

**UNISIG**  
DEEP HOLE DRILLING SYSTEMS

2021 PRODUCT CATALOG



# UNISIG® Deep Hole Drilling Systems

## Performance and value

We seek to understand our customers' needs and develop exceptional products that achieve high performance and provide value. Durability, reliability and efficient designs are the result of our experience building deep hole drilling systems for over 40 years.

## More than machines

Our solutions include the necessary application expertise, automation, training and service to achieve our customers' objectives as soon as the installation is finished.

## We stand behind our solutions

UNISIG has a long view of success, and we stay with our customers and solve problems. We strive to be easy to work with and adaptable while always building new strength in our people and in our business. We will be here to support our customers around the world through the life of their investment, and the next ones.

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

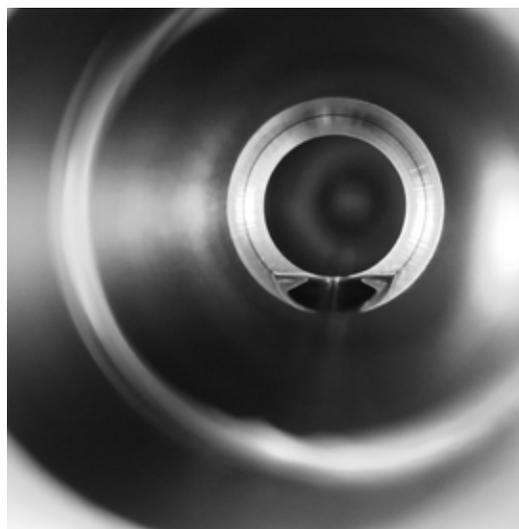


## Deep Hole Drilling

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 pages 34-35 for additional technical information.*



## Common Industries Benefitting from Deep Hole Drilling

### AEROSPACE

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

### HYDRAULICS

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

### MOLD

BTA or Gundrilling  
USC-M, USK, UNI

### STEEL PROCESSING

BTA  
B-Series, USC

### AUTOMOTIVE

BTA or Gundrilling  
UNI

### JOB SHOPS

Standardized Gundrilling  
UNE, USK

### OIL & GAS

BTA or Gundrilling  
B-Series, USC, USK, UNX

### TUBE SHEETS AND ENERGY

BTA or Gundrilling  
USC-TS, USK

### DEFENSE

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

### MEDICAL

Gundrilling  
UNE6, UNI

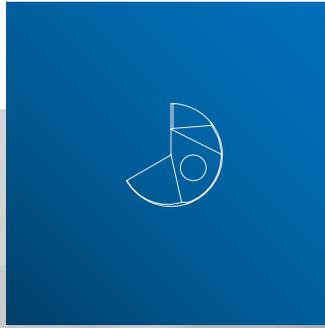
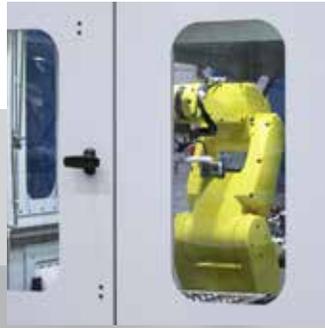
### SPECIALIZED PRODUCTION

BTA or Gundrilling  
UNE, UNI

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# UNE6 Small Diameter Gundrilling Machines

for Medical Manufacturers

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 critical parts are made.

## STANDARD FEATURES

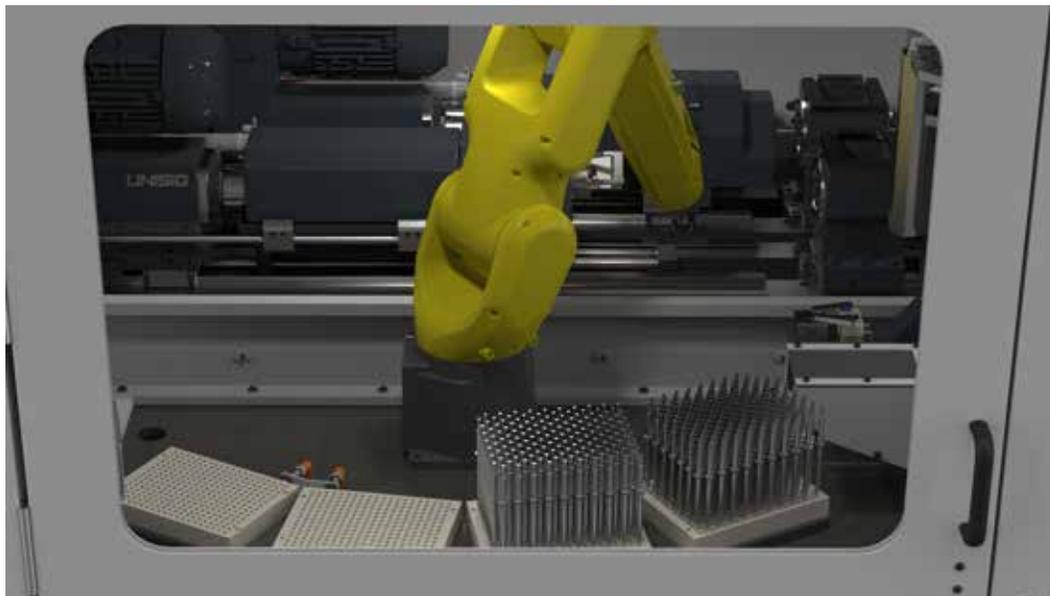
- Counter-rotating tool and workpiece
- Specialized workholding for small parts
- Exceptional process control
- Integral motor spindles
- Simple 3-point leveling installation
- Flow-based coolant system
- UNISIG Smart Control Interface with program storage

## UNE6

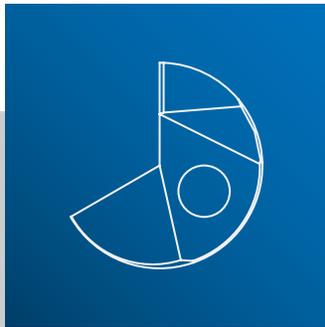
## UNE6-2i

PERFORMANCE				
	1		2 independent	
Number of spindles				
Hole diameter min	0.8 mm	0.03 in	0.8 mm	0.03 in
Hole diameter max	6.0 mm	0.24 in	6.0 mm	0.24 in
Part length max	750 mm	30 in	250 or 750 mm	10 or 30 in
Tool spindle speed max	20,000 rpm		20,000 rpm	
Work spindle speed max	4,000 rpm		4,000 rpm	
Combined drilling speed max	24,000 rpm		24,000 rpm	
Coolant pressure max	207 bar	3,000 psi	207 bar	3,000 psi

*Specifications are subject to change without notice | Performance ratings may vary based on actual tooling and materials used. Modular construction allows additional configurations not listed, contact UNISIG*



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



# UNE Gundrilling Machines

for Job Shop and Production Environments

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

- Cast iron headstock and chipbox components
- Cartridge spindles with premium quality bearings
- High precision preloaded ballscrew feed
- Programmable coolant delivery
- Digital servo drives with absolute encoders
- 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

### UNE12-2

### UNE20-2

### UNE25

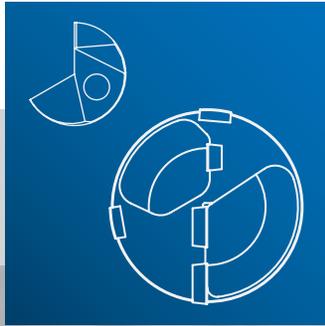
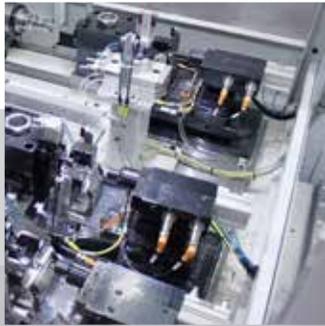
### UNE32-2

### UNE40

PERFORMANCE	UNE12-2		UNE20-2		UNE25		UNE32-2		UNE40	
Number of spindles	2		2		1		2		1	
Drill diameter max	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
Drill diameter max, single spindle mode	19 mm	0.75 in	25 mm	1.0 in	-	-	40 mm	1.57 in	-	-
Drill diameter min	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
Tool max speed	12,000 RPM		8,000 RPM		8,000 RPM		6,000 RPM		6,000 RPM	
Work max speed	900 RPM		600 RPM		600 RPM		400 RPM		400 RPM	
Rated workpiece designation 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

*Specifications are subject to change without notice | Performance ratings may vary based on actual tooling and materials used. Modular construction allows additional configurations not listed, contact UNISIG*





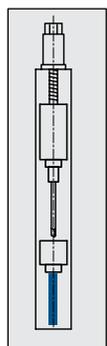
# UNI Production Drilling Machines

for High-Volume and High-Accuracy Deep Hole Drilling

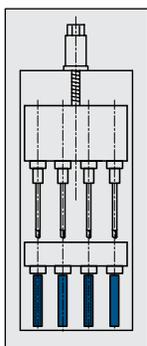
UNI series deep hole drilling machines are used in demanding high production or high accuracy applications. Modular construction allows build-to-order flexibility from standard components. Customization or specialized configurations are common and engineered for reliability.

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

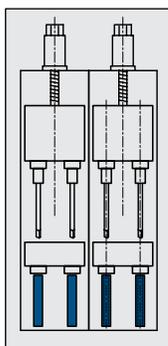
See following pages for examples of UNI machines.



Single spindle,  
single axis



Multiple spindle  
single axis



Multiple spindle  
multiple axis



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



## UNI-6

## UNI-12

## UNI-20

## UNI-25

## UNI-38

## UNI-50

	UNI-6		UNI-12		UNI-20		UNI-25		UNI-38		UNI-50	
Tooling type	Gundrill		Gundrill		Gundrill		Gundrill, BTA option		Gundrill, BTA option		BTA, Gundrill option	
Number of spindles	1 to 4		1 to 4		1 to 4		1 to 4		1 to 4		1, 2	
Max drilling diameter	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
Max counterbore diameter											65 mm	2.50 in
Drilling depths	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 are subject to change without notice | Performance ratings may vary based on actual tooling and materials used. Modular construction allows additional configurations not listed, contact UNISIG*

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.



## 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 difficult-to-drill holes
- Exceptional process reliability for critical, small-diameter deep holes

UNI-6-150-4i SPECIFICATIONS		
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	

*Modular construction allows alternate specifications and configurations not listed.*



## 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.



## FEATURES

- 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

UNI-12-4-750-CR SPECIFICATIONS		
Number of spindles	4	
Minimum drilling diameter	3 mm	0.12 in
Maximum drilling diameter	12 mm	0.50 in
Drill depth shown	750 mm	30 in
Drill depths available	500 mm	20 in
	750 mm	30 in
	1,000 mm	40 in
Tool spindle power (480V)	2.2 kw	3 hp
Tool spindle speed	12,000 rpm	
Work spindle power (480V)	0.8 kw	1 hp
Work spindle speed	2,000 rpm	

*Modular construction allows alternate specifications and configurations not listed.*



Additional models, configurations, and options are available, contact UNISIG.

## UNI-25BTA-4-750-CR



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-25BTA-4-750-CR SPECIFICATIONS

Number of spindles	4	
Minimum drilling diameter	12 mm	0.47 in
Maximum drilling diameter	25 mm	1.00 in
Drill depth shown	750 mm	30 in
Drill depths available	750 mm	30 in
	1,000 mm	40 in
	1,500 mm	60 in
Tool spindle power (480V)	15 kw	19 hp
Tool spindle speed	3,000 rpm	
Work spindle power (480V)	3.7 kw	5 hp
Work spindle speed	500 rpm	

Modular construction allows alternate specifications and configurations not listed.



## 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

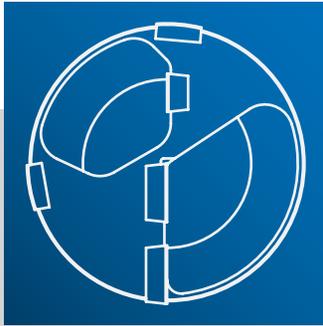
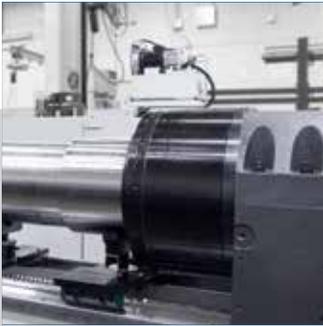
- Rapid changeover from BTA to Gundrill tooling
- Counter-rotation for minimized centerline drift
- High-precision zero endplay spindles for bottom forming operations
- Preloaded ballscrew drives for precise depth control
- Process monitoring and graphical display of critical information
- Automatic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

### UNI-50BTA-1500-CR SPECIFICATIONS

Tooling type	Gundrill 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	3,000 rpm	
Work spindle power (480V)	20 kw	27 hp
Work spindle speed	1,000 rpm	

Modular construction allows alternate specifications and configurations not listed.

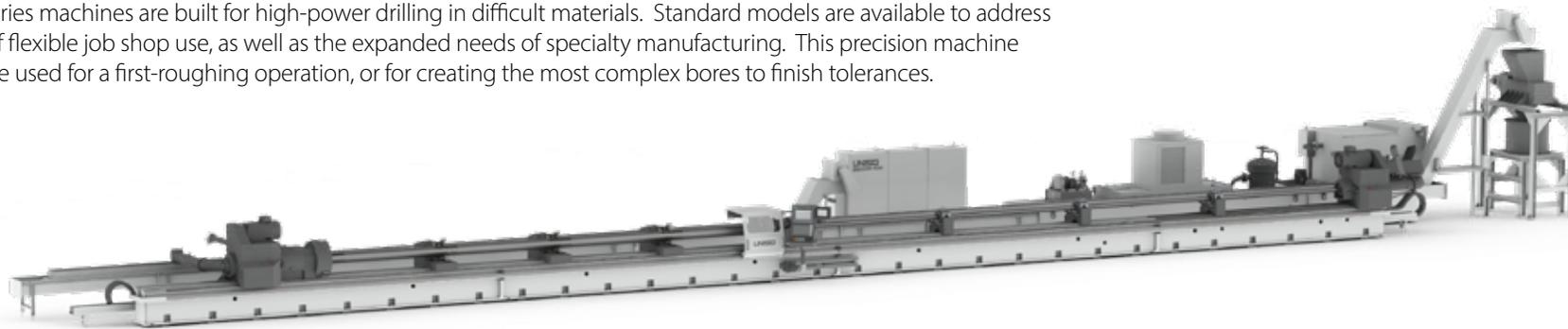




# B-Series BTA Drilling Machines < 800 mm Swing

for On-Center Deep Hole Drilling of Cylindrical Workpieces

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.



## B380

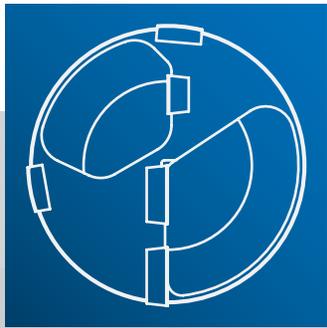
## B500

## B600

## B700

DIMENSION	B380		B500		B600		B700	
Swing over bed	380 mm	15.0 in	500 mm	19.7 in	600 mm	23.6 in	700 mm	27.6 in
Drilling depths - Ballscrew drive	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
Drilling depths - Rack and pinion 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
PERFORMANCE								
Max drilling diameter from solid (Nickel Alloy)	65 mm	2.6 in	100 mm	4.0 in	125 mm	5.0 in	180 mm	7.0 in
Max drilling diameter from solid (Carbon Steel)	80 mm	3.1 in	125 mm	5.0 in	150 mm	6.0 in	200 mm	8.0 in
Maximum tool diameter	100 mm	4.0 in	160 mm	6.3 in	200 mm	8.0 in	300 mm	12.0 in
WORKPIECE HEADSTOCK (STANDARD)								
Spindle nose	ISO 702/1 A2-8		ISO 702/1 A2-8		ISO 702/1 A2-11		ISO 702/1 A2-15	
Spindle bore	110 mm	4.3 in	92 mm	3.6 in	160 mm	6.3 in	215 mm	8.5 in
Power, continuous S1 (400/480 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
Spindle speed range	1-700 rpm		1-275 rpm		1-343 rpm (1-900 rpm option)		1-270 rpm (1-850 rpm option)	
Headstock transmission	single reduction		single reduction		geared transmission (2 range option)		geared transmission (2 range option)	
WORKPIECE HEADSTOCK (LARGE BORE OPTION)								
Spindle nose	-	-	ISO 702/1 A2-15		ISO 702/1 A2-15		ISO 702/1 A2-20	
Spindle bore	-	-	215 mm	8.5 in	215 mm	8.5 in	280 mm	11.0 in
TOOL HEADSTOCK								
Spindle nose	ISO 702/1 A2-6		ISO 702/1 A2-8		ISO 702/1 A2-11		DIN 55027 size 15	
Spindle bore	60 mm	2.4 in	92 mm	3.6 in	128 mm	5.0 in	200 mm	7.9 in
Power, continuous S1 (400/480 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
Spindle speed range	1-1,800 rpm		1-1,000 rpm		1-1,000 rpm		1-900 rpm	
Headstock transmission	single reduction		single reduction		geared transmission, 2 range		geared transmission, 2 range	
COOLANT SYSTEM								
Maximum programmable flow	284 L/min	75 gpm	529 L/min	140 gpm	756 L/min	200 gpm	945 L/min	250 gpm
ACCESSORY SPECIFICATION								
Roller steady diameter capacity (1)	150 mm	5.9 in	260 mm	10.2 in	360 mm	14.2 in	500 mm	19.7 in
Roller steady diameter capacity (2)	200 mm	7.9 in	350 mm	13.8 in	475 mm	18.7 in	630 mm	25.0 in
WORKPIECE WEIGHT								
Between centers	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) Workpiece steady	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) Workpiece steady	2.0 t	4,410 lbs	5.0 t	11,030 lbs	5.0 t	11,030 lbs	9.0 t	19,850 lbs

Specifications are subject to change without notice | Drilling performance ratings may vary based on actual tooling and materials used | Modular construction allows additional configurations not listed, contact UNISIG



# B-Series BTA Drilling Machines > 800 mm Swing

for On-Center Deep Hole Drilling of Cylindrical Workpieces

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.



## B850

## B1000

## B1200

## B1600

## B2000

DIMENSIONS										
Swing over bed	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	78.7 in
Swing over optional gap	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
Drilling depths	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
PERFORMANCE										
Max solid drill diameter (Nickel 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
Max solid drill diameter (Carbon 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
Max tool diameter (1) high load 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
Max tool diameter (2) large bore 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
WORKPIECE HEADSTOCK										
Spindle nose	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	
Spindle bore	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
Power, continuous S1 (400/480 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
Spindle speed range	1-700 rpm		1-500 rpm		1 - 500 rpm		1 - 483 rpm		1 - 363 rpm	
Headstock transmission	3 ranges, automatic		3 ranges, automatic		4 ranges, automatic		4 ranges, automatic		4 ranges, automatic	
TOOL HEADSTOCK										
Spindle nose	DIN 55027 size 15		DIN 55027 size 15		DIN 55027 size 15		DIN 55027 size 20		DIN 55027 size 20	
Spindle bore	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
Power, continuous S1 (400/480 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
Spindle speed range	1-900 rpm		1-700 rpm		1 - 750 rpm		1 - 500 rpm		1 - 500 rpm	
Headstock transmission	3 ranges, automatic		3 ranges, automatic		4 ranges, automatic		4 ranges, automatic		4 ranges, automatic	
WORKPIECE WEIGHT										
Between centers	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
(1) workpiece steady	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
(2) workpiece steady	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
(3) workpiece steady	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

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# 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 control in every aspect of the process.

## FEATURES

- Straightforward setup and operation
- Quick changeover between workpieces and tools
- Use for high production and job shop applications
- Automation ready

## UNIVERSAL TOOLING APPLICATION

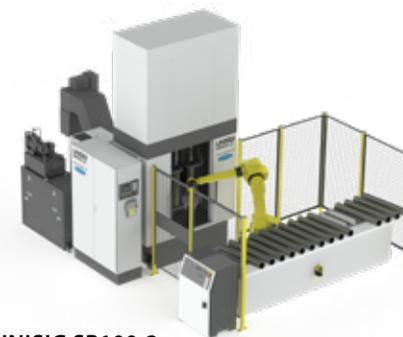
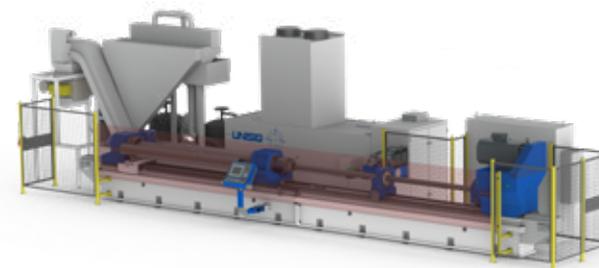
- Skiving and roller burnishing
- Counter-boring, skiving and roller burnishing
- Standard and pressure compensated tools

## 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

## S500

## S600

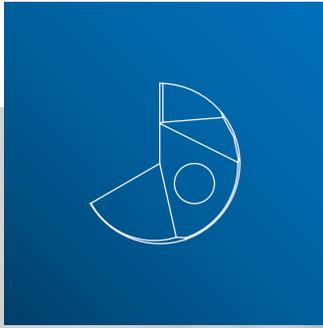
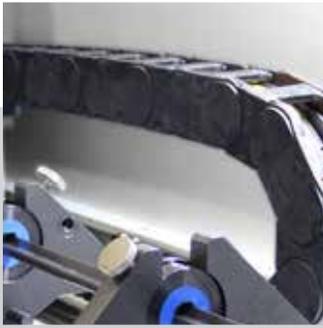
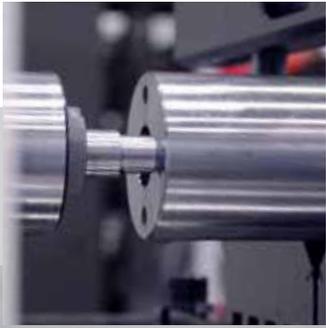
## S700

DIMENSION						
Swing over bed	500 mm	19.7 in	600 mm	23.6 in	700 mm	27.6 in
Drilling depths - Ballscrew drive	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
Drilling depths - Rack and pinion 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
PERFORMANCE						
Rated skiving and burnishing diameter	140 mm	5.5 in	203 mm	8.0 in	305 mm	12.0 in
TOOL HEADSTOCK						
Spindle nose	ISO 702/1 A2-6		ISO 702/1 A2-8		ISO 702/1 A2-11	
Power, continuous S1 (400/480 VAC)	50/67 kW	67/90 hp	85/94 kW	114/126 hp	95/124 kW	127/166 hp
Spindle speed maximum	1,500 rpm		1,500 rpm		1,200 rpm	
Headstock transmission	single reduction		3 ranges, automatic selection		3 ranges, automatic selection	
COOLANT SYSTEM						
Maximum programmable flow	529 L/min	140 gpm	756 L/min	200 gpm	1,134 L/min	300 gpm

*Specifications are subject to change without notice | Performance ratings may vary based on actual tooling and materials used | Modular construction allows additional configurations not listed, contact UNISIG*



Actual results from UNISIG skiving and roller burnishing machine

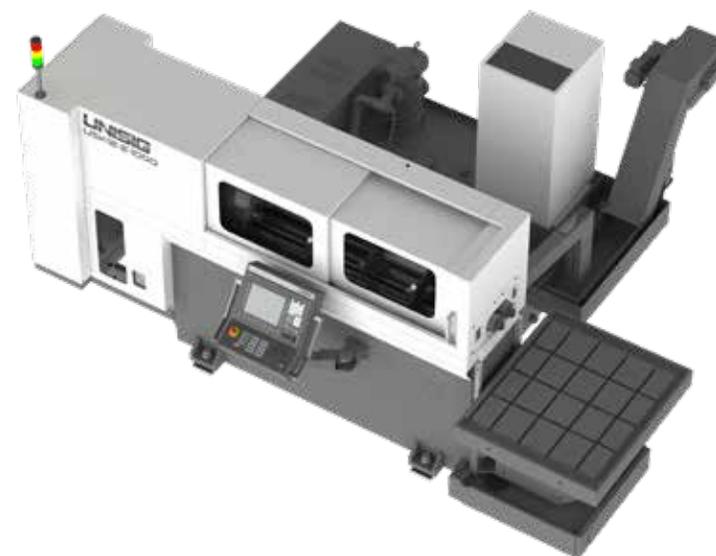


# USK Series CNC Drilling Machines

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

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

### USK12-2

### USK20-2

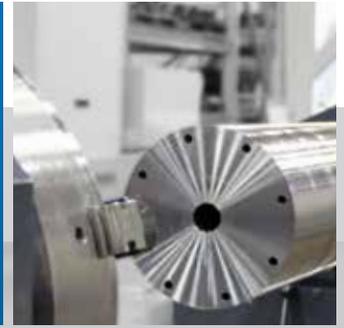
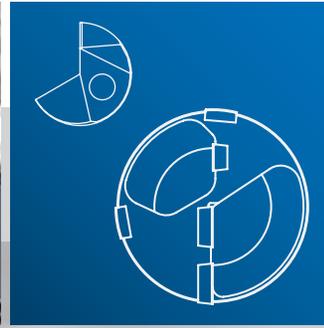
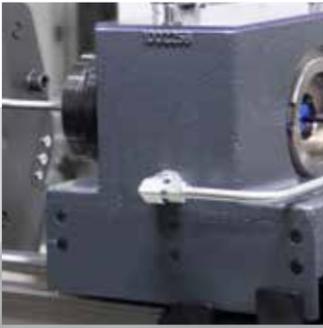
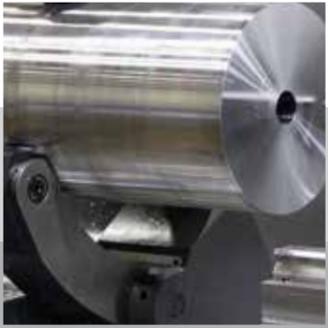
### USK25

### USK40

DIMENSION								
Tooling type	Gundrill		Gundrill		Gundrill		Gundrill	
Number of spindles	2		2		1		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						

*Specifications are subject to change without notice | Performance ratings may vary based on actual tooling and materials used | Modular construction allows additional configurations not listed, contact UNISIG*





# 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

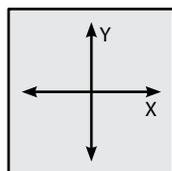
## UNX40

## UNX50

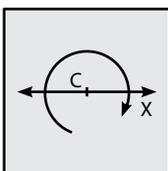
DIMENSION						
Tooling type	Gundrill		Gundrill		Gundrill/BTA	
Drilling diameter max	20 mm	0.79 in	25 mm	1.00 in	40 mm	1.57 in
Counterbore max	-		-		65 mm 2.6 in	
Motion profile	Cartesian + Polar [CP]		Cartesian [C] or Polar [P]		Polar [P]	
Single stroke drilling depth	1,500 mm	59 in	1,500 mm [C]	59 in	1,500 mm	59 in
			2,000 mm [P]	79 in	2,000 mm	79 in
			3,000 mm [P]	118 in	3,000 mm	118 in
Workpiece length	2,000 mm	79 in	2,000 mm	79 in	2,000 mm	79 in
	3,000 mm	118 in	3,000 mm	118 in	3,000 mm	118 in
	4,000 mm	158 in	4,000 mm	158 in	4,000 mm	158 in
	6,000 mm	236 in	6,000 mm	236 in	6,000 mm	236 in
	10,000 mm	394 in	10,000 mm	394 in	10,000 mm	394 in

*Specifications are subject to change without notice | Performance ratings may vary based on actual tooling and materials used | Modular construction allows additional configurations not listed, contact UNISIG*

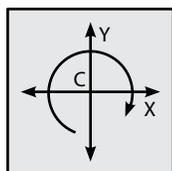
### MOTION PROFILES



Cartesian  
UNX-C



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.

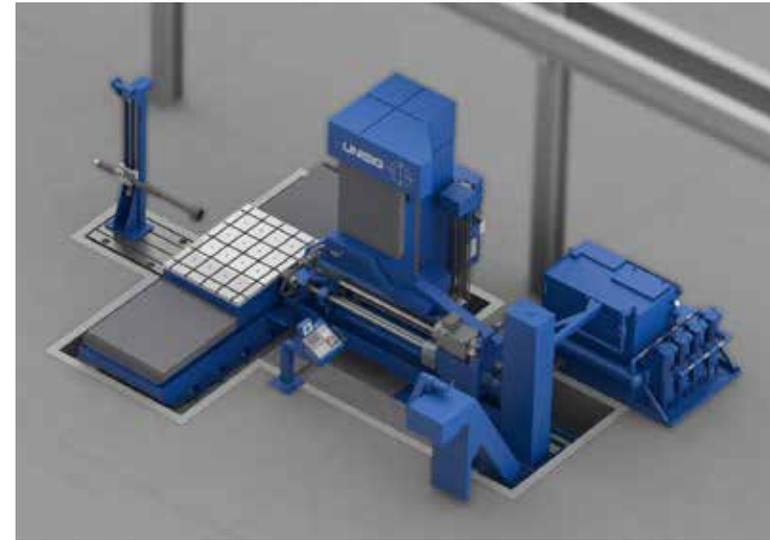
Polar positioning **[P]** rotates a cylindrical part on its axis, with an X-axis to position the drilling headstock distance from center.

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



# 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



## USC75

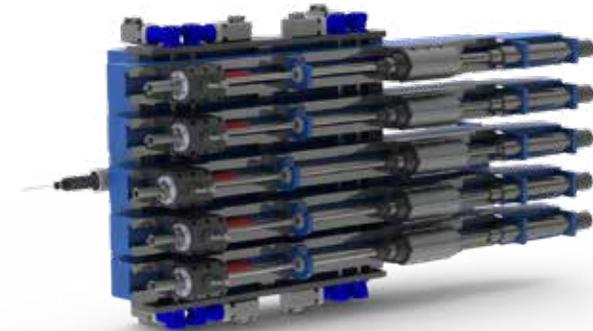
## USC100

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 x 2,000 mm	
	78.7 x 59.1 in		118.1 x 78.7 in	
Table capacity	15,000 kg	16.5 ton	25,000 kg	27.6 ton

*Specifications are subject to change without notice | Performance ratings may vary based on actual tooling and materials used | Modular construction allows additional configurations not listed, contact UNISIG*

# USC-TS Deep Hole Drilling Machines

For Drilling Heat Exchanger Tube Sheets



## USC-TS32

## USC-TS50

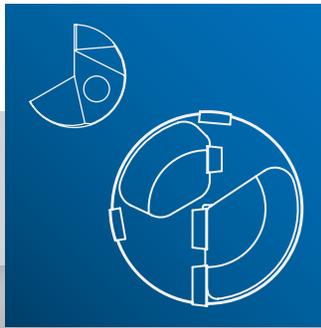
## USC-TS65

DIMENSIONS						
Gundrilling diameter	8 - 32 mm	0.3 - 1.26 in	8 - 50 mm	0.3 - 2.0 in	--	
BTA drilling diameter	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
Number of spindles	2, 3 or 5		2, 3 or 5		2 or 3	
Nominal drilling depth	750 mm	30 in	1,000 mm	40 in	1,000 mm	40 in
X-axis travel (various options)	3 - 10 m	10 - 32.8 ft	3 - 10 m	10 - 32.8 ft	3 - 10 m	10 - 32.8 ft
Y-axis travel (various options)	2.5 - 5 m	8 - 16.4 ft	2.5 - 5 m	8 - 16.4 ft	2.5 - 5 m	8 - 16.4 ft

*Specifications are subject to change without notice | Performance ratings may vary based on actual tooling and materials used  
Modular construction allows additional configurations not listed, contact UNISIG*

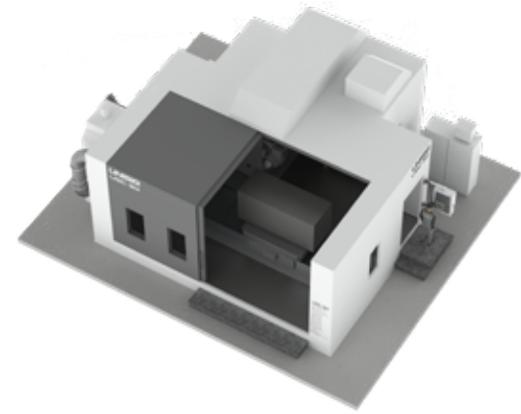
## PERFORMANCE

- 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



# USC-M Milling and Drilling Machines

for Mold Manufacturing



## THREE MODEL FAMILIES TO MEET THE NEEDS OF THE MOLD INDUSTRY

- USC-2M | USC-3M** 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
- USC-M38 | USC-M50** Dedicated Geared Spindle for Machining | Additional Spindle for BTA/Gundrilling | Below-Floor Installation

### USC-2M

### USC-3M

### USC-2M-BTA

### USC-3M-BTA

### USC-M38

### USC-M50

	USC-2M		USC-3M		USC-2M-BTA		USC-3M-BTA		USC-M38		USC-M50	
<b>PERFORMANCE</b>												
Spindle Type	Universal		Universal		Dedicated		Dedicated		Dedicated		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
<b>TRAVELS</b>												
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 positions		360,000 positions		360,000 positions		360,000 positions		360,000 positions		360,000 positions	
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
<b>TABLE</b>												
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
<b>MACHINING SPINDLE</b>												
Spindle nose	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-range, 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
<b>DRILLING SPINDLE</b>												
Spindle nose	--	--	--	--	DHD		DHD		DHD		DHD	
Maximum speed	--	--	--	--	4,500 rpm		4,500 rpm		5,000 rpm		5,000 rpm	
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
<b>TOOL CHANGER</b>												
Automatic tool changer	60 position		60 position		40 position		40 position		120 position		120 position	
<b>CONTROLS</b>												
CNC	Heidenhain TNC 640 CNC		Heidenhain TNC 640 CNC		Heidenhain TNC 640 CNC							

Specifications are subject to change without notice. Some specifications represent optional configurations.

## 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.



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

## Extended Range Machines

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



## Deep Hole Drilling Automation

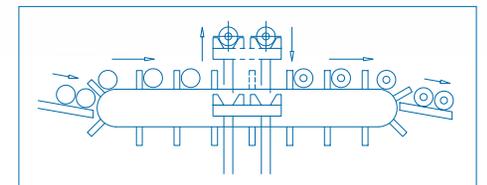
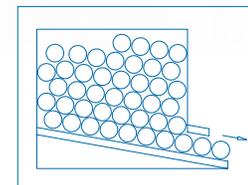
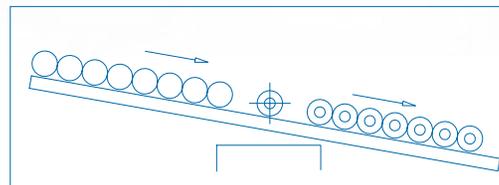
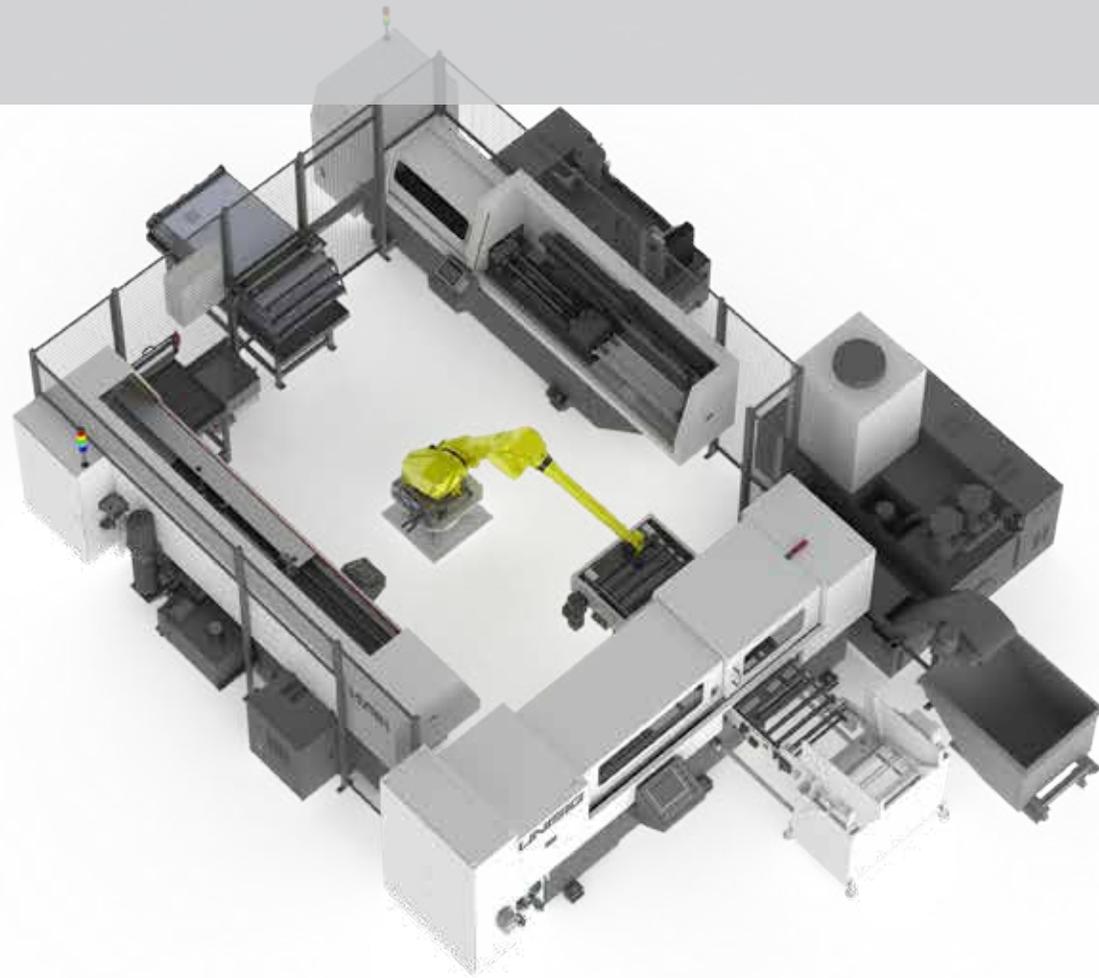


### Automation

UNISIG routinely provides automation for gundrilling and BTA deep hole drilling systems. Automation can be machine-mounted 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



## PICK-AND-PLACE

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. Uniquely-shaped 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.



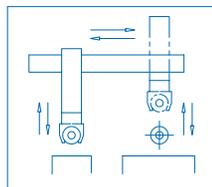
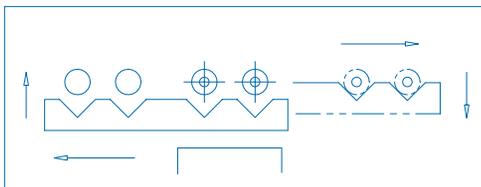
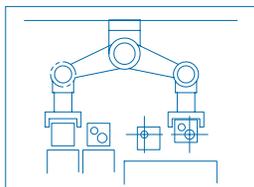
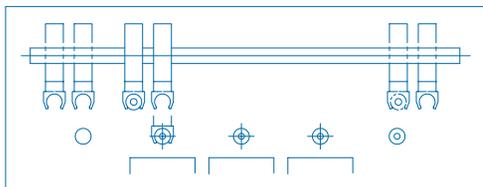
## CONVEYOR-FED & PALLET AUTOMATION

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.



## 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.



### 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 quick 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.



### 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)

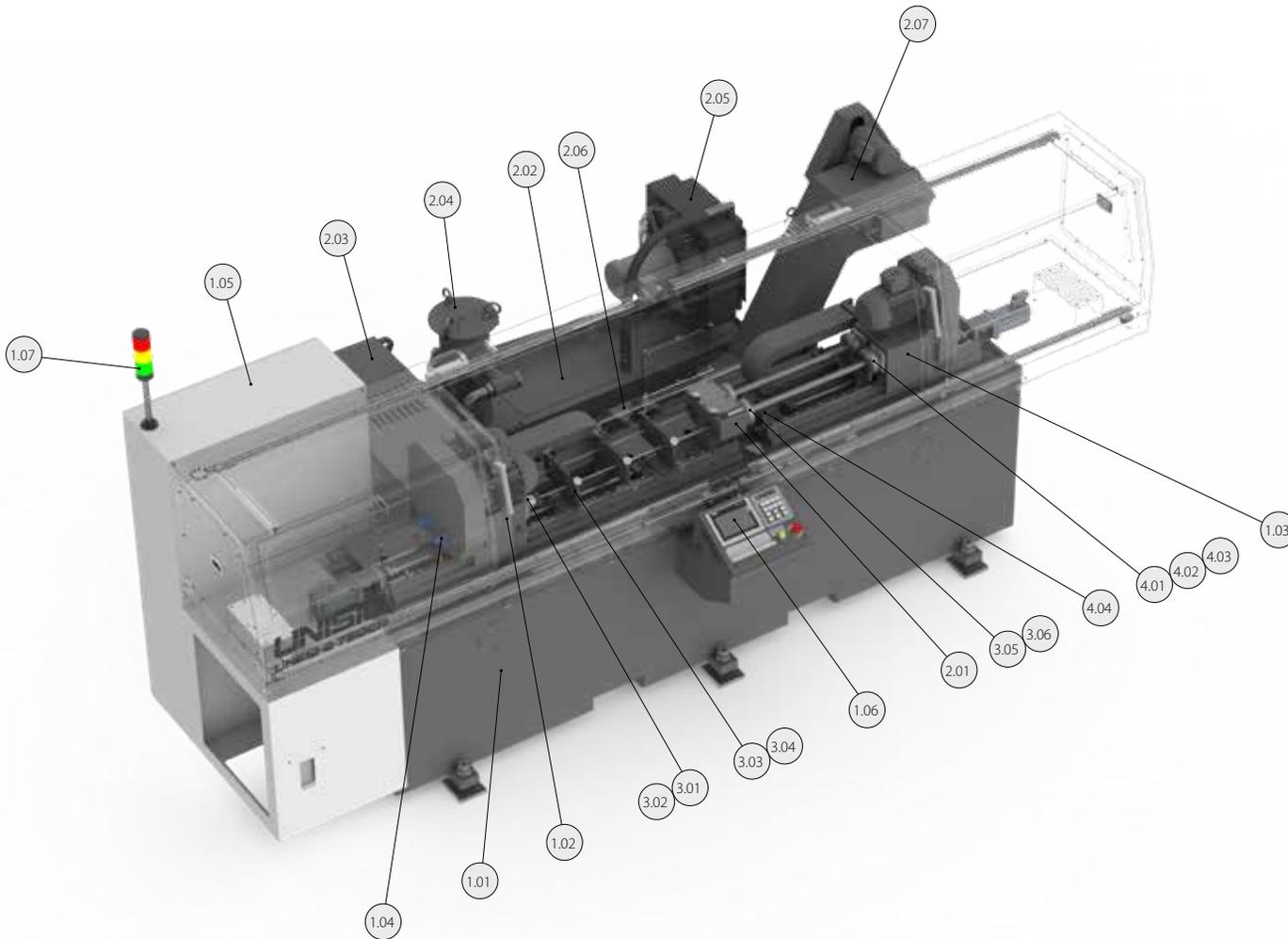
**CANADA** - Compliance with CSA standards of construction relevant to machine tools and industrial equipment (460 VAC, 3-phase, 60Hz)

**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.

# Gundrill Machine Component Identification



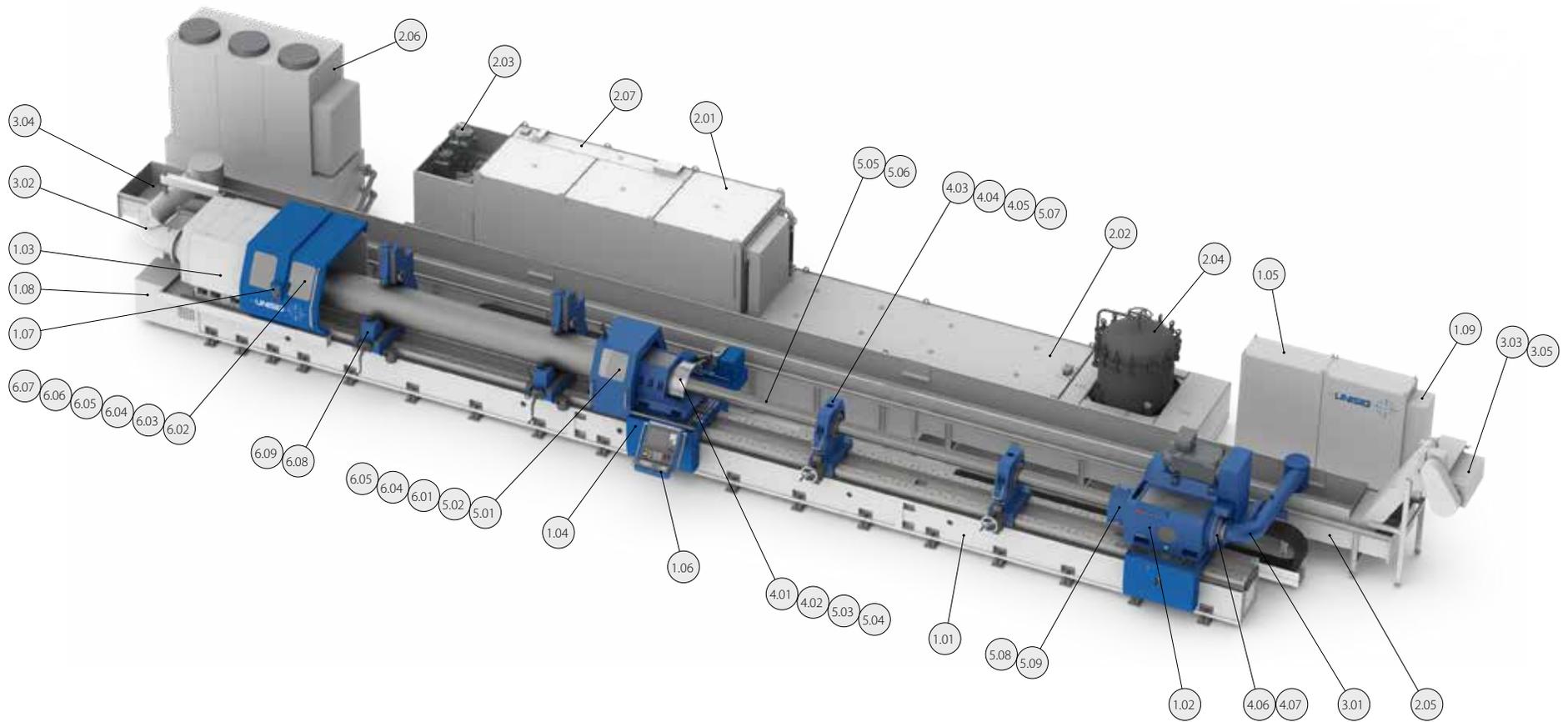
MACHINE AND OPTIONS		COOLANT SYSTEM AND CHIP REMOVAL		ACCESSORIES AND TOOLING		WORKHOLDING	
1.01	Machine Base	2.01	Chip Box	3.01	Tool Holders	4.01	Clamping Cones
1.02	Tool Headstock	2.02	Coolant Reservoir	3.02	Collet and Seal	4.02	Chucks
1.03	Workpiece Headstock	2.03	High Pressure Coolant Pumps	3.03	Whip Guide Carriage	4.03	Collets
1.04	Coolant Inducer	2.04	Coolant Filter	3.04	Whip Guide Adapters	4.04	Locating Vees
1.05	Electrical Cabinet	2.05	Coolant Chiller or Heat Exchanger	3.05	Drill Bushing Holders		
1.06	Operators Interface	2.06	Chip Basket	3.06	Drill Bushings		
1.07	Signal Tower	2.07	Chip Conveyor				

## Gundrill Durable Tooling



Request additional gundrill tooling information and size availability at [unisig.com](http://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

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.

**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.



**Precision drill tubes and thread adapters** connect the drill head to the machine spindle. A precision hole starts with high quality drill tubes and connections.



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



**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.



**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.



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



**Workholding components** secure the ends of heavy workpieces accurately on center and prevent slippage while drilling.



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



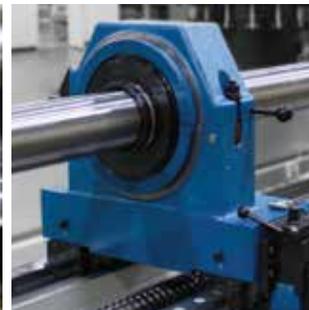
**Lantern chucks** allow a pull boring tool to be easily installed and aligned during the drilling process, without requiring a special pilot hole machined in the part.



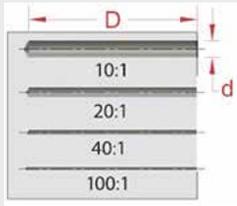
**Breakthrough seal** systems provide a clean return path for cutting fluid and chips when drilling holes through a workpiece.



Please request your complete tooling catalog online at [unisig.com](http://unisig.com)



## Deep Hole Definition

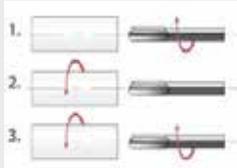


Depth to diameter ratio

### 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



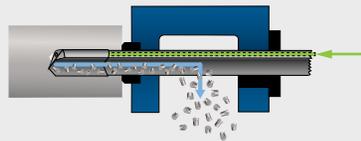
Tool and workpiece rotation

- 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

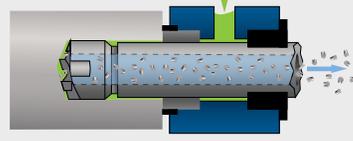
### GUNDRILL

Internal Coolant Delivery  
External Chip Exhaust



### 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.

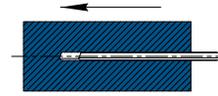
## Deep Hole Drilling Methods

### GUNDRILLING

- Internal coolant
- High pressure coolant is introduced through the machine spindle and tool center
- Chips are discharged along the v-shaped groove on the outside of the tool body
- Special forms can be ground in tool tip for form tool operations
- Brazed shank, solid carbide, and inserted tools are available

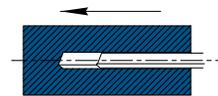
#### Solid Carbide

0.5 - 12 mm  
[0.02 - 0.47 in]



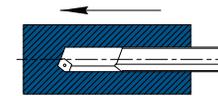
#### Brazed

2 - 50 mm  
[0.08 - 2.00 in]



#### Indexable

13.5 - 50 mm  
[0.53 - 2.00 in]

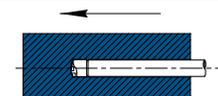


### BTA DRILLING

- External coolant
- High-pressure coolant is introduced through the space between the finished hole 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

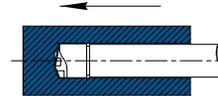
#### Brazed

12 - 65 mm  
[0.47 - 2.56 in]



#### Indexable

25 - 630 mm  
[1.0 - 24.8 in]

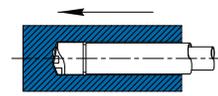


### EJECTOR DRILLING

- Internal and external coolant
- High-pressure coolant is introduced through the space between the inner and 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 spindle
- 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 chips and fluid discharge
- Limited depth to diameter ratio compared to BTA system

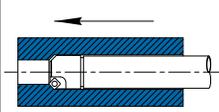
#### Ejector

20 - 200 mm  
[0.79 - 7.87 in]

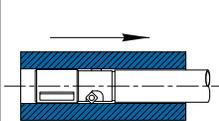


### ADDITIONAL TOOLS FOR USE ON BTA MACHINES

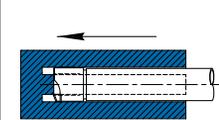
**PUSH-COUNTER BORING/ REAMING**  
20 - 630 mm  
[0.79 - 24.8 in]  
*External coolant*



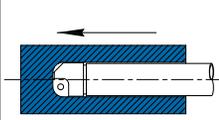
**PULL BORING**  
20 - 630 mm  
[0.79 - 24.8 in]  
*External coolant*



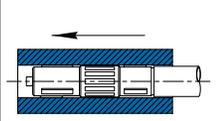
**TREPANNING**  
20 - 500 mm  
[0.79 - 20.0 in]  
*External coolant*



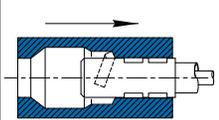
**BOTTOM FORMING**  
20 - 500 mm  
[0.79 - 20.0 in]  
*External coolant*



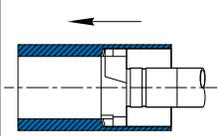
**SKIVING AND ROLLER BURNISHING**  
20 - 500 mm  
[0.79 - 20.0 in]  
*External coolant*



**BOTTLE BORING**  
Special application  
*External coolant*



**TUBE FINISHING LARGE DIAMETER COUNTERBORE**  
300 - 1200 mm  
[12.0 - 48.0 in]  
*Internal coolant*



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

<ul style="list-style-type: none"> <li>Counterboring enlarges an existing hole that is drilled or cast</li> <li>Push configuration tools pilot off a finished bore (wear pads supported by finished hole diameter). They can also be designed to pilot off the pre-bore (wear pads supported by pre-bore diameter) for stringent concentricity requirements</li> <li>Multi-cutter counterbore tools are available for high stock removal</li> <li>Reaming performs the same operations as counter boring, but typically, a reduced radial depth and unique geometry are used</li> </ul>
<ul style="list-style-type: none"> <li>A special configuration of counterboring, in which the tool enlarges the existing bore as it is pulled back through the workpiece</li> <li>The boring bar is in tension rather than compression, providing better control over hole straightness</li> <li>Can be used to straighten a hole with tools designed to follow the center line of the machine by supporting off the finished hole</li> <li>Can also be designed for maintaining uniform wall thickness, with tools made to pilot off existing holes. Multi-cutter pull boring tools are commonly used for boring centrifugally cast tubing</li> <li>A lantern chuck may be used to align a guide bushing to the centerline of the machine</li> </ul>
<ul style="list-style-type: none"> <li>Process performed on blank material without a pre-drilled hole. The tool leaves a solid core in the middle of the hole, rather than removing the entire machined area in the form of chips</li> <li>Consumes less power than solid drilling, for the same hole diameter</li> <li>Trepanning in blind hole applications may not be practical due to the difficulty in removing the core</li> </ul>
<ul style="list-style-type: none"> <li>Bottom forming is essentially a form tooling operation for finishing off the base of a hole</li> <li>After deep hole drilling, the drawing may require a specific form to the hole</li> <li>Bottom forming tools are guided with wear pads along the finished hole diameter, and have very specific designs depending on customer needs</li> <li>Radius, steps, and flat bottom forms are common</li> </ul>
<ul style="list-style-type: none"> <li>A skiving tool can be visualized as a modified floating reamer, used to finish the surface when close diameter and roundness tolerances are required</li> <li>Used for rapid stock removal with high penetration rates and low radial engagements</li> <li>A burnishing operation cold works the surface of a workpiece; one or more rollers are pressed against the surface, plasticizing the material's top layer, compressing peaks and filling in valleys</li> <li>In deep hole applications, skiving knives and burnishing rollers are often combined in a single tool to finish the operation in one pass</li> </ul>
<ul style="list-style-type: none"> <li>Bottle boring is also known as internal profiling or chamber boring</li> <li>The boring tool is extended and retracted to produce the intended contour inside the workpiece.</li> <li>The internal profile is then bigger within the part than at the entry and exit</li> <li>CNC is used to coordinate multiple axes simultaneously to achieve desired profiles</li> <li>Bottle boring tools are typically produced to profile a specific workpiece, or series of workpieces</li> </ul>
<ul style="list-style-type: none"> <li>Tube finishing for extremely large diameters requires specially configured counter boring tools</li> <li>This process can be visualized as a push counter boring operation with a gun drilling type (internal) coolant supply, and BTA type indexable tooling</li> <li>Extreme diameters need extreme amounts of coolant flow, which necessitates a design change in coolant induction and exhaust strategy</li> </ul>

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

## Applications and Tolerances

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
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.

PROCESS	CONFIGURATION	HOLE SIZE	HOLE STRAIGHTNESS		SURFACE FINISH	
			(inch/foot)	(mm/meter)	μ-inch Ra	μ-m Ra
Gundrilling	Tool rotate- Work rotate	IT6-IT11 (heavily influenced by work material)	0.001-0.004	0.08-0.33	8-248	0.2-6.3
	Tool stationary- Work rotate		0.002-0.006	0.16-0.5		
	Tool rotate- Work stationary		0.012	1.00		
BTA • Solid drilling • Trepanning • Counter-boring	Tool rotate – Work rotate	IT8-IT10	0.001-0.003	0.08-0.25	60-125	1.5-3.2
	Tool stationary – Work rotate		0.003-0.005	0.25-0.42		
	Tool rotate – Work stationary		0.012	1.00		
Pull boring	Tool rotate- Work rotate	IT7-IT9	0.001	0.08	32-125	1.5-3.2
Skive-burnishing	Tool rotate- Work stationary	IT8-IT9	as received	as received	< 8.0	< 0.2

DIAMETER 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
6	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

DIAMETER RANGE		IT6	IT7	IT8	IT9	IT10	IT11
over	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
1.1811	1.9685	0.0006	0.0010	0.0015	0.0024	0.0039	0.0063
1.9685	3.1496	0.0007	0.0012	0.0018	0.0029	0.0047	0.0075
3.1496	4.7244	0.0009	0.0014	0.0021	0.0034	0.0055	0.0087
4.7244	7.0866	0.0010	0.0016	0.0025	0.0039	0.0063	0.0098
7.0866	9.8425	0.0011	0.0018	0.0028	0.0045	0.0073	0.0114
9.8425	12.4016	0.0013	0.0020	0.0032	0.0051	0.0083	0.0126
12.4016	15.7480	0.0014	0.0022	0.0035	0.0055	0.0091	0.0142
15.7480	19.6850	0.0016	0.0025	0.0038	0.0061	0.0098	0.0157

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 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.

## 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



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