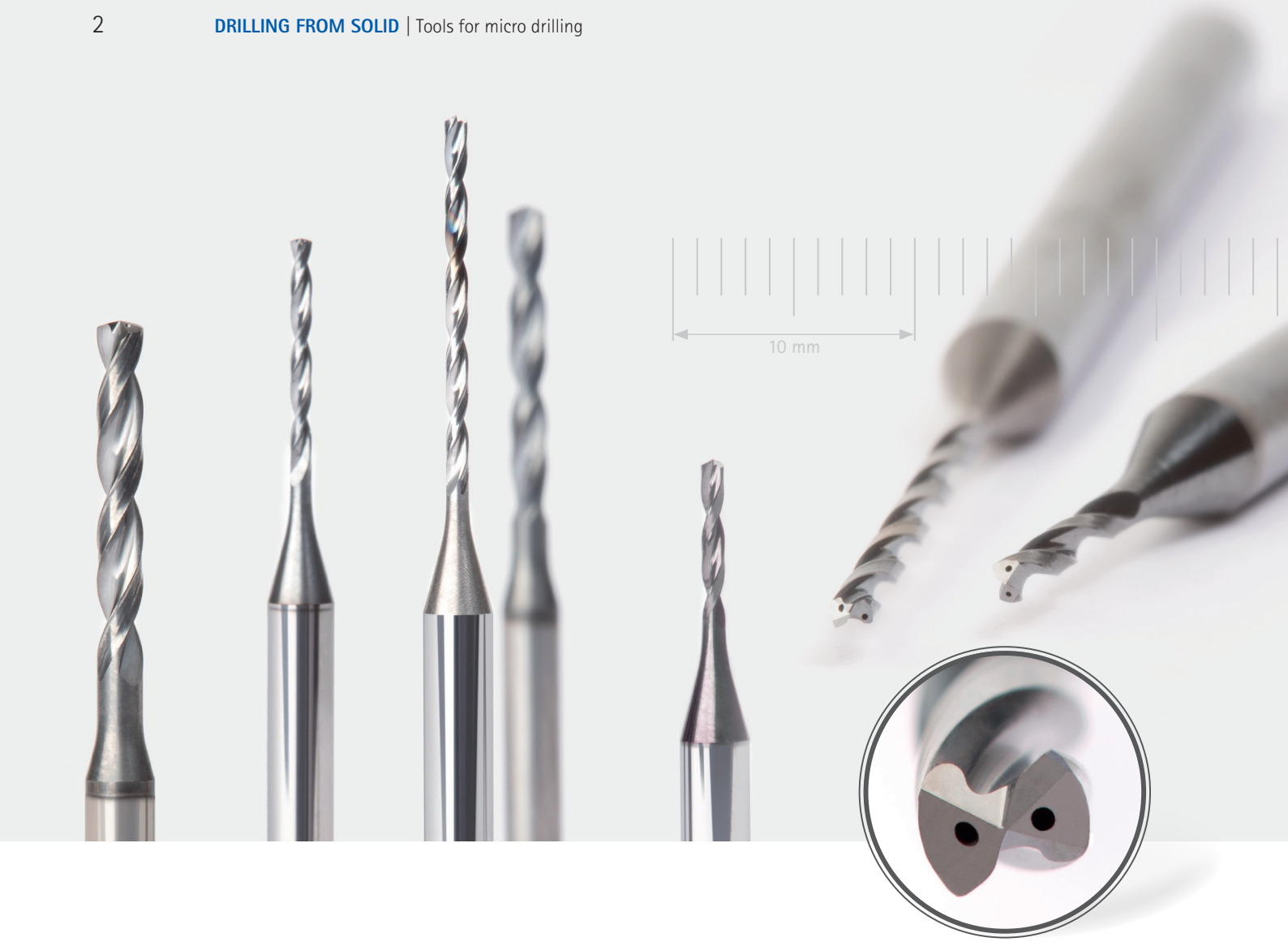
Your technology partner for cost-effective machining

TOOLS FOR MICRO DRILLING



MICRO-Drill-Steel

Drilling diameters from one millimetre with internal cooling

Whether in the machining of injection nozzles for vehicles or in the production of moulds for the smallest injection moulding components – machining in the micro range is used in many applications.

MAPAL has expanded its range of solid carbide drills for steel machining in order to offer the right tool for these machining operations. The new MICRO-Drill series for the diameter range from 1.0 to 2.9 mm with internal cooling allows users to drill at depths of 5xD, 8xD and 12xD. Four guiding chamfers ensure the best guiding properties. The tool experts have developed the geometry especially for the efficient and economical machining of very small bores in steel.

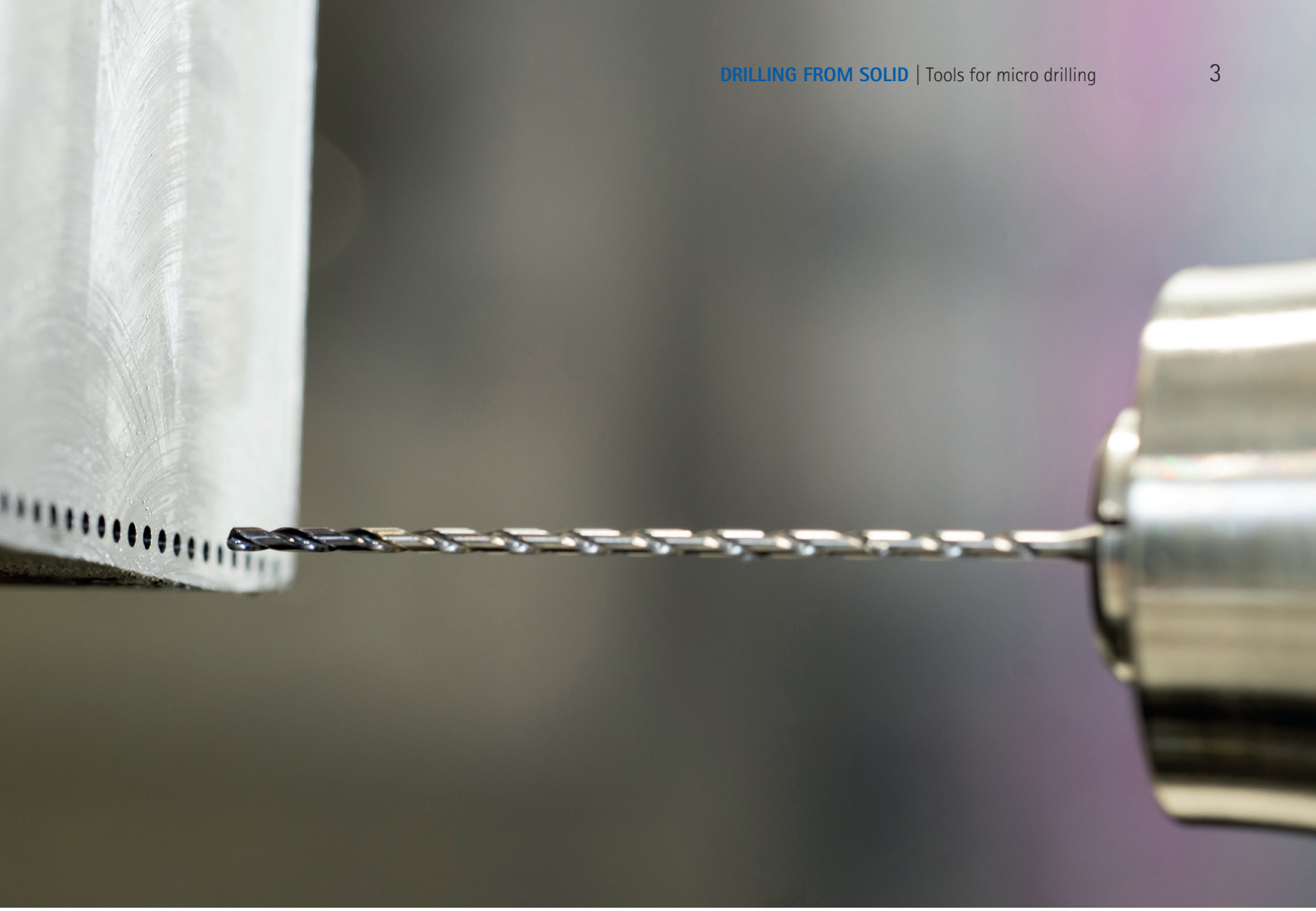
The flute shape with core tapering ensures ideal chip removal even with tough steel materials. Maximum performance and tool life are guaranteed thanks to a new combination of cutting materials and specially adapted micro-geometries.

AT A GLANCE

- Drill for machining steel in the micro range
- Available in diameter range 1.0 to 2.9 mm with internal cooling
- Four guiding chamfers
- Micro-geometries matched to steel

ADVANTAGES

- Ideal chip removal
- High level of performance
- High level of rigidity



MEGA-Deep-Drill

Deep drills even for the smallest diameters

Deep drills with very small diameters are needed for various sectors in the automotive industry, for example for the drilling of fuel injection nozzles, or for medical technology.

In order to be able to produce these delicate parts, MAPAL has extended its portfolio of deep drills with internal cooling for machining centres to include models above one millimetre diameter.

The geometry of the new drills has been specially adapted to the small diameter range. Thanks to the newly designed chip flute and special face geometry, very high feeds and cutting speeds are possible with deep drills. Thanks to the innovative cooling channels, the drills are also suitable for use with minimum quantity lubrication (MQL). Despite lengths of up to 30xD, the gas/oil mixture is reliably transported to the cutting edges. Instead of a full coating, the new tools are coated only at the head for higher cost-effectiveness.

AT A GLANCE

- Machining of delicate parts of steel or cast iron
- Available in the diameter range from 1.0 to 2.9 mm (shank diameter 3 mm) for universal drilling in steel and cast iron machining for drilling depths between 20 and 30xD.
- Internal cooling, suitable for MQL

ADVANTAGES

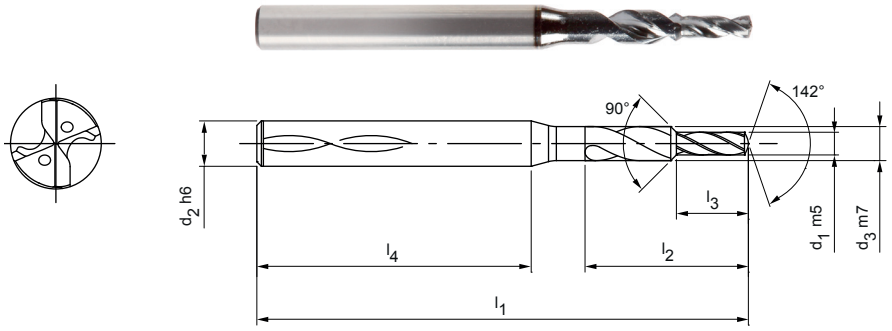
- High feed and cutting speed
- High cost-effectiveness thanks to the coating of the head

MEGA-Pilot-Drill

Solid carbide step drill
SCD581, internal coolant supply

Design:

Drill diameter:	1,00 – 3,00 mm
Bore tolerance:	IT 9 (achievable)
Cutting material:	HP246
Number of cutting edges:	2
Number of guiding chamfers:	2
Tip angle:	142°



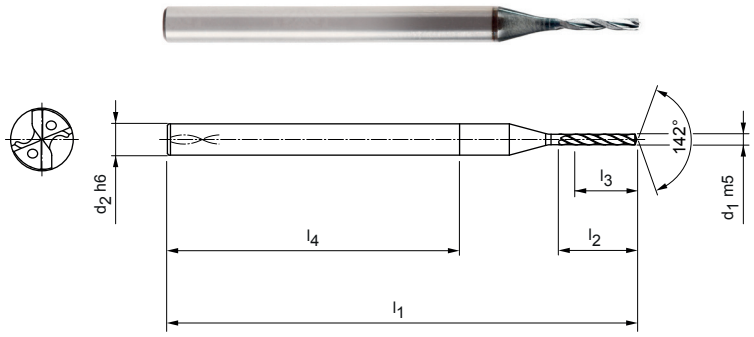
Application:
Pilot drill specially adapted to MEGA-Deep-Drill. Can be used to a maximum of < 3.00 mm diameter with countersink step for optimum insertion of the following deep drill.

Dimensions							Shank form HA	
d_1 m5	d_2 h6	d_3 m7	l_1	l_2	l_3	l_4	Specification	Order No.
1,00	3,00	1,50	50	7,2	3,0	38	SCD581-0100-2-2-142HA-HP246	31080870
1,10	3,00	1,65	50	7,9	3,3	37,5	SCD581-0110-2-2-142HA-HP246	31080871
1,20	3,00	1,80	50	8,6	3,6	36,9	SCD581-0120-2-2-142HA-HP246	31080872
1,30	3,00	1,95	50	9,4	3,9	36,3	SCD581-0130-2-2-142HA-HP246	31080873
1,40	3,00	2,10	50	10,1	4,2	35,7	SCD581-0140-2-2-142HA-HP246	31080874
1,50	3,00	2,25	50	10,8	4,5	35,1	SCD581-0150-2-2-142HA-HP246	31080875
1,60	3,00	2,40	50	11,5	4,8	34,6	SCD581-0160-2-2-142HA-HP246	31080876
1,70	3,00	2,55	50	12,2	5,1	34	SCD581-0170-2-2-142HA-HP246	31080877
1,80	3,00	2,70	50	13,0	5,4	33,4	SCD581-0180-2-2-142HA-HP246	31080878
1,90	4,00	2,85	55	13,7	5,7	35,9	SCD581-0190-2-2-142HA-HP246	31080879
2,00	4,00	3,00	55	14,4	6,0	35,3	SCD581-0200-2-2-142HA-HP246	31080880
2,10	4,00	3,15	55	15,1	6,3	34,8	SCD581-0210-2-2-142HA-HP246	31080881
2,20	4,00	3,30	55	15,8	6,6	34,2	SCD581-0220-2-2-142HA-HP246	31080882
2,30	4,00	3,45	55	16,6	6,9	33,6	SCD581-0230-2-2-142HA-HP246	31080883
2,40	4,00	3,60	55	17,3	7,2	33	SCD581-0240-2-2-142HA-HP246	31080884
2,50	4,00	3,75	55	18,0	7,5	32,4	SCD581-0250-2-2-142HA-HP246	31080885
2,60	6,00	3,90	66	18,7	7,8	39,1	SCD581-0260-2-2-142HA-HP246	31080886
2,70	6,00	4,05	66	19,4	8,1	38,5	SCD581-0270-2-2-142HA-HP246	31080887
2,80	6,00	4,20	66	20,2	8,4	37,9	SCD581-0280-2-2-142HA-HP246	31080888
2,90	6,00	4,35	66	20,9	8,7	37,4	SCD581-0290-2-2-142HA-HP246	31080889
3,00	6,00	4,50	66	21,6	9,0	36,8	SCD581-0300-2-2-142HA-HP246	31080890

Dimensions in mm.
For recommended cutting values, see page 12/13.
Special designs and other coatings on request.

MICRO-Drill-Steel

Solid carbide step drill
SCD371 (5xD), internal coolant supply



Design:

Drill diameter:	0,80 – 2,90 mm
Bore tolerance:	IT9 (achievable)
Cutting material:	HP246
Number of cutting edges:	2
Number of guiding chamfers:	4
Tip angle:	142°
Side rake angle:	30°

Application:
Pilot drill specially adapted to MEGA-Deep-Drill. Can be used up to a maximum diameter of 3.00 mm.

Dimensions								Shank form HA	
d_1 m5	d_2 h6	l_1	l_2	l_3	l_4	l_5	Shank transition angle	Specification	Order No.
0,80	3,00	45	6,0	4,0	32,9	8,0	30°	SDC371-0080-2-4-142HA05-HP246	31238823
0,90	3,00	45	6,8	4,5	32,3	8,8	30°	SDC371-0090-2-4-142HA05-HP246	31238824
1,00	3,00	45	7,5	5,0	31,8	9,5	30°	SDC371-0100-2-4-142HA05-HP246	31238825
1,10	3,00	45	8,3	5,5	31,2	10,3	30°	SDC371-0110-2-4-142HA05-HP246	31238826
1,20	3,00	45	9,0	6,0	30,6	11,0	30°	SDC371-0120-2-4-142HA05-HP246	31238827
1,30	3,00	45	9,8	6,5	30,1	11,8	30°	SDC371-0130-2-4-142HA05-HP246	31238828
1,40	3,00	45	10,5	7,0	29,5	12,5	30°	SDC371-0140-2-4-142HA05-HP246	31238829
1,50	3,00	45	11,3	7,5	29,0	13,3	30°	SDC371-0150-2-4-142HA05-HP246	31238890
1,60	3,00	50	12,0	8,0	33,4	14,0	30°	SDC371-0160-2-4-142HA05-HP246	31238891
1,70	3,00	50	12,8	8,5	32,8	14,8	30°	SDC371-0170-2-4-142HA05-HP246	31238892
1,80	3,00	50	13,5	9,0	32,3	15,5	30°	SDC371-0180-2-4-142HA05-HP246	31238893
1,90	3,00	50	14,3	9,5	31,7	16,3	30°	SDC371-0190-2-4-142HA05-HP246	31238894
2,00	3,00	50	15,0	10,0	31,1	17,0	30°	SDC371-0200-2-4-142HA05-HP246	31238895
2,10	3,00	50	15,8	10,5	30,6	17,8	30°	SDC371-0210-2-4-142HA05-HP246	31238896
2,20	3,00	52	16,5	11,0	32,0	18,5	30°	SDC371-0220-2-4-142HA05-HP246	31238897
2,30	3,00	52	17,3	11,5	31,4	19,3	30°	SDC371-0230-2-4-142HA05-HP246	31238898
2,40	3,00	52	18,0	12,0	30,9	20,0	30°	SDC371-0240-2-4-142HA05-HP246	31238899
2,50	3,00	52	18,8	12,5	30,3	20,8	30°	SDC371-0250-2-4-142HA05-HP246	31238900
2,60	3,00	55	19,5	13,0	32,8	21,5	30°	SDC371-0260-2-4-142HA05-HP246	31238901
2,70	3,00	55	20,3	13,5	32,2	22,3	30°	SDC371-0270-2-4-142HA05-HP246	31238902
2,80	3,00	55	21,0	14,0	31,6	23,0	30°	SDC371-0280-2-4-142HA05-HP246	31238903
2,90	3,00	55	21,8	14,5	31,1	23,8	30°	SDC371-0290-2-4-142HA05-HP246	31238904

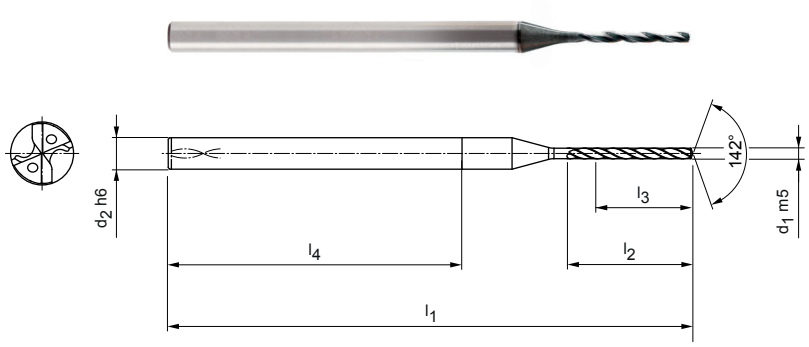
Dimensions in mm.
For recommended cutting values, see page 14/15.
Special designs and other coatings on request.

MICRO-Drill-Steel

Solid carbide twist drill
SCD371 (8xD), internal coolant supply

Design:

Drill diameter:	1,00 – 2,90 mm
Bore tolerance:	IT9 (achievable)
Cutting material:	HP246
Number of cutting edges:	2
Number of guiding chamfers:	4
Tip angle:	142°
Side rake 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 3

Performance LINE | IT9 | 8xD | HA DIN 6535

Dimensions								Shank form HA	
d_1 m5	d_2 h6	l_1	l_2	l_3	l_4	l_5	Shank transition angle	Specification	Order No.
1,00	3,00	50	12,0	8,0	32,3	14,0	30°	SCD371-0100-2-4-142HA08-HP246	31238905
1,10	3,00	50	13,2	8,8	31,3	15,2	30°	SCD371-0110-2-4-142HA08-HP246	31238906
1,20	3,00	50	14,4	9,6	30,2	16,4	30°	SCD371-0120-2-4-142HA08-HP246	31238907
1,30	3,00	52	15,6	10,4	31,2	17,6	30°	SCD371-0130-2-4-142HA08-HP246	31238908
1,40	3,00	52	16,8	11,2	30,2	18,8	30°	SCD371-0140-2-4-142HA08-HP246	31238909
1,50	3,00	52	18,0	12,0	29,2	20,0	30°	SCD371-0150-2-4-142HA08-HP246	31238910
1,60	3,00	55	19,2	12,8	31,2	21,2	30°	SCD371-0160-2-4-142HA08-HP246	31238911
1,70	3,00	55	20,4	13,6	30,2	22,4	30°	SCD371-0170-2-4-142HA08-HP246	31238912
1,80	3,00	55	21,6	14,4	29,2	23,6	30°	SCD371-0180-2-4-142HA08-HP246	31238913
1,90	3,00	60	22,8	15,2	33,1	24,8	30°	SCD371-0190-2-4-142HA08-HP246	31238914
2,00	3,00	60	24,0	16,0	32,1	26,0	30°	SCD371-0200-2-4-142HA08-HP246	31238915
2,10	3,00	60	25,2	16,8	31,1	27,2	30°	SCD371-0210-2-4-142HA08-HP246	31238916
2,20	3,00	62	26,4	17,6	32,1	28,4	30°	SCD371-0220-2-4-142HA08-HP246	31238917
2,30	3,00	62	27,6	18,4	31,1	29,6	30°	SCD371-0230-2-4-142HA08-HP246	31238918
2,40	3,00	62	28,8	19,2	30,1	30,8	30°	SCD371-0240-2-4-142HA08-HP246	31238919
2,50	3,00	62	30,0	20,0	29,1	32,0	30°	SCD371-0250-2-4-142HA08-HP246	31238920
2,60	3,00	66	31,2	20,8	32,1	33,2	30°	SCD371-0260-2-4-142HA08-HP246	31238921
2,70	3,00	66	32,4	21,6	31,0	34,4	30°	SCD371-0270-2-4-142HA08-HP246	31238922
2,80	3,00	66	33,6	22,4	30,0	35,6	30°	SCD371-0280-2-4-142HA08-HP246	31238923
2,90	3,00	66	34,8	23,2	29,0	36,8	30°	SCD371-0290-2-4-142HA08-HP246	31238924

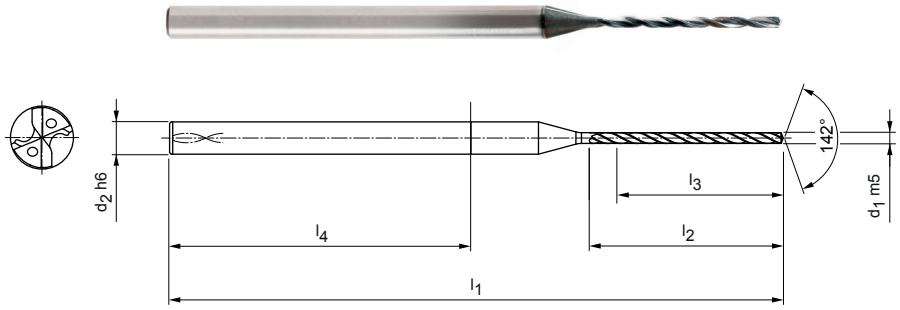
Dimensions in mm.
For recommended cutting values, see page 14/15.
Special designs and other coatings on request.

MICRO-Drill-Steel

Solid carbide twist drill
SCD371 (12xD), internal coolant supply

Design:

Drill diameter:	1,00 – 2,90 mm
Bore tolerance:	IT9 (achievable)
Cutting material:	HP246
Number of cutting edges:	2
Number of guiding chamfers:	4
Tip angle:	142°
Side rake 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 3

Performance LINE | IT9 | 12xD | HA DIN 6535

Dimensions								Shank form HA	
d_1 m5	d_2 h6	l_1	l_2	l_3	l_4	l_5	Shank transition angle	Specification	Order No.
1,00	3,00	57	18,0	12,0	33,3	20,0	30°	SCD371-0100-2-4-142HA12-HP246	31238925
1,10	3,00	57	19,8	13,2	31,7	21,8	30°	SCD371-0110-2-4-142HA12-HP246	31238926
1,20	3,00	57	21,6	14,4	30,0	23,6	30°	SCD371-0120-2-4-142HA12-HP246	31238927
1,30	3,00	62	23,4	15,6	33,4	25,4	30°	SCD371-0130-2-4-142HA12-HP246	31238928
1,40	3,00	62	25,2	16,8	31,8	27,2	30°	SCD371-0140-2-4-142HA12-HP246	31238929
1,50	3,00	62	27,0	18,0	30,2	29,0	30°	SCD371-0150-2-4-142HA12-HP246	31238930
1,60	3,00	66	28,8	19,2	32,6	30,8	30°	SCD371-0160-2-4-142HA12-HP246	31238931
1,70	3,00	66	30,6	20,4	31,0	32,6	30°	SCD371-0170-2-4-142HA12-HP246	31238932
1,80	3,00	66	32,4	21,6	29,4	34,4	30°	SCD371-0180-2-4-142HA12-HP246	31238933
1,90	3,00	72	34,2	22,8	33,7	36,2	30°	SCD371-0190-2-4-142HA12-HP246	31238934
2,00	3,00	72	36,0	24,0	32,1	38,0	30°	SCD371-0200-2-4-142HA12-HP246	31238935
2,10	3,00	72	37,8	25,2	30,5	39,8	30°	SCD371-0210-2-4-142HA12-HP246	31238936
2,20	3,00	79	39,6	26,4	35,9	41,6	30°	SCD371-0220-2-4-142HA12-HP246	31238937
2,30	3,00	79	41,4	27,6	34,3	43,4	30°	SCD371-0230-2-4-142HA12-HP246	31238938
2,40	3,00	79	43,2	28,8	32,7	45,2	30°	SCD371-0240-2-4-142HA12-HP246	31238939
2,50	3,00	79	45,0	30,0	31,1	47,0	30°	SCD371-0250-2-4-142HA12-HP246	31238940
2,60	3,00	85	46,8	31,2	35,5	48,8	30°	SCD371-0260-2-4-142HA12-HP246	31238941
2,70	3,00	85	48,6	32,4	33,8	50,6	30°	SCD371-0270-2-4-142HA12-HP246	31238942
2,80	3,00	85	50,4	33,6	32,2	52,4	30°	SCD371-0280-2-4-142HA12-HP246	31238943
2,90	3,00	85	52,2	34,8	30,6	54,2	30°	SCD371-0290-2-4-142HA12-HP246	31238944

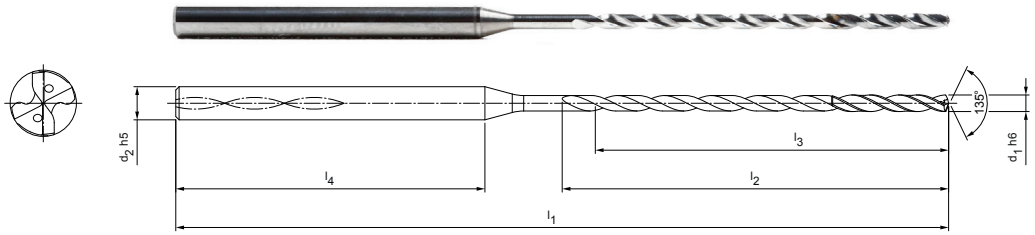
Dimensions in mm.
For recommended cutting values, see page 14/15.
Special designs and other coatings on request.

MEGA-Deep-Drill

Solid carbide twist drill
SCD171 (20xD), internal coolant supply

Design:

Drill diameter:	1,00 – 2,90 mm
Bore tolerance:	≥ IT 9
Cutting material:	HP246
Number of cutting edges:	2
Number of guiding chamfers:	4
Tip angle:	135°
Side rake 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 3

IT9 20xD HA DIN 6535

Dimensions							Shank form HA	
d_1 h6	d_2 h5	l_1	l_2	l_3	L/d relation	l_4	Specification	Order No.
1,00	3	62	27	25	25	28	SCD171-0100-2-4-135HA20-HP246	30998795
1,10	3	62	27	25	23	28	SCD171-0110-2-4-135HA20-HP246	30998796
1,20	3	62	27	25	21	28	SCD171-0120-2-4-135HA20-HP246	30998798
1,30	3	70	35	33	25	28	SCD171-0130-2-4-135HA20-HP246	30998799
1,40	3	70	35	32	23	28	SCD171-0140-2-4-135HA20-HP246	30998800
1,50	3	70	35	32	21	28	SCD171-0150-2-4-135HA20-HP246	30998801
1,60	3	75	41	38	24	28	SCD171-0160-2-4-135HA20-HP246	30998802
1,70	3	75	41	38	22	28	SCD171-0170-2-4-135HA20-HP246	30998803
1,80	3	75	41	38	21	28	SCD171-0180-2-4-135HA20-HP246	30998804
1,90	3	80	46	43	23	28	SCD171-0190-2-4-135HA20-HP246	30998805
2,00	3	80	46	43	22	28	SCD171-0200-2-4-135HA20-HP246	30998806
2,10	3	80	46	42	20	28	SCD171-0210-2-4-135HA20-HP246	30998807
2,20	3	90	55	51	23	28	SCD171-0220-2-4-135HA20-HP246	30998808
2,30	3	90	55	51	22	28	SCD171-0230-2-4-135HA20-HP246	30998809
2,40	3	90	55	51	21	28	SCD171-0240-2-4-135HA20-HP246	30998810
2,50	3	90	55	51	20	28	SCD171-0250-2-4-135HA20-HP246	30998811
2,60	3	100	66	62	24	28	SCD171-0260-2-4-135HA20-HP246	30998812
2,70	3	100	66	61	23	28	SCD171-0270-2-4-135HA20-HP246	30998813
2,80	3	100	66	61	22	28	SCD171-0280-2-4-135HA20-HP246	30998814
2,90	3	100	66	61	21	28	SCD171-0290-2-4-135HA20-HP246	30998815

Recommendation for pilot drill:
Please use the MEGA-Pilot-Drill or the MICRO-Drill-Steel 5xD as pilot drill with internal coolant supply with the same nominal diameter.
Tip angle and diameter tolerances are for optimum functionality as well as to the interaction of pilot drill and deep drill.

Technical application notes on deep drilling can be found on pages 10/11.

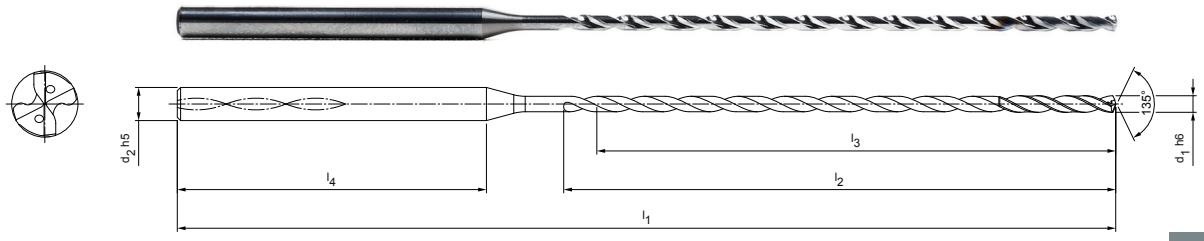
Dimensions in mm.
For recommended cutting values, see page 12/13.
Special designs and other coatings on request.

MEGA-Deep-Drill

Solid carbide twist drill
SCD171 (30xD), internal coolant supply

Design:

Drill diameter:	1,00 – 2,90 mm
Bore tolerance:	≥ IT 9
Cutting material:	HP246
Number of cutting edges:	2
Number of guiding chamfers:	4
Tip angle:	135°
Side rake 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 3

Performance LINE

IT9 30xD HA DIN 6535

Dimensions							Shank form HA	
d_1 h6	d_2 h5	l_1	l_2	l_3	L/d relation	l_4	Specification	Order No.
1,00	3	75	38	36	36	28	SCD171-0100-2-4-135HA30-HP246	30998816
1,10	3	75	38	36	33	28	SCD171-0110-2-4-135HA30-HP246	30998817
1,20	3	75	38	36	30	28	SCD171-0120-2-4-135HA30-HP246	30998818
1,30	3	85	50	48	37	28	SCD171-0130-2-4-135HA30-HP246	30998819
1,40	3	85	50	47	34	28	SCD171-0140-2-4-135HA30-HP246	30998820
1,50	3	85	50	47	31	28	SCD171-0150-2-4-135HA30-HP246	30998821
1,60	3	95	59	56	35	28	SCD171-0160-2-4-135HA30-HP246	30998822
1,70	3	95	59	56	33	28	SCD171-0170-2-4-135HA30-HP246	30998823
1,80	3	95	59	56	31	28	SCD171-0180-2-4-135HA30-HP246	30998824
1,90	3	100	66	63	33	28	SCD171-0190-2-4-135HA30-HP246	30998825
2,00	3	100	66	63	32	28	SCD171-0200-2-4-135HA30-HP246	30998826
2,10	3	100	66	62	30	28	SCD171-0210-2-4-135HA30-HP246	30998827
2,20	3	115	80	76	35	28	SCD171-0220-2-4-135HA30-HP246	30998828
2,30	3	115	80	76	33	28	SCD171-0230-2-4-135HA30-HP246	30998829
2,40	3	115	80	76	32	28	SCD171-0240-2-4-135HA30-HP246	30998830
2,50	3	115	80	76	30	28	SCD171-0250-2-4-135HA30-HP245	30451572
2,60	3	130	96	92	35	28	SCD171-0260-2-4-135HA30-HP246	30998832
2,70	3	130	96	91	34	28	SCD171-0270-2-4-135HA30-HP246	30998833
2,80	3	130	96	91	33	28	SCD171-0280-2-4-135HA30-HP246	30998834
2,90	3	130	96	91	31	28	SCD171-0290-2-4-135HA30-HP246	30998835

Recommendation for pilot drill:
Please use as pilot drill the MEGA-Pilot-Drill or the MICRO-Drill-Steel 5xD with internal coolant supply with the same nominal diameter.
Tip angle and diameter tolerances are for optimum functionality as well as to the interaction of pilot drill and deep drill.

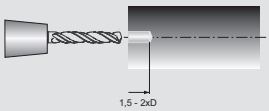
Technical application notes on deep drilling can be found on pages 10/11.

Dimensions in mm.
For recommended cutting values, see page 12/13.
Special designs and other coatings on request.

Deep drilling

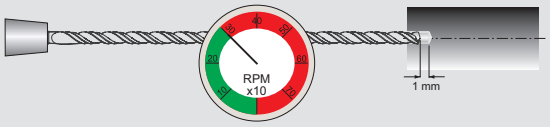
for MEGA-Deep-Drill | SCD171

1



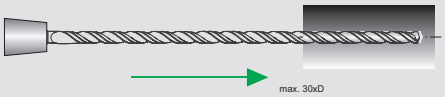
Set pilot bore
- Point angle pilot drill 142° / tolerance m5 (or 0.01 - 0.02 > ø deep drill)
- Pilot bore depth between 1.5 and 2xD
- Pilot depth: chamfer must be mapped

2



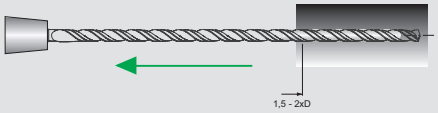
MEGA-Deep-Drill – Entry of the pilot bore
- Retracting with max. 300 min^{-1} and v_f = 1000 mm/min
- Without coolant - up to 1 mm before the bottom of the pilot bore
- Switch on coolant

3



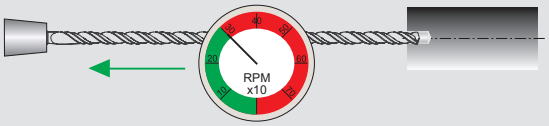
Drilling with MEGA-Deep-Drill
- Cutting speed (v_c) and feeds (f) according to table (see page 12/13). Drill without relief cycles

4



MEGA-Deep-Drill – Drive back
- Retract with current spindle speed (= v_c) and double feed (= 2 x v_f) to 1.5 - 2xD to end of bore

5



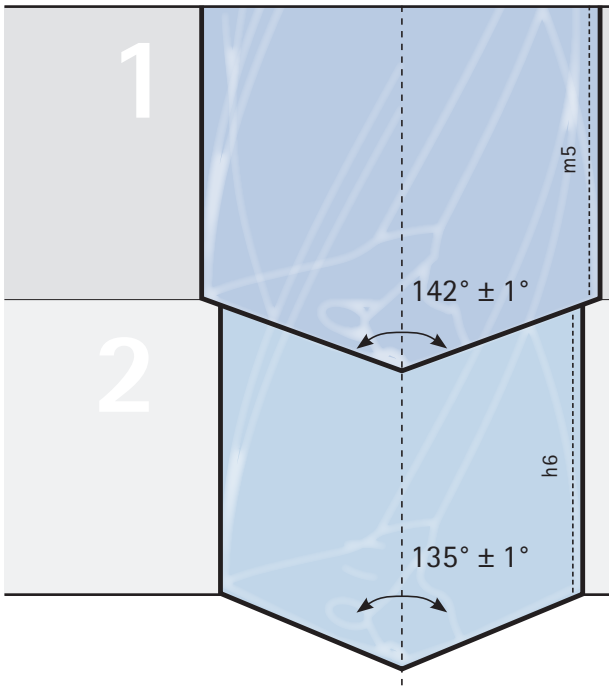
MEGA-Deep-Drill – extending out of the bore
- Switch off the coolant
- Extension with max. 300 min^{-1} and v_f = 1.000 mm/min

Application advice

- Choose a coolant type that is suitable for small tools for optimal lubrification
- Use effective filtration to prevent blockage of the coolant bores
- Choose a suitable bore cycle (if necessary with relief cycle)

Deep drilling 20xD - 30xD in two steps

Deep drilling 20xD - 30xD with MEGA-Deep-Drill | SCD171



Pilot bore
142° | d_1 m5
MEGA-Pilot-Drill | SCD581
MICRO-Drill-Steel | SCD371
Tolerance consideration m5 in µm
ø 0 - 2,99 mm ➔ m5
+2/+6 µm

For the pilot bore, please use the corresponding drill with internal coolant supply with the same nominal diameter.

Deep drilling 20xD - 30xD
135° | d_1 h6
MEGA-Deep-Drill | SCD171
Tolerance consideration h6 in µm
ø 0 - 2,99 mm ➔ h6
0/-6 µm

For deep drilling please use the corresponding deep drill with internal coolant supply with the same nominal diameter.

Recommended cutting values for solid carbide drills

Feed and cutting speed

MEGA-Pilot-Drill | SCD581

MZG*			Material	Strength/Hardness [N/mm²] [HRC]
P	P1	P1.1	Structural, free-cutting, case hardened and heat-treated	< 700
		P1.2	Structural, free-cutting, case hardened and heat-treated	< 1200
	P2	P2.1	Nitrated, case hardened and heat-treated steel, alloyed	< 900
		P2.2	Nitrated, case hardened and heat-treated steel, alloyed	< 1400
	P3	P3.1	Tool, roller bearing, spring and high speed steel**	< 800
		P3.2	Tool, roller bearing, spring and high speed steel**	< 1000
		P3.3	Tool, roller bearing, spring and high speed steel**	< 1500
	P5	P5.1	Cast steel	
M	M1	M1.1	Stainless steels, austenitic	< 700
		M1.2	Stainless steels, ferritic/austenitic (duplex)	< 1000
K	K1	K1.1	Cast iron with lamellar graphite (grey cast iron), EN-GJL	< 300
	K2	K2.1	Cast iron with spheroidal graphite, EN-GJS	< 500
		K2.2	Cast iron with spheroidal graphite, EN-GJS	≤ 800
		K2.3	Cast iron with spheroidal graphite, EN-GJS	> 800
	K3	K3.1	Cast iron with vermicular graphite, EN-GJV; Malleable cast	< 500
		K3.2	Cast iron with vermicular graphite, EN-GJV; Malleable cast	> 500

MICRO-Drill-Steel | SCD371

MZG*			Material	Strength/Hardness [N/mm²] [HRC]
P	P1	P1.1	Structural, free-cutting, case hardened and heat-treated	< 700
		P1.2	Structural, free-cutting, case hardened and heat-treated	< 1200
	P2	P2.1	Nitrated, case hardened and heat-treated steel, alloyed	< 900
		P2.2	Nitrated, case hardened and heat-treated steel, alloyed	< 1400
	P3	P3.1	Tool, roller bearing, spring and high speed steel**	< 800
		P3.2	Tool, roller bearing, spring and high speed steel**	< 1000
		P3.3	Tool, roller bearing, spring and high speed steel**	< 1500
	P5	P5.1	Cast steel	
M	M1	M1.1	Stainless steels, austenitic	< 700
		M1.2	Stainless steels, ferritic/austenitic (duplex)	< 1000
K	K1	K1.1	Cast iron with lamellar graphite (grey cast iron), EN-GJL	< 300
	K2	K2.1	Cast iron with spheroidal graphite, EN-GJS	< 500
		K2.2	Cast iron with spheroidal graphite, EN-GJS	≤ 800
		K2.3	Cast iron with spheroidal graphite, EN-GJS	> 800
	K3	K3.1	Cast iron with vermicular graphite, EN-GJV; Malleable cast	< 500
		K3.2	Cast iron with vermicular graphite, EN-GJV; Malleable cast	> 500

** MAPAL machining groups
** If the alloy components Cr, Mo, Ni, V, W in total > 8 % then select the next higher MAPAL machining group.
The cutting values given are guide values.
The optimum data for the respective machining case should be determined in trials or during machining.

Cutting speed v_c [m/min]				Feed f [mm] at drill diameter					
Internal coolant	External coolant	MMS	Air	1,00	1,20	1,60	1,90	2,40	3,00
80	**70**	**70**		0,05	0,06	0,06	0,07	0,08	0,09
70	**60**	**60**		0,07	0,07	0,08	0,09	0,10	0,11
80	**70**	**70**		0,06	0,07	0,08	0,08	0,10	0,11
55	**50**	**50**		0,06	0,06	0,07	0,07	0,08	0,09
60	**50**	**50**		0,06	0,06	0,07	0,07	0,08	0,10
50	**45**	**45**		0,05	0,05	0,06	0,07	0,07	0,08
50	**35**	**40**		0,05	0,05	0,05	0,06	0,06	0,07
80	**70**	**70**		0,06	0,07	0,08	0,08	0,10	0,11
45	**30**	**30**		0,04	0,04	0,05	0,05	0,06	0,06
95	**70**	**70**	**70**	0,06	0,07	0,08	0,09	0,10	0,12
130	**80**	**95**	**95**	0,07	0,07	0,08	0,09	0,11	0,13
80	**60**	**60**		0,06	0,07	0,08	0,09	0,10	0,11
70	**65**	**65**		0,07	0,08	0,08	0,09	0,11	0,12
65	**55**	**55**		0,06	0,07	0,08	0,08	0,09	0,11

Cutting speed v_c [m/min]				Feed f [mm] at drill diameter					
Internal coolant	External coolant	MMS	Air	0,80	1,04	1,36	1,77	2,30	3,00
80	**70**	**70**		0,04	0,04	0,05	0,06	0,07	0,08
70	**60**	**60**		0,04	0,05	0,06	0,07	0,08	0,10
80	**70**	**70**		0,04	0,05	0,06	0,07	0,08	0,09
55	**50**	**50**		0,04	0,05	0,05	0,06	0,07	0,08
60	**50**	**50**		0,04	0,04	0,05	0,06	0,07	0,08
50	**45**	**45**		0,04	0,04	0,04	0,05	0,06	0,07
50	**35**	**40**		0,03	0,04	0,04	0,05	0,05	0,06
80	**70**	**70**		0,04	0,05	0,06	0,07	0,08	0,09
40	**25**	**25**		0,03	0,03	0,03	0,04	0,05	0,06
95	**70**	**70**		0,03	0,04	0,05	0,06	0,08	0,11
130	**80**	**95**		0,04	0,05	0,06	0,07	0,09	0,11
80	**60**	**60**		0,04	0,05	0,05	0,07	0,08	0,10
70	**65**	**65**		0,04	0,05	0,06	0,07	0,09	0,11
65	**55**	**55**		0,04	0,05	0,06	0,07	0,08	0,09

Recommended cutting values for solid carbide drills

Feed and cutting speed

MEGA-Deep-Drill | SCD171

MZG*			Material	Strength/Hardness [N/mm²] [HRC]	
P	P1	P1.1	Structural, free-cutting, case hardened and heat-treated	< 700	
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	P3	P3.1	Tool, roller bearing, spring and high speed steel**	< 800	
		P3.2	Tool, roller bearing, spring and high speed steel**	< 1000	
		P3.3	Tool, roller bearing, spring and high speed steel**	< 1500	
	P5	P5.1	Cast steel		
K	K1	K1.1	Cast iron with lamellar graphite (grey cast iron), EN-GJL	< 300	
	K2	K2.1	Cast iron with spheroidal graphite, EN-GJS	< 500	
		K2.2	Cast iron with spheroidal graphite, EN-GJS	≤ 800	
		K2.3	Cast iron with spheroidal graphite, EN-GJS	> 800	
	K3	K3.1	Cast iron with vermicular graphite, EN-GJV; Malleable cast	< 500	
		K3.2	Cast iron with vermicular graphite, EN-GJV; Malleable cast	> 500	

** MAPAL machining groups
** If the alloy components Cr, Mo, Ni, V, W in total > 8 % then select the next higher MAPAL machining group.
The cutting values given are guide values.
The optimum data for the respective machining case should be determined in trials or during machining.

Cutting speed v_c [m/min]				Feed f [mm] at drill diameter					
Internal coolant	External coolant	MMS	air	1,00	2,00	4,00	6,00	9,00	16,00
90	**80**	**80**		0,04	0,06	0,09	0,13	0,19	0,27
80	**70**	**70**		0,06	0,08	0,11	0,16	0,24	0,34
90	**75**	**75**		0,05	0,07	0,10	0,16	0,23	0,32
65	**55**	**55**		0,05	0,07	0,09	0,13	0,18	0,25
70	**60**	**60**		0,05	0,06	0,09	0,14	0,21	0,29
55	**50**	**50**		0,04	0,06	0,08	0,12	0,17	0,23
55	**40**	**45**		0,04	0,05	0,07	0,09	0,13	0,18
90	**75**	**75**		0,05	0,07	0,10	0,16	0,23	0,32
110	**75**	**75**	**75**	0,14	0,18	0,25	0,32	0,41	0,53
145	**90**	**110**	**110**	0,14	0,18	0,24	0,30	0,38	0,49
90	**70**	**70**		0,13	0,16	0,21	0,26	0,33	0,42
55	**35**	**45**		0,10	0,12	0,14	0,18	0,22	0,28
80	**70**	**70**		0,14	0,18	0,22	0,28	0,36	0,46
70	**65**	**65**		0,12	0,15	0,18	0,23	0,29	0,36

Explanation

Pictograms

Performance Line:
High-performance tools, wide range of applications, high productivity in series production


Bore
With counterbore


Smallest borehole


Pilot bore


Deep drilling

IT9
Achievable bore tolerance

5xD
Maximum machining depth


Internal coolant

HA
DIN 6535
Shank form HA to DIN

Material suitability

Perfectly suitable

Conditionally suitable

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	3
■	■	■	■	◒	■	◒					■	■	■																

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