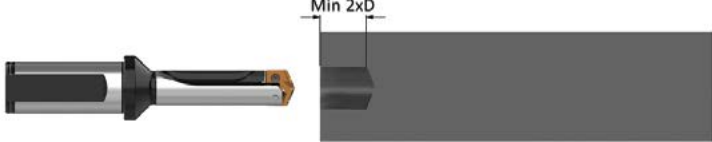
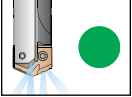

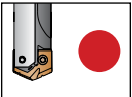

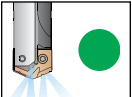

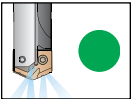

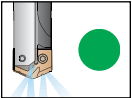

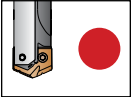


Deep Hole Drilling Guidelines

T-A Pro | 10xD, 12xD, 15xD Holders

A
DRILLING
B
BORING
C
REAMING
D
URNISHING
E
HREADING
X
PECIALS

<p>1. Pilot Hole 100 % RPM 100% mm/rev (IPR)</p>	<p>Establish the pilot hole using the same diameter short drill to a depth of 2xD minimum. Utilise a pilot drill with the same or larger included point angle.</p> 	<p>Coolant ON</p> 
<p>2. Feed-in 50 RPM max 300 mm/min (12 IPM)</p>	<p>Feed the longer drill within 1.5mm (1/16") short of the established pilot hole bottom at a maximum of 50 RPM and 300 mm/min (12 IPM) feed rate.</p> 	<p>Coolant OFF</p> 
<p>3. Deep Hole Transition Drilling 50 % RPM 75% mm/rev (IPR)</p>	<p>Drill additional 1xD past the bottom of the pilot hole at 50% reduction of recommended speed and 25% reduction of recommended feed. Minimum of one second dwell is required to meet full speed before feeding.</p> 	<p>Coolant ON</p> 
<p>4. Deep Hole Drilling - Blind 100% RPM 100% mm/rev (IPR)</p>	<p>Drill to full depth at recommended speed and feed for longer drill according to Allied speed and feed charts. No peck cycle recommended.</p> 	<p>Coolant ON</p> 
<p>5. Deep Hole Drilling - at Breakout 50% RPM 75% mm/rev (IPR)</p>	<p>For through holes only: Reduce speed by 50% and feed by 25% prior to breakout. Do not break out more than 3mm (1/8") past the full diameter of the drill.</p> 	<p>Coolant ON</p> 
<p>6. Drill Retract 50 RPM max</p>	<p>Reduce speed to a maximum of 50 RPM before retracting from the hole.</p> 	<p>Coolant OFF</p> 

⚠ WARNING Tool failure can cause serious injury. To prevent:

- When using holders without support bushing, use a short T-A Pro holder to establish an initial hole that is a minimum of 2 diameters deep.
- Do not rotate tool holders more than 50 RPM unless it is engaged with the workpiece or fixture.

Visit www.alliedmachine.com/DeepHoleGuidelines for the most up-to-date information and procedures.
Factory technical assistance is available for your specific applications through our Application Engineering department. *email: engineering.eu@alliedmachine.com*

Tap Drill Information and Formulas | Metric (mm)

Tap Size	Tap Drill Size	Decimal Equivalent (inch)	* Theo % Thread	Probable Mean Oversize	Probable Hole Size	** Probable % Thread
12 X 1.25	27/64	0.4219	79%	0.075mm	10.79mm	74%
	10.8mm	0.4252	74%	0.075mm	10.88mm	69%
14 X 2.0	15/32	0.4688	81%	0.075mm	11.98mm	78%
	12.0mm	0.4724	77%	0.075mm	12.08mm	74%
14 X 1.5	12.5mm	0.4921	77%	0.075mm	12.58mm	73%
16 X 2.0	14.0mm	0.5512	77%	0.075mm	14.08mm	74%
16 X 1.5	14.5mm	0.5709	77%	0.075mm	14.58mm	73%
	37/64	0.5781	68%	0.075mm	14.76mm	64%
18 X 2.5	15.5 mm	0.6102	77%	0.075mm	15.58mm	75%
18 X 1.5	16.5mm	0.6496	77%	0.075mm	16.58mm	73%
	21/32	0.6563	68%	0.075mm	16.75mm	64%
20 X 2.5	11/16	0.6875	78%	0.075mm	17.54mm	76%
	17.5 mm	0.6890	77%	0.075mm	17.58mm	74%
20 X 1.5	18.5mm	0.7283	77%	0.075mm	18.58mm	73%
	47/64	0.7344	69%	0.075mm	18.66mm	65%
22 X 2.5	49/64	0.7656	79%	0.075mm	19.52mm	76%
	19.5 mm	0.7677	77%	0.075mm	19.58mm	75%
22 X 1.5	20.5mm	0.8071	77%	0.075mm	20.58mm	73%
	13/16	0.8125	70%	0.075mm	20.71mm	66%
24 X 3	13/16	0.8125	86%	0.075mm	20.71mm	84%
	21.0 mm	0.8268	76%	0.075mm	21.08mm	75%
24 X 2	22.0mm	0.8661	77%	0.075mm	22.08mm	74%
	7/8	0.8750	68%	0.075mm	22.30mm	65%
27 X 3	24.0mm	0.9449	77%	0.075mm	24.08mm	75%

Formulas

1.	RPM = $(318.47 \cdot M/min) / DIA$ where: RPM = revolutions per minute (rev/min) M/min = speed (M/min) DIA = diameter of drill (mm)
2.	mm/min = $RPM \cdot mm/rev$ where: mm/min = mm per minute (mm/min) RPM = revolutions per minute (rev/min) mm/rev = feed rate (mm/rev)
3.	M/min = $RPM \cdot 0.003 \cdot DIA$ where: M/min = speed (M/min) RPM = revolutions per minute (rev/min) DIA = diameter of drill (mm)
4.	Thrust = $154 \cdot (mm/rev) \cdot DIA \cdot K_m$ where: Thrust = axial thrust (N) mm/rev = feed rate (mm/rev) DIA = diameter of drill (mm) K_m = specific cutting energy (kPa)
5.	Tool Power = $((mm/rev) \cdot RPM \cdot K_m \cdot DIA^2) / 218604.8$ where: Tool Power = tool power (HP) mm/rev = feed rate (mm/rev) RPM = revolutions per minute (rev/min) K_m = specific cutting energy (kPa) DIA = diameter of drill (mm)

BSP and ISO 7-1

Tap Size	Tap Drill Size	Decimal Equivalent	* Theo % Thread	Probable Mean Oversize	Probable Hole Size	** Probable % Thread
1/4-19	7/16"	0.4375"	-	0.075mm	11.19 mm	-
3/8-19	37/64"	0.5781"	-	0.075mm	14.76 mm	-
1/2-14	23/32"	0.7188"	-	0.075mm	18.33 mm	-
3/4-14	15/16"	0.9375"	-	0.075mm	23.89 mm	-

* Based on nominal tap drill diameter

** Based on 0.075mm probable mean oversize

To calculate the percent of full thread for a given hole diameter:

$$\% \text{ Thread} = \frac{76.93}{\text{Pitch (mm)}} \cdot (\text{Basic major diameter} - \text{Drill hole size})$$

Notes

- The above tap drill information represents probable thread percentages for the standard tap drills stocked at Allied Machine. Special insert diameters may be required in order to meet a user specific percentage of thread requirement.
- The .075mm probable mean oversize hole condition is based on optimum cutting conditions. Probable percent of full thread may vary based on less ideal cutting conditions.
- The table and equations on this page are found in the *Machinery's Handbook*. Permission to simplify and print the equations is granted by the Editor of the *Machinery's Handbook*.

Material Constants

Type of Material	Hardness	K_m (kPa)
Plain Carbon and Alloy Steel	85 - 200 BHN	5.45
	200 - 275 BHN	6.48
	275 - 375 BHN	6.89
	375 - 425 BHN	7.93
High Temperature Alloys	-	9.93
Titanium Alloy	-	4.96
Stainless Steels	135 - 275 BHN	6.48
	30 - 45 RC	7.45
Cast Iron	100 - 200 BHN	3.45
	200 - 300 BHN	7.45
Copper Alloy	20 - 80 RB	2.96
	80 - 100 RB	4.96
Aluminum Alloy	-	1.52
Magnesium Alloy	-	1.10

Troubleshooting Guide

A DRILLING
B BORING
C REAMING
D BURNISHING
E THREADING
X SPECIALS

	Potential Problem																				
	Accelerated corner wear	Barber pole	Bell mouth hole	Insert chipping	Blue chips	Build Up Edge (BUE)	Chatter	Chip packing	Chipping of point	Damaged or broken tools	Excessive margin wear	High flank wear	Hole lead off	Hole out of position	Hole out of round	Oversize hole	Poor hole finish	Poor tool life	Power spikes - Load meter	Retract spiral	
Setup Condition	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	Possible Solutions
Worn or misaligned spindle (lathe, screw machine, chucker)	1		3				7		9	10	11		13			16	17			20	<ul style="list-style-type: none"> Align spindle and turret or tailstock. Repair spindle.
Use of low rigidity machine tools		2	3	4			7		9	10			13	14						20	<ul style="list-style-type: none"> Reduce penetration rate to fall within the physical limits of the machine or setup (NOTICE: Do not reduce feed below threshold of good chip formation).
Poor work piece support		2		4			7			10	11				15					20	<ul style="list-style-type: none"> Provide additional support for the work piece. Reduce penetration rate to fall within the physical limits of the machine or setup (NOTICE: Do not reduce feed below threshold of good chip formation).
Flood coolant, low coolant pressure, or low coolant volume	1				5	6		8		10		12					16	17	18	19	<ul style="list-style-type: none"> Run coolant through tool holder when drilling greater than 1xD. Increase coolant pressure and volume through the tool holder. Reduce penetration rate to fall within the coolant limitations (NOTICE: Do not reduce feed below threshold of good chip formation). Add a peck cycle to help clear chips.
Interrupted cuts. Entry or exit surfaces that are not perpendicular to the spindle (draft angles, parting lines, curved or stepped surfaces, cross holes, and cast or forged surfaces)				4			7		9	10	11		13	14	15	16	17	18			<ul style="list-style-type: none"> Pre-mill (spot face) entry or exit surface to remove interruption. Decrease feed as much as 50% through entry or exit interruption. Use short holders in low impact entry cuts.
Material harder than expected or running tools beyond recommended speed	1				5	6				10		12								18	<ul style="list-style-type: none"> Reduce speed. Increase coolant pressure and volume. Improve coolant condition by use of quality products and regular maintenance.
Poor material micro-structure or foreign particles (forgings and castings that have not been normalised or annealed, poorly prepared steel, flame cut parts, and sand casting)				4		6				10		12	13							18	<ul style="list-style-type: none"> Compare performance of other tools for similar wear problems, which may indicate poor micro-structure. Anneal or normalise parts to improve micro-structure for machining. Reduce feeds (NOTICE: Do not reduce feed below threshold of good chip formation).
Poor chip control								8		10	11		13				16	17	18	19	<ul style="list-style-type: none"> Increase feed to recommended levels. Contact Allied Application Engineering group for technical recommendations. Increase coolant pressure and volume. Improve coolant condition by use of quality products and regular maintenance.
Spot drilled holes with included angle less than that matching T-A Pro or cored holes	1			4			7						13							18	<ul style="list-style-type: none"> Spot hole with short tool of same or greater included angle as T-A Pro drill insert. Reduce feed (NOTICE: Do not reduce feed below threshold of good chip formation). If possible, drill from solid.

Guaranteed Application Form

Distributor PO #

The Followig must be filled out completely before your test will be considered

CONTACT DETAILS

Trial P.O No* Date* Proposed Test Date*
 Distributor* Distributor Contact*
 Customer Name* Industry..... Contact Name*

APPLICATION INFORMATION

ATTENTION: The following Information is required to enable the best combination of tooling to be recommended. Please complete all that apply.

Material Type* Specification* Material Hardness Kg BRN RC N/mm²
 Material Condition Flat Stock Round Stock Tubular Stock Plate
 Stacked Plate Hot Rolled Cold Rolled Casting Forging
 Hole Diameter mm Inch Hole Depth..... Thru Hole Blind Hole
 Drilled Hole Tolerance Req'd Drilled Hole RMS Finished Req'd µInch µMetre

APPLICATION INFORMATION

Material Condition Machining Centre Round Stock Boring Mill
 Multi-spindle auto Multi spindle drill Transfer Line
 Gantry machine Dial Index Machine Radial Arm
 Gun Drilling Machine Pedestal Drill Other
 Machine Tool Builder* Model
 Machine Tool Control* CNC NC Manual Other
 Spindle Orientation* Vertical Horizontal Other
 Tool* Stationary Revolves
 Available Power* KW HP Available Feed Trust Newtons Lbs
 Available Speed* Variable Fixed RPM m/Min
 Preferred Shank Type* Flanged Morse No RCA Lathe Diameter mm Inch
 Coolant Type* Cutting Oil Water Soluble Oil Air Mist Air Dry
 Coolant Pressure* Bar PSI
 Coolant Flow Rate* L/min GPM Coolant Supply Through Tool External

CURRENT DRILL INFORMATION

Drill Manufacturer Part Nuber
 Drill Type Twist Brazed Indexable Insert Gun Drill
 Removable Tip Other
 Tool Grade HSS Carbide Ceramic Other
 Tool Coating Uncoated TiN TiCN TiAlN Other
 Current Speed RPM m/Min Current Feed Rate mm/rev mm/min
 Average Number of Holes Drilled New After Regrind?
 Reason(s) for Tool change Wear Fracture Chipping
 Losing Hole Tolerance Losing Chip Control Burr
 Other Chatter New Application
 What Criteria defines a successful test* Decreased Cycle Time Better Chip Control Safer Process
 Longer Tool Life Reduced Cost per Hole Other

Potential this application: Current Annual Usage €/£:

Tools per Annum?

*Required Fields where applicable

FOR OFFICE USE ONLY

Application Engineer:

Number:

Status: