AAA PRODUCTS INTERNATIONAL

- PREMIUM QUALITY
- UNSURPASSED SERVICE
- EXCEPTIONAL DELIVERY

Jiffy

HYDRAULIC DRILLING & TAPPING UNITS

MOST POWERFUL UNITS IN THE WORLD FOR THEIR SIZE

2nd Edition

AAA PRODUCTS INTERNATIONAL • DALLAS, TEXAS U.S.A.
http://www.aaaproducts.com e-mail: info@aaaproducts.com

AAA Products International

FLUID POWER VALVES - ***Jiffy*** PRODUCTS

Dear Manufacturers,

You probably know that more and more U.S. manufacturing is being done out of our country. This can affect your profits, but you can do something about it.

Here is some simple tooling you can do at a relatively small cost that can help you retain most of your business. Are you aware that large part of the production machining done in this country is done on CNC machining centers? Most manufacturers use them, both in the USA and abroad. Machining centers drill and tap from one side of a part at a time. The answer is for you to drill and/or tap your parts from more than one side at a time. if you drill or tap on 2 sides of a part simultaneously, you can double the output, 3 sides at a time will triple your output, etc. and multiple spindle drill or tap heads help even more.

We use AAA Products ***Jiffy*-Tap** units in our plant, where we tap 17 holes in 5 sides of our 3/8 inch aluminum air valve body (5 of the holes are 3/8" NPTF and 12 are 10-24). The total time floor to floor is 5 seconds. That's 204 precision tapped holes per minute! The total cost of the machine, built in our shop using ***Jiffy*-Tap** units, is a fraction of the cost of one small CNC machining center. We have been using this machine daily since 1982 and have not had to perform any repair work on the ***Jiffy*-Tap** units, hydraulic power unit, hydraulic valves, nor the hydraulic motors. The machine is built using cold rolled steel bars and steel angle iron. Our AAA ***Jiffy*** units have been in production since 1981 and are being used in many of the largest high production manufacturing plants.

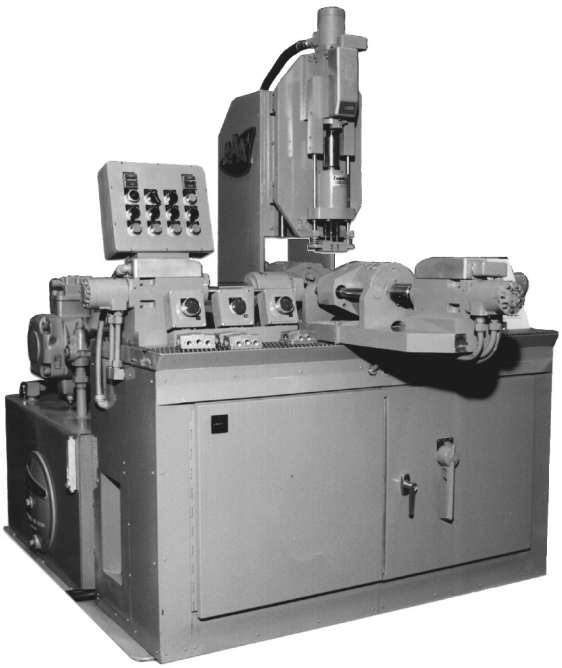
For most jobs, you can mount the ***Jiffy*** drilling or tapping units on a angle iron frame, and can change them from one frame to another in a few minutes to drill from 1/8" through 1-1/2" in steel or precision lead screw tapping from 4-40 through 1-1/2" diameter in steel. There is no complex maintenance in using the ***Jiffy*** units, and these simple machines can be operated and maintained with an unskilled operator. (This is not the case with machining centers.) With the ***Jiffy*-Tap** units, all holes are tapped to exact depth, and there are no thread depth problems as with clutch type tappers.

***Jiffy*-Tap** is the only precision lead screw tapping unit in the world that can be changed from one size and/or thread pitch to another in 5 minutes. (Change from a 6-32 to 1-1/2 NC or metric equivalent.)

You can not compete with foreign manufacturers with the same machines that they use. Foreign labor and overhead is a small fraction of your cost here in the USA.

If we can answer any questions, or provide you with more information, please call us at 214-357-3851. Ask for a free video. "We can help you."

Sincerely,
AAA Products International
R.C. Womack
President



Simple17 Tapper - 20 times more production than a machining center at a fraction of the investment (shop built: 4-1/2' width x 7' depth)

Find out for yourself why Jiffy-Drills and Jiffy-Taps are the best in the world!

We, at AAA Products International, are committed to provide our customers with superior products of premium quality.

AAA Products International manufactures the most powerful, compact, dependable and affordable drilling and tapping units available today. We invite you to put them on your toughest jobs.

We pride ourself in our ability to supply special customer specific products to fit their unique applications. We invite you to join with us to help you solve your production challenges. We promise unsurpassed customer service, exceptional delivery and competitive prices.

CATALOG CONTENTS

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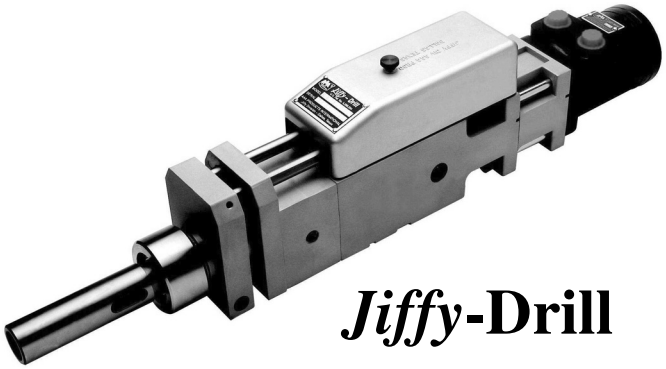
National FLUID POWER Association
MEMBER

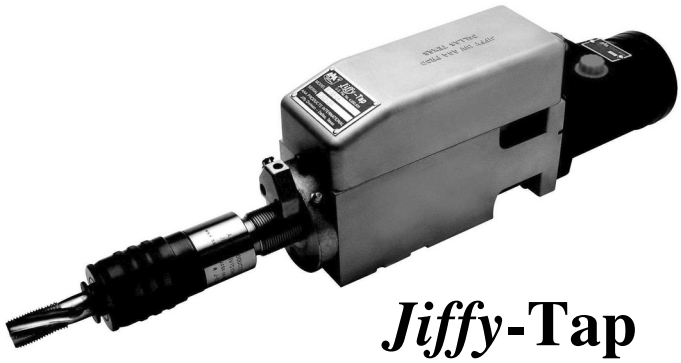
American National Standards Institute
MEMBER

See Bulletin A-266 for the location of your authorized AAA distributor.

AAA PRODUCTS INTERNATIONAL
Jiffy UNITS



***Jiffy*-Drill**



***Jiffy*-Tap**

OPERATIONAL ADVANTAGES OF Jiffy PRODUCTS

1. High strength aluminum alloy body.
2. 1"- 6 spline ETD-150 steel alloy drive.
3. Hardened drive spindle and sleeve for long life.
4. Precision ground drive components.
5. Heavy duty hydraulic motors. Quick change motors available.
6. Four large, 1/2"-13 mounting holes.
7. 5/8" x 3/32" deep alignment cross keyways precision milled for easy alignment. (Easily move units from one machine to another.)
8. Optional 8 pin plug-in cable with/without 12 foot cord.
9. No proprietary power unit configuration required.

ADVANTAGES SPECIFIC TO *JIFFY*-DRILL

1. The ***Jiffy*-Drill** has a piston quill that is one piece, precision ground with special wear resistant and corrosion resistant coating. Quill is equipped with long life, anti-galling wear rings.
2. Can be setup for rapid advance, rapid retract or skip drilling.
3. All internal parts have a special long-wear, corrosion resistant coating.
4. Safety interlock switch.
5. Large variety of spindle adaptors including Morse female tapers, ASA, and Jacobs types.
6. Easily handles 1-1/2" drilling capacity in steel. Will drill 1-3/4" in mild steel.
7. Can be used as a screw or plug driver using depth or torque retraction signal.

ADVANTAGES SPECIFIC TO *JIFFY*-TAP

1. 1-5/16" diameter ETD-150 steel alloy lead screw.
2. Grease fitting on lead screw nut, and oiler on lead screw wiper assembly for easy lubrication and extended life.
3. #4 Jacobs taper for true chuck alignment. Additional chuck features are:
   A) Chuck is secured with 1/4" socket head cap screw.
   B) 808 Woodruff key prevents rotation.
4. Optional Lead Screw quick change is available.
5. Optional Lead Screw auto reverse is available.

JIFFY MODEL NUMBERING CODE

***Jiffy*-Drills** and ***Jiffy*-Taps** use a simplified model code which calls out the most important characteristics with a minimum of coding.

The first two letters in the code (3D) designates the type of unit. The next two letters designates the motor or drive style. The third grouping designates either a ***Jiffy*-Drill** spindle size, or pitch size for a ***Jiffy*-Tap** lead screw. This completes the basic drilling or tapping unit. Additional optional features available are described on pages 12 and 13 for ***Jiffy*-Drills** and pages 34 through 37 for ***Jiffy*-Taps**, with the correct option code to be added to the standard model number.

3D=***Jiffy*-Drill** (See page 7)
3T=***Jiffy*-Tap** (See page 29)

3D-B3-M4-MQ

Append option codes, separated by dashes, as needed.
i.e.: MQ-EP-L, (Order is not critical)

Drive Style (See page 10 or page 32)

Hydraulic Motor		Auxillary Drive Styles
B0 = 2.2 in.^{3}/rev	M0 = .50 in.^{3}/rev	XX = No Drive Style
B1 = 2.8 in.^{3}/rev	M1 = .79 in.^{3}/rev	DDK1 = "C-Face"
B1.5 = 3.6 in.^{3}/rev	M2 = 1.21 in.^{3}/rev	SBA1 = 1" Dia. Shaft
B2 = 4.5 in.^{3}/rev	M3 = 1.93 in.^{3}/rev	
B3 = 5.9 in.^{3}/rev	A1 = .82 in.^{3}/rev	
B3.3 = 7.3 in.^{3}/rev	A2 = 1.16 in.^{3}/rev	
B3.6 = 8.9 in.^{3}/rev	A3 = 1.53 in.^{3}/rev	
B4 = 9.1 in.^{3}/rev	A4 = 1.88 in.^{3}/rev	
B5 = 11.3 in.^{3}/rev		
B6 = 14.1 in.^{3}/rev		
B7 = 17.9 in.^{3}/rev		
B8 = 22.6 in.^{3}/rev		

Unit Options

EP = 8 Pin male plug, w/ 12 ft. cable
PD = 8 Pin male plug only
MQ = Motor Quick Change
ST = Internal Stop Tube*
L = Left Side Ports*
B = Bottom Ports*
SQ = Quick Change Lead Screw‡
ES = Extended Stroke‡
RO = Reverse Option‡
PX = Proximity Switch‡
LH = Left Hand Pitch‡

* ***Jiffy*-Drill** Only
‡ ***Jiffy*-Tap** Only

(See page 12 or page 34)

Spindle Style (See page 8 or page 30)

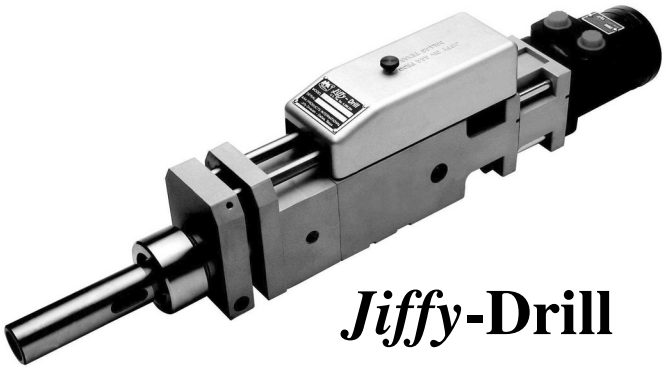
***Jiffy*-Tap** Standard Lead Screw Pitches		***Jiffy*-Drill** Spindles
40 = 40 tpi	13 = 13 tpi	XX = No Spindle
32 = 32 tpi	12 = 12 tpi	J3 = #3 Jacobs male
28 = 28 tpi	11.5 = 11 1/2 tpi	J4 = #4 Jacobs male
27 = 27 tpi	11 = 11 tpi	M3 = #3 Morse female
24 = 24 tpi	10 = 10 tpi	M4 = #4 Morse female
20 = 20 tpi	8 = 8 tpi	S1 = 1-1/8" ASA
18 = 18 tpi	7 = 7 tpi	S134 = 1-3/4" ASA
16 = 16 tpi	6 = 6 tpi	S34 = 3/4" ASA
14 = 14 tpi		S58 = 5/8" ASA

Jiffy-DRILL
Compact Drilling Unit

Features at a Glance

SPECIFICATIONS*
- **Stroke Length:** 0" to 3-1/2" maximum‡
- **Drill Capacity:** 1-1/2" in 1018 steel
- **Spindle RPM:** 5000 RPM maximum
- **Spindle Type:** #3 Morse (shown) - others available
- **Spindle Torque:** 15 - 3700 in.-lbs. maximum
- **Drill Thrust:** 400 - 2500 lbs. maximum
- **Feed Cylinder:** Extend - 3.15 in.² rear piston area
  Retract - 1.37 in.² front piston area
- **Weight:** 39 lbs. approximately

*Some options may limit or alter the listed values.
‡Stroke is limited by drilling torque. (See page 19)



***Jiffy*-Drill**

TYPES OF OPERATIONS:
- Standard Hole Drilling: (See page 16)
- Peck Drilling: (See page 17)
- Multiple Spindles: (See page 18)
- Hole Reaming: (See page 16)
- Spot Facing: (See page 16)
- Skip Drilling: (See page 18)
- Hole Tapping: (See page 18)

AVAILABLE SPINDLES: (See page 8)
- M3: #3 Morse Female Taper (standard)
- M4: #4 Morse Female Taper
- J3: #3 Jacobs Male Taper
- J4: #4 Jacobs Male Taper
- S58: 5/8" Adjustable Adapter
- S34: 3/4" Adjustable Adapter
- S1: 1-1/16" Adjustable Adapter
- S138: 1-3/8" Adjustable Adapter

AVAILABLE DRIVE STYLES:
- Hydraulic Motor: (See page 10)
- Electric Motor: (See page 10)
- 1" Keyed Shaft: (See page 11)
- C-Face Mount: (See page 10)

AVAILABLE DRILL OPTIONS:
- EP or PD: 12 Ft. Cord and/or 8-Pin Pigtail (See page 13)
- MQ: Motor Quick Change (See page 12)
- L or B: Alternate Feed Port Location (See page 13)
- ST: Stroke Limiting Stop Tube (See page 13)

Jiffy-Drill *Quick Index*

Jiffy-Drill *Features*

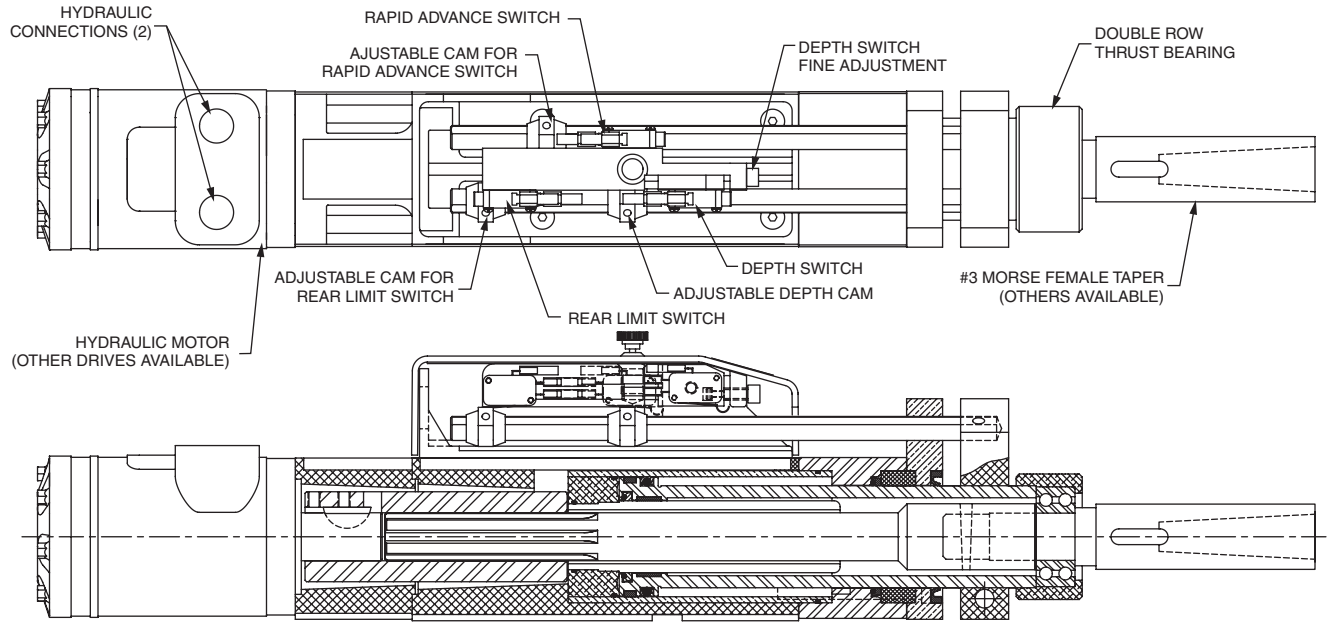
- Light weight - approximately 39 lbs. It is so light that it can be used in special fixtures as a portable drilling unit, or with magnetic base, or as a rail drill.
- Can easily be set up for rapid advance feed, rapid return, and to dwell, skip, or peck drill. (May require optional equipment and different feed control circuits.)
- Precision adjustment on the limit switch which controls depth of drilled hole.
- Your choice of spindle tapers or configuration.
- When using hydraulic motors, ***Jiffy*-Drill** unit can be stalled in the work or operated at a high cycle rate without overheating or damage to the hydraulic motor or to the system.
- Quill and feed piston are manufactured from 1-piece alloy steel, with a special long wearing, space age corrosion resistant coating.
- Quill retract piston area is approximately half the extension piston area. This allows for rapid retract of the quill.

What Is a Jiffy-Drill

***Jiffy*-Drill** is the light, powerful, and compact answer to production drilling, reaming, spot facing, and similar operations. It will drill holes up through 1-1/2" diameter in steel with ample allowance for dull bits. In tests, it has drilled 1-3/4" diameter holes in cast iron, and has produced 0.025 chips in mild steel using a Model B-6 hydraulic motor.

Using a hydraulic motor to rotate the spindle, the standard unit will produce more than 10 HP, yet is so compact that two units will mount side-by-side on 3-5/16" spacing, or as close as 3-3/16" if hydraulic motor housing is specially machined and if one unit is ordered with feed piston ports on the opposite side, or bottom. (See optional port locations on page 13.)

The ***Jiffy*-Drill** is very compact when using a hydraulic motor. With a maximum length of less than 27" from end of motor to end of drill chuck when a standard Model B-3 hydraulic motor and a #3 Morse female taper spindle are used. The length is slightly greater with larger hydraulic motors.



How a Jiffy-Drill *Works*

Spindle Rotation: The spindle is rotated by your choice of drive style options. (See page 10 for drive styles.) We recommend using compact hydraulic motors for greater power. Although in many applications alternative methods to rotate the spindle may be beneficial. Spindle should be limited to 5000 RPM maximum to prevent over heating of the spindle bearing causing possible damage.

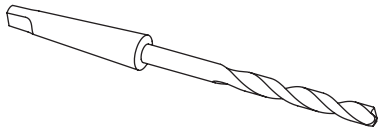
Spindle Advance: The spindle is advanced and retracted by a built-in coaxial piston which is powered by hydraulic power. The pressure to advance the spindle is dependent upon the size of the drill. The limit on feed pressure is 800 PSI maximum which will develop over 2500 lbs. thrust. (See pages 15 through 18 for control circuits.)

Position Switches: Built-in electric limit switches and cams are used to provide spindle location feedback to your control circuit. The use of these switches is entirely dependant upon your control circuit and how you choose to operate the ***Jiffy*-Drill** unit.

Both the rear limit switch and the rapid advance switch are securely mounted to the switch plate and sensor trigger adjustments are easily made by moving the appropriate position cam. Only the forward limit switch has both a position cam adjustment as well as a fine adjustment for controlling stroke limitation.

Jiffy-Drill *Spindles*

The type of spindle that you need is dependent upon the tool you are planning on using. The number and types of tools that can be controlled by the ***Jiffy*-Drill** is unimaginable. But fortunately the tooling industry has centered their efforts around a few standards. We offer these standards and a few others to reduce the confusion of how to attach your tooling to the ***Jiffy*-Drill**. We recommend that you have decided on the tooling prior to selection of the spindle.



Morse Size for Standard Drills

Drill Size Range	Morse Taper
1/8" to 15/32"	1
31/64" to 25/32"	2
51/64" to 1-1/16"	3
1-5/64" to 1-1/2"	4
1-17/32" to 3"	5

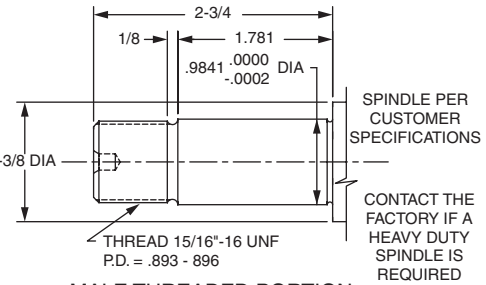
For standard drilling with off the shelf twist drills, the most common standard is the Morse female taper. The size of the Morse taper depends upon the size of the drill. The table shows the most common Morse taper versus size designation. This table is to serve only as a guideline. Consult your drill supplier for availability and cost. Most drill suppliers stock drills in one Morse size on either side of the standard.

All spindles use the same size drive shaft with different spindles attached at the factory. The spindles are attached to a male splined drive shaft using an anti-seize compound on the mating threads. The combined drive shaft and spindle are drilled and reamed for a tapered pin. This pin is interference fit to prevent the spindle detaching from the drive shaft. Separation of the spindle and drive shaft is not recommend. If a new spindle configuration is required, a replacement drive shaft and spindle combination should be used.

XX - No Spindle

Some customers want to create their own spindle for driving a unique tool. When ordering a drill unit without a spindle, the drill will be supplied with a drive shaft, standard bearing retainer, and standard bearing. The customer will need to supply a #6 taper pin, and a spindle end machined to fit the drive shaft on one end and the other end configured to attach to their tool.

To assemble spindle and drive shaft, first place spindle (threaded end) through the bearing retainer, slide the bearing over spindle bearing surface. Coat threads with anti-seize compound, and thread spindle into female end of drive shaft. After spindle is securely attached and completely bottomed out, drill and ream for the #6 taper. The taper should be located so it goes through the drive shaft and spindle. Location should be 0.500" from end of drive shaft (rear of bearing). Once the pin is hammered in place, turn drive shaft between centers and remove excess pin. Mark the small end of the tapered pin by stamping “X” on either side of the pin, so you can remove the pin by placing a punch between the “X’s”.



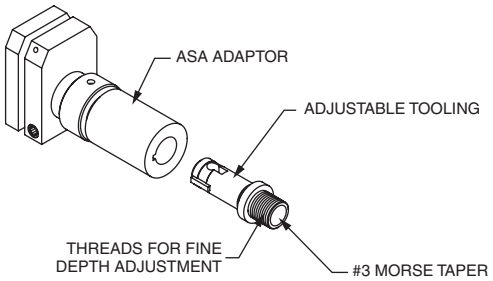
MALE THREADED PORTION OF STANDARD SPINDLE

S1, S138, S34, or S58 - Adjustable Spindle Adaptor

The adjustable spindle adaptors are designed to use adjustable tooling manufactured by several readily available “off the shelf” vendors.

There are several benefits of using adjustable adaptors. One benefit is the additional fine adjustment of drill depths between drill changes. Great for use with internal stroke limiter option. (See page 13.) Another advantage is the ability to install quick change adaptors to facilitate rapid changing of drills. Another benefit to adjustable adaptors, is that your shop can use standardized tooling for all your drilling operations and be able to swap drills from operation to operation.

The exact style of adjustable adaptors is dependent upon the manufacturer of the tooling. Consult your local machine supply shop for adaptors available in your area.



EXAMPLE OF ADJUSTABLE TOOLING

M3 or M4 - Morse Female Taper Spindle

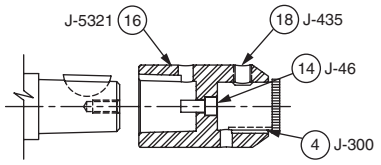
The M3 and M4 are an internal, “Self-Holding” Morse female taper. Common off the shelf twist drills will readily fit either a #3 Morse or a #4 Morse taper. Adapters to go from a #3 Morse to a #2 or #1 Morse are available from local tooling supply stores. Most drills are also available with either a larger or smaller than standard Morse taper. Consult your tool supply store for various options available.

Jiffy-Drill *Spindles (continued)*

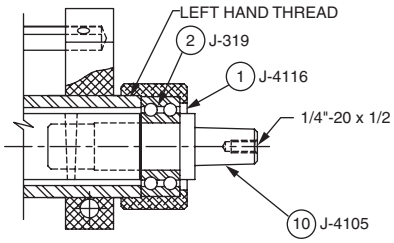
J3 or J4 - Jacobs Male Taper Spindle

The J3 and the J4, are an external "Self-Holding" Jacobs male tapers. Most common tool holders are supplied with either a #3 Jacobs female or a #4 Jacobs female taper. Both #3 and #4 Jacobs male tapers have a 1/4"-20 threaded hole, and #4 has an 808 Woodruff key for securing tool holders. Contact your local tool supply store for tooling options available.

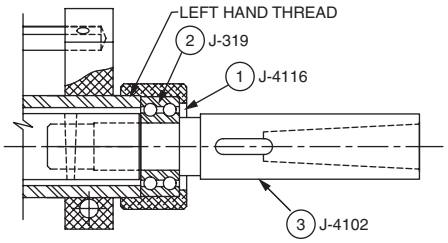
(See page 30 for additional tap chucks for #4 Jacobs male taper.)



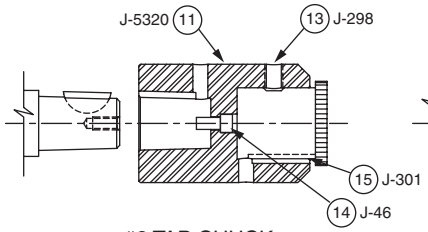
#1 TAP CHUCK
MOUNTS ON #4 JACOBS TAPER



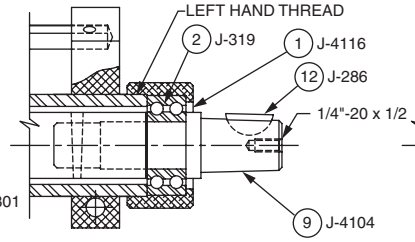
J3 - #3 JACOBS MALE TAPER



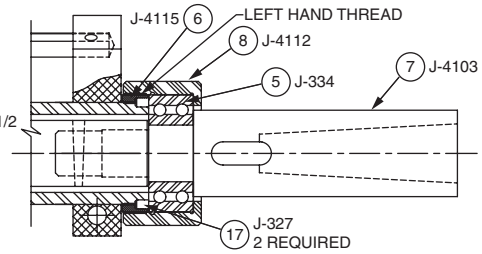
M3 - #3 MORSE FEMALE TAPER



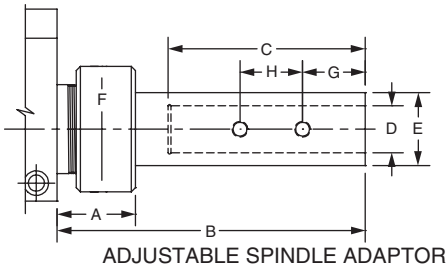
#2 TAP CHUCK
MOUNTS ON #4 JACOBS TAPER



J4 - #4 JACOBS MALE TAPER



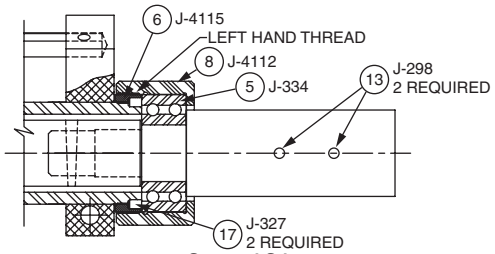
M4 - #4 MORSE FEMALE TAPER
REQUIRING LARGER BEARING



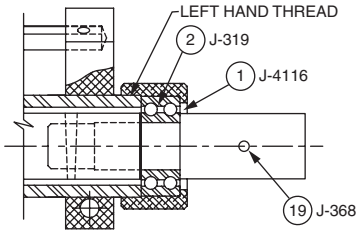
ADJUSTABLE SPINDLE ADAPTOR

PART NO.	A	B	C	D	E	F	G	H	Set Screw
S-58	1-5/8	4-3/4	2-5/8	5/8	1.235	2-5/8	1-1/4	N/A	5/16"-24 x 1/4
S-34	1-5/8	4-3/4	2-5/8	3/4	1.235	2-5/8	1-1/4	N/A	5/16"-24 x 1/4
S-1	1-5/8	5-5/16	3-1/8	1-1/16	1.610	2-5/8	1-9/16	N/A	5/16"-24 x 1/4
S-138	1-7/8	6-5/8	4-1/8	1-3/8	2.230	3	1-1/2	1-1/2	3/8"-16 x 1/2

Order adjustable spindles by their part numbers (e.g. S-1, S-138)



S-138 ASA
REQUIRING LARGER BEARING



S-58 THROUGH S-1
REQUIRING STANDARD BEARING

Parts List

Item	Part No.	Description
1	J-4116	Bearing Retainer, Standard
2	J-319	Dbl. Seal Bearing (5205 SBKFF) 0.984" I.D. x 2.047" O.D.
3	J-4102	Drill Spindle, #3 Morse Female Taper
4	J-300	Long Key (optional) 1/8" sq. x 3/4"
5	J-334	Dbl. Seal Bearing (5206 SBKFF) 1.181" I.D. x 2.440" O.D.
6	J-4115	Adaptor Ring
7	J-4103	Spindle, #4 Morse Female Taper
8	J-4112	Bearing Retainer, Heavy Duty
9	J-4104	Spindle, #4 Jacobs Male Taper
10	J-4105	Spindle, #3 Jacobs Male Taper
11	J-5320	Tap Chuck, #2
12	J-286	Woodruff Key 808
13	J-298	Cup Point Set Screw, 3/8"-16 x 1/2"
14	J-46	Socket Head Cap Screw 1/4"-20 x 3/4"
15	J-301	Long Key 3/16" sq. x 1-1/4"
16	J-5321	Tap Chuck, #1
17	J-327	Set Screw, 10-24 x 5/16"
18	J-435	Cup Point Set Screw, 3/8"-16 x 3/8"
19	J-368	Cup Point Set Screw, 5/16"-24 x 1/4"

Order adjustable spindles by their part numbers (e.g. S-1)

Jiffy-Drill *Drive Styles*

Hydraulic Motor Drive

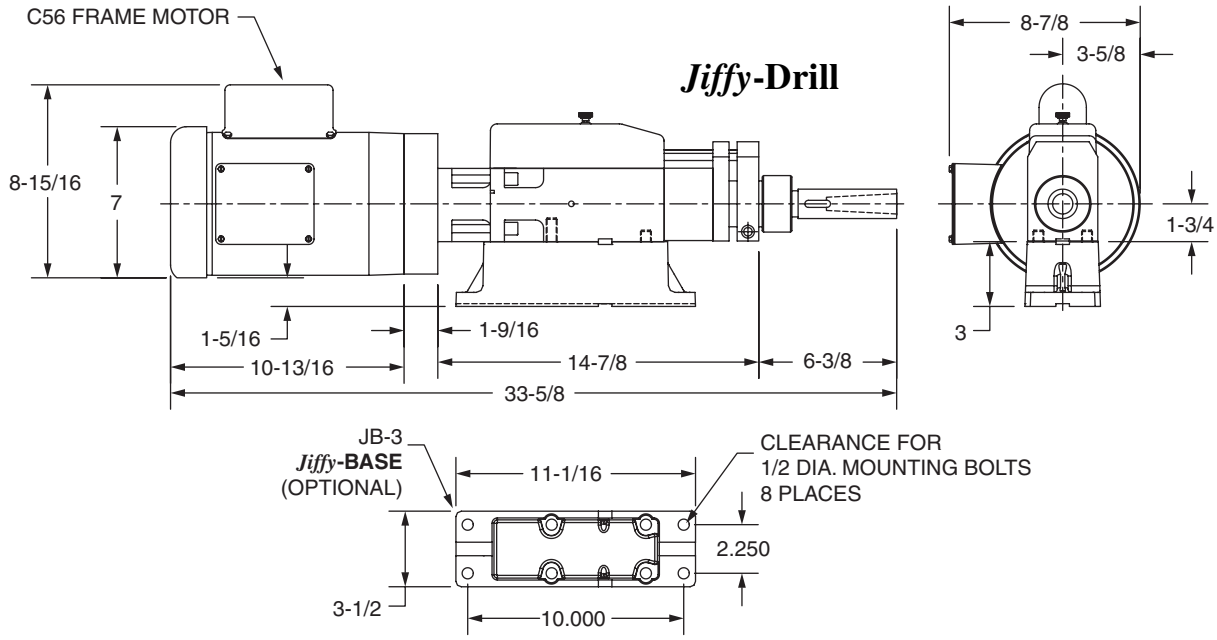
Spindle Hydraulic Motor: The ***Jiffy*-Drill** can be ordered with choice of 20 hydraulic motor models covering a wide range of speed/torque ratios. Motor selection depends on the drill bit diameter, speed, and the hardness of the material to be drilled. Hydraulic motors can be attached in any 90º increment for easy plumbing. All ***Jiffy*** motors are reversible.

There is a choice of 8 motor models for medium speed tapping up to 2200 RPM. A choice of another 12 motor models for low speed, high torque tapping with larger taps or when working with harder materials. Consult factory for additional high speed, low torque motors for applications up to 5000 RPM.

Motors A-1 through A-4 and M-0 through M-3 are for high speed drilling up to 2200 RPM. Motors B-0 through B-8 are low speed, high torque motors for larger bits or harder materials.

In order to size the proper hydraulic motor, you must know what RPM and torque is required for the cutting tool to machine the material you are using. This information can usually be obtained from the manufacturer of the cutting tool used. For standard twist drills, see pages 19 through 22 to estimate required torque, RPM and thrust. Then refer to pages 53 through 57 to choose a hydraulic motor that will deliver the torque and RPM needed. If you will be using an existing power unit, you will be limited by the pressure and GPM available from your existing power unit. On new applications try to keep operating pressures around 600 - 800 PSI and GPM at 25% to 75% of maximum GPM the motor can operate at.

DDK1 - "C-Face" Mount For Electric Motor Drive



1 H.P. DIRECT DRIVE UNIT - SHOWING OPTIONAL ***Jiffy*-BASE** (JB-3)

Electric Drive Features

- Speed range, 1140, 1725, or 3450 RPM using standard electric motors.
- Optional variable speed drive is available by using an inverter duty motor and control. (Consult factory for additional information.)
- Adaptable for usage of local electric motors and voltages.
- Uses standard C56 frame C-Face mounting arrangement.

How a DDK1 Works

The spindle is rotated with an in-line, totally enclosed, fan cooled electric motor. Choice of 1/2 to 2 HP single phase or 3-phase electric motor.

Will easily drill holes up to 3/4" in cold rolled steel. The quill is advanced and retracted by a built-in piston assembly. The piston will deliver 2500 lbs. thrust when powered by 800 PSI hydraulic pressure.

Built-in cams and electric limit switches can easily be adjusted for stroke limits, for feed start position, or for rapid advance and rapid retract when used with properly designed fluid and electric circuits.

Jiffy-Drill *Drive Styles (continued)*

SBA1 - 1" Diameter External Shaft

External Shaft Features

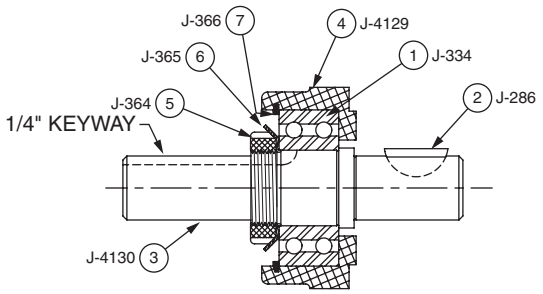
- Speed and horse power range is determined by drive component. (Maximum spindle speed is 5000 RPM.)
- Adaptable for various usages.
- Uses standard 1" diameter shaft.

How a SBA1 Works

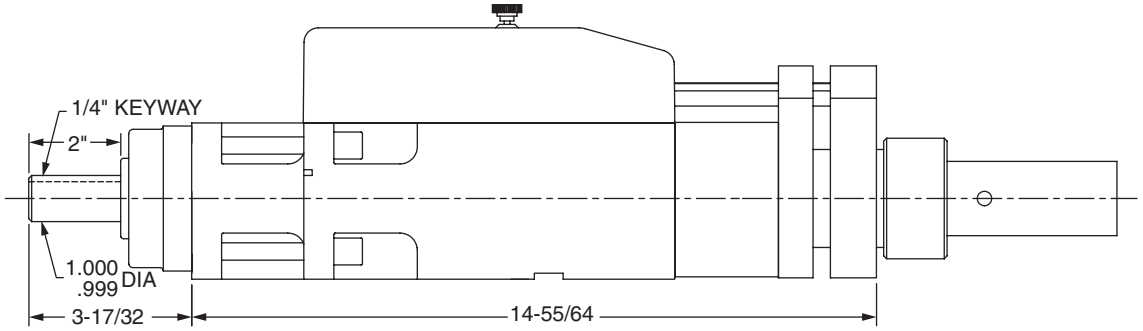
The unit is equipped with a 1" diameter shaft. This is equipped with a 1/4" keyway that runs the entire length of the exposed shaft. The unit can be driven by any method conceivable by connecting to this external shaft.

Parts List

Item	Qnty	Part No.	Description
1	1	J-334	Dbl. Seal Bearing (5206 SBKFF) 1.181" I.D. x 2.440" O.D.
2	1	J-286	Woodruff Key 808
3	1	J-4130	Direct Drive Shaft
4	1	J-4129	Drive Shaft Adapter
5	1	J-364	Locknut
6	1	J-365	Tap Washer
7	1	J-366	Retainer Ring



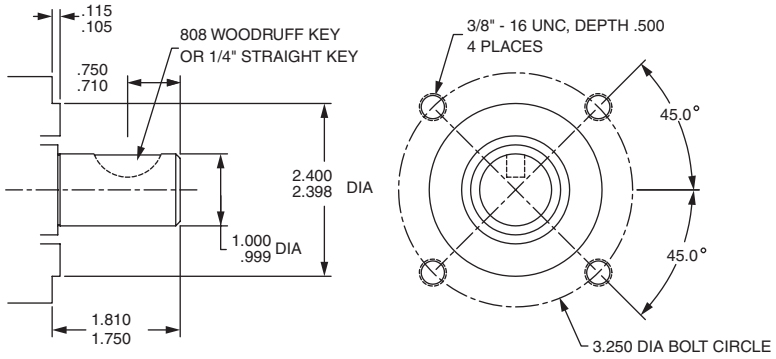
1" KEYED SHAFT DIRECT DRIVE



1" KEYED SHAFT - DIRECT DRIVE ***Jiffy*-DRILL**
(side view)

XX - No Drive Unit

The ***Jiffy*-Drill** unit can be ordered without a drive unit. When ordered, a standard unit will be supplied with a splined spindle sleeve, a hydraulic motor adapter ring, four attachment studs, four socket head nuts and an 808 Woodruff key. The customer will need to supply a drive style that mounts to the rear of the unit with the appropriate interface dimensions.



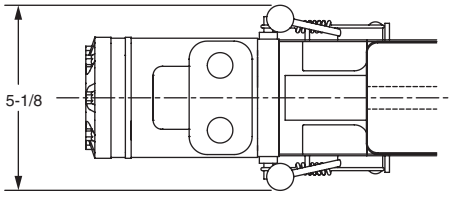
DIMENSIONS OF REQUIRED CUSTOMER DRIVE

To attach drive unit to the rear of unit, first attach the splined sleeve to the drive shaft of the customer drive unit, using the 808 Woodruff key or customer supplied 1/4" straight key. If the hydraulic motor adapter ring is required, place the ring on prior to attaching the sleeve (the outside diameter of the sleeve is larger than the inside diameter of the ring). Once the sleeve is securely attached, it is recommended to swedge the set screws in place to prevent accidental loosening by vibration. Slide the spindle sleeve over the drive shaft, and secure drive unit to ***Jiffy*-Drill** unit using the four studs and four socket head nuts.

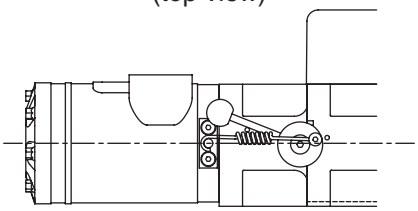
Jiffy-Drill *Options*

Option MQ: Hydraulic Motor Quick-Change System

CHANGE HYDRAULIC MOTORS IN 3 MINUTES OR LESS

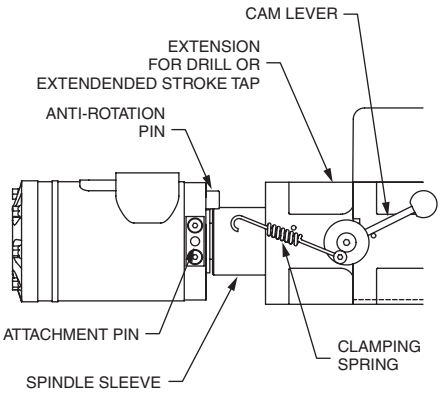


MOTOR ATTACHED
(top view)



MOTOR ATTACHED
(side view)

Example of Quick-Change option for Hydraulic Motors



REMOVAL OF MOTOR

Above items are factory order items and must be ordered with the ***Jiffy*-Drill** unit, except for extra hydraulic motors with the quick change option. When ordering extra hydraulic motors with the quick change feature, we recommend ordering the motor with an extra spindle sleeve. (Specify spindle sleeve is for ***Jiffy*-Drill**.)

The quick change option does not add any length to unit but will increase the width from 3-5/16" to 5-1/8".

Quick-Change Parts List

QUICK-CHANGE MOTOR - Unit Side

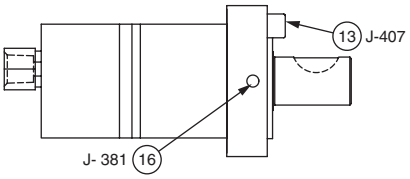
Item	Qnty	Part No.	Description
1	1	J-391	Cam - Right Side, Motor End
2	1	J-403	Cam - Left Side, Motor End
3	2	J-373	Screw 1/4"-20 x 3/4" Flat Head
4	2	J-370	Roll Pin 3/16" x 2-1/4"
5	2	J-175	Knob 3/4" Diameter
6	2	J-372	Screw 10-24 x 3/8" Button Head
7	1	J-380	Spring - Right Side, Motor End
8	1	J-379	Spring - Left Side, Motor End
9	4	J-371	Drive Lock Pin 1/8" x 1"
10	1	J-406-1	Modified Bushing
11	2	J-376	Modified #10 Split Lock Washer

QUICK-CHANGE MOTOR - B Series

Item	Qnty	Part No.	Description
12	2	J-389	Rivet 1/4" x 5/8"
13	1	J-407	Anti-Rotation Pin
14	4	J-390	Screw 10-24 x 3/4" Flat Head
15	2	J-385	Plate

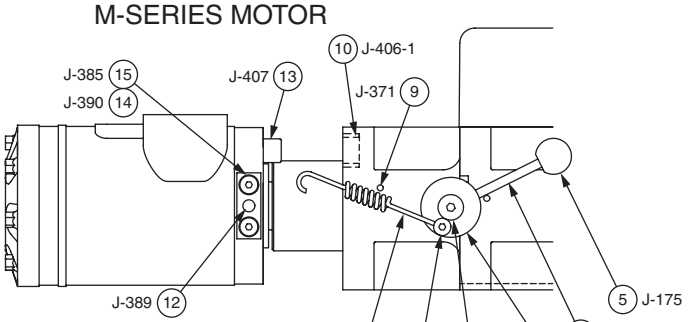
QUICK-CHANGE MOTOR - A or M Series

Item	Qnty	Part No.	Description
16	2	J-381	Drive Lock Pin 1/4" x 1"
13	1	J-407	Anti-Rotation Pin



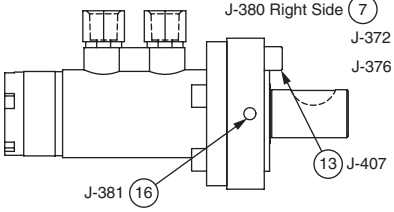
M-SERIES MOTOR

For questions or replace parts not shown, please consult factory.



B-SERIES MOTOR

LEFT SIDE SHOWN



A-SERIES MOTOR

Jiffy-Drill *Options (continued)*

Option EP and PD: Pre-wired Cord and Connector

Wiring harness, cable and plug assembly used to connect ***Jiffy*-Drill** limit switches to external circuitry through a plug and socket disconnect.

When ordered at the same time as the ***Jiffy*-Drill**, it will be installed and wired to terminals on the limit switches. If ordered later, connections to the ***Jiffy*-Drill** limit switches must be made by the user.

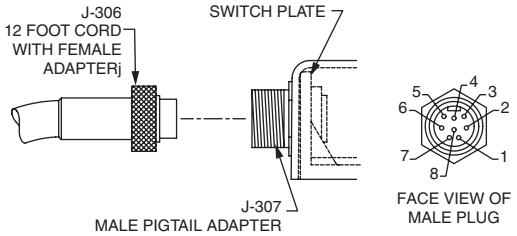
Option EP includes an 8-pin male plug with screw coupling, to mount on the ***Jiffy*-Drill**, with wiring harness connected to limit switch terminals. Also included is an 8-wire socket to plug into the ***Jiffy*-Drill**. Standard length of this cable is 12-ft. unless otherwise specified. Wires in the 12-ft. connecting cable are the same colors as those inside the ***Jiffy*-Drill** which connect to the switch terminals.

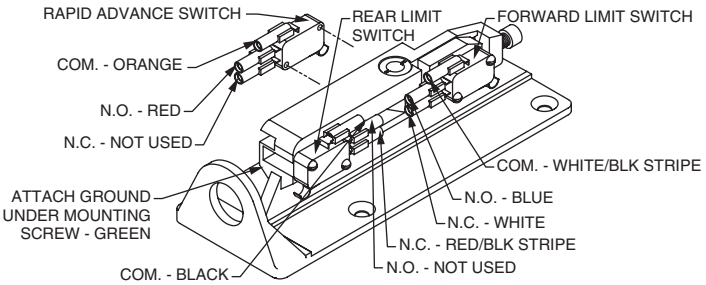
Option PD includes only an 8-pin male plug with screw coupling to mount on the ***Jiffy*-Drill**. No wiring harness is supplied.

On both options, equipment ground is carried through the green wire to Pin 4.

Replacement Parts:

J-306: 12 foot cord with 8 pin female pigtail adapter.
J-307: 8 pin male pigtail adapter.





WIRING COLOR CODE

Switch Circuit	Wire Color	Plug Term.
Common - Rear Limit Switch	Black	1
Normally Closed - Front Limit Sw.	White	2
Normally Open - Rapid Advance Sw.	Red	3
Earth Ground to Frame	Green	4

Switch Circuit	Wire Color	Plug Term.
Common - Rapid Advance Sw.	Orange	5
Normally Open - Front Limit Sw.	Blue	6
Common - Front Limit Sw.	White/Blk	7
Normally Closed - Rear Limit Sw.	Red/Blk	8

Option ST: Internal Stroke Limiter

The standard stroke of the ***Jiffy*-Drill** is 3-1/2". By using the depth switch, strokes from 0" to 3-1/2" can be obtained. These depths are not a positive stop. Meaning, as soon as the depth switch is triggered, the control circuit will retract the feed cylinder. The bottom of the hole may not completely clean-up. If you plan on using any kind of dwell circuit, then a positive stop is recommended.

The stroke limiter is a short piece of tube that is placed in the cylinder to reduce the complete stroke of the unit. **When ordering this option, please include the desired stroke.**

Option L or B: Alternate Feed Port Locations

The width of the ***Jiffy*-Drill** unit is 3-5/16". But a unit can be specially machined to be as narrow as 3-3/16". When placing two units side by side, the feed cylinder connections of one unit may interfere with the location of the second unit. To accommodate the placing of two units side by side, you can order one unit with feed ports either located on the left (when looking from the spindle to the motor) of the drill unit or on the bottom. (Refer to drawing on page 26 for standard location of ports.)

When ordering bottom located feed ports, alter your machine surface to allow clearance of the cylinder connectors.

Option L: Left side feed ports.

Option B: Bottom located feed ports.

Standard Setup for All Types of Drilling

Mounting the Jiffy-Drill

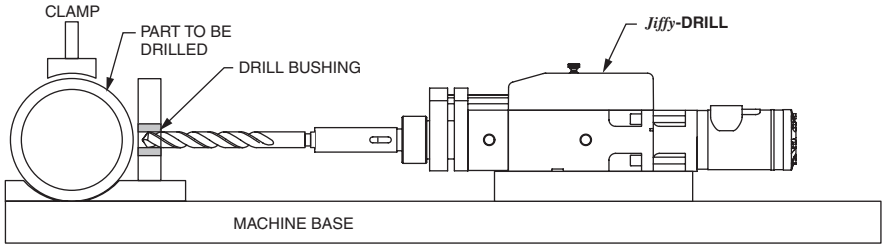
The unit can be mounted in any position, but if mounted to drill upward, a chip cover should be used to keep coolant and chips out of the electrical switch compartment or use coolant resistant limit switches.

There are four, 1/2"-13, tapped holes in the base of the ***Jiffy*-Drill** body which can be used for mounting. **Caution!** The two front mounting bolts must not penetrate more than 1/2" to avoid damage to the feed piston barrel. Although, on most tapping jobs, usually less than 50 lbs. feed force is required, on drilling applications the structure supporting the ***Jiffy*-Drill** may have to take up to 2500 lbs. thrust. (See page 26 for mounting dimensions and envelope requirements.)

General Information

The ***Jiffy*-Drill** is designed specifically to drill both small holes and large holes in a variety of materials. The size of hole and the material determines the power and RPM required to perform the task. On most applications a single motor is not capable of doing a wide range of holes or materials. In these cases, the motor can be changed to achieve the best power and RPM needed. Although, you can normally sacrifice drilling cycle times to reduce the number of different motor sizes needed.

When using the ***Jiffy*-Drill** unit, **we always recommend using a fixed hardened bushing**. The design of the ***Jiffy*-Drill** allows for smooth extension and retraction, using soft seals and wear rings. The unit can not sustain accuracy if the drill bit is subjected to a side load or drilling on a curved or uneven surface without a hardened bushing. We recommend installing a bushing in a fixture as close to the part as possible. In some cases this fixture and the ***Jiffy*-Drill** can be mounted on a slide and becomes an integral part of clamping the part to be drilled.



Hydraulic Setup

A hydraulic power unit to operate a ***Jiffy*-Drill** is not part of the ***Jiffy*-Drill** but may be ordered as auxiliary equipment, or perhaps a standard hydraulic power unit already on hand can be used. Hydraulic hoses should be ordered locally after the distance between the power unit and the drilling unit is established. Several ***Jiffy*-Drill** units, which are powered with hydraulic motors can be run from one hydraulic power supply.

Hydraulic to Rotate Spindle

Flow for spindle motor will be determined by desired RPM on each ***Jiffy*-Drill**. Several power arrangements may be used: two (or more) pumps driven from the same or from opposite ends of a double shaft electric motor; a two-section (or more) hydraulic pump; two (or more) separate hydraulic power units. A pressure compensated pump may be used for both the main motor drive and the spindle advance. Spindle rotation is determined by which port is connected to the hydraulic pump. During setup, verify tool rotation.

Choose a hydraulic motor from pages 53 through 57 that will deliver the required torque and RPM. If you will be using an existing power unit, you will be limited by the pressure and flow available from your existing power unit. On new applications try to keep operating pressures around 600 - 800 PSI and GPM at 25% to 75% of maximum GPM the motor can operate at.

On jobs where several ***Jiffy*-Drill** units are to be used, one large power unit can serve all the units by having one or more large pumps and with pressure compensated flow control valves installed in each ***Jiffy*-Drill** motor circuit and feed circuit.

Hydraulic to Advance Jiffy-Drill *Spindle*

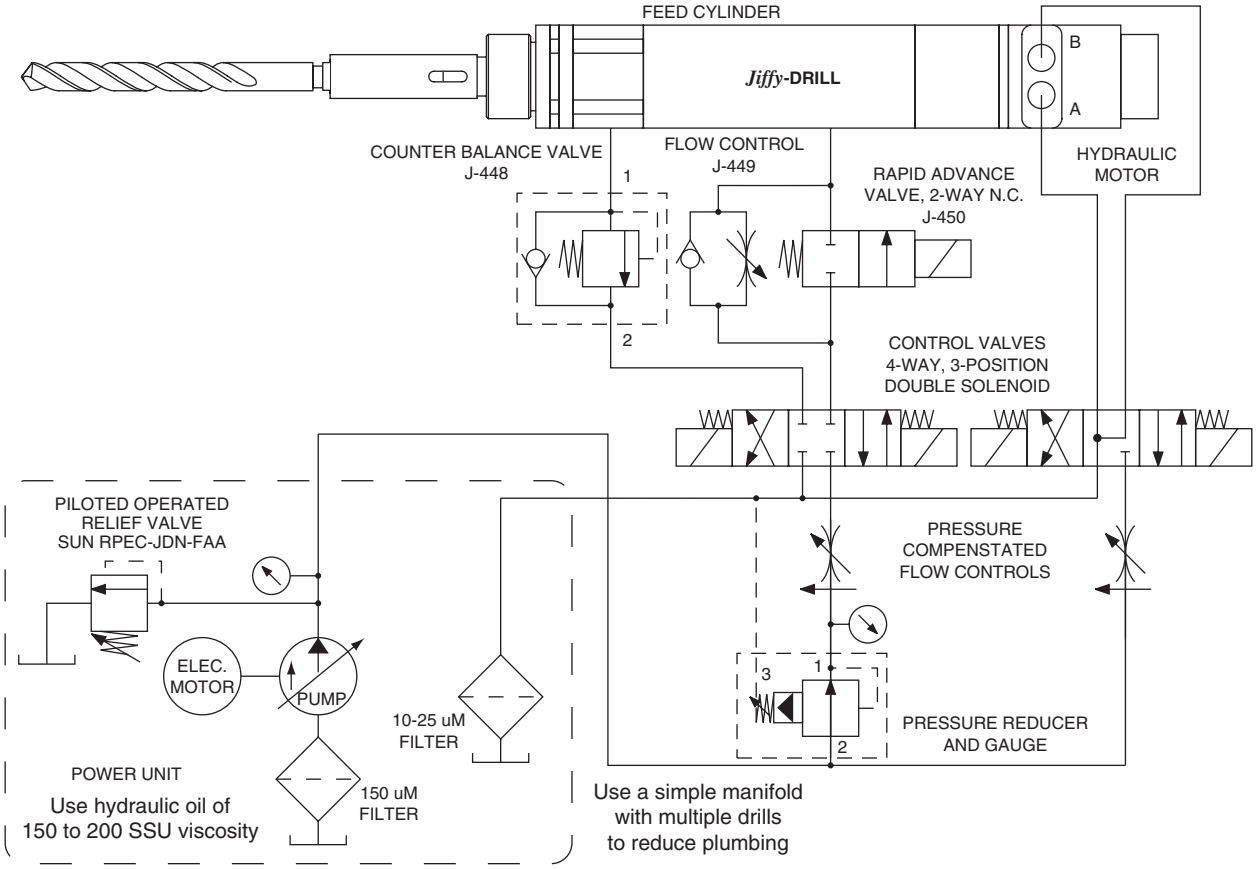
A flow of 2 GPM is usually sufficient for piston advancement. Hydraulic pressure of 100-800 PSI is needed to advance and retract the spindle when drilling holes. A hydraulic pressure of 200 PSI, for example, working on the internal piston area of 3.14 square inches, will give a thrust of about 600 lbs. on the drill bit. With hydraulic feed pressure up to a maximum of 800 PSI, a thrust of about 2500 lbs. can be produced. It is important to use a pressure reducer and gauge in the feed circuit.

To maximize drill feed control, a counter balance valve should be installed in the outgoing flow line of the ***Jiffy*-Drill**. This valve tends to hold the drill back when it strokes forward by resisting sudden high surges in the flow. It should be adjusted to the minimum setting which gives adequate control, as it places an extra load on the hydraulic power source. The counter balance valve should contain a check valve for free flow on drill retraction.

The system compensator setting should not be used to regulate chip thickness. It should be set and locked at a pressure high enough to take care of moderately dull drills, but no higher than necessary because surplus oil from the hydraulic power supply must discharge across it. The higher its setting, the greater the heat generated in the oil.

The 2-way solenoid valve is optional, and used only when a rapid advance up to the work is desired. It should be energized for rapid advance, then de-energized just before the drill bit touches the work. It may be wired to operate from the deceleration switch located on the ***Jiffy*-Drill** unit.

Recommended Jiffy-Drill *Hydraulic Circuit*



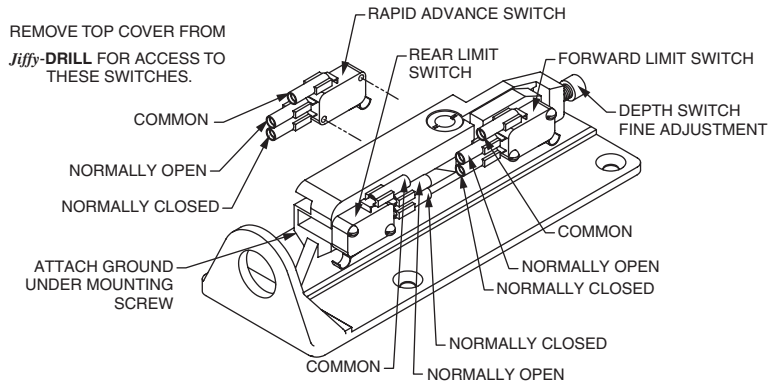
Do not use meter-out circuits for *Jiffy*-Drill units. The design of the ***Jiffy*-Drill** unit allows for quicker retract by using a reduced front piston area. This reduced area will increase pressure approximately 2-1/2 to 1 when using a meter-out circuit. Damage to the unit may occur.

Electric Control of the Jiffy-Drill

Three built-in limit switches should provide adequate switching for design of circuits for fast forward, skip feed, normal feed, dwell, reverse, and reverse stop. Each switch is actuated by an adjustable cam. The forward limit switch has a fine thread adjustment for drill depth. After setting its cam for approximate depth, loosen lock screw and adjust screw for fine adjustment. Turn adjusting screw clockwise for a depth increase of 0.0357" per turn. Tighten lock screw to secure adjustment screw.

Limit switches are rated up to 4 amps at 125 volts A-C or 1/2 amp at 125 volts D-C. Use relays, if necessary, to control higher current or voltage.

On standard ***Jiffy*-Drill** units these switches are not wired, and the external wiring is brought through the conduit hole in the rear of the switch cover. (For factory wired units see option -EP on page 13.)

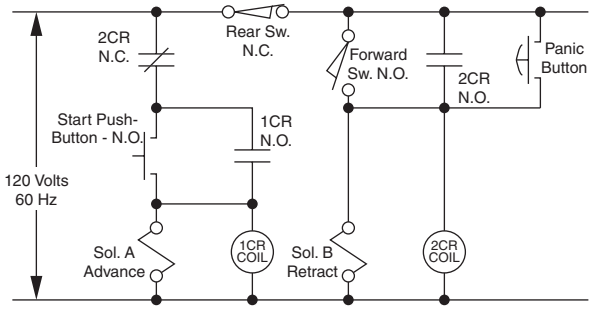


Sample Jiffy-Drill *Operations*

General Information

The following samples only consider the electrical controls needed to control the extension and retraction of the feed cylinder for various types of drilling operations. The control of the spindle rotation may be incorporated into the feed circuit. Although for most applications the spindle rotation control is independent of the feed. These circuits serve only as a guideline in assisting you in setting up the ***Jiffy*-Drill**. We currently use several of these circuits in our manufacturing facility, but caution is urged to limit possible damage during the initial setup and testing of your control circuit. In some cases, customers have incorporated a reverse spindle rotation option during the initial design of their machining center.

Standard Drilling with Jiffy-Drill



ELECRICAL DIAGRAM FOR QUILL FEED
FOR STANDARD DRILLING

The two limit switches are those in the ***Jiffy*-Drill**. Solenoids A and B are those on a 4-way hydraulic valve. Other components include two relays, a start push-button, and a panic button. The rear limit switch is held in its open position when the quill is retracted.

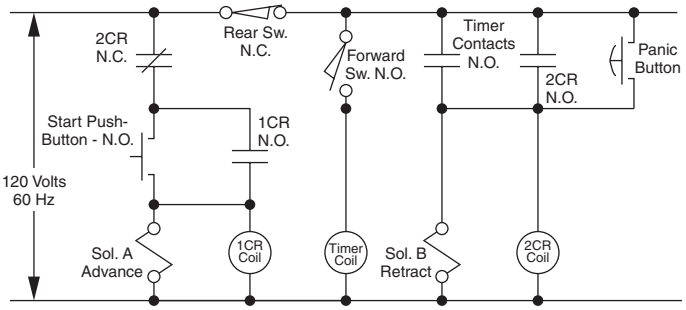
To start a drilling cycle the operator momentarily presses the start push-button. Solenoid A and Relay 1CR become energized and the quill starts forward. The relay locks in electrically through its own contacts and the N.C. (normally closed) contacts of Relay 2CR. This keeps Solenoid A energized throughout the forward stroke. When the forward (depth) limit switch is actuated, Solenoid B and Relay 2CR become energized. The relay locks in electrically through its own contacts. It also breaks the locking circuit to Relay 1CR and releases Solenoid A. The quill retracts until the rear limit switch is actuated. This breaks the circuit to Solenoid B and Relay 2CR. The 4-way valve spool goes to neutral position and unloads the pump.

Hole Reaming with Jiffy-Drill

The ***Jiffy*-Drill** can be used to ream an existing hole. It is critical in this application to have proper alignment between the ***Jiffy*-Drill**, drill bushing, and existing hole. Any one of these elements being out of alignment will cause flexing of the drill and reduce performance and tool life.

Spot Facing with Jiffy-Drill

The ***Jiffy*-Drill** can be used to spot face an existing hole or used with a step drill. In these applications the hydraulic feed circuit must be carefully designed to reduce the possibility of chatter on the spot face surface. The control circuit is designed with a short dwell time when the depth limit switch is triggered. This allows the spot face to be cleaned up before the drill retracts. (Timer is not included with the ***Jiffy*-Drill**.)



ELECRICAL DIAGRAM FOR QUILL FEED
WITH A TIMED DWELL AT DEPTH

The drill must be installed so that at full stroke of the unit (cylinder is bottomed out), the desired depth of the spot face is achieved. The unit can be mounted on a locking slide to allow for periodic adjustment of the spot face depth. (The location of the drill determines spot face depth.) To reduce the full length stroke, an internal stop tube can be used. (See page 13.)

The electric timer used for dwell timing is the re-set type: its contacts do not close until the end of the time period. When the coils de-energize, the contacts re-set to zero time.

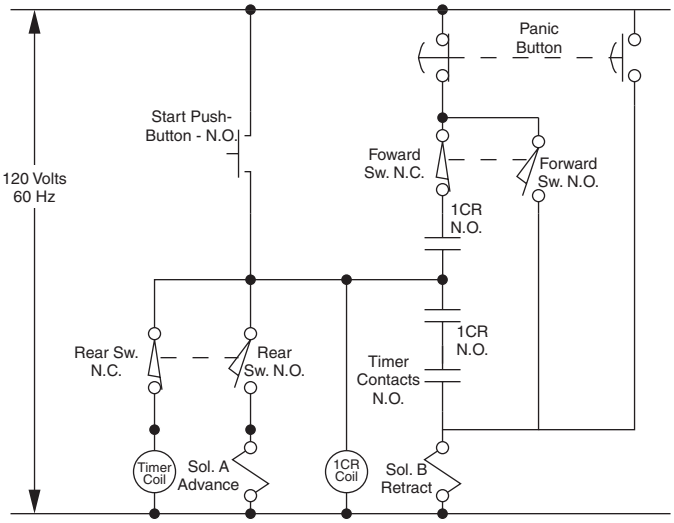
The operator momentarily presses the start push-button. Solenoid A becomes energized and causes the quill to advance. When the forward limit switch is actuated, this energizes the coil of the electric timer. The quill remains stalled at full stroke until the timer contacts close. This energizes Solenoid B to retract the quill.

Sample Jiffy-Drill *Operations (continued)*

Peck Drilling with Jiffy-Drill

The ***Jiffy*-Drill** can be used to stroke in and out to perform a peck drilling operation. In these applications the hydraulic feed circuit must be carefully designed to allow the timing of each stroke.

When the quill is in retracted position, the rear limit switch is mechanically held in the actuated position. When the operator momentarily presses the start push-button, Solenoid A becomes energized and the quill starts forward. When the rear limit switch is released, the timer coil is energized and starts a timing period, but its contacts do not close until the timing period is completed. Relay 1CR coil becomes energized and locks closed through a set of its own contacts.



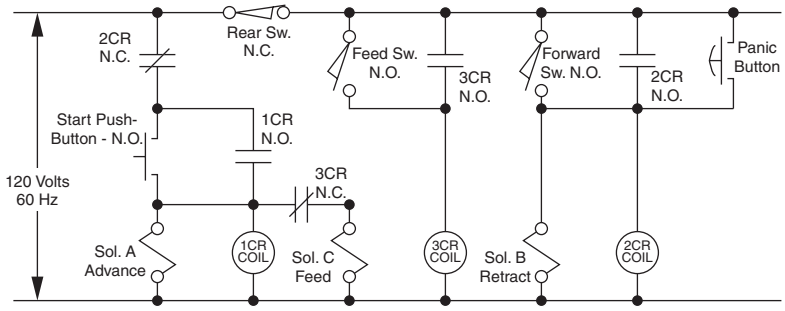
ELECRICAL DIAGRAM FOR QUILL FEED
FOR DEEP HOLE ("PECK") DRILLING

During the drilling period, and after the timer has completed the timing period, its contacts close. This energizes Solenoid B and causes the quill to retract, pulling the drill bit out of the hole to clear the chips. The quill returns to its home position and actuates the rear limit switch. One set of contacts breaks the timer coil circuit allowing it to re-set to zero time. The other set of contacts energizes Solenoid A and starts the quill forward again. As the quill moves forward, the timer coil again becomes energized and starts another timing period. This "pecking" action may occur several times before final drill depth has been reached.

When, finally, the depth limit switch has been actuated, one set of contacts energizes Solenoid B to retract the quill. The other set of contacts breaks the holding circuit and releases 1CR relay. This makes it impossible, when the quill has retracted to home position, for it to start forward again until the operator presses the start push-button for another drilling operation.

The flow control valves in the feed circuit should be adjusted to limit free travel speed to a safe value, one which will not break the drill bit when it contacts the work. Feed force for the drilling should be adjusted with a pressure regulator in the line to the feed circuit. It should be adjusted to a feed pressure which will not overload the drill. The time period should be short enough so the drill bit does not load up with chips.

Rapid Advance Spindle, Then Slow Feed Drill



ELECRICAL DIAGRAM FOR QUILL FEED
FOR RAPID ADVANCE THEN DRILL

Using a 2-way, normally closed solenoid valve to bypass the slow feed control, the ***Jiffy*-Drill** can be advanced at two separate feed rates. This allows the drill to be placed farther away from the work piece to facilitate part loading and unloading, yet still not greatly affect production cycle time by rapidly advancing the drill.

The three limit switches are those in the ***Jiffy*-Drill**. Solenoids A and B are the coils on the hydraulic valve controlling the feed cylinder, and Solenoid C is the 2-way, normally closed valve that allows the bypasses of the slow feed control valve.

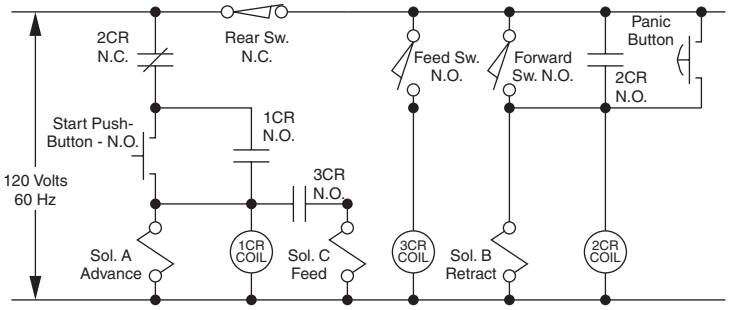
To start a drilling cycle, the operator momentarily presses the start push-button. Solenoid A is energized and starts the quill forward. Relay 1CR and Solenoid C are also energized for rapid advance feed, the slow feed control is bypassed. Relay 1CR locks in electrically through a set of its own contacts, and keeps the quill advancing after the start push-button has been released.

When the feed switch is actuated, Relay 3CR is energized and locks in electrically through its own contacts. Another set of contacts de-energizes Solenoid C, causing the quill to slow down to feed speed for the remainder of its forward travel.

When the forward (depth) switch actuates, Solenoid B and Relay 2CR become energized. The relay locks in electrically through its own contacts. Another set of contacts de-energizes Solenoid A, causing the 4-way valve to shift into retract position. When the quill has fully retracted, actuating the rear limit switch, Relay 2CR is released, causing Solenoid B to become de-energized and allowing the 4-way valve spool to go to center neutral, unloading the pump. The quill remains retracted until the operator presses the start push-button for another cycle.

Sample Jiffy-Drill *Operations (continued)*

Skip Drilling with Jiffy-Drill

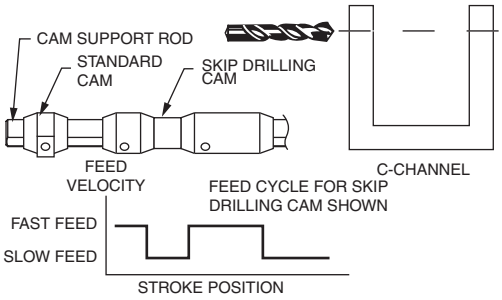


ELECRICAL DIAGRAM FOR QUILL FEED
FOR SKIP DRILLING

When the operator momentarily depresses the start push-button, Solenoid A is energized and starts the quill forward. Depending upon the location and design of the skip drilling cam, the ***Jiffy*-Drill** will advance at one of two feed rates. The rapid advance switch is "On" during the high spots of the skip drilling cam and "Off" during the low spots. When the advance switch is "On", Coil 3CR is activated causing Solenoid C to energize and allow the feed cycle to bypass the slow feed control valve therefore rapidly advancing the feed cylinder. When the advance switch is "Off", the feed cycle resumes to normal slow feed.

The ***Jiffy*-Drill** can be made to shift from fast forward into feed several times during forward stroke of the quill by replacing the standard deceleration cam with a special cam made by the user on a lathe, having peaks and valleys to energize and de-energize Solenoid C at the proper distance intervals.

Similar to the "Rapid Advance Feed Circuit", skip drilling uses a 2-way, normally closed solenoid valve to bypass the slow feed control. The major difference between the skip drilling circuit and the rapid advance circuit, is the rapid advance switch is used to turn "On" the bypass of the slow feed valve in the skip drilling circuit. In the rapid advance circuit this switch is used to turn "Off" the bypass valve.



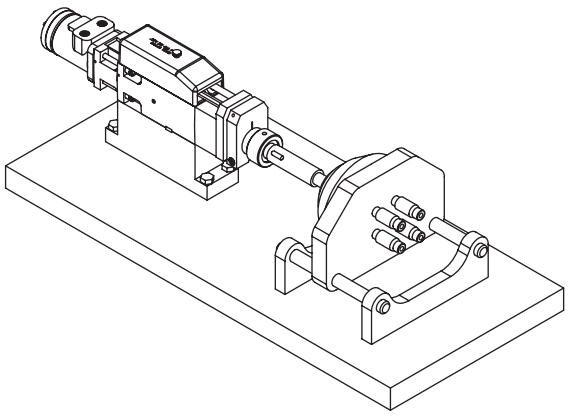
Hole Tapping with Jiffy-Drill

Although we recommend our ***Jiffy*-Tap** lead screw tapping unit for best thread quality on tapping applications, tap chucks are also available for the ***Jiffy*-Drill** and it can be used for hole tapping or die threading from 1/4" through 1-1/2" N.C. by using the proper hydraulic motor to rotate the spindle at the best tapping speed. The ***Jiffy*-Drill** should be ordered with an "ASA" adjustable spindle to be used with an after market tension/compression tap holder. Once the tap has entered the hole it will follow its own lead. Class 1 and 2 threads may be produced this way, but Class 3 threads usually require lead screw tapping such as with the ***Jiffy*-Tap**.

Precision Boring

Precision boring directly with the ***Jiffy*-Drill** is not recommended. The clearance in the sliding spline on the inner end of the spindle could cause chatter. If the customer still desires to use a ***Jiffy*-Drill** for precision boring, the user should construct a special fixture to hold a boring bar between two bronze bushings. The ***Jiffy*-Drill** spindle can be coupled to the boring bar to cause it to rotate, advance, and retract, using the bronze bushings for steady support.

Multi-Spindle Drilling

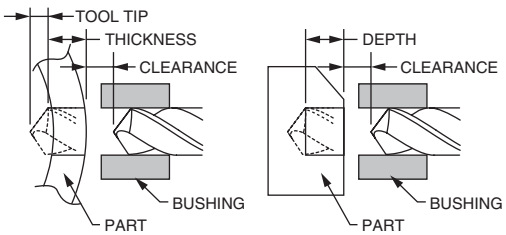


A multi-spindle head can easily be attached to and controlled by a standard ***Jiffy*-Drill** unit. By using a riser block you can raise the center line of the ***Jiffy*-Drill** to match the center line of the multi-spindle head. The head can then be moved along hardened chrome rods using oil impregnated bronze bushings inserted in the head.

When sizing a ***Jiffy*-Drill** for multi-spindle head use, remember that the RPM of the unit will usually be the same as an individual spindle but that the horsepower will need to be multiplied by the number of spindles.

Sizing Jiffy-Drill *Units*

Determining Required Stroke



Through Hole Applications: Add the length of the tool tip to the thickness of the part, and the clearance from the tool tip to the part. Add a little extra for cleaning up the through hole.

Blind Hole Applications: Add the clearance from the tool tip to the part at fully retracted position, to the depth of the desired hole.

Tool Tip = Drill Dia. x *A*, where *A* is from table below.

	Drill Tip Angle		
	Ø = 118°	**Ø = 135°**	**Other**
Constant *A*	0.300	0.207	1/(2 x Tan(Ø/2))

Example: Tip length of a 3/8" drill with 135° tip
0.375 x 0.207 = 0.078 in.

Possible Stroke Limitations

The ***Jiffy*-Drill** operates by an S.A.E. 6-spline sliding torque transfer joint. This allows the transfer of horsepower from the stationary driving unit to the linearly advancing spindle. At rest, the drive shaft is retracted into this splined fitting and has maximum spline engagement. As the spindle is advanced forward, this engagement is reduced. As the amount of spline engagement reduces, the amount of torque that can be transferred to the spline is reduced. Excessive spline wear should not occur with the following recommended stroke limitation. For torques greater than 350 in.-lbs. use the following limitation on stroke: *Stroke (in.) = 3.50 - Torque (in.-lbs.) / 850.*

Example: Drilling a 3/4" diameter hole in mild steel takes approximately 400 in.-lbs. Limit stroke of unit to 3" to prevent excessive spline wear.

Estimating Cycle Time

Once you have determined the necessary stroke of the unit, desired feed rate, and spindle RPM; use the following formula to calculate cycle times: $Time = \frac{Stroke \times 60}{feed \times RPM}$, where *Stroke* is inches, and *feed* is inches per revolution (IPR). The time it takes to retract the drill bit is not normally considered when calculating cycle times since it occurs so rapidly and is negligible compared to the slower feed rate when advancing the drill bit.

Example: Drilling a 3/8", 0.5" deep hole in Aluminum with a tip clearance of 1/4" - feed rate is 0.006 IPR, RPM is approximately 2600, stroke is 0.75". The cycle time for this operation is approximately 2.9 seconds.

Estimating Feed Cylinder Pressure

Once you have determined the necessary thrust of the unit, use the following formula to calculate feed cylinder pressure: $Pressure = \frac{Thrust}{3.15in^2}$, where *Thrust* is lbs. force. The minimum pressure for reliable shifting and control of the feed rate should be 150 PSI, and the maximum pressure to prevent damage to cylinder during retract is 800 PSI.

Example: to develop 450 lbs. of force, you need 150 PSI of pressure.

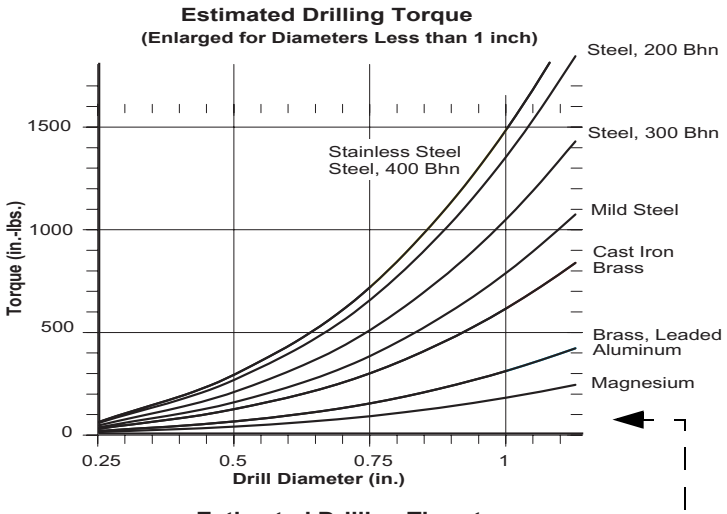
Converting Torque and RPM to Horsepower

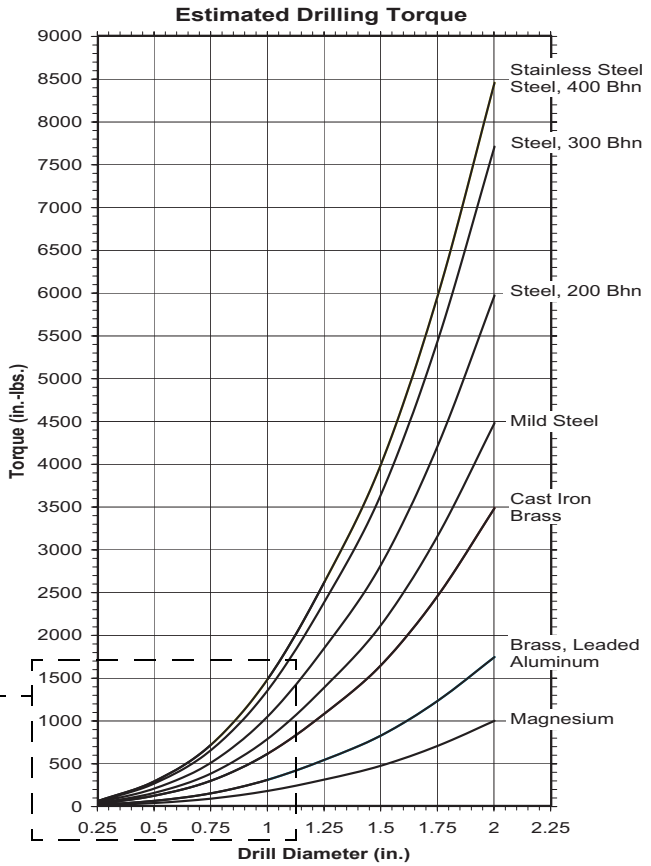
To convert torque (in.-lbs.) and RPM to horsepower use the following equation: HP = Torque (in.-lbs.) x RPM / 63025.
To convert torque (ft.-lbs.) and RPM to horsepower use the following equation: HP = Torque (ft.-lbs.) x RPM / 5252.

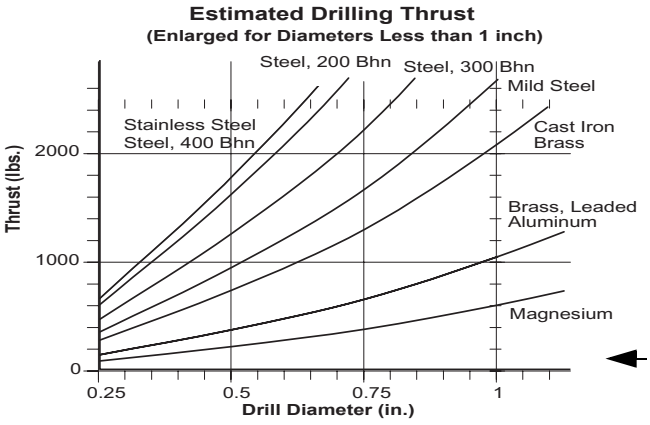
Converting Horsepower and RPM to Torque

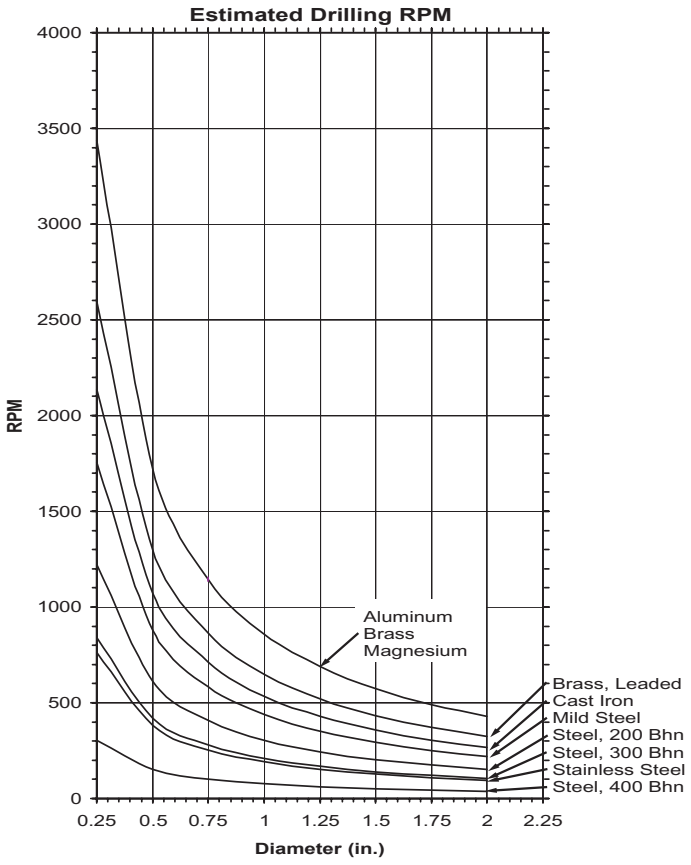
To convert horsepower and RPM to torque (in.-lbs.) use the following equation: Torque (in-lbs.) = HP x 63025 / RPM.
To convert horsepower and RPM to torque (ft.-lbs.) use the following equation: Torque (ft.-lbs.) = HP x 5252 / RPM.

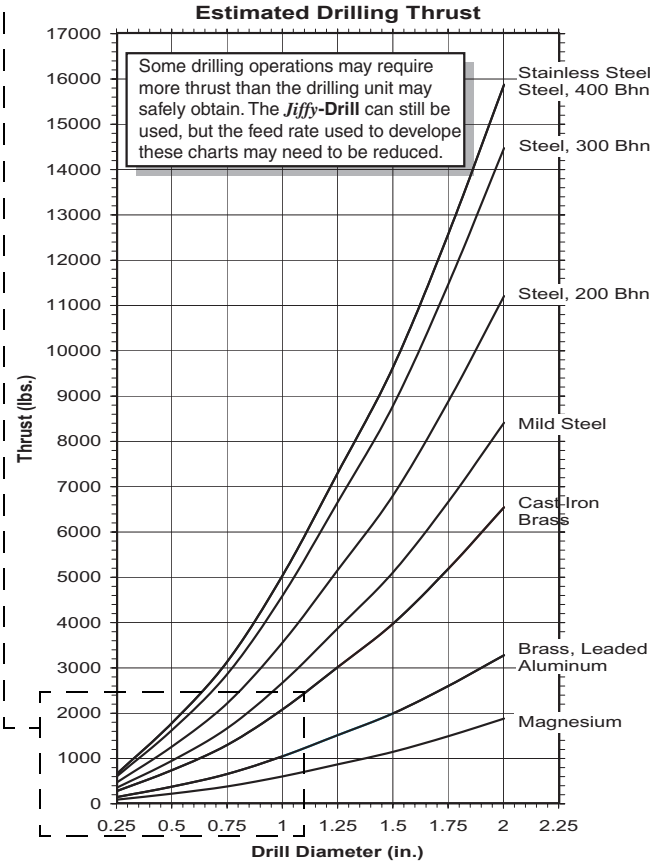
Drilling Torque, Thrust and RPM Estimation Charts











Sizing Jiffy-Drill *Units (continued)*

Estimating Drilling Torque, Thrust and RPM

The ***Jiffy*-Drill** is designed specifically to drill both small holes and large holes in a variety of materials. The size of hole and the material determines the power and RPM required to perform the task. In order to size the proper drive requirements you must know the RPM and torque required for the cutting tool to machine the material you are using. This information can usually be obtained from the manufacturer of the cutting tool you are using.

For standard twist drills see page 20 to estimate required torque, RPM and thrust.

CAUTION: Drilling torques, thrusts and speeds depend on many factors; the machine, the material being drilled, the design of the hole, the lubricant, and the style of drill used. No exact rules can be given that take into account all of these variables. However, the following can be used as a guide in determining a starting point and course to follow for obtaining maximum unit performance.

Sizing By Using The Charts On Page 20

Feed Rate: The charts use a fixed feed rate based on the diameter of the drill. To determine what feed rate was used, you must use the equation given below.

RPM: To estimate RPM, use the chart labeled "*Estimated Drilling RPM*". On the bottom axis, locate the diameter of the standard twist drill. Create an imaginary vertical line from the diameter to where it intersects the material being drilled. Create another imaginary horizontal line from this intersection point to the left axis, this will be the suggested RPM of the standard twist drill.

Torque: Use the above described technique with the cart labeled "*Estimated Drilling Torque*" to estimate torque.

Thrust: Use the above described technique with the cart labeled "*Estimated Drilling Thrust*" to estimate thrust.

Sizing By Using The Equations Below

Feed Rate: The charts use a fixed feed rate based on the diameter of the drill. To determine the feed rate used to determine the charts, use the equation: $Feed = (0.0109 \times Dia) + 0.0021$ where *Dia* is drill diameter in inches.
Example: Drilling a 3/4" hole in aluminum. Feed rate = (0.0109 x 0.75) + 0.0021 = 0.010 inches per revolution.

RPM: To estimate RPM use the following equation: $RPM = 3.82 \times \frac{SFM}{Dia}$ where SFM is from the table "*Drilling SFM*" from the table below-right, and *Dia* is drill diameter in inches.
Example: Drilling a 3/4" hole in aluminum. RPM = 3.82 x 225/0.75 = 1146 RPM

Torque: To estimate torque, use the following equation: $Torque = 1.41 \times K \times f^{0.8} \times Dia^{1.8}$ where *f* is feed rate, *Dia* is drill diameter in inches, *K* is from the table below-right, and *Torque* is in.-lbs.
Example: Drilling a 3/4" hole in aluminum, and using previous calculated values. Torque = 1.41 x 7000 x $0.010^{0.8}$ x $0.75^{1.8}$ = 147.7 in.-lbs.

Thrust: To estimate thrust, use the following equation: $Thrust = 3.523 \times K \times f^{0.8} \times Dia^{0.8} + 0.0345 \times K \times Dia^{2}$ where *f* is feed rate, *Dia* is drill diameter in inches, *K* is from the table below-right, and *Thrust* is lbs.-force.
Example: Drilling a 3/4" hole in aluminum, and using previous calculated values. Thrust = 3.523 x 7000 x $0.010^{0.8}$ x $0.75^{0.8}$ + 0.0345 x 7000 x 0.75^{2} = 571 lbs. force.

Standard Feed Rates Versus Drill Diameter:

Drill Diameter	Feed Rate (inches/rev)
smaller than 1/8 in.	0.001 to 0.003
1/8 to 1/4 in.	0.002 to 0.006
1/4 to 1/2 in.	0.004 to 0.010
1/2 to 1 in.	0.007 to 0.015
larger than 1 in.	0.010 to 0.025

Drilling SFM And Equation Constants:

Material	Allowable SFM	SFM Used	Constant K
Steel, 200 Bhn	70-90	80	24,000
Steel, 300 Bhn	40-65	55	31,000
Steel, 400 Bhn	15-25	20	34,000
Aluminum Alloys, Most	200-250	225	7,000
Magnesium Alloys, Most	200-250	225	4,000
Brass, Most	200-250	225	14,000
Brass, Leaded	140-200	170	7,000
Cast Iron	130-150	140	14,000
Steel, Mild, Resulfurized	110-120	115	18,000
Stainless Steel (316)	50	50	34,000

Sizing Jiffy-Drill *Units (continued)*

Choosing a Hydraulic Motor

Once you have determined the required torque and RPM, use the table below to choose the optimum hydraulic motor. For the actual GPM and pressure required to operate the chosen hydraulic motor, refer to the motor data on pages 53 through 57. Only 14 of the available 20 hydraulic motors are listed in the table below since the performance of several motors may overlap. The table below is just a quick reference, and all values should be compared to the actual motor data sheets.

When using the ***Jiffy*-Drill** to drill various hole sizes or materials, a single hydraulic motor may not be able to generate the range of torques and the range of RPMs needed. In these cases, the motor can be changed to achieve the best power and RPMs needed. Although in some cases, you can sacrifice drilling cycle times to reduce the number of different motor sizes needed.

How to Use the Table: For a given torque, scan down the list to find a motor where the torque is within the recommended torque range. Verify that the desired RPM is also within the recommended RPM range. If there is no motor that meets both criteria, you may use a motor that has a higher torque range to maintain the desired RPM. You may have to sacrifice RPM to obtain desired torque. The values in the table are based on the average performance of the hydraulic motor at moderate GPM and pressures. You can go directly to the motor data and choose a motor where the GPM is either higher and/or lower or the pressure is either higher or lower. For extreme RPMs above 1500, refer to Motor A-1 on page 54 or consult factory.

	RECOMMENDED		LIMITS	
	TORQUE	RPM	TORQUE	RPM
A-1 (page 54)	20 - 100	1500 +	8 - 128	86 - 2239
M-0 (page 53)	20 - 67	1055 - 1500	6 - 102	250 - 1902
M-1 (page 53)	67 - 135	715 - 1055	6 - 214	194 - 1575
B-0 (page 56)	135 - 232	620 - 715	36 - 489	162 - 1021
B-1 (page 56)	232 - 349	567 - 620	36 - 641	127 - 969
B-2 (page 56)	349 - 481	442 - 567	36 - 1036	76 - 760
B-3 (page 56)	481 - 613	347 - 442	52 - 1365	55 - 585
B-3.3 (page 56)	613 - 761	281 - 347	67 - 1687	45 - 469
B-3.6 (page 57)	761 - 883	243 - 281	82 - 1942	39 - 385
B-4 (page 57)	883 - 1013	217 - 243	92 - 2046	37 - 353
B-5 (page 57)	1013 - 1238	182 - 217	120 - 2320	29 - 304
B-6 (page 57)	1238 - 1565	145 - 182	167 - 2657	25 - 243
B-7 (page 57)	1565 - 1976	114 - 145	211 - 2977	13 - 192
B-8 (page 57)	1976 - 2450	30 - 114	266 - 3604	16 - 152

Choosing a Motor From The Data: If you must use the hydraulic motor data on pages 53 through 57 to choose a motor, use the following guidelines:

- Choose a motor that is capable of generating required torques at a moderate range of pressure, between 400 to 1000 PSI.
- Keep the GPM requirements low, but still above 1-2 GPM on A and M series motors, and above 3-4 GPM on B series.
- If using an existing power unit, you will be limited by the GPM and pressure your unit can deliver.
- If using a new power unit, it is normally cheaper to build a power unit that is higher in pressure than higher in GPM.

Choosing an Electric Motor

Once you have determined the required torque and RPM, convert these values to horsepower. Then use the table below to choose the optimum electric motor. With a direct drive electric motor your RPM is fixed to that of the electric motor. Variable speed is obtained by using an inverter duty motor with variable speed drive. Consult your local motor supplier. Choose the motor with the greater torque than what you need:

To convert to horsepower: $HP = \frac{torque \times RPM}{63025}$, where *torque* is in.-lbs.

Torque (in.-lbs.)	HP	RPM	Voltage
9	1/2	3450	120/240 1Ø, 230/460 3Ø
14	3/4	3450	120/240 1Ø, 230/460 3Ø
18	1/2	1725	120/240 1Ø, 230/460 3Ø
18	1	3450	120/240 1Ø, 230/460 3Ø
27	3/4	1725	120/240 1Ø, 230/460 3Ø
27	1 1/2	3450	120/240 1Ø, 230/460 3Ø
28	1/2	1140	120/240 1Ø, 230/460 3Ø

Torque (in.-lbs.)	HP	RPM	Voltage
37	1	1725	120/240 1Ø, 230/460 3Ø
37	2	3450	120/240 1Ø, 230/460 3Ø
41	3/4	1140	120/240 1Ø, 230/460 3Ø
55	1	1140	230/460 3Ø
55	1 1/2	1725	120/240 1Ø, 230/460 3Ø
73	2	1725	230/460 3Ø
83	1 1/2	1140	230/460 3Ø

Jiffy-Drill *Maintenance*

Routine Maintenance Items

Spline Drive Lubrication: The spindle drive spline should be wiped generously with a high film strength grease. To reach the spline, unscrew the bearing retainer. This is a left-hand thread. Pull out the spindle for access to the spline.

Wipe a light film of the same grease on the switch cam rods where they go through the torque plate.

Hydraulic Drive Motor: This motor is lubricated by the hydraulic oil and needs no other lubrication. Should the shaft seal ever need replacing, seal kits are available from the factory, complete with instructions.

Removing Drill Bits: With Morse taper spindles, drill bits should be removed from the spindle by inserting a lever-type drill knock-out in the slot provided. **Caution!** Do not hammer on the knock-out or spindle; this may damage the spindle bearing.

Quill: Keep dirt wiped off the quill, and lubricate it once every 12,000 cycles or once a month, whichever is sooner, with a few drops of oil.

Limit Switches: Routinely inspect limit switches for loose contacts, damaged trigger levers, broken or worn mechanisms, and general structural rigidity.

Seals: Visually inspect unit for hydraulic leakage which could indicate the need for seal replacement. (Seal leakage is a very rare occurrence.)

Removing Spindle Bearing

First remove spindle as described under spline drive lubrication. The spindle and drive shaft are locked together by a tapered pin. Punch the taper pin out by striking it from the side labeled X-X. To remove the bearing, the two parts of the spindle must be unscrewed from each other. These are standard right hand threads.

Interchanging Hydraulic Motors

In setting up for a different job, the hydraulic motor can be interchanged with a different model which may have a more favorable ratio of torque and RPM for the new job. See our motor quick change option on page 12 for alternative options.

Remove four socket head nuts. Pull out the motor with spline sleeve still attached. The spline sleeve set screws are swedged in place and removal might be difficult. It is recommended when using interchangeable motors, that you keep the spline sleeve attached and not swap sleeves between motors. If removal of sleeve is necessary, the swedge must be removed by deburring or use a small end mill to remove swedge. Loosen set screw, and pull spline sleeve off motor shaft. Transfer motor ring, if used, to new motor shaft. Replace spindle sleeve and re-swedge tightened set screw. Unscrew four studs from the old motor and mount them on the new motor. Place the spline sleeve on new motor shaft and tighten set screw. Plug the new motor assembly into the ***Jiffy*-Drill** body, engaging the spline sleeve with the spline on the spindle. Reinstall and tighten the four socket head cap nuts.

Recommended Spare Parts

At least one spare limit switch should be kept on hand. In an emergency, the deceleration limit switch, if not used, can be substituted as a replacement for one of the other switches.

When replacing a limit switch, transfer one wire at a time from the old to the new switch, to avoid the possibility of getting the new switch wired incorrectly.

Locating Unit Serial Number

The unit serial number is located on the right side of the unit when looking at the spindle end. Be aware that the covers between units are interchangeable. Therefore, the part number on the cover may not be the correct part number of the unit. Consult the factory for determining the exact part number of your unit or locating the serial number. Serial number may be required when ordering replacement parts.

Seal Kits

Seal kits are available from your local distributor or the factory. Be prepared to supply unit serial number to determine proper seal kit number.

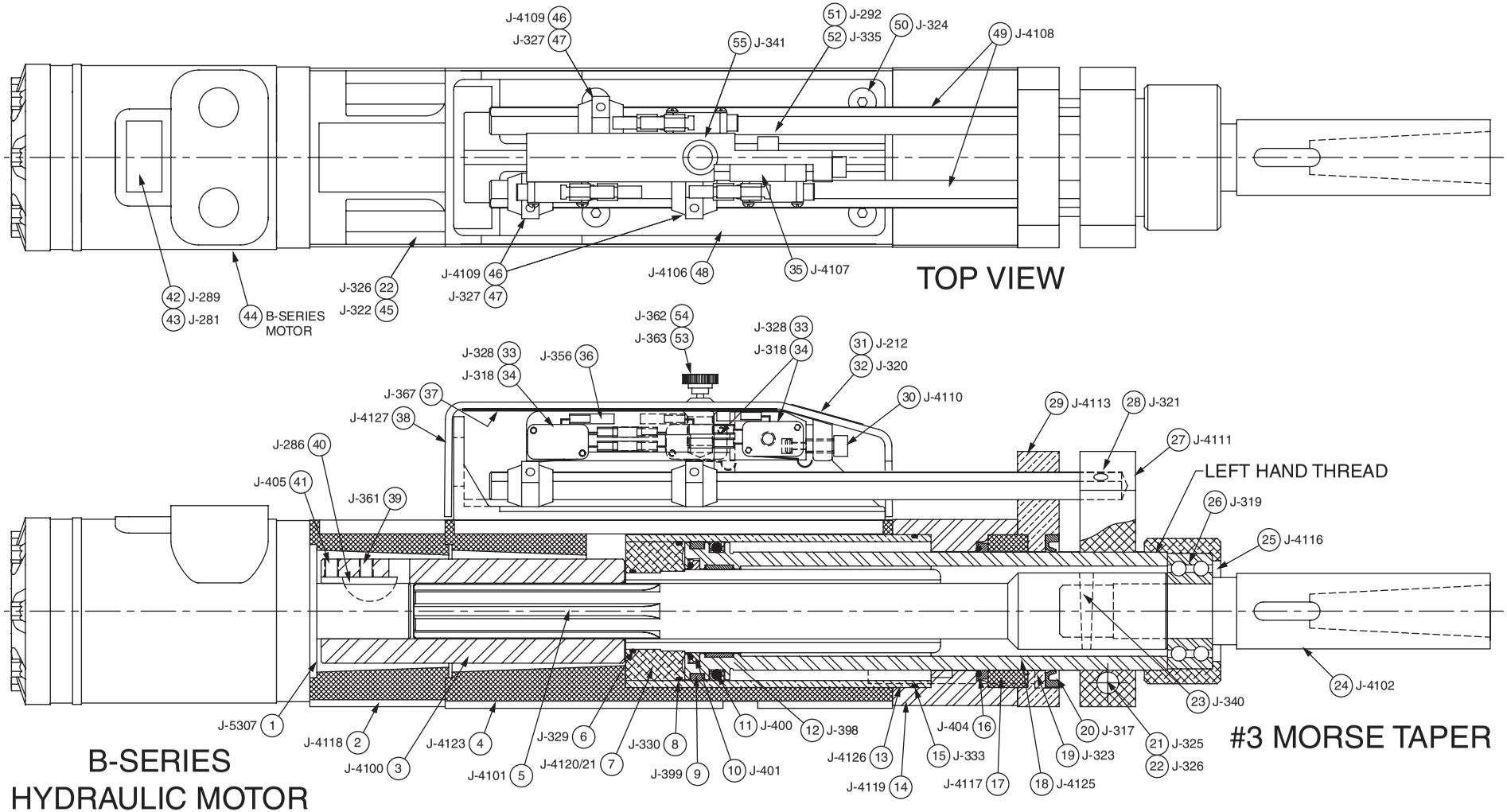
RKJD-l: Complete soft seal kit for serial numbers up to 577Ql. (Units purchased prior March, 1986.)

RKJD-2: Complete soft seal kit for serial numbers starting with 578Q3.

Drill Cylinder Seal Kit Installation

1. Remove bearing retainer nut (left hand thread). Pull drive shaft out.
2. If there is an adapter ring, remove by first removing the two loc-tited set screws in face. Use a torch to break the loc-tite bond. Remove the adapter ring (left hand thread).
3. To remove stop rod mounting plate, loosen socket head cap screw at bottom. Use a flat head screw driver to slightly spread stop rod mounting plate and slide mounting plate off of the quill. You will need to remove the switch cams to completely remove stop rod mounting assembly.
4. To remove torque plate, remove 4 mounting screws. Pull torque plate up to the threads on quill. It is easier to remove plate by unscrewing seal around thread (left hand thread).
5. To remove cylinder rod end, rotate rod end 45 degrees, slide off rod end using the corners to grab hold of. Remove bronze bearing and seal from the rod end. Remove quill from the barrel. Remove seals, being careful not to damage quill surface. Clean and dry surface of all parts before re-assembly. Lubricate using high film strength grease.
6. Replace seals using a small screw driver, being careful not to damage seal or quill surface. Using a thin film of grease on the seals will improve installation and sealing.
7. Re-assemble in reverse order.

Jiffy-Drill *Parts*



SIDE VIEW - STANDARD MODEL WITH
#3 MORSE TAPER SPINDLE AND
B-SERIES HYDRAULIC MOTOR

Jiffy-Drill *Parts List*

Item	Qnty	Part No.	Description
1	1	J-5307	Adapter Ring, Motor
2	1	J-4118	Adaptor, Hydraulic Motor
3	1	J-4100	Sleeve, Spindle
4	1	J-4123	***Jiffy*-Drill** Body
5	1	J-4101	Drive Shaft
6	1	J-329	O-Ring, No. 028
7	1	J-4120-21	Cylinder Blind End/Inner Seal Tube
8	1	J-330	O-Ring, No. 036
9	1	J-399	Outer Wear Ring
10	1	J-401	Inner Seal
11	1	J-400	Outer Seal
12	1	J-398	Inner Wear Ring
13	1	J-4126	Barrel
14	1	J-4119	Piston Rod End
15	1	J-333	O-Ring, No. 038
16	1	J-404	Front Quill Seal
17	1	J-4117	Plain Bronze Bearing
18	1	J-4125	Quill
19	4	J-323	Socket Head Cap Screw 5/16"-18 x 3"
20	1	J-317	Wiper, CR No. 21059
21	1	J-325	Socket Head Cap Scr. 3/8"-16 x 2-1/2"
22	5	J-326	Socket Head Nut, 3/8"-16
23	1	J-340	No. 6 Taper Pin
24	1	J-4102	Drill Spindle, #3 Morse Female Taper
25	1	J-4116	Bearing Retainer (Std.)
26	1	J-319	Dbl. Seal Bearing (5205 SBKFF) 0.984" I.D. x 2.047" O.D.
27	1	J-4111	Stop Rod Mtg. Plate
28	2	J-321	NY-LOK Set Screw, 1/4"-28 x 1/2"
29	1	J-4113	Torque Plate
30	1	J-4110	Retract Switch Adjusting Screw
31	4	J-212	Drive Screw, No. 2 x 3/16"
32	1	J-320	Nameplate, Main Unit
33	6	J-328	Round Head Screw, 4-40 x 5/8"
34	3	J-318	Limit Switch
35	1	J-4107	Retract Switch Adj. Block
36	9	J-356	Solderless Terminal
37	1	J-367	Insulator
38	1	J-4127	Switch Cover
39	1	J-361	NY-LOK Set Screw, 1/4"-28 x 5/16"
40	1	J-286	808 Woodruff Key
41	1	J-405	NY-LOK Set Screw, 1/4"-28 x 7/16"
42	1	J-289	Nameplate, Hydraulic Motor
43	2	J-281	Drive Screw, No. 4 x 3/16"
44	1	B-X	Hydraulic Motor, B-Series
45	4	J-322	Studs, 3/8"-16 x 4"
46	3	J-4109	Switch cam
47	3	J-327	Set Screw, 10-24 x 5/16"
48	1	J-4106	Limit Switch Plate
49	2	J-4108	Plain Switch cam Rod
50	4	J-324	Flat Head Screw, 1/4"-20 x 1/2"
51	1	J-292	Socket Head Cap Screw 1/4"-20 x 1/2"
52	1	J-335	SAE Washer, 1/4"
53	1	J-363	External Lock Ring
54	1	J-362	Knob Cover
55	1	J-341	Switch Cover Retainer Receptacle

Seal Kits

Seal kits are available from your local distributor or the factory. Be prepared to supply unit serial number to determine proper seal kit number. Refer to page 23 for installation instructions.

RKJD-l: Complete soft seal kit for serial numbers up to 577Ql. (Units purchased prior March, 1986.)

RKJD-2: Complete soft seal kit for serial numbers starting with 578Q3.

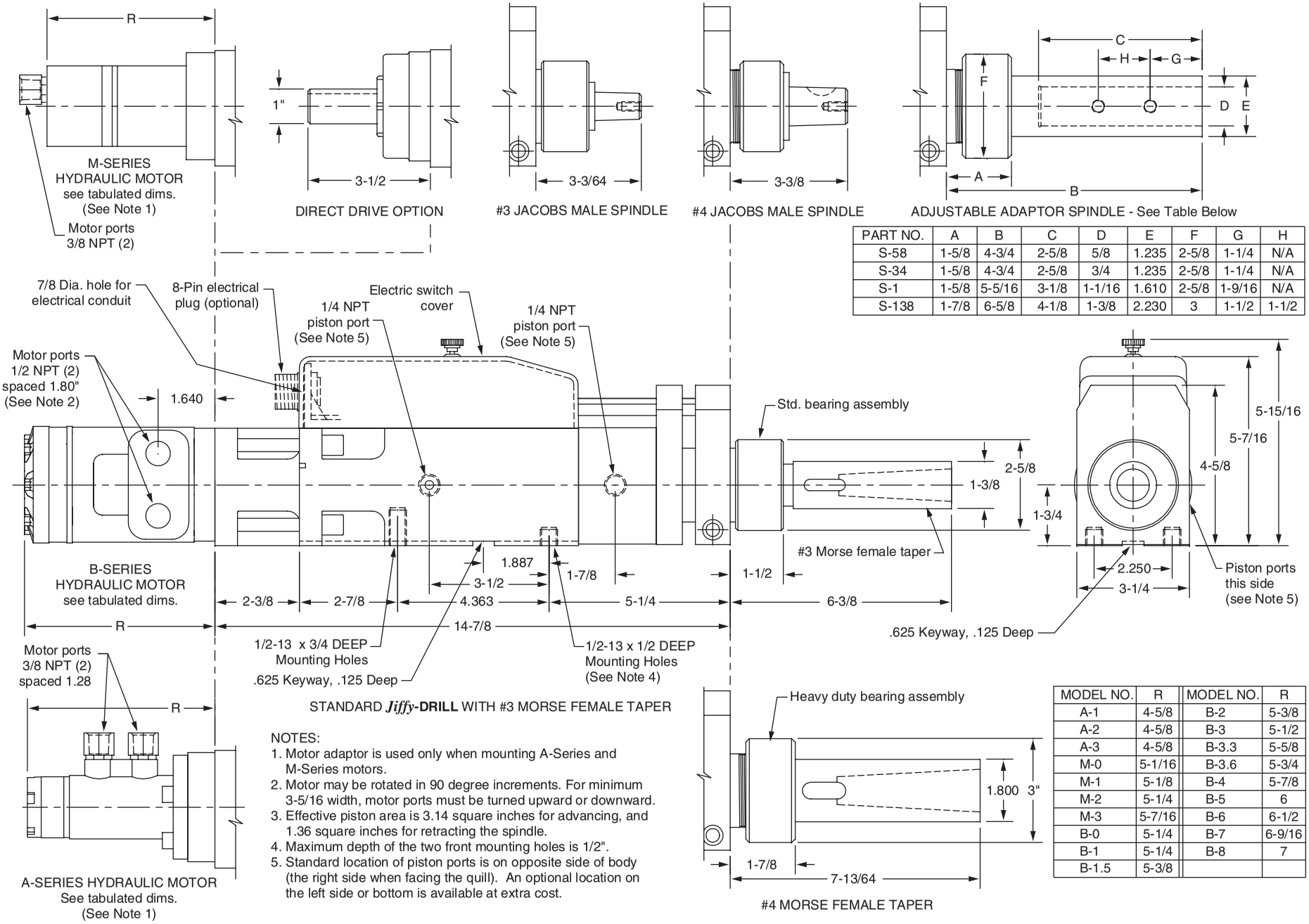
Not All Parts Are Shown Above.

For parts specifically associated with *Jiffy*-Drill spindles see pages 8 and 9.

For parts specifically associated with *Jiffy*-Drill drive styles see pages 10 and 11.

For parts specifically associated with *Jiffy*-Drill options see pages 12 and 13.

Jiffy-Drill *Dimensional Drawing*



PART NO.	A	B	C	D	E	F	G	H
S-58	1-5/8	4-3/4	2-5/8	5/8	1.235	2-5/8	1-1/4	N/A
S-34	1-5/8	4-3/4	2-5/8	3/4	1.235	2-5/8	1-1/4	N/A
S-1	1-5/8	5-5/16	3-1/8	1-1/16	1.610	2-5/8	1-9/16	N/A
S-138	1-7/8	6-5/8	4-1/8	1-3/8	2.230	3	1-1/2	1-1/2

NOTES:
1. Motor adaptor is used only when mounting A-Series and M-Series motors.
2. Motor may be rotated in 90 degree increments. For minimum 3-5/16 width, motor ports must be turned upward or downward.
3. Effective piston area is 3.14 square inches for advancing, and 1.36 square inches for retracting the spindle.
4. Maximum depth of the two front mounting holes is 1/2".
5. Standard location of piston ports is on opposite side of body (the right side when facing the quill). An optional location on the left side or bottom is available at extra cost.

MODEL NO.	R	MODEL NO.	R
A-1	4-5/8	B-2	5-3/8
A-2	4-5/8	B-3	5-1/2
A-3	4-5/8	B-3.3	5-5/8
M-0	5-1/16	B-3.6	5-3/4
M-1	5-1/8	B-4	5-7/8
M-2	5-1/4	B-5	6
M-3	5-7/16	B-6	6-1/2
B-0	5-1/4	B-7	6-9/16
B-1	5-1/4	B-8	7
B-1.5	5-3/8		

Notes:

Jiffy-TAP

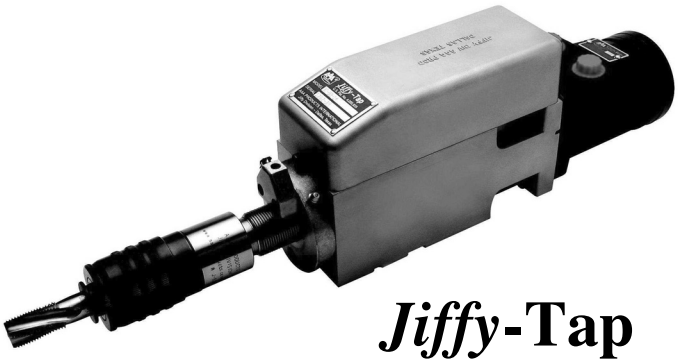
Compact Tapping Unit

Features at a Glance

SPECIFICATIONS*

Standard Stroke Length: 0" to 2-1/8"‡
Extended Stroke Length: 0" to 3-3/8"‡
Tap Capacity: 1-1/2" NPT in cast iron
Spindle RPM: 3000 RPM maximum
Spindle Taper: #4 Jacobs male taper
Spindle Torque: 15 - 3700 in.-lbs. maximum
Weight: 28 lbs. with hydraulic motor

*Some options may limit or alter the listed values.
‡Stroke is limited by tapping torque, (See page 41.)



***Jiffy*-Tap**

TYPES OF OPERATIONS:

Lead Screw Taping: (See page 40)
External Threading: (See page 40)
Multiple Spindles: (See page 40)
Rapid Retract: (See page 40)
Thread Chasing: (See page 40)

AVAILABLE SPINDLE PITCHES:

Listing of Standard and Special Pitches: (See page 30)
Extra Lead Screws: (See page 30)

AVAILABLE CHUCKS:

#1 Chuck: (See page 30)
#2 Chuck: (See page 30)
#3 Chuck: (See page 30)
#4 Chuck - Quick Change Taps: (See page 30)

AVAILABLE DRIVE STYLES:

Hydraulic Motor: (See page 32)
Electric Motor: (See page 32)
1" Keyed Shaft: (see page 33)
C-Face Mount: (see page 32)

AVAILABLE TAP OPTIONS:

EP or PT: 12 foot cord and/or 8-pin pigtail (See page 37)
MQ: Motor Quick Change (See page 34)
SQ: Lead Screw Quick Change (See page 35)
RO: Automatic Reverse Option (See page 36)
ES: Extended Stroke Option (See page 35)
PX: Coolant Resistant Sensors (See page 36)
LH: Left Handed Pitch (See page 30)

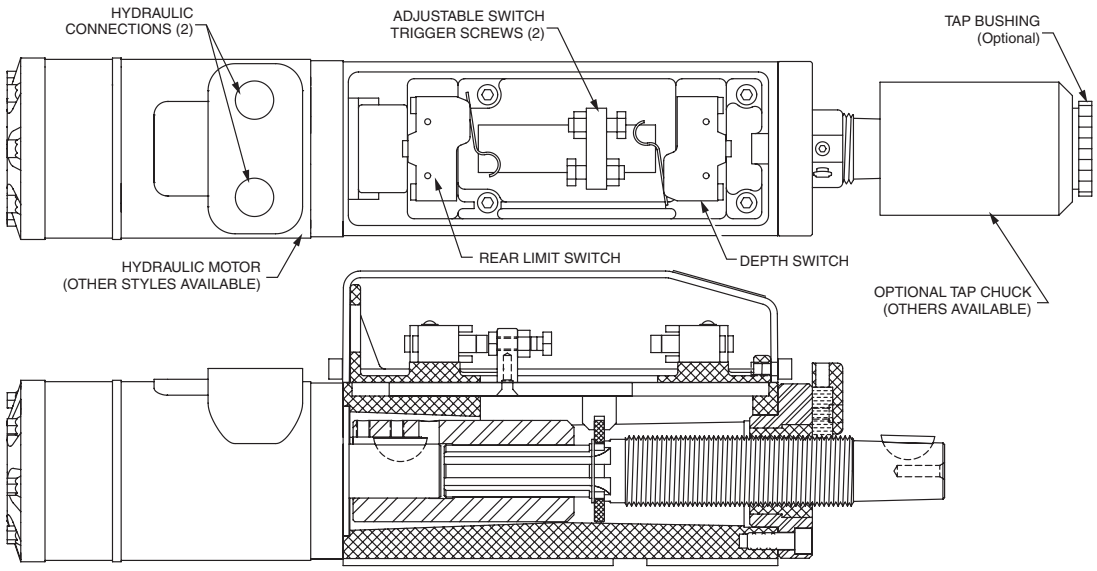
Quick Jiffy-Tap *Index*

Jiffy-Tap *Features*

- Choice of lead screws from 6 to 40 threads per inch, Class 3 thread. Metric, left hand and special leads are available with many in stock; consult factory. The lead screw can be changed in the field in less than 5 minutes by changing the lead screw spindle and its matching bushing.
- ***Jiffy*-Tap** allows the use of smaller diameter rotary tables and shorter linear movement when building transfer type machines. This allows more tapped holes per work piece, and more tapping stations in a given space.
- Tap torque can be adjusted with the relief valve on the remote hydraulic power unit which furnishes power for the ***Jiffy*-Tap** hydraulic motor.
- ***Jiffy*-Tap** units weigh approximately 28 lbs., and can readily be moved from one machine to another because of the line-up slot in the base. If hydraulic quick couplers and the optional electrical plug-in harness are used, the ***Jiffy*-Tap** unit can be rapidly re-located.
- ***Jiffy*-Tap** units can be used with multiple tap heads with mounted guide rods. Each standard unit will handle up to six 3/8" N.C. taps in cast iron, and larger or more taps in brass or aluminum, or at reduced RPM. Larger hydraulic motors will do much more.
- ***Jiffy*-Tap** can be used as a portable tapping unit with a slide-in fixture for large parts.
- ***Jiffy*-Tap** can be reversed 120 times a minute without damage.
- ***Jiffy*-Tap** is a heavy duty unit; it has been used for many years on tough production jobs. (Very popular with the high production Detroit parts manufacturers.)

What Is a Jiffy-Tap

***Jiffy*-Tap** is the light, compact, and powerful answer to production lead screw tapping or die threading in close quarters. It will easily drive taps up through 1-1/2" N.C. size in medium cast iron with ample allowance for dull taps. Using a hydraulic motor to rotate the spindle, the standard unit will produce more than 10 HP, yet is so compact that two units will mount side-by-side on 3-5/16" spacing. On special orders this can be reduced to 3-3/16". The maximum length from end of motor to end of tap chuck is less than 20". No other tapping unit can deliver the long life and high torque of the ***Jiffy*-Tap** in such a small frame.



How a Jiffy-Tap *Works*

Spindle Rotation: The spindle is rotated by your choice of drive style option. (See page 10.) We recommend using compact hydraulic motors for greater power. Although in many applications alternative methods to rotate the spindle may be beneficial. Reversals of 120 times per minute (or more) are no problem for the ***Jiffy*-Tap**.

Spindle Advance: The ***Jiffy*-Tap** is a lead screw tapping unit. As the spindle rotates, the spindle is either advanced or retracted depending upon the direction of spindle rotation and lead screw pitch. The lead screw pitch is the same as the pitch of the hole to be tapped.

Position Switches: Built-in electric limit switches and adjustment screws are used to provide spindle location feedback to your control circuit. The use of these switches is entirely dependant upon your control circuit and how you choose to operate the ***Jiffy*-Tap** unit.

Both the rear limit switch and the depth switch are securely mounted to the switch plate and sensor trigger adjustments are easily made by adjusting the appropriate trigger screw.

Jiffy-Tap *Spindles*

***Jiffy*-Tap** lead screw spindles are available in a wide range of standard pitches and custom pitches. The table below specifies our standard pitches and the most common non-standard lead screw spindles. Consult factory for pitches not listed below.

Standard Pitches (Right Hand Threads)		
40 tpi	18 tpi	11 tpi
32 tpi	16 tpi	10 tpi
28 tpi	14 tpi	8 tpi
27 tpi	13 tpi	7 tpi
24 tpi	12 tpi	6 tpi
20 tpi	11 1/2 tpi	

Common Non-standard Pitches (Right Hand Threads)		
36 tpi	2.00 mm	0.75 mm
26 tpi	1.75 mm	0.70 mm
19 tpi	1.5 mm	
15 tpi	1.25 mm	
9 tpi	1.00 mm	
	0.80 mm	

Options: If ordering a left hand thread lead screw, use the option code "-LH" in either the unit part number or the extra lead screw part number (i.e. 3T-B3-11.5-LH, or LS-11.5-LH). All left hand threaded lead screws are considered non-standard.

Lead screw spindles, nut housings, or nut bushings can not be sold separately. However, individual parts such as wiper housing, screws, wiper felt, and etcetera can be purchased separately. Contact factory or local distributor.

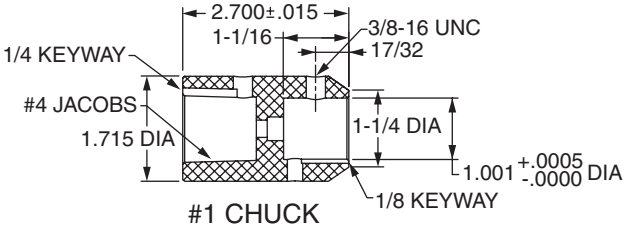
Extra Lead Screws

Additional lead screws are sold as a matched set that includes lead screw, nut, and wiper assembly. To order an additional lead screw use the following part number: LS-XX where XX is replaced by the pitch of the lead screw. **Example:** an 11-1/2 tpi pitch lead screw would be ordered as LS-11.5. A 1.00 mm pitch metric lead screw would be LS-1.00MM. If the additional lead screw is to go on a unit with either the quick change spindle option (option code "-SQ", see page 35), an extended stroke unit (option code -ES, see page 35), or a unit with the automatic reverse option (option code "-RO", see page 36), then use the appropriate option code when ordering a replacement lead screw (i.e. LS-11.5-RO). When ordering extra lead screws, it is recommended to also order an extra chuck, since changing chucks between lead screws is difficult and time consuming.

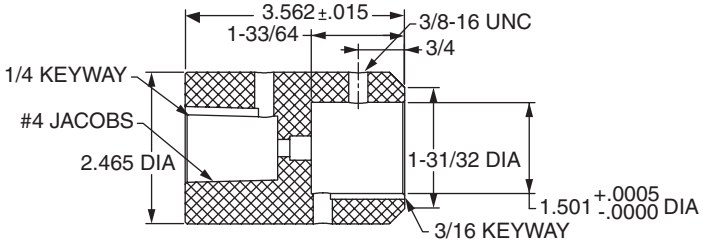
Jiffy-Tap *Chucks*

All chucks attach to the same size #4 Jacobs male taper using a standard 808 Woodruff key and can be secured with a standard 1/4"-20 x 3/4 socket head cap screw. Chucks can be interchanged in the field, but it is recommended to keep chucks attached to the lead screw. We can manufacture special chucks to meet customer specifications, please contact the factory for additional information.

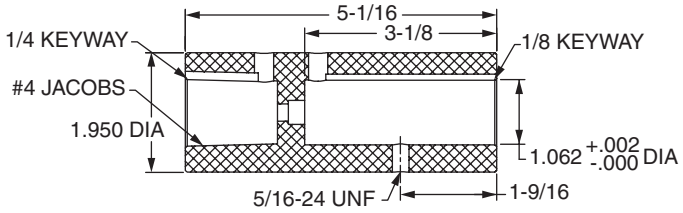
To determine which size chuck you need, first refer to the table "Standard Tap Dimensions" on pages 63 and 64. Determine the diameter of the tap you will use, then refer to the table of available bushings for the size of tap used.



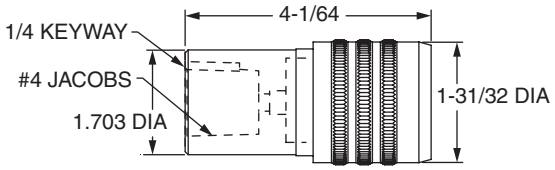
#1 CHUCK



#2 CHUCK



#3 CHUCK

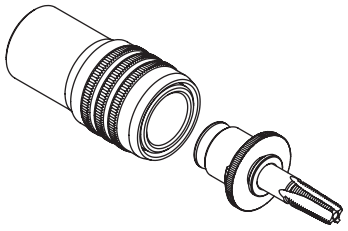


#4 CHUCK

All chucks and bushings are ordered as separate line items.

Jiffy-Tap *Chucks (continued)*

Benefits of #4 Chuck - Quick Change Bushings



#4 Chuck and Quick Change Bushing

The ***Jiffy*** quick change chuck and tap bushing system are better:

- To change a tap bushing you don't need any type of wrenches or keys. Just push back on the knurled section of the chuck and the tap bushing pops out.
- To install a new bushing, align the square driver in the back of the bushing flange with the cut out in the top of the chuck and push. The knurled part of the chuck will pop forward and lock the bushing in place.
- To change a tap in a bushing, you don't have to remove the bushing from the chuck. Just push back the small bushing flange and the tap will come out. Insert a new sharp tap and push tap in. The bushing flange will pop back in place, securing the new sharp tap.
- All tap changes can be accomplished in under a minute.
- Can utilize existing quick change bushing manufactured by, Bilz, T.M. Smith, etc.

Note: Change lead screws when changing tap pitches.

Adaptor Bushings to Fit #4 Chuck (Quick Change Bushings)

Part No.	Adaptor Bushing I.D.‡	For Tap Size	Part No.	Adaptor Bushing I.D.‡	For Tap Size	Part No.	Adaptor Bushing I.D.‡	For Tap Size
QB-006	0.141	0 to No.6	QB-120	0.367	1/2"	QPB-116	0.3125	1/16" NPT†
QB-008	0.168	No. 7 & 8	QB-916	0.429	9/16"	QPB-180	0.4375	1/8" NPT†
QB-010	0.194	No. 9 & 10	QB-580	0.480	5/8"	QPB-140	0.5625	1/4" NPT
QB-012	0.220	No.12	QB-1116	0.542	11/16"	QPB-380	0.700	3/8" NPT
QB-140	0.255	1/4"	QB-340	0.590	3/4"	QPB-120	0.6875	1/2" NPT
QB-516	0.318	5/16"	QB-1316	0.652	13/16"			
QB-380	0.381	3/8"	QB-780	0.697	7/8"			
QB-716	0.323	7/16"						

Jiffy-Tap Bushings for #1 and #2 Chucks

A bushing is needed for each size tap to be used.
They come in small (1" O.D.) and large (1-1/2" O.D., size to fit many tap sizes).
(Specify desired bushing by part number. Select from sizes shown below.)

Adaptor Bushings to Fit #1 Chuck (Small 1" O.D.)

Part No.	Adaptor Bushing I.D.‡	For Tap Size	Part No.	Adaptor Bushing I.D.‡	For Tap Size
SB-006	0.141	0 to No.6	SB-1116	0.542	11/16"
SB-008	0.168	No. 7 & 8	SB-340	0.590	3/4"
SB-010	0.194	No. 9 & 10	SB-1316	0.652	13/16"
SB-012	0.220	No.12	SB-1516	0.760	15/16"
SB-140	0.255	1/4"	SPB-116	0.3125	1/16" NPT†
SB-516	0.318	5/16"	SPB-180	0.4375	1/8" NPT†
SB-380	0.381	3/8"	SPB-140	0.5625	1/4" NPT
SB-716	0.323	7/16"	SPB-380	0.700	3/8" NPT
SB-120	0.367	1/2"	SPB-120	0.6875	1/2" NPT
SB-916	0.429	9/16"			
SB-580	0.480	5/8"			

Adaptor Bushings to Fit #2 Chuck (Large 1-1/2" O.D.)

Part No.	Adaptor Bushing I.D.‡	For Tap Size	Part No.	Adaptor Bushing I.D.‡	For Tap Size
LB-008	0.168	No.7&8	LB-1018	0.896	1-1/8"†
LB-010	0.194	No. 10	LB-10316	0.959	1-3/16"
LB-012	0.220	No.12	LB-1014	1.021	1-1/4"
LB-140	0.255	1/4"	LB-1038	1.108	1-3/8"
LB-516	0.318	5/16"	LB-10716	1.171	1-7/16"
LB-380	0.381	3/8"	LB-1012	1.233	1-1/2"
LB-716	0.323	7/16"	LB-1058	1.305	1-5/8"
LB-120	0.367	1/2"	LPB-116	0.3125	1/16" NPT†
LB-916	0.429	9/16"	LPB-180	0.4375	1/8" NPT†
LB-580	0.480	5/8"	LPB-140	0.5625	1/4" NPT
LB-1116	0.542	11/16"	LPB-380	0.700	3/8" NPT
LB-340	0.590	3/4"	LPB-120	0.6875	1/2" NPT
LB-1316	0.652	13/16"	LPB-340	0.9063	3/4" NPT
LB-780	0.697	7/8"	LPB-1000	1.125	1" NPT
LB-1516	0.760	15/16"			
LB-1000	0.800	1"			
LB-10116	0.862	1-1/16"†			

‡ Refer to standard tap dimensions on pages 63 and 64

†Tap manufacturers may vary shank diameter. Verify actual tap shank diameter to order proper bushing.

Jiffy-Tap *Drive Styles*

Hydraulic Motor Drive

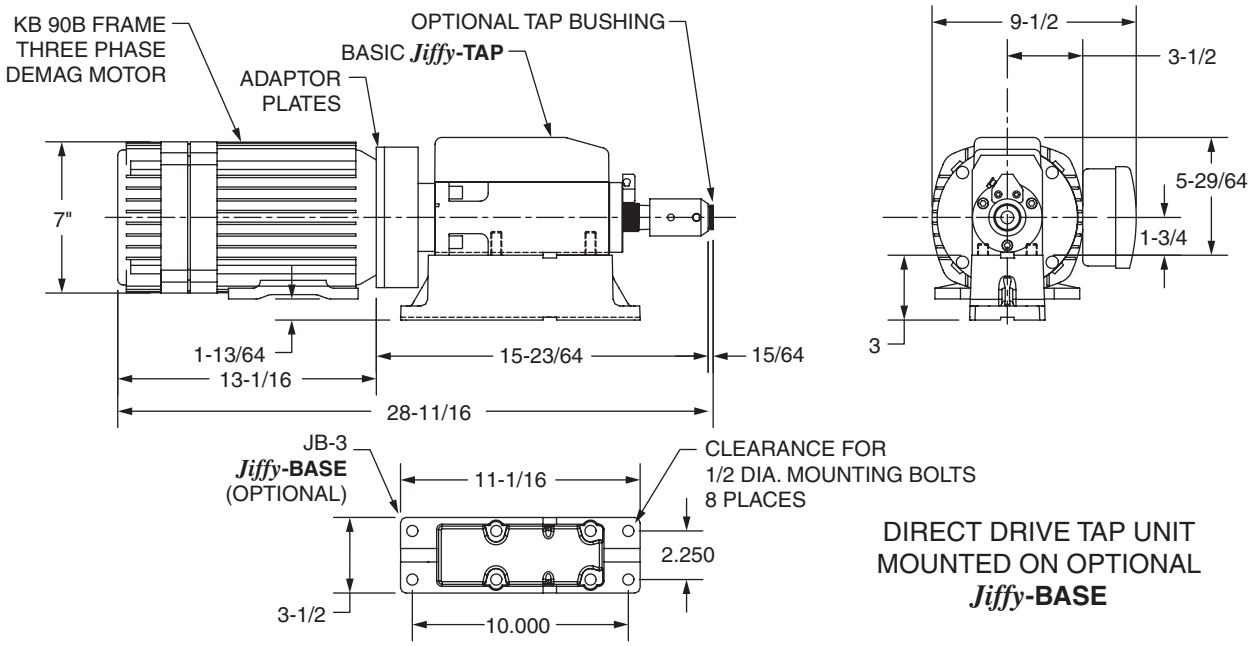
Spindle Hydraulic Motor: The ***Jiffy*-Tap** can be ordered with choice of 20 hydraulic motor models covering a wide range of speed/torque ratios. Motor selection depends on the tap size, thread pitch, speed, and the hardness of the material to be tapped. Hydraulic motors can be attached in any 90º increment for easy plumbing. All ***Jiffy*** motors are reversible.

There is a choice of 8 motor models for medium speed tapping up to 2200 RPM. A choice of another 12 motor models for low speed, high torque tapping with larger taps or when working with harder materials. Consult factory for additional high speed, low torque motors for applications up to 3000 RPM.

Motors A-l through A-4 and M-0 through M-3 are for high speed tapping up to 2200 RPM. Motors B-0 through B-8 are low speed, high torque models for larger taps or harder materials.

In order to size the proper hydraulic motor, you must know what RPM and torque is required for the cutting tool to machine the material you are using. This information can usually be obtained from the manufacturer of the cutting tool used. For standard taps see pages 41 through 44 to estimate required torque and RPM. Then refer to pages 53 through 57 to choose a hydraulic motor that will deliver the torque and RPM needed. If you will be using an existing power unit, you will be limited by the pressure and GPM available from your existing power unit. On new applications try to keep operating pressures around 600 - 800 PSI and GPM at 25% to 75% of maximum GPM the motor can operate at.

DDK1 - "C-Face" Mount For Electric Motor Drive



DIRECT DRIVE TAP UNIT
MOUNTED ON OPTIONAL
***Jiffy*-BASE**

Electric Drive Features

- Direct drive speed range is 900, 1200, or 1800 RPM.
- Adaptable for usage of local electric motors and voltages.
- Uses standard C56 frame C-Face mounting arrangement.
- Not suitable for precision, high speed tapping.

How a DDK1 Works

The unique ***Jiffy*-Tap** is powered by a brake motor especially designed for high start/stop cycling. A wide selection of lead screws, tap chucks, and adaptor bushings are also available.

The tapping cycle is started with an electrical signal. The signal may originate from a push-button, or from a sequence switch on an automatic machine installation. A limit switch mounted in the ***Jiffy*-Tap** provides a signal for reversal when proper depth has been reached. Another built-in switch stops the tap when retracted position has been reached. These stop and reverse positions are adjustable.

Jiffy-Tap *Drive Styles (continued)*

SBA1 - 1" Diameter External Shaft

External Shaft Features

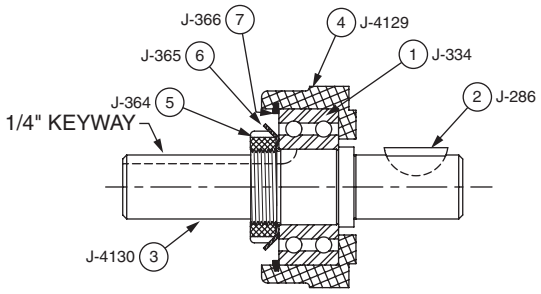
- Speed and horsepower range is determined by drive component. (Maximum spindle speed is 3000 RPM.)
- Adaptable for various usages.
- Uses standard 1" diameter shaft.

How a SBA1 Works

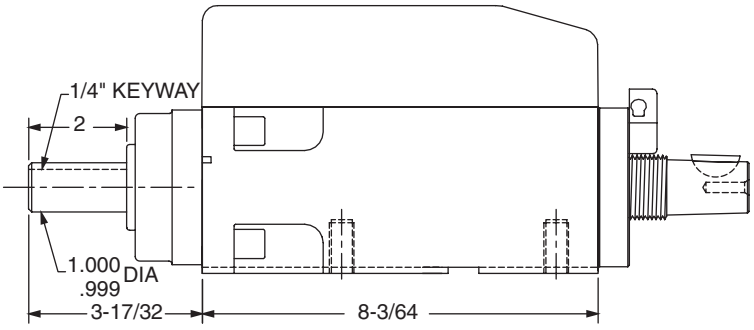
The unit is equipped with a 1" diameter shaft. This is equipped with a 1/4" keyway that runs the entire length of the exposed shaft. The unit can be driven by any method conceivable by connecting to this external shaft.

Parts List

Item	Qnty	Part No.	Description
1	1	J-334	Dbl. Seal Bearing (5206 SBKFF) 1.181" I.D. x 2.440" O.D.
2	1	J-286	Woodruff Key 808
3	1	J-4130	Direct Drive Shaft
4	1	J-4129	Drive Shaft Adapter
5	1	J-364	Locknut
6	1	J-365	Tap Washer
7	1	J-366	Retainer Ring



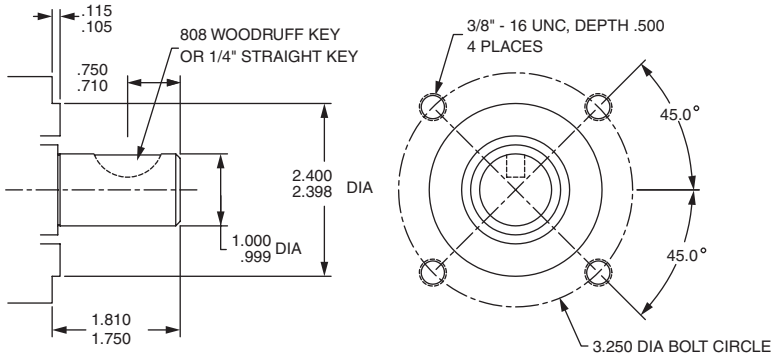
1" KEYED SHAFT DIRECT DRIVE



1" KEYED SHAFT - DIRECT DRIVE ***Jiffy*-TAP**
(side view)

XX - No Drive Unit

The ***Jiffy*-Tap** unit can be ordered without a drive unit. When ordered, a standard unit will be supplied with a splined spindle sleeve, a hydraulic motor adapter ring, four attachment studs, four socket head nuts and an 808 Woodruff key. The customer will need to supply a drive style that mounts to the rear of the unit with the appropriate interface dimensions.



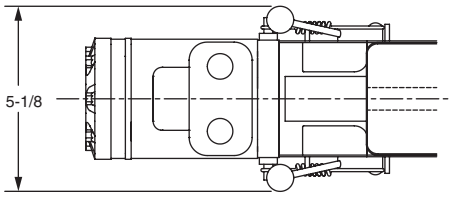
DIMENSIONS OF REQUIRED CUSTOMER DRIVE

To attach drive unit to the rear of unit, first attach the splined sleeve to the drive shaft of the customer drive unit, using the 808 Woodruff key or customer supplied 1/4" straight key. If the hydraulic motor adapter ring is required, place the ring on prior to attaching the sleeve (the outside diameter of the sleeve is larger than the inside diameter of the ring). Once the sleeve is securely attached, it is recommended to swedge the set screws in place to prevent accidental loosening by vibration. Slide the spindle sleeve over the drive shaft, and secure drive unit to ***Jiffy*-Tap** unit using the four studs and four socket head nuts.

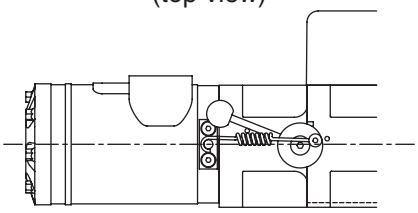
Jiffy-Tap *Options*

Option MQ: Hydraulic Motor Quick-Change System

CHANGE HYDRAULIC MOTORS IN 3 MINUTES OR LESS

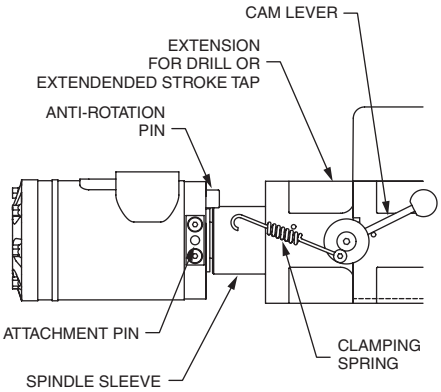


MOTOR ATTACHED
(top view)



MOTOR ATTACHED
(side view)

Example of Quick-Change Option for Hydraulic Motors.



REMOVAL OF MOTOR

Above items are factory order items and must be ordered with the ***Jiffy*-Tap** unit, except for extra hydraulic motors with the quick change option. When ordering extra hydraulic motors with the quick change feature, we recommend ordering the motor with an extra spindle sleeve. (Specify spindle sleeve is for ***Jiffy*-Tap.**)

The quick change option does not add any length to unit but will increase the width from 3-5/16" to 5-1/8".

Hydraulic Motor Quick-Change Parts List

QUICK-CHANGE MOTOR - Unit Side

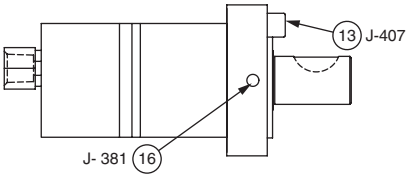
Item	Qnty	Part No.	Description
1	1	J-391	Cam - Right Side, Motor End
2	1	J-403	Cam - Left Side, Motor End
3	2	J-373	Screw 1/4"-20 x 3/4" Flat Head
4	2	J-370	Roll Pin 3/16" x 2-1/4"
5	2	J-175	Knob 3/4" Diameter
6	2	J-372	Screw 10-24 x 3/8" Button Head
7	1	J-380	Spring - Right Side, Motor End
8	1	J-379	Spring - Left Side, Motor End
9	4	J-371	Drive Lock Pin 1/8" x 1"
10	1	J-406-1	Modified Bushing
11	2	J-376	Modified #10 Split Lock Washer

QUICK-CHANGE MOTOR - B Series

Item	Qnty	Part No.	Description
12	2	J-389	Rivet 1/4" x 5/8"
13	1	J-407	Anti-Rotation Pin
14	4	J-390	Screw 10-24 x 3/4" Flat Head
15	2	J-385	Plate

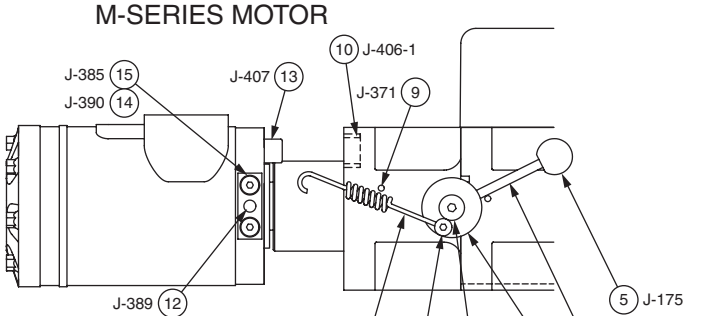
QUICK-CHANGE MOTOR - A or M Series

Item	Qnty	Part No.	Description
16	2	J-381	Drive Lock Pin 1/4" x 1"
13	1	J-407	Anti-Rotation Pin



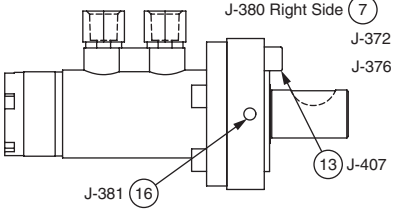
M-SERIES MOTOR

For questions or replace parts not shown, please consult factory.



B-SERIES MOTOR

LEFT SIDE SHOWN

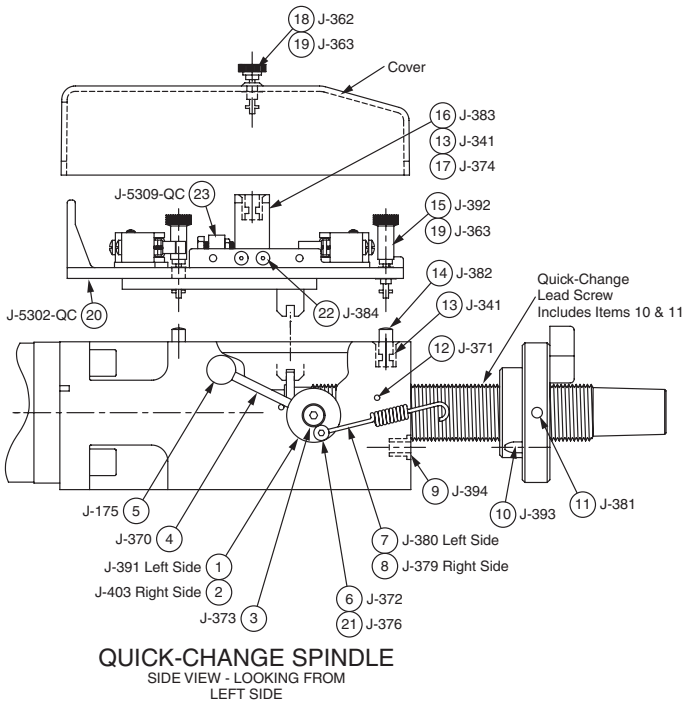


A-SERIES MOTOR

Jiffy-Tap *Options (continued)*

Option SQ: Spindle Quick Change

CHANGE LEAD SCREW SPINDLES IN 5 MINUTES OR LESS



QUICK-CHANGE SPINDLE
SIDE VIEW - LOOKING FROM LEFT SIDE

Example of Quick-Change Option for *Jiffy*-Tap Lead Screw Spindles.

Lead Screw Spindle Quick-Change Parts List

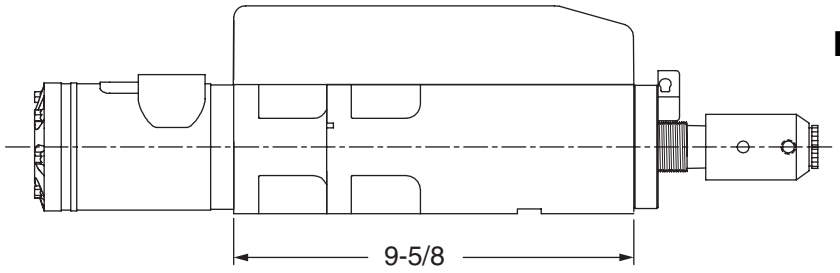
Item	Qnty	Part No.	Description
1	1	J-391	Cam - Left Side, Spindle End
2	1	J-403	Cam - Right Side, Spindle End
3	2	J-373	Screw 1/4" - 20 x 3/4" Flat Head
4	2	J-370	Roll Pin 3/16" x 2-1/4"
5	2	J-175	Knob 3/4" Diameter
6	2	J-372	Screw 10-24 x 3/8" Button Head
7	1	J-380	Spring - Left Side, Spindle End
8	1	J-379	Spring - Right Side, Spindle End
9	1	J-394	Bushing
10	1	J-393	Bullet Nose Dowel
11	2	J-381	Drive Lock Pin 1/4" x 1"
12	4	J-371	Drive Lock Pin 1/8" x 1"
13	3	J-341	1/4 Turn Cam Receptacle
14	2	J-382	Drive Lock Pin 5/16" x 3/4"
15	2	J-392	Extended 1/4 Turn Cam
16	1	J-383	Angle Mount
17	1	J-374	Nut - 1/4 Turn Receptacle
18	1	J-362	1/4 Turn Cam
19	3	J-363	Lock-Ring
20	1	J-5302-QC	Quick-Change Switch Plate
21	2	J-376	#10 Split Lock Washer
22	2	J-384	Screw 6-32 x 3/8" Flat Head
23	1	J-5309-SQ	Block, Sw. Act, Quick Chg

Above items are factory order items and must be ordered with the ***Jiffy*-Tap** unit, except for extra lead screw spindles with the quick change option. Standard lead screws will not work on units modified for quick change spindles. This option can not be used in combination with the auto-reverse option shown on page 36.

The quick change option does not add any length to unit but will increase the width from 3-5/16" to 5-1/8".

Option ES: Extended Stroke Unit

Everything is the same as the basic tapping unit, except over stroke is increased by 1-1/4" to a full 3-3/8" stroke. (See page 41 for stroke limitations.) The overall length of unit increases by 1-5/8".



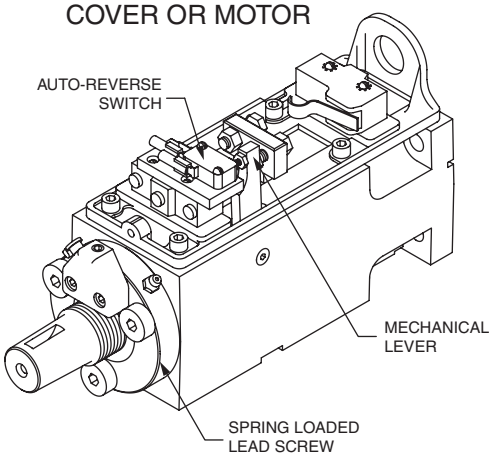
Example of Extended Stroke Option for *Jiffy*-Tap Units

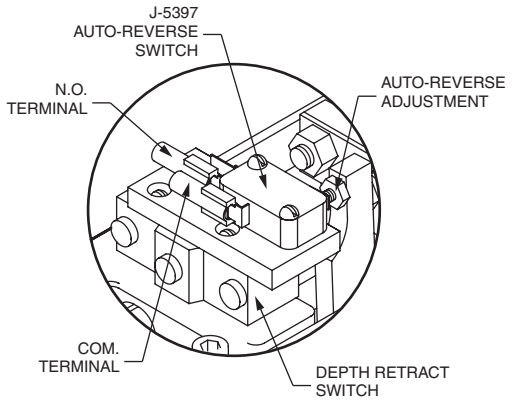
Jiffy-Tap *Options (continued)*

Option RO: Jiffy-Tap *Auto-Reverse Option*

NO LONGER IS THE FEAR OF BREAKING SMALL TAPS A LIMIT FOR HIGH PRODUCTION.

AUTO-REVERSE ***Jiffy*-TAP** WITHOUT COVER OR MOTOR





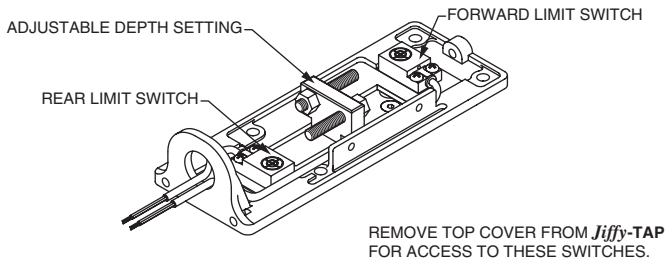
CLOSE-UP OF AUTO-REVERSE

The Auto-Reverse (option -RO on ***Jiffy*-Taps**) prevents tap breakage by instantly retracting the lead screw if the tap misses the hole or if there is no hole in the part. The Auto-Reverse option uses a mechanical linkage that senses motion in the lead screw nut. Standard lead screw translation is 0.030". The electrical sensing switch is triggered causing the tap to instantaneously reverse and retract the tap. The sensitivity of the lead screw nut can be adjusted by the strength of the internal compression springs. The standard sensitivity is hard for large taps over 1/2" and soft for taps 1/2" and under. When ordering this option, specify either hard or soft sensitivity. The internal springs that determine sensitivity can easily be changed in the field.

The Auto-Reverse switch can be wired in parallel with the depth retract switch, or as a separate circuit. The Auto-Reverse switch provides a common (Com.) terminal and both normally open (N.O.) and normally closed (N.C.) terminals. The separate Auto-Reverse switch provides you with great flexibility in designing and implementing your control circuit. For example: to stop a machine, turn on a light or open a reject chute. The Auto-Reverse switch is rated up to 4 amps at 125 volts A-C or 1/2 amp at 125 volts D-C. Use relays, if necessary, to control a higher current or voltage. The Auto-Reverse switch can be replaced with part number J-5397.

Above items are factory order items and must be ordered with the ***Jiffy*-Tap** unit, except for extra lead screw spindles with the Auto-Reverse option. The Auto-Reverse option does not affect the overall envelope space required for a ***Jiffy*-Tap**. This option can not be used in combination with the spindle quick change option shown on page 35 or the proximity switch option shown below. Auto-Reverse option is not recommended for high speed, short stroke applications. Consult factory for options.

Option PX: Proximity Switch - Coolant Resistant Sensors



REMOVE TOP COVER FROM ***Jiffy*-TAP** FOR ACCESS TO THESE SWITCHES.

The environment around machining centers is the pits -- flooding coolant, material chips, grease, dirt and heat. But the proximity switch takes it all in stride. Completely waterproof, the switch functions just fine being splashed by either water based coolant or black oil. The envelope of the ***Jiffy*-Tap** is unaffected by the use of the proximity switch option.

Proximity sensors are made to interface with solid state controllers such as programmable controllers (PLC's). Each switch is normally open (N.O.), and NPN. NPN type sensors are designed to be a current sink device. Current from the controller is supplied to the sensor and it will "sink" the current to ground when the sensor is activated. Sensor activation is triggered by the depth setting adjustment bolts.

The proximity switch housing is manufactured from high quality ABS plastic resin. The switch can handle supply voltages between 10-30 VDC, with 100 mA maximum load. The length of cord is approximately 42 inches. The ambient temperature should be between -13 to 158ºF (-25 to 70ºC). The environmental rating is IP 67 and is equipped with short circuit and reverse polarity protection.

Replacement Proximity Switch: J-453, proximity sensor switch

For reliable depth and retraction detection in the most severe conditions, use the option -PX.

Jiffy-Tap *Options (continued)*

Option EP and PT: Pre-wired Cord and Connector

Wiring harness, cable and plug assembly can be used on a ***Jiffy*-Tap** to connect limit switches to external circuitry through a plug and socket disconnect.

When ordered at the same time as the ***Jiffy*-Tap**, it will be installed and wired to terminals on the electric switches. If ordered later, connections to the ***Jiffy*-Tap** limit switches must be made by the user.

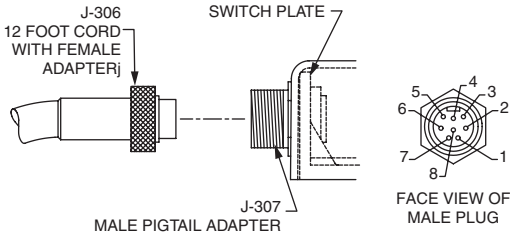
Option EP includes an 8-pin male plug with screw coupling, to mount on the ***Jiffy*-Tap**, with wiring harness connected to limit switch terminals. Also included is an 8-wire socket to plug into the ***Jiffy*-Tap**. Standard length of this cable is 12-ft. unless otherwise specified. Wires in the 12-ft. connecting cable are the same colors as those inside the ***Jiffy*-Tap** which connect to the switch terminals.

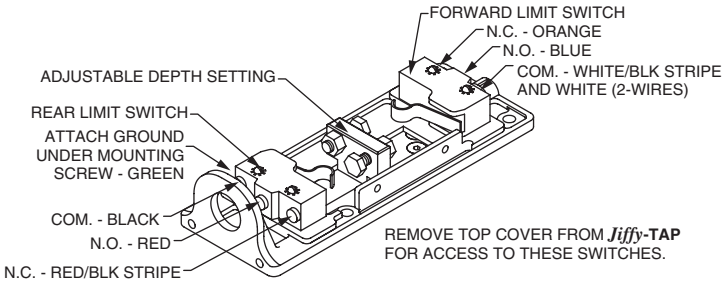
Option PT includes only an 8-pin male plug with screw coupling to mount on the ***Jiffy*-Tap**. No wiring harness is supplied.

On both options, equipment ground is carried through the green wire to Pin 4.

Replacement Parts:

J-306: 12 foot cord with 8 pin female pigtail adapter.
J-307: 8 pin male pigtail adapter.





WIRING COLOR CODE

Switch Circuit	Wire Color	Plug Term.	Switch Circuit	Wire Color	Plug Term.
Common - Rear Limit Switch	Black	1	Norm. Closed - Front Limit Sw.	Orange	5
Incoming Voltage - Front Limit Sw.	White	2	Norm. Open - Front Limit Sw.	Blue	6
Norm. Open - Rear Limit Sw.	Red	3	Voltage Return- Front Limit Sw.	White/Blk	7
Earth Ground to Frame	Green	4	Norm. Closed - Rear Limit Sw.	Red/Blk	8

When the ***Jiffy*-Tap** is wired as shown, the control circuits are dead and the ***Jiffy*-Tap** hydraulic motor cannot run, unless the 12-ft. cable is plugged into the ***Jiffy*-Tap**. The hot side of the incoming voltage supply runs into the ***Jiffy*-Tap** on the white wire in the cable to Pin 2. Pins 2 and 7 are connected together on the COM terminal of the front limit switch, so if the cable is plugged into the ***Jiffy*-Tap**, the hot line returns through Pin 7. When the 12-ft. cable is plugged into the ***Jiffy*-Tap**, all control circuits become active. This interlocking arrangement prevents the ***Jiffy*-Tap** from over-running the limit switches while they are disconnected from the control box.

Standard Setup for All Types of Tapping

Mounting the Jiffy-Tap

***Jiffy*-Tap** units may be mounted in any position. However, if they are to be mounted with the switch cover down, two 1/8" diameter holes should be drilled in the cover, one at each end, to allow drainage of any hydraulic oil which might leak past the shaft seal in the hydraulic motor. If any drainage is noticed, a new shaft seal kit for the motor should be ordered. Like all seals on hydraulic equipment, the motor shaft seal may have to be replaced after extended service. Instructions for replacing the motor shaft seal are included with the seal kit.

To hold the ***Jiffy*-Tap** securely, four mounting holes are provided. Mounting bolts, 1/2"-13, should be used, and should be long enough to engage the ***Jiffy*-Tap** body to a depth of 5/8". An alignment groove, 5/8" wide and 3/32" deep is provided in the base of the ***Jiffy*-Tap** body. With this groove, the ***Jiffy*-Tap** can be accurately re-aligned with the work after having been removed for use elsewhere.

If tapping a brittle material that may produce fine granular chip dust, avoid tapping vertically upward, or use an extension on the tap with a rotary seal to prevent chip dust from getting into the ***Jiffy*-Tap** spindle bearing. Avoid washing fine cuttings into the lead screw with the coolant by directing the coolant flow away from the lead screw. Also use a strainer on the coolant to prevent fine granular chips from packing into the lead screw nut, causing it to lock.

General Information

The ***Jiffy*-Tap** is designed specifically to tap both small holes and large holes in a variety of materials. The size of hole and the material determines the power and RPM required to perform the task. In most cases a single motor is not capable of doing a wide range of holes or materials. In these cases, the motor can be changed to achieve the best power and RPM needed. Although in some cases, you can sacrifice tapping cycle times to reduce the number of different motor sizes needed.

Tap Stroke and Spindle Adjustment

The spindle spline will disengage from the hydraulic motor at about a 2-1/2" extension. To prevent damage to the spline, it must always be sufficiently engaged. (See page 41 for possible stroke limitations when tapping large holes or hard material. If longer strokes are needed, see page 35 for extended stroke option.)

The spindle should not be allowed to bottom out on the retraction stroke because the thrust may force the lead screw nut out of its housing. (If this should happen, it can be pressed back in.) The switch actuator block and rear actuator screw have been designed, and have been factory set, to stop the spindle about 1/16" from the bottom out position. Normally, the position of the rear limit switch need not be adjusted. In practice, however, either switch can be set to stop the spindle at any position, forward or reverse, although in extreme cases, the standard 1/4"-20 x 3/4" actuating bolt may have to be replaced with a longer one. Be sure that the longer bolt will not damage the opposite switch.

When changing the depth of stroke or the retract position, carefully cycle through the tapping process manually. This is accomplished by using a JOG button in the circuit. (Refer to the standard ***Jiffy*-Tap** circuit on page 40.) You can determine potential problems prior to any damage to the unit or control switches by slowly advancing the lead screw to verify proper setup.

Hydraulic Setup

A hydraulic power unit to operate a ***Jiffy*-Tap** is not part of the ***Jiffy*-Tap** but may be ordered as auxiliary equipment, or perhaps a standard hydraulic power unit already on hand can be used. Hydraulic hoses should be ordered locally after the distance between the power unit and the tapping unit is established. Several ***Jiffy*-Tap** units which are powered with hydraulic motors can be run from one hydraulic power supply.

Hydraulic to Rotate and Advance Spindle

Flow for spindle motor will be determined by desired RPM on each ***Jiffy*-Tap**. Several power arrangements may be used: two (or more) pumps driven from the same or from opposite ends of a double shaft electric motor; a two-section (or more) hydraulic pump; two (or more) separate hydraulic power units. A pressure compensated pump may be used for the main motor drive. Spindle rotation is determined by which port is connected to the hydraulic pump. During setup, verify tool rotation.

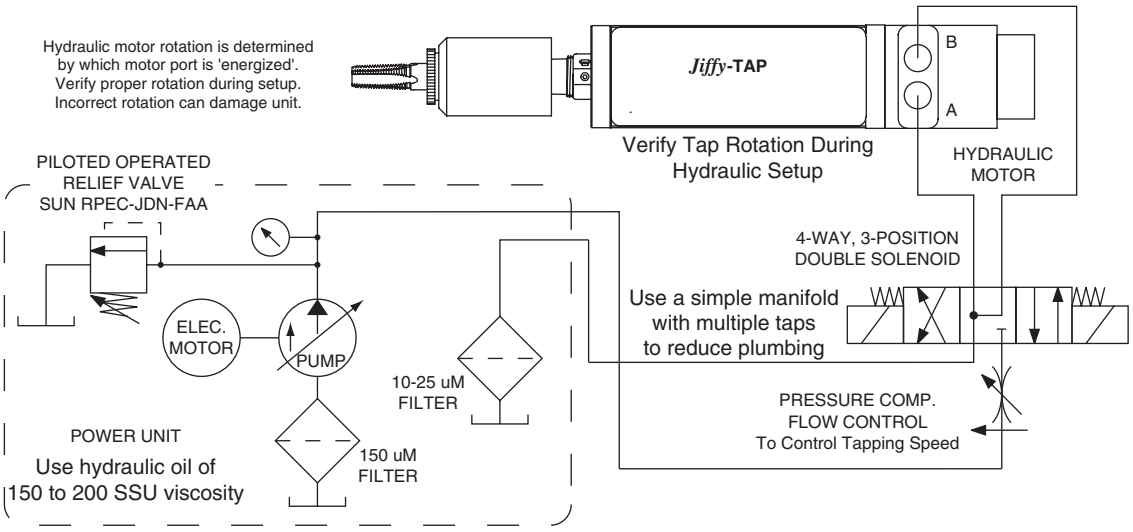
With lead screw spindles, the spindle is advanced or retracted depending upon the rotation of the spindle.

Choose a hydraulic motor from pages 53 through 57 that will deliver the required torque and RPM. If you will be using an existing power unit, you will be limited by the pressure and flow available from your existing power unit. On new applications try to keep operating pressures around 600 - 800 PSI and GPM at 25% to 75% of maximum GPM the motor can operate at.

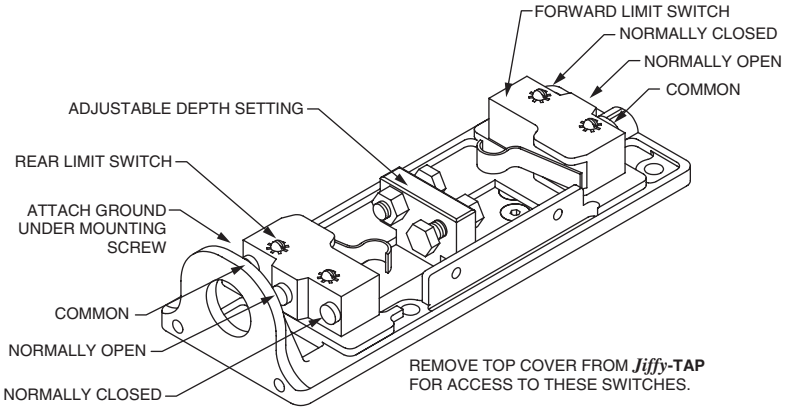
On jobs where several ***Jiffy*-Tap** units are to be used, one large power unit can serve all the units by having one or more large pumps and with pressure compensated flow control valves installed in each ***Jiffy*-Tap** motor circuit.

Jiffy-Tap *Setup (continued)*

Recommended Jiffy-Tap *Hydraulic Circuit*



Electric Control of the Jiffy-Tap



Two built-in electric limit switches mounted inside the top cover of the ***Jiffy*-Tap** are of high quality with a life expectancy of 20,000,000 cycles. Each switch has a common, a normally open (N.O.), and a normally closed (N.C.) set of contacts, permitting them to be used in almost any electrical control circuit devised for the ***Jiffy*-Tap**. On Standard basic ***Jiffy*-Tap** units these switches are not wired, and the external wiring is brought through the conduit hole in the rear of the switch cover. Electrical Option EP is a 12-foot cable wired to all terminals on the switches and to frame ground, and brought in through an 8-pin plug and socket in the switch cover. This permits the ***Jiffy*-Tap** to be unplugged quickly from its wiring. (Limit switches are rated up to 4 amps at 125 volts A-C or 1/2 amp at 125 volts D-C. Use relays, if necessary, to control higher current or voltage.)

The position of both limit switches may be adjusted to control tapping depth and retracted position of the spindle. If a switch should fail, or if the control valve spool should fail to center when both solenoids are de-energized, the ***Jiffy*-Tap** spindle might over travel. However, precautions have been taken in the ***Jiffy*-Tap** design to minimize damage (if any) if such a failure should ever occur.

If the spindle should over travel on its forward stroke, chances are that the tap would simply stall in the work piece, especially on tapered pipe threads, provided the relief or compensator valve on the hydraulic power supply has been properly set. If the relief or compensator valve has been set too high, the tap (especially a small tap) may break, or the advancing spindle may cause the two 6-32 mounting screws on the forward limit switch to break off. After the cause of the malfunction has been corrected, these mounting screws can be replaced. If the spindle should continue to advance, the internal spline will disengage before serious damage is done to the lead screw nut. This disengagement occurs at about 2-1/2" extension of the spindle.

If the spindle should over travel on its return stroke, the lead screw nut may be pushed out of its press fit in the housing. After the malfunction has been corrected, the nut can be pressed back into its housing and secured with two screws in a new place.

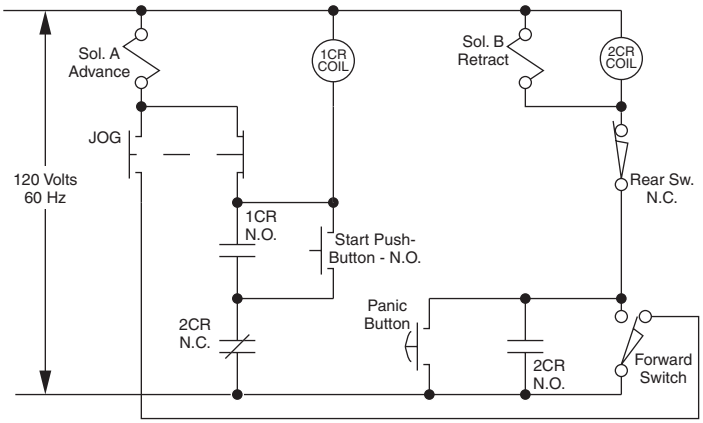
If the spindle should lock up in its retracted position and will not start forward, the rear limit switch adjustment may be incorrect, letting the spindle bottom against the hydraulic motor shaft. To release the jam, use a strap wrench to screw the spindle out one turn. Never use a wrench on the threaded portion of the lead screw. Set the limit switch actuating screw 1/16" toward the rear switch, then lock it. If spindle cannot be turned with a strap wrench, loosen the three screws holding the nut.

Sample Jiffy-Tap *Operations*

General Information

The following samples only consider the electrical controls needed to control the spindle rotation. These circuits serve only as a guideline in assisting you in setting up the ***Jiffy*-Tap**. We currently use several of these circuits in our manufacturing facility, but caution is urged to limit possible damage during the initial setup and testing of your control circuit.

Standard Tapping with Jiffy-Tap



ELECRICAL DIAGRAM FOR ***Jiffy*-TAP**

The two limit switches are those in the ***Jiffy*-Tap**. Solenoids A and B are those on a 4-way hydraulic valve. Other components include two relays, a start push-button, a jog button and a panic button. The rear limit switch is held in its open position when the spindle is retracted.

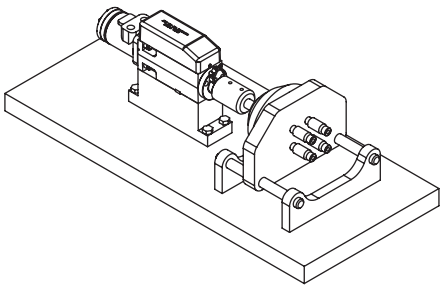
To start a tapping cycle, the operator momentarily presses the start push-button. Solenoid A and Relay 1CR become energized and the spindle starts forward. The relay locks in electrically through its own contacts and the N.C. contacts of Relay 2CR. This keeps Solenoid A energized throughout the forward stroke. When the forward (depth) limit switch is actuated, Solenoid B and Relay 2CR become energized. The relay locks in electrically through its own contacts. It also breaks the locking circuit to Relay 1CR and releases Solenoid A. The spindle retracts until the rear limit switch is actuated. This breaks the circuit to Solenoid B and Relay 2CR. The 4-way valve spool goes to neutral position and unloads the pump.

The jog button allows the user to slowly advance the spindle to verify that it will retract when the depth switch is set. This function is recommended during any change in setup or wiring of the ***Jiffy*-Tap**. If the forward limit switch is not properly wired, the spindle will not retract when at depth and possibly break the forward limit switch.

External Threading with Jiffy-Tap

Any style of rotating thread cutting head, or standard die can be attached to a standard ***Jiffy*-Tap** and used to cut external threads. Rotating thread cutting heads with a 1" shank can be attached using a #1 Chuck. Dies must use a customer supplied tool holder that attaches to the unit using either a standard chuck, or directly to the #4 Jacobs male tapper.

Multi-Spindle Tapping



A multi-spindle head can easily be attached to and controlled by a standard ***Jiffy*-Tap** unit. With a riser block, you can raise the center line of the ***Jiffy*-Tap** to match the center line of the multi-spindle head. The head can then be moved along hardened chrome rods using oil impregnated bronze bushings inserted in the head.

When sizing a ***Jiffy*-Tap** for multi-spindle head use, remember the RPM of the unit will usually be the same as an individual spindle but the horsepower will need to be multiplied by the number of spindles. Also remember that the connection should match the #4 Jacobs male taper on the lead screw spindle or match the inside diameter of #1 Chuck, #2 Chuck or #3 Chuck. (See page 30.)

Setting Jiffy-Tap *for Rapid Retract*

The ***Jiffy*-Tap** can be retracted at a higher speed than advancing by carefully controlling the spindle motor. When using a carefully selected motor, and two pressure compensated flow controls instead of one, you can set the retract GPM higher than the advance GPM. The hydraulic motor must be able to operate under the higher GPM. Other drive systems can be used and setup to allow for different spindle RPM's.

Thread Chasing - Picking Up Existing Lead

The ***Jiffy*-Tap** is a lead screw tapping unit. Any tool directly connected to the spindle will follow the pitch of the lead screw. In order to pick up an existing thread, you must use a tension/compression tool holder. Contact your local tool supplier.

Sizing Jiffy-Tap *Units*

Calculating Proper Tap Drill Diameter

Tapping troubles are sometimes caused by tap drills that are too small in diameter. The tap drill should not be smaller than is necessary to give the required strength to the thread as even a very small decrease in the diameter of the drill will increase the torque required and the possibility of broken taps. Tests have shown that any increase in the percentage of full thread over 60 percent does not significantly increase the strength of the thread. Often a 55 to 60 percent thread is satisfactory, although 75 percent threads are commonly used to provide an extra measure of safety.

It must be remembered that a twist drill is a roughing tool that may be expected to drill slightly oversize and that some variations in the size of the tapping holes are almost inevitable. When a closer control of the hole size is required it must be reamed. Reaming is recommended for the larger thread diameters and for some fine pitch threads.

To calculate tap drill diameter:

For American Unified Thread form: $HoleSize = BasicMajorDiameter - \frac{0.01299 \times PercentThread}{NumberofThreadsperInch}$

For ISO Metric Thread form (mm): $HoleSize = BasicMajorDiameter - (0.01299 \times Pitch \times PercentThread)$

Example: What drill size to use for 1/4"-20 with 75% thread; 0.25 - (0.01299 x 75 / 20) = 0.201

Calculated values for common American Unified Thread forms are listed in the table on page 65.

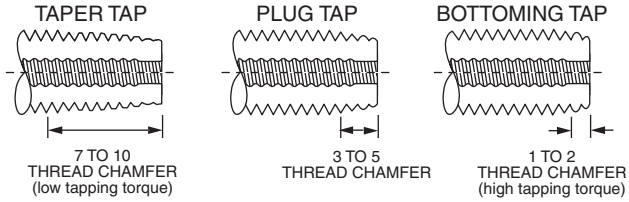
Calculating Proper Hole Depth

The depth of the thread in the tapped hole is dependent on the length of thread engagement and on the material. In general, when the engagement length is more than one and one-half times the nominal diameter, a 50 or 55 percent thread is satisfactory. Soft ductile materials may permit use of a slightly larger tapping hole than brittle materials such as cast iron.

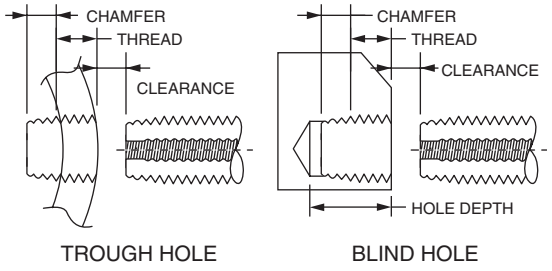
As a rule of thumb, acceptable allowances on the threaded portion of the blind or though hole should be around:

- for Steel castings; depth approximately 1.25 times fastener diameter.
- for Cast Iron or Bronze; depth approximately 1.5 to 1.75 times fastener diameter.
- for Aluminum; depth approximately 1.75 to 2 times fastener diameter.

The type of tap used also affects the depth of the tapped hole. When tapping you must tap the depth of the hole plus the thread chamfer. Therefore the depth of the hole should be at least the sum of the length of needed thread engagement, plus the chamfer allowance shown, plus 2 thread pitches for chip clearance.



Determining Required Stroke



Through Hole Applications: Add the clearance from the tool tip to the part at fully retracted position, to the thickness of the part, plus the chamfer of the tap. Add a little extra for making sure the thread is completely formed.

Blind Hole Applications: Add the clearance from the tool tip to the part at fully retracted position, plus the chamfer of the tap, plus chip clearance.

Nothing beats experimentation to get the correct stroke required, the tap style used and exact thread length required.

Possible Stroke Limitations

The ***Jiffy*-Tap** operates by an S.A.E. 6-spline sliding torque transfer joint. This allows the transfer of horsepower from the stationary driving unit to the linearly advancing spindle. At rest, the drive shaft is retracted into this splined fitting and has maximum spline engagement. As the spindle is advanced forward, this engagement is reduced. As the amount of spline engagement reduces, the amount of torque that can be transferred to the spline is reduced. Excessive spline wear should not occur with the following recommended stroke limitation. For torques greater than 350 in.-lbs. use the following limitation on stroke: *Stroke (in.) = 2.125 - Torque (in.-lbs.) / 850.*

For extended stroke units (option code -ES, see page 35): Add 1.25 in. to available stroke.

Example: Tapping 3/4"-10 hole in mild steel takes approximately 850 in.-lbs. Limit stroke of unit to 1.125" to prevent excessive spline wear.

Sizing Jiffy-Tap *Units (continued)*

Estimating Tapping Torque and RPM

The ***Jiffy*-Tap** is designed specifically to tap both small holes and large holes in a variety of materials. The size of hole, pitch of the thread and the material determines the power and RPM required to perform the task. In order to size the proper drive requirements, you must know the RPM and torque required for the cutting tool to machine the material you are using. This information can usually be obtained from the manufacturer of the cutting tool you are using.

For standard projection taps see page 43 to estimate required torque, RPM and thrust.

CAUTION: Tapping torques and speeds depend on many factors, the machine, the material being tapped, thread pitch, the design of the hole, the lubricant, and the style of tap used. No exact rules can be given that take into account all of these variables. However, the following can be used as a guide in determining a starting point and course to follow for obtaining maximum unit performance.

Sizing By Using The Tables On Page 43

RPM: To estimate RPM, use the table labeled "*Torque and RPM Required to Tap Cast Iron Using Plug Tap or Standard Pipe Taps*". Find the tap size, and record the RPM @ 1 SFM. Multiply this value by the SFM based on pitch from the table below to get the preferred RPM.

Torque: To estimate torque, use the table labeled "*Torque and RPM Required to Tap Cast Iron Using Plug Tap or Standard Pipe Taps*". Find the tap size, and record the torque. This is the torque to tap cast iron. For other materials use the table labeled "*Material Multipliers*" to obtain the material multiplier. Multiply this value with the torque for cast iron to get the estimated torque required to tap the hole.

Sizing By Using The Equations Below

RPM: To estimate RPM use the following equation: $RPM = 3.82 \times \frac{SFM}{Diameter}$ where SFM is from the table "*Tapping SFM*" shown below.

Example: Tapping a 3/4"-10 hole in aluminum. RPM = 3.82 x 100/0.75 = 509 RPM.

Torque: To estimate torque, use the following equation: $Torque = K \times C_T \times C_M$ where all constants are from the tables below, and *Torque* is in.-lbs.

Example: Tapping a 3/4"-10 hole in aluminum with a standard tap and 75% thread. Cm = 0.000618; Torque = 324 in.-lbs.

Tapping SFM And Equation Constant

Material	SFM based on Pitch				Constant K
	3-7	8-15	16-24	25 Up	
Steel, 200 Bhn	30	40	50	50	350,000
Steel, 300 Bhn	20	40	50	50	450,000
Steel, 400 Bhn	5	10	15	25	500,000
Aluminum Alloys, Most	50	100	150	200	100,000
Magnesium Alloys, Most	40	80	100	150	60,000
Brass, Most	50	100	150	200	200,000
Brass, Leaded	50	100	150	200	100,000
Cast Iron	30	60	90	140	175,000
Steel, Mild, Resulfurized	40	55	70	90	260,000
Stainless Steel (316)	8	10	15	20	500,000

For 55% Thread Height:

$$C_M = \frac{0.125}{N^2}\left(\frac{Dia}{2} - \frac{0.202}{N}\right)\left(\frac{N}{20}\right)^{0.2}$$

For 65% Thread Height:

$$C_M = \frac{0.162}{N^2}\left(\frac{Dia}{2} - \frac{0.245}{N}\right)\left(\frac{N}{20}\right)^{0.2}$$

For 75% Thread Height:

$$C_M = \frac{0.205}{N^2}\left(\frac{Dia}{2} - \frac{0.289}{N}\right)\left(\frac{N}{20}\right)^{0.2}$$

For 85% Thread Height:

$$C_M = \frac{0.252}{N^2}\left(\frac{Dia}{2} - \frac{0.332}{N}\right)\left(\frac{N}{20}\right)^{0.2}$$

where N = Number of Threads per Inch

Equation Constant C_T

Tap Style	Constant C_T	
	Sharp	Dull
Chip Driver (Spiral Point)	2.10	3.15
R.H. Helical Flutes	2.73	4.20
Straight Flutes	3.57	5.24
Standard Pipe Tap	-	5.24

For Pipe Threads

For pipe threads you must account for the taper and can not use the size designation in the formulas. You use the actual pipe diameters (see page 64) in the formulas above, and use the following multiplier:

$$C_P = \frac{3.838^{Dia}}{4.2376}$$ Therefore: $Torque = K \times C_T \times C_M \times C_P$

Example: 1/4 NPT, actual pipe diameter is 0.540
Cp = 0.488, Cm @ 75% = 0.000157
In Aluminum torque = 40 in.-lbs.

Sizing Jiffy-Tap *Units (continued)*

Tapping Torque and RPM Estimation Tables

Torque and RPM Required to Tap Cast Iron Using Plug Tap or Standard Pipe Taps (75% thread)

Tap Size	Torque (in.-lbs.)	RPM @ 1 SFM
1/4-20	52	15.28
1/4-28	29	15.28
5/16-18	80	12.22
5/16-24	49	12.22
3/8-16	119	10.20
3/8-24	59	10.20
7/16-14	177	8.75
7/16-20	96	8.75
1/2-13	233	7.64
1/2-20	111	7.64
9/16-12	303	6.80
9/16-18	151	6.80
5/8-11	395	6.11
5/8-18	169	6.11
3/4-10	567	5.08
3/4-16	251	5.08
7/8-9	803	4.35
7/8-14	373	4.35

Tap Size	Torque (in.-lbs.)	RPM @ 1 SFM
1-8	1136	3.82
1-12	562	3.82
1 1/8-7	1623	3.40
1 1/8-12	635	3.40
1 1/4-7	1817	3.06
1 1/4-12	709	3.06
1 3/8-6	2627	2.78
1 3/8-12	783	2.78
1 1/2-6	2884	2.56
1 1/2-12	857	2.56
1 3/4-5	4662	2.18
2-4.5	6453	1.91
2 1/4-4.5	7315	1.70
2 1/2-4	10040	1.53
2 3/4-4	11105	1.39
3-4	12171	1.27

Pipe Taps	Torque (in.-lbs.)	RPM @ 1 SFM	Pipe Dia.
1/8-27	22	9.48	0.405
1/4-18	72	7.08	0.540
38-18	108	5.65	0.675
1/2-14	242	4.55	0.840
3/4-14	466	3.64	1.050
1-11 1/2	1184	2.91	1.315
1 1/4 - 11 1/2	2040	2.31	1.660
1 1/2 - 11 1/2	3414	2.01	1.900

Material Multipliers

Material	M
Steel, 200 Bhn	2.00
Steel, 300 Bhn	2.57
Steel, 400 Bhn	2.86
Aluminum Alloys, Most	0.57
Magnesium Alloys, Most	0.34
Brass, Most	1.14
Brass, Leaded	0.57
Cast Iron	1.00
Steel, Mild, Resulfurized	1.48
Stainless Steel (316)	2.86

Example:

Find the torque required to tap 3/8"-16 in aluminum:
For cast iron = 119 in.-lbs. and 1020 RPM @ 100 SFM
Material multiplier is 0.57
Torque = 0.57 x 119 in.-lbs = 67.8 = 68 in.-lbs.
From SFM table page 42, SFM at 16 pitch = 150
RPM = 10.20 x 150 = 1530 RPM

Estimating Cycle Time

Once you have determined the necessary stroke of the unit and spindle RPM; use the following formula to calculate cycle times: $Time = \frac{2 \times Pitch \times Stroke \times 60}{RPM}$, where *stroke* is inches. The time it takes to retract the tap is considered when calculating cycle times since it occurs normally at the same rate as the forward cycle.

Example: Tapping 3/8"-16, 0.5 inches deep (actual thread engagement is less) in Aluminum with a tool clearance of 1/4". RPM is approximately 1530, stroke is 0.75. The cycle time for this operation is approximately 0.94 seconds.

Sizing Jiffy-Tap *Units (continued)*

Choosing a Hydraulic Motor

Once you have determined the required torque and RPM, use the table below to choose the optimum hydraulic motor. For the actual GPM and pressure required to operate the chosen hydraulic motor, refer to the motor data on pages 53 through 57. Only 14 of the available 20 hydraulic motors are listed in the table below, since the performance of several motors may overlap. The table below is just a quick reference, and all values should be compared to the actual motor data sheets.

When using the ***Jiffy*-Tap** to tap various hole sizes or materials, a single hydraulic motor may not be able to generate the range of torques and the range of RPMs needed. In these cases, the motor can be changed to achieve the best power and RPM needed. Although, in some cases, you can sacrifice cycle times to reduce the number of different motor sizes needed.

How to Use the Table: For a given torque scan down the list to find a motor where the torque is within the recommended torque range. Verify that the desired RPM is also within the recommended RPM range. If there is no motor that meets both criteria, you may use a motor that has a higher torque range to maintain the desired RPM. You may have to sacrifice RPM to obtain the desired torque. The values in the table are based on the average performance of the hydraulic motor at moderate GPM and pressures. You can go directly to the motor data and choose a motor where the GPM is either higher or lower or the pressure is either higher or lower. For extreme RPM above 1500, refer to Motor A-1 on page 54.

	RECOMMENDED		LIMITS	
	TORQUE	**RPM**	**TORQUE**	**RPM**
A-1 (page 54)	20 - 100	1500 +	8 - 128	86 - 2239
M-0 (page 53)	20 - 67	1055 - 1500	6 - 102	250 - 1902
M-1 (page 53)	67 - 135	715 - 1055	6 - 214	194 - 1575
B-0 (page 56)	135 - 232	620 - 715	36 - 489	162 - 1021
B-1 (page 56)	232 - 349	567 - 620	36 - 641	127 - 969
B-2 (page 56)	349 - 481	442 - 567	36 - 1036	76 - 760
B-3 (page 56)	481 - 613	347 - 442	52 - 1365	55 - 585
B-3.3 (page 56)	613 - 761	281 - 347	67 - 1687	45 - 469
B-3.6 (page 57)	761 - 883	243 - 281	82 - 1942	39 - 385
B-4 (page 57)	883 - 1013	217 - 243	92 - 2046	37 - 353
B-5 (page 57)	1013 - 1238	182 - 217	120 - 2320	29 - 304
B-6 (page 57)	1238 - 1565	145 - 182	167 - 2657	25 - 243
B-7 (page 57)	1565 - 1976	114 - 145	211 - 2977	13 - 192
B-8 (page 57)	1976 - 2450	30 - 114	266 - 3604	16 - 152

Choosing a Motor From The Data: If you must use the hydraulic motor data on pages 53 through 57 to choose a motor, use the following guidelines:

- Choose a motor that is capable of generating required torques at a moderate range of pressure, between 400 to 1000 PSI.
- Keep the GPM requirements low, but still above 1-2 GPM on A and M series motors, and above 3-4 GPM on B series.
- If using an existing power unit, you will be limited by the GPM and pressure your unit can deliver.
- If using a new power unit, it is normally cheaper to build a power unit that is higher in pressure than higher in GPM.

Choosing an Electric Motor

Once you have determined the required torque and RPM, convert these values to horsepower. Then use the table below to choose the optimum electric "braking" motor. With a direct drive unit your RPM is fixed to that of the electric motor. Choose the motor with the greater torque than what you need:

To convert to horsepower: $HP = \frac{Torque \times RPM}{63025}$, where *Torque* is in.-lbs.

Torque (in.-lbs.)	HP	RPM	Voltage
94	2.5	1700	230/460 3Ø
89	1.55	1110	230/460 3Ø

Torque (in.-lbs.)	HP	RPM	Voltage
67.2	.88	840	230/460 3Ø

Note: Electric motors are not recommended on high cycle tapping applications.

Jiffy-Tap *Maintenance*

Routine Maintenance Items

Tap Lubrication and Coolant: ***Jiffy*-Tap** units are properly lubricated at assembly, and should be checked periodically, especially if running under unusually severe conditions or located where coolant splash tends to wash lubricant off the spindle threads. Re-lubrication points are the spline end of the spindle, the switch slide bar, the switch fork, the switch fork disc, and lead screw threads. Access to these points is by removal of the switch cover, and the switch mounting plate. Coat the above parts with a high film strength grease. These lubrication points should be checked occasionally as a precautionary measure.

The felt wiper which keeps the spindle threads lubricated should occasionally be oiled with 10 to 20 weight engine or machine oil. Once a year it should be removed, cleaned, and re-oiled and replaced if worn. This spring loaded felt wiper clears chips off the spindle as it retracts, as well as lubricating the spindle threads.

Tapping or threading should be done with a good grade of lubricant/coolant. Your local supplier can recommend the best type for the material being worked.

It is best to have the coolant coming out of the tap flutes, toward the ***Jiffy*-Tap** if possible. This helps to wash out chips which otherwise would load the tap. This is especially important when cutting taper pipe threads because, as the tap is being retracted, chips fall into the threads and are crushed. On many jobs of pipe thread tapping, the coolant can be pumped through the bottom of the hole, and will flow outward toward the ***Jiffy*-Tap**. On jobs where this is not possible, the parts should be flooded with coolant to carry away chips and heat and to lubricate the tap.

Once each month put a very small shot of high film strength grease in the grease fitting located on the lead screw nut housing. Care must be taken when greasing the lead screw through the grease fitting. Excess grease will squirt out of the lead screw nut and become a potential chip collector. These chips would eventually work their way between the lead screw spindle and the lead screw nut, causing the lead screw to seize and lock-up. Remove any excess grease from the front of the lead screw nut.

Hydraulic Drive Motor: This motor is lubricated by the hydraulic oil and needs no other lubrication. Should the shaft seal ever need replacing, seal kits are available from the factory, complete with instructions.

Inspecting Lead Screws: The lead screws should be inspected for impacted chips, excessive wear and unusual wear patterns. The lead screws should be evaluated on a maintenance schedule that is in conformance with the environment that the tap is operating in.

Limit Switches: Routinely inspect limit switches for loose contacts, damaged trigger levers, broken or worn mechanisms, and general structural rigidity.

Removing the Lead Screw Spindle

To change to a different thread lead, the ***Jiffy*-Tap** spindle must be changed. Order additional spindles in any standard thread from 6 to 40 threads per inch, N.F., N.C., or metric.

No more than 5 - 10 minutes should be required to replace the spindle. Please follow these steps in sequence:

1. Be sure to cut off all electrical power to the ***Jiffy*-Tap** unit before working on it.
2. Loosen 3 screws and take off switch cover.
3. Remove 4 socket head screws, which hold the switch plate, but do not remove the plate.
4. Remove 3 socket head screws, holding the lead screw nut housing to front of ***Jiffy*-Tap**.
5. Lift the limit switch plate, and the limit switch slide bar, just far enough to disengage the slide bar from the disc on the spindle.
6. Pull out the complete spindle assembly from the front of the ***Jiffy*-Tap**.

Installing a New Lead Screw Spindle

1. Screw the new lead screw nut and housing assembly on the spindle to about the same position as the old nut and housing on the spindle just removed.
2. Insert the complete spindle assembly into the ***Jiffy*-Tap** body, lifting the slide bar slightly so the fork on the slide bar can clear the disc on the spindle. Slightly rotate the spindle to engage the spline.
3. Lower the fork on the slide bar to engage the disc on the spindle. To check for engagement, move the spindle in and out. The slide bar should move with it.
4. Position the limit switch plate. Insert and tighten 4 screws.
5. Install and tighten the 3 screws which hold the lead screw nut housing to the ***Jiffy*-Tap** body. **Caution:** As you tighten these screws, be careful that the rear limit switch actuating bolt does not jam into and damage the rear switch, and that the spindle does not bottom out against the end of the hydraulic motor shaft, in case the lead screw nut was not positioned correctly when it was installed.
6. Turn on electric power to the ***Jiffy*-Tap** unit.
7. Cycle the unit under power, jogging it to see that the limit switch bar is operating and that spindle reversal takes place at the desired position.
8. Set the position of the forward limit switch actuating bolt for the desired tapping depth and lock with the jam nut. The rear switch actuating bolt has been factory set to leave about 1/16" gap between the lead screw spindle and the end of the hydraulic motor shaft when spindle is retracted. It can be adjusted to leave more gap, if desired, but should not be set to allow the spindle to bump the motor shaft.
9. Replace the switch cover.

Jiffy-Tap *Maintenance (continued)*

Interchanging Hydraulic Motors

In setting up for a different job, the hydraulic motor can be interchanged with a different model which may have a more favorable ratio of torque and speed for the new job.

Remove four socket head bolts. Pull out the motor with spline sleeve still attached. The spline sleeve set screws are swedged in place and removal might be difficult. It is recommended when using interchangeable motors, that you keep the spline sleeve attached and not to swap sleeves between motors. If removal of sleeve is necessary, the swedge must be removed by deburring or a small end mill to remove swedge. Remove set screws, and pull spline sleeve off of motor shaft. Transfer motor ring if used, to the new motor shaft. Place the spline sleeve on new motor shaft, insert and tighten set screws. Plug the new motor assembly into the ***Jiffy*-Tap** body, engaging the spline sleeve with the spline on the spindle. Reinstall and tighten the four socket head cap bolts.

Recommended Spare Parts

At least one spare limit switch (J-282) should be kept on hand for replacement in an emergency. When replacing a limit switch, transfer one wire at a time from the old to the new switch, to avoid the possibility of getting the new switch wired incorrectly.

In high production applications an extra lead screw should also be kept on hand.

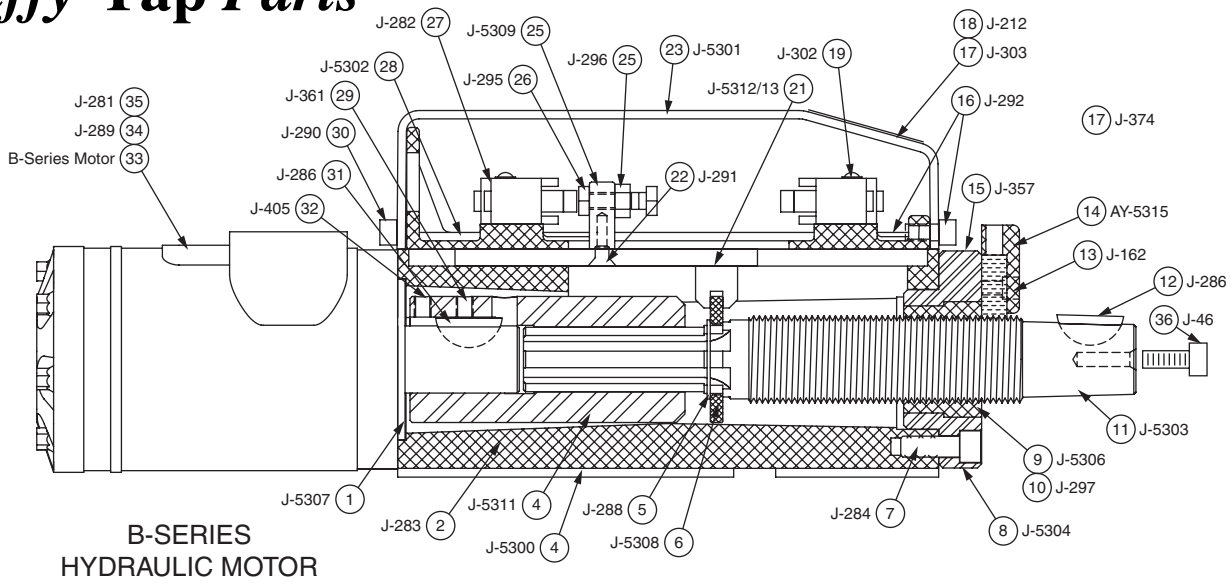
Locating Unit Serial Number

The unit serial number is located on the right side of the unit when looking at the spindle end. Be aware that the covers between units are interchangeable. Therefore, the part number on the cover may not be the correct part number of the unit. Consult the factory for determining the exact part number of your unit or locating the serial number. Serial number may be required when ordering replacement parts.

Factory Repair

The factory can repair units or lead screws at a fraction of the replacement cost for units that need extensive repair or lead screw replacement. Each unit received will be evaluated and the best repair/replace scenario will be provided to the customer.

Jiffy-Tap *Parts*



B-SERIES
HYDRAULIC MOTOR

Jiffy-Tap *Parts List*

Item	Qnty	Part No.	Description
1	1	J-5307	Adapter Ring
2	4	J-283	Soc. Hd. Cap Scr. 3/8"-16 x 1-1/4"
3	1	J-5311	Spindle Sleeve
4	1	J-5300	***Jiffy*-Tap** Body
5‡	1	J-288	Retaining Ring
6‡	1	J-5308	Switch Fork Disc
7	3	J-284	Soc. Hd. Cap Scr. 5/16"-18 x 7/8"
8*‡	1	J-5304	Lead Screw Nut Housing
9*‡	1	J-5306	Lead Screw Nut
10‡	2	J-297	Cup Pt. Set Scr. 1/4"-20 x 3/8"
11*‡	1	J-5303	Spindle, #4 Jacobs Taper
12‡	1	J-286	Woodruff Key 808 (modified)
13‡	2	J-162	Soc. Hd. Cap Scr. 10-24 x 5/8"
14‡	1	AY-5315	Wiper Housing Assembly (felt wiper, set screw and spring)
15‡	1	J-357	Grease Fitting
16	5	J-292	Soc. Head Screw 1/4"-20 x 1/2"
17	1	J-303	Nameplate, ***Jiffy*-Tap**
18	4	J-212	Drive Screw, No.2 x 3/16"
19	4	J-302	Lock washer, No. 6
20	4	J-293	Round Head Screw 6-32 x 7/8"
21	1	J-5312/13	Slide Bar Assembly
22	2	J-291	NY-LOK Flat Head 10-24 x 1/2"
23	1	J-5301	Switch Cover
24	2	J-296	Hex Nut 1/4"-20
25	1	J-5309	Switch Actuator Block
26	2	J-295	Hex Hd. Bolt 1/4"-20 x 1"
27	2	J-282	Limit Switch
28	1	J-5302	Limit Switch Plate
29	1	J-361	NY-LOK Set Scr. 1/4"-28 x 5/16"
30	2	J-290	Soc. Hd. Cap Scr. 1/4"-20 x 3/8"
31	1	J-286	Woodruff Key 808
32	1	J-405	NY-LOK Set Screw 1/4"-28 x 7/16"
33	1	B-XX	B-Series Motor
34	1	J-289	Nameplate, Motor
35	2	J-281	Drive Screw, No. 4 x 3/16"
36	1	J-46	Soc. Hd. Cap Scr. 1/4"-20 x 3/4"

* Lead screw nut, nut housing and spindle sold as match set only. Refer to page 30 when ordering a lead screw assembly.

‡ These items are included when ordering an LS-XX lead screw; where XX is the lead screw pitch, see page 30.

Not All Parts Are Shown Above.

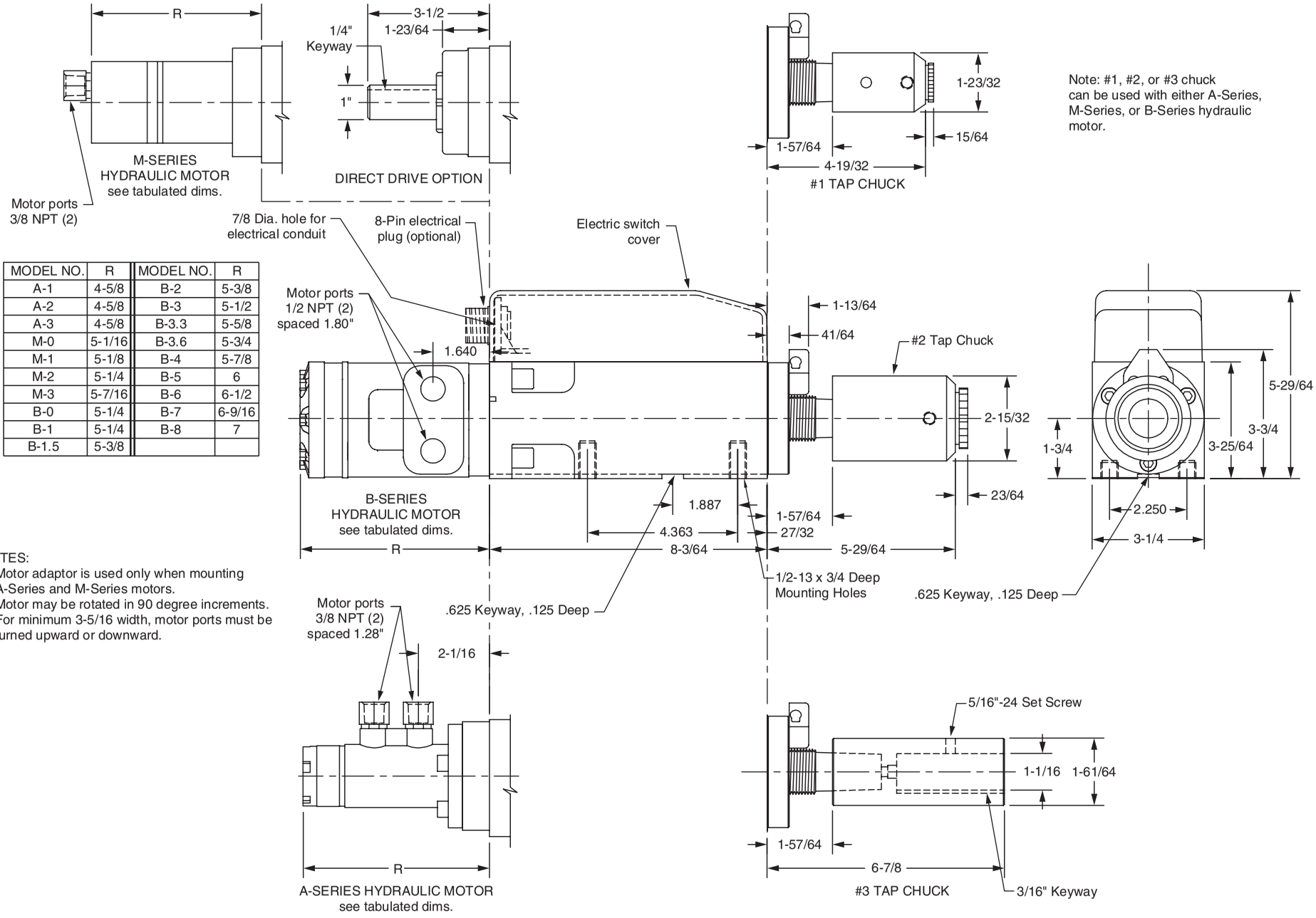
For parts specifically associated with *Jiffy*-Tap spindles see page 30.

For parts specifically associated with *Jiffy*-Tap chuck styles see pages 30 and 31.

For parts specifically associated with *Jiffy*-Tap drive styles see pages 32 and 33.

For parts specifically associated with *Jiffy*-Tap options see pages 34 through 37.

Jiffy-Tap *Dimensional Drawing*



MODEL NO.	R	MODEL NO.	R
A-1	4-5/8	B-2	5-3/8
A-2	4-5/8	B-3	5-1/2
A-3	4-5/8	B-3.3	5-5/8
M-0	5-1/16	B-3.6	5-3/4
M-1	5-1/8	B-4	5-7/8
M-2	5-1/4	B-5	6
M-3	5-7/16	B-6	6-1/2
B-0	5-1/4	B-7	6-9/16
B-1	5-1/4	B-8	7
B-1.5	5-3/8		

NOTES:
1. Motor adaptor is used only when mounting A-Series and M-Series motors.
2. Motor may be rotated in 90 degree increments. For minimum 3-5/16 width, motor ports must be turned upward or downward.

Notes:

"EA" Series Hydraulic Power Unit

Why Use Hydraulic Power With Jiffy Units

- Hydraulic Power Transmission is the most dependable and flexible means of power transmission known to man. This is evidenced by the fact that the automobile brakes you trust your life to are hydraulic.
- All large aircraft use hydraulics for flaps, landing gear, brakes and controls. Why? Because hydraulics are self lubricating and super dependable under all conditions.
- Hydraulics take some of the shock out of a system due to slight compressibility of air bubbles entrained in the hydraulic fluid. This makes for the smooth machine reversals during any part of the machining cycle.
- Hydraulic motors produce more torque for a given size than electric motors. The small physical size and weight of hydraulic motors make high reversals easy, due to low inertia of rotating parts. Hydraulic motors can handle the heat developed by 100 plus reversals a minute, because the heat generated is carried from the hydraulic motor back to the fluid reservoir after each cycle, feeding cooled oil in return to the hydraulic motor.
- Hydraulic driven units can be mounted on much closer centers than electric units developing the same horsepower. This allows a smaller machine base and can save your buying multi-spindle heads.
- The ***Jiffy*** unit is so small and light that one person can handle and mount it on a machine.
- There is no comparison of price of electric driven versus hydraulic driven tapping systems. Any tapping job above 3/8" diameter will cost less and have longer life expectancy when using hydraulics.

What Is An "EA" Series

"EA" Series hydraulic power units range from 3 to 30 horsepower, deliver fixed or variable flows from 2 to 32 GPM with pressures up to 3000 PSI and reservoirs from 20 to 80 gallon capacity. While these power units are designed for economy, only the highest quality components have been used. Baldor and Lincoln electric motors; John S. Barnes W series fixed displacement gear pumps; Rexroth AA10VSO variable displacement piston pumps; Hycon 10µ filters, strainers (except on piston pumps), sight level gauges and filler breathers; Sun pressure relief valves; and Wika glycerin filled pressure gauges. The vertically mounted pump/motor results in a quieter and safer installation requiring much less floor space than J.I.C. style reservoirs. External pressure adjustment is standard on all units.

Sizing A Hydraulic Power Unit

CAUTION: The following is a starting point in sizing a hydraulic power unit. We have simplified the sizing approach in order to decrease the length of time it takes to size a hydraulic unit and tailored the approach towards operating the ***Jiffy*-Drill** and ***Jiffy*-Tap**. Please consult the factory or your local distributor prior to ordering to verify all components.

To properly size a power unit, you need to know the maximum total GPM you will need and the maximum pressure you want to develop. If you are using multiple tapping or drilling units, remember to add all the flow for the motors as well as the flow required for ***Jiffy*-Drill** spindle advancement (normally 2 GPM per spindle is sufficient). Use the following equation to determine the horsepower of the motor required to turn the pump. Round horsepower up to 3, 5, 7.5, 10, 15, 20, 25 or 30.

$$horsepower = \frac{PSI \times GPM}{1714 \times \eta}$$ Where η = efficiency, use 0.85

Determine the basic "EA" Series part number using the chart below. Always choose the next higher component if close to the limit of that component's range. Normal tank size is 3-4 times the pump flow.

"EA" Series Model Number

E A _ _ _ _

NOTE:
Not All "EA" Series Model Number Combinations Are Available from Stock

"EA" Series = EA

Motor Horsepower◊

3 HP	= 0
5 HP	= 1
7½ HP	= 2
10 HP	= 3
15 HP	= 4
20 HP	= 5
25 HP	= 6
30 HP	= 7

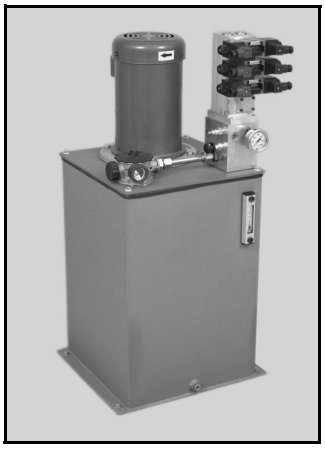
◊ All motors TEFC,1725 RPM, 230/460 VAC, 3Ø

Reservoir Size

Single Reservoir	Double-Wide Reservoirs
20 gallons = 2	40 gallons (2 x 20 gal) = 5
30 gallons = 3	60 gallons (2 x 30 gal) = 6
40 gallons = 4	80 gallons (2 x 40 gal) = 8

Pump Flow @ 1725 RPM

Fixed Displacement Gear Pumps		Variable Displacement Piston Pumps	
2.5 gpm = A	10.5 gpm = H	4.5 gpm	= Z
3.5 gpm = C	11.5 gpm = I	4 – 8 gpm	= L
5.0 gpm = E	12.5 gpm = J	6 – 12.7 gpm	= M
6.4 gpm = F	15.2 gpm = K	10 – 20 gpm	= N
8.6 gpm = G		20 – 32 gpm	= P

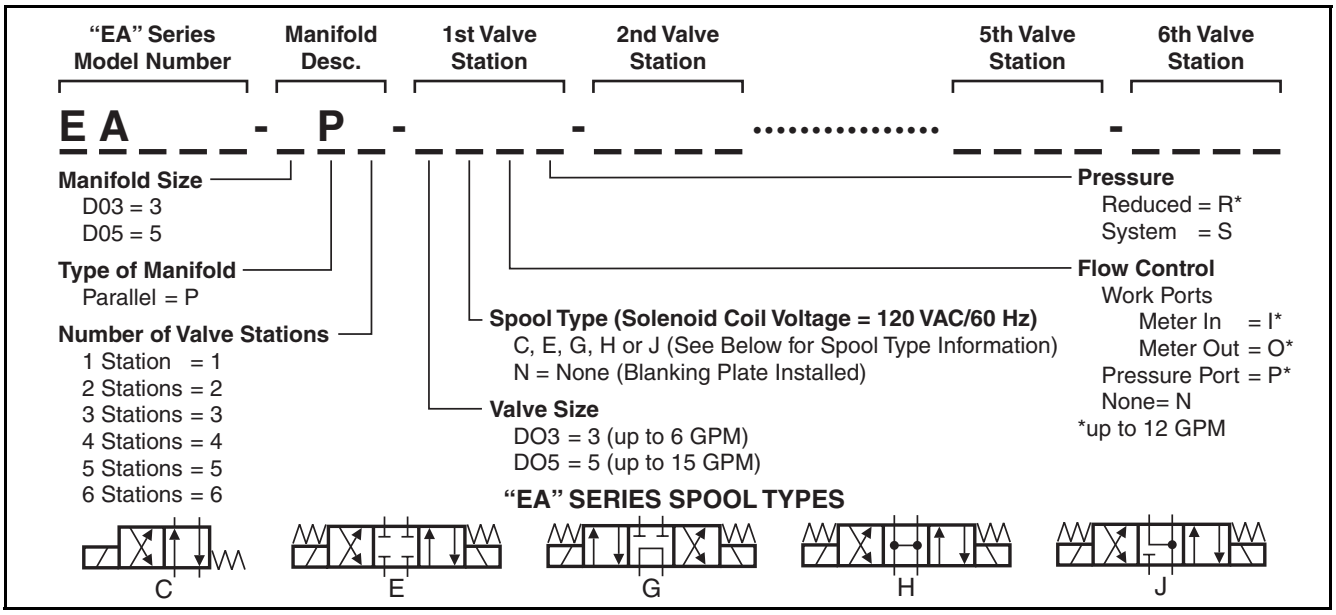


"EA" Series Without Options

"EA" Series (continued)

Adding Control Valves and Manifold

The basic "EA" Series hydraulic power unit can be supplied with control valves, pressure reducing valves, or flow controls, all plumbed using parallel bar manifold mounted directly to the power unit tank. When choosing control valves for ***Jiffy*-Tap**, use a "J" spool (all ports to tank in center position). If there is any leaking of the seals in the center position, the motor may rotate and advance the spindle. This will not occur when using a "J" spool. Valves for ***Jiffy*-Drill** can use any spool, but we recommend using "J" spools for motor control, and "E" spools for spindle control.

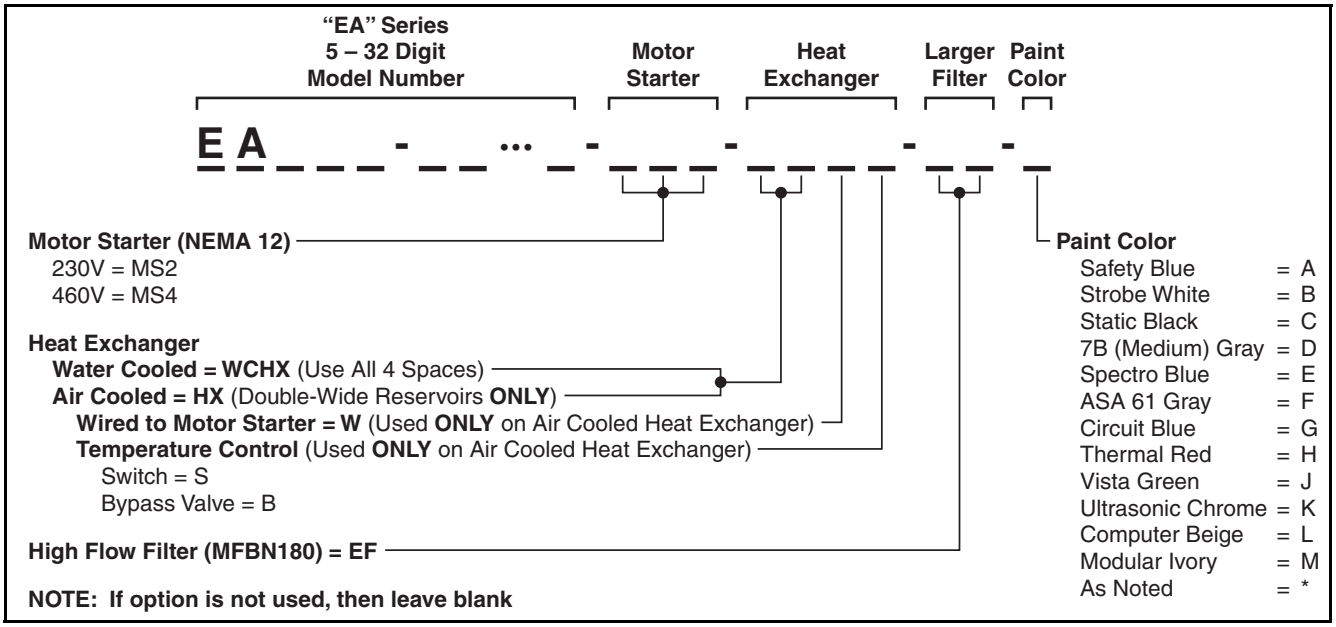


Adding Other Options

In high cycle operations, a heat exchanger is recommended. Choose between a water cooled or air cooled unit.

The power unit is primed using gray primer. If unit is to be painted, please specify color.

The following table shows the options available:

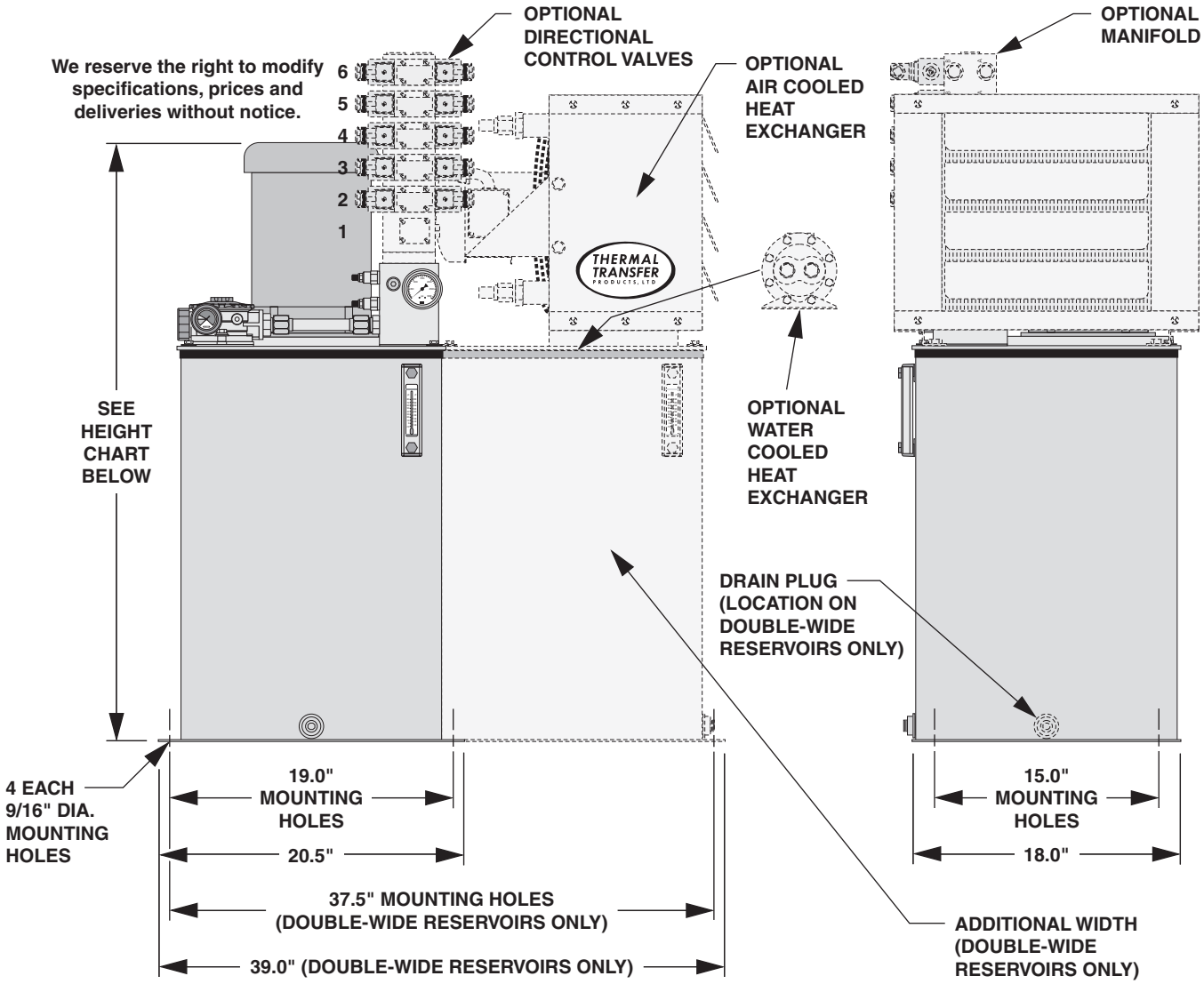


Note: You do not have to worry about sizing the hydraulic system. We will size the system for you and do it quickly.

"EA" Series (continued)

Dimensional Information

Actual configuration may change based on the components selected. Use dimensional information as a reference only.



"EA" SERIES HEIGHT* (INCHES)

MOTOR SIZE (HP)	RESERVOIR SIZE		
	20 & 40† GAL	30 & 60† GAL	40 & 80† GAL
3	35"	43"	51"
5	36"	44"	52"
7.5	38"	46"	54"
10	39"	47"	55"
15	43"	51"	59"
20		51"	59"
25		55"	63"
30		55"	63"

*Without motor starter or heat exchanger options
†Double-Wide Reservoir

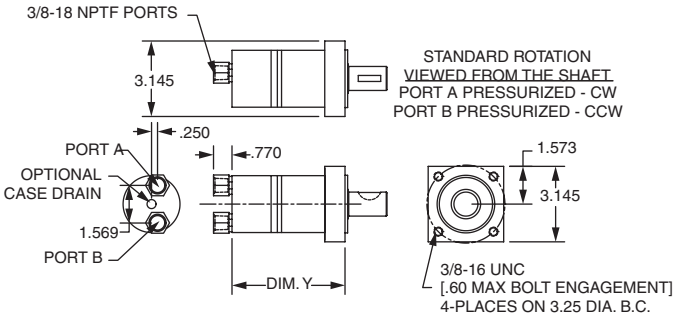
"EA" SERIES PORT SIZES

PUMP SIZE	PRESSURE PORT	RETURN PORT
A, C	Male J.I.C. 8	Male J.I.C. 12
E, F, G	Male J.I.C. 16	Male J.I.C. 12
H, I	Male J.I.C. 12	Male J.I.C. 12
J, K	Male J.I.C. 16	Male J.I.C. 12
L, M, Z	Male J.I.C. 12	Male J.I.C. 12
N	Male J.I.C. 16	Male J.I.C. 12
Manifold Working Ports SAE 8 - All Sizes		
Extra Return Port (After Filter) Male J.I.C. 12		
EF Return Port Male J.I.C. 20 (No Extra Port)		

"EA" Series units can be customized to your specifications by adding sandwich valves, oil heaters, etc.

If your power unit requirements are beyond the size and capacity listed, we can also design and build a custom hydraulic power unit to your specifications. Please consult AAA Products International.

M-Series Hydraulic Motors



Model Number	Displ. $in.^3/rev$	Dim. Y
M0	.50	4.09
M1	.79	4.21
M2	1.21	4.38
M3	1.93	4.68

Motor dimensions based on model number.

Recommended Fluids: Premium quality, anti-wear type hydraulic oil. Minimum oil viscosity (at operating temperature) should be greater than 70 SUS.

Recommended Maximum System Operating Temp.: -30°F to 180°F

For best motor life, run motor for approximately one hour at 30% of rated pressure before application to full load. Be sure motor is filled with fluid prior to any load applications.

Motor Options

Option MQM: Basic ***M-Series*** motor ordered with Quick-Change option. This options does **not** include the spindle sleeve. Order a 0.50 cu. in./rev as B0-MQM.

Option MQD: Basic ***M-Series*** motor ordered with Quick-Change option and spindle sleeve for use with a ***Jiffy*-Drill**. This option is available only on original factory order. Order a 0.50 cu. in./rev as B0-MQD.

Option MQT: Basic ***M-Series*** motor ordered with Quick-Change option and spindle sleeve for use with a ***Jiffy*-Tap**. This option is available only on original factory order. Order a 0.50 cu. in./rev as B0-MQT.

Motor Repair Kit

RKMM: Includes seals and instructions for replacing worn out or broken seals for all sizes of ***M-Series*** motors.

Note: Motors are sold with adapter plate and shaft adapter for replacement of any drive style.

The information listed is in the following format: $\frac{[Torque(in\text{–}lbs)]}{Rpm}$

M-0 (.50 $in.^3/rev$)

Flow GPM (gal./min.) \ PSI ($lbs./in.^2$)	200	400	500	600	700	800	1000	1500	2000
1	[11] 456	[25] 444	[33] 437	[40] 429	[47] 422	[55] 412	[69] 394	[102] 332	[130] 250
2	[9] 897	[24] 886	[31] 877	[38] 867	[46] 860	[53] 847	[68] 823	[105] 749	[139] 657
3	[6] 1349	[20] 1331	[28] 1318	[35] 1309	[44] 1296	[51] 1285	[65] 1261	[102] 1176	[137] 1070
4.5	0 0	[16] 1902	[23] 1885	[30] 1873	[36] 1858	[44] 1846	[60] 1817	[97] 1721	[131] 1684

M-1 (.79 $in.^3/rev$)

Flow GPM (gal./min.) \ PSI ($lbs./in.^2$)	200	400	500	600	700	800	1000	1500	2000
1	[19] 290	[43] 285	[54] 281	[65] 277	[76] 273	[88] 268	[109] 260	[164] 230	[214] 194
2	[16] 573	[39] 566	[51] 561	[63] 555	[74] 549	[86] 544	[109] 534	[165] 490	[221] 442
3	[11] 859	[35] 849	[47] 843	[58] 838	[70] 832	[82] 825	[105] 810	[163] 763	[219] 708
4	[6] 1153	[30] 1140	[41] 1135	[53] 1129	[64] 1124	[76] 1117	[99] 1101	[157] 1044	[214] 982
5.5	0 0	[19] 1575	[30] 1566	[42] 1556	[54] 1547	[65] 1539	[89] 1521	[148] 1457	[205] 1396

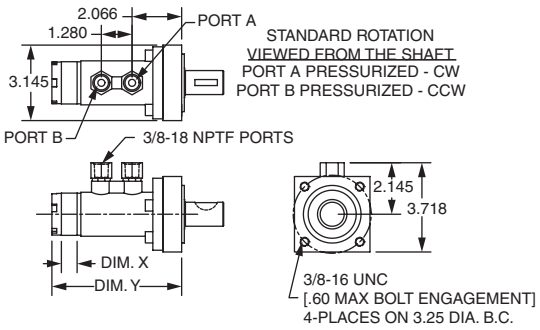
M-2 (1.21 $in.^3/rev$)

Flow GPM (gal./min.) \ PSI ($lbs./in.^2$)	200	400	500	600	700	800	1000	1500	2000
1	[32] 189	[67] 187	[85] 186	[102] 185	[119] 183	[136] 182	[170] 179	[253] 169	[321] 141
2	[30] 379	[65] 375	[83] 373	[101] 370	[119] 368	[136] 366	[172] 361	[257] 347	[328] 312
3	[21] 569	[57] 565	[75] 563	[93] 560	[111] 558	[128] 556	[163] 551	[248] 523	[325] 487
4	[12] 761	[47] 758	[65] 754	[83] 751	[101] 749	[119] 746	[154] 741	[239] 707	[316] 660
5.5	0 0	[31] 1043	[49] 1040	[67] 1035	[84] 1033	[101] 1028	[137] 1021	[218] 990	[295] 938

M-3 (1.93 $in.^3/rev$)

Flow GPM (gal./min.) \ PSI ($lbs./in.^2$)	200	400	500	600	700	800	1000	1500	1750
1	[51] 118	[106] 116	[133] 115	[160] 113	[187] 112	[213] 111	[265] 107	[383] 81	[439] 70
2	[46] 236	[103] 234	[132] 232	[159] 230	[187] 228	[214] 225	[269] 221	[387] 175	[446] 165
3	[36] 355	[94] 352	[122] 349	[149] 347	[177] 345	[205] 342	[259] 336	[377] 287	[440] 273
4	[24] 474	[79] 472	[107] 469	[135] 466	[162] 462	[190] 460	[246] 452	[362] 393	[425] 373
5.5	0 0	[55] 650	[83] 647	[111] 645	[139] 640	[167] 636	[221] 629	[334] 575	[400] 550

A-Series Hydraulic Motors



Model Number	Displ. $in.^3/rev$	Dim. X	Dim. Y
A1	.82	.25	5-13/32
A2	1.16	.375	5-13/32
A3	1.53	.50	5-13/32
A4	1.88	.625	5-17/32

Table 1: Dimensions based on model number.

Recommended Fluids: Premium quality, anti-wear type hydraulic oil. 100 SUS AT 100°F

Recommended Maximum System Operating Temp.: 130°F

Standard Seals: Motors come with T-84 jacketed teflon seals as a standard. Optional 301 stainless metal seals available.

For best motor life, run motor for approximately one hour at 30% of rated pressure before application to full load. Be sure motor is filled with fluid prior to any load applications.

Motor Options

Option MQM: Basic ***A-Series*** motor ordered with Quick-Change option. This options does **not** include the spindle sleeve.

Option MQD: Basic ***A-Series*** motor ordered with Quick-Change option for use with a ***Jiffy*-Drill**. This option is available only on original factory order.

Option MQT: Basic ***A-Series*** motor ordered with Quick-Change option for use with a ***Jiffy*-Tap**. This option is available only on original factory order.

Motor Repair Kit

RKMA: Includes seals and instructions for replacing worn out or broken seals for all sizes of ***A-Series*** motors.

Note: Motors are sold with adapter plate and shaft adapter for replacement of any drive style.

The information listed is in the following format: $\frac{[Torque(in-lbs)]}{Rpm}$

A-1 (.82 $in.^3$/rev)

Flow GPM (gal./min.) \ PSI ($lbs./in.^2$)	200	400	600	800	1000	1200	1400	1500
1	[17] 298	[37] 265	[58] 233	[78] 200	[98] 168	[119] 135	[139] 103	[149] 86
2	[14] 580	[34] 547	[54] 515	[75] 482	[95] 450	[116] 417	[136] 385	[146] 368
3	[11] 862	[31] 829	[51] 797	[72] 764	[92] 732	[113] 699	[133] 667	[143] 650
4	[8] 1144	[28] 1111	[48] 1079	[69] 1046	[89] 1014	[110] 981	[130] 948	[140] 932
6		[22] 1675	[42] 1642	[63] 1610	[83] 1577	[104] 1545	[124] 1512	[134] 1496
8		[16] 2239	[36] 2206	[57] 2174	[77] 2141	[97] 2109	[118] 2076	[128] 2060

A-2 (1.16 $in.^3$/rev)

Flow GPM (gal./min.) \ PSI ($lbs./in.^2$)	200	400	600	800	1000	1200	1400	1500
1	[29] 201	[59] 183	[88] 164	[118] 146	[148] 127	[178] 109	[207] 90	[222] 81
2	[24] 401	[53] 383	[83] 364	[113] 346	[143] 327	[172] 309	[202] 290	[217] 281
3	[18] 601	[48] 583	[78] 564	[108] 546	[137] 527	[167] 509	[197] 490	[212] 481
4	[13] 801	[43] 783	[73] 764	[102] 746	[132] 727	[162] 709	[192] 690	[206] 681
6		[32] 1183	[62] 1164	[92] 1146	[122] 1127	[151] 1109	[181] 1091	[196] 1081
8		[22] 1583	[52] 1564	[81] 1546	[111] 1528	[141] 1509	[170] 1491	[185] 1481

A-3 (1.53 $in.^3$/rev)

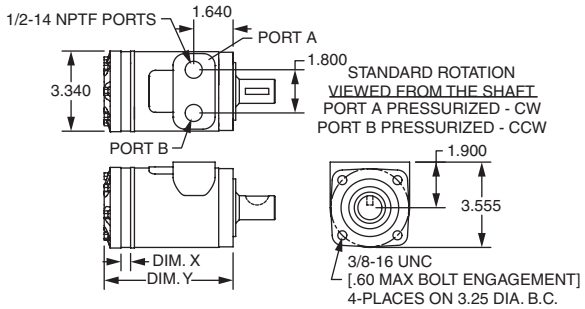
Flow GPM (gal./min.) \ PSI ($lbs./in.^2$)	200	400	600	800	1000	1200	1400	1500
1	[37] 153	[75] 146	[113] 140	[151] 133	[189] 126	[227] 118	[265] 111	[284] 107
2	[34] 302	[71] 296	[109] 289	[147] 282	[185] 275	[224] 267	[262] 260	[281] 256
3	[29] 453	[67] 446	[105] 439	[143] 432	[181] 425	[220] 418	[258] 410	[277] 406
4	[24] 605	[62] 598	[100] 591	[138] 584	[177] 577	[215] 569	[253] 562	[272] 558
6	[12] 902	[50] 900	[88] 895	[127] 890	[165] 884	[203] 877	[242] 869	[261] 865
8		[35] 1205	[74] 1203	[112] 1200	[150] 1196	[188] 1189	[227] 1182	[246] 1178

A-4 (1.88 $in.^3$/rev)

Flow GPM (gal./min.) \ PSI ($lbs./in.^2$)	200	400	600	800	1000	1200	1400	1500
1	[50] 117	[98] 110	[146] 100	[195] 88	[243] 73	[291] 54	[339] 34	[363] 22
2	[46] 233	[95] 227	[143] 217	[191] 204	[239] 188	[287] 170	[335] 149	[360] 137
3	[42] 352	[90] 345	[138] 335	[187] 322	[235] 306	[283] 288	[332] 266	[356] 254
4	[36] 474	[84] 467	[133] 456	[181] 443	[230] 427	[278] 408	[327] 386	[351] 374
6	[22] 724	[70] 717	[119] 706	[168] 692	[216] 675	[265] 655	[314] 632	[338] 620
8		[52] 978	[101] 967	[150] 952	[199] 935	[248] 914	[297] 890	[321] 877

B-Series Hydraulic Motors

The B-Series hydraulic motors are economical, efficient, small, compact, and powerful, designed for medium duty applications. These motors have the industry proven spool valve design combined with state-of-the-art gerotors. In addition, direction of shaft rotation and shaft speed can be controlled easily and smoothly throughout the speed range of the motor.



Model Number	Displ. $in.^3/rev$	Dim. X	Dim. Y
B0	2.2	0.25	5.22
B1	2.8	0.25	5.22
B1.5	3.6	0.40	5.37
B2	4.5	0.40	5.37
B3	5.9	0.52	5.49
B3.3	7.3	0.65	5.62
B3.6	8.9	0.79	5.76

Model Number	Displ. $in.^3/rev$	Dim. X	Dim. Y
B4	9.7	0.86	5.84
B5	11.3	1.00	5.97
B6	14.1	1.25	6.22
B7	17.9	1.59	6.56
B8	22.6	2.00	6.97

Table 1: Motor dimensions based on model number.

Recommended Fluids: Premium quality, anti-wear type hydraulic oil. Minimum oil viscosity (at operating temperature) should be the highest of the following: 100 SUS or $\frac{20 \times PSI}{RPM} = SUS$

Recommended Maximum System Operating Temp.: -30°F to 180°F

For best motor life, run motor for approximately one hour at 30% of rated pressure before application to full load. Be sure motor is filled with fluid prior to any load applications.

Motor Options

Option MQM: Basic ***B-Series*** motor ordered with Quick-Change option. This options does **not** include the spindle sleeve.

Option MQD: Basic ***B-Series*** motor ordered with Quick-Change option for use with a ***Jiffy*-Drill**. This option is available only on original factory order.

Option MQT: Basic ***B-Series*** motor ordered with Quick-Change option for use with a ***Jiffy*-Tap**. This option is available only on original factory order.

Motor Repair Kit

RKMB: Includes seals and instructions for replacing worn out or broken seals for all sizes of ***B-Series*** motors.

Note: B-Motors are a direct replacement for any drive style.

B-Series (continued)

The information listed is in the following format: $\frac{[Torque(in-lbs)]}{Rpm}$

B-0 (2.2 in.^{3}/rev)

Flow GPM (gal./min.)	PSI (lbs./in.^{2}) 200	400	600	800	1000	1200	1400	1600	1800
2	[49] 204	[103] 201	[162] 198	[189] 194	[270] 189	[325] 184	[379] 177	[432] 170	[489] 162
4	[47] 408	[106] 407	[160] 402	[191] 399	[274] 394	[327] 387	[384] 381	[439] 373	[495] 365
6	[44] 613	[102] 612	[158] 609	[188] 604	[272] 599	[328] 591	[383] 586	[440] 576	[496] 565
8	[40] 817	[97] 817	[153] 814	[184] 807	[270] 799	[326] 793	[383] 785	[440] 776	[497] 762
10	[36] 1021	[90] 1021	[148] 1015	[180] 1008	[265] 1001	[322] 991	[380] 981	[438] 969	[495] 959

B-1 (2.8 in.^{3}/rev)

Flow GPM (gal./min.)	PSI (lbs./in.^{2}) 200	400	600	800	1000	1200	1400	1600	1800
2	[64] 161	[136] 158	[212] 156	[284] 153	[355] 148	[426] 145	[497] 139	[567] 133	[641] 127
4	[61] 323	[139] 320	[209] 316	[286] 314	[359] 310	[429] 304	[503] 300	[576] 293	[649] 287
6	[58] 486	[134] 481	[207] 479	[282] 475	[356] 471	[430] 464	[502] 461	[577] 453	[650] 444
8	[52] 648	[128] 643	[200] 640	[276] 635	[354] 628	[428] 623	[502] 617	[577] 610	[651] 599
10	[47] 808	[118] 803	[194] 798	[269] 793	[347] 787	[423] 779	[498] 771	[575] 761	[649] 753
12	[36] 969	[109] 964	[188] 960	[260] 952	[340] 946	[417] 938	[492] 931	[567] 922	[643] 914

B-1.5 (3.6 in.^{3}/rev)

Flow GPM (gal./min.)	PSI (lbs./in.^{2}) 200	400	600	800	1000	1200	1400	1600	1800
2	[79] 127	[169] 125	[260] 123	[305] 121	[437] 117	[526] 114	[616] 109	[704] 103	[796] 96
4	[76] 254	[168] 254	[257] 251	[307] 249	[441] 246	[529] 241	[620] 236	[710] 230	[800] 224
6	[73] 381	[161] 381	[252] 380	[303] 377	[439] 373	[529] 368	[618] 364	[709] 358	[802] 349
8	[64] 508	[151] 508	[243] 508	[294] 504	[428] 500	[519] 496	[609] 491	[701] 484	[794] 476
10	[57] 635	[141] 635	[234] 634	[283] 630	[419] 626	[512] 621	[602] 614	[693] 608	[786] 601
12	[45] 762	[131] 762	[227] 762	[274] 757	[409] 753	[505] 747	[593] 741	[684] 734	[778] 728
14	[33] 889	[118] 889	[213] 887	[266] 882	[396] 877	[492] 872	[583] 866	[676] 860	[770] 851
15	[29] 953	[111] 953	[205] 951	[260] 945	[389] 940	[486] 935	[576] 929	[670] 921	[765] 913

B-2 (4.5 in.^{3}/rev)

Flow GPM (gal./min.)	PSI (lbs./in.^{2}) 200	400	600	800	1000	1200	1400	1600	1800
2	[103] 101	[220] 99	[339] 98	[454] 96	[569] 93	[685] 90	[801] 86	[916] 81	[1036] 76
4	[99] 203	[219] 201	[335] 199	[457] 197	[574] 194	[689] 191	[808] 187	[925] 182	[1042] 177
6	[94] 305	[210] 303	[328] 301	[451] 298	[571] 296	[689] 292	[805] 288	[924] 283	[1044] 276
8	[86] 406	[196] 404	[319] 402	[438] 399	[558] 396	[676] 393	[793] 388	[913] 383	[1033] 377
10	[74] 507	[183] 505	[310] 502	[422] 499	[545] 496	[667] 492	[784] 486	[903] 482	[1024] 476
12	[58] 608	[171] 606	[295] 603	[408] 600	[533] 596	[657] 591	[773] 587	[891] 581	[1013] 576
14	[43] 709	[154] 706	[277] 702	[396] 698	[515] 694	[640] 691	[760] 686	[880] 681	[1002] 674
15	[36] 760	[145] 757	[268] 753	[387] 749	[506] 744	[632] 740	[750] 735	[873] 729	[996] 723

B-3 (5.9 in.^{3}/rev)

Flow GPM (gal./min.)	PSI (lbs./in.^{2}) 200	400	600	800	1000	1200	1400	1600	1800
2	[134] 78	[292] 76	[442] 75	[593] 73	[746] 71	[899] 68	[1054] 65	[1209] 61	[1365] 55
4	[131] 156	[281] 155	[436] 153	[596] 151	[750] 149	[903] 147	[1059] 143	[1212] 139	[1367] 134
6	[126] 234	[269] 233	[425] 231	[588] 230	[747] 228	[900] 224	[1054] 221	[1206] 217	[1368] 210
8	[110] 312	[246] 311	[408] 310	[566] 308	[718] 305	[873] 303	[1023] 300	[1177] 295	[1339] 291
10	[96] 390	[231] 389	[392] 387	[539] 385	[699] 383	[859] 380	[1005] 376	[1156] 373	[1318] 368
12	[77] 468	[218] 467	[378] 465	[522] 463	[681] 460	[844] 457	[990] 453	[1142] 449	[1301] 445
14	[60] 546	[197] 544	[358] 542	[513] 539	[662] 537	[828] 535	[973] 531	[1131] 526	[1293] 521
15	[52] 585	[189] 583	[346] 581	[495] 578	[651] 575	[819] 573	[963] 569	[1126] 564	[1286] 559

B-3.3(7.3 in.^{3}/rev)

Flow GPM (gal./min.)	PSI (lbs./in.^{2}) 200	400	600	800	1000	1200	1400	1600	1800
2	[162] 62	[357] 61	[544] 61	[736] 59	[927] 58	[1116] 55	[1305] 53	[1498] 49	[1687] 45
4	[160] 125	[348] 124	[539] 123	[736] 121	[930] 120	[1119] 119	[1316] 116	[1506] 114	[1698] 110
6	[155] 188	[338] 187	[530] 186	[729] 185	[923] 183	[1116] 180	[1310] 178	[1500] 175	[1699] 170
8	[139] 250	[319] 250	[515] 249	[710] 247	[901] 245	[1094] 243	[1283] 241	[1476] 237	[1673] 233
10	[121] 313	[303] 312	[497] 311	[686] 309	[883] 308	[1081] 306	[1267] 302	[1460] 300	[1655] 296
12	[102] 375	[288] 374	[480] 373	[664] 371	[862] 370	[1060] 367	[1246] 365	[1440] 361	[1640] 358
14	[78] 438	[263] 437	[458] 435	[652] 433	[841] 431	[1041] 430	[1228] 427	[1420] 423	[1616] 419
15	[67] 469	[253] 468	[446] 466	[632] 464	[828] 462	[1030] 460	[1214] 458	[1411] 454	[1608] 450

B-Series (continued)

B-3.6 (8.9 in.^{3}/rev)

PSI (lbs./in.^{2})

Flow GPM (gal./min.)	200	400	600	800	1000	1200	1400	1600	1700
2	[198] 51	[435] 50	[664] 50	[897] 49	[1130] 47	[1361] 45	[1591] 43	[1827] 40	[1942] 39
4	[196] 103	[424] 102	[657] 101	[898] 99	[1133] 99	[1365] 97	[1604] 95	[1836] 93	[1954] 92
6	[189] 154	[412] 153	[646] 152	[889] 151	[1125] 150	[1361] 148	[1598] 146	[1829] 143	[1951] 141
8	[169] 205	[389] 205	[628] 204	[866] 203	[1098] 201	[1333] 200	[1564] 197	[1799] 195	[1919] 193
10	[148] 257	[369] 256	[605] 255	[836] 253	[1076] 252	[1318] 251	[1544] 248	[1780] 246	[1899] 244
12	[125] 308	[351] 307	[586] 306	[810] 305	[1051] 303	[1293] 301	[1519] 299	[1756] 296	[1878] 295
14	[95] 359	[321] 358	[558] 357	[795] 355	[1026] 354	[1290] 352	[1497] 350	[1731] 347	[1851] 346
15	[82] 385	[308] 384	[544] 383	[771] 381	[1010] 379	[1256] 378	[1480] 375	[1720] 373	[1840] 371

B-4 (9.7 in.^{3}/rev)

PSI (lbs./in.^{2})

Flow GPM (gal./min.)	200	400	600	800	1000	1200	1400	1600	1650
2	[209] 47	[465] 46	[715] 46	[937] 45	[1228] 44	[1478] 42	[1724] 40	[1981] 38	[2046] 37
4	[210] 94	[460] 94	[710] 93	[971] 91	[1229] 91	[1480] 90	[1745] 89	[1996] 87	[2059] 87
6	[205] 141	[454] 141	[704] 140	[965] 139	[1216] 138	[1477] 136	[1738] 134	[1991] 132	[2055] 132
8	[186] 188	[440] 188	[683] 187	[951] 186	[1205] 185	[1461] 183	[1716] 181	[1973] 179	[2038] 178
10	[164] 235	[422] 234	[671] 234	[930] 232	[1189] 232	[1451] 230	[1702] 228	[1965] 226	[2032] 225
12	[144] 282	[404] 281	[652] 281	[900] 279	[1163] 279	[1421] 277	[1674] 275	[1937] 273	[2004] 272
14	[109] 330	[374] 329	[623] 328	[883] 327	[1140] 325	[1396] 323	[1653] 322	[1900] 319	[1963] 319
15	[92] 353	[359] 352	[612] 351	[861] 350	[1123] 348	[1381] 347	[1633] 345	[1886] 343	[1950] 342

B-5 (11.3 in.^{3}/rev)

PSI (lbs./in.^{2})

Flow GPM (gal./min.)	200	400	600	800	1000	1200	1400	1600
2	[257] 40	[554] 40	[847] 39	[1150] 38	[1447] 37	[1739] 36	[2035] 33	[2320] 29
4	[254] 81	[546] 81	[845] 80	[1145] 79	[1448] 78	[1744] 77	[2049] 76	[2343] 74
6	[246] 121	[540] 121	[834] 120	[1137] 120	[1434] 119	[1736] 117	[2036] 115	[2337] 112
8	[224] 162	[520] 162	[820] 161	[1117] 160	[1414] 159	[1716] 157	[2014] 155	[2315] 152
10	[202] 202	[499] 202	[793] 201	[1095] 201	[1394] 200	[1699] 198	[1997] 196	[2299] 193
12	[176] 243	[475] 242	[767] 242	[1063] 241	[1368] 240	[1664] 238	[1969] 236	[2268] 234
14	[140] 283	[443] 283	[735] 282	[1035] 281	[1340] 280	[1637] 279	[1936] 277	[2227] 274
15	[120] 304	[425] 303	[719] 302	[1014] 301	[1320] 300	[1618] 299	[1914] 297	[2205] 294

B-6 (14.1 in.^{3}/rev)

PSI (lbs./in.^{2})

Flow GPM (gal./min.)	200	400	600	800	1000	1200	1400	1450
2	[338] 32	[707] 32	[1074] 31	[1456] 30	[1827] 30	[2192] 28	[2572] 26	[2657] 25
4	[328] 65	[695] 65	[1076] 64	[1447] 63	[1827] 62	[2201] 62	[2577] 60	[2699] 60
6	[317] 97	[687] 97	[1057] 97	[1434] 96	[1811] 95	[2186] 94	[2555] 92	[2650] 91
8	[289] 130	[659] 130	[1038] 130	[1406] 129	[1777] 128	[2160] 127	[2531] 124	[2625] 124
10	[265] 162	[631] 162	[1004] 162	[1381] 162	[1751] 160	[2131] 158	[2510] 156	[2602] 156
12	[230] 195	[599] 195	[968] 194	[1345] 194	[1722] 193	[2088] 192	[2480] 189	[2571] 189
14	[191] 227	[563] 227	[927] 227	[1299] 226	[1686] 226	[2058] 224	[2428] 222	[2519] 221
15	[167] 243	[538] 243	[904] 243	[1279] 242	[1661] 242	[2030] 240	[2404] 238	[2493] 238

B-7 (17.9 in.^{3}/rev)

PSI (lbs./in.^{2})

Flow GPM (gal./min.)	200	400	600	800	1000	1200	1350
2	[427] 26	[893] 25	[1361] 25	[1829] 24	[2293] 22	[2672] 16	[2977] 13
4	[419] 51	[886] 51	[1362] 51	[1833] 50	[2305] 49	[2771] 47	[3110] 44
6	[402] 77	[872] 77	[1342] 76	[1819] 76	[2291] 74	[2757] 71	[3098] 68
8	[367] 102	[838] 102	[1316] 102	[1785] 101	[2252] 100	[2723] 98	[3070] 95
10	[332] 128	[803] 128	[1276] 128	[1749] 127	[2215] 126	[2684] 123	[3034] 120
12	[289] 153	[760] 153	[1230] 153	[1706] 153	[2177] 151	[2634] 149	[2989] 146
14	[241] 179	[712] 179	[1176] 179	[1650] 179	[2126] 177	[2592] 175	[2935] 172
15	[211] 192	[683] 192	[1149] 192	[1623] 191	[2096] 190	[2558] 188	[2905] 185

B-8 (22.6 in.^{3}/rev)

PSI (lbs./in.^{2})

Flow GPM (gal./min.)	200	400	600	800	1000	1200	1250
2	[537] 20	[1121] 20	[1715] 20	[2285] 19	[2862] 16		
4	[532] 40	[1123] 40	[1715] 40	[2308] 39	[2893] 38	[3467] 36	[3604] 35
6	[508] 61	[1100] 61	[1693] 61	[2294] 60	[2884] 58	[3458] 55	[3598] 53
8	[463] 81	[1060] 81	[1661] 81	[2255] 80	[2840] 79	[3414] 76	[3557] 74
10	[414] 101	[1017] 101	[1613] 101	[2203] 101	[2788] 99	[3363] 96	[3506] 94
12	[363] 121	[960] 121	[1553] 121	[2152] 121	[2737] 119	[3305] 116	[3446] 115
14	[303] 142	[897] 142	[1484] 142	[2086] 142	[2667] 140	[3246] 137	[3386] 136
15	[266] 152	[862] 152	[1452] 152	[2050] 152	[2630] 150	[3206] 148	[3347] 147

Notes:

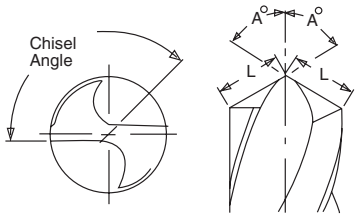
Reference Data Section

Drill Points Suggested for Various Materials

The follow data is supplied by Regal Cutting Tools.

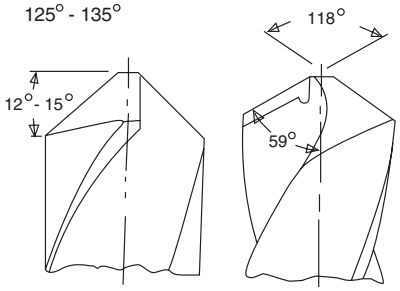
NOTE: Point designs illustrated are not necessarily available from factory stock. Grinds suggested may be made and evaluated by user.

IMPORTANT: Lip lengths and angles must be equal.



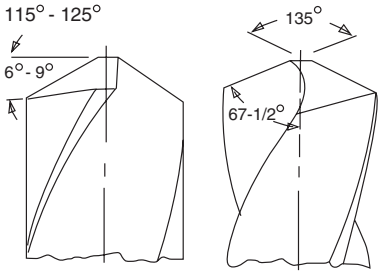
BRASS and SOFT BRONZE

CHISEL ANGLE
125° - 135°



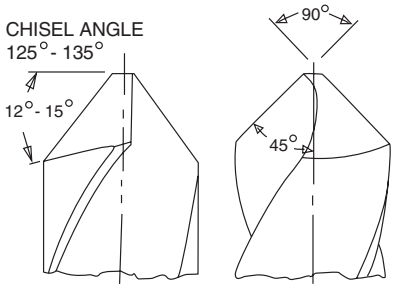
HARD and TOUGH MATERIALS, MANGANESE STEEL RAILS, etc.

CHISEL ANGLE
115° - 125°



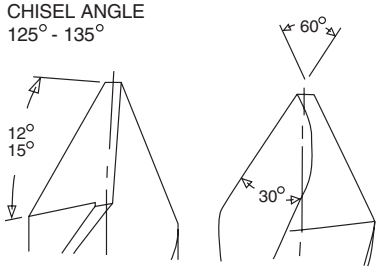
HARD WOOD, BAKELITE, HARD RUBBER and FIBERS, SOFT and MEDIUM CAST IRON

CHISEL ANGLE
125° - 135°



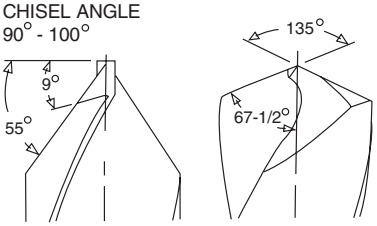
WOOD, RUBER, BAKELITE, FIBER, MOLDED PLASTICS

CHISEL ANGLE
125° - 135°



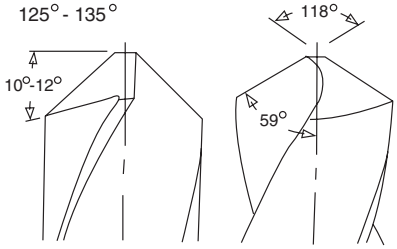
CRANKSHAFT or SPLIT POINT for DEEP HOLES
Overcomes excessive thrust (due to heavy web) HARD and TOUGH MATERIALS

CHISEL ANGLE
90° - 100°



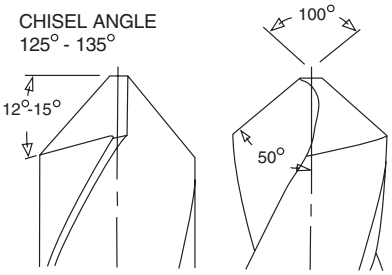
REGULAR POINT...GENERAL PURPOSE, MILD STEELS, LAMINATED PLASTICS, etc.

CHISEL ANGLE
125° - 135°



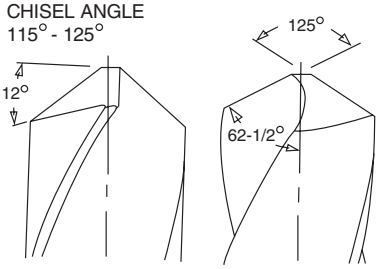
SOFT ALUMINUM, MAGNESIUM, COPPER and MEDIUM HARD BRASS

CHISEL ANGLE
125° - 135°



HEAT TREATED STEELS, DROP FORGINGS and CONNECTING RODS

CHISEL ANGLE
115° - 125°



Decimal and Millimeter Equivalents of Fractional Inches

Fraction	Decimal	mm
1/64	0.0156	0.3969
1/32	0.0313	0.7938
3/64	0.0469	1.1906
1/16	0.0625	1.5875
5/64	0.0781	1.9844
3/32	0.0938	2.3813
7/64	0.1094	2.7781
1/8	0.1250	3.1750
9/64	0.1406	3.5719
5/32	0.1563	3.9688
11/64	0.1719	4.3656
3/16	0.1875	4.7625
13/64	0.2031	5.1594
7/32	0.2188	5.5563
15/64	0.2344	5.9531
1/4	0.2500	6.3500
17/64	0.2656	6.7469
9/32	0.2813	7.1438
19/64	0.2969	7.5406
5/16	0.3125	7.9375
21/64	0.3281	8.3344
11/32	0.3438	8.7313
23/64	0.3594	9.1281
3/8	0.3750	9.5250
25/64	0.3906	9.9219
13/32	0.4063	10.3188
27/64	0.4219	10.7156
7/16	0.4375	11.1125
29/64	0.4531	11.5094
15/32	0.4688	11.9063
31/64	0.4844	12.3031
1/2	0.5000	12.7000
33/64	0.5156	13.0969
17/32	0.5313	13.4938
35/64	0.5469	13.8906
9/16	0.5625	14.2875
37/64	0.5781	14.6844
19/32	0.5938	15.0813
39/64	0.6094	15.4781
5/8	0.6250	15.8750
41/64	0.6406	16.2719
21/32	0.6563	16.6688
43/64	0.6719	17.0656
11/16	0.6875	17.4625
45/64	0.7031	17.8594
23/32	0.7188	18.2563
47/64	0.7344	18.6531
3/4	0.7500	19.0500
49/64	0.7656	19.4469
25/32	0.7813	19.8438
51/64	0.7969	20.2406
13/16	0.8125	20.6375
53/64	0.8281	21.0344
27/32	0.8438	21.4313
55/64	0.8594	21.8281
7/8	0.8750	22.2250
57/64	0.8906	22.6219
29/32	0.9063	23.0188
59/64	0.9219	23.4156
15/16	0.9375	23.8125
61/64	0.9531	24.2094
31/32	0.9688	24.6063
63/64	0.9844	25.0031
1	1.0000	25.4000
1-1/64	1.0156	25.7969
1-1/32	1.0313	26.1938
1-3/64	1.0469	26.5906
1-1/16	1.0625	26.9875
1-5/64	1.0781	27.3844
1-3/32	1.0938	27.7813
1-7/64	1.1094	28.1781
1-1/8	1.1250	28.5750
1-9/64	1.1406	28.9719
1-5/32	1.1563	29.3688
1-11/64	1.1719	29.7656
1-3/16	1.1875	30.1625
1-13/64	1.2031	30.5594
1-7/32	1.2188	30.9563
1-15/64	1.2344	31.3531
1-1/4	1.2500	31.7500
1-17/64	1.2656	32.1469
1-9/32	1.2813	32.5438
1-19/64	1.2969	32.9406
1-5/16	1.3125	33.3375
1-21/64	1.3281	33.7344
1-11/32	1.3438	34.1313
1-23/64	1.3594	34.5281
1-3/8	1.3750	34.9250
1-25/64	1.3906	35.3219
1-13/32	1.4063	35.7188
1-27/64	1.4219	36.1156
1-7/16	1.4375	36.5125
1-29/64	1.4531	36.9094
1-15/32	1.4688	37.3063
1-31/64	1.4844	37.7031
1-1/2	1.5000	38.1000
1-33/64	1.5156	38.4969
1-17/32	1.5313	38.8938
1-35/64	1.5469	39.2906
1-9/16	1.5625	39.6875
1-37/64	1.5781	40.0844
1-19/32	1.5938	40.4813
1-39/64	1.6094	40.8781
1-5/8	1.6250	41.2750
1-41/64	1.6406	41.6719
1-21/32	1.6563	42.0688
1-43/64	1.6719	42.4656
1-11/16	1.6875	42.8625
1-45/64	1.7031	43.2594
1-23/32	1.7188	43.6563
1-47/64	1.7344	44.0531
1-3/4	1.7500	44.4500
1-49/64	1.7656	44.8469
1-25/32	1.7813	45.2438
1-51/64	1.7969	45.6406
1-13/16	1.8125	46.0375
1-53/64	1.8281	46.4344
1-27/32	1.8438	46.8313
1-55/64	1.8594	47.2281
1-7/8	1.8750	47.6250
1-57/64	1.8906	48.0219
1-29/32	1.9063	48.4188
1-59/64	1.9219	48.8156
1-15/16	1.9375	49.2125
1-61/64	1.9531	49.6094
1-31/32	1.9688	50.0063
1-63/64	1.9844	50.4031
2	2.0000	50.8000
2-1/64	2.0156	51.1969
2-1/32	2.0313	51.5938
2-3/64	2.0469	51.9906
2-1/16	2.0625	52.3875
2-5/64	2.0781	52.7844
2-3/32	2.0938	53.1813
2-7/64	2.1094	53.5781
2-1/8	2.1250	53.9750
2-9/64	2.1406	54.3719
2-5/32	2.1563	54.7688
2-11/64	2.1719	55.1656
2-3/16	2.1875	55.5625
2-13/64	2.2031	55.9594
2-7/32	2.2188	56.3563
2-15/64	2.2344	56.7531
2-1/4	2.2500	57.1500
2-17/64	2.2656	57.5469
2-9/32	2.2813	57.9438
2-19/64	2.2969	58.3406
2-5/16	2.3125	58.7375
2-21/64	2.3281	59.1344
2-11/32	2.3438	59.5313
2-23/64	2.3594	59.9281
2-3/8	2.3750	60.3250
2-25/64	2.3906	60.7219
2-13/32	2.4063	61.1188
2-27/64	2.4219	61.5156
2-7/16	2.4375	61.9125
2-29/64	2.4531	62.3094
2-15/32	2.4688	62.7063
2-31/64	2.4844	63.1031
2-1/2	2.5000	63.5000
2-33/64	2.5156	63.8969
2-17/32	2.5313	64.2938
2-35/64	2.5469	64.6906
2-9/16	2.5625	65.0875
2-37/64	2.5781	65.4844
2-19/32	2.5938	65.8813
2-39/64	2.6094	66.2781
2-5/8	2.6250	66.6750
2-41/64	2.6406	67.0719
2-21/32	2.6563	67.4688
2-43/64	2.6719	67.8656
2-11/16	2.6875	68.2625
2-45/64	2.7031	68.6594
2-23/32	2.7188	69.0563
2-47/64	2.7344	69.4531
2-3/4	2.7500	69.8500
2-49/64	2.7656	70.2469
2-25/32	2.7813	70.6438
2-51/64	2.7969	71.0406
2-13/16	2.8125	71.4375
2-53/64	2.8281	71.8344
2-27/32	2.8438	72.2313
2-55/64	2.8594	72.6281
2-7/8	2.8750	73.0250
2-57/64	2.8906	73.4219
2-29/32	2.9063	73.8188
2-59/64	2.9219	74.2156
2-15/16	2.9375	74.6125
2-61/64	2.9531	75.0094
2-31/32	2.9688	75.4063
2-63/64	2.9844	75.8031
3	3.0000	76.2000

Decimal and Millimeter Equivalents of Wire, Fractional and Letter Size Drills

Drill Size	Decimal	mm
80	0.0135	0.3429
79	0.0145	0.3683
1/64	0.0156	0.3969
78	0.0160	0.4064
77	0.0180	0.4572
76	0.0200	0.5080
75	0.0210	0.5334
74	0.0225	0.5715
73	0.0240	0.6096
72	0.0250	0.6350
71	0.0260	0.6604
70	0.0280	0.7112
69	0.0292	0.7417
68	0.0310	0.7874
1/32	0.0313	0.7938
67	0.0320	0.8128
66	0.0330	0.8382
65	0.0350	0.8890
64	0.0360	0.9144
63	0.0370	0.9398
62	0.0380	0.9652
61	0.0390	0.9906
60	0.0400	1.0160
59	0.0410	1.0414
58	0.0420	1.0668
57	0.0430	1.0922
56	0.0465	1.1811
3/64	0.0469	1.1906
55	0.0520	1.3208
54	0.0550	1.3970
53	0.0595	1.5113
1/16	0.0625	1.5875
52	0.0635	1.6129
51	0.0670	1.7018
50	0.0700	1.7780
49	0.0730	1.8542
48	0.0760	1.9304
5/64	0.0781	1.9844
47	0.0785	1.9939
46	0.0810	2.0574
45	0.0820	2.0828
44	0.0860	2.1844
43	0.0890	2.2606
42	0.0935	2.3749
3/32	0.0938	2.3813
41	0.0960	2.4384
40	0.0980	2.4892
39	0.0995	2.5273
38	0.1015	2.5781
37	0.1040	0.2642
36	0.1065	2.7051
7/64	0.1094	2.7781
35	0.1100	2.7940
34	0.1110	2.8194
33	0.1130	2.8702
32	0.1160	2.9464
31	0.1200	3.0480
1/8	0.1250	3.1750
30	0.1285	3.2639
29	0.1360	3.4544
28	0.1405	3.5687
9/64	0.1406	3.5719
27	0.1440	3.6576
26	0.1470	3.7338
25	0.1495	3.7973
24	0.1520	3.8608
23	0.1540	3.9116
5/32	0.1563	3.9688
22	0.1570	3.9878
21	0.1590	4.0386
20	0.1610	4.0894
19	0.1660	4.2164
18	0.1695	4.3053
11/64	0.1719	4.3656
17	0.1730	4.3942
16	0.1770	4.4958
15	0.1800	4.5720
14	0.1820	4.6228
13	0.1850	4.6990
3/16	0.1875	4.7625
12	0.1890	4.8006
11	0.1910	4.8514
10	0.1935	4.9149
9	0.1960	4.9784
8	0.1990	5.0546
7	0.2010	5.1054
13/64	0.2031	5.1594
6	0.2040	5.1816
5	0.2055	5.2197
4	0.2090	5.3086
3	0.2130	5.4102
7/32	0.2188	5.5563
2	0.2210	5.6134
1	0.2280	5.7912
A	0.2340	5.9436
15/64	0.2344	5.9531
B	0.2380	6.0452
C	0.2420	6.1468
D	0.2460	6.2484
1/4	0.2500	6.3500
E	0.2500	6.3500
F	0.2570	6.5278
G	0.2610	6.6294
17/64	0.2656	6.7469
H	0.2660	6.7564
I	0.2720	6.9088
J	0.2770	7.0358
K	0.2810	7.1374
9/32	0.2813	7.1438
L	0.2900	7.3660
M	0.2950	7.4930
19/64	0.2969	7.5406
N	0.3020	7.6708
5/16	0.3125	7.9375
O	0.3160	8.0264
P	0.3230	8.2042
21/64	0.3281	8.3344
Q	0.3320	8.4328
R	0.3390	8.6106
11/32	0.3438	8.7313
S	0.3480	8.8392
T	0.3580	9.0932
23/64	0.3594	9.1281
U	0.3680	9.3472
3/8	0.3750	9.5250
V	0.3770	9.5758
W	0.3860	9.8044
25/64	0.3906	9.9219
X	0.3970	10.0838
Y	0.4040	10.2616
13/32	0.4063	10.3188
Z	0.4130	10.4902
27/64	0.4219	10.7156
7/16	0.4375	11.1125
29/64	0.4531	11.5094
15/32	0.4688	11.9063
31/64	0.4844	12.3031
1/2	0.5000	12.7000

Millimeters Converted to Decimal Inches

mm	Inches	mm	Inches	mm	Inches	mm	Inches	mm	Inches
0.50	0.0197	8.00	0.3150	15.50	0.6102	23.00	0.9055	30.50	1.2008
1.00	0.0394	8.50	0.3346	16.00	0.6299	23.50	0.9252	31.00	1.2205
1.50	0.0591	9.00	0.3543	16.50	0.6496	24.00	0.9449	31.50	1.2402
2.00	0.0787	9.50	0.3740	17.00	0.6693	24.50	0.9646	32.00	1.2598
2.50	0.0984	10.00	0.3937	17.50	0.6890	25.00	0.9843	32.50	1.2795
3.00	0.1181	10.50	0.4134	18.00	0.7087	25.50	1.0039	33.00	1.2992
3.50	0.1378	11.00	0.4331	18.50	0.7283	26.00	1.0236	33.50	1.3189
4.00	0.1575	11.50	0.4528	19.00	0.7480	26.50	1.0433	34.00	1.3386
4.50	0.1772	12.00	0.4724	19.50	0.7677	27.00	1.0630	34.50	1.3583
5.00	0.1969	12.50	0.4921	20.00	0.7874	27.50	1.0827	35.00	1.3780
5.50	0.2165	13.00	0.5118	20.50	0.8071	28.00	1.1024	35.50	1.3976
6.00	0.2362	13.50	0.5315	21.00	0.8268	28.50	1.1220	36.00	1.4173
6.50	0.2559	14.00	0.5512	21.50	0.8465	29.00	1.1417	36.50	1.4370
7.00	0.2756	14.50	0.5709	22.00	0.8661	29.50	1.1614	37.00	1.4567
7.50	0.2953	15.00	0.5906	22.50	0.8858	30.00	1.1811	37.50	1.4764

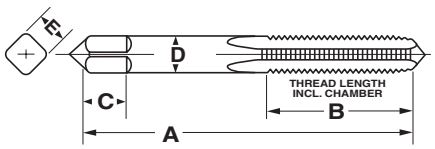
For other values use the following conversion: to convert millimeters to inches divide by 25.4

Hardness Conversion Numbers For Steel

Brinell 3000 kg. Load 10 mm. Ball		ROCKWELL		Tensile Strength PSI Approx.
Diameter mm	Hardness Number	B Scale	C Scale	
2.25	745		65.3	
2.30	712			
2.35	682		61.7	
2.40	653		60.0	
2.45	627		58.7	
2.50	601		57.3	
2.55	578		56.0	
2.60	555		54.7	298,000
2.65	534		53.5	288,000
2.70	514		52.1	274,000
2.75	495		51.0	264,000
2.80	477		49.6	252,000
2.85	461		48.5	242,000
2.90	444		47.1	230,000
2.95	429		45.7	219,000
3.00	415		44.5	212,000
3.05	401		43.1	202,000
3.10	338		41.8	193,000
3.15	375		40.4	184,000
3.20	363		39.1	177,000
3.25	352	110.0	37.9	170,000
3.30	341	109.0	36.6	163,000
3.35	331	108.5	35.5	158,000
3.40	321	108.0	34.3	152,000
3.45	311	107.5	33.1	147,000
3.50	302	107.0	32.1	143,000
3.55	293	106.0	30.9	139,000
3.60	285	105.5	2.9	136,000
3.65	277	104.5	28.8	131,000
3.70	269	104.0	27.6	128,000

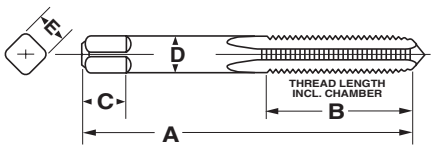
Brinell 3000 kg. Load 10 mm. Ball		ROCKWELL		Tensile Strength PSI Approx.
Diameter mm	Hardness Number	B Scale	C Scale	
3.75	262	103.0	26.6	125,000
3.80	255	102.0	25.4	121,000
3.85	248	101.0	24.2	118,000
3.90	241	100.0	22.8	114,000
3.95	235	99.0	21.7	111,000
4.00	229	98.2	20.5	109,000
4.05	223	97.3	18.8	104,000
4.10	217	96.4	17.5	103,000
4.15	212	95.5	16.0	100,000
4.20	207	94.6	15.2	99,000
4.25	201	93.8	13.8	97,000
4.30	197	92.8	12.7	94,000
4.35	192	91.9	11.5	92,000
4.40	187	90.7	10.0	90,000
4.45	183	90.0	9.0	89,000
4.50	179	89.0	8.0	88,000
4.55	174	87.8	6.4	86,000
4.60	170	86.8	5.4	84,000
4.65	167	86.0	4.4	83,000
4.70	163	85.0	3.3	82,000
4.80	156	82.9	0.9	80,000
4.90	149	80.8		
5.00	143	78.7		
5.10	137	76.4		
5.20	131	74.0		
5.30	126	72.0		
5.40	121	69.8		
5.50	116	67.6		
5.60	111	65.7		

Standard Tap Dimensions



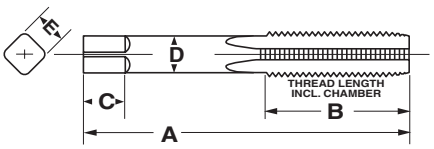
Size #0-12 Machine Screw
Sizes 1.6-6.3 mm

STYLE-1



Size #14 Machine Screw
Sizes 7-10 mm

STYLE-2

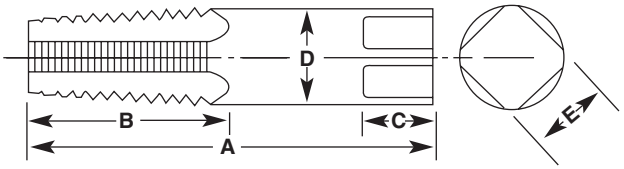


Sizes larger than 3/8"
Sizes 12 mm and larger

STYLE-3

Nominal Diameter Range (in.)		Mach. Screw Size No.	Nominal Fractional Diameter (in.)	Nominal Metric Diameter (mm)	Style	Tap Dimensions - Inches				
Over	To (incl.)					Length Overall A	Length of Thread B	Length of Square C	Diameter of Shank D	Size of Square E
.052	.065	0	1/16	M1.6	1	1-5/8	5/16	3/16	.141	.110
.065	.078	1	-	M1.8	1	1-11/16	3/8	3/16	.141	.110
.078	.091	2	-	M2, M2.2	1	1-3/4	7/16	3/16	.141	.110
.091	.104	3	3/32	M2.5	1	1-13/16	1/2	3/16	.141	.110
.104	.117	4	-	-	1	1-7/8	9/16	3/16	.141	.110
.117	.130	5	1/8	M3, M3.15	1	1-15/16	5/8	3/16	.141	.110
.130	.145	6	-	M3.5	1	2	11/16	3/16	.141	.110
.145	.171	8	5/32	M4	1	2-1/8	3/4	1/4	.168	.131
.171	.197	10	3/16	M4.5, M5	1	2-3/8	7/8	1/4	.194	.152
.197	.223	12	7/32	-	1	2-3/8	15/16	9/32	.220	.165
.223	.260	14	1/4	M6, M6.3	2	2-1/2	1	5/16	.255	.191
.260	.323	-	5/16	M7, M8	2	2-23/32	1-1/8	3/8	.318	.238
.323	.395	-	3/8	M10	2	2-15/16	1-1/4	7/16	.381	.286
.395	.448	-	7/16	-	3	3-5/32	1-7/16	13/32	.323	.242
.448	.510	-	1/2	M12, M12.5	3	3-3/8	1-21/32	7/16	.367	.275
.510	.573	-	9/16	M14	3	3-19/32	1-21/32	1/2	.429	.322
.573	.635	-	5/8	M16	3	3-13/16	1-13/16	9/16	.480	.360
.635	.709	-	11/16	M18	3	4-1/32	1-13/16	5/8	.542	.406
.709	.760	-	3/4	-	3	4-1/4	2	11/16	.590	.442
.760	.823	-	13/16	M20	3	4-15/32	2	11/16	.652	.489
.823	.885	-	7/8	M22	3	4-11/16	2-7/32	3/4	.697	.523
.885	.948	-	15/16	M24	3	4-29/32	2-7/32	3/4	.760	.570
.948	1.010	-	1	M25	3	5-1/8	2-1/2	13/16	.800	.600
1.010	1.073	-	1-1/16	M27	3	5-1/8	2-1/2	7/8	.896	.672
1.073	1.135		1-1/8		3	5-7/16	2-9/16	7/8	.896	.672
1.135	1.198		1-3/16	M30	3	5-7/16	2-9/16	1	1.021	.766
1.198	1.260		1-1/4		3	5-3/4	2-9/16	1	1.021	.766
1.260	1.323		1-5/16	M33	3	5-3/4	2-9/16	1-1/16	1.108	.831
1.323	1.385		1-3/8		3	6-1/16	3	1-1/16	1.108	.831
1.385	1.448		1-7/16	M36	3	6-1/16	3	1-1/8	1.233	.925
1.448	1.510		1-1/2		3	6-3/8	3	1-1/8	1.233	.925
1.510	1.635		1-5/8	M39	3	6-11/16	3-3/16	1-1/8	1.305	.979
1.635	1.760		1-3/4	M42	3	7	3-3/16	1-1/4	1.430	1.072
1.760	1.885		1-7/8		3	7-5/16	3-9/16	1-1/4	1.519	1.139
1.885	2.010		2	M48	3	7-5/8	3-9/16	1-3/8	1.644	1.233
2.010	2.135		2-1/8		3	8	3-9/16	1-3/8	1.769	1.327
2.135	2.260		2-1/4	M56	3	8-1/4	3-9/16	1-7/16	1.894	1.420
2.260	2.385		2-3/8		3	8-1/2	4	1-7/16	2.019	1.514
2.385	2.510		2-1/2		3	8-3/4	4	1-1/2	2.100	1.575
2.510	2.635		2-5/8	M64	3	8-3/4	4	1-1/2	2.225	1.669
2.635	2.760		2-3/4		3	9-1/4	4	1-9/16	2.350	1.762
2.760	2.885		2-7/8	M72	3	9-1/4	4	1	2.475	1.856
2.885	3.010		3		3	9-3/4	4-9/16	1-5/8	2.543	1.907
3.010	3.135		3-1/8		3	9-3/4	4-9/16	1-5/8	2.668	2.001
3.135	3.260		3-1/4	M80	3	10	4-9/16	1-3/4	2.793	2.095
3.260	3.385		3-3/8		3	10	4-9/16	1-3/4	2.883	2.162
3.385	3.510		3-1/2		3	10-1/4	4-15/16	2	3.008	2.256
3.510	3.635		3-5/8	M90	3	10-1/4	4-15/16	2	3.133	2.350
3.635	3.760		3-3/4		3	10-1/2	5-5/16	2-1/8	3.217	2.413
3.760	3.885		3-7/8		3	10-1/2	5-5/16	2-1/8	3.342	2.506
3.885	4.010		4	M100	3	10-3/4	5-5/16	2-1/4	3.467	2.600

Pipe Tap Dimensions - Straight and Taper



Nominal Size Inches	Pipe Diameter Inches	Standard Projection	Minimum Projection	Length Overall A	Length of Thread B	Length of Square C	Diameter of Shank D	Size of Square E
1/16-27	0.300	0.312	Flush ("0" Proj.)	2-1/8	11/16	3/8	0.3125	0.234
1/8-27 Small Shank	0.405	0.312	Flush ("0" Proj.)	2-1/8	3/4	3/8	0.3125	0.234
1/8-27	0.405	0.312	Flush ("0" Proj.)	2-1/8	3/4	3/8	0.4375	0.328
1/4-18	0.540	0.459	0.218	2-7/16	1-1/16	7/16	0.5625	0.421
3/8-18	0.675	0.454	0.150	2-9/16	1-1/16	1/2	0.7000	0.531
1/2-14	0.840	0.579	0.260	3-1/8	1-3/8	5/8	0.6875	0.515
3/4-14	1.050	0.565	0.245	3-1/4	1-3/8	11/16	0.9063	0.679
1-11.5	1.315	0.678	0.275	3-3/4	1-3/4	13/16	1.1250	0.843
1-1/4-11.5	1.660	0.686	0.285	4	1-3/4	15/16	1.3125	0.984
1-1/2-11.5	1.900	0.699	0.300	4-1/4	1-3/4	1	1.5000	1.125
2-11.5	2.375	0.667	0.267	4-1/2	1-3/4	1-1/8	1.8750	1.406
2-1/2-8	2.875	0.925	0.525	5-1/2	2-9/16	1-1/4	2.2500	1.687
3-8	3.500	0.925	0525	6	2-5/8	1-3/8	2.6250	1.968
3-1/2-8	4.000	0.938	0.525	6-1/2	2-11/16	1-1/2	2.8125	2.108
4-8	4.500	0.950	0.525	6-3/4	2-3/4	1-5/8	3.0000	2.250

Standard Tap Drill Sizes for Cut Threads

Drill Size (inches) = Major Diameter (inches) - (0.01299 x %Thread / # of Threads Per Inch)

Tap	Tap Drill	Decimal Equiv. of Tap Drill	Theo. % of Thrd	Probable Oversize (mean)	Probable Hole Size	% of Thrd
10-24	27	.1440	85	.0032	.1472	79
	26	.1470	79	.0032	.1502	74
	25	.1495	75	.0032	.1527	69
	24	.1520	70	.0032	.1552	64
10-32	5/32	.1653	83	.0032	.1595	75
	22	.1570	81	.0032	.1602	73
	21	.1590	76	.0032	.1622	68
12-24	11/64	.1719	82	.0035	.1754	75
	17	.1730	79	.0035	.1765	73
	16	.1770	72	.0035	.1805	66
12-28	16	.1770	84	.0035	.1805	77
	15	.1800	78	.0035	.1835	70
	14	.1820	73	.0035	.1855	66
1/4-20	9	.1960	83	.0038	.1998	77
	8	.1990	79	.0038	.2028	73
	7	.2010	75	.0038	.2048	70
	13/64	.2031	72	.0038	.2069	66
1/4-28	3	.2130	80	.0038	.2168	72
5/16-18	F	.2570	77	.0038	.2608	72
	G	.2610	71	.0041	.2651	66
5/16-24	H	.2660	86	.0041	.2701	78
	I	.2720	75	.0041	.2761	67
3/8-16	5/16	.3125	77	.0044	.3169	72
	O	.3160	73	.0044	.3204	68
3/8-24	21/64	.3281	87	.0044	.3325	79
	Q	.3320	79	.0044	.3364	71
7/16-14	T	.3580	86	.0046	.3626	81
	23/64	.3594	84	.0046	.3640	79
	U	.3680	75	.0046	.3726	70
7/16-20	W	.3860	79	.0046	.3906	72
	25/64	.3906	72	.0046	.3952	65

Tap	Tap Drill	Decimal Equiv. of Tap Drill	Theo. % of Thrd	Proba-ble Over-size (mean)	Probable Hole Size	% of Thrd
1/2-13	27/64	.4219	78	.0047	.4266	73
1/2-20	29/64	.4531	72	.0047	.4578	65
9/16-12	15/32	.4688	87	.0048	.4736	82
	31/64	.4844	72	.0048	.4892	68
9/16-18	1/2	.500	87	.0048	.5048	80
5/8-11	17/32	.5313	79	.0049	.5362	75
5/8-18	9/16	.5625	87	.0049	.5674	80
3/4-10	41/64	.6406	84	.0050	.6456	80
	21/32	.6563	72	.0050	.6613	68
3/4-16	11/16	.6875	77	.0050	.6925	71
7/8-9	49/64	.7656	76	.0052	.7708	72
7/8-14	51/64	.7969	84	.0052	.8021	79
1-8	55/64	.8594	87	.0059	.8653	83
	7/8	.875	77	.0059	.8809	73
1-12	29/32	.9063	87	.0059	.9122	81
	59/64	.9219	72	.0060	.9279	67
1-14	59/64	.9219	84	.0060	.9279	78
1-1/8-7	31/32	.9688	84	.0062	.9750	81
	63/64	.9844	76	.0067	.9911	72
	1-1/64	1.0156	59	.0070	1.0226	55
1-1/8-12	1-1/32	1.0313	87	.0071	1.0384	80
1-1/4-7	1-3/32	1.0938	84			
	1-7/64	1.1094	76			
1-1/4-12	1-11/64	1.1719	72			
1-3/8-6	1-13/64	1.2031	79			
	1-7/32	1.2188	72			
1-3/8-12	1-19/64	1.2969	72			
1-1/2-6	1-21/64	1.3281	79			
	1-11/32	1.3438	72			
1-1/2-12	1-27/64	1.4219	72			

REAMING RECOMMENDED

Pipe Tap Drill Sizes for Cut Threads

Suggested Pipe Tap Drill Size		Taps Size	1/16	1/8	1/4	3/8	1/2	3/4	1	1-1/4	1-1/2	2	2-1/2	3
	Drill Size	Taper Pipe Tap	C	R	7/16	37/64	23/32	59/64	1-5/32	1-1/2	1-47/64	2-7/32	2-5/8	3-1/4
		Straight Pipe Tap‡	1/4	S	29/64	19/32	47/64	15/16	1-3/16	1-33/64	1-3/4	2-7/32	2-21/32	3-9/32

‡For dryseal straight pipe threads, suggested drill sizes are as shown, except: 1/4" pipe, 0.444 drill size.

Standard Tap Drill Sizes for Rolled Threads

Drill Size (inches) = Major Diameter (inches) - (0.0068 x %Thread / # of Threads Per Inch)

Tap	Basic Major Diame-ter	Theoretical Drill Size		Recom-mended Drill Size	Dec. Equiv.
		Max. 55% Thread	Min. 75% Thread		
10-24	0.1900	0.1744	0.1692	11/64	0.1719
10-32	0.1900	0.1783	0.1744	16	0.1770
12-24	0.2160	0.2004	0.1952	8	0.1990
12-28	0.2160	0.2026	0.1981	7	0.2010
1/4-20	0.2500	0.2313	0.2250	1	0.2280
1/4-28	0.2500	0.2366	0.2321	15/64	0.2344
5/16-18	0.3125	0.2917	0.2847	L	0.2900
5/16-24	0.3125	0.2969	0.2917	M	0.2950
3/8-16	0.3750	0.3516	0.3438	S	0.3480
3/8-24	0.3750	0.3594	0.3542	T	0.3580

Tap	Basic Major Diame-ter	Theoretical Drill Size		Recom-mended Drill Size	Dec. Equiv.
		Max. 55% Thread	Min. 75% Thread		
7/16-14	0.4375	0.4107	0.4018	13/32	0.4062
7/16-20	0.4375	0.4188	0.4125	Z	0.4130
1/2-13	0.5000	0.4712	0.4615	15/32	0.4682
1/2-20	0.5000	0.4813	0.4750	12.25mm	0.4823
9/16-12	0.5625	0.5313	0.5208	17/32	0.5313
9/16-18	0.5625	0.5417	0.5347	13.65mm	0.5374
5/8-11	0.6250	0.5909	0.5795	14.85mm	0.5846
5/8-18	0.6250	0.6042	0.5972	15.25mm	0.6004
3/4-10	0.7500	0.7125	0.7000	45/64	0.7031
3/4-16	0.7500	0.7266	0.7188	23/32	0.7188

Metric Tap Drill Sizes for Cut Threads

Drill Size (mm) = Major Diameter (mm) - (0.01299 x Metric Pitch x %Thread)

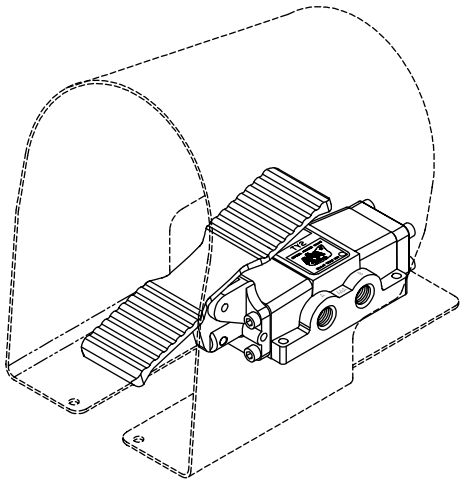
Tap	Tap Drill	Decimal Equiv. of Tap Drill (inches)	Theo. % of Thrd	Mean Probable Oversize (inches)	Probable Hole Size (inches)	% of Thrd
4-0.70	#30	.1285	81	.0029	.1314	73
	3.3mm	.1299	77	.0029	.1328	69
	3.7mm	.1457	82	.0032	.1489	74
4.5-0.75	#26	.1470	79	.0032	.1502	70
	#25	.1495	72	.0032	.1527	64
	4.2mm	.1654	77	.0032	.1686	69
5-0.80	#19	.1660	75	.0032	.1692	68
	#10	.1935	84	.0038	.1973	76
	#9	.1960	79	.0038	.1998	71
6-1.00	5mm	.1968	77	.0038	.2006	70
	#8	.1990	73	.0038	.2028	65
	"A"	.2340	81	.0038	.2378	74
7-1.00	6mm	.2362	77	.0038	.2400	70
	"B"	.2380	74	.0838	.2418	66
	6.7mm	.2638	80	.0041	.2679	74
	17/64	.2656	77	.0041	.2697	71
8-1.25	"H"	.2660	77	.0041	.2701	70
	6.8mm	.2677	74	.0041	.2718	68
	8.4mm	.3307	82	.0044	.3351	76
10-1.50	"Q"	.3320	80	.0044	.3364	75
	8.5mm	.3346	77	.0044	.3390	71
	10.25mm	.2035	77	.0047	.4082	72
12-1.75	"Y"	.4040	76	.0047	.4087	71
	13/32	.4062	74	.0047	.4109	69
	15/32	.4688	81	.0048	.4736	76
14-2.00	12mm	.4724	77	.0048	.4772	72
	35/64	.5469	81	.0049	.5518	76
16-2.00	14mm	.5512	77	.0049	.5561	72
	11/16	.6875	78	.0050	.6925	74
20-2.50	17.5mm	.6890	77	.0052	.6942	73
	13/16	.8125	86	.0052	.8177	82
24-3.00	21mm	.8268	77	.0059	.8327	73
	53/64	.8281	76	.0059	.8340	72
	1-1/32	1.0312	83	.0071	1.0383	80
30-3.50	26.5mm	1.0433	77	.0071	1.0504	73
	1-3/64	1.0469	75	.0072	1.0541	70
36-4.00	1-17/64	1.2656	74	Reaming Recommended		

Metric Tap Drill Sizes for Rolled Threads

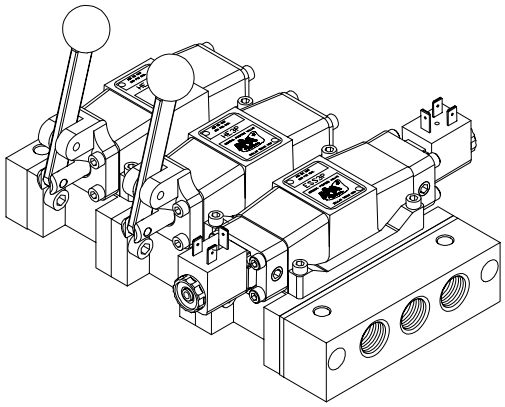
Drill Size (mm) = Major Diameter (mm) - (0.0068 x Metric Pitch x %Thread)

Tap	Theoretical Drill Size	
	Max. 55% Thread	Min. 75% Thread
5-0.50	4.81	4.75
5-0.80	4.70	4.60
6-0.75	5.72	5.63
6-1.00	5.63	5.50
7-0.75	6.72	6.63
7-1.00	6.63	6.50
8-0.75	7.72	7.63
8-1.25	7.53	7.38
10-0.75	9.72	9.63
10-1.50	9.44	9.25
12-1.00	11.63	11.50
12-1.75	11.34	11.13
14-1.00	13.63	13.50
14-2.00	13.25	13.00
16-1.00	15.63	15.50
16-2.00	15.25	15.00
20-1.00	19.63	19.50
20-2.50	19.06	18.75
24-1.00	23.63	23.50
24-3.00	22.88	22.50
30-3.50	28.69	28.25
36-4.00	34.50	34.00

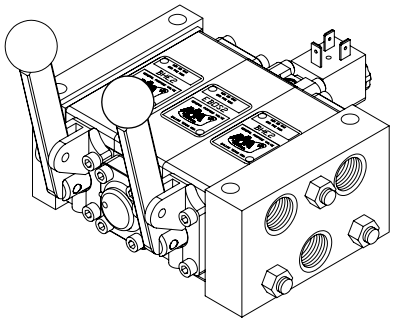
AAA Products International Also Manufactures Control Valves for your Pneumatic Needs



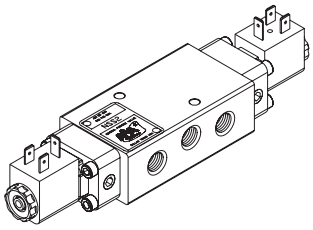
Foot Operated Valves



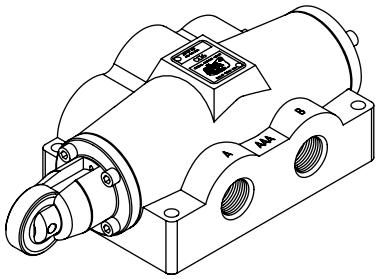
Manifold Style Valves



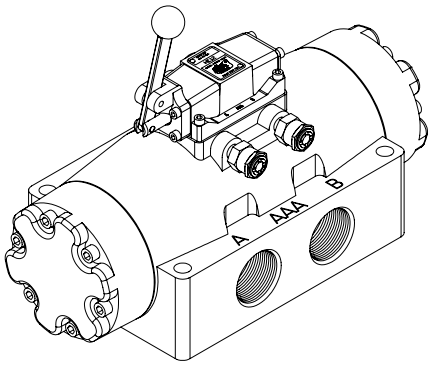
Stacking Valves



Small Valves



Medium Valves



Large Valves

- Spool Type Directional Valves
- Single and Stack Valves
- All Popular Actuators
- 1/4" Through 2" Sizes
- 250 PSI Air Service

Example of a Few of Our Valves

Over 250 Customer Specials

Soft Seal 4-Way Air Valves

Soft seal valves will operate on vacuum, inert gas, or compressed air. Solenoid models are the pilot operated type, and operate from 50 to 150 PSI, but will cover higher pressure ranges if a suitable source of external pilot air is used.

O-Ring seals between all ports give leaktight operations. Viton rings are used on 1/4" and 3/8" valves, buna-N on larger sizes. Bodies, end caps, and spools are aluminum; springs are stainless or music wire.

All valves are built with dual exhaust ports. Any valve port may be plugged or pressurized for 2-way, 3-way, or 5-way service. One secret to the superior performance is the large spool end area which is 25 to 50% larger than competitive valves. The double taper of the flow grooves on the spool allows more accurate throttling on manually controlled valves.

Seals are standard O-Rings. If a valve should ever need repacking, seals are available almost every where, and replacement is quick and easy.

Closed center spools are standard on all 3-position valves. Alternate spool configurations are available.

Solenoid models use a “DIN 43650” style with 11 mm “Industrial Form B” connector pin pattern, most common voltages are immediately available. Other voltages and coil styles available. Consult factory or distributor for options.