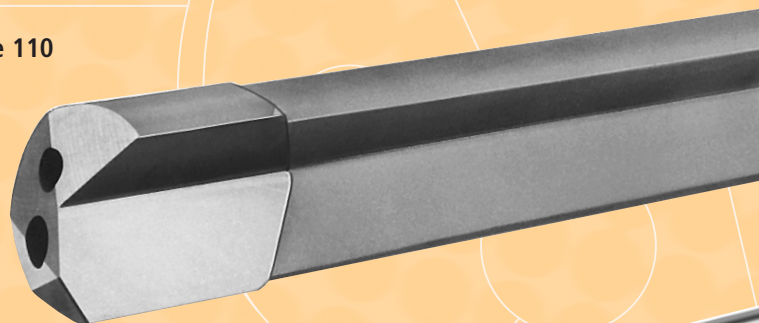


botek

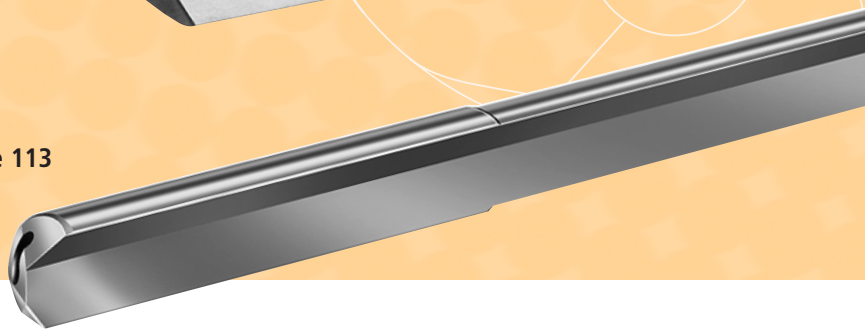
DEEP HOLE DRILLING SYSTEMS
SOLID CARBIDE TOOLS

Single flute gundrills
Type 110/111/112
Type 113/114/115

Type 110



Type 113



Solid drilling and counterboring tools
- in solid carbide design
- with brazed carbide tip
Trepanning tools



botek –
Your expert partner in precision drilling



THE INTERNATIONAL CERTIFICATION NETWORK
CERTIFICATE

IQNet and
DQS GmbH Deutsche Gesellschaft zur Zertifizierung von Managementsystemen
 hereby certify that the company

botek Präzisionsbohrtechnik GmbH

Längenfeldstraße 4
 D-72585 Riederich
 Germany

for the scope

Design, development, production and sale of
 deep hole drilling systems and solid carbide tools

has implemented and maintains a

Quality Management System.

An audit, documented in a report, has verified that
 this quality management system fulfills the requirements
 of the following standard:

ISO 9001 : 2000

This certificate is valid until 2006-06-24

Frankfurt am Main, Berlin 2003-06-25

Registration Number: DE-070195 QM



[Signature]
 Dr. Fabio Roversi
 President of IQNet

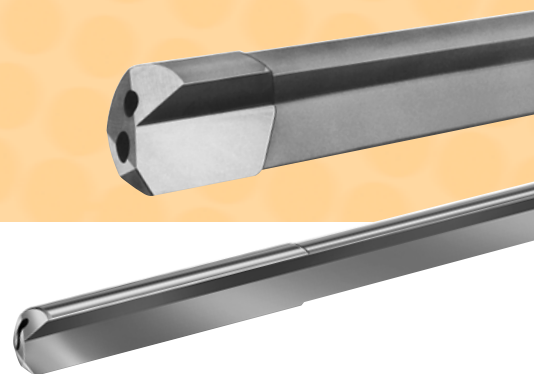
[Signature]
 S. Heinloth
 Managing Directors of DQS GmbH

[Signature]
 Dr. K. Petrick
 Managing Directors of DQS GmbH



IQNet Partners*:

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Tools

- Page 4+5 botek advantages
Page 6+7 The gundrilling process and the requirements for application
- Information on the guide hole (pilot hole) and guide values

Solid carbide single flute gundrill (Type 113)

- Page 8 Overview
Page 8 Tool design
Page 9 1. Drill head (contours and nose grinds)
Page 10 Solid drilling and counterboring,
Type 113, 113-01, 113-02: standard designs
Page 10 2. Drill shaft
Page 11 3. Driver (overview and order numbers)

Single flute gundrill with brazed carbide tip

- Page 12 Overview
Page 12 Tool design
Page 13 1. Drill head (contours and nose grinds)
Page 14 Solid drilling, Type 110, 111, 112: standard versions
Page 15 Counterboring and trepanning,
Type 114, 115, 115-03, 115-04: standard versions
Page 15 2. Drill tube
Page 16+17 3. Driver (overview and order numbers)

Technical Information

- Page 18+19 Drilling quality (drilling tolerances, surface quality, centerline deviation,
straightness, roundness)
Page 20+21 Solid carbide single flute gundrill (Type 113)
- Guide values for gundrilling of various materials
- Coolant flow and pressure
Page 22+23 Single flute gundrill with brazed carbide tip
- Guide values for gundrilling of various materials
- Coolant flow and pressure
Page 24+25 Application notes for botek deep hole drilling tools (single flute gundrills)

Accessories

- Page 26+27 Consumable accessories (drill bushings, whipguides, etc.)
Page 28+29 Regrinding of botek single flute gundrills
(in-house regrinding service, grinding machines and fixtures)

Inquiry/order

- Page 30 Inquiry form/Order form

General Terms and Conditions, Guide values

- Page 31 Important information

Contents



botek advantages

1. Cost effective and precise holemaking.
2. botek quality tools are synonymous with high cutting performance.
3. Minimum centerline deviation.
4. Outstanding drilling quality and trouble-free chip removal.
5. High process reliability.
6. Tool lengths up to 5.000 mm are available depending on tool type and tool dia.
7. Diametric tolerances up to IT 7 are possible under specific conditions.
8. Suitable for use on machining centres and turning machines with high pressure coolant system.
9. Minimum quantity lubrication (MQL) is possible under certain conditions.
10. Drills can be used horizontally or vertically with either tool, workpiece or counterrotation.

botek advantages

11. Tools can be reground at botek's factory or in your facility (see brochure: botek grinding machines and accessories).
12. Gundrills are optimally adapted by botek to machining requirements in close cooperation with the customer.
13. Each of our tools is the product of over 30 years' experience in deep hole drill production and applications.
14. We develop and manufacture tools for all deep hole drilling processes (Gundrilling, BTA and Ejector).
15. The solid carbide single flute gundrill (Type 113) was developed and manufactured by botek since 1982.
This innovative technology made it possible, for the first time, gundrilling down to diameters less than 2 mm. This capability is, among other things, a prerequisite for the production of modern fuel injection systems.
16. botek is the world market leader in the field of single flute gundrills.



The single flute gundrilling process and the requirements for application

The characteristic of the single flute gundrilling process is that coolant is fed through the coolant hole in the tool and exits along with the chips in the V-shaped groove (flute) on the drill tube from the drilled hole. The coolant also provides lubrication to the drill periphery. This is possible if coolant, i.e. deep-hole drilling oil or emulsion (min. 10-12% concentration, with additives), is provided in sufficient quantity and pressure (coolant information see page 20-23).

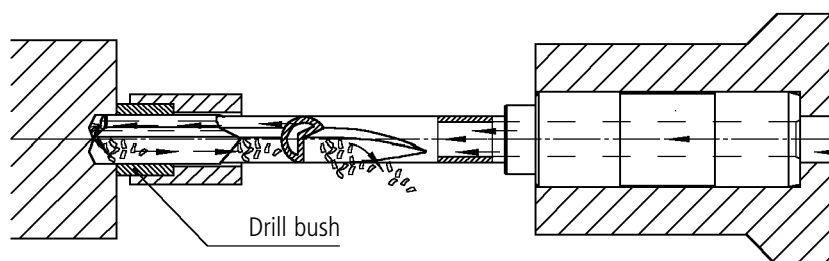
Minimum quantity lubrication (MQL) may be used under certain conditions.

High pressure coolant systems should already be integrated in the machine or can be provided as a separate unit by the machine's manufacturer. Economical deep-hole drilling is therefore, not only possible on special deep-hole drilling machines but also on CNC machining centres (lathes, horizontal boring machines, etc.).

A detailed description of the single flute gundrilling process can be found on our information CD:

"botech Deep Hole Drilling Systems – Tools and Applications."

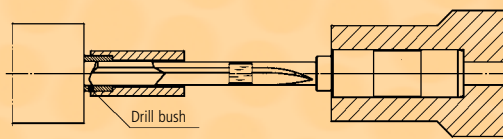
Please contact your botech representative.



Information on the guide hole (pilot hole)

Guide hole

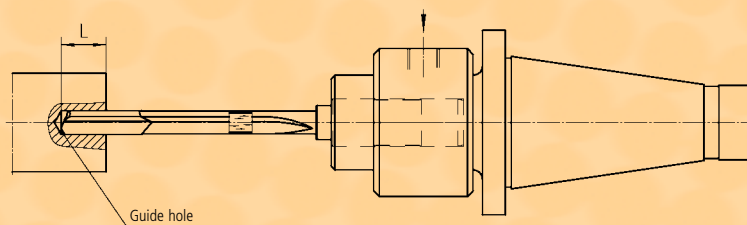
with drill bush



The gundrill is a single-edged tool without self-centering. When positioning the drill, the tool must be guided through a drill bush or a pilot hole.

The quality of the pilot hole affects the drilling performance (tool life, centerline deviation, etc.)

with pilot hole



Dimensions for the guide hole

Drill diameter (mm)	Dimensions for guide hole (pilot hole)	L (mm)	D (mm)
0.5 - 2.5		approx. 2 x D	+ 0.005 to + 0.015
2.6 - 8.9		approx. 1.5 x D	+ 0.010 to + 0.020
9.0 - 50.00		approx. 1 x D	+ 0.015 to + 0.040

The dimensions specified in the table are guide values. To avoid chipping of the cutting edge, a chamfered pilot hole (F) is recommended depending on machining requirements.




→ Please read our application notes on page 24 and 25.



Type 113

Solid carbide single flute gundrill

Solid carbide gundrill – Types

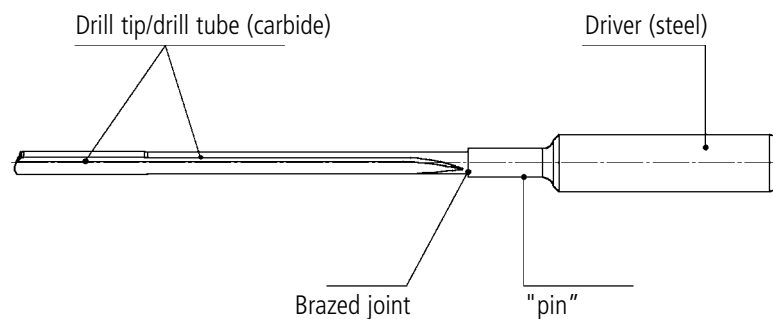
Type	Tool dia.	
Type 113 Solid carbide Gundrill	kidney-shaped coolant channel for tool dia.: 0.500 - 12.000 mm	
Type 113-01* Solid carbide stepped drill	kidney-shaped coolant channel for tool dia.: 1.500 - ... mm	
Type 113-02 Solid carbide counterboring tool	kidney-shaped coolant channel for tool dia.: 0.500 - 12.000 mm	

* Tool on request only

Solid carbide gundrill – tool design

Drill tip and drill tube are manufactured from a single piece of carbide blank. The advantage of this tool is high process reliability and performance. Longer tool life is possible because of reduced torsional vibrations and higher rigidity.

With this tool type, the driver (steel) has a "pin". The driver and the drill tube are connected by a brazed joint.

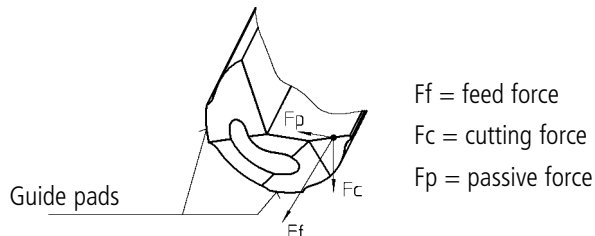


1. Drill head

a) Peripheral contour

The solid carbide gundrill is selfguided while drilling. Guide pads on the drill head act as supports. The layout of the guide pads often has a decisive influence on the surface quality and dimensional accuracy of the drilled hole. Cutting forces press the guide pads against the hole wall with force that a burnishing effect occurs, producing the surface quality and dimensional accuracy (roundness) typical of the gundrilling process.

Various contours (see page 10) are available to suit your drilling requirements.



**Solid carbide
single flute gundrill**

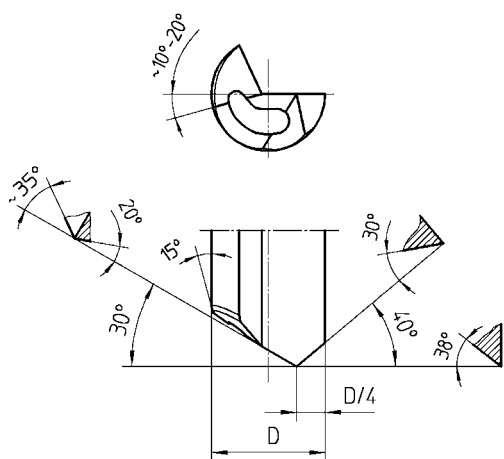
Type 113

b) Nose grind geometry

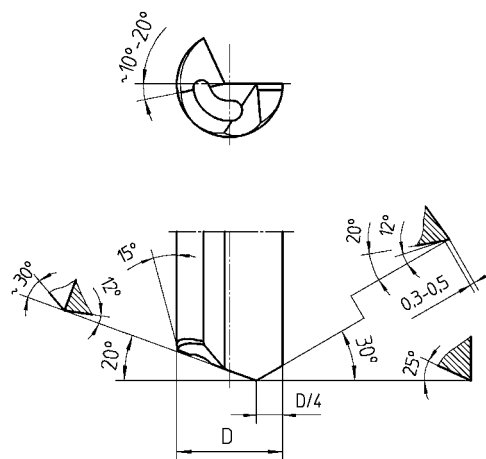
The nose grind geometry affect the following, hole tolerance, chip formation, coolant pressure & flow, tool life, centerline deviation and surface quality. Over the years, botek has successfully tested a number of different nose grinds for drilling various materials.

botek's experience has formed the foundation for the development of our standard nose grind geometries. This meets the requirements of most drilling applications. Deep-hole drilling of especially long chipping materials and difficult to machine materials usually call for special nose grind geometries, and in some cases, made to order chip breakers, all available from botek.

Standard nose grinds for Type 113 and 113-01



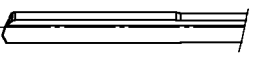



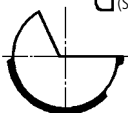
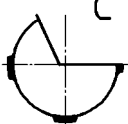
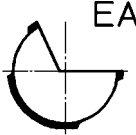
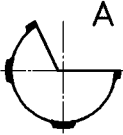
Nose grind no. 001/1 (SA-0009)
for drill range: 0.500 - 4.000 mm



Nose grind no. 002 (SA-0002)
for drill range: 4.001 - 12.000 mm



Solid carbide gundrill (Type 113) – Solid drilling and counterboring tools

Design of drill head and shank	Solid carbide design		
	Solid drilling tools		Counterboring tools
Working method/ tool-type	Type 113	Type 113-01	Type 113-02
Illustration			
Drilling range from - to (mm)	Ø = 0.500 - 12.000 mm	Ø = 1.500 - ... mm	Ø = 0.500 - 12.000 mm
Tool length	Available up to 100 x diameter		
Coolant hole design	 Kidney-shaped coolant channel		
Type 113 Solid carbide gundrill	Advantages <ul style="list-style-type: none"> - Deep holes with extremely small diameters can be drilled - Solid carbide design allows greater rigidity reducing vibration and tensional flex during drilling - Higher feedrates are possible/greater penetration feed rates - Various peripheral contours for greater application flexibility - Even higher cutting speeds are possible compared to the gundrill with brazed carbide tip (Type 110). - Regrindable - Optimum coolant flow due to kidney shaped coolant channel - Minimized drift by higher tool rigidity 		
	Peripheral contours botek adapts the contour optimally to meet your drilling requirements! Important: Contour EA and G are non-micable		
		 G (Standard) - All materials - Suitable for most drilling requirements - Close hole tolerance - Minimum drift	 C - Steel, stainless steel - Not easily machinable materials - Preferred for water soluble (emulsion) coolants
		 EA - Cast iron, malleable materials - Crosshole drilling - Angular entrance and exit bores	 A - Aluminium, copper - Close hole tolerance
Special contour	Also available upon special request		
Special nose grinds	All tools are also available with special nose grind		
Tool coatings	Please specify the coating you require		
Diamond/PCD	Also available with PCD cutting edge		

2. Drill tube

The drill tube and tip are made entirely of solid carbide with a kidney shaped coolant channel. Coolant and chips are flushed out of the drilled hole via the V-shaped groove, or flute, on the drill shank.

With standard tool designs, the V-shaped flute extends to the driver (pin). Solid carbide gundrills are available with a drill shank length up to 100 x diameter, however maximum flute length is 300 mm depending on diameter.

3. Driver

botek solid carbide gundrills are made complete with drivers. Drivers transmit the torque from the machine to the drill. High rotational accuracy between the drill shank and the driver avoids additional vibration, thereby increasing the cutting performance and process reliability of the tools. In addition to a large number of standard drivers, botek manufactures drivers also to customer specifications.


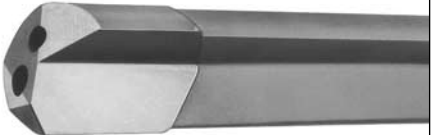
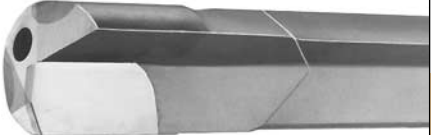





Cylindrical drivers (DIN 6535 HA) used in hydraulic chucks or sealed collets achieve best true running, typical on machining centres.

Standard Drivers for Solid carbide gundrills (Type 113)

Designation		Drawing	botek order no.	for tool length calculation			X = Notch location	M = Thread size	
ø dia. (mm)	Type			drill dia. range (mm) from - to	L Driver = clamping area	L Driver with pin			
6			ZH 6-03	0.500 - 4.649	30	45	17	Type 113 Solid carbide grundrill	
10	ideal for hydraulic chucks and collets		ZH 10-15	0.500 - 6.349	55	70	M6x0.5		
10			ZH 10-37	0.500 - 6.349	40	55	32.7		M6x0.5
10			ZH 10-42	0.500 - 6.349	40	55	24		
12.7			ZH 12.7-01	0.500 - 6.349	38	48	25.4		
12.7	ideal for hydraulic chucks and collets		ZH 12.7-09	0.500 - 6.349	51	65	M6x0.5		
16			ZH 16-75	0.500 - 12.000	80	105	37		M10x1
4	DIN 6535-HA ideal for hydraulic chucks and collets		ZH 4-08	0.500 - 5.149	34	46			
6			ZH 6-12	0.500 - 4.649	36	50			
10			ZH 10-51	0.500 - 6.349	40	55			
12			ZH 12-27	0.500 - 6.349	45	60			
16			ZH 16-86	0.500 - 12.000	48	63			
6	DIN 6535-HB		ZH 6-13	0.500 - 4.649	36	50	20		
10			ZH 10-47	0.500 - 6.349	40	55	23.5		
12			ZH 12-30	0.500 - 6.349	45	60	26.5		
16	DIN 1835-B		ZH 16-78	0.500 - 12.000	48	63	29		
6	DIN 6535-HE		ZH 6-01	0.500 - 4.649	36	50	25		
10			ZH 10-49	0.500 - 6.349	40	55	28		
12			ZH 12-28	0.500 - 6.349	45	60	33		
16	DIN 1835-E		ZH 16-84	0.500 - 12.000	48	63	36		



Single flute gundrills with brazed drill head – Types

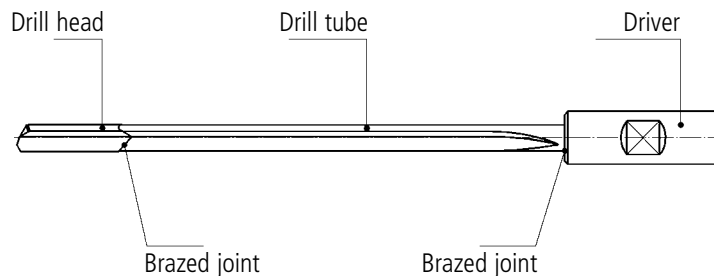
Type	Tool dia.	
Type 110 Single flute gundrill with brazed solid carbide tip	kidney-shaped coolant channel for tool dia. 1.850 - 7.059 mm	
	2 coolant holes for tool dia. 7.060 - 51.200 mm	
Type 111 Single flute gundrill drill head made of a steel body with inserted carbide cutting blade and bearing pads	1 coolant hole for tool dia. 5.800 - 40.009 mm 2 coolant holes for tool dia. 40.010 - 60.009 mm (not shown)	
Type 112 Single flute stepped gundrill with solid carbide tip (to produce precise stepped holes in one operation)	Kidney-shaped coolant channel or 2 coolant holes depending on diameters Tool dia. 2.000 - 51.200 mm	
Type 114 Trepanning gundrill carbide tip for producing annular drill-holes	Tool dia. 11.000 - 50.000 mm	
Type 115 Single flute counterboring tool with solid carbide tip	Kidney-shaped coolant channel or 2 coolant holes depending on diameters	
Type 115-01 Single flute stepped counterboring tool	Tool dia. 2.000 - 51.200 mm	
Type 115-03 Single flute counterboring tool with guiding pilot with solid carbide tip	Tool dia. 4.000 - 12.000 mm	
Type 115-04 Single flute counterboring tool with guiding pilot steel body with inserted carbide cutting blade and bearing pads	Tool dia. 12.001 - 60.006 mm	

Type 110,
111, 112,
114, 115

Gundrills
with brazed
drill head

Single flute gundrills with brazed drill head – Tool design

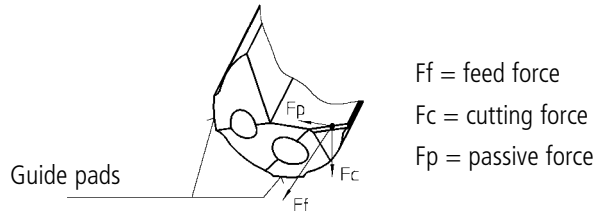
The typical gundrill is fabricated with a drill head section of solid carbide or a steel body with inserted carbide cutting blade and bearing pads. The head section is brazed to a heat treated tube (flute) section then fitted and brazed to a hardened and ground steel driver.



1. Drill head

a) Peripheral contour

The single flute gundrill is selfguided while drilling. Guide pads on the drill head act as supports. The layout of the guide pads often has a decisive influence on the surface quality and dimensional accuracy of the drilled hole. Cutting forces press the guide pads against the hole wall with force that a burnishing effect occurs, producing the surface quality and dimensional accuracy (roundness) typical of the gundrilling process. Various contours (see page 14+15) are available to suit your drilling requirements.



**Type 110,
111, 112,
114, 115**

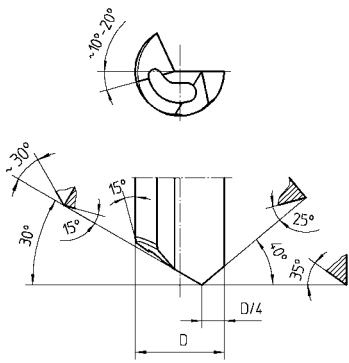
b) Nose grind geometry

The nose grind geometry affect the following, hole tolerance, chip formation, coolant pressure & flow, tool life, centerline deviation and surface quality. Over the years, botek has successfully tested a number of different nose grinds for drilling various materials.

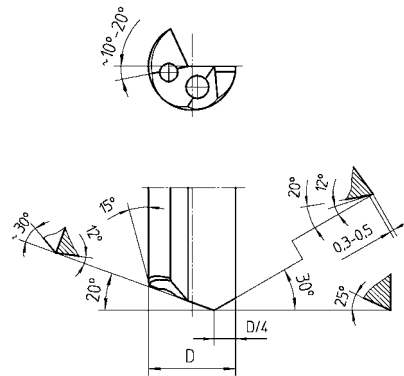
botek's experience has formed the foundation for the development of our standard nose grind geometries. This meets the requirements of most drilling applications. Deep-hole drilling of especially long chipping materials and difficult to machine materials usually call for special nose grind geometries, and in some cases, made to order chip breakers, all available from botek.

**Single flute
gundrills with
brazed
carbide tip**

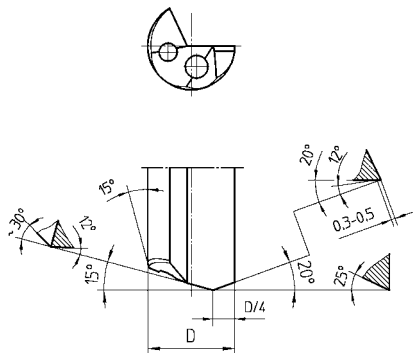
Standard nose grinds for Type 110, 111, 111-01, 112



Nose grind no. 001 (SA-0001)
for drill range 1.850 - 4.000 mm



Nose grind no. 002 (SA-0002)
for drill range 4.001 - 20.000 mm

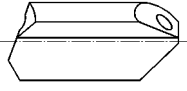
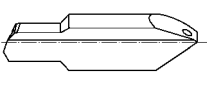
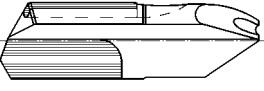
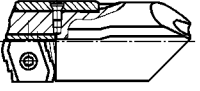








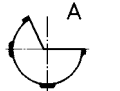
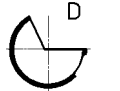
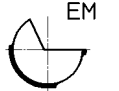

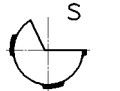


Nose grind no. 003 (SA-0003)
for drill range 20.001 - ... mm

We are pleased to provide you with
regrinding instructions on request.



Single flute gundrills with brazed drill head – Solid drilling tools

Drill head design	Solid carbide tip		Steel body with brazed carbide cutting blade and bearing pads		Steel body with indexable carbide inserts and guide pads	
Working method/ tool type	Solid drilling tools					
	Type 110	Type 112 Step drill	Type 111		Type 01-000 + 01-010	
Illustration						
Drilling range from - to (mm)	1.850 - 51.200		5.800 - 60.009		15.000 - 43.990	
Tool length	depending on diameter, max. 5000 mm					
Coolant hole design (standard)	Kidney  Tool dia. 1.850 - 7.059	2-hole  Tool dia. 7.060 - 51.200	1-hole  Tool dia. 5.800 - 40.009	2-hole  Tool dia. 40.010 - 60.009	1-hole  Tool dia. 18.000 - 43.990	
Advantages	<ul style="list-style-type: none"> - Several peripheral contours are available to suit your drilling applications - Regrindable - Optimum coolant flow due to various coolant channel designs - Available with PCD cutting edge 		<ul style="list-style-type: none"> - Carbide grade of cutting blades may be different than guide pads to suit specific drilling applications. - Regrindable - Drill breakage is minimized by the damping effect of drill head body section. 		<ul style="list-style-type: none"> - Cost effective for high production - Variety of carbide grades and chip breaker designs available - Indexable insert eliminates resharpening - Indexable guide pads. - Inserts and guide pads are easily changed or replaced - Extended guide pads with Model 01-010 ideal for cross hole drilling applications 	
Peripheral contours	 G (Standard)	 E	 C		Fixed peripheral contour due to tool design	
botek adapts the contour optimally to meet your drilling requirements!	 A	 D	 EM			
Important: Contour EA, G and E are non-micable	 EA	 S				
Special contour	Also available upon special request		–		see botek brochure: Deep hole drilling tool Type 01	
Special nose grinds	All tools are also available with special nose grind					
Tool coatings	Please specify the coating you require					
Diamond/PKD	Also available cutting edge with PCD		–			Also available with PCD cutting edge

**Type 110,
111, 112,
114, 115**

**Single flute
gundrill with
brazed drill head**

Single flute gundrills with brazed drill head – Counterboring/Trepanning

Drill head design	Solid carbide tip		Steel body with brazed carbide cutting blade and bearing pads	Steel body with indexable carbide inserts and guide pads	
Working method/tool	Drilling tools		Counterboring tools with guiding pilot		Trepanning tool
	Type 115	Type 115-01	Type 115-03	Type 115-04	Type 114
Illustration					
Drilling ranges from - to (mm)	2.000 - 51.200		4.000 - 12.000	12.001 - 60.009	11.000 - 50.000
Coolant hole design (standard)	Kidney Tool dia. 1.850 - 7.059	2-hole Tool dia. 7.060 - 51.200	1-hole Tool dia. 5.800 - 40.009	2-hole Tool dia. 40.010 - 60.009	Determined by tool design
Special features	Type 115 only: - with round drill tube (chip removal in drilling direction) or - with fluted standard drill tube (chip removal against drilling direction)				
Peripheral contours optimized to suit your drilling requirements! Important: Contour EA, G and E are non-micable	 G (Standard) <ul style="list-style-type: none"> - All materials - Suitable for nearly all drilling requirements - Close drilling tolerance - Minimal drift 	 E <ul style="list-style-type: none"> - All materials and plastics - Preferred for Speedbit devices 	 C <ul style="list-style-type: none"> - Stainless steel, wood - Not easily machinable materials - Preferred for water soluble (emulsion) coolants 	Fixed peripheral contour due to tool design	
 A <ul style="list-style-type: none"> - Aluminium - Close drilling tolerance 	 D <ul style="list-style-type: none"> - Cast iron and graphite - Close drilling tolerance in cast iron 	 EM <ul style="list-style-type: none"> - Steel, cast iron - Soft materials 			
 EA <ul style="list-style-type: none"> - Steel and aluminium - Crosshole drilling operations - Unfavourable drilling conditions 	 S <ul style="list-style-type: none"> - Steel - Close drilling tolerance - Good surface quality - Ideal for short holes 				
Special contour	Also available upon special request			-	-
Special nose grinds	All tools are also available with special nose grind			-	-
Tool coatings	Please specify the coating you require			-	-
Diamond/PCD	Also available to order with PCD point			-	-

Type 110, 111, 112, 114, 115

Single flute gundrill with brazed drill head

2. Drill tube

Tempered alloy steel tubing is formed with a V-shaped groove (flute) to create the swarf (coolant) return channel required for the gundrilling operation. Design considerations for proper drill tube sizes include the ratio between the drill tube outside diameter and inside diameter for optimum torsional rigidity. This ensures exceptional cutting performance, coolant flow and tool life.

With standard gundrills the flute section is typically extended to the driver. For longer gundrills it is possible to have a round section of drill tube with a shorter flute length for added rigidity and strength.



Various standard drivers for single flute gundrills with brazed drill head

Designation		Drawing	botek driver no.	for tool length calculation			X = Notch location	M = Thread size
∅ dia. (mm)	Type			drill dia. range (mm) from - to	L Driver = clamping area	L Driver with pin		
10			ZH10-00	1.850 - 7.299	40		24.0	
16			ZH16-03	1.850 - 12.399	45	53	31.0	
25			ZH25-00	7.300 - 19.509	70	78	34.0	
10	with pin		ZH10-01	7.300 - >	40	57	24.0	
16			ZH16-04	12.400 - >	45	72	31.0	
25	with pin and drive key		ZH25-01	19.510 - >	70	105	34.0	
16	with pin		ZH16-02	1.850 - 12.399	50	58	47.5	
16			ZH16-33	12.400 - 20.500	50	77	47.5	
10			ZH10-06	1.850 - 7.299	60			M6x0.5
16	GKT with metr. thread		ZH16-15	1.850 - 12.399	80			M10x1
25			ZH25-08	7.300 - 19.509	100			M16x1.5
10	GKT with metr. thread with pin		ZH10-28	7.300 - >	60	77		M6x0.5
16			ZH16-22	12.400 - >	80	105		M10x1
25			ZH25-10	19.510 - >	100	140		M16x1.5
12.7	1/2"		ZH12.7-00	1.850 - 9.699	38.1		25.4	
19.05	3/4"		ZH19.05-01	3.960 - 14.899	70		45.0	
25.4	1" inch dia.		ZH25.4-00	6.000 - 19.509	70		57.5	
31.7	1 1/4"		ZH31.7-00	9.700 - 25.609	70		57.5	
38.1	1 1/2"		ZH38.1-00	9.700 - 32.609	70		57.5	
19.05	3/4"		ZH19.05-11	14.900 - >	70	97	45.0	
25.4	1" inch dia.		ZH25.4-01	19.510 - >	70	100	57.5	
31.7	1 1/4" with pin		ZH31.7-01	25.610 - >	70	110	57.5	
38.1	1 1/2"		ZH38.1-01	32.610 - >	70	110	57.5	
10	VDI 3208		ZH10-44	1.850 - 6.749	60	68	35	M6x0.5
16			ZH16-31	3.960 - 10.799	80	90	37	M10x1
25			ZH25-34	6.000 - 19.509	100	112	45	M16x1.5
16	VDI 3208 with pin		ZH16-66	10.800 - >	80	110	37	M10x1
25			ZH25-40	19.510 - >	100	142	45	M16x1.5

3. Driver

The single flute gundrill is typically provided with a driver for holding the tool in the machine spindle. The driver transmits the torque from the machine spindle. Botek manufactures a variety of standard drivers from stock as well as customer specific configurations.

**Type 110,
111, 112,
114, 115**

**Single flute
gundrill with
brazed drill head**

Various standard drivers for gundrills with brazed drill head

Designation		Drawing	brotek driver no.	for tool length calculation			X = Notch location	M = Thread size
Ø dia. (mm)	Type			drill dia. range (mm) from - to	L Driver = clamping area	L Driver with pin		
16	Adjustable driver with acme thread		SH16-00	1.850 - 12.559	112		73.0	TR16x1.5
20			SH20-00	1.850 - 14.899	126		82.0	TR20x2
28			SH28-00	6.000 - 21.509	126		82.0	TR28x2
36			SH36-00	8.700 - 28.609	162		109.0	TR36x2
16	Speedbit		ZH16-21	1.850 - 12.399	40		28.0	
25			ZH25-16	7.300 - 19.509	50		35.0	
35			ZH35-00	9.700 - 28.609	60		40.0	
16	Speedbit with pin		ZH16-30	12.400 - >	40	67	28.0	
25			ZH25-20	19.510 - >	50	77	35.0	
35			ZH35-01	28.610 - >	60	100	40.0	
10	DIN 6535-HA		ZH10-40	1.850 - 7.299	40			
12			ZH12-18	1.850 - 8.999	45			
16			ZH16-11	1.850 - 12.399	48			
20			ZH20-01	1.850 - 15.899	50			
25			ZH25-11	7.300 - 19.509	56			
32	DIN1835-A40		ZH32-24	9.700 - 25.609	60			
40			ZH40-03	9.700 - 32.609	70			
10	DIN 6535-HA or 1835-A with pin		ZH10-41	7.300 - >	40	57		
12			ZH12-19	9.000 - >	45	62		
16			ZH16-20	12.400 - >	48	75		
20			ZH20-60	15.900 - >	50	77		
25			ZH25-21	19.510 - >	56	86		
32			ZH32-23	25.610 - >	60	100		
40	ZH40-04	32.610 - >	70	110				
10	DIN 6535-HB		ZH10-11	1.850 - 7.299	40		23.5	
12			ZH12-07	1.850 - 8.999	45		26.5	
16			ZH16-32	1.850 - 12.399	48		29.0	
20			ZH20-29	1.850 - 15.899	50		30.5	
25	DIN6535-HB		ZH25-22	7.300 - 19.509	56		38.0	
32	DIN1835-B32		ZH32-10	9.700 - 25.609	60		43.0	
40	DIN1835-B40		ZH40-13	9.700 - 32.609	70		47.0	
10	DIN 6535-HB or 1835-B with pin		ZH10-23	7.300 - >	40	57	23.5	
12			ZH12-02	9.000 - >	45	62	26.5	
16			ZH16-53	12.400 - >	48	75	29.0	
20			ZH20-34	15.900 - >	50	77	30.5	
25			ZH25-31	19.510 - >	56	86	38.0	
32			ZH32-11	25.610 - >	60	100	43.0	
40	ZH40-14	32.610 - >	70	110	47.0			
10	DIN 1835-E		ZH10-20	1.850 - 7.299	40		28.0	
12			ZH12-08	1.850 - 8.999	45		33.0	
16			ZH16-47	1.850 - 12.399	48		36.0	
20			ZH20-40	1.850 - 15.899	50		38.0	
25			ZH25-36	7.300 - 19.509	56		44.0	
32			ZH32-12	9.700 - 25.609	60		48.0	
40	ZH40-18	9.700 - 32.609	70		66.0			
10	DIN 1835-E with pin		ZH10-24	7.300 - >	40	57	28.0	
12			ZH12-05	9.000 - >	45	62	33.0	
16			ZH16-51	12.400 - >	48	75	36.0	
20			ZH20-43	15.900 - >	50	77	38.0	
25			ZH25-37	19.510 - >	56	86	44.0	
32			ZH32-13	25.610 - >	60	100	48.0	
40			ZH40-17	32.610 - >	70	110	66.0	
10	DIN 6535-HE		ZH10-29	1.850 - 7.299	40		28.0	
12			ZH12-13	1.850 - 8.999	45		33.0	
16			ZH16-62	1.850 - 12.399	48		36.0	
20			ZH20-55	1.850 - 15.899	50		38.0	
10	DIN 6535-HE with pin		ZH10-30	7.300 - >	40	57	28.0	
12			ZH12-14	9.000 - >	45	62	33.0	
16			ZH16-70	12.400 - >	48	75	36.0	
20			ZH20-56	15.900 - >	50	77	38.0	

**Type 110,
111, 112,
114, 115**

**Single flute
gundrill with
brazed drill head**



Drilling quality



To achieve optimum drilling results **when using carbide tipped or solid carbide gundrills**, various criteria must be applied. In addition to tool design, key factors are machine design and construction, process techniques, pressurized and filtered deep hole drilling coolant. Selection of proper cutting parameters is also a significant factor.

The key factors botek considers when designing gundrills:

- Material type
- Diameter, tolerance and surface finish
- Peripheral contour
- Carbide grade and coating
- Nose grind geometry

In addition to our refined manufacturing and technology for consistent product quality, our application and technical experience help you realize optimal solutions.



Achievable drilling tolerances with single flute gundrills







-  under normal conditions
-  under favourable conditions

(guide values)

Non ferrous metals	Material	IT	13	12	11	10	9	8	7	6	5
Aluminium alloys (depending on Si-content)											
Tool steel											
Cast iron (Grey + Nodular)											
Heat treatable steel											
Nitriding steel											
Free machining steel											
Case-hardening steel											
Drilling quality area											

Surface quality

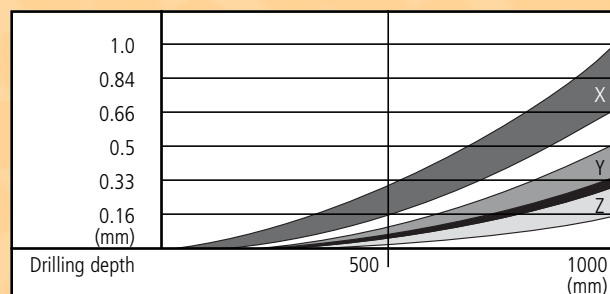
-  under normal conditions
-  under favourable conditions

Roughness class	N8	N7	N6	N5	N4	N3
Quality area						
Surface roughness values	Rt μm	21	11.5	6.2	3.4	1.9
	Ra μm	3.2	1.6	0.8	0.4	0.1
	Rz μm	14	7.6	4.5	2.2	1.2

Centerline deviation (drift)

- Counter-rotation: The optimum results are achieved with rotating tool and simultaneous workpiece counter-rotation. (See "Z")
- Workpiece rotating: The next best technique involves the workpiece rotating with the gundrill non-rotating. (See "Y")
- Tool rotating: (See "X")

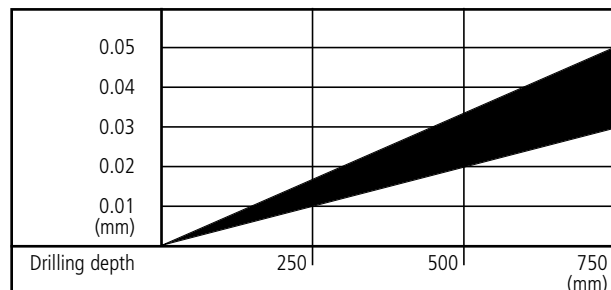
In all applications tool drift is minimized by using a close fitting pilot bore or guide bushing during gundrilling. Angular alignment of pilot bore with desired gundrill bore is imperative. With a guide bushing, alignment and distance from the workpiece are also important.



The data above is based on single flute carbide tipped gundrills. Achieved results may be improved using single flute solid carbide gundrills.

Hole straightness

Whipping or deflection of the gundrill flute plays a decisive role in hole straightness and run out in the workpiece. Carbide tipped gundrills must be supported by a steady rest or whip guide every 40 diameters. For further information, refer to page 25.



Roundness

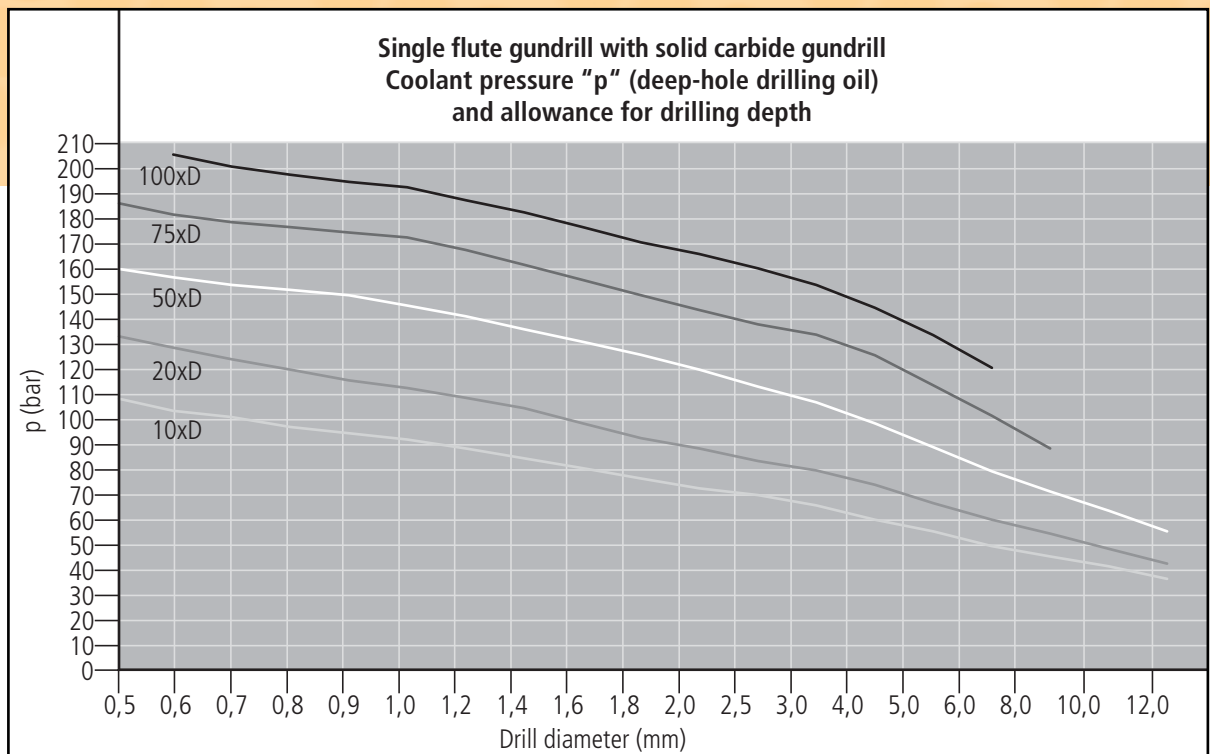
Hole roundness is a primary advantage of gundrilling over conventional twist drilling. Hole roundness measurements as low as 3 μm are possible.



Guide values for gundrilling of various materials with solid carbide gundrill – Type 113

Material groups	Structural steel Carbon steel Low alloyed steel Case hardening steel < 900 N/mm ² (265HB)	Alloyed tempered steel Case hardening steel Nitriding steel Tool steel > 900 N/mm ² (265HB)	Stainless steel (ferritic/martensitic) 13-25% Cr (sulphurized)	Stainless steel corrosion and heat resisting (austenitic) 18-25% Cr Ni > 8%
	"free machining"			
Cutting speed m/min	70 - 100	60 - 80	40 - 80	30 - 60
Drill dia. (mm)	Feed rate mm/rev.			
	from - to	from - to	from - to	from - to
0.5 - 0.59	0.0002 - 0.0010	0.0003 - 0.0008	0.0004 - 0.0007	0.0002 - 0.0007
0.6 - 0.69	0.0002 - 0.0011	0.0005 - 0.0010	0.0004 - 0.0008	0.0003 - 0.0008
0.7 - 0.79	0.0003 - 0.0014	0.0007 - 0.0012	0.0006 - 0.0010	0.0005 - 0.0010
0.8 - 0.89	0.0004 - 0.0017	0.0010 - 0.0016	0.0007 - 0.0014	0.0007 - 0.0012
0.9 - 0.99	0.0007 - 0.0020	0.0009 - 0.0020	0.0009 - 0.0019	0.0011 - 0.0017
1.0 - 1.09	0.0010 - 0.0026	0.0010 - 0.0026	0.0012 - 0.0024	0.0014 - 0.0020
1.1 - 1.19	0.0014 - 0.0035	0.0013 - 0.0032	0.0015 - 0.0028	0.0016 - 0.0023
1.2 - 1.39	0.0018 - 0.0045	0.0015 - 0.0041	0.0020 - 0.0033	0.0020 - 0.0028
1.4 - 1.59	0.0021 - 0.0060	0.0021 - 0.0052	0.0025 - 0.0042	0.0025 - 0.0036
1.6 - 1.79	0.0028 - 0.0079	0.0024 - 0.0066	0.0031 - 0.0054	0.0032 - 0.0045
1.8 - 1.99	0.0030 - 0.0100	0.0030 - 0.0081	0.0039 - 0.0065	0.0040 - 0.0057
2.0 - 2.49	0.004 - 0.013	0.004 - 0.010	0.005 - 0.008	0.005 - 0.007
2.5 - 2.99	0.006 - 0.017	0.005 - 0.014	0.008 - 0.012	0.008 - 0.010
3.0 - 3.99	0.008 - 0.021	0.007 - 0.018	0.012 - 0.016	0.011 - 0.014
4.0 - 4.99	0.012 - 0.029	0.008 - 0.027	0.017 - 0.022	0.016 - 0.020
5.0 - 5.99	0.015 - 0.037	0.012 - 0.035	0.024 - 0.030	0.023 - 0.026
6.0 - 7.99	0.020 - 0.046	0.017 - 0.045	0.033 - 0.039	0.031 - 0.034
8.0 - 9.99	0.024 - 0.061	0.021 - 0.062	0.043 - 0.051	0.040 - 0.044
10.0 - 12.00	0.030 - 0.078	0.027 - 0.079	0.055 - 0.064	0.050 - 0.056
Deep-hole drilling oil	highly suitable			
Emulsion	suitable at limited degree			
MQL	suitable at limited degree			

Cutting speed and feed rate are dependent on tool length, coolant type and material being drilled, as well as the stability of the drilling machine and workpiece clamping. All figures specified are guide values.



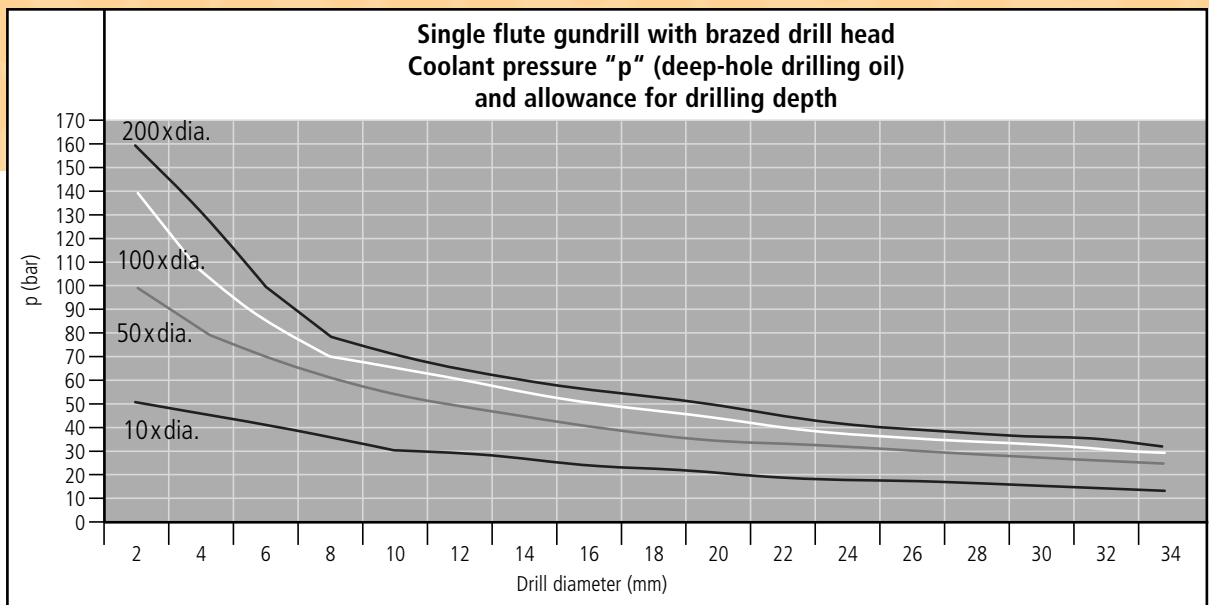
Guide values for gundrilling of various materials with carbide tipped gundrill – Type 110, 111

Material groups	Structural steel Carbon steel Low alloyed steel Case hardening steel < 900 N/mm ² (265HB)	Alloyed tempered steel Case hardening steel Nitriding steel Tool steel > 900 N/mm ² (265HB)	Stainless steel (ferritic/martensitic) 13-25% Cr (sulphurized)	Stainless steel corrosion and heat resisting (austenitic) 18-25% Cr Ni > 8%
	"free machining"			
Cutting speed m/min	70 - 100	60 - 80	40 - 80	30 - 60
Drill dia. (mm)	Feed rate mm/rev.			
	from - to	from - to	from - to	from - to
1.85 - 2.49	0.0019 - 0.0060	0.0019 - 0.0078	0.0019 - 0.0039	0.0016 - 0.0029
2.5 - 2.99	0.0025 - 0.0094	0.0033 - 0.0119	0.0038 - 0.0064	0.0025 - 0.0046
3.0 - 3.49	0.0034 - 0.0128	0.0053 - 0.0157	0.0049 - 0.0089	0.0037 - 0.0063
3.5 - 3.99	0.0045 - 0.0165	0.0070 - 0.0196	0.0070 - 0.0122	0.0050 - 0.0081
4.0 - 4.49	0.0056 - 0.0211	0.0089 - 0.0236	0.0080 - 0.0157	0.0070 - 0.0098
4.5 - 4.99	0.0069 - 0.0254	0.0102 - 0.0274	0.0098 - 0.0189	0.0089 - 0.0118
5.0 - 5.99	0.0089 - 0.0295	0.0125 - 0.0316	0.0118 - 0.0222	0.0113 - 0.0136
6.0 - 6.99	0.0110 - 0.0364	0.0150 - 0.0393	0.0143 - 0.0276	0.0140 - 0.0170
7.0 - 7.99	0.0133 - 0.0431	0.0175 - 0.0467	0.0163 - 0.0343	0.0160 - 0.0205
8.0 - 8.99	0.0157 - 0.0495	0.0200 - 0.0550	0.0183 - 0.0405	0.0180 - 0.0243
9.0 - 9.99	0.0184 - 0.0565	0.0225 - 0.0632	0.0212 - 0.0466	0.0200 - 0.0283
10.0 - 11.99	0.023 - 0.063	0.025 - 0.071	0.026 - 0.053	0.025 - 0.032
12.0 - 13.99	0.027 - 0.076	0.031 - 0.086	0.032 - 0.065	0.030 - 0.041
14.0 - 15.99	0.032 - 0.090	0.035 - 0.102	0.038 - 0.077	0.035 - 0.050
16.0 - 17.99	0.036 - 0.103	0.039 - 0.119	0.045 - 0.090	0.041 - 0.059
18.0 - 19.99	0.041 - 0.116	0.044 - 0.135	0.053 - 0.105	0.048 - 0.071
20.0 - 23.99	0.051 - 0.130	0.049 - 0.153	0.068 - 0.119	0.060 - 0.083
24.0 - 27.99	0.060 - 0.157	0.054 - 0.185	0.083 - 0.143	0.073 - 0.106
28.0 - 31.99	0.070 - 0.184	0.059 - 0.217	0.100 - 0.168	0.087 - 0.127
32.0 >	0.085 - 0.211	0.063 - 0.247	0.125 - 0.193	0.107 - 0.151
Deep-hole drilling oil	highly suitable			unsuitable
Emulsion	suitable at limited degree			unsuitable
MQL	suitable at limited degree			unsuitable

Technical Information

Gundrill with brazed drill head Type 110, 111

Cutting speed and feed rate are dependent on tool length, coolant type and material being drilled, as well as the stability of the drilling machine and workpiece clamping. All figures specified are guide values.



The ideal viscosity of deep-hole drilling oil should be 15 mm²/s (60-70 SUS) at 40°C for drilling diameters up to 18 mm. When using emulsion, the specified pressures (p) may be reduced by up to 20 %.

For all drill diameters filtering is required between 5 µm and 20 µm.

Guide values for gundrilling of various materials with carbide tipped gundrill – Type 110, 111

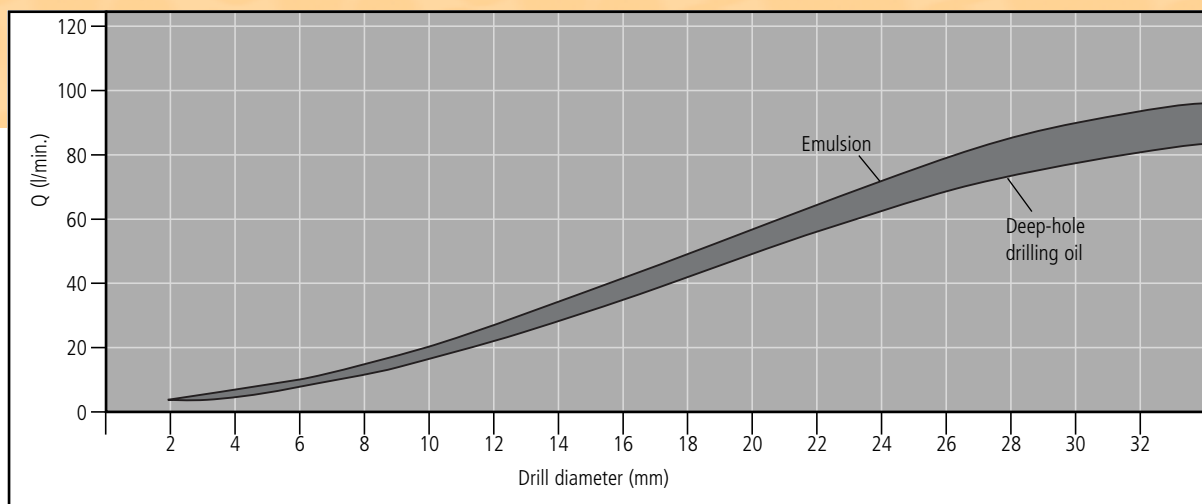
Spring steel Hardened steel Hardened steel castings Heat resisting steel Titanium, Ti - alloys Special alloys: Inconel, Nimonic, etc.	Cast iron Grey cast iron < 300 N/mm ² Nodular cast iron < 400 N/mm ² Malleable cast iron	Cast iron Grey cast iron > 300 N/mm ² Nodular graphite iron > 400 N/mm ² Steel castings	Copper Bronze Brass Plastics	Aluminium + Aluminium alloys Si content > 5% "free machining"	Aluminium + Aluminium alloys Si content < 5% "not hardened"
25 - 60	70 - 100	60 - 90	80 - 150	100 - 180	100 - 300
Feed rate mm/rev.					
from - to	from - to	from - to	from - to	from - to	from - to
0.0013 - 0.0015	0.0046 - 0.0116	0.0023 - 0.0063	0.0028 - 0.0074	0.0019 - 0.0182	0.0019 - 0.0031
0.0019 - 0.0022	0.0068 - 0.0178	0.0034 - 0.0129	0.0041 - 0.0126	0.0029 - 0.0368	0.0033 - 0.0053
0.0026 - 0.0028	0.0086 - 0.0236	0.0049 - 0.0188	0.0060 - 0.0176	0.0055 - 0.0589	0.0049 - 0.0088
0.0040 - 0.0038	0.0105 - 0.0300	0.0073 - 0.0242	0.0070 - 0.0234	0.0078 - 0.0859	0.0063 - 0.0154
0.0056 - 0.0052	0.0127 - 0.0362	0.0092 - 0.0311	0.0080 - 0.0293	0.0106 - 0.1178	0.0078 - 0.0214
0.0077 - 0.0071	0.0145 - 0.0424	0.0112 - 0.0377	0.0088 - 0.0377	0.0127 - 0.1466	0.0094 - 0.0273
0.0100 - 0.0092	0.0185 - 0.0495	0.0141 - 0.0440	0.0106 - 0.0450	0.0165 - 0.1717	0.0122 - 0.0324
0.0120 - 0.0126	0.0235 - 0.0603	0.0172 - 0.0563	0.0123 - 0.0565	0.0192 - 0.2167	0.0154 - 0.0414
0.0147 - 0.0165	0.0280 - 0.0728	0.0201 - 0.0676	0.0144 - 0.0674	0.0235 - 0.2624	0.0176 - 0.0498
0.0176 - 0.0209	0.0343 - 0.0859	0.0231 - 0.0795	0.0166 - 0.0804	0.0282 - 0.3140	0.0198 - 0.0578
0.0207 - 0.0240	0.0394 - 0.0983	0.0261 - 0.0917	0.0188 - 0.0942	0.0333 - 0.3550	0.0220 - 0.0659
0.024 - 0.027	0.050 - 0.110	0.031 - 0.103	0.023 - 0.104	0.042 - 0.396	0.026 - 0.075
0.028 - 0.033	0.060 - 0.133	0.037 - 0.126	0.027 - 0.125	0.052 - 0.478	0.031 - 0.093
0.034 - 0.040	0.070 - 0.156	0.042 - 0.146	0.032 - 0.146	0.063 - 0.560	0.035 - 0.111
0.038 - 0.046	0.079 - 0.178	0.047 - 0.165	0.037 - 0.166	0.071 - 0.631	0.040 - 0.131
0.043 - 0.053	0.087 - 0.201	0.052 - 0.182	0.042 - 0.187	0.078 - 0.692	0.044 - 0.151
0.051 - 0.060	0.106 - 0.224	0.063 - 0.199	0.051 - 0.207	0.094 - 0.754	0.053 - 0.167
0.063 - 0.073	0.123 - 0.270	0.073 - 0.234	0.060 - 0.246	0.110 - 0.871	0.062 - 0.201
0.072 - 0.086	0.141 - 0.316	0.084 - 0.269	0.070 - 0.281	0.126 - 0.989	0.070 - 0.234
0.086 - 0.100	0.169 - 0.362	0.099 - 0.301	0.085 - 0.315	0.149 - 1.099	0.084 - 0.268
highly suitable					
unsuitable					
suitable at limited degree					

**Technical
Information**

**Gundrill
with brazed
drill head
Type 110, 111**

Cutting speed and feed rate are dependent on tool length, coolant type and material being drilled,
as well as the stability of the drilling machine and workpiece clamping. All figures specified are guide values.

Coolant quantity/volumetric flow rate "Q"

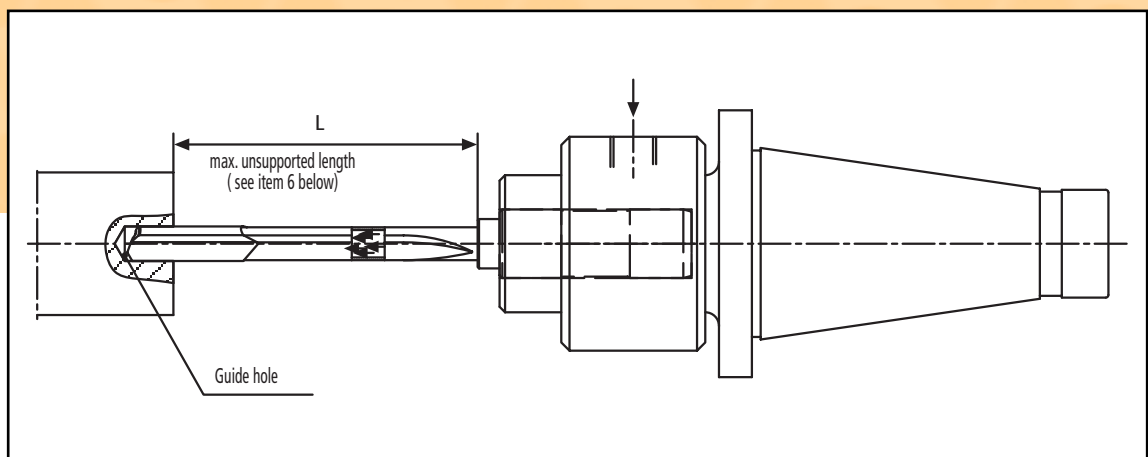


Reliable chip removal is only assured if sufficient coolant is supplied to the tool. The diagrams show our recommendation for coolant pressure and quantity by drill diameter and drilling depth.



Application notes for botek deep hole drilling tools (gundrills)

1. **Before using the drills make sure the machine has the necessary equipment to do 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. Deep hole drilling tools are not self centering and can be unbalanced. Therefore the drills must be guided **during the start of the drilling cycle** by means of a sufficiently long drill bush or pilot hole. (see detail "Z" on below illustration)

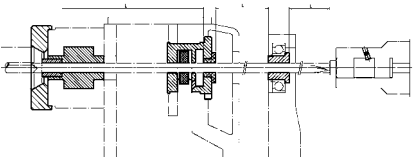


4. The gundrill is fed into drill bush or pilot hole while non rotating or rotated slowly at <50 RPM (illustr. 3a and b). Then the coolant and the machine spindle should get started.
5. After reaching the drilling depth switch off the coolant and retract with **the spindle stopped or slowly rotated at < 50 RPM.**
6. **Tool support: unsupported drill length** should never exceed the dimensions as shown on table (6a). If the unsupported drill length is exceeded the drill might cause injury.
Do not exceed 40 times diameter unsupported!

Application notes for botek deep hole drilling tools (gundrills)

Technical Information

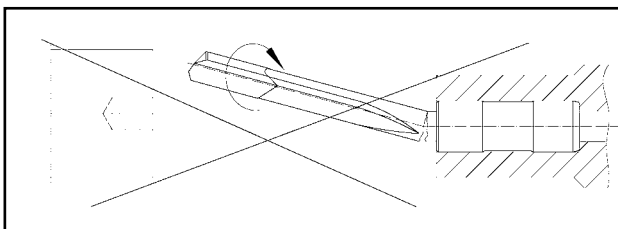
6a. Guide values for tool support of botek deep hole drilling tools (gundrills)

Maximum unsupported drill length (L) between the steady rests or in a guide hole		Gundrill	Drill dia. = D (mm)	Maximum unsupported drill length (L)
		Solid carbide (Type 113)	0.500 - 0.999	approx. 80 x D
	1.000 - 1.999	approx. 100 x D		
	2.000 - 6.999	approx. 80 x D		
	7.000 - 12.000	approx. 60 x D		
	with brazed drill head (Type 110, 111)	1.850 - 20.999	approx. 40 x D	
		21.000 - 30.999	approx. 35 x D	
		31.000 - 40.999	approx. 30 x D	
		41.000 - 55.000	approx. 25 x D	

Example 1: drill diameter, D = 2.0 mm, unsupported drill length up to maximum 80 mm = 40 x D
Example 2: drill diameter, D = 2.0 mm x 200 mm OAL, 1st support at 80 mm and 2nd support 160 mm.

7. Grinding of carbide produces dust (cobalt, etc.) that may be potentially hazardous. Use adequate ventilation and safety glasses during grinding.

8. Consequences of not following our application notes No. 1-7



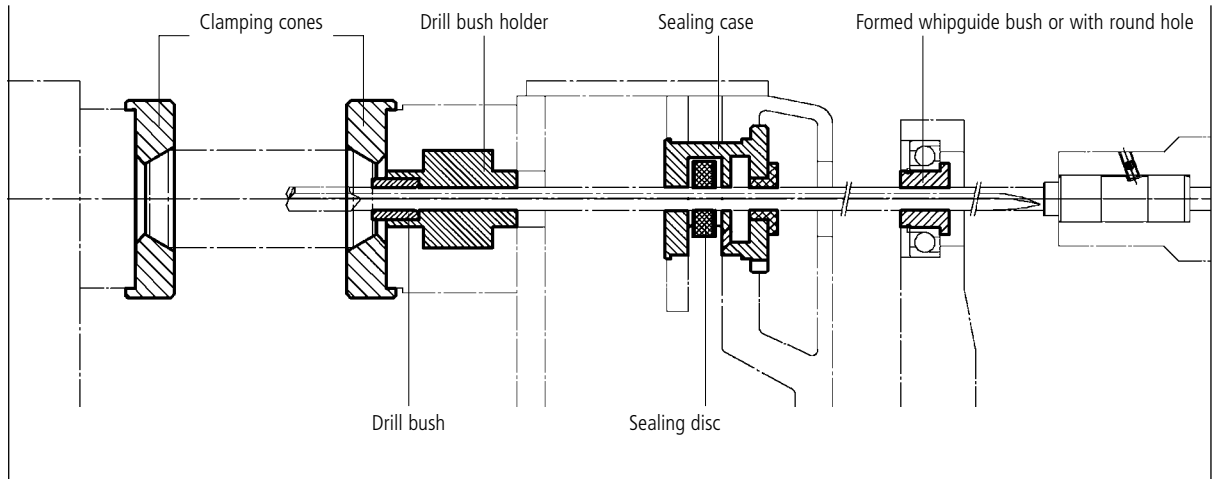
Using botek gundrills other than directed may cause personal injury. Tool breakage and unsupported gundrills can be extremely dangerous. Please use with caution and care.

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 queries? Please call up at +49-(0)-7123-3808-0. We will be pleased to offer you advice.

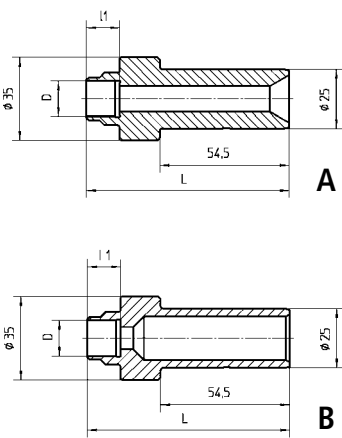


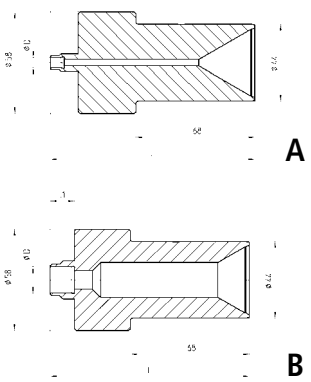
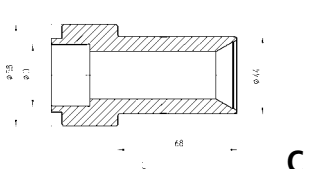
Machine accessories

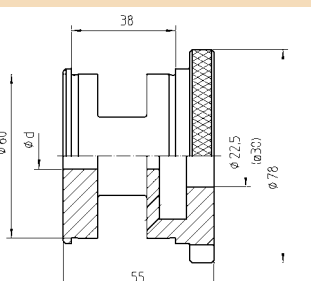


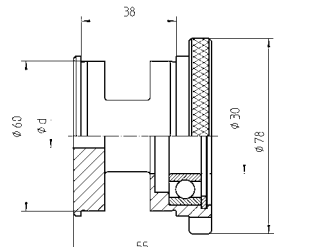
Machine accessories

Whipguide bush with round hole		Tool dia. (mm)	D	L	I1	d	botek order no.
		1.850 - 15.399	25	22	12	Please specify tool dia. and outer dia. (D) when ordering	170-05-4-1060
		1.850 - 25.609	30	26	16		170-05-4-1238
		1.850 - 36.699	45	26	14		170-05-4-1341
		1.850 - 25.609	35	26	14		170-05-4-2227
		1.850 - 25.609	30	26	13		170-05-4-2278
		1.850 - 36.699	45	26	16		170-05-4-2279
		1.850 - 11.799	20	22	12		170-05-4-2650
		1.850 - 32.600	40	26	15		170-05-4-3897
Formed whipguide bush		Tool dia. (mm)	D	L	I1	d	botek order no.
		3.960 - 12.399	20	20	12	Please specify tool dia. and outer dia. (D) when ordering	170-05-4-1809
		5.750 - 22.609	30	26	14		170-05-4-1810
		7.800 - 34.699	45	26	16		170-05-4-1812
		29.610 - 50.000	75	40	20.3		170-05-4-1816
Whipguide bush		Tool dia. (mm)	D	L		d	botek order no.
		1.850 - 12.399	22.6	15		Please specify tool dia. when ordering	170-06-4-1180
Sealing disc		Tool dia. (mm)	D	L		d	botek order no.
		1.850 - 5.749	20	3		Please specify tool dia. and outer dia. (D) when ordering	170-07-4-1572
		3.960 - 5.749	32	3			
		5.750 - 20.509	32	4			
		5.750 - 25.609	40	4			
		23.610 - 49.999	90	4			
Special sealing disc		Tool dia. (mm)	D	L		d	botek order no.
	Steel discs	2.900 - 5.249	20	7		Please specify tool dia. when ordering	170-07-4-3885
	Sealing disc	5.250 - 16.399	32	11			170-07-4-3886
		16.400 - 25.609	40	12			170-07-4-3887
		25.610 - 40.999	90	12			170-07-4-2708
Drill bushings to DIN 179A						d	botek order no.
	Cylindrical drill bushings to DIN 179A in long version made from hardened tool steel					Please specify tool dia. when ordering	170-04

Drill bush (small) in versions A and B (depending on drilling range)	Drilling range (mm) from - to	L	I1	Version	d	botek order no. and version
	0.500 - 2.699	88.5	17	A or B	Please specify tool dia. and version when ordering	170-03-3-2538 A, B
	2.700 - 5.099	87.5	16			
	5.100 - 8.099	86.5	15			
	8.100 - 12.099	85.5	14			
	12.100 - 15.099	83.5	12			
	15.100 - 18.099	81.5	10			

Drill bush (large) in versions A, B and C (depending on drilling range)	Drilling range (mm) from - to	L	I1	Version	d	botek order no. and version
	1.100 - 2.699	117	17	A or B	Please specify tool dia. and version when ordering	170-03-3-2979 A, B or C
	2.700 - 5.099	116	16			
	5.100 - 8.099	115	15			
	8.100 - 12.099	114	14			
	12.100 - 15.099	112	12			
	15.100 - 18.099	110	10			
	18.100 - 30.099	106	6	C		
	30.100 - 35.099	103	-			

Sealing case	Tool dia. (mm)	d	botek order no.
	with whipguide bush for dia. 1.850 - 12.399 without whipguide bush for dia. 12.400 - 22.500	Please specify tool dia. when ordering Whipguide bush and sealing disc to be ordered separately	170-01-3-1570

Sealing case (with bearing)	Tool dia. (mm)	d	botek order no.
	Whipguide bush with round hole for dia. 1.850 - 25.609 or formed whipguide bush for dia. 5.750 - 22.609	Please specify tool dia. when ordering Whipguide bush with round hole or formed whipguide bush (max. outer dia. 30 mm) and sealing disc to be ordered separately	170-01-4-1809



Machine accessories

Regrinding of botek gundrills

Gundrills must be reground with great care using a diamond grinding wheel. Drills with a dia. greater than 10 mm, in particular drills with inserted carbide cutting blade and guide pads should be wet ground when possible.
botek provides a customized regrinding service, and will be pleased to carry out this work for you.

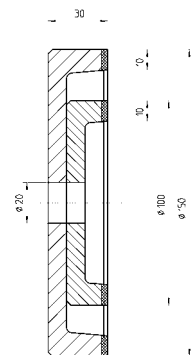
We also supply special grinding machines and accessories which enable you to regrind single flute gundrills easily and quickly at your facility.

botek twin grinding wheels for pre- and finish-grinding have a proven record of performance. These grinding wheels allow our customers to economically regrind our gundrills.

Various grinding wheels are available from stock.

It is important that the carbide tip does not become overheated during grinding. Overheated carbide can cause thermal cracking and premature tool life.

Under no circumstances should the ground surface show any signs of discoloration.



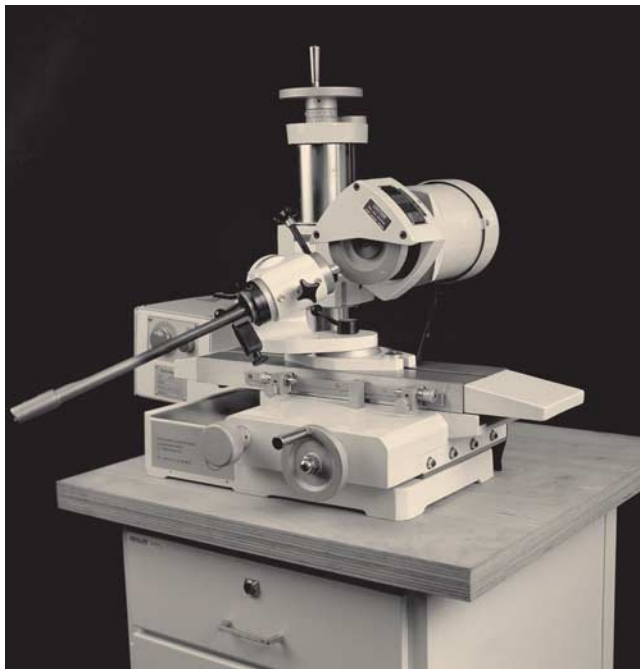


Using **botek grinding fixtures**, single flute gun-drills can be reground on any good tool grinding machine.

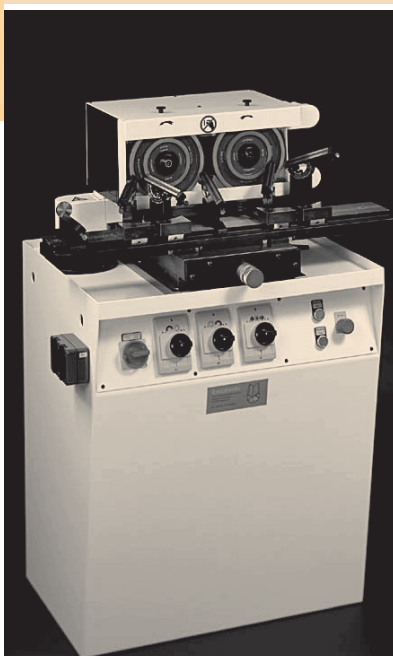
botek grinding fixtures are
 - depending on tool dia.
 - available as Model ZS (see ill. on left) or Model PS (for solid carbide gun-drills).

Regrinding service and Accessories

For grinding **small** batches, we supply the botek MS-01 single station grinding machine (with worktop).



You can easily install the above-mentioned botek grinding fixtures on this machine.



For highly efficient grinding of **large batches** of tools with the same point geometry, we recommend botek MS-12 multi-station grinding machine.

The machine is suitable for tool diameters from **1.850 to 12.000 mm** and tool lengths up to approx. **1.000 mm**, and is available with either 2 spindles (MS-12) or 3 spindles (MS-12/3) (standard version without lamp).

After you have set the fixture, you will obtain consistent and economical regrinding results easily and quickly with botek machines.



For detailed information, refer to brochure 'botek Grinding Machines and Accessories'



Form for your inquiry/order for single flute gundrills



Inquiry
 Order (please mark with a cross where applicable)
FAX to +49-(0)-7123-3808-138

1) Drilling method

- Solid drilling
 Stepped drilling
 Counterboring
 Trepanning

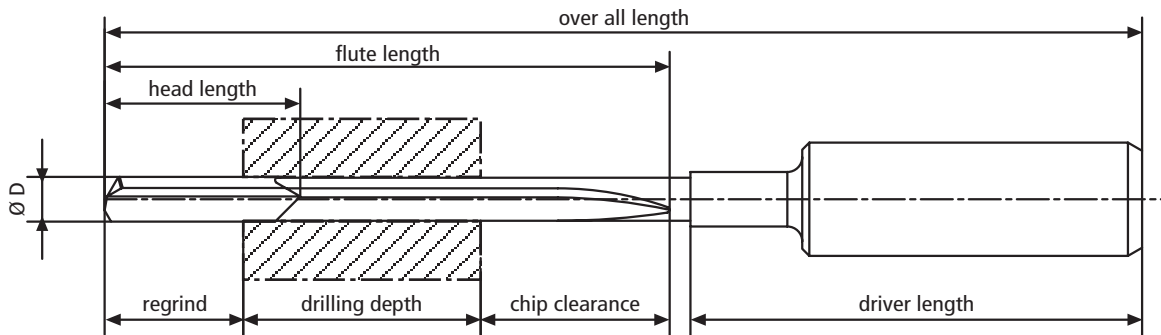
2) Tool type: single flute gundrill

- in solid carbide version/Type 113
 drill head with inserted carbide bearing pads + cutting tip/Type 111
 with solid carbide drill head/Type 110
 with indexable inserts and guide pads/Type 01

3) Driver

- Driver no.: _____
(see botek order no. in catalogues)
 without driver
 Special driver
(please supply information on dimensions and version)

4) Tool dimensions (please fill in)



Calculation of Tool length (mm):

Drill dia.	0.5 - 0.899	0.9 - 1.899	1.9 - 2.499	2.5 - 3.099	3.1 - 5.099	5.1 - 8.099	8.1 - 18.099	18.1 - 30.0
Regrind	10.0	12.0	12.0	14.0	15.0	20.0	30.0	30.0
Min. Clearance	15.0	20.0	22.0	25.0	30.0	35.0	55.0	70.0

5) Nose Grinds

- Standard nose grind
You will find details of botek grindings in our gundrill brochure and under www.botek.de. You can also request this information directly from botek.
 Special grind (as per drawing)

6) Coating

Coating type: _____

7) Drill hole dia.

_____ mm

8) Material

Material no.: _____ Description: _____ Hardness: _____

9) Machine/coolant

- Gundrilling machine
 Machining centre
 Deep-hole drilling oil
 Emulsion (min. 10%)
 coolant pressure (p): _____ bar

10) Notes, additional information: (on machining, use, material, etc.)

11) Quantity

_____ piece(s)

12) Delivery date

week _____

13) Customer info

Customer: _____ Company stamp: _____
 Phone/Fax: _____
 Contact: _____
 Date/Signature: _____ e-mail: _____

You will find a special inquiry sheet for new tool design or tool redesign under www.botek.de

Inquiry/Order

General Terms and Conditions/ Guide values

- Our general General Terms and Conditions, which we assume are known to be applied.
- The values specified in this catalogue (e.g. for feedrate, coolant pressure and coolant quantity, etc.) are guide values only and can vary depending on your application.
- We reserve the right to make changes of any nature in the interests of technical progress. Such changes cannot, in principle, be accepted as a complaint.
- Subject to change without prior notice. Errors excepted.

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