Deep Hole Drilling Systems

Definitions and Standards

Deep Hole Definition

![Diagram of Deep Hole Definition]

HOLE DEPTH : DIAMETER (D:d)

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

Depth to diameter ratio

Drilling Process

1. ROTATING TOOL - Typically used for non-symmetrical components, or off-center hole requirements
2. ROTATING WORKPIECE - Used for round parts with a deep on-center hole, and allows for a reduction in drill drift.
3. COUNTER-ROTATING TOOL AND WORKPIECE - Used for round parts with a deep on-center hole, provides the best hole straightness and concentricity.

Tool and workpiece rotation

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.

Additional deep hole drilling references can be accessed at [www.unisig.com](http://www.unisig.com), including more detailed information, videos, machines, and applications.

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Deep Hole Drilling Systems
Tools, Methods, Applications, and Parameters

TOOL FORS CREATING HOLES FROM SOLID
- Gun drilling
- BTA
- Ejector drilling
- Treparring

DEEP HOLE DRILLING SYSTEMS
- www.unisig.com
- Used to straighten the hole or to achieve uniform wall thickness

ISO - IT GRADE TOLERANCES FOR COMMON DIAMETERS

DEEP HOLE DRILLING PROCESS PARAMETERS

COUNTER-BORING/REAMING
- Boring tool is designed to straighten a hole by rotating the tool around the axis of the hole
- Used to increase productivity compared to individual skiving + burnishing

SILVER-BURNISHING
- Used for large stock removal
- Tool rotate - Work rotate
- Tool rotate - Work stationary

VARIOUS APPLICATIONS
- Counter-boring
- Treparring
- Bottle boring
- Bottom forming
- Skiving and roller burnishing
- Tube finishing

TUBE FINISHING LARGE DIAMETER COUNTERBORE
- Tube finishing for extremely large diameters requires specially configured counterboring tools
- The tool is extended and retracted to produce the intended contour inside the workpiece

COUNTER-BORE/REAMING APPLICATIONS
- Solid drilling
- Counter-boring/reaming
- Treparring
- Full counter boring
- Skiving
- Roller burnishing
- Silver-burnishing
- Honing

TOLERANCE AND SURFACE FINISH BY PROCESS
- Surface finish
- Hole straightness
- Hole size
- Process

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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, tool type, substrate, and coating. Use tool manufacturer, or UNISIG engineering recommendations.

Approximate starting values for Cutting Speed and Feed and based on published values of cutting tool manufacturers. Use tool manufacturer or UNISIG engineering recommendations for other cutting parameters and tool life. Cutting Fluid Flow Rate and Cutting Fluid Pressure are dependent on the particular application and should be determined by the user.