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The tool specialists for the trade.



Solid carbide drills and end-mills

Supplementary volume 2018

MILLER
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INNOVATIVE PRODUCTION STRATEGIES FOR YOUR TECHNICAL ADVANCE

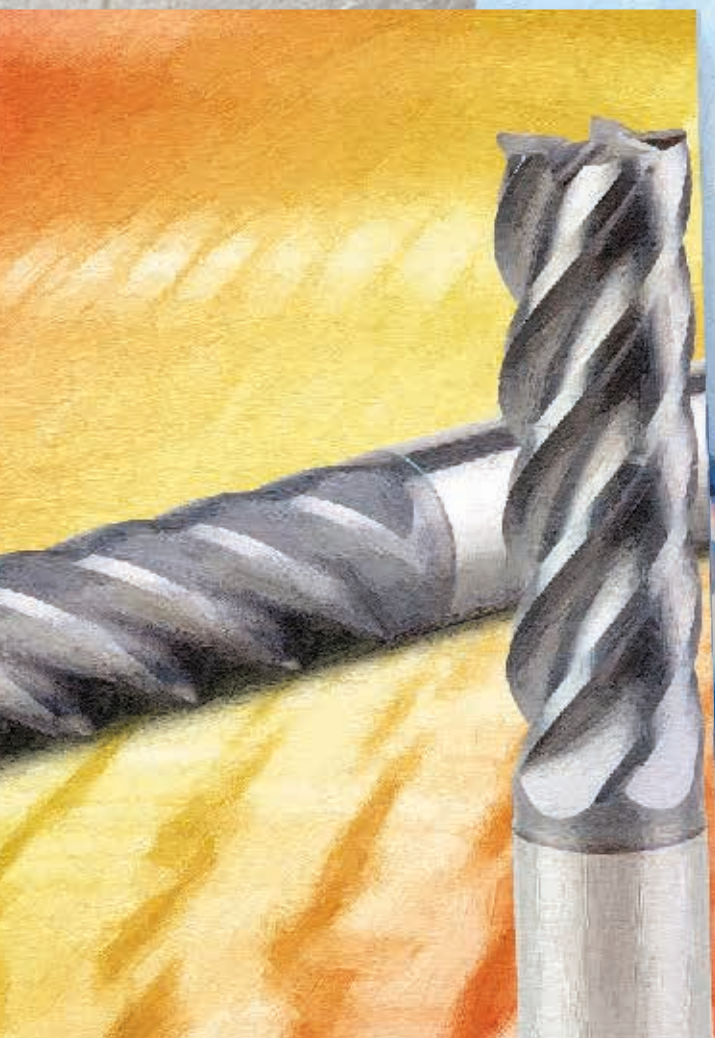
Miller GmbH & Co. KG, Präzisionswerkzeuge in Altenstadt produces solid carbide precision tools for drilling and milling with resounding success and an innovative production strategy. PCD tools for drilling into the solid round off the product portfolio.

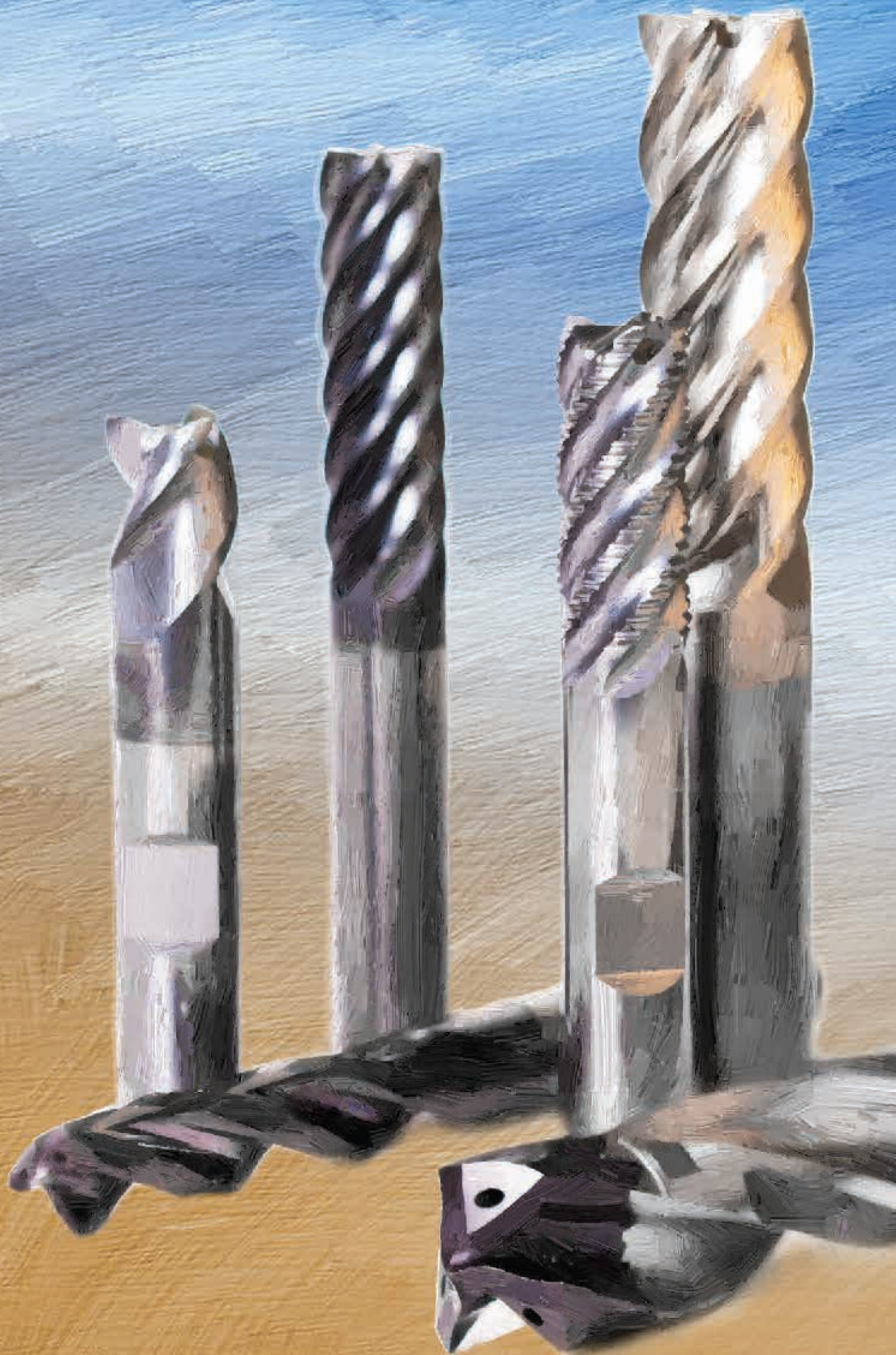
The greatest strengths of MILLER are its extensive range of standard products with application-specific catalogue tools as well as its high degree of flexibility in developing outstanding complex special tools made of solid carbide.



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Miller GmbH & Co. KG, Präzisionswerkzeuge in Altenstadt is a member of the "tool-traders-partner" association and takes the advantages of this strong community to the benefit of its customers and the quality of its products. For further information see the last pages of this catalogue or visit us on the internet at www.tool-traders-partner.com.





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DRILLING

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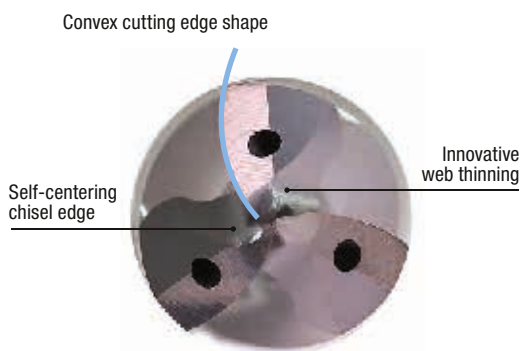
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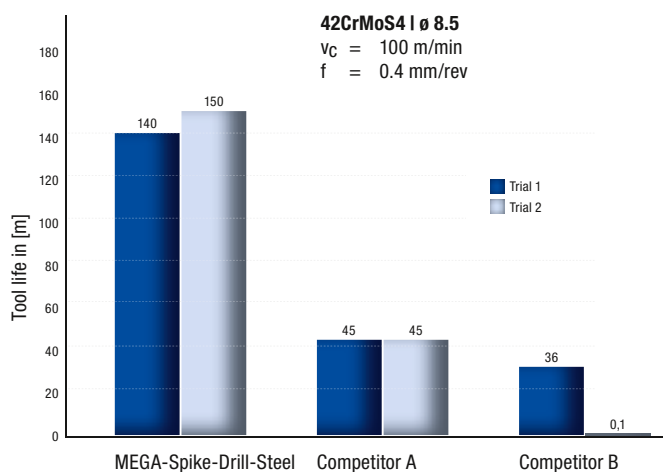
MEGA-Spike-Drill-Steel

Highest feed in steel



High-performance coating

Finely ground flute profile



AT A GLANCE

- Drills with three cutting edges for highest performance level
- Specially intended for machining steel
- New shape of main cutting edge; adjusted coating
- Ideally suited for difficult drilling tasks
- Available in the diameters 4 to 20 mm in designs of 3xD (M9933) and 5xD (M9935)

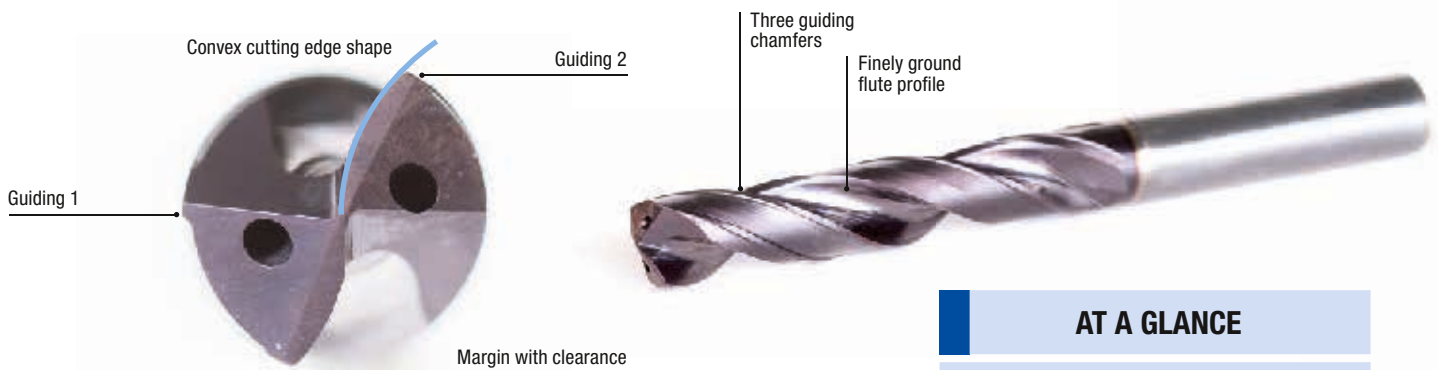
ADVANTAGES

- Considerably increased feed rate
- Fast chip removal
- Robust tool with stable cutting edges
- No oscillation when machining
- Long tool life



MEGA-Speed-Drill-Steel

Highest speed in steel

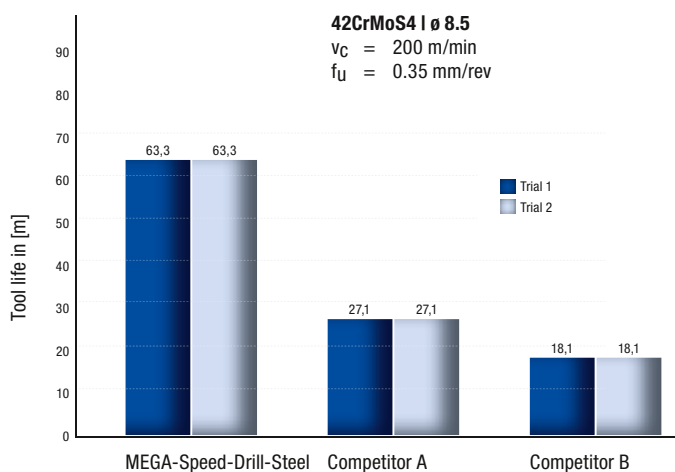


AT A GLANCE

- High-Performance from the MEGA-Speed-Drill series
- Specially intended for machining steel
- Optimized shape of main cutting edge; and design of cutting edge
- Unique, finely ground flute profile
- Available in the diameters 3 to 20 mm in design 5xD (M9925)

ADVANTAGES

- Doubled cutting speed and 20 % higher feeds compared to equivalent drills with two cutting edges
- Extremely robust cutting edges
- Long tool life
- Fast chip removal
- Highest productivity





TTD-Tritan

The triple cutting edged replaceable head system

TTS connection



AT A GLANCE

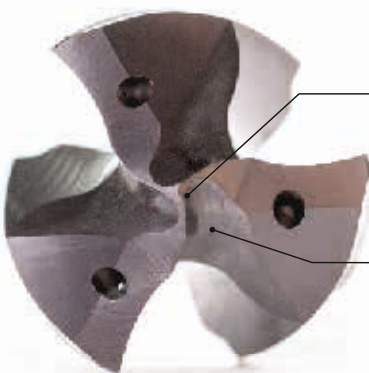
- First triple cutting edged replaceable head drill available as standard
- Tool head and tool holder are joined by particularly sturdy Hirth serrations
- Available as an universal model for machining steel in the diameter range from 12 to 32,4 mm
- Corresponding holders available in 3xD and 5xD

ADVANTAGES

- Up to doubled feed rate compared to head drills with two cutting edges
- The tool is perfectly centred via its pronounced drill point and ensures very good circularity
- Lower costs even with large diameters
- Boring on inclined surfaces possible

Self-centering chisel edge

Innovative web thinning



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Standard programme
Solid carbide drills

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Standard-Programm - Gesamtpreisliste | Standard Programme - Common Price List
Bohren und Fräsen | Drilling and Milling

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PRODUCT OVERVIEW

Drilling using solid carbide and replaceable head system

Miller has been researching intensively into the various challenges facing drilling operations for decades and as a consequence has gained extensive experience and competence. This work has produced innovative tools made of solid carbide for machining almost all workpiece materials such as cast iron, non-ferrous metals, steels and difficult-to-machine materials.

The addition to the solid carbide tools includes universal double edge and triple edge drills specially matched to machine steel.

You will find tools for machining lightweight material such as CFRP or GFRP in the catalogue "Tools for modern lightweight materials".



Basic Line:

Universal tools, broad application area, low procurement costs



Performance Line:

High-performance tools, broad application area, high productivity in series production manufacturing



Expert Line:

Specialist tools for selected applications, maximum precision and productivity

Drilling using solid carbide



MEGA-Spike-Drill-Steel

The new standard with three cutting edges - drilling with up to twice the feed rate where other drills fail.



Ø range: 4.00 - 20.00 mm

Drilling depth:



MEGA-Speed-Drill-Steel

Three guiding chamfers for high performance and process reliability.



Ø range: 3.00 - 20.00 mm

Drilling depth:





Drilling using replaceable head drill



Replaceable head drill TTD-Tritan

First triple edge replaceable head drill available as standard.

Perfor
mance
LINE

ø range: 12.00 – 32.40 mm

Drilling depth:

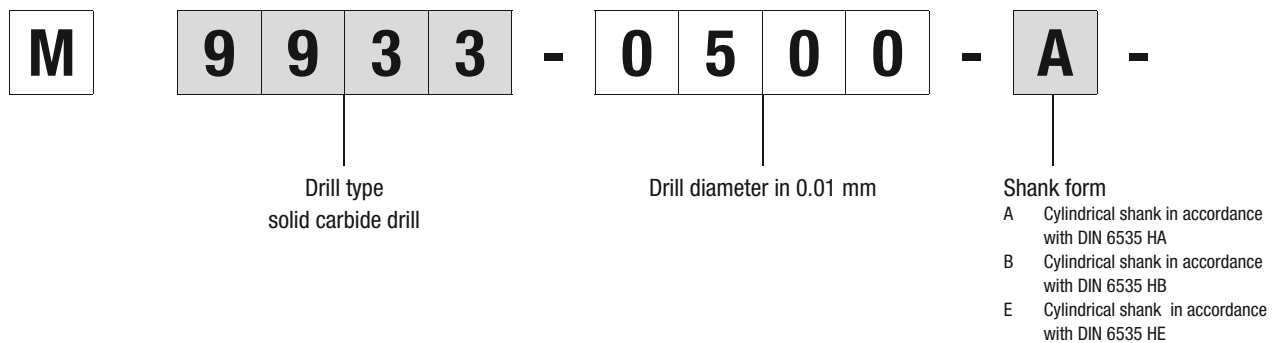
3xD 5xD

P K

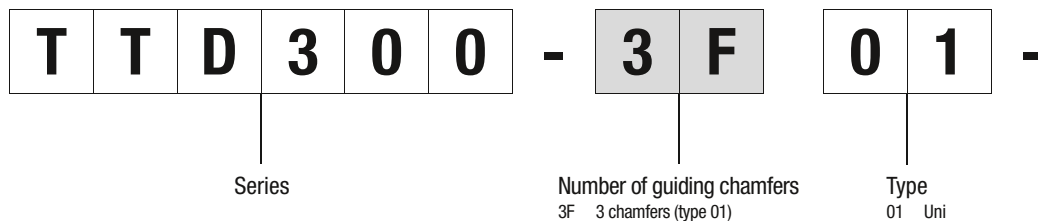
Model key

Solid carbide and replaceable head drills and holders

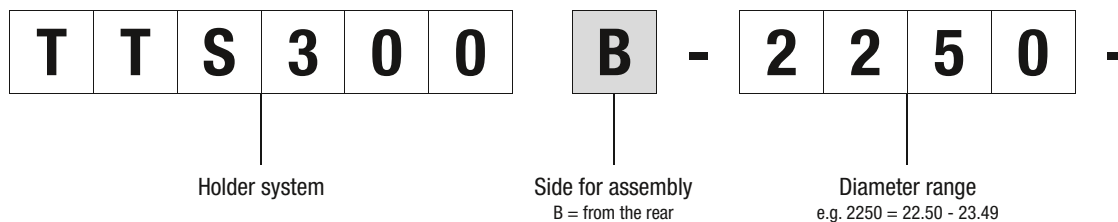
Solid carbide drills



Changing system TTD-Tritan



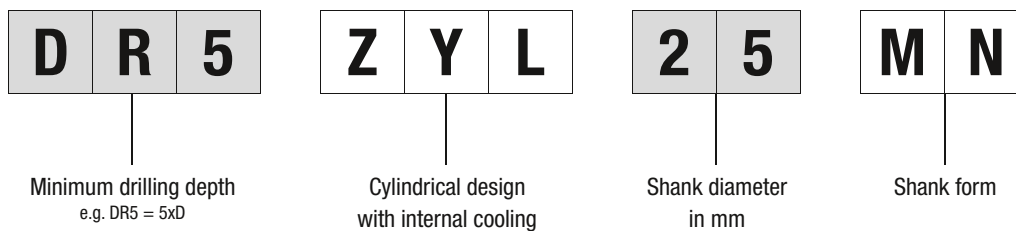
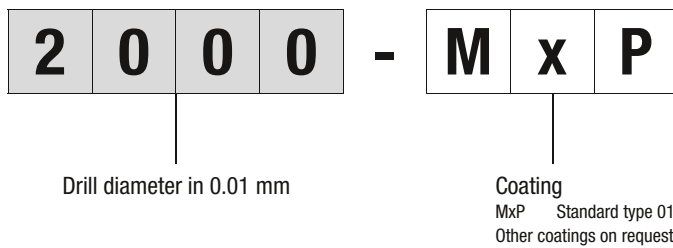
Holder range TTS for TTD-Tritan



R

Coating

A	Mx11	M	MxH	V	Mx5
E	MxF Mx8	P	MxM	W	Mx4
H	MxA	Q	Diamond coating		
J	MxB	R	MxP		
K	Mx2	U	Uncoated		Other coatings on request.



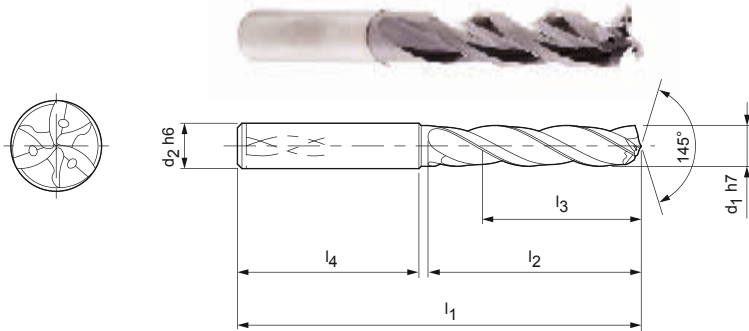
MEGA-Spike-Drill-Steel

Solid carbide twist drill

M9933 (3xD), internal coolant supply

Design:

Drill diameter:	4.00 – 20.00 mm
Bore tolerance:	≥ IT 9
Coating:	MxP
Number of cutting edges:	3
Number of guiding chamfers:	3
Point angle:	145°
Helix angle:	30°



Dimensions						Shank form HA	
d ₁ h7	d ₂ h6	l ₁	l ₂	l ₃	l ₄	Order designation	Order No.
4,00	6	66	24	17	36	M9933-0400AR	30790215
4,10	6	66	24	17	36	M9933-0410AR	30790216
4,20	6	66	24	17	36	M9933-0420AR	30790217
4,30	6	66	24	17	36	M9933-0430AR	30790218
4,40	6	66	24	17	36	M9933-0440AR	30790219
4,50	6	66	24	17	36	M9933-0450AR	30790220
4,60	6	66	24	17	36	M9933-0460AR	30790221
4,65	6	66	24	17	36	M9933-0465AR	30862011
4,70	6	66	24	17	36	M9933-0470AR	30790222
4,80	6	66	28	20	36	M9933-0480AR	30790223
4,90	6	66	28	20	36	M9933-0490AR	30790224
5,00	6	66	28	20	36	M9933-0500AR	30790225
5,10	6	66	28	20	36	M9933-0510AR	30790226
5,20	6	66	28	20	36	M9933-0520AR	30790227
5,30	6	66	28	20	36	M9933-0530AR	30790228
5,40	6	66	28	20	36	M9933-0540AR	30790229
5,50	6	66	28	20	36	M9933-0550AR	30790230
5,55	6	66	28	20	36	M9933-0555AR	30862012
5,60	6	66	28	20	36	M9933-0560AR	30790231
5,70	6	66	28	20	36	M9933-0570AR	30790232
5,80	6	66	28	20	36	M9933-0580AR	30790233
5,90	6	66	28	20	36	M9933-0590AR	30790234
6,00	6	66	28	20	36	M9933-0600AR	30790235
6,10	8	79	34	24	36	M9933-0610AR	30790236
6,20	8	79	34	24	36	M9933-0620AR	30790237
6,30	8	79	34	24	36	M9933-0630AR	30790238
6,40	8	79	34	24	36	M9933-0640AR	30790239
6,50	8	79	34	24	36	M9933-0650AR	30790240
6,60	8	79	34	24	36	M9933-0660AR	30790241
6,70	8	79	34	24	36	M9933-0670AR	30790242
6,80	8	79	34	24	36	M9933-0680AR	30790243
6,90	8	79	34	24	36	M9933-0690AR	30790244
7,00	8	79	34	24	36	M9933-0700AR	30790245
7,10	8	79	41	29	36	M9933-0710AR	30790246
7,20	8	79	41	29	36	M9933-0720AR	30790247
7,30	8	79	41	29	36	M9933-0730AR	30790248

MEGA-Spike-Drill-Steel | Solid carbide twist drills M9933 (3xD), internal coolant supply

Dimensions						Shank form HA	
d ₁ h7	d ₂ h6	l ₁	l ₂	l ₃	l ₄	Order designation	Order No.
7,40	8	79	41	29	36	M9933-0740AR	30790249
7,45	8	79	41	29	36	M9933-0745AR	30862013
7,50	8	79	41	29	36	M9933-0750AR	30790250
7,60	8	79	41	29	36	M9933-0760AR	30790251
7,70	8	79	41	29	36	M9933-0770AR	30790252
7,80	8	79	41	29	36	M9933-0780AR	30790253
7,90	8	79	41	29	36	M9933-0790AR	30790254
8,00	8	79	41	29	36	M9933-0800AR	30790255
8,10	10	89	47	35	40	M9933-0810AR	30790256
8,20	10	89	47	35	40	M9933-0820AR	30790257
8,30	10	89	47	35	40	M9933-0830AR	30790258
8,40	10	89	47	35	40	M9933-0840AR	30790259
8,50	10	89	47	35	40	M9933-0850AR	30790260
8,60	10	89	47	35	40	M9933-0860AR	30790261
8,70	10	89	47	35	40	M9933-0870AR	30790262
8,80	10	89	47	35	40	M9933-0880AR	30790263
8,90	10	89	47	35	40	M9933-0890AR	30790264
9,00	10	89	47	35	40	M9933-0900AR	30790265
9,10	10	89	47	35	40	M9933-0910AR	30790266
9,20	10	89	47	35	40	M9933-0920AR	30790267
9,30	10	89	47	35	40	M9933-0930AR	30790268
9,40	10	89	47	35	40	M9933-0940AR	30790269
9,50	10	89	47	35	40	M9933-0950AR	30790270
9,60	10	89	47	35	40	M9933-0960AR	30790271
9,70	10	89	47	35	40	M9933-0970AR	30790272
9,80	10	89	47	35	40	M9933-0980AR	30790273
9,90	10	89	47	35	40	M9933-0990AR	30790274
10,00	10	89	47	35	40	M9933-1000AR	30790275
10,10	12	102	55	40	45	M9933-1010AR	30790276
10,20	12	102	55	40	45	M9933-1020AR	30790277
10,30	12	102	55	40	45	M9933-1030AR	30790278
10,40	12	102	55	40	45	M9933-1040AR	30790279
10,50	12	102	55	40	45	M9933-1050AR	30790280
10,60	12	102	55	40	45	M9933-1060AR	30790281
10,70	12	102	55	40	45	M9933-1070AR	30790282
10,80	12	102	55	40	45	M9933-1080AR	30790283
10,90	12	102	55	40	45	M9933-1090AR	30790284
11,00	12	102	55	40	45	M9933-1100AR	30790285
11,10	12	102	55	40	45	M9933-1110AR	30790286
11,20	12	102	55	40	45	M9933-1120AR	30790287
11,30	12	102	55	40	45	M9933-1130AR	30790288
11,40	12	102	55	40	45	M9933-1140AR	30790289
11,50	12	102	55	40	45	M9933-1150AR	30790290
11,60	12	102	55	40	45	M9933-1160AR	30790291
11,70	12	102	55	40	45	M9933-1170AR	30790292
11,80	12	102	55	40	45	M9933-1180AR	30790293
11,90	12	102	55	40	45	M9933-1190AR	30790294
12,00	12	102	55	40	45	M9933-1200AR	30790295
12,20	14	107	60	43	45	M9933-1220AR	30790491
12,50	14	107	60	43	45	M9933-1250AR	30790296
12,80	14	107	60	43	45	M9933-1280AR	30790297
13,00	14	107	60	43	45	M9933-1300AR	30790298
13,20	14	107	60	43	45	M9933-1320AR	30790722
13,50	14	107	60	43	45	M9933-1350AR	30790299
13,80	14	107	60	43	45	M9933-1380AR	30790300
14,00	14	107	60	43	45	M9933-1400AR	30790301
14,20	16	115	65	45	48	M9933-1420AR	30790492

Continued on next page.

MEGA-Spike-Drill-Steel | Solid carbide twist drills M9933 (3xD), internal coolant supply

Dimensions						Shank form HA	
d ₁ h7	d ₂ h6	l ₁	l ₂	l ₃	l ₄	Order designation	Order No.
14,50	16	115	65	45	48	M9933-1450AR	30790302
14,80	16	115	65	45	48	M9933-1480AR	30790303
15,00	16	115	65	45	48	M9933-1500AR	30790304
15,20	16	115	65	45	48	M9933-1520AR	30790493
15,50	16	115	65	45	48	M9933-1550AR	30790305
15,80	16	115	65	45	48	M9933-1580AR	30790306
16,00	16	115	65	45	48	M9933-1600AR	30790307
16,20	18	123	73	51	48	M9933-1620AR	30790723
16,50	18	123	73	51	48	M9933-1650AR	30790308
16,80	18	123	73	51	48	M9933-1680AR	30790309
17,00	18	123	73	51	48	M9933-1700AR	30790310
17,20	18	123	73	51	48	M9933-1720AR	30790724
17,50	18	123	73	51	48	M9933-1750AR	30790311
17,80	18	123	73	51	48	M9933-1780AR	30790312
18,00	18	123	73	51	48	M9933-1800AR	30790313
18,20	20	131	79	55	50	M9933-1820AR	30790725
18,50	20	131	79	55	50	M9933-1850AR	30790314
18,80	20	131	79	55	50	M9933-1880AR	30790315
19,00	20	131	79	55	50	M9933-1900AR	30790316
19,20	20	131	79	55	50	M9933-1920AR	30790726
19,50	20	131	79	55	50	M9933-1950AR	30790317
19,80	20	131	79	55	50	M9933-1980AR	30790318
20,00	20	131	79	55	50	M9933-2000AR	30790319

Dimensions in mm.

For cutting data recommendation, see end of section.

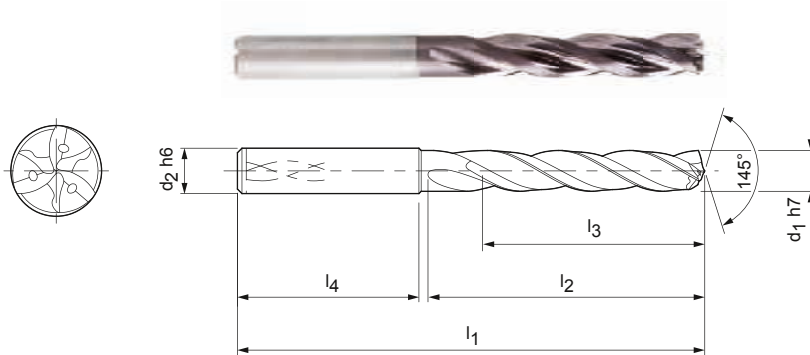
Special designs and other coatings on request.

MEGA-Spike-Drill-Steel

Solid carbide twist drill
M9935 (5xD), internal coolant supply

Design:

Drill diameter: 4.00 – 20.00 mm
Bore tolerance: $\geq IT 9$
Coating: MxP
Number of cutting edges: 3
Number of guiding chamfers: 3
Point angle: 145°
Helix angle: 30°



Dimensions						Shank form HA	
d ₁ h7	d ₂ h6	l ₁	l ₂	l ₃	l ₄	Order designation	Order No.
4,00	6	74	36	29	36	M9935-0400AR	30790320
4,10	6	74	36	29	36	M9935-0410AR	30790321
4,20	6	74	36	29	36	M9935-0420AR	30790322
4,30	6	74	36	29	36	M9935-0430AR	30790323
4,40	6	74	36	29	36	M9935-0440AR	30790324
4,50	6	74	36	29	36	M9935-0450AR	30790325
4,60	6	74	36	29	36	M9935-0460AR	30790326
4,65	6	74	36	29	36	M9935-0465AR	30862014
4,70	6	74	36	29	36	M9935-0470AR	30790327
4,80	6	82	44	35	36	M9935-0480AR	30790328
4,90	6	82	44	35	36	M9935-0490AR	30790329
5,00	6	82	44	35	36	M9935-0500AR	30790330
5,10	6	82	44	35	36	M9935-0510AR	30790331
5,20	6	82	44	35	36	M9935-0520AR	30790332
5,30	6	82	44	35	36	M9935-0530AR	30790333
5,40	6	82	44	35	36	M9935-0540AR	30790334
5,50	6	82	44	35	36	M9935-0550AR	30790335
5,55	6	82	44	35	36	M9935-0555AR	30862015
5,60	6	82	44	35	36	M9935-0560AR	30790336
5,70	6	82	44	35	36	M9935-0570AR	30790337
5,80	6	82	44	35	36	M9935-0580AR	30790338
5,90	6	82	44	35	36	M9935-0590AR	30790339
6,00	6	82	44	35	36	M9935-0600AR	30790340
6,10	8	91	53	43	36	M9935-0610AR	30790341
6,20	8	91	53	43	36	M9935-0620AR	30790342
6,30	8	91	53	43	36	M9935-0630AR	30790343
6,40	8	91	53	43	36	M9935-0640AR	30790344
6,50	8	91	53	43	36	M9935-0650AR	30790345
6,60	8	91	53	43	36	M9935-0660AR	30790346
6,70	8	91	53	43	36	M9935-0670AR	30790347
6,80	8	91	53	43	36	M9935-0680AR	30790348
6,90	8	91	53	43	36	M9935-0690AR	30790349
7,00	8	91	53	43	36	M9935-0700AR	30790350
7,10	8	91	53	43	36	M9935-0710AR	30790351
7,20	8	91	53	43	36	M9935-0720AR	30790352
7,30	8	91	53	43	36	M9935-0730AR	30790353

Continued on next page.

MEGA-Spike-Drill-Steel | Solid carbide twist drills M9935 (5xD), internal coolant supply

Dimensions						Shank form HA	
d ₁ h7	d ₂ h6	l ₁	l ₂	l ₃	l ₄	Order designation	Order No.
7,40	8	91	53	43	36	M9935-0740AR	30790354
7,45	8	91	53	43	36	M9935-0745AR	30862016
7,50	8	91	53	43	36	M9935-0750AR	30790355
7,60	8	91	53	43	36	M9935-0760AR	30790356
7,70	8	91	53	43	36	M9935-0770AR	30790357
7,80	8	91	53	43	36	M9935-0780AR	30790358
7,90	8	91	53	43	36	M9935-0790AR	30790359
8,00	8	91	53	43	36	M9935-0800AR	30790360
8,10	10	103	61	49	40	M9935-0810AR	30790361
8,20	10	103	61	49	40	M9935-0820AR	30790362
8,30	10	103	61	49	40	M9935-0830AR	30790363
8,40	10	103	61	49	40	M9935-0840AR	30790364
8,50	10	103	61	49	40	M9935-0850AR	30790365
8,60	10	103	61	49	40	M9935-0860AR	30790366
8,70	10	103	61	49	40	M9935-0870AR	30790367
8,80	10	103	61	49	40	M9935-0880AR	30790368
8,90	10	103	61	49	40	M9935-0890AR	30790369
9,00	10	103	61	49	40	M9935-0900AR	30790370
9,10	10	103	61	49	40	M9935-0910AR	30790371
9,20	10	103	61	49	40	M9935-0920AR	30790372
9,30	10	103	61	49	40	M9935-0930AR	30790373
9,35	10	103	61	49	40	M9935-0935AR	30862017
9,40	10	103	61	49	40	M9935-0940AR	30790374
9,50	10	103	61	49	40	M9935-0950AR	30790375
9,55	10	103	61	49	40	M9935-0955AR	30862018
9,60	10	103	61	49	40	M9935-0960AR	30790376
9,70	10	103	61	49	40	M9935-0970AR	30790377
9,80	10	103	61	49	40	M9935-0980AR	30790378
9,90	10	103	61	49	40	M9935-0990AR	30790379
10,00	10	103	61	49	40	M9935-1000AR	30790380
10,10	12	118	71	56	45	M9935-1010AR	30790381
10,20	12	118	71	56	45	M9935-1020AR	30790382
10,30	12	118	71	56	45	M9935-1030AR	30790383
10,40	12	118	71	56	45	M9935-1040AR	30790384
10,50	12	118	71	56	45	M9935-1050AR	30790385
10,60	12	118	71	56	45	M9935-1060AR	30790386
10,70	12	118	71	56	45	M9935-1070AR	30790387
10,80	12	118	71	56	45	M9935-1080AR	30790388
10,90	12	118	71	56	45	M9935-1090AR	30790389
11,00	12	118	71	56	45	M9935-1100AR	30790390
11,10	12	118	71	56	45	M9935-1110AR	30790391
11,20	12	118	71	56	45	M9935-1120AR	30790392
11,30	12	118	71	56	45	M9935-1130AR	30790393
11,40	12	118	71	56	45	M9935-1140AR	30790394
11,50	12	118	71	56	45	M9935-1150AR	30790395
11,60	12	118	71	56	45	M9935-1160AR	30790396
11,70	12	118	71	56	45	M9935-1170AR	30790397
11,80	12	118	71	56	45	M9935-1180AR	30790398
11,90	12	118	71	56	45	M9935-1190AR	30790399
12,00	12	118	71	56	45	M9935-1200AR	30790400
12,20	14	124	77	60	45	M9935-1220AR	30790494
12,50	14	124	77	60	45	M9935-1250AR	30790401
12,80	14	124	77	60	45	M9935-1280AR	30790402
13,00	14	124	77	60	45	M9935-1300AR	30790403
13,20	14	124	77	60	45	M9935-1320AR	30790727
13,50	14	124	77	60	45	M9935-1350AR	30790404
13,80	14	124	77	60	45	M9935-1380AR	30790405

MEGA-Spike-Drill-Steel | Solid carbide twist drills M9935 (5xD), internal coolant supply

Dimensions						Shank form HA	
d ₁ h7	d ₂ h6	l ₁	l ₂	l ₃	l ₄	Order designation	Order No.
14,00	14	124	77	60	45	M9935-1400AR	30790406
14,20	16	133	83	63	48	M9935-1420AR	30790495
14,50	16	133	83	63	48	M9935-1450AR	30790407
14,80	16	133	83	63	48	M9935-1480AR	30790408
15,00	16	133	83	63	48	M9935-1500AR	30790409
15,10	16	133	83	63	48	M9935-1510AR	30862019
15,20	16	133	83	63	48	M9935-1520AR	30790496
15,25	16	133	83	63	48	M9935-1525AR	30862020
15,50	16	133	83	63	48	M9935-1550AR	30790410
15,80	16	133	83	63	48	M9935-1580AR	30790411
16,00	16	133	83	63	48	M9935-1600AR	30790412
16,20	18	143	93	71	48	M9935-1620AR	30790728
16,50	18	143	93	71	48	M9935-1650AR	30790413
16,80	18	143	93	71	48	M9935-1680AR	30790414
17,00	18	143	93	71	48	M9935-1700AR	30790415
17,20	18	143	93	71	48	M9935-1720AR	30790729
17,50	18	143	93	71	48	M9935-1750AR	30790416
17,80	18	143	93	71	48	M9935-1780AR	30790417
18,00	18	143	93	71	48	M9935-1800AR	30790418
18,20	20	153	101	77	50	M9935-1820AR	30790730
18,50	20	153	101	77	50	M9935-1850AR	30790419
18,80	20	153	101	77	50	M9935-1880AR	30790420
19,00	20	153	101	77	50	M9935-1900AR	30790421
19,20	20	153	101	77	50	M9935-1920AR	30790731
19,50	20	153	101	77	50	M9935-1950AR	30790422
19,80	20	153	101	77	50	M9935-1980AR	30790423
20,00	20	153	101	77	50	M9935-2000AR	30790424

Dimensions in mm.

For cutting data recommendation, see end of section.

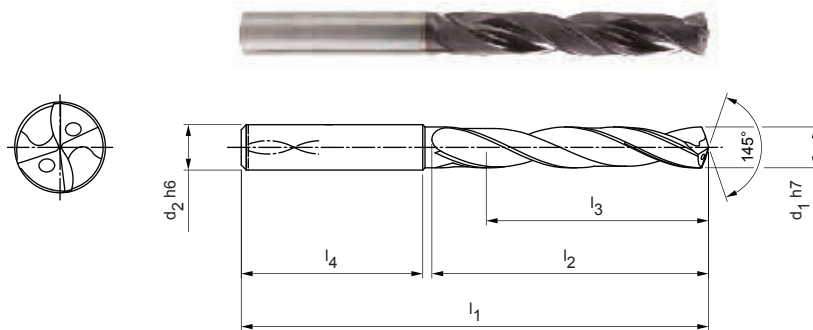
Special designs and other coatings on request.

MEGA-Speed-Drill-Steel

Solid carbide twist drill
M9925 (5xD), internal coolant supply

Design:

Drill diameter: 3.00 – 20.00 mm
Bore tolerance: $\geq IT 9$
Coating: MxP
Number of cutting edges: 2
Number of guiding chamfers: 3
Point angle: 145°
Helix angle: 30°



Dimensions						Shank form HA	
d ₁ h7	d ₂ h6	l ₁	l ₂	l ₃	l ₄	Order designation	Order No.
3,00	6	66	28	23	36	M9925-0300AR	30890196
3,10	6	66	28	23	36	M9925-0310AR	30890197
3,20	6	66	28	23	36	M9925-0320AR	30890198
3,30	6	66	28	23	36	M9925-0330AR	30890199
3,40	6	66	28	23	36	M9925-0340AR	30890200
3,50	6	66	28	23	36	M9925-0350AR	30890201
3,60	6	66	28	23	36	M9925-0360AR	30890202
3,70	6	66	28	23	36	M9925-0370AR	30890203
3,80	6	74	36	29	36	M9925-0380AR	30890204
3,90	6	74	36	29	36	M9925-0390AR	30890205
4,00	6	74	36	29	36	M9925-0400AR	30890206
4,10	6	74	36	29	36	M9925-0410AR	30890207
4,20	6	74	36	29	36	M9925-0420AR	30890208
4,30	6	74	36	29	36	M9925-0430AR	30890209
4,40	6	74	36	29	36	M9925-0440AR	30890210
4,50	6	74	36	29	36	M9925-0450AR	30890211
4,60	6	74	36	29	36	M9925-0460AR	30890212
4,70	6	74	36	29	36	M9925-0470AR	30890213
4,80	6	82	44	35	36	M9925-0480AR	30890214
4,90	6	82	44	35	36	M9925-0490AR	30890215
5,00	6	82	44	35	36	M9925-0500AR	30890216
5,10	6	82	44	35	36	M9925-0510AR	30890217
5,20	6	82	44	35	36	M9925-0520AR	30890218
5,30	6	82	44	35	36	M9925-0530AR	30890219
5,40	6	82	44	35	36	M9925-0540AR	30890220
5,50	6	82	44	35	36	M9925-0550AR	30890221
5,60	6	82	44	35	36	M9925-0560AR	30890222
5,70	6	82	44	35	36	M9925-0570AR	30890223
5,80	6	82	44	35	36	M9925-0580AR	30890224
5,90	6	82	44	35	36	M9925-0590AR	30890225
6,00	6	82	44	35	36	M9925-0600AR	30890226
6,10	8	91	53	43	36	M9925-0610AR	30890227
6,20	8	91	53	43	36	M9925-0620AR	30890228
6,30	8	91	53	43	36	M9925-0630AR	30890229
6,40	8	91	53	43	36	M9925-0640AR	30890230
6,50	8	91	53	43	36	M9925-0650AR	30890231

MEGA-Speed-Drill-Steel | Solid carbide twist drills M9925 (5xD), internal coolant supply

Dimensions						Shank form HA	
d ₁ h7	d ₂ h6	l ₁	l ₂	l ₃	l ₄	Order designation	Order No.
6,60	8	91	53	43	36	M9925-0660AR	30890232
6,70	8	91	53	43	36	M9925-0670AR	30890233
6,80	8	91	53	43	36	M9925-0680AR	30890234
6,90	8	91	53	43	36	M9925-0690AR	30890235
7,00	8	91	53	43	36	M9925-0700AR	30890236
7,10	8	91	53	43	36	M9925-0710AR	30890237
7,20	8	91	53	43	36	M9925-0720AR	30890238
7,30	8	91	53	43	36	M9925-0730AR	30890239
7,40	8	91	53	43	36	M9925-0740AR	30890240
7,50	8	91	53	43	36	M9925-0750AR	30890241
7,60	8	91	53	43	36	M9925-0760AR	30890242
7,70	8	91	53	43	36	M9925-0770AR	30890243
7,80	8	91	53	43	36	M9925-0780AR	30890244
7,90	8	91	53	43	36	M9925-0790AR	30890245
8,00	8	91	53	43	36	M9925-0800AR	30890246
8,10	10	103	61	49	40	M9925-0810AR	30890247
8,20	10	103	61	49	40	M9925-0820AR	30890248
8,30	10	103	61	49	40	M9925-0830AR	30890249
8,40	10	103	61	49	40	M9925-0840AR	30890250
8,50	10	103	61	49	40	M9925-0850AR	30890251
8,60	10	103	61	49	40	M9925-0860AR	30890252
8,70	10	103	61	49	40	M9925-0870AR	30890253
8,80	10	103	61	49	40	M9925-0880AR	30890254
8,90	10	103	61	49	40	M9925-0890AR	30890255
9,00	10	103	61	49	40	M9925-0900AR	30890256
9,10	10	103	61	49	40	M9925-0910AR	30890257
9,20	10	103	61	49	40	M9925-0920AR	30890258
9,30	10	103	61	49	40	M9925-0930AR	30890259
9,40	10	103	61	49	40	M9925-0940AR	30890260
9,50	10	103	61	49	40	M9925-0950AR	30890261
9,60	10	103	61	49	40	M9925-0960AR	30890262
9,70	10	103	61	49	40	M9925-0970AR	30890263
9,80	10	103	61	49	40	M9925-0980AR	30890264
9,90	10	103	61	49	40	M9925-0990AR	30890265
10,00	10	103	61	49	40	M9925-1000AR	30890266
10,10	12	118	71	56	45	M9925-1010AR	30890267
10,20	12	118	71	56	45	M9925-1020AR	30890268
10,30	12	118	71	56	45	M9925-1030AR	30890269
10,40	12	118	71	56	45	M9925-1040AR	30890270
10,50	12	118	71	56	45	M9925-1050AR	30890271
10,60	12	118	71	56	45	M9925-1060AR	30890272
10,70	12	118	71	56	45	M9925-1070AR	30890273
10,80	12	118	71	56	45	M9925-1080AR	30890274
10,90	12	118	71	56	45	M9925-1090AR	30890275
11,00	12	118	71	56	45	M9925-1100AR	30890276
11,10	12	118	71	56	45	M9925-1110AR	30890277
11,20	12	118	71	56	45	M9925-1120AR	30890278
11,30	12	118	71	56	45	M9925-1130AR	30890279
11,40	12	118	71	56	45	M9925-1140AR	30890280
11,50	12	118	71	56	45	M9925-1150AR	30890281
11,60	12	118	71	56	45	M9925-1160AR	30890282
11,70	12	118	71	56	45	M9925-1170AR	30890283
11,80	12	118	71	56	45	M9925-1180AR	30890284
11,90	12	118	71	56	45	M9925-1190AR	30890285
12,00	12	118	71	56	45	M9925-1200AR	30890286
12,20	14	124	77	60	45	M9925-1220AR	30890287
12,50	14	124	77	60	45	M9925-1250AR	30890288

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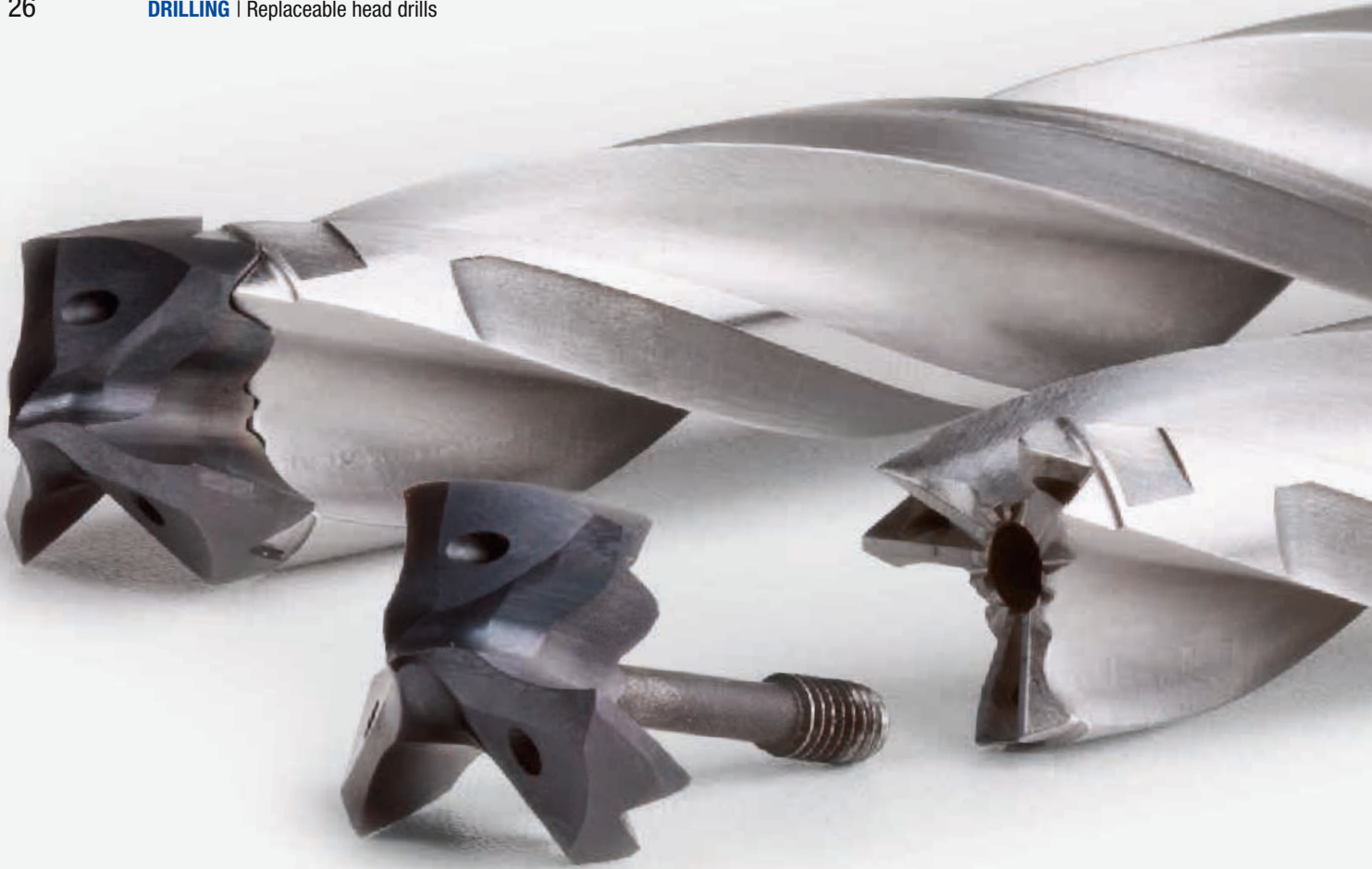
MEGA-Speed-Drill-Steel | Solid carbide twist drills M9925 (5xD), internal coolant supply

Dimensions						Shank form HA	
d ₁ h7	d ₂ h6	l ₁	l ₂	l ₃	l ₄	Order designation	Order No.
12,80	14	124	77	60	45	M9925-1280AR	30890289
13,00	14	124	77	60	45	M9925-1300AR	30890290
13,50	14	124	77	60	45	M9925-1350AR	30890291
13,80	14	124	77	60	45	M9925-1380AR	30890292
14,00	14	124	77	60	45	M9925-1400AR	30890293
14,20	16	133	83	63	48	M9925-1420AR	30890294
14,50	16	133	83	63	48	M9925-1450AR	30890295
14,80	16	133	83	63	48	M9925-1480AR	30890296
15,00	16	133	83	63	48	M9925-1500AR	30890297
15,20	16	133	83	63	48	M9925-1520AR	30890298
15,50	16	133	83	63	48	M9925-1550AR	30890299
15,80	16	133	83	63	48	M9925-1580AR	30890300
16,00	16	133	83	63	48	M9925-1600AR	30890301
16,50	18	143	93	71	48	M9925-1650AR	30890302
16,80	18	143	93	71	48	M9925-1680AR	30890303
17,00	18	143	93	71	48	M9925-1700AR	30890304
17,50	18	143	93	71	48	M9925-1750AR	30890305
17,80	18	143	93	71	48	M9925-1780AR	30890306
18,00	18	143	93	71	48	M9925-1800AR	30890307
18,50	20	153	101	77	50	M9925-1850AR	30890308
18,80	20	153	101	77	50	M9925-1880AR	30890309
19,00	20	153	101	77	50	M9925-1900AR	30890310
19,50	20	153	101	77	50	M9925-1950AR	30890311
19,80	20	153	101	77	50	M9925-1980AR	30890312
20,00	20	153	101	77	50	M9925-2000AR	30890313

Dimensions in mm.

For cutting data recommendation, see end of section.

Special designs and other coatings on request.



Replaceable head drill TTD-Tritan – minimised usage of carbide with highest stability and precision

Replaceable head systems in machining production are first choice when it comes to meeting the demands of rising raw material prices, resource efficiency and streamlining of stocks. Reason enough to further develop the triple edge MEGA-Spike-Drill, with which MILLER has defined a new standard in drilling, as a replaceable head variant and to place this on the market as the first triple edge replaceable head drill available as standard.

On the TTD-Tritan, tool head and tool holder are joined by Hirth serrations. This connection is particularly stable so that all the benefits and the performance level of the solid carbide equivalent are fully retained with the replaceable head variant. The stability of the connection derives among other things from the triple cutting possibility that is predestined for a replaceable head system.

The three cutting edges ensure a homogeneous load on the connection so that the forces occurring during machining are transmitted uniformly to the steel tool holder. In addition the connection guarantees optimum torque transmission with at the same time high changing and radial run-out accuracy. Compared to double edge replaceable head drills made of solid carbide, feeds up to twice as high can be realised using the TTD-Tritan.

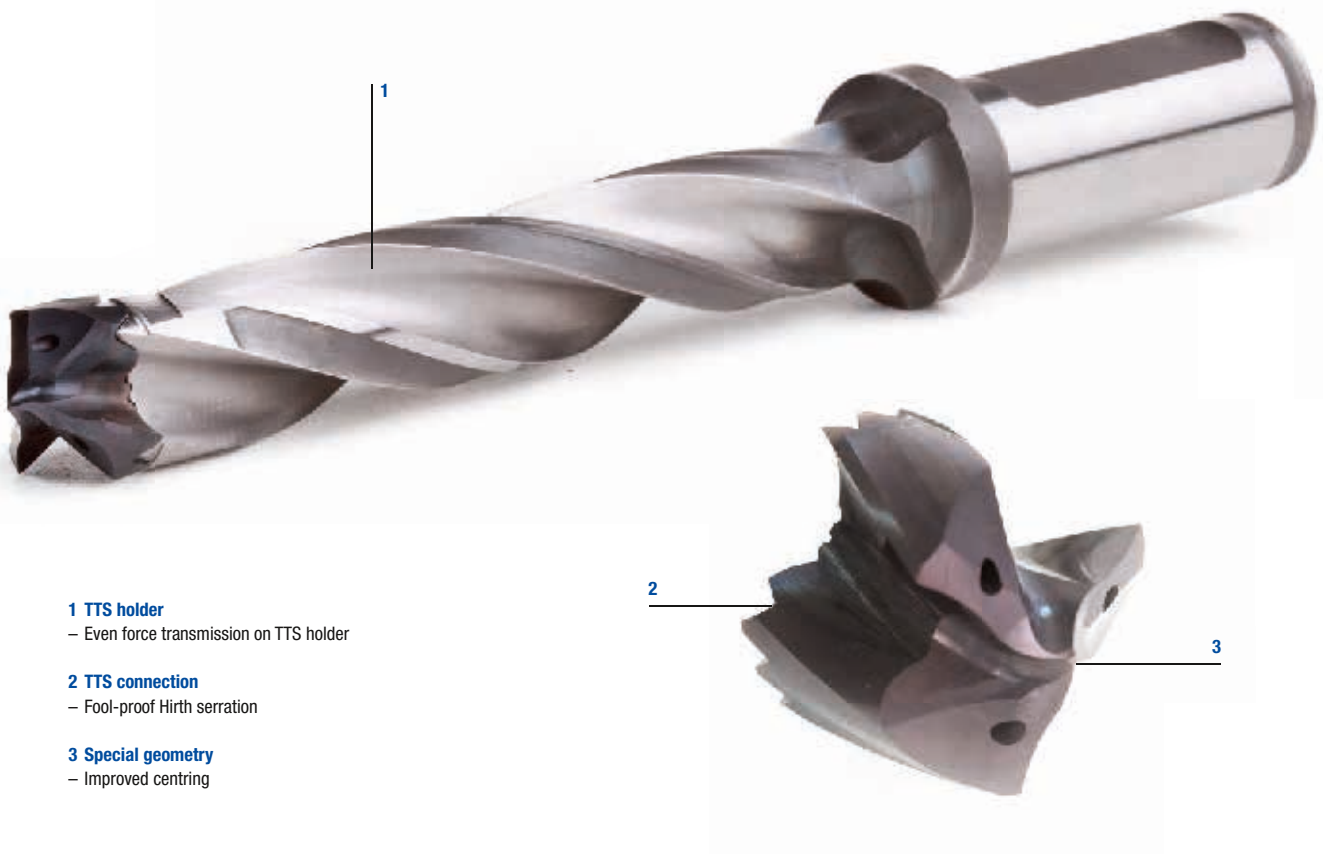
As a result, it can be used reliably and stably even in difficult drilling situations, such as with inclined bore entrance or in cross bores. The tool is perfectly centred via its pronounced drill point and ensures very good circularity – and that at lower costs, because with the new replaceable head system, the cost-intensive carbide is limited to the tool head. Lower costs are thus guaranteed even with large diameters.

FEATURES

- Up to twice the feed compared to double edge replaceable head drills
- High changeover accuracy and radial run-out accuracy
- Ideal for inclined bore entrances
- With internal cooling
- Tool centres optimally due to its pronounced drill point
- High torque transmission



Tool features in detail



1 TTS holder

- Even force transmission on TTS holder

2 TTS connection

- Fool-proof Hirth serration

3 Special geometry

- Improved centring

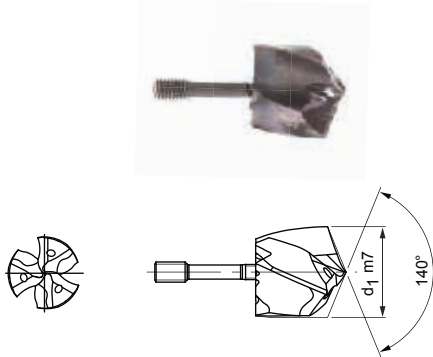
Replaceable drill head TTD-Tritan

Made of solid carbide, internal coolant supply

Type 01 - Uni

Design:

Drill diameter:	12.00 – 32.40 mm
Bore tolerance:	IT 9 (achievable)
Coating:	MxP
Number of cutting edges:	3
Number of guiding chamfers:	3
Point angle:	140°



d ₁ from 12.00 to 15.40			
d ₁ m7	Connection	Order designation	Order No.
12,00	TTS-B1200	TTD300-3F01-1200-MxP	30870944
12,10	TTS-B1200	TTD300-3F01-1210-MxP	30870945
12,20	TTS-B1200	TTD300-3F01-1220-MxP	30870946
12,30	TTS-B1200	TTD300-3F01-1230-MxP	30870947
12,40	TTS-B1200	TTD300-3F01-1240-MxP	30870948
12,50	TTS-B1250	TTD300-3F01-1250-MxP	30870949
12,60	TTS-B1250	TTD300-3F01-1260-MxP	30870950
12,70	TTS-B1250	TTD300-3F01-1270-MxP	30870951
12,80	TTS-B1250	TTD300-3F01-1280-MxP	30870952
12,90	TTS-B1250	TTD300-3F01-1290-MxP	30870953
13,00	TTS-B1300	TTD300-3F01-1300-MxP	30870954
13,10	TTS-B1300	TTD300-3F01-1310-MxP	30870955
13,20	TTS-B1300	TTD300-3F01-1320-MxP	30870956
13,30	TTS-B1300	TTD300-3F01-1330-MxP	30870957
13,40	TTS-B1300	TTD300-3F01-1340-MxP	30870958
13,50	TTS-B1350	TTD300-3F01-1350-MxP	30870959
13,60	TTS-B1350	TTD300-3F01-1360-MxP	30870960
13,70	TTS-B1350	TTD300-3F01-1370-MxP	30870961
13,80	TTS-B1350	TTD300-3F01-1380-MxP	30870962
13,90	TTS-B1350	TTD300-3F01-1390-MxP	30870963
14,00	TTS-B1400	TTD300-3F01-1400-MxP	30870964
14,10	TTS-B1400	TTD300-3F01-1410-MxP	30870965
14,20	TTS-B1400	TTD300-3F01-1420-MxP	30870966
14,30	TTS-B1400	TTD300-3F01-1430-MxP	30870967
14,40	TTS-B1400	TTD300-3F01-1440-MxP	30870968
14,50	TTS-B1450	TTD300-3F01-1450-MxP	30870969
14,60	TTS-B1450	TTD300-3F01-1460-MxP	30870970
14,70	TTS-B1450	TTD300-3F01-1470-MxP	30870971
14,80	TTS-B1450	TTD300-3F01-1480-MxP	30870972
14,90	TTS-B1450	TTD300-3F01-1490-MxP	30870973
15,00	TTS-B1500	TTD300-3F01-1500-MxP	30870974
15,10	TTS-B1500	TTD300-3F01-1510-MxP	30870975
15,20	TTS-B1500	TTD300-3F01-1520-MxP	30870976
15,30	TTS-B1500	TTD300-3F01-1530-MxP	30870977
15,40	TTS-B1500	TTD300-3F01-1540-MxP	30870978

d ₁ from 15.50 to 18.90			
d ₁ m7	Connection	Order designation	Order No.
15,50	TTS-B1550	TTD300-3F01-1550-MxP	30870979
15,60	TTS-B1550	TTD300-3F01-1560-MxP	30870980
15,70	TTS-B1550	TTD300-3F01-1570-MxP	30870981
15,80	TTS-B1550	TTD300-3F01-1580-MxP	30870982
15,90	TTS-B1550	TTD300-3F01-1590-MxP	30870983
16,00	TTS-B1600	TTD300-3F01-1600-MxP	30870984
16,10	TTS-B1600	TTD300-3F01-1610-MxP	30870985
16,20	TTS-B1600	TTD300-3F01-1620-MxP	30870986
16,30	TTS-B1600	TTD300-3F01-1630-MxP	30870987
16,40	TTS-B1600	TTD300-3F01-1640-MxP	30870988
16,50	TTS-B1650	TTD300-3F01-1650-MxP	30870989
16,60	TTS-B1650	TTD300-3F01-1660-MxP	30870990
16,70	TTS-B1650	TTD300-3F01-1670-MxP	30870991
16,80	TTS-B1650	TTD300-3F01-1680-MxP	30870992
16,90	TTS-B1650	TTD300-3F01-1690-MxP	30870993
17,00	TTS-B1700	TTD300-3F01-1700-MxP	30870994
17,10	TTS-B1700	TTD300-3F01-1710-MxP	30870995
17,20	TTS-B1700	TTD300-3F01-1720-MxP	30870996
17,30	TTS-B1700	TTD300-3F01-1730-MxP	30870997
17,40	TTS-B1700	TTD300-3F01-1740-MxP	30870998
17,50	TTS-B1750	TTD300-3F01-1750-MxP	30870999
17,60	TTS-B1750	TTD300-3F01-1760-MxP	30871000
17,70	TTS-B1750	TTD300-3F01-1770-MxP	30871001
17,80	TTS-B1750	TTD300-3F01-1780-MxP	30871002
17,90	TTS-B1750	TTD300-3F01-1790-MxP	30871003
18,00	TTS-B1800	TTD300-3F01-1800-MxP	30871004
18,10	TTS-B1800	TTD300-3F01-1810-MxP	30871005
18,20	TTS-B1800	TTD300-3F01-1820-MxP	30871006
18,30	TTS-B1800	TTD300-3F01-1830-MxP	30871007
18,40	TTS-B1800	TTD300-3F01-1840-MxP	30871008
18,50	TTS-B1850	TTD300-3F01-1850-MxP	30871009
18,60	TTS-B1850	TTD300-3F01-1860-MxP	30871010
18,70	TTS-B1850	TTD300-3F01-1870-MxP	30871011
18,80	TTS-B1850	TTD300-3F01-1880-MxP	30871012
18,90	TTS-B1850	TTD300-3F01-1890-MxP	30871013

d ₁ from 19.00 to 22.40			
d ₁ m7	Connection	Order designation	Order No.
19,00	TTS-B1900	TTD300-3F01-1900-MxP	30871014
19,10	TTS-B1900	TTD300-3F01-1910-MxP	30871015
19,20	TTS-B1900	TTD300-3F01-1920-MxP	30871016
19,30	TTS-B1900	TTD300-3F01-1930-MxP	30871017
19,40	TTS-B1900	TTD300-3F01-1940-MxP	30871018
19,50	TTS-B1950	TTD300-3F01-1950-MxP	30871019
19,60	TTS-B1950	TTD300-3F01-1960-MxP	30871020
19,70	TTS-B1950	TTD300-3F01-1970-MxP	30871021
19,80	TTS-B1950	TTD300-3F01-1980-MxP	30871022
19,90	TTS-B1950	TTD300-3F01-1990-MxP	30871023
20,00	TTS-B2000	TTD300-3F01-2000-MxP	30871024
20,10	TTS-B2000	TTD300-3F01-2010-MxP	30871025
20,20	TTS-B2000	TTD300-3F01-2020-MxP	30871026
20,30	TTS-B2000	TTD300-3F01-2030-MxP	30871027
20,40	TTS-B2000	TTD300-3F01-2040-MxP	30871028
20,50	TTS-B2050	TTD300-3F01-2050-MxP	30871029
20,60	TTS-B2050	TTD300-3F01-2060-MxP	30871031
20,70	TTS-B2050	TTD300-3F01-2070-MxP	30871032
20,80	TTS-B2050	TTD300-3F01-2080-MxP	30871033
20,90	TTS-B2050	TTD300-3F01-2090-MxP	30871034
21,00	TTS-B2100	TTD300-3F01-2100-MxP	30871035
21,10	TTS-B2100	TTD300-3F01-2110-MxP	30871036
21,20	TTS-B2100	TTD300-3F01-2120-MxP	30871037
21,30	TTS-B2100	TTD300-3F01-2130-MxP	30871038
21,40	TTS-B2100	TTD300-3F01-2140-MxP	30871039
21,50	TTS-B2150	TTD300-3F01-2150-MxP	30871040
21,60	TTS-B2150	TTD300-3F01-2160-MxP	30871041
21,70	TTS-B2150	TTD300-3F01-2170-MxP	30871042
21,80	TTS-B2150	TTD300-3F01-2180-MxP	30871043
21,90	TTS-B2150	TTD300-3F01-2190-MxP	30871044
22,00	TTS-B2200	TTD300-3F01-2200-MxP	30871045
22,10	TTS-B2200	TTD300-3F01-2210-MxP	30871046
22,20	TTS-B2200	TTD300-3F01-2220-MxP	30871047
22,30	TTS-B2200	TTD300-3F01-2230-MxP	30871048
22,40	TTS-B2200	TTD300-3F01-2240-MxP	30871049

Replaceable drill head TTD-Tritan-Uni made of solid carbide, internal coolant supply - type 01

d ₁ from 22.50 to 25.70				d ₁ from 25.80 to 29.00				d ₁ from 29.10 to 32.40			
d ₁ m7	Connection	Order designation	Order No.	d ₁ m7	Connection	Order designation	Order No.	d ₁ m7	Connection	Order designation	Order No.
22,50	TTS-B2250	TTD300-3F01-2250-MxP	30871050	25,80	TTS-B2550	TTD300-3F01-2580-MxP	30871083	29,10	TTS-B2900	TTD300-3F01-2910-MxP	30871116
22,60	TTS-B2250	TTD300-3F01-2260-MxP	30871051	25,90	TTS-B2550	TTD300-3F01-2590-MxP	30871084	29,20	TTS-B2900	TTD300-3F01-2920-MxP	30871117
22,70	TTS-B2250	TTD300-3F01-2270-MxP	30871052	26,00	TTS-B2600	TTD300-3F01-2600-MxP	30871085	29,30	TTS-B2900	TTD300-3F01-2930-MxP	30871118
22,80	TTS-B2250	TTD300-3F01-2280-MxP	30871053	26,10	TTS-B2600	TTD300-3F01-2610-MxP	30871086	29,40	TTS-B2900	TTD300-3F01-2940-MxP	30871119
22,90	TTS-B2250	TTD300-3F01-2290-MxP	30871054	26,20	TTS-B2600	TTD300-3F01-2620-MxP	30871087	29,50	TTS-B2950	TTD300-3F01-2950-MxP	30871120
23,00	TTS-B2300	TTD300-3F01-2300-MxP	30871055	26,30	TTS-B2600	TTD300-3F01-2630-MxP	30871088	29,60	TTS-B2950	TTD300-3F01-2960-MxP	30871121
23,10	TTS-B2300	TTD300-3F01-2310-MxP	30871056	26,40	TTS-B2600	TTD300-3F01-2640-MxP	30871089	29,70	TTS-B2950	TTD300-3F01-2970-MxP	30871122
23,20	TTS-B2300	TTD300-3F01-2320-MxP	30871057	26,50	TTS-B2650	TTD300-3F01-2650-MxP	30871090	29,80	TTS-B2950	TTD300-3F01-2980-MxP	30871123
23,30	TTS-B2300	TTD300-3F01-2330-MxP	30871058	26,60	TTS-B2650	TTD300-3F01-2660-MxP	30871091	29,90	TTS-B2950	TTD300-3F01-2990-MxP	30871124
23,40	TTS-B2300	TTD300-3F01-2340-MxP	30871059	26,70	TTS-B2650	TTD300-3F01-2670-MxP	30871092	30,00	TTS-B3000	TTD300-3F01-3000-MxP	30871125
23,50	TTS-B2350	TTD300-3F01-2350-MxP	30871060	26,80	TTS-B2650	TTD300-3F01-2680-MxP	30871093	30,10	TTS-B3000	TTD300-3F01-3010-MxP	30871126
23,60	TTS-B2350	TTD300-3F01-2360-MxP	30871061	26,90	TTS-B2650	TTD300-3F01-2690-MxP	30871094	30,20	TTS-B3000	TTD300-3F01-3020-MxP	30871127
23,70	TTS-B2350	TTD300-3F01-2370-MxP	30871062	27,00	TTS-B2700	TTD300-3F01-2700-MxP	30871095	30,30	TTS-B3000	TTD300-3F01-3030-MxP	30871128
23,80	TTS-B2350	TTD300-3F01-2380-MxP	30871063	27,10	TTS-B2700	TTD300-3F01-2710-MxP	30871096	30,40	TTS-B3000	TTD300-3F01-3040-MxP	30871129
23,90	TTS-B2350	TTD300-3F01-2390-MxP	30871064	27,20	TTS-B2700	TTD300-3F01-2720-MxP	30871097	30,50	TTS-B3050	TTD300-3F01-3050-MxP	30871130
24,00	TTS-B2400	TTD300-3F01-2400-MxP	30871065	27,30	TTS-B2700	TTD300-3F01-2730-MxP	30871098	30,60	TTS-B3050	TTD300-3F01-3060-MxP	30871131
24,10	TTS-B2400	TTD300-3F01-2410-MxP	30871066	27,40	TTS-B2700	TTD300-3F01-2740-MxP	30871099	30,70	TTS-B3050	TTD300-3F01-3070-MxP	30871132
24,20	TTS-B2400	TTD300-3F01-2420-MxP	30871067	27,50	TTS-B2750	TTD300-3F01-2750-MxP	30871100	30,80	TTS-B3050	TTD300-3F01-3080-MxP	30871133
24,30	TTS-B2400	TTD300-3F01-2430-MxP	30871068	27,60	TTS-B2750	TTD300-3F01-2760-MxP	30871101	30,90	TTS-B3050	TTD300-3F01-3090-MxP	30871134
24,40	TTS-B2400	TTD300-3F01-2440-MxP	30871069	27,70	TTS-B2750	TTD300-3F01-2770-MxP	30871102	31,00	TTS-B3100	TTD300-3F01-3100-MxP	30871135
24,50	TTS-B2450	TTD300-3F01-2450-MxP	30871070	27,80	TTS-B2750	TTD300-3F01-2780-MxP	30871103	31,10	TTS-B3100	TTD300-3F01-3110-MxP	30871136
24,60	TTS-B2450	TTD300-3F01-2460-MxP	30871071	27,90	TTS-B2750	TTD300-3F01-2790-MxP	30871104	31,20	TTS-B3100	TTD300-3F01-3120-MxP	30871137
24,70	TTS-B2450	TTD300-3F01-2470-MxP	30871072	28,00	TTS-B2800	TTD300-3F01-2800-MxP	30871105	31,30	TTS-B3100	TTD300-3F01-3130-MxP	30871138
24,80	TTS-B2450	TTD300-3F01-2480-MxP	30871073	28,10	TTS-B2800	TTD300-3F01-2810-MxP	30871106	31,40	TTS-B3100	TTD300-3F01-3140-MxP	30871139
24,90	TTS-B2450	TTD300-3F01-2490-MxP	30871074	28,20	TTS-B2800	TTD300-3F01-2820-MxP	30871107	31,50	TTS-B3150	TTD300-3F01-3150-MxP	30871140
25,00	TTS-B2500	TTD300-3F01-2500-MxP	30871075	28,30	TTS-B2800	TTD300-3F01-2830-MxP	30871108	31,60	TTS-B3150	TTD300-3F01-3160-MxP	30871141
25,10	TTS-B2500	TTD300-3F01-2510-MxP	30871076	28,40	TTS-B2800	TTD300-3F01-2840-MxP	30871109	31,70	TTS-B3150	TTD300-3F01-3170-MxP	30871142
25,20	TTS-B2500	TTD300-3F01-2520-MxP	30871077	28,50	TTS-B2850	TTD300-3F01-2850-MxP	30871110	31,80	TTS-B3150	TTD300-3F01-3180-MxP	30871143
25,30	TTS-B2500	TTD300-3F01-2530-MxP	30871078	28,60	TTS-B2850	TTD300-3F01-2860-MxP	30871111	31,90	TTS-B3150	TTD300-3F01-3190-MxP	30871144
25,40	TTS-B2500	TTD300-3F01-2540-MxP	30871079	28,70	TTS-B2850	TTD300-3F01-2870-MxP	30871112	32,00	TTS-B3200	TTD300-3F01-3200-MxP	30871145
25,50	TTS-B2550	TTD300-3F01-2550-MxP	30871080	28,80	TTS-B2850	TTD300-3F01-2880-MxP	30871113	32,40	TTS-B3200	TTD300-3F01-3240-MxP	30871146
25,60	TTS-B2550	TTD300-3F01-2560-MxP	30871081	28,90	TTS-B2850	TTD300-3F01-2890-MxP	30871114				
25,70	TTS-B2550	TTD300-3F01-2570-MxP	30871082	29,00	TTS-B2900	TTD300-3F01-2900-MxP	30871115				

Holder

	Replaceable head holders TTS TTS300, 3xD	Page 30
	Replaceable head holders TTS TTS300, 5xD	Page 31

Dimensions in mm.

You will find handling and application instructions from page 34.

For cutting data recommendation, see end of section.

Special designs and other coatings on request.

Replaceable head holders TTS

TTS300 with axial clamping system for replaceable head drill TTD-Tritan (3xD),
Internal coolant supply

Design:

Drill diameter:

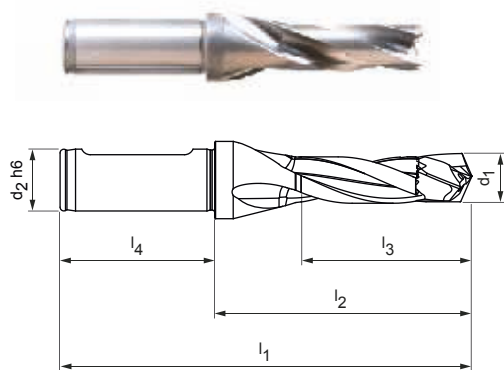
12.00 - 32.49 mm

Changing system:

Central clamping over
coolant bore

Note:

Assembly tool included.



Dimensions						Shank form MN	
d ₁	d ₂ h6	l ₁	l ₂	l ₃	l ₄	Order designation	Order No.
12,00-12,49	16	111	63	41	48	TTS300B-1200-DR3-ZYL-16-MN	30857294
12,50-12,99	16	113	65	43	48	TTS300B-1250-DR3-ZYL-16-MN	30857295
13,00-13,49	16	115	67	45	48	TTS300B-1300-DR3-ZYL-16-MN	30857296
13,50-13,99	16	117	69	46	48	TTS300B-1350-DR3-ZYL-16-MN	30857297
14,00-14,49	16	120	72	48	48	TTS300B-1400-DR3-ZYL-16-MN	30857298
14,50-14,99	16	122	74	49	48	TTS300B-1450-DR3-ZYL-16-MN	30857299
15,00-15,49	16	124	76	51	48	TTS300B-1500-DR3-ZYL-16-MN	30857300
15,50-16,49	20	131	81	54	50	TTS300B-1550-DR3-ZYL-20-MN	30857301
16,50-17,49	20	135	85	58	50	TTS300B-1650-DR3-ZYL-20-MN	30857302
17,50-18,49	20	140	90	61	50	TTS300B-1750-DR3-ZYL-20-MN	30857303
18,50-19,49	25	150	94	64	56	TTS300B-1850-DR3-ZYL-25-MN	30857304
19,50-20,49	25	155	99	68	56	TTS300B-1950-DR3-ZYL-25-MN	30857305
20,50-21,49	25	159	103	71	56	TTS300B-2050-DR3-ZYL-25-MN	30857306
21,50-22,49	25	164	108	74	56	TTS300B-2150-DR3-ZYL-25-MN	30857307
22,50-23,49	25	168	112	78	56	TTS300B-2250-DR3-ZYL-25-MN	30857309
23,50-24,49	25	173	117	81	56	TTS300B-2350-DR3-ZYL-25-MN	30857310
24,50-25,49	32	182	122	84	60	TTS300B-2450-DR3-ZYL-32-MN	30857311
25,50-26,49	32	186	126	87	60	TTS300B-2550-DR3-ZYL-32-MN	30857312
26,50-27,49	32	191	131	91	60	TTS300B-2650-DR3-ZYL-32-MN	30857313
27,50-28,49	32	195	135	94	60	TTS300B-2750-DR3-ZYL-32-MN	30857314
28,50-29,49	32	200	140	97	60	TTS300B-2850-DR3-ZYL-32-MN	30857315
29,50-30,49	32	204	144	101	60	TTS300B-2950-DR3-ZYL-32-MN	30857316
30,50-31,49	32	209	149	104	60	TTS300B-3050-DR3-ZYL-32-MN	30857317
31,50-32,49	32	213	153	107	60	TTS300B-3150-DR3-ZYL-32-MN	30857318

Dimensions in mm.

Special designs on request.

Replaceable head holders TTS

TTS300 with axial clamping system for replaceable head drill TTD-Tritan (5xD),
Internal coolant supply

Design:

Drill diameter:

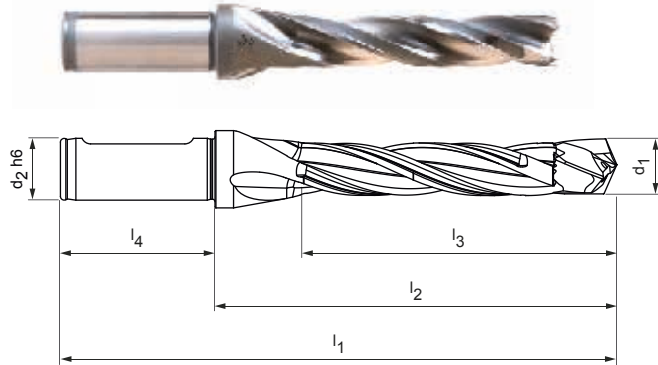
12.00 - 32.49 mm

Changing system:

Central clamping over
coolant bore

Note:

Assembly tool included.

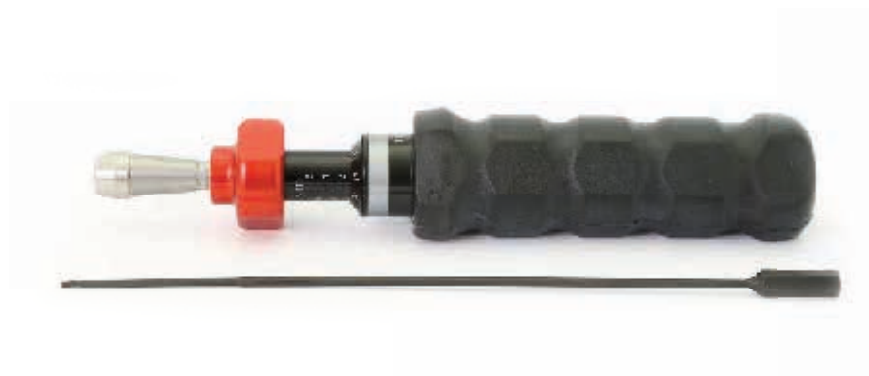


Dimensions						Shank form MN	
d ₁	d ₂ h6	l ₁	l ₂	l ₃	l ₄	Order designation	Order No.
12,00-12,49	16	136	88	66	48	TTS300B-1200-DR5-ZYL-16-MN	30857319
12,50-12,99	16	139	91	69	48	TTS300B-1250-DR5-ZYL-16-MN	30857320
13,00-13,49	16	142	94	71	48	TTS300B-1300-DR5-ZYL-16-MN	30857321
13,50-13,99	16	145	97	74	48	TTS300B-1350-DR5-ZYL-16-MN	30857322
14,00-14,49	16	149	101	77	48	TTS300B-1400-DR5-ZYL-16-MN	30857323
14,50-14,99	16	152	104	79	48	TTS300B-1450-DR5-ZYL-16-MN	30857324
15,00-15,49	16	155	107	82	48	TTS300B-1500-DR5-ZYL-16-MN	30857325
15,50-16,49	20	164	114	87	50	TTS300B-1550-DR5-ZYL-20-MN	30857326
16,50-17,49	20	170	120	93	50	TTS300B-1650-DR5-ZYL-20-MN	30857327
17,50-18,49	20	177	127	98	50	TTS300B-1750-DR5-ZYL-20-MN	30857328
18,50-19,49	25	189	133	103	56	TTS300B-1850-DR5-ZYL-25-MN	30857329
19,50-20,49	25	196	140	109	56	TTS300B-1950-DR5-ZYL-25-MN	30857330
20,50-21,49	25	202	146	114	56	TTS300B-2050-DR5-ZYL-25-MN	30857331
21,50-22,49	25	209	153	119	56	TTS300B-2150-DR5-ZYL-25-MN	30857332
22,50-23,49	25	215	159	124	56	TTS300B-2250-DR5-ZYL-25-MN	30857333
23,50-24,49	25	222	166	130	56	TTS300B-2350-DR5-ZYL-25-MN	30857334
24,50-25,49	32	233	173	135	60	TTS300B-2450-DR5-ZYL-32-MN	30857335
25,50-26,49	32	239	179	140	60	TTS300B-2550-DR5-ZYL-32-MN	30857336
26,50-27,49	32	246	186	146	60	TTS300B-2650-DR5-ZYL-32-MN	30857337
27,50-28,49	32	252	192	151	60	TTS300B-2750-DR5-ZYL-32-MN	30857338
28,50-29,49	32	259	199	156	60	TTS300B-2850-DR5-ZYL-32-MN	30857339
29,50-30,49	32	265	205	162	60	TTS300B-2950-DR5-ZYL-32-MN	30857340
30,50-31,49	32	272	212	167	60	TTS300B-3050-DR5-ZYL-32-MN	30857341
31,50-32,49	32	278	218	172	60	TTS300B-3150-DR5-ZYL-32-MN	30857342

Dimensions in mm.

Special designs on request.

Accessories and spare parts for TTD-Tritan



TORX® wrench

Diameter range Replaceable drill head TTD-Tritan	Torx	Order No.
		For holder lengths 3xD and 5xD
12,00 - 12,49	6	30890316
12,50 - 12,99		
13,00 - 13,49		
13,50 - 13,99		
14,00 - 14,49		
14,50 - 14,99	7	30890318
15,00 - 15,49		
15,50 - 16,49		
16,50 - 17,49		
17,50 - 18,49		
18,50 - 19,49	8	30890321
19,50 - 20,49		
20,50 - 21,49		
21,50 - 22,49	10	30890323
22,50 - 23,49		
23,50 - 24,49		
24,50 - 25,49		
25,50 - 26,49		
26,50 - 27,49	15	30890326
27,50 - 28,49		
28,50 - 29,49		
29,50 - 30,49		
30,50 - 31,49		
31,50 - 32,49		

Torque wrench

Accessories	Tightening torque range [Nm]	Order No.
Torque wrench 	0,2 - 1,2	30911425
Torque wrench 	1,0 - 6,0	30911426

Handle for TORX® wrench

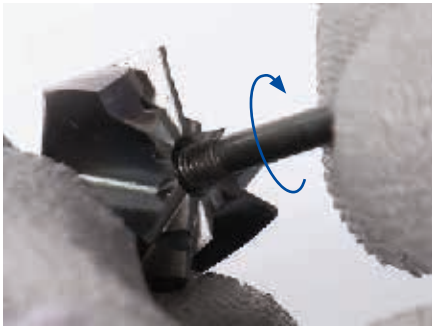
Spare part	Attachment shank	Order No.
Multi-grip 	Internal hexagon 1/4"	30918896

Dimensions in mm.



Handling notes, replaceable head drills TTD-Tritan

Tool assembly



1. Insert and tighten special clamping screw

Fit the special clamping screw into the bore on the replaceable drill head with the small thread end facing forward. Then screw in the special clamping screw clockwise to the stop.



2. Clean with compressed air

Clean the replaceable head holder and replaceable drill head using compressed air.



3. Fit the replaceable drill head

Fit replaceable drill head to replaceable head holder.

Note:

The special clamping screw is already installed on the replaceable drill head on delivery. If removed, the special clamping screw can be installed again by screwing into the replaceable drill head.



4. Check positioning of the drill head

Check whether chip flute and serrations of replaceable drill head and replaceable head holder are aligned. If they are not aligned, turn the replaceable drill head until chip flute and serrations are aligned.

Result:

Chip flute and serrations are aligned (left) | are not aligned (right)

- 1 Handle for TORX® wrench
- 2 Replaceable head holders TTS
- 3 TORX® wrench
- 4 Replaceable drill head with special clamping screw



6. Tighten the special clamping screw to the prescribed tightening torque

Using a suitable torque wrench with internal hexagon bit in combination with the TORX® wrench, tighten the special clamping screw to the stipulated tightening torque.

Note:

The stipulated tightening torque for the special clamping screw is given on the underside of the replaceable head holder.

Result:

The special clamping screw is tightened to the prescribed torque and the replaceable drill head is securely connected to the replaceable head holder. Installation is completed.

Items included:

- 1 Handle for TORX® wrench
- 2 Replaceable head holders TTS
- 3 TORX® wrench

5. Tighten the special clamping screw up to the stop

Hold the replaceable drill head lightly against the replaceable head holder so that it maintains its fitted position. Then insert the TORX® wrench in the central bore on the replaceable head holder to the threaded bore for the special clamping screw. Hand-tighten the special clamping screw using the TORX® wrench by turning counter-clockwise to the stop.

Tightening torques for the special clamping screw

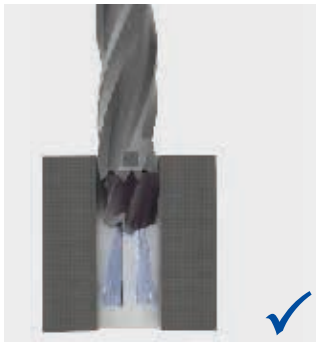
Diameter range [mm]	Thread of replaceable head holder	TORX® size	Permissible transferable tightening torque [Nm]
12,00 - 13,99	M3 x 0,5	T6	0,40
14,00 - 17,49	M3,5 x 0,6	T7	0,70
17,50 - 19,49	M4 x 0,7	T8	1,30
19,50 - 24,49	M5 x 0,8	T10	2,00
24,50 - 28,49	M6 x 1,0	T15	3,10
28,50 - 32,49	M6 x 1,0	T15	5,60

Application notes, replaceable head drills TTD-Tritan

The triple edge replaceable head drill TTD-Tritan guarantees optimal torque transmission at the connection with high changing and radial run-out accuracy at the same time. The replaceable head can be changed quickly and reliably, incorrect positioning is impossible. A suitable TORX® wrench and handle are included with the tool for exactly clamping the replaceable head to the replaceable head holder via the special clamping screw.

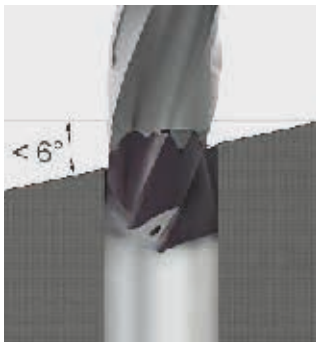
Coolant situation:

Coolant pressure dependent upon the drilling depth: 3xD: 8 bar | 5xD: 12 bar



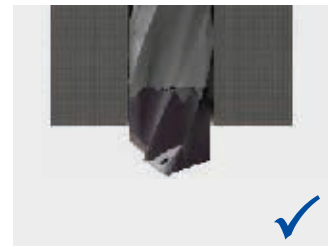
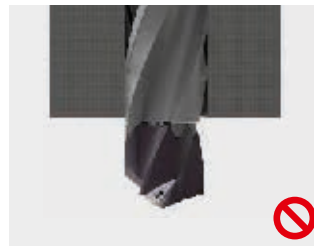
Maximum entry and exit angle:

At the start of drilling and at the outlet from inclined surfaces, reduce v_f by 50%.

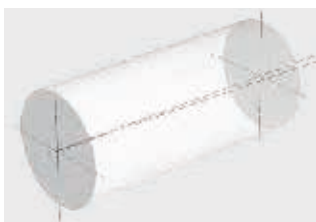


Through bore:

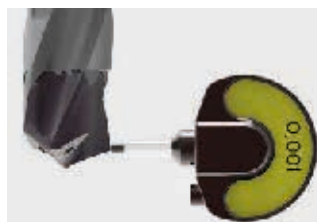
It is recommended not to reduce the cutting data at the bore outlet.



Radial run-out accuracy:



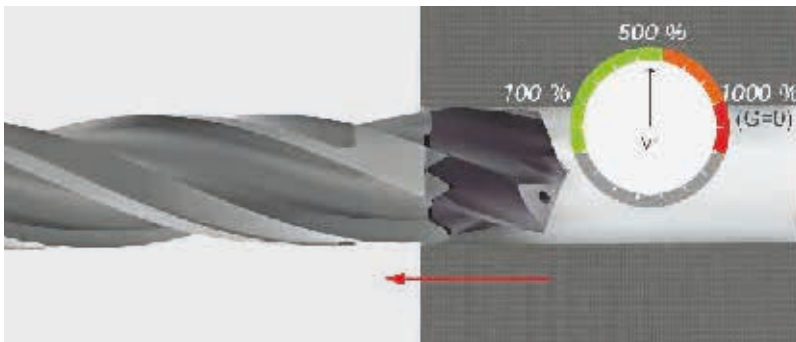
Max. 0.02 mm



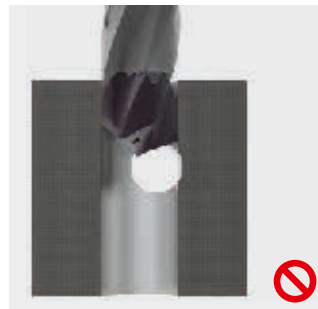
Max. 0.04 mm

No rapid traverse on withdrawal:

Five times the feed rate is recommended for the withdrawal speed.

**Machining situations:**

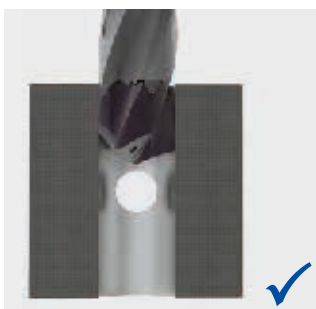
Bore off-centre;
Chisel edge cutting



Bore off-centre;
Chisel edge not cutting



Breakthrough to bore in opposite direction;
 $v_f = -50\%$



Bore centred and $\ll D$



Bore centred and $\approx D$



Bore centred and $\gg D$

Cutting data recommendation for solid carbide drills

Feed and cutting speed

MEGA-Spike-Drill-Steel | M9933, M9935

MMG*		Material	Tensile strength/Hardness [N/mm ²] [HRC]	
P	P1	P1.1 Structural, free-cutting, case hardened and heat-treated steel, non-alloyed	< 700 N/mm ²	
		P1.2 Structural, free-cutting, case hardened and heat-treated steel, non-alloyed	< 1200 N/mm ²	
	P2	P2.1 Nitratated, case hardened and heat-treated steel, alloyed	< 900 N/mm ²	
		P2.2 Nitratated, case hardened and heat-treated steel, alloyed	< 1400 N/mm ²	
	P3	P3.1 Tool, roller bearing, spring and high speed steel	< 900 N/mm ²	
		P3.2 Tool, roller bearing, spring and high speed steel	< 1500 N/mm ²	
	P4	P4.1 Stainless steel, ferritic and martensitic		
	P5	P5.1 Cast steel		
	P6	P6.1 Stainless cast steel, ferritic and martensitic		
M	M1	M1.1 Stainless steel, austenitic	< 700 N/mm ²	
		M1.2 Stainless steel, ferritic/austenitic (duplex)	< 1000 N/mm ²	
	M2	M2.1 Stainless cast steel, austenitic	< 700 N/mm ²	
	M3	M3.1 Stainless cast steel, ferritic/austenitic (duplex)	< 1000 N/mm ²	
K	K1	K1.1 Cast iron with lamellar graphite (grey cast iron), EN-GJL	< 300 N/mm ²	
		K2.1 Cast iron with spheroidal graphite, EN-GJS	< 500 N/mm ²	
	K2	K2.2 Cast iron with spheroidal graphite, EN-GJS	500-800 N/mm ²	
		K2.3 Cast iron with spheroidal graphite, EN-GJS	> 800 N/mm ²	
	K3	K3.1 Cast iron with vermicular graphite, EN-GJV; Malleable cast iron, GJM	< 500 N/mm ²	
		K3.2 Cast iron with vermicular graphite, EN-GJV; Malleable cast iron, GJM	> 500 N/mm ²	

MEGA-Speed-Drill-Steel | M9925

MMG*		Material	Tensile strength/Hardness [N/mm ²] [HRC]	
P	P1	P1.1 Structural, free-cutting, case hardened and heat-treated steel, non-alloyed	< 700 N/mm ²	
		P1.2 Structural, free-cutting, case hardened and heat-treated steel, non-alloyed	< 1200 N/mm ²	
	P2	P2.1 Nitratated, case hardened and heat-treated steel, alloyed	< 900 N/mm ²	
		P2.2 Nitratated, case hardened and heat-treated steel, alloyed	< 1400 N/mm ²	
	P3	P3.1 Tool, roller bearing, spring and high speed steel	< 900 N/mm ²	
		P3.2 Tool, roller bearing, spring and high speed steel	< 1500 N/mm ²	
	P4	P4.1 Stainless steel, ferritic and martensitic		
	P5	P5.1 Cast steel		
	P6	P6.1 Stainless cast steel, ferritic and martensitic		
M	M1	M1.1 Stainless steel, austenitic	< 700 N/mm ²	
		M1.2 Stainless steel, ferritic/austenitic (duplex)	< 1000 N/mm ²	
	M2	M2.1 Stainless cast steel, austenitic	< 700 N/mm ²	
	M3	M3.1 Stainless cast steel, ferritic/austenitic (duplex)	< 1000 N/mm ²	
K	K1	K1.1 Cast iron with lamellar graphite (grey cast iron), EN-GJL	< 300 N/mm ²	
		K2.1 Cast iron with spheroidal graphite, EN-GJS	< 500 N/mm ²	
	K2	K2.2 Cast iron with spheroidal graphite, EN-GJS	500-800 N/mm ²	
		K2.3 Cast iron with spheroidal graphite, EN-GJS	> 800 N/mm ²	
	K3	K3.1 Cast iron with vermicular graphite, EN-GJV; Malleable cast iron, GJM	< 500 N/mm ²	
		K3.2 Cast iron with vermicular graphite, EN-GJV; Malleable cast iron, GJM	> 500 N/mm ²	

* MILLER machining groups

	Cutting speed v_c [m/min]				Feed f [mm] for drill diameter [mm]					
	Internal cooling	External cooling	MQL	Air	4.00	5.50	7.50	10.50	14.50	20.00
	115	105	105		0.24	0.29	0.36	0.45	0.56	0.66
	105	85	85		0.30	0.37	0.45	0.57	0.70	0.83
	115	100	100		0.28	0.35	0.43	0.54	0.66	0.78
	80	70	70		0.24	0.29	0.35	0.43	0.52	0.62
	85	75	75		0.25	0.31	0.38	0.48	0.59	0.70
	70	65	65		0.21	0.26	0.32	0.40	0.48	0.57
	70	50	60		0.17	0.21	0.25	0.32	0.39	0.46
	115	100	100		0.28	0.35	0.43	0.54	0.66	0.78
	70	50	60		0.17	0.21	0.25	0.32	0.39	0.46
	55	35	35		0.11	0.14	0.17	0.22	0.27	0.32
	50	30	30		0.10	0.12	0.15	0.19	0.23	0.27
	55	35	35		0.11	0.14	0.17	0.22	0.27	0.32
	50	30	30		0.10	0.12	0.15	0.19	0.23	0.27
	140	100	100	100	0.34	0.44	0.56	0.73	0.91	1.10
	185	115	140	140	0.34	0.43	0.54	0.68	0.85	1.01
	115	85	85		0.30	0.38	0.47	0.59	0.73	0.87
	70	45	60		0.17	0.20	0.25	0.31	0.37	0.44
	105	90	90		0.32	0.40	0.50	0.64	0.79	0.94
	90	80	80		0.27	0.33	0.41	0.51	0.62	0.74

	Cutting speed v_c [m/min]				Feed f [mm] for drill diameter [mm]					
	Internal cooling	External cooling	MQL	Air	3.00	4.50	6.50	9.50	14.00	20.00
	170	155	155		0.13	0.17	0.22	0.28	0.36	0.44
	155	130	130		0.17	0.21	0.27	0.35	0.45	0.54
	170	145	145		0.16	0.20	0.26	0.33	0.42	0.51
	120	100	100		0.13	0.17	0.21	0.27	0.34	0.41
	130	110	110		0.14	0.18	0.23	0.30	0.38	0.46
	100	95	95		0.12	0.15	0.19	0.25	0.31	0.38
	100	75	85		0.09	0.12	0.15	0.20	0.25	0.30
	170	145	145		0.16	0.20	0.26	0.33	0.42	0.51
	100	75	85		0.09	0.12	0.15	0.20	0.25	0.30
	65	40	40		0.07	0.09	0.12	0.15	0.19	0.23
	60	35	35		0.06	0.08	0.10	0.13	0.16	0.20
	65	40	40		0.07	0.09	0.12	0.15	0.19	0.23
	60	35	35		0.06	0.08	0.10	0.13	0.16	0.20
	150	105	105	105	0.15	0.21	0.28	0.37	0.49	0.60
	200	125	150	150	0.15	0.20	0.26	0.35	0.45	0.55
	125	95	95		0.14	0.18	0.23	0.30	0.39	0.47
	115	100	100		0.15	0.19	0.25	0.32	0.42	0.51
	100	90	90		0.13	0.16	0.20	0.26	0.33	0.40

The cutting data stated are indicative.

The optimal data for the specific machining case should be determined in trials or during the machining.

Cutting data recommendation for replaceable head drills

Feed and cutting speed

TTD-Tritan | type 01 - Uni

MMG*		Material	Tensile strength/Hardness [N/mm ²] [HRC]	
P	P1	P1.1 Structural, free-cutting, case hardened and heat-treated steel, non-alloyed	< 700 N/mm ²	
		P1.2 Structural, free-cutting, case hardened and heat-treated steel, non-alloyed	< 1200 N/mm ²	
	P2	P2.1 Nitrated, case hardened and heat-treated steel, alloyed	< 900 N/mm ²	
		P2.2 Nitrated, case hardened and heat-treated steel, alloyed	< 1400 N/mm ²	
	P3	P3.1 Tool, roller bearing, spring and high speed steel	< 900 N/mm ²	
		P3.2 Tool, roller bearing, spring and high speed steel	< 1500 N/mm ²	
	P4	P4.1 Stainless steel, ferritic and martensitic		
	P5	P5.1 Cast steel		
	P6	P6.1 Stainless cast steel, ferritic and martensitic		
K	K1	K1.1 Cast iron with lamellar graphite (grey cast iron), EN-GJL	< 300 N/mm ²	
		K2.1 Cast iron with spheroidal graphite, EN-GJS	< 500 N/mm ²	
	K2	K2.2 Cast iron with spheroidal graphite, EN-GJS	500-800 N/mm ²	
		K2.3 Cast iron with spheroidal graphite, EN-GJS	> 800 N/mm ²	
	K3	K3.1 Cast iron with vermicular graphite, EN-GJV; Malleable cast iron, GJM	< 500 N/mm ²	
		K3.2 Cast iron with vermicular graphite, EN-GJV; Malleable cast iron, GJM	> 500 N/mm ²	

	Cutting speed v_c [m/min]				Feed f [mm] for drill diameter [mm]					
	Internal cooling	External cooling	MQL	Air	12.00	14.50	17.50	21.50	26.00	32.00
	90	80	80		0.37	0.42	0.46	0.51	0.54	0.55
	80	70	70		0.46	0.52	0.58	0.64	0.68	0.69
	90	75	75		0.44	0.49	0.55	0.60	0.64	0.66
	65	55	55		0.35	0.39	0.43	0.48	0.50	0.51
	70	60	60		0.39	0.44	0.49	0.54	0.58	0.59
	55	50	50		0.32	0.36	0.40	0.44	0.47	0.48
	55	40	45		0.26	0.29	0.32	0.36	0.38	0.39
	90	75	75		0.44	0.49	0.55	0.60	0.64	0.66
	55	40	45		0.26	0.29	0.32	0.36	0.38	0.39
	110	75	75	75	0.60	0.69	0.77	0.85	0.91	0.93
	145	90	110	110	0.56	0.64	0.71	0.78	0.83	0.85
	90	70	70		0.49	0.55	0.61	0.67	0.72	0.73
	55	35	45		0.32	0.36	0.40	0.44	0.47	0.48
	80	70	70		0.52	0.59	0.66	0.72	0.77	0.78
	70	65	65		0.42	0.47	0.52	0.57	0.61	0.62

The cutting data stated are indicative.

The optimal data for the specific machining case should be determined in trials or during the machining.





MILLING

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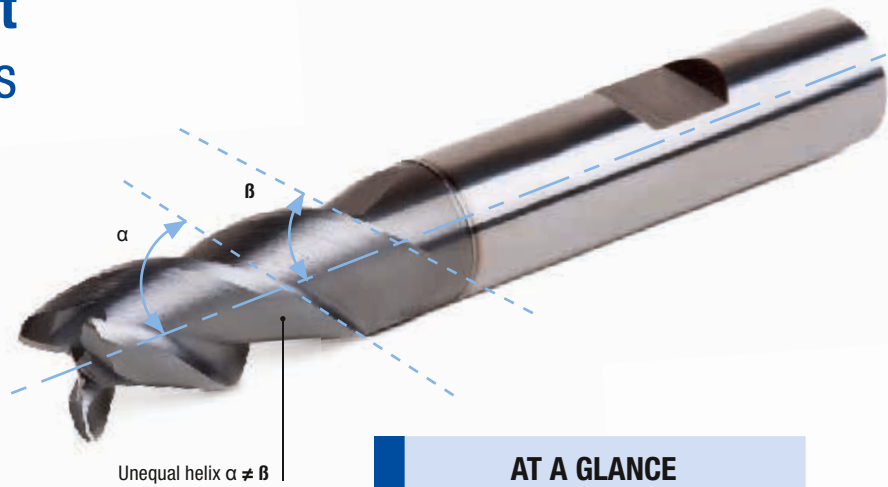
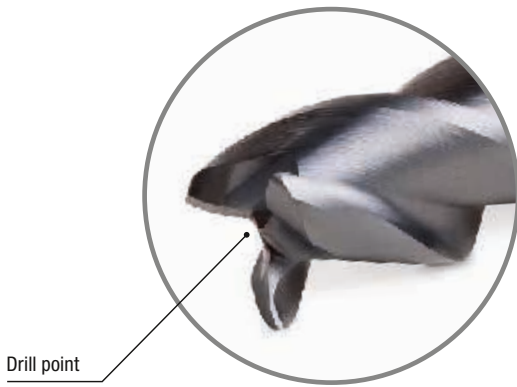
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OptiMill-Uni-HPC-Pocket

Efficient milling of pockets



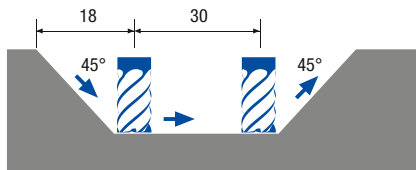
Helical plunging (42CrMo4V) | ϕ 12

v_c	=	220 m/min
f_z	=	0.05 mm
n	=	5,836 rpm
v_f	=	875 mm/min
a_p	=	18 mm (total)
G	=	1.5*
S_{max}	=	0.75 x D**



Ramping (GGG40) | ϕ 12

v_c	=	190 m/min
f_z	=	0.06 mm
n	=	5,040 rpm
v_f	=	907 mm/min
a_p	=	18 mm
α_{max}	=	45°



Applications:



AT A GLANCE

- Universal machining of steel, stainless steel and cast iron
- Available in the designs "long" (M3993) and "overlong" (M3991) with cylindrical shank form HB in a diameter range of 5.7 to 20 mm
- Point geometry with integrated drill point
- Suitable for angled entry at up to 45°, for helix milling and for plunging

ADVANTAGES

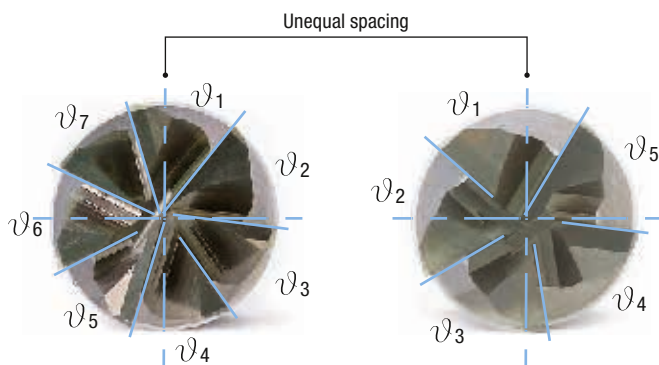
- Pilot bore drilling and tool changing are eliminated
- Point thinning with three large chip flutes for optimum discharge of the chips
- Long tool lives thanks to special cutting edge preparation, wear-resistant coating and ductile carbide substrate
- High feed rates up to 2xD possible

* Ratio of circular pocket diameter at plunging and tool diameter | ** Maximum incline of the helix



OptiMill-Tro-PM | OptiMill-Tro-Uni

Highly productive milling up to 5xD



OptiMill-Tro-PM | $z = 7$ | 5xD | $\phi 12$
(X6CrNiMoTi17-12-2)

$v_c = 180 \text{ m/min}$
 $f_z = 0,11 \text{ mm}$
 $a_p = 52 \text{ mm}$
 $a_{e \text{ min}} = 0,91 \text{ mm}$
 $a_{e \text{ max}} = 1,21 \text{ mm}$
 $h_m = 0,060 \text{ mm}$

OptiMill-Tro-Uni | $z = 5$ | 5xD | $\phi 12$
(16MnCr5)

$v_c = 240 \text{ m/min}$
 $f_z = 0,18 \text{ mm}$
 $a_p = 52 \text{ mm}$
 $a_{e \text{ min}} = 0,20 \text{ mm}$
 $a_{e \text{ max}} = 1,09 \text{ mm}$
 $h_m = 0,092 \text{ mm}$

AT A GLANCE

- OptiMill-Tro-Uni in dimensions 4xD and 5xD (M3099-4D/5D) with 5 cutting edges
- OptiMill-Tro-PM in dimensions 2xD to 5xD (M3299-2D/3D/4D/5D) with 7 cutting edges
- Available in diameters 4 mm to 25 mm in uneven cutting edge distribution for reduced vibration during machining
- New substrate, improved ductility and resistance to bending
- Flute profile adjusted to L/D ratio
- Chip breaker for optimum evacuation of short, divided chips

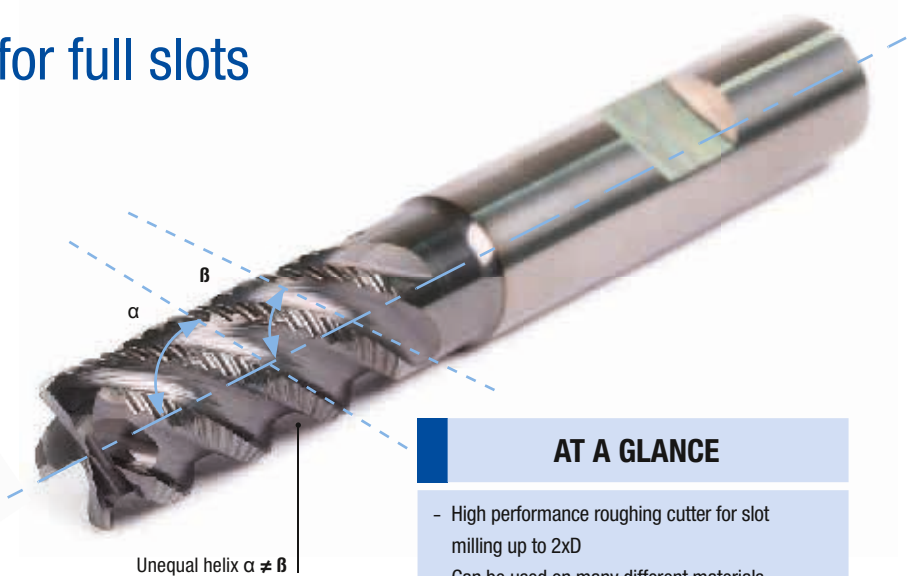
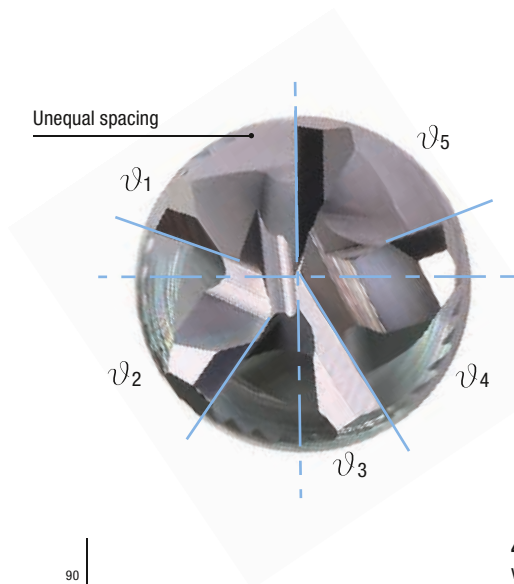
ADVANTAGES

- Highest axial feed ap up to 5xD
- Usage of the whole cutting length
- Increased productivity due to reduced machining time
- High material removal rate and longer tool life



OptiMill-Uni-Wave

Fast and cost-effective for full slots

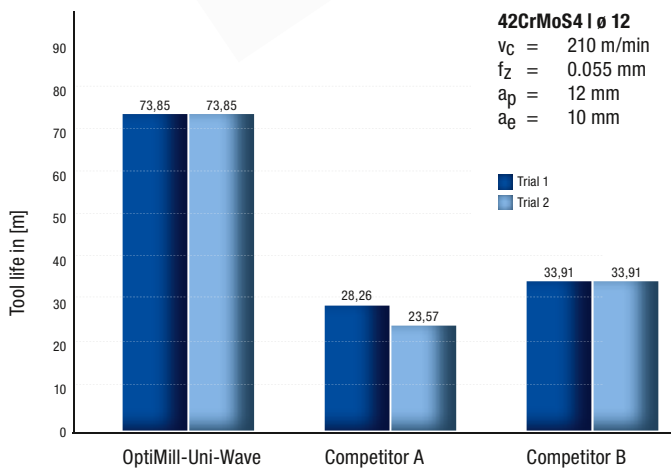


AT A GLANCE

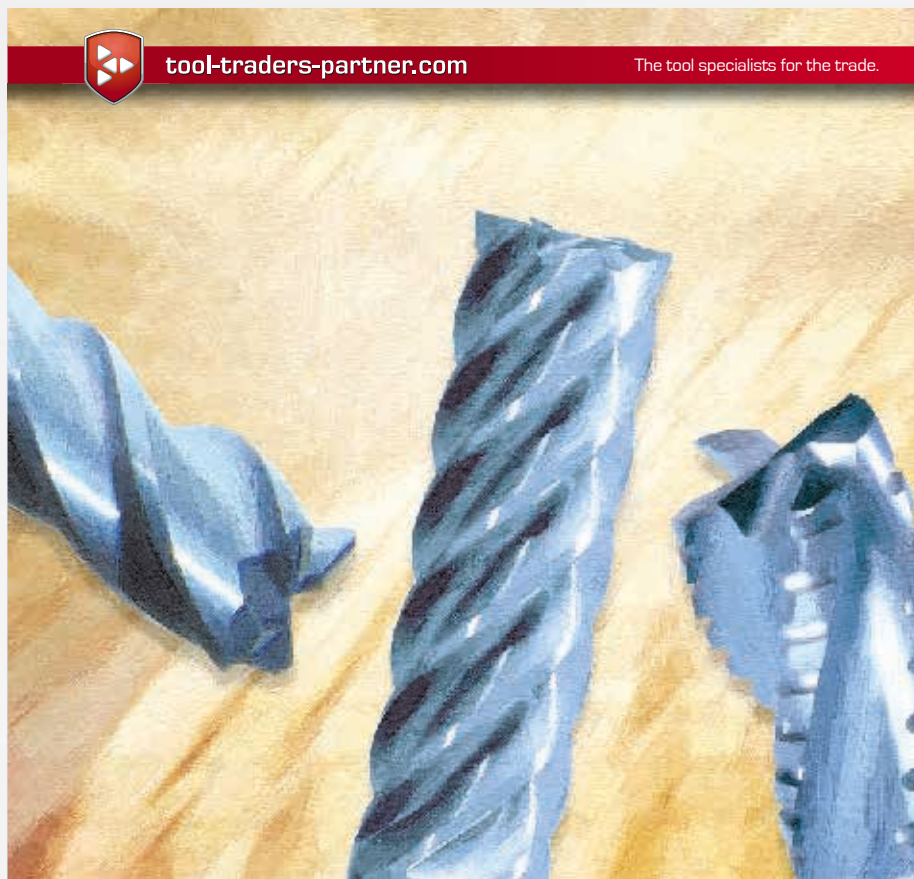
- High performance roughing cutter for slot milling up to 2xD
- Can be used on many different materials
- New diamond knurl geometry
- Uneven spacing of the five cutting edges
- Available in long design (M3985) in shank form HB with a diameter range of 4 to 25 mm

ADVANTAGES

- Higher levels of performance and less oscillation and vibration compared to existing HPC roughing cutters
- Extreme machining rates possible
- Process reliable chip evacuation due to short, tightly rolled chips
- Highly cost-effective machining



Request our complete catalogue of solid carbide end-mills!



Standard programme
Solid carbide end-mills

MILLER
MAPAL GROUP



Standard-Programm - Gesamtpreisliste | Standard Programme - Common Price List
Bohren und Fräsen | Drilling and Milling

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PRODUCT OVERVIEW

End-mills with fixed cutting edges

New milling cutters for roughing, finishing, trochoidal milling and especially for milling pockets make the machining of steel, stainless steel and cast iron even more cost-effective. Profile milling cutters for the delamination-free machining of fibre-reinforced plastics also supplement the range.

The trochoidal milling cutter OptiMill-Tro-PM with seven cutting edges makes it possible to rough steel and stainless steel close to the final contours with the highest material removal rate. Thin-walled parts can be reliably machined with the highest precision while protecting the machine tool at the same time. New cutting lengths up to 5xD also increase the cost-effectiveness. The

OptiMill-Tro-Uni also profits from these lengths. This milling cutter is available with the cutting lengths 4xD and 5xD with immediate effect.

With the new high-performance roughing milling cutter OptiMill-Uni-Wave, flutes can be milled with a slot depth of up to 2xD. The newly developed roughing profile significantly reduces the radial forces on the tool. As a consequence significantly higher cutting data can be used.

To save time-consuming ramping processes or pilot bores on milling pockets, MILLER has developed the new solid carbide milling cutter OptiMill-Uni-HPC-Pocket. The innovative face ge-

ometry with integrated drill point permits inclined entry at an angle of up to 45°, helix milling and vertical plunging.

Especially for the repair of CFRP or GFRP structures, the OptiMill-Composite-Speed has been expanded with new designs with corner radius and full radius.

Trochoidal milling		Shoulder milling – roughing	
 OptiMill-Tro-Uni - In the designs 4xD and 5xD with five cutting edges - New substrate with improved flexural strength and ductility - Chip breaker for optimal removal of short, even chips Expert LINE Ø range: 5.00 - 25.00 mm Design: 4xD 5xD P M K	 OptiMill-Tro-PM - Seven cutting edges for machining steel and stainless steels - Maximum efficiency - High cost-effectiveness due to high machining rate with large cutting depths and thin-walled parts Expert LINE Ø range: 4.00 - 25.00 mm Design: 2xD 3xD 4xD 5xD P M K	 OptiMill-Uni-Wave - Optimal chip removal due to short, tightly rolled chips - Cost-effective machining times due to significantly higher cutting data - Low radial forces due to newly developed roughing profile - High-performance roughing milling cutter for groove milling up to 2xD Performance LINE Ø range: 4.00 - 25.00 mm Design: 2xD 3xD 4xD 5xD P M K	
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Groove milling and general applications



OptiMill-Uni-HPC-Pocket

- Universal machining of steel, stainless steel and cast iron
- Face geometry with integrated drill point - Suitable for angled entry at up to 45°, for helix milling and for plunging
- High feed rates up to 2xD possible



Ø range: 5.70 - 20.00 mm

Design:



P M K



OptiMill-Uni-HPC-Plus

- New design with corner radius
- High-performance substrate and high-end coating for excellent tool lives
- Dynamic helix pitch and unequal spacing for particularly smooth running
- Precise cutting edge for high surface quality



Ø range: 4.00 - 20.00 mm

Design:



P M K

Milling modern lightweight materials



OptiMill-Composite-Speed

- New designs with corner radius and full radius
- Ideal for the repair of CFRP or GFRP structures
- Roughing and finishing in one machining step
- Delamination-free machining due to optimised chip flutes



Ø range: 4.00 - 20.00 mm

Design:



N C

Model key

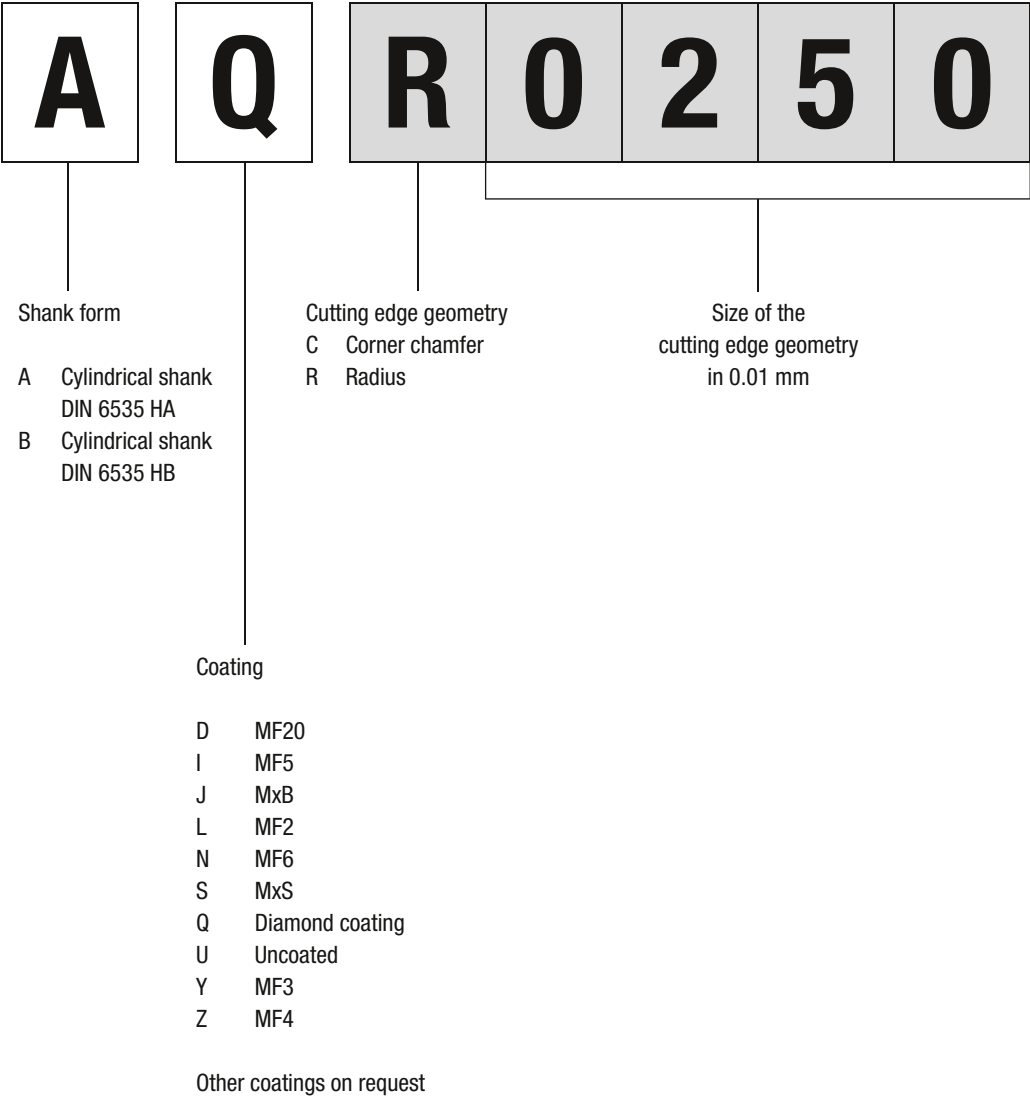
End-mills with fixed cutting edges

M	7	2	2	8

Tool type

1	0	0	0

End-mill diameter
in 0.01 mm



OptiMill®-Tro-Uni

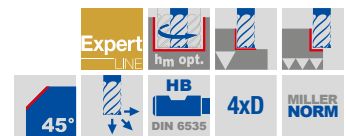
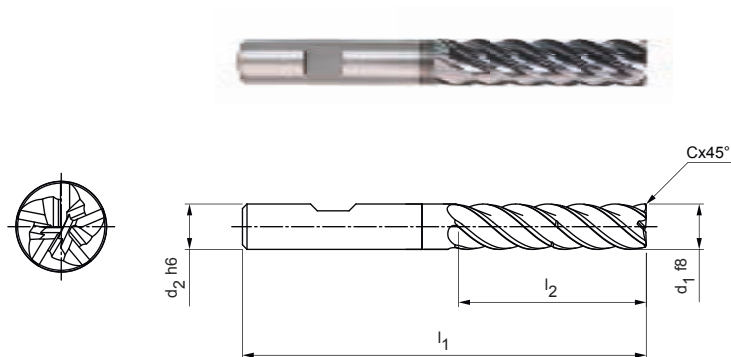
Design 4xD
M3099

Design:

Milling cutter diameter: 5.00 - 25.00 mm
Coating: MF3
Number of cutting edges: 5
Helix angle: ~41°
Balancing quality: Cutting edge portion balanced to G2.5 in acc. with DIN ISO1940-G2.5
Special features: Unequal spacing

Application:

Especially for trochoidal milling – part-contact cutting/trimming. For cutting depths up to 4xD with special chip breakers for optimum chip control.



Dimensions					z	Order designation	Order No.
d ₁ f8	d ₂ h6	l ₁	l ₂	C x 45°			
5,00	6	66	20	0,10	5	M3099-4D-0500BY-C0010-1CD	30837565
6,00	6	66	24	0,12	5	M3099-4D-0600BY-C0012-1CD	30837566
8,00	8	74	32	0,16	5	M3099-4D-0800BY-C0016-1CD	30837567
10,00	10	89	40	0,20	5	M3099-4D-1000BY-C0020-1CD	30837568
12,00	12	100	48	0,24	5	M3099-4D-1200BY-C0024-1CD	30837569
14,00	14	108	56	0,28	5	M3099-4D-1400BY-C0028-1CD	30837570
16,00	16	123	64	0,32	5	M3099-4D-1600BY-C0032-1CD	30837571
18,00	18	130	72	0,36	5	M3099-4D-1800BY-C0036-1CD	30837572
20,00	20	141	80	0,40	5	M3099-4D-2000BY-C0040-1CD	30837573
25,00	25	170	100	0,50	5	M3099-4D-2500BY-C0050-1CD	30882080

Dimensions in mm.

For cutting data recommendation, see end of section.

Special designs and other coatings on request.

OptiMill®-Tro-Uni

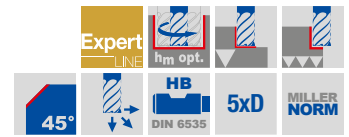
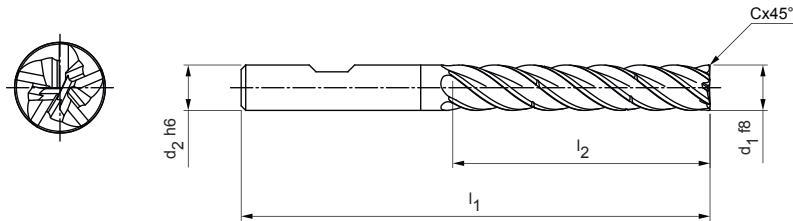
Design 5xD
M3099

Design:

Milling cutter diameter: 8.00 - 25.00 mm
Coating: MF3
Number of cutting edges: 5
Helix angle: ~41°
Balancing quality: Cutting edge portion balanced to G2.5 in acc. with DIN ISO1940-G2.5
Special features: Unequal spacing

Application:

Especially for trochoidal milling – part-contact cutting/trimming. For cutting depths up to 5xD with special chip breakers for optimum chip control.



Dimensions					z	Order designation	Order No.
d ₁ f8	d ₂ h6	l ₁	l ₂	C x 45°			
8,00	8	81	40	0,16	5	M3099-5D-0800BY-C0016-2CD	30837574
10,00	10	96	50	0,20	5	M3099-5D-1000BY-C0020-2CD	30837575
12,00	12	112	60	0,24	5	M3099-5D-1200BY-C0024-2CD	30837576
14,00	14	122	70	0,28	5	M3099-5D-1400BY-C0028-2CD	30837577
16,00	16	136	80	0,32	5	M3099-5D-1600BY-C0032-2CD	30837578
18,00	18	147	90	0,36	5	M3099-5D-1800BY-C0036-2CD	30837579
20,00	20	160	100	0,40	5	M3099-5D-2000BY-C0040-2CD	30837580
25,00	25	195	125	0,50	5	M3099-5D-2500BY-C0050-2CD	30882083

Dimensions in mm.

For cutting data recommendation, see end of section.

Special designs and other coatings on request.

OptiMill®-Tro-PM

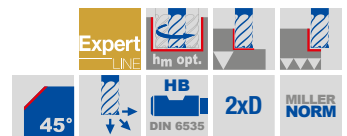
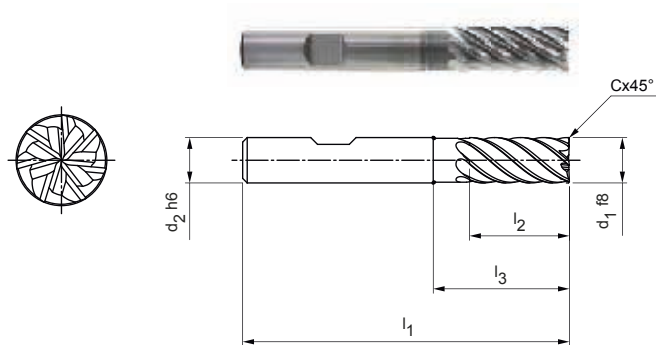
Design 2xD with neck
M3299

Design:

Milling cutter diameter: 4.00 - 25.00 mm
Coating: MF2
Number of cutting edges: 7
Helix angle: ~40°
Balancing quality: Cutting edge portion balanced to G2.5 in acc. with DIN ISO1940-G2.5
Special features: Unequal spacing

Application:

Especially for trochoidal milling – part-contact cutting/trimming. For cutting depths up to 2xD.



Dimensions						z	Order designation	Order No.
d ₁ f8	d ₂ h6	l ₁	l ₂	l ₃	C x 45°			
4,00	6	57	11	-	0,08	7	M3299-2D-0400BL-C0008	30837528
5,00	6	57	13	-	0,10	7	M3299-2D-0500BL-C0010	30837529
6,00	6	57	13	19	0,12	7	M3299-2D-0600BL-C0012	30837530
8,00	8	63	19	25	0,16	7	M3299-2D-0800BL-C0016	30837531
10,00	10	72	22	30	0,20	7	M3299-2D-1000BL-C0020	30837532
12,00	12	83	26	36	0,24	7	M3299-2D-1200BL-C0024	30837533
14,00	14	83	26	36	0,28	7	M3299-2D-1400BL-C0028	30837534
16,00	16	92	32	42	0,32	7	M3299-2D-1600BL-C0032	30837536
18,00	18	92	32	42	0,36	7	M3299-2D-1800BL-C0036	30837537
20,00	20	104	41	52	0,40	7	M3299-2D-2000BL-C0040	30837538
25,00	25	125	50	65	0,50	7	M3299-2D-2500BL-C0050	30837539

Dimensions in mm.

For cutting data recommendation, see end of section.

Special designs and other coatings on request.

OptiMill®-Tro-PM

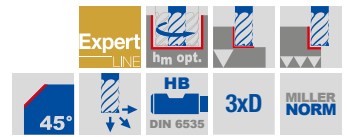
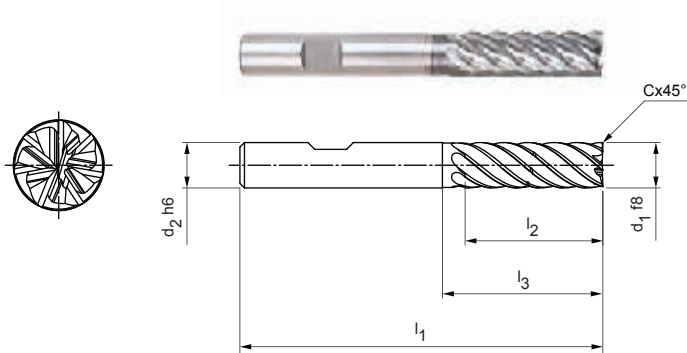
Design 3xD with neck
M3299

Design:

Milling cutter diameter: 4.00 - 25.00 mm
Coating: MF2
Number of cutting edges: 7
Helix angle: ~40°
Balancing quality: Cutting edge portion balanced to G2.5 in acc. with DIN ISO1940-G2.5
Special features: Unequal spacing

Application:

Especially for trochoidal milling – part-contact cutting/trimming. For cutting depths up to 3xD with special chip breakers for optimum chip control.



Dimensions						z	Order designation	Order No.
d ₁ f8	d ₂ h6	l ₁	l ₂	l ₃	C x 45°			
4,00	6	62	16	23	0,08	7	M3299-3D-0400BL-C0008-1CD z=7	30838298
5,00	6	62	17	24	0,10	7	M3299-3D-0500BL-C0010-1CD z=7	30838299
6,00	6	62	18	25	0,12	7	M3299-3D-0600BL-C0012-1CD z=7	30838301
8,00	8	68	24	30	0,16	7	M3299-3D-0800BL-C0016-1CD z=7	30838302
10,00	10	80	30	35	0,20	7	M3299-3D-1000BL-C0020-1CD z=7	30838304
12,00	12	93	36	45	0,24	7	M3299-3D-1200BL-C0024-1CD z=7	30838306
14,00	14	99	42	50	0,28	7	M3299-3D-1400BL-C0028-1CD z=7	30838307
16,00	16	108	48	55	0,32	7	M3299-3D-1600BL-C0032-1CD z=7	30838308
18,00	18	117	54	67	0,36	7	M3299-3D-1800BL-C0036-1CD z=7	30838309
20,00	20	126	60	70	0,40	7	M3299-3D-2000BL-C0040-1CD z=7	30838310
25,00	25	150	75	92	0,50	7	M3299-3D-2500BL-C0050-1CD z=7	30838311

Dimensions in mm.

For cutting data recommendation, see end of section.

Special designs and other coatings on request.

OptiMill®-Tro-PM

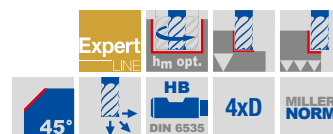
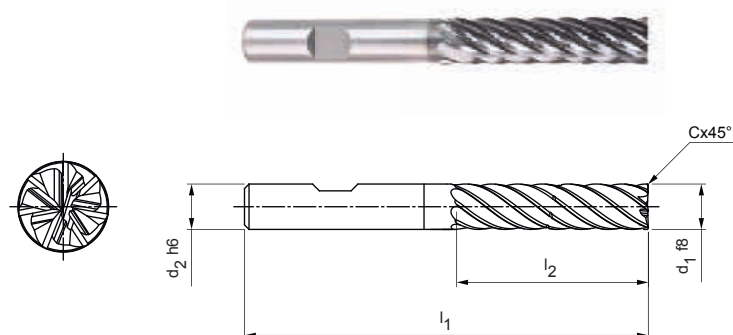
Design 4xD
M3299

Design:

Milling cutter diameter: 5.00 - 25.00 mm
Coating: MF2
Number of cutting edges: 7
Helix angle: ~38°
Balancing quality: Cutting edge portion balanced to G2.5 in acc. with DIN ISO1940-G2.5
Special features: Unequal spacing

Application:

Especially for trochoidal milling – part-contact cutting/trimming. For cutting depths up to 4xD with special chip breakers for optimum chip control.



Dimensions					z	Order designation	Order No.
d ₁ f8	d ₂ h6	l ₁	l ₂	C x 45°			
5,00	6	66	20	0,10	7	M3299-4D-0500BL-C0010-1CD	30837540
6,00	6	66	24	0,12	7	M3299-4D-0600BL-C0012-1CD	30837541
8,00	8	74	32	0,16	7	M3299-4D-0800BL-C0016-1CD	30837542
10,00	10	89	40	0,20	7	M3299-4D-1000BL-C0020-1CD	30837543
12,00	12	100	48	0,24	7	M3299-4D-1200BL-C0024-1CD	30837544
14,00	14	108	56	0,28	7	M3299-4D-1400BL-C0028-1CD	30837545
16,00	16	123	64	0,32	7	M3299-4D-1600BL-C0032-1CD	30837546
18,00	18	130	72	0,36	7	M3299-4D-1800BL-C0036-1CD	30837547
20,00	20	141	80	0,40	7	M3299-4D-2000BL-C0040-1CD	30837548
25,00	25	170	100	0,50	7	M3299-4D-2500BL-C0050-1CD	30882077

Dimensions in mm.

For cutting data recommendation, see end of section.

Special designs and other coatings on request.

OptiMill®-Tro-PM

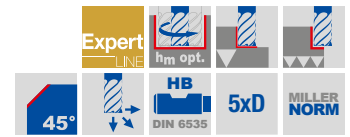
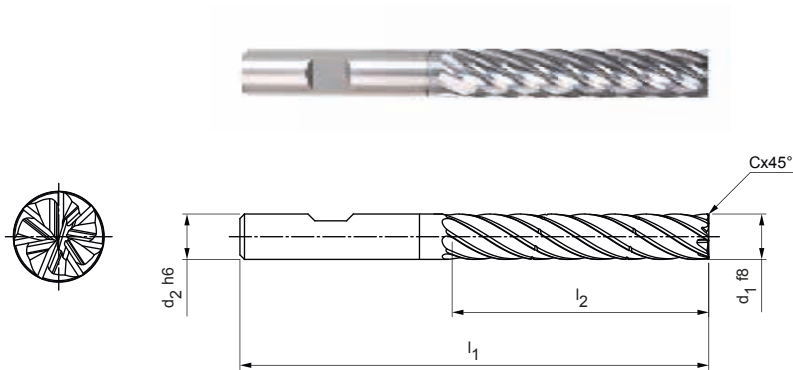
Design 5xD
M3299

Design:

Milling cutter diameter: 8.00 - 25.00 mm
Coating: MF2
Number of cutting edges: 7
Helix angle: ~36°
Balancing quality: Cutting edge portion balanced to G2.5 in acc. with DIN ISO1940-G2.5
Special features: Unequal spacing

Application:

Especially for trochoidal milling – part-contact cutting/trimming. For cutting depths up to 5xD with special chip breakers for optimum chip control.



Dimensions					z	Order designation	Order No.
d ₁ f8	d ₂ h6	l ₁	l ₂	C x 45°			
8,00	8	81	40	0,16	7	M3299-5D-0800BL-C0016-2CD	30837549
10,00	10	96	50	0,20	7	M3299-5D-1000BL-C0020-2CD	30837550
12,00	12	112	60	0,24	7	M3299-5D-1200BL-C0024-2CD	30837551
14,00	14	122	70	0,28	7	M3299-5D-1400BL-C0028-2CD	30837552
16,00	16	136	80	0,32	7	M3299-5D-1600BL-C0032-2CD	30837553
18,00	18	147	90	0,36	7	M3299-5D-1800BL-C0036-2CD	30837554
20,00	20	160	100	0,40	7	M3299-5D-2000BL-C0040-2CD	30837555
25,00	25	195	125	0,50	7	M3299-5D-2500BL-C0050-2CD	30882078

Dimensions in mm.

For cutting data recommendation, see end of section.

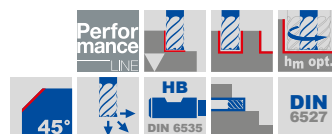
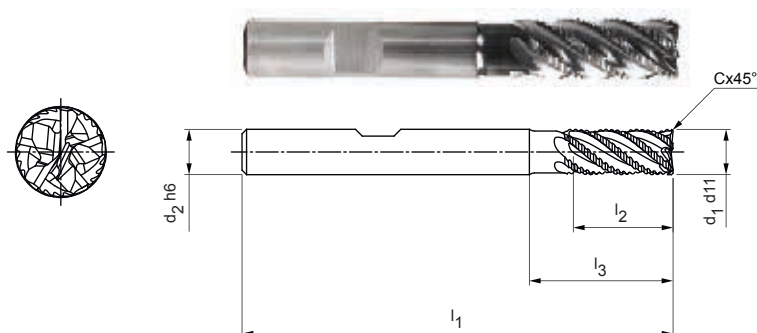
Special designs and other coatings on request.

OptiMill®-Uni-Wave

Long design with neck
M3985

Design:

Milling cutter diameter: 4.00 - 25.00 mm
Coating: MF2
Number of cutting edges: 5
Helix angle: ~41.5°
Special features: Unequal spacing. Newly developed roughing profile.



Dimensions						z	Order designation	Order No.
d ₁ d11	d ₂ h6	l ₁	l ₂	l ₃	C x 45°			
4,00	6	57	11	19	0,20	5	M3985-0400BL	30837662
5,00	6	57	13	19	0,25	5	M3985-0500BL	30837663
6,00	6	57	13	19	0,30	5	M3985-0600BL	30837664
7,00	8	63	16	25	0,35	5	M3985-0700BL	30837665
8,00	8	63	19	25	0,40	5	M3985-0800BL	30837666
9,00	10	72	19	30	0,45	5	M3985-0900BL	30837667
10,00	10	72	22	30	0,50	5	M3985-1000BL	30837668
12,00	12	83	26	36	0,60	5	M3985-1200BL	30837669
14,00	14	83	26	36	0,70	5	M3985-1400BL	30837670
16,00	16	92	32	42	0,80	5	M3985-1600BL	30837671
18,00	18	92	32	42	0,90	5	M3985-1800BL	30837672
20,00	20	104	38	52	1,00	5	M3985-2000BL	30837673
25,00	25	125	50	65	1,25	5	M3985-2500BL	30882074

Dimensions in mm.

For cutting data recommendation, see end of section.

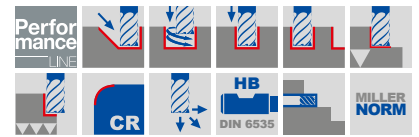
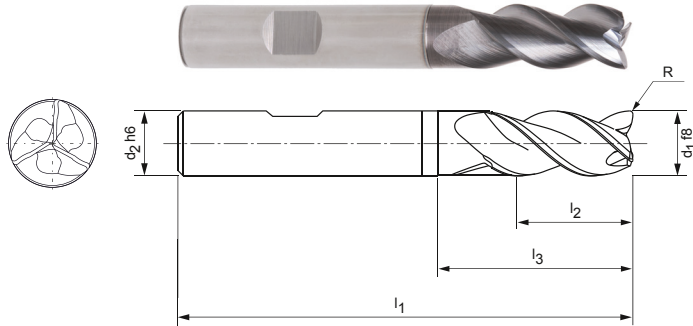
Special designs and other coatings on request.

OptiMill®-Uni-HPC-Pocket

Long design with neck
M3993

Design:

Milling cutter diameter: 5.70 - 20.00 mm
Coating: MF2
Number of cutting edges: 3
Helix angle: 42°
Special features: Face geometry with integrated drill point. Ideal for angled entry at up to 45°, for helix milling and for plunging.



Dimensions						z	Order designation	Order No.
d ₁ f8	d ₂ h6	l ₁	l ₂	l ₃	R			
5,70	6	57	13	19	0,29	3	M3993-0570BL	30787991
6,00	6	57	13	19	0,30	3	M3993-0600BL	30787992
6,70	8	63	16	25	0,34	3	M3993-0670BL	30787993
7,00	8	63	16	25	0,35	3	M3993-0700BL	30787994
7,70	8	63	19	25	0,39	3	M3993-0770BL	30787995
8,00	8	63	19	25	0,40	3	M3993-0800BL	30787996
8,70	10	72	22	30	0,44	3	M3993-0870BL	30787997
9,00	10	72	22	30	0,45	3	M3993-0900BL	30787998
9,70	10	72	22	30	0,49	3	M3993-0970BL	30787999
10,00	10	72	22	30	0,50	3	M3993-1000BL	30788000
11,70	12	83	26	36	0,59	3	M3993-1170BL	30788001
12,00	12	83	26	36	0,60	3	M3993-1200BL	30788002
13,70	14	83	26	36	0,69	3	M3993-1370BL	30788003
14,00	14	83	26	36	0,70	3	M3993-1400BL	30788004
15,50	16	92	31	42	0,78	3	M3993-1550BL	30788005
16,00	16	92	31	42	0,80	3	M3993-1600BL	30788006
17,50	18	92	31	42	0,88	3	M3993-1750BL	30788007
18,00	18	92	31	42	0,90	3	M3993-1800BL	30788008
19,50	20	104	41	52	0,98	3	M3993-1950BL	30788009
20,00	20	104	41	52	1,00	3	M3993-2000BL	30788010

Dimensions in mm.

For cutting data recommendation, see end of section.

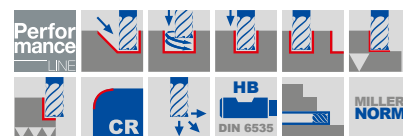
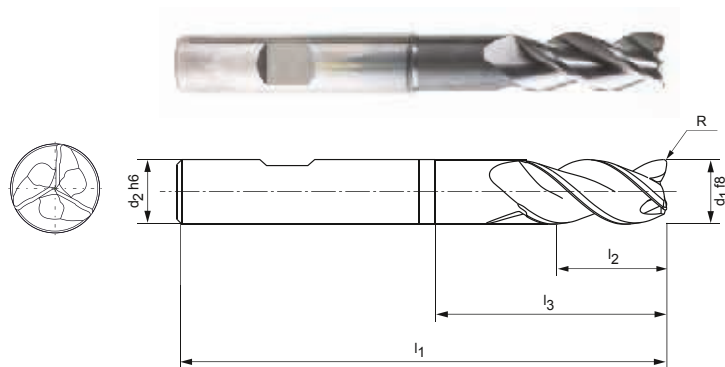
Special designs and other coatings on request.

OptiMill®-Uni-HPC-Pocket

Overlong design with neck
M3991

Design:

Milling cutter diameter: 5.70 - 20.00 mm
Coating: MF2
Number of cutting edges: 3
Helix angle: 42°
Special features: Face geometry with integrated drill point. Ideal for angled entry at up to 45°, for helix milling and for plunging.



Dimensions						z	Order designation	Order No.
d ₁ f8	d ₂ h6	l ₁	l ₂	l ₃	R			
5,70	6	62	13	24	0,29	3	M3991-0570BL	30787924
6,00	6	62	13	24	0,30	3	M3991-0600BL	30787927
6,70	8	68	16	30	0,34	3	M3991-0670BL	30787928
7,00	8	68	16	30	0,35	3	M3991-0700BL	30787929
7,70	8	68	21	30	0,39	3	M3991-0770BL	30787930
8,00	8	68	21	30	0,40	3	M3991-0800BL	30787931
8,70	10	80	22	38	0,44	3	M3991-0870BL	30787932
9,00	10	80	22	38	0,45	3	M3991-0900BL	30787933
9,70	10	80	22	38	0,49	3	M3991-0970BL	30787934
10,00	10	80	22	38	0,50	3	M3991-1000BL	30787935
11,70	12	93	26	46	0,59	3	M3991-1170BL	30787936
12,00	12	93	26	46	0,60	3	M3991-1200BL	30787937
13,70	14	99	26	52	0,69	3	M3991-1370BL	30787938
14,00	14	99	26	52	0,70	3	M3991-1400BL	30787939
15,50	16	108	36	58	0,78	3	M3991-1550BL	30787940
16,00	16	108	36	58	0,80	3	M3991-1600BL	30787941
17,50	18	117	36	67	0,88	3	M3991-1750BL	30787942
18,00	18	117	36	67	0,90	3	M3991-1800BL	30787943
19,50	20	126	41	74	0,98	3	M3991-1950BL	30787944
20,00	20	126	41	74	1,00	3	M3991-2000BL	30787945

Dimensions in mm.

For cutting data recommendation, see end of section.

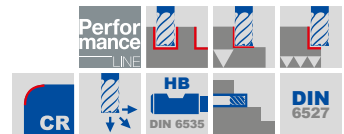
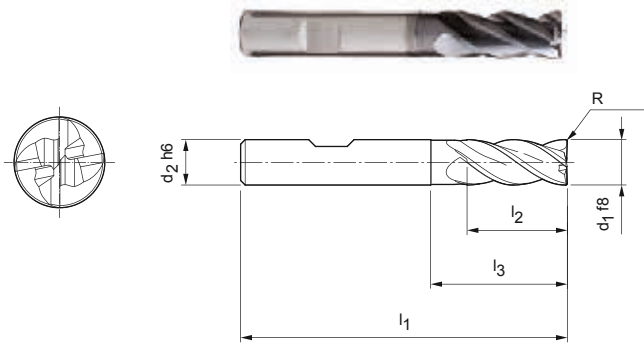
Special designs and other coatings on request.

OptiMill®-Uni-HPC-Plus

Long design with neck and corner radius
M3094P

Design:

Milling cutter diameter: 4.00 - 20.00 mm
Coating: MF2
Number of cutting edges: 4
Helix angle: 36°/38°
Special features: Unequal spacing, rounded cutting edge.



Dimensions						z	Order designation	Order No.
d ₁ f8	d ₂ h6	l ₁	l ₂	l ₃	R			
4,00	6	57	11	-	0,40	4	M3094P-0400BL-R0040	30782243
4,00	6	57	11	-	0,50	4	M3094P-0400BL-R0050	30782244
4,00	6	57	11	-	1,00	4	M3094P-0400BL-R0100	30782245
5,00	6	57	13	-	0,50	4	M3094P-0500BL-R0050	30782246
5,00	6	57	13	-	1,00	4	M3094P-0500BL-R0100	30782247
6,00	6	57	13	20	0,50	4	M3094P-0600BL-R0050	30782248
6,00	6	57	13	20	1,00	4	M3094P-0600BL-R0100	30782249
6,00	6	57	13	20	1,50	4	M3094P-0600BL-R0150	30782250
6,00	6	57	13	20	2,00	4	M3094P-0600BL-R0200	30782251
8,00	8	63	21	25	0,50	4	M3094P-0800BL-R0050	30782252
8,00	8	63	21	25	1,00	4	M3094P-0800BL-R0100	30782253
8,00	8	63	21	25	1,50	4	M3094P-0800BL-R0150	30782254
8,00	8	63	21	25	2,00	4	M3094P-0800BL-R0200	30782255
8,00	8	63	21	25	2,50	4	M3094P-0800BL-R0250	30782256
8,00	8	63	21	25	3,00	4	M3094P-0800BL-R0300	30782257
10,00	10	72	22	30	0,50	4	M3094P-1000BL-R0050	30782258
10,00	10	72	22	30	1,00	4	M3094P-1000BL-R0100	30782259
10,00	10	72	22	30	1,50	4	M3094P-1000BL-R0150	30782260
10,00	10	72	22	30	2,00	4	M3094P-1000BL-R0200	30782261
10,00	10	72	22	30	2,50	4	M3094P-1000BL-R0250	30782262
10,00	10	72	22	30	3,00	4	M3094P-1000BL-R0300	30782263
12,00	12	83	26	36	0,50	4	M3094P-1200BL-R0050	30782264
12,00	12	83	26	36	1,00	4	M3094P-1200BL-R0100	30782265
12,00	12	83	26	36	1,50	4	M3094P-1200BL-R0150	30782266
12,00	12	83	26	36	2,00	4	M3094P-1200BL-R0200	30782267
12,00	12	83	26	36	2,50	4	M3094P-1200BL-R0250	30782268
12,00	12	83	26	36	3,00	4	M3094P-1200BL-R0300	30782269
12,00	12	83	26	36	4,00	4	M3094P-1200BL-R0400	30782270
16,00	16	92	36	42	0,50	4	M3094P-1600BL-R0050	30782271
16,00	16	92	36	42	1,00	4	M3094P-1600BL-R0100	30782272
16,00	16	92	36	42	2,00	4	M3094P-1600BL-R0200	30782273
16,00	16	92	36	42	2,50	4	M3094P-1600BL-R0250	30782274
16,00	16	92	36	42	3,00	4	M3094P-1600BL-R0300	30782275
16,00	16	92	36	42	4,00	4	M3094P-1600BL-R0400	30782276
20,00	20	104	41	52	1,00	4	M3094P-2000BL-R0100	30782277

Continued on next page.

OptiMill-Uni-HPC-Plus | Long design with neck and corner radius M3094P

Dimensions						z	Order designation	Order No.
d ₁ f8	d ₂ h6	l ₁	l ₂	l ₃	R			
20,00	20	104	41	52	2,00	4	M3094P-2000BL-R0200	30782278
20,00	20	104	41	52	3,00	4	M3094P-2000BL-R0300	30782279
20,00	20	104	41	52	4,00	4	M3094P-2000BL-R0400	30782280

Dimensions in mm.

For cutting data recommendation, see end of section.

Special designs and other coatings on request.

OptiMill®-Composite-Speed

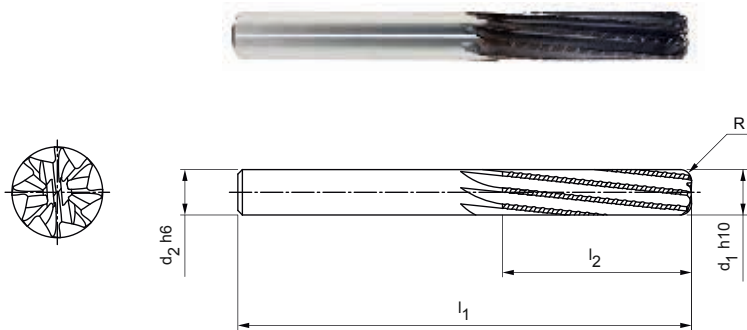
Design with pulling cut, with corner radius
M7228

Design:

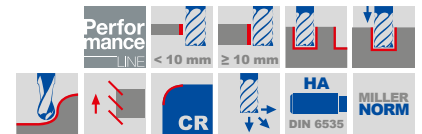
Milling cutter diameter: 4.00 - 20.00 mm
Coating: Diamond
Number of cutting edges: 8
Helix angle: 8°
Special features: Diamond coating for long tool life.

Application:

Pulling cutting edge for better removal of the chips/dust (e.g. on milling pockets and slots). Particularly suitable for difficult-to-machine surface layers (e.g. UD or copper mesh) to prevent delamination on the underside of the part.



N	1.1	1.2	1.3	1.4	2.1	2.2	2.3	3.1	4.1	4.2	4.3	C	1.1	1.2	1.3	2.1	3.1	4.1	4.2	5.1	5.2	5.3



Dimensions					z	Order designation	Order No.
d ₁ h10	d ₂ h6	l ₁	l ₂	R			
4,00	6	60	16	1,00	8	M7228-0400AQ-R0100	30866533
5,00	6	60	18	1,25	8	M7228-0600AQ-R0125	30866534
6,00	6	60	20	1,50	8	M7228-0600AQ-R0150	30866535
6,00	6	65	25	1,50	8	M7228-0600AQ-R0150	30866536
6,00	6	75	28	1,50	8	M7228-0600AQ-R0150	30866537
8,00	8	63	22	2,00	8	M7228-0800AQ-R0200	30866538
8,00	8	75	32	2,00	8	M7228-0800AQ-R0200	30866539
10,00	10	72	32	2,50	8	M7228-1000AQ-R0250	30866540
12,00	12	83	32	3,00	8	M7228-1200AQ-R0300	30866541
16,00	16	92	36	4,00	8	M7228-1600AQ-R0400	30866542
20,00	20	104	45	5,00	8	M7228-2000AQ-R0500	30866543

Dimensions in mm.

For cutting data recommendation, see end of section.

Special designs and other coatings on request.

OptiMill®-Composite-Speed-Radius

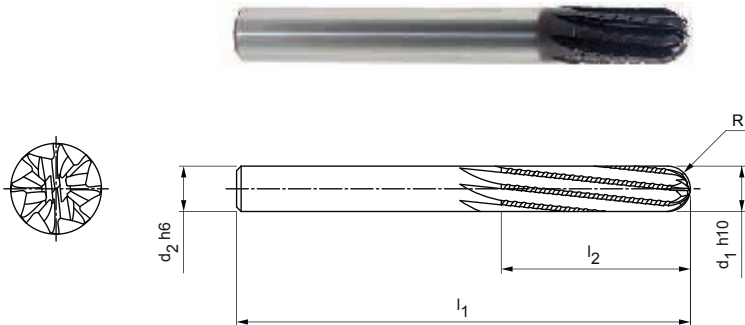
Design with pulling cut, with full radius
M7828

Design:

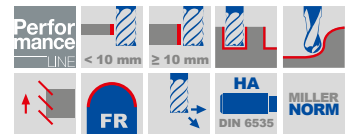
Milling cutter diameter: 4.00 - 20.00 mm
Coating: Diamond
Number of cutting edges: 8
Helix angle: 8°
Special features: Diamond coating for long tool life.

Application:

Pulling cutting edge for better removal of the chips/dust (e.g. on milling pockets and slots). Particularly suitable for difficult-to-machine surface layers (e.g. UD or copper mesh) to prevent delamination on the underside of the part.



N	1.1	1.2	1.3	1.4	2.1	2.2	2.3	3.1	4.1	4.2	4.3	C	1.1	1.2	1.3	2.1	3.1	4.1	4.2	5.1	5.2	5.3



Dimensions					z	Order designation	Order No.
d ₁ h10	d ₂ h6	l ₁	l ₂	R			
4,00	6	60	16	2,00	8	M7828-0400AQ-R0200	30869232
5,00	6	60	18	2,50	8	M7828-0500AQ-R0250	30869233
6,00	6	60	20	3,00	8	M7828-0600AQ-R0300	30869234
6,00	6	65	25	3,00	8	M7828-0600AQ-R0300	30869235
6,00	6	75	28	3,00	8	M7828-0600AQ-R0300	30869236
8,00	8	63	22	4,00	8	M7828-0800AQ-R0400	30869237
8,00	8	75	32	4,00	8	M7828-0800AQ-R0400	30869238
10,00	10	72	32	5,00	8	M7828-1000AQ-R0500	30869239
12,00	12	83	32	6,00	8	M7828-1200AQ-R0600	30869240
16,00	16	92	36	8,00	8	M7828-1600AQ-R0800	30869241
20,00	20	104	45	10,00	8	M7828-2000AQ-R1000	30869242

Dimensions in mm.

For cutting data recommendation, see end of section.

Special designs and other coatings on request.



Cutting data recommendation for trochoidal milling cutters

Feed and cutting speed

Correction factor

Factor	v _c			a _e max.	h _m
	P	K	M		
2xD	1,10		1,05	21,00 %	1,05
3xD	1,00		1,00	20,00 %	1,00
4xD	0,85		0,92	18,50 %	0,94
5xD	0,60		0,80	16,00 %	0,87

OptiMill-Tro-Uni | M3099

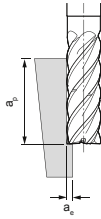
OptiMill-Tro-PM | M3299

MMG*			Material	Strength/hardness [N/mm²] [HRC]	Cooling			
					MQL/air	Dry	Wet	
P	P1	P1.1	Structural, free-cutting, case hardened and heat-treated steel, non-alloyed	< 700	✓	✓	✓	
		P1.2	Structural, free-cutting, case hardened and heat-treated steel, non-alloyed	< 1200	✓	✓	✓	
	P2	P2.1	Nitrated, case hardened and heat-treated steel, alloyed	< 900	✓	✓	✓	
		P2.2	Nitrated, case hardened and heat-treated steel, alloyed	< 1400	✓		✓	
	P3	P3.1	Tool, roller bearing, spring and high speed steel	< 900	✓	✓	✓	
		P3.2	Tool, roller bearing, spring and high speed steel	< 1500	✓		✓	
	P4	P4.1	Stainless steel, ferritic and martensitic		✓		✓	
	P5	P5.1	Cast steel				✓	
P6	P6.1	Stainless cast steel, ferritic and martensitic				✓		
M	M1	M1.1	Stainless steel, austenitic	< 700	✓		✓	
		M1.2	Stainless steel, ferritic/austenitic (duplex)	< 1000			✓	
	M2	M2.1	Stainless cast steel, austenitic	< 700	✓		✓	
	M3	M3.1	Stainless cast steel, ferritic/austenitic (duplex)	< 1000			✓	
K	K1	K1.1	Cast iron with lamellar graphite (grey cast iron), EN-GJL	< 300	✓	✓	✓	
		K2.1	Cast iron with spheroidal graphite, EN-GJS	< 500	✓	✓	✓	
	K2	K2.2	Cast iron with spheroidal graphite, EN-GJS	500-800	✓	✓	✓	
		K2.3	Cast iron with spheroidal graphite, EN-GJS	> 800	✓	✓	✓	
	K3	K3.1	Cast iron with vermicular graphite, EN-GJV; Malleable cast iron, GJM	< 500	✓	✓	✓	
		K3.2	Cast iron with vermicular graphite, EN-GJV; Malleable cast iron, GJM	> 500	✓	✓	✓	

Note:

With trochoidal milling, the cutting conditions indicated change during the machining process. This is also dependent on the CAM software used and the machining position of the tool in the workpiece. Feed rate and contact width or contact angle change constantly during the machining process in order to achieve the most constant average chip thickness possible, depending on the contour.

Trochoidal milling



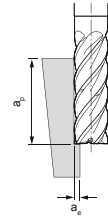
a_p = Dependent on max. tool machining depth
 a_e = Dependent on the material

	v_c [m/min]	f_z [mm/tooth] in % of D	a_e [mm] in % of D	h_m [mm] in % of D	Machining example	
	380-520	1.4 - 2.0	14 - 18	0.66 - 0.80	16MnCr5 $\emptyset = 12$ mm $v_c = 480$ m/min $f_z = 0.22$ mm $a_e = 1.7$ mm $a_p = 32$ mm	42CrMo4 $\emptyset = 12$ mm $v_c = 375$ m/min $f_z = 0.17$ mm $a_e = 1.2$ mm $a_p = 32$ mm
	320-460	1.2 - 1.8	12 - 16	0.62 - 0.76		
	340-480	1.2 - 1.8	10 - 14	0.58 - 0.71		
	280-380	1.0 - 1.6	8 - 12	0.56 - 0.68		
	240-350	1.0 - 1.6	8 - 14	0.54 - 0.65		
	210-320	0.8 - 1.4	6 - 12	0.52 - 0.62		
	180-260	0.8 - 1.2	6 - 12	0.50 - 0.60		
	220-300	1.2 - 1.8	8 - 12	0.54 - 0.62		
	160-240	0.8 - 1.4	6 - 12	0.50 - 0.60	X5CrNi18-8 $\emptyset = 12$ mm $v_c = 180$ m/min $f_z = 0.09$ mm	$a_e = 1.2$ mm $a_p = 32$ mm
	140-220	0.6 - 1.0	5 - 10	0.48 - 0.60		
	110-180	0.6 - 1.0	5 - 10	0.46 - 0.58		
	130-200	0.8 - 1.2	6 - 12	0.52 - 0.60		
	120-180	0.8 - 1.2	5 - 10	0.46 - 0.56		
	400-500	2.0 - 2.6	15 - 20	0.64 - 0.78		
	340-500	1.8 - 2.4	12 - 16	0.62 - 0.70		
	300-440	1.6 - 2.2	10 - 14	0.58 - 0.68		
	180-260	1.4 - 2.0	8 - 12	0.56 - 0.68		
	280-360	1.6 - 2.2	10 - 16	0.60 - 0.68		
	210-340	1.4 - 2.0	10 - 16	0.58 - 0.66		

Cutting data recommendation for shoulder milling cutters

Feed and cutting speed

Trochoidal milling



OptiMill-Uni-Wave | M3985

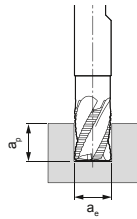
MMG*		Material	Strength/ hardness [N/mm ²] [HRC]	Cooling			v_c [m/min]	f_z [mm/tooth] in % of D	a_e [mm] in % of D	h_m [mm] in % of D	
				MQL/air	Dry	Wet					
P	P1	P1.1	Structural, free-cutting, case hardened and heat-treated steel, non-alloyed	< 700	✓	✓	✓	On request			
	P1	P1.2	Structural, free-cutting, case hardened and heat-treated steel, non-alloyed	< 1200	✓	✓	✓				
	P2	P2.1	Nitrated, case hardened and heat-treated steel, alloyed	< 900	✓	✓	✓				
	P2	P2.2	Nitrated, case hardened and heat-treated steel, alloyed	< 1400	✓	✓	✓				
	P3	P3.1	Tool, roller bearing, spring and high speed steel	< 900	✓	✓	✓				
	P3	P3.2	Tool, roller bearing, spring and high speed steel	< 1500	✓	✓	✓				
	P4	P4.1	Stainless steel, ferritic and martensitic		✓	✓	✓				
	P5	P5.1	Cast steel			✓	✓				
	P6	P6.1	Stainless cast steel, ferritic and martensitic			✓	✓				
M	M1	M1.1	Stainless steel, austenitic	< 700	✓		✓	On request			
	M1	M1.2	Stainless steel, ferritic/austenitic (duplex)	< 1000			✓				
	M2	M2.1	Stainless cast steel, austenitic	< 700	✓		✓				
	M3	M3.1	Stainless cast steel, ferritic/austenitic (duplex)	< 1000			✓				
K	K1	K1.1	Cast iron with lamellar graphite (grey cast iron), EN-GJL	< 300	✓	✓	✓	On request			
	K2	K2.1	Cast iron with spheroidal graphite, EN-GJS	< 500	✓	✓	✓				
	K2	K2.2	Cast iron with spheroidal graphite, EN-GJS	500-800	✓	✓	✓				
	K2	K2.3	Cast iron with spheroidal graphite, EN-GJS	> 800	✓	✓	✓				
	K3	K3.1	Cast iron with vermicular graphite, EN-GJV; Malleable cast iron, GJM	< 500	✓	✓	✓				
	K3	K3.2	Cast iron with vermicular graphite, EN-GJV; Malleable cast iron, GJM	> 500	✓	✓	✓				

Note:

The cutting data stated are indicative.

The optimal data for the specific machining case should be determined in trials or during the machining.

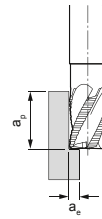
Groove milling



$$a_p = 1 \times D$$

$$a_e = 1 \times D$$

Roughing



$$a_p = 1.5 \times D$$

$$a_e = 0.25 \times D$$

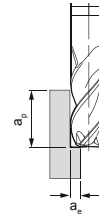
	v _c [m/min]	f _z [mm/tooth]							v _c [m/min]	f _z [mm/tooth]						
		Milling cutter diameter [mm]								Milling cutter diameter [mm]						
		6.00	8.00	10.00	12.00	16.00	20.00	25.00		6.00	8.00	10.00	12.00	16.00	20.00	25.00
	200	0.036	0.046	0.056	0.066	0.082	0.095	0.106	405	0.061	0.079	0.096	0.111	0.139	0.162	0.179
	160	0.034	0.043	0.053	0.061	0.077	0.089	0.098	330	0.057	0.074	0.089	0.104	0.130	0.151	0.167
	180	0.036	0.046	0.056	0.066	0.082	0.095	0.106	370	0.061	0.079	0.096	0.111	0.139	0.162	0.179
	125	0.030	0.039	0.047	0.055	0.068	0.079	0.088	260	0.051	0.066	0.080	0.093	0.116	0.135	0.149
	115	0.034	0.044	0.054	0.062	0.078	0.090	0.100	240	0.058	0.075	0.091	0.106	0.132	0.153	0.170
	100	0.031	0.040	0.049	0.057	0.071	0.083	0.091	200	0.053	0.068	0.083	0.097	0.121	0.140	0.155
	80	0.024	0.031	0.038	0.044	0.055	0.063	0.070	165	0.041	0.053	0.064	0.074	0.093	0.108	0.119
	120	0.035	0.045	0.054	0.063	0.079	0.092	0.102	245	0.059	0.076	0.092	0.108	0.135	0.156	0.173
	80	0.017	0.022	0.026	0.031	0.038	0.044	0.049	165	0.029	0.037	0.045	0.052	0.065	0.075	0.084
	55	0.021	0.027	0.033	0.038	0.048	0.056	0.062	110	0.036	0.046	0.056	0.065	0.081	0.094	0.104
	50	0.017	0.022	0.027	0.032	0.040	0.046	0.051	105	0.030	0.038	0.046	0.054	0.067	0.078	0.087
	60	0.023	0.029	0.036	0.042	0.052	0.060	0.067	120	0.039	0.050	0.061	0.071	0.088	0.102	0.113
	55	0.018	0.023	0.028	0.033	0.041	0.048	0.053	110	0.031	0.039	0.048	0.056	0.070	0.081	0.090
	215	0.060	0.077	0.094	0.109	0.137	0.159	0.176	440	0.102	0.131	0.159	0.186	0.232	0.269	0.298
	200	0.051	0.066	0.080	0.093	0.116	0.135	0.149	405	0.087	0.112	0.135	0.158	0.198	0.229	0.254
	160	0.042	0.054	0.066	0.077	0.096	0.111	0.123	330	0.072	0.092	0.112	0.130	0.163	0.189	0.209
	90	0.024	0.031	0.038	0.044	0.055	0.063	0.070	185	0.041	0.053	0.064	0.074	0.093	0.108	0.119
	145	0.042	0.054	0.066	0.077	0.096	0.111	0.123	295	0.072	0.092	0.112	0.130	0.163	0.189	0.209
	135	0.036	0.046	0.056	0.066	0.082	0.095	0.106	275	0.061	0.079	0.096	0.111	0.139	0.162	0.179

Cutting data recommendation for shoulder milling cutters

Feed and cutting speed

Tool length/correction factor:	
Length	f_z & v_c
Short	-
Long	1
Overlong	0.8
Extra long	-

Groove milling - partial slot



$$a_p = 1.5 \times D$$

$$a_e = 0.25 \times D$$

OptiMill-Uni-HPC-Pocket I M3993, M3991

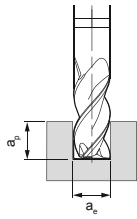
MMG*			Material	Strength/ hardness [N/mm²] [HRC]	Cooling			v _c [m/min]	f _z [mm/tooth]						
					MQL/air	Dry	Wet		Milling cutter diameter [mm]						
									6.00	8.00	10.00	12.00	16.00	20.00	
P	P1	P1.1	Structural, free-cutting, case hardened and heat-treated steel, non-alloyed	< 700	✓	✓	✓	445	0.070	0.090	0.109	0.127	0.158	0.184	
		P1.2	Structural, free-cutting, case hardened and heat-treated steel, non-alloyed	< 1200	✓	✓	✓	365	0.065	0.084	0.101	0.118	0.148	0.171	
	P2	P2.1	Nitrated, case hardened and heat-treated steel, alloyed	< 900	✓	✓	✓	405	0.070	0.090	0.109	0.127	0.158	0.184	
		P2.2	Nitrated, case hardened and heat-treated steel, alloyed	< 1400	✓		✓	285	0.058	0.075	0.091	0.106	0.132	0.153	
	P3	P3.1	Tool, roller bearing, spring and high speed steel	< 900	✓	✓	✓	265	0.066	0.085	0.103	0.120	0.151	0.174	
		P3.2	Tool, roller bearing, spring and high speed steel	< 1500	✓		✓	225	0.060	0.078	0.094	0.110	0.137	0.159	
	P4	P4.1	Stainless steel, ferritic and martensitic		✓		✓	180	0.046	0.060	0.072	0.084	0.106	0.122	
	P5	P5.1	Cast steel				✓	270	0.067	0.087	0.105	0.122	0.153	0.177	
P6	P6.1	Stainless cast steel, ferritic and martensitic				✓	180	0.033	0.042	0.051	0.059	0.074	0.086		
M	M1	M1.1	Stainless steel, austenitic	< 700	✓		✓	120	0.041	0.052	0.063	0.074	0.092	0.107	
		M1.2	Stainless steel, ferritic/austenitic (duplex)	< 1000			✓	115	0.034	0.043	0.053	0.061	0.077	0.089	
	M2	M2.1	Stainless cast steel, austenitic	< 700	✓		✓	135	0.044	0.057	0.069	0.080	0.100	0.116	
	M3	M3.1	Stainless cast steel, ferritic/austenitic (duplex)	< 1000			✓	120	0.035	0.045	0.054	0.063	0.079	0.092	
K	K1	K1.1	Cast iron with lamellar graphite (grey cast iron), EN-GJL	< 300	✓	✓	✓	485	0.116	0.149	0.181	0.211	0.264	0.306	
		K2.1	Cast iron with spheroidal graphite, EN-GJS	< 500	✓	✓	✓	445	0.099	0.127	0.154	0.179	0.224	0.260	
	K2	K2.2	Cast iron with spheroidal graphite, EN-GJS	500-800	✓	✓	✓	365	0.081	0.105	0.127	0.148	0.185	0.214	
		K2.3	Cast iron with spheroidal graphite, EN-GJS	> 800	✓	✓	✓	200	0.046	0.060	0.072	0.084	0.106	0.122	
	K3	K3.1	Cast iron with vermicular graphite, EN-GJV; Malleable cast iron, GJM	< 500	✓	✓	✓	325	0.081	0.105	0.127	0.148	0.185	0.214	
		K3.2	Cast iron with vermicular graphite, EN-GJV; Malleable cast iron, GJM	> 500	✓	✓	✓	305	0.070	0.090	0.109	0.127	0.158	0.184	

Note:

The cutting data stated are indicative.

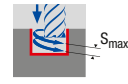
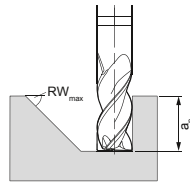
The optimal data for the specific machining case should be determined in trials or during the machining.

Groove milling



$$a_p = 1 \times D$$

$$a_e = 1 \times D$$



	v_c [m/min]	f_z [mm/tooth]						Ramping	Helix milling			Drilling
		Milling cutter diameter [mm]						RW_{max}	S_{max}	EW_{max}		f_z factor
		6.00	8.00	10.00	12.00	16.00	20.00			G = 1.5	G = 1.8	
	220	0.041	0.053	0.064	0.075	0.093	0.108	45°	0.75xD	25°	16°	0.90
	180	0.038	0.049	0.060	0.070	0.087	0.101	45°	0.75xD	25°	16°	0.80
	200	0.041	0.053	0.064	0.075	0.093	0.108	45°	0.75xD	25°	16°	0.80
	140	0.034	0.044	0.053	0.062	0.078	0.090	45°	0.75xD	25°	16°	0.70
	130	0.039	0.050	0.061	0.071	0.089	0.103	30°	0.5xD	18°	11°	0.80
	110	0.036	0.046	0.056	0.065	0.081	0.094	30°	0.5xD	18°	11°	0.70
	90	0.027	0.035	0.043	0.050	0.062	0.072	15°	0.5xD	18°	11°	
	135	0.040	0.051	0.062	0.072	0.090	0.105	30°	0.5xD	18°	11°	
	90	0.019	0.025	0.030	0.035	0.044	0.051	15°	0.5xD	18°	11°	
	60	0.024	0.031	0.037	0.044	0.054	0.063	15°	0.5xD	18°	11°	
	55	0.020	0.026	0.031	0.036	0.045	0.052	15°	0.5xD	18°	11°	
	65	0.026	0.033	0.041	0.047	0.059	0.069	15°	0.5xD	18°	11°	
	60	0.021	0.026	0.032	0.037	0.047	0.054	15°	0.5xD	18°	11°	
	240	0.068	0.088	0.107	0.124	0.156	0.180	45°	0.75xD	25°	16°	0.80
	220	0.058	0.075	0.091	0.106	0.132	0.153	45°	0.75xD	25°	16°	0.80
	180	0.048	0.062	0.075	0.087	0.109	0.126	45°	0.75xD	25°	16°	0.80
	100	0.027	0.035	0.043	0.050	0.062	0.072	45°	0.75xD	25°	16°	0.80
	160	0.048	0.062	0.075	0.087	0.109	0.126	45°	0.75xD	25°	16°	0.80
	150	0.041	0.053	0.064	0.075	0.093	0.108	45°	0.75xD	25°	16°	0.80

Terminology:

RW_{max} = Maximum angle of the ramp

S_{max} = Maximum pitch of the helix

G = Ratio of circular pocket $\emptyset$ on plunging to the tool $\emptyset$

Example: Tool $\emptyset$ 12 mm at G=1.5 gives pocket $\emptyset$ of 18 mm

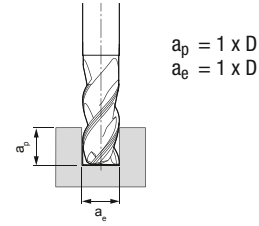
EW_{max} = Pitch angle of the helix (given by G and S_{max})

Cutting data recommendation for shoulder milling cutters

Feed and cutting speed

Tool length/correction factor:	
Length	f_z & v_c
Long	0.9
Overlong	0.8

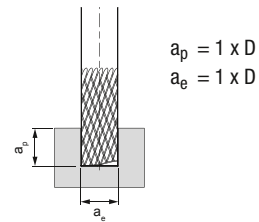
Groove milling



OptiMill-Uni-HPC-Plus | M3094P

MMG*			Material	Strength/ hardness [N/mm²] [HRC]	Cooling			v _c [m/min]	f _z [mm/tooth]								
					MQL/air	Dry	Wet		Milling cutter diameter [mm]								
									2.00	4.00	6.00	8.00	10.00	12.00	16.00	20.00	
P	P1	P1.1	Structural, free-cutting, case hardened and heat-treated steel, non-alloyed	< 700	✓	✓	✓	220	0.016	0.029	0.041	0.053	0.064	0.075	0.093	0.108	
		P1.2	Structural, free-cutting, case hardened and heat-treated steel, non-alloyed	< 1200	✓	✓	✓	180	0.015	0.027	0.038	0.049	0.06	0.07	0.087	0.101	
	P2	P2.1	Nitrated, case hardened and heat-treated steel, alloyed	< 900	✓	✓	✓	200	0.016	0.029	0.041	0.053	0.064	0.075	0.093	0.108	
		P2.2	Nitrated, case hardened and heat-treated steel, alloyed	< 1400	✓		✓	140	0.014	0.024	0.034	0.044	0.053	0.062	0.078	0.09	
	P3	P3.1	Tool, roller bearing, spring and high speed steel	< 900	✓	✓	✓	130	0.015	0.027	0.039	0.05	0.061	0.071	0.089	0.103	
		P3.2	Tool, roller bearing, spring and high speed steel	< 1500	✓		✓	110	0.014	0.025	0.036	0.046	0.056	0.065	0.081	0.094	
	P4	P4.1	Stainless steel, ferritic and martensitic		✓		✓	90	0.011	0.019	0.027	0.035	0.043	0.05	0.062	0.072	
	P5	P5.1	Cast steel					135	0.016	0.028	0.04	0.051	0.062	0.072	0.09	0.105	
P6	P6.1	Stainless cast steel, ferritic and martensitic				✓	90	0.008	0.013	0.019	0.025	0.03	0.035	0.044	0.051		
M	M1	M1.1	Stainless steel, austenitic	< 700	✓		✓	60	0.01	0.017	0.024	0.031	0.037	0.044	0.054	0.063	
		M1.2	Stainless steel, ferritic/austenitic (duplex)	< 1000			✓	55	0.008	0.014	0.02	0.026	0.031	0.036	0.045	0.052	
	M2	M2.1	Stainless cast steel, austenitic	< 700	✓		✓	65	0.01	0.018	0.026	0.033	0.041	0.047	0.059	0.069	
	M3	M3.1	Stainless cast steel, ferritic/austenitic (duplex)	< 1000			✓	60	0.008	0.014	0.021	0.026	0.032	0.037	0.047	0.054	
K	K1	K1.1	Cast iron with lamellar graphite (grey cast iron), EN-GJL	< 300	✓	✓	✓	240	0.027	0.048	0.068	0.088	0.107	0.124	0.156	0.18	
		K2.1	Cast iron with spheroidal graphite, EN-GJS	< 500	✓	✓	✓	220	0.023	0.041	0.058	0.075	0.091	0.106	0.132	0.153	
	K2	K2.2	Cast iron with spheroidal graphite, EN-GJS	500-800	✓	✓	✓	180	0.019	0.034	0.048	0.062	0.075	0.087	0.109	0.126	
		K2.3	Cast iron with spheroidal graphite, EN-GJS	> 800	✓	✓	✓	100	0.011	0.019	0.027	0.035	0.043	0.05	0.062	0.072	
	K3	K3.1	Cast iron with vermicular graphite, EN-GJV; Malleable cast iron, GJM	< 500	✓	✓	✓	160	0.019	0.034	0.048	0.062	0.075	0.087	0.109	0.126	
		K3.2	Cast iron with vermicular graphite, EN-GJV; Malleable cast iron, GJM	> 500	✓	✓	✓	150	0.016	0.029	0.041	0.053	0.064	0.075	0.093	0.108	

Groove milling



OptiMill-Composite-Speed | M7228

OptiMill-Composite-Speed-Radius | M7828

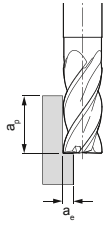
MMG*			Material	Strength/ hardness [N/mm²] [HRC]	Cooling			v _c [m/min]	f _z [mm/tooth]							
					MQL/air	Dry	Wet		Milling cutter diameter [mm]							
									4.00	6.00	8.00	10.00	12.00	16.00	20.00	
N	N4	N4.2	Plastic, thermosetting plastic (duroplast)		✓	✓	✓	150	0.019	0.027	0.035	0.043	0.050	0.062	0.072	
C	C1	C1.2	Plastic matrix (thermosetting), CFRP/GFRP		✓	✓	✓	150	0.019	0.027	0.035	0.043	0.050	0.062	0.072	
	C2	C2.1	Carbon matrix, carbon fibre-reinforced (CFC)		✓	✓	✓	150	0.017	0.025	0.032	0.038	0.045	0.056	0.065	
	C4	C4.1	Sandwich construction, honeycomb core of paper		✓	✓		200	0.011	0.015	0.020	0.024	0.028	0.035	0.040	
		C4.2	Sandwich construction, honeycomb core of aluminium		✓	✓		150	0.012	0.016	0.021	0.026	0.030	0.037	0.043	

Note:

The cutting data stated are indicative.

The optimal data for the specific machining case should be determined in trials or during the machining.

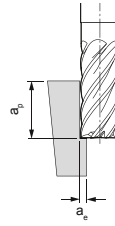
Roughing



$$a_p = 1.5 \times D$$

$$a_e = 0.25 \times D$$

Finishing

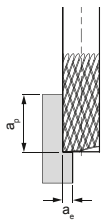


$$a_p = 1.5 \times D$$

$$a_e = 0.1 \times D$$

	v _c [m/min]	f _z [mm/tooth]								v _c [m/min]	f _z [mm/tooth]							
		Milling cutter diameter [mm]									Milling cutter diameter [mm]							
		2.00	4.00	6.00	8.00	10.00	12.00	16.00	20.00		2.00	4.00	6.00	8.00	10.00	12.00	16.00	20.00
	445	0.028	0.049	0.07	0.09	0.109	0.127	0.158	0.184	655	0.044	0.077	0.11	0.142	0.172	0.2	0.251	0.29
	365	0.026	0.046	0.065	0.084	0.101	0.118	0.148	0.171	535	0.041	0.072	0.103	0.132	0.16	0.187	0.234	0.271
	405	0.028	0.049	0.07	0.09	0.109	0.127	0.158	0.184	595	0.044	0.077	0.11	0.142	0.172	0.2	0.251	0.29
	285	0.023	0.041	0.058	0.075	0.091	0.106	0.132	0.153	415	0.036	0.064	0.092	0.118	0.143	0.167	0.209	0.242
	265	0.026	0.046	0.066	0.085	0.103	0.12	0.151	0.174	385	0.042	0.073	0.105	0.135	0.163	0.19	0.238	0.276
	225	0.024	0.042	0.06	0.078	0.094	0.11	0.137	0.159	325	0.038	0.067	0.095	0.123	0.149	0.174	0.217	0.252
	180	0.018	0.033	0.046	0.06	0.072	0.084	0.106	0.122	265	0.029	0.052	0.073	0.094	0.115	0.133	0.167	0.194
	270	0.027	0.047	0.067	0.087	0.105	0.122	0.153	0.177	400	0.042	0.075	0.106	0.137	0.166	0.194	0.242	0.281
	180	0.013	0.023	0.033	0.042	0.051	0.059	0.074	0.086	265	0.02	0.036	0.051	0.066	0.08	0.093	0.117	0.135
	120	0.016	0.029	0.041	0.052	0.063	0.074	0.092	0.107	180	0.026	0.045	0.064	0.083	0.1	0.117	0.146	0.169
	115	0.013	0.024	0.034	0.043	0.053	0.061	0.077	0.089	165	0.021	0.037	0.053	0.068	0.083	0.097	0.121	0.14
	135	0.018	0.031	0.044	0.057	0.069	0.08	0.1	0.116	195	0.028	0.049	0.07	0.09	0.109	0.127	0.159	0.184
	120	0.014	0.024	0.035	0.045	0.054	0.063	0.079	0.092	180	0.022	0.039	0.055	0.071	0.086	0.1	0.125	0.145
	485	0.046	0.082	0.116	0.149	0.181	0.211	0.264	0.306	715	0.073	0.129	0.184	0.236	0.286	0.334	0.418	0.484
	445	0.039	0.069	0.099	0.127	0.154	0.179	0.224	0.26	655	0.062	0.11	0.156	0.201	0.243	0.284	0.355	0.411
	365	0.032	0.057	0.081	0.105	0.127	0.148	0.185	0.214	535	0.051	0.09	0.128	0.165	0.2	0.234	0.292	0.339
	200	0.018	0.033	0.046	0.06	0.072	0.084	0.106	0.122	295	0.029	0.052	0.073	0.094	0.115	0.133	0.167	0.194
	325	0.032	0.057	0.081	0.105	0.127	0.148	0.185	0.214	475	0.051	0.09	0.128	0.165	0.2	0.234	0.292	0.339
	305	0.028	0.049	0.07	0.09	0.109	0.127	0.158	0.184	445	0.044	0.077	0.11	0.142	0.172	0.2	0.251	0.29

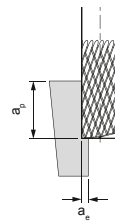
Roughing



$$a_p = 1.5 \times D$$

$$a_e = 0.25 \times D$$

Finishing



$$a_p = 1.5 \times D$$

$$a_e = 0.1 \times D$$

	v _c [m/min]	f _z [mm/tooth]							v _c [m/min]	f _z [mm/tooth]						
		Milling cutter diameter [mm]								Milling cutter diameter [mm]						
		4.00	6.00	8.00	10.00	12.00	16.00	20.00		4.00	6.00	8.00	10.00	12.00	16.00	20.00
	300	0.033	0.046	0.060	0.072	0.084	0.106	0.122	445	0.052	0.073	0.094	0.115	0.133	0.167	0.194
	300	0.033	0.046	0.060	0.072	0.084	0.106	0.122	445	0.052	0.073	0.094	0.115	0.133	0.167	0.194
	300	0.029	0.042	0.054	0.065	0.076	0.095	0.110	445	0.046	0.066	0.085	0.103	0.120	0.150	0.174
	300	0.018	0.026	0.033	0.041	0.047	0.059	0.069	400	0.029	0.041	0.053	0.064	0.075	0.094	0.108
	300	0.020	0.028	0.036	0.043	0.051	0.063	0.073	445	0.031	0.044	0.057	0.069	0.080	0.100	0.116

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Pictograms

1	Drilling from the solid	 Monolithic	 Modular TTS	 Shank form HA in accordance with DIN	 Shank form MN
		 Internal cooling	 Inclined bore outlets	 Interrupted cut	 Maximum drilling depth
2	Milling	 Trochoidal milling	 Roughing	 Finishing	 Groove milling
		 Ramping	 Vertical plunging/grooving	 Helix milling	 Profile milling
		 Trimming material thickness < 10 mm	 Trimming material thickness ≥ 10 mm	 Pulling cut	 Corner radius
		 45° chamfer	 Full radius	 Shank form HA in accordance with DIN	 Shank form HB in accordance with DIN
		 Long	 Overlong	 Maximum machining depth	 In accordance with works standard
		 Design DIN 6527	 For lateral material removal rates and for inclined entry	 Lateral material removal rates, for inclined entry and recessing	
3	Product class	 Basic Line: Universal tools, broad application area, low procurement costs	 Performance Line: High-performance tools, broad application area, high productivity in series production manufacturing		
		 Expert Line: Specialist tools for selected applications, maximum precision and productivity			
4	Material suitability	 Highly suitable	 Suitable in some situations		

Example standard material suitability table

P	1	2	3	4	5	6	M	1	2	3	K	1	2	3	N	1	2	3	4	S	1	2	3	4	5	H	1	2

Example material suitability table for non-ferrous metals and lightweight materials

N	1.1	1.2	1.3	1.4	2.1	2.2	2.3	3.1	4.1	4.2	4.3	C	1.1	1.2	1.3	2.1	3.1	4.1	4.2	5.1	5.2	5.3

NOTE:
On request we would be pleased to provide you with information on prices and availability for the products in this catalogue.

MILLER machining groups

The MILLER machining groups make it possible to provide precise information on the suitability of a tool for certain workpiece materials. Crucial for the categorisation of the groups is the machinability in relation to the cutting data (cutting speed and feed) for a material. It is necessary to sub-divide certain workpiece material groups based on the strength/hardness of the related workpiece material.

Machining group			Material	Strength - hardness [N/mm² - HRC]	Frequently machined workpiece materials
P	P1	P1.1	Structural, free-cutting, case hardened and heat-treated steel, non-alloyed	< 700 N/mm²	1.0122 (S235/St 37), 1.0401 (C15), 1.0503 (C45), 1.0570 (S355/St 52), 1.1213 (C453)
		P1.2	Structural, free-cutting, case hardened and heat-treated steel, non-alloyed	< 1200 N/mm²	1.1249 (Cf70)
	P2	P2.1	Nitrated, case hardened and heat-treated steel, alloyed	< 900 N/mm²	1.7131 (16MnCr5)
		P2.2	Nitrated, case hardened and heat-treated steel, alloyed	< 1400 N/mm²	1.7227 (42CrMoS4)
	P3	P3.1	Tool, roller bearing, spring and high speed steel	< 900 N/mm²	1.2343 (X38CrMoV5-1)
		P3.2	Tool, roller bearing, spring and high speed steel	< 1500 N/mm²	1.3505 (100Cr6)
	P4	P4.1	Stainless steel, ferritic and martensitic		1.4510 (X3CrTi17), 1.4589 (X5CrNiMoTi15-2)
	P5	P5.1	Cast steel		1.7231 (G42CrMo4)
P6	P6.1	Stainless cast steel, ferritic and martensitic			
M	M1	M1.1	Stainless steel, austenitic	< 700 N/mm²	1.4301 (V2A), 1.4571 (V4A)
		M1.2	Stainless steel, ferritic/austenitic (duplex)	< 1000 N/mm²	1.4362 (Alloy 2304), 1.4501, 1.4662 (LDX 2404)
	M2	M2.1	Stainless cast steel, austenitic	< 700 N/mm²	1.4849 (GX40NiCrSiNb38-19), 1.4848, 1.4837
	M3	M3.1	Stainless cast steel, ferritic/austenitic (duplex)	< 1000 N/mm²	
K	K1	K1.1	Cast iron with lamellar graphite (grey cast iron), EN-GJL	< 300 N/mm²	GJL-250 (GG-25), GJL-260 (GG-26 Cr)
		K2.1	Cast iron with spheroidal graphite, EN-GJS	< 500 N/mm²	GJS-400 (GGG-40), GJS-450 (GGG-45)
	K2	K2.2	Cast iron with spheroidal graphite, EN-GJS	500-800 N/mm²	GJS-600 (GGG-60), GJS-800-2 (GGG-80), GJS-800-8 (ADI 800)
		K2.3	Cast iron with spheroidal graphite, EN-GJS	> 800 N/mm²	GJS-900-2 (GGG-90), GJS-1000-5 (ADI 1000), GJS-1200-2 (ADI 1200), GJS-1400-1 (ADI 1400)
	K3	K3.1	Cast iron with vermicular graphite, EN-GJV; Malleable cast iron, GJM	< 500 N/mm²	GJV-300, GJV-400, GJMW-400-5 (GTW-40)
K3.2		Cast iron with vermicular graphite, EN-GJV; Malleable cast iron, GJM	> 500 N/mm²	GJV-500	
N	N1	N1.1	Aluminium, non-alloy and alloy < 3 % Si		Alloy 2024, Alloy 7075, Al99
		N1.2	Aluminium, alloy ≤ 7 % Si		AlSi7
		N1.3	Aluminium, alloy > 7-12 % Si		AlSi9, AlSi9Cu
		N1.4	Aluminium, alloy > 12 % Si		AlSi12, AlSi17
	N2	N2.1	Copper, non-alloy and low-alloy	< 300 N/mm²	SE-Cu
		N2.2	Copper, alloy	> 300 N/mm²	CuSn6
		N2.3	Brass, bronze, gunmetal	< 1200 N/mm²	CuZn33, CuAl9Mn3
	N3	N3.1	Graphite		
	N4	N4.1	Plastic, thermoplastics		PA, PE, PC, PS, PVC, PP, PTFE, POM, PMMA
		N4.2	Plastic, thermosets		PU, PF, EP, UP, VE, CR
N4.3		Plastic, foams		EPS, PUR, PVC-E, PS-E, PP-E	
C	C1	C1.1	Plastic matrix, aramide fibre-reinforced (AFRP)		Nomex, Kevlar, Twaron, KOREX
		C1.2	Plastic matrix (thermosetting), CFRP/GFRP		IMS, HTA
		C1.3	Plastic matrix (thermoplastic), CFRP/GFRP		GMT-PP, PEEK
	C2	C2.1	Carbon matrix, carbon fibre-reinforced (CFC)		CF222, CF225, CF226, CF227, CF260
	C3	C3.1	Metal matrix (MMC)		CeramTec AO-403 (AlSi9MgMn-Al2O3), Al/Cu/Mg-SiO2/Al2O3/AlN/TiC/SiC/BN/TiB2
	C4	C4.1	Sandwich construction, honeycomb core		
		C4.2	Sandwich construction, foam core		PLASCORE PMMG-XR1 5052, PCGA-XR1 3003, PMMG-XR1 5056, micro-cell (core made out of alloy 5052/5056)
	C5	C5.1	Composite (stack), non-metal - non-ferrous metal composite		CFRP-aluminium, IMS/HTA + Alloy 2024/6061/7075
		C5.2	Composite (stack), non-metal - metal composite		CFRP-titanium, IMS/HTA + TiAl6V4/AMS4905
		C5.3	Composite (stack), non-metal - non-metallic composite		CFRP-CFRP
C5.4		Composite (stack), non-ferrous metal - non-ferrous metal composite		Aluminium-aluminium	
C5.5		Composite (stack), non-ferrous metal - metal composite		Aluminium-titanium	
C5.6		Composite (stack), metal - metal composite		Titanium-inox	
S	S1	S1.1	Titanium, titanium alloys	< 400 N/mm²	
		S2.1	Titanium, titanium alloys	< 1200 N/mm²	TiAl6V4
	S2	S2.2	Titanium, titanium alloys	> 1200 N/mm²	
		S3	S3.1	Nickel, non-alloy and alloy	< 900 N/mm²
	S3.2		Nickel, non-alloy and alloy	> 900 N/mm²	
	S4	S4.1	High-temperature super alloy Ni, Co and Fe-based		Hardox, Hastelloy, Incoloy, Inconel, NIMONIC, Stellite, Waspaloy
S5	S5.1	Tungsten and molybdenum alloys			
H	H1	H1.1	Hardened steel/cast steel	45-55 HRC	
		H1.2	Hardened steel/cast steel	55-64 HRC	
		H1.3	Hardened steel/cast steel	64-70 HRC	
	H2	H2.1	Wear-resistant cast iron/chilled cast iron, GJN		



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