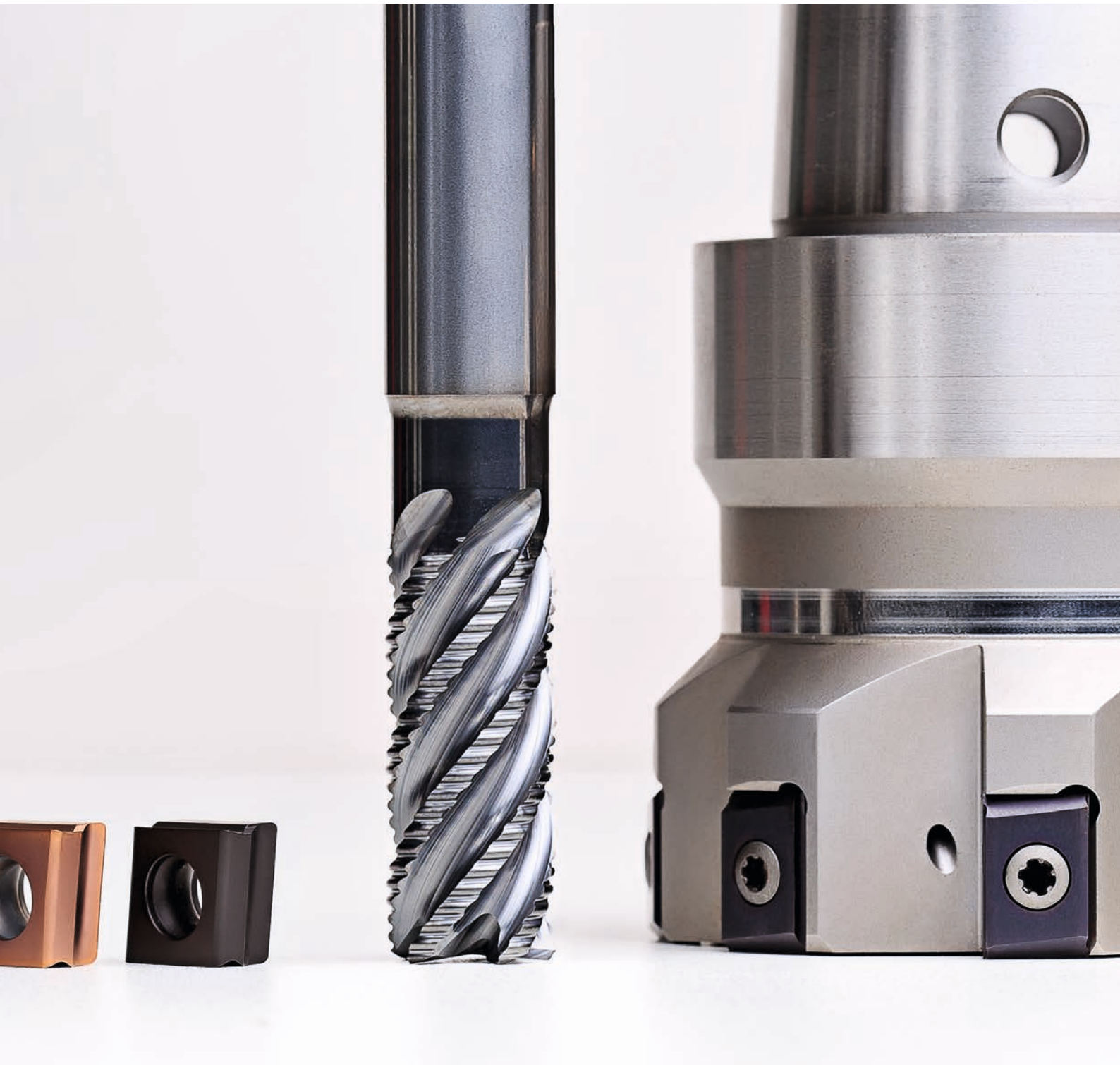
Your technology partner for cost-effective machining

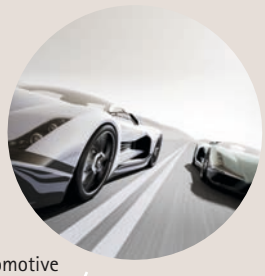
SUPPLEMENTARY VOLUME 2018



When there's something more between you and us: That's the MAPAL effect.

Machine and plant engineering

Aerospace



Automotive

Shipbuilding

Rail transport

Power generation

Medical technology

Tool and mould making

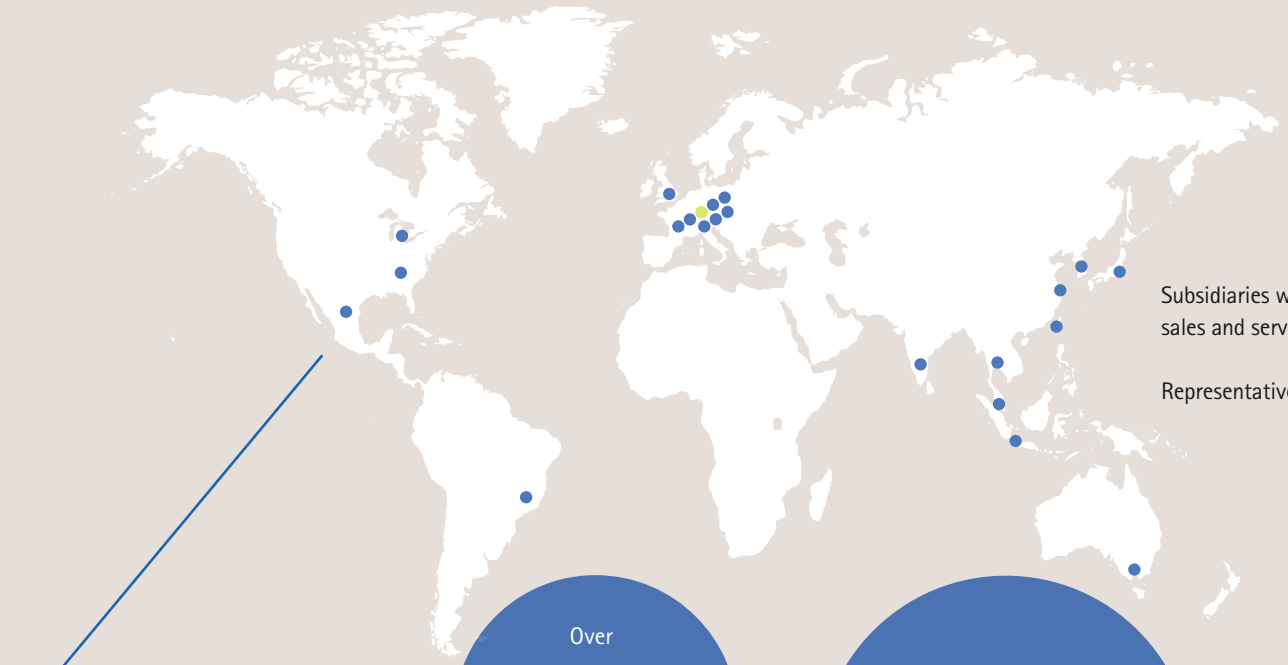
You

are looking for a technology expert who thinks the way you think?

Partner-ship

We

employ all our resources for the solution of your tasks.



Subsidiaries with production, sales and service in 21 countries

Representatives in 25 countries

Over **5,000** staff worldwide

No. 1 technology leader for the machining of cubic parts

Tool and process solutions combined with comprehensive services

We see ourselves as a technology partner, supporting you with the development of efficient and resource-saving manufacturing processes using standard tools, individual tool concepts and the optimisation of tool details. Our tools satisfy all the requirements on process reliability, precision and simple handling. How? Using advanced development and design methods as well as production using the latest manufacturing facilities.

You do not just need the optimal tool for your task, you are also looking for a partner who takes over the entire planning and management of your process? We are also there for you in this situation. We support you during all production phases and keep your manufacturing at the top level: highly productive, cost-effective and reliable. We also offer you complete networked solutions for all peripheral tasks related to the actual machining process.

Reaming and fine boring

Drilling, boring and countersinking

Milling

Turning

Actuating

Clamping

Setting, measuring and dispensing

Services

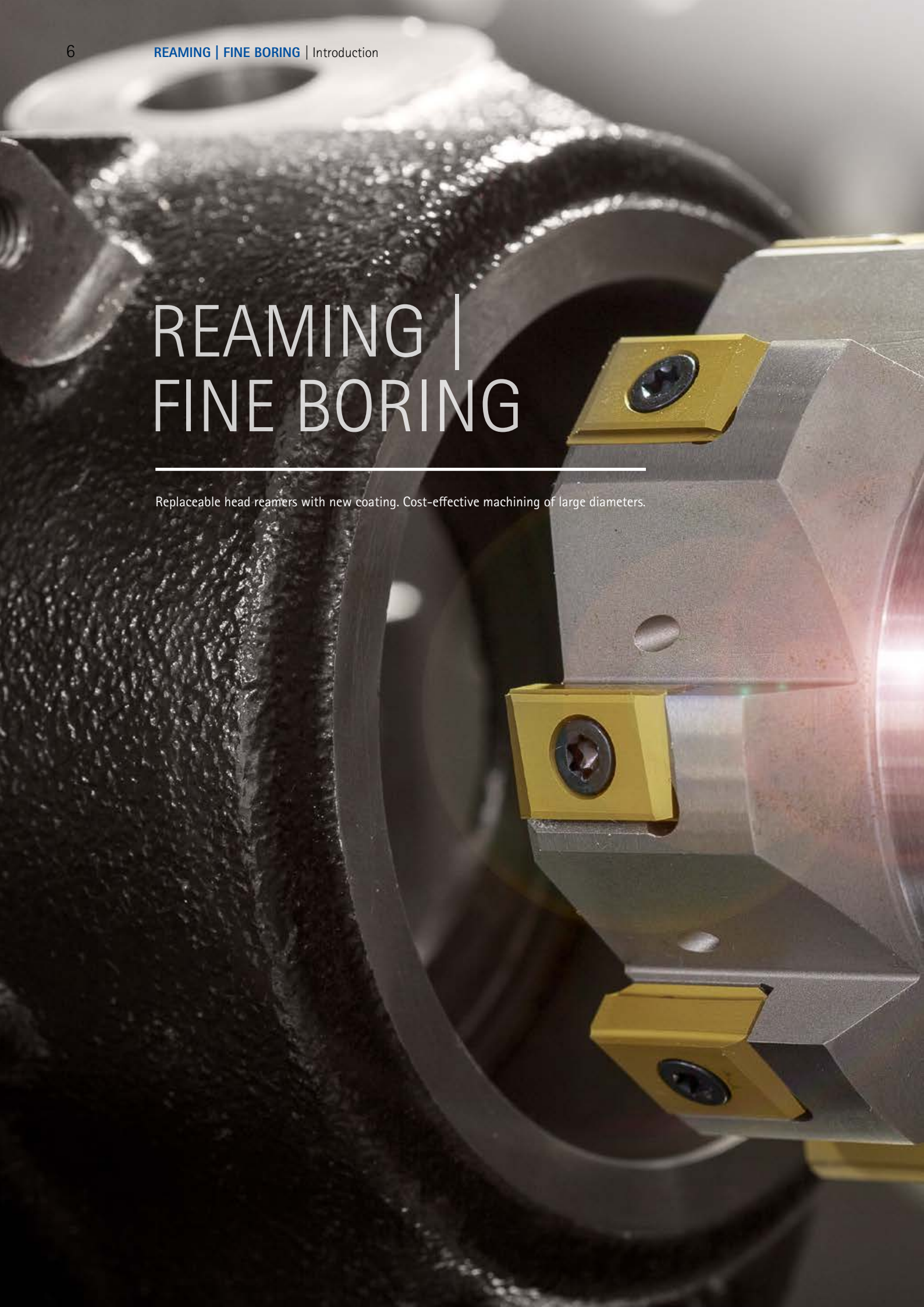
The MAPAL catalogue range

For an optimal overview of the MAPAL product range, at the end of 2016 the catalogues were reissued and structured by application to help customers. The new products and additions to the MAPAL portfolio are now combined in a new supplementary volume.

2017
Complete range as catalogue slipcase

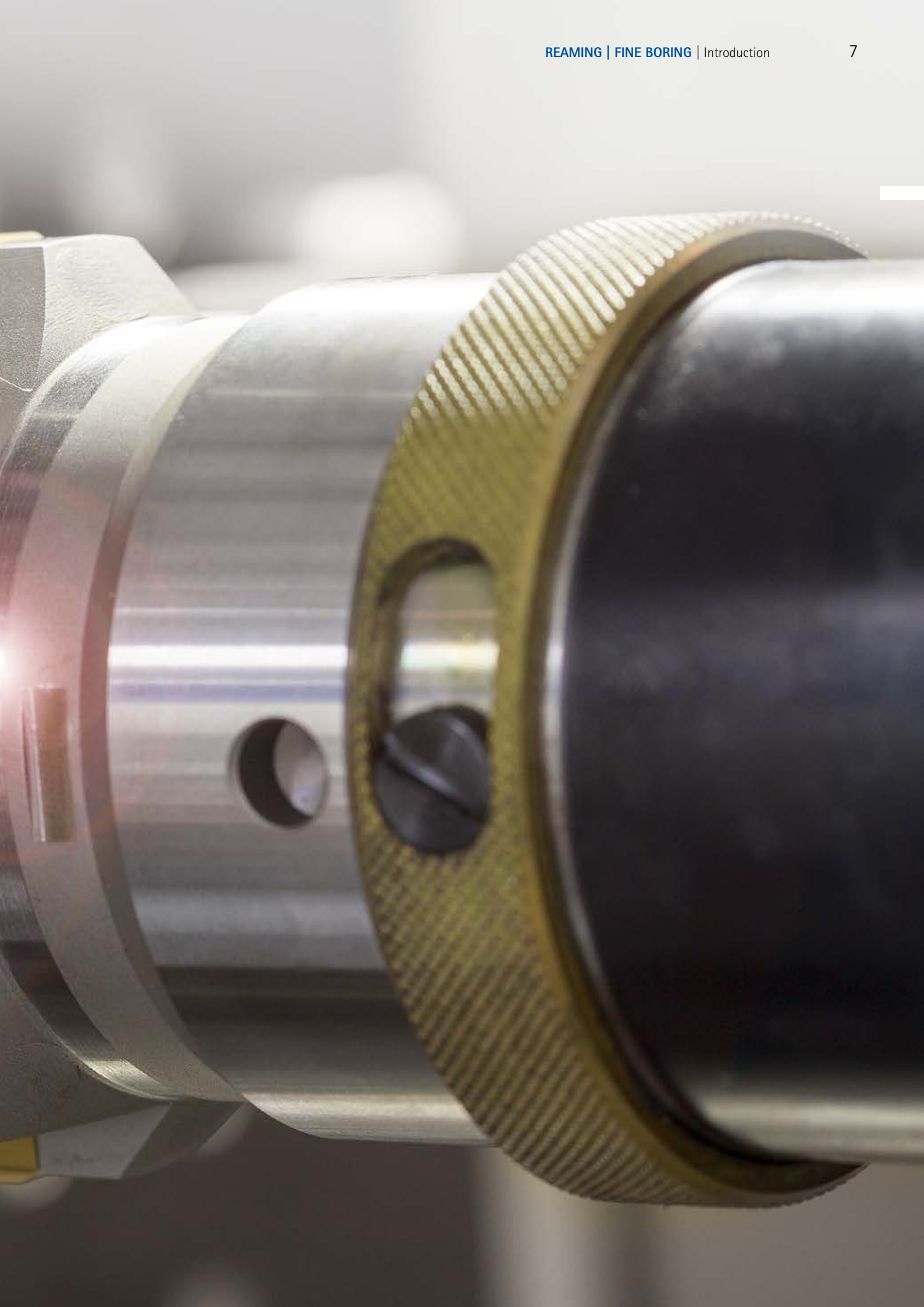
2018
Supplementary volume to catalogue slipcase

CONTENTS



REAMING | FINE BORING

Replaceable head reamers with new coating. Cost-effective machining of large diameters.



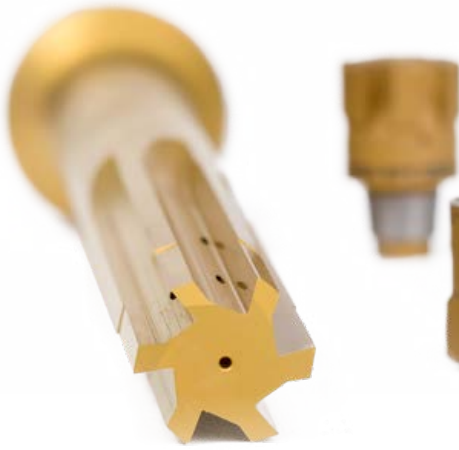
ADDITIONS TO PROGRAMME

Replaceable head reamers

MAPAL is expanding the range of HPR and CPR replaceable head reamers with new, high-performance CVD and PVD coatings. The innovative CVD coating HC419 was developed for the reliable machining of the complete range of cast iron materials – GJL, GJV and GJS. Along with a significant increase in tool life and hence greater cost-effectiveness, higher cutting speeds and therefore maximum productivity are possible. Also the CPR series has been expanded with new replaceable heads for machining stainless steel, cast iron, non-ferrous metals and difficult-to-machine materials.

Solutions for large diameters

The focus of the development of the HPR400 plus reamers was on increasing cost-effectiveness by means of efficient reconditioning. The multi-bladed tools impress due to high cost-effectiveness thanks to fast application data and simple insert changing on site by the customer. This is possible due to the highly accurate insert seats. As such the logistics costs for transport to the manufacturer are completely eliminated. Tool stock and reconditioning costs are at a low level. Indexable inserts with four cutting edges guarantee optimal cutting material utilisation.



Basic LINE

Basic Line:
Universal tools, broad application area, low procurement costs

Performance LINE

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

Expert LINE

Expert Line:
Specialist tools for selected applications, maximum precision and productivity

Replaceable head reamers

HPR replaceable head reamers with HFS connection

- Exact radial run-out thanks to HFS replaceable head system
- Safe, easy handling
- Optimal coolant supply, directly at the cutting edge
- Can be used with MQL
- From diameter 7 mm for through and blind bores
- HFS holder range with axial and radial clamping system in different lengths

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CPR replaceable head reamers with CFS connection

- Greatest possible stability and rigidity thanks to taper and face connection
- Highly precise radial run-out accuracy of 5 µm
- Simple, quick replacement of the reaming heads in the machining center possible
- From diameter 8 mm for through bore and 10 mm for blind bore
- Highly suitable for all machining groups

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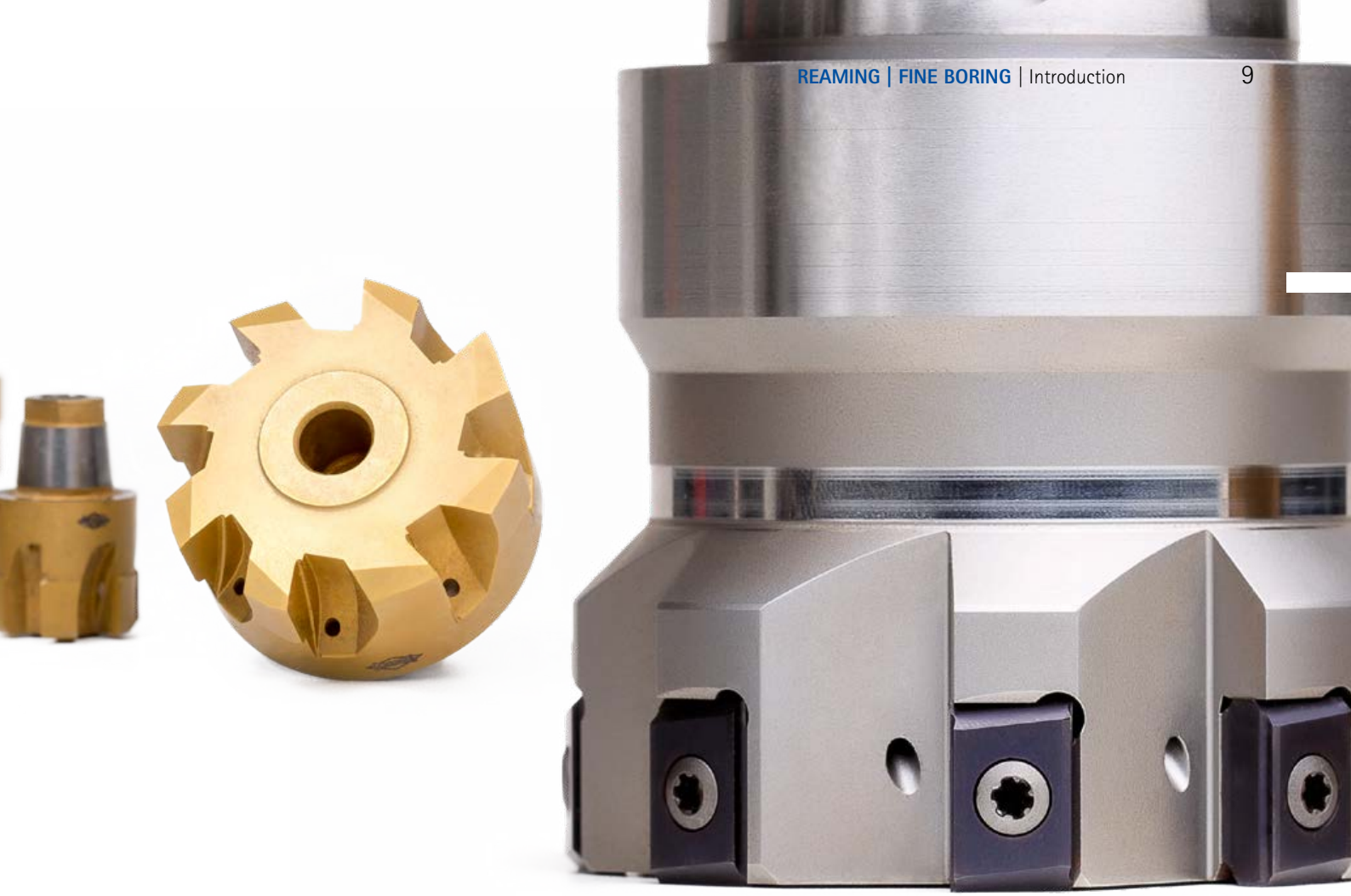

Solutions for large diameters

HPR400 plus

- Insert change on site by the customer
- Four cutting edges instead of one cutting edge previously
- Indexable inserts simple to rotate and change
- No setting necessary
- Low tool stock and low reconditioning costs

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High-performance CVD coatings

Extremely wear-resistant with good ductility

- Coatings optimally matched to reaming
- Ideal for reliably machining ductile cast iron materials
- High wear resistance with good ductility at the same time
- Longer tool lives also in difficult machining situations due to interrupted cut or unstable conditions

REPLACEABLE HEAD REAMERS

Introduction

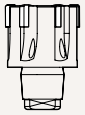
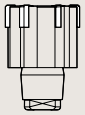
HPR replaceable head reamers

CPR replaceable head reamers

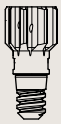
Technical appendix

Article overview replaceable head reamer | Ordering example

1. Series HPR

Type of bore	Material	Coolant supply	Flute helix angle	Series
	K	✔		HPR130 HPR100
	K	✔		HPR180 HPR150

1. Series CPR

Type of bore	Material	Coolant supply	Flute helix angle	Series
	P M S	✔		CPR510
	K N	✔		CPR500
	P M K N S	✔		CPR505

HPR / CPR replaceable head reamers

Ordering example, HPR replaceable head reamer

1. Series | **2. Diameter** | **Tolerance**

H P R | 1 0 0 | C | ø 2 0 . 0 0 0 | H 7

- H P R: HPR replaceable head reamer
- 1 0 0: **Designs:** 1 = Fixed reamer; 2 = Finely adjustable reamer
- 1 0 0: **Flute helix angle on the cutting edges:** 00 = Straight fluted up to ø 65.00 mm; 10 = Left-hand spiral fluted up to ø 65.00 mm; 30 = Left-hand spiral up to ø 18.59 mm; 50 = Blind bore up to ø 65.00 mm; 80 = Blind bore up to ø 21.29 mm
- C: **C = Configurable variant:** Length deviates from the standard or information on the required grinding tolerance; **G = Tool diameter information** Digit is only used for C and G variants
- ø 2 0 . 0 0 0: Bore or tool diameter
- H 7: IT or dimensions in µm (example: +30+10)

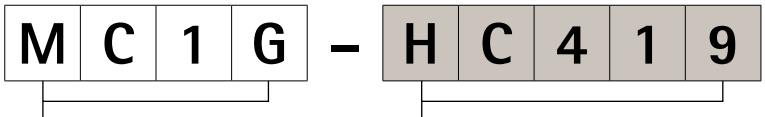
Ordering example, CPR replaceable head reamer

1. Series | **2. Diameter** | **Tolerance**

C P R | 5 1 0 | ø 2 0 . 0 0 0 | H 7

- C P R: CPR replaceable head reamer
- 5 1 0: **Designs:** 5 = Solid carbide; 6 = Brazed cutting edges, fixed
- 5 1 0: **Flute helix angle on the cutting edges:** 0 = Straight fluted; 1 = Left-hand spiral fluted
- 5 1 0: **Type of bore:** 0 = Through bore; 5 = Blind bore
- ø 2 0 . 0 0 0: Bore diameter
- H 7: IT or dimensions in µm (example: +30+10)

3. Lead **Cutting material**



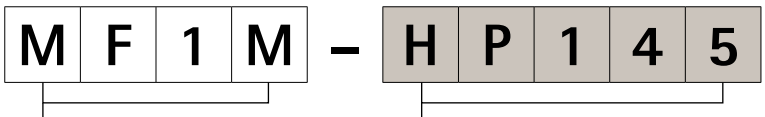
Lead geometry and rake angle:

MC1G	ME1G
MA0A	ML2G
MO2G	MF1G

For an explanation of the lead geometry, see catalogue Reaming and fine boring.

Cutting material:
CU134
CP134
HC412
HC419
HP421
HP612
PU620

3. Lead **Cutting material**



Lead geometry and rake angle:
MY1G
MV0A
MG1M
MC1G
MA0A
MT0A
MF1G
MC0A
MF1M
MG1C
MG0A
MF0A

For an explanation of the lead geometry, see catalogue Reaming and fine boring.

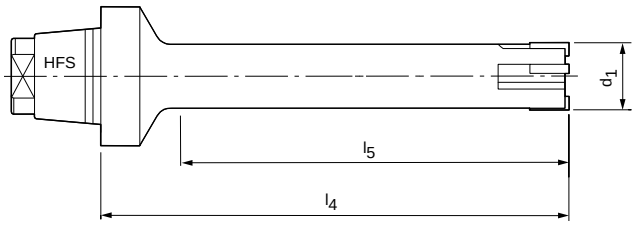
Cutting material:
CU130
HU612
HC419
HP141
HP145
HP421
HP613
HP622
PU620

HPR130

Fixed design

Design:
Reamer diameter: 7.00 - 18.00 mm
Lead: MC1G
Cutting material: HC419

Note:
You will find the related HFS replaceable head holders in the catalogue Reaming and fine boring.

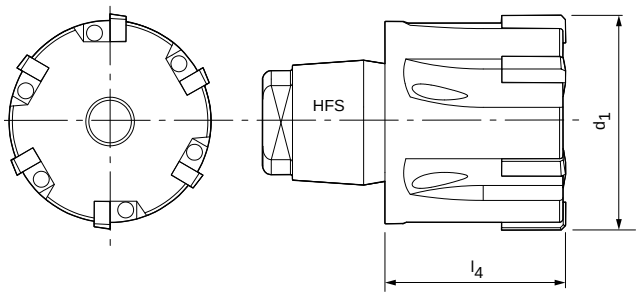


Dimensions				z	Specification	Order No.
d_1	HFS size	l_4	l_5			
7,00	12	60	45	4	HPR130Ø7H7MC1G-HC419	30965661
8,00	12	60	45	4	HPR130Ø8H7MC1G-HC419	30965662
9,00	12	60	45	4	HPR130Ø9H7MC1G-HC419	30965663
10,00	12	60	45	6	HPR130Ø10H7MC1G-HC419	30965664
11,00	12	60	45	6	HPR130Ø11H7MC1G-HC419	30965665
12,00	12	60	45	6	HPR130Ø12H7MC1G-HC419	30965666
13,00	12	60	45	6	HPR130Ø13H7MC1G-HC419	30965667
14,00	12	60	45	6	HPR130Ø14H7MC1G-HC419	30965668
15,00	12	60	45	6	HPR130Ø15H7MC1G-HC419	30965669
16,00	12	60	45	6	HPR130Ø16H7MC1G-HC419	30965680
17,00	12	60	45	6	HPR130Ø17H7MC1G-HC419	30965681
18,00	12	60	45	6	HPR130Ø18H7MC1G-HC419	30965682

Dimensions in mm.
For cutting data recommendation, see end of the section.
Please order intermediate sizes and tolerances other than H7 using the configuration description at the beginning of the section "Replaceable head reamers".

HPR100

Fixed design



Design:

Reamer diameter:	16.00 - 65.00 mm
Lead:	MC1G
Cutting material:	HC419

Note:
You will find the related HFS replaceable head holders in the catalogue Reaming and fine boring.

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

Performance H7

Dimensions			z	Specification	Order No.
d_1	HFS size	l_4			
16,00	10	14	6	HPR100Ø16H7MC1G-HC419	30965683
17,00	10	14	6	HPR100Ø17H7MC1G-HC419	30965684
18,00	10	14	6	HPR100Ø18H7MC1G-HC419	30965685
19,00	12	14,5	6	HPR100Ø19H7MC1G-HC419	30965686
20,00	12	14,5	6	HPR100Ø20H7MC1G-HC419	30965687
21,00	12	14,5	6	HPR100Ø21H7MC1G-HC419	30965688
22,00	14	15,5	6	HPR100Ø22H7MC1G-HC419	30965689
23,00	14	15,5	6	HPR100Ø23H7MC1G-HC419	30965690
24,00	16	16	6	HPR100Ø24H7MC1G-HC419	30965691
25,00	16	16	6	HPR100Ø25H7MC1G-HC419	30965692
26,00	16	16	6	HPR100Ø26H7MC1G-HC419	30965693
27,00	16	16	6	HPR100Ø27H7MC1G-HC419	30965694
28,00	16	16	6	HPR100Ø28H7MC1G-HC419	30965695
30,00	20	17	8	HPR100Ø30H7MC1G-HC419	30965696
31,00	20	17	8	HPR100Ø31H7MC1G-HC419	30965697
32,00	20	17	8	HPR100Ø32H7MC1G-HC419	30965698
33,00	20	17	8	HPR100Ø33H7MC1G-HC419	30965699
34,00	20	17	8	HPR100Ø34H7MC1G-HC419	30965700
35,00	20	17	8	HPR100Ø35H7MC1G-HC419	30965701
36,00	20	17	8	HPR100Ø36H7MC1G-HC419	30965702
37,00	20	17	8	HPR100Ø37H7MC1G-HC419	30965703
38,00	20	17	8	HPR100Ø38H7MC1G-HC419	30965704
39,00	20	17	8	HPR100Ø39H7MC1G-HC419	30965705
40,00	24	19	8	HPR100Ø40H7MC1G-HC419	30965706
41,00	24	19	8	HPR100Ø41H7MC1G-HC419	30965707
42,00	24	19	8	HPR100Ø42H7MC1G-HC419	30965708
43,00	24	19	8	HPR100Ø43H7MC1G-HC419	30965709
44,00	24	19	8	HPR100Ø44H7MC1G-HC419	30965710
45,00	24	19	8	HPR100Ø45H7MC1G-HC419	30965711
46,00	24	19	8	HPR100Ø46H7MC1G-HC419	30965712
47,00	24	19	8	HPR100Ø47H7MC1G-HC419	30965713
48,00	24	19	8	HPR100Ø48H7MC1G-HC419	30965714
49,00	24	19	8	HPR100Ø49H7MC1G-HC419	30965715
50,00	24	19	8	HPR100Ø50H7MC1G-HC419	30965716
51,00	24	25	8	HPR100Ø51H7MC1G-HC419	30965717
52,00	24	25	8	HPR100Ø52H7MC1G-HC419	30965718
53,00	24	25	8	HPR100Ø53H7MC1G-HC419	30965719
54,00	24	25	8	HPR100Ø54H7MC1G-HC419	30965720

Continued on next page.

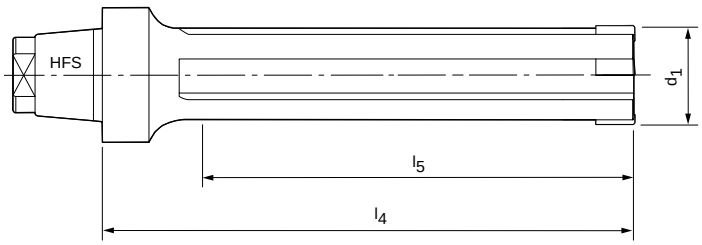
HPR100 | Fixed design

Dimensions			z	Specification	Order No.
d_1	HFS size	l_4			
55,00	24	25	8	HPR100Ø55H7MC1G-HC419	30965721
56,00	24	25	8	HPR100Ø56H7MC1G-HC419	30965722
57,00	24	25	8	HPR100Ø57H7MC1G-HC419	30965723
58,00	24	25	8	HPR100Ø58H7MC1G-HC419	30965724
59,00	24	25	8	HPR100Ø59H7MC1G-HC419	30965725
60,00	24	25	8	HPR100Ø60H7MC1G-HC419	30965726
61,00	24	25	8	HPR100Ø61H7MC1G-HC419	30965727
62,00	24	25	8	HPR100Ø62H7MC1G-HC419	30965728
63,00	24	25	8	HPR100Ø63H7MC1G-HC419	30965729
64,00	24	25	8	HPR100Ø64H7MC1G-HC419	30965730
65,00	24	25	8	HPR100Ø65H7MC1G-HC419	30965731

Dimensions in mm.
For cutting data recommendation, see end of the section.
Please order intermediate sizes and tolerances other than H7 using the configuration description at the beginning of the section "Replaceable head reamers".

HPR180

Fixed design



Design:

Reamer diameter:	7.00 - 21.00 mm
Lead:	MC1G
Cutting material:	HC419

Note:
You will find the related HFS replaceable head holders in the catalogue Reaming and fine boring.

Dimensions				z	Specification	Order No.
d_1	HFS size	l_4	l_5			
7,00	12	60	40	4	HPR180Ø7H7MC1G-HC419	30965781
8,00	12	60	40	4	HPR180Ø8H7MC1G-HC419	30965782
9,00	12	60	40	4	HPR180Ø9H7MC1G-HC419	30965783
10,00	12	60	40	4	HPR180Ø10H7MC1G-HC419	30965784
11,00	12	60	40	4	HPR180Ø11H7MC1G-HC419	30965785
12,00	12	60	40	4	HPR180Ø12H7MC1G-HC419	30965786
13,00	12	60	40	4	HPR180Ø13H7MC1G-HC419	30965787
14,00	12	60	40	4	HPR180Ø14H7MC1G-HC419	30965788
15,00	12	60	40	6	HPR180Ø15H7MC1G-HC419	30965789
16,00	12	60	40	6	HPR180Ø16H7MC1G-HC419	30965790
17,00	12	60	40	6	HPR180Ø17H7MC1G-HC419	30965791
18,00	12	60	40	6	HPR180Ø18H7MC1G-HC419	30965792
19,00	12	60	40	6	HPR180Ø19H7MC1G-HC419	30965793
20,00	12	60	40	6	HPR180Ø20H7MC1G-HC419	30965794
21,00	12	60	40	6	HPR180Ø21H7MC1G-HC419	30965795

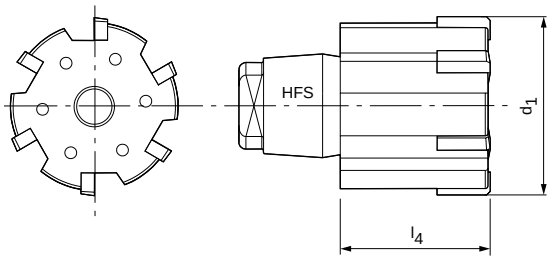
Dimensions in mm.
For cutting data recommendation, see end of the section.
Please order intermediate sizes and tolerances other than H7 using the configuration description at the beginning of the section "Replaceable head reamers".

HPR150

Fixed design

Design:
Reamer diameter: 17.00 - 65.00 mm
Lead: MC1G
Cutting material: HC419

Note:
You will find the related HFS replaceable head holders in the catalogue Reaming and fine boring.



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

Performance LNF H7

Dimensions			z	Specification	Order No.
d_1	HFS size	l_4			
17,00	10	14	6	HPR150Ø17H7MC1G-HC419	30965732
18,00	10	14	6	HPR150Ø18H7MC1G-HC419	30965733
19,00	10	14	6	HPR150Ø19H7MC1G-HC419	30965734
20,00	10	14	6	HPR150Ø20H7MC1G-HC419	30965735
21,00	10	14	6	HPR150Ø21H7MC1G-HC419	30965736
22,00	12	15,5	6	HPR150Ø22H7MC1G-HC419	30965737
23,00	12	15,5	6	HPR150Ø23H7MC1G-HC419	30965738
24,00	12	15,5	6	HPR150Ø24H7MC1G-HC419	30965739
25,00	14	15,5	6	HPR150Ø25H7MC1G-HC419	30965740
26,00	14	15,5	6	HPR150Ø26H7MC1G-HC419	30965741
27,00	14	15,5	6	HPR150Ø27H7MC1G-HC419	30965742
28,00	14	15,5	6	HPR150Ø28H7MC1G-HC419	30965743
29,00	16	17	6	HPR150Ø29H7MC1G-HC419	30965744
30,00	16	17	6	HPR150Ø30H7MC1G-HC419	30965745
31,00	16	17	6	HPR150Ø31H7MC1G-HC419	30965746
32,00	16	17	6	HPR150Ø32H7MC1G-HC419	30965747
33,00	16	17	6	HPR150Ø33H7MC1G-HC419	30965748
34,00	16	17	6	HPR150Ø34H7MC1G-HC419	30965749
35,00	16	17	6	HPR150Ø35H7MC1G-HC419	30965750
36,00	16	17	6	HPR150Ø36H7MC1G-HC419	30965751
37,00	20	17	8	HPR150Ø37H7MC1G-HC419	30965752
38,00	20	17	8	HPR150Ø38H7MC1G-HC419	30965753
39,00	20	17	8	HPR150Ø39H7MC1G-HC419	30965754
40,00	20	17	8	HPR150Ø40H7MC1G-HC419	30965755
41,00	20	17	8	HPR150Ø41H7MC1G-HC419	30965756
42,00	20	17	8	HPR150Ø42H7MC1G-HC419	30965757
43,00	20	17	8	HPR150Ø43H7MC1G-HC419	30965758
44,00	20	17	8	HPR150Ø44H7MC1G-HC419	30965759
45,00	24	19	8	HPR150Ø45H7MC1G-HC419	30965760
46,00	24	19	8	HPR150Ø46H7MC1G-HC419	30965761
47,00	24	19	8	HPR150Ø47H7MC1G-HC419	30965762
48,00	24	19	8	HPR150Ø48H7MC1G-HC419	30965763
49,00	24	19	8	HPR150Ø49H7MC1G-HC419	30965764
50,00	24	19	8	HPR150Ø50H7MC1G-HC419	30965765
51,00	24	25	8	HPR150Ø51H7MC1G-HC419	30965766
52,00	24	25	8	HPR150Ø52H7MC1G-HC419	30965767
53,00	24	25	8	HPR150Ø53H7MC1G-HC419	30965768
54,00	24	25	8	HPR150Ø54H7MC1G-HC419	30965769
55,00	24	25	8	HPR150Ø55H7MC1G-HC419	30965770

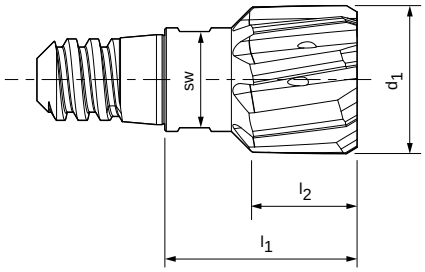
HPR150 | Fixed design

Dimensions			z	Specification	Order No.
d_1	HFS size	l_4			
56,00	24	25	8	HPR150Ø56H7MC1G-HC419	30965771
57,00	24	25	8	HPR150Ø57H7MC1G-HC419	30965772
58,00	24	25	8	HPR150Ø58H7MC1G-HC419	30965773
59,00	24	25	8	HPR150Ø59H7MC1G-HC419	30965774
60,00	24	25	8	HPR150Ø60H7MC1G-HC419	30965775
61,00	24	25	8	HPR150Ø61H7MC1G-HC419	30965776
62,00	24	25	8	HPR150Ø62H7MC1G-HC419	30965777
63,00	24	25	8	HPR150Ø63H7MC1G-HC419	30965778
64,00	24	25	8	HPR150Ø64H7MC1G-HC419	30965779
65,00	24	25	8	HPR150Ø65H7MC1G-HC419	30965780

Dimensions in mm.
For cutting data recommendation, see end of the section.
Please order intermediate sizes and tolerances other than H7 using the configuration description at the beginning of the section "Replaceable head reamers".

CPR510

Preferred series for through bore, internal coolant supply



Design: **Solid carbide**
Reamer diameter: 8.00 - 40.00 mm
Lead: MF1M
Cutting material: HP145

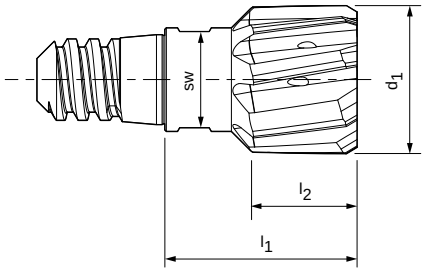
Note:
You will find the related CFS replaceable head holders in the catalogue Reaming and fine boring.

Dimensions				z	Wrench size [sw]	Specification	Order No.
d_1	CFS size	l_1	l_2				
8,00	6	18	10	6	6	CPR510Ø8H7MF1M-HP145	30966672
8,50	6	18	10	6	6	CPR510Ø8.5H7MF1M-HP145	30966673
9,00	6	18	10	6	6	CPR510Ø9H7MF1M-HP145	30966674
9,50	6	18	10	6	6	CPR510Ø9.5H7MF1M-HP145	30966675
10,00	6	18	10	6	6	CPR510Ø10H7MF1M-HP145	30966676
10,50	6	18	10	6	6	CPR510Ø10.5H7MF1M-HP145	30966677
11,00	8	20	10	6	8	CPR510Ø11H7MF1M-HP145	30966678
11,50	8	20	10	6	8	CPR510Ø11.5H7MF1M-HP145	30966679
12,00	8	20	10	6	8	CPR510Ø12H7MF1M-HP145	30966690
12,50	8	20	10	6	8	CPR510Ø12.5H7MF1M-HP145	30966691
13,00	10	22	10	6	10	CPR510Ø13H7MF1M-HP145	30966692
14,00	10	22	12	6	10	CPR510Ø14H7MF1M-HP145	30966693
15,00	10	22	12	6	10	CPR510Ø15H7MF1M-HP145	30966694
16,00	10	22	12	6	10	CPR510Ø16H7MF1M-HP145	30966695
17,00	10	22	12	8	10	CPR510Ø17H7MF1M-HP145	30966696
18,00	12	26	14	8	13	CPR510Ø18H7MF1M-HP145	30966697
19,00	12	26	14	8	13	CPR510Ø19H7MF1M-HP145	30966698
20,00	12	26	14	8	13	CPR510Ø20H7MF1M-HP145	30966699
21,00	12	26	14	8	13	CPR510Ø21H7MF1M-HP145	30966700
22,00	16	26	14	8	16	CPR510Ø22H7MF1M-HP145	30966701
23,00	16	26	14	8	16	CPR510Ø23H7MF1M-HP145	30966702
24,00	16	26	14	8	16	CPR510Ø24H7MF1M-HP145	30966703
25,00	16	26	14	8	16	CPR510Ø25H7MF1M-HP145	30966704
26,00	16	26	14	8	16	CPR510Ø26H7MF1M-HP145	30966705
27,00	16	26	14	8	16	CPR510Ø27H7MF1M-HP145	30966706
28,00	16	26	14	8	24	CPR510Ø28H7MF1M-HP145	30966707
29,00	16	26	14	8	24	CPR510Ø29H7MF1M-HP145	30966708
30,00	16	26	14	8	24	CPR510Ø30H7MF1M-HP145	30966709
31,00	16	30	14	8	24	CPR510Ø31H7MF1M-HP145	30966710
32,00	16	30	14	8	24	CPR510Ø32H7MF1M-HP145	30966711
33,00	16	30	14	8	24	CPR510Ø33H7MF1M-HP145	30966712
34,00	16	30	14	8	24	CPR510Ø34H7MF1M-HP145	30966713
35,00	16	30	14	8	24	CPR510Ø35H7MF1M-HP145	30966714
36,00	16	30	14	8	24	CPR510Ø36H7MF1M-HP145	30966715
37,00	16	30	14	8	24	CPR510Ø37H7MF1M-HP145	30966716
38,00	16	30	14	8	24	CPR510Ø38H7MF1M-HP145	30966717
39,00	16	30	14	8	24	CPR510Ø39H7MF1M-HP145	30966718
40,00	16	30	14	8	24	CPR510Ø40H7MF1M-HP145	30966719

Dimensions in mm.
For cutting data recommendation, see end of the section.
Please order intermediate sizes and tolerances other than H7 using the configuration description at the beginning of the section "Replaceable head reamers".

CPR510

Preferred series for through bore, internal coolant supply



Design: **Solid carbide**
Reamer diameter: 8.00 - 40.00 mm
Lead: MF1M
Cutting material: HP613

Note:
You will find the related CFS replaceable head holders in the catalogue Reaming and fine boring.

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

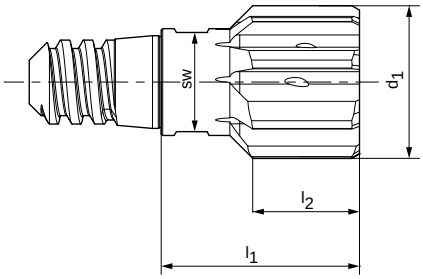
Performance INF H7

Dimensions				z	Wrench size [sw]	Specification	Order No.
d_1	CFS size	l_1	l_2				
8,00	6	18	10	6	6	CPR510Ø8H7MF1M-HP613	30966720
8,50	6	18	10	6	6	CPR510Ø8.5H7MF1M-HP613	30966721
9,00	6	18	10	6	6	CPR510Ø9H7MF1M-HP613	30966722
9,50	6	18	10	6	6	CPR510Ø9.5H7MF1M-HP613	30966723
10,00	6	18	10	6	6	CPR510Ø10H7MF1M-HP613	30966724
10,50	6	18	10	6	6	CPR510Ø10.5H7MF1M-HP613	30966725
11,00	8	20	10	6	8	CPR510Ø11H7MF1M-HP613	30966726
11,50	8	20	10	6	8	CPR510Ø11.5H7MF1M-HP613	30966727
12,00	8	20	10	6	8	CPR510Ø12H7MF1M-HP613	30966728
12,50	8	20	10	6	8	CPR510Ø12.5H7MF1M-HP613	30966729
13,00	10	22	10	6	10	CPR510Ø13H7MF1M-HP613	30966730
14,00	10	22	12	6	10	CPR510Ø14H7MF1M-HP613	30966731
15,00	10	22	12	6	10	CPR510Ø15H7MF1M-HP613	30966732
16,00	10	22	12	6	10	CPR510Ø16H7MF1M-HP613	30966733
17,00	10	22	12	8	10	CPR510Ø17H7MF1M-HP613	30966734
18,00	12	26	14	8	13	CPR510Ø18H7MF1M-HP613	30966735
19,00	12	26	14	8	13	CPR510Ø19H7MF1M-HP613	30966736
20,00	12	26	14	8	13	CPR510Ø20H7MF1M-HP613	30966737
21,00	12	26	14	8	13	CPR510Ø21H7MF1M-HP613	30966738
22,00	16	26	14	8	16	CPR510Ø22H7MF1M-HP613	30966739
23,00	16	26	14	8	16	CPR510Ø23H7MF1M-HP613	30966740
24,00	16	26	14	8	16	CPR510Ø24H7MF1M-HP613	30966741
25,00	16	26	14	8	16	CPR510Ø25H7MF1M-HP613	30966742
26,00	16	26	14	8	16	CPR510Ø26H7MF1M-HP613	30966743
27,00	16	26	14	8	16	CPR510Ø27H7MF1M-HP613	30966744
28,00	16	26	14	8	24	CPR510Ø28H7MF1M-HP613	30966745
29,00	16	26	14	8	24	CPR510Ø29H7MF1M-HP613	30966746
30,00	16	26	14	8	24	CPR510Ø30H7MF1M-HP613	30966747
31,00	16	30	14	8	24	CPR510Ø31H7MF1M-HP613	30966748
32,00	16	30	14	8	24	CPR510Ø32H7MF1M-HP613	30966749
33,00	16	30	14	8	24	CPR510Ø33H7MF1M-HP613	30966750
34,00	16	30	14	8	24	CPR510Ø34H7MF1M-HP613	30966751
35,00	16	30	14	8	24	CPR510Ø35H7MF1M-HP613	30966752
36,00	16	30	14	8	24	CPR510Ø36H7MF1M-HP613	30966753
37,00	16	30	14	8	24	CPR510Ø37H7MF1M-HP613	30966754
38,00	16	30	14	8	24	CPR510Ø38H7MF1M-HP613	30966755
39,00	16	30	14	8	24	CPR510Ø39H7MF1M-HP613	30966756
40,00	16	30	14	8	24	CPR510Ø40H7MF1M-HP613	30966757

Dimensions in mm.
For cutting data recommendation, see end of the section.
Please order intermediate sizes and tolerances other than H7 using the configuration description at the beginning of the section "Replaceable head reamers".

CPR500

Preferred series for through bore, internal coolant supply



Design: **Solid carbide**
Reamer diameter: 8.00 - 40.00 mm
Lead: MG1C
Cutting material: HC419

Note:
You will find the related CFS replaceable head holders in the catalogue Reaming and fine boring.

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

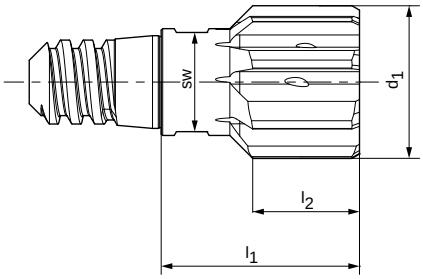
Performance INF H7

Dimensions				z	Wrench size [sw]	Specification	Order No.
d_1	CFS size	l_1	l_2				
8,00	6	18	10	6	6	CPR500Ø8H7MG1C-HC419	30967053
8,50	6	18	10	6	6	CPR500Ø8.5H7MG1C-HC419	30967054
9,00	6	18	10	6	6	CPR500Ø9H7MG1C-HC419	30967055
9,50	6	18	10	6	6	CPR500Ø9.5H7MG1C-HC419	30967056
10,00	6	18	10	6	6	CPR500Ø10H7MG1C-HC419	30967057
10,50	6	18	10	6	6	CPR500Ø10.5H7MG1C-HC419	30967058
11,00	8	20	10	6	8	CPR500Ø11H7MG1C-HC419	30967059
11,50	8	20	10	6	8	CPR500Ø11.5H7MG1C-HC419	30967060
12,00	8	20	10	6	8	CPR500Ø12H7MG1C-HC419	30967061
12,50	8	20	10	6	8	CPR500Ø12.5H7MG1C-HC419	30967062
13,00	10	22	10	6	10	CPR500Ø13H7MG1C-HC419	30967063
14,00	10	22	12	6	10	CPR500Ø14H7MG1C-HC419	30967064
15,00	10	22	12	6	10	CPR500Ø15H7MG1C-HC419	30967065
16,00	10	22	12	6	10	CPR500Ø16H7MG1C-HC419	30967066
17,00	10	22	12	8	10	CPR500Ø17H7MG1C-HC419	30967067
18,00	12	26	14	8	13	CPR500Ø18H7MG1C-HC419	30967068
19,00	12	26	14	8	13	CPR500Ø19H7MG1C-HC419	30967069
20,00	12	26	14	8	13	CPR500Ø20H7MG1C-HC419	30967070
21,00	12	26	14	8	13	CPR500Ø21H7MG1C-HC419	30967071
22,00	16	26	14	8	16	CPR500Ø22H7MG1C-HC419	30967072
23,00	16	26	14	8	16	CPR500Ø23H7MG1C-HC419	30967073
24,00	16	26	14	8	16	CPR500Ø24H7MG1C-HC419	30967074
25,00	16	26	14	8	16	CPR500Ø25H7MG1C-HC419	30967075
26,00	16	26	14	8	16	CPR500Ø26H7MG1C-HC419	30967076
27,00	16	26	14	8	16	CPR500Ø27H7MG1C-HC419	30967077
28,00	16	26	14	8	24	CPR500Ø28H7MG1C-HC419	30967078
29,00	16	26	14	8	24	CPR500Ø29H7MG1C-HC419	30967079
30,00	16	26	14	8	24	CPR500Ø30H7MG1C-HC419	30967080
31,00	16	30	14	8	24	CPR500Ø31H7MG1C-HC419	30967081
32,00	16	30	14	8	24	CPR500Ø32H7MG1C-HC419	30967082
33,00	16	30	14	8	24	CPR500Ø33H7MG1C-HC419	30967083
34,00	16	30	14	8	24	CPR500Ø34H7MG1C-HC419	30967084
35,00	16	30	14	8	24	CPR500Ø35H7MG1C-HC419	30967085
36,00	16	30	14	8	24	CPR500Ø36H7MG1C-HC419	30967086
37,00	16	30	14	8	24	CPR500Ø37H7MG1C-HC419	30967087
38,00	16	30	14	8	24	CPR500Ø38H7MG1C-HC419	30967088
39,00	16	30	14	8	24	CPR500Ø39H7MG1C-HC419	30967089
40,00	16	30	14	8	24	CPR500Ø40H7MG1C-HC419	30967090

Dimensions in mm.
For cutting data recommendation, see end of the section.
Please order intermediate sizes and tolerances other than H7 using the configuration description at the beginning of the section "Replaceable head reamers".

CPR500

Preferred series for through bore, internal coolant supply



Design: **Solid carbide**
Reamer diameter: 8.00 - 40.00 mm
Lead: MG0A
Cutting material: HP622

Note:
You will find the related CFS replaceable head holders in the catalogue Reaming and fine boring.

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

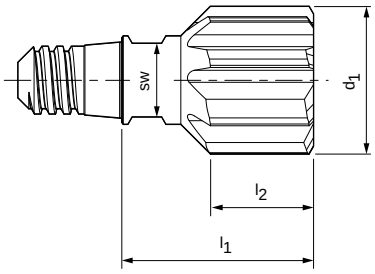
Performance INF H7

Dimensions				z	Wrench size [sw]	Specification	Order No.
d_1	CFS size	l_1	l_2				
8,00	6	18	10	6	6	CPR500Ø8H7MG0A-HP622	30966796
8,50	6	18	10	6	6	CPR500Ø8.5H7MG0A-HP622	30966797
9,00	6	18	10	6	6	CPR500Ø9H7MG0A-HP622	30966798
9,50	6	18	10	6	6	CPR500Ø9.5H7MG0A-HP622	30966799
10,00	6	18	10	6	6	CPR500Ø10H7MG0A-HP622	30966800
10,50	6	18	10	6	6	CPR500Ø10.5H7MG0A-HP622	30966801
11,00	8	20	10	6	8	CPR500Ø11H7MG0A-HP622	30966802
11,50	8	20	10	6	8	CPR500Ø11.5H7MG0A-HP622	30966803
12,00	8	20	10	6	8	CPR500Ø12H7MG0A-HP622	30966804
12,50	8	20	10	6	8	CPR500Ø12.5H7MG0A-HP622	30966805
13,00	10	22	10	6	10	CPR500Ø13H7MG0A-HP622	30966806
14,00	10	22	12	6	10	CPR500Ø14H7MG0A-HP622	30966807
15,00	10	22	12	6	10	CPR500Ø15H7MG0A-HP622	30966808
16,00	10	22	12	6	10	CPR500Ø16H7MG0A-HP622	30966809
17,00	10	22	12	8	10	CPR500Ø17H7MG0A-HP622	30966810
18,00	12	26	14	8	13	CPR500Ø18H7MG0A-HP622	30966811
19,00	12	26	14	8	13	CPR500Ø19H7MG0A-HP622	30966812
20,00	12	26	14	8	13	CPR500Ø20H7MG0A-HP622	30966813
21,00	12	26	14	8	13	CPR500Ø21H7MG0A-HP622	30966814
22,00	16	26	14	8	16	CPR500Ø22H7MG0A-HP622	30966815
23,00	16	26	14	8	16	CPR500Ø23H7MG0A-HP622	30966816
24,00	16	26	14	8	16	CPR500Ø24H7MG0A-HP622	30966817
25,00	16	26	14	8	16	CPR500Ø25H7MG0A-HP622	30966818
26,00	16	26	14	8	16	CPR500Ø26H7MG0A-HP622	30966819
27,00	16	26	14	8	16	CPR500Ø27H7MG0A-HP622	30966820
28,00	16	26	14	8	24	CPR500Ø28H7MG0A-HP622	30966821
29,00	16	26	14	8	24	CPR500Ø29H7MG0A-HP622	30966822
30,00	16	26	14	8	24	CPR500Ø30H7MG0A-HP622	30966823
31,00	16	30	14	8	24	CPR500Ø31H7MG0A-HP622	30966824
32,00	16	30	14	8	24	CPR500Ø32H7MG0A-HP622	30966825
33,00	16	30	14	8	24	CPR500Ø33H7MG0A-HP622	30966826
34,00	16	30	14	8	24	CPR500Ø34H7MG0A-HP622	30966827
35,00	16	30	14	8	24	CPR500Ø35H7MG0A-HP622	30966828
36,00	16	30	14	8	24	CPR500Ø36H7MG0A-HP622	30966829
37,00	16	30	14	8	24	CPR500Ø37H7MG0A-HP622	30966830
38,00	16	30	14	8	24	CPR500Ø38H7MG0A-HP622	30966831
39,00	16	30	14	8	24	CPR500Ø39H7MG0A-HP622	30966832
40,00	16	30	14	8	24	CPR500Ø40H7MG0A-HP622	30966833

Dimensions in mm.
For cutting data recommendation, see end of the section.
Please order intermediate sizes and tolerances other than H7 using the configuration description at the beginning of the section "Replaceable head reamers".

CPR505

Preferred series for blind bore, internal coolant supply



Design: **Solid carbide**
Reamer diameter: 10.00 - 40.00 mm
Lead: MG1C
Cutting material: HC419

Note:
You will find the related CFS replaceable head holders in the catalogue Reaming and fine boring.

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

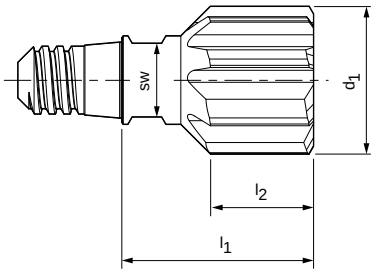
Performance INF H7

Dimensions				z	Wrench size [sw]	Specification	Order No.
d_1	CFS size	l_1	l_2				
10,00	6	18	10	6	6	CPR505Ø10H7MG1C-HC419	30992790
10,50	6	18	10	6	6	CPR505Ø10.5H7MG1C-HC419	30992791
11,00	6	20	10	6	6	CPR505Ø11H7MG1C-HC419	30992792
11,50	6	20	10	6	6	CPR505Ø11.5H7MG1C-HC419	30992793
12,00	6	20	10	6	6	CPR505Ø12H7MG1C-HC419	30992794
12,50	6	20	10	6	6	CPR505Ø12.5H7MG1C-HC419	30992795
13,00	6	22	12	6	6	CPR505Ø13H7MG1C-HC419	30992796
14,00	6	22	12	6	6	CPR505Ø14H7MG1C-HC419	30992797
15,00	8	22	12	6	8	CPR505Ø15H7MG1C-HC419	30992798
16,00	8	22	12	6	8	CPR505Ø16H7MG1C-HC419	30992799
17,00	10	22	12	8	10	CPR505Ø17H7MG1C-HC419	30992800
18,00	10	26	14	8	10	CPR505Ø18H7MG1C-HC419	30992801
19,00	10	26	14	8	10	CPR505Ø19H7MG1C-HC419	30992802
20,00	10	26	14	8	10	CPR505Ø20H7MG1C-HC419	30992803
21,00	12	26	14	8	13	CPR505Ø21H7MG1C-HC419	30992804
22,00	12	26	14	8	13	CPR505Ø22H7MG1C-HC419	30992805
23,00	12	26	14	8	13	CPR505Ø23H7MG1C-HC419	30992806
24,00	12	26	14	8	13	CPR505Ø24H7MG1C-HC419	30992807
25,00	16	26	14	8	16	CPR505Ø25H7MG1C-HC419	30992808
26,00	16	26	14	8	16	CPR505Ø26H7MG1C-HC419	30992809
27,00	16	26	14	8	16	CPR505Ø27H7MG1C-HC419	30992810
28,00	16	26	14	8	16	CPR505Ø28H7MG1C-HC419	30992811
29,00	16	26	14	8	16	CPR505Ø29H7MG1C-HC419	30992812
30,00	16	26	14	8	16	CPR505Ø30H7MG1C-HC419	30992813
31,00	16	30	14	8	16	CPR505Ø31H7MG1C-HC419	30992814
32,00	16	30	14	8	16	CPR505Ø32H7MG1C-HC419	30992815
33,00	16	30	14	8	24	CPR505Ø33H7MG1C-HC419	30992816
34,00	16	30	14	8	24	CPR505Ø34H7MG1C-HC419	30992817
35,00	16	30	14	8	24	CPR505Ø35H7MG1C-HC419	30992818
36,00	16	30	14	8	24	CPR505Ø36H7MG1C-HC419	30992819
37,00	16	30	14	8	24	CPR505Ø37H7MG1C-HC419	30992820
38,00	16	30	14	8	24	CPR505Ø38H7MG1C-HC419	30992821
39,00	16	30	14	8	24	CPR505Ø39H7MG1C-HC419	30992822
40,00	16	30	14	8	24	CPR505Ø40H7MG1C-HC419	30992823

Dimensions in mm.
For cutting data recommendation, see end of the section.
Please order intermediate sizes and tolerances other than H7 using the configuration description at the beginning of the section "Replaceable head reamers".

CPR505

Preferred series for blind bore, internal coolant supply



Design: **Solid carbide**
Reamer diameter: 10.00 - 40.00 mm
Lead: MT0A
Cutting material: HP145

Note:
You will find the related CFS replaceable head holders in the catalogue Reaming and fine boring.

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
				■		■		■	■	■																			

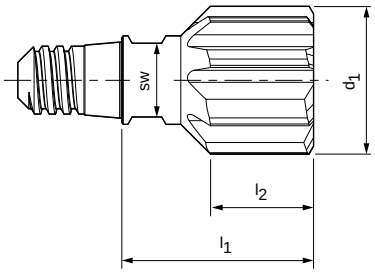
Performance INF H7

Dimensions				z	Wrench size [sw]	Specification	Order No.
d_1	CFS size	l_1	l_2				
10,00	6	18	10	6	6	CPR505Ø10H7MT0A-HP145	30966906
10,50	6	18	10	6	6	CPR505Ø10.5H7MT0A-HP145	30966907
11,00	6	20	10	6	6	CPR505Ø11H7MT0A-HP145	30966908
11,50	6	20	10	6	6	CPR505Ø11.5H7MT0A-HP145	30966909
12,00	6	20	10	6	6	CPR505Ø12H7MT0A-HP145	30966910
12,50	6	20	10	6	6	CPR505Ø12.5H7MT0A-HP145	30966911
13,00	6	22	12	6	6	CPR505Ø13H7MT0A-HP145	30966912
14,00	6	22	12	6	6	CPR505Ø14H7MT0A-HP145	30966913
15,00	8	22	12	6	8	CPR505Ø15H7MT0A-HP145	30966914
16,00	8	22	12	6	8	CPR505Ø16H7MT0A-HP145	30966915
17,00	10	22	12	8	10	CPR505Ø17H7MT0A-HP145	30966916
18,00	10	26	14	8	10	CPR505Ø18H7MT0A-HP145	30966917
19,00	10	26	14	8	10	CPR505Ø19H7MT0A-HP145	30966918
20,00	10	26	14	8	10	CPR505Ø20H7MT0A-HP145	30966919
21,00	12	26	14	8	13	CPR505Ø21H7MT0A-HP145	30966920
22,00	12	26	14	8	13	CPR505Ø22H7MT0A-HP145	30966921
23,00	12	26	14	8	13	CPR505Ø23H7MT0A-HP145	30966922
24,00	12	26	14	8	13	CPR505Ø24H7MT0A-HP145	30966923
25,00	16	26	14	8	16	CPR505Ø25H7MT0A-HP145	30966924
26,00	16	26	14	8	16	CPR505Ø26H7MT0A-HP145	30966925
27,00	16	26	14	8	16	CPR505Ø27H7MT0A-HP145	30966926
28,00	16	26	14	8	16	CPR505Ø28H7MT0A-HP145	30966927
29,00	16	26	14	8	16	CPR505Ø29H7MT0A-HP145	30966928
30,00	16	26	14	8	16	CPR505Ø30H7MT0A-HP145	30966929
31,00	16	30	14	8	16	CPR505Ø31H7MT0A-HP145	30966930
32,00	16	30	14	8	16	CPR505Ø32H7MT0A-HP145	30966931
33,00	16	30	14	8	24	CPR505Ø33H7MT0A-HP145	30966932
34,00	16	30	14	8	24	CPR505Ø34H7MT0A-HP145	30966933
35,00	16	30	14	8	24	CPR505Ø35H7MT0A-HP145	30966934
36,00	16	30	14	8	24	CPR505Ø36H7MT0A-HP145	30966935
37,00	16	30	14	8	24	CPR505Ø37H7MT0A-HP145	30966936
38,00	16	30	14	8	24	CPR505Ø38H7MT0A-HP145	30966937
39,00	16	30	14	8	24	CPR505Ø39H7MT0A-HP145	30966938
40,00	16	30	14	8	24	CPR505Ø40H7MT0A-HP145	30966939

Dimensions in mm.
For cutting data recommendation, see end of the section.
Please order intermediate sizes and tolerances other than H7 using the configuration description at the beginning of the section "Replaceable head reamers".

CPR505

Preferred series for blind bore, internal coolant supply



Design: **Solid carbide**
Reamer diameter: 10.00 - 40.00 mm
Lead: MT0A
Cutting material: HP613

Note:
You will find the related CFS replaceable head holders in the catalogue Reaming and fine boring.

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

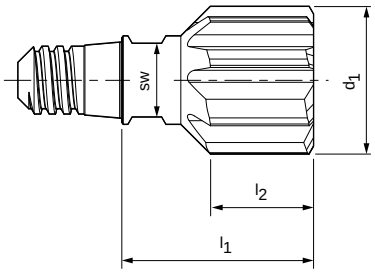
Performance INF H7

Dimensions				z	Wrench size [sw]	Specification	Order No.
d_1	CFS size	l_1	l_2				
10,00	6	18	10	6	6	CPR505Ø10H7MT0A-HP613	30966940
10,50	6	18	10	6	6	CPR505Ø10.5H7MT0A-HP613	30966941
11,00	6	20	10	6	6	CPR505Ø11H7MT0A-HP613	30966942
11,50	6	20	10	6	6	CPR505Ø11.5H7MT0A-HP613	30966943
12,00	6	20	10	6	6	CPR505Ø12H7MT0A-HP613	30966944
12,50	6	20	10	6	6	CPR505Ø12.5H7MT0A-HP613	30966945
13,00	6	22	12	6	6	CPR505Ø13H7MT0A-HP613	30966946
14,00	6	22	12	6	6	CPR505Ø14H7MT0A-HP613	30966947
15,00	8	22	12	6	8	CPR505Ø15H7MT0A-HP613	30966948
16,00	8	22	12	6	8	CPR505Ø16H7MT0A-HP613	30966949
17,00	10	22	12	8	10	CPR505Ø17H7MT0A-HP613	30966950
18,00	10	26	14	8	10	CPR505Ø18H7MT0A-HP613	30966951
19,00	10	26	14	8	10	CPR505Ø19H7MT0A-HP613	30966952
20,00	10	26	14	8	10	CPR505Ø20H7MT0A-HP613	30966953
21,00	12	26	14	8	13	CPR505Ø21H7MT0A-HP613	30966954
22,00	12	26	14	8	13	CPR505Ø22H7MT0A-HP613	30966955
23,00	12	26	14	8	13	CPR505Ø23H7MT0A-HP613	30966956
24,00	12	26	14	8	13	CPR505Ø24H7MT0A-HP613	30966957
25,00	16	26	14	8	16	CPR505Ø25H7MT0A-HP613	30966959
26,00	16	26	14	8	16	CPR505Ø26H7MT0A-HP613	30966960
27,00	16	26	14	8	16	CPR505Ø27H7MT0A-HP613	30966961
28,00	16	26	14	8	16	CPR505Ø28H7MT0A-HP613	30966962
29,00	16	26	14	8	16	CPR505Ø29H7MT0A-HP613	30966963
30,00	16	26	14	8	16	CPR505Ø30H7MT0A-HP613	30966964
31,00	16	30	14	8	16	CPR505Ø31H7MT0A-HP613	30966965
32,00	16	30	14	8	16	CPR505Ø32H7MT0A-HP613	30966966
33,00	16	30	14	8	24	CPR505Ø33H7MT0A-HP613	30966967
34,00	16	30	14	8	24	CPR505Ø34H7MT0A-HP613	30966968
35,00	16	30	14	8	24	CPR505Ø35H7MT0A-HP613	30966969
36,00	16	30	14	8	24	CPR505Ø36H7MT0A-HP613	30966970
37,00	16	30	14	8	24	CPR505Ø37H7MT0A-HP613	30966971
38,00	16	30	14	8	24	CPR505Ø38H7MT0A-HP613	30966972
39,00	16	30	14	8	24	CPR505Ø39H7MT0A-HP613	30966973
40,00	16	30	14	8	24	CPR505Ø40H7MT0A-HP613	30966974

Dimensions in mm.
For cutting data recommendation, see end of the section.
Please order intermediate sizes and tolerances other than H7 using the configuration description at the beginning of the section "Replaceable head reamers".

CPR505

Preferred series for blind bore, internal coolant supply



Design: **Solid carbide**
Reamer diameter: 10.00 - 40.00 mm
Lead: MV0A
Cutting material: HP622

Note:
You will find the related CFS replaceable head holders in the catalogue Reaming and fine boring.

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

Performance INF H7

Dimensions				z	Wrench size [sw]	Specification	Order No.
d_1	CFS size	l_1	l_2				
10,00	6	18	10	6	6	CPR505Ø10H7MV0A-HP622	30966975
10,50	6	18	10	6	6	CPR505Ø10.5H7MV0A-HP622	30966976
11,00	6	20	10	6	6	CPR505Ø11H7MV0A-HP622	30966977
11,50	6	20	10	6	6	CPR505Ø11.5H7MV0A-HP622	30966978
12,00	6	20	10	6	6	CPR505Ø12H7MV0A-HP622	30966979
12,50	6	20	10	6	6	CPR505Ø12.5H7MV0A-HP622	30966980
13,00	6	22	12	6	6	CPR505Ø13H7MV0A-HP622	30966981
14,00	6	22	12	6	6	CPR505Ø14H7MV0A-HP622	30966982
15,00	8	22	12	6	8	CPR505Ø15H7MV0A-HP622	30966983
16,00	8	22	12	6	8	CPR505Ø16H7MV0A-HP622	30966984
17,00	10	22	12	8	10	CPR505Ø17H7MV0A-HP622	30966985
18,00	10	26	14	8	10	CPR505Ø18H7MV0A-HP622	30966986
19,00	10	26	14	8	10	CPR505Ø19H7MV0A-HP622	30966987
20,00	10	26	14	8	10	CPR505Ø20H7MV0A-HP622	30966988
21,00	12	26	14	8	13	CPR505Ø21H7MV0A-HP622	30966989
22,00	12	26	14	8	13	CPR505Ø22H7MV0A-HP622	30967000
23,00	12	26	14	8	13	CPR505Ø23H7MV0A-HP622	30967001
24,00	12	26	14	8	13	CPR505Ø24H7MV0A-HP622	30967002
25,00	16	26	14	8	16	CPR505Ø25H7MV0A-HP622	30967003
26,00	16	26	14	8	16	CPR505Ø26H7MV0A-HP622	30967004
27,00	16	26	14	8	16	CPR505Ø27H7MV0A-HP622	30967005
28,00	16	26	14	8	16	CPR505Ø28H7MV0A-HP622	30967006
29,00	16	26	14	8	16	CPR505Ø29H7MV0A-HP622	30967007
30,00	16	26	14	8	16	CPR505Ø30H7MV0A-HP622	30967008
31,00	16	30	14	8	16	CPR505Ø31H7MV0A-HP622	30967009
32,00	16	30	14	8	16	CPR505Ø32H7MV0A-HP622	30967010
33,00	16	30	14	8	24	CPR505Ø33H7MV0A-HP622	30967011
34,00	16	30	14	8	24	CPR505Ø34H7MV0A-HP622	30967012
35,00	16	30	14	8	24	CPR505Ø35H7MV0A-HP622	30967013
36,00	16	30	14	8	24	CPR505Ø36H7MV0A-HP622	30967014
37,00	16	30	14	8	24	CPR505Ø37H7MV0A-HP622	30967015
38,00	16	30	14	8	24	CPR505Ø38H7MV0A-HP622	30967016
39,00	16	30	14	8	24	CPR505Ø39H7MV0A-HP622	30967017
40,00	16	30	14	8	24	CPR505Ø40H7MV0A-HP622	30967018

Dimensions in mm.
For cutting data recommendation, see end of the section.
Please order intermediate sizes and tolerances other than H7 using the configuration description at the beginning of the section "Replaceable head reamers".

Handling notes, replaceable head reamer HPR

MAPAL HFS® system with axial clamping

Fig. 1a

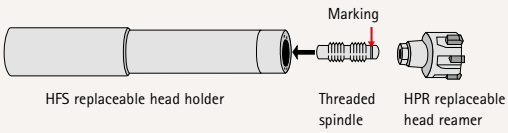


Fig. 2a

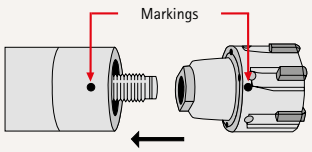


Fig. 3a

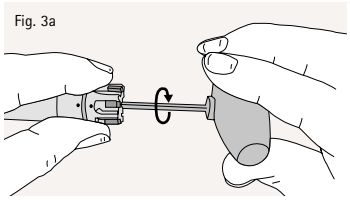
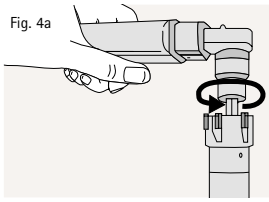


Fig. 4a



MAPAL HFS® system with radial clamping

Fig. 1b

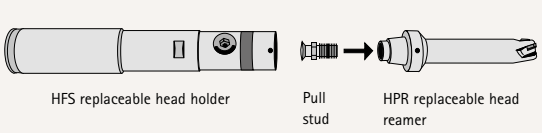


Fig. 2b

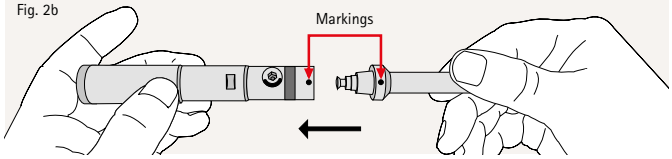


Fig. 3b

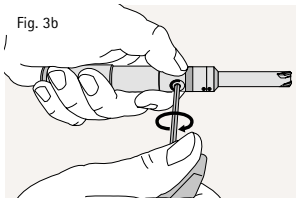
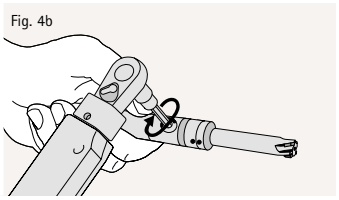


Fig. 4b



Cleaning

Clean all individual parts and make sure that the internal and external taper as well as the face surface on the HFS taper are free of foreign bodies (e.g. chips). To clean the internal taper, we recommend the special taper wiper (see catalogue Reaming and fine boring page 324).

Clamping

1. Fit the end of the threaded spindle without marking into the HFS replaceable head holder, without screwing in the threaded spindle (see Fig. 1a).
2. Fit the HPR replaceable head reamer to the threaded spindle. During this process align the markings on the HPR replaceable head reamer and the HFS replaceable head holder: "point to point" (see Fig. 2a). Then fit the HPR replaceable head reamer all the way into the HFS replaceable head holder and hold both parts firmly.
3. Screw together the HPR replaceable head reamer and the HFS replaceable head holder using a hex-wrench and tighten firmly. Make sure that the markings are aligned and the face surface is in contact (see Fig. 3a).
   Note: HPR 100, 110, 150 are tightened through the reamer (direction of rotation clockwise). HPR 130, 131, 180 are tightened through the holder (direction of rotation counter-clockwise). The directions of rotation are stated on the holder.
4. **Note:** The HFS replaceable head holders are labelled with the necessary tightening torque. Tighten the HPR replaceable head reamer clockwise using a torque wrench (see Fig. 4a).

Undoing

1. **Note:** The direction of rotation on undoing the HPR replaceable head reamer is the opposite to the direction of rotation for the clamping process.
   To undo the HPR replaceable head reamer, turn the threaded spindle using a hex-wrench.
2. Remove the HPR replaceable head reamer.

Clamping

1. Screw the threaded end of the pull stud into the HPR replaceable head reamer using the left-hand thread (see Fig. 1b).
2. Fit the HPR replaceable head reamer all the way into the HFS replaceable head holder. During this process align the markings on the HPR replaceable head reamer and the HFS replaceable head holder: "point to point" (see Fig. 2b). Then hold both parts firmly.
3. Turn the clamping stud clockwise using a hex-wrench (see Fig. 3b). The direction of rotation is stated on the HFS replaceable head holder.
4. **Note:** The HFS replaceable head holders are labelled with the necessary tightening torque. Tighten the HPR replaceable head reamer clockwise using a torque wrench (see Fig. 4b).

Connection size HFS	Tightening torque [Nm]	
	Axial	Radial
10	4	-
12	6	7
14	6	7
16	15	12
20	15	12
24	20	-

Undoing

1. To undo the reamer turn the clamping stud counter-clockwise to the stop using a hex-wrench.
   ➔ The HPR replaceable head reamer is ejected and can be removed.

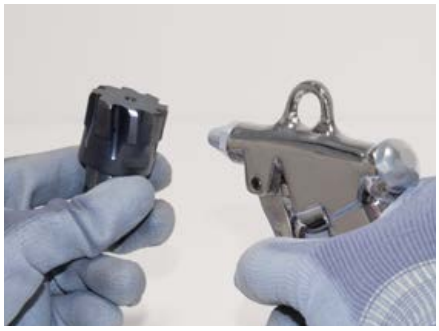
Handling notes, replaceable head reamer CPR

The universal replaceable heads in the CPReam series feature a complete and particularly user-friendly programme. The CFS connection ensures the straightforward, fast changing of the replaceable heads with high accuracy of repetition. At the same time prefect retention with maximum stability and rigidity is achieved.

The replaceable head is tightened to the stipulated tightening torque and produces a joint with force and form fit. The key features of this system are high radial run-out accuracy in conjunction with very good rigidity.

Assembly of the replaceable heads CPReam

Note:
To minimise the risk of injuries, it is recommended to wear gloves for the following actions.

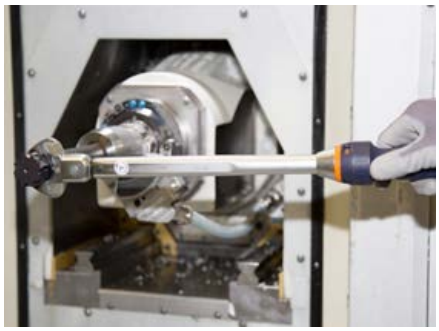


1. Clean the taper, thread and face surface on the replaceable head using compressed air and a cloth.

2. Clean the taper, thread and face surface on the replaceable head holder using compressed air and a cloth.

Note:
Only for trained personnel.

3. Screw the replaceable head clockwise into the replaceable head holder so it is hand-tight. Then clamp the replaceable head holder with the tool in the machine holder.



4. Place the torque wrench on the replaceable milling head so it is as horizontal as possible; do not tilt the faces on the spanner.

5. Tighten the replaceable head to the stated tightening torque with the aid of the torque wrench and the appropriate open-ended spanner attachment (see table "Tightening torques for the replaceable heads").

Result:
The gap between the replaceable head and replaceable head holder is closed and a joint with a force and form fit is formed. The replaceable head CPReam is now ready to use.

Tightening torques for replaceable heads

Connection size CFS	Tightening torque [Nm]
6	5
8	12,5
10	15
12	20
16	25
20	30

Cutting data recommendation for replaceable head reamers

Feed and cutting speed

HPR130 | HPR100 | HPR180 | HPR150
Cutting material: HC419 | Lead: MC1G

MMG*			Material	Strength/hardness [N/mm²] [HRC]	
K	K1	K1.1	Cast iron with lamellar graphite (grey cast iron), GJL	< 300 N/mm²	
	K2	K2.1	Cast iron with spheroidal graphite, GJS	< 500 N/mm²	
		K2.2	Cast iron with spheroidal graphite, GJS	500-800 N/mm²	
		K2.3	Cast iron with spheroidal graphite, GJS	> 800 N/mm²	
	K3	K3.1	Cast iron with spheroidal graphite, GJV; malleable cast iron, GJM	< 500 N/mm²	
		K3.2	Cast iron with spheroidal graphite, GJV; malleable cast iron, GJM	> 500 N/mm²	

CPR510
Cutting material: HP145 | Lead: MF1M

CPR505
Cutting material: HP145 | Lead: MT0A

MMG*			Material	Strength/hardness [N/mm²] [HRC]	
P	P4	P4.1	Stainless steels, ferritic and martensitic		
	P5	P5.1	Cast steel		
	P6	P6.1	Stainless cast steel, ferritic and martensitic		
M	M1	M1.1	Stainless steels, austenitic	< 700 N/mm²	
		M1.2	Stainless steels, ferritic/austenitic (duplex)	< 1000 N/mm²	
	M2	M2.1	Stainless cast steel, austenitic	< 700 N/mm²	
	M2	M3.1	Stainless cast steel, ferritic/austenitic (duplex)	< 1000 N/mm²	

CPR510
Cutting material: HP613 | Lead: MF1M

CPR505
Cutting material: HP613 | Lead: MT0A

S	S1	S1.1	Titanium, titanium alloys	< 400 N/mm²	
	S2	S2.1	Titanium, titanium alloys	< 1200 N/mm²	
		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		
	S5	S5.1	Tungsten and molybdenum alloys		

* MAPAL machining groups

	Application data for ø [mm]								
	7 - 9.59			9.6 - 29.99			30 - 65		
	v_c	f	Stock removal a	v_c	f	Stock removal a	v_c	f	Stock removal a
	130	0.60	0.10	130	1.40	0.15	130	1.80	0.15
	150	0.60	0.10	150	1.40	0.15	150	1.80	0.15
	150	0.60	0.10	150	1.40	0.15	150	1.80	0.15
	140	0.40	0.10	140	1.20	0.15	140	1.60	0.15
	120	0.40	0.10	120	1.20	0.15	120	1.60	0.15
	120	0.40	0.10	120	1.20	0.15	120	1.60	0.15

	Application data for ø [mm]											
	8 - 12			12 - 16			16 - 30			30 - 40		
	v_c	f	Stock removal a	v_c	f	Stock removal a	v_c	f	Stock removal a	v_c	f	Stock removal a
	40	0.32	0.10	40	0.48	0.10	40	0.90	0.10	40	1.20	0.10
	40	0.32	0.10	40	0.48	0.10	40	0.90	0.10	40	1.20	0.10
	40	0.32	0.10	40	0.48	0.10	40	0.90	0.10	40	1.20	0.10
	30	0.32	0.10	30	0.48	0.10	30	0.90	0.10	30	1.20	0.10
	40	0.32	0.10	40	0.48	0.10	40	0.90	0.10	40	1.20	0.10
	30	0.32	0.10	30	0.48	0.10	30	0.90	0.10	30	1.20	0.10
	35	0.24	0.10	35	0.60	0.10	35	1.00	0.10	35	1.00	0.10
	25	0.24	0.10	25	0.60	0.10	25	1.00	0.10	25	1.00	0.10
	25	0.24	0.10	25	0.60	0.10	25	1.00	0.10	25	1.00	0.10
	30	0.24	0.10	30	0.60	0.10	30	1.00	0.10	30	1.00	0.10
	30	0.24	0.10	30	0.60	0.10	30	1.00	0.10	30	1.00	0.10
	25	0.24	0.10	25	0.60	0.10	25	1.00	0.10	25	1.00	0.10
	25	0.24	0.10	25	0.60	0.10	25	1.00	0.10	25	1.00	0.10

Units:
v_c [m/min] | f [mm/rev] | a [mm]

The machining values shown are indicative values.
The optimum data for a particular machining process may vary slightly.

Cutting data recommendation for replaceable head reamers

Feed and cutting speed

CPR500 | CPR505
Cutting material: HC419 | Lead: MG1C

MMG*			Material	Strength/hardness [N/mm²] [HRC]	
K	K1	K1.1	Cast iron with lamellar graphite (grey cast iron), GJL	< 300 N/mm²	
	K2	K2.1	Cast iron with spheroidal graphite, GJS	< 500 N/mm²	
		K2.2	Cast iron with spheroidal graphite, GJS	500-800 N/mm²	
		K2.3	Cast iron with spheroidal graphite, GJS	> 800 N/mm²	
	K3	K3.1	Cast iron with spheroidal graphite, GJV; malleable cast iron, GJM	< 500 N/mm²	
		K3.2	Cast iron with spheroidal graphite, GJV; malleable cast iron, GJM	> 500 N/mm²	

CPR500
Cutting material: HP622 | Lead: MG0A

CPR505
Cutting material: HP622 | Lead: MV0A

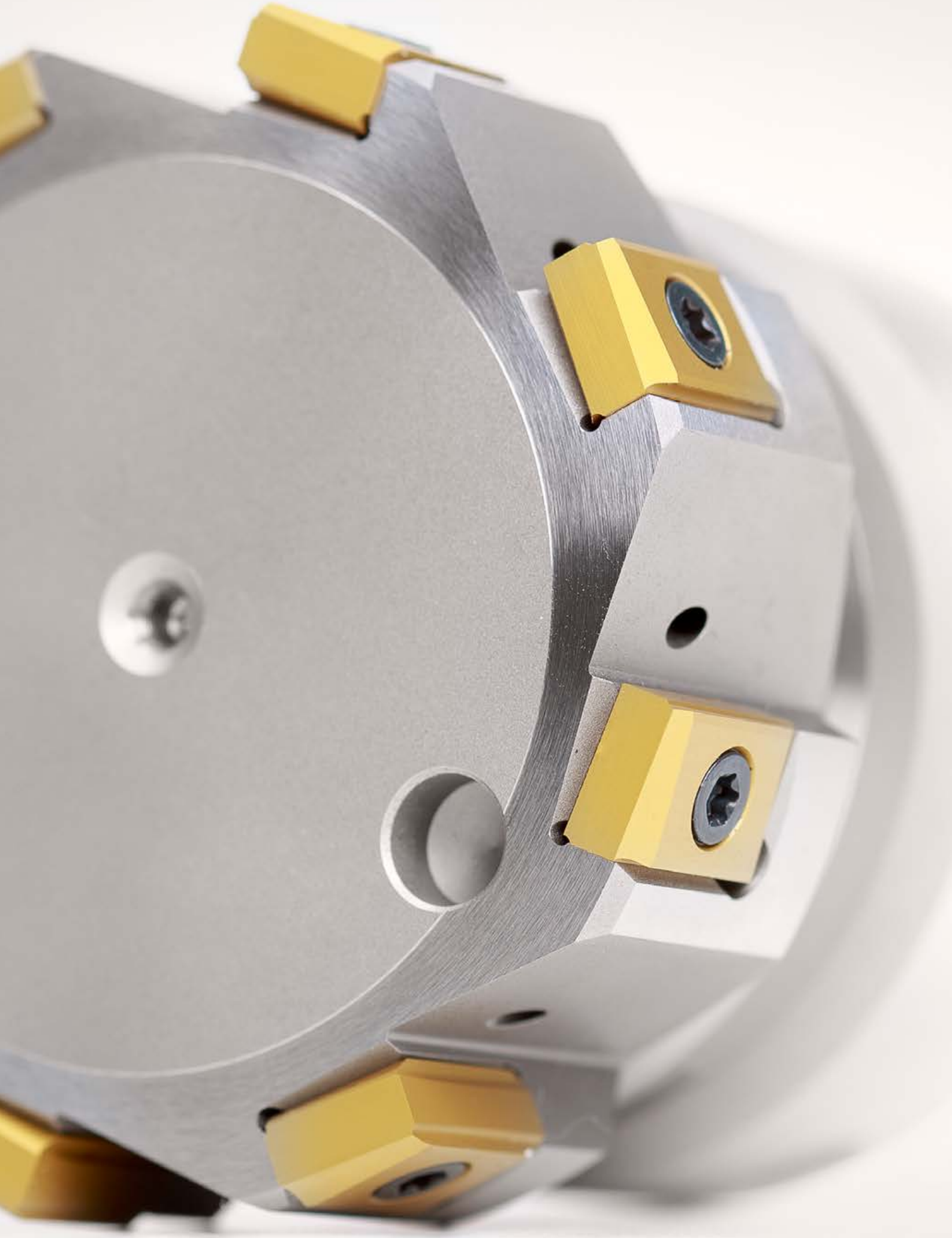
N	N1	N1.1	Aluminium, non-alloy and alloy < 3 % Si		
		N1.2	Aluminium, alloy ≤ 7 % Si		
		N1.3	Aluminium, alloy > 7-12 % Si		
		N1.4	Aluminium, alloy > 12 % Si		
	N2	N2.1	Copper, non-alloy and low-alloy	< 300 N/mm²	
		N2.2	Copper, alloy	> 300 N/mm²	
		N2.3	Brass, bronze, gunmetal	< 1200 N/mm²	
	N3	N3.1	Graphite		
	N4	N4.1	Plastic, thermoplastics		
		N4.2	Plastic, thermosets		
		N4.3	Plastic, foams		

* MAPAL machining groups

	Application data for ø [mm]											
	8 - 12			12 - 16			16 - 30			30 - 40		
	v_c	f	Stock removal a	v_c	f	Stock removal a	v_c	f	Stock removal a	v_c	f	Stock removal a
	130	0.60	0.10	130	1.32	0.15	130	1.76	0.15	130	1.76	0.15
	150	0.60	0.10	150	1.32	0.15	150	1.76	0.15	150	1.76	0.15
	150	0.60	0.10	150	1.20	0.15	150	1.60	0.15	150	1.60	0.15
	140	0.40	0.10	140	1.20	0.15	140	1.60	0.15	140	1.60	0.15
	120	0.40	0.10	120	1.20	0.15	120	1.60	0.15	120	1.60	0.15
	120	0.40	0.10	120	1.20	0.15	120	1.60	0.15	120	1.60	0.15
	180	0.90	0.15	180	1.20	0.15	180	1.80	0.15	180	1.80	0.15
	180	0.90	0.15	180	1.20	0.15	180	1.80	0.15	180	1.80	0.15
	180	0.90	0.15	180	1.20	0.15	180	1.80	0.15	180	1.80	0.15
	180	0.90	0.15	180	1.20	0.15	180	1.80	0.15	180	1.80	0.15

Units:
v_c [m/min] | f [mm/rev] | a [mm]

The machining values shown are indicative values.
The optimum data for a particular machining process may vary slightly.



SOLUTIONS FOR LARGE DIAMETERS

Product overview

General technical information

HPR400 plus: no setting and four cutting edges significantly reduce cost-per-part

Increases in cost-effectiveness due to efficient reconditioning were the focus of the development of the HPR400 reamers. The multi-bladed tools impress due to high cost-effectiveness thanks to fast application data and simple insert changing on site by the customer. This is possible due to the highly accurate insert seats. As such the logistics costs for transport to the manufacturer are completely eliminated. Tool stock and reconditioning costs are at a low level.

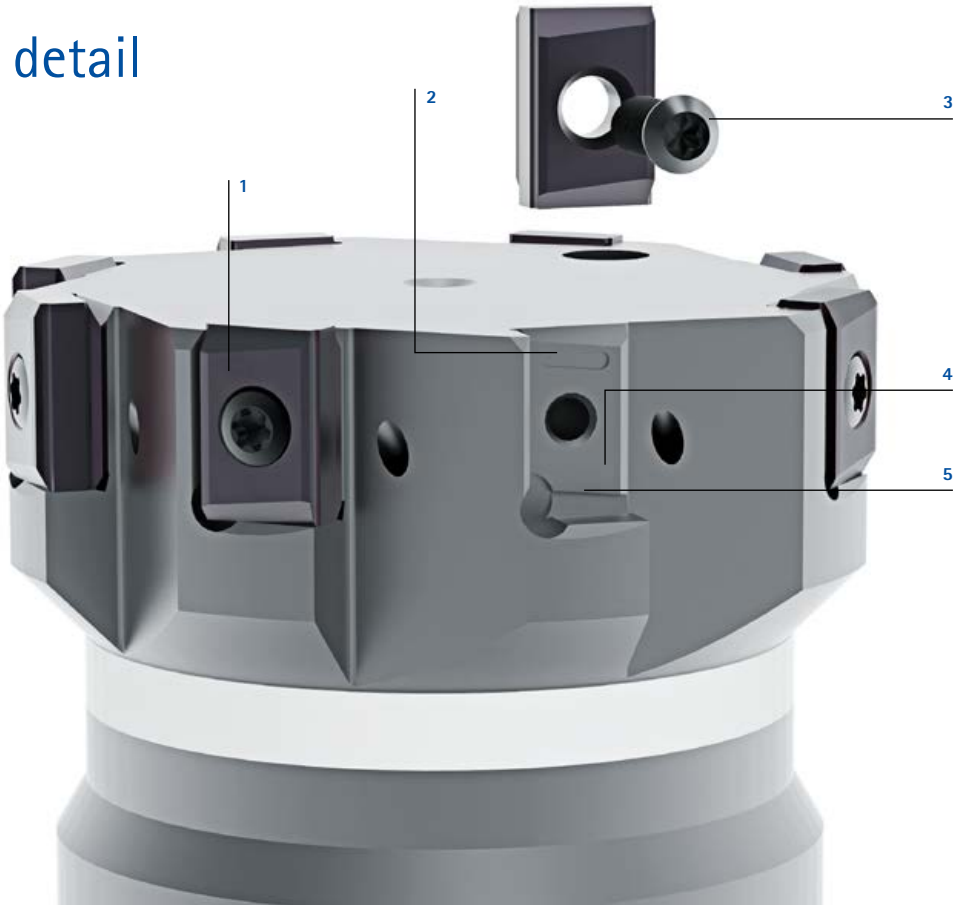
To further increase the cost-effectiveness during the machining of large diameters, the indexable inserts on the newly developed HPR400 plus no longer have a single cutting edge, instead they have four cutting edges. The cutting material is therefore optimally utilised. The high technological level of production at MAPAL ensures the four-cutting edge indexable inserts are manufactured so accurately that they can be rotated or changed on-site by the customer's staff without problems.

As a consequence the inventory of inserts can be further reduced, the reconditioning costs and therefore the cost-per-part drop further.

AT A GLANCE

- Insert change on site by the customer
- Four instead of one cutting edge previously
- Diameter range 65 to 400 mm
- Can be used universally with all materials
- Cutting material is optimally utilised
- No logistics costs for transport to the manufacturer for reconditioning
- Low tool stock and low reconditioning costs
- Indexable inserts simple to rotate and change

Tool features in detail



1 Indexable insert
Four cutting edges for high cost-effectiveness

2 Wiper pocket
For removing microsoiling

3 TORX® PLUS screw

4 Insert seat
Highly accurate for optimal adherence to tolerances

5 Particle slot

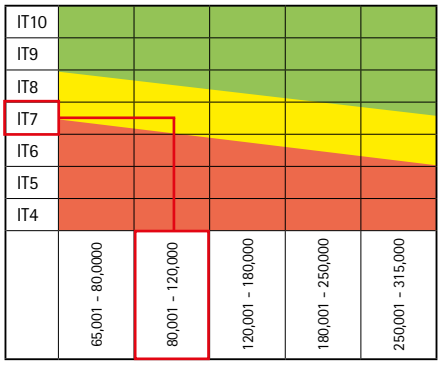
Insert change on-site by the customer

– Easy handling
– Accurate insert change thanks to highly accurate insert seat
– No setting necessary

Four cutting edges for high cost-effectiveness

– Different cutting materials and leads available
– Special leads are possible on request without problems

IT7 tolerance from diameter 65 mm



– Tolerance class IT7 can be realised without problems on larger diameters, as well as smaller tolerances for larger diameters

Handling notes HPR400 plus

The four-cutting edge inserts on the HPR400 plus are manufactured so accurately that they can be rotated or changed on site by the customer's staff without problems.

Changing the inserts

Requirements:
Clean the tool before starting to change the inserts.

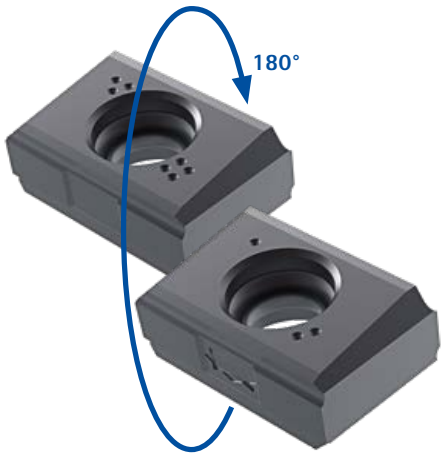
Note:
Only for trained personnel.

1. Undo the TORX® PLUS screw using a suitable screwdriver, for this purpose turn the TORX® PLUS screw counter-clockwise.Then remove the TORX® PLUS screw.

2. Carefully push the insert up out of the insert seat in the axial direction and remove. Remove the remaining inserts.

Note:
When changing the inserts, all indexable inserts must always be rotated or changed!

3. Clean the insert seats using compressed air and clean the insert seats properly using alcohol. Clean the contact faces for the inserts using cleaning compound.



Note:
On rotating the insert, pay attention to the cutting edge sequence with the aid of the marking points (one to four points).

4. Fit the new or rotated insert half-way into the insert seat. Then press the insert gently into the insert seat using your thumb and at the same time push the insert axially downward into the insert seat.Then fix the insert using the TORX® PLUS screw.

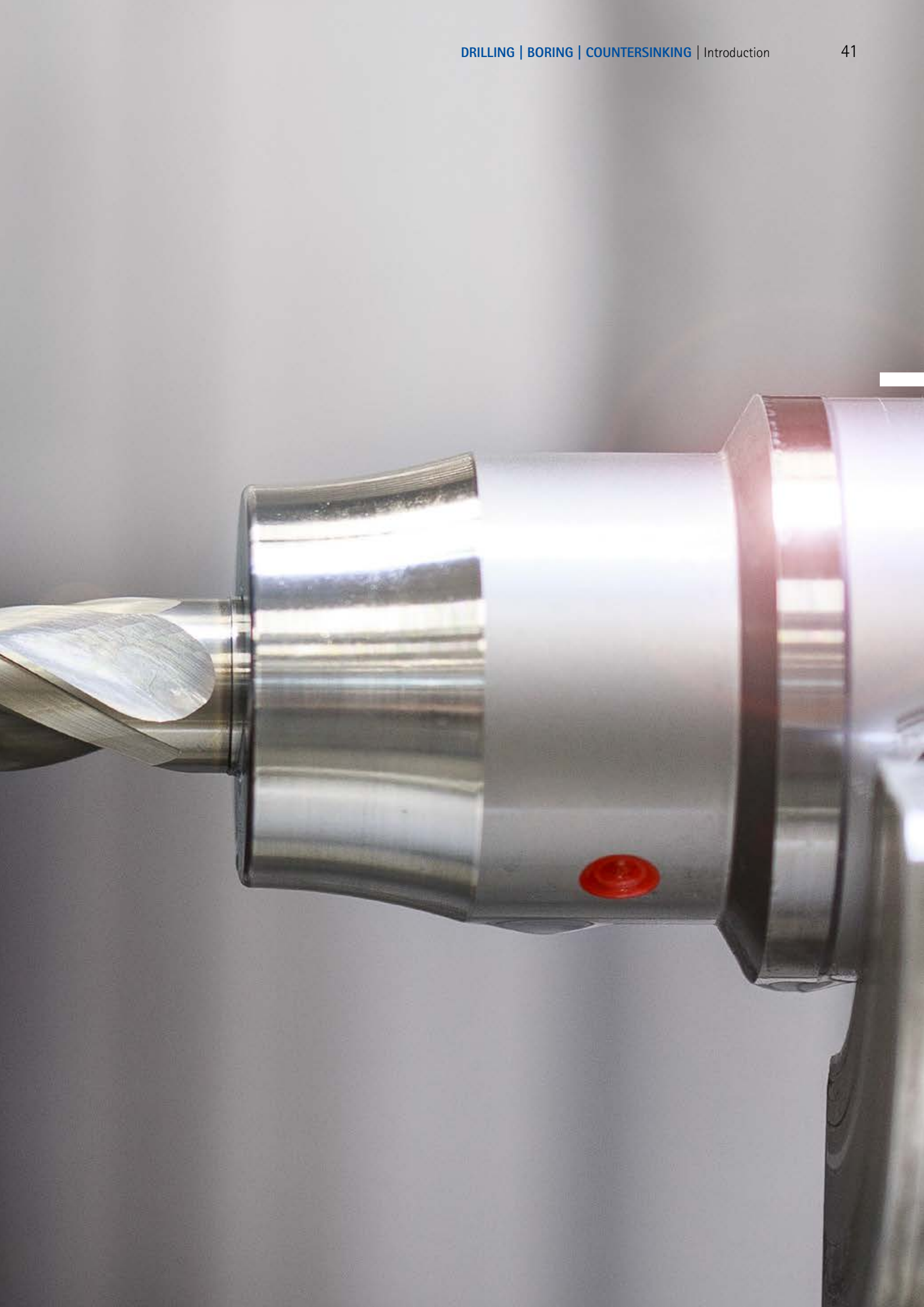
5. Tighten TORX® PLUS screw clockwise to the stipulated tightening torque.

Note:
Only tighten the TORX® PLUS screws using a suitable torque wrench. The tightening torque for TORX® PLUS screws is **3.2** Nm.

Result:
The inserts have been completely changed and the tool is ready for use.

DRILLING | BORING | COUNTERSINKING

Double and triple edge drills especially for steel machining. New cutting materials for machining cast iron, steel, stainless steel and for mixed machining.



ADDITIONS TO PROGRAMME

New solid carbide drills and ISO indexable inserts

To supplement the comprehensive standard programme of drills, MAPAL is offering an expansion of the solid carbide drills and replaceable head systems.

The supplement covers the double edge drill MEGA-Speed-Drill-Steel, which is specially matched to machining steel. Compared to conventional double edge drills, up to 20 percent higher feeds and up to 100 percent higher cutting speed can be realised.

In addition, MAPAL is announcing a supplement to triple edge drills for drilling and for high-feed machining of steel materials. Furthermore, for the first time a replaceable head system with three cutting edges is being placed on the market for even more cost-effective machining.

MAPAL boring tools impress with innovative technology and absolute precision in production. An understanding of the complete machining process and the production process as a whole makes real progress possible. Due to the developments in the automotive industry, ever higher requirements are placed on a modern cutting material. Material combinations such as aluminium-sintered steel must be machined reliably.

MAPAL has yet again risen to the challenges and with them the requirements of the market and developed a completely new range of cutting materials suitable for drilling this combination.

Drilling

Solid carbide drills for steel machining

- Double and triple edge drills especially matched to steel machining
- Inclined drilling up to 12 degrees with 5xD
- Self-centring chisel edge
- Longer tool lives
- Robust tool with stable cutting edges
- No oscillating movements during machining
- In the diameter range 4.00 - 20.00 mm

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Triple edge replaceable head drill TTD-Tritan

- Optimal positioning accuracy as well as best circularity and diameter tolerance
- High torque transmission thanks to precise Hirth serration
- Easy and quick to use
- Very good bore quality
- Cost-effective alternative to the solid carbide drill
- In the diameter range 12.00 - 32.40 mm

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Boring

New cutting materials for cast iron, steel and stainless steel

- Complete programme of ISO indexable inserts for drilling cast iron, steel, stainless steel and heat-resistant cast steel
- Standard and custom ISO indexable inserts available
- Inexpensive, tangential "press-to-size" ISO indexable inserts as alternative
- CVD and PVD-coated cutting materials can be selected depending on general conditions
- The right cutting material is available for every requirement in relation to cost and accuracy

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Cutting materials for the mixed machining

- New cutting material for the simultaneous machining of the material combinations aluminium-cast iron and aluminium-sintered steel
- Modified carbide substrate, optimised micro and macro geometries on the insert, PVD coating based on TiAlN alloy with special dopant
- Standard and custom ISO indexable inserts available
- First functioning ISO indexable insert for machining the combination aluminium-sintered steel

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DRILLING

Introduction

Drilling using solid carbide

Drilling using replaceable head system

Technical appendix

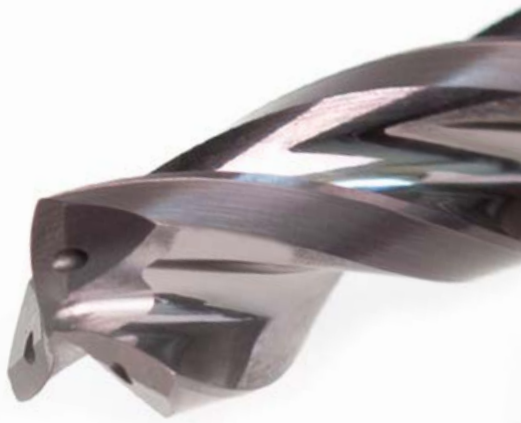
PRODUCT OVERVIEW

Drilling using solid carbide and replaceable head system

MAPAL 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 and NC pilot drills that are specially matched to steel machining.

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

Tritan-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:
3xD 5xD 8xD 12xD

P M K

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Tritan-Spot-Drill-Steel

Optimal centring properties thanks to three cutting edges and pronounced drill tip. Perfectly suited to piloting for triple edge drills.

ø range: 4.00 - 20.00 mm

P M K

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Drilling using replaceable head drill

MEGA-Speed-Drill-Steel

Three guiding chamfers for high performance and process reliability.

Expert LINE

ø range: 13.00 - 20.00 mm
Drilling depth:
5xD

P M K

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Replaceable head drill TTD-Tritan

First triple edge replaceable head drill available as standard.

Performance LINE

ø range: 12.00 - 32.40 mm
Drilling depth:
3xD 5xD

P K

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Article overview solid carbide and replaceable head drills | Designation key

Machining groups	Tritan-Drill-Steel	MEGA-Speed-Drill-Steel	Tritan-Spot-Drill-Steel	Replaceable head drill TTD-Tritan-Uni
P	★	★	★	★
M	⬓	⬓	⬓	
K	⬓	⬓	⬓	⬓

★ 1st choice ⬓ suitable in some situations

Solid carbide drills

S	C	D	6	2	1	-	1	0	0	0	-	2	-	3	-

- SCD: Drill type (SCD: Solid carbide drills)
- 62: Series
- 1: Coolant supply (0 = external coolant supply, 1 = Internal coolant supply)
- 1000: Diameter in 0.01 mm
- 2: Number of cutting edges
- 3: Number of guiding chamfers

Changing system TTD-Tritan

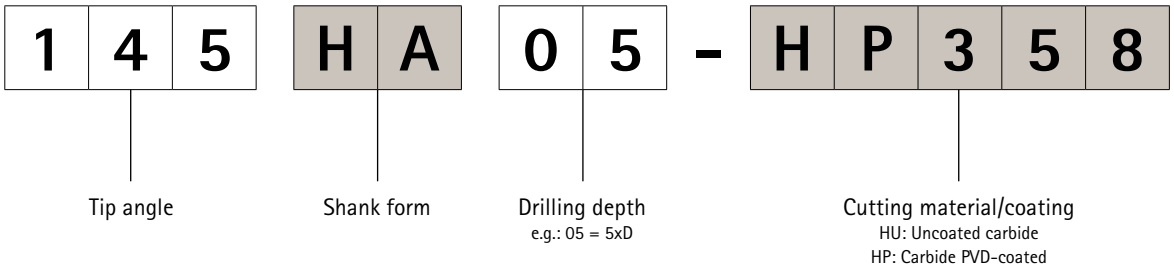
T	T	D	3	0	0	-	3	F	0	1	-

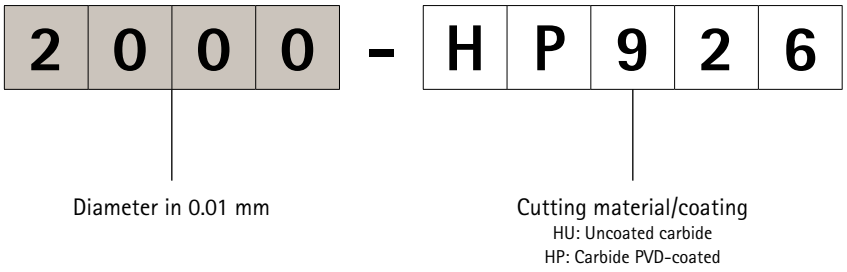
- TTD300: Series (TTD: Replaceable head drills)
- 3F: Number of guiding chamfers
- 01: Type

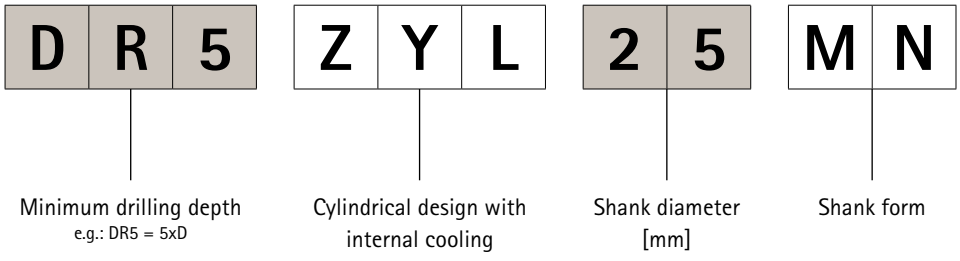
Holder range TTS for TTD-Tritan

T	T	S	3	0	0	B	-	2	2	5	0	-

- TTS300: Holder system
- B: Fastening side (B = from rear)
- 2250: Diameter range (e.g.: 2250 = 22.50 - 23.49 mm)


1 4 5
H A
0 5
-
H P 3 5 8
Tip angle
Shank form
Drilling depth
e.g.: 05 = 5xD
Cutting material/coating
HU: Uncoated carbide
HP: Carbide PVD-coated


2 0 0 0
-
H P 9 2 6
Diameter in 0.01 mm
Cutting material/coating
HU: Uncoated carbide
HP: Carbide PVD-coated

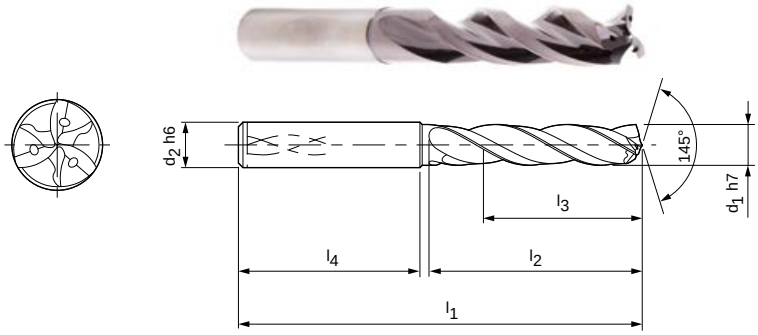

D R 5
Z Y L
2 5
M N
Minimum drilling depth
e.g.: DR5 = 5xD
Cylindrical design with internal cooling
Shank diameter [mm]
Shank form

Tritan-Drill-Steel

Solid carbide twist drill
SCD66 (3xD), internal coolant supply

Design:

Drill diameter:	4.00 – 20.00 mm
Bore tolerance:	≥ IT 9
Cutting material:	HP358
Number of cutting edges:	3
Number of guiding chamfers:	3
Tip angle:	145°
Helix angle:	30°



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

Dimensions						Shank form HA	
d_1 h7	d_2 h6	l_1	l_2	l_3	l_4	Specification	Order No.
4,00	6	66	24	17	36	SCD661-0400-3-3-145HA03-HP358	30902036
4,10	6	66	24	17	36	SCD661-0410-3-3-145HA03-HP358	30902037
4,20	6	66	24	17	36	SCD661-0420-3-3-145HA03-HP358	30902038
4,30	6	66	24	17	36	SCD661-0430-3-3-145HA03-HP358	30902039
4,40	6	66	24	17	36	SCD661-0440-3-3-145HA03-HP358	30902040
4,50	6	66	24	17	36	SCD661-0450-3-3-145HA03-HP358	30902041
4,60	6	66	24	17	36	SCD661-0460-3-3-145HA03-HP358	30902042
4,65	6	66	24	17	36	SCD661-0465-3-3-145HA03-HP358	30902043
4,70	6	66	24	17	36	SCD661-0470-3-3-145HA03-HP358	30902044
4,80	6	66	28	20	36	SCD661-0480-3-3-145HA03-HP358	30902045
4,90	6	66	28	20	36	SCD661-0490-3-3-145HA03-HP358	30902046
5,00	6	66	28	20	36	SCD661-0500-3-3-145HA03-HP358	30902047
5,10	6	66	28	20	36	SCD661-0510-3-3-145HA03-HP358	30902048
5,20	6	66	28	20	36	SCD661-0520-3-3-145HA03-HP358	30902049
5,30	6	66	28	20	36	SCD661-0530-3-3-145HA03-HP358	30902050
5,40	6	66	28	20	36	SCD661-0540-3-3-145HA03-HP358	30902051
5,50	6	66	28	20	36	SCD661-0550-3-3-145HA03-HP358	30902052
5,55	6	66	28	20	36	SCD661-0555-3-3-145HA03-HP358	30902053
5,60	6	66	28	20	36	SCD661-0560-3-3-145HA03-HP358	30902054
5,70	6	66	28	20	36	SCD661-0570-3-3-145HA03-HP358	30902055
5,80	6	66	28	20	36	SCD661-0580-3-3-145HA03-HP358	30902056
5,90	6	66	28	20	36	SCD661-0590-3-3-145HA03-HP358	30902057
6,00	6	66	28	20	36	SCD661-0600-3-3-145HA03-HP358	30902058
6,10	8	79	34	24	36	SCD661-0610-3-3-145HA03-HP358	30902059
6,20	8	79	34	24	36	SCD661-0620-3-3-145HA03-HP358	30902060
6,30	8	79	34	24	36	SCD661-0630-3-3-145HA03-HP358	30902061
6,40	8	79	34	24	36	SCD661-0640-3-3-145HA03-HP358	30902062
6,50	8	79	34	24	36	SCD661-0650-3-3-145HA03-HP358	30902063
6,60	8	79	34	24	36	SCD661-0660-3-3-145HA03-HP358	30902064
6,70	8	79	34	24	36	SCD661-0670-3-3-145HA03-HP358	30902065
6,80	8	79	34	24	36	SCD661-0680-3-3-145HA03-HP358	30902066
6,90	8	79	34	24	36	SCD661-0690-3-3-145HA03-HP358	30902067
7,00	8	79	34	24	36	SCD661-0700-3-3-145HA03-HP358	30902068
7,10	8	79	41	29	36	SCD661-0710-3-3-145HA03-HP358	30902069
7,20	8	79	41	29	36	SCD661-0720-3-3-145HA03-HP358	30902070
7,30	8	79	41	29	36	SCD661-0730-3-3-145HA03-HP358	30902071

Tritan-Drill-Steel | Solid carbide twist drills SCD66 (3xD), internal coolant supply

Dimensions						Shank form HA	
d_1 h7	d_2 h6	l_1	l_2	l_3	l_4	Specification	Order No.
7,40	8	79	41	29	36	SCD661-0740-3-3-145HA03-HP358	30902072
7,45	8	79	41	29	36	SCD661-0745-3-3-145HA03-HP358	30902073
7,50	8	79	41	29	36	SCD661-0750-3-3-145HA03-HP358	30902074
7,60	8	79	41	29	36	SCD661-0760-3-3-145HA03-HP358	30902075
7,70	8	79	41	29	36	SCD661-0770-3-3-145HA03-HP358	30902076
7,80	8	79	41	29	36	SCD661-0780-3-3-145HA03-HP358	30902077
7,90	8	79	41	29	36	SCD661-0790-3-3-145HA03-HP358	30902078
8,00	8	79	41	29	36	SCD661-0800-3-3-145HA03-HP358	30902079
8,10	10	89	47	35	40	SCD661-0810-3-3-145HA03-HP358	30902080
8,20	10	89	47	35	40	SCD661-0820-3-3-145HA03-HP358	30902081
8,30	10	89	47	35	40	SCD661-0830-3-3-145HA03-HP358	30902082
8,40	10	89	47	35	40	SCD661-0840-3-3-145HA03-HP358	30902083
8,50	10	89	47	35	40	SCD661-0850-3-3-145HA03-HP358	30902084
8,60	10	89	47	35	40	SCD661-0860-3-3-145HA03-HP358	30902085
8,70	10	89	47	35	40	SCD661-0870-3-3-145HA03-HP358	30902086
8,80	10	89	47	35	40	SCD661-0880-3-3-145HA03-HP358	30902087
8,90	10	89	47	35	40	SCD661-0890-3-3-145HA03-HP358	30902088
9,00	10	89	47	35	40	SCD661-0900-3-3-145HA03-HP358	30902089
9,10	10	89	47	35	40	SCD661-0910-3-3-145HA03-HP358	30902090
9,20	10	89	47	35	40	SCD661-0920-3-3-145HA03-HP358	30902091
9,30	10	89	47	35	40	SCD661-0930-3-3-145HA03-HP358	30902092
9,40	10	89	47	35	40	SCD661-0940-3-3-145HA03-HP358	30902093
9,50	10	89	47	35	40	SCD661-0950-3-3-145HA03-HP358	30902094
9,60	10	89	47	35	40	SCD661-0960-3-3-145HA03-HP358	30902095
9,70	10	89	47	35	40	SCD661-0970-3-3-145HA03-HP358	30902096
9,80	10	89	47	35	40	SCD661-0980-3-3-145HA03-HP358	30902097
9,90	10	89	47	35	40	SCD661-0990-3-3-145HA03-HP358	30902098
10,00	10	89	47	35	40	SCD661-1000-3-3-145HA03-HP358	30902099
10,10	12	102	55	40	45	SCD661-1010-3-3-145HA03-HP358	30902100
10,20	12	102	55	40	45	SCD661-1020-3-3-145HA03-HP358	30902101
10,30	12	102	55	40	45	SCD661-1030-3-3-145HA03-HP358	30902102
10,40	12	102	55	40	45	SCD661-1040-3-3-145HA03-HP358	30902103
10,50	12	102	55	40	45	SCD661-1050-3-3-145HA03-HP358	30902104
10,60	12	102	55	40	45	SCD661-1060-3-3-145HA03-HP358	30902105
10,70	12	102	55	40	45	SCD661-1070-3-3-145HA03-HP358	30902106
10,80	12	102	55	40	45	SCD661-1080-3-3-145HA03-HP358	30902107
10,90	12	102	55	40	45	SCD661-1090-3-3-145HA03-HP358	30902108
11,00	12	102	55	40	45	SCD661-1100-3-3-145HA03-HP358	30902109
11,10	12	102	55	40	45	SCD661-1110-3-3-145HA03-HP358	30902110
11,20	12	102	55	40	45	SCD661-1120-3-3-145HA03-HP358	30902111
11,30	12	102	55	40	45	SCD661-1130-3-3-145HA03-HP358	30902112
11,40	12	102	55	40	45	SCD661-1140-3-3-145HA03-HP358	30902113
11,50	12	102	55	40	45	SCD661-1150-3-3-145HA03-HP358	30902114
11,60	12	102	55	40	45	SCD661-1160-3-3-145HA03-HP358	30902115
11,70	12	102	55	40	45	SCD661-1170-3-3-145HA03-HP358	30902116
11,80	12	102	55	40	45	SCD661-1180-3-3-145HA03-HP358	30902117
11,90	12	102	55	40	45	SCD661-1190-3-3-145HA03-HP358	30902118
12,00	12	102	55	40	45	SCD661-1200-3-3-145HA03-HP358	30902119
12,20	14	107	60	43	45	SCD661-1220-3-3-145HA03-HP358	30902120
12,50	14	107	60	43	45	SCD661-1250-3-3-145HA03-HP358	30902121
12,80	14	107	60	43	45	SCD661-1280-3-3-145HA03-HP358	30902122
13,00	14	107	60	43	45	SCD661-1300-3-3-145HA03-HP358	30902123
13,20	14	107	60	43	45	SCD661-1320-3-3-145HA03-HP358	30902124
13,50	14	107	60	43	45	SCD661-1350-3-3-145HA03-HP358	30902125
13,80	14	107	60	43	45	SCD661-1380-3-3-145HA03-HP358	30902126
14,00	14	107	60	43	45	SCD661-1400-3-3-145HA03-HP358	30902127
14,20	16	115	65	45	48	SCD661-1420-3-3-145HA03-HP358	30902128

Continued on next page.

Tritan-Drill-Steel | Solid carbide twist drills SCD66 (3xD), internal coolant supply

Dimensions						Shank form HA	
d_1 h7	d_2 h6	l_1	l_2	l_3	l_4	Specification	Order No.
14,50	16	115	65	45	48	SCD661-1450-3-3-145HA03-HP358	30902129
14,80	16	115	65	45	48	SCD661-1480-3-3-145HA03-HP358	30902130
15,00	16	115	65	45	48	SCD661-1500-3-3-145HA03-HP358	30902131
15,20	16	115	65	45	48	SCD661-1520-3-3-145HA03-HP358	30902132
15,50	16	115	65	45	48	SCD661-1550-3-3-145HA03-HP358	30902133
15,80	16	115	65	45	48	SCD661-1580-3-3-145HA03-HP358	30902134
16,00	16	115	65	45	48	SCD661-1600-3-3-145HA03-HP358	30902135
16,20	18	123	73	51	48	SCD661-1620-3-3-145HA03-HP358	30902136
16,50	18	123	73	51	48	SCD661-1650-3-3-145HA03-HP358	30902137
16,80	18	123	73	51	48	SCD661-1680-3-3-145HA03-HP358	30902138
17,00	18	123	73	51	48	SCD661-1700-3-3-145HA03-HP358	30902139
17,20	18	123	73	51	48	SCD661-1720-3-3-145HA03-HP358	30902140
17,50	18	123	73	51	48	SCD661-1750-3-3-145HA03-HP358	30902141
17,80	18	123	73	51	48	SCD661-1780-3-3-145HA03-HP358	30902142
18,00	18	123	73	51	48	SCD661-1800-3-3-145HA03-HP358	30902143
18,20	20	131	79	55	50	SCD661-1820-3-3-145HA03-HP358	30902144
18,50	20	131	79	55	50	SCD661-1850-3-3-145HA03-HP358	30902145
18,80	20	131	79	55	50	SCD661-1880-3-3-145HA03-HP358	30902146
19,00	20	131	79	55	50	SCD661-1900-3-3-145HA03-HP358	30902147
19,20	20	131	79	55	50	SCD661-1920-3-3-145HA03-HP358	30902148
19,50	20	131	79	55	50	SCD661-1950-3-3-145HA03-HP358	30902149
19,80	20	131	79	55	50	SCD661-1980-3-3-145HA03-HP358	30902150
20,00	20	131	79	55	50	SCD661-2000-3-3-145HA03-HP358	30902151

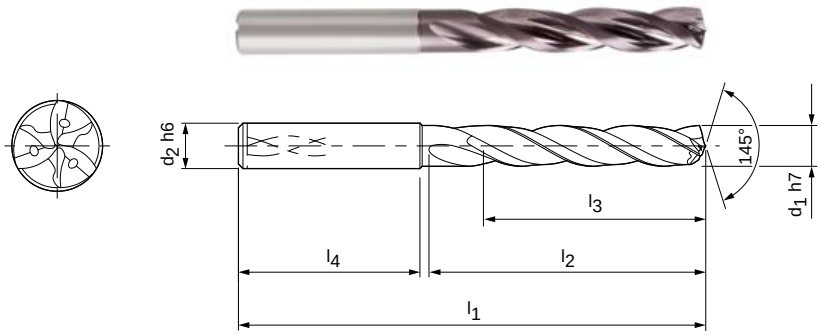
Dimensions in mm.
For cutting data recommendation, see end of section.
Special designs and other coatings on request.

Tritan-Drill-Steel

Solid carbide twist drill
SCD66 (5xD), internal coolant supply

Design:

Drill diameter:	4.00 – 20.00 mm
Bore tolerance:	≥ IT 9
Cutting material:	HP358
Number of cutting edges:	3
Number of guiding chamfers:	3
Tip angle:	145°
Helix angle:	30°



Dimensions						Shank form HA	
d_1 h7	d_2 h6	l_1	l_2	l_3	l_4	Specification	Order No.
4,00	6	74	36	29	36	SCD661-0400-3-3-145HA05-HP358	30902152
4,10	6	74	36	29	36	SCD661-0410-3-3-145HA05-HP358	30902153
4,20	6	74	36	29	36	SCD661-0420-3-3-145HA05-HP358	30902154
4,30	6	74	36	29	36	SCD661-0430-3-3-145HA05-HP358	30902155
4,40	6	74	36	29	36	SCD661-0440-3-3-145HA05-HP358	30902156
4,50	6	74	36	29	36	SCD661-0450-3-3-145HA05-HP358	30902157
4,60	6	74	36	29	36	SCD661-0460-3-3-145HA05-HP358	30902158
4,65	6	74	36	29	36	SCD661-0465-3-3-145HA05-HP358	30902159
4,70	6	74	36	29	36	SCD661-0470-3-3-145HA05-HP358	30902160
4,80	6	82	44	35	36	SCD661-0480-3-3-145HA05-HP358	30902161
4,90	6	82	44	35	36	SCD661-0490-3-3-145HA05-HP358	30902162
5,00	6	82	44	35	36	SCD661-0500-3-3-145HA05-HP358	30902163
5,10	6	82	44	35	36	SCD661-0510-3-3-145HA05-HP358	30902164
5,20	6	82	44	35	36	SCD661-0520-3-3-145HA05-HP358	30902165
5,30	6	82	44	35	36	SCD661-0530-3-3-145HA05-HP358	30902166
5,40	6	82	44	35	36	SCD661-0540-3-3-145HA05-HP358	30902167
5,50	6	82	44	35	36	SCD661-0550-3-3-145HA05-HP358	30902168
5,55	6	82	44	35	36	SCD661-0555-3-3-145HA05-HP358	30902169
5,60	6	82	44	35	36	SCD661-0560-3-3-145HA05-HP358	30902170
5,70	6	82	44	35	36	SCD661-0570-3-3-145HA05-HP358	30902171
5,80	6	82	44	35	36	SCD661-0580-3-3-145HA05-HP358	30902172
5,90	6	82	44	35	36	SCD661-0590-3-3-145HA05-HP358	30902173
6,00	6	82	44	35	36	SCD661-0600-3-3-145HA05-HP358	30902174
6,10	8	91	53	43	36	SCD661-0610-3-3-145HA05-HP358	30902175
6,20	8	91	53	43	36	SCD661-0620-3-3-145HA05-HP358	30902176
6,30	8	91	53	43	36	SCD661-0630-3-3-145HA05-HP358	30902177
6,40	8	91	53	43	36	SCD661-0640-3-3-145HA05-HP358	30902178
6,50	8	91	53	43	36	SCD661-0650-3-3-145HA05-HP358	30902179
6,60	8	91	53	43	36	SCD661-0660-3-3-145HA05-HP358	30902180
6,70	8	91	53	43	36	SCD661-0670-3-3-145HA05-HP358	30902181
6,80	8	91	53	43	36	SCD661-0680-3-3-145HA05-HP358	30902182
6,90	8	91	53	43	36	SCD661-0690-3-3-145HA05-HP358	30902183
7,00	8	91	53	43	36	SCD661-0700-3-3-145HA05-HP358	30902184
7,10	8	91	53	43	36	SCD661-0710-3-3-145HA05-HP358	30902185
7,20	8	91	53	43	36	SCD661-0720-3-3-145HA05-HP358	30902186
7,30	8	91	53	43	36	SCD661-0730-3-3-145HA05-HP358	30902187

Continued on next page.

Tritan-Drill-Steel | Solid carbide twist drills SCD66 (5xD), internal coolant supply

Dimensions						Shank form HA	
d_1 h7	d_2 h6	l_1	l_2	l_3	l_4	Specification	Order No.
7,40	8	91	53	43	36	SCD661-0740-3-3-145HA05-HP358	30902188
7,45	8	91	53	43	36	SCD661-0745-3-3-145HA05-HP358	30902189
7,50	8	91	53	43	36	SCD661-0750-3-3-145HA05-HP358	30902190
7,60	8	91	53	43	36	SCD661-0760-3-3-145HA05-HP358	30902191
7,70	8	91	53	43	36	SCD661-0770-3-3-145HA05-HP358	30902192
7,80	8	91	53	43	36	SCD661-0780-3-3-145HA05-HP358	30902193
7,90	8	91	53	43	36	SCD661-0790-3-3-145HA05-HP358	30902194
8,00	8	91	53	43	36	SCD661-0800-3-3-145HA05-HP358	30902195
8,10	10	103	61	49	40	SCD661-0810-3-3-145HA05-HP358	30902196
8,20	10	103	61	49	40	SCD661-0820-3-3-145HA05-HP358	30902197
8,30	10	103	61	49	40	SCD661-0830-3-3-145HA05-HP358	30902198
8,40	10	103	61	49	40	SCD661-0840-3-3-145HA05-HP358	30902199
8,50	10	103	61	49	40	SCD661-0850-3-3-145HA05-HP358	30902200
8,60	10	103	61	49	40	SCD661-0860-3-3-145HA05-HP358	30902201
8,70	10	103	61	49	40	SCD661-0870-3-3-145HA05-HP358	30902202
8,80	10	103	61	49	40	SCD661-0880-3-3-145HA05-HP358	30902203
8,90	10	103	61	49	40	SCD661-0890-3-3-145HA05-HP358	30902204
9,00	10	103	61	49	40	SCD661-0900-3-3-145HA05-HP358	30902205
9,10	10	103	61	49	40	SCD661-0910-3-3-145HA05-HP358	30902206
9,20	10	103	61	49	40	SCD661-0920-3-3-145HA05-HP358	30902207
9,30	10	103	61	49	40	SCD661-0930-3-3-145HA05-HP358	30902208
9,35	10	103	61	49	40	SCD661-0935-3-3-145HA05-HP358	30902209
9,40	10	103	61	49	40	SCD661-0940-3-3-145HA05-HP358	30902210
9,50	10	103	61	49	40	SCD661-0950-3-3-145HA05-HP358	30902211
9,55	10	103	61	49	40	SCD661-0955-3-3-145HA05-HP358	30902212
9,60	10	103	61	49	40	SCD661-0960-3-3-145HA05-HP358	30902213
9,70	10	103	61	49	40	SCD661-0970-3-3-145HA05-HP358	30902214
9,80	10	103	61	49	40	SCD661-0980-3-3-145HA05-HP358	30902215
9,90	10	103	61	49	40	SCD661-0990-3-3-145HA05-HP358	30902216
10,00	10	103	61	49	40	SCD661-1000-3-3-145HA05-HP358	30902217
10,10	12	118	71	56	45	SCD661-1010-3-3-145HA05-HP358	30902218
10,20	12	118	71	56	45	SCD661-1020-3-3-145HA05-HP358	30902219
10,30	12	118	71	56	45	SCD661-1030-3-3-145HA05-HP358	30902220
10,40	12	118	71	56	45	SCD661-1040-3-3-145HA05-HP358	30902221
10,50	12	118	71	56	45	SCD661-1050-3-3-145HA05-HP358	30902222
10,60	12	118	71	56	45	SCD661-1060-3-3-145HA05-HP358	30902223
10,70	12	118	71	56	45	SCD661-1070-3-3-145HA05-HP358	30902224
10,80	12	118	71	56	45	SCD661-1080-3-3-145HA05-HP358	30902225
10,90	12	118	71	56	45	SCD661-1090-3-3-145HA05-HP358	30902226
11,00	12	118	71	56	45	SCD661-1100-3-3-145HA05-HP358	30902227
11,10	12	118	71	56	45	SCD661-1110-3-3-145HA05-HP358	30902228
11,20	12	118	71	56	45	SCD661-1120-3-3-145HA05-HP358	30902229
11,30	12	118	71	56	45	SCD661-1130-3-3-145HA05-HP358	30902230
11,40	12	118	71	56	45	SCD661-1140-3-3-145HA05-HP358	30902231
11,50	12	118	71	56	45	SCD661-1150-3-3-145HA05-HP358	30902232
11,60	12	118	71	56	45	SCD661-1160-3-3-145HA05-HP358	30902233
11,70	12	118	71	56	45	SCD661-1170-3-3-145HA05-HP358	30902234
11,80	12	118	71	56	45	SCD661-1180-3-3-145HA05-HP358	30902235
11,90	12	118	71	56	45	SCD661-1190-3-3-145HA05-HP358	30902236
12,00	12	118	71	56	45	SCD661-1200-3-3-145HA05-HP358	30902237
12,20	14	124	77	60	45	SCD661-1220-3-3-145HA05-HP358	30902238
12,50	14	124	77	60	45	SCD661-1250-3-3-145HA05-HP358	30902239
12,80	14	124	77	60	45	SCD661-1280-3-3-145HA05-HP358	30902240
13,00	14	124	77	60	45	SCD661-1300-3-3-145HA05-HP358	30902241
13,20	14	124	77	60	45	SCD661-1320-3-3-145HA05-HP358	30902242
13,50	14	124	77	60	45	SCD661-1350-3-3-145HA05-HP358	30902243
13,80	14	124	77	60	45	SCD661-1380-3-3-145HA05-HP358	30902244

Tritan-Drill-Steel | Solid carbide twist drills SCD66 (5xD), internal coolant supply

Dimensions						Shank form HA	
d_1 h7	d_2 h6	l_1	l_2	l_3	l_4	Specification	Order No.
14,00	14	124	77	60	45	SCD661-1400-3-3-145HA05-HP358	30902245
14,20	16	133	83	63	48	SCD661-1420-3-3-145HA05-HP358	30902246
14,50	16	133	83	63	48	SCD661-1450-3-3-145HA05-HP358	30902247
14,80	16	133	83	63	48	SCD661-1480-3-3-145HA05-HP358	30902248
15,00	16	133	83	63	48	SCD661-1500-3-3-145HA05-HP358	30902249
15,10	16	133	83	63	48	SCD661-1510-3-3-145HA05-HP358	30902250
15,20	16	133	83	63	48	SCD661-1520-3-3-145HA05-HP358	30902251
15,25	16	133	83	63	48	SCD661-1525-3-3-145HA05-HP358	30902252
15,50	16	133	83	63	48	SCD661-1550-3-3-145HA05-HP358	30902253
15,80	16	133	83	63	48	SCD661-1580-3-3-145HA05-HP358	30902254
16,00	16	133	83	63	48	SCD661-1600-3-3-145HA05-HP358	30902255
16,20	18	143	93	71	48	SCD661-1620-3-3-145HA05-HP358	30902256
16,50	18	143	93	71	48	SCD661-1650-3-3-145HA05-HP358	30902257
16,80	18	143	93	71	48	SCD661-1680-3-3-145HA05-HP358	30902258
17,00	18	143	93	71	48	SCD661-1700-3-3-145HA05-HP358	30902259
17,20	18	143	93	71	48	SCD661-1720-3-3-145HA05-HP358	30902260
17,50	18	143	93	71	48	SCD661-1750-3-3-145HA05-HP358	30902261
17,80	18	143	93	71	48	SCD661-1780-3-3-145HA05-HP358	30902262
18,00	18	143	93	71	48	SCD661-1800-3-3-145HA05-HP358	30902263
18,20	20	153	101	77	50	SCD661-1820-3-3-145HA05-HP358	30902264
18,50	20	153	101	77	50	SCD661-1850-3-3-145HA05-HP358	30902265
18,80	20	153	101	77	50	SCD661-1880-3-3-145HA05-HP358	30902266
19,00	20	153	101	77	50	SCD661-1900-3-3-145HA05-HP358	30902267
19,20	20	153	101	77	50	SCD661-1920-3-3-145HA05-HP358	30902268
19,50	20	153	101	77	50	SCD661-1950-3-3-145HA05-HP358	30902269
19,80	20	153	101	77	50	SCD661-1980-3-3-145HA05-HP358	30902270
20,00	20	153	101	77	50	SCD661-2000-3-3-145HA05-HP358	30902271

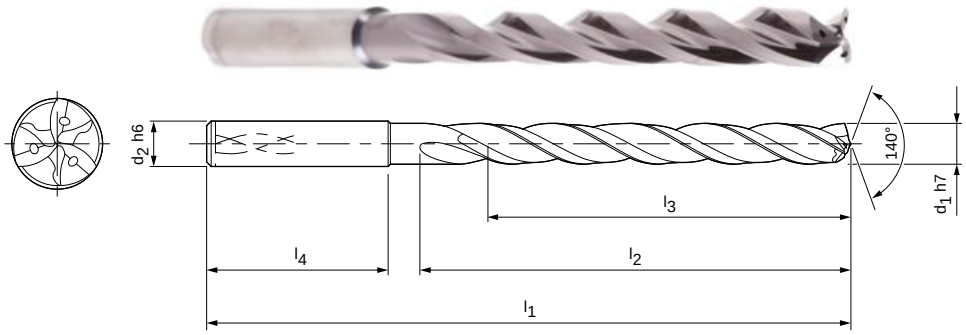
Dimensions in mm.
For cutting data recommendation, see end of section.
Special designs and other coatings on request.

Tritan-Drill-Steel

Solid carbide twist drill
SCD66 (8xD), internal coolant supply

Design:

Drill diameter:	4.00 – 20.00 mm
Bore tolerance:	≥ IT 9
Cutting material:	HP358
Number of cutting edges:	3
Number of guiding chamfers:	3
Tip angle:	140°
Helix angle:	30°



Dimensions						Shank form HA	
d_1 h7	d_2 h6	l_1	l_2	l_3	l_4	Specification	Order No.
4,00	6	81	43	36	36	SCD661-0400-3-3-140HA08-HP358	30902272
4,10	6	81	43	36	36	SCD661-0410-3-3-140HA08-HP358	30902273
4,20	6	81	43	36	36	SCD661-0420-3-3-140HA08-HP358	30902274
4,30	6	81	43	36	36	SCD661-0430-3-3-140HA08-HP358	30902275
4,40	6	81	43	36	36	SCD661-0440-3-3-140HA08-HP358	30902276
4,50	6	81	43	36	36	SCD661-0450-3-3-140HA08-HP358	30902277
4,60	6	81	43	36	36	SCD661-0460-3-3-140HA08-HP358	30902278
4,70	6	81	43	36	36	SCD661-0470-3-3-140HA08-HP358	30902279
4,80	6	95	57	48	36	SCD661-0480-3-3-140HA08-HP358	30902280
4,90	6	95	57	48	36	SCD661-0490-3-3-140HA08-HP358	30902281
5,00	6	95	57	48	36	SCD661-0500-3-3-140HA08-HP358	30902282
5,10	6	95	57	48	36	SCD661-0510-3-3-140HA08-HP358	30902283
5,20	6	95	57	48	36	SCD661-0520-3-3-140HA08-HP358	30902284
5,30	6	95	57	48	36	SCD661-0530-3-3-140HA08-HP358	30902285
5,40	6	95	57	48	36	SCD661-0540-3-3-140HA08-HP358	30902286
5,50	6	95	57	48	36	SCD661-0550-3-3-140HA08-HP358	30902287
5,60	6	95	57	48	36	SCD661-0560-3-3-140HA08-HP358	30902288
5,70	6	95	57	48	36	SCD661-0570-3-3-140HA08-HP358	30902289
5,80	6	95	57	48	36	SCD661-0580-3-3-140HA08-HP358	30902290
5,90	6	95	57	48	36	SCD661-0590-3-3-140HA08-HP358	30902291
6,00	6	95	57	48	36	SCD661-0600-3-3-140HA08-HP358	30902292
6,10	8	114	76	64	36	SCD661-0610-3-3-140HA08-HP358	30902293
6,20	8	114	76	64	36	SCD661-0620-3-3-140HA08-HP358	30902294
6,30	8	114	76	64	36	SCD661-0630-3-3-140HA08-HP358	30902295
6,40	8	114	76	64	36	SCD661-0640-3-3-140HA08-HP358	30902296
6,50	8	114	76	64	36	SCD661-0650-3-3-140HA08-HP358	30902297
6,60	8	114	76	64	36	SCD661-0660-3-3-140HA08-HP358	30902298
6,70	8	114	76	64	36	SCD661-0670-3-3-140HA08-HP358	30902299
6,80	8	114	76	64	36	SCD661-0680-3-3-140HA08-HP358	30902300
6,90	8	114	76	64	36	SCD661-0690-3-3-140HA08-HP358	30902301
7,00	8	114	76	64	36	SCD661-0700-3-3-140HA08-HP358	30902302
7,10	8	114	76	64	36	SCD661-0710-3-3-140HA08-HP358	30902303
7,20	8	114	76	64	36	SCD661-0720-3-3-140HA08-HP358	30902304
7,30	8	114	76	64	36	SCD661-0730-3-3-140HA08-HP358	30902305
7,40	8	114	76	64	36	SCD661-0740-3-3-140HA08-HP358	30902306
7,50	8	114	76	64	36	SCD661-0750-3-3-140HA08-HP358	30902307

Tritan-Drill-Steel | Solid carbide twist drills SCD66 (8xD), internal coolant supply

Dimensions						Shank form HA	
d_1 h7	d_2 h6	l_1	l_2	l_3	l_4	Specification	Order No.
7,60	8	114	76	64	36	SCD661-0760-3-3-140HA08-HP358	30902308
7,70	8	114	76	64	36	SCD661-0770-3-3-140HA08-HP358	30902309
7,80	8	114	76	64	36	SCD661-0780-3-3-140HA08-HP358	30902310
7,90	8	114	76	64	36	SCD661-0790-3-3-140HA08-HP358	30902311
8,00	8	114	76	64	36	SCD661-0800-3-3-140HA08-HP358	30902312
8,10	10	142	95	80	40	SCD661-0810-3-3-140HA08-HP358	30902313
8,20	10	142	95	80	40	SCD661-0820-3-3-140HA08-HP358	30902314
8,30	10	142	95	80	40	SCD661-0830-3-3-140HA08-HP358	30902315
8,40	10	142	95	80	40	SCD661-0840-3-3-140HA08-HP358	30902316
8,50	10	142	95	80	40	SCD661-0850-3-3-140HA08-HP358	30902317
8,60	10	142	95	80	40	SCD661-0860-3-3-140HA08-HP358	30902318
8,70	10	142	95	80	40	SCD661-0870-3-3-140HA08-HP358	30902319
8,80	10	142	95	80	40	SCD661-0880-3-3-140HA08-HP358	30902320
8,90	10	142	95	80	40	SCD661-0890-3-3-140HA08-HP358	30902321
9,00	10	142	95	80	40	SCD661-0900-3-3-140HA08-HP358	30902322
9,10	10	142	95	80	40	SCD661-0910-3-3-140HA08-HP358	30902323
9,20	10	142	95	80	40	SCD661-0920-3-3-140HA08-HP358	30902324
9,30	10	142	95	80	40	SCD661-0930-3-3-140HA08-HP358	30902325
9,40	10	142	95	80	40	SCD661-0940-3-3-140HA08-HP358	30902326
9,50	10	142	95	80	40	SCD661-0950-3-3-140HA08-HP358	30902327
9,60	10	142	95	80	40	SCD661-0960-3-3-140HA08-HP358	30902328
9,70	10	142	95	80	40	SCD661-0970-3-3-140HA08-HP358	30902329
9,80	10	142	95	80	40	SCD661-0980-3-3-140HA08-HP358	30902330
9,90	10	142	95	80	40	SCD661-0990-3-3-140HA08-HP358	30902331
10,00	10	142	95	80	40	SCD661-1000-3-3-140HA08-HP358	30902332
10,10	12	162	114	96	45	SCD661-1010-3-3-140HA08-HP358	30902333
10,20	12	162	114	96	45	SCD661-1020-3-3-140HA08-HP358	30902334
10,30	12	162	114	96	45	SCD661-1030-3-3-140HA08-HP358	30902335
10,40	12	162	114	96	45	SCD661-1040-3-3-140HA08-HP358	30902336
10,50	12	162	114	96	45	SCD661-1050-3-3-140HA08-HP358	30902337
10,60	12	162	114	96	45	SCD661-1060-3-3-140HA08-HP358	30902338
10,70	12	162	114	96	45	SCD661-1070-3-3-140HA08-HP358	30902339
10,80	12	162	114	96	45	SCD661-1080-3-3-140HA08-HP358	30902340
10,90	12	162	114	96	45	SCD661-1090-3-3-140HA08-HP358	30902341
11,00	12	162	114	96	45	SCD661-1100-3-3-140HA08-HP358	30902342
11,10	12	162	114	96	45	SCD661-1110-3-3-140HA08-HP358	30902343
11,20	12	162	114	96	45	SCD661-1120-3-3-140HA08-HP358	30902344
11,30	12	162	114	96	45	SCD661-1130-3-3-140HA08-HP358	30902345
11,40	12	162	114	96	45	SCD661-1140-3-3-140HA08-HP358	30902346
11,50	12	162	114	96	45	SCD661-1150-3-3-140HA08-HP358	30902347
11,60	12	162	114	96	45	SCD661-1160-3-3-140HA08-HP358	30902348
11,70	12	162	114	96	45	SCD661-1170-3-3-140HA08-HP358	30902349
11,80	12	162	114	96	45	SCD661-1180-3-3-140HA08-HP358	30902350
11,90	12	162	114	96	45	SCD661-1190-3-3-140HA08-HP358	30902351
12,00	12	162	114	96	45	SCD661-1200-3-3-140HA08-HP358	30902352
12,20	14	178	133	112	45	SCD661-1220-3-3-140HA08-HP358	30902353
12,50	14	178	133	112	45	SCD661-1250-3-3-140HA08-HP358	30902354
12,80	14	178	133	112	45	SCD661-1280-3-3-140HA08-HP358	30902355
13,00	14	178	133	112	45	SCD661-1300-3-3-140HA08-HP358	30902356
13,20	14	178	133	112	45	SCD661-1320-3-3-140HA08-HP358	30902357
13,50	14	178	133	112	45	SCD661-1350-3-3-140HA08-HP358	30902358
13,80	14	178	133	112	45	SCD661-1380-3-3-140HA08-HP358	30902359
14,00	14	178	133	112	45	SCD661-1400-3-3-140HA08-HP358	30902360
14,20	16	203	152	128	48	SCD661-1420-3-3-140HA08-HP358	30902361
14,50	16	203	152	128	48	SCD661-1450-3-3-140HA08-HP358	30902362
14,80	16	203	152	128	48	SCD661-1480-3-3-140HA08-HP358	30902363
15,00	16	203	152	128	48	SCD661-1500-3-3-140HA08-HP358	30902364

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Tritan-Drill-Steel | Solid carbide twist drills SCD66 (8xD), internal coolant supply

Dimensions						Shank form HA	
d_1 h7	d_2 h6	l_1	l_2	l_3	l_4	Specification	Order No.
15,20	16	203	152	128	48	SCD661-1520-3-3-140HA08-HP358	30902365
15,50	16	203	152	128	48	SCD661-1550-3-3-140HA08-HP358	30902366
15,80	16	203	152	128	48	SCD661-1580-3-3-140HA08-HP358	30902367
16,00	16	203	152	128	48	SCD661-1600-3-3-140HA08-HP358	30902368
16,20	18	222	171	144	48	SCD661-1620-3-3-140HA08-HP358	30902369
16,50	18	222	171	144	48	SCD661-1650-3-3-140HA08-HP358	30902370
16,80	18	222	171	144	48	SCD661-1680-3-3-140HA08-HP358	30902371
17,00	18	222	171	144	48	SCD661-1700-3-3-140HA08-HP358	30902372
17,20	18	222	171	144	48	SCD661-1720-3-3-140HA08-HP358	30902373
17,50	18	222	171	144	48	SCD661-1750-3-3-140HA08-HP358	30902374
17,80	18	222	171	144	48	SCD661-1780-3-3-140HA08-HP358	30902375
18,00	18	222	171	144	48	SCD661-1800-3-3-140HA08-HP358	30902376
18,20	20	243	190	160	50	SCD661-1820-3-3-140HA08-HP358	30902377
18,50	20	243	190	160	50	SCD661-1850-3-3-140HA08-HP358	30902378
18,80	20	243	190	160	50	SCD661-1880-3-3-140HA08-HP358	30902379
19,00	20	243	190	160	50	SCD661-1900-3-3-140HA08-HP358	30902380
19,20	20	243	190	160	50	SCD661-1920-3-3-140HA08-HP358	30902381
19,50	20	243	190	160	50	SCD661-1950-3-3-140HA08-HP358	30902382
19,80	20	243	190	160	50	SCD661-1980-3-3-140HA08-HP358	30902383
20,00	20	243	190	160	50	SCD661-2000-3-3-140HA08-HP358	30902384

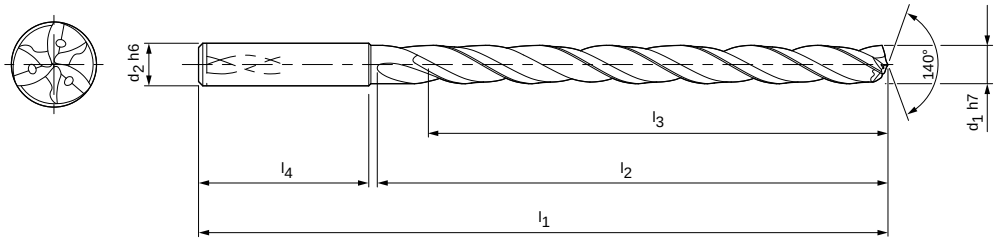
Dimensions in mm.
For cutting data recommendation, see end of section.
Special designs and other coatings on request.

Tritan-Drill-Steel

Solid carbide twist drill
SCD66 (12xD), internal coolant supply

Design:

Drill diameter:	4.00 – 20.00 mm
Bore tolerance:	≥ IT 9
Cutting material:	HP358
Number of cutting edges:	3
Number of guiding chamfers:	3
Tip angle:	140°
Helix angle:	30°



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

Dimensions						Shank form HA	
d_1 h7	d_2 h6	l_1	l_2	l_3	l_4	Specification	Order No.
4,00	6	102	64	58	36	SCD661-0400-3-3-140HA12-HP358	30902385
4,10	6	102	64	58	36	SCD661-0410-3-3-140HA12-HP358	30902386
4,20	6	102	64	58	36	SCD661-0420-3-3-140HA12-HP358	30902387
4,30	6	102	64	58	36	SCD661-0430-3-3-140HA12-HP358	30902388
4,40	6	102	64	58	36	SCD661-0440-3-3-140HA12-HP358	30902389
4,50	6	102	64	58	36	SCD661-0450-3-3-140HA12-HP358	30902390
4,60	6	102	64	58	36	SCD661-0460-3-3-140HA12-HP358	30902391
4,70	6	102	64	58	36	SCD661-0470-3-3-140HA12-HP358	30902392
4,80	6	116	78	70	36	SCD661-0480-3-3-140HA12-HP358	30902393
4,90	6	116	78	70	36	SCD661-0490-3-3-140HA12-HP358	30902394
5,00	6	116	78	70	36	SCD661-0500-3-3-140HA12-HP358	30902395
5,10	6	116	78	70	36	SCD661-0510-3-3-140HA12-HP358	30902396
5,20	6	116	78	70	36	SCD661-0520-3-3-140HA12-HP358	30902397
5,30	6	116	78	70	36	SCD661-0530-3-3-140HA12-HP358	30902398
5,40	6	116	78	70	36	SCD661-0540-3-3-140HA12-HP358	30902399
5,50	6	116	78	70	36	SCD661-0550-3-3-140HA12-HP358	30902400
5,60	6	116	78	70	36	SCD661-0560-3-3-140HA12-HP358	30902401
5,70	6	116	78	70	36	SCD661-0570-3-3-140HA12-HP358	30902402
5,80	6	116	78	70	36	SCD661-0580-3-3-140HA12-HP358	30902403
5,90	6	116	78	70	36	SCD661-0590-3-3-140HA12-HP358	30902404
6,00	6	116	78	70	36	SCD661-0600-3-3-140HA12-HP358	30902405
6,10	8	146	108	94	36	SCD661-0610-3-3-140HA12-HP358	30902406
6,20	8	146	108	94	36	SCD661-0620-3-3-140HA12-HP358	30902407
6,30	8	146	108	94	36	SCD661-0630-3-3-140HA12-HP358	30902408
6,40	8	146	108	94	36	SCD661-0640-3-3-140HA12-HP358	30902409
6,50	8	146	108	94	36	SCD661-0650-3-3-140HA12-HP358	30902410
6,60	8	146	108	94	36	SCD661-0660-3-3-140HA12-HP358	30902411
6,70	8	146	108	94	36	SCD661-0670-3-3-140HA12-HP358	30902412
6,80	8	146	108	94	36	SCD661-0680-3-3-140HA12-HP358	30902413
6,90	8	146	108	94	36	SCD661-0690-3-3-140HA12-HP358	30902414
7,00	8	146	108	94	36	SCD661-0700-3-3-140HA12-HP358	30902415
7,10	8	146	108	94	36	SCD661-0710-3-3-140HA12-HP358	30902416
7,20	8	146	108	94	36	SCD661-0720-3-3-140HA12-HP358	30902417
7,30	8	146	108	94	36	SCD661-0730-3-3-140HA12-HP358	30902418
7,40	8	146	108	94	36	SCD661-0740-3-3-140HA12-HP358	30902419
7,50	8	146	108	94	36	SCD661-0750-3-3-140HA12-HP358	30902420

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Tritan-Drill-Steel | Solid carbide twist drills SCD66 (12xD), internal coolant supply

Dimensions						Shank form HA	
d_1 h7	d_2 h6	l_1	l_2	l_3	l_4	Specification	Order No.
7,60	8	146	108	94	36	SCD661-0760-3-3-140HA12-HP358	30902421
7,70	8	146	108	94	36	SCD661-0770-3-3-140HA12-HP358	30902422
7,80	8	146	108	94	36	SCD661-0780-3-3-140HA12-HP358	30902423
7,90	8	146	108	94	36	SCD661-0790-3-3-140HA12-HP358	30902424
8,00	8	146	108	94	36	SCD661-0800-3-3-140HA12-HP358	30902425
8,10	10	162	120	110	40	SCD661-0810-3-3-140HA12-HP358	30902426
8,20	10	162	120	110	40	SCD661-0820-3-3-140HA12-HP358	30902427
8,30	10	162	120	110	40	SCD661-0830-3-3-140HA12-HP358	30902428
8,40	10	162	120	110	40	SCD661-0840-3-3-140HA12-HP358	30902429
8,50	10	162	120	110	40	SCD661-0850-3-3-140HA12-HP358	30902430
8,60	10	162	120	110	40	SCD661-0860-3-3-140HA12-HP358	30902431
8,70	10	162	120	110	40	SCD661-0870-3-3-140HA12-HP358	30902432
8,80	10	162	120	110	40	SCD661-0880-3-3-140HA12-HP358	30902433
8,90	10	162	120	110	40	SCD661-0890-3-3-140HA12-HP358	30902434
9,00	10	162	120	110	40	SCD661-0900-3-3-140HA12-HP358	30902435
9,10	10	162	120	110	40	SCD661-0910-3-3-140HA12-HP358	30902436
9,20	10	162	120	110	40	SCD661-0920-3-3-140HA12-HP358	30902437
9,30	10	162	120	110	40	SCD661-0930-3-3-140HA12-HP358	30902438
9,40	10	162	120	110	40	SCD661-0940-3-3-140HA12-HP358	30902439
9,50	10	162	120	110	40	SCD661-0950-3-3-140HA12-HP358	30902440
9,60	10	162	120	110	40	SCD661-0960-3-3-140HA12-HP358	30902441
9,70	10	162	120	110	40	SCD661-0970-3-3-140HA12-HP358	30902442
9,80	10	162	120	110	40	SCD661-0980-3-3-140HA12-HP358	30902443
9,90	10	162	120	110	40	SCD661-0990-3-3-140HA12-HP358	30902444
10,00	10	162	120	110	40	SCD661-1000-3-3-140HA12-HP358	30902445
10,10	12	204	156	142	45	SCD661-1010-3-3-140HA12-HP358	30902446
10,20	12	204	156	142	45	SCD661-1020-3-3-140HA12-HP358	30902447
10,30	12	204	156	142	45	SCD661-1030-3-3-140HA12-HP358	30902448
10,40	12	204	156	142	45	SCD661-1040-3-3-140HA12-HP358	30902449
10,50	12	204	156	142	45	SCD661-1050-3-3-140HA12-HP358	30902450
10,60	12	204	156	142	45	SCD661-1060-3-3-140HA12-HP358	30902451
10,70	12	204	156	142	45	SCD661-1070-3-3-140HA12-HP358	30902452
10,80	12	204	156	142	45	SCD661-1080-3-3-140HA12-HP358	30902453
10,90	12	204	156	142	45	SCD661-1090-3-3-140HA12-HP358	30902454
11,00	12	204	156	142	45	SCD661-1100-3-3-140HA12-HP358	30902455
11,10	12	204	156	142	45	SCD661-1110-3-3-140HA12-HP358	30902456
11,20	12	204	156	142	45	SCD661-1120-3-3-140HA12-HP358	30902457
11,30	12	204	156	142	45	SCD661-1130-3-3-140HA12-HP358	30902458
11,40	12	204	156	142	45	SCD661-1140-3-3-140HA12-HP358	30902459
11,50	12	204	156	142	45	SCD661-1150-3-3-140HA12-HP358	30902460
11,60	12	204	156	142	45	SCD661-1160-3-3-140HA12-HP358	30902461
11,70	12	204	156	142	45	SCD661-1170-3-3-140HA12-HP358	30902462
11,80	12	204	156	142	45	SCD661-1180-3-3-140HA12-HP358	30902463
11,90	12	204	156	142	45	SCD661-1190-3-3-140HA12-HP358	30902464
12,00	12	204	156	142	45	SCD661-1200-3-3-140HA12-HP358	30902465
12,20	14	230	182	166	45	SCD661-1220-3-3-140HA12-HP358	30902466
12,50	14	230	182	166	45	SCD661-1250-3-3-140HA12-HP358	30902467
12,80	14	230	182	166	45	SCD661-1280-3-3-140HA12-HP358	30902468
13,00	14	230	182	166	45	SCD661-1300-3-3-140HA12-HP358	30902469
13,20	14	230	182	166	45	SCD661-1320-3-3-140HA12-HP358	30902470
13,50	14	230	182	166	45	SCD661-1350-3-3-140HA12-HP358	30902471
13,80	14	230	182	166	45	SCD661-1380-3-3-140HA12-HP358	30902472
14,00	14	230	182	166	45	SCD661-1400-3-3-140HA12-HP358	30902473
14,20	16	260	208	192	48	SCD661-1420-3-3-140HA12-HP358	30902474
14,50	16	260	208	192	48	SCD661-1450-3-3-140HA12-HP358	30902475
14,80	16	260	208	192	48	SCD661-1480-3-3-140HA12-HP358	30902476
15,00	16	260	208	192	48	SCD661-1500-3-3-140HA12-HP358	30902477

Tritan-Drill-Steel | Solid carbide twist drills SCD66 (12xD), internal coolant supply

Dimensions						Shank form HA	
d_1 h7	d_2 h6	l_1	l_2	l_3	l_4	Specification	Order No.
15,20	16	260	208	192	48	SCD661-1520-3-3-140HA12-HP358	30902478
15,50	16	260	208	192	48	SCD661-1550-3-3-140HA12-HP358	30902479
15,80	16	260	208	192	48	SCD661-1580-3-3-140HA12-HP358	30902480
16,00	16	260	208	192	48	SCD661-1600-3-3-140HA12-HP358	30902481
16,20	18	285	234	216	48	SCD661-1620-3-3-140HA12-HP358	30902482
16,50	18	285	234	216	48	SCD661-1650-3-3-140HA12-HP358	30902483
16,80	18	285	234	216	48	SCD661-1680-3-3-140HA12-HP358	30902484
17,00	18	285	234	216	48	SCD661-1700-3-3-140HA12-HP358	30902485
17,20	18	285	234	216	48	SCD661-1720-3-3-140HA12-HP358	30902486
17,50	18	285	234	216	48	SCD661-1750-3-3-140HA12-HP358	30902487
17,80	18	285	234	216	48	SCD661-1780-3-3-140HA12-HP358	30902488
18,00	18	285	234	216	48	SCD661-1800-3-3-140HA12-HP358	30902489
18,20	20	310	258	240	50	SCD661-1820-3-3-140HA12-HP358	30902490
18,50	20	310	258	240	50	SCD661-1850-3-3-140HA12-HP358	30902491
18,80	20	310	258	240	50	SCD661-1880-3-3-140HA12-HP358	30902492
19,00	20	310	258	240	50	SCD661-1900-3-3-140HA12-HP358	30902493
19,20	20	310	258	240	50	SCD661-1920-3-3-140HA12-HP358	30902494
19,50	20	310	258	240	50	SCD661-1950-3-3-140HA12-HP358	30902495
19,80	20	310	258	240	50	SCD661-1980-3-3-140HA12-HP358	30902496
20,00	20	310	258	240	50	SCD661-2000-3-3-140HA12-HP358	30902497

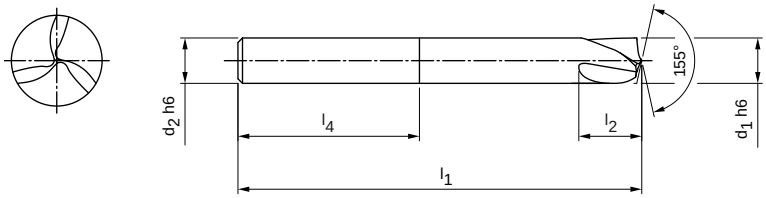
Dimensions in mm.
For cutting data recommendation, see end of section.
Special designs and other coatings on request.

Tritan-Spot-Drill-Steel

Solid carbide NC pilot drills
SCD67, external coolant supply

Design:

Drill diameter:	4.00 – 20.00 mm
Shank form:	HA (DIN 6535)
Cutting material:	HP358
Number of cutting edges:	3
Tip angle:	155°
Note:	Special NC pilot drill for Tritan-Drill



Dimensions					Shank form HA	
d_1 h6	d_2 h6	l_1	l_2	l_4	Specification	Order No.
4,00	4	55	6	28	SCD670-0400-3-0-155HA-HP358	30980587
5,00	6	62	7	36	SCD670-0500-3-0-155HA-HP358	30980588
6,00	6	66	9	36	SCD670-0600-3-0-155HA-HP358	30980589
8,00	8	79	11	36	SCD670-0800-3-0-155HA-HP358	30980590
10,00	10	89	14	40	SCD670-1000-3-0-155HA-HP358	30980592
12,00	12	102	17	45	SCD670-1200-3-0-155HA-HP358	30980594
16,00	16	115	23	48	SCD670-1600-3-0-155HA-HP358	30980595
20,00	20	131	28	50	SCD670-2000-3-0-155HA-HP358	30980596

Pilot drilling depths

d_1 h6	d_2 h6	l_1	l_2	l_4	Maximum pilot drilling depth *		Minimum pilot drilling depth *	
4,00	4	55	6	28	0,40	10 %	0,24	6 %
5,00	6	62	7	36	0,50		0,30	
6,00	6	66	9	36	0,60		0,36	
8,00	8	79	11	36	0,80		0,48	
10,00	10	89	14	40	1,00		0,60	
12,00	12	102	17	45	1,20		0,72	
16,00	16	115	23	48	1,60		0,96	
20,00	20	131	28	50	2,00		1,20	

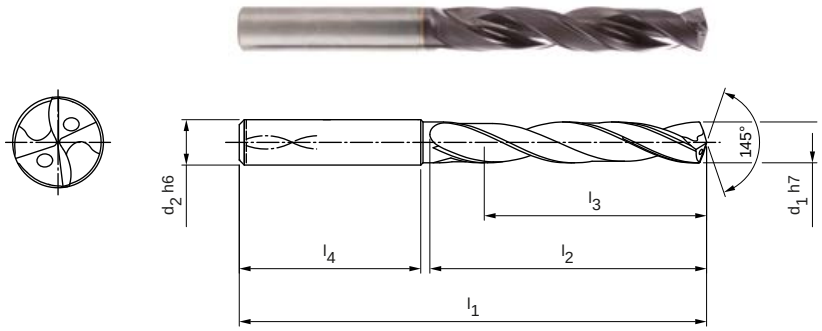
* % of nominal Ø
Dimensions in mm.
For cutting data recommendation, see end of section.
Special designs and other coatings on request.

MEGA-Speed-Drill-Steel

Solid carbide twist drill
SCD62 (5xD), internal coolant supply

Design:

Drill diameter:	3.00 – 20.00 mm
Bore tolerance:	≥ IT 9
Cutting material:	HP358
Number of cutting edges:	2
Number of guiding chamfers:	3
Tip angle:	145°
Helix angle:	30°



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

Dimensions						Shank form HA	
d_1 h7	d_2 h6	l_1	l_2	l_3	l_4	Specification	Order No.
3,00	6	66	28	23	36	SCD621-0300-2-3-145HA05-HP358	30966287
3,10	6	66	28	23	36	SCD621-0310-2-3-145HA05-HP358	30966288
3,20	6	66	28	23	36	SCD621-0320-2-3-145HA05-HP358	30966289
3,30	6	66	28	23	36	SCD621-0330-2-3-145HA05-HP358	30966310
3,40	6	66	28	23	36	SCD621-0340-2-3-145HA05-HP358	30966311
3,50	6	66	28	23	36	SCD621-0350-2-3-145HA05-HP358	30959126
3,60	6	66	28	23	36	SCD621-0360-2-3-145HA05-HP358	30966312
3,70	6	66	28	23	36	SCD621-0370-2-3-145HA05-HP358	30966313
3,80	6	74	36	29	36	SCD621-0380-2-3-145HA05-HP358	30966314
3,90	6	74	36	29	36	SCD621-0390-2-3-145HA05-HP358	30966315
4,00	6	74	36	29	36	SCD621-0400-2-3-145HA05-HP358	30966316
4,10	6	74	36	29	36	SCD621-0410-2-3-145HA05-HP358	30966317
4,20	6	74	36	29	36	SCD621-0420-2-3-145HA05-HP358	30966318
4,30	6	74	36	29	36	SCD621-0430-2-3-145HA05-HP358	30966319
4,40	6	74	36	29	36	SCD621-0440-2-3-145HA05-HP358	30966320
4,50	6	74	36	29	36	SCD621-0450-2-3-145HA05-HP358	30966321
4,60	6	74	36	29	36	SCD621-0460-2-3-145HA05-HP358	30966322
4,70	6	74	36	29	36	SCD621-0470-2-3-145HA05-HP358	30966323
4,80	6	82	44	35	36	SCD621-0480-2-3-145HA05-HP358	30966324
4,90	6	82	44	35	36	SCD621-0490-2-3-145HA05-HP358	30966326
5,00	6	82	44	35	36	SCD621-0500-2-3-145HA05-HP358	30966327
5,10	6	82	44	35	36	SCD621-0510-2-3-145HA05-HP358	30966328
5,20	6	82	44	35	36	SCD621-0520-2-3-145HA05-HP358	30966329
5,30	6	82	44	35	36	SCD621-0530-2-3-145HA05-HP358	30966330
5,40	6	82	44	35	36	SCD621-0540-2-3-145HA05-HP358	30966331
5,50	6	82	44	35	36	SCD621-0550-2-3-145HA05-HP358	30966332
5,60	6	82	44	35	36	SCD621-0560-2-3-145HA05-HP358	30966333
5,70	6	82	44	35	36	SCD621-0570-2-3-145HA05-HP358	30966334
5,80	6	82	44	35	36	SCD621-0580-2-3-145HA05-HP358	30966335
5,90	6	82	44	35	36	SCD621-0590-2-3-145HA05-HP358	30966336
6,00	6	82	44	35	36	SCD621-0600-2-3-145HA05-HP358	30966337
6,10	8	91	53	43	36	SCD621-0610-2-3-145HA05-HP358	30966338
6,20	8	91	53	43	36	SCD621-0620-2-3-145HA05-HP358	30966339
6,30	8	91	53	43	36	SCD621-0630-2-3-145HA05-HP358	30966340
6,40	8	91	53	43	36	SCD621-0640-2-3-145HA05-HP358	30966341
6,50	8	91	53	43	36	SCD621-0650-2-3-145HA05-HP358	30966342

Continued on next page.

MEGA-Speed-Drill-Steel | Solid carbide twist drills SCD62 (5xD), internal coolant supply

Dimensions						Shank form HA	
d_1 h7	d_2 h6	l_1	l_2	l_3	l_4	Specification	Order No.
6,60	8	91	53	43	36	SCD621-0660-2-3-145HA05-HP358	30966343
6,70	8	91	53	43	36	SCD621-0670-2-3-145HA05-HP358	30966344
6,80	8	91	53	43	36	SCD621-0680-2-3-145HA05-HP358	30966345
6,90	8	91	53	43	36	SCD621-0690-2-3-145HA05-HP358	30966346
7,00	8	91	53	43	36	SCD621-0700-2-3-145HA05-HP358	30966347
7,10	8	91	53	43	36	SCD621-0710-2-3-145HA05-HP358	30966348
7,20	8	91	53	43	36	SCD621-0720-2-3-145HA05-HP358	30966349
7,30	8	91	53	43	36	SCD621-0730-2-3-145HA05-HP358	30966350
7,40	8	91	53	43	36	SCD621-0740-2-3-145HA05-HP358	30966351
7,50	8	91	53	43	36	SCD621-0750-2-3-145HA05-HP358	30966352
7,60	8	91	53	43	36	SCD621-0760-2-3-145HA05-HP358	30966353
7,70	8	91	53	43	36	SCD621-0770-2-3-145HA05-HP358	30966354
7,80	8	91	53	43	36	SCD621-0780-2-3-145HA05-HP358	30966355
7,90	8	91	53	43	36	SCD621-0790-2-3-145HA05-HP358	30966356
8,00	8	91	53	43	36	SCD621-0800-2-3-145HA05-HP358	30948674
8,10	10	103	61	49	40	SCD621-0810-2-3-145HA05-HP358	30966357
8,20	10	103	61	49	40	SCD621-0820-2-3-145HA05-HP358	30966358
8,30	10	103	61	49	40	SCD621-0830-2-3-145HA05-HP358	30966359
8,40	10	103	61	49	40	SCD621-0840-2-3-145HA05-HP358	30966360
8,50	10	103	61	49	40	SCD621-0850-2-3-145HA05-HP358	30959302
8,60	10	103	61	49	40	SCD621-0860-2-3-145HA05-HP358	30966361
8,70	10	103	61	49	40	SCD621-0870-2-3-145HA05-HP358	30812607
8,80	10	103	61	49	40	SCD621-0880-2-3-145HA05-HP358	30966362
8,90	10	103	61	49	40	SCD621-0890-2-3-145HA05-HP358	30966363
9,00	10	103	61	49	40	SCD621-0900-2-3-145HA05-HP358	30966364
9,10	10	103	61	49	40	SCD621-0910-2-3-145HA05-HP358	30966365
9,20	10	103	61	49	40	SCD621-0920-2-3-145HA05-HP358	30966366
9,30	10	103	61	49	40	SCD621-0930-2-3-145HA05-HP358	30966367
9,40	10	103	61	49	40	SCD621-0940-2-3-145HA05-HP358	30966368
9,50	10	103	61	49	40	SCD621-0950-2-3-145HA05-HP358	30966369
9,60	10	103	61	49	40	SCD621-0960-2-3-145HA05-HP358	30966370
9,70	10	103	61	49	40	SCD621-0970-2-3-145HA05-HP358	30958145
9,80	10	103	61	49	40	SCD621-0980-2-3-145HA05-HP358	30959402
9,90	10	103	61	49	40	SCD621-0990-2-3-145HA05-HP358	30966371
10,00	10	103	61	49	40	SCD621-1000-2-3-145HA05-HP358	30948675
10,10	12	118	71	56	45	SCD621-1010-2-3-145HA05-HP358	30966372
10,20	12	118	71	56	45	SCD621-1020-2-3-145HA05-HP358	30966373
10,30	12	118	71	56	45	SCD621-1030-2-3-145HA05-HP358	30966374
10,40	12	118	71	56	45	SCD621-1040-2-3-145HA05-HP358	30966375
10,50	12	118	71	56	45	SCD621-1050-2-3-145HA05-HP358	30966376
10,60	12	118	71	56	45	SCD621-1060-2-3-145HA05-HP358	30966377
10,70	12	118	71	56	45	SCD621-1070-2-3-145HA05-HP358	30966378
10,80	12	118	71	56	45	SCD621-1080-2-3-145HA05-HP358	30966379
10,90	12	118	71	56	45	SCD621-1090-2-3-145HA05-HP358	30966380
11,00	12	118	71	56	45	SCD621-1100-2-3-145HA05-HP358	30966381
11,10	12	118	71	56	45	SCD621-1110-2-3-145HA05-HP358	30966382
11,20	12	118	71	56	45	SCD621-1120-2-3-145HA05-HP358	30966383
11,30	12	118	71	56	45	SCD621-1130-2-3-145HA05-HP358	30966384
11,40	12	118	71	56	45	SCD621-1140-2-3-145HA05-HP358	30966385
11,50	12	118	71	56	45	SCD621-1150-2-3-145HA05-HP358	30966386
11,60	12	118	71	56	45	SCD621-1160-2-3-145HA05-HP358	30966387
11,70	12	118	71	56	45	SCD621-1170-2-3-145HA05-HP358	30966388
11,80	12	118	71	56	45	SCD621-1180-2-3-145HA05-HP358	30966389
11,90	12	118	71	56	45	SCD621-1190-2-3-145HA05-HP358	30966390
12,00	12	118	71	56	45	SCD621-1200-2-3-145HA05-HP358	30948676
12,20	14	124	77	60	45	SCD621-1220-2-3-145HA05-HP358	30966391
12,50	14	124	77	60	45	SCD621-1250-2-3-145HA05-HP358	30966392

MEGA-Speed-Drill-Steel | Solid carbide twist drills SCD62 (5xD), internal coolant supply

Dimensions						Shank form HA	
d_1 h7	d_2 h6	l_1	l_2	l_3	l_4	Specification	Order No.
12,80	14	124	77	60	45	SCD621-1280-2-3-145HA05-HP358	30980599
13,00	14	124	77	60	45	SCD621-1300-2-3-145HA05-HP358	30966393
13,50	14	124	77	60	45	SCD621-1350-2-3-145HA05-HP358	30966394
13,80	14	124	77	60	45	SCD621-1380-2-3-145HA05-HP358	30966395
14,00	14	124	77	60	45	SCD621-1400-2-3-145HA05-HP358	30966396
14,20	16	133	83	63	48	SCD621-1420-2-3-145HA05-HP358	30966397
14,50	16	133	83	63	48	SCD621-1450-2-3-145HA05-HP358	30966398
14,80	16	133	83	63	48	SCD621-1480-2-3-145HA05-HP358	30966399
15,00	16	133	83	63	48	SCD621-1500-2-3-145HA05-HP358	30966400
15,20	16	133	83	63	48	SCD621-1520-2-3-145HA05-HP358	30966401
15,50	16	133	83	63	48	SCD621-1550-2-3-145HA05-HP358	30966402
15,80	16	133	83	63	48	SCD621-1580-2-3-145HA05-HP358	30966403
16,00	16	133	83	63	48	SCD621-1600-2-3-145HA05-HP358	30966404
16,50	18	143	93	71	48	SCD621-1650-2-3-145HA05-HP358	30966405
16,80	18	143	93	71	48	SCD621-1680-2-3-145HA05-HP358	30966406
17,00	18	143	93	71	48	SCD621-1700-2-3-145HA05-HP358	30966407
17,50	18	143	93	71	48	SCD621-1750-2-3-145HA05-HP358	30966408
17,80	18	143	93	71	48	SCD621-1780-2-3-145HA05-HP358	30966409
18,00	18	143	93	71	48	SCD621-1800-2-3-145HA05-HP358	30966410
18,50	20	153	101	77	50	SCD621-1850-2-3-145HA05-HP358	30966411
18,80	20	153	101	77	50	SCD621-1880-2-3-145HA05-HP358	30966412
19,00	20	153	101	77	50	SCD621-1900-2-3-145HA05-HP358	30966413
19,50	20	153	101	77	50	SCD621-1950-2-3-145HA05-HP358	30966414
19,80	20	153	101	77	50	SCD621-1980-2-3-145HA05-HP358	30966415
20,00	20	153	101	77	50	SCD621-2000-2-3-145HA05-HP358	30966416

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 manufacture 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 Tritan-Drill, with which MAPAL 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.

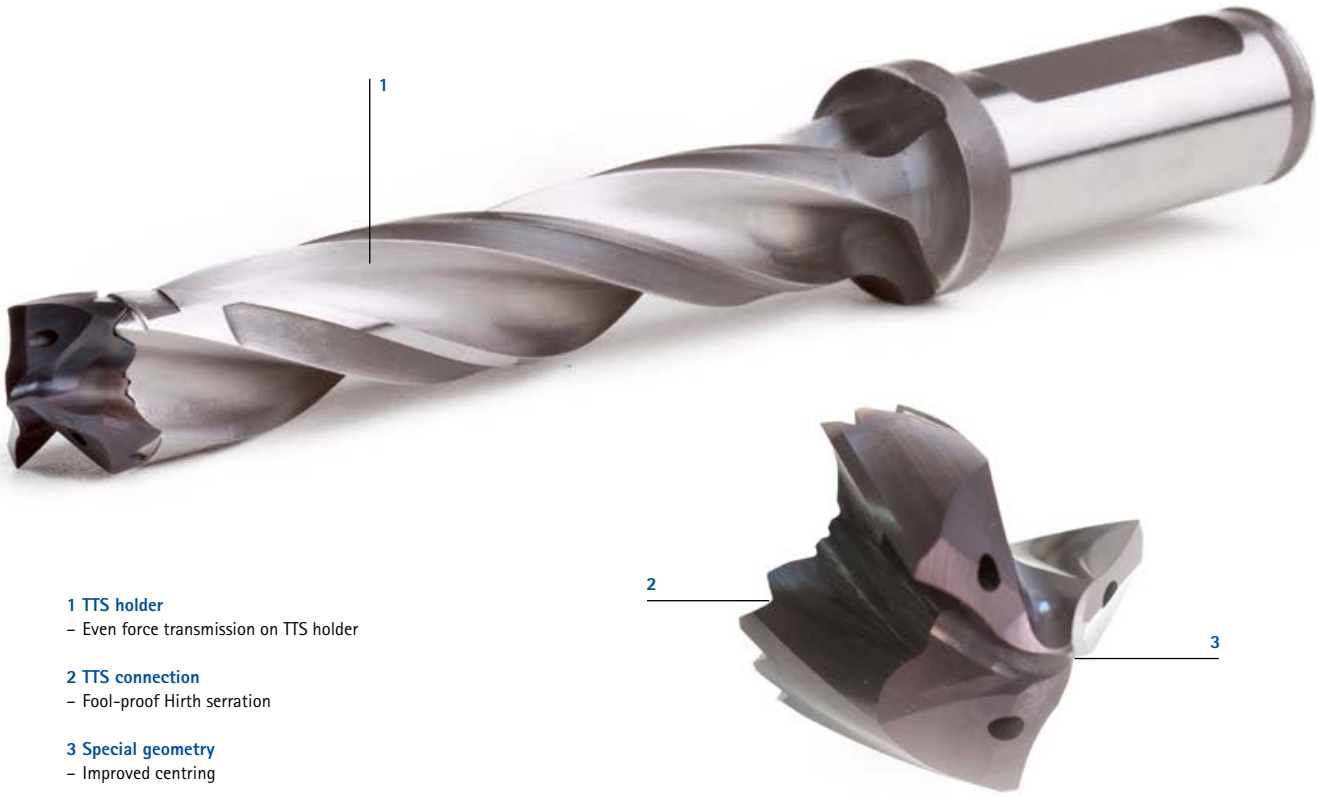
The three cutting edges ensure a homogeneous load on the connection so that the forces occurring during machining are transmitted uniformly to the steel tool holder. In addition the connection guarantees optimum torque transmission with at the same time high changing and radial run-out accuracy. Compared 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 tip 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 tip
- High torque transmission

Tool features in detail



1 TTS holder
– Even force transmission on TTS holder

2 TTS connection
– Fool-proof Hirth serration

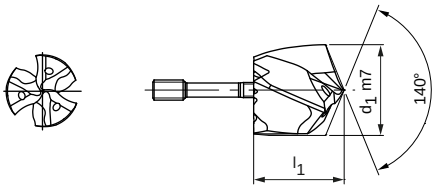
3 Special geometry
– Improved centring

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)
Cutting material:	HP926
Number of cutting edges:	3
Number of guiding chamfers:	3
Tip angle:	140°



d_1 from 12.00 to 15.40			
d_1 m7	Connection	Specification	Order No.
12,00	TTS-B1200	TTD300-3F01-1200-HP926	30871158
12,10	TTS-B1210	TTD300-3F01-1210-HP926	30871159
12,20	TTS-B1220	TTD300-3F01-1220-HP926	30871160
12,30	TTS-B1230	TTD300-3F01-1230-HP926	30871161
12,40	TTS-B1240	TTD300-3F01-1240-HP926	30871162
12,50	TTS-B1250	TTD300-3F01-1250-HP926	30871163
12,60	TTS-B1260	TTD300-3F01-1260-HP926	30871164
12,70	TTS-B1270	TTD300-3F01-1270-HP926	30871165
12,80	TTS-B1280	TTD300-3F01-1280-HP926	30871166
12,90	TTS-B1290	TTD300-3F01-1290-HP926	30871167
13,00	TTS-B1300	TTD300-3F01-1300-HP926	30871168
13,10	TTS-B1310	TTD300-3F01-1310-HP926	30871169
13,20	TTS-B1320	TTD300-3F01-1320-HP926	30871170
13,30	TTS-B1330	TTD300-3F01-1330-HP926	30871171
13,40	TTS-B1340	TTD300-3F01-1340-HP926	30871172
13,50	TTS-B1350	TTD300-3F01-1350-HP926	30871173
13,60	TTS-B1360	TTD300-3F01-1360-HP926	30871174
13,70	TTS-B1370	TTD300-3F01-1370-HP926	30871175
13,80	TTS-B1380	TTD300-3F01-1380-HP926	30871176
13,90	TTS-B1390	TTD300-3F01-1390-HP926	30871177
14,00	TTS-B1400	TTD300-3F01-1400-HP926	30871178
14,10	TTS-B1410	TTD300-3F01-1410-HP926	30871179
14,20	TTS-B1420	TTD300-3F01-1420-HP926	30871180
14,30	TTS-B1430	TTD300-3F01-1430-HP926	30871181
14,40	TTS-B1440	TTD300-3F01-1440-HP926	30871182
14,50	TTS-B1450	TTD300-3F01-1450-HP926	30871183
14,60	TTS-B1460	TTD300-3F01-1460-HP926	30871184
14,70	TTS-B1470	TTD300-3F01-1470-HP926	30871185
14,80	TTS-B1480	TTD300-3F01-1480-HP926	30871186
14,90	TTS-B1490	TTD300-3F01-1490-HP926	30871187
15,00	TTS-B1500	TTD300-3F01-1500-HP926	30871188
15,10	TTS-B1510	TTD300-3F01-1510-HP926	30871189
15,20	TTS-B1520	TTD300-3F01-1520-HP926	30871190
15,30	TTS-B1530	TTD300-3F01-1530-HP926	30871191
15,40	TTS-B1540	TTD300-3F01-1540-HP926	30871192

d_1 from 15.50 to 18.90			
d_1 m7	Connection	Specification	Order No.
15,50	TTS-B1550	TTD300-3F01-1550-HP926	30871193
15,60	TTS-B1560	TTD300-3F01-1560-HP926	30871194
15,70	TTS-B1570	TTD300-3F01-1570-HP926	30871195
15,80	TTS-B1580	TTD300-3F01-1580-HP926	30871196
15,90	TTS-B1590	TTD300-3F01-1590-HP926	30871197
16,00	TTS-B1600	TTD300-3F01-1600-HP926	30871198
16,10	TTS-B1610	TTD300-3F01-1610-HP926	30871199
16,20	TTS-B1620	TTD300-3F01-1620-HP926	30871200
16,30	TTS-B1630	TTD300-3F01-1630-HP926	30871201
16,40	TTS-B1640	TTD300-3F01-1640-HP926	30871202
16,50	TTS-B1650	TTD300-3F01-1650-HP926	30871203
16,60	TTS-B1660	TTD300-3F01-1660-HP926	30871204
16,70	TTS-B1670	TTD300-3F01-1670-HP926	30871205
16,80	TTS-B1680	TTD300-3F01-1680-HP926	30871206
16,90	TTS-B1690	TTD300-3F01-1690-HP926	30871207
17,00	TTS-B1700	TTD300-3F01-1700-HP926	30871209
17,10	TTS-B1710	TTD300-3F01-1710-HP926	30871210
17,20	TTS-B1720	TTD300-3F01-1720-HP926	30871211
17,30	TTS-B1730	TTD300-3F01-1730-HP926	30871212
17,40	TTS-B1740	TTD300-3F01-1740-HP926	30871213
17,50	TTS-B1750	TTD300-3F01-1750-HP926	30871214
17,60	TTS-B1760	TTD300-3F01-1760-HP926	30871215
17,70	TTS-B1770	TTD300-3F01-1770-HP926	30871216
17,80	TTS-B1780	TTD300-3F01-1780-HP926	30871217
17,90	TTS-B1790	TTD300-3F01-1790-HP926	30871218
18,00	TTS-B1800	TTD300-3F01-1800-HP926	30871219
18,10	TTS-B1810	TTD300-3F01-1810-HP926	30871220
18,20	TTS-B1820	TTD300-3F01-1820-HP926	30871221
18,30	TTS-B1830	TTD300-3F01-1830-HP926	30871222
18,40	TTS-B1840	TTD300-3F01-1840-HP926	30871223
18,50	TTS-B1850	TTD300-3F01-1850-HP926	30871224
18,60	TTS-B1860	TTD300-3F01-1860-HP926	30871225
18,70	TTS-B1870	TTD300-3F01-1870-HP926	30871226
18,80	TTS-B1880	TTD300-3F01-1880-HP926	30871227
18,90	TTS-B1890	TTD300-3F01-1890-HP926	30871228

d_1 from 19.00 to 22.40			
d_1 m7	Connection	Specification	Order No.
19,00	TTS-B1900	TTD300-3F01-1900-HP926	30871229
19,10	TTS-B1910	TTD300-3F01-1910-HP926	30871230
19,20	TTS-B1920	TTD300-3F01-1920-HP926	30871231
19,30	TTS-B1930	TTD300-3F01-1930-HP926	30871232
19,40	TTS-B1940	TTD300-3F01-1940-HP926	30871233
19,50	TTS-B1950	TTD300-3F01-1950-HP926	30871234
19,60	TTS-B1960	TTD300-3F01-1960-HP926	30871235
19,70	TTS-B1970	TTD300-3F01-1970-HP926	30871236
19,80	TTS-B1980	TTD300-3F01-1980-HP926	30871237
19,90	TTS-B1990	TTD300-3F01-1990-HP926	30871238
20,00	TTS-B2000	TTD300-3F01-2000-HP926	30871239
20,10	TTS-B2010	TTD300-3F01-2010-HP926	30871240
20,20	TTS-B2020	TTD300-3F01-2020-HP926	30871241
20,30	TTS-B2030	TTD300-3F01-2030-HP926	30871242
20,40	TTS-B2040	TTD300-3F01-2040-HP926	30871243
20,50	TTS-B2050	TTD300-3F01-2050-HP926	30871244
20,60	TTS-B2060	TTD300-3F01-2060-HP926	30871245
20,70	TTS-B2070	TTD300-3F01-2070-HP926	30871246
20,80	TTS-B2080	TTD300-3F01-2080-HP926	30871247
20,90	TTS-B2090	TTD300-3F01-2090-HP926	30871248
21,00	TTS-B2100	TTD300-3F01-2100-HP926	30871249
21,10	TTS-B2110	TTD300-3F01-2110-HP926	30871250
21,20	TTS-B2120	TTD300-3F01-2120-HP926	30871251
21,30	TTS-B2130	TTD300-3F01-2130-HP926	30871252
21,40	TTS-B2140	TTD300-3F01-2140-HP926	30871253
21,50	TTS-B2150	TTD300-3F01-2150-HP926	30871254
21,60	TTS-B2160	TTD300-3F01-2160-HP926	30871255
21,70	TTS-B2170	TTD300-3F01-2170-HP926	30871256
21,80	TTS-B2180	TTD300-3F01-2180-HP926	30871257
21,90	TTS-B2190	TTD300-3F01-2190-HP926	30871258
22,00	TTS-B2200	TTD300-3F01-2200-HP926	30871259
22,10	TTS-B2210	TTD300-3F01-2210-HP926	30871260
22,20	TTS-B2220	TTD300-3F01-2220-HP926	30871261
22,30	TTS-B2230	TTD300-3F01-2230-HP926	30871262
22,40	TTS-B2240	TTD300-3F01-2240-HP926	30871263

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

d_1 from 22.50 to 25.70			
d_1 m7	Connection	Specification	Order No.
22,50	TTS-B2250	TTD300-3F01-2250-HP926	30871264
22,60	TTS-B2260	TTD300-3F01-2260-HP926	30871265
22,70	TTS-B2270	TTD300-3F01-2270-HP926	30871266
22,80	TTS-B2280	TTD300-3F01-2280-HP926	30871267
22,90	TTS-B2290	TTD300-3F01-2290-HP926	30871268
23,00	TTS-B2300	TTD300-3F01-2300-HP926	30871269
23,10	TTS-B2310	TTD300-3F01-2310-HP926	30871270
23,20	TTS-B2320	TTD300-3F01-2320-HP926	30871271
23,30	TTS-B2330	TTD300-3F01-2330-HP926	30871272
23,40	TTS-B2340	TTD300-3F01-2340-HP926	30871273
23,50	TTS-B2350	TTD300-3F01-2350-HP926	30871274
23,60	TTS-B2360	TTD300-3F01-2360-HP926	30871275
23,70	TTS-B2370	TTD300-3F01-2370-HP926	30871276
23,80	TTS-B2380	TTD300-3F01-2380-HP926	30871277
23,90	TTS-B2390	TTD300-3F01-2390-HP926	30871278
24,00	TTS-B2400	TTD300-3F01-2400-HP926	30871279
24,10	TTS-B2410	TTD300-3F01-2410-HP926	30871280
24,20	TTS-B2420	TTD300-3F01-2420-HP926	30871281
24,30	TTS-B2430	TTD300-3F01-2430-HP926	30871282
24,40	TTS-B2440	TTD300-3F01-2440-HP926	30871283
24,50	TTS-B2450	TTD300-3F01-2450-HP926	30871285
24,60	TTS-B2460	TTD300-3F01-2460-HP926	30871286
24,70	TTS-B2470	TTD300-3F01-2470-HP926	30871287
24,80	TTS-B2480	TTD300-3F01-2480-HP926	30871288
24,90	TTS-B2490	TTD300-3F01-2490-HP926	30871289
25,00	TTS-B2500	TTD300-3F01-2500-HP926	30871290
25,10	TTS-B2510	TTD300-3F01-2510-HP926	30871291
25,20	TTS-B2520	TTD300-3F01-2520-HP926	30871292
25,30	TTS-B2530	TTD300-3F01-2530-HP926	30871293
25,40	TTS-B2540	TTD300-3F01-2540-HP926	30871294
25,50	TTS-B2550	TTD300-3F01-2550-HP926	30871295
25,60	TTS-B2560	TTD300-3F01-2560-HP926	30871296
25,70	TTS-B2570	TTD300-3F01-2570-HP926	30871297

d_1 from 25.80 to 29.00			
d_1 m7	Connection	Specification	Order No.
25,80	TTS-B2580	TTD300-3F01-2580-HP926	30871298
25,90	TTS-B2590	TTD300-3F01-2590-HP926	30871299
26,00	TTS-B2600	TTD300-3F01-2600-HP926	30871300
26,10	TTS-B2610	TTD300-3F01-2610-HP926	30871301
26,20	TTS-B2620	TTD300-3F01-2620-HP926	30871302
26,30	TTS-B2630	TTD300-3F01-2630-HP926	30871303
26,40	TTS-B2640	TTD300-3F01-2640-HP926	30871304
26,50	TTS-B2650	TTD300-3F01-2650-HP926	30871305
26,60	TTS-B2660	TTD300-3F01-2660-HP926	30871306
26,70	TTS-B2670	TTD300-3F01-2670-HP926	30871307
26,80	TTS-B2680	TTD300-3F01-2680-HP926	30871308
26,90	TTS-B2690	TTD300-3F01-2690-HP926	30871309
27,00	TTS-B2700	TTD300-3F01-2700-HP926	30871310
27,10	TTS-B2710	TTD300-3F01-27010-HP926	30871311
27,20	TTS-B2720	TTD300-3F01-2720-HP926	30871312
27,30	TTS-B2730	TTD300-3F01-2730-HP926	30871313
27,40	TTS-B2740	TTD300-3F01-2740-HP926	30871314
27,50	TTS-B2750	TTD300-3F01-2750-HP926	30871315
27,60	TTS-B2760	TTD300-3F01-2760-HP926	30871316
27,70	TTS-B2770	TTD300-3F01-2770-HP926	30871317
27,80	TTS-B2780	TTD300-3F01-2780-HP926	30871318
27,90	TTS-B2790	TTD300-3F01-2790-HP926	30871319
28,00	TTS-B2800	TTD300-3F01-2800-HP926	30871320
28,10	TTS-B2810	TTD300-3F01-2810-HP926	30871321
28,20	TTS-B2820	TTD300-3F01-2820-HP926	30871322
28,30	TTS-B2830	TTD300-3F01-2830-HP926	30871323
28,40	TTS-B2840	TTD300-3F01-2840-HP926	30871324
28,50	TTS-B2850	TTD300-3F01-2850-HP926	30871325
28,60	TTS-B2860	TTD300-3F01-2860-HP926	30871326
28,70	TTS-B2870	TTD300-3F01-2870-HP926	30871327
28,80	TTS-B2880	TTD300-3F01-2880-HP926	30871328
28,90	TTS-B2890	TTD300-3F01-2890-HP926	30871329
29,00	TTS-B2900	TTD300-3F01-2900-HP926	30871330

d_1 from 29.10 to 32.40			
d_1 m7	Connection	Specification	Order No.
29,10	TTS-B2910	TTD300-3F01-2910-HP926	30871331
29,20	TTS-B2920	TTD300-3F01-2920-HP926	30871332
29,30	TTS-B2930	TTD300-3F01-2930-HP926	30871333
29,40	TTS-B2940	TTD300-3F01-2940-HP926	30871334
29,50	TTS-B2950	TTD300-3F01-2950-HP926	30871335
29,60	TTS-B2960	TTD300-3F01-2960-HP926	30871336
29,70	TTS-B2970	TTD300-3F01-2970-HP926	30871337
29,80	TTS-B2980	TTD300-3F01-2980-HP926	30871338
29,90	TTS-B2990	TTD300-3F01-2990-HP926	30871339
30,00	TTS-B3000	TTD300-3F01-3000-HP926	30871340
30,10	TTS-B3010	TTD300-3F01-3010-HP926	30871341
30,20	TTS-B3020	TTD300-3F01-3020-HP926	30871342
30,30	TTS-B3030	TTD300-3F01-3030-HP926	30871343
30,40	TTS-B3040	TTD300-3F01-3040-HP926	30871344
30,50	TTS-B3050	TTD300-3F01-3050-HP926	30871345
30,60	TTS-B3060	TTD300-3F01-3060-HP926	30871346
30,70	TTS-B3070	TTD300-3F01-3070-HP926	30871347
30,80	TTS-B3080	TTD300-3F01-3080-HP926	30871348
30,90	TTS-B3090	TTD300-3F01-3090-HP926	30871349
31,00	TTS-B3100	TTD300-3F01-3100-HP926	30871350
31,10	TTS-B3110	TTD300-3F01-3110-HP926	30871351
31,20	TTS-B3120	TTD300-3F01-3120-HP926	30871352
31,30	TTS-B3130	TTD300-3F01-3130-HP926	30871353
31,40	TTS-B3140	TTD300-3F01-3140-HP926	30871354
31,50	TTS-B3150	TTD300-3F01-3150-HP926	30871355
31,60	TTS-B3160	TTD300-3F01-3160-HP926	30871356
31,70	TTS-B3170	TTD300-3F01-3170-HP926	30871357
31,80	TTS-B3180	TTD300-3F01-3180-HP926	30871358
31,90	TTS-B3190	TTD300-3F01-3190-HP926	30871359
32,00	TTS-B3200	TTD300-3F01-3200-HP926	30871360
32,40	TTS-B3240	TTD300-3F01-3240-HP926	30871361

Accessories

	Replaceable head holders TTS TTS300, 3xD	Page 70
	Replaceable head holders TTS TTS300, 5xD	Page 71

Dimensions in mm.
You will find handling and application instructions from page 74.
For cutting data recommendation, see end of section.
Special designs and other coatings on request.

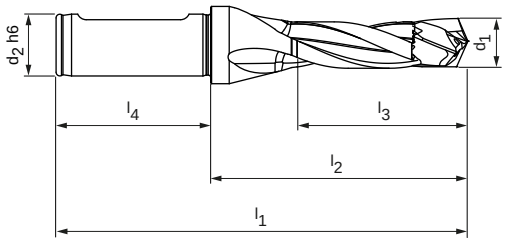
Replaceable head holders TTS

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 HB	
d_1	d_2 h6	l_1	l_2	l_3	l_4	Specification	Order No.
12,00-12,49	16	111	63	41	48	TTS300B-1200-DR3-ZYL-16-MN	30839680
12,50-12,99	16	113	65	43	48	TTS300B-1250-DR3-ZYL-16-MN	30839681
13,00-13,49	16	115	67	45	48	TTS300B-1300-DR3-ZYL-16-MN	30839682
13,50-13,99	16	117	69	46	48	TTS300B-1350-DR3-ZYL-16-MN	30839683
14,00-14,49	16	120	72	48	48	TTS300B-1400-DR3-ZYL-16-MN	30839684
14,50-14,99	16	122	74	49	48	TTS300B-1450-DR3-ZYL-16-MN	30839685
15,00-15,49	16	124	76	51	48	TTS300B-1500-DR3-ZYL-16-MN	30839686
15,50-16,49	20	131	81	54	50	TTS300B-1550-DR3-ZYL-20-MN	30839687
16,50-17,49	20	135	85	58	50	TTS300B-1650-DR3-ZYL-20-MN	30839688
17,50-18,49	20	140	90	61	50	TTS300B-1750-DR3-ZYL-20-MN	30839689
18,50-19,49	25	150	94	64	56	TTS300B-1850-DR3-ZYL-25-MN	30839690
19,50-20,49	25	155	99	68	56	TTS300B-1950-DR3-ZYL-25-MN	30839691
20,50-21,49	25	159	103	71	56	TTS300B-2050-DR3-ZYL-25-MN	30839692
21,50-22,49	25	164	108	74	56	TTS300B-2150-DR3-ZYL-25-MN	30839693
22,50-23,49	25	168	112	78	56	TTS300B-2250-DR3-ZYL-25-MN	30839694
23,50-24,49	25	173	117	81	56	TTS300B-2350-DR3-ZYL-25-MN	30839695
24,50-25,49	32	182	122	84	60	TTS300B-2450-DR3-ZYL-32-MN	30839696
25,50-26,49	32	186	126	87	60	TTS300B-2550-DR3-ZYL-32-MN	30839697
26,50-27,49	32	191	131	91	60	TTS300B-2650-DR3-ZYL-32-MN	30839698
27,50-28,49	32	195	135	94	60	TTS300B-2750-DR3-ZYL-32-MN	30839699
28,50-29,49	32	200	140	97	60	TTS300B-2850-DR3-ZYL-32-MN	30839700
29,50-30,49	32	204	144	101	60	TTS300B-2950-DR3-ZYL-32-MN	30839701
30,50-31,49	32	209	149	104	60	TTS300B-3050-DR3-ZYL-32-MN	30839702
31,50-32,49	32	213	153	107	60	TTS300B-3150-DR3-ZYL-32-MN	30839703

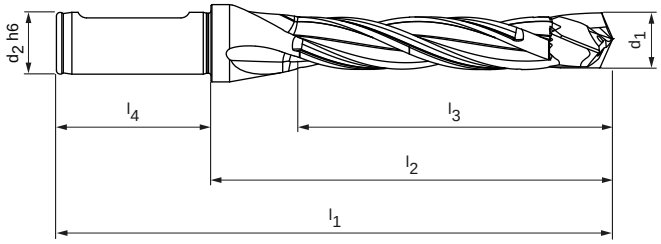
Dimensions in mm.
Special designs on request.

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 HB	
d_1	d_2 h6	l_1	l_2	l_3	l_4	Specification	Order No.
12,00-12,49	16	136	88	66	48	TTS300B-1200-DR5-ZYL-16-MN	30839704
12,50-12,99	16	139	91	69	48	TTS300B-1250-DR5-ZYL-16-MN	30839705
13,00-13,49	16	142	94	71	48	TTS300B-1300-DR5-ZYL-16-MN	30839706
13,50-13,99	16	145	97	74	48	TTS300B-1350-DR5-ZYL-16-MN	30839707
14,00-14,49	16	149	101	77	48	TTS300B-1400-DR5-ZYL-16-MN	30839708
14,50-14,99	16	152	104	79	48	TTS300B-1450-DR5-ZYL-16-MN	30839709
15,00-15,49	16	155	107	82	48	TTS300B-1500-DR5-ZYL-16-MN	30839710
15,50-16,49	20	164	114	87	50	TTS300B-1550-DR5-ZYL-20-MN	30839711
16,50-17,49	20	170	120	93	50	TTS300B-1650-DR5-ZYL-20-MN	30839712
17,50-18,49	20	177	127	98	50	TTS300B-1750-DR5-ZYL-20-MN	30839713
18,50-19,49	25	189	133	103	56	TTS300B-1850-DR5-ZYL-25-MN	30839714
19,50-20,49	25	196	140	109	56	TTS300B-1950-DR5-ZYL-25-MN	30839715
20,50-21,49	25	202	146	114	56	TTS300B-2050-DR5-ZYL-25-MN	30839716
21,50-22,49	25	209	153	119	56	TTS300B-2150-DR5-ZYL-25-MN	30839717
22,50-23,49	25	215	159	124	56	TTS300B-2250-DR5-ZYL-25-MN	30839718
23,50-24,49	25	222	166	130	56	TTS300B-2350-DR5-ZYL-25-MN	30839719
24,50-25,49	32	233	173	135	60	TTS300B-2450-DR5-ZYL-32-MN	30839720
25,50-26,49	32	239	179	140	60	TTS300B-2550-DR5-ZYL-32-MN	30839721
26,50-27,49	32	246	186	146	60	TTS300B-2650-DR5-ZYL-32-MN	30839722
27,50-28,49	32	252	192	151	60	TTS300B-2750-DR5-ZYL-32-MN	30839723
28,50-29,49	32	259	199	156	60	TTS300B-2850-DR5-ZYL-32-MN	30839724
29,50-30,49	32	265	205	162	60	TTS300B-2950-DR5-ZYL-32-MN	30839725
30,50-31,49	32	272	212	167	60	TTS300B-3050-DR5-ZYL-32-MN	30839726
31,50-32,49	32	278	218	172	60	TTS300B-3150-DR5-ZYL-32-MN	30839727

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	7	30890318
14,50 - 14,99		
15,00 - 15,49		
15,50 - 16,49		
16,50 - 17,49		
17,50 - 18,49	8	30890321
18,50 - 19,49		
19,50 - 20,49	10	30890323
20,50 - 21,49		
21,50 - 22,49		
22,50 - 23,49		
23,50 - 24,49		
24,50 - 25,49	15	30890326
25,50 - 26,49		
26,50 - 27,49		
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

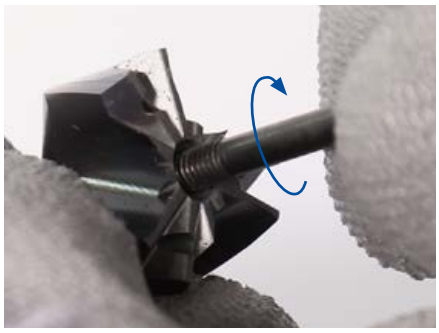
Handle for TORX® wrench

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

Dimensions in mm.

Handling notes, replaceable head drills TTD-Tritan

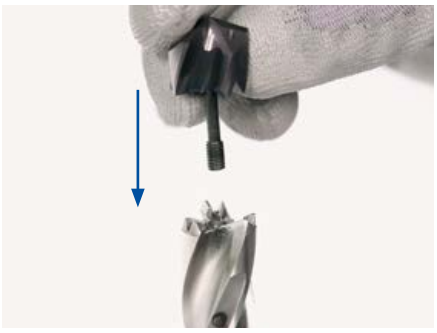
Tool assembly



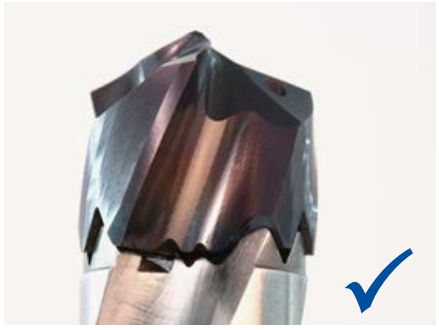
1. **Insert and tighten special clamping screw**
   Fit the special clamping screw into the bore on the replaceable drill head with the small thread end facing forward. Then screw in the special clamping screw clockwise to the stop.

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.

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.

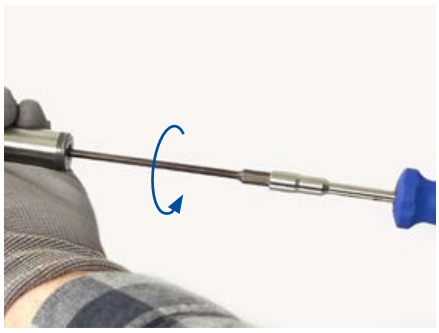


4. **Check positioning of the drill head**
   Check whether chip flute and serrations of replaceable drill head and replaceable head holder are aligned.
   If they are not aligned, turn the replaceable drill head until chip flute and serrations are aligned.

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

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.



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

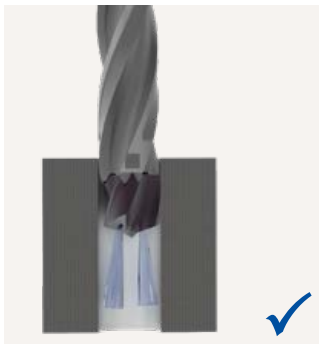
Tightening torques for the special clamping screw

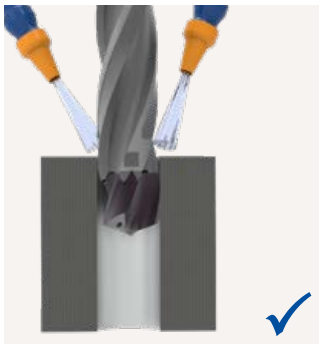
Diameter range [mm]	Thread of replaceable head holder	TORX® size	Permissible transferable tightening torque [Nm]
12,00 - 13,99	M3 x 0,5	T6	0,40
14,00 - 17,49	M3,5 x 0,6	T7	0,70
17,50 - 19,49	M4 x 0,7	T8	1,30
19,50 - 24,49	M5 x 0,8	T10	2,00
24,50 - 28,49	M6 x 1,0	T15	3,10
28,50 - 32,49	M6 x 1,0	T15	5,60

Application notes, replaceable head drills TTD-Tritan

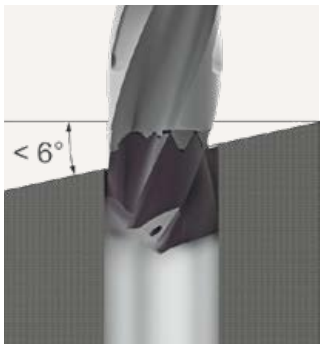
The triple edge replaceable head drill TTD-Tritan guarantees optimal torque transmission at the connection with high changing and radial run-out accuracy at the same time. The replaceable head can be changed quickly and reliably, incorrect positioning is impossible. A suitable TORX® wrench and handle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

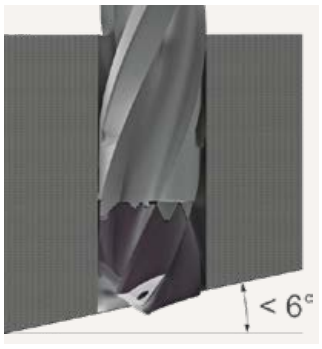
Coolant situation:
Coolant pressure as a function of the drilling depth: 3xD: 8 bar | 5xD: 12 bar



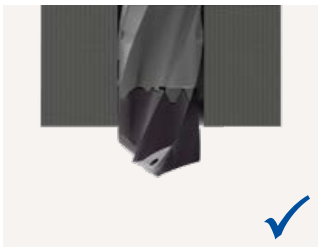


Maximum entry and exit angle:
At the start of drilling and at the outlet from inclined surfaces, reduce v_f by 50%.

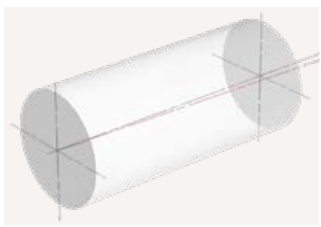




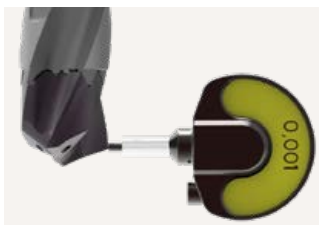
Through bore:
It is recommended not to reduce the cutting data at the bore outlet.



Radial run-out accuracy:

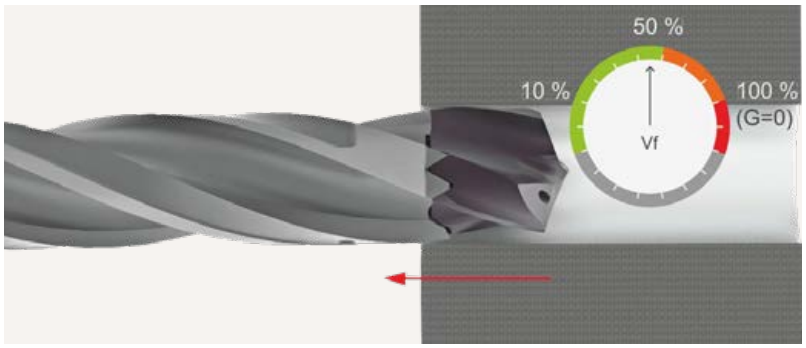


Max. 0.02 mm

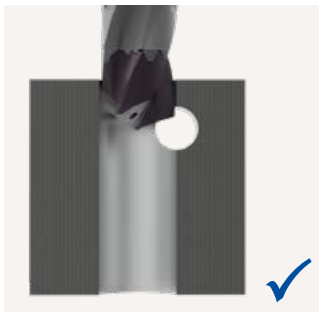


Max. 0.04 mm

No rapid traverse on withdrawal:
Five times the feed rate is recommended for the withdrawal speed.



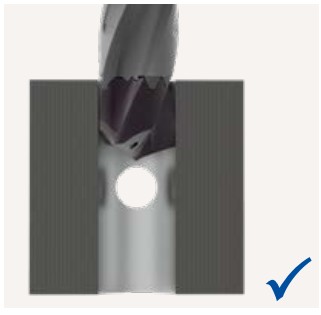
Machining situations:



Bore off-centre; chisel edge in contact

Bore off-centre; chisel edge not in contact

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



Bore centred and << D

Bore centred and ≅ D

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Cutting data recommendation for solid carbide drills

Feed and cutting speed

Tritan-Drill-Steel | SCD66

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

Tritan-Spot-Drill-Steel | SCD67

MMG*			Material	Strength/hardness [N/mm²] [HRC]	
P	P1	P1.1	Structural, free-cutting, case hardened and heat-treated steels, non-alloy	< 700 N/mm²	
		P1.2	Structural, free-cutting, case hardened and heat-treated steels, non-alloy	< 1200 N/mm²	
	P2	P2.1	Nitrided, case hardened and heat-treated steels, alloy	< 900 N/mm²	
		P2.2	Nitrided, case hardened and heat-treated steels, alloy	< 1400 N/mm²	
	P3	P3.1	Tool, bearing, spring and high-speed steels	< 900 N/mm²	
		P3.2	Tool, bearing, spring and high-speed steels	< 1500 N/mm²	
	P4	P4.1	Stainless steels, ferritic and martensitic		
	P5	P5.1	Cast steel		
	P6	P6.1	Stainless cast steel, ferritic and martensitic		
M	M1	M1.1	Stainless steels, austenitic	< 700 N/mm²	
		M1.2	Stainless steels, ferritic/austenitic (duplex)	< 1000 N/mm²	
	M2	M2.1	Stainless cast steel, austenitic	< 700 N/mm²	
	M3	M3.1	Stainless cast steel, ferritic/austenitic (duplex)	< 1000 N/mm²	
K	K1	K1.1	Cast iron with lamellar graphite (grey cast iron), GJL	< 300 N/mm²	
	K2	K2.1	Cast iron with spheroidal graphite, GJS	< 500 N/mm²	
		K2.2	Cast iron with spheroidal graphite, GJS	500-800 N/mm²	
		K2.3	Cast iron with spheroidal graphite, GJS	> 800 N/mm²	

* MAPAL 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	8.00	10.00	12.00	16.00	20.00
	160			0.080	0.097	0.113	0.141	0.164
	130			0.075	0.090	0.105	0.132	0.153
	145			0.080	0.097	0.113	0.141	0.164
	100			0.067	0.081	0.094	0.118	0.136
	95			0.076	0.092	0.107	0.134	0.155
	80			0.069	0.084	0.098	0.122	0.142
	65			0.053	0.065	0.075	0.094	0.109
	95			0.077	0.094	0.109	0.136	0.158
	65			0.037	0.045	0.053	0.066	0.076
	45			0.047	0.056	0.066	0.082	0.095
	40			0.039	0.047	0.055	0.068	0.079
	50			0.051	0.061	0.071	0.089	0.104
	45			0.040	0.048	0.056	0.071	0.082
	175			0.133	0.161	0.188	0.235	0.273
	160			0.113	0.137	0.160	0.200	0.232
	130			0.093	0.113	0.132	0.165	0.191
	70			0.053	0.065	0.075	0.094	0.109

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 solid carbide drills

Feed and cutting speed

MEGA-Speed-Drill-Steel | SCD62

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

Cutting data recommendation for replaceable head drills

Feed and cutting speed

TTD-Tritan | type 01 – Uni

MMG*			Material	Strength/hardness [N/mm²] [HRC]	
P	P1	P1.1	Structural, free-cutting, case hardened and heat-treated steels, non-alloy	< 700 N/mm²	
		P1.2	Structural, free-cutting, case hardened and heat-treated steels, non-alloy	< 1200 N/mm²	
	P2	P2.1	Nitrided, case hardened and heat-treated steels, alloy	< 900 N/mm²	
		P2.2	Nitrided, case hardened and heat-treated steels, alloy	< 1400 N/mm²	
	P3	P3.1	Tool, bearing, spring and high-speed steels	< 900 N/mm²	
		P3.2	Tool, bearing, spring and high-speed steels	< 1500 N/mm²	
	P4	P4.1	Stainless steels, 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), GJL	< 300 N/mm²	
	K2	K2.1	Cast iron with spheroidal graphite, GJS	< 500 N/mm²	
		K2.2	Cast iron with spheroidal graphite, GJS	500-800 N/mm²	
		K2.3	Cast iron with spheroidal graphite, GJS	> 800 N/mm²	
	K3	K3.1	Cast iron with spheroidal graphite, GJV; malleable cast iron, GJM	< 500 N/mm²	
		K3.2	Cast iron with spheroidal graphite, GJV; malleable cast iron, GJM	> 500 N/mm²	

* MAPAL machining groups

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

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.

BORING

Introduction

Tangential indexable inserts

Radial indexable inserts

Technical appendix

ADDITIONS TO PROGRAMME

New cutting material series for boring P M K

For the new series of cutting materials, not only optimal coatings have been developed in an in-house coating plant, but also the carbide substrate for the inserts as well as the geometries and chip guiding stages have been optimised for machining. Depending on the prevailing general conditions, you can choose between PVD and CVD-coated cutting materials.

Together with the special and standard ISO indexable inserts, MAPAL is also offering the newly developed, tangential, "press-to-size" ISO indexable inserts with the series of cutting materials. These are an inexpensive and optimum addition to the high-precision ground inserts and are used for applications with larger permissible tolerances.

AT A GLANCE

- New cutting material series for boring K, P and M materials
- Ground inserts with optimised chip guiding stages
- Pressed inserts for medium machining and roughing:
- Inexpensive addition to the high-precision ground inserts
- Usage with larger permissible bore tolerances
- Inserts available for every requirement in relation to accuracy and costs

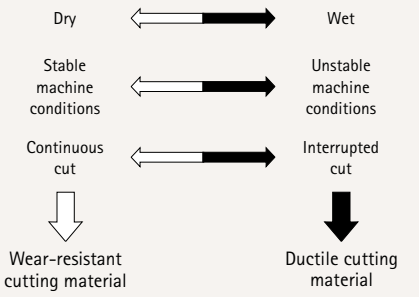
Selection of a cutting material

The new cutting materials cover a very large range between wear resistance and ductility. The cutting material identifier is designed such that the ductility increases as the number increases.

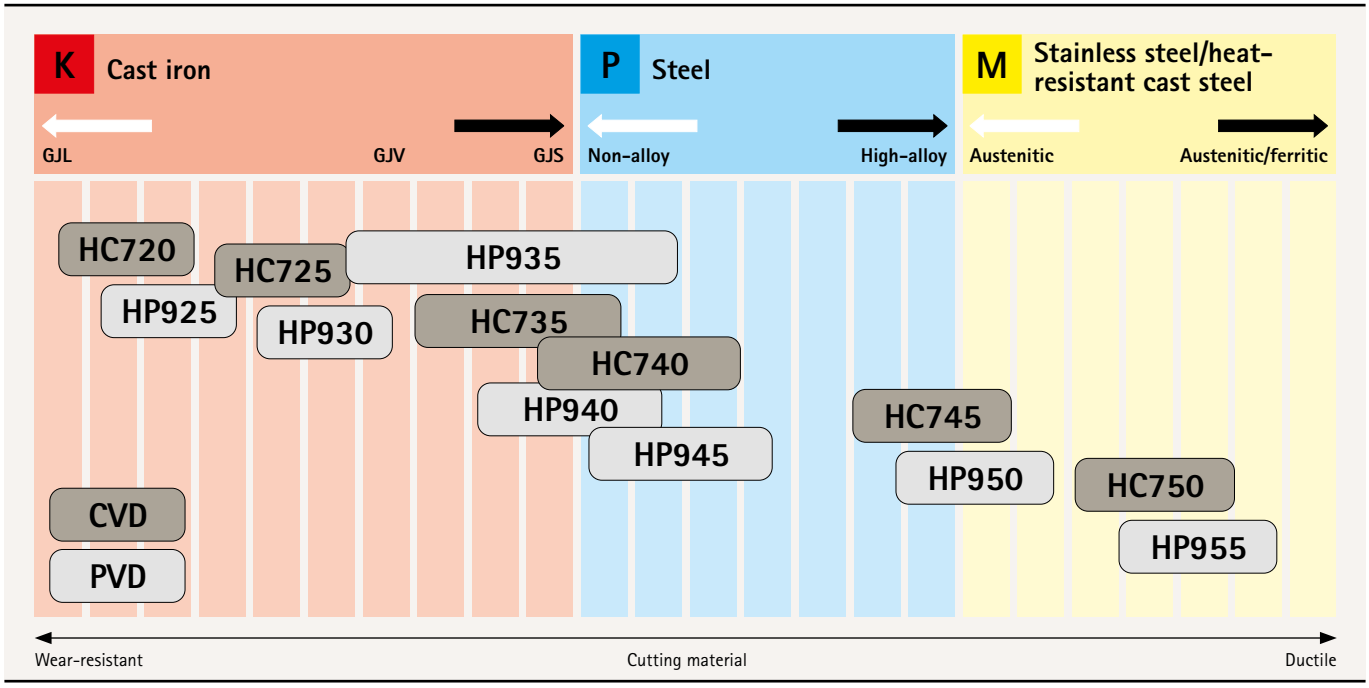
Example: HC740 is more ductile than HC720 (the more ductile a cutting material, the lower the wear resistance).

1. CVD-coated cutting materials (HC...) are the first choice for boring K, P and M workpiece materials, the highest tool life can be achieved by using these cutting materials.
2. Choose your workpiece material using the MMGs (MAPAL Machining Groups, see fold-out on the cover).
3. From the **"Cutting material overview" table,** choose the grade underneath the required workpiece material.
4. Depending on the general conditions (see **table "General conditions"**) a more wear-resistant or more ductile CVD-coated cutting material is to be selected.
5. If general conditions in the direction of the black arrow predominate and breakages cannot be prevented despite a ductile CVD grade, you should change to PVD-coated cutting materials.

General conditions



Cutting material overview

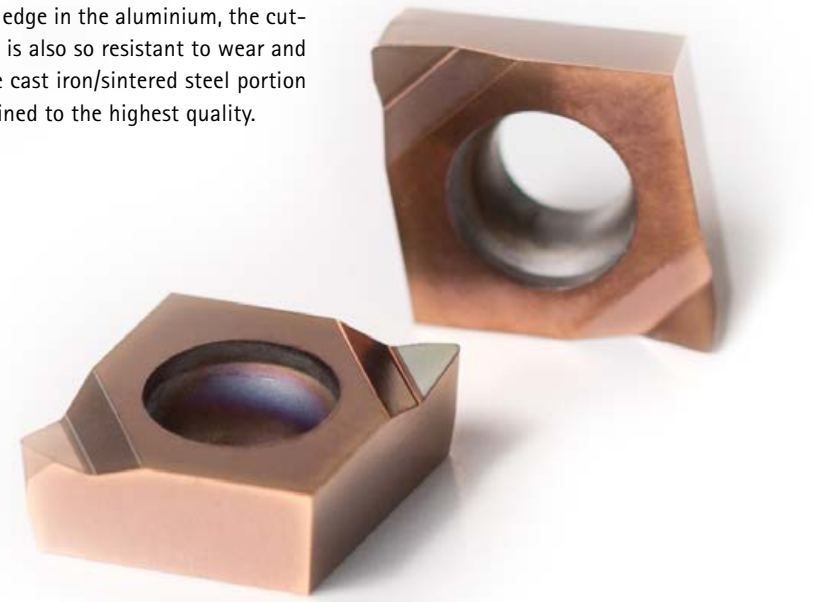


New cutting materials for the mixed machining of N+K and N+P

Due to new material combinations and therefore increasing requirements on the cutting material, MAPAL has placed on the market a new series of ISO indexable inserts.

As a result of the combination of the materials aluminium and sintered steel, as is used for instance by automotive manufacturers in crankcases, the challenges for machining are changing dramatically. To counteract premature wear and to prevent a chemical reaction between the iron alloy in the sintered steel and the aluminium, MAPAL has developed a completely new cutting material. The carbide substrates have been adapted and the micro and macro geometries on the inserts optimised with modified rake angles.

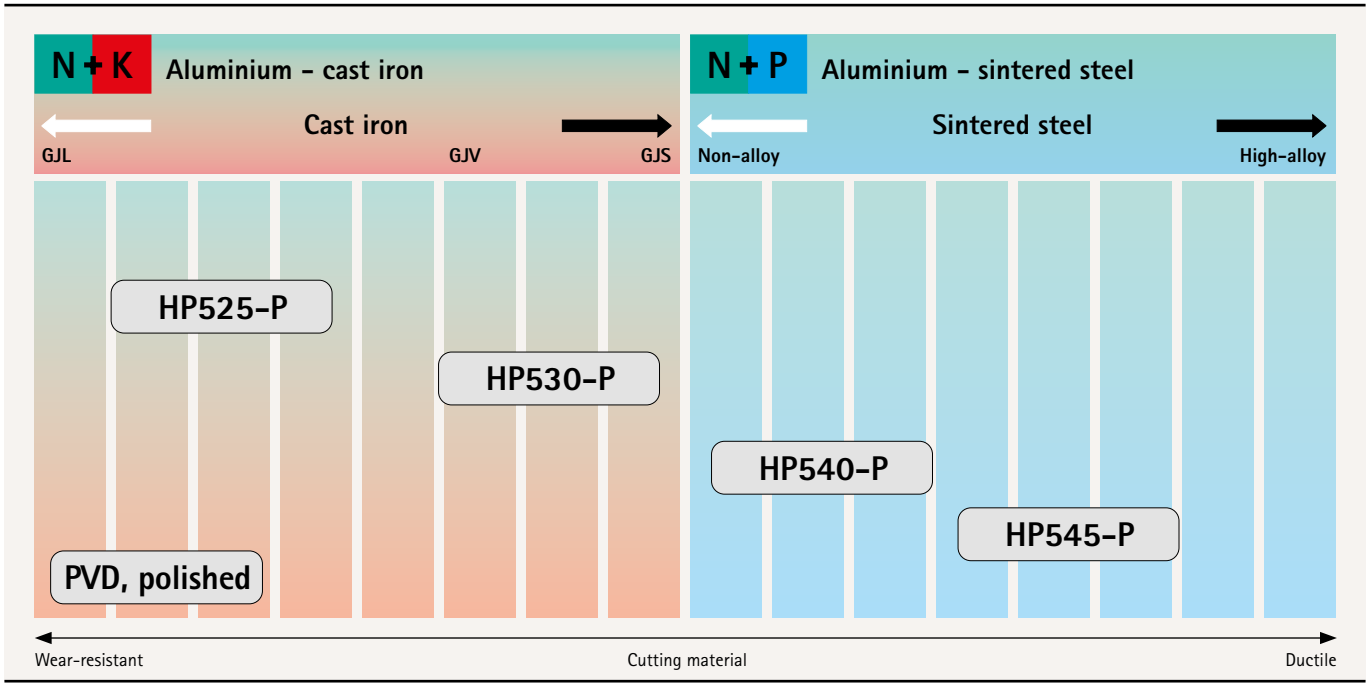
MAPAL has also developed a new PVD coating. The new coating prevents the formation of a built-up edge in the aluminium, the cutting material is also so resistant to wear and heat that the cast iron/sintered steel portion can be machined to the highest quality.



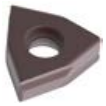
Selection of a cutting material

1. From the **"Cutting material overview" table,** choose the grade underneath the required workpiece material.
2. For the mixed machining of aluminium-cast iron, the grade HP530-P is the first choice, for aluminium-steel the grade HP545-P.
3. If a stable process is ensured with normal wear, a wear-resistant grade – HP525-P for aluminium-cast iron or HP540-P for aluminium-steel - can be selected for improved tool life.

Cutting material overview

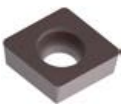


Overview of indexable inserts

	Insert type	Tangential technology						
		CTHQ...	CTNQ...	FTHQ...	FTNQ...	STHD / STHE...	WTHQ...	
		P M1 M2 K	P M1 M2 K	P M1 M2 K	P M1 M2 K	P M1 M2 K	P M1 K	
								
Features	Number of cutting edges	4	4	4	4	4	6	
	Insert size	06 / 09 / 12	09 / 12	06 / 09 / 12	09 / 12	06 / 09	07 / 09	
	Diameter range	from 28 mm	from 41 mm	from 22 mm	from 30 mm		from 37 mm	
	Cutting direction	L / R	L / R	L / R	L / R	N	L / R	
	Boring – neutral	■	■	■	■		■	
	Boring – arc shaped land	■		■			■	
	Countersinking / chamfering					■		
Application	Roughing	■	■	■	■		■	
	Medium machining	■	■	■	■		■	
	Finishing	■		■			■	
Quality	Ground carbide	■		■		■	■	
	Pressed carbide		■		■			
	Page	96	102	104	110	112	114	

P M1 M2 K New cutting material series for steel, stainless steel, heat-resistant cast steel (turbocharger materials) and cast iron.

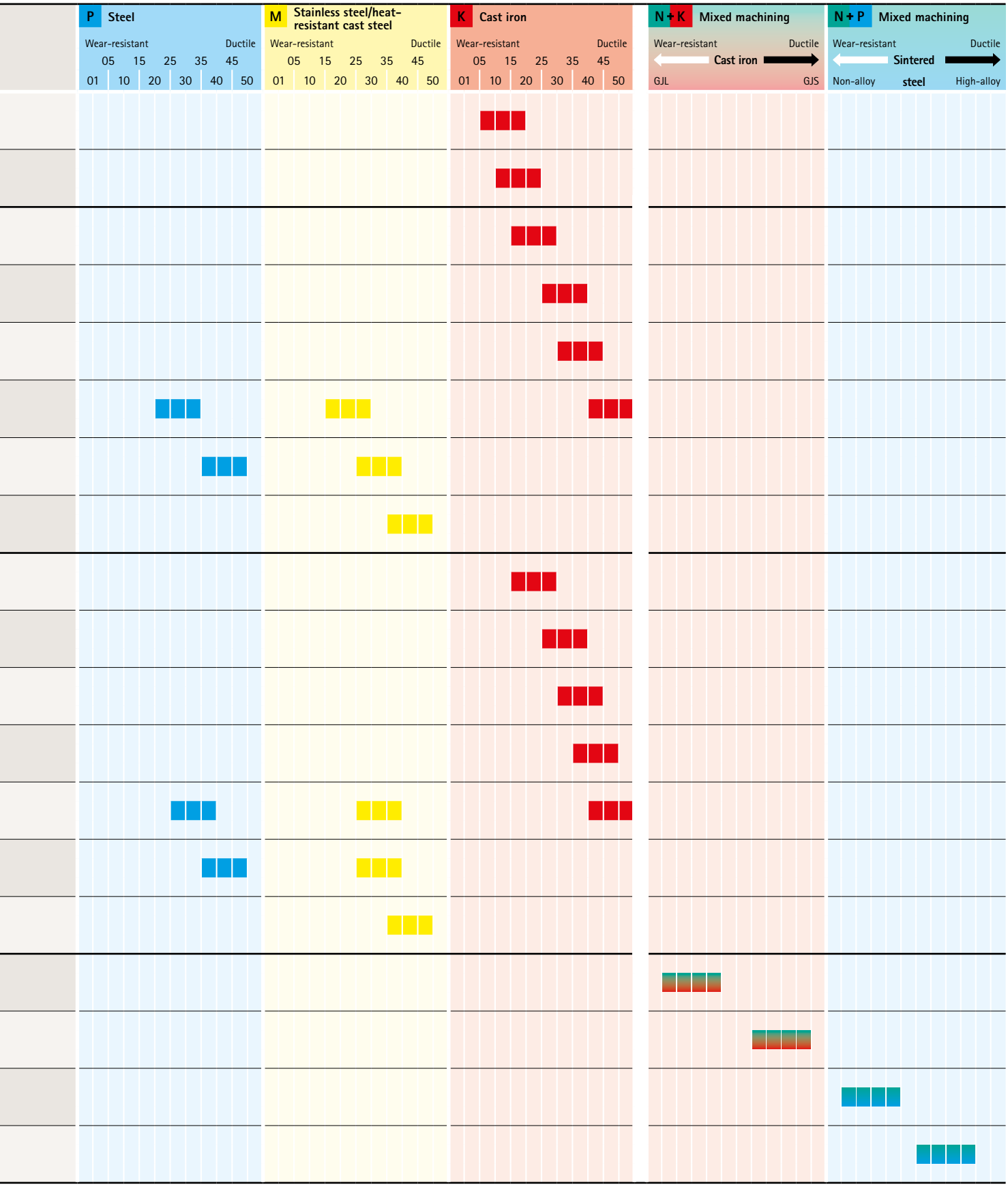
N+K N+P New cutting material series for mixed machining.

	Radial technology								
	CCGW...	**CCHT...**	**SPGW/SCGW...**	**SPHT/SCHT...**	**SPHT/SCHT...**	**TCHT...**		**CCHT...**	**SCHT...**
	K	K	K	K	K	K	K	N+K N+P	N+K N+P
									
	2	2	4	4	2	3	1	2	4
	06 / 09	06 / 09 / 12	06 / 09 / 12	06 / 09 / 12	06 / 09 / 12	06 / 09 / 11 / 16		09	09
	from 17 mm	from 17 mm	from 17 mm	from 17 mm	from 17 mm	from 15 mm	from 15 mm	from 24 mm	from 25 mm
	N	L / R	N	L / R	X	L / R	N	L / R	L / R
	■	■	■	■	■	■	■	■	■
	■	■	■	■	■	■	■	■	■
	■	■	■	■	■	■	■	■	■
	■	■	■	■	■	■	■	■	■
	120	121	123	124	126	127	129	130	131

Cutting material overview: Grades and grade description

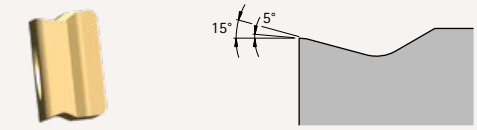
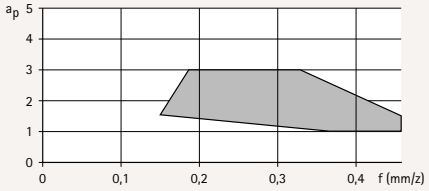
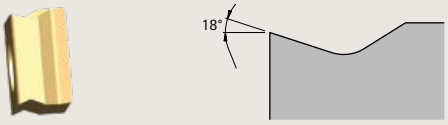
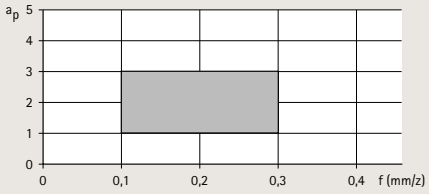
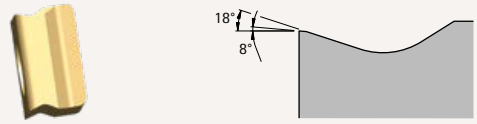
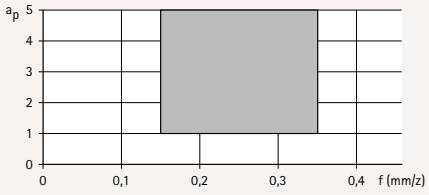
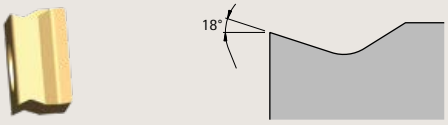
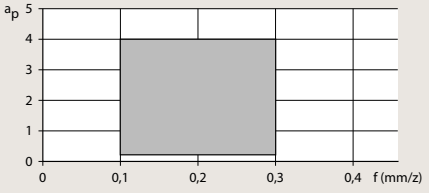
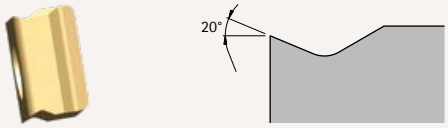
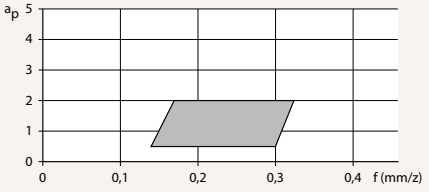
Cutting material	Cutting material code	Coating composition	Coating colour	Applications	Recommended application
CVD-coated	**HC704**	TiCN+TiN	Gold	●	Finest grain carbide with a wear-resistant CVD coating for machining GJL and GJS with high cutting speeds. With smooth cut for finishing.
	HC709	TiCN+TiN	Gold	◖	Fine grain carbide with a wear-resistant CVD coating for machining GJL and GJS with high cutting speeds. With smooth to slightly interrupted cut for finishing.
	HC720	TiCN+Al_2O_3	Black	●	Finest grain carbide with very high wear resistance and thermal stability and a multi-layer CVD coating with Al_2O_3 top coating for machining GJL and GJS at high cutting speeds. For smoother to slightly interrupted cut for medium machining.
	HC725	TiCN+Al_2O_3	Black	◖	Fine grain carbide with high wear resistance and a multi-layer CVD coating with Al_2O_3 top coating for machining GJL and GJS at high cutting speeds. For smooth to slightly interrupted cut for medium machining to roughing.
	HC735	TiCN+Al_2O_3	Black	✱	Finest grain carbide with a balanced relationship between wear and ductility and a multi-layer CVD coating with Al_2O_3 top coating for machining GJL and GJS at high cutting speeds. For interrupted cut or unstable conditions for medium machining to roughing.
	HC740	TiCN+Al_2O_3	Black	◖	Fine grain carbide with high wear resistance and a multi-layer CVD coating with Al_2O_3 top coating. For smooth to slightly interrupted cut for medium machining to roughing in GJS, non-alloy steels as well as heat-resistant cast steel.
	HC745	TiCN+Al_2O_3	Black	✱	Fine grain carbide with a balanced relationship between wear and ductility and a multi-layer CVD coating with Al_2O_3 top coating for machining at higher cutting speeds. For interrupted cut or unstable conditions and materials with increased tensile strength and high-alloy to stainless steels as well as heat-resistant cast steel.
	HC750	TiCN+Al_2O_3	Black	✱	Fine grain carbide with a balanced ductility relationship and a multi-layer CVD coating with Al_2O_3 top coating. For interrupted cut or unstable conditions and materials with very high tensile strength, stainless steels up to heat-resistant steels.
PVD-coated	**HP925**	AlTiCrN	Black-anthracite	●	Finest grain carbide with thick PVD coating. Grade for semi-machining and roughing for machining GJL and GJS.
	HP930	AlTiCrN	Black-anthracite	◖	Fine grain carbide with PVD top coating. Grade for semi-machining and roughing, for machining GJL and GJS.
	HP935	AlTiCrN	Black-anthracite	✱	Ductile finest grain carbide with PVD top coating. Grade for boring in the area of roughing to semi-machining with interrupted cuts or unstable conditions while machining GJS.
	HP940	AlTiCrN	Black-anthracite	✱	Fine grain carbide with PVD top coating. Grade for boring in the area of roughing to semi-machining with interrupted cuts or for unstable conditions while machining GJS.
	HP945	AlTiCrN	Black-anthracite	✱	Fine grain carbide with PVD top coating. For boring steels or stainless steels as well as heat-resistant cast steel.
	HP950	TiAlSiN	Copper	✱	Ductile fine grain with PVD coating. For boring materials with highest tensile strength, stainless steels and heat-resistant cast steel.
	HP955	TiAlSiN	Copper	✱	Ductile fine grain and balanced ductility with PVD coating. For boring materials with highest tensile strength, stainless steels up to heat-resistant cast steel.
PVD-coated, mixed machining	**HP525-P**	TiAlXN	Golden brown	●	PVD-coated carbide, particularly suitable for the mixed machining of aluminium and GJL/GJS with smooth cut.
	HP530-P	TiAlXN	Golden brown	◖	PVD-coated carbide, particularly suitable for the mixed machining of aluminium and GJL/GJS with smooth cut to slightly interrupted cut.
	HP540-P	TiAlXN	Golden brown	◖	PVD-coated carbide, particularly suitable for the mixed machining of aluminium and sintered steel with smooth cut to slightly interrupted cut.
	HP545-P	TiAlXN	Golden brown	◖	PVD-coated carbide with a balanced ductility relationship, particularly suitable for the mixed machining of aluminium and sintered steel with smooth cut to slightly interrupted cut.

Applications: ✱ Unstable machining ◖ General machining ● Stable machining


P Steel
Wear-resistant
Ductile
05 15 25 35 45
01 10 20 30 40 50
M Stainless steel/heat-resistant cast steel
Wear-resistant
Ductile
05 15 25 35 45
01 10 20 30 40 50
K Cast iron
Wear-resistant
Ductile
05 15 25 35 45
01 10 20 30 40 50
N + K Mixed machining
Wear-resistant
Ductile
Cast iron
GJL
GJS
N + P Mixed machining
Wear-resistant
Ductile
Sintered
Non-alloy
steel
High-alloy

Overview of chip guiding stages - boring

Tangential indexable inserts

	Type	Ground (H tolerance)	Pressed (N tolerance)	Edge rounding	Diagram
Roughing	**A53** 	P	P	++	
		M_1	M_1		
		M_2	M_2		
		K	K		
	A32 	P	P	++	
		M_1	M_1		
		M_2	M_2		
		K	K		
	H02 	P	P	++	
		M_1	M_1		
		M_2	M_2		
		K	K		
Medium machining	**A32** 	P	P	++	
		M_1	M_1		
		M_2	M_2		
		K	K		
	A56 	P	P	+	
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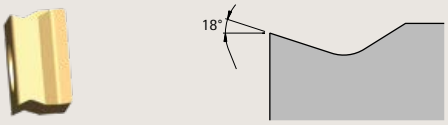
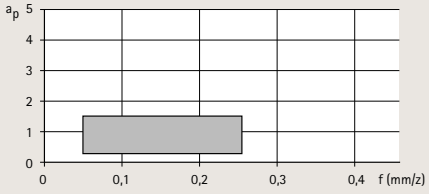
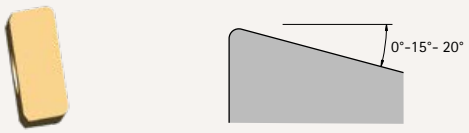
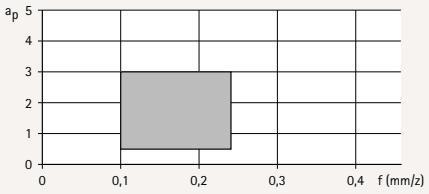
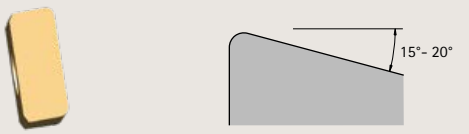
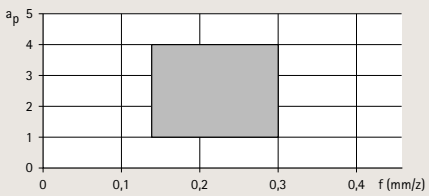
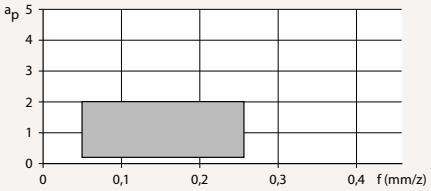
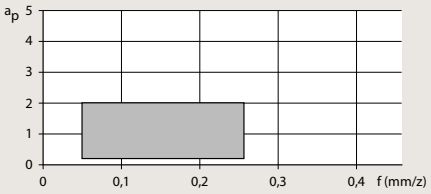
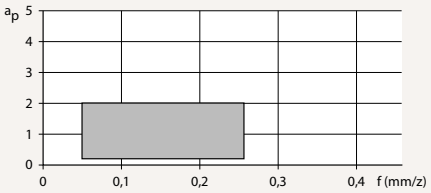
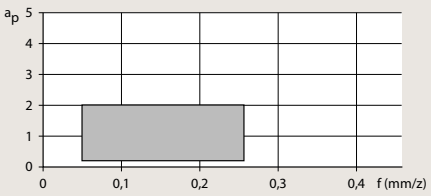
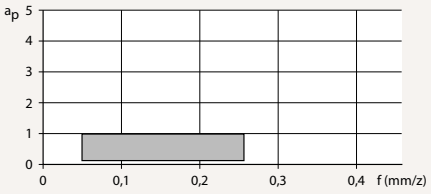
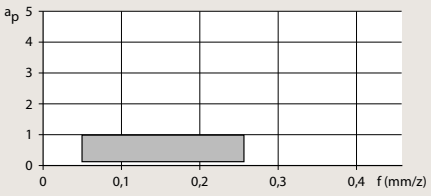
		M_2	M_2		
		K	K		
Finishing	**A31** 	P	P	+	
		M_1	M_1		
		M_2	M_2		
		K	K		
Universal application	**D01** 	P	P	+	
		M_1	M_1		
		M_2	M_2		
		K	K		
	D02 	P	P	++	
		M_1	M_1		
		M_2	M_2		
		K	K		

Radial indexable inserts

	Type	ISO 513	Edge rounding	Diagram
Mixed machining	**1W** 	P M K N S	+	
	2W 	P M K N S	+	
	1R 	P M K N S	+	
	2R 	P M K N S	+	
	X11 	P M K N S	+	
	X21 	P M K N S	+	

Marking on "press-to-size" indexable inserts

1 MAPAL embossing and chip guiding stage

2 Radius / lead and cutting direction

0 = sharp edged | + = slightly rounded | ++ = medium rounded | +++ = heavily rounded

Designation key tangential indexable inserts

C	T	H	Q	0 9	0 5	0 8
Insert form	Indexable insert	Tolerance	Insert type	Insert size	Insert thickness	Corner radius

Insert form

C (80°)
F (70°)
S (90)°
W (80)°

Indexable insert

T
Tangential

Tolerance

	d [mm]	s [mm]
H	±0.013	±0.025
G	±0.025	±0.13
N	±0.05 – ±0.15	±0.025
M	±0.05 – ±0.15	±0.13

Insert type

	D
	E
	Q

Insert size

Incircle	d	d	d	d	d
d [mm]	W	C	F	L	S
6.35	–	06/09	06	–	06
10.16	07	–	–	–	–
9.525	–	09	09	15	09
12.7	–	12	12	–	–
13.65	09	–	–	–	–

Insert thickness

Code	s [mm]
03	3.18
T3	3.97
04	4.76
05	5.56
06	6.35
07	7.94

Corner radius

Code	r [mm]
00	0
04	0.4
08	0.8
12	1.2
20	2.0
30	3.0

A	3	2	L	0	0	B	0	4	1	-	H	C	7	3	5	-	P

Chip guiding stage

Code letter	
A	01...99
C	01...99
D	01...99
G	01...99
H	01...99

Contact angle

Boring

Arc shaped land

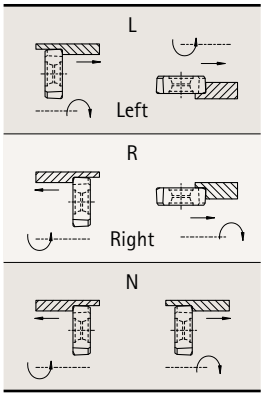
Code	Angle
00	0°
10	10°

Cutting material

HC735

(Example)

Cutting direction



Arc shaped land

Installation position	Code	Radius	CTHQ/FTHQ/WTHQ
	B012	12	
	B016	16	
	B021	21	
	B026	25	
	B041	40	
	B081	80	

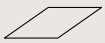
Only with polished inserts

Code letter	Design
P	Polished insert

Designation key radial indexable inserts

T	C	H	T	0	9	T	3

Insert form | Tolerance | Insert type | Insert size

Insert form
S (90°) 
C (80°) 
T (60°) 
D (55°) 
V (35°) 

	d [mm]	m [mm]	s [mm]
H	±0.013	±0.013	±0.025
G	±0.025	±0.025	From ±0.05 To ±0.13 *
M	From ±0.05 To ±0.15 *	From ±0.08 To ±0.20 *	From ±0.05 To ±0.13 *

* Tolerance independent of the insert size

Insert type
40° - 60° W
40° - 60° T

Incircle	d	d	d	u	
d [mm]	S	C	T	D	V
5.56	–	05	09	–	–
6.35	06	06	11	07	11
6.70	–	–	–	–	–
7.938	07	08	–	–	–
9.525	09	09	16	11	16
9.60	–	–	–	–	–
12.70	12	12	22	15	–
15.875	15	–	–	–	–

Clearance angle

B	5°
C	7°
P	11°

Insert thickness

Code	s [mm]
T1	1.98
02	2.38
03	3.18
T3	3.97
04	4.76

0	4		E	0	4		R	-	U	3	0	-	H	C	7	2	5	-	P
			Not required with sintered inserts																
			Ground indexable insert																

Cutting edge design

Code letter	Design
F 01	Sharp edged
E 01 02 04	Rounded
T 51	Chamfered

Cutting direction

L	Left
R	Right
N	Neutral
X	Right/left

Cutting material

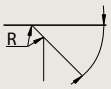
HC725

(Example)

Only with polished inserts

Code letter	Design
P	Polished insert

Chamfer lead with radius



Code	Chamfer	r [mm]
FB	0.8 x 45°	0.2
FC	0.8 x 45°	0.4

Corner radius

Code	r [mm]
02	0.2
04	0.4
08	0.8
12	1.2

2	L		A		U	3	0
			Only with cutting edges fitted				
Ground chip guiding stage					Sintered chip guiding stage		

Chip guiding stage

Code letter
0A
1R
2R
1L
2L
5L
6L
1W
2W
X11
X21

Tipping

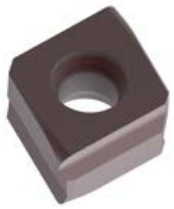
Code letter	Design
A	Fitted on one side
	One corner or one cutting edge

Cutting edge design

Code letter	Design
U 01...99	Chip guiding stage finishing
M 01...99	Chip guiding stage semi
R 01...99	Chip guiding stage roughing

CTHQ

Tangential indexable inserts, four cutting edges, blind bore, with arc shaped land



			Carbide						
Material			P				M_1		
			Non-alloy Alloy Wear-resistant Ductile		Non-alloy Alloy Wear-resistant Ductile		Austenitic Ferritic Wear-resistant Ductile		
Coating			CVD		PVD		CVD	PVD	
Cutting material types			HC740	HC745	HP945	HP950	HC750	HP955	
Cutting edge design			A53	A53	A53	A53	A32	A32	
	CTHQ from ø 65 mm	a_p max. [mm]							
Roughing	CTHQ060408...L00B021-...	1.5 - 2.5	30950046				30951499	30951571	
	CTHQ from ø 65 mm								
	CTHQ090508...L00B041-...	1.5 - 3.0	30933714	30933715	30933716	30933717	30933718	30933719	
		1.5 - 4.0							
	CTHQ090512...L00B041-...	1.5 - 3.0	30950047						
		1.5 - 4.0							
	CTHQ from ø 78 mm								
	CTHQ120608...L00B081-..	1.5 - 3.0	30933733	30933734					
		1.5 - 5.0							
	CTHQ120612...L00B081-...	1.5 - 3.0	30950048						
		1.5 - 5.0							
	Cutting edge design		A32		A32				
	CTHQ from ø 35 mm	a_p max. [mm]							
Medium machining	CTHQ060404...L00B021-...	0.5 - 2.0	30950049						
	CTHQ060408...L00B021-...	0.5 - 2.0	30988731		30988740				
	CTHQ from ø 65 mm								
	CTHQ090504...L00B041-...	0.5 - 2.0	30950080		30988741				
	CTHQ090508...L00B041-...	0.5 - 2.0	30988732		30988742				
	CTHQ090512...L00B041-...	0.5 - 2.0	30988733		30988743				
	CTHQ from ø 78 mm								
	CTHQ120608...L00B081-..	0.5 - 2.0	30988734		30988744				
	CTHQ120612...L00B081-...	0.5 - 2.0	30988735		30988745				
	Cutting edge design								
	CTHQ from ø 35 mm	a_p max. [mm]							
Finishing	CTHQ060404...L00B021-...	0.2 - 1.5							
	CTHQ060408...L00B021-...	0.2 - 1.5							
	CTHQ from ø 65 mm								
	CTHQ090504...L00B041-...	0.2 - 1.5							
	CTHQ090508...L00B041-...	0.2 - 1.5							

Right design on request.

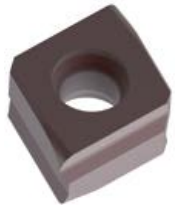
M_1 Stainless steel

	Carbide										
	K										
	GJL Wear-resistant	GJS Ductile	GJL Wear-resistant			GJS Ductile	GJL Wear-resistant				GJS Ductile
	CVD-Finish		CVD				PVD				
	HC704	HC709	HC720	HC725	HC735	HC740	HP925	HP930	HP935	HP940	HP945
			H02	H02	H02	H02	H02	H02	H02	H02	H02
			30933720	30933721	30933722	30988707	30933723	30933724	30933725	30933726	30988736
			30942345	30933727	30933728	30988708	30933729	30933730	30933731	30933732	30988737
				30933735	30933736	30988709	30933737	30933738		30933739	30988738
					30933740	30988730				30933741	30988739
			A32	A32	A32	A32	A32	A32	A32	A32	A32
						30950049					
			30933744	30679857	30933746	30988731	30933747	30933748		30933749	30988740
			30933752	30679858	30933754	30950080	30933755	30933756	30933757	30933758	30988741
			30933761	30679859	30631381	30988732	30933764	30933765	30933766	30933767	30988742
				30631362	30942346	30988733	30942347	30942348	30942349	30942360	30988743
				30789882	30631343	30988734	30933776	30933777		30933778	30988744
				30942361	30933779	30988735	30942362	30942363		30933780	30988745
	A31	A31									
	30933742	30933743									
	30933750	30933751									
	30933759	30933760									

For general figures for the minimum boring diameter in relation to the number of teeth, see catalogue Drilling | Boring | Countersinking.
For clamping screws, screwdriver and tightening torques for indexable inserts, see catalogue Drilling | Boring | Countersinking.

CTHQ

Tangential indexable inserts, four cutting edges, through bore, with arc shaped land



			Carbide						
			P				M_1		
Material			Non-alloy ← Wear-resistant	Alloy → Ductile	Non-alloy ← Wear-resistant	Alloy → Ductile	Austenitic ← Wear-resistant	Ferritic → Ductile	
Coating			CVD		PVD		CVD	PVD	
Cutting material types			HC740	HC745	HP945	HP950	HC750	HP955	
Cutting edge design			A53	A53	A53	A53	A32	A32	
	CTHQ from ø 40 mm	**a_p max. [mm]**							
Roughing	CTHQ060408...L10B021-...	1.5 - 2.5	30950081				30933712	30933713	
	CTHQ from ø 65 mm								
	CTHQ090508...L10B041-...	1.5 - 3.0	30933783	30933784	30933785	30933786	30933787	30933788	
		1.5 - 4.0							
	CTHQ from ø 78 mm								
	CTHQ120608...L10B081-...	1.5 - 3.0	30950082						
		1.5 - 5.0							
	Cutting edge design		A32		A32				
	CTHQ from ø 40 mm	**a_p max. [mm]**							
Medium machining	CTHQ060404...L10B021-...	0.5 - 2.0							
	CTHQ060408...L10B021-...	0.5 - 2.0	30988748		30988753				
	CTHQ from ø 65 mm								
	CTHQ090504...L10B041-...	0.5 - 2.0	30950083		30988754				
	CTHQ090508...L10B041-...	0.5 - 2.0	30988749		30988755				
	CTHQ from ø 78 mm								
	CTHQ120608...L10B081-...	0.5 - 2.0	30988750		30988756				

Right design on request.

	Cutting edge design								
	CTHQ from ø 40 mm	**a_p max. [mm]**							
Finishing	CTHQ060408...L10B021-...	0.2 - 1.5							
	CTHQ from ø 65 mm								
	CTHQ090504...L10B041-...	0.2 - 1.5							
	CTHQ090508...L10B041-...	0.2 - 1.5							

M_1 Stainless steel

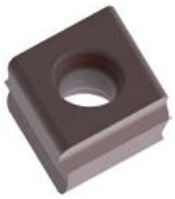
BS
L10

	Carbide										
	K										
	GJL ← Wear-resistant	GJS → Ductile	GJL ← Wear-resistant			GJS → Ductile	GJL ← Wear-resistant				GJS → Ductile
	CVD-Finish		CVD				PVD				
	HC704	HC709	HC720	HC725	HC735	HC740	HP925	HP930	HP935	HP940	HP945
			H02	H02	H02	H02	H02	H02	H02	H02	H02
			30933789	30933790	30933791	30988746	30933792	30933793	30933794	30933795	30988751
				30933796	30933797	30988747	30933798	30933799		30933800	30988752
			A32	A32	A32	A32	A32	A32	A32	A32	A32
			30933803	30679863	30933805	30988748	30933806	30933807		30933808	30988753
			30933811	30679864	30933813	30950083	30933814	30933815	30933817	30933818	30988754
			30933821	30679865	30933823	30988749	30933824	30933825	30933826	30933827	30988755
					30908210	30988750				30933829	30988756
	A31	A31									
	30933801	30933802									
	30933809	30933810									
	30933819	30933820									

For general figures for the minimum boring diameter in relation to the number of teeth, see catalogue Drilling | Boring | Countersinking.
For clamping screws, screwdriver and tightening torques for indexable inserts, see catalogue Drilling | Boring | Countersinking.

CTHQ

Tangential indexable inserts, four cutting edges, without arc shaped land



			Carbide								
Material			P				M_1		M_2		
			Non-alloy → Alloy Wear-resistant → Ductile		Non-alloy → Alloy Wear-resistant → Ductile		Austenitic → Ferritic Wear-resistant → Ductile		Austenitic → Ferritic Wear-resistant → Ductile		
Coating			CVD		PVD		CVD	PVD	CVD		
Cutting material types			HC740	HC745	HP945	HP950	HC750	HP955	HC740	HC745	HC750
Cutting edge design			A53	A53	A53	A53	A32	A32	H02	H02	H02
	CTHQ from ø 28 mm	a_p max. [mm]									
Roughing	CTHQ060408...L-...	1.5 - 2.5	30933830	30933831	30933832	30933833	30933834	30933835	30980615	30980616	30980617
	CTHQ060408...R-...	1.5 - 2.5	30933836	30933837	30933838	30933839			30980621	30980622	30980623
	CTHQ from ø 41 mm										
	CTHQ090508...L-...	1.5 - 3.0	30933840	30933841	30933842	30933843	30950084	30950085	30980629	30980630	30980631
		1.5 - 4.0									
	CTHQ090508...R-...	1.5 - 3.0	30933844		30933845		30950086	30950087	30980712	30980713	30980714
		1.5 - 4.0									
	CTHQ from ø 54 mm										
	CTHQ120608...L-...	1.5 - 3.0	30933858	30933859	30933860	30933861			30980759	30980764	30980765
		1.5 - 5.0									
	CTHQ120608...R-...	1.5 - 3.0	30933862		30933863				30980784	30980785	30980786
		1.5 - 5.0									
	Cutting edge design		A32	A32	A32	A32		A56	A32	A32	A32
	CTHQ from ø 28 mm	a_p max. [mm]									
Medium machining	CTHQ060404...L-...	0.5 - 2.0	30933870	30933871	30933872	30933873		30950103	30933870	30933871	30980942
	CTHQ060404...R-...	0.5 - 2.0	30942364	30942365	30942366	30942367		30950104	30942364	30942365	30980965
	CTHQ from ø 41 mm										
	CTHQ090504...L-...	0.5 - 2.0	30933878	30933879	30933880	30933881		30950107	30933878	30933879	30980967
	CTHQ090504...R-...	0.5 - 2.0		30942369		30942370		30950108		30942369	30980968
	CTHQ090508...L-...	0.5 - 2.0	30813598	30933884	30933885	30933886			30813598	30933884	30950084
	CTHQ090508...R-...	0.5 - 2.0		30942377		30942378				30942377	30950086
	CTHQ from ø 54 mm										
	CTHQ120604...L-...	0.5 - 2.0	30933904						30933904		
	CTHQ120604...R-...	0.5 - 2.0	30980051						30980051		
	Cutting edge design										
	CTHQ from ø 41 mm	a_p max. [mm]									
*	CTHQ090504...L-...	0.2 - 1.5									
	CTHQ090508...L-...	0.2 - 1.5									

*** = Finishing**

M_1 Stainless steel

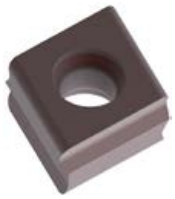
M_2 Heat-resistant cast steel (turbocharger materials)

	Carbide													
	M_2			K										
	Austenitic ← Wear-resistant		Ferritic → Ductile	GJL ← Wear-resistant	GJS → Ductile	GJL ← Wear-resistant			GJS → Ductile	GJL ← Wear-resistant				GJS → Ductile
	PVD			CVD-Finish		CVD				PVD				
	HP945	HP950	HP955	HC704	HC709	HC720	HC725	HC735	HC740	HP925	HP930	HP935	HP940	HP945
	H02	H02	H02			H02	H02	H02	H02	H02	H02	H02	H02	H02
	30980618	30980619	30980620			30933906	30933907	30933908	30980615	30933909	30933910		30933911	30980618
	30980625	30980626	30980627				30933912	30933913	30980621					30980625
	30980632	30980633	30980634											30980632
							30921024	30933915	30980629	30933916	30933917	30933918	30933919	
	30980751	30980752	30980753											30980751
							30921023	30933921	30980712	30933922	30933923	30933924	30933925	
	30980766	30980767	30980768											30980766
							30933946	30933947	30980759	30933948	30933949		30933950	
	30980787	30980788	30980822											30980787
							30933951	30933952	30980784	30933953	30933954		30933955	
	A32	A32	A32			A32	A32	A32	A32	A32	A32	A32	A32	A32
	30933872	30933873	30980944			30933966	30679872	30703102	30933870	30933969	30933970		30933971	30933872
	30942366	30942367	30980966				30679873	30942368	30942364					30942366
	30933880	30933881	30980969			30933975	30679874	30933977	30933878	30933978	30933979	30933980	30933981	30933880
		30942370	30980970			30942371	30679875	30942372		30942373	30942374	30942375	30942376	
	30933885	30933886	30950085			30933990	30724676	30813597	30813598	30933993	30933994	30933995	30933996	30933885
		30942378	30950087			30942379	30789885	30942380		30942381	30942382	30942383	30942384	
							30789886	30934026	30933904	30934027	30934028		30934029	
							30789887	30980052	30980051	30980053	30980054		30980055	
				A31	A31									
				30933882	30933974									
				30933887	30933989									

For general figures for the minimum boring diameter in relation to the number of teeth, see catalogue Drilling | Boring | Countersinking.
For clamping screws, screwdriver and tightening torques for indexable inserts, see catalogue Drilling | Boring | Countersinking.

CTNQ

Tangential indexable inserts, four cutting edges, without arc shaped land



			Carbide						
			P				M_1		
Material			Non-alloy ← Wear-resistant	→ Alloy Ductile	Non-alloy ← Wear-resistant	→ Alloy Ductile	Austenitic ← Wear-resistant	→ Ferritic Ductile	
Coating			CVD		PVD		CVD	PVD	
Cutting material types			HC740	HC745	HP945	HP950	HC750	HP955	
Cutting edge design			H02	H02	H02	H02	A32	A32	
	CTNQ from ø 41 mm	a_p max. [mm]							
Roughing	CTNQ090508...L-...	1.5 - 3.0	30933846	30933847	30933848	30933849	30950088	30950089	
		1.5 - 4.0							
	CTNQ090508...R-...	1.5 - 3.0	30933850	30950090	30933851	30950091	30950092	30950093	
		1.5 - 4.0							
	CTNQ090512...L-...	1.5 - 3.0	30933852	30933853	30933854	30933855	30950094	30950095	
		1.5 - 4.0							
	CTNQ090512...R-...	1.5 - 3.0	30933856	30950096	30933857	30950097	30950099	30950100	
		1.5 - 4.0							
	CTNQ from ø 54 mm								
	CTNQ120608...L-...	1.5 - 3.0	30933864	30933865	30933866	30933867			
		1.5 - 5.0							
	CTNQ120612...L-...	1.5 - 3.0	30933868	30980910	30933869	30980913			
		1.5 - 5.0							
	Cutting edge design		A32	A32	A32	A32	A32	A32	
	CTNQ from ø 41 mm	a_p max. [mm]							
Medium machining	CTNQ090508...L-...	1.5 - 3.0	30933892	30933893	30933894	30933895	30950088	30950089	
		1.5 - 4.0							
	CTNQ090508...R-...	1.5 - 3.0	30933896	30950111	30933897	30950112	30950092	30950093	
		1.5 - 4.0							
	CTNQ090512...L-...	1.5 - 3.0	30933898	30933899	30933900	30933901	30950094	30950095	
		1.5 - 4.0							
	CTNQ090512...R-...	1.5 - 3.0	30933902	30950117	30933903	30950118	30950099	30950100	
		1.5 - 4.0							

M_1 Stainless steel

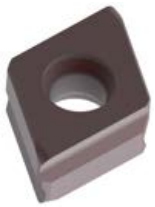
M_2 Heat-resistant cast steel (turbocharger materials)

	Carbide									
	M_2						K			
	Austenitic ← Wear-resistant		→ Ferritic Ductile	Austenitic ← Wear-resistant		→ Ferritic Ductile	GJL ← Wear-resistant	→ GJS Ductile	GJL ← Wear-resistant	→ GJS Ductile
	CVD			PVD			CVD		PVD	
	HC740	HC745	HC750	HP945	HP950	HP955	HC725	HC740	HP930	HP945
	H02	H02	H02	H02	H02	H02	H02	H02	H02	H02
	30933846	30933847	30980873	30933848	30933849	30980877				30933848
							30933926	30933846	30933929	
	30933850	30950090	30980900	30933851	30950091	30980901				30933851
							30933931	30933850	30933934	
	30933852	30933853	30980902	30933854	30933855	30980903				30933854
							30933936	30933852	30933939	
	30933856	30950096	30980905	30933857	30950097	30980906				30933857
							30933941	30933856	30933944	
	30933864	30933865	30980907	30933866	30933867	30980909				30933866
							30933956	30933864	30933959	
	30933868	30980910	30980911	30933869	30980913	30980914				30933869
							30933961	30933868	30933964	
	A32	A32	A32	A32	A32	A32	A32	A32	A32	A32
	30933892	30933893	30950088	30933894	30933895	30950089				30933894
							30934005	30933892	30934008	
	30933896	30950111	30950092	30933897	30950112	30950093				30933897
							30934010	30933896	30934013	
	30933898	30933899	30950094	30933900	30933901	30950095				30933900
							30934015	30933898	30934018	
	30933902	30950117	30950099	30933903	30950118	30950100				30933903
							30934020	30933902	30934023	

For general figures for the minimum boring diameter in relation to the number of teeth, see catalogue Drilling | Boring | Countersinking.
For clamping screws, screwdriver and tightening torques for indexable inserts, see catalogue Drilling | Boring | Countersinking.

FTHQ

Tangential indexable inserts, four cutting edges, blind bore, with arc shaped land



			Carbide				
			P		M1		
Material			Non-alloy ← Wear-resistant / Alloy → Ductile	Non-alloy ← Wear-resistant / Alloy → Ductile	Austenitic ← Wear-resistant / Ferritic → Ductile	Austenitic ← Wear-resistant / Ferritic → Ductile	
Coating			CVD	PVD	CVD	PVD	
Cutting material types			HC740	HP945	HC750	HP955	
Cutting edge design			A53	A53	A32	A32	
	FTHQ from ø 30 mm	a_p max. [mm]					
Roughing	FTHQ090508...L00B016-...	1.5 - 3.0	30980181	30934058	30934059	30934070	
		1.5 - 4.0					
	FTHQ090512...L00B016-...	1.5 - 3.0	30934075	30934076			
		1.5 - 4.0					
	FTHQ from ø 40 mm						
	FTHQ120608...L00B021-...	1.5 - 3.0	30934081	30934082			
		1.5 - 5.0					
	FTHQ120612...L00B021-...	1.5 - 3.0	30934087	30934088			
		1.5 - 5.0					
	Cutting edge design		A32	A32			
	FTHQ from ø 22 mm	a_p max. [mm]					
Medium machining	FTHQ060404...L00B012-...	0.5 - 1.5	30950121	30988764			
	FTHQ060408...L00B012-...	0.5 - 1.5	30950122	30988765			
	FTHQ from ø 30 mm						
	FTHQ090504...L00B016-...	0.5 - 2.0	30950123	30988766			
	FTHQ090508...L00B016-...	0.5 - 2.0	30901249	30934106			
	FTHQ from ø 40 mm						
	FTHQ120604...L00B021-...	0.5 - 2.0					
	FTHQ120608...L00B021-...	0.5 - 2.0	30934113	30934114			
	FTHQ120612...L00B021-...	0.5 - 2.0					
	Cutting edge design						
	FTHQ from ø 30 mm	a_p max. [mm]					
*	FTHQ090508...L00B016-...	0.2 - 1.5					

*** = Finishing**

Right design on request.

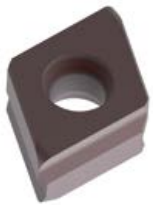
M1 Stainless steel

	Carbide							
	K							
	GJL ← Wear-resistant	→ GJS Ductile	GJL ← Wear-resistant		→ GJS Ductile	GJL ← Wear-resistant		→ GJS Ductile
	CVD-Finish		CVD			PVD		
	HC704	HC709	HC725	HC735	HC740	HP930	HP940	HP945
			H02	H02	H02	H02	H02	H02
			30934071	30912753	30934057	30934073	30934074	30988760
			30934077	30934078	30988757	30934079	30934080	30988761
			30934083	30934084	30988758	30934085	30934086	30988762
			30934089	30934090	30988759	30934091	30934092	30988763
			A32	A32	A32	A32	A32	A32
			30679879	30934094	30950121	30934095	30934096	30988764
			30679880	30934098	30950122	30934099	30934100	30988765
			30679881	30934102	30950123	30934103	30934104	30988766
			30679882	30912554	30901249	30934111	30934112	30934106
			30934115	30934116	30934113	30934118	30934119	30934114
	A31	A31						
	30934107	30934108						

For general figures for the minimum boring diameter in relation to the number of teeth, see catalogue Drilling | Boring | Countersinking.
For clamping screws, screwdriver and tightening torques for indexable inserts, see catalogue Drilling | Boring | Countersinking.

FTHQ

Tangential indexable inserts, four cutting edges, through bore, with arc shaped land



			Carbide				
			P		M1		
Material			Non-alloy ← Alloy Wear-resistant → Ductile	Non-alloy ← Alloy Wear-resistant → Ductile	Austenitic ← Ferritic Wear-resistant → Ductile	Austenitic ← Ferritic Wear-resistant → Ductile	
Coating			CVD	PVD	CVD	PVD	
Cutting material types			HC740	HP945	HC750	HP955	
Cutting edge design			A53	A53	A32	A32	
	FTHQ from ø 30 mm	a_p max. [mm]					
Roughing	FTHQ090508...L10B016-...	1.5 - 3.0	30934120	30934121	30934122	30934123	
		1.5 - 4.0					
	FTHQ from ø 40 mm						
	FTHQ120608...L10B021-...	1.5 - 3.0	30934128	30934129			
		1.5 - 5.0					
	Cutting edge design		A32	A32			
	FTHQ from ø 22 mm	a_p max. [mm]					
Medium machining	FTHQ060404...L10B012-...	0.5 - 1.5	30950124				
	FTHQ060408...L10B012-...	0.5 - 1.5	30942386	30942388			
	FTHQ from ø 30 mm						
	FTHQ090504...L10B016-...	0.5 - 2.0	30950125				
	FTHQ090508...L10B016-...	0.5 - 2.0	30942389	30942390			
	FTHQ from ø 40 mm						
	FTHQ120604...L10B021-...	0.5 - 2.0	30950126				
	FTHQ120608...L10B021-...	0.5 - 2.0	30942391	30942392			

Right design on request.

	Cutting edge design						
	FTHQ from ø 22 mm	a_p max. [mm]					
Finishing	FTHQ060404...L10B012-...	0.2 - 1.5					
	FTHQ060408...L10B012-...	0.2 - 1.5					
	FTHQ from ø 30 mm						
	FTHQ090504...L10B016-...	0.2 - 1.5					
	FTHQ090508...L10B016-...	0.2 - 1.5					

M1 Stainless steel

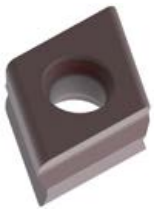
BS
L10

	Carbide								
	K								
	GJL ← Wear-resistant	→ GJS Ductile	GJL ← Wear-resistant			→ GJS Ductile	GJL ← Wear-resistant		→ GJS Ductile
	CVD-Finish		CVD				PVD		
	HC704	HC709	HC720	HC725	HC735	HC740	HP930	HP940	HP945
				H02	H02	H02	H02	H02	H02
				30934124	30934125	30988767	30934126	30934127	30988769
				30934130	30934131	30988768	30934132	30934133	30988770
			A32	A32	A32	A32	A32	A32	A32
			30942385	30679885	30950127	30950124			
				30679886	30942393	30942386	30942394	30942395	30942388
				30679887	30950128	30950125			
				30679888	30942396	30942389	30942397	30942398	30942390
				30789888	30950129	30950126			
				30789889	30942399	30942391	30942400	30942401	30942392
	A31	A31							
	30934134	30934135							
	30934142	30934143							
	30934146	30934147							

For general figures for the minimum boring diameter in relation to the number of teeth, see catalogue Drilling | Boring | Countersinking.
For clamping screws, screwdriver and tightening torques for indexable inserts, see catalogue Drilling | Boring | Countersinking.

FTHQ

Tangential indexable inserts, four cutting edges, without arc shaped land



			Carbide						
			P				M_1		
Material			Non-alloy ← Wear-resistant	→ Alloy Ductile	Non-alloy ← Wear-resistant	→ Alloy Ductile	Austenitic ← Wear-resistant	→ Ferritic Ductile	
Coating			CVD		PVD		CVD	PVD	
Cutting material types			HC740	HC745	HP945	HP950	HC750	HP955	
Cutting edge design			A53	A53	A53	A53	A32	A32	
	FTHQ from ø 30 mm	a_p max. [mm]							
Roughing	FTHQ090508...L-...	1.5 - 3.0	30980167		30934159		30934160	30934161	
		1.5 - 4.0							
	FTHQ090508...R-...	1.5 - 3.0	30934166		30934167		30950130	30950131	
		1.5 - 4.0							
	FTHQ from ø 40 mm								
	FTHQ120608...L-...	1.5 - 3.0	30934177	30950132	30934178	30950133	30934179	30934180	
		1.5 - 5.0							
	FTHQ120608...R-...	1.5 - 3.0	30934185	30950134	30934186		30950135	30950136	
		1.5 - 5.0							
	Cutting edge design		A32		A32			A56	
	FTHQ from ø 22 mm	a_p max. [mm]							
Medium machining	FTHQ060408...L-...	0.5 - 1.5	30934204		30934205			30980551	
	FTHQ060408...R-...	0.5 - 1.5							
	FTHQ from ø 30 mm								
	FTHQ090508...L-...	0.5 - 2.0	30934214		30934215			30980562	
	FTHQ090508...R-...	0.5 - 2.0							
	FTHQ from ø 40 mm								
	FTHQ120608...L-...	0.5 - 2.0	30934231		30934232				
	FTHQ120608...R-...	0.5 - 2.0							
	Cutting edge design								
	FTHQ from ø 22 mm	a_p max. [mm]							
Finishing	FTHQ060404...L-...	0.2 - 1.5							
	FTHQ060408...L-...	0.2 - 1.5							
	FTHQ from ø 30 mm								
	FTHQ090504...L-...	0.2 - 1.5							
	FTHQ090508...L-...	0.2 - 1.5							
	FTHQ from ø 40 mm								
	FTHQ120604...L-...	0.2 - 1.5							
	FTHQ120608...L-...	0.2 - 1.5							

M_1 Stainless steel

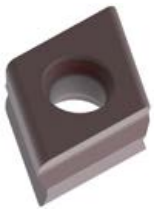
M_2 Heat-resistant cast steel (turbocharger materials)

	Carbide													
	M_2						K							
	Austenitic ← Wear-resistant		Ferritic → Ductile	Austenitic ← Wear-resistant		Ferritic → Ductile	GJL ← Wear-resistant	GJS → Ductile	GJL ← Wear-resistant		GJS → Ductile	GJL ← Wear-resistant		GJS → Ductile
	CVD			PVD			CVD-Finish		CVD			PVD		
	HC740	HC745	HC750	HP945	HP950	HP955	HC704	HC709	HC725	HC735	HC740	HP930	HP940	HP945
	H02	H02	H02	H02	H02	H02			H02	H02	H02	H02	H02	H02
	30912756	30980483	30980484	30980485	30980486	30980487								
									30934162	30912755	30912756	30934164	30934165	30980485
	30980488			30980489										
											30980488	30934168		30980489
	30980491	30980492	30980493	30980494	30980496	30980497								
									30934181	30934182	30980491	30934183	30934184	30980494
	30980501			30980502										
											30980501	30934187		30980502
	A32	A32	A32	A32	A32	A32			A32	A32	A32	A32	A32	A32
	30934204	30980552	30980555	30934205	30980556	30980558			30679893	30934209	30934204	30934210	30934211	
														30934205
	30934214	30980563	30934160	30934215	30980564	30934161			30679895	30934219	30934214	30934220	30934221	
			30950130			30950131								30934215
	30934231	30980566	30934179	30934232	30980567	30934180			30789898	30934236	30934231	30934237	30934238	
			30950135			30950136								30934232
							A31	A31						
							30934202	30934203						
							30934206	30934207						
							30934212	30934213						
							30934216	30934217						
							30934229	30934230						
							30934233	30934234						

For general figures for the minimum boring diameter in relation to the number of teeth, see catalogue Drilling | Boring | Countersinking.
For clamping screws, screwdriver and tightening torques for indexable inserts, see catalogue Drilling | Boring | Countersinking.

FTNQ

Tangential indexable inserts, four cutting edges, without arc shaped land



			Carbide						
	Material		P				M_1		
			Non-alloy ← Wear-resistant	→ Alloy Ductile	Non-alloy ← Wear-resistant	→ Alloy Ductile	Austenitic ← Wear-resistant	→ Ferritic Ductile	
	Coating		CVD		PVD		CVD	PVD	
	Cutting material types		HC740	HC745	HP945	HP950	HC750	HP955	
	Cutting edge design		H02	H02	H02	H02	A32	A32	
	FTNQ from ø 30 mm	**a_p max. [mm]**							
Roughing	FTNQ090508...L-...	1.5 - 3.0	30934169	30980506	30934170	30980509	30934171	30934172	
		1.5 - 4.0							
	FTNQ from ø 40 mm								
	FTNQ120608...L-...	1.5 - 3.0	30934188	30980522	30934189	30980524			
		1.5 - 5.0							
	FTNQ120608...R-...	1.5 - 3.0	30934196		30934197				
		1.5 - 5.0							
	Cutting edge design		A32	A32	A32	A32			
	FTNQ from ø 30 mm	**a_p max. [mm]**							
*	FTNQ090508...L-...	1.5 - 3.0	30934222	30950139	30934223	30950140			
		1.5 - 4.0							

*** = Medium machining**

M_1 Stainless steel

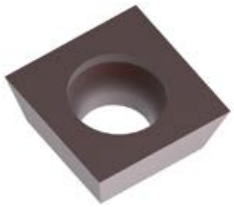
M_2 Heat-resistant cast steel (turbocharger materials)

	Carbide									
	M_2						K			
	Austenitic ← Wear-resistant		Ferritic → Ductile	Austenitic ← Wear-resistant		Ferritic → Ductile	GJL ← Wear-resistant	GJS → Ductile	GJL ← Wear-resistant	GJS → Ductile
	CVD			PVD			CVD		PVD	
	HC740	HC745	HC750	HP945	HP950	HP955	HC725	HC740	HP930	HP945
	H02	H02	H02	H02	H02	H02	H02	H02	H02	H02
	30934169	30980506	30980508	30934170	30980509	30980520				
							30934173	30934169	30934175	30934170
	30934188	30980522	30980523	30934189	30980524	30980525				
							30934192	30934188	30934194	30934189
	30934196			30934197						
							30934198	30934196	30934200	30934197
	A32	A32	A32	A32	A32	A32	A32	A32	A32	A32
	30934222	30950139	30934171	30934223	30950140	30934172				
							30934173	30934222	30934175	30934223

For general figures for the minimum boring diameter in relation to the number of teeth, see catalogue Drilling | Boring | Countersinking.
For clamping screws, screwdriver and tightening torques for indexable inserts, see catalogue Drilling | Boring | Countersinking.

STHD - STHE

Tangential indexable inserts, four cutting edges, chamfers, neutral design

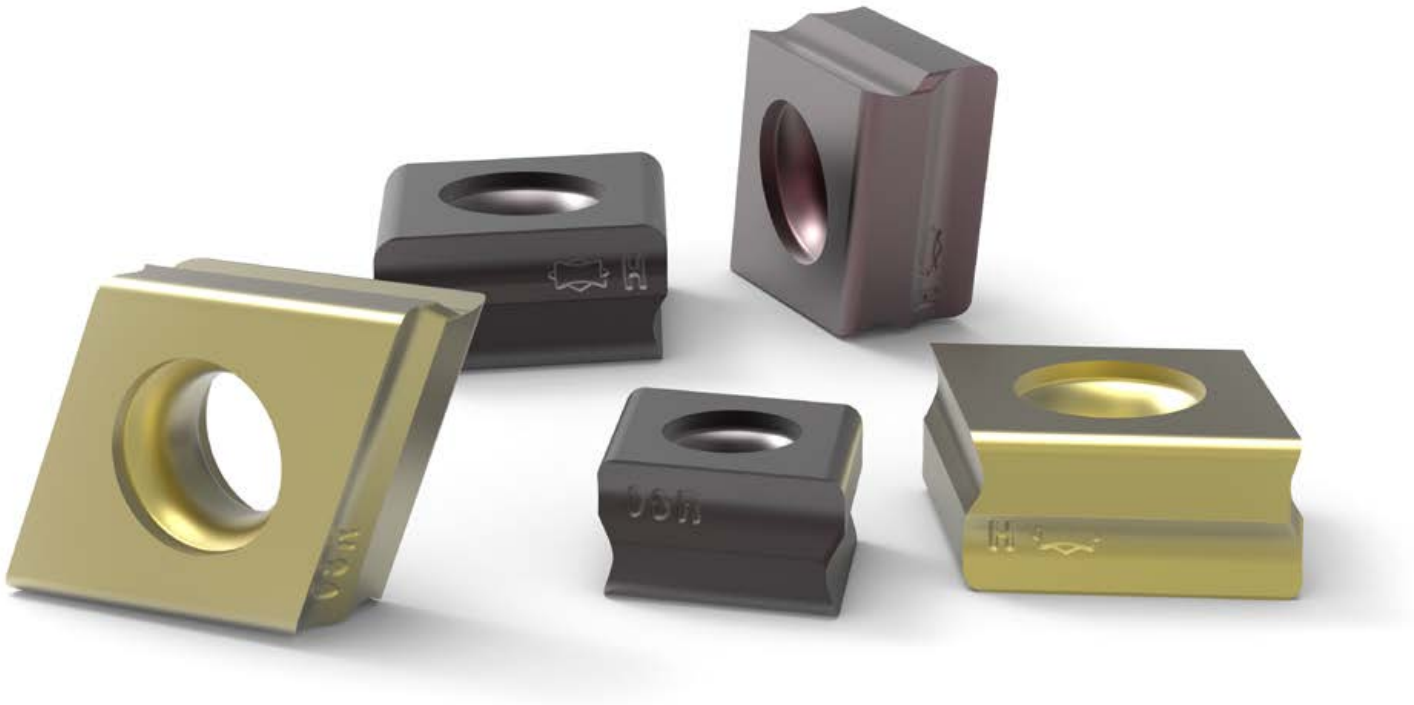


			Carbide				
Material			P	M_1 M_2	K		
			Non-alloy ← Alloy Wear-resistant → Ductile	Austenitic ← Ferritic Wear-resistant → Ductile	GJL ← GJS Wear-resistant → Ductile	GJL ← GJS Wear-resistant → Ductile	GJL ← GJS Wear-resistant → Ductile
Coating			PVD	PVD	CVD-Finish	CVD	PVD
Cutting material types			HP930	HP930	HC709	HC725	HP930
Cutting edge design			D02	D02	D01	D02	D02
	STHD	a_p max. [mm]					
Chamfering	STHD060300...N-...	0.1 - 4.2	30950141	30950141	30934460	30774242	30950141
	STHE060300...N-...	0.1 - 4.2	30950142	30950142	30934461	30789899	30950142
	STHD						
	STHD09T300...N-...	0.1 - 6.3	30950143	30950143	30934462	30631370	30950143
	STHE09T300...N-...	0.1 - 6.3	30950144	30950144	30934463	30631351	30950144

M_1 Stainless steel

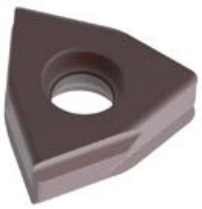
M_2 Heat-resistant cast steel (turbocharger materials)

For general figures for the minimum boring diameter in relation to the number of teeth, see catalogue Drilling | Boring | Countersinking.
For clamping screws, screwdriver and tightening torques for indexable inserts, see catalogue Drilling | Boring | Countersinking.



WTHQ

Tangential indexable inserts, six cutting edges, blind bore, with arc shaped land



			Carbide			
	Material		P			
			Non-alloy ← Wear-resistant	Alloy → Ductile	Non-alloy ← Wear-resistant	Alloy → Ductile
	Coating		CVD		PVD	
	Cutting material types		HC740	HC745	HP945	HP950
	Cutting edge design		A53	A53	A53	A53
	WTHQ from ø 37 mm	**a_p max. [mm]**				
Roughing	WTHQ070508...L00B026-...	1.5 - 3.0	30934270		30934271	
	WTHQ from ø 59.5 mm					
	WTHQ090604...L00B041-...	1.5 - 3.0				
	WTHQ090608...L00B041-...	1.5 - 3.0	30934272	30934273	30934274	30934275
		1.5 - 5.0				
	WTHQ from ø 159.5 mm					
	WTHQ090604...L00B081-...	1.5 - 3.0	30934276		30934277	
		1.5 - 5.0				
	WTHQ090608...L00B081-...	1.5 - 3.0	30934278	30934279	30934280	30934281
		1.5 - 5.0				
	Cutting edge design		A32	A32	A32	A32
	WTHQ from ø 37 mm	**a_p max. [mm]**				
Medium mach'g	WTHQ070508...L00B026-...	0.5 - 2.0	30980071		30980074	
	WTHQ from ø 59.5 mm					
	WTHQ090608...L00B041-...	0.5 - 2.0	30980078	30980079	30980080	30980081
	WTHQ from ø 159.5 mm					
	WTHQ090608...L00B081-...	0.5 - 2.0	30980086		30980087	

Right design on request.

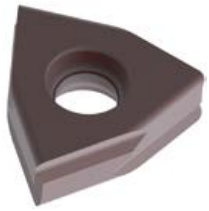
	Cutting edge design					
	WTHQ from ø 37 mm	**a_p max. [mm]**				
Finishing	WTHQ070508...L00B026-...	0.2 - 1.5				
	WTHQ from ø 59.5 mm					
	WTHQ090608...L00B041-...	0.2 - 1.5				
	WTHQ from ø 159.5 mm					
	WTHQ090608...L00B081-...	0.2 - 1.5				

	Carbide						
	K						
	GJL ← Wear-resistant / GJS → Ductile	GJL ← Wear-resistant / GJS → Ductile			GJL ← Wear-resistant / GJS → Ductile		
	CVD-Finish	CVD			PVD		
	HC704	HC720	HC735	HC740	HP925	HP940	HP945
		H02	H02	H02	H02	H02	H02
		30934286	30934288	30988771	30934289	30934291	30988776
		30934321	30934322	30988772			30988777
		30934298	30915789	30988773	30934301	30934303	30988778
		30934329	30934330	30988774			30988779
		30934308	30934310	30988775	30934311	30934313	30988780
		A32	A32	A32	A32	A32	A32
		30679903	30980075	30980071	30980076	30980077	30980074
		30789906	30789907	30980078	30980082	30980083	30980080
		30980088	30789908	30980086	30980089	30980090	30980087
	A31						
	30934284						
	30934296						
	30934306						

For general figures for the minimum boring diameter in relation to the number of teeth, see catalogue Drilling | Boring | Countersinking.
For clamping screws, screwdriver and tightening torques for indexable inserts, see catalogue Drilling | Boring | Countersinking.

WTHQ

Tangential indexable inserts, six cutting edges, through bore, with arc shaped land



			Carbide						
			P				M_1		
Material			Non-alloy ← Wear-resistant	→ Alloy Ductile	Non-alloy ← Wear-resistant	→ Alloy Ductile	Austenitic ← Wear-resistant	→ Ferritic Ductile	
Coating			CVD		PVD		CVD	PVD	
Cutting material types			HC740	HC745	HP945	HP950	HC750	HP955	
Cutting edge design			A53	A53	A53	A53	A32	A32	
	WTHQ from ø 37 mm	a_p max. [mm]							
Roughing	WTHQ070508...L10B026-...	1.5 - 3.0	30980187		30934338				
	WTHQ from ø 59.5 mm								
	WTHQ090604...L10B041-...	1.5 - 3.0	30934343		30934344				
		1.5 - 5.0							
	WTHQ090608...L10B041-...	1.5 - 3.0	30934351	30934352	30934353	30934354	30934355	30934356	
		1.5 - 5.0							
	WTHQ from ø 159.5 mm								
	WTHQ090608...L10B081-...	1.5 - 3.0	30934363		30934364				
		1.5 - 5.0							
	Cutting edge design		A32		A32				
	WTHQ from ø 37 mm	a_p max. [mm]							
Medium mach'g	WTHQ070508...L10B026-...	0.5 - 2.0	30929030		30988790				
	WTHQ from ø 59.5 mm								
	WTHQ090608...L10B041-...	0.5 - 2.0	30988784		30988791				
	WTHQ from ø 159.5 mm								
	WTHQ090608...L10B081-...	0.5 - 2.0	30988785		30988792				

Right design on request.

	Cutting edge design								
	WTHQ from ø 37 mm	a_p max. [mm]							
Finishing	WTHQ070508...L10B026-...	0.2 - 1.5							
	WTHQ from ø 59.5 mm								
	WTHQ090608...L10B041-...	0.2 - 1.5							

M_1 Stainless steel

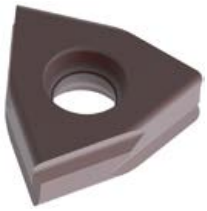
BS
L10

	Carbide						
	K						
	GJL ← Wear-resistant / GJS → Ductile	GJL ← Wear-resistant / GJS → Ductile			GJL ← Wear-resistant / GJS → Ductile		
	CVD-Finish	CVD			PVD		
	HC704	HC720	HC735	HC740	HP925	HP940	HP945
		H02	H02	H02	H02	H02	H02
		30934339	30927096	30927037	30934341	30934342	30988786
		30934345	30934347	30988781	30934348	30934350	30988787
		30934357	30915803	30988782	30934360	30934362	30988788
		30934365	30934367	30988783	30934368	30934370	30988789
		A32	A32	A32	A32	A32	A32
		30789913	30789914	30929030	30934375	30934376	30988790
		30679912	30789917	30988784	30934382	30934384	30988791
		30789919	30934387	30988785	30934388	30934390	30988792
	A31						
	30934371						
	30934377						

For general figures for the minimum boring diameter in relation to the number of teeth, see catalogue Drilling | Boring | Countersinking.
For clamping screws, screwdriver and tightening torques for indexable inserts, see catalogue Drilling | Boring | Countersinking.

WTHQ

Tangential indexable inserts, six cutting edges, without arc shaped land



			Carbide				
			P		M_1		
Material			Non-alloy ← Alloy Wear-resistant → Ductile	Non-alloy ← Alloy Wear-resistant → Ductile	Austenitic ← Ferritic Wear-resistant → Ductile	Austenitic ← Ferritic Wear-resistant → Ductile	
Coating			CVD	PVD	CVD	PVD	
Cutting material types			HC740	HP945	HC750	HP955	
Cutting edge design			A53	A53	A32	A32	
	WTHQ from ø 37 mm	**a_p max. [mm]**					
Roughing	WTHQ070504...L-...	1.5 - 3.0	30942402	30934392			
	WTHQ070504...R-...	1.5 - 3.0	30942403				
	WTHQ070508...L-...	1.5 - 3.0	30942404	30934399	30934400	30934401	
	WTHQ070508...R-...	1.5 - 3.0	30942405				
	WTHQ from ø 59.5 mm						
	WTHQ090604...L-...	1.5 - 3.0	30942406				
		1.5 - 5.0					
	WTHQ090604...R-...	1.5 - 3.0					
		1.5 - 5.0					
	WTHQ090608...L-...	1.5 - 3.0			30934417	30934418	
		1.5 - 5.0					
	WTHQ090608...R-...	1.5 - 3.0	30934425	30934426			
		1.5 - 5.0					
	Cutting edge design		A32	A32			
	WTHQ from ø 37 mm	**a_p max. [mm]**					
Medium mach'g	WTHQ070504...L-...	0.2 - 1.5					
	WTHQ070508...R-...	0.2 - 1.5	30934437	30934438			
	WTHQ from ø 59.5 mm						
	WTHQ090604...L-...	0.2 - 1.5					
	WTHQ090608...R-...	0.2 - 1.5	30934449	30934450			

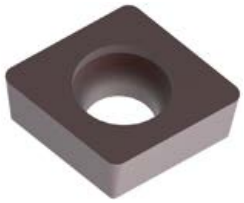
M_1 Stainless steel

	K					
	GJL ← Wear-resistant		GJS → Ductile	GJL ← Wear-resistant		GJS → Ductile
	CVD			PVD		
	HC720	HC735	HC740	HP925	HP940	HP945
	H02	H02	H02	H02	H02	H02
	30934393	30934394	30988793	30934395	30934396	30988798
	30934405	30934407	30988794	30934408	30934410	30988799
	30934411	30934413	30988795	30934414	30934416	30988800
	30934419	30934421	30988796	30934422	30934424	30988801
	30934391	30934398	30988797	30934402	30934404	30988802
	A32	A32	A32	A32	A32	A32
	30679917	30934434		30934435	30934436	
	30679919	30679920	30934437	30934441	30934442	30934438
	30679922	30679923		30934446	30934448	
	30679925	30679926	30934449	30934454	30934456	30934450

For general figures for the minimum boring diameter in relation to the number of teeth, see catalogue Drilling | Boring | Countersinking.
For clamping screws, screwdriver and tightening torques for indexable inserts, see catalogue Drilling | Boring | Countersinking.

CCGW

Radial indexable inserts, double edge



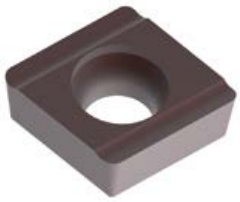
			Carbide				
Material			K				
			GJL ← Wear-resistant / GJS → Ductile	GJL ← Wear-resistant / GJS → Ductile		GJL ← Wear-resistant / GJS → Ductile	
Coating			CVD-Finish	CVD		PVD	
Cutting material types			HC709	HC725	HC735	HP930	HP940
Cutting edge design							
	CCGW	**a_p max. [mm]**					
Medium machining	CCGW060204E04N-0A-...	0.5 - 3.2		30679928	30941677	30950259	30941701
	CCGW060208E04N-0A-...	0.5 - 3.2		30679929	30941678	30950280	30941702
	CCGW09T304E04N-0A-...	0.5 - 4.0		30679930	30941679	30950281	30941703
	CCGW09T308E04N-0A-...	0.5 - 4.0		30679931	30965999	30950282	30941704
	CCGW09T312E04N-0A-...	0.5 - 4.0		30679932	30941700	30950283	30941705

	Cutting edge design						
	CCGW	**a_p max. [mm]**					
Finishing	CCGW060204E02N-0A-...	0.2 - 1.0	30679933			30950284	30941706
	CCGW060208E02N-0A-...	0.2 - 1.0	30679934			30950285	30941707
	CCGW09T304E02N-0A-...	0.2 - 2.0	30679935			30950286	30941708
	CCGW09T308E02N-0A-...	0.2 - 2.0	30679936			30950287	30941709

For general figures for the minimum boring diameter in relation to the number of teeth, see catalogue Drilling | Boring | Countersinking.
For clamping screws, screwdriver and tightening torques for indexable inserts, see catalogue Drilling | Boring | Countersinking.

CCHT

Radial indexable inserts, double edge, left design



			Carbide				
Material			K				
			GJL ← Wear-resistant	→ GJS Ductile	GJL ← Wear-resistant	→ GJS Ductile	GJL ← Wear-resistant → GJS Ductile
Coating			CVD-Finish		CVD		PVD
Cutting material types			HC709		HC725	HC735	HP930	HP940
Cutting edge design					1L	1L	1L	1L
	CCHT	a_p max. [mm]						
Medium machining	CCHT060204E04L-...-...	0.5 - 3.2			30679937	30941710	30950288	30941718
	CCHT060208E04L-...-...	0.5 - 3.2			30679938	30941711	30950289	30941719
	CCHT09T304E04L-...-...	0.5 - 4.0			30679939	30941712	30950290	30941720
	CCHT09T308E04L-...-...	0.5 - 4.0			30679940	30941713	30950291	30941721
	CCHT09T312E04L-...-...	0.5 - 4.0			30679941	30941714	30950292	30941722
	CCHT120404E04L-...-...	0.5 - 5.0			30679942	30941715	30950293	30941723
	CCHT120408E04L-...-...	0.5 - 5.0			30679943	30941716	30950294	30941724
	CCHT120412E04L-...-...	0.5 - 5.0			30679944	30941717	30950295	30941725
	Cutting edge design		1L				1L	1L
	CCHT	a_p max. [mm]						
Finishing	CCHT060204E02L-...-...	0.1 - 1.0	30679945				30950296	30941726
	CCHT060208E02L-...-...	0.1 - 1.0	30679946				30950297	30941727
	CCHT09T304E02L-...-...	0.1 - 2.0	30679947				30950298	30941728
	CCHT09T308E02L-...-...	0.1 - 2.0	30679948				30950299	30941729

For general figures for the minimum boring diameter in relation to the number of teeth, see catalogue Drilling | Boring | Countersinking.
For clamping screws, screwdriver and tightening torques for indexable inserts, see catalogue Drilling | Boring | Countersinking.

CCHT

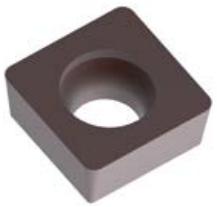
Radial indexable inserts, double edge, right design

			Carbide				
Material			K				
			GJL ← Wear-resistant / GJS → Ductile	GJL ← Wear-resistant / GJS → Ductile		GJL ← Wear-resistant / GJS → Ductile	
Coating			CVD-Finish	CVD		PVD	
Cutting material types			HC709	HC725	HC735	HP930	HP940
Cutting edge design				1L	1L	1L	1L
	CCHT	a_p max. [mm]					
Medium machining	CCHT060204E04R-...-...	0.5 - 3.2		30679949	30941710	30950300	30941718
	CCHT060208E04R-...-...	0.5 - 3.2		30679950	30941711	30950301	30941719
	CCHT09T304E04R-...-...	0.5 - 4.0		30679951	30941712	30950302	30941720
	CCHT09T308E04R-...-...	0.5 - 4.0		30679952	30941713	30950303	30941721
	CCHT09T312E04R-...-...	0.5 - 4.0		30679953	30941714	30950304	30941722
	CCHT120404E04R-...-...	0.5 - 5.0		30679954	30941715	30950305	30941723
	CCHT120408E04R-...-...	0.5 - 5.0		30679955	30941716	30950306	30941724
	CCHT120412E04R-...-...	0.5 - 5.0		30679956	30941717	30950307	30941725
	Cutting edge design		1L			1L	1L
	CCHT	a_p max. [mm]					
Finishing	CCHT060204E02R-...-...	0.1 - 1.0	30679957			30950308	30941747
	CCHT060208E02R-...-...	0.1 - 1.0	30679958			30950309	30941748
	CCHT09T304E02R-...-...	0.1 - 2.0	30679959			30950310	30941749
	CCHT09T308E02R-...-...	0.1 - 2.0	30679960			30950311	30941750

For general figures for the minimum boring diameter in relation to the number of teeth, see catalogue Drilling | Boring | Countersinking.
For clamping screws, screwdriver and tightening torques for indexable inserts, see catalogue Drilling | Boring | Countersinking.

SPGW - SCGW

Radial indexable inserts, four cutting edges



			Carbide				
			K				
Material			GJL ← Wear-resistant / GJS → Ductile	GJL ← Wear-resistant / GJS → Ductile		GJL ← Wear-resistant / GJS → Ductile	
Coating			CVD-Finish	CVD		PVD	
Cutting material types			HC709	HC725	HC735	HP930	HP940
Cutting edge design							
	SPGW	a_p max. [mm]					
Medium machining	SPGW060304E04N-0A-...	0.5 - 3.2		30679961	30941751	30950312	30941756
	SPGW060308E04N-0A-...	0.5 - 3.2		30679962	30941752	30950313	30941757
	SCGW						
	SCGW09T304E04N-0A-...	0.5 - 4.0		30679963	30941753	30950314	30941758
	SCGW09T308E04N-0A-...	0.5 - 4.0		30679964	30941754	30950315	30941759
	SCGW120404E04N-0A-...	0.5 - 5.0		30679965	30941755	30950316	30941760
	SCGW120408E04N-0A-...	0.5 - 5.0		30679966	30939412	30950317	30941761
	Cutting edge design						
	SPGW	a_p max. [mm]					
Finishing	SPGW060304E02N-0A-...	0.2 - 1.0	30679967			30950318	30941762
	SPGW060308E02N-0A-...	0.2 - 1.0	30679968			30950319	30941763
	SCGW						
	SCGW09T304E02N-0A-...	0.2 - 2.0	30679969			30950320	30941764
	SCGW09T308E02N-0A-...	0.2 - 2.0	30679970			30950321	30941765

For general figures for the minimum boring diameter in relation to the number of teeth, see catalogue Drilling | Boring | Countersinking.
For clamping screws, screwdriver and tightening torques for indexable inserts, see catalogue Drilling | Boring | Countersinking.

SPHT - SCHT

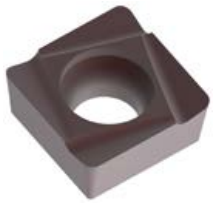
Radial indexable inserts, four cutting edges, left design

			Carbide				
Material			K				
			GJL ← Wear-resistant	→ GJS Ductile	GJL ← Wear-resistant	→ GJS Ductile	GJL ← Wear-resistant	→ GJS Ductile
Coating			CVD-Finish		CVD		PVD	
Cutting material types			HC709		HC725	HC735	HP930	HP940
Cutting edge design					2L	2L	2L	2L
	SPHT	a_p max. [mm]						
Medium machining	SPHT060304E04L-...-...	0.5 - 3.2			30679971	30941766	30950322	30941774
	SPHT060308E04L-...-...	0.5 - 3.2			30679972	30941767	30950323	30941775
	SCHT							
	SCHT09T304E04L-...-...	0.5 - 4.0			30679973	30941768	30950324	30941776
	SCHT09T308E04L-...-...	0.5 - 4.0			30679974	30941769	30950325	30941777
	SCHT09T312E04L-...-...	0.5 - 4.0			30679975	30941770	30950326	30941778
	SCHT120404E04L-...-...	0.5 - 5.0			30679976	30941771	30950327	30941779
	SCHT120408E04L-...-...	0.5 - 5.0			30679977	30941772	30950328	30941780
	SCHT120412E04L-...-...	0.5 - 5.0			30679978	30941773	30950329	30941781
	Cutting edge design		2L				2L	2L
	SPHT	a_p max. [mm]						
Finishing	SPHT060304E02L-...-...	0.1 - 1.0	30679979				30950330	30941782
	SPHT060308E02L-...-...	0.1 - 1.0	30679980				30950331	30941783
	SCHT							
	SCHT09T304E02L-...-...	0.1 - 2.0	30679981				30950332	30941784
	SCHT09T308E02L-...-...	0.1 - 2.0	30679982				30950333	30941785

For general figures for the minimum boring diameter in relation to the number of teeth, see catalogue Drilling | Boring | Countersinking.
For clamping screws, screwdriver and tightening torques for indexable inserts, see catalogue Drilling | Boring | Countersinking.

SPHT - SCHT

Radial indexable inserts, four cutting edges, right design

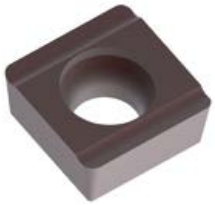


			Carbide				
Material			K				
			GJL ← Wear-resistant / GJS → Ductile	GJL ← Wear-resistant / GJS → Ductile		GJL ← Wear-resistant / GJS → Ductile	
Coating			CVD-Finish	CVD		PVD	
Cutting material types			HC709	HC725	HC735	HP930	HP940
Cutting edge design				2L	2L	2L	2L
	SPHT	a_p max. [mm]					
Medium machining	SPHT060304E04R-...-...	0.5 - 3.2		30679983	30941786	30950346	30941794
	SPHT060308E04R-...-...	0.5 - 3.2		30679984	30941787	30950347	30941795
	SCHT						
	SCHT09T304E04R-...-...	0.5 - 4.0		30679985	30941788	30950348	30941796
	SCHT09T308E04R-...-...	0.5 - 4.0		30679986	30941789	30950349	30941797
	SCHT09T312E04R-...-...	0.5 - 4.0		30679987	30941790	30950350	30941798
	SCHT120404E04R-...-...	0.5 - 5.0		30791104	30941791	30950351	30941799
	SCHT120408E04R-...-...	0.5 - 5.0		30973491	30941792	30950352	30941800
	SCHT120412E04R-...-...	0.5 - 5.0		30791108	30941793	30950353	30941801
	Cutting edge design		2L			2L	2L
	SPHT	a_p max. [mm]					
Finishing	SPHT060304E02R-...-...	0.1 - 1.0	30679988			30950354	30941802
	SPHT060308E02R-...-...	0.1 - 1.0	30679989			30950355	30941803
	SCHT						
	SCHT09T304E02R-...-...	0.1 - 2.0	30679990			30950356	30941804
	SCHT09T308E02R-...-...	0. 1- 2.0	30679991			30950357	30941805

For general figures for the minimum boring diameter in relation to the number of teeth, see catalogue Drilling | Boring | Countersinking.
For clamping screws, screwdriver and tightening torques for indexable inserts, see catalogue Drilling | Boring | Countersinking.

SPHT - SCHT

Radial indexable inserts, double edge

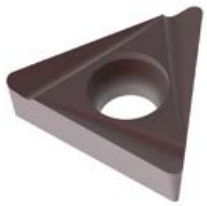


			Carbide				
Material			K				
			GJL ← Wear-resistant	GJS → Ductile	GJL ← Wear-resistant	GJS → Ductile	GJL ← Wear-resistant	GJS → Ductile
Coating			CVD-Finish		CVD		PVD	
Cutting material types			HC709		HC725	HC735	HP930	HP940
Cutting edge design					1L	1L	1L	1L
	SPHT	a_p max. [mm]						
Medium machining	SPHT060304E04X-...-...	0.5 - 3.2			30679992	30941806	30953122	30941814
	SPHT060308E04X-...-...	0.5 - 3.2			30679993	30941807	30953126	30941815
	SCHT							
	SCHT09T304E04X-...-...	0.5 - 4.0			30679994	30941808	30953127	30941816
	SCHT09T308E04X-...-...	0.5 - 4.0			30679995	30941809	30953128	30941817
	SCHT09T312E04X-...-...	0.5 - 4.0			30679996	30941810	30953150	30941818
	SCHT120404E04X-...-...	0.5 - 5.0			30679997	30941811	30953151	30941819
	SCHT120408E04X-...-...	0.5 - 5.0			30679998	30941812	30953152	30941820
	SCHT120412E04X-...-...	0.5 - 5.0			30679999	30941813	30953154	30941821
	Cutting edge design		1L				1L	1L
	SPHT	a_p max. [mm]						
Finishing	SPHT060304E02X-...-...	0.1 - 1.0	30680000				30953158	30941822
	SPHT060308E02X-...-...	0.1 - 1.0	30680001				30953164	30941823
	SCHT							
	SCHT09T304E02X-...-...	0.1 - 2.0	30680002				30953159	30941824
	SCHT09T308E02X-...-...	0.1 - 2.0	30680003				30953168	30941825

For general figures for the minimum boring diameter in relation to the number of teeth, see catalogue Drilling | Boring | Countersinking.
For clamping screws, screwdriver and tightening torques for indexable inserts, see catalogue Drilling | Boring | Countersinking.

TCHT

Radial indexable inserts, triple edge, left design

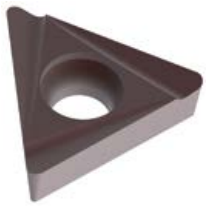


			Carbide				
Material			K				
			GJL ← Wear-resistant	→ GJS Ductile	GJL ← Wear-resistant	→ GJS Ductile	GJL ← Wear-resistant	→ GJS Ductile
Coating			CVD-Finish		CVD		PVD	
Cutting material types			HC709		HC725	HC735	HP930	HP940
Cutting edge design					2L	2L	2L	2L
	TCHT	a_p max. [mm]						
Medium machining	TCHT090204E04L-...-...	0.5 - 2.5			30680004	30941826	30950224	30941832
	TCHT090208E04L-...-...	0.5 - 2.5			30680005	30941827	30950225	30941833
	TCHT110204E04L-...-...	0.5 - 3.0			30680006	30941828	30950226	30941834
	TCHT110208E04L-...-...	0.5 - 3.0			30680007	30941829	30950227	30941835
	TCHT16T304E04L-...-...	0.5 - 4.0			30680008	30941830	30950228	30941836
	TCHT16T308E04L-...-...	0.5 - 4.0			30680009	30941831	30950229	30941837
	Cutting edge design		2L				2L	2L
	TCHT	a_p max. [mm]						
Finishing	TCHT06T104E02L-...-...	0.1 - 1.0	30680010				30950230	
	TCHT090204E02L-...-...	0.1 - 1.0	30680011				30950231	30941838
	TCHT090208E02L-...-...	0.1 - 1.0	30680012				30950232	30941839
	TCHT110204E02L-...-...	0.1 - 1.5	30973450				30950233	30941840
	TCHT110208E02L-...-...	0.1 - 1.5	30680014				30950234	30941841

For general figures for the minimum boring diameter in relation to the number of teeth, see catalogue Drilling | Boring | Countersinking.
For clamping screws, screwdriver and tightening torques for indexable inserts, see catalogue Drilling | Boring | Countersinking.

TCHT

Radial indexable inserts, triple edge, right design

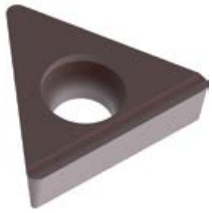


			Carbide				
Material			K				
			GJL ← Wear-resistant / GJS → Ductile	GJL ← Wear-resistant / GJS → Ductile		GJL ← Wear-resistant / GJS → Ductile	
Coating			CVD-Finish	CVD		PVD	
Cutting material types			HC709	HC725	HC735	HP930	HP940
Cutting edge design				2L	2L	2L	2L
	TCHT	a_p max. [mm]					
Medium machining	TCHT090204E04R-...-...	0.5 - 2.5		30680015	30941842	30950235	30941848
	TCHT090208E04R-...-...	0.5 - 2.5		30680016	30941843	30950236	30941849
	TCHT110204E04R-...-...	0.5 - 3.0		30680017	30941844	30950237	30941850
	TCHT110208E04R-...-...	0.5 - 3.0		30680018	30941845	30950238	30941851
	TCHT16T304E04R-...-...	0.5 - 4.0		30680019	30941846	30950239	30941852
	TCHT16T308E04R-...-...	0.5 - 4.0		30680020	30941847	30950240	30941853
	Cutting edge design		2L			2L	2L
	TCHT	a_p max. [mm]					
Finishing	TCHT06T104E02R-...-...	0.1 - 1.0	30680021			30950241	
	TCHT090204E02R-...-...	0.1 - 1.0	30680022			30950242	30941854
	TCHT090208E02R-...-...	0.1 - 1.0	30680023			30950243	30941855
	TCHT110204E02R-...-...	0.1 - 1.5	30973442			30950244	30941856
	TCHT110208E02R-...-...	0.1 - 1.5	30680025			30950245	30941857

For general figures for the minimum boring diameter in relation to the number of teeth, see catalogue Drilling | Boring | Countersinking.
For clamping screws, screwdriver and tightening torques for indexable inserts, see catalogue Drilling | Boring | Countersinking.

TCHT

Radial indexable inserts, single edge, neutral design

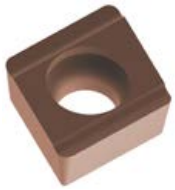


			Carbide				
Material			K				
			GJL ← Wear-resistant	→ GJS Ductile	GJL ← Wear-resistant	→ GJS Ductile	GJL ← Wear-resistant	→ GJS Ductile
Coating			CVD-Finish		CVD		PVD	
Cutting material types			HC709		HC725	HC735	HP930	HP940
Cutting edge design					1L	1L	1L	1L
	TCHT	a_p max. [mm]						
Medium machining	TCHT090204E04X-...-...	0.5 - 2.5			30680026	30941858	30950246	30941864
	TCHT090208E04X-...-...	0.5 - 2.5			30680027	30941859	30950247	30941865
	TCHT110204E04X-...-...	0.5 - 3.0			30680028	30941860	30950248	30941866
	TCHT110208E04X-...-...	0.5 - 3.0			30680029	30941861	30950249	30941867
	TCHT16T304E04X-...-...	0.5 - 4.0			30680030	30941862	30950250	30941868
	TCHT16T308E04X-...-...	0.5 - 4.0			30680031	30941863	30950251	30941869
	Cutting edge design		1L				1L	1L
	TCHT	a_p max. [mm]						
Finishing	TCHT06T104E02X-...-...	0.1 - 1.0	30680032				30950252	
	TCHT090204E02X-...-...	0.1 - 1.0	30680033				30950253	30941870
	TCHT090208E02X-...-...	0.1 - 1.0	30680034				30950254	30941871
	TCHT110204E02X-...-...	0.1 - 1.5	30680035				30950255	30941872
	TCHT110208E02X-...-...	0.1 - 1.5	30680036				30950256	30941873

For general figures for the minimum boring diameter in relation to the number of teeth, see catalogue Drilling | Boring | Countersinking.
For clamping screws, screwdriver and tightening torques for indexable inserts, see catalogue Drilling | Boring | Countersinking.

CCHT | Mixed machining

Radial indexable inserts, double edge, mixed machining



			Carbide			
Material			N + K Wear-resistant ← → Ductile		N + P Wear-resistant ← → Ductile	
Coating			PVD		PVD	
Cutting material types			HP525-P	HP530-P	HP540-P	HP545-P
Cutting edge design			1W	1W	1R	1R
	CCHT	a_p max. [mm]				
Radius	CCHT09T304E02L-...-...	0.1 - 2.0 *	30909374	30909375	30907411	30909351
	CCHT09T304E02R-...-...	0.1 - 2.0	30909376	30909377	30909352	30909353
	CCHT09T308E02L-...-...	0.1 - 2.0	30909378	30909379	30909354	30909355
	CCHT09T308E02R-...-...	0.1 - 2.0	30909380	30909381	30909356	30909357

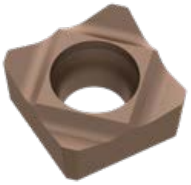
* Depending on the thrust bearing
Also possible for custom inserts.
For general figures for the minimum boring diameter in relation to the number of teeth, see catalogue Drilling | Boring | Countersinking.
For clamping screws, screwdriver and tightening torques for indexable inserts, see catalogue Drilling | Boring | Countersinking.

SCHT | Mixed machining

Radial indexable inserts, four cutting edges, mixed machining

SCHT, with chamfer lead

SCHT, with 45° chamfer lead



SCHT, with radius

			Carbide			
Material			N + K Wear-resistant ← → Ductile		N + P Wear-resistant ← → Ductile	
Coating			PVD		PVD	
Cutting material types			HP525-P	HP530-P	HP540-P	HP545-P
Cutting edge design						
	SCHT	**a_p max. [mm]**				
*	SCHT09T3FXL-606860658-...	0.1 - 1.0	30909358	30909359	30900344	30907537
	SCHT09T3FXR-606876373-...	0.1 - 1.0	30909360	30909361	30909339	30909340
	Cutting edge design		X21	X21	X11	X11
	SCHT	**a_p max. [mm]**				
**	SCHT09T3FBE02N-...-...	0.1 - 0.8	30909362	30909363	30909341	30909342
	SCHT09T3FCE02N-...-...	0.1 - 0.8	30909364	30909365	30909343	30909344
	Cutting edge design		2W	2W	2R	2R
	SCHT	**a_p max. [mm]**				
Radius	SCHT09T304E02L-...-...	0.1 - 2.0	30909366	30909367	30909345	30909346
	SCHT09T304E02R-...-...	0.1 - 2.0	30909368	30909369	30909347	30909348
	SCHT09T308E02L-...-...	0.1 - 2.0	30909370	30909371	30909349	30909350
	SCHT09T308E02R-...-...	0.1 - 2.0	30909372	30909373	30903215	30907589

*** Chamfer lead | ** 45° chamfer lead**

Also possible for custom inserts.
For general figures for the minimum boring diameter in relation to the number of teeth, see catalogue Drilling | Boring | Countersinking.
For clamping screws, screwdriver and tightening torques for indexable inserts, see catalogue Drilling | Boring | Countersinking.

Cutting data recommendation for boring tools with ISO elements

Cutting speed [m/min]

MMG*			Material	Strength/hardness [N/mm²] [HRC]	
P	P1	P1.1	Structural, free-cutting, case hardened and heat-treated steels, non-alloy	< 700 N/mm²	
		P1.2	Structural, free-cutting, case hardened and heat-treated steels, non-alloy	< 1200 N/mm²	
	P2	P2.1	Nitrided, case hardened and heat-treated steels, alloy	< 900 N/mm²	
		P2.2	Nitrided, case hardened and heat-treated steels, alloy	< 1400 N/mm²	
	P3	P3.1	Tool, bearing, spring and high-speed steels	< 900 N/mm²	
		P3.2	Tool, bearing, spring and high-speed steels	< 1500 N/mm²	
	P4	P4.1	Stainless steels, ferritic and martensitic		
	P5	P5.1	Cast steel		
	P6	P6.1	Stainless cast steel, ferritic and martensitic		
M	M1	M1.1	Stainless steels, austenitic	< 700 N/mm²	
		M1.2	Stainless steels, ferritic/austenitic (duplex)	< 1000 N/mm²	
	M2	M2.1	Stainless/heat-resistant cast steel, austenitic (turbocharger materials)	< 700 N/mm²	
	M3	M3.1	Stainless cast steel, ferritic/austenitic (duplex)	< 1000 N/mm²	
K	K1	K1.1	Cast iron with lamellar graphite (grey cast iron), GJL	< 300 N/mm²	
	K2	K2.1	Cast iron with spheroidal graphite, GJS	< 500 N/mm²	
		K2.2	Cast iron with spheroidal graphite, GJS	500-800 N/mm²	
		K2.3	Cast iron with spheroidal graphite, GJS	> 800 N/mm²	
	K3	K3.1	Cast iron with spheroidal graphite, GJV; malleable cast iron, GJM	< 500 N/mm²	
		K3.2	Cast iron with spheroidal graphite, GJV; malleable cast iron, GJM	> 500 N/mm²	
N	N1	N1.1	Aluminium, non-alloy and alloy < 3 % Si		
		N1.2	Aluminium, alloy ≤ 7 % Si		
		N1.3	Aluminium, alloy > 7-12 % Si		
		N1.4	Aluminium, alloy > 12 % Si		
	N2	N2.1	Copper, non-alloy and low-alloy	< 300 N/mm²	
		N2.2	Copper, alloy	> 300 N/mm²	
		N2.3	Brass, bronze, gunmetal	< 1200 N/mm²	
	N3	N3.1	Graphite		
	N4	N4.1	Plastic, thermoplastics		
		N4.2	Plastic, thermosets		
		N4.3	Plastic, foams		
S	S1	S1.1	Titanium, titanium alloys	< 400 N/mm²	
	S2	S2.1	Titanium, titanium alloys	< 1200 N/mm²	
		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		
	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		

Mixed machining

K + K	K1.1, K1.2	Mixed machining of cast iron (GJL and GJS)	
K + P	K1.1, sintered	Mixed machining of cast iron and sintered steel	
N + K	N1.2, K1.1	Mixed machining of aluminium and cast iron (GJL)	
	N1.2, K1.2	Mixed machining of aluminium and cast iron (GJS)	
N + P	N1.2, sintered	Mixed machining of aluminium and sintered steel	

* MAPAL machining groups

	Carbide CVD-coated								Carbide PVD-coated										
	HC704	HC709	HC720	HC725	HC735	HC740	HC745	HC750	HP525-P	HP530-P	HP540-P	HP545-P	HP925	HP930	HP935	HP940	HP945	HP950	HP955
						100-220	100-200										100-180	100-160	
						100-220	100-200										100-180	100-160	
						100-180	100-180										100-180	100-160	
						80-150	80-150										80-150	80-150	
						100-180	100-180										100-180	100-160	
						90-130	80-130										80-130	90-130	
						90-130	80-130										80-130	90-130	
						90-130	80-130										80-130	90-130	
						90-130	80-130										80-130	90-130	
								100-160											60-140
								80-140											80-130
						70-120	70-120	70-120									70-120	70-120	70-120
								70-130											70-130
	140-280	140-280	140-300	140-300	130-250	120-240							140-220	140-220	140-220	130-200	120-200		
	120-210	120-210	120-260	120-260	110-240	110-230							120-200	120-200	120-200	120-180	120-180		
	120-190	120-190	120-220	120-220	100-200	100-200							120-180	120-180	120-180	120-180	120-180		
	80-150	80-150	80-140	80-140	80-120	80-120							80-140	80-140	80-140	80-120	80-120		
	80-140	80-140	80-130	80-130	80-120	80-120							60-130	60-130	60-130	60-100	60-100		
	80-130	80-130	80-120	80-120	80-120	80-120							60-120	60-120	60-120	60-100	60-100		

	HC704	HC709	HC720	HC725	HC735	HC740	HC745	HC750	HP525-P	HP530-P	HP540-P	HP545-P	HP925	HP930	HP935	HP940	HP945	HP950	HP955
									120-220	120-220	120-200								
										120-200	120-200	110-200							
									120-300	120-300	120-230								
									120-280	120-280	120-230								
										120-220	120-230	110-200							

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

MILLING

New end milling cutters for trochoidal milling, finishing, roughing and milling modern lightweight materials. New milling cutters for face and shoulder milling of cast iron and hardened steel.

ADDITIONS TO PROGRAMME

End milling cutters with fixed cutting edges and milling cutters with indexable inserts

MAPAL's many years of experience, accumulated know-how and high level of process understanding in the area of milling are reflected in the standard programme. Process reliability, efficiency and the highest productivity for customers are therefore guaranteed.

Milling cutters from MAPAL arrive at the customer after extensive research and development work, design and simulation using the latest software, production and finally inspection on the latest manufacturing equipment. In conjunction with the most efficient cutting materials, MAPAL therefore offers the optimal milling tool for almost all applications and workpiece materials.

MAPAL is expanding this comprehensive range with milling cutters made of solid carbide for roughing, finishing, trochoidal milling as well as especially for milling pockets. New profile milling cutters for the delamination-free machining of fibre-reinforced plastics supplement the range.

Also new in the programme are economical high-performance milling cutters with triple and six cutting edge indexable inserts for the face and shoulder milling of cast iron and hardened steel.

End milling cutters with fixed cutting edges

Solid carbide milling cutters

- Maximum machining efficiency
- High cost-effectiveness due to high machining rate with large cutting depths and thin-walled parts
- Shorter machining times due to significantly higher total feed
- Optimal chip transport due to short, tightly rolled chips

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Milling cutters with replaceable inserts

CartridgeMill-HD-Finishing / CartridgeMill-WD-Finishing

- For face and shoulder milling of cast iron and hardened steel
- High cost-effectiveness thanks to triple and six cutting edge indexable inserts
- Axial run-out can be adjusted to the µm
- Available in the diameter range from 50 (z=3) to 250 mm (z=17)

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END MILLING CUTTERS WITH FIXED CUTTING EDGES

Introduction

Trochoidal milling

Shoulder milling – finishing

Shoulder milling – roughing

Milling modern lightweight materials

Technical appendix

PRODUCT OVERVIEW

End milling cutters 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 OptiMill-PM-Trochoid 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 at the same time. New cutting lengths up to 5xD also increase the cost-effectiveness. The OptiMill-Uni-Trochoid also profits from these lengths. This milling cutter is available with the cutting lengths 4xD and 5xD with immediate effect.

The finishing milling cutter OptiMill-Uni-HPC-Finish with seven cutting edges impresses with short machining times and the highest quality surface finish. The stable core diameter significantly increases the tool stiffness and consequently prevents the displacement of the tool. In this way the highest quality surface finishes can be produced reliably even with cutting lengths up to 5xD.

With the new high-performance roughing milling cutter OptiMill-Uni-Wave, slots can be milled with a 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 when milling pockets, MAPAL has developed the new solid carbide milling cutter OptiMill-Uni-HPC-Pocket. The innovative face geometry with integrated drill tip 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

OptiMill-Uni-Trochoid

- 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

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OptiMill-PM-Trochoid

- 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

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Shoulder milling – finishing

OptiMill-Uni-HPC-Finish

- Seven cutting edges, individually adapted substrate
- Shorter machining times due to significantly higher total feed
- Adapted groove profile for optimal chip removal
- In the lengths 2, 3, 4 and 5xD

Performance LINE

ø range: 4.00 - 25.00 mm
Design:
2xD 3xD 4xD 5xD

P M K

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Shoulder milling – roughing

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:

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 tip - Suitable for inclined entry at up to 45°, for helix milling and for grooving
- High infeed rates up to 2xD possible

Performance LINE

ø range: 5.70 - 20.00 mm
Design:

P M K

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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 spaces

Performance LINE

ø range: 4.00 - 20.00 mm
Design:

N C

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Designation key

End milling cutters with fixed cutting edges

S	C	M	5	8	0	-	1	2	0	0	A	Z	0	5	R	-

Milling cutter type

CPM	Replaceable head milling cutters Complete Performance Milling
SCM	Solid carbide milling cutters Solid Carbide Milling
SHM	Milling cutters with extremely hard cutting materials Superhard Milling

Series

	Specific code

Tool diameter x 0.01 mm

0800	8.00 mm
...	...

Coolant supply

0	External coolant supply
1	Internal coolant supply

Cutting length *

A	0 - 5 mm
B	5.1 - 10 mm
C	10.1 - 15 mm
D	15.1 - 20 mm
E	20.1 - 25 mm
...	...

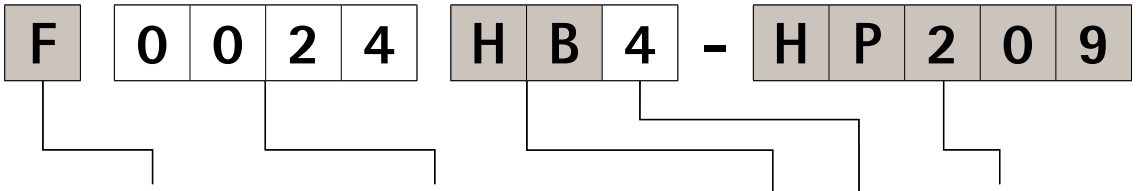
Number of teeth

Z01	Number of teeth = 1
Z02	Number of teeth = 2
Z05	Number of teeth = 5
Z07	Number of teeth = 7
ZMV	Multiple teeth, medium tooth
ZGV	Multiple teeth, coarse tooth

Cutting direction **

L	Left
R	Right

* Only with milling cutter type SHM
** Information not required for milling cutter type CPM
*** For milling cutter type CPM shank form corresponds to CFS connection size



Cutting edge design (CED)

R	Radius
F	Chamfer
S	Sharp

Size of the CED x 0.01 mm

0400	4.00 mm (example)
	For sharp only "S"; no information on size

Cutting material

HC	Carbide CVD-coated
HP	Carbide PVD-coated
HU	Uncoated carbide
PU	Polycrystalline diamond (PCD/CVD)

Shank form ***

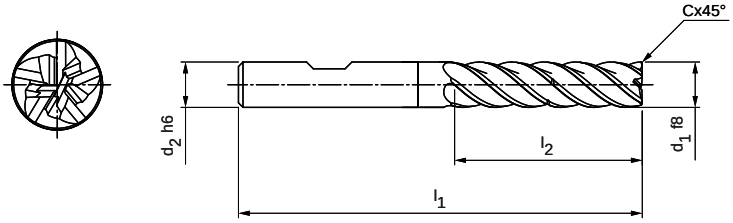
HA	Cylindrical shank Form HA
HB	Cylindrical shank Form HB
A6	HSK-A63
S4	SK40
B4	BT40
06	CFS connection size 06

Machining depth

3	3xD
4	4xD
5	5xD

OptiMill®-Uni-Trochoid

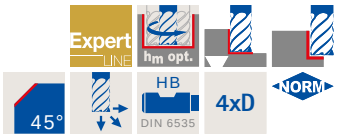
Design 4xD
SCM58



Design:

Milling cutter diameter:	5.00 - 25.00 mm
Cutting material:	HP209
Number of cutting edges:	5
Helix angle:	~41°
Balancing value:	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.

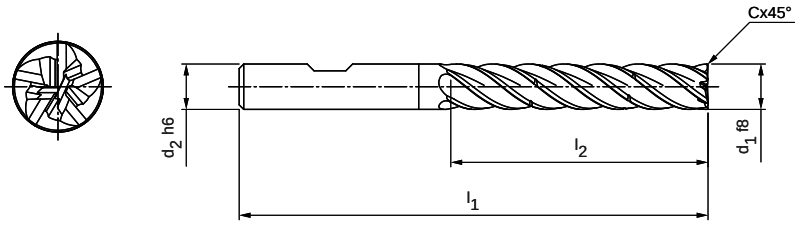


Dimensions					z	Specification	Order No.
d_1 f8	d_2 h6	l_1	l_2	C x 45°			
5,00	6	66	20	0,10	5	SCM580-0500Z05R-F0010HB4-HP209	30856667
6,00	6	66	24	0,12	5	SCM580-0600Z05R-F0012HB4-HP209	30856668
8,00	8	74	32	0,16	5	SCM580-0800Z05R-F0016HB4-HP209	30856669
10,00	10	89	40	0,20	5	SCM580-1000Z05R-F0020HB4-HP209	30856670
12,00	12	100	48	0,24	5	SCM580-1200Z05R-F0024HB4-HP209	30856671
14,00	14	108	56	0,28	5	SCM580-1400Z05R-F0028HB4-HP209	30856672
16,00	16	123	64	0,32	5	SCM580-1600Z05R-F0032HB4-HP209	30856673
18,00	18	130	72	0,36	5	SCM580-1800Z05R-F0036HB4-HP209	30856674
20,00	20	141	80	0,40	5	SCM580-2000Z05R-F0040HB4-HP209	30856675
25,00	25	170	100	0,50	5	SCM580-2500Z05R-F0050HB4-HP209	30965850

Dimensions in mm.
For cutting data recommendation, see end of section.
Special designs and other coatings on request.

OptiMill®-Uni-Trochoid

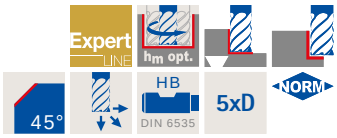
Design 5xD
SCM58



Design:

Milling cutter diameter:	8.00 - 25.00 mm
Cutting material:	HP209
Number of cutting edges:	5
Helix angle:	~41°
Balancing value:	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.

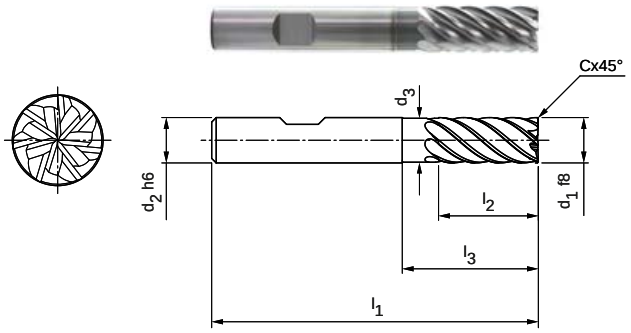


Dimensions					z	Specification	Order No.
d_1 f8	d_2 h6	l_1	l_2	C x 45°			
8,00	8	81	40	0,16	5	SCM580-0800Z05R-F0016HB5-HP209	30856676
10,00	10	96	50	0,20	5	SCM580-1000Z05R-F0020HB5-HP209	30856677
12,00	12	112	60	0,24	5	SCM580-1200Z05R-F0024HB5-HP209	30856678
14,00	14	122	70	0,28	5	SCM580-1400Z05R-F0028HB5-HP209	30856679
16,00	16	136	80	0,32	5	SCM580-1600Z05R-F0032HB5-HP209	30856680
18,00	18	147	90	0,36	5	SCM580-1800Z05R-F0036HB5-HP209	30856681
20,00	20	160	100	0,40	5	SCM580-2000Z05R-F0040HB5-HP209	30856682
25,00	25	195	125	0,50	5	SCM580-2500Z05R-F0050HB5-HP209	30965851

Dimensions in mm.
For cutting data recommendation, see end of section.
Special designs and other coatings on request.

OptiMill®-PM-Trochoid

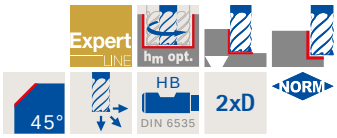
Design 2xD with neck
SCM82



Design:

Milling cutter diameter:	4.00 - 25.00 mm
Cutting material:	HP723
Number of cutting edges:	7
Helix angle:	~40°
Balancing value:	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.

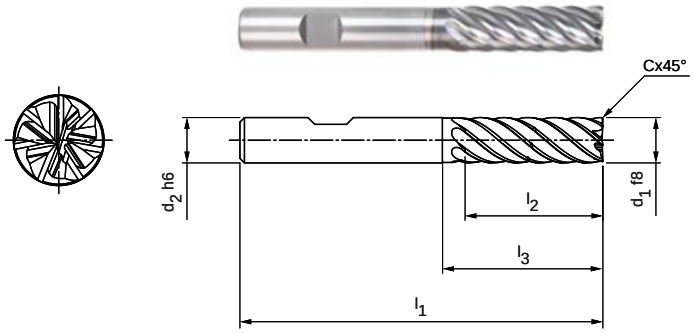


Dimensions						z	Specification	Order No.
d_1 f8	d_2 h6	l_1	l_2	l_3	C x 45°			
4,00	6	57	11	-	0,08	7	SCM820-0400Z07R-F0008HB2-HP723	30855545
5,00	6	57	13	-	0,10	7	SCM820-0500Z07R-F0010HB2-HP723	30855546
6,00	6	57	13	19	0,12	7	SCM820-0600Z07R-F0012HB2-HP723	30855547
8,00	8	63	19	25	0,16	7	SCM820-0800Z07R-F0016HB2-HP723	30855548
10,00	10	72	22	30	0,20	7	SCM820-1000Z07R-F0020HB2-HP723	30855549
12,00	12	83	26	36	0,24	7	SCM820-1200Z07R-F0024HB2-HP723	30855550
14,00	14	83	26	36	0,28	7	SCM820-1400Z07R-F0028HB2-HP723	30855551
16,00	16	92	32	42	0,32	7	SCM820-1600Z07R-F0032HB2-HP723	30855552
18,00	18	92	32	42	0,36	7	SCM820-1800Z07R-F0036HB2-HP723	30855553
20,00	20	104	41	52	0,40	7	SCM820-2000Z07R-F0040HB2-HP723	30855554
25,00	25	125	50	65	0,50	7	SCM820-2500Z07R-F0050HB2-HP723	30855555

Dimensions in mm.
For cutting data recommendation, see end of section.
Special designs and other coatings on request.

OptiMill®-PM-Trochoid

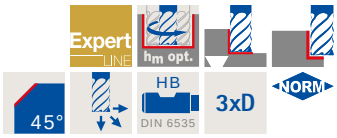
Design 3xD with neck
SCM82



Design:

Milling cutter diameter:	4.00 - 25.00 mm
Cutting material:	HP723
Number of cutting edges:	7
Helix angle:	~40°
Balancing value:	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.

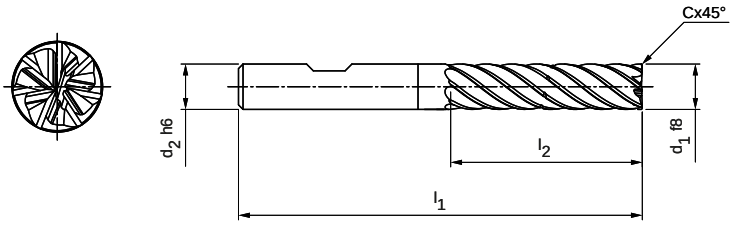


Dimensions						z	Specification	Order No.
d_1 f8	d_2 h6	l_1	l_2	l_3	C x 45°			
4,00	6	62	16	23	0,08	7	SCM820-0400Z07R-F0008HB3-HP723	30855556
5,00	6	62	17	24	0,10	7	SCM820-0500Z07R-F0010HB3-HP723	30855557
6,00	6	62	18	25	0,12	7	SCM820-0600Z07R-F0012HB3-HP723	30855558
8,00	8	68	24	30	0,16	7	SCM820-0800Z07R-F0016HB3-HP723	30855559
10,00	10	80	30	35	0,20	7	SCM820-1000Z07R-F0020HB3-HP723	30855560
12,00	12	93	36	45	0,24	7	SCM820-1200Z07R-F0024HB3-HP723	30855561
14,00	14	99	42	50	0,28	7	SCM820-1400Z07R-F0028HB3-HP723	30855562
16,00	16	108	48	55	0,32	7	SCM820-1600Z07R-F0032HB3-HP723	30855563
18,00	18	117	54	67	0,36	7	SCM820-1800Z07R-F0036HB3-HP723	30855564
20,00	20	126	60	70	0,40	7	SCM820-2000Z07R-F0040HB3-HP723	30855565
25,00	25	150	75	92	0,50	7	SCM820-2500Z07R-F0050HB3-HP723	30855566

Dimensions in mm.
For cutting data recommendation, see end of section.
Special designs and other coatings on request.

OptiMill®-PM-Trochoid

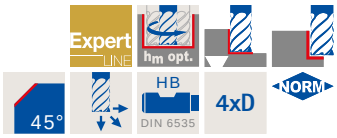
Design 4xD
SCM82



Design:

Milling cutter diameter:	5.00 - 25.00 mm
Cutting material:	HP210
Number of cutting edges:	7
Helix angle:	~38°
Balancing value:	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.

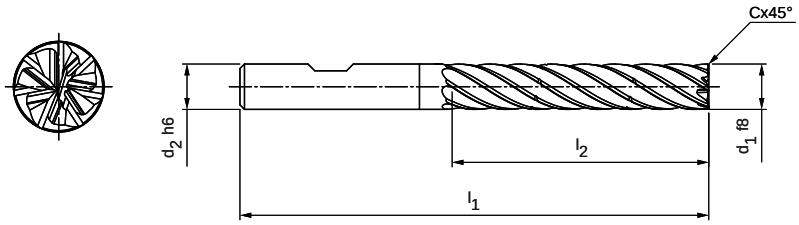


Dimensions					z	Specification	Order No.
d_1 f8	d_2 h6	l_1	l_2	C x 45°			
5,00	6	66	20	0,10	7	SCM820-0500Z07R-F0010HB4-HP210	30855567
6,00	6	66	24	0,12	7	SCM820-0600Z07R-F0012HB4-HP210	30855568
8,00	8	74	32	0,16	7	SCM820-0800Z07R-F0016HB4-HP210	30855569
10,00	10	89	40	0,20	7	SCM820-1000Z07R-F0020HB4-HP210	30855570
12,00	12	100	48	0,24	7	SCM820-1200Z07R-F0024HB4-HP210	30855571
14,00	14	108	56	0,28	7	SCM820-1400Z07R-F0028HB4-HP210	30855572
16,00	16	123	64	0,32	7	SCM820-1600Z07R-F0032HB4-HP210	30855573
18,00	18	130	72	0,36	7	SCM820-1800Z07R-F0036HB4-HP210	30855574
20,00	20	141	80	0,40	7	SCM820-2000Z07R-F0040HB4-HP210	30855575
25,00	25	170	100	0,50	7	SCM820-2500Z07R-F0050HB4-HP210	30965852

Dimensions in mm.
For cutting data recommendation, see end of section.
Special designs and other coatings on request.

OptiMill®-PM-Trochoid

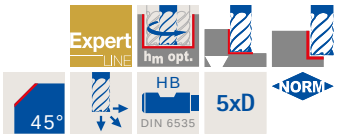
Design 5xD
SCM82



Design:

Milling cutter diameter:	8.00 - 25.00 mm
Cutting material:	HP210
Number of cutting edges:	7
Helix angle:	~36°
Balancing value:	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	Specification	Order No.
d_1 f8	d_2 h6	l_1	l_2	C x 45°			
8,00	8	81	40	0,16	7	SCM820-0800Z07R-F0016HB5-HP210	30855576
10,00	10	96	50	0,20	7	SCM820-1000Z07R-F0020HB5-HP210	30855577
12,00	12	112	60	0,24	7	SCM820-1200Z07R-F0024HB5-HP210	30855578
14,00	14	122	70	0,28	7	SCM820-1400Z07R-F0028HB5-HP210	30855579
16,00	16	136	80	0,32	7	SCM820-1600Z07R-F0032HB5-HP210	30855580
18,00	18	147	90	0,36	7	SCM820-1800Z07R-F0036HB5-HP210	30855581
20,00	20	160	100	0,40	7	SCM820-2000Z07R-F0040HB5-HP210	30855582
25,00	25	195	125	0,50	7	SCM820-2500Z07R-F0050HB5-HP210	30965853

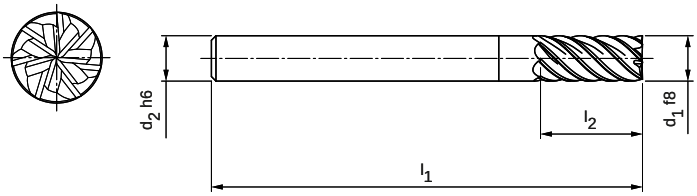
Dimensions in mm.
For cutting data recommendation, see end of section.
Special designs and other coatings on request.

OptiMill®-Uni-HPC-Finish

Design 2xD
SCM83

Design:

Milling cutter diameter:	4.00 - 25.00 mm
Cutting material:	HP213
Number of cutting edges:	7
Helix angle:	45°
Special features:	Unequal spacing



Dimensions					z	Specification	Order No.
d_1 f8	d_2 h6	l_1	l_2	C x 45°			
4,00	6	57	11	0,04	7	SCM830-0400Z07R-F0004HA2-HP213	30936070
5,00	6	57	13	0,05	7	SCM830-0500Z07R-F0005HA2-HP213	30936071
6,00	6	57	13	0,06	7	SCM830-0600Z07R-F0006HA2-HP213	30936072
8,00	8	63	19	0,08	7	SCM830-0800Z07R-F0008HA2-HP213	30936073
10,00	10	72	22	0,10	7	SCM830-1000Z07R-F0010HA2-HP213	30936074
12,00	12	83	26	0,12	7	SCM830-1200Z07R-F0012HA2-HP213	30936076
14,00	14	83	26	0,14	7	SCM830-1400Z07R-F0014HA2-HP213	30936077
16,00	16	92	32	0,16	7	SCM830-1600Z07R-F0016HA2-HP213	30936078
18,00	18	92	32	0,18	7	SCM830-1800Z07R-F0018HA2-HP213	30936079
20,00	20	104	41	0,20	7	SCM830-2000Z07R-F0020HA2-HP213	30936090
25,00	25	125	50	0,25	7	SCM830-2500Z07R-F0025HA2-HP213	30936091

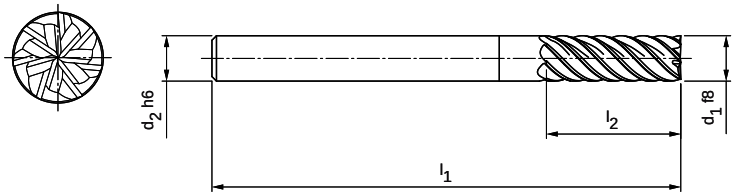
Dimensions in mm.
For cutting data recommendation, see end of section.
Special designs and other coatings on request.

OptiMill®-Uni-HPC-Finish

Design 3xD
SCM83

Design:

Milling cutter diameter:	4.00 - 25.00 mm
Cutting material:	HP213
Number of cutting edges:	7
Helix angle:	45°
Special features:	Unequal spacing



Dimensions					z	Specification	Order No.
d_1 f8	d_2 h6	l_1	l_2	C x 45°			
4,00	6	62	16	0,04	7	SCM830-0400Z07R-F0004HA3-HP213	30936093
5,00	6	62	17	0,05	7	SCM830-0500Z07R-F0005HA3-HP213	30936094
6,00	6	62	18	0,06	7	SCM830-0600Z07R-F0006HA3-HP213	30936095
8,00	8	68	24	0,08	7	SCM830-0800Z07R-F0008HA3-HP213	30936096
10,00	10	80	30	0,10	7	SCM830-1000Z07R-F0010HA3-HP213	30936098
12,00	12	93	36	0,12	7	SCM830-1200Z07R-F0012HA3-HP213	30936099
14,00	14	99	42	0,14	7	SCM830-1400Z07R-F0014HA3-HP213	30936110
16,00	16	108	48	0,16	7	SCM830-1600Z07R-F0016HA3-HP213	30936111
18,00	18	117	54	0,18	7	SCM830-1800Z07R-F0018HA3-HP213	30936112
20,00	20	126	60	0,20	7	SCM830-2000Z07R-F0020HA3-HP213	30936114
25,00	25	150	75	0,25	7	SCM830-2500Z07R-F0025HA3-HP213	30936115

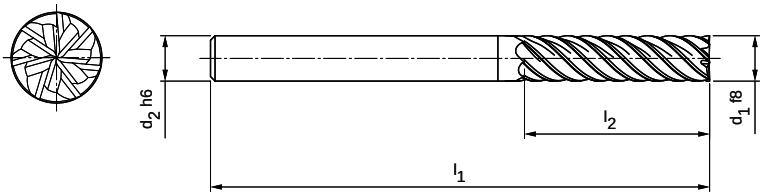
Dimensions in mm.
For cutting data recommendation, see end of section.
Special designs and other coatings on request.

OptiMill®-Uni-HPC-Finish

Design 4xD
SCM83

Design:

Milling cutter diameter:	6.00 - 25.00 mm
Cutting material:	HP213
Number of cutting edges:	7
Helix angle:	45°
Special features:	Unequal spacing



Dimensions					z	Specification	Order No.
d_1 f8	d_2 h6	l_1	l_2	C x 45°			
6,00	6	66	24	0,06	7	SCM830-0600Z07R-F0006HA4-HP213	30936116
8,00	8	74	32	0,08	7	SCM830-0800Z07R-F0008HA4-HP213	30936117
10,00	10	89	40	0,10	7	SCM830-1000Z07R-F0010HA4-HP213	30936118
12,00	12	100	48	0,12	7	SCM830-1200Z07R-F0012HA4-HP213	30936119
14,00	14	108	56	0,14	7	SCM830-1400Z07R-F0014HA4-HP213	30936131
16,00	16	123	64	0,16	7	SCM830-1600Z07R-F0016HA4-HP213	30936132
18,00	18	130	72	0,18	7	SCM830-1800Z07R-F0018HA4-HP213	30936133
20,00	20	140	80	0,20	7	SCM830-2000Z07R-F0020HA4-HP213	30936134
25,00	25	170	100	0,25	7	SCM830-2500Z07R-F0025HA4-HP213	30936136

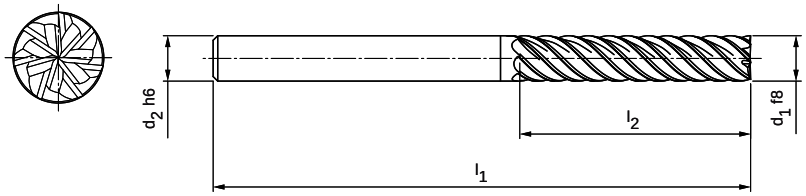
Dimensions in mm.
For cutting data recommendation, see end of section.
Special designs and other coatings on request.

OptiMill®-Uni-HPC-Finish

Design 5xD
SCM83

Design:

Milling cutter diameter:	8.00 - 25.00 mm
Cutting material:	HP213
Number of cutting edges:	7
Helix angle:	45°
Special features:	Unequal spacing



Dimensions					z	Specification	Order No.
d_1 f8	d_2 h6	l_1	l_2	C x 45°			
8,00	8	81	40	0,08	7	SCM830-0800Z07R-F0008HA5-HP213	30936137
10,00	10	96	50	0,10	7	SCM830-1000Z07R-F0010HA5-HP213	30936138
12,00	12	112	60	0,12	7	SCM830-1200Z07R-F0012HA5-HP213	30936139
14,00	14	122	70	0,14	7	SCM830-1400Z07R-F0014HA5-HP213	30936150
16,00	16	136	80	0,16	7	SCM830-1600Z07R-F0016HA5-HP213	30936151
18,00	18	147	90	0,18	7	SCM830-1800Z07R-F0018HA5-HP213	30936152
20,00	20	160	100	0,20	7	SCM830-2000Z07R-F0020HA5-HP213	30936153
25,00	25	195	125	0,25	7	SCM830-2500Z07R-F0025HA5-HP213	30936154

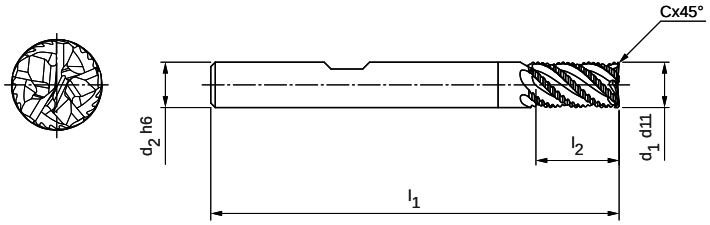
Dimensions in mm.
For cutting data recommendation, see end of section.
Special designs and other coatings on request.

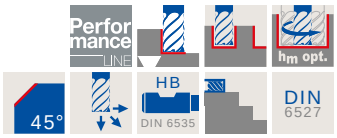
OptiMill®-Uni-Wave

Short design
SCM89

Design:

Milling cutter diameter:	4.00 - 25.00 mm
Cutting material:	HP723
Number of cutting edges:	5
Helix angle:	~41.5°
Special features:	Unequal spacing. Newly developed roughing profile.





Dimensions					z	Specification	Order No.
d_1 d11	d_2 h6	l_1	l_2	C x 45°			
4,00	6	54	8	0,20	5	SCM890-0400Z05R-F0020HB-HP723	30917921
5,00	6	54	9	0,25	5	SCM890-0500Z05R-F0025HB-HP723	30917923
6,00	6	54	10	0,30	5	SCM890-0600Z05R-F0030HB-HP723	30917924
7,00	8	58	11	0,35	5	SCM890-0700Z05R-F0035HB-HP723	30917925
8,00	8	58	12	0,40	5	SCM890-0800Z05R-F0040HB-HP723	30917926
9,00	10	66	13	0,45	5	SCM890-0900Z05R-F0045HB-HP723	30917927
10,00	10	66	14	0,50	5	SCM890-1000Z05R-F0050HB-HP723	30917928
12,00	12	73	16	0,60	5	SCM890-1200Z05R-F0060HB-HP723	30917929
14,00	14	75	18	0,70	5	SCM890-1400Z05R-F0070HB-HP723	30917930
16,00	16	82	22	0,80	5	SCM890-1600Z05R-F0080HB-HP723	30917931
18,00	18	84	24	0,90	5	SCM890-1800Z05R-F0090HB-HP723	30917932
20,00	20	92	26	1,00	5	SCM890-2000Z05R-F0100HB-HP723	30917933
25,00	25	105	32	1,25	5	SCM890-2500Z05R-F0125HB-HP723	30917934

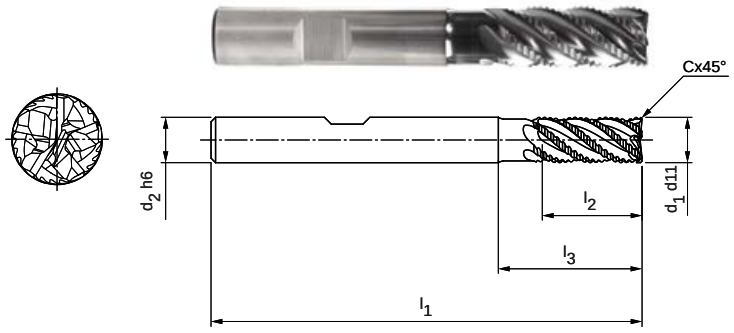
Dimensions in mm.
For cutting data recommendation, see end of section.
Special designs and other coatings on request.

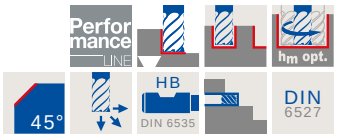
OptiMill®-Uni-Wave

Long design with neck
SCM88

Design:

Milling cutter diameter:	4.00 - 25.00 mm
Cutting material:	HP723
Number of cutting edges:	5
Helix angle:	~41.5°
Special features:	Unequal spacing. Newly developed roughing profile.





Dimensions						z	Specification	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	SCM880-0400Z05R-F0020HB-HP723	30917935
5,00	6	57	13	19	0,25	5	SCM880-0500Z05R-F0025HB-HP723	30917936
6,00	6	57	13	19	0,30	5	SCM880-0600Z05R-F0030HB-HP723	30917937
7,00	8	63	16	25	0,35	5	SCM880-0700Z05R-F0035HB-HP723	30917938
8,00	8	63	19	25	0,40	5	SCM880-0800Z05R-F0040HB-HP723	30917939
9,00	10	72	19	30	0,45	5	SCM880-0900Z05R-F0045HB-HP723	30917940
10,00	10	72	22	30	0,50	5	SCM880-1000Z05R-F0050HB-HP723	30917941
12,00	12	83	26	36	0,60	5	SCM880-1200Z05R-F0060HB-HP723	30917942
14,00	14	83	26	36	0,70	5	SCM880-1400Z05R-F0070HB-HP723	30917943
16,00	16	92	32	42	0,80	5	SCM880-1600Z05R-F0080HB-HP723	30917944
18,00	18	92	32	42	0,90	5	SCM880-1800Z05R-F0090HB-HP723	30917945
20,00	20	104	38	52	1,00	5	SCM880-2000Z05R-F0100HB-HP723	30917946
25,00	25	125	50	65	1,25	5	SCM880-2500Z05R-F0125HB-HP723	30917947

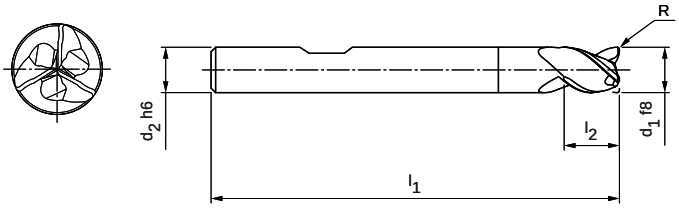
Dimensions in mm.
For cutting data recommendation, see end of section.
Special designs and other coatings on request.

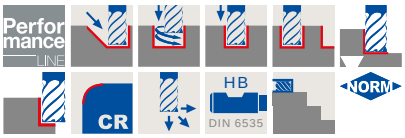
OptiMill®-Uni-HPC-Pocket

Short design
SCM84

Design:

Milling cutter diameter:	5.70 - 20.00 mm
Cutting material:	HP920
Number of cutting edges:	3
Helix angle:	42°
Special features:	Face geometry with integrated drill tip. Ideal for angled entry at up to 45°, for helix milling and for grooving.





Dimensions					z	Specification	Order No.
d_1 f8	d_2 h6	l_1	l_2	R			
5,70	6	54	7	0,20	3	SCM840-0570Z03R-R0020HB-HP920	30965832
6,00	6	54	7	0,20	3	SCM840-0600Z03R-R0020HB-HP920	30965833
6,70	8	58	8	0,20	3	SCM840-0670Z03R-R0020HB-HP920	30965834
7,00	8	58	8	0,20	3	SCM840-0700Z03R-R0020HB-HP920	30965835
7,70	8	58	9	0,20	3	SCM840-0770Z03R-R0020HB-HP920	30965836
8,00	8	58	9	0,20	3	SCM840-0800Z03R-R0020HB-HP920	30965837
8,70	10	66	10	0,32	3	SCM840-0870Z03R-R0032HB-HP920	30965838
9,00	10	66	10	0,32	3	SCM840-0900Z03R-R0032HB-HP920	30965839
9,70	10	66	11	0,32	3	SCM840-0970Z03R-R0032HB-HP920	30965840
10,00	10	66	11	0,32	3	SCM840-1000Z03R-R0032HB-HP920	30953712
11,70	12	73	12	0,32	3	SCM840-1170Z03R-R0032HB-HP920	30965841
12,00	12	73	12	0,32	3	SCM840-1200Z03R-R0032HB-HP920	30948678
13,70	14	75	14	0,32	3	SCM840-1370Z03R-R0032HB-HP920	30965842
14,00	14	75	14	0,32	3	SCM840-1400Z03R-R0032HB-HP920	30965843
15,50	16	82	16	0,32	3	SCM840-1550Z03R-R0032HB-HP920	30965844
16,00	16	82	16	0,32	3	SCM840-1600Z03R-R0032HB-HP920	30965845
17,50	18	84	18	0,32	3	SCM840-1750Z03R-R0032HB-HP920	30965846
18,00	18	84	18	0,32	3	SCM840-1800Z03R-R0032HB-HP920	30965847
19,50	20	92	20	0,50	3	SCM840-1950Z03R-R0050HB-HP920	30965848
20,00	20	92	20	0,50	3	SCM840-2000Z03R-R0050HB-HP920	30965849

Corner radius especially for parallel key groove milling in accordance with DIN 6885.

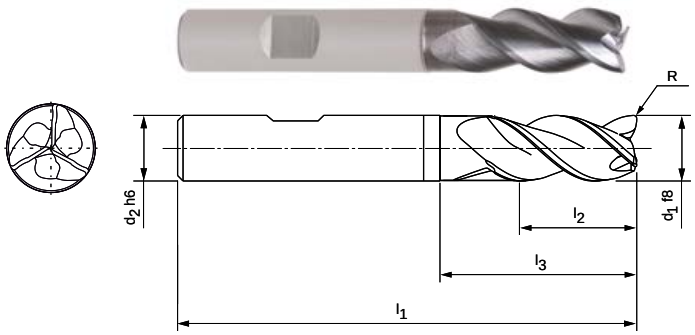
Dimensions in mm.
For cutting data recommendation, see end of section.
Special designs and other coatings on request.

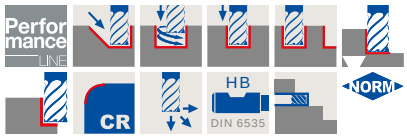
OptiMill®-Uni-HPC-Pocket

Long design with neck
SCM81

Design:

Milling cutter diameter:	5.70 - 20.00 mm
Cutting material:	HP920
Number of cutting edges:	3
Helix angle:	42°
Special features:	Face geometry with integrated drill tip. Ideal for angled entry at up to 45°, for helix milling and for grooving.





Dimensions						z	Specification	Order No.
d_1 f8	d_2 h6	l_1	l_2	l_3	R			
5,70	6	57	13	19	0,29	3	SCM810-0570Z03R-R0029HB-HP920	30788023
6,00	6	57	13	19	0,30	3	SCM810-0600Z03R-R0030HB-HP920	30788024
6,70	8	63	16	25	0,34	3	SCM810-0670Z03R-R0034HB-HP920	30788025
7,00	8	63	16	25	0,35	3	SCM810-0700Z03R-R0035HB-HP920	30788026
7,70	8	63	19	25	0,39	3	SCM810-0770Z03R-R0039HB-HP920	30788027
8,00	8	63	19	25	0,40	3	SCM810-0800Z03R-R0040HB-HP920	30788028
8,70	10	72	22	30	0,44	3	SCM810-0870Z03R-R0044HB-HP920	30788029
9,00	10	72	22	30	0,45	3	SCM810-0900Z03R-R0045HB-HP920	30788030
9,70	10	72	22	30	0,49	3	SCM810-0970Z03R-R0049HB-HP920	30788031
10,00	10	72	22	30	0,50	3	SCM810-1000Z03R-R0050HB-HP920	30788032
11,70	12	83	26	36	0,59	3	SCM810-1170Z03R-R0059HB-HP920	30788033
12,00	12	83	26	36	0,60	3	SCM810-1200Z03R-R0060HB-HP920	30788034
13,70	14	83	26	36	0,69	3	SCM810-1370Z03R-R0069HB-HP920	30788035
14,00	14	83	26	36	0,70	3	SCM810-1400Z03R-R0070HB-HP920	30788036
15,50	16	92	31	42	0,78	3	SCM810-1550Z03R-R0078HB-HP920	30788037
16,00	16	92	31	42	0,80	3	SCM810-1600Z03R-R0080HB-HP920	30788038
17,50	18	92	31	42	0,88	3	SCM810-1750Z03R-R0088HB-HP920	30788039
18,00	18	92	31	42	0,90	3	SCM810-1800Z03R-R0090HB-HP920	30788040
19,50	20	104	41	52	0,98	3	SCM810-1950Z03R-R0098HB-HP920	30788041
20,00	20	104	41	52	1,00	3	SCM810-2000Z03R-R0100HB-HP920	30788042

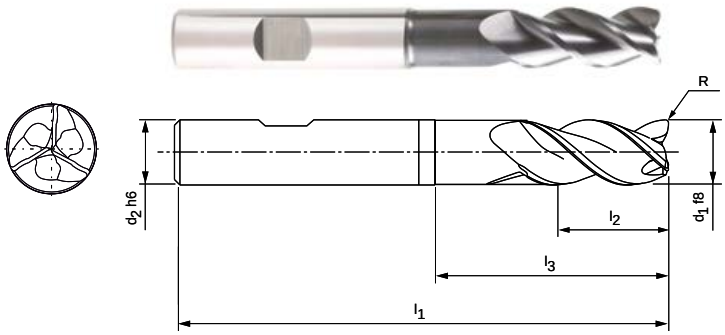
Dimensions in mm.
For cutting data recommendation, see end of section.
Special designs and other coatings on request.

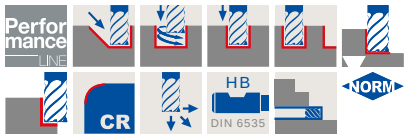
OptiMill®-Uni-HPC-Pocket

Overlong design with neck
SCM80

Design:

Milling cutter diameter:	5.70 - 20.00 mm
Cutting material:	HP920
Number of cutting edges:	3
Helix angle:	42°
Special features:	Face geometry with integrated drill tip. Ideal for angled entry at up to 45°, for helix milling and for grooving.





Dimensions						z	Specification	Order No.
d_1 f8	d_2 h6	l_1	l_2	l_3	R			
5,70	6	62	13	24	0,29	3	SCM800-0570Z03R-R0029HB-HP920	30787957
6,00	6	62	13	24	0,30	3	SCM800-0600Z03R-R0030HB-HP920	30787958
6,70	8	68	16	30	0,34	3	SCM800-0670Z03R-R0034HB-HP920	30787959
7,00	8	68	16	30	0,35	3	SCM800-0700Z03R-R0035HB-HP920	30787960
7,70	8	68	21	30	0,39	3	SCM800-0770Z03R-R0039HB-HP920	30787961
8,00	8	68	21	30	0,40	3	SCM800-0800Z03R-R0040HB-HP920	30787962
8,70	10	80	22	38	0,44	3	SCM800-0870Z03R-R0044HB-HP920	30787963
9,00	10	80	22	38	0,45	3	SCM800-0900Z03R-R0045HB-HP920	30787964
9,70	10	80	22	38	0,49	3	SCM800-0970Z03R-R0049HB-HP920	30787965
10,00	10	80	22	38	0,50	3	SCM800-1000Z03R-R0050HB-HP920	30787966
11,70	12	93	26	46	0,59	3	SCM800-1170Z03R-R0059HB-HP920	30787967
12,00	12	93	26	46	0,60	3	SCM800-1200Z03R-R0060HB-HP920	30787968
13,70	14	99	26	52	0,69	3	SCM800-1370Z03R-R0069HB-HP920	30787969
14,00	14	99	26	52	0,70	3	SCM800-1400Z03R-R0070HB-HP920	30787970
15,50	16	108	36	58	0,78	3	SCM800-1550Z03R-R0078HB-HP920	30787971
16,00	16	108	36	58	0,80	3	SCM800-1600Z03R-R0080HB-HP920	30787972
17,50	18	117	36	67	0,88	3	SCM800-1750Z03R-R0088HB-HP920	30787973
18,00	18	117	36	67	0,90	3	SCM800-1800Z03R-R0090HB-HP920	30787974
19,50	20	126	41	74	0,98	3	SCM800-1950Z03R-R0098HB-HP920	30787975
20,00	20	126	41	74	1,00	3	SCM800-2000Z03R-R0100HB-HP920	30787976

Dimensions in mm.
For cutting data recommendation, see end of section.
Special designs and other coatings on request.

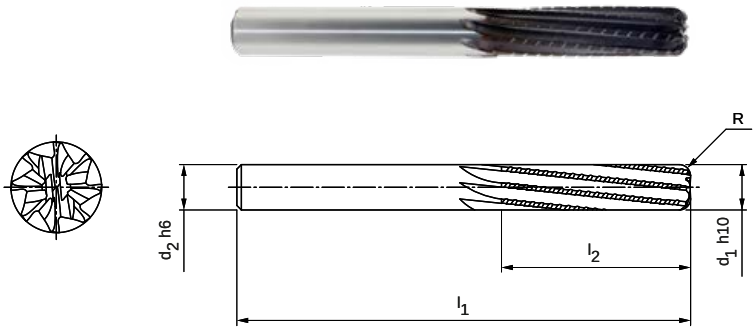
OptiMill®-Composite-Speed

Design with pulling cut, with corner radius
SCM46

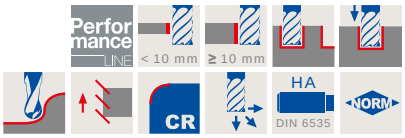
Design:

Milling cutter diameter:	4.00 - 20.00 mm
Cutting material:	HC611/HC619
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	1.1	1.2	1.3	2.1	3.1	4.1	4.2	5.1	5.2	5.3
										■			■		■		⬓	⬓			

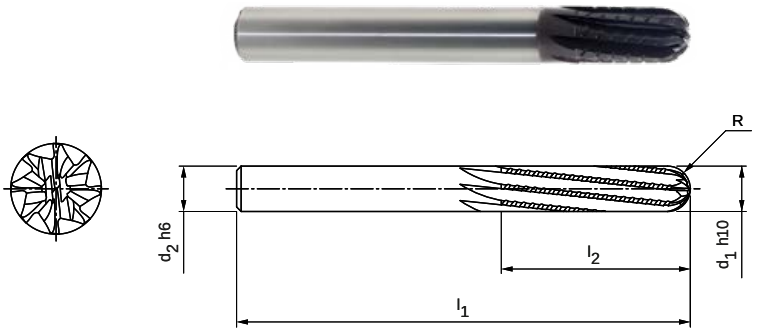


Dimensions					z	Specification	Order No.
d_1 h10	d_2 h6	l_1	l_2	R			
4,00	6	60	16	1,00	8	SCM460-0400Z08R-R0100HA-HC619	30869171
5,00	6	60	18	1,25	8	SCM460-0500Z08R-R0125HA-HC619	30869172
6,00	6	60	20	1,50	8	SCM460-0600Z08R-R0150HA-HC619	30869173
6,00	6	65	25	1,50	8	SCM460-0600Z08R-R0150HA-HC619	30869174
6,00	6	75	28	1,50	8	SCM460-0600Z08R-R0150HA-HC619	30869175
8,00	8	63	22	2,00	8	SCM460-0800Z08R-R0200HA-HC619	30869176
8,00	8	75	32	2,00	8	SCM460-0800Z08R-R0200HA-HC619	30869177
10,00	10	72	32	2,50	8	SCM460-1000Z08R-R0250HA-HC619	30869178
12,00	12	83	32	3,00	8	SCM460-1200Z08R-R0300HA-HC611	30869179
16,00	16	92	36	4,00	8	SCM460-1600Z08R-R0400HA-HC611	30869180
20,00	20	104	45	5,00	8	SCM460-2000Z08R-R0500HA-HC611	30869181

Dimensions in mm.
For cutting data recommendation, see end of section.
Special designs and other coatings on request.

OptiMill®-Composite-Speed-Radius

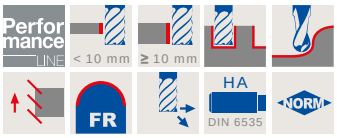
Design with pulling cut, with full radius
SCM87



Design:

Milling cutter diameter:	4.00 - 20.00 mm
Cutting material:	HC611/HC619
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.



Dimensions					z	Specification	Order No.
d_1 h10	d_2 h6	l_1	l_2	R			
4,00	6	60	16	2,00	8	SCM870-0400Z08R-R0200HA-HC619	30869182
5,00	6	60	18	2,50	8	SCM870-0500Z08R-R0250HA-HC619	30869183
6,00	6	60	20	3,00	8	SCM870-0600Z08R-R0300HA-HC619	30869184
6,00	6	65	25	3,00	8	SCM870-0600Z08R-R0300HA-HC619	30869185
6,00	6	75	28	3,00	8	SCM870-0600Z08R-R0300HA-HC619	30869186
8,00	8	63	22	4,00	8	SCM870-0800Z08R-R0400HA-HC619	30869187
8,00	8	75	32	4,00	8	SCM870-0800Z08R-R0400HA-HC619	30869188
10,00	10	72	32	5,00	8	SCM870-1000Z08R-R0500HA-HC619	30869189
12,00	12	83	32	6,00	8	SCM870-1200Z08R-R0600HA-HC611	30869190
16,00	16	92	36	8,00	8	SCM870-1600Z08R-R0800HA-HC611	30869191
20,00	20	104	45	10,00	8	SCM870-2000Z08R-R1000HA-HC611	30869192

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
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

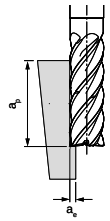
OptiMill-Uni-Trochoid | SCM58
OptiMill-PM-Trochoid | SCM82

MMG*			Material	Strength/hardness [N/mm²] [HRC]	Cooling			
					MQL/air	Dry	Wet	
P	P1	P1.1	Structural, free-cutting, case hardened and heat-treated steels, non-alloy	< 700	✓	✓	✓	
		P1.2	Structural, free-cutting, case hardened and heat-treated steels, non-alloy	< 1200	✓	✓	✓	
	P2	P2.1	Nitrided, case hardened and heat-treated steels, alloy	< 900	✓	✓	✓	
		P2.2	Nitrided, case hardened and heat-treated steels, alloy	< 1400	✓		✓	
	P3	P3.1	Tool, bearing, spring and high-speed steels	< 900	✓	✓	✓	
		P3.2	Tool, bearing, spring and high-speed steels	< 1500	✓		✓	
	P4	P4.1	Stainless steels, ferritic and martensitic		✓		✓	
	P5	P5.1	Cast steel				✓	
	P6	P6.1	Stainless cast steel, ferritic and martensitic				✓	
M	M1	M1.1	Stainless steels, austenitic	< 700	✓		✓	
		M1.2	Stainless steels, 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), GJL	< 300	✓	✓	✓	
	K2	K2.1	Cast iron with spheroidal graphite, GJS	< 500	✓	✓	✓	
		K2.2	Cast iron with spheroidal graphite, GJS	500-800	✓	✓	✓	
		K2.3	Cast iron with spheroidal graphite, GJS	> 800	✓	✓	✓	
	K3	K3.1	Cast iron with spheroidal graphite, GJV; malleable cast iron, GJM	< 500	✓	✓	✓	
		K3.2	Cast iron with spheroidal graphite, 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.

* MAPAL machining groups

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
	380–520	1.4 - 2.0	14 - 18	0.66 - 0.80
	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
	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

Machining example

16MnCr5

ø = 12 mm
v_c = 480 m/min
f_z = 0.22 mm
a_e = 1.7 mm
a_p = 32 mm

42CrMo4

ø = 12 mm
v_c = 375 m/min
f_z = 0.17 mm
a_e = 1.2 mm
a_p = 32 mm

X5CrNi18-8

ø = 12 mm
v_c = 180 m/min
f_z = 0.09 mm
a_e = 1.2 mm
a_p = 32 mm

Cutting data recommendation for shoulder milling cutters

Feed and cutting speed

Factors for tool lengths 3xD/4xD/5xD **

Max. machining depth a_p	a_e max.	Correction factor	
		v_c	f_z
3xD	0,1 xD	0,9	0,9
4xD	0,05 xD	0,9	0,7
5xD	0,05 xD	0,8	0,6

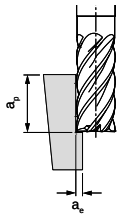
OptiMill-Uni-HPC-Finish | SCM83

MMG*			Material	Strength/hardness [N/mm²] [HRC]	Cooling			
					MQL/air	Dry	Wet	
P	P1	P1.1	Structural, free-cutting, case hardened and heat-treated steels, non-alloy	< 700	✓	✓	✓	
		P1.2	Structural, free-cutting, case hardened and heat-treated steels, non-alloy	< 1200	✓	✓	✓	
	P2	P2.1	Nitrided, case hardened and heat-treated steels, alloy	< 900	✓	✓	✓	
		P2.2	Nitrided, case hardened and heat-treated steels, alloy	< 1400	✓	✓	✓	
	P3	P3.1	Tool, bearing, spring and high-speed steels	< 900	✓	✓	✓	
		P3.2	Tool, bearing, spring and high-speed steels	< 1500	✓		✓	
	P4	P4.1	Stainless steels, ferritic and martensitic		✓		✓	
	P5	P5.1	Cast steel				✓	
	P6	P6.1	Stainless cast steel, ferritic and martensitic				✓	
M	M1	M1.1	Stainless steels, austenitic	< 700	✓		✓	
		M1.2	Stainless steels, 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), GJL	< 300	✓	✓	✓	
	K2	K2.1	Cast iron with spheroidal graphite, GJS	< 500	✓	✓	✓	
		K2.2	Cast iron with spheroidal graphite, GJS	500-800	✓	✓	✓	
		K2.3	Cast iron with spheroidal graphite, GJS	> 800	✓	✓	✓	
	K3	K3.1	Cast iron with spheroidal graphite, GJV; malleable cast iron, GJM	< 500	✓	✓	✓	
		K3.2	Cast iron with spheroidal graphite, GJV; malleable cast iron, GJM	> 500	✓	✓	✓	

* MAPAL machining groups

** For very good surface finish results, the feed must be further reduced!

Finishing



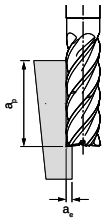
a_p = 1.5 x D
a_e = 0.1 x D

	v_c [m/min]	f_z [mm/tooth]							
		Milling cutter diameter [mm]							
		4.00	6.00	8.00	10.00	12.00	16.00	20.00	25.00
	475	0.040	0.057	0.074	0.089	0.104	0.130	0.151	0.167
	390	0.038	0.053	0.069	0.083	0.097	0.122	0.141	0.156
	430	0.040	0.057	0.074	0.089	0.104	0.130	0.151	0.167
	300	0.034	0.048	0.061	0.074	0.087	0.109	0.126	0.139
	280	0.038	0.054	0.070	0.085	0.099	0.124	0.143	0.159
	240	0.035	0.050	0.064	0.077	0.090	0.113	0.131	0.145
	195	0.027	0.038	0.049	0.060	0.069	0.087	0.101	0.111
	290	0.039	0.055	0.071	0.086	0.101	0.126	0.146	0.162
	195	0.019	0.027	0.034	0.042	0.049	0.061	0.070	0.078
	130	0.023	0.033	0.043	0.052	0.061	0.076	0.088	0.098
	120	0.019	0.028	0.036	0.043	0.050	0.063	0.073	0.081
	145	0.025	0.036	0.047	0.057	0.066	0.083	0.096	0.106
	130	0.020	0.029	0.037	0.045	0.052	0.065	0.075	0.084
	520	0.067	0.095	0.123	0.149	0.174	0.217	0.252	0.279
	475	0.057	0.081	0.104	0.127	0.147	0.185	0.214	0.237
	390	0.047	0.067	0.086	0.104	0.121	0.152	0.176	0.195
	215	0.027	0.038	0.049	0.060	0.069	0.087	0.101	0.111
	345	0.047	0.067	0.086	0.104	0.121	0.152	0.176	0.195
	325	0.040	0.057	0.074	0.089	0.104	0.130	0.151	0.167

Cutting data recommendation for shoulder milling cutters

Feed and cutting speed

Trochoidal milling



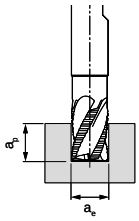
OptiMill-Uni-Wave | SCM88,89

MMG*			Material	Strength/ hardness [N/mm²] [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 steels, non-alloy	< 700	✓	✓	✓	On request				
		P1.2	Structural, free-cutting, case hardened and heat-treated steels, non-alloy	< 1200	✓	✓	✓					
	P2	P2.1	Nitrided, case hardened and heat-treated steels, alloy	< 900	✓	✓	✓					
		P2.2	Nitrided, case hardened and heat-treated steels, alloy	< 1400	✓		✓					
	P3	P3.1	Tool, bearing, spring and high-speed steels	< 900	✓	✓	✓					
		P3.2	Tool, bearing, spring and high-speed steels	< 1500	✓		✓					
	P4	P4.1	Stainless steels, ferritic and martensitic		✓		✓					
	P5	P5.1	Cast steel				✓					
	P6	P6.1	Stainless cast steel, ferritic and martensitic				✓					
M	M1	M1.1	Stainless steels, austenitic	< 700	✓		✓	On request				
		M1.2	Stainless steels, 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), GJL	< 300	✓	✓	✓	On request				
	K2	K2.1	Cast iron with spheroidal graphite, GJS	< 500	✓	✓	✓					
		K2.2	Cast iron with spheroidal graphite, GJS	500-800	✓	✓	✓					
		K2.3	Cast iron with spheroidal graphite, GJS	> 800	✓	✓	✓					
	K3	K3.1	Cast iron with spheroidal graphite, GJV; malleable cast iron, GJM	< 500	✓	✓	✓					
		K3.2	Cast iron with spheroidal graphite, 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.

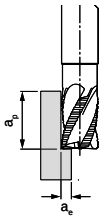
* MAPAL machining groups

Groove milling



a_p = 1 x D
a_e = 1 x D

Roughing



a_p = 1.5 x D
a_e = 0.25 x D

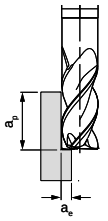
v_c [m/min]	f_z [mm/tooth]							v_c [m/min]	f_z [mm/tooth]						
	Milling cutter diameter [mm]								Milling cutter diameter [mm]						
	6.00	8.00	10.00	12.00	16.00	20.00	25.00		6.00	8.00	10.00	12.00	16.00	20.00	25.00
200	0.036	0.046	0.056	0.066	0.082	0.095	0.106	**405**	0.061	0.079	0.096	0.111	0.139	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	1
Long	1
Overlong	0.8
Extra long	-

Part-contact cutting

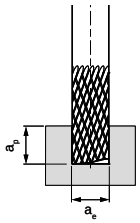


a_p = 1.5 x D
a_e = 0.25 x D

OptiMill-Uni-HPC-Pocket | SCM80, 81, 84

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 steels, non-alloy	< 700	✓	✓	✓	**445**	0.070	0.090	0.109	0.127	0.158	0.184
		P1.2	Structural, free-cutting, case hardened and heat-treated steels, non-alloy	< 1200	✓	✓	✓	**365**	0.065	0.084	0.101	0.118	0.148	0.171
	P2	P2.1	Nitrided, case hardened and heat-treated steels, alloy	< 900	✓	✓	✓	**405**	0.070	0.090	0.109	0.127	0.158	0.184
		P2.2	Nitrided, case hardened and heat-treated steels, alloy	< 1400	✓		✓	**285**	0.058	0.075	0.091	0.106	0.132	0.153
	P3	P3.1	Tool, bearing, spring and high-speed steels	< 900	✓	✓	✓	**265**	0.066	0.085	0.103	0.120	0.151	0.174
		P3.2	Tool, bearing, spring and high-speed steels	< 1500	✓		✓	**225**	0.060	0.078	0.094	0.110	0.137	0.159
	P4	P4.1	Stainless steels, 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 steels, austenitic	< 700	✓		✓	**120**	0.041	0.052	0.063	0.074	0.092	0.107
		M1.2	Stainless steels, 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), GJL	< 300	✓	✓	✓	**485**	0.116	0.149	0.181	0.211	0.264	0.306
	K2	K2.1	Cast iron with spheroidal graphite, GJS	< 500	✓	✓	✓	**445**	0.099	0.127	0.154	0.179	0.224	0.260
		K2.2	Cast iron with spheroidal graphite, GJS	500-800	✓	✓	✓	**365**	0.081	0.105	0.127	0.148	0.185	0.214
		K2.3	Cast iron with spheroidal graphite, GJS	> 800	✓	✓	✓	**200**	0.046	0.060	0.072	0.084	0.106	0.122
	K3	K3.1	Cast iron with spheroidal graphite, GJV; malleable cast iron, GJM	< 500	✓	✓	✓	**325**	0.081	0.105	0.127	0.148	0.185	0.214
		K3.2	Cast iron with spheroidal graphite, GJV; malleable cast iron, GJM	> 500	✓	✓	✓	**305**	0.070	0.090	0.109	0.127	0.158	0.184

Groove milling



a_p = 1 x D
a_e = 1 x D

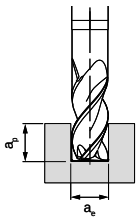
OptiMill-Composite-Speed | SCM46
OptiMill-Composite-Speed-Radius | SCM87

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, thermosets		✓	✓	✓	**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		✓	✓		**200**	0.011	0.015	0.020	0.024	0.028	0.035	0.040
		C4.2	Sandwich construction, foam core		✓	✓		**150**	0.012	0.016	0.021	0.026	0.030	0.037	0.043

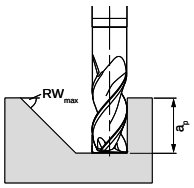
Note:
The cutting data stated are indicative. The optimal data for the specific machining case should be determined in trials or during the machining.

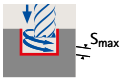
* MAPAL machining groups

Full-contact cutting



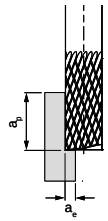
a_p = 1 x D
a_e = 1 x D





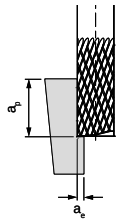
v_c [m/min]	f_z [mm/tooth]						Ramping	Helix milling			Drilling
	Milling cutter diameter [mm]						RW_{max}	S_{max}	EW_{max}		f_z factor
	6.00	8.00	10.00	12.00	16.00	20.00			G = 1.5	G = 1.8	
220	0.041	0.053	0.064	0.075	0.093	0.108	45°	0.75xD	25°	16°	0.90
180	0.038	0.049	0.060	0.070	0.087	0.101	45°	0.75xD	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

Roughing



a_p = 1.5 x D
a_e = 0.25 x D

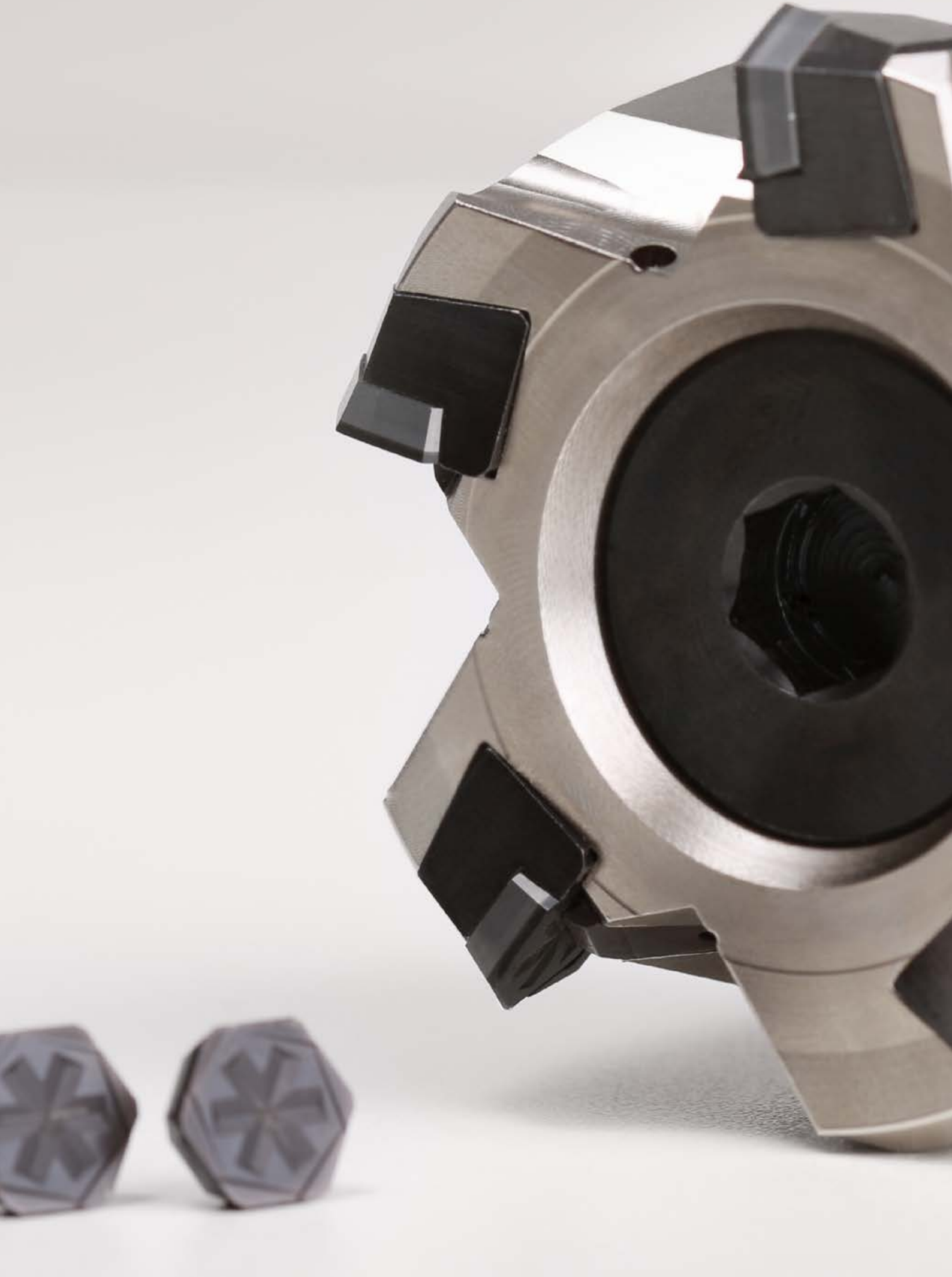
Finishing



a_p = 1.5 x D
a_e = 0.1 x 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

Terminology:
RW_{max} = Maximum angle of the ramp
S_{max} = Maximum pitch of the helix
G = Ratio of circular pocket Ø on plunging to the tool Ø
Example: Tool Ø 12 mm at G=1.5 gives pocket Ø of 18 mm
EW_{max} = Pitch angle of the helix (given by G and S_{max})



MILLING CUTTERS WITH REPLACEABLE INSERTS

Milling cutters with indexable inserts

Indexable inserts

Technical appendix

CartridgeMill-HD-Finishing and CartridgeMill-WD-Finishing - proven in practice

MAPAL has further developed the existing HX milling cutter to a new milling cutter for face and shoulder milling of cast iron and hardened steel. The milling cutter can now be used with both HD indexable inserts with six cutting edges for face milling and with W-shaped indexable inserts with three cutting edges for shoulder and face milling. Thanks to the easily replaced milling cartridges, both insert types can be used in the same tool body. The tool body of nickel-plated steel is particularly wear-resistant and is thus well-suited to the demands of hard machining. The use of proven adjustment and clamping systems guarantees the optimum, backlash-free mounting of the indexable inserts. The axial run-out can be set with µ-precision thanks to the high-precision wedge adjustment of the milling cartridges. The new milling cutter displays its strengths particularly in the automotive sector and in mould making thanks to the extremely good surface finishes that can be achieved. Furthermore, the central coolant supply is directed straight at the cutting edges to ensure an optimum chip flow.

Low costs per cutting edge

Both the HD indexable inserts and the W-shaped indexable inserts are designed as full-face variants, i.e. tipped on one side over the whole surface with the extremely hard cutting material, PcBN.

The HD indexable inserts impress with their very good cost-effectiveness, because thanks to their hexagonal form they have six usable cutting edges, and thus achieve very low costs per cutting edge.

And thanks to the new W-shaped indexable inserts, three cutting edges can now be used for the shoulder machining of cast iron and hardened steel. This again gives a significant boost to cost-effectiveness for this machining operation. Furthermore, the W-shaped indexable inserts can also be used for face milling.

AT A GLANCE

- Available in the diameter range from 50 (z=3) to 250 mm (z=17)
- For face and shoulder milling of cast iron and hardened steel
- W-shaped indexable inserts with three cutting edges for shoulder and face milling
- H-shaped indexable inserts with six cutting edges for face milling
- Both insert types can be used in the same tool body

ADVANTAGES

- High cost-effectiveness thanks to triple and six cutting edge indexable inserts
- µ-precise setting of the axial run-out

Tool features in detail

1 Diameter range from 50 to 250 mm

2 Face and shoulder milling of cast iron and hardened steel
– Contact angle 60° and 90°

3 Nickel-plated tool body
– Body material made of nickel-plated steel
– Particularly wear-resistant

4 Integrated coolant outlets
– Direct cooling and lubrication of the cutting edges

5 High flexibility
– Both insert types can be used in the same tool body

6 Proven adjusting system
– Guaranteed optimal seating of the indexable insert
– High-accuracy wedge adjustment
– Simple handling
– Setting of the axial run-out to the µm

Indexable inserts in H-shape HDHX

– Indexable inserts in H-shape: High cost-effectiveness with six cutting edges for face milling
– Indexable inserts are full-face tipped with the extremely hard cutting material PcBN

Indexable inserts in W-shape WDHX

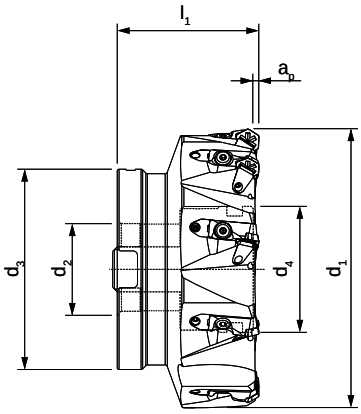
– Indexable inserts in W-shape: Three cutting edges for shoulder and face milling
– Indexable inserts are full-face tipped with the extremely hard cutting material PcBN

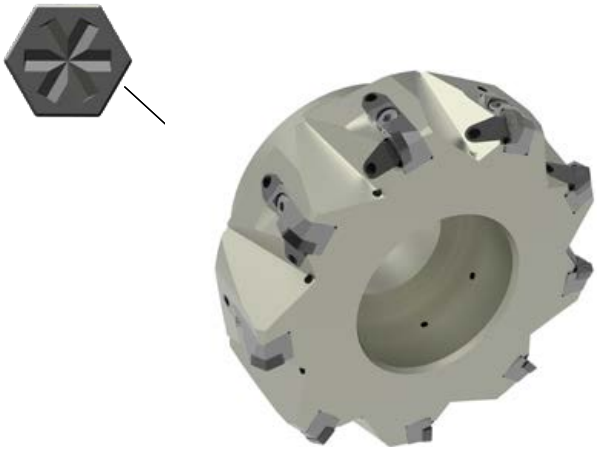
For finish machining

– Optimal surface finish values are realised due to special wiper geometries
– Application in the automotive sector and in mould making
– High process reliability due to stable cassette design

CartridgeMill-HD-Finishing

Face cutter heads with radial technology





Body material made of nickel-plated steel

Dimensions					z_{eff}	a_p max.	Weight incl. milling cartridge [kg]	Max. spindle speed [rpm]	Specification	Order No.
d_1	d_2	d_3	d_4	l_1						
50	22	48	18	50	3	0,1 - 1,0*	0,51	19.000	CFM601-050-CA22-Z03R-HDHX10	30604540
63	22	48	28	50	5	0,1 - 1,0*	0,72	16.000	CFM601-063-CA22-Z05R-HDHX10	30604538
80	27	60	38	50	6	0,1 - 1,0*	1,19	15.000	CFM601-080-CA27-Z06R-HDHX10	30703131
100	32	78	44	50	7	0,1 - 1,0*	2,00	13.000	CFM601-100-CA32-Z07R-HDHX10	30703133
125	40	89	56	63	9	0,1 - 1,0*	3,69	12.000	CFM601-125-CA40-Z09R-HDHX10	30703134
160	40	89	-	63	11	0,1 - 1,0*	5,70	10.000	CFM601-160-CA40-Z11R-HDHX10	30703136
200	60	140	-	63	13	0,1 - 1,0*	9,57	9.000	CFM601-200-CA60-Z13R-HDHX10	30703137
250	60	140	-	63	17	0,1 - 1,0*	14,23	8.000	CFM601-250-CA60-Z17R-HDHX10	30709649

Accessories

	Milling cartridge	30613329
	Indexable insert	Page 176
	See catalogue "CLAMPING"	

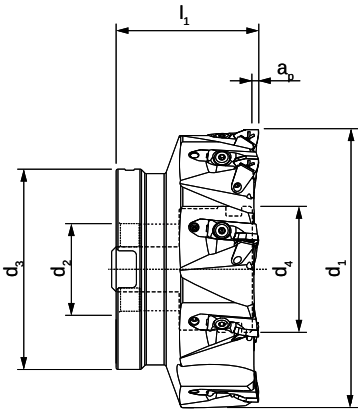
Spare parts **

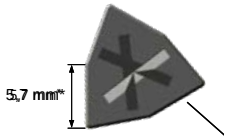
	Clamping screws for milling cartridge	10019695
	Threaded spindle	10093055
	Adjusting wedge	30557564
	Milling cutter clamping screw Ø 50	10003660
	Milling cutter clamping screw Ø 63	10053822
	Milling cutter clamping screw Ø 80	10049206
	Milling cutter clamping screw Ø 100	10073932
	Milling cutter clamping screw Ø 125	10064487
	Milling cutter clamping screw Ø 160	10018907
	Milling cutter clamping screw Ø 200 / 250	10022995
	Clamping plate	30893393

Dimensions in mm.
* Cutting depth is dependent on the material to be machined.
** Included.

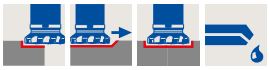
CartridgeMill-WD-Finishing

Shoulder cutter head with radial technology





* **Application note:**
Maximum flank height



Body material made of nickel-plated steel

Dimensions					z_{eff}	a_p max.	Weight incl. milling cartridge [kg]	Max. spindle speed [rpm]	Specification	Order No.
d_1	d_2	d_3	d_4	l_1						
50	22	48	18	50	3	0,1 - 1,0*	0,51	19.000	CCM901-050-CA22-Z03R-WDHX90	30836598
63	22	48	28	50	5	0,1 - 1,0*	0,72	16.000	CCM901-063-CA22-Z05R-WDHX90	30787032
80	27	60	38	50	6	0,1 - 1,0*	1,19	15.000	CCM901-080-CA27-Z06R-WDHX90	30836599
100	32	78	44	50	7	0,1 - 1,0*	2,00	13.000	CCM901-100-CA32-Z07R-WDHX90	30836600
125	40	89	56	63	9	0,1 - 1,0*	3,69	12.000	CCM901-125-CA40-Z09R-WDHX90	30836601
160	40	89	-	63	11	0,1 - 1,0*	5,70	10.000	CCM901-160-CA40-Z11R-WDHX90	30836602
200	60	140	-	63	13	0,1 - 1,0*	9,57	9.000	CCM901-200-CA60-Z13R-WDHX90	30836603
250	60	140	-	63	17	0,1 - 1,0*	14,23	8.000	CCM901-250-CA60-Z17R-WDHX90	30836604

Accessories

	Milling cartridge	30780692
	Indexable insert	Page 176
	See catalogue "CLAMPING"	

Spare parts **

	Clamping screws for milling cartridge	10019695
	Threaded spindle	10093055
	Adjusting wedge	30557564
	Milling cutter clamping screw Ø 50	10003660
	Milling cutter clamping screw Ø 63	10053822
	Milling cutter clamping screw Ø 80	10049206
	Milling cutter clamping screw Ø 100	10073932
	Milling cutter clamping screw Ø 125	10064487
	Milling cutter clamping screw Ø 160	10018907
	Milling cutter clamping screw Ø 200 / 250	10022995
	Clamping plate	30893394

Dimensions in mm.
* Cutting depth is dependent on the material to be machined.
** Included.

HDHX

Radial indexable inserts, six cutting edges

PcBN

Material		K					
Cutting material types		FU430					
Cutting edge design		W36	W37	S09	S36	W38	E02
	a_p max. [mm]						
HDHX103004...R-0AF	0,1 - 1,0	30855896	30855906	30855908	30855910	30855918	30855930
HDHX103008...R-0AF	0,1 - 1,0	30855934	30855939	30855940	30855942	30855946	30855947

WDHX

Radial indexable inserts, triple edge

PcBN

Material		K					
Cutting material types		FU430					
Cutting edge design		W36	W37	S09	S36	W38	E02
	a_p max. [mm]						
WDHX903004...R-0AF	0,1 - 1,0	30855949	30856192	30856196	30856198	30856209	30856218
WDHX903008...R-0AF	0,1 - 1,0	30856219	30856223	30856225	30856226	30856230	30856231

	H					
	FU430					
	W36	W37	S09	S36	W38	E02
	30855896	30855906	30855908	30855910	30855918	30855930
	30855934	30855939	30855940	30855942	30855946	30855947

	H					
	FU430					
	W36	W37	S09	S36	W38	E02
	30855949	30856192	30856196	30856198	30856209	30856218
	30856219	30856223	30856225	30856226	30856230	30856231

Handling notes for CartridgeMill-HD-Finishing and CartridgeMill-WD-Finishing

The existing HX milling cutter has been further developed to produce a new milling cutter for face and shoulder milling cast iron and hardened steel. The milling cutter can now be used both with HD indexable inserts for face milling and with W-shaped indexable inserts for shoulder and face milling.

Thanks to the easily replaced milling cartridges, both insert types can be used in the same tool body. The indexable inserts are set to the μ using the highly accurate wedge adjustment with threaded spindle.

Changing and setting the indexable inserts

Requirements:
When changing inserts and setting, always check whether the milling cutter body, the indexable inserts and the remaining components are still of adequate quality for use. Even if not set, each time before using the milling cutter it must be checked whether the clamping screws are tightened to a tightening torque of 3 Nm.

Note:
Only for trained personnel.

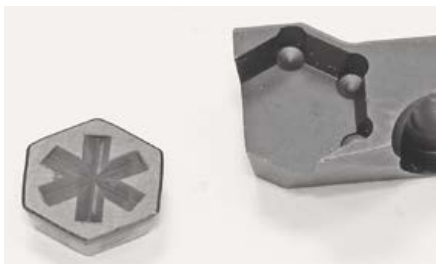
1. Turn the threaded spindle for the adjusting wedge 1½ to 2 turns counter-clockwise using a hex-wrench.

Information:
On milling cutters already set, turn the threaded spindle for the adjusting wedge 1½ to 2 turns counter-clockwise, otherwise unscrew 3 turns from the inner stop. In this way the axial setting must be 0.1 to 0.2 mm in relation to EM after changing the indexable inserts.

2. Turn the clamping screw for the milling cartridge counter-clockwise using a hex-wrench and remove the clamping screw undone.

3. Undo the clamping jaw, for this purpose turn the threaded spindle for the clamping jaw 1½ to 2 turns counter-clockwise using a hex-wrench.

4. Remove the milling cartridge upward out of the seat for the milling cartridge. Then clean the seat for the milling cartridge using compressed air.

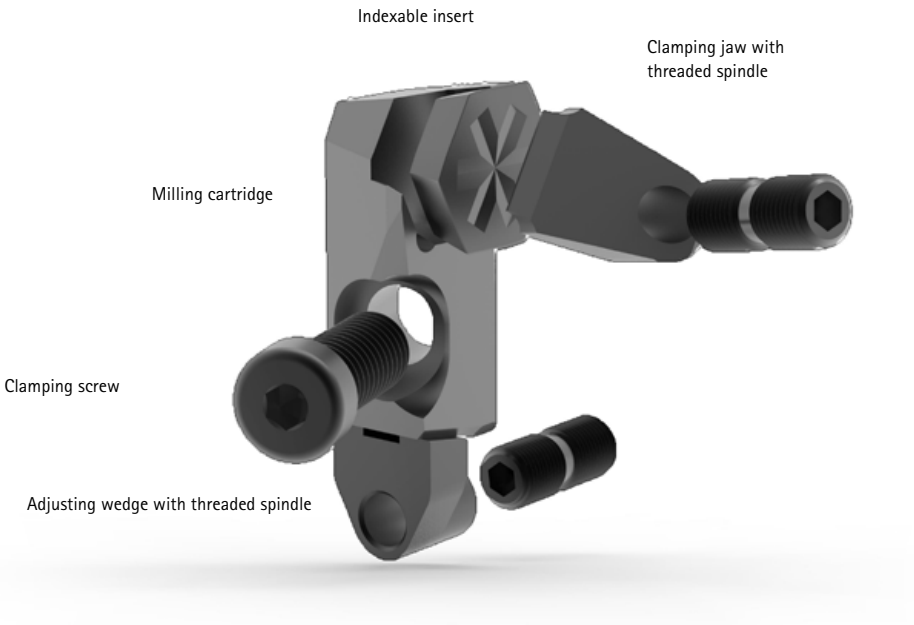


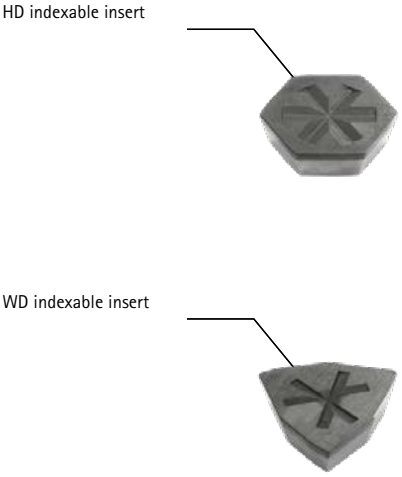
5. Turn the indexable insert or replace completely and re-fit in the milling cartridge.

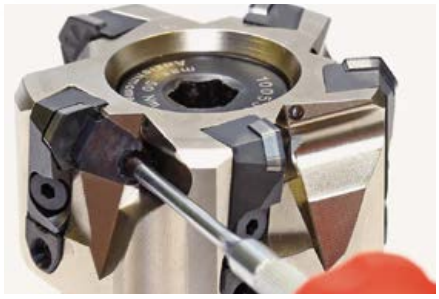
6. Fit the milling cartridge from above in the seat of the milling cartridge.

Note:
The setting dimension EM relates only to the milling cutter's tool body incl. milling cartridges. If a milling cutter with connection is set, the length of the connection l_A must always be taken into account. In this situation the setting dimension is l_A + EM.

7. Lightly screw in the clamping screw for the milling cartridge using a hex-wrench.Then carefully press down the milling cartridge using a finger and at the same tighten the clamping screw clockwise to 2 to 3 Nm using a torque wrench.

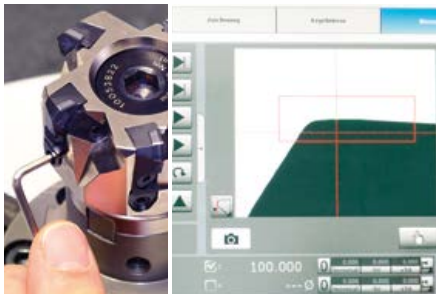






8. Tighten the threaded spindle for the clamping jaw clockwise to 2 to 3 Nm using a torque wrench.

Information:
To prevent measurement inaccuracy, clean all cutting edges using a cleaning compound.



9. Setting using setting fixture (optical)
Establish the cutting edge using the optical measuring device and using a hex-wrench turn the threaded spindle for the adjusting wedge clockwise until EM is reached (value "100" on the monitor; tolerance: ± 1 to 2 µm). Repeat this process for the remaining milling cartridges.

10. Setting using dial gauge/measuring plate (tactile)

Information:
On rotating the milling cutter, do not leave the measuring probe in contact with the indexable insert. Aluminium measuring probes are recommended. As far as possible only approach the cutting edge from the clearance surface.

During the setting process using a dial gauge, set the EM with the aid of a gauge block. Then set the indexable insert to the EM. For this purpose move the probe to the highest point on the milling cartridge to read the actual dimension. Then turn the milling cartridge upward with the aid of the threaded spindle for the adjusting wedge until the EM is reached. Repeat this process for the remaining milling cartridges.

11. Checking / setting again if necessary
Using the setting fixture, either optically or using a dial gauge, identify the indexable insert with the highest protruding cutting edge and set to zero. If necessary, set all indexable inserts to the highest protruding cutting edge. For this purpose turn the threaded spindle for the adjusting wedge until the zero dimension is reached (tolerance: ± 1 to 2 µm).

Result:
The indexable inserts have been changed and set.

Tightening torques for the milling cutter clamping screw

Milling head diameter [mm]	Dimensions	Wrench size SW	Tightening torque [Nm]	Order No.
50	M10	SW 10	50	10003660
63	M10	SW 10	50	10053822
80	M12	SW 12	70	10049206
100	M16	SW 14	100	10073932
125	M20	SW 14	125	10064487
160	M12	SW 12	70	10018907
200	M16	SW 14	70	10022995
250	M16	SW 14	70	10022995

CLAMPING

Series expansion with new lengths for HSK-A, SK and BT


MAPAL
MAPAL
MAPAL

ADDITIONS TO PROGRAMME

New lengths supplement existing series

On using tools, their connection to the machine spindle, and therefore the clamping technology, plays a central role that is often undervalued.

When fine machining parts, the best results with the highest radial run-out accuracies must be achieved. Even during drilling or milling, the clamping system used must operate very accurately, as even minor radial deviations will be detrimental to the tool lives. The MAPAL clamping technology programme offers the optimal solution for every application and a connection that ensures the tool has the necessary performance as well as the highest radial run-out and changeover accuracy in use.

MAPAL is expanding the range with new, additively manufactured hydraulic chucks with a slender 3° contour that are specially designed for finishing, reaming and fine boring. The HydroChuck Compensation with radial alignment feature is also available for SK 50 and HSK 100 connections.

The range of shrink chucks is also expanding with products with new lengths.

Hydraulic clamping technology:
- High torque transmission
- Process reliability up to 170 °C
- Increased tool life due to very high radial run-out accuracy and accuracy of repetition

Shrinking technology:
- High torque transmission and radial rigidity
- Long service life due to usage of heat-resistant tool steel
- Numerous possible combinations of shrink chucks and extensions

Hydraulic clamping technology

HighTorque Chuck HTC

- HSK-A: 40 | 63 | 100
- SK: 30 | 40
- BT: 30 | 40
- BT-FC: 30
- Lengths l_1: 80 | 85 | 120 | 160 | 200

Connection	HSK-A	SK	BT	BT-FC
Page	194	200	203	204

Hydraulic chucks HydroChuck

- HSK-A: 63 | 100
- Lengths l_1: 70 | 90 | 170 | 210 | 230

Connection	HSK-A
Page	196

Hydraulic chucks HydroChuck Compensation

- HSK-A: 100
- SK: 40 | 50
- Lengths l_1: 100 | 105 | 110 | 115 | 120 | 125 | 130 | 135 | 140 | 150

Connection	HSK-A	SK
Page	198	201

Shrinking technology

Shrink chucks ThermoChuck

- HSK-A: 63 | 100
- SK: 40 | 50
- Lengths l_1: 130

Connection	HSK-A	SK
Page	199	202

CHUCK

Introduction

HSK-A

SK

BT

LARGEST APPLICATION-ORIENTATED CHUCK RANGE

1 Direct clamping
With slender contour from ø 3 mm

2 Extra short design
With BT and BT with face connection

3 With optimised tool restriction contour
For highest rigidity in mould making with length 226 mm

4 HSK-E
With adapted tool restriction contour in short design

5 Minimum tool restriction contour
For special contour-critical machining in long design

6 Shrink chuck
With optimal contour and adapted lengths for mould making

7 Slender shrink chuck
With slender contour

8 Miniature hydraulic chuck
With HSK-25

9 Hydraulic chuck
With additional decentral coolant outlets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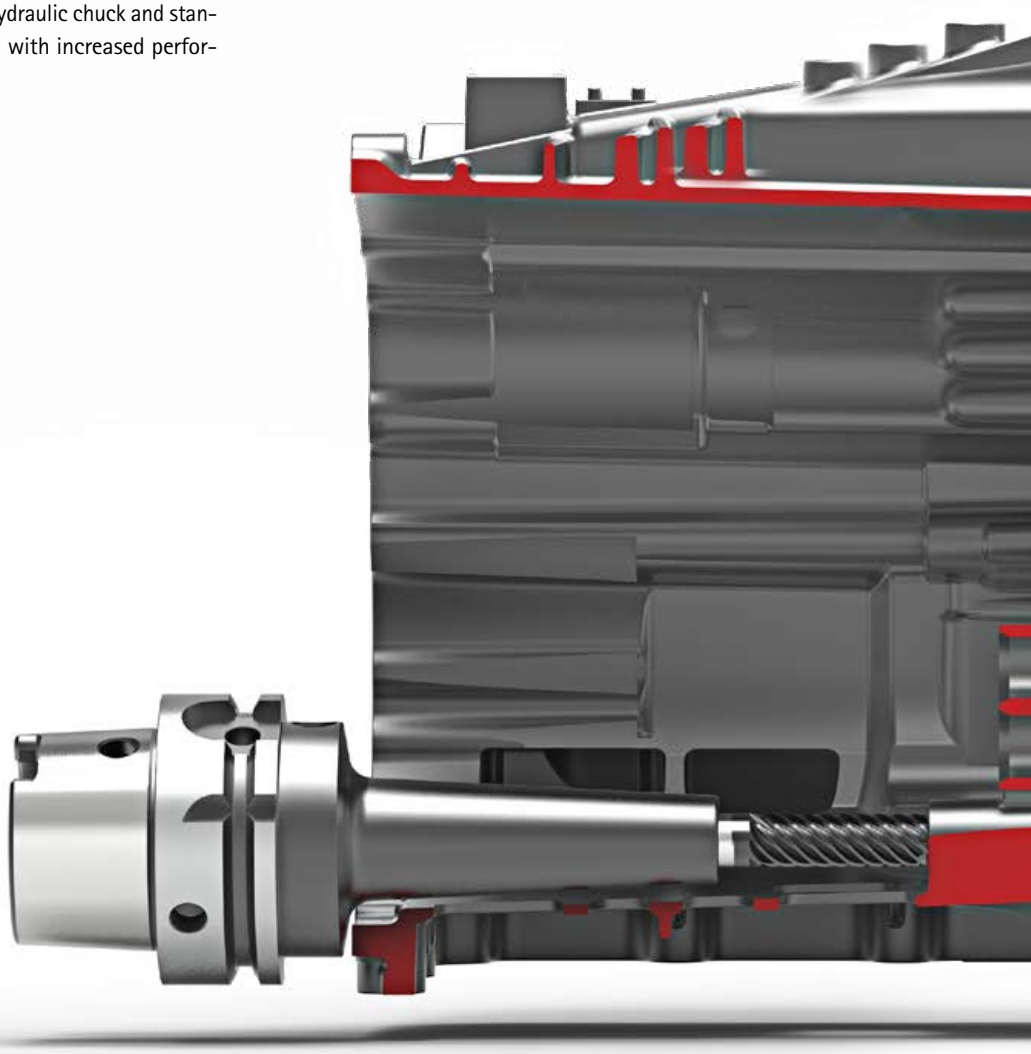
HIGH SAVING POTENTIAL

The ideal combination of application-optimised hydraulic chuck and standard tool makes high savings potential possible with increased performance and tool life.

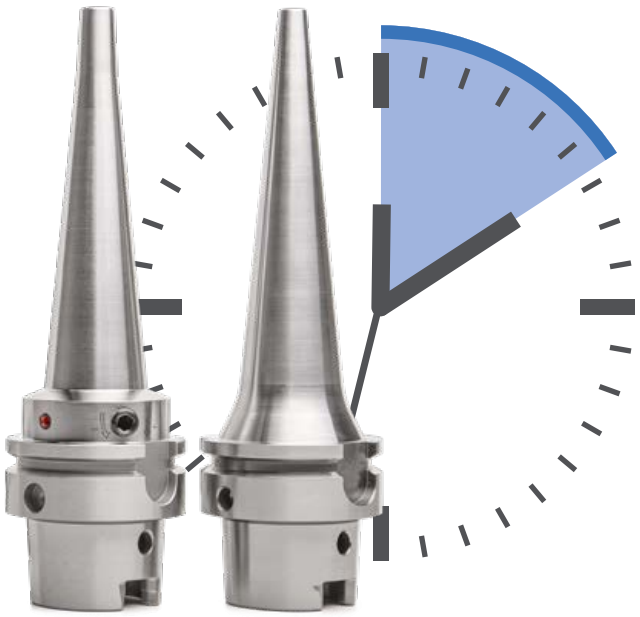


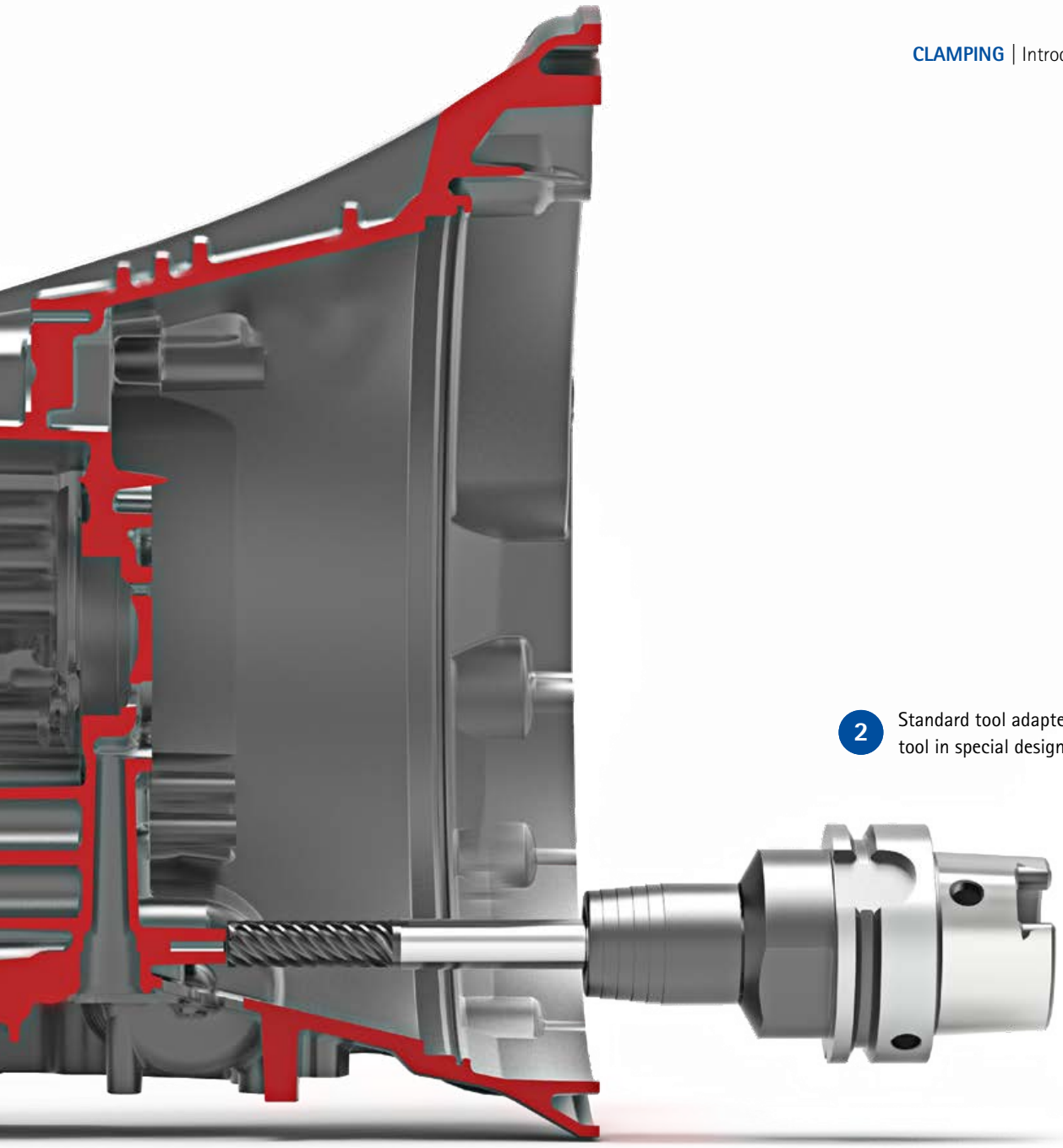
1 Long hydraulic chuck and standard solid carbide tool

Saving in non-productive times by changing to hydraulic technology

A further argument in favour of the changeover from shrink chuck to the HighTorque Chuck HTC with slender contour is not only the better surface finish that can be achieved, but also the significantly easier handling. A simple hex-wrench and a defined number of turns is sufficient for clamping and releasing of the tool, so that a tool change is significantly faster and easier.

Number of tools in use	Tool changes per day	Time saved in minutes
10	3	120
20	3	240
50	3	600
10	5	200
20	5	400
50	5	1.000
100	5	2.000

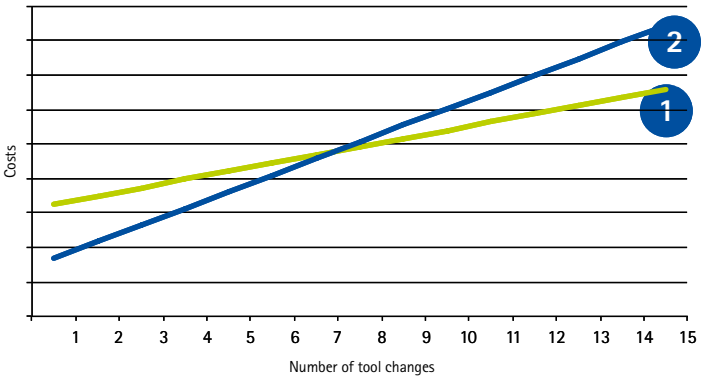




2 Standard tool adapter solid carbide tool in special design, extra long

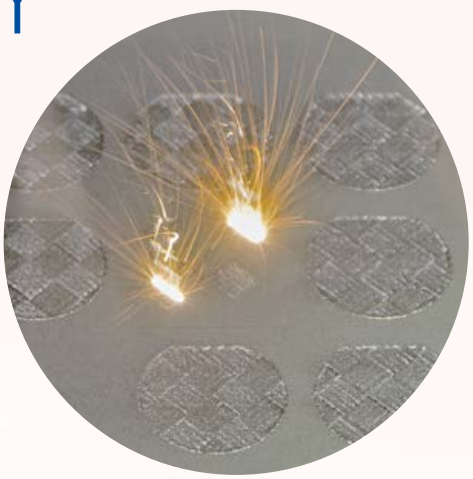
Amortisation calculation: Long hydraulic chuck and standard solid carbide tool

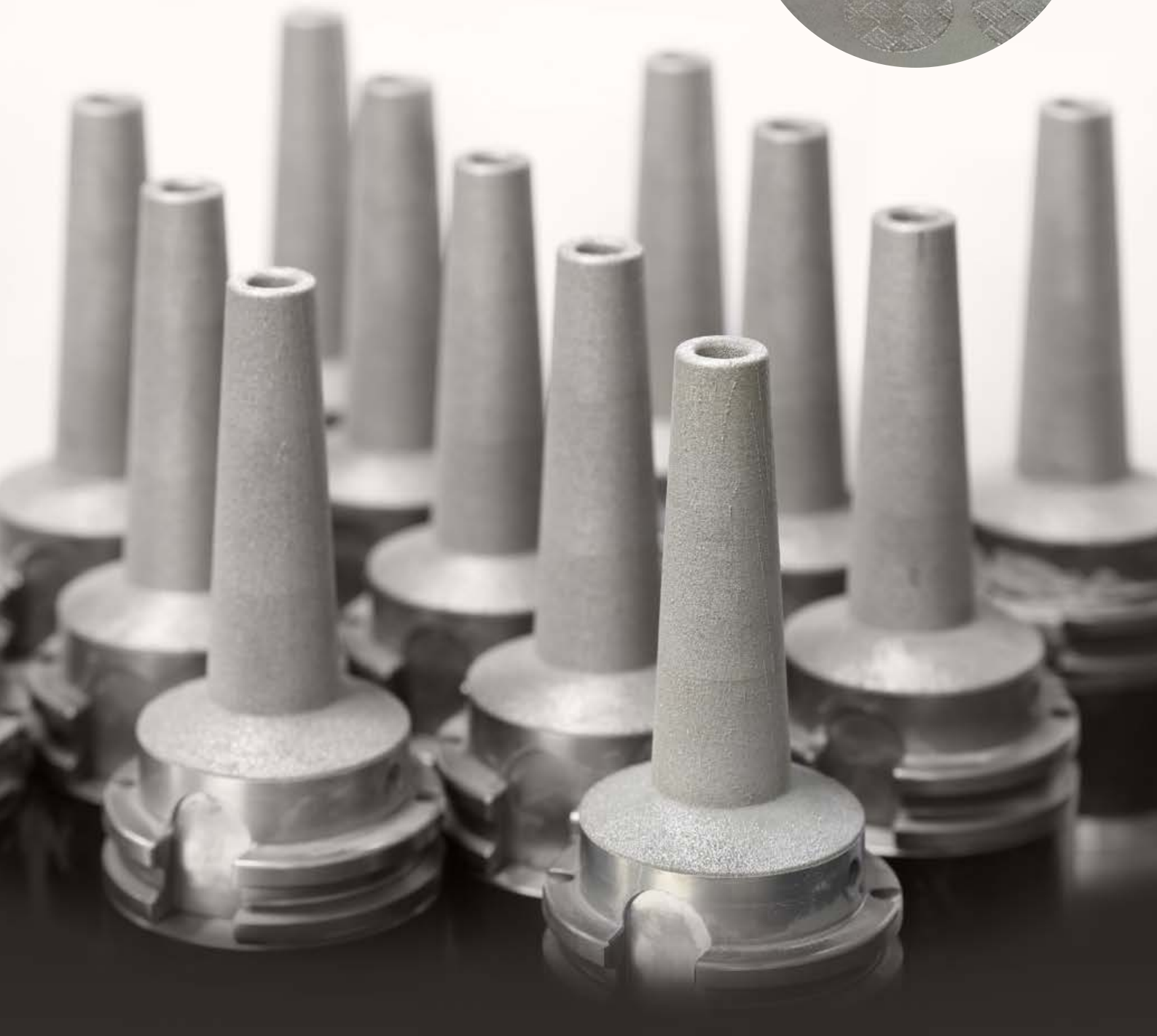
An exemplary calculation shows that the higher procurement costs of an application-optimised chuck with standard tool compared with the use of a standard chuck with special solid carbide tool are recouped after just eight tool changes.



ADDITIVE MANUFACTURING PUSHES BACK THE BOUNDARIES OF HYDRAULIC TECHNOLOGY

Accuracy, process reliability, flexibility and straightforward handling are key requirements on chucks. Of the available solutions, hydraulic chucks give the greatest consideration to the factor of accuracy. Until now, however, above all the brazed joint on hydraulic chucks has been a limiting factor in relation to, for example, thermal stability and torque transmission. Additive manufacturing is pushing back these boundaries by allowing the chuck to be manufactured "in one piece" without the limiting brazed joint. As such hydraulic technology can be used for a significantly broader range of applications.





ADVANTAGES OF ADDITIVELY MANUFACTURES HYDRAULIC TECHNOLOGY IN DETAIL

Additively manufactured hydraulic technology with minimum tool restriction for a broad spectrum of applications

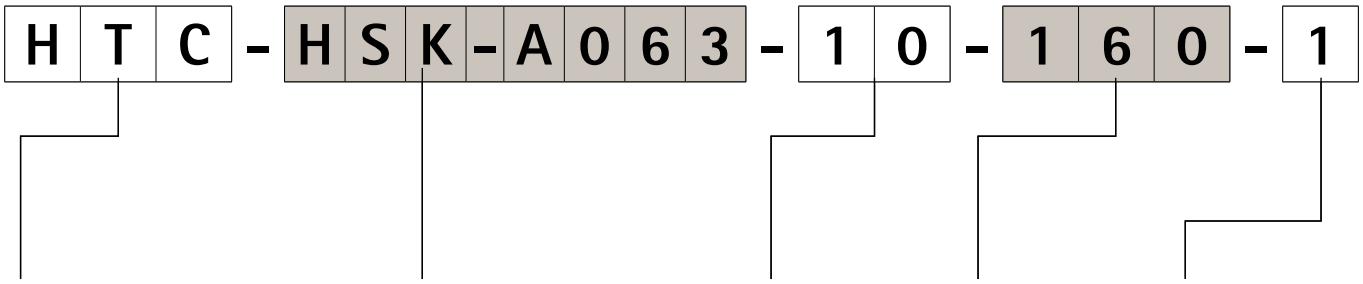
ADVANTAGES

- Broad spectrum of applications, for example in mould making, but also in the automotive and aerospace sector
- Machining in the contour-critical areas
- Reliable clamping even at temperatures up to 170 °C thanks to the elimination of the brazed joint between sleeve and tool body
- Optimum radial run-out accuracy of 3 µm with a projection length of 2.5 x D
- Better surface finish with longer tool life of the tool
- Shorter set-up times and lower tool costs
- No peripheral equipment necessary

FEATURES

- Lean contour with a back taper of 3°
- High torque transmission and bending resistance
- Quick and simple clamping directly on the machine
- Balancing value G=2.5 at 25,000 rpm
- Diameter range 3 - 32 mm
- Available with HSK and SK shanks
- RFID possible as an option

Designation key for chuck specification



Type

HTC	HighTorque Chuck
MHC	Hydraulic chucks (HydroChuck)
MHA	Hydraulic clamping arbor
MTC	Shrink chuck (ThermoChuck)
MWC	Weldon chuck
MNC	Whistle Notch chuck
MCC	Chucks for collets
MCA	Milling cutter arbor
MPC	Precision-DrillChuck
MSC	Synchro tapping chuck
MFH	Floating holders

Locating shank

HSK-A	Hollow shank taper Form A
HSK-C	Hollow shank taper Form C
HSK-E	Hollow shank taper Form E
HSK-F	Hollow shank taper Form F
MOD	Module connection
ZYL	Cylindrical shank
SK	Steep taper Form A in acc. with ISO
AD-FC	Steep taper Form A in acc. with ISO
BT	Steep taper Form J in acc. with ISO
JD-FC	Steep taper Form J similar to ISO with face connection
CAT	Steep taper in acc. with ASME
VDI	VDI connection
STH	Shank of adjusting bushing

Clamping diameter (max. clamping ø)

Projection length

Internal cooling/MQL – general conditions

0	Without
1	Internal
2	Lateral (SK)
3	Internal and lateral combined
	Only with MQL:
A	MQL 1-channel system automatic tool change
B	MQL 1-channel system manual tool change
C	MQL 2-channel system automatic tool change
D	MQL 2-channel system manual tool change
E	MQL 1-channel system Tool change not specified
F	MQL 2-channel system Tool change not specified
G	MQL not specified Tool change not specified

Extension with MQL

- **0** - **A** - **A** **A** **A** **3**

Alignment

0	Without alignment
1	Radial alignment
2	Radial and angular alignment

Length adjustment

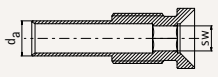
A	Axial length adjustment
R	Radial length adjustment
W	Without length adjustment

Body (BDY)

A	MAPAL Standard range
B	MAPAL Semi-standard MTC long design Thread for LS differs
C	MAPAL Semi-standard MTC short design HSK32

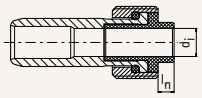
Length adjustment screw (LS)

A	MAPAL Standard range
B	MAPAL Semi-standard MTC 2-channel applications Sealing diameter d_a reduced for wrench size 2
C	MAPAL Semi-standard For tool body design B and C



Coolant supply unit (CU)

A	MAPAL Standard range
B	MAPAL Semi-standard l_n reduced
C	MAPAL Semi-standard $l_n = 0$
D	MAPAL Semi-standard Sealing diameter d_i differs
E	MAPAL Semi-standard l_n reduced Sealing diameter d_i differs
F	MAPAL Semi-standard $l_n = 0$ Sealing diameter d_i differs



Wrench size AF (only for 2-channel)

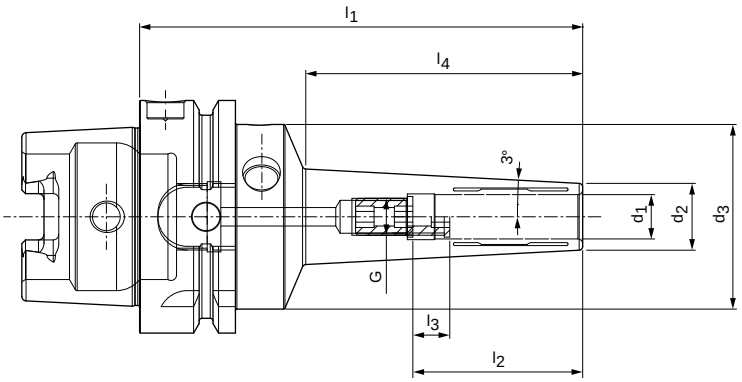
1	Wrench size 1.5
2	Wrench size 2
3	Wrench size 3
4	Wrench size 4
5	Wrench size 5
6	Wrench size 6
7	Wrench size 2.5

The following items of information are appended to the specification:

VS: Foolproofing
FB: Fine balanced
BC: Chip version with Balluff chip
FAS: Milling cutter clamping screw

HighTorque Chuck HTC

With axial tool length adjustment
Shank HSK-A in accordance with DIN 69893-1



Slender design, 3 degrees

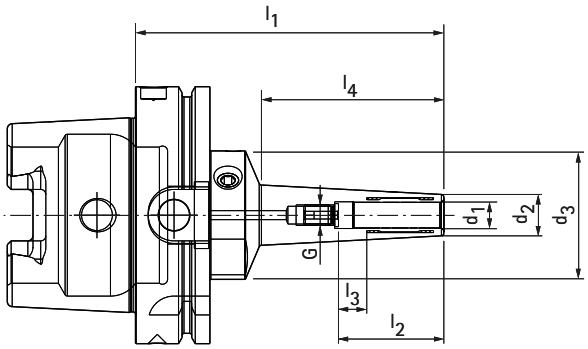
HSK-A	Dimensions							G	Wrench size	Specification	Order No.	Order No. chip version
	d_1	d_2	d_3	l_1	l_2	l_3	l_4					
40	3	9	34	85	28	16	45	M2.5	1,3	HTC-HSK-A040-03-85-1-0-A	30817979	30983306
40	4	10	34	85	28	12	45	M2.5	1,3	HTC-HSK-A040-04-85-1-0-A	30817980	30983307
40	5	11	34	85	28	8	45	M2.5	1,3	HTC-HSK-A040-05-85-1-0-A	30817981	30983308
40	6	12	34	85	37	10	46	M5	2,5	HTC-HSK-A040-06-85-1-0-A	30817982	30983309
40	8	14	34	85	37	10	46	M6	3	HTC-HSK-A040-08-85-1-0-A	30817983	30983320
40	10	16	34	85	41	10	47	M8x1	3	HTC-HSK-A040-10-85-1-0-A	30817984	30983321
40	12	18	34	85	46	10	47	M8x1	3	HTC-HSK-A040-12-85-1-0-A	30817985	30983322
63	3	13	50	160	28	16	110	M2,5	1,3	HTC-HSK-A063-03-160-1-0-A	30858322	30981892
63	3	13	50	200	28	16	151	M2,5	1,3	HTC-HSK-A063-03-200-1-0-A	30858329	30981893
63	4	14	50	160	28	12	110	M2,5	1,3	HTC-HSK-A063-04-160-1-0-A	30858323	30981894
63	4	14	50	200	28	12	151	M2,5	1,3	HTC-HSK-A063-04-200-1-0-A	30858330	30981895
63	5	15	50	160	28	8	110	M2,5	1,3	HTC-HSK-A063-05-160-1-0-A	30858324	30981896
63	5	15	50	200	28	8	151	M2,5	1,3	HTC-HSK-A063-05-200-1-0-A	30858331	30981897
63	6	16	50	160	37	10	111	M5	2,5	HTC-HSK-A063-06-160-1-0-A	30727647	30981898
63	6	16	50	200	37	10	152	M5	2,5	HTC-HSK-A063-06-200-1-0-A	30720812	30981899
63	7	13	50	120	37	10	74	M5	2,5	HTC-HSK-A063-07-120-1-0-A	30856736	30981900
63	8	18	50	160	37	10	111	M6	3	HTC-HSK-A063-08-160-1-0-A	30727648	30981901
63	8	18	50	200	37	10	152	M6	3	HTC-HSK-A063-08-200-1-0-A	30720815	30981902
63	9	15	50	120	37	10	74	M6	3	HTC-HSK-A063-09-120-1-0-A	30856737	30981903
63	10	20	50	160	41	10	113	M8x1	3	HTC-HSK-A063-10-160-1-0-A	30727650	30981904
63	10	20	50	200	41	10	154	M8x1	3	HTC-HSK-A063-10-200-1-0-A	30720816	30981905
63	11	17	50	120	41	10	74	M8x1	3	HTC-HSK-A063-11-120-1-0-A	30856738	30981906
63	12	22	50	160	46	10	113	M10x1	5	HTC-HSK-A063-12-160-1-0-A	30727651	30981907
63	12	22	50	200	46	10	154	M10x1	5	HTC-HSK-A063-12-200-1-0-A	30720817	30981908
63	13	19	50	120	46	10	75	M10x1	5	HTC-HSK-A063-13-120-1-0-A	30856739	30981909
63	14	26	50	160	46	10	113	M10x1	5	HTC-HSK-A063-14-160-1-0-A	30858325	30981910
63	14	26	50	200	46	10	154	M10x1	5	HTC-HSK-A063-14-200-1-0-A	30858332	30981911
63	16	28	50	160	49	10	113	M12x1	5	HTC-HSK-A063-16-160-1-0-A	30858326	30981912
63	16	28	50	200	49	10	154	M12x1	5	HTC-HSK-A063-16-200-1-0-A	30858333	30981913
63	18	30	50	160	49	10	115	M12x1	5	HTC-HSK-A063-18-160-1-0-A	30858327	30981914
63	18	30	50	200	49	10	156	M12x1	5	HTC-HSK-A063-18-200-1-0-A	30858334	30981915
63	20	32	50	160	51	10	115	M16x1	5	HTC-HSK-A063-20-160-1-0-A	30858328	30981916
63	20	32	50	200	51	10	156	M16x1	5	HTC-HSK-A063-20-200-1-0-A	30858335	30981917

Dimensions in mm.
Use: For clamping tools with smooth cylindrical shanks in accordance with DIN 1835 Form A, DIN 6535 Form HA up to clamping diameter d_1 = 20 mm as well as with recesses in accordance with DIN 1835 Form B, E and DIN 6535 Form HB, HE directly and with reducing sleeve in the clamping diameter. The clamping diameter is designed for a shank tolerance of h6.
Items included: With length adjustment screw, without coolant tube.

Design: Longest tool lives and highest manufacturing quality on usage of smooth cylindrical shanks in accordance with DIN 1835 Form A and DIN 6535 Form HA. With a projection length of 2.5 x D (max. 50 mm) radial run-out accuracy 3 µm. On usage of cylindrical shanks with angled clamping surface (Form E and Form HE) the accuracy may be affected.
Note: Chuck with axial tool length adjustment. Coolant supply via central through bore.
Chip version: Equipped with Balluff code carrier, see the catalogue "Clamping".
Further code carriers on request.
Balancing value: G 2.5 at 25,000 rpm as delivered.

HighTorque Chuck HTC

With axial tool length adjustment
Shank HSK-A in accordance with DIN 69893-1



Slender design, 3 degrees

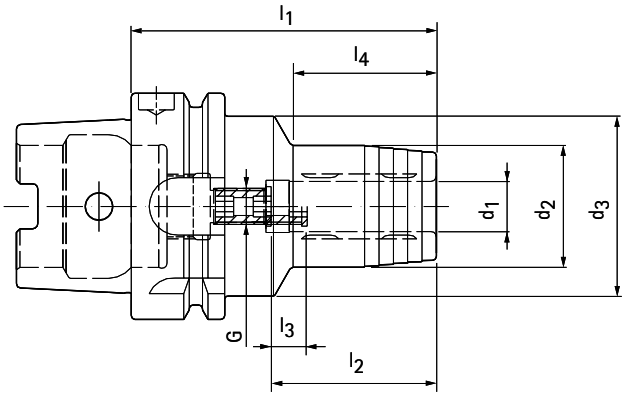
HSK-A	Dimensions							G	Wrench size	Specification	Order No.	Order No. chip version
	d_1	d_2	d_3	l_1	l_2	l_3	l_4					
100	3	9	50	120	28	16	73	M3	1,5	HTC-HSK-A100-03-120-1-0-A	30856740	30981918
100	4	10	50	120	28	12	73	M3	1,5	HTC-HSK-A100-04-120-1-0-A	30856741	30981919
100	5	11	50	120	28	8	73	M3	1,5	HTC-HSK-A100-05-120-1-0-A	30856742	30981920
100	6	12	50	120	37	10	73	M5	2,5	HTC-HSK-A100-06-120-1-0-A	30856743	30981921
100	7	13	50	120	37	10	74	M5	2,5	HTC-HSK-A100-07-120-1-0-A	30856744	30981922
100	8	14	50	120	37	10	74	M6	3	HTC-HSK-A100-08-120-1-0-A	30856745	30981923
100	9	15	50	120	37	10	74	M6	3	HTC-HSK-A100-09-120-1-0-A	30856746	30981924
100	10	16	50	120	41	10	74	M8x1	3	HTC-HSK-A100-10-120-1-0-A	30856747	30981925
100	11	17	50	120	41	10	75	M8x1	3	HTC-HSK-A100-11-120-1-0-A	30856748	30981926
100	12	18	50	120	46	10	75	M10x1	5	HTC-HSK-A100-12-120-1-0-A	30856749	30981927
100	13	19	50	120	46	10	76	M10x1	5	HTC-HSK-A100-13-120-1-0-A	30856750	30981928
100	14	22	50	120	46	10	71	M10x1	5	HTC-HSK-A100-14-120-1-0-A	30856751	30981929
100	16	24	50	120	49	10	71,5	M12x1	5	HTC-HSK-A100-16-120-1-0-A	30856752	30981930
100	18	26	50	120	49	10	72	M12x1	5	HTC-HSK-A100-18-120-1-0-A	30856753	30981931
100	20	28	50	120	51	10	72	M16x1	5	HTC-HSK-A100-20-120-1-0-A	30856754	30981932

Dimensions in mm.
Use: For clamping tools with smooth cylindrical shanks in accordance with DIN 1835 Form A, DIN 6535 Form HA up to clamping diameter d_1 = 20 mm as well as with recesses in accordance with DIN 1835 Form B, E and DIN 6535 Form HB, HE directly and with reducing sleeve in the clamping diameter. The clamping diameter is designed for a shank tolerance of h6.
Items included: With length adjustment screw, without coolant tube.

Design: Longest tool lives and highest manufacturing quality on usage of smooth cylindrical shanks in accordance with DIN 1835 Form A and DIN 6535 Form HA. With a projection length of 2.5 x D (max. 50 mm) radial run-out accuracy 3 µm. On usage of cylindrical shanks with angled clamping surface (Form E and Form HE) the accuracy may be affected.
Note: Chuck with axial tool length adjustment. Coolant supply via central through bore.
Chip version: Equipped with Balluff code carrier, see the catalogue "Clamping". Further code carriers on request.
Balancing value: G 2.5 at 25,000 rpm as delivered.

Hydraulic chucks HydroChuck

In accordance with DIN 69882-7 with axial tool length adjustment
Shank HSK-A in accordance with DIN 69893-1



HSK-A	Dimensions							G	Wrench size	Specification	Order No.	Order No. chip version
	d_1	d_2	d_3	l_1	l_2	l_3	l_4					
63	6	26	50	90	37	10	44	M5	2,5	MHC-HSK-A063-06-090-1-0-A	30882153	On request
63	6	26	50	170	37	10	123	M5	2,5	MHC-HSK-A063-06-170-1-0-A	30882154	On request
63	6	26	50	210	37	10	153	M5	2,5	MHC-HSK-A063-06-210-1-0-A	30882226	On request
63	6	26	50	230	37	10	153	M5	2,5	MHC-HSK-A063-06-230-1-0-A	30882227	On request
63	7	27	50	70	37	10	23	M5	2,5	MHC-HSK-A063-07-070-1-0-A	30882155	On request
63	8	28	50	90	37	10	45	M6	3	MHC-HSK-A063-08-090-1-0-A	30882156	On request
63	8	28	50	170	37	10	124	M6	3	MHC-HSK-A063-08-170-1-0-A	30882157	On request
63	8	28	50	210	37	10	154	M6	3	MHC-HSK-A063-08-210-1-0-A	30882228	On request
63	8	28	50	230	37	10	154	M6	3	MHC-HSK-A063-08-230-1-0-A	30882229	On request
63	9	29	50	70	37	10	24	M6	3	MHC-HSK-A063-09-070-1-0-A	30882158	On request
63	10	30	50	170	41	10	124	M8x1	3	MHC-HSK-A063-10-170-1-0-A	30882159	On request
63	10	30	50	210	41	10	154	M8x1	3	MHC-HSK-A063-10-210-1-0-A	30882230	On request
63	10	30	50	230	41	10	154	M8x1	3	MHC-HSK-A063-10-230-1-0-A	30882231	On request
63	11	31	50	80	41	10	34	M8x1	3	MHC-HSK-A063-11-080-1-0-A	30882160	On request
63	12	32	50	170	46	10	125	M10x1	5	MHC-HSK-A063-12-170-1-0-A	30882161	On request
63	12	32	50	210	46	10	155	M10x1	5	MHC-HSK-A063-12-210-1-0-A	30882232	On request
63	12	32	50	230	46	10	155	M10x1	5	MHC-HSK-A063-12-230-1-0-A	30882233	On request
63	13	33	50	85	46	10	39	M10x1	5	MHC-HSK-A063-13-085-1-0-A	30882162	On request
63	14	34	50	170	46	10	125	M10x1	5	MHC-HSK-A063-14-170-1-0-A	30882163	On request
63	14	34	50	210	46	10	155	M10x1	5	MHC-HSK-A063-14-210-1-0-A	30882234	On request
63	14	34	50	230	46	10	155	M10x1	5	MHC-HSK-A063-14-230-1-0-A	30882235	On request
63	16	38	50	170	49	10	126	M12x1	5	MHC-HSK-A063-16-170-1-0-A	30882164	On request
63	16	38	50	210	49	10	156	M12x1	5	MHC-HSK-A063-16-210-1-0-A	30882236	On request
63	16	38	50	230	49	10	156	M12x1	5	MHC-HSK-A063-16-230-1-0-A	30882237	On request
63	18	40	50	170	49	10	127	M12x1	5	MHC-HSK-A063-18-170-1-0-A	30882165	On request
63	18	40	50	210	49	10	157	M12x1	5	MHC-HSK-A063-18-210-1-0-A	30882238	On request
63	18	40	50	230	49	10	157	M12x1	5	MHC-HSK-A063-18-230-1-0-A	30882239	On request
63	20	42	50	170	51	10	128	M16x1	5	MHC-HSK-A063-20-170-1-0-A	30882166	On request
63	20	42	50	210	51	10	158	M16x1	5	MHC-HSK-A063-20-210-1-0-A	30882240	On request
63	20	42	50	230	51	10	158	M16x1	5	MHC-HSK-A063-20-230-1-0-A	30882241	On request
63	25	57	52,5	150	57	10	93	M16x1	5	MHC-HSK-A063-25-150-1-0-A	30785029	On request
63	25	57	52,5	170	57	10	113	M16x1	5	MHC-HSK-A063-25-170-1-0-A	30882167	On request
63	25	57	52,5	200	57	10	143	M16x1	5	MHC-HSK-A063-25-200-1-0-A	30882168	On request
63	25	57	52,5	210	57	10	143	M16x1	5	MHC-HSK-A063-25-210-1-0-A	30882242	On request
63	25	57	52,5	230	57	10	143	M16x1	5	MHC-HSK-A063-25-230-1-0-A	30882243	On request
63	32	63	59	150	61	10	116	M16x1	5	MHC-HSK-A063-32-150-1-0-A	30882169	On request
63	32	63	59	170	61	10	136	M16x1	5	MHC-HSK-A063-32-170-1-0-A	30882170	On request
63	32	63	59	200	61	10	166	M16x1	5	MHC-HSK-A063-32-200-1-0-A	30882171	On request
63	32	63	59	210	61	10	166	M16x1	5	MHC-HSK-A063-32-210-1-0-A	30882244	On request

Hydraulic chucks HydroChuck | In acc. with DIN 69882-7 with axial tool length adjustment | Shank HSK-A in acc. with DIN 69893-1

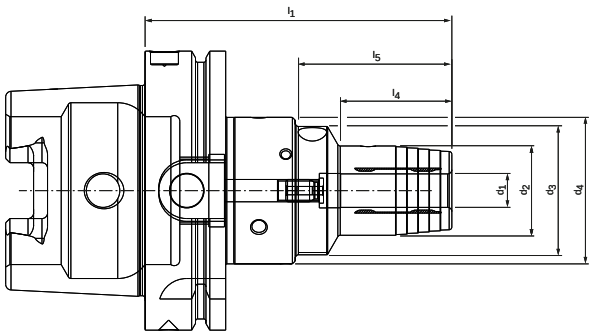
HSK-A	Dimensions							G	Wrench size	Specification	Order No.	Order No. chip version
	d_1	d_2	d_3	l_1	l_2	l_3	l_4					
63	32	63	59	230	61	10	166	M16x1	5	MHC-HSK-A063-32-230-1-0-A	30882245	On request
100	6	26	50	90	37	10	41	M5	2,5	MHC-HSK-A100-06-090-1-0-A	30882172	On request
100	6	26	50	170	37	10	131	M5	2,5	MHC-HSK-A100-06-170-1-0-A	30882173	On request
100	6	26	50	210	37	10	131	M5	2,5	MHC-HSK-A100-06-210-1-0-A	30882246	On request
100	6	26	50	230	37	10	131	M5	2,5	MHC-HSK-A100-06-230-1-0-A	30882247	On request
100	7	27	50	90	37	10	41	M5	2,5	MHC-HSK-A100-07-090-1-0-A	30882174	On request
100	8	28	50	90	37	10	41	M6	3	MHC-HSK-A100-08-090-1-0-A	30882175	On request
100	8	28	50	170	37	10	131	M6	3	MHC-HSK-A100-08-170-1-0-A	30882176	On request
100	8	28	50	210	37	10	161	M6	3	MHC-HSK-A100-08-210-1-0-A	30882248	On request
100	8	28	50	230	37	10	161	M6	3	MHC-HSK-A100-08-230-1-0-A	30882249	On request
100	9	30	50	90	37	10	41	M6	3	MHC-HSK-A100-09-090-1-0-A	30882177	On request
100	10	30	50	170	41	10	122	M8x1	3	MHC-HSK-A100-10-170-1-0-A	30884632	On request
100	10	30	50	210	41	10	152	M8x1	3	MHC-HSK-A100-10-210-1-0-A	30882250	On request
100	10	30	50	230	41	10	152	M8x1	3	MHC-HSK-A100-10-230-1-0-A	30882251	On request
100	11	32	50	90	41	10	42	M8x1	3	MHC-HSK-A100-11-090-1-0-A	30882178	On request
100	12	32	50	170	46	10	122	M10x1	5	MHC-HSK-A100-12-170-1-0-A	30882179	On request
100	12	32	50	210	46	10	152	M10x1	5	MHC-HSK-A100-12-210-1-0-A	30882252	On request
100	12	32	50	230	46	10	152	M10x1	5	MHC-HSK-A100-12-230-1-0-A	30882253	On request
100	13	34	50	95	46	10	47	M10x1	5	MHC-HSK-A100-13-095-1-0-A	30882181	On request
100	16	38	50	170	49	10	123	M12x1	5	MHC-HSK-A100-16-170-1-0-A	30882182	On request
100	16	38	50	210	49	10	153	M12x1	5	MHC-HSK-A100-16-210-1-0-A	30882254	On request
100	16	38	50	230	49	10	153	M12x1	5	MHC-HSK-A100-16-230-1-0-A	30882255	On request
100	20	42	50	170	51	10	124	M16x1	5	MHC-HSK-A100-20-170-1-0-A	30882183	On request
100	20	42	50	210	51	10	154	M16x1	5	MHC-HSK-A100-20-210-1-0-A	30882256	On request
100	20	42	50	230	51	10	154	M16x1	5	MHC-HSK-A100-20-230-1-0-A	30882257	On request
100	25	57	63	165	57	10	117	M16x1	5	MHC-HSK-A100-25-165-1-0-A	30882185	On request
100	25	57	63	170	57	10	122	M16x1	5	MHC-HSK-A100-25-170-1-0-A	30882186	On request
100	25	57	63	210	57	10	152	M16x1	5	MHC-HSK-A100-25-210-1-0-A	30882258	On request
100	25	57	63	230	57	10	152	M16x1	5	MHC-HSK-A100-25-230-1-0-A	30882259	On request
100	32	63	67	165	61	10	117	M16x1	5	MHC-HSK-A100-32-165-1-0-A	30882187	On request
100	32	63	67	170	61	10	122	M16x1	5	MHC-HSK-A100-32-170-1-0-A	30882188	On request
100	32	63	67	210	61	10	152	M16x1	5	MHC-HSK-A100-32-210-1-0-A	30882260	On request
100	32	63	67	230	61	10	152	M16x1	5	MHC-HSK-A100-32-230-1-0-A	30882261	On request

Dimensions in mm.
Use: For clamping tools with smooth cylindrical shanks in accordance with DIN 6535 Form HA up to clamping diameter d_1 = 32 mm as well as with recesses in accordance with DIN 1835 Form B, E and DIN 6535 Form HB, HE directly and with reducing sleeve in the clamping diameter. The clamping diameter is designed for a tool tolerance of h6.
Items included: With length adjustment screw, without coolant tube.
Design: Longest tool lives and highest manufacturing quality on usage of smooth cylindrical shanks in accordance with DIN 1835 Form A and DIN 6535 Form HA.

With a projection length of 2.5 x D (max. 50 mm) radial run-out accuracy 3 µm.
On usage of cylindrical shanks with angled clamping surface (Form E and Form HE) the accuracy may be affected.
Note: Chuck with axial tool length adjustment. Coolant supply via central through bore.
Chip version: Equipped with Balluff code carrier, see the catalogue "Clamping".
Further code carriers on request.
Balancing value: G 2.5 at 25,000 rpm as delivered.

Hydraulic chucks HydroChuck Compensation

With axial tool length adjustment and radial alignment feature
Shank HSK-A in accordance with DIN 69893-1



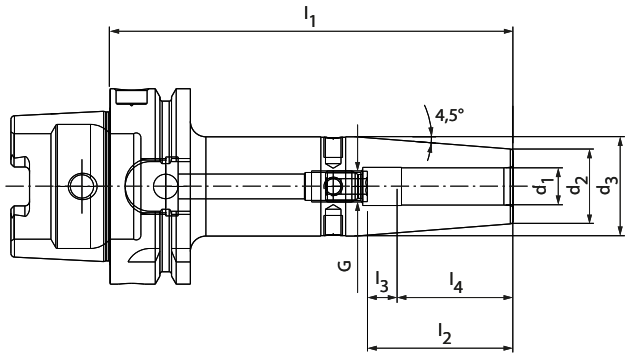
HSK-A	Dimensions									G	Wrench size	Specification	Order No.	Order No. chip version
	d_1	d_2	d_3	d_4	l_1	l_2	l_3	l_4	l_5					
100	12	32	46	52,5	110	46	10	40	55,3	M8x1	3	MHC-HSK-A100-12-110-1-1-A	30871667	30981994
100	16	38	46	52,5	115	49	10	45	60,3	M8x1	3	MHC-HSK-A100-16-115-1-1-A	30871668	30981995
100	20	42	46	52,5	120	51	10	50	65,3	M8x1	3	MHC-HSK-A100-20-120-1-1-A	30871669	30981996
100	25	57	64	70	130	57	10	55	69,5	M16x1	8	MHC-HSK-A100-25-130-1-1-A	30871670	30981997
100	32	63	64	70	135	61	10	60	74,5	M16x1	8	MHC-HSK-A100-32-135-1-1-A	30871671	30981998

Dimensions in mm.
Items included: Built-in length adjustment screw with through hole.
Without coolant tube.
Design: Permissible run-out deviation on the hollow taper shank in relation to the clamping diameter d_1 = 3 µm. The clamping diameter is designed for a shank tolerance of h6.

Note: For coolant tubes and Balluff code carriers, see section "Accessories, spare parts and measuring equipment".
Chip version: Equipped with Balluff code carrier, see the catalogue "Clamping".
Further code carriers on request.
Balancing value: G 2.5 at 16,000 rpm as delivered.

Shrink chucks ThermoChuck

In accordance with DIN 69882-8 with axial tool length adjustment
Shank HSK-A in accordance with DIN 69893-1



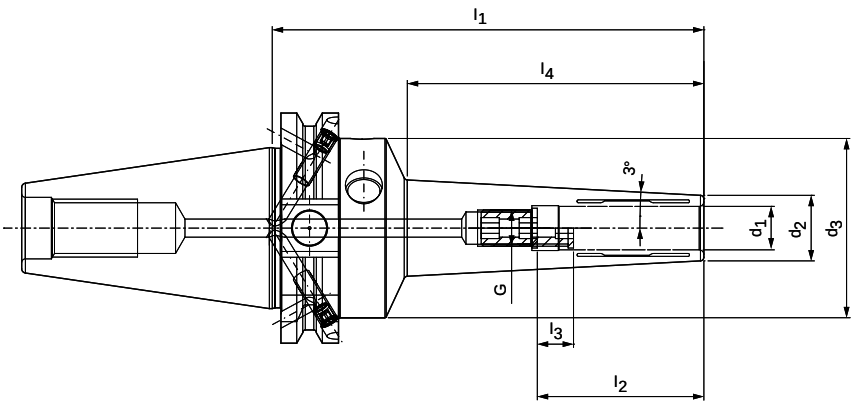
HSK-A	Dimensions							G	Wrench size	Specification	Order No.	Order No. chip version
	d_1	d_2	d_3	l_1	l_2	l_3	l_4					
63*	3	10	20	130	-	-	12	-	-	MTC-HSK-A063-03-130-1-0-W	30872496	30981999
63*	4	15	22	130	-	-	16	-	-	MTC-HSK-A063-04-130-1-0-W	30872497	30982010
63*	5	15	22	130	-	-	20	-	-	MTC-HSK-A063-05-130-1-0-W	30872498	30982011
63	6	21	27	130	36	10	26	M5	2,5	MTC-HSK-A063-06-130-1-0-A	30872499	30982012
63	8	21	27	130	36	10	26	M6	3	MTC-HSK-A063-08-130-1-0-A	30872500	30982013
63	10	24	32	130	41	10	31	M8x1	3	MTC-HSK-A063-10-130-1-0-A	30872501	30982014
63	12	24	32	130	47	10	37	M10x1	5	MTC-HSK-A063-12-130-1-0-A	30872502	30982015
63	14	27	34	130	47	10	37	M10x1	5	MTC-HSK-A063-14-130-1-0-A	30872503	30982016
63	16	27	34	130	50	10	40	M12x1	5	MTC-HSK-A063-16-130-1-0-A	30872504	30982017
63	18	33	42	130	50	10	40	M12x1	5	MTC-HSK-A063-18-130-1-0-A	30872505	30982018
63	20	33	42	130	52	10	42	M16x1	8	MTC-HSK-A063-20-130-1-0-A	30872506	30982019
63	25	44	53	130	58	10	48	M16x1	8	MTC-HSK-A063-25-130-1-0-A	30872507	30982020
63	32	44	53	130	62	10	52	M16x1	8	MTC-HSK-A063-32-130-1-0-A	30872508	30982021
100	6	21	27	130	36	10	26	M5	2,5	MTC-HSK-A100-06-130-1-0-A	30872509	30982022
100	8	21	27	130	36	10	26	M6	3	MTC-HSK-A100-08-130-1-0-A	30872510	30982023
100	10	24	32	130	41	10	31	M8x1	3	MTC-HSK-A100-10-130-1-0-A	30872511	30982024
100	12	24	32	130	47	10	37	M10x1	5	MTC-HSK-A100-12-130-1-0-A	30872512	30982025
100	14	27	34	130	47	10	37	M10x1	5	MTC-HSK-A100-14-130-1-0-A	30872513	30982026
100	16	27	34	130	50	10	40	M12x1	5	MTC-HSK-A100-16-130-1-0-A	30872514	30982027
100	18	33	42	130	50	10	40	M12x1	5	MTC-HSK-A100-18-130-1-0-A	30872515	30982028
100	20	33	42	130	52	10	42	M16x1	8	MTC-HSK-A100-20-130-1-0-A	30872516	30982029
100	25	44	53	130	58	10	48	M16x1	8	MTC-HSK-A100-25-130-1-0-A	30872517	30982030
100	32	44	53	130	62	10	52	M16x1	8	MTC-HSK-A100-32-130-1-0-A	30872518	30982031

Dimensions in mm.
Items included: Built-in length adjustment screw with through hole.
Without fine balancing screws and coolant tube.
Design: Permissible run-out deviation on the hollow taper shank in relation to clamping diameter d_1 = 3 µm. The clamping diameter is designed for a shank tolerance of h6.

Note: For coolant tubes and Balluff code carriers, see section "Accessories, spare parts and measuring equipment".
Chip version: Equipped with Balluff code carrier, see the catalogue "Clamping".
Further code carriers on request.
Balancing value: G 2.5 at 25,000 rpm as delivered.

HighTorque Chuck HTC

With axial tool length adjustment
Shank SK in accordance with ISO 7388-1 Form AD/AF



Slender design, 3 degrees

SK	Dimensions							G	Wrench size	Specification	Order No.
	d_1	d_2	d_3	l_1	l_2	l_3	l_4				
30*	3	9	40	80	28	16	40	M2.5	1,3	HTC-SK030-03-80-1-0-A	30817986
30*	4	10	40	80	28	12	40	M2.5	1,3	HTC-SK030-04-80-1-0-A	30817987
30*	5	11	40	80	28	8	40	M2.5	1,3	HTC-SK030-05-80-1-0-A	30817988
30*	6	12	40	80	37	10	41	M5	2,5	HTC-SK030-06-80-1-0-A	30817989
30*	8	14	40	80	37	10	41	M6	3,0	HTC-SK030-08-80-1-0-A	30817990
30*	10	16	40	80	41	10	42	M8x1	3,0	HTC-SK030-10-80-1-0-A	30817991
30*	12	18	40	80	46	10	42	M8x1	3,0	HTC-SK030-12-80-1-0-A	30817992
40	3	13	49,5	160	28	10	117	M2,5	1,3	HTC-SK040-03-160-3-0-A	30858308
40	3	13	49,5	200	28	10	158	M2,5	1,3	HTC-SK040-03-200-3-0-A	30858315
40	4	14	49,5	160	28	10	117	M2,5	1,3	HTC-SK040-04-160-3-0-A	30858309
40	4	14	49,5	200	28	10	158	M2,5	1,3	HTC-SK040-04-200-3-0-A	30858316
40	5	15	49,5	160	28	10	117	M2,5	1,3	HTC-SK040-05-160-3-0-A	30858310
40	5	15	49,5	200	28	10	158	M2,5	1,3	HTC-SK040-05-200-3-0-A	30858317
40	6	16	49,5	160	37	10	119	M5	2,5	HTC-SK040-06-160-3-0-A	30817993
40	6	16	49,5	200	37	10	161	M5	2,5	HTC-SK040-06-200-3-0-A	30817997
40	8	18	49,5	160	37	10	120	M6	3	HTC-SK040-08-160-3-0-A	30817994
40	8	18	49,5	200	37	10	161	M6	3	HTC-SK040-08-200-3-0-A	30817998
40	10	20	49,5	160	41	10	121	M8x1	3	HTC-SK040-10-160-3-0-A	30817995
40	10	20	49,5	200	41	10	162	M8x1	3	HTC-SK040-10-200-3-0-A	30817999
40	12	22	49,5	160	46	10	122	M10x1	5	HTC-SK040-12-160-3-0-A	30817996
40	12	22	49,5	200	46	10	163	M10x1	5	HTC-SK040-12-200-3-0-A	30818000
40	14	26	49,5	160	46	10	121	M10x1	5	HTC-SK040-14-160-3-0-A	30858311
40	14	26	49,5	200	46	10	162	M10x1	5	HTC-SK040-14-200-3-0-A	30858318
40	16	28	49,5	160	49	10	121	M12x1	5	HTC-SK040-16-160-3-0-A	30858312
40	16	28	49,5	200	49	10	162	M12x1	5	HTC-SK040-16-200-3-0-A	30858319

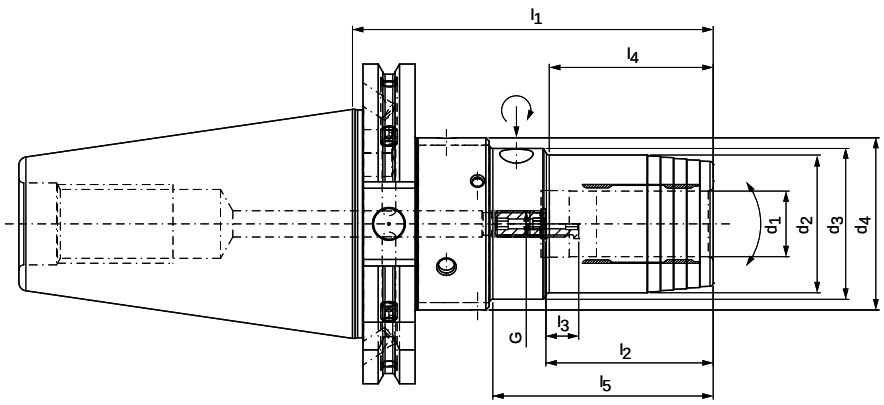
* Design: Steep taper size is not available in combined design AD/AF.

Dimensions in mm.
Use: For clamping tools with smooth cylindrical shanks in accordance with DIN 1835 Form A, DIN 6535 Form HA up to clamping diameter d_1 = 20 mm as well as with recesses in accordance with DIN 1835 Form B, E and DIN 6535 Form HB, HE directly and with reducing sleeve in the clamping diameter. The clamping diameter is designed for a shank tolerance of h6.
Items included: With length adjustment screw, including hexagonal T-key. Without pull stud.

Design: Longest tool lives and highest manufacturing quality on usage of smooth cylindrical shanks in accordance with DIN 1835 Form A and DIN 6535 Form HA. With a projection length of 2.5 x D (max. 50 mm) radial run-out accuracy 3 µm. On usage of cylindrical shanks with angled clamping surface (Form E and Form HE) the accuracy may be affected. Normal setting Form AD, if Form AF is required, please state with the order.
Note: Chuck with axial tool length adjustment.
Balancing value: G 2.5 at 25,000 rpm as delivered.

Hydraulic chucks HydroChuck Compensation

With axial tool length adjustment and radial alignment feature
Shank SK in accordance with ISO 7388-1 Form AD/AF



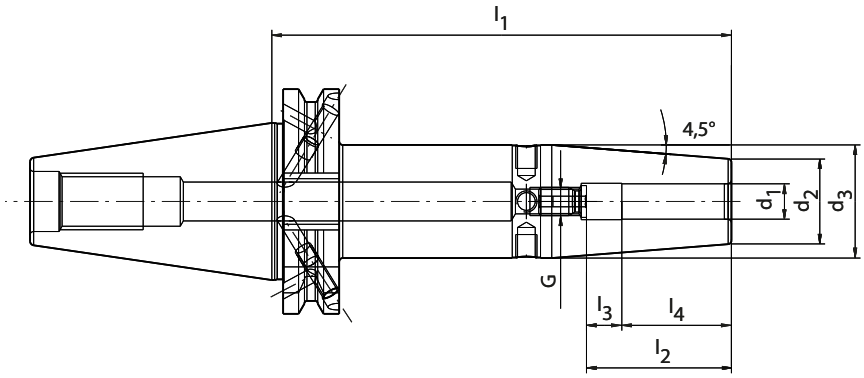
SK	Dimensions									G	Wrench size	Specification	Order No.
	d_1	d_2	d_3	d_4	l_1	l_2	l_3	l_4	l_5				
40	12	32	46	52,5	120	46	10	40	57,2	M8x1	3	MHC-SK040-12-120-3-1-A	30871662
40	16	38	46	52,5	125	49	10	45	62,2	M8x1	3	MHC-SK040-16-125-3-1-A	30871663
40	20	42	46	52,5	130	51	10	50	67,2	M8x1	3	MHC-SK040-20-130-3-1-A	30871664
40	25	55	64	70	140	57	10	50	64,8	M16x1	8	MHC-SK040-25-140-3-1-A	30871665
40	32	63	64	70	150	61	10	61	74,8	M16x1	8	MHC-SK040-32-145-3-1-A	30871666
50	12	32	46	52,5	100	46	10	40	57,2	M8x1	3	MHC-SK050-12-100-3-1-A	30871659
50	16	38	46	52,5	105	49	10	45	62,2	M8x1	3	MHC-SK050-16-105-3-1-A	30871660
50	20	42	46	52,5	110	51	10	50	67,2	M8x1	3,5	MHC-SK050-20-110-3-1-A	30631601
50	25	55	64	70	115	57	10	50	64,8	M16x1	4,4	MHC-SK050-25-115-3-1-A	30631604
50	32	63	64	70	125	61	10	61	74,8	M16x1	4,7	MHC-SK050-32-125-3-1-A	30631608

Dimensions in mm.
Use: For clamping tools with smooth cylindrical shanks in accordance with DIN 1835 Form A, DIN 6535 Form HA up to clamping diameter d_1 = 32 mm as well as with recesses in accordance with DIN 1835 Form B, E and DIN 6535 Form HB, HE directly and with reducing sleeve in the clamping diameter. The clamping diameter is designed for a shank tolerance of h6.

Items included: With length adjustment screws. Without pull stud.
Design: Normal setting Form AD, if Form AF is required, please state with the order.
Note: Chuck with axial tool length adjustment. You will find information on handling in the technical appendix.
Balancing value: G 2.5 at 16,000 rpm as delivered.

Shrink chucks ThermoChuck

With axial tool length adjustment
Shank SK in accordance with ISO 7388-1 Form AD/AF



SK	Dimensions							G	Wrench size	Specification	Order No.
	d_1	d_2	d_3	l_1	l_2	l_3	l_4				
40*	3	10	20	130	-	-	12	-	-	MTC-SK040-03-130-3-0-W	30872519
40*	4	15	22	130	-	-	16	-	-	MTC-SK040-04-130-3-0-W	30872520
40*	5	15	22	130	-	-	20	-	-	MTC-SK040-05-130-3-0-W	30872521
40	6	21	27	130	36	10	26	M5	2,5	MTC-SK040-06-130-3-0-A	30872522
40	8	21	27	130	36	10	26	M6	3	MTC-SK040-08-130-3-0-A	30872523
40	10	24	32	130	41	10	31	M8x1	3	MTC-SK040-10-130-3-0-A	30872524
40	12	24	32	130	47	10	37	M10x1	5	MTC-SK040-12-130-3-0-A	30872525
40	14	27	34	130	47	10	37	M10x1	5	MTC-SK040-14-130-3-0-A	30872526
40	16	27	34	130	50	10	40	M12x1	5	MTC-SK040-16-130-3-0-A	30872527
40	18	33	42	130	50	10	40	M12x1	5	MTC-SK040-18-130-3-0-A	30872528
40	20	33	42	130	52	10	42	M16x1	8	MTC-SK040-20-130-3-0-A	30872529
40	25	44	53	130	58	10	48	M16x1	8	MTC-SK040-25-130-3-0-A	30872530
40	32	44	53	130	62	10	52	M16x1	8	MTC-SK040-32-130-3-0-A	30872532
50	18	33	42	130	50	10	40	M12x1	5	MTC-SK050-18-130-3-0-A	30872533
50	20	33	42	130	52	10	42	M16x1	8	MTC-SK050-20-130-3-0-A	30872534
50	25	44	53	130	58	10	48	M16x1	8	MTC-SK050-25-130-3-0-A	30872535
50	32	44	53	130	62	10	52	M16x1	8	MTC-SK050-32-130-3-0-A	30872536

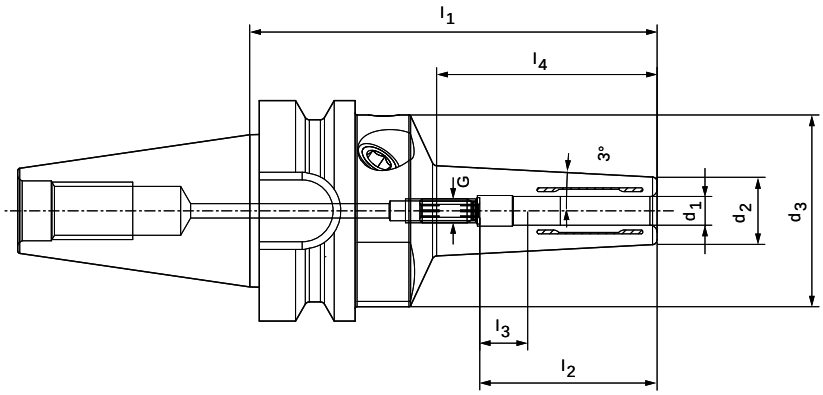
* Without axial tool length adjustment

Dimensions in mm.
Items included: Built-in length adjustment screw with through hole.
Without fine balancing screws or pull studs.

Design: Permissible run-out deviation on the taper shank in relation to the clamping diameter d_1 = 3 µm. The clamping diameter is designed for a shank tolerance of h6.
Note: You will find tool extensions in the section "Chucks with cylindrical shank".
Balancing value: G 2.5 at 25,000 rpm as delivered.

HighTorque Chuck HTC

With axial tool length adjustment
Shank BT in accordance with ISO 7388-2 Form JD/JS (JIS B 6339)



Slender design, 3 degrees

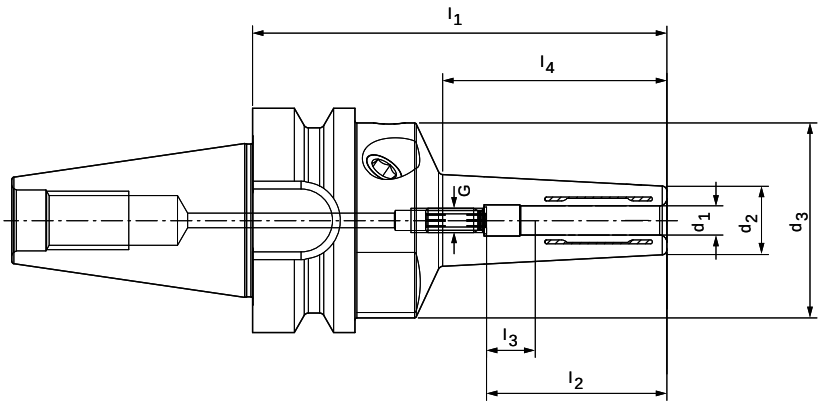
BT	Dimensions							G	Wrench size	Specification	Order No.
	d_1	d_2	d_3	l_1	l_2	l_3	l_4				
30	3	10	40	85	28	16	45	M3	1,5	HTC-BT030-03-85-1-0-A	30819403
30	4	12	40	85	28	12	45	M3	1,5	HTC-BT030-04-85-1-0-A	30819404
30	5	13	40	85	28	8	45	M3	1,5	HTC-BT030-05-85-1-0-A	30819405
30	6	14	40	85	37	10	46	M5	2,5	HTC-BT030-06-85-1-0-A	30819406
30	8	16	40	85	37	10	46	M6	3	HTC-BT030-08-85-1-0-A	30819407
30	10	18	40	85	41	10	47	M8x1	3	HTC-BT030-10-85-1-0-A	30819408
30	12	20	40	85	46	10	47	M8x1	3	HTC-BT030-12-85-1-0-A	30819409
30	14	24	40	85	46	10	47	M8x1	3	HTC-BT030-14-85-1-0-A	30819410
30	16	26	40	85	49	10	48	M8x1	3	HTC-BT030-16-85-1-0-A	30819411
30	18	28	40	85	49	10	48	M8x1	3	HTC-BT030-18-85-1-0-A	30819412
30	20	30	40	85	51	10	49	M8x1	3	HTC-BT030-20-85-1-0-A	30819413
40	3	9	50	120	28	16	70,5	M3	1,5	HTC-BT040-03-120-3-0-A	30781286
40	4	10	50	120	28	12	70,5	M3	1,5	HTC-BT040-04-120-3-0-A	30781287
40	5	11	50	120	28	8	71	M3	1,5	HTC-BT040-05-120-3-0-A	30781290
40	6	12	50	120	37	10	72	M5	2,5	HTC-BT040-06-120-3-0-A	30757078
40	8	14	50	120	37	10	72,5	M6	3	HTC-BT040-08-120-3-0-A	30757080
40	10	16	50	120	41	10	73	M8x1	3	HTC-BT040-10-120-3-0-A	30757081
40	12	18	50	120	46	10	73,5	M10x1	5	HTC-BT040-12-120-3-0-A	30757082
40	14	22	50	120	46	10	71	M10x1	5	HTC-BT040-14-120-3-0-A	30858267
40	16	24	50	120	49	10	71	M12x1	5	HTC-BT040-16-120-3-0-A	30858268
40	18	26	50	120	49	10	72	M12x1	5	HTC-BT040-18-120-3-0-A	30858269
40	20	28	50	120	51	10	72	M16x1	5	HTC-BT040-20-120-3-0-A	30858270
40	6	16	50	160	37	10	111	M5	2,5	HTC-BT040-06-160-3-0-A	30858274
40	8	18	50	160	37	10	111,5	M6	3	HTC-BT040-08-160-3-0-A	30858275
40	10	20	50	160	41	10	113	M8x1	3	HTC-BT040-10-160-3-0-A	30858277
40	12	22	50	160	46	10	114	M10x1	5	HTC-BT040-12-160-3-0-A	30858278
40	6	16	50	200	37	10	152,5	M5	2,5	HTC-BT040-06-200-3-0-A	30858286
40	8	18	50	200	37	10	152,5	M6	3	HTC-BT040-08-200-3-0-A	30858287
40	10	20	50	200	41	10	154	M8x1	3	HTC-BT040-10-200-3-0-A	30858288
40	12	22	50	200	46	10	155	M10x1	5	HTC-BT040-12-200-3-0-A	30858289

Dimensions in mm.
Use: For clamping tools with smooth cylindrical shanks in accordance with DIN 1835 Form A, DIN 6535 Form HA up to clamping diameter d_1 = 20 mm as well as with recesses in accordance with DIN 1835 Form B, E and DIN 6535 Form HB, HE directly and with reducing sleeve in the clamping diameter. The clamping diameter is designed for a shank tolerance of h6.
Items included: With length adjustment screw, without pull stud.

Design: Longest tool lives and highest manufacturing quality on usage of smooth cylindrical shanks in accordance with DIN 1835 Form A and DIN 6535 Form HA. With a projection length of 2.5 x D (max. 50 mm) radial run-out accuracy 3 µm. On usage of cylindrical shanks with angled clamping surface (Form E and Form HE) the accuracy may be affected. Note: Chuck with axial tool length adjustment. Coolant supply via central through bore.
Balancing value: G 2.5 at 25,000 rpm as delivered.

HighTorque Chuck HTC

With axial tool length adjuwstment
Shank similar to ISO 7388-2 Form JD (with face connection)



Slender design, 3 degrees

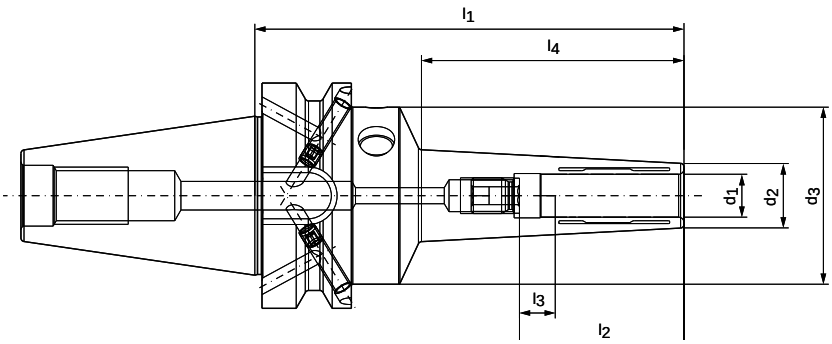
BT	Dimensions							G	Wrench size	Specification	Order No.
	d_1	d_2	d_3	l_1	l_2	l_3	l_4				
30	3	10	40	85	28	16	45	M3	1,5	HTC-JD-FC030-03-85-1-0-A	30819441
30	4	12	40	85	28	12	45	M3	1,5	HTC-JD-FC030-04-85-1-0-A	30819442
30	5	13	40	85	28	8	45	M3	1,5	HTC-JD-FC030-05-85-1-0-A	30819443
30	6	14	40	85	37	10	46	M5	2,5	HTC-JD-FC030-06-85-1-0-A	30819444
30	8	16	40	85	37	10	46	M6	3	HTC-JD-FC030-08-85-1-0-A	30819445
30	10	18	40	85	41	10	46	M8x1	3	HTC-JD-FC030-10-85-1-0-A	30819446
30	12	20	40	85	46	10	47	M8x1	3	HTC-JD-FC030-12-85-1-0-A	30819448
30	14	24	40	85	46	10	47	M8x1	3	HTC-JD-FC030-14-85-1-0-A	30819449
30	16	26	40	85	49	10	48	M8x1	3	HTC-JD-FC030-16-85-1-0-A	30819450
30	18	28	40	85	49	10	48	M8x1	3	HTC-JD-FC030-18-85-1-0-A	30819451
30	20	30	40	85	51	10	49	M8x1	3	HTC-JD-FC030-20-85-1-0-A	30819452

Dimensions in mm.
Use: For clamping tools with smooth cylindrical shanks in accordance with DIN 1835 Form A, DIN 6535 Form HA up to clamping diameter d_1 = 20 mm as well as with recesses in accordance with DIN 1835 Form B, E and DIN 6535 Form HB, HE directly and with reducing sleeve in the clamping diameter. The clamping diameter is designed for a shank tolerance of h6.
Items included: With length adjustment screw. Without pull stud.

Design: Longest tool lives and highest manufacturing quality on usage of smooth cylindrical shanks in accordance with DIN 1835 Form A and DIN 6535 Form HA. With a projection length of 2.5 x D (max. 50 mm) radial run-out accuracy 3 µm. On usage of cylindrical shanks with angled clamping surface (Form E and Form HE) the accuracy may be affected.
Note: Chuck with axial tool length adjustment. Coolant supply via central through bore.
Balancing value: G 2.5 at 25,000 rpm as delivered.

HighTorque Chuck HTC

With axial tool length adjustment
Shank BT in accordance with ISO 7388-2 Form JD/JF (JIS B 6339)



Slender design, 3 degrees

BT	Dimensions							G	Wrench size	Specification	Order No.
	d_1	d_2	d_3	l_1	l_2	l_3	l_4				
40	3	13	49,5	160	28	16	109	M2,5	1,3	HTC-BT040-03-160-3-0-A	30858271
40	3	13	49,5	200	28	16	150	M2,5	1,3	HTC-BT040-03-200-3-0-A	30858283
40	4	14	49,5	160	28	12	109	M2,5	1,3	HTC-BT040-04-160-3-0-A	30858272
40	4	14	49,5	200	28	12	150	M2,5	1,3	HTC-BT040-04-200-3-0-A	30858284
40	5	15	49,5	160	28	8	109	M2,5	1,3	HTC-BT040-05-160-3-0-A	30858273
40	5	15	49,5	200	28	8	150	M2,5	1,3	HTC-BT040-05-200-3-0-A	30858285
40	6	16	49,5	160	37	10	111	M5	2,5	HTC-BT040-06-160-3-0-A	30858274
40	6	16	49,5	200	37	10	153	M5	2,5	HTC-BT040-06-200-3-0-A	30858286
40	8	18	49,5	160	37	10	112	M6	3	HTC-BT040-08-160-3-0-A	30858275
40	8	18	49,5	200	37	10	153	M6	3	HTC-BT040-08-200-3-0-A	30858287
40	10	20	49,5	160	41	10	113	M8x1	3	HTC-BT040-10-160-3-0-A	30858277
40	10	20	49,5	200	41	10	154	M8x1	3	HTC-BT040-10-200-3-0-A	30858288
40	12	22	49,5	160	46	10	114	M10x1	5	HTC-BT040-12-160-3-0-A	30858278
40	12	22	49,5	200	46	10	155	M10x1	5	HTC-BT040-12-200-3-0-A	30858289
40	14	22	49,5	120	46	10	71	M10x1	5	HTC-BT040-14-120-3-0-A	30858267
40	14	26	49,5	160	46	10	113	M10x1	5	HTC-BT040-14-160-3-0-A	30858279
40	14	26	49,5	200	46	10	154	M10x1	5	HTC-BT040-14-200-3-0-A	30858290
40	16	24	49,5	120	49	10	71	M12x1	5	HTC-BT040-16-120-3-0-A	30858268
40	16	28	49,5	160	49	10	113	M12x1	5	HTC-BT040-16-160-3-0-A	30858280
40	16	28	49,5	200	49	10	154	M12x1	5	HTC-BT040-16-200-3-0-A	30858291
40	18	26	49,5	120	49	10	72	M12x1	5	HTC-BT040-18-120-3-0-A	30858269
40	18	30	49,5	160	49	10	114	M12x1	5	HTC-BT040-18-160-3-0-A	30858281
40	18	30	49,5	200	49	10	155	M12x1	5	HTC-BT040-18-200-3-0-A	30858292
40	20	28	49,5	120	51	10	72	M16x1	5	HTC-BT040-20-120-3-0-A	30858270
40	20	32	49,5	160	51	10	114	M16x1	5	HTC-BT040-20-160-3-0-A	30858282
40	20	32	49,5	200	51	10	155	M16x1	5	HTC-BT040-20-200-3-0-A	30858293
40	12	18	49,5	120	46	10	73,4	M10x1	1,3	HTC-BT040-12-120-3-0-A	30757082

Dimensions in mm.
Use: For clamping tools with smooth cylindrical shanks in accordance with DIN 1835 Form A, DIN 6535 Form HA up to clamping diameter d_1 = 12 mm as well as with recesses in accordance with DIN 1835 Form B, E and DIN 6535 Form HB, HE directly and with reducing sleeve in the clamping diameter. The clamping diameter is designed for a shank tolerance of h6. Items included: With length adjustment screw, including hexagonal T-key. Without pull stud.

Design: Longest tool lives and highest manufacturing quality on usage of smooth cylindrical shanks in accordance with DIN 1835 Form A and DIN 6535 Form HA. With a projection length of 2.5 x D (max. 50 mm) radial run-out accuracy 3 µm. On usage of cylindrical shanks with angled clamping surface (Form E and Form HE) the accuracy may be affected. Normal setting Form JD, if Form JF is required, please state with the order.
Note: Chuck with axial tool length adjustment. Length adjustment screws available on request.
Balancing value: G 2.5 at 25,000 rpm as delivered.

SETTING | MEASURING | DISPENSING

UNIBASE-V expansion cabinet, UNIBASE-C, software UNIBASE, UNISET-C


VISET-V vision

ADDITIONS TO PROGRAMME

Dispensing

For the upright storage of already assembled tools, MAPAL is introducing the new UNIBASE-V expansion cabinets with up to four electronically locked vertical drawers. Each of the automatically opening drawers has a maximum load-bearing capacity of 600 kg and can be equipped inside with tool holders using specific customer specifications.

The new UNIBASE-C cabinets for controlled individual tool dispensing complete the portfolio of the storage modules. A very large number of small and individual parts can be stored in a UNIBASE-C cabinet on a relatively small area. By selecting an article, only this specific compartment opens so that the individual tool dispensing solution also offers advantages in the matter of anti-theft protection.

In addition, the software UNIBASE has been completely revised. The ease of use has been improved and remote access from any terminal device is possible with immediate effect.

Setting

One thing was in particular focus during the development of the new UNISET-C setting fixture from MAPAL: simple handling for optical setting and measurement in the entry-level segment. The UNISET-C has a compact design, the tool to be measured is easily accessible. The measuring arm, with optical measuring camera and additional light source with dimmer, can be moved intuitively both horizontally and vertically to the required position using a handle.

Dispensing

UNIBASE-V expansion cabinet

- Ideal storage system for connections and complete tools
- Proven in usage in tool management projects
- Automatic opening of the drawers
- Load-bearing capacity of a drawer up to 600 kg
- Can be integrated into existing systems
- Upright storage of long tools
- No risk for inserts

Page 212

UNIBASE-C

- Controlled individual dispensing
- Increased protection against theft
- Safe, optimal storage of small parts
- Up to 640 compartments

Page 216

Setting

Software UNIBASE

- Keyword-based search
- User-specific customisation of the software user interface
- Remote access from any terminal devices
- Connection to the customer network or ERP system
- Open web interface – "Internet of Things" support
- Shopping basket withdrawal realises quick article dispensing
- Few clicks to article withdrawal – one navigation direction
- Comprehensive graphic evaluation features (bar or pie charts)
- Indication of the drawer divisions assists correct article withdrawal

Page 220

UNISET-C

- Precise setting and measuring optically in the entry-level segment for electronic setting fixtures
- Measuring arm with measuring camera for additional light and transmitted light measurement
- Handle with sensor control
- Tools can be set up to diameter 400 mm and length 400 or 700 mm; caliper gauge principle: 100 mm
- Additional light source with dimmer for optimal inspection work

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HSK63-675
HSK63-675

DISPENSING AND SETTING

UNIBASE-V expansion cabinet

UNIBASE-C

Software UNIBASE

UNISET-C


MAPAL
UNIBASE-M
MAPAL
elo

UNIBASE-V EXPANSION CABINET

Vertical cabinets for storing completely mounted tools

If large, heavy tools are already completely mounted in the setting room but they are not yet needed on the machine, they must be stored temporarily. The available drawer modules of the UNIBASE-M are not optimally suited for this with their maximum load-bearing capacity of 75 kg. This is because they often reach their limits due to being loaded with several completely mounted tools. In certain circumstances the tool can only be stored horizontally due to its complete length with the subsequent risk of insert damage. For these situations, MAPAL has introduced the new UNIBASE-V expansion cabinets with up to four electronically locked vertical drawers. Each of the automatically opening drawers has a maximum load-bearing capacity of 600 kg and can be equipped inside with tool holders to suit the specific customer requirements. The vertical drawers are compatible with existing UNIBASE-M systems and are controlled via the master unit.

Technical features UNIBASE-V expansion cabinet

1 Master cabinet
The master cabinet is the basic module of the UNIBASE-M and includes the monitor and the computer unit for automatic tool dispensing.

2 UNIBASE-V expansion cabinet
The vertical cabinet is controlled via the master unit and has a maximum of four electronically locking vertical drawers.

3 Vertical drawer
The automatically opening vertical drawers can be individually equipped with tool holders. Up to 600 kg can be stored in each drawer on castors.

4 Tool holder
The tool holders are configurable and can be loaded with large, fully assembled and pre-set upright tools.

5 Cabinet lock
The emergency unlocking of the vertical drawers is activated and deactivated via the cabinet lock.

UNIBASE-V expansion cabinets

MAPAL offers the UNIBASE-V expansion cabinet in various standard designs that differ in the division of the vertical drawers. To address individual requirements, the tool holders in the drawers can be configured as required. Subsequent expansion at the customer is easy to realise.

Expansion cabinets – vertical cabinet
Standard designs:

Cabinet features	Expansion cabinet with 2 vertical drawers	Expansion cabinet with 3 vertical drawers	Expansion cabinet with 4 vertical drawers
			
Height	2,000 mm	2,000 mm	2,000 mm
Width	717 mm	717 mm	717 mm
Depth	725 mm	725 mm	725 mm
Storage area	1.085 m^2	1.085 m^2	1.085 m^2

Individual vertical drawers for vertical cabinet

Vertical drawer	Width	Spacing	Height	Useful height	Usable depth
	155 mm	40 mm	1,960 mm	1,750 mm	628 mm
	315 mm	40 mm	1,960 mm	1,750 mm	628 mm


MAPA
ASE-M

UNIBASE-C

Individual tool dispensing machines for safe storage of small parts

The new UNIBASE-C cabinets for controlled individual tool dispensing complete the portfolio of the storage modules. A very large number of small and individual parts can be stored in a UNIBASE-C cabinet on a relatively small area. On the selection of an article, only this specific dispensing compartment opens so that the individual tool dispensing solution also offers advantages in the matter of anti-theft protection. UNIBASE-C is available as standard versions but can be used as an individual solution or can be connected to existing UNIBASE-M systems.

Technical features UNIBASE-C

1 UNIBASE-C master system
The UNIBASE-C with computer unit and touch monitor can be used as an independent system. Additional slave systems can also be integrated subsequently into existing systems.

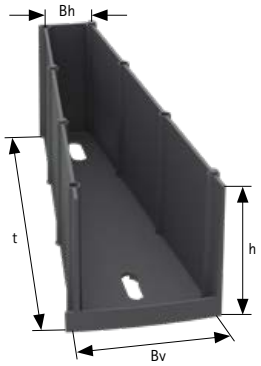
2 Dispensing compartment
The dispensing compartments open automatically after article dispensing. Due to the individual dispensing solution, only one compartment can be opened at a time and in this way a reliable, controlled withdrawal process for individual articles is supported.

3 Software UNIBASE
The revised, easy to use software UNIBASE can be operated conveniently using a touch monitor. You will find more information on the software features from page 220.

UNIBASE-C automatic individual dispensers

MAPAL offers the UNIBASE-C automatic individual dispensers in various designs. The number and arrangement of the dispensing compartments can be configured to address specific requirements. Here different drum designs can be selected. The UNIBASE-C is available as a master system and as a slave system.

UNIBASE-C compartment versions



UNIBASE-C compartment versions				
Compartment feature	Compartment A	Compartment B	Compartment C	Compartment D
Height (H)	68 mm	68 mm	136 mm	136 mm
Width front (Bv)	68 mm	140 mm	68 mm	140 mm
Width rear (Bh)	23 mm	60 mm	23 mm	60 mm
Depth (t)	237 mm	237 mm	237 mm	237 mm

UNIBASE-C drum designs

Total number of compartments	640 compartments	448 compartments	320 compartments	160 compartments
				
Quantity, compartment A	640	320		
Quantity, compartment B		32	160	
Quantity, compartment C		64	160	
Quantity, compartment D		32		160

Cabinet features

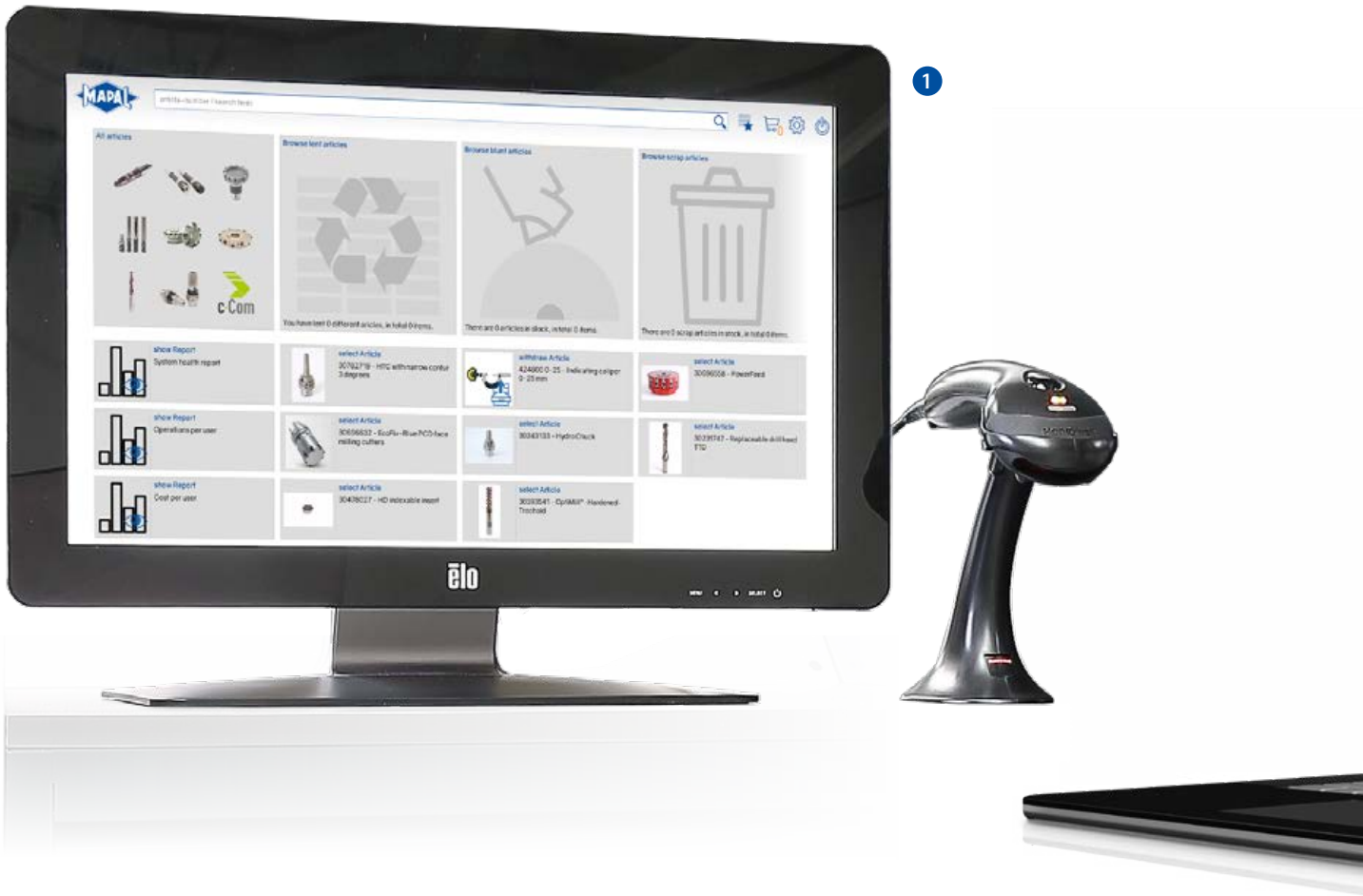
Cabinet feature	Dimension
Height	2,000 mm
Width	1,080 mm
Depth	875 mm
Weight	275 kg

Software UNIBASE

MAPAL has developed new software for UNIBASE-M tool dispensing systems: UNIBASE. In the new version, the search logic has been completely revised to significantly improve the ease of use. Previously the search function was transaction-based and it often required several selection criteria to access the required article. From now on the focus is on the searched article instead of a transaction. The search function is now significantly more convenient and faster due to the simple entry of one or more keywords.

The second major innovation of the new software is the open web interface. The software is based on the "Internet of Things" and is remote-enabled. It can be controlled by any end device and operation system. Master data and movement data can be exchanged via the open, cloud-based c-Com platform without restriction. The new UNIBASE-M tool dispensing systems will be delivered with the new software from October 2017. Existing systems for customers can be updated with the new software as an option.

Software UNIBASE in detail



1 Main Menu

The user interface can be set up and arranged individually to suit the specific needs of the system user. The most recent withdrawals and user-specific reports can be arranged and opened on the main menu.

Software Features

- Keyword-based search
- User-specific customisation of the software user interface
- Remote access from any terminal devices
- Connection to the customer network or ERP system
- Open web interface – "Internet of Things" support
- Shopping basket withdrawal realises quick article dispensing
- Few clicks to article withdrawal – one navigation direction
- Comprehensive graphic evaluation features (bar or pie charts)
- Indication of the drawer divisions assists correct article withdrawal

2 Article selection

Using the keyword search, it is possible to find the required articles more quickly and more efficiently via individual items of article information. After article selection, the system user decides which action is to be undertaken. Depending on the user's authorisation, the article can be dispensed, stored or edited.

3 Remote access

Graphic reports can be opened and evaluated at any time from anywhere using any terminal device. Here different evaluation diagrams are available.

4 Shopping basket withdrawal

Selected articles can be dispensed in a defined manner using the shopping basket withdrawal. During this process the drawers for the individual articles open one after the other and in this way reduce the time required for withdrawal. The depiction of the compartment on the display supports unambiguous withdrawal.


MAPA
UNISET-C

UNISET-C

Setting and measuring optically in the entry-level segment

One thing was in particular focus during the development of the new UNISET-C setting fixture from MAPAL: simple handling for optical setting and measurement in the entry-level segment. The UNISET-C has a compact design, the tool to be measured is easily accessible. The measuring arm, with optical measuring camera and additional light source with dimmer, can be moved intuitively both horizontally and vertically to the required position using a handle.

A sensor controller integrated into the handle activates the laser in the measuring arm when touched. The laser simplifies quick movement to the desired tool position, as the current camera position is always visible as a red light dot. Fixed tools, in particular, such as solid carbide or PCD tools, can be quickly and easily measured and set using the UNISET-C. The maximum tool diameter is 400 mm, the maximum tool length can be selected as either 400 or 700 mm.

The UNISET software already in use on other MAPAL setting fixtures has been adapted to the UNISET-C with user-friendly measuring functions. A greatly simplified operator mode with pre-defined setting programs for certain tool types makes the work easier, even for only occasional users of the fixture. Integrated control geometries permit fully automatic measurements within a few seconds. To retrieve or log tool data more quickly, tool chips can be used as an option. The UNISET software can be expanded or modified on customer request.

Technical features

1 Vertical guide tower
The vertical guide tower can be moved horizontally on a highly precise linear roller guide. A vertical guide is integrated into the guide tower; the measuring arm is positioned for height using this guide.

1.1 Fine adjusting wheel
The measuring arm can be vertically moved precisely using the rotating fine adjusting wheel.

2 Touch monitor
The MAPAL UNISET software modified for the UNISET-C makes menu-based measuring and setting including a database function possible. Operation is very easy by means of optional touchscreen operation on the 19" TFT flat screen monitor. If Internet access is allowed, remote maintenance or the installation of updates is possible.

3 Measuring arm
The measuring arm has an optical measuring camera and an additional light source with dimmer. The measuring arm can be moved quickly and straightforwardly both horizontally and vertically to the required position using a handle. A red laser light is activated on the actuation of the handle; this light helps with alignment on the measuring position.

4 Controls
The controls contain buttons through which the additional light can be dimmed, the spindle clamped, closed or engaged (indexed). The measuring arm can be horizontally moved precisely using the rotating fine adjusting wheel.

5 Precision spindle SK50
The precision spindle with roller bearings for SK50 shanks is equipped with a pneumatic clamping mechanism.

6 Base
The optional base can be moved and contains the PC for the camera and software and also permits working while seated. There is enough stability to be able to set tools without vibration.

SOFTWARE FEATURES

- User-friendly, customisable UNISET software
- Straightforward, intuitive cutting edge configuration (radius, angle, maxima)
- Optional tool identification software with tool chip
- Straightforward setting of the measuring range
- User-friendly programming for individual program runs

FEATURES

- Precise setting and measuring optically in the entry-level segment for electronic setting fixtures
- Measuring arm with measuring camera for additional light and transmitted light measurement
- Handle with sensor control
- Tools can be set up to diameter 400 mm and length 400 or 700 mm; caliper gauge principle: 100 mm
- Additional light source with dimmer for optimal inspection work

ADVANTAGES

- Quick, easy handling due to freely moving measuring arm and comprehensive, intuitive software
- Usual high MAPAL quality
- Compact, space-saving design with high level of accessibility
- Laser light on the measuring arm eases movement to the measuring position

Application example

Optical measurement

A five cutting edge solid carbide end milling cutter is to be checked for the stipulated values for cutting length and diameter after delivery from the re-grinding service.

1. After the milling cutter has been clamped in the tool spindle on the UNISET-C, the measuring arm is moved roughly to the cutting edge. This task can be undertaken very quickly with the aid of the laser. The cutting edge on the milling cutter is then positioned at the cross line on the touch monitor with the aid of the fine adjusting wheel.

Detail view of a solid carbide end milling cutter with projected laser spot for rough alignment of the measuring position.

2. To measure the length and width of the cutting edge, the buttons "X" and "Z" are selected on the monitor. After actuation, the measurement is undertaken immediately and automatically and the measurement results are displayed on the monitor.

3. To measure all cutting edges, the value "5" is entered as the number of cutting edges and the measuring sequence initialised by pressing the start button. After the first measurement, the spindle is turned together with the tool to the next cutting edge. Once the cutting edge is at the crosshair on the monitor, the measurement is started. The next cutting edge is then moved to and measured. All cutting edges are measured in sequence using this method. Then the measurement results logged can be viewed and printed out for assessment.

Options UNISET-C

Measuring length 400 mm / 700 mm

- Depending on the tool length, the UNISET-C is available with a maximum measuring length of 400 mm or 700 mm.

Base

- The base is optimally designed for the UNISET-C and can be moved on castors.

Balluff tool identification system

- Tool identification software for reading the actual measurement values and for writing the measurement values to the Balluff code carrier.

Label printer

- Printer on the basic device for editable data output via the MAPAL software.

Second camera system for rotation centre measuring device

- Additional camera in the measuring arm for checking the height of the rotation centre including variable LED reflected lighting.

UNISET-C accessories

Reducing adapters incl. taper wiper, suitable for headstock SK50
Adapter can be aligned axially and radially *

Adapter	Measuring length reduction	Order No.
SK50 / HSK32	76 mm	30479379
SK50 / HSK40	80 mm	30479380
SK50 / HSK50	85 mm	30479381
SK50 / HSK63	103 mm	30479383
SK50 / HSK80	110 mm	30479384
SK50 / HSK100	130 mm	30479386

Reducing adapters, suitable for headstock SK50
Adapter cannot be aligned

Reducing adapters	Measuring length reduction	Order No.
SK50 / PSK40	Eccentric clamping	30614555
SK50 / PSK50	80 mm	30525299
SK50 / PSK63	90 mm	30610883
SK50 / PSK80	105 mm	30640859

Reducing adapters, suitable for headstock SK50

Reducing adapters	Measuring length reduction	Order No.
SK50 / SK30	16 mm	30849787
SK50 / SK40	16 mm	30849788
SK50 / VDI30	80 mm	30372833
SK50 / VDI40	80 mm	30372834
SK50 / VDI50	80 mm	30416485
SK50 / VDI60	100 mm	30615358
SK50 / KM50	60 mm	30622666
SK50 / KM60	60 mm	30622667

Torque wrenches and bits
For clamping KS clamping cartridges

Torque wrench / bit	Order No.
Torque wrench for HSK32-40	10040125
Torque wrench for HSK50-80	10040126
Torque wrench for HSK100	10074788
Hex bit for HSK32-40	10040122
Hex bit for HSK50	10040123
Torx bit for HSK63	MN5215-17
Torx bit for HSK80	MN5215-18
Torx bit for HSK100	MN5215-19

Taper wipers
For cleaning and protecting locating shanks

Taper wiper for	Order No.
HSK32	30325980
HSK40	30325981
HSK50	30325982
HSK63	30325983
HSK80	30325984
HSK100	30325985

Setting gauge with straightedge fitted for calibration

Setting gauge for	Order No.
HSK32	30610432
HSK40	30610431
HSK50	30610430
HSK63	30610428
HSK80	30610426
HSK100	30524629
SK30	30459723
SK40	30459725
SK50	30459727
PSK40	30640923
PSK50	30538282
PSK63	30641097
PSK80	30641099

* The measuring range is limited by these accessories.

SERVICES

Tool Management 4.0

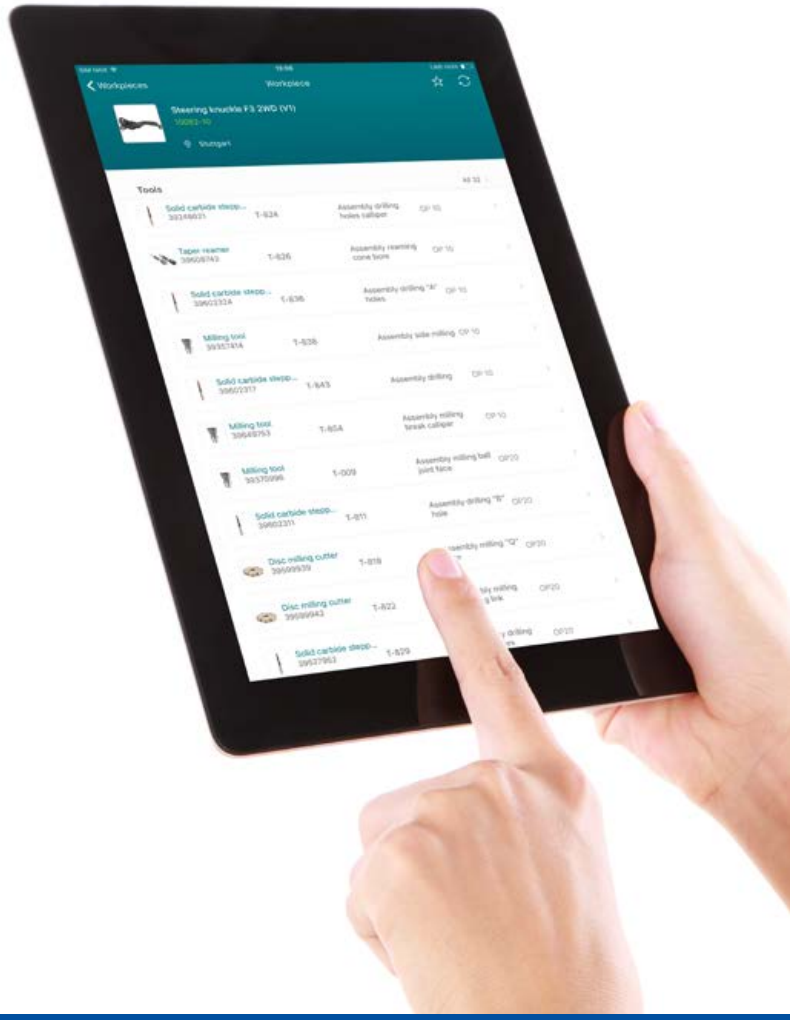

UNIBASE-M

LOGISTICS

Tool Management 4.0

THE FUTURE FOR YOUR PRODUCTION **TOOL MANAGEMENT 4.0**

MAPAL now offers its tool management services based on the c-Com platform. "Tool management 4.0" ensures the highest possible transparency with regard to all data and item flows as well as costs.



Digitalisation is bringing about completely new possibilities for tool management. Data and information can be provided in a much more transparent and consistent manner for all parties involved – manufacturing, purchasing, planning, tool manager and supplier. In this way the overall process is more efficiently structured. For this purpose, MAPAL relies on the c-Com open cloud platform, a product of c-Com GmbH and offers digital tool management based on this. This gives rise to a cross-functional and group-wide technology database for companies. Redundant structures are a thing of the past.

YOUR INITIAL SITUATION

YOU WANT TO SAVE COSTS

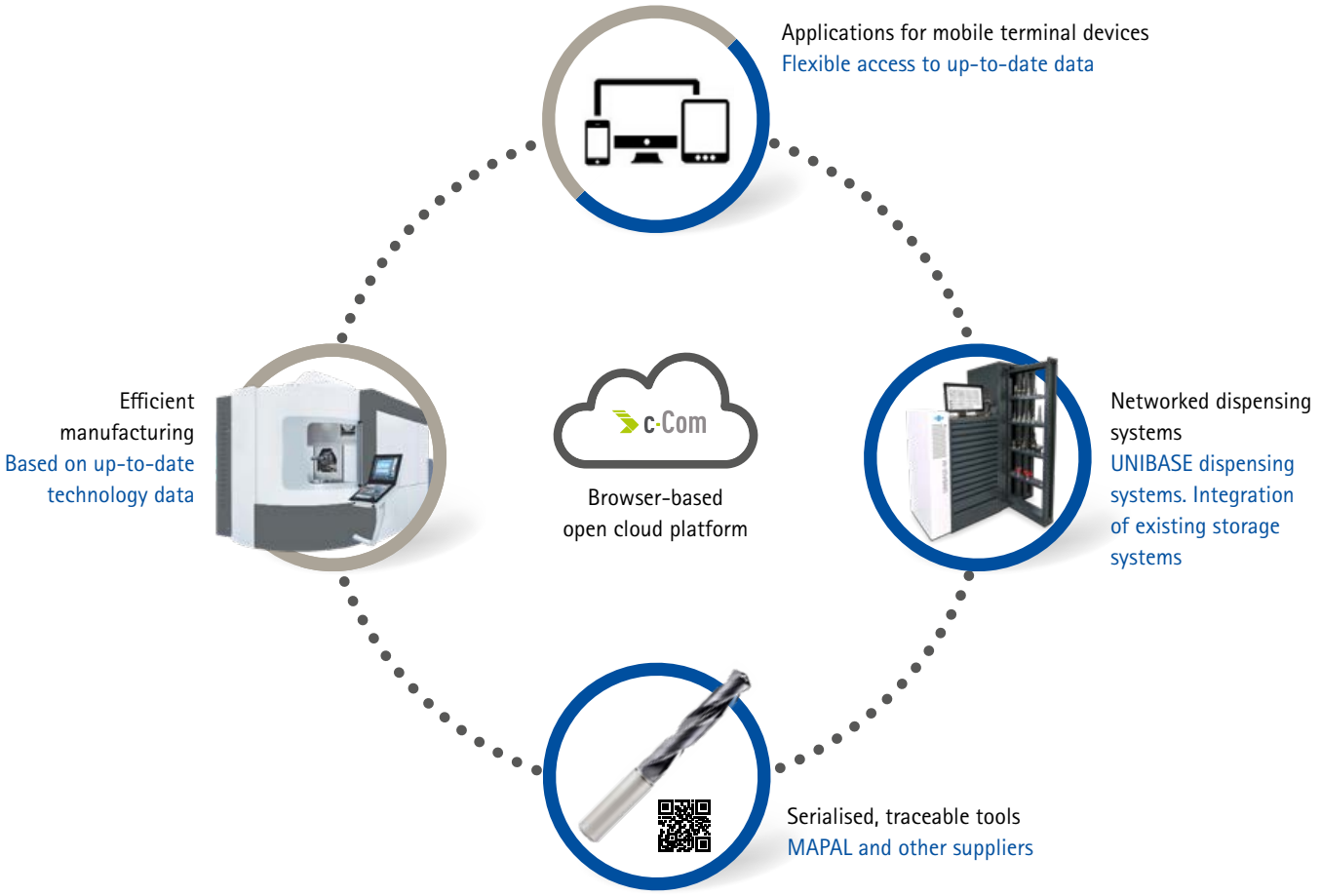
Using Tool Management 4.0 your processes are simpler, more transparent and quicker. Up-to-date technology data ensure efficient manufacturing, and that worldwide. You have access to all relevant data at all times and therefore retain complete control of costs.

YOU WANT MORE TRANSPARENCY

At all times you have access to all data related to your Tool Management project. All data changes, such as changes to the cutting parameters or the tool drawings, are documented and are available to be viewed in full by all involved.

YOU WANT UP-TO-DATE DATA

Tool Management 4.0 makes working together easier than ever before. All data are only entered once. Duplicate data sets are a thing of the past. Information is available to all involved and is always up-to-date.



CUSTOMER TOOL MANAGER

With Tool Management 4.0 you profit from our comprehensive know-how as a complete provider for machining. Along with leading tool solutions and services related to the machining process, MAPAL offers highly accurate setting fixtures, as well as intelligent dispensing systems developed in-house. The browser-based open cloud platform c-Com networks tool, store and production and ensures you can access your data in real time from anywhere. You therefore have full control of all costs incurred at all times. Technology data are entered and managed centrally. In this way it is ensured that all employees on all sites have access to the same up-to-date data at all times. You profit from everyone's accumulated knowledge and know-how. As a consequence your manufacturing is more efficient and the costs can be reduced.

YOUR ADVANTAGES

MORE networking

MORE transparency

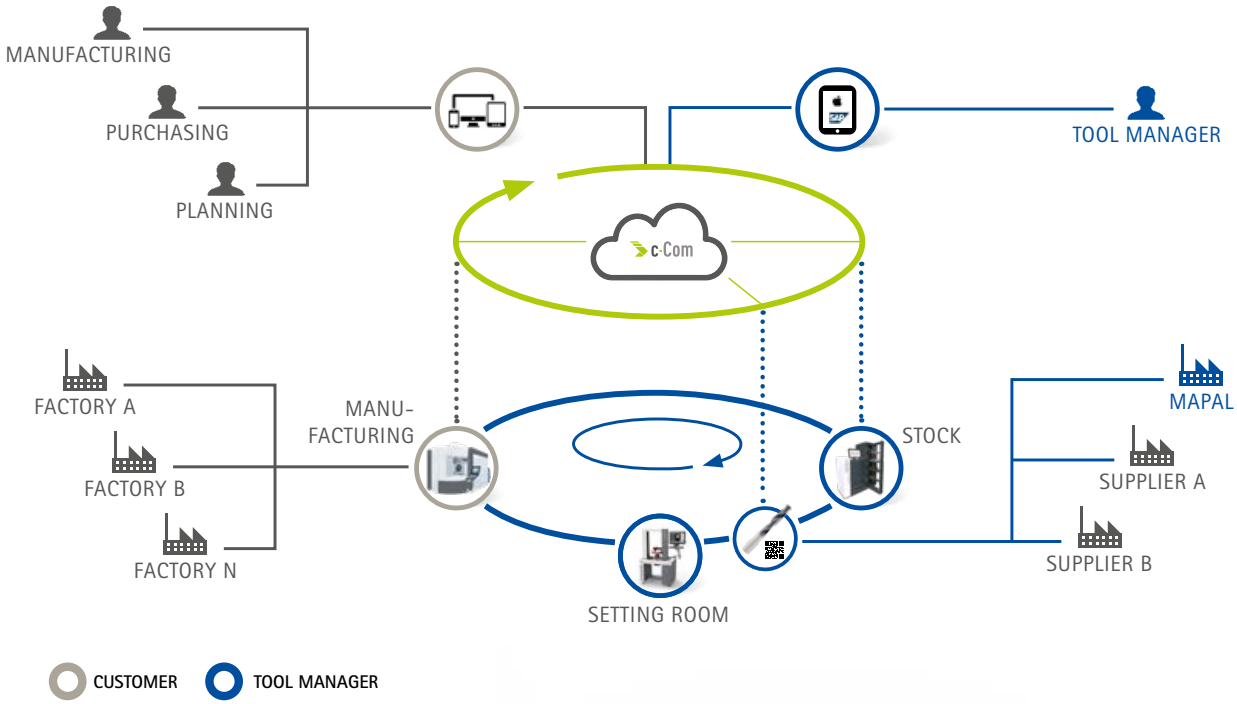
MORE efficiency

MORE cost control

TECHNOLOGY IN FOCUS
COMPARING INFORMATION ACROSS SITES

Tool Management 4.0 makes your corporate data transparent. In this way you can very straightforwardly compare the data from different factories and production facilities. Why does site A need twice as many drills per part as site B?

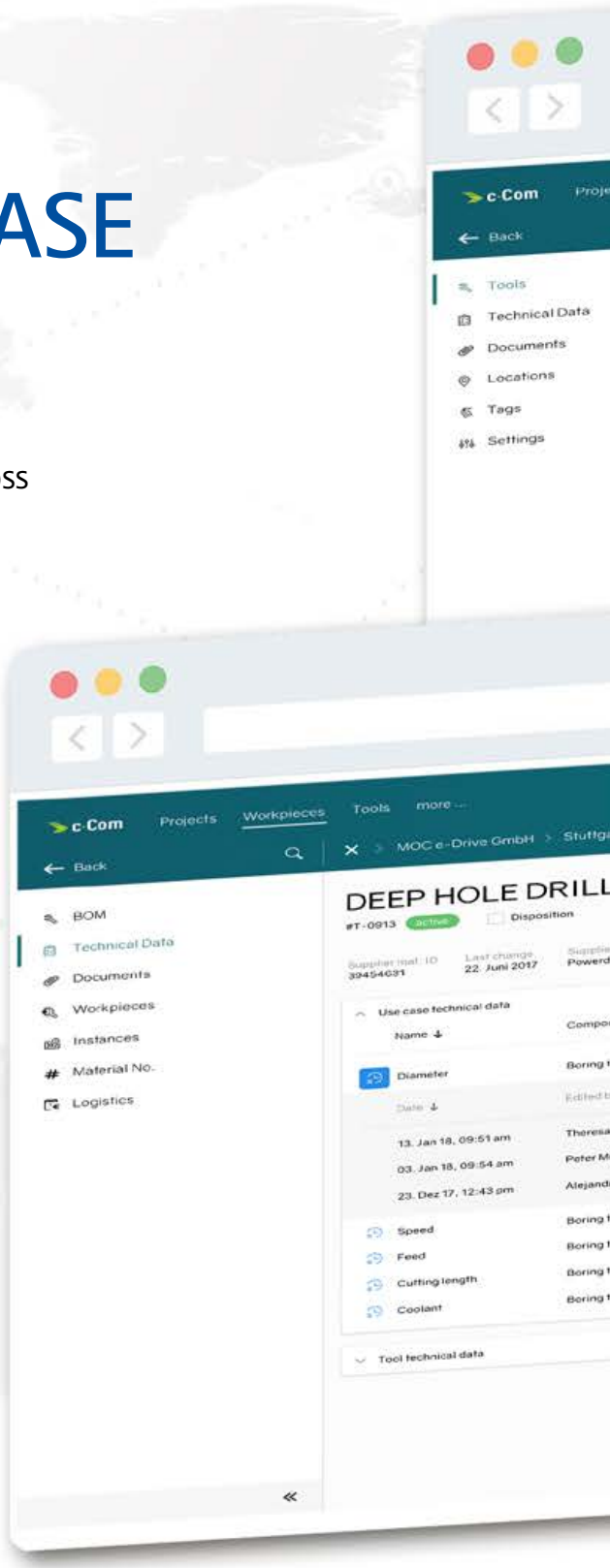
All relevant data are saved centrally on the common c-Com platform. The data can come, for instance, from manufacturing, the setting room or from the supplier. The advantage here is that the data are entered once where they are produced and are available for all subsequent processes. Along with purely logistics data, comprehensive information on the technology is also saved on the platform. In this way cross-site comparisons of costs and technology are possible. The comprehensive authorisation concept makes it possible to define exactly who can access which information. You therefore always have full control.



The company-wide comparison options also permit you to implement standardisation and benchmark strategies to increase productivity and efficiency for increased competitiveness – all due to the full availability of the tool data.

CROSS-FUNCTIONAL AND COMPANY-WIDE **TECHNOLOGY DATABASE**

Process parameters such as tool life and cutting data are managed centrally and are available over the entire value chain. In this way it is ensured you can always access the same, up-to-date technology within a factory or also across sites.



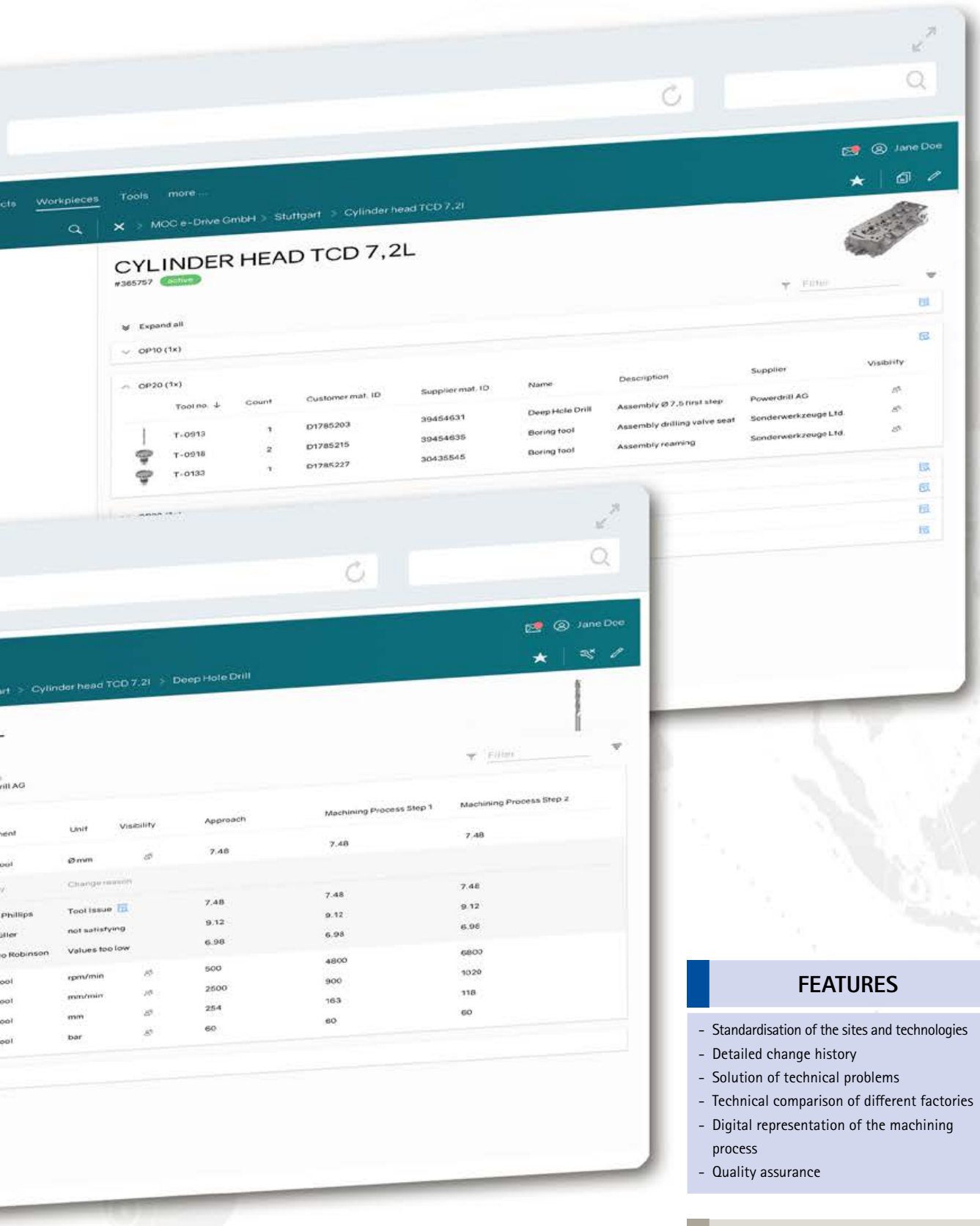
All users along the delivery chain (manufacturing, purchase, logistics, tool manager ...) have access to the tool data relevant for them. The data are related to the individual processes, applications and parts – and that across sites. The transfer of technology is therefore significantly easier. A time-consuming search for data is avoided. The flow of data is seamless and there are no media discontinuities. As such valuable company-wide evaluations are possible. Exchanging data manually, for example via Excel files, is a thing of the past. All tools are classified in the technology data in accordance with DIN 4000.

FULL CONTROL

You can define who can access which data, who is allowed to change the data and which data are only allowed to be viewed or changed internally by selected employees. It is logged exactly who has changed what and why.

HIGHEST DATA SECURITY

To save the data in the cloud, c-Com uses the SAP security network. The data are saved on SAP's servers and therefore protected by the highest security standards.



Technical data, such as the cutting speed, can be adjusted in real time. During any change it is logged exactly who has changed what, for what reason and when. In this way the change can be fully traced at any time.

FEATURES

- Standardisation of the sites and technologies
- Detailed change history
- Solution of technical problems
- Technical comparison of different factories
- Digital representation of the machining process
- Quality assurance

AT A GLANCE

- All relevant data are available on one platform in real time
- Full data transparency
- No manual data exchange
- No loss of know-how
- Classification of tools in accordance with DIN 4000

EVALUATIONS IN REAL TIME ALWAYS AND ANYWHERE

Tool Management 4.0 provides access to automated evaluations in real time, including usage data, current inventory, the number of times each tool has been re-conditioned or the tool costs per part.

You can gain an overview of the overall tool management and the TCO (Total Cost of Ownership) at any time and without coordination effort.

EVALUATIONS IN REAL TIME

Due to the cloud-based solution, you can access your data at any time and around the clock from any terminal device. Data are retrieved in real time. As a consequence you do not waste valuable time and can react immediately if a problem arises.

INDIVIDUAL EVALUATIONS

You can assemble your evaluations individually by clicking with the mouse. You only see the information you really need.

FULL COST TRANSPARENCY

You have access to all data related to your Tool Management project and can, for instance, view the current tool costs per part. You can also see how the costs change.

AT A GLANCE

Evaluations in real time with the current data on:

- Available tool life
- Tool status
- Tool costs per part
- Tool consumption
- Inventory

SIMPLE HANDLING OF RECONDITIONED TOOLS
RE-GRINDING MANAGEMENT

Using Tool Management 4.0 you can trace at all times how many tools are in stock, undergoing reconditioning or are in use. As such you have a detailed overview of your inventory. As a result, planning is significantly more efficient.

Using Tool Management 4.0, the handling of re-ground and reconditioned tools is integrated into the stock management system. The serial numbering of the tools using an RFID chip or 2D code (QR code, DataMatrix code, ...) makes possible unambiguous identification. Each tool is inventoried and checked in or out during each process by scanning. Via c-Com, you and MAPAL share data on the tools – including every reconditioning cycle.

At all times you can see how many new, reconditioned or blunt tools there are in stock, are undergoing reconditioning or are in use. You can also see how many times a tool can be reconditioned again. If the inventory is running short, replacements can be obtained in good time. An optimised inventory and reduced costs are further advantages.

The serial numbering of tools using an RFID chip or 2D code (QR code, DataMatrix code, ...) makes unambiguous identification possible. Among other aspects, the exact re-grinding status can be seen.

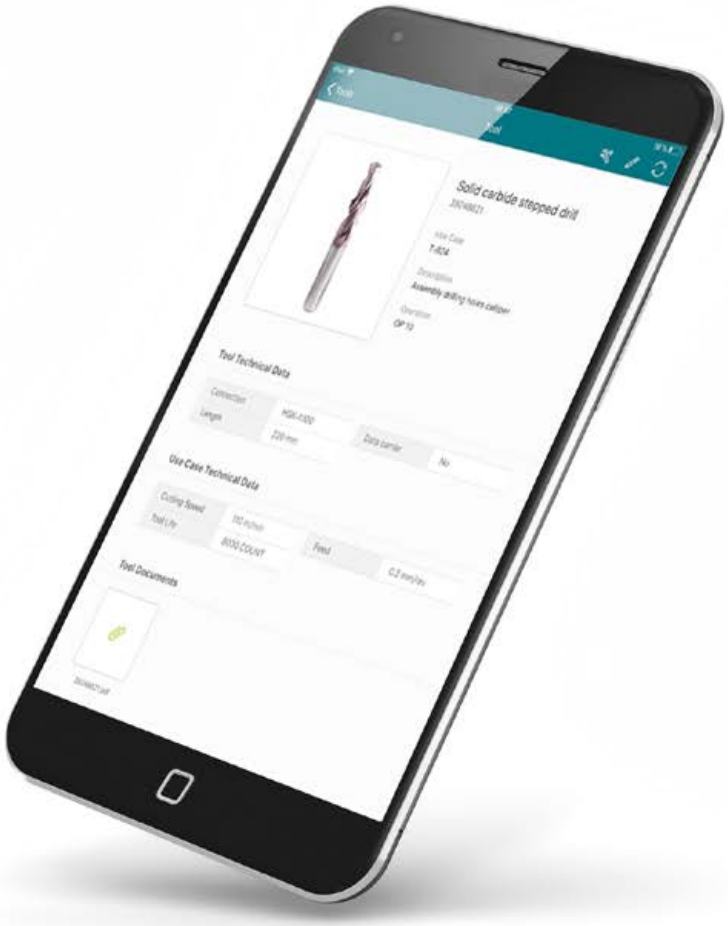
AT A GLANCE

- Optimised planning
- Integration of blunt, re-ground and reconditioned tools on the stock management system
- Detailed overview of the inventory
- Available life remaining

DESIGNING PROCESSES MORE EFFICIENTLY **APPS FOR MOBILE TERMINAL DEVICES**

To be able to use all technology data at any time and anywhere without restriction, a mobile app is available. This brings the technology database including all drawings and attachments to the mobile terminal device.

Using the app, the data can not only be accessed, they can also be edited and maintained. If, for example on breaking in tools, changes are made to the tool geometry or to the cutting parameters, these changes can be documented directly using the app. As such the changes are available and can be viewed by all involved and during all subsequent processes.



Access at any time and from anywhere to your data...

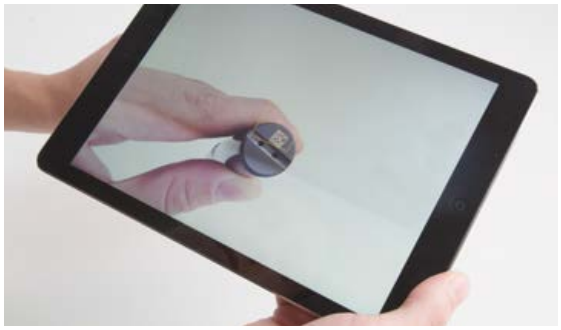
Using the app, reports about tests, tool defects or damage to tools can be drafted quickly and distributed in real time to the persons responsible, for example the product manager or the development engineer. In addition to the reports, images or other attachments can be provided. As such the person responsible quickly has available all the information necessary to analyse and rectify the cause of defects.

AT A GLANCE

- Mobile access to all data
- Fast detection of problem tools and tool breakages
- Modification of the data in real time
- Availability of drawings and attachments
- Quick, straightforward communication
- Availability of the tool history

Practical example:

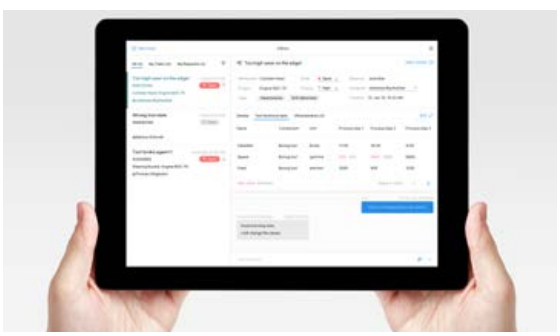
Standardised problem recording in the Tool Manager app



1. Mobile identification of a personalised tool

2. Simplified, standardised problem recording

3. Digital attachments (images, videos, ...)



4. Digital report in real time

NETWORKED AND FUTURE-PROOF **SMART DISPENSING SYSTEMS**

The heart of Tool Management 4.0 is the latest generation of the tool dispensing system UNIBASE. The new software with open web interface makes it possible to access and control the system using any terminal device. Master data and movement data can be exchanged via the open, cloud-based c-Com platform without restriction.

Software UNIBASE

- Web interface for external access using an app
- Optional integration into the open, cloud-based platform c-Com
- Comprehensive evaluation features
- Few clicks to article withdrawal
- Continuous, automatic inventory monitoring
- Possibility of integration into existing ERP systems

UNIBASE-M

- Ideal storage system for tools, components and accessories
- Dispensing limit for selective withdrawal of individual parts
- Variable drawer division

You will find more information on the products in the section "Setting | Measuring | Dispensing" from page 206.

UNIBASE-V

- Secure storage of fully assembled tools
- Upright storage of long tools
- No risk for cutting edges
- Vertical cabinets with drawers on castors
- Can be integrated into existing systems
- Proven in usage in tool management projects

UNIBASE-C

- Automatic individual dispenser
- Storage of small parts and individual parts
- Individual dispensing solution increases protection against theft
- Ready for use as individual solution and also in existing systems

Pictograms

1 Reaming | Fine boring

- Connection HFS
- Connection CFS
- Through bore
- Blind bore
- H7 — Achievable bore tolerance
- Internal cooling

2 Drilling

- Monolithic
- Modular TTS
- HA DIN 6535 — Shank form HA in accordance with DIN
- Internal cooling
- Inclined bore entrances
- Inclined bore outlets
- Interrupted cut
- MAX. — Maximum drilling depth

Boring

- Through bore
- Blind bore
- BS L00 — Arc shaped land - blind bore
- BS L10 — Arc shaped land - through bore
- Chamfering / countersinking

3 Clamping

- Shrinking technology
- Hydraulic clamping technology

4 Milling

- hm opt. — Trochoidal milling
- Roughing
- Finishing
- Groove milling
- Ramping
- Vertical plunging/ grooving
- Helix milling
- Profile milling
- < 10 mm — Trimming material thickness < 10 mm
- ≥ 10 mm — Trimming material thickness ≥ 10 mm
- Pulling cut
- Shoulder milling
- Face milling
- Groove milling
- 45° — 45° chamfer
- 90° — Sharp edged
- CR — Corner radius
- FR — Full radius
- HA DIN 6535 — Shank form HA in accordance with DIN
- HB DIN 6535 — Shank form HB in accordance with DIN
- Internal cooling
- Short
- Long
- Overlong
- 3xD — Maximum machining depth
- For lateral material removal rates
- For lateral material removal rates and for inclined entry
- For lateral material removal rates, for inclined entry and recessing
- NORM — In accordance with works standard
- DIN 6527 — Design DIN 6527

5 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

6 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
										■				■		■		◒	◒			

MAPAL machining groups

The MAPAL 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 steels, non-alloy	< 700 N/mm²	1.0122 (S235/St 37), 1.0401 (C15), 1.0503 (C45), 1.0570 (S355/St 52), 1.1213 (Cf53)
		P1.2	Structural, free-cutting, case hardened and heat-treated steels, non-alloy	< 1200 N/mm²	1.1249 (Cf70)
	P2	P2.1	Nitrided, case hardened and heat-treated steels, alloy	< 900 N/mm²	1.7131 (16MnCr5)
		P2.2	Nitrided, case hardened and heat-treated steels, alloy	< 1400 N/mm²	1.7227 (42CrMoS4)
	P3	P3.1	Tool, bearing, spring and high-speed steels	< 900 N/mm²	1.2343 (X38CrMoV5-1)
		P3.2	Tool, bearing, spring and high-speed steels	< 1500 N/mm²	1.3505 (100Cr6)
	P4	P4.1	Stainless steels, 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 steels, austenitic	< 700 N/mm²	1.4301 (V2A), 1.4571 (V4A)
		M1.2	Stainless steels, ferritic/austenitic (duplex)	< 1000 N/mm²	1.4362 (Alloy 2304), 1.4501, 1.4662 (LDX 2404)
	M2	M2.1	Stainless/heat-resistant 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), GJL	< 300 N/mm²	GJL-250 (GG-25), GJL-260 (GG-26 Cr)
	K2	K2.1	Cast iron with spheroidal graphite, GJS	< 500 N/mm²	GJS-400 (GGG-40), GJS-450 (GGG-45)
		K2.2	Cast iron with spheroidal graphite, 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, 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 spheroidal graphite, GJV; malleable cast iron, GJM	< 500 N/mm²	GJV-300, GJV-400, GJMW-400-5 (GTW-40)
		K3.2	Cast iron with spheroidal graphite, 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 PAMG-XR1 5052, PCGA-XR1 3003, PAMG-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	S2.1	Titanium, titanium alloys	< 1200 N/mm²	TiAl6V4
		S2.2	Titanium, titanium alloys	> 1200 N/mm²	
	S3	S3.1	Nickel, non-alloy and alloy	< 900 N/mm²	1.3912 (invar, Ni36)
		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		

Order our complete range.

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PLEASE NOTE:

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