD	3,000 - 20,000	89411	215
						DIN 6537L	TS 100 R	VHM	F	rechts	HA	5xD	3,000 - 20,000	89420	222
	•				○	DIN 6537L	TS 100 H	VHM	Y	rechts	HA	5xD	3,000 - 20,000	89425	220
	•				○	DIN 6537L	TS 100 H	VHM	Y	rechts	HE	5xD	3,000 - 20,000	89426	220
						DIN 6537L	TS 100 INOX	VHM	a	rechts	HA	5xD	3,000 - 20,000	89451	218
	•					DIN 6537L	TS 100 INOX	VHM	a	rechts	HE	5xD	3,000 - 20,000	89551	218



P	M	K	N	S	H	Norm	Typ	Schneidstoff	Oberfläche	Schneid- richtung	Schaft- form	Bohrtiefe	d1/mm	Artikel-Nr.	Progr. Seite
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## TS-Drills mit Innenkühlung

	•	○	○	○	○	DIN 6538L	TS 80 U	<b>HM</b>		rechts	HE	7xD	10,000 - 22,000	<b>89308</b>	226
	○	○	○	○	○	Werksnorm	TS 150 GG	<b>VHM</b>	○	rechts	HA	7xD	3,000 - 20,000	<b>89294</b>	230
	•	○	○	○	○	Werksnorm	TS 100 U	<b>VHM</b>		rechts	HA	7xD	3,000 - 20,000	<b>89412</b>	224
	•	○	○	○	○	Werksnorm	TS 100 U	<b>VHM</b>		rechts	HE	7xD	3,000 - 20,000	<b>89416</b>	224
	○	○	○	○	○	Werksnorm	TS 100 R	<b>VHM</b>		rechts	HA	7xD	4,000 - 20,000	<b>89421</b>	228
	•	○	○	○	○	Werksnorm	TS 100 H	<b>VHM</b>		rechts	HA	7xD	3,000 - 16,000	<b>89427</b>	227
	○	○	○	○	○	Werksnorm	TS 150 GG	<b>VHM</b>	○	rechts	HA	10xD	3,000 - 20,000	<b>89293</b>	231
	○	○	○	○	○	Werksnorm	TS 150 GG	<b>VHM</b>	○	rechts	HA	10xD	3,000 - 20,000	<b>89295</b>	231
	•	○	○	○	○	Werksnorm	TS 100 U	<b>VHM</b>		rechts	HA	12xD	3,000 - 20,000	<b>89418</b>	233
	•	•	○	○	○	Werksnorm	TS 100 T	<b>VHM</b>		rechts	HA	15xD	3,000 - 14,000	<b>86509</b>	235
	•	•	○	○	○	Werksnorm	TS 100 T	<b>VHM</b>		rechts	HA	20xD	3,000 - 14,000	<b>86511</b>	236
	•	•	○	○	○	Werksnorm	TS 100 T	<b>VHM</b>		rechts	HA	25xD	3,000 - 12,000	<b>86512</b>	237
	•	•	○	○	○	Werksnorm	TS 100 T	<b>VHM</b>		rechts	HA	30xD	3,000 - 10,000	<b>86513</b>	238
	•	•	○	○	○	Werksnorm	TS 100 T	<b>VHM</b>		rechts	HA	40xD	3,000 - 8,000	<b>86514</b>	239

P	M	K	N	S	H	Norm	Typ	Schneidstoff	Oberfläche	Schneid- richtung	Schaft- form	Bohrtiefe	d1/mm	Artikel-Nr.	Progr. Seite
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## TS-Drills, 3-schneidig



		•	•			DIN 6537L	TS 3 G	VHM	○	rechts	HA	5xD	3,000 - 20,000	89247	240
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		•	•			DIN 6539	TS 3 G	VHM	○	rechts	zyl.	5xD	3,000 - 20,000	89239	241
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## Entgratgabeln



•	•	•	○	•	○	Werksnorm	TS 100 EG	VHM	○	rechts	zyl.			84100	243
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•	•	•	○	•	○	Werksnorm	TS 100 EG	VHM	○	rechts	HA			84101	244
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## Vor- und Rückwärtsentgrater 90°



•	•	•	○	•	○	Werksnorm	TS 100 VR	VHM	ⓐ	rechts	HA		3,000 - 12,000	80495	245
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## TS-Drills ohne Innenkühlung

### Artikel-Nr. 89413



P	M	K	N	S	H
●	○	●	○	○	○



Ausspitzung  $\geq \varnothing 3,000$  • Flächenanschliff • Hauptschneidenform gerade • optimierte Schneidengeometrie  
 Bau- und Einsatzstähle • Automatenstähle, Vergütungsstähle • Stähle (legiert/unleg.) bis 1200 N/mm<sup>2</sup> • Gusswerkstoffe • Bronze, Messing • hochlegierte AlSi-Legierungen

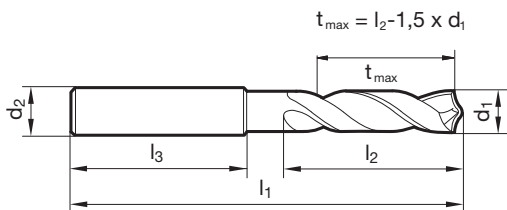
### Artikel-Nr. 89402



P	M	K	N	S	H
●	○	●	○	○	○



Ausspitzung  $\geq \varnothing 3,000$  • Flächenanschliff • Hauptschneidenform gerade • optimierte Schneidengeometrie  
 Bau- und Einsatzstähle • Automatenstähle, Vergütungsstähle • Stähle (legiert/unleg.) bis 1200 N/mm<sup>2</sup> • Gusswerkstoffe • Bronze, Messing • hochlegierte AlSi-Legierungen



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	62,000	20,000	36,000	5,200		6,000	66,000	28,000	36,000
3,100		6,000	62,000	20,000	36,000	5,300		6,000	66,000	28,000	36,000
3,170	1/8	6,000	62,000	20,000	36,000	5,400		6,000	66,000	28,000	36,000
3,200		6,000	62,000	20,000	36,000	5,500		6,000	66,000	28,000	36,000
3,250		6,000	62,000	20,000	36,000	5,550		6,000	66,000	28,000	36,000
3,300		6,000	62,000	20,000	36,000	5,560	7/32	6,000	66,000	28,000	36,000
3,400		6,000	62,000	20,000	36,000	5,600		6,000	66,000	28,000	36,000
3,500		6,000	62,000	20,000	36,000	5,700		6,000	66,000	28,000	36,000
3,570	9/64	6,000	62,000	20,000	36,000	5,800		6,000	66,000	28,000	36,000
3,600		6,000	62,000	20,000	36,000	5,900		6,000	66,000	28,000	36,000
3,700		6,000	62,000	20,000	36,000	5,950	15/64	6,000	66,000	28,000	36,000
3,800		6,000	66,000	24,000	36,000	6,000		6,000	66,000	28,000	36,000
3,900		6,000	66,000	24,000	36,000	6,100		8,000	79,000	34,000	36,000
3,970	5/32	6,000	66,000	24,000	36,000	6,200		8,000	79,000	34,000	36,000
4,000		6,000	66,000	24,000	36,000	6,300		8,000	79,000	34,000	36,000
4,100		6,000	66,000	24,000	36,000	6,350	1/4	8,000	79,000	34,000	36,000
4,200		6,000	66,000	24,000	36,000	6,400		8,000	79,000	34,000	36,000
4,300		6,000	66,000	24,000	36,000	6,500		8,000	79,000	34,000	36,000
4,370	11/64	6,000	66,000	24,000	36,000	6,600		8,000	79,000	34,000	36,000
4,400		6,000	66,000	24,000	36,000	6,700		8,000	79,000	34,000	36,000
4,500		6,000	66,000	24,000	36,000	6,750	17/64	8,000	79,000	34,000	36,000
4,600		6,000	66,000	24,000	36,000	6,800		8,000	79,000	34,000	36,000
4,650		6,000	66,000	24,000	36,000	6,900		8,000	79,000	34,000	36,000
4,700		6,000	66,000	24,000	36,000	7,000		8,000	79,000	34,000	36,000
4,760	3/16	6,000	66,000	28,000	36,000	7,100		8,000	79,000	41,000	36,000
4,800		6,000	66,000	28,000	36,000	7,140	9/32	8,000	79,000	41,000	36,000
4,900		6,000	66,000	28,000	36,000	7,200		8,000	79,000	41,000	36,000
5,000		6,000	66,000	28,000	36,000	7,300		8,000	79,000	41,000	36,000
5,100		6,000	66,000	28,000	36,000	7,400		8,000	79,000	41,000	36,000
5,160	13/64	6,000	66,000	28,000	36,000	7,500		8,000	79,000	41,000	36,000



## TS-Drills ohne Innenkühlung

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

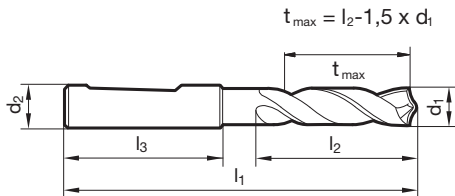
Artikel-Nr. 89264



P	M	K	N	S	H
●	○	●	○	○	○



Ausspitzung  $\geq \text{Ø } 3,000$  • Flächenanschliff • Hauptschneidenform gerade • optimierte Schneidengeometrie  
 Bau- und Einsatzstähle • Automatenstähle, Vergütungsstähle • Stähle (legiert/unleg.) bis  $1200 \text{ N/mm}^2$  • Gusswerkstoffe • Bronze, Messing • hochlegierte AlSi-Legierungen



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	7,140	9/32	8,000	79,000	41,000	36,000
3,100		6,000	62,000	20,000	36,000	7,400		8,000	79,000	41,000	36,000
3,200		6,000	62,000	20,000	36,000	7,500		8,000	79,000	41,000	36,000
3,300		6,000	62,000	20,000	36,000	7,600		8,000	79,000	41,000	36,000
3,400		6,000	62,000	20,000	36,000	7,700		8,000	79,000	41,000	36,000
3,500		6,000	62,000	20,000	36,000	7,800		8,000	79,000	41,000	36,000
3,600		6,000	62,000	20,000	36,000	7,900		8,000	79,000	41,000	36,000
3,700		6,000	62,000	20,000	36,000	8,000		8,000	79,000	41,000	36,000
3,800		6,000	66,000	24,000	36,000	8,100		10,000	89,000	47,000	40,000
3,900		6,000	66,000	24,000	36,000	8,200		10,000	89,000	47,000	40,000
4,000		6,000	66,000	24,000	36,000	8,300		10,000	89,000	47,000	40,000
4,100		6,000	66,000	24,000	36,000	8,330	21/64	10,000	89,000	47,000	40,000
4,200		6,000	66,000	24,000	36,000	8,400		10,000	89,000	47,000	40,000
4,300		6,000	66,000	24,000	36,000	8,500		10,000	89,000	47,000	40,000
4,500		6,000	66,000	24,000	36,000	8,700		10,000	89,000	47,000	40,000
4,600		6,000	66,000	24,000	36,000	8,730	11/32	10,000	89,000	47,000	40,000
4,700		6,000	66,000	24,000	36,000	8,800		10,000	89,000	47,000	40,000
4,760	3/16	6,000	66,000	28,000	36,000	8,900		10,000	89,000	47,000	40,000
4,800		6,000	66,000	28,000	36,000	9,000		10,000	89,000	47,000	40,000
4,900		6,000	66,000	28,000	36,000	9,100		10,000	89,000	47,000	40,000
5,000		6,000	66,000	28,000	36,000	9,300		10,000	89,000	47,000	40,000
5,100		6,000	66,000	28,000	36,000	9,400		10,000	89,000	47,000	40,000
5,200		6,000	66,000	28,000	36,000	9,500		10,000	89,000	47,000	40,000
5,300		6,000	66,000	28,000	36,000	9,600		10,000	89,000	47,000	40,000
5,400		6,000	66,000	28,000	36,000	9,700		10,000	89,000	47,000	40,000
5,500		6,000	66,000	28,000	36,000	9,800		10,000	89,000	47,000	40,000
5,560	7/32	6,000	66,000	28,000	36,000	9,900		10,000	89,000	47,000	40,000
5,600		6,000	66,000	28,000	36,000	9,920	25/64	10,000	89,000	47,000	40,000
5,700		6,000	66,000	28,000	36,000	10,000		10,000	89,000	47,000	40,000
5,800		6,000	66,000	28,000	36,000	10,100		12,000	102,000	55,000	45,000
5,900		6,000	66,000	28,000	36,000	10,200		12,000	102,000	55,000	45,000
6,000		6,000	66,000	28,000	36,000	10,300		12,000	102,000	55,000	45,000
6,100		8,000	79,000	34,000	36,000	10,500		12,000	102,000	55,000	45,000
6,200		8,000	79,000	34,000	36,000	10,600		12,000	102,000	55,000	45,000
6,300		8,000	79,000	34,000	36,000	10,800		12,000	102,000	55,000	45,000
6,400		8,000	79,000	34,000	36,000	11,000		12,000	102,000	55,000	45,000
6,500		8,000	79,000	34,000	36,000	11,100		12,000	102,000	55,000	45,000
6,600		8,000	79,000	34,000	36,000	11,200		12,000	102,000	55,000	45,000
6,700		8,000	79,000	34,000	36,000	11,400		12,000	102,000	55,000	45,000
6,750	17/64	8,000	79,000	34,000	36,000	11,500		12,000	102,000	55,000	45,000
6,800		8,000	79,000	34,000	36,000	11,600		12,000	102,000	55,000	45,000
7,000		8,000	79,000	34,000	36,000	11,700		12,000	102,000	55,000	45,000



## TS-Drills ohne Innenkühlung

d1 mm	inch	d2 h6 mm	l1 mm	l2 mm	l3 mm	d1 mm	inch	d2 h6 mm	l1 mm	l2 mm	l3 mm
11,800		12,000	102,000	55,000	45,000	14,400		16,000	115,000	65,000	48,000
11,900		12,000	102,000	55,000	45,000	15,000		16,000	115,000	65,000	48,000
12,000		12,000	102,000	55,000	45,000	15,200		16,000	115,000	65,000	48,000
12,100		14,000	107,000	60,000	45,000	15,800		16,000	115,000	65,000	48,000
12,200		14,000	107,000	60,000	45,000	15,870	5/8	16,000	115,000	65,000	48,000
12,300	31/64	14,000	107,000	60,000	45,000	16,000		16,000	115,000	65,000	48,000
12,400		14,000	107,000	60,000	45,000	16,100		18,000	123,000	73,000	48,000
12,500		14,000	107,000	60,000	45,000	16,300		18,000	123,000	73,000	48,000
13,000		14,000	107,000	60,000	45,000	16,500		18,000	123,000	73,000	48,000
13,200		14,000	107,000	60,000	45,000	17,000		18,000	123,000	73,000	48,000
13,300		14,000	107,000	60,000	45,000	17,500		18,000	123,000	73,000	48,000
13,500		14,000	107,000	60,000	45,000	18,000		18,000	123,000	73,000	48,000
13,800		14,000	107,000	60,000	45,000	18,300		20,000	131,000	79,000	50,000
13,890	35/64	14,000	107,000	60,000	45,000	19,000		20,000	131,000	79,000	50,000
14,000		14,000	107,000	60,000	45,000	19,200		20,000	131,000	79,000	50,000
14,200		16,000	115,000	65,000	48,000	19,500		20,000	131,000	79,000	50,000
14,290	9/16	16,000	115,000	65,000	48,000	20,000		20,000	131,000	79,000	50,000
14,300		16,000	115,000	65,000	48,000						



## TS-Drills ohne Innenkühlung

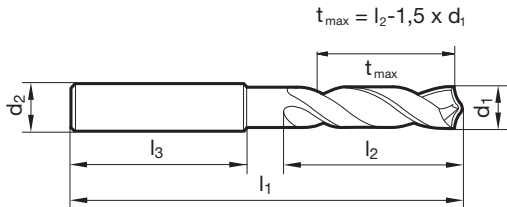
Artikel-Nr. 89422



P	M	K	N	S	H
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Ausspitzung  $\geq \text{Ø } 3,000$  • Kegelmantelschliff • Hauptschneidenform leicht konkav • optimierte Schneidengeometrie  
 legierte und hochfeste Stähle bis  $1400 \text{ N/mm}^2$  • Inconel, Hastelloy, Monel • Titan und Titanlegierungen



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 ohne Innenkühlung

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 ohne Innenkühlung

### Artikel-Nr. 89237



P	M	K	N	S	H
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Ausspitzung  $\geq \varnothing 3,000$  • Flächenanschliff • Hauptschneidenform gerade • optimierte Schneidengeometrie  
 Bau- und Einsatzstähle • Automatenstähle, Vergütungsstähle • Stähle (legiert/unleg.) bis 1200 N/mm<sup>2</sup> • Gusswerkstoffe • Bronze, Messing • hochlegierte AlSi-Legierungen

### Artikel-Nr. 89401

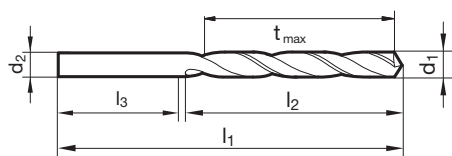


P	M	K	N	S	H
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Ausspitzung  $\geq \varnothing 3,000$  • Flächenanschliff • Hauptschneidenform gerade • optimierte Schneidengeometrie  
 Bau- und Einsatzstähle • Automatenstähle, Vergütungsstähle • Stähle (legiert/unleg.) bis 1200 N/mm<sup>2</sup> • Gusswerkstoffe • Bronze, Messing • hochlegierte AlSi-Legierungen

$$t_{\max} = l_2 - 1,5 \times d_1$$



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	7,000		7,000	74,000	34,000	40,000
3,100		3,100	49,000	18,000	31,000	7,100		7,100	74,000	34,000	40,000
3,200		3,200	49,000	18,000	31,000	7,140	9/32	7,140	74,000	34,000	40,000
3,300		3,300	49,000	18,000	31,000	7,200		7,200	74,000	34,000	40,000
3,400		3,400	52,000	20,000	32,000	7,400		7,400	74,000	34,000	40,000
3,500		3,500	52,000	20,000	32,000	7,500		7,500	74,000	34,000	40,000
3,600		3,600	52,000	20,000	32,000	7,800		7,800	79,000	37,000	42,000
3,700		3,700	52,000	20,000	32,000	8,000		8,000	79,000	37,000	42,000
3,800		3,800	55,000	22,000	33,000	8,200		8,200	79,000	37,000	42,000
3,900		3,900	55,000	22,000	33,000	8,400		8,400	79,000	37,000	42,000
4,000		4,000	55,000	22,000	33,000	8,500		8,500	79,000	37,000	42,000
4,100		4,100	55,000	22,000	33,000	8,600		8,600	84,000	40,000	44,000
4,200		4,200	55,000	22,000	33,000	8,700		8,700	84,000	40,000	44,000
4,500		4,500	58,000	24,000	34,000	8,800		8,800	84,000	40,000	44,000
4,800		4,800	62,000	26,000	36,000	9,000		9,000	84,000	40,000	44,000
5,000		5,000	62,000	26,000	36,000	9,500		9,500	84,000	40,000	44,000
5,100		5,100	62,000	26,000	36,000	9,800		9,800	89,000	43,000	46,000
5,200		5,200	62,000	26,000	36,000	10,000		10,000	89,000	43,000	46,000
5,300		5,300	62,000	26,000	36,000	10,100		10,100	89,000	43,000	46,000
5,500		5,500	66,000	28,000	38,000	10,200		10,200	89,000	43,000	46,000
5,600		5,600	66,000	28,000	38,000	10,300		10,300	89,000	43,000	46,000
5,700		5,700	66,000	28,000	38,000	10,500		10,500	89,000	43,000	46,000
5,800		5,800	66,000	28,000	38,000	10,600		10,600	89,000	43,000	46,000
6,000		6,000	66,000	28,000	38,000	10,800		10,800	95,000	47,000	48,000
6,100		6,100	70,000	31,000	39,000	11,000		11,000	95,000	47,000	48,000
6,200		6,200	70,000	31,000	39,000	11,110	7/16	11,110	95,000	47,000	48,000
6,400		6,400	70,000	31,000	39,000	11,500		11,500	95,000	47,000	48,000
6,500		6,500	70,000	31,000	39,000	11,800		11,800	95,000	47,000	48,000
6,700		6,700	70,000	31,000	39,000	12,000		12,000	102,000	51,000	51,000
6,800		6,800	74,000	34,000	40,000	12,500		12,500	102,000	51,000	51,000



## TS-Drills ohne Innenkühlung

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	12,700	102,000	51,000	51,000	15,500		15,500	115,000	58,000	57,000
13,000		13,000	102,000	51,000	51,000	16,000		16,000	115,000	58,000	57,000
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 ohne Innenkühlung

### Artikel-Nr. 89414



P	M	K	N	S	H
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Ausspitzung  $\geq \varnothing 3,000$  • Flächenanschliff • Hauptschneidenform gerade • optimierte Schneidengeometrie  
 Bau- und Einsatzstähle • Automatenstähle, Vergütungsstähle • Stähle (legiert/unleg.) bis 1200 N/mm<sup>2</sup> • Gusswerkstoffe • Bronze, Messing • hochlegierte AlSi-Legierungen

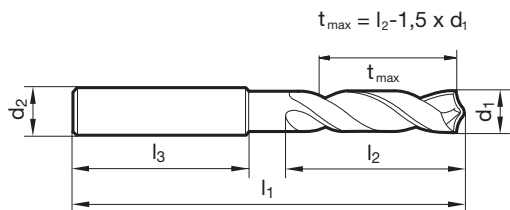
### Artikel-Nr. 89417



P	M	K	N	S	H
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Ausspitzung  $\geq \varnothing 3,000$  • Flächenanschliff • Hauptschneidenform gerade • optimierte Schneidengeometrie  
 Bau- und Einsatzstähle • Automatenstähle, Vergütungsstähle • Stähle (legiert/unleg.) bis 1200 N/mm<sup>2</sup> • Gusswerkstoffe • Bronze, Messing • hochlegierte AlSi-Legierungen



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	66,000	28,000	36,000	5,200		6,000	82,000	44,000	36,000
3,100		6,000	66,000	28,000	36,000	5,300		6,000	82,000	44,000	36,000
3,170	1/8	6,000	66,000	28,000	36,000	5,400		6,000	82,000	44,000	36,000
3,200		6,000	66,000	28,000	36,000	5,500		6,000	82,000	44,000	36,000
3,250		6,000	66,000	28,000	36,000	5,550		6,000	82,000	44,000	36,000
3,300		6,000	66,000	28,000	36,000	5,560	7/32	6,000	82,000	44,000	36,000
3,400		6,000	66,000	28,000	36,000	5,600		6,000	82,000	44,000	36,000
3,500		6,000	66,000	28,000	36,000	5,700		6,000	82,000	44,000	36,000
3,570	9/64	6,000	66,000	28,000	36,000	5,800		6,000	82,000	44,000	36,000
3,600		6,000	66,000	28,000	36,000	5,900		6,000	82,000	44,000	36,000
3,700		6,000	66,000	28,000	36,000	5,950	15/64	6,000	82,000	44,000	36,000
3,800		6,000	74,000	36,000	36,000	6,000		6,000	82,000	44,000	36,000
3,900		6,000	74,000	36,000	36,000	6,100		8,000	91,000	53,000	36,000
3,970	5/32	6,000	74,000	36,000	36,000	6,200		8,000	91,000	53,000	36,000
4,000		6,000	74,000	36,000	36,000	6,300		8,000	91,000	53,000	36,000
4,100		6,000	74,000	36,000	36,000	6,350	1/4	8,000	91,000	53,000	36,000
4,200		6,000	74,000	36,000	36,000	6,400		8,000	91,000	53,000	36,000
4,300		6,000	74,000	36,000	36,000	6,500		8,000	91,000	53,000	36,000
4,370	11/64	6,000	74,000	36,000	36,000	6,600		8,000	91,000	53,000	36,000
4,400		6,000	74,000	36,000	36,000	6,700		8,000	91,000	53,000	36,000
4,500		6,000	74,000	36,000	36,000	6,750	17/64	8,000	91,000	53,000	36,000
4,600		6,000	74,000	36,000	36,000	6,800		8,000	91,000	53,000	36,000
4,650		6,000	74,000	36,000	36,000	6,900		8,000	91,000	53,000	36,000
4,700		6,000	74,000	36,000	36,000	7,000		8,000	91,000	53,000	36,000
4,760	3/16	6,000	82,000	44,000	36,000	7,100		8,000	91,000	53,000	36,000
4,800		6,000	82,000	44,000	36,000	7,140	9/32	8,000	91,000	53,000	36,000
4,900		6,000	82,000	44,000	36,000	7,200		8,000	91,000	53,000	36,000
5,000		6,000	82,000	44,000	36,000	7,300		8,000	91,000	53,000	36,000
5,100		6,000	82,000	44,000	36,000	7,400		8,000	91,000	53,000	36,000
5,160	13/64	6,000	82,000	44,000	36,000	7,500		8,000	91,000	53,000	36,000



## TS-Drills ohne Innenkühlung

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

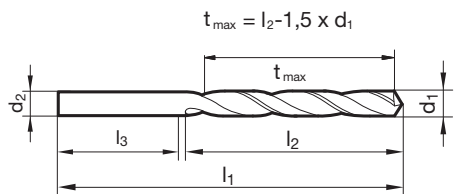
Artikel-Nr. 89275



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●	○	●	○	○	○



Ausspitzung  $\geq \text{Ø } 5,000$  • Flächenanschliff • Hauptschneidenform gerade • optimierte Schneidengeometrie  
 Bau- und Einsatzstähle • Automatenstähle, Vergütungsstähle • Stähle (legiert/unleg.) bis  $1200 \text{ N/mm}^2$  • Gusswerkstoffe • Bronze, Messing • hochlegierte AlSi-Legierungen



d1		d2 h6	l1	l2	l3	d1		d2 h6	l1	l2	l3
mm	inch	mm	mm	mm	mm	mm	inch	mm	mm	mm	mm
5,000		5,000	73,000	34,000	39,000	10,000		10,000	105,000	60,000	45,000
5,160	13/64	5,160	76,000	38,000	38,000	10,200		10,200	112,000	66,000	46,000
5,200		5,200	76,000	38,000	38,000	10,300		10,300	112,000	66,000	46,000
5,500		5,500	76,000	38,000	38,000	10,320	13/32	10,320	112,000	66,000	46,000
5,560	7/32	5,560	81,000	41,000	40,000	10,500		10,500	112,000	66,000	46,000
5,700		5,700	81,000	41,000	40,000	10,720	27/64	10,720	114,000	68,000	46,000
5,800		5,800	81,000	41,000	40,000	10,800		10,800	114,000	68,000	46,000
6,000		6,000	81,000	41,000	40,000	11,000		11,000	114,000	68,000	46,000
6,350	1/4	6,350	81,000	41,000	40,000	11,110	7/16	11,110	118,000	71,000	47,000
6,400		6,400	81,000	41,000	40,000	11,500		11,500	118,000	71,000	47,000
6,500		6,500	81,000	41,000	40,000	11,800		11,800	121,000	73,000	48,000
6,750	17/64	6,750	83,000	43,000	40,000	11,910	15/32	11,910	121,000	73,000	48,000
6,800		6,800	83,000	43,000	40,000	12,000		12,000	121,000	73,000	48,000
7,000		7,000	83,000	43,000	40,000	12,500		12,500	135,000	76,000	59,000
7,500		7,500	87,000	45,000	42,000	12,700	1/2	12,700	137,000	78,000	59,000
7,800		7,800	90,000	48,000	42,000	13,000		13,000	137,000	78,000	59,000
7,940	5/16	7,940	90,000	48,000	42,000	13,500		13,500	144,000	84,000	60,000
8,000		8,000	90,000	48,000	42,000	14,000		14,000	147,000	86,000	61,000
8,100		8,100	96,000	53,000	43,000	14,500		14,500	151,000	89,000	62,000
8,330	21/64	8,330	96,000	53,000	43,000	15,000		15,000	153,000	91,000	62,000
8,400		8,400	96,000	53,000	43,000	15,500		15,500	157,000	94,000	63,000
8,500		8,500	96,000	53,000	43,000	16,000		16,000	160,000	96,000	64,000
8,600		8,600	98,000	55,000	43,000						
8,730	11/32	8,730	98,000	55,000	43,000						
8,800		8,800	98,000	55,000	43,000						
9,000		9,000	98,000	55,000	43,000						
9,130	23/64	9,130	102,000	58,000	44,000						
9,500		9,500	102,000	58,000	44,000						
9,520	3/8	9,520	105,000	60,000	45,000						
9,800		9,800	105,000	60,000	45,000						



## TS-Drills mit Innenkühlung

### Artikel-Nr. 89410



P	M	K	N	S	H
●	○	●	○	○	○



Ausspitzung  $\geq \varnothing 3,000$  • Flächenanschliff • Hauptschneidenform gerade • optimierte Schneidengeometrie  
 Bau- und Einsatzstähle • Automatenstähle, Vergütungsstähle • Stähle (legiert/unleg.) bis 1200 N/mm<sup>2</sup> • Gusswerkstoffe • Bronze, Messing • hochlegierte AlSi-Legierungen

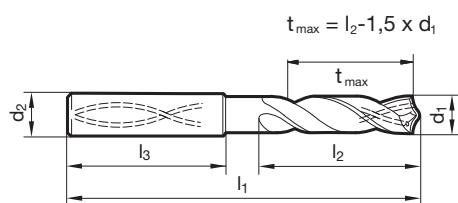
### Artikel-Nr. 89415



P	M	K	N	S	H
●	○	●	○	○	○



Ausspitzung  $\geq \varnothing 3,000$  • Flächenanschliff • Hauptschneidenform gerade • optimierte Schneidengeometrie  
 Bau- und Einsatzstähle • Automatenstähle, Vergütungsstähle • Stähle (legiert/unleg.) bis 1200 N/mm<sup>2</sup> • Gusswerkstoffe • Bronze, Messing • hochlegierte AlSi-Legierungen



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	62,000	20,000	36,000	5,200		6,000	66,000	28,000	36,000
3,100		6,000	62,000	20,000	36,000	5,300		6,000	66,000	28,000	36,000
3,170	1/8	6,000	62,000	20,000	36,000	5,400		6,000	66,000	28,000	36,000
3,200		6,000	62,000	20,000	36,000	5,500		6,000	66,000	28,000	36,000
3,250		6,000	62,000	20,000	36,000	5,550		6,000	66,000	28,000	36,000
3,300		6,000	62,000	20,000	36,000	5,560	7/32	6,000	66,000	28,000	36,000
3,400		6,000	62,000	20,000	36,000	5,600		6,000	66,000	28,000	36,000
3,500		6,000	62,000	20,000	36,000	5,700		6,000	66,000	28,000	36,000
3,570	9/64	6,000	62,000	20,000	36,000	5,800		6,000	66,000	28,000	36,000
3,600		6,000	62,000	20,000	36,000	5,900		6,000	66,000	28,000	36,000
3,700		6,000	62,000	20,000	36,000	5,950	15/64	6,000	66,000	28,000	36,000
3,800		6,000	66,000	24,000	36,000	6,000		6,000	66,000	28,000	36,000
3,900		6,000	66,000	24,000	36,000	6,100		8,000	79,000	34,000	36,000
3,970	5/32	6,000	66,000	24,000	36,000	6,200		8,000	79,000	34,000	36,000
4,000		6,000	66,000	24,000	36,000	6,300		8,000	79,000	34,000	36,000
4,100		6,000	66,000	24,000	36,000	6,350	1/4	8,000	79,000	34,000	36,000
4,200		6,000	66,000	24,000	36,000	6,400		8,000	79,000	34,000	36,000
4,300		6,000	66,000	24,000	36,000	6,500		8,000	79,000	34,000	36,000
4,370	11/64	6,000	66,000	24,000	36,000	6,600		8,000	79,000	34,000	36,000
4,400		6,000	66,000	24,000	36,000	6,700		8,000	79,000	34,000	36,000
4,500		6,000	66,000	24,000	36,000	6,750	17/64	8,000	79,000	34,000	36,000
4,600		6,000	66,000	24,000	36,000	6,800		8,000	79,000	34,000	36,000
4,650		6,000	66,000	24,000	36,000	6,900		8,000	79,000	34,000	36,000
4,700		6,000	66,000	24,000	36,000	7,000		8,000	79,000	34,000	36,000
4,760	3/16	6,000	66,000	28,000	36,000	7,100		8,000	79,000	41,000	36,000
4,800		6,000	66,000	28,000	36,000	7,140	9/32	8,000	79,000	41,000	36,000
4,900		6,000	66,000	28,000	36,000	7,200		8,000	79,000	41,000	36,000
5,000		6,000	66,000	28,000	36,000	7,300		8,000	79,000	41,000	36,000
5,100		6,000	66,000	28,000	36,000	7,400		8,000	79,000	41,000	36,000
5,160	13/64	6,000	66,000	28,000	36,000	7,500		8,000	79,000	41,000	36,000



## TS-Drills mit Innenkühlung

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

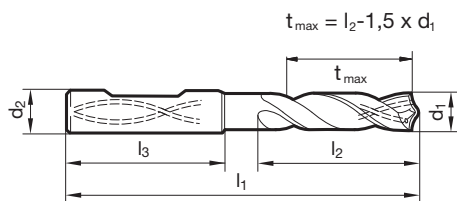
Artikel-Nr. 89266



P	M	K	N	S	H
●	○	●	○	○	○



Ausspitzung  $\geq \varnothing 4,000$  • Flächenanschliff • Hauptschneidenform gerade • optimierte Schneidengeometrie  
 Bau- und Einsatzstähle • Automatenstähle, Vergütungsstähle • Stähle (legiert/unleg.) bis 1200 N/mm<sup>2</sup> • Gusswerkstoffe • Bronze, Messing • hochlegierte AlSi-Legierungen



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	66,000	24,000	36,000	10,720	27/64	12,000	102,000	55,000	45,000
5,000		6,000	66,000	28,000	36,000	10,800		12,000	102,000	55,000	45,000
5,500		6,000	66,000	28,000	36,000	11,000		12,000	102,000	55,000	45,000
5,800		6,000	66,000	28,000	36,000	11,500		12,000	102,000	55,000	45,000
6,000		6,000	66,000	28,000	36,000	11,800		12,000	102,000	55,000	45,000
6,400		8,000	79,000	34,000	36,000	12,000		12,000	102,000	55,000	45,000
6,800		8,000	79,000	34,000	36,000	12,500		14,000	107,000	60,000	45,000
7,000		8,000	79,000	34,000	36,000	12,700	1/2	14,000	107,000	60,000	45,000
7,400		8,000	79,000	41,000	36,000	13,000		14,000	107,000	60,000	45,000
7,500		8,000	79,000	41,000	36,000	13,500		14,000	107,000	60,000	45,000
7,800		8,000	79,000	41,000	36,000	14,000		14,000	107,000	60,000	45,000
7,940	5/16	8,000	79,000	41,000	36,000	14,500		16,000	115,000	65,000	48,000
8,000		8,000	79,000	41,000	36,000	15,000		16,000	115,000	65,000	48,000
8,100		10,000	89,000	47,000	40,000	15,200		16,000	115,000	65,000	48,000
8,400		10,000	89,000	47,000	40,000	15,500		16,000	115,000	65,000	48,000
8,500		10,000	89,000	47,000	40,000	16,200		18,000	123,000	73,000	48,000
8,700		10,000	89,000	47,000	40,000	16,500		18,000	123,000	73,000	48,000
8,800		10,000	89,000	47,000	40,000	18,000		18,000	123,000	73,000	48,000
9,000		10,000	89,000	47,000	40,000	18,500		20,000	131,000	79,000	50,000
9,500		10,000	89,000	47,000	40,000	19,000		20,000	131,000	79,000	50,000
9,800		10,000	89,000	47,000	40,000	20,000		20,000	131,000	79,000	50,000
10,000		10,000	89,000	47,000	40,000						
10,200		12,000	102,000	55,000	45,000						
10,500		12,000	102,000	55,000	45,000						





## TS-Drills mit Innenkühlung

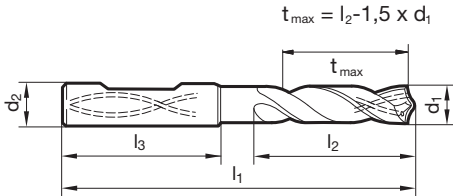
Artikel-Nr. 89306



P	M	K	N	S	H
●	○	○	○		



Ausspitzung  $\geq \varnothing 10,000$  • Kegelmantelschliff • dämpft Schwingungen und Stöße • HSS-Träger mit eingelöteter HM-Platte  
 unlegierte/niedrig legierte Stähle • Grauguss, Kugelgraphitguss • Messing, Bronzen, Kunststoffe, Graphit



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	17,000	20,000	130,000	76,000	50,000
10,500	16,000	103,000	51,000	48,000	17,500	20,000	130,000	76,000	50,000
10,600	16,000	103,000	51,000	48,000	17,700	20,000	130,000	76,000	50,000
11,000	16,000	103,000	51,000	48,000	18,000	20,000	130,000	76,000	50,000
12,000	16,000	103,000	51,000	48,000	18,500	25,000	144,000	84,000	56,000
12,200	16,000	111,000	59,000	48,000	19,000	25,000	144,000	84,000	56,000
12,500	16,000	111,000	59,000	48,000	19,700	25,000	144,000	84,000	56,000
13,000	16,000	111,000	59,000	48,000	20,000	25,000	144,000	84,000	56,000
13,700	16,000	111,000	59,000	48,000	20,500	25,000	153,000	93,000	56,000
14,000	16,000	111,000	59,000	48,000	21,000	25,000	153,000	93,000	56,000
14,200	20,000	122,000	68,000	50,000	21,500	25,000	153,000	93,000	56,000
14,400	20,000	122,000	68,000	50,000	22,000	25,000	153,000	93,000	56,000
14,600	20,000	122,000	68,000	50,000	22,500	25,000	161,000	101,000	56,000
15,000	20,000	122,000	68,000	50,000	23,500	25,000	161,000	101,000	56,000
15,300	20,000	122,000	68,000	50,000	25,000	32,000	174,000	110,000	60,000
15,800	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					



## TS-Drills mit Innenkühlung

### Artikel-Nr. 89450



P	M	K	N	S	H
	•			•	



Ausspitzung  $\geq \varnothing 3,000$  • Flächenanschliff • Hauptschneidenform gerade • optimierte Schneidengeometrie  
rost-/säure-/hitzebeständige Stähle • Titan und Titanlegierungen • Inconel, Hastelloy, Monel

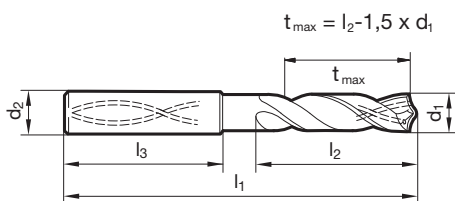
### Artikel-Nr. 89550



P	M	K	N	S	H
	•			•	



Ausspitzung  $\geq \varnothing 3,000$  • Flächenanschliff • Hauptschneidenform gerade • optimierte Schneidengeometrie  
rost-/säure-/hitzebeständige Stähle • Titan und Titanlegierungen • Inconel, Hastelloy, Monel



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	62,000	20,000	36,000	5,200		6,000	66,000	28,000	36,000
3,100		6,000	62,000	20,000	36,000	5,300		6,000	66,000	28,000	36,000
3,170	1/8	6,000	62,000	20,000	36,000	5,400		6,000	66,000	28,000	36,000
3,200		6,000	62,000	20,000	36,000	5,500		6,000	66,000	28,000	36,000
3,250		6,000	62,000	20,000	36,000	5,550		6,000	66,000	28,000	36,000
3,300		6,000	62,000	20,000	36,000	5,560	7/32	6,000	66,000	28,000	36,000
3,400		6,000	62,000	20,000	36,000	5,600		6,000	66,000	28,000	36,000
3,500		6,000	62,000	20,000	36,000	5,700		6,000	66,000	28,000	36,000
3,570	9/64	6,000	62,000	20,000	36,000	5,800		6,000	66,000	28,000	36,000
3,600		6,000	62,000	20,000	36,000	5,900		6,000	66,000	28,000	36,000
3,700		6,000	62,000	20,000	36,000	5,950	15/64	6,000	66,000	28,000	36,000
3,800		6,000	66,000	24,000	36,000	6,000		6,000	66,000	28,000	36,000
3,900		6,000	66,000	24,000	36,000	6,100		8,000	79,000	34,000	36,000
3,970	5/32	6,000	66,000	24,000	36,000	6,200		8,000	79,000	34,000	36,000
4,000		6,000	66,000	24,000	36,000	6,300		8,000	79,000	34,000	36,000
4,100		6,000	66,000	24,000	36,000	6,350	1/4	8,000	79,000	34,000	36,000
4,200		6,000	66,000	24,000	36,000	6,400		8,000	79,000	34,000	36,000
4,300		6,000	66,000	24,000	36,000	6,500		8,000	79,000	34,000	36,000
4,370	11/64	6,000	66,000	24,000	36,000	6,600		8,000	79,000	34,000	36,000
4,400		6,000	66,000	24,000	36,000	6,700		8,000	79,000	34,000	36,000
4,500		6,000	66,000	24,000	36,000	6,750	17/64	8,000	79,000	34,000	36,000
4,600		6,000	66,000	24,000	36,000	6,800		8,000	79,000	34,000	36,000
4,650		6,000	66,000	24,000	36,000	6,900		8,000	79,000	34,000	36,000
4,700		6,000	66,000	24,000	36,000	7,000		8,000	79,000	34,000	36,000
4,760	3/16	6,000	66,000	28,000	36,000	7,100		8,000	79,000	41,000	36,000
4,800		6,000	66,000	28,000	36,000	7,140	9/32	8,000	79,000	41,000	36,000
4,900		6,000	66,000	28,000	36,000	7,200		8,000	79,000	41,000	36,000
5,000		6,000	66,000	28,000	36,000	7,300		8,000	79,000	41,000	36,000
5,100		6,000	66,000	28,000	36,000	7,400		8,000	79,000	41,000	36,000
5,160	13/64	6,000	66,000	28,000	36,000	7,500		8,000	79,000	41,000	36,000



## TS-Drills mit Innenkühlung

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

### Artikel-Nr. 89423



P	M	K	N	S	H
•				•	○



Ausspitzung  $\geq \varnothing 3,000$  • Kegelmantelschliff • Hauptschneidenform leicht konkav • optimierte Schneidengeometrie  
legierte und hochfeste Stähle bis 1400 N/mm<sup>2</sup> • Inconel, Hastelloy, Monel • Titan und Titanlegierungen

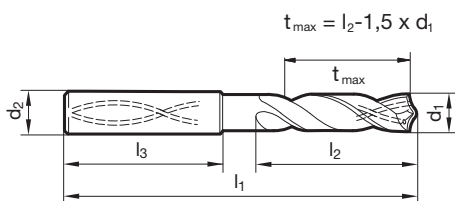
### Artikel-Nr. 89424



P	M	K	N	S	H
•				•	○



Ausspitzung  $\geq \varnothing 3,000$  • Kegelmantelschliff • Hauptschneidenform leicht konkav • optimierte Schneidengeometrie  
legierte und hochfeste Stähle bis 1400 N/mm<sup>2</sup> • Inconel, Hastelloy, Monel • Titan und Titanlegierungen



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	62,000	20,000	36,000	5,200		6,000	66,000	28,000	36,000
3,100		6,000	62,000	20,000	36,000	5,300		6,000	66,000	28,000	36,000
3,170	1/8	6,000	62,000	20,000	36,000	5,400		6,000	66,000	28,000	36,000
3,200		6,000	62,000	20,000	36,000	5,500		6,000	66,000	28,000	36,000
3,250		6,000	62,000	20,000	36,000	5,550		6,000	66,000	28,000	36,000
3,300		6,000	62,000	20,000	36,000	5,560	7/32	6,000	66,000	28,000	36,000
3,400		6,000	62,000	20,000	36,000	5,600		6,000	66,000	28,000	36,000
3,500		6,000	62,000	20,000	36,000	5,700		6,000	66,000	28,000	36,000
3,570	9/64	6,000	62,000	20,000	36,000	5,800		6,000	66,000	28,000	36,000
3,600		6,000	62,000	20,000	36,000	5,900		6,000	66,000	28,000	36,000
3,700		6,000	62,000	20,000	36,000	5,950	15/64	6,000	66,000	28,000	36,000
3,800		6,000	66,000	24,000	36,000	6,000		6,000	66,000	28,000	36,000
3,900		6,000	66,000	24,000	36,000	6,100		8,000	79,000	34,000	36,000
3,970	5/32	6,000	66,000	24,000	36,000	6,200		8,000	79,000	34,000	36,000
4,000		6,000	66,000	24,000	36,000	6,300		8,000	79,000	34,000	36,000
4,100		6,000	66,000	24,000	36,000	6,350	1/4	8,000	79,000	34,000	36,000
4,200		6,000	66,000	24,000	36,000	6,400		8,000	79,000	34,000	36,000
4,300		6,000	66,000	24,000	36,000	6,500		8,000	79,000	34,000	36,000
4,370	11/64	6,000	66,000	24,000	36,000	6,600		8,000	79,000	34,000	36,000
4,400		6,000	66,000	24,000	36,000	6,700		8,000	79,000	34,000	36,000
4,500		6,000	66,000	24,000	36,000	6,750	17/64	8,000	79,000	34,000	36,000
4,600		6,000	66,000	24,000	36,000	6,800		8,000	79,000	34,000	36,000
4,650		6,000	66,000	24,000	36,000	6,900		8,000	79,000	34,000	36,000
4,700		6,000	66,000	24,000	36,000	7,000		8,000	79,000	34,000	36,000
4,760	3/16	6,000	66,000	28,000	36,000	7,100		8,000	79,000	41,000	36,000
4,800		6,000	66,000	28,000	36,000	7,140	9/32	8,000	79,000	41,000	36,000
4,900		6,000	66,000	28,000	36,000	7,200		8,000	79,000	41,000	36,000
5,000		6,000	66,000	28,000	36,000	7,300		8,000	79,000	41,000	36,000
5,100		6,000	66,000	28,000	36,000	7,400		8,000	79,000	41,000	36,000
5,160	13/64	6,000	66,000	28,000	36,000	7,500		8,000	79,000	41,000	36,000



## TS-Drills mit Innenkühlung

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

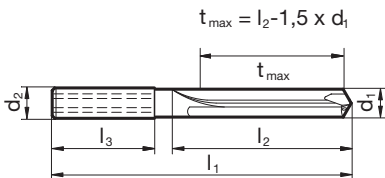
Artikel-Nr. 89292



P	M	K	N	S	H
		○	●		



Ausspitzung  $\geq \text{Ø } 3,000$  • Flächenanschliff • enge Durchmessertoleranzen • sehr gute Bohrungsflächen • Kühlmitteldruck beachten  
 Aluminium und Al-Legierungen • Al-Werkstoffe mit hohem Si-Gehalt



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	8,400		10,000	103,000	61,000	40,000
3,100		6,000	66,000	24,000	36,000	8,500		10,000	103,000	61,000	40,000
3,200		6,000	66,000	24,000	36,000	8,700		10,000	103,000	61,000	40,000
3,300		6,000	66,000	24,000	36,000	9,000		10,000	103,000	61,000	40,000
3,400		6,000	66,000	24,000	36,000	9,400		10,000	103,000	61,000	40,000
3,500		6,000	66,000	24,000	36,000	10,000		10,000	103,000	61,000	40,000
3,600		6,000	66,000	24,000	36,000	10,200		12,000	118,000	71,000	45,000
3,700		6,000	66,000	24,000	36,000	10,500		12,000	118,000	71,000	45,000
3,800		6,000	74,000	30,000	36,000	11,000		12,000	118,000	71,000	45,000
3,900		6,000	74,000	30,000	36,000	11,500		12,000	118,000	71,000	45,000
4,000		6,000	74,000	30,000	36,000	12,000		12,000	118,000	71,000	45,000
4,200		6,000	74,000	30,000	36,000	12,300	31/64	14,000	124,000	74,000	45,000
5,000		6,000	74,000	36,000	36,000	12,500		14,000	124,000	74,000	45,000
5,100		6,000	74,000	36,000	36,000	12,700	1/2	14,000	124,000	74,000	45,000
5,300		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	18,000		18,000	143,000	93,000	48,000
6,800		8,000	91,000	53,000	36,000	19,000		20,000	153,000	101,000	50,000
7,000		8,000	91,000	53,000	36,000	20,000		20,000	153,000	101,000	50,000
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						



## TS-Drills mit Innenkühlung

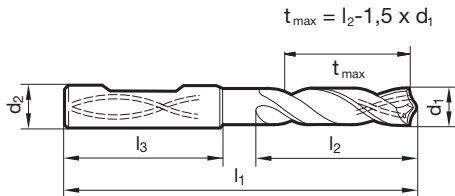
Artikel-Nr. 89272



P	M	K	N	S	H
●	○	●	○	○	○



Ausspitzung  $\geq \text{Ø } 3,700$  • Flächenanschliff • Hauptschneidenform gerade • optimierte Schneidengeometrie  
 Bau- und Einsatzstähle • Automatenstähle, Vergütungsstähle • Stähle (legiert/unleg.) bis  $1200 \text{ N/mm}^2$  • Gusswerkstoffe • Bronze, Messing • hochlegierte AlSi-Legierungen



d1		d2 h6	l1	l2	l3	d1		d2 h6	l1	l2	l3
mm	inch	mm	mm	mm	mm	mm	inch	mm	mm	mm	mm
3,700		6,000	66,000	28,000	36,000	10,800		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
5,160	13/64	6,000	82,000	44,000	36,000	11,110	7/16	12,000	118,000	71,000	45,000
5,500		6,000	82,000	44,000	36,000	11,200		12,000	118,000	71,000	45,000
5,560	7/32	6,000	82,000	44,000	36,000	11,500		12,000	118,000	71,000	45,000
5,800		6,000	82,000	44,000	36,000	11,510	29/64	12,000	118,000	71,000	45,000
6,000		6,000	82,000	44,000	36,000	11,800		12,000	118,000	71,000	45,000
6,350	1/4	8,000	91,000	53,000	36,000	11,910	15/32	12,000	118,000	71,000	45,000
6,400		8,000	91,000	53,000	36,000	12,000		12,000	118,000	71,000	45,000
6,500		8,000	91,000	53,000	36,000	12,500		14,000	124,000	77,000	45,000
6,750	17/64	8,000	91,000	53,000	36,000	12,700	1/2	14,000	124,000	77,000	45,000
6,800		8,000	91,000	53,000	36,000	13,000		14,000	124,000	77,000	45,000
7,000		8,000	91,000	53,000	36,000	13,500		14,000	124,000	77,000	45,000
7,140	9/32	8,000	91,000	53,000	36,000	14,000		14,000	124,000	77,000	45,000
7,500		8,000	91,000	53,000	36,000	14,290	9/16	16,000	133,000	83,000	48,000
7,540	19/64	8,000	91,000	53,000	36,000	14,500		16,000	133,000	83,000	48,000
7,700		8,000	91,000	53,000	36,000	15,000		16,000	133,000	83,000	48,000
7,800		8,000	91,000	53,000	36,000	15,500		16,000	133,000	83,000	48,000
7,940	5/16	8,000	91,000	53,000	36,000	15,870	5/8	16,000	133,000	83,000	48,000
8,000		8,000	91,000	53,000	36,000	16,000		16,000	133,000	83,000	48,000
8,500		10,000	103,000	61,000	40,000	16,500		18,000	143,000	93,000	48,000
8,600		10,000	103,000	61,000	40,000	17,000		18,000	143,000	93,000	48,000
8,730	11/32	10,000	103,000	61,000	40,000	17,500		18,000	143,000	93,000	48,000
8,800		10,000	103,000	61,000	40,000	18,000		18,000	143,000	93,000	48,000
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						
9,520	3/8	10,000	103,000	61,000	40,000						
9,700		10,000	103,000	61,000	40,000						
9,800		10,000	103,000	61,000	40,000						
9,920	25/64	10,000	103,000	61,000	40,000						
10,000		10,000	103,000	61,000	40,000						
10,200		12,000	118,000	71,000	45,000						
10,320	13/32	12,000	118,000	71,000	45,000						
10,500		12,000	118,000	71,000	45,000						
10,720	27/64	12,000	118,000	71,000	45,000						



## TS-Drills mit Innenkühlung

### Artikel-Nr. 89411



P	M	K	N	S	H
●	○	●	○	○	○



Ausspitzung  $\geq \varnothing 3,000$  • Flächenanschliff • Hauptschneidenform gerade • optimierte Schneidengeometrie  
 Bau- und Einsatzstähle • Automatenstähle, Vergütungsstähle • Stähle (legiert/unleg.) bis 1200 N/mm<sup>2</sup> • Gusswerkstoffe • Bronze, Messing • hochlegierte AlSi-Legierungen

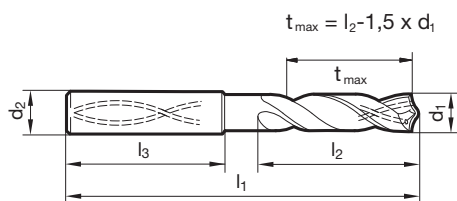
### Artikel-Nr. 89408



P	M	K	N	S	H
●	○	●	○	○	○



Ausspitzung  $\geq \varnothing 3,000$  • Flächenanschliff • Hauptschneidenform gerade • optimierte Schneidengeometrie  
 Bau- und Einsatzstähle • Automatenstähle, Vergütungsstähle • Stähle (legiert/unleg.) bis 1200 N/mm<sup>2</sup> • Gusswerkstoffe • Bronze, Messing • hochlegierte AlSi-Legierungen



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	66,000	28,000	36,000	5,200		6,000	82,000	44,000	36,000
3,100		6,000	66,000	28,000	36,000	5,300		6,000	82,000	44,000	36,000
3,170	1/8	6,000	66,000	28,000	36,000	5,400		6,000	82,000	44,000	36,000
3,200		6,000	66,000	28,000	36,000	5,500		6,000	82,000	44,000	36,000
3,250		6,000	66,000	28,000	36,000	5,550		6,000	82,000	44,000	36,000
3,300		6,000	66,000	28,000	36,000	5,560	7/32	6,000	82,000	44,000	36,000
3,400		6,000	66,000	28,000	36,000	5,600		6,000	82,000	44,000	36,000
3,500		6,000	66,000	28,000	36,000	5,700		6,000	82,000	44,000	36,000
3,570	9/64	6,000	66,000	28,000	36,000	5,800		6,000	82,000	44,000	36,000
3,600		6,000	66,000	28,000	36,000	5,900		6,000	82,000	44,000	36,000
3,700		6,000	66,000	28,000	36,000	5,950	15/64	6,000	82,000	44,000	36,000
3,800		6,000	74,000	36,000	36,000	6,000		6,000	82,000	44,000	36,000
3,900		6,000	74,000	36,000	36,000	6,100		8,000	91,000	53,000	36,000
3,970	5/32	6,000	74,000	36,000	36,000	6,200		8,000	91,000	53,000	36,000
4,000		6,000	74,000	36,000	36,000	6,300		8,000	91,000	53,000	36,000
4,100		6,000	74,000	36,000	36,000	6,350	1/4	8,000	91,000	53,000	36,000
4,200		6,000	74,000	36,000	36,000	6,400		8,000	91,000	53,000	36,000
4,300		6,000	74,000	36,000	36,000	6,500		8,000	91,000	53,000	36,000
4,370	11/64	6,000	74,000	36,000	36,000	6,600		8,000	91,000	53,000	36,000
4,400		6,000	74,000	36,000	36,000	6,700		8,000	91,000	53,000	36,000
4,500		6,000	74,000	36,000	36,000	6,750	17/64	8,000	91,000	53,000	36,000
4,600		6,000	74,000	36,000	36,000	6,800		8,000	91,000	53,000	36,000
4,650		6,000	74,000	36,000	36,000	6,900		8,000	91,000	53,000	36,000
4,700		6,000	74,000	36,000	36,000	7,000		8,000	91,000	53,000	36,000
4,760	3/16	6,000	82,000	44,000	36,000	7,100		8,000	91,000	53,000	36,000
4,800		6,000	82,000	44,000	36,000	7,140	9/32	8,000	91,000	53,000	36,000
4,900		6,000	82,000	44,000	36,000	7,200		8,000	91,000	53,000	36,000
5,000		6,000	82,000	44,000	36,000	7,300		8,000	91,000	53,000	36,000
5,100		6,000	82,000	44,000	36,000	7,400		8,000	91,000	53,000	36,000
5,160	13/64	6,000	82,000	44,000	36,000	7,500		8,000	91,000	53,000	36,000





## TS-Drills mit Innenkühlung

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



## TS-Drills mit Innenkühlung

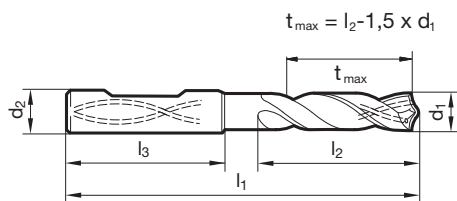
Artikel-Nr. 89307



P	M	K	N	S	H
●	○	○	○		



Ausspitzung  $\geq \text{Ø } 9,800$  • Kegelmantelschliff • HSS-Träger mit eingelöteter HM-Platte • dämpft Schwingungen und Stöße  
 unlegierte/niedrig legierte Stähle • Grauguss, Kugelgraphitguss • Messing, Bronzen, Kunststoffe, Graphit



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



## TS-Drills mit Innenkühlung

### Artikel-Nr. 89451



P	M	K	N	S	H
	•			•	



Ausspitzung  $\geq \text{Ø } 3,000$  • Flächenanschliff • Hauptschneidenform gerade • optimierte Schneidengeometrie  
rost-/säure-/hitzebeständige Stähle • Titan und Titanlegierungen • Inconel, Hastelloy, Monel

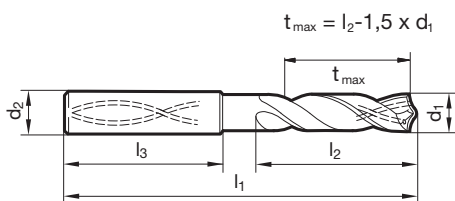
### Artikel-Nr. 89551



P	M	K	N	S	H
	•			•	



Ausspitzung  $\geq \text{Ø } 3,000$  • Flächenanschliff • Hauptschneidenform gerade • optimierte Schneidengeometrie  
rost-/säure-/hitzebeständige Stähle • Titan und Titanlegierungen • Inconel, Hastelloy, Monel



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	66,000	28,000	36,000	5,200		6,000	82,000	44,000	36,000
3,100		6,000	66,000	28,000	36,000	5,300		6,000	82,000	44,000	36,000
3,170	1/8	6,000	66,000	28,000	36,000	5,400		6,000	82,000	44,000	36,000
3,200		6,000	66,000	28,000	36,000	5,500		6,000	82,000	44,000	36,000
3,250		6,000	66,000	28,000	36,000	5,550		6,000	82,000	44,000	36,000
3,300		6,000	66,000	28,000	36,000	5,560	7/32	6,000	82,000	44,000	36,000
3,400		6,000	66,000	28,000	36,000	5,600		6,000	82,000	44,000	36,000
3,500		6,000	66,000	28,000	36,000	5,700		6,000	82,000	44,000	36,000
3,570	9/64	6,000	66,000	28,000	36,000	5,800		6,000	82,000	44,000	36,000
3,600		6,000	66,000	28,000	36,000	5,900		6,000	82,000	44,000	36,000
3,700		6,000	66,000	28,000	36,000	5,950	15/64	6,000	82,000	44,000	36,000
3,800		6,000	74,000	36,000	36,000	6,000		6,000	82,000	44,000	36,000
3,900		6,000	74,000	36,000	36,000	6,100		8,000	91,000	53,000	36,000
3,970	5/32	6,000	74,000	36,000	36,000	6,200		8,000	91,000	53,000	36,000
4,000		6,000	74,000	36,000	36,000	6,300		8,000	91,000	53,000	36,000
4,100		6,000	74,000	36,000	36,000	6,350	1/4	8,000	91,000	53,000	36,000
4,200		6,000	74,000	36,000	36,000	6,400		8,000	91,000	53,000	36,000
4,300		6,000	74,000	36,000	36,000	6,500		8,000	91,000	53,000	36,000
4,370	11/64	6,000	74,000	36,000	36,000	6,600		8,000	91,000	53,000	36,000
4,400		6,000	74,000	36,000	36,000	6,700		8,000	91,000	53,000	36,000
4,500		6,000	74,000	36,000	36,000	6,750	17/64	8,000	91,000	53,000	36,000
4,600		6,000	74,000	36,000	36,000	6,800		8,000	91,000	53,000	36,000
4,650		6,000	74,000	36,000	36,000	6,900		8,000	91,000	53,000	36,000
4,700		6,000	74,000	36,000	36,000	7,000		8,000	91,000	53,000	36,000
4,760	3/16	6,000	82,000	44,000	36,000	7,100		8,000	91,000	53,000	36,000
4,800		6,000	82,000	44,000	36,000	7,140	9/32	8,000	91,000	53,000	36,000
4,900		6,000	82,000	44,000	36,000	7,200		8,000	91,000	53,000	36,000
5,000		6,000	82,000	44,000	36,000	7,300		8,000	91,000	53,000	36,000
5,100		6,000	82,000	44,000	36,000	7,400		8,000	91,000	53,000	36,000
5,160	13/64	6,000	82,000	44,000	36,000	7,500		8,000	91,000	53,000	36,000



## TS-Drills mit Innenkühlung

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

### Artikel-Nr. 89425



P	M	K	N	S	H
•				•	○



Ausspitzung  $\geq \varnothing 3,000$  • Kegelmantelschliff • Hauptschneidenform leicht konkav • optimierte Schneidengeometrie  
legierte und hochfeste Stähle bis 1400 N/mm<sup>2</sup> • Inconel, Hastelloy, Monel • Titan und Titanlegierungen

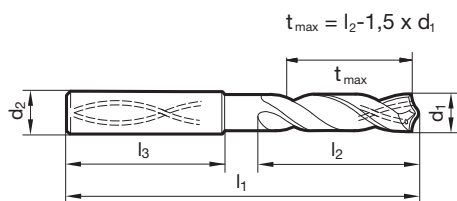
### Artikel-Nr. 89426



P	M	K	N	S	H
•				•	○



Ausspitzung  $\geq \varnothing 3,000$  • Kegelmantelschliff • Hauptschneidenform leicht konkav • optimierte Schneidengeometrie  
legierte und hochfeste Stähle bis 1400 N/mm<sup>2</sup> • Inconel, Hastelloy, Monel • Titan und Titanlegierungen



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	66,000	28,000	36,000	5,200		6,000	82,000	44,000	36,000
3,100		6,000	66,000	28,000	36,000	5,300		6,000	82,000	44,000	36,000
3,170	1/8	6,000	66,000	28,000	36,000	5,400		6,000	82,000	44,000	36,000
3,200		6,000	66,000	28,000	36,000	5,500		6,000	82,000	44,000	36,000
3,250		6,000	66,000	28,000	36,000	5,550		6,000	82,000	44,000	36,000
3,300		6,000	66,000	28,000	36,000	5,560	7/32	6,000	82,000	44,000	36,000
3,400		6,000	66,000	28,000	36,000	5,600		6,000	82,000	44,000	36,000
3,500		6,000	66,000	28,000	36,000	5,700		6,000	82,000	44,000	36,000
3,570	9/64	6,000	66,000	28,000	36,000	5,800		6,000	82,000	44,000	36,000
3,600		6,000	66,000	28,000	36,000	5,900		6,000	82,000	44,000	36,000
3,700		6,000	66,000	28,000	36,000	5,950	15/64	6,000	82,000	44,000	36,000
3,800		6,000	74,000	36,000	36,000	6,000		6,000	82,000	44,000	36,000
3,900		6,000	74,000	36,000	36,000	6,100		8,000	91,000	53,000	36,000
3,970	5/32	6,000	74,000	36,000	36,000	6,200		8,000	91,000	53,000	36,000
4,000		6,000	74,000	36,000	36,000	6,300		8,000	91,000	53,000	36,000
4,100		6,000	74,000	36,000	36,000	6,350	1/4	8,000	91,000	53,000	36,000
4,200		6,000	74,000	36,000	36,000	6,400		8,000	91,000	53,000	36,000
4,300		6,000	74,000	36,000	36,000	6,500		8,000	91,000	53,000	36,000
4,370	11/64	6,000	74,000	36,000	36,000	6,600		8,000	91,000	53,000	36,000
4,400		6,000	74,000	36,000	36,000	6,700		8,000	91,000	53,000	36,000
4,500		6,000	74,000	36,000	36,000	6,750	17/64	8,000	91,000	53,000	36,000
4,600		6,000	74,000	36,000	36,000	6,800		8,000	91,000	53,000	36,000
4,650		6,000	74,000	36,000	36,000	6,900		8,000	91,000	53,000	36,000
4,700		6,000	74,000	36,000	36,000	7,000		8,000	91,000	53,000	36,000
4,760	3/16	6,000	82,000	44,000	36,000	7,100		8,000	91,000	53,000	36,000
4,800		6,000	82,000	44,000	36,000	7,140	9/32	8,000	91,000	53,000	36,000
4,900		6,000	82,000	44,000	36,000	7,200		8,000	91,000	53,000	36,000
5,000		6,000	82,000	44,000	36,000	7,300		8,000	91,000	53,000	36,000
5,100		6,000	82,000	44,000	36,000	7,400		8,000	91,000	53,000	36,000
5,160	13/64	6,000	82,000	44,000	36,000	7,500		8,000	91,000	53,000	36,000



## TS-Drills mit Innenkühlung

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

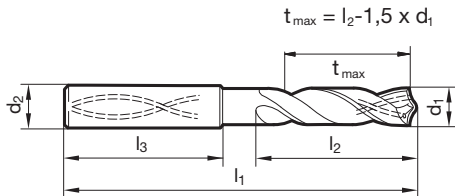
Artikel-Nr. 89420



P	M	K	N	S	H
		•			



Ausspitzung  $\geq \text{Ø } 3,000$  • patentierter Radienanschliff • Schneidenform gerade (durch Korrektur)  
 Vermikularguss GGK und ADI, CDI • Grauguss, Temperguss, Sphäroguss



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 mit Innenkühlung

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 mit Innenkühlung

### Artikel-Nr. 89412



P	M	K	N	S	H
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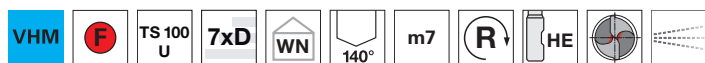


Ausspitzung  $\geq \varnothing 3,000$  • Flächenanschliff • Hauptschneidenform gerade • optimierte Schneidengeometrie  
 Bau- und Einsatzstähle • Automatenstähle, Vergütungsstähle • Stähle (legiert/unleg.) bis 1200 N/mm<sup>2</sup> • Gusswerkstoffe • Bronze, Messing • hochlegierte AlSi-Legierungen

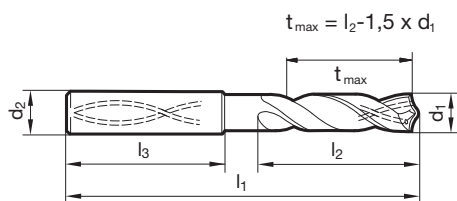
### Artikel-Nr. 89416



P	M	K	N	S	H
●	○	●	○	○	○



Ausspitzung  $\geq \varnothing 3,000$  • Flächenanschliff • Hauptschneidenform gerade • optimierte Schneidengeometrie  
 Bau- und Einsatzstähle • Automatenstähle, Vergütungsstähle • Stähle (legiert/unleg.) bis 1200 N/mm<sup>2</sup> • Gusswerkstoffe • Bronze, Messing • hochlegierte AlSi-Legierungen



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	5,200		6,000	90,000	50,000	36,000
3,100		6,000	70,000	30,000	36,000	5,300		6,000	90,000	50,000	36,000
3,170	1/8	6,000	70,000	30,000	36,000	5,400		6,000	97,000	57,000	36,000
3,200		6,000	70,000	30,000	36,000	5,500		6,000	97,000	57,000	36,000
3,250		6,000	70,000	30,000	36,000	5,700		6,000	97,000	57,000	36,000
3,300		6,000	70,000	30,000	36,000	5,800		6,000	97,000	57,000	36,000
3,400		6,000	75,000	35,500	36,000	5,900		6,000	97,000	57,000	36,000
3,500		6,000	75,000	35,500	36,000	5,950	15/64	6,000	97,000	57,000	36,000
3,570	9/64	6,000	75,000	35,500	36,000	6,000		6,000	97,000	57,000	36,000
3,600		6,000	75,000	35,500	36,000	6,200		8,000	106,000	66,000	36,000
3,700		6,000	75,000	35,500	36,000	6,300		8,000	106,000	66,000	36,000
3,800		6,000	75,000	37,500	36,000	6,350	1/4	8,000	106,000	66,000	36,000
3,900		6,000	75,000	37,500	36,000	6,500		8,000	106,000	66,000	36,000
3,970	5/32	6,000	75,000	37,500	36,000	6,600		8,000	106,000	66,000	36,000
4,000		6,000	75,000	37,500	36,000	6,700		8,000	106,000	66,000	36,000
4,100		6,000	75,000	37,500	36,000	6,800		8,000	106,000	66,000	36,000
4,200		6,000	75,000	37,500	36,000	6,900		8,000	116,000	76,000	36,000
4,300		6,000	85,000	45,000	36,000	7,000		8,000	116,000	76,000	36,000
4,370	11/64	6,000	85,000	45,000	36,000	7,100		8,000	116,000	76,000	36,000
4,400		6,000	85,000	45,000	36,000	7,200		8,000	116,000	76,000	36,000
4,500		6,000	85,000	45,000	36,000	7,500		8,000	116,000	76,000	36,000
4,600		6,000	85,000	45,000	36,000	7,600		8,000	116,000	76,000	36,000
4,650		6,000	85,000	45,000	36,000	7,700		8,000	116,000	76,000	36,000
4,700		6,000	85,000	45,000	36,000	7,800		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	8,400		10,000	131,000	87,000	40,000
5,100		6,000	90,000	50,000	36,000	8,500		10,000	131,000	87,000	40,000
5,160	13/64	6,000	90,000	50,000	36,000	8,600		10,000	131,000	87,000	40,000



## TS-Drills mit Innenkühlung

d1 mm	inch	d2 h6 mm	l1 mm	l2 mm	l3 mm	d1 mm	inch	d2 h6 mm	l1 mm	l2 mm	l3 mm
8,700		10,000	131,000	87,000	40,000	14,000		14,000	182,000	133,000	45,000
8,800		10,000	131,000	87,000	40,000	14,100		16,000	204,000	152,000	48,000
9,000		10,000	131,000	87,000	40,000	14,200		16,000	204,000	152,000	48,000
9,100		10,000	139,000	95,000	40,000	14,500		16,000	204,000	152,000	48,000
9,200		10,000	139,000	95,000	40,000	15,000		16,000	204,000	152,000	48,000
9,250		10,000	139,000	95,000	40,000	15,100		16,000	204,000	152,000	48,000
9,300		10,000	139,000	95,000	40,000	15,500		16,000	204,000	152,000	48,000
9,400		10,000	139,000	95,000	40,000	16,000		16,000	204,000	152,000	48,000
9,500		10,000	139,000	95,000	40,000	16,500		18,000	223,000	171,000	48,000
9,520	3/8	10,000	139,000	95,000	40,000	16,900		18,000	223,000	171,000	48,000
9,700		10,000	139,000	95,000	40,000	17,000		18,000	223,000	171,000	48,000
9,800		10,000	139,000	95,000	40,000	17,500		18,000	223,000	171,000	48,000
9,900		10,000	139,000	95,000	40,000	18,000		18,000	223,000	171,000	48,000
10,000		10,000	139,000	95,000	40,000	18,500		20,000	244,000	190,000	50,000
10,200		12,000	155,000	106,000	45,000	18,900		20,000	244,000	190,000	50,000
10,300		12,000	155,000	106,000	45,000	19,000		20,000	244,000	190,000	50,000
10,500		12,000	155,000	106,000	45,000	19,050	3/4	20,000	244,000	190,000	50,000
10,800		12,000	155,000	106,000	45,000	19,500		20,000	244,000	190,000	50,000
11,000		12,000	155,000	106,000	45,000	20,000		20,000	244,000	190,000	50,000
11,200		12,000	163,000	114,000	45,000						
11,500		12,000	163,000	114,000	45,000						
11,800		12,000	163,000	114,000	45,000						
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						
12,500		14,000	182,000	133,000	45,000						
12,700	1/2	14,000	182,000	133,000	45,000						
13,000		14,000	182,000	133,000	45,000						
13,100	33/64	14,000	182,000	133,000	45,000						
13,500		14,000	182,000	133,000	45,000						



## TS-Drills mit Innenkühlung

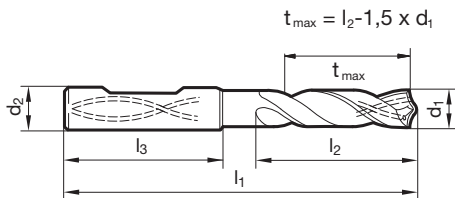
Artikel-Nr. 89308



P	M	K	N	S	H
●	○	○	○		



Ausspitzung  $\geq \varnothing 10,000$  • Kegelmantelschliff • dämpft Schwingungen und Stöße • HSS-Träger mit eingelöteter HM-Platte  
 unlegierte/niedrig legierte Stähle • Grauguss, Kugelgraphitguss • Messing, Bronzen, Kunststoffe, Graphit



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	18,000	20,000	202,000	148,000	50,000
11,000	16,000	151,000	99,000	48,000	19,000	25,000	224,000	164,000	56,000
11,800	16,000	151,000	99,000	48,000	20,000	25,000	224,000	164,000	56,000
12,000	16,000	151,000	99,000	48,000	22,000	25,000	241,000	181,000	56,000
13,000	16,000	167,000	115,000	48,000					
13,500	16,000	167,000	115,000	48,000					
14,000	16,000	167,000	115,000	48,000					
15,000	20,000	186,000	132,000	50,000					
16,000	20,000	186,000	132,000	50,000					
16,500	20,000	202,000	148,000	50,000					
17,000	20,000	202,000	148,000	50,000					
17,500	20,000	202,000	148,000	50,000					



## TS-Drills mit Innenkühlung

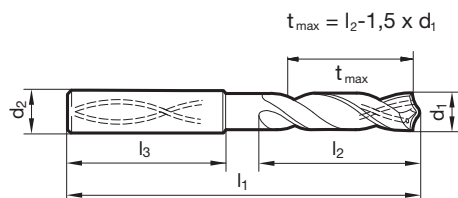
Artikel-Nr. 89427



P	M	K	N	S	H
•				•	○



Ausspitzung  $\geq \text{Ø } 3,000$  • Kegelmantelanschliff • Hauptschneidenform leicht konkav • optimierte Schneidengeometrie  
 legierte und hochfeste Stähle bis 1400 N/mm<sup>2</sup> • Inconel, Hastelloy, Monel • Titan und Titanlegierungen



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 mit Innenkühlung

Artikel-Nr. 89421

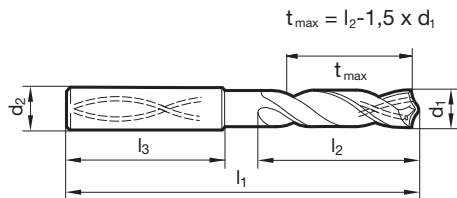


P	M	K	N	S	H
		•			



Ausspitzung  $\geq \varnothing 4,000$  • patentierter Radienanschliff • Schneidenform gerade (durch Korrektur)

Vermikularguss GGv und ADI, CDI • Grauguss, Temperguss, Sphäroguss



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 mit Innenkühlung

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						

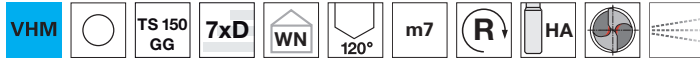


## TS-Drills mit Innenkühlung

Artikel-Nr. 89294

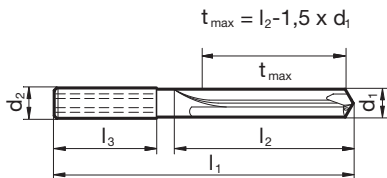


P	M	K	N	S	H
		○	●		



Ausspitzung  $\geq \text{Ø } 3,000$  • Kegelmantelschliff • enge Durchmesser-toleranzen • sehr gute Bohrungsflächen • optimalen Kühlmitteldruck beachten

Aluminium und Al-Legierungen • Al-Werkstoffe mit hohem Si-Gehalt



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

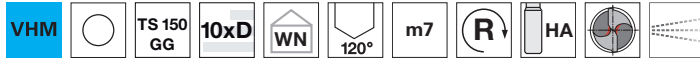


## TS-Drills mit Innenkühlung

### Artikel-Nr. 89293



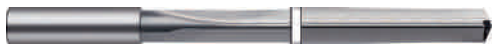
P	M	K	N	S	H
		○	●		



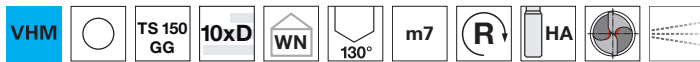
Ausspitzung  $\geq \varnothing 3,000$  • Kegelmantelschliff • enge Durchmessertoleranzen • sehr gute Bohrungsflächen • optimalen Kühlmitteldruck beachten

Aluminium und Al-Legierungen • Al-Werkstoffe mit hohem Si-Gehalt

### Artikel-Nr. 89295

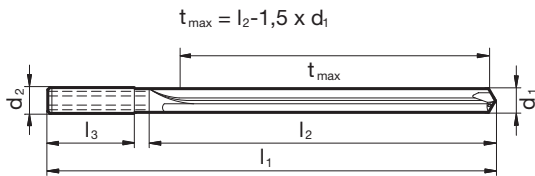


P	M	K	N	S	H
		●	○		



Ausspitzung  $\geq \varnothing 3,000$  • Flächenanschliff • enge Durchmessertoleranzen • sehr gute Bohrungsflächen • optimalen Kühlmitteldruck beachten

Grauguss, Temperguss, Sphäroguss



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	8,000		8,000	146,000	106,000	36,000
3,100		6,000	91,000	42,000	36,000	8,330	21/64	10,000	175,000	130,000	40,000
3,170	1/8	6,000	91,000	42,000	36,000	8,500		10,000	175,000	130,000	40,000
3,250		6,000	91,000	42,000	36,000	8,730	11/32	10,000	175,000	130,000	40,000
3,300		6,000	91,000	42,000	36,000	9,000		10,000	175,000	130,000	40,000
3,500		6,000	91,000	48,000	36,000	9,130	23/64	10,000	175,000	130,000	40,000
3,570	9/64	6,000	91,000	48,000	36,000	9,500		10,000	175,000	130,000	40,000
3,600		6,000	91,000	48,000	36,000	9,520	3/8	10,000	175,000	130,000	40,000
3,700		6,000	91,000	48,000	36,000	10,000		10,000	175,000	130,000	40,000
3,800		6,000	121,000	77,000	36,000	10,200		12,000	209,000	159,000	45,000
3,900		6,000	121,000	77,000	36,000	10,320	13/32	12,000	209,000	159,000	45,000
3,970	5/32	6,000	121,000	77,000	36,000	10,500		12,000	209,000	159,000	45,000
4,000		6,000	121,000	77,000	36,000	10,720	27/64	12,000	209,000	159,000	45,000
4,200		6,000	121,000	77,000	36,000	11,000		12,000	209,000	159,000	45,000
4,400		6,000	121,000	77,000	36,000	11,110	7/16	12,000	209,000	159,000	45,000
4,500		6,000	121,000	77,000	36,000	11,500		12,000	209,000	159,000	45,000
4,700		6,000	121,000	77,000	36,000	11,510	29/64	12,000	209,000	159,000	45,000
4,800		6,000	121,000	82,000	36,000	12,000		12,000	209,000	159,000	45,000
4,900		6,000	121,000	82,000	36,000	12,300	31/64	14,000	233,000	183,000	45,000
5,000		6,000	121,000	82,000	36,000	12,500		14,000	233,000	183,000	45,000
5,500		6,000	121,000	82,000	36,000	12,700	1/2	14,000	233,000	183,000	45,000
6,000		6,000	121,000	82,000	36,000	13,000		14,000	233,000	183,000	45,000
6,350	1/4	8,000	146,000	106,000	36,000	13,500		14,000	233,000	183,000	45,000
6,500		8,000	146,000	106,000	36,000	14,000		14,000	233,000	183,000	45,000
6,800		8,000	146,000	106,000	36,000	14,500		16,000	260,000	207,000	48,000
7,000		8,000	146,000	106,000	36,000	15,000		16,000	260,000	207,000	48,000
7,140	9/32	8,000	146,000	106,000	36,000	15,500		16,000	260,000	207,000	48,000
7,500		8,000	146,000	106,000	36,000	16,000		16,000	260,000	207,000	48,000
7,800		8,000	146,000	106,000	36,000	17,500		18,000	284,000	231,000	48,000
7,940	5/16	8,000	146,000	106,000	36,000	18,000		18,000	284,000	231,000	48,000





## TS-Drills mit Innenkühlung

d1 mm	inch	d2 h6 mm	l1 mm	l2 mm	l3 mm	d1 mm	inch	d2 h6 mm	l1 mm	l2 mm	l3 mm
18,500		20,000	308,000	255,000	50,000						
19,500		20,000	308,000	255,000	50,000						
20,000		20,000	308,000	255,000	50,000						



## TS-Drills mit Innenkühlung

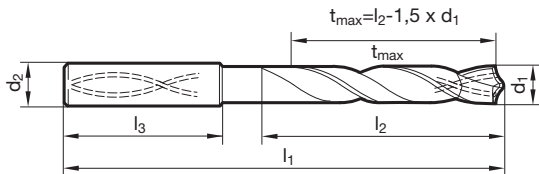
Artikel-Nr. 89418



P	M	K	N	S	H
●	○	●	○	○	○



Ausspitzung  $\geq \text{Ø } 3,000$  • Flächenanschliff • Kopfbeschichtung • Hauptschneidenform gerade • optimierte Schneidengeometrie  
 Bau- und Einsatzstähle • Automatenstähle, Vergütungsstähle • Stähle (legiert/unleg.) bis  $1200 \text{ N/mm}^2$  • Gusswerkstoffe • Bronze, Messing • hochlegierte AlSi-Legierungen



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	7,000		8,000	146,000	108,000	36,000
3,100		6,000	90,000	50,000	36,000	7,100		8,000	146,000	108,000	36,000
3,170	1/8	6,000	90,000	50,000	36,000	7,200		8,000	146,000	108,000	36,000
3,200		6,000	90,000	50,000	36,000	7,300		8,000	146,000	108,000	36,000
3,300		6,000	90,000	50,000	36,000	7,400		8,000	146,000	108,000	36,000
3,400		6,000	90,000	50,000	36,000	7,500		8,000	146,000	108,000	36,000
3,500		6,000	90,000	50,000	36,000	7,600		8,000	146,000	108,000	36,000
3,600		6,000	90,000	50,000	36,000	7,700		8,000	146,000	108,000	36,000
3,700		6,000	90,000	50,000	36,000	7,800		8,000	146,000	108,000	36,000
3,800		6,000	102,000	64,000	36,000	7,900		8,000	146,000	108,000	36,000
3,900		6,000	102,000	64,000	36,000	8,000		8,000	146,000	108,000	36,000
4,000		6,000	102,000	64,000	36,000	8,100		10,000	162,000	120,000	40,000
4,100		6,000	102,000	64,000	36,000	8,200		10,000	162,000	120,000	40,000
4,200		6,000	102,000	64,000	36,000	8,300		10,000	162,000	120,000	40,000
4,300		6,000	102,000	64,000	36,000	8,400		10,000	162,000	120,000	40,000
4,400		6,000	102,000	64,000	36,000	8,500		10,000	162,000	120,000	40,000
4,500		6,000	102,000	64,000	36,000	8,600		10,000	162,000	120,000	40,000
4,600		6,000	102,000	64,000	36,000	8,700		10,000	162,000	120,000	40,000
4,700		6,000	102,000	64,000	36,000	8,800		10,000	162,000	120,000	40,000
4,800		6,000	116,000	78,000	36,000	8,900		10,000	162,000	120,000	40,000
4,900		6,000	116,000	78,000	36,000	9,000		10,000	162,000	120,000	40,000
5,000		6,000	116,000	78,000	36,000	9,100		10,000	162,000	120,000	40,000
5,100		6,000	116,000	78,000	36,000	9,200		10,000	162,000	120,000	40,000
5,200		6,000	116,000	78,000	36,000	9,300		10,000	162,000	120,000	40,000
5,300		6,000	116,000	78,000	36,000	9,400		10,000	162,000	120,000	40,000
5,400		6,000	116,000	78,000	36,000	9,500		10,000	162,000	120,000	40,000
5,500		6,000	116,000	78,000	36,000	9,520	3/8	10,000	162,000	120,000	40,000
5,600		6,000	116,000	78,000	36,000	9,600		10,000	162,000	120,000	40,000
5,700		6,000	116,000	78,000	36,000	9,700		10,000	162,000	120,000	40,000
5,800		6,000	116,000	78,000	36,000	9,800		10,000	162,000	120,000	40,000
5,900		6,000	116,000	78,000	36,000	9,900		10,000	162,000	120,000	40,000
6,000		6,000	116,000	78,000	36,000	10,000		10,000	162,000	120,000	40,000
6,100		8,000	146,000	108,000	36,000	10,200		12,000	204,000	156,000	45,000
6,200		8,000	146,000	108,000	36,000	10,500		12,000	204,000	156,000	45,000
6,300		8,000	146,000	108,000	36,000	11,000		12,000	204,000	156,000	45,000
6,350	1/4	8,000	146,000	108,000	36,000	11,500		12,000	204,000	156,000	45,000
6,400		8,000	146,000	108,000	36,000	12,000		12,000	204,000	156,000	45,000
6,500		8,000	146,000	108,000	36,000	12,500		14,000	230,000	182,000	45,000
6,600		8,000	146,000	108,000	36,000	12,700	1/2	14,000	230,000	182,000	45,000
6,700		8,000	146,000	108,000	36,000	13,000		14,000	230,000	182,000	45,000
6,800		8,000	146,000	108,000	36,000	13,500		14,000	230,000	182,000	45,000
6,900		8,000	146,000	108,000	36,000	14,000		14,000	230,000	182,000	45,000



## TS-Drills mit Innenkühlung

d1 mm	inch	d2 h6 mm	l1 mm	l2 mm	l3 mm	d1 mm	inch	d2 h6 mm	l1 mm	l2 mm	l3 mm
14,500		16,000	260,000	208,000	48,000	20,000		20,000	310,000	258,000	50,000
15,000		16,000	260,000	208,000	48,000						
15,500		16,000	260,000	208,000	48,000						
16,000		16,000	260,000	208,000	48,000						
16,500		18,000	285,000	234,000	48,000						
17,000		18,000	285,000	234,000	48,000						
17,500		18,000	285,000	234,000	48,000						
18,000		18,000	285,000	234,000	48,000						
18,500		20,000	310,000	258,000	50,000						
19,000		20,000	310,000	258,000	50,000						
19,050	3/4	20,000	310,000	258,000	50,000						
19,500		20,000	310,000	258,000	50,000						



## TS-Drills mit Innenkühlung

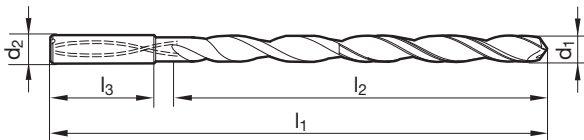
Artikel-Nr. 86509



P	M	K	N	S	H
•	•	•	○	○	○



- Ausspitzung  $\geq \text{Ø } 3,000$  • Kegelmantelschliff • Kopfbeschichtung • Hauptschneidenform konkav • optimierter Nutquerschnitt
- maximaler Kühlkanalquerschnitt • Kühlmitteldruck beachten
- Bau- und Einsatzstähle • Automatenstähle, Vergütungsstähle • legierte Stähle bis 1200 N/mm<sup>2</sup> • rostfreie Stähle • Gusswerkstoffe



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	7,940	5/16	8,000	183,000	143,000	36,000
3,170	1/8	6,000	106,000	67,000	36,000	8,000		8,000	183,000	143,000	36,000
3,500		6,000	116,000	76,000	36,000	8,330	21/64	10,000	204,000	160,000	40,000
3,570	9/64	6,000	116,000	76,000	36,000	8,500		10,000	204,000	160,000	40,000
3,970	5/32	6,000	116,000	76,000	36,000	9,000		10,000	204,000	160,000	40,000
4,000		6,000	116,000	76,000	36,000	9,130	23/64	10,000	221,000	177,000	40,000
4,370	11/64	6,000	133,000	93,000	36,000	9,520	3/8	10,000	221,000	177,000	40,000
4,500		6,000	133,000	93,000	36,000	9,920	25/64	10,000	221,000	177,000	40,000
4,760	3/16	6,000	133,000	93,000	36,000	10,000		10,000	221,000	177,000	40,000
5,000		6,000	133,000	93,000	36,000	10,320	13/32	12,000	247,000	198,000	45,000
5,100		6,000	150,000	110,000	36,000	10,720	27/64	12,000	247,000	198,000	45,000
5,160	13/64	6,000	150,000	110,000	36,000	11,000		12,000	247,000	198,000	45,000
5,410		6,000	150,000	110,000	36,000	11,110	7/16	12,000	263,000	214,000	45,000
5,500		6,000	150,000	110,000	36,000	11,510	29/64	12,000	263,000	214,000	45,000
5,560	7/32	6,000	150,000	110,000	36,000	11,910	15/32	12,000	263,000	214,000	45,000
5,950	15/64	6,000	150,000	110,000	36,000	12,000		12,000	263,000	214,000	45,000
6,000		6,000	150,000	110,000	36,000	12,300	31/64	14,000	297,000	248,000	45,000
6,350	1/4	8,000	167,000	127,000	36,000	12,700	1/2	14,000	297,000	248,000	45,000
6,500		8,000	167,000	127,000	36,000	13,100	33/64	14,000	297,000	248,000	45,000
6,750	17/64	8,000	167,000	127,000	36,000	13,490	17/32	14,000	297,000	248,000	45,000
7,000		8,000	167,000	127,000	36,000	13,890	35/64	14,000	297,000	248,000	45,000
7,140	9/32	8,000	183,000	143,000	36,000	14,000		14,000	297,000	248,000	45,000
7,500		8,000	183,000	143,000	36,000						
7,540	19/64	8,000	183,000	143,000	36,000						



## TS-Drills mit Innenkühlung

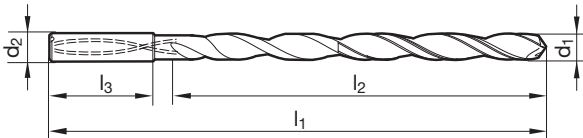
Artikel-Nr. 86511



P	M	K	N	S	H
•	•	•	○	○	○



- Ausspitzung  $\geq \text{Ø } 3,000$  • Kegelmantelschliff • Kopfbeschichtung • Hauptschneidenform konkav • optimierter Nutquerschnitt
- maximaler Kühlkanalquerschnitt • Kühlmitteldruck beachten
- Bau- und Einsatzstähle • Automatenstähle, Vergütungsstähle • legierte Stähle bis 1200 N/mm<sup>2</sup> • rostfreie Stähle • Gusswerkstoffe



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	9,000		10,000	249,000	205,000	40,000
3,170	1/8	6,000	123,000	83,000	36,000	9,920	25/64	10,000	271,000	227,000	40,000
3,500		6,000	136,000	96,000	36,000	10,000		10,000	271,000	227,000	40,000
3,970	5/32	6,000	136,000	96,000	36,000	11,000		12,000	302,000	253,000	45,000
4,000		6,000	136,000	96,000	36,000	12,000		12,000	323,000	274,000	45,000
4,500		6,000	158,000	118,000	36,000	12,300	31/64	14,000	367,000	318,000	45,000
4,760	3/16	6,000	158,000	118,000	36,000	13,100	33/64	14,000	367,000	318,000	45,000
5,000		6,000	158,000	118,000	36,000	13,490	17/32	14,000	367,000	318,000	45,000
5,500		6,000	180,000	140,000	36,000	13,890	35/64	14,000	367,000	318,000	45,000
5,560	7/32	6,000	180,000	140,000	36,000	14,000		14,000	367,000	318,000	45,000
6,000		6,000	180,000	140,000	36,000						
6,350	1/4	8,000	202,000	162,000	36,000						
6,500		8,000	202,000	162,000	36,000						
7,000		8,000	202,000	162,000	36,000						
7,140	9/32	8,000	223,000	183,000	36,000						
7,500		8,000	223,000	183,000	36,000						
8,000		8,000	223,000	183,000	36,000						
8,500		10,000	249,000	205,000	40,000						



## TS-Drills mit Innenkühlung

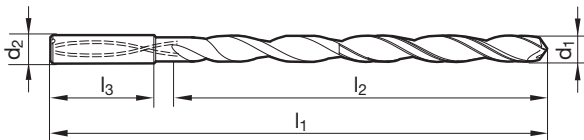
Artikel-Nr. 86512



P	M	K	N	S	H
•	•	•	○	○	○



- Ausspitzung  $\geq \text{Ø } 3,000$  • Kegelmantelschliff • Kopfbeschichtung • Hauptschneidenform konkav • optimierter Nutquerschnitt
- maximaler Kühlkanalquerschnitt • Kühlmitteldruck beachten
- Bau- und Einsatzstähle • Automatenstähle, Vergütungsstähle • legierte Stähle bis  $1200 \text{ N/mm}^2$  • rostfreie Stähle • Gusswerkstoffe



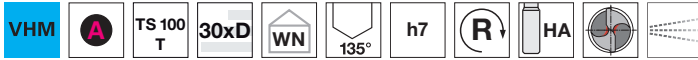
d1		d2 h6	l1	l2	l3	d1		d2 h6	l1	l2	l3
mm	inch	mm	mm	mm	mm	mm	inch	mm	mm	mm	mm
3,000		6,000	125,000	85,000	36,000	7,140	9/32	8,000	263,000	223,000	36,000
3,100		6,000	141,000	101,000	36,000	7,500		8,000	263,000	223,000	36,000
3,170	1/8	6,000	141,000	101,000	36,000	8,000		8,000	263,000	223,000	36,000
3,500		6,000	156,000	116,000	36,000	8,500		10,000	294,000	250,000	40,000
3,800		6,000	156,000	116,000	36,000	8,800		10,000	294,000	250,000	40,000
3,970	5/32	6,000	156,000	116,000	36,000	9,000		10,000	294,000	250,000	40,000
4,000		6,000	156,000	116,000	36,000	9,920	25/64	10,000	321,000	277,000	40,000
4,200		6,000	183,000	143,000	36,000	10,000		10,000	321,000	277,000	40,000
4,500		6,000	183,000	143,000	36,000	10,320	13/32	12,000	359,000	310,000	45,000
4,760	3/16	6,000	183,000	143,000	36,000	11,000		12,000	359,000	310,000	45,000
5,000		6,000	183,000	143,000	36,000	11,510	29/64	12,000	386,000	337,000	45,000
5,500		6,000	210,000	170,000	36,000	11,910	15/32	12,000	386,000	337,000	45,000
5,560	7/32	6,000	210,000	170,000	36,000	12,000		12,000	386,000	337,000	45,000
6,000		6,000	210,000	170,000	36,000						
6,300		8,000	237,000	197,000	36,000						
6,350	1/4	8,000	237,000	197,000	36,000						
6,500		8,000	237,000	197,000	36,000						
7,000		8,000	237,000	197,000	36,000						



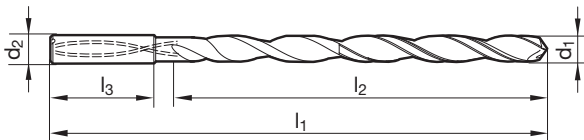
## TS-Drills mit Innenkühlung

Artikel-Nr. 86513

P	M	K	N	S	H
•	•	•	○	○	○



- Ausspitzung  $\geq \text{Ø } 3,000$  • Kegelmantelschliff • Kopfbeschichtung • Hauptschneidenform konkav • optimierter Nutquerschnitt
- maximaler Kühlkanalquerschnitt • Kühlmitteldruck beachten
- Bau- und Einsatzstähle • Automatenstähle, Vergütungsstähle • legierte Stähle bis 1200 N/mm<sup>2</sup> • rostfreie Stähle • Gusswerkstoffe



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	7,140	9/32	8,000	303,000	263,000	36,000
3,100		6,000	158,000	118,000	36,000	7,500		8,000	303,000	263,000	36,000
3,170	1/8	6,000	158,000	118,000	36,000	8,000		8,000	303,000	263,000	36,000
3,500		6,000	176,000	136,000	36,000	8,500		10,000	339,000	295,000	40,000
3,800		6,000	176,000	136,000	36,000	8,800		10,000	339,000	295,000	40,000
3,970	5/32	6,000	176,000	136,000	36,000	9,000		10,000	339,000	295,000	40,000
4,000		6,000	176,000	136,000	36,000	9,920	25/64	10,000	371,000	327,000	40,000
4,200		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						
4,760	3/16	6,000	208,000	168,000	36,000						
5,000		6,000	208,000	168,000	36,000						
5,500		6,000	240,000	200,000	36,000						
5,560	7/32	6,000	240,000	200,000	36,000						
6,000		6,000	240,000	200,000	36,000						
6,300		8,000	272,000	232,000	36,000						
6,350	1/4	8,000	272,000	232,000	36,000						
6,500		8,000	272,000	232,000	36,000						
7,000		8,000	272,000	232,000	36,000						

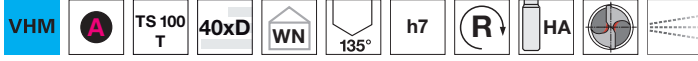


## TS-Drills mit Innenkühlung

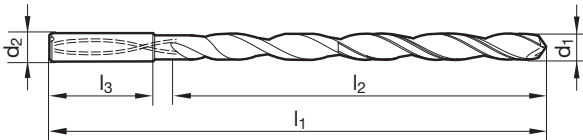
Artikel-Nr. 86514



P	M	K	N	S	H
•	•	•	○	○	○



- Ausspitzung  $\geq \text{Ø } 3,000$  • Kegelmantelschliff • Kopfbeschichtung • Hauptschneidenform konkav • optimierter Nutquerschnitt
- maximaler Kühlkanalquerschnitt • Kühlmitteldruck beachten
- Bau- und Einsatzstähle • Automatenstähle, Vergütungsstähle • legierte Stähle bis 1200 N/mm<sup>2</sup> • rostfreie Stähle • Gusswerkstoffe



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	5,950	15/64	6,000	300,000	260,000	36,000
3,100		6,000	193,000	153,000	36,000	6,000		6,000	300,000	260,000	36,000
3,170	1/8	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	7,000		8,000	342,000	302,000	36,000
4,000		6,000	216,000	176,000	36,000	7,140	9/32	8,000	363,000	323,000	36,000
4,200		6,000	238,000	198,000	36,000	7,500		8,000	363,000	323,000	36,000
4,370	11/64	6,000	238,000	198,000	36,000	7,540	19/64	8,000	383,000	343,000	36,000
4,500		6,000	238,000	198,000	36,000	7,940	5/16	8,000	383,000	343,000	36,000
4,760	3/16	6,000	258,000	218,000	36,000	8,000		8,000	383,000	343,000	36,000
5,000		6,000	258,000	218,000	36,000						
5,100		6,000	280,000	240,000	36,000						
5,160	13/64	6,000	280,000	240,000	36,000						
5,410		6,000	280,000	240,000	36,000						
5,500		6,000	280,000	240,000	36,000						
5,560	7/32	6,000	300,000	260,000	36,000						



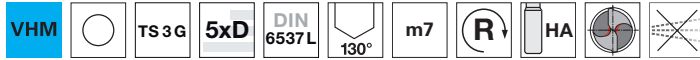


## TS-Drills, 3-schneidig

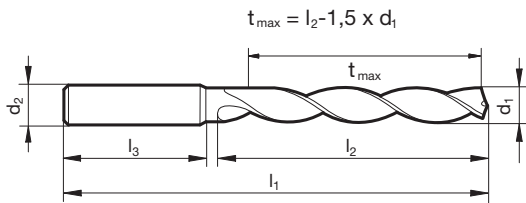
Artikel-Nr. 89247



P	M	K	N	S	H
		•	•		



Ausspitzung  $\geq \text{Ø } 3,000$  • Spiropointanschliff • weite Spannuten • optimales Zentrieren • für unterbrochenen Schnitt geeignet  
 Guss • langspanende Al-Legierungen • Messing, Bronzen



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

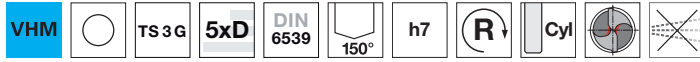


## TS-Drills, 3-schneidig

Artikel-Nr. 89239

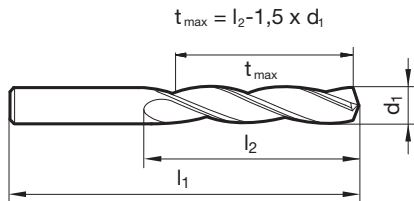


P	M	K	N	S	H
		•	•		



Ausspitzung  $\geq \text{Ø } 3,000$  • Flächenanschliff • für sehr maßhaltige Bohrungen • sehr gute Bohrungsflächen • für unterbrochenen Schnitt geeignet

Gusswerkstoffe • Al-Gusslegierungen



d1 mm	l1 mm	l2 mm	d1 mm	l1 mm	l2 mm
3,000	46,000	22,000	7,400	74,000	45,000
3,100	49,000	24,000	7,500	74,000	45,000
3,200	49,000	24,000	7,600	79,000	48,000
3,300	49,000	24,000	7,700	79,000	48,000
3,400	52,000	27,000	7,800	79,000	48,000
3,500	52,000	27,000	8,000	79,000	48,000
3,600	52,000	27,000	8,100	79,000	48,000
3,700	52,000	27,000	8,200	79,000	48,000
3,800	55,000	30,000	8,400	79,000	48,000
3,900	55,000	30,000	8,500	79,000	48,000
4,000	55,000	30,000	8,700	84,000	52,000
4,100	55,000	30,000	8,800	84,000	52,000
4,200	55,000	30,000	9,000	84,000	52,000
4,300	58,000	32,000	9,100	84,000	52,000
4,500	58,000	32,000	9,200	84,000	52,000
4,600	58,000	32,000	9,300	84,000	52,000
4,700	58,000	32,000	9,500	84,000	52,000
4,800	62,000	35,000	9,600	89,000	55,000
4,900	62,000	35,000	9,700	89,000	55,000
5,000	62,000	35,000	9,800	89,000	55,000
5,100	62,000	35,000	10,000	89,000	55,000
5,200	62,000	35,000	10,200	89,000	55,000
5,300	62,000	35,000	10,300	89,000	55,000
5,400	66,000	39,000	10,500	89,000	55,000
5,500	66,000	39,000	10,700	95,000	60,000
5,600	66,000	39,000	11,000	95,000	60,000
5,700	66,000	39,000	11,110	95,000	60,000
5,800	66,000	39,000	11,200	95,000	60,000
5,900	66,000	39,000	11,500	95,000	60,000
6,000	66,000	39,000	11,800	95,000	60,000
6,100	70,000	42,000	12,000	102,000	65,000
6,200	70,000	42,000	12,500	102,000	65,000
6,300	70,000	42,000	12,700	102,000	65,000
6,400	70,000	42,000	13,000	102,000	65,000
6,500	70,000	42,000	13,500	107,000	66,000
6,600	70,000	42,000	13,800	107,000	66,000
6,700	70,000	42,000	14,000	107,000	66,000
6,800	74,000	45,000	14,300	111,000	70,000
7,000	74,000	45,000	14,500	111,000	70,000
7,100	74,000	45,000	15,000	111,000	70,000
7,200	74,000	45,000	15,500	115,000	73,000
7,300	74,000	45,000	16,000	115,000	73,000



HARTNER

TS-Drills, 3-schneidig

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



## Entgratgabeln

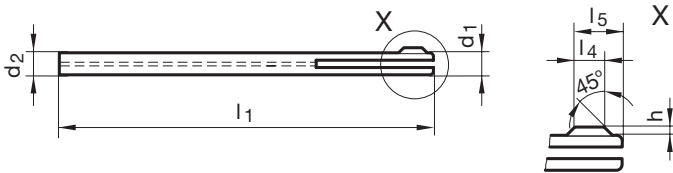
Artikel-Nr. 84100



P	M	K	N	S	H
•	•	•	○	•	○



mit Innenkühlung • mit durchgängig zylindrischem Schaft für die Aufnahme in Spannzangen  
 Innen- und Außenentgratung • universell einsetzbar auf Werkzeug-, Fräs- und Drehmaschinen sowie Robotern



Ø-Bereich	d1 mm	d2 mm	l1 mm	l4 mm	l5 mm	h mm	Code-Nr.
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



## Entgratgabeln

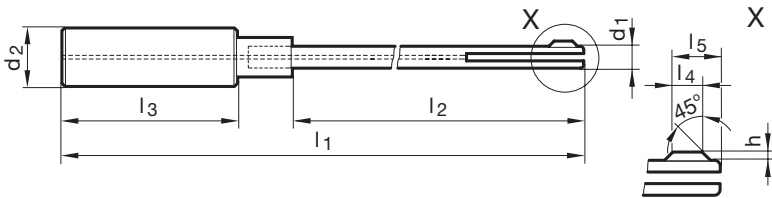
Artikel-Nr. 84101



P	M	K	N	S	H
•	•	•	○	•	○



für die Aufnahme in Hydraulik-Dehnspannfutter und Schruppfutter • mit Schaft nach DIN 6535 • mit Innenkühlung  
 Innen- und Außenentgratung • universell einsetzbar auf Werkzeug-, Fräs- und Drehmaschinen sowie Robotern



Ø-Bereich	d1 mm	d2 mm	l1 mm	l2 mm	l3 mm	l4 mm	l5 mm	h mm	Code-Nr.
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



## Vor- und Rückwärtsentgrater 90°

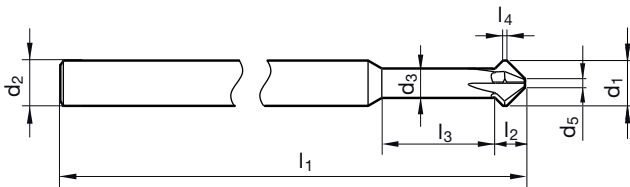
Artikel-Nr. 80495



P	M	K	N	S	H
•	•	•	○	•	○



mit Schaft nach DIN 6535 • für die Aufnahme in Hydraulik-Dehnspannfutter und Schrumpffutter  
 Innen- und Außenentgratung • Entgraten von Bohrungen und Konturen

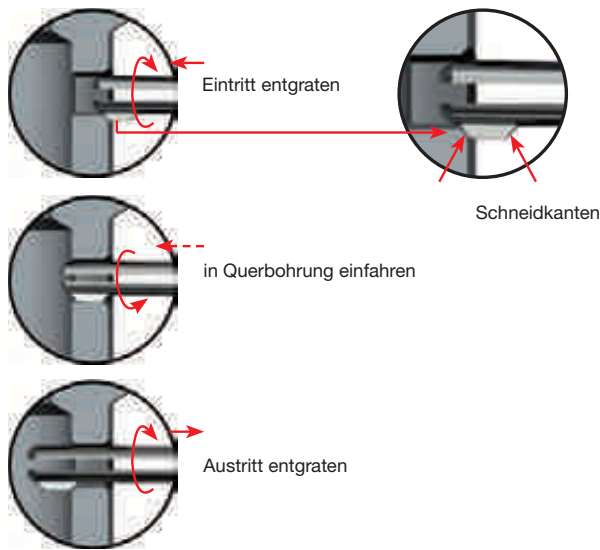


d1 mm	d2 h6 mm	d3 mm	d5 mm	l1 mm	l2 mm	l3 mm	l4 mm	Z	Code-Nr.
3,000	4,000	2,200	0,600	75,000	2,10	9,300	0,500	4	3,000
4,000	4,000	2,900	0,800	75,000	2,70	12,300	0,500	4	4,000
5,000	5,000	3,900	1,000	75,000	3,00	15,000	0,500	4	5,000
6,000	6,000	3,900	1,200	100,000	3,90	14,300	0,500	4	6,000
8,000	6,000	6,000	1,600	100,000	4,70		0,500	4	8,000
10,000	6,000	6,000	2,000	100,000	6,50		0,500	4	10,000
12,000	6,000	6,000	2,400	100,000	8,30		0,500	4	12,000



## Entgratgabel TS 100 EG

### Die Bearbeitung



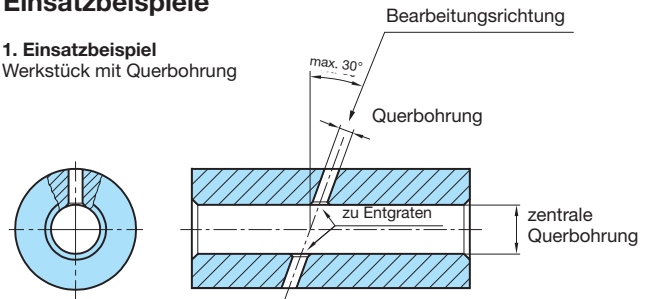
### Schritt für Schritt:

Die maschinelle Ein- und Austritts-Entgratung mit der Entgratgabel TS 100 EG ist eine einfache und kostengünstige Alternative zur bisherigen, aufwändigen Nachbearbeitung per Hand. Dabei kommt ein einziges Werkzeug für alle Arbeitsschritte zum Einsatz.

Ø-Bereich (mm)	$v_c$ m/min	$f_u$ (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

### Einsatzbeispiele

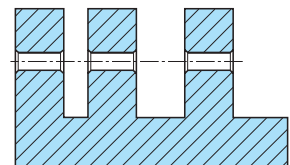
#### 1. Einsatzbeispiel Werkstück mit Querbohrung



Bei Werkstücken mit Querbohrung muss:

- der Durchmesser der Querbohrung maximal 35% des Durchmessers der zentralen Bohrung betragen
- der Durchmesser der Querbohrung 40% größer sein als die Schneidlänge  $l_4$

#### 2. Einsatzbeispiel Werkstück mit mehrfach unterbrochener Bohrung



### Universell einsetzbar:

Mit der Standard-Entgratgabel können sowohl Werkstücke mit Querbohrung als auch Werkstücke mit mehrfach unterbrochenem Schnitt bearbeitet werden. Resultat sind in jedem Fall sauber entgratete Bohrungsein- und -austritte.

### Wichtig:

Bitte beachten Sie, dass die Schnittwerte nur Richtwerte sind. Sie können nach oben wie nach unten hin angepasst werden.

## Vor-/Rückwärtsentgrater TS 100 VR

### Schnittwerte Vor-/Rückwärtsentgrater TS 100 VR

Werkstoffgruppe	Zugfestigkeit Härte MPa (N/mm <sup>2</sup> )	$v_c$ (m/min)	VR- Code
Stähle	< 850	120 - 200	71
	850-1200	100 - 180	71
	> 1200	80 - 140	71
Gehärtete Stähle	< 54 HRC	60 - 120	71
	54-60 HRC	40 - 80	71
Rost- und säurebest. Stähle	< 850	80 - 120	71
Nickel-Basis-Legierungen	< 1300	30 - 60	71
Titan-Legierungen	< 1300	50 - 100	71
Guss	< 240 HB30	120 - 180	72
	> 240 HB30	100 - 160	72
Al Knetlegierungen < 3% Si		150 - 250	72
Al Gusslegierungen > 3% Si		100 - 200	72
Magnesium-Legierungen		150 - 250	72
Nichteisen-Legierungen	< 850	30 - 200	72

### Vorschubreihen-Code (mm/U)

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

### Wichtig:

Bitte beachten Sie, dass die Schnittwerte nur Richtwerte sind. Sie können nach oben wie nach unten hin angepasst werden.



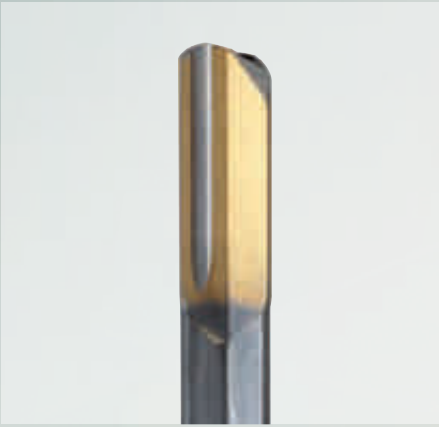
# HARTNER

Präzisionswerkzeuge



# MULTIPLYEX







# HARTNER

Präzisionswerkzeuge

## EIN- UND ZWEILIPPEN- TIEFLOCHBOHRER

aus Vollhartmetall, mit HM-Kopf oder mit Wechselplatten  
blank und beschichtet

Ein- & Zweilippen-  
Tieflochbohrer







P	M	K	N	S	H	Norm	Typ	Schneidstoff	Oberfläche	Schneid- richtung	Schaft- form	Bohrtiefe	d1/mm	Artikel-Nr.	Progr. Seite
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## Einlippenbohrer E 100













	•	•	○	•	○	○	Werksnorm	TLB E 100	VHM		rechts	HA	25xD	2,380 - 12,000	89520	253
	•	•	○	•	○	○	Werksnorm	TLB E 100	VHM		rechts	HA	50xD	2,380 - 8,000	89521	254
	•	•	○	•	○	○	Werksnorm	TLB E 100	VHM		rechts	HA	75xD	2,380 - 6,000	89522	255
	○	○	○	•	•	○	Werksnorm	TLB E 100	VHM	○	rechts	HA	45.000	1,200 - 3,200	89503	256
	•	○	•	○	○	○	Werksnorm	TLB E 100	VHM		rechts	HA	45.000	1,200 - 3,200	89510	256
	○	○	○	•	•	○	Werksnorm	TLB E 100	VHM	○	rechts	HA	80.000	1,200 - 5,000	89501	257
	•	○	•	○	○	○	Werksnorm	TLB E 100	VHM		rechts	HA	80.000	1,200 - 5,000	89511	257
	○	○	○	•	•	○	Werksnorm	TLB E 100	VHM	○	rechts	HA	120.000	1,500 - 5,000	89504	258
	•	○	•	○	○	○	Werksnorm	TLB E 100	VHM		rechts	HA	120.000	1,500 - 5,000	89512	258
	○	○	○	•	•	○	Werksnorm	TLB E 100	VHM	○	rechts	HA	160.000	1,500 - 8,000	89502	259
	•	○	•	○	○	○	Werksnorm	TLB E 100	VHM		rechts	HA	160.000	1,500 - 8,000	89513	259

## Einlippenbohrer E 80



	•	○	•	○	○	○	Werksnorm	TLB E 80	HM		rechts	HA	20xD	3,970 - 12,700	89505	260
	○	•	○	•	○	○	Werksnorm	TLB E 80	HM		rechts	HA	20xD	3,970 - 12,700	89514	260

P	M	K	N	S	H	Norm	Typ	Schneidstoff	Oberfläche	Schneid- richtung	Schaft- form	Bohrtiefe	d1/mm	Artikel-Nr.	Progr. Seite
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## Einlippenbohrer E 80

	•	○	•	○	○	Werksnorm	TLB E 80	HM		rechts	HA	30xD	3,970 - 12,700	89509	261
	○	•	○	•	○	Werksnorm	TLB E 80	HM		rechts	HA	30xD	3,970 - 12,700	89515	261
	•	○	•	○	○	Werksnorm	TLB E 80	HM		rechts	HA	40xD	3,970 - 12,700	89506	262
	○	•	○	•	○	Werksnorm	TLB E 80	HM		rechts	HA	40xD	3,970 - 12,700	89516	262
	•	○	•	○	○	Werksnorm	TLB E 80	HM		rechts	HA	80xD	4,950 - 12,650	89507	263
	○	•	○	•	○	Werksnorm	TLB E 80	HM		rechts	HA	80xD	4,950 - 12,650	89517	263


## Einlippenbohrer E 800 mit Wechselplatten

	•	○	○	•	○	Werksnorm	TLB E 800	HM		rechts	HB	30xD	12,000 - 24,000	89530	264
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## Schneidplatten für Einlippenbohrer E 800

•	○	○	•	○	Werksnorm		VHM		rechts			12,000 - 40,000	89535	265
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## Führungsleisten für Einlippenbohrer E 800

•	○	○	•	○	Werksnorm		VHM					12,000 - 40,000	89536	266
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## Zweilippenbohrer Z 80

			•		Werksnorm	TLB Z 80	HM	○	rechts	HA	30xD	8,000 - 12,000	89508	267
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P	M	K	N	S	H	Norm	Typ	Schneidstoff	Oberfläche	Schneid- richtung	Schaft- form	Bohrtiefe	d1/mm	Artikel-Nr.	Progr. Seite
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## Zweilippenbohrer Z 80



		•				Werksnorm	TLB Z 80	HM	○	rechts	HA	30xD	8,000 - 12,000	89518	267
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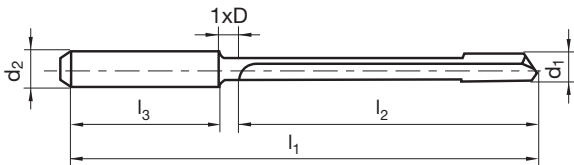
## Einlippenbohrer E 100

Artikel-Nr. 89520

P	M	K	N	S	H
•	•	○	•	○	○



Bohrtiefe bis 25xD • Umfangsform G • VHM-Vollschaft mit kegeligem MMS-Schaftende ab d1 = 3 mm bzw. d2 = 6 mm



d1 mm	inch	d2 h6 mm	l1 mm	l2 mm	l3 mm
2,380	3/32	4,000	100,000	70,000	28,000
2,500		4,000	115,000	85,000	28,000
2,780	7/64	4,000	115,000	85,000	28,000
3,000		6,000	145,000	105,000	36,000
3,170	1/8	6,000	145,000	105,000	36,000
3,500		6,000	145,000	105,000	36,000
3,970	5/32	6,000	160,000	120,000	36,000
4,000		6,000	160,000	120,000	36,000
5,000		6,000	220,000	180,000	36,000
5,560	7/32	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
7,000		8,000	260,000	210,000	36,000
7,140	9/32	8,000	285,000	240,000	36,000
8,000		8,000	285,000	240,000	36,000
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
12,000		12,000	420,000	360,000	45,000



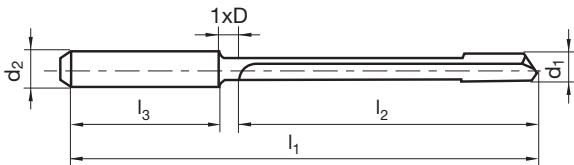
## Einlippenbohrer E 100

Artikel-Nr. 89521

P	M	K	N	S	H
•	•	○	•	○	○



Bohrtiefe bis 50xD • Umfangsform G • VHM-Vollschaft mit kegeligem MMS-Schaftende ab d1 = 3 mm bzw. d2 = 6 mm



d1		d2 h6	l1	l2	l3
mm	inch	mm	mm	mm	mm
2,380	3/32	4,000	160,000	130,000	28,000
2,500		4,000	185,000	155,000	28,000
2,780	7/64	4,000	185,000	155,000	28,000
3,000		6,000	230,000	190,000	36,000
3,170	1/8	6,000	230,000	190,000	36,000
3,500		6,000	230,000	190,000	36,000
3,970	5/32	6,000	260,000	220,000	36,000
4,000		6,000	260,000	220,000	36,000
5,000		6,000	370,000	330,000	36,000
5,560	7/32	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
7,000		8,000	430,000	385,000	36,000
7,140	9/32	8,000	485,000	440,000	36,000
8,000		8,000	485,000	440,000	36,000



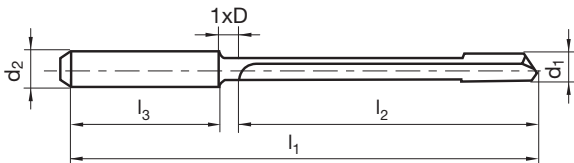
## Einlippenbohrer E 100

Artikel-Nr. 89522

P	M	K	N	S	H
•	•	○	•	○	○



Bohrtiefe bis 75xD • Umfangsform G • VHM-Vollschaft mit kegeligem MMS-Schaftende ab d1 = 3 mm bzw. d2 = 6 mm



d1 mm	inch	d2 h6 mm	l1 mm	l2 mm	l3 mm
2,380	3/32	4,000	220,000	190,000	28,000
2,500		4,000	255,000	220,000	28,000
2,780	7/64	4,000	255,000	220,000	28,000
3,000		6,000	320,000	280,000	36,000
3,170	1/8	6,000	320,000	280,000	36,000
3,500		6,000	320,000	280,000	36,000
3,970	5/32	6,000	360,000	320,000	36,000
4,000		6,000	360,000	320,000	36,000
5,000		6,000	525,000	485,000	36,000
5,560	7/32	6,000	525,000	485,000	36,000
6,000		6,000	525,000	485,000	36,000





## Einlippenbohrer E 100

### Artikel-Nr. 89503



P	M	K	N	S	H
○	○	○	●	●	○



Spannutlänge 45 mm • Umfangsform G

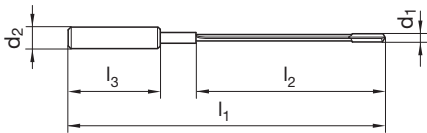
### Artikel-Nr. 89510



P	M	K	N	S	H
●	○	●	○	○	○



Spannutlänge 45 mm • Umfangsform 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
1,600		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



## Einlippenbohrer E 100

Artikel-Nr. 89501



P	M	K	N	S	H
○	○	○	●	●	○



Spannutlänge 80 mm • Umfangsform G

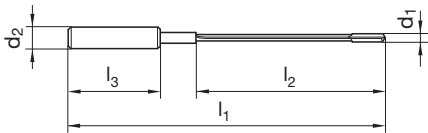
Artikel-Nr. 89511



P	M	K	N	S	H
●	○	●	○	○	○



Spannutlänge 80 mm • Umfangsform 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
1,600		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



## Einlippenbohrer E 100

Artikel-Nr. 89504



P	M	K	N	S	H
○	○	○	●	●	○



Spannutlänge 120 mm • Umfangsform G

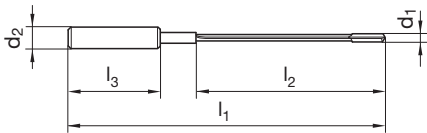
Artikel-Nr. 89512



P	M	K	N	S	H
●	○	●	○	○	○



Spannutlänge 120 mm • Umfangsform G



d1		d2 h6	l1	l2	l3
mm	inch	mm	mm	mm	mm
1,500		4,000	165,000	120,000	28,000
1,600		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



## Einlippenbohrer E 100

Artikel-Nr. 89502



P	M	K	N	S	H
○	○	○	●	●	○



Spannutlänge 160 mm • Umfangsform G

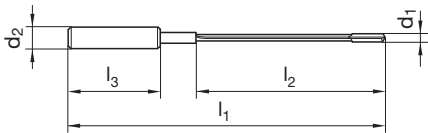
Artikel-Nr. 89513



P	M	K	N	S	H
●	○	●	○	○	○



Spannutlänge 160 mm • Umfangsform G



d1		d2 h6	l1	l2	l3
mm	inch	mm	mm	mm	mm
1,500		4,000	205,000	160,000	28,000
1,600		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



## Einlippenbohrer E 80

### Artikel-Nr. 89505



P	M	K	N	S	H
●	○	●	○	○	○



Bohrtiefe bis 20xD • Umfangsform G • mit Längsspanteiler

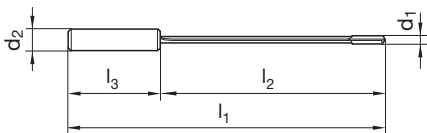
### Artikel-Nr. 89514



P	M	K	N	S	H
○	●	○	○	●	○



Bohrtiefe bis 20xD • Umfangsform G • für legierte und hochlegierte Stähle



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



## Einlippenbohrer E 80

Artikel-Nr. 89509



P	M	K	N	S	H
●	○	●	○	○	○



Bohrtiefe bis 30xD • Umfangsform G • mit Längsspanteiler

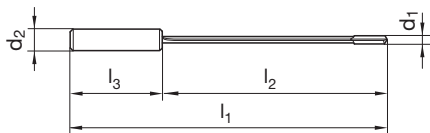
Artikel-Nr. 89515



P	M	K	N	S	H
○	●	○	○	●	○



Bohrtiefe bis 30xD • Umfangsform G • für legierte und hochlegierte Stähle



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



# HARTNER

## Einlippenbohrer E 80

Artikel-Nr. 89506



P	M	K	N	S	H
●	○	●	○	○	○



Bohrtiefe bis 40xD • Umfangsform G • mit Längsspanteiler

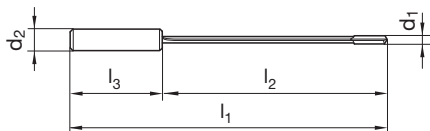
Artikel-Nr. 89516



P	M	K	N	S	H
○	●	○	○	●	○



Bohrtiefe bis 40xD • Umfangsform G • für legierte und hochlegierte Stähle



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



## Einlippenbohrer E 80

Artikel-Nr. 89507



P	M	K	N	S	H
•	○	•	○	○	○



Bohrtiefe bis 80xD • Umfangsform G • mit Längsspanteiler • für langspanende Stähle • maximale Bohrtiefe je Werkzeug 40xD, bei größeren Bohrtiefen zuerst Bohrer Art.-Nr. 89506 verwenden

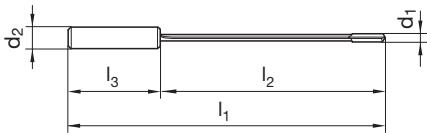
Artikel-Nr. 89517



P	M	K	N	S	H
○	•	○	○	•	○



Bohrtiefe bis 80xD • Umfangsform G • maximale Bohrtiefe je Werkzeug 40xD, bei größeren Bohrtiefen zuerst Bohrer Art.-Nr. 89516 verwenden • für legierte und hochlegierte Stähle



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





## Einlippenbohrer E 800 mit Wechselplatten

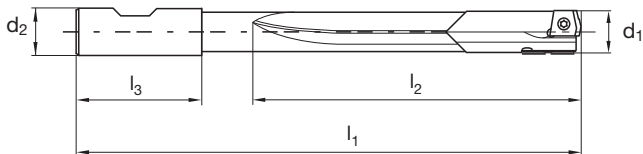
Artikel-Nr. 89530



P	M	K	N	S	H
•	○	○	•	○	○



Bohrtiefe bis 30xD • mit Wechselplatten • mit Wechsel-Führungsleisten • mit Schraubendreher • mit Schrauben • universell einsetzbar



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



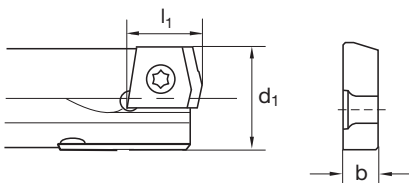
## Schneidplatten für Einlippenbohrer E 800

Artikel-Nr. 89535

P	M	K	N	S	H
●	○	○	●	○	○



universell einsetzbar



d1 mm	l1 mm	b mm	Code-Nr.	d1 mm	l1 mm	b mm	Code-Nr.
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



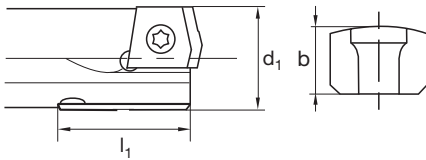
## Führungsleisten für Einlippenbohrer E 800

Artikel-Nr. 89536

P	M	K	N	S	H
●	○	○	●	○	○



universell einsetzbar



d1 mm	l1 mm	b mm	Code-Nr.	d1 mm	l1 mm	b mm	Code-Nr.
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



## Zweilippenbohrer Z 80

Artikel-Nr. 89508



P	M	K	N	S	H
			•		



Bohrtiefe bis 30xD • 4-Fasen TLB • für Aluminium

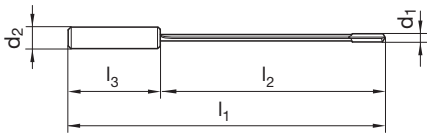
Artikel-Nr. 89518



P	M	K	N	S	H
		•			



Bohrtiefe bis 30xD • 4-Fasen TLB • für Gusswerkstoffe



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



# HARTNER

## VHM Einlippenbohrer E 100

geeignet für fast alle Werkstoffe, lieferbar von  $\varnothing$  0,9 - 12,0 mm,  
max. Spannuttlänge 500\* mm



\*  $\varnothing$ -abhängig

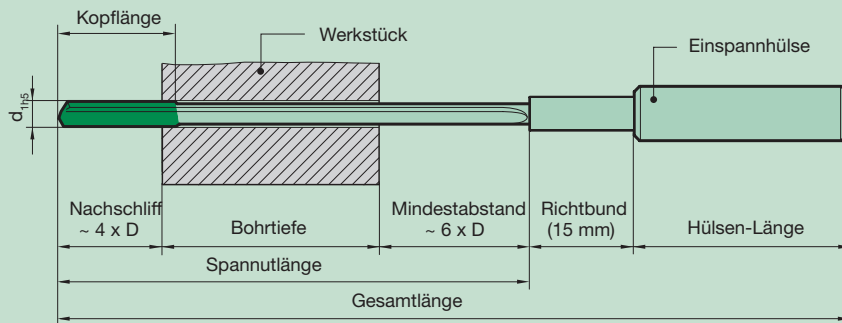


Damit der VHM Einlippenbohrer E 100 speziell für Ihren Anwendungsfall ausgelegt und hergestellt wird, verwenden Sie bitte für Ihre Anfrage und Bestellung das Anfrageformular am Ende des Kapitels.

Bei einer Reihe von Werkstoffen ist eine Beschichtung erforderlich, da die Funktion der Tieflochbohrer in blanker Ausführung nicht gewährleistet werden kann. Beschichtungs-Definition siehe Einsatzempfehlungen im Technischen Teil.

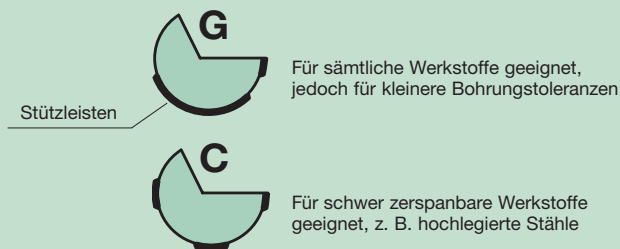
**T** TiN   **A** TiAlN   **C** TiCN   **F** FIRE   **Y** TiAlSiN   **A** AlTiN   **a** AlTiN nano

### Benötigte Abmessungen zur Längenberechnung für konventionelle Werkzeugmaschinen



### Umfangsformen

(Lage der Stützleiste.  
Lieferung von Sonder-  
Umfangsformen möglich)



### Standardanschliffe

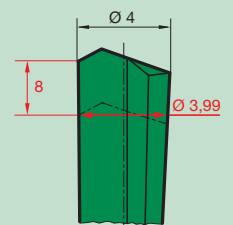
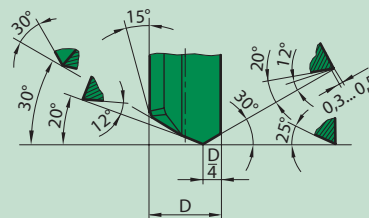
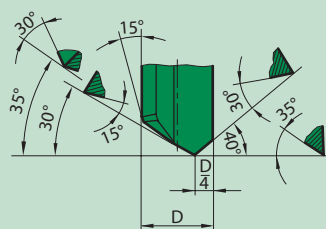
(Lieferung von Sonder-  
anschliffen möglich)

$\varnothing$  2...4,00 mm

$\varnothing$  > 4,01...20 mm

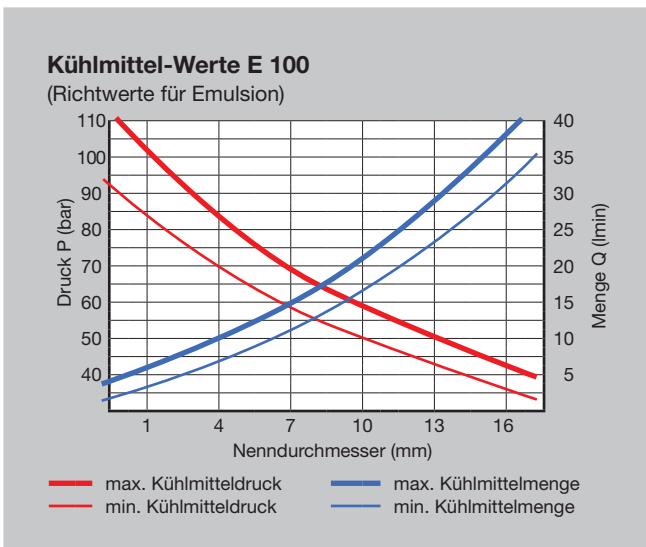
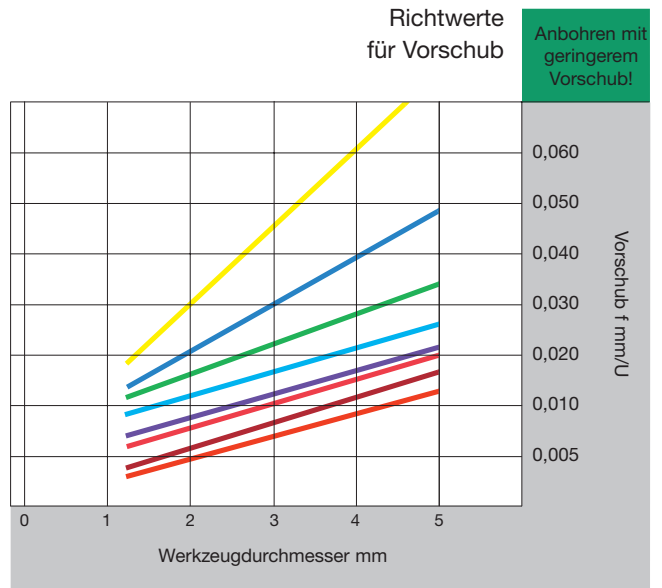
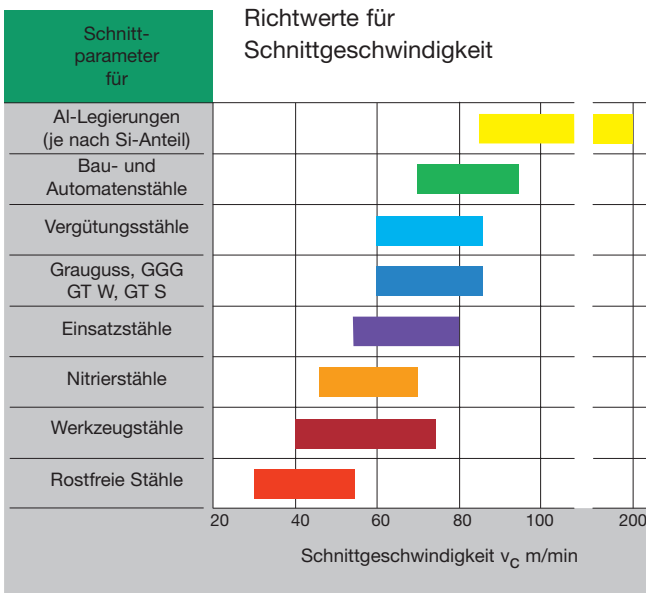
**Konizität**  
(Abmessungen  
in mm)

1:800 (Standard)





## VHM Einlippenbohrer E 100



### E100 mit VHM-Vollschäft



**AlTiN nano-beschichtete Ausführung für fast alle Werkstoffe**



**VHM-Vollschäft mit kegeligem MMS-Schaftende**



## Einlippenbohrer mit VHM-Kopf E 80

geeignet für fast alle Werkstoffe, von  $\varnothing 2 - 40,0$  mm,  
max. Gesamtlänge 3000 mm

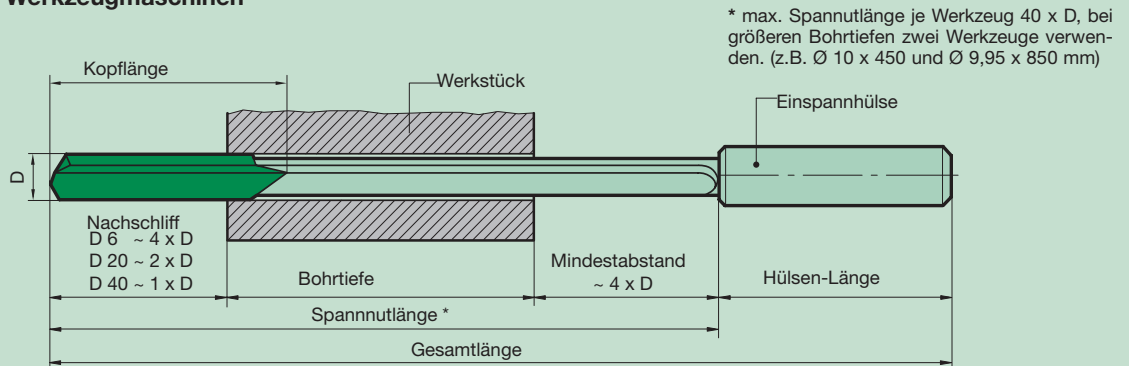


Damit der Einlippenbohrer mit VHM-Kopf E 80 speziell für Ihren Anwendungsfall ausgelegt und hergestellt wird, verwenden Sie bitte für Ihre Anfrage und Bestellung das Anfrageformular am Ende des Kapitels. Von  $\varnothing 6,0 \dots 20,0$  mm können wir auf Anfrage PKD-bzw. PKB-Schneiden einsetzen. Bei AlSi-Legierungen z.B. erhöht sich die Standzeit dadurch um ein Mehrfaches.

Bei einer Reihe von Werkstoffen ist eine Beschichtung erforderlich, da die Funktion der Tieflochbohrer in blanker Ausführung nicht gewährleistet werden kann. Beschichtungs-Definition siehe Einsatzempfehlungen im Technischen Teil.

**T** TiN **A** TiAlN **C** TiCN **F** FIRE **Y** TiAlSiN **A** AlTiN **G** AlTiN nano

### Benötigte Abmessungen zur Längenberechnung für konventionelle Werkzeugmaschinen



### Umfangsformen

(Lage der Stützleisten)

#### Standardausführungen



Für sämtliche Werkstoffe geeignet, jedoch für kleinere Bohrungstoleranzen



Für schwer zerspanbare Werkstoffe geeignet, z. B. hochlegierte Stähle

Stützleiste

#### Spezielle Ausführungen

Für sämtliche Werkstoffe geeignet, jedoch für größere Bohrungstoleranzen

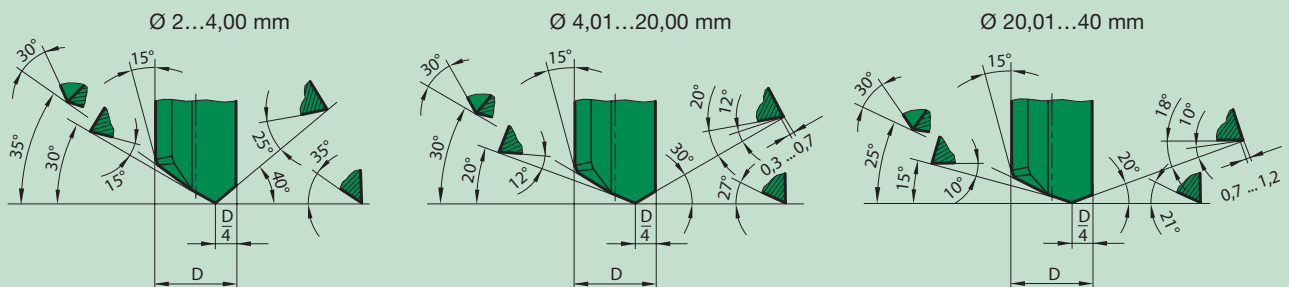


Für sämtliche Werkstoffe geeignet, jedoch nur bei ungünstigen Anbohrverhältnissen



Diese Ausführung ist hauptsächlich für Grauguss geeignet

### Standardanschliffe (Sonderanschliffe möglich)

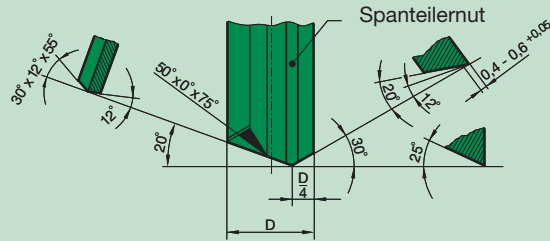




## Einlippenbohrer mit VHM-Kopf E 80

### Standardanschliff mit Spanteilernut

für Art.-Nr. 89505, 89509, 89506 und 89507



### Schnellservice für gelötete Einlippenbohrer

Zusätzlich zum Lagerprogramm bietet Hartner einen Schnell-Service für folgende Abmessungen mit Standardanschliff und Standard-Einspannhülsen. Die Lieferzeit beträgt max. 3 Wochen.

Nenn-Ø-mm	steigend um mm	Umfangsform	Gesamtlänge	Preise auf Anfrage
2,00...13,90	0,1	G	≤ 7,5 mm Ø 650 max	
4,00...13,90	0,1	C	> 7,5 mm Ø 1200 max	
14,00...22,00	0,5	G	1200 max	
14,00...22,00	0,5	C	1200 max	

### Schneidstoff: VHM

Oberfläche:

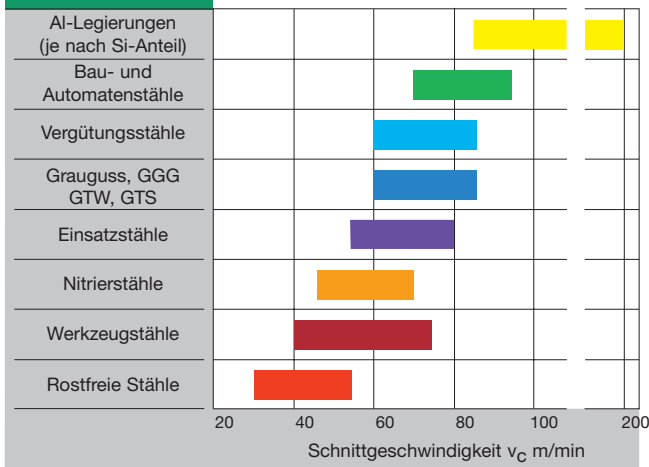
Standard-Kopflängen (mm)

Ø-Bereich	Länge	Ø-Bereich	Länge
2,00...2,49	15	10,00...10,99	35
2,50...2,99	18	11,00...17,00	40
3,00...3,99	20	17,01...20,00	45
4,00...5,19	25	20,01...23,00	50
5,20...6,99	30	23,01...26,00	55
7,00...9,99	35	26,01...40,00	65

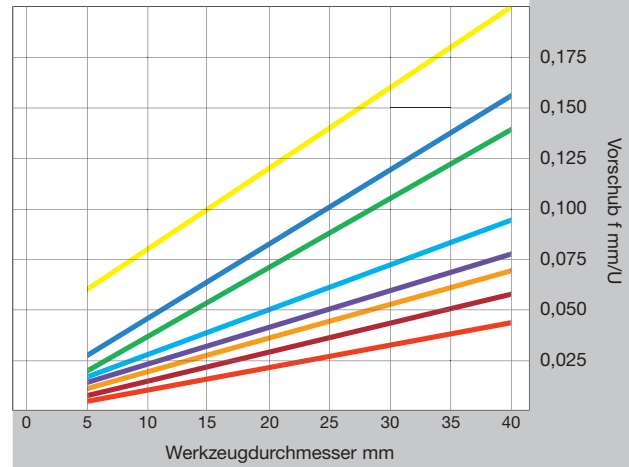
Spannutlänge: min. 20 x D

### Schnittparameter für

### Richtwerte für Schnittgeschwindigkeit

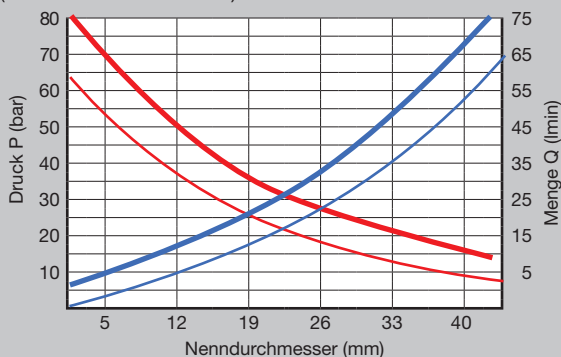


### Richtwerte für Vorschub



### Kühlmittel-Werte E 80

(Richtwerte für Emulsion)



**TiN-beschichtete Ausführung mit Spanteilernut für langspanende Stähle**



**TiCN-beschichtete Ausführung ohne Spanteilernut für legierte und hochlegierte Stähle**





## Zweilippenbohrer mit VHM-Kopf Z 80

geeignet für Guss, Aluminium und kurzspannende NE-Metalle,  
von  $\varnothing 6,0 - 27,0$  mm, max. Gesamtlänge 1000 mm



Damit der Zweilippenbohrer mit VHM-Kopf Z 80 speziell für Ihren Anwendungsfall ausgelegt und hergestellt wird, verwenden Sie bitte für Ihre Anfrage und Bestellung das Anfrageformular am Ende des Kapitels.

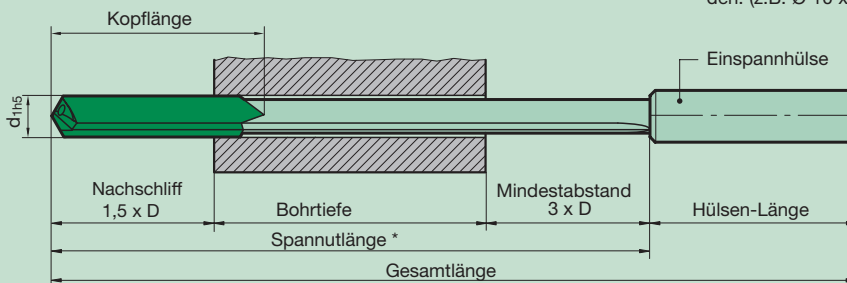
**F** FIRE      **a** AITiN nano

Bei einer Reihe von Werkstoffen ist eine Beschichtung erforderlich, da die Funktion der Tieflochbohrer in blanker Ausführung nicht gewährleistet werden kann.

Wesentlicher Vorteil der Zweilippen- gegenüber den Einlippen-Tieflochbohrern ist der deutlich höhere Vorschub, mit dem bei der Herstellung von Bohrungen gearbeitet werden kann. Er resultiert aus der Konstruktion des Zweilippenbohrers mit zwei Schneiden und zwei Spannuten. Bohrungen können also wesentlich schneller hergestellt werden. Allerdings ist dieser Zuwachs bei der Bearbeitungsgeschwindigkeit verbunden mit einer geringeren Bohrungsgenauigkeit. Auch diese ist eine direkte Folge der Bohrerkonstruktion mit

zwei Schneiden. Da es eine gegenüberliegende Schneide gibt, sind der Glättungseffekt und die Führung geringer als bei einem Einlippen-Tieflochbohrer. Bei Bohrtiefen  $\leq 10 \times D$  empfehlen wir den TS-Drill TS 150 GG. Er ist ab Lager lieferbar und bei diesen Bohrtiefen kostengünstiger als gelötete Tieflochbohrer. Außerdem kann beim Bohrer TS 150 GG in vielen Bearbeitungsfällen die Pilotbohrung entfallen.

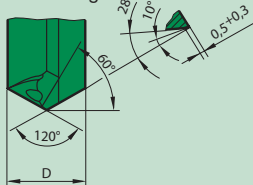
### Benötigte Abmessungen zur Längenberechnung für konventionelle Werkzeugmaschinen



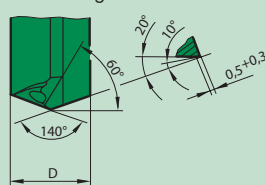
\* Max. Spann­tlänge je Werkzeug  $40 \times D$ , bei größeren Bohrtiefen zwei Werkzeuge verwenden. (z.B.  $\varnothing 10 \times 450$  und  $\varnothing 9,95 \times 850$  mm)

### Standardanschliffe (Sonderanschliffe möglich)

Anschliff G für Guss-Bearbeitung

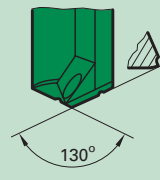


Anschliff A für Aluminium-Bearbeitung

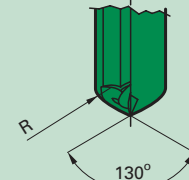


### Sonderanschliffe, z.B.:

Aluminium

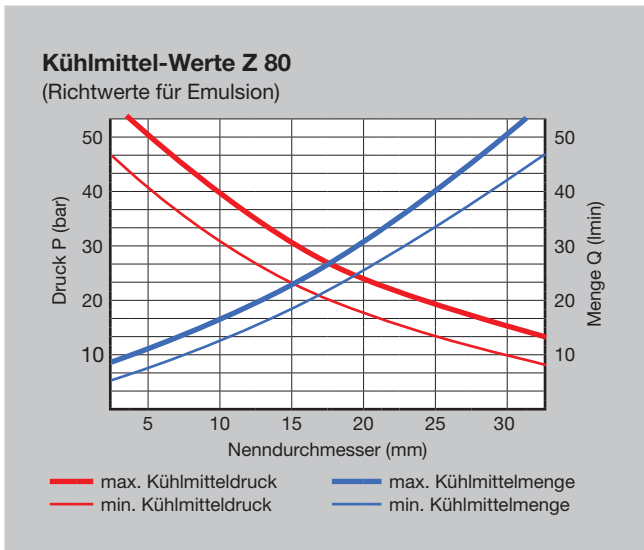
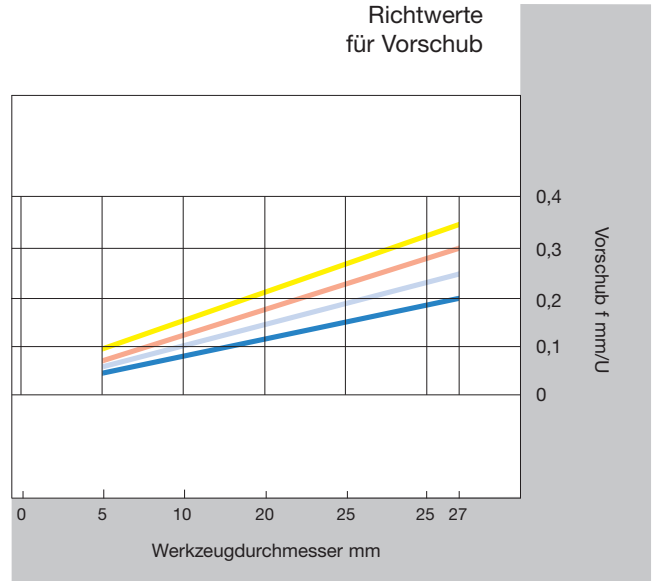
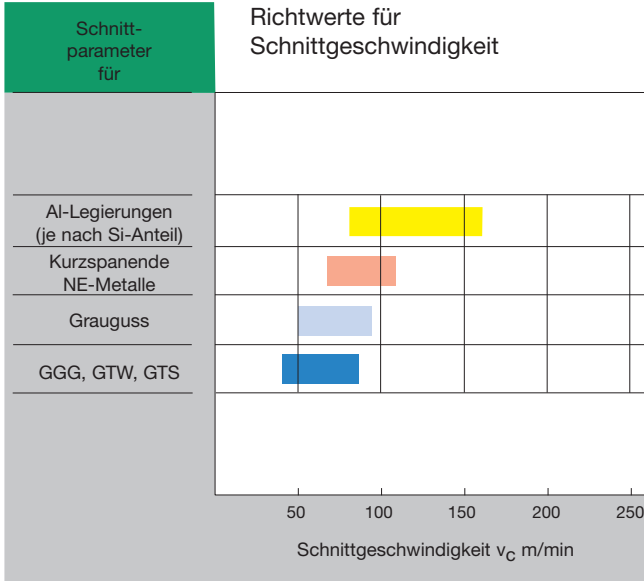


Guss





## Zweilippenbohrer mit VHM-Kopf Z 80



Art.-Nr. 89518 mit Anschliff für Gusswerkstoffe

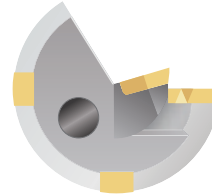
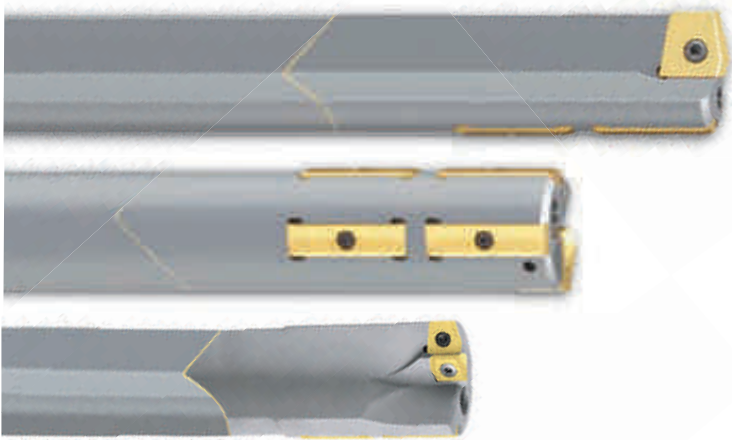


Art.-Nr. 89508 mit Anschliff für Aluminium

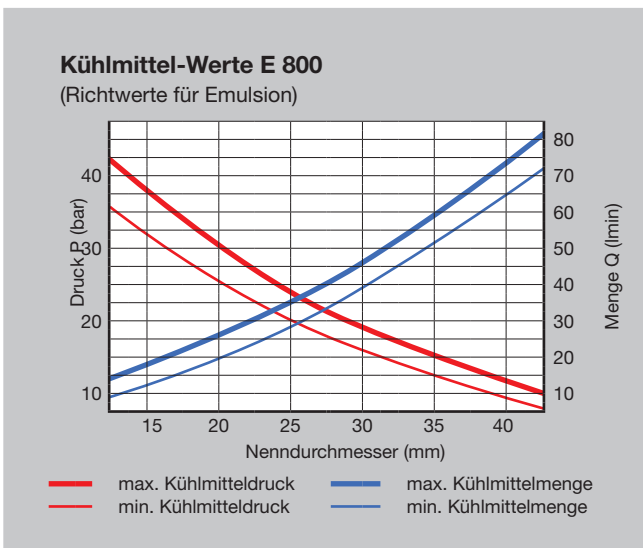
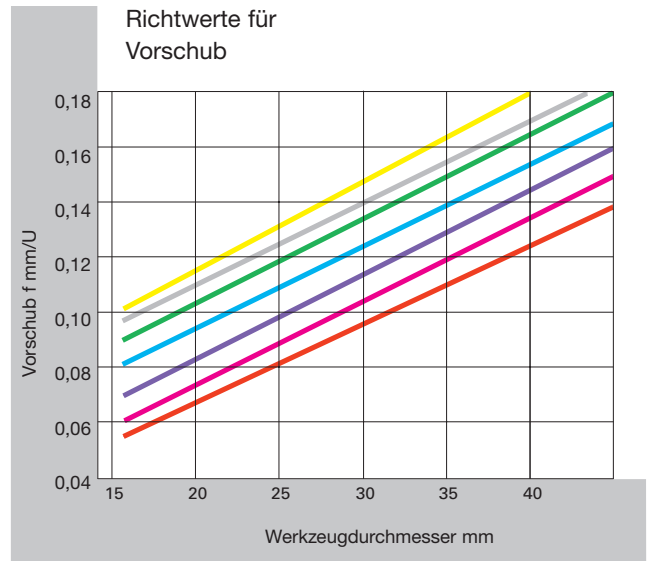
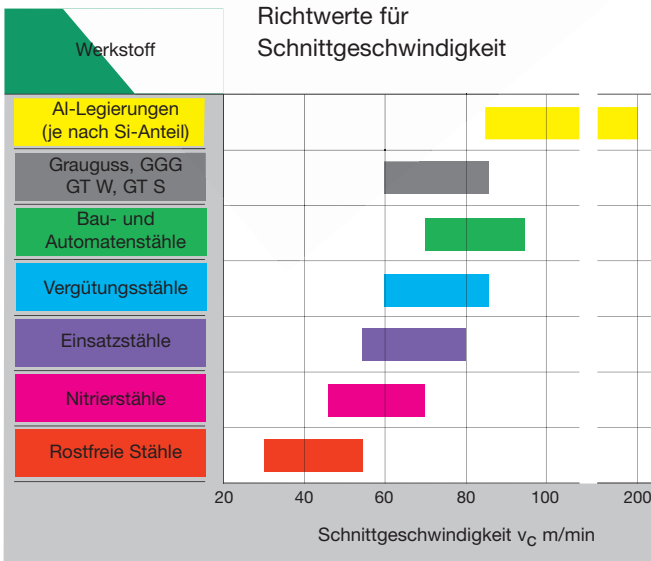


## Einlippenbohrer E 800

mit Wechsellatten und Wechselführungsleisten, geeignet für fast alle Werkstoffe, von  $\varnothing$  12,0 - 52,0 mm, max. Gesamtlänge 3000 mm



$\varnothing$  40,01 - 52,00 mm mit interner und externer Schneidplatte



Damit der Einlippenbohrer E 800 speziell für Ihren Anwendungsfall ausgelegt und hergestellt wird, verwenden Sie bitte für Ihre Anfrage und Bestellung das Anfrageformular am Ende des Kapitels.



## Einlippenbohrer E 800

### Zubehör-Tabelle

Bei der Erstbestellung erhalten Sie den E800-Wechselplatten-Tieflochbohrer komplett inkl. Wechselplatten, Führungsleisten und Zubehör. Für eine Nachbestellung verwenden Sie bitte folgende Material- bzw. Artikelnummern:

Ø	Wechselplatte	Schraube für WP	Schraubendreher für WP	Führungsleisten	Schraube für FL	Schraubendreher für FL
16	Art. 89535 Ø 16,0 + TiN	89537 3,002	89538 9.001	Art. 89536 Ø 16,0 + TiN	89537 2,203	89538 7.001
18	Art. 89535 Ø 18,0 + TiN	89537 3,002	89538 9.001	Art. 89536 Ø 18,0 + TiN	89537 2,203	89538 7.001
20	Art. 89535 Ø 20,0 + TiN	89537 4,001	89538 15.001	Art. 89536 Ø 20,0 + TiN	89537 2,502	89538 8.001
24	Art. 89535 Ø 24,0 + TiN	89537 4,001	89538 15.001	Art. 89536 Ø 24,0 + TiN	89537 2,502	89538 8.001

**Jeder Einlippenbohrer mit Wechselteilen E 800 - sowohl aus dem Lagerprogramm als auch Sonderlösungen - kann innerhalb des untenstehenden Durchmesserbereiches umgebaut werden**

Größe	Ø-Bereich (mm)
0.00	12,00 - 12,49
0.01	12,50 - 12,99
0.02	13,00 - 13,49
0.03	13,50 - 13,99
0.04	14,00 - 14,49
0.05	14,50 - 14,99
0.06	15,00 - 15,49
0.07	15,50 - 15,99
1.00	16,00 - 16,49
1.01	16,50 - 16,99
1.02	17,00 - 17,49
1.03	17,50 - 17,99
1.04	18,00 - 18,49
1.05	18,50 - 18,99
1.06	19,00 - 19,49
1.07	19,50 - 19,99
2.00	20,00 - 20,49
2.01	20,50 - 20,99
2.02	21,00 - 21,49
2.03	21,50 - 21,99
2.04	22,00 - 22,49
2.05	22,50 - 22,99
2.06	23,00 - 23,49
2.07	23,50 - 23,99
2.08	24,00 - 24,49
2.09	24,50 - 24,99
2.10	25,00 - 25,49
2.11	25,50 - 25,99
3.00	26,00 - 26,49
3.01	26,50 - 26,99

Größe	Ø-Bereich (mm)
3.02	27,00 - 27,49
3.03	27,50 - 27,99
3.04	28,00 - 28,49
3.05	28,50 - 28,99
3.06	29,00 - 29,49
3.07	29,50 - 29,99
4.00	30,00 - 30,49
4.01	30,50 - 30,99
4.02	31,00 - 31,49
4.03	31,50 - 31,99
4.04	32,00 - 32,49
4.05	32,50 - 32,99
4.06	33,00 - 33,49
4.07	33,50 - 33,99
5.00	34,00 - 34,49
5.01	34,50 - 34,99
5.02	35,00 - 35,49
5.03	35,50 - 35,99
5.04	36,00 - 36,49
5.05	36,50 - 36,99
5.06	37,00 - 37,49
5.07	37,50 - 37,99
6.00	38,00 - 38,49
6.01	38,50 - 38,99
6.02	39,00 - 39,49
6.03	39,50 - 40,00
7.00	40,01 - 43,99
8.00	44,00 - 47,99
9.00	48,00 - 52,00



## Einlippenbohrer E 800 mit Wechselplatten

Zubehörtabelle für Ø 12,0 - 52,0 mm

Größe	Durchmesser / Halter-Bereich	Grundkörper / Halter	Schneidplatten								
			WSP Außenschneiden	Schraube	Schraubendreher						
			TiN-beschichtet								
0.	Ø12,00 - Ø12,49 Ø12,50 - Ø12,99 Ø13,00 - Ø13,49 Ø13,50 - Ø13,99 Ø14,00 - Ø14,49 Ø14,50 - Ø14,99 Ø15,00 - Ø15,49 Ø15,50 - Ø15,99	Grundkörper / Halter individuell auf Kundenwunsch. Gesamtlänge bis 3000 mm, Spannnutlänge ab 15xD  Alternativ: Standardprogramm Bestell-Nr. 89530 von Ø 12,00 mm bis 24,00 mm in Vorzugsabmessungen komplett mit TiN-Wechselplatten und TiN-Führungsleisten	Bestell-Nr. 89535 + Nenn-Ø = Bestell-Nr.	Bestell-Nr. 4071 2,502 T8 M2,5x 5,2	Bestell-Nr. 86842 8,001						
	1.			Ø16,00 - Ø16,49 Ø16,50 - Ø16,99 Ø17,00 - Ø17,49 Ø17,50 - Ø17,99 Ø18,00 - Ø18,49 Ø18,50 - Ø18,99 Ø19,00 - Ø19,49 Ø19,50 - Ø19,99	Bestell-Nr. 4071 3,002 T9 M3x6,4	Bestell-Nr. 86842 9,001					
				2.	Ø20,00 - Ø20,49 Ø20,50 - Ø20,99 Ø21,00 - Ø21,49 Ø21,50 - Ø21,99 Ø22,00 - Ø22,49 Ø22,50 - Ø22,99 Ø23,00 - Ø23,49 Ø23,50 - Ø23,99 Ø24,00 - Ø24,49 Ø24,50 - Ø24,99 Ø25,00 - Ø25,49 Ø25,50 - Ø25,99	Bestell-Nr. 4071 4,001 T15 M4x7,7	Bestell-Nr. 86842 15,001				
					3.	Ø26,00 - Ø26,49 Ø26,50 - Ø26,99 Ø27,00 - Ø27,49 Ø27,50 - Ø27,99 Ø28,00 - Ø28,49 Ø28,50 - Ø28,99 Ø29,00 - Ø29,49 Ø29,50 - Ø29,99		Bestell-Nr. 4071 4,002 T15 M4x10,6			
						4.			Ø30,00 - Ø30,49 Ø30,50 - Ø30,99 Ø31,00 - Ø31,49 Ø31,50 - Ø31,99 Ø32,00 - Ø32,49 Ø32,50 - Ø32,99 Ø33,00 - Ø33,49 Ø33,50 - Ø33,99		
									5.	Ø34,00 - Ø34,49 Ø34,50 - Ø34,99 Ø35,00 - Ø35,49 Ø35,50 - Ø35,99 Ø36,00 - Ø36,49 Ø36,50 - Ø36,99 Ø37,00 - Ø37,49 Ø37,50 - Ø37,99	Bestell-Nr. 4071 5,002 T20 M5x14,2
6.										Ø38,00 - Ø38,49 Ø38,50 - Ø38,99 Ø39,00 - Ø39,49 Ø39,50 - Ø40,00	auf Anfrage
	7.									Ø40,01 - Ø40,49 Ø40,50 - Ø40,99 Ø41,00 - Ø41,49 Ø41,50 - Ø41,99 Ø42,00 - Ø42,49 Ø42,50 - Ø42,99 Ø43,00 - Ø43,49 Ø43,50 - Ø43,99	
				8.			Ø44,00 - Ø44,49 Ø44,50 - Ø44,99 Ø45,00 - Ø45,49 Ø45,50 - Ø45,99 Ø46,00 - Ø46,49 Ø46,50 - Ø46,99 Ø47,00 - Ø47,49 Ø47,50 - Ø47,99			Bestell-Nr. 4071 4,001 TX15 M4x7,7	
					9.		Ø48,00 - Ø48,49 Ø48,50 - Ø48,99 Ø49,00 - Ø49,49 Ø49,50 - Ø49,99 Ø50,00 - Ø50,49 Ø50,50 - Ø50,99 Ø51,00 - Ø51,49 Ø51,50 - Ø52,00	Bestell-Nr. 4071 4,002 TX15 M4x10,6			



## Einlippenbohrer E 800 mit Wechselplatten

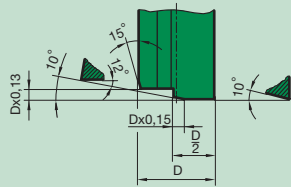
Schneidplatten			Führungsleisten		
WSP Innenschneiden	Schraube	Schraubendreher	Führungsleisten TiN-beschichtet	Schraube	Schraubendreher
				Bestell-Nr. 4071 1,601 T5 M1,6x4,4	Bestell-Nr. 86842 5,001
				Bestell-Nr. 4071 2,203 T7 / M2,2x 4,6	Bestell-Nr. 86842 7,001
				Bestell-Nr. 4071 2,202 T7 / M2,2x5,6	
				Bestell-Nr. 4071 2,502 T8 M2,5x 5,2	Bestell-Nr. 86842 8,001
				Bestell-Nr. 4071 2,501 T8 M2,5x6,4	
		Bestell-Nr. 89536 + Nenn-Ø = Bestell-Nr.			
auf Anfrage	Bestell-Nr. 4071 4,501 T15 M4,5x11,8	Bestell-Nr. 86842 15,001	auf Anfrage	Bestell-Nr. 4071 3,003 T9 M3x8	Bestell-Nr. 86842 9,001



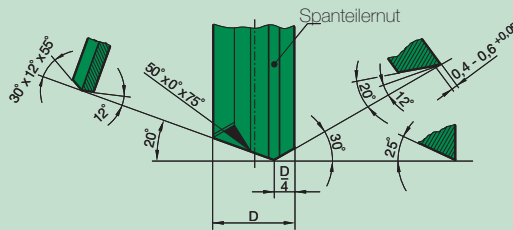
## Ergänzende technische Parameter

### Sonderschliffe für Einlippenbohrer mit VHM-Kopf

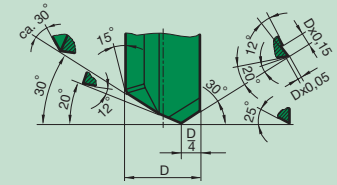
mit zurückgesetztem Ölraum



mit Spanteiernut



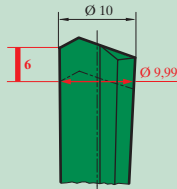
mit Spanleitstufe



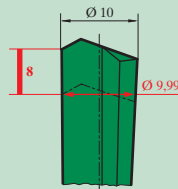
### Konizität an Tieflochbohrern

(Abmessungen in mm)

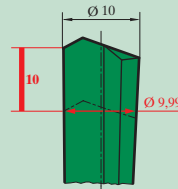
1:600



1:800 (Standard)

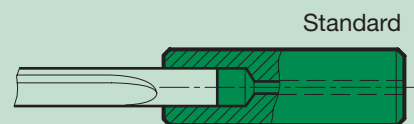


1:1000

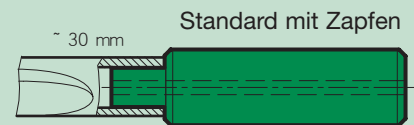


### Fertigungsvarianten der Einspannhülsen an Tieflochbohrern mit Rohrschaft

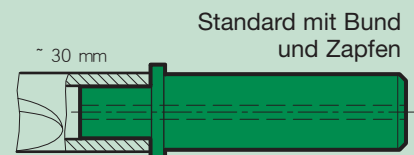
Vorgehensweise für Nom.Ø < Hülsen-Ø  
(Differenz muss ca. 6 mm sein):  
Rohrschaft sitzt in der Einspannhülse



Vorgehensweise für Nom.Ø ≠ Hülsen-Ø  
(max. bis Gleichstand):  
Rohrschaft sitzt über dem Zapfen



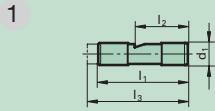
Vorgehensweise für Nom.Ø > Hülsen-Ø:  
Rohrschaft sitzt über dem Zapfen,  
dessen Innen-Ø > Hülsen-Ø ist, und schließt  
bündig mit dem Bund ab.



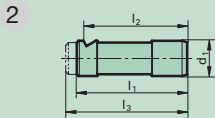


## Einspannhülsen

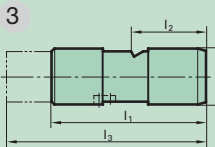
### Einspannhülsen für Tiefbohrmaschinen



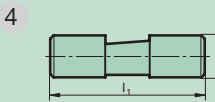
Kennzahl	d <sub>1</sub>	l <sub>1</sub>	l <sub>2</sub>	l <sub>3</sub>
1.1	10	40	24	-
1.2	10	40	24	45
1.3	10	40	24	55
1.4	16	45	31,2	-
1.5	25	70	34	-
1.6	25	70	34	78



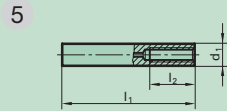
Kennzahl	d <sub>1</sub>	l <sub>1</sub>	l <sub>2</sub>	l <sub>3</sub>
2.1	16	50	47	-
2.2	16	50	47	55
2.3	16	50	47	70



Kennzahl	d <sub>1</sub>	l <sub>1</sub>	l <sub>2</sub>	l <sub>3</sub>
3.1	25	70	34	100



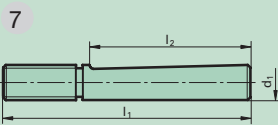
Kennzahl	d <sub>1</sub>	l <sub>1</sub>
4.1	19,05	70
4.2	12,70	70
4.3	25,40	70
4.4	31,75	70
4.5	38,10	70



Kennzahl	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	-
5.5	10	110	-



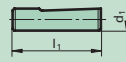
Kennzahl	d <sub>1</sub>	l <sub>1</sub>
6.1	12.7	38
6.2	19.05	70
6.3	38.1	70



Kennzahl	d <sub>1</sub>	l <sub>1</sub>	l <sub>2</sub>
7.1	16	112	73
7.2	20	126	82

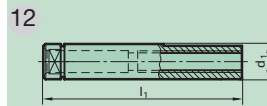
### Einspannhülsen nach DIN 1835

#### 9 Form E



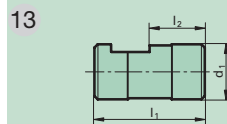
Kennzahl	d <sub>1</sub>	l <sub>1</sub>
9.1	8	36
9.2	10	40
9.3	12	45
9.4	16	48
9.5	20	50
9.6	25	56
9.7	32	60
9.8	31.75	70
9.9	38.1	70
9.10	40	70

### Einspannhülsen nach VDI-Entwurf



Kennzahl	d <sub>1</sub>	l <sub>1</sub>
12.1	10	68
12.2	16	90
12.3	25	112

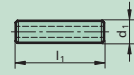
### Einspannhülsen nach Speed-Bit-System



Kennzahl	d <sub>1</sub>	l <sub>1</sub>	l <sub>2</sub>
13.1	16	40	16
13.2	25	50	25
13.3	35.6	60	-

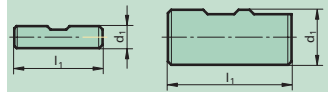
### Einspannhülsen nach DIN 6535

#### 10 Form HA



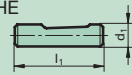
Kennzahl	d <sub>1</sub>	l <sub>1</sub>
10.1	8	36
10.2	10	40
10.3	12	45
10.4	16	48
10.5	20	50
10.6	25	56
10.7	32	60
10.8	25	70
10.9	40	70

#### 8 Form HB bei Kennzahl 8.6, 8.7, 8.8



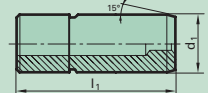
Kennzahl	d <sub>1</sub>	l <sub>1</sub>
8.1	8	36
8.2	10	40
8.3	12	45
8.4	16	48
8.5	20	50
8.6	25	56
8.7	32	60
8.8	40	70

#### 11 Form HE



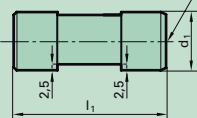
Kennzahl	d <sub>1</sub>	l <sub>1</sub>
11.1	8	36
11.2	10	40
11.3	12	45
11.4	16	48
11.5	20	50
11.6	25.4	70
11.7	25	56
11.8	32	60
11.9	40	70

#### 16 ähnl. Form HA



Kennzahl	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

#### 17 ähnl. Form HE 2 DIN 332



Kennzahl	d <sub>1</sub>	l <sub>1</sub>
17.1	19.05	70
17.2	25.40	70
17.3	31.75	70
17.4	38.1	70

Das hier vorgestellte Hülsenprogramm halten wir am Lager, es stellt jedoch nur eine Auswahl von Einspannhülsen dar. Wir fertigen natürlich auch Hülsen nach Kundenzeichnung individuell mit höchster Präzision. **Achtung!** Bei **VHM-Tieflochbohrern** sind Spannhülsen mit Richtzapfen erforderlich. Informationen auf Anfrage.





### Kurze Einführung zum Thema Tieflochbohren

In der Zerspanungstechnik wird ab einer Bohrtiefe von  $10 \times D$  und mehr vom so genannten Tieflochbohren gesprochen, wobei selbstverständlich auch kürzere Bohrungen mit Tieflochbohrern hergestellt werden können. Man nutzt somit die positiven Begleiterscheinungen der Bohrung wie gute Oberfläche, geringe Durchmesserabweichung und optimierte Geradheit.

#### Vorgehensweise auf konventionellen Werkzeugmaschinen mit allen Tiefbohrwerkzeugen:

- Herstellen einer Pilotbohrung (Toleranz H8). Einfahren mit einer Drehzahl von ca. 200 U/min, Vorschub ca. 500 mm/min.
- Einstellen des Kühlschmierstoff-Druckes und der Drehzahl.
- Kontinuierliches Bohren auf Bohrtiefe ohne Entspannen. Bei Einsatz von Tieflochbohrern mit sehr großem Längen-Durchmesser-Verhältnis (z.B. VHM Einlippenbohrer ab Spannut-Länge 160 mm) empfehlen wir, bis zu einer Bohrtiefe von ca. 25 mm mit reduzierten Schnittparametern (ca. 75% der optimalen Schnittgeschwindigkeit) zu arbeiten.
- Abschalten der Kühlschmierstoff-Zufuhr nach Erreichen der Bohrtiefe.
- Rückzug im Eilgang mit stehender Spindel.

#### Hochdruckkühlung - inzwischen eine Selbstverständlichkeit

Da sich in den letzten Jahren die Innenkühlung bei sämtlichen Bohrwerkzeugen durchgesetzt hat, wird der Kühlschmierstoff seinem Namen gerecht und durch Kühlkanäle dorthin gebracht, wo er dringend benötigt wird. Man erreichte mit dieser Maßnahme auch bei Spiralbohrern, Gewindeschneidern usw. deutliche Standzeit-Verbesserungen und weniger Werkzeugbrüche.

Jede konventionelle Werkzeugmaschine wird heute mit Hochdruck-Innenkühlung angeboten und ist somit auch zum Tiefbohren geeignet. Der Anteil der Tieflochbohrer auf Bearbeitungszentren, Drehmaschinen usw. gewinnt immer mehr an Bedeutung. Das Verfahren wird dadurch in der Zerspanungstechnik immer populärer.



Sämtliche Tieflochbohrer müssen beim Anbohren geführt werden. Tieflochbohrer dürfen nie mit voller Drehzahl frei im Maschinenraum bewegt werden.

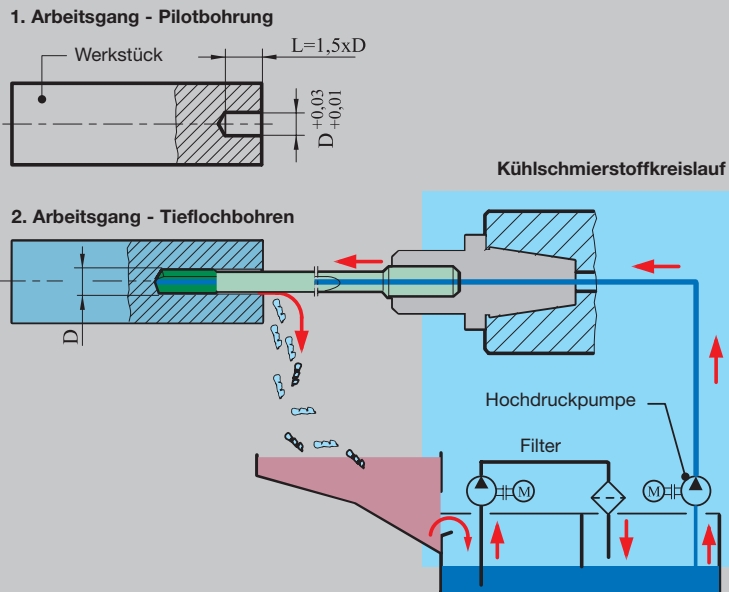
Tiefbohren ist kein Buch mit sieben Siegeln, sondern durch Einhaltung von gewissen Voraussetzungen von jedermann beherrschbar.

Richtwerte für den Einsatz der Hartner-Tieflochbohrer finden Sie auf den Seiten des jeweiligen Typs!

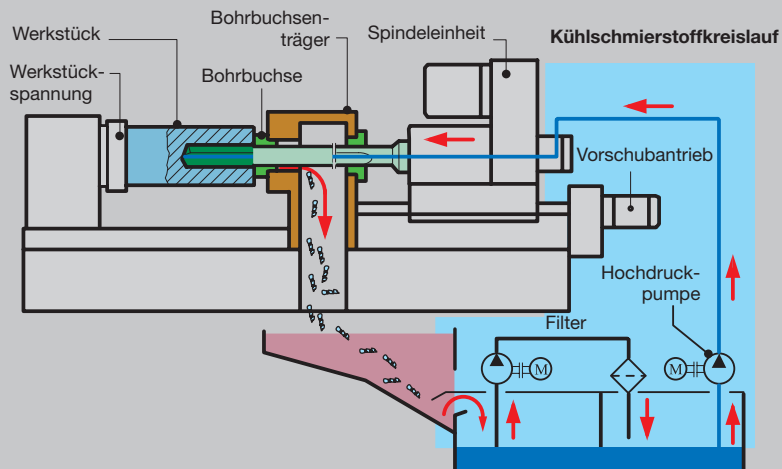


### Schematische Darstellung

#### Tiefbohren auf konventionellen Werkzeugmaschinen



#### Tiefbohren auf Tiefbohrmaschinen

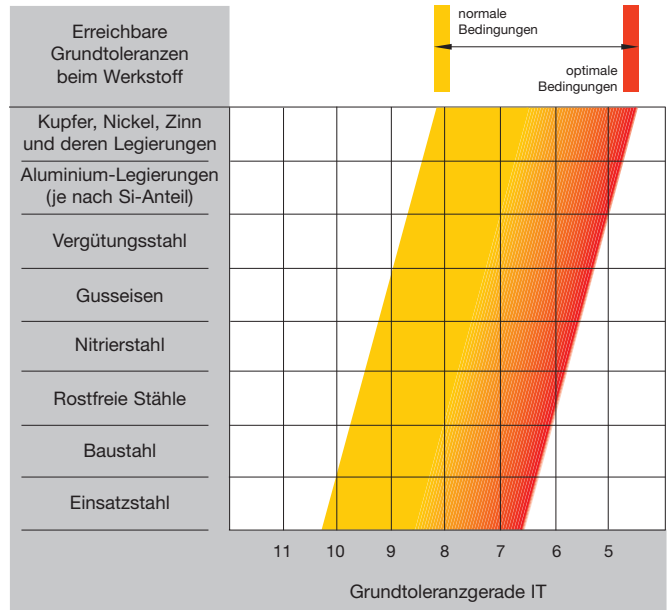




### Bei Einlippen-Tieflochbohrern

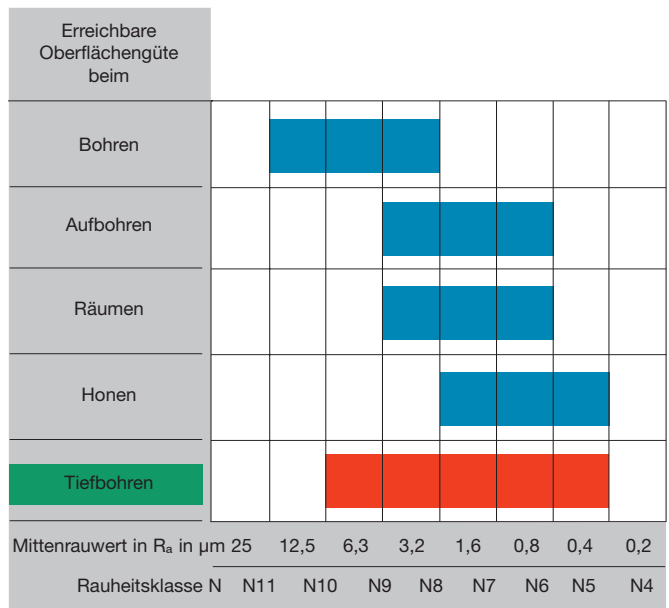
#### Grundtoleranzen

Mit Einlippenbohrern kann eine kleinere Grundtoleranz erreicht werden, da die Schnittkräfte an der Schneide von den vorhandenen Stützleisten aufgenommen werden und nicht wie z.B. bei Spiralbohrern schon durch geringe Abweichungen der beiden Schneiden sofort eine größere Bohrung entsteht.



#### Oberflächengüte

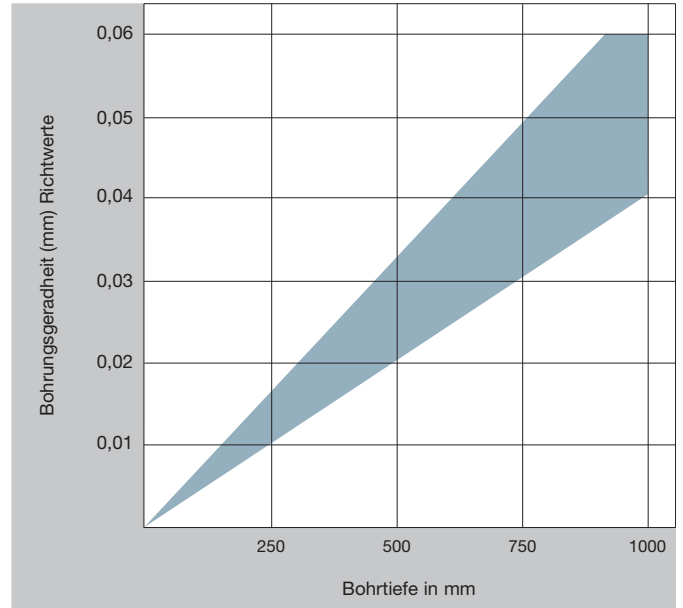
Die Kräfte werden an der Schneide von den Stützleisten aufgenommen, welche wiederum die Oberfläche glätten. Der Schmierfilm zwischen den Stützleisten und der Bohrungsoberfläche spielt deshalb eine wichtige Rolle. Je besser der Kühlschmierstoff, desto besser die Oberfläche.



## Präzision

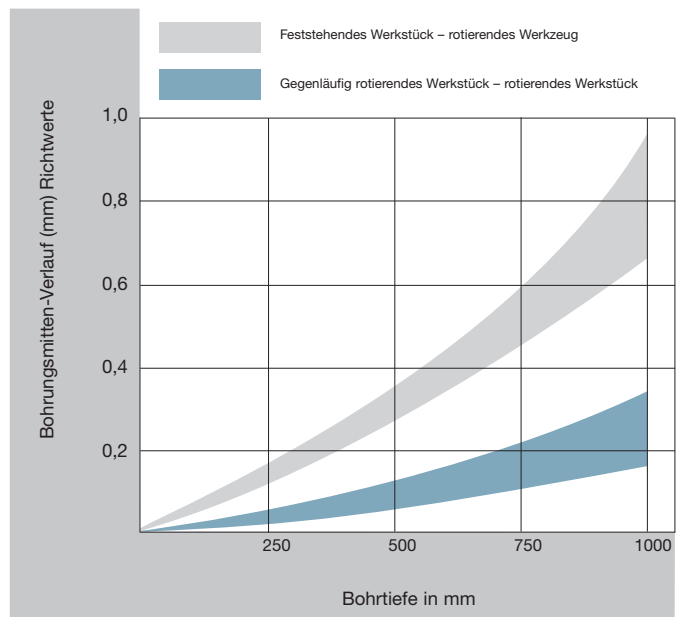
### Bohrungsgeradheit

Da der Präzisions-HM-Kopf bei gelöteten Einlippenbohrern immer auf einen flexiblen Rohrschaft gelötet wird, erzeugt das Werkzeug unbeeinflusst von eventuellen Rundlauf Fehlern eine sehr gerade Bohrung. Extreme Materialschwankungen und andere Einflussfaktoren können jedoch die Geradheit beeinträchtigen.



### Bohrungsmittenverlauf

Wird eine Bohrung z.B. mit einem handelsüblichen Spiralbohrer hergestellt, beeinflusst die Qualität des Spitzenanschliffs unter anderem den Bohrungsmittenverlauf. Es entsteht ein Kräfte-Ungleichgewicht an den Schneiden. Beim Einlippenbohren nehmen Stützleisten die Schnittkräfte auf, woraus ein guter Mittenverlauf resultiert.





## Anfrageformular E 100, E 80 und Z 80

Anfrage  Bestellung per Fax an: (07431) 125 - 21547  
oder per E-Mail an: info@hartner.de

Anspruchpartner		Kunden-Nr.	Neukunde	Bestellnummer					
Hartner GmbH Postfach 10 04 27 D-72425 Albstadt Telefon: (07431) 125-0 Fax: (07431) 125-21547 www.hartner.de		Firma		Anspruchpartner					
		Straße/Hausnummer		PLZ/Ort					
		Telefon		Telefax					
		Datum		Unterschrift					

Tieflochbohrer:  VHM-Einlippenbohrer E 100  Einlippenbohrer mit VHM-Kopf E 80  Zweilippenbohrer Z 80

U-Form: \_\_\_\_\_ Benötigte Stückzahl: \_\_\_\_\_ Stück

**Skizze Bohrsituation**

nur in Sonderfällen nötig

Einspannhülse:  Keine  Kennzahl:  nach beigefügter Zeichnung

Beschichtung:  TiN  FIRE  MolyGlide  TiAlN  AlTiN nano  TiCN  \_\_\_\_\_

Werkstück: Bohrtiefe: \_\_\_\_\_ Bohrungs-Toleranz: \_\_\_\_\_ Material: \_\_\_\_\_

Sackloch  Durchgangsloch  Querbohrung

Maschinen-Typ:  Tiefbohrmaschine  Konventionelle Werkzeugmaschine

Kühlschmierstoff:  Tiefbohröl  Emulsion

Druck \_\_\_\_\_ bar Druck \_\_\_\_\_ bar



## Anfrageformular E 800

Anfrage  Bestellung per Fax an: (07431) 125 - 21547  
oder per E-Mail an: info@hartner.de

Ansprechpartner	Kunden-Nr.	Neukunde	Bestellnummer
	Firma		Ansprechpartner
	Straße/ Hausnummer		PLZ/Ort
	Telefon		Telefax
	Datum		Unterschrift

**Hartner GmbH**  
 Postfach 10 04 27  
 D-72425 Albstadt  
 Telefon: (07431) 125-0  
 Fax: (07431) 125-21547  
 www.hartner.de

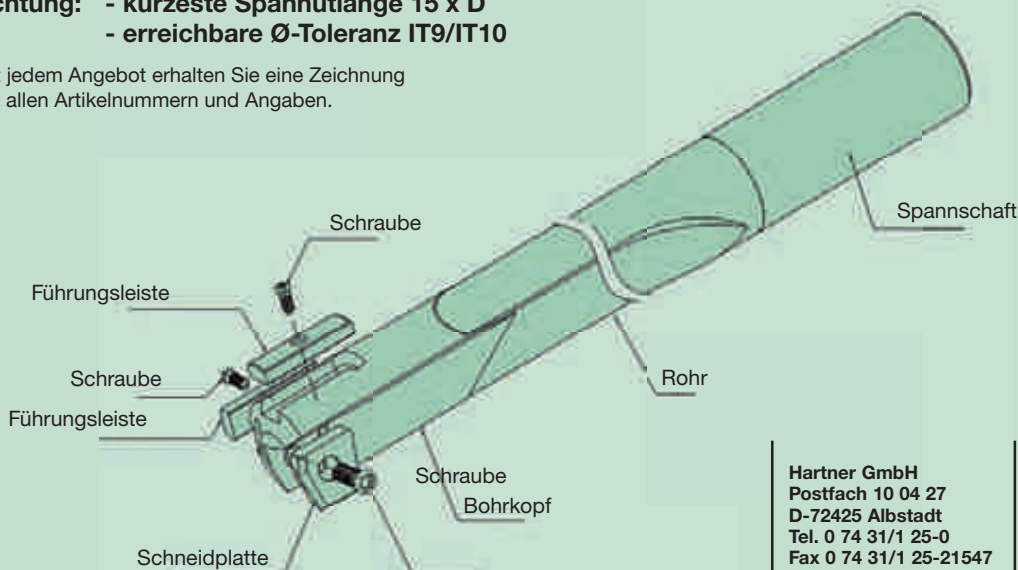
<b>Werkstück</b>	<b>Werkstoff:</b>	<b>Bohrungs-Durchmesser:</b>	<b>geforderte Oberflächengüte:</b>
	<b>Teilebezeichnung:</b>	<b>Durchmesser-Toleranz:</b>	<b>Störkante:</b> Nein Ja mm
	<b>Stückzahl/Jahr:</b>	<b>Bohrtiefe:</b>	<b>Zusatzinfo:</b>

<b>Maschine</b>	<b>Bearbeitungszentren (BAZ):</b>	<b>Tiefbohrmaschine (TBM):</b>	<b>Kühlschmierstoff:</b> Emulsion Öl
	<b>Einspannelement:</b>	<b>Einspannelement:</b>	<b>Druck:</b> bar
	<b>Spindelanzahl:</b>	<b>Spindelanzahl:</b>	<b>Menge:</b> l/min

### Der Wechsellatten-Tieflochbohrer E 800 für Ihren Anwendungsfall

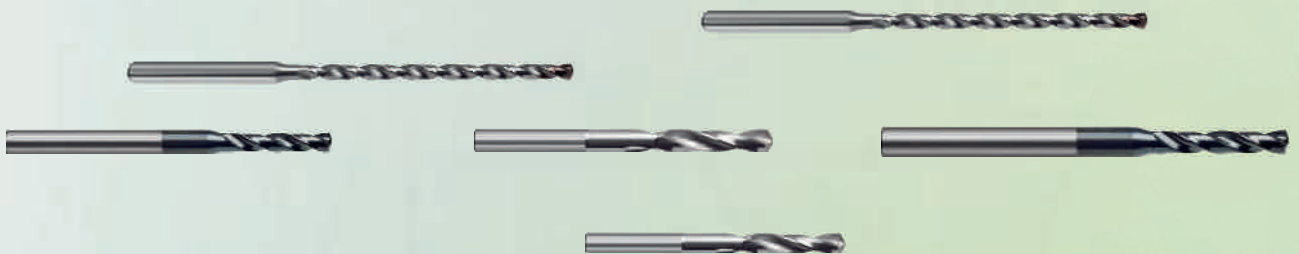
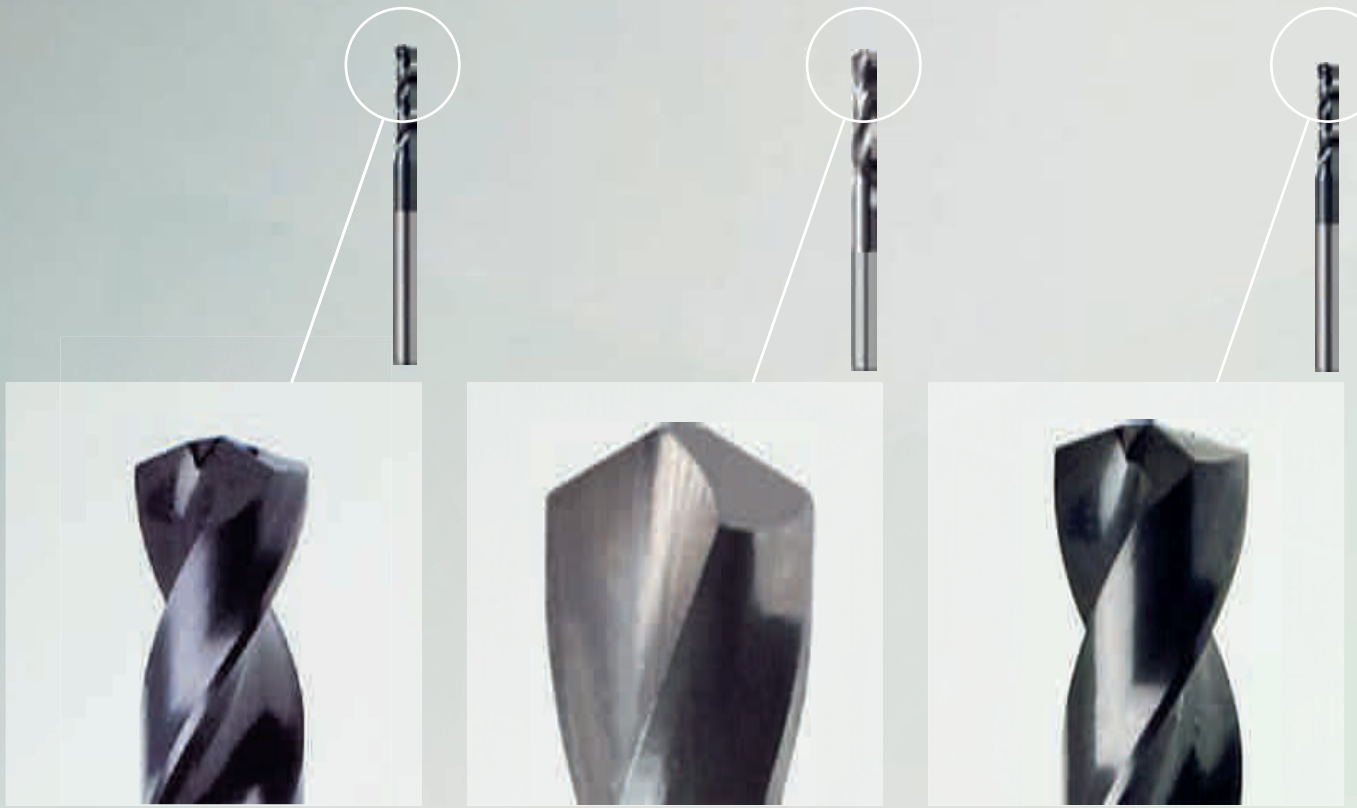
**Achtung:** - kürzeste Spannuttlänge 15 x D  
 - erreichbare Ø-Toleranz IT9/IT10

Mit jedem Angebot erhalten Sie eine Zeichnung mit allen Artikelnummern und Angaben.



Hartner GmbH  
 Postfach 10 04 27  
 D-72425 Albstadt  
 Tel. 0 74 31/1 25-0  
 Fax 0 74 31/1 25-21547

Einlippenbohrer  
 mit Wechsellatten und  
 Wechselführungseisen,  
 Innenkühlung  
 Ø-Bereich: 12,00 - 52,00 mm





# HARTNER

Präzisionswerkzeuge

## KLEINSTBOHRER

aus Vollhartmetall und HSS-E-PM  
blank und beschichtet

Kleinst-  
bohrer







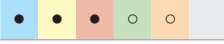


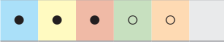



P	M	K	N	S	H	Norm	Typ	Schneidstoff	Oberfläche	Schneid- richtung	Schaft- form	Bohrtiefe	d1/mm	Artikel-Nr.	Progr. Seite
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## Kleinstbohrer ohne Kühlkanäle

		DIN 1899	N	HSS-E-PM		rechts	zyl.	~5xD	0,050 - 1,900	<b>87011</b>	289
		DIN 1899	N	HSS-E-PM		links	zyl.	~5xD	0,150 - 1,450	<b>87016</b>	291
		DIN 1899	N	HSS-E-PM		rechts	zyl.	~5xD	0,200 - 1,500	<b>84810</b>	292
		Werksnorm	N	VHM		rechts	zyl.		0,100 - 3,000	<b>86402</b>	294
		Werksnorm	N	VHM		rechts	zyl.	4xD	0,500 - 3,000	<b>86400</b>	295
		Werksnorm	N	VHM		rechts	zyl.	~5xD	0,200 - 1,300	<b>89281</b>	293
		Werksnorm	N	VHM		rechts	zyl.	7xD	0,500 - 3,000	<b>86401</b>	296

## Kleinstbohrer mit Kühlkanälen

		Werksnorm	N	VHM		rechts	zyl.	5xD	1,400 - 3,000	<b>86405</b>	297
		Werksnorm	N	VHM		rechts	zyl.	8xD	1,400 - 3,000	<b>86408</b>	298
		Werksnorm	N	VHM		rechts	zyl.	15xD	1,400 - 3,000	<b>86412</b>	299



## Kleinstbohrer ohne Kühlkanäle

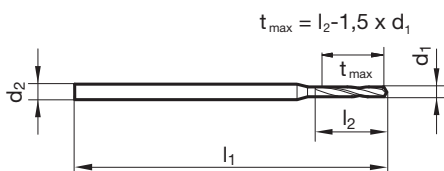
Artikel-Nr. 87011



P	M	K	N	S	H
•	•	•	•	○	



Flächenanschliff • < Ø 0,15 mm Co-legierter HSS-Stahl • mit verstärktem Schaft  
hochlegierte Stähle



d1 mm	d2 mm	l1 mm	l2 mm	d1 mm	d2 mm	l1 mm	l2 mm
0,050	1,000	25,000	0,400	0,345	1,000	25,000	2,400
0,060	1,000	25,000	0,400	0,350	1,000	25,000	2,400
0,080	1,000	25,000	0,500	0,355	1,000	25,000	2,400
0,090	1,000	25,000	0,500	0,360	1,000	25,000	2,400
0,100	1,000	25,000	0,500	0,365	1,000	25,000	2,400
0,110	1,000	25,000	0,500	0,370	1,000	25,000	2,400
0,120	1,000	25,000	0,500	0,375	1,000	25,000	2,400
0,130	1,000	25,000	0,800	0,380	1,000	25,000	2,400
0,140	1,000	25,000	0,800	0,390	1,000	25,000	3,000
0,150	1,000	25,000	0,800	0,400	1,000	25,000	3,000
0,160	1,000	25,000	1,100	0,405	1,000	25,000	3,000
0,170	1,000	25,000	1,100	0,410	1,000	25,000	3,000
0,180	1,000	25,000	1,100	0,415	1,000	25,000	3,000
0,190	1,000	25,000	1,100	0,420	1,000	25,000	3,000
0,200	1,000	25,000	1,500	0,425	1,000	25,000	3,000
0,205	1,000	25,000	1,500	0,430	1,000	25,000	3,000
0,210	1,000	25,000	1,500	0,440	1,000	25,000	3,000
0,215	1,000	25,000	1,500	0,450	1,000	25,000	3,000
0,220	1,000	25,000	1,500	0,460	1,000	25,000	3,000
0,225	1,000	25,000	1,500	0,470	1,000	25,000	3,000
0,230	1,000	25,000	1,500	0,480	1,000	25,000	3,000
0,235	1,000	25,000	1,500	0,485	1,000	25,000	3,400
0,240	1,000	25,000	1,500	0,490	1,000	25,000	3,400
0,245	1,000	25,000	1,900	0,495	1,000	25,000	3,400
0,250	1,000	25,000	1,900	0,500	1,000	25,000	3,400
0,255	1,000	25,000	1,900	0,510	1,000	25,000	3,400
0,260	1,000	25,000	1,900	0,520	1,000	25,000	3,400
0,265	1,000	25,000	1,900	0,530	1,000	25,000	3,400
0,270	1,000	25,000	1,900	0,535	1,000	25,000	3,900
0,275	1,000	25,000	1,900	0,540	1,000	25,000	3,900
0,280	1,000	25,000	1,900	0,550	1,000	25,000	3,900
0,285	1,000	25,000	1,900	0,555	1,000	25,000	3,900
0,290	1,000	25,000	1,900	0,560	1,000	25,000	3,900
0,295	1,000	25,000	1,900	0,570	1,000	25,000	3,900
0,300	1,000	25,000	1,900	0,580	1,000	25,000	3,900
0,310	1,000	25,000	2,400	0,585	1,000	25,000	3,900
0,315	1,000	25,000	2,400	0,590	1,000	25,000	3,900
0,320	1,000	25,000	2,400	0,600	1,000	25,000	3,900
0,325	1,000	25,000	2,400	0,610	1,000	25,000	4,200
0,330	1,000	25,000	2,400	0,620	1,000	25,000	4,200
0,335	1,000	25,000	2,400	0,630	1,000	25,000	4,200
0,340	1,000	25,000	2,400	0,640	1,000	25,000	4,200



## Kleinstbohrer ohne Kühlkanäle

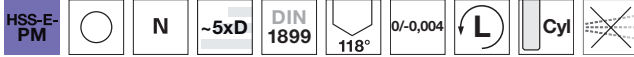
d1 mm	d2 mm	l1 mm	l2 mm	d1 mm	d2 mm	l1 mm	l2 mm
0,650	1,000	25,000	4,200	1,060	1,500	25,000	6,800
0,660	1,000	25,000	4,200	1,070	1,500	25,000	7,600
0,665	1,000	25,000	4,200	1,080	1,500	25,000	7,600
0,670	1,000	25,000	4,200	1,100	1,500	25,000	7,600
0,680	1,000	25,000	4,800	1,110	1,500	25,000	7,600
0,690	1,000	25,000	4,800	1,120	1,500	25,000	7,600
0,700	1,000	25,000	4,800	1,140	1,500	25,000	7,600
0,710	1,000	25,000	4,800	1,150	1,500	25,000	7,600
0,720	1,000	25,000	4,800	1,160	1,500	25,000	7,600
0,730	1,000	25,000	4,800	1,180	1,500	25,000	7,600
0,740	1,000	25,000	4,800	1,190	1,500	25,000	8,500
0,750	1,000	25,000	4,800	1,200	1,500	25,000	8,500
0,760	1,000	25,000	5,300	1,210	1,500	25,000	8,500
0,770	1,000	25,000	5,300	1,230	1,500	25,000	8,500
0,780	1,000	25,000	5,300	1,240	1,500	25,000	8,500
0,790	1,000	25,000	5,300	1,250	1,500	25,000	8,500
0,800	1,500	25,000	5,300	1,260	1,500	25,000	8,500
0,810	1,500	25,000	5,300	1,270	1,500	25,000	8,500
0,820	1,500	25,000	5,300	1,280	1,500	25,000	8,500
0,830	1,500	25,000	5,300	1,300	1,500	25,000	8,500
0,840	1,500	25,000	5,300	1,310	1,500	25,000	8,500
0,850	1,500	25,000	5,300	1,320	1,500	25,000	8,500
0,860	1,500	25,000	6,000	1,340	1,500	25,000	9,500
0,870	1,500	25,000	6,000	1,350	1,500	25,000	9,500
0,880	1,500	25,000	6,000	1,380	1,500	25,000	9,500
0,890	1,500	25,000	6,000	1,390	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
0,920	1,500	25,000	6,000	1,420	1,500	25,000	9,500
0,930	1,500	25,000	6,000	1,430	1,500	25,000	9,500
0,940	1,500	25,000	6,000	1,440	1,500	25,000	9,500
0,950	1,500	25,000	6,000	1,450	1,500	25,000	9,500
0,960	1,500	25,000	6,800	1,500	2,000	30,000	9,500
0,970	1,500	25,000	6,800	1,600	2,000	30,000	10,600
0,980	1,500	25,000	6,800	1,630	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				
1,040	1,500	25,000	6,800				
1,050	1,500	25,000	6,800				



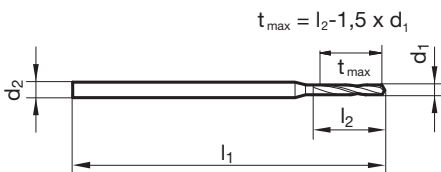
## Kleinstbohrer ohne Kühlkanäle

Artikel-Nr. 87016

P	M	K	N	S	H
•	•	•	•	○	



Flächenanschliff • < Ø 0,15 mm Co-legierter HSS-Stahl • mit verstärktem Schaft  
hochlegierte Stähle



d1 mm	d2 mm	l1 mm	l2 mm	d1 mm	d2 mm	l1 mm	l2 mm
0,150	1,000	25,000	0,800	0,710	1,000	25,000	4,800
0,160	1,000	25,000	1,100	0,750	1,000	25,000	4,800
0,200	1,000	25,000	1,500	0,760	1,000	25,000	5,300
0,210	1,000	25,000	1,500	0,780	1,000	25,000	5,300
0,220	1,000	25,000	1,500	0,800	1,500	25,000	5,300
0,230	1,000	25,000	1,500	0,820	1,500	25,000	5,300
0,240	1,000	25,000	1,500	0,830	1,500	25,000	5,300
0,280	1,000	25,000	1,900	0,840	1,500	25,000	5,300
0,300	1,000	25,000	1,900	0,870	1,500	25,000	6,000
0,310	1,000	25,000	2,400	0,900	1,500	25,000	6,000
0,330	1,000	25,000	2,400	0,910	1,500	25,000	6,000
0,350	1,000	25,000	2,400	0,920	1,500	25,000	6,000
0,370	1,000	25,000	2,400	0,930	1,500	25,000	6,000
0,380	1,000	25,000	2,400	0,940	1,500	25,000	6,000
0,390	1,000	25,000	3,000	0,950	1,500	25,000	6,000
0,400	1,000	25,000	3,000	0,970	1,500	25,000	6,800
0,410	1,000	25,000	3,000	0,980	1,500	25,000	6,800
0,420	1,000	25,000	3,000	0,990	1,500	25,000	6,800
0,430	1,000	25,000	3,000	1,000	1,500	25,000	6,800
0,440	1,000	25,000	3,000	1,010	1,500	25,000	6,800
0,450	1,000	25,000	3,000	1,040	1,500	25,000	6,800
0,460	1,000	25,000	3,000	1,080	1,500	25,000	7,600
0,480	1,000	25,000	3,000	1,100	1,500	25,000	7,600
0,490	1,000	25,000	3,400	1,150	1,500	25,000	7,600
0,500	1,000	25,000	3,400	1,250	1,500	25,000	8,500
0,510	1,000	25,000	3,400	1,300	1,500	25,000	8,500
0,520	1,000	25,000	3,400	1,340	1,500	25,000	9,500
0,540	1,000	25,000	3,900	1,350	1,500	25,000	9,500
0,550	1,000	25,000	3,900	1,450	1,500	25,000	9,500
0,560	1,000	25,000	3,900				
0,570	1,000	25,000	3,900				
0,600	1,000	25,000	3,900				
0,610	1,000	25,000	4,200				
0,670	1,000	25,000	4,200				
0,680	1,000	25,000	4,800				
0,700	1,000	25,000	4,800				



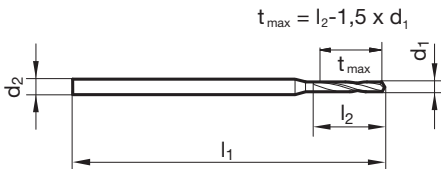
## Kleinstbohrer ohne Kühlkanäle

Artikel-Nr. 84810

P	M	K	N	S	H
•	•	•	•	○	



Flächenanschliff • mit verstärktem Schaft • höhere Verschleißfestigkeit  
hochlegierte Stähle



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	1,400	1,500	25,000	9,500
0,590	1,000	25,000	3,900	1,450	1,500	25,000	9,500
0,600	1,000	25,000	3,900	1,500	2,000	30,000	9,500
0,700	1,000	25,000	4,800				
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				

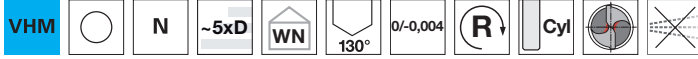


## Kleinstbohrer ohne Kühlkanäle

Artikel-Nr. 89281

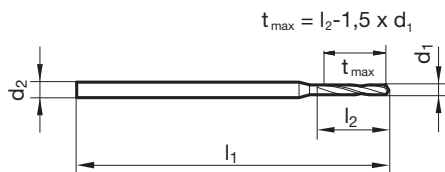


P	M	K	N	S	H
●	○	●	○	○	○



Ausspitzung  $\geq \varnothing 0,800$  • Flächenanschliff • Hauptschneidenform gerade

Bau- und Einsatzstähle • Gusswerkstoffe • Bronze, Messing • Aluminium und Al-Legierungen • Magnesium und Mg-Legierungen  
 • Kunststoffe und faserverstärkte Kunststoffe



d1 mm	d2 mm	l1 mm	l2 mm	d1 mm	d2 mm	l1 mm	l2 mm
0,200	1,000	25,000	1,500	0,700	1,000	25,000	4,800
0,300	1,000	25,000	1,900	0,800	1,500	25,000	5,300
0,350	1,000	25,000	2,400	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

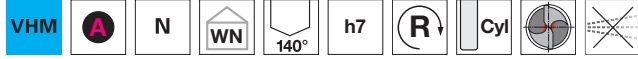


## Kleinstbohrer ohne Kühlkanäle

Artikel-Nr. 86402

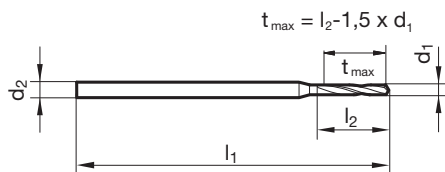


P	M	K	N	S	H
•		•			



Ausspitzung  $\geq \varnothing 0,800$  • Flächenanschliff • Einheitschaft 3 mm • Einheitslänge 38 mm

Bau- und Einsatzstähle • Automatenstähle, Vergütungsstähle • legierte Stähle bis 1200 N/mm<sup>2</sup> • Gusswerkstoffe • Platinenbearbeitung



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					



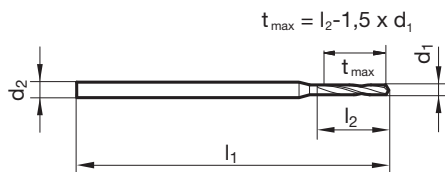
## Kleinstbohrer ohne Kühlkanäle

Artikel-Nr. 86400

P	M	K	N	S	H
•	•	•	○	○	



Ausspitzung  $\geq \text{Ø } 0,500$  • Flächenanschliff • Hauptschneidenform gerade • geschliffener Schneidenabzug  
 Bau- und Einsatzstähle • Automatenstähle, Vergütungsstähle • legierte Stähle bis 1200 N/mm<sup>2</sup> • rostfreie Stähle • Gusswerkstoffe



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					





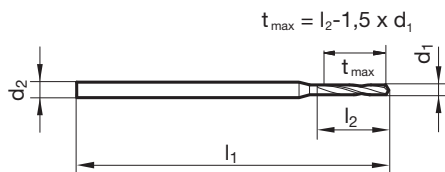
## Kleinstbohrer ohne Kühlkanäle

Artikel-Nr. 86401

P	M	K	N	S	H
•	•	•	○	○	



Ausspitzung  $\geq \varnothing 0,500$  • Flächenanschliff • Hauptschneidenform gerade • geschliffener Schneidenabzug  
 Bau- und Einsatzstähle • Automatenstähle, Vergütungsstähle • legierte Stähle bis 1200 N/mm<sup>2</sup> • rostfreie Stähle • Gusswerkstoffe



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					



## Kleinstbohrer mit Kühlkanälen

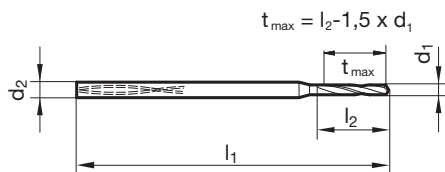
Artikel-Nr. 86405

P	M	K	N	S	H
•	•	•	○	○	



Ausspitzung  $\geq \varnothing 1,400$  • Flächenanschliff • Hauptschneidenform gerade • geschliffener Schneidenabzug

Bau- und Einsatzstähle • Automatenstähle, Vergütungsstähle • legierte Stähle bis 1200 N/mm<sup>2</sup> • rostfreie Stähle • Gusswerkstoffe



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					



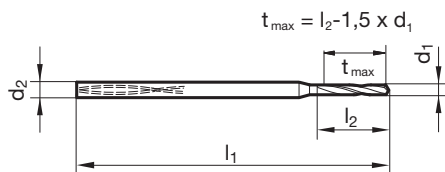
## Kleinstbohrer mit Kühlkanälen

Artikel-Nr. 86408

P	M	K	N	S	H
•	•	•	○	○	



Ausspitzung  $\geq \text{Ø } 1,400$  • Flächenanschliff • Hauptschneidenform gerade • geschliffener Schneidenabzug  
 Bau- und Einsatzstähle • Automatenstähle, Vergütungsstähle • legierte Stähle bis 1200 N/mm<sup>2</sup> • rostfreie Stähle • Gusswerkstoffe



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				



## Kleinstbohrer mit Kühlkanälen

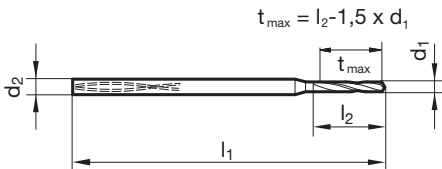
Artikel-Nr. 86412



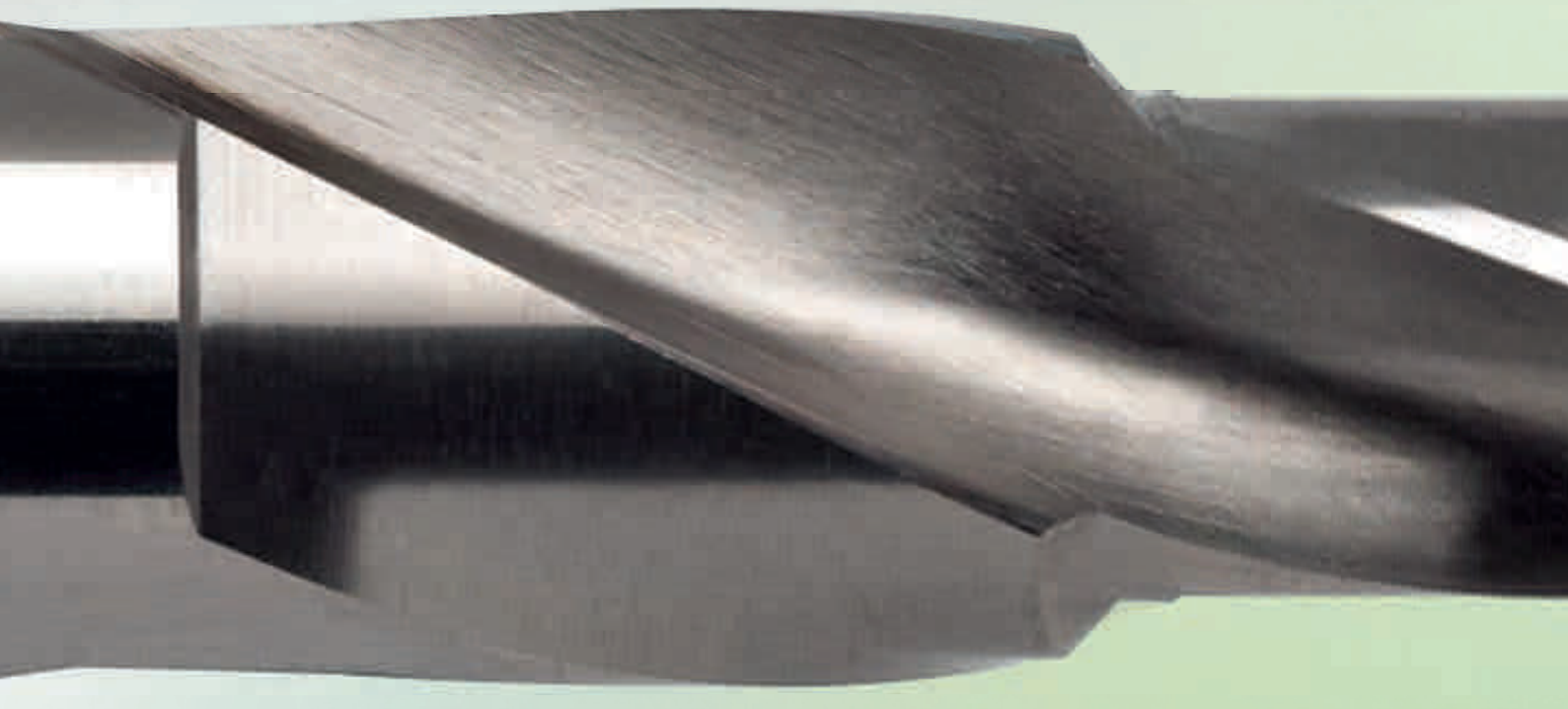
P	M	K	N	S	H
•	•	•	○	○	



Ausspitzung  $\geq \text{Ø } 1,400$  • Flächenanschliff • Hauptschneidenform gerade • geschliffener Schneidenabzug  
 Bau- und Einsatzstähle • Automatenstähle, Vergütungsstähle • legierte Stähle bis 1200 N/mm<sup>2</sup> • rostfreie Stähle • Gusswerkstoffe



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

Präzisionswerkzeuge

## ZENTRIERBOHRER/ STUFENBOHRER/ KEGELSENKER

Kurzstufenbohrer, Mehrfasenstufenbohrer  
aus HSS und VHM mit Zylinderschaft und Morsekegel

Zentrierbohrer aus HSS, HSS-E und VHM  
blank und beschichtet

Senker aus HSS









Stufenbohrer  
Zentrierbohrer

P	M	K	N	S	H	Norm	Typ	Schneidstoff	Oberfläche	Schneid- richtung	Schaft- form	Senk- winkel/ Form	d1/mm	Artikel-Nr.	Progr. Seite
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## Stufenbohrer für Zentrierungen DIN 332

	•	○	•	•	○	Werksnorm	N	HSS	○	rechts	zyl.	90	8,000 - 40,000	85910	306
	•	○	•	•	○	Werksnorm	N	HSS	○	rechts	zyl.	90	8,000 - 40,000	85911	306
	•	○	•	•	○	Werksnorm	N	HSS	○	rechts	zyl.	90	8,000 - 20,000	85912	307
	•	○	•	•	○	Werksnorm	N	HSS	○	rechts	MK	90	14,000 - 40,000	85914	308

## Kurzstufenbohrer mit Zylinderschaft






	•	○	•	•	○	Werksnorm	N	HSS	ⓧ	rechts	zyl.	90	3,400 - 13,500	84445	313
	•	○	•	•	○	Werksnorm	N	HSS	○	rechts	zyl.	90	6,000 - 19,000	85916	310
	•	○	•	•	○	Werksnorm	N	HSS	○	rechts	zyl.	90	6,600 - 21,500	85917	311
	•	○	•	•	○	Werksnorm	N	HSS	○	rechts	zyl.	180	6,000 - 18,000	85918	312
	•	○	•	•	○	Werksnorm	N	HSS	○	rechts	zyl.	90	3,400 - 13,500	85920	314
	○	○	○	•	○	Werksnorm	N	VHM	○	rechts	HE	90	5,500 - 9,000	89254	309

## Mehrfasenstufenbohrer mit Zylinderschaft






	•	○	•	○	○	DIN 8374	N	HSS	○	rechts	zyl.	90	6,000 - 19,000	85010	315
	•	○	•	○	○	DIN 8374	N	HSS	○	rechts	zyl.	90	7,500 - 19,000	85218	318

P	M	K	N	S	H	Norm	Typ	Schneidstoff	Oberfläche	Schneid- richtung	Schaft- form	Senk- winkel/ Form	d1/mm	Artikel-Nr.	Progr. Seite
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## Mehrfasenstufenbohrer mit Zylinderschaft

		DIN 8376	N	<b>HSS</b>		rechts	zyl.	180	6,000 - 18,000	<b>85210</b>	319
		DIN 8378	N	<b>HSS</b>		rechts	zyl.	90	3,400 - 13,500	<b>85310</b>	317
		Werksnorm	N	<b>HSS</b>		rechts	zyl.	90	6,600 - 17,200	<b>85110</b>	316
		Werksnorm	N	<b>HSS</b>		rechts	zyl.	180	5,900 - 16,500	<b>85216</b>	320
			N	<b>VHM</b>		rechts	zyl.	180	6,000 - 11,000	<b>89252</b>	321

## Mehrfasenstufenbohrer mit Morsekegel

		DIN 8375	N	<b>HSS</b>		rechts	MK	90	12,000 - 23,000	<b>85619</b>	326
		DIN 8377	N	<b>HSS</b>		rechts	MK	180	10,000 - 33,000	<b>85610</b>	324
		DIN 8379	N	<b>HSS</b>		rechts	MK	90	9,000 - 22,000	<b>85710</b>	323
		Werksnorm	N	<b>HSS</b>		rechts	MK	90	11,000 - 21,500	<b>85510</b>	322
		Werksnorm	N	<b>HSS</b>		rechts	MK	180	9,400 - 33,000	<b>85616</b>	325
















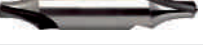


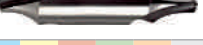












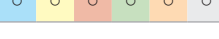

## Kegelsenker 90°

		DIN 335		<b>HSS</b>		rechts	zyl.	C	4,300 - 31,000	<b>88200</b>	327
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P	M	K	N	S	H	Norm	Typ	Schneidstoff	Oberfläche	Schneid- richtung	Schaft- form	Senk- winkel/ Form	d1/mm	Artikel-Nr.	Progr. Seite
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## Zentrierbohrer ohne Fläche

		DIN 333	N	HSS		rechts	zyl.	A	0,500 - 12,500	<b>83100</b>	328
		DIN 333	N	HSS		links	zyl.	A	0,500 - 4,000	<b>83105</b>	329
		DIN 333	N	HSS		rechts	zyl.	A	1,000 - 10,000	<b>83300</b>	332
		DIN 333	N	HSS		rechts	zyl.	A	0,500 - 12,500	<b>84450</b>	328
		DIN 333	N	HSS		rechts	zyl.	B	1,000 - 10,000	<b>83200</b>	335
		DIN 333	N	HSS		rechts	zyl.	R	0,500 - 10,000	<b>83000</b>	330
		DIN 333	N	HSS		links	zyl.	R	1,000 - 4,000	<b>83005</b>	331
		DIN 333	N	HSS		rechts	zyl.	R	0,500 - 10,000	<b>84448</b>	330
		Werksnorm	N	HSS		rechts	zyl.	A	1,000 - 3,150	<b>83110</b>	334
		DIN 333	N	HSS-E		rechts	zyl.	A	1,000 - 4,000	<b>83101</b>	333
		Werksnorm	N	VHM		rechts	zyl.	A	0,500 - 6,300	<b>83370</b>	336

## Zentrierbohrer mit Fläche

		DIN 333	N	HSS		rechts	zyl.	A	1,600 - 12,500	<b>83600</b>	337
		DIN 333	N	HSS		rechts	zyl.	B	1,600 - 8,000	<b>83700</b>	338

P	M	K	N	S	H	Norm	Typ	Schneidstoff	Oberfläche	Schneid- richtung	Schaft- form	Senk- winkel/ Form	d1/mm	Artikel-Nr.	Progr. Seite
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## Zentrierbohrer mit Fläche



•	○	•	•			DIN 333	N	<b>HSS</b>	○	rechts	zyl.	R	1,600 - 12,500	<b>83500</b>	337
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## Stufenbohrer für Zentrierungen DIN 332

### Artikel-Nr. 85910



P	M	K	N	S	H
•	○	•	•		



Ausspitzung  $\geq \varnothing 8,000$  • Kegelmantelschliff • mit Fläche am Schaft • Senkwinkel 60° • für Gewindekernbohrungen mit Zentrierung nach DIN 332, Blatt 2, Form D • Einsatz auf Zentrier-/Ablängmaschinen

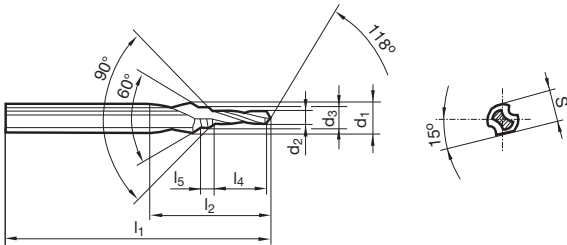
### Artikel-Nr. 85911



P	M	K	N	S	H
•	○	•	•		



Ausspitzung  $\geq \varnothing 8,000$  • Kegelmantelschliff • mit Fläche am Schaft • Senkwinkel 60° • für Gewindekernbohrungen mit Zentrierung nach DIN 332, Blatt 2, Form DR • Einsatz auf Zentrier-/Ablängmaschinen



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

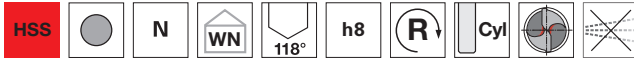


## Stufenbohrer für Zentrierungen DIN 332

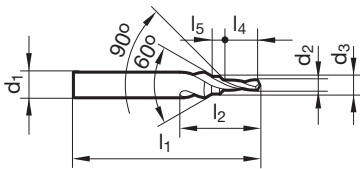
Artikel-Nr. 85912



P	M	K	N	S	H
•	○	•	•		



Ausspitzung  $\geq \varnothing 8,000$  • Kegelmantelschliff • Senkwinkel  $60^\circ$  • für Gewindekernbohrungen mit Zentrierung nach DIN 332, Blatt 2, Form D



d1 h7 mm	d3 h11 mm	d2 h8 mm	l1 mm	l2 mm	l4 mm	l5 mm	für Gewinde
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



## Stufenbohrer für Zentrierungen DIN 332

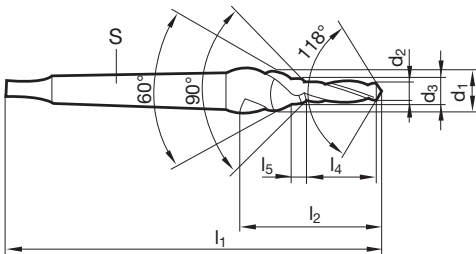
Artikel-Nr. 85914



P	M	K	N	S	H
•	○	•	•		



Ausspitzung  $\geq \varnothing 14,000$  • Kegelmantelanschliff • Senkwinkel  $60^\circ$  • für Gewindekernbohrungen mit Zentrierung nach DIN 332, Blatt 2, Form D



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



## Kurzstufenbohrer mit Zylinderschaft

Artikel-Nr. 89254

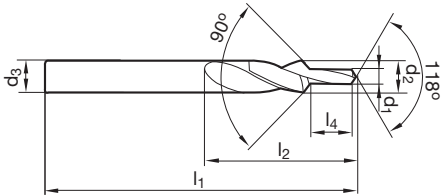


P	M	K	N	S	H
○	○	○	●	○	○



Ausspitzung  $\geq \text{Ø } 3,400$  • Flächenanschliff • sehr torsionsstabil • für CNC- und NC-Maschinen • für Gewindekernbohrungen nach DIN 336 • für Freisenkungen  $90^\circ$  entsprechend den Durchgangsbohrungen nach DIN EN 20273, Reihe mittel • f richtet sich nach kleinem Durchmesser • vc richtet sich nach großem Durchmesser

Stahlguss, Grauguss, Hartguss • Mangan-Hartstähle, Bronzen • Leicht- und Buntmetalle • abrasive Werkstoffe (AISI-Legierungen)  
 • faserverstärkte Kunststoffe • Duroplaste mit Schmirgelwirkung auf Schneiden und Fasen



d1 h7 mm	d2 h9 mm	d3 mm	l1 mm	l2 mm	l4 mm	für Gewinde
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

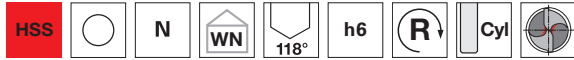


## Kurzstufenbohrer mit Zylinderschaft

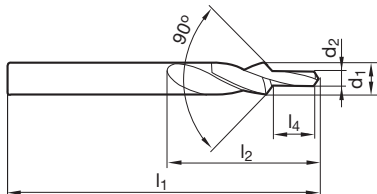
Artikel-Nr. 85916



P	M	K	N	S	H
•	○	•	•		



Ausspitzung  $\geq \varnothing 6,000$  • Kegelmantelschliff • sehr torsionsstabil • für CNC- und NC-Maschinen • für Durchgangsbohrungen nach DIN EN 20273, Reihe fein • für Schraubenkopfsenkungen  $90^\circ$  • f richtet sich nach kleinem Durchmesser • vc richtet sich nach großem Durchmesser



d1 h6 mm	d2 h9 mm	l1 mm	l2 mm	l4 mm	für Gewinde
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	M 10



## Kurzstufenbohrer mit Zylinderschaft

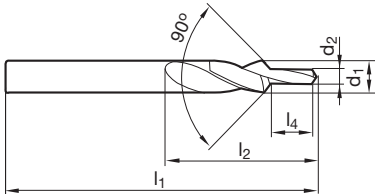
Artikel-Nr. 85917



P	M	K	N	S	H
•	○	•	•		



Ausspitzung  $\geq \text{Ø } 6,600$  • Kegelmantelschliff • sehr torsionsstabil • für CNC- und NC-Maschinen • für Durchgangsbohrungen nach DIN EN 20273, Reihe mittel • für Schraubenkopfsenkungen  $90^\circ$  nach DIN 74, Form A • f richtet sich nach kleinem Durchmesser • vc richtet sich nach großem Durchmesser



d1 h6 mm	d2 h9 mm	l1 mm	l2 mm	l4 mm	für Gewinde
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	M 10





## Kurzstufenbohrer mit Zylinderschaft

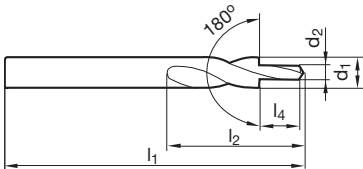
Artikel-Nr. 85918



P	M	K	N	S	H
•	○	•	•		



Ausspitzung  $\geq \varnothing 6,000$  • Kegelmantelschliff • sehr torsionsstabil • für CNC- und NC-Maschinen • für Durchgangsbohrungen nach DIN EN 20273, Reihe mittel • für Schraubenkopfsenkungen  $180^\circ$  nach DIN 974-1, Reihe 1 • für Schrauben nach DIN 6912, 7984, 34821, DIN EN ISO 1207, 4762, 14579, 14580 • f richtet sich nach kleinem Durchmesser • vc richtet sich nach großem Durchmesser



d1 h6 mm	d2 h9 mm	l1 mm	l2 mm	l4 mm	für Gewinde
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	M 10

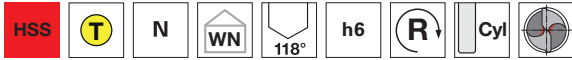


## Kurzstufenbohrer mit Zylinderschaft

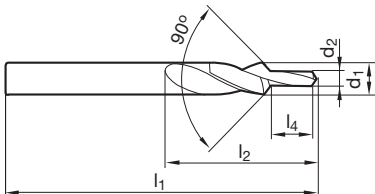
Artikel-Nr. 84445



P	M	K	N	S	H
•	○	•	•		



Ausspitzung  $\geq \text{Ø } 3,400$  • Kegelmantelschliff • sehr torsionsstabil • für CNC- und NC-Maschinen • für Gewindekernbohrungen nach DIN 336 • für Freisenkungen  $90^\circ$  entsprechend den Durchgangsbohrungen nach DIN EN 20273, Reihe mittel • f richtet sich nach kleinem Durchmesser • vc richtet sich nach großem Durchmesser



d1 h6 mm	d2 h9 mm	l1 mm	l2 mm	l4 mm	für Gewinde
3,400	2,500	52,000	20,000	8,800	M 3
4,500	3,300	58,000	24,000	11,400	M 4
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	M 10
13,500	10,200	107,000	54,000	30,000	M 12



## Kurzstufenbohrer mit Zylinderschaft

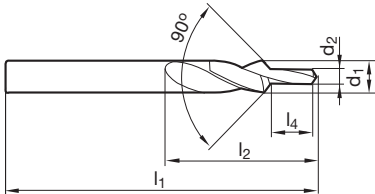
Artikel-Nr. 85920



P	M	K	N	S	H
•	○	•	•		



Ausspitzung  $\geq \varnothing 3,400$  • Kegelmantelschliff • sehr torsionsstabil • für CNC- und NC-Maschinen • für Gewindekernbohrungen nach DIN 336 • für Freisenkungen  $90^\circ$  entsprechend den Durchgangsbohrungen nach DIN EN 20273, Reihe mittel • f richtet sich nach kleinem Durchmesser • vc richtet sich nach großem Durchmesser



d1 h6 mm	d2 h9 mm	l1 mm	l2 mm	l4 mm	für Gewinde
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	M 10
13,500	10,200	107,000	54,000	30,000	M 12

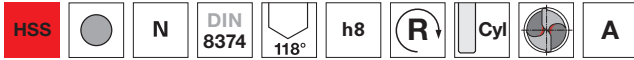


## Mehrfasenstufenbohrer mit Zylinderschaft

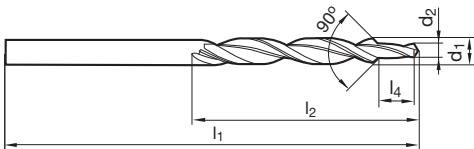
Artikel-Nr. 85010



P	M	K	N	S	H
•	○	•	○		



Ausspitzung  $\geq \varnothing 6,000$  • Kegelmantelschliff • für Durchgangsbohrungen nach DIN EN 20273, Reihe fein • für Schraubenkopfsenkungen  $90^\circ$  • f richtet sich nach kleinem Durchmesser • vc richtet sich nach großem Durchmesser



d1 h8 mm	d2 h9 mm	l1 mm	l2 mm	l4 mm	für Gewinde
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	M 10



## Mehrfasenstufenbohrer mit Zylinderschaft

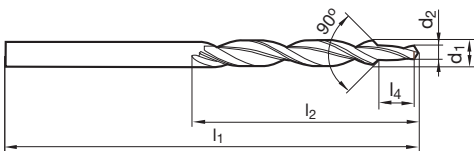
Artikel-Nr. 85110



P	M	K	N	S	H
•	○	•	○		



Ausspitzung  $\geq \text{Ø } 6,600$  • Kegelmantelschliff • für Durchgangsbohrungen nach DIN EN 20273, Reihe mittel • für Schraubenkopfsenkungen  $90^\circ$  nach DIN 74 Teil 1 (Ausgabe 12.1980 zurückgezogen), Form A und B, Ausführung mittel • f richtet sich nach kleinem Durchmesser • vc richtet sich nach großem Durchmesser



d1 h8 mm	d2 h9 mm	l1 mm	l2 mm	l4 mm	für Gewinde
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



## Mehrfasenstufenbohrer mit Zylinderschaft

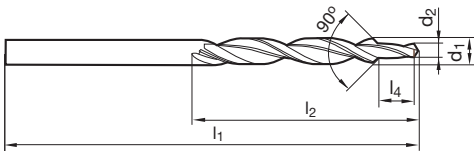
Artikel-Nr. 85310



P	M	K	N	S	H
•	○	•	○		



Ausspitzung  $\geq \varnothing 3,400$  • Kegelmantelschliff • für Gewindekernbohrungen nach DIN 336 • für Freisenkungen  $90^\circ$  entsprechend den Durchgangsbohrungen nach DIN EN 20273, Reihe mittel • f richtet sich nach kleinem Durchmesser • vc richtet sich nach großem Durchmesser



d1 h8 mm	d2 h9 mm	l1 mm	l2 mm	l4 mm	für Gewinde
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	M 10
13,500	10,200	160,000	108,000	30,000	M 12

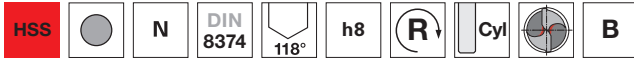


## Mehrfasenstufenbohrer mit Zylinderschaft

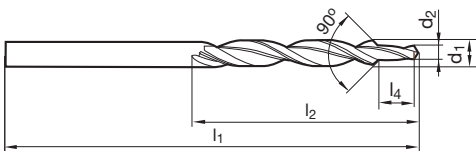
Artikel-Nr. 85218



P	M	K	N	S	H
•	○	•	○		



Ausspitzung  $\geq \text{Ø } 7,500$  • Kegelmantelschliff • für Durchgangsbohrungen nach DIN EN 20273, Reihe mittel • für Schraubenkopfsenkungen  $90^\circ$  nach DIN 74, Form A und F • f richtet sich nach kleinem Durchmesser • vc richtet sich nach großem Durchmesser



d1 h8 mm	d2 h9 mm	l1 mm	l2 mm	l4 mm	für Gewinde
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



## Mehrfasenstufenbohrer mit Zylinderschaft

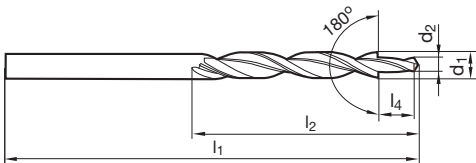
Artikel-Nr. 85210



P	M	K	N	S	H
•	○	•	○		



Ausspitzung  $\geq \varnothing 6,000$  • Kegelmantelschliff • für Durchgangsbohrungen nach DIN EN 20273, Reihe mittel • für Schraubenkopfsenkungen  $180^\circ$  nach DIN 974-1, Reihe 1 • für Schrauben nach DIN 6912, 7984, 34821, DIN EN ISO 1207, 4762, 14579, 14580 und DIN 7513, 7516, 7500-1 • f richtet sich nach kleinem Durchmesser • vc richtet sich nach großem Durchmesser



d1 h8 mm	d2 h9 mm	l1 mm	l2 mm	l4 mm	für Gewinde
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	M 10





## Mehrfasenstufenbohrer mit Zylinderschaft

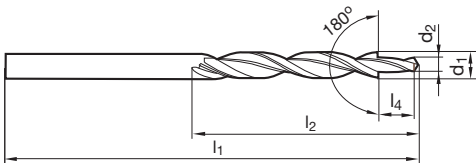
Artikel-Nr. 85216



P	M	K	N	S	H
•	○	•	○		



Ausspitzung  $\geq \text{Ø } 5,900$  • Kegelmantelschliff • für Durchgangsbohrungen mit alten Senkungen Form H, J, K nach DIN 75 Teil 2 (Ausgabe 04.1968 zurückgezogen), Ausführung mittel und fein • für Schrauben nach DIN 84, 912, 6912 • f richtet sich nach kleinem Durchmesser • vc richtet sich nach großem Durchmesser



d1 h8 mm	d2 h9 mm	l1 mm	l2 mm	l4 mm	für Gewinde
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	M 10

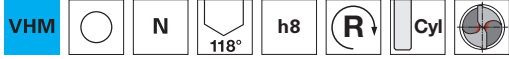


## Mehrfasenstufenbohrer mit Zylinderschaft

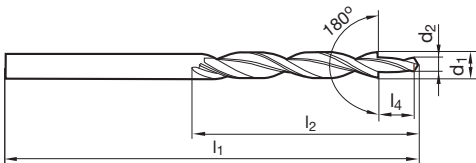
Artikel-Nr. 89252



P	M	K	N	S	H
○	○	○	○	○	○



Ausspitzung  $\geq \text{Ø } 8,000$  • Kegelmantelschliff • für Durchgangsbohrungen nach DIN EN 20273, Reihe mittel • für Schraubenkopfsenkungen  $180^\circ$  nach DIN 974-1, Reihe 1 • für Schrauben nach DIN 6912, 7984, 34821, DIN EN ISO 1207, 4762, 14579, 14580 und DIN 7513, 7516, 7500-1 • f richtet sich nach kleinem Durchmesser • vc richtet sich nach großem Durchmesser



d1 h8 mm	d2 h9 mm	l1 mm	l2 mm	l4 mm	für Gewinde
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



## Mehrfasenstufenbohrer mit Morsekegel

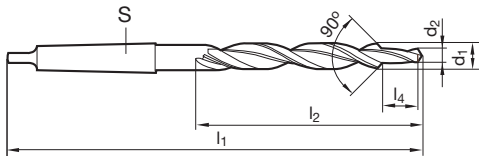
Artikel-Nr. 85510



P	M	K	N	S	H
•	○	•	○		



Ausspitzung  $\geq \text{Ø } 11,000$  • Kegelmantelschliff • für Durchgangsbohrungen nach DIN EN 20273, Reihe mittel • für Schraubkopfsenkungen  $90^\circ$  nach DIN 74 Teil 1 (Ausgabe 12.1980 zurückgezogen), Form A und B, Ausführung mittel • f richtet sich nach kleinem Durchmesser • vc richtet sich nach großem Durchmesser



d1 h8 mm	d2 h9 mm	S	l1 mm	l2 mm	l4 mm	für Gewinde
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	M 10



## Mehrfasenstufenbohrer mit Morsekegel

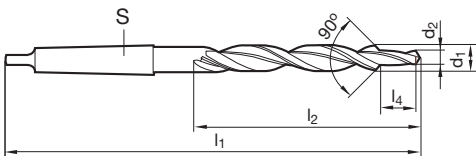
Artikel-Nr. 85710



P	M	K	N	S	H
•	○	•	○		



Ausspitzung  $\geq \text{Ø } 9,000$  • Kegelmantelschliff • für Gewindekernbohrungen nach DIN 336 • für Freisenkungen  $90^\circ$  entsprechend den Durchgangsbohrungen nach DIN EN 20273, Reihe mittel • f richtet sich nach kleinem Durchmesser • vc richtet sich nach großem Durchmesser



d1 h8 mm	d2 h9 mm	S	l1 mm	l2 mm	l4 mm	für Gewinde
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	M 10
13,500	10,200	MK-1	189,000	108,000	30,000	M 12
15,500	12,000	MK-2	218,000	120,000	34,500	M 14
17,500	14,000	MK-2	228,000	130,000	38,500	M 16
20,000	15,500	MK-2	238,000	140,000	43,500	M 18
22,000	17,500	MK-2	248,000	150,000	47,500	M 20



## Mehrfasenstufenbohrer mit Morsekegel

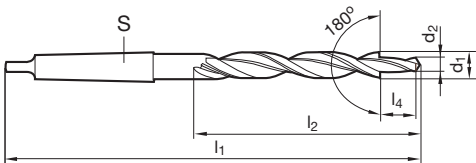
Artikel-Nr. 85610



P	M	K	N	S	H
•	○	•	○		



Ausspitzung  $\geq \text{Ø } 10,000$  • Kegelmantelanschliff • für Durchgangsbohrungen nach DIN EN 20273, Reihe mittel • für Schraubenkopfsenkungen  $180^\circ$  nach DIN 974-1, Reihe 1 • für Schrauben nach DIN 6912, 7984, 34821, DIN EN ISO 1207, 4762, 14579, 14580 und DIN 7513, 7516, 7500-1 • f richtet sich nach kleinem Durchmesser • vc richtet sich nach großem Durchmesser



d1 h8 mm	d2 h9 mm	S	l1 mm	l2 mm	l4 mm	für Gewinde
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	M 10
20,000	13,500	MK-2	238,000	140,000	27,000	M 12
24,000	15,500	MK-3	281,000	160,000	31,000	M 14
26,000	17,500	MK-3	286,000	165,000	35,000	M 16
30,000	20,000	MK-3	296,000	175,000	39,000	M 18
33,000	22,000	MK-4	334,000	185,000	43,000	M 20



## Mehrfasenstufenbohrer mit Morsekegel

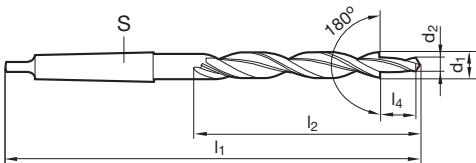
Artikel-Nr. 85616



P	M	K	N	S	H
•	○	•	○		



Ausspitzung  $\geq \text{Ø } 9,400$  • Kegelmantelschliff • für Durchgangsbohrungen mit alten Senkungen Form H, J, K nach DIN 75 Teil 2 (Ausgabe 04.1968 zurückgezogen), Ausführung mittel und fein • für Schrauben nach DIN 84, 912, 6912 • f richtet sich nach kleinem Durchmesser • vc richtet sich nach großem Durchmesser



d1 h8 mm	d2 h9 mm	S	l1 mm	l2 mm	l4 mm	für Gewinde
9,400	5,300	MK-1	162,000	81,000	16,000	M 5
10,000	5,800	MK-1	168,000	87,000	16,000	M 5
10,400	6,400	MK-1	168,000	87,000	19,000	M 6
11,000	7,000	MK-1	175,000	94,000	19,000	M 6
14,500	9,500	MK-2	212,000	114,000	22,000	M 8
17,500	11,500	MK-2	228,000	130,000	25,000	M 10
19,000	13,000	MK-2	233,000	135,000	28,000	M 12
20,000	14,000	MK-2	238,000	140,000	28,000	M 12
23,000	15,000	MK-2	253,000	155,000	30,000	M 14
24,000	16,000	MK-3	281,000	160,000	30,000	M 14
25,000	17,000	MK-3	281,000	160,000	33,000	M 16
28,000	19,000	MK-3	291,000	170,000	36,000	M 18
29,000	20,000	MK-3	296,000	175,000	36,000	M 18
31,000	21,000	MK-3	301,000	180,000	39,000	M 20
33,000	23,000	MK-4	334,000	185,000	39,000	M 20



## Mehrfasenstufenbohrer mit Morsekegel

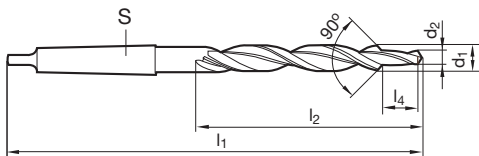
Artikel-Nr. 85619



P	M	K	N	S	H
•	○	•	○		



Ausspitzung  $\geq \text{Ø } 12,000$  • Kegelmantelanschliff • für Durchgangsbohrungen nach DIN EN 20273, Reihe fein • für Schraubenkopfsenkungen  $90^\circ$  nach DIN 74, Form A und F • f richtet sich nach kleinem Durchmesser • vc richtet sich nach großem Durchmesser



d1 h8 mm	d2 h9 mm	S	l1 mm	l2 mm	l4 mm	für Gewinde
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

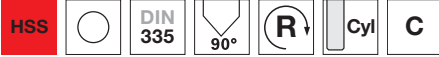


## Kegelsenker 90°

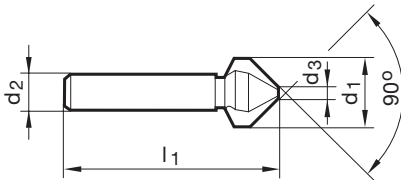
Artikel-Nr. 88200



P	M	K	N	S	H
•	○	•	•		



radial hinterschliffen • dreischneidig



d1 mm	d2 h9 mm	d3 mm	l1 mm	Z	Code-Nr.
4,300	4,000	4,300	40,000	3	4,300
5,000	4,000	5,000	40,000	3	5,000
5,300	4,000	5,300	40,000	3	5,300
5,800	5,000	5,800	45,000	3	5,800
6,000	5,000	6,000	45,000	3	6,000
6,300	5,000	6,300	45,000	3	6,300
7,000	6,000	7,000	50,000	3	7,000
7,300	6,000	7,300	50,000	3	7,300
8,000	6,000	8,000	50,000	3	8,000
8,300	6,000	8,300	50,000	3	8,300
9,400	6,000	9,400	50,000	3	9,400
10,000	6,000	10,000	50,000	3	10,000
10,400	6,000	10,400	50,000	3	10,400
11,500	8,000	11,500	56,000	3	11,500
12,400	8,000	12,400	56,000	3	12,400
13,400	10,000	13,400	56,000	3	13,400
15,000	10,000	15,000	60,000	3	15,000
16,500	10,000	16,500	60,000	3	16,500
19,000	10,000	19,000	63,000	3	19,000
20,500	10,000	20,500	63,000	3	20,500
23,000	10,000	23,000	67,000	3	23,000
25,000	10,000	25,000	67,000	3	25,000
26,000	10,000	26,000	67,000	3	26,000
28,000	12,000	28,000	71,000	3	28,000
30,000	12,000	30,000	71,000	3	30,000
31,000	12,000	31,000	71,000	3	31,000



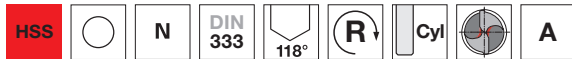


## Zentrierbohrer ohne Fläche

### Artikel-Nr. 83100



P	M	K	N	S	H
•	○	•	•		

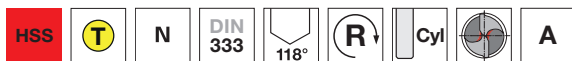


Ausspitzung  $\geq \varnothing 2,000$  • Kegelmantelschliff • ohne Schutzsenkung • für Zentrierbohrungen nach DIN 332 Teil 1, Form A •  $d1 \leq 0,8$  mm: einseitig mit Spitze

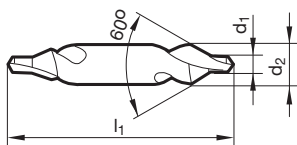
### Artikel-Nr. 84450



P	M	K	N	S	H
•	○	•	•		



Ausspitzung  $\geq \varnothing 2,000$  • Kegelmantelschliff • ohne Schutzsenkung • für Zentrierbohrungen nach DIN 332 Teil 1, Form A •  $d1 \leq 0,8$  mm: einseitig mit Spitze • höhere Verschleißfestigkeit



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			



## Zentrierbohrer ohne Fläche

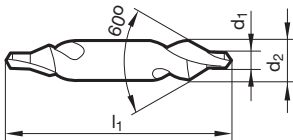
Artikel-Nr. 83105



P	M	K	N	S	H
•	○	•	•		



Ausspitzung  $\geq \varnothing 2,000$  • Kegelmantelschliff • ohne Schutzsenkung • für Zentrierbohrungen nach DIN 332 Teil 1, Form A •  $d_1 \leq 0,8$  mm: einseitig mit Spitze



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			

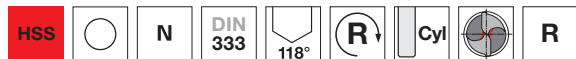


## Zentrierbohrer ohne Fläche

### Artikel-Nr. 83000



P	M	K	N	S	H
•	○	•	•		



Ausspitzung  $\geq \varnothing 2,000$  • Kegelmantelschliff • korrekte Anlage zwischen Körnerspitzen • für Zentrierbohrungen nach DIN 332 Teil 1, Form R •  $d1 \leq 0,8$  mm: einseitig mit Spitze

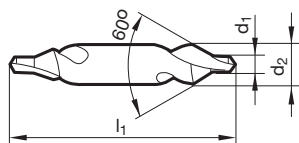
### Artikel-Nr. 84448



P	M	K	N	S	H
•	○	•	•		



Ausspitzung  $\geq \varnothing 2,000$  • Kegelmantelschliff • korrekte Anlage zwischen Körnerspitzen • für Zentrierbohrungen nach DIN 332 Teil 1, Form R •  $d1 \leq 0,8$  mm: einseitig mit Spitze • höhere Verschleißfestigkeit



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			



## Zentrierbohrer ohne Fläche

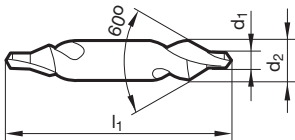
Artikel-Nr. 83005



P	M	K	N	S	H
•	○	•	•		



Ausspitzung  $\geq \text{Ø } 2,000$  • Kegelmantelschliff • korrekte Anlage zwischen Körnerspitzen • für Zentrierbohrungen nach DIN 332 Teil 1, Form R •  $d1 \leq 0,8 \text{ mm}$ : einseitig mit Spitze



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			

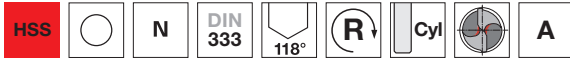


## Zentrierbohrer ohne Fläche

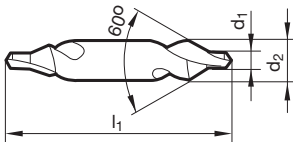
Artikel-Nr. 83300



P	M	K	N	S	H
•	○	•	•		



Ausspitzung  $\geq \varnothing 2,000$  • Kegelmantelschliff • mit Wulst für besonders hohe Bruchsicherheit • ohne Schutzsenkung • Vertiefung am Übergang Senkung/Bohrung für zusätzlichen Schmierstoffraum • für Zentrierbohrungen nach DIN 332 Teil 1, Form 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			



## Zentrierbohrer ohne Fläche

Artikel-Nr. 83101

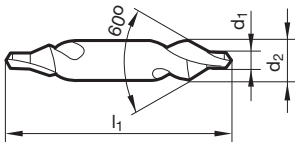


P	M	K	N	S	H
•	•	•	•	○	



Ausspitzung  $\geq \text{Ø } 2,000$  • Kegelmantelschliff • ohne Schutzsenkung • höhere Verschleißfestigkeit • für Zentrierbohrungen nach DIN 332 Teil 1, Form A

Werkstoffe über  $800 \text{ N/mm}^2$  • rost-/säure-/hitzebeständige CrNi-Stähle



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			

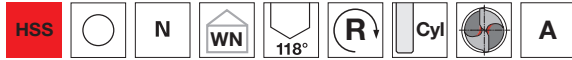


## Zentrierbohrer ohne Fläche

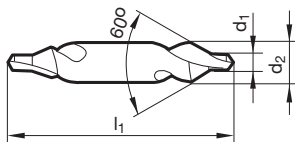
Artikel-Nr. 83110



P	M	K	N	S	H
•	○	•	•		



Ausspitzung  $\geq \text{Ø } 2,000$  • Kegelmantelschliff • überlanger Zentrierbohrer • ohne Schutzsenkung • für Zentrierbohrungen ähnlich DIN 332 Blatt 1, Form A • für vertieft liegende Zentrierstellen



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			

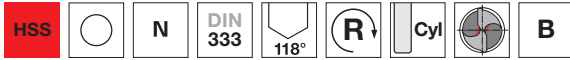


## Zentrierbohrer ohne Fläche

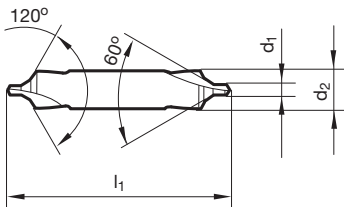
Artikel-Nr. 83200



P	M	K	N	S	H
•	○	•	•	○	



Ausspitzung  $\geq \varnothing 2,000$  • Kegelmantelschliff • für Zentrierbohrungen nach DIN 332 Teil 1, Form B • mit Schutzsenkung 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			





## Zentrierbohrer ohne Fläche

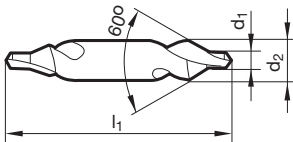
Artikel-Nr. 83370



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



Ausspitzung  $\geq \varnothing 2,000$  • Kegelmantelschliff • ohne Schutzsenkung • für Zentrierbohrungen nach DIN 332 Teil 1, Form A •  $d_1 \leq 0,8$  mm: einseitig mit Spitze  
universell einsetzbar



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			

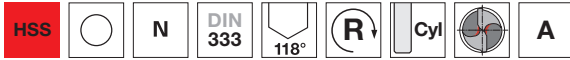


## Zentrierbohrer mit Fläche

### Artikel-Nr. 83600



P	M	K	N	S	H
•	○	•	•		

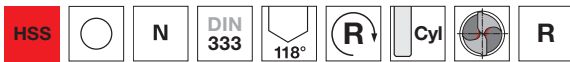


Ausspitzung  $\geq \varnothing 2,000$  • Kegelmantelanschliff • für Zentrierbohrungen nach DIN 332 Teil 1, Form A • ohne Schutzsenkung

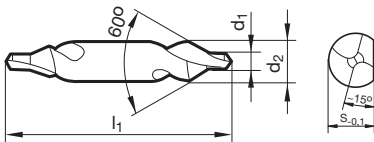
### Artikel-Nr. 83500



P	M	K	N	S	H
•	○	•	•		



Ausspitzung  $\geq \varnothing 2,000$  • Kegelmantelanschliff • korrekte Anlage zwischen Körnerspitzen • für Zentrierbohrungen nach DIN 332 Teil 1, Form 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	12,500	31,500	125,000	28,400
4,000	10,000	56,000	8,400				
5,000	12,500	63,000	10,950				

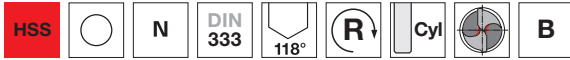


## Zentrierbohrer mit Fläche

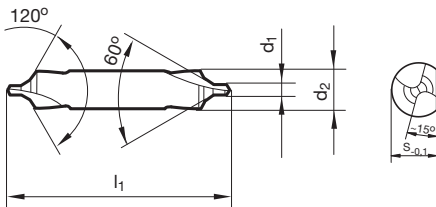
Artikel-Nr. 83700



P	M	K	N	S	H
•	○	•	•		



Ausspitzung  $\geq \text{Ø } 2,000$  • Kegelmantelanschliff • für Zentrierbohrungen nach DIN 332 Teil 1, Form B • mit Schutzsenkung  $120^\circ$



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				

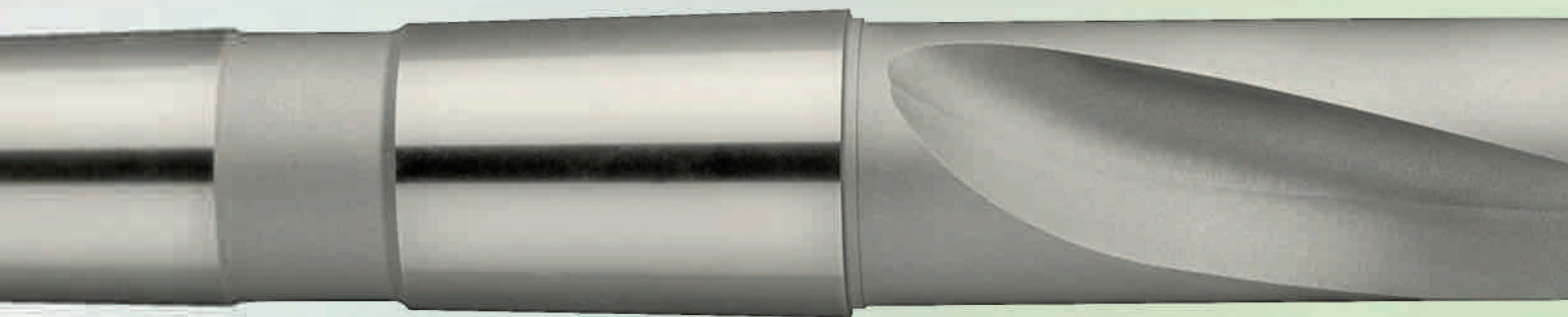
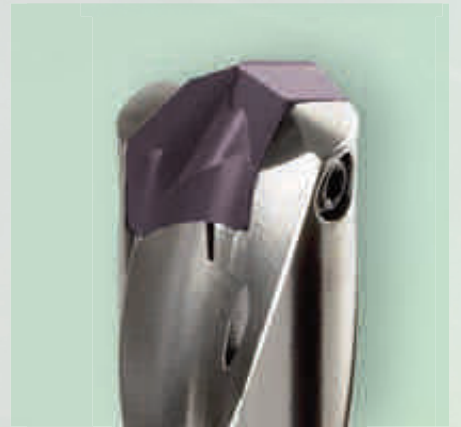


# HARTNER

Präzisionswerkzeuge



TOOL MANAGEMENT



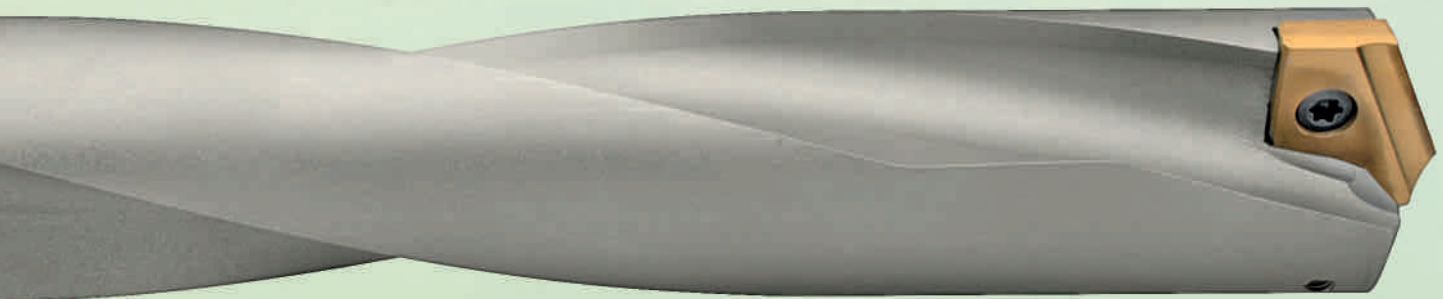


# HARTNER

Präzisionswerkzeuge

## MULTIPLEX MULTIPLEX HPC

Wechselplatten-Spiralbohrer mit Innenkühlung  
Wechselplatten aus HSS-E, HSS-E-PM, Vollhartmetall  
beschichtet



Multiplex  
Multiplex HPC

P	M	K	N	S	H	Norm	Typ	Schneidstoff	Oberfläche	Schneid- richtung	Innen- kühlung	Bohrtiefe	d1/mm	Artikel-Nr.	Progr. Seite
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## Multiplex-Halter mit Zylinderschaft



Werksnorm



rechts

mit

<3xD

**86612**

349



Werksnorm



rechts

mit

<5xD

**86622**

350



Werksnorm



rechts

mit

<7xD

**86624**

351

## Multiplex-Halter mit Morsekegel



Werksnorm



rechts

mit

**86630**

352



Werksnorm



rechts

mit

**86650**

354



Werksnorm



rechts

mit

**86670**

353



Werksnorm



rechts

mit

**86680**

355

P	M	K	N	S	H	Norm	Typ	Schneidstoff	Oberfläche	Schneid- richtung	Innen- kühlung	Bohrtiefe	d1/mm	Artikel-Nr.	Progr. Seite
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## Multiplex-Halter mit Zylinderschaft, Sonderabmessungen



						Werksnorm		Ni		rechts	mit			86628	356
--	--	--	--	--	--	-----------	--	----	--	--------	-----	--	--	-------	-----

## Multiplex-Halter mit Morsekegel, Sonderabmessungen



						Werksnorm		Ni		rechts	mit			86678	358
--	--	--	--	--	--	-----------	--	----	--	--------	-----	--	--	-------	-----

## Wechselplatten



•	○	•	○			Werksnorm	HSS-E-PM	T		rechts				86602	361
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•	○	•	○			Werksnorm	HSS-E-PM	F		rechts				86608	362
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•	○	•	○			Werksnorm	HSS-E-PM	A		rechts				86609	363
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•	○	•	○			Werksnorm	VHM	F		rechts				86701	367
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•	○	•	○			Werksnorm	VHM	F		rechts				86702	365
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P	M	K	N	S	H	Norm	Typ	Schneidstoff	Oberfläche	Schneid- richtung	Innen- kühlung	Bohrtiefe	d1/mm	Artikel-Nr.	Progr. Seite
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## Wechselplatten



•	○	•	○			Werksnorm		<b>VHM</b>		<b>T</b>		rechts		<b>86708</b>	364
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•	○	•	○			Werksnorm		<b>VHM</b>		<b>T</b>		rechts		<b>86709</b>	366
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## Kühlmittelzuführringe



						Werksnorm								<b>86690</b>	368
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## Kühlmittelzuführrohre



						Werksnorm				●				<b>82571</b>	369
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## Schnellverschlusskupplung



						Werksnorm								<b>82578</b>	370
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## Torx-Schraubendreher



						Werksnorm								<b>86842</b>	371
--	--	--	--	--	--	-----------	--	--	--	--	--	--	--	--------------	-----

P	M	K	N	S	H	Norm	Typ	Schneidstoff	Oberfläche	Schneid- richtung	Innen- kühlung	Bohrtiefe	d1/mm	Artikel-Nr.	Progr. Seite
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## Kühlmittelzuführfutter für Multiplex



Werksnorm

ⓑ

86691

372



Werksnorm

ⓑ

86692

373



Werksnorm

ⓑ

86693

374



Werksnorm

ⓑ

86694

375

## Reduzierhülsen für Kühlmittelzuführfutter



Werksnorm







ⓑ

86699



376

P	M	K	N	S	H	Norm	Typ	Schneidstoff	Oberfläche	Schneid- richtung	Innen- kühlung	Bohrtiefe	d1/mm	Artikel-Nr.	Progr. Seite
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## Multiplex HPC-Halter

						Werksnorm	HPC	Ni		rechts	mit	1xD		<b>86681</b>	378
						Werksnorm	HPC	Ni		rechts	mit	1,5xD		<b>86682</b>	379
						Werksnorm	HPC	Ni		rechts	mit	3xD		<b>86683</b>	381
						Werksnorm	HPC	Ni		rechts	mit	5xD		<b>86684</b>	383
						Werksnorm	HPC	Ni		rechts	mit	7xD		<b>86685</b>	385
						Werksnorm	HPC	Ni		rechts	mit	10xD		<b>86686</b>	387

## Multiplex HPC-Wechselplatten

	○	○	○	○	○	Werksnorm	HPC	VHM	a	rechts		11,000 - 40,000	<b>86721</b>	389
	●	○	○	○	○	Werksnorm	HPC	VHM	F	rechts		11,000 - 40,000	<b>86722</b>	392

P	M	K	N	S	H	Norm	Typ	Schneidstoff	Oberfläche	Schneid- richtung	Innen- kühlung	Bohrtiefe	d1/mm	Artikel-Nr.	Progr. Seite
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## Multiplex HPC-Wechselplatten



○	●	○	○	○	○	Werksnorm	HPC	VHM	Ⓡ	rechts		11,000 - 40,000	86723	395
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○	○	○	●	○	○	Werksnorm	HPC	VHM	○	rechts		11,000 - 40,000	86724	398
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○	●	○	○	○	○	Werksnorm	HPC	VHM	Ⓢ	rechts		11,000 - 40,000	86725	401
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## Multiplex HPC-Senkplatten



○	○	●	○	○	○	Werksnorm		VHM	Ⓢ	neutral			86726	404
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○	○	○	●	○	○	Werksnorm		VHM	○	rechts			86727	404
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●	○	○	○	○	○	Werksnorm		VHM	Ⓢ	rechts			86728	405
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## Spannschrauben für Multiplex HPC-Halter 1,5-10xD



						Werksnorm							86843	406
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P	M	K	N	S	H	Norm	Typ	Schneidstoff	Oberfläche	Schneid- richtung	Innen- kühlung	Bohrtiefe	d1/mm	Artikel-Nr.	Progr. Seite
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## Drehmomentschlüssel



Werksnorm

86844

407

## Torx-Einsätze



Werksnorm

86845

408

## Spannschrauben für Multiplex HPC-Senkhalter



Werksnorm

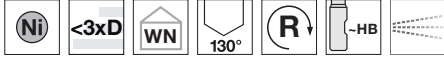
86846

409

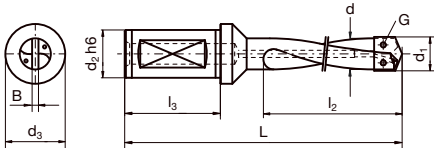


## Multiplex-Halter mit Zylinderschaft

Artikel-Nr. 86612



vernickelt • Halter für Wechselplatten. Der Halter mit Zylinderschaft besitzt eine innere Kühlmittelzufuhr. Weite Spannuten gewährleisten einen optimalen Spantransport. Einfaches Wechseln der Schneidplatten durch Klemmschrauben. Kein Einjustieren der Wechselplatten nötig. Mit dem Wechselplatten-Spiralbohrer soll grundsätzlich ins volle Material gebohrt werden. Zum Aufbohren vorgegossener oder vorgebohrter Löcher ist dieses Werkzeug nicht geeignet. Spannschrauben Artikel-Nr. 86807 enthalten.

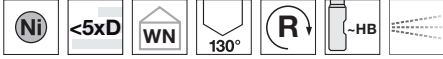


d1 mm	d mm	d2 h6 mm	d3 mm	L mm	l2 mm	l3 mm	B mm	G	Code-Nr.
10,00-11,7	9,500	20,000	25,000	108,000	50,000	40,000	2,500	86807 2.000	9,500
11,71-13,4	11,500	20,000	25,000	109,000	53,000	40,000	2,500	86807 2.000	11,500
13,41-16,4	13,000	20,000	25,000	116,000	60,000	40,000	3,500	86807 2.500	13,000
16,41-18,9	16,000	20,000	25,000	118,000	65,000	40,000	3,500	86807 2.501	16,000
18,91-22,4	18,500	20,000	25,000	124,000	73,000	40,000	4,000	86807 3.000	18,500
22,41-25,4	22,000	20,000	25,000	127,000	78,000	40,000	4,000	86807 3.001	22,000
25,41-29,0	24,000	32,000	40,000	178,000	105,000	60,000	5,000	86807 3.500	24,000
29,01-35,0	28,000	32,000	40,000	178,000	108,000	60,000	5,000	86807 3.500	28,000
35,01-45,0	34,000	32,000	40,000	223,000	152,000	60,000	7,000	86807 4.001	34,000
45,01-55,0	44,000	40,000	50,000	233,000	152,000	70,000	7,000	86807 4.001	44,000
55,01-65,0	54,000	40,000	50,000	233,000	152,000	70,000	7,000	86807 4.001	54,000

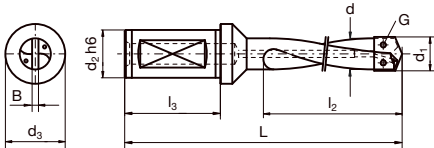


## Multiplex-Halter mit Zylinderschaft

Artikel-Nr. 86622



vernickelt • Halter für Wechselplatten. Der Halter mit Zylinderschaft besitzt eine innere Kühlmittelzufuhr. Weite Spannuten gewährleisten einen optimalen Spantransport. Einfaches Wechseln der Schneidplatten durch Klemmschrauben. Kein Einjustieren der Wechselplatten nötig. Mit dem Wechselplatten-Spiralbohrer soll grundsätzlich ins volle Material gebohrt werden. Zum Aufbohren vorgegossener oder vorgebohrter Löcher ist dieses Werkzeug nicht geeignet. Spannschrauben Artikel-Nr. 86807 enthalten.



d1 mm	d mm	d2 h6 mm	d3 mm	L mm	l2 mm	l3 mm	B mm	G	Code-Nr.
10,00-11,7	9,500	20,000	25,000	140,000	83,000	40,000	2,500	86807 2.000	<b>9,500</b>
11,71-13,4	11,500	20,000	25,000	150,000	94,000	40,000	2,500	86807 2.000	<b>11,500</b>
13,41-16,4	13,000	20,000	25,000	160,000	104,000	40,000	3,500	86807 2.500	<b>13,000</b>
16,41-18,9	16,000	20,000	25,000	170,000	117,000	40,000	3,500	86807 2.501	<b>16,000</b>
18,91-22,4	18,500	20,000	25,000	180,000	129,000	40,000	4,000	86807 3.000	<b>18,500</b>
22,41-25,4	22,000	20,000	25,000	180,000	131,000	40,000	4,000	86807 3.001	<b>22,000</b>
25,41-29,0	24,000	32,000	40,000	240,000	166,000	60,000	5,000	86807 3.500	<b>24,000</b>
29,01-35,0	28,000	32,000	40,000	240,000	170,000	60,000	5,000	86807 3.500	<b>28,000</b>
35,01-45,0	34,000	32,000	40,000	280,000	210,000	60,000	7,000	86807 4.001	<b>34,000</b>
45,01-55,0	44,000	40,000	50,000	290,000	210,000	70,000	7,000	86807 4.001	<b>44,000</b>
55,01-65,0	54,000	40,000	50,000	290,000	210,000	70,000	7,000	86807 4.001	<b>54,000</b>

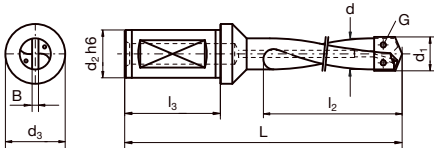


## Multiplex-Halter mit Zylinderschaft

Artikel-Nr. 86624



vernickelt • Halter für Wechselplatten. Der Halter mit Zylinderschaft besitzt eine innere Kühlmittelzufuhr. Weite Spannuten gewährleisten einen optimalen Spantransport. Einfaches Wechseln der Schneidplatten durch Klemmschrauben. Kein Einjustieren der Wechselplatten nötig. Mit dem Wechselplatten-Spiralbohrer soll grundsätzlich ins volle Material gebohrt werden. Zum Aufbohren vorgegossener oder vorgebohrter Löcher ist dieses Werkzeug nicht geeignet. Spannschrauben Artikel-Nr. 86807 enthalten.



d1 mm	d mm	d2 h6 mm	d3 mm	L mm	l2 mm	l3 mm	B mm	G	Code-Nr.
10,00-11,7	9,500	20,000	25,000	180,000	123,000	40,000	2,500	86807 2.000	<b>9,500</b>
11,71-13,4	11,500	20,000	25,000	190,000	134,000	40,000	2,500	86807 2.000	<b>11,500</b>
13,41-16,4	13,000	20,000	25,000	210,000	155,000	40,000	3,500	86807 2.500	<b>13,000</b>
16,41-18,9	16,000	20,000	25,000	220,000	168,000	40,000	3,500	86807 2.501	<b>16,000</b>
18,91-22,4	18,500	20,000	25,000	250,000	199,000	40,000	4,000	86807 3.000	<b>18,500</b>
22,41-25,4	22,000	20,000	25,000	250,000	201,000	40,000	4,000	86807 3.001	<b>22,000</b>
25,41-29,0	24,000	32,000	40,000	320,000	246,000	60,000	5,000	86807 3.500	<b>24,000</b>
29,01-35,0	28,000	32,000	40,000	320,000	250,000	60,000	5,000	86807 3.500	<b>28,000</b>
35,01-45,0	34,000	32,000	40,000	380,000	310,000	60,000	7,000	86807 4.001	<b>34,000</b>
45,01-55,0	44,000	40,000	50,000	390,000	310,000	70,000	7,000	86807 4.001	<b>44,000</b>
55,01-65,0	54,000	40,000	50,000	390,000	310,000	70,000	7,000	86807 4.001	<b>54,000</b>





## Multiplex-Halter mit Morsekegel

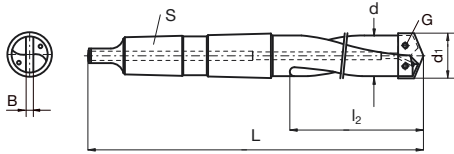
Artikel-Nr. 86630



vernickelt • Halter für Wechselplatten in kurzer Ausführung. Der Halter mit Kegelschaft besitzt eine innere Kühlmittelzufuhr. Weite Spannuten gewährleisten einen optimalen Spantransport. Einfaches Wechseln der Schneidplatten durch Klemmschrauben. Kein Einstellen der Wechselplatten nötig. Mit dem Wechselplatten-Spiralbohrer soll grundsätzlich ins volle Material gebohrt werden. Zum Aufbohren vorgegossener oder vorgebohrter Löcher ist dieses Werkzeug nicht geeignet.

Kühlmittelzuführung: axial (radial auf Anfrage)

Spannschrauben Artikel-Nr. 86807 enthalten



d1 mm	d mm	S	L mm	l <sub>2</sub> mm	B mm	G	Code-Nr.
10,00-11,7	9,500	MK-2	139,000	56,000	2,500	86807 2.000	<b>9,500</b>
11,71-13,4	11,500	MK-2	141,000	58,000	2,500	86807 2.000	<b>11,500</b>
13,41-16,4	13,000	MK-2	148,000	63,000	3,500	86807 2.500	<b>13,000</b>
16,41-18,9	16,000	MK-2	150,000	67,000	3,500	86807 2.501	<b>16,000</b>
18,91-22,4	18,500	MK-3	178,000	76,000	4,000	86807 3.000	<b>18,500</b>
22,41-25,4	22,000	MK-3	181,000	80,000	4,000	86807 3.001	<b>22,000</b>



## Multiplex-Halter mit Morsekegel

Artikel-Nr. 86670



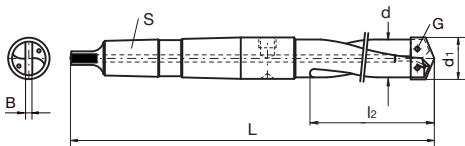
≤ Ø 28 mm: vernickelt, > Ø 28 mm: brüniert • Halter für Wechselplatten in kurzer Ausführung mit Ringlauffläche für Kühlmittelzuführung. Der Halter mit Kegelschaft besitzt eine innere Kühlmittelzufuhr. Weite Spannuten gewährleisten einen optimalen Spantransport. Einfaches Wechseln der Schneidplatten durch Klemmschrauben. Kein Einjustieren der Wechselplatten nötig. Mit dem Wechselplatten-Spiralbohrer soll grundsätzlich ins volle Material gebohrt werden. Zum Aufbohren vorgegossener oder vorgebohrter Löcher ist dieses Werkzeug nicht geeignet.

Kühlmittelzuführung: radial (axial auf Anfrage)

Ab Halter-Ø 63,0 mm: gerade genutet

Schaftgröße MK 5: mit Querkeilnut

Spannschrauben Artikel-Nr. 86807 enthalten



d1 mm	d mm	S	L mm	l2 mm	B mm	G	Code-Nr.
25,01-29,0	24,000	MK-4	279,000	108,000	5,000	86807 3.500	24,000
29,01-35,0	28,000	MK-4	279,000	108,000	5,000	86807 3.500	28,000
35,01-45,0	34,000	MK-4	324,000	152,000	7,000	86807 4.001	34,000
45,01-55,0	44,000	MK-4	324,000	152,000	7,000	86807 4.001	44,000
55,01-65,0	54,000	MK-4	324,000	152,000	7,000	86807 4.001	54,000
65,01-78,0	63,000	MK-5	436,000	216,000	9,000	86807 5.000	63,000
78,01-90,0	77,000	MK-5	436,000	216,000	9,000	86807 5.000	77,000
90,01-102,0	89,000	MK-5	436,000	216,000	9,000	86807 5.000	89,000



## Multiplex-Halter mit Morsekegel

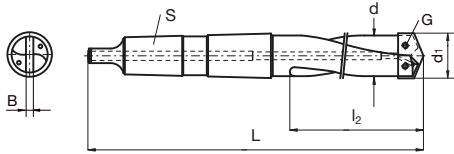
Artikel-Nr. 86650



vernickelt • Halter für Wechselplatten in langer Ausführung. Der Halter mit Kegelschaft besitzt eine innere Kühlmittelzufuhr. Weite Spannuten gewährleisten einen optimalen Spantransport. Einfaches Wechseln der Schneidplatten durch Klemmschrauben. Kein Einstufen der Wechselplatten nötig. Mit dem Wechselplatten-Spiralbohrer soll grundsätzlich ins volle Material gebohrt werden. Zum Aufbohren vorgegossener oder vorgebohrter Löcher ist dieses Werkzeug nicht geeignet.

Kühlmittelzuführung: axial (radial auf Anfrage)

Spannschrauben Artikel-Nr. 86807 enthalten



d1 mm	d mm	S	L mm	l2 mm	B mm	G	Code-Nr.
10,00-11,7	9,500	MK-2	186,000	103,000	2,500	86807 2.000	<b>9,500</b>
11,71-13,4	11,500	MK-2	191,000	108,000	2,500	86807 2.000	<b>11,500</b>
13,41-16,4	13,000	MK-2	210,000	125,000	3,500	86807 2.500	<b>13,000</b>
16,41-18,9	16,000	MK-2	218,000	135,000	3,500	86807 2.501	<b>16,000</b>
18,91-22,4	18,500	MK-3	258,000	156,000	4,000	86807 3.000	<b>18,500</b>
22,41-25,4	22,000	MK-3	266,000	166,000	4,000	86807 3.001	<b>22,000</b>



## Multiplex-Halter mit Morsekegel

Artikel-Nr. 86680



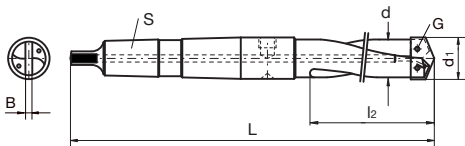
≤ Ø 28 mm: vernickelt, > Ø 28 mm: brüniert • Halter für Wechselplatten in langer Ausführung mit Ringlauffläche für Kühlmittelzuführung. Der Halter mit Kegelschaft besitzt eine innere Kühlmittelzufuhr. Weite Spannuten gewährleisten einen optimalen Spantransport. Einfaches Wechseln der Schneidplatten durch Klemmschrauben. Kein Einjustieren der Wechselplatten nötig. Mit dem Wechselplatten-Spiralbohrer soll grundsätzlich ins volle Material gebohrt werden. Zum Aufbohren vorgegossener oder vorgebohrter Löcher ist dieses Werkzeug nicht geeignet.

Kühlmittelzuführung: radial (axial auf Anfrage)

Ab Halter-Ø 63,0 mm: gerade genutet

Schaftgröße MK 5: mit Querkeilnut

Spannschrauben Artikel-Nr. 86807 enthalten



d1 mm	d mm	S	L mm	l2 mm	B mm	G	Code-Nr.
25,01-29,0	24,000	MK-4	379,000	208,000	5,000	86807 3.500	<b>24,000</b>
29,01-35,0	28,000	MK-4	379,000	208,000	5,000	86807 3.500	<b>28,000</b>
35,01-45,0	34,000	MK-4	429,000	257,000	7,000	86807 4.001	<b>34,000</b>
45,01-55,0	44,000	MK-4	429,000	257,000	7,000	86807 4.001	<b>44,000</b>
55,01-65,0	54,000	MK-4	429,000	257,000	7,000	86807 4.001	<b>54,000</b>
65,01-78,0	63,000	MK-5	536,000	316,000	9,000	86807 5.000	<b>63,000</b>
78,01-90,0	77,000	MK-5	536,000	316,000	9,000	86807 5.000	<b>77,000</b>
90,01-102,0	89,000	MK-5	536,000	316,000	9,000	86807 5.000	<b>89,000</b>

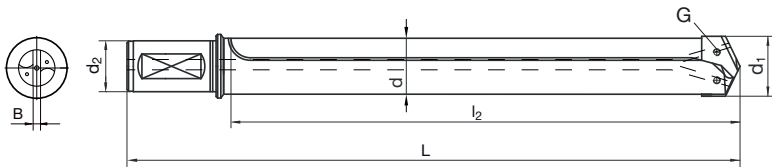


## Multiplex-Halter mit Zylinderschaft, Sonderabmessungen

Artikel-Nr. 86628



vernickelt • Halter für Wechselplatten. Der überlange Halter mit Zylinderschaft besitzt eine innere Kühlmittelzufuhr. Weite Spannuten gewährleisten einen optimalen Spantransport. Einfaches Wechseln der Schneidplatten durch Klemmschrauben. Kein Einjustieren der Wechselplatten nötig. Mit dem Wechselplatten-Spiralbohrer soll grundsätzlich ins volle Material gebohrt werden. Zum Aufbohren vorgegessener oder vorgebohrter Löcher ist dieses Werkzeug nicht geeignet. Spannschrauben Artikel-Nr. 86807 enthalten



d1 mm	d mm	d2 h6 mm	L mm	l2 mm	B mm	G	Code-Nr.
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 3.001	23,063
25,41-29,0	23,000	32,000	173,000	98,000	5,000	86807 3.001	23,098
25,41-29,0	23,000	32,000	225,000	150,000	5,000	86807 3.001	23,150
25,41-29,0	23,000	32,000	273,000	198,000	5,000	86807 3.001	23,198
25,41-29,0	23,000	32,000	343,000	268,000	5,000	86807 3.001	23,268
25,41-29,0	23,000	32,000	433,000	358,000	5,000	86807 3.001	23,358
25,41-29,0	23,000	32,000	503,000	428,000	5,000	86807 3.001	23,428
25,41-29,0	23,000	32,000	683,000	608,000	5,000	86807 3.001	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



## Multiplex-Halter mit Zylinderschaft, Sonderabmessungen

d1 mm	d mm	d2 h6 mm	L mm	l2 mm	B mm	G	Code-Nr.
35,01-45,0	34,000	32,000	907,000	838,000	7,000	86807 4.001	34,838
45,01-55,0	44,000	40,000	467,000	394,000	7,000	86807 4.001	44,394
45,01-55,0	44,000	40,000	617,000	544,000	7,000	86807 4.001	44,544
45,01-55,0	44,000	40,000	917,000	844,000	7,000	86807 4.001	44,844
55,01-65,0	54,000	40,000	467,000	393,000	7,000	86807 4.001	54,393
55,01-65,0	54,000	40,000	617,000	543,000	7,000	86807 4.001	54,543
55,01-65,0	54,000	40,000	917,000	843,000	7,000	86807 4.001	54,843
65,01-78,0	63,000	40,000	230,000	155,000	9,000	86807 5.000	63,155
65,01-78,0	63,000	40,000	340,000	265,000	9,000	86807 5.000	63,265
65,01-78,0	63,000	40,000	470,000	395,000	9,000	86807 5.000	63,395
65,01-78,0	63,000	40,000	620,000	545,000	9,000	86807 5.000	63,545
65,01-78,0	63,000	40,000	920,000	845,000	9,000	86807 5.000	63,845
78,01-90,0	77,000	50,000	240,000	155,000	9,000	86807 5.000	77,155
78,01-90,0	77,000	50,000	350,000	265,000	9,000	86807 5.000	77,265
78,01-90,0	77,000	50,000	480,000	395,000	9,000	86807 5.000	77,395
78,01-90,0	77,000	50,000	630,000	545,000	9,000	86807 5.000	77,545
78,01-90,0	77,000	50,000	930,000	845,000	9,000	86807 5.000	77,845
90,01-102,0	89,000	50,000	240,000	155,000	9,000	86807 5.000	89,155
90,01-102,0	89,000	50,000	350,000	265,000	9,000	86807 5.000	89,265
90,01-102,0	89,000	50,000	480,000	395,000	9,000	86807 5.000	89,395
90,01-102,0	89,000	50,000	630,000	545,000	9,000	86807 5.000	89,545
90,01-102,0	89,000	50,000	930,000	845,000	9,000	86807 5.000	89,845



## Multiplex-Halter mit Morsekegel, Sonderabmessungen

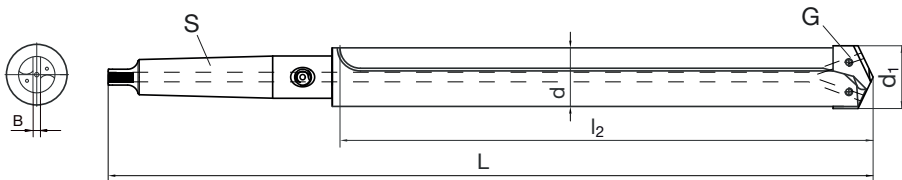
Artikel-Nr. 86678



Oberfläche  $\leq 1000$  mm Gesamtlänge vernickelt,  $> 1000$  mm Gesamtlänge brüniert • Halter für Wechselplatten in überlanger Ausführung. Der Halter mit Kegelschaft besitzt eine innere Kühlmittelzufuhr. Weite Spannuten gewährleisten einen optimalen Spantransport. Einfaches Wechseln der Schneidplatten durch Klemmschrauben. Kein Einjustieren der Wechselplatten nötig. Mit dem Wechselplatten-Spiralbohrer soll grundsätzlich ins volle Material gebohrt werden. Zum Aufbohren vorgegossener oder vorgebohrter Löcher ist dieses Werkzeug nicht geeignet.

Kühlmittelzuführung: radial (axial auf Anfrage)

Spannschrauben Artikel-Nr. 86807 enthalten



d1 mm	d mm	S	L mm	l2 mm	B mm	G	Code-Nr.
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	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>



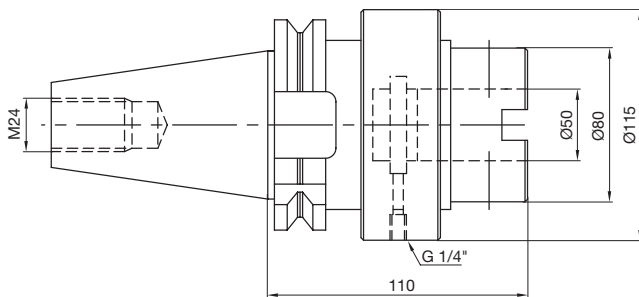
## Sonderprogramm Multiplex Modular-System Ø 97 mm bis 210 mm



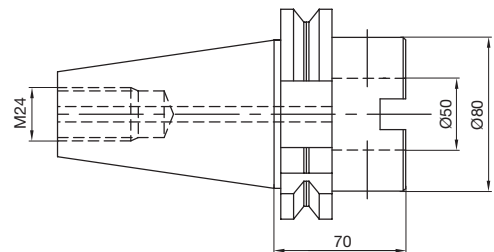
### Aufnahmen

Folgende Versionen sind auf Anfrage lieferbar:

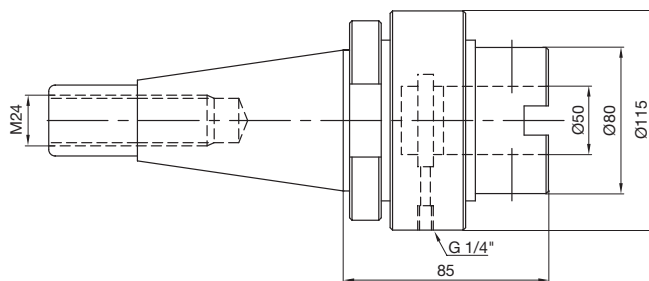
- SK50 DIN ISO 7388-1 mit Kühlmittelring



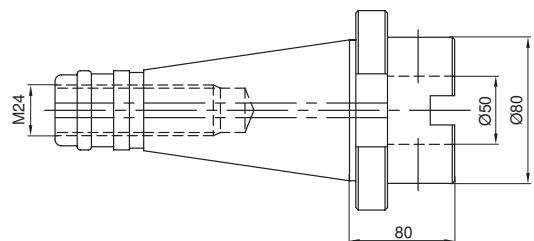
- SK50 DIN ISO 7388-1 ohne Kühlmittelring



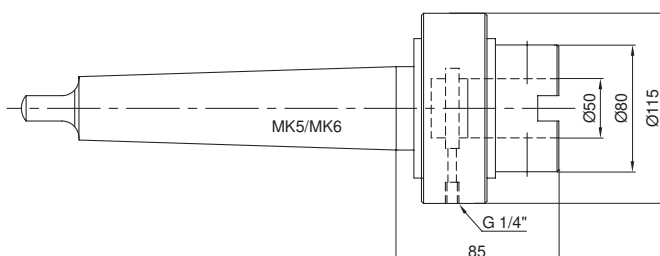
- SK50 DIN 2080 mit Kühlmittelring



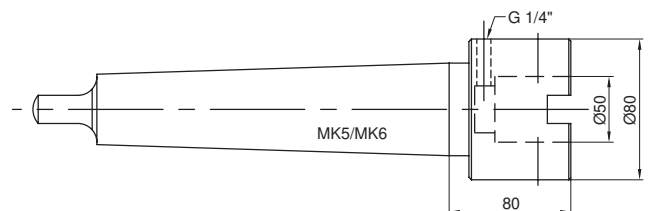
- SK50 DIN 2080 ohne Kühlmittelring



- MK 5/MK 6 mit Kühlmittelring



- MK 5/MK 6 ohne Kühlmittelring

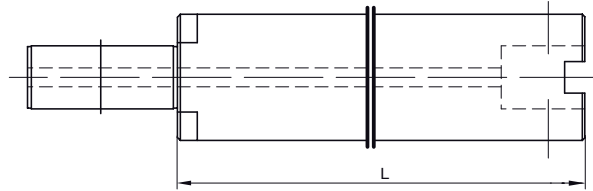






## Sonderprogramm Multiplex Modular-System Ø 97 mm bis 210 mm

### Verlängerungen für Bohrkopf



Verlängerungen für Bohrkopf  
 Ø 97 mm - Ø 130 mm  
 L = 186 mm  
 L = 300 mm

Verlängerungen für Bohrkopf  
 Ø 131 mm - Ø 165 mm und Ø 164 mm - Ø 210 mm  
 L = 204 mm  
 L = 300 mm  
 L = 500 mm

### Mitnehmer

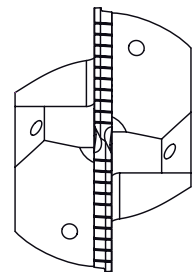
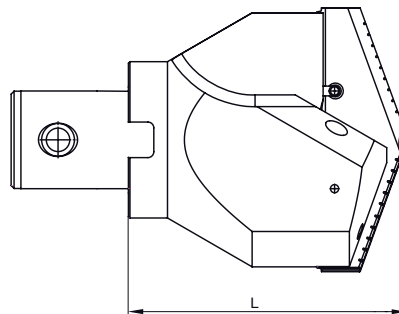


klein, für Bohrkopf Ø 97 mm - Ø 130 mm,  
 Breite 14 mm



groß, für Bohrkopf Ø 131 mm - Ø 165 mm  
 und Ø 164 mm - Ø 210 mm, Breite 16 mm

### Bohrköpfe



Folgende Größen sind auf Anfrage lieferbar:  
 - Ø 97 mm bis Ø 130 mm, L = 118,5 mm  
 - Ø 131 mm bis Ø 165 mm, L = 142,5 mm  
 - Ø 164 mm bis Ø 210 mm, L = 142,5 mm



## Wechselplatten

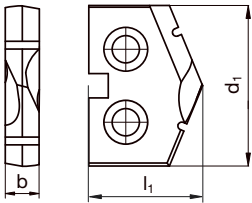
Artikel-Nr. 86602



P	M	K	N	S	H
●	○	●	○		



Ausspitzung  $\geq \varnothing 9,800$  • Wechselplatte mit Spanteilernuten. Spitzenwinkel 135°. Für universelle Anwendung.



d1 mm	l1 mm	b mm	Code-Nr.	d1 mm	l1 mm	b mm	Code-Nr.
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>	18,750	11,700	3,500	<b>18,750</b>
11,110	8,700	2,500	<b>11,110</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>
11,750	8,700	2,500	<b>11,750</b>	19,750	13,700	4,000	<b>19,750</b>
12,000	8,700	2,500	<b>12,000</b>	20,000	13,700	4,000	<b>20,000</b>
12,300	8,700	2,500	<b>12,300</b>	20,250	13,700	4,000	<b>20,250</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>	21,250	13,700	4,000	<b>21,250</b>
13,250	8,700	2,500	<b>13,250</b>	21,500	13,700	4,000	<b>21,500</b>
13,500	11,700	3,500	<b>13,500</b>	21,750	13,700	4,000	<b>21,750</b>
13,750	11,700	3,500	<b>13,750</b>	22,000	13,700	4,000	<b>22,000</b>
14,000	11,700	3,500	<b>14,000</b>	22,500	13,700	4,000	<b>22,500</b>
14,250	11,700	3,500	<b>14,250</b>	23,000	13,700	4,000	<b>23,000</b>
14,500	11,700	3,500	<b>14,500</b>	23,500	13,700	4,000	<b>23,500</b>
14,750	11,700	3,500	<b>14,750</b>	24,000	13,700	4,000	<b>24,000</b>
15,000	11,700	3,500	<b>15,000</b>	24,500	13,700	4,000	<b>24,500</b>
15,250	11,700	3,500	<b>15,250</b>	24,750	13,700	4,000	<b>24,750</b>
15,500	11,700	3,500	<b>15,500</b>	25,000	13,700	4,000	<b>25,000</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>				
17,500	11,700	3,500	<b>17,500</b>				
17,750	11,700	3,500	<b>17,750</b>				



## Wechselplatten

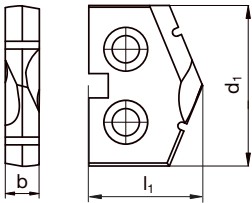
Artikel-Nr. 86608



P	M	K	N	S	H
•	○	•	○		



Ausspitzung  $\geq \varnothing 10,000$  • Wechselplatte mit Spanteilernuten. Spitzenwinkel 135°. Für universelle Anwendung.



d1 mm	l1 mm	b mm	Code-Nr.	d1 mm	l1 mm	b mm	Code-Nr.
10,000	8,700	2,500	<b>10,000</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>	20,250	13,700	4,000	<b>20,250</b>
13,500	11,700	3,500	<b>13,500</b>	20,500	13,700	4,000	<b>20,500</b>
13,750	11,700	3,500	<b>13,750</b>	21,000	13,700	4,000	<b>21,000</b>
14,000	11,700	3,500	<b>14,000</b>	21,250	13,700	4,000	<b>21,250</b>
14,250	11,700	3,500	<b>14,250</b>	21,500	13,700	4,000	<b>21,500</b>
14,500	11,700	3,500	<b>14,500</b>	21,750	13,700	4,000	<b>21,750</b>
14,750	11,700	3,500	<b>14,750</b>	22,000	13,700	4,000	<b>22,000</b>
15,000	11,700	3,500	<b>15,000</b>	22,500	13,700	4,000	<b>22,500</b>
15,250	11,700	3,500	<b>15,250</b>	23,000	13,700	4,000	<b>23,000</b>
15,500	11,700	3,500	<b>15,500</b>	23,500	13,700	4,000	<b>23,500</b>
15,750	11,700	3,500	<b>15,750</b>	24,000	13,700	4,000	<b>24,000</b>
16,000	11,700	3,500	<b>16,000</b>	24,500	13,700	4,000	<b>24,500</b>
16,500	11,700	3,500	<b>16,500</b>	24,750	13,700	4,000	<b>24,750</b>
17,000	11,700	3,500	<b>17,000</b>	25,000	13,700	4,000	<b>25,000</b>
17,500	11,700	3,500	<b>17,500</b>				



## Wechselplatten

Artikel-Nr. 86609



P	M	K	N	S	H
•	○	•	○		



Ausspitzung  $\geq \varnothing 25,000$  • Wechselplatte mit Spanteilernuten. Für universelle Anwendung.

Spitzenwinkel:

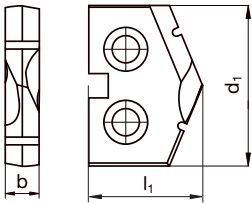
$\geq \varnothing 25,0 \text{ mm} = 132^\circ$

$> \varnothing 66,0 \text{ mm} = 140^\circ$

Schneidstoff:

$\leq \varnothing 66,0 \text{ mm}$  HSS-E-PM

$> \varnothing 66,0 \text{ mm}$  HSS-E



d1 mm	inch	l1 mm	b mm	Code-Nr.	d1 mm	inch	l1 mm	b mm	Code-Nr.
25,000		18,000	5,000	<b>25,000</b>	66,000		37,000	9,000	<b>66,000</b>
25,500		18,000	5,000	<b>25,500</b>	68,000		37,000	9,000	<b>68,000</b>
26,000		18,000	5,000	<b>26,000</b>	70,000		37,000	9,000	<b>70,000</b>
26,500		18,000	5,000	<b>26,500</b>	74,000		37,000	9,000	<b>74,000</b>
27,000		18,000	5,000	<b>27,000</b>	75,000		37,000	9,000	<b>75,000</b>
28,000		18,000	5,000	<b>28,000</b>	78,000		37,000	9,000	<b>78,000</b>
29,000		18,000	5,000	<b>29,000</b>	80,000		37,000	9,000	<b>80,000</b>
29,500		18,000	5,000	<b>29,500</b>	82,000		37,000	9,000	<b>82,000</b>
30,000		18,000	5,000	<b>30,000</b>	84,000		37,000	9,000	<b>84,000</b>
31,000		18,000	5,000	<b>31,000</b>	85,000		37,000	9,000	<b>85,000</b>
32,000		18,000	5,000	<b>32,000</b>	88,000		37,000	9,000	<b>88,000</b>
33,000		18,000	5,000	<b>33,000</b>	90,000		37,000	9,000	<b>90,000</b>
34,000		18,000	5,000	<b>34,000</b>	93,000		37,000	9,000	<b>93,000</b>
35,000		18,000	5,000	<b>35,000</b>	95,000		37,000	9,000	<b>95,000</b>
36,000		25,000	7,000	<b>36,000</b>	96,000		37,000	9,000	<b>96,000</b>
37,000		25,000	7,000	<b>37,000</b>	98,000		37,000	9,000	<b>98,000</b>
38,000		25,000	7,000	<b>38,000</b>	100,000		37,000	9,000	<b>100,000</b>
39,000		25,000	7,000	<b>39,000</b>	102,000		37,000	9,000	<b>102,000</b>
40,000		25,000	7,000	<b>40,000</b>	103,000		37,000	9,000	<b>103,000</b>
41,000		25,000	7,000	<b>41,000</b>	105,000		37,000	9,000	<b>105,000</b>
42,000		25,000	7,000	<b>42,000</b>	110,000		37,000	9,000	<b>110,000</b>
43,000		25,000	7,000	<b>43,000</b>	115,000		37,000	9,000	<b>115,000</b>
44,000		25,000	7,000	<b>44,000</b>	120,000		37,000	9,000	<b>120,000</b>
45,000		25,000	7,000	<b>45,000</b>	125,000		37,000	9,000	<b>125,000</b>
46,000		25,000	7,000	<b>46,000</b>	130,000		37,000	9,000	<b>130,000</b>
47,000		25,000	7,000	<b>47,000</b>	135,000		47,000	9,000	<b>135,000</b>
48,000		25,000	7,000	<b>48,000</b>	140,000		47,000	9,000	<b>140,000</b>
49,000		25,000	7,000	<b>49,000</b>	145,000		47,000	9,000	<b>145,000</b>
50,000		25,000	7,000	<b>50,000</b>	150,000		47,000	9,000	<b>150,000</b>
51,000		25,000	7,000	<b>51,000</b>	155,000		47,000	9,000	<b>155,000</b>
52,000		25,000	7,000	<b>52,000</b>	160,000		47,000	9,000	<b>160,000</b>
53,000		25,000	7,000	<b>53,000</b>	165,000		47,000	9,000	<b>165,000</b>
54,000		25,000	7,000	<b>54,000</b>	170,000		47,000	9,000	<b>170,000</b>
55,000		25,000	7,000	<b>55,000</b>	175,000		47,000	9,000	<b>175,000</b>
56,000		25,000	7,000	<b>56,000</b>	180,000		47,000	9,000	<b>180,000</b>
57,000		25,000	7,000	<b>57,000</b>	185,000		47,000	9,000	<b>185,000</b>
58,000		25,000	7,000	<b>58,000</b>	190,000		47,000	9,000	<b>190,000</b>
59,000		25,000	7,000	<b>59,000</b>	195,000		47,000	9,000	<b>195,000</b>
60,000		25,000	7,000	<b>60,000</b>	200,000		47,000	9,000	<b>200,000</b>
62,000		25,000	7,000	<b>62,000</b>	205,000		47,000	9,000	<b>205,000</b>
64,000		25,000	7,000	<b>64,000</b>	210,000		47,000	9,000	<b>210,000</b>
65,000		25,000	7,000	<b>65,000</b>					



## Wechselplatten

Artikel-Nr. 86708



P	M	K	N	S	H
•	○	•	○		

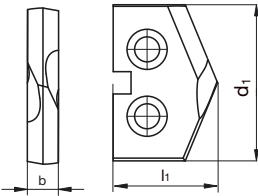


Ausspitzung  $\geq \varnothing 9,800$  • Wechselplatte ohne Spanteilernuten. Für Werkstoffe über  $600 \text{ N/mm}^2$ . Für universelle Anwendung.  
Spitzenwinkel:

$\leq \varnothing 25,4 \text{ mm} = 135^\circ$

$> \varnothing 25,4 \text{ mm} = 132^\circ$

Mit Fase (siehe „Einsatzempfehlungen Multiplex“/ Technischer Teil)



d1 mm	l1 mm	b mm	Code-Nr.	d1 mm	l1 mm	b mm	Code-Nr.
10,000	8,700	2,500	10,000	19,500	13,700	4,000	19,500
10,200	8,700	2,500	10,200	19,750	13,700	4,000	19,750
10,500	8,700	2,500	10,500	20,000	13,700	4,000	20,000
11,000	8,700	2,500	11,000	20,500	13,700	4,000	20,500
11,500	8,700	2,500	11,500	21,000	13,700	4,000	21,000
12,000	8,700	2,500	12,000	21,500	13,700	4,000	21,500
12,250	8,700	2,500	12,250	22,000	13,700	4,000	22,000
12,500	8,700	2,500	12,500	22,500	13,700	4,000	22,500
12,750	8,700	2,500	12,750	22,750	13,700	4,000	22,750
13,000	8,700	2,500	13,000	23,000	13,700	4,000	23,000
13,500	11,700	3,500	13,500	23,500	13,700	4,000	23,500
13,750	11,700	3,500	13,750	24,000	13,700	4,000	24,000
14,000	11,700	3,500	14,000	24,250	13,700	4,000	24,250
14,250	11,700	3,500	14,250	24,500	13,700	4,000	24,500
14,500	11,700	3,500	14,500	25,000	13,700	4,000	25,000
14,750	11,700	3,500	14,750	26,000	17,300	5,000	26,000
15,000	11,700	3,500	15,000	27,000	17,300	5,000	27,000
15,500	11,700	3,500	15,500	28,000	17,300	5,000	28,000
15,750	11,700	3,500	15,750	29,000	17,300	5,000	29,000
16,000	11,700	3,500	16,000	30,000	17,300	5,000	30,000
16,250	11,700	3,500	16,250	31,000	17,300	5,000	31,000
16,500	11,700	3,500	16,500	32,000	17,300	5,000	32,000
16,750	11,700	3,500	16,750	34,000	17,300	5,000	34,000
17,000	11,700	3,500	17,000	35,000	17,300	5,000	35,000
17,500	11,700	3,500	17,500				
17,750	11,700	3,500	17,750				
18,000	11,700	3,500	18,000				
18,250	11,700	3,500	18,250				
18,500	11,700	3,500	18,500				
19,000	13,700	4,000	19,000				



## Wechselplatten

Artikel-Nr. 86702



P	M	K	N	S	H
•	○	•	○		



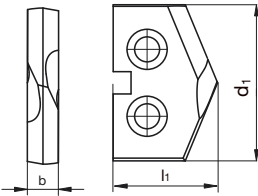
Ausspitzung  $\geq \varnothing 10,000$  • Wechselplatte ohne Spanteilernuten. Für Werkstoffe über 600 N/mm<sup>2</sup>. Für universelle Anwendung.

Spitzenwinkel:

$\leq \varnothing 25,4 \text{ mm} = 135^\circ$

$> \varnothing 25,4 \text{ mm} = 132^\circ$

Mit Fase (siehe „Einsatzempfehlungen Multiplex“/ Technischer Teil)



d1 mm	l1 mm	b mm	Code-Nr.	d1 mm	l1 mm	b mm	Code-Nr.
10,000	8,700	2,500	10,000	20,500	13,700	4,000	20,500
10,200	8,700	2,500	10,200	21,000	13,700	4,000	21,000
10,500	8,700	2,500	10,500	21,500	13,700	4,000	21,500
11,000	8,700	2,500	11,000	22,000	13,700	4,000	22,000
12,000	8,700	2,500	12,000	22,300	13,700	4,000	22,300
12,500	8,700	2,500	12,500	22,750	13,700	4,000	22,750
12,750	8,700	2,500	12,750	23,000	13,700	4,000	23,000
13,000	8,700	2,500	13,000	24,250	13,700	4,000	24,250
13,500	11,700	3,500	13,500	24,500	13,700	4,000	24,500
13,750	11,700	3,500	13,750	25,000	13,700	4,000	25,000
14,000	11,700	3,500	14,000	26,000	17,300	5,000	26,000
14,100	11,700	3,500	14,100	26,500	17,300	5,000	26,500
14,500	11,700	3,500	14,500	27,000	17,300	5,000	27,000
14,750	11,700	3,500	14,750	28,000	17,300	5,000	28,000
15,000	11,700	3,500	15,000	29,000	17,300	5,000	29,000
15,500	11,700	3,500	15,500	29,800	17,300	5,000	29,800
16,000	11,700	3,500	16,000	30,000	17,300	5,000	30,000
16,250	11,700	3,500	16,250	32,000	17,300	5,000	32,000
16,500	11,700	3,500	16,500	33,000	17,300	5,000	33,000
16,750	11,700	3,500	16,750	34,000	17,300	5,000	34,000
17,000	11,700	3,500	17,000	35,000	17,300	5,000	35,000
17,500	11,700	3,500	17,500				
17,750	11,700	3,500	17,750				
18,000	11,700	3,500	18,000				
18,250	11,700	3,500	18,250				
18,500	11,700	3,500	18,500				
19,000	13,700	4,000	19,000				
19,500	13,700	4,000	19,500				
19,750	13,700	4,000	19,750				
20,000	13,700	4,000	20,000				



## Wechselplatten

Artikel-Nr. 86709



P	M	K	N	S	H
•	○	•	○		



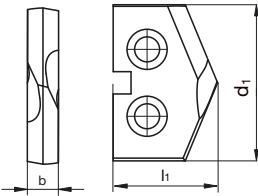
Ausspitzung  $\geq \varnothing 9,800$  • Wechselplatte ohne Spanteilernuten. Für Werkstoffe bis 600 N/mm<sup>2</sup>. Für universelle Anwendung.

Spitzenwinkel:

$\leq \varnothing 25,4 \text{ mm} = 135^\circ$

$> \varnothing 25,4 \text{ mm} = 132^\circ$

Ohne Fase (siehe „Einsatzempfehlungen Multiplex“/ Technischer Teil)



d1 mm	l1 mm	b mm	Code-Nr.	d1 mm	l1 mm	b mm	Code-Nr.
10,000	8,700	2,500	<b>10,000</b>	18,250	11,700	3,500	<b>18,250</b>
10,200	8,700	2,500	<b>10,200</b>	18,500	11,700	3,500	<b>18,500</b>
10,500	8,700	2,500	<b>10,500</b>	19,000	13,700	4,000	<b>19,000</b>
11,000	8,700	2,500	<b>11,000</b>	19,500	13,700	4,000	<b>19,500</b>
11,110	8,700	2,500	<b>11,110</b>	20,000	13,700	4,000	<b>20,000</b>
12,000	8,700	2,500	<b>12,000</b>	20,500	13,700	4,000	<b>20,500</b>
12,500	8,700	2,500	<b>12,500</b>	20,640	13,700	4,000	<b>20,640</b>
12,700	8,700	2,500	<b>12,700</b>	21,000	13,700	4,000	<b>21,000</b>
12,750	8,700	2,500	<b>12,750</b>	21,500	13,700	4,000	<b>21,500</b>
13,000	8,700	2,500	<b>13,000</b>	22,000	13,700	4,000	<b>22,000</b>
13,500	11,700	3,500	<b>13,500</b>	23,000	13,700	4,000	<b>23,000</b>
14,000	11,700	3,500	<b>14,000</b>	23,250	13,700	4,000	<b>23,250</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>
15,880	11,700	3,500	<b>15,880</b>	27,000	17,300	5,000	<b>27,000</b>
16,250	11,700	3,500	<b>16,250</b>	28,000	17,300	5,000	<b>28,000</b>
16,500	11,700	3,500	<b>16,500</b>	29,000	17,300	5,000	<b>29,000</b>
16,670	11,700	3,500	<b>16,670</b>	30,000	17,300	5,000	<b>30,000</b>
16,750	11,700	3,500	<b>16,750</b>	33,000	17,300	5,000	<b>33,000</b>
17,000	11,700	3,500	<b>17,000</b>	34,000	17,300	5,000	<b>34,000</b>
17,500	11,700	3,500	<b>17,500</b>	35,000	17,300	5,000	<b>35,000</b>
17,750	11,700	3,500	<b>17,750</b>				
18,000	11,700	3,500	<b>18,000</b>				



## Wechselplatten

Artikel-Nr. 86701



P	M	K	N	S	H
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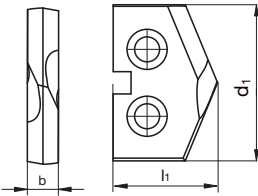
Ausspitzung  $\geq \varnothing 10,000$  • Wechselplatte ohne Spanteilernuten. Für Werkstoffe bis  $600 \text{ N/mm}^2$ . Für universelle Anwendung.

Spitzenwinkel:

$\leq \varnothing 25,4 \text{ mm} = 135^\circ$

$> \varnothing 25,4 \text{ mm} = 132^\circ$

Ohne Fase (siehe „Einsatzempfehlungen Multiplex“/ Technischer Teil)



d1 mm	l1 mm	b mm	Code-Nr.	d1 mm	l1 mm	b mm	Code-Nr.
10,000	8,700	2,500	<b>10,000</b>	17,750	11,700	3,500	<b>17,750</b>
10,200	8,700	2,500	<b>10,200</b>	18,000	11,700	3,500	<b>18,000</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>
14,250	11,700	3,500	<b>14,250</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>	33,000	17,300	5,000	<b>33,000</b>
17,000	11,700	3,500	<b>17,000</b>	34,000	17,300	5,000	<b>34,000</b>
17,500	11,700	3,500	<b>17,500</b>	35,000	17,300	5,000	<b>35,000</b>



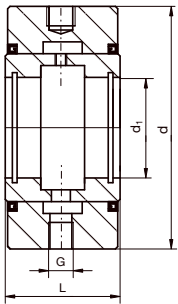


## Kühlmittelzuführinge

Artikel-Nr. 86690



Kühlmittelzuführung für Halter mit MK und Ringlauffläche 86670 und 86680 (ohne Verschraubungsset).



für	d1 mm	d mm	G	L mm	Code-Nr.
MK 4	31,750	80,000	G 1/4	45,000	<b>31,750</b>
MK 5	63,500	127,000	G 1/2	60,000	<b>63,500</b>

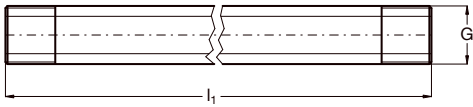


## Kühlmittelzuführrohre

Artikel-Nr. 82571



Kühlmittelzuführrohr für Kühlmittelzuführhänge Artikel-Nr. 86690.



G	l1 mm	Code-Nr.	G	l1 mm	Code-Nr.
G 1/4	200,000	13,160			
G 1/2	200,000	20,960			



# HARTNER

## Schnellverschlusskupplung

Artikel-Nr. 82578



G	d mm	l1 mm	Code-Nr.	G	d mm	l1 mm	Code-Nr.
G 1/4	9,000	118,000	<b>9,000</b>				
G 1/2	13,000	118,000	<b>13,000</b>				



# HARTNER

## Torx-Schraubendreher

Artikel-Nr. 86842



Torx	l1 mm	Code-Nr.	Torx	l1 mm	Code-Nr.
T6	150,000	6,001	T20	205,000	20,001
T7	150,000	7,001	T25	207,000	25,001
T8	150,000	8,001			
T9	150,000	9,001			
T10	170,000	10,001			
T15	190,000	15,001			

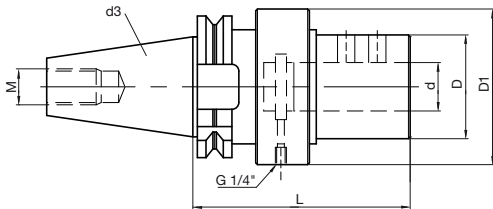


## Kühlmittelzufuhrfutter für Multiplex

Artikel-Nr. 86691



Kühlmittelzufuhrfutter mit SK nach DIN ISO 7388-1 und zylindrischer Aufbohrung. Bei kleineren Schaft-Ø Verwendung mit Reduzierhülse.



d3	d mm	D mm	D1 mm	L mm	M	kg	Code-Nr.
<b>SK 40</b>	32,000	65,000	88,000	130,000	M16	0,909	<b>32,040</b>
<b>SK 50</b>	40,000	65,000	98,000	135,000	M24	1,694	<b>40,050</b>
<b>SK 50</b>	50,000	90,000	123,000	165,000	M24	2,981	<b>50,050</b>

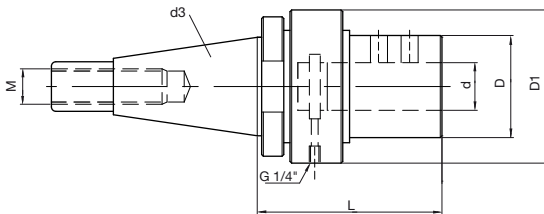


## Kühlmittelzuführfutter für Multiplex

Artikel-Nr. 86692



Kühlmittelzuführfutter mit SK nach DIN 2080 und zylindrischer Aufbohrung. Bei kleineren Schaft-Ø Verwendung mit Reduzierhülse.



d3	d mm	D mm	D1 mm	L mm	M	kg	Code-Nr.
<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	3,037	<b>50,050</b>

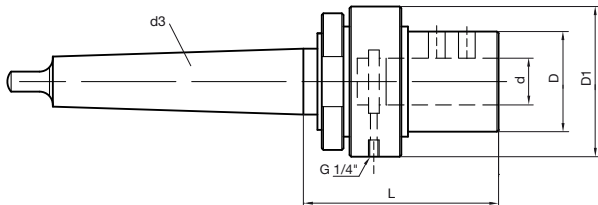


## Kühlmittelzuführfutter für Multiplex

Artikel-Nr. 86693



Kühlmittelzuführfutter mit MK nach DIN 228 B und zylindrischer Aufbohrung. Bei kleineren Schaft-Ø Verwendung mit Reduzierhülse.



d3	d mm	D mm	D1 mm	L mm	M	kg	Code-Nr.
<b>MK-4</b>	32,000	65,000	88,000	100,000	M14	1,019	<b>32,400</b>
<b>MK-5</b>	40,000	75,000	98,000	110,000	M16	1,899	<b>40,500</b>
<b>MK-6</b>	40,000	75,000	98,000	120,000	M16	2,427	<b>40,600</b>
<b>MK-5</b>	50,000	90,000	123,000	140,000	M20	3,293	<b>50,500</b>
<b>MK-6</b>	50,000	90,000	123,000	140,000	M20	3,997	<b>50,600</b>

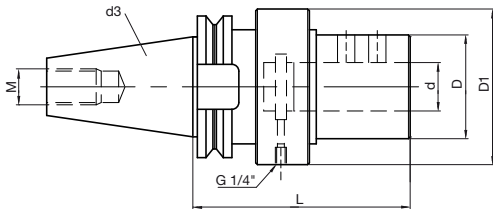


## Kühlmittelzuführfutter für Multiplex

Artikel-Nr. 86694



Kühlmittelzuführfutter mit MAS BT nach DIN ISO 7388-2 und zylindrischer Aufbohrung. Bei kleineren Schaft-Ø Verwendung mit Reduzierhülse.



d3	d mm	D mm	D1 mm	L mm	M	kg	Code-Nr.
<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	1,766	<b>40,050</b>
<b>BT 50</b>	50,000	90,000	123,000	170,000	M24	3,037	<b>50,050</b>



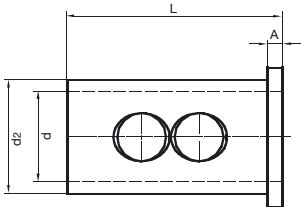


## Reduzierhülsen für Kühlmittelzuführfutter

Artikel-Nr. 86699



Reduzierhülse für Kühlmittelzuführfutter mit zylindrischer Aufnahmebohrung



d mm	d2 mm	L mm	A mm	Code-Nr.
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

Präzisionswerkzeuge



# MULTIPILEX HPC

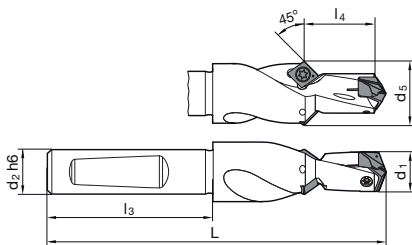


## Multiplex HPC-Halter

Artikel-Nr. 86681



besonders hohe Verschleißfestigkeit • optimierter Nutquerschnitt • optimierter Kühlkanalaustritt • Spanschrauben Art.-Nr. 86843 und 86846 enthalten • Schraubendreher Art.-Nr. 86842 enthalten zum Pilotieren und Senken 45°



Größe	d1 mm	d2 h6 mm	d5 mm	L mm	l3 mm	l4 mm	Code-Nr.
110	11,00-11,99	12,000	17,000	81,000	45,000	12,000	11,000
110	11,00-11,99	12,700	17,000	81,000	45,000	12,000	11,005
120	12,00-12,99	12,000	18,000	84,000	45,000	13,000	12,000
120	12,00-12,99	12,700	18,000	84,000	45,000	13,000	12,005
130	13,00-13,99	14,000	18,000	86,000	45,000	14,000	13,000
130	13,00-13,99	15,875	18,000	86,000	45,000	14,000	13,005
140	14,00-15,99	16,000	18,000	93,000	48,000	16,000	14,000
140	14,00-15,99	15,875	18,000	93,000	48,000	16,000	14,005
160	16,00-17,99	18,000	20,000	99,000	48,000	18,000	16,000
160	16,00-17,99	19,050	20,000	99,000	48,000	18,000	16,005
180	18,00-19,99	20,000	22,000	106,000	50,000	20,000	18,000
180	18,00-19,99	19,050	22,000	106,000	50,000	20,000	18,005
200	20,00-21,99	25,000	25,000	117,000	56,000	22,000	20,000
200	20,00-21,99	25,400	25,400	117,000	56,000	22,000	20,005
220	22,00-23,99	25,000	26,000	122,000	56,000	24,000	22,000
220	22,00-23,99	25,400	26,000	122,000	56,000	24,000	22,005
240	24,00-25,99	25,000	28,000	128,000	56,000	26,000	24,000
240	24,00-25,99	25,400	28,000	128,000	56,000	26,000	24,005
260	26,00-27,99	32,000	32,000	142,000	60,000	28,000	26,000
260	26,00-27,99	31,750	32,000	142,000	60,000	28,000	26,005
280	28,00-29,99	32,000	34,000	147,000	60,000	30,000	28,000
280	28,00-29,99	31,750	34,000	147,000	60,000	30,000	28,005
300	30,00-31,99	32,000	38,000	152,000	60,000	32,000	30,000
300	30,00-31,99	31,750	38,000	152,000	60,000	32,000	30,005
320	32,00-35,99	32,000	42,000	163,000	60,000	36,000	32,000
320	32,00-35,99	31,750	42,000	163,000	60,000	36,000	32,005
360	36,00-40,00	32,000	46,000	173,000	60,000	40,000	36,000
360	36,00-40,00	31,750	46,000	173,000	60,000	40,000	36,005

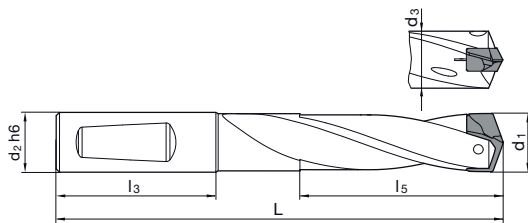


## Multiplex HPC-Halter

Artikel-Nr. 86682



besonders hohe Verschleißfestigkeit • optimierter Nutquerschnitt • optimierter Kühlkanalaustritt • Spanschrauben Art.-Nr. 86843 enthalten • Schraubendreher Art.-Nr. 86842 enthalten



Größe	d1 mm	d2 h6 mm	d3 mm	L mm	l3 mm	l5 mm	Code-Nr.
110	11,00-11,49	12,000	10,700	84,000	45,000	19,300	11,000
110	11,00-11,49	12,700	10,700	84,000	45,000	19,300	11,005
115	11,50-11,99	12,000	11,200	85,000	45,000	20,100	11,500
115	11,50-11,99	12,700	11,200	85,000	45,000	20,100	11,505
120	12,00-12,49	12,000	11,700	87,000	45,000	21,000	12,000
120	12,00-12,49	12,700	11,700	87,000	45,000	21,000	12,005
125	12,50-12,99	14,000	12,200	89,000	45,000	21,900	12,500
125	12,50-12,99	15,875	12,200	89,000	45,000	21,900	12,505
130	13,00-13,49	14,000	12,700	90,000	45,000	22,600	13,000
130	13,00-13,49	15,875	12,700	90,000	45,000	22,600	13,005
135	13,50-13,99	14,000	13,200	92,000	45,000	23,600	13,500
135	13,50-13,99	15,875	13,200	92,000	45,000	23,600	13,505
140	14,00-14,49	14,000	13,700	93,000	45,000	24,500	14,000
140	14,00-14,49	15,875	13,700	93,000	45,000	24,500	14,005
145	14,50-14,99	16,000	14,200	98,000	48,000	25,300	14,500
145	14,50-14,99	15,875	14,200	98,000	48,000	25,300	14,505
150	15,00-15,49	16,000	14,700	100,000	48,000	26,100	15,000
150	15,00-15,49	15,875	14,700	100,000	48,000	26,100	15,005
155	15,50-15,99	16,000	15,200	101,000	48,000	27,000	15,500
155	15,50-15,99	15,875	15,200	101,000	48,000	27,000	15,505
160	16,00-16,49	16,000	15,700	102,000	48,000	27,800	16,000
160	16,00-16,49	15,875	15,700	102,000	48,000	27,800	16,005
165	16,50-16,99	18,000	16,200	105,000	48,000	28,700	16,500
165	16,50-16,99	19,050	16,200	105,000	48,000	28,700	16,505
170	17,00-17,49	18,000	16,700	106,000	48,000	29,600	17,000
170	17,00-17,49	19,050	16,700	106,000	48,000	29,600	17,005
175	17,50-17,99	18,000	17,200	107,000	48,000	30,400	17,500
175	17,50-17,99	19,050	17,200	107,000	48,000	30,400	17,505
180	18,00-18,49	18,000	17,700	109,000	48,000	31,200	18,000
180	18,00-18,49	19,050	17,700	109,000	48,000	31,200	18,005
185	18,50-18,99	20,000	18,200	113,000	50,000	32,100	18,500
185	18,50-18,99	19,050	18,200	113,000	50,000	32,100	18,505
190	19,00-19,49	20,000	18,700	114,000	50,000	32,900	19,000
190	19,00-19,49	19,050	18,700	114,000	50,000	32,900	19,005
195	19,50-19,99	20,000	19,200	116,000	50,000	33,700	19,500
195	19,50-19,99	19,050	19,200	116,000	50,000	33,700	19,505
200	20,00-20,49	20,000	19,700	117,000	50,000	34,600	20,000
200	20,00-20,49	19,050	19,700	117,000	50,000	34,600	20,005
205	20,50-20,99	25,000	20,200	128,000	56,000	35,500	20,500
205	20,50-20,99	25,400	20,200	128,000	56,000	35,500	20,505
210	21,00-21,49	25,000	20,700	129,000	56,000	36,400	21,000
210	21,00-21,49	25,400	20,700	129,000	56,000	36,400	21,005



## Multiplex HPC-Halter

Größe	d1 mm	d2 h6 mm	d3 mm	L mm	I3 mm	I5 mm	Code-Nr.
215	21,50-21,99	25,000	21,200	130,000	56,000	37,200	21,500
215	21,50-21,99	25,400	21,200	130,000	56,000	37,200	21,505
220	22,00-22,49	25,000	21,700	131,000	56,000	38,000	22,000
220	22,00-22,49	25,400	21,700	131,000	56,000	38,000	22,005
225	22,50-22,99	25,000	22,200	134,000	56,000	38,900	22,500
225	22,50-22,99	25,400	22,200	134,000	56,000	38,900	22,505
230	23,00-23,49	25,000	22,700	135,000	56,000	39,800	23,000
230	23,00-23,49	25,400	22,700	135,000	56,000	39,800	23,005
235	23,50-23,99	25,000	23,200	137,000	56,000	40,600	23,500
235	23,50-23,99	25,400	23,200	137,000	56,000	40,600	23,505
240	24,00-24,49	25,000	23,700	138,000	56,000	41,500	24,000
240	24,00-24,49	25,400	23,700	138,000	56,000	41,500	24,005
245	24,50-24,99	25,000	24,200	140,000	56,000	42,300	24,500
245	24,50-24,99	25,400	24,200	140,000	56,000	42,300	24,505
250	25,00-25,49	25,000	24,700	142,000	56,000	43,200	25,000
250	25,00-25,49	25,400	24,700	142,000	56,000	43,200	25,005
255	25,50-25,99	32,000	25,200	148,000	60,000	44,000	25,500
255	25,50-25,99	31,750	25,200	148,000	60,000	44,000	25,505
260	26,00-26,49	32,000	25,700	151,000	60,000	44,300	26,000
260	26,00-26,49	31,750	25,700	151,000	60,000	44,300	26,005
265	26,50-26,99	32,000	26,200	153,000	60,000	45,100	26,500
265	26,50-26,99	31,750	26,200	153,000	60,000	45,100	26,505
270	27,00-27,49	32,000	26,700	155,000	60,000	46,000	27,000
270	27,00-27,49	31,750	26,700	155,000	60,000	46,000	27,005
275	27,50-27,99	32,000	27,200	156,000	60,000	46,800	27,500
275	27,50-27,99	31,750	27,200	156,000	60,000	46,800	27,505
280	28,00-28,49	32,000	27,700	157,000	60,000	47,700	28,000
280	28,00-28,49	31,750	27,700	157,000	60,000	47,700	28,005
285	28,50-28,99	32,000	28,200	159,000	60,000	48,500	28,500
285	28,50-28,99	31,750	28,200	159,000	60,000	48,500	28,505
290	29,00-29,49	32,000	28,700	161,000	60,000	49,400	29,000
290	29,00-29,49	31,750	28,700	161,000	60,000	49,400	29,005
295	29,50-29,99	32,000	29,200	162,000	60,000	50,200	29,500
295	29,50-29,99	31,750	29,200	162,000	60,000	50,200	29,505
300	30,00-30,49	32,000	29,700	164,000	60,000	50,900	30,000
300	30,00-30,49	31,750	29,700	164,000	60,000	50,900	30,005
305	30,50-30,99	32,000	30,200	166,000	60,000	51,700	30,500
305	30,50-30,99	31,750	30,200	166,000	60,000	51,700	30,505
310	31,00-31,49	32,000	30,700	167,000	60,000	52,600	31,000
310	31,00-31,49	31,750	30,700	167,000	60,000	52,600	31,005
315	31,50-31,99	32,000	31,200	168,000	60,000	53,400	31,500
315	31,50-31,99	31,750	31,200	168,000	60,000	53,400	31,505
320	32,00-32,99	32,000	31,700	172,000	60,000	55,100	32,000
320	32,00-32,99	31,750	31,700	172,000	60,000	55,100	32,005
330	33,00-33,99	32,000	32,700	175,000	60,000	56,800	33,000
330	33,00-33,99	31,750	32,700	175,000	60,000	56,800	33,005
340	34,00-34,99	32,000	33,700	178,000	60,000	58,500	34,000
340	34,00-34,99	31,750	33,700	178,000	60,000	58,500	34,005
350	35,00-35,99	32,000	34,700	181,000	60,000	60,200	35,000
350	35,00-35,99	31,750	34,700	181,000	60,000	60,200	35,005
360	36,00-36,99	32,000	35,700	184,000	60,000	61,800	36,000
360	36,00-36,99	31,750	35,700	184,000	60,000	61,800	36,005
370	37,00-37,99	32,000	36,700	188,000	60,000	63,500	37,000
370	37,00-37,99	31,750	36,700	188,000	60,000	63,500	37,005
380	38,00-38,99	32,000	37,700	191,000	60,000	65,200	38,000
380	38,00-38,99	31,750	37,700	191,000	60,000	65,200	38,005
390	39,00-40,00	32,000	38,700	194,000	60,000	66,900	39,000
390	39,00-40,00	31,750	38,700	194,000	60,000	66,900	39,005

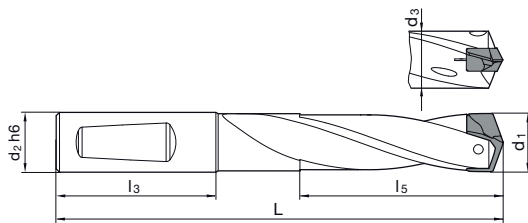


## Multiplex HPC-Halter

Artikel-Nr. 86683



besonders hohe Verschleißfestigkeit • optimierter Nutquerschnitt • besonders hohe Stabilität • Spanschrauben Art.-Nr. 86843 enthalten  
• Schraubendreher Art.-Nr. 86842 enthalten



Größe	d1 mm	d2 h6 mm	d3 mm	L mm	l3 mm	l5 mm	Code-Nr.
110	11,00-11,49	12,000	10,700	101,000	45,000	36,600	11,000
110	11,00-11,49	12,700	10,700	101,000	45,000	36,600	11,005
115	11,50-11,99	12,000	11,200	103,000	45,000	38,100	11,500
115	11,50-11,99	12,700	11,200	103,000	45,000	38,100	11,505
120	12,00-12,49	12,000	11,700	106,000	45,000	39,700	12,000
120	12,00-12,49	12,700	11,700	106,000	45,000	39,700	12,005
125	12,50-12,99	14,000	12,200	108,000	45,000	41,300	12,500
125	12,50-12,99	15,875	12,200	108,000	45,000	41,300	12,505
130	13,00-13,49	14,000	12,700	110,000	45,000	42,900	13,000
130	13,00-13,49	15,875	12,700	110,000	45,000	42,900	13,005
135	13,50-13,99	14,000	13,200	113,000	45,000	44,600	13,500
135	13,50-13,99	15,875	13,200	113,000	45,000	44,600	13,505
140	14,00-14,49	14,000	13,700	115,000	45,000	46,200	14,000
140	14,00-14,49	15,875	13,700	115,000	45,000	46,200	14,005
145	14,50-14,99	16,000	14,200	120,000	48,000	47,800	14,500
145	14,50-14,99	15,875	14,200	120,000	48,000	47,800	14,505
150	15,00-15,49	16,000	14,700	123,000	48,000	49,300	15,000
150	15,00-15,49	15,875	14,700	123,000	48,000	49,300	15,005
155	15,50-15,99	16,000	15,200	125,000	48,000	50,900	15,500
155	15,50-15,99	15,875	15,200	125,000	48,000	50,900	15,505
160	16,00-16,49	16,000	15,700	127,000	48,000	52,900	16,000
160	16,00-16,49	15,875	15,700	127,000	48,000	52,900	16,005
165	16,50-16,99	18,000	16,200	130,000	48,000	54,100	16,500
165	16,50-16,99	19,050	16,200	130,000	48,000	54,100	16,505
170	17,00-17,49	18,000	16,700	132,000	48,000	55,800	17,000
170	17,00-17,49	19,050	16,700	132,000	48,000	55,800	17,005
175	17,50-17,99	18,000	17,200	134,000	48,000	57,400	17,500
175	17,50-17,99	19,050	17,200	134,000	48,000	57,400	17,505
180	18,00-18,49	18,000	17,700	137,000	48,000	58,900	18,000
180	18,00-18,49	19,050	17,700	137,000	48,000	58,900	18,005
185	18,50-18,99	20,000	18,200	141,000	50,000	60,500	18,500
185	18,50-18,99	19,050	18,200	141,000	50,000	60,500	18,505
190	19,00-19,49	20,000	18,700	143,000	50,000	62,100	19,000
190	19,00-19,49	19,050	18,700	143,000	50,000	62,100	19,005
195	19,50-19,99	20,000	19,200	146,000	50,000	63,700	19,500
195	19,50-19,99	19,050	19,200	146,000	50,000	63,700	19,505
200	20,00-20,49	20,000	19,700	148,000	50,000	65,300	20,000
200	20,00-20,49	19,050	19,700	148,000	50,000	65,300	20,005
205	20,50-20,99	25,000	20,200	159,000	56,000	67,000	20,500
205	20,50-20,99	25,400	20,200	159,000	56,000	67,000	20,505
210	21,00-21,49	25,000	20,700	161,000	56,000	68,600	21,000
210	21,00-21,49	25,400	20,700	161,000	56,000	68,600	21,005



## Multiplex HPC-Halter

Größe	d1 mm	d2 h6 mm	d3 mm	L mm	I3 mm	I5 mm	Code-Nr.
215	21,50-21,99	25,000	21,200	163,000	56,000	70,100	21,500
215	21,50-21,99	25,400	21,200	163,000	56,000	70,100	21,505
220	22,00-22,49	25,000	21,700	165,000	56,000	71,700	22,000
220	22,00-22,49	25,400	21,700	165,000	56,000	71,700	22,005
225	22,50-22,99	25,000	22,200	168,000	56,000	73,300	22,500
225	22,50-22,99	25,400	22,200	168,000	56,000	73,300	22,505
230	23,00-23,49	25,000	22,700	170,000	56,000	74,900	23,000
230	23,00-23,49	25,400	22,700	170,000	56,000	74,900	23,005
235	23,50-23,99	25,000	23,200	173,000	56,000	76,500	23,500
235	23,50-23,99	25,400	23,200	173,000	56,000	76,500	23,505
240	24,00-24,49	25,000	23,700	175,000	56,000	78,100	24,000
240	24,00-24,49	25,400	23,700	175,000	56,000	78,100	24,005
245	24,50-24,99	25,000	24,200	177,000	56,000	79,700	24,500
245	24,50-24,99	25,400	24,200	177,000	56,000	79,700	24,505
250	25,00-25,49	25,000	24,700	180,000	56,000	81,300	25,000
250	25,00-25,49	25,400	24,700	180,000	56,000	81,300	25,005
255	25,50-25,99	32,000	25,200	187,000	60,000	82,900	25,500
255	25,50-25,99	31,750	25,200	187,000	60,000	82,900	25,505
260	26,00-26,49	32,000	25,700	191,000	60,000	84,000	26,000
260	26,00-26,49	31,750	25,700	191,000	60,000	84,000	26,005
265	26,50-26,99	32,000	26,200	193,000	60,000	86,100	26,500
265	26,50-26,99	31,750	26,200	193,000	60,000	86,100	26,505
270	27,00-27,49	32,000	26,700	196,000	60,000	87,200	27,000
270	27,00-27,49	31,750	26,700	196,000	60,000	87,200	27,005
275	27,50-27,99	32,000	27,200	198,000	60,000	88,900	27,500
275	27,50-27,99	31,750	27,200	198,000	60,000	88,900	27,505
280	28,00-28,49	32,000	27,700	200,000	60,000	90,400	28,000
280	28,00-28,49	31,750	27,700	200,000	60,000	90,400	28,005
285	28,50-28,99	32,000	28,200	202,000	60,000	92,500	28,500
285	28,50-28,99	31,750	28,200	202,000	60,000	92,500	28,505
290	29,00-29,49	32,000	28,700	205,000	60,000	94,600	29,000
290	29,00-29,49	31,750	28,700	205,000	60,000	94,600	29,005
295	29,50-29,99	32,000	29,200	207,000	60,000	95,100	29,500
295	29,50-29,99	31,750	29,200	207,000	60,000	95,100	29,505
300	30,00-30,49	32,000	29,700	210,000	60,000	96,700	30,000
300	30,00-30,49	31,750	29,700	210,000	60,000	96,700	30,005
305	30,50-30,99	32,000	30,200	212,000	60,000	98,300	30,500
305	30,50-30,99	31,750	30,200	212,000	60,000	98,300	30,505
310	31,00-31,49	32,000	30,700	214,000	60,000	99,800	31,000
310	31,00-31,49	31,750	30,700	214,000	60,000	99,800	31,005
315	31,50-31,99	32,000	31,200	216,000	60,000	101,400	31,500
315	31,50-31,99	31,750	31,200	216,000	60,000	101,400	31,505
320	32,00-32,99	32,000	31,700	221,000	60,000	104,600	32,000
320	32,00-32,99	31,750	31,700	221,000	60,000	104,600	32,005
330	33,00-33,99	32,000	32,700	226,000	60,000	107,800	33,000
330	33,00-33,99	31,750	32,700	226,000	60,000	107,800	33,005
340	34,00-34,99	32,000	33,700	230,000	60,000	111,000	34,000
340	34,00-34,99	31,750	33,700	230,000	60,000	111,000	34,005
350	35,00-35,99	32,000	34,700	235,000	60,000	114,200	35,000
350	35,00-35,99	31,750	34,700	235,000	60,000	114,200	35,005
360	36,00-36,99	32,000	35,700	240,000	60,000	117,300	36,000
360	36,00-36,99	31,750	35,700	240,000	60,000	117,300	36,005
370	37,00-37,99	32,000	36,700	245,000	60,000	120,500	37,000
370	37,00-37,99	31,750	36,700	245,000	60,000	120,500	37,005
380	38,00-38,99	32,000	37,700	249,000	60,000	123,700	38,000
380	38,00-38,99	31,750	37,700	249,000	60,000	123,700	38,005
390	39,00-40,00	32,000	38,700	254,000	60,000	126,900	39,000
390	39,00-40,00	31,750	38,700	254,000	60,000	126,900	39,005

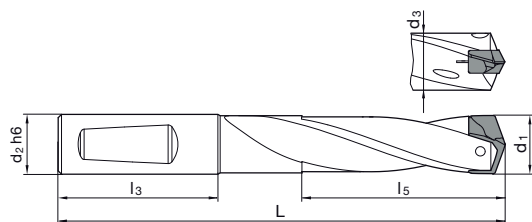


## Multiplex HPC-Halter

Artikel-Nr. 86684



besonders hohe Verschleißfestigkeit • optimierter Nutquerschnitt • besonders hohe Stabilität • Spanschrauben Art.-Nr. 86843 enthalten  
• Schraubendreher Art.-Nr. 86842 enthalten



Größe	d1 mm	d2 h6 mm	d3 mm	L mm	l3 mm	l5 mm	Code-Nr.
110	11,00-11,49	12,000	10,700	124,000	45,000	59,600	11,000
110	11,00-11,49	12,700	10,700	124,000	45,000	59,600	11,005
115	11,50-11,99	12,000	11,200	127,000	45,000	62,100	11,500
115	11,50-11,99	12,700	11,200	127,000	45,000	62,100	11,505
120	12,00-12,49	12,000	11,700	131,000	45,000	64,700	12,000
120	12,00-12,49	12,700	11,700	131,000	45,000	64,700	12,005
125	12,50-12,99	14,000	12,200	134,000	45,000	67,300	12,500
125	12,50-12,99	15,875	12,200	134,000	45,000	67,300	12,505
130	13,00-13,49	14,000	12,700	137,000	45,000	69,900	13,000
130	13,00-13,49	15,875	12,700	137,000	45,000	69,900	13,005
135	13,50-13,99	14,000	13,200	141,000	45,000	72,600	13,500
135	13,50-13,99	15,875	13,200	141,000	45,000	72,600	13,505
140	14,00-14,49	14,000	13,700	144,000	45,000	75,200	14,000
140	14,00-14,49	15,875	13,700	144,000	45,000	75,200	14,005
145	14,50-14,99	16,000	14,200	150,000	48,000	77,800	14,500
145	14,50-14,99	15,875	14,200	150,000	48,000	77,800	14,505
150	15,00-15,49	16,000	14,700	154,000	48,000	80,300	15,000
150	15,00-15,49	15,875	14,700	154,000	48,000	80,300	15,005
155	15,50-15,99	16,000	15,200	157,000	48,000	82,900	15,500
155	15,50-15,99	15,875	15,200	157,000	48,000	82,900	15,505
160	16,00-16,49	16,000	15,700	160,000	48,000	85,900	16,000
160	16,00-16,49	15,875	15,700	160,000	48,000	85,900	16,005
165	16,50-16,99	18,000	16,200	164,000	48,000	88,100	16,500
165	16,50-16,99	19,050	16,200	164,000	48,000	88,100	16,505
170	17,00-17,49	18,000	16,700	167,000	48,000	90,800	17,000
170	17,00-17,49	19,050	16,700	167,000	48,000	90,800	17,005
175	17,50-17,99	18,000	17,200	170,000	48,000	93,400	17,500
175	17,50-17,99	19,050	17,200	170,000	48,000	93,400	17,505
180	18,00-18,49	18,000	17,700	174,000	48,000	95,900	18,000
180	18,00-18,49	19,050	17,700	174,000	48,000	95,900	18,005
185	18,50-18,99	20,000	18,200	179,000	50,000	98,500	18,500
185	18,50-18,99	19,050	18,200	179,000	50,000	98,500	18,505
190	19,00-19,49	20,000	18,700	182,000	50,000	101,100	19,000
190	19,00-19,49	19,050	18,700	182,000	50,000	101,100	19,005
195	19,50-19,99	20,000	19,200	186,000	50,000	103,700	19,500
195	19,50-19,99	19,050	19,200	186,000	50,000	103,700	19,505
200	20,00-20,49	20,000	19,700	189,000	50,000	106,300	20,000
200	20,00-20,49	19,050	19,700	189,000	50,000	106,300	20,005
205	20,50-20,99	25,000	20,200	201,000	56,000	109,000	20,500
205	20,50-20,99	25,400	20,200	201,000	56,000	109,000	20,505
210	21,00-21,49	25,000	20,700	204,000	56,000	111,600	21,000
210	21,00-21,49	25,400	20,700	204,000	56,000	111,600	21,005





## Multiplex HPC-Halter

Größe	d1 mm	d2 h6 mm	d3 mm	L mm	I3 mm	I5 mm	Code-Nr.
215	21,50-21,99	25,000	21,200	207,000	56,000	114,100	21,500
215	21,50-21,99	25,400	21,200	207,000	56,000	114,100	21,505
220	22,00-22,49	25,000	21,700	210,000	56,000	116,700	22,000
220	22,00-22,49	25,400	21,700	210,000	56,000	116,700	22,005
225	22,50-22,99	25,000	22,200	214,000	56,000	119,300	22,500
225	22,50-22,99	25,400	22,200	214,000	56,000	119,300	22,505
230	23,00-23,49	25,000	22,700	217,000	56,000	121,900	23,000
230	23,00-23,49	25,400	22,700	217,000	56,000	121,900	23,005
235	23,50-23,99	25,000	23,200	221,000	56,000	124,500	23,500
235	23,50-23,99	25,400	23,200	221,000	56,000	124,500	23,505
240	24,00-24,49	25,000	23,700	224,000	56,000	127,100	24,000
240	24,00-24,49	25,400	23,700	224,000	56,000	127,100	24,005
245	24,50-24,99	25,000	24,200	227,000	56,000	129,700	24,500
245	24,50-24,99	25,400	24,200	227,000	56,000	129,700	24,505
250	25,00-25,49	25,000	24,700	231,000	56,000	132,300	25,000
250	25,00-25,49	25,400	24,700	231,000	56,000	132,300	25,005
255	25,50-25,99	32,000	25,200	239,000	60,000	134,900	25,500
255	25,50-25,99	31,750	25,200	239,000	60,000	134,900	25,505
260	26,00-26,49	32,000	25,700	244,000	60,000	137,000	26,000
265	26,50-26,99	32,000	26,200	247,000	60,000	140,000	26,500
270	27,00-27,49	32,000	26,700	251,000	60,000	142,200	27,000
275	27,50-27,99	32,000	27,200	254,000	60,000	144,800	27,500
280	28,00-28,49	32,000	27,700	257,000	60,000	147,400	28,000
285	28,50-28,99	32,000	28,200	260,000	60,000	150,400	28,500
290	29,00-29,49	32,000	28,700	264,000	60,000	153,500	29,000
295	29,50-29,99	32,000	29,200	267,000	60,000	155,100	29,500
300	30,00-30,49	32,000	29,700	271,000	60,000	157,600	30,000
305	30,50-30,99	32,000	30,200	274,000	60,000	160,200	30,500
310	31,00-31,49	32,000	30,700	277,000	60,000	162,800	31,000
315	31,50-31,99	32,000	31,200	280,000	60,000	165,400	31,500
320	32,00-32,99	32,000	31,700	287,000	60,000	170,600	32,000
330	33,00-33,99	32,000	32,700	294,000	60,000	175,800	33,000
340	34,00-34,99	32,000	33,700	300,000	60,000	181,000	34,000
350	35,00-35,99	32,000	34,700	307,000	60,000	186,200	35,000
360	36,00-36,99	32,000	35,700	314,000	60,000	191,300	36,000
370	37,00-37,99	32,000	36,700	321,000	60,000	196,500	37,000
380	38,00-38,99	32,000	37,700	327,000	60,000	201,700	38,000
390	39,00-40,00	32,000	38,700	334,000	60,000	206,900	39,000

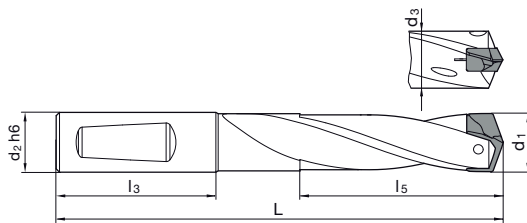


## Multiplex HPC-Halter

Artikel-Nr. 86685



besonders hohe Verschleißfestigkeit • optimierter Nutquerschnitt • besonders hohe Stabilität • Spanschrauben Art.-Nr. 86843 enthalten  
• Schraubendreher Art.-Nr. 86842 enthalten



Größe	d1 mm	d2 h6 mm	d3 mm	L mm	l3 mm	l5 mm	Code-Nr.
110	11,00-11,49	12,000	10,700	147,000	45,000	82,600	11,000
110	11,00-11,49	12,700	10,700	147,000	45,000	82,600	11,005
115	11,50-11,99	12,000	11,200	151,000	45,000	86,100	11,500
115	11,50-11,99	12,700	11,200	151,000	45,000	86,100	11,505
120	12,00-12,49	12,000	11,700	156,000	45,000	89,700	12,000
120	12,00-12,49	12,700	11,700	156,000	45,000	89,700	12,005
125	12,50-12,99	14,000	12,200	160,000	45,000	93,300	12,500
125	12,50-12,99	15,875	12,200	160,000	45,000	93,300	12,505
130	13,00-13,49	14,000	12,700	164,000	45,000	96,900	13,000
130	13,00-13,49	15,875	12,700	164,000	45,000	96,900	13,005
135	13,50-13,99	14,000	13,200	169,000	45,000	100,600	13,500
135	13,50-13,99	15,875	13,200	169,000	45,000	100,600	13,505
140	14,00-14,49	14,000	13,700	173,000	45,000	104,200	14,000
140	14,00-14,49	15,875	13,700	173,000	45,000	104,200	14,005
145	14,50-14,99	16,000	14,200	180,000	48,000	107,800	14,500
145	14,50-14,99	15,875	14,200	180,000	48,000	107,800	14,505
150	15,00-15,49	16,000	14,700	185,000	48,000	111,300	15,000
150	15,00-15,49	15,875	14,700	185,000	48,000	111,300	15,005
155	15,50-15,99	16,000	15,200	189,000	48,000	114,900	15,500
155	15,50-15,99	15,875	15,200	189,000	48,000	114,900	15,505
160	16,00-16,49	16,000	15,700	193,000	48,000	118,900	16,000
160	16,00-16,49	15,875	15,700	193,000	48,000	118,900	16,005
165	16,50-16,99	18,000	16,200	198,000	48,000	122,100	16,500
165	16,50-16,99	19,050	16,200	198,000	48,000	122,100	16,505
170	17,00-17,49	18,000	16,700	202,000	48,000	125,800	17,000
170	17,00-17,49	19,050	16,700	202,000	48,000	125,800	17,005
175	17,50-17,99	18,000	17,200	206,000	48,000	129,400	17,500
175	17,50-17,99	19,050	17,200	206,000	48,000	129,400	17,505
180	18,00-18,49	18,000	17,700	211,000	48,000	132,900	18,000
180	18,00-18,49	19,050	17,700	211,000	48,000	132,900	18,005
185	18,50-18,99	20,000	18,200	217,000	50,000	136,500	18,500
185	18,50-18,99	19,050	18,200	217,000	50,000	136,500	18,505
190	19,00-19,49	20,000	18,700	221,000	50,000	140,100	19,000
190	19,00-19,49	19,050	18,700	221,000	50,000	140,100	19,005
195	19,50-19,99	20,000	19,200	226,000	50,000	143,700	19,500
195	19,50-19,99	19,050	19,200	226,000	50,000	143,700	19,505
200	20,00-20,49	20,000	19,700	230,000	50,000	147,300	20,000
200	20,00-20,49	19,050	19,700	230,000	50,000	147,300	20,005
205	20,50-20,99	25,000	20,200	243,000	56,000	151,000	20,500
205	20,50-20,99	25,400	20,200	243,000	56,000	151,000	20,505
210	21,00-21,49	25,000	20,700	247,000	56,000	154,600	21,000
210	21,00-21,49	25,400	20,700	247,000	56,000	154,600	21,005



## Multiplex HPC-Halter

Größe	d1 mm	d2 h6 mm	d3 mm	L mm	I3 mm	I5 mm	Code-Nr.
215	21,50-21,99	25,000	21,200	251,000	56,000	158,100	21,500
215	21,50-21,99	25,400	21,200	251,000	56,000	158,100	21,505
220	22,00-22,49	25,000	21,700	255,000	56,000	161,700	22,000
220	22,00-22,49	25,400	21,700	255,000	56,000	161,700	22,005
225	22,50-22,99	25,000	22,200	260,000	56,000	165,300	22,500
225	22,50-22,99	25,400	22,200	260,000	56,000	165,300	22,505
230	23,00-23,49	25,000	22,700	264,000	56,000	168,900	23,000
230	23,00-23,49	25,400	22,700	264,000	56,000	168,900	23,005
235	23,50-23,99	25,000	23,200	269,000	56,000	172,500	23,500
235	23,50-23,99	25,400	23,200	269,000	56,000	172,500	23,505
240	24,00-24,49	25,000	23,700	273,000	56,000	176,100	24,000
240	24,00-24,49	25,400	23,700	273,000	56,000	176,100	24,005
245	24,50-24,99	25,000	24,200	277,000	56,000	179,700	24,500
245	24,50-24,99	25,400	24,200	277,000	56,000	179,700	24,505
250	25,00-25,49	25,000	24,700	282,000	56,000	183,300	25,000
250	25,00-25,49	25,400	24,700	282,000	56,000	183,300	25,005
255	25,50-25,99	32,000	25,200	291,000	60,000	186,900	25,500
255	25,50-25,99	31,750	25,200	291,000	60,000	186,900	25,505
260	26,00-26,49	32,000	25,700	297,000	60,000	190,000	26,000
260	26,00-26,49	31,750	25,700	297,000	60,000	190,000	26,005
265	26,50-26,99	32,000	26,200	301,000	60,000	194,000	26,500
265	26,50-26,99	31,750	26,200	301,000	60,000	194,000	26,505
270	27,00-27,49	32,000	26,700	306,000	60,000	197,200	27,000
270	27,00-27,49	31,750	26,700	306,000	60,000	197,200	27,005
275	27,50-27,99	32,000	27,200	310,000	60,000	200,800	27,500
275	27,50-27,99	31,750	27,200	310,000	60,000	200,800	27,505
280	28,00-28,49	32,000	27,700	314,000	60,000	204,400	28,000
280	28,00-28,49	31,750	27,700	314,000	60,000	204,400	28,005
285	28,50-28,99	32,000	28,200	318,000	60,000	208,400	28,500
285	28,50-28,99	31,750	28,200	318,000	60,000	208,400	28,505
290	29,00-29,49	32,000	28,700	323,000	60,000	212,500	29,000
290	29,00-29,49	31,750	28,700	323,000	60,000	212,500	29,005
295	29,50-29,99	32,000	29,200	327,000	60,000	215,100	29,500
295	29,50-29,99	31,750	29,200	327,000	60,000	215,100	29,505
300	30,00-30,49	32,000	29,700	332,000	60,000	218,600	30,000
300	30,00-30,49	31,750	29,700	332,000	60,000	218,600	30,005
305	30,50-30,99	32,000	30,200	336,000	60,000	222,200	30,500
305	30,50-30,99	31,750	30,200	336,000	60,000	222,200	30,505
310	31,00-31,49	32,000	30,700	340,000	60,000	225,800	31,000
310	31,00-31,49	31,750	30,700	340,000	60,000	225,800	31,005
315	31,50-31,99	32,000	31,200	344,000	60,000	229,400	31,500
315	31,50-31,99	31,750	31,200	344,000	60,000	229,400	31,505

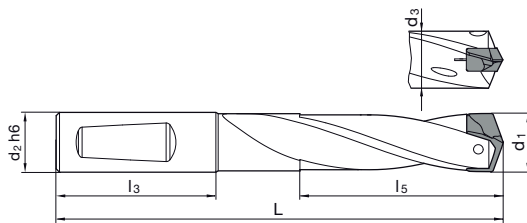


## Multiplex HPC-Halter

Artikel-Nr. 86686



besonders hohe Verschleißfestigkeit • optimierter Nutquerschnitt • besonders hohe Stabilität • Spanschrauben Art.-Nr. 86843 enthalten  
• Schraubendreher Art.-Nr. 86842 enthalten



Größe	d1 mm	d2 h6 mm	d3 mm	L mm	l3 mm	l5 mm	Code-Nr.
110	11,00-11,49	12,000	10,700	182,000	45,000	117,100	11,000
110	11,00-11,49	12,700	10,700	182,000	45,000	117,100	11,005
115	11,50-11,99	12,000	11,200	187,000	45,000	122,100	11,500
115	11,50-11,99	12,700	11,200	187,000	45,000	122,100	11,505
120	12,00-12,49	12,000	11,700	194,000	45,000	127,200	12,000
120	12,00-12,49	12,700	11,700	194,000	45,000	127,200	12,005
125	12,50-12,99	14,000	12,200	199,000	45,000	132,300	12,500
125	12,50-12,99	15,875	12,200	199,000	45,000	132,300	12,505
130	13,00-13,49	14,000	12,700	205,000	45,000	137,500	13,000
130	13,00-13,49	15,875	12,700	205,000	45,000	137,500	13,005
135	13,50-13,99	14,000	13,200	211,000	45,000	142,500	13,500
135	13,50-13,99	15,875	13,200	211,000	45,000	142,500	13,505
140	14,00-14,49	14,000	13,700	217,000	45,000	147,700	14,000
140	14,00-14,49	15,875	13,700	217,000	45,000	147,700	14,005
145	14,50-14,99	16,000	14,200	225,000	48,000	152,800	14,500
145	14,50-14,99	15,875	14,200	225,000	48,000	152,800	14,505
150	15,00-15,49	16,000	14,700	232,000	48,000	157,800	15,000
150	15,00-15,49	15,875	14,700	232,000	48,000	157,800	15,005
155	15,50-15,99	16,000	15,200	237,000	48,000	162,900	15,500
155	15,50-15,99	15,875	15,200	237,000	48,000	162,900	15,505
160	16,00-16,49	16,000	15,700	243,000	48,000	168,000	16,000
160	16,00-16,49	15,875	15,700	243,000	48,000	168,000	16,005
165	16,50-16,99	18,000	16,200	249,000	48,000	170,000	16,500
165	16,50-16,99	19,050	16,200	249,000	48,000	170,000	16,505
170	17,00-17,49	18,000	16,700	255,000	48,000	178,300	17,000
170	17,00-17,49	19,050	16,700	255,000	48,000	178,300	17,005
175	17,50-17,99	18,000	17,200	260,000	48,000	183,500	17,500
175	17,50-17,99	19,050	17,200	260,000	48,000	183,500	17,505
180	18,00-18,49	18,000	17,700	267,000	48,000	188,400	18,000
180	18,00-18,49	19,050	17,700	267,000	48,000	188,400	18,005
185	18,50-18,99	20,000	18,200	274,000	50,000	193,500	18,500
185	18,50-18,99	19,050	18,200	274,000	50,000	193,500	18,505
190	19,00-19,49	20,000	18,700	280,000	50,000	198,700	19,000
190	19,00-19,49	19,050	18,700	280,000	50,000	198,700	19,005
195	19,50-19,99	20,000	19,200	286,000	50,000	203,700	19,500
195	19,50-19,99	19,050	19,200	286,000	50,000	203,700	19,505
200	20,00-20,49	20,000	19,700	292,000	50,000	208,900	20,000
200	20,00-20,49	19,050	19,700	292,000	50,000	208,900	20,005
205	20,50-20,99	25,000	20,200	306,000	56,000	214,000	20,500
205	20,50-20,99	25,400	20,200	306,000	56,000	214,000	20,505
210	21,00-21,49	25,000	20,700	312,000	56,000	219,100	21,000
210	21,00-21,49	25,400	20,700	312,000	56,000	219,100	21,005



## Multiplex HPC-Halter

Größe	d1 mm	d2 h6 mm	d3 mm	L mm	I3 mm	I5 mm	Code-Nr.
215	21,50-21,99	25,000	21,200	317,000	56,000	224,200	21,500
215	21,50-21,99	25,400	21,200	317,000	56,000	224,200	21,505
220	22,00-22,49	25,000	21,700	323,000	56,000	229,300	22,000
220	22,00-22,49	25,400	21,700	323,000	56,000	229,300	22,005
225	22,50-22,99	25,000	22,200	329,000	56,000	234,400	22,500
225	22,50-22,99	25,400	22,200	329,000	56,000	234,400	22,505
230	23,00-23,49	25,000	22,700	335,000	56,000	239,500	23,000
230	23,00-23,49	25,400	22,700	335,000	56,000	239,500	23,005
235	23,50-23,99	25,000	23,200	341,000	56,000	244,600	23,500
235	23,50-23,99	25,400	23,200	341,000	56,000	244,600	23,505
240	24,00-24,49	25,000	23,700	347,000	56,000	249,700	24,000
240	24,00-24,49	25,400	23,700	347,000	56,000	249,700	24,005
245	24,50-24,99	25,000	24,200	352,000	56,000	254,800	24,500
245	24,50-24,99	25,400	24,200	352,000	56,000	254,800	24,505
250	25,00-25,49	25,000	24,700	359,000	56,000	259,900	25,000
250	25,00-25,49	25,400	24,700	359,000	56,000	259,900	25,005
255	25,50-25,99	32,000	25,200	369,000	60,000	265,000	25,500
255	25,50-25,99	31,750	25,200	369,000	60,000	265,000	25,505
260	26,00-26,49	32,000	25,700	377,000	60,000	270,000	26,000
260	26,00-26,49	31,750	25,700	377,000	60,000	270,000	26,005
265	26,50-26,99	32,000	26,200	382,000	60,000	275,000	26,500
265	26,50-26,99	31,750	26,200	382,000	60,000	275,000	26,505
270	27,00-27,49	32,000	26,700	388,000	60,000	280,100	27,000
270	27,00-27,49	31,750	26,700	388,000	60,000	280,100	27,005
275	27,50-27,99	32,000	27,200	394,000	60,000	285,200	27,500
275	27,50-27,99	31,750	27,200	394,000	60,000	285,200	27,505
280	28,00-28,49	32,000	27,700	400,000	60,000	290,300	28,000
280	28,00-28,49	31,750	27,700	400,000	60,000	290,300	28,005
285	28,50-28,99	32,000	28,200	405,000	60,000	295,400	28,500
285	28,50-28,99	31,750	28,200	405,000	60,000	295,400	28,505
290	29,00-29,49	32,000	28,700	412,000	60,000	300,500	29,000
290	29,00-29,49	31,750	28,700	412,000	60,000	300,500	29,005
295	29,50-29,99	32,000	29,200	418,000	60,000	305,600	29,500
295	29,50-29,99	31,750	29,200	418,000	60,000	305,600	29,505
300	30,00-30,49	32,000	29,700	424,000	60,000	310,600	30,000
300	30,00-30,49	31,750	29,700	424,000	60,000	310,600	30,005
305	30,50-30,99	32,000	30,200	429,000	60,000	315,700	30,500
305	30,50-30,99	31,750	30,200	429,000	60,000	315,700	30,505
310	31,00-31,49	32,000	30,700	435,000	60,000	320,800	31,000
310	31,00-31,49	31,750	30,700	435,000	60,000	320,800	31,005
315	31,50-31,99	32,000	31,200	441,000	60,000	325,900	31,500
315	31,50-31,99	31,750	31,200	441,000	60,000	325,900	31,505



## Multiplex HPC-Wechselplatten

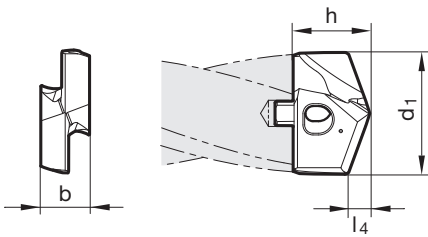
Artikel-Nr. 86721



P	M	K	N	S	H
○	○	○	○	○	○



Ausspitzung  $\geq \text{Ø } 11,000$  • Flächenanschliff • Hauptschneidenform gerade (durch Korrektur) • Spanschrauben Art.-Nr. 86843 enthalten  
 Pilotieren in allen Werkstoffen



Größe	d1 mm	inch	l4 mm	b mm	h mm	Code-Nr.
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



## Multiplex HPC-Wechselplatten

Größe	d1 mm	inch	l4 mm	b mm	h mm	Code-Nr.
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



## Multiplex HPC-Wechselplatten

Größe	d1 mm	inch	l4 mm	b mm	h mm	Code-Nr.
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





## Multiplex HPC-Wechselplatten

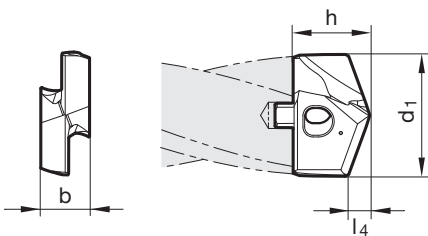
Artikel-Nr. 86722



P	M	K	N	S	H
●	○	○			



Ausspitzung  $\geq \text{Ø } 11,000$  • Flächenanschliff • Hauptschneidenform gerade (durch Korrektur) • Spannschrauben Art.-Nr. 86843 enthalten  
 Bau- und Einsatzstähle • Automatenstähle, Vergütungsstähle • legierte Stähle bis 1200 N/mm<sup>2</sup>



Größe	d1 mm	inch	l4 mm	b mm	h mm	Code-Nr.
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



## Multiplex HPC-Wechselplatten

Größe	d1 mm	inch	l4 mm	b mm	h mm	Code-Nr.
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



## Multiplex HPC-Wechselplatten

Größe	d1 mm	inch	l4 mm	b mm	h mm	Code-Nr.
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



## Multiplex HPC-Wechselplatten

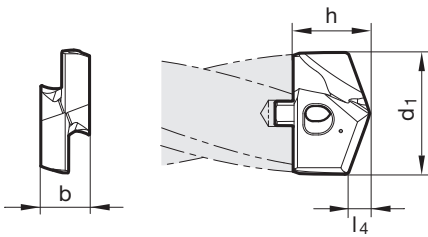
Artikel-Nr. 86723



P	M	K	N	S	H
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Ausspitzung  $\geq \text{Ø } 11,000$  • Flächenanschliff • Hauptschneidenform gerade (durch Korrektur) • Spanschrauben Art.-Nr. 86843 enthalten  
 Vermikularguss GGv • Grauguss, Temperguss, Sphäroguss



Größe	d1 mm	inch	l4 mm	b mm	h mm	Code-Nr.
110	11,000		2,700	4,500	7,500	11,000
110	11,200		2,700	4,500	7,500	11,200
115	11,500		2,800	4,500	7,500	11,500
115	11,510	29/64	2,800	4,500	7,500	11,510
115	11,700		2,800	4,500	7,500	11,700
115	11,800		2,800	4,500	7,500	11,800
115	11,910	15/32	2,800	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		3,100	5,000	7,700	12,500
125	12,600		3,100	5,000	7,700	12,600
125	12,700	1/2	3,100	5,000	7,700	12,700
125	12,800		3,100	5,000	7,700	12,800
125	12,900		3,100	5,000	7,700	12,900
130	13,000		3,200	5,500	8,500	13,000
130	13,100	33/64	3,200	5,500	8,500	13,100
130	13,490	17/32	3,200	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		3,600	6,000	9,600	14,500
145	14,600		3,600	6,000	9,600	14,600
145	14,680	37/64	3,600	6,000	9,600	14,680
145	14,700		3,600	6,000	9,600	14,700
145	14,800		3,600	6,000	9,600	14,800
150	15,000		3,700	6,000	9,800	15,000
150	15,080	19/32	3,700	6,000	9,800	15,080
150	15,100		3,700	6,000	9,800	15,100
150	15,200		3,700	6,000	9,800	15,200
150	15,300		3,700	6,000	9,800	15,300
150	15,480	39/64	3,700	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



## Multiplex HPC-Wechselplatten

Größe	d1 mm	inch	l4 mm	b mm	h mm	Code-Nr.
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		3,900	7,000	11,000	16,000
160	16,270	41/64	3,900	7,000	11,000	16,270
165	16,500		4,100	7,000	11,000	16,500
165	16,670	21/32	4,100	7,000	11,000	16,670
170	17,000		4,200	7,000	11,000	17,000
170	17,070	43/64	4,200	7,000	11,000	17,070
170	17,460	11/16	4,200	7,000	11,000	17,460
175	17,500		4,300	7,000	11,000	17,500
175	17,600		4,300	7,000	11,000	17,600
175	17,860	45/64	4,300	7,000	11,000	17,860
180	18,000		4,400	8,000	12,600	18,000
180	18,260	23/32	4,400	8,000	12,600	18,260
185	18,500		4,500	8,000	12,600	18,500
185	18,650	47/64	4,500	8,000	12,600	18,650
190	19,000		4,700	8,000	12,600	19,000
190	19,050	3/4	4,700	8,000	12,600	19,050
190	19,250		4,700	8,000	12,600	19,250
190	19,450	49/64	4,700	8,000	12,600	19,450
195	19,500		4,800	8,000	12,600	19,500
195	19,600		4,800	8,000	12,600	19,600
195	19,840	25/32	4,800	8,000	12,600	19,840
200	20,000		4,900	9,000	13,900	20,000
200	20,240	51/64	4,900	9,000	13,900	20,240
205	20,500		5,100	9,000	13,900	20,500
205	20,640	13/16	5,100	9,000	13,900	20,640
210	21,000		5,200	9,000	13,900	21,000
210	21,030	53/64	5,200	9,000	13,900	21,030
210	21,100		5,200	9,000	13,900	21,100
210	21,430	27/32	5,200	9,000	13,900	21,430
215	21,500		5,300	9,000	13,900	21,500
215	21,830	55/64	5,300	9,000	13,900	21,830
220	22,000		5,400	10,000	15,300	22,000
220	22,220	7/8	5,400	10,000	15,300	22,220
225	22,500		5,600	10,000	15,300	22,500
225	22,620	57/64	5,600	10,000	15,300	22,620
230	23,000		5,700	10,000	15,300	23,000
230	23,020	29/32	5,700	10,000	15,300	23,020
230	23,420	59/64	5,700	10,000	15,300	23,420
235	23,500		5,800	10,000	15,300	23,500
235	23,810	15/16	5,800	10,000	15,300	23,810
240	24,000		6,000	11,000	15,800	24,000
240	24,100		6,000	11,000	15,800	24,100
240	24,210	61/64	6,000	11,000	15,800	24,210
245	24,500		6,100	11,000	15,800	24,500
245	24,610	31/32	6,100	11,000	15,800	24,610
250	25,000	63/64	6,200	11,000	15,800	25,000
250	25,400	1	6,200	11,000	15,800	25,400
255	25,500		6,300	11,000	15,800	25,500
255	25,670		6,300	11,000	15,800	25,670
255	25,700		6,300	11,000	15,800	25,700
255	25,810		6,300	11,000	15,800	25,810
260	26,000		6,400	12,000	20,000	26,000
260	26,190	1 1/32	6,400	12,000	20,000	26,190
265	26,500		6,500	12,000	20,000	26,500
265	26,590	1 3/64	6,500	12,000	20,000	26,590
270	27,000		6,600	12,000	20,000	27,000
275	27,500		6,700	12,000	20,000	27,500
275	27,700		6,700	12,000	20,000	27,700
275	27,780	1 3/32	6,700	12,000	20,000	27,780
280	28,000		6,800	13,000	20,700	28,000
280	28,180	1 7/64	6,800	13,000	20,700	28,180
285	28,500		6,900	13,000	20,700	28,500
285	28,580		6,900	13,000	20,700	28,580
290	29,000		7,100	13,000	20,700	29,000
290	29,370	1 5/32	7,100	13,000	20,700	29,370
295	29,500		7,200	13,000	20,700	29,500
295	29,770	1 11/64	7,200	13,000	20,700	29,770
300	30,000		7,300	14,000	22,300	30,000
300	30,160	1 3/16	7,300	14,000	22,300	30,160
305	30,500		7,400	14,000	22,300	30,500



## Multiplex HPC-Wechselplatten

Größe	d1 mm	inch	l4 mm	b mm	h mm	Code-Nr.
305	30,960	1 7/32	7,400	14,000	22,300	30,960
310	31,000		7,500	14,000	22,300	31,000
315	31,500		7,600	14,000	22,300	31,500
315	31,750	1 1/4	7,600	14,000	22,300	31,750
320	32,000		7,700	15,000	23,100	32,000
320	32,500		7,800	15,000	23,100	32,500
320	32,540	1 9/32	7,800	15,000	23,100	32,540
320	32,940	1 19/64	7,800	15,000	23,100	32,940
330	33,000		7,900	15,000	23,100	33,000
330	33,340	1 5/16	7,900	15,000	23,100	33,340
330	33,500		8,100	15,000	23,100	33,500
340	34,000		8,200	15,000	23,100	34,000
340	34,130	1 11/32	8,200	15,000	23,100	34,130
340	34,500		8,400	15,000	23,100	34,500
340	34,930		8,400	15,000	23,100	34,930
350	35,000		8,500	15,000	23,100	35,000
350	35,500		8,600	15,000	23,100	35,500
350	35,720	1 13/32	8,600	15,000	23,100	35,720
360	36,000		8,700	16,000	23,900	36,000
360	36,500		8,800	16,000	23,900	36,500
360	36,510	1 7/16	8,800	16,000	23,900	36,510
370	37,000		9,000	16,000	23,900	37,000
370	37,310	1 15/32	9,000	16,000	23,900	37,310
370	37,500		9,100	16,000	23,900	37,500
380	38,000		9,200	16,000	23,900	38,000
380	38,100	1 1/2	9,200	16,000	23,900	38,100
380	38,500	1 33/64	9,400	16,000	23,900	38,500
390	39,000		9,500	16,000	23,900	39,000
390	39,500		9,700	16,000	23,900	39,500
400	40,000		9,700	16,000	23,900	40,000

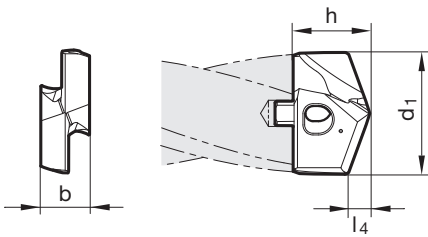


## Multiplex HPC-Wechselplatten

Artikel-Nr. 86724



Ausspitzung  $\geq \text{Ø } 11,000$  • Kegelmantelschliff • Spannschrauben Art.-Nr. 86843 enthalten • Hauptschneidenform konkav  
Aluminium und Al-Legierungen • NE-Metalle



Größe	d1 mm	inch	l4 mm	b mm	h mm	Code-Nr.
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



## Multiplex HPC-Wechselplatten

Größe	d1 mm	inch	l4 mm	b mm	h mm	Code-Nr.
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





## Multiplex HPC-Wechselplatten

Größe	d1 mm	inch	l4 mm	b mm	h mm	Code-Nr.
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



## Multiplex HPC-Wechselplatten

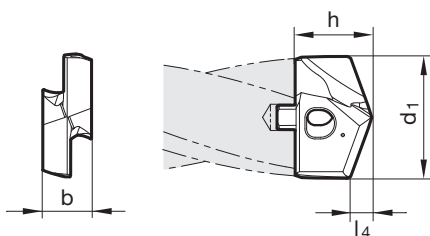
Artikel-Nr. 86725



P	M	K	N	S	H
○	●			○	○



Ausspitzung  $\geq \varnothing 11,000$  • Kegelmantelanschliff • Hauptschneidenform gerade (durch Korrektur) • Spannschrauben Art.-Nr. 86843 enthalten  
rostfreie Stähle



Größe	d1 mm	inch	l4 mm	b mm	h mm	Code-Nr.
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



## Multiplex HPC-Wechselplatten

Größe	d1 mm	inch	l4 mm	b mm	h mm	Code-Nr.
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



## Multiplex HPC-Wechselplatten

Größe	d1 mm	inch	l4 mm	b mm	h mm	Code-Nr.
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



## Multiplex HPC-Senkplatten

### Artikel-Nr. 86726



P	M	K	N	S	H
○		●			



Grauguss, Temperguss, Sphäroguss

ISO	Halter-Größe	Code-Nr.	ISO	Halter-Größe	Code-Nr.
CPGW050202FN-K	110-140	52,020			
CPGW050204FN-K	110-140	52,040			
CPGW060202FN-K	160-180	62,020			
CPGW060204FN-K	160-180	62,040			
CPGW09T308FN-K	300-360	93,080			

### Artikel-Nr. 86727



P	M	K	N	S	H
			●		



Aluminium und Al-Legierungen • NE-Metalle

ISO	Halter-Größe	Code-Nr.	ISO	Halter-Größe	Code-Nr.
CPGT050202FR-AL	110-140	52,020			
CPGT050204FR-AL	110-140	52,040			
CPGT060202FR-AL	160-180	62,020			
CPGT060204FR-AL	160-180	62,040			
CPGT09T308FR-AL	300-360	93,080			



## Multiplex HPC-Senkplatten

Artikel-Nr. 86728



P	M	K	N	S	H
•	○	○	○	○	○



Stahl und Stahlguss (legiert und unleg.)

ISO	Halter-Größe	Code-Nr.	ISO	Halter-Größe	Code-Nr.
CPGT050202FR-P	110-140	52,020			
CPGT050204FR-P	110-140	52,040			
CPGT060202FR-P	160-180	62,020			
CPGT060204FR-P	160-180	62,040			
CPGT09T308FR-P	300-360	93,080			

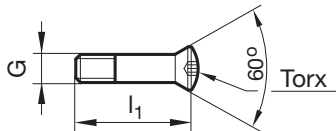


## Spannschrauben für Multiplex HPC-Halter 1,5-10xD

Artikel-Nr. 86843



Zuordnung Spannschrauben/Halter s. „Multiplex HPC - Technik und Vorteile“



G	l1 mm	Torx	Code-Nr.	G	l1 mm	Torx	Code-Nr.
M 2,2	9,500	T7	<b>2,200</b>	M 6	28,500	T25	<b>6,001</b>
M 2,2	10,500	T7	<b>2,201</b>	M 6	32,500	T25	<b>6,002</b>
M 2,5	11,400	T8	<b>2,500</b>				
M 3	12,100	T9	<b>3,000</b>				
M 3	13,100	T9	<b>3,001</b>				
M 3,5	14,250	T10	<b>3,500</b>				
M 4	16,000	T15	<b>4,000</b>				
M 4,5	18,000	T15	<b>4,500</b>				
M 5	19,750	T20	<b>5,000</b>				
M 5	21,750	T20	<b>5,001</b>				
M 5	23,400	T20	<b>5,003</b>				
M 6	27,000	T25	<b>6,000</b>				



# HARTNER

## Drehmomentschlüssel

Artikel-Nr. 86844



6-kant Aufnahme

Antrieb	Drehmoment Nm	L mm	Typ	Code-Nr.
1/4"	0,8...2	160,000	A	<b>2,000</b>
1/4"	2...8	200,000	A	<b>8,000</b>
1/4"	0,4...14	200,000	A	<b>14,000</b>





# HARTNER

## Torx-Einsätze

Artikel-Nr. 86845



Antrieb		Torx	L mm	Code-Nr.
1/4	6-kant	T7	25,000	7,000
1/4	6-kant	T8	25,000	8,000
1/4	6-kant	T9	25,000	9,000
1/4	6-kant	T10	25,000	10,000
1/4	6-kant	T15	25,000	15,000
1/4	6-kant	T20	25,000	20,000
1/4	6-kant	T25	25,000	25,001

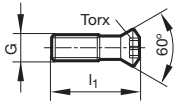


## Spannschrauben für Multiplex HPC-Senkhalter

Artikel-Nr. 86846



Zuordnung Spannschrauben/Halter s. „Multiplex HPC - Technik und Vorteile“



G	l1 mm	Torx	Code-Nr.	G	l1 mm	Torx	Code-Nr.
M 2,0X5,50	5,500	T6	<b>2,000</b>				
M 2,0X5,30	5,300	T7	<b>2,500</b>				
M 4 X9,50	9,500	T15	<b>4,006</b>				



## Multiplex - Die Kühlmittel-Zuführung

Jeder Multiplex-Halter verfügt über eine innere Kühlmittel-Zufuhr. Sie gewährleistet sowohl beim horizontalen als auch beim vertikalen Bohren eine optimale Kühlmittel- sowie Schmiermittel-Versorgung der Schneiden und verlängert so die Standwege. Gleichzeitig sorgt das Kühlmittel für einen optimierten Spänetransport aus der Bohrung heraus. Die Kühlmittel-Zuführung erfolgt bei den verschiedenen Schaftausführungen unterschiedlich:

### Zuführbohrung an der Stirnseite des Schaftes

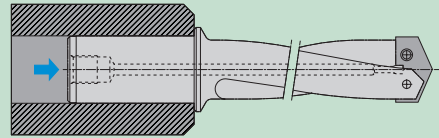
Für **stehende** und **drehende** Werkzeuge:

Kühlmittelzufuhr axial durch die Werkzeugaufnahme.

Für Halter mit Zylinderschaft und Bohr-Ø 10 bis 102 mm.

Halter Art.-Nr. 86612/86622/86624/86730/86740/86750

und überlange Halter



### Zuführbohrung an der Stirnseite des Schaftes mit Zuführfutter

Für **drehende** Werkzeuge:

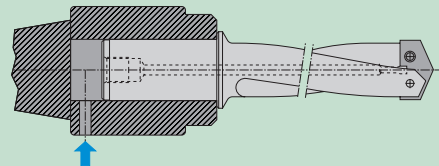
Kühlmittelzufuhr radial durch das Kühlmittelzuführfutter.

Für Halter mit Zylinderschaft und Bohr-Ø 10 bis 102 mm.

Halter Art.-Nr. 86612/86622/86624/86730/86740/86750

und überlange Halter

Kühlmittelzuführfutter SK40/50 auf zyl. und MK4/5/6 auf zyl.



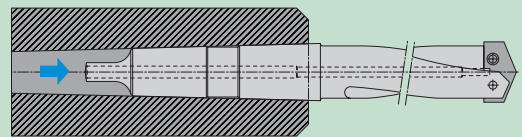
### Zuführbohrung am Austreibblappen

Für **stehende** und **drehende** Werkzeuge:

Kühlmittelzufuhr axial durch die Werkzeugaufnahme.

Für Halter mit Morsekegelschaft und Bohr-Ø 10 bis 25 mm.

Halter Art.-Nr. 86630/86650



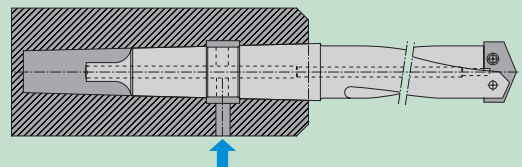
### Zuführbohrung seitlich am Morsekegel

Für **stehende** Werkzeuge:

Kühlmittelzufuhr radial durch die Werkzeugaufnahme.

Für Halter mit Morsekegelschaft und Bohr-Ø 10 bis 25 mm.

Halter auf Anfrage



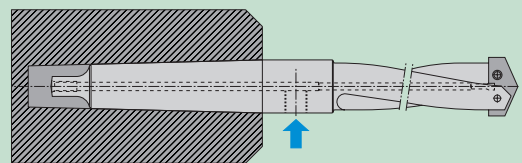
### Zuführbohrung seitlich am Sitz der Ringlaufläche

Für **stehende** Werkzeuge:

Kühlmittelzufuhr über direkte Schlauch-/Rohrverbindung

mit Gewinde R1/4" und R1/2". Für Halter mit Morsekegel und Sitz für Zuführring für Bohr-Ø 25 bis 102 mm.

Halter Art.-Nr. 86670/86680 und überlange Halter



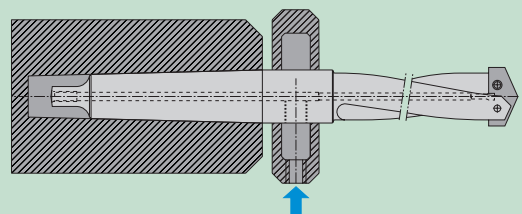
### Zuführbohrung seitlich am Sitz der Ringlaufläche

Für **drehende** Werkzeuge:

Kühlmittelzufuhr radial durch den Zuführring. Für Halter mit

Morsekegel und Ringlaufläche ab Bohr-Ø 25 mm.

Halter Art.-Nr. 86670/86680 und überlange Halter

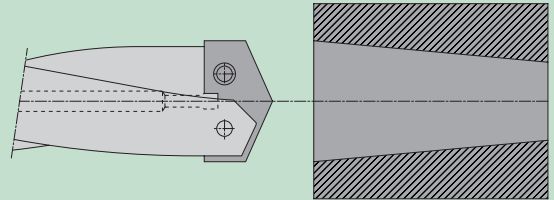




## Multiplex - Tipps und Tricks

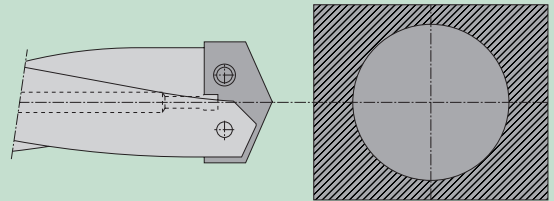
### Bohren vorgebohrter Bohrungen

Da das Multiplex System hauptsächlich durch die Querschneide geführt wird, ist es zum Aufbohren von vorgegessenen oder vorgebohrten Löchern nicht geeignet. Falls das System dennoch eingesetzt wird, sind die Einsatzparameter zu verringern.



### Bohren in unterbrochenem Schnitt

Zum Bohren in unterbrochenem Schnitt (z.B. Querbohrungen, die größer als der Bohrdurchmesser sind) ist das Multiplex System nicht geeignet.

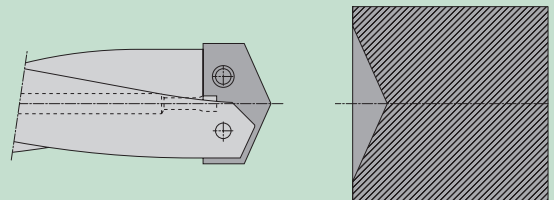


### Anzentrieren der Bohrung

Die Bohrplatten des Multiplex-Systems sind ausgespitzt. Ein Anzentrieren ist somit erst ab größeren Bohrtiefen notwendig. Falls das Anzentrieren aus technischen Gründen notwendig ist, muss der Spitzenwinkel der Zentrierung gleich oder größer wie der Spitzenwinkel der Schneidplatte sein.

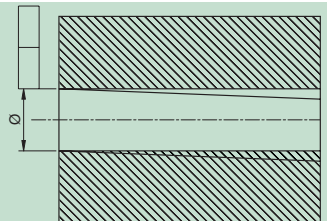
Dies entspricht: bis  $d = 25,4 \text{ mm} = 135^\circ$   
bis  $d = 66,0 \text{ mm} = 132^\circ$   
ab  $d = 66,0 \text{ mm} = 140^\circ$

Es kann auch ein kurzer Halter (3xD) zum Anbohren verwendet werden.



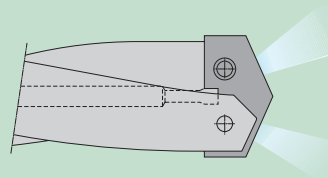
### Verlaufen des Bohrers

Ein Verlaufen des Bohrers hängt von verschiedenen Faktoren ab. Als Richtwert für Bohrtiefen bis 7xD kann man einen Wert von ca. 0,1-0,16 mm annehmen. In diesem Fall sollte aber immer der kürzest mögliche und somit stabilste Haltertyp verwendet werden.



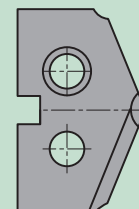
### Kühlmitteldruck

Das Kühlschmiermittel ist beim Multiplex System für die Spanabfuhr sehr wichtig. Es kann ab einem Druck von ca. 5 bar betrieben werden. Generell gilt aber: Je mehr Kühlmittel zur Verfügung steht, desto besser. Durch den Einsatz von Kühlmittlingen oder Kühlmittelzuführfuttern ist das Multiplex-System auch mit der an älteren Maschinen vorhandenen Außenkühlung einsetzbar. Der jeweilige Anwendungsfall kann jederzeit mit unseren Anwendungstechnikern abgeklärt werden.



### Starker Schneidenverschleiß

Wenn sich an den Schneidecken eine Stufe eingebrannt hat, ist die Schnittgeschwindigkeit zu hoch und muss reduziert werden. Messen Sie den Durchmesser, der abgebrannt ist, und berechnen Sie die Schnittgeschwindigkeit anhand dieses Durchmessers neu. Von dieser neuen Drehzahl ziehen Sie 10% ab und geben diesen Wert dann in die Maschine ein.

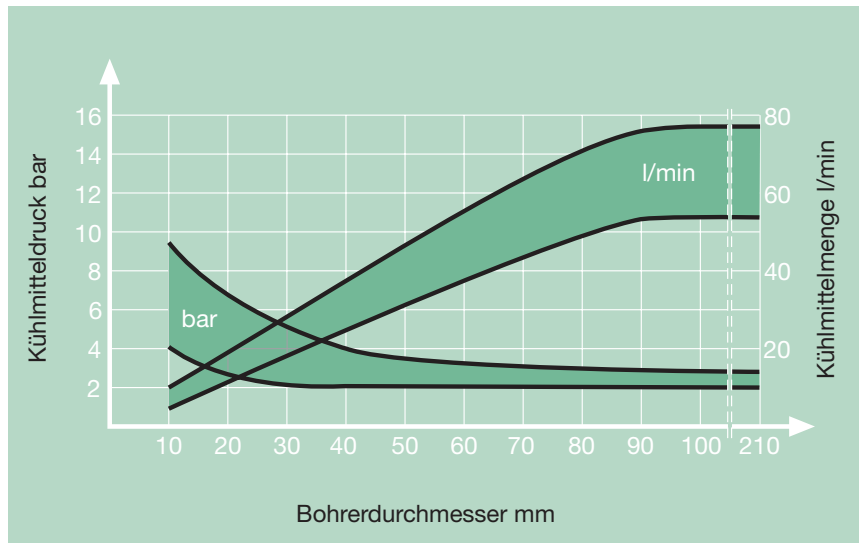




## Multiplex - Das Kühlmittelaggregat

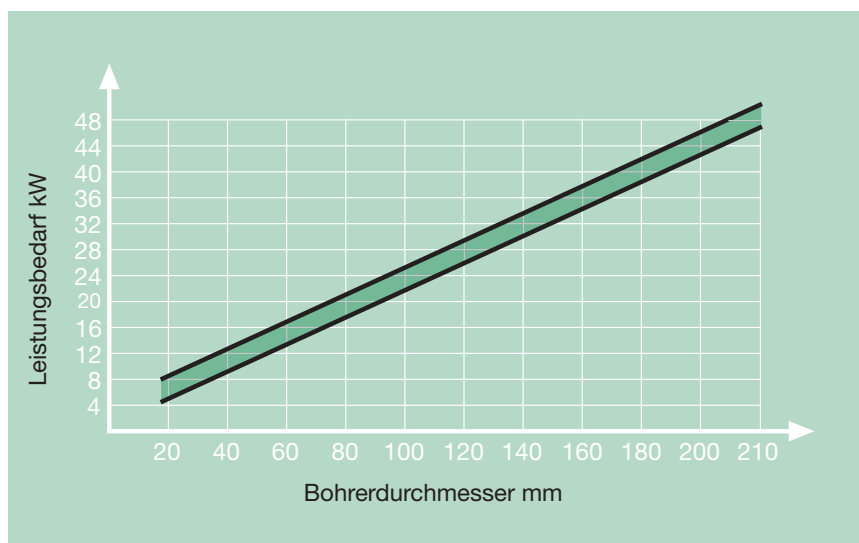
Von ganz entscheidender Bedeutung ist ein leistungsfähiges Kühlmittelaggregat. Sind Druck und Menge des Kühlmittels nicht ausreichend, so kann dies zu einer schlechten Bohrungs Oberfläche oder zum Werkzeugbruch führen. Die Größe der Feststoffteilchen im Kühlmittel sollten 50 µm möglichst nicht überschreiten.

Als Kühlschmiermittel empfehlen wir beim Einsatz der Multiplex-Werkzeuge sowohl bei Schnellstahl- als auch bei Hartmetall-Wechselplatten Bohremulsion im üblichen Mischungsverhältnis 1 : 20. Wichtiger als die Zusammensetzung der Bohremulsion sind der Kühlmitteldruck und die Kühlmittelmenge. Ein leistungsfähiges Kühlmittelaggregat ist deshalb eine wichtige Voraussetzung für eine ausreichende Kühlung und Schmierung.



## Maschine und Werkstück

Erst die Stabilität von Maschine, Spindel, Werkstückaufspannung und Werkstück ermöglichen den Einsatz des Schneidstoffs Hartmetall. Ungenügende Steifigkeit führt zu Schwingungen oder Durchsacken des Bohrers bei Durchgangslöchern, wenn die Querschneide aus dem Werkstück austritt. Geringe Standwege oder Plattenbruch können die Folge sein.

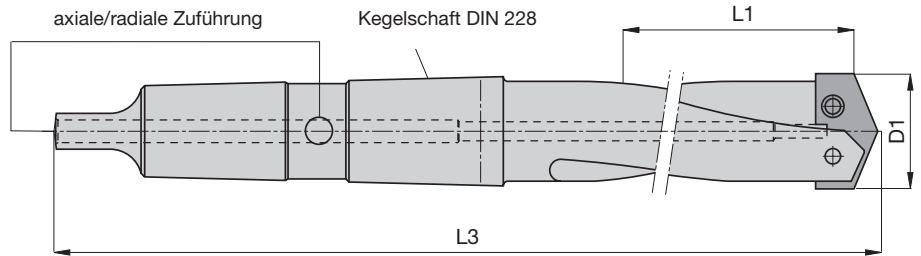




## Multiplex - Auf Wunsch bieten wir Sonderlösungen an

(BITTE KREUZEN SIE NACH IHREN WÜNSCHEN AN):

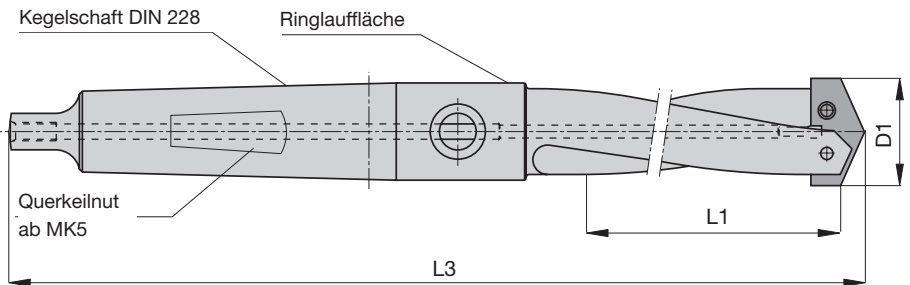
Halter mit Morsekegel



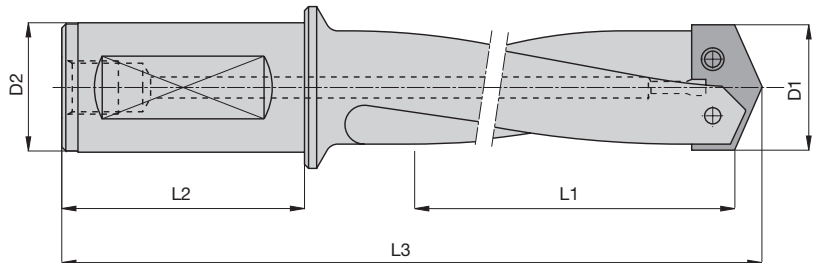
Halter mit Morsekegel und Ringlauffläche für Zuführing Art.-Nr. 86690

mit Querkeilnut

ohne Querkeilnut



Halter mit Zylinderschaft



Für ein Angebot benötigen wir noch folgende Angaben:

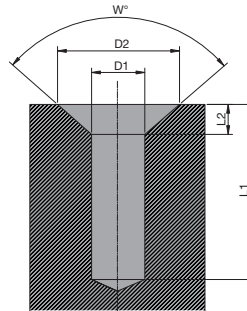
Bohrungsdurchmesser (max. Platten-Ø 210 mm) .....	<input type="checkbox"/>	Zu zerspanendes Material .....	<input type="checkbox"/>
Bohrungstiefe L1 .....	<input type="checkbox"/>	Kühlmitteldruck .....	<input type="checkbox"/>
Spannutlänge .....	<input type="checkbox"/>	Stückzahl (Mindestabnahme 2 Stück) .....	<input type="checkbox"/>
Gesamtlänge (bis ca. 1000 mm) .....	<input type="checkbox"/>	Querkeilnut (bei Morsekegel) .....	<input type="checkbox"/>
Schaftdurchmesser (bei Weldonschaft) .....	<input type="checkbox"/>		

Für Fragen steht Ihnen gerne unsere Anwendungstechnik telefonisch und auch vor Ort zur Verfügung. Telefon 07431/125-0

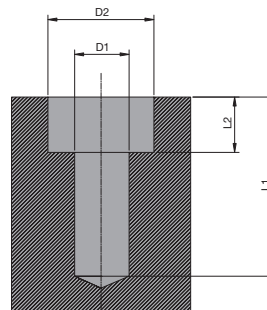


## Multiplex - Für Sonderlängen benötigen wir folgende Angaben

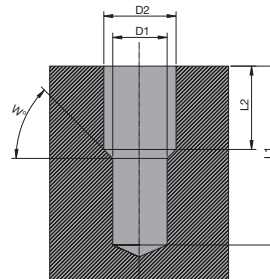
**Stufenbohrer  
für Gewindekernloch  
mit Senkung 90°**



**Stufenbohrer  
mit Stufenwinkel 180°**



**Stufenbohrung  
mit frei wählbarem Senkwinkel**



Für ein Angebot benötigen wir noch folgende Angaben:

Bohrungsform .....	Bitte oben ankreuzen	Winkel $W^\circ$ .....	
Durchmesser D1 .....		Zu zerspanendes Material .....	
Durchmesser D2 .....			
Länge L1 .....			
Länge L2 .....			

oder senden Sie uns einen Zeichnungsausschnitt, aus dem wir alle Maße entnehmen können.



## Multiplex - Sondergeometrien



Formplatte\* nach Kundenzeichnung  
(HSS-E/PM HSS-E oder HM).



NC-Platte (HSS-E/PM HSS-E oder HM) mit 90° oder 120°. (Je nach Ø wird der 90°-Winkel im Spitzenbereich verzerrt)



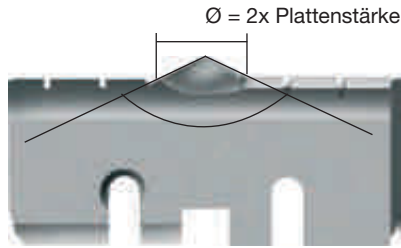
Platte mit Eckenradius (HSS-E/PM HSS-E oder HM).



Stufenplatte (HSS-E/PM HSS-E oder HM).



Aluminium-Geometrie (HM) für den Einsatz in Leichtmetallen und Kunststoffen.



Sacklochplatte\* (HSS-E/PM HSS-E) mit Zentrierspitze.



Messing-Geometrie (HM) für den Einsatz in Messing und ähnlichen Werkstoffen.



Sacklochplatte\* (HSS-E/PM HSS-E) ohne Zentrierspitze.



Anschliff für faserverstärkte Kunststoffe (HM).

**\* Beim Einsatz von Sackloch- und Formplatten bitte beachten:**

- Nur mit kurzem Halter einsetzen.
- Die Bohrung sollte mit einer normalen Multiplex-Platte vorgebohrt werden (gleicher oder kleinerer Ø).
- Nur bedingt zum Bohren ins Volle geeignet.
- Wenn möglich Zeichnungsausschnitt der Bohrung zuschicken

Sondergeometrien erhalten Sie auf Anfrage mit den unterschiedlichsten Beschichtungen aus unserem Programm. Sprechen Sie uns einfach an. **Lieferzeit ca. 3 Wochen.**



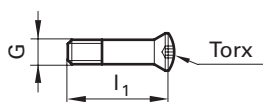


## Multiplex HPC – Technik und Vorteile

Mit dem neuen Wechselplatten-Bohrsystem Multiplex HPC bietet Hartner leistungsstarke und kostengünstige Halter und Wechselplatten für Bohrungen im Durchmesserbereich von 11,00 bis 40,00 mm an, die durch folgende Vorteile überzeugen:

- Hohe Standzeit**  
 Dank spezieller, mikro-bearbeiteter Schneiden und der anwendungsorientierten Oberfläche sind die Wechselplatten des Multiplex HPC-Bohrsystems besonders verschleißbeständig. Die Halter des Multiplex HPC-Bohrsystems verfügen ebenfalls über eine sehr hohe Verschleißbeständigkeit. Grundlage hierfür sind der optimierte Halterwerkstoff mit vernickelter Oberfläche ebenso wie die Abstufung der Haltergrößen in 0,5 mm-Schritten bis Durchmesser 31,99 mm bzw. in 1,0 mm Schritten ab Durchmesser 32,00 mm. Dies führt zu weniger Verschleiß am Halterrücken.
- Optimierter Spantransport**  
 Dank ihres Nutquerschnitts gewährleisten die Halter des Multiplex HPC-Bohrsystems auch bei größeren Bohrtiefen einen optimalen Spantransport aus der Bohrung.
- Perfekte Kühlschmierung**  
 Für eine perfekte Kühlschmierung sorgen die Kühlkanäle mit maximalem Querschnitt, die in der Spannute austreten. Dadurch ermöglichen sie eine optimale Kühlschmierung der Schneiden und unterstützen zudem die Spanabfuhr aus der Bohrung.
- Hochpräziser und stabiler Plattensitz**  
 Der präzise Plattensitz ermöglicht den Plattenwechsel innerhalb der Maschine mit nur wenigen Handgriffen unter Verwendung eines herkömmlichen Torx-Schlüssels. Dank des optimierten Werkstoffs für die Halter des Multiplex HPC-Bohrsystems können die Platten häufiger als bei herkömmlichen Systemen gewechselt werden, bevor der Halter wegen Verschleiß des Plattensitzes ausgetauscht werden muss.  
 Die Spannschrauben mit Schraubensicherung sorgen auch bei stark vibrationsbelasteten Maschinen für einen sicheren Halt der Wechselplatte im Halter.
- Stabile Halter**  
 Die eng gestuften Durchmessersprünge bei den Haltergrößen reduzieren nicht nur den Verschleiß. Sie erhöhen durch die bessere Führung des Werkzeugs in der Bohrung auch die Stabilität des Bohrsystems Multiplex HPC. Daraus wiederum resultieren neben längerer Lebensdauer auch bessere Werkstückoberflächen.

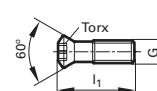
### Spannschraubenzuordnung für Halter 1,5 - 10 x D 86843



für Träger-Größe	Torx	Code-Nr.
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

für Träger-Größe	Torx	Code-Nr.
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

### für Senkhalter 86846



für Träger-Größe	Torx	Code-Nr.
110 - 140	T6	2,000
160 - 280	T7	2,500
300 - 360	T15	4,006

Wir empfehlen, bei jedem Plattenwechsel auch die Spannschraube zu wechseln!

Jeder Halter wird deshalb mit Spannschraube, Art.-Nr. 86843, und Schraubendreher, Artikel-Nr. 86842, ausgeliefert, jede Wechselplatte mit Spannschraube, Art.-Nr. 86843.

### Anzugsmomente für die Spannschraube:

Campo de dia.	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
Tamaño Torx	T7	T8	T9	T10	T15	T15	T20	T25
Anzugsmoment [Nm]	0,8	1,0	1,7	2,7	4,0	6,0	8,0	14,0



## Multiplex HPC – Fragebogen Sonderwerkzeuge

### Bestellung Anfrage

Name/falls vorhanden Kunden-Nr.  Neukunde

Straße/Hausnummer

Telefon

Datum

Ansprechpartner für Rückfragen

Bestellnummer

PLZ/Ort

Telefax

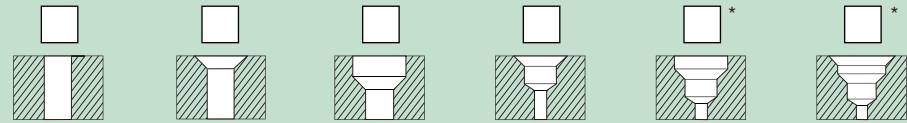
Unterschrift

### Stückzahl

Halter  Platten

### Zu bearbeitender Werkstoff

### Bearbeitung



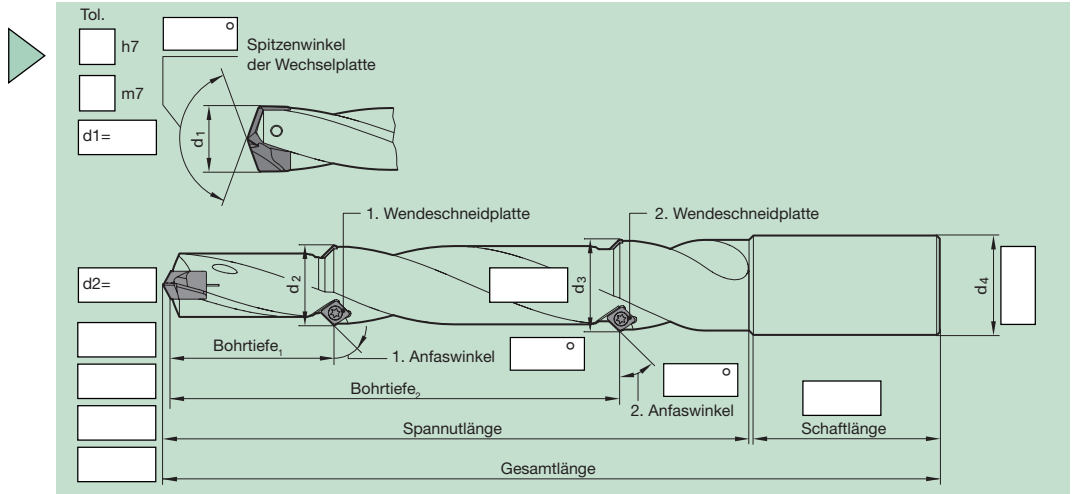
\*Bitte mit separater Zeichnung

### Spannut

spiralisiert  teilspiralisiert  geradegenutet

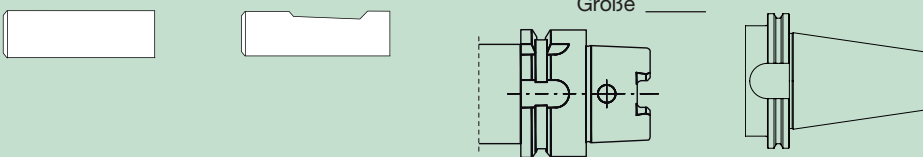
### Baumaße

Für spiralisierte & gerade genutete Varianten



### Schaftform

HA  HE  HSK, Form \_\_\_\_\_ Größe \_\_\_\_\_  SK, Größe \_\_\_\_\_



### Kühlung intern

Ja   Nein

### Beschichtung Wechselplatte

FIRE  TiAlN SuperA  TiAlN  TiCN  TiN  blank  nano FIRE  AlTiN nano





# HARTNER

Präzisionswerkzeuge

## TECHNISCHER TEIL

Baumaße, Begriffe, Einsatzempfehlungen



## Inhalt Baumaße, Bezeichnungen

Beschreibung	Seite
Längenmaße - Spiralbohrer mit Zylinderschaft	421
Längenmaße - Spiralbohrer mit Morsekegel	422
Schneidstoffe für Hartner Werkzeuge	423
Beschichtungen und Oberflächenbehandlung	426
Umrechnungstafel inch-Millimeter	430
Maße für Zylinderschäfte aus Schnellstahl nach DIN 1835	431
Maße für Zylinderschäfte aus Hartmetall nach DIN 6535	432
Maße für Kegelschäfte mit Austreiblappen nach DIN 228 Form B	433
Kernlochdurchmesser für das Gewindeschneiden	434
Kernlochdurchmesser für das Gewindeformen	436
Die neuen Werkstoff-Kurznamen (Auswahl)	438
Durchmessertoleranzen	439
Begriffe für Spiralbohrer nach DIN ISO 5419	440
Anschliffformen	441
Freiwinkel/Ausspannhäufigkeit	442
Kühlmitteldruck und Kühlmittelvolumen	443
Einsatzempfehlungen für Spiralbohrer $\leq 3 \times D$	444
Einsatzempfehlungen für Spiralbohrer $\leq 5 \times D$	448
Einsatzempfehlungen für Spiralbohrer $\leq 10 \times D$	456
Einsatzempfehlungen für Kühlkanalbohrer $\leq 10 \times D$ und $> 10 \times D$	459
Einsatzempfehlungen für Spiralbohrer $> 10 \times D$	460
Einsatzempfehlungen für Kleinstbohrer	462
Einsatzempfehlungen für TS-Drills $\leq 3 \times D$	464
Einsatzempfehlungen für TS-Drills $\leq 4 \times D / \leq 5 \times D$	466
Einsatzempfehlungen für TS-Drills $\leq 7 \times D, \leq 10 \times D$ und $\leq 12 \times D$	470
Einsatzempfehlungen für TS-Drills $\leq 15 \times D$ und TS 100 T	472
Einsatzempfehlungen für Einlippen-Tieflochbohrer	474
Einsatzempfehlungen für Multiplex	476
Einsatzempfehlungen für Multiplex HPC	478



# HARTNER

## Längenmaße Spiralbohrer mit Zylinderschaft

Ø mm über bis		DIN 1897		DIN 338		DIN 339		DIN 340		DIN 1869		DIN 1869		DIN 1869	
		Ge- samt- länge mm	Span- nut- länge mm	Ge- samt- länge mm	Span- nut- länge mm	Ge- samt- länge mm	Span- nut- länge mm	Ge- samt- länge mm	Span- nut- länge mm	Ge- samt- länge mm	Span- nut- länge mm	Ge- samt- länge mm	Span- nut- länge mm	Ge- samt- länge mm	Span- nut- länge mm
				19	2,5					Reihe 1		Reihe 2		Reihe 3	
0,19 – 0,24				19	3										
0,24 – 0,30				19	4										
0,30 – 0,38				19	4										
0,38 – 0,48				20	5										
0,48 – 0,53		20	3	22	6	28	12	32	12						
0,53 – 0,60		21	3,5	24	7	32	15	35	15						
0,60 – 0,67		22	4	26	8	36	18	38	18						
0,67 – 0,75		23	4,5	28	9	39	20	42	21						
0,75 – 0,85		24	5	30	10	42	22	46	25						
0,85 – 0,95		25	5,5	32	11	45	24	51	29						
0,95 – 1,06		26	6	34	12	48	26	56	33						
1,06 – 1,18		28	7	36	14	50	28	60	37						
1,18 – 1,32		30	8	38	16	52	30	65	41						
1,32 – 1,50		32	9	40	18	55	33	70	45						
1,50 – 1,70		34	10	43	20	58	35	76	50						
1,70 – 1,90		36	11	46	22	62	38	80	53						
1,90 – 2,12		38	12	49	24	66	41	85	56						
2,12 – 2,36		40	13	53	27	70	44	90	59	125	85				
2,36 – 2,65		43	14	57	30	74	47	95	62	135	90				
2,65 – 3,00		46	16	61	33	79	51	100	66	140	95	190	130		
3,00 – 3,35		49	18	65	36	84	55	106	69	150	100	200	135		
3,35 – 3,75		52	20	70	39	91	60	112	73	155	105	210	145	265	180
3,75 – 4,25		55	22	75	43	96	64	119	78	165	115	220	150	280	190
4,25 – 4,75		58	24	80	47	102	69	126	82	175	120	230	160	295	200
4,75 – 5,30		62	26	86	52	108	74	132	87	185	125	245	170	315	210
5,30 – 6,00		66	28	93	57	116	80	139	91	195	135	260	180	330	225
6,00 – 6,70		70	31	101	63	124	86	148	97	205	140	275	190	350	235
6,70 – 7,50		74	34	109	69	133	93	156	102	215	150	290	200	370	250
7,50 – 8,50		79	37	117	75	142	100	165	109	225	155	305	210	390	265
8,50 – 9,50		84	40	125	81	151	107	175	115	240	165	320	220	410	280
9,50 – 10,60		89	43	133	87	162	116	184	121	250	175	340	235	430	295
10,60 – 11,80		95	47	142	94	173	125	195	128	265	185				
11,80 – 13,20		102	51	151	101	184	134	205	134						
13,20 – 14,00		107	54	160	108	194	142	214	140						
14,00 – 15,00		111	56	169	114	202	147	220	144						
15,00 – 16,00		115	58	178	120	211	153	227	149						
16,00 – 17,00		119	60	184	125	218	159	235	154						
17,00 – 18,00		123	62	191	130	226	165	241	158						
18,00 – 19,00		127	64	198	135	234	171	247	162						
19,00 – 20,00		131	66	205	140	242	177	254	166						
20,00 – 21,20		136	68					261	171						
21,20 – 22,40		141	70					268	176						
22,40 – 23,60		146	72					275	180						
23,60 – 25,00		151	75					282	185						
25,00 – 26,50		156	78												
26,50 – 28,00		162	81												
28,00 – 30,00		168	84												
30,00 – 31,50		174	87												
31,50 – 33,50		180	90												
33,50 – 35,50		186	93												
35,50 – 37,50		193	96												
37,50 – 40,00		200	100												



# HARTNER

## Längenmaße Spiralbohrer mit Morsekegel

Ø mm über	bis	DIN 345			DIN 346			DIN 341			DIN 1870			DIN 1870		
		Ge- samt- länge mm	Span- nut- länge mm	MK	Ge- samt- länge mm	Span- nut- länge mm	MK	Ge- samt- länge mm	Span- nut- länge mm	MK	Ge- samt- länge mm	Span- nut- länge mm	MK	Ge- samt- länge mm	Span- nut- länge mm	MK
2,65	3,00	114	33	1							Reihe 1			Reihe 2		
3,00	3,35	117	36	1												
3,35	3,75	120	39	1												
3,75	4,25	124	43	1				145	64	1						
4,25	4,75	128	47	1				150	69	1						
4,75	5,30	133	52	1				155	74	1						
5,30	6,00	138	57	1				161	80	1						
6,00	6,70	144	63	1				167	86	1						
6,70	7,50	150	69	1				174	93	1						
7,50	8,50	156	75	1				181	100	1	265	165	1	330	210	1
8,50	9,50	162	81	1				188	107	1	275	175	1	345	220	1
9,50	10,60	168	87	1	185	87	2	197	116	1	285	185	1	360	235	1
10,60	11,80	175	94	1	192	94	2	206	125	1	300	195	1	375	250	1
11,80	13,20	182	101	1	199	101	2	215	134	1	310	205	1	395	260	1
13,20	14,00	189	108	1	206	108	2	223	142	1	325	220	1	410	275	1
14,00	15,00	212	114	2	235	114	3	245	147	2	340	220	2	425	275	2
15,00	16,00	218	120	2	241	120	3	251	153	2	355	230	2	445	295	2
16,00	17,00	223	125	2	246	125	3	257	159	2	355	230	2	445	295	2
17,00	18,00	228	130	2	251	130	3	263	165	2	370	245	2	465	310	2
18,00	19,00	233	135	2	256	135	3	269	171	2	370	245	2	465	310	2
19,00	20,00	238	140	2	261	140	3	275	177	2	385	260	2	490	325	2
20,00	21,20	243	145	2	266	145	3	282	184	2	385	260	2	490	325	2
21,20	22,40	248	150	2	271	150	3	289	191	2	405	270	2	515	345	2
22,40	23,02	253	155	2	276	155	3	296	198	2	405	270	2	515	345	2
23,02	23,60	276	155	3	276	155	3	319	198	3	425	270	3	535	345	3
23,60	25,00	281	160	3	309	160	4	327	206	3	440	290	3	555	365	3
25,00	26,50	286	165	3	314	165	4	335	214	3	440	290	3	555	365	3
26,50	28,00	291	170	3	319	170	4	343	222	3	460	305	3	580	385	3
28,00	30,00	296	175	3	324	175	4	351	230	3	460	305	3	580	385	3
30,00	31,50	301	180	3	329	180	4	360	239	3	480	320	3	610	410	3
31,50	31,75	306	185	3	334	185	4	369	248	3	480	320	3	610	410	3
31,75	33,50	334	185	4	372	185	5	397	248	4	505	320	4	635	410	4
33,50	35,50	339	190	4	377	190	5	406	257	4	530	340	4	665	430	4
35,50	37,50	344	195	4	382	195	5	416	267	4	530	340	4	665	430	4
37,50	40,00	349	200	4	387	200	5	426	277	4	555	360	4	695	460	4
40,00	42,50	354	205	4	392	205	5	436	287	4	555	360	4	695	460	4
42,50	45,00	359	210	4	397	210	5	447	298	4	585	385	4	735	490	4
45,00	47,50	364	215	4	402	215	5	459	310	4	585	385	4	735	490	4
47,50	50,00	369	220	4	407	220	5	470	321	4	605	405	4	765	510	4
50,00	50,80	374	225	4	412	225	5									
50,80	53,00	412	225	5												
53,00	56,00	417	230	5												
56,00	60,00	422	235	5												
60,00	63,00	427	240	5												
63,00	67,00	432	245	5												
67,00	71,00	437	250	5												
71,00	75,00	442	255	5												
75,00	76,20	447	260	5												
76,20	80,00	514	260	6												
80,00	85,00	519	265	6												
85,00	90,00	524	270	6												
90,00	95,00	529	275	6												
95,00	100,00	534	280	6												



# HARTNER

## Schneidstoffe für Hartner Werkzeuge

### Schnellarbeitsstähle

Kurzbezeichnung	Stahlbezeichnung	Werkstoff-Nr. (Stahlschlüssel)	Anwendungsgebiet Eigenschaften	vergleichbare ausländische Stähle			
				USA	Frankreich	Italien	Großbritannien
HSS	S-6-5-2 (DMO5)	1.3343	Standardschneidstoff für universelle Anwendungen	M 2	Z 90 WDCV 06-05-04-02	HS 6-5-2	BM 2
HSS-E	S-6-5-2-5 (EMO5CO5)	1.3243	hohe Warmhärte, besonders geeignet bei hohen Schnitttemperaturen oder bei ungünstiger Kühlung	M 35	Z 90 WDKCV 06-05-05-04-02	HS 6-5-2-5	BM 35
HSS-E	S-6-5-3 (EMO5V3)	1.3344	hohe Abriebfestigkeit und Schneidkantenstabilität, wichtig insbesondere beim Reiben	M 3	Z 120 WDCV 06-05-04-03	HS 6-5-3	-
M42 HSS-E	S-2-10-1-8	1.3247	erhöhte Warmfestigkeit und Härte, geeignet für Arbeiten in schwer zerspanbaren Werkstoffen	M 42	Z 110 DKCWW 09-08-04-02-01	HS 2-9-1-8	BM 42
HSS-E-PM	S-6-5-3-9 ASP 30	-	hohe Härte, Warmfestigkeit und Schneidkantenstabilität; sehr dichtes, gleichmäßiges Gefüge	-	-	-	-

### Hartmetalle

Artikel	Schneidstoff und Beschichtung		ISO-Anwendungsgruppe	Anwendung
Multiplex Bohrplatte	Hartmetall H22	FIRE TiN	Feinkornsorte K20-K40	für Grauguss, Nichteisenmetalle und Kunststoffe, Stähle und Stahlguss
VHM Spiralbohrer	Hartmetall		K10-K20	für Grauguss, Stahlwerkstoffe Alu-Legierungen, Duroplaste, CFK, GFK
VHM TS-Drill U	Hartmetall	FIRE TiN	Feinkornsorte K/P	für Stähle bis ca. 1200 N/mm <sup>2</sup>
VHM TS-Drill U	Hartmetall	FIRE TiN	Feinkornsorte K/P	für Grauguss, un-, niedrig- und hochlegierte Stähle, Messing, Bronze, Kunststoffe
VHM TS-Drill U	Hartmetall	FIRE TiN	Feinkornsorte K/P	für kurzspanende Werkstoffe wie Grauguss, Kugelgraphitguss, AISI-Guss
VHM TS-Drill R	Hartmetall	FIRE	Feinkornsorte K/P	für GGv und ADI
VHM TS-150 GG	Hartmetall		Feinkornsorte K	für kurzspanende Werkstoffe wie Gusseisen, Grauguss, vergüterter Grauguss, Temperguss
VHM TS 100 T	Hartmetall	TiAlN	Feinkornsorte K/P	für Stähle und Guss
VHM TS 100 INOX	Hartmetall	AlTiN nano	Feinkornsorte K/P	für rostfreie Stähle
VHM TS 100 H	Hartmetall	TiAlSiN	Feinkornsorte K/P	für hochfeste und gehärtete Stähle, Sonderlegierungen

Die universelle Einsetzbarkeit unserer neuen K-Hartmetalle hat u.a. auch zur Folge, dass wir die HM-Anwendungsgruppen nur noch mit K (bei unbeschichteten Werkzeugen) bzw. K/P (bei beschichteten Werkzeugen) definieren.





# HARTNER

## Schneidstoffe für Hartner Werkzeuge

### Der Schneidstoff Hartmetall

Hartmetall ist, ähnlich wie Stahl, ein wenig präziser Oberbegriff für eine ganze Werkstoffgruppe. Denn Hartmetall ist ein Verbundwerkstoff, der durch die Kombination mindestens zweier Basiskomponenten in letztlich unendlich vielen Varianten mit unterschiedlichen Eigenschaften hergestellt werden kann.

#### Die Hartmetall-Fertigung

Hartmetalle bestehen aus einem Härteträger – Wolframcarbid (WC) und gegebenenfalls weiteren Karbiden – und einer zähen Komponente: Kobalt (Co). Kobalt dient dabei sozusagen als Einbettmasse bzw. Klebstoff, in dem sich die Hartstoffpartikel verteilen.

Um die unterschiedlichen Anforderungen, die je nach Anwendung an das Hartmetall gestellt werden, zu erfüllen, stehen bei Hartner über 20 verschiedene Standard-Hartmetallsorten zur Wahl. Die einen sind besonders hart, andere verfügen über mehr Zähigkeit, die einen sind besonders feinkörnig, andere dagegen gröber. Außerdem kann auf Kundenwunsch natürlich jede denkbare Hartmetallsorte, sozusagen als Sonderanfertigung, entwickelt und hergestellt werden.

Damit die Hartmetallprodukte stets den hohen Kundenanforderungen entsprechen, steht in der Hartmetallfertigung ein hochmodernes Labor zur Verfügung. Vom Rohstoff bis hin zum fertigen Produkt werden hier ständig Proben untersucht, um höchste Qualität und Prozesssicherheit entsprechend der Zertifizierung gewährleisten und dokumentieren zu können.

#### Grundlegende Eigenschaften von Hartmetallen

Für Bohranwendungen sind die folgenden Eigenschaften von Bedeutung:

##### Steifigkeit

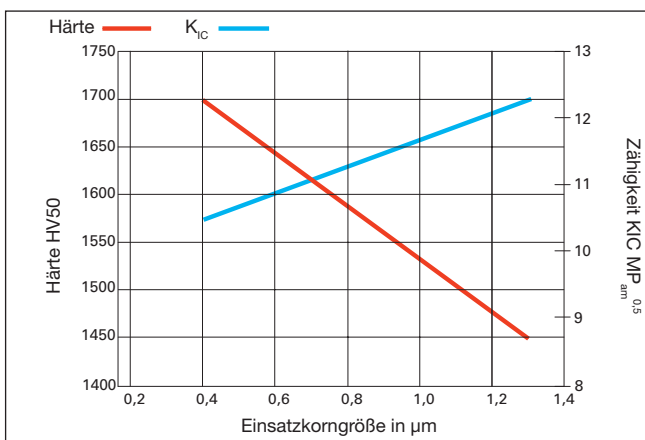
Die Steifigkeit ist ein Maß für die Kraft, die benötigt wird, um einem Material eine Verformung aufzuzwingen. Sie wird bei Hartmetall durch den Kobaltgehalt bestimmt. Je höher der Kobaltgehalt, desto geringer die Steifigkeit des Materials.

Herkömmliche Hartmetalle sind beispielsweise mehr als doppelt so steif wie Stähle. Dadurch lassen sich mit Hartmetallbohrern erheblich geradere Bohrungen herstellen als mit Bohrern aus Stahl. Dieser positive Effekt der Steifigkeit wird jedoch eingeschränkt, weil dem Bohrer aufgezwungene Verformungen – beispielsweise durch Versätze oder Unwuchten – zu einer stark erhöhten Belastung des Materials führen. Dadurch sind steifere Materialien auch bruchempfindlicher.

##### Härte

Als Härte wird der Widerstand eines Materials gegen das Eindringen eines anderen bezeichnet. Klar ist, dass das Werkzeugmaterial deutlich härter sein muss als das zu bearbeitende Werkstück, um nicht selber einem starken Verschleiß zu unterliegen.

Zur Einstellung der Härte eines Hartmetalls gibt es mehrere Möglichkeiten: einerseits die Veränderung des Kobaltgehalts, andererseits die Variation der Korngröße des eingesetzten Karbides. Erhöht man den Kobaltgehalt bei gleichbleibender Korngröße, so sinkt die Härte des Hartmetalls. Senkt man dagegen die Korngröße bei gleichbleibendem Kobaltgehalt, so steigt die Härte.



#### Zähigkeit

Als Zähigkeit wird der Widerstand definiert, den ein Material dem Wachstum eines Risses entgegensetzt. Ein hoher Risswiderstand ist ein Kennzeichen „gutmütiger“ Hartmetalle, die eine hohe Schlagfestigkeit aufweisen. Leider sind Härte und Zähigkeit gegenläufige Eigenschaften (s. Abb.).

Hoher Kobaltgehalt und/oder gröbere Hartstoffkörner sind Kennzeichen zäher Hartmetalle. Eine hohe Zähigkeit ist im Bearbeitungsprozess dann notwendig, wenn schlagartige Belastungen oder hohe Schnittlasten auftreten. Hohe Schnittlasten entstehen insbesondere dann, wenn ein hoher Reibungsbeiwert zwischen Werkzeug und Werkstoff vorliegt. Dieser wird durch die Oberflächenrauigkeit des Werkzeugs und durch die chemischen Verhältnisse zwischen Werkzeugoberfläche und Werkstück bestimmt.

Hier muss darauf hingewiesen werden, dass zäh nicht gleichbedeutend mit hoher Biegefestigkeit ist. Die durch die Biegefestigkeit wesentlich bestimmte Eigenschaft ist die Kantenfestigkeit.

#### Kantenfestigkeit

Die Kantenfestigkeit beschreibt den Widerstand einer Kante gegen Ausbrüche entweder einzelner Hartstoffkörner oder größerer Kornverbände. Die Biegefestigkeit stellt ein grobes Maß für die Kantenfestigkeit dar. In die Biegefestigkeit geht neben der Zähigkeit auch noch die Größe der längsten Korngrenze im belasteten Gefüge ein. Hierbei steigert eine hohe Zähigkeit die Biegefestigkeit, längere Korngrenzen (= gröbere Körner) senken sie jedoch.

#### Reaktivität

Auch wenn die meisten Hartmetalle heutzutage beschichtet eingesetzt werden, muss die Reaktionsneigung zwischen Hartmetall und Werkstück berücksichtigt werden. Da die Beschichtung an der Schneide schnell verschleißt, kann eine Reaktion zwischen Werkzeug und Werkstück stattfinden.

Ähnlich dem Lochfraß bei der Korrosion zeigt ein lokaler Angriff erheblich nachhaltigere Folgen als eine großflächige Schädigung. Insbesondere Kobalt reagiert gerade bei den hohen, an der Schneide vorherrschenden Temperaturen schnell mit Eisenmetallen. Andere Metalle wie zum Beispiel Titan oder Silizium reagieren bevorzugt mit dem Wolframcarbid. Aus diesen Gründen ist der Kobaltgehalt des Werkzeugs interessant für die Reaktivität des Werkzeugs.



### Der Schneidstoff Hartmetall

#### Materialauswahl

Eine sorgfältige Balance der verschiedenen Eigenschaften für den jeweiligen Anwendungszweck ist daher notwendig. Dies führt dazu, dass eine Vielzahl von Hartmetallen angeboten wird. Um für einen bestimmten Anwendungsfall das richtige Hartmetall zu finden, wurden verschiedene Klassifizierungssysteme erprobt und als Norm eingeführt, die die Auswahl erleichtern sollen. Weit verbreitet ist das System der ISO-Anwendungsklassen gemäß der 2005 neu gefassten DIN ISO 513.

Hier werden die Anwendungsgebiete der Hartmetall-/Beschichtungskombination über einen Kennbuchstaben gekennzeichnet, die Härte-/Zähigkeitsbalance durch eine Kennzahl. Eine niedrige Kennzahl deutet hohen Härtebedarf für die Anwendung an, eine hohe hohen Zähigkeitsbedarf.

#### Hauptanwendungsgruppe P

Diese Gruppe umfasst langspannende Eisenmetalle außer rostfreien und austenitischen Stählen und ist, je nach Schnittbelastung, in die Anwendungsgruppen 01 – 50 unterteilt.

#### Hauptanwendungsgruppe M

Zur Gruppe M gehören austenitische rostfreie Stähle, austenitisch/ferritische Stähle und Gussstähle. Sie ist, je nach Schnittbelastung, in die Anwendungsgruppen 01 – 40 gegliedert. Bei Hartner werden P- und M-Anwendungen mit beschichteten K-Hartmetallen realisiert.

#### Hauptanwendungsgruppe K

In der Gruppe K sind Grauguss in allen Formen und schmiedbare Gusseisen zusammengefasst. Je nach Schnittbelastung erfolgt die Einteilung in die Anwendungsgruppen 01 – 40.

#### Hauptanwendungsgruppe S

Hitzebeständige "Superlegierungen" basierend auf Eisen, Nickel oder Kobalt sowie Titanlegierungen gehören zur Gruppe S. Hier gibt es, je nach Schnittbelastung, die Anwendungsgruppen 01 – 30.

#### Hauptanwendungsgruppe N

Diese Gruppe umfasst Nichteisen-Metalle, insbesondere Aluminium-Legierungen, und nichtmetallische Materialien. Sie ist, je nach Schnittbelastung, in die Anwendungsgruppen 01 – 30 gegliedert.

#### Hauptanwendungsgruppe H

In dieser Gruppe ist die Hartbearbeitung von gehärteten Stählen und Hartguss zusammengefasst. Die Anwendungsgruppen reichen, je nach Schnittbelastung, von 01 – 30.

Viele Hartmetallsorten decken einen breiten Bereich dieser Zerspannungshauptgruppen ab, insbesondere wenn ein beschichteter Einsatz erfolgt. So sind beispielsweise die meisten FIRE-beschichteten Hartmetallbohrer aus dem Hartner Programm den Zerspannungshauptgruppen K und P zugeordnet.

#### Einzelne Hartner Sorten

Die folgende Tabelle stellt die wesentlichen, bei Hartner im Lagerprogramm erhältlichen Hartmetalle für allgemeine Bohranwendungen dar. Weitere Sorten sind auf Anfrage erhältlich. Bei über 80% aller uns bekannten Anwendungen waren die Ergebnisse von Werkzeugen aus DK460UF in Verbindung mit einer angepassten Beschichtung durch andere, auch beschichtete, Hartmetallsorten nicht zu überbieten. Dies und die hohe Lagerverfügbarkeit dieses Materials vereinfachen die Werkzeugauswahl stark. Unsere Anwendungstechniker beraten Sie gerne, wann ein Einsatz der anderen Sorten sinnvoll ist.

Sorte	Co-Gehalt [M-%]	WC-Einsatzkorn [µm]	Härte [HV]	ISO-Klassifikation [ISO 513]	Charakterisierung
DK460UF	10	0,5	1620	K20-K40 beschichtet: P, M20-M40, H, S, N25	Sehr breitbandig einsetzbare Sorte, die, meist beschichtet eingesetzt, Stähle, weiche Aluminium-Legierungen, Gusseisen, aber auch Superlegierungen wie Inconel 718 schneidet. Diese Sorte stellt das Rückgrat unserer Produktion dar.
DK255F	8	0,7	1720	K20 beschichtet: P, M, H, S, N20	Diese Sorte wird für die Hartbearbeitung, die Bearbeitung von hochfesten Graugussarten und harten AISI-Legierungen empfohlen. Trockenbearbeitung ist möglich. Beschichteter Einsatz ist anzustreben.
DK120	6	1,3	1620	K15 beschichtet: N15	Insbesondere für den Einsatz mit Diamantbeschichtung ist diese Sorte geeignet.
DK120UF	7	0,5	1850	K05	Ultrafeinstkornsorte mit höchster Verschleißfestigkeit, geeignet für absolut stabile Maschinen, bevorzugt für Reibahlen
DK400N	10	0,7	1580	K35M beschichtet: P, M, S, N35M	Hochzähigkeit Sorte für die Bearbeitung hochtemperaturfester Metalle

## Kurzbeschreibung

	T	A	A	C	DLC	F	Diamant
	TiN-Schicht	TiAlN-Schicht	AlTiN / AlTiN nano-Schicht	TiCN-Schicht	DLC- Schicht	FIRE-Schicht	Diamant-Schicht
Prozess	PVD	PVD	PVD	PVD	PVD	PVD	CVD
Beschichtungs-temperatur (°C)	400° – 500°	400° – 500°	400° – 500°	400° – 500°	< 150°	400° – 500°	> 700°
Substrat	Schnellstahl, HM, Cermet	Schnellstahl, HM, Cermet	Schnellstahl, HM, Cermet	Schnellstahl, HM, Cermet	Hartmetall, Cermet, HSS	Schnellstahl, HM, Cermet	HM, Cermet
Schichtaufbau	einlagig	einlagig	einlagig bzw. nanolagig	einlagig	einlagig	mehrlagig (6)	einlagig
Farbe	Goldgelb	Grauviolett, Blauviolett	Blauanthrazit	Grau	Schwarz	Rotviolett oder Blauviolett	Grauschwarz
Härte (HV 0,05)	2200	3300	3400	3000	> 6000	3000	> 8000
Anwendungs-temperatur (°C)	< 600°	< 800°	< 900°	< 450°	< 500°	< 800°	< 600°
Wärmeleitfähigkeit (kW/mK)	0,07	0,05	0,05	0,1	0,01	0,05	> 0,1
Typische Zerspanungsart	universell	Drehen, Bohren	alles (besonders Fräsen)	Fräsen, Gewinde-schneiden	Bohren, Reiben, Gewinden	Bohren, Fräsen, Gewinden	Drehen, Bohren, Fräsen
Bevorzugt bearbeitbare Werkstoffe	universell	Stahl, Guss	rostfreie Stähle, gehärtete Stähle, Nickelbasis-legierungen	Stahl allgem. hochfeste Werkstoffe, Inconel, Monel	Aluminium-knetlegierungen, Al-Guss bis 12% Si, Buntmetalle	universell	<u>Diamant C:</u> Graphit  <u>Diamant F:</u> Faserverst. Kunststoffe  <u>Diamant M:</u> AlSi, MMC
Besonderheiten	kostengünstig	temperatur-beständig	HSC Bearbeitung, Hart-Zerspanung	unempfindlich gegen Schlag-belastung	geringe Aufbauneigung, hohe Härte	breit anwendbar	hochabrasive Anwendung

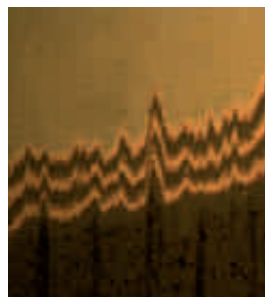
## Vergleich Schichtaufbau

### einlagig



Beispiel  
TiAlN-Schicht

### mehrlagig



Beispiel  
FIRE-Schicht



# HARTNER

## Beschichtungen

### Kurzbeschreibung

	<b>M</b>	TiAlZrN	AlTiZrN	<b>Y</b>	TiSiN	ZrN
	MolyGlide-Schicht	TiAlZrN-Schicht	AlTiZrN-Schicht	TiAlSiN-Schicht	TiSiN-Schicht	ZrN-Schicht
Prozess	PVD	PVD	PVD	PVD	PVD	PVD
Beschichtungs-temperatur (°C)	100° – 150°	400° – 500°	400° – 500°	400° – 500°	450° – 500°	400° – 500°
Substrat	Schnellstahl, HM, Cermet	Schnellstahl, HM, Cermet	Schnellstahl, HM, Cermet	Schnellstahl, HM, Cermet	Schnellstahl (GeBo), HM, Cermet	Schnellstahl, HM, Cermet
Schichtaufbau	einlagig	mehrlagig (7)	Nanolagig	mehrlagig, Nanokomposit	mehrlagig, Nanokomposit	mehrlagig
Farbe	Grüngrau	Blassgold	Blassgold	Bronze	Kupfer	Blassgold
Härte (HV 0,05)	20 – 50	3300	3400	5500	4000	2500
Anwendungs-temperatur (°C)	< 800°	< 800°	< 800°	< 800°	< 800°	< 700°
Wärmeleitfähigkeit (kW/mK)	< 0,1	0,05	0,05	0,03	0,03	0,04
Typische Zerspanungsart	Bohren, Reiben, Fräsen, Gew. schneiden	Bohren, Fräsen, Gewinden	Bohren, Gewinden	Bohren, Fräsen, Reiben	Bohren, Fräsen, Reiben	Bohren, Fräsen, Dekor
Bevorzugt bearbeitbare Werkstoffe	Al, AlSi, Stahl Sonderlegierungen	universell	rostfreie Stähle, Nickelbasislegierungen	universell, insbes. Gusseisen, gehärtete Stähle, hochfeste Stähle, CFK	universell, insbes. C-Stähle, Automatenstähle, Mn-Stähle, hochwarmfeste Stähle	Titan, Al, Nickelbasislegierungen, rostfr. Stahl
Besonderheiten	Reibungsminde- rung und Trocken- bearb.	verbesserter Spanfluss	geringe Reibung	hochhart, universell	geringe Adhäsionsneigung	geringe Adhäsionsneigung



# HARTNER

## Beschichtungen

### Oberflächenbehandlung

○ blank

Werkzeuge aus Schnellarbeitsstahl oder Hartmetall werden aufgrund ihrer allgemeinen guten Grundeigenschaften ohne zusätzliche Oberflächenbehandlung, d.h. in blanker Ausführung geliefert.

#### Oberflächen-Veredlungsverfahren

Für spezielle Einsatzfälle empfiehlt es sich durch Oberflächen-Veredlungsverfahren die Verschleißfestigkeit zu erhöhen und den Gleitwiderstand sowie die Aufschweißneigung zu mindern. Die nachfolgend aufgeführten Veredlungsverfahren verlieren jedoch immer mehr an Bedeutung. Generell sehr viel bessere Ergebnisse erzielen Sie mit hart- bzw. weichstoffbeschichteten Werkzeugen.

● dampfnitriert

◐ Fasen nitriert

Nitrieren ist eine Möglichkeit, Werkzeuge verschleißfester zu machen. Empfehlenswert für die Bearbeitung von Werkstoffen wie Grauguss, Al mit hohem Si-Gehalt, Kunststoffen, Stählen mit hohem Perlitgehalt u.a.. Unsere Werkzeuge nitrieren wir mit unterschiedlichen, anwendungsorientierten Verfahren.

● dampfbehandelt

Dampfbehandelte Werkzeuge bieten gleichfalls einen geringeren Gleitwiderstand. Dadurch können Kaltverschweißungen, wie sie beispielsweise gerne bei der Bearbeitung von kohlenstoffarmen Stählen auftreten, preisgünstig vermieden werden. Dampfbehandelte Werkzeuge sind nur für die Bearbeitung von Eisenwerkstoffen geeignet.

#### Die Hartner-Schichten

**A** **A-Schicht** oder TiAlN-Schicht (Titanaluminiumnitrid)

Optisches Kennzeichen: Farbe Schwarzviolett

Speziellschicht für Zerspanungsaufgaben in abrasiven Werkstoffen (Guss, AISi) und/oder hohen Temperaturbelastungen, also bei Einsätzen ohne Kühlung oder eingeschränkter Kühlmöglichkeit, wie bei tiefen Bohrungen oder kleinen Durchmessern. Speziell hier gilt, dass erst bei höheren Schnittdaten die A-Schicht zu deutlichen Leistungsverbesserungen führt.

**A** **Super A-Schicht** oder AlTiN-Schicht (Aluminiumtitannitrid)

**a** **nanoA-Schicht** oder AlTiN nano-Schicht (Aluminiumtitannitrid)

Optisches Kennzeichen: Farbe Schwarzviolett

Die bewährte A-Schicht auf TiAlN-Basis aus unserem Hause wurde kontinuierlich weiterentwickelt. Die optimierten strukturellen, chemischen und mechanischen Eigenschaften der Super A-Schicht führen zu einer extrem hohen Warmhärte, einer sehr guten Oxidationsbeständigkeit sowie einer exzellenten Schichthaftung. Diese Schicht eignet sich nur in Verbindung mit Hartmetall für die Bearbeitung schwer zerspanbarer Materialien wie zum Beispiel Inconel und gehärteten Stählen sowie für die Hartzerspannung (>52HRC) und die HSC-Bearbeitung. Sehr geeignet für die Bearbeitung von rostfreien Stählen.

**C** **C-Schicht** oder TiCN-Schicht (Titanarbonnitrid)

Optisches Kennzeichen: Farbe Grauviolett

Mit sehr geringer Spanneigung insbesondere für die Gewindefertigung in Stählen geeignet. Wegen hoher Zähigkeit auch bei unterbrochenen Schnitten und schwer bearbeitbaren Werkstoffen gut geeignet. Nicht für MMS- oder Trockenbearbeitung.

**F** **F-Schicht** oder FIRE-Schicht/nanoFIRE

Optisches Kennzeichen: Farbe Schwarzviolett

Multilayer-TiAlN-Schicht mit gradientem Aufbau. Allroundschicht mit min. 2 mal höherer Leistung als TiN. Vereint die Vorteile von TiN, TiAlN und TiCN. Exzellente, sozusagen "feuerfeste" Wärmeisolierung. Hohe Zähigkeit. FIRE plus MolyGlide - die ideale Kombination und Voraussetzung für Trocken- und HSC-Bearbeitung.

**T** **T-Schicht** oder TiN-Schicht (Titannitrid)

Optisches Kennzeichen: Farbe Gold-gelb

Millionenfach bewährte, preisgünstige Allroundschicht. Damit lassen sich hohe Leistungssteigerungen erzielen. Spitzenwerte wie bei den A-, C- und F-Schichten sind nicht erreichbar.

**M** **M-Schicht** oder MolyGlide®-Schicht auf MoS<sub>2</sub>-Basis

Optisches Kennzeichen: Farbe Grau

Patentierter Weichstoffschicht, speziell entwickelt zur Verbesserung der Gleitwirkung und Eliminierung der Aufbauschnitten bei der Bearbeitung von Al-Legierungen. In Kombination mit der Hartstoffschicht FIRE lässt sich auch die Trockenbearbeitung bzw. Bearbeitung mit Minimalmengenschmierung (MMS) realisieren.



### Oberflächenbehandlung

#### **Y-Schicht** oder TiAlSiN-Schicht

Optisches Kennzeichen: Farbe Bronzerot  
Hochharte, warmfeste Mehrlagenschicht speziell für die Bearbeitung hochfester sowie gehärteter Stähle und von Gusseisen.

#### **U-Schicht** oder AlTiZrN-Schicht

Optisches Kennzeichen: Farbe Blassgold  
Besonders geeignet für die Bearbeitung von rostfreien Stählen bei hohen Anforderungen an den Spanfluss.

#### **X-Schicht** oder TiSiN-Schicht

Optisches Kennzeichen: Farbe Kupferrot  
Hochwarmfeste Nanokompositschicht für die Bearbeitung von Kohlenstoffstählen, Automatenstählen und manganhaltigen Stählen. Reduziert Kolkverschleißneigung. Weiterhin für die Bearbeitung hochwarmfester Stähle sehr gut geeignet. Für Bohren und Fräsen auf Hartmetallwerkzeuge beschränkt.

#### **Z-Schicht** oder ZrN-Schicht

Optisches Kennzeichen: Farbe Blassgold  
Schicht speziell für die Bearbeitung von Titan, weicheren Nickelbasislegierungen und festeren Aluminiumknetlegierungen und Aluminiumgußlegierungen bis ca. 12% Si ist dieses mehrlagige Schichtsystem ausgelegt worden. Die Bildung von Aufbauschneiden wird minimiert und ein guter Spanfluß sichergestellt.

#### **Cb-Schicht** oder DLC-Schicht

Optisches Kennzeichen: Farbe Schwarz  
Diese hochharte Kohlenstoffbeschichtung (DLC-diamond-like-carbon) verringert bei der Bearbeitung von sehr adhäsiven Aluminiumknet- und -gusslegierungen die Bildung von Aufbauschneiden und erlaubt so präzise Dimensionskontrolle und gute Oberflächenbildung am Bauteil.

#### **H-Schicht** oder Diamant-Schicht

Optisches Kennzeichen: Farbe schwarzgrau  
Hochharte Diamantschicht für die Bearbeitung von Graphit, faserverstärkten Kunststoffen und Aluminiumgußlegierungen mit mehr als 12% Si. Extrem hoher Verschleißwiderstand paart sich mit sehr geringer Aufbaulagenbildung.

#### **R-Schicht** oder TiAlZrN-Schicht

Optisches Kennzeichen: Farbe Blassgold  
Weiterentwicklung der FIRE für die allgemeine Stahlbearbeitung. Sie hat ihr Haupteinsatzgebiet dort, wo Spanflußprobleme den Einsatz der FIRE begrenzen.



### Von 1/64 bis 11 63/64

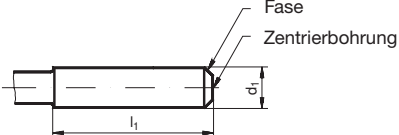
Teile des inch		inch (Zoll)											
		0	1	2	3	4	5	6	7	8	9	10	11
		mm											
0	0	0	25,400 0	50,800 0	76,200	101,600 0	127,000 0	152,400 0	177,800 0	203,200 0	228,600 0	254,000 0	279,400 0
1/ 64	0,015 625	0,396 9	25,796 9	51,196 9	76,596	101,996 9	127,396 9	152,796 9	178,196 9	203,596 9	228,996 9	254,396 9	279,796 9
1/ 32	0,031 25	0,793 8	26,193 8	51,593 8	76,993	102,393 8	127,793 8	153,193 8	178,593 8	203,993 8	229,393 8	254,793 8	280,193 8
3/ 64	0,046 875	1,190 6	26,590 6	51,990 6	77,390	102,790 6	128,190 6	153,590 6	178,990 6	204,390 6	229,790 6	255,190 6	280,590 6
1/ 16	0,062 5	1,587 5	26,987 5	52,387 5	77,787	103,187 5	128,587 5	153,987 5	179,387 5	204,787 5	230,187 5	255,587 5	280,987 5
5/ 64	0,078 125	1,984 4	27,384 4	52,784 4	78,181	103,584 4	128,984 4	154,384 4	179,784 4	205,184 4	230,584 4	255,984 4	281,384 4
3/ 32	0,093 75	2,381 2	27,781 2	53,181 2	78,581	103,981 2	129,381 2	154,781 2	180,181 2	205,581 2	230,981 2	256,381 2	281,781 2
7/ 64	0,109 375	2,778 1	28,178 1	53,578 1	78,978	104,378 1	129,778 1	155,178 1	180,578 1	205,978 1	231,378 1	256,778 1	282,178 1
1/ 8	0,125	3,175 0	28,575 0	53,975 0	79,375	104,775 0	130,175 0	155,575 0	180,975 0	206,375 0	231,775 0	257,175 0	282,575 0
9/ 64	0,140 625	3,571 9	28,971 9	54,371 9	79,771	105,171 9	130,571 9	155,971 9	181,371 9	206,771 9	232,171 9	257,571 9	282,971 9
5/ 32	0,156 25	3,968 8	29,368 8	54,768 8	80,168	105,568 8	130,968 8	156,368 8	181,768 8	207,168 8	232,568 8	257,968 8	283,368 8
11/ 64	0,171 875	4,365 6	29,765 6	55,165 6	80,565	105,965 6	131,365 6	156,765 6	182,165 6	207,565 6	232,965 6	258,365 6	283,765 6
3/ 16	0,187 5	4,762 5	30,162 5	55,562 5	80,962	106,362 5	131,762 5	157,162 5	182,562 5	207,962 5	233,362 5	258,762 5	284,162 5
13/ 64	0,203 125	5,159 4	30,559 4	55,959 4	81,359	106,759 4	132,159 4	157,559 4	182,959 4	208,359 4	233,759 4	259,159 4	284,559 4
7/ 32	0,218 75	5,556 2	30,956 2	56,356 2	81,756	107,156 2	132,556 2	157,956 2	183,356 2	208,756 2	234,156 2	259,556 2	284,956 2
15/ 64	0,234 375	5,953 1	31,353 1	56,753 1	82,153	107,553 1	132,953 1	158,353 1	183,753 1	209,153 1	234,553 1	259,953 1	285,353 1
1/ 4	0,25	6,350 0	31,750 0	57,150 0	82,550	107,950 0	133,350 0	158,750 0	184,150 0	209,550 0	234,950 0	260,350 0	285,750 0
17/ 64	0,265 625	6,746 9	32,146 9	57,546 9	82,946	108,346 9	133,746 9	159,146 9	184,546 9	209,946 9	235,346 9	260,746 9	286,146 9
9/ 32	0,281 25	7,143 8	32,543 8	57,943 8	83,343	108,743 8	134,143 8	159,543 8	184,943 8	210,343 8	235,743 8	261,143 8	286,543 8
19/ 64	0,296 875	7,540 6	32,940 6	58,340 6	83,740	109,140 6	134,540 6	159,940 6	185,340 6	210,740 6	236,140 6	261,540 6	286,940 6
5/ 16	0,312 5	7,937 5	33,337 5	58,737 5	84,137	109,537 5	134,937 5	160,337 5	185,737 5	211,137 5	236,537 5	261,937 5	287,337 5
21/ 64	0,328 125	8,334 4	33,734 4	59,134 4	84,534	109,934 4	135,334 4	160,734 4	186,134 4	211,534 4	236,934 4	262,334 4	287,734 4
11/ 32	0,343 75	8,731 2	34,131 2	59,531 2	84,931	110,331 2	135,731 2	161,131 2	186,531 2	211,931 2	237,331 2	262,731 2	288,131 2
23/ 64	0,359 375	9,128 1	34,528 1	59,928 1	85,328	110,728 1	136,128 1	161,528 1	186,928 1	212,328 1	237,728 1	263,128 1	288,528 1
3/ 8	0,375	9,525 0	34,925 0	60,325 0	85,725	111,125 0	136,525 0	161,925 0	187,325 0	212,725 0	238,125 0	263,525 0	288,925 0
25/ 64	0,390 625	9,921 9	35,321 9	60,721 9	86,121	111,521 9	136,921 9	162,321 9	187,721 9	213,121 9	238,521 9	263,921 9	289,321 9
13/ 32	0,406 25	10,318 8	35,718 8	61,118 8	86,518	111,918 8	137,318 8	162,718 8	188,118 8	213,518 8	238,918 8	264,318 8	289,718 8
27/ 64	0,421 875	10,715 6	36,115 6	61,515 6	86,915	112,315 6	137,715 6	163,115 6	188,515 6	213,915 6	239,315 6	264,715 6	290,115 6
7/ 16	0,437 5	11,112 5	36,512 5	61,912 5	87,312	112,712 5	138,112 5	163,512 5	188,912 5	214,312 5	239,712 5	265,112 5	290,512 5
29/ 64	0,453 125	11,509 4	36,909 4	62,309 4	87,709	113,109 4	138,509 4	163,909 4	189,309 4	214,709 4	240,109 4	265,509 4	290,909 4
15/ 32	0,468 75	11,906 2	37,306 2	62,706 2	88,106	113,506 2	138,906 2	164,306 2	189,706 2	215,106 2	240,506 2	265,906 2	291,306 2
31/ 64	0,484 375	12,303 1	37,703 1	63,103 1	88,503	113,903 1	139,303 1	164,703 1	190,103 1	215,503 1	240,903 1	266,303 1	291,703 1
1/ 2	0,5	12,700 0	38,100 0	63,500 0	88,900	114,300 0	139,700 0	165,100 0	190,500 0	215,900 0	241,300 0	266,700 0	292,100 0
33/ 64	0,515 625	13,096 9	38,496 9	63,896 9	89,296	114,696 9	140,096 9	165,496 9	190,896 9	216,296 9	241,696 9	267,096 9	292,496 9
17/ 32	0,531 25	13,493 8	38,893 8	64,293 8	89,693	115,093 8	140,493 8	165,893 8	191,293 8	216,693 8	242,093 8	267,493 8	292,893 8
35/ 64	0,546 875	13,890 6	39,290 6	64,690 6	90,090	115,490 6	140,890 6	166,290 6	191,690 6	217,090 6	242,490 6	267,890 6	293,290 6
9/ 16	0,562 5	14,287 5	39,687 5	65,087 5	90,487	115,887 5	141,287 5	166,687 5	192,087 5	217,487 5	242,887 5	268,287 5	293,687 5
37/ 64	0,578 125	14,684 4	40,084 4	65,484 4	90,884	116,284 4	141,684 4	167,084 4	192,484 4	217,884 4	243,284 4	268,684 4	294,084 4
19/ 32	0,593 75	15,081 2	40,481 2	65,881 2	91,281	116,681 2	142,081 2	167,481 2	192,881 2	218,281 2	243,681 2	269,081 2	294,481 2
39/ 64	0,609 375	15,478 1	40,878 1	66,278 1	91,678	117,078 1	142,478 1	167,878 1	193,278 1	218,678 1	244,078 1	269,478 1	294,878 1
5/ 8	0,625	15,875 0	41,275 0	66,675 0	92,075	117,475 0	142,875 0	168,275 0	193,675 0	219,075 0	244,475 0	269,875 0	295,275 0
41/ 64	0,640 625	16,271 9	41,671 9	67,071 9	92,471	117,871 9	143,271 9	168,671 9	194,071 9	219,471 9	244,871 9	270,271 9	295,671 9
21/ 32	0,656 25	16,668 8	42,068 8	67,468 8	92,868	118,268 8	143,668 8	169,068 8	194,468 8	219,868 8	245,268 8	270,668 8	296,068 8
43/ 64	0,671 875	17,065 6	42,465 6	67,865 6	93,265	118,665 6	144,065 6	169,465 6	194,865 6	220,265 6	245,665 6	271,065 6	296,465 6
11/ 16	0,687 5	17,462 5	42,862 5	68,262 5	93,662	119,062 5	144,462 5	169,862 5	195,262 5	220,662 5	246,062 5	271,462 5	296,862 5
45/ 64	0,703 125	17,859 4	43,259 4	68,659 4	94,059	119,459 4	144,859 4	170,259 4	195,659 4	221,059 4	246,459 4	271,859 4	297,259 4
23/ 32	0,718 75	18,256 2	43,656 2	69,056 2	94,456	119,856 2	145,256 2	170,656 2	196,056 2	221,456 2	246,856 2	272,256 2	297,656 2
47/ 64	0,734 375	18,653 1	44,053 1	69,453 1	94,853	120,253 1	145,653 1	171,053 1	196,453 1	221,853 1	247,253 1	272,653 1	298,053 1
3/ 4	0,75	19,050 0	44,450 0	69,850 0	95,250	120,650 0	146,050 0	171,450 0	196,850 0	222,250 0	247,650 0	273,050 0	298,450 0
49/ 64	0,765 625	19,446 9	44,846 9	70,246 9	95,646	121,046 9	146,446 9	171,846 9	197,246 9	222,646 9	248,046 9	273,446 9	298,846 9
25/ 32	0,781 25	19,843 8	45,243 8	70,643 8	96,043	121,443 8	146,843 8	172,243 8	197,643 8	223,043 8	248,443 8	273,843 8	299,243 8
51/ 64	0,796 875	20,240 6	45,640 6	70,040 6	96,440	121,840 6	147,240 6	172,640 6	198,040 6	223,440 6	248,840 6	274,240 6	299,640 6
13/ 16	0,812 5	20,637 5	46,037 5	71,437 5	96,837	122,237 5	147,637 5	173,037 5	198,437 5	223,837 5	249,237 5	274,637 5	300,037 5
53/ 64	0,828 125	21,034 4	46,434 4	71,834 4	97,234	122,634 4	148,034 4	173,434 4	198,834 4	224,234 4	249,634 4	275,034 4	300,434 4
27/ 32	0,843 75	21,431 2	46,831 2	72,231 2	97,631	123,031 2	148,431 2	173,831 2	199,231 2	224,631 2	250,031 2	275,431 2	300,831 2
55/ 64	0,859 375	21,828 1	47,228 1	72,628 1	98,028	123,428 1	148,828 1	174,228 1	199,628 1	225,028 1	250,428 1	275,828 1	301,228 1
7/ 8	0,875	22,225 0	47,625 0	73,025 0	98,425	123,825 0	149,225 0	174,625 0	200,025 0	225,425 0	250,825 0	276,225 0	301,625 0
57/ 64	0,890 625	22,621 9	48,021 9	73,421 9	98,821	124,221 9	149,621 9	175,021 9	200,421 9	225,821 9	251,221 9	276,621 9	302,021 9
29/ 32	0,906 25	23,018 8	48,418 8	73,818 8	99,218	124,618 8	150,018 8	175,418 8	200,818 8	226,218 8	251,618 8	277,018 8	302,418 8
59/ 64	0,921 875	23,415 6	48,815 6	74,215 6	99,615	125,015 6	150,415 6	175,815 6	201,215 6	226,615 6	252,015 6	277,415 6	302,815 6
15/ 16	0,937 5	23,812 5	49,212 5	74,612 5	100,012	125,412 5	150,812 5	176,212 5	201,612 5	227,012 5	252,412 5	277,812 5	303,212 5
61/ 64	0,953 125	24,209 4	49,609 4	75,009 4	100,409	125,809 4	151,209 4	176,609 4	202,009 4	227,409 4	252,809 4	278,209 4	303,609 4
31/ 32	0,968 75	24,606 2	50,006 2	75,406 2	100,806	126,206 2	151,606 2	177,006 2	202,406 2	227,806 2	253,206 2	278,606 2	304,006 2
63/ 64	0,984 375	25,003 1	50,40										



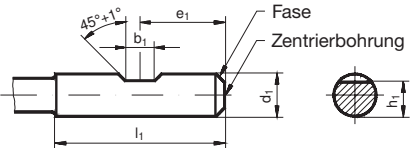
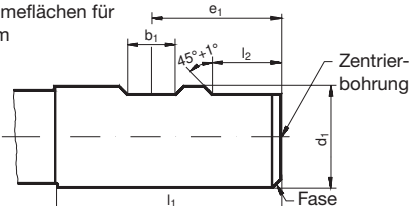
# HARTNER

## Maße für Zylinderschäfte aus Schnellstahl nach DIN 1835 (Auszug)

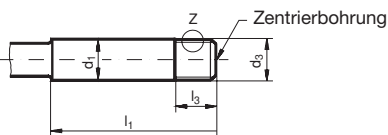
### Form A, glatt

Maße in mm	$d_1$ h8	$l_1$ +2 0	$d_1$ h8	$l_1$ +2 0	$d_1$ h8	$l_1$ +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		

### Form B, mit seitlicher Mitnahmefläche

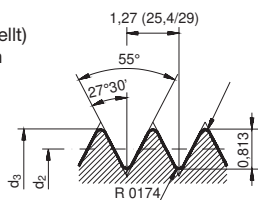
Maße in mm	$d_1$ h6	$b_1$ +0,05 0	$e_1$ 0 -1	$h_1$ h13	$l_1$ +2 0	$l_2$ +1 0	Zentrierbohrung Form R DIN 332 Teil 1
mit <b>einer</b> Mitnahmefläche für $d_1 = 6 \dots 20$ mm	6	4,2	18	4,8	36	-	1,6x2,5
	8	5,5	18	6,6	36	-	1,6x3,35
	10	7	20	8,4	40	-	1,6x3,35
	12	8	22,5	10,4	45	-	1,6x3,35
	16	10	24	14,2	48	-	2,0x4,25
	20	11	25	18,2	50	-	2,5x5,3
mit <b>zwei</b> Mitnahmeflächen für $d_1 = 25 \dots 63$ 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

### Form D, mit Anzugsgewinde

Maße in mm	$d_1$ h8	$d_3$ Grenz- abmaße	$d_2$ Grenz- abmaße	$l_1$ +2 0	$l_3$ +2 0	Zentrierbohrung Form R DIN 332 Teil 1		
	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

#### Einzelheit Z

(im Schnitt dargestellt)  
Gewindeprofil nach  
DIN ISO 228 Teil 1







## Maße für Zylinderschäfte aus Hartmetall nach DIN 6535 (Auszug)

### Form HA, glatt

Maße in 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		

### Form HB, mit seitlicher Mitnahmefläche

Maße in mm	$d_1$ h6	$b_1$ $+0,05$ 0	$e_1$ 0 -1	$h_1$ h11	$l_1$ $+2$ 0	$l_2$ $+1$ 0
mit <b>einer</b> Mitnahmefläche für $d_1 = 6$ bis 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	-
mit <b>zwei</b> Mitnahmeflächen für $d_1 = 25$ und 32 mm	25	12	32	23	56	17
	32	14	36	30	60	19

### Form HE, mit geneigter Spannfläche ohne Kühlkanäle\*

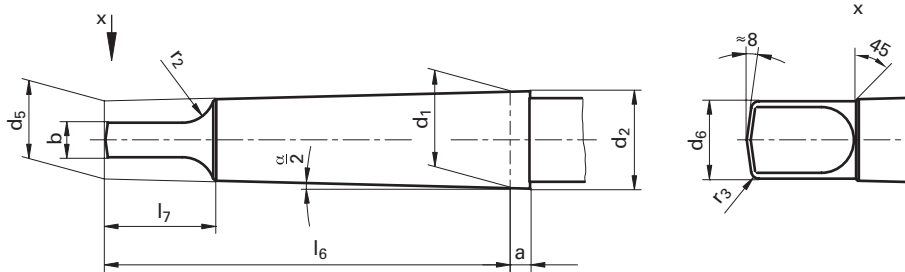
\* Ausführung: Zylinderschäfte nach DIN 6535 werden ohne oder mit Kühlkanälen ausgeführt. Anwendung der Ausführung für unterschiedliche Werkzeuge sowie Maßangaben und Bezeichnung für die Lage der Kühlkanäle sind in den entsprechenden Maßnormen enthalten.

	$d_1$ h6	$(b_2)$ ≈	$(b_1)$	$h_2$ h13	$(h_1)$	$l_1$ $+2$ 0	$l_2$ 0 -1	$l_3$ Nenn- maß	$r_2$ min.
für $d_1 = 6$ bis 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
für $d_1 = 25$ und 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



## Maße für Kegelschäfte mit Austreibblappen nach DIN 228 Form B

Schaft nach DIN 228 Form B Größe	a	Grenzabmaße	b h13	d <sub>1</sub>	d <sub>2</sub>	d <sub>5</sub>	d <sub>6</sub> max.	l <sub>6</sub> -1	l <sub>7</sub> max.	r <sub>2</sub> max.	r <sub>3</sub>	$\frac{\alpha}{2}$
<b>MK 0</b>	3,0	+1,2 0	3,9	9,045	9,2	6,1	6	56,5	10,5	4	1	1°29'27''
<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''
<b>MK 6</b>	8,0	+2,3 0	19,0	63,348	63,8	52,4	51,0	210,0	40	13	4	1°29'36''





## Kernlochdurchmesser für das Gewindeschneiden

### Metrische ISO-Regelgewinde DIN 13

Nenn-Ø	Steigung P	Kernloch-(Bohr-)Ø DIN 336 mm	Kern-Ø Muttergewinde 6H*	
			min. mm	max. mm
M 1	0,25	<b>0,75</b>	0,729	0,785
M 1,1	0,25	<b>0,85</b>	0,829	0,885
M 1,2	0,25	<b>0,95</b>	0,929	0,985
M 1,4	0,30	<b>1,10</b>	1,075	1,142
M 1,6	0,35	<b>1,25</b>	1,221	1,321
M 1,8	0,35	<b>1,45</b>	1,421	1,521
M 2	0,40	<b>1,60</b>	1,567	1,679
M 2,2	0,45	<b>1,75</b>	1,713	1,838
M 2,5	0,45	<b>2,05</b>	2,013	2,138
M 3	0,50	<b>2,50</b>	2,459	2,599
M 3,5	0,60	<b>2,90</b>	2,850	3,010
M 4	0,70	<b>3,30</b>	3,242	3,422
M 4,5	0,75	<b>3,70</b>	3,688	3,878
M 5	0,80	<b>4,20</b>	4,134	4,334
M 6	1,00	<b>5,00</b>	4,917	5,153
M 7	1,00	<b>6,00</b>	5,917	6,153
M 8	1,25	<b>6,80</b>	6,647	6,912
M 9	1,25	<b>7,80</b>	7,647	7,912
M 10	1,50	<b>8,50</b>	8,376	8,676
M 11	1,50	<b>9,50</b>	9,376	9,676
M 12	1,75	<b>10,20</b>	10,106	10,441
M 14	2,00	<b>12,00</b>	11,835	12,210
M 16	2,00	<b>14,00</b>	13,835	14,210
M 18	2,50	<b>15,50</b>	15,294	15,744
M 20	2,50	<b>17,50</b>	17,294	17,744
M 22	2,50	<b>19,50</b>	19,294	19,744
M 24	3,00	<b>21,00</b>	20,752	21,252
M 27	3,00	<b>24,00</b>	23,752	24,252
M 30	3,50	<b>26,50</b>	26,211	26,771
M 33	3,50	<b>29,50</b>	29,211	29,771
M 36	4,00	<b>32,00</b>	31,670	32,270
M 39	4,00	<b>35,00</b>	34,670	35,270
M 42	4,50	<b>37,50</b>	37,129	37,799
M 45	4,50	<b>40,50</b>	40,129	40,799
M 48	5,00	<b>43,00</b>	42,587	43,297
M 52	5,00	<b>47,00</b>	46,587	47,297
M 56	5,50	<b>50,50</b>	50,046	50,796

\* M 1,1 bis M 1,4 Kern-Ø Muttergewinde 5H

### Metrische ISO-Feingewinde DIN 13

Nenn-Ø	Steigung P	Kernloch-(Bohr-)Ø DIN 336 mm	Kern-Ø Muttergewinde 6H	
			min. mm	max. mm
M 2,5 x 0,35		<b>2,15</b>	2,121	2,221
M 3,0 x 0,35		<b>2,65</b>	2,621	2,721
M 3,5 x 0,35		<b>3,15</b>	3,121	3,221
M 4,0 x 0,50		<b>3,50</b>	3,459	3,599
M 4,5 x 0,50		<b>4,00</b>	3,959	4,099
M 5,0 x 0,50		<b>4,50</b>	4,459	4,599
M 5,5 x 0,50		<b>5,00</b>	4,959	5,099
M 6,0 x 0,75		<b>5,20</b>	5,188	5,378
M 7,0 x 0,75		<b>6,20</b>	6,188	6,378
M 8,0 x 0,50		<b>7,50</b>	7,459	7,599
M 8,0 x 0,75		<b>7,20</b>	7,188	7,378
M 8,0 x 1,00		<b>7,00</b>	6,917	7,153
M 9,0 x 0,75		<b>8,20</b>	8,188	8,378
M 9,0 x 1,00		<b>8,00</b>	7,917	8,153
M 10 x 0,75		<b>9,20</b>	9,188	9,378
M 10 x 1,00		<b>9,00</b>	8,917	9,153
M 10 x 1,25		<b>8,80</b>	8,647	8,912
M 11 x 0,75		<b>10,20</b>	10,188	10,378
M 11 x 1,00		<b>10,00</b>	9,917	10,153
M 12 x 1,00		<b>11,00</b>	10,917	11,153
M 12 x 1,25		<b>10,80</b>	10,647	10,912
M 12 x 1,50		<b>10,50</b>	10,376	10,676
M 14 x 1,00		<b>13,00</b>	12,917	13,153
M 14 x 1,25		<b>12,80</b>	12,647	12,912
M 14 x 1,50		<b>12,50</b>	12,376	12,676
M 15 x 1,00		<b>14,00</b>	13,917	14,153
M 15 x 1,50		<b>13,50</b>	13,376	13,676
M 16 x 1,00		<b>15,00</b>	14,917	15,153
M 16 x 1,25		<b>14,80</b>	14,647	14,912
M 16 x 1,50		<b>14,50</b>	14,376	14,676
M 17 x 1,00		<b>16,00</b>	15,917	16,153
M 17 x 1,50		<b>15,50</b>	15,376	15,676
M 18 x 1,00		<b>17,00</b>	16,917	17,153
M 18 x 1,50		<b>16,50</b>	16,376	16,676
M 20 x 1,00		<b>19,00</b>	18,917	19,153
M 20 x 1,50		<b>18,50</b>	18,376	18,676
M 20 x 2,00		<b>18,00</b>	17,835	18,210
M 22 x 1,00		<b>21,00</b>	20,917	21,153

### UNC-Gewinde ASME B1.1

Nenn-Ø	Gang	Kernloch-(Bohr-)Ø DIN 336 mm	Kern-Ø Muttergewinde 2B	
			min. mm	max. mm
Nr. 1 - 64		<b>1,55</b>	1,425	1,580
Nr. 2 - 56		<b>1,85</b>	1,694	1,872
Nr. 3 - 48		<b>2,10</b>	1,941	2,146
Nr. 4 - 40		<b>2,35</b>	2,157	2,385
Nr. 5 - 40		<b>2,65</b>	2,487	2,698
Nr. 6 - 32		<b>2,85</b>	2,642	2,896
Nr. 8 - 32		<b>3,50</b>	3,302	3,531
Nr. 10 - 24		<b>3,90</b>	3,683	3,937
Nr. 12 - 24		<b>4,50</b>	4,343	4,597
1/4 - 20		<b>5,10</b>	4,978	5,258
5/16 - 18		<b>6,60</b>	6,401	6,731
3/8 - 16		<b>8,00</b>	7,798	8,153
7/16 - 14		<b>9,40</b>	9,144	9,550
1/2 - 13		<b>10,80</b>	10,592	11,024
9/16 - 12		<b>12,20</b>	11,989	12,446
5/8 - 11		<b>13,50</b>	13,386	13,868
3/4 - 10		<b>16,50</b>	16,307	16,840
7/8 - 9		<b>19,50</b>	19,177	19,761
1 - 8		<b>22,25</b>	21,971	22,606
1 1/8 - 7		<b>25,00</b>	24,638	25,349
1 1/4 - 7		<b>28,00</b>	27,813	28,524
1 3/8 - 6		<b>30,75</b>	30,353	31,115
1 1/2 - 6		<b>34,00</b>	33,528	34,290
1 3/4 - 5		<b>39,50</b>	38,938	39,802
2 - 4,5		<b>45,00</b>	44,679	45,593

### MJ-Gewinde DIN ISO 5855

Nenn-Ø	Steigung P	Kernloch-(Bohr-)Ø mm	Kern-Ø Muttergewinde 5H*	
			min. mm	max. mm
MJ 3 x 0,50		<b>2,60</b>	2,513	2,653
MJ 4 x 0,70		<b>3,40</b>	3,318	3,498
MJ 5 x 0,80		<b>4,30</b>	4,221	4,421
MJ 6 x 0,50		<b>5,55</b>	5,513	5,625
MJ 6 x 0,75		<b>5,35</b>	5,269	5,419
MJ 6 x 1,00		<b>5,10</b>	5,026	5,216
MJ 8 x 0,50		<b>7,55</b>	7,513	7,625
MJ 8 x 0,75		<b>7,35</b>	7,269	7,419
MJ 8 x 1,00		<b>7,10</b>	7,026	7,216
MJ 8 x 1,25		<b>6,90</b>	6,782	6,994
MJ 10 x 1,00		<b>9,10</b>	9,026	9,216
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

### UNJC-Gewinde ISO 3161

Nenn-Ø	Gang	Kernloch-(Bohr-)Ø mm	Kern-Ø Muttergewinde 3B	
			min. mm	max. mm
Nr. 6 - 32		<b>2,85</b>	2,733	2,939
Nr. 8 - 32		<b>3,55</b>	3,393	3,599
Nr. 10 - 24		<b>4,00</b>	3,795	4,064
Nr. 12 - 24		<b>4,60</b>	4,455	4,704
1/4 - 20		<b>5,30</b>	5,113	5,387
5/16 - 18		<b>6,75</b>	6,563	6,833
3/8 - 16		<b>8,20</b>	7,978	8,255
7/16 - 14		<b>9,60</b>	9,346	9,639
1/2 - 13		<b>11,00</b>	10,798	11,095
9/16 - 12		<b>12,40</b>	12,228	12,482
5/8 - 11		<b>13,80</b>	13,627	13,904

\* MJ 3 x 0,50 bis MJ 5 x 0,80 Kern-Ø Muttergewinde 6H

### UNJF-Gewinde ISO 3161

Nenn-Ø	Gang	Kernloch-(Bohr-)Ø mm	Kern-Ø Muttergewinde 3B	
			min. mm	max. mm
Nr. 6 - 40		<b>3,00</b>	2,888	3,053
Nr. 8 - 36		<b>3,60</b>	3,480	3,663
Nr. 10 - 32		<b>4,20</b>	4,054	4,255
Nr. 12 - 28		<b>4,75</b>	4,602	4,816
1/4 - 28		<b>5,60</b>	5,466	5,662
5/16 - 24		<b>7,00</b>	6,906	7,109
3/8 - 24		<b>8,60</b>	8,494	8,679
7/16 - 20		<b>10,00</b>	9,876	10,084
1/2 - 20		<b>11,60</b>	11,463	11,661
9/16 - 18		<b>13,00</b>	12,913	13,122
5/8 - 18		<b>14,60</b>	14,501	14,702



## Kernlochdurchmesser für das Gewindeschneiden

UNF-Gewinde ASME B1.1					BSW-(Whitworth)-Gewinde BS84					(Whitworth-) Rohrgewinde (nach DIN-ISO 228-1)					Stahlpanzerrohr-Gewinde nach DIN 40430				
Nenn-Ø	Gang	Kernloch-(Bohr-)Ø DIN 336 mm	Kern-Ø Muttergewinde 2B		Nenn-Ø	Gang	Kernloch-(Bohr-)Ø mm	Kern-Ø Muttergewinde		Nenn-Ø	Gang	Kernloch-(Bohr-)Ø DIN 336 mm	Kern-Ø Muttergewinde		Nenn-Ø	Gang	Kernloch-(Bohr-)Ø mm	Kern-Ø Muttergewinde	
			min. mm	max. mm				min. mm	max. mm				min. mm	max. mm				min. mm	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

#### Amerik. kegeliges Rohrgewinde Kegel 1:16

Ausführung A (möglichst vermeiden)	Ausführung B	Nenn-Ø	Gang pro inch	Kernloch-Ø zylindr. (A) d <sub>1</sub>	Kernloch-Ø konisch (B) D <sub>1</sub>	Einschneidtiefe ET mm	Bohrtiefe 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

### EG-Gewinde Metr./Metr. Fein (EG M 14 x 1,25) für Gewindedrahteinsätze DIN 8140

Nenn-Ø	x Steigung P	Kernloch-(Bohr-)Ø mm	Kern-Ø Muttergewinde	
			min. mm	max. mm
EG M 4	0,70	<b>4,20</b>	4,152	4,292
EG M 5	0,80	<b>5,25</b>	5,174	5,334
EG M 6	1,00	<b>6,30</b>	6,217	6,407
EG M 8	1,25	<b>8,40</b>	8,271	8,483
EG M10	1,50	<b>10,50</b>	10,324	10,560
EG M12	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	2,00	<b>16,50</b>	16,433	16,733

### EG UNC (UNC-STI) Gewinde für Gewindedrahteinsätze ASME B18.29.1

Nenn-Ø	Gang pro inch	Kernloch-(Bohr-)Ø mm	Kern-Ø Muttergewinde	
			min. mm	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

### EG UNF (UNF-STI) Gewinde für Gewindedrahteinsätze ASME B18.29.1

Nenn-Ø	Gang pro inch	Kernloch-(Bohr-)Ø mm	Kern-Ø Muttergewinde	
			min. mm	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



## Kernlochdurchmesser für das Gewindeformen

Metrische ISO-Gewinde DIN 13						Metrische ISO-Feingewinde DIN 13														
Nenn- Ø	Steigung P	Bohr- Ø	Bohr-Ø		Kern-Ø Muttergewinde 7H*		Nenn-x Ø	Steigung P	Bohr- Ø	Bohr-Ø		Kern-Ø Muttergewinde 7H*		Nenn-x Ø	Steigung P	Bohr- Ø	Bohr-Ø		Kern-Ø Muttergewinde 7H*	
			min. mm	max. mm	min. mm	max. mm				min. mm	max. mm	min. mm	max. mm				min. mm	max. mm	min. mm	max. mm
M 1	0,25	<b>0,75</b>	0,729	0,785			M 2,5 x 0,35	<b>2,35</b>	2,35	2,38	2,121	2,221	M 20 x 1,50	<b>19,30</b>	19,26	19,38	18,376	19,751		
M 1,1	0,25	<b>0,85</b>	0,829	0,885			M 3 x 0,35	<b>2,85</b>	2,85	2,88	2,621	2,721	M 24 x 1,00	<b>23,55</b>	23,52	23,62	22,917	23,217		
M 1,2	0,25	<b>0,95</b>	0,929	0,985			M 4 x 0,35	<b>3,85</b>	3,85	3,88	3,621	3,721	M 24 x 1,50	<b>23,30</b>	23,26	23,38	22,376	22,751		
M 1,4	0,30	<b>1,10</b>	1,075	1,142			M 4 x 0,50	<b>3,80</b>	3,78	3,83	3,459	3,639	M 24 x 2,00	<b>23,10</b>	23,05	23,20	21,835	22,310		
M 1,6	0,35	<b>1,25</b>	1,221	1,321			M 5 x 0,50	<b>4,80</b>	4,78	4,83	4,459	4,639	M 27 x 1,50	<b>26,30</b>	26,26	26,38	25,376	25,751		
M 1,8	0,35	<b>1,45</b>	1,421	1,521			M 5,5 x 0,50	<b>5,30</b>	5,28	5,33	4,959	5,139	M 30 x 1,50	<b>29,30</b>	29,26	29,38	28,376	28,751		
M 2	0,40	<b>1,85</b>	1,84	1,88	1,567	1,679	M 6 x 0,75	<b>5,65</b>	5,62	5,70	5,188	5,424	M 33 x 1,50	<b>32,30</b>	32,26	32,38	31,376	31,751		
M 2,2	0,45	<b>2,00</b>	2,01	2,05	1,713	1,838	M 7 x 0,75	<b>6,65</b>	6,62	6,70	6,188	6,424	M 36 x 1,50	<b>35,30</b>	35,26	35,38	34,376	34,751		
M 2,5	0,45	<b>2,30</b>	2,28	2,32	2,013	2,138	M 8 x 0,75	<b>7,65</b>	7,62	7,70	7,188	7,424	M 39 x 1,50	<b>38,30</b>	38,26	38,38	37,376	37,751		
M 3	0,50	<b>2,80</b>	2,78	2,85	2,459	2,639	M 8 x 1,00	<b>7,55</b>	7,52	7,62	6,917	7,217	M 42 x 1,50	<b>41,30</b>	41,26	41,38	42,376	42,751		
M 3,5	0,60	<b>3,25</b>	3,23	3,30	2,850	3,050	M 9 x 0,75	<b>8,65</b>	8,62	8,70	8,188	8,424								
M 4	0,70	<b>3,70</b>	3,68	3,76	3,242	3,466	M 9 x 1,00	<b>8,55</b>	8,52	8,62	7,917	8,217								
M 4,5	0,75	<b>4,20</b>					M 10 x 0,75	<b>9,65</b>	9,62	9,70	9,188	9,424								
M 5	0,80	<b>4,65</b>	4,62	4,71	4,134	4,384	M 10 x 1,00	<b>9,55</b>	9,52	9,62	8,917	9,217								
M 6	1,00	<b>5,55</b>	5,52	5,62	4,917	5,217	M 10 x 1,25	<b>9,40</b>	9,36	9,47	8,647	8,982								
M 7	1,00	<b>6,55</b>	6,52	6,62	5,917	6,217	M 11 x 0,75	<b>10,65</b>	10,62	10,70	10,188	10,424								
M 8	1,25	<b>7,40</b>	7,36	7,47	6,647	6,982	M 11 x 1,00	<b>10,55</b>	10,52	10,62	9,917	10,217								
M 9	1,25	<b>8,40</b>	8,36	8,47	7,647	7,982	M 12 x 1,00	<b>11,55</b>	11,52	11,62	10,917	11,217								
M 10	1,50	<b>9,30</b>	9,26	9,38	8,376	8,751	M 12 x 1,25	<b>11,40</b>	11,36	11,47	10,647	10,982								
M 11	1,50	<b>10,30</b>	10,26	10,38	9,376	9,751	M 12 x 1,50	<b>11,30</b>	11,26	11,38	10,376	10,751								
M 12	1,75	<b>11,20</b>	11,15	11,29	10,106	10,531	M 14 x 1,00	<b>13,55</b>	13,52	13,62	12,917	13,217								
M 14	2,00	<b>13,10</b>	13,05	13,20	11,835	12,310	M 14 x 1,25	<b>13,40</b>	13,36	13,47	12,647	12,982								
M 16	2,00	<b>15,10</b>	15,05	15,20	13,835	14,310	M 14 x 1,50	<b>13,30</b>	13,26	13,38	12,376	12,751								
M 18	2,50	<b>16,90</b>	16,83	17,02	15,294	15,854	M 15 x 1,00	<b>14,55</b>	14,52	14,62	13,917	14,217								
M 20	2,50	<b>18,90</b>	18,83	19,02	17,294	17,854	M 15 x 1,50	<b>14,30</b>	14,26	14,38	13,376	13,751								
M 22	2,50	<b>20,90</b>	20,83	21,02	19,294	19,854	M 16 x 1,00	<b>15,55</b>	15,52	15,62	14,917	15,217								
M 24	3,00	<b>22,70</b>	22,62	22,80	20,752	21,382	M 16 x 1,50	<b>15,30</b>	15,26	15,38	14,376	14,751								
M 27	3,00	<b>25,70</b>	25,62	25,80	23,752	24,382	M 17 x 1,00	<b>16,55</b>	16,52	16,62	15,917	16,217								
M 30	3,50	<b>28,50</b>	28,40	28,60	26,211	26,921	M 17 x 1,50	<b>16,30</b>	16,26	16,38	15,376	15,751								
M 33	3,50	<b>31,50</b>	31,40	31,60	29,211	29,921	M 18 x 1,00	<b>17,55</b>	17,52	17,62	16,917	17,217								
M 36	4,00	<b>34,30</b>	34,17	34,40	31,670	32,420	M 18 x 1,50	<b>17,30</b>	17,26	17,38	16,376	16,751								
M 39	4,00	<b>37,30</b>	37,17	37,40	34,670	35,420	M 18 x 2,00	<b>17,10</b>	17,05	17,20	15,835	16,310								
M 42	4,50	<b>40,10</b>	39,95	40,20	37,129	37,979	M 20 x 1,00	<b>19,55</b>	19,52	19,62	18,917	19,217								

\* M 2 bis M 2,5 Kern-Ø Muttergewinde 6H

\* M 2,5 x 0,35 bis M 4 x 0,35 Kern-Ø Muttergewinde 6H

### Kerndurchmesser-Toleranzfeld beim Gewindeformen (nach DIN 13, Teil 50)

Aus Festigkeitsgründen ist es nicht erforderlich, die Kerndurchmessertoleranzen der Toleranzklasse 6H einzuhalten; die Toleranzklasse 7H genügt dem Anspruch, dass die Flankenüberdeckung von Bolzen- und Muttergewinde 0,32 x P nicht unterschreiten soll. Außerdem haben geformte Gewinde wegen des nicht unterbrochenen Faserverlaufs und der erfolgten Kaltverfestigung im Regelfall eine höhere Festigkeit als geschnittene Gewinde.



## Kernlochdurchmesser für das Gewindeformen

UNC-Gewinde ASME B1.1						
Nenn- Ø	Gang	Bohr- Ø		Kern-Ø Muttergewinde 2B		
		pro inch	mm	min. mm	max. mm	min. mm
Nr. 1 - 64		<b>1,68</b>	1,67	1,70	1,425	1,580
Nr. 2 - 56		<b>1,98</b>	1,97	2,01	1,694	1,872
Nr. 3 - 48		<b>2,28</b>	2,27	2,32	1,941	2,146
Nr. 4 - 40		<b>2,55</b>	2,54	2,59	2,157	2,385
Nr. 5 - 40		<b>2,90</b>	2,89	2,94	2,487	2,698
Nr. 6 - 32		<b>3,15</b>	3,14	3,19	2,642	2,896
Nr. 8 - 32		<b>3,80</b>	3,78	3,82	3,302	3,531
Nr. 10 - 24		<b>4,35</b>	4,33	4,39	3,683	3,937
Nr. 12 - 24		<b>5,00</b>	4,97	5,03	4,343	4,597
1/4 - 20		<b>5,75</b>	5,72	5,80	4,978	5,258
5/16 - 18		<b>7,30</b>	7,26	7,37	6,401	6,731
3/8 - 16		<b>8,80</b>	8,77	8,88	7,798	8,153
7/16 - 14		<b>10,30</b>	10,27	10,37	9,144	9,550
1/2 - 13		<b>11,80</b>	11,77	11,88	10,592	11,024
9/16 - 12		<b>13,30</b>	13,28	13,39	11,989	12,446
5/8 - 11		<b>14,80</b>	14,78	14,90	13,386	13,868
3/4 - 10		<b>17,90</b>	17,85	17,97	16,307	16,840
7/8 - 9		<b>21,00</b>	20,95	21,10	19,177	19,761
1 - 8		<b>24,00</b>	23,95	24,12	21,971	22,606

UNF-Gewinde ASME B1.1						
Nenn- Ø	Gang	Bohr- Ø		Kern-Ø Muttergewinde 2B		
		pro inch	mm	min. mm	max. mm	min. mm
Nr. 1 - 72		<b>1,70</b>	1,69	1,72	1,473	1,610
Nr. 2 - 64		<b>2,00</b>	1,99	2,03	1,755	1,910
Nr. 3 - 56		<b>2,30</b>	2,29	2,34	2,024	2,197
Nr. 4 - 48		<b>2,60</b>	2,59	2,63	2,271	2,459
Nr. 5 - 44		<b>2,90</b>	2,89	2,93	2,550	2,741
Nr. 6 - 40		<b>3,20</b>	3,19	3,24	2,819	3,023
Nr. 8 - 36		<b>3,85</b>	3,83	3,88	3,404	3,607
Nr. 10 - 32		<b>4,45</b>	4,43	4,49	3,962	4,166
Nr. 12 - 28		<b>5,10</b>	5,07	5,13	4,496	4,724
1/4 - 28		<b>5,95</b>	5,92	5,99	5,359	5,588
5/16 - 24		<b>7,45</b>	7,42	7,50	6,782	7,036
3/8 - 24		<b>9,05</b>	9,02	9,10	8,838	8,636
7/16 - 20		<b>10,55</b>	10,48	10,58	9,728	10,033
1/2 - 20		<b>12,10</b>	12,08	12,18	11,328	11,608
9/16 - 18		<b>13,65</b>	13,61	13,72	12,751	13,081
5/8 - 18		<b>15,25</b>	15,21	15,32	14,351	14,681
3/4 - 16		<b>18,35</b>	18,30	18,41	17,323	17,678
7/8 - 14		<b>21,40</b>	21,35	21,49	20,269	20,650
1 - 12		<b>24,45</b>	24,40	24,54	23,114	23,571

(Whitworth-) Rohrgewinde G DIN EN ISO 228-1						
Nenn- Ø	Gang	Bohr- Ø		Kern-Ø Muttergewinde		
		pro inch	mm	min. mm	max. mm	min. mm
G 1/16 28		<b>7,30</b>	7,28	7,35	6,561	6,843
G 1/8 28		<b>9,30</b>	9,28	9,35	8,566	8,848
G 1/4 19		<b>12,50</b>	12,48	12,55	11,445	11,890
G 3/8 19		<b>16,00</b>	15,98	16,05	14,950	15,395
G 1/2 14		<b>20,00</b>	19,98	20,12	18,631	19,172
G 5/8 14		<b>22,00</b>	21,98	22,12	20,587	21,128
G 3/4 14		<b>25,50</b>	25,48	25,62	24,117	24,658
G 7/8 14		<b>29,25</b>	29,23	29,37	27,877	28,418
G 1 11		<b>32,00</b>	31,98	32,15	30,291	30,931
G 1 1/4 11		<b>40,75</b>	40,70	40,85	38,952	39,592



## Die neuen Werkstoff-Kurznamen (Auswahl)

Werkstoff-Nr.	Kurzname alt	Kurzname neu	Werkstoff-Nr.	Kurzname alt	Kurzname neu	Werkstoff-Nr.	Kurzname alt	Kurzname neu	Werkstoff-Nr.	Kurzname alt	Kurzname neu
0.6010	GG10	EN-GJL-100	1.0728	60 S 20	-	1.4436	X5CrNiMo17133	X3CrNiMo17-13-3	1.7043	-	38Cr4
0.6020	GG20	EN-GJL-200	1.0736	9 SMn 36	11SMn37	1.4438	X2CrNiMo18164	X2CrNiMo18-15-4	1.7147	20 MnCr 5	20MnCr5
0.6025	GG25	EN-GJL-250	1.0737	9 SMnPb 36	11SMnPb37	1.4460	X4CrNiMo2752	X3CrNiMoN27-5-2	1.7149	20 MnCrS 5	20MnCrS5
0.6035	GG35	EN-GJL-350	1.0756	35 SPb 20	35SPb20	1.4462	X2CrNiMoN2253	X2CrNiMoN22-5-3	1.7176	55 Cr 3	55Cr3
0.7050	GGG50	EN-GJS-500-7	1.0757	45 SPb 20	46SPb20	1.4509	X6CrTiNb 18	X2CrTiNb18	1.7182	27 MnCrB 5 2	27MnCrB5-2
0.7070	GGG70	EN-GJS-700-2	1.0760	-	38SMn26	1.4510	X6CrTi 17	X3CrTi17	1.7185	33 MnCrB 5 2	33MnCrB5-2
0.8035	GTW35	EN-GJMW-350-4	1.0761	-	38SMnPb26	1.4511	X6CrNb 17	X3CrNb17	1.7189	39 MnCrB 6 2	39MnCrB6-2
0.8155	GTS55	EN-GJMB-550-4	1.0762	-	44SMn28	1.4512	X6CrTi 12	X2CrTi12	1.7213	25 CrMoS 4	25CrMoS4
0.8170	GTS70	EN-GJMB-700-2	1.0763	-	44SMnPb28	1.4520	X1CrTi 15	X2CrTi17	1.7215	25 CrMo 4	25CrMo4
1.0022	St 01Z	-	1.0873	-	DC06 [Fe P06]	1.4521	X2CrMoTi 18 2	X2CrMoTi18-2	1.7219	-	26CrMo4-2
1.0035	St 33	S185	1.1103	ESTe 255	S255NL1	1.4522	X2CrMoNb 18 2	X2CrMoNb18-2	1.7220	34 CrMo 4	34CrMo4
1.0039	St 37 -2	S235JRH	1.1105	ESTe 315	S315NL1	1.4532	X7CrNiMoAl 15 7	X8CrNiMoAl15-7-2	1.7225	42 CrMo 4	42CrMo4
1.0044	St 44 -2	S275JR	1.1121	Ck 10	C10E	1.4541	X6CrNiTi18 10	X6CrNiTi18-10	1.7226	34 CrMoS 4	34CrMoS4
1.0050	St 50 -2	E295	1.1141	Ck15	C15E	1.4542	X5CrNiCuNb 17 4	X5CrNiCuNb16-4	1.7227	42 CrMoS 4	42CrMoS4
1.0060	St 60 -2	E335	1.1151	Ck 22	C22E	1.4550	X6CrNiNb 18 10	X6CrNiNb18-10	1.7228	50 CrMo 4	50CrMo4
1.0070	St 70 -2	E360	1.1158	Ck 25	C25E	1.4558	X2NiCrAlTi 32 20	X2NiCrAlTi32-20	1.7264	20 CrMo 5	20CrMo5
1.0114	St 37 -3U	S235J0	1.1170	28 Mn 6	28Mn6	1.4567	X3CrNiCu 18 9 X	X3CrNiCu18-9-4	1.7321	20 MoCr 4	20MoCr4
1.0226	St 02Z	DX51D	1.1178	Ck 30	C30E	1.4568	X7CrNiAl 17 7	X7CrNiAl17-7	1.7323	20 MoCrS 4	20MoCrS4
1.0242	StE 250 -2Z	S250GD	1.1181	Ck 35	C35E	1.4571	-	X6CrNiMoTi17-12-2	1.7333	22 CrMoS 3 5	22CrMoS3-5
1.0244	StE 280 -2Z	S280GD	1.1186	Ck 40	C40E	1.4577	X3CrNiMoTi 25 25	X3CrNiMoTi25-25	1.7335	13 CrMo 4 4	13CrMo4-5
1.0250	StE 320 -3Z	S320GD	1.1191	Ck 45	C45E	1.4592	X1CrMoTi 29 4	X2CrMoTi29-4	1.7362	12 CrMo 19 5	12CrMo19-5
1.0301	C 10	-	1.1203	Ck 55	C55E	1.4713	X10CrAl 7	X10CrAlSi7	1.7380	10 CrMo 9 10	10CrMo9-10
1.0302	C 10 Pb	-	1.1206	Ck 50	C50E	1.4724	X10CrAl 13	X10CrAlSi13	1.7383	-	11CrMo9-10
1.0306	St 06 Z	DX54D	1.1221	Ck 60	C60E	1.4742	X10CrAl 18	X10CrAlSi18	1.7779	-	20CrMoV13-5-5
1.0312	St 15	DC05 [Fe P05]	1.1241	Cm 50	C50R	1.4762	X10CrAl 24	X10CrAlSi25	1.8159	50 CrV 4	51CrV4
1.0319	RRStE 210.7	L210GA	1.1750	C 75 W	C75W	1.4821	X20CrNiSi 25 4	X20CrNiSi25-4	1.8504	34 CrAl 6	34CrAl6
1.0322	-	DX56D	1.2067	102 Cr 6	102Cr6	1.4828	X15CrNiSi 20 12	X15CrNiSi20-12	1.8519	31 CrMoV 9	31CrMoV9
1.0330	St 12 [St 2]	DC01 [Fe P01]	1.2080	-	X210Cr12	1.4833	X7CrNi 23 14	X7CrNi23-12	1.8550	34 CrAlNi 7	34CrAlNi7
1.0333	USt 13	-	1.2083	-	X42Cr13	1.4841	X15CrNiSi 25 20	X15CrNiSi25-21	1.8807	13 MnNiMoV 5 4	13MnNiMoV5-4
1.0338	St 14 [St 4]	DC04 [Fe P04]	1.2419	-	105WCr6	1.4845	X12CrNi 25 21	X12CrNi25-21	1.8812	18 MnMoV 5 2	18MnMoV5-2
1.0345	H 1	P235GH	1.2767	-	X45NiCrMo4	1.4864	X12NiCrSi 36 16	X12NiCrSi35-16	1.8815	18 MnMoV 6 3	18MnMoV6-3
1.0347	RRSt 13 [RRSt 3]	DC03 [Fe P03]	1.3243	S6-5-2-5	S 6-5-2-5	1.4878	X12CrNiTi 18 9	X10CrNiTi18-10	1.8821	StE 355 TM	P355M
1.0348	UH 1	P195GH	1.3343	S6-5-2	S 6-5-2	1.4903	-	X10CrMoVNb9-1	1.8824	StE 420 TM	P420M
1.0350	St 03Z	DX52D	1.3344	S6-5-3	S 6-5-3	1.5026	55 Si 7	55Si7	1.8826	StE 460 TM	P460M
1.0355	St 05Z	DX53D	1.4000	X6Cr 13	X6Cr13	1.5131	50 MnSi 4	50MnSi4	1.8828	ESTe 420 TM	P420ML2
1.0356	TTSt 35 N	P215NL	1.4002	X6CrAl 13	X6CrAl13	1.5415	15 Mo 3	16Mo3	1.8831	ESTe 460 TM	P460ML2
1.0358	St 05 Z	-	1.4003	X2Cr 11	X2CrNi12	1.5530	21 MnB 5	20MnB5	1.8832	TSSt 355 TM	P355ML1
1.0401	C 15	-	1.4005	-	X12CrS13	1.5531	30 MnB 5	30MnB5	1.8835	TSSt 420 TM	P420ML1
1.0402	C 22	C22	1.4006	X10Cr 13	X12Cr13	1.5532	38 MnB 5	38MnB5	1.8837	TSSt 460 TM	P460ML1
1.0403	C 15 Pb	-	1.4016	X6Cr 17	X6Cr17	1.5637	10 Ni 14	12Ni14	1.8879	StE ...	P690Q
1.0406	C 25	C25	1.4021	X20Cr 13	X20Cr13	1.5662	-	X11CrMo5+1	1.8880	WStE ...	P690QH
1.0419	St 52.0	L355	1.4028	X30Cr 13	X30Cr13	1.5680	-	X12Ni5	1.8881	TSSt ...	P690QL1
1.0424	St 45.8 (ersetzt)	P265	1.4031	X38Cr 13	X38Cr13	1.5710	36 NiCr 6	36NiCr6	1.8882	10 MnTi 3	10MnTi3
1.0424	St 42.8 (ersetzt)	P265	1.4034	X46Cr 13	X46Cr13	1.5715	-	16NiCrS4	1.8888	ESTe ...	P690QL2
1.0425	H2	P265GH	1.4037	X65Cr13	X65Cr13	1.5752	14 NiCr 14	15NiCr13	1.8900	StE 380	S380N
1.0429	StE 290.7 TM	L290MB	1.4057	X20CrNi 17 2	X17CrNi16-2	1.6210	15 MnNi 6 3	15MnNi6-3	1.8901	StE 460	S460N
1.0457	StE 240.7	L245NB	1.4104	X12CrMoS 17	X14CrMoS17	1.6211	16 MnNi 6 3	16MnNi6-3	1.8902	StE 420	S420N
1.0459	RRStE 240.7	L245GA	1.4105	X4CrMoS 18	X6CrMoS17	1.6310	20 MnMoNi 5 5	20MnMoNi5-5	1.8903	TSSt 460	S460NL
1.0461	StE 255	S255N	1.4109	X65CrMo 14	X70CrMo15	1.6311	20 MnMoNi 4 5	20MnMoNi4-5	1.8905	StE 460	P460N
1.0473	19 Mn 6	P355GH	1.4110	X55CrMo 14	X55CrMo14	1.6341	11 NiMoV 5 3	11NiMoV5-3	1.8907	StE 500	S500N
1.0481	17 Mn 4	P295GH	1.4112	X90CrMoV 18	X90CrMoV18	1.6368	15 NiCuMoNb 5	15NiCuMoNb5	1.8910	TSSt 380	S380NL
1.0484	StE 290.7	L290NB	1.4113	X6CrMo 17 1	X6CrMo17-1	1.6511	36 CrNiMo 4	36CrNiMo4	1.8911	ESTe 380	S380NL1
1.0486	StE 285	P275N	1.4116	X45CrMoV 15	X50CrMoV15	1.6523	21 NiCrMo 2	21NiCrMo2-2	1.8912	TSSt 420	S420NL
1.0501	C 35	C35	1.4120	X20CrMo 13	X20CrMo13	1.6526	21 NiCrMoS 2	21NiCrMoS2-2	1.8913	ESTe 420	S420NL1
1.0503	C 45	C45	1.4122	X35CrMo 17	X39CrMo17-1	1.6580	30 CrNiMo 8	30CrNiMo8	1.8915	TSSt 460	P460NL1
1.0505	StE 315	P315N	1.4125	X105CrMo 17	X105CrMo17	1.6582	34 CrNiMo 6	34CrNiMo6	1.8917	WStE 500	S500NL
1.0511	C 40	C40	1.4301	X5CrNi 18 10	X5CrNi18-10	1.6587	17 CrNiMo 6	18CrNiMo7-6	1.8918	ESTe 460	P460NL2
1.0528	C 30	C30	1.4303	X5CrNi 18 12	X4CrNi18-12	1.7003	38 Cr 2	38Cr2	1.8919	ESTe 500	S500NL1
1.0529	StE 350 -3Z	S350GD	1.4305	X10CrNiS 18 9	X8CrNiS18-9	1.7006	46 Cr 2	46Cr2	1.8930	WStE 380	P380NH
1.0535	C 55	C55	1.4306	X2CrNi 19 11	X2CrNi19-11	1.7016	17 Cr 3	17Cr3	1.8932	WStE 420	P420NH
1.0539	StE 355N	S355NH	1.4310	X12CrNi 17 7	X10CrNi18-8	1.7023	38 CrS 2	38CrS2	1.8935	WStE 460	P460NH
1.0540	C 50	C50	1.4311	X2CrNiN 18 10	X2CrNiN18-10	1.7025	46 CrS 2	46CrS2	1.8937	StE 500	P500NH
1.0547	St 52 -3U	S355J0H	1.4313	X4CrNi 13 4	X3CrNiMo13-4	1.7030	28 Cr 4	28Cr4	1.8972	StE 415.7 TM	L415NB
1.0582	StE 360.7	L360NB	1.4318	X2CrNiN 18 7	X2CrNiN18-7	1.7033	34 Cr 4	34Cr4	1.8973	StE 415.7 TM	L415MB
1.0601	C 60	C60	1.4335	X1CrNi 25 21	X1CrNi25-21	1.7034	37 Cr 4	37Cr4	1.8975	StE 445.7 TM	L450MB
1.0710	15 S 10	-	1.4361	X1CrNiSi 18 15	X1CrNiSi18-15-4	1.7035	41 Cr 4	41Cr4	1.8977	StE 480.7 TM	L485MB
1.0715	9 SMn 28	11SMn30	1.4362	X2CrNiN 23 4	X2CrNiN23-4	1.7036	28 CrS 4	28CrS4	1.8978	StE 550.7 TM	L555MB
1.0718	9 SMnPb 28	11SMnPb30	1.4401	X5CrNiMo 17 122	X5CrNiMo17-12-2	1.7037	34 CrS 4	34CrS4			
1.0721	10 S 20	10S20	1.4404	X2CrNiMo 17 132	X2CrNiMo17-12-2	1.7038	37 CrS 4	37CrS4			
1.0722	10 S Pb 20	10SPb20	1.4410	X10CrNiMo 18 9	X2CrNiMoN25-7-4	1.7039	41 CrS 4	41CrS4			
1.0726	35 S 20	35S20	1.4418	X4CrNiMo 16 5	X4CrNiMo16-5-1	1.7131	16 MnCr 5	16MnCr5			
1.0727	45 S 20	46S20	1.4435	X2CrNiMo 18 143	X2CrNiMo18-14-3	1.7139	16 MnCrS 5	16MnCrS5			





# HARTNER

## Durchmessertoleranzen

### ISO-Abmaße

Die normale Herstellgenauigkeit für Spiralbohrer nach DIN 1414 entspricht dem Toleranzfeld h8. Für Spiralbohrer mit verengten Durchmessertoleranzen nach den Toleranzfeldern h7, h6 und h5 werden Preiszuschläge berechnet.

Durchmesserbereich mm	Abmaße mm (auf den Fasen, an den Schneidecken gemessen)				
	h8	h7	h6	h5	m7
von 1,0	0	0	0		
bis 3,0	-0,014	-0,010	-0,006	-0,004	
über 3,0	0	0	0	0	+0,016
bis 6,0	-0,018	-0,012	-0,008	-0,005	+0,004
über 6,0	0	0	0	0	+0,021
bis 10,0	-0,022	-0,015	-0,009	-0,006	+0,006
über 10,0	0	0	0	0	+0,025
bis 18,0	-0,027	-0,018	-0,011	-0,008	+0,007
über 18,0	0	0	0	0	+0,029
bis 30,0	-0,033	-0,021	-0,013	-0,009	+0,008
über 30,0	0	0	0	0	
bis 50,0	-0,039	-0,025	-0,016	-0,011	
über 50,0	0	0	0	0	
bis 80,0	-0,046	-0,030	-0,019	-0,013	
über 80,0	0	0	0	0	
bis 100,0	-0,054	-0,035	-0,022	-0,015	

### Kleinstbohrertoleranzen nach DIN 1899

Die Herstellgenauigkeit für Kleinstbohrer bis 1,5 mm Durchmesser entspricht den Toleranzen von DIN 1899.

Durchmessertoleranz am Schneidteil	= 0/- 0,004 mm
Durchmessertoleranz am Schaft h8	= 0/- 0,014 mm

### Freimaßtoleranzen nach DIN-ISO 2768

Grenzabmaße für Längenmaße (Werte in mm)

Genauigkeitsgrad	Nennmaßbereich							
	0,5 bis 3	über 3 bis 6	über 6 bis 30	über 30 bis 120	über 120 bis 400	über 400 bis 1000	über 1000 bis 2000	über 2000 bis 4000
fein	± 0,05	± 0,05	± 0,1	± 0,15	± 0,2	± 0,3	± 0,5	-
mittel	± 0,1	± 0,1	± 0,2	± 0,3	± 0,5	± 0,8	± 1,2	± 2
grob	± 0,15	± 0,2	± 0,5	± 0,8	± 1,2	± 2	± 3	± 4
sehr grob	-	± 0,5	± 1	± 1,5	± 2,5	± 4	± 6	± 8

Grenzabmaße für Winkelmaße (Werte in Grad und Minuten)

Genauigkeitsgrad	Nennmaßbereich					
	bis 10	über 10 bis 50	über 50 bis 120	über 120 bis 400	über 400	
fein, mittel	± 1°	± 0° 30'	± 0° 20'	± 0° 10'	± 0° 5'	
grob	± 1°30'	± 1°	± 0° 30'	± 0° 15'	± 0° 10'	
sehr grob	± 3°	± 2°	± 1°	± 0° 30'	± 0° 20'	

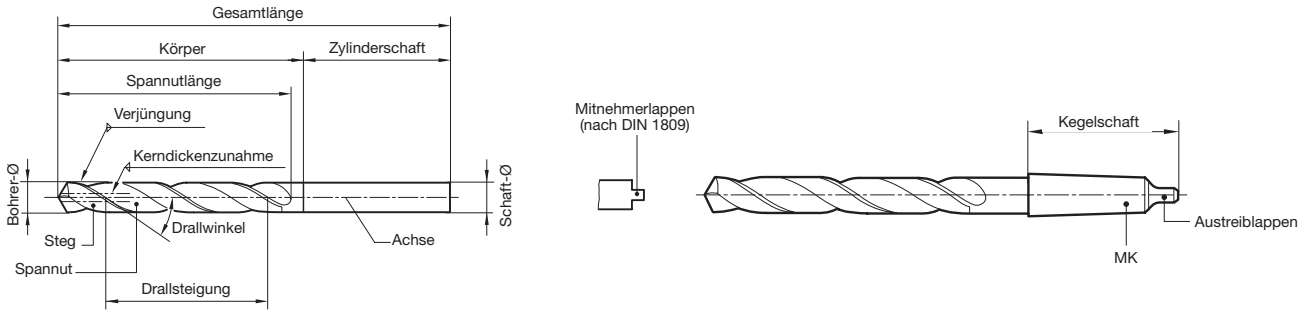




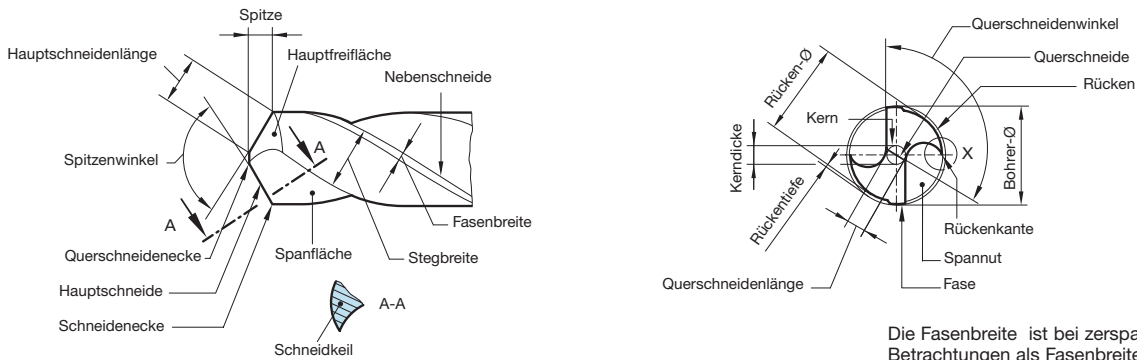
# HARTNER

## Begriffe für Spiralbohrer nach DIN ISO 5419 (Auszug: Ausgabe 06/1998)

### Spiralbohrer mit Zylinderschaft/Kegelschaft

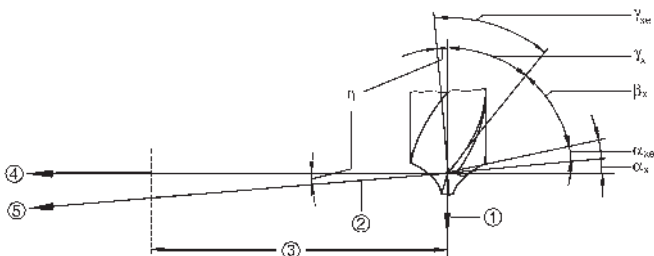


### Schneidteil



Die Fasenbreite ist bei zerspannungstechnischen Betrachtungen als Fasenbreite der Nebenschneiden anzusehen und mit  $bf_{an}$  zu bezeichnen. Siehe DIN 6518.

### Winkel an den Schneiden



$\alpha_x$	Seitenfreiwinkel (Alpha)	$\gamma_x$	Seitenspanwinkel (Gamma)
$\alpha_{xe}$	Wirk-Seitenfreiwinkel	$\gamma_{xe}$	Wirk-Seitenspanwinkel
$\beta_x$	Seitenkeilwinkel (Beta)	$\eta$	Wirkrichtungswinkel (Eta)

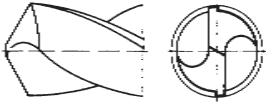
- Bezeichnungen:  
 1 = Vorschubrichtung  
 2 = Vorschub  $f$   
 3 = Schnittweg je Umdrehung ( $d \cdot p$ )  
 4 = Schnitttrichtung  
 5 = Wirkrichtung

Freiwinkel  $\alpha$ , Keilwinkel  $\beta$  und Spanwinkel  $\gamma$  werden in der Keilmessebene gemessen. Einzelheiten siehe DIN 6581, Begriffe der Zerspantechnik: Geometrie am Schneidkeil des Werkzeuges.



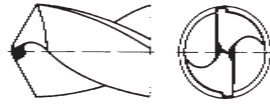
### nach Werksnorm

### nach DIN 1412 (Auszug, Ausgabe 03/01)



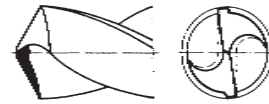
#### Kegelmantelanschliff Normalanschliff

Anwendung: Für alle üblichen Bohrarbeiten in Stahl, Buntmetallen und Kunststoffen. Die Spitzenwinkel richten sich nach der Zerspanbarkeit der Werkstoffe.  
 Vorteile: Kräftige Hauptschneiden, unempfindlich gegen Stoß und Seitenkräfte. Einfacher Anschliff, von Hand möglich.  
 Nachteile: Breite Querschneide erfordert hohe Vorschubkraft.



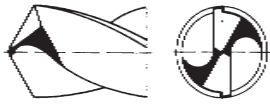
#### Ausgespitzte Querschneide nach DIN 1412 A

Anwendung: Für alle üblichen Bohrarbeiten bei Bohrern mit starkem Kern, bei großen Bohrerdurchmessern, zum Bohren ins volle Material.  
 Vorteile: Gute Zentrierung beim Anbohren durch Verkürzung der Querschneidenlänge auf 1/10 des Bohrerdurchmessers und Verringerung der Vorschubkraft.  
 Nachteile: Zusätzliche Schleifarbeit.



#### Ausgespitzte Querschneide mit korrigierter Hauptschneide nach DIN 1412 B

Anwendung: Bei Bohrern für Stähle mit hoher Festigkeit, für Manganstähle mit über 10% Mn, für harte Federstähle und zum Aufbohren.  
 Vorteile: Unempfindlichkeit gegen Stoß, einseitige Belastung und Seitenkräfte. Kein Einhaken bei dünnwandigen Werkstücken.  
 Nachteile: Hohe Vorschubkraft, Neigung zum Verlaufen, Mehraufwand beim Nachschleifen.



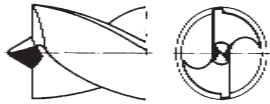
#### Kreuzanschliff nach DIN 1412 C

Anwendung: Bei Bohrern mit sehr starkem Kern für besonders zähe und harte Werkstoffe und bei Tieflochbohrern.  
 Vorteile: Gute Zentrierungen, geringe Vorschubkraft. Durch Spanteilung verbesserter Spantransport.  
 Nachteile: Einwandfreier Nachschliff nur maschinell möglich.



#### Anschliff für Grauguss nach DIN 1412 D

Anwendung: Für Bohrungen in Grauguss, Temperguss und Schmiedestücke.  
 Vorteile: Schonung der Schneidenecken durch verlängerte Hauptschneiden, unempfindlich gegen Stoß, gute Wärmeableitung - dadurch verbesserte Standzeit.  
 Nachteile: Mehraufwand beim Nachschleifen.



#### Zentrumspitze nach DIN 1412 E

Anwendung: Zum Bohren von Blechen und weichen Werkstoffen, für Sacklöcher mit ebenem Grund.  
 Vorteile: Gute Zentrierung, geringe Gratbildung beim Durchbohren, genaue Bohrungen in dünnen Blechen und Rohren, kein Einhaken. Lieferbar ab 2,5 Ø.  
 Nachteile: Empfindlich gegen Stoß und einseitige Belastung. Einwandfreier Anschliff nur maschinell möglich.

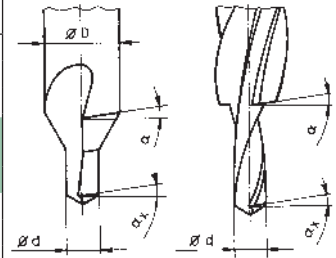


### Freiwinkel an Spiralbohrern aus HSS und HSS-E

Durchmesserbereich	Typ N, Typ H und für die Bohrstufe an Zentrierbohrern		Typ W, Typ FN, Typ FW, Typ S, Typ IS		Typ V	
	Seitenfreiwinkel $\alpha_x$	Spitzenwinkel	Seitenfreiwinkel $\alpha_x$	Spitzenwinkel	Seitenfreiwinkel $\alpha_x$	Spitzenwinkel
Bohrer-Ø im mm über bis						
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°

### Freiwinkel an der Senkschneide bei Mehrfasenstufenbohrern, Stufenbohrern und Zentrierbohrern

Durchmesserbereich	Typ N, Typ S Senkwinkelbereich 20 - 160°      161 - 180°		Typ W, Typ H Senkwinkelbereich 20 - 160°      161 - 180°		Zentrierbohrer
	Seitenfreiwinkel $\alpha_x$	Seitenfreiwinkel $\alpha$	Seitenfreiwinkel $\alpha_x$	Seitenfreiwinkel $\alpha$	
Bohrer-Ø D über bis					Freiwinkel gem. am Schaft-Ø D
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°	-

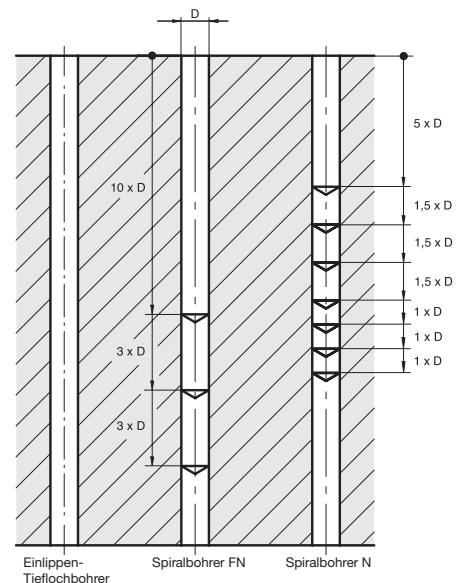


### Ausspannhäufigkeit beim Tiefbohren

Bei tiefen Bohrungen ist besonders zu beachten, dass genügend Kühlmittelflüssigkeit an die Schneiden des Bohrers gelangt. Durch ein- oder mehrmaliges Entspannen der Bohrung wird die Bohrer Spitze ausreichend gekühlt. Die Entspannhäufigkeit ist hauptsächlich von dem zu bohrenden Werkstoff, der Bohrtiefe und vom Bohrertyp abhängig.

Bei Verwendung von Tieflochbohrern mit Flachnutprofil FN wird die Entspannhäufigkeit deutlich verringert. Durch Veränderung des Spitzenwinkels kann bei bestimmten Werkstoffen die Art der Spanbildung beeinflusst werden. Eine günstige Spanform verbessert sowohl den Spantransport als auch den Kühlmittelzufluss. Für extrem tiefe Bohrungen oder beim Horizontalbohren sind Kühlkanalbohrer mit innerer Kühlmittelzufuhr zu empfehlen.

Alle aufgeführten Daten sind Richtangaben und stellen Mittelwerte dar.

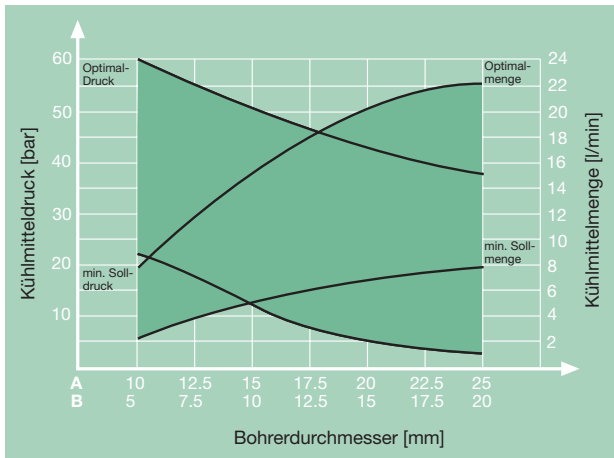




# HARTNER

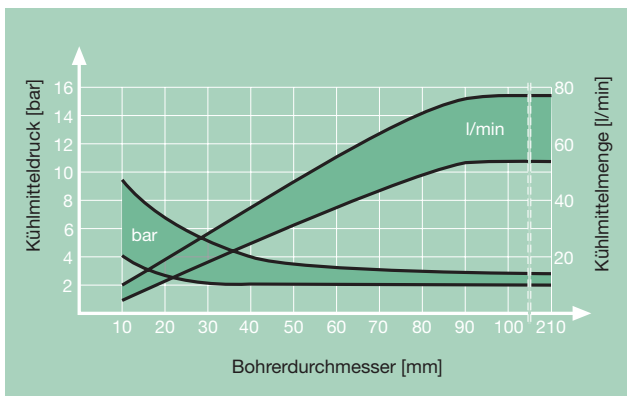
## Kühlmitteldiagramme Kühlmitteldruck und Kühlmittelvolumen

### Für Hartmetall-Spiralbohrer mit Innenkühlkanälen



A = Durchmesserreihe für Werkzeuge mit zentralem Innenkühlkanal  
 B = Durchmesserreihe für Werkzeuge mit verdrehten Innenkühlkanälen

### Für Wechselplatten-Spiralbohrer Multiplex mit Innenkühlkanälen



Als Kühlschmiermittel beim Bohren mit Wechselplatten aus HSS-E und HM dient Bohremulsion; sie kann im üblichen Mischungsverhältnis 1 : 20 verwendet werden.

Von ganz entscheidender Bedeutung ist ein leistungsfähiges Kühlmittelaggregat. Stehen Druck und Menge des Kühlmittels nicht in ausreichendem Maße zur Verfügung, so kann dies zu schlechter

Bohrungs-Oberfläche oder sogar zum Werkzeugbruch führen. Die Größe der Feststoffteilchen im Kühlmittel sollte 50 µm möglichst nicht überschreiten.

## Einsatzempfehlungen Spiralbohrer

Bestell-Nr. 

Bestell-Nr. 

Norm/DIN

Schneidstoff

Oberfläche

Typ

Programm Seite



Werkzeuge mit fett gedruckter Vorschubreihen-Nr. sind bevorzugt auszuwählen.





















































Bohrer-Ø mm	Vorschubreihen-Code								
	1	2	3	4	5	6	7	8	9
	f (mm/U)								
<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

Werkstoffbezogene Kühlmittel:

-  Luft
-  Öl
-  Emulsion

Schneidrichtung:

-  rechtsschneidend
-  linksschneidend

Werkstoffgruppe	Werkstoffbeispiele, neue Bezeichnung (in Klammern alte Bezeichnung) Fettgedruckte Zahlen = Werkstoff-Nr. nach DIN EN	Zugfestigkeit MPa (N/mm <sup>2</sup> )	Härte	Kühl- mittel
Allgemeine Baustähle	<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		 
Automatenstähle	<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		 
Unlegierte Vergütungsstähle	<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		  
Legierte Vergütungsstähle	<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		 
Unlegierte Einsatzstähle	<b>1.0301</b> (C10), <b>1.1121</b> C10E (Ck10)	≤850		
Legierte Einsatzstähle	<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		 
Nitrierstähle	<b>1.8504</b> 34CrAl6 <b>1.8519</b> 31CrMoV9, <b>1.8550</b> 34CrAlNi7	≤1000 ≤1400		 
Werkzeugstähle	<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		 
Schnellarbeitsstähle	<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		
Federstähle	<b>1.5026</b> 55Si7, <b>1.7176</b> 55Cr3, <b>1.8159</b> 51CrV4 (51CrV4)		≤350 HB	
Gehärtete Stähle	-		≤48 HRC ≤66 HRC	 
Rostfreie Stähle, geschwefelt austenitisch martensitisch	<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 ≤1200		  
Gusseisen	<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	 
Kugelgraphit- und Tempereguss	<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	 
Hartguss	-		≤350 HB	
Neue Gusswerkstoffe 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	 
Neue Gusswerkstoffe 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		 
Sonderlegierungen	Nimonic, Inconel, Monel, Hastelloy	≤1600		
Titan und Titan-Legierungen	<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		 
Aluminium und Al-Legierungen	<b>3.0255</b> Al99,5, <b>3.2315</b> AlMgSi1, <b>3.3515</b> AlMg1	≤400		
Al-Knetlegierungen	<b>3.0615</b> AlMgSiPb, <b>3.1325</b> AlCuMg1, <b>3.3245</b> AlMg3Si, <b>3.4365</b> AlZnMgCu1,5	≤650		
Al-Gusslegierungen ≤ 10 % Si	<b>3.2131</b> G-AlSi5Cu1, <b>3.2153</b> G-AlSi7Cu3, <b>3.2573</b> G-AlSi9	≤600		
≤ 24 % Si	<b>3.2581</b> G-AlSi12, <b>3.2583</b> G-AlSi12Cu, - G-AlSi12CuNiMg	≤600		
Magnesium-Legierungen	<b>3.5200</b> MgMn2, <b>3.5812.05</b> G-MgAl8Zn1, <b>3.5612.05</b> G-MgAl6Zn1	≤450		
Kupfer, niedriglegiert	<b>2.0070</b> SE-Cu, <b>2.1020</b> CuSn6, <b>2.1096</b> G-CuSn5ZnPb	≤600		
Messing, kurzspanend	<b>2.0380</b> CuZn39Pb2, <b>2.0401</b> CuZn39Pb3, <b>2.0410</b> CuZn43Pb2	≤600		
langspanend	<b>2.0250</b> CuZn20, <b>2.0280</b> CuZn33, <b>2.0332</b> CuZn37Pb0,5	≤600		
Bronzen, kurzspanend	<b>2.1090</b> CuSn7ZnPb, <b>2.1170</b> CuPb5Sn5, <b>2.1176</b> CuPb10Sn <b>2.0790</b> CuNi18Zn19Pb	≤600 ≤850		 
Bronzen, langspanend	<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		 
Kunststoffe, duroplastisch	Bakelit, Resopal, Pertinax, Moltopren	≤150		
thermoplastisch	Plexiglas, Hostalen, Novodur, Makralon	≤100		 
aramidfaserverstärkt	Kevlar	≤1000		
glas-/kohlefaserverstärkt	GFK/CFK	≤1000		



≤3xD

81110	81120	81130	81140
81115			81145
1897	1897	1897	1897
<b>HSS</b>			
N	H	W	FN
69/71	75	76	77/78

84400
1897
<b>HSS</b>
N
73

84501
1897
<b>HSS</b>
N
73

81171	82971	81173	82972
1897	WN	1897	WN
<b>HSS-E</b>			
V	V	IS	IS
81	166	80	165

84803
1897
<b>HSS-E</b>
V
83


84503
1897
<b>HSS-E</b>
V
83



V <sub>c</sub> m/min	Vorschubreihen- Code				V <sub>c</sub> m/min	VR- Code	V <sub>c</sub> m/min	VR- Code	V <sub>c</sub> m/min	Vorschubreihen- Code				V <sub>c</sub> m/min	VR- Code	V <sub>c</sub> m/min	VR- Code
27	6			6	30	6	32	7	35	5	5	5	5	38	5	42	6
22	5			5	24	5	26	6	30	5	5	5	5	33	4	36	5
30	6			6	33	6	36	7	40	5	5	5	5	44	5	48	6
30	5			5	33	5	36	6	40	5	5	5	5	38	5	42	6
25	5			5	28	5	31	6	40	5	5	5	5	44	5	48	6
25	5			5	28	5	31	6	40	5	5	5	5	44	5	48	6
					25	4	28	5	35	4	4			38	4	42	5
					22	4	24	5	20	4	4			27	4	30	5
									16	3	3			22	3	24	4
30	6			6	33	6	36	7	36	6	6	6	6	44	4	48	5
					20	4	22	5	20	4	4			22	4	24	5
					14	4	16	5	15	3	3			18	3	20	4
16	4			4	18	4	20	5	16	4	4			22	4	24	5
									12	3	3			18	3	20	4
									15	3	3			14	3	17	4
									8	2	2			9	2	11	3
									45	4	4			4	1	5	2
									18	4	4	4	4	20	4	22	5
									14	3	3	3	3	15	3	17	4
									16	3	3	3	3	18	3	20	4
30	6			6	33	6	36	7	35	6	6			40	6	45	7
30	6			6	33	6	36	7	30	6	6			35	6	40	7
25	6			6	28	6	31	7	30	6	6			33	6	36	7
20	6			6	22	6	24	7	25	6	6			27	6	29	7
									10	3	3			12	3	14	4
70				7	85	8	90	8	90	7	7			6	2	7	2
70				7	85	8	90	8	90					11	2	12	3
50	7			7	60	8	80	7	80	7	7			7	2	8	3
50	6			6	60	7	70	7	70	6	6						
70	6			6	90	6	90	6	70	6	6						
60	5			5	75	5	80	6	70	5	5						
70				6	50	6	60	5	60	5	5						
40	5			5	45	5	50	6	40	5	5						
30	4			4	33	4	36	5	35	4	4	4	4	45	5	50	6
25	4			4	27	4	30	5	30	4	4	4	4	40	4	45	5
15	4			4	16	4	18	5	20	4	4	4	4	23	4	26	5
					15	4	18	5	15	4	4	4	4	17	4	20	5
18	4			4	22	4	29	5	20	4	4						
28	5			5	36	5	47	6	30	4	4	4	4				

## Einsatzempfehlungen Spiralbohrer

Bestell-Nr. 

Bestell-Nr. 

Norm/DIN

Schneidstoff

Oberfläche

Typ

Programm Seite



Werkzeuge mit fett gedruckter Vorschubreihen-Nr. sind bevorzugt auszuwählen.

Bohrer-Ø mm	Vorschubreihen-Code								
	1	2	3	4	5	6	7	8	9
	f (mm/U)								
<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

Werkstoffbezogene Kühlmittel:

- Luft
- Öl
- Emulsion

Schneidrichtung:

-  rechtsschneidend
-  linksschneidend

Werkstoffgruppe	Werkstoffbeispiele, neue Bezeichnung (in Klammern alte Bezeichnung) Fettgedruckte Zahlen = Werkstoff-Nr. nach DIN EN	Zugfestigkeit MPa (N/mm <sup>2</sup> )	Härte	Kühl- mittel
Allgemeine Baustähle	<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"/>
Automatenstähle	<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"/>
Unlegierte Vergütungsstähle	<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"/>
Legierte Vergütungsstähle	<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"/>
Unlegierte Einsatzstähle	<b>1.0301</b> (C10), <b>1.1121</b> C10E (Ck10)	≤850		<input type="radio"/>
Legierte Einsatzstähle	<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"/>
Nitrierstähle	<b>1.8504</b> 34CrAl6 <b>1.8519</b> 31CrMoV9, <b>1.8550</b> 34CrAlNi7	≤1000 ≤1400		<input type="radio"/> <input checked="" type="radio"/>
Werkzeugstähle	<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 type="radio"/>
Schnellarbeitsstähle	<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"/>
Federstähle	<b>1.5026</b> 55Si7, <b>1.7176</b> 55Cr3, <b>1.8159</b> 51CrV4 (51CrV4)		≤350 HB	<input checked="" type="radio"/>
Gehärtete Stähle	-		≤48 HRC ≤66 HRC	<input checked="" type="radio"/> <input checked="" type="radio"/>
Rostfreie Stähle, geschwefelt austenitisch martensitisch	<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		<input checked="" type="radio"/> <input checked="" type="radio"/> <input checked="" type="radio"/>
Gusseisen	<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"/>
Kugelgraphit- und Temperguss	<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"/>
Hartguss	-		≤350 HB	<input type="radio"/>
Neue Gusswerkstoffe 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"/>
Neue Gusswerkstoffe 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"/>
Sonderlegierungen	Nimonic, Inconel, Monel, Hastelloy	≤2000		<input checked="" type="radio"/>
Titan und Titan-Legierungen	<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"/>
Aluminium und Al-Legierungen	<b>3.0255</b> Al99,5, <b>3.2315</b> AlMgSi1, <b>3.3515</b> AlMg1	≤400		<input type="radio"/>
Al-Knetlegierungen	<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"/>
Al-Gusslegierungen ≤ 10 % Si	<b>3.2131</b> G-AlSi5Cu1, <b>3.2153</b> G-AlSi7Cu3, <b>3.2573</b> G-AlSi9	≤600		<input type="radio"/>
≤ 24 % Si	<b>3.2581</b> G-AlSi12, <b>3.2583</b> G-AlSi12Cu, - G-AlSi12CuNiMg	≤600		<input type="radio"/>
Magnesium-Legierungen	<b>3.5200</b> MgMn2, <b>3.5812.05</b> G-MgAl8Zn1, <b>3.5612.05</b> G-MgAl6Zn1	≤400		<input type="radio"/>
Kupfer, niedriglegiert	<b>2.0070</b> SE-Cu, <b>2.1020</b> CuSn6, <b>2.1096</b> G-CuSn5ZnPb	≤600		<input type="radio"/>
Messing, kurzspanend	<b>2.0380</b> CuZn39Pb2, <b>2.0401</b> CuZn39Pb3, <b>2.0410</b> CuZn43Pb2	≤600		<input type="radio"/>
langspanend	<b>2.0250</b> CuZn20, <b>2.0280</b> CuZn33, <b>2.0332</b> CuZn37Pb0,5	≤600		<input type="radio"/>
Bronzen, kurzspanend	<b>2.1090</b> CuSn7ZnPb, <b>2.1170</b> CuPb5Sn5, <b>2.1176</b> CuPb10Sn	≤600		<input type="radio"/>
langspanend	<b>2.0790</b> CuNi18Zn19Pb	≤850		<input checked="" type="radio"/>
Bronzen, langspanend	<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"/>
Kunststoffe, duroplastisch	Bakelit, Resopal, Pertinax, Moltopren	≤150		<input type="radio"/>
thermoplastisch	Plexiglas, Hostalen, Novodur, Makralon	≤100		<input type="radio"/>
aramidfaserverstärkt	Kevlar	≤1000		<input type="radio"/>
glas-/kohlefaserverstärkt	GFK/CFK	≤1000		<input type="radio"/>







## Einsatzempfehlungen Spiralbohrer

Bestell-Nr.

Bestell-Nr.

Norm/DIN

Schneidstoff

Oberfläche

Typ

Programm Seite

Werkzeuge mit fett gedruckter Vorschubreihen-Nr. sind bevorzugt auszuwählen.

Bohrer-Ø mm	Vorschubreihen-Code								
	1	2	3	4	5	6	7	8	9
	f (mm/U)								
<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

Werkstoffbezogene Kühlmittel:

- Luft
- Öl
- Emulsion

Schneidrichtung:

- rechtsschneidend
- linksschneidend

Werkstoffgruppe	Werkstoffbeispiele, neue Bezeichnung (in Klammern alte Bezeichnung) Fettgedruckte Zahlen = Werkstoff-Nr. nach DIN EN	Zugfestigkeit MPa (N/mm <sup>2</sup> )	Härte	Kühl- mittel
Allgemeine Baustähle	<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		 
Automatenstähle	<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		 
Unlegierte Vergütungsstähle	<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		  
Legierte Vergütungsstähle	<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		 
Unlegierte Einsatzstähle	<b>1.0301</b> (C10), <b>1.1121</b> C10E (Ck10)	≤850		
Legierte Einsatzstähle	<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		 
Nitrierstähle	<b>1.8504</b> 34CrAl6 <b>1.8519</b> 31CrMoV9, <b>1.8550</b> 34CrAlNi7	≤1000 ≤1400		 
Werkzeugstähle	<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		 
Schnellarbeitsstähle	<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		
Federstähle	<b>1.5026</b> 55Si7, <b>1.7176</b> 55Cr3, <b>1.8159</b> 51CrV4 (51CrV4)		≤350 HB	
Gehärtete Stähle	-		≤48 HRC ≤66 HRC	 
Rostfreie Stähle, geschwefelt austenitisch martensitisch	<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		  
Gusseisen	<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	 
Kugelgraphit- und Tempereguss	<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	 
Hartguss	-		≤350 HB	
Neue Gusswerkstoffe 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	 
Neue Gusswerkstoffe 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		 
Sonderlegierungen	Nimonic, Inconel, Monel, Hastelloy	≤2000		
Titan und Titan-Legierungen	<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		 
Aluminium und Al-Legierungen	<b>3.0255</b> Al99,5, <b>3.2315</b> AlMgSi1, <b>3.3515</b> AlMg1	≤400		
Al-Knetlegierungen	<b>3.0615</b> AlMgSiPb, <b>3.1325</b> AlCuMg1, <b>3.3245</b> AlMg3Si, <b>3.4365</b> AlZnMgCu1,5	≤650		
Al-Gusslegierungen ≤ 10 % Si	<b>3.2131</b> G-AlSi5Cu1, <b>3.2153</b> G-AlSi7Cu3, <b>3.2573</b> G-AlSi9	≤600		
≤ 24 % Si	<b>3.2581</b> G-AlSi12, <b>3.2583</b> G-AlSi12Cu, - G-AlSi12CuNiMg	≤600		
Magnesium-Legierungen	<b>3.5200</b> MgMn2, <b>3.5812.05</b> G-MgAl8Zn1, <b>3.5612.05</b> G-MgAl6Zn1	≤400		
Kupfer, niedriglegiert	<b>2.0070</b> SE-Cu, <b>2.1020</b> CuSn6, <b>2.1096</b> G-CuSn5ZnPb	≤600		
Messing, kurzspanend	<b>2.0380</b> CuZn39Pb2, <b>2.0401</b> CuZn39Pb3, <b>2.0410</b> CuZn43Pb2	≤600		
langspanend	<b>2.0250</b> CuZn20, <b>2.0280</b> CuZn33, <b>2.0332</b> CuZn37Pb0,5	≤600		
Bronzen, kurzspanend	<b>2.1090</b> CuSn7ZnPb, <b>2.1170</b> CuPb5Sn5, <b>2.1176</b> CuPb10Sn <b>2.0790</b> CuNi18Zn19Pb	≤600 ≤850		 
Bronzen, langspanend	<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		 
Kunststoffe, duroplastisch	Bakelit, Resopal, Pertinax, Moltopren	≤150		
thermoplastisch	Plexiglas, Hostalen, Novodur, Makralon	≤100		
aramidfaserverstärkt	Kevlar	≤1000		
glas-/kohlefaserverstärkt	GFK/CFK	≤1000		



## Einsatzempfehlungen Spiralbohrer

Bestell-Nr. 

Bestell-Nr. 

Norm/DIN

Schneidstoff

Oberfläche

Typ

Programm Seite



Werkzeuge mit fett gedruckter Vorschubreihen-Nr. sind bevorzugt auszuwählen.

Bohrer-Ø mm	Vorschubreihen-Code								
	1	2	3	4	5	6	7	8	9
	f (mm/U)								
<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

Werkstoffbezogene Kühlmittel:

- Luft
- Öl
- Emulsion

Schneidrichtung:

-  rechtsschneidend
-  linksschneidend

Werkstoffgruppe	Werkstoffbeispiele, neue Bezeichnung (in Klammern alte Bezeichnung) Fettgedruckte Zahlen = Werkstoff-Nr. nach DIN EN	Zugfestigkeit MPa (N/mm <sup>2</sup> )	Härte	Kühl- mittel
Allgemeine Baustähle	<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"/>
Automatenstähle	<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"/>
Unlegierte Vergütungsstähle	<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"/>
Legierte Vergütungsstähle	<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"/>
Unlegierte Einsatzstähle	<b>1.0301</b> (C10), <b>1.1121</b> C10E (Ck10)	≤850		<input type="radio"/>
Legierte Einsatzstähle	<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"/>
Nitrierstähle	<b>1.8504</b> 34CrAl6 <b>1.8519</b> 31CrMoV9, <b>1.8550</b> 34CrAlNi7	≤1000 ≤1400		<input type="radio"/> <input checked="" type="radio"/>
Werkzeugstähle	<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 type="radio"/>
Schnellarbeitsstähle	<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"/>
Federstähle	<b>1.5026</b> 55Si7, <b>1.7176</b> 55Cr3, <b>1.8159</b> 51CrV4 (51CrV4)		≤350 HB	<input checked="" type="radio"/>
Gehärtete Stähle	-		≤48 HRC ≤66 HRC	<input checked="" type="radio"/> <input checked="" type="radio"/>
Rostfreie Stähle, geschwefelt austenitisch martensitisch	<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		<input checked="" type="radio"/> <input checked="" type="radio"/> <input checked="" type="radio"/>
Gusseisen	<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"/>
Kugelgraphit- und Temperguss	<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"/>
Hartguss	-		≤350 HB	<input type="radio"/>
Neue Gusswerkstoffe 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"/>
Neue Gusswerkstoffe 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"/>
Sonderlegierungen	Nimonic, Inconel, Monel, Hastelloy	≤2000		<input checked="" type="radio"/>
Titan und Titan-Legierungen	<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"/>
Aluminium und Al-Legierungen	<b>3.0255</b> Al99,5, <b>3.2315</b> AlMgSi1, <b>3.3515</b> AlMg1	≤400		<input type="radio"/>
Al-Knetlegierungen	<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"/>
Al-Gusslegierungen ≤ 10 % Si	<b>3.2131</b> G-AlSi5Cu1, <b>3.2153</b> G-AlSi7Cu3, <b>3.2573</b> G-AlSi9	≤600		<input type="radio"/>
≤ 24 % Si	<b>3.2581</b> G-AlSi12, <b>3.2583</b> G-AlSi12Cu, - G-AlSi12CuNiMg	≤600		<input type="radio"/>
Magnesium-Legierungen	<b>3.5200</b> MgMn2, <b>3.5812.05</b> G-MgAl8Zn1, <b>3.5612.05</b> G-MgAl6Zn1	≤400		<input type="radio"/>
Kupfer, niedriglegiert	<b>2.0070</b> SE-Cu, <b>2.1020</b> CuSn6, <b>2.1096</b> G-CuSn5ZnPb	≤600		<input type="radio"/>
Messing, kurzspanend	<b>2.0380</b> CuZn39Pb2, <b>2.0401</b> CuZn39Pb3, <b>2.0410</b> CuZn43Pb2	≤600		<input type="radio"/>
langspanend	<b>2.0250</b> CuZn20, <b>2.0280</b> CuZn33, <b>2.0332</b> CuZn37Pb0,5	≤600		<input type="radio"/>
Bronzen, kurzspanend	<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"/>
Bronzen, langspanend	<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"/>
Kunststoffe, duroplastisch	Bakelit, Resopal, Pertinax, Moltopren	≤150		<input type="radio"/>
thermoplastisch	Plexiglas, Hostalen, Novodur, Makralon	≤100		<input type="radio"/>
aramidfaserverstärkt	Kevlar	≤1000		<input type="radio"/>
glas-/kohlefaserverstärkt	GFK/CFK	≤1000		<input type="radio"/>



# HARTNER

≤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
47	161	49	57	55	162	65

84800	84859	84807
338		338
HSS-E		
FN	N	S
51	164	61

84504	84505
338	338
HSS-E	
FN	S
51	61




V <sub>c</sub> m/min	Vorschubreihen- Code					
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	5
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	3
15	3	3	3	3	3	3
16	4	4	4	4	4	3
12	3	3	3	3	3	3
15	4	4	4	4	4	3
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	Vorschubreihen- Code		
38	6	6	
33	5	5	
44	5	5	
38	5	5	
44	5	5	
38	4	4	
27	4	4	
22	3	3	3
44	4	4	
22	4	4	
18	3	3	
22	4	4	
18	3	3	
19	4	4	
14	3	3	
14	3	3	3
9		2	2
20	4	4	4
15		3	3
18	3		3
40	6	6	
35	6	6	
33	6	6	
27	6	6	
12			3
6			2
11			2
7			2
88	5	5	
40		4	
22	4	4	
17	4	4	4
22	4	4	

V <sub>c</sub> m/min	Vorschubreihen- Code	
42	6	
36	5	
48	6	
42	6	
48	6	
42	5	
30	5	
34	4	4
48	6	
24	5	
20	4	
24	5	
20	4	
21	5	
16	4	
17	4	4
11	3	2
6	1	
22	5	5
17	4	3
20	4	4
45	7	
40	7	
36	7	
29	7	
14	4	3
7		2
12		2
8		2
85	8	
72	7	
96	6	
25	5	
20	5	4
24	5	

## Einsatzempfehlungen Spiralbohrer

Bestell-Nr. 

Bestell-Nr. 

Norm/DIN

Schneidstoff

Oberfläche

Typ

Programm Seite

Werkzeuge mit fett gedruckter Vorschubreihen-Nr. sind bevorzugt auszuwählen.

Bohrer-Ø mm	Vorschubreihen-Code								
	1	2	3	4	5	6	7	8	9
	f (mm/U)								
<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

Werkstoffbezogene Kühlmittel:

- Luft
- Öl
- Emulsion

Schneidrichtung:

- rechtsschneidend
- linksschneidend

Werkstoffgruppe	Werkstoffbeispiele, neue Bezeichnung (in Klammern alte Bezeichnung) Fettgedruckte Zahlen = Werkstoff-Nr. nach DIN EN	Zugfestigkeit MPa (N/mm <sup>2</sup> )	Härte	Kühl- mittel
Allgemeine Baustähle	<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 checked="" type="radio"/>
Automatenstähle	<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 checked="" type="radio"/>
Unlegierte Vergütungsstähle	<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 checked="" type="radio"/>
Legierte Vergütungsstähle	<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 checked="" type="radio"/>
Unlegierte Einsatzstähle	<b>1.0301</b> (C10), <b>1.1121</b> C10E (Ck10)	≤850		<input checked="" type="radio"/>
Legierte Einsatzstähle	<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"/>
Nitrierstähle	<b>1.8504</b> 34CrAl6 <b>1.8519</b> 31CrMoV9, <b>1.8550</b> 34CrAlNi7	≤1000 ≤1400		<input checked="" type="radio"/>
Werkzeugstähle	<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 checked="" type="radio"/>
Schnellarbeitsstähle	<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"/>
Federstähle	<b>1.5026</b> 55Si7, <b>1.7176</b> 55Cr3, <b>1.8159</b> 51CrV4 (51CrV4)		≤350 HB	<input checked="" type="radio"/>
Gehärtete Stähle	-		≤48 HRC ≤66 HRC	<input checked="" type="radio"/>
Rostfreie Stähle, geschwefelt austenitisch martensitisch	<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		<input checked="" type="radio"/>
Gusseisen	<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 checked="" type="radio"/>
Kugelgraphit- und Temperguss	<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 checked="" type="radio"/>
Hartguss	-		≤350 HB	<input checked="" type="radio"/>
Neue Gusswerkstoffe 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 checked="" type="radio"/>
Neue Gusswerkstoffe 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 checked="" type="radio"/>
Sonderlegierungen	Nimonic, Inconel, Monel, Hastelloy	≤2000		<input checked="" type="radio"/>
Titan und Titan-Legierungen	<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"/>
Aluminium und Al-Legierungen	<b>3.0255</b> Al99,5, <b>3.2315</b> AlMgSi1, <b>3.3515</b> AlMg1	≤400		<input checked="" type="radio"/>
Al-Knetlegierungen	<b>3.0615</b> AlMgSiPb, <b>3.1325</b> AlCuMg1, <b>3.3245</b> AlMg3Si, <b>3.4365</b> AlZnMgCu1,5	≤650		<input checked="" type="radio"/>
Al-Gusslegierungen ≤ 10 % Si	<b>3.2131</b> G-AlSi5Cu1, <b>3.2153</b> G-AlSi7Cu3, <b>3.2573</b> G-AlSi9	≤600		<input checked="" type="radio"/>
≤ 24 % Si	<b>3.2581</b> G-AlSi12, <b>3.2583</b> G-AlSi12Cu, - G-AlSi12CuNiMg	≤600		<input checked="" type="radio"/>
Magnesium-Legierungen	<b>3.5200</b> MgMn2, <b>3.5812.05</b> G-MgAl8Zn1, <b>3.5612.05</b> G-MgAl6Zn1	≤400		<input checked="" type="radio"/>
Kupfer, niedriglegiert	<b>2.0070</b> SE-Cu, <b>2.1020</b> CuSn6, <b>2.1096</b> G-CuSn5ZnPb	≤600		<input checked="" type="radio"/>
Messing, kurzspanend	<b>2.0380</b> CuZn39Pb2, <b>2.0401</b> CuZn39Pb3, <b>2.0410</b> CuZn43Pb2	≤600		<input checked="" type="radio"/>
langspanend	<b>2.0250</b> CuZn20, <b>2.0280</b> CuZn33, <b>2.0332</b> CuZn37Pb0,5	≤600		<input checked="" type="radio"/>
Bronzen, kurzspanend	<b>2.1090</b> CuSn7ZnPb, <b>2.1170</b> CuPb5Sn5, <b>2.1176</b> CuPb10Sn <b>2.0790</b> CuNi18Zn19Pb	≤600 ≤850		<input checked="" type="radio"/>
Bronzen, langspanend	<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"/>
Kunststoffe, duroplastisch	Bakelit, Resopal, Pertinax, Moltopren	≤150		<input checked="" type="radio"/>
thermoplastisch	Plexiglas, Hostalen, Novodur, Makralon	≤100		<input checked="" type="radio"/>
aramidfaserverstärkt	Kevlar	≤1000		<input checked="" type="radio"/>
glas-/kohlefaserverstärkt	GFK/CFK	≤1000		<input checked="" type="radio"/>



# HARTNER

≤5xD

84804

338

HSS-E

○

FU 500 DZ

53

84802

338

HSS-E

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FU 500 DZ

53

84801

WN

HSS-E

Ⓣ

FU 500

94

84660

345

HSS-E

Ⓐ

FN

163

81062

338

HSS-E

●

P2000

59



V <sub>c</sub> m/min	Vorschubreihen- Code
35	6
30	5
40	6
30	6
32	6
28	6
20	5
15	4
13	3
30	6
16	4
12	3
15	4
10	3
15	4
10	3
10	3
14	4
10	4
12	4
36	6
30	6
30	6
22	6
50	7
50	7
65	7
60	6
60	6
70	5
45	5
30	5
36	4
30	4
30	4
25	4
20	4
15	4

V <sub>c</sub> m/min	Vorschubreihen- Code
45	6
35	5
50	6
40	6
44	6
44	6
40	5
27	4
22	3
44	6
22	4
18	3
22	4
16	3
20	4
15	3
13	3
9	2
20	4
16	4
18	4
45	6
40	6
40	6
30	6
70	7
70	7
85	7
70	6
80	6
80	6
80	5
77	5
44	5
50	4
40	4
32	4
28	4
25	4
27	4

V <sub>c</sub> m/min	Vorschubreihen- Code
45	6
35	5
50	6
40	5
44	6
44	6
40	5
27	4
22	3
44	6
22	4
18	3
22	4
16	3
20	4
15	3
13	3
9	2
20	4
16	4
18	4
45	6
40	6
40	6
30	6
70	7
70	7
85	7
70	6
80	6
88	5
77	5
44	5
50	4
40	4
32	4
28	4
25	4
27	4

V <sub>c</sub> m/min	Vorschubreihen- Code
42	5
45	7
40	7
36	7
29	7
85	7
96	7
25	5
20	5
24	5

V <sub>c</sub> m/min	Vorschubreihen- Code
35	6
30	5
40	6
40	5
40	5
40	5
35	4
25	4
20	3
40	6
20	4
15	3
20	4
15	3
18	4
12	3
12	3
8	2
14	4
10	3
12	3
38	6
30	6
30	6
25	6
10	3
5	2
90	7
90	7
80	7
70	6
85	6
80	5
70	5
40	5
40	4
30	4
25	4
15	4
20	4
25	5





## Einsatzempfehlungen Spiralbohrer

Bestell-Nr.
Norm/DIN
Schneidstoff
Oberfläche
Typ
Kühlung
Programm Seite

Werkzeuge mit fett gedruckter Vorschubreihen-Nr. sind bevorzugt auszuwählen.

Bohrer-Ø mm	Vorschubreihen-Code								
	1	2	3	4	5	6	7	8	9
	f (mm/U)								
<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

Werkstoffbezogene Kühlmittel:

- Luft
- Öl
- Emulsion

Schneidrichtung:

- rechtsschneidend
- linksschneidend

Werkstoffgruppe	Werkstoffbeispiele, neue Bezeichnung (in Klammern alte Bezeichnung) Fettgedruckte Zahlen = Werkstoff-Nr. nach DIN EN	Zugfestigkeit MPa (N/mm <sup>2</sup> )	Härte	Kühl- mittel
Allgemeine Baustähle	<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"/>
Automatenstähle	<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"/>
Unlegierte Vergütungsstähle	<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"/>
Legierte Vergütungsstähle	<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"/>
Unlegierte Einsatzstähle	<b>1.0301</b> (C10), <b>1.1121</b> C10E (Ck10)	≤850		<input type="radio"/>
Legierte Einsatzstähle	<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"/>
Nitrierstähle	<b>1.8504</b> 34CrAl6 <b>1.8519</b> 31CrMoV9, <b>1.8550</b> 34CrAlNi7	≤1000 ≤1400		<input type="radio"/> <input checked="" type="radio"/>
Werkzeugstähle	<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"/>
Schnellarbeitsstähle	<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"/>
Federstähle	<b>1.5026</b> 55Si7, <b>1.7176</b> 55Cr3, <b>1.8159</b> 51CrV4 (51CrV4)		≤350 HB	<input checked="" type="radio"/>
Gehärtete Stähle	-		≤48 HRC ≤66 HRC	<input checked="" type="radio"/> <input checked="" type="radio"/>
Rostfreie Stähle, geschwefelt austenitisch martensitisch	<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		<input checked="" type="radio"/> <input checked="" type="radio"/> <input checked="" type="radio"/>
Gusseisen	<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"/>
Kugelgraphit- und Temperguss	<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"/>
Hartguss	-		≤350 HB	<input type="radio"/>
Neue Gusswerkstoffe 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"/>
Neue Gusswerkstoffe 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"/>
Sonderlegierungen	Nimonic, Inconel, Monel, Hastelloy	≤2000		<input checked="" type="radio"/>
Titan und Titan-Legierungen	<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"/>
Aluminium und Al-Legierungen	<b>3.0255</b> Al99,5, <b>3.2315</b> AlMgSi1, <b>3.3515</b> AlMg1	≤400		<input type="radio"/>
Al-Knetlegierungen	<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"/>
Al-Gusslegierungen ≤ 10 % Si	<b>3.2131</b> G-AlSi5Cu1, <b>3.2153</b> G-AlSi7Cu3, <b>3.2573</b> G-AlSi9	≤600		<input type="radio"/>
≤ 24 % Si	<b>3.2581</b> G-AlSi12, <b>3.2583</b> G-AlSi12Cu, - G-AlSi12CuNiMg	≤600		<input type="radio"/>
Magnesium-Legierungen	<b>3.5200</b> MgMn2, <b>3.5812.05</b> G-MgAl8Zn1, <b>3.5612.05</b> G-MgAl6Zn1	≤400		<input type="radio"/>
Kupfer, niedriglegiert	<b>2.0070</b> SE-Cu, <b>2.1020</b> CuSn6, <b>2.1096</b> G-CuSn5ZnPb	≤600		<input type="radio"/>
Messing, kurzspanend	<b>2.0380</b> CuZn39Pb2, <b>2.0401</b> CuZn39Pb3, <b>2.0410</b> CuZn43Pb2	≤600		<input type="radio"/>
langspanend	<b>2.0250</b> CuZn20, <b>2.0280</b> CuZn33, <b>2.0332</b> CuZn37Pb0,5	≤600		<input type="radio"/>
Bronzen, kurzspanend	<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"/>
Bronzen, langspanend	<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"/>
Kunststoffe, duroplastisch	Bakelit, Resopal, Pertinax, Moltopren	≤150		<input type="radio"/>
thermoplastisch	Plexiglas, Hostalen, Novodur, Makralon	≤100		<input type="radio"/>
aramidfaserverstärkt	Kevlar	≤1000		<input type="radio"/>
glas-/kohlefaserverstärkt	GFK/CFK	≤1000		<input type="radio"/>



≤5xD

84811
338
HSS-E-PM
<b>T</b>
FN 500 DZ
64

84507
WN
HSS-E-PM
<b>F</b>
FN 500
96

82761
WN
HSS-E
○
FN
axial
108

84461
WN
HSS-E
<b>T</b>
FN
axial
108

89244
WN
VHM
○
N
67




V <sub>c</sub> m/min	Vorschubreihen- Code	V <sub>c</sub> m/min	Vorschubreihen- Code	V <sub>c</sub> m/min	Vorschubreihen- Code	V <sub>c</sub> m/min	Vorschubreihen- Code	V <sub>c</sub> m/min	Vorschubreihen- Code
40	6	42	6	48	7	60	7	80	4
32	5	37	5	38	6	48	6	70	4
45	6	47	6	48	7	60	7	80	5
40	5	44	6	38	6	48	6	70	4
42	6	47	6	48	6	60	6	80	4
40	5	47	6	48	6	60	6	70	4
28	4	44	5	45	5	50	5	60	4
25	4	30	4	30	5	33	5	60	4
20	3	25	3	28	4	31	4	60	4
40	4	47	3	50	7	55	7	80	5
22	4	25	4	25	5	31	5	60	4
18	3	20	3	25	4	31	4	50	4
20	4	25	4	25	5	30	5	50	3
15	3	18	4	20	4	24	4		
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
				4	3	5	3	20	2
15	4	22	4	20	5	25	5	25	2
10	3	18	3	14	4	18	4	15	1
12	3	20	3	16	4	20	4	25	2
50	6	50	7	48	7	60	7	90	4
40	6	40	7	38	7	48	7	80	4
45	6	44	7	42	7	52	7	70	4
32	6	33	7	35	7	40	7	80	4
8	3	16	4	12	4	15	4		
5	2	6	2	10	2	12	2	15	2
				14	3	18	3	15	1
				10	3	12	3	15	1
								200	7
								200	7
				95	7	120	7	150	6
				75	8	95	8	120	6
								180	5
50	5	50	5	90	6	100	6	80	5
								180	5
60	5	60	5	50	6	55	6	180	5
50	5	50	5					120	5
45	4	44	5	48	5	60	5	120	5
40	4	33	5	45	5	55	5	70	4
32	4	28	5	38	5	45	5	50	3
25	4	25	4					50	4
				38	6	48	6	40	3
								80	3



## Einsatzempfehlungen Spiralbohrer

Bestell-Nr. 

Bestell-Nr. 

Norm/DIN

Schneidstoff

Oberfläche

Typ

Programm Seite



Werkzeuge mit fett gedruckter Vorschubreihen-Nr. sind bevorzugt auszuwählen.

Bohrer-Ø mm	Vorschubreihen-Code								
	1	2	3	4	5	6	7	8	9
	f (mm/U)								
<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

Werkstoffbezogene Kühlmittel:

- Luft
- Öl
- Emulsion

Schneidrichtung:

-  rechtsschneidend
-  linksschneidend

Werkstoffgruppe	Werkstoffbeispiele, neue Bezeichnung (in Klammern alte Bezeichnung) Fettgedruckte Zahlen = Werkstoff-Nr. nach DIN EN	Zugfestigkeit MPa (N/mm <sup>2</sup> )	Härte	Kühl- mittel
Allgemeine Baustähle	<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"/>
Automatenstähle	<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"/>
Unlegierte Vergütungsstähle	<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"/>
Legierte Vergütungsstähle	<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"/>
Unlegierte Einsatzstähle	<b>1.0301</b> (C10), <b>1.1121</b> C10E (Ck10)	≤850		<input type="radio"/>
Legierte Einsatzstähle	<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"/>
Nitrierstähle	<b>1.8504</b> 34CrAl6 <b>1.8519</b> 31CrMoV9, <b>1.8550</b> 34CrAlNi7	≤1000 ≤1400		<input type="radio"/> <input checked="" type="radio"/>
Werkzeugstähle	<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"/>
Schnellarbeitsstähle	<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"/>
Federstähle	<b>1.5026</b> 55Si7, <b>1.7176</b> 55Cr3, <b>1.8159</b> 51CrV4 (51CrV4)		≤350 HB	<input checked="" type="radio"/>
Gehärtete Stähle	-		≤48 HRC ≤66 HRC	<input checked="" type="radio"/> <input checked="" type="radio"/>
Rostfreie Stähle, geschwefelt austenitisch martensitisch	<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		<input checked="" type="radio"/> <input checked="" type="radio"/> <input checked="" type="radio"/>
Gusseisen	<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"/>
Kugelgraphit- und Tempereguss	<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"/>
Hartguss	-		≤350 HB	<input type="radio"/>
Neue Gusswerkstoffe 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"/>
Neue Gusswerkstoffe 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"/>
Sonderlegierungen	Nimonic, Inconel, Monel, Hastelloy	≤2000		<input checked="" type="radio"/>
Titan und Titan-Legierungen	<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"/>
Aluminium und Al-Legierungen	<b>3.0255</b> Al99,5, <b>3.2315</b> AlMgSi1, <b>3.3515</b> AlMg1	≤400		<input type="radio"/>
Al-Knetlegierungen	<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"/>
Al-Gusslegierungen ≤ 10 % Si	<b>3.2131</b> G-AlSi5Cu1, <b>3.2153</b> G-AlSi7Cu3, <b>3.2573</b> G-AlSi9	≤600		<input type="radio"/>
≤ 24 % Si	<b>3.2581</b> G-AlSi12, <b>3.2583</b> G-AlSi12Cu, - G-AlSi12CuNiMg	≤600		<input type="radio"/>
Magnesium-Legierungen	<b>3.5200</b> MgMn2, <b>3.5812.05</b> G-MgAl8Zn1, <b>3.5612.05</b> G-MgAl6Zn1	≤400		<input type="radio"/>
Kupfer, niedriglegiert	<b>2.0070</b> SE-Cu, <b>2.1020</b> CuSn6, <b>2.1096</b> G-CuSn5ZnPb	≤600		<input type="radio"/>
Messing, kurzspanend	<b>2.0380</b> CuZn39Pb2, <b>2.0401</b> CuZn39Pb3, <b>2.0410</b> CuZn43Pb2	≤600		<input type="radio"/>
langspanend	<b>2.0250</b> CuZn20, <b>2.0280</b> CuZn33, <b>2.0332</b> CuZn37Pb0,5	≤600		<input type="radio"/>
Bronzen, kurzspanend	<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"/>
Bronzen, langspanend	<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"/>
Kunststoffe, duroplastisch	Bakelit, Resopal, Pertinax, Moltopren	≤150		<input type="radio"/>
thermoplastisch	Plexiglas, Hostalen, Novodur, Makralon	≤100		<input type="radio"/>
aramidfaserverstärkt	Kevlar	≤1000		<input type="radio"/>
glas-/kohlefaserverstärkt	GFK/CFK	≤1000		<input type="radio"/>



# HARTNER

## ≤10xD

81210	81317	81310	82210	81320	81330	81350	81340	84814	84812	84418	84423	84506
339	340	340	341	340	340	340	340	340	340	340	340	340
HSS								HSS-E	HSS-E	HSS		HSS
N	N	N	N	H	W	FW	FN	FU500DZ	FU500DZ	N	FN	FN
109	114	111	168	117	118	124	120	131	131	115	122	122



V <sub>c</sub> m/min	Vorschubreihen-Code								V <sub>c</sub> m/min	VR-Code	V <sub>c</sub> m/min	VR-Code	V <sub>c</sub> m/min	Vorschubreihen-Code		V <sub>c</sub> m/min	VR-Code	
24	6	6	6	6					6	29	5	32	5	28	6	6	30	7
20	5	5	5	5					5	22	4	25	4	22	5	5	24	6
27	6	6	6	6					6	32	5	35	5	30	6	6	33	7
27	5	5	5	5					5	25	5	28	5	30	5	5	33	6
22	5	5	5	5					5	25	5	28	5	25	5	5	28	6
22	5	5	5	5					5	22	5	25	5	25	5	5	28	6
										13	4	15	4	22	4	4	24	5
										12	3	13	3	18	4	4	23	5
										11	2	12	2					
27	6	6	6	6					6	25	5	28	5	30	6	6	33	7
										12	3	14	3	14	4	4	18	5
										11	2	12	2					
14	4	4	4	4					4	12	3	13	3	12	4	4	15	5
										7	2	8	2					
										12	3	13	9	16	4	4	19	5
										9	2	10	2	10	3	3	13	4
										9	2	10	2					
										12	3	13	3					
										7	3	8	3					
										11	3	12	3					
27	6	6	6	6					6	29	6	32	6	30	6	6	33	7
27	6	6	6	6					6	23	6	26	6	30	6	6	33	7
22	6	6	6	6					6	25	6	28	6	24	6	6	26	7
18	6	6	6	6					6	18	6	20	6	20	6	6	22	7
65										45	7	50	7					
65										45	7	50	7					
45	7	7	7	7					7	54	7	60	7	50	7	7	55	8
45	6	6	6	6					6	45	6	50	6	50	6	6	55	7
63	6	6	6	6					6	45	6	50	6	70	6	6		
54	5	5	5	5					5	60	5	70	5	60	5	5	65	6
63									6	40	5	50	5					
36	5	5	5	5					5	25	5	28	5	40	5	5	44	6
28	4	4	4	4					4	31	4	35	4	30	4			
22	4	4	4	4					4	22	4	25	4	25	4			
22	4	4	4	4					4	22	4	24	4	14	4	4	16	5
										18	4	20	4	12	4	4	14	5
14	4	4	4	4					4	16	4	18	4	18	4	4	23	5
22	5	5	5	5					5	11	4	12	4	32	5			



## Einsatzempfehlungen Spiralbohrer

<b>Bestell-Nr.</b>
<b>Norm/DIN</b>
<b>Schneidstoff</b>
<b>Oberfläche</b>
<b>Typ</b>
<b>Kühlung</b>
<b>Programm Seite</b>

Werkzeuge mit fett gedruckter Vorschubreihen-Nr. sind bevorzugt auszuwählen.

Bohrer-Ø mm	Vorschubreihen-Code								
	1	2	3	4	5	6	7	8	9
	f (mm/U)								
<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

Werkstoffbezogene Kühlmittel:

- Luft
- Öl
- Emulsion

Schneidrichtung:

- rechtsschneidend
- linksschneidend

Werkstoffgruppe	Werkstoffbeispiele, neue Bezeichnung (in Klammern alte Bezeichnung) Fettgedruckte Zahlen = Werkstoff-Nr. nach DIN EN	Zugfestigkeit MPa (N/mm <sup>2</sup> )	Härte	Kühl- mittel
Allgemeine Baustähle	<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"/>
Automatenstähle	<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"/>
Unlegierte Vergütungsstähle	<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"/>
Legierte Vergütungsstähle	<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"/>
Unlegierte Einsatzstähle	<b>1.0301</b> (C10), <b>1.1121</b> C10E (Ck10)	≤850		<input type="radio"/>
Legierte Einsatzstähle	<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"/>
Nitrierstähle	<b>1.8504</b> 34CrAl6 <b>1.8519</b> 31CrMoV9, <b>1.8550</b> 34CrAlNi7	≤1000 ≤1400		<input checked="" type="radio"/>
Werkzeugstähle	<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"/>
Schnellarbeitsstähle	<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"/>
Federstähle	<b>1.5026</b> 55Si7, <b>1.7176</b> 55Cr3, <b>1.8159</b> 51CrV4 (51CrV4)		≤350 HB	<input checked="" type="radio"/>
Gehärtete Stähle	-		≤48 HRC ≤66 HRC	<input checked="" type="radio"/>
Rostfreie Stähle, geschwefelt austenitisch martensitisch	<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		<input checked="" type="radio"/>
Gusseisen	<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"/>
Kugelgraphit- und Temperguss	<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"/>
Hartguss	-		≤350 HB	<input type="radio"/>
Neue Gusswerkstoffe 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"/>
Neue Gusswerkstoffe 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"/>
Sonderlegierungen	Nimonic, Inconel, Monel, Hastelloy	≤2000		<input checked="" type="radio"/>
Titan und Titan-Legierungen	<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"/>
Aluminium und Al-Legierungen	<b>3.0255</b> Al99,5, <b>3.2315</b> AlMgSi1, <b>3.3515</b> AlMg1	≤400		<input type="radio"/>
Al-Knetlegierungen	<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"/>
Al-Gusslegierungen ≤ 10 % Si	<b>3.2131</b> G-AlSi5Cu1, <b>3.2153</b> G-AlSi7Cu3, <b>3.2573</b> G-AlSi9	≤600		<input type="radio"/>
≤ 24 % Si	<b>3.2581</b> G-AlSi12, <b>3.2583</b> G-AlSi12Cu, - G-AlSi12CuNiMg	≤600		<input type="radio"/>
Magnesium-Legierungen	<b>3.5200</b> MgMn2, <b>3.5812.05</b> G-MgAl8Zn1, <b>3.5612.05</b> G-MgAl6Zn1	≤400		<input type="radio"/>
Kupfer, niedriglegiert	<b>2.0070</b> SE-Cu, <b>2.1020</b> CuSn6, <b>2.1096</b> G-CuSn5ZnPb	≤600		<input type="radio"/>
Messing, kurzspanend	<b>2.0380</b> CuZn39Pb2, <b>2.0401</b> CuZn39Pb3, <b>2.0410</b> CuZn43Pb2	≤600		<input type="radio"/>
langspanend	<b>2.0250</b> CuZn20, <b>2.0280</b> CuZn33, <b>2.0332</b> CuZn37Pb0,5	≤600		<input type="radio"/>
Bronzen, kurzspanend	<b>2.1090</b> CuSn7ZnPb, <b>2.1170</b> CuPb5Sn5, <b>2.1176</b> CuPb10Sn	≤600		<input type="radio"/>
langspanend	<b>2.0790</b> CuNi18Zn19Pb	≤850		<input checked="" type="radio"/>
Bronzen, langspanend	<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"/>
Kunststoffe, duroplastisch	Bakelit, Resopal, Pertinax, Moltopren	≤150		<input type="radio"/>
thermoplastisch	Plexiglas, Hostalen, Novodur, Makralon	≤100		<input type="radio"/>
aramidfaserverstärkt	Kevlar	≤1000		<input type="radio"/>
glas-/kohlefaserverstärkt	GFK/CFK	≤1000		<input type="radio"/>



# HARTNER

≤10xD

81311	82211	81341	81361
340	341	340	340
HSS-E			
N	N	FN	S
126	169	127	129

81362
340
HSS-E
S
129

89286
WN
VHM
N
133

82710	82521	82535
WN	WN	WN
HSS		
FN	N	FN
axial	axial	axial
107	180	179

82525
WN
HSS-E
FN
axial
181

82515
WN
HSS-E
FN
axial
182



V <sub>c</sub> m/min	Vorschubreihen- Code				V <sub>c</sub> m/min	VR- Code	V <sub>c</sub> m/min	VR- Code	V <sub>c</sub> m/min	Vorschubreihen- Code			V <sub>c</sub> m/min	VR- Code	V <sub>c</sub> m/min	VR- Code
33	5	O5	5						26	6	6	6	35	6	30	5
27	5	5	5						22	5	5	5	30	5	25	4
36	5	5	5						30	6	6	6	30	6	30	5
32	5	5	5						30	5	5	5	30	5	25	4
36	5	5	5						24	5	5	5	35	5	30	4
36	5	5	5						24	5	5	5	29	5	25	4
22	4	4	4						22	4	4	4	22	4	18	3
18	4	4	4						20	4	4	4	18	4	16	3
14	3	3	3	3	15	3			14	3	3	3	14	3	12	2
32	5	5	5						30	6	6	6	35	6	30	5
18	4	4	4						17	4	4	4	18	4	16	3
13	3	3	3		13	3			12	3	3	3	14	3	12	2
14	4	4	4						12	4	4	4	14	4	12	3
10	3	3	3		10	3			10	3	3	3	12	3	10	2
13	4	4	4						15	4	4	4	15	4	13	3
10	3	3	3		10	3			10	3	3	3	11	3	9	2
12	3	3	3		10	3			10	3	3	3	11	3	9	2
6	2	2	2		8	2			7	2	2	2	8	2	6	2
4			1										4	2	4	1
12	4	4	4	4	15	4							14	4	12	3
8	3	3	2	3	10	3							10	3	8	2
10	3	3	3	3	13	3							12	3	12	2
32	6	6	6						30	6	6	6	30	6	28	5
27	6	6	6						30	6	6	6	24	6	22	5
26	6	6	6						24	6	6	6	24	6	22	5
24	6	6	6						20	6	6	6	20	6	18	5
6	3	3	3	3	6	3			7	3	3	3	8	3	6	2
5	1	1		1	6	1							8	1	6	1
8				2	10	2							10	2	8	2
5				2	6	2							8	2	6	2
70			7						80	6						
60			6						50	7	7	7	60	7	55	6
60				5					50	6	6	6	50	6	44	5
36	5	5	5						60	5	5	5	38	5	35	4
54			5						60	5	5	5	55	5	50	4
36	5	5	5						40	5	5	5	36	5	33	4
30	4	4	5						24	4	4	4	24	4	22	4
24	4	4	5						24	4	4	4	20	4	18	4
18	4	4	4						22	4	4	4	14	4	12	4
13	4	4	4	4	25	4										
16	4	4	4						50	4						
26			4						40	3						
									80	3						

## Einsatzempfehlungen Spiralbohrer

Bestell-Nr. 

Norm/DIN

Schneidstoff

Oberfläche

Typ

Programm Seite

Werkzeuge mit fett gedruckter Vorschubreihen-Nr. sind bevorzugt auszuwählen.

Bohrer-Ø mm	Vorschubreihen-Code								
	1	2	3	4	5	6	7	8	9
	f (mm/U)								
<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

Werkstoffbezogene Kühlmittel:

- Luft
- Öl
- Emulsion

Schneidrichtung:

- rechtsschneidend
- linksschneidend

Werkstoffgruppe	Werkstoffbeispiele, neue Bezeichnung (in Klammern alte Bezeichnung) Fettgedruckte Zahlen = Werkstoff-Nr. nach DIN EN	Zugfestigkeit MPa (N/mm <sup>2</sup> )	Härte	Kühl- mittel
Allgemeine Baustähle	<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"/>
Automatenstähle	<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"/>
Unlegierte Vergütungsstähle	<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"/>
Legierte Vergütungsstähle	<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"/>
Unlegierte Einsatzstähle	<b>1.0301</b> (C10), <b>1.1121</b> C10E (Ck10)	≤850		<input type="radio"/>
Legierte Einsatzstähle	<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"/>
Nitrierstähle	<b>1.8504</b> 34CrAl6 <b>1.8519</b> 31CrMoV9, <b>1.8550</b> 34CrAlNi7	≤1000 ≤1400		<input type="radio"/> <input checked="" type="radio"/>
Werkzeugstähle	<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 type="radio"/>
Schnellarbeitsstähle	<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"/>
Federstähle	<b>1.5026</b> 55Si7, <b>1.7176</b> 55Cr3, <b>1.8159</b> 51CrV4 (51CrV4)		≤350 HB	<input checked="" type="radio"/>
Gehärtete Stähle	-		≤48 HRC ≤66 HRC	<input checked="" type="radio"/> <input checked="" type="radio"/>
Rostfreie Stähle, geschwefelt austenitisch martensitisch	<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		<input checked="" type="radio"/> <input checked="" type="radio"/> <input checked="" type="radio"/>
Gusseisen	<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"/>
Kugelgraphit- und Tempereguss	<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"/>
Hartguss	-		≤350 HB	<input type="radio"/>
Neue Gusswerkstoffe 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"/>
Neue Gusswerkstoffe 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"/>
Sonderlegierungen	Nimonic, Inconel, Monel, Hastelloy	≤2000		<input checked="" type="radio"/>
Titan und Titan-Legierungen	<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"/>
Aluminium und Al-Legierungen	<b>3.0255</b> Al99,5, <b>3.2315</b> AlMgSi1, <b>3.3515</b> AlMg1	≤400		<input type="radio"/>
Al-Knetlegierungen	<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"/>
Al-Gusslegierungen ≤ 10 % Si	<b>3.2131</b> G-AlSi5Cu1, <b>3.2153</b> G-AlSi7Cu3, <b>3.2573</b> G-AlSi9	≤600		<input type="radio"/>
≤ 24 % Si	<b>3.2581</b> G-AlSi12, <b>3.2583</b> G-AlSi12Cu, - G-AlSi12CuNiMg	≤600		<input type="radio"/>
Magnesium-Legierungen	<b>3.5200</b> MgMn2, <b>3.5812.05</b> G-MgAl8Zn1, <b>3.5612.05</b> G-MgAl6Zn1	≤400		<input type="radio"/>
Kupfer, niedriglegiert	<b>2.0070</b> SE-Cu, <b>2.1020</b> CuSn6, <b>2.1096</b> G-CuSn5ZnPb	≤600		<input type="radio"/>
Messing, kurzspanend	<b>2.0380</b> CuZn39Pb2, <b>2.0401</b> CuZn39Pb3, <b>2.0410</b> CuZn43Pb2	≤600		<input type="radio"/>
langspanend	<b>2.0250</b> CuZn20, <b>2.0280</b> CuZn33, <b>2.0332</b> CuZn37Pb0,5	≤600		<input type="radio"/>
Bronzen, kurzspanend	<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"/>
Bronzen, langspanend	<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"/>
Kunststoffe, duroplastisch	Bakelit, Resopal, Pertinax, Moltopren	≤150		<input type="radio"/>
thermoplastisch	Plexiglas, Hostalen, Novodur, Makralon	≤100		<input type="radio"/>
aramidfaserverstärkt	Kevlar	≤1000		<input type="radio"/>
glas-/kohlefaserverstärkt	GFK/CFK	≤1000		<input type="radio"/>



# HARTNER

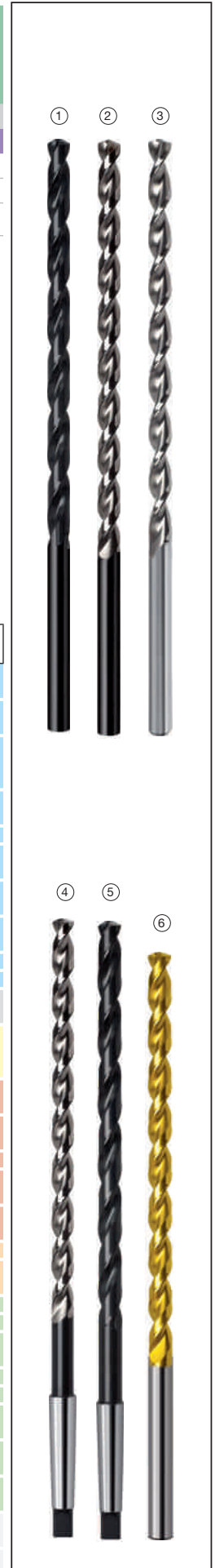
>10xD

81410	82310	81450	81440	81740	82340	82466
81510	82410		81540	81750	82440	82467
81610			81640	81760		82468
						82469
1869	1870	1869	1869	WN	1870	WN
<b>HSS</b>						
N	N	FW	FN	FN	FN	FN
134/139/ 143	170/173	137	135/140/ 144	145-147	171/174	175-178
①	⑤	③	②	④	④	④

84425
84426
1869
<b>HSS</b>
GT 100
136/141
⑥

81441
81541
1869
<b>HSS-E</b>
FN
138/142
②

82341
1870
<b>HSS-E</b>
FN
172
④



V <sub>c</sub> m/min	Vorschubreihen- Code					
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	VR- Code
28	5
22	4
28	5
22	4
28	4
22	4
16	3
28	5
12	3
8	2
10	2
14	3
10	2
10	3
8	2
11	3
8	2
8	2
5	1
3	1
28	5
22	5
25	5
18	5
6	1
70	6
70	6
55	6
45	5
70	5
28	4
36	4
28	3
25	3
22	3
18	3
15	3
22	4

V <sub>c</sub> m/min	VR- Code
30	4
25	4
33	4
30	4
33	4
33	4
20	3
14	3
10	2
29	4
14	3
10	2
10	3
8	2
11	3
8	2
8	2
5	1
3	1
10	3
8	2
10	2
20	5
16	5
5	2
5	1
6	1
5	1
50	6
40	5
30	4
45	4
30	4
25	4
20	4
16	3
10	3
14	3
20	3

V <sub>c</sub> m/min	VR- Code
30	4
25	4
33	4
30	4
33	4
33	4
20	3
14	3
10	2
29	4
14	3
10	2
10	3
8	2
11	3
8	2
8	2
5	1
3	1
10	3
8	2
10	2
20	5
16	5
5	2
5	1
6	1
5	1
50	6
70	5
30	4
45	4
30	4
25	4
20	4
16	3
10	3
14	3
20	3



# Einsatzempfehlungen Kleinbohrer

 Artikel-Nr. 

 Artikel-Nr. 

Norm/DIN

Schneidstoff

HM-Anwendungsgruppe

Oberfläche

Typ

Kühlung

Programm Seite



Bohrer-Ø mm	Vorschubreihen-Code								
	101	102	103	104	105	106	107	108	109
	f (mm/U)								
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



























































































Bohrer-Ø mm	Vorschubreihen-Code Art.-Nr. 6400/6401/6408/6412												
	56	57	58	59	60	61	62	63	64	65	66	67	68
	f (mm/U)												
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

Werkstoffbezogene Kühlmittel:

-  Luft
-  Öl
-  Emulsion

Schneidrichtung:

-  rechtsschneidend
-  linksschneidend

Werkstoffgruppe	Werkstoffbeispiele, neue Bezeichnung (in Klammern alte Bezeichnung) Fettgedruckte Zahlen = Werkstoff-Nr. nach DIN EN	Zugfestigkeit MPa (N/mm <sup>2</sup> )	Härte	Kühl- mittel
Allgemeine Baustähle	<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		  
Automatenstähle	<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		  
Unlegierte Vergütungsstähle	<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		  
Legierte Vergütungsstähle	<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		  
Unlegierte Einsatzstähle	<b>1.0301</b> (C10), <b>1.1121</b> C10E (Ck10)	≤850		  
Legierte Einsatzstähle	<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		  
Nitrierstähle	<b>1.8504</b> 34CrAl6 <b>1.8519</b> 31CrMoV9, <b>1.8550</b> 34CrAlNi7	≤1000 ≤1400		  
Werkzeugstähle	<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		  
Schnellarbeitsstähle	<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		  
Federstähle	<b>1.5026</b> 55Si7, <b>1.7176</b> 55Cr3, <b>1.8159</b> 51CrV4 (51CrV4)		≤350 HB	  
Gehärtete Stähle	-		≤48 HRC ≤66 HRC	  
Rostfreie Stähle, geschwefelt austenitisch martensitisch	<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		  
Gusseisen	<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	  
Kugelgraphit- und Tempereguss	<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	  
Hartguss	-		≤350 HB	  
Neue Gusswerkstoffe 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	  
Neue Gusswerkstoffe 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		  
Sonderlegierungen	Nimonic, Inconel, Monel, Hastelloy	≤2000		  
Titan und Titan-Legierungen	<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		  
Aluminium und Al-Legierungen	<b>3.0255</b> Al99,5, <b>3.2315</b> AlMgSi1, <b>3.3515</b> AlMg1	≤400		  
Al-Knetlegierungen	<b>3.0615</b> AlMgSiPb, <b>3.1325</b> AlCuMg1, <b>3.3245</b> AlMg3Si, <b>3.4365</b> AlZnMgCu1,5	≤650		  
Al-Gusslegierungen ≤ 10 % Si ≤ 24 % 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		  
Magnesium-Legierungen	<b>3.5200</b> MgMn2, <b>3.5812.05</b> G-MgAl8Zn1, <b>3.5612.05</b> G-MgAl6Zn1	≤400		  
Kupfer, niedriglegiert	<b>2.0070</b> SE-Cu, <b>2.1020</b> CuSn6, <b>2.1096</b> G-CuSn5ZnPb	≤600		  
Messing, kurzspanend langspanend	<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		  
Bronzen, kurzspanend	<b>2.1090</b> CuSn7ZnPb, <b>2.1170</b> CuPb5Sn5, <b>2.1176</b> CuPb10Sn <b>2.0790</b> CuNi18Zn19Pb	≤600 ≤850		  
Bronzen, langspanend	<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		  
Kunststoffe, duroplastisch thermoplastisch	Bakelit, Resopal, Pertinax, Moltopren Plexiglas, Hostalen, Novodur, Makralon	≤150 ≤100		  
aramidfaserverstärkt	Kevlar	≤1000		  
glas-/kohlefaserverstärkt	GFK/CFK	≤1000		  



# HARTNER

## ≤4xD ≤7xD

## ≤5xD ≤8xD ≤15xD

87011
87016
1899
HSS-E-PM
N
289/291

84810
1899
HSS-E-PM
N
292

89281
WN
VHM
K10/K20
N
293

86402
WN
VHM
K/P
N
294

86400	86401
WN	WN
VHM	VHM
K/P	K/P
N	N
295	296

86405	86408	86412
WN	WN	WN
VHM	VHM	VHM
K/P	K/P	K/P
N	N	N
axial	axial	axial
297	298	299



V <sub>c</sub> m/min	VR-Code	V <sub>c</sub> m/min	VR-Code	V <sub>c</sub> m/min	VR-Code	V <sub>c</sub> m/min	VR-Code	V <sub>c</sub> m/min	Vorschubreihen-Code		V <sub>c</sub> m/min	Vorschubreihen-Code		
21	106	27	106	50	105	100	62	100	64	62	105	62	58	58
18	105	23	105	35	104	100	62	100	64	62	100	62	58	58
18	106	23	106	50	105	100	62	100	64	62	105	62	59	59
16	105	21	105	45	104	90	61	90	63	61	90	61	59	59
20	105	26	105	45	104	90	62	90	64	62	95	62	58	58
18	105	23	105	35	104	90	62	90	64	62	95	62	58	58
14	104	18	104	30	103	90	61	90	63	61	90	61	58	58
14	104	18	104	30	103	90	61	90	63	61	90	61	58	58
12	103	16	103	70	60	70	60	70	62	60	70	60	58	58
18	106	23	106	50	103	100	61	100	63	61	100	61	57	57
14	104	18	104	40	103	85	61	85	63	61	85	61	58	58
12	103	16	103	70	60	70	60	70	62	60	70	60	58	58
14	104	18	104	25	103	70	60	70	62	60	70	60	57	57
12	103	16	103	60	60	60	60	60	62	60	60	60	57	57
16	104	20	104	25	103	50	60	50	62	60	50	60	58	58
14	103	18	103	60	60	60	60	60	62	60	50	60	58	58
14	103	18	103	60	60	60	60	60	57	57	50	57	57	57
8	102	10	102	20	102	60	57	60	57	57	50	57	57	57
				15	104									
18	104	20	104	25	103	30	57	30	57	57	70	57	57	57
14	103	16	103	25	102	15	56	15	56	56	60	56	56	56
16	103	18	103	25	102	30	57	30	57	57	70	57	57	57
26	106	33	106	80	105	130	66	130	68	66	150	60	60	60
22	106	28	106	60	105	130	66	130	68	66	140	60	60	60
18	106	23	106	60	105	130	66	130	68	66	140	60	60	60
22	106	28	106	50	105	120	65	120	67	65	130	60	60	60
				15	103			10	56	56	25	56	56	56
				45	104			15	56	56	35	56	56	56
				25	104			15	56	56	35	56	56	56
				160	107			70	68	68	70	68	68	68
				150	106			70	68	68	70	68	68	68
26	107			100	106			135	59	59	135	59	59	59
18	106			60	106			135	59	59	135	59	59	59
75	106	80	106	150	105									
42	105	53	105	50	105									
				67	106									
22	105	28	105	44	104									
22	104	28	104	68	103									
18	104	23	104	49	103									
13	104	16	104	53	103									
		14	104	36	103									
16	104	20	104	50	103									
18	104	23	104	36	103									
				60	104									



## Einsatzempfehlungen TS-Drills

Bestell-Nr. 

Norm/DIN

Schneidstoff

HM-Gruppe

Oberfläche

Typ

Schaffform

Kühlung

Programm Seite



Werkzeuge mit fett gedruckter Vorschubreihen-Nr. sind bevorzugt auszuwählen.

Bohrer-Ø mm	Vorschubreihen-Code								
	1	2	3	4	5	6	7	8	9
	f (mm/U)								
<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

Werkstoffbezogene Kühlmittel:

- Luft
- Öl
- Emulsion

Schneidrichtung:

-  rechtsschneidend
-  linksschneidend

Werkstoffgruppe	Werkstoffbeispiele, neue Bezeichnung (in Klammern alte Bezeichnung) Fettgedruckte Zahlen = Werkstoff-Nr. nach DIN EN	Zugfestigkeit MPa (N/mm <sup>2</sup> )	Härte	Kühl- mittel
Allgemeine Baustähle	<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		○ ○
Automatenstähle	<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		○ ○
Unlegierte Vergütungsstähle	<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		○ ○ ○
Legierte Vergütungsstähle	<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		○ ○
Unlegierte Einsatzstähle	<b>1.0301</b> (C10), <b>1.1121</b> C10E (Ck10)	≤850		○
Legierte Einsatzstähle	<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		● ●
Nitrierstähle	<b>1.8504</b> 34CrAl6 <b>1.8519</b> 31CrMoV9, <b>1.8550</b> 34CrAlNi7	≤1000 ≤1400		○ ●
Werkzeugstähle	<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		○ ○
Schnellarbeitsstähle	<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		●
Federstähle	<b>1.5026</b> 55Si7, <b>1.7176</b> 55Cr3, <b>1.8159</b> 51CrV4 (51CrV4)		≤350 HB	●
Gehärtete Stähle	-		≤48 HRC ≤66 HRC	● ●
Rostfreie Stähle, geschwefelt austenitisch martensitisch	<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		● ● ●
Gusseisen	<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	○ ○
Kugelgraphit- und Temperguss	<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	○ ○
Hartguss	-		≤350 HB	○
Neue Gusswerkstoffe 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	○ ○
Neue Gusswerkstoffe 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		○ ○
Sonderlegierungen	Nimonic, Inconel, Monel, Hastelloy	≤2000		●
Titan und Titan-Legierungen	<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		● ○
Aluminium und Al-Legierungen	<b>3.0255</b> Al99,5, <b>3.2315</b> AlMgSi1, <b>3.3515</b> AlMg1	≤400		○
Al-Knetlegierungen	<b>3.0615</b> AlMgSiPb, <b>3.1325</b> AlCuMg1, <b>3.3245</b> AlMg3Si, <b>3.4365</b> AlZnMgCu1,5	≤650		○
Al-Gusslegierungen ≤ 10 % Si	<b>3.2131</b> G-AlSi5Cu1, <b>3.2153</b> G-AlSi7Cu3, <b>3.2573</b> G-AlSi9	≤600		○
≤ 24 % Si	<b>3.2581</b> G-AlSi12, <b>3.2583</b> G-AlSi12Cu, - G-AlSi12CuNiMg	≤600		○
Magnesium-Legierungen	<b>3.5200</b> MgMn2, <b>3.5812.05</b> G-MgAl8Zn1, <b>3.5612.05</b> G-MgAl6Zn1	≤400		○
Kupfer, niedriglegiert	<b>2.0070</b> SE-Cu, <b>2.1020</b> CuSn6, <b>2.1096</b> G-CuSn5ZnPb	≤600		○
Messing, kurzspanend	<b>2.0380</b> CuZn39Pb2, <b>2.0401</b> CuZn39Pb3, <b>2.0410</b> CuZn43Pb2	≤600		○
langspanend	<b>2.0250</b> CuZn20, <b>2.0280</b> CuZn33, <b>2.0332</b> CuZn37Pb0,5	≤600		○
Bronzen, kurzspanend	<b>2.1090</b> CuSn7ZnPb, <b>2.1170</b> CuPb5Sn5, <b>2.1176</b> CuPb10Sn <b>2.0790</b> CuNi18Zn19Pb	≤600 ≤850		○ ○
Bronzen, langspanend	<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		○ ○
Kunststoffe, duroplastisch	Bakelit, Resopal, Pertinax, Moltopren	≤150		○
thermoplastisch	Plexiglas, Hostalen, Novodur, Makralon	≤100		○
aramidfaserverstärkt	Kevlar	≤1000		○
glas-/kohlefaserverstärkt	GFK/CFK	≤1000		○



# HARTNER

≤3xD

89306
6538K
VHM

<b>T</b>
80U
HE
208

89264	89237
6537K	6539
VHM	

K/P	K/P
<b>T</b>	<b>T</b>
100U	100U
HE	DZ
196	200

89422
6537K
VHM

<b>Y</b>
100H
HA
198

89413	89402	89401
6537K	6537K	6539
VHM		

K/P	K/P	K/P
<b>F</b>	<b>F</b>	<b>F</b>
100U	100U	100U
HA	HE	DZ
194	194	200

89450	89550
6537K	6537K
VHM	VHM

K/P	K/P
<b>a</b>	<b>a</b>
100INOX	100INOX
HA	HE
axial	axial
209	209

89266
6537K
VHM

<b>T</b>
100U
HE
axial
207



v <sub>c</sub> m/min	VR- Code	v <sub>c</sub> m/min	Vorschubreihen- Code	v <sub>c</sub> m/min	VR- Code	v <sub>c</sub> m/min	Vorschubreihen- Code			v <sub>c</sub> m/min	Vorschubreihen- Code	v <sub>c</sub> m/min	VR- Code	
95	6	100	6	130	7	130	7	7	7			110	6	
80	5	85	5	110	6	110	6	6	6			90	5	
95	7	110	7	145	8	145	8	8	8			130	7	
75	6	85	6	110	7	110	7	7	7			110	7	
80	6	90	6	120	7	120	7	7	7			100	7	
75	6	85	6	110	7	110	7	7	7			95	6	
70	6	80	6	105	7	105	7	7	7			90	6	
75	6	80	6	105	7	105	7	7	7			90	6	
60	5	75	5	100	6	100	6	6	6			80	6	
90	7	100	7	130	8	130	8	8	8			110	7	
75	6	90	6	120	7	120	7	7	7			90	6	
60	5	65	4	85	5	85	5	5	5			65	4	
75	6	75	5	100	6	100	6	6	6			85	6	
60	5	70	4	90	5	90	5	5	5			80	5	
45	5	50	5	65	6	65	6	6	6			60	5	
35	5	40	4	55	5	55	5	5	5			50	4	
40	4			55	4							45	3	
		35	2	45	3	45	3	3	3			45	2	
		35	1	40	1	40	1	1	1			40	2	
		20	1	20	1	20	1	1	1			20	1	
40	2	40	2	40	2	40	2	2	2	80	5	45	4	
35	2	15	1	15	1	15	1	1	1	60	2-3	40	2	
35	2	35	2	35	2	35	2	2	2	80	5	35	4	
150	7	160	7			210	8	8	8			160	8	
110	7	120	7			155	8	8	8			120	8	
110	7	120	6			155	7	7	7			100	8	
90	6	95	6			125	7	7	7			95	7	
		25	2			35	3	3	3			30	2	
		20	3	25	4	25	4	4	4	30	4	4	25	3
		15	1	15	1	15	1	1	1	45	4	4	35	3
		15	1	15	1	15	1	1	1	40	3	3	30	2
200	8	200	8			260	9	9	9			240	8	
200	8	200	8			260	9	9	9			240	8	
170	8	170	8			220	8	8	8			200	8	
140	7	140	7			180	8	8	8			170	8	
		200	7			260	8	8	8			230	7	
		80	6			105	7	7	7			95	6	
		210	7			270	8	8	8			250	7	
		140	6			180	7	7	7			170	6	
		80	5			105	6	6	6			95	6	
		65	5			85	6	6	6			80	5	
		60	4			80	5	5	5			70	5	
		45	4			60	5	5	5			60	5	

## Einsatzempfehlungen TS-Drills

<b>Bestell-Nr.</b> 
<b>Norm/DIN</b>
<b>Schneidstoff</b>
<b>HM-Gruppe</b>
<b>Oberfläche</b>
<b>Typ</b>
<b>Schaffform</b>
<b>Kühlung</b>
<b>Programm Seite</b>



Werkzeuge mit fett gedruckter Vorschubreihen-Nr. sind bevorzugt auszuwählen.

Bohrer-Ø mm	Vorschubreihen-Code								
	1	2	3	4	5	6	7	8	9
	f (mm/U)								
<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

Werkstoffbezogene Kühlmittel:

- Luft
- Öl
- Emulsion

Schneidrichtung:

-  rechtsschneidend
-  linksschneidend

Werkstoffgruppe	Werkstoffbeispiele, neue Bezeichnung (in Klammern alte Bezeichnung) Fettgedruckte Zahlen = Werkstoff-Nr. nach DIN EN	Zugfestigkeit MPa (N/mm <sup>2</sup> )	Härte	Kühl- mittel
Allgemeine Baustähle	<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		○ ●
Automatenstähle	<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		○ ●
Unlegierte Vergütungsstähle	<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		○ ● ●
Legierte Vergütungsstähle	<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		○ ●
Unlegierte Einsatzstähle	<b>1.0301</b> (C10), <b>1.1121</b> C10E (Ck10)	≤850		○
Legierte Einsatzstähle	<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		● ●
Nitrierstähle	<b>1.8504</b> 34CrAl6 <b>1.8519</b> 31CrMoV9, <b>1.8550</b> 34CrAlNi7	≤1000 ≤1400		○ ●
Werkzeugstähle	<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		○ ●
Schnellarbeitsstähle	<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		●
Federstähle	<b>1.5026</b> 55Si7, <b>1.7176</b> 55Cr3, <b>1.8159</b> 51CrV4 (51CrV4)		≤350 HB	●
Gehärtete Stähle	-		≤48 HRC ≤66 HRC	● ●
Rostfreie Stähle, geschwefelt austenitisch martensitisch	<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		● ● ●
Gusseisen	<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	○ ○
Kugelgraphit- und Temperguss	<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	○ ○
Hartguss	-		≤350 HB	○
Neue Gusswerkstoffe 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	○ ○
Neue Gusswerkstoffe 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		○ ○
Sonderlegierungen	Nimonic, Inconel, Monel, Hastelloy	≤2000		●
Titan und Titan-Legierungen	<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		● ●
Aluminium und Al-Legierungen	<b>3.0255</b> Al99,5, <b>3.2315</b> AlMgSi1, <b>3.3515</b> AlMg1	≤400		○
Al-Knetlegierungen	<b>3.0615</b> AlMgSiPb, <b>3.1325</b> AlCuMg1, <b>3.3245</b> AlMg3Si, <b>3.4365</b> AlZnMgCu1,5	≤650		○
Al-Gusslegierungen ≤ 10 % Si	<b>3.2131</b> G-AlSi5Cu1, <b>3.2153</b> G-AlSi7Cu3, <b>3.2573</b> G-AlSi9	≤600		○
≤ 24 % Si	<b>3.2581</b> G-AlSi12, <b>3.2583</b> G-AlSi12Cu, - G-AlSi12CuNiMg	≤600		○
Magnesium-Legierungen	<b>3.5200</b> MgMn2, <b>3.5812.05</b> G-MgAl8Zn1, <b>3.5612.05</b> G-MgAl6Zn1	≤400		○
Kupfer, niedriglegiert	<b>2.0070</b> SE-Cu, <b>2.1020</b> CuSn6, <b>2.1096</b> G-CuSn5ZnPb	≤600		○
Messing, kurzspanend	<b>2.0380</b> CuZn39Pb2, <b>2.0401</b> CuZn39Pb3, <b>2.0410</b> CuZn43Pb2	≤600		○
langspanend	<b>2.0250</b> CuZn20, <b>2.0280</b> CuZn33, <b>2.0332</b> CuZn37Pb0,5	≤600		○
Bronzen, kurzspanend	<b>2.1090</b> CuSn7ZnPb, <b>2.1170</b> CuPb5Sn5, <b>2.1176</b> CuPb10Sn <b>2.0790</b> CuNi18Zn19Pb	≤600 ≤850		○ ●
Bronzen, langspanend	<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		● ●
Kunststoffe, duroplastisch	Bakelit, Resopal, Pertinax, Moltopren	≤150		○
thermoplastisch	Plexiglas, Hostalen, Novodur, Makralon	≤100		○
aramidfaserverstärkt	Kevlar	≤1000		○
glas-/kohlefaserverstärkt	GFK/CFK	≤1000		○



# HARTNER

## ≤3xD

89410	89415
6537K	6537K
VHM	
K/P	K/P
<b>F</b>	<b>F</b>
100U	100U
HA	HE
axial	axial
205	205



## ≤4xD

89423	89424
6537K	6537K
VHM	VHM
<b>Y</b>	<b>Y</b>
100H	100H
HA	HE
axial	axial
211	211



## ≤5xD

89292
WN
VHM
K
○
150GG
HA
axial
213



89307
6538M
HM
P
<b>T</b>
80U
HE
axial
217



89420
6537L
VHM
K/P
<b>F</b>
100R
HA
axial
222



89451	89551
6537L	6537L
VHM	VHM
K/P	K/P
<b>a</b>	<b>a</b>
100INOX	100INOX
HA	HE
axial	axial
218	218



V <sub>c</sub> m/min	Vorschubreihen- Code	V <sub>c</sub> m/min	Vorschubreihen- Code	V <sub>c</sub> m/min	VR- Code	V <sub>c</sub> m/min	VR- Code	V <sub>c</sub> m/min	VR- Code	V <sub>c</sub> m/min	Vorschubreihen- Code
145	7 7	145	7 7			95	5				
120	6 6	120	6 6			80	4				
170	8 8	170	8 8			95	6				
145	8 8	145	8 8			75	5				
130	8 8	130	8 8			80	5				
125	7 7	125	7 7			75	5				
120	7 7	120	7 7			75	5				
120	7 7	120	7 7			75	5				
105	7 7	105	7 7			55	4				
145	8 8	145	8 8			90	6				
120	7 7	120	7 7			75	5				
85	5 5	85	5 5			55	4				
110	7 7	110	7 7			70	5				
105	5 5	105	5 5			55	4				
80	6 6	80	6 6			40	4				
65	5 5	65	5 5			35	4				
60	4 4	60	4 4			40	3				
60	3 3	60	3 3								
55	3 3	55	3 3								
35	2 2	35	2 2								
60	5 5					40	2			80	5 5
55	2 2					35	2			60	2-3 2-3
45	5 5					35	2			80	5 5
210	9 9					150	6	210	9		
160	9 9			120	7	110	6	160	9		
140	9 9			100	7	110	6	160	9		
130	8 8			90	7	90	5	130	8		
40	3 3			80	7			130	8		
				40	2			100	8		
								80	8		
								60	8		
35	4 4	35	4 4							30	4 4
45	4 4	45	4 4							45	4 4
40	3 3	40	3 3							40	3 3
310	9 9					200	7				
310	9 9					200	7				
260	9 9					170	7				
220	9 9					140	6				
280	8 8										
125	7 7										
325	8 8										
220	7 7										
125	7 7										
105	6 6										
90	6 6										
80	6 6										
				410	9						
				410	9						
				380	9						
				330	9						
				280	9						
				110	6						
				80	5						



## Einsatzempfehlungen TS-Drills

Bestell-Nr.

Norm/DIN

Schneidstoff

HM-Gruppe

Oberfläche

Typ

Schaffform

Kühlung

Programm Seite

Werkzeuge mit fett gedruckter Vorschubreihen-Nr. sind bevorzugt auszuwählen.

Bohrer-Ø mm	Vorschubreihen-Code								
	1	2	3	4	5	6	7	8	9
	f (mm/U)								
<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	0,200
<b>4,00</b>	0,040	0,050	0,063	0,080	0,100	0,125	0,160	0,200	0,250
<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	0,400
<b>10,00</b>	0,080	0,100	0,125	0,160	0,200	0,250	0,315	0,400	0,500
<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	0,800
<b>25,00</b>	0,160	0,200	0,250	0,315	0,400	0,500	0,630	0,800	1,000
<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	1,600
<b>63,00</b>	0,315	0,400	0,500	0,630	0,800	1,000	1,250	1,600	2,000
<b>80,00</b>	0,400	0,500	0,630	0,800	1,000	1,250	1,600	2,000	

Werkstoffbezogene Kühlmittel:

- Luft
- Öl
- Emulsion

Schneidrichtung:

- rechtsschneidend
- linksschneidend

Werkstoffgruppe	Werkstoffbeispiele, neue Bezeichnung (in Klammern alte Bezeichnung) Fettgedruckte Zahlen = Werkstoff-Nr. nach DIN EN	Zugfestigkeit MPa (N/mm <sup>2</sup> )	Härte	Kühl- mittel
Allgemeine Baustähle	<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"/>
Automatenstähle	<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"/>
Unlegierte Vergütungsstähle	<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"/>
Legierte Vergütungsstähle	<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"/>
Unlegierte Einsatzstähle	<b>1.0301</b> (C10), <b>1.1121</b> C10E (Ck10)	≤850		<input type="radio"/>
Legierte Einsatzstähle	<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"/>
Nitrierstähle	<b>1.8504</b> 34CrAl6 <b>1.8519</b> 31CrMoV9, <b>1.8550</b> 34CrAlNi7	≤1000 ≤1400		<input checked="" type="radio"/>
Werkzeugstähle	<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"/>
Schnellarbeitsstähle	<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"/>
Federstähle	<b>1.5026</b> 55Si7, <b>1.7176</b> 55Cr3, <b>1.8159</b> 51CrV4 (51CrV4)		≤350 HB	<input checked="" type="radio"/>
Gehärtete Stähle	-		≤48 HRC ≤66 HRC	<input checked="" type="radio"/>
Rostfreie Stähle, geschwefelt austenitisch martensitisch	<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 ≤1200		<input checked="" type="radio"/>
Gusseisen	<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"/>
Kugelgraphit- und Tempereguss	<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"/>
Hartguss	-		≤350 HB	<input type="radio"/>
Neue Gusswerkstoffe 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"/>
Neue Gusswerkstoffe 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"/>
Sonderlegierungen	Nimonic, Inconel, Monel, Hastelloy	≤2000		<input checked="" type="radio"/>
Titan und Titan-Legierungen	<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"/>
Aluminium und Al-Legierungen	<b>3.0255</b> Al99,5, <b>3.2315</b> AlMgSi1, <b>3.3515</b> AlMg1	≤400		<input type="radio"/>
Al-Knetlegierungen	<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"/>
Al-Gusslegierungen ≤ 10 % Si	<b>3.2131</b> G-AlSi5Cu1, <b>3.2153</b> G-AlSi7Cu3, <b>3.2573</b> G-AlSi9	≤600		<input type="radio"/>
≤ 24 % Si	<b>3.2581</b> G-AlSi12, <b>3.2583</b> G-AlSi12Cu, - G-AlSi12CuNiMg	≤600		<input type="radio"/>
Magnesium-Legierungen	<b>3.5200</b> MgMn2, <b>3.5812.05</b> G-MgAl8Zn1, <b>3.5612.05</b> G-MgAl6Zn1	≤400		<input type="radio"/>
Kupfer, niedriglegiert	<b>2.0070</b> SE-Cu, <b>2.1020</b> CuSn6, <b>2.1096</b> G-CuSn5ZnPb	≤600		<input type="radio"/>
Messing, kurzspanend	<b>2.0380</b> CuZn39Pb2, <b>2.0401</b> CuZn39Pb3, <b>2.0410</b> CuZn43Pb2	≤600		<input type="radio"/>
langspanend	<b>2.0250</b> CuZn20, <b>2.0280</b> CuZn33, <b>2.0332</b> CuZn37Pb0,5	≤600		<input type="radio"/>
Bronzen, kurzspanend	<b>2.1090</b> CuSn7ZnPb, <b>2.1170</b> CuPb5Sn5, <b>2.1176</b> CuPb10Sn <b>2.0790</b> CuNi18Zn19Pb	≤600 ≤850		<input checked="" type="radio"/>
Bronzen, langspanend	<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"/>
Kunststoffe, duroplastisch	Bakelit, Resopal, Pertinax, Moltopren	≤150		<input type="radio"/>
thermoplastisch	Plexiglas, Hostalen, Novodur, Makralon	≤100		<input type="radio"/>
aramidfaserverstärkt	Kevlar	≤1000		<input type="radio"/>
glas-/kohlefaserverstärkt	GFK/CFK	≤1000		<input type="radio"/>



# HARTNER

≤5xD

89275
WN
VHM
K/P
<b>T</b>
100U
DZ
204

89414	89417
6537L	6537L
VHM	VHM
K/P	K/P
<b>F</b>	<b>F</b>
100U	100U
HA	HE
202	202

89272
6537L
VHM
K/P
<b>T</b>
100U
HE
axial
214

89411	89408
6537L	6537L
VHM	VHM
K/P	K/P
<b>F</b>	<b>F</b>
100U	100U
HA	HE
axial	axial
215	215

89425	89426
6537L	6537L
VHM	VHM
<b>Y</b>	<b>Y</b>
100H	100H
HA	HE
axial	axial
220	220



V <sub>c</sub> m/min	VR-Code	V <sub>c</sub> m/min	Vorschubreihen-Code	V <sub>c</sub> m/min	VR-Code	V <sub>c</sub> m/min	Vorschubreihen-Code	V <sub>c</sub> m/min	Vorschubreihen-Code
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		



## Einsatzempfehlungen TS-Drills

**Bestell-Nr. **
**Norm/DIN**
**Schneidstoff**
**HM-Gruppe**
**Oberfläche**
**Typ**
**Schaffform**
**Kühlung**
**Programm Seite**



Werkzeuge mit fett gedruckter Vorschubreihen-Nr. sind bevorzugt auszuwählen.





















































Bohrer-Ø mm	Vorschubreihen-Code								
	1	2	3	4	5	6	7	8	9
	f (mm/U)								
<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

Werkstoffbezogene Kühlmittel:

-  Luft
-  Öl
-  Emulsion

Schneidrichtung:

-  rechtsschneidend
-  linksschneidend

Werkstoffgruppe	Werkstoffbeispiele, neue Bezeichnung (in Klammern alte Bezeichnung) Fettgedruckte Zahlen = Werkstoff-Nr. nach DIN EN	Zugfestigkeit MPa (N/mm <sup>2</sup> )	Härte	Kühl- mittel
Allgemeine Baustähle	<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		 
Automatenstähle	<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		 
Unlegierte Vergütungsstähle	<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		  
Legierte Vergütungsstähle	<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		 
Unlegierte Einsatzstähle	<b>1.0301</b> (C10), <b>1.1121</b> C10E (Ck10)	≤850		
Legierte Einsatzstähle	<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		 
Nitrierstähle	<b>1.8504</b> 34CrAl6 <b>1.8519</b> 31CrMoV9, <b>1.8550</b> 34CrAlNi7	≤1000 ≤1400		 
Werkzeugstähle	<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		 
Schnellarbeitsstähle	<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		
Federstähle	<b>1.5026</b> 55Si7, <b>1.7176</b> 55Cr3, <b>1.8159</b> 51CrV4 (51CrV4)		≤350 HB	 
Gehärtete Stähle	-		≤48 HRC ≤66 HRC	 
Rostfreie Stähle, geschwefelt austenitisch martensitisch	<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		  
Gusseisen	<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	 
Kugelgraphit- und Tempereguss	<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	 
Hartguss	-		≤350 HB	
Neue Gusswerkstoffe 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	 
Neue Gusswerkstoffe 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		 
Sonderlegierungen	Nimonic, Inconel, Monel, Hastelloy	≤2000		
Titan und Titan-Legierungen	<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		 
Aluminium und Al-Legierungen	<b>3.0255</b> Al99,5, <b>3.2315</b> AlMgSi1, <b>3.3515</b> AlMg1	≤400		
Al-Knetlegierungen	<b>3.0615</b> AlMgSiPb, <b>3.1325</b> AlCuMg1, <b>3.3245</b> AlMg3Si, <b>3.4365</b> AlZnMgCu1,5	≤650		
Al-Gusslegierungen ≤ 10 % Si ≤ 24 % 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		 
Magnesium-Legierungen	<b>3.5200</b> MgMn2, <b>3.5812.05</b> G-MgAl8Zn1, <b>3.5612.05</b> G-MgAl6Zn1	≤400		
Kupfer, niedriglegiert	<b>2.0070</b> SE-Cu, <b>2.1020</b> CuSn6, <b>2.1096</b> G-CuSn5ZnPb	≤600		
Messing, kurzspanend langspanend	<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		 
Bronzen, kurzspanend	<b>2.1090</b> CuSn7ZnPb, <b>2.1170</b> CuPb5Sn5, <b>2.1176</b> CuPb10Sn <b>2.0790</b> CuNi18Zn19Pb	≤600 ≤850		 
Bronzen, langspanend	<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		 
Kunststoffe, duroplastisch thermoplastisch	Bakelit, Resopal, Pertinax, Moltopren Plexiglas, Hostalen, Novodur, Makralon	≤150 ≤100		 
aramidfaserverstärkt	Kevlar	≤1000		
glas-/kohlefaserverstärkt	GFK/CFK	≤1000		



# HARTNER

## ≤5xD

89239	89247
6539	6537L
VHM	VHM
K	K
○	○
TS 3 G	TS 3 G
DZ	HA
241	240

## ≤7xD

89308
6538L
VHM
P
ⓧ
80U
HE
226

89294
WN
VHM
K
○
150GG
HA
axial
230

89421
WN
VHM
K/P
ⓧ
100R
HA
axial
228

89412	89416
WN	WN
VHM	VHM
K/P	K/P
ⓧ	ⓧ
100U	100U
HA	HE
axial	axial
224	224

89427
WN
VHM
ⓧ
100H
HA
axial
227

## ≤10xD

89293	89295
WN	WN
VHM	VHM
K	K
○	○
150GG	150GG
HA	HA
axial	axial
231	231

## ≤12xD

89418
WN
VHM
K/P
ⓧ
100U
HA
axial
233



v <sub>c</sub> m/min	Vorschubreihen- Code	v <sub>c</sub> m/min	VR- Code	v <sub>c</sub> m/min	VR- Code	v <sub>c</sub> m/min	VR- Code	v <sub>c</sub> m/min	Vorschubreihen- Code	v <sub>c</sub> m/min	VR- Code	v <sub>c</sub> m/min	Vorschubreihen- Code	v <sub>c</sub> m/min	VR- Code
		95	4					145	6 6	145	6			110	6
		75	3					120	5 5	120	5			110	5
		90	5					170	7 7	170	7			110	7
		75	4					145	7 7	145	7			100	7
		80	4					130	7 7	130	7			110	7
		75	4					125	6 6	125	6			110	6
		60	4					120	6 6	120	6			100	6
		75	4					120	6 6	120	6			110	6
		60	3					105	6 6	105	6			105	6
		90	5					145	7 7	145	7			110	7
		75	4					120	6 6	120	6			110	6
		55	3					85	4 4	85	4			85	4
		75	4					110	6 6	110	6			100	6
		55	3					105	4 4	105	4			80	4
		40	3					80	5 5	80	5			80	5
		35	3					65	4 4	65	4			65	4
		40	2					60	4 4	60	3			50	4
								60	2 2	60	2			50	2
								55	2 2	55	2				
								35	1 1	35	1				
		35	1					60	4 4					60	4
		33	1					55	2 2					55	2
		25	1					45	4 4					45	4
100	6 6	150	5	120	6	210	8	195	8 8			120	6 6	120	8
80	6 6	110	5	100	6	160	8	160	8 8			100	6 6	120	8
80	6 6	110	5	90	6	160	8	140	8 8			90	6 6	100	8
70	6 6	90	4	80	6	130	7	130	7 7			80	6 6	90	7
				40	2			40	2 2			40	1 2		
						130	7								
						100	7								
						80	7								
						60	7								
								35	3 3	35	3				
								40	3 3	45	3				
								40	2 2	40	4				
180	7 7	180	6	410	8			310	8 8			410	8 6	150	8
160	7 7	180	6	410	8			310	8 8			410	8 6	150	8
150	7 7	160	6	380	8			260	8 8			380	8 6	150	8
120	6 6	130	5	330	8			220	8 8			330	8 6	120	8
180	6 6							280	7 7					150	7
								125	6 6					80	6
180	6 6			280	7			325	7 7			280	7 7	120	7
								220	6 6					120	6
				110	6			125	6 6			110	6 6	40	6
				80	5			105	5 5			80	5 5		
								90	5 5					40	5
								80	5 5						



## Einsatzempfehlungen TS-Drills

**Bestell-Nr. **
**Norm/DIN**
**Schneidstoff**
**HM-Gruppe**
**Typ**
**Oberfläche**
**Kühlung**
**Programm Seite**
**Vorgehensweise:**

- Anfräsen einer Fläche rechtwinklig zum Eintrittswinkel der Bohrbearbeitung (nur bei schrägen Flächen notwendig).
- Herstellen einer zylindrischen Pilotbohrung (Toleranz F9) mit einer Bohrtiefe von mindestens 1 x D.
- Einfahren in Pilotbohrung mit ca. 300 U/min bei f = 500 mm/min.
- Einstellen des Kühlschmierstoffdruckes und der Drehzahl.
- Kontinuierliches Bohren auf volle Bohrtiefe ohne Entspanzyklus.
- Bei Durchgangsbohrungen mit schrägem Austritt die Vorschubgeschwindigkeit vf ca. 1mm vor dem Durchbrechen auf 40% reduzieren.
- Nach Erreichen der Bohrtiefe Drehzahl und Kühlschmierstoff abschalten, Ausfahren im Eilgang.

Werkzeuge mit fett gedruckter Vorschubreihen-Nr. sind bevorzugt auszuwählen.

Bohrer-Ø mm	Vorschubreihen-Code								
	1	2	3	4	5	6	7	8	9
	f (mm/U)								
<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

Werkstoffbezogene Kühlmittel:

- Luft
- Öl
- Emulsion

Schneidrichtung:

- rechtsschneidend
- linksschneidend

Werkstoffgruppe	Werkstoffbeispiele, neue Bezeichnung (in Klammern alte Bezeichnung) Fettgedruckte Zahlen = Werkstoff-Nr. nach DIN EN	Zugfestigkeit MPa (N/mm <sup>2</sup> )	Härte	Kühl- mittel
Allgemeine Baustähle	<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"/>
Automatenstähle	<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"/>
Unlegierte Vergütungsstähle	<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"/>
Legierte Vergütungsstähle	<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"/>
Unlegierte Einsatzstähle	<b>1.0301</b> (C10), <b>1.1121</b> C10E (Ck10)	≤850		<input type="radio"/>
Legierte Einsatzstähle	<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"/>
Nitrierstähle	<b>1.8504</b> 34CrAl6 <b>1.8519</b> 31CrMoV9, <b>1.8550</b> 34CrAlNi7	≤1000 ≤1400		<input checked="" type="radio"/>
Werkzeugstähle	<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"/>
Schnellarbeitsstähle	<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"/>
Federstähle	<b>1.5026</b> 55Si7, <b>1.7176</b> 55Cr3, <b>1.8159</b> 51CrV4 (51CrV4)		≤350 HB	<input checked="" type="radio"/>
Gehärtete Stähle	-		≤48 HRC ≤66 HRC	<input checked="" type="radio"/>
Rostfreie Stähle, geschwefelt austenitisch martensitisch	<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		<input checked="" type="radio"/>
Gusseisen	<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"/>
Kugelgraphit- und Tempereguss	<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"/>
Hartguss	-		≤350 HB	<input type="radio"/>
Neue Gusswerkstoffe 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"/>
Neue Gusswerkstoffe 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"/>
Sonderlegierungen	Nimonic, Inconel, Monel, Hastelloy	≤2000		<input checked="" type="radio"/>
Titan und Titan-Legierungen	<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"/>
Aluminium und Al-Legierungen	<b>3.0255</b> Al99,5, <b>3.2315</b> AlMgSi1, <b>3.3515</b> AlMg1	≤400		<input type="radio"/>
Al-Knetlegierungen	<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"/>
Al-Gusslegierungen ≤ 10 % Si	<b>3.2131</b> G-AlSi5Cu1, <b>3.2153</b> G-AlSi7Cu3, <b>3.2573</b> G-AlSi9	≤600		<input type="radio"/>
≤ 24 % Si	<b>3.2581</b> G-AlSi12, <b>3.2583</b> G-AlSi12Cu, - G-AlSi12CuNiMg	≤600		<input type="radio"/>
Magnesium-Legierungen	<b>3.5200</b> MgMn2, <b>3.5812.05</b> G-MgAl8Zn1, <b>3.5612.05</b> G-MgAl6Zn1	≤400		<input type="radio"/>
Kupfer, niedriglegiert	<b>2.0070</b> SE-Cu, <b>2.1020</b> CuSn6, <b>2.1096</b> G-CuSn5ZnPb	≤500		<input type="radio"/>
Messing, kurzspanend	<b>2.0380</b> CuZn39Pb2, <b>2.0401</b> CuZn39Pb3, <b>2.0410</b> CuZn43Pb2	≤600		<input type="radio"/>
langspanend	<b>2.0250</b> CuZn20, <b>2.0280</b> CuZn33, <b>2.0332</b> CuZn37Pb0,5	≤600		<input type="radio"/>
Bronzen, kurzspanend	<b>2.1090</b> CuSn7ZnPb, <b>2.1170</b> CuPb5Sn5, <b>2.1176</b> CuPb10Sn <b>2.0790</b> CuNi18Zn19Pb	≤600 ≤850		<input checked="" type="radio"/>
Bronzen, langspanend	<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"/>
Kunststoffe, duroplastisch	Bakelit, Resopal, Pertinax, Moltopren	≤150		<input type="radio"/>
thermoplastisch	Plexiglas, Hostalen, Novodur, Makralon	≤100		<input type="radio"/>
aramidfaserverstärkt	Kevlar	≤1000		<input type="radio"/>
glas-/kohlefaserverstärkt	GFK/CFK	≤1000		<input type="radio"/>



# HARTNER

## ≤15xD

86509
WN
VHM
K/P
RT 100 T
<b>A</b>
40 bar MMS
235

## ≤20xD

86511
WN
VHM
K/P
RT 100 T
<b>A</b>
40 bar MMS
236

## ≤25xD

86512
WN
VHM
K/P
RT 100 T
<b>A</b>
40 bar MMS
237

## ≤30xD

86513
WN
VHM
K/P
RT 100 T
<b>A</b>
40 bar MMS
238

## ≤40xD

86514
WN
VHM
K/P
RT 100 T
<b>A</b>
40 bar
239



$v_c$ m/min	VR- Code	$v_c$ m/min	VR- Code	$v_c$ m/min	VR- Code	$v_c$ m/min	VR- Code	$v_c$ m/min	VR- Code	$v_c$ m/min	VR- Code	$v_c$ m/min	VR- Code	$v_c$ m/min	VR- Code
110	8			110	8			100	8			80	7		
110	8			110	8			100	8			80	7		
120	8			120	8			120	8			100	8		
120	8			120	8			100	8			100	8		
110	6			110	6			110	6			110	6		
110	8			110	8			100	8			80	7		
100	7			100	7			100	7			80	7		
110	7	80	7	110	7	80	7	100	7	70	7	80	7	60	7
110	6	80	7	110	6	80	7	100	6	70	7	80	6	60	7
110	8			110	8			100	8			80	7		
110	7	80	6-7	110	7	80	6-7	100	7	70	6-7	80	6	60	6-7
110	6	80	6-7	110	6	80	6-7	100	6	70	6-7	80	6	60	6-7
100	5			100	5			80	5			80	5		
80	5			80	5			60	5			60	5		
100	6-7			100	6			90	6			80	6		
80	5			80	5			70	4			70	4		
50	5			50	5			50	4			50	4		
50	5			50	5			50	4			50	4		
50	4			50	4			50	4			50	4		
100	5			100	5			100	5			80	5		
70	2-3			60	3			60	3			60	3		
100	5			100	5			100	5			80	5		
140	8			140	8			130	8			120	8		
100	8			100	8			90	8			80	8		
140	8			140	8			130	8			120	8		
100	8			100	8			90	8			80	8	65	8
100	6			100	6			90	6			80	6		
100	6			100	6			90	6			80	6		
90	8	90	8	90	8	90	8	80	8	80	8	70	8	70	8
30	2			30	2			30	2			30	2		
120	1			120	1			120	1			120	1		
120	8			120	8			110	8			100	8		

## Einsatzempfehlungen Tieflochbohrer

### Die Arbeitsschritte beim Tiefbohren

- Herstellen einer Pilotbohrung (L = 1,5 x D / Alu L ≈ 3 x D, Toleranz H8)
- Einfahren mit einer Drehzahl von ca. 200 U/min, Vorschub ca. 500 mm/min. Bei Werkzeugen ab 40 x D einfahren im Linkslauf.
- Einstellen des Kühlschmierstoff-Drucks und der Drehzahl
- Kontinuierliches Bohren auf Bohrtiefe ohne Entspannen. Bei Einsatz von Tieflochbohrern mit sehr großem Längen-Durchmesser-Verhältnis empfehlen wir, bis zu einer Bohrtiefe von ca. 25 mm mit reduzierten Schnittparametern (ca. 75% der optimalen Schnittgeschwindigkeit) zu arbeiten.
- Abschalten der Kühlschmierstoff-Zufuhr nach Erreichen der Bohrtiefe
- Rückzug im Eilgang mit stehender Spindel

Bohrer-Ø mm	Vorschubreihen-Code							
	11	12	13	14	15	16	17	18
	f (mm/U)							
1,50	0,002	0,004	0,006	0,008	0,012	0,020	0,032	0,045
2,00	0,003	0,005	0,007	0,010	0,016	0,028	0,046	0,055
2,50	0,004	0,006	0,008	0,012	0,018	0,030	0,054	0,070
4,00	0,005	0,007	0,010	0,016	0,025	0,043	0,065	0,085
6,00	0,007	0,009	0,013	0,024	0,035	0,061	0,085	0,120
8,00	0,010	0,014	0,022	0,032	0,045	0,068	0,100	0,150
10,00	0,012	0,016	0,028	0,040	0,055	0,075	0,120	0,160
14,00	0,020	0,025	0,035	0,050	0,065	0,085	0,130	0,180
18,00	0,025	0,030	0,040	0,055	0,070	0,095	0,145	0,200
20,00	0,026	0,035	0,045	0,060	0,080	0,110	0,180	0,250
24,00	0,027	0,036	0,047	0,065	0,085	0,130	0,185	0,300
28,00	0,028	0,038	0,049	0,068	0,090	0,140	0,195	0,350
30,00	0,030	0,040	0,050	0,070	0,100	0,150	0,200	0,400
35,00	0,035	0,045	0,055	0,075	0,120	0,180	0,250	0,450
40,00	0,040	0,050	0,060	0,080	0,150	0,200	0,300	0,500

Werkstoffbezogene Kühlmittel:

- Luft
- Öl
- Emulsion

### E100

Einlippenbohrer

VHM

0,9 ... 12,0

Programm Seite

253



\* Die Vorschubwerte beziehen sich immer auf Werkzeuge mit der empfohlenen Beschichtung. In einigen Fällen kann die Funktion der Werkzeuge ohne Beschichtung nicht gewährleistet werden.

Werkstoffgruppe	Werkstoffbeispiele Fettgedruckte Zahlen = Werkstoff-Nr. nach DIN EN	Zugfestigk. Härte N/mm <sup>2</sup>	Kühl- mittel	empf. Schicht	<=35xD		>35xD	
					v <sub>c</sub> m/min	Vorschub- Code	v <sub>c</sub> m/min	Vorschub- Code
Allgemeine Baustähle	1.0035 S185(St33), 1.0486 P275N(StE285), 1.0345	≤500	●		100	15	100	15
	1.0050 E295 (St50-2), 1.0070 E360 (St70-2), 1.8937	≤1000	●		85	15	85	15
Automatenstähle	1.0718 11SMnPb30 (9SMnPb28), 1.0736 11SMn37	≤850	●		90	15	90	15
	1.0727 46S20 (45S20), 1.0728 (60S20), 1.0757 46SPb2	≤1000	●		80	15	80	15
Unlegierte Vergütungsstähle	1.0402 C22, 1.1178 C30E (Ck30)	≤700	●		80	14	80	14
	1.0503 C45, 1.1191 C45E (Ck45)	≤850	●		75	14	75	14
	1.0601 C60, 1.1221 C60E (Ck60)	≤1000	●		75	14	75	14
Legierte Vergütungsstähle	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
Unlegierte Einsatzstähle	1.0301 (C10), 1.1121 C10E (Ck10)	≤850	●	●	80	15	80	15
Legierte Einsatzstähle	1.7276 10CrMo11, 1.5125 11MnSi6	≤1000	●	●	75	14	75	14
Nitrierstähle	1.5752 15NiCr13, 1.7131 16MnCr5, 1.7264 20CrMo5	≤1400	●	●	65	14	65	14
	1.8504 34CrAl6	≤1000	●	●	75	14	75	14
Werkzeugstähle	1.8519 31CrMoV9, 1.8550 34CrAlNi7	≤1400	●	●	65	14	65	14
	1.1750 C75W, 1.2067 102Cr6, 1.2307 29CrMoV9	≤850	●	●	75	13	75	13
Schnellarbeitsstähle	1.2080 X210Cr12, 1.2083 X42Cr13, 1.2419 105WCr6	≤1400	●	●	65	13	65	13
	1.3243 S 6-5-2-5, 1.3343 S 6-5-2, 1.3344 S 6-5-3	≤1400	●	●	55	12	55	12
Federstähle	1.5026 55Si7, 1.7176 55Cr3, 1.8159 51CrV4 (51CrV4)	≤350 HB	●	●	65	13	65	13
Gehärtete Stähle	-	≤48 HRC	●	●	30	13	30	13
	-	≤66 HRC	●	●	25	10	25	14
Rostfreie Stähle, geschwefelt	1.4005 X12CrS13, 1.4104 X14CrMoS17, 1.4105	≤900	●	●	40	14	40	14
	1.4301 X5CrNi18-10 (V2A), 1.4541 X6CrNiTi18-10	≤1100	●	●	35	14	35	14
	1.4057 X20CrNi172 (X17CrNi16-2), 1.4122	≤1500	●	●	35	14	35	14
Gusseisen	0.6010 EN-GJL-100 (GG10), 0.6020 EN-GJL-200 (GG20)	≤240 HB	●	●	85	16	85	16
	0.6025 EN-GJL-250 (GG25), 0.6035 EN-GJL-350 (GG35)	≤350 HB	●	●	80	16	85	16
Kugelgraphit- und Temperguss	0.7050 EN-GJS-500-7 (GGG50), 0.8035	≤240 HB	●	●	80	15	80	15
	0.7070 EN-GJS-700-2 (GGG70), 0.8170 EN-GJMB-700-2	≤350 HB	●	●	70	15	70	15
Hartguss	-	≤350 HB	●	●	55	14	55	14
Neue Gusswerkstoffe GGV	EN-GJV250 (GGV25), EN-GJV350 (GGV35)	≤220 HB	●	●				
	EN-GJV400 (GGV40), EN-GJV500 (GGV50), SiMo 6	≤300 HB	●	●				
Neue Gusswerkstoffe ADI	EN-GJS-800-8 (ADI800), EN-GJS-1000-5 (ADI1000)	≤1000	●	●				
	EN-GJS-1200-2 (ADI1200), EN-GJS-1400-1 (ADI1400)	≤1400	●	●				
Sonderlegierungen	Nimonic, Inconel, Monel, Hastelloy	≤2000	●	●	20	12	20	12
Titan und Titan-Legierungen	3.7024 Ti99,5, 3.7114 TiAl5Sn2,5, 3.7124 TiCu2	≤850	●	●	35	12	35	12
	3.7154 TiAl6Zr5, 3.7165 TiAl6V4, 3.7184 TiAl4Mo4Sn2,5	≤1400	●	●	30	12	30	12
Aluminium und Al-Legierungen	3.0255 Al99,5, 3.2315 AlMgSi1, 3.3515 AlMg1	≤400	●	●	150	17	150	17
Al-Knetlegierungen	3.0615 AlMgSiPb, 3.1325 AlCuMg1, 3.3245 AlMg3Si	≤650	●	●	120	19	120	19
Al-Gusslegierungen ≤ 10 % Si	3.2131 G-AlSi5Cu1, 3.2153 G-AlSi7Cu3, 3.2573 G-AlSi9	≤600	●	●	120	20	120	20
	3.2581 G-AlSi12, 3.2583 G-AlSi12Cu, - G-AlSi12CuNiMg	≤600	●	●	130	18	130	18
Magnesium-Legierungen	3.5200 MgMn2, 3.5812.05 G-MgAl8Zn1, 3.5612.05	≤400	●	●	110	17	110	17
	2.0070 SE-Cu, 2.1020 CuSn6, 2.1096 G-CuSn5ZnPb	≤500	●	●	75	15	75	15
Kupfer, niedriglegiert	2.0380 CuZn39Pb2, 2.0401 CuZn39Pb3, 2.0410	≤600	●	●	120	18	120	18
	2.0250 CuZn20, 2.0280 CuZn33, 2.0332 CuZn37Pb0,5	≤600	●	●	90	18	90	18
Bronzen, kurzspanend	2.1090 CuSn7ZnPb, 2.1170 CuPb5Sn5, 2.1176	≤600	●	●	95	17	95	17
	2.0790 CuNi18Zn19Pb	≤850	●	●	75	17	75	17
Bronzen, langspanend	2.0916 CuAl5, 2.0960 CuAl9Mn, 2.1050 CuSn10	≤850	●	●	70	17	70	17
	2.0980 CuAl11Ni, 2.1247 CuBe2	≤1000	●	●	60	17	60	17
	-	≤150	●	●	75	15	75	15
Kunststoffe, duroplastisch	Bakelit, Resopal, Pertinax, Moltopren	≤150	○	○	70	15	70	15
thermoplastisch	Plexiglas, Hostalen, Novodur, Makralon	≤100	○	○	75	15	70	15
aramidfaserverstärkt	Kevlar	≤1000	○	○	60	14	60	14
glas/kohlefaserverstärkt	GFK/CFK	≤1000	○	○	50	14	50	14



### Tipps und Tricks

- Bei Bohrtiefen über 40 x D empfehlen wir die Verwendung von zwei oder mehr Tieflochbohrern, z.B. Ø 10 x 400 mm und Ø 9,95 x 800mm.
- Tieflochbohrer für Bohrtiefen über 40 x D sollten im Linkslauf in die Pilotbohrung eingefahren werden.
- Beim Einwechseln von Werkzeugen ab 40 x D kann das Werkzeug durch Aufschalten der Hochdruck-Innenkühlung für ca. 1 Sekunde beruhigt werden.
- Für die Bearbeitung langspanender Werkstoffe empfehlen wir die Bestellung von Tieflochbohrern mit polierten Spannuten.
- Generell empfehlen wir, den Fettgehalt der Emulsion auf mindestens 10% einzustellen.
- Einlippen-Tieflochbohrer für langspanendes Aluminium sollten mit Anschliff 180° und Ölraumabsatz bestellt werden.
- Beim Anbohren in Aluminium mit weniger als 1% Si-Anteil, d.h. bei empfohlenen Schnittgeschwindigkeiten  $v_c > 160$  m/min, empfehlen wir, in mehreren Schritten auf die Enddrehzahl hochzufahren. Außerdem sollte eine tiefere Pilotbohrung von ca. 3 x D vorgebohrt werden.



Sämtliche Tieflochbohrer müssen beim Anbohren geführt werden. Tieflochbohrer dürfen nie mit voller Drehzahl frei im Maschinenraum bewegt werden.

## E80

Einlippenbohrer  
VHM-Kopf

2,0 ... 40,0  
260



## Z80

Zweilippenbohrer  
VHM-Kopf

6,0 ... 27,0  
252



## E800

Einlippenbohrer  
mit Wechsellatten

12,0 ... 40,0  
264



empf. Schicht	≤35xD		>35xD		empf. Schicht	≤35xD		>35xD		empf. Schicht	≤35xD		>35xD	
	$v_c$ m/min	Vorschub-Code	$v_c$ m/min	Vorschub-Code		$v_c$ m/min	Vorschub-Code	$v_c$ m/min	Vorschub-Code		$v_c$ m/min	Vorschub-Code	$v_c$ m/min	Vorschub-Code
T	100	14	95	13						T	90	15	85	15
	85	14	80	13						T	80	15	75	15
T	90	14	85	13						T	85	16	80	16
	80	14	75	13						T	75	16	70	16
T	90	13	85	12						T	85	15	80	15
	80	13	75	12						T	80	15	75	15
	75	13	70	12						T	75	15	70	15
T	75	13	70	12						T	75	15	70	15
	65	13	60	12						T	65	15	60	15
T	80	14	75	13						T	80	15	75	15
	75	13	70	12						T	75	15	70	15
	65	13	60	12						T	70	15	65	15
	75	13	70	12						T	70	15	65	15
C	65	13	60	12						T	60	15	55	15
	75	12	70	11						T	65	14	60	14
C	65	12	60	11						T	60	14	55	14
	55	11	50	11						T	55	14	50	14
C	65	12	60	12						T	65	15	60	15
	30	12	25	11						T	30	13	25	13
	25	11	20	11						T	25	12	20	12
	55	13	50	12						T	50	14	45	14
C	45	13	40	12						F	45	14	40	14
	35	13	35	12							40	14	35	14
	85	15	80	14		85	18	80	17		85	16	80	16
	80	15	75	14		80	18	75	17		80	16	75	16
	80	14	75	13		75	17	70	16		75	16	70	16
	70	14	65	13		70	17	65	16	T	70	16	65	16
	55	13	50	12		65	16	60	15		55	15	50	15
C	20	11	20	11						F	25	13	20	13
	35	11	30	11							35	13	30	13
	30	11	25	11							30	12	25	12
	150	16	140	15		120	18	115	17		140	16	135	16
	120	15	115	14		110	18	105	17	F	125	16	120	16
	150	16	140	15		135	18	130	17		170	17	165	17
	130	16	120	15		120	17	115	16		140	17	135	17
	110	16	100	15							115	16	110	16
	75	14	70	13							75	15	70	15
	120	17	115	16		130	18	125	17	F	120	17	115	17
	90	17	85	16		120	18	115	17		90	17	85	17
	95	16	90	15		110	17	105	16		95	17	90	17
	75	16	70	15		110	17	105	16		75	17	70	17
	70	16	65	15		95	17	90	16		70	17	65	17
	60	16	55	15		95	17	90	16		60	17	55	17
	75	14	70	13							75	16	70	16
	70	14	65	13							70	16	65	16
	60	13	55	12							60	15	55	15
	50	13	45	12							50	15	45	15

## Einsatzempfehlungen Multiplex

Bestell-Nr.  
 Ø-Bereich  
 Schneidstoff  
 Hartmetallsorte  
 HM-Anwendungsgruppe  
 Oberfläche  
 Programm Seite

Werkzeuge mit fett gedruckter Vorschubreihen-Nr. sind bevorzugt auszuwählen.

Bohrer-Ø mm	Vorschubreihen-Code					
	1	2	3	4	5	6
	f (mm/U)					
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

Werkstoffbezogene Kühlmittel:

- Luft
- Öl
- Emulsion

Schneidrichtung:

- Ⓜ rechtsschneidend
- Ⓛ linksschneidend

Werkstoffgruppe	Werkstoffbeispiele, neue Bezeichnung (in Klammern alte Bezeichnung) Fettgedruckte Zahlen = Werkstoff-Nr. nach DIN EN	Zugfestigkeit MPa (N/mm <sup>2</sup> )	Härte	Kühl- mittel
Allgemeine Baustähle	<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		○
Automatenstähle	<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		○
Unlegierte Vergütungsstähle	<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		○
Legierte Vergütungsstähle	<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		○
Unlegierte Einsatzstähle	<b>1.0301</b> (C10), <b>1.1121</b> C10E (Ck10)	≤850		○
Legierte Einsatzstähle	<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		●
Nitrierstähle	<b>1.8504</b> 34CrAl6 <b>1.8519</b> 31CrMoV9, <b>1.8550</b> 34CrAlNi7	≤1000 ≤1400		●
Werkzeugstähle	<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		○
Schnellarbeitsstähle	<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		●
Federstähle	<b>1.5026</b> 55Si7, <b>1.7176</b> 55Cr3, <b>1.8159</b> 51CrV4 (51CrV4)		≤350 HB	●
Gehärtete Stähle	-		≤48 HRC ≤66 HRC	●
Rostfreie Stähle, geschwefelt austenitisch martensitisch	<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		●
Gusseisen	<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	○
Kugelgraphit- und Temperguss	<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	○
Hartguss	-		≤350 HB	○
Neue Gusswerkstoffe 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	○
Neue Gusswerkstoffe 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		○
Sonderlegierungen	Nimonic, Inconel, Monel, Hastelloy	≤2000		●
Titan und Titan-Legierungen	<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		●
Aluminium und Al-Legierungen	<b>3.0255</b> Al99,5, <b>3.2315</b> AlMgSi1, <b>3.3515</b> AlMg1	≤400		○
Al-Knetlegierungen	<b>3.0615</b> AlMgSiPb, <b>3.1325</b> AlCuMg1, <b>3.3245</b> AlMg3Si, <b>3.4365</b> AlZnMgCu1,5	≤650		○
Al-Gusslegierungen ≤ 10 % Si ≤ 24 % 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		○
Magnesium-Legierungen	<b>3.5200</b> MgMn2, <b>3.5812.05</b> G-MgAl8Zn1, <b>3.5612.05</b> G-MgAl6Zn1	≤400		○
Kupfer, niedriglegiert	<b>2.0070</b> SE-Cu, <b>2.1020</b> CuSn6, <b>2.1096</b> G-CuSn5ZnPb	≤500		○
Messing, kurzspanend	<b>2.0380</b> CuZn39Pb2, <b>2.0401</b> CuZn39Pb3, <b>2.0410</b> CuZn43Pb2	≤600		○
Messing, langspanend	<b>2.0250</b> CuZn20, <b>2.0280</b> CuZn33, <b>2.0332</b> CuZn37Pb0,5	≤600		○
Bronzen, kurzspanend	<b>2.1090</b> CuSn7ZnPb, <b>2.1170</b> CuPb5Sn5, <b>2.1176</b> CuPb10Sn <b>2.0790</b> CuNi18Zn19Pb	≤600 ≤850		○
Bronzen, langspanend	<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		○
Kunststoffe, duroplastisch	Bakelit, Resopal, Pertinax, Moltopren	≤150		○
thermoplastisch	Plexiglas, Hostalen, Novodur, Makralon	≤100		○
aramidfaserverstärkt	Kevlar	≤1000		○
glas-/kohlefaserverstärkt	GFK/CFK	≤1000		○



# HARTNER

86602
10...25
HSS-E-PM
<b>T</b>
361


86608
10...25
HSS-E-PM
<b>F</b>
362

86609
10...102
HSS-E-PM
<b>A</b>
363


86708	86709
10...35	10...35
VHM	VHM
H22	H22
K20/K40	K20/K40
<b>T</b>	<b>T</b>
364	366

86701	86702
10...35	10...35
VHM	VHM
H22	H22
K20/K40	K20/K40
<b>F</b>	<b>F</b>
367	365

**Art.-Nr. 86709/86701 ohne Fasen**  
für Werkstoffe bis ca. 600 N/mm<sup>2</sup> Zugfestigkeit



**Art.-Nr. 86708/86702 mit Fasen**  
für Werkstoffe ab ca. 600 N/mm<sup>2</sup> Zugfestigkeit



$v_c$ m/min	Vorschubreihen-Code	$v_c$ m/min	Vorschubreihen-Code	$v_c$ m/min	Vorschubreihen-Code	$v_c$ m/min	Vorschubreihen-Code	$v_c$ m/min	Vorschubreihen-Code
40	4	48	4	48	4	60	5	70	5
35	4	42	4	42	4	55	4	65	4
50	5	60	5	60	5	100	4	115	4
40	5	50	5	50	5	95	4	105	4
40	4	45	4	45	4	80	4	90	4
35	4	40	4	40	4	80	4	90	4
30	4	35	4	35	4	75	3	85	3
25	3	28	3	28	3	70	4	80	4
22	2	25	2	25	2	60	3	70	3
35	3	40	3	40	3	85	4	95	4
25	3	28	3	28	3	70	4	80	4
22	2	25	2	25	2	55	3	65	3
22	3	25	3	25	3	60	3	65	3
15	2	18	2	18	2	50	2	55	2
26	3	28	3	28	3	40	3	45	3
22	2	25	2	25	2	35	2	40	2
12	2	18	2	18	2	40	2	45	2
10	2	13	2	13	2	35	2	40	2
						25	1	30	1
20	2	23	2	23	2	40	2	45	2
15	2	17	2	17	2				
15	2	20	2	20	2	25	2	30	2
35	4	40	4	40	4	100	5	120	5
35	4	40	4	40	4	90	4	105	4
35	4	40	4	40	4	80	4	90	4
28	4	33	4	33	4	65	3	75	3
						25	1	30	1
60	5	65	5	65	5	180	5	200	5
80	5	85	5	85	5	160	5	180	5
85	5	85	5	85	5	140	5	160	5
70	5	70	5	70	5	130	5	150	5
45	4	50	4	50	4	150	5	160	5
45	4	50	4	50	4	70	4	80	4
60	5	65	5	65	5	160	5	180	5
45	4	50	4	50	4	110	4	120	4
32	5	35	5	35	5	80	5	90	5
40	3	45	3	45	3	65	4	75	4
36	3	40	3	40	3	45	4	50	4
28	3	32	3	32	3	35	4	40	4
22	3	27	3	27	3	70	3	85	3
						70	3	85	3
						70	3	85	3
						70	3	85	3



## Einsatzempfehlungen Multiplex HPC

Artikel-Nr.
Norm/DIN
Schneidstoff
HM-Gruppe
Bohrtiefe
Oberfläche
Typ
Programm Seite

Bohrer-Ø mm	Vorschubreihen-Code								
	1	2	3	4	5	6	7	8	9
	f (mm/U)								
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

Werkstoffbezogene Kühlmittel:

- Luft
- Öl
- ◐ Emulsion

Alle Angaben sind Richtwerte. Die tatsächlich erreichbaren Schnittgeschwindigkeiten und Vorschübe hängen von den jeweiligen Bearbeitungsbedingungen ab. Wir empfehlen entsprechende Bohrversuche.

Werkstoffgruppe	Werkstoffbeispiele, neue Bezeichnung (in Klammern alte Bezeichnung) Fettgedruckte Zahlen = Werkstoff-Nr. nach DIN EN	Zugfestigkeit MPa (N/mm <sup>2</sup> )	Härte	Kühl- mittel
Allgemeine Baustähle	<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		○ ○
Automatenstähle	<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		○ ○
Unlegierte Vergütungsstähle	<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		○ ○ ○
Legierte Vergütungsstähle	<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		○ ○
Unlegierte Einsatzstähle	<b>1.0301</b> (C10), <b>1.1121</b> C10E (Ck10)	≤850		○
Legierte Einsatzstähle	<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		● ●
Nitrierstähle	<b>1.8504</b> 34CrAl6 <b>1.8519</b> 31CrMoV9, <b>1.8550</b> 34CrAlNi7	≤1000 ≤1400		○ ●
Werkzeugstähle	<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		○ ●
Schnellarbeitsstähle	<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		●
Federstähle	<b>1.5026</b> 55Si7, <b>1.7176</b> 55Cr3, <b>1.8159</b> 51CrV4 (51CrV4)		≤350 HB	●
Gehärtete Stähle	-		≤48 HRC ≤66 HRC	● ●
Rostfreie Stähle, geschwefelt austenitisch martensitisch	<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		● ● ●
Gusseisen	<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	○ ○
Kugelgraphit- und Temperguss	<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	○ ○
Hartguss	-		≤350 HB	○
Neue Gusswerkstoffe 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	○ ○
Neue Gusswerkstoffe 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		○ ○
Sonderlegierungen	Nimonic, Inconel, Monel, Hastelloy	≤2000		●
Titan und Titan-Legierungen	<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		● ●
Aluminium und Al-Legierungen	<b>3.0255</b> Al99,5, <b>3.2315</b> AlMgSi1, <b>3.3515</b> AlMg1	≤400		○
Al-Knetlegierungen	<b>3.0615</b> AlMgSiPb, <b>3.1325</b> AlCuMg1, <b>3.3245</b> AlMg3Si, <b>3.4365</b> AlZnMgCu1,5	≤650		○
Al-Gusslegierungen ≤ 10 % Si ≤ 24 % 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		○ ○
Magnesium-Legierungen	<b>3.5200</b> MgMn2, <b>3.5812.05</b> G-MgAl8Zn1, <b>3.5612.05</b> G-MgAl6Zn1	≤400		○
Kupfer, niedriglegiert	<b>2.0070</b> SE-Cu, <b>2.1020</b> CuSn6, <b>2.1096</b> G-CuSn5ZnPb	≤500		○
Messing, kurzspanend	<b>2.0380</b> CuZn39Pb2, <b>2.0401</b> CuZn39Pb3, <b>2.0410</b> CuZn43Pb2	≤600		○
Messing, langspanend	<b>2.0250</b> CuZn20, <b>2.0280</b> CuZn33, <b>2.0332</b> CuZn37Pb0,5	≤600		○
Bronzen, kurzspanend	<b>2.1090</b> CuSn7ZnPb, <b>2.1170</b> CuPb5Sn5, <b>2.1176</b> CuPb10Sn <b>2.0790</b> CuNi18Zn19Pb	≤600 ≤850		○ ●
Bronzen, langspanend	<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		○ ●
Kunststoffe, duroplastisch	Bakelit, Resopal, Pertinax, Moltopren	≤150		○
thermoplastisch	Plexiglas, Hostalen, Novodur, Makralon	≤100		○
aramidfaserverstärkt	Kevlar	≤1000		○
glas-/kohlefaserverstärkt	GFK/CFK	≤1000		○



# HARTNER

≤1,5xD

≤3xD

86722
WN
VHM
K/P
1,5xD
Stahl
392

86725
WN
VHM
K/P
1,5xD
rostfr. St.
401

86723
WN
VHM
K/P
1,5xD
Guss
395

86724
WN
VHM
K/P
1,5xD
Al/AI-Leg.
398

86722
WN
VHM
K/P
3xD
Stahl
392

86725
WN
VHM
K/P
3xD
rostfr. St.
401

86723
WN
VHM
K/P
3xD
Guss
395

86724
WN
VHM
K/P
3xD
Al/AI-Leg.
398



V <sub>c</sub> m/min	VR-Code	V <sub>c</sub> m/min	VR-Code	V <sub>c</sub> m/min	VR-Code	V <sub>c</sub> m/min	VR-Code	V <sub>c</sub> m/min	VR-Code	V <sub>c</sub> m/min	VR-Code	V <sub>c</sub> m/min	VR-Code
130	6							130	6				
110	5							110	5				
130	7							130	7				
110	6							110	6				
130	6							130	6				
125	6							125	6				
110	5							110	5				
110	6							110	6				
90	5							90	5				
130	7							130	7				
110	6							110	6				
70	4							70	4				
105	5							105	5				
70	4							70	4				
60	5							60	5				
55	4							55	4				
55	3							55	3				
50	2							50	2				
		25	2							25	2		
		55	3							55	3		
		40	3							40	3		
		35	3							35	3		
				100	6							100	6
				90	6							90	6
				120	7							120	7
				100	6							100	6
		90	6							90	6		
				80	5							80	5
				80	5							80	5
				80	5							80	5
				80	5							80	5
		25	2							25	2		
		40	3							40	3		
		35	2							35	2		
						200	7					200	7
						180	7					180	7
						150	7					150	7
						120	7					120	7
						180	7					180	7
						70	6					70	6
						180	7					180	7
						120	6					120	6
						70	6					70	6
						50	6					50	6
						45	6					45	6
						35	5					35	5



## Einsatzempfehlungen Multiplex HPC

Artikel-Nr.
Norm/DIN
Schneidstoff
HM-Gruppe
Bohrtiefe
Oberfläche
Typ
Programm Seite

Bohrer-Ø mm	Vorschubreihen-Code								
	1	2	3	4	5	6	7	8	9
	f (mm/U)								
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

Werkstoffbezogene Kühlmittel:

- Luft
- Öl
- ◐ Emulsion

Alle Angaben sind Richtwerte. Die tatsächlich erreichbaren Schnittgeschwindigkeiten und Vorschübe hängen von den jeweiligen Bearbeitungsbedingungen ab. Wir empfehlen entsprechende Bohrversuche.

Werkstoffgruppe	Werkstoffbeispiele, neue Bezeichnung (in Klammern alte Bezeichnung) Fettgedruckte Zahlen = Werkstoff-Nr. nach DIN EN	Zugfestigkeit MPa (N/mm <sup>2</sup> )	Härte	Kühl- mittel
Allgemeine Baustähle	<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		○ ○
Automatenstähle	<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		○ ○
Unlegierte Vergütungsstähle	<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		○ ○ ○
Legierte Vergütungsstähle	<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		○ ○
Unlegierte Einsatzstähle	<b>1.0301</b> (C10), <b>1.1121</b> C10E (Ck10)	≤850		○
Legierte Einsatzstähle	<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		● ●
Nitrierstähle	<b>1.8504</b> 34CrAl6 <b>1.8519</b> 31CrMoV9, <b>1.8550</b> 34CrAlNi7	≤1000 ≤1400		○ ●
Werkzeugstähle	<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		○ ●
Schnellarbeitsstähle	<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		●
Federstähle	<b>1.5026</b> 55Si7, <b>1.7176</b> 55Cr3, <b>1.8159</b> 51CrV4 (51CrV4)		≤350 HB	●
Gehärtete Stähle	-		≤48 HRC ≤66 HRC	● ●
Rostfreie Stähle, geschwefelt austenitisch martensitisch	<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		● ● ●
Gusseisen	<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	○ ○
Kugelgraphit- und Temperguss	<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	○ ○
Hartguss	-		≤350 HB	○
Neue Gusswerkstoffe 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	○ ○
Neue Gusswerkstoffe 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		○ ○
Sonderlegierungen	Nimonic, Inconel, Monel, Hastelloy	≤2000		●
Titan und Titan-Legierungen	<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		● ●
Aluminium und Al-Legierungen	<b>3.0255</b> Al99,5, <b>3.2315</b> AlMgSi1, <b>3.3515</b> AlMg1	≤400		○
Al-Knetlegierungen	<b>3.0615</b> AlMgSiPb, <b>3.1325</b> AlCuMg1, <b>3.3245</b> AlMg3Si, <b>3.4365</b> AlZnMgCu1,5	≤650		○
Al-Gusslegierungen ≤ 10 % Si ≤ 24 % 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		○ ○
Magnesium-Legierungen	<b>3.5200</b> MgMn2, <b>3.5812.05</b> G-MgAl8Zn1, <b>3.5612.05</b> G-MgAl6Zn1	≤400		○
Kupfer, niedriglegiert	<b>2.0070</b> SE-Cu, <b>2.1020</b> CuSn6, <b>2.1096</b> G-CuSn5ZnPb	≤500		○
Messing, kurzspanend	<b>2.0380</b> CuZn39Pb2, <b>2.0401</b> CuZn39Pb3, <b>2.0410</b> CuZn43Pb2	≤600		○
Messing, langspanend	<b>2.0250</b> CuZn20, <b>2.0280</b> CuZn33, <b>2.0332</b> CuZn37Pb0,5	≤600		○
Bronzen, kurzspanend	<b>2.1090</b> CuSn7ZnPb, <b>2.1170</b> CuPb5Sn5, <b>2.1176</b> CuPb10Sn <b>2.0790</b> CuNi18Zn19Pb	≤600 ≤850		○ ●
Bronzen, langspanend	<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		○ ●
Kunststoffe, duroplastisch	Bakelit, Resopal, Pertinax, Moltopren	≤150		○
thermoplastisch	Plexiglas, Hostalen, Novodur, Makralon	≤100		○
aramidfaserverstärkt	Kevlar	≤1000		○
glas-/kohlefaserverstärkt	GFK/CFK	≤1000		○



# HARTNER

≤5xD

≤7xD

86722
WN
VHM
K/P
1,5xD
Stahl
392

86725
WN
VHM
K/P
1,5xD
rostfr. St.
401

86723
WN
VHM
K/P
1,5xD
Guss
395

86724
WN
VHM
K/P
1,5xD
Al/Al-Leg.
398

86722
WN
VHM
K/P
3xD
Stahl
392

86725
WN
VHM
K/P
3xD
rostfr. St.
401

86723
WN
VHM
K/P
3xD
Guss
395

86724
WN
VHM
K/P
3xD
Al/Al-Leg.
398



V <sub>c</sub> m/min	VR-Code	V <sub>c</sub> m/min	VR-Code	V <sub>c</sub> m/min	VR-Code	V <sub>c</sub> m/min	VR-Code	V <sub>c</sub> m/min	VR-Code	V <sub>c</sub> m/min	VR-Code	V <sub>c</sub> m/min	VR-Code	
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

## Einsatzempfehlungen Multiplex HPC

Artikel-Nr.
Norm/DIN
Schneidstoff
HM-Gruppe
Bohrtiefe
Oberfläche
Typ
Programm Seite

Bohrer-Ø mm	Vorschubreihen-Code								
	1	2	3	4	5	6	7	8	9
	f (mm/U)								
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

Werkstoffbezogene Kühlmittel:

- Luft
- Öl
- ◐ Emulsion

Alle Angaben sind Richtwerte. Die tatsächlich erreichbaren Schnittgeschwindigkeiten und Vorschübe hängen von den jeweiligen Bearbeitungsbedingungen ab. Wir empfehlen entsprechende Bohrversuche.

Werkstoffgruppe	Werkstoffbeispiele, neue Bezeichnung (in Klammern alte Bezeichnung) Fettgedruckte Zahlen = Werkstoff-Nr. nach DIN EN	Zugfestigkeit MPa (N/mm <sup>2</sup> )	Härte	Kühl- mittel
Allgemeine Baustähle	<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		○ ○
Automatenstähle	<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		○ ○
Unlegierte Vergütungsstähle	<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		○ ○ ○
Legierte Vergütungsstähle	<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		○ ○
Unlegierte Einsatzstähle	<b>1.0301</b> (C10), <b>1.1121</b> C10E (Ck10)	≤850		○
Legierte Einsatzstähle	<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		● ●
Nitrierstähle	<b>1.8504</b> 34CrAl6 <b>1.8519</b> 31CrMoV9, <b>1.8550</b> 34CrAlNi7	≤1000 ≤1400		○ ●
Werkzeugstähle	<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		○ ●
Schnellarbeitsstähle	<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		●
Federstähle	<b>1.5026</b> 55Si7, <b>1.7176</b> 55Cr3, <b>1.8159</b> 51CrV4 (51CrV4)		≤350 HB	●
Gehärtete Stähle	-		≤48 HRC ≤66 HRC	● ●
Rostfreie Stähle, geschwefelt austenitisch martensitisch	<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		● ● ●
Gusseisen	<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	○ ○
Kugelgraphit- und Temperguss	<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	○ ○
Hartguss	-		≤350 HB	○
Neue Gusswerkstoffe 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	○ ○
Neue Gusswerkstoffe 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		○ ○
Sonderlegierungen	Nimonic, Inconel, Monel, Hastelloy	≤2000		●
Titan und Titan-Legierungen	<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		● ●
Aluminium und Al-Legierungen	<b>3.0255</b> Al99,5, <b>3.2315</b> AlMgSi1, <b>3.3515</b> AlMg1	≤400		○
Al-Knetlegierungen	<b>3.0615</b> AlMgSiPb, <b>3.1325</b> AlCuMg1, <b>3.3245</b> AlMg3Si, <b>3.4365</b> AlZnMgCu1,5	≤650		○
Al-Gusslegierungen ≤ 10 % Si ≤ 24 % 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		○ ○
Magnesium-Legierungen	<b>3.5200</b> MgMn2, <b>3.5812.05</b> G-MgAl8Zn1, <b>3.5612.05</b> G-MgAl6Zn1	≤400		○
Kupfer, niedriglegiert	<b>2.0070</b> SE-Cu, <b>2.1020</b> CuSn6, <b>2.1096</b> G-CuSn5ZnPb	≤500		○
Messing, kurzspanend	<b>2.0380</b> CuZn39Pb2, <b>2.0401</b> CuZn39Pb3, <b>2.0410</b> CuZn43Pb2	≤600		○
Messing, langspanend	<b>2.0250</b> CuZn20, <b>2.0280</b> CuZn33, <b>2.0332</b> CuZn37Pb0,5	≤600		○
Bronzen, kurzspanend	<b>2.1090</b> CuSn7ZnPb, <b>2.1170</b> CuPb5Sn5, <b>2.1176</b> CuPb10Sn <b>2.0790</b> CuNi18Zn19Pb	≤600 ≤850		○ ○
Bronzen, langspanend	<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		○ ○
Kunststoffe, duroplastisch	Bakelit, Resopal, Pertinax, Moltopren	≤150		○
thermoplastisch	Plexiglas, Hostalen, Novodur, Makralon	≤100		○
aramidfaserverstärkt	Kevlar	≤1000		○
glas-/kohlefaserverstärkt	GFK/CFK	≤1000		○



# HARTNER

## ≤10xD

86722
WN
VHM
K/P
1,5xD
F
Stahl
392

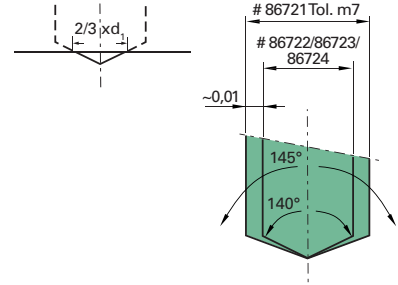
86725
WN
VHM
K/P
1,5xD
a
rostfr. St.
401

86723
WN
VHM
K/P
1,5xD
F
Guss
395

86724
WN
VHM
K/P
1,5xD
○
Al/Al-Leg.
398

## ≤1xD Pilotieren/Senken

86721
WN
VHM
K/P
1xD
a
Pil./Senken
389



V <sub>c</sub> m/min	VR-Code	V <sub>c</sub> m/min	VR-Code	V <sub>c</sub> m/min	VR-Code	V <sub>c</sub> m/min	VR-Code	V <sub>c</sub> m/min	VR-Code	V <sub>c</sub> m/min	VR-Code
100	5							130	6		
95	4							110	5		
100	6							130	7		
95	5							110	6		
100	5							130	6		
95	5							125	6		
90	4							110	5		
90	5							110	6		
85	4							90	5		
100	6							130	7		
90	5							110	6		
70	4							70	4		
95	4							105	5		
70	3							70	4		
55	4							60	5		
50	3							55	4		
55	2							55	3		
50	2							50	2		
		25	1					25	2		
		55	2					55	3		
		40	2					40	3		
		35	2					35	3		
				80	6			100	6		
				70	6			90	6		
				100	7			120	7		
				80	6			100	6		
		70	6					90	6		
				60	5			80	5		
				60	5			80	5		
				60	5			80	5		
				60	5			80	5		
		25	1					25	2		
		40	2					40	3		
		35	1					35	2		
								150	6		
								150	6		
								130	6		
								105	6		
								150	6		
								70	5		
								150	6		
								110	5		
								70	5		
								50	5		
								45	5		
								35	4		

- Bei Durchgangsbohrungen ist darauf zu achten, dass die Führungsfasen im Eingriff bleiben. Außerdem empfehlen wir, vor dem Durchbohren den Vorschub zu reduzieren.
- Generell empfehlen wir bei Bohrtiefen ab 5xD mit Halter Art.-Nr. 86681 und Pilotierplatte Art.-Nr. 86721 zu zentrieren bzw. zu pilotieren.
- Beim Bohren ohne Anzentrieren empfehlen wir eine Reduzierung des Vorschubs während des Anbohrens.
- Das Bohrwerkzeug ist nicht ohne Versuch im unterbrochenen Schnitt (Nuten, Querbohrungen) einzusetzen. Bei unterbrochenem Schnitt (max. 0,2xD) empfehlen wir den Vorschub nach Möglichkeit zu reduzieren.
- Multiplex ist im Gegensatz zum klassischen Wendepaltenbohrer auch zum Bohren von Blechpaketen geeignet.
- Bei Drehmaschinen (stehendes Bohrwerkzeug) ist darauf zu achten, dass das Werkzeug exakt auf Mitte steht.
- Voraussetzung für eine optimale Zerspanung ist eine ausreichende Kühlschmierstoff-Versorgung durch Emulsion oder Öl.
- Das Werkzeug ist nur bedingt für die Trockenbearbeitung oder MMS geeignet. Bei MMS-Einsatz empfehlen wir die Verwendung des kegeligen MMS-Schaftendes sowie der MMS-Bauteile. Unser Außendienst berät Sie gerne.











Hartner verfügt sowohl im In- als auch im Ausland über ein flächendeckendes Vertriebsnetz. Leistungsstarke Vertriebspartner betreuen unsere Kunden vor Ort in den Bereichen Vertrieb und technische Beratung sowie beim Service rund um Hartner Bohrwerkzeuge.

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[www.hartner.de](http://www.hartner.de)

Selbstverständlich können Sie uns aber auch direkt ansprechen:

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72458 Albstadt  
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[info@hartner.de](mailto:info@hartner.de)



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