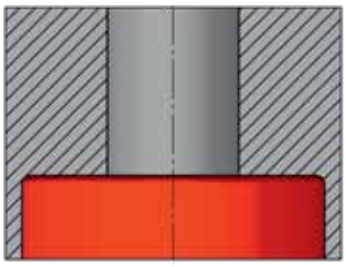
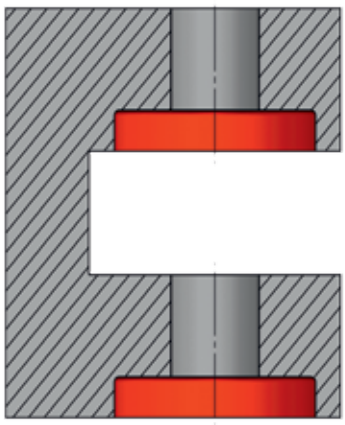
HEULE
PRECISION TOOLS

BSF

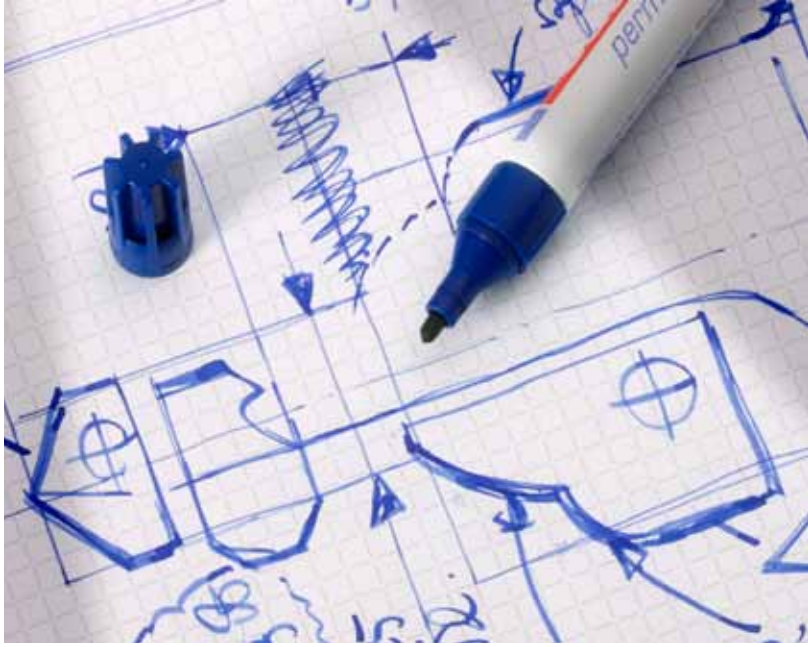
Large Ratio Automatic Back Counterboring & Spotfacing Tool

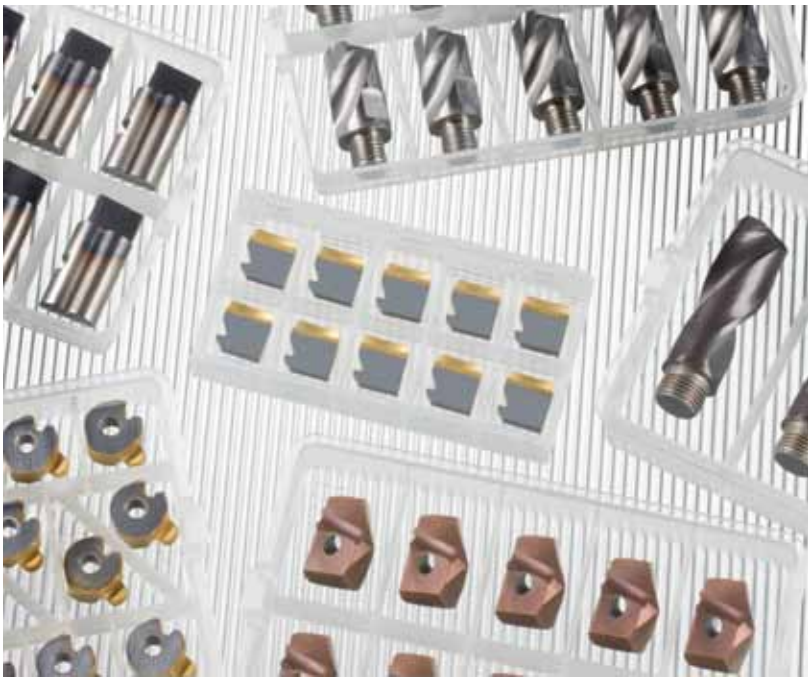
- Counterbores up to 2.3xd
- Replaceable carbide coated blades for extended life
- Very simple to use
- Suitable for CNC machines with through coolant
- Sizes 6.5-20.5mm (.256-.807”) available from stock





SWISS MADE





HEULE
PRECISION TOOLS

The Innovator and Quality Leader
in the Cutting Tool Industry since 1961

Innovative Tools with Timesaving Results

Founded in 1961 by Heinrich Heule in the Rhine Valley of eastern Switzerland, HEULE continues to be a world leader in manufacturing of chamfering and deburring tools. After serving the European community for over 25 years, HEULE expanded to the United States. Heule Tool Corporation has been providing high quality chamfering and deburring tools to the North American market since 1988.

HEULE is committed to the values of quality, precision and service. Competent service, fast delivery times and customized solutions are the highest priorities. From all ranks, HEULE's committed and motivated expert staff carry out their work with reliability and professionalism. Customer's worldwide attest to the high quality standard HEULE provides and continually improves through innovative ideas and sophisticated technology.

SWISS MADE

AEROSPACE CERTIFIED TOOLING

ONEOPERATION

HeuleTool.com (513) 860-9900

Heule Tool Corporation
4722 A Interstate Drive | Cincinnati, Ohio 45246

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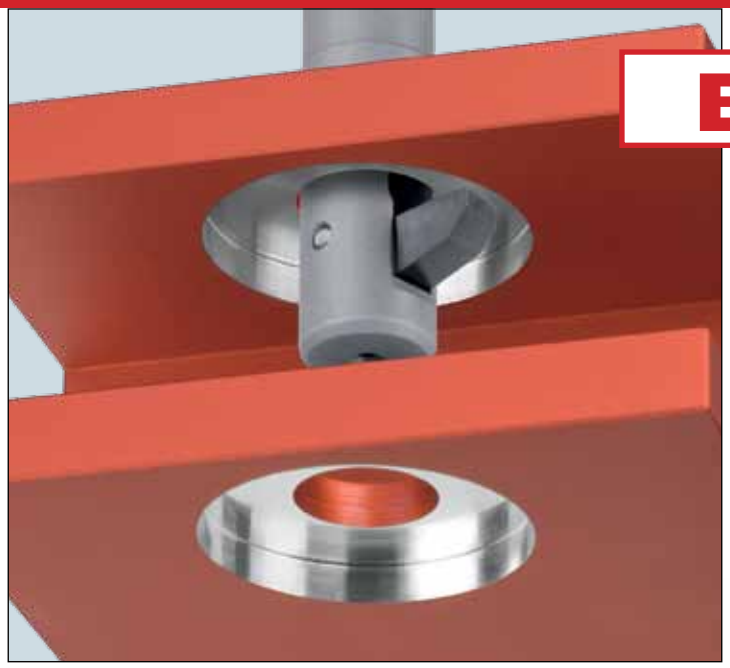
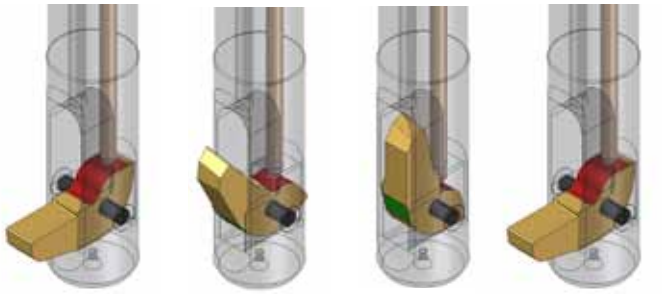


BSF

Large Ratio Automatic Back Counterboring & Spotfacing Tool

Blade Working Principle



Back Spotfacing up to 2.3 x Bore Diameter

The simple BSF tool concept allows back spotfacing or back counterboring in one operation without turning the workpiece.

The BSF spotfaces up to 2.3 times the bore diameter. Our standard range starts with holes as small as 6.5 mm to 20.5 mm and designed to cut all materials.

Clean Surface Finish

Study Details

TOOL
BSF 12.6 - 22.0 with working length 80 mm
Blade: carbide DLC coated

INDUSTRY
Automotive

WORK PIECE
Cylinder head

MATERIAL
Cast aluminum

APPLICATION
Bore: Ø12.6 mm
Spot face: Ø22.0 mm

PROCESSING
Spindle speed: 2000 rev/min
Feed: 0.05 mm/rev
Cooling: internal coolant
Coolant Pressure: 500 PSI
Shaving: short chips

REMARKS
Due to the interrupted cut, the tool was out of the recommended parameters, and was of concern. The customer took the risk and it was worth it. The interupted cut caused chatter which was corrected with higher spindle speed.

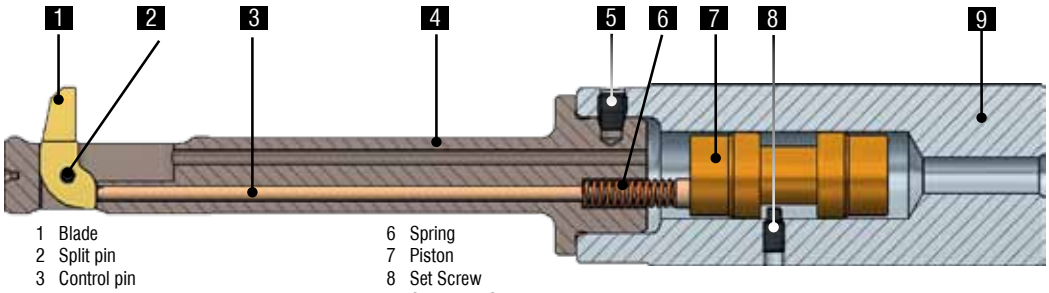
How Does the BSF Tool Work?

BSF (Back Spot Facer) is an economical backwards counterboring tool. It allows the machining of large spot faces and counter bores without turning the work piece over. This means that the machining is done on the same side as the drilled hole. The BSF is specifically designed for CNC machining and functions without an anti-rotation device, change of spindle direction or contact mechanism. The blade expands using centrifugal force when activating the spindle. The blade retracts by coolant pressure. The coolant pressure moves a piston which is pushing a pin that forces the blade (closed) into the blade housing. The design of the BSF focuses on optimal cutting performance, chip removal and reliability. The tool and the blade have special coolant pipes and chip guiding geometries that continuously flush the blade window and the blade itself with coolant. This keeps the whole section clean and allows for optimal chip removal performance. The tool is a simplistic design but very robust with the pressure of the coolant.

Easy to Change Carbide Cutting Blades

Changing the blade is easily executed with an assembly pin that is included with each tool. An extra split pin is included with each blade that is ordered. See page 34 for more information.

Tool Description



1 Blade
2 Split pin
3 Control pin
4 Housing
5 Clamping screw
6 Spring
7 Piston
8 Set Screw
9 Cylindrical Shank

How to Order

The tools and blades are sold separately and they each have an OFFSET dimension. When combined they equal the effective counterbore diameter. Choose the tool closest to the bore diameter, then choose the proper blade for the required counterbore diameter. There are 36 different size carbide blades that can fit their corresponding tool holder series.

Tool Part Number

Offset
Working Length
Min. Hole
Series

BSF- A - 0650 / 40 - 7.0

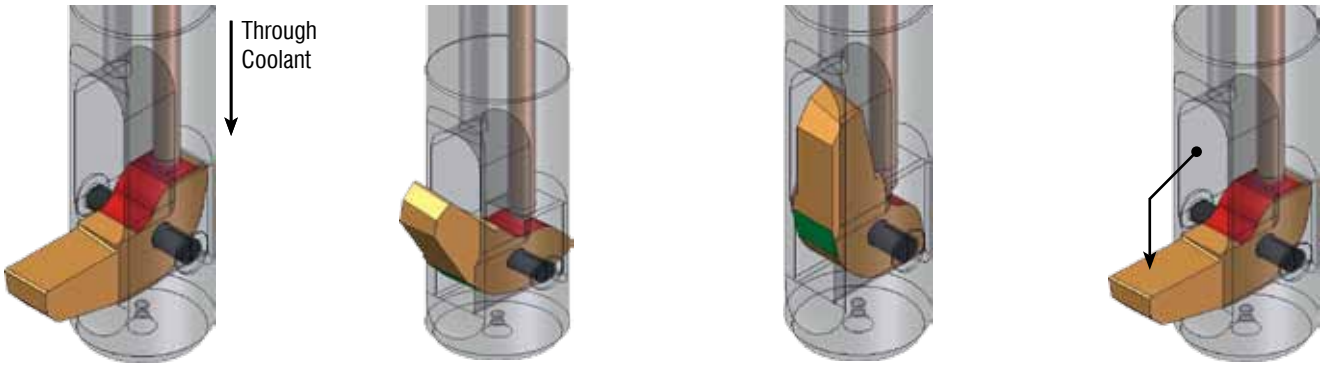
Blade Part Number

Offset
Coating
Material
Series

BSF- M - A - 1A - 6.0

Coating: A = TiAlN Material: 1 = Carbide blade
D = DLC 3 = HSS blade

Blade Working Principle



1 With the coolant on, the control pin is forcing the blade (red color) to retract into the blade housing.

2 The control pin, while still under coolant pressure, supplies pressure to the back of the blade which forces the blade to fully retract.

3 The control pin holds the blade in the retracted position and the tool may be moved in the axial direction (Z-axis) through the hole.

4 Turn off the through coolant and start the spindle rotation at the recommended activation speed. With centrifugal force the blade will swing out into working position. The through coolant may be turned on when the cutting blade is in full contact with the work piece. When the counterbore operation is finished the through coolant is turned off, the insert exits the counterbore. Reactivate the through coolant, the blade will retract again.

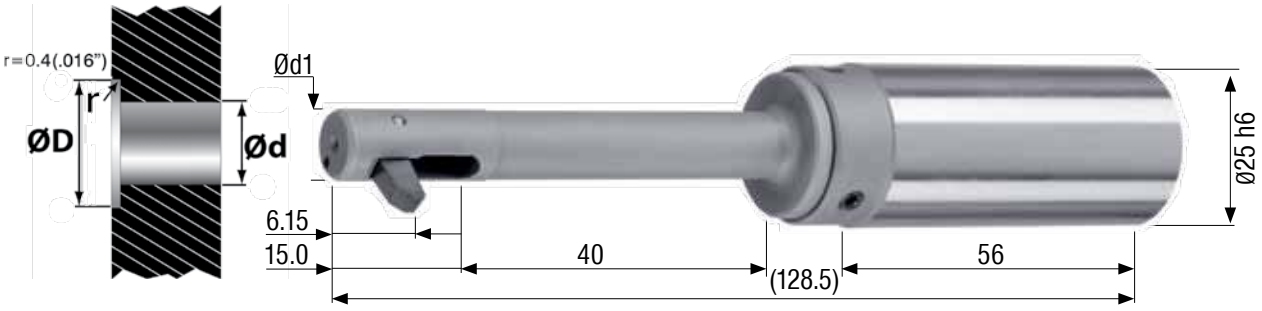
CNC Machine Requirements

BSF Tools require a minimum 280 PSI (approximately 19.3 BAR) and 2000-5000 RPM to properly activate. Typical spotface diameter tolerances of +/-0.1 mm (0.004“). The recommended tool diameters should be 0.004“-0.016“ below the minimum hole diameter. All materials can be machined but special considerations should be given to interruptions and long chipping materials. All tools are ground with large cylindrical shanks with h6 tolerances. Proper tool holding may include hydraulic, mill chuck or precision collet holders.

BSF Series A

Back Spotfacing and Counterboring Tools

For holes **Ø6.5-7.5** .256" - .295"



Minimum Hole Ød		Tool Series A					
		Ød1		C'Bore ØD		Tool Order #	Blade Order #
mm	*inches*	mm	*inches*	mm	*inches*		Carbide, TiAlN*
6.5	*0.256*	**6.4**	*0.252*	**9.50**	*0.374*	**BSF-A-0650/040-6.5**	**BSF-M-A-1A-3.0**
				10.00	*0.394*	**BSF-A-0650/040-7.0**	
				10.50	*0.413*	**BSF-A-0650/040-7.5**	
				11.00	*0.433*	**BSF-A-0650/040-6.5**	**BSF-M-A-1A-4.5**
				11.50	*0.453*	**BSF-A-0650/040-7.0**	
				12.00	*0.472*	**BSF-A-0650/040-7.5**	
				12.50	*0.492*	**BSF-A-0650/040-6.5**	**BSF-M-A-1A-6.0**
				13.00	*0.512*	**BSF-A-0650/040-7.0**	
				13.50	*0.531*	**BSF-A-0650/040-7.5**	
				14.00	*0.551*	**BSF-A-0650/040-6.5**	**BSF-M-A-1A-7.5**
				14.50	*0.571*	**BSF-A-0650/040-7.0**	
				15.00	*0.591*	**BSF-A-0650/040-7.5**	
7.0	*0.276*	**6.9**	*0.272*	**10.50**	*0.413*	**BSF-A-0700/040-7.5**	**BSF-M-A-1A-3.0**
				11.00	*0.433*	**BSF-A-0700/040-8.0**	
				11.50	*0.453*	**BSF-A-0700/040-7.0**	**BSF-M-A-1A-4.5**
				12.00	*0.472*	**BSF-A-0700/040-7.5**	
				12.50	*0.492*	**BSF-A-0700/040-8.0**	
				13.00	*0.512*	**BSF-A-0700/040-7.0**	**BSF-M-A-1A-6.0**
				13.50	*0.531*	**BSF-A-0700/040-7.5**	
				14.00	*0.551*	**BSF-A-0700/040-8.0**	
				14.50	*0.571*	**BSF-A-0700/040-7.0**	**BSF-M-A-1A-7.5**
				15.00	*0.591*	**BSF-A-0700/040-7.5**	
				15.50	*0.610*	**BSF-A-0700/040-8.0**	
				16.00	*0.630*	**BSF-A-0700/040-7.0**	**BSF-M-A-1A-9.0**
				16.50	*0.650*	**BSF-A-0700/040-7.5**	

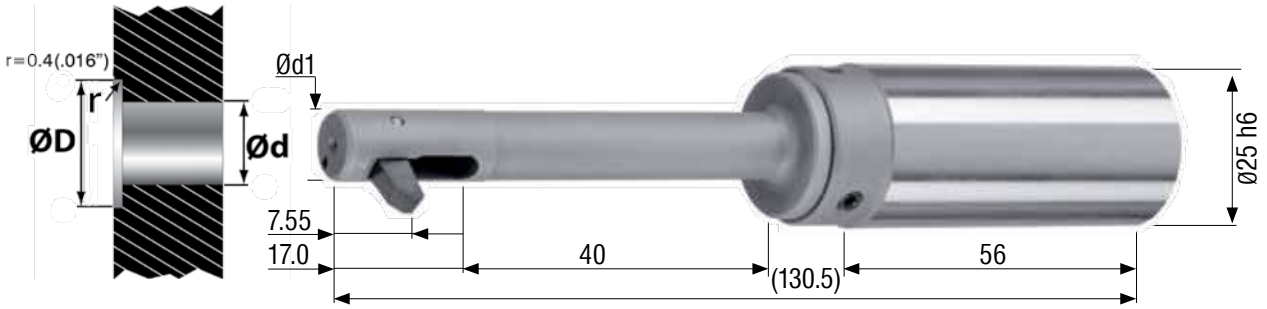
*Other blade options available

Order Instructions:
Refer to page 4 "How to Order" for order instructions and example

Special Application?
Submit the Application Data Sheet on Page 38 to Heule Tool with your application information for our engineering team to review.

Submit to:
info@heuletool.com

SPARE PARTS PG. 31
PROGRAMMING PG. 35



Minimum Hole Ød		Tool Series B				
		Ød1		C'Bore ØD	Tool Order #	Blade Order #
mm	*inches*	mm	*inches*	mm *inches*		Carbide, TiAlN*
7.5	*0.295*	**7.4**	*0.291*	**11.0** *0.433*	**BSF-B-0750/040-7.5**	**BSF-M-B-1A-3.5**
				11.5 *0.453*	**BSF-B-0750/040-8.0**	
				12.0 *0.472*	**BSF-B-0750/040-8.5**	
				12.5 *0.492*	**BSF-B-0750/040-7.5**	**BSF-M-B-1A-5.0**
				13.0 *0.512*	**BSF-B-0750/040-8.0**	
				13.5 *0.531*	**BSF-B-0750/040-8.5**	
				14.0 *0.551*	**BSF-B-0750/040-7.5**	**BSF-M-B-1A-6.5**
				14.5 *0.571*	**BSF-B-0750/040-8.0**	
				15.0 *0.591*	**BSF-B-0750/040-8.5**	
				15.5 *0.610*	**BSF-B-0750/040-7.5**	**BSF-M-B-1A-8.0**
				16.0 *0.630*	**BSF-B-0750/040-8.0**	
				16.5 *0.650*	**BSF-B-0750/040-8.5**	
				17.0 *0.669*	**BSF-B-0750/040-7.5**	**BSF-M-B-1A-9.5**
				17.5 *0.689*	**BSF-B-0750/040-8.0**	
				18.0 *0.709*	**BSF-B-0750/040-8.5**	
8.0	*0.315*	**7.9**	*0.311*	**12.0** *0.472*	**BSF-B-0800/040-8.5**	**BSF-M-B-1A-3.5**
				12.5 *0.492*	**BSF-B-0800/040-9.0**	
				13.0 *0.512*	**BSF-B-0800/040-8.0**	**BSF-M-B-1A-5.0**
				13.5 *0.531*	**BSF-B-0800/040-8.5**	
				14.0 *0.551*	**BSF-B-0800/040-9.0**	
				14.5 *0.571*	**BSF-B-0800/040-8.0**	**BSF-M-B-1A-6.5**
				15.0 *0.591*	**BSF-B-0800/040-8.5**	
				15.5 *0.610*	**BSF-B-0800/040-9.0**	
				16.0 *0.630*	**BSF-B-0800/040-8.0**	**BSF-M-B-1A-8.0**
				16.5 *0.650*	**BSF-B-0800/040-8.5**	
				17.0 *0.669*	**BSF-B-0800/040-9.0**	
				17.5 *0.689*	**BSF-B-0800/040-8.0**	**BSF-M-B-1A-9.5**
				18.0 *0.709*	**BSF-B-0800/040-8.5**	
				18.5 *0.728*	**BSF-B-0800/040-9.0**	

*Other blade options available

continued on next page

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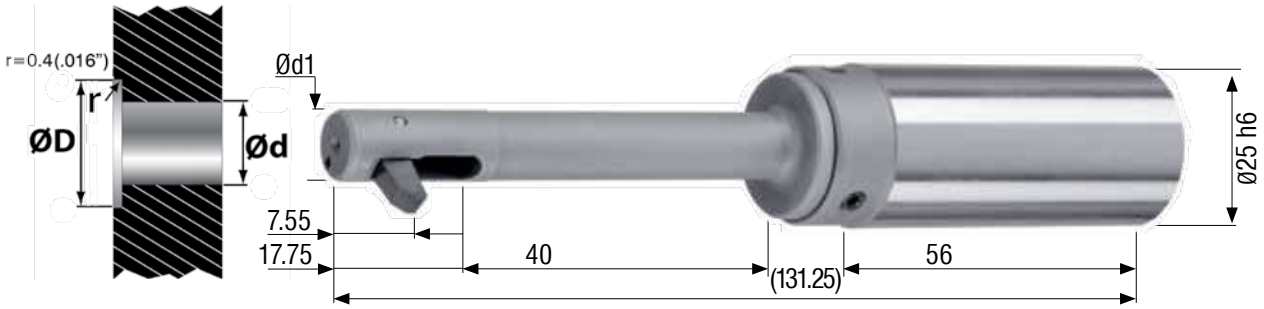

Minimum Hole Ød		Tool Series B			
		Ød1	C'Bore ØD	Tool Order #	Blade Order #
mm	*inches*	mm	*inches*		Carbide, TiAlN*
8.5	*0.335*	**8.4**	*0.331*	**12.5** *0.492*	**BSF-B-0850/040-9.0**	**BSF-M-B-1A-3.5**
				13.0 *0.512*	**BSF-B-0850/040-9.5**	
				13.5 *0.531*	**BSF-B-0850/040-8.5**	**BSF-M-B-1A-5.0**
				14.0 *0.551*	**BSF-B-0850/040-9.0**	
				14.5 *0.571*	**BSF-B-0850/040-9.5**	
				15.0 *0.591*	**BSF-B-0850/040-8.5**	**BSF-M-B-1A-6.5**
				15.5 *0.610*	**BSF-B-0850/040-9.0**	
				16.0 *0.630*	**BSF-B-0850/040-9.5**	
				16.5 *0.650*	**BSF-B-0850/040-8.5**	**BSF-M-B-1A-8.0**
				17.0 *0.669*	**BSF-B-0850/040-9.0**	
				17.5 *0.689*	**BSF-B-0850/040-9.5**	
				18.0 *0.709*	**BSF-B-0850/040-8.5**	**BSF-M-B-1A-9.5**
				18.5 *0.728*	**BSF-B-0850/040-9.0**	
				19.0 *0.748*	**BSF-B-0850/040-9.5**	
				19.5 *0.768*	**BSF-B-0850/040-8.5**	**BSF-M-B-1A-11.0**
				20.0 *0.787*	**BSF-B-0850/040-9.0**	

*Other blade options available

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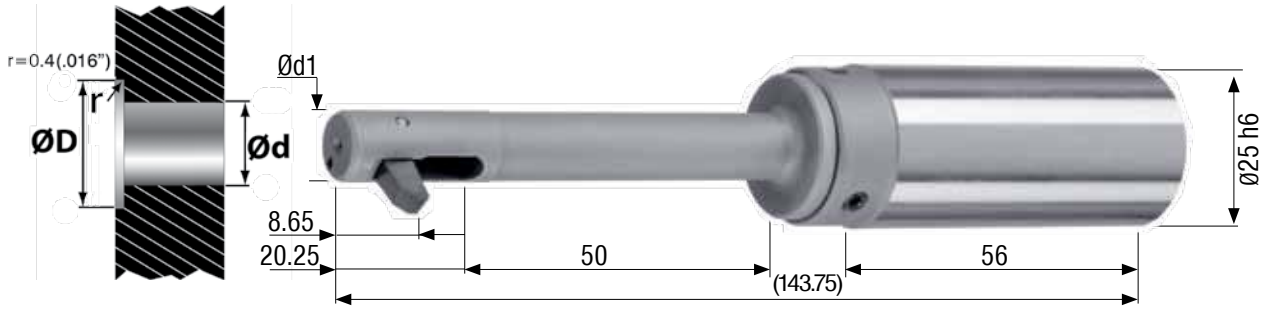
PROGRAMMING PG. 35



Minimum Hole Ød		Tool Series C					
		Ød1		C'Bore ØD		Tool Order #	Blade Order #
mm	*inches*	mm	*inches*	mm	*inches*		Carbide, TiAlN*
9.0	*0.354*	**8.9**	*0.350*	**13.5**	*0.531*	**BSF-C-0900/050-9.5**	**BSF-M-C-1A-4.0**
				14.0	*0.551*	**BSF-C-0900/050-10.0**	
				14.5	*0.571*	**BSF-C-0900/050-10.5**	
				15.0	*0.591*	**BSF-C-0900/050-9.5**	**BSF-M-C-1A-5.5**
				15.5	*0.610*	**BSF-C-0900/050-10.0**	
				16.0	*0.630*	**BSF-C-0900/050-10.5**	
				16.5	*0.650*	**BSF-C-0900/050-9.5**	**BSF-M-C-1A-7.0**
				17.0	*0.669*	**BSF-C-0900/050-10.0**	
				17.5	*0.689*	**BSF-C-0900/050-10.5**	
				18.0	*0.709*	**BSF-C-0900/050-9.5**	**BSF-M-C-1A-8.5**
				18.5	*0.728*	**BSF-C-0900/050-10.0**	
				19.0	*0.748*	**BSF-C-0900/050-10.5**	
				19.5	*0.768*	**BSF-C-0900/050-9.5**	**BSF-M-C-1A-10.0**
				20.0	*0.787*	**BSF-C-0900/050-10.0**	
				20.5	*0.807*	**BSF-C-0900/050-10.5**	
				21.0	*0.827*	**BSF-C-0900/050-9.5**	**BSF-M-C-1A-11.5**
9.5	*0.374*	**9.4**	*0.370*	**14.5**	*0.571*	**BSF-C-0950/050-10.5**	**BSF-M-C-1A-4.0**
				15.0	*0.591*	**BSF-C-0950/050-11.0**	
				15.5	*0.610*	**BSF-C-0950/050-10.0**	**BSF-M-C-1A-5.5**
				16.0	*0.630*	**BSF-C-0950/050-10.5**	
				16.5	*0.650*	**BSF-C-0950/050-11.0**	
				17.0	*0.669*	**BSF-C-0950/050-10.0**	**BSF-M-C-1A-7.0**
				17.5	*0.689*	**BSF-C-0950/050-10.5**	
				18.0	*0.709*	**BSF-C-0950/050-11.0**	
				18.5	*0.728*	**BSF-C-0950/050-10.0**	**BSF-M-C-1A-8.5**
				19.0	*0.748*	**BSF-C-0950/050-10.5**	
				19.5	*0.768*	**BSF-C-0950/050-11.0**	
				20.0	*0.787*	**BSF-C-0950/050-10.0**	**BSF-M-C-1A-10.0**
				20.5	*0.807*	**BSF-C-0950/050-10.5**	
				21.0	*0.827*	**BSF-C-0950/050-11.0**	
				21.5	*0.846*	**BSF-C-0950/050-10.0**	**BSF-M-C-1A-11.5**
				22.0	*0.866*	**BSF-C-0950/050-10.5**	

*Other blade options available

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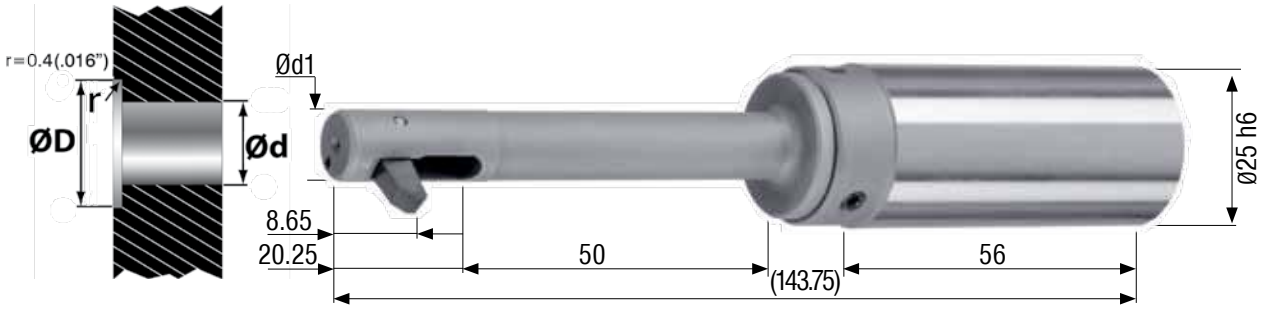
SPARE PARTS PG. 31
PROGRAMMING PG. 35



Minimum Hole Ød		Tool Series C				
		Ød1		C'Bore ØD	Tool Order #	Blade Order #
mm	*inches*	mm	*inches*	mm *inches*		Carbide, TiAlN*
10.0	*0.394*	**9.9**	*0.390*	**15.0** *0.591*	**BSF-C-1000/050-11.0**	**BSF-M-C-1A-4.0**
				15.5 *0.610*	**BSF-C-1000/050-11.5**	
				16.0 *0.630*	**BSF-C-1000/050-10.5**	**BSF-M-C-1A-5.5**
				16.5 *0.650*	**BSF-C-1000/050-11.0**	
				17.0 *0.669*	**BSF-C-1000/050-11.5**	
				17.5 *0.689*	**BSF-C-1000/050-10.5**	**BSF-M-C-1A-7.0**
				18.0 *0.709*	**BSF-C-1000/050-11.0**	
				18.5 *0.728*	**BSF-C-1000/050-11.5**	
				19.0 *0.748*	**BSF-C-1000/050-10.5**	**BSF-M-C-1A-8.5**
				19.5 *0.768*	**BSF-C-1000/050-11.0**	
				20.0 *0.787*	**BSF-C-1000/050-11.5**	
				20.5 *0.807*	**BSF-C-1000/050-10.5**	**BSF-M-C-1A-10.0**
				21.0 *0.827*	**BSF-C-1000/050-11.0**	
				21.5 *0.846*	**BSF-C-1000/050-11.5**	
				22.0 *0.866*	**BSF-C-1000/050-10.5**	**BSF-M-C-1A-11.5**
				22.5 *0.886*	**BSF-C-1000/050-11.0**	
				23.0 *0.906*	**BSF-C-1000/050-11.5**	

*Other blade options available

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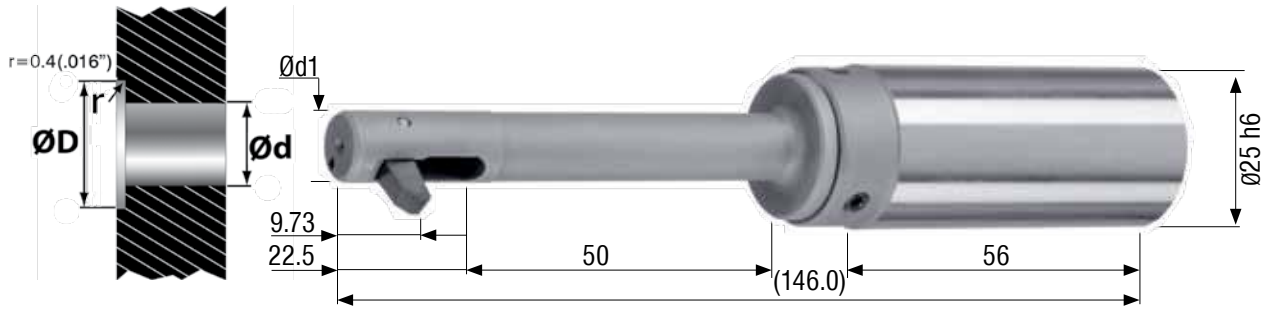
SPARE PARTS PG. 31
PROGRAMMING PG. 35



Minimum Hole Ød		Tool Series D				
		Ød1		C'Bore ØD	Tool Order #	Blade Order #
mm	*inches*	mm	*inches*	mm *inches*		Carbide, TiAlN*
10.5	*0.413*	**10.4**	*0.409*	**16.0** *0.630*	**BSF-D-1050/050-11.5**	**BSF-M-D-1A-4.5**
				16.5 *0.650*	**BSF-D-1050/050-12.0**	
				17.0 *0.669*	**BSF-D-1050/050-12.5**	
				17.5 *0.689*	**BSF-D-1050/050-13.0**	
				18.0 *0.709*	**BSF-D-1050/050-11.0**	**BSF-M-D-1A-7.0**
				18.5 *0.728*	**BSF-D-1050/050-11.5**	
				19.0 *0.748*	**BSF-D-1050/050-12.0**	
				19.5 *0.768*	**BSF-D-1050/050-12.5**	
				20.0 *0.787*	**BSF-D-1050/050-13.0**	
				20.5 *0.807*	**BSF-D-1050/050-11.0**	**BSF-M-D-1A-9.5**
				21.0 *0.827*	**BSF-D-1050/050-11.5**	
				21.5 *0.846*	**BSF-D-1050/050-12.0**	
				22.0 *0.866*	**BSF-D-1050/050-12.5**	
				22.5 *0.886*	**BSF-D-1050/050-13.0**	
				23.0 *0.906*	**BSF-D-1050/050-11.0**	**BSF-M-D-1A-12.0**
				23.5 *0.925*	**BSF-D-1050/050-11.5**	
				24.0 *0.945*	**BSF-D-1050/050-12.0**	
				24.5 *0.965*	**BSF-D-1050/050-12.5**	
				25.0 *0.984*	**BSF-D-1100/050-13.0**	
				25.5 *1.004*	**BSF-D-1100/050-13.5**	

*Other blade options available

continued on next page

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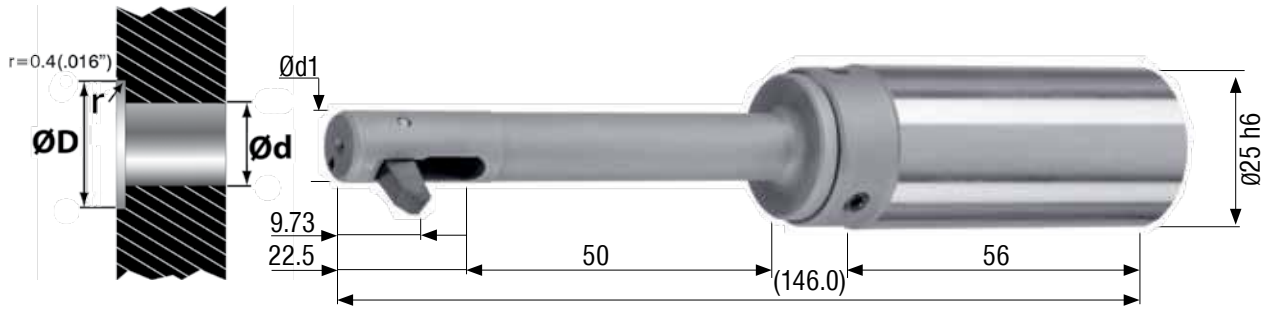
PROGRAMMING PG. 35



Minimum Hole Ød		Tool Series D				
		Ød1		C'Bore ØD	Tool Order #	Blade Order #
mm	*inches*	mm	*inches*	mm *inches*		Carbide, TiAlN*
11.0	*0.433*	**10.9**	*0.429*	**16.5** *0.650*	**BSF-D-1100/050-12.0**	**BSF-M-D-1A-4.5**
				17.0 *0.669*	**BSF-D-1100/050-12.5**	
				17.5 *0.689*	**BSF-D-1100/050-13.0**	
				18.0 *0.709*	**BSF-D-1100/050-13.5**	
				18.5 *0.728*	**BSF-D-1100/050-11.5**	**BSF-M-D-1A-7.0**
				19.0 *0.748*	**BSF-D-1100/050-12.0**	
				19.5 *0.768*	**BSF-D-1100/050-12.5**	
				20.0 *0.787*	**BSF-D-1100/050-13.0**	
				20.5 *0.807*	**BSF-D-1100/050-13.5**	
				21.0 *0.827*	**BSF-D-1100/050-11.5**	**BSF-M-D-1A-9.5**
				21.5 *0.846*	**BSF-D-1100/050-12.0**	
				22.0 *0.866*	**BSF-D-1100/050-12.5**	
				22.5 *0.886*	**BSF-D-1100/050-13.0**	
				23.0 *0.906*	**BSF-D-1100/050-13.5**	
				23.5 *0.925*	**BSF-D-1100/050-11.5**	**BSF-M-D-1A-12.0**
				24.0 *0.945*	**BSF-D-1100/050-12.0**	
				24.5 *0.965*	**BSF-D-1100/050-12.5**	
				25.0 0.984	**BSF-D-1100/050-13.0**	
				25.5 1.004	**BSF-D-1100/050-13.5**	

*Other blade options available

continued on next page

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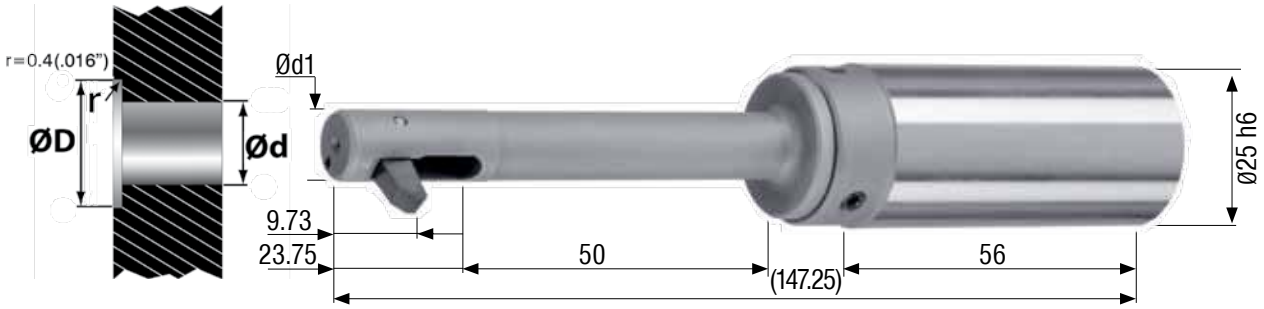

Minimum Hole Ød		Tool Series D					
		Ød1		C'Bore ØD		Tool Order #	Blade Order #
mm	*inches*	mm	*inches*	mm	*inches*		Carbide, TiAlN*
11.5	*0.453*	**11.4**	0.449	**17.5**	*0.689*	**BSF-D-1150/050-13.0**	**BSF-M-D-1A-4.5**
				18.0	*0.709*	**BSF-D-1150/050-13.5**	
				18.5	*0.728*	**BSF-D-1150/050-14.0**	
				19.0	*0.748*	**BSF-D-1150/050-12.0**	**BSF-M-D-1A-7.0**
				19.5	*0.768*	**BSF-D-1150/050-12.5**	
				20.0	*0.787*	**BSF-D-1150/050-13.0**	
				20.5	*0.807*	**BSF-D-1150/050-13.5**	
				21.0	*0.827*	**BSF-D-1150/050-14.0**	
				21.5	*0.846*	**BSF-D-1150/050-12.0**	**BSF-M-D-1A-9.5**
				22.0	*0.866*	**BSF-D-1150/050-12.5**	
				22.5	*0.886*	**BSF-D-1150/050-13.0**	
				23.0	*0.906*	**BSF-D-1150/050-13.5**	
				23.5	*0.925*	**BSF-D-1150/050-14.0**	
				24.0	*0.945*	**BSF-D-1150/050-12.0**	**BSF-M-D-1A-12.0**
				24.5	*0.965*	**BSF-D-1150/050-12.5**	
				25.0	*0.984*	**BSF-D-1150/050-13.0**	
				25.5	*1.004*	**BSF-D-1150/050-13.5**	
				26.0	*1.024*	**BSF-D-1150/050-14.0**	
				26.5	*1.043*	**BSF-D-1150/050-12.0**	**BSF-M-D-1A-14.5**

*Other blade options available

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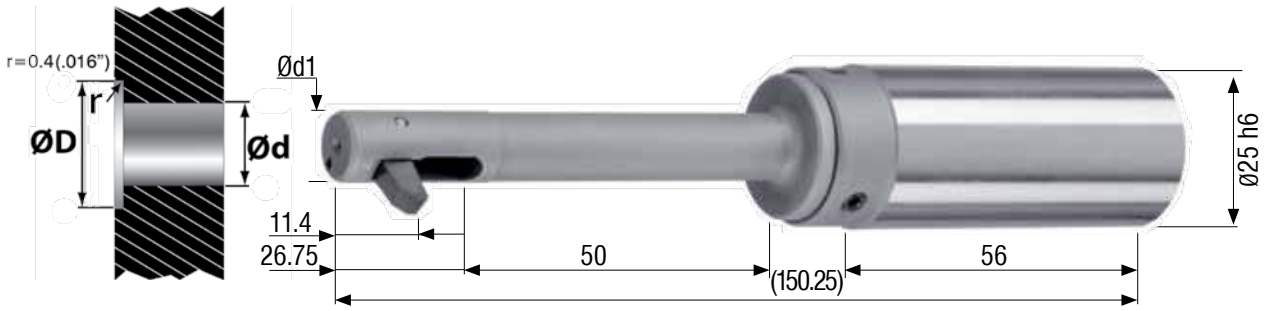
PROGRAMMING PG. 35



Minimum Hole Ø		Tool Series E			
		Ød1		C'Bore	Tool Order #	Blade Order #
mm	*inches*	mm	*inches*	mm *inches*		Carbide, TiAlN*
12.0	*0.472*	**11.9**	*0.469*	**18.0** *0.709*	**BSF-E-1200/050-13.0**	**BSF-M-E-1A-5.0**
				18.5 *0.728*	**BSF-E-1200/050-13.5**	
				19.0 *0.748*	**BSF-E-1200/050-14.0**	
				19.5 *0.768*	**BSF-E-1200/050-14.5**	
				20.0 *0.787*	**BSF-E-1200/050-15.0**	
				20.5 *0.807*	**BSF-E-1200/050-13.0**	**BSF-M-E-1A-7.5**
				21.0 *0.827*	**BSF-E-1200/050-13.5**	
				21.5 *0.846*	**BSF-E-1200/050-14.0**	
				22.0 *0.866*	**BSF-E-1200/050-14.5**	
				22.5 *0.886*	**BSF-E-1200/050-15.0**	
				23.0 *0.906*	**BSF-E-1200/050-13.0**	**BSF-M-E-1A-10.0**
				23.5 *0.925*	**BSF-E-1200/050-13.5**	
				24.0 *0.945*	**BSF-E-1200/050-14.0**	
				24.5 *0.965*	**BSF-E-1200/050-14.5**	
				25.0 *0.984*	**BSF-E-1200/050-15.0**	
				25.5 *1.004*	**BSF-E-1200/050-13.0**	**BSF-M-E-1A-12.5**
				26.0 *1.024*	**BSF-E-1200/050-13.5**	
				26.5 *1.043*	**BSF-E-1200/050-14.0**	
				27.0 *1.063*	**BSF-E-1200/050-14.5**	
				27.5 *1.083*	**BSF-E-1200/050-15.0**	
				28.0 *1.102*	**BSF-E-1200/050-13.0**	**BSF-M-E-1A-15.0**

*Other blade options available

continued on next page

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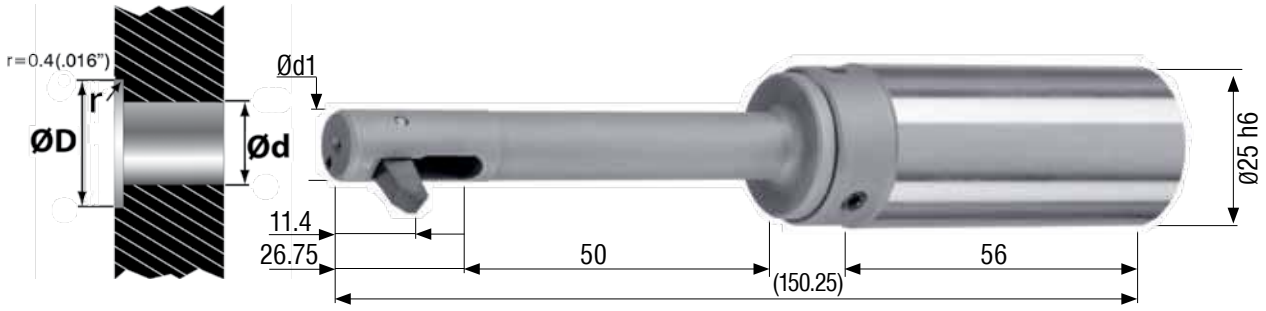
PROGRAMMING PG. 35



Minimum Hole Ød		Tool Series E			
	Ød1	C'Bore ØD		Tool Order #	Blade Order #
mm *inches*	mm *inches*	mm *inches*			Carbide, TiAlN*
12.5 *0.492*	**12.4** *0.488*	**19.0** *0.748*		**BSF-E-1250/050-14.0**	**BSF-M-E-1A-5.0**
		19.5 *0.768*		**BSF-E-1250/050-14.5**	
		20.0 *0.787*		**BSF-E-1250/050-15.0**	
		20.5 *0.807*		**BSF-E-1250/050-15.5**	
		21.0 *0.827*		**BSF-E-1250/050-13.5**	**BSF-M-E-1A-7.5**
		21.5 *0.846*		**BSF-E-1250/050-14.0**	
		22.0 *0.866*		**BSF-E-1250/050-14.5**	
		22.5 *0.886*		**BSF-E-1250/050-15.0**	
		23.0 *0.906*		**BSF-E-1250/050-15.5**	
		23.5 *0.925*		**BSF-E-1250/050-13.5**	**BSF-M-E-1A-10.0**
		24.0 *0.945*		**BSF-E-1250/050-14.0**	
		24.5 *0.965*		**BSF-E-1250/050-14.5**	
		25.0 *0.984*		**BSF-E-1250/050-15.0**	
		25.5 *1.004*		**BSF-E-1250/050-15.5**	
		26.0 *1.024*		**BSF-E-1250/050-13.5**	**BSF-M-E-1A-12.5**
		26.5 *1.043*		**BSF-E-1250/050-14.0**	
		27.0 *1.063*		**BSF-E-1250/050-14.5**	
		27.5 *1.083*		**BSF-E-1250/050-15.0**	
		28.0 *1.102*		**BSF-E-1250/050-15.5**	
		28.5 *1.122*		**BSF-E-1250/050-13.5**	**BSF-M-E-1A-15.0**
		29.0 *1.142*		**BSF-E-1250/050-14.0**	

*Other blade options available

continued on next page

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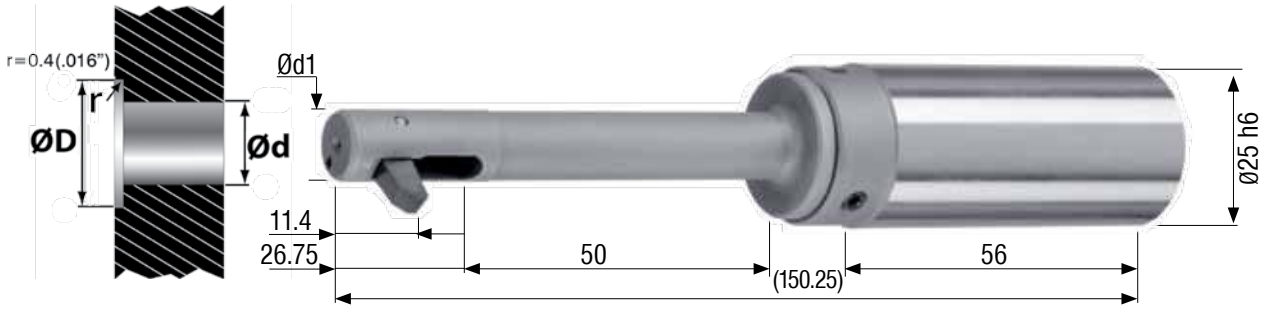

Minimum Hole Ød		Tool Series E			
		Ød1		C'Bore ØD	Tool Order #	Blade Order #
mm	*inches*	mm	*inches*	mm *inches*		Carbide, TiAlN*
13.0	*0.512*	12.9	*0.508*	19.5 *0.768*	BSF-E-1300/050-14.5	BSF-M-E-1A-5.0
				20.0 *0.787*	BSF-E-1300/050-15.0	
				20.5 *0.807*	BSF-E-1300/050-15.5	
				21.0 *0.827*	BSF-E-1300/050-16.0	
				21.5 *0.846*	BSF-E-1300/050-14.0	BSF-M-E-1A-7.5
				22.0 *0.866*	BSF-E-1300/050-14.5	
				22.5 *0.886*	BSF-E-1300/050-15.0	
				23.0 *0.906*	BSF-E-1300/050-15.5	
				23.5 *0.925*	BSF-E-1300/050-16.0	
				24.0 *0.945*	BSF-E-1300/050-14.0	BSF-M-E-1A-10.0
				24.5 *0.965*	BSF-E-1300/050-14.5	
				25.0 *0.984*	BSF-E-1300/050-15.0	
				25.5 *1.004*	BSF-E-1300/050-15.5	
				26.0 *1.024*	BSF-E-1300/050-16.0	
				26.5 *1.043*	BSF-E-1300/050-14.0	BSF-M-E-1A-12.5
				27.0 *1.063*	BSF-E-1300/050-14.5	
				27.5 *1.083*	BSF-E-1300/050-15.0	
				28.0 *1.102*	BSF-E-1300/050-15.5	
				28.5 *1.122*	BSF-E-1300/050-16.0	
				29.0 *1.142*	BSF-E-1300/050-14.0	BSF-M-E-1A-15.0
				29.5 *1.161*	BSF-E-1300/050-14.5	
				30.0 *1.181*	BSF-E-1300/050-15.0	

*Other blade options available

continued on next page

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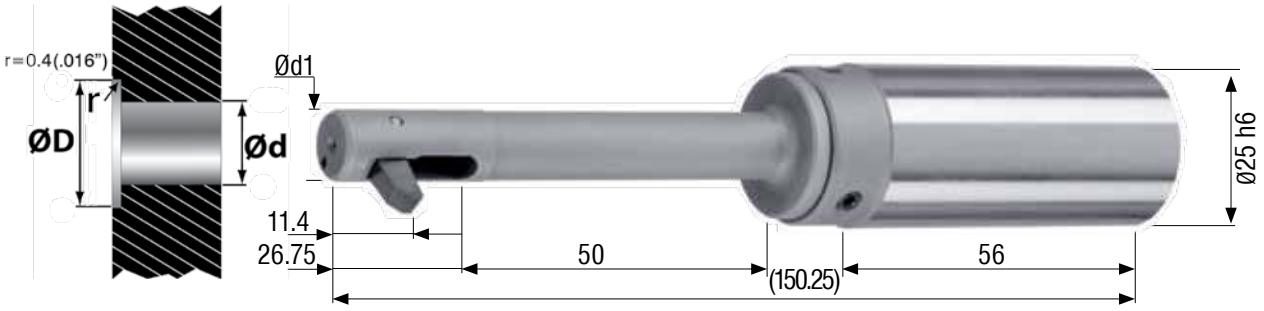

Minimum Hole Ød		Tool Series E			
		Ød1		C'Bore ØD	Tool Order #	Blade Order #
mm *inches*		mm *inches*		mm *inches*		Carbide, TiAlN*
13.5 *0.531*		**13.4** *0.528*		**20.5** *0.807*	**BSF-E-1350/050-15.5**	**BSF-M-E-1A-5.0**
				21.0 *0.827*	**BSF-E-1350/050-16.0**	
				21.5 *0.846*	**BSF-E-1350/050-16.5**	
				22.0 *0.866*	**BSF-E-1350/050-14.5**	**BSF-M-E-1A-7.5**
				22.5 *0.886*	**BSF-E-1350/050-15.0**	
				23.0 *0.906*	**BSF-E-1350/050-15.5**	
				23.5 *0.925*	**BSF-E-1350/050-16.0**	
				24.0 *0.945*	**BSF-E-1350/050-16.5**	
				24.5 *0.965*	**BSF-E-1350/050-14.5**	**BSF-M-E-1A-10.0**
				25.0 *0.984*	**BSF-E-1350/050-15.0**	
				25.5 *1.004*	**BSF-E-1350/050-15.5**	
				26.0 *1.024*	**BSF-E-1350/050-16.0**	
				26.5 *1.043*	**BSF-E-1350/050-16.5**	
				27.0 *1.063*	**BSF-E-1350/050-14.5**	**BSF-M-E-1A-12.5**
				27.5 *1.083*	**BSF-E-1350/050-15.0**	
				28.0 *1.102*	**BSF-E-1350/050-15.5**	
				28.5 *1.122*	**BSF-E-1350/050-16.0**	
				29.0 *1.142*	**BSF-E-1350/050-16.5**	
				29.5 *1.161*	**BSF-E-1350/050-14.5**	**BSF-M-E-1A-15.0**
				30.0 *1.181*	**BSF-E-1350/050-15.0**	
				30.5 *1.201*	**BSF-E-1350/050-15.5**	
				31.0 *1.220*	**BSF-E-1350/050-16.0**	
				31.5 *1.240*	**BSF-E-1350/050-16.5**	

*Other blade options available

continued on next page

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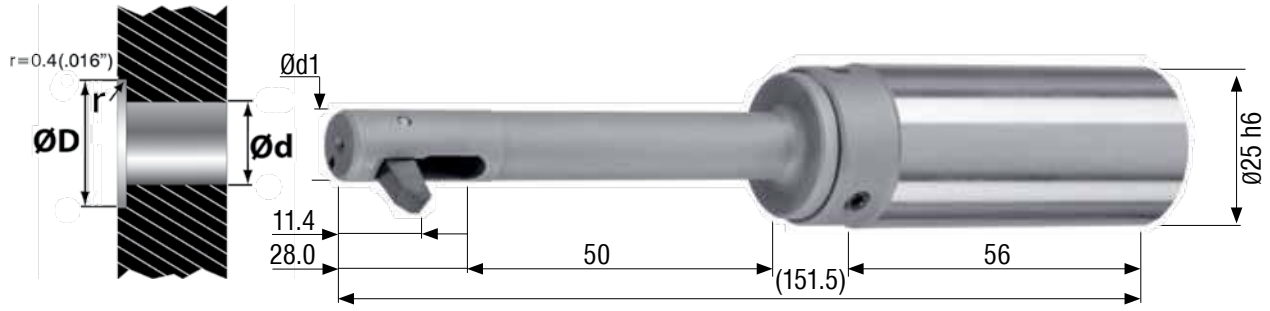

Minimum Hole Ød		Tool Series E			
		Ød1	C'Bore ØD	Tool Order #	Blade Order #
mm *inches*		mm *inches*	mm *inches*		Carbide, TiAlN*
14.0 *0.551*		**13.9** *0.547*	**21.0** *0.827*	**BSF-E-1400/050-16.0**	**BSF-M-E-1A-5.0**
			21.5 *0.846*	**BSF-E-1400/050-16.5**	
			22.0 *0.866*	**BSF-E-1400/050-17.0**	
			22.5 *0.886*	**BSF-E-1400/050-15.0**	**BSF-M-E-1A-7.5**
			23.0 *0.906*	**BSF-E-1400/050-15.5**	
			23.5 *0.925*	**BSF-E-1400/050-16.0**	
			24.0 *0.945*	**BSF-E-1400/050-16.5**	
			24.5 *0.965*	**BSF-E-1400/050-17.0**	
			25.0 *0.984*	**BSF-E-1400/050-15.0**	**BSF-M-E-1A-10.0**
			25.5 *1.004*	**BSF-E-1400/050-15.5**	
			26.0 *1.024*	**BSF-E-1400/050-16.0**	
			26.5 *1.043*	**BSF-E-1400/050-16.5**	
			27.0 *1.063*	**BSF-E-1400/050-17.0**	
			27.5 *1.083*	**BSF-E-1400/050-15.0**	**BSF-M-E-1A-12.5**
			28.0 *1.102*	**BSF-E-1400/050-15.5**	
			28.5 *1.122*	**BSF-E-1400/050-16.0**	
			29.0 *1.142*	**BSF-E-1400/050-16.5**	
			29.5 *1.161*	**BSF-E-1400/050-17.0**	
			30.0 *1.181*	**BSF-E-1400/050-15.0**	**BSF-M-E-1A-15.0**
			30.5 *1.201*	**BSF-E-1400/050-15.5**	
			31.0 *1.220*	**BSF-E-1400/050-16.0**	
			31.5 *1.240*	**BSF-E-1400/050-16.5**	
			32.0 *1.260*	**BSF-E-1400/050-17.0**	
			32.5 *1.280*	**BSF-E-1400/050-15.0**	**BSF-M-E-1A-17.5**

*Other blade options available

Order Instructions:
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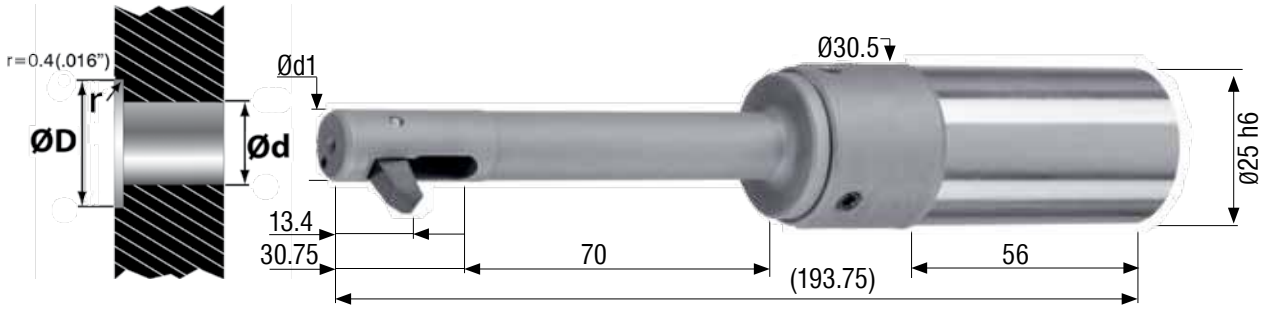
SPARE PARTS PG. 31
PROGRAMMING PG. 35



Minimum Hole Ød		Tool Series F			
		Ød1		C'Bore ØD		Tool Order #	Blade Order #
mm	*inches*	mm	*inches*	mm	*inches*		Carbide, TiAlN*
14.5	*0.571*	**14.4**	*0.567*	**22.0**	*0.866*	**BSF-F-1450/070-16.5**	**BSF-M-F-1A-5.5**
				22.5	*0.886*	**BSF-F-1450/070-17.0**	
				23.0	*0.906*	**BSF-F-1450/070-17.5**	
				23.5	*0.925*	**BSF-F-1450/070-18.0**	
				24.0	*0.945*	**BSF-F-1450/070-18.5**	
				24.5	*0.965*	**BSF-F-1450/070-19.0**	
				25.0	*0.984*	**BSF-F-1450/070-16.0**	**BSF-M-F-1A-9.0**
				25.5	*1.004*	**BSF-F-1450/070-16.5**	
				26.0	*1.024*	**BSF-F-1450/070-17.0**	
				26.5	*1.043*	**BSF-F-1450/070-17.5**	
				27.0	*1.063*	**BSF-F-1450/070-18.0**	
				27.5	*1.083*	**BSF-F-1450/070-18.5**	
				28.0	*1.102*	**BSF-F-1450/070-19.0**	
				28.5	*1.122*	**BSF-F-1450/070-16.0**	**BSF-M-F-1A-12.5**
				29.0	*1.142*	**BSF-F-1450/070-16.5**	
				29.5	*1.161*	**BSF-F-1450/070-17.0**	
				30.0	*1.181*	**BSF-F-1450/070-17.5**	
				30.5	*1.201*	**BSF-F-1450/070-18.0**	
				31.0	*1.220*	**BSF-F-1450/070-18.5**	
				31.5	*1.240*	**BSF-F-1450/070-19.0**	
				32.0	*1.260*	**BSF-F-1450/070-16.0**	**BSF-M-F-1A-16.0**
				32.5	*1.280*	**BSF-F-1450/070-16.5**	
				33.0	*1.299*	**BSF-F-1450/070-17.0**	
				33.5	*1.319*	**BSF-F-1450/070-17.5**	

*Other blade options available

continued on next page

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SPARE PARTS PG. 31
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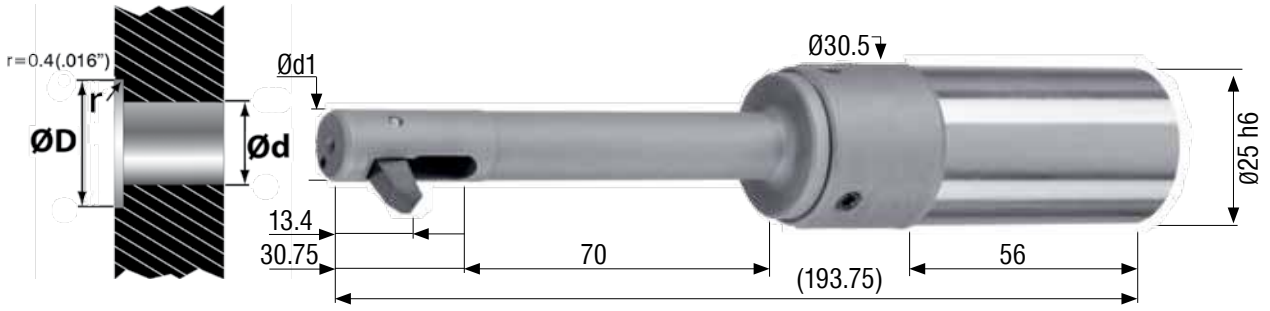

Minimum Hole Ød		Tool Series F			
		Ød1		C'Bore ØD	Tool Order #	Blade Order #
mm	*inches*	mm	*inches*	mm *inches*		Carbide, TiAlN*
15.0	*0.591*	**14.9**	*0.587*	**22.5** *0.886*	**BSF-F-1500/070-17.0**	**BSF-M-F-1A-5.5**
				23.0 *0.906*	**BSF-F-1500/070-17.5**	
				23.5 *0.925*	**BSF-F-1500/070-18.0**	
				24.0 *0.945*	**BSF-F-1500/070-18.5**	
				24.5 *0.965*	**BSF-F-1500/070-19.0**	
				25.0 *0.984*	**BSF-F-1500/070-19.5**	
				25.5 *1.004*	**BSF-F-1500/070-16.5**	**BSF-M-F-1A-9.0**
				26.0 *1.024*	**BSF-F-1500/070-17.0**	
				26.5 *1.043*	**BSF-F-1500/070-17.5**	
				27.0 *1.063*	**BSF-F-1500/070-18.0**	
				27.5 *1.083*	**BSF-F-1500/070-18.5**	
				28.0 *1.102*	**BSF-F-1500/070-19.0**	
				28.5 *1.122*	**BSF-F-1500/070-19.5**	
				29.0 *1.142*	**BSF-F-1500/070-16.5**	**BSF-M-F-1A-12.5**
				29.5 *1.161*	**BSF-F-1500/070-17.0**	
				30.0 *1.181*	**BSF-F-1500/070-17.5**	
				30.5 *1.201*	**BSF-F-1500/070-18.0**	
				31.0 *1.220*	**BSF-F-1500/070-18.5**	
				31.5 *1.240*	**BSF-F-1500/070-19.0**	
				32.0 *1.260*	**BSF-F-1500/070-19.5**	
				32.5 *1.280*	**BSF-F-1500/070-16.5**	**BSF-M-F-1A-16.0**
				33.0 *1.299*	**BSF-F-1500/070-17.0**	
				33.5 *1.319*	**BSF-F-1500/070-17.5**	
				34.0 *1.339*	**BSF-F-1500/070-18.0**	
				34.5 *1.358*	**BSF-F-1500/070-18.5**	

*Other blade options available

continued on next page

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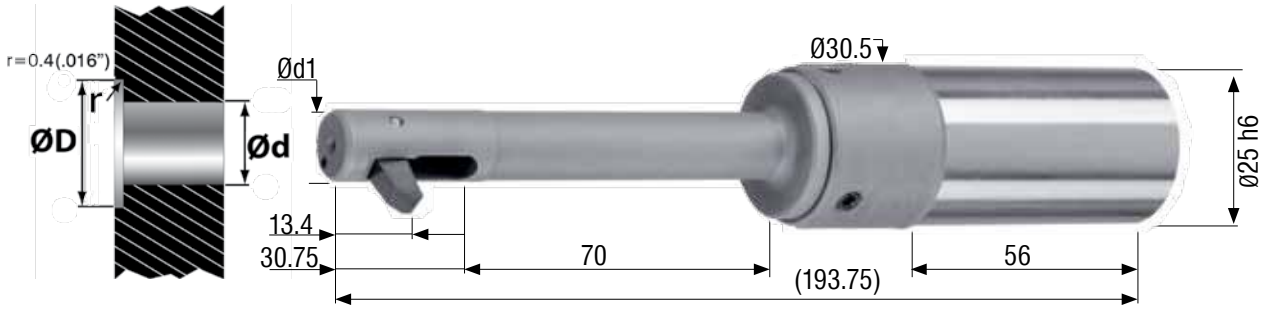
SPARE PARTS PG. 31
PROGRAMMING PG. 35



Minimum Hole Ød		Tool Series F			
		Ød1		C'Bore ØD	Tool Order #	Blade Order #
mm	*inches*	mm	*inches*	mm *inches*		Carbide, TiAlN*
15.5	*0.610*	15.4	*0.606*	23.5 *0.925*	BSF-F-1550/070-18.0	BSF-M-F-1A-5.5
				24.0 *0.945*	BSF-F-1550/070-18.5	
				24.5 *0.965*	BSF-F-1550/070-19.0	
				25.0 *0.984*	BSF-F-1550/070-19.5	
				25.5 *1.004*	BSF-F-1550/070-20.0	
				26.0 *1.024*	BSF-F-1550/070-17.0	BSF-M-F-1A-9.0
				26.5 *1.043*	BSF-F-1550/070-17.5	
				27.0 *1.063*	BSF-F-1550/070-18.0	
				27.5 *1.083*	BSF-F-1550/070-18.5	
				28.0 *1.102*	BSF-F-1550/070-19.0	
				28.5 *1.122*	BSF-F-1550/070-19.5	
				29.0 *1.142*	BSF-F-1550/070-20.0	
				29.5 *1.161*	BSF-F-1550/070-17.0	BSF-M-F-1A-12.5
				30.0 *1.181*	BSF-F-1550/070-17.5	
				30.5 *1.201*	BSF-F-1550/070-18.0	
				31.0 *1.220*	BSF-F-1550/070-18.5	
				31.5 *1.240*	BSF-F-1550/070-19.0	
				32.0 *1.260*	BSF-F-1550/070-19.5	
				32.5 *1.280*	BSF-F-1550/070-20.0	
				33.0 *1.299*	BSF-F-1550/070-17.0	BSF-M-F-1A-16.0
				33.5 *1.319*	BSF-F-1550/070-17.5	
				34.0 *1.339*	BSF-F-1550/070-18.0	
				34.5 *1.358*	BSF-F-1550/070-18.5	
				35.0 *1.378*	BSF-F-1550/070-19.0	
				35.5 *1.398*	BSF-F-1550/070-19.5	
				36.0 *1.417*	BSF-F-1550/070-20.0	

*Other blade options available

continued on next page

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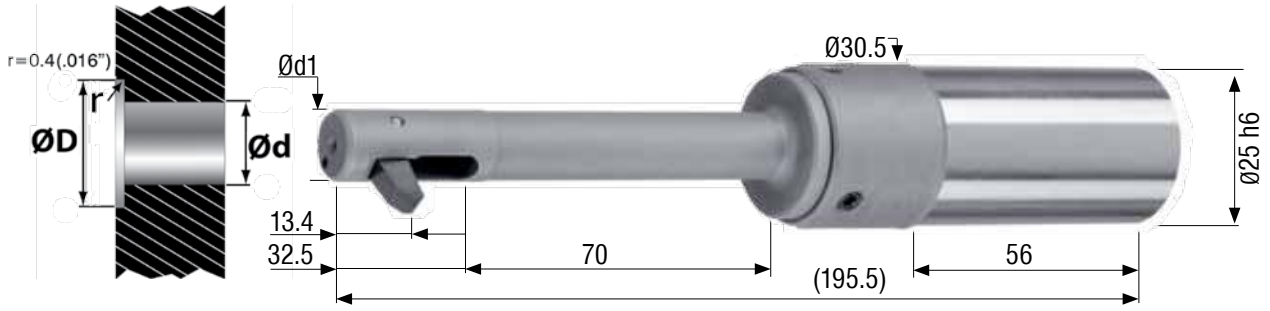

Minimum Hole Ød		Tool Series F			
		Ød1		C'Bore ØD	Tool Order #	Blade Order #
mm	*inches*	mm	*inches*	mm *inches*		Carbide, TiAlN*
16.0	*0.630*	15.9	*0.626*	**24.0** *0.945*	**BSF-F-1600/070-18.5**	**BSF-M-F-1A-5.5**
				24.5 *0.965*	**BSF-F-1600/070-19.0**	
				25.0 *0.984*	**BSF-F-1600/070-19.5**	
				25.5 *1.004*	**BSF-F-1600/070-20.0**	
				26.0 *1.024*	**BSF-F-1600/070-20.5**	
				26.5 *1.043*	**BSF-F-1600/070-17.5**	**BSF-M-F-1A-9.0**
				27.0 *1.063*	**BSF-F-1600/070-18.0**	
				27.5 *1.083*	**BSF-F-1600/070-18.5**	
				28.0 *1.102*	**BSF-F-1600/070-19.0**	
				28.5 *1.122*	**BSF-F-1600/070-19.5**	
				29.0 *1.142*	**BSF-F-1600/070-20.0**	
				29.5 *1.161*	**BSF-F-1600/070-20.5**	
				30.0 *1.181*	**BSF-F-1600/070-17.5**	**BSF-M-F-1A-12.5**
				30.5 *1.201*	**BSF-F-1600/070-18.0**	
				31.0 *1.220*	**BSF-F-1600/070-18.5**	
				31.5 *1.240*	**BSF-F-1600/070-19.0**	
				32.0 *1.260*	**BSF-F-1600/070-19.5**	
				32.5 *1.280*	**BSF-F-1600/070-20.0**	
				33.0 *1.299*	**BSF-F-1600/070-20.5**	
				33.5 *1.319*	**BSF-F-1600/070-17.5**	**BSF-M-F-1A-16.0**
				34.0 *1.339*	**BSF-F-1600/070-18.0**	
				34.5 *1.358*	**BSF-F-1600/070-18.5**	
				35.0 *1.378*	**BSF-F-1600/070-19.0**	
				35.5 *1.398*	**BSF-F-1600/070-19.5**	
				36.0 *1.417*	**BSF-F-1600/070-20.0**	
				36.5 *1.437*	**BSF-F-1600/070-20.5**	

*Other blade options available

continued on next page

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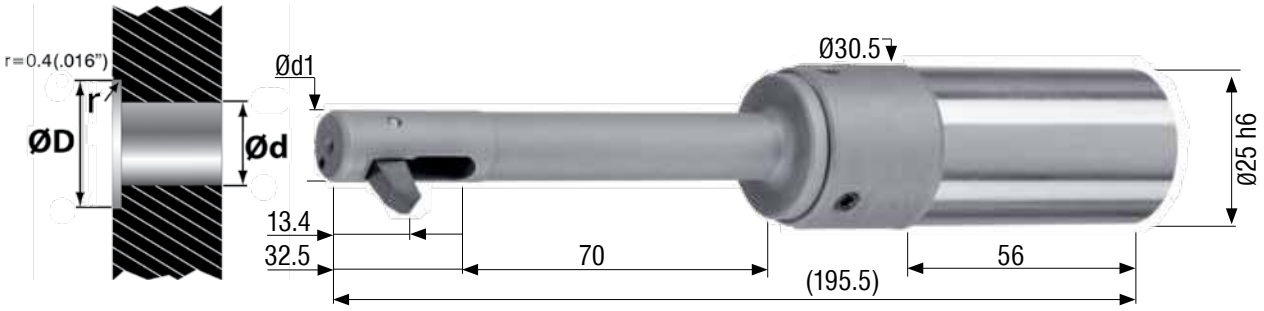

Minimum Hole Ød		Tool Series F			
	Ød1	C'Bore ØD		Tool Order #	Blade Order #
mm *inches*	mm *inches*	mm *inches*			Carbide, TiAlN*
16.5 *0.650*	**16.4** *0.646*	**25.0** *0.984*		**BSF-F-1650/070-19.5**	**BSF-M-F-1A-5.5**
		25.5 *1.004*		**BSF-F-1650/070-20.0**	
		26.0 *1.024*		**BSF-F-1650/070-20.5**	
		26.5 *1.043*		**BSF-F-1650/070-21.0**	
		27.0 *1.063*		**BSF-F-1650/070-18.0**	**BSF-M-F-1A-9.0**
		27.5 *1.083*		**BSF-F-1650/070-18.5**	
		28.0 *1.102*		**BSF-F-1650/070-19.0**	
		28.5 *1.122*		**BSF-F-1650/070-19.5**	
		29.0 *1.142*		**BSF-F-1650/070-20.0**	
		29.5 *1.161*		**BSF-F-1650/070-20.5**	
		30.0 *1.181*		**BSF-F-1650/070-21.0**	
		30.5 *1.201*		**BSF-F-1650/070-18.0**	**BSF-M-F-1A-12.5**
		31.0 *1.220*		**BSF-F-1650/070-18.5**	
		31.5 *1.240*		**BSF-F-1650/070-19.0**	
		32.0 *1.260*		**BSF-F-1650/070-19.5**	
		32.5 *1.280*		**BSF-F-1650/070-20.0**	
		33.0 *1.299*		**BSF-F-1650/070-20.5**	
		33.5 *1.319*		**BSF-F-1650/070-21.0**	
		34.0 *1.339*		**BSF-F-1650/070-18.0**	**BSF-M-F-1A-16.0**
		34.5 *1.358*		**BSF-F-1650/070-18.5**	
		35.0 *1.378*		**BSF-F-1650/070-19.0**	
		35.5 *1.398*		**BSF-F-1650/070-19.5**	
		36.0 *1.417*		**BSF-F-1650/070-20.0**	
		36.5 *1.437*		**BSF-F-1650/070-20.5**	
		37.0 *1.457*		**BSF-F-1650/070-21.0**	
		37.5 *1.476*		**BSF-F-1650/070-18.0**	**BSF-M-F-1A-19.5**
		38.0 *1.496*		**BSF-F-1650/070-18.5**	

*Other blade options available

continued on next page

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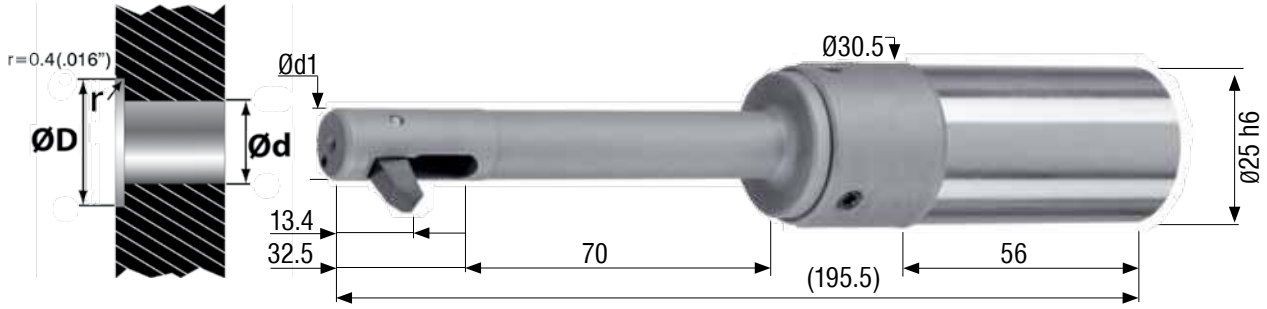

Minimum Hole Ød		Tool Series F			
		Ød1		C'Bore ØD	Tool Order #	Blade Order #
mm	*inches*	mm	*inches*	mm *inches*		Carbide, TiAlN*
17.0	*0.669*	**16.9**	*0.665*	**25.5** *1.004*	**BSF-F-1700/070-20.0**	**BSF-M-F-1A-5.5**
				26.0 *1.024*	**BSF-F-1700/070-20.5**	
				26.5 *1.043*	**BSF-F-1700/070-21.0**	
				27.0 *1.063*	**BSF-F-1700/070-21.5**	
				27.5 *1.083*	**BSF-F-1700/070-18.5**	**BSF-M-F-1A-9.0**
				28.0 *1.102*	**BSF-F-1700/070-19.0**	
				28.5 *1.122*	**BSF-F-1700/070-19.5**	
				29.0 *1.142*	**BSF-F-1700/070-20.0**	
				29.5 *1.161*	**BSF-F-1700/070-20.5**	
				30.0 *1.181*	**BSF-F-1700/070-21.0**	
				30.5 *1.201*	**BSF-F-1700/070-21.5**	
				31.0 *1.220*	**BSF-F-1700/070-18.5**	**BSF-M-F-1A-12.5**
				31.5 *1.240*	**BSF-F-1700/070-19.0**	
				32.0 *1.260*	**BSF-F-1700/070-19.5**	
				32.5 *1.280*	**BSF-F-1700/070-20.0**	
				33.0 *1.299*	**BSF-F-1700/070-20.5**	
				33.5 *1.319*	**BSF-F-1700/070-21.0**	
				34.0 *1.339*	**BSF-F-1700/070-21.5**	
				34.5 *1.358*	**BSF-F-1700/070-18.5**	**BSF-M-F-1A-16.0**
				35.0 *1.378*	**BSF-F-1700/070-19.0**	
				35.5 *1.398*	**BSF-F-1700/070-19.5**	
				36.0 *1.417*	**BSF-F-1700/070-20.0**	
				36.5 *1.437*	**BSF-F-1700/070-20.5**	
				37.0 *1.457*	**BSF-F-1700/070-21.0**	
				37.5 *1.476*	**BSF-F-1700/070-21.5**	
				38.0 *1.496*	**BSF-F-1700/070-18.5**	**BSF-M-F-1A-19.5**
				38.5 *1.516*	**BSF-F-1700/070-19.0**	
				39.0 *1.535*	**BSF-F-1700/070-19.5**	
				39.5 *1.555*	**BSF-F-1700/070-20.0**	

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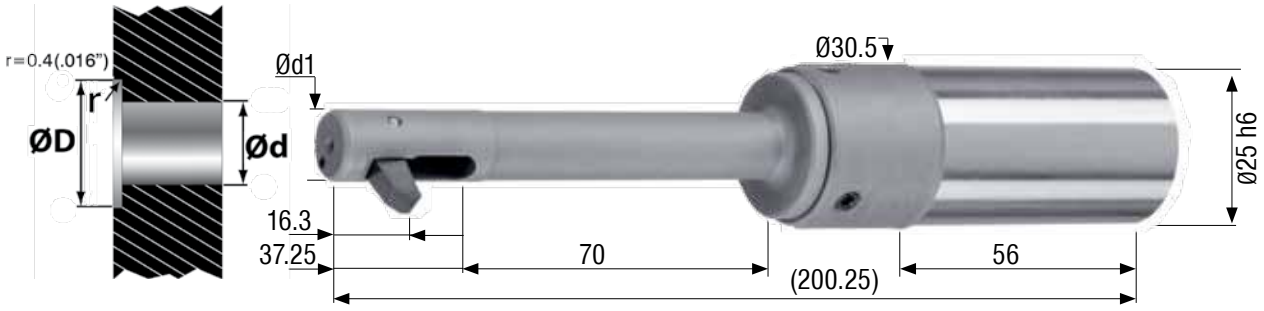

Minimum Hole Ød		Tool Series G			
		Ød1		C'Bore ØD	Tool Order #	Blade Order #
mm	*inches*	mm	*inches*	mm *inches*		Carbide, TiAlN*
17.5	*0.689*	**17.4**	*0.685*	**26.5** *1.043*	**BSF-G-1750/070-20.5**	**BSF-M-G-1A-6.0**
				27.0 *1.063*	**BSF-G-1750/070-21.0**	
				27.5 *1.083*	**BSF-G-1750/070-21.5**	
				28.0 *1.102*	**BSF-G-1750/070-22.0**	
				28.5 *1.122*	**BSF-G-1750/070-22.5**	
				29.0 *1.142*	**BSF-G-1750/070-23.0**	
				29.5 *1.161*	**BSF-G-1750/070-23.5**	
				30.0 *1.181*	**BSF-G-1750/070-24.0**	
				30.5 *1.201*	**BSF-G-1750/070-20.0**	**BSF-M-G-1A-10.5**
				31.0 *1.220*	**BSF-G-1750/070-20.5**	
				31.5 *1.240*	**BSF-G-1750/070-21.0**	
				32.0 *1.260*	**BSF-G-1750/070-21.5**	
				32.5 *1.280*	**BSF-G-1750/070-22.0**	
				33.0 *1.299*	**BSF-G-1750/070-22.5**	
				33.5 *1.319*	**BSF-G-1750/070-23.0**	
				34.0 *1.339*	**BSF-G-1750/070-23.5**	
				34.5 *1.358*	**BSF-G-1750/070-24.0**	
				35.0 *1.378*	**BSF-G-1750/070-20.0**	**BSF-M-G-1A-15.0**
				35.5 *1.398*	**BSF-G-1750/070-20.5**	
				36.0 *1.417*	**BSF-G-1750/070-21.0**	
				36.5 *1.437*	**BSF-G-1750/070-21.5**	
				37.0 *1.457*	**BSF-G-1750/070-22.0**	
				37.5 *1.476*	**BSF-G-1750/070-22.5**	
				38.0 *1.496*	**BSF-G-1750/070-23.0**	
				38.5 *1.516*	**BSF-G-1750/070-23.5**	
				39.0 *1.535*	**BSF-G-1750/070-24.0**	
				39.5 *1.555*	**BSF-G-1750/070-20.0**	**BSF-M-G-1A-19.5**
				40.0 *1.575*	**BSF-G-1750/070-20.5**	
				40.5 *1.594*	**BSF-G-1750/070-21.0**	

*Other blade options available

continued on next page

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Special Application?
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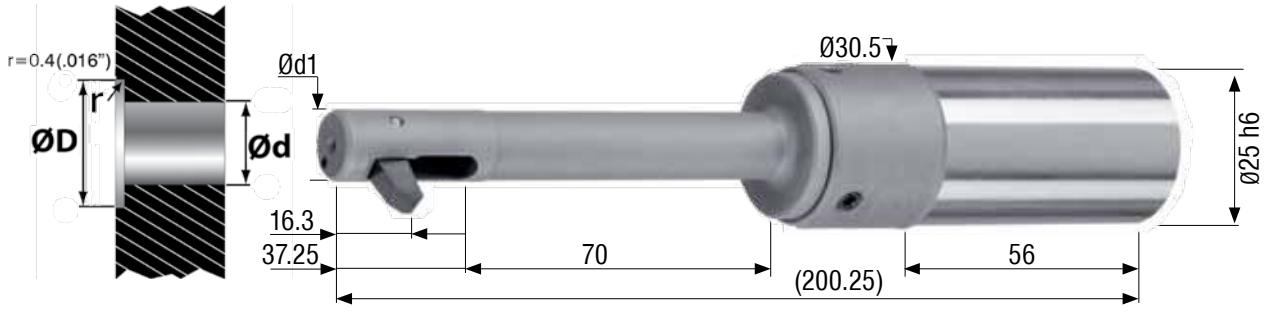
SPARE PARTS PG. 31
PROGRAMMING PG. 35



Minimum Hole Ød		Tool Series G			
		Ød1		C'Bore ØD		Tool Order #	Blade Order #
mm	*inches*	mm	*inches*	mm	*inches*		Carbide, TiAlN*
18.0	*0.709*	**17.9**	*0.705*	**27.0**	*1.063*	**BSF-G-1800/070-21.0**	**BSF-M-G-1A-6.0**
				27.5	*1.083*	**BSF-G-1800/070-21.5**	
				28.0	*1.102*	**BSF-G-1800/070-22.0**	
				28.5	*1.122*	**BSF-G-1800/070-22.5**	
				29.0	*1.142*	**BSF-G-1800/070-23.0**	
				29.5	*1.161*	**BSF-G-1800/070-23.5**	
				30.0	*1.181*	**BSF-G-1800/070-24.0**	
				30.5	*1.201*	**BSF-G-1800/070-24.5**	
				31.0	*1.220*	**BSF-G-1800/070-20.5**	**BSF-M-G-1A-10.5**
				31.5	*1.240*	**BSF-G-1800/070-21.0**	
				32.0	*1.260*	**BSF-G-1800/070-21.5**	
				32.5	*1.280*	**BSF-G-1800/070-22.0**	
				33.0	*1.299*	**BSF-G-1800/070-22.5**	
				33.5	*1.319*	**BSF-G-1800/070-23.0**	
				34.0	*1.339*	**BSF-G-1800/070-23.5**	
				34.5	*1.358*	**BSF-G-1800/070-24.0**	
				35.0	*1.378*	**BSF-G-1800/070-24.5**	
				35.5	*1.398*	**BSF-G-1800/070-20.5**	**BSF-M-G-1A-15.0**
				36.0	*1.417*	**BSF-G-1800/070-21.0**	
				36.5	*1.437*	**BSF-G-1800/070-21.5**	
				37.0	*1.457*	**BSF-G-1800/070-22.0**	
				37.5	*1.476*	**BSF-G-1800/070-22.5**	
				38.0	*1.496*	**BSF-G-1800/070-23.0**	
				38.5	*1.516*	**BSF-G-1800/070-23.5**	
				39.0	*1.535*	**BSF-G-1800/070-24.0**	
				39.5	*1.555*	**BSF-G-1800/070-24.5**	
				40.0	*1.575*	**BSF-G-1800/070-20.5**	**BSF-M-G-1A-19.5**
				40.5	*1.594*	**BSF-G-1800/070-21.0**	
				41.0	*1.614*	**BSF-G-1800/070-21.5**	
				41.5	*1.634*	**BSF-G-1800/070-22.0**	

*Other blade options available

continued on next page

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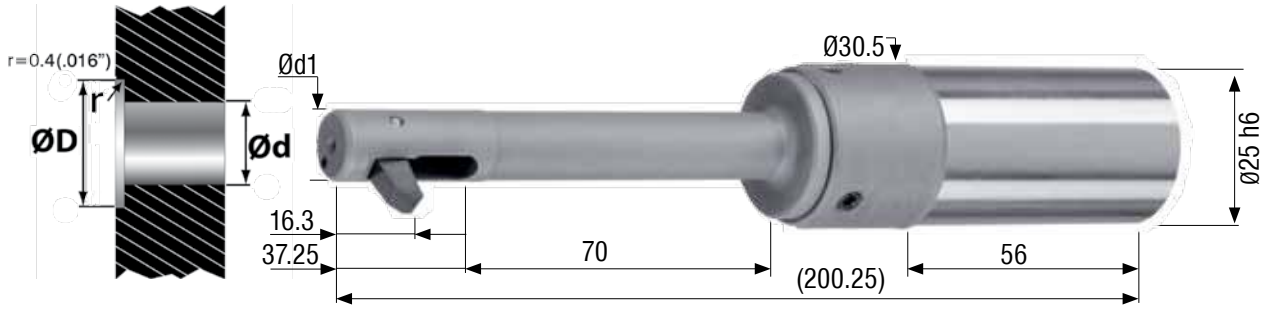
SPARE PARTS PG. 31
PROGRAMMING PG. 35



Minimum Hole Ød		Tool Series G					
		Ød1		C'Bore ØD		Tool Order #	Blade Order #
mm	*inches*	mm	*inches*	mm	*inches*		Carbide, TiAlN*
18.5	*0.728*	**18.4**	*0.724*	**28.0**	*1.102*	**BSF-G-1850/070-22.0**	**BSF-M-G-1A-6.0**
				28.5	*1.122*	**BSF-G-1850/070-22.5**	
				29.0	*1.142*	**BSF-G-1850/070-23.0**	
				29.5	*1.161*	**BSF-G-1850/070-23.5**	
				30.0	*1.181*	**BSF-G-1850/070-24.0**	
				30.5	*1.201*	**BSF-G-1850/070-24.5**	
				31.0	*1.220*	**BSF-G-1850/070-25.0**	
				31.5	*1.240*	**BSF-G-1850/070-21.0**	**BSF-M-G-1A-10.5**
				32.0	*1.260*	**BSF-G-1850/070-21.5**	
				32.5	*1.280*	**BSF-G-1850/070-22.0**	
				33.0	*1.299*	**BSF-G-1850/070-22.5**	
				33.5	*1.319*	**BSF-G-1850/070-23.0**	
				34.0	*1.339*	**BSF-G-1850/070-23.5**	
				34.5	*1.358*	**BSF-G-1850/070-24.0**	
				35.0	*1.378*	**BSF-G-1850/070-24.5**	
				35.5	*1.398*	**BSF-G-1850/070-25.0**	
				36.0	*1.417*	**BSF-G-1850/070-21.0**	**BSF-M-G-1A-15.0**
				36.5	*1.437*	**BSF-G-1850/070-21.5**	
				37.0	*1.457*	**BSF-G-1850/070-22.0**	
				37.5	*1.476*	**BSF-G-1850/070-22.5**	
				38.0	*1.496*	**BSF-G-1850/070-23.0**	
				38.5	*1.516*	**BSF-G-1850/070-23.5**	
				39.0	*1.535*	**BSF-G-1850/070-24.0**	
				39.5	*1.555*	**BSF-G-1850/070-24.5**	
				40.0	*1.575*	**BSF-G-1850/070-25.0**	
				40.5	*1.594*	**BSF-G-1850/070-21.0**	**BSF-M-G-1A-19.5**
				41.0	*1.614*	**BSF-G-1850/070-21.5**	
				41.5	*1.634*	**BSF-G-1850/070-22.0**	
				42.0	*1.654*	**BSF-G-1850/070-22.5**	
				42.5	*1.673*	**BSF-G-1850/070-23.0**	
				43.0	*1.693*	**BSF-G-1850/070-23.5**	

*Other blade options available

continued on next page

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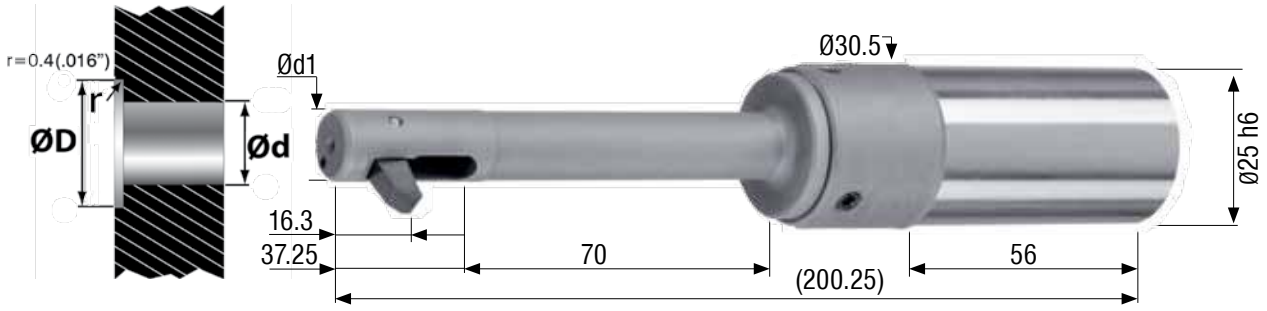
SPARE PARTS PG. 31
PROGRAMMING PG. 35



Minimum Hole Ød		Tool Series G					
		Ød1		C'Bore ØD		Tool Order #	Blade Order #
mm	*inches*	mm	*inches*	mm	*inches*		Carbide, TiAlN*
19.0	*0.748*	**18.9**	*0.744*	**28.5**	*1.122*	**BSF-G-1900/070-22.5**	**BSF-M-G-1A-6.0**
				29.0	*1.142*	**BSF-G-1900/070-23.0**	
				29.5	*1.161*	**BSF-G-1900/070-23.5**	
				30.0	*1.181*	**BSF-G-1900/070-24.0**	
				30.5	*1.201*	**BSF-G-1900/070-24.5**	
				31.0	*1.220*	**BSF-G-1900/070-25.0**	
				31.5	*1.240*	**BSF-G-1900/070-25.5**	
				32.0	*1.260*	**BSF-G-1900/070-21.5**	**BSF-M-G-1A-10.5**
				32.5	*1.280*	**BSF-G-1900/070-22.0**	
				33.0	*1.299*	**BSF-G-1900/070-22.5**	
				33.5	*1.319*	**BSF-G-1900/070-23.0**	
				34.0	*1.339*	**BSF-G-1900/070-23.5**	
				34.5	*1.358*	**BSF-G-1900/070-24.0**	
				35.0	*1.378*	**BSF-G-1900/070-24.5**	
				35.5	*1.398*	**BSF-G-1900/070-25.0**	
				36.0	*1.417*	**BSF-G-1900/070-25.5**	
				36.5	*1.437*	**BSF-G-1900/070-21.5**	**BSF-M-G-1A-15.0**
				37.0	*1.457*	**BSF-G-1900/070-22.0**	
				37.5	*1.476*	**BSF-G-1900/070-22.5**	
				38.0	*1.496*	**BSF-G-1900/070-23.0**	
				38.5	*1.516*	**BSF-G-1900/070-23.5**	
				39.0	*1.535*	**BSF-G-1900/070-24.0**	
				39.5	*1.555*	**BSF-G-1900/070-24.5**	
				40.0	*1.575*	**BSF-G-1900/070-25.0**	
				40.5	*1.594*	**BSF-G-1900/070-25.5**	
				41.0	*1.614*	**BSF-G-1900/070-21.5**	**BSF-M-G-1A-19.5**
				41.5	*1.634*	**BSF-G-1900/070-22.0**	
				42.0	*1.654*	**BSF-G-1900/070-22.5**	
				42.5	*1.673*	**BSF-G-1900/070-23.0**	
				43.0	*1.693*	**BSF-G-1900/070-23.5**	
				43.5	*1.713*	**BSF-G-1900/070-24.0**	
				44.0	*1.732*	**BSF-G-1900/070-24.5**	

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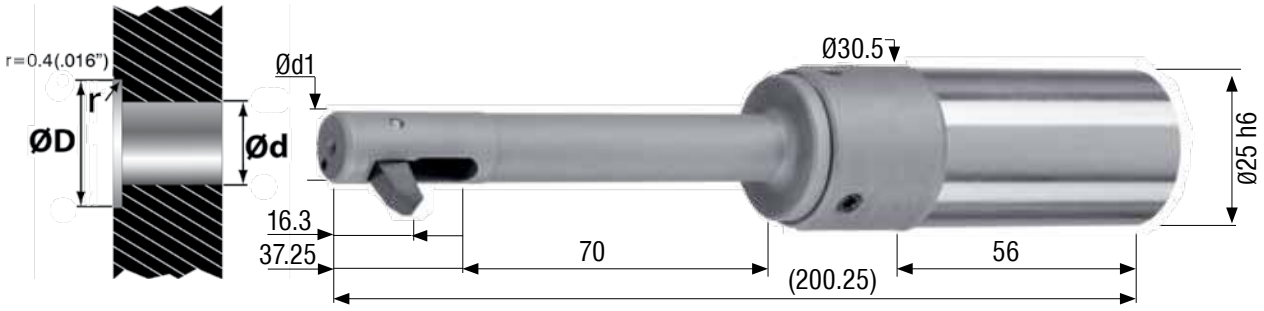
PROGRAMMING PG. 35



Minimum Hole Ød		Tool Series G				
		Ød1		C'Bore ØD	Tool Order #	Blade Order #
mm	*inches*	mm	*inches*	mm *inches*		Carbide, TiAlN*
19.5	*0.768*	**19.4**	*0.764*	**29.5** *1.161*	**BSF-G-1950/070-23.5**	**BSF-M-G-1A-6.0**
				30.0 *1.181*	**BSF-G-1950/070-24.0**	
				30.5 *1.201*	**BSF-G-1950/070-24.5**	
				31.0 *1.220*	**BSF-G-1950/070-25.0**	
				31.5 *1.240*	**BSF-G-1950/070-25.5**	
				32.0 *1.260*	**BSF-G-1950/070-26.0**	
				32.5 *1.280*	**BSF-G-1950/070-22.0**	**BSF-M-G-1A-10.5**
				33.0 *1.299*	**BSF-G-1950/070-22.5**	
				33.5 *1.319*	**BSF-G-1950/070-23.0**	
				34.0 *1.339*	**BSF-G-1950/070-23.5**	
				34.5 *1.358*	**BSF-G-1950/070-24.0**	
				35.0 *1.378*	**BSF-G-1950/070-24.5**	
				35.5 *1.398*	**BSF-G-1950/070-25.0**	
				36.0 *1.417*	**BSF-G-1950/070-25.5**	
				36.5 *1.437*	**BSF-G-1950/070-26.0**	
				37.0 *1.457*	**BSF-G-1950/070-22.0**	**BSF-M-G-1A-15.0**
				37.5 *1.476*	**BSF-G-1950/070-22.5**	
				38.0 *1.496*	**BSF-G-1950/070-23.0**	
				38.5 *1.516*	**BSF-G-1950/070-23.5**	
				39.0 *1.535*	**BSF-G-1950/070-24.0**	
				39.5 *1.555*	**BSF-G-1950/070-24.5**	
				40.0 *1.575*	**BSF-G-1950/070-25.0**	
				40.5 *1.594*	**BSF-G-1950/070-25.5**	
				41.0 *1.614*	**BSF-G-1950/070-26.0**	
				41.5 *1.634*	**BSF-G-1950/070-22.0**	**BSF-M-G-1A-19.5**
				42.0 *1.654*	**BSF-G-1950/070-22.5**	
				42.5 *1.673*	**BSF-G-1950/070-23.0**	
				43.0 *1.693*	**BSF-G-1950/070-23.5**	
				43.5 *1.713*	**BSF-G-1950/070-24.0**	
				44.0 *1.732*	**BSF-G-1950/070-24.5**	
				44.5 *1.752*	**BSF-G-1950/070-25.0**	
				45.0 *1.772*	**BSF-G-1950/070-25.5**	

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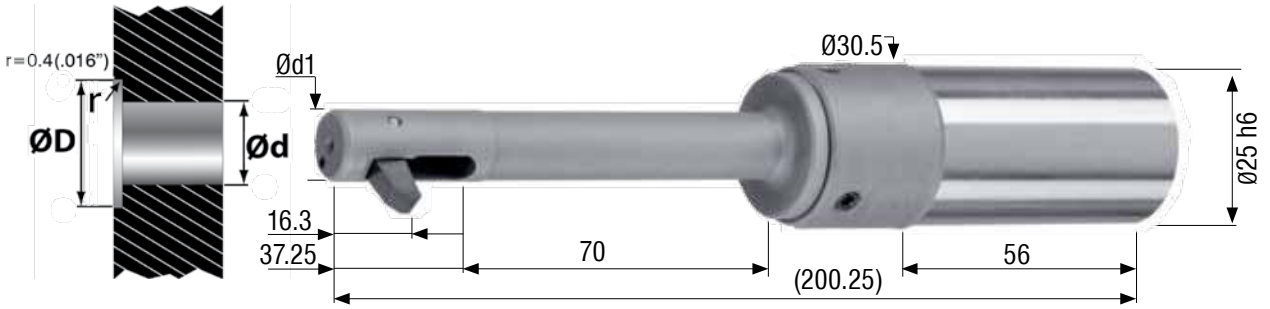

Minimum Hole Ød	Tool Series G			
	Ød1	C'Bore ØD	Tool Order #	Blade Order #
mm *inches*	mm *inches*	mm *inches*		Carbide, TiAlN*
20.0 *0.787*	19.9 *0.783*	30.0 *1.181*	BSF-G-2000/070-24.0	BSF-M-G-1A-6.0
		30.5 *1.201*	BSF-G-2000/070-24.5	
		31.0 *1.220*	BSF-G-2000/070-25.0	
		31.5 *1.240*	BSF-G-2000/070-25.5	
		32.0 *1.260*	BSF-G-2000/070-26.0	
		32.5 *1.280*	BSF-G-2000/070-26.5	
		33.0 *1.299*	BSF-G-2000/070-22.5	BSF-M-G-1A-10.5
		33.5 *1.319*	BSF-G-2000/070-23.0	
		34.0 *1.339*	BSF-G-2000/070-23.5	
		34.5 *1.358*	BSF-G-2000/070-24.0	
		35.0 *1.378*	BSF-G-2000/070-24.5	
		35.5 *1.398*	BSF-G-2000/070-25.0	
		36.0 *1.417*	BSF-G-2000/070-25.5	
		36.5 *1.437*	BSF-G-2000/070-26.0	
		37.0 *1.457*	BSF-G-2000/070-26.5	
		37.5 *1.476*	BSF-G-2000/070-22.5	BSF-M-G-1A-15.0
		38.0 *1.496*	BSF-G-2000/070-23.0	
		38.5 *1.516*	BSF-G-2000/070-23.5	
		39.0 *1.535*	BSF-G-2000/070-24.0	
		39.5 *1.555*	BSF-G-2000/070-24.5	
		40.0 *1.575*	BSF-G-2000/070-25.0	
		40.5 *1.594*	BSF-G-2000/070-25.5	
		41.0 *1.614*	BSF-G-2000/070-26.0	
		41.5 *1.634*	BSF-G-2000/070-26.5	
		42.0 *1.654*	BSF-G-2000/070-22.5	BSF-M-G-1A-19.5
		42.5 *1.673*	BSF-G-2000/070-23.0	
		43.0 *1.693*	BSF-G-2000/070-23.5	
		43.5 *1.713*	BSF-G-2000/070-24.0	
		44.0 *1.732*	BSF-G-2000/070-24.5	
		44.5 *1.752*	BSF-G-2000/070-25.0	
		45.0 *1.772*	BSF-G-2000/070-25.5	
		45.5 *1.791*	BSF-G-2000/070-26.0	
		46.0 *1.811*	BSF-G-2000/070-26.5	

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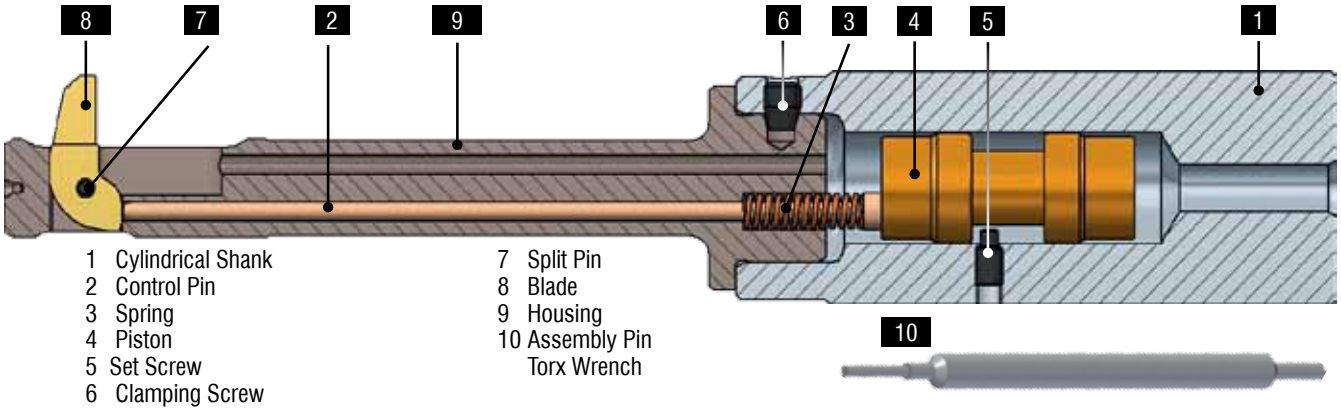
Tool Description



1 Cylindrical Shank
2 Control Pin
3 Spring
4 Piston
5 Set Screw
6 Clamping Screw
7 Split Pin
8 Blade
9 Housing
10 Assembly Pin
Torx Wrench

	SPARE PARTS	SERIES A	SERIES B	SERIES C
1	CYLINDRICAL SHANK	BSF-S-0003	BSF-S-0003	BSF-S-0003
2	CONTROL PIN	BSF-B-0001 BSF-B-0002	BSF-B-0003 BSF-B-0004	BSF-B-0005
3	SPRING	GH-H-F-0052	GH-H-F-0052	GH-H-F-0053
4	PISTON	BSF-E-0014	BSF-E-0014	BSF-E-0014
5	SET SCREW	GH-H-S-0302	GH-H-S-0302	GH-H-S-0302
6	CLAMPING SCREW	GH-H-S-0201	GH-H-S-0201	GH-H-S-0201
7	SPLIT PIN	BSF-E-0009	BSF-E-0018	BSF-E-0010
10	ASSEMBLY PIN	BSF-V-0009	BSF-V-0009	BSF-V-0006
	WRENCH	GH-H-S-2023	GH-H-S-2023	GH-H-S-2023

	SPARE PARTS	SERIES D	SERIES E	SERIES F
1	CYLINDRICAL SHANK	BSF-S-0003	BSF-S-0003	BSF-S-0004
2	CONTROL PIN	BSF-B-0006 BSF-B-0007	BSF-B-0008 BSF-B-0009	BSF-B-0010 BSF-B-0011
3	SPRING	GH-H-F-0053	GH-H-F-0053	GH-H-F-0051
4	PISTON	BSF-E-0014	BSF-E-0014	BSF-E-0014
5	SET SCREW	GH-H-S-0302	GH-H-S-0302	GH-H-S-0302
6	CLAMPING SCREW	GH-H-S-0201	GH-H-S-0201	GH-H-S-0202
7	SPLIT PIN	BSF-E-0019	BSF-E-0011	BSF-E-0012
10	ASSEMBLY PIN	BSF-V-0006	BSF-V-0007	BSF-V-0007
	WRENCH	GH-H-S-2023	GH-H-S-2023	GH-H-S-2100

	SPARE PARTS	SERIES G
1	CYLINDRICAL SHANK	BSF-S-0004
2	CONTROL PIN	BSF-B-0012 BSF-B-0013
3	SPRING	GH-H-F-0051
4	PISTON	BSF-E-0014
5	SET SCREW	GH-H-S-0302
6	CLAMPING SCREW	GH-H-S-0202
7	SPLIT PIN	BSF-E-0013
10	ASSEMBLY PIN	BSF-V-0008
	WRENCH	GH-H-S-2100

1- Clamping screws sold individually (3x needed)

(8) Carbide TiAlN BLADES	TOOL NUMBER	(9) HOUSING
SERIES A	BSF-A-0650/040-6.5	BSF-N-A-0650/N025/040
BSF-M-A-1A-3.0	BSF-A-0650/040-7.0	BSF-N-A-0650/0000/040
BSF-M-A-1A-4.5	BSF-A-0650/040-7.5	BSF-N-A-0650/P025/040
BSF-M-A-1A-6.0	BSF-A-0700/040-7.0	BSF-N-A-0700/0000/040
BSF-M-A-1A-7.5	BSF-A-0700/040-7.5	BSF-N-A-0700/P025/040
BSF-M-A-1A-9.0	BSF-A-0700/040-8.0	BSF-N-A-0700/P050/040
SERIES B	BSF-B-0750/040-7.5	BSF-N-B-0750/N025/040
BSF-M-B-1A-3.5	BSF-B-0750/040-8.0	BSF-N-B-0750/0000/040
BSF-M-B-1A-5.0	BSF-B-0750/040-8.5	BSF-N-B-0750/P025/040
BSF-M-B-1A-6.5	BSF-B-0800/040-8.0	BSF-N-B-0800/0000/040
BSF-M-B-1A-8.0	BSF-B-0800/040-8.5	BSF-N-B-0800/P025/040
BSF-M-B-1A-9.5	BSF-B-0800/040-9.0	BSF-N-B-0800/P050/040
BSF-M-B-1A-11.0	BSF-B-0850/040-8.5	BSF-N-B-0850/P025/040
SERIES C	BSF-B-0850/040-9.0	BSF-N-B-0850/P050/040
BSF-M-C-1A-4.0	BSF-B-0850/040-9.5	BSF-N-B-0850/P075/040
BSF-M-C-1A-5.5	BSF-C-0900/050-9.5	BSF-N-C-0900/N025/050
BSF-M-C-1A-7.0	BSF-C-0900/050-10.0	BSF-N-C-0900/0000/050
BSF-M-C-1A-8.5	BSF-C-0900/050-10.5	BSF-N-C-0900/P025/050
BSF-M-C-1A-10.0	BSF-C-0950/050-10.0	BSF-N-C-0950/0000/050
BSF-M-C-1A-11.5	BSF-C-0950/050-10.5	BSF-N-C-0950/P025/050
SERIES D	BSF-C-0950/050-11.0	BSF-N-C-0950/P050/050
BSF-M-D-1A-4.5	BSF-C-1000/050-10.5	BSF-N-C-1000/P025/050
BSF-M-D-1A-7.0	BSF-C-1000/050-11.0	BSF-N-C-1000/P050/050
BSF-M-D-1A-9.5	BSF-C-1000/050-11.5	BSF-N-C-1000/P075/050
BSF-M-D-1A-12.0	BSF-D-1050/050-11.0	BSF-N-D-1050/N050/050
BSF-M-D-1A-14.5	BSF-D-1050/050-11.5	BSF-N-D-1050/N025/050
SERIES E	BSF-D-1050/050-12.0	BSF-N-D-1050/0000/050
BSF-M-E-1A-5.0	BSF-D-1050/050-12.5	BSF-N-D-1050/P025/050
BSF-M-E-1A-7.5	BSF-D-1050/050-13.0	BSF-N-D-1050/P050/050
BSF-M-E-1A-10.0	BSF-D-1100/050-11.5	BSF-N-D-1100/N025/050
BSF-M-E-1A-12.5	BSF-D-1100/050-12.0	BSF-N-D-1100/0000/050
BSF-M-E-1A-15.0	BSF-D-1100/050-12.5	BSF-N-D-1100/P025/050
SERIES F	BSF-D-1100/050-13.0	BSF-N-D-1100/P050/050
BSF-M-F-1A-5.5	BSF-D-1100/050-13.5	BSF-N-D-1100/P075/050
BSF-M-F-1A-9.0	BSF-D-1150/050-12.0	BSF-N-D-1150/0000/050
BSF-M-F-1A-12.5	BSF-D-1150/050-12.5	BSF-N-D-1150/P025/050
BSF-M-F-1A-16.0	BSF-D-1150/050-13.0	BSF-N-D-1150/P050/050
BSF-M-F-1A-19.5	BSF-D-1150/050-13.5	BSF-N-D-1150/P075/050
SERIES G	BSF-D-1150/050-14.0	BSF-N-D-1150/P100/050
BSF-M-G-1A-6.0		
BSF-M-G-1A-10.5		
BSF-M-G-1A-15.0		
BSF-M-G-1A-19.5		

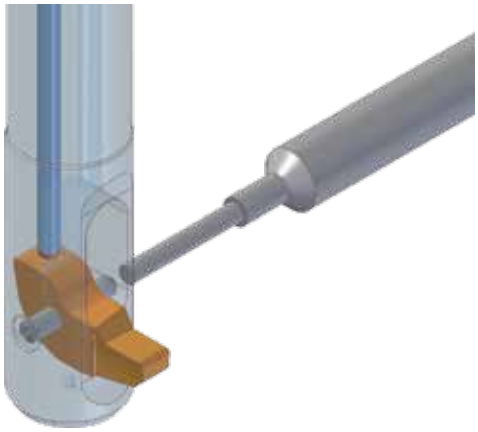
TOOL NUMBER	(9) HOUSING
SERIES E	
BSF-E-1200/050-13.0	BSF-N-E-1200/N050/050
BSF-E-1200/050-13.5	BSF-N-E-1200/N025/050
BSF-E-1200/050-14.0	BSF-N-E-1200/0000/050
BSF-E-1200/050-14.5	BSF-N-E-1200/P025/050
BSF-E-1200/050-15.0	BSF-N-E-1200/P050/050
BSF-E-1250/050-13.5	BSF-N-E-1250/N025/050
BSF-E-1250/050-14.0	BSF-N-E-1250/0000/050
BSF-E-1250/050-14.5	BSF-N-E-1250/P025/050
BSF-E-1250/050-15.0	BSF-N-E-1250/P050/050
BSF-E-1250/050-15.5	BSF-N-E-1250/P075/050
BSF-E-1300/050-14.0	BSF-N-E-1300/0000/050
BSF-E-1300/050-14.5	BSF-N-E-1300/P025/050
BSF-E-1300/050-15.0	BSF-N-E-1300/P050/050
BSF-E-1300/050-15.5	BSF-N-E-1300/P075/050
BSF-E-1300/050-16.0	BSF-N-E-1300/P100/050
BSF-E-1350/050-14.5	BSF-N-E-1350/P025/050
BSF-E-1350/050-15.0	BSF-N-E-1350/P050/050
BSF-E-1350/050-15.5	BSF-N-E-1350/P075/050
BSF-E-1350/050-16.0	BSF-N-E-1350/P100/050
BSF-E-1350/050-16.5	BSF-N-E-1350/P125/050
BSF-E-1400/050-15.0	BSF-N-E-1400/P050/050
BSF-E-1400/050-15.5	BSF-N-E-1400/P075/050
BSF-E-1400/050-16.0	BSF-N-E-1400/P100/050
BSF-E-1400/050-16.5	BSF-N-E-1400/P125/050
BSF-E-1400/050-17.0	BSF-N-E-1400/P150/050

Series F and G on next page

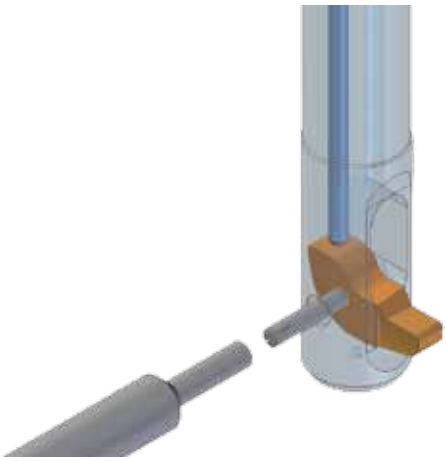
SERIES F		SERIES G	
TOOL NUMBER	(9) HOUSING	TOOL NUMBER	(9) HOUSING
BSF-F-1450/070-16.0	BSF-N-F-1450/N075/070	BSF-G-1750/070-20.0	BSF-N-G-1750/N100/070
BSF-F-1450/070-16.5	BSF-N-F-1450/N050/070	BSF-G-1750/070-20.5	BSF-N-G-1750/N075/070
BSF-F-1450/070-17.0	BSF-N-F-1450/N025/070	BSF-G-1750/070-21.0	BSF-N-G-1750/N050/070
BSF-F-1450/070-17.5	BSF-N-F-1450/0000/070	BSF-G-1750/070-21.5	BSF-N-G-1750/N025/070
BSF-F-1450/070-18.0	BSF-N-F-1450/P025/070	BSF-G-1750/070-22.0	BSF-N-G-1750/0000/070
BSF-F-1450/070-18.5	BSF-N-F-1450/P050/070	BSF-G-1750/070-22.5	BSF-N-G-1750/P025/070
BSF-F-1450/070-19.0	BSF-N-F-1450/P075/070	BSF-G-1750/070-23.0	BSF-N-G-1750/P050/070
BSF-F-1500/070-16.5	BSF-N-F-1500/N050/070	BSF-G-1750/070-23.5	BSF-N-G-1750/P075/070
BSF-F-1500/070-17.0	BSF-N-F-1500/N025/070	BSF-G-1750/070-24.0	BSF-N-G-1750/P100/070
BSF-F-1500/070-17.5	BSF-N-F-1500/0000/070	BSF-G-1800/070-20.5	BSF-N-G-1800/N075/070
BSF-F-1500/070-18.0	BSF-N-F-1500/P025/070	BSF-G-1800/070-21.0	BSF-N-G-1800/N050/070
BSF-F-1500/070-18.5	BSF-N-F-1500/P050/070	BSF-G-1800/070-21.5	BSF-N-G-1800/N025/070
BSF-F-1500/070-19.0	BSF-N-F-1500/P075/070	BSF-G-1800/070-22.0	BSF-N-G-1800/0000/070
BSF-F-1500/070-19.5	BSF-N-F-1500/P100/070	BSF-G-1800/070-22.5	BSF-N-G-1800/P025/070
BSF-F-1550/070-17.0	BSF-N-F-1550/N025/070	BSF-G-1800/070-23.0	BSF-N-G-1800/P050/070
BSF-F-1550/070-17.5	BSF-N-F-1550/0000/070	BSF-G-1800/070-23.5	BSF-N-G-1800/P075/070
BSF-F-1550/070-18.0	BSF-N-F-1550/P025/070	BSF-G-1800/070-24.0	BSF-N-G-1800/P100/070
BSF-F-1550/070-18.5	BSF-N-F-1550/P050/070	BSF-G-1800/070-24.5	BSF-N-G-1800/P125/070
BSF-F-1550/070-19.0	BSF-N-F-1550/P075/070	BSF-G-1850/070-21.0	BSF-N-G-1850/N050/070
BSF-F-1550/070-19.5	BSF-N-F-1550/P100/070	BSF-G-1850/070-21.5	BSF-N-G-1850/N025/070
BSF-F-1550/070-20.0	BSF-N-F-1550/P125/070	BSF-G-1850/070-22.0	BSF-N-G-1850/0000/070
BSF-F-1600/070-17.5	BSF-N-F-1600/0000/070	BSF-G-1850/070-22.5	BSF-N-G-1850/P025/070
BSF-F-1600/070-18.0	BSF-N-F-1600/P025/070	BSF-G-1850/070-23.0	BSF-N-G-1850/P050/070
BSF-F-1600/070-18.5	BSF-N-F-1600/P050/070	BSF-G-1850/070-23.5	BSF-N-G-1850/P075/070
BSF-F-1600/070-19.0	BSF-N-F-1600/P075/070	BSF-G-1850/070-24.0	BSF-N-G-1850/P100/070
BSF-F-1600/070-19.5	BSF-N-F-1600/P100/070	BSF-G-1850/070-24.5	BSF-N-G-1850/P125/070
BSF-F-1600/070-20.0	BSF-N-F-1600/P125/070	BSF-G-1850/070-25.0	BSF-N-G-1850/P150/070
BSF-F-1600/070-20.5	BSF-N-F-1600/P150/070	BSF-G-1900/070-21.5	BSF-N-G-1900/N025/070
BSF-F-1650/070-18.0	BSF-N-F-1650/P025/070	BSF-G-1900/070-22.0	BSF-N-G-1900/0000/070
BSF-F-1650/070-18.5	BSF-N-F-1650/P050/070	BSF-G-1900/070-22.5	BSF-N-G-1900/P025/070
BSF-F-1650/070-19.0	BSF-N-F-1650/P075/070	BSF-G-1900/070-23.0	BSF-N-G-1900/P050/070
BSF-F-1650/070-19.5	BSF-N-F-1650/P100/070	BSF-G-1900/070-23.5	BSF-N-G-1900/P075/070
BSF-F-1650/070-20.0	BSF-N-F-1650/P125/070	BSF-G-1900/070-24.0	BSF-N-G-1900/P100/070
BSF-F-1650/070-20.5	BSF-N-F-1650/P150/070	BSF-G-1900/070-24.5	BSF-N-G-1900/P125/070
BSF-F-1650/070-21.0	BSF-N-F-1650/P175/070	BSF-G-1900/070-25.0	BSF-N-G-1900/P150/070
BSF-F-1700/070-18.5	BSF-N-F-1700/P050/070	BSF-G-1900/070-25.5	BSF-N-G-1900/P175/070
BSF-F-1700/070-19.0	BSF-N-F-1700/P075/070	BSF-G-1950/070-22.0	BSF-N-G-1950/0000/070
BSF-F-1700/070-19.5	BSF-N-F-1700/P100/070	BSF-G-1950/070-22.5	BSF-N-G-1950/P025/070
BSF-F-1700/070-20.0	BSF-N-F-1700/P125/070	BSF-G-1950/070-23.0	BSF-N-G-1950/P050/070
BSF-F-1700/070-20.5	BSF-N-F-1700/P150/070	BSF-G-1950/070-23.5	BSF-N-G-1950/P075/070
BSF-F-1700/070-21.0	BSF-N-F-1700/P175/070	BSF-G-1950/070-24.0	BSF-N-G-1950/P100/070
BSF-F-1700/070-21.5	BSF-N-F-1700/P200/070	BSF-G-1950/070-24.5	BSF-N-G-1950/P125/070
		BSF-G-1950/070-25.0	BSF-N-G-1950/P150/070
		BSF-G-1950/070-25.5	BSF-N-G-1950/P175/070
		BSF-G-1950/070-26.0	BSF-N-G-1950/P200/070
		BSF-G-2000/070-22.5	BSF-N-G-2000/P025/070
		BSF-G-2000/070-23.0	BSF-N-G-2000/P050/070
		BSF-G-2000/070-23.5	BSF-N-G-2000/P075/070
		BSF-G-2000/070-24.0	BSF-N-G-2000/P100/070
		BSF-G-2000/070-24.5	BSF-N-G-2000/P125/070
		BSF-G-2000/070-25.0	BSF-N-G-2000/P150/070
		BSF-G-2000/070-25.5	BSF-N-G-2000/P175/070
		BSF-G-2000/070-26.0	BSF-N-G-2000/P200/070
		BSF-G-2000/070-26.5	BSF-N-G-2000/P225/070

1

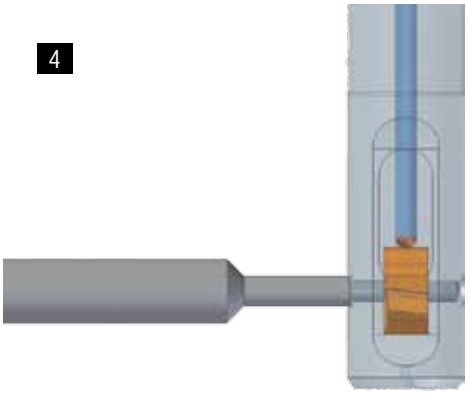
2



3



4



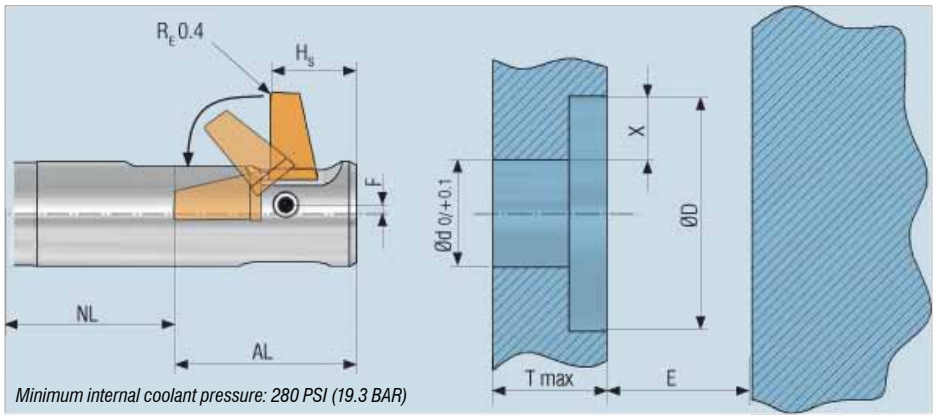
Dismantling
(1) Use the supplied assembly pin for the BSF blade change. **(2)** Position the assembly pin on the solid end of the split pin (opposite side of the slot). Press the assembly pin in until the split pin falls out and the blade is free.

Assembling
(3) Insert the blade. Then insert the split pin and fix the blade. **(4)** With the flat side of the assembly pin, push in the split pin until it is flush with the blade housing diameter. Blade is fixed in place.

Note:
The blade must move freely. If it is not, dismantle the blade and repeat the steps listed above. The blade and blade housing must be cleaned and inspected.

After an extended time, check that the blade moves about freely. Dried oil, coolant or dust may cause the blade to stick.

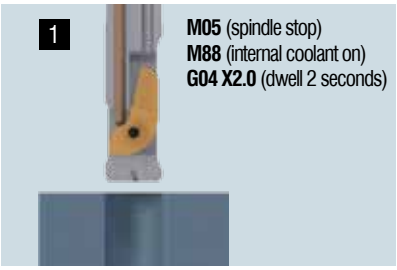
Every time the blade is changed the split pin must be replaced (pin is included in blade shipment). Using a split pin several times may cause blade fixing problems.



Minimum internal coolant pressure: 280 PSI (19.3 BAR)

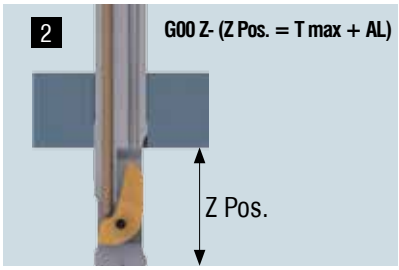
Legend

Ød	Bore diameter (tol. 0/+0.1)
ØD	Counterbore diameter
X	Cutting edge width
E	Distance interfering edge
NL	Working length
AL	Swing length
H_S	Cutting position
R_E	Edge radius standard 0.4 mm
T max	Maximum material thickness



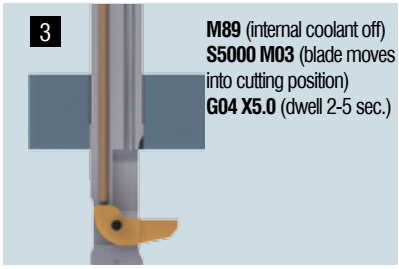
1 **M05** (spindle stop)
M88 (internal coolant on)
G04 X2.0 (dwell 2 seconds)

Position tool above part, spindle off, internal coolant on, dwell 2- 5 seconds (dwell time depends on pump), blade retracts.



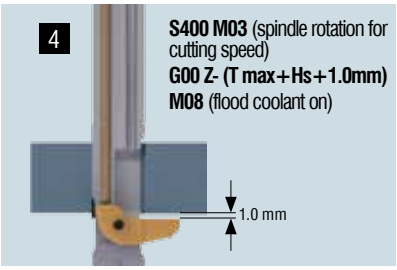
2 **G00 Z- (Z Pos. = T max + AL)**

Position tool through the hole (Z Pos. = T max + AL).



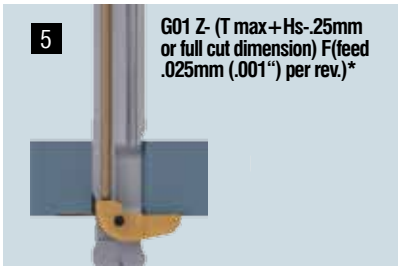
3 **M89** (internal coolant off)
S5000 M03 (blade moves into cutting position)
G04 X5.0 (dwell 2-5 sec.)

Internal coolant off and start spindle 2000-5000 RPM, dwell 2-5 seconds (dwell depends on time it takes to purge the internal coolant), blade moves into cutting position.



4 **S400 M03** (spindle rotation for cutting speed)
G00 Z- (T max+Hs+1.0mm)
M08 (flood coolant on)

Turn on spindle at cutting speed. Position cutting blade 1 mm below T max (note tolerance and burr size), turn on flood coolant.

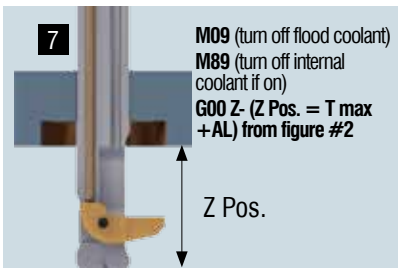


5 **G01 Z- (T max+Hs-.25mm or full cut dimension) F(feed .025mm (.001") per rev.)***

Move Z axis for cutting (approximately .25 mm deep or until full cut) with cutting feed rate.
*continue to desired depth of cut unless optional next step is required

6 **<u>Optional Step</u>**
M88 (internal coolant on)
G01 Z- (desired depth of cut)

Optional: For deep bores, turn internal coolant on and feed to desired depth. Insert must be in full cut.

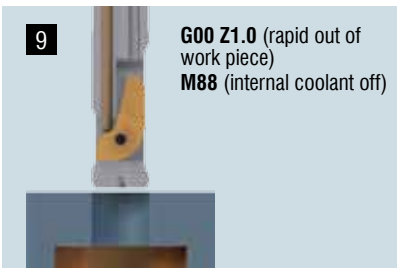


7 **M09** (turn off flood coolant)
M89 (turn off internal coolant if on)
G00 Z- (Z Pos. = T max +AL) from figure #2

If the counterbore depth is reached, switch off internal coolant and external coolant, and rapid back to Z position (Z Pos. = T max + AL).

8 **M05** (spindle off)
M88 (internal coolant on)
G04 X5.0 (dwell 5 seconds)

Spindle stop, internal coolant on, dwell 2-5 seconds, blade retracts.



9 **G00 Z1.0** (rapid out of work piece)
M88 (internal coolant off)

Position tool out of work piece. Internal coolant off or move to next hole location.

**Programming codes vary per machine make and model*

1 - Check swing length 2 - Check activation speed on pg 36 3 - Reference cutting data on pg 36

Cutting Data

Material	Blade material	SFM	Feed f (mm/rev) Series and bore diameter						
			A 6.50 - 7.00	**B** 7.50 - 8.50	**C** 9.00 - 10.00	**D** 10.50 - 11.50	**E** 12.00 - 14.00	**F** 14.50 - 17.00	**G** 17.50 - 21.00
Carbon steel < 200 HB	HM	130-260	0.02-0.04	0.02-0.04	0.02-0.04	0.03-0.06	0.03-0.08	0.03-0.08	0.03-0.08
	HSS	65-130							
Carbon steel > 200 HB	HM	100-230	0.02-0.03	0.02-0.03	0.02-0.03	0.02-0.05	0.03-0.06	0.03-0.06	0.03-0.08
	HSS	50-100							
Alloy steel < 240 HB	HM	100-200	0.02-0.04	0.02-0.04	0.02-0.04	0.03-0.06	0.03-0.08	0.03-0.08	0.03-0.08
	HSS	50-100							
Tool steel < 300 HB	HM	65-130	0.02-0.04	0.02-0.04	0.02-0.04	0.03-0.06	0.03-0.08	0.03-0.08	0.03-0.08
	HSS	30-50							
Tool steel > 300 HB	HM	30-30	0.02-0.03	0.02-0.03	0.02-0.03	0.02-0.04	0.03-0.05	0.03-0.05	0.03-0.06
	HSS	15-30							
Stainless steel < 200 HB	HM	65-100	0.02-0.04	0.02-0.04	0.02-0.04	0.03-0.06	0.03-0.05	0.03-0.05	0.03-0.06
	HSS	30-65							
Stainless steel > 200 HB	HM	50-65	0.02-0.03	0.02-0.03	0.02-0.03	0.02-0.04	0.03-0.05	0.03-0.05	0.03-0.06
	HSS	15-30							
Grey cast	HM	65-130	0.02-0.03	0.02-0.03	0.02-0.03	0.02-0.05	0.03-0.05	0.03-0.06	0.05-0.08
	HSS	30-65							
Aluminium	HM	200-400	0.02-0.05	0.02-0.05	0.02-0.05	0.02-0.08	0.05-0.1	0.05-0.1	0.05-0.12
	HSS	100-200							
Special alloy material	HM	30-65	0.02-0.03	0.02-0.03	0.02-0.03	0.02-0.04	0.02-0.05	0.02-0.05	0.03-0.06
	HSS	15-30							

*IPR $= \frac{\text{mm/rev}}{25.4}$

Recommendations:
- Activation speed: 2000 - 5000 RPM
- Coolant filtration (<25μm)
- Clamping: Sealed collet or hydraulic holder
- If there is long chipping and deep counterbores, program the feed cycle so short chips are received
- Minimum coolant pressure: 280 PSI (approximately 19.3 BAR)

Note:
- Cutting data is dependent on irregular surface, machine and workpiece stability.
- For uneven bore edges and critical conditions use the lower cutting values.
- All cutting information = guideline values

Frequently Asked Questions

The blade swings out automatically after the spindle stops (vertical position), is that normal?
Yes. The BSF is designed so the blade swings out automatically. Nevertheless, for machining the recommended activation speed is compulsory.

After running the machine, a counterbore is missing.
Check for correct activation speed and tool position. Check to see if the blade moves freely. Dismount the blade and clean the window of the blade housing and the blade itself. Increase activation speed and/or dwell if necessary. Check to make sure through coolant is off. Replace split pin if necessary.

Does the BSF tool rub the bore surface?
The possibility of rubbing the hole exists due to the single blade design. For critical hole finishes we recommend using a smaller bore diameter (semi-finished bore).

The housing is fixed with 3 clamping screws. Is there a fixing procedure recommended?
No. The housing can be set in any position. Make sure all screws are secure.

Are the housings replaceable?
Yes, each tool size has a different diameter and hole off-set size, housings are not interchangeable between series.

Are sloping surface permitted?
If you are working near a radius area do not use internal coolant until blade is in a full cut. Slow feeds and speeds accordingly.

Caution must be taken on interrupted cuts

Fully interrupted cut (nut, groove, etc.) not possible.

Note:
Pay special attention to the recommended bore hole tolerance (+0.1). Bores with a bigger tolerance can cause undesirable results (tool is rubbing in the bore, reduced counterbore diameter etc.) Watch the tool collision diameter (counterbore diameter + 2 mm) when you store the tool in the tool magazine.

Return to info@heuletool.com

HEULE Application Data Sheet
For Back Counterboring – Spotfacing

Information for:
Purchase Order_____
Request for Quotation (RFQ)

Date Needed:
☐ Urgent
☐ ASAP
By_____

Company Name:_____

Contact Name:_____

Address:_____

_____

City:_____

State:_____ **Zip:**_____

Date:_____

Phone:_____

Fax:_____

Email:_____

REF: Part name/Drawing number:_____

Part Configuration: (Fill in values that apply):

Ød1 = _____ +/- _____

ØD = _____ +/- _____

T max = _____

r = _____

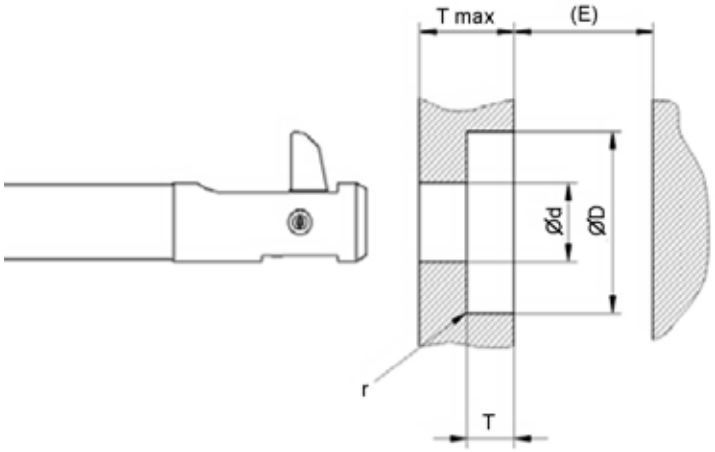
E = _____

T (depth) = _____

Surface Finish required: _____

Material: _____

Hardness: _____



Other Information/Sketch:

Production (Yr.):_____ **Cycle Time:**_____
Sequence (1, 2, 3, etc.):
___Drill ___Bore ___Tap
___Ream ___C'bore/sink

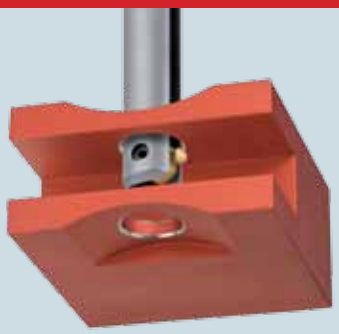
Machine Type/Data: _____
Shank Size: _____
Tool Holder: _____ **Coolant Pressure :** _____ (300 PSI Required)
Interrupted Cuts/Cross Holes? Y or N

Over 50 Years of Manufacturing Cutting Tools

HEULE manufactures cutting tools of the highest quality and precision consistent with Swiss craftsmanship for use in the machine tools of some of the world's largest manufacturers; and the smallest machine shops.

CHAMFERING / DEBURRING

COFA
SNAP
GH-S
DEFA



COUNTERSINKING

GH-K
COMP

BACK SPOTFACING

BSF
SOLO
GH-Z/E

DRILLING

VEX-P
VEX-S
COMBI

HEULE
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