CERATIZIT GROUP

The C900/MD900 Drilling Catalog

TEAM CUTTING TOOLS

CUTTING SOLUTIONS BY CERATIZIT · KOMET · WNT · KLENK

CERATIZIT is a high-tech engineering group specialized in tooling and hard material technologies.

Tooling the Future

www.ceratizit.com

Welcome!

Local Distribution Partner

Technical Sales Engineer

Tools and Inserts for Drilling

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Welcome to CERATIZIT

CERATIZIT has been a pioneer in the field of demanding carbide solutions for machining and wear protection for more than 95 years, controlling the entire value chain from powder to the finished end product.

With exclusive access to the highest quality carbide raw materials, CERATIZIT offers more than 130 carbide grades and as a full-range supplier manufactures highly specialized cutting tools, indexable inserts, rods made of hard materials and wear parts.

With more than 9,000 employees worldwide at 34 production sites and a sales network of more than 70 branches, the CERATIZIT Group is a global player in the carbide industry. As a technology leader, CERATIZIT continually invests in research and development and owns more than 1,000 patents.

Under the motto "Tooling the Future," our innovative materials and applications help our customers develop a variety of machines and products that shape our immediate environment and are part of our everyday lives.

The goal remains the same: CERATIZIT provides competitive advantages through new technological standards, innovative materials and coatings as well as unique carbide products.

Why Choose

CERATIZIT

CERATIZIT is recognized as a **premium brand** offering a **full range** of cutting tools.

We are a **"best in class" innovator** and the **fastest growing supplier** of cutting tools within our focus segments.

We are fully committed to **deliver the highest customer value** and continually strive for **outstanding performance and results.**

CERATIZIT USA works diligently to meet business partner's expectations. As a leader in materials technology, CERATIZIT continuously invests in research and development and holds over 1,000 patents. As a business partner you can draw on CERATIZIT's expertise as a leading supplier of cutting tools and carbide solutions. A line-up of benefits include:

- Highly skilled specialists in a variety of fields
- Monitoring and controlling every step of the production process is our way of life
- Our modern production facilities are continuously being updated
- Our optimized production processes reduce costs and ensure high quality while being mindful of the environment
- Technical support
- Technical training
- The majority of our standard products are available from stock
- Real time product availability check
- Up-to-date technical information and graphic illustrations
- Featured products ship the same day if ordered by 5 p.m. EST
- We work only with the most reliable service providers in the sector

It couldn't be easier

Ordering via the Online Shop

In the online shop you can select and order your tool with a mouse click, 24 hours a day, 7 days a week. All your transactions including those in the past can be viewed clearly and easily in the online shop. Register and use our service: e-techstore.com. For more information about e-techstore.com, our products or to place an order, contact Customer Care by calling (800) 783-2280 or email info.usa@ceratizit.com.

From single items to large orders!

There are no minimum order quantities

No matter which tool you need, we promise you quick and uncomplicated delivery, even if you only order one item! We do not have minimum order quantities.

Where is my order right now?

Order Delivery Tracking

For those who do not want to lose sight of their order: With the shipment number you can track the current status of your order online – no matter how your order was placed.

OEM service

You will receive not only excellent cutting tools but also customized complete solutions and tooling packages for optimal machining of entire work pieces on your machine.

Your service package

Every project is supported by a large team comprising various specializations and fields of expertise. No matter whether project leader, employees in the field or in the office, engineers, construction, production or logistics – you will benefit from the full range of services of an international company with a world-wide service network:

- Definition of machining phases with tool assignment
- Determination of cutting data and calculation of machining times
- Calculation of machining costs per piece
- Projection of tooling costs per piece
- Calculation of performance (cutting forces, spindle power, torque moment)
- Testing at the Michigan based CERATIZIT Technical Center
- Support during final acceptance and commissioning runs
- Detailed project documentation

Everything from one source – operating globally for you

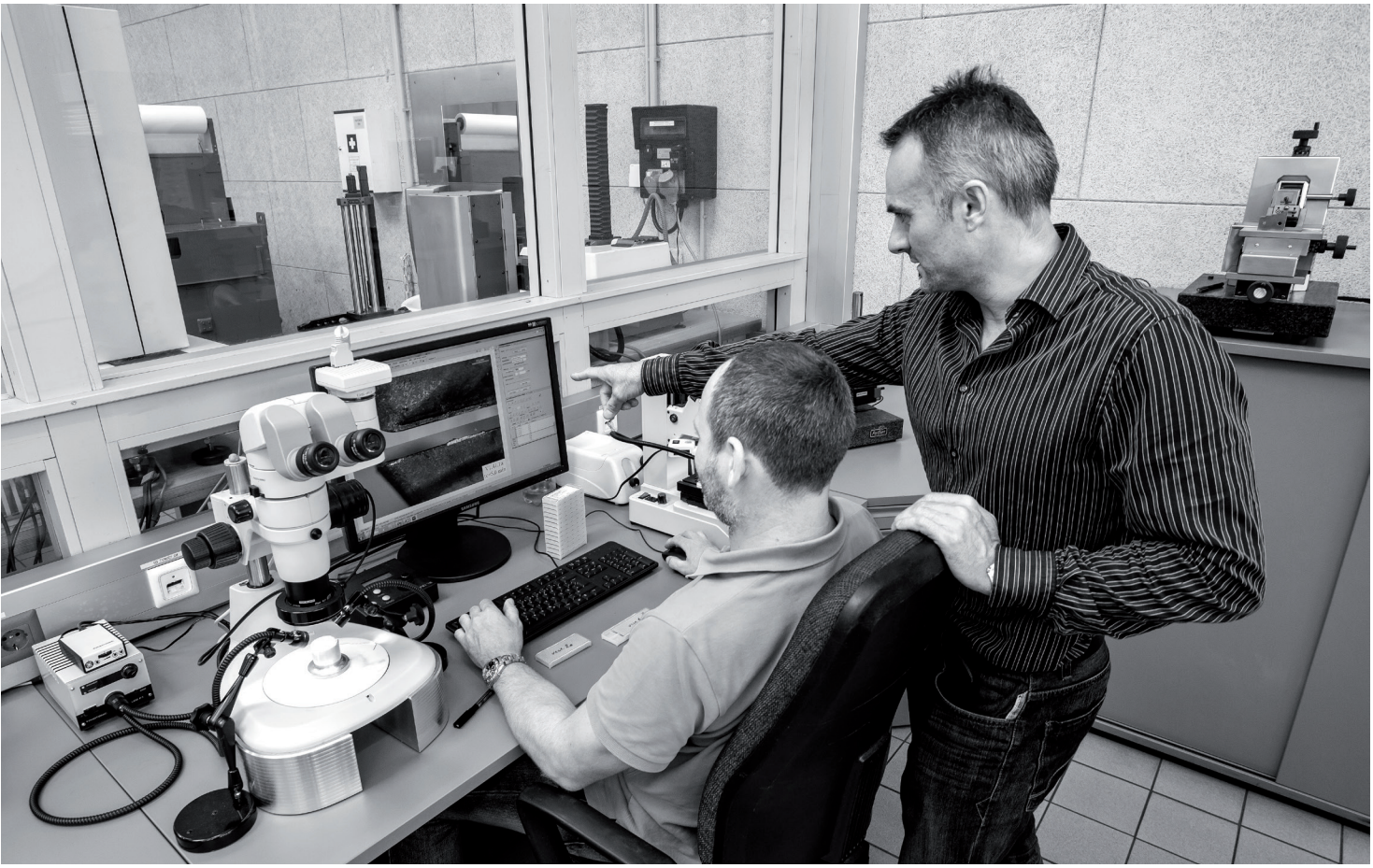
Our OEM team coordinates every project centrally from our center of excellence for Cutting Solutions by CERATIZIT in Reutte, Austria. In this way we are able to guarantee maximum professionalism and reliability as well as solutions that are individually adapted to your requirements. Additionally, we will provide you with the expert support you need when implementing your specific concept on site.

Cutting materials

Based on the application we recommend the suitable cutting material and coating: no matter whether carbide, cermets, cutting ceramic, PCD or CBN. We're vertically integrated and control the entire manufacturing process in house. This enables us to offer you first class quality.

Standard tools

We provide a wide range of inserts and solid carbide tools for cutting tool applications, including multi-function tools. Discover the performance capacity and reliability of our products for yourself.



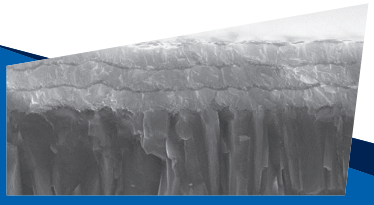
Dragonskin by CERATIZIT

The latest generation of coating technology

Decades of experience coupled to consistent and constant development are in the unique Dragonskin coating technology. Thanks to our innovative design and expertise in powder metallurgy, we – and above all you – achieve an unmatched level of performance in machining.

Like the Dragon‘s invulnerability, Dragonskin coating technology offers the highest levels of protection against wear and is designed with its impermeable layer for the most adverse requirements. The result is an extremely hard and durable surface with a satin finish.

The perfect combination of state-of-the-art high-performance substrates and new coating structures enable high cutting speeds and increased process reliability. A proven – up to 80% – increased performance through the latest Dragonskin coating technology offers you a significant competitive advantage.



Dragonskin Coating

DRAGONSKIN

Dragonskin – The coatings for the highest performance

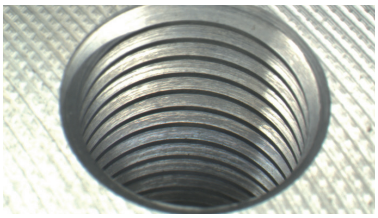
The product category Dragonskin is intended to help make tools easily recognizable and quick to find using CERATIZIT's high-performance coating technology. All products that are marked with the Dragonskin icon represent unmatchable performance, maximum tool life and maximum process reliability.

KOMET – CERATIZIT's line of premium hole making products

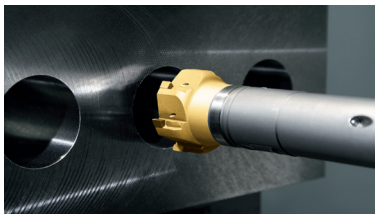
The CERATIZIT Group is a global player in the carbide industry which includes the brands of Cutting Solutions by CERATIZIT, KOMET, Klenk, and WNT. The KOMET brand is known for its premium line of quality tools that offer drilling, boring, reaming, and threading tools along with adaptors and cutting elements.

Be confident in knowing that economical systems, either as standard tools or for specific applications, will be provided for your individual situation. Customers recognize the ideas behind our innovative tool concepts and holistic solutions, making CERATIZIT's KOMET brand a worldwide leader in machining technology.

Successful solutions of drilling and boring for solid drilling, roughing and fine boring.



Innovative solutions of threading tools for the efficient production of threads.



High-precision reaming tools for finishing and fine internal machining.

MaxiDrill 900. Meet the next generation in drilling performance.

MaxiDrill 900 delivers high productivity and low cost with the added benefits of easy handling and simple inventory. MaxiDrill 900 is one of the most wide-ranging drilling systems you can buy.

A true universal application tool, this system from CERATIZIT offers balance so precise, you can count on smooth drilling with high cutting speeds in some of the toughest materials on the machining floor.

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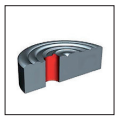
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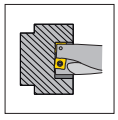
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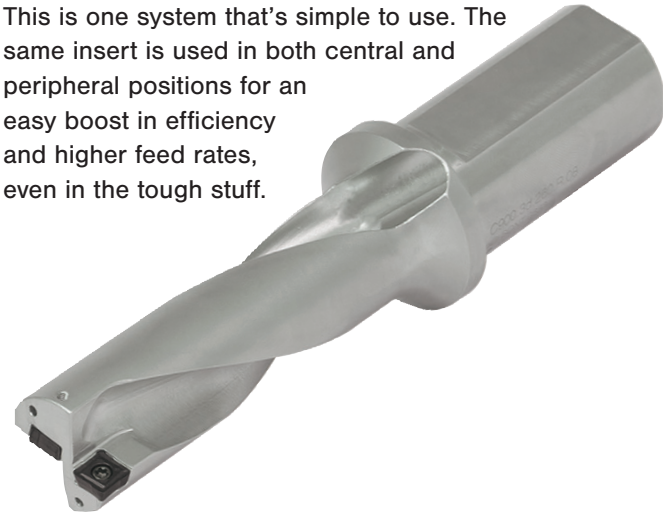
Reach new levels of productivity.

This is one system that's simple to use. The same insert is used in both central and peripheral positions for an easy boost in efficiency and higher feed rates, even in the tough stuff.



Low cost/high productivity –

4 cutting edges per insert; peripheral and central cutting edges have the same geometry, size and grade for simpler handling, less inventory

High feeds in tough materials –

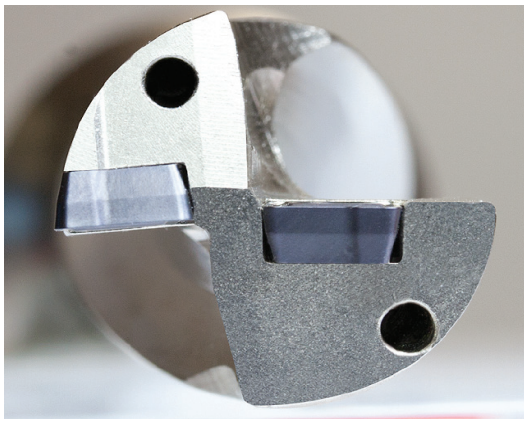
Even with lengths 5xD

Exceptional balance –

Chipbreaker design and insert mounting position are precision balanced for smooth drilling, even with high cutting parameters.

Extremely long tool life –

Optimized for toughness and wear resistance



Easier to use –

Same insert used in central and peripheral positions

More efficient production –

High feed rate, more holes possible; optimal chip evacuation through asymmetric chip pocket design

Better machining stability –

The radial force compensation prevents the drill axis from running off-center

Universal grade –

Steel, stainless steel, cast iron, non-ferrous metals and hard-to-machine materials; .625"– 2.25" diameter range; 2xD, 3xD, 4xD, 5xD available

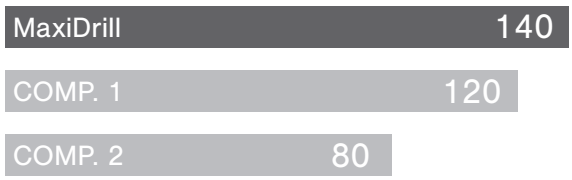
Optimized chipbreaker geometry –

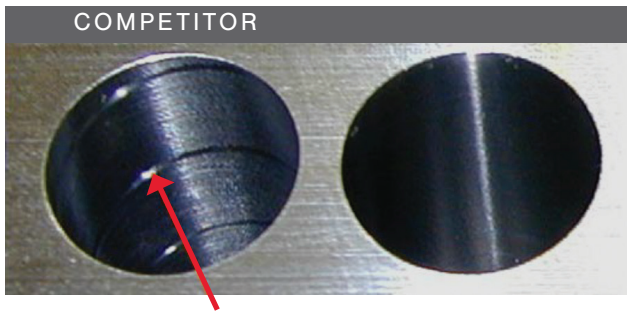
Adapted for higher cutting speed requirements

Special applications –

Cross hole, stack drilling, drilling on uneven surfaces, chain drilling and more

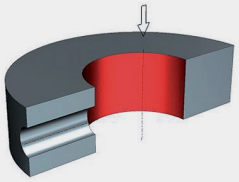
NUMBER OF BORE HOLES



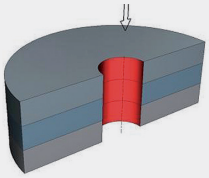


Universal application is possible

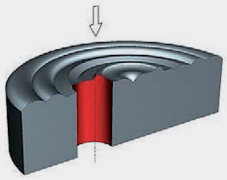
The MaxiDrill 900 proves its high-performance capacity in a wide application range and most difficult-to-machine situations.



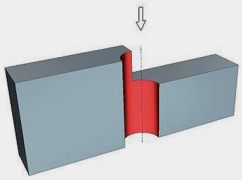
Producing a transverse through-hole



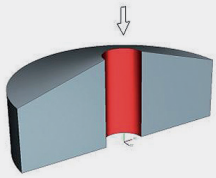
Stack drilling



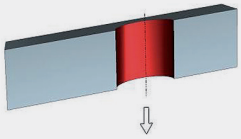
Drilling on an uneven surface



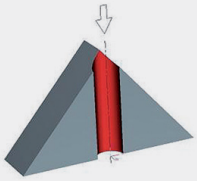
Drilling on a stepped surface



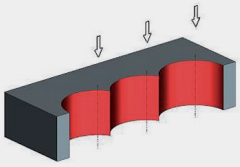
Drilling of a convex surface



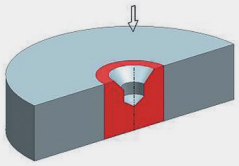
Drilling on inclined surfaces: the drill exits at an angle



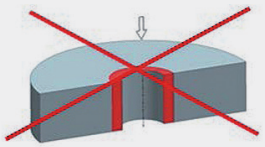
Drilling on a ridge



Chain drilling is possible, depending on the material



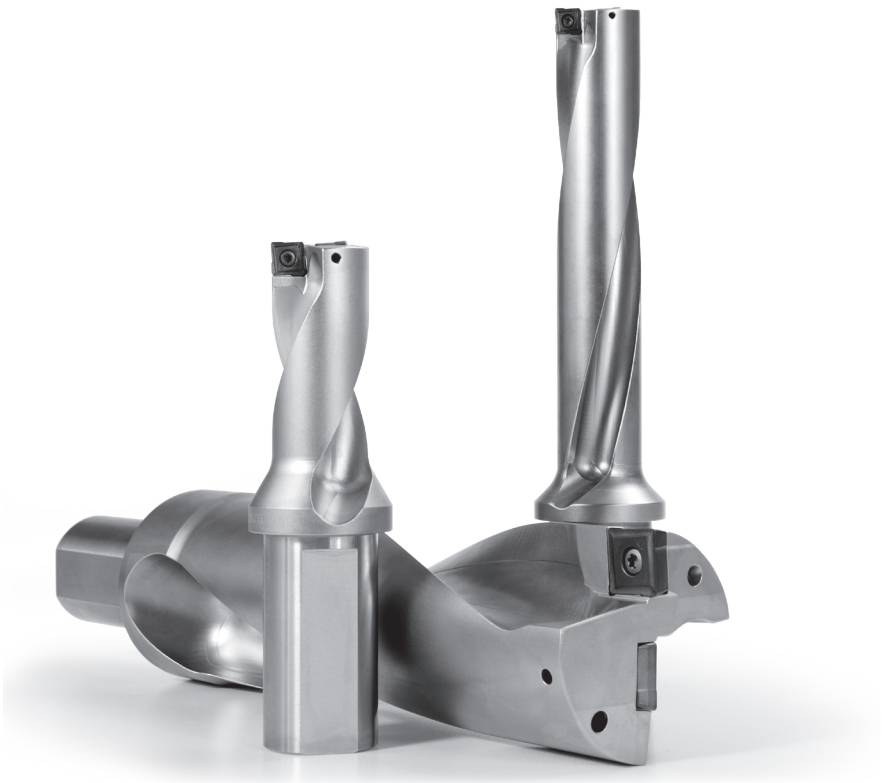
Spot drilling in a central hole or bead



DO NOT USE FOR REBORING!

Note: A 30% to 60% feed rate reduction is required for all drilling situations shown. Also, machining possibilities decrease when working in long-chipping tough materials.

With a .625“– 2.437" diameter range and an asymmetrical chip pocket design for optimal chip evacuation, the MaxiDrill 900 system can maintain higher feed rates in steel, stainless steel, cast iron and non-ferrous metals than you ever thought possible.



C T C P 4 3 0

1 2 3 4 5

1 Manufacturer: CERATIZIT

2 Cutting material

W Uncoated carbide
C CVD-coated carbide
P PVD-coated carbide
T Uncoated cermet
E Coated cermet
N Uncoated silicon nitride
M Coated silicon nitride
S Mixed ceramic
I Sialon
D PCD
B CBN
L CBN-coated
H Sintered HSS

3 Main application (material) Variant 1: number

1 Steel
2 Stainless steel
3 Cast iron
4 Light and non-ferrous metals, non-metals
5 Heat-resistant alloys, titanium
6 Hard materials
7 Universal grade for a variety of application

Main application (material) Variant 2: ISO letter

P Steel
M Stainless steel
K Cast iron
N Light and non-ferrous metals, non-metals
S Heat-resistant alloys, titanium
H Hard materials
X Universal grade for a variety of applications

4 Main application (machining method)

1 Turning
2 Milling
3 Parting and grooving
4 Drilling
5 Threading
6 Others
7 Universal grade for a variety of applications

5 ISO 513 Application range

For example:
05
10
15
25
35 ISO P35

High-performance grade CTCP420

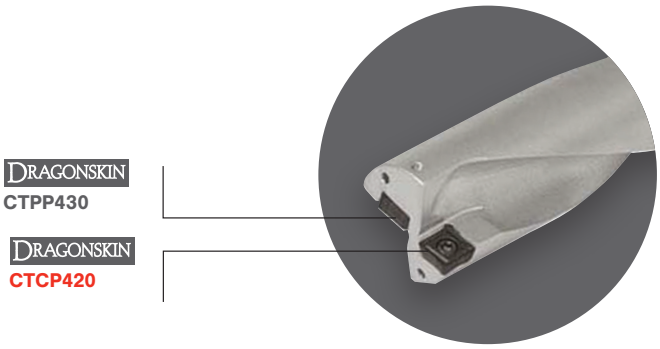
Reach higher productivity levels with the CTCP420, our high-performance grade for even longer working life in a wide range of applications.

A dynamo alone or in combination

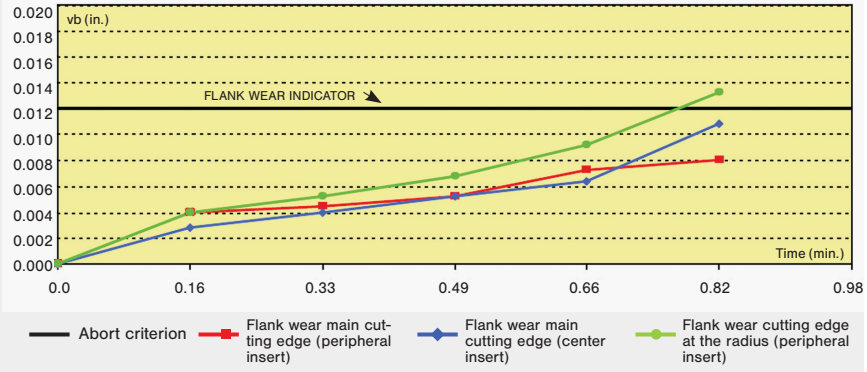
Run a tough, PVD-coated CTPP430 insert in the center with a wear-resistant, CVD-coated CTCP420 insert on the peripheral geometry to get:

- Longer tool life
- Increased speed of up to 30%

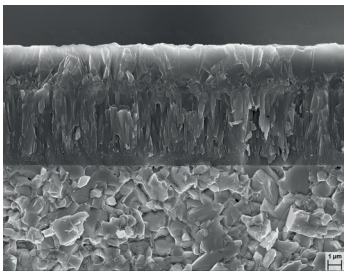
For the peripheral cutting edge, we recommend using CTCP420 exclusively.



Longer Tool Life Using CTPP430/CTCP420



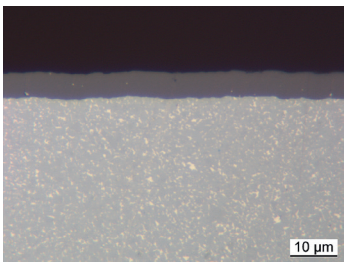
CTCP420 DRAGONSKIN	HC-P20 | HC-K20	● ●



Specification:
Composition: Co 8.0%; mixed carbides 2.0%; WC balance | Grain size: 1-2 µm | Hardness: HV_{30} 1500 | Coating specification: CVD TiCN-Al_2O_3

Recommended application:
The wear-resistant solution for steel and cast iron for high cutting speeds.

CTPP430 DRAGONSKIN	HC-P30 | HC-M25 | HC-S25	● ○ ●



Specification:
Composition: Co 9.0%; others 0.75%; WC balance| Grain size: 0.85 µm | Hardness: HV30 1590 | Coating specification: PVD TiAlN

Recommended application:
The universal high-performance grade for steel, austenitic steel and heat-resistant alloys.

Productivity takes a revolutionary turn.

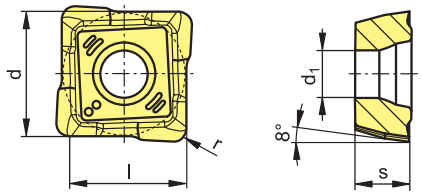
Get high feeds, even in depths up to 5xD. It's all because of the stable design. CERATIZIT engineers MaxiDrill 900 tools with exceptional balance so radial force compensation prevents the turning axis from running off-center.

Chipbreaker design and insert mounting position are precision balanced for smooth drilling, even with high cutting parameters.

P	● ●
M	●
K	● ○
N	○
S	○ ○
H	

● Main application
○ Extended application

		CTCP420 DRAGONSKIN	CTPP430 DRAGONSKIN	d [mm]	l [mm]	s [mm]	r [mm]	d_1 [mm]
-M30		SONT 031803ER-M30	● ●	4.30	3.80	1.80	0.40	2.10
		SONT 042105ER-M30	● ●	4.60	4.20	2.10	0.50	2.25
		SONT 052306ER-M30	● ●	5.30	4.80	2.30	0.60	2.25
		SONT 062506ER-M30	● ●	5.90	5.50	2.50	0.60	2.50
		SONT 072907ER-M30	● ●	6.50	6.10	2.90	0.70	2.50
		SONT 083308ER-M30	● ●	7.70	7.30	3.30	0.80	2.90
		SONT 093808ER-M30	● ●	8.90	8.50	3.80	0.80	3.50
		SONT 104408ER-M30	● ●	10.10	9.60	4.40	0.80	4.10
		SONT 124810ER-M30	● ●	11.60	11.00	4.80	1.00	4.10
		SONT 135012ER-M30	● ●	13.00	12.20	5.00	1.20	5.30
		SONT 155312ER-M30	● ●	15.20	14.40	5.30	1.20	5.30
		SONT 175612ER-M30	● ●	17.50	16.70	5.60	1.20	5.30
		CTCP420 DRAGONSKIN	CTPP430 DRAGONSKIN	d	l	s	r	d_1



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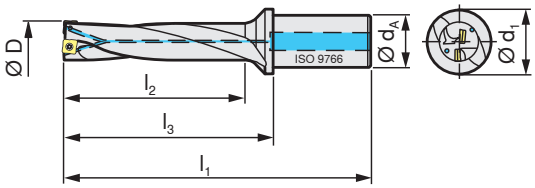

D [mm]	Type, description	d_A [mm]	d_1 [mm]	l_1 [mm]	l_2 [mm]	l_3 [mm]		
12.0	MD900.2D.120.R.03	20	28	90	24	40	SONT 03..	E07
12.5	MD900.2D.125.R.03	20	28	91	25	41	SONT 03..	E07
13.0	MD900.2D.130.R.03	20	28	92	26	42	SONT 03..	E07
13.5	MD900.2D.135.R.03	20	28	93	27	43	SONT 03..	E07
14.0	MD900.2D.140.R.04	20	30	96	28	46	SONT 04..	E01
14.5	MD900.2D.145.R.04	20	30	97	29	47	SONT 04..	E01
15.0	MD900.2D.150.R.04	20	30	98	30	48	SONT 04..	E01
15.5	MD900.2D.155.R.04	20	30	99	31	49	SONT 04..	E01
16.0	MD900.2D.160.R.05	20	30	100	32	50	SONT 05..	E01
16.5	MD900.2D.165.R.05	20	30	101	33	51	SONT 05..	E01
17.0	MD900.2D.170.R.05	20	30	102	34	52	SONT 05..	E01
17.5	MD900.2D.175.R.05	20	30	103	35	53	SONT 05..	E01
18.0	MD900.2D.180.R.06	25	32	111	36	55	SONT 06..	E02
18.5	MD900.2D.185.R.06	25	32	112	37	56	SONT 06..	E02
19.0	MD900.2D.190.R.06	25	32	113	38	57	SONT 06..	E02
19.5	MD900.2D.195.R.06	25	32	114	39	58	SONT 06..	E02
20.0	MD900.2D.200.R.06	25	32	115	40	59	SONT 06..	E02
20.5	MD900.2D.205.R.06	25	32	116	41	60	SONT 06..	E02
21.0	MD900.2D.210.R.07	25	32	118	42	62	SONT 07..	E02
22.0	MD900.2D.220.R.07	25	32	120	44	64	SONT 07..	E02
23.0	MD900.2D.230.R.07	25	32	122	46	66	SONT 07..	E02
24.0	MD900.2D.240.R.08	32	40	132	48	72	SONT 08..	E03
25.0	MD900.2D.250.R.08	32	40	134	50	74	SONT 08..	E03
26.0	MD900.2D.260.R.08	32	40	136	52	76	SONT 08..	E03
27.0	MD900.2D.270.R.08	32	40	138	54	78	SONT 08..	E03
28.0	MD900.2D.280.R.09	32	40	140	56	80	SONT 09..	E04
29.0	MD900.2D.290.R.09	32	40	142	58	82	SONT 09..	E04
30.0	MD900.2D.300.R.09	32	40	144	60	84	SONT 09..	E04
31.0	MD900.2D.310.R.09	32	40	146	62	86	SONT 09..	E04
32.0	MD900.2D.320.R.09	32	40	148	64	88	SONT 09..	E04
33.0	MD900.2D.330.R.10	40	50	163	66	93	SONT 10..	E05
34.0	MD900.2D.340.R.10	40	50	165	68	95	SONT 10..	E05
35.0	MD900.2D.350.R.10	40	50	167	70	97	SONT 10..	E05
36.0	MD900.2D.360.R.10	40	50	169	72	99	SONT 10..	E05

E01	11807480	11817562	11817560
E02	11684214	11450898	11450849
E03	11684216	11690144	11114698
E04	11227305	11690146	11690140
E05	11610311	11450867	11450858
E07	11807484	11817562	11817560

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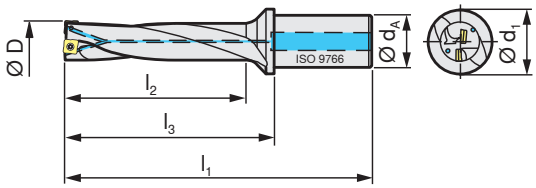

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38.0	MD900.2D.380.R.12	40	56	176	76	106	SONT 12..	E01
39.0	MD900.2D.390.R.12	40	56	178	78	108	SONT 12..	E01
40.0	MD900.2D.400.R.12	40	56	180	80	110	SONT 12..	E01
41.0	MD900.2D.410.R.12	40	56	182	82	112	SONT 12..	E01
42.0	MD900.2D.420.R.13	40	60	187	84	117	SONT 13..	E02
43.0	MD900.2D.430.R.13	40	60	189	86	119	SONT 13..	E02
44.0	MD900.2D.440.R.13	40	60	191	88	121	SONT 13..	E02
45.0	MD900.2D.450.R.13	40	60	193	90	123	SONT 13..	E02
46.0	MD900.2D.460.R.13	40	60	195	92	125	SONT 13..	E02
47.0	MD900.2D.470.R.15	40	60	198	94	128	SONT 15..	E02
48.0	MD900.2D.480.R.15	40	60	200	96	130	SONT 15..	E02
49.0	MD900.2D.490.R.15	40	60	202	98	132	SONT 15..	E02
50.0	MD900.2D.500.R.15	40	60	204	100	134	SONT 15..	E02
51.0	MD900.2D.510.R.15	40	60	206	102	136	SONT 15..	E02
52.0	MD900.2D.520.R.15	40	60	208	104	138	SONT 15..	E02
53.0	MD900.2D.530.R.15	40	60	210	106	140	SONT 15..	E02
54.0	MD900.2D.540.R.15	40	60	212	108	142	SONT 15..	E02
55.0	MD900.2D.550.R.17	40	60	215	110	145	SONT 17..	E02
56.0	MD900.2D.560.R.17	40	60	217	112	147	SONT 17..	E02
57.0	MD900.2D.570.R.17	40	60	219	114	149	SONT 17..	E02
58.0	MD900.2D.580.R.17	40	60	221	116	151	SONT 17..	E02
59.0	MD900.2D.590.R.17	40	60	223	118	153	SONT 17..	E02
60.0	MD900.2D.600.R.17	40	62	225	120	155	SONT 17..	E02
61.0	MD900.2D.610.R.17	40	62	227	122	157	SONT 17..	E02
62.0	MD900.2D.620.R.17	40	64	229	124	159	SONT 17..	E02
63.0	MD900.2D.630.R.17	40	64	231	126	161	SONT 17..	E02

E01	11610311	11450867	11450858
E02	11801441	11816987	11816974

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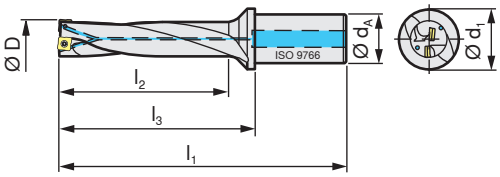

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0.750	C900.3D.0750.R.06-EF	1.000	1.260	5.163	2.329	2.959	SONT 06	E02
0.765	C900.3D.0765.R.06-EF	1.000	1.260	9.004	2.295	3.004	SONT 06	E02
0.812	C900.3D.0812.R.06-EF	1.000	1.260	5.349	2.215	3.145	SONT 06	E02
0.843	C900.3D.0843.R.07-EF	1.000	1.260	10.316	2.529	3.316	SONT 07	E02
0.875	C900.3D.0875.R.07-EF	1.000	1.260	5.617	2.743	3.412	SONT 07	E02
0.937	C900.3D.0937.R.08-EF	1.250	1.575	6.079	2.929	3.717	SONT 08	E03
1.000	C900.3D.1000.R.08-EF	1.250	1.575	6.268	3.118	3.906	SONT 08	E03
1.109	C900.3D.1109.R.09-EF	1.250	1.575	13.233	3.327	4.233	SONT 09	E04
1.125	C900.3D.1125.R.09-EF	1.250	1.575	6.643	3.493	4.281	SONT 09	E04
1.156	C900.3D.1156.R.09-EF	1.250	1.575	13.374	3.468	4.374	SONT 09	E04
1.218	C900.3D.1218.R.09-EF	1.250	1.575	13.560	3.654	4.560	SONT 09	E04
1.250	C900.3D.1250.R.09-EF	1.250	1.575	7.018	3.868	4.656	SONT 09	E04
1.281	C900.3D.1281.R.10-EF	1.500	1.969	14.867	3.843	4.867	SONT 10	E05
1.312	C900.3D.1312.R.10-EF	1.500	1.969	7.716	4.054	4.960	SONT 10	E05
1.328	C900.3D.1328.R.10-EF	1.500	1.969	15.008	3.984	5.008	SONT 10	E05
1.375	C900.3D.1375.R.10-EF	1.500	1.969	7.905	4.243	5.149	SONT 10	E05
1.406	C900.3D.1406.R.10-EF	1.500	1.969	15.242	4.218	5.242	SONT 10	E05
1.469	C900.3D.1469.R.12-EF	1.500	2.205	17.588	4.407	5.588	SONT 12	E05
1.500	C900.3D.1500.R.12-EF	1.500	2.205	8.437	4.618	5.681	SONT 12	E05
1.531	C900.3D.1531.R.12-EF	1.500	2.205	17.774	4.593	5.774	SONT 12	E05
1.625	C900.3D.1625.R.12-EF	1.500	2.205	8.812	4.993	6.056	SONT 12	E05
1.656	C900.3D.1656.R.13-EF	1.500	2.362	19.267	4.968	6.267	SONT 13	E06
1.750	C900.3D.1750.R.13-EF	1.500	2.362	9.305	5.368	6.549	SONT 13	E06
1.781	C900.3D.1781.R.13-EF	1.500	2.362	19.642	5.343	6.642	SONT 13	E06
1.875	C900.3D.1875.R.15-EF	1.500	2.362	9.719	5.743	6.964	SONT 15	E06
1.975	C900.3D.1975.R.15-EF	1.500	2.362	22.264	5.925	7.264	SONT 15	E06
2.062	C900.3D.2062.R.15-EF	1.500	2.362	22.525	6.186	7.525	SONT 15	E06
2.165	C900.3D.2165.R.15-EF	1.500	2.362	22.834	6.495	7.834	SONT 15	E06
2.203	C900.3D.2203.R.17-EF	1.500	2.362	24.987	6.609	7.987	SONT 17	E06
2.250	C900.3D.2250.R.17-EF	1.500	2.362	10.884	6.868	8.128	SONT 17	E06
2.281	C900.3D.2281.R.17-EF	1.500	2.441	25.221	6.843	8.221	SONT 17	E06
2.437	C900.3D.2437.R.17-EF	1.500	2.519	25.689	7.311	8.689	SONT 17	E06

E01	11807480	11817562	11817560
E02	11684214	11450898	11450849
E03	11684216	11690144	11114698
E04	11227305	11690146	11690140
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E06	11801441	11816987	11816974

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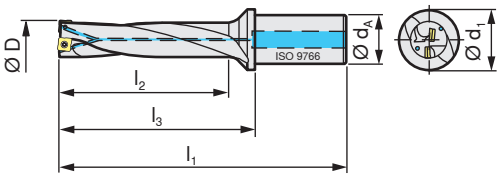

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12.5	MD900.3D.125.R.03	20	28	104	37.5	54	SONT 03..	E07
13.0	MD900.3D.130.R.03	20	28	105	39	55	SONT 03..	E07
13.5	MD900.3D.135.R.03	20	28	107	45	57	SONT 03..	E07
14.0	MD900.3D.140.R.04	20	30	109	42	59	SONT 04..	E01
14.5	MD900.3D.145.R.04	20	30	111	44	61	SONT 04..	E01
15.0	MD900.3D.150.R.04	20	30	112	45	62	SONT 04..	E01
15.5	MD900.3D.155.R.04	20	30	114	47	64	SONT 04..	E01
16.0	MD900.3D.160.R.05	20	30	115	48	65	SONT 05..	E01
16.5	MD900.3D.165.R.05	20	30	117	50	67	SONT 05..	E01
17.0	MD900.3D.170.R.05	20	30	118	51	68	SONT 05..	E01
17.5	MD900.3D.175.R.05	20	30	120	53	70	SONT 05..	E01
18.0	MD900.3D.180.R.06	25	32	128	54	72	SONT 06..	E02
18.5	MD900.3D.185.R.06	25	32	130	56	74	SONT 06..	E02
19.0	MD900.3D.190.R.06	25	32	131	57	75	SONT 06..	E02
19.5	MD900.3D.195.R.06	25	32	133	59	77	SONT 06..	E02
20.0	MD900.3D.200.R.06	25	32	134	60	78	SONT 06..	E02
20.5	MD900.3D.205.R.06	25	32	136	62	80	SONT 06..	E02
21.0	MD900.3D.210.R.07	25	32	138	63	82	SONT 07..	E02
21.5	MD900.3D.215.R.07	25	32	140	65	84	SONT 07..	E02
22.0	MD900.3D.220.R.07	25	32	141	66	85	SONT 07..	E02
22.5	MD900.3D.225.R.07	25	32	143	68	87	SONT 07..	E02
23.0	MD900.3D.230.R.07	25	32	144	69	88	SONT 07..	E02
23.5	MD900.3D.235.R.07	25	32	146	71	90	SONT 07..	E02
24.0	MD900.3D.240.R.08	32	40	155	72	95	SONT 08..	E03
24.5	MD900.3D.245.R.08	32	40	157	74	97	SONT 08..	E03
25.0	MD900.3D.250.R.08	32	40	158	75	98	SONT 08..	E03
25.5	MD900.3D.255.R.08	32	40	160	77	100	SONT 08..	E03
26.0	MD900.3D.260.R.08	32	40	161	78	101	SONT 08..	E03
26.5	MD900.3D.265.R.08	32	40	163	80	103	SONT 08..	E03
27.0	MD900.3D.270.R.08	32	40	164	81	104	SONT 08..	E03
27.5	MD900.3D.275.R.08	32	40	166	83	106	SONT 08..	E03
28.0	MD900.3D.280.R.09	32	40	167	84	107	SONT 09..	E04
28.5	MD900.3D.285.R.09	32	40	169	86	109	SONT 09..	E04
29.0	MD900.3D.290.R.09	32	40	170	87	110	SONT 09..	E04
29.5	MD900.3D.295.R.09	32	40	172	89	112	SONT 09..	E04
30.0	MD900.3D.300.R.09	32	40	173	90	113	SONT 09..	E04
30.5	MD900.3D.305.R.09	32	40	175	92	115	SONT 09..	E04
31.0	MD900.3D.310.R.09	32	40	176	93	116	SONT 09..	E04
31.5	MD900.3D.315.R.09	32	40	178	95	118	SONT 09..	E04
32.0	MD900.3D.320.R.09	32	40	179	96	119	SONT 09..	E04

E01	11807480	11817562	11817560
E02	11684214	11450898	11450849
E03	11684216	11690144	11114698
E04	11227305	11690146	11690140
E07	11807484	11817562	11817560

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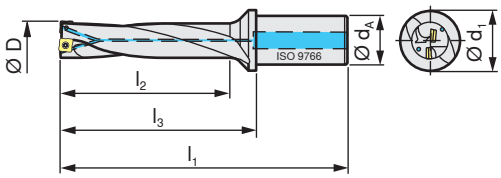

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33.0	MD900.3D.330.R.10	40	50	193	99	125	SONT 10..	E01
33.5	MD900.3D.335.R.10	40	50	195	101	127	SONT 10..	E01
34.0	MD900.3D.340.R.10	40	50	196	102	128	SONT 10..	E01
34.5	MD900.3D.345.R.10	40	50	198	104	130	SONT 10..	E01
35.0	MD900.3D.350.R.10	40	50	199	105	131	SONT 10..	E01
35.5	MD900.3D.355.R.10	40	50	201	107	133	SONT 10..	E01
36.0	MD900.3D.360.R.10	40	50	202	108	134	SONT 10..	E01
36.5	MD900.3D.365.R.10	40	50	204	110	136	SONT 10..	E01
37.0	MD900.3D.370.R.12	40	56	211	111	141	SONT 12..	E01
38.0	MD900.3D.380.R.12	40	56	214	114	144	SONT 12..	E01
39.0	MD900.3D.390.R.12	40	56	217	117	147	SONT 12..	E01
40.0	MD900.3D.400.R.12	40	56	220	120	150	SONT 12..	E01
41.0	MD900.3D.410.R.12	40	56	223	123	153	SONT 12..	E01
42.0	MD900.3D.420.R.13	40	60	229	126	159	SONT 13..	E02
43.0	MD900.3D.430.R.13	40	60	232	129	162	SONT 13..	E02
44.0	MD900.3D.440.R.13	40	60	235	132	165	SONT 13..	E02
45.0	MD900.3D.450.R.13	40	60	238	135	168	SONT 13..	E02
46.0	MD900.3D.460.R.13	40	60	241	138	171	SONT 13..	E02
47.0	MD900.3D.470.R.15	40	60	245	141	175	SONT 15..	E02
48.0	MD900.3D.480.R.15	40	60	248	144	178	SONT 15..	E02
49.0	MD900.3D.490.R.15	40	60	251	147	181	SONT 15..	E02
50.0	MD900.3D.500.R.15	40	60	254	150	184	SONT 15..	E02
51.0	MD900.3D.510.R.15	40	60	257	153	187	SONT 15..	E02
52.0	MD900.3D.520.R.15	40	60	260	156	190	SONT 15..	E02
53.0	MD900.3D.530.R.15	40	60	263	159	193	SONT 15..	E02
54.0	MD900.3D.540.R.15	40	60	266	162	196	SONT 15..	E02
55.0	MD900.3D.550.R.17	40	60	270	165	200	SONT 17..	E02
56.0	MD900.3D.560.R.17	40	60	273	168	203	SONT 17..	E02
57.0	MD900.3D.570.R.17	40	60	276	171	206	SONT 17..	E02
58.0	MD900.3D.580.R.17	40	60	279	174	209	SONT 17..	E02
59.0	MD900.3D.590.R.17	40	60	282	177	212	SONT 17..	E02
60.0	MD900.3D.600.R.17	40	62	285	180	215	SONT 17..	E02
61.0	MD900.3D.610.R.17	40	62	288	183	218	SONT 17..	E02
62.0	MD900.3D.620.R.17	40	64	291	186	221	SONT 17..	E02
63.0	MD900.3D.630.R.17	40	64	294	189	224	SONT 17..	E02

E01	11610311	11450867	11450858
E02	11801441	11816987	11816974

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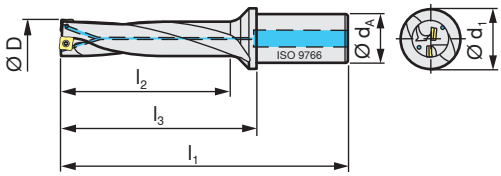

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12.5	MD900.4D.125.R.03	20	28	116	50	66	SONT 03..	E07
13.0	MD900.4D.130.R.03	20	28	118	52	68	SONT 03..	E07
13.5	MD900.4D.135.R.03	20	28	120	54	70	SONT 03..	E07
14.0	MD900.4D.140.R.04	20	30	123	56	73	SONT 04..	E02
14.5	MD900.4D.145.R.04	20	30	125	58	75	SONT 04..	E01
15.0	MD900.4D.150.R.04	20	30	127	60	77	SONT 04..	E02
15.5	MD900.4D.155.R.04	20	30	129	62	79	SONT 04..	E01
16.0	MD900.4D.160.R.05	20	30	131	64	81	SONT 05..	E02
16.5	MD900.4D.165.R.05	20	30	133	66	83	SONT 05..	E01
17.0	MD900.4D.170.R.05	20	30	135	68	85	SONT 05..	E02
17.5	MD900.4D.175.R.05	20	30	137	70	87	SONT 05..	E01
18.0	MD900.4D.180.R.06	25	32	146	72	90	SONT 06..	E03
18.5	MD900.4D.185.R.06	25	32	148	74	92	SONT 06..	E02
19.0	MD900.4D.190.R.06	25	32	150	76	94	SONT 06..	E03
19.5	MD900.4D.195.R.06	25	32	152	78	96	SONT 06..	E02
20.0	MD900.4D.200.R.06	25	32	154	80	98	SONT 06..	E03
20.5	MD900.4D.205.R.06	25	32	156	82	100	SONT 06..	E02
21.0	MD900.4D.210.R.07	25	40	159	84	103	SONT 07..	E03
22.0	MD900.4D.220.R.07	25	40	163	88	107	SONT 07..	E03
23.0	MD900.4D.230.R.07	25	40	167	92	111	SONT 07..	E03
24.0	MD900.4D.240.R.08	32	40	179	96	119	SONT 08..	E04
25.0	MD900.4D.250.R.08	32	40	183	100	123	SONT 08..	E04
26.0	MD900.4D.260.R.08	32	40	187	104	127	SONT 08..	E04
27.0	MD900.4D.270.R.08	32	40	191	108	131	SONT 08..	E04
28.0	MD900.4D.280.R.09	32	40	195	112	135	SONT 09..	E05
29.0	MD900.4D.290.R.09	32	40	199	116	139	SONT 09..	E05
30.0	MD900.4D.300.R.09	32	40	203	120	143	SONT 09..	E05
31.0	MD900.4D.310.R.09	32	40	207	124	147	SONT 09..	E05
32.0	MD900.4D.320.R.09	32	40	211	128	151	SONT 09..	E05
33.0	MD900.4D.330.R.10	40	50	226	132	159	SONT 10..	E06
34.0	MD900.4D.340.R.10	40	50	230	136	162	SONT 10..	E06
35.0	MD900.4D.350.R.10	40	50	234	140	166	SONT 10..	E06
36.0	MD900.4D.360.R.10	40	50	238	144	170	SONT 10..	E06

E01	11807480	11817562	11817560
E02	11684214	11450898	11450849
E03	11684216	11690144	11114698
E04	11227305	11690146	11690140
E05	11610311	11450867	11450858
E07	11807484	11817562	11817560

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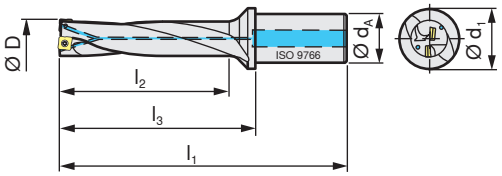

D [mm]	Type, description	d_A [mm]	d_1 [mm]	l_1 [mm]	l_2 [mm]	l_3 [mm]		
37.0	MD900.4D.370.R.12	40	56	248	148	178	SONT 12..	E01
38.0	MD900.4D.380.R.12	40	56	252	152	182	SONT 12..	E01
39.0	MD900.4D.390.R.12	40	56	256	156	186	SONT 12..	E01
40.0	MD900.4D.400.R.12	40	56	260	160	190	SONT 12..	E01
41.0	MD900.4D.410.R.12	40	56	264	164	194	SONT 12..	E01
42.0	MD900.4D.420.R.13	40	60	271	168	201	SONT 13..	E02
43.0	MD900.4D.430.R.13	40	60	275	172	205	SONT 13..	E02
44.0	MD900.4D.440.R.13	40	60	279	176	209	SONT 13..	E02
45.0	MD900.4D.450.R.13	40	60	283	180	213	SONT 13..	E02
46.0	MD900.4D.460.R.13	40	60	287	184	217	SONT 13..	E02
47.0	MD900.4D.470.R.15	40	60	292	188	222	SONT 15..	E02
48.0	MD900.4D.480.R.15	40	60	296	192	226	SONT 15..	E02
49.0	MD900.4D.490.R.15	40	60	300	196	230	SONT 15..	E02
50.0	MD900.4D.500.R.15	40	60	304	200	234	SONT 15..	E02
51.0	MD900.4D.510.R.15	40	60	308	204	238	SONT 15..	E02
52.0	MD900.4D.520.R.15	40	60	312	208	242	SONT 15..	E02
53.0	MD900.4D.530.R.15	40	60	316	212	246	SONT 15..	E02
54.0	MD900.4D.540.R.15	40	60	320	216	250	SONT 15..	E02

E01	11610311	11450867	11450858
E02	11801441	11816987	11816974

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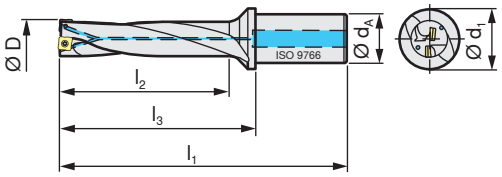

D [in]	Type, description	d_A [in]	d_1 [in]	l_1 [in]	l_2 [in]	l_3 [in]		
0.562	C900.5D.0562.R.04-EF	0.750	1.181	5.389	2.849	3.420	SONT 04	E01
0.594	C900.5D.0594.R.04-EF	0.750	1.181	7.580	2.970	3.580	SONT 04	E01
0.625	C900.5D.0625.R.04-EF	0.750	1.181	5.704	3.164	3.735	SONT 04	E01
0.656	C900.5D.0656.R.05-EF	0.750	1.181	8.910	3.280	3.910	SONT 05	E01
0.687	C900.5D.0687.R.05-EF	0.750	1.181	6.014	3.494	4.045	SONT 05	E01
0.709	C900.5D.0709.R.06-EF	1.000	1.260	10.214	3.545	4.214	SONT 06	E02
0.750	C900.5D.0750.R.06-EF	1.000	1.260	6.624	3.829	4.419	SONT 06	E02
0.765	C900.5D.0765.R.06-EF	1.000	1.260	10.494	3.825	4.494	SONT 06	E02
0.787	C900.5D.0787.R.06-EF	1.000	1.260	10.604	3.935	4.604	SONT 06	E02
0.812	C900.5D.0812.R.06-EF	1.000	1.260	6.851	4.119	4.647	SONT 06	E02
0.827	C900.5D.0827.R.07-EF	1.000	1.260	11.883	4.135	4.883	SONT 07	E02
0.843	C900.5D.0843.R.07-EF	1.000	1.260	11.963	4.215	4.963	SONT 07	E02
0.875	C900.5D.0875.R.07-EF	1.000	1.260	7.328	4.454	5.123	SONT 07	E02
0.906	C900.5D.0906.R.07-EF	1.000	1.260	12.278	4.530	5.278	SONT 07	E02
0.984	C900.5D.0984.R.08-EF	1.250	1.575	13.826	4.920	5.826	SONT 08	E03
1.000	C900.5D.1000.R.08-EF	1.250	1.575	8.268	5.118	5.906	SONT 08	E03
1.062	C900.5D.1062.R.08-EF	1.250	1.575	14.216	5.310	6.216	SONT 08	E03
1.109	C900.5D.1109.R.09-EF	1.250	1.575	15.411	5.545	6.411	SONT 09	E04
1.125	C900.5D.1125.R.09-EF	1.250	1.575	8.853	5.704	6.491	SONT 09	E04
1.156	C900.5D.1156.R.09-EF	1.250	1.575	15.646	5.780	6.646	SONT 09	E04
1.187	C900.5D.1187.R.09-EF	1.250	1.575	9.163	6.014	6.801	SONT 09	E04
1.218	C900.5D.1218.R.09-EF	1.250	1.575	15.956	6.090	6.956	SONT 09	E04
1.250	C900.5D.1250.R.09-EF	1.250	1.575	9.478	6.329	7.116	SONT 09	E04
1.281	C900.5D.1281.R.10-EF	1.500	1.969	17.429	6.405	7.429	SONT 10	E05
1.312	C900.5D.1312.R.10-EF	1.500	1.969	10.340	6.678	7.584	SONT 10	E05
1.328	C900.5D.1328.R.10-EF	1.500	1.969	17.664	6.640	7.664	SONT 10	E05
1.375	C900.5D.1375.R.10-EF	1.500	1.969	10.655	6.993	7.899	SONT 10	E05
1.406	C900.5D.1406.R.10-EF	1.500	1.969	18.054	7.030	8.054	SONT 10	E05
1.437	C900.5D.1437.R.10-EF	1.500	1.969	10.965	7.303	8.209	SONT 10	E05
1.469	C900.5D.1469.R.12-EF	1.500	2.205	20.526	7.345	8.526	SONT 12	E05
1.500	C900.5D.1500.R.12-EF	1.500	2.205	11.437	7.618	8.681	SONT 12	E05
1.531	C900.5D.1531.R.12-EF	1.500	2.205	20.836	7.655	8.836	SONT 12	E05
1.562	C900.5D.1562.R.12-EF	1.500	2.205	11.747	7.928	8.991	SONT 12	E05
1.625	C900.5D.1625.R.12-EF	1.500	2.205	12.062	8.243	9.306	SONT 12	E05

E01	11807480	11817562	11817560
E02	11684214	11450898	11450849
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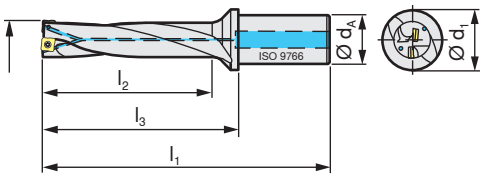

D [mm]	Type, description	d_A [mm]	d_1 [mm]	l_1 [mm]	l_2 [mm]	l_3 [mm]		
12.0	MD900.5D.120.R.03	20	28	126	60	76	SONT 03..	E07
12.5	MD900.5D.125.R.03	20	28	128	62.5	78	SONT 03..	E07
13.0	MD900.5D.130.R.03	20	28	131	65	81	SONT 03..	E07
13.5	MD900.5D.135.R.03	20	28	132	67.5	82	SONT 03..	E07
14.0	MD900.5D.140.R.04	20	30	137	70	87	SONT 04..	E01
14.5	MD900.5D.145.R.04	20	30	139	72.5	89	SONT 04..	E01
15.0	MD900.5D.150.R.04	20	30	142	75	92	SONT 04..	E01
15.5	MD900.5D.155.R.04	20	30	144	77.5	95	SONT 04..	E01
16.0	MD900.5D.160.R.05	20	30	147	80	97	SONT 05..	E01
16.5	MD900.5D.165.R.05	20	30	149	82.5	99	SONT 05..	E01
17.0	MD900.5D.170.R.05	20	30	152	85	102	SONT 05..	E01
17.5	MD900.5D.175.R.05	20	30	154	87.5	104	SONT 05..	E01
18.0	MD900.5D.180.R.06	25	32	164	90	108	SONT 06..	E02
18.5	MD900.5D.185.R.06	25	32	166	92.5	110	SONT 06..	E02
19.0	MD900.5D.190.R.06	25	32	169	95	113	SONT 06..	E02
19.5	MD900.5D.195.R.06	25	32	171	97.5	115	SONT 06..	E02
20.0	MD900.5D.200.R.06	25	32	174	100	118	SONT 06..	E02
20.5	MD900.5D.205.R.06	25	32	175	102.5	119	SONT 06..	E02
21.0	MD900.5D.210.R.07	25	32	180	105	124	SONT 07..	E02
22.0	MD900.5D.220.R.07	25	32	184	110	128	SONT 07..	E02
23.0	MD900.5D.230.R.07	25	32	189	115	133	SONT 07..	E02
24.0	MD900.5D.240.R.08	32	40	203	120	143	SONT 08..	E03
25.0	MD900.5D.250.R.08	32	40	208	125	148	SONT 08..	E03
26.0	MD900.5D.260.R.08	32	40	212	130	152	SONT 08..	E03
27.0	MD900.5D.270.R.08	32	40	217	135	157	SONT 08..	E03
28.0	MD900.5D.280.R.09	32	40	221	140	161	SONT 09..	E04
29.0	MD900.5D.290.R.09	32	40	226	145	166	SONT 09..	E04
30.0	MD900.5D.300.R.09	32	40	230	150	170	SONT 09..	E04
31.0	MD900.5D.310.R.09	32	40	235	155	175	SONT 09..	E04
32.0	MD900.5D.320.R.09	32	40	239	160	179	SONT 09..	E04
33.0	MD900.5D.330.R.10	40	50	259	165	191	SONT 10..	E05
34.0	MD900.5D.340.R.10	40	50	264	170	196	SONT 10..	E05
35.0	MD900.5D.350.R.10	40	50	269	175	201	SONT 10..	E05
36.0	MD900.5D.360.R.10	40	50	274	180	206	SONT 10..	E05
37.0	MD900.5D.370.R.12	40	56	285	185	215	SONT 12..	E05
38.0	MD900.5D.380.R.12	40	56	290	190	220	SONT 12..	E05
39.0	MD900.5D.390.R.12	40	56	295	195	225	SONT 12..	E05
40.0	MD900.5D.400.R.12	40	56	300	200	230	SONT 12..	E05
41.0	MD900.5D.410.R.12	40	56	305	205	235	SONT 12..	E05

E01	11807480	11817562	11817560
E02	11684214	11450898	11450849
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You know the drill.

Now find the right speed and feed, coolant pressure and machining formula for the results you need. It's all here.

Questions? Call the experts at CERATIZIT. We'll have you running smoothly in no time.

	Work piece material	Type of treatment / alloy		VDI 3323 group	Hardness HB
A	Non alloyed steel	annealed	≤ .15% C	1	125
		annealed	.15% - .45% C	2	150 - 250
		tempered	≥ .45% C	3	300
	Low alloyed steel	annealed		6	180
		tempered		7 / 8	250 - 300
		tempered		9	350
	High alloyed steel	annealed		10	200
		tempered		11	350
	Corrosion-resistant steel	annealed	ferritic	12	200
		tempered	martensitic	13	325
R	Stainless steel	annealed	ferritic / martensitic	14	200
		quenched	austenitic	14	180
		quenched	duplex	14	230 - 260
		hardened	martensitic / austenitic	14	330
F	Grey cast iron		pearlitic / ferritic	15	180
			pearlitic / martensitic	16	260
	Spheroidal cast iron		ferritic	17	160
			pearlitic	18	–
	Malleable cast iron		ferritic	19	130
			pearlitic	20	230
N	Aluminum wrought alloys	non hardened		21	60
		hardened		22	100
	Aluminum cast alloys	non hardened	< 12% Si	23	80
		hardened	< 12% Si	24	90
		non hardened	> 12% Si	25	130
	Copper and copper alloys (bronze, brass)		machining alloy stock (1% Pb)	26	–
			brass, red bronze	27	90
			bronze	28	100
			lead-free copper and electrolytic copper	29	100
	Non-metallic materials		thermosetting plastics	29	–
			fiber-reinforced plastics	29	–
			hard rubber	30	–
S	Heat-resistant alloys	annealed	Fe-base	31	200
		hardened	Fe-base	32	280
		annealed	Ni or Co-base	33	250
		hardened	Ni or Co-base 30 - 58 HRC	34	–
		cast	Ni or Co-base 1500 - 2200 N/mm²	35	–
	Titanium alloys		pure titanium	36	R_m 440*
			alpha + beta alloys	37	R_m 1050*
H	Tempered steel	hardened and tempered		38	55 HRC
		hardened and tempered		39	60 HRC
	Chilled castings	cast		40	400
	Tempered cast iron	hardened and tempered		40	55 HRC

* R_m = ultimate tensile strength, measured in MPa

Coated carbide CTCP420 DRAGONSKIN		Coated carbide CTPP430 DRAGONSKIN	
V_c (ft/min)	V_c (m/min)	V_c (ft/min)	V_c (m/min)
670-1140	220-360	560-950	180-300
420-935	170-300	350-780	140-250
420-935	170-300	350-780	140-250
625-1090	200-335	520-910	160-280
490-815	160-265	410-680	130-220
400-790	120-240	330-660	100-200
400-790	130-240	350-660	110-200
400-620	120-240	330-515	100-160
450-990	145-300	380-820	120-250
300-575	100-180	250-480	80-150
400-615	120-240	330-510	100-160
400-615	120-220	330-510	100-180
300-540	100-170	250-450	80-140
300-540	100-170	250-450	80-140
450-770	145-240	380-640	120-200
400-690	120-220	330-575	100-180
450-770	145-240	380-640	120-200
400-690	120-220	330-576	100-180
400-615	100-240	250-510	80-160
270-575	85-180	225-480	70-150
575-1900	180-600	480-1600	150-500
575-1725	180-540	480-1440	150-450
575-1350	180-420	480-1120	150-350
575-1150	180-360	480-960	150-300
575-960	180-300	480-800	150-250
575-960	180-420	480-800	150-350
575-960	180-420	480-800	150-350
575-1350	180-420	480-1120	150-350
770-1535	240-480	640-1280	200-400
190-575	60-180	160-480	50-150
190-540	60-170	160-450	50-140
300-770	100-240	250-640	80-200
80-400	25-100	65-250	20-80
80-400	25-100	65-250	20-80
80-400	25-100	65-250	20-80
80-400	25-100	65-250	20-80
80-400	25-100	65-250	20-80
155-400	50-120	130-330	40-100
155-400	50-120	130-330	40-100
–	–	–	–
–	–	–	–
–	–	–	–
–	–	–	–

	Work piece material	Type of treatment / alloy		VDI 3323 group	Hardness HB
A	Non alloyed steel	annealed	≤ .15% C	1	125
		annealed	.15% - .45% C	2	150 - 250
		tempered	≥ .45% C	3	300
	Low alloyed steel	annealed		6	180
		tempered		7 / 8	250 - 300
		tempered		9	350
	High alloyed steel	annealed		10	200
		tempered		11	350
	Corrosion-resistant steel	annealed	ferritic	12	200
		tempered	martensitic	13	325
R	Stainless steel	annealed	ferritic / martensitic	14	200
		quenched	austenitic	14	180
		quenched	duplex	14	230 - 260
		hardened	martensitic / austenitic	14	330
F	Grey cast iron		pearlitic / ferritic	15	180
			pearlitic / martensitic	16	260
	Spheroidal cast iron		ferritic	17	160
			pearlitic	18	–
	Malleable cast iron		ferritic	19	130
			pearlitic	20	230
N	Aluminum wrought alloys	non hardened		21	60
		hardened		22	100
	Aluminum cast alloys	non hardened	< 12% Si	23	80
		hardened	< 12% Si	24	90
		non hardened	> 12% Si	25	130
	Copper and copper alloys (bronze, brass)		machining alloy stock (1% Pb)	26	–
			brass, red bronze	27	90
			bronze	28	100
			lead-free copper and electrolytic copper	29	100
	Non-metallic materials		thermosetting plastics	29	–
			fiber-reinforced plastics	29	–
			hard rubber	30	–
S	Heat-resistant alloys	annealed	Fe-base	31	200
		hardened	Fe-base	32	280
		annealed	Ni or Co-base	33	250
		hardened	Ni or Co-base 30 - 58 HRC	34	–
		cast	Ni or Co-base 1500 - 2200 N/mm²	35	–
	Titanium alloys		pure titanium	36	R_m 440*
			alpha + beta alloys	37	R_m 1050*
H	Tempered steel	hardened and tempered		38	55 HRC
		hardened and tempered		39	60 HRC
	Chilled castings	cast		40	400
	Tempered cast iron	hardened and tempered		40	55 HRC

* R_m = ultimate tensile strength, measured in MPa

SONT 04 Ø.625 f [in/rev]	SONT 05	SONT 06 Ø.750-.812 f [in/rev]	SONT 07 Ø.843-.875 f [in/rev]	SONT 08 Ø.937-1.000 f [in/rev]	SONT 09 Ø1.109-1.250 f [in/rev]	SONT 10 Ø1.281-1.406 f [in/rev]	SONT 12 Ø1.469-1.625 f [in/rev]	SONT 13 Ø1.656-1.781 f [in/rev]	SONT 15 Ø1.875-2.165 f [in/rev]	SONT 17 Ø2.203-2.437 f [in/rev]
.0015-.0050	n/a	.0019-.0060	.0027-.0058	.0031-.0066	.0031-.0070	.0035-.0074	.0035-.0074	.0035-.0078	.0039-.0086	.0039-.0086
.0015-.0058	n/a	.0019-.0062	.0027-.0066	.0031-.0074	.0031-.0078	.0035-.0082	.0035-.0086	.0035-.0094	.0039-.0101	.0039-.0101
.0015-.0062	n/a	.0019-.0070	.0031-.0078	.0035-.0086	.0035-.0090	.0039-.0093	.0039-.0097	.0039-.0105	.0039-.0117	.0039-.0117
.0015-.0066	n/a	.0019-.0078	.0031-.0086	.0035-.0090	.0035-.0093	.0039-.0097	.0039-.0105	.0039-.0117	.0039-.0125	.0039-.0125
.0015-.0062	n/a	.0019-.0078	.0031-.0078	.0035-.0082	.0035-.0086	.0039-.0090	.0039-.0097	.0039-.0109	.0039-.0117	.0039-.0117
.0015-.0062	n/a	.0019-.0078	.0031-.0078	.0035-.0082	.0035-.0086	.0039-.0090	.0039-.0097	.0039-.0105	.0039-.0113	.0039-.0113
.0015-.0058	n/a	.0019-.0078	.0031-.0078	.0035-.0082	.0035-.0086	.0039-.0090	.0039-.0097	.0039-.0105	.0039-.0113	.0039-.0113
.0015-.0058	n/a	.0019-.0078	.0031-.0078	.0035-.0082	.0035-.0086	.0039-.0090	.0039-.0097	.0039-.0105	.0039-.0113	.0039-.0113
.0015-.0050	n/a	.0019-.0060	.0031-.0058	.0031-.0066	.0031-.0070	.0035-.0074	.0039-.0082	.0039-.0090	.0039-.0090	.0039-.0090
.0015-.0050	n/a	.0019-.0060	.0031-.0058	.0031-.0066	.0031-.0070	.0035-.0074	.0039-.0082	.0039-.0090	.0039-.0090	.0039-.0090
.0015-.0047	n/a	.0019-.0050	.0019-.0062	.0019-.0070	.0027-.0070	.0031-.0082	.0039-.0090	.0039-.0090	.0039-.0090	.0039-.0090
.0015-.0043	n/a	.0019-.0047	.0019-.0058	.0023-.0062	.0027-.0070	.0031-.0078	.0039-.0086	.0039-.0086	.0039-.0086	.0039-.0086
.0015-.0039	n/a	.0019-.0047	.0019-.0058	.0023-.0058	.0027-.0062	.0031-.0078	.0031-.0078	.0031-.0078	.0031-.0078	.0031-.0078
.0015-.0039	n/a	.0019-.0047	.0019-.0054	.0019-.0058	.0023-.0058	.0027-.0074	.0031-.0078	.0031-.0078	.0031-.0078	.0031-.0078
.0027-.0078	n/a	.0031-.0094	.0039-.0097	.0039-.0110	.0039-.0110	.0039-.0117	.0039-.0125	.0039-.0125	.0039-.0132	.0039-.0132
.0027-.0074	n/a	.0031-.0086	.0039-.0093	.0039-.0101	.0039-.0110	.0039-.0110	.0039-.0117	.0039-.0117	.0039-.0125	.0039-.0125
.0027-.0078	n/a	.0031-.0086	.0039-.0097	.0039-.0110	.0039-.0110	.0039-.0110	.0039-.0117	.0039-.0117	.0039-.0125	.0039-.0125
.0027-.0070	n/a	.0031-.0078	.0039-.0093	.0039-.0097	.0039-.0097	.0039-.0097	.0039-.0105	.0039-.0105	.0039-.0113	.0039-.0113
.0027-.0078	n/a	.0031-.0082	.0039-.0097	.0039-.0110	.0039-.0110	.0039-.0117	.0039-.0125	.0039-.0125	.0039-.0132	.0039-.0132
.0023-.0074	n/a	.0031-.0082	.0039-.0097	.0039-.0110	.0039-.0110	.0039-.0117	.0039-.0125	.0039-.0125	.0039-.0132	.0039-.0132
.0023-.0047	n/a	.0031-.0058	.0039-.0058	.0039-.0058	.0039-.0066	.0039-.0070	.0039-.0070	.0039-.0070	.0039-.0070	.0039-.0070
.0023-.0050	n/a	.0031-.0058	.0039-.0058	.0039-.0058	.0039-.0066	.0039-.0074	.0039-.0078	.0039-.0078	.0039-.0078	.0039-.0078
.0023-.0047	n/a	.0031-.0058	.0039-.0070	.0039-.0070	.0039-.0074	.0039-.0074	.0039-.0078	.0039-.0078	.0039-.0078	.0039-.0078
.0023-.0047	n/a	.0031-.0058	.0039-.0070	.0039-.0070	.0039-.0074	.0039-.0090	.0039-.0097	.0039-.0097	.0039-.0097	.0039-.0097
.0023-.0047	n/a	.0031-.0058	.0050-.0078	.0051-.0078	.0051-.0086	.0039-.0097	.0051-.0097	.0051-.0097	.0051-.0097	.0051-.0097
.0023-0050	n/a	.0031-.0058	.0039-.0062	.0039-.0062	.0039-.0066	.0039-.0070	.0039-.0074	.0039-.0074	.0039-.0074	.0039-.0074
.0023-.0058	n/a	.0031-.0070	.0039-.0070	.0039-.0070	.0039-.0078	.0039-.0090	.0039-.0097	.0039-.0097	.0039-.0097	.0039-.0097
.0023-.0058	n/a	.0031-.0070	.0039-.0070	.0039-.0070	.0039-.0078	.0039-.0090	.0039-.0097	.0039-.0097	.0039-.0097	.0039-.0097
.0023-.0054	n/a	.0031-.0062	.0039-.0062	.0039-.0062	.0039-.0066	.0039-.0074	.0039-.0078	.0039-.0078	.0039-.0078	.0039-.0078
.0016-.0035	n/a	.0019-.0039	.0019-.0046	.0019-.0047	.0019-.0047	.0019-.0047	.0019-.0047	.0019-.0047	.0019-.0047	.0019-.0047
.0023-.0054	n/a	.0031-.0058	.0039-.0062	.0039-.0062	.0039-.0062	.0039-.0062	.0039-.0070	.0039-.0070	.0039-.0070	.0039-.0070
.0019-.0039	n/a	.0023-.0047	.0031-.0054	.0031-.0054	.0031-.0054	.0031-.0054	.0039-.0058	.0039-.0058	.0039-.0058	.0039-.0058
.0012-.0027	n/a	.0015-.0031	.0019-.0031	.0019-.0039	.0019-.0039	.0019-.0047	.0019-.0047	.0019-.0047	.0023-.0058	.0023-.0058
.0012-.0027	n/a	.0015-.0031	.0019-.0031	.0019-.0039	.0019-.0039	.0019-.0047	.0019-.0047	.0019-.0047	.0023-.0058	.0023-.0058
.0012-.0027	n/a	.0015-.0031	.0019-.0031	.0019-.0039	.0019-.0039	.0019-.0047	.0019-.0047	.0019-.0047	.0023-.0058	.0023-.0058
.0012-.0027	n/a	.0015-.0031	.0019-.0031	.0019-.0039	.0019-.0039	.0019-.0047	.0019-.0047	.0019-.0047	.0023-.0058	.0023-.0058
.0012-.0027	n/a	.0015-.0031	.0019-.0031	.0019-.0039	.0019-.0039	.0019-.0047	.0019-.0047	.0019-.0047	.0023-.0058	.0023-.0058
.0015-.0039	n/a	.0015-.0039	.0019-.0047	.0023-.0047	.0027-.0058	.0027-.0058	.0031-.0062	.0031-.0062	.0031-.0070	.0031-.0070
.0015-.0039	n/a	.0015-.0039	.0019-.0047	.0023-.0047	.0027-.0058	.0027-.0058	.0031-.0062	.0031-.0062	.0031-.0070	.0031-.0070
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Work piece material		Type of treatment / alloy		VDI 3323 group	Hardness HB
A	Non alloyed steel	annealed	≤ .15% C	1	125
		annealed	.15% - .45% C	2	150 - 250
		tempered	≥ .45% C	3	300
	Low alloyed steel	annealed		6	180
		tempered		7 / 8	250 - 300
		tempered		9	350
	High alloyed steel	annealed		10	200
		tempered		11	350
	Corrosion-resistant steel	annealed	ferritic	12	200
		tempered	martensitic	13	325
R	Stainless steel	annealed	ferritic / martensitic	14	200
		quenched	austenitic	14	180
		quenched	duplex	14	230 - 260
		hardened	martensitic / austenitic	14	330
F	Grey cast iron		pearlitic / ferritic	15	180
			pearlitic / martensitic	16	260
	Spheroidal cast iron		ferritic	17	160
			pearlitic	18	–
	Malleable cast iron		ferritic	19	130
			pearlitic	20	230
N	Aluminum wrought alloys	non hardened		21	60
		hardened		22	100
	Aluminum cast alloys	non hardened	< 12% Si	23	80
		hardened	< 12% Si	24	90
		non hardened	> 12% Si	25	130
	Copper and copper alloys (bronze, brass)		machining alloy stock (1% Pb)	26	–
			brass, red bronze	27	90
			bronze	28	100
			lead-free copper and electrolytic copper	29	100
	Non-metallic materials		thermosetting plastics	29	–
			fiber-reinforced plastics	29	–
			hard rubber	30	–
S	Heat-resistant alloys	annealed	Fe-base	31	200
		hardened	Fe-base	32	280
		annealed	Ni or Co-base	33	250
		hardened	Ni or Co-base 30 - 58 HRC	34	–
		cast	Ni or Co-base 1500 - 2200 N/mm²	35	–
	Titanium alloys		pure titanium	36	R_m 440*
			alpha + beta alloys	37	R_m 1050*
H	Tempered steel	hardened and tempered		38	55 HRC
		hardened and tempered		39	60 HRC
	Chilled castings	cast		40	400
	Tempered cast iron	hardened and tempered		40	55 HRC

* R_m = ultimate tensile strength, measured in MPa

SONT 03/04 Ø12-15.5 f [mm/rev]	SONT 05 Ø16-17.5 f [mm/rev]	SONT 06 Ø18-20.5 f [mm/rev]	SONT 07 Ø21-23.5 f [mm/rev]	SONT 08 Ø24-27.5 f [mm/rev]	SONT 09 Ø28-32 f [mm/rev]	SONT 10 Ø32.5-36.5 f [mm/rev]	SONT 12 Ø37-41 f [mm/rev]	SONT 13 Ø42-46 f [mm/rev]	SONT 15 Ø47-54 f [mm/rev]	SONT 17 Ø55-63 f [mm/rev]
.04-.13	.04-.14	.05-.15	.07-.15	.08-.17	.08-.18	.09-.19	.09-.19	.09-.20	.10-.22	.10-.22
.04-.15	.04-.15	.05-.16	.07-.17	.08-.19	.08-.20	.09-.21	.09-.22	.09-.24	.10-.26	.10-.26
.04-.16	.05-.17	.05-.18	.08-.20	.09-.22	.09-.23	.10-.24	.10-.25	.10-.27	.10-.30	.10-.30
.04-.17	.05-.18	.05-.20	.08-.22	.09-.23	.09-.24	.10-.25	.10-.27	.10-.30	.10-.32	.10-.32
.04-.16	.04-.17	.05-.18	.08-.20	.09-.21	.09-.22	.10-.23	.10-.25	.10-.28	.10-.30	.10-.30
.04-.16	.04-.17	.05-.18	.08-.20	.09-.21	.09-.22	.10-.23	.10-.25	.10-.27	.10-.29	.10-.29
.04-.15	.05-.16	.05-.18	.08-.20	.09-.21	.09-.22	.10-.23	.10-.25	.10-.27	.10-.29	.10-.29
.04-.15	.05-.16	.05-.18	.08-.20	.09-.21	.09-.22	.10-.23	.10-.25	.10-.27	.10-.29	.10-.29
.04-.13	.05-.14	.05-.15	.08-.15	.08-.17	.08-.18	.09-.19	.10-.21	.10-.23	.10-.23	.10-.23
.04-.13	.05-.14	.05-.15	.08-.15	.08-.17	.08-.18	.09-.19	.10-.21	.10-.23	.10-.23	.10-.23
.04-.12	.04-.13	.05-.14	.05-.16	.05-.18	.07-.18	.08-.21	.10-.23	.10-.23	.10-.23	.10-.23
.04-.11	.04-.12	.05-.13	.05-.15	.06-.16	.07-.16	.08-.20	.10-.22	.10-.22	.10-.22	.10-.22
.04-.10	.04-.11	.05-.13	.05-.15	.06-.15	.07-.16	.08-.20	.08-.20	.08-.20	.08-.20	.08-.20
.04-.10	.04-.11	.05-.12	.05-.14	.05-.15	.06-.15	.07-.19	.08-.20	.08-.20	.08-.20	.08-.20
.07-.20	.07-.22	.08-.24	.10-.25	.1-.28	.1-.28	.1-.30	.1-.32	.1-.32	.1-.34	.1-.34
.07-.19	.07-.20	.08-.22	.10-.24	.1-.26	.1-.26	.1-.28	.1-.30	.1-.30	.1-.32	.1-.32
.07-.20	.07-.20	.08-.22	.10-.25	.1-.28	.1-.28	.1-.28	.1-.30	.1-.30	.1-.32	.1-.32
.07-.18	.07-.18	.08-.20	.10-.23	.1-.25	.1-.25	.1-.25	.1-.27	.1-.27	.1-.29	.1-.29
.07-.19	.07-.20	.08-.21	.10-.25	.1-.28	.1-.28	.1-.30	.1-.32	.1-.32	.1-.34	.1-.34
.07-.19	.07-.20	.08-.21	.10-.25	.1-.28	.1-.28	.1-.30	.1-.32	.1-.32	.1-.34	.1-.34
.06-.12	.07-.14	.08-.15	.10-.15	.10-.15	.10-.17	.10-.18	.10-.18	.10-.18	.10-.18	.10-.18
.06-.13	.07-.14	.08-.15	.10-.15	.10-.15	.10-.17	.10-.19	.10-.20	.10-.20	.10-.20	.10-.20
.06-.12	.07-.14	.08-.15	.10-.18	.10-.18	.10-.19	.10-.19	.10-.20	.10-.20	.10-.20	.10-.20
.06-.12	.07-.14	.08-.15	.10-.18	.10-.18	.10-.19	.10-.23	.10-.25	.10-.25	.10-.25	.10-.25
.06-.12	.07-.14	.08-.15	.13-.20	.13-.20	.13-.22	.13-.25	.13-.25	.13-.25	.13-.25	.13-.25
.06-.13	.07-.14	.08-.15	.10-.16	.10-.16	.10-.17	.10-.18	.10-.19	.10-.19	.10-.19	.10-.19
.06-.15	.07-.16	.08-.18	.10-.18	.10-.18	.10-.20	.10-.23	.10-.25	.10-.25	.10-.25	.10-.25
.06-.15	.07-.16	.08-.18	.10-.18	.10-.18	.10-.20	.10-.23	.10-.25	.10-.25	.10-.25	.10-.25
.06-.14	.07-.15	.08-.16	.10-.16	.10-.16	.10-.17	.10-.19	.10-.20	.10-.20	.10-.20	.10-.20
.04-.09	.04-.10	.05-.10	.05-.12	.05-.12	.05-.12	.05-.12	.05-.12	.05-.12	.05-.12	.05-.12
.06-.14	.07-.14	.08-.15	.10-.16	.10-.16	.10-.16	.10-.16	.10-.18	.10-.18	.10-.18	.10-.18
.05-.10	.05-.10	.06-.12	.08-.14	.08-.14	.08-.14	.08-.14	.10-.15	.10-.15	.10-.15	.10-.15
.03-.07	.04-.08	.04-.08	.05-.08	.05-.10	.05-.10	.05-.12	.05-.12	.05-.12	.06-.15	.06-.15
.03-.07	.04-.08	.04-.08	.05-.08	.05-.10	.05-.10	.05-.12	.05-.12	.05-.12	.06-.15	.06-.15
.03-.07	.04-.08	.04-.08	.05-.08	.05-.10	.05-.10	.05-.12	.05-.12	.05-.12	.06-.15	.06-.15
.03-.07	.04-.08	.04-.08	.05-.08	.05-.10	.05-.10	.05-.12	.05-.12	.05-.12	.06-.15	.06-.15
.03-.07	.04-.08	.04-.08	.05-.08	.05-.10	.05-.10	.05-.12	.05-.12	.05-.12	.06-.15	.06-.15
.04-.10	.04-.10	.05-.10	.05-.12	.06-.12	.07-.15	.07-.15	.08-.16	.08-.16	.08-.18	.08-.18
.04-.10	.04-.10	.05-.10	.05-.12	.06-.12	.07-.15	.07-.15	.08-.16	.08-.16	.08-.18	.08-.18
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	Work piece material	Type of treatment / alloy		VDI 3323 group	Hardness HB
A	Non alloyed steel	annealed	≤ .15% C	1	125
		annealed	.15% - .45% C	2	150 - 250
		tempered	≥ .45% C	3	300
	Low alloyed steel	annealed		6	180
		tempered		7 / 8	250 - 300
		tempered		9	350
	High alloyed steel	annealed		10	200
		tempered		11	350
	Corrosion-resistant steel	annealed	ferritic	12	200
		tempered	martensitic	13	325
R	Stainless steel	annealed	ferritic / martensitic	14	200
		quenched	austenitic	14	180
		quenched	duplex	14	230 - 260
		hardened	martensitic / austenitic	14	330
F	Grey cast iron		pearlitic / ferritic	15	180
			pearlitic / martensitic	16	260
	Spheroidal cast iron		ferritic	17	160
			pearlitic	18	–
	Malleable cast iron		ferritic	19	130
			pearlitic	20	230
N	Aluminum wrought alloys	non hardened		21	60
		hardened		22	100
	Aluminum cast alloys	non hardened	< 12% Si	23	80
		hardened	< 12% Si	24	90
		non hardened	> 12% Si	25	130
	Copper and copper alloys (bronze, brass)		machining alloy stock (1% Pb)	26	–
			brass, red bronze	27	90
			bronze	28	100
			lead-free copper and electrolytic copper	29	100
	Non-metallic materials		thermosetting plastics	29	–
			fiber-reinforced plastics	29	–
			hard rubber	30	–
S	Heat-resistant alloys	annealed	Fe-base	31	200
		hardened	Fe-base	32	280
		annealed	Ni or Co-base	33	250
		hardened	Ni or Co-base 30 - 58 HRC	34	–
		cast	Ni or Co-base 1500 - 2200 N/mm²	35	–
	Titanium alloys		pure titanium	36	R_m 440*
			alpha + beta alloys	37	R_m 1050*
H	Tempered steel	hardened and tempered		38	55 HRC
		hardened and tempered		39	60 HRC
	Chilled castings	cast		40	400
	Tempered cast iron	hardened and tempered		40	55 HRC

* R_m = ultimate tensile strength, measured in MPa

SONT 03/04 Ø12-15.5 f [mm/rev]	SONT 05 Ø16-17.5 f [mm/rev]	SONT 06 Ø18-20.5 f [mm/rev]	SONT 07 Ø21-23 f [mm/rev]	SONT 08 Ø24-27 f [mm/rev]	SONT 09 Ø28-32 f [mm/rev]	SONT 10 Ø33-36 f [mm/rev]	SONT 12 Ø37-41 f [mm/rev]	SONT 13 Ø42-46 f [mm/rev]	SONT15 Ø47-54 f [mm/rev]
.04-.11	.04-.12	.05-.12	.05-.13	.06-.15	.06-.17	.06-.17	.06-.17	.07-.17	.07-.19
.04-.13	.04-.14	.05-.14	.05-.15	.06-.17	.06-.19	.06-.19	.06-.20	.07-.22	.07-.24
.04-.14	.04-.15	.05-.16	.06-.18	.07-.20	.07-.22	.07-.22	.07-.23	.08-.25	.08-.27
.04-.17	.04-.18	.05-.18	.06-.20	.07-.20	.07-.23	.07-.23	.07-.24	.08-.26	.08-.28
.04-.14	.04-.15	.05-.15	.06-.17	.07-.20	.07-.23	.07-.23	.07-.23	.08-.25	.08-.27
.04-.14	.04-.15	.05-.15	.06-.18	.07-.21	.07-.23	.07-.23	.07-.23	.08-.25	.08-.27
.04-.14	.04-.15	.05-.15	.06-.18	.07-.20	.07-.23	.07-.23	.07-.23	.08-.25	.08-.27
.04-.14	.04-.15	.05-.15	.06-.18	.07-.20	.07-.23	.07-.23	.07-.23	.08-.25	.08-.27
.04-.11	.04-.12	.05-.12	.06-.12	.06-.15	.06-.17	.08-.20	.08-.22	.08-.22	.08-.22
.04-.11	.04-.12	.05-.12	.06-.12	.06-.15	.06-.17	.08-.20	.08-.22	.08-.22	.08-.22
.04-.12	.04-.12	.05-.13	.05-.15	.05-.16	.07-.16	.08-.20	.08-.22	.08-.22	.08-.22
.04-.10	.04-.10	.05-.11	.05-.13	.06-.14	.07-.15	.08-.18	.08-.20	.08-.20	.08-.20
.04-.10	.04-.10	.05-.11	.05-.12	.06-.12	.07-.14	.08-.16	.08-.17	.08-.17	.08-.17
.04-.10	.04-.10	.05-.10	.05-.11	.05-.12	.06-.13	.07-.14	.07-.16	.07-.16	.07-.16
.07-.18	.07-.20	.08-.22	.10-.24	.10-.25	.10-.25	.10-.28	.10-.30	.10-.30	.10-.32
.07-.17	.07-.18	.08-.20	.10-.22	.10-.25	.10-.25	.10-.27	.10-.29	.10-.29	.10-.30
.07-.18	.07-.18	.08-.20	.10-.24	.10-.26	.10-.26	.10-.26	.10-.28	.10-.28	.10-.30
.07-.17	.07-.18	.08-.18	.10-.22	.10-.22	.10-.22	.10-.23	.10-.25	.10-.25	.10-.27
.07-.17	.07-.18	.08-.18	.10-.22	.10-.25	.10-.25	.10-.28	.10-.30	.10-.30	.10-.32
.07-.17	.07-.18	.08-.18	.10-.22	.01-.25	.10-.25	.10-.28	.10-.30	.01-.30	.10-.32
.06-.12	.07-.14	.08-.15	.10-.15	.10-.15	.10-.17	.10-.17	.10-.17	.10-.17	.10-.17
.06-.13	.07-.14	.08-.15	.10-.15	.10-.15	.10-.17	.10-.17	.10-.18	.10-.18	.10-.18
.06-.12	.07-.14	.08-.15	.10-.18	.10-.18	.10-.19	.10-.19	.10-.20	.10-.20	.10-.20
.06-.12	.07-.14	.08-.15	.10-.18	.10-.18	.10-.19	.10-.19	.10-.21	.10-.21	.10-.21
.06-.12	.07-.14	.08-.15	.13-.20	.13-.20	.13-.22	.13-.22	.13-.22	.13-.22	.13-.22
.06-.13	.07-.14	.08-.15	.10-.16	.10-.16	.10-.17	.10-.17	.10-.18	.10-.18	.10-.18
.06-.15	.07-.16	.08-.18	.10-.18	.10-.18	.10-.20	.10-.20	.10-.22	.10-.22	.10-.22
.06-.15	.07-.16	.08-.18	.10-.18	.10-.18	.10-.20	.10-.20	.10-.22	.10-.22	.10-.22
.06-.14	.07-.15	.08-.16	.10-.16	.10-.16	.10-.17	.10-.17	.10-.18	.10-.18	.10-.18
.04-.09	.04-.10	.05-.08	.05-.10	.05-.10	.05-.12	.05-.12	.05-.12	.05-.12	.05-.12
.06-.14	.07-.14	.08-.14	.10-.15	.10-.16	.10-.16	.10-.16	.10-.18	.10-.18	.10-.18
.05-.10	.05-.10	.06-.10	.08-.12	.08-.14	.08-.14	.08-.14	.08-.15	.08-.15	.08-.15
.03-.07	.04-.07	.04-.07	.04-.07	.05-.08	.05-.08	.05-.10	.05-.10	.05-.10	.05-.12
.03-.07	.04-.07	.04-.07	.04-.07	.05-.08	.05-.08	.05-.10	.05-.10	.05-.10	.05-.12
.03-.07	.04-.07	.04-.07	.04-.07	.05-.08	.05-.08	.05-.10	.05-.10	.05-.10	.05-.12
.03-.07	.04-.07	.04-.07	.04-.07	.05-.08	.05-.08	.05-.10	.05-.10	.05-.10	.05-.12
.03-.07	.04-.07	.04-.07	.04-.07	.05-.08	.05-.08	.05-.10	.05-.10	.05-.10	.05-.12
.04-.10	.04-.10	.05-.10	.05-.12	.05-.12	.06-.15	.07-.15	.07-.15	.07-.15	.07-.16
.04-.10	.04-.10	.05-.10	.05-.12	.05-.12	.06-.15	.07-.15	.07-.15	.07-.15	.07-.16
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	Work piece material	Type of treatment / alloy		VDI 3323 group	Hardness HB
A	Non alloyed steel	annealed	≤ .15% C	1	125
		annealed	.15% - .45% C	2	150 - 250
		tempered	≥ .45% C	3	300
	Low alloyed steel	annealed		6	180
		tempered		7 / 8	250 - 300
		tempered		9	350
	High alloyed steel	annealed		10	200
		tempered		11	350
	Corrosion-resistant steel	annealed	ferritic	12	200
		tempered	martensitic	13	325
R	Stainless steel	annealed	ferritic / martensitic	14	200
		quenched	austenitic	14	180
		quenched	duplex	14	230 - 260
		hardened	martensitic / austenitic	14	330
F	Grey cast iron		pearlitic / ferritic	15	180
			pearlitic / martensitic	16	260
	Spheroidal cast iron		ferritic	17	160
			pearlitic	18	–
	Malleable cast iron		ferritic	19	130
			pearlitic	20	230
N	Aluminum wrought alloys	non hardened		21	60
		hardened		22	100
	Aluminum cast alloys	non hardened	< 12% Si	23	80
		hardened	< 12% Si	24	90
		non hardened	> 12% Si	25	130
	Copper and copper alloys (bronze, brass)		machining alloy stock (1% Pb)	26	–
			brass, red bronze	27	90
			bronze	28	100
			lead-free copper and electrolytic copper	29	100
	Non-metallic materials		thermosetting plastics	29	–
			fiber-reinforced plastics	29	–
			hard rubber	30	–
S	Heat-resistant alloys	annealed	Fe-base	31	200
		hardened	Fe-base	32	280
		annealed	Ni or Co-base	33	250
		hardened	Ni or Co-base 30 - 58 HRC	34	–
		cast	Ni or Co-base 1500 - 2200 N/mm²	35	–
	Titanium alloys		pure titanium	36	R_m 440*
			alpha + beta alloys	37	R_m 1050*
H	Tempered steel	hardened and tempered		38	55 HRC
		hardened and tempered		39	60 HRC
	Chilled castings	cast		40	400
	Tempered cast iron	hardened and tempered		40	55 HRC

* R_m = ultimate tensile strength, measured in MPa

SONT 04 Ø.562-.625 f [in/rev]	SONT 05 Ø.656-.687 f [in/rev]	SONT 06 Ø.709-.812 f [in/rev]	SONT 07 Ø.827-.906 f [in/rev]	SONT 08 Ø.984-1.062 f [in/rev]	SONT 09 Ø1.109-1.250 f [in/rev]	SONT 10 Ø1.281-1.437 f [in/rev]	SONT 12 Ø1.469-1.625 f [in/rev]
.0016-.0035	.0016-.0035	.0016-.0035	.0016-.0039	.0023-.0047	.0023-.0051	.0031-.0066	.0031-.0070
.0016-.0039	.0016-.0043	.0019-.0043	.0019-.0047	.0023-.0055	.0023-.0058	.0031-.0074	.0031-.0078
.0016-.0047	.0016-.0051	.0019-.0051	.0019-.0058	.0027-.0066	.0031-.0070	.0039-.0078	.0039-.0097
.0016-.0058	.0016-.0062	.0019-.0062	.0019-.0068	.0027-.0070	.0031-.0074	.0039-.0090	.0039-.0097
.0016-.0051	.0016-.0055	.0019-.0055	.0019-.0058	.0027-.0066	.0031-.0070	.0039-.0078	.0039-.0090
.0016-.0051	.0016-.0055	.0019-.0055	.0019-.0058	.0027-.0066	.0031-.0070	.0039-.0078	.0039-.0090
.0016-.0051	.0016-.0055	.0019-.0055	.0019-.0058	.0027-.0066	.0031-.0070	.0039-.0078	.0039-.0090
.0016-.0051	.0016-.0055	.0019-.0055	.0019-.0058	.0027-.0066	.0031-.0070	.0039-.0078	.0039-.0090
.0016-.0035	.0016-.0035	.0016-.0035	.0016-.0039	.0023-.0047	.0027-.0055	.0027-.0070	.0027-.0078
.0016-.0035	.0016-.0035	.0016-.0035	.0016-.0039	.0023-.0047	.0027-.0055	.0027-.0070	.0027-.0078
.0016-.0043	.0016-.0043	.0019-.0047	.0019-.0051	.0019-.0055	.0023-.0058	.0031-.0070	.0031-.0078
.0016-.0035	.0016-.0035	.0019-.0035	.0019-.0043	.0019-.0047	.0023-.0051	.0031-.0066	.0031-.0070
.0016-..0031	.0016-.0031	.0019-.0031	.0019-.0035	.0019-.0039	.0023-.0043	.0027-.0055	.0031-.0059
.0016-..0031	.0016-.0031	.0019-.0031	.0019-.0035	.0019-.0039	.0023-.0043	.0027-.0055	.0031-.0059
.0027-.0070	.0027-.0078	.0031-.0086	.0039-.0090	.0039-.0097	.0039-.0097	.0039-.0097	.0039-.0097
.0027-.0066	.0027-.0070	.0031-.0070	.0039-.0078	.0039-.0086	.0039-.0078	.0039-.0078	.0039-.0078
.0027-.0070	.0027-.0070	.0031-.0070	.0039-.0090	.0039-.0097	.0039-.0097	.0039-.0097	.0039-.0097
.0027-.00667	.0027-.0070	.0031-.0062	.0039-.0078	.0039-.0078	.0039-.0078	.0039-.0078	.0039-.0078
.0027-.0066	.0027-.0070	.0031-.0062	.0039-.0078	.0039-.0078	.0039-.0078	.0039-.0078	.0039-.0078
.0027-.0066	.0027-.0070	.0031-.0062	.0039-.0078	.0039-.0078	.0039-.0078	.0039-.0078	.0039-.0078
.0023-.0047	.0027-.0055	.0031-.0055	.0039-.0058	.0039-.0058	.0039-.0066	.0039-.0066	.0039-.0066
.0023-.0051	.0027-.0055	.0031-.0055	.0039-.0058	.0039-.0058	.0039-.0066	.0039-.0066	.0039-.0066
.0023-.0047	.0027-.0055	.0031-.0055	.0039-.0070	.0039-.0070	.0039-.0074	.0039-.0074	.0039-.0074
.0023-.0047	.0027-.0055	.0031-.0055	.0039-.0070	.0039-.0070	.0039-.0074	.0039-.0074	.0039-.0074
.0023-.0047	.0027-.0054	.0039-.0059	.0051-.0078	.0051-.0078	.0051-.0078	.0051-.0078	.0051-.0078
.0023-.0051	.0027-.0054	.0031-.0059	.0039-.0062	.0039-.0062	.0039-.0066	.0039-.0066	.0039-.0066
.0023-.0059	.0027-.0062	.0031-.0062	.0039-.0070	.0039-.0070	.0039-.0078	.0039-.0078	.0039-.0078
.0023-.0059	.0027-.0062	.0031-.0062	.0039-.0070	.0039-.0070	.0039-.0078	.0039-.0078	.0039-.0078
.0023-.0054	.0027-.0058	.0031-.0054	.0039-.0062	.0039-.0062	.0039-.0066	.0039-.0066	.0039-.0066
.0016-.0035	.0016-.0039	.0016-.0031	.0019-.0039	.0019-.0039	.0019-.0039	.0019-.0039	.0019-.0039
.0023-.0054	.0027-.0054	.0031-.0054	.0039-.0059	.0039-.0059	.0039-.0059	.0039-.0059	.0039-.0059
.0019-.0039	.0019-.0039	.0023-.0039	.0031-.0047	.0031-.0047	.0031-.0047	.0031-.0047	.0031-.0047
.0012-.0023	.0016-.0023	.0016-.0023	.0016-.0023	.0016-.0027	.0019-.0031	.0019-.0031	.0019-.0035
.0012-.0023	.0016-.0023	.0016-.0023	.0016-.0023	.0016-.0039	.0019-.0031	.0019-.0031	.0019-.0035
.0012-.0023	.0016-.0023	.0016-.0023	.0016-.0023	.0016-.0039	.0019-.0031	.0019-.0031	.0019-.0035
.0012-.0023	.0016-.0023	.0016-.0023	.0016-.0023	.0016-.0039	.0019-.0031	.0019-.0031	.0019-.0035
.0012-.0023	.0016-.0023	.0016-.0023	.0016-.0023	.0016-.0039	.0019-.0031	.0019-.0031	.0019-.0035
.0016-.0031	.0016-.0031	.0016-.0031	.0019-.0043	.0019-.0043	.0023-.0047	.0027-.0047	.0027-.0047
.0016-.0031	.0016-.0031	.0016-.0031	.0019-.0043	.0019-.0043	.0023-.0047	.0027-.0047	.0027-.0047
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	Work piece material	Type of treatment / alloy		VDI 3323 group	Hardness HB
A	Non alloyed steel	annealed	≤ .15% C	1	125
		annealed	.15% - .45% C	2	150 - 250
		tempered	≥ .45% C	3	300
	Low alloyed steel	annealed		6	180
		tempered		7 / 8	250 - 300
		tempered		9	350
	High alloyed steel	annealed		10	200
		tempered		11	350
	Corrosion-resistant steel	annealed	ferritic	12	200
		tempered	martensitic	13	325
R	Stainless steel	annealed	ferritic / martensitic	14	200
		quenched	austenitic	14	180
		quenched	duplex	14	230 - 260
		hardened	martensitic / austenitic	14	330
F	Grey cast iron		pearlitic / ferritic	15	180
			pearlitic / martensitic	16	260
	Spheroidal cast iron		ferritic	17	160
			pearlitic	18	–
	Malleable cast iron		ferritic	19	130
			pearlitic	20	230
N	Aluminum wrought alloys	non hardened		21	60
		hardened		22	100
	Aluminum cast alloys	non hardened	< 12% Si	23	80
		hardened	< 12% Si	24	90
		non hardened	> 12% Si	25	130
	Copper and copper alloys (bronze, brass)		machining alloy stock (1% Pb)	26	–
			brass, red bronze	27	90
			bronze	28	100
			lead-free copper and electrolytic copper	29	100
	Non-metallic materials		thermosetting plastics	29	–
			fiber-reinforced plastics	29	–
			hard rubber	30	–
S	Heat-resistant alloys	annealed	Fe-base	31	200
		hardened	Fe-base	32	280
		annealed	Ni or Co-base	33	250
		hardened	Ni or Co-base 30 - 58 HRC	34	–
		cast	Ni or Co-base 1500 - 2200 N/mm²	35	–
	Titanium alloys		pure titanium	36	R_m 440*
			alpha + beta alloys	37	R_m 1050*
H	Tempered steel	hardened and tempered		38	55 HRC
		hardened and tempered		39	60 HRC
	Chilled castings	cast		40	400
	Tempered cast iron	hardened and tempered		40	55 HRC

* R_m = ultimate tensile strength, measured in MPa

SONT 03/04 Ø12-15.5 f [mm/rev]	SONT 05 Ø16-17.5 f [mm/rev]	SONT 06 Ø18-20.5 f [mm/rev]	SONT 07 Ø21-23 f [mm/rev]	SONT 08 Ø24-27 f [mm/rev]	SONT 09 Ø28-32 f [mm/rev]	SONT 10 Ø33-36 f [mm/rev]	SONT 12 Ø37-41 f [mm/rev]
.04-.09	.04-.09	.04-.09	.04-.10	.06-.12	.06-.13	.08-.17	.08-.18
.04-.10	.04-.11	.05-.11	.05-.12	.06-.14	.06-.15	.08-.19	.08-.20
.04-.12	.04-.13	.05-.13	.05-.15	.07-.17	.08-.18	.10-.22	.10-.25
.04-.15	.04-.16	.05-.16	.05-.17	.07-.18	.08-.19	.10-.23	.10-.25
.04-.13	.04-.14	.05-.14	.05-.15	.07-.17	.08-.18	.10-.22	.10-.23
.04-.13	.04-.14	.05-.14	.05-.15	.07-.17	.08-.18	.10-.22	.10-.23
.04-.13	.04-.14	.05-.14	.05-.15	.07-.17	.08-.18	.10-.22	.10-.23
.04-.13	.04-.14	.05-.14	.05-.15	.07-.17	.08-.18	.10-.22	.10-.23
.04-.09	.04-.09	.04-.09	.04-.10	.06-.12	.07-.14	.09-.18	.09-.20
.04-.09	.04-.09	.04-.09	.04-.10	.06-.12	.07-.14	.09-.18	.09-.20
.04-.11	.04-.11	.05-.12	.05-.13	.05-.14	.06-.15	.08-.18	.08-.20
.04-.09	.04-.09	.05-.09	.05-.11	.05-.12	.06-.13	.08-.17	.08-.18
.04-.08	.04-.08	.05-.08	.05-.09	.05-.10	.06-.11	.07-.14	.08-.15
.04-.08	.04-.08	.05-.08	.05-.09	.05-.10	.06-.11	.07-.14	.08-.15
.07-.18	.07-.20	.08-.22	.10-.23	.10-.25	.10-.25	.10-.25	.10-.25
.07-.17	.07-.18	.08-.18	.10-.20	.10-.22	.10-.22	.10-.22	.10-.22
.07-.18	.07-.18	.08-.18	.10-.23	.10-.25	.10-.25	.10-.25	.10-.25
.07-.17	.07-.18	.08-.16	.10-.20	.10-.22	.10-.22	.10-.22	.10-.22
.07-.17	.07-.18	.08-.16	.10-.20	.10-.22	.10-.22	.10-.22	.10-.22
.07-.17	.07-.18	.08-.16	.10-.20	.10-.22	.10-.22	.10-.22	.10-.22
.06-.12	.07-.14	.08-.14	.10-.15	.10-.15	.10-.17	.10-.17	.10-.17
.06-.13	.07-.14	.08-.14	.10-.15	.10-.15	.10-.17	.10-.17	.10-.17
.06-.12	.07-.14	.08-.14	.10-.18	.10-.18	.10-.19	.10-.19	.10-.19
.06-.12	.07-.14	.08-.14	.10-.18	.10-.18	.10-.19	.10-.19	.10-.19
.06-.12	.07-.14	.10-.15	.13-.20	.13-.20	.13-.22	.13-.22	.13-.22
.06-.13	.07-.14	.08-.15	.10-.16	.10-.16	.10-.17	.10-.17	.10-.17
.06-.15	.07-.16	.08-.16	.10-.18	.10-.18	.10-.20	.10-.20	.10-.20
.06-.15	.07-.16	.08-.16	.10-.18	.10-.18	.10-.20	.10-.20	.10-.20
.06-.14	.07-.15	.08-.14	.10-.16	.10-.16	.10-.17	.10-.17	.10-.17
.04-.09	.04-.10	.04-.08	.05-.10	.05-.10	.05-.10	.05-.10	.05-.10
.06-.14	.07-.14	.08-.14	.10-.15	.10-.15	.10-.15	.10-.15	.10-.15
.05-.10	.05-.10	.06-.10	.08-.12	.08-.12	.08-.12	.08-.12	.08-.12
.03-.06	.04-.06	.04-.06	.04-.06	.04-.07	.05-.08	.05-.08	.05-.09
.03-.06	.04-.06	.04-.06	.04-.06	.04-.07	.05-.08	.05-.08	.05-.09
.03-.06	.04-.06	.04-.06	.04-.06	.04-.07	.05-.08	.05-.08	.05-.09
.03-.06	.04-.06	.04-.06	.04-.06	.04-.07	.05-.08	.05-.08	.05-.09
.03-.06	.04-.06	.04-.06	.04-.06	.04-.07	.05-.08	.05-.08	.05-.09
.04-.08	.04-.08	.04-.08	.05-.11	.05-.11	.06-.12	.07-.12	.07-.12
.04-.08	.04-.08	.04-.08	.05-.11	.05-.11	.06-.12	.07-.12	.07-.12
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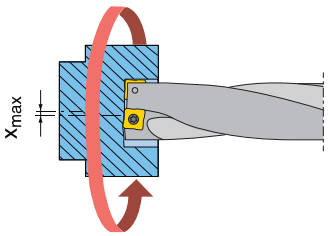
To guarantee that all four cutting edges of the insert are used, the following offset dimensions X must be observed:



With the maximum offset X_{max} the hole becomes: $D_{max} = D + 2X_{max}$

INCH EXAMPLE:
e.g. D = 1.00", X_{max} = 0.01"
D_{max} = D + 0.02 = 1.02"

METRIC EXAMPLE:
e.g. D = 20 mm, X_{max} = 0,20 mm
D_{max} = D + 0,4 = 20,4 mm

Type, description	Ø [in]	Ø [mm]	max. offset x_{max} [in]	max. offset x_{max} [mm]	D_{max} [in]	D_{max} [mm]
SONT 031808ER	0.47	12,0	0.019	0,50	0.51	13,0
	0.49	12,5	0.015	0,40	0.52	13,3
	0.51	13,0	0.014	0,35	0.54	13,7
	0.53	13,5	0.012	0,30	0.55	14,1
SONT 042105ER	0.55	14,0	0.01	0,35	0.57	14,7
	0.57	14,5	0.01	0,25	0.59	15,0
	0.59	15,0	0.01	0,20	0.61	15,4
	0.60	15,5	0.01	0,15	0.62	15,8
SONT 052306ER	0.62	16,0	0.02	0,40	0.66	16,8
	0.64	16,5	0.01	0,35	0.66	17,2
	0.66	17,0	0.01	0,30	0.69	17,6
	0.68	17,5	0.01	0,25	0.70	18,0
SONT 062506ER	0.70	18,0	0.02	0,50	0.74	19,0
	0.72	18,5	0.02	0,40	0.76	19,3
	0.74	19,0	0.01	0,35	0.77	19,7
	0.76	19,5	0.01	0,25	0.78	20,0
	0.78	20,0	0.01	0,20	0.80	20,4
	0.80	20,5	0.01	0,15	0.82	20,8
SONT 072907ER	0.82	21,0	0.01	0,35	0.85	21,7
	0.84	21,5	0.01	0,30	0.86	22,1
	0.86	22,0	0.01	0,25	0.88	22,5
	0.88	22,5	0.01	0,15	0.90	22,8
	0.90	23,0	0.01	0,15	0.92	23,3
	0.92	23,5	0.01	0,10	0.94	23,7
SONT 083308ER	0.94	24,0	0.03	0,65	1.00	25,3
	0.96	24,5	0.02	0,55	1.00	25,6
	0.98	25,0	0.02	0,55	1.02	26,1
	0.99	25,5	0.02	0,40	1.03	26,3
	1.01	26,0	0.01	0,35	1.04	26,7
	1.03	26,5	0.01	0,30	1.06	27,1
	1.05	27,0	0.01	0,25	1.07	27,5
	1.07	27,5	0.01	0,15	1.09	27,8
SONT 093808ER	1.09	28,0	0.04	0,90	1.17	29,8
	1.11	28,5	0.03	0,80	1.17	30,1
	1.13	29,0	0.03	0,75	1.19	30,5
	1.15	29,5	0.03	0,70	1.21	30,9
	1.17	30,0	0.02	0,60	1.21	31,2
	1.19	30,5	0.02	0,55	1.23	31,6
	1.21	31,0	0.02	0,45	1.25	31,9
	1.23	31,5	0.02	0,40	1.27	32,3
	1.25	32,0	0.01	0,30	1.27	32,6

Type, description	Ø [in]	Ø [mm]	max. offset x_{max} [in]	max. offset x_{max} [mm]	D_{max} [in]	D_{max} [mm]
SONT 104408ER	1.27	32,5	0.03	0,80	1.33	34,1
	1.29	33,0	0.03	0,80	1.35	34,6
	1.31	33,5	0.03	0,65	1.37	34,8
	1.33	34,0	0.02	0,60	1.37	35,2
	1.35	34,5	0.02	0,50	1.39	35,5
	1.37	35,0	0.02	0,45	1.41	35,9
	1.38	35,5	0.01	0,35	1.41	36,2
	1.40	36,0	0.01	0,35	1.42	36,7
	1.42	36,5	0.01	0,20	1.44	36,9
SONT 124810ER	1.44	37,0	0.04	1,00	1.52	39,0
	1.48	38,0	0.03	0,85	1.54	39,7
	1.52	39,0	0.03	0,70	1.58	40,4
	1.56	40,0	0.02	0,50	1.60	41,0
	1.60	41,0	0.01	0,35	1.63	41,7
SONT 135012ER	1.64	42,0	0.04	0,95	1.72	43,9
	1.68	43,0	0.03	0,80	1.74	44,6
	1.72	44,0	0.02	0,60	1.76	45,2
	1.76	45,0	0.02	0,45	1.80	45,9
	1.79	46,0	0.01	0,30	1.82	46,6
SONT 155312ER	1.83	47,0	0.07	1,80	1.97	50,6
	1.87	48,0	0.06	1,65	2.00	51,3
	1.91	49,0	0.06	1,50	2.03	52,0
	1.95	50,0	0.05	1,35	2.05	52,7
	1.99	51,0	0.04	1,15	2.07	53,3
	2.03	52,0	0.04	0,95	2.11	53,9
	2.07	53,0	0.03	0,80	2.13	54,6
	2.11	54,0	0.02	0,60	2.15	55,2
SONT 175612ER	2.15	55,0	0.08	2,10	2.31	59,2
	2.18	56,0	0.07	1,90	2.32	59,8
	2.22	57,0	0.07	1,75	2.36	60,5
	2.26	58,0	0.06	1,55	2.38	61,1
	2.30	59,0	0.05	1,35	2.40	61,7
	2.34	60,0	0.04	1,15	2.42	62,3
	2.38	61,0	0.04	1,00	2.46	63,0
	2.42	62,0	0.03	0,85	2.48	63,7
	2.46	63,0	0.03	0,65	2.52	64,3

The maximum radial offset dimension X influences the force compensation of the drill, therefore a low feed rate is recommended.

Hole tolerances

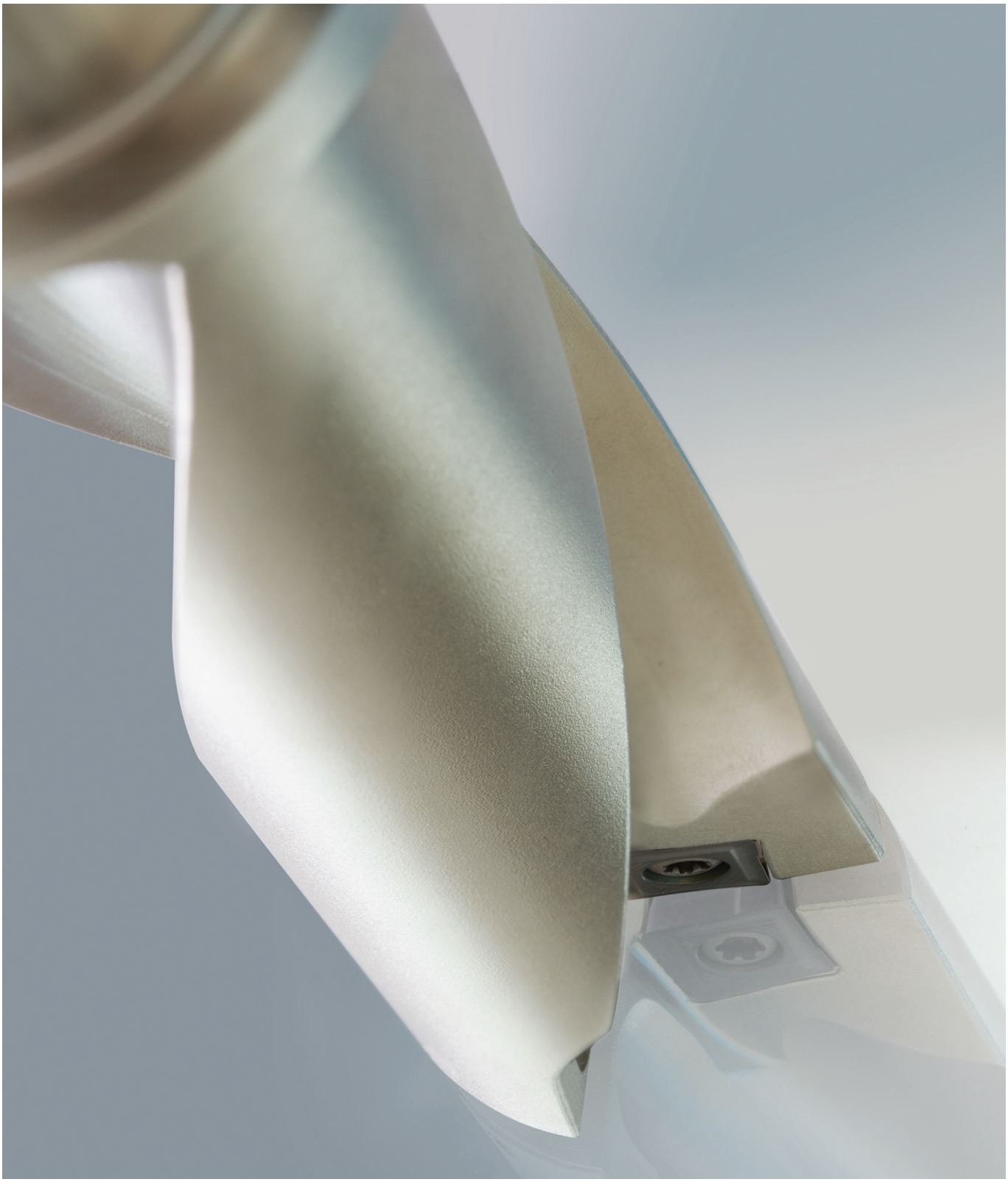
	2xD	3xD		4xD	5xD	
	[mm]	[in]	[mm]	[mm]	[in]	[mm]
Drilling diameter	12–63	.625–2.437	12-63	12-54	.562–1.625	12-41
Drilling tolerance	0/+0,30	0/+.012	0/+0,30	0/+0,35	0/+.015	0/+0,40

Recommended coolant pressure and coolant flow

To guarantee efficient chip evacuation from the hole, a minimum coolant pressure of 5 bar is required.

The optimal coolant pressure is >15 bar.

5 bar (72.5 psi), 15 bar (217.5 psi)



Revolution number	$n = \frac{v_c \cdot 12}{\varpi \cdot D}$	**[min^{-1}]**
Cutting speed	$v_c = \frac{\varpi \cdot D \cdot n}{12}$	**[ft/min]**
Feed rate	f	**[ft/rev.]**
Feed rate	$v_f = f \cdot n$	**[ft/min]**
Machining cross section	$A_t = \frac{\varpi \cdot D^2}{4}$	**[in^2]**
Metal removal rate	$Q = \frac{v_f \cdot A_t}{12}$	**[in^3/min]**
Specific cutting force	k_c = see table	**[N/mm^2]**
Power requirements	$P_c = \frac{Q}{60 \cdot 1000 \cdot \eta} \cdot k_c$	**[kW]**
Torque moment	$M_c = \frac{f \cdot k_c}{1000} \cdot \frac{D^2}{8}$	**[Nm]**
Feed force (approx.)	$F_f \approx 0.7 \cdot \frac{D}{2} \cdot f \cdot k_c$	**[N]**
Drilling time	$T_c = \frac{L + h}{v_f}$	**[min]**
Clearance	h	**[in]**
Drilling depth	L	**[in]**

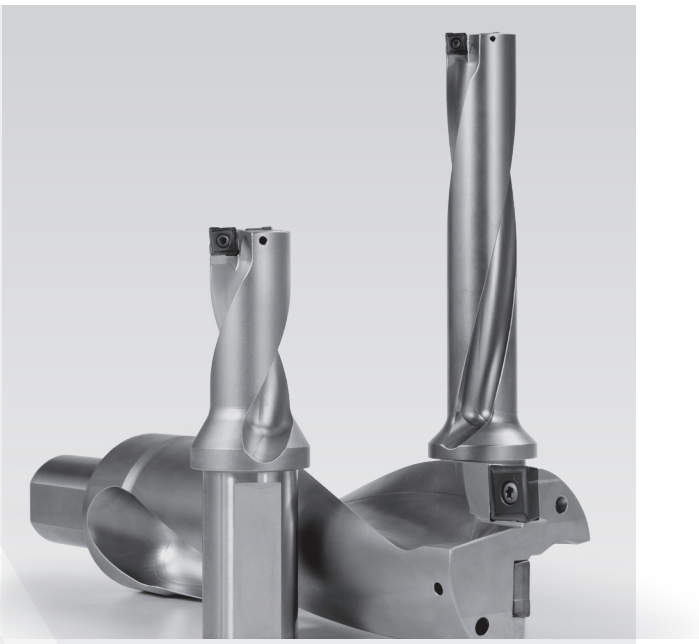
Material	**Specific cutting force k_c (N/mm^2)**
St 37.11; St 42.11	1740
St 50.11	1950
St 60.11	2070
St 70.11	2220
C 35, C 45, Ck 45	2060/2175
C 60, Ck 60	2090
16 Mn Cr 5	2060
18 Cr Ni 6	2220
34 Cr Mo 4	2190
50 Cr V 4	2175
Tempered 100 Cr 6	2335
Mn, Cr Ni alloyed steel	2335
Cr Mo alloyed steel	2570
Corrosion-resistant steel	2530
Hot working steel	2570
Nitriding steel	2570
GS 45	1570
GS 52	1765
GG 22, GG 25	1140
GGG 42	1370
Aluminum cast alloys	640

Please note! The k_c values depend on the feed. Therefore, the table contains their upper limit values. The calculated power is possibly higher than the power actually needed (~10–20%).

SUCCESS FACTORS:

Drilling

- **Process security and precision:** Dimensional accuracy even under demanding conditions
- **Excellent productivity:** High feed rates are possible
- **Reduced friction for smooth operations:** Optimal chip evacuation through asymmetric chip flute design



Revolution number	$n = \frac{v_c \cdot 1000}{\varpi \cdot D}$	**[min⁻¹]**
Cutting speed	$v_c = \frac{\varpi \cdot D \cdot n}{1000}$	**[m/min]**
Feed rate	f	**[mm/rev.]**
Feed rate	$v_f = f \cdot n$	**[m/min]**
Machining cross section	$A_t = \frac{\varpi \cdot D^2}{4}$	**[mm²]**
Metal removal rate	$Q = \frac{v_f \cdot A_t}{1000}$	**[cm³/min]**
Specific cutting force	k_c = see table	**[N/mm²]**
Power requirements	$P_c = \frac{Q}{60 \cdot 1000 \cdot \eta} \cdot k_c$	**[kW]**
Torque moment	$M_c = \frac{f \cdot k_c}{1000} \cdot \frac{D^2}{8}$	**[Nm]**
Feed force (approx.)	$F_f \approx 0.7 \cdot \frac{D}{2} \cdot f \cdot k_c$	**[N]**
Drilling time	$T_c = \frac{L + h}{v_f}$	**[min]**
Clearance	h	**[mm]**
Drilling depth	L	**[mm]**

Material	**Specific cutting force k_c (N/mm²)**
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Please note! The k_c values depend on the feed. Therefore, the table contains their upper limit values. The calculated power is possibly higher than the power actually needed (~10–20%).

	Material	Type, description	Key size	Torque moment [Nm]	Torque moment [in.lbs]
	11450867	DMSD 3,2Nm/SORT 15IP	15IP	3,2	28,3
	11450898	DMSD 1,0Nm/SORT 07IP	07IP	1,0	8,9
	11690144	DMSD 1,2NM/SORT 08IP	08IP	1,2	10,6
	11690146	DMSD 2,2NM/SORT 09IP	09IP	2,2	19,5
	11816987	DMSD 5,0Nm/SORT 20IP	20IP	5,0	44,3
	11817562	DMSD 0,7Nm/SORT 06IP	06IP	0,7	6,2

	Material	Type, description	Key size
	11206195	10002494/TORX 08IP F	08IP
	11488748	10007404/TORX 07IP F	07IP
	11843205	10014921/TORX 06IP F	06IP
	11843208	10014922/TORX 09IP F	09IP
	11114698	10000276/TORX 08IP	08IP
	11450849	10006918/TORX 07IP	07IP
	11450858	10006919/TORX 15IP	15IP
	11690140	10009333/TORX 09IP	09IP
	11816974	10013909/TORX 20IP	20IP
	11817560	10013959/TORX 06IP	06IP

	Material	Type, description	Length	Thread size	Key size	Torque moment [Nm]	Torque moment [in.lbs]
	11227305	M3,0x7,0-09IP/10003007	7.0	M3,0	09IP	2,2	19,5
	11610311	M3,5X8,6-15IP/10008749	8.6	M3,5	15IP	3,2	28,3
	11684214	M2,2x5,0-07IP/10009244	5.0	M2,2	07IP	1,0	8,9
	11684216	M2,5x6,0-08IP/10009243	6.0	M2,5	08IP	1,2	10,6
	11801441	M4,5X10,5-20IP/10013040	10.5	M4,5	20IP	5,0	44,3
	11807480	M2,0x4,3-06IP/10013332	4.3	M2,0	06IP	0,7	6,2
	11807484	M1,8x3,6-06IP/10013338	3.6	M1,8	06IP	0,4	3,6

	Material	Type, description	Length	Thread size	Key size
	310720	7897990/M8X1X8 DIN913	8.0	M8	SW4

SUCCESS FACTORS:

Technical Support

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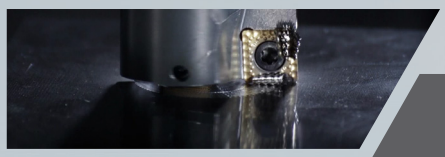

KOMET

THE QUALITY LABEL FOR EFFICIENT BORE PRODUCTION

High-precision drilling, reaming, countersinking and boring is a matter of expertise: efficient tooling solutions for drilling and mechatronic tools are therefore part of the KOMET brand name.

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WNT is synonymous with product diversity: solid carbide and HSS rotating tools, tool holders and efficient workholding solutions are all part of this brand.

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CUTTING TOOLS FOR THE AEROSPACE INDUSTRY

Solid carbide drills specially developed for the aerospace industry bear the product name KLENK. The highly specialized products are specifically designed for machining lightweight materials.

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