OPERATOR'S MANUAL

Metal Working

VARIABLE SPEED RADIAL DRILL

MODEL: RD-1600H-VS

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Book 1 of 2

Rev. 02/2018

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THANK YOU & WARRANTY

Thank you for your purchase of a machine from Baileigh Industrial. We hope that you find it productive and useful to you for a long time to come.

Inspection & Acceptance. Buyer shall inspect all Goods within ten (10) days after receipt thereof. Buyer's payment shall constitute final acceptance of the Goods and shall act as a waiver of the Buyer's rights to inspect or reject the goods unless otherwise agreed. If Buyer rejects any merchandise, Buyer must first obtain a Returned Goods Authorization ("RGA") number before returning any goods to Seller. Goods returned without a RGA will be refused. Seller will not be responsible for any freight costs, damages to goods, or any other costs or liabilities pertaining to goods returned without a RGA. Seller shall have the right to substitute a conforming tender. Buyer will be responsible for all freight costs to and from Buyer and repackaging costs, if any, if Buyer refuses to accept shipment. If Goods are returned in unsalable condition, Buyer shall be responsible for full value of the Goods. Buyer may not return any special-order Goods. Any Goods returned hereunder shall be subject to a restocking fee equal to 30% of the invoice price.

Specifications. Seller may, at its option, make changes in the designs, specifications or components of the Goods to improve the safety of such Goods, or if in Seller's judgment, such changes will be beneficial to their operation or use. Buyer may not make any changes in the specifications for the Goods unless Seller approves of such changes in writing, in which event Seller may impose additional charges to implement such changes.

Limited Warranty. Seller warrants to the original end-user that the Goods manufactured or provided by Seller under this Agreement shall be free of defects in material or workmanship for a period of twelve (12) months from the date of purchase, provided that the Goods are installed, used, and maintained in accordance with any instruction manual or technical guidelines provided by the Seller or supplied with the Goods, if applicable. The original end-user must give written notice to Seller of any suspected defect in the Goods prior to the expiration of the warranty period. The original end-user must also obtain a RGA from Seller prior to returning any Goods to Seller for warranty service under this paragraph. Seller will not accept any responsibility for Goods returned without a RGA. The original end-user shall be responsible for all costs and expenses associated with returning the Goods to Seller for warranty service. In the event of a defect, Seller, at its sole option, shall repair or replace the defective Goods or refund to the original end-user the purchase price for such defective Goods. Goods are not eligible for replacement or return after a period of 30 days from date of receipt. The foregoing warranty is Seller's sole obligation, and the original end-user's exclusive remedy, with regard to any defective Goods. This limited warranty does not apply to: (a) die sets, tooling, and saw blades; (b) periodic or routine maintenance and setup, (c) repair or replacement of the Goods due to normal wear and tear, (d) defects or damage to the Goods resulting from misuse, abuse, neglect, or accidents, (f) defects or damage to the Goods resulting from improper or unauthorized alterations, modifications, or changes; and (f) any Goods that has not been installed and/or maintained in accordance with the instruction manual or technical guidelines provided by Seller.

EXCLUSION OF OTHER WARRANTIES. THE FOREGOING LIMITED WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED. ANY AND ALL OTHER EXPRESS, STATUTORY OR IMPLIED WARRANTIES, INCLUDING BUT NOT LIMITED TO, ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR ANY PARTICULAR PURPOSE ARE EXPRESSLY DISCLAIMED. NO WARRANTY IS MADE WHICH EXTENDS BEYOND THAT WHICH IS EXPRESSLY CONTAINED HEREIN.

Limitation of Liability. IN NO EVENT SHALL SELLER BE LIABLE TO BUYER OR ANY OTHER PARTY FOR ANY INCIDENTAL, CONSEQUENTIAL OR SPECIAL DAMAGES (INCLUDING, WITHOUT LIMITATION, LOST PROFITS OR DOWN TIME) ARISING FROM OR IN MANNER CONNECTED WITH THE GOODS, ANY BREACH BY SELLER OR ITS AGENTS OF THIS AGREEMENT, OR ANY OTHER CAUSE WHATSOEVER, WHETHER BASED ON CONTRACT, TORT OR ANY OTHER THEORY OF LIABILITY. BUYER'S REMEDY WITH RESPECT TO ANY CLAIM ARISING UNDER THIS AGREEMENT IS STRICTLY LIMITED TO NO MORE THAN THE AMOUNT PAID BY THE BUYER FOR THE GOODS.

Force Majeure. Seller shall not be responsible for any delay in the delivery of, or failure to deliver, Goods due to causes beyond Seller's reasonable control including, without limitation, acts of God, acts of war or terrorism, enemy actions, hostilities, strikes, labor difficulties, embargoes, non-delivery or late delivery of materials, parts and equipment or transportation delays not caused by the fault of Seller, delays caused by civil authorities, governmental regulations or orders, fire, lightening, natural disasters or any other cause beyond Seller's reasonable control. In the event of any such delay, performance will be postponed by such length of time as may be reasonably necessary to compensate for the delay.

Installation. If Buyer purchases any Goods that require installation, Buyer shall, at its expense, make all arrangements and connections necessary to install and operate the Goods. Buyer shall install the Goods in accordance with any Seller instructions and shall indemnify Seller against any and all damages, demands, suits, causes of action, claims and expenses (including actual attorneys' fees and costs) arising directly or indirectly out of Buyer's failure to properly install the Goods.

Work By Others; Safety Devices. Unless agreed to in writing by Seller, Seller has no responsibility for labor or work performed by Buyer or others, of any nature, relating to design, manufacture, fabrication, use, installation or provision of Goods. Buyer is solely responsible for furnishing, and requiring its employees and customers to use all safety devices, guards and safe operating procedures required by law and/or as set forth in manuals and instruction sheets furnished by Seller. Buyer is responsible for consulting all operator's manuals, ANSI or comparable safety standards, OSHA regulations and other sources of safety standards and regulations applicable to the use and operation of the Goods.

Remedies. Each of the rights and remedies of Seller under this Agreement is cumulative and in addition to any other or further remedies provided under this Agreement or at law or equity.

Attorney's Fees. In the event legal action is necessary to recover monies due from Buyer or to enforce any provision of this Agreement, Buyer shall be liable to Seller for all costs and expenses associated therewith, including Seller's actual attorneys' fees and costs.

Governing Law/Venue. This Agreement shall be construed and governed under the laws of the State of Wisconsin, without application of conflict of law principles. Each party agrees that all actions or proceedings arising out of or in connection with this Agreement shall be commenced, tried, and litigated only in the state courts sitting in Manitowoc County, Wisconsin or the U.S. Federal Court for the Eastern District of Wisconsin. Each party waives any right it may have to assert the doctrine of "forum non conveniens" or to object to venue to the extent that any proceeding is brought in accordance with this section. Each party consents to and waives any objection to the exercise of personal jurisdiction over it by courts described in this section. Each party waives to the fullest extent permitted by applicable law the right to a trial by jury.

Summary of Return Policy.

- 10 Day acceptance period from date of delivery. Damage claims and order discrepancies will not be accepted after this time.
- You must obtain a Baileigh issued RGA number PRIOR to returning any materials.
- Returned materials must be received at Baileigh in new condition and in original packaging.
- Altered items are not eligible for return.
- Buyer is responsible for all shipping charges.
- A 30% re-stocking fee applies to all returns.

Baileigh Industrial makes every effort to ensure that our posted specifications, images, pricing and product availability are as correct and timely as possible. We apologize for any discrepancies that may occur. Baileigh Industrial reserves the right to make any and all changes deemed necessary in the course of business including but not limited to pricing, product specifications, quantities, and product availability.

For Customer Service & Technical Support:
Please contact one of our knowledgeable Sales and Service team members at:
(920) 684-4990 or e-mail us at sales@baileigh.com

INTRODUCTION

The quality and reliability of the components assembled on a Baileigh Industrial machine guarantee near perfect functioning, free from problems, even under the most demanding working conditions. However, if a situation arises, refer to the manual first. If a solution cannot be found, contact the distributor where you purchased our product. Make sure you have the serial number and production year of the machine (stamped on the nameplate). For replacement parts refer to the assembly numbers on the parts list drawings.

Our technical staff will do their best to help you get your machine back in working order.

In this manual you will find: (when applicable)

- Safety procedures
- Correct installation guidelines
- Description of the functional parts of the machine
- Capacity charts
- Setup and start-up instructions
- Machine operation
- Scheduled maintenance
- Parts lists

GENERAL NOTES

After receiving your equipment remove the protective container. Do a complete visual inspection, and if damage is noted, **photograph it for insurance claims** and contact your carrier at once, requesting inspection. Also contact Baileigh Industrial and inform them of the unexpected occurrence. Temporarily suspend installation.

Take necessary precautions while loading / unloading or moving the machine to avoid any injuries.

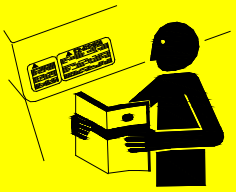
Your machine is designed and manufactured to work smoothly and efficiently. Following proper maintenance instructions will help ensure this. Try and use original spare parts, whenever possible, and most importantly; **DO NOT** overload the machine or make any modifications.

Note: *This symbol refers to useful information throughout the manual.*

IMPORTANT

PLEASE READ THIS OPERATORS MANUAL CAREFULLY

It contains important safety information, instructions, and necessary operating procedures. The continual observance of these procedures will help increase your production and extend the life of the equipment.



SAFETY INSTRUCTIONS

LEARN TO RECOGNIZE SAFETY INFORMATION

This is the safety alert symbol. When you see this symbol on your machine or in this manual, **BE ALERT TO THE POTENTIAL FOR PERSONAL INJURY!**

Follow recommended precautions and safe operating practices.

UNDERSTAND SIGNAL WORDS

A signal word – **DANGER**, **WARNING**, or **CAUTION** – is used with the safety alert symbol. **NOTICE**, which is not related to personal injury, is used without a symbol.

DANGER: Indicates a hazardous situation which, if not avoided, will result in death or serious injury.

WARNING: Indicates a hazardous situation which, if not avoided, could result in death or serious injury.

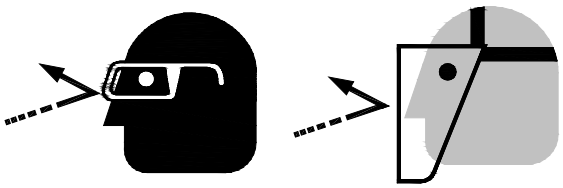
CAUTION: Indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.

NOTICE: Indicates a situation which, if not avoided, could result in property damage.

SAVE THESE INSTRUCTIONS.
Refer to them often and use them to instruct others.

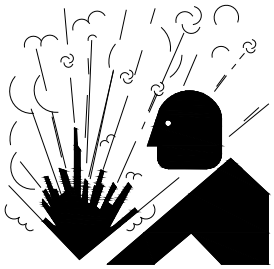
PROTECT EYES

Wear safety glasses or suitable eye protection when working on or around machinery.



HYDRAULIC HOSE FAILURE

Exercise **CAUTION** around hydraulic hoses in case of a hose or fitting failure.

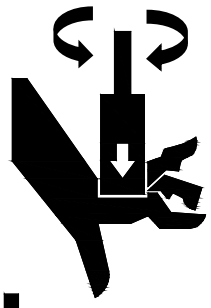


PROTECT AGAINST NOISE

Prolonged exposure to loud noise can cause impairment or loss of hearing. Wear suitable hearing protective devices such as ear muffs or earplugs to protect against objectionable or uncomfortable loud noises.

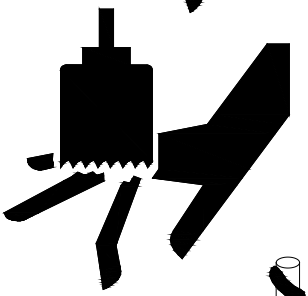
BEWARE OF PIERCING POINTS AND CUTTING HAZARD

NEVER place hands, fingers, or any part of your body on or near rotating tooling. This tooling can be extremely dangerous if you do not follow proper safety procedures. **Keep hand at least 6" (150mm) from the tooling while operating.**



BEWARE OF CUTTING POINTS

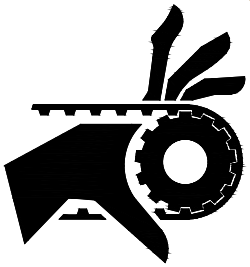
Keep hands and fingers clear of the rotating hole saw. The teeth are extremely sharp and can cause severe bodily injury.



ENTANGLEMENT HAZARD – ROTATING SPINDLE

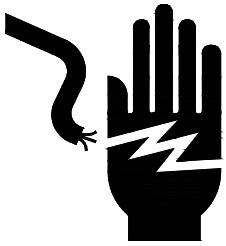
Contain long hair, **DO NOT** wear jewelry or loose-fitting clothing.

BEWARE OF PINCH POINTS



Keep hands and fingers away from the motors, drive belt, and pulleys when performing maintenance. Keep motor guards in place at all times while the machine is running.

HIGH VOLTAGE



USE CAUTION IN HIGH VOLTAGE AREAS. DO NOT assume the power to be off.
FOLLOW PROPER LOCKOUT PROCEDURES.

EMERGENCY STOP BUTTON

In the event of incorrect operation or dangerous conditions, the machine can be stopped immediately by pressing the **E-STOP** button. Twist the emergency stop button clockwise (cw) to reset. Note: Resetting the E-Stop will not start the machine.

SAFETY PRECAUTIONS

Metal working can be dangerous if safe and proper operating procedures are not followed. As with all machinery, there are certain hazards involved with the operation of the product. Using the machine with respect and caution will considerably lessen the possibility of personal injury. However, if normal safety precautions are overlooked or ignored, personal injury to the operator may result.
Safety equipment such as guards, hold-downs, safety glasses, dust masks, and hearing protection can reduce your potential for injury. But even the best guard won't make up for poor judgment, carelessness, or inattention. **Always use common sense** and exercise **caution** in the workshop. If a procedure feels dangerous, don't try it.
REMEMBER: Your personal safety is your responsibility.

WARNING: FAILURE TO FOLLOW THESE RULES MAY RESULT IN SERIOUS PERSONAL INJURY

Dear Valued Customer:

- All Baileigh machines should be used only for their intended use.
- Baileigh does not recommend or endorse making any modifications or alterations to a Baileigh machine. Modifications or alterations to a machine may pose a substantial risk of injury to the operator or others and may do substantial damage to the machine.
- Any modifications or alterations to a Baileigh machine will invalidate the machine's warranty.

PLEASE ENJOY YOUR BAILEIGH MACHINE! ....PLEASE ENJOY IT SAFELY!

1. **FOR YOUR OWN SAFETY, READ INSTRUCTION MANUAL BEFORE OPERATING THE MACHINE.** Learn the machine's application and limitations as well as the specific hazards.
2. **Only trained and qualified personnel can operate this machine.**
3. **Make sure guards are in place and in proper working order before operating machinery.**
4. **Remove any adjusting tools.** Before operating the machine, make sure any adjusting tools have been removed.
5. **Keep work area clean.** Cluttered areas invite injuries.
6. **Overloading machine.** By overloading the machine you may cause injury from flying parts. **DO NOT** exceed the specified machine capacities.
7. **Dressing material edges.** Always chamfer and deburr all sharp edges.
8. **Do not force tool.** Your machine will do a better and safer job if used as intended. **DO NOT** use inappropriate attachments in an attempt to exceed the machine's rated capacity.
9. **Use the right tool for the job. DO NOT** attempt to force a small tool or attachment to do the work of a large industrial tool. **DO NOT** use a tool for a purpose for which it was not intended.
10. **Turn off** main power to the machine and wait for the cutting tool to stop turning before removing debris, removing or securing the workpiece, or changing the position of the work table.
11. **Never** expose your hands or limbs to the cutting area while the machine is operating.
12. Wear oil-free protective garments such as leather gloves, heavy shirt, high shoes or boots, cuffless trousers, and a cap.
13. The radial arm covers a large area when it moves. Use caution and keep the swing path clear when rotating the arm.
14. **Never** leave the machine running while unattended. Turn the power OFF. Do not leave the machine until the spindle comes to a complete stop.
15. **Never** start the machine before clearing the table of all objects (tools, scrap pieces, etc.).

16. **Machines can eject** workpieces towards the operator. Know and avoid the conditions which cause the workpiece to kickback.
17. **Do not remove** any safety equipment, such as safety covers, emergency stop buttons, safety mats, railings, light booms, ramps, and warning signs.
18. **Make sure** electrical cables are well protected from damage. Check insulation periodically for wear.
19. **Dress appropriately. DO NOT** wear loose fitting garments, jewelry, neckties, or gloves which may get caught in moving machine parts. Protective clothing and steel toe shoes are recommended when using machinery. Wear a restrictive hair covering to contain long hair.
20. **Use eye and ear protection**. Always wear ISO approved impact safety goggles. Wear a full-face shield if you are producing metal filings.
21. **Stay alert**. Watch what you are doing and use common sense. **DO NOT** operate any tool or machine when you are tired.
22. **Check for damaged parts**. Before using any tool or machine, carefully check any part that appears damaged. Check for alignment and binding of moving parts that may affect proper machine operation.
23. **Do not overreach**. Maintain proper footing and balance at all times. **DO NOT** reach over or across a running machine.
24. **Observe work area conditions**. **DO NOT** use machines or power tools in damp or wet locations. Do not expose to rain. **DO NOT** use electrically powered tools in the presence of flammable gases or liquids.
25. **Keep children away**. Children must never be allowed in the work area. **DO NOT** let them handle machines, tools, or extension cords.
26. **Store idle equipment**. When not in use, tools must be stored in a dry location to inhibit rust. Always lock up tools and keep them out of reach of children.
27. **DO NOT operate machine if under the influence of alcohol or drugs**. Read warning labels on prescriptions. If there is any doubt, **DO NOT** operate the machine.
28. **Turn off** power before checking, cleaning, or replacing any parts.
29. Be sure **all** equipment is properly installed and grounded according to national, state, and local codes.
30. Keep **all** cords dry, free from grease and oil, and protected from sparks and hot metal.
31. Inspect power and control cables periodically. Replace if damaged or bare wires are exposed. **Bare wiring can kill! DO NOT** touch live electrical components or parts.
32. **DO NOT** bypass or defeat any safety interlock systems.
33. Keep visitors a safe distance from the work area.

TECHNICAL SPECIFICATIONS

Drilling Diameter Max. for No. 45 steel	2.5" (63.5mm)
Drilling Diameter Max. for HT200 cast iron	2.87" (73mm)
Tapping Diameter Max. for No. 45 steel	1.75" (44.5mm)
Tapping Diameter Max. for HT200 cast iron	2" (50.8mm)
Working Table Size	29.5" x 19.625" (750 x 498mm)
Working Table T Slots	3 @ .875" (22mm)
Tilt Table Size	23.625" x 16" (600 x 406mm)
Tilt Table T Slots	3 @ .625" (16mm)
Base Working Area	68.5" x 38.625" (1740 x 981mm)
Base T Slots	4 @ 1.25" (31mm)
Column Surface to Spindle Center	13.75"-63" (350-1600mm)
Spindle Travel Max.	49.5" (1253mm)
Base to Spindle	13.75"-49.25" (350-1250mm)
Spindle Travel	12.37" (314mm)
Spindle Diameter	3.12" (79mm)
Spindle Taper	MT5
Spindle Speed Range	38-2000 r/min.
Spindle Feed Steps	8
Spindle Feed Range	.0024-.0394 r/in (.06-1 r/mm)
Elevating Speed	47.2 in/min (1.2 m/min)
Arm Rotation Angle	180°
Spindle Elevation of each dial revolution	4.8" (122mm)
Spindle Torque Max.	3540 lbf/in (400 Nm)
Maximum Feed Load	3597 lbf (16000N)
Power Requirement	220 V, 3 ph, 60hz
Motor Spindle Driving	5-3/8 hp (4kW), 220V, 3 ph, 60hz, 16A
Motor Arm Elevation	2 hp (1.5kW)
Motor Clamping	1 hp (.75kW), 220V, 3ph, 60hz, 3.5A
Motor Coolant	1/16 hp (124.2 watt), 220V, 3 ph, 60hz, .6A
Net Weight	7849 lbs (3560kg)
Shipping Weight	8069 lbs (3660kg)
Shipping Dimensions	98" x 48" x 103" (2490 x 1220 x 2620mm)

TECHNICAL SUPPORT

Our technical support department can be reached at 920.684.4990, and asking for the support desk for purchased machines. Tech Support handles questions on machine setup, schematics, warranty issues, and individual parts needs: (other than die sets and blades).

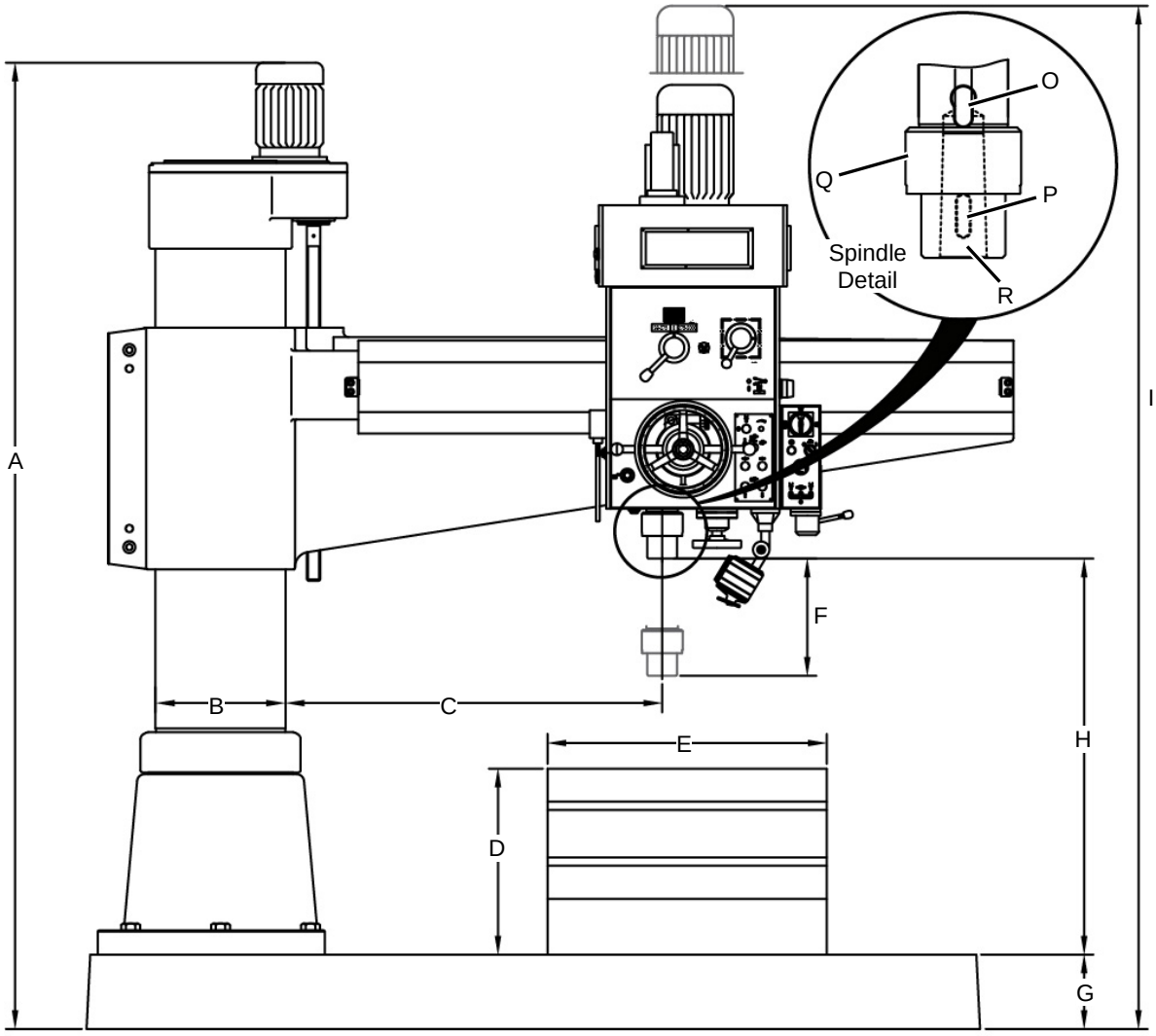
For specific application needs or future machine purchases contact the Sales Department at: sales@baileigh.com, Phone: 920.684.4990, or Fax: 920.684.3944.

***Note**: The photos and illustrations used in this manual are representative only and may not depict the actual color, labeling, or accessories and may be intended to illustrate technique only.*

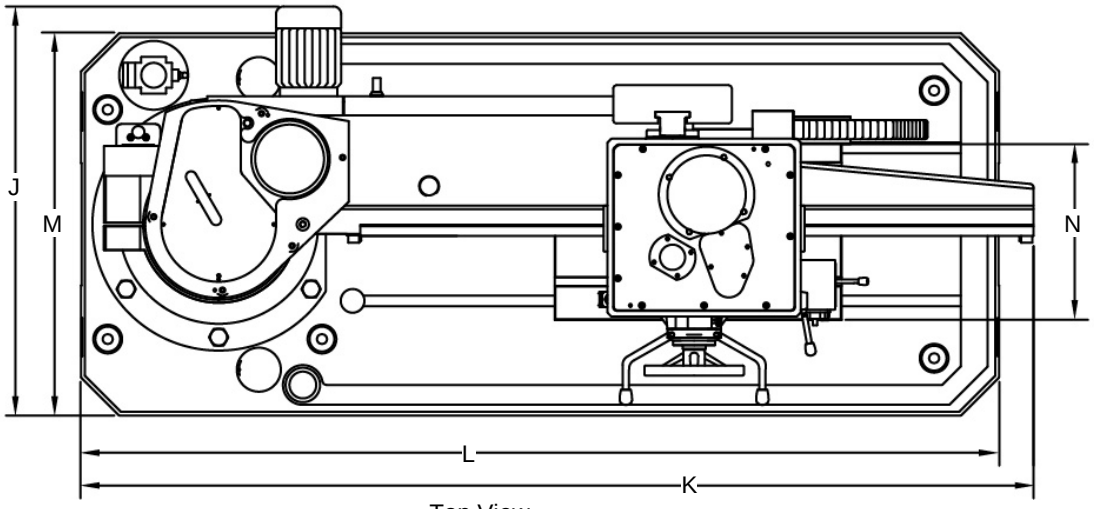
***Note**: The specifications and dimensions presented here are subject to change without prior notice due to improvements of our products.*

OVERALL DIMENSIONS

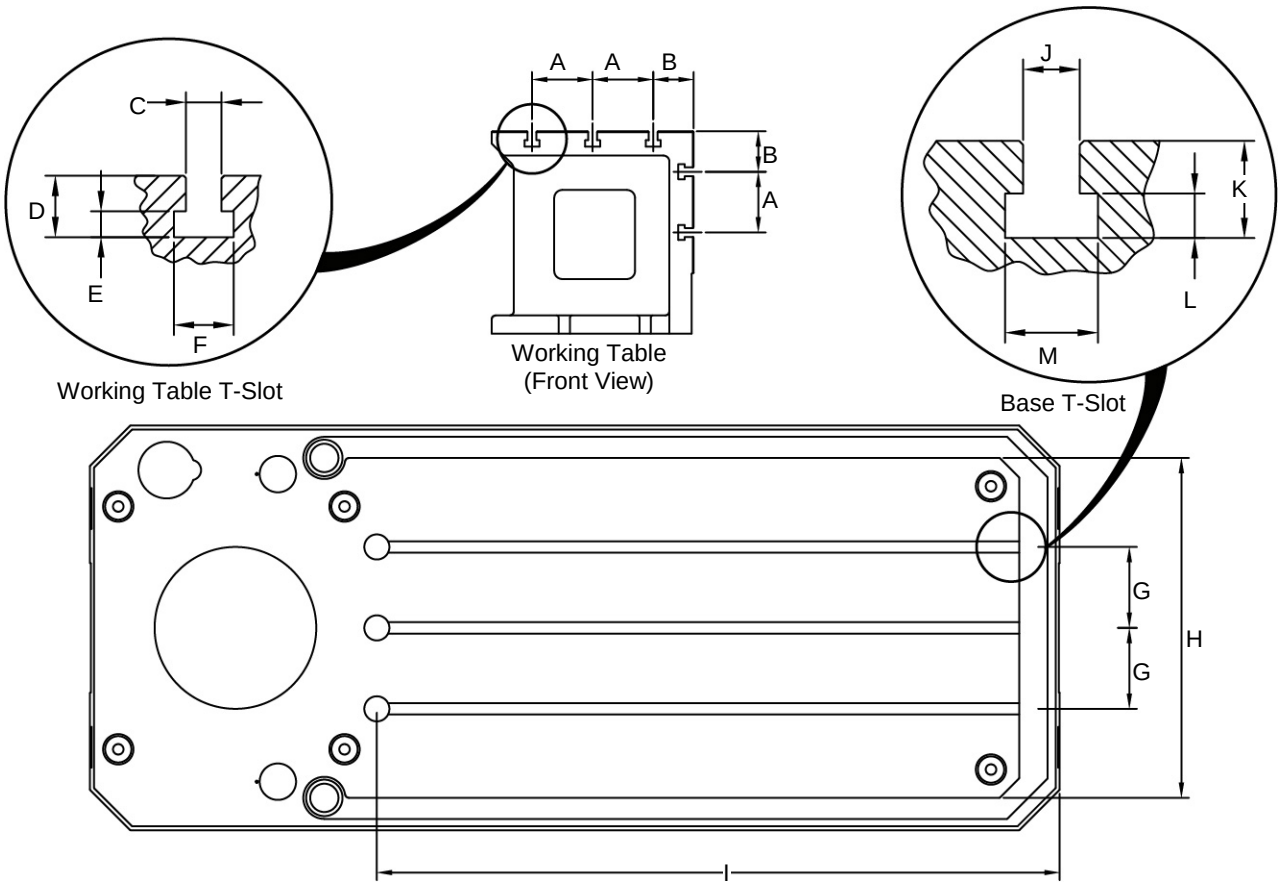
Overall		
A	Column Height	102.38" (2600mm)
B	Column Diameter	13.75" (350mm)
C	Column Surface to Spindle Center	13.75"-63" (350-1600mm)
D	Working Table Height	19.69" (500mm)
E	Working Table Width	29.5" (750mm)
F	Spindle Travel	12.38" (314mm)
G	Base Height	7.88" (200mm)
H	Base to Spindle	13.75"-49.25" (350-1250mm)
I	Overall Machine Max. Height	109.4" (2780mm)
J	Overall Machine Width	42" (1067mm)
K	Overall Machine Length	98" (2490mm)
L	Base Length	94.5" (2400mm)
M	Base Width	39.38" (1000mm)
N	Working Table Length	19.63" (500mm)
Spindle Detail		
O	Inner Wedge Slot	1.5" (38.1mm) H x .625" (15.9mm) W
P	Outer Wedge Slot	1.56" (39.6mm) H x .5" (12.7mm) W
Q	Spindle	5" (127mm) H x 3.125" (79.4mm) Dia.
R	Inner Taper	5.31" (134.9mm) H x 1.75" (44.5mm) Dia.



Front View



Top View



Working Table T-Slot		
A	Distance Between T-Slots	5.875" (149.2mm)
B	T-Slot Center to Table Edge	4" (101.6mm)
C	T-Slot Width	.875" (22.2mm)
D	T-Slot Height	1.5" (38.1mm)
E	T-Slot Groove Width	.625" (15.9mm)
F	T-Slot Groove Height	1.5" (38.1mm)
Base T-Slot		
G	Distance Between T-Slots	7.875" (200mm)
H	Inner Table Width	33" (838mm)
I	T-Slot Length	66.5" (1689mm)
J	T-Slot Width	1.125" (28.6mm)
K	T-Slot Height	1.875" (47.6mm)
L	T-Slot Groove Width	.875" (22.2mm)
M	T-Slot Groove Height	1.75" (44.4mm)

UNPACKING AND CHECKING CONTENTS

Your Baileigh machine is shipped complete. Separate all parts from the packing material and check each item carefully. Make certain all items are accounted for before discarding any packing material.

The arm elevation motor is not assembled on the machine during shipping.

WARNING: SUFFOCATION HAZARD! Immediately discard any plastic bags and packing materials to eliminate choking and suffocation hazards to children and animals.
If any parts are missing, DO NOT place the machine into service until the missing parts are obtained and installed correctly.

NOTICE: DO NOT *remove the radial arm or spindle box shipping braces until the machine has been installed and secured to the floor in order to prevent the radial arm from turning or equipment damage. Machine tipping could occur.*

Contents of the Tool Box	
A	Disassemble Spanner Tool (1 Qty.)
B	Wedge for Taper Adapter Sleeves (1 Qty.)
C	Drill Chuck 1-13mm capacity B16 (1 Qty.)
D	Drill Chuck Key
E	Drill Chuck Arbor MT4 / B16
F	Taper Adapter Sleeve MT5 / MT4 (1 Qty.)
G	Taper Adapter Sleeve MT4 / MT3 (1 Qty.)
H	Taper Adapter Sleeve MT3 / MT2 (1 Qty.)

Accessory Box	
I	Quick Change Chuck Accessory Kit (1 Qty.)
	Contains: Chuck Connecting Rod
	MS1, MS2, MS3, and MS5 Chucks

TRANSPORTING AND LIFTING

NOTICE: Lifting and carrying operations should be carried out by skilled workers, such as a truck operator, crane operator, etc. If a crane is used to lift the machine, attach the lifting chain carefully, making sure the machine is well balanced. Choose a location that will keep the machine free from vibration and dust from other machinery. Keep in mind that having a large clearance area around the machine is important for safe and efficient working conditions.

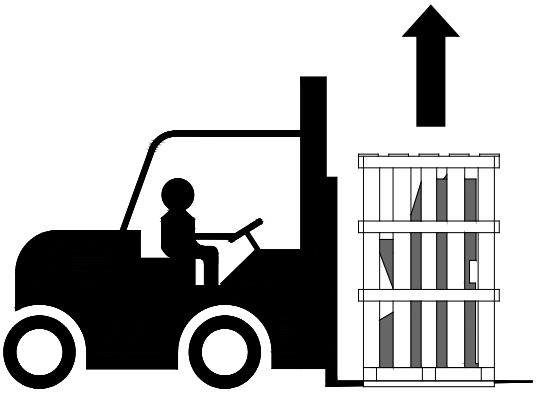
***NOTICE: DO NOT** remove the radial arm or spindle box shipping braces until the machine has been installed and secured to the floor in order to prevent the radial arm from turning or equipment damage. Machine tipping could occur.*

Lifting Instructions:

- **DO NOT** remove the radial arm and spindle box shipping braces until the machine has been installed and secured to the floor.
- **DO NOT** crush or damage the electrical cabinet or drill arm during lifting.
- Consider the height of this machine before lifting. Be sure that height clearance is sufficient throughout the transport route.

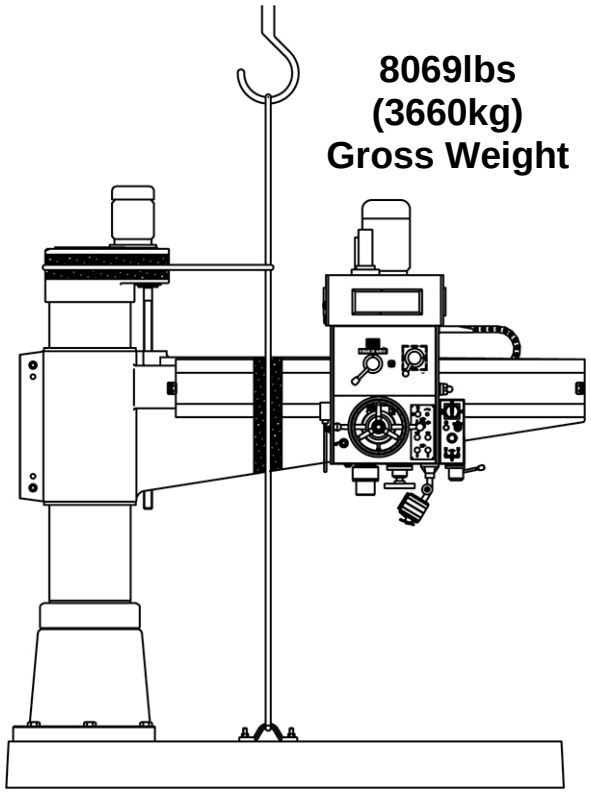
Follow these guidelines when lifting with truck or trolley:

- The lift truck must be able to lift at least 1.5 – 2 times the machine's gross weight.
- Make sure the machine is balanced. While transporting, avoid rough or jerky motion, and maintain a safe clearance zone around the transport area.
- Use a forklift with sufficient lifting capacity and forks that are long enough to reach the complete width of the machine.
- Remove the securing bolts that attach the machine to the pallet.
- Approaching the machine from the side, lift the machine on the frame taking care that there are no cables or pipes in the area of the forks.
- Move the machine to the required position and lower gently to the floor.
- Level the machine so that all the supporting feet are taking the weight of the machine and no rocking is taking place.



Follow these guidelines when lifting with crane or hoist:

- Always lift and carry the machine with the lifting lug brackets as shown.
- Use lift equipment such as straps, chains, capable of lifting 1.5 – 2 times the weight of the machine.
- Place a soft pad between the machine and the lifting cable in order to avoid damage to the guideway of the machine or the paint.
- Take proper precautions for handling and lifting.
- Check if the load is properly balanced by lifting it an inch or two.



- Lift the machine, avoiding sudden accelerations or quick changes of direction.
- Locate the machine where it is to be installed, then lower slowly until it touches the floor.

INSTALLATION

IMPORTANT:

Consider the following when looking for a suitable location to place the machine:

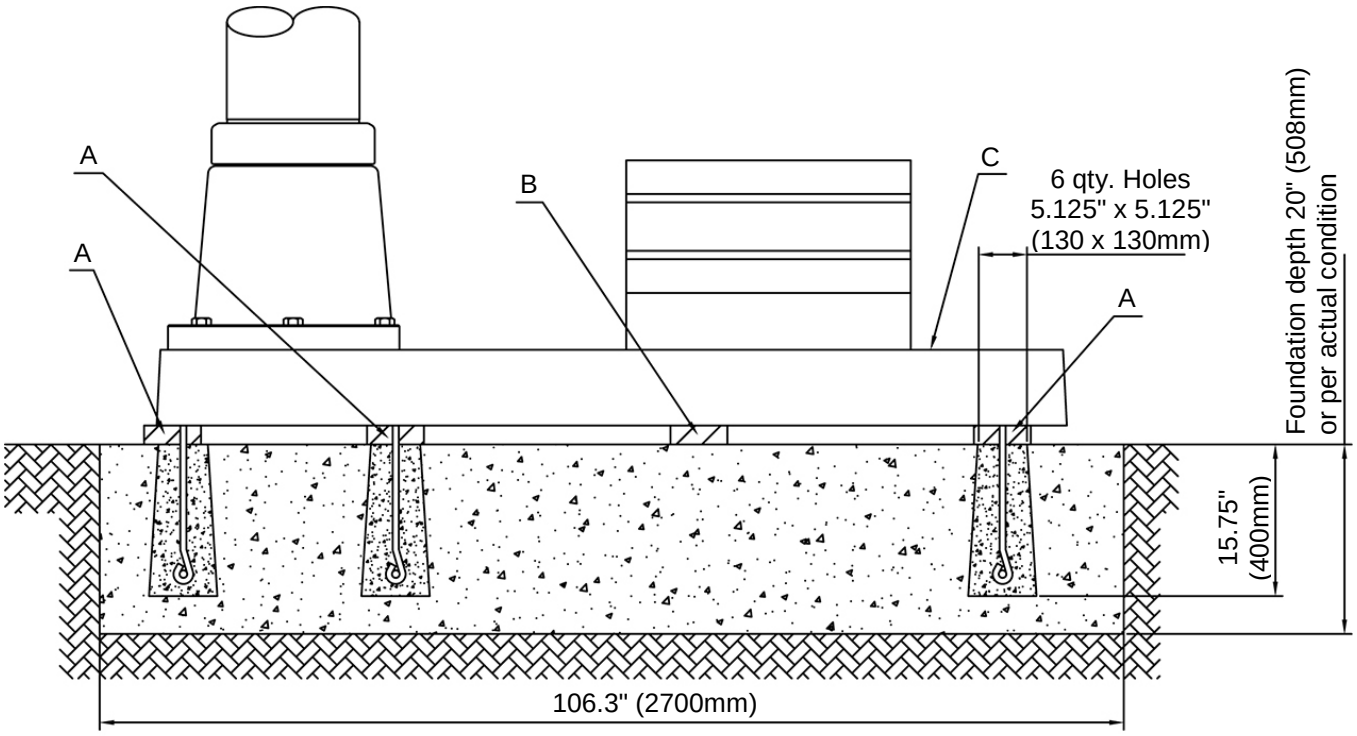
- Overall weight of the machine.
- Weight of material being processed.
- Sizes of material to be processed through the machine.
- Space needed for auxiliary stands, work tables, or other machinery.
- Clearance from walls and other obstacles.
- Maintain an adequate working area around the machine for safety.
- Have the work area well illuminated with proper lighting.
- Keep the floor free of oil and make sure it is not slippery.
- Remove scrap and waste materials regularly, and make sure the work area is free from obstructing objects.
- If long lengths of material are to be fed into the machine, make sure that they will not extend into any aisles.
- **LEVELING:** The machine should be sited on a level, concrete floor. Provisions for securing it should be in position prior to placing the machine. The accuracy of any machine depends on the precise placement of it to the mounting surface.
- **FLOOR:** This machine distributes a large amount of weight over a small area. Make certain that the floor is capable of supporting the weight of the machine, work stock, and the operator. The floor should also be a level surface. If the unit wobbles or rocks once in place, be sure to eliminate by using shims.
- **WORKING CLEARANCES:** Take into consideration the size of the material to be processed. Make sure that you allow enough space for you to operate the machine freely.
- **POWER SUPPLY PLACEMENT:** The power supply should be located close enough to the machine so that the power cord is not in an area where it would cause a tripping hazard. Be sure to observe all electrical codes if installing new circuits and/or outlets.
- **OILS and LUBRICANTS:** Follow the section on lubrication and oil filling and maintenance to ensure the proper fluid levels before starting the machine.

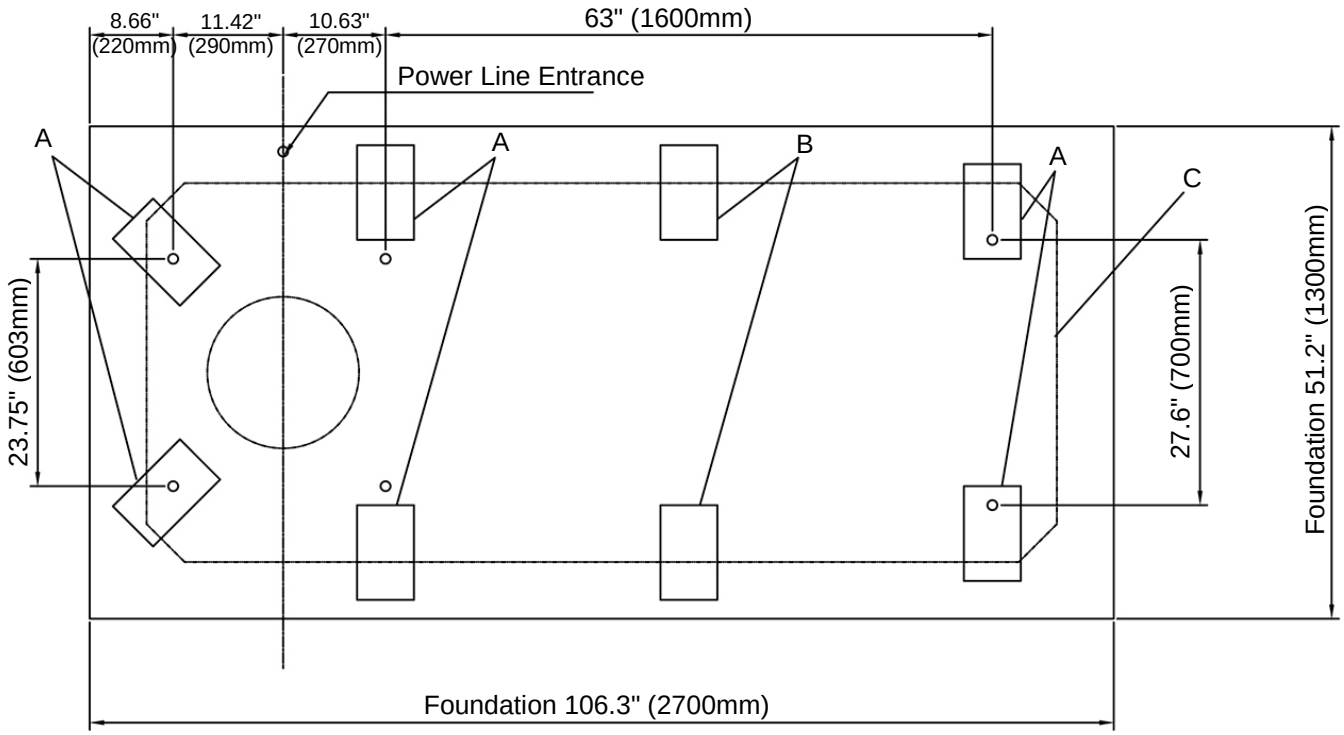
Anchoring the Machine

- This machine requires a minimum of 23 ft^2 (2.14m^2) and a solid floor such as concrete at a minimum of 4" (102mm) thick. 6" (152mm) minimum is preferred.

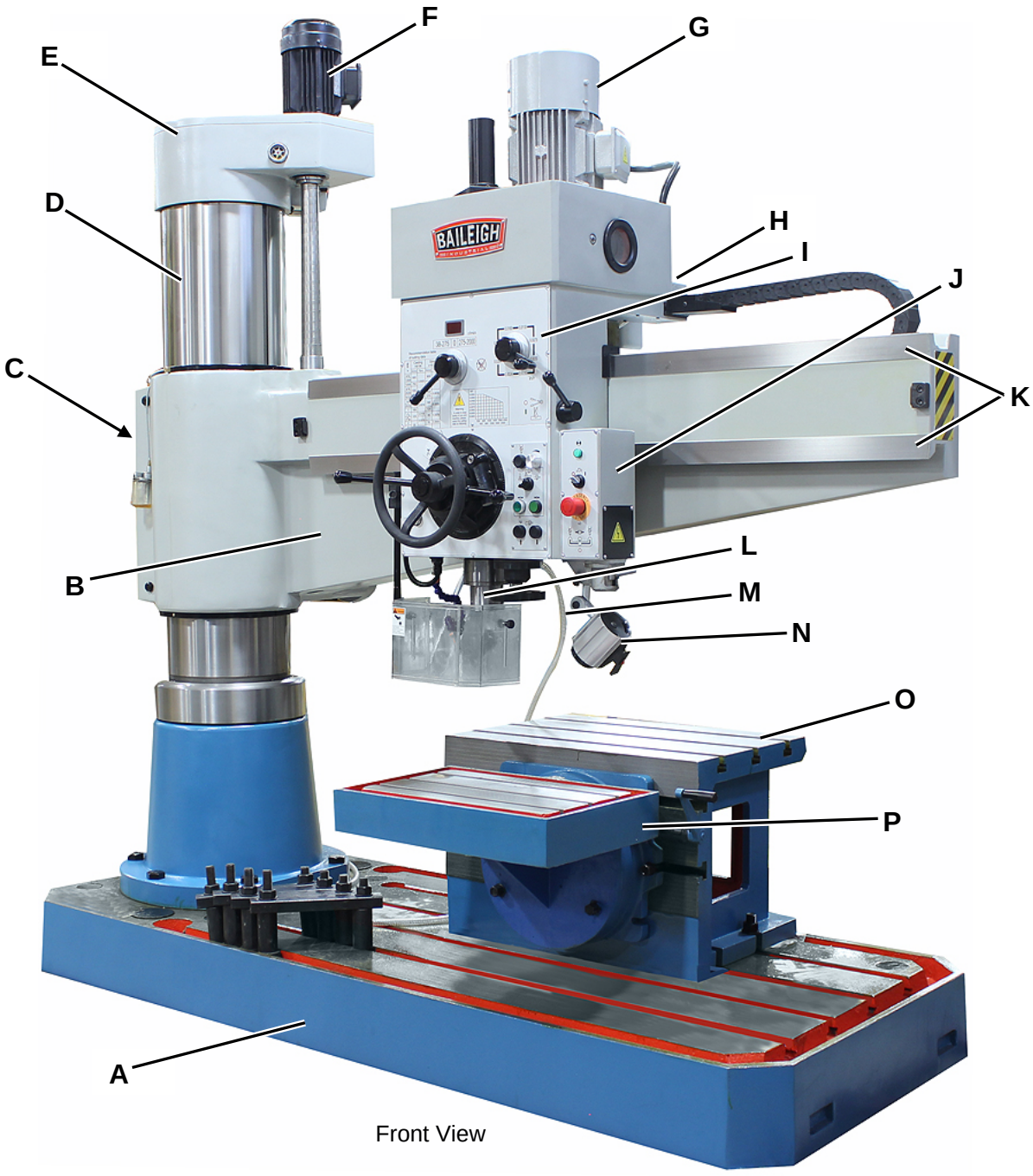
NOTICE: *Secure the machine to the floor to prevent movement or tipping due to off-center loading.*

- Once positioned, anchor the machine to the floor, as shown in the diagram. Use the eight (8) supplied M24 x 20" foundation bolts, bolts and expansion plugs, or sunken tie rods that connect through and are sized for the holes in the base of the stand.
- Ensure that the foundation is strong enough for this application. It is recommended to fill the foundation bolt holes with concrete and allow to dry completely.
- Roughly level the machine.
- Final level the machine to be within .0015"/40" (.04/1000mm) in each direction across the machine base (C) by adjusting the three (3) steel shim pairs (A) as needed. Steel shims (B) are for auxiliary purpose only.

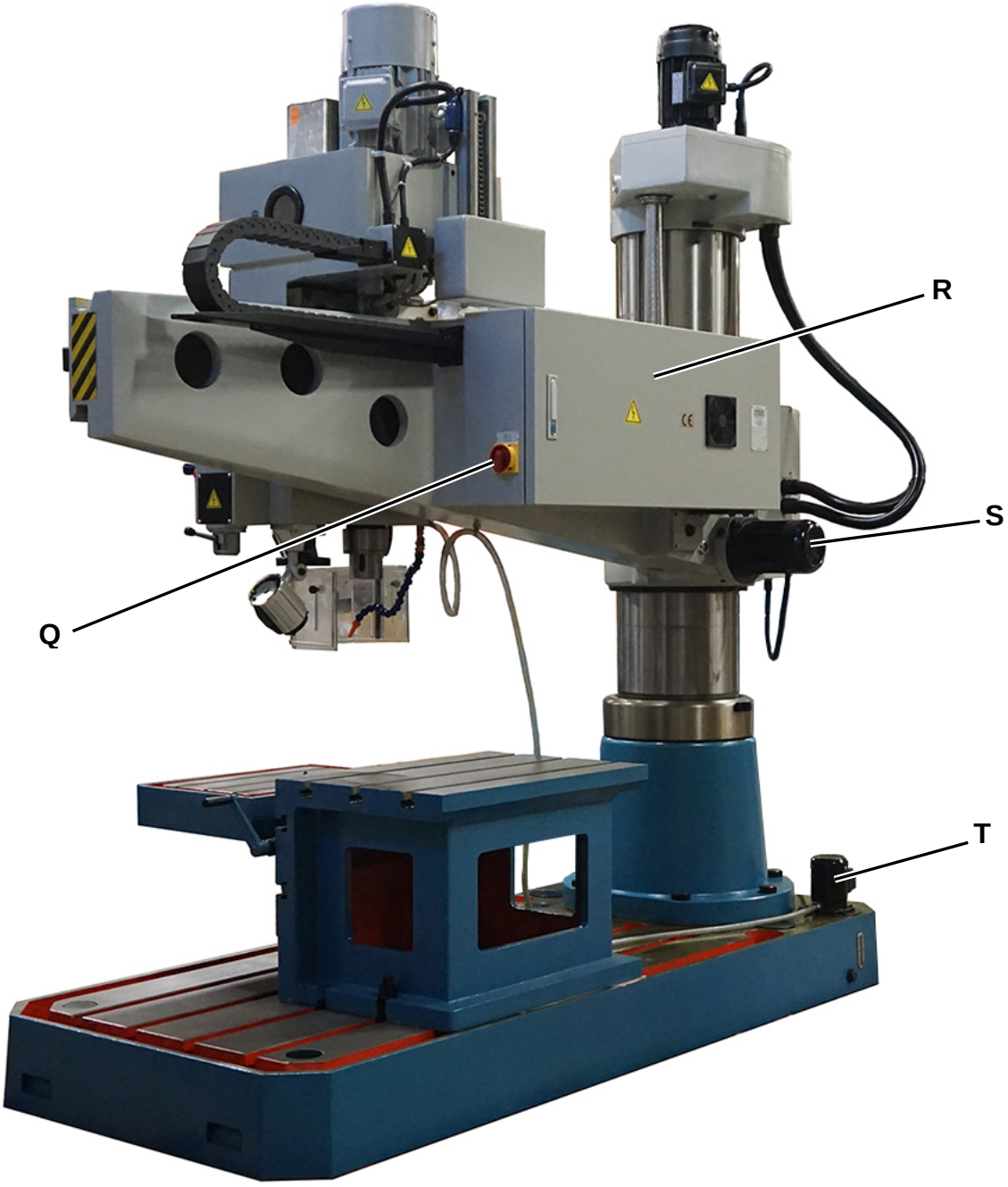

A
A
B
C
6 qty. Holes
5.125" x 5.125"
(130 x 130mm)
A
Foundation depth 20" (508mm)
or per actual condition
15.75"
(400mm)
106.3" (2700mm)


8.66"
(220mm)
11.42"
(290mm)
10.63"
(270mm)
63" (1600mm)
Power Line Entrance
A
A
B
A
C
23.75" (603mm)
27.6" (700mm)
Foundation 51.2" (1300mm)
Foundation 106.3" (2700mm)

GETTING TO KNOW YOUR MACHINE



Front View

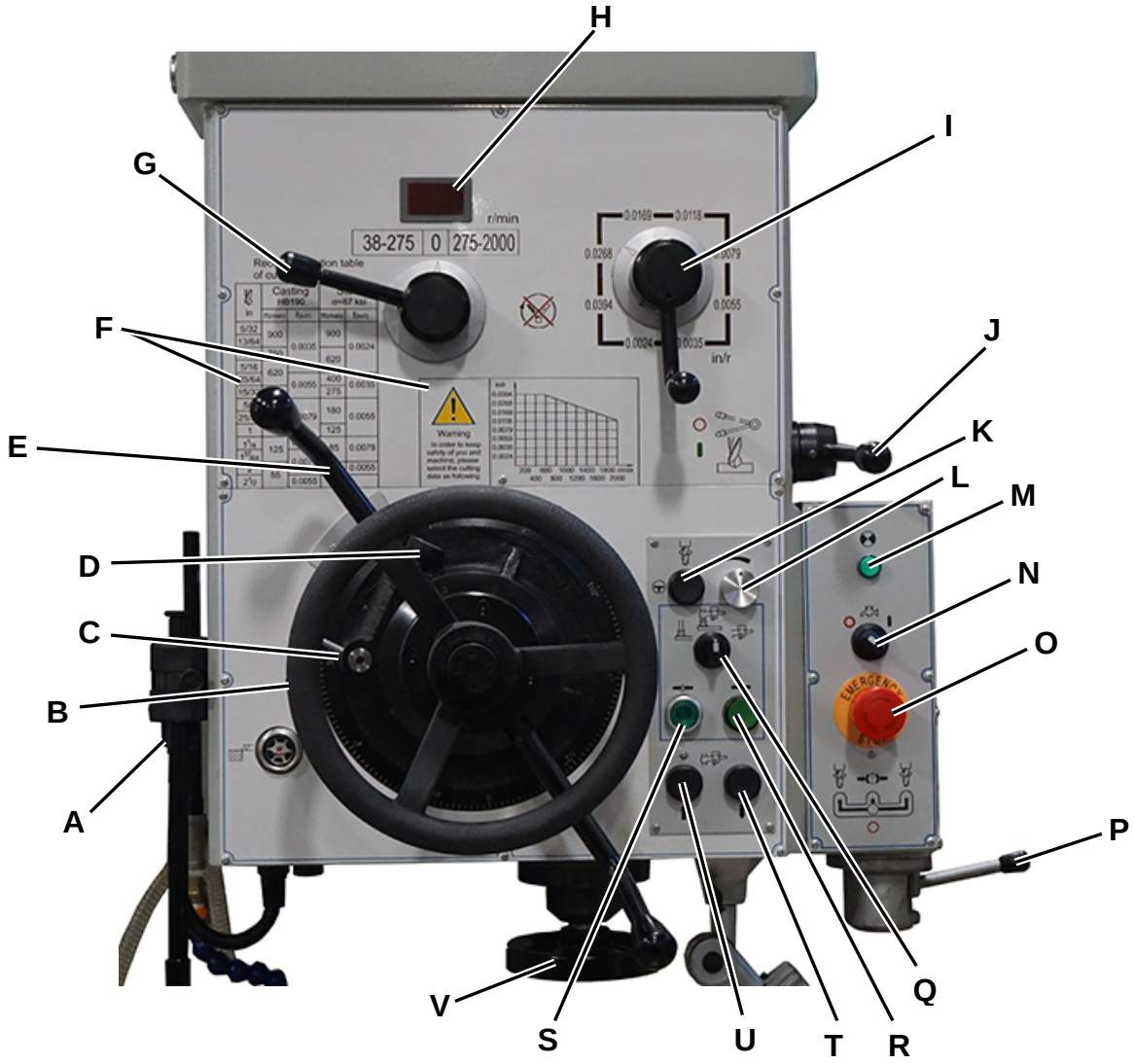


Back View

This conventional radial drill is suitable for medium and small parts in drilling, spot facing, counter-boring, hole boring and tapping, etc. for single workpiece machining or batch production.

A	Machine Base	Supports the column and houses the coolant reservoir in the left side of the base, under the column.
B	Radial Arm	Provides support and mobility for the spindle box. Moves up and down to adjust the working height and rotates on the column to position the spindle box for desired hole locations.
C	Lubrication Label (located on the backside of the radial arm)	Label showing the lubrication points, lubricant type, and frequency for each. It is located on the backside of the radial arm for quick reference of the requirements for proper machine maintenance.
D	Column	Provides support, and is the pivot point, for the radial arm.
E	Up and Down Box	Located on the top of the column. Supports the arm elevation motor and houses the column oil tank and clamping cylinder.
F	Arm Elevation Motor	Provides power that raises and lowers the radial arm.
G	Spindle Drive Motor	Main motor of the machine that provides power to the spindle for all machining processes.
H	Spindle Box	Houses the machining mechanism and the controls. The spindle box travels along the radial arm guideways.
I	Operation Controls	The machining controls are located on the spindle box.
J	Machine Controls Box	Houses the power indication light, coolant switch, Emergency Stop button, and the spindle control.
K	Guideway	The portion of the radial arm that supports the spindle box. The spindle box moves horizontally along the guideway.
L	Spindle	When loaded with a tool, rotates and provides the machining process. The spindle has a long barrel made of superior material with nitrogen treatment which provides rigidity, accuracy, and durability.
M	Flexible Coolant Hose	Directs the coolant flow toward the cutting point.
N	Work Lamp	Works independently of the machining operation to provide additional lighting to the work area. The On/Off switch is located on the lamp housing.
O	Working Table	Holds the workpiece for machining.
P	Tilt Table	Work table that can incline for machining convenience.
Q	Main Disconnect Power Switch	On/Off switch used to control the power source to the machine.
R	Electrical Enclosure	Houses electrical components and wire terminal strips.
S	Hydraulic Clamping Motor	Hydraulic clamping is used for the column, radial arm, and spindle box.
T	Coolant Motor	Supplies coolant when the spindle is running.

Machine Controls



A	Chuck Guard Limit Switch	A limit switch at the left side of spindle box to ensure that the chuck guard is closed.
B	Spindle Box Handwheel	Used the handwheel when moving the spindle box to the desired position along the length of the radial arm.
C	Depth Stop Lock Pin	Used to lock and engage the depth stop.
D	Micro Adjustment Knob	Used to finely adjust the dial and lock-in the cutting depth preset.
E	Spindle Feed Handle	Controls the spindle feed or automatically.
F	Cutting Tables	Provides tool, material, spindle rate, and speed recommendations.
G	Spindle Speed Range Change Handle	Used to select the spindle speed range. Choose Low, Neutral (idle), or High. Stop the machine when changing the speed range.
H	Speed Display Screen	DRO (Digital Readout) that indicates the actual spindle speed.
I	Feed Rate Handle	Controls the feed rate change in inches per revolution (in/r).
J	Power Feed Engagement Handle	Activates the power feed. Located at the right side of the spindle box to avoid operator contact of scalding metal chips.
K	Spindle Jog Button	Push to assist spindle speed change if difficulty occurs.
L	Spindle Speed Change Dial	Used for stepless speed adjustment within the Low or High speed ranges.
M	Power Indicator Light	Illuminates when the main power switch is activated, indicating that machine power is on.
N	Coolant Pump On/Off Switch	Turns the coolant pump on or off.
O	Emergency Stop Button	Press to stop the machine immediately in the event of dangerous conditions or incorrect operation. Twist the emergency stop button clockwise (cw) to reset. Note: Resetting will not start the machine.
P	Spindle Control Handle	Used to activate the spindle in forward rotation, reverse rotation, stop, and brake.
Q	Clamping Selector Switch	Selection switch for column and spindle box clamping or unclamping action. Clamping or unclamping of the spindle box and column can be selected simultaneously or individually.
R	Release Button	Push to unclamp (release) the action indicated by the clamping select switch.
S	Clamp Button	Push to clamp the action indicated by the clamping select switch.
T	Arm Lower Button	Push to lower the radial arm.
U	Arm Raise Button	Push to raise the radial arm.
V	Micro Feed Handwheel	Used to micro adjust the spindle feed.

Drive System

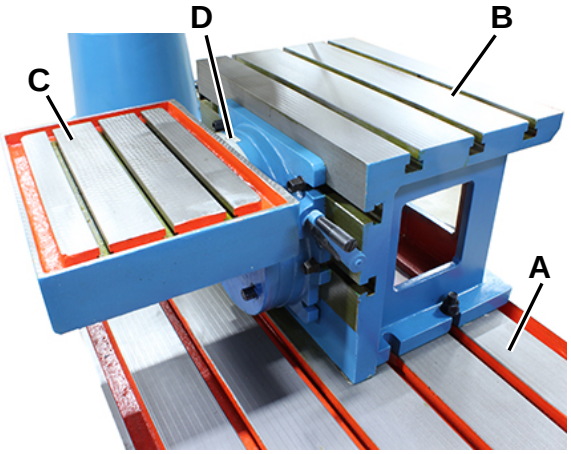
The drive system involves three (3) individual motors.
The spindle drive motor (M1), located on top of the spindle box, provides power for spindle revolution, spindle feed, and the lubricating pump of the spindle box. The spindle speed mechanism uses three drive shafts for stepless spindle speed change of both the high and low speed ranges. The spindle feed mechanism consists of a worm shaft and a horizontal shaft that are fixed respectively in vertical and in horizontal position in the lower portion of the spindle box. The feed power of the spindle is transmitted from this spindle feed mechanism to the spindle sleeve via the worm shaft, worm wheel, and horizontal shaft. The bottom of the worm shaft engages with the micro feed handwheel via the end gear clutch. There are eight (8) feed rates available between 0.0024 and 0.0394 in/r (0.06 and 1.00mm/r).
The arm elevation motor (M2), located on top of the up and down box, powers arm elevation.
The hydraulic clamping motor (M3), located at back side of the radial arm, powers the hydraulic clamping system.

Hydraulic System

The hydraulic system is mainly responsible for clamping and unclamping the column, radial arm, and spindle box. Column clamping action holds the inner column to the outer column, which stops the pivot of the radial arm. Arm clamping action holds the radial arm at the set elevation. Spindle box clamping action holds the spindle box at the set horizontal location on the arm.
The closed loop oil circulation system transmits pressure for the clamping system and also lubricates the running parts of the hydraulic clamping pump.

Positioning the Workpiece

Securely fasten the workpiece directly to the machine base (A), to the working table (B), or to the tilt table (C), which may be rotated to specific angles using the scale (D).

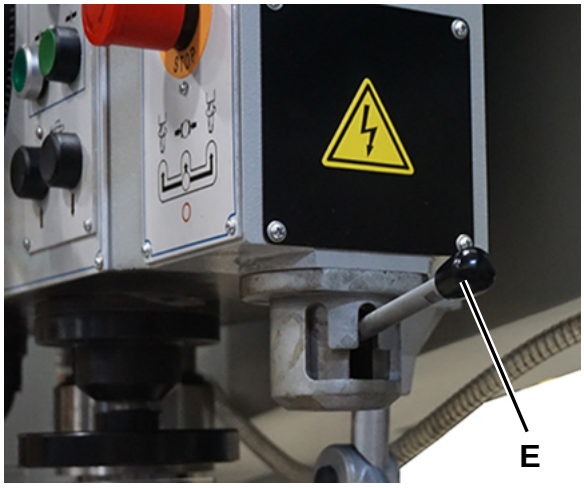


Machine Hole Positioning

The major function of this radial drill is to machine holes into metal using the spindle mechanism. Obtain desired hole positioning by mechanically elevating the arm to meet the workpiece, manually pivoting the arm to forward and backward positions, and manually moving the spindle box along the guideway to left and right positions.

Spindle Operations

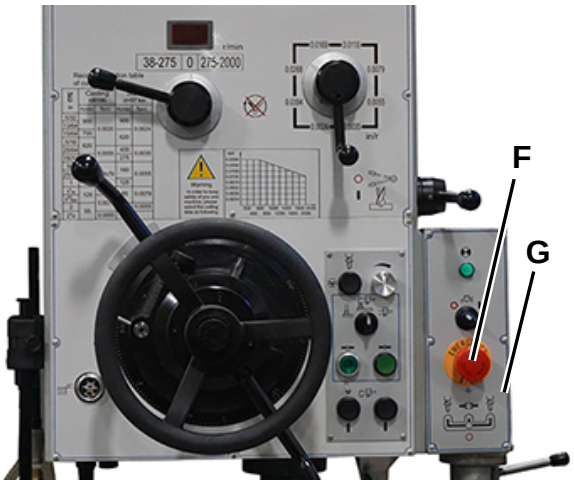
The position of the Spindle Control Handle (E) controls the four spindle functions. Pull the handle forward for clockwise (cw) rotation, backward for counterclockwise (ccw) rotation, to the center for neutral, and upward to brake.



Emergency Stop Controls

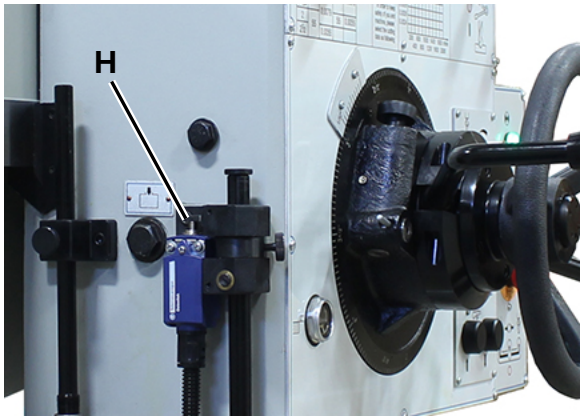
This machine can be stopped immediately in the event of incorrect operation or dangerous conditions by two emergency stop means.

Push the emergency stop button (F), located at the right-hand side of the spindle box on the operation controls box (G), to stop the machine. Twist the emergency stop button clockwise (cw) to reset. Push the emergency limit switch lever in any direction to stop the machine. The limit switch (H) is located on the left-hand side of the spindle box.



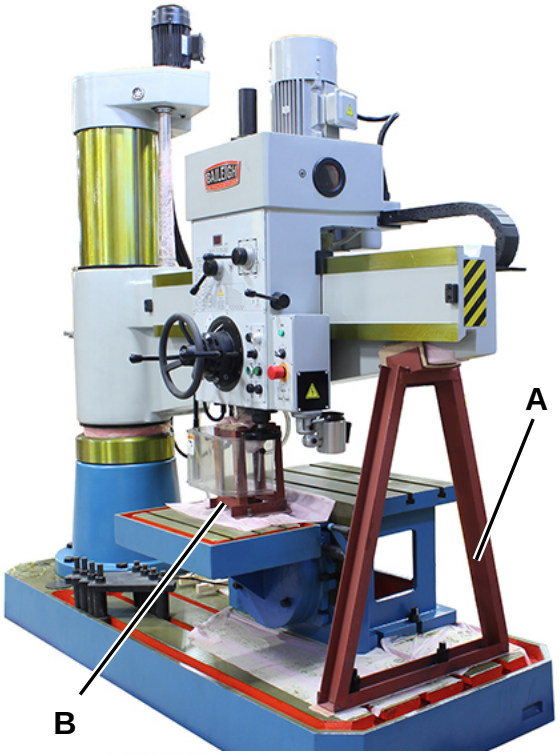
Note: *Resetting the E-Stop will not start the machine.*

Restore power by moving the spindle control handle to the middle position (neutral) first, then to the forward (cw) or backward (ccw) position.



ASSEMBLY AND SETUP

WARNING: For your own safety, DO NOT connect the machine to the power source until the machine is completely assembled and you read and understand the entire instruction manual.



Remove Shipping Braces

Remove the shipping braces from the radial arm (A) and the spindle box (B). Remove and dispose of any remaining shipping wrap.

Arm Elevation Motor Installation

1. Locate and unpack the arm elevation motor.
2. Install the motor onto the top of the main column and secure with the four bolts and washers included.
3. Connect the power supply connector.

Cleaning

WARNING: DO NOT USE gasoline or other petroleum products to clean the machine. They have low flash points and can explode or cause fire.

CAUTION: When using cleaning solvents work in a well-ventilated area. Many cleaning solvents are toxic if inhaled.

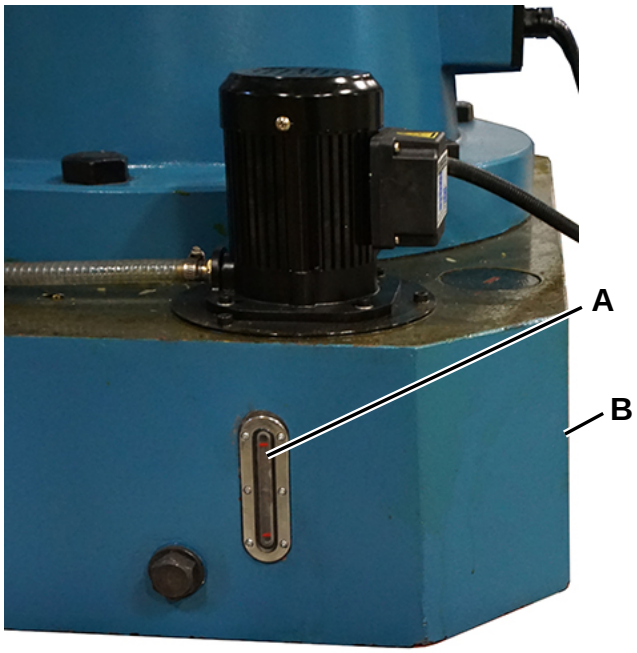
Your machine may be shipped with a rustproof waxy coating and/or grease on the exposed unpainted metal surfaces. Fully and completely remove this protective coating using a degreaser or solvent cleaner. Moving items will need to be moved along their travel path to allow for cleaning the entire surface. For a more thorough cleaning, some parts will occasionally

have to be removed. **DO NOT USE** acetone or brake cleaner as they may damage painted surfaces.
Follow manufacturer's label instructions when using any type of cleaning product. After cleaning, wipe unpainted metal surfaces with a light coating of quality oil or grease for protection.

Important: *This waxy coating is **NOT** a lubricant and will cause the machine to stick and lose performance as the coating continues to dry.*

Coolant

Fill the coolant water reservoir located in the left side of the base to 80% capacity. The sight glass window (A), at the backside of the base (B), indicates the level.



Electrical Connection

CAUTION: HAVE ELECTRICAL UTILITIES CONNECTED TO MACHINE BY A CERTIFIED ELECTRICIAN!
Check if the available power supply is the same as listed on the machine nameplate.

WARNING: Baileigh Industrial is not responsible for any damage caused by wiring up to an alternative 3-phase power source other than direct 3-phase. If you are using an alternate power source, consult a certified electrician or contact Baileigh Industrial prior to energizing the machine.

WARNING: Make sure the grounding wire (green) is properly connected to avoid electric shock. DO NOT switch the position of the green grounding wire if any electrical plug wires are switched during hookup.

Power Specifications

Your machine is wired for 220 volts, 60hz alternating current. Before connecting the machine to the power source, make sure the power source is OFF.
Before switching on the power, you must check the voltage and frequency of the power to see if they meet with the requirement, the allowed range for the voltage is ±5%, and for the frequency is ±1%.

Considerations

- Observe local electrical codes when connecting the machine.
- The circuit should be protected with a time delay fuse or circuit breaker with an amperage rating slightly higher than the full load current of machine.
- A separate electrical circuit should be used for your machines. Before connecting the motor to the power line, make sure the switch is in the “OFF” position and be sure that the electric current is of the same characteristics as indicated on the machine.
- All line connections should make good contact. Running on low voltage will damage the motor.
- In the event of a malfunction or breakdown, grounding provides a path of least resistance for electric current to reduce the risk of electric shock. This machine is equipped with an electric cord having an equipment-grounding conductor and a grounding plug. The plug must be plugged into a matching outlet that is properly installed and grounded in accordance with all local codes and ordinances.

⚠ WARNING: In all cases, make certain the receptacle in question is properly grounded. If you are not sure, have a qualified electrician check the receptacle.

- Improper connection of the equipment-grounding conductor can result in risk of electric shock. The conductor with insulation having an outer surface that is green with or without yellow stripes is the equipment-grounding conductor. If repair or replacement of the electric cord or plug is necessary, do not connect the equipment-grounding conductor to a live terminal.
- Check with a qualified electrician or service personnel if the grounding instructions are not completely understood, or if in doubt as to whether the machine is properly grounded.
- Repair or replace damaged or worn cord immediately.

Power cord connection:

Have a qualified electrician install the power connection.

1. Locate the power cord which connects to the terminal strip at locations **E, L1, L2,** and **L3**. Insert a fitting into an open hole to grip the power cord (supplied by customer).
2. Connect the three power wires terminals **L1, L2, & L3**. Connect the ground wire (typically green) to the **E** terminal.
3. Check that the power cord has not been damaged during installation.
4. Secure the electrical enclosure door when completed.

Route the cord to the power supply in a manner that will not cause a trip or entanglement hazard.

Check for Correct Motor Connections

***NOTICE: DO NOT** run the machine until fluid levels have been filled per "PRE-OPERATION, Lubricate the Machine" and all packaging materials have been removed.*

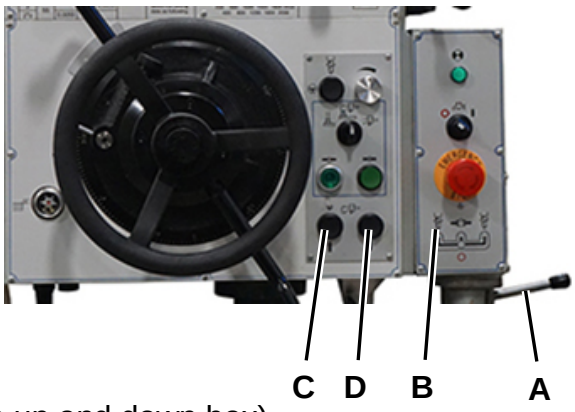
Check the spindle drive motor for correct rotation and the arm elevation motor for proper raise and lower connection.

1. Ensure that all fluid levels have been filled per "PRE-OPERATION, Lubricate the Machine".
2. Verify that all tools and materials have been removed from all areas around the machine's moving parts.
3. With power connected, turn the main disconnect power switch ON. The power indicator on the machine controls box will light.

4. Check the spindle rotation (motor located on top of the spindle box).

   Pull the spindle control handle (A) forward toward the operator to start the spindle. The spindle should rotate in a clockwise direction when looking down on the spindle from and overhead position, matching the label illustration (B).

   If not, disconnect power to the machine, and switch any two phase wires. **DO NOT** move the ground wire. Retest.



5. Check the arm elevation (motor located on top of the up and down box).

   Place the clamping selector switch in the center position.

   One at a time, press the arm raise (C) and arm lower (D) buttons. The arm should raise or lower as the matching button is pressed.

   If not, disconnect power to the machine and switch the L1 and L3 wires. **DO NOT** move the ground wire. Retest.

PRE-OPERATION

Lubricate the Machine

NOTICE: *The machine must be properly lubricated prior to operation to prevent machine damage.*

Proper lubrication is necessary before every operation of the machine. Refer to the lubrication chart (A) for lubrication requirements.

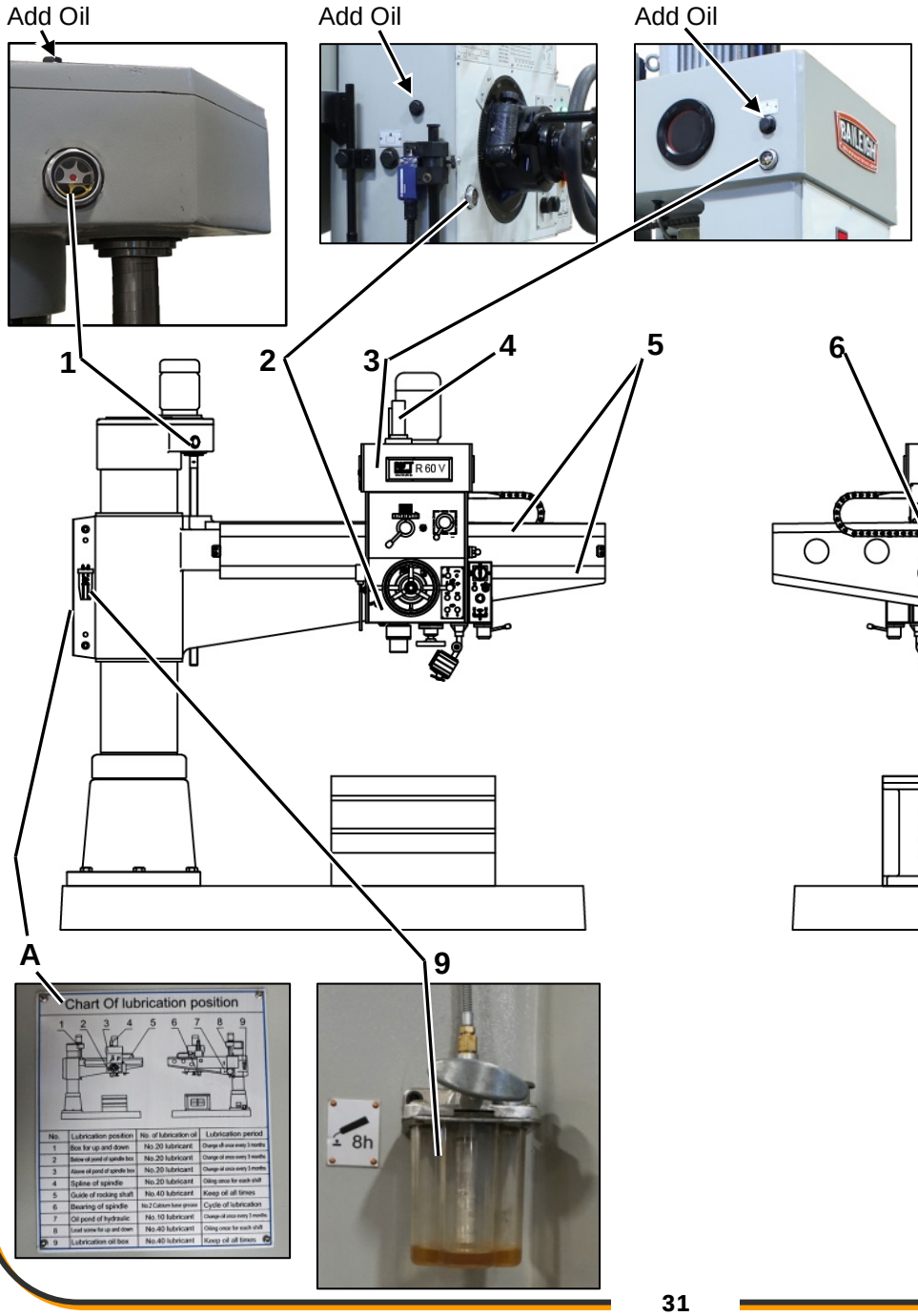
Manual Lubrication
Manually lubricate the radial arm guideway (5) and the leadscrew (8) with No. 40 oil, lubricate the spindle spline (4) with No. 20 oil. Grease the spindle bearing (6) with No. 2 grease.

Lubrication Oil
Use No. 20 oil as needed to ensure that the three lubrication oil tank levels are slightly higher than the centerline of each sight glass window. There is one oil tank for the up and down box (1). There are two oil tanks located in the spindle box: the lower tank (2) is for the wormgear and the upper (3) is for the oil pump.
Ensure that there is also No. 40 lubrication oil in the tank attached to the radial arm (9) for lubricating the outer column.

Hydraulic Oil

NOTICE: *A shortage of hydraulic oil can cause hydraulic system breakdown and damage to major mechanical parts due to overheating.*

Use #68 SHELL BRAND hydraulic oil or an equivalent as needed to ensure the hydraulic oil tank level is slightly higher than the centerline of the sight glass window (7).



Item	Lubrication Position	Name of Lubrication Oil*	Lubrication Period
1	Up and Down Box	No. 20 mechanical oil	Once every three months
2	Lower Oil Tank of Spindle Box	No. 20 mechanical oil	Once every three months
3	Upper Oil Tank of Spindle Box	No. 20 mechanical oil	Once every three months
4	Spindle Spline	No. 20 mechanical oil	Few drops each shift
5	Radial Arm Guideway	No. 40 mechanical oil	Keep oiled all the time
6	Spindle Bearings	Grease No. 2	Lubrication period
7	Hydraulic Tank	No. 10 mechanical oil	Once every three months
8	Up and Down Leadscrew	No. 40 mechanical oil	Once every shift
9	Lubrication Tank of Outer Column	No. 40 mechanical oil	Keep filled all the time

*No. 40 oil is equivalent to ISO VG68; No. 20 oil is equivalent to ISO VG33; No. 10 oil is equivalent to #68 SHELL BRAND hydraulic oil

Initial Start-Up Only

Special attention needs to be given to the radial arm movement for the first time use.

1. Start the machine and lower the radial arm 2" (50mm) and clean and lubricate the exposed surface.
2. Raise the radial arm 4" (100mm) and clean and lubricate the exposed surface. This will remove any dirt or grit that may have accumulated to prevent damaging or scratching of the column.
3. Test run the machine for 30 minutes, switching from low speed to high speed, checking all handles and buttons. If the machine runs smoothly, it may be placed into service.

Material Selection

CAUTION: It must be determined by the customer that materials being processed through the machine are NOT potentially hazardous to operator or personnel working nearby.

When selecting materials keep these instructions in mind:

- Material must be clean and dry. (without oil)
- Material should have a smooth surface so it processes easily.
- Dimensional properties of material must be consistent and not exceed the machine capacity values.

- Chemical structure of material must be consistent.
- Buy certificated steel from the same vendor when possible.

Tool Use Preparation

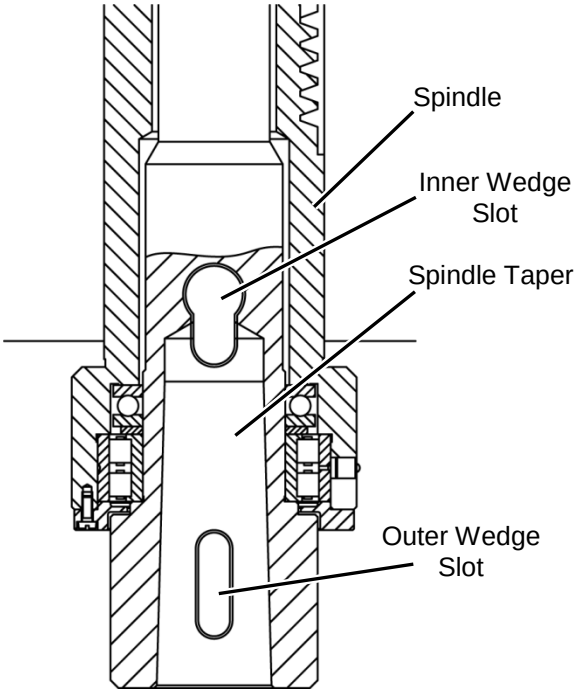
CAUTION: Turn the main power to the machine OFF before inserting or removing any tools.
Be sure that the spindle taper and mating tools are in good condition, clean, and dry before use to prevent the tapered fit from falling loose during machining.

Turn the main power to the machine **OFF.**

1. To create a secure fit, thoroughly clean the spindle taper and any tools that are being put into use.

2. Check that the tools are in good condition, without nicks or burrs. Do not use substandard connecting pieces, which can damage the spindle taper hole.

3. Securely attach the chuck to a tool holder, such as an arbor, taper sleeve, or the quick-connecting rod. Once an arbor or taper sleeve is joined together with a chuck, they should remain as an assembly. Use a new arbor or taper sleeve to mount a different chuck. The quick connecting rod can easily accept chuck tool changes.



Spindle Section View

***Note**:* A taper adapter sleeve wedge is supplied for tool removal.

OPERATION

CAUTION: Always wear proper eye protection with side shields, safety footwear, and leather gloves to protect from burrs and sharp edges.
When handling large heavy materials make sure they are properly supported.

NOTICE: *The machine must be properly lubricated prior to operation to prevent machine damage. Refer to "PRE-OPERATION, Lubricate the Machine" for specifications.*

Note*:* Refer to the "GETTING TO KNOW YOUR MACHINE" section in this manual and your actual machine to become familiar with the operator controls.
See the drawing on the label near each control which visually illustrates the action.

Turn on the Power

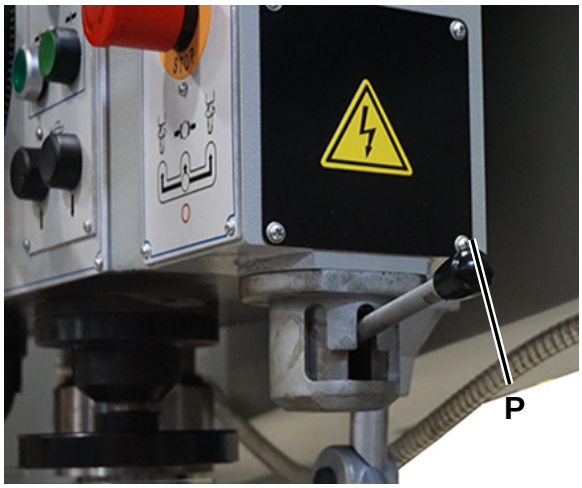
Turn on the main switch power switch located at the backside of the spindle box. The power indicator light on the controls box will illuminate.

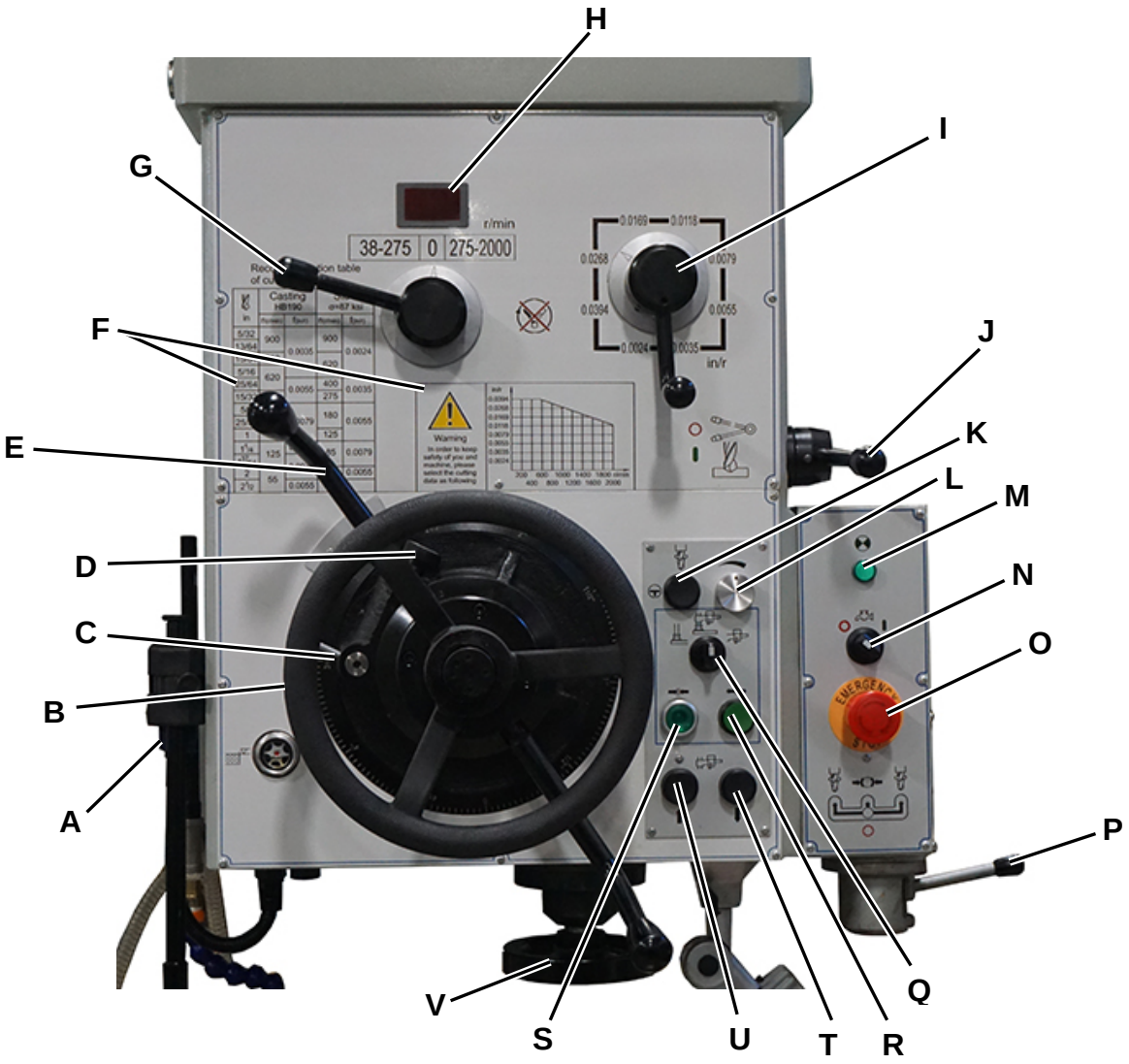
Spindle Control

The spindle control handle (P) is used for all machining processes to set the spindle action in forward (clockwise), backward (counterclockwise), brake, or neutral position.

Begin with the handle in the neutral (middle) position for two (2) seconds while the motor "powers up".

To start the spindle rotation, move the handle forward, toward the operator, or backward, away from the operator. Stop the spindle by moving the handle to the middle position, and brake the spindle by lifting the handle upward.





Speed Range and Speed Change

The speed range change handle (G) is used to select the spindle speed range. Choose low range (38-275 r/min), neutral (idle), or high range (275-2000 r/min). Stop the machine when changing the speed range. Use the feed/speed tables (F) as a guide.
Stepless spindle speed from 38-2000 r/min is available by turning the speed change dial (L). The actual spindle speed will be shown on the digital display (H).
If spindle speed change is difficult, press the spindle jog button (K). Refer to the feed/speed tables (F).

Feed Rate Selection

Select the feed rate with the feed rate handle (I), pointing the dial indicator to the desired rate. There are eight (8) feed rates 0.0024-0.0394 in/r (0.06-1.00mm/r). Refer to the cutting data speed/feed tables (F) for guidance.

Stop the machine when changing the feed rate. If feed rate change is difficult, manually rotate the handwheel (V) at the same time.

***Note**: The maximum spindle torque is 90 lbf (400N) and the maximum feed resistance of the spindle is 4000 lbf (16000N). Actual cutting torque and feed resistance cannot be over these maximum values.*
The hardness of the workpiece material, cutting performance, and sharpness of the cutting tool will influence cutting force.

Spindle Feed

***Note**:* The column and the spindle box must be clamped when machining.

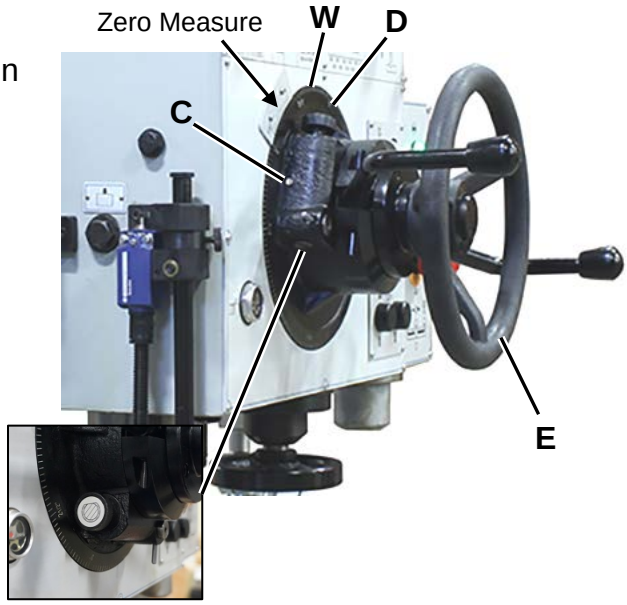
The spindle system uses a strengthened spindle sleeve with double supports. The sleeve moves up and down in the spindle hole of the spindle box during feed operation.
There is a counterbalance weight mechanism inside the spindle box for spindle return.

Spindle feed can be done manually, by using power feed, or by using micro feed.
Feed manually by pushing the feed handle (E) toward the machine and rotating the spindle handwheel (B).

Activate power feed by moving the power feed engagement handle (J) to the **down** position and pull the feed handle (E) outward toward the operator.
Set up micro feed by first moving the power feed engagement handle (J) to the **up** position to disengage power feed, then pull the feed handle (E) outward. Move the micro feed handwheel (V) up, engaging the end gear clutch, and turn to micro feed. Pull the micro feed handwheel down when micro feed is not being used.

CAUTION: When micro feed is required, DO NOT move the power feed engagement handle (J) to the down position. This would activate the power feed, causing the micro feed handwheel to turn quickly.

Cutting Depth Preset



Flat Side Indicator

Preset the cutting depth to stop the spindle feed when the cutting tool reaches the preset depth during manual or power feed modes.

1. Manually rotate the feed handle (E) to lower the spindle until the cutting tool just touches the surface of the workpiece.
2. Disengage the cutting depth control pin (C) by pulling it outward.
3. Pull the micro adjustment knob (D) outward and twist the knob away from the scale plate (W) at least 180° to clear settings. Continue to twist the knob in the same direction until the flat side is facing inward as shown.
4. While still holding the knob out, turn the scale plate (W) until the desired cutting depth measure lines up with the zero (0) point of the spindle box.
5. Push the knob in, which will engage the cutting depth control pin (C) and lock in (fix) this position.
6. Continue to fine adjust in this manner until the desired cutting depth is locked-in and lined-up with the zero (0) point of the spindle box.

Begin the spindle feed. When the cutting tool reaches the preset depth, the machine will operate according to the mode.

POWER FEED MODE: When the cutting tool reaches the preset depth, the power feed engagement handle (J) will automatically move up, stopping the feed.

MANUAL FEED MODE: Rotate the spindle handwheel (B) to feed the cutting tool as normal. When the handwheel reaches the zero (0) point, it will “hard” stop rotation, stopping the feed at the preset depth.

Tapping

Tapping is a manual function. Do not use the power feed mode.

Important: *Chamfer the holes before tapping. A tapping rate of eight times per minute or less is recommended.*

Tap the holes using this method.

1. Pull the cutting depth control pin (C) outward.
2. Turn the power feed handle (E) to lower the tap to the workpiece.
3. Give enough force to the handle, based on the diameter of the tap, to allow easy hole entry.
4. When the desired tap depth is reached, reverse the spindle direction, while at the same time moving the power feed handle (E) in the reverse direction forcefully enough to raise the tap away from the workpiece.

NOTICE: *This is a conventional radial drill, not a special purpose machine, therefore frequent tapping jobs will wear the motor and gears.*

Radial Arm Elevation

Press and hold the arm raise (U) or lower (T) button to raise or lower the radial arm. When the arm is at the desired elevation, release the button and the arm will stop and the hydraulic clamping mechanism will automatically clamp the arm in position.

Note*:* There is a security nut system in place that will mechanically prevent the radial arm from dropping down in case of a hydraulic system failure.

Radial Arm Rotation

WARNING: **Before rotating the radial arm, be sure that no one is standing at the end of the radial arm, and that there are no other obstructions in the way. Do not use strong force to push or pull the radial arm.**

With the column unclamped, manually push or pull the radial arm to rotate it. A **maximum** of 180° in either direction is strongly recommended. Do not use strong force to move the radial arm: the torque for rotation is up to 6.7 lbf (30N).

NOTICE: *Do not regularly rotate the radial arm all the way around the column (360°). This will break wires in the inner column and damage cables or hoses that are routed between the column and the arm.*

Spindle Box Positioning

When unclamped, the spindle box can be moved manually along the guideway to the desired location. Do not use strong force to push or pull the spindle box.

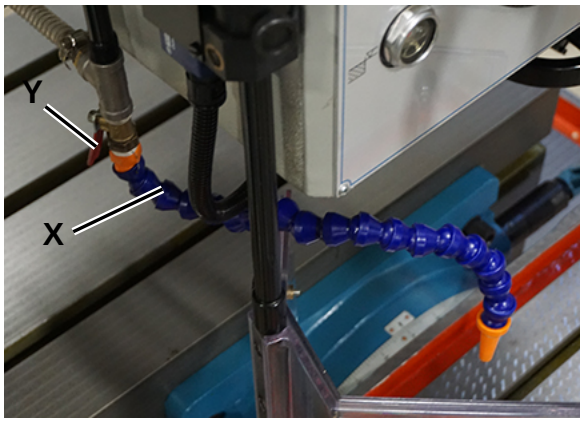
Clamping and Unclamping the Column and Spindle Box

Clamping and unclamping the column or spindle box can be done individually by positioning the selector switch (Q) in the left position for column action to the secure radial arm pivot position, in the right position for spindle box action, or in the center position for simultaneous action. After selecting the desired action, push the Clamp button (S) to clamp, or the Release button (R) to unclamp.

Note*: The radial arm will automatically unclamp while elevating and clamp when stationary. There is no operator control for clamping the radial arm elevation position.*

Coolant Pump

The coolant pump On/Off switch (N) is located on the machine controls box. Use the flexible tube (X) to direct the coolant flow toward the cutting point in one direction. Use the valve (Y) at the base of the flexible tube to control the coolant flow. The coolant pump works simultaneously with the spindle motor; it will automatically stop coolant flow when the spindle stops.

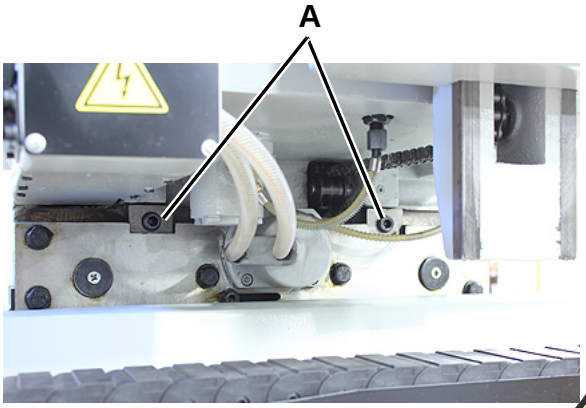


ADJUSTMENTS

Spindle Box Clamping Force

1. With the spindle box unclamped, adjust the two (2) set screws (A) for the taper wedge.

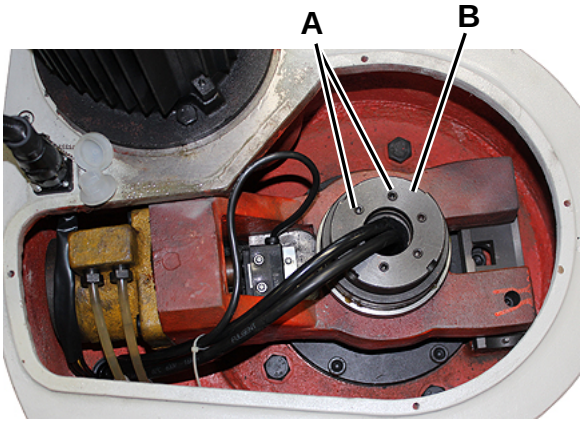
Note*: Adjust the set screws evenly in 1/16 to 1/8 of a turn increments. This will make a big change to the clamping pressure.*



2. Clamp the spindle box. The adjustment is correct if the spindle box does not move along the guideway when 90 lbf (400N) twisting force is exerted on the spindle box handwheel.
3. Inspect the releasing action. With the spindle box unclamped, twisting the spindle box handwheel with 9 lbf (40N) force should allow the spindle box to move.

Column Clamping Force

When pivoting the radial arm on the column axis, the entire outer upper column pivots on the inner column post. Column clamping is used to hold the outer column secure to the inner column so the radial arm will not rotate.



1. Unclamp the column and remove the cover on top of the column.
2. Loosen the six (6) set screws (A) and adjust the nut (B) on the top of the column.

***Note**: Only adjust the nut in 1/8 to 1/4 of a turn increments. This will make a big change to the clamping pressure.*

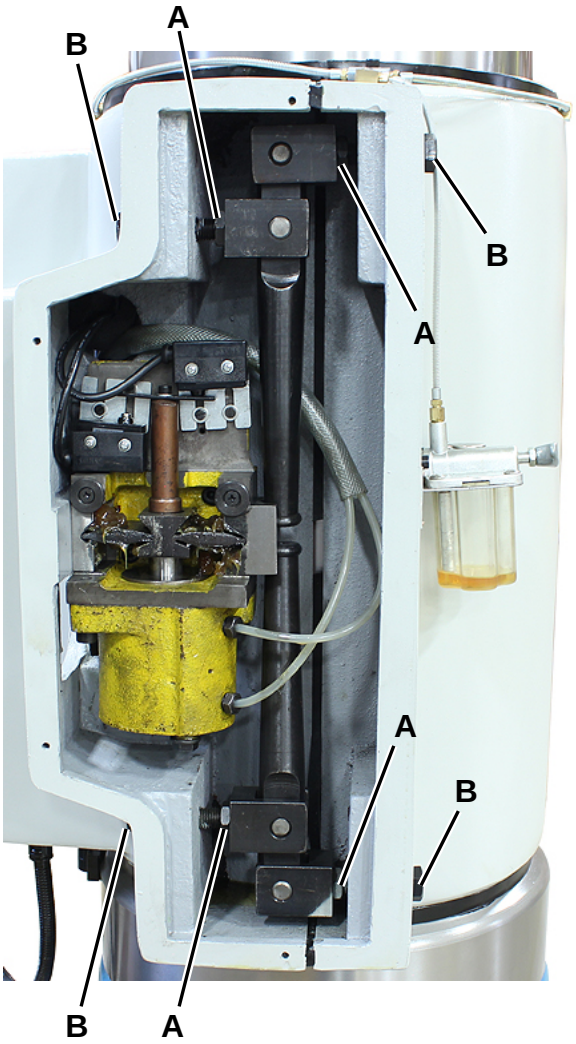
3. Tighten the six (6) set screws. The adjustment is correct when the radial arm does not move when 360 lbf (1600N) downward force is exerted at the end of the radial arm.

***Note**: If the nut cannot be adjusted properly in this manner, shim washers may be required to allow for more clamping pressure. Then adjust the nut on the top of the column again.*

4. Inspect the releasing action. With the radial arm unclamped, exerting 6.7 lbf (30N) downward force on the end of the radial arm should allow the radial arm to move. Install the cover on top of the column when completed.

Radial Arm Clamping Force

When raising and lowering the radial arm on the column, the radial arm releases from the outer upper column. The keyway on the outer column keeps the radial arm from pivoting on the outer column. When the desired height is achieved, the radial arm will automatically clamp to the outer column to secure that position.



1. Remove the end cover.
2. Turn the power off *<u>while</u>* the radial arm is rising. This will hold the cylinder in the released position.
3. Loosen the jam nuts (A) and adjust the upper and lower hexagon head bolts (B).

***Note**: Adjust the bolts evenly in 1/16 of a turn increments. This will make a big change to the clamping pressure.*

4. Turn the power on. The clamping motor will run and clamp the radial arm to the column.
5. Install the end cover.

Hydraulic Pressure

The hydraulic pressure is set between 290-360 psi (2-2.5MPa) at the factory and is not adjustable. No further adjustments will be required under normal conditions.

MAINTENANCE AND LUBRICATION

WARNING: Make sure the electrical disconnect is OFF before working on the machine.
Maintenance should be performed on a regular basis by qualified personnel.
Always follow proper safety precautions when working on or around any machinery.

***Note**: Proper maintenance and lubrication can increase the life expectancy of your machine. Refer to the Lubrication Chart for specifications.*

Daily Maintenance

- Check daily for any unsafe conditions and fix immediately.
- Check that all nuts and bolts are properly tightened.
- Do a general cleaning by removing dust and metal chips from the machine.
- Top off the coolant reservoir (80% capacity), the full capacity is 15.8 gallons (60 liters).
- Clean filter screens located on the machine base.
- Sharpen or replace any worn or damaged tooling.
- Clean the spindle taper hole and tool taper.
- Using a soft cotton cloth, clean and manually lubricate the radial arm guideway (5), the leadscrew (8), and the spindle spline (4) per the Lubrication Chart.
- Top off lubrication oil in the outer column oil tank.

Weekly Maintenance

- Clean the machine and the area around it.
- Apply rust inhibitive lubricant to all non-painted surfaces.
- Thoroughly clean the machine including the coolant reservoir.

Monthly Maintenance

- Wipe the guideway and column with precision emery paper to prevent the surface from scratching.
- Disassemble the seal ring of the column at both sides of the big hole and clean the felt in order to avoid dust or chips from damaging the guideway surface.
- Grease the spindle bearing (6) with No. 2 grease per the Lubrication Chart.

- Check that all screws and bolts are tight and secure.
- Wipe built-up grime from the vertical mill with a rag and a mild solvent.
- Check for worn or damaged electrical cables.

***Note**: When cleaning chips and debris from the machine, use a brush and a shop vacuum. **DO NOT** blow off the machine with compressed air. The force of the compressed air may force chips into critical mechanisms or may inflict injury to yourself or others.*

Three Month Maintenance

Lubrication Oil Tanks

The oil tanks supply major working parts of the machine which are lubricated automatically. The three tank levels should be slightly higher than the centerline of each sight glass window.

- Use ISO VG33 oil or equivalent.
- The up and down box oil tank capacity is .26 gallon (1 liter).
- The lower spindle box oil tank capacity is 1 gallon (4 liters).
- The upper spindle box oil tank capacity is 1.38 gallon (5.2 liters).

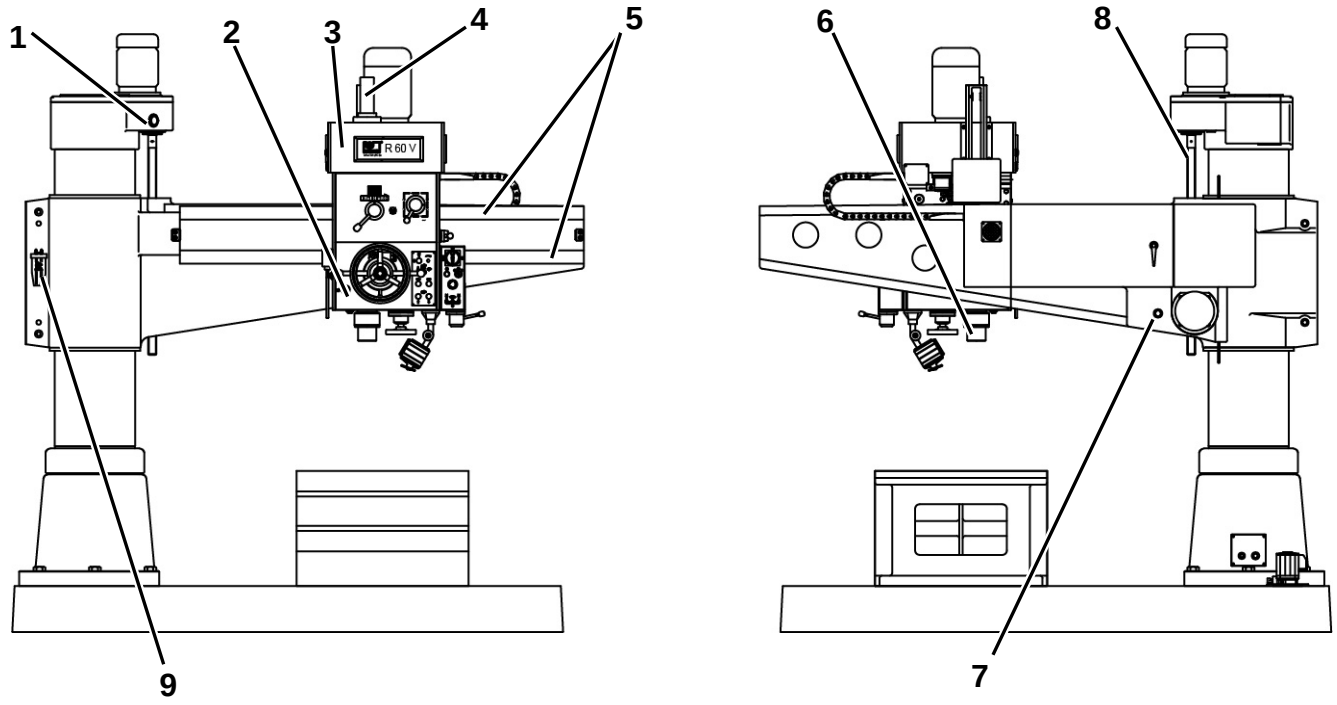
Hydraulic Oil Tank

The hydraulic oil is the primary medium for transmitting pressure and must lubricate the running parts of the pump.

***NOTICE:** A shortage of hydraulic oil can cause hydraulic system breakdown and damage to major mechanical parts due to overheating.*

- Use #68 SHELL BRAND hydraulic oil or an equivalent.
- Keep the hydraulic oil reservoir level slightly higher than the centerline of the sight glass window (80% capacity), the full capacity is .5 gallon (2 liters).
- DO NOT rely totally on the sight glass as they can sometimes indicate an incorrect level reading. Do a visual inspection with the oil fill cap removed as well.
- Change the hydraulic oil every 12 months along with the oil filter.

Lubrication Schedule



Item	Lubrication Position	Name of Lubrication Oil*	Lubrication Period
1	Up and Down Box	No. 20 mechanical oil	Once every three months
2	Lower Oil Tank of Spindle Box	No. 20 mechanical oil	Once every three months
3	Upper Oil Tank of Spindle Box	No. 20 mechanical oil	Once every three months
4	Spindle Spline	No. 20 mechanical oil	Few drops each shift
5	Radial Arm Guideway	No. 40 mechanical oil	Keep oiled all the time
6	Spindle Bearings	Grease No. 2	Lubrication period
7	Hydraulic Tank	No. 10 mechanical oil	Once every three months
8	Up and Down Leadscrew	No. 40 mechanical oil	Once every shift
9	Lubrication Tank of Outer Column	No. 40 mechanical oil	Keep filled all the time

*No. 40 oil is equivalent to ISO VG68; No. 20 oil is equivalent to ISO VG33; No. 10 oil is equivalent to #68 SHELL BRAND hydraulic oil

Oil Disposal

Used oil products must be disposed of in a proper manner following your local regulations.

Accessing and Cleaning the Coolant System

- Clean the drain screens on the machine base.
- Drain and wash out the dirt and debris from the reservoir.
- Thoroughly clean the pump and pump inlet.
- Re-fill the tank with coolant solution.

Oils for Lubricating Coolant

Any 10:1 (water to coolant) solution will work, however we recommend Baileigh B-Cool 20:1 (water to coolant) biodegradable metal cutting fluid. It has excellent cooling and heat transfer characteristics, is non-flammable, and extends tool and machine life. Each gallon of concentrate makes 21 gallons of coolant.

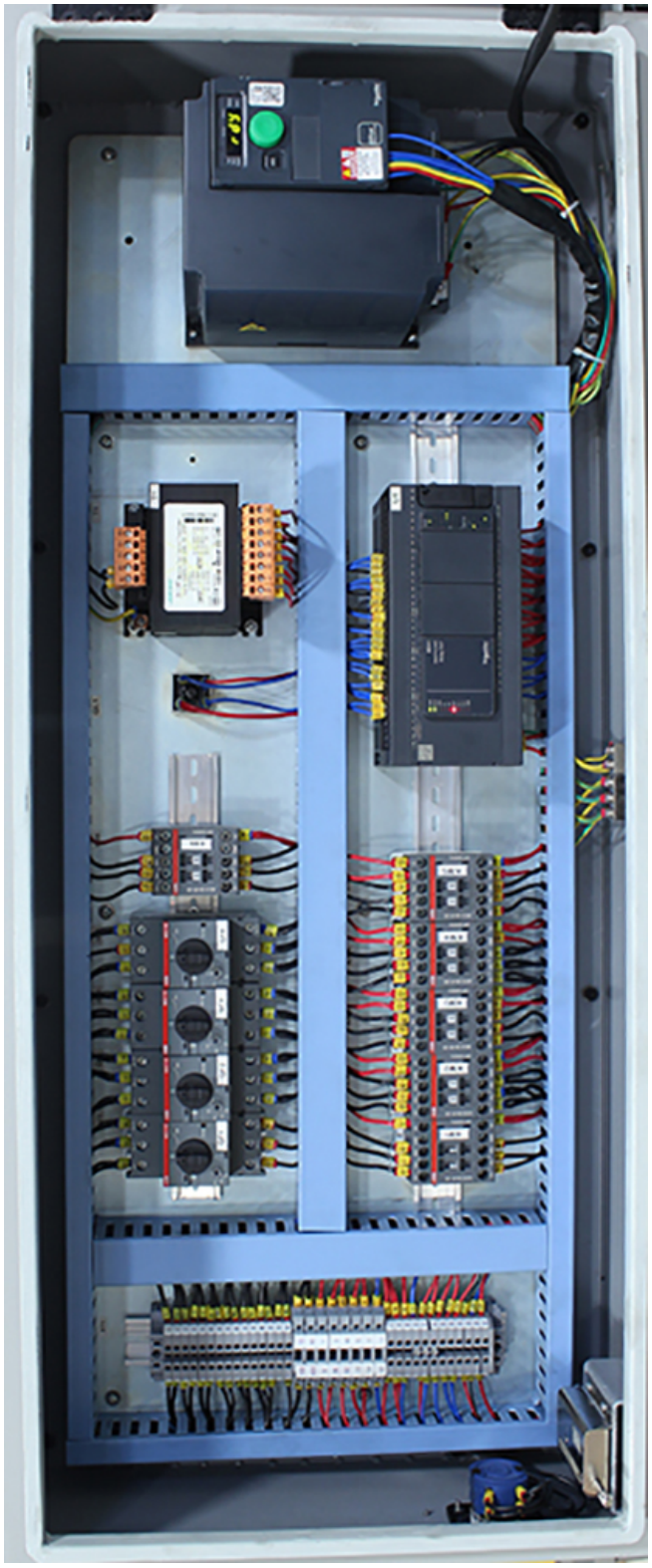
Storing Machine for Extended Period of Time

If this machine is to be inactive for a long period of time, prepare the machine as follows:

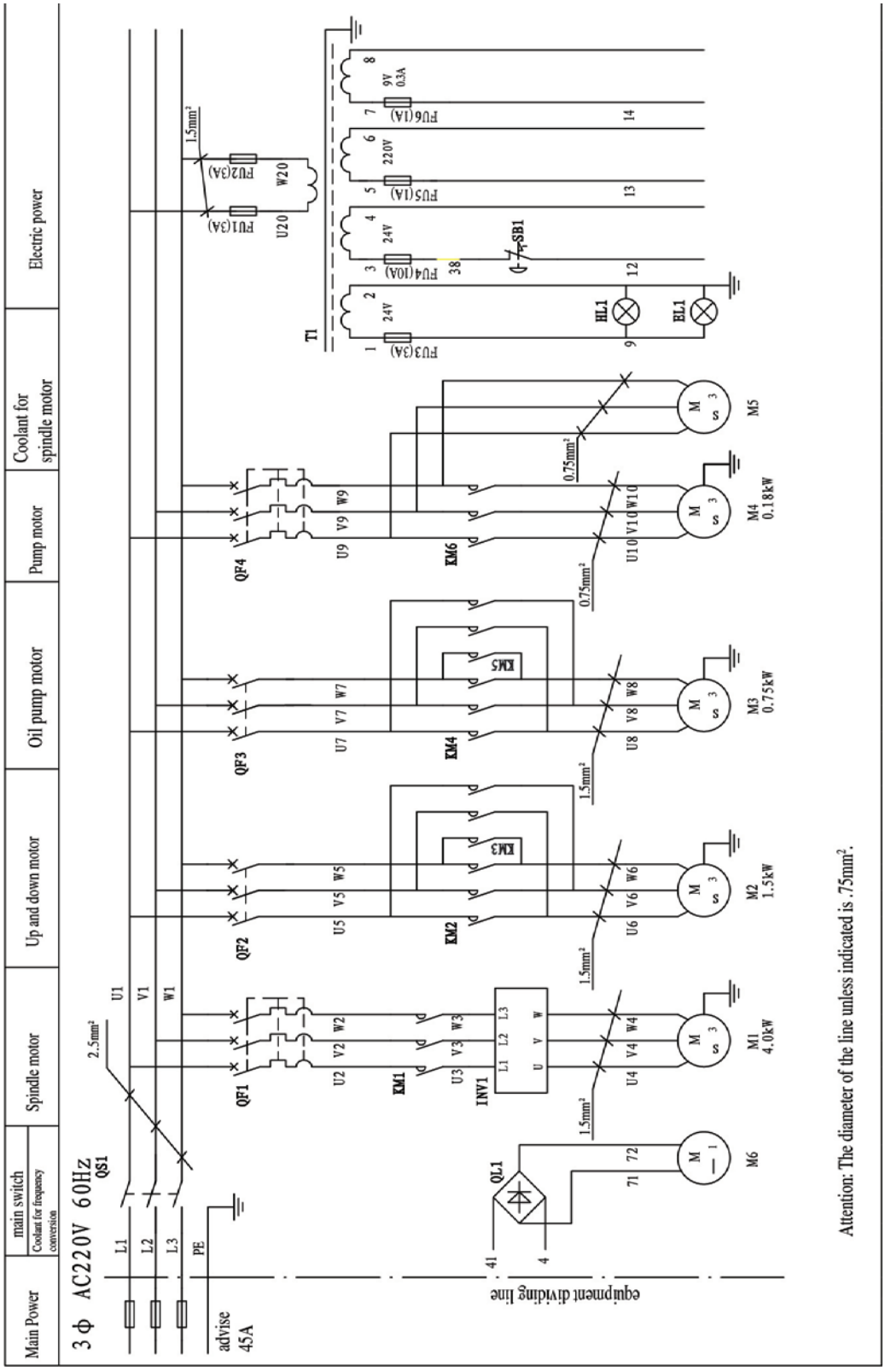
- Disconnect the electrical supply from the power panel.
- Empty and clean the coolant reservoir.
- Clean and grease the machine.
- Cover the machine.

ELECTRICAL ENCLOSURE AND SCHEMATIC

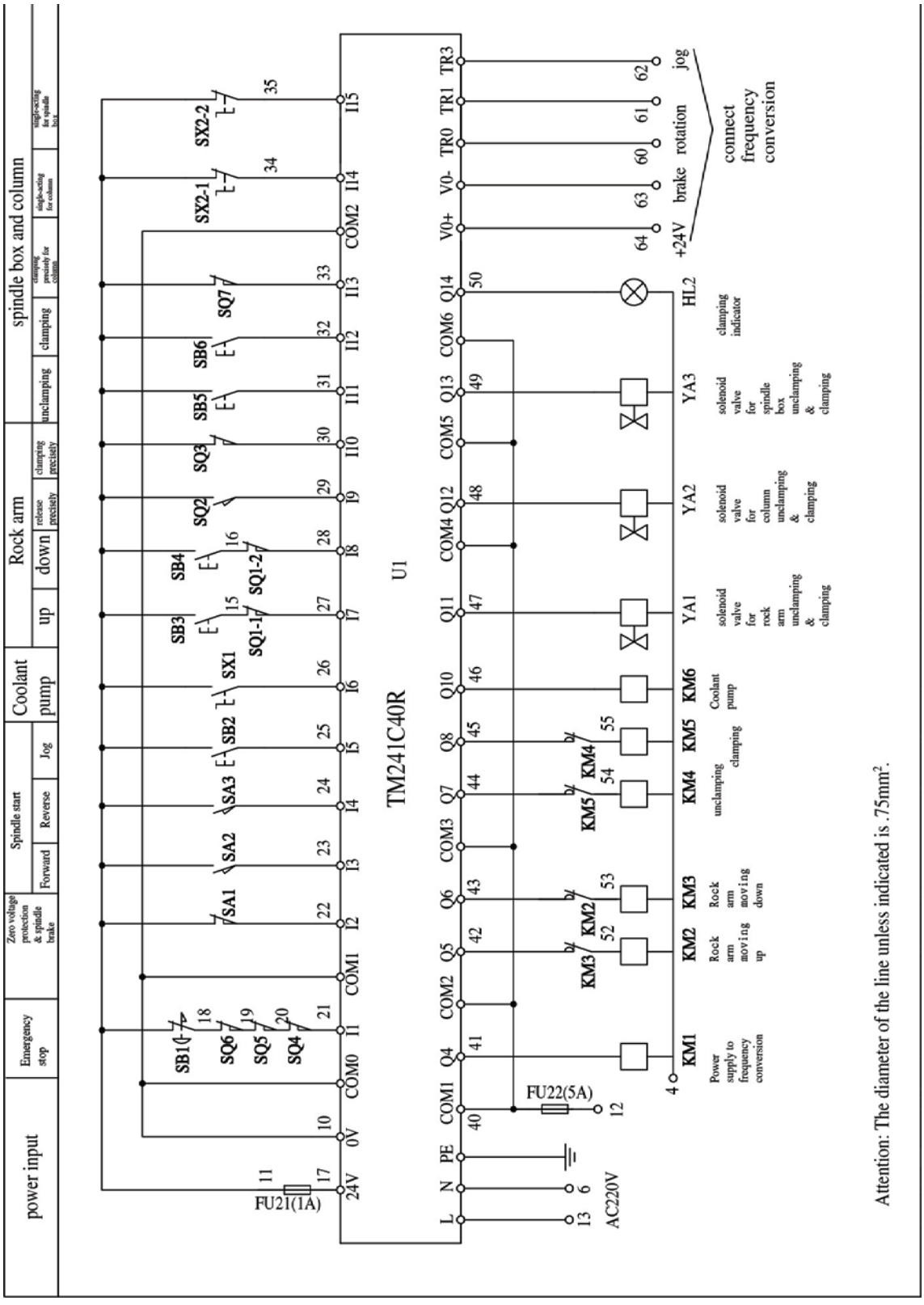
Electrical Enclosure



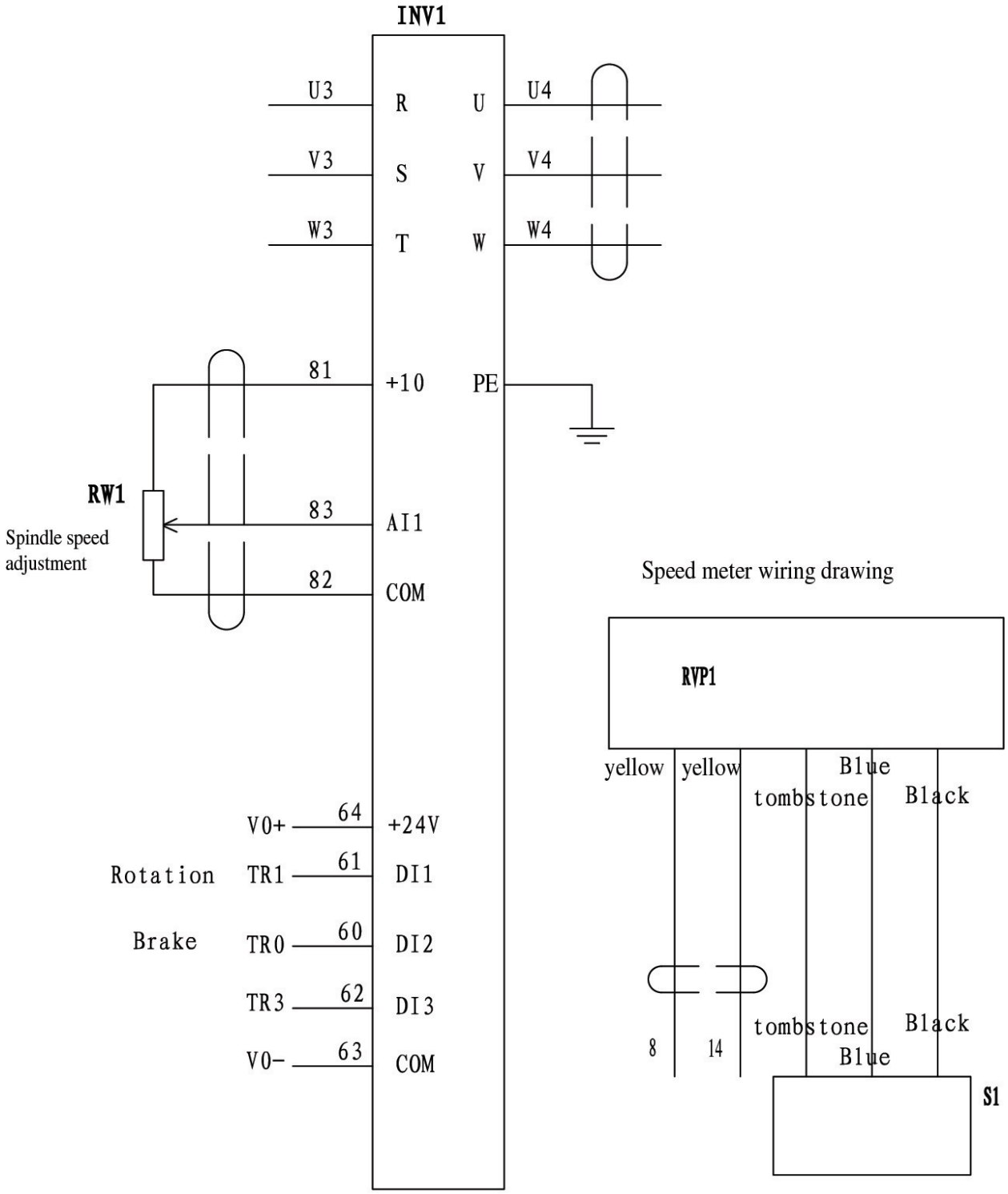
Main Power Schematic



Power Input Schematic



Frequency Conversion Schematic

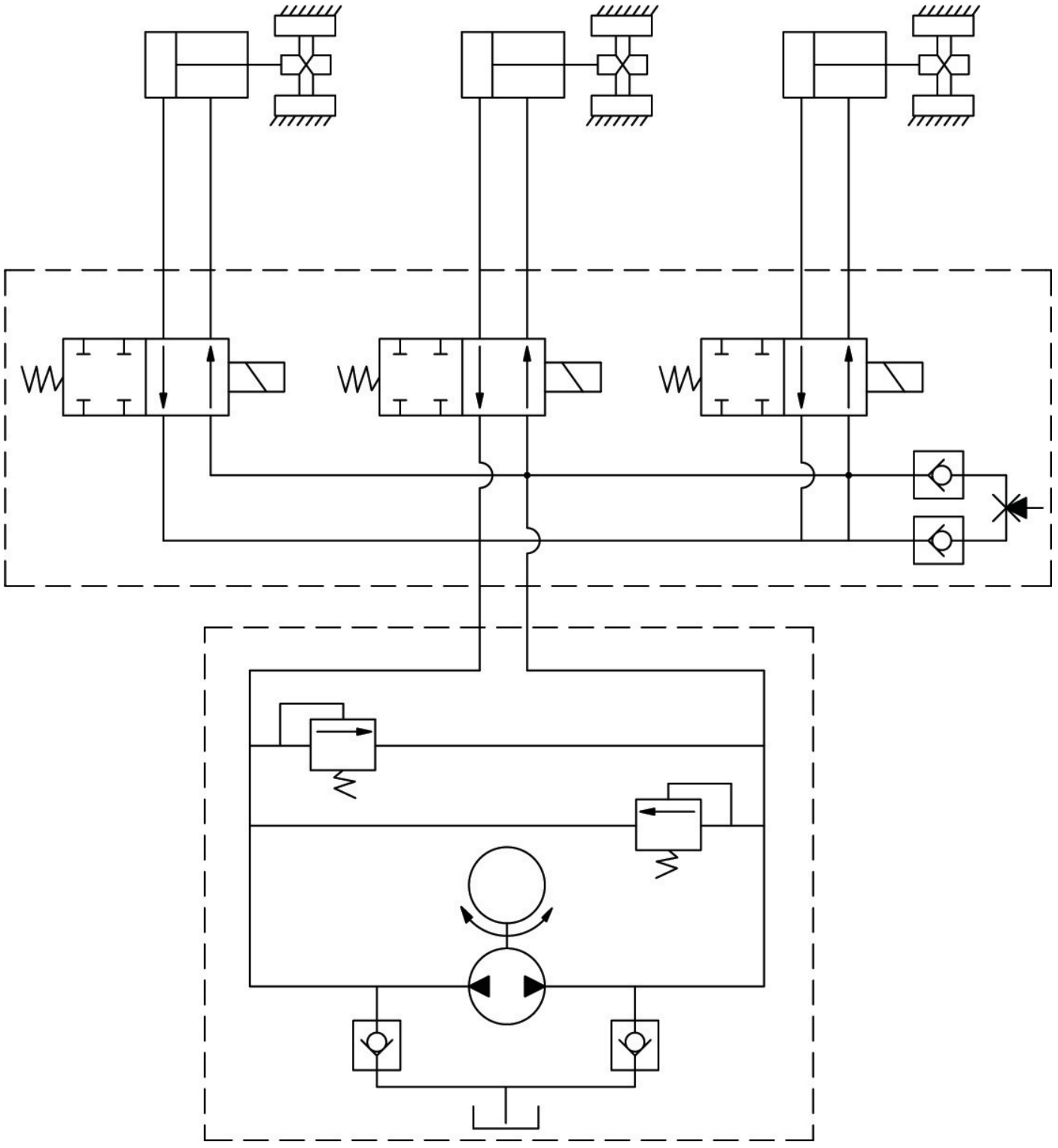


Attention: The diameter of the line unless indicated is .75mm².

Electrical Schematics Parts List

Item	Description	
QF1	Breaker	MS116-20
QF2	Breaker	MS116-10
QF3	Breaker	MS116-4
QF4	Breaker	MS116-1
QS1	Instruction switch	3LBB-20/X718.2 GS DN
SB1	Emergency stop button	MPMT3-10R, MCBH-00, MCB-01 (2 Req.)
SA1,2,3	Limit switch	LXP1(3SE3)020-0A (3 Req.)
SB2,3,4	Up and down button	CP1-10B-10 (3 Req.)
SB5	Release button	CP1-10G-10
SB6	Clamping button	MP1-11G
		MCBH-00
		MCB-10
		MLB-1
		MA5-1020 (lamp voltage AC24V)
SX1	Water pump switch	C2SS2-10B-10
SX2	3 position selection switch	C3SS1-10B-02
SQ1-1, SQ1-2	Limit switch	SND6166-SP-C-001 (2 Req.)
SQ2, SQ3, SQ7	Limit switch	Z-15GD (3 Req.)
SQ4	Door switch	JWM6-11
SQ5	Emergency stop switch	ZCP29+ZCPEP16+ZCE10
SQ6	Limit switch	XCKN2127P20C
KM1-6	Contactor	AS12-30-01-20(AC24V) (6 Req.)
U1	PLC	TM241C40R
HL1	Signal lamp	AD17-16 AC24V
EL1	Illuminator	25W AC24V
T1	Transformer	JBK5-250W,220V/24,24,9V,220V
QL1	Bridge rectifier	QL5A200V
INV1	Frequency converter	ATV320U40M3C
RVP1, S1	Speed meter	RSD-27
RW1	Potential resistance, knob	RV24YN20SB202

HYDRAULIC SCHEMATIC



NOTES

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