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VERSION: JAN-2020-US-EN





2020 PRODUCT CATALOG



UNISIG Deep Hole Drilling Systems

Performance and value

More than machines

We stand behind our solutions

"No other company offers the full service like UNISIG - from machine, to process collaboration, through support."







Deep Hole Drilling

A deep hole is defined by its depth-to-diameter ratio (D:d) of typically 10:1 or greater, sometimes exceeding extreme depths of 400:1. Common CNC machining centers may be retrofitted to perform select deep hole drilling processes. However, this setup is limited in capabilities, requires more involved setup and risks a higher rejection rate.

UNISIG develops specialized drilling equipment, supported by years of experience designing specific machines, to solve specific needs in deep hole drilling applications. These systems, complete with advanced controls programming and precision components, are capable of accurate holes in deep hole drilling applications. Engineered components include durable tooling, which complete a machine.

Please reference page 34-35 for additional technical information.

AEROSPACE BTA or Gundrilling B-Series, USC, USK, UNI

AUTOMOTIVE BTA or Gundrilling UNI

DEFENSE BTA or Gundrilling B-Series, USC, USK, UNI





Common Industries Benefitting from Deep Hole Drilling

HYDRAULICS BTA, Gundrilling, Skiving S-Series, B-Series, USC, USK

JOB SHOPS Standardized Gundrilling UNE, USK

MEDICAL Gundrilling UNE6, UNI

MOLD BTA or Gundrilling USC-M, USK, UNI

> OIL & GAS BTA or Gundrilling B-Series, USC, USK, UNX

SPECIALIZED PRODUCTION BTA or Gundrilling UNE, UNI

STEEL PROCESSING BTA **B-Series**, USC

TUBE SHEETS AND ENERGY BTA or Gundrilling USC-TS, USK

LINICIC Machina Cuida

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UNE6 Small Diameter Gundrilling Machines

Medical manufacturers can maximize production by gundrilling on UNE6 machines after Swiss turning. With superior alignment and precision, you can confidently hold concentricity tolerances and minimize mismatch. UNISIG machines increase throughput and accuracy, and open up possibilities for the way

Simple 3-point leveling installation

- Flow-based coolant system
- UNISIG Smart Control Interface with program storage

UNE6

UNE6-2i

	1	2 inde	2 independent			
0.8 mm	0.03 in	0.8 mm	0.03 in			
6.0 mm	0.24 in	6.0 mm	0.24 in			
750 mm	30 in	250 or 750 mm	10 or 30 in			
20,00	0 rpm	20,000 rpm				
4,000) rpm	4,0	00 rpm			
24,00	0 rpm	24,0	000 rpm			
207 bar	3,000 psi	207 bar	3,000 psi			





UNE6 configurations offer single-spindle, or two independent spindle layouts, with optional robot ready or robotic automation, shown here





UNE series gundrilling machines are optimized to allow anyone to bring deep hole drilling into their machine shop. Standard machine models balance high-performance components and engineering with a lower overall investment, to make the UNE machines a reliable compliment to CNC machining cells.

STANDARD FEATURES

- High precision preloaded ballscrew feed
- Programmable coolant delivery
- Digital servo drives with absolute encoders

PERFORMANCE

- Number of spindles Drill diameter max Drill diameter max, single spin Drill diameter min
- Tool max speed
- Work max speed
- Rated workpiece designation of



UNE Gundrilling Machines

for Job Shop and Production Environments



- Cast iron headstock and chipbox components
- Cartridge spindles with premium quality bearings

- Process monitoring with automatic interrupt
- Part program storage with USB transfer
- Compact construction for quick installation
- Twin spindle machines have single spindle mode for extended drilling diameter range

	UNE	12-2	UNE	20-2	UN	E25	UNE	32-2	UN	E40	
		2	2	2		1		2		1	
	12 mm	0.5 in	20 mm	0.8 in	25 mm	1.0 in	32 mm	1.26 in	40 mm	1.57 in	
idle mode	19 mm	0.75 in	25 mm	1.0 in		-	40 mm	1.57 in		-	
	1.4 mm	0.06 in	2.0 mm	0.08 in	2.0 mm	0.08 in	3.0 mm	0.12 in	3.0 mm	0.12 in	
	12,000 RPM 8,000 RPM		8,000 RPM		6,000 RPM		6,000 RPM				
	900	RPM	600	600 RPM		600 RPM		400 RPM		400 RPM	
options	750 mm	29.5 in	750 mm	29.5 in	750 mm	29.5 in	1,000 mm	39.4 in	1,000 mm	39.4 in	
	1,000 mm	39.4 in	1,000 mm	39.4 in	1,000 mm	39.4 in	1,500 mm	59.1 in	1,500 mm	59.1 in	
	1,500 mm	59.1 in	1,500 mm	59.1 in	1,500 mm	59.1 in	2,000 mm	78.7 in	2,000 mm	78.7 in	
							3,000 mm	118.1 in	3,000 mm	118.1 in	

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UNI Production Drilling Machines

UNI series deep hole drilling machines are used in demanding high production or high accuracy applications. Modular construction allows build-to-order flexibility from standard components. Customization or specialized configurations are common and engineered for reliability.

UNISIG's experience with automation and tooling provides a full system with complete documentation and support.



Single spindle, single axis

Multiple spindle single axis

Tooling type Number of spindles Max drilling diameter Max counterbore diameter Drilling depths

for High-Volume and High-Accuracy Deep Hole Drilling

See following pages for examples of UNI machines.







CNC positioning, rotary motion and modular workholding are available for complex drilling operations in production



UN	I-6	UNI	-12	UNI	-20	UNI	-25	UNI	-38	UNI	-50
Gur	drill	Gun	drill	Gun	drill	Gundrill, B	TA option	Gundrill, B	TA option	BTA, Gund	rill option
1 t	o 4	1 to	0.4	1 to	o 4	1 to	o 4	1 to	o 4	1,	2
6 mm	0.25 in	12 mm	0.50 in	20 mm	0.80 in	25 mm	1.00 in	38 mm	1.50 in	50 mm	2.00 in
										65 mm	2.50 in
150 mm	6 in	500 mm	20 in	500 mm	20 in	750 mm	30 in	1,000 mm	40 in	1,000 mm	40 in
250 mm	10 in	750 mm	30 in	750 mm	30 in	1,000 mm	40 in	1,500 mm	60 in	1,500 mm	60 in
500 mm	20 in	1,000 mm	40 in	1,000 mm	40 in	1,500 mm	60 in	2,000 mm	80 in	2,000 mm	80 in
										3,000 mm	120 in

Specifications represent standardized program. Optional configurations and modifications of standards may be available upon application review. Contact UNISIG for more information.

UNI Machine Examples

UNI-6-150-4i



High-accuracy gundrilling of small parts with multiple off-center and angled holes from 0.8 mm to 6 mm [0.03 to 0.25 inch] diameter up to 150 mm [6.0 inch] deep.



UNI-6-150-4i SPECIFICATION

FEATURES

- Integral motor spindles for high-speed drilling
- Independent drilling modules for sequential or simultaneous operation
- Tray handling conveyor and robot to automate non-uniform workpiece transfer
- Very high dimensional accuracy of difficultto-drill holes
- Exceptional process reliability for critical, small-diameter deep holes



UNI-12-4-750-CR SPECIFICATIONS

Number of spindles

Drill depth shown

Tool spindle speed

Drill depths available

Minimum drilling diameter

Maximum drilling diameter

Tool spindle power (480V)

Work spindle power (480V)

FEATURES

4

12.000 rpm

2.000 rpm

3 mm

12 mm

750 mm

500 mm

750 mm

1.000 mm

2.2 kw

0.8 kw

0.12 in

0.50 in

30 in

20 in

30 in

40 in

3 hp

1 hp

- Counter-rotation for minimized centerline drift and high concentricity
- Programmable workpiece headstock position and clamping force
- Automatic loading system adjustable for workpiece length and diameter
- Compact construction for installation in a CNC machining cell or larger integrated drilling system

1	1	X	2	-	-
- Contra		-	1		I
18					
					1.54
					2
- 8	20		-	6	80

		Tool spindle power (480V)
		Tool spindle speed
		Work spindle power (480V)
		Work spindle speed

UNI-25BTA-4-750-CR SPECIF Number of spindles Drill depth shown Drill depths available

2	-	10 0 0 .	(. /
	م الم الم			
Ś	spinale	speed		

Minimum drilling diameter Maximum drilling diameter

Number of spindles			4		
Minimum drilling diameter	0.8	mm	0.03	in	
Maximum drilling diameter	6	mm	0.24	in	
Drill depth shown	150	mm	6	in	
Drill depths available	150	mm	6	in	
	250	mm	10	in	
	500	mm	20	in	
Tool spindle power (480V)	1.5	kw	2	hp	
Tool spindle speed	20,000 rpm				



UNI-12-4-750-CR



High-volume production gundrilling of shafts with very straight holes from 3 mm to 12 mm [0.12 to 0.50 inch] diameter up to 750 mm [30 inch] deep.







Powerful four-spindle machine for production BTA drilling of holes from 12 mm to 25 mm [0.47 to 1.0 inch] diameter up to 750 mm [30 inch] deep.

FEATURES

- Ultra-high feed rates using BTA tooling
- Hydraulic clamping chucks for increased driving torque with high-performance tools
- Servo driven loader for automatic workpiece diameter adjustment
- Cell-integrated, robot-ready design

UNI-50BTA-1500-CR



Versatile, high-precision machine for centerline bores up to 65mm [2.6 inch] dia and 1,500 mm [60 inch] deep in the toughest materials using gundrill and BTA tooling.



FEATURES

- Rapid changeover from BTA to Gundrill tooling
- Counter-rotation for minimized centerline drift
- High-precision zero endplay spindles for bottom forming operations
- Preloaded ballscrew drives for precise depth control
- Process monitoring and graphical display of critical information
- Automatic process interruption for unattended operation

ICATION	S						
			4				
	12	mm	0.47	in			
	25	mm	1.00	in			
	750	mm	30	in			
	750	mm	30	in			
	1,000	mm	40	in			
	1,500	mm	60	in			
	15	kw	19	hp			
		3,000 rpm					
	3.7	kw	5	hp			
		500) rpm				



UNI-50BTA-1500-CR SPECIFICATIONS								
Tooling type		Gund	rill and BTA					
Minimum drilling diameter	8	mm	0.31	in				
Maximum drilling diameter	50	mm	1.97	in				
Maximum counterbore diameter	65	mm	2.56	in				
Drill depth shown	1,500	mm	59	in				
Drill depths available	1,000	mm	40	in				
	1,500	mm	60	in				
	2,000	mm	80	in				
	3,000	mm	120	in				
Tool spindle power (480V)	28	kw	38	hp				
Tool spindle speed		3,0)00 rpm					
Work spindle power (480V)	20	kw	27	hp				
Work spindle speed	1.000 rpm							







B-Series BTA Drilling Machines < 800 mm Swing

UNISIG B-Series machines are built for high-power drilling in difficult materials. Standard models are available to address the range of flexible job shop use, as well as the expanded needs of specialty manufacturing. This precision machine series can be used for a first-roughing operation, or for creating the most complex bores to finish tolerances.



DIMENSION

Swing over bed Drilling depths - Ballscrew driv Drilling depths - Rack and pinic

PERFORMANCE

Max drilling diameter from sol Max drilling diameter from soli Maximum tool diameter

WORKPIECE HEADSTOCK (

Spindle nose Spindle bore Power, continuous S1 (400/480 Spindle speed range Headstock transmission WORKPIECE HEADSTOCK (Spindle nose

Spindle bore

TOOL HEADSTOCK Spindle nose Spindle bore

Power, continuous S1 (400/480

Spindle speed range Headstock transmission

COOLANT SYSTEM

Maximum programmable flow

ACCESSORY SPECIFICATION

Roller steady diameter capacit Roller steady diameter capacit

WORKPIECE WEIGHT

Between centers (1) Workpiece steady

(2) Workpiece steady

for On-Center Deep Hole Drilling of Cylindrical Workpieces

B380 B500 B600 B700

	380 mm	15.0 in	500 mm	19.7 in	600 mm	23.6 in	700 mm	27.6 in	
/e	1.5, 2, 3 m	5, 6, 10 ft	2, 3, 4, 6 m	6, 10, 13, 20 ft	2, 3, 4, 6 m	6, 10, 13, 20 ft	2, 3, 4, 6 m	6, 10, 13, 20 ft	
ion drive	-	-	8, 10 m and longer	26, 32 ft and longer	8, 10 m and longer	26, 32 ft and longer	8, 10 m and longer	26, 32 ft and longer	
id (Nickel Alloy)	65 mm	2.6 in	100 mm	4.0 in	125 mm	5.0 in	180 mm	7.0 in	
id (Carbon Steel)	80 mm	3.1 in	125 mm	5.0 in	150 mm	6.0 in	200 mm	8.0 in	
	100 mm	4.0 in	160 mm	6.3 in	200 mm	8.0 in	300 mm	12.0 in	
STANDARD)									
	ISO 70	2/1 A2-8	ISO 702	2/1 A2-8	ISO 702/	/1 A2-11	ISO 702	/1 A2-15	
	110 mm	4.3 in	92 mm	3.6 in	160 mm	6.3 in	215 mm	8.5 in	
0 VAC)	13/16 kW	17/22 hp	25/30 kW	34/40 hp	44/50 kW	59/67 hp	58/67 kW	78/90 hp	
	1-70	10 rpm	1-27	5 rpm	1-343 rpm (1-9	00 rpm option)	1-270 rpm (1-8	50 rpm option)	
	single r	eduction	single re	eduction	geared transmissic	on (2 range option)	geared transmissio	on (2 range option)	
LARGE BORE OPTI	ON)								
	-	-	ISO 702	/1 A2-15	ISO 702,	/1 A2-15	ISO 702	/1 A2-20	
	-	-	215 mm	8.5 in	215 mm	8.5 in	280 mm	11.0 in	
	ISO 70	2/1 A2-6	ISO 702	2/1 A2-8	ISO 702/	/1 A2-11	DIN 5502	27 size 15	
	60 mm	2.4 in	92 mm	3.6 in	128 mm	5.0 in	200 mm	7.9 in	
0 VAC)	31/34 kW	42/46 hp	58/67 kW	78/90 hp	58/67 kW	78/90 hp	85/94 kW	114/126 hp	
	1-1,8	00 rpm	1-1,00	0 rpm	1-1,00	0 rpm	1-900 rpm		
	single r	eduction	single re	eduction	geared transm	ission, 2 range	geared transm	nission, 2 range	
V	284 L/min	75 gpm	529 L/min	140 gpm	756 L/min	200 gpm	945 L/min	250 gpm	
N									
ty (1)	150 mm	5.9 in	260 mm	10.2 in	360 mm	14.2 in	500 mm	19.7 in	
ty (2)	200 mm	7.9 in	350 mm	13.8 in	475 mm	18.7 in	630 mm	25.0 in	
	1.0 t	2,210 lbs	3.0 t	6,620 lbs	3.0 t	6,620 lbs	4.5 t	9,920 lbs	
	1.5 t	3,310 lbs	4.0 t	8,820 lbs	4.0 t	8,820 lbs	6.8 t	14,990 lbs	
	2.0 t	4,410 lbs	5.0 t	11,030 lbs	5.0 t	11,030 lbs	9.0 t	19,850 lbs	





B-Series BTA Drilling Machines > 800 mm Swing

B-Series machines with over 800 mm swing are designed to handle the largest bores and heaviest parts, while holding the close tolerances UNISIG built its reputation on.

Incredible power and torque are delivered through a modern powertrain. UNISIG builds these machines to take advantage of the latest CNC motion control technologies, while simplifying mechanical systems for improved performance and reliability.

DIMENSIONS

Swing over bed Swing over optional gap Drilling depths

PERFORMANCE

Max solid drill diameter (Nicke Max solid drill diameter (Carbor Max tool diameter (1) high load Max tool diameter (2) large bo

WORKPIECE HEADSTOCK

Spindle nose Spindle bore Power, continuous S1 (400/480 Spindle speed range Headstock transmission

TOOL HEADSTOCK

Spindle nose Spindle bore Power, continuous S1 (400/480

Spindle speed range

Headstock transmission WORKPIECE WEIGHT

Between centers (1) workpiece steady (2) workpiece steady

(3) workpiece steady



for On-Center Deep Hole Drilling of Cylindrical Workpieces



	B850		B1	B1000		200	B1	600	B2000	
	850 mm	33.5 in	1,000 mm	39.4 in	1,200 mm	47.2 in	1,600 mm	63.0 in	2,000 mm	/8./ in
	2,000 mm	78.7 in	2,200 mm	86.6 in	2,400 mm	94.5 in	2,800 mm	110.2 in	3,200 mm	126.0 in
	2 -10 m and longer	6 - 32 ft and longer	2 - 10 m and longer	6 - 32 ft and longer	2 -10 m and longer	6 - 32 ft and longer	2 -10 m and longer	6 - 32 ft and longer	2 - 10 m and longer	6 - 32 ft and longer
Alloy)	180 mm	7.1 in	220 mm	9.0 in	300 mm	11.8 in	400 mm	15.7 in	400 mm	15.7 in
n Steel)	220 mm	8.7 in	255 mm	10.0 in	350 mm	13.8 in	500 mm	19.7 in	500 mm	19.7 in
d PH	254 mm	10.0 in	400 mm	15.7 in	400 mm	15.7 in	550 mm	21.7 in	550 mm	21.7 in
re PH	320 mm	12.6 in	460 mm	18.1 in	500 mm	19.7 in	630 mm	24.8 in	630 mm	24.8 in
	ISO 702/1 A2-15		ISO 702/1 A2-15		ISO 702/1 A2-20		ISO 702/1 A2-20		ISO 702/1 A2-28	
	160 mm	6.3 in	200 mm	7.9 in	250 mm	9.8 in	250 mm	9.8 in	250 mm	9.8 in
VAC)	95/124 kW	127/166 hp	130/153 kW	174/205 hp	130/153 kW	174/205 hp	150/175 kW	200/235 hp	150/175 kW	200/235 hp
	1-70) rpm	1-500 rpm		1 - 500 rpm		1 - 483 rpm		1 - 36	i3 rpm
	3 ranges,	automatic	3 ranges, automatic		4 ranges, automatic		4 ranges, automatic		4 ranges, automatic	
	<u> </u>				•		•		•	
	DIN 5502	27 size 15	DIN 5502	27 size 15	DIN 55027 size 15		DIN 55027 size 20		DIN 55027 size 20	
	160 mm	6.3 in	200 mm	7.9 in	200 mm	7.9 in	250 mm	9.8 in	250 mm	9.8 in
) VAC)	95/124 kW	127/166 hp	130/153 kW	174/205 hp	130/153 kW	174/205 hp	150/175 kW	200/235 hp	150/175 kW	200/235 hp
	1-90) rpm	1-700) rpm	1 - 75	0 rpm	1 - 50	0 rpm	1 - 50	0 rpm
	3 ranges,	automatic	3 ranges,	automatic	4 ranges,	automatic	4 ranges,	automatic	4 ranges,	automatic
					•		•	•	•	
	5.5 t	12,130 lbs	6.0 t	13,230 lbs	8.0 t	17,640 lbs	15.0 t	33,080 lbs	20.0 t	44,100 lbs
	6.8 t	14,990 lbs	8.0 t	17,640 lbs	14.0 t	30,870 lbs	30.0 t	66,150 lbs	40.0 t	88,200 lbs
	9.0 t	19,850 lbs	10.0 t	22,050 lbs	22.0 t	48,510 lbs	40.0 t	88,200 lbs	50.0 t	110,250 lbs
	10.0 t	22,050 lbs	12.0 t	26,460 lbs	30.0 t	66,150 lbs	50.0 t	110,250 lbs	60.0 t	132,300 lbs







S-Series Skiving and Roller Burnishing Machines for Hydraulic Cylinder Manufacturing and Tube Finishing

Skiving and roller burnishing is an extremely productive method for manufacturing hydraulic cylinders. UNISIG S-Series machines are engineered to maximize tooling performance and give the operator precise



- Quick changeover between workpieces and tools
- Use for high production and job shop applications

PROCESS CONTROL

- Programmable coolant flow and maximum pressures
- Servo positioned workpiece length setup
- Torque and thrust monitoring with trip points
- Part program storage for all process data

DESIGN

- Robust coolant filtration and temperature controls
- High powered spindles for greatest productivity
- Standardized workholding and tool connections



UNISIG SB100-2

Vertical skive burnish system with robotic automation for high volume production of hydraulic cylinders

	S5	00	S600		S700		
	500 mm	19.7 in	600 mm	23.6 in	700 mm	27.6 in	
ve	2, 3, 4, or 6 m	6, 10, 13, or 20 ft	2, 3, 4, or 6 m	6, 10, 13, or 20 ft	2, 3, 4, or 6 m	6, 10, 13, or 20 ft	
ion drive	8, 10 m and longer	26, 32 ft and longer	8, 10 m and longer	26, 32 ft and longer	8, 10 m and longer	26, 32 ft and longer	
diameter	140 mm	5.5 in	203 mm	8.0 in	305 mm	12.0 in	
	ISO 702	2/1 A2-6	ISO 702	2/1 A2-8	ISO 702	2/1 A2-11	
80 VAC)	50/67 kW	67/90 hp	85/94 kW	114/126 hp	95/124 kW	127/166 hp	
	1,500) rpm	1,500) rpm	1,20	0 rpm	
	single re	eduction	3 ranges, auto	matic selection	3 ranges, auto	matic selection	
	·		·		<u> </u>		
N	529 L/min	140 gpm	756 L/min	200 gpm	1,134 L/min	300 gpm	
							•



Actual results from UNISIG skiving and roller burnishing machine





USK Series CNC Drilling Machines for High-Accuracy Off-Center Drilling

USK machines gundrill deep holes in workpieces using a CNC programmable table for off-center positioning. These machines have a compact footprint to conserve floor space.

Single and twin spindle machines are available for job shop and production use. UNISIG USK machines have a versatile operating range and are designed to drill deep holes in the toughest materials.

FEATURES

DIMENSION

- Simple operation with CNC flexibility
- Heavy duty, precision workpiece table
- Standard drilling headstock enclosure
- Programmable coolant system



USK12-2	USK20-2	USK25	USK40
115K12-2	115K20-2	LICK25	LICK 10

DIMENSION								
Tooling type	Gun	Gundrill		Gundrill		drill	Gundrill	
Number of spindles	2	2		2			1	
Drilling diameter max	12 mm	0.5 in	20 mm	0.8 in	25 mm	1.0 in	40 mm	1.57 in
Drilling diameter max single spindle mode	-		25 mm	1.0 in	-		-	
Rated drill depths	750 mm	29.5 in	1,000 mm	39.4 in	1,000 mm	39.4 in	1,000 mm	39.4 in
	1,000 mm	39.4 in	1,500 mm	59.1 in	1,500 mm	59.1 in	1,500 mm	59.1 in
Table top dimensions	1,000 x 1,000 mm	39.4 x 39.4 in	1,000 x 1,000 mm	39.4 x 39.4 in	1,000 x 1,000 mm	39.4 x 39.4 in	1,000 x 1,000 mm	39.4 x 39.4 in
Table capacity	1,000 kg	2,205 lbs						
X-travel (horizontal)	500 mm	20.0 in						
Y-travel (vertical)	350 mm	14.0 in						





UNX Series Off-Center Drilling Machines for Extreme Depth Drilling

The UNX machines meet the challenge of off-center holes with extreme depth-to-diameter ratios. These machines automatically drill deep holes in long, heavy workpieces without a loss of accuracy.

UNISIG process monitoring and controls technology work in conjunction with a precision machine structure enabling users to confidently tackle problematic drilling applications every day.



UNX20 UNX25 UNX40 UNX50 Gundrill Gundrill Gundrill Gundrill/BTA 20 mm 0.79 in 25 mm 1.00 in 40 mm 1.57 in 50 mm 2.0 in 65 mm 2.6 in -Cartesian + Polar [CP] Cartesian [C] or Polar [P] Polar [P] Polar [P] 1,500 mm 59 in 1,500 mm [C] 59 in 1,500 mm 59 in 1,500 mm 59 in 79 in 2,000 mm [P] 79 in 2,000 mm 2,000 mm 79 in 3,000 mm [P] 118 in 3,000 mm 118 in 3,000 mm 118 in 2.000 mm 2.000 mm 2.000 mm 79 in 2.000 mm 79 in 79 in 79 in 3,000 mm 118 in 3,000 mm 118 in 3,000 mm 118 in 3,000 mm 118 in 158 in 4,000 mm 158 in 4,000 mm 158 in 158 in 4,000 mm 4,000 mm 6,000 mm 236 in 6,000 mm 236 in 6,000 mm 236 in 6,000 mm 236 in 394 in 394 in 10,000 mm 394 in 10,000 mm 10,000 mm 10,000 mm 394 in

Polar UNX-P

Cartesian + Polar UNX-CP

OFF-CENTER DRILLING

Cartesian positioning **[C]** maintains a stationary workpiece and moves the drilling headstock in the X and Y axis.

Polar positioning **[P]** rotates a cylindrical part on its axis, with an X-axis to position the drilling headstock distance from center.

Cartesian and Polar positioning **[CP]** are combined with advanced motion control to achieve the highest accuracy in small diameter, extreme depth drilling.



		U	SC75		USC100			
DIMENSIONS								
BTA drilling diameter	75	mm	3	in	102	mm	4	in
BTA counterbore diameter	108	mm	4.3	in	165	mm	6.5	in
Drilling spindle power	50	kW	67	hp	67	kW	90	hp
Nominal drilling depth	2,000	mm	78.7	in	2,800	mm	110.2	in
X-axis travel	2,000	mm	78.7	in	3,000	mm	118.1	in
Y-axis travel	1,500	mm	59.1	in	1,500	mm	59.1	in
Table top dimensions (X x Z)	2,000 x 1,500 mm 3,000				3,000 x 2,0	x 2,000 mm		
	78.7 x 59.1 in 118.1 x 78.7 in				78.7 in			
Table capacity	15,000	kg	16.5	ton	25,000	kg	27.6	ton

USC Deep Hole Drilling Machines For Drilling Off-Center Holes in Large Workpieces



PERFORMANCE

- Massive structure for accuracy and durability
- Large dimension off-center drilling capability
- BTA system tool for high metal removal rates
- Designed for difficult-to-machine materials



DIMENSIONS

Gundrilling diameter
BTA drilling diameter
Number of spindles
Nominal drilling depth
X-axis travel (various optio
Y-axis travel (various optio

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USC-TS Deep Hole Drilling Machines For Drilling Heat Exchanger Tube Sheets





USC-TS32

USC-TS65

	8-32 mm 0.3-1.26 in	8 - 50 mm 0.3 - 2.0 in	
	12.7 - 32 mm 0.5 - 1.26 in	12.7 - 50 mm 0.5 - 2.0 in	12.7 - 65 mm 0.5 - 2.6 in
	2, 3 or 5	2, 3 or 5	2 or 3
	750 mm 30 in	1,000 mm 40 in	1,000 mm 40 in
s)	3-10 m 10-32.8 ft	3 -10 m 10 - 32.8 ft	3 - 10 m 10 - 32.8 ft
5)	2.5 - 5 m 8 - 16.4 ft	2.5 -5 m 8 - 16.4 ft	2.5 - 5 m 8 - 16.4 ft

USC-TS50

PERFORMANCE

- CNC programmable centerline pitch
- Completely independent control of individual drilling spindles
- Programmable cutting fluid delivery by spindle
- Safety interlocks for automatic process interruption
- Chip discharge designed for unbroken strings
- Reliable BTA drilling system in small diameter holes

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USC-M Milling and Drilling Machines for Mold Manufacturing

PERFORMANCE Spindle Type Nominal drilling depth

THREE MODEL FAMILIES TO MEET THE NEEDS OF THE MOLD INDUSTRY

Universal Spindle for Machining and Gundrilling | Above-Floor Installation

USC-2M-BTA | USC-3M-BTA Dedicated Spindle for Machining | Additional Spindle for BTA/Gundrilling | Above-Floor Installation

Dedicated Geared Spindle for Machining | Additional Spindle for BTA/Gundrilling | Below-Floor Installation



USC-2M USC-2M-BTA USC-3M-BTA **USC-M38** USC-M50 USC-3M

Spindle Type	Unive	ersal	Unive	ersal	Dedic	ated	Dedicated		Dedicated		Dedica	Dedicated	
Nominal drilling depth	1,500 mm	59.1 in	1,800 mm	70.9 in	1,650 mm	65.0 in	1,650 mm	65.0 in	1,500 mm	59.1 in	1,830 mm	72.0 in	
Gundrilling diameter	50 mm	2.00 in	50 mm	2.00 in	50 mm	2.00 in	50 mm	2.0 in	50 mm	2.00 in	50 mm	2.00 in	
BTA drilling diameter					38 mm	1.50 in	38 mm	1.50 in	38 mm	1.50 in	50 mm	2.00 in	
TRAVELS			· · · · ·				· · · · · · · · · · · · · · · · · · ·		· · · · ·		· · · · · · · · · · · · · · · · · · ·		
X-axis (horizontal)	2,100 mm	82.7 in	3,100 mm	122.0 in	2,100 mm	82.7 in	3,100 mm	122.0 in	2,200 mm	86.6 in	3,100 mm	122.0 in	
Y-axis (vertical)	1,500 mm	59.1 in	1,750 mm	68.9 in	1,500 mm	59.1 in	1,750 mm	68.9 in	1,700 mm	66.9 in	2,500 mm	98.4 in	
Z-axis (horizontal)	850 mm	33.5 in	1,300 mm	51.2 in	850 mm	33.5 in	1,300 mm	51.2 in	1,000 mm	39.4 in	1,550 mm	61.0 in	
A-axis (inclination)	+30 °,	-15°	+30 °,	-15°	+30 °,	-15°	+30 °,	-15 °	+30 °,	-15 °	+30 °, ·	20 °	
B-axis (rotary table)	360,000 p	ositions	360,000 p	ositions	360,000 p	ositions	360,000 p	ositions	360,000 p	ositions	360,000 p	ositions	
Drilling or Universal spindle	2,300 mm	90.6 in	2,700 mm	106.3 in	2,000 mm	78.7 in	2,000 mm	78.7 in	1,830 mm	72.0 in	2,450 mm	96.5 in	
Machining spindle	-		-		500 mm	19.7 in	500 mm	19.7 in	500 mm	19.7 in	500 mm	19.7 in	
TABLE													
Top surface	1,250 x 1,600 mm	49.2 x 63.0 in	1,600 x 2,000 mm	63.0 x 78.7 in	1,250 x 1,600 mm	49.2 x 63.0 in	1,600 x 2,000 mm	63.0 x 78.7 in	1,000 x 1,200 mm	39.4 x 47.2 in	1,250 x 1,600 mm	49.2 x 63.0 in	
Weight capacity	20 t	44,100 lbs	30 t	66,615 lbs	20 t	44,100 lbs	30 t	66,615 lbs	15 t	33,069 lbs	23 t	50,715 lbs	
MACHINING SPINDLE													
Spindle nose	SK 50 / 0	CAT 50	SK 50 / 0	CAT 50	SK 50 / CAT 50		SK 50 / 0	SK 50 / CAT 50		SK 50 / CAT 50		SK 50 / CAT 50	
Maximum speed	4,500	rpm	4,500	rpm	4,500	rpm	4,500	rpm	4,000 rpm (2-ra	ange, geared)	4,000 rpm (2-range, geared)		
Power (480V S1 100% / S6 60%)	24 kW / 30 kW	32 hp / 40 hp	24 kW / 30 kW	32 hp / 40 hp	20 kW / 25 kW	27 hp / 34 hp	20 kW / 25 kW	27 hp / 34 hp	20 kW / 25 kW	27 hp / 34 hp	24 kW / 30 kW	32 hp / 40 hp	
DRILLING SPINDLE													
Spindle nose					DH	D	DH	D	DH	D	DHI)	
Maximum speed					4,500	rpm	4,500	rpm	5,000	rpm	5,000 ו	pm	
Power (S1 100% / S6 60%)					15 kW / 20 kW	20 hp / 27 hp	15 kW / 20 kW	20 hp / 27 hp	15 kW / 20 kW	20 hp / 27 hp	24 kW / 30 kW	32 hp / 40 hp	
TOOL CHANGER													
Automatic tool changer	60 pos	sition	60 pos	ition	40 pos	sition	40 pos	ition	120 ро	sition	120 pos	ition	
CONTROLS													
CNC	Heidenhain T	NC 640 CNC	Heidenhain T	NC 640 CNC	Heidenhain Tl	Heidenhain TNC 640 CNC		Heidenhain TNC 640 CNC		Heidenhain TNC 640 CNC		Heidenhain TNC 640 CNC	

Custom Machines are Standard

UNISIG takes a modular approach to machine design, allowing us to offer customized solutions when one of our many standard machines does not match our customers' unique applications.

Most custom machines start with components and design concepts from our library of standard machines, reducing costs, lead times and ensuring reliability.

Every custom-built UNISIG machine has a solid engineering basis and carries the same quality standards and long-term spare parts and service commitment as our standard models.

Certain industries require extreme deep hole drilling applications or machining processes. UNISIG has the experience to understand the theoretical limits of tooling and machines, maximizing their useful range for production.



UNISIG

UNISIG B700 BTA machine with drop bed to swing up to 63 in [1600 mm] for commercial landing gear



UNISIG UNI-Series automated machine for high volume production cell to manufacture power train components



UNISIG USC BTA drilling machine with 50-taper milling spindle and special capacity table

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Extended Range Machines

UNISIG S-Series skiving and roller burnishing machine, used to produce precision bores up to 42 ft [13 meters] deep



Deep Hole Drilling Automation



Automation

UNISIG routinely provides automation for gundrilling and BTA deep hole drilling systems. Automation can be machinemounted or used to combine multiple machines or operations.

To achieve the levels of reliability demanded in these applications, expertise and attention must be given to both design and implementation.

When automation is required, our design engineering staff will develop the most simple and effective approach.









Automation Examples











Pneumatically driven pick-and-place units are economical devices used to service one or more spindles. Odd-form parts can be handled and placed into fixtures for complex drilling operations.

MAGAZINE LOADERS

Small, uniform size components can be quickly transferred through the drilling operation with minimal increase in floor space.

WALKING BEAM SHAFT LOADER

Shafts are frequently handled with walking beam automation to productively service multiple spindles. The part-staging process can occur simultaneously with the drilling operation for maximum productivity.

PROGRAMMABLE SHAFT LOADER

Intelligent shaft loading systems allow multiple parts to be transferred simultaneously, but with added capabilities to single out parts for secondary operations, skip spindles and service bulk-feed systems.

HEAVY PART LOADERS

Automation does not have to be limited to small components. Automation of large or heavy workpieces is possible with the proper plan and budget.













SERVO DRIVEN GANTRY

Complex production drilling systems often have multiple stations and various load and unload points. Overhead servo driven gantry systems offer flexible programming options combined with high-speed and large service envelopes. Inspection stations and reject points are also possible.

ROBOTIC AUTOMATION

Robots offer the ultimate in automation flexibility. Uniquelyshaped parts with multiple operations required are common applications. Inspection and rejection stations are easily added to a robotic tended machine, along with secondary operations.

ROBOT-READY MACHINES

UNISIG machines are available as robot-ready, allowing them to be serviced by automation already in place or planned for the future. This option typically includes automatic doors, safety relays, internal part seated sensing and intelligent or discrete handshaking with factory automation.

CONVEYOR-FED & PALLET AUTOMATION

Conveyor systems bring parts to and from the machine. Sometimes used to queue odd shaped components, they are a simple option to extend the value of an automation investment. Flexible automation can take advantage of pallet systems and conveyors to improve part transfer throughout the facility.

BULK FEEDERS

Bulk feeders allow many parts to be loaded into a device which presents parts to an unattended machine. They can also include sorting and orientation features which further reduce manual intervention.





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Machine Controls

Machine controls are vitally important, as they are the interface between the user and machine. Control systems must be capable of both error-free motion control and ease of operator use. UNISIG integrates an array of proven controls with each system, programmed for individual customer and machining requirements.

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UNISIG

UNISIG provides a PLC based machine control for non-CNC applications. This control has been developed through customer feedback emphasizing their need for ease of use without sacrificing capability.

A color touchscreen interface allows guick setup and intuitive operation. Process monitoring with set points for automatic interruption provides worry-free drilling. Manual control with override during the first cycle provides a method to "learn" the part or material with infinite variability, to get the perfect chip.

Unlike a proprietary PC-based control system, the UNISIG PLC based control is built on industrial grade SIEMENS components. High-performance motion controllers, digital drives and harsh environment motors are used for reliability.



SIEMENS

- SINUMERIK 840D CNCs from Siemens offer a scalable solution for the most complex machines.
- Multiple channels, industrial networking, advanced synchronous motion, and open programming options allow the machine, tool, and process control to interact in real time.
- UNISIG takes advantage of this capability to make the most difficult machining applications possible in any shop.



FANUC

- FANUC is legendary for its reliability, with lifetime parts and maintenance support
- UNISIG standard applications use the feature rich and robust FANUC Oi Control, with more advanced machines leveraging the 30i-Series CNC power.
- All UNISIG machines equipped with a FANUC CNC also use FANUC digital servo systems.

HEIDENHAIN

- The iTNC 640 CNC from Heidenhain is particularly suited to 5-axis machining and shop floor programming.
- On-machine programming of tilted work planes, geometry import, and complex surface contouring are possible.
- Heidenhain feedback devices such as linear and angular encoders are frequently incorporated into UNISIG machines.



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UNISIG

CONTROLS FOR PRODUCTION

- Multiple-spindle, highly automated systems require a custom control architecture and interface.
- UNISIG bases these machine controls on standard modules, then provides comprehensive process monitoring, setup, and diagnostic screens.
- This allows very high machine utilization and simplified preventative maintenance tasks.

UNISIG Machine Controls are Standardized for Compliance by Country

USA - Compliance with NFPA 79 standards of construction for machine tools and industrial equipment and National Electric Code (460 VAC, 3-phase, 60Hz)

CANADA - Compliance with CSA standards of construction relevant to machine tools and industrial equipment (460 VAC, 3-phase, 60Hz)

MEXICO - USA standards with regional adaptation to meet NOM requirements (460 VAC, 3-phase, 60Hz)

EUROPEAN UNION - Control systems designed to comply with applicable CE directives (400 VAC, 3-phase, 50Hz)

ASIA - Compliance with IEC standards and regulations by regional authority relevant to machine tools and industrial equipment will be followed.

MACHINE AND OPTIONS

1.01	Machine Base
1.02	Tool Headstock
1.03	Workpiece Headstock
1.04	Coolant Inducer
1.05	Electrical Cabinet
1.06	Operators Interface
1.07	Signal Tower

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Gundrill Machine Component Identification



C00	LANT SYSTEM AND CHIP REMOVAL		ACCESSORIES AND TOOLING	WORKHOLDING			
2.01	Chip Box	3.01	Tool Holders	4.01	Clamping Cones		
2.02	Coolant Reservoir	3.02	Collet and Seal	4.02	Chucks		
2.03	High Pressure Coolant Pumps	3.03	Whip Guide Carriage	4.03	Collets		
2.04	Coolant Filter	3.04	Whip Guide Adapters	4.04	Locating Vees		
2.05	Coolant Chiller or Heat Exchanger	3.05	Drill Bushing Holders				
2.06	Chip Basket	3.06	Drill Bushings				
2.07	Chip Conveyor						

Gundrill Durable Tooling

Gundrill presetting

screw and seal



Gundrill drivers and collets



Gundrill Driver Extension





Whip guide adapters

Whip guide inserts





Gundrill bushing holder

Gundrill bushing insert



workholding

Collet - workholding



Workholding chucks



Special fixtures

Request additional gundrill tooling information and size availability at www.unisig.com

BTA Drilling Machine Component Identification



MACHINE AND OPTIONS		COOLANT SYSTEM		CHIP REMOVAL		ACCESSORIES		TOOLING		WORKHOLDING	
1.01	Machine Base	2.01	Filtered Coolant Reservoir	3.01	Chip Discharge, Rear	4.01	Pressure Head	5.01	Master Bushing System	6.01	Pressure Head Chuck
1.02	Tool Headstock	2.02	Unfiltered Coolant Reservoir	3.02	Chip Discharge, Forward	4.02	Pressure Head Mounting Reducer	5.02	Drill Bushings	6.02	Workpiece Chuck, Manual
1.03	Workpiece Headstock	2.03	High Pressure Coolant Pumps	3.03	Chip Conveyor	4.03	Vibration Dampener Carriage	5.03	Packing Gland	6.03	Workpiece Chuck, Automatic
1.04	Pressure Head Carriage	2.04	Coolant Filter System	3.04	Chip Baskets	4.04	Vibration Dampener Cartridge	5.04	Packing Gland Mounting Reducer	6.04	Offset Jaw Sets
1.05	Electrical Cabinet	2.05	Coolant Return Trough	3.05	Chip Crusher/Wringer	4.05	Vibration Dampener Mounting Reducer	5.05	Drill Tube	6.05	Clamping Cones
1.06	Operators Interface	2.06	Coolant Refrigerant Chiller			4.06	Rotary Union and Hydraulic Circuit for Skiving	5.06	Thread Adapter	6.06	Breakthrough Seal
1.07	Remote Operators Interface	2.07	Coolant Oil-Water Heat Exchanger			4.07	Servo Driven Actuator for Bottle Boring Tools	5.07	Vibration Dampener Collet	6.07	Lantern For Pull Boring
1.08	Hydraulic Power Unit							5.08	Tube Clamp Spindle Adapter	6.08	Workpiece Steady Rest, Manual
1.09	Electrical Cabinet Air Conditioner							5.09	Tube Clamp Insert and Seal	6.09	Workpiece Steady Rest, Automatic

BTA Durable Tooling and Machine Accessories

UNISIG durable tooling and accessories are engineered to integrate into the machine and provide stability and support, as well as contribute to the overall accuracy of finished holes. These components are engineered and produced

BTA drill tube clamps connect

the machine spindle nose to the drill tube and transmit drilling power. Reducers allow multiple drill sizes per tube clamp range.



BTA master bushing systems mount to the pressure head chuck, enabling a cost-effective solution that fits a range of sizes of perishable bushings.





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DURABLE TOOLING AND ACCESSORIES

by UNISIG to maximize fit between the drilling tools and the machine. Parts are chosen based on the diameter of the hole and length of the machine.

Packing glands provide a

fluid seal for the drill tube as it

enters the pressure head. These

assemblies also guide the drill

tube for straight and accurate

drilling.







Vibration dampeners allow rotating drill tubes to be guided while dampening vibrations, resulting in a better finish and predictable tool life.



Workpiece support accessories are adjustable to hold longer workpieces for stability during setup, and accuracy during drilling, for the straightest holes possible.



Lantern chucks allow a pull boring tool to be easily installed and aligned during the drilling process, without requiring a special pilot hole machined in the part.



Pressure heads locate the workpiece, guide the drill, and introduce cutting fluid to the operation. The pressure head is a critical component in an accurate BTA process.



Breakthrough seal systems provide a clean return path for cutting fluid and chips when drilling holes through a workpiece.



Please request your complete tooling catalog online at www.unisig.com







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Deep Hole Definition



- HOLE DEPTH : DIAMETER (D:d) 5:1 Common twist drills
- 10:1 High performance twist drills with through-tool coolant
- 20:1 Special deep hole drilling tools with through-tool coolant
- 100:1 Deep hole drilling tools on dedicated deep hole
- drilling machines 200:1 Gundrilling tools on high performance gundrilling machines 400:1 Extreme drilling range, proprietary processes and

equipment required

Drilling Process



1. ROTATING TOOL - Typically used for non-symmetrical components, or off-center hole requirements

2. ROTATING WORKPIECE - Used for round parts with a deep on-center hole, and allows for a reduction in drill drift.

3. COUNTER-ROTATING TOOL AND WORKPIECE - Used for round parts with a deep on-center hole, provides the best hole straightness and concentricity.

Deep Hole Drilling Systems



BTA External Coolant Delivery Internal Chip Exhaust



Deep hole drilling is accomplished productively using a variety of different tools, determined by finished tolerance objectives and starting condition of parts.

In addition to the machine dimensions, power and dynamics, compatibility of these tools with various machines is primarily determined by the fluid delivery and chip exhaust systems. The two most common deep hole drilling systems are gundrilling and BTA.

Innovations by tooling manufacturers have caused machines to require an array of specialized options to support various fluid delivery and discharge strategies.

UNISIG will provide application advice after reviewing part drawings, tolerance requirements and production volume. Feed and speed recommendations are made by UNISIG based on reputable tooling manufacturer's technical data and our experience drilling many varieties of standard and exotic materials.

Deep Hole Drilling Methods

UNDRILLING

Internal coolant



BTA DRILLING

External coolant

· High-pressure coolant is introduced through the space between the finish and the outside of the tool

Chips are discharged through the tool center and machine spindle

· Compared to gundrilling, BTA method provides higher penetration rates [3-5 times faster] and has higher power requirements

Brazed disposable and indexable tools are available



Internal and external coolant

· High-pressure coolant is introduced through the space between the inner outer tubes

 Chips are discharged through the inside diameter of the inner tube and exhausted through an adapter mounted to the front of the machining spi

 Typically used to retrofit lathes or machining centers for deep hole drilling · Chip evacuation is not as efficient as a BTA system, due to smaller area for and fluid discharge

· Limited depth to diameter ratio compared to BTA system

Ejector 20 - 200 mm

[0.79 – 7.87 in]



DDITIONAL TOOLS FOR USE ON BTA MACHINES

ol center ol body	PUSH- COUNTER BORING/ REAMING 20 - 630 mm [0.79 – 24.8 in] External coolant	Counterboring enlarges an existing hole that is Push configuration tools pilot off a finished bore can also be designed to pilot off the pre-bore (concentricity requirements Multi-cutter counterbore tools are available for I Reaming performs the same operations as coun geometry are used
	PULL BORING 20 - 630 mm [0.79 - 24.8 in] External coolant	 A special configuration of counterboring, in wh through the workpiece The boring bar is in tension rather than compre Can be used to straighten a hole with tools desi off the finished hole Can also be designed for maintaining uniform v Multi-cutter pull boring tools are commonly us A lantern chuck may be used to align a guide bit
	TREPANNING 20 - 500 mm [0.79 – 20.0 in] <i>External coolant</i>	Process performed on blank material without a the hole, rather than removing the entire mach Consumes less power than solid drilling, for the Trepanning in blind hole applications may not b
hed hole	BOTTOM FORMING 20 - 500 mm [0.79 – 20.0 in] <i>External coolant</i>	Bottom forming is essentially a form tooling ope After deep hole drilling, the drawing may requir Bottom forming tools are guided with wear pad designs depending on customer needs Radius, steps, and flat bottom forms are common
	SKIVING AND ROLLER BURNISHING 20 - 500 mm [0.79 - 20.0 in] External coolant	 A skiving tool can be visualized as a modified flo and roundness tolerances are required Used for rapid stock removal with high penetrat A burnishing operation cold works the surface of surface, plasticizing the material's top layer, con In deep hole applications, skiving knives and bu the operation in one pass
_	BOTTLE BORING Special application External coolant	Bottle boring is also knows as internal profiling of The boring tool is extended and retracted to pro The internal profile is then bigger within the par CNC is used to coordinate multiple axes simulta Bottle boring tools are typically produced to pro
r and bindle chips	TUBE FINISHING LARGE DIAMETER COUNTERBORE 300 - 1200 mm [12.0 - 4 8.0 in] Internal coolant	 Tube finishing for extremely large diameters req This process can be visualized as a push counter supply, and BTA type indexable tooling Extreme diameters need extreme amounts of co- induction and exhaust strategy

The tooling application ranges above are generalized and will vary by tooling manufacturers

The tooling application ranges above are generalized and will vary by tooling manufacturers

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0.0038 0.0098 0.0157 15.7480 0.0016 0.0025 0.0061 The tolerances provided are estimates, commonly quoted by tool manufacturers for applications with depth to diameter ratio up to 100:1 and under optimal conditions. As with any machining process, achieved www.unisig.com tolerances depend on several factors; process parameters, workpiece condition or dimensions, tool geometry, desired trade-offs between productivity and tool life, cutting oil, etc. Individual results may vary.

0.0075

0.0087

0.0114

0.0142

Applications and Tolerances

I	APPLICATION	OBJECTIVE
	Solid drilling	Large stock removal.
	Counter-boring/ Reaming	Large stock removal; may be used for finishing operations
	Trepanning	Large stock removal at lower horsepower; core-slug left after the operation is reusable
	Pull counter boring	Straighten the hole or achieve uniform wall thickness
	Skiving	Create a geometrically true round hole
Ī	Roller burnishing	Create a mirror-surface finish or impart desired surface qualities
	Skive-burnishing	Increase productivity compared to individual skiving+ burnishing applications
	Honing	Eliminate the residual stress layer left by machining process and control the hole diameter

DDOCECC	CONFIGURATION	HOLE SIZE	HOLE STRAIGHTNESS		SURFACE FINISH	
PROCESS				(mm/meter)	µ-inch Ra	
ndrilling	Tool rotate- Work rotate	IT6-IT11	0.001-0.004	0.08-0.33	8-248	0.2-6.3
	Tool stationary- Work rotate	influenced	0.002-0.006	0.16-0.5		
	Tool rotate- Work stationary	material)	0.012	1.00		
\ blid drilling epanning	Tool rotate – Work rotate		0.001-0.003	0.08-0.25	60-125	1.5-3.2
	Tool stationary – Work rotate	IT8-IT10	0.003-0.005	0.25-0.42		
ounter-boring	Tool rotate – Work stationary		0.012	1.00		
l boring	Tool rotate- Work rotate	IT7-IT9	0.001	0.08	32-125	1.5-3.2
ve-burnishing	Tool rotate- Work stationary	IT8-IT9	as received	as received	< 8.0	< 0.2

	DIAMETE	R RANGE	IT6	IT7	IT8	IT9	IT10	IT11
	over	incl	tolerance - millimeters					
	0	3	0.006	0.010	0.014	0.025	0.040	0.060
	3	6	0.008	0.012	0.018	0.030	0.048	0.075
	б	10	0.009	0.015	0.022	0.036	0.058	0.090
	10	18	0.011	0.018	0.027	0.043	0.070	0.110
	18	30	0.013	0.021	0.033	0.052	0.084	0.130
	30	50	0.016	0.025	0.039	0.062	0.100	0.160
	50	80	0.019	0.030	0.046	0.074	0.120	0.190
	80	120	0.022	0.035	0.054	0.087	0.140	0.220
	120	180	0.025	0.040	0.063	0.100	0.160	0.250
	180	250	0.029	0.046	0.072	0.115	0.185	0.290
	250	315	0.032	0.052	0.081	0.130	0.210	0.320
	315	400	0.036	0.057	0.089	0.140	0.230	0.360
	400	500	0.040	0.063	0.097	0.155	0.250	0.400
	DIAMETE	R RANGE	IT6	IT7	IT8	IT9	IT10	IT11
		incl	tolerance - inches					
	0	0.1181	0.0002	0.0004	0.0006	0.0010	0.0016	0.0024
	0.1181	0.2362	0.0003	0.0005	0.0007	0.0012	0.0019	0.0030
	0.2362	0.3937	0.0004	0.0006	0.0009	0.0014	0.0023	0.0035
	0.3937	0.7087	0.0004	0.0007	0.0011	0.0017	0.0028	0.0043
	0.7087	1.1811	0.0005	0.0008	0.0013	0.0020	0.0033	0.0051
	1 1 8 1 1	1 9685	0.0006	0.0010	0.0015	0.0024	0.0030	0.0063

BTA Drill Tube Size and Solid Drill Diameter Standards

BTA Tube Size	Tube OD (mm)	Drilled Hole Diameter (mm)	Drilled Hole Diameter (inch)
794	11	12.6 - 13.6	0.496 - 0.535
795	12	13.6 - 14.6	0.536 - 0.575
796	13	14.6 - 15.6	0.576 - 0.614
797	14	15.6 - 16.7	0.615 - 0.657
798	15	16.7 - 17.7	0.658 - 0.696
799	16	17.7 - 18.9	0.697 - 0.744
800	17	18.9 - 20.0	0.745 - 0.787
801	18	20.0 - 21.8	0.788 - 0.858
802	20	21.8 - 24.1	0.859 - 0.948
803	22	24.1 - 26.4	0.949 - 1.039
804	24	26.4 - 28.7	1.040 - 1.129
805	26	28.7 - 31.0	1.130 - 1.220
806	28	31.0 - 33.3	1.221 - 1.311
807	30	33.3 - 36.2	1.312 - 1.425
808	33	36.2 - 39.6	1.426 - 1.559
809	36	39.6 - 43.0	1.560 - 1.692
810	39	43.0 - 47.0	1.693 - 1.850
811	43	47.0 - 51.7	1.851 - 2.035
812	47	51.7 - 56.2	2.036 - 2.212
813	51	56.2 - 65.0	2.213 - 2.559
813E	56	60.6 - 65.0	2.386 - 2.559
814	56	65.0 - 67.0	2.559 - 2.637
815	62	67.0 - 73.0	2.638 - 2.873
816	68	73.0 - 80.0	2.874 - 3.149
817	75	80.0 - 87.0	3.150 - 3.424
818	82	87.0 - 100.0	3.425 - 3.936
819	94	100.0 - 112.0	3.937 - 4.408
820	106	112.0 - 124.0	4.409 - 4.881
821	118	124.0 - 136.0	4.882 - 5.353
822	130	136.0 - 148.0	5.354 - 5.826
823	142	148.0 - 160.0	5.827 - 6.298
824	154	160.0 - 171.9	6.299 - 6.767
825	166	172.0 - 183.9	6.772 - 7.240
826	178	184.0 - 195.9	7.244 - 7.712
827	190	196.0 - 207.9	7.717 - 8.185
828	202	208.0 - 219.9	8.189 - 8.657
829	214	220.0 - 231.9	8.661 - 9.130
830	226	232.0 - 243.9	9.134 - 9.602
831	238	244.0 - 255.9	9.606 - 10.075
832	250	256.0 - 267.9	10.079 - 10.547
833	262	268.0 - 279.9	10.551 - 11.020
834	274	280.0 - 291.9	11.024 - 11.492
835	286	292.0 - 303.9	11.496 - 11.964
836	298	304.0 - 315.9	11.968 - 12.436
837	310	316.0 - 327.9	12.440 - 12.909

drilled or cast

re (wear pads supported by finished hole diameter). They (wear pads supported by pre-bore diameter) for stringent

high stock removal

inter boring, but typically, a reduced radial depth and unique

nich the tool enlarges the existing bore as it is pulled back

ession, providing better control over hole straightness signed to follow the center line of the machine by supporting

wall thickness, with tools made to pilot off existing holes. sed for boring centrifugally cast tubing oushing to the centerline of the machine

pre-drilled hole. The tool leaves a solid core in the middle of hined area in the form of chips

e same hole diameter

be practical due to the difficulty in removing the core

peration for finishing off the base of a hole

ire a specific form to the hole

ds along the finished hole diameter, and have very specific

loating reamer, used to finish the surface when close diameter

ation rates and low radial engagements

of a workpiece; one or more rollers are pressed against the mpressing peaks and filling in valleys

urnishing rollers are often combined in a single tool to finish

or chamber boring

roduce the intended contour inside the workpiece.

art than at the entry and exit

aneously to achieve desired profiles

rofile a specific workpiece, or series of workpieces

quires specially configured counter boring tools er boring operation with a gun drilling type (internal) coolant

coolant flow, which necessitates a design change in coolant

1.9685

3.1496

4.7244

7.0866

12.4016

3.1496

4.7244

9.8425

9.8425 12.4016 0.0013

15.7480

9.6850

0.0007

0.0009

0.0011

0.0014

7.0866 0.0010

0.0012

0.0014

0.0016

0.0018

0.0022

0.0020

0.0018

0.0021

0.0028

0.0035

0.0029

0.0034

0.0045

0.0055

0.0047

0.0055

0.0073

0.0091

0.0025 0.0039 0.0063 0.0098

0.0032 0.0051 0.0083 0.0126