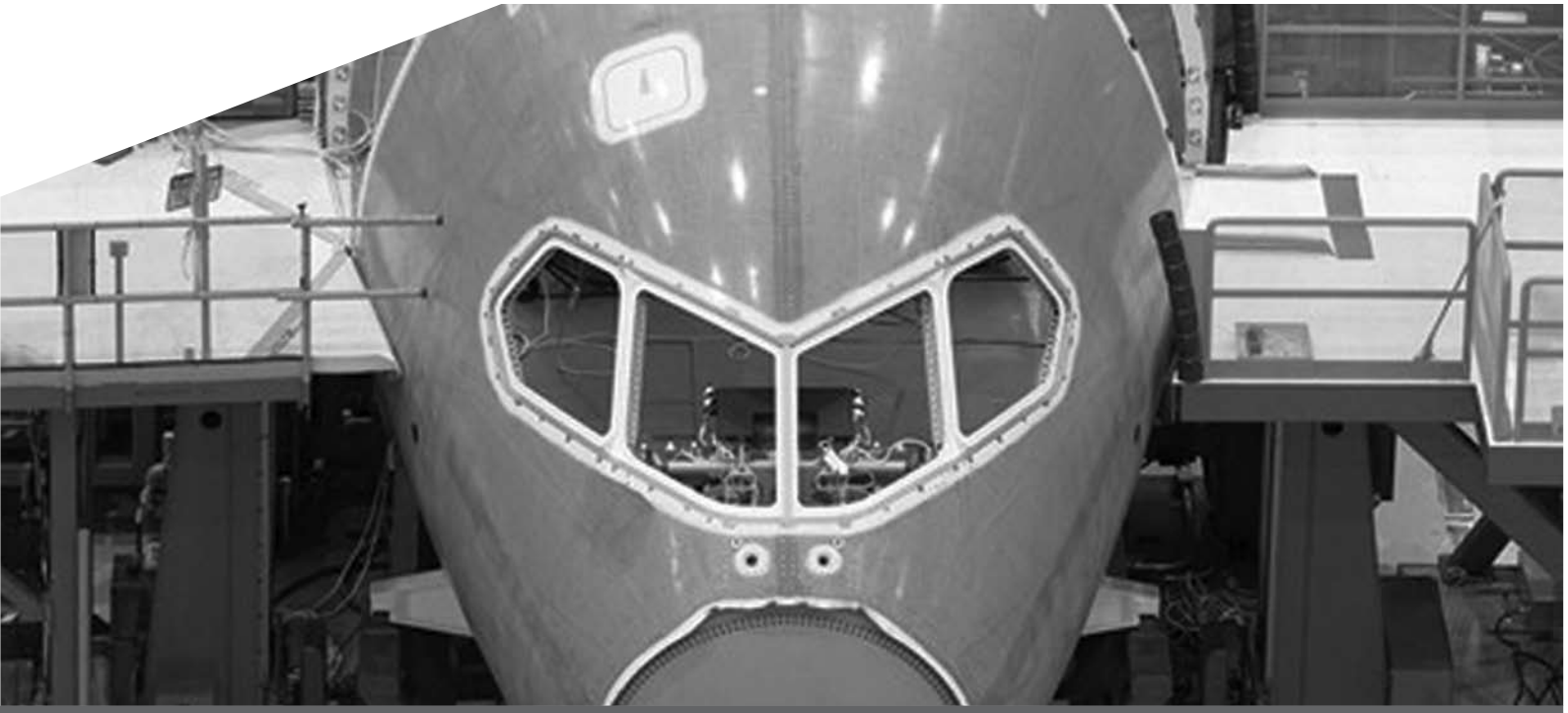


Quackenbush® • Doler® • Recoules® • Apex® • Cleco® • Dotco®

Tools for the Aerospace Industry

SP-1300-I-EN 0908 .5M

COOPER Tools

ISO 9001
Quality System Certified

Cooper Tools Division has attained ISO 9001 Quality System Certification for seven of our facilities. The driving force behind the implementation of the Quality System is the commitment "to provide our customers with the **best value delivered** by offering only products and services **that meet or exceed their expectations**".


DET NORSKE VERITAS
MANAGEMENT SYSTEM CERTIFICATE
COOPER INDUSTRIES
COOPER TOOLS DIVISION
LEXINGTON OPERATION
ISO 9001:2000
THE DESIGN, MANUFACTURE AND TESTING OF INDUSTRIAL POWER TOOLS

Lexington, South Carolina


DET NORSKE VERITAS
MANAGEMENT SYSTEM CERTIFICATE
COOPER INDUSTRIES COOPERTOOLS
DAYTON OPERATION
ISO 9001:2000 and AS9100:2004
AIR5359B.
THE DESIGN, MANUFACTURE AND TESTING OF INDUSTRIAL FASTENER TOOLS AND UNIVERSAL JOINTS

Dayton, Ohio


DET NORSKE VERITAS
MANAGEMENT SYSTEM CERTIFICATE
COOPERTOOLS
HICKSVILLE OPERATION
ISO 9001:2000
THE DESIGN, MANUFACTURE AND TESTING OF INDUSTRIAL POWER TOOLS AND TORQUE TOOLS.

Hicksville, Ohio


DET NORSKE VERITAS
MANAGEMENT SYSTEM CERTIFICATE
COOPER INDUSTRIES
COOPER TOOLS - SPRINGFIELD OPERATION
ISO 9001:2000
THE DESIGN, MANUFACTURE, AND TESTING OF TUBE EXPANDERS AND CLEANERS

Springfield, Ohio


CERTIFICATE OF APPROVAL
This is to certify that the Quality Management System of:
Metronix Meßgeräte und Elektronik GmbH
Kocherstr. 3, 38120 Braunschweig
Germany
has been approved by Lloyd's Register Quality Assurance to the following Quality Management System Standards:
DIN EN ISO 9001:2000
The Quality Management System is applicable to:
Development and production of devices and software for industrial electronics.

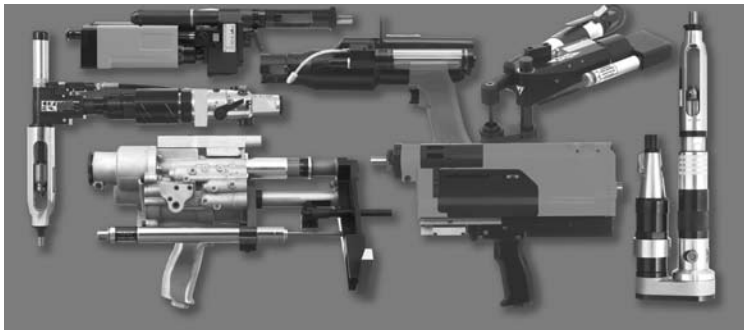
Braunschweig, Germany


CERTIFICATE OF APPROVAL
This is to certify that the Quality Management System of:
Cooper Power Tools GmbH & Co.
Industriestraße, 73463 Westhausen
Germany
has been approved by Lloyd's Register Quality Assurance to the following Quality Management System Standards:
ISO 9001:2000
The Quality Management System is applicable to:
Development, manufacture, marketing and distribution of pneumatic tools, electric tools, tightening systems, assembly machines, assembly lines and electronic controls.

Westhausen, Germany


CERTIFICATION
N° QUAL/1994/2132a
RECOULES SA
CONCEPTION, USINAGE ET MONTAGE MECANIQUES. FABRICATION ET COMMERCIALISATION D'OUTILLAGES PNEUMATIQUES ET HYDRAULIQUES. OUTILS COUPANTS.
DESIGN, MECHANICAL MACHINING AND ASSEMBLY, MANUFACTURING AND MARKETING AND SALES OF HYDRAULIC AND PNEUMATIC TOOLINGS, CUTTING TOOLS.
ISO 9001 : 2000

Ozoir-la-Ferrière, France



Our Tools Are So Much In Demand Because We Demand So Much From Our Tools

Advanced Drilling Equipment from Cooper Tools is the most complete and the most comprehensive line of drilling systems available to the aerospace industry.

Branded under the highly respected Doler and Quackenbush names, the Cooper line represents "the best of the best," encompassing the premium features from a number of tool lines our company has acquired over the years.

All of the tools in the Advanced Drilling Equipment line are designed to be fixture-mounted, with torque and thrust counteracted by the fixture, not by the operator.

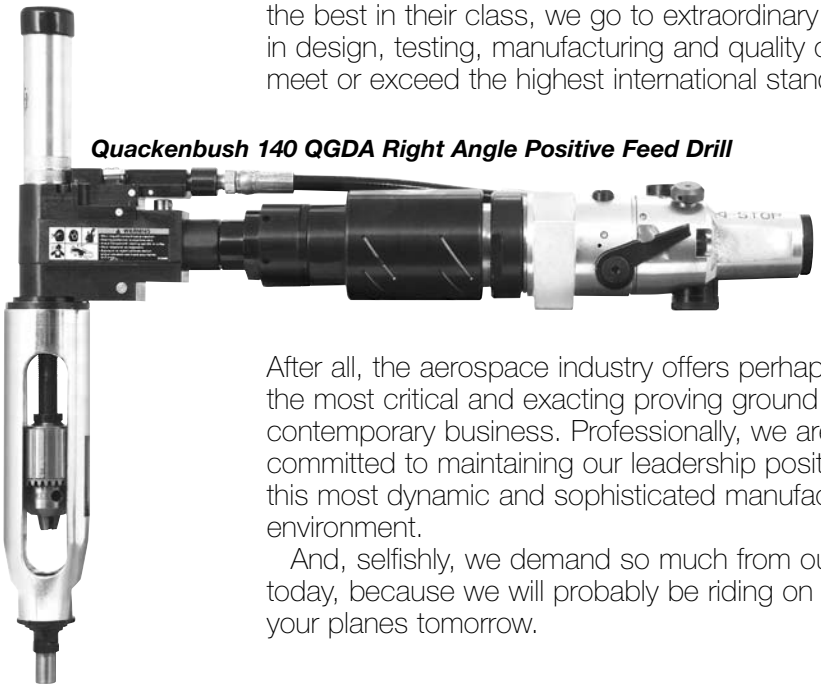
These tools do not rely on the variable strength of manpower to push against a drill, which means they deliver greater accuracy, repeatability and consistency of hole integrity, as well as greatly reduced fatigue and chance of injury to the operator.

We have designed our tools to help you achieve optimum hole quality, including diameter, angularity and depth tolerances. Of course, the drill is but one factor that effects hole quality. The condition of the cutter, fixture, bushing in the fixture, lubrication, and the skill of the operator are major factors.

And to ensure that our tools and accessories are the best in their class, we go to extraordinary lengths in design, testing, manufacturing and quality control to meet or exceed the highest international standards.

Quackenbush 158 QGB Inline Positive Feed Drill

Quackenbush 140 QGDA Right Angle Positive Feed Drill



After all, the aerospace industry offers perhaps the most critical and exacting proving ground in contemporary business. Professionally, we are deeply committed to maintaining our leadership position in this most dynamic and sophisticated manufacturing environment.

And, selfishly, we demand so much from our tools today, because we will probably be riding on one of your planes tomorrow.

Assuring You Of The Right Tool For The Right Application

The Advanced Drilling Equipment line has been developed to address the singular nature of achieving optimum hole quality in the aerospace industry.

In most traditional industries, precision holes can be successfully drilled with a drill press or CNC machine. But because a significant number of aircraft components are too large, too complex and too irregularly shaped to be taken to a machining center, portable precision drill motors must be taken to the plane itself. It is impractical to drill precision holes in a wing, fuselage or engine nacelle any other way.

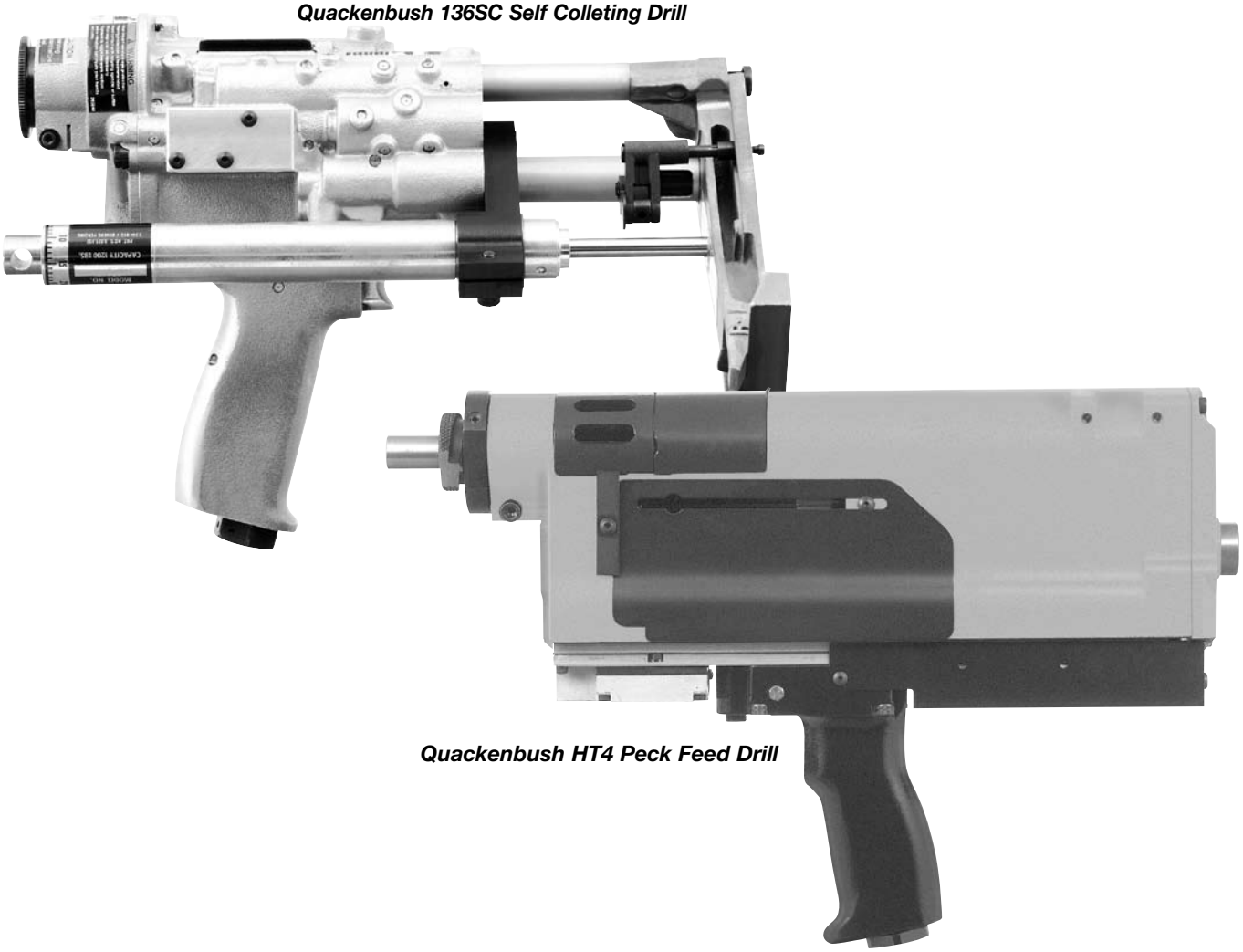
The wide range of hole sizes, the critically close tolerances required of those holes and the divergent materials used in the aerospace manufacturing industry demand that these portable precision drill motors be available with a remarkably broad range of cutter speeds, feed rate combinations, and physical properties that can accommodate virtually any workspace or application.

Responding successfully to these demands for quality and flexibility has made the Cooper Tools Advanced Drilling Equipment line the most impressive, and the most respected, in the business.

Included are positive feed drills for deep hole drilling in in-line, piggyback, and right angle configurations, peck drills designed specifically to enhance hole quality when drilling through layers of dissimilar materials, and self colleting drills that are perfect for drilling smaller holes throughout the aircraft.

We invite your attention to a detailed picture of the various Advanced Drilling Equipment tools and accessories in the pages that follow.

Quackenbush 136SC Self Colleting Drill



Quackenbush HT4 Peck Feed Drill

Selecting The Right Tool

The old saying, "you've got to have the right tool to do the job right", is so true in regards to advanced drilling equipment. For certain applications, as shown in the diagram below, a specific tool is required. However, other applications may be served by more than one tool. Detailed analysis by one of our experienced technical assistants will help you make the right tool selection for your particular applications. Some factors to consider are fixturing costs, access, hole quality, material(s) being drilled, production rate, budget, and familiarity with product.

Peck Feed Drill
- **Stacks of different materials**
- **Close tolerance, one-shot drilling**

Peck Feed or Positive Feed Drill

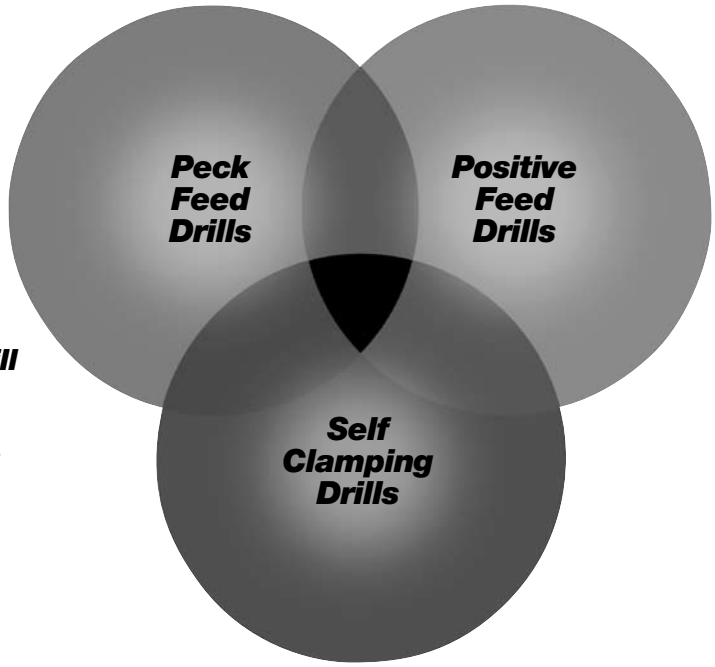
Positive Feed Drill
- **Work hardening materials**
- **Controlled fixed feed rates**
- **Drilling stroke >4 inches**

Positive Feed or Self Clamping Drill

Self Clamping Drill
- **Drilling and countersinking of wings and fuselage**
- **Nutplate holes**

Self Clamping or Peck Feed Drill

Peck Feed or Positive Feed or Self Clamping Drill



Quackenbush 10QNPD Nut Plate Drill

Quackenbush 60QBSF Back Spotfacer

Speed, Feed & Power

Please use the chart below as a guide only. Many variables contribute to the optimum parameters for each application. These variables include: particular material characteristics, cutter design, cutter sharpness, airline pressure and flow capacity and cutter lubrication.

All portable drilling tools have limited power and thrust. In most cases, holes over 1/2 inch diameter cannot be produced at machine tool rates. Feed rates and/or speeds are reduced. Consult Cooper Tools for advise on particular applications.

For best results with your drilling system:

1. Maintain lubricated air to the tool with pressure of 90 psig *while the tool is running.*

2. Use high quality cutters.

3. Replace cutters when point dulls – hole diameter generally increases, cycle times lengthen *(except positive feed)* and hole finish worsens.

4. Whenever possible, provide lubricant mist to the drill point.

5. Insure there is an adequate flow path for drill chips *(swarf).*

6. Utilize fixtures that are secure and rigid.

7. Assure that accessory items are sized correctly and working properly.

8. Train operating personnel in the proper use of the tool.

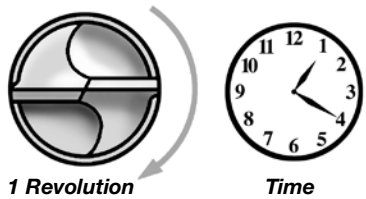
		Drill Diameter						
		1/8	3/16	1/4	5/16	3/8	7/16	1/2
Material	**Function**	**.125**	**.188**	**.250**	**.313**	**.375**	**.437**	**.500**
Aluminum (300 SFM)	Speed (RPM)	9000	6000	4600	3600	3000	2600	2300
	Feed Rate (IPR)	.002	.003	.004	.004	.004	.004	.004
	Power (HP)	.2	.3	.6	1.0	1.5	1.8	2.0
Mild Steel (90 SFM)	Speed (RPM)	2700	1800	1300	1100	900	750	650
	Feed Rate (IPR)	.005	.005	.005	.006	.006	.006	.006
	Power (HP)	.2	.3	.6	1.0	1.5	1.8	2.0
High Strength Steel Stainless Steel (30 SFM)	Speed (RPM)	900	600	450	375	300	250	220
	Feed Rate (IPR)	.001	.001	.001	.001	.001	.001	.001
	Power (HP)	.2	.3	.6	1.0	1.5	1.8	2.0
Titanium/Inconel (20 SFM)	Speed (RPM)	600	400	300	250	200	175	150
	Feed Rate (IPR)	.002	.003	.003	.003	.004	.004	.005
	Power (HP)	.2	.3	.6	1.0	1.5	1.8	2.0
Composites	Graphite, kevlar, fiberglass, and other composite materials vary widely. Fiber, resin, processing method and type of cutting tool all affect the optimum drilling speed and feedrate. Little power or thrust is normally required, but controlled feedrates at the proper speed is mandatory. Carbide or diamond cutting tools are required. Contact your material supplier or experiment with an NC Drilling Machine.							
Stacks of Various Materials	Use the lowest speed and feedrate of the materials in the stack. Peck feed drilling is best.							

A. Peck Drilling permits higher drilling speeds *B. Carbide cutting tools (when applicable) permits higher drilling speeds* *C. Oil hole cutting tools permit higher drilling speeds.*

Speed (RPM)

Describes the number of revolutions of the spindle per unit of time.

Example: *Revolutions per minute=RPM*

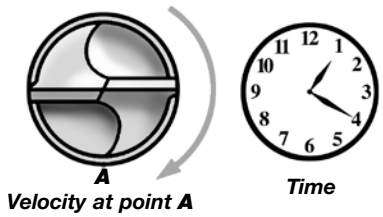


Speed = Revolution ÷ Time

Surface Speed (SFM)

Describes the velocity *(speed)* of the ***outside*** of the drill bit.

Example: *30 surface feet per minute (30 SFM)*

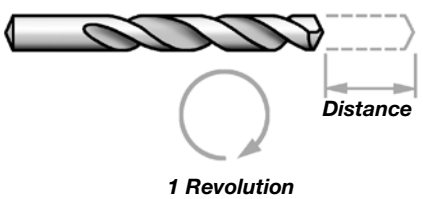


Surface Speed = Distance ÷ Time (rotational)

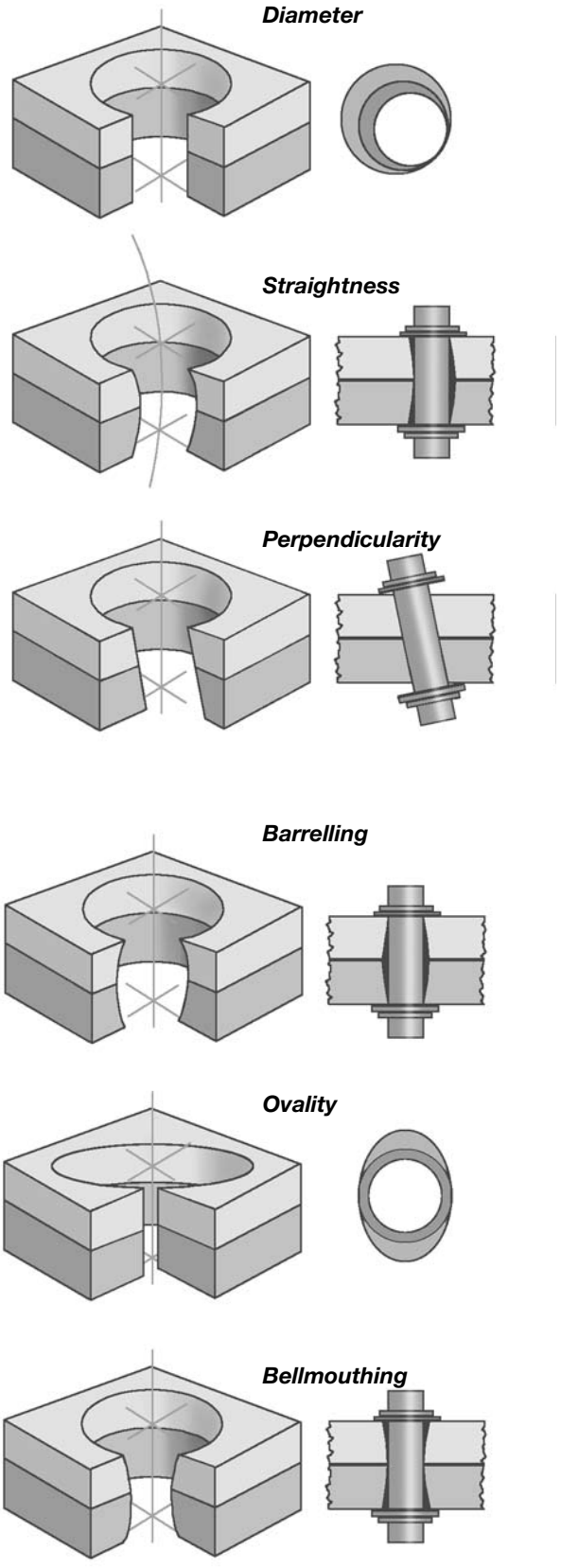
Feed Rate (IPR)

Describes the distance the spindle travels during each revolution.

Example: *0.002 inches per revolution = .002 IPR*



Feed Rate = Distance ÷ Revolution



Benefits of Proper Hole Preparation

Improved Hole Quality

- Diameter tolerance
- Countersink depth tolerance
- Hole finish
- Hole straightness
- Lack of burrs
- No delamination in composites
- No fiber fraying in composites
- No metallurgical change from excess heat

Lowered Cost Per Hole

- Decrease the drilling time
- Reduce the number of operations for a finished hole
- Combine drilling and countersinking into one operation
- Self clamping attachments minimize hole to hole time

Reduced Inventory & Capital Investment

- Portable equipment eliminates expensive, large stationary machines
- Simultaneous drilling and countersinking reduces total equipment requirements
- Self clamping significantly reduces fixturing costs
- Modular designs reduce the number of complete backup units

Reduced Safety Hazards

- Less operator contact
- Drill bit control through nosepieces and fixtured bushings
- All reactions of the drilling process are absorbed by the fixture and drilling equipment

The Total Solution

The total solution from Cooper Tools includes not only a complete line of quality industrial tools and accessories but also a professional engineering and product support staff to help customize each tool to specific application requirements. All are as close as a telephone or e-mail.

Cooper Tools maintains company-owned Service Centers in strategic locations throughout the world, staffed with professional tool repair technicians who use genuine Cooper Tools parts and who are outfitted with the very latest in testing, calibration and inspection equipment. Each tool that is returned to a customer from one of our Service Centers carries with it a warranty that is Cooper Tools' assurance that it will perform just like it did when it was purchased new.

Our support personnel are fully capable of helping to diagnose problems and promptly recommend solutions.

Our complete line of tools are carefully designed and built from the finest materials available in order to provide years of trouble free service. But, as with any piece of equipment, service problems can occur. All tools are designed to be easy to service ... that is, of course, with properly trained personnel.

To facilitate quick repairs, and limit downtime ... Cooper Tools conducts training seminars covering all aspects of every tool we make.

Introductory training seminars are designed to fully acquaint students with the entire line of tools and their fundamental operation. Advanced training seminars, which are often tailored to individual needs, are designed to hone the skills of the experienced student. Hands-on experience, with an emphasis on troubleshooting and repairing, are the focus of this training.

Service literature, product information, brand catalogs and FAQs are also available around the clock on the web. Just access ***www.coopertools.com*** for the latest information available.


COOPER Tools
GARDNER-DENVER • DOTCO • DGD • APEX • DOLER • BUCK
2200 LBS 1000 KG
Airetool
Cleco
Tightening Manager
12.2
13
TM-COM
TM-COM1
TM-COM1M

Sales & Service Centers

Note: All locations may not service all products. Please contact the nearest Sales & Service Center for the appropriate facility to handle your service requirements.

Dallas, TX

Cooper Tools
Sales & Service Center
1470 Post & Paddock
Grand Prairie, TX 75050
Tel: (972) 641-9563
Fax: (972) 641-9674

Detroit, MI

Cooper Tools
Sales & Service Center
4121 North Atlantic Blvd.
Auburn Hills, MI 48326
Tel: (248) 391-3700
Fax: (248) 391-7824

Houston, TX

Cooper Tools
Sales & Service Center
6550 West Sam Houston
Parkway North, Suite 200
Houston, TX 77041
Tel: (713) 849-2364
Fax: (713) 849-2047

Seattle, WA

Cooper Tools
Sales & Service Center
2865 152nd Ave N.E.
Redmond, WA 98052
Tel: (425) 497-0476
Fax: (425) 497-0496

Lexington, SC

Cooper Tools
670 Industrial Drive
Lexington, SC 29072
Tel: (800) 845-5629
Tel: (803) 951-7544
Fax: (803) 358-7681

Los Angeles, CA

Cooper Tools
Sales & Service Center
15503 Blackburn Ave
Norwalk, CA 90650
Tel: (562) 926-0810
Fax: (562) 802-1718

York, PA

Cooper Tools
Sales & Service Center
York Service Center
3990 E. Market Street
York, PA 17402
Tel: (717) 755-2933
Fax: (717) 757-5063

Brazil

Cooper Tools Industrial Ltda.
Av. Liberdade, 4055
Zona Industrial - Iporanga
18087-170 Sorocaba, SP Brazil
Tel: (011) 55 15 238 3929
Fax: (011) 55 15 228 3260

Canada

Cooper Tools
Sales & Service Center
5925 McLaughlin Road
Mississauga, Ont. L5R 1B8
Canada
Tel: (905) 501-4785
Fax: (905) 501-4786

China

Cooper (China) Co., Ltd.
955 Sheng Li Road,
Heqing Pudong, Shanghai
China 201201
Tel:+86-21-28994176
Fax: + 86-21-51118446

France

Cooper Power Tools SAS
Recoules Operation
Zone Industrielle
BP 28
Avenue Maurice Chevalier
77831 Ozoir-la-Ferrière Cedex
France
Tel: (011) 33 1 64 43 22 00
Fax: (011) 33 1 64 40 17 17

Germany

Cooper Power Tools
GmbH & Co. OHG
Postfach 30
D-73461 Westhausen
Tel: +49 (0) 73 63/ 81-0
Fax: +49 (0) 73 63/ 81-222

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Libramiento La Joya No. 1
Bodega No. 2
Esq. Politécnico, Barrio San José
Cuautitlán, Edo de México C.P. 54870
Phone: (011) 525 5899 9510
Fax: (011) 525 5870 5012

Cooper Tools Is On The Web!

Cooper Tools provides a complete resource for power tools on-line. Our website ***www.coopertools.com*** offers product information, service literature, brand catalogs, press releases and more. A dominant source of information, the Cooper Tools website is your source for application solutions on-line.

Making your job easier is our goal!

You can access service literature anytime. Choose a category such as Assembly Tools or Material Removal Tools from the main menu and then click on the brand you're looking for. You'll be on your way to any current service literature you need, whether it's Cleco, Apex, Master Power, or any of our power tool brands.

Up-to-date product catalogs are also available online providing you with current information on our broad product line. Even Material Safety Data Sheets (M.S.D.S.) for Safety and Disposal Information are available on our website.

It's simple!

Our *Customer Care* section provides you with information such as answers to frequently asked questions or contact phone numbers and addresses for your area of the country. You can browse through the *What's New* information to learn how Cooper Tools continues to be your source for solutions.

For even faster searches, you can go direct to a brand site by simply entering the brand name. Entering ***www.dotco-tools.com*** takes you directly to the Dotco brand site.

What is the future of ***www.coopertools.com***? A dynamic site continuing to focus on your need for up-to-date information on the latest Cooper Tools' offerings that you can access anytime you need...twenty-four hours a day, seven days a week!

Warranty

Cooper warrants products and parts sold by it, insofar as they are of its own manufacture, against defects of material and workmanship, under normal use and service in accordance with its written instructions, recommendations, and ratings for installation, operation, maintenance, and service of products, for a period of **ONE YEAR FROM THE DATE OF INITIAL USE, BUT IN NO EVENT SHALL THE WARRANTY EXCEED 24 MONTHS FROM DATE OF DELIVERY TO DISTRIBUTOR.** Proof of Purchase with shipment date must be furnished by the user to validate the warranty. This warranty applies only to products manufactured by Cooper and specifically excludes products manufactured by others. Products not manufactured by Cooper are warranted only to the extent and in the manner warranted to Cooper by the manufacturer and then only to the extent Cooper is able to enforce such warranty. Cooper's warranty with respect to products manufactured by it is limited to the repair or replacement, as Cooper may elect, of any defective part regarding which the Distributor has given 5 days written notice from the discovery of such defect. Installation and transportation costs are not included. Cooper shall have the option of requiring the return to it of the defective material, transportation prepaid, for inspection. No allowance will be made for repairs without Cooper's approval. **COOPER MAKES NO OTHER WARRANTY OF ANY KIND WHATSOEVER, EXPRESSED OR IMPLIED, AND HEREBY DISCLAIMS ALL WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.**

Lubrication Products

Cooper Tools' products are classified as non-hazardous manufactured items, defined in the OSHA 1910.1200 Hazard Communication Standard as "Articles". These products, under conditions of normal use, do not release or cause exposure to a hazardous chemical.

Under normal conditions of use, lubrication products sold separately for or used within these tools should not cause an exposure hazard. Refer to the Material Safety Data Sheet (M.S.D.S.) for Safety and Disposal Information. M.S.D.S. sheets are available upon request from Cooper Tools or on our website at ***www.coopertools.com***.

Cooper is also aware of, and complies with, the provisions of section 611 amendments to the Clean Air Act of 1990. No ozone depleting chemicals have been used in the manufacture of our products.

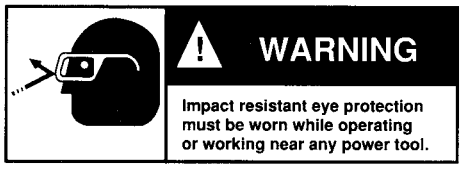
If you resell or distribute these products, you have the responsibility for ensuring that the Material Safety Data Sheets are provided to the purchaser.

Proper lubrication is essential to the economical operation of pneumatic and electric tools. Cooper Tools perform better and their life is extended by using the recommended lubricants. All lubricants that are listed in the accessory section of this catalog have undergone extensive testing and are recommended for use with Cooper Tools products.

Safety Recommendations – Safe Drilling Practices

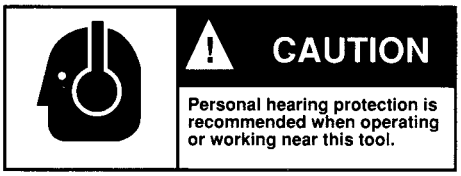
For your safety and the safety of others, read and understand the safety recommendations and operating instructions supplied with the tool.

Always wear personal protective equipment.

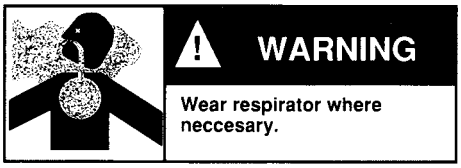


For additional information on eye protection, refer to Federal OSHA Regulations, 29 CFR, Section 1910.133, Eye and face Protection, and ANSI Z 87.1, Occupational and Educational Eye and Face Protection. This standard is available from the American National Standards Institute, Inc., 11 West 42nd Street, New York, NY 10036.

Hearing protection is recommended in high noise areas (above 85 dBA). Close proximity of additional tools, reflective surfaces, process noises, and resonant structures can substantially contribute to the sound level experienced by the operator. For additional information on hearing protection,



refer to Federal OSHA regulations, 29 CFR, Section 1910.95, Occupational Noise Exposure and American National Standards Institute, ANSI S12.6, Hearing Protectors.

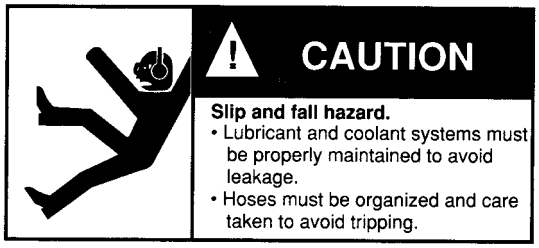


Drilling operations may produce hazardous fumes and/or dust. To avoid adverse health effects utilize adequate ventilation and/or wear a respirator. Read the material safety data sheet

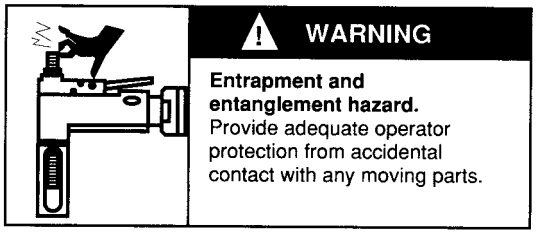
of any cutting fluids or materials involved in the drilling process. Follow good machine shop practices. Rotating shafts and moving components entangle and entrap, and may result in serious injuries. Never wear long hair, loose fitting clothes, gloves, ties, or jewelry when working with or near a drill of any type.

Safety Labels. The safety labels found on our Advanced Drilling Equipment are essential parts of the product. Labels should not be removed. Labels should be checked periodically for legibility. Replace safety labels when missing or when the information can no longer be read. Replacement labels can be ordered using the part numbers found in each respective tool's Operating Instructions and Service Manual.

WARNING Some non-ferrous metal chips (or dusts) are combustible. Examples: Aluminum, magnesium, titanium, and zirconium. See the material safety data sheets for combustibility of materials drilled. Never collect spark generating material with combustible material. Examples: Collecting both steel and aluminum or steel and titanium.



Our Advanced Drilling Equipment tools are often used with lubricant or cooling systems which must be properly maintained to avoid leakage. Failure to do so can result in serious injuries from slipping on oily surfaces.



Due to the multitude and variety of tooling applications, the user's methods engineering, standard tooling engineering, and/or safety engineering departments, etc., must consider any entrapment and entanglement hazards that may be associated with each specific application and provide adequate operator protection from inadvertent contact with any moving components. Spindle guards are available in one inch increments for all of our Advanced Drilling Equipment right angle drills, and should be used to cover any exposed spindle.

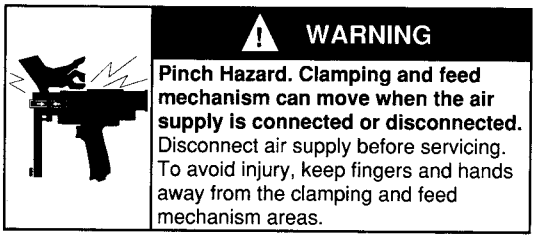
Our Advanced Drilling Equipment tools are designed to operate on 90 psig (6.2 bar) air pressure. Excessive air pressure can increase the loads and stress on tool parts and drills, and may cause breakage. **Higher air pressure can also increase the sound level of the tool.** Installation of a filter-regulator-lubricator in the air supply line ahead of the tool is recommended. The use of a quick disconnect or self-relieving valve within reach of the user of the tool is highly recommended.

Before connecting the tool with a trigger to the air supply, check the throttle for proper operation (i.e. throttle valve moves freely and returns to closed position). Before removing a tool from service or changing drill bits, make sure the air line is shut off and drained of air by using the self-relieving valve. This will prevent the tool from operating if the throttle is accidentally engaged. Also, make sure the chuck key or drill drift is removed before operating.

CAUTION Cutting tools used with our Advanced Drilling Equipment tools are sharp. Handle them carefully to avoid injury.

CAUTION Before mounting any positive feed drill, check the means for mounting the drill to the tooling fixture or jig. Lock screws, lock liners, and bushings must be in good condition and securely installed. Before operating, be sure the nose piece is properly locked in the fixture. Positive feed drills can exert high torques and high thrust loads. If failure of the lock screws, lock liners, or drill bushing occurs, the drill may suddenly spin and back away from the drill fixture.

Keep fingers and hands away from the slots in the tool nose at all times. **Rapid spindle retraction occurs automatically on some models after drilling cycle and can be activated manually, even with the air supply disconnected, on other models.** Most nose pieces used with positive feed drills are slotted for visibility and access to the chuck and cutter. Because the spindle retracts at a much faster rate than it feeds, care should be taken to avoid entrapment.



The clamping and feed mechanisms of our self-colleting drills can move when air supply is connected or disconnected. To avoid injury, keep fingers and hands away from the clamping and feed mechanism of the tool when handling or operating. The clamping and feed mechanism of our nut plate drills

is covered by a clear polycarbonate guard for visibility. The clamping and feed mechanism can also move when the air supply is connected or disconnected. To avoid injury, keep fingers and hands away from these areas when handling or operating these tools and **keep the guard in place.**

⚠ WARNING Before starting the tool, the collet and mandrel of our Advanced Drilling Equipment tools must be inserted into a properly sized pre-drilled hole of proper material thickness. An improperly sized pre-drilled hole prevents the mandrel from engaging the collet and could result in slippage of the tool. An improperly selected collet and mandrel can also result in slippage of the tool.
Some individuals may be susceptible to disorders of the

⚠ WARNING

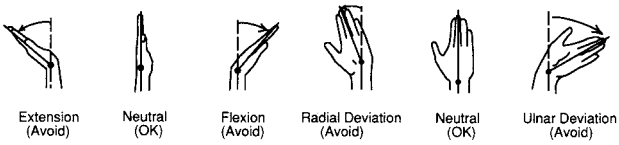
Repetitive work motions and /or vibration may cause injury to hands and arms.
Use minimum hand grip force consistent with proper control and safe operation.
Keep body and hands warm and dry.
Avoid anything that inhibits blood circulation.
Avoid continuous vibration exposure.
Keep wrists straight.
Avoid repeated bending of wrists and hands.

hands and arms when performing tasks consisting of highly repetitive motions and/or exposure to extended vibration. Cumulative trauma disorders such as carpal tunnel syndrome and tendonitis can be caused or aggravated by repetitious, forceful exertions of the hands and arms. Vibration may contribute to a condition called Raynaud's Syndrome. These disorders develop gradually over a period of weeks, months, and years. It is presently unknown to what extent exposure to vibrations or repetitive motions may contribute to the disorders. Hereditary factors, vasculatory or circulatory problems, exposure to cold and dampness, diet, smoking and work practices are thought to contribute to the conditions.

Operators should be made aware of the following symptoms and warning signs so that a problem can be addressed before it becomes a debilitating injury. Any user suffering prolonged symptoms of tingling, numbness, blanching of fingers, clumsiness or weakened grip, nocturnal pain in the hand, or any other disorders of the shoulders, arms, wrists, or fingers is advised to consult a physician. If it is determined that the symptoms are job related or aggravated by movements and postures dictated by the job design, it may be necessary for the employer to take steps to prevent further occurrences. These steps might include, but are not limited to, repositioning the workpiece or redesigning the workstation, reassigning workers to other jobs, rotating jobs, changing work pace, and/or changing the type of tool used so as to minimize stress on the operator. Some tasks may require more than one type of tool to obtain the optimum operator/tool/task relationship.

The following suggestions will help reduce or moderate the effects of repetitive workmotions and/or extended vibration exposure:

- Use a minimum hand grip force consistent with proper control and safe operations.
- Keep body and hands warm and dry (cold weather is reported to be a major factor contributing to Raynaud's Syndrome)
- Avoid anything that inhibits blood circulation
  – Smoking Tobacco (another contributing factor)
  – Cold Temperatures
  – Certain Drugs
- Tasks should be performed in such a manner that the wrists are maintained in a neutral position, which is not flexed, hyperextended, or turned side to side
- Stressful postures should be avoided – select a tool appropriate for the job and work location
- Avoid highly repetitive movements of hands and wrists, and continuous vibration exposure (aftereach period of operation, exercise to increase blood circulation)
- Interrupt work, activities, or rotate jobs to provide periods free from repetitive work motions
- Keep tool well maintained and replace worn parts



Speed and Feed Selection Considerations

Because our Advanced Drilling Equipment tools are portable and generally hand-carried from one drill location to the next, every effort has been made to make them as compact and light-weight as possible without compromising the strength required to provide rugged durability and service. A wide selection of feeds and speeds are available to accommodate drilling of a variety of materials.

⚠ CAUTION Good machining practice is an integral part of obtaining optimum service life from the tool and the cutter. Selection of speeds and feeds must take into consideration workpiece material and hardness, cutter geometry and sharpness, and quality of lubrication.

Use of the highest feed rates at the lowest speeds in conjunction with very tough or hard materials will likely result in higher than normal maintenance. The exceptionally low speeds, obtained by high numerical gear reductions, can yield very high theoretical stall torque that far exceed the torque requirements of a well engineered drilling application. High loads imposed by feeds excessive for the material and cutter combination may result in damage.

TORQUE CONVERSION – IN. LBS. (NM)					
In.	Nm	In.	Nm	In.	Nm
5	0.6	50	5.7	140	15.8
10	1.1	60	6.8	150	17.0
15	1.7	70	7.9	160	18.1
20	2.3	80	9.0	170	19.2
25	2.8	90	10.2	180	20.3
30	3.4	100	11.3	190	21.5
35	4.0	110	12.4	200	22.6
40	4.5	120	13.6		
45	5.1	130	14.7		

Suggested Surface Speeds for High Speed Steel Drills*

MATERIAL	S.F.M.
Alloy Steels – 300 to 4000 Brinell	20-30
Stainless Steels – Medium range	30-40
Automotive Steel Forgings and the like	40-50
Tool Steels Annealed – 90 to 1.20 Carbon	50-60
Steels – .40 to .50 Carbon	70-80
Steels – .20 to .30 Carbon (Machinery Steel)	80-110
Hard, Chilled Cast Iron	30-40
Medium Hard Cast Iron	70-110
Soft Cast Iron	100-150
Malleable Iron	80-90
Monel Metal	40-50
High Tensile Strength Bronze	70-150
Ordinary Brass and Bronze	200-300
Aluminum and its Common Alloys	250-400
Magnesium and its Common Alloys	250-400
Plastics – Common Types	100-150
Wood	300-400

* Carbon Steel Drills should be operated at 40%–50% of the above speeds.

These speeds indicate the approximate range under normal conditions. For peak performance on individual jobs, adjustments may be required.

To convert surface feet per minute (SFM) into revolutions per minutes (RPM) use the following formula:

$$RPM = \frac{SFM \times 3.82}{Diameter}$$

Example: To drill 1/4" hole in aluminum:

$$\frac{300 \times 3.82}{.250} = 4.584 \text{ RPM}$$

Recommended Tool: Cleco 111 DO-50B

TORQUE CONVERSION FACTORS		
To Convert	Into	Mulitply By
Inch Pounds	Foot Pounds	0.0835
Inch Pounds	Newton meters	0.1130
Inch Pounds	Kg-meters	0.0115
Inch Pounds	Kg-Cm	1.1519
Foot Pounds	Inch Pounds	12.000
Foot Pounds	Newton meters	1.3560
Foot Pounds	Kg-meters	0.1382
Foot Pounds	Kg-Cm	13.8240
Newton Meters	Inch Pounds	8.8440
Newton Meters	Foot Pounds	0.7370
Newton Meters	Kg-meters	0.1020
Newton Meters	Kg-Cm	10.2000
Kg meters	Inch Pounds	86.8100
Kg meters	Foot Pounds	7.2340
Kg meters	Newton-meters	9.8040
Kg Cm	Inch Pounds	0.8681
Kg Cm	Foot Pounds	0.0723
Kg Cm	Newton-meters	0.0980

MISCELLANEOUS CONVERSION FACTORS		
To Convert	Into	Mulitply By
Inches	Millimeters	25.4000
Millimeters	Inches	0.0394
Pounds	Kilograms	0.4536
Kilograms	Pounds	2.2050
psi	bar	0.069
bar	psi	14.5

AIR PRESSURE CONVERSION		
PSI	kPa*	Bar**
85	586	5.9
90	620	6.2
95	655	6.6
100	690	6.9
125	860	8.6

* Preferred: Approximate to the nearest 5 kPa.
** Approximate to the nearest 0.5 Bar.

Drill Diameter (inches)	Surface Speed, Feet per Minute											
	30	40	50	60	70	80	90	100	110	200	300	400
Spindle Speeds, RPM												
1/4	458	611	764	917	1070	1222	1375	1528	1681	3056	4584	6111
5/16	367	489	611	733	856	976	1100	1222	1345	2445	3666	4888
3/8	306	407	509	611	713	815	917	1019	1120	2037	3056	4074
7/16	262	349	437	524	611	698	786	873	960	1746	2619	3492
1/2	229	306	382	458	535	611	688	764	840	1528	2282	3056

If there is a choice between tools of about the same speed but of different sizes, final selection is made by preference for a lighter-weight tool or one with more power to maintain speed under load.

Sales & Service Centers

Note: All locations may not service all products. Please contact the nearest Sales & Service Center for the appropriate facility to handle your service requirements.

Dallas, TX
Cooper Tools
Sales & Service Center
1470 Post & Paddock
Grand Prairie, TX 75050
Tel: (972) 641-9563
Fax: (972) 641-9674

Detroit, MI
Cooper Tools
Sales & Service Center
4121 North Atlantic Blvd.
Auburn Hills, MI 48326
Tel: (248) 391-3700
Fax: (248) 391-6295

Houston, TX
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Sales & Service Center
6550 West Sam Houston
Parkway North, Suite 200
Houston, TX 77041
Tel: (713) 849-2364
Fax: (713) 849-2047

Lexington, SC
Cooper Tools
670 Industrial Drive
Lexington, SC 29072
Tel: (800) 845-5629
Tel: (803) 359-1200
Fax: (803) 358-7681

Los Angeles, CA
Cooper Tools
Sales & Service Center
15503 Blackburn Ave
Norwalk, CA 90650
Tel: (562) 926-0810
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Seattle, WA
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Sales & Service Center
2865 152nd Ave N.E.
Redmond, WA 98052
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Fax: (425) 497-0496

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3990 East Market Street
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