ALLIED MACHINE & ENGINEERING

Holemaking Solutions for Today's Manufacturing

AHB

TOOLING & MACHINERY

COMPLETE METALWORKING SOLUTIONS

(800) 991-4225 www.ahbinc.com

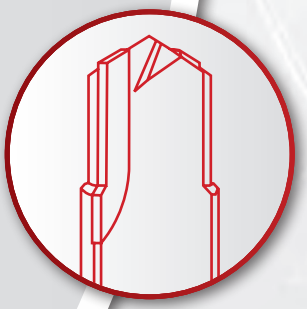
ISO Certified customerservice@ahbinc.com

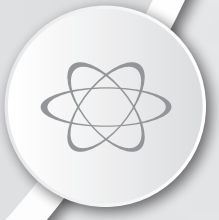
Boring

Reaming

Burnishing

Threading





Specials

Superion®

▶ *SPECIALS*

Technical Information

Solid Carbide / PCD Drilling Tools

North America

Allied Machine
120 Deeds Drive
Dover, OH 44622
United States

Allied Machine
485 West 3rd Street
Dover, OH 44622
United States

ThreadMills USA™
4185 Crosstowne Ct #B
Evans, GA 30809
United States

Superion®
1285 S Patton St.
Xenia, OH 45385
United States

Europe

Allied Machine Europe
93 Vantage Point
Pensnett Estate
Kingswinford
West Midlands
DY6 7FR, United Kingdom

Wohlhaupter™ GmbH
Maybachstrasse 4
Postfach 1264
72636 Frickenhausen
Germany

Asia

Wohlhaupter™ India
B-23, 2nd Floor
B Block Community Centre
Janakpuri, New Delhi - 110058
India

Allied Machine & Engineering is a worldwide leader in holemaking and finishing solutions. We are committed to providing practical and dependable solutions to our customers through innovative designs and superior customer and technical support.

We continue to expand our product offering in order to provide new and different solutions. With Field Sales Engineers located around the world, we position ourselves to provide technical support on site, right at your spindle.

ALLIED MACHINE & ENGINEERING®

www.alliedmachine.com

ALLIED MACHINE & ENGINEERING

Holemaking Solutions for Today's Manufacturing

Superion® Solutions

The Foundation

Since 1941, Allied Machine & Engineering has provided dependable and practical holemaking solutions to the world. What was once a small job shop in Ohio is now a worldwide leader in cutting tool technology. With three manufacturing facilities in Ohio, one in Georgia, another in Germany, and headquarters in both the United States and Europe, Allied Machine is positioned to bring innovative solutions and technical expertise directly to the customers' hands.

The Beginning

Harold E. Stokey founded Allied Machine & Engineering to aid the war effort, manufacturing taper bearing lock nuts for the production of M1 tanks. Years later, after a sales meeting gone wrong, Stokey possessed a warehouse stocked with spade drill inserts. He set forth into the industry that would become Allied Machine's thriving identity: holemaking.

The T-A®

When Harold's son, William H. Stokey, became the president and CEO, he developed the Throw Away, or T-A, spade drill insert system. The T-A revolutionized the holemaking industry, launching Allied Machine ahead of the competition. Since then, numerous innovations and advancements have been created from the T-A's inspiration.

The Innovation

Since the development of the T-A, Allied Machine has expanded its product offering to support a vast range of customer applications, including large diameter and deep hole drilling, boring, reaming, burnishing, porting, and threading.

The People

Allied Machine understands that high quality products are only one facet of success. Our customer support is crucial to what we do, and that's why we make sure the best engineers and customer service associates are in place to assist our customers around the world.

The Future

With over 75 years of experience, Allied Machine has encountered the challenges of growth and success. By investing in cutting edge technology and the brightest and sharpest minds, our knowledge and capabilities continue to expand and grow every day.

Steve Stokey
Executive Vice President

William H. Stokey
President and CEO

Mike Stokey
Executive Vice President

WOHLHAUPTER® ThreadMills USA SUPERION® CRITERION®

Replaceable Insert Drills

- Reduce costs by decreasing setup time and utilizing a single holder for the lives of multiple inserts
- Provide flexibility to quickly switch between inserts with different geometries
- Products:
  - **GEN3SYS® XT | GEN3SYS® XT Pro**
  - **T-A® | T-A® GEN2 | T-A Pro™**
  - **High Performance | Universal**

Indexable Insert Drills

- Protect your investment and reduce your inventory with replaceable cartridges that allow the same holder to be used repeatedly
- Indexable inserts increase productivity and tool life while reducing costs
- Products:
  - **4TEX® Drill**
  - **Revolution Drill®**
  - **Opening Drill®**

Replaceable / Indexable Insert Drills

- Drill large diameter holes and maximize penetration rates even on low horsepower machines
- Delivers strength and versatility needed for any deep hole drilling application
- Holders cover a range of sizes with the replaceable heads determining the cutting diameter
- Products:
  - **APX™ Drill**

Solid Carbide Drills

- Offer greater strength and stability when drilling tougher materials
- Available in diameters from 3mm - 20mm
- Can be made-to-order specifically for your application (Superion® quoted specials)
  - **ASC 320®**
  - **Superion®**

Structural Steel Solutions

- Deliver outstanding performance and durability in structural steel applications
- Designed to produce optimal results in difficult-to-machine materials
- Available in multiple lengths and diameters
- T-A® style drills have different insert geometry options to improve performance, depending on material
- Products:
  - **T-A® | T-A® GEN2**
  - **GEN3SYS® XT Pro**

BTA (STS) Machining Solutions

- The internal ejection system flushes chips and debris from the hole with no interference to the cutting process
- Utilizes the advantages of the T-A® drill insert
- Designed to significantly increase penetration rates over brazed heads and traditional gun drills
- Products:
  - **BT-A Drill**

Hydraulic Port Contour Cutters

- Save significant time and money by performing four processes in one step
- Replaceable insert design reduces costs, inventory, and setup times
- Available in four industry specifications:
  - Imperial: SAE J-1926
  - Metric: ISO 6149-1:2006
  - Military: SAE AS5202
  - John Deere: JDS-G173.1
- Products:
  - **AccuPort 432®**

4 IN 1

Enhanced Special Drilling Capabilities

- Allied Machine engineers are available to meet with you to evaluate your application and recommend the best solution for you
- Special drilling solutions can incorporate advanced features such as adjustable diameter locations, multiple steps, additional coolant designs, special lengths and diameters, and more
- Special drills can drastically reduce your cost per hole and increase your overall productivity by eliminating multiple processes and increasing tool life

WOHLHAUPTER®
High Precision Boring Systems

- Designs available for high volume applications that increase rigidity to improve performance
- Versatile boring heads that are flexible with changing applications while maintaining excellent performance
- Provides high precision with absolute repeatability to ensure every part is held to tolerance
- Offers an industry leading modular shank connection that maintains rigidity and reduces inventory on your boring system
- Available with both digital and analog settings
- Products:
  - **Wohlhaupter™ Boring Tools**

NOTE: Adjustment accuracy of 0.0001" or 0.002mm on diameter

CRITERION®
Modular Boring Systems

- The modular capabilities are ideal for use across multiple different projects
- Offers versatile boring heads suitable for job shops and tooling rooms
- Provides an economical solution for low volume and/or short-term production applications
- Offers finish boring solutions
- Products:
  - **Criterion® Boring Tools**

S.C.A.M.I.®
Expandable Reaming Solutions

- Expandable cutting diameters accommodate for wear, which extends tool life
- Replaceable cutting heads and rings reduce waste and improve production time versus solid high speed steel and carbide reamers
- Holds tight tolerances to ensure processes are performed to accurate specifications
- Reduces tooling costs because many items are available for reconditioning
- Products:
  - **ALVAN® Reamers**

S.C.A.M.I.®
Roller Burnishing Solutions

- Produce excellent surface finishes
- Provide accurate size control
- Increase surface hardness
- Solutions for both through hole and blind hole applications
- Products:
  - **S.C.A.M.I.® Roller Burnishing Tools**

Solid Carbide Thread Mills

- Available with coolant through options
- Covers a wide range of thread forms
- Provides optimal solutions for both high production projects and short-run applications
- Products
  - **AccuThread™ 856**
  - **AccuThread™ T3**
  - **ThreadMills USA™**

Replaceable Insert Thread Mills

- Three insert lengths are available that cover a wide range of thread forms
- Holders can utilize inserts with different pitches and thread forms
- Repeatability is achieved by both the bolt-in style and the pin style locking systems
- Increases tool life by 25 - 50% with Allied Machine's AM210® coating
- Products
  - **AccuThread™ 856: Bolt-in Style**
  - **AccuThread™ 856: Pin Style**

SPECIAL CAPABILITIES

When it comes to designing and developing special solutions for customers, Allied Machine is the top choice. If your application requires special tooling, give us a call. Our engineered specials are developed by the brightest engineers in the industry. Most of our standard tooling can be altered as specials, or we can create entirely new concepts for particularly unique applications.

One special tooling solution is Insta-Quote®, the online system that allows you to design your own special tooling 24/7. Receive a quote and drawings within minutes just by following the steps.

And with the addition of Superion® technology and capabilities, we can customize made-to-order solid carbide tools to achieve optimal results for your applications.

Whatever your application, Allied Machine has the answer.

Insta-Quote®

SUPERION®

ToolMD™

Increase the production and success of your applications today.

- Direct access to 2D drawings and 3D models
- Assemble and view tool images in your browser
- Download drawings for use in most machining software programs
- Browse products, search item numbers, and save assemblies for future use

toolmd.com

WOHLHAUPTER® Boring Insert Selector

Find the best insert for your application.

- Generate the correct boring insert for your job in just six easy steps
- Choose type, shape, substrate, insert form, nose radius, and material
- Order easily by adding the item to your cart

alliedmachine.com/bis

Product Selector

Use the product selector to find the right tool for your application.

- Follow guided steps to generate the right tool for your application
- Learn about your recommended tool and how to maximize its performance

alliedmachine.com/productselector

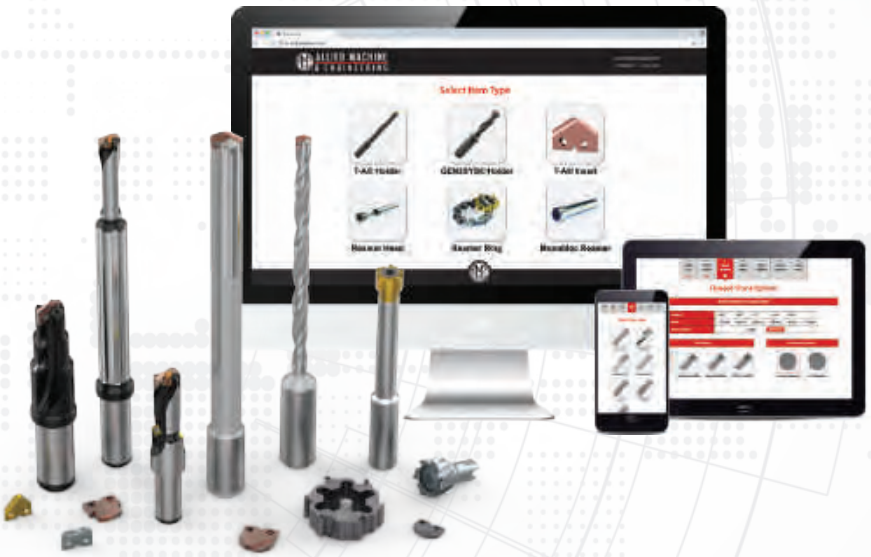
Insta-Code®

Eliminate the wait. Get your program now.

- Choose the best thread mill for your application
- Create program code for your machine
- Available as a PC download app (that can be used offline)
- Website app available 24/7

Insta-Code also has a **Cycle Time Calculator**

alliedmachine.com/InstaCode



Insta-Quote®

Design your custom tooling and receive a drawing and quote...all within minutes.

- Design and quote your own tooling
- Generate the solution you need in just a few steps
- Features the following products
  - **T-A® Inserts**
  - **T-A® Holders**
  - **GEN3SYS® XT Holders**
  - **ALVAN® Reamers**

iq.alliedmachine.com

Solution Hub App

All Allied all the time.

- Quickly look up product information
- Links to our free online tools
- Locate distributors
- Stay up to date on news and events

Machinist Tool App

Quickly convert cutting tool parameters for the machine inputs you need.

- Input data to calculate the RPM and speed and feed rates
- Also features the Boring Insert Selector
- Access product literature right at your fingertips

Customer Support

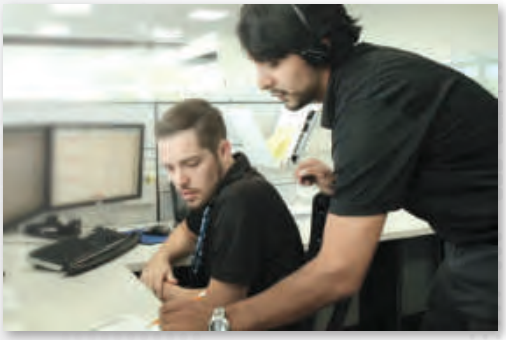
Support You Can Count On

Allied Machine has many lines of support to ensure we're available to assist you at all times. It's important to establish relationships with new customers, but we also know it's equally important to strengthen and support relationships with existing customers. Whether you need help with an order or you need someone to come assist you at the spindle, we have the right people to get you what you need.

1 Inside Sales Support

Our inside sales team is trained to handle your account information and general inquiries. We are happy to assist you and find the answers to your questions.

- 1.330.343.4283 ext. 8610
- 1.800.321.5537 (toll free United States and Canada)
- insidesales@alliedmachine.com



2 Engineering Support

Our highly trained and skilled Application Engineers are here to assist you. If you are experiencing technical difficulties, our engineers will recommend the best solutions to the problem. Speeds and feeds, coolant pressure, and other machining components all affect the performance of our tooling. Our AEs are experienced in working with difficult materials in many different environments. Give us a call and put our knowledge to the test.

- 1.330.343.4283 ext. 7611
- 1.800.321.5537 (toll free United States and Canada)
- appeng@alliedmachine.com

3 Field Support

Allied Machine provides local engineering support all over the world. Our Field Sales Engineers (FSEs) spend months training in-house before going to the field. This support line allows us to provide assistance to our customers right at the spindle. They are available to visit your facility, run demos and tests, and work hand-in-hand with machine operators and engineers to find the best possible tooling solutions.

NOTE: If you do not know your local FSE, please contact us

- 1.330.343.4283
- 1.800.321.5537 (toll free United States and Canada)
- info@alliedmachine.com

Allied Tool Academy

Online | On-site Technical Education Seminar (TES) | LIVE (Broadcasting)

Online Training

Get ***all*** the tooling training of our 3-day in-person Technical Education Seminar (TES) through the online **Allied Tool Academy** training platform. Level up your tooling IQ through a series of product overviews, demos, and short quizzes.

- Online TES Certification as well as other training modules
- On demand
- On YOUR schedule

Register online today:
www.alliedtoolacademy.com

Allied LIVE (Broadcasting)

Join us for ***LIVE*** **broadcast** training events where you will have the ability to learn about our tooling, watch live demos, and ask our trainers questions.

- Online
- Quick brief presentation provides basic knowledge of our products
- Watch live demos of tools at the spindle at different speeds and feeds

Register online today:
www.alliedmachine.com/live

On-site Technical Education Seminar (TES)

Allied Machine's **Technical Education Seminar (TES)** puts the attendees in front of the machines. When you attend our three day TES program, you'll gain first-hand experience in ***real-life*** application situations. Test and experiment with different speeds and feeds, observe the results, and discover the best solution.

- Training Lab: In-depth training at the spindle allows you to choose speeds and feeds
- Learning Lab: Quick, brief sessions provide basic knowledge of our products
- Facility Tours: Take guided tours of our two manufacturing facilities located in Dover, Ohio

Register online today:
www.alliedmachine.com/TES

Allied Machine Training Facility
485 West 3rd Street
Dover, OH 44622

Superion®

Solid Carbide / PCD Drilling Tools

Out of the Box *Solutions*

The Superion Philosophy

Superion became a subsidiary of Allied Machine and Engineering in 2016. We share a common mission to provide product excellence, expert technical support, and innovative holemaking solutions to our metal-cutting partners. As Superion's foundation was built on serving partners in the automotive industry and other lean manufacturing, we remain firmly rooted in a tradition of process improvements and capabilities.

We have strengthened these roots while growing to serve the unique cutting tool needs of new industries such as aerospace, defense, equipment testing, material processing, and more.

With significant investment in technology, Superion has opened the door for our team to manufacture new solutions including several carbide and PCD configurations. We focus on providing solutions that reduce our customers' costs, increase throughput and assist in developing processes that allow for consistent and repeatable performance.

Material-specific coatings / geometries	Reduce setup times	Decrease cost per hole

Applicable Industries

Aerospace | Agriculture | Automotive | Firearms | General Machining | Oil & Gas | Renewable Energy

Your safety and the safety of others is very important. This catalog contains important safety messages. Always read and follow all safety precautions.

This triangle is a safety hazard symbol. It alerts you to potential safety hazards that can cause tool failure and serious injury.

When you see this symbol in the catalog, look for a related safety message that may be near this triangle or referred to in the nearby text.

There are safety signal words also used in the catalog. Safety messages follow these words.

⚠ WARNING

WARNING (shown above) means that failure to follow the precautions in this message could result in tool failure and serious injury.

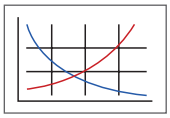
NOTICE means that failure to follow the precautions in this message could result in damage to the tool or machine but not result in personal injury.

NOTE and **IMPORTANT** are also used. These are important that you read and follow but are not safety-related.

Visit www.alliedmachine.com for the most up-to-date information and procedures.

Reference Icons
The following icons will appear throughout the catalog to help you navigate between products.

Setup / Assembly Information
Detailed instructions and information regarding the corresponding part(s)



Recommended Cutting Data
Speed and feed recommendations for optimum and safe drilling

Superion® Drills Contents

Superion Capabilities

WHAT IS SUPERION?

Superion capabilities provide cutting edge solutions in both solid carbide and PCD tooling.

WHY SHOULD YOU USE SUPERION?

- State-of-the-art manufacturing automation allows for high repeatability and consistency, regardless of the quantity you need.
- Superion provides application-specific solutions tailored to meet your toughest demands.
- Superion tooling excels in difficult and unique material applications.
- Our goal is to provide you a quality solution to exceed your need on a schedule that satisfies.

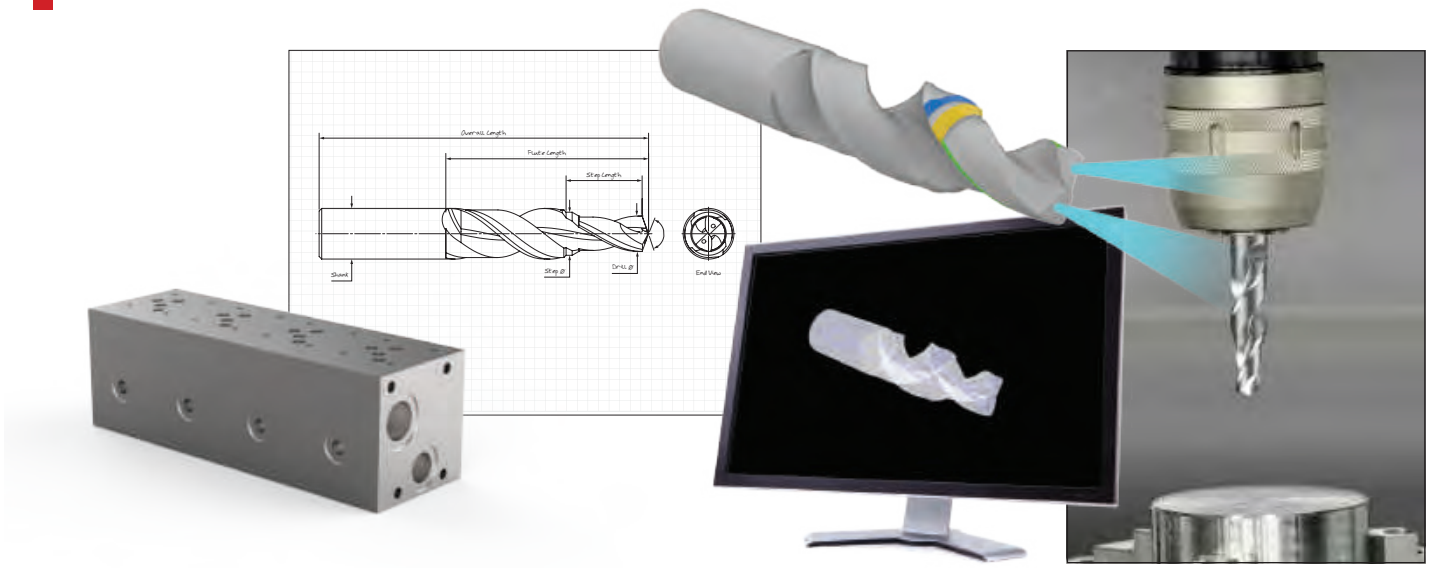
WHEN SHOULD YOU USE SUPERION?

- When finish is critical and dimensions are tight, Superion will deliver a tool to maintain your tolerances.
- When your tooling budget requires regrinds and the ability to remanufacture, Superion tackles your needs.
- If you're dealing with CFRP or other unique materials, Superion tooling is the right solution.

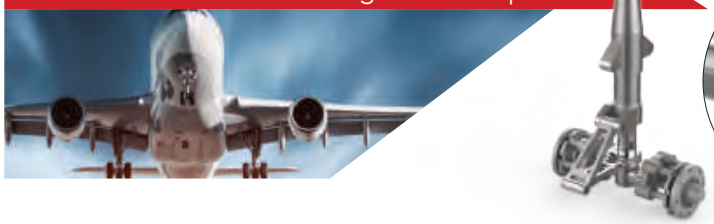
Tough Applications *SOLVED*

FROM CONCEPT TO REALITY

Allied's team of engineers is ready to assist you with your application. We'll gather all the information we need about your application and turn your concept into reality. Give us a call today to collaborate with you. We'll listen to your needs, formulate a concept, develop the model, and build the solution.



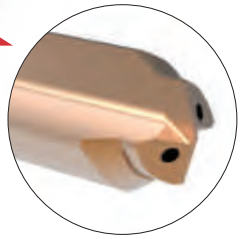
AEROSPACE / Landing Gear Components



DRILL BURNISH TOOLS

Reduce cycle time, increase throughput, and increase profitability by combining roughing and finishing operations using our burnishing geometry for applications in which surface finish and hole tolerance are critical.

AUTOMOTIVE / Crankshafts



COMBINATION TOOLS

Combine multiple steps and various profile features to improve throughput. Combination tools reduce cost per hole and increase profit potential.

HEAVY EQUIPMENT / Manifolds

SOLID CARBIDE TOOLS WITH COOLANT

Solid carbide solutions optimize the manufacturing of manifolds. Most port specs call for at least 3 steps, and combining these features can reduce costs and increase throughput.

AUTOMOTIVE / Transmission Components

SOLID CARBIDE STEP TOOLS

You can rely on Superion's state-of-the-art manufacturing facility, built specifically to satisfy the customer's need whether it's 10 drills or 1,000 drills. Superion will provide consistent and effective solutions to your production needs.

Case Study

If you need to hold a tight tolerance, we have the solution.

When an application requires you to hold a tight tolerance, it quickly eliminates many tooling options because those options aren't capable of holding the strict tolerance. Our customer was using a solid carbide drill to machine cylinder heads for the automotive industry. The cylinder blocks were made from A356 aluminum.

When the end user raised concerns over the hole tolerance created by our customer's previous tooling, our customer changed the required tolerance from ±.0005" *(±.013mm)* to ±.0003" *(±.009mm)*. However, the previous tooling couldn't achieve the new tolerance requirements.

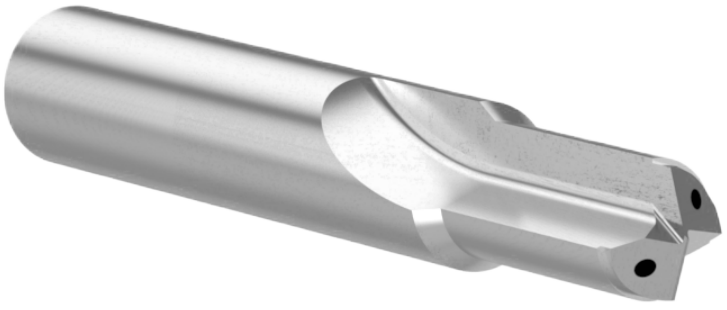
The customer tested the **Superion Solid Carbide Step Burnishing Drill** in this application. The Superion drill did exactly what the customer needed and successfully held the new tolerance of ±.0003" *(±.009mm)*. It also held the new tolerance with a 1.66 CPK, which was higher than the previous tool's CPK even at the initial ±.0005" *(±.013mm)* tolerance.

Don't tolerate tolerance issues. ***Call us to help you find the right tool for the job.***

Product: Superion® Step Burnishing Drill
Objectives: Achieve required tolerance
Industry: Automotive
Part: Cylinder head
Material: A356 aluminum
Hole Ø: 0.579" *(14.70mm)*
Hole Depth: 1.181" *(30.00mm)*

Measure	Superion® Step Burnishing Drill
RPM	3,490
Speed	528 SFM *(160.1 M/min)*
Feed	0.0115 IPR *(0.29 mm/rev)*
Penetration Rate	43 IPM *(1,100 mm/min)*
Cycle Time	4 sec
Tool Life	3,000 parts
Tolerance	±0.0003" *(±0.009mm)*

▸ Superion
Superion Step Burnishing Drill



The Step Burnishing Drill provided:

- ✓ Required tolerance
- ✓ Increased CPK

Case Study: CS0503

Case Study

Old adage, modern innovation: the right tool for the job.

Reduce costs and eliminate headaches by calling us to help solve your challenges. If your current process doesn't seem to be providing the results you want, you might be using the wrong tooling. Our customer was using a diamond-coated end mill to machine guide pads on frac pocket plugs used in down-hole oil drilling. The guide pads were made from fiberglass and glass wound filament material, which is very abrasive and shortens the life of cutting tools.

When the diamond coating wore off the end mill, the carbide substrate was exposed directly to the abrasive material, and the tool would quickly fail. The customer needed an optimized tool to extend tool life in this abrasive material and to solidify the repeatability of the process.

The customer tested the **Superion® PCD Flat Bottom Drill** in this application. The PCD substrate is more wear-resistant in the fiberglass material and provided more even wear of the tool throughout the process. Much to the customer's delight, the Superion drill ran at a higher penetration rate, which shortened cycle time. Most importantly, the Superion drill increased the customer's tool life from 7,500 holes to 50,000 holes (*a 567% increase*).

A costly application became effective and worry-free by finding the right tooling. The Superion drill didn't just increase the customer's tool life; it provided a repeatable, reliable process so the customer could "set it and forget it."

Don't tolerate unnecessary hassle and stress in your production. ***Call us to help you find the right tool for the job.***

Product: Superion® PCD Flat Bottom Drill
Objectives: Increase tool life
Industry: Oil & gas/petrochemical
Part: Frac pocket plug guide pads
Material: Fiberglass and glass wound filament
Hole Ø: 0.380" *(9.652 mm)*
Hole Depth: 0.275" *(6.985 mm)*

Measure	Diamond Coated End Mill	Superion® PCD Flat Bottom Drill
RPM	4500	7500
Speed	448 SFM *(136.55 M/min)*	746 SFM *(227.381 M/min)*
Feed Rate	0.008 IPR *(0.203 mm/rev)*	0.008 IPR *(0.203 mm/rev)*
Penetration Rate	36 IPM *(914.4 mm/min)*	60 IPM *(1524 mm/min)*
Cycle Time	0.46 sec	0.28 sec
Tool Life	7,500 holes	50,000 holes

▸ Superion
PCD solid carbide flat bottom drill

The PCD substrate for wear-resistance in abrasive materials provided:

- ✓ Increased tool life
- ✓ Increased penetration rate
- ✓ Repeatable/reliable machining process

Case Study: CS0502

Superion Geometries

There's a Geometry for That

Allied Machine knows there isn't a one-size-fits-all solution when it comes to holemaking. To better accommodate the countless holes our customers drill, we offer multiple options in material-specific geometries and material-specific coatings.

Superion geometries feature a unique edge prep tailored to specific material groups to optimize tool life and edge strength. Some geometries also offer solutions for rough and finish burnishing.

If you're unsure which geometry would be best for your application, give our Application Engineers a call. They're standing by, ready to help.

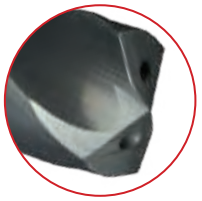
1.330.343.4283 ext: 7611

1.800.321.5537 (toll free United States and Canada)

appeng@alliedmachine.com

HPM

- Linear cutting edge aids in corner strength and improves chip formation in softer materials
- Free cutting primary and secondary clearance
- Ideal for drilling softer carbon, alloy and tool steel materials
- AM420 coating for enhanced heat thresholds and tool life
- TiCN coating for use in aluminum bronze

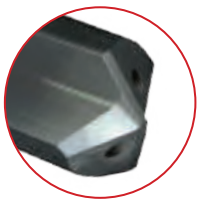


HPS

- Radius cutting edge for improved chip formation
- Cam ground clearance for added point strength and stability
- Reduced bell mouth for longer drill depths
- OD flute edge prep for added corner strength
- Ideal for drilling harder steels, high-temp alloys, and stainless
- AM420 coating for enhanced heat thresholds and tool life

HP106

- Optimized core, point, and web features for increased strength
- Utilizes a single margin design with straight flutes
- Ideal for drilling hardened steels and wear plates
- AM420 coating for enhanced heat thresholds and tool life

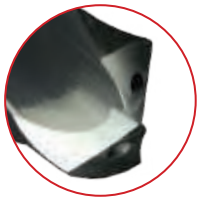


HPM2M

- HPM geometry with a double margin
- Recommended for improved hole tolerance and hole finish
- Recommended for interrupted cuts and drill depths greater than 8xD
- Double margins are optimized with a unique web for full engagement of all four margins at entry, leading to better stability
- AM420 coating for enhanced heat thresholds and tool life

HPS2M

- HPS geometry with a double margin
- Recommended for improved hole tolerance and hole finish
- Recommended for interrupted cuts and drill depths greater than 8xD
- Double margins are optimized with a unique web for full engagement of all four margins at entry, leading to better stability
- Ideal for drilling gray/white and SG/nodular cast iron
- AM420 coating for enhanced heat thresholds and tool life in steels and stainless
- AM440 coating for reduced flank wear in cast irons



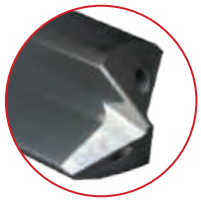
HPF

- Unique open geometry for high penetration rates specifically tailored for aluminum
- Double margins are optimized with a unique web for full engagement of all four margins at entry, leading to better stability
- Reduced helix angle for increased chip evacuation
- Enhanced surface finish on tool to improve chip flow and reduce built-up edge
- High lubricity TiCN coating for use in cast/wrought aluminum

Superion Geometries

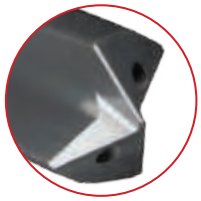
CIB (cast iron burnishing drill)

- Unique point, web, and cutting edge designed to significantly improve hole finish and hole tolerance
- Double margins designed for enhanced stability
- Minimized back taper to enhance straightness
- Ideal pre-drill when using carbide taps
- Straight flute design ideal for use on lathes
- Enhanced surface finish on tool to improve chip flow and reduce built-up edge
- AM440 coating for reduced flank wear in cast irons



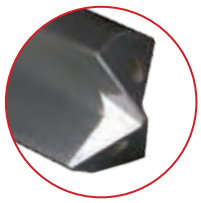
CAB (cast aluminum burnishing drill)

- Unique point, web, and cutting edge designed to significantly improve hole finish and hole tolerance
- Straight flute design ideal for use on lathes
- Double margins designed for enhanced stability
- Minimized back taper to enhance straightness
- Enhanced surface finish on tool to improve chip flow and reduce built-up edge
- TiCN coating to enhance lubricity when drilling in aluminum



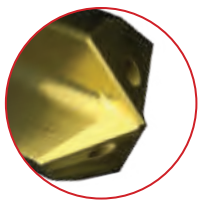
WAB (wrought aluminum burnishing drill)

- Unique point, web, and cutting edge designed to significantly improve hole finish and hole tolerance
- Straight flute design ideal for use on lathes
- Double margins designed for enhanced stability
- Minimized back taper to enhance straightness
- Geometry enhancements for drilling wrought aluminum
- Enhanced surface finish on tool to improve chip flow and reduce built-up edge
- TiCN coating to enhance lubricity when drilling in aluminum



BCB (brass copper burnishing drill)

- Straight flute design ideal for use on lathes
- Double margins designed for enhanced stability
- Minimized back taper to enhance straightness
- Geometry enhancements for drilling brass and copper
- Enhanced surface finish on tool to improve chip flow and reduce built-up edge
- TiN coating



Recommended Drilling Data | Imperial (inch)

ISO	Material	Hardness (BHN)	General Application Geometry	Special Geometry*	Coating	Speed (SFM)	Feed Rate (IPR) by Diameter 0.118 - 0.157	Feed Rate (IPR) by Diameter 0.157 - 0.197
P	**Free Machining Steel** 1118, 1215, 12L14, etc.	100 - 150	HPM	● HPM2M	AM420	500	0.006	0.007
		150 - 200	HPM	● HPM2M	AM420	475	0.005	0.0065
		200 - 250	HPS	▲ HPS2M	AM420	450	0.004	0.006
	Low Carbon Steel 1010, 1020, 1025, 1522, 1144, etc.	85 - 125	HPM	● HPM2M	AM420	455	0.006	0.007
		125 - 175	HPM	● HPM2M	AM420	440	0.006	0.0065
		175 - 225	HPM	● HPM2M	AM420	425	0.005	0.006
		225 - 275	HPS	▲ HPS2M	AM420	410	0.0045	0.006
	Medium Carbon Steel 1030, 1040, 1050, 1527, 1151, etc.	125 - 175	HPM	● HPM2M	AM420	440	0.0055	0.006
		175 - 225	HPM	● HPM2M	AM420	430	0.005	0.0055
		225 - 275	HPS	▲ HPS2M	AM420	400	0.0045	0.005
		275 - 325	HPS	▲ HPS2M	AM420	375	0.004	0.005
	Alloy Steel 4140, 5140, 8640, etc.	125-175	HPM	● HPM2M	AM420	405	0.0055	0.006
		175-225	HPM	● HPM2M	AM420	380	0.005	0.0055
		225-275	HPS	▲ HPS2M	AM420	365	0.004	0.005
		275-325	HPS	▲ HPS2M	AM420	340	0.004	0.005
		325-375	HP106	–	AM420	325	0.0035	0.0045
	High Strength Alloy 4340, 4330V, 300M, etc.	225 - 300	HPS	▲ HPS2M	AM420	340	0.004	0.005
		300 - 350	HPS	▲ HPS2M	AM420	320	0.004	0.005
		350 - 400	HP106	–	AM420	250	0.0035	0.004
	Structural Steel A36, A285, A516, etc.	100 - 150	HPS	▲ HPS2M	AM420	450	0.0055	0.0065
		150 - 250	HPS	▲ HPS2M	AM420	425	0.0045	0.0055
		250 - 350	HPS	▲ HPS2M	AM420	390	0.004	0.005
	Tool Steel H-13, H-21, A-4, 0-2, S-3, etc.	150 - 200	HPM	● HPM2M	AM420	270	0.0045	0.0045
		200 -250	HPS	▲ HPS2M	AM420	250	0.004	0.004
S	**High Temp Alloy** Hastelloy B, Inconel 600, etc.	140-220	HPS	–	AM420	110	0.003	0.003
		220-310	HPS	–	AM420	100	0.002	0.002
	Titanium Alloy	140-220	HPS	–	AM420	150	0.0025	0.003
		220-310	HPS	–	AM420	120	0.002	0.0025
	Aerospace Alloy S82	185-275	HPS	–	AM420	160	0.003	0.003
		275-350	HPS	–	AM420	130	0.002	0.002

***Special Geometry**

● Use HPM2M for greater drill depths over 8xD. HPM2M is used for any interruptions and produces a better hole tolerance and finish in comparison to HPM.

▲ Use HPS2M for greater drill depths over 8xD. HPS2M is used for any interruptions and produces a better hole tolerance and finish in comparison to HPS.

Parameter Reductions for Length to Diameter Relationships

6xD	0.90 reduction for speed and feed adjustment
⚠ 9xD	0.80 reduction for speed and feed adjustment
⚠ 12xD	0.70 reduction for speed and feed adjustment
⚠ 15xD - 20xD	0.60 reduction for speed and feed adjustment

Flood Coolant Applications

Recommend if diameter to depth is less than or equal to three times the diameter. Reduce speed by 20% and if needed drop feed by 10% to maintain optimal chip formation

Parameter Recommendations for Step Drills

- Feed rate is based off the pilot diameter
- Speed rate is based off the largest step diameter

⚠ **WARNING** Refer to Speed and Feed charts for recommended adjustments to speeds and feeds. Refer to page A15: 17 for deep hole drilling guidelines in this section of the catalog. 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 Team. *ext:* **7611** | *email:* **appeng@alliedmachine.com**

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Recommended Drilling Data | Imperial (inch)

Feed Rate (IPR) by Diameter								
0.197 - 0.236	0.236 - 0.276	0.276 - 0.315	0.315 - 0.394	0.394 - 0.472	0.472 - 0.551	0.551 - 0.630	0.630 - 0.709	0.709 - 0.787
0.008	0.009	0.010	0.012	0.013	0.015	0.017	0.018	0.020
0.0075	0.0085	0.0095	0.011	0.012	0.014	0.016	0.017	0.019
0.007	0.008	0.009	0.010	0.011	0.013	0.015	0.016	0.018
0.008	0.009	0.010	0.012	0.0135	0.0145	0.0165	0.0175	0.0195
0.0075	0.0085	0.0095	0.0115	0.013	0.014	0.016	0.017	0.019
0.007	0.008	0.009	0.011	0.0125	0.0135	0.015	0.016	0.018
0.007	0.008	0.009	0.010	0.012	0.013	0.015	0.016	0.018
0.007	0.0075	0.009	0.011	0.012	0.013	0.0145	0.016	0.0175
0.006	0.007	0.0085	0.0105	0.0115	0.0125	0.014	0.0155	0.017
0.006	0.007	0.0085	0.0105	0.011	0.0125	0.0135	0.0145	0.0165
0.0055	0.0065	0.008	0.010	0.011	0.012	0.013	0.014	0.016
0.0065	0.0075	0.0085	0.0105	0.0115	0.013	0.0145	0.016	0.017
0.006	0.007	0.008	0.010	0.011	0.0125	0.014	0.0155	0.0165
0.006	0.0065	0.008	0.0095	0.0105	0.012	0.0135	0.0145	0.0155
0.0055	0.006	0.0075	0.009	0.010	0.0115	0.013	0.014	0.015
0.005	0.0055	0.007	0.009	0.010	0.011	0.0125	0.0135	0.0145
0.006	0.0065	0.008	0.0095	0.0105	0.012	0.0135	0.0145	0.0155
0.0055	0.006	0.0075	0.009	0.01	0.0115	0.013	0.014	0.015
0.0045	0.0055	0.0065	0.008	0.0085	0.010	0.011	0.012	0.013
0.007	0.008	0.0095	0.012	0.013	0.014	0.0155	0.016	0.0185
0.006	0.007	0.008	0.011	0.012	0.012	0.0135	0.014	0.016
0.0055	0.0065	0.0075	0.0095	0.0105	0.0115	0.0125	0.0135	0.015
0.005	0.006	0.007	0.0095	0.010	0.011	0.0125	0.013	0.015
0.0045	0.0055	0.0065	0.0085	0.009	0.010	0.0115	0.012	0.014
0.0035	0.004	0.0045	0.0055	0.006	0.0065	0.007	0.0075	0.0085
0.003	0.0035	0.0035	0.0045	0.005	0.006	0.0065	0.0065	0.0075
0.0035	0.004	0.0045	0.006	0.006	0.007	0.0075	0.008	0.009
0.003	0.0035	0.004	0.005	0.0055	0.006	0.007	0.007	0.008
0.0035	0.004	0.004	0.0045	0.0055	0.006	0.0065	0.007	0.008
0.003	0.0035	0.0035	0.004	0.0045	0.0055	0.006	0.006	0.007

***Special Geometry**

● Use HPM2M for greater drill depths over 8xD. HPM2M is used for any interruptions and produces a better hole tolerance and finish in comparison to HPM.

▲ Use HPS2M for greater drill depths over 8xD. HPS2M is used for any interruptions and produces a better hole tolerance and finish in comparison to HPS.

Parameter Reductions for Length to Diameter Relationships

6xD	0.90 reduction for speed and feed adjustment
⚠ 9xD	0.80 reduction for speed and feed adjustment
⚠ 12xD	0.70 reduction for speed and feed adjustment
⚠ 15xD - 20xD	0.60 reduction for speed and feed adjustment

Flood Coolant Applications

Recommend if diameter to depth is less than or equal to three times the diameter. Reduce speed by 20% and if needed drop feed by 10% to maintain optimal chip formation

Parameter Recommendations for Step Drills

- Feed rate is based off the pilot diameter
- Speed rate is based off the largest step diameter

⚠ WARNING Refer to Speed and Feed charts for recommended adjustments to speeds and feeds. Refer to page A15: 17 for deep hole drilling guidelines in this section of the catalog. 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 Team. *ext:* **7611** | *email:* **appeng@alliedmachine.com**

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Recommended Drilling Data | Imperial (inch)

ISO	Material	Hardness (BHN)	General Application Geometry	Special Geometry	Coating	Speed (SFM)	Feed Rate (IPR) by Diameter 0.118 - 0.157	Feed Rate (IPR) by Diameter 0.157 - 0.197
M	**Stainless Steel 400 Series** 416, 420, etc.	185-275	HPS	▲ HPS2M	AM420	250	0.004	0.0045
		275-350	HPS	▲ HPS2M	AM420	195	0.0035	0.004
	Stainless Steel 300 Series 304, 316, 17-4PH, etc.	135-185	HPS	▲ HPS2M	AM420	200	0.0035	0.004
		185-275	HPS	▲ HPS2M	AM420	175	0.003	0.0035
	Super Duplex Stainless Steel	135-185	HPS	▲ HPS2M	AM420	150	0.0035	0.004
		185-275	HPS	▲ HPS2M	AM420	135	0.003	0.0035
H	**Wear Plate** Hardox, AR400, T-1, etc.	400	HP106	–	AM420	170	0.002	0.002
		500	HP106	–	AM420	140	0.002	0.002
		600	HP106	–	AM420	100	0.002	0.002
	Hardened Steel	300-400	HP106	–	AM420	170	0.002	0.002
		400-500	HP106	–	AM420	140	0.002	0.002
K	**SG/Nodular Cast Iron**	120-150	HPS2M	◆ CIB	AM440	500	0.008	0.0085
		150-200	HPS2M	◆ CIB	AM440	485	0.007	0.0075
		200-220	HPS2M	◆ CIB	AM440	470	0.006	0.007
		220-260	HPS2M	◆ CIB	AM440	455	0.006	0.007
		260-320	HPS2M	◆ CIB	AM440	415	0.005	0.0065
	Gray/White Cast Iron	120-150	HPS2M	◆ CIB	AM440	545	0.009	0.0095
		150-200	HPS2M	◆ CIB	AM440	530	0.008	0.0085
		200-220	HPS2M	◆ CIB	AM440	515	0.007	0.008
		220-260	HPS2M	◆ CIB	AM440	475	0.007	0.008
		260-320	HPS2M	◆ CIB	AM440	450	0.006	0.0075
N	**Cast Aluminum**	30	HPF	○ CAB	TiCN	950	0.0075	0.0085
		180	HPF	○ CAB	TiCN	755	0.0065	0.0075
	Wrought Aluminum	30	HPF	△ WAB	TiCN	1100	0.0075	0.0085
		180	HPF	△ WAB	TiCN	950	0.0065	0.0075
	Aluminum Bronze	100-200	HPM	–	TiCN	370	0.004	0.005
		200-250	HPM	–	TiCN	310	0.0035	0.0045
	Brass	100	BCB	–	TIN	750	0.005	0.006
	Copper	60	BCB	–	TIN	510	0.002	0.0025

*Special Geometry

▲ Use HPS2M for greater drill depths over 8xD. HPS2M is used for any interruptions and produces a better hole tolerance and finish in comparison to HPS.

◆ CIB (Cast Iron Burnish): Unique point, web, and cutting edge designed to significantly improve hole finish and hole tolerance.
NOTE: Reduce speed and feed parameters above from 40% - 50% reduction.

○ CAB (Cast Aluminum Burnish): Unique point, web, and cutting edge designed to significantly improve hole finish and hole tolerance.
NOTE: Reduce speed and feed parameters above from 40% - 50% reduction.

△ WAB (Wrought Aluminum Burnish): Unique point, web, and cutting edge designed to significantly improve hole finish and hole tolerance.
NOTE: Reduce speed and feed parameters above from 40% - 50% reduction.

Parameter Reductions for Length to Diameter Relationships

6xD	0.90 reduction for speed and feed adjustment
⚠ 9xD	0.80 reduction for speed and feed adjustment
⚠ 12xD	0.70 reduction for speed and feed adjustment
⚠ 15xD - 20xD	0.60 reduction for speed and feed adjustment

Flood Coolant Applications

Recommend if diameter to depth is less than or equal to three times the diameter. Reduce speed by 20% and if needed drop feed by 10% to maintain optimal chip formation

Parameter Recommendations for Step Drills

- Feed rate is based off the pilot diameter
- Speed rate is based off the largest step diameter

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Recommended Drilling Data | Imperial (inch)

Feed Rate (IPR) by Diameter								
0.197 - 0.236	0.236 - 0.276	0.276 - 0.315	0.315 - 0.394	0.394 - 0.472	0.472 - 0.551	0.551 - 0.630	0.630 - 0.709	0.709 - 0.787
0.0055	0.0065	0.0075	0.009	0.0095	0.010	0.011	0.011	0.012
0.0045	0.0055	0.0065	0.008	0.0085	0.0095	0.010	0.010	0.011
0.0045	0.005	0.006	0.007	0.0075	0.008	0.009	0.0095	0.0105
0.004	0.004	0.005	0.006	0.0065	0.007	0.008	0.008	0.009
0.0045	0.005	0.006	0.007	0.007	0.0075	0.0075	0.008	0.0085
0.004	0.004	0.0045	0.0055	0.0055	0.0065	0.0065	0.007	0.007
0.002	0.003	0.003	0.004	0.005	0.0055	0.007	0.008	0.009
0.002	0.003	0.003	0.004	0.004	0.0045	0.006	0.007	0.008
0.002	0.003	0.003	0.004	0.004	0.0045	0.006	0.007	0.008
0.002	0.003	0.003	0.004	0.005	0.0055	0.007	0.008	0.009
0.002	0.003	0.003	0.004	0.004	0.0045	0.006	0.007	0.008
0.009	0.011	0.012	0.014	0.0155	0.017	0.019	0.0205	0.022
0.0085	0.01	0.0115	0.013	0.014	0.0155	0.0165	0.0185	0.021
0.008	0.009	0.011	0.012	0.013	0.014	0.015	0.017	0.019
0.008	0.009	0.011	0.012	0.013	0.014	0.015	0.017	0.019
0.0075	0.0085	0.01	0.0115	0.0125	0.0135	0.0145	0.0155	0.017
0.010	0.012	0.013	0.0155	0.0165	0.0185	0.020	0.022	0.024
0.0095	0.011	0.0125	0.0145	0.0155	0.0165	0.0175	0.0195	0.022
0.009	0.010	0.012	0.013	0.014	0.015	0.016	0.018	0.020
0.009	0.010	0.012	0.013	0.014	0.015	0.016	0.018	0.020
0.0085	0.0095	0.0115	0.0125	0.0135	0.0145	0.0155	0.0165	0.019
0.009	0.010	0.0125	0.0145	0.016	0.018	0.0195	0.020	0.022
0.0085	0.009	0.0115	0.0135	0.0155	0.017	0.0185	0.019	0.021
0.0095	0.011	0.0125	0.0145	0.017	0.0185	0.020	0.021	0.023
0.0085	0.010	0.0115	0.0135	0.0155	0.0175	0.019	0.020	0.022
0.006	0.007	0.008	0.009	0.01	0.012	0.013	0.014	0.015
0.005	0.006	0.0065	0.007	0.008	0.01	0.011	0.012	0.014
0.007	0.009	0.010	0.0115	0.0125	0.014	0.016	0.017	0.018
0.003	0.003	0.003	0.004	0.004	0.004	0.005	0.006	0.007

*Special Geometry

▲ Use HPS2M for greater drill depths over 8xD. HPS2M is used for any interruptions and produces a better hole tolerance and finish in comparison to HPS.

◆ CIB (Cast Iron Burnish): Unique point, web, and cutting edge designed to significantly improve hole finish and hole tolerance.
NOTE: Reduce speed and feed parameters above from 40% - 50% reduction.

○ CAB (Cast Aluminum Burnish): Unique point, web, and cutting edge designed to significantly improve hole finish and hole tolerance.
NOTE: Reduce speed and feed parameters above from 40% - 50% reduction.

△ WAB (Wrought Aluminum Burnish): Unique point, web, and cutting edge designed to significantly improve hole finish and hole tolerance.
NOTE: Reduce speed and feed parameters above from 40% - 50% reduction.

Parameter Reductions for Length to Diameter Relationships

6xD	0.90 reduction for speed and feed adjustment
⚠ 9xD	0.80 reduction for speed and feed adjustment
⚠ 12xD	0.70 reduction for speed and feed adjustment
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Flood Coolant Applications

Recommend if diameter to depth is less than or equal to three times the diameter. Reduce speed by 20% and if needed drop feed by 10% to maintain optimal chip formation

Parameter Recommendations for Step Drills

- Feed rate is based off the pilot diameter
- Speed rate is based off the largest step diameter

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Recommended Drilling Data | Metric (mm)

ISO	Material	Hardness (BHN)	General Application Geometry	Special Geometry*	Coating	Speed (M/min)	Feed Rate (mm/rev) by Diameter 3.00 - 4.00	Feed Rate (mm/rev) by Diameter 4.00 - 5.00
P	**Free Machining Steel** 1118, 1215, 12L14, etc.	100-150	HPM	● HPM2M	AM420	152	0.15	0.18
		150-200	HPM	● HPM2M	AM420	145	0.13	0.17
		200-250	HPS	▲ HPS2M	AM420	137	0.10	0.15
	Low Carbon Steel 1010, 1020, 1025, 1522, 1144, etc.	85-125	HPM	● HPM2M	AM420	139	0.15	0.18
		125-175	HPM	● HPM2M	AM420	134	0.15	0.17
		175-225	HPM	● HPM2M	AM420	130	0.13	0.15
		225-275	HPS	▲ HPS2M	AM420	125	0.11	0.15
	Medium Carbon Steel 1030, 1040, 1050, 1527, 1151, etc.	125-175	HPM	● HPM2M	AM420	134	0.14	0.15
		175-225	HPM	● HPM2M	AM420	131	0.13	0.14
		225-275	HPS	▲ HPS2M	AM420	122	0.11	0.13
		275-325	HPS	▲ HPS2M	AM420	114	0.10	0.13
	Alloy Steel 4140, 5140, 8640, etc.	125-175	HPM	● HPM2M	AM420	123	0.14	0.15
		175-225	HPM	● HPM2M	AM420	116	0.13	0.14
		225-275	HPS	▲ HPS2M	AM420	111	0.10	0.13
		275-325	HPS	▲ HPS2M	AM420	104	0.10	0.13
		325-375	HP106	–	AM420	99	0.09	0.11
	High Strength Alloy 4340, 4330V, 300M, etc.	225-300	HPS	▲ HPS2M	AM420	104	0.10	0.13
		300-350	HPS	▲ HPS2M	AM420	98	0.10	0.13
		350-400	HP106	–	AM420	76	0.09	0.10
	Structural Steel A36, A285, A516, etc.	100-150	HPS	▲ HPS2M	AM420	137	0.14	0.17
		150-250	HPS	▲ HPS2M	AM420	130	0.11	0.14
		250-350	HPS	▲ HPS2M	AM420	119	0.10	0.13
	Tool Steel H-13, H-21, A-4, 0-2, S-3, etc.	150-200	HPM	● HPM2M	AM420	82	0.11	0.11
		200-250	HPS	▲ HPS2M	AM420	76	0.10	0.10
S	**High Temp Alloy** Hastelloy B, Inconel 600, etc.	140-220	HPS	–	AM420	34	0.08	0.08
		220-310	HPS	–	AM420	30	0.05	0.05
	Titanium Alloy	140-220	HPS	–	AM420	46	0.06	0.08
		220-310	HPS	–	AM420	37	0.05	0.06
	Aerospace Alloy S82	185-275	HPS	–	AM420	49	0.08	0.08
		275-350	HPS	–	AM420	40	0.05	0.05

*Special Geometry

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Parameter Reductions for Length to Diameter Relationships

6xD	0.90 reduction for speed and feed adjustment
⚠ 9xD	0.80 reduction for speed and feed adjustment
⚠ 12xD	0.70 reduction for speed and feed adjustment
⚠ 15xD - 20xD	0.60 reduction for speed and feed adjustment

Flood Coolant Applications

Recommend if diameter to depth is less than or equal to three times the diameter. Reduce speed by 20% and if needed drop feed by 10% to maintain optimal chip formation

Parameter Recommendations for Step Drills

- Feed rate is based off the pilot diameter
- Speed rate is based off the largest step diameter

⚠ WARNING Refer to Speed and Feed charts for recommended adjustments to speeds and feeds. Refer to page A15: 17 for deep hole drilling guidelines in this section of the catalog. 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 Team. *ext:* **7611** | *email:* **appeng@alliedmachine.com**

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Recommended Drilling Data | Metric (mm)

Feed Rate (mm/rev) by Diameter								
5.00 - 6.00	6.00 - 7.00	7.00 - 8.00	8.00 - 10.00	10.00 - 12.00	12.00- 14.00	14.00 - 16.00	16.00 - 18.00	18.00 - 20.00
0.20	0.23	0.25	0.30	0.33	0.38	0.43	0.46	0.51
0.19	0.22	0.24	0.28	0.30	0.36	0.41	0.43	0.48
0.18	0.20	0.23	0.25	0.28	0.33	0.38	0.41	0.46
0.20	0.23	0.25	0.30	0.34	0.37	0.42	0.44	0.50
0.19	0.22	0.24	0.29	0.33	0.36	0.41	0.43	0.48
0.18	0.20	0.23	0.28	0.32	0.34	0.38	0.41	0.46
0.18	0.20	0.23	0.25	0.30	0.33	0.38	0.41	0.46
0.18	0.19	0.23	0.28	0.30	0.33	0.37	0.41	0.44
0.15	0.18	0.22	0.27	0.29	0.32	0.36	0.39	0.43
0.15	0.18	0.22	0.27	0.28	0.32	0.34	0.37	0.42
0.14	0.17	0.20	0.25	0.28	0.30	0.33	0.36	0.41
0.17	0.19	0.22	0.27	0.29	0.33	0.37	0.41	0.43
0.15	0.18	0.20	0.25	0.28	0.32	0.36	0.39	0.42
0.15	0.17	0.20	0.24	0.27	0.30	0.34	0.37	0.39
0.14	0.15	0.19	0.23	0.25	0.29	0.33	0.36	0.38
0.13	0.14	0.18	0.23	0.25	0.28	0.32	0.34	0.37
0.15	0.17	0.20	0.24	0.27	0.30	0.34	0.37	0.39
0.14	0.15	0.19	0.23	0.25	0.29	0.33	0.36	0.38
0.11	0.14	0.17	0.20	0.22	0.25	0.28	0.30	0.33
0.18	0.20	0.24	0.30	0.33	0.36	0.39	0.41	0.47
0.15	0.18	0.20	0.27	0.30	0.30	0.34	0.36	0.41
0.14	0.17	0.19	0.24	0.27	0.29	0.32	0.34	0.38
0.13	0.15	0.18	0.24	0.25	0.28	0.32	0.33	0.38
0.11	0.14	0.17	0.22	0.23	0.25	0.29	0.30	0.36
0.09	0.10	0.11	0.14	0.15	0.17	0.18	0.19	0.22
0.08	0.09	0.09	0.11	0.13	0.15	0.17	0.17	0.19
0.09	0.10	0.11	0.15	0.15	0.18	0.19	0.20	0.23
0.08	0.09	0.10	0.13	0.14	0.15	0.18	0.18	0.20
0.09	0.10	0.10	0.11	0.14	0.15	0.17	0.18	0.20
0.08	0.09	0.09	0.10	0.11	0.14	0.15	0.15	0.18

***Special Geometry**

● Use HPM2M for greater drill depths over 8xD. HPM2M is used for any interruptions and produces a better hole tolerance and finish in comparison to HPM.

▲ Use HPS2M for greater drill depths over 8xD. HPS2M is used for any interruptions and produces a better hole tolerance and finish in comparison to HPS.

Parameter Reductions for Length to Diameter Relationships

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Flood Coolant Applications

Recommend if diameter to depth is less than or equal to three times the diameter. Reduce speed by 20% and if needed drop feed by 10% to maintain optimal chip formation

Parameter Recommendations for Step Drills

- Feed rate is based off the pilot diameter
- Speed rate is based off the largest step diameter

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Recommended Drilling Data | Metric (mm)

ISO	Material	Hardness (BHN)	General Application Geometry	Special Geometry	Coating	Speed (M/min)	Feed Rate (mm/rev) by Diameter 3.00 - 4.00	Feed Rate (mm/rev) by Diameter 4.00 - 5.00
M	**Stainless Steel 400 Series**	185-275	HPS	▲ HPS2M	AM420	76	0.10	0.11
	416, 420, etc.	275-350	HPS	▲ HPS2M	AM420	59	0.09	0.10
	Stainless Steel 300 Series	135-185	HPS	▲ HPS2M	AM420	61	0.09	0.10
	304, 316, 17-4PH, etc.	185-275	HPS	▲ HPS2M	AM420	53	0.08	0.09
	Super Duplex Stainless Steel	135-185	HPS	▲ HPS2M	AM420	46	0.09	0.10
		185-275	HPS	▲ HPS2M	AM420	41	0.08	0.09
H	**Wear Plate**	400	HP106	–	AM420	52	0.05	0.05
	Hardox, AR400, T-1, etc.	500	HP106	–	AM420	43	0.05	0.05
		600	HP106	–	AM420	30	0.05	0.05
	Hardened Steel	300-400	HP106	–	AM420	52	0.05	0.05
		400-500	HP106	–	AM420	43	0.05	0.05
K	**SG/Nodular Cast Iron**	120-150	HPS2M	◆ CIB	AM440	152	0.20	0.22
		150-200	HPS2M	◆ CIB	AM440	148	0.18	0.19
		200-220	HPS2M	◆ CIB	AM440	143	0.15	0.18
		220-260	HPS2M	◆ CIB	AM440	139	0.15	0.18
		260-320	HPS2M	◆ CIB	AM440	127	0.13	0.17
	Gray/White Cast Iron	120-150	HPS2M	◆ CIB	AM440	166	0.23	0.24
		150-200	HPS2M	◆ CIB	AM440	162	0.20	0.22
		200-220	HPS2M	◆ CIB	AM440	157	0.18	0.20
		220-260	HPS2M	◆ CIB	AM440	145	0.18	0.20
		260-320	HPS2M	◆ CIB	AM440	137	0.15	0.19
N	**Cast Aluminum**	30	HPF	○ CAB	TiCN	290	0.19	0.22
		180	HPF	○ CAB	TiCN	230	0.17	0.19
	Wrought Aluminum	30	HPF	△ WAB	TiCN	335	0.19	0.22
		180	HPF	△ WAB	TiCN	290	0.17	0.19
	Aluminum Bronze	100-200	HPM	–	TiCN	113	0.10	0.13
		200-250	HPM	–	TiCN	95	0.09	0.11
	Brass	100	BCB	–	TIN	229	0.13	0.15
	Copper	60	BCB	–	TIN	155	0.05	0.06

*Special Geometry

▲ Use HPS2M for greater drill depths over 8xD. HPS2M is used for any interruptions and produces a better hole tolerance and finish in comparison to HPS.

◆ CIB (Cast Iron Burnish): Unique point, web, and cutting edge designed to significantly improve hole finish and hole tolerance.
NOTE: Reduce speed and feed parameters above from 40% - 50% reduction.

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NOTE: Reduce speed and feed parameters above from 40% - 50% reduction.

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Parameter Reductions for Length to Diameter Relationships

6xD	0.90 reduction for speed and feed adjustment
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Flood Coolant Applications

Recommend if diameter to depth is less than or equal to three times the diameter. Reduce speed by 20% and if needed drop feed by 10% to maintain optimal chip formation

Parameter Recommendations for Step Drills

- Feed rate is based off the pilot diameter
- Speed rate is based off the largest step diameter

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Recommended Drilling Data | Metric (mm)

Feed Rate (mm/rev) by Diameter								
5.00 - 6.00	6.00 - 7.00	7.00 - 8.00	8.00 - 10.00	10.00 - 12.00	12.00- 14.00	14.00 - 16.00	16.00 - 18.00	18.00 - 20.00
0.14	0.17	0.19	0.23	0.24	0.25	0.28	0.28	0.30
0.11	0.14	0.17	0.20	0.22	0.24	0.25	0.25	0.28
0.11	0.13	0.15	0.18	0.19	0.20	0.23	0.24	0.27
0.10	0.10	0.13	0.15	0.17	0.18	0.20	0.20	0.23
0.11	0.13	0.15	0.18	0.18	0.19	0.19	0.20	0.22
0.10	0.10	0.11	0.14	0.14	0.17	0.17	0.18	0.18
0.05	0.08	0.08	0.10	0.13	0.14	0.18	0.20	0.23
0.05	0.08	0.08	0.10	0.10	0.11	0.15	0.18	0.20
0.05	0.08	0.08	0.10	0.10	0.11	0.15	0.18	0.20
0.05	0.08	0.08	0.10	0.13	0.14	0.18	0.20	0.23
0.05	0.08	0.08	0.10	0.10	0.11	0.15	0.18	0.20
0.23	0.28	0.30	0.36	0.39	0.43	0.47	0.52	0.56
0.22	0.25	0.29	0.33	0.36	0.39	0.42	0.47	0.53
0.20	0.23	0.28	0.30	0.33	0.36	0.38	0.43	0.47
0.20	0.23	0.28	0.30	0.33	0.36	0.38	0.43	0.47
0.19	0.22	0.25	0.29	0.32	0.34	0.37	0.39	0.43
0.25	0.30	0.33	0.39	0.42	0.47	0.51	0.56	0.61
0.24	0.28	0.32	0.37	0.39	0.42	0.44	0.50	0.56
0.23	0.25	0.30	0.33	0.36	0.38	0.41	0.46	0.51
0.23	0.25	0.30	0.33	0.36	0.38	0.41	0.46	0.51
0.22	0.24	0.29	0.32	0.34	0.37	0.39	0.42	0.48
0.23	0.25	0.32	0.37	0.41	0.46	0.50	0.51	0.56
0.22	0.23	0.29	0.34	0.39	0.43	0.47	0.48	0.53
0.24	0.28	0.32	0.37	0.43	0.47	0.51	0.53	0.58
0.22	0.25	0.29	0.34	0.39	0.44	0.48	0.51	0.56
0.15	0.18	0.20	0.23	0.25	0.30	0.33	0.36	0.38
0.13	0.15	0.17	0.18	0.20	0.25	0.28	0.30	0.36
0.18	0.23	0.25	0.29	0.32	0.36	0.41	0.43	0.46
0.08	0.08	0.08	0.10	0.10	0.10	0.13	0.15	0.18

*Special Geometry

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Flood Coolant Applications

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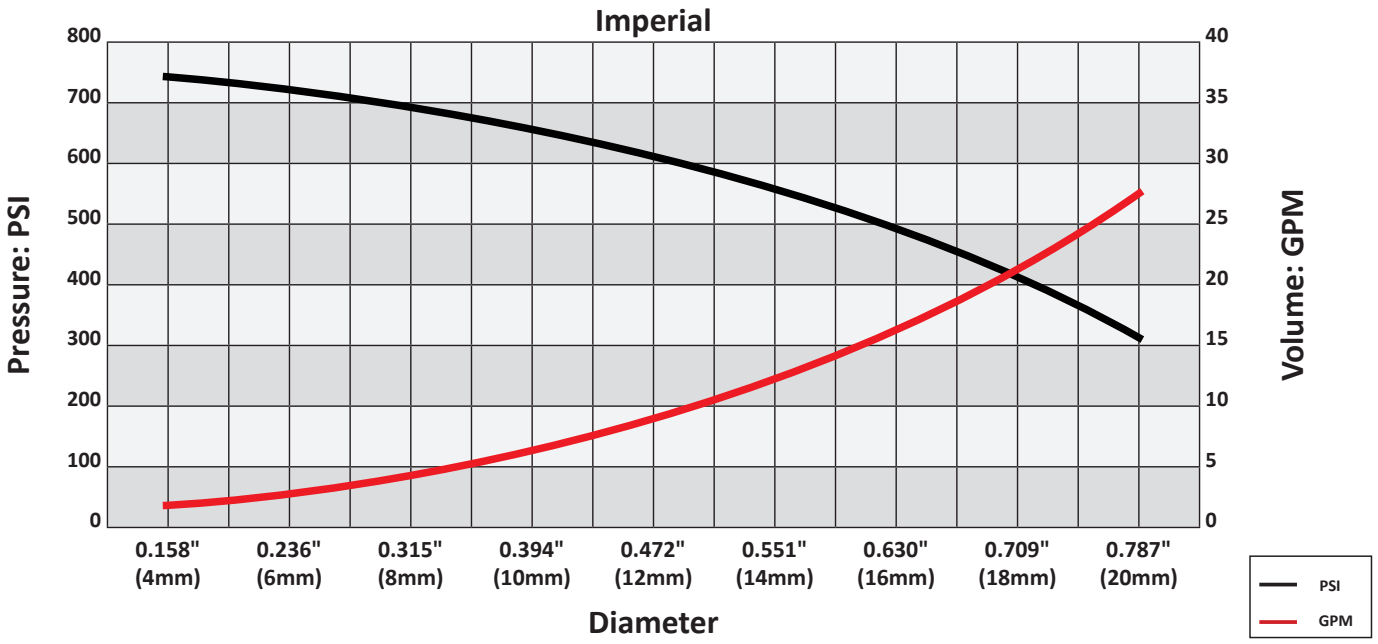
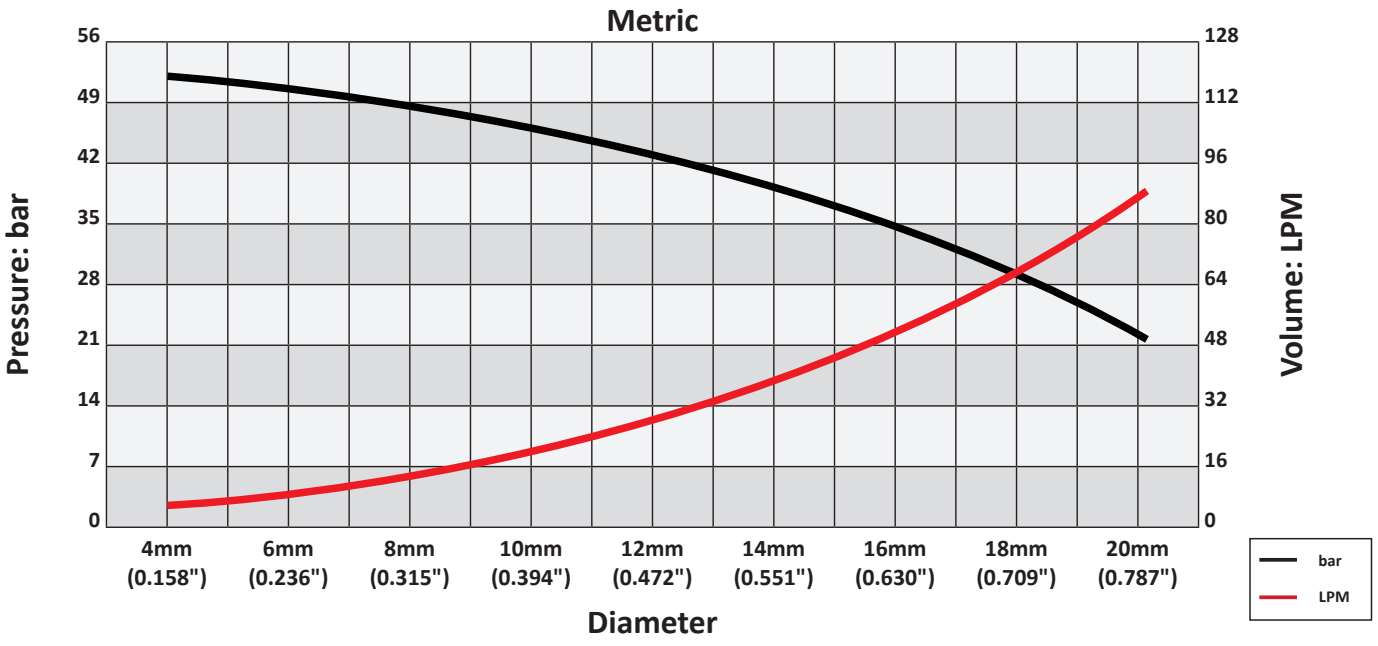
Coolant Recommendations





Coolant Adjustment

Drill Length	Pressure and Flow Multiplier
Up to 6xD	See above chart
>6 - 9xD	1.2
⚠ >9 - 12xD	1.4
⚠ >12 - 15xD	1.6
⚠ >15 - 20xD	2

Coolant Recommendation Example | Imperial

If the recommended coolant pressure and flow is 600 PSI and 12 GPM for a 3xD tool, the adjusted pressure and flow for a 9xD tool would be:

600 x 1.2 = 720 PSI	12 x 1.2 = 14.4 GPM

Coolant Recommendation Example | Metric

If the recommended coolant pressure and flow is 42 bar and 32 LPM for a 3xD tool, the adjusted pressure and flow for a 9xD tool would be:

42 x 1.2 = 50.4 bar	32 x 1.2 = 38.4 LPM

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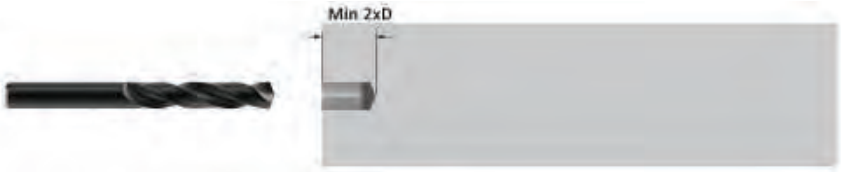
NOTES:
- Coolant must have proper additives to prevent excessive foaming during drilling cycle.
- Positive displacement coolant pump is recommended to maintain coolant flow at recommended values.
- The coolant filter must be less than 5 microns. Fine filtration is necessary to prevent blockage of the smaller coolant holes of the solid carbide tool.

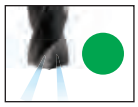
Deep Hole Drilling Guidelines

1. Pilot Hole
100 % RPM
100% IPR (mm/rev)

Establish the pilot hole using the same diameter short drill to a depth of 2xD minimum.
Utilize a pilot drill with the same or larger included point angle.



Coolant ON



2. Feed-in
50 RPM max
12 IPM (300 mm/min)

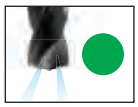
Feed the longer drill within 1/16" (1.5mm) short of the established pilot hole bottom at a **maximum of 50 RPM** and 12 IPM (300 mm/min) feed rate.

Coolant OFF

3. Deep Hole Transition Drilling
50 % RPM
75% IPR (mm/rev)

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.

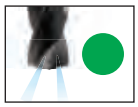
Coolant ON



4. Deep Hole Drilling - Blind
100% RPM
100% IPR (mm/rev)

Drill to full depth at recommended speed and feed for longer drill according to Allied speed and feed charts.
No peck cycle recommended.

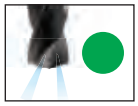
Coolant ON



5. Deep Hole Drilling - at Breakout
50% RPM
75% IPR (mm/rev)

For through holes only:
Reduce speed by 50% and feed by 25% prior to breakout.
Do not break out more than 1/8" (3mm) past the full diameter of the drill.

Coolant ON



6. Drill Retract
50 RPM max

Reduce speed to a **maximum of 50 RPM** before retracting from the hole.

Coolant OFF

WARNING **Tool failure can cause serious injury. To prevent:**
- When using Superion drills greater than 9xD without support bushing, use a short Superion drill to establish an initial hole that is a minimum of 2 diameters deep.
- Do not rotate drills more than 50 RPM unless it is engaged with the workpiece or fixture.

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Troubleshooting Guide

Problem	Condition	Shorten Flute Length	Increase Feed Rate[G]	Increase Speed[G]	Decrease Feed Rate[A G]	Decrease Speed[G]	Increase Coolant Pressure	Increase Coolant Flow	Use Through Tool Coolant[B]	Change Point Angle	Align / Repair Spindle
Decrease Tool Life	Lack of Drill Rigidity	○									
	Improper Cutting Parameters		●		●	●					
	Excessive Margin Wear					●	○	○	○		●
	Cutting Edge Chipping				●						●
	Chattering/Vibration	○	●			○					●
	Built-up Edge[D]					●	○	○	●		
	Chipping of Point				●	●				○	●
Poor Chip Evacuation[C]	Long Chips		●			●	○	○			
	Chip Packing				●	●	●	○	●		
	Blue Chips				●	●	●	●	●		
Hole Form	Workpiece Deflection				●					○	
	Bell Mouth	○	●			●				○	
	Oversized Hole	○		●	●						●
	Undersized Hole		●			●	●	●			
	Hole Leadoff	○			●	○				○	●
Performance	Workpiece Burning				●	●	●	●	●		
	Tool Deflection	○			●	●				○	●
	Harder Materials				●	●			●		
	Retract Spiral	●			●	●					●
	Exit Burr			●	●					○	

●: Primary solution
○: Secondary solution

A: Do not reduce feed rates below threshold of good chip form
B: Run coolant through tool when drilling greater than 3xD.
C: Add peck cycle to help clear chips
D: Ensure coolant quality with regular maintenance free of swarf
G: Refer to speed and feed chart

IMPORTANT: Factory technical assistance is available for your specific applications through our Application Engineering department.
ext: **7611** | *email:* **appeng@alliedmachine.com**

Troubleshooting Guide

Problem	Condition	Different Coating	Different Geometry	Tool Clamping	Workpiece Fixturing	Regrind/ Recondition	Check Tool Diameter	Entry Speed & Feed [E]	TIR Verification [F]	Exit Speed & Feed
Decrease Tool Life	Lack of Drill Rigidity			●	●					
	Improper Cutting Parameters									
	Excessive Margin Wear	○		●	●	○				
	Cutting Edge Chipping		○	●	●	○				
	Chattering/Vibration			●	●					
	Built up Edge [D]	○	○							
	Chipping of Point		○	●	●	○				
Poor Chip Evacuation [C]	Long Chips		○							
	Chip Packing		○							
	Blue Chips									
Hole Form	Workpiece Deflection		○		●					
	Bell Mouth			●	●			●		
	Oversized Hole			●	●	○			●	
	Undersized Hole					●	●		●	
	Hole Lead Off		○	●	●	○		●	●	
Performance	Workpiece Burning									
	Tool Deflection		○	●	●			●	○	
	Harder Materials	○	○							
	Retract Spiral		○	●					●	●
	Exit Burr		○							

●: Primary solution
○: Secondary solution

C: Add peck cycle to help clear chips
D: Ensure coolant quality with regular maintenance free of swarf
E: Reduce entry speed and feed parameters 20%
F: TIR range of 0.000"-0.001" (prefer 0.0000"-0.0005")

Speed and Feed Reduction Table		
Interruptions:		
Condition	**Reduction Speed**	**Reduction Feed**
Small Cross Hole (C.H)	0.90	0.85
Large Cross Hole(C.H)	0.75	0.70
Incline Angle Entry(I.A)	0.80	0.75
I.A + C.H	0.70	0.65
Coolant Type:		
Condition	**Reduction Speed**	**Reduction Feed**
**Flood	See Note	See Note
Dry	0.50	0.50
Mist	0.70	0.85
Machine:		
Machine Type	**Reduction Speed**	**Reduction Feed**
Lathe	0.90	0.85
Depth Ratio:		
Condition	**Reduction Speed**	**Reduction Feed**
6xD	0.90	0.90
9xD	0.80	0.80
12xD	0.70	0.70
15-20xD	0.60	0.60
Example: If the recommended speed and feed is 365 SFM and 0.010 IPR for a 0.276" - 0.315" diameter drill at 12xD, the speed and feed would be 255 SFM & 0.007 IPR.		
365 SFM x 0.70 = 255 SFM	0.010 IPR x 0.70 = 0.007 IPR	
****Flood coolant applications**: Recommend if diameter to depth is less than or equal to 3xD. Reduce speed by 20% and if needed, drop feed by 10% to maintain optimal chip formation.		

IMPORTANT: Factory technical assistance is available for your specific applications through our Application Engineering department.
ext: **7611** | *email:* **appeng@alliedmachine.com**

ALLIED MACHINE & ENGINEERING | SUPERION® Tooling Quote Form

Please email the completed form to:
your local FSE (if applicable) or **appeng@alliedmachine.com**.

Please include any prints for the part (specify the feature) and/or tool for this project. More information will help ensure proper tooling for this quote.

LOGIN TO DOWNLOAD AND COMPLETE THIS FORM OFFLINE:
alliedmachine.com/SuperionQuoteForm

Name	
FSE (if applicable)	

Please fill in the fields below completely for a quote to be processed.

Distributor Information

Company Name: _____
Contact: _____
Account Number: _____
Phone: _____
Email: _____

End User Information

Company Name: _____
Contact: _____
Industry: _____
Phone: _____
Email: _____

Superion Objective

What issue(s) are we solving? (i.e. penetration rate, finish, tool life, hole size, etc.)

_____

_____

Application Information

Hole Diameter: _____ in/mm
Tolerance: _____
Material: _____ (4150 / A36 / Cast Iron / etc.)

Pre-existing Diameter: _____ in/mm
Depth of Cut: _____ in/mm
Hardness: _____ (BHN / Rc)

Required Finish: _____ RMS
State: _____ (Casting / Hot rolled / Forging)

Machine Information

Machine Type: _____ (Lathe / Screw machine / Machine center / etc.)
Builder: _____ (Haas, Mori Seiki, etc.)
Model #: _____

Shank Required: _____ (Cylindrical / Whistle Notch / Tang / etc.)
Power: _____ HP/KW

Rigidity:
- ☐ Excellent
- ☐ Good
- ☐ Poor

Orientation:
- ☐ Vertical
- ☐ Horizontal

Tool Rotating:
- ☐ Yes
- ☐ No

Thrust: _____ lbs/N

Max Spindle Speed: _____ RPM

Coolant Information

Coolant Delivery: _____ (Through tool/Flood)
Coolant Pressure: _____ PSI / bar

Coolant Type: _____ (Air mist, oil, synthetic, water soluble, etc.)
Coolant Volume: _____ GPM / LPM

Current Process

Is this a new project? Yes___ No___ (If selected no, please fill the box out below)

Current Tooling: _____ (Manufacturer / Item Number)
Current Tool Life: _____ Holes _____ Parts _____ Inches

Current Speeds and Feeds: _____
Current Coating/Substrate: _____

Notes: _____

Notes

Notes

ALLIED MACHINE & ENGINEERING

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Allied Machine & Engineering ("Allied Machine") warrants to original equipment manufacturers, distributors, industrial and commercial users of its products for one year from the original date of sale that each new product manufactured or supplied by Allied Machine shall be free from defects in material and workmanship.

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Complete information as to operating conditions, machine, setup, and the application of cutting fluid should accompany any product returned for inspection. This warranty shall not apply to any Allied Machine products which have been subjected to misuse, abuse, improper operating conditions, improper machine setup or improper application of cutting fluid or which have been repaired or altered if such repair or alteration, in the judgement of Allied Machine, would adversely affect the performance of the product.

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