

botek[®]

DEEP HOLE DRILLING SYSTEMS
SOLID CARBIDE TOOLS

Deep hole drilling tools

System BTA (STS)



botek



The botek company

Manufacturing deep and precise holes is a technical challenge when processing metal. Accordingly specialising in deep hole drilling technology was the founding idea in 1974 of botek Präzisionsbohrtechnik GmbH in Riederich.

Botek grew to be an international supplier of deep hole drilling tools. Over 550 employees in the main company develop and manufacture single and two fluted tools, deep hole drilling tools BTA and Ejector systems as well as special tools.

A complete product program, regarding all deep hole drilling aspects and a team of highly qualified and dedicated cutting specialists make botek a competent partner for the automobile industry and their suppliers, shipbuilding industry, hydraulic industry as well as motor, gear and machine building companies.



- Please note our safety pointers at www.botekUSA.com
- Our General Standard Terms and Conditions, which we assume as known, apply.
- We reserve the right to make modifications in the interest of technical improvement. Such modifications cannot, in principle, be accepted as justifiable reasons for complaints.
- Subject to change. The manufacturer accepts no responsibility for misprints and other errors.

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Overview of types




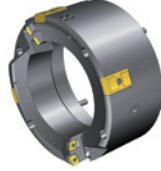
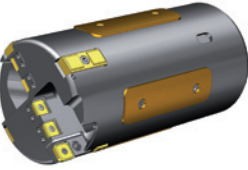
1-start connection thread internal	4-start connection thread external	
		Type 14 solid drilling tool <ul style="list-style-type: none"> - High cutting capacity and simple handling - Stable tool - Suitable for extremely close tolerances - Low up-front costs for small batches
		Type 17/18/20 solid drilling tool <ul style="list-style-type: none"> - Simple handling - Stable tool - Tools can be reground several times - Suitable for extremely close tolerances - Low up-front costs for small batches
		Type 11/61 solid drilling tool <ul style="list-style-type: none"> - Indexable inserts with various chip breakers available to suit processed material - Very economical, with optimal cutting capacity - No adjustment required when changing wear parts, no readjustment within +/- 0.01 mm - Tool adjustment range up to 0.5 mm using suitable replacement parts - Ø fine adjustment with stop plate
		Type 12/64 solid drilling tool <ul style="list-style-type: none"> - New chip breakers for large feed rates and high productivity - No adjustment required when changing wear parts, no readjustment within +/- 0.01 mm - Tool adjustment range up to 0.5 mm using suitable replacement parts - Minimal axis deviation at large drilling depths - Ø fine adjustment with stop plate
		Type 70 A/B solid drilling tool <ul style="list-style-type: none"> - Very few wear parts over the whole drilling range - New chip breakers for large feed rates and high productivity - No adjustment after a change of indexable inserts - We keep wear parts in stock
		Type 43 A/B/F solid drilling tool <ul style="list-style-type: none"> - Simplest operation, change of wear parts without readjustment within +/- 0.01 mm - Wear parts can be exchanged on the machine - Tool adjustment range up to 10 mm using suitable replacement parts - New cutting geometries for high cutting capacity - Minimal axis deviation at large drilling depths - Ø fine adjustment with stop plate
		Type 13 A/B counterboring tool <ul style="list-style-type: none"> - New chip breakers for large feed rates and high productivity - No adjustment required when changing wear parts, no readjustment within +/- 0.01 mm - Tool adjustment range up to 0.5 mm using suitable replacement parts - Maximum shape accuracy and hole straightness - Ø fine adjustment with stop plate
		Type 34/35 counterboring tool <ul style="list-style-type: none"> - Tool adjustment range up to 50 mm - Low requirement for tools over the whole drilling range - Adjustment system for easy change of diameter - New patented adjustment system with a central adjusting ring from Ø 149 mm - No adjustment required when changing wear parts, no readjustment within +/- 0.01 mm - Ø fine adjustment with stop plate
 1-start	 1-start	Type 33/36 counterboring tool <ul style="list-style-type: none"> - Bore tolerance in the range of IT7 (IT6) roundness/diameter - Tool adjustment range up to 5 mm - No adjustment required when changing wear parts, no readjustment within +/- 0.01 mm - Special tool for smallest centerline deviations
		Type 38/58 pullboring tool <ul style="list-style-type: none"> - Bore tolerance in the range of IT7 (IT6) roundness/diameter - Tool adjustment range up to 5 mm - No adjustment required when changing wear parts, no readjustment within +/- 0.01 mm - Special tool for smallest centerline deviations
		Type 28/48 trepanning tool <ul style="list-style-type: none"> - Tool adjustment range up to 5 mm - No adjustment required when changing wearing parts, no readjustment within +/- 0.01 mm - For machines with insufficient spindle power - The core may be reused for new workpieces - Ø fine adjustment with stop plate

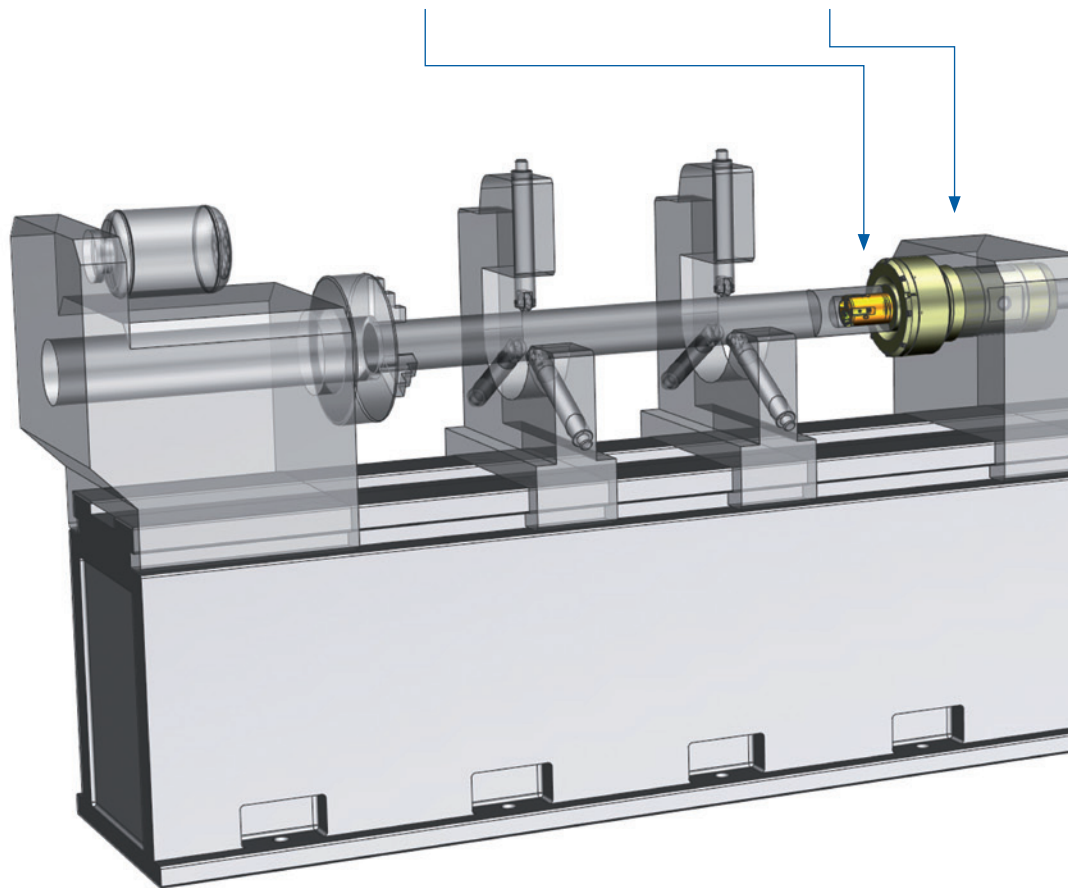
Areas of application

Page	Surface quality Ra	Drilling tolerance	Workpiece material				
			Steel	Stainless steel	Cast iron	Aluminium alloys	Heat resisting alloys
8, 9	2 µm	IT 8 (IT 7)	• • •	• • •	• • •	• • •	• • •
10, 11	2 µm	IT 8 (IT 7)	• • •	• •	• • •	• •	•
12, 13, 14, 15	2 µm	IT 8 (IT 7)	• • •	• • •	• • •	• • •	• • •
16, 17	2 µm	IT 8	• • •	• • •	• • •	• • •	• • •
18, 19	2 µm	IT 10	• • •	• • •	• • •	• • •	• • •
20, 21, 22, 23	2 µm	IT 8	• • •	• • •	• • •	• • •	• • •
24, 25	2 µm	IT 7	• • •	• • •	• • •	• • •	• • •
26, 27, 28, 29	2 µm	IT 7	• • •	• • •	• • •	• • •	• • •
30, 31	2 µm	IT 12	• • •	• •	• • •	• • •	• •
32, 33	2 µm	IT 7 (IT 6)	• • •	• • •	• • •	• • •	• • •
34, 35	2 µm	IT 9	• • •	• •	• • •	• •	•




• • • = good • = on average

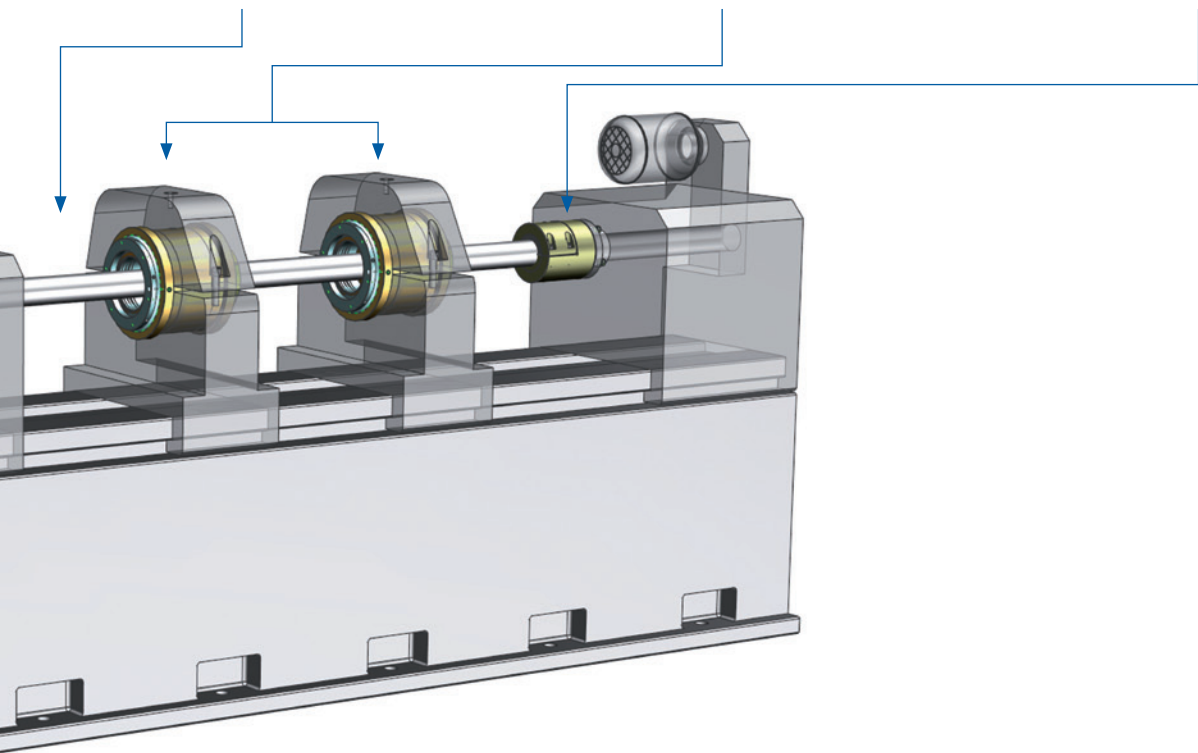
Deep-hole drilling BTA (STS) system

Drilling diameter (mm)	Drilling methods	Oil pressure head (BOZA)
7.76 - 700 Page 8 - 23	Page 54, 55 Solid drilling 	Page 45 
28.71 - 800 Page 24 - 33	Counterboring 	
55.00 - 600 Page 34 - 35	Trepanning 	
15.00 - 300 Page 37	Formboring 	



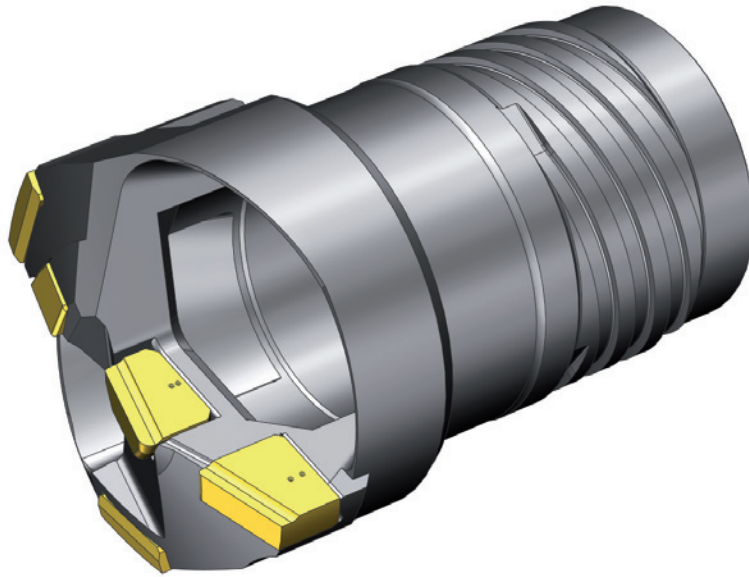
Deep-hole drilling BTA (STS) system

Drill tube	Vibration damper	Drill tube clamping
Page 38 - 41	Page 46, 47	Page 48, 49
		



Type 14

Solid drill head, brazed type
Ø 15.61 to 65.00 mm

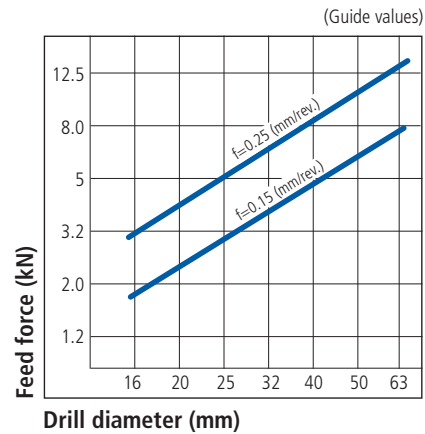
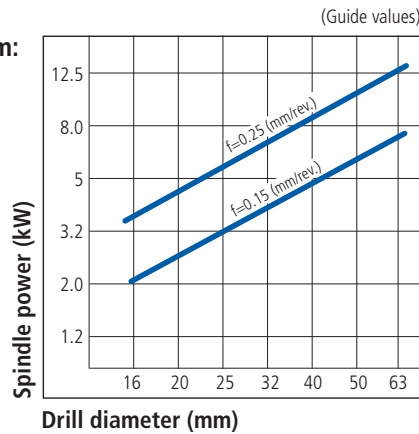


Type 14

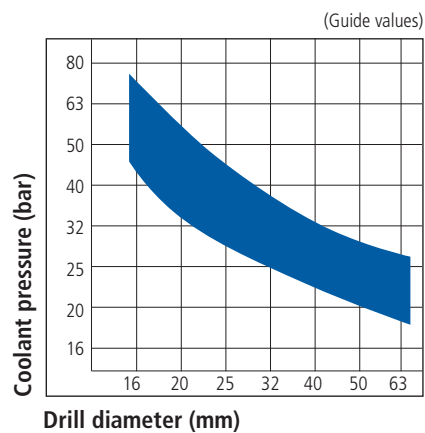
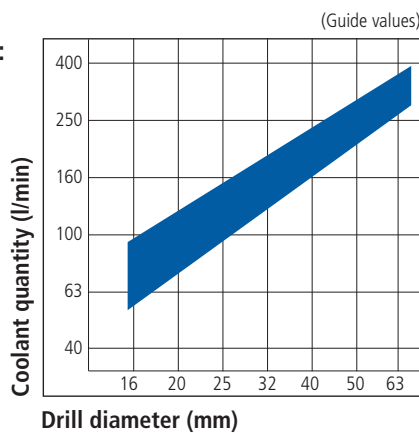
Advantages:

- High cutting capacity and simple handling
- Stable tool
- Suitable for extremely close tolerances
- Low up-front costs for small batches

Performance diagram:



Coolant information:



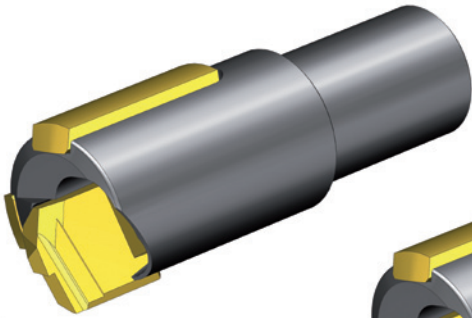
Guide values for deep hole drilling of different materials

Material / Mechanical strength properties	Cutting speed (m/min)	Feed (mm/rev.) for drill diameter (mm)				Carbide grades
		15.61 - 20.00	20.01 - 31.00	31.01 - 43.00	43.01 - 65.00	
Structural steel ≤ 700 N/mm ²	70 - 120	0.10 - 0.20	0.15 - 0.25	0.15 - 0.30	0.18 - 0.32	020
Case hardened steel ≤ 750 N/mm ²	70 - 100	0.10 - 0.20	0.17 - 0.25	0.20 - 0.30	0.24 - 0.32	020
Case hardened steel ≤ 1100 N/mm ²	55 - 100	0.10 - 0.20	0.17 - 0.25	0.20 - 0.30	0.24 - 0.32	020
Heat treated steel ≤ 700 N/mm ²	70 - 100	0.10 - 0.20	0.17 - 0.25	0.20 - 0.30	0.24 - 0.32	020
Heat treated steel ≤ 1100 N/mm ²	55 - 100	0.10 - 0.20	0.17 - 0.25	0.20 - 0.30	0.24 - 0.32	020
Nitriding steel ≤ 1100 N/mm ²	55 - 100	0.10 - 0.20	0.17 - 0.25	0.20 - 0.30	0.24 - 0.32	020
Ferritic steel ≤ 900 N/mm ²	40 - 85	0.12 - 0.20	0.18 - 0.25	0.22 - 0.30	0.24 - 0.36	029*/020
Austenitic steel (stainless)	40 - 85	0.10 - 0.20	0.18 - 0.25	0.22 - 0.30	0.24 - 0.36	029*/020
Heat resisting steel (stainless), Tool steel	50 - 100	0.10 - 0.20	0.17 - 0.25	0.20 - 0.30	0.24 - 0.32	022
Steel castings ≤ 700 N/mm ²	50 - 100	0.12 - 0.20	0.15 - 0.25	0.20 - 0.30	0.24 - 0.36	029*/020
Nodular cast iron ≤ 1000 N/mm ²	50 - 100	0.10 - 0.18	0.15 - 0.22	0.20 - 0.28	0.24 - 0.32	022
Cast iron unalloyed and alloyed	60 - 100	0.10 - 0.18	0.15 - 0.22	0.20 - 0.28	0.24 - 0.32	022
Aluminium and Aluminium alloys	65 - 130	0.10 - 0.20	0.16 - 0.25	0.18 - 0.30	0.20 - 0.45	022
Copper Cu content < 99%	65 - 130	0.05 - 0.20	0.05 - 0.25	0.05 - 0.30	0.05 - 0.45	022

* First recommendation

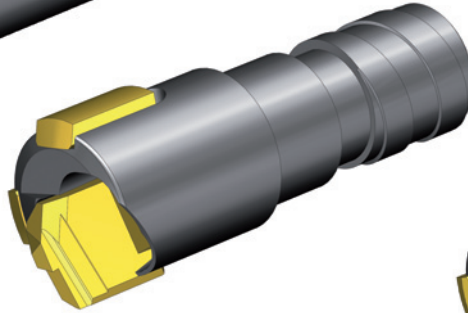
Type 17/18/20

Solid drill head, brazed type
Ø 7.76 to 36.99 mm



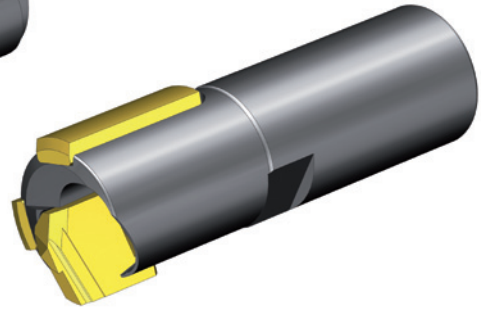
Type 17

Drilling range Ø 7.76 - 15.50 mm
without thread
Drill head and drill tube are
brazed together.



Type 18

Drilling range Ø 12.21 - 15.50 mm
1-start external thread



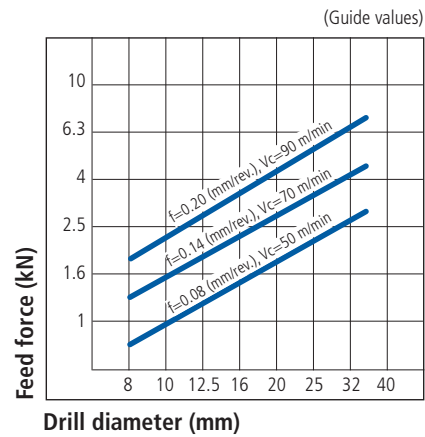
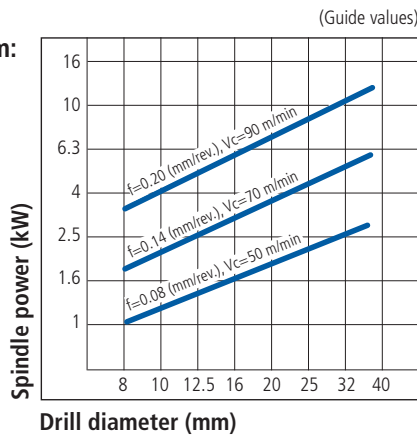
Type 20

Drilling range Ø 14.51 - 36.99 mm
1-start internal thread

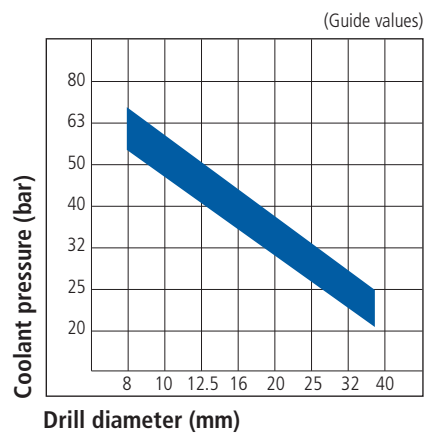
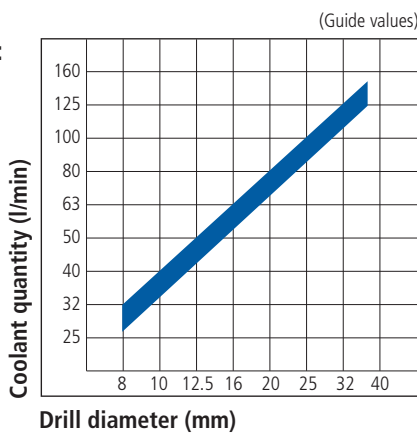
Advantages:

- Simple handling
- Tools can be reground several times
- Stable tool
- Suitable for extremely close tolerances
- Low up-front costs for small batches

Performance diagram:



Coolant information:



Guide values for deep hole drilling of different materials

Material / Mechanical strength properties	Cutting speed (m/min)	Feed (mm/rev.) for drill diameter (mm)			Carbide grades			
		7.76 - 15.99	16.00 - 24.99	25.00 - ...	Cutting plate			
					Type 17	Type 18 + 20		
Structural steel $\leq 700 \text{ N/mm}^2$	80 - 100	0.02 - 0.04	0.03 - 0.10	0.05 - 0.18	010			
Case hardened steel $\leq 750 \text{ N/mm}^2$	80 - 100	0.02 - 0.04	0.03 - 0.10	0.05 - 0.18				
Case hardened steel $\leq 1100 \text{ N/mm}^2$	70 - 80	0.02 - 0.04	0.05 - 0.12	0.10 - 0.18				
Heat treated steel $\leq 700 \text{ N/mm}^2$	70 - 90	0.02 - 0.04	0.05 - 0.12	0.10 - 0.20				
Heat treated steel $\leq 1100 \text{ N/mm}^2$	55 - 75	0.02 - 0.04	0.05 - 0.12	0.10 - 0.20				
Nitriding steel $\leq 1100 \text{ N/mm}^2$	55 - 75	0.02 - 0.04	0.05 - 0.12	0.05 - 0.18				
Ferritic steel $\leq 900 \text{ N/mm}^2$	60 - 80	0.02 - 0.04	0.02 - 0.06	0.02 - 0.10			022	022
Austenitic steel (stainless)	60 - 80	0.02 - 0.04	0.02 - 0.06	0.02 - 0.10				
Heat resisting steel (stainless), Tool steel	50 - 70	0.02 - 0.04	0.05 - 0.12	0.05 - 0.18			010	
Steel castings $\leq 700 \text{ N/mm}^2$	60 - 80	0.02 - 0.04	0.03 - 0.10	0.05 - 0.18				
Nodular cast iron $\leq 1000 \text{ N/mm}^2$	65 - 80	0.02 - 0.04	0.05 - 0.15	0.10 - 0.23				
Cast iron unalloyed and alloyed	70 - 100	0.02 - 0.04	0.05 - 0.12	0.05 - 0.18	022			
Aluminium and Aluminium alloys	80 - 150	0.02 - 0.04	0.05 - 0.18	0.10 - 0.25				
Copper Cu content < 99%	120 - ...	0.02 - 0.04	0.02 - 0.10	0.02 - 0.15				

Type 11/61

Solid drill head with exchangeable inserts and guide pads
Ø 14.55 to 17.95 mm



Type 11
Drilling range Ø 14.55 - 17.95 mm



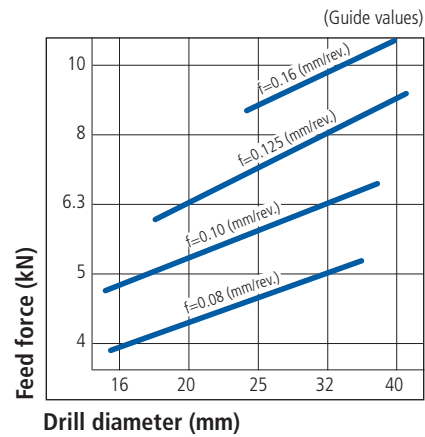
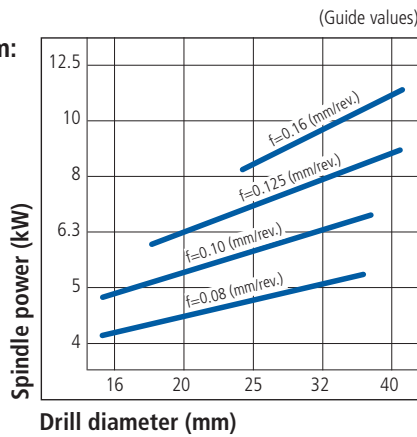
Type 61
Drilling range Ø 15.65 – 17.95 mm

Advantages:

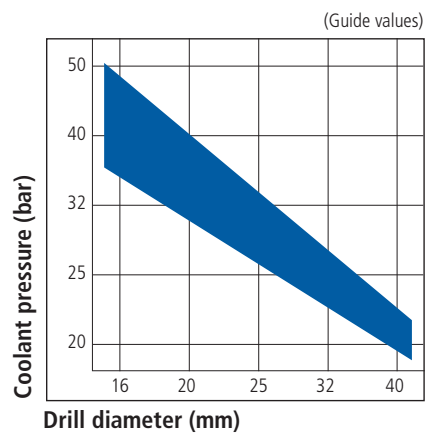
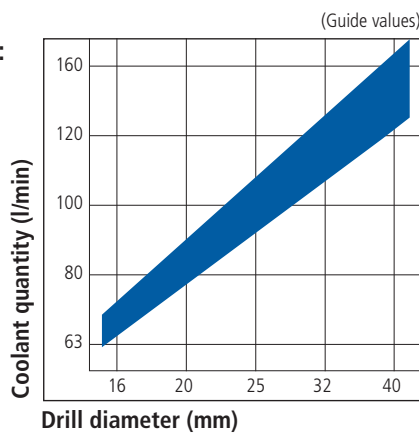
- Very economical, with optimal cutting performance
- Cutting inserts with various chip breakers available to suit processed material
- No adjustment required when changing wear parts, no re-adjustment within +/- 0.01 mm
- Tool adjustment range up to 0.5 mm using suitable replacement parts



Performance diagram:



Coolant information:



Guide values for deep hole drilling of different materials

Material / Mechanical strength properties	Cutting speed (m/min)	Feed (mm/rev.) for drill diameter (mm)				Carbide grades		
		14.55 - 17.99	18.00 - 24.99	25.00 - 31.99	32.00 - ...	Indexable insert		Guide pad
						up to Ø 17.99	from Ø 18.00	
Structural steel ≤ 700 N/mm ²	80 - 100	0.06 - 0.10	0.08 - 0.11	0.10 - 0.14	0.13 - 0.16	K 30 B - 1	P 25 B - 2	P 20 B
Case hardened steel ≤ 750 N/mm ²								
Case hardened steel ≤ 1100 N/mm ²	70 - 80	0.06 - 0.10	0.08 - 0.11	0.10 - 0.13	0.12 - 0.15	K 30 BX - 91	P 25 BX - 91	
Heat treated steel ≤ 700 N/mm ²	70 - 90	0.06 - 0.10	0.08 - 0.11	0.10 - 0.14	0.13 - 0.16			
Heat treated steel ≤ 1100 N/mm ²	55 - 75	0.06 - 0.10	0.08 - 0.11	0.10 - 0.13	0.12 - 0.15			
Nitriding steel ≤ 1100 N/mm ²	55 - 75	0.06 - 0.09	0.08 - 0.10	0.09 - 0.12	0.11 - 0.14			
Ferritic steel ≤ 900 N/mm ²	60 - 80	0.06 - 0.10	0.08 - 0.11	0.10 - 0.14	0.13 - 0.16	K 10 B - 1	K 10 B - 2	
Austenitic steel (stainless)	60 - 80	0.06 - 0.09	0.08 - 0.10	0.10 - 0.12	0.12 - 0.14	K 30 BX - 91	P 25 BX - 91	
Heat resisting steel (stainless), Tool steel	50 - 70	0.06 - 0.09	0.08 - 0.10	0.10 - 0.12	0.12 - 0.14			
Steel castings ≤ 700 N/mm ²	60 - 80	0.06 - 0.10	0.08 - 0.11	0.10 - 0.14	0.13 - 0.16			
Nodular cast iron ≤ 1000 N/mm ²	65 - 80	0.08 - 0.12	0.10 - 0.13	0.12 - 0.15	0.14 - 0.18			
Cast iron unalloyed and alloyed	70 - 100	0.08 - 0.12	0.10 - 0.13	0.12 - 0.15	0.14 - 0.18	K 10 - 1	K 10 - 1	
Aluminium and Aluminium alloys	100 - 200	0.07 - 0.11	0.09 - 0.12	0.10 - 0.14	0.12 - 0.18			
Copper Cu content < 99%	120 - ...	0.04 - 0.09	0.06 - 0.10	0.08 - 0.12	0.10 - 0.14			

Type 11/61

Solid drill head with indexable inserts and guide pads
Ø 18.00 to 36.99 mm



Type 11

Drilling range Ø 18.00 - 36.99 mm

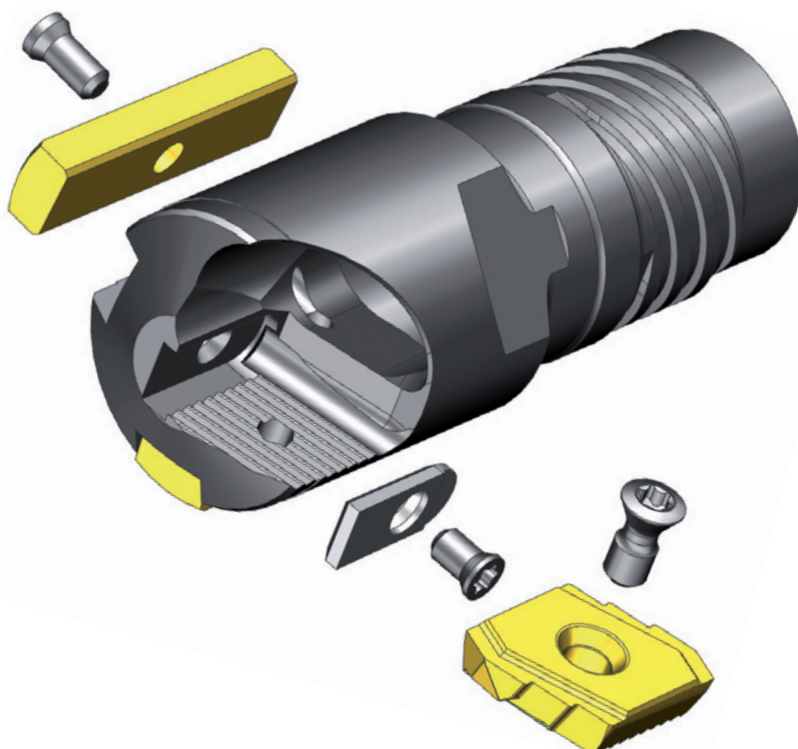


Type 61

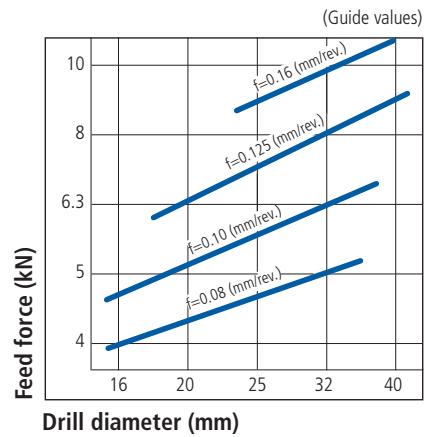
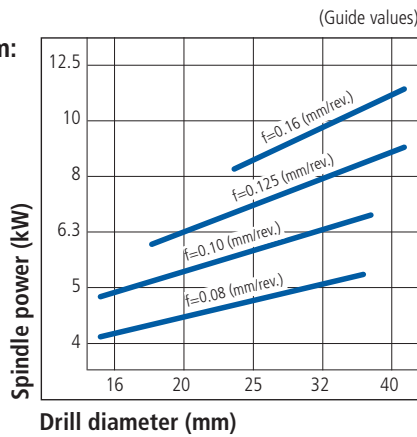
Drilling range Ø 18.00 - 36.20 mm

Advantages:

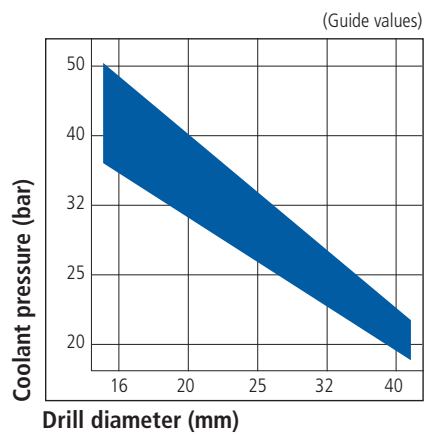
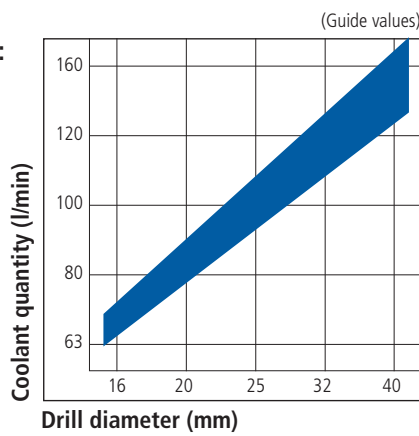
- Very economical, with optimal cutting performance
- Indexable inserts with various chip breakers available to suit processed material
- Tool adjustment range up to 0.5 mm using suitable replacement parts
- Ø fine adjustment with stop plate
- No adjustment required when changing wear parts, no re-adjustment within +/- 0.01 mm



Performance diagram:



Coolant information:

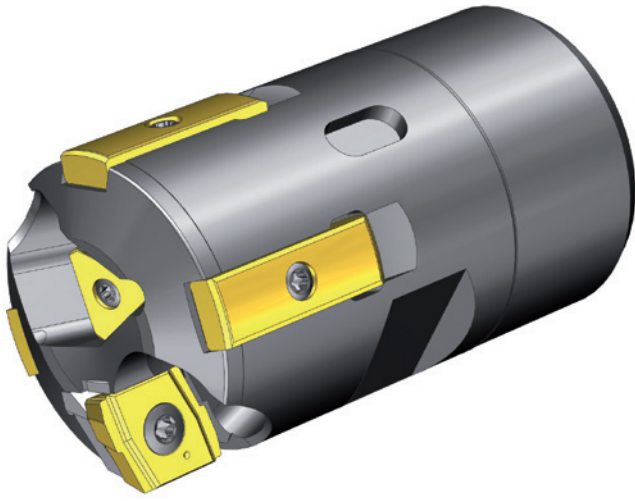


Guide values for deep hole drilling of different materials

Material / Mechanical strength properties	Cutting speed (m/min)	Feed (mm/rev.) for drill diameter (mm)				Carbide grades		
		14,55 - 17,99	18,00 - 24,99	25,00 - 31,99	32,00 - ...	Indexable insert		Guide pad
						up to Ø 17.99	from Ø 18.00	
Structural steel ≤ 700 N/mm ²	80 - 100	0.06 - 0.10	0.08 - 0.11	0.10 - 0.14	0.13 - 0.16	K 30 B - 1	P 25 B - 2	P 20 B
Case hardened steel ≤ 750 N/mm ²								
Case hardened steel ≤ 1100 N/mm ²	70 - 80	0.06 - 0.10	0.08 - 0.11	0.10 - 0.13	0.12 - 0.15	K 30 BX - 91	P 25 BX - 91	
Heat treated steel ≤ 700 N/mm ²	70 - 90	0.06 - 0.10	0.08 - 0.11	0.10 - 0.14	0.13 - 0.16			
Heat treated steel ≤ 1100 N/mm ²	55 - 75	0.06 - 0.10	0.08 - 0.11	0.10 - 0.13	0.12 - 0.15			
Nitriding steel ≤ 1100 N/mm ²	55 - 75	0.06 - 0.09	0.08 - 0.10	0.09 - 0.12	0.11 - 0.14	K 10 B - 1	K 10 B - 2	
Ferritic steel ≤ 900 N/mm ²	60 - 80	0.06 - 0.10	0.08 - 0.11	0.10 - 0.14	0.13 - 0.16			
Austenitic steel (stainless)	60 - 80	0.06 - 0.09	0.08 - 0.10	0.10 - 0.12	0.12 - 0.14	K 30 BX - 91	P 25 BX - 91	
Heat resisting steel (stainless), Tool steel	50 - 70	0.06 - 0.09	0.08 - 0.10	0.10 - 0.12	0.12 - 0.14			
Steel castings ≤ 700 N/mm ²	60 - 80	0.06 - 0.10	0.08 - 0.11	0.10 - 0.14	0.13 - 0.16			
Nodular cast iron ≤ 1000 N/mm ²	65 - 80	0.08 - 0.12	0.10 - 0.13	0.12 - 0.15	0.14 - 0.18	K 10 - 1	K 10 - 1	
Cast iron unalloyed and alloyed	70 - 100	0.08 - 0.12	0.10 - 0.13	0.12 - 0.15	0.14 - 0.18			
Aluminium and Aluminium alloys	100 - 200	0.07 - 0.11	0.09 - 0.12	0.10 - 0.14	0.12 - 0.18	K 10 - 1	K 10 - 1	
Copper Cu content < 99%	120 - ...	0.04 - 0.09	0.06 - 0.10	0.08 - 0.12	0.10 - 0.14			

Type 12/64

Solid drill head with indexable inserts and guide pads
Ø 28.50 to 74.99 mm



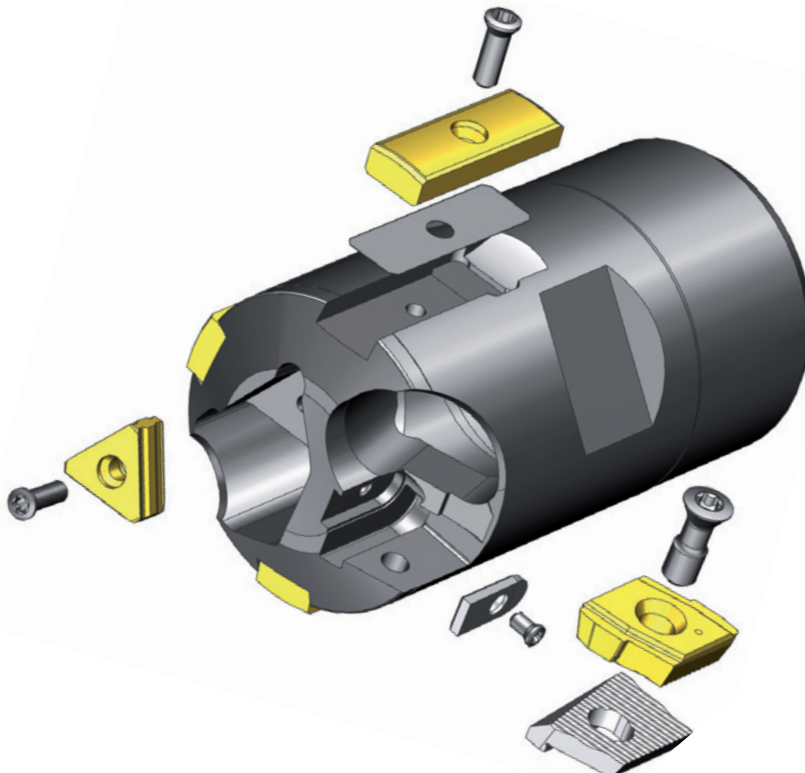
Type 12
Drilling range Ø 28.50 - 74.99 mm



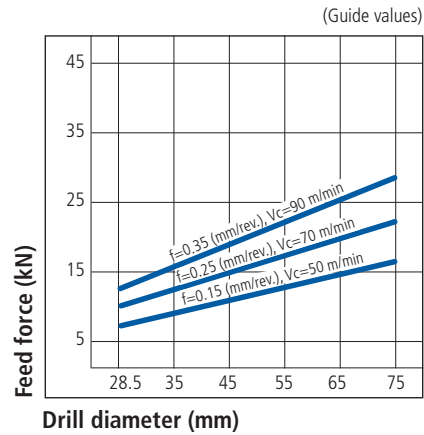
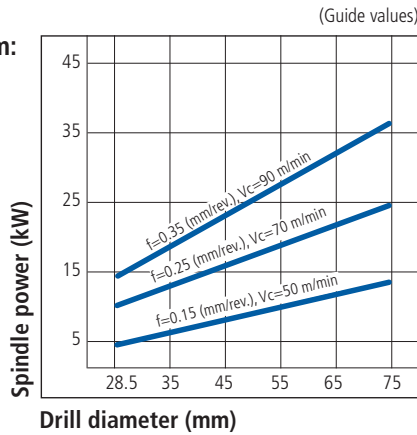
Type 64
Drilling range Ø 28.71 - 74.99 mm

Advantages:

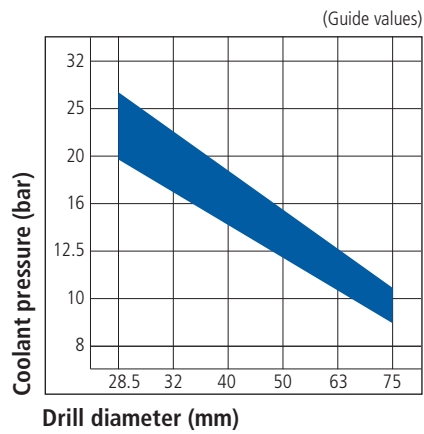
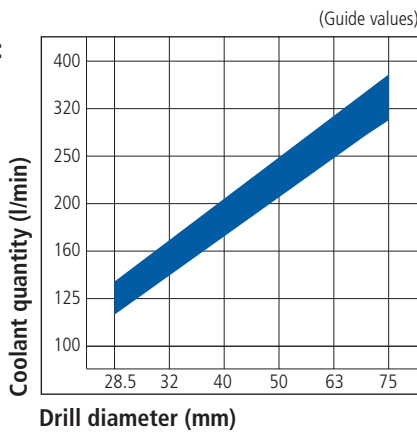
- New chip breakers for high feed rates and high productivity
- No adjustment required when changing wear parts, no re-adjustment within +/- 0.01 mm
- Tool adjustment range up to 0.5 mm using suitable replacement parts
- Minimal axis deviation at large drilling depths
- Ø fine adjustment with stop plate



Performance diagram:



Coolant information:

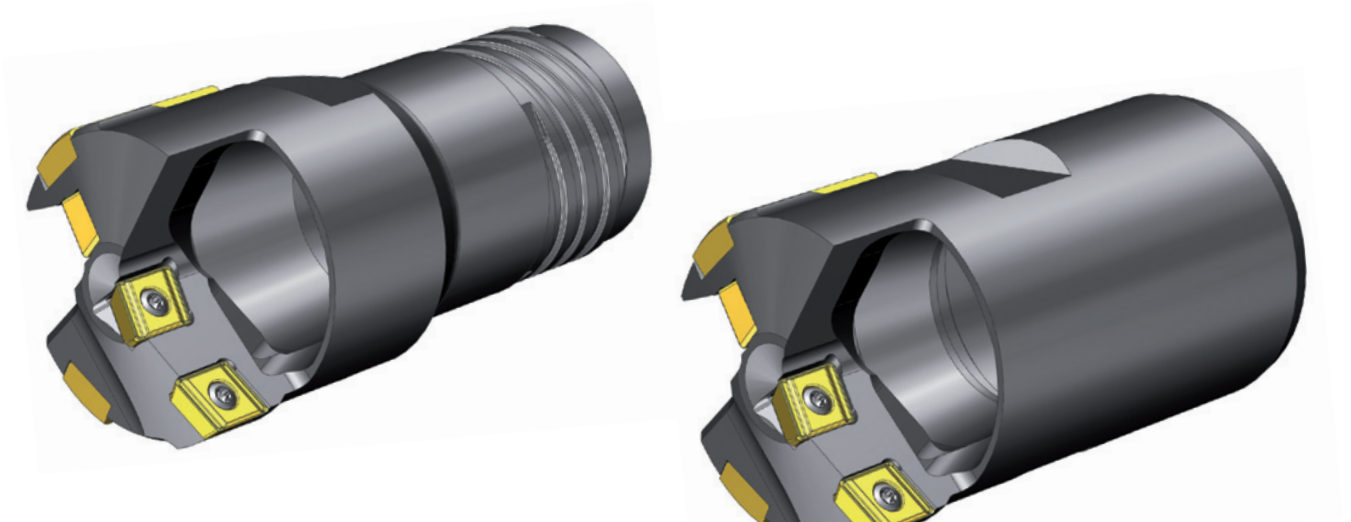


Guide values for deep hole drilling of different materials

Material / Mechanical strength properties	Cutting speed (m/min)	Feed (mm/rev.) for drill diameter (mm)			Carbide grades		
		28.50 - 39.99	40.00 - 51.99	52.00 - 74.99	Peripheral insert	Center insert	Guide pad
Structural steel $\leq 700 \text{ N/mm}^2$	80 - 100	0.12 - 0.18	0.15 - 0.20	0.15 - 0.22	P 25 B - 2	P 40 B - 1	P 20 B
Case hardened steel $\leq 750 \text{ N/mm}^2$	80 - 100	0.12 - 0.18	0.15 - 0.20	0.15 - 0.22	P 25 B - 1		
Case hardened steel $\leq 1100 \text{ N/mm}^2$	70 - 80	0.20 - 0.25	0.20 - 0.30	0.20 - 0.35	P 25 B - 5		
Heat treated steel $\leq 700 \text{ N/mm}^2$	70 - 90	0.20 - 0.28	0.20 - 0.35	0.20 - 0.40			
Heat treated steel $\leq 1100 \text{ N/mm}^2$	55 - 75	0.20 - 0.25	0.20 - 0.30	0.20 - 0.30	P 25 B - 1		
Nitriding steel $\leq 1100 \text{ N/mm}^2$	55 - 75	0.20 - 0.25	0.20 - 0.30	0.20 - 0.30	P 25 B - 2		
Ferritic steel $\leq 900 \text{ N/mm}^2$	60 - 80	0.15 - 0.25	0.15 - 0.30	0.20 - 0.30	K 10 BX - 2		
Austenitic steel (stainless)	60 - 80	0.08 - 0.12	0.10 - 0.18	0.10 - 0.22	P 25 B - 5	P 40 B - 1	
Heat resisting steel (stainless), Tool steel	50 - 70	0.15 - 0.25	0.20 - 0.25	0.20 - 0.30			
Steel castings $\leq 700 \text{ N/mm}^2$	60 - 80	0.20 - 0.25	0.20 - 0.35	0.20 - 0.35			
Nodular cast iron $\leq 1000 \text{ N/mm}^2$	65 - 80	0.20 - 0.35	0.25 - 0.40	0.25 - 0.50			
Cast iron unalloyed and alloyed	70 - 100	0.20 - 0.35	0.20 - 0.40	0.25 - 0.50	K 10 B - 5	K 10 B - 1	
Aluminium and Aluminium alloys	100 - 200	0.08 - 0.25	0.10 - 0.30	0.10 - 0.45	K 10 - 1	K 10 - 1	
Copper Cu content < 99%	120 - ...	0.07 - 0.15	0.10 - 0.25	0.10 - 0.25			

Type 70 A/B

Solid drill head with indexable inserts and guide pads
Ø 25.00 to 64.99 mm



Type 70 A

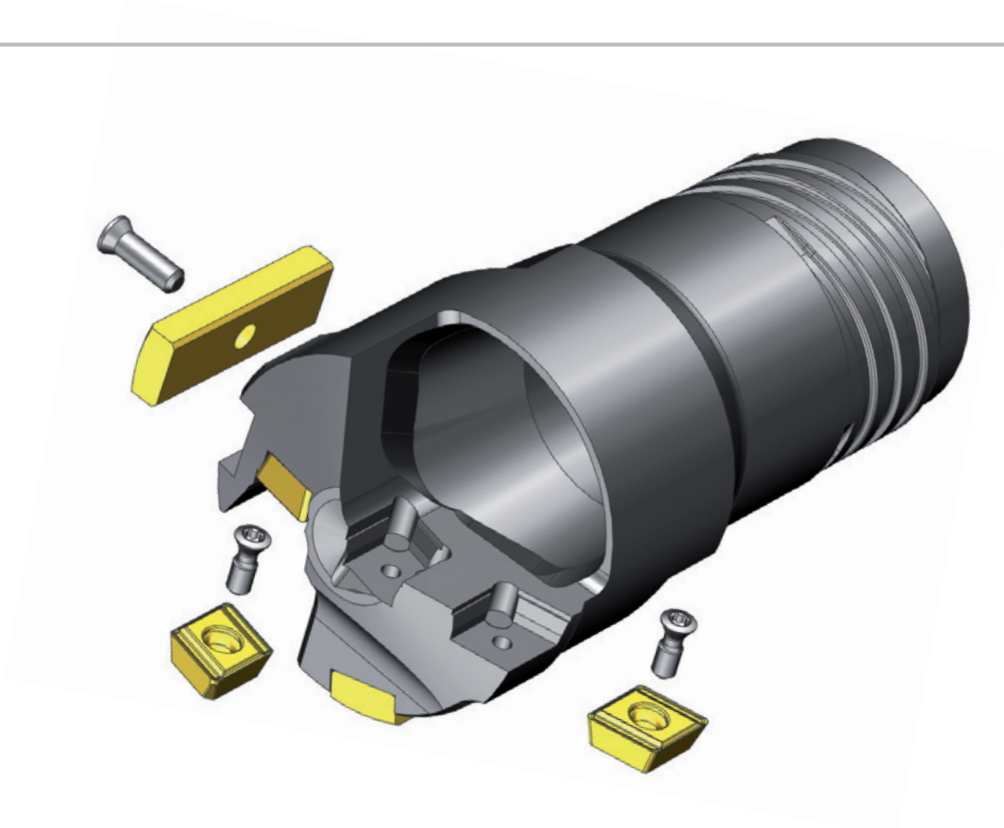
Drilling range Ø 25.00 - 64.99 mm

Type 70 B

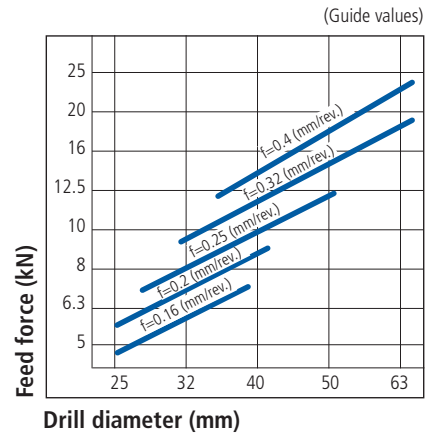
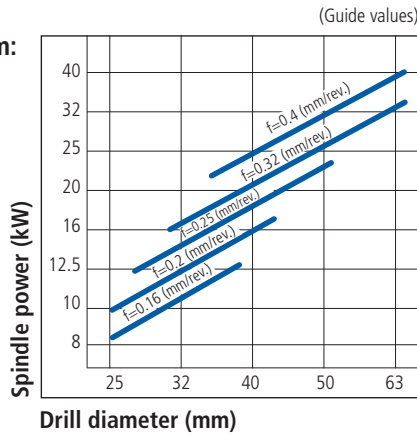
Drilling range Ø 25.00 - 64.99 mm

Advantages:

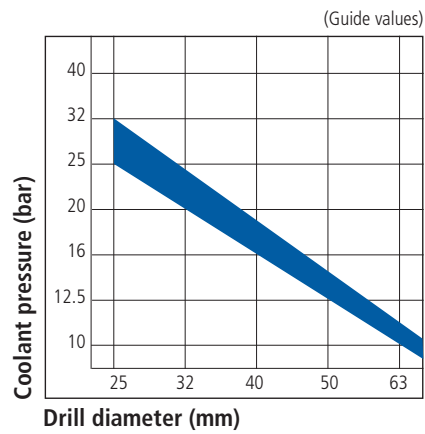
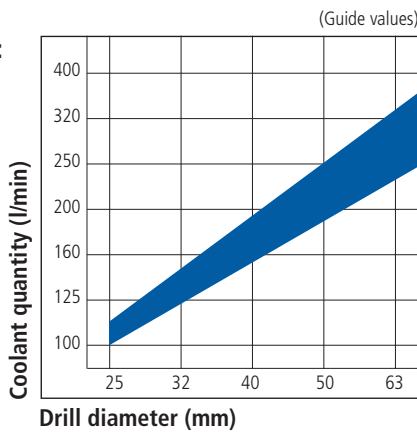
- Very few wear parts over the whole drilling range
- New chip breakers for high feed rates and high productivity
- No adjustment after a change of indexable inserts
- We keep wear parts in stock



Performance diagram:



Coolant information:



Guide values for deep hole drilling of different materials

Material / Mechanical strength properties	Cutting speed (m/min)	Feed (mm/rev.) for drill diameter (mm)			Carbide grades		
		25.00 - 29.99	30.00 - 44.99	45.00 - 64.99	Peripheral insert + intermediate insert	Center insert	Guide pad
Structural steel $\leq 700 \text{ N/mm}^2$	80 - 100	0.10 - 0.25	0.10 - 0.35	0.10 - 0.40	U 225 BX - 5	U 440 BX - 5	P 20 B
Case hardened steel $\leq 750 \text{ N/mm}^2$	80 - 100	0.10 - 0.25	0.10 - 0.35	0.10 - 0.40			
Case hardened steel $\leq 1100 \text{ N/mm}^2$	70 - 80	0.20 - 0.25	0.20 - 0.30	0.20 - 0.35			
Heat treated steel $\leq 700 \text{ N/mm}^2$	70 - 90	0.20 - 0.25	0.25 - 0.30	0.25 - 0.40			
Heat treated steel $\leq 1100 \text{ N/mm}^2$	55 - 75	0.20 - 0.25	0.25 - 0.30	0.25 - 0.30			
Nitriding steel $\leq 1100 \text{ N/mm}^2$	55 - 75	0.15 - 0.20	0.15 - 0.20	0.15 - 0.25			
Ferritic steel $\leq 900 \text{ N/mm}^2$	60 - 80	0.15 - 0.25	0.25 - 0.30	0.25 - 0.30			
Austenitic steel (stainless)	60 - 80	0.20 - 0.27	0.25 - 0.35	0.25 - 0.37			
Heat resisting steel (stainless), Tool steel	50 - 70	0.15 - 0.20	0.15 - 0.20	0.15 - 0.25			
Steel castings $\leq 700 \text{ N/mm}^2$	60 - 80	0.20 - 0.25	0.25 - 0.30	0.20 - 0.35			
Nodular cast iron $\leq 1000 \text{ N/mm}^2$	65 - 80	0.20 - 0.35	0.25 - 0.40	0.30 - 0.40			
Cast iron unalloyed and alloyed	70 - 100	0.20 - 0.35	0.30 - 0.40	0.30 - 0.40			
Aluminium and Aluminium alloys	100 - 200	0.10 - 0.25	0.15 - 0.30	0.15 - 0.45			
Copper Cu content < 99%	120 - ...	0.05 - 0.15	0.05 - 0.15	0.05 - 0.15			

Type 43 A/B

Solid drill head with indexable inserts and guide pads
Ø 60.00 to 149.99 mm



Type 43 A

Drilling range Ø 60.00 - 149.99 mm

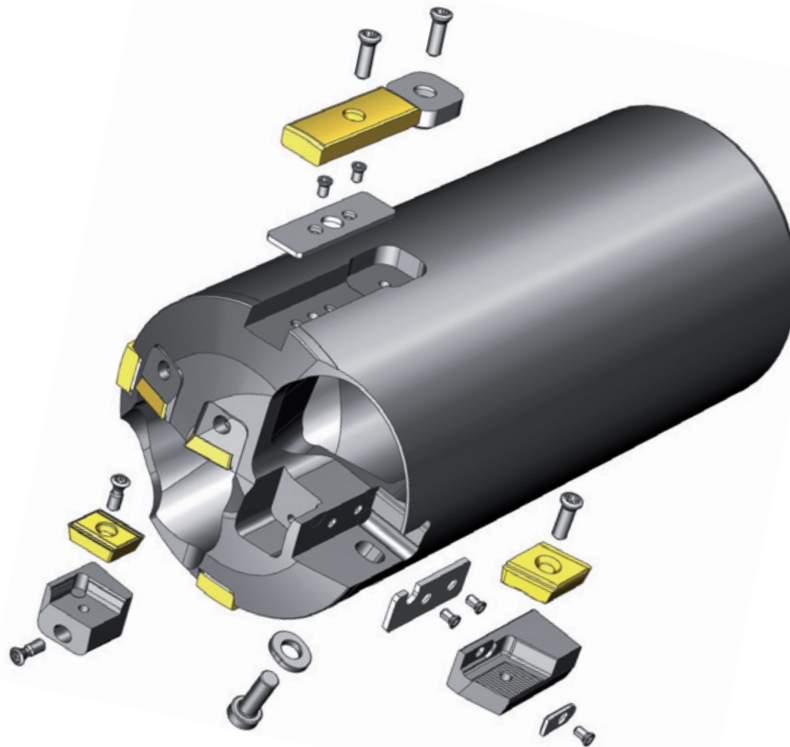


Type 43 B

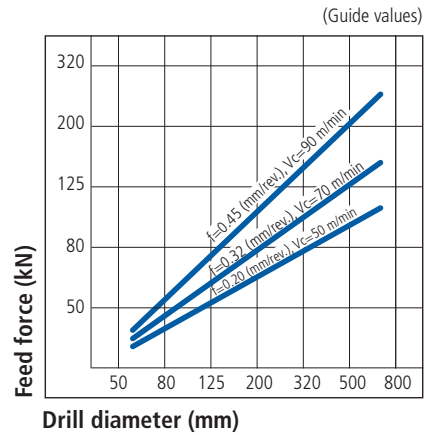
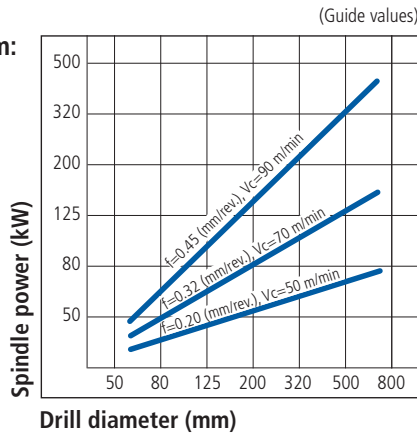
Drilling range Ø 60.00 - 149.99 mm

Advantages:

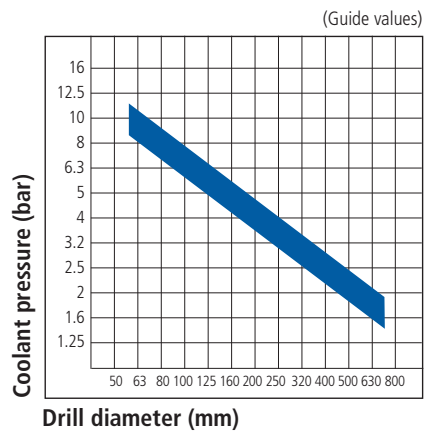
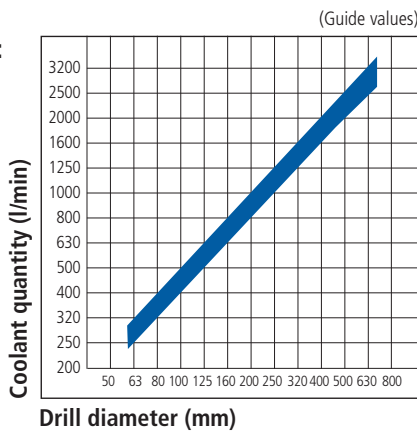
- Simplest operation, change of wear parts without re-adjustment within +/- 0.01 mm
- Wear parts can be exchanged on the machine
- Tool adjustment range depending on tool diameter up to 5 mm with replacement parts
- New cutting geometry for high cutting performance
- Minimal axis deviation at large drilling depths
- Ø fine adjustment with stop plate



Performance diagram:



Coolant information:



Guide values for deep hole drilling of different materials

Material / Mechanical strength properties	Cutting speed (m/min)	Feed (mm/rev.) for drill diameter (mm)	Carbide grades / chip breakers						Guide pad		
			60.00 - 149.99		60.00 - 69.99		70.00 - 89.99			90.00 - 149.99	
			Outer insert	Intermediate and center insert	Intermediate insert	Center insert	Intermediate insert	Center insert			
Structural steel ≤ 700 N/mm ²	80 - 100	0.15 - 0.30	P 25 B - 1								
Case hardened steel ≤ 750 N/mm ²	80 - 100	0.15 - 0.30									
Case hardened steel ≤ 1100 N/mm ²	70 - 80	0.15 - 0.25	P 25 B - 5	U 225 BX - 6	U 225 BX - 6	U 440 BX - 6	P 25 B - 5	P 25 B - 5			
Heat treated steel ≤ 700 N/mm ²	70 - 90	0.20 - 0.35									
Heat treated steel ≤ 1100 N/mm ²	55 - 75	0.15 - 0.25									
Nitriding steel ≤ 1100 N/mm ²	55 - 75	0.15 - 0.25	P 25 B - 1								
Ferritic steel ≤ 900 N/mm ²	60 - 80	0.12 - 0.20									
Austenitic steel (stainless)	60 - 80	0.12 - 0.20	K 10 BX - 2	U 225 BX - 2	U 225 BX - 2	U 440 BX - 5	P 25 BX - 2	P 25 BX - 2	P 20 B		
Heat resisting steel (stainless), Tool steel	50 - 70	0.15 - 0.25	P 25 B - 5	U 225 BX - 6	U 225 BX - 6	U 440 BX - 6	P 25 B - 5	P 25 B - 5			
Steel castings ≤ 700 N/mm ²	60 - 80	0.15 - 0.25									
Nodular cast iron ≤ 1000 N/mm ²	65 - 80	0.20 - 0.40									
Cast iron unalloyed and alloyed	70 - 100	0.15 - 0.25									
Aluminium and Aluminium alloys	80 - 150	0.25 - 0.60	P 25 B - 5								
Copper Cu content < 99%	120 - ...	0.05 - 0.25	K 10 - 1	U 225 BX - 5	U 225 BX - 5	U 440 BX - 5	P 25 - 5	P 25 - 5			

Type 43 A/B/F

Solid drill head with indexable inserts and guide pads
Ø 149.00 to 368.99 mm (larger diameters on request)



Type 43 A

Drilling range Ø 149.00 - 368.99 mm

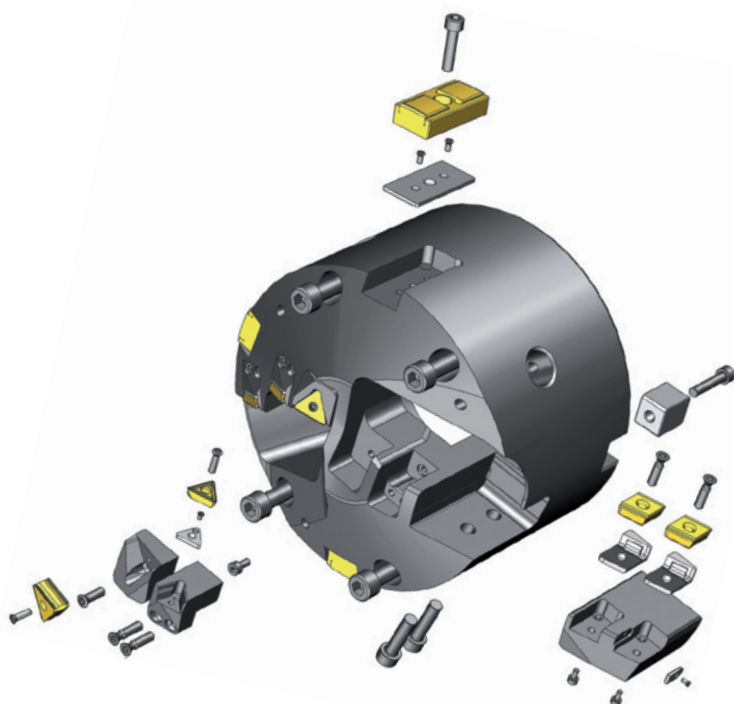


Type 43 B

Drilling range Ø 149.00 - 368.99 mm

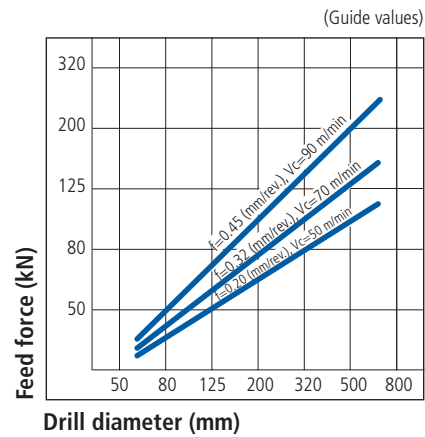
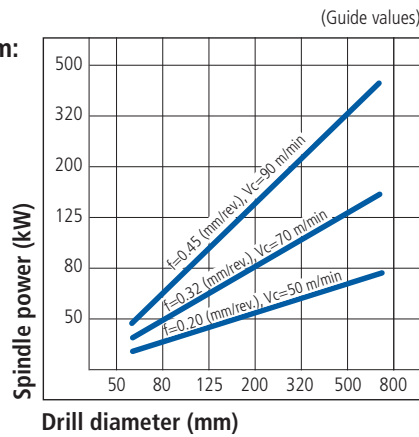
Advantages:

- Simplest operation, change of wear parts without re-adjustment within +/- 0.01 mm
- Wear parts can be exchanged on the machine
- Tool dia. adjustment range up to 10 mm using suitable replacement parts
- New cutting geometry for high cutting performance
- Minimal axis deviation at large drilling depths
- Ø fine adjustment with stop plate

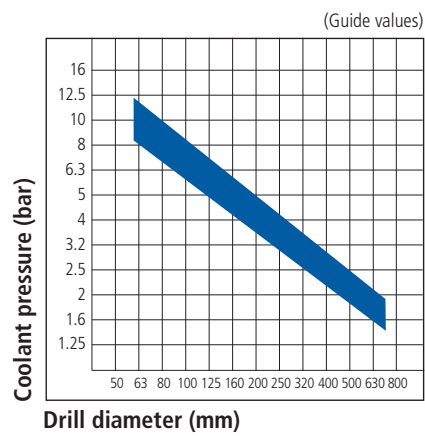
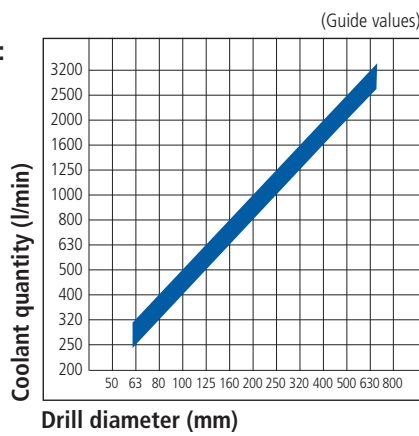


Type 43 F

Performance diagram:



Coolant information:



Guide values for deep hole drilling of different materials

Material / Mechanical strength properties	Cutting speed (m/min)	Feed (mm/rev.) for drill diameter (mm)	Carbide grades / chip breakers			Guide pad
		149.00 - 700.00	Outer insert	Intermediate insert	Center insert	
Structural steel $\leq 700 \text{ N/mm}^2$	80 - 100	0.20 - 0.40	P 25 B - 1			P 20 B
Case hardened steel $\leq 750 \text{ N/mm}^2$	80 - 100	0.25 - 0.40				
Case hardened steel $\leq 1100 \text{ N/mm}^2$	70 - 80	0.20 - 0.35	P 25 B - 5	P 25 B - 5	P 25 B - 5	
Heat treated steel $\leq 700 \text{ N/mm}^2$	70 - 90	0.25 - 0.40				
Heat treated steel $\leq 1100 \text{ N/mm}^2$	55 - 75	0.20 - 0.35	P 25 B - 1			
Nitriding steel $\leq 1100 \text{ N/mm}^2$	55 - 75	0.20 - 0.35				
Ferritic steel $\leq 900 \text{ N/mm}^2$	60 - 80	0.18 - 0.30	K 10 BX - 2	P 25 BX - 2	P 25 BX - 2	
Austenitic steel (stainless)	60 - 80	0.15 - 0.25				
Heat resisting steel (stainless), Tool steel	50 - 70	0.18 - 0.30	P 25 B - 5	P 25 B - 5	P 25 B - 5	
Steel castings $\leq 700 \text{ N/mm}^2$	60 - 80	0.20 - 0.30				
Nodular cast iron $\leq 1000 \text{ N/mm}^2$	65 - 80	0.25 - 0.50	P 25 B - 5	P 25 B - 5	P 25 B - 5	
Cast iron unalloyed and alloyed	70 - 100	0.25 - 0.50				
Aluminium and Aluminium alloys	80 - 150	0.15 - 0.50	P 25 B - 5			
Copper Cu content < 99%	120 - ...	0.10 - 0.25	K 10 - 1	P 25 - 5	P 25 - 5	

Type 13 A/B

Counterboring head with indexable inserts and guide pads
Ø 28.50 to 74.99 mm



Type 13 A

Drilling range Ø 28.71 - 74.99 mm

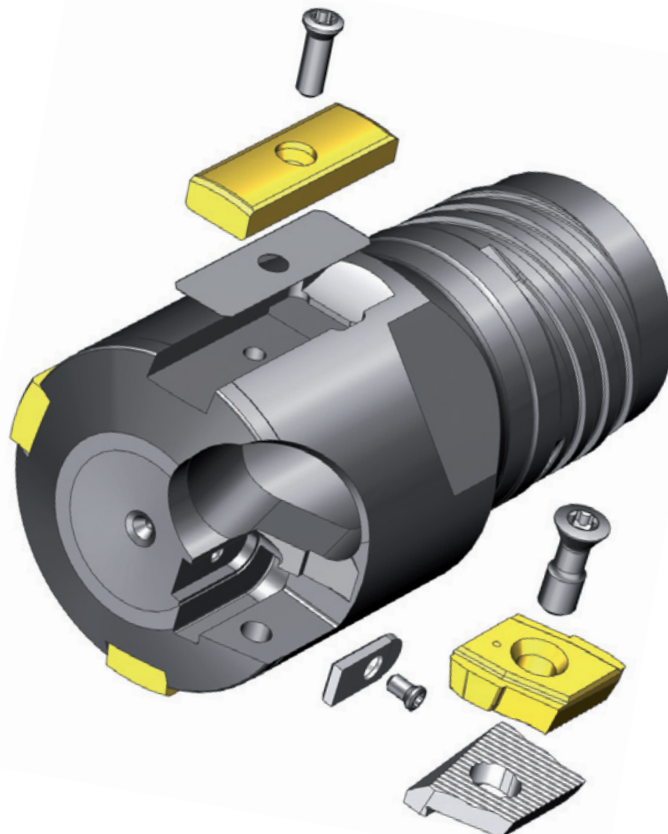


Type 13 B

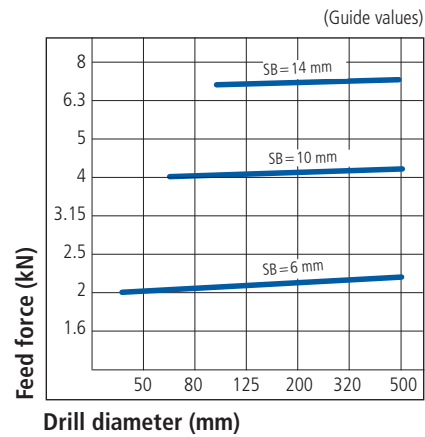
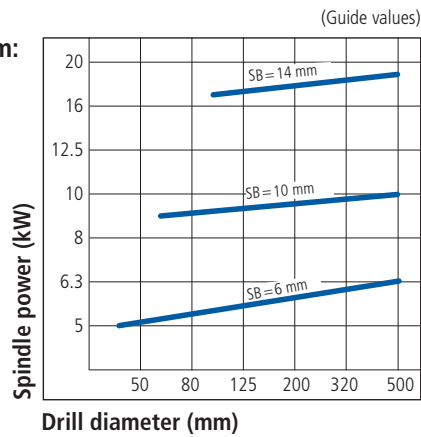
Drilling range Ø 28.50 - 74.99 mm

Advantages:

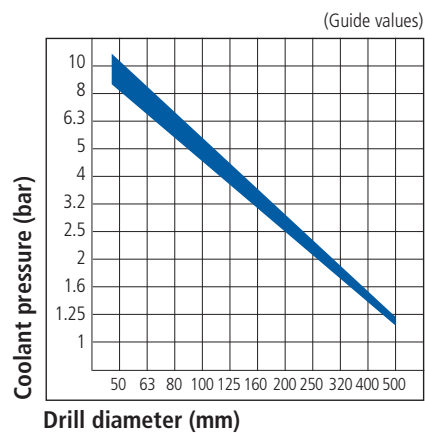
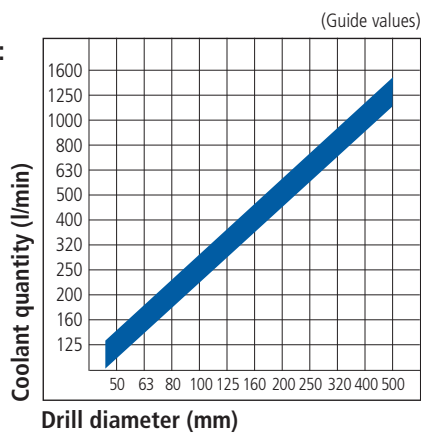
- New chip breakers for high feed rates and high productivity
- No adjustment required when changing wear parts, no re-adjustment within +/- 0.01 mm
- Tool adjustment range up to 0.5 mm using suitable replacement parts
- Maximum shape accuracy and hole straightness
- Ø fine adjustment with stop plate



Performance diagram:



Coolant information:

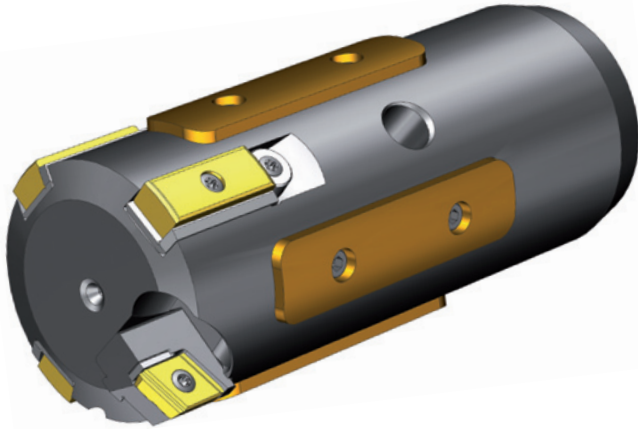


Guide values for deep hole drilling of different materials

Material / Mechanical strength properties	Cutting speed (m/min)	Feed (mm/rev.) for drill diameter (mm)			Carbide grades / chip breakers	
		30.00 - 80.99	81.00 - 123.99	124 - ...	Outer insert	Guide pad
Structural steel $\leq 700 \text{ N/mm}^2$	80 - 100	0.15 - 0.20	0.20 - 0.30	0.30 - 0.45	P 25 B - 1	P 20 B
Case hardened steel $\leq 750 \text{ N/mm}^2$	80 - 100	0.15 - 0.20	0.20 - 0.30	0.20 - 0.45		
Case hardened steel $\leq 1100 \text{ N/mm}^2$	70 - 80	0.20 - 0.30	0.20 - 0.35	0.25 - 0.40	P 25 B - 5	
Heat treated steel $\leq 700 \text{ N/mm}^2$	70 - 90	0.20 - 0.30	0.25 - 0.40	0.30 - 0.50		
Heat treated steel $\leq 1100 \text{ N/mm}^2$	55 - 75	0.15 - 0.25	0.20 - 0.30	0.25 - 0.40	P 25 B - 1	
Nitriding steel $\leq 1100 \text{ N/mm}^2$	55 - 75	0.15 - 0.25	0.20 - 0.25	0.25 - 0.32		
Ferritic steel $\leq 900 \text{ N/mm}^2$	60 - 80	0.15 - 0.20	0.20 - 0.25	0.20 - 0.30	K 10 BX - 2	
Austenitic steel (stainless)	60 - 80	0.12 - 0.18	0.15 - 0.22	0.15 - 0.25		
Heat resisting steel (stainless), Tool steel	50 - 70	0.15 - 0.25	0.20 - 0.30	0.20 - 0.32	P 25 B - 5	
Steel castings $\leq 700 \text{ N/mm}^2$	60 - 80	0.15 - 0.25	0.20 - 0.30	0.20 - 0.35		
Nodular cast iron $\leq 1000 \text{ N/mm}^2$	65 - 80	0.20 - 0.35	0.25 - 0.40	0.25 - 0.50		
Cast iron unalloyed and alloyed	70 - 100	0.15 - 0.25	0.20 - 0.35	0.20 - 0.40	K 10 B - 5	
Aluminium and Aluminium alloys	80 - 150	0.08 - 0.25	0.12 - 0.45	0.15 - 0.60		
Copper Cu content < 99%	120 - ...	0.06 - 0.15	0.06 - 0.20	0.06 - 0.20	K 10 - 1	

Type 34/54

Counterboring head with indexable inserts and guide pads
Ø 44.00 to 353.99 mm



Type 34

Drilling range Ø 44.00 - 353.99 mm

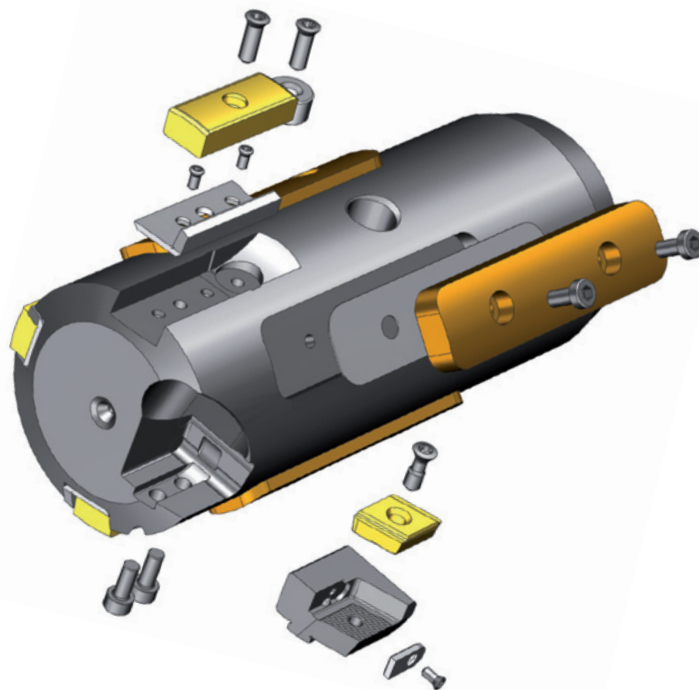


Type 54

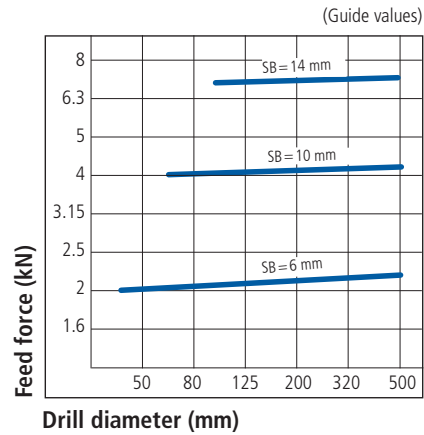
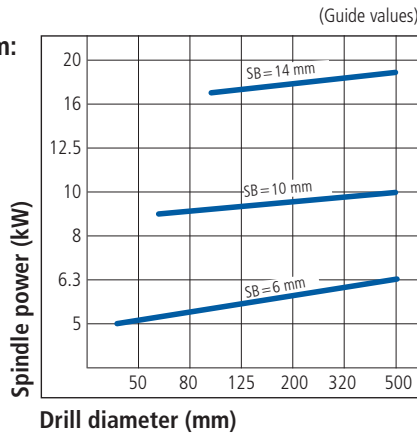
Drilling range Ø 47.00 - 353.99 mm

Advantages:

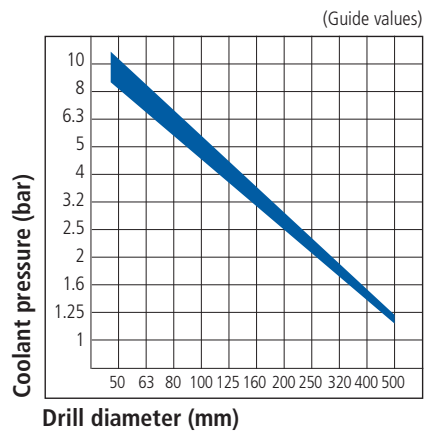
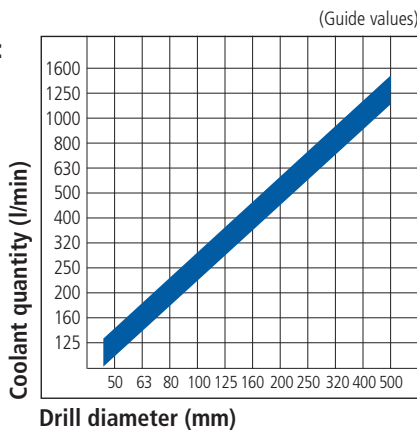
- New chip breakers for high feed rates and high productivity
- No adjustment required when changing wear parts, no re-adjustment within +/- 0.01 mm
- Tool adjustment range depending on tool diameter up to 12 mm with replacement parts
- Maximum shape accuracy and hole straightness even at large drilling depths
- Internal 1-start connection thread - with additional fibre guide pads for large drilling depths
- Ø fine adjustment with stop plate



Performance diagram:



Coolant information:



Guide values for deep hole drilling of different materials

Material / Mechanical strength properties	Cutting speed (m/min)	Feed (mm/rev.) for drill diameter (mm)			Carbide grades / chip breakers	
		30.00 - 80.99	81.00 - 123.99	124 - ...	Outer insert	Guide pad
Structural steel $\leq 700 \text{ N/mm}^2$	80 - 100	0.15 - 0.20	0.20 - 0.30	0.30 - 0.45	P 25 B - 1	P 20 B
Case hardened steel $\leq 750 \text{ N/mm}^2$	80 - 100	0.15 - 0.20	0.20 - 0.30	0.20 - 0.45		
Case hardened steel $\leq 1100 \text{ N/mm}^2$	70 - 80	0.20 - 0.30	0.20 - 0.35	0.25 - 0.40	P 25 B - 5	
Heat treated steel $\leq 700 \text{ N/mm}^2$	70 - 90	0.20 - 0.30	0.25 - 0.40	0.30 - 0.50		
Heat treated steel $\leq 1100 \text{ N/mm}^2$	55 - 75	0.15 - 0.25	0.20 - 0.30	0.25 - 0.40	P 25 B - 1	
Nitriding steel $\leq 1100 \text{ N/mm}^2$	55 - 75	0.15 - 0.25	0.20 - 0.25	0.25 - 0.32		
Ferritic steel $\leq 900 \text{ N/mm}^2$	60 - 80	0.15 - 0.20	0.20 - 0.25	0.20 - 0.30	K 10 BX - 2	
Austenitic steel (stainless)	60 - 80	0.12 - 0.18	0.15 - 0.22	0.15 - 0.25		
Heat resisting steel (stainless), Tool steel	50 - 70	0.15 - 0.25	0.20 - 0.30	0.20 - 0.32	P 25 B - 5	
Steel castings $\leq 700 \text{ N/mm}^2$	60 - 80	0.15 - 0.25	0.20 - 0.30	0.20 - 0.35		
Nodular cast iron $\leq 1000 \text{ N/mm}^2$	65 - 80	0.20 - 0.35	0.25 - 0.40	0.25 - 0.50		
Cast iron unalloyed and alloyed	70 - 100	0.15 - 0.25	0.20 - 0.35	0.20 - 0.40	K 10 B - 5	
Aluminium and Aluminium alloys	80 - 150	0.08 - 0.25	0.12 - 0.45	0.15 - 0.60		
Copper Cu content < 99%	120 - ...	0.06 - 0.15	0.06 - 0.20	0.06 - 0.20	K 10 - 1	

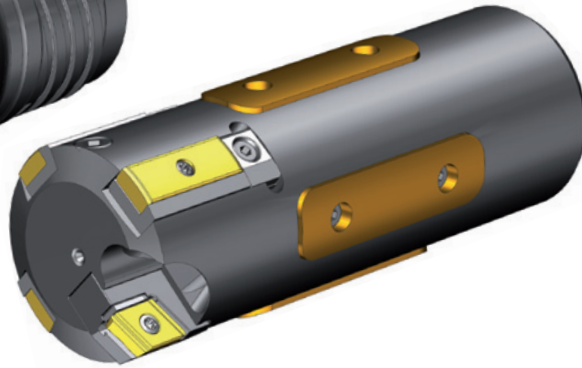
Type 35 A/B/F

Counterboring head with large adjustment range
Ø 61.00 to 498.99 mm



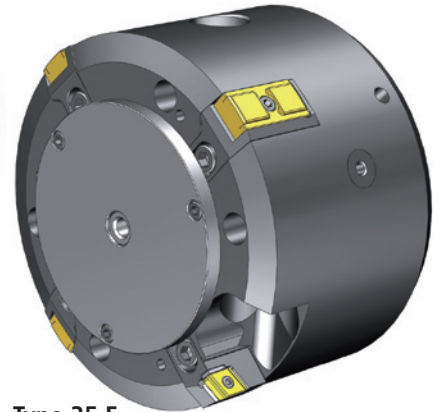
Type 35 A

4-start external connection thread
Drilling range Ø 61.00 - 223.99 mm



Type 35 B

1-start internal connection thread
Drilling range Ø 61.00 - 498.99 mm

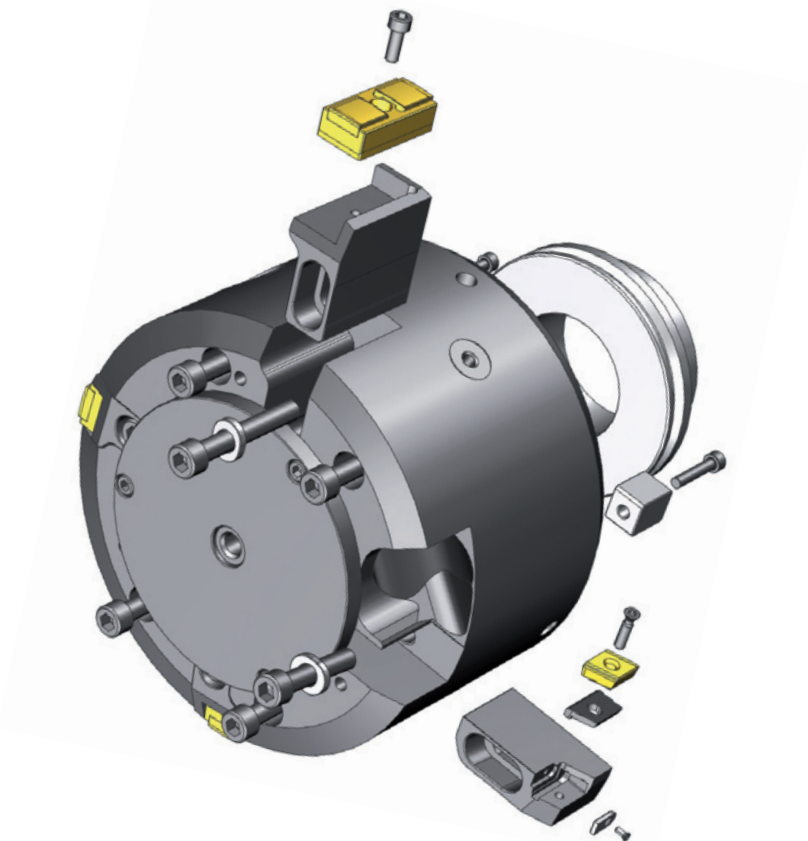


Type 35 F

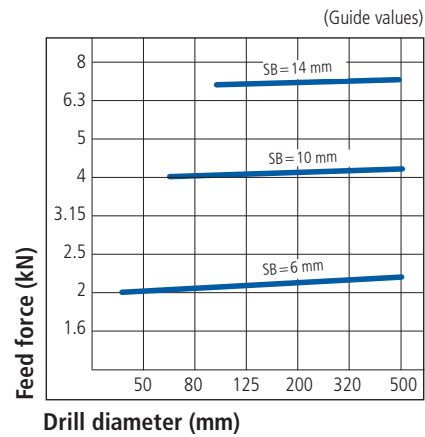
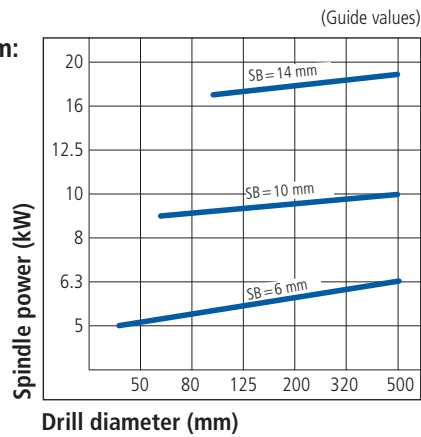
Flange connection
Drilling range Ø 224.00 - 498.99 mm

Advantages:

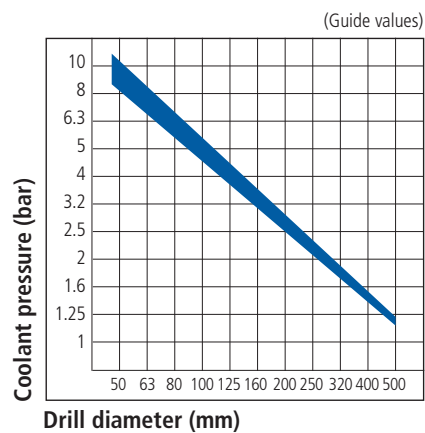
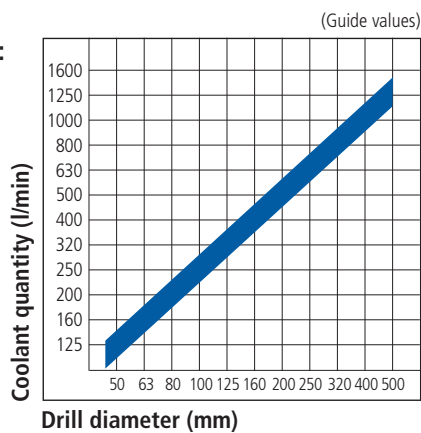
- Tool dia. adjustment range starting at 6 mm, from Ø 149 mm = 25 mm, from Ø 299 mm = 50 mm
- Low requirement for tools over the whole drilling range
- Adjustment system for easy change of diameter
- New patented adjustment system with a central adjusting ring from Ø 149 mm
- Simplest operation, change of wear parts without re-adjustment within +/- 0.01 mm
- Ø fine adjustment with stop plate



Performance diagram:



Coolant information:



Guide values for deep hole drilling of different materials

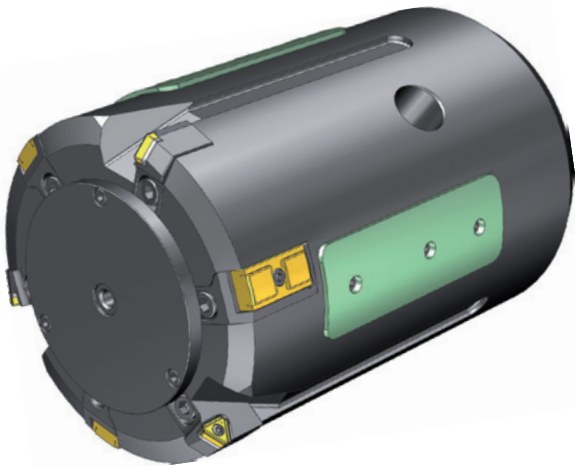
Material / Mechanical strength properties	Cutting speed (m/min)	Feed (mm/rev.) for drill diameter (mm)			Carbide grades/chip breakers	
		30.00 - 80.99	81.00 - 123.99	124 - ...	Outer insert	Guide pad
Structural steel $\leq 700 \text{ N/mm}^2$	80 - 100	0.15 - 0.20	0.20 - 0.30	0.30 - 0.45	P 25 B - 1	P 20 B
Case hardened steel $\leq 750 \text{ N/mm}^2$	80 - 100	0.15 - 0.20	0.20 - 0.30	0.20 - 0.45		
Case hardened steel $\leq 1100 \text{ N/mm}^2$	70 - 80	0.20 - 0.30	0.20 - 0.35	0.25 - 0.40	P 25 B - 5	
Heat treated steel $\leq 700 \text{ N/mm}^2$	70 - 90	0.20 - 0.30	0.25 - 0.40	0.30 - 0.50		
Heat treated steel $\leq 1100 \text{ N/mm}^2$	55 - 75	0.15 - 0.25	0.20 - 0.30	0.25 - 0.40	P 25 B - 1	
Nitriding steel $\leq 1100 \text{ N/mm}^2$	55 - 75	0.15 - 0.25	0.20 - 0.25	0.25 - 0.32		
Ferritic steel $\leq 900 \text{ N/mm}^2$	60 - 80	0.15 - 0.20	0.20 - 0.25	0.20 - 0.30	K 10 BX - 2	
Austenitic steel (stainless)	60 - 80	0.12 - 0.18	0.15 - 0.22	0.15 - 0.25		
Heat resisting steel (stainless), Tool steel	50 - 70	0.15 - 0.25	0.20 - 0.30	0.20 - 0.32	P 25 B - 5	
Steel castings $\leq 700 \text{ N/mm}^2$	60 - 80	0.15 - 0.25	0.20 - 0.30	0.20 - 0.35		
Nodular cast iron $\leq 1000 \text{ N/mm}^2$	65 - 80	0.20 - 0.35	0.25 - 0.40	0.25 - 0.50		
Cast iron unalloyed and alloyed	70 - 100	0.15 - 0.25	0.20 - 0.35	0.20 - 0.40	K 10 B - 5	
Aluminium and Aluminium alloys	80 - 150	0.08 - 0.25	0.12 - 0.45	0.15 - 0.60		
Copper Cu content < 99%	120 - ...	0.06 - 0.15	0.06 - 0.20	0.06 - 0.20	K 10 - 1	

Type 33/36

Counterboring head for hydraulic cylinders

Chip removal in feed direction

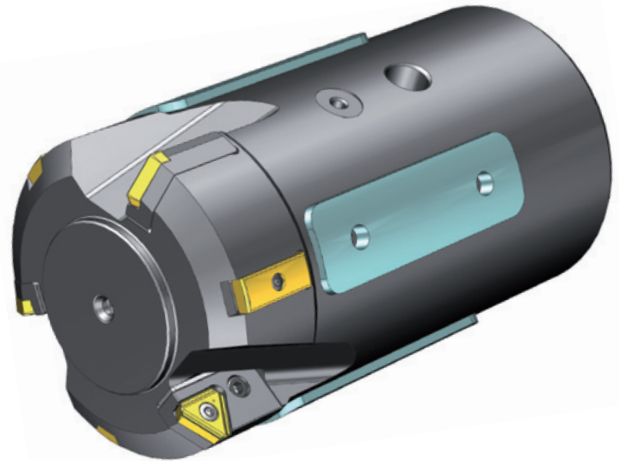
Ø 60.00 to 498.99 mm



Type 33

Drilling range Ø 159.00 - 498.99 mm

On request



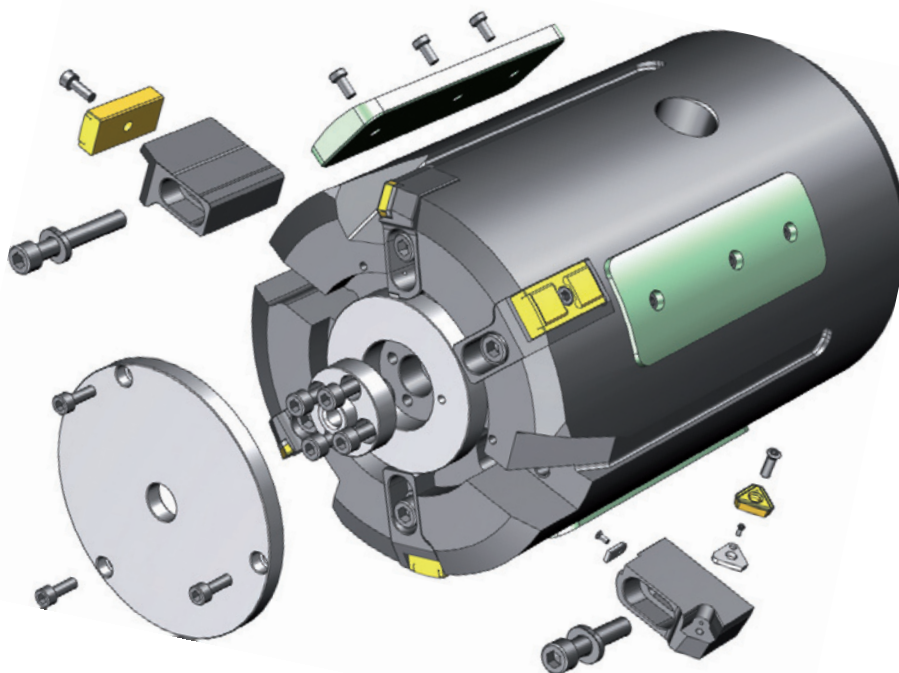
Type 36

Bohrbereich Ø 60,00 - 250,00 mm

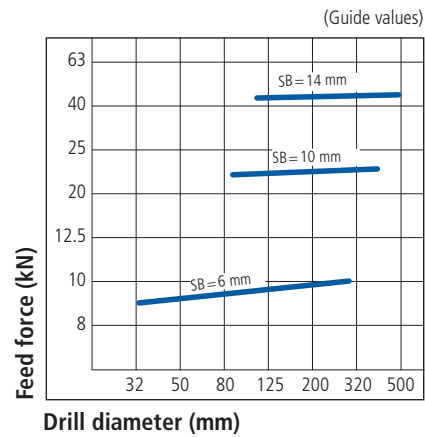
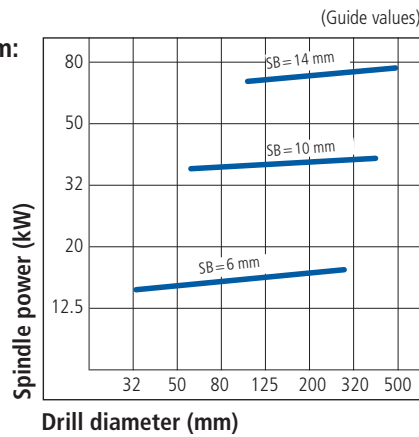
On request

Advantages:

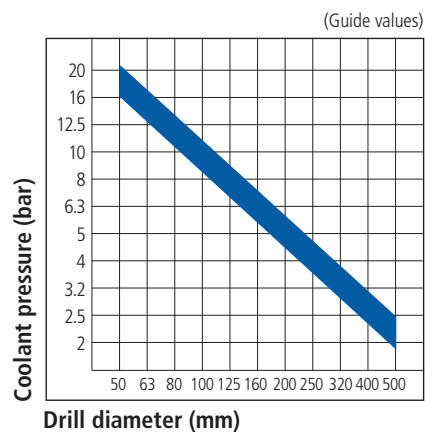
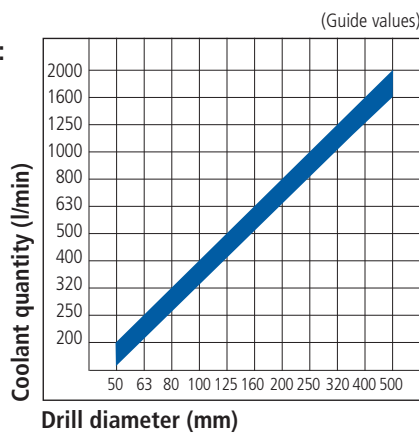
- Type 33: Newly patented adjustment system with central adjusting disc for easy diameter setting.
From Ø 159 mm adjustment range = 25 mm, from tool diameter 299 mm = 50 mm
- Type 36 Ø 60 to 250 mm with radial and axial fixed adjustment
- No adjustment required when changing wear parts, no re-adjustment within +/- 0.01 mm



Performance diagram:



Coolant information:



Guide values for deep hole drilling of different materials

Material / Mechanical strength properties	Cutting speed (m/min)	Feed (mm/rev.) for drill diameter (mm)					Carbide grades / chip breakers	
		34.00 - 59.99	60.00 - 79.99	80.00 - 119.99	120.00 - 299.99	300.00 - 498.99	Cutting insert	Guide pad
Structural steel ≤ 700 N/mm ²	80 - 120	0.40 - 0.60	0.60 - 1.00	0.80 - 1.20	1.00 - 1.50	1.00 - 1.50	HC 115 - 5*	P 20
Case hardened steel ≤ 750 N/mm ²	60 - 70	0.50 - 0.80	0.60 - 1.00	0.60 - 1.00	0.80 - 1.20	0.80 - 1.20	P 25 B - 1	
Case hardened steel ≤ 1100 N/mm ²	**							
Heat treated steel ≤ 700 N/mm ²	**							
Heat treated steel ≤ 1100 N/mm ²	**							
Nitriding steel ≤ 1100 N/mm ²	**							
Ferritic steel ≤ 900 N/mm ²	**							
Austenitic steel (stainless)	60 - 80	0.40 - 0.60	0.50 - 0.80	0.60 - 1.00	0.80 - 1.20	0.80 - 1.20	P 25 BX - 1	
Heat resisting steel (stainless), Tool steel	**							
Rust proof steel castings	50 - 60	0.30 - 0.50	0.40 - 0.60	0.50 - 1.00	0.80 - 1.20		HC 115 - 5	
Steel castings ≤ 700 N/mm ²	**							
Cast iron unalloyed and alloyed	**							
Aluminium and Aluminium alloys	150 - 250	0.60 - 0.90	0.80 - 1.20	1.00 - 1.50	1.00 - 1.80	1.00 - 2.00	HC 115 - 5	
Copper Cu content < 99%	**							

* first recommendation

** On request

Type 38/58

Pull-boring head with indexable inserts and guide pads
Ø 20.00 to 222.99 mm



Type 38

Drilling range Ø 20.00 - 222.99 mm

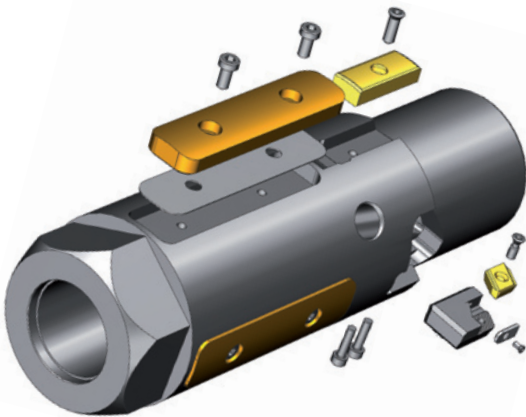


Type 58

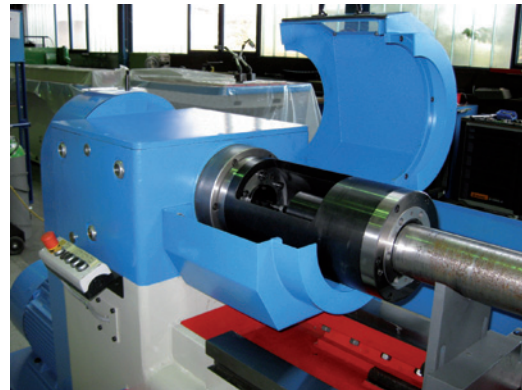
Drilling range Ø 20.00 - 222.99 mm

Advantages:

- Tool adjustment range depending on tool diameter up to 5 mm with replacement parts
- Simplest operation, change of wear parts without re-adjustment within +/- 0.01 mm
- Minimal axis deviation at large drilling depths
- Bore tolerance in the range of IT7 (IT6) roundness/diameter

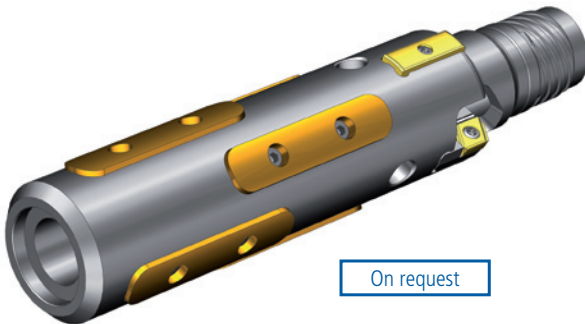


Lantern (on request)



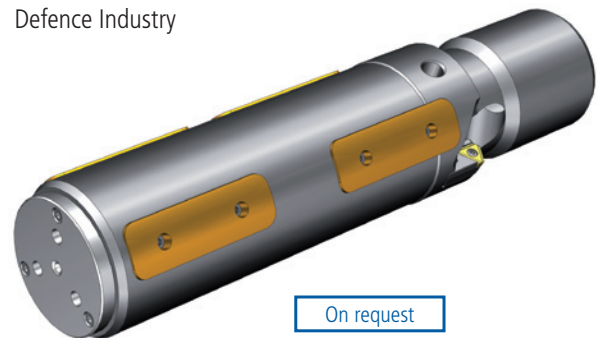
Special pull-boring tool

Machining of twin screw extruders



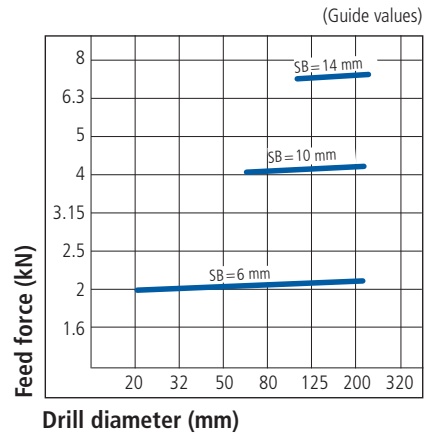
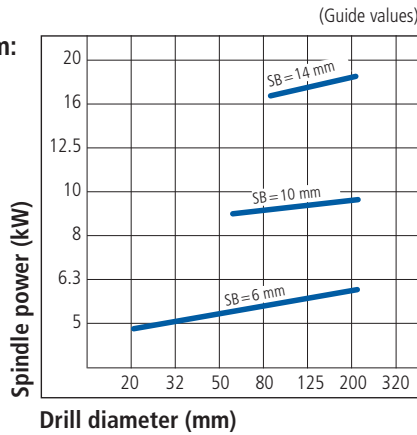
On request

Defence Industry

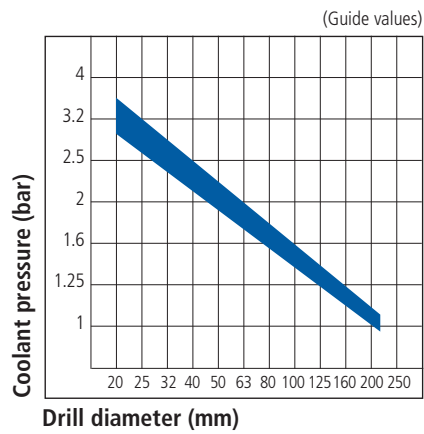
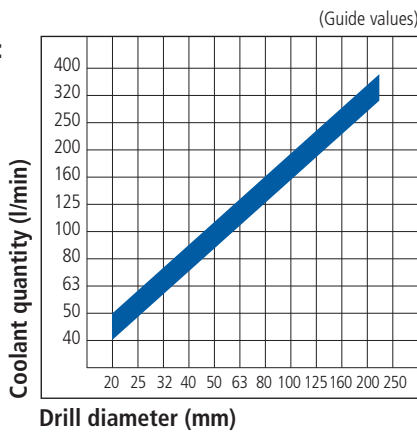


On request

Performance diagram:



Coolant information:

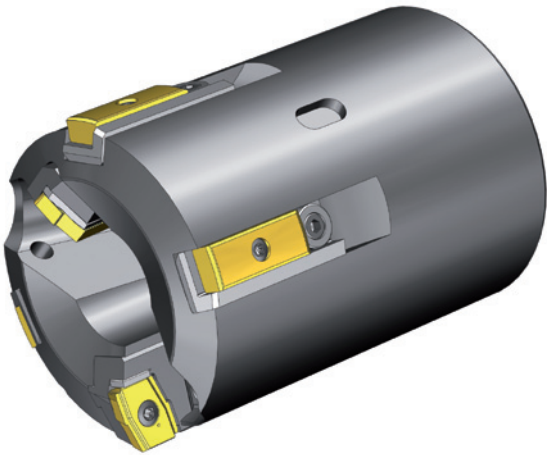


Guide values for deep hole drilling of different materials

Material / Mechanical strength properties	Cutting speed (m/min)	Feed (mm/rev.) for drill diameter (mm)			Carbide grades / chip breakers	
		20.00 - 43.99	44.00 - 90.99	91.00 - 222.99	Outer insert	Guide pad
Structural steel $\leq 700 \text{ N/mm}^2$	80 - 100	0.16 - 0.25	0.20 - 0.32	0.20 - 0.40	P 25 B - 2	P 20 B
Case hardened steel $\leq 750 \text{ N/mm}^2$	80 - 100	0.16 - 0.25	0.20 - 0.32	0.20 - 0.40	P 25 B - 1	
Case hardened steel $\leq 1100 \text{ N/mm}^2$	70 - 80	0.12 - 0.20	0.15 - 0.25	0.20 - 0.32		
Heat treated steel $\leq 700 \text{ N/mm}^2$	70 - 90	0.16 - 0.25	0.20 - 0.30	0.20 - 0.40		
Heat treated steel $\leq 1100 \text{ N/mm}^2$	55 - 75	0.12 - 0.22	0.20 - 0.25	0.20 - 0.30	P 25 B - 2	
Nitriding steel $\leq 1100 \text{ N/mm}^2$	55 - 75	0.12 - 0.20	0.20 - 0.25	0.20 - 0.30		
Ferritic steel $\leq 900 \text{ N/mm}^2$	60 - 80	0.12 - 0.22	0.15 - 0.25	0.20 - 0.30	K 10 BX - 2	
Austenitic steel (stainless)	60 - 80	0.12 - 0.16	0.15 - 0.20	0.15 - 0.25		
Heat resisting steel (stainless), Tool steel	50 - 70	0.12 - 0.20	0.15 - 0.22	0.20 - 0.30	P 25 B - 1	
Steel castings $\leq 700 \text{ N/mm}^2$	60 - 80	0.15 - 0.25	0.20 - 0.30	0.20 - 0.35		
Nodular cast iron $\leq 1000 \text{ N/mm}^2$	65 - 80	0.12 - 0.25	0.28 - 0.30	0.25 - 0.35		
Cast iron unalloyed and alloyed	70 - 100	0.20 - 0.30	0.20 - 0.40	0.25 - 0.50		
Aluminium and Aluminium alloys	80 - 150	0.20 - 0.30	0.20 - 0.40	0.25 - 0.50	K 10 B - 1	
Copper Cu content < 99%	120 - ...	0.07 - 0.15	0.10 - 0.20	0.10 - 0.20	K 10 - 1	

Type 28/48

Trepanning head with indexable inserts and guide pads
Ø 55.00 to 412.99 mm



Type 28

Drilling range Ø 55.00 - 412.99 mm

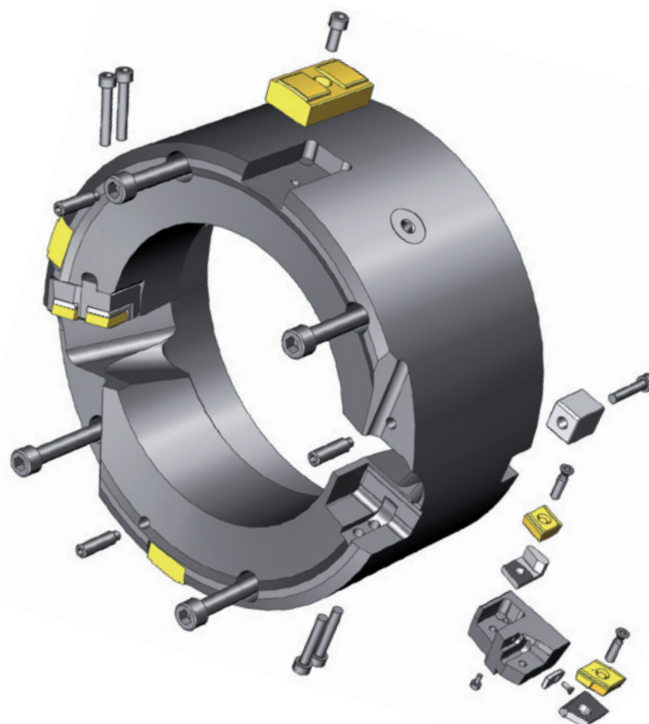


Type 48

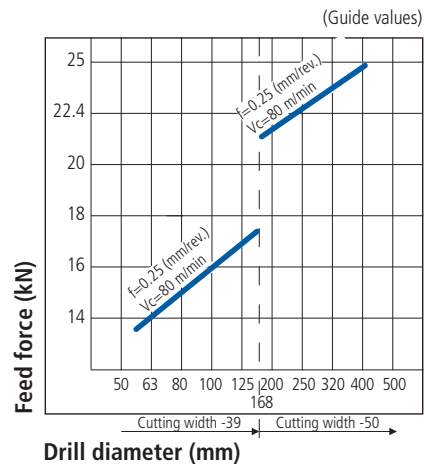
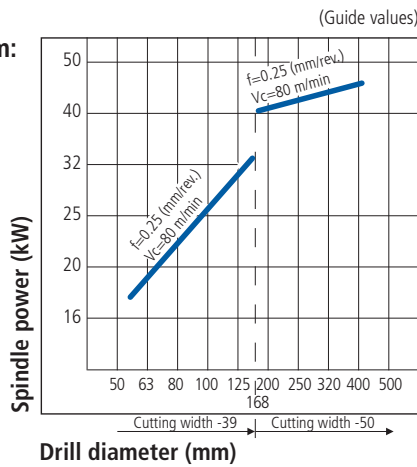
Drilling range Ø 55.00 - 412.99 mm

Advantages:

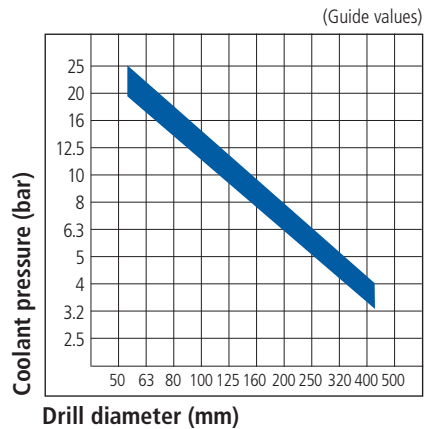
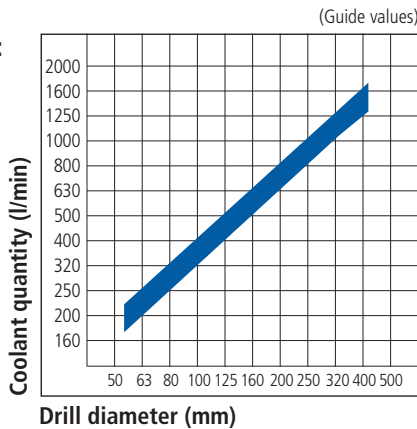
- No adjustment required when changing wear parts
- Simplest operation, change of wear parts without re-adjustment within +/- 0.01 mm
- Tool adjustment range depending on tool diameter up to 5 mm with replacement parts
- Ø fine adjustment with stop plate
- The core may be reused for new workpieces
- For machines with insufficient spindle power



Performance diagram:



Coolant information:



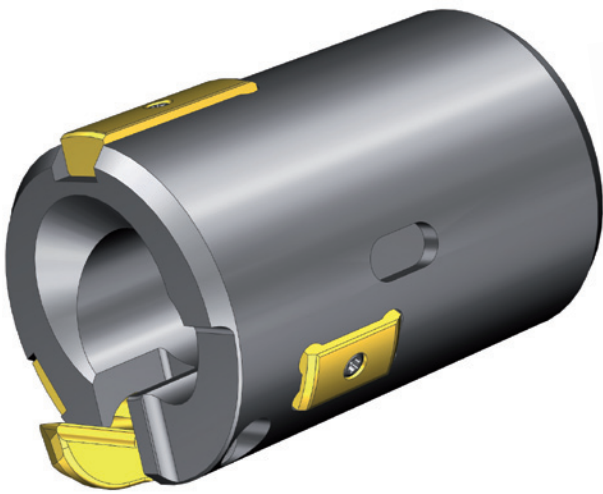
Guide values for deep hole drilling of different materials

Material / Mechanical strength properties	Cutting speed (m/min)	Feed (mm/rev.) for drill diameter (mm)			Carbide grades/chip breakers			
		55.00 - 98.99	99.00 - 167.99	168 - ...	Outer insert	Intermediate insert	Center insert	Guide pad
Structural steel $\leq 700 \text{ N/mm}^2$	80 - 100	0.18 - 0.25	0.20 - 0.30	0.20 - 0.40	P 25 B - 2	P 25 B - 1	P 25 B - 1	P 20 B
Case hardened steel $\leq 750 \text{ N/mm}^2$	80 - 100	0.18 - 0.25	0.20 - 0.30	0.25 - 0.40	P 25 B - 1			
Case hardened steel $\leq 1100 \text{ N/mm}^2$	70 - 80	0.16 - 0.22	0.20 - 0.30	0.20 - 0.30				
Heat treated steel $\leq 700 \text{ N/mm}^2$	70 - 90	0.18 - 0.25	0.20 - 0.35	0.25 - 0.40				
Heat treated steel $\leq 1100 \text{ N/mm}^2$	55 - 75	0.16 - 0.22	0.20 - 0.30	0.20 - 0.35	P 25 B - 2			
Nitriding steel $\leq 1100 \text{ N/mm}^2$	55 - 75	0.16 - 0.22	0.20 - 0.30	0.20 - 0.35				
Ferritic steel $\leq 900 \text{ N/mm}^2$	60 - 80	0.16 - 0.22	0.18 - 0.25	0.18 - 0.30	K 10 BX - 2			
Austenitic steel (stainless)	60 - 80	0.16 - 0.20	0.16 - 0.25	0.18 - 0.28				
Heat resisting steel (stainless), Tool steel	50 - 70	0.16 - 0.22	0.18 - 0.25	0.18 - 0.30				
Steel castings $\leq 700 \text{ N/mm}^2$	60 - 80	0.18 - 0.25	0.20 - 0.30	0.20 - 0.30	P 25 B - 1	P 25 B - 1	P 25 B - 1	
Nodular cast iron $\leq 1000 \text{ N/mm}^2$	65 - 80	0.20 - 0.25	0.20 - 0.35	0.25 - 0.40				
Cast iron unalloyed and alloyed	70 - 100	0.20 - 0.25	0.20 - 0.35	0.25 - 0.40				
Aluminium and Aluminium alloys	80 - 150	0.10 - 0.25	0.15 - 0.30	0.15 - 0.45	K 10 B - 1	K 10 B - 1	K 10 B - 1	
Copper Cu content < 99%	120 - ...	0.07 - 0.15	0.10 - 0.20	0.10 - 0.20	K 10 - 1	K 10 - 1	K 10 - 1	

Type 29/49

Core cutting head

Ø 55.00 to 120.00mm



Type 29

On request



Type 49

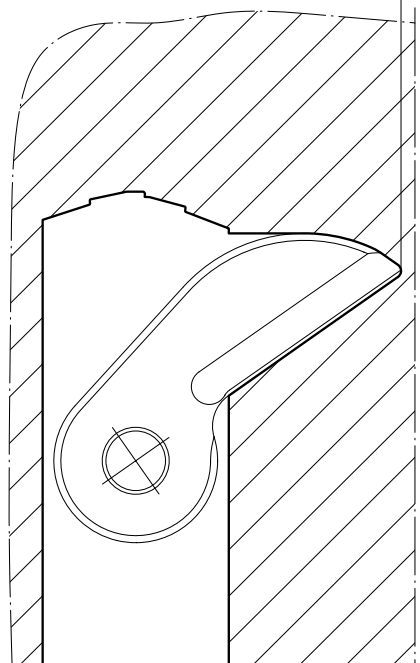
On request

Application:

- Common application with turbine shafts and blind holes for energy technology
- The cores are needed for materials tests and tensile specimens
- Preparation of holes using trepanning tool Type 28/48

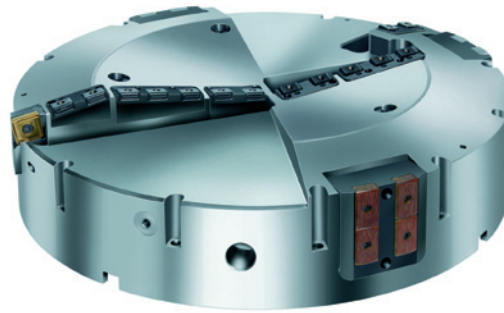


~ Ø 3
Break-off Core



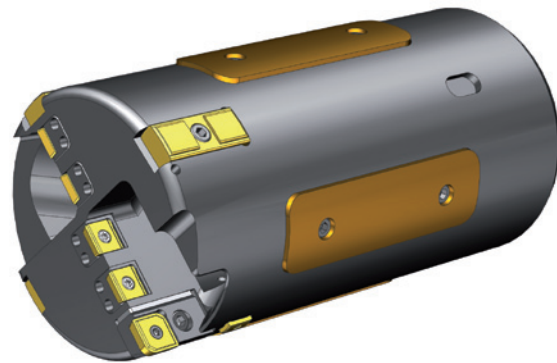
Solid drill head up to \varnothing 700 mm

On request



Flat bottom

On request



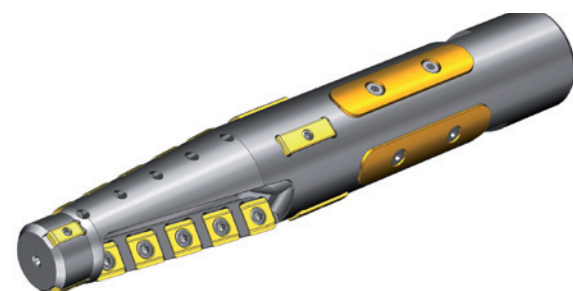
Full radius

On request



Cone

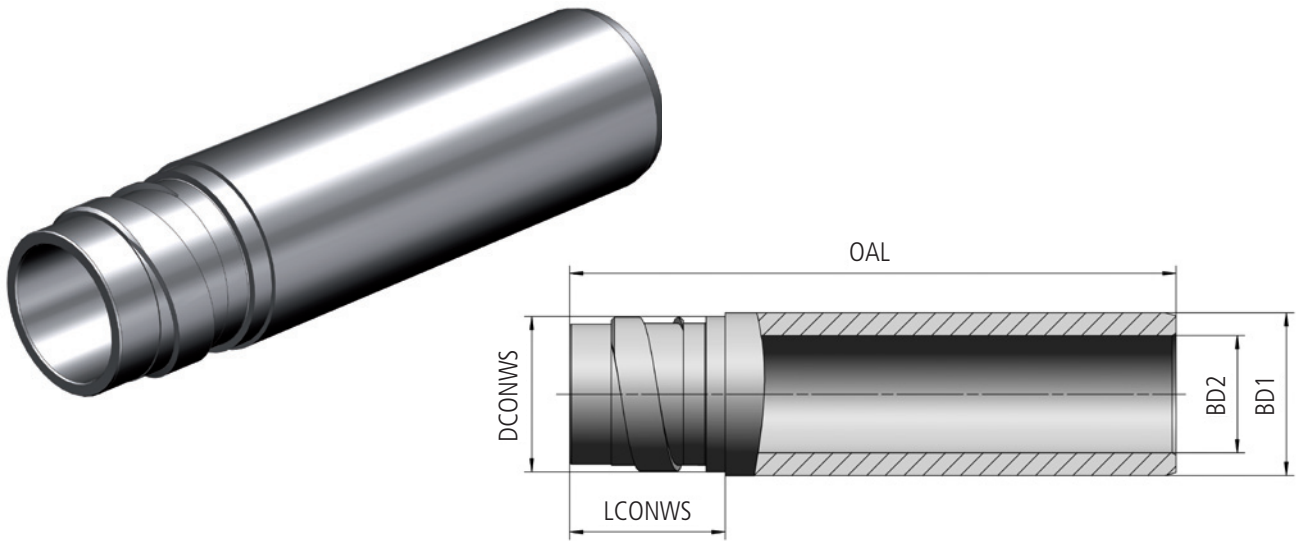
On request



Accessories

Drill tubes Type 25

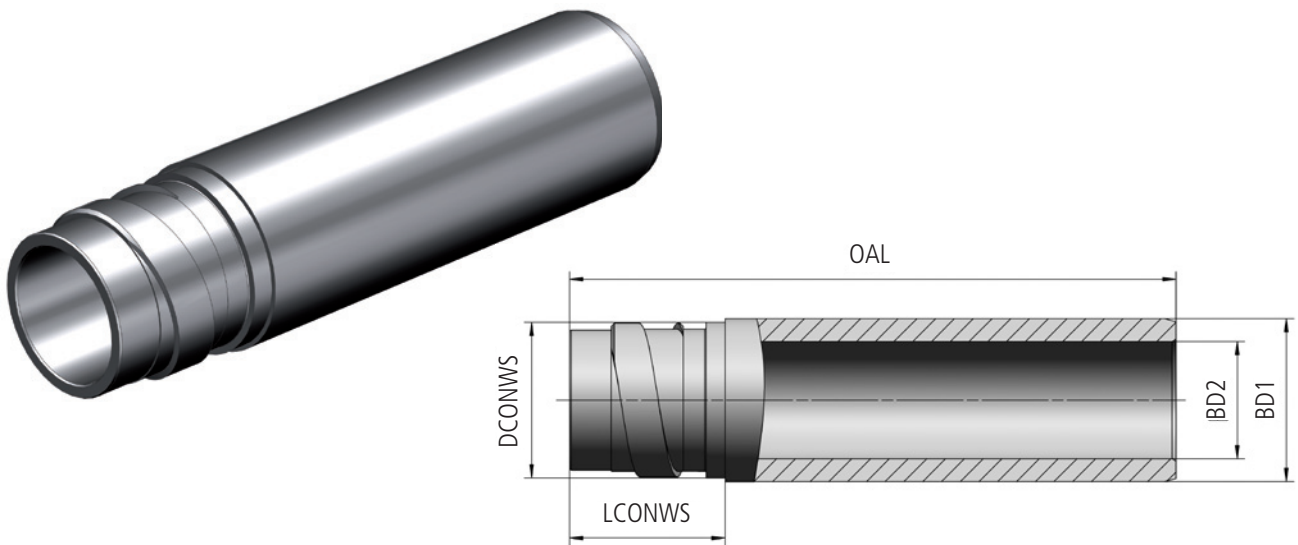
with 1-start external thread



Order no.	BD1 _{h8}	BD2	DCONWS	LCONWS	Thread pitch
25-9310-OAL	12	8	11.5	23.3	6
25-9410-OAL	13	8.5	11.8		
25-9510-OAL	13	8.5	12.4		
25-9610-OAL	14	9	12.7		
25-9710-OAL	14	9	13.4		
25-9810-OAL	15	10	13.7		
25-9910-OAL	15	10	14.4		
25-0110-OAL	16.5	11	15.5	23	10
25-0210-OAL	18	12	16.5	26	
25-0310-OAL	20	13	19		
25-0410-OAL	22	14	20		
25-0510-OAL	24	15.5	22		
25-0610-OAL	26	17	24		
25-0710-OAL	28	18.5	26		
25-0810-OAL	30	20	27		
25-0910-OAL	33	23	30		
25-1010-OAL	36	25.5	33		
25-1110-OAL	39	28	37		
25-1210-OAL	43	31	41		
25-1310-OAL	47	35	44		
25-1410-OAL	51	39	49	71	
25-1510-OAL	56	43	53		
25-1710-OAL	62	48	59		
25-1810-OAL	68	53	65		
25-1910-OAL	75	59	71		
25-2010-OAL	82	66	79		
25-2110-OAL	94	78	90		
25-2210-OAL	106	88	102		
25-2310-OAL	118	94	114		
25-2410-OAL	130	104	126		
25-2510-OAL	142	116	139		

Accessories

Drill tubes Type 25 with 1-start external thread

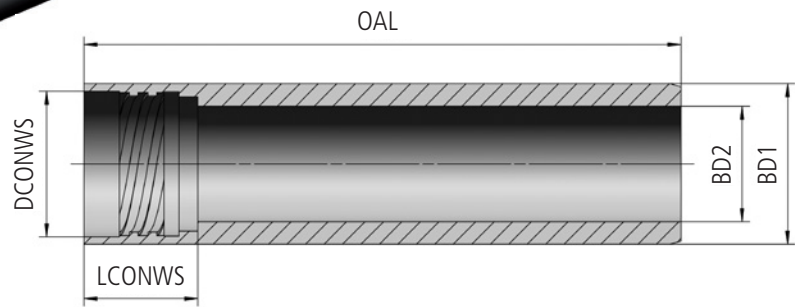
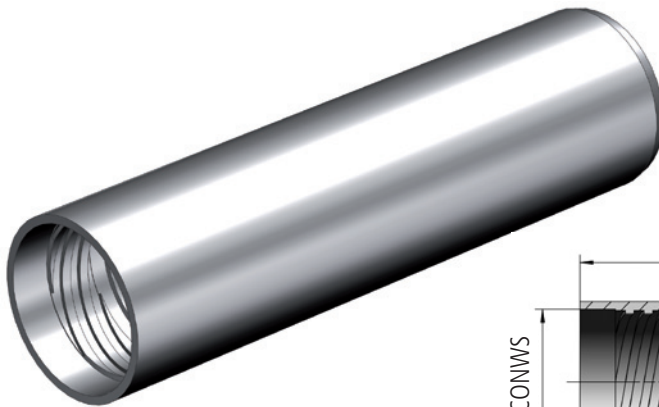


Order no.	BD1 _{h8}	BD2	DCONWS	LCONWS	Thread pitch
25-2610-OAL	154	128	151	86	56
25-2710-OAL	166	136	163		
25-2810-OAL	178	145	175		
25-2910-OAL	190	154	187		
25-3010-OAL	202	166	199		
25-3110-OAL	214	178	211		
25-3210-OAL	226	190	223		
25-3310-OAL	238	202	235		
25-3410-OAL	250	214	247	121	56
25-3510-OAL	262	226	259		
25-3610-OAL	274	238	271		
25-3710-OAL	286	250	283		
25-3810-OAL	298	262	295		
25-3910-OAL	310	274	307		
25-4010-OAL	322	286	319		
25-4110-OAL	334	298	331		
25-4210-OAL	346	310	343		

Accessories

Drill tubes Type 45

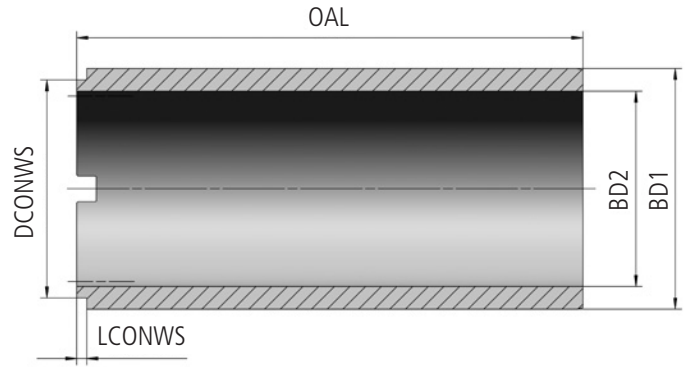
with 4-start internal thread



Order no.	BD1 _{h8}	BD2	DCONWS	LCONWS	Thread pitch
45-9710-OAL	14	9	12.6	21	8
45-9810-OAL	15	10	13.6		
45-9910-OAL	16	10.5	14.5		
45-0110-OAL	17	11.5	15.5	22	10
45-0210-OAL	18	12	16		
45-0310-OAL	20	13	18	21.5	12
45-0410-OAL	22	14	19.5		
45-0510-OAL	24	15.5	21		
45-0610-OAL	26	17	23.5	24.5	16
45-0710-OAL	28	18.5	25.5		
45-0810-OAL	30	20	28		
45-0910-OAL	33	23	30	30.5	20
45-1010-OAL	36	25.5	33		
45-1110-OAL	39	28	36		
45-1210-OAL	43	31	39	34.5	24
45-1310-OAL	47	35	43		
45-1410-OAL	51	39	47		
45-1510-OAL	56	43	51	75	32
45-1610-OAL	56	43	52		
45-1710-OAL	62	48	58		
45-1810-OAL	68	53	63	97	44
45-1910-OAL	75	59	70		
45-2010-OAL	82	66	77		
45-2110-OAL	94	78	89	118	60
45-2210-OAL	106	88	101		
45-2310-OAL	118	94	113		
45-2410-OAL	130	104	125	139	72
45-2510-OAL	142	116	137		
45-2610-OAL	154	128	149		
45-2710-OAL	166	136	161	144	80
45-2810-OAL	178	145	173		

Accessories

Drill tubes Type 45 with flange connection



Order no.	BD1 _{h8}	BD2	DCONWS	LCONWS
45-2910-OAL	190	154	172	8
45-3010-OAL	202	166	184	
45-3110-OAL	214	178	196	
45-3210-OAL	226	190	208	
45-3310-OAL	238	202	220	
45-3410-OAL	250	214	232	
45-3510-OAL	262	226	244	
45-3610-OAL	274	238	256	
45-3710-OAL	286	250	268	
45-3810-OAL	298	262	280	
45-3910-OAL	310	274	292	
45-4010-OAL	322	286	304	
45-4110-OAL	334	298	316	
45-4210-OAL	346	310	328	
45-4310-OAL	358	322	340	
45-4410-OAL	370	334	352	
45-4510-OAL	382	346	364	
45-4610-OAL	394	358	376	
45-4710-OAL	406	370	388	
45-4810-OAL	418	382	400	
45-4910-OAL	430	394	412	
45-5010-OAL	442	406	424	
45-5110-OAL	454	418	436	
45-5210-OAL	466	430	448	
45-5310-OAL	478	442	460	
45-5410-OAL	490	454	472	

Accessories

Thread wear piece/guide piece

Wear piece (standard)



Type 29-510
1-start external thread

[On request](#)



Type 49-510
4-start internal thread

[On request](#)

Wear pieces are inserted into the drill tube instead of the standard connection thread. They have less wear and tear, especially when tools have to be exchanged frequently. They are also used for repairing damaged threads. Drill tubes can be repaired on-site with the length remaining the same.

Retrac- wear piece



Type 29-518

[On request](#)

Retrac- wear pieces – mechanical or hydraulic – are used when counterboring, skiving and roller burnishing tools are being used. The activations are delivered by the tool supplier.

Guide piece



Type 29-550/555
1-start external thread

[On request](#)



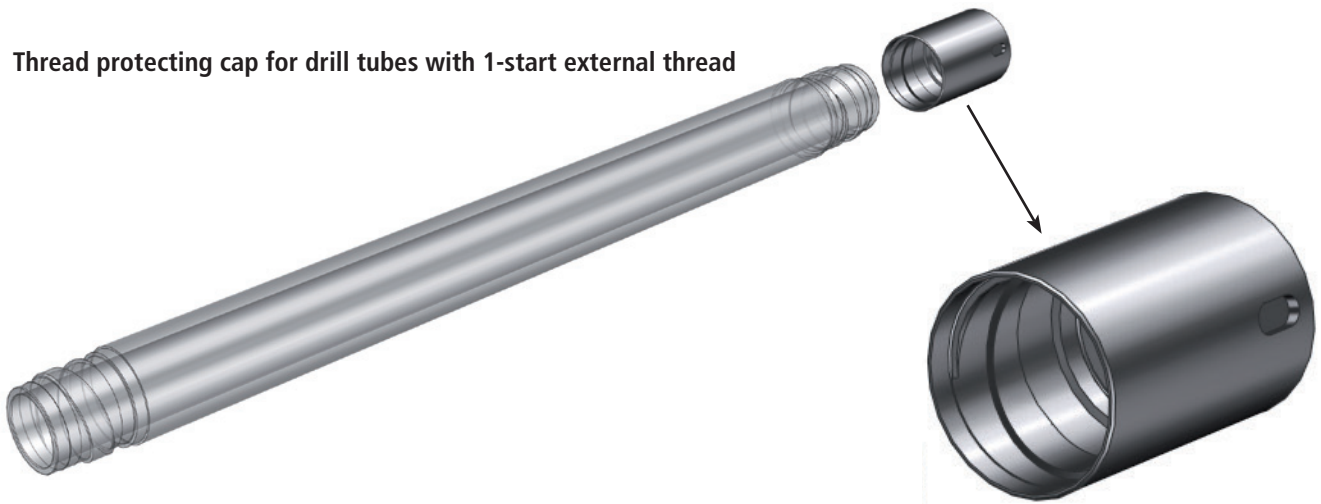
Type 49-550/555
4-start internal thread

[On request](#)

Guide pieces are inserted between drill head and drill tube. They are used to pass cross holes. They are also suitable for minimizing drill hole deviation.

Accessories Thread protecting cap

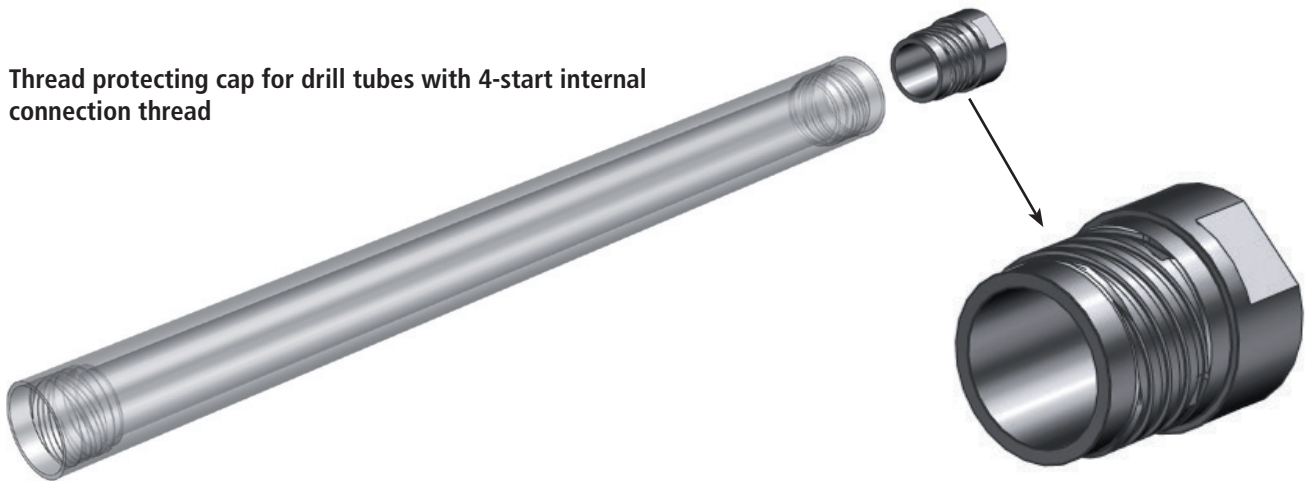
Thread protecting cap for drill tubes with 1-start external thread



Type 29-500

On request

Thread protecting cap for drill tubes with 4-start internal connection thread



Type 49-500

On request

Caps are used on drill tubes with threads on both ends. They prevent drill tube damages when clamping and/or by chips.

Accessories

Thread adapter



Type 29-520
1-start/4-start

On request



Type 29-530
1-start/1-start

On request



Type 49-520
4-start/1-start

On request



Type 49-530
4-start/4-start

On request



Type 49-530
Flange/4-start

On request



Type 49-520
Flange/1-start

On request

Thread adapters are used to connect tools and drill tubes with different connection threads and/or to reduce the number of drill tubes (with large-size reductions please consider the effect of the torque).

Accessories

Oil pressure head (BOZA) for rotating workpieces

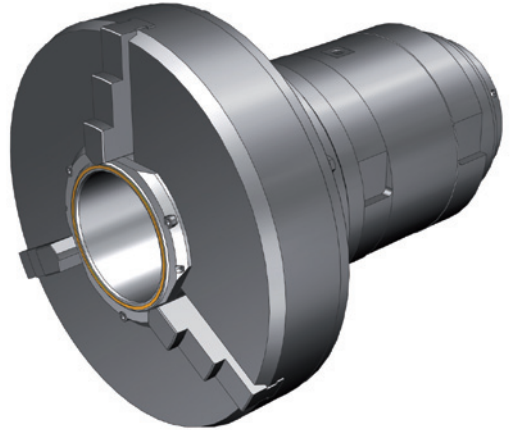
Cone clamping



Type 91

On request

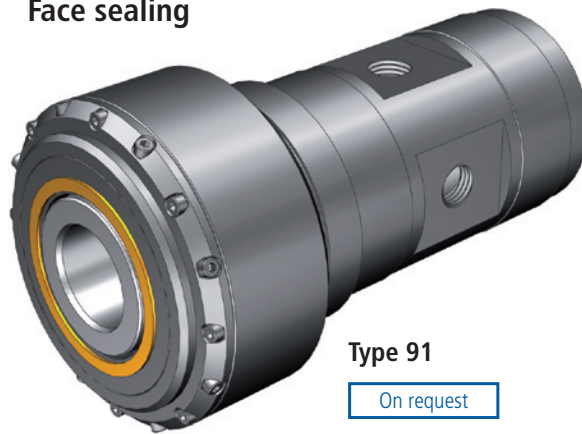
Jaw chuck



Type 91

On request

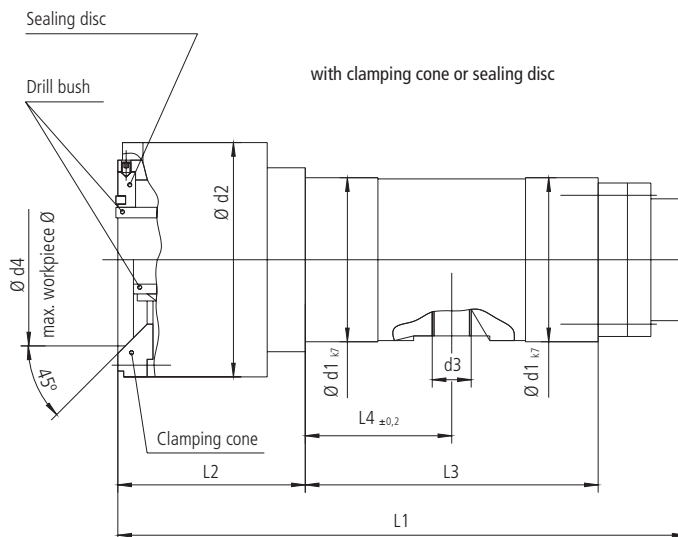
Face sealing



Type 91

On request

Installation dimensions

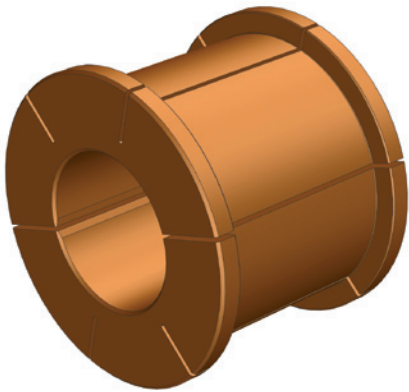


Size	Drilling range	d1 _{k7}	d2	L1	L2	L3	L4 _{±0.2}	d3	d4
50	12.50 - 50.00	140	200	485	160	250	125	R1"	150
100	25.00 - 100.00	180	250	510	160	250	125	R1,5"	200
200	50.00 - 200.00	355	400	535	160	300	125	R2"	350
250	50.00 - 250.00	355	475	600	200	300	125	R2"	425
400	100.00 - 400.00	490	625	750	200	425	175	Ø 80	550
500	100.00 - 500.00	650	725	800	250	475	235	Ø 100	600
600	200.00 - 600.00	750	975	1000	400	600	300	Ø 100	750

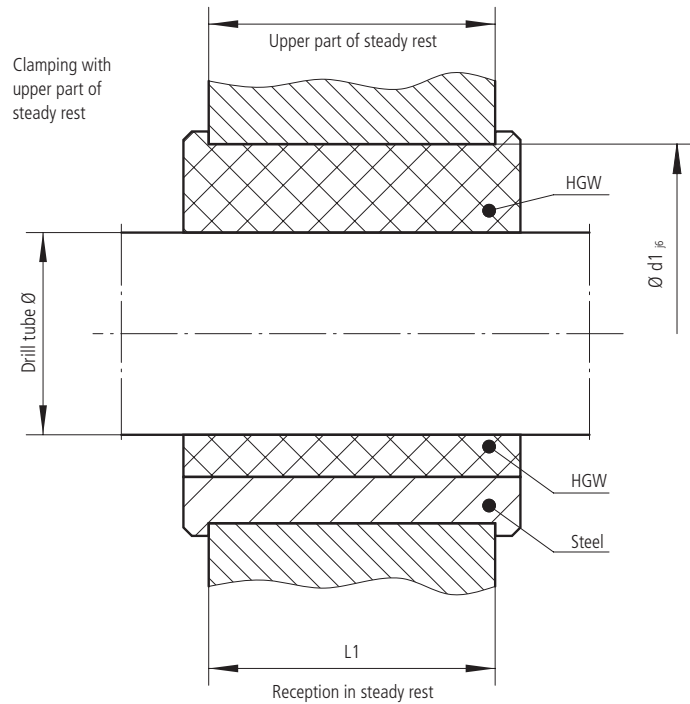
Accessories

Vibration dampers for non-rotating tools

Non-rotating tools



Type 91-030



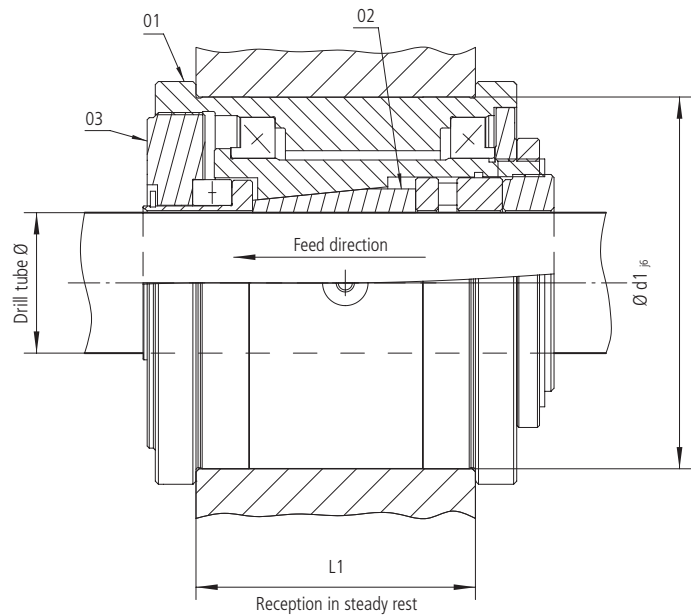
- Vibration dampers are built into a steady rest.
- The steady rest is clamped in its upper part. The vibration dampers for stationary tools consist of **two-piece damping sleeves**. These can also be supplied in a combination of steel and plastic.

Drill tube Ø max. (mm)	Size	Damper Ø d1 x L1 (mm)	Order no.
130	0	150 x 135	91-030000-000
154	1	180 x 135	91-030100-000
250	2	280 x 165	91-030200-000
310	3	355 x 165	91-030300-000

Rotating tools



Type 91-028



- Vibration dampers are built into a steady rest.
- The damping pressure is adjusted on the pressure ring. The position of the damping cone is limited axially by the adjusting disc.
- The vibration damper works mechanically without any further intervention.

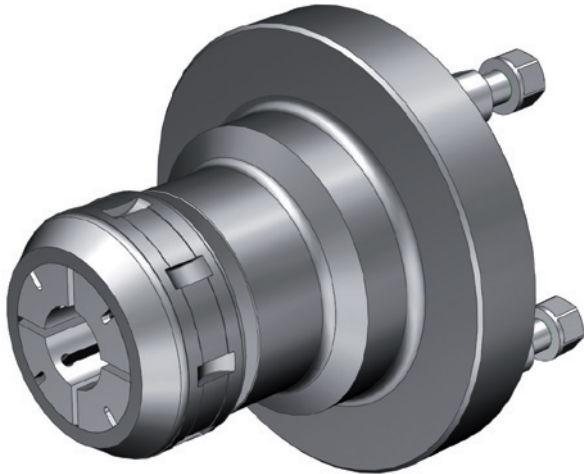
Drill tube Ø (mm)	Size	Damper Ø d1 x L1 (mm)	Order no.	max. speed (rpm)
11 - 68	1	180 x 135	91-028100-000	1200
43 - 142	2	280 x 165	91-028200-000	500
118 - 226	3	355 x 165	91-028300-000	250

Accessories

Drill tube clamping

Collet clamping

for drill tubes \varnothing 7.00 - 56.00 mm
standard design for spindle nose DIN 55026-A



Type 91-045

Drill tube \varnothing (mm)	Size	Spindle nose flange size	Order no.
7 - 20	1	4	91-045100-040
		6	91-045100-060
16 - 33	2	6	91-045200-060
		8	91-045200-080
16 - 56	3	6	91-045300-060
		8	91-045300-080
		11	91-045300-110

Further spindle nose flange versions on request

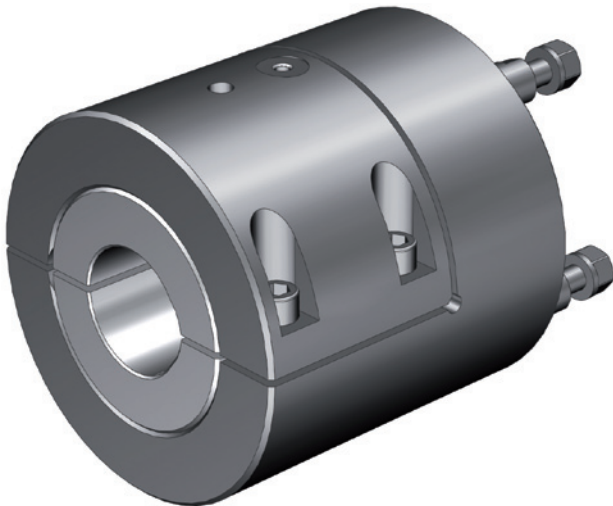
Spindle nose		Flange	Order no.
Screw connection from the front A Bolt hole circle extern	DIN 55026-A	DIN 55028-A	91-045...-... *
Bayonet disc mounting	DIN 55027	DIN 55028-C	91-050...-... *
Camlock	DIN 55029	DIN 55029	91-051...-... *
Special design	—————	Special flanges	99-91.....-... *

* The order number depends on the design and will be added upon clarification of all technical details.

Specify inner diameter of the machines spindle passage to evaluate a possible chip congestion.

Drill tube driver, split-bush style

for drill tubes Ø 62.00 mm and larger standard design for spindle nose DIN 55026-AA



Type 91-052

Drill tube Ø (mm)	Size	Spindle nose size	Order no.
36 - 68 (Special design)	0	6	91-052000-060
		8	91-052000-080
62 - 106	1	8	91-052100-080
		11	91-052100-110
118 - 166	2	11	91-052200-110
		15	91-052200-150
178 - 190	3	11	91-052300-110
178 - 238		15	91-052300-150
		20	91-052300-200
250 - 274	4	15	91-052400-150
250 - 382		20	91-052400-200

Spindle nose mount in other designs on request

Spindle nose		Flange	Order no.
Screw connection from the front A Bolt hole circle extern	DIN 55026-A	DIN 55028-A	91-052...-...*
Bayonet disc mounting	DIN 55027	DIN 55028-C	91-054...-...*
Camlock	DIN 55029	DIN 55029	91-055...-...*
Special design	—————	Special flanges	99-91.....-...*

* The order number depends on the design and will be added upon clarification of all technical details.

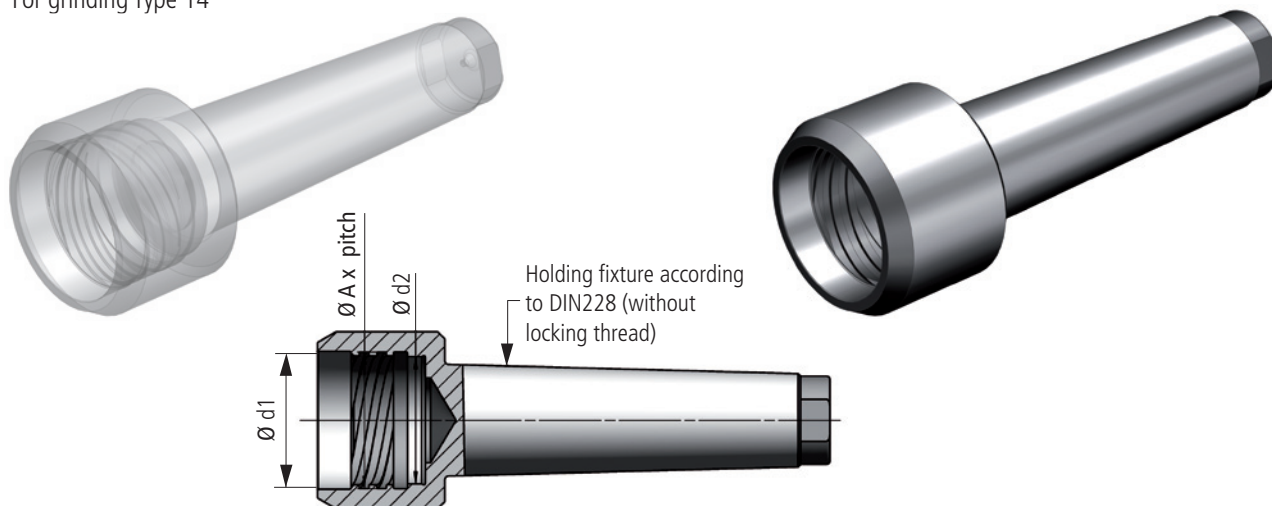
Specify inner diameter of the machines spindle passage to evaluate a possible chip congestion.

Accessories

Grinding arbor

Grinding arbor with 4-start thread

For grinding Type 14

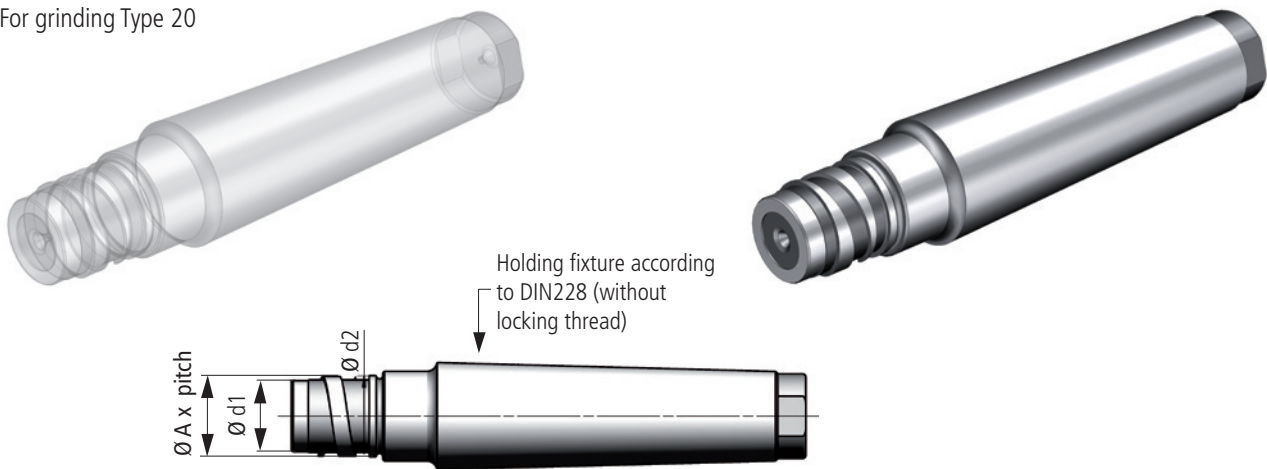


Order no.	Drill tube size	Drill tube Ø D (mm)	small fitting Ø d2	large fitting Ø d1	A x pitch	Holder
49-9710-100	97	14	10.8	12.6	12.3 x 8.0	MK 4
49-9810-100	98	15	11.8	13.6	13.3 x 8.0	MK 4
49-9910-100	99	16	12.5	14.5	14.1 x 8.0	MK 4
49-0110-100	01	17	13.5	15.5	15.1 x 8.0	MK 4
49-0210-100	02	18	14.0	16.0	15.5 x 10.0	MK 4
49-0310-100	03	20	16.0	18.0	17.5 x 12.0	MK 4
49-0410-100	04	22	17.5	19.5	19.0 x 12.0	MK 4
49-0510-100	05	24	19.0	21.0	20.5 x 12.0	MK 4
49-0610-100	06	26	21.0	23.5	23.0 x 16.0	MK 4
49-0710-100	07	28	23.0	25.5	25.0 x 16.0	MK 4
49-0810-100	08	30	25.5	28.0	27.5 x 16.0	MK 4
49-0910-100	09	33	27.0	30.0	29.4 x 20.0	MK 4
49-1010-100	10	36	30.0	33.0	32.4 x 20.0	MK 4
49-1110-100	11	39	33.0	36.0	35.4 x 20.0	MK 4
49-1210-100	12	43	36.0	39.0	38.4 x 20.0	MK 4
49-1310-100	13	47	39.5	43.0	42.4 x 24.0	MK 4
49-1410-100	14	51	43.5	47.0	46.4 x 24.0	MK 4
49-1510-100	15	56	47.5	51.0	50.4 x 24.0	MK 4
49-1610-100	16	56	47.0	52.0	51.3 x 32.0	MK 5
49-1710-100	17	62	53.0	58.0	57.3 x 32.0	MK 5
49-1810-100	18	68	58.0	63.0	62.3 x 32.0	MK 5
49-1910-100	19	75	64.0	70.0	69.0 x 44.0	MK 5
49-2010-100	20	82	71.0	77.0	76.0 x 44.0	MK 5
49-2110-100	21	94	83.0	89.0	88.0 x 44.0	MK 5
49-2210-100	22	106	95.0	101.0	100.0 x 60.0	MK 5
49-2310-100	23	118	107.0	113.0	112.0 x 60.0	MK 5
49-2410-100	24	130	119.0	125.0	124.0 x 60.0	MK 5
49-2510-100	25	142	131.0	137.0	136.0 x 72.0	MK 5
49-2610-100	26	154	143.0	149.0	148.0 x 72.0	MK 5
49-2710-100	27	166	155.0	161.0	160.0 x 72.0	MK 5
49-2810-100	28	178	167.0	173.0	172.0 x 80.0	MK 5

Hardened and ground

Grinding arbor with 1-start thread

For grinding Type 20



Order no.	Drill tube size	Drill tube Ø D (mm)	small fitting Ø d1	large fitting Ø d2	A x pitch	Holder
29-9310-100	93	12	9.9	11.5	11.3 x 6.0	MK 4
29-9410-100	94	13-1	10.2	11.8	11.6 x 6.0	MK 4
29-9510-100	95	13-2	10.8	12.4	12.2 x 6.0	MK 4
29-9610-100	96	14-1	11.1	12.7	12.5 x 6.0	MK 4
29-9710-100	97	14-2	11.8	13.4	13.2 x 6.0	MK 4
29-9810-100	98	15-1	12.1	13.7	13.5 x 6.0	MK 4
29-9910-100	99	15-2	12.8	14.4	14.2 x 6.0	MK 4
29-0110-100	01	16,5	13.5	15.5	15.3 x 6.0	MK 4
29-0210-100	02	18	14.5	16.5	16.3 x 10.0	MK 4
29-0310-100	03	20	16.0	19.0	18.5 x 10.0	MK 4
29-0410-100	04	22	17.0	20.0	19.5 x 10.0	MK 4
29-0510-100	05	24	19.0	22.0	21.5 x 10.0	MK 4
29-0610-100	06	26	21.0	24.0	23.5 x 10.0	MK 4
29-0710-100	07	28	23.0	26.0	25.5 x 10.0	MK 4
29-0810-100	08	30	24.0	27.0	26.5 x 20.0	MK 4
29-0910-100	09	33	27.0	30.0	29.5 x 20.0	MK 4
29-1010-100	10	36	30.0	33.0	32.5 x 20.0	MK 4
29-1110-100	11	39	34.0	37.0	36.5 x 20.0	MK 4
29-1210-100	12	43	37.0	41.0	40.5 x 20.0	MK 4
29-1310-100	13	47	40.0	44.0	43.5 x 20.0	MK 4
29-1410-100	14	51	45.0	49.0	48.5 x 20.0	MK 4
29-1510-100	15	56	49.0	53.0	52.5 x 20.0	MK 4
29-1710-100	17	62	54.0	59.0	58.5 x 20.0	MK 4
29-1810-100	18	68	60.0	65.0	64.5 x 40.0	MK 5
29-1910-100	19	75	66.0	71.0	70.5 x 40.0	MK 5
29-2010-100	20	82	74.0	79.0	78.5 x 40.0	MK 5
29-2110-100	21	94	85.0	90.0	89.5 x 40.0	MK 5
29-2210-100	22	106	97.0	102.0	101.5 x 40.0	MK 5
29-2310-100	23	118	109.0	114.0	113.5 x 40.0	MK 5
29-2410-100	24	130	121.0	126.0	125.5 x 40.0	MK 5
29-2510-100	25	142	134.0	139.0	138.5 x 40.0	MK 5
29-2610-100	26	154	145.0	151.0	150.5 x 56.0	MK 5
29-2710-100	27	166	157.0	163.0	162.5 x 56.0	MK 5
29-2810-100	28	178	169.0	175.0	174,5. x 56.0	MK 5
29-2910-100	29	190	181.0	187.0	186.5 x 56.0	MK 5
29-3010-100	30	202	193.0	199.0	198.5 x 56.0	MK 5
29-3110-100	31	214	205.0	211.0	210.5 x 56.0	MK 5
29-3210-100	32	226	217.0	223.0	222.5 x 56.0	MK 5
29-3310-100	33	238	229.0	235.0	234.5 x 56.0	MK 5

Hardened and ground

Accessories

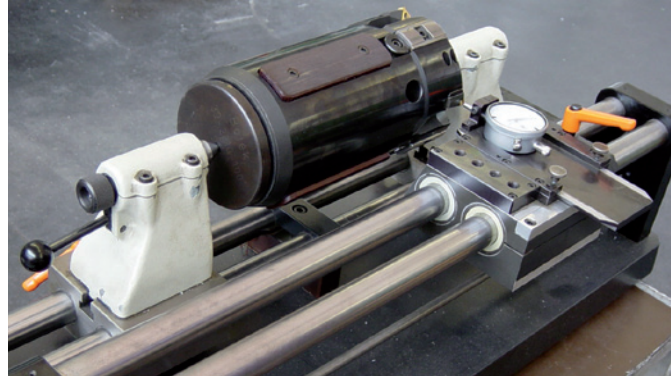
Centre disc

for tools with 1-start thread internal

Centre disc cartridge

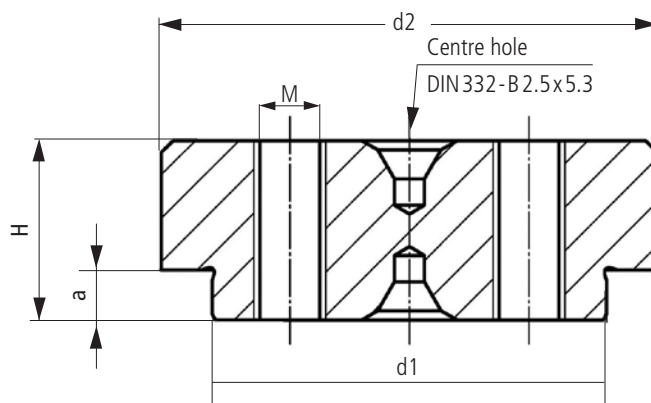


Example Type 36 – Installation and adjustment of cartridges



The centre disc is used to clamp the tools between centers.

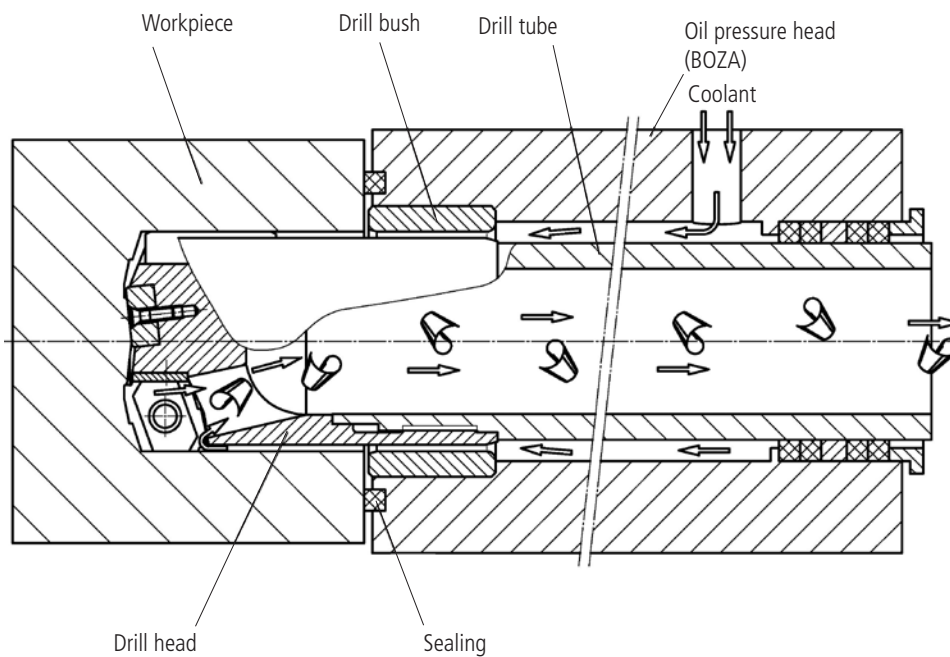
With this the fibre guide pads can be reworked or the tool can be measured and adjusted between centers.



Order no.	Drill tube Ø	d1	d2	l1	a	H	M	Order no.	Drill tube Ø	d1	d2	l1	a	H	M
39-1010-101	36	33	41.5	20	4.5	15	M6	39-2810-101	178	175	190	110	4.5	20	M8
39-1110-101	39	37	44					39-2910-101	190	187	198				
39-1210-101	43	41	53	39-3010-101				202	199	215					
39-1310-101	47	44	57	39-3110-101				214	211	226					
39-1410-101	51	49	63	39-3210-101				226	223	238					
39-1510-101	56	53	68	39-3310-101				238	235	245					
39-1710-101	62	59	74	39-3410-101				250	247	260					
39-1810-101	68	65	79	39-3510-101				262	259	270					
39-1910-101	75	71	86	39-3610-101				274	271	280					
39-2010-101	82	79	94	39-3710-101				286	283	300					
39-2110-101	94	90	105	50	4.5	15	M8	39-3810-101	298	295	305	160	11	20	M8
39-2210-101	106	102	111					39-3910-101	310	307	317				
39-2310-101	118	114	129					39-4010-101	322	319	329				
39-2410-101	130	126	141					39-4110-101	334	331	341				
39-2510-101	142	139	154					39-4210-101	346	343	353				
39-2610-101	154	151	166												
39-2710-101	166	163	178												

Technical appendix

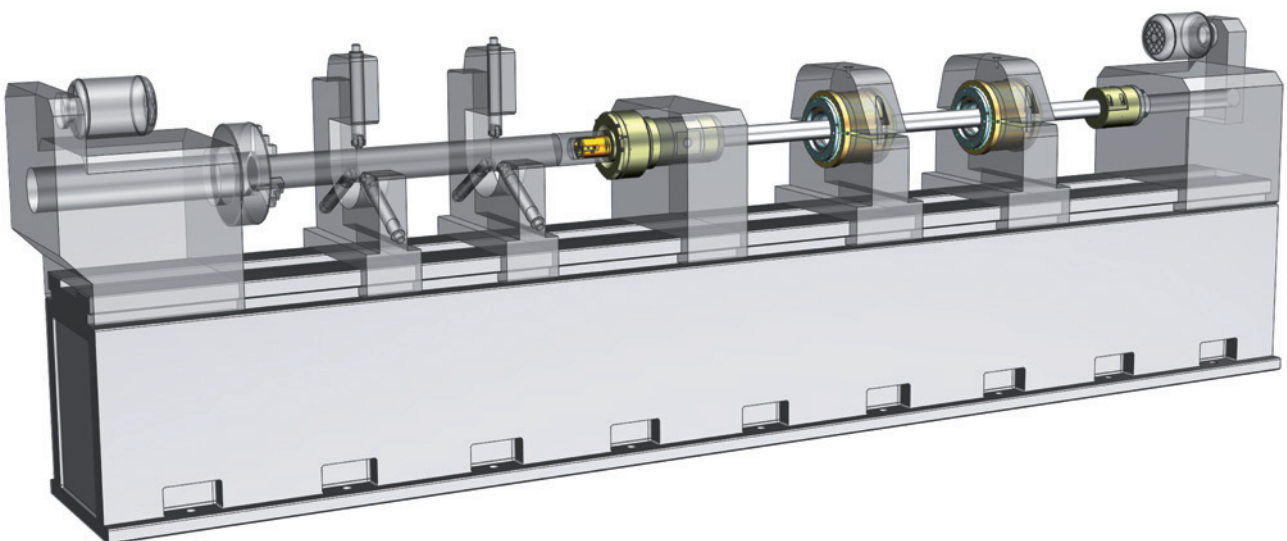
BTA (STS) drilling process



The BTA (STS) drilling process is a deep-hole drilling method for special deep hole drilling machines with external coolant supply and inner chip removal (single tube process). To provide the coolant an oil pressure head with sealing to the workpiece is needed.

With this method drilling depths of up to $250 \times D$ are possible. Solid drilling tools $\varnothing 60.00 - 100.00$ mm are used up to a drilling depth of 17,000 mm. Tools for the BTA system are available in a diameter range from 7.76 mm to approx. 1,000 mm.

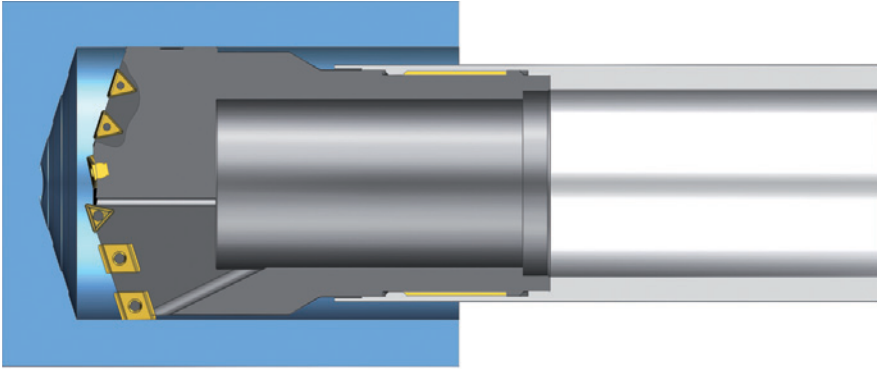
From a diameter of 16.00 mm and upwards, tools with exchangeable inserts and guide pads are used.



Technical appendix

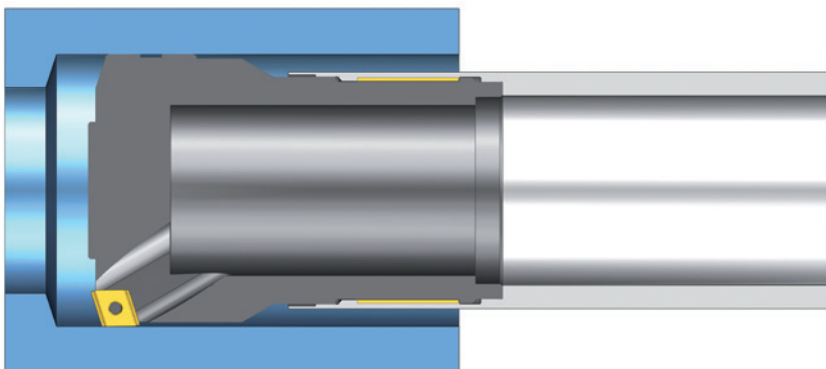
Deep hole drilling methods

Solid drilling



To drill a hole into solid material. Solid drilling is the most commonly used method for drilling operations. Drill hole diameters using the BTA (STS) deep-hole drilling system range from approx. \varnothing 7.76 to 700.00 mm.

Counter-boring



Counter-boring is used for increasing the diameter of predrilled holes, cast holes (e.g. tubes and pipes) or rolled tubes and bores made by other methods. Generally, the work method counter-boring improves the hole quality.

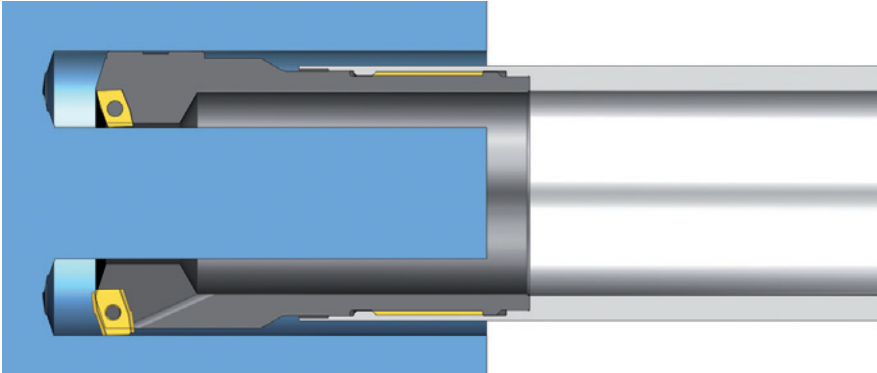
By counter-boring gradually the necessary drive power and feed force can be reduced. This is useful, when the desired drilling diameter cannot be produced in one work step because the spindle power of the machine is insufficient.

Single or multi-edged BTA tools can be used as counterboring tools.

In addition to push-boring heads, pull-boring heads are also used when highest quality is desired.

Using counter-boring tools allow an increased cutting speed, compared to solid drilling or trepanning tools.

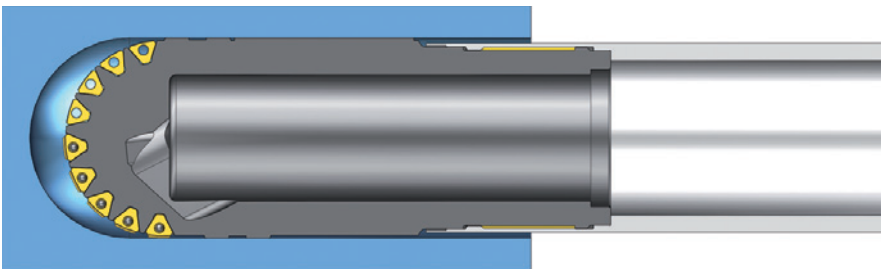
Trepanning



With trepanning only a part of the full cross-section of a bore is cut. There are three reasons for this:

- A material sample should be taken.
- The core represents valuable material that can be processed even further (core is a "workpiece").
- The machine's drive power is not sufficient for a solid bore.

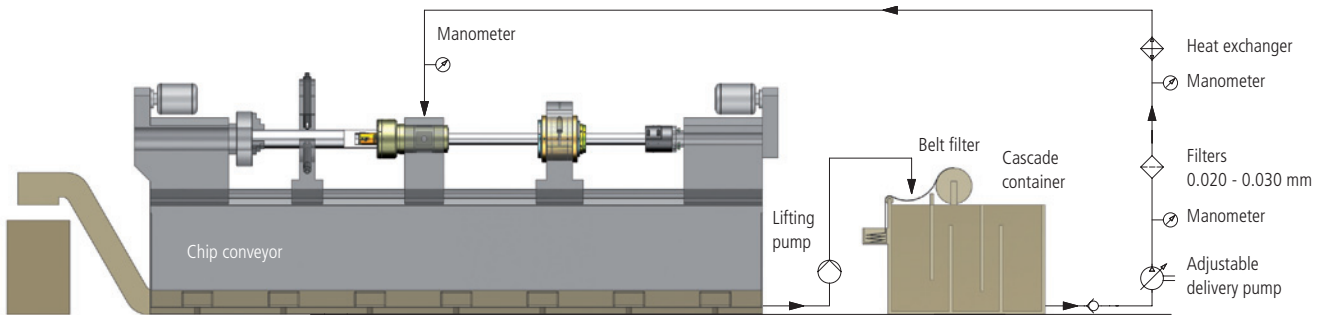
Form counter-boring



Drilling contour sections that are incorporated into the tool.

Technical appendix

Schematic diagram of the coolant system



Cooling lubricant system

The purpose of a cooling lubricant in a deep hole drilling system is:

- Cooling of tools.
- Discharge of heat energy generated in the drilling process.
- Reduce friction of elements involved in cutting and guiding.
- Extract the chips.

Tank volume/tank size

- Tanks should be designed to have a volume approximately equivalent to ten times the maximum pump output.
- Baffles arranged in cascade form produce better settling of the suspended particles and air bubbles contained in the filtered coolant.

The tank is heated by

90% of the operating energy for the drill is converted into heat energy.

95% of the pumping energy of all pressure and circulation pumps is converted into heat energy.

The frictional energy in the lines/fans/filters is converted into heat energy.

All this energy is absorbed by the cooling lubricant.

The tank is cooled by

The tank gives off warmth to its environment as soon as the temperature of the cooling lubricant exceeds that of the environment. If the tank is not free-standing, heat transfer is strongly reduced.

The workpiece is normally at ambient temperature and thus has a cooling effect.

Centre-line deviation

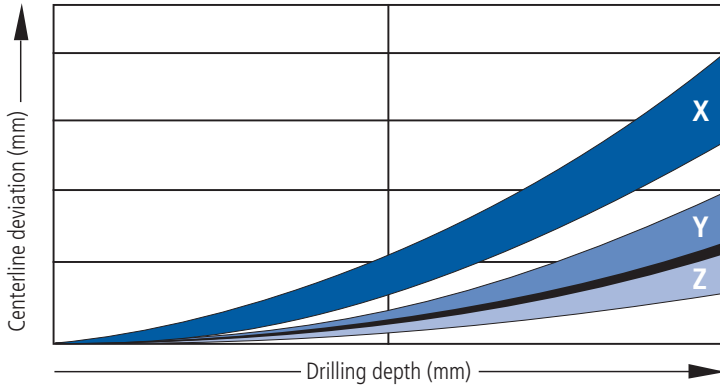
Centre-line deviation means the deviation of the drilling axis from the ideal axis. The centre-line deviation does not follow a straight line; the size of the deviation depends on many factors and cannot be predicted systematically.

Guidelines are according to VDI 3210 Sheet 1/Part 1 Page 5.

Decisive influencing variables:

- Working method
- Drilling process
- Machine geometry
- Homogeneity of workpiece material
- Workpiece orientation
- Tool adjustment
- Cutting values
- Wear and tear of tools and inserts

Graphic representation: Working method and drilling process



Working method

- X** Only tool rotating
- Y** Tool and workpiece rotating (counter rotation)
- Z** Only workpiece rotating

Drilling process

- X** Solid drilling
- Y** Counter-boring
- Z** Pull-boring

(Please do not combine working method and drilling process.)

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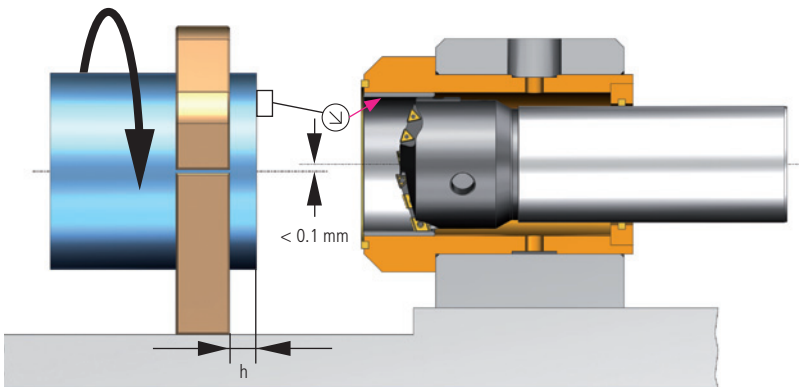
BOZA with oil pressure head



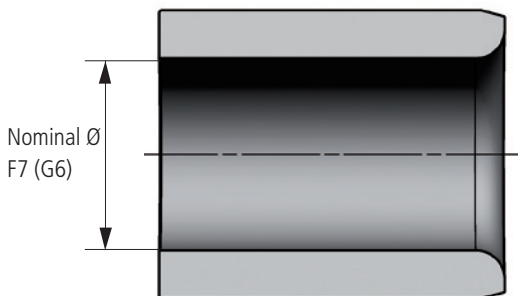
The steady rest of the tool should be as close as possible to BOZA (dimension "h"). This is the only way to achieve that the radial forces that transfer into the work-piece when beginning to drill are properly diverted into the machine bed.

Precise alignment of the axis of rotation between workpiece and drill bush is an absolute requirement in order to prevent damage to the tool and achieve a high bore quality.

Work-piece alignment and stability when beginning to drill (tool-face sealing)



Drill bushes and tolerances



The drill bush guides the tool during the beginning of the boring process.

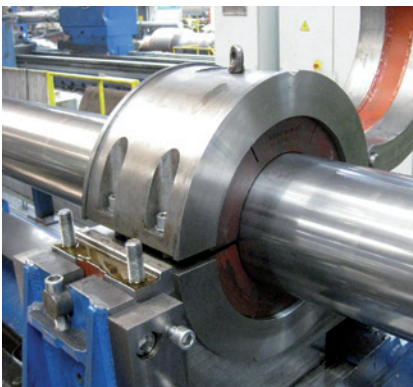
The quality of the bore depends on the drill bush tolerance.

For standard applications we recommend drill bushes with a (nominal Ø) tolerance of F7. For bores with highest requirements a tolerance of G6.

Vibration dampers



Rotating and non-rotating tools

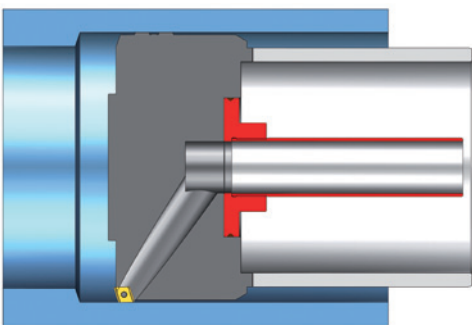


Non-rotating tools

The job of the vibration damper is both to support the drill tube and also to reduce the longitudinal and torsional vibrations occurring during the drilling process. By reducing the vibration amplitude the quality of the hole surface is improved and cutting wear is reduced.

The botek vibration damper works purely mechanically and can be used for both rotating and non-rotating applications. A pre-loaded spring presses the damping cone with constant force against the counter-bearing and balances any slight diameter differences the continuous drill tube might have. The damper is also used for **enclosed machines** or machines which are not accessible during drilling. If the vibration damper is not set correctly, it must be readjusted during the drilling process. Also applied for **pull-boring**. Since with pull-boring the tensile forces are low and the feed rate is small, the vibrations are reduced very well by the pressurized counter-bearing. The spring assembly can be fully loaded for this application.

Chip tube



With long drill tubes in particular and large drill tube diameters it is advantageous to use a chip tube.

The flow velocity of the cooling lubricant is often not sufficient to divert chips safely from the process. Usually these chips build up in the drill tube just behind the drill head. By using a chip tube the flow velocity is increased enough so that chips can be flushed out safely. The chip tube cannot be used in trepanning operations. Please contact us for further information in this regard.

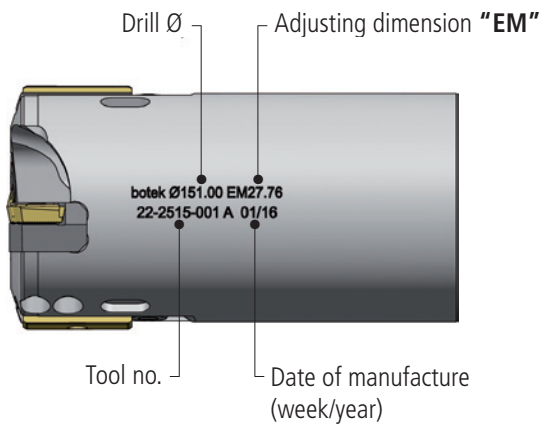
botek counter-boring tools diameter 162 mm and upwards are generally equipped with a chip tube connection.

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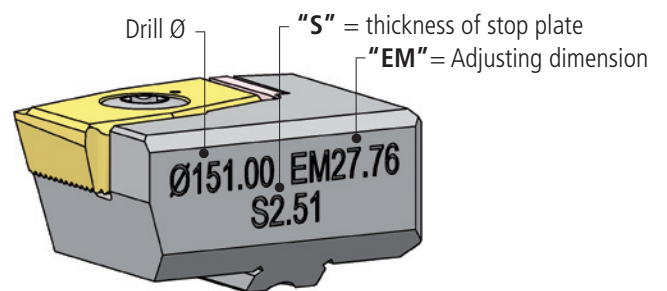
Adjusting tools

When they leave the factory, tools are preset to the diameter stated in the order, and all **important** data (drill diameter, setting gauge and thickness of the stop plate) are engraved on the body or on the cartridge.

Example: Labelling - drill head



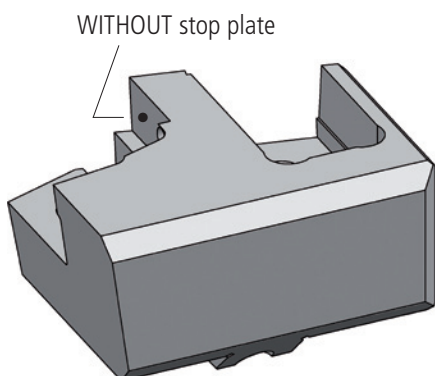
Example: Labelling - cartridge peripheral insert



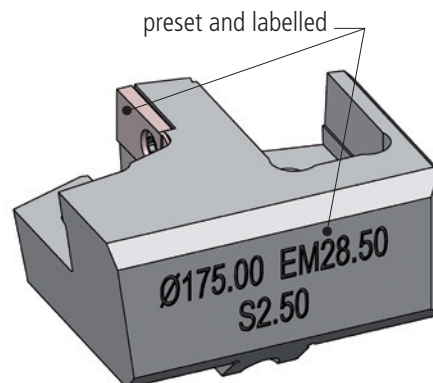
Cartridges - replacement orders

When ordering replacement cartridges, always quote the information engraved on the body. Preset cartridges will then be supplied (please quote adjusting dimension and drill-Ø).

Example: If cartridges are ordered **without** stating the setting gauge, they will be supplied **without** fittings.

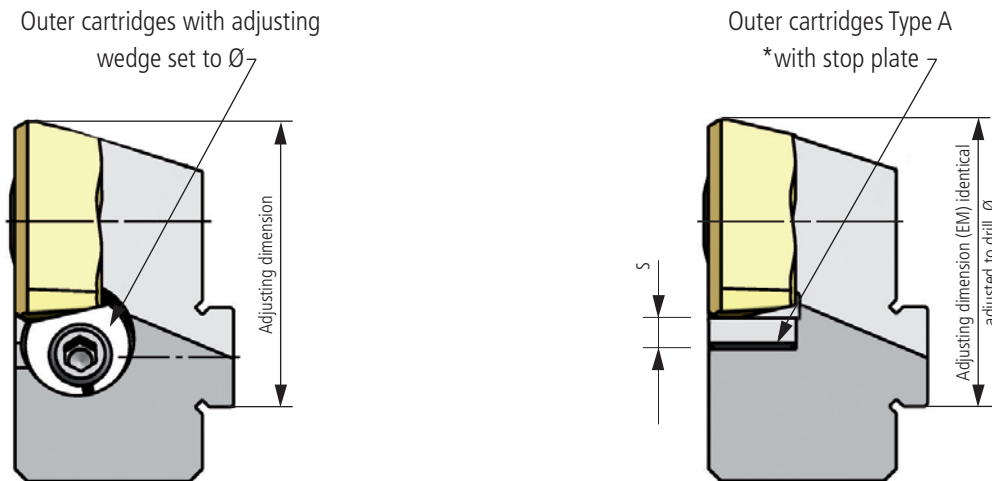


Example: If cartridges are ordered **stating** the "EM" size, they will be supplied **preset** and **labelled**.

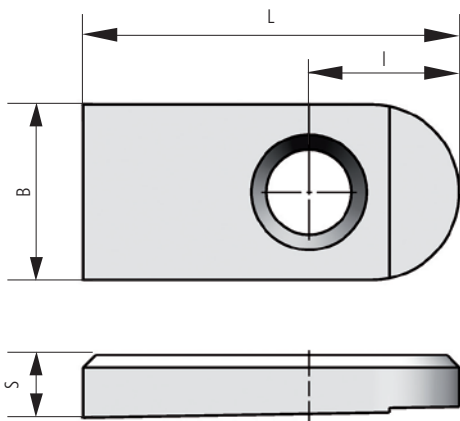


Ordering information for type A cartridges

The following must be ensured when changing the outer cartridge from the version with adjusting wedge to the Type A design with stop plate (this also applies to exchange/replacement of Type A cartridges).



- When changing from cartridge with adjusting wedge to type A cartridges with stop plate, please quote order number and in addition the adjusting dimension ("EM") (take size from cartridge with adjusting wedge). The thickness of the stop plate (size "S") can thereby be determined and suitably supplied.
- When a drill head with type A outer cartridge is supplied, the adjusting dimension ("EM") for the drill head diameter supplied is engraved on the drill head and on the cartridge.
- When ordering a type A cartridge, quote adjusting dimensions ("EM") and drill Ø.
- Stop plates are available in thickness steps (dimension "S") of 0.01 mm. The respective thickness is engraved on the stop plate. For available S dimensions see VU-01-0056-B.
- It is advisable to store a certain assortment of these stop plates so that any diameter adjustments required can be made without delay.

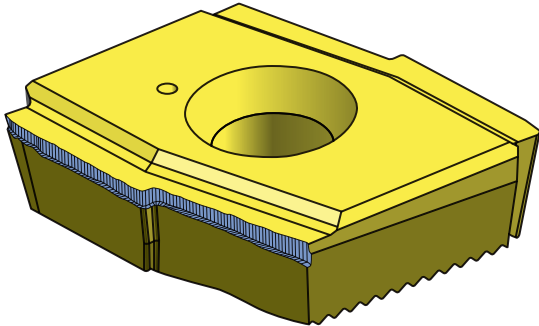


- * Stop plates are available in thickness steps (dimension "S") of 0.01 mm. For range, see table. The respective thickness is engraved on the part. When reordering, quote the order number and in addition the dimension "S".

Order no.	S	B	L	I	d	Screw	
						Order No.	Dimensions
01-2050-610-S...	1.30 - 2.00	5	11	4.8	2.8	01-0200-860	M2.5 x 4.3
01-2400-610-S...	1.80 - 2.50	6	13.5	6	2.7	21-0200-860	M2.5 x 4.7
01-3750-610-S...	2.20 - 3.00	7	15	6	3.4	21-0600-860	M3.0 x 6.7

Types of wear

Flank wear

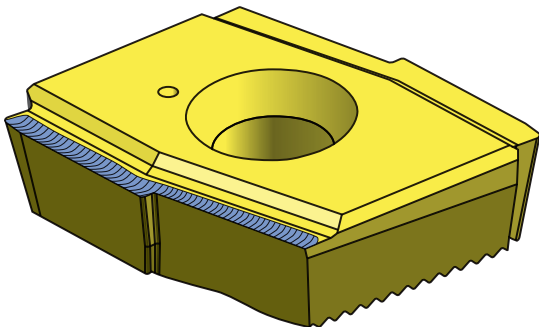


Abrasion of the cutting material almost parallel to the direction of cut because of the sliding abrasion at the cutting surface. Flank wear is normal wear that increases constantly over the operating lifetime.

To extend lifetime:

- use cutting material more resistant to wear
- lower cutting speed

Crater wear

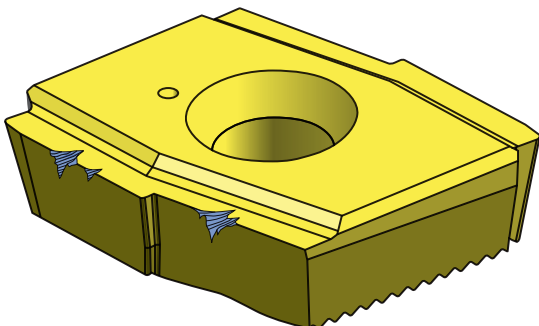


Erosion of the cutting material in the form of depressions behind the cutting edge caused by sliding wear from the chips exiting. Crater wear is normal wear that increases constantly over the operating lifetime.

To extend lifetime:

- suitable chip pilot stage
- greater cutting material strength
- alternative coating

Notch wear

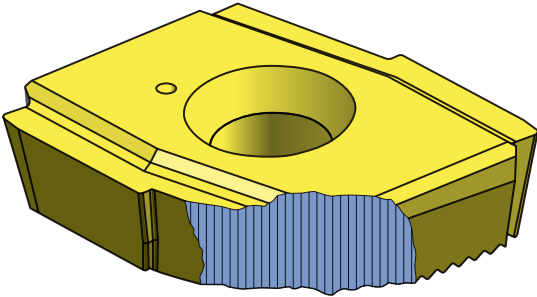


Erosion of the cutting material in the form of notches. Frequently occurs with counter-boring and is caused by a hard surface layer.

To extend lifetime:

- greater cutting material strength
- alternative coating
- regular exchange of indexable inserts

Breakage



Forced breakage of the cutting material in the cutting plane caused by chip congestion, chip breakers too short, drill bush play and vibrations.

Remedial action:

- Chip congestion: Shorter chip breakers
Adjust suitable quantity of cooling lubricant
- Chip breaker too short: Use longer chip breaker
- Drill bush play: Drill bush nominal dimension F7
- Vibrations: Unsupported drill tube length too long
Setting of vibration damper
Carbide selection

Chip-breaker (SP)

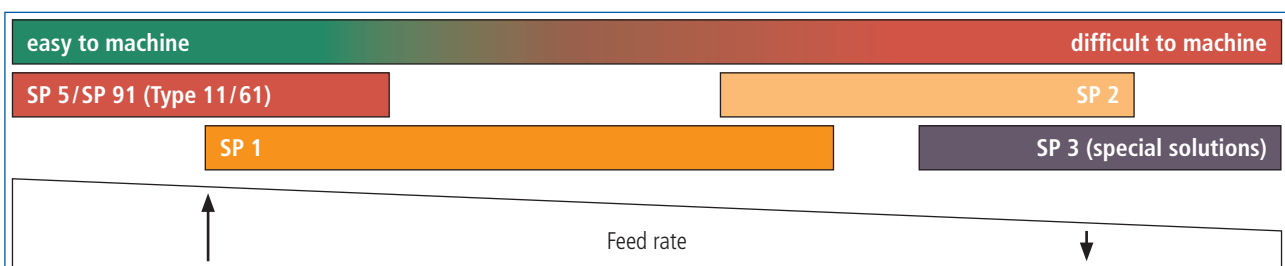
It is the job of the chip-breaker to divert the chips when they roll off on the chip face so that when they hit the tool end face they tear off.

It is generally recommended to use chip-breaker SP 1 + 5. With these chip breakers, higher feed values can also be used.

With work-piece materials that are difficult to machine, chip-breaker SP 2 should be used.

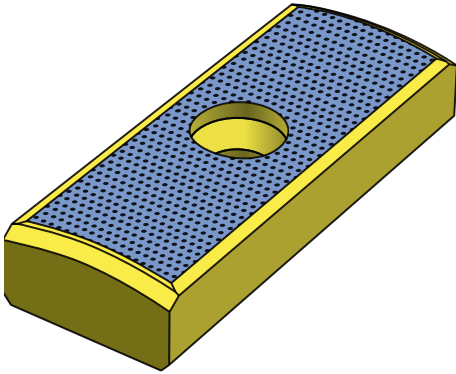
In special cases and if SP 2 has no effect either, a special chip-breaker SP 3 can be manufactured to customer specifications.

Materials to be processed



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Cobalt leaching

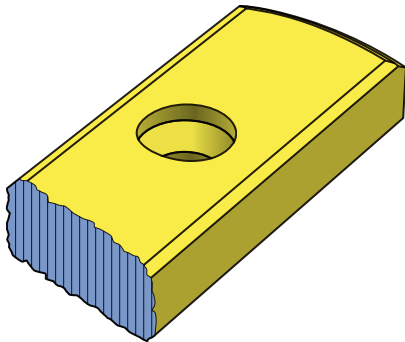


Material fatigue due to unsuitable lubricant

Remedial action:

- Use deep hole drilling oil.
- Use emulsion with high EP additive content.

Breakage

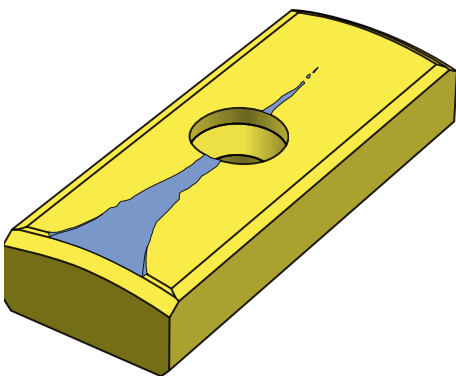


Overload breakage of the guide pad caused by chip congestion or rifling

Remedial action:

- Chip congestion Optimize process
- Rifling Optimize process

Material abrasion



Surface abrasion of hard metal. This appearance is a normal wear, which increases continuously with the duration of use.

Remedial action:

- Observe max. tool life.
- Remove dirt particles from cooling lubricant (scale acts like emery).
- Increase lubricating effect of cooling lubricant (EP additives).

Changing the drill head diameter

By replacing the accessories the diameter can be changed.

Depending on the type of tool stop plate, guide pads, shims and the cartridge of the peripheral insert must be replaced.

- Stop plate - Increments of 0.01 mm
- Cartridges - Please choose according to information given in our catalogues
- Guide pads - Are produced on diameter, alternatively shims can be supplied in thickness of 0.025; 0.05; 0.1 and 0.25 mm.
Other dimensions must be sourced in locally.

When re-ordering accessories please always state technical details.

- Drill heads without cartridge (e.g. Type 60) → dimension "S" and drill Ø
- Drill heads with cartridge (e.g. Type 43) → adjusting dimension "EM" and drill Ø

Examination

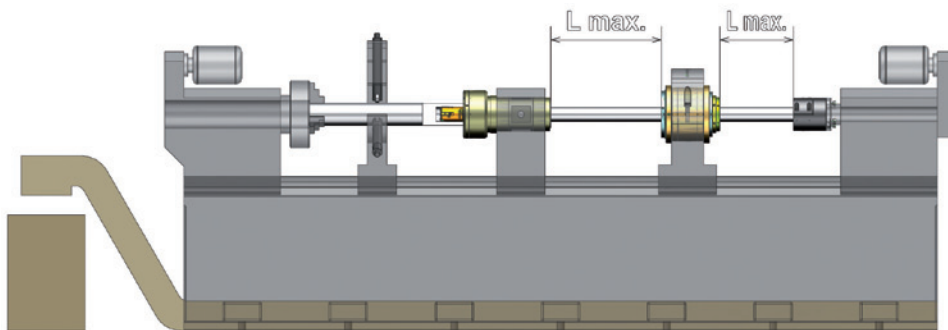
Please check the correct setting after every diameter change by using the botek head setting gauge.



botek setting gauge, measurement range 100 - 600 mm

Application notes

1. **Before using the drills make sure the machine has the necessary equipment for proper deep hole drilling. The machine should have suitable safety guarding for protection from cutting chips and coolant for operator.**
Check with machine builder!
2. **Improper use or handling of deep hole drilling tools can cause serious injuries**, e.g. skin cuts from the cutting edge.
3. **Tool support: Unsupported drill length** should never exceed the dimensions as shown on table.
If the unsupported drill length is exceeded the drill might cause injury.



Drill tube-Ø	Maximum unsupported tube length
mm	mm
11	880
12	960
13	1040
14	1120
16	1360
18 - 20	1530
22 - 24	1760
26 - 28	1950
30 - 33	2100
36 - 39	2340
43 - 47	2580
51 - 56	2703
62 - 75	3100
82 - 94	3690
106 - 130	3922
142 - 178	4544
190 - 226	5130
238 - 274	5474
286 - 334	6006

The values shown in the table are guide values for the maximum unsupported tube length. The actual unsupported tube length may vary, depending on the drilling task.

Where drill tube lengths are equal to or more than approximately half of the maximum free length, we recommend in general the use of a vibration damper.

4. Grinding of carbide produces dust (cobalt etc.) that may be potentially hazardous. Use adequate ventilation and safety glasses during grinding.
5. **Consequences of not following** our application notes 1-4.

Please note that all application notes and values contained herein are intended as guidelines only. We do not accept any liability for damages caused by improper handling of botek deep hole drilling tools, operating errors, unsuitable machinery or misuse while using our tools!

Do you have any further questions? Please call us (630) 893-5300. We will be pleased to offer you advice.

botek[®]

DEEP HOLE DRILLING SYSTEMS
SOLID CARBIDE TOOLS

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