

UNISIG
DEEP HOLE DRILLING SYSTEMS

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."

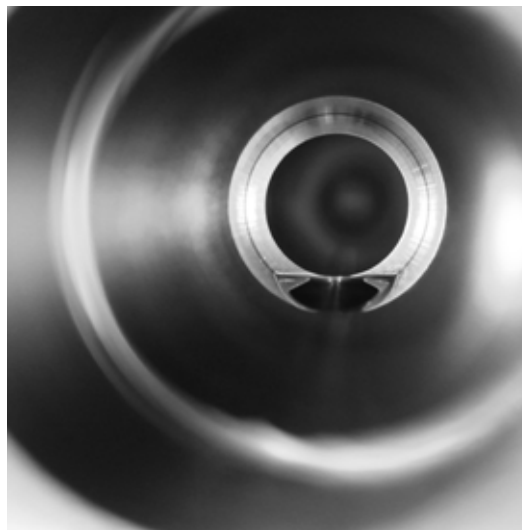


Deep Hole Drilling

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

AUTOMOTIVE

BTA or Gundrilling
UNI

DEFENSE

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

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

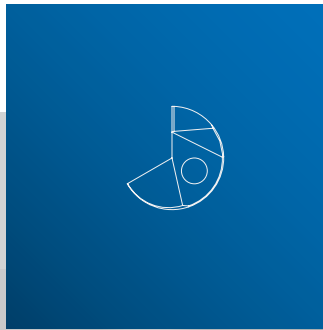
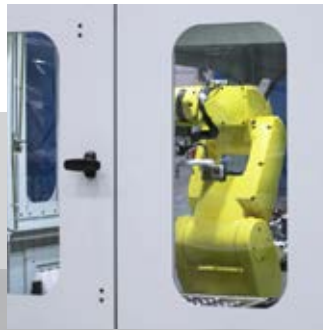
TUBE SHEETS AND ENERGY

BTA or Gundrilling
USC-TS, USK

UNISIG Machine Guide

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UNE6 Small Diameter Gndrilling Machines

for Medical Manufacturers

Medical manufacturers can maximize production by gndrilling 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

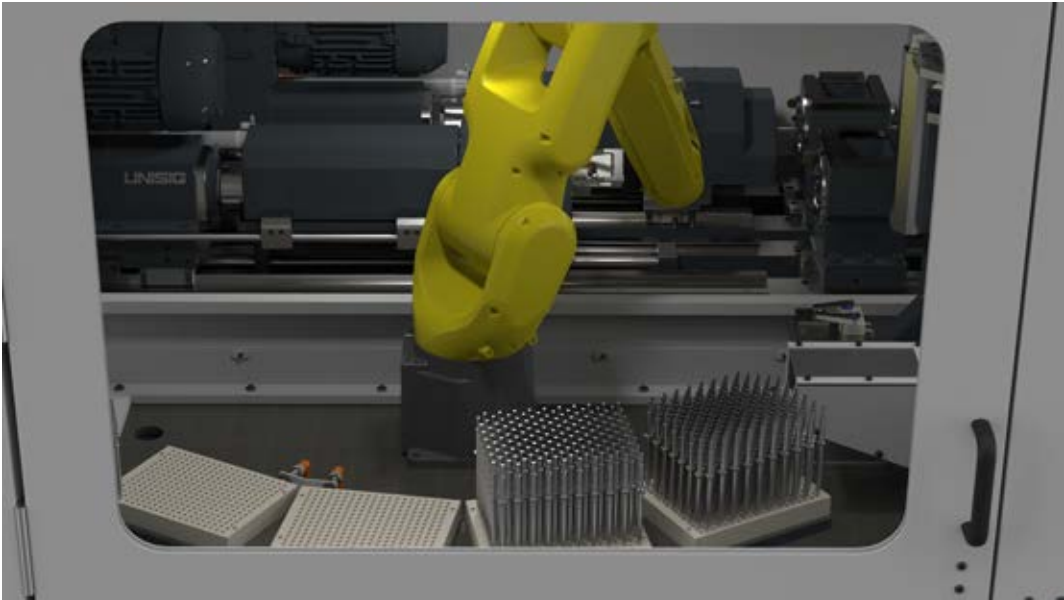
- Counter-rotating tool and workpiece
- Specialized workholding for small parts
- Exceptional process control
- Integral motor spindles
- Simple 3-point leveling installation
- Flow-based coolant system
- UNISIG Smart Control Interface with program storage

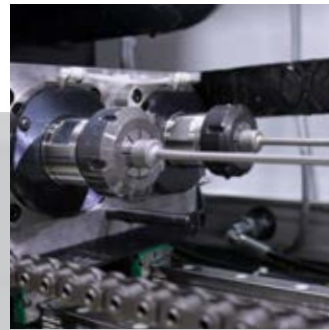
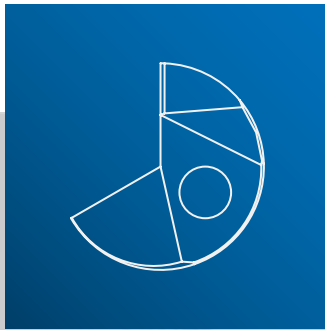
| | UNE6 | | UNE6-2i | |
|-----------------------------|------------|-----------|---------------|-------------|
| PERFORMANCE | | | | |
| Number of spindles | 1 | | 2 independent | |
| Hole diameter min | 0.8 mm | 0.03 in | 0.8 mm | 0.03 in |
| Hole diameter max | 6.0 mm | 0.24 in | 6.0 mm | 0.24 in |
| 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

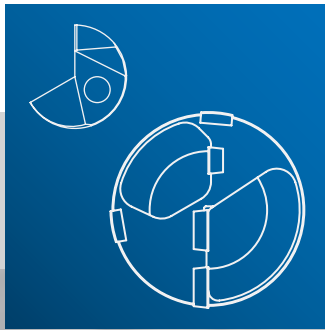
- Cast iron headstock and chipbox components
- Cartridge spindles with premium quality bearings
- High precision preloaded ballscrew feed
- Programmable coolant delivery
- Digital servo drives with absolute encoders
- Process monitoring with automatic interrupt
- Part program storage with USB transfer
- 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 | | | | | | | | | | |
| 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





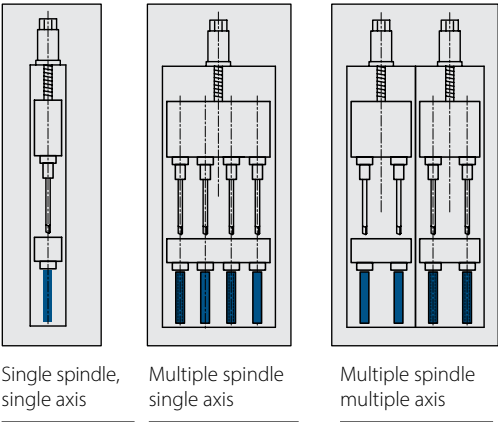
UNI Production Drilling Machines

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.



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 |
|--------------------------|-----------------|-------------------|-------------------|-------------------|----------------------|----------------------|
| Tooling type | Gundrill | | Gundrill | Gundrill | Gundrill, BTA option | Gundrill, BTA option |
| Number of spindles | 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

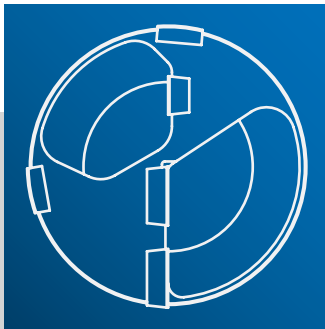
- Rapid changeover from BTA to Gundrill tooling
- Counter-rotation for minimized centerline drift
- High-precision zero endplay spindles for bottom forming operations
- Preloaded ballscrew drives for precise depth control
- Process monitoring and graphical display of critical information
- Automatic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

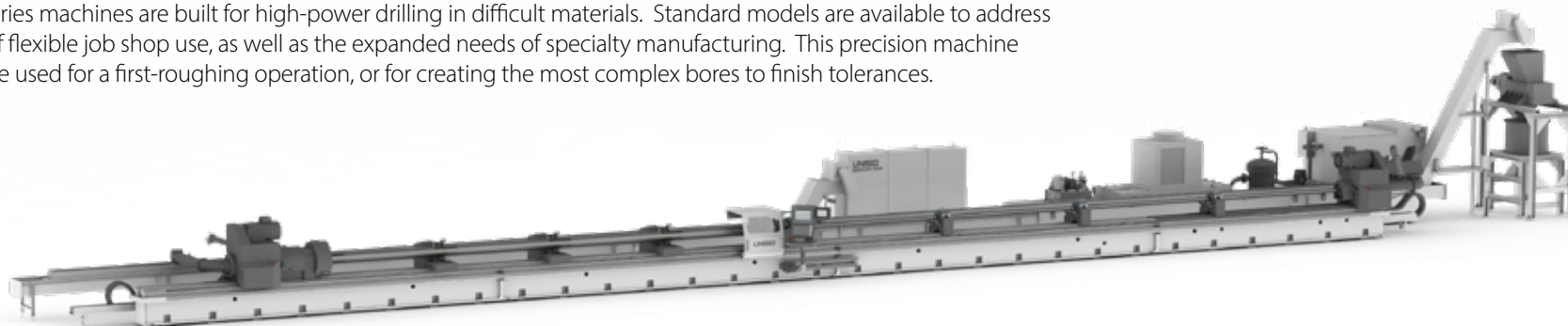




B-Series BTA Drilling Machines < 800 mm Swing

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

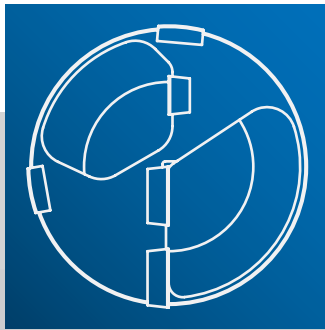
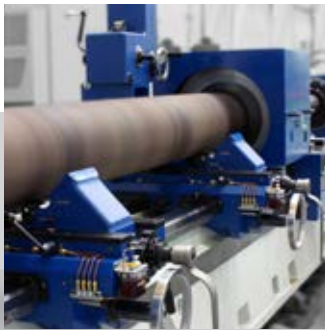
B500

B600

B700

| DIMENSION | | | | | | | | |
|---|------------------|-------------|--------------------|----------------------|--------------------------------------|----------------------|--------------------------------------|----------------------|
| 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 |

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





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

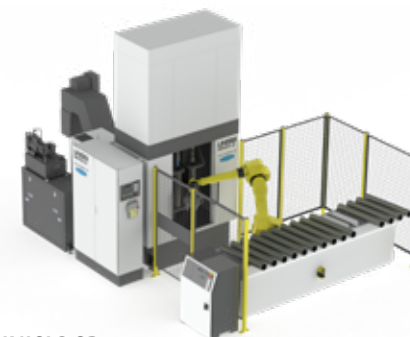
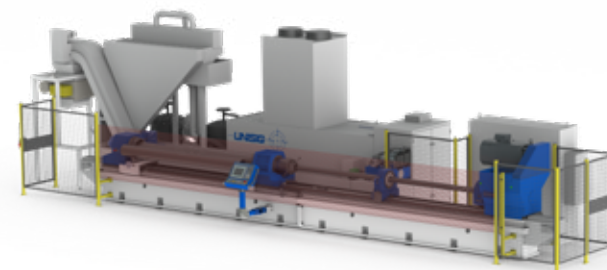
- Skiving and roller burnishing
- Counter-boring, skiving and roller burnishing
- Standard and pressure compensated tools

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

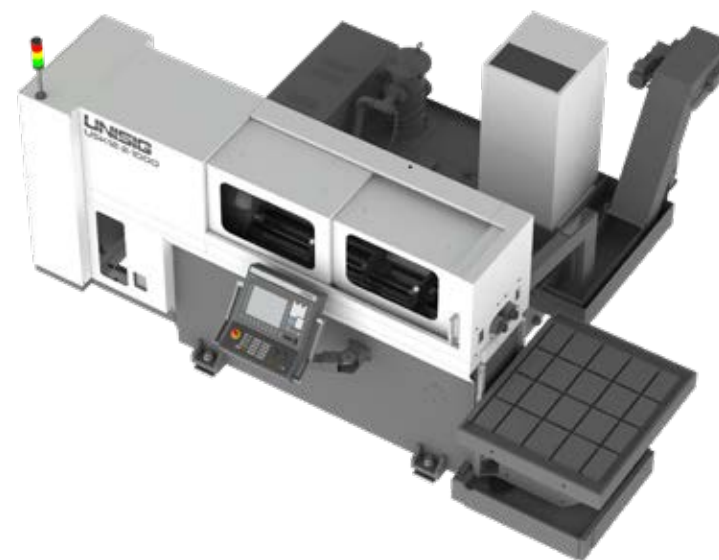
for High-Accuracy Off-Center Drilling

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

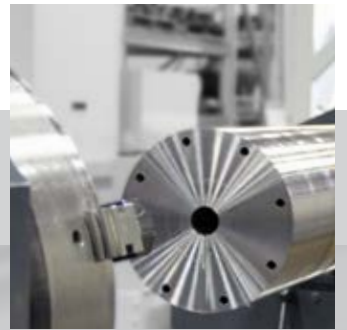
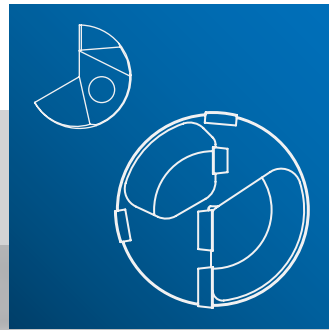
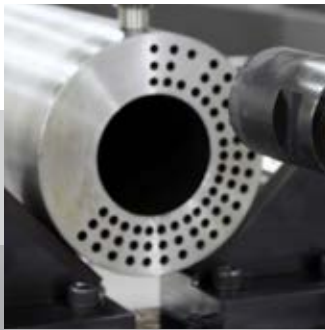
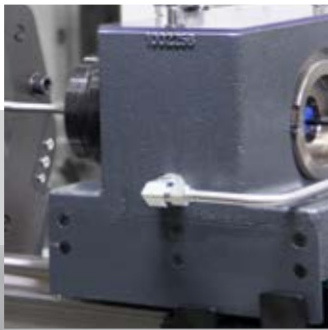
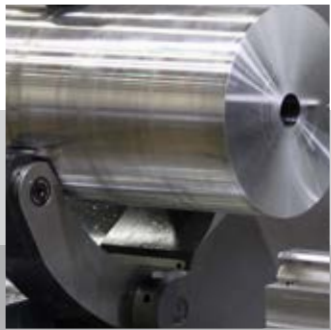
USK25

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 | 1,000 kg | 2,205 lbs | 1,000 kg | 2,205 lbs | 1,000 kg | 2,205 lbs | |
| X-travel (horizontal) | 500 mm | 20.0 in | 500 mm | 20.0 in | 500 mm | 20.0 in | 500 mm | 20.0 in | |
| Y-travel (vertical) | 350 mm | 14.0 in | 350 mm | 14.0 in | 350 mm | 14.0 in | 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

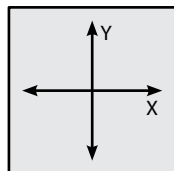
UNX40

UNX50

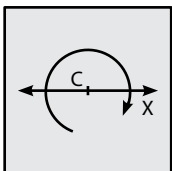
| DIMENSION | | | | | | |
|------------------------------|------------------------|---------|----------------------------|---------|--------------|---------|
| Tooling type | Gundrill | | Gundrill | | Gundrill/BTA | |
| Drilling diameter max | 20 mm | 0.79 in | 25 mm | 1.00 in | 40 mm | 1.57 in |
| Counterbore max | - | | - | | 65 mm | |
| 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

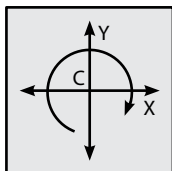
MOTION PROFILES



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.

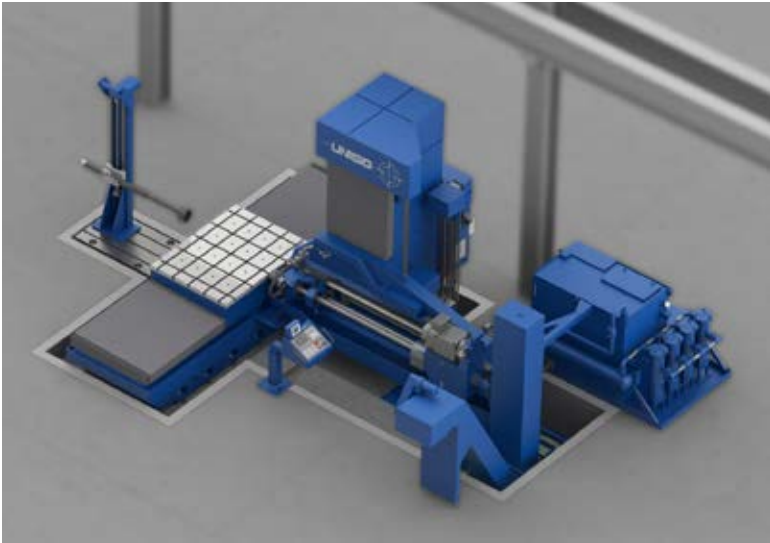
Polar positioning **[P]** rotates a cylindrical part on its axis, with an X-axis to position the drilling headstock distance from center.

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



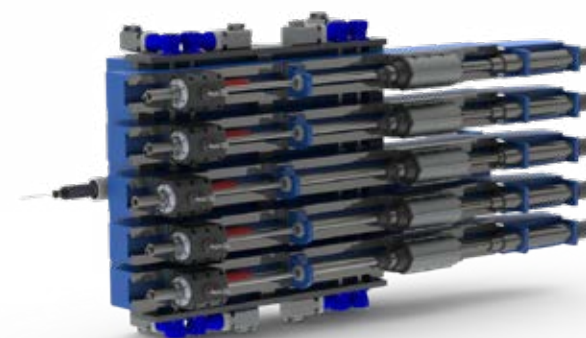
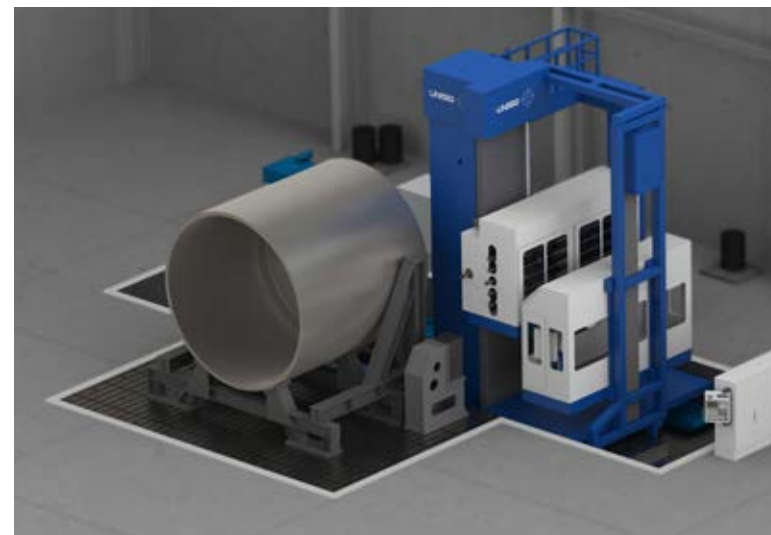
USC75 USC100

| 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

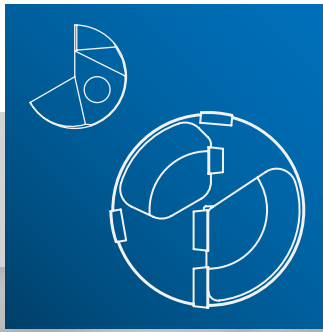
USC-TS65

| 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*

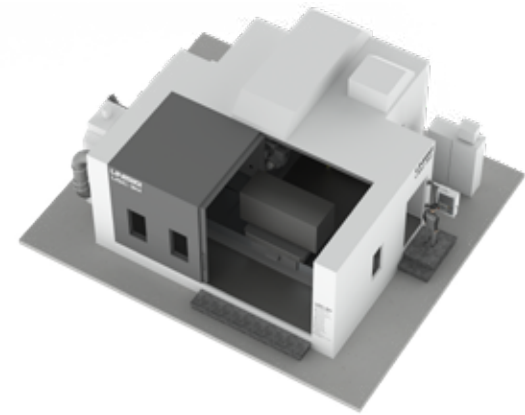
PERFORMANCE

- 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 | | |
|-------------------------------|------------------------|----------------|------------------------|----------------|------------------------|----------------|------------------------|----------------|-----------------------------|----------------|-----------------------------|----------------|
| PERFORMANCE | | | | | | | | | | | | |
| 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 |
| 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 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 | | 500 mm | | 500 mm | | 500 mm | |
| 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 / CAT 50 | | SK 50 / CAT 50 | | SK 50 / CAT 50 | | 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 |
| DRILLING SPINDLE | | | | | | | | | | | | |
| 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 | | 15 kW / 20 kW | | 15 kW / 20 kW | | 24 kW / 30 kW | |
| TOOL CHANGER | | | | | | | | | | | | |
| Automatic tool changer | 60 position | | 60 position | | 40 position | | 40 position | | 120 position | | 120 position | |
| CONTROLS | | | | | | | | | | | | |
| CNC | Heidenhain TNC 640 CNC | | Heidenhain TNC 640 CNC | | Heidenhain TNC 640 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



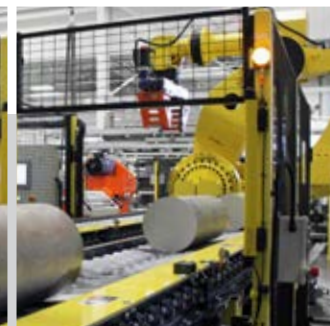
UNISIG USC BTA drilling machine with 50-taper milling spindle and special capacity table

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

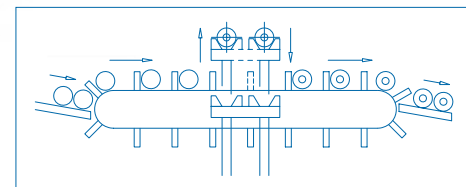
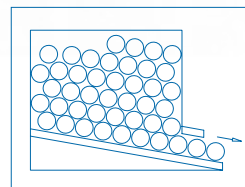
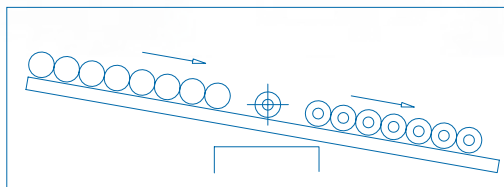
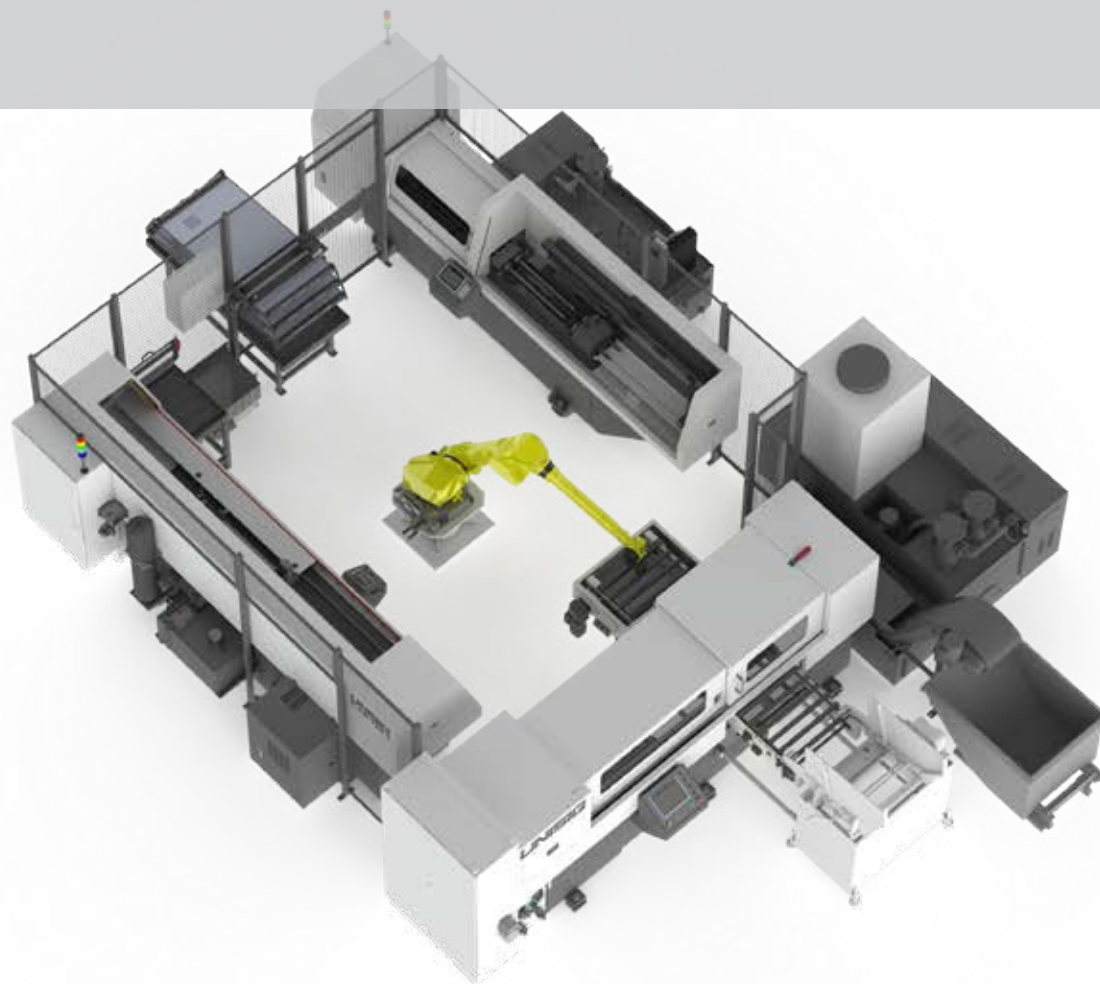


Automation

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.



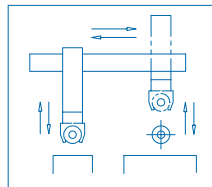
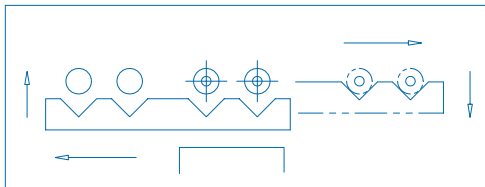
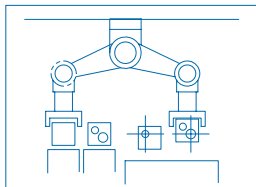
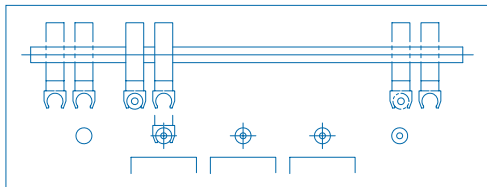
CONVEYOR-FED & PALLET AUTOMATION

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.



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.



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.



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)

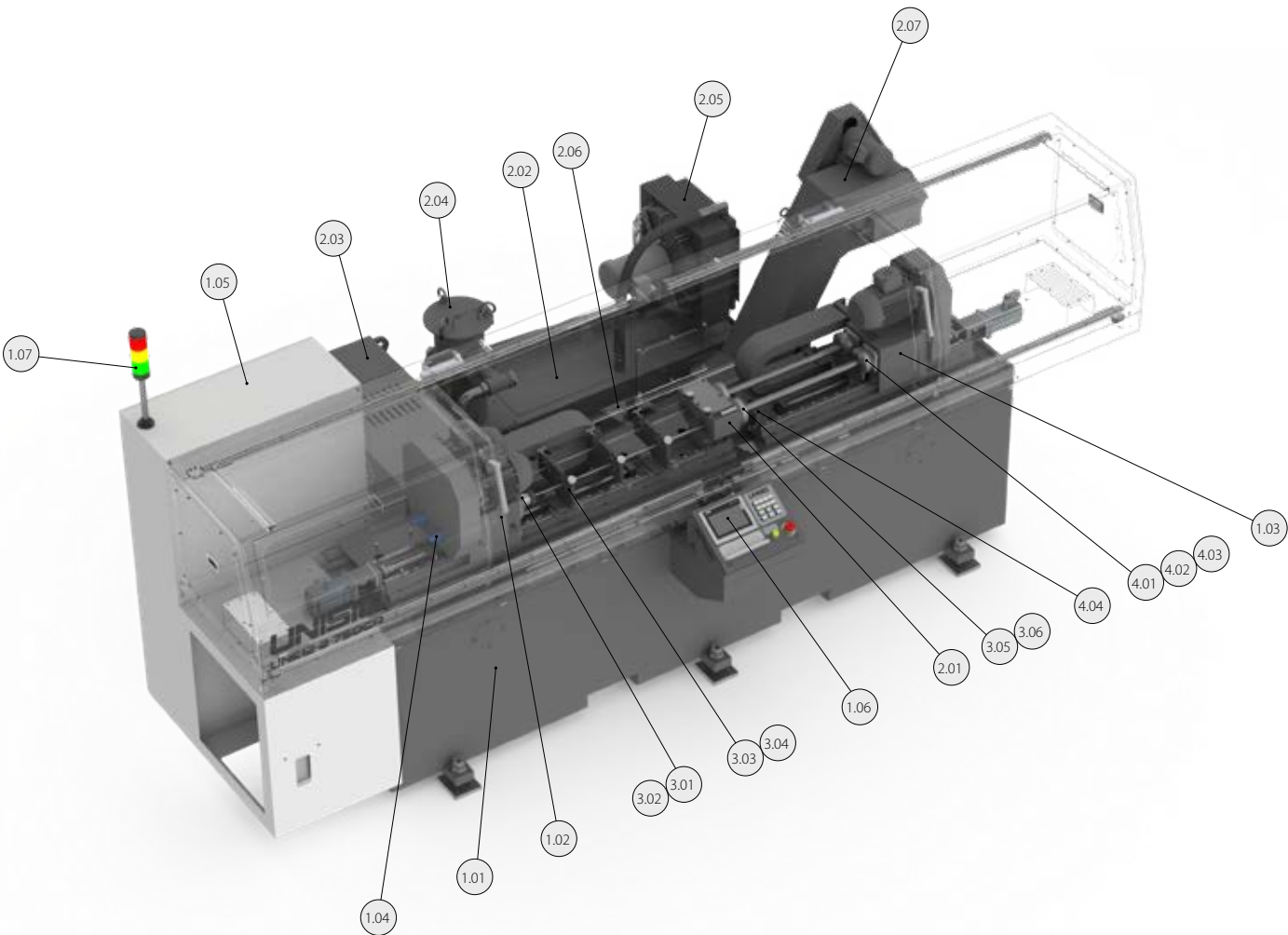
CANADA - Compliance with CSA standards of construction relevant to machine tools and industrial equipment (460 VAC, 3-phase, 60Hz)

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



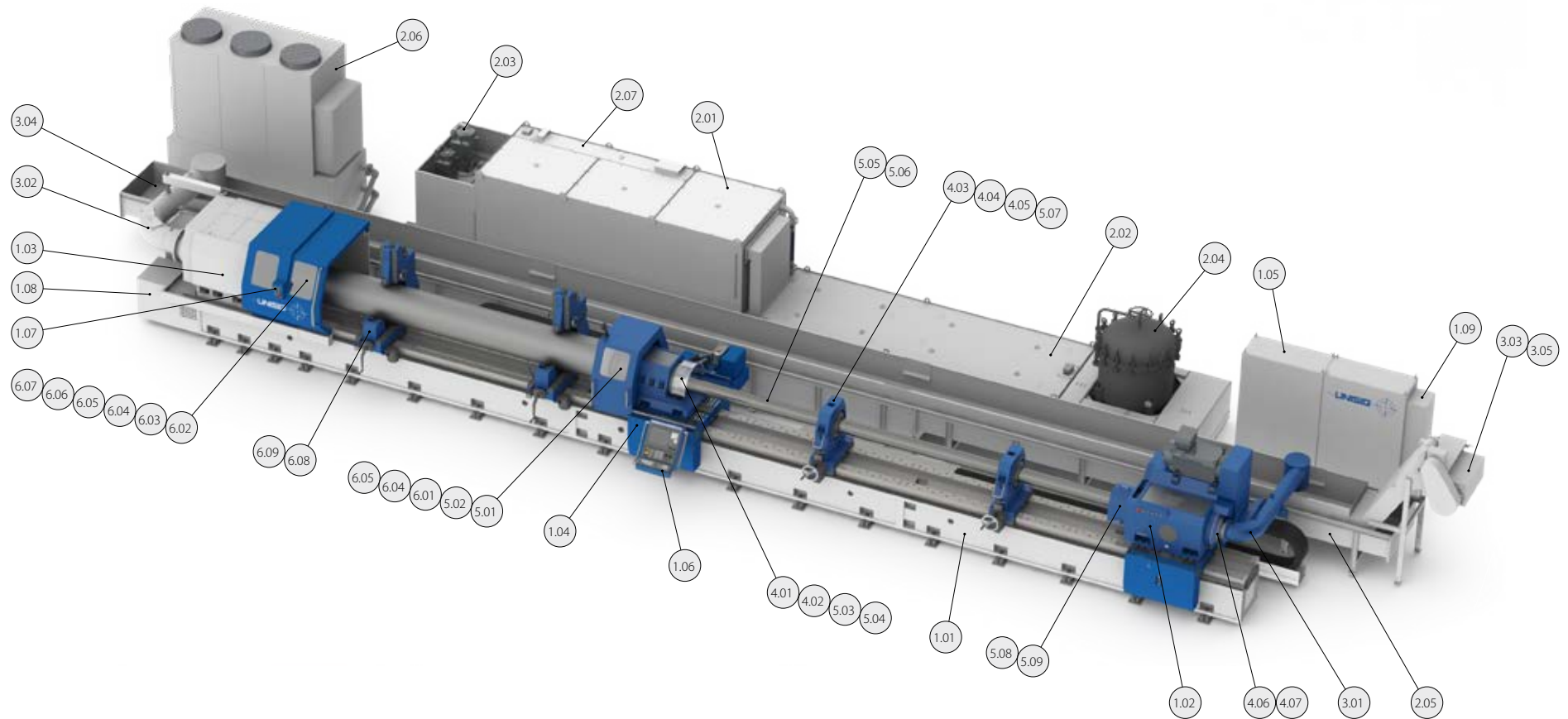
| MACHINE AND OPTIONS | | COOLANT SYSTEM AND CHIP REMOVAL | | ACCESSORIES AND TOOLING | | WORKHOLDING | |
|---------------------|---------------------|---------------------------------|-----------------------------------|-------------------------|-----------------------|-------------|----------------|
| 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](https://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

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.



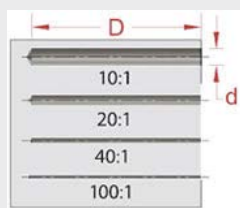
Breakthrough seal systems provide a clean return path for cutting fluid and chips when drilling holes through a workpiece.



Please request your complete tooling catalog online at unisig.com



Deep Hole Definition

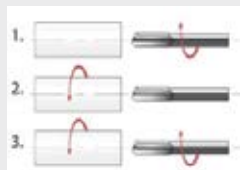


Depth to diameter ratio

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

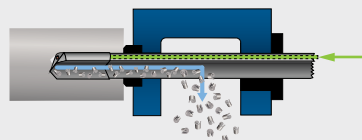
2. ROTATING WORKPIECE - Used for round parts with a deep on-center hole, and allows for a reduction in drill drift.

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

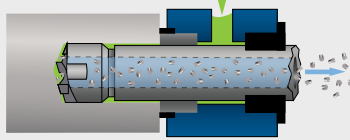
GUNDRILL

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.

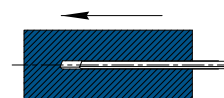
Deep Hole Drilling Methods

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

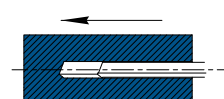
Solid Carbide

0.5 - 12 mm
[0.02 - 0.47 in]



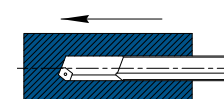
Brazed

2 - 50 mm
[0.08 - 2.00 in]



Indexable

13.5 - 50 mm
[0.53 - 2.00 in]

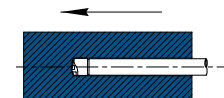


BTA DRILLING

- 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

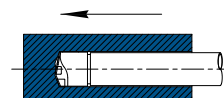
Brazed

12 - 65 mm
[0.47 - 2.56 in]



Indexable

25 - 630 mm
[1.0 - 24.8 in]

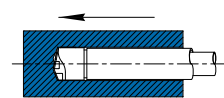


EJECTOR DRILLING

- 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

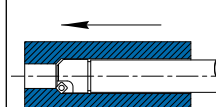
20 - 200 mm
[0.79 - 7.87 in]



ADDITIONAL TOOLS FOR USE ON BTA MACHINES

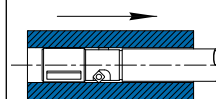
PUSH-COUNTER BORING/ REAMING

20 - 630 mm
[0.79 - 24.8 in]
External coolant



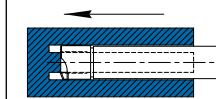
PULL BORING

20 - 630 mm
[0.79 - 24.8 in]
External coolant



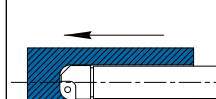
TREPPANNING

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



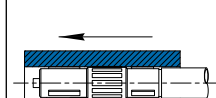
BOTTOM FORMING

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



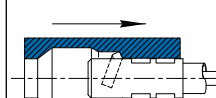
SKIVING AND ROLLER BURNISHING

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



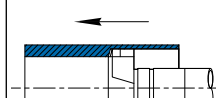
BOTTLE BORING

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">•Counterboring enlarges an existing hole that is drilled or cast•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•Multi-cutter counterbore tools are available for high stock removal•Reaming performs the same operations as counter boring, but typically, a reduced radial depth and unique geometry are used |
| <ul style="list-style-type: none">•A special configuration of counterboring, in which the tool enlarges the existing bore as it is pulled back through the workpiece•The boring bar is in tension rather than compression, providing better control over hole straightness•Can be used to straighten a hole with tools designed to follow the center line of the machine by supporting off the finished hole•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•A lantern chuck may be used to align a guide bushing to the centerline of the machine |
| <ul style="list-style-type: none">•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•Consumes less power than solid drilling, for the same hole diameter•Trepanning in blind hole applications may not be practical due to the difficulty in removing the core |
| <ul style="list-style-type: none">•Bottom forming is essentially a form tooling operation for finishing off the base of a hole•After deep hole drilling, the drawing may require a specific form to the hole•Bottom forming tools are guided with wear pads along the finished hole diameter, and have very specific designs depending on customer needs•Radius, steps, and flat bottom forms are common |
| <ul style="list-style-type: none">•A skiving tool can be visualized as a modified floating reamer, used to finish the surface when close diameter and roundness tolerances are required•Used for rapid stock removal with high penetration rates and low radial engagements•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•In deep hole applications, skiving knives and burnishing rollers are often combined in a single tool to finish the operation in one pass |
| <ul style="list-style-type: none">•Bottle boring is also knows as internal profiling or chamber boring•The boring tool is extended and retracted to produce the intended contour inside the workpiece.•The internal profile is then bigger within the part than at the entry and exit•CNC is used to coordinate multiple axes simultaneously to achieve desired profiles•Bottle boring tools are typically produced to profile a specific workpiece, or series of workpieces |
| <ul style="list-style-type: none">•Tube finishing for extremely large diameters requires specially configured counter boring tools•This process can be visualized as a push counter boring operation with a gun drilling type (internal) coolant supply, and BTA type indexable tooling•Extreme diameters need extreme amounts of coolant flow, which necessitates a design change in coolant induction and exhaust strategy |

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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UNISIG

DEEP HOLE DRILLING SYSTEMS

UNISIG Deep Hole Drilling Systems
N58W14630 Shawn Circle, Menomonee Falls WI 53051 | USA
UNISIG.com | ☎ +1-262-252-5151

UNISIG GmbH
Heuweg 3, 72574 Bad Urach, Germany
UNISIG.de | ☎ +49 (0) 7125 9687590

