



WATER COOLED CLUTCHES/BRAKES WITH COPPER ALLOY WEAR PLATES

INSTALLATION AND MAINTENANCE MANUAL



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1.0 Introduction



DANGER:

Forward this manual to the person or persons responsible for the installation and/or operation and/or maintenance of the product described herein. Without access to this information, faulty installation, operation and/or maintenance may occur, which could result in equipment damage, personal injury and even death.



DANGER

Use of improper tools and/or methods used in installing or servicing this brake can result in accidents causing injury and/or death. Adequate lifting points are provided to safely handle only the individual brake components. Lifting and handling of the assembled brake will require the use of alternate methods.



DANGER

Read these instructions thoroughly and review until you fully understand all warning and hazards before proceeding with the work described in this manual. Failure to follow these instructions in this manual can result in unreasonable exposure to hazardous conditions and/or personal injury and/or death.

Throughout there are a number of **HAZARD WARNINGS** that must be read and adhered to in order to prevent possible loss of equipment and/or personal injury and /or loss of life. The three warning words are **“DANGER”**, **“WARNING”** and **“CAUTION”**. They are used to indicate the severity of the hazard and are preceded by a safety alert symbol. 

“DANGER” – Denotes the most serious injury hazard and is used when serious injury or death **WILL** result from misuse or failure to follow the specific instructions set forth in this manual.

“WARNING” – Denotes when serious injury or death **MAY** result from misuse or failure to follow the specific instructions set forth in this manual.

“CAUTION” – Denotes when injury or product or equipment damage may result from the misuse or failure to follow the specific instructions set forth in this manual.

It is the responsibility of the personnel involved in the installation, operation and maintenance of this equipment, on which this brake is mounted, that they must fully understand the warnings and dangers that are listed in this manual and are aware of what the correct procedures must be to safely install, operate and maintain this equipment.

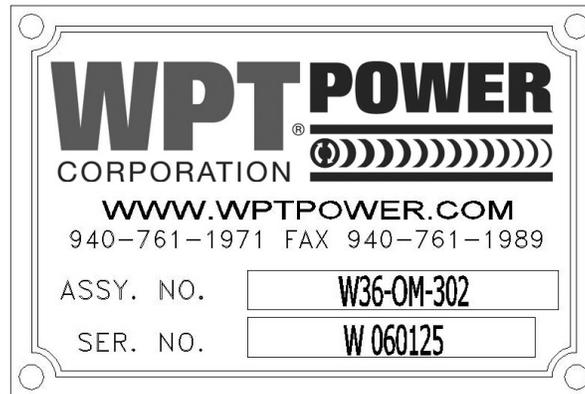
2.0 The Manual

Read these instructions completely through and fully understand before proceeding.

The diagrams and instructions in this manual are provided as a general guide for the field repairman servicing the WPT brake. The diagrams are not intended to cover all models of brakes but to provide general information.

Part numbers used in this manual refer only to the diagrams in this manual. When ordering replacement parts, use the part numbers from the bill of materials and drawing supplied with the brake. If these documents are lost, free replacements may be obtained by contacting WPT or their distributor. When ordering parts, provide the assembly number and serial number for the unit found on the brass tag affixed to the brake.

See example below:



The WPT water cooled brake is designed for constant tension applications. It is very well suited for high inertia stopping and rapid heat dissipation. The design of the WPT water cooled brake permits mid-shaft and end-shaft mounting.

The WPT water cooled brakes are available in various sizes and quantities of friction discs. The model number identifies the number of disc and the diameter of the brake. For example, 324 WCB indicates that there are three 24" diameter drive plates.

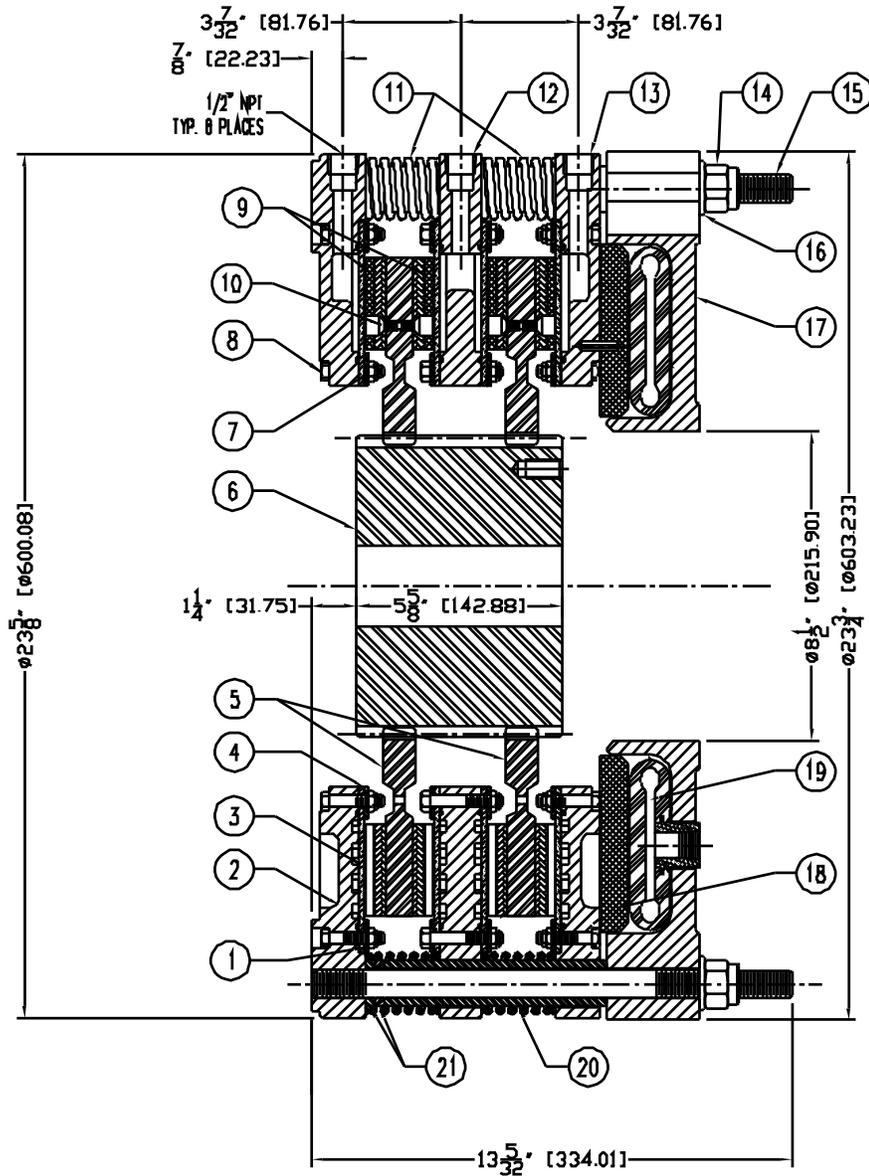
The WPT water cooled brakes can be used on a closed or an open loop water system.

This manual has metric measurements given also. The metric measurements are shown in (*).

The brake must have the hub attached to the shaft of the equipment that is being managed. Also the housing of the brake must be attached to either the equipment that is being managed or a rigid support housing.

The brake works when air pressure is applied through the ports in the cylinder plate or the air tube holding plate and causes the piston or the air tube to inflate and apply pressure to the pressure plate assembly. The pressure plate moves towards the mounting plate and closes the gap of the release springs, which engages the friction disc material with the copper wear plates. The equipment's shaft can be controlled by the amount of air pressure used to operate the brake. The release springs assist in the disengagement and retraction of the piston or air tube and the pressure plate. High heat dissipation is accomplished by the passing water through a special cavity behind the copper alloy wear plates. Torque flows through the brake from the equipment's shaft, which is being controlled by the brake, through the friction disc material, through the pressure plate and the reaction plates, through the clamp tubes and the studs, to the mounting flange which is attached to a rigid surface.

NOTE: SOME THREE, FOUR AND FIVE DISC UNITS MAY REQUIRE SUPPORT ON THE CYLINDER END OF THE BRAKE IN CERTAIN HIGH TORQUE APPLICATIONS. CONTACT THE WPT'S ENGINEERING DEPARTMENT FOR SPECIFIC APPLICATION INFORMATION.

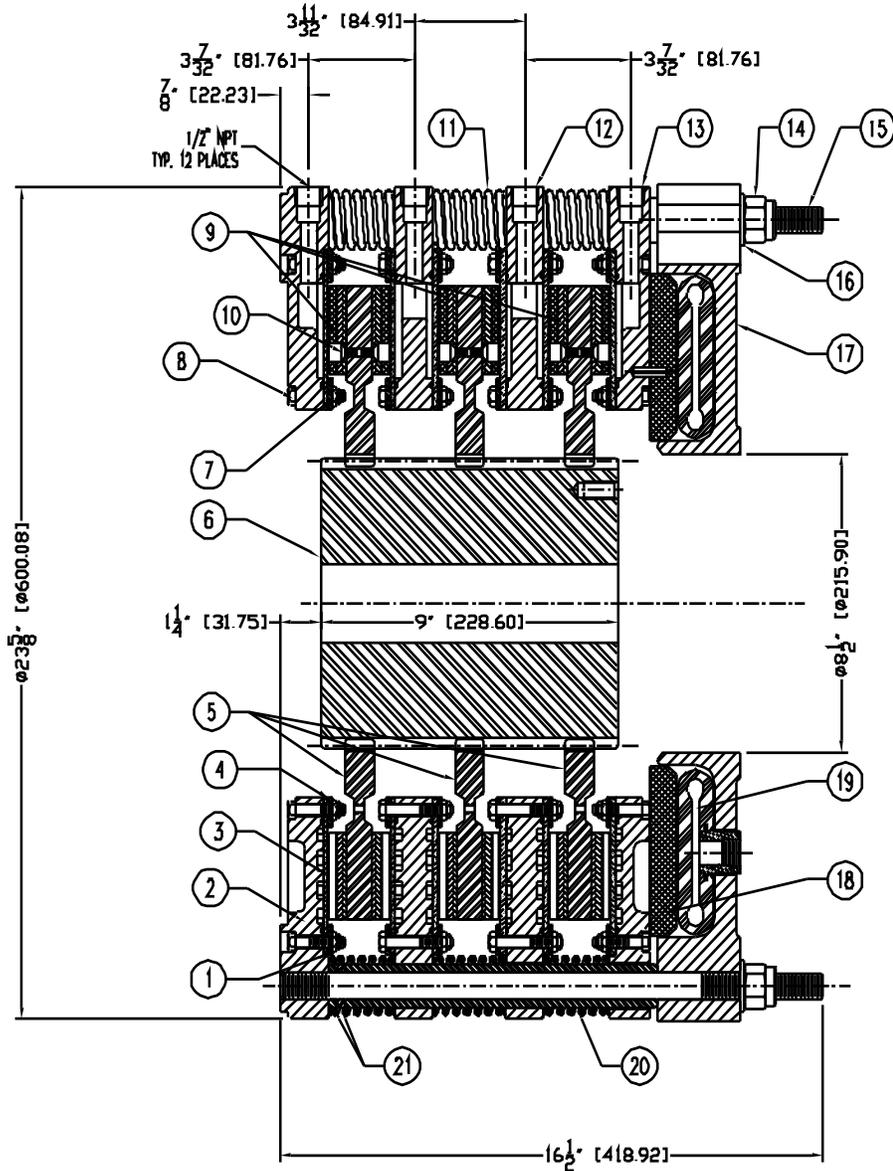


18" DOUBLE DRIVE PLATE - AIR TUBE TYPE

TABLE 1

WPT Copper Water Cooled Brake Parts Identification

Item	Description	Item	Description	Item	Description
1	Support Ring Segment - OD	8	Bolt - Copper Mounting	15	Stud
2	Backplate Water Jacket	9	Friction Disc	16	Flat Washer
3	Copper Wear Plate	10	Flat Head Screw	17	Airtube Holding Plate
4	Support Ring Segment - ID	11	Release Spring	18	Pressure Plate
5	Drive Plate	12	Center Water Jacket	19	Airtube
6	Hub	13	Floating Water Jacket	20	Clamp Tube
7	Nut - Copper Mounting	14	Locking Nut	21	Wear Spacer

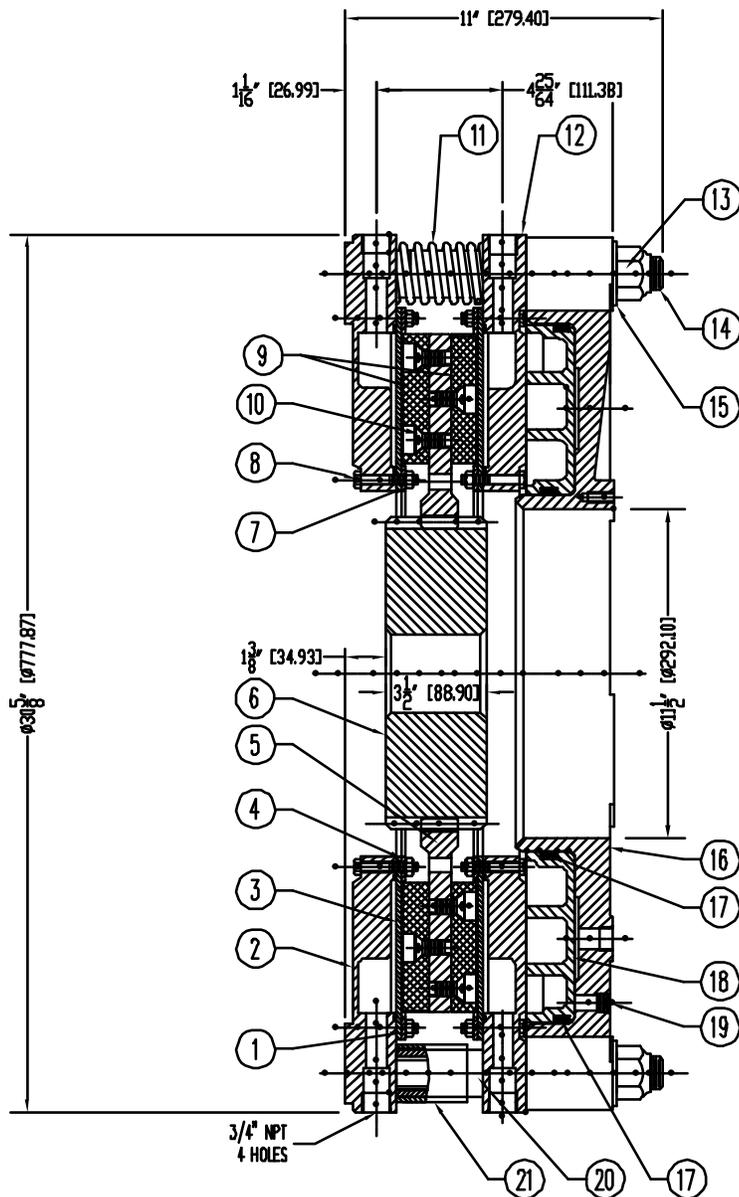


18" TRIPLE DRIVE PLATE – AIR TUBE TYPE

TABLE 1

WPT Copper Water Cooled Brake Parts Identification

Item	Description	Item	Description	Item	Description
1	Support Ring Segment - OD	8	Bolt - Copper Mounting	15	Stud
2	Backplate Water Jacket	9	Friction Disc	16	Flat Washer
3	Copper Wear Plate	10	Flat Head Screw	17	Airtube Holding Plate
4	Support Ring Segment - ID	11	Release Spring	18	Pressure Plate
5	Drive Plate	12	Center Water Jacket	19	Airtube
6	Hub	13	Floating Water Jacket	20	Clamp Tube
7	Nut - Copper Mounting	14	Locking Nut	21	Wear Spacer

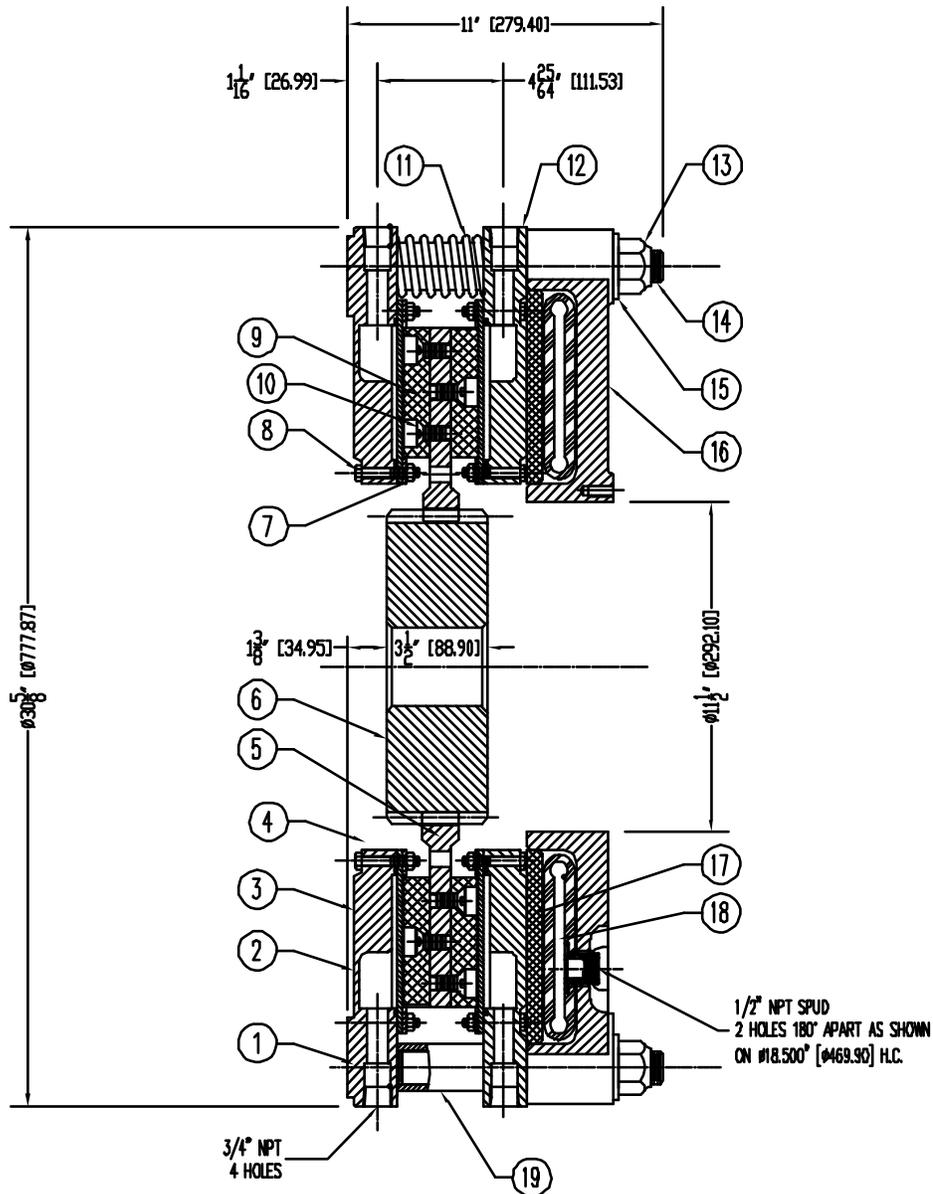


24" SINGLE DRIVE PLATE – PISTON TYPE

TABLE 2

WPT Copper Water Cooled Brake Parts Identification

Item	Description	Item	Description	Item	Description
1	Support Ring Segment - OD	8	Bolt - Copper Mounting	15	Flat Washer
2	Backplate Water Jacket	9	Friction Disc	16	Cylinder Plate
3	Copper Wear Plate	10	Flat Head Screw	17	Seal
4	Support Ring Segment - ID	11	Release Spring	18	Piston
5	Drive Plate	12	Floating Water Jacket	19	Plug
6	Hub	13	Locking Nut	20	Stud
7	Nut - Copper Mounting	14	Stud	21	Clamp Tube

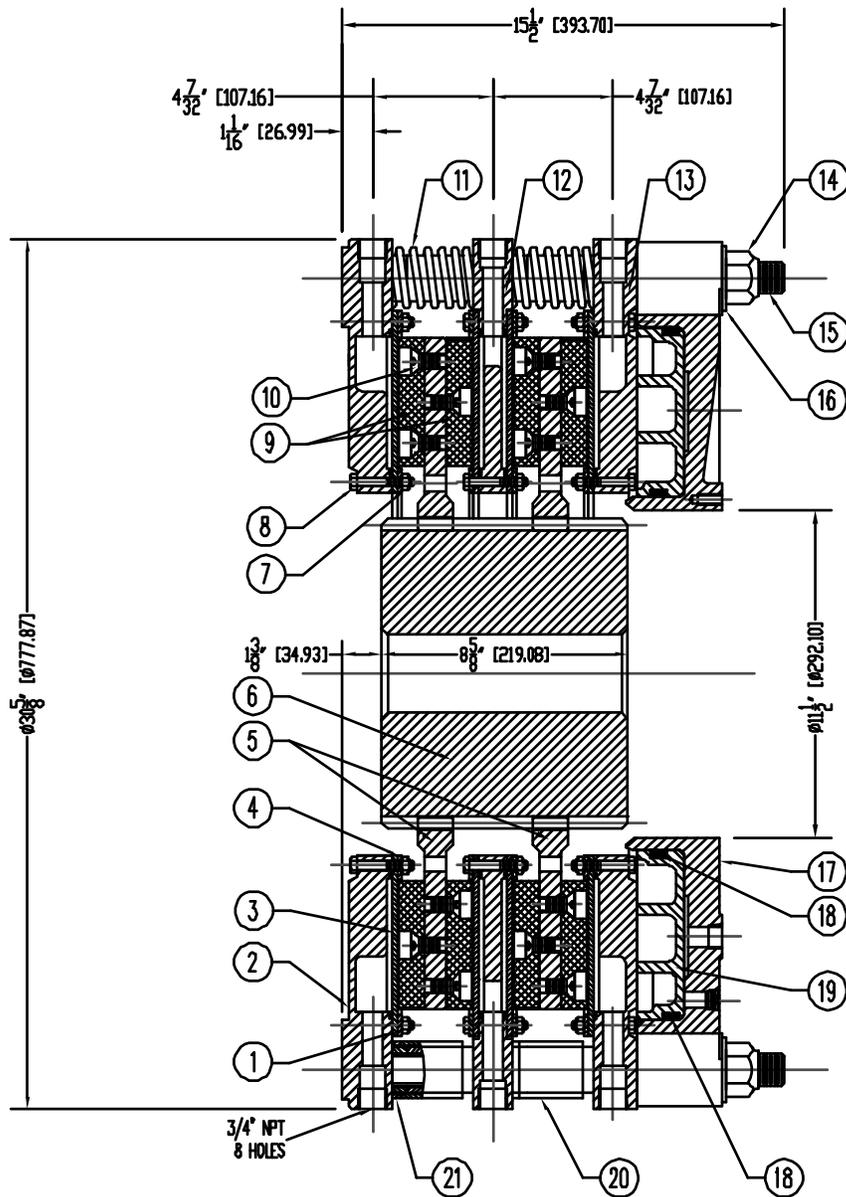


24" SINGLE DRIVE PLATE - AIR TUBE TYPE

TABLE 3

WPT Copper Water Cooled Brake Parts Identification

Item	Description	Item	Description	Item	Description
1	Support Ring Segment - OD	8	Bolt - Copper Mounting	15	Flat Washer
2	Backplate Water Jacket	9	Friction Disc	16	Air Tube Holding Plate
3	Copper Wear Plate	10	Flat Head Screw	17	Pressure Plate
4	Support Ring Segment - ID	11	Release Spring	18	Air Tube
5	Drive Plate	12	Floating Water Jacket	19	Clamp Tube
6	Hub	13	Locking Nut	20	
7	Nut - Copper Mounting	14	Stud	21	

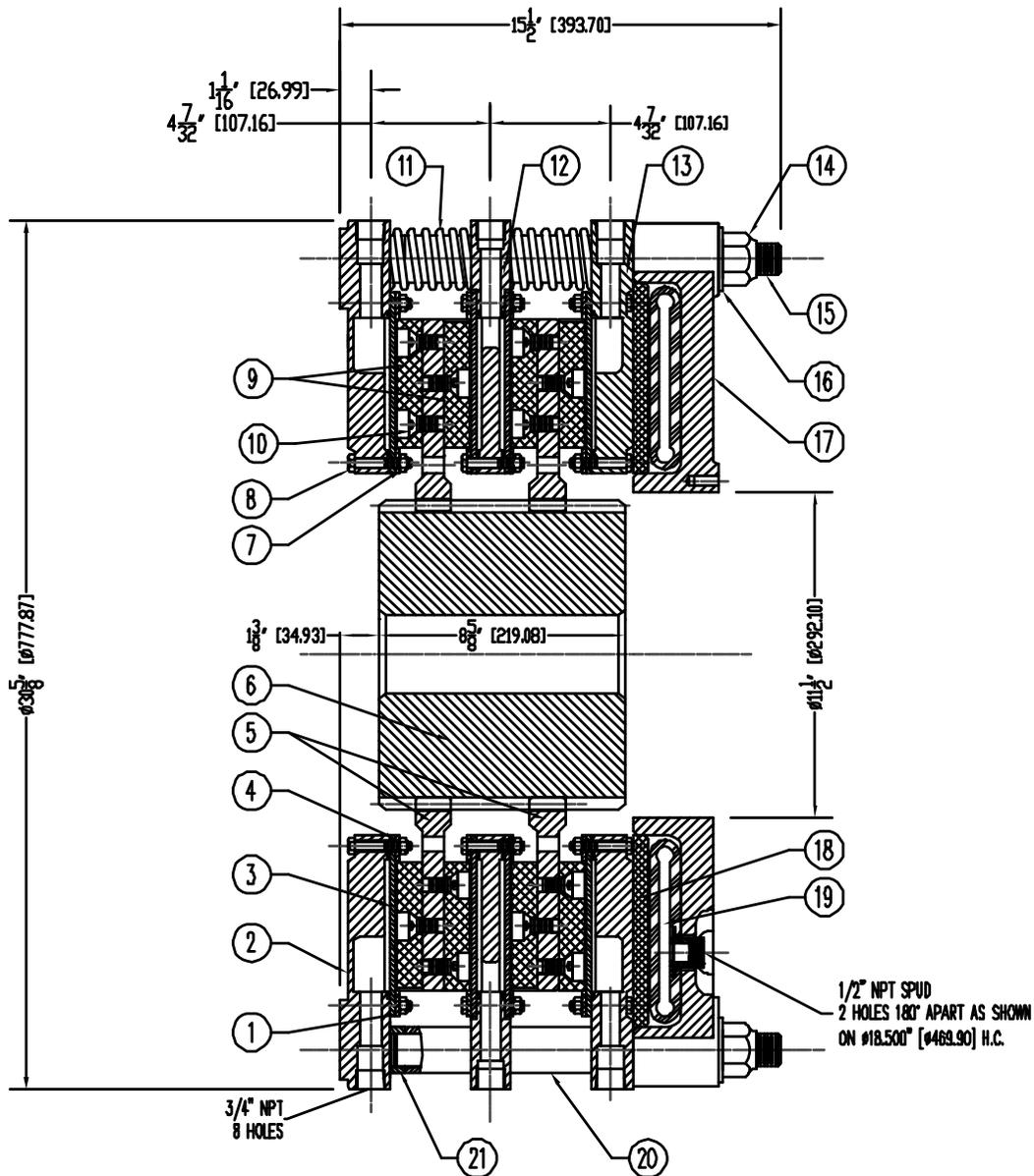


24" DOUBLE DRIVE PLATE - PISTON TYPE

TABLE 4

WPT Copper Water Cooled Brake Parts Identification

Item	Description	Item	Description	Item	Description
1	Support Ring Segment - OD	8	Bolt - Copper Mounting	15	Stud
2	Backplate Water Jacket	9	Friction Disc	16	Flat Washer
3	Copper Wear Plate	10	Flat Head Screw	17	Cylinder Plate
4	Support Ring Segment - ID	11	Release Spring	18	Seal
5	Drive Plate	12	Center Water Jacket	19	Piston
6	Hub	13	Floating Water Jacket	20	Clamp Tube
7	Nut - Copper Mounting	14	Locking Nut	21	Wear Spacer

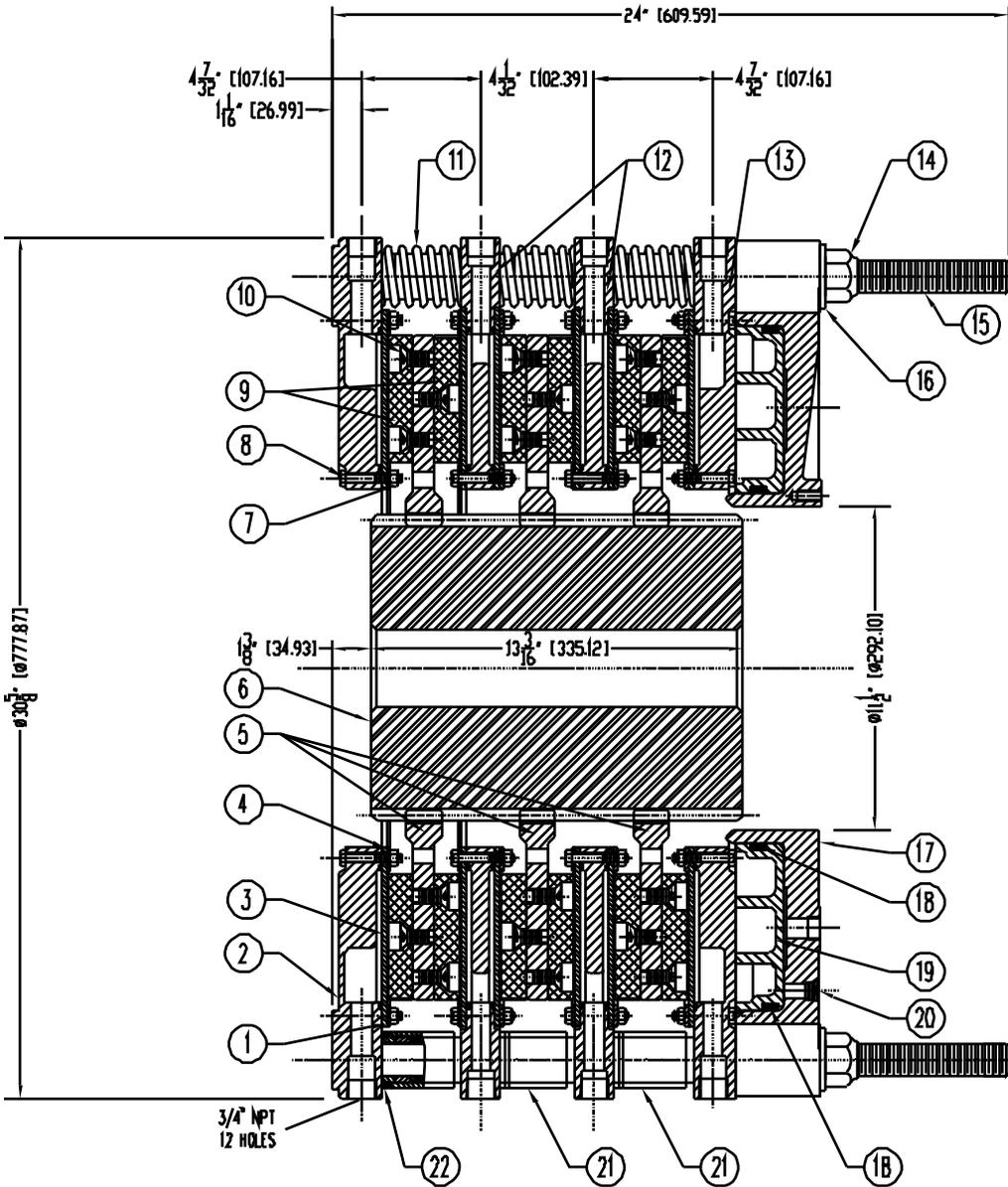


24" DOUBLE DRIVE PLATE - AIR TUBE TYPE

TABLE 1

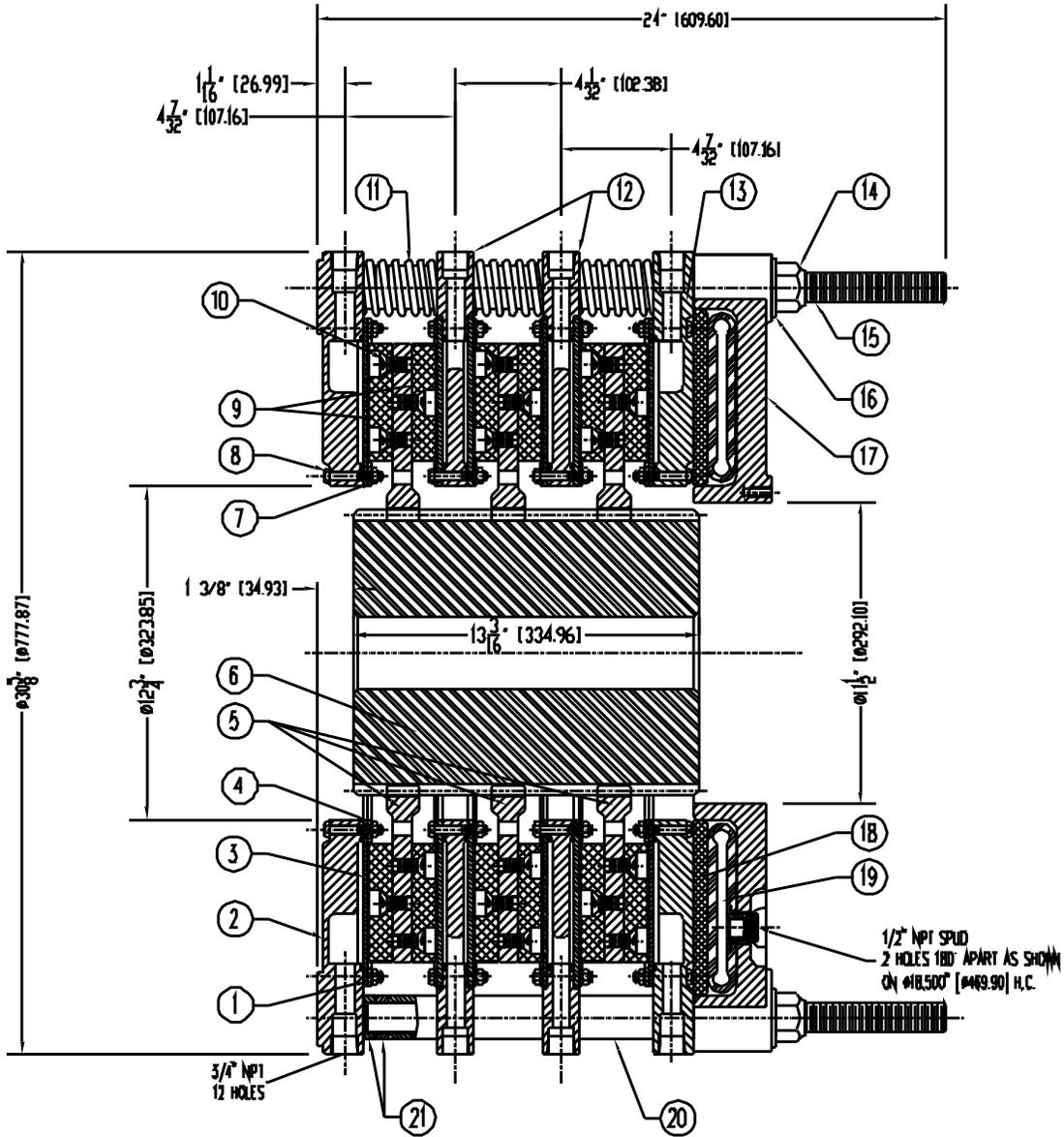
WPT Copper Water Cooled Brake Parts Identification

Item	Description	Item	Description	Item	Description
1	Support Ring Segment - OD	8	Bolt - Copper Mounting	15	Stud
2	Backplate Water Jacket	9	Friction Disc	16	Flat Washer
3	Copper Wear Plate	10	Flat Head Screw	17	Airtube Holding Plate
4	Support Ring Segment - ID	11	Release Spring	18	Pressure Plate
5	Drive Plate	12	Center Water Jacket	19	Airtube
6	Hub	13	Floating Water Jacket	20	Clamp Tube
7	Nut - Copper Mounting	14	Locking Nut	21	Wear Spacer



24" TRIPLE DRIVE PLATE - PISTON TYPE

TABLE 5					
WPT Copper Water Cooled Brake Parts Identification					
Item	Description	Item	Description	Item	Description
1	Support Ring Segment - OD	9	Friction Disc	17	Cylinder Plate
2	Backplate Water Jacket	10	Flat Head Screw	18	Seal
3	Copper Wear Plate	11	Release Spring	19	Piston
4	Support Ring Segment - ID	12	Center Water Jacket	20	Plug
5	Drive Plate	13	Floating Water Jacket	21	Clamp Tube
6	Hub	14	Locking Nut	22	Wear Spacer
7	Nut - Copper Mounting	15	Stud	23	
8	Bolt - Copper Mounting	16	Flat Washer	24	

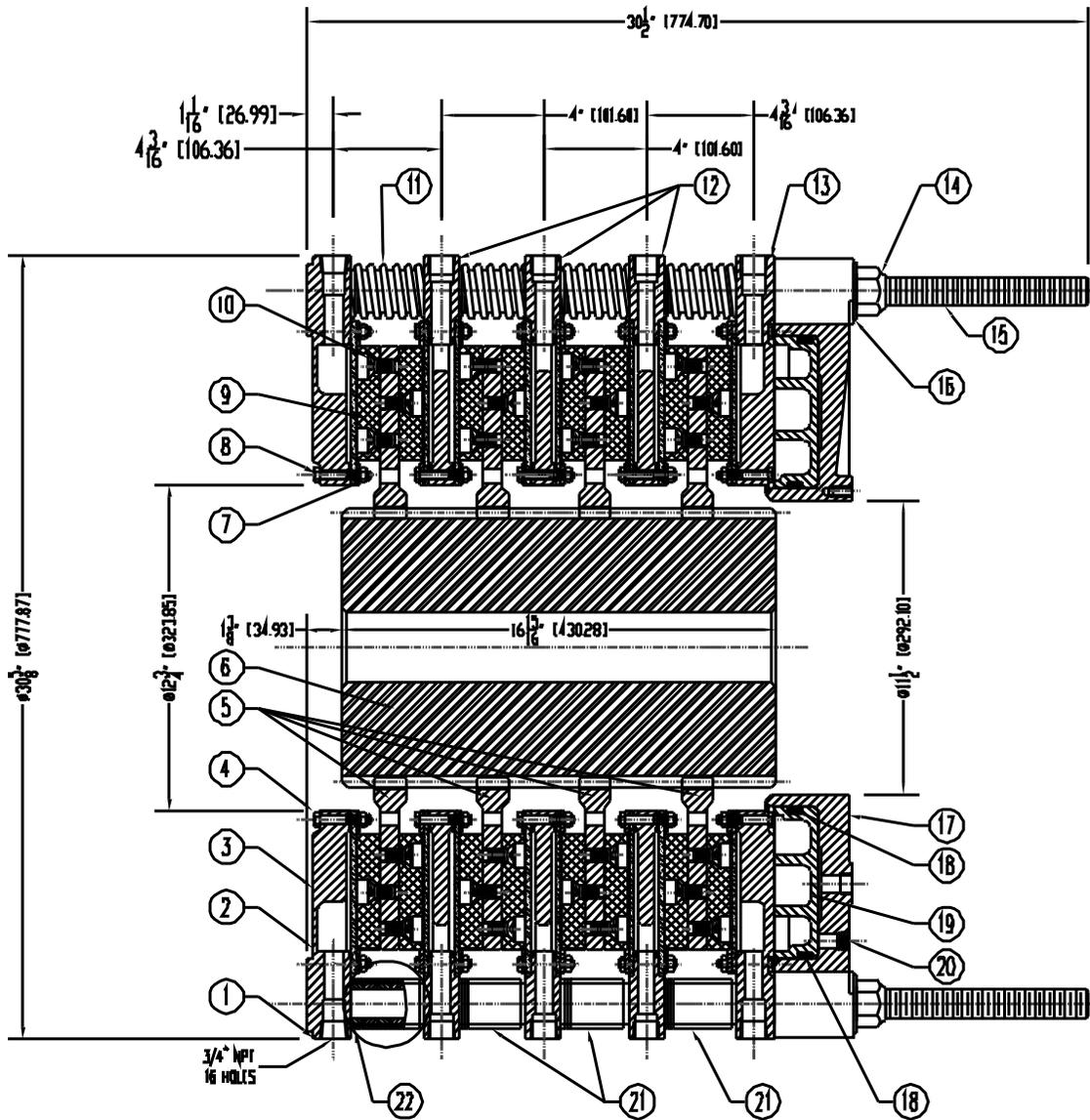


24" TRIPLE DRIVE PLATE - AIR TUBE TYPE

TABLE 1

WPT Copper Water Cooled Brake Parts Identification

Item	Description	Item	Description	Item	Description
1	Support Ring Segment - OD	8	Bolt - Copper Mounting	15	Stud
2	Backplate Water Jacket	9	Friction Disc	16	Flat Washer
3	Copper Wear Plate	10	Flat Head Screw	17	Airtube Holding Plate
4	Support Ring Segment - ID	11	Release Spring	18	Pressure Plate
5	Drive Plate	12	Center Water Jacket	19	Airtube
6	Hub	13	Floating Water Jacket	20	Clamp Tube
7	Nut - Copper Mounting	14	Locking Nut	21	Wear spacer

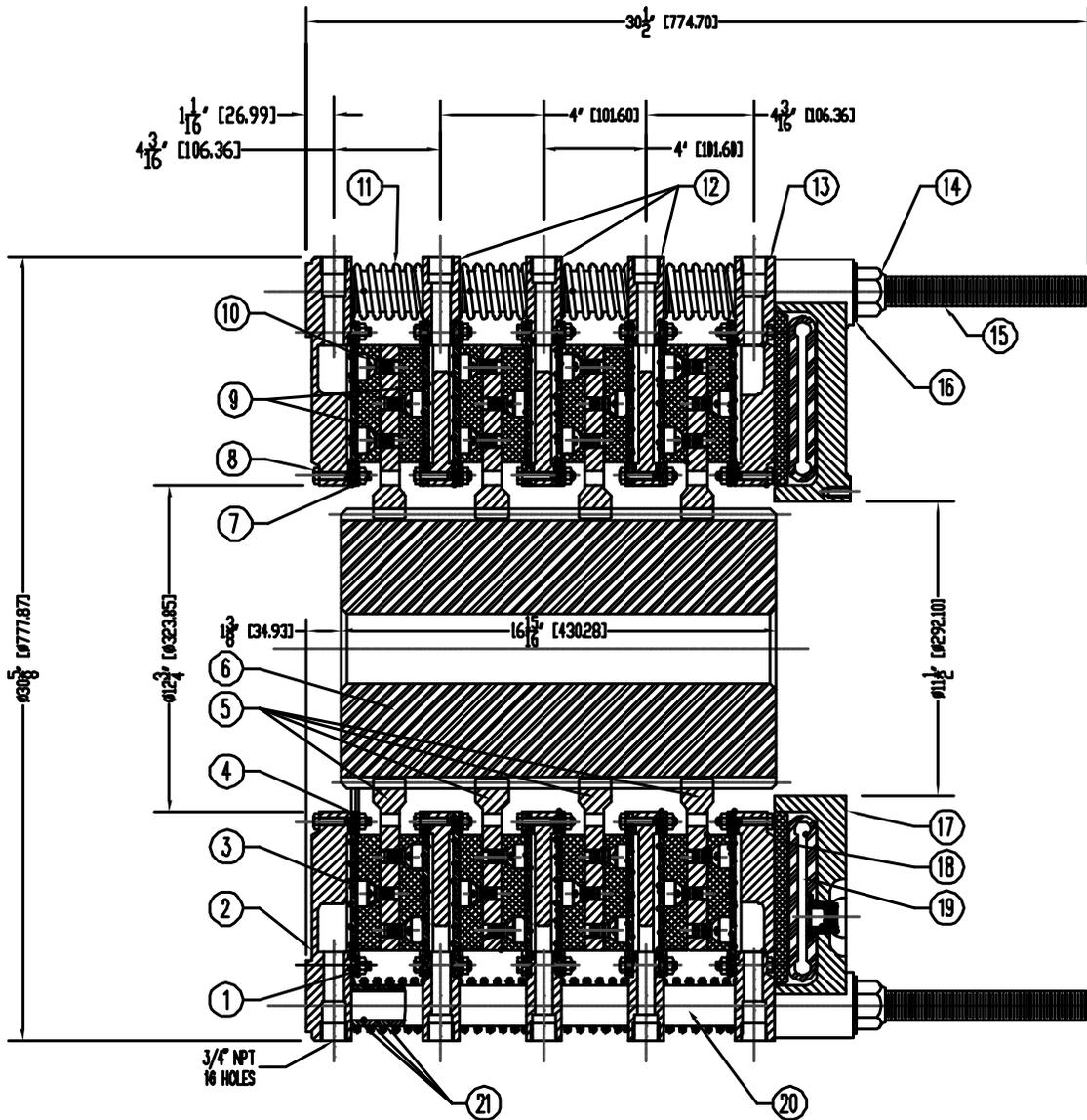


24" QUAD DRIVE PLATE – PISTON TYPE

TABLE 5

WPT Copper Water Cooled Brake Parts Identification

Item	Description	Item	Description	Item	Description
1	Support Ring Segment - OD	9	Friction Disc	17	Cylinder Plate
2	Backplate Water Jacket	10	Flat Head Screw	18	Seal
3	Copper Wear Plate	11	Release Spring	19	Piston
4	Support Ring Segment - ID	12	Center Water Jacket	20	Plug
5	Drive Plate	13	Floating Water Jacket	21	Clamp Tube
6	Hub	14	Locking Nut	22	Wear Spacer
7	Nut - Copper Mounting	15	Stud	23	
8	Bolt - Copper Mounting	16	Flat Washer	24	

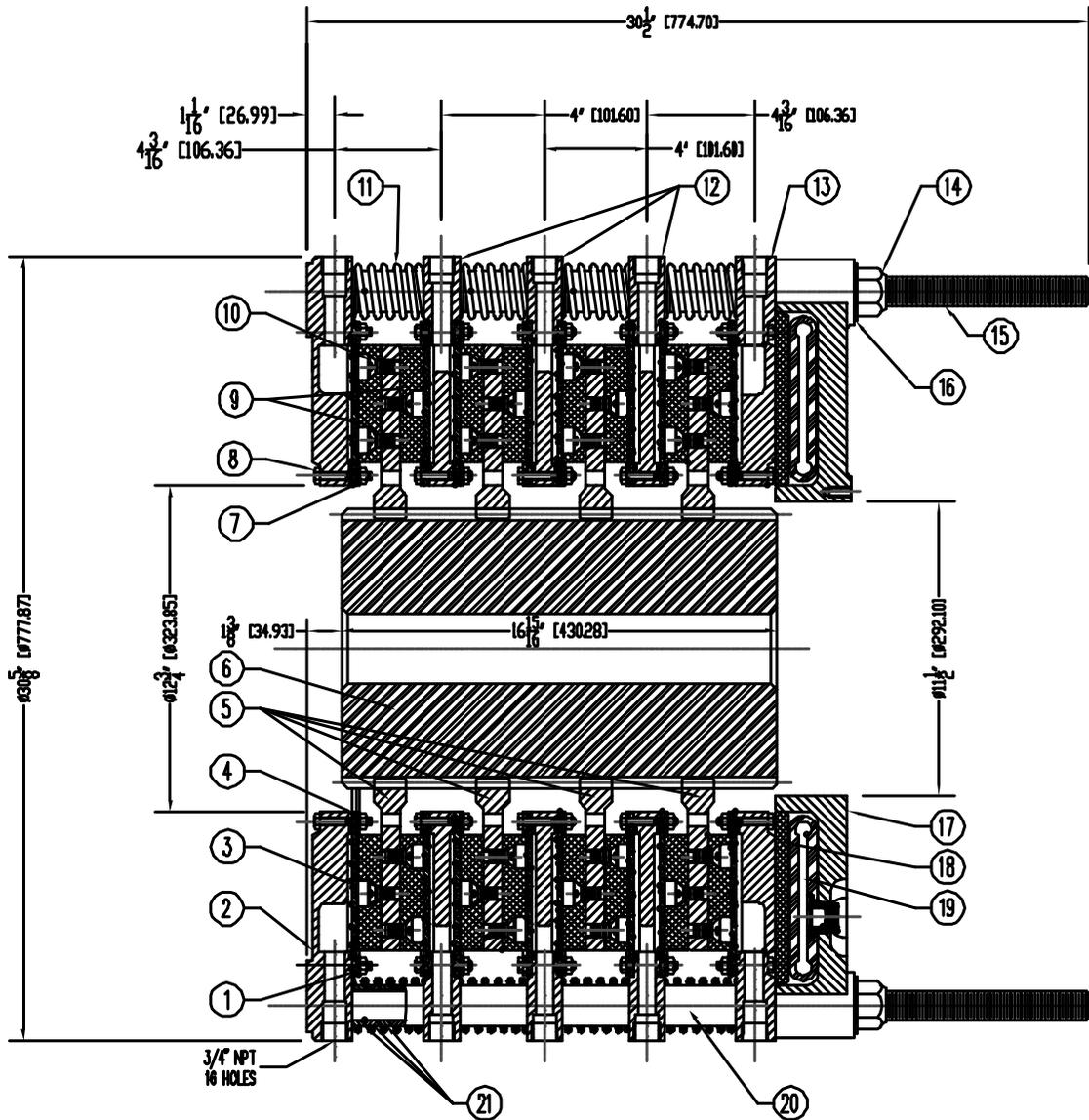


24" QUAD DRIVE PLATE - AIR TUBE TYPE

TABLE 1

WPT Copper Water Cooled Brake Parts Identification

Item	Description	Item	Description	Item	Description
1	Support Ring Segment - OD	8	Bolt - Copper Mounting	15	Stud
2	Backplate Water Jacket	9	Friction Disc	16	Flat Washer
3	Copper Wear Plate	10	Flat Head Screw	17	Airtube Holding Plate
4	Support Ring Segment - ID	11	Release Spring	18	Pressure Plate
5	Drive Plate	12	Center Water Jacket	19	Airtube
6	Hub	13	Floating Water Jacket	20	Clamp Tube
7	Nut - Copper Mounting	14	Locking Nut	21	Wear Spacer

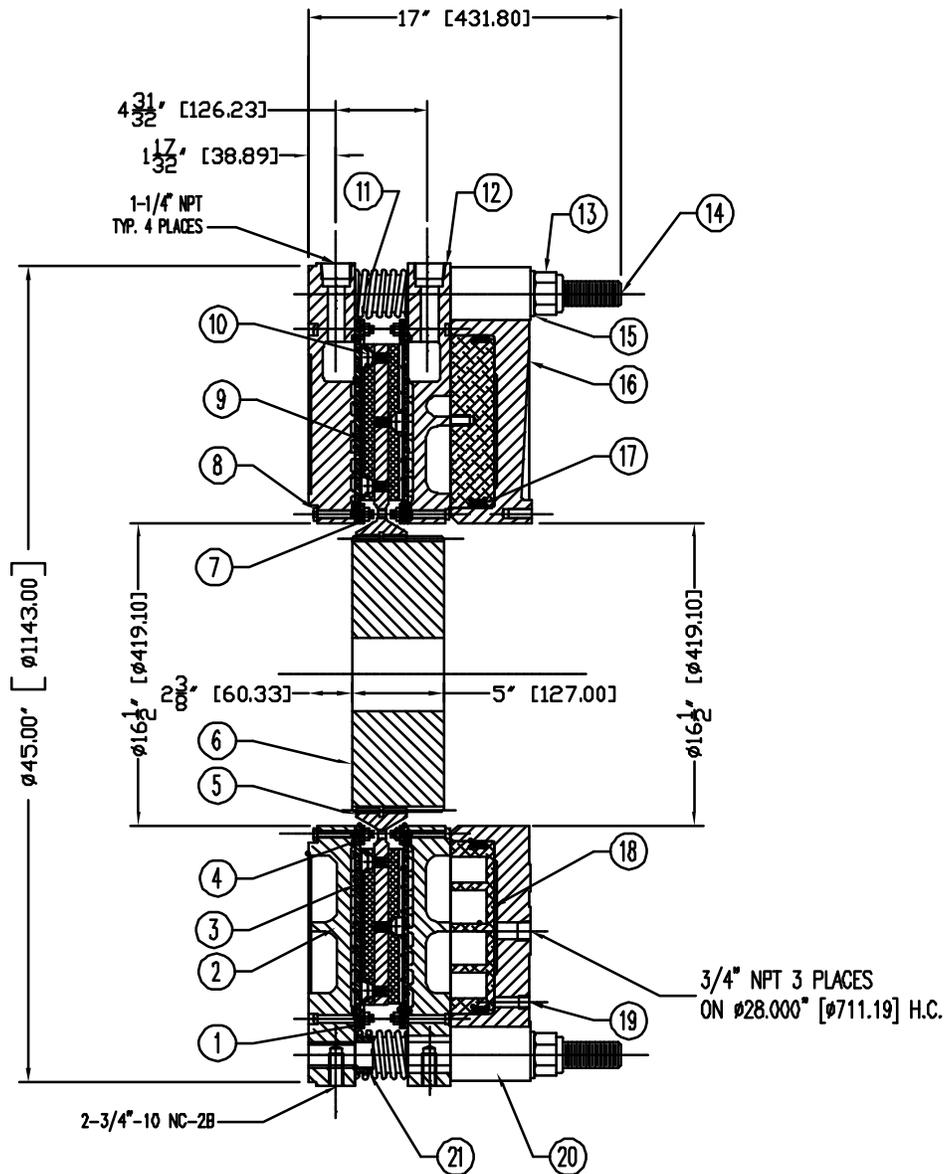


24" FIVE DRIVE PLATE - AIR TUBE TYPE

TABLE 1

WPT Copper Water Cooled Brake Parts Identification

Item	Description	Item	Description	Item	Description
1	Support Ring Segment - OD	8	Bolt - Copper Mounting	15	Stud
2	Backplate Water Jacket	9	Friction Disc	16	Flat Washer
3	Copper Wear Plate	10	Flat Head Screw	17	Airtube Holding Plate
4	Support Ring Segment - ID	11	Release Spring	18	Pressure Plate
5	Drive Plate	12	Center Water Jacket	19	Airtube
6	Hub	13	Floating Water Jacket	20	Clamp Tube
7	Nut - Copper Mounting	14	Locking Nut	21	Wear Spacer

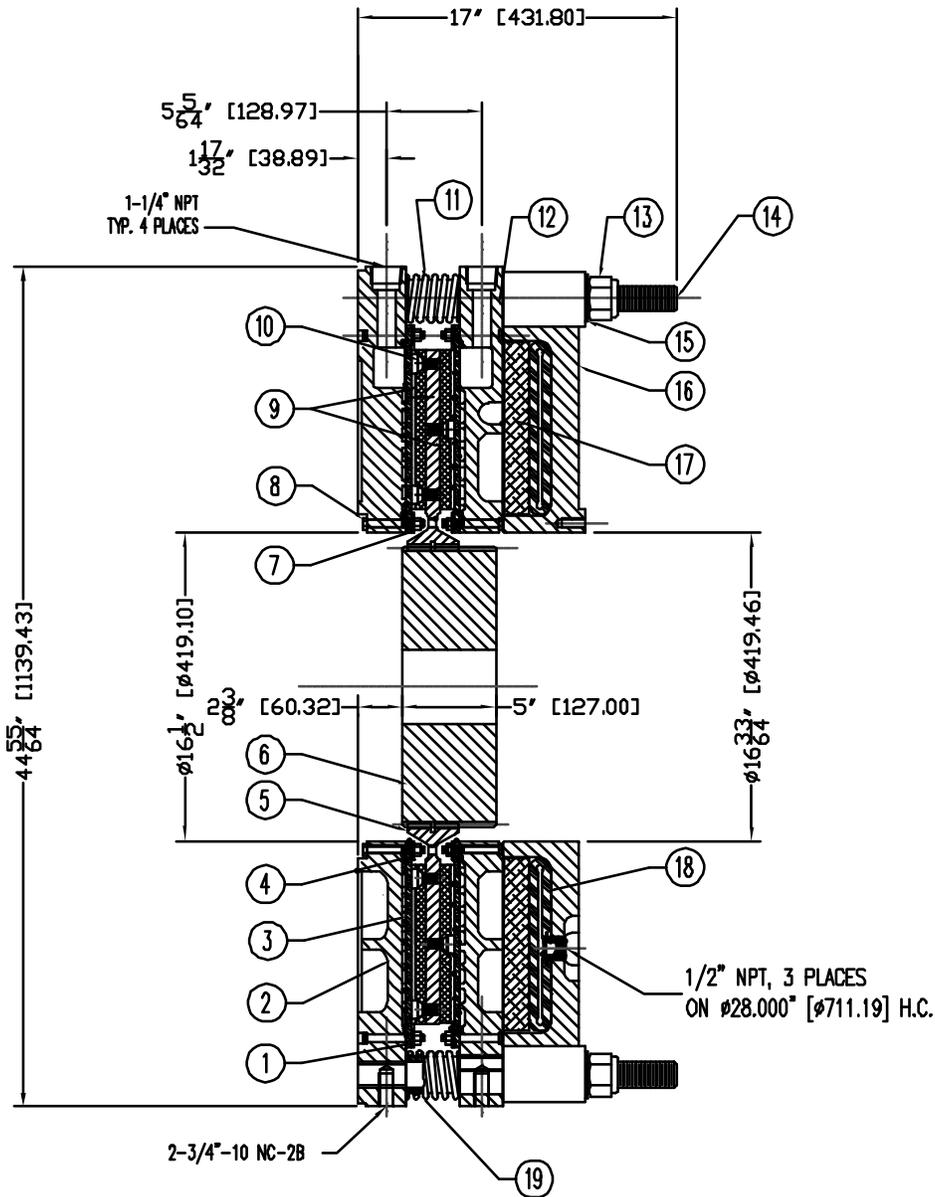


36" SINGLE DRIVE PLATE – PISTON TYPE

TABLE 2

WPT Copper Water Cooled Brake Parts Identification

Item	Description	Item	Description	Item	Description
1	Support Ring Segment - OD	8	Bolt - Copper Mounting	15	Flat Washer
2	Backplate Water Jacket	9	Friction Disc	16	Cylinder Plate
3	Copper Wear Plate	10	Flat Head Screw	17	Seal
4	Support Ring Segment - ID	11	Release Spring	18	Piston
5	Drive Plate	12	Floating Water Jacket	19	Plug
6	Hub	13	Locking Nut	20	Stud
7	Nut - Copper Mounting	14	Stud	21	Clamp Tube

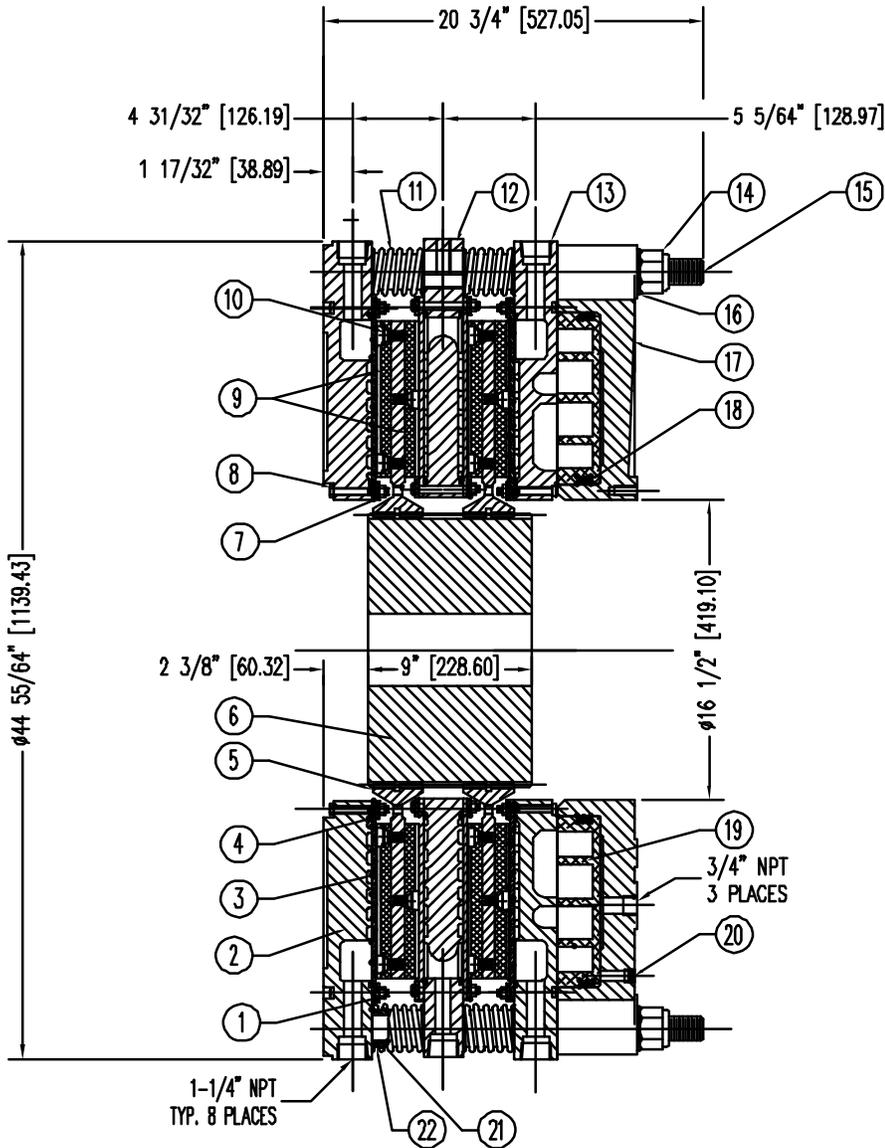


36" SINGLE DRIVE PLATE - AIR TUBE TYPE

TABLE 3

WPT Copper Water Cooled Brake Parts Identification

Item	Description	Item	Description	Item	Description
1	Support Ring Segment - OD	8	Bolt - Copper Mounting	15	Flat Washer
2	Backplate Water Jacket	9	Friction Disc	16	Air Tube Holding Plate
3	Copper Wear Plate	10	Flat Head Screw	17	Pressure Plate
4	Support Ring Segment - ID	11	Release Spring	18	Air Tube
5	Drive Plate	12	Floating Water Jacket	19	Clamp Tube
6	Hub	13	Locking Nut	20	
7	Nut - Copper Mounting	14	Stud	21	

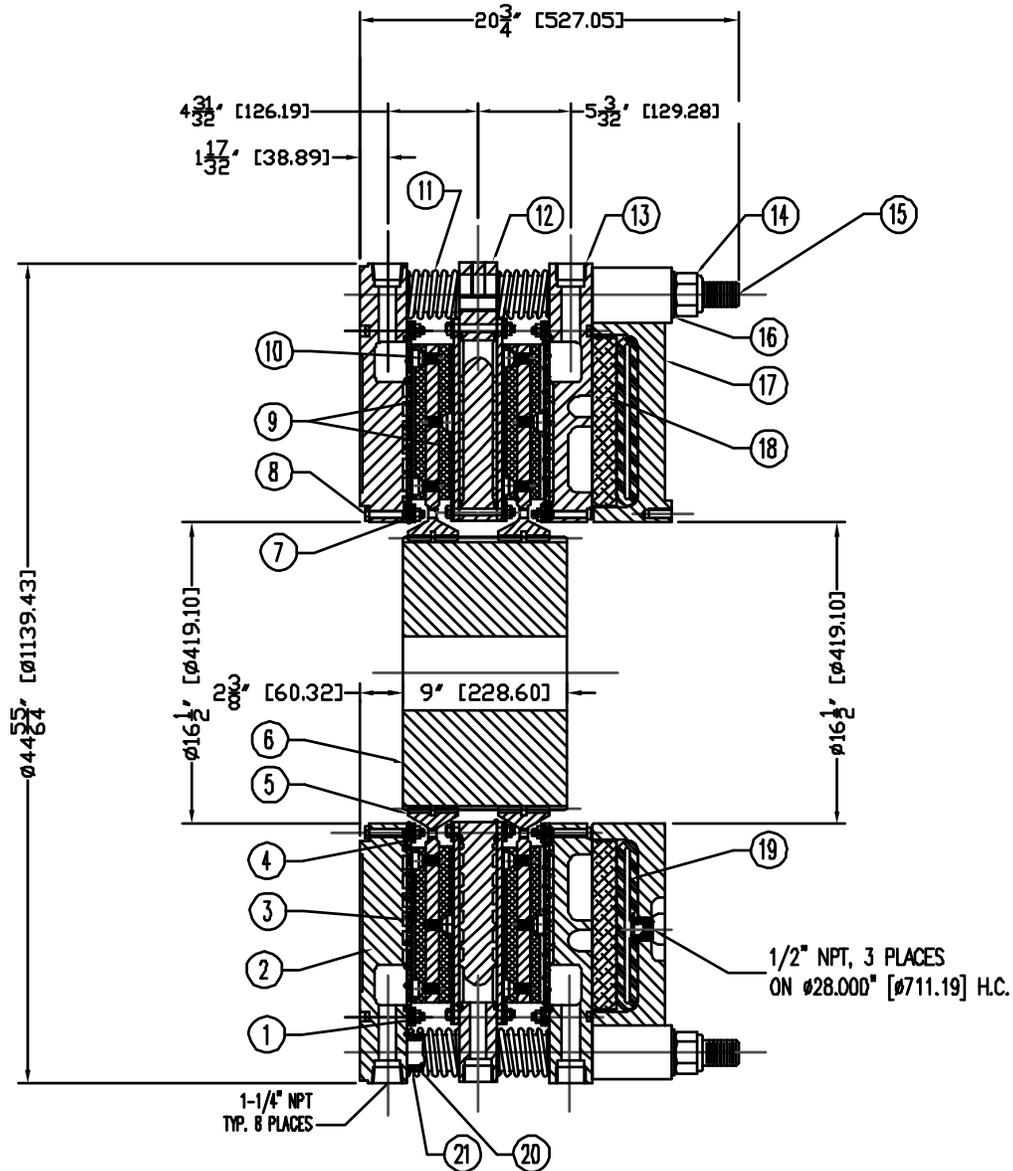


36" DOUBLE DRIVE PLATE - PISTON TYPE

TABLE 5

WPT Copper Water Cooled Brake Parts Identification

Item	Description	Item	Description	Item	Description
1	Support Ring Segment - OD	9	Friction Disc	17	Cylinder Plate
2	Backplate Water Jacket	10	Flat Head Screw	18	Seal
3	Copper Wear Plate	11	Release Spring	19	Piston
4	Support Ring Segment - ID	12	Center Water Jacket	20	Plug
5	Drive Plate	13	Floating Water Jacket	21	Clamp Tube
6	Hub	14	Locking Nut	22	Wear Spacer
7	Nut - Copper Mounting	15	Stud	23	
8	Bolt - Copper Mounting	16	Flat Washer	24	

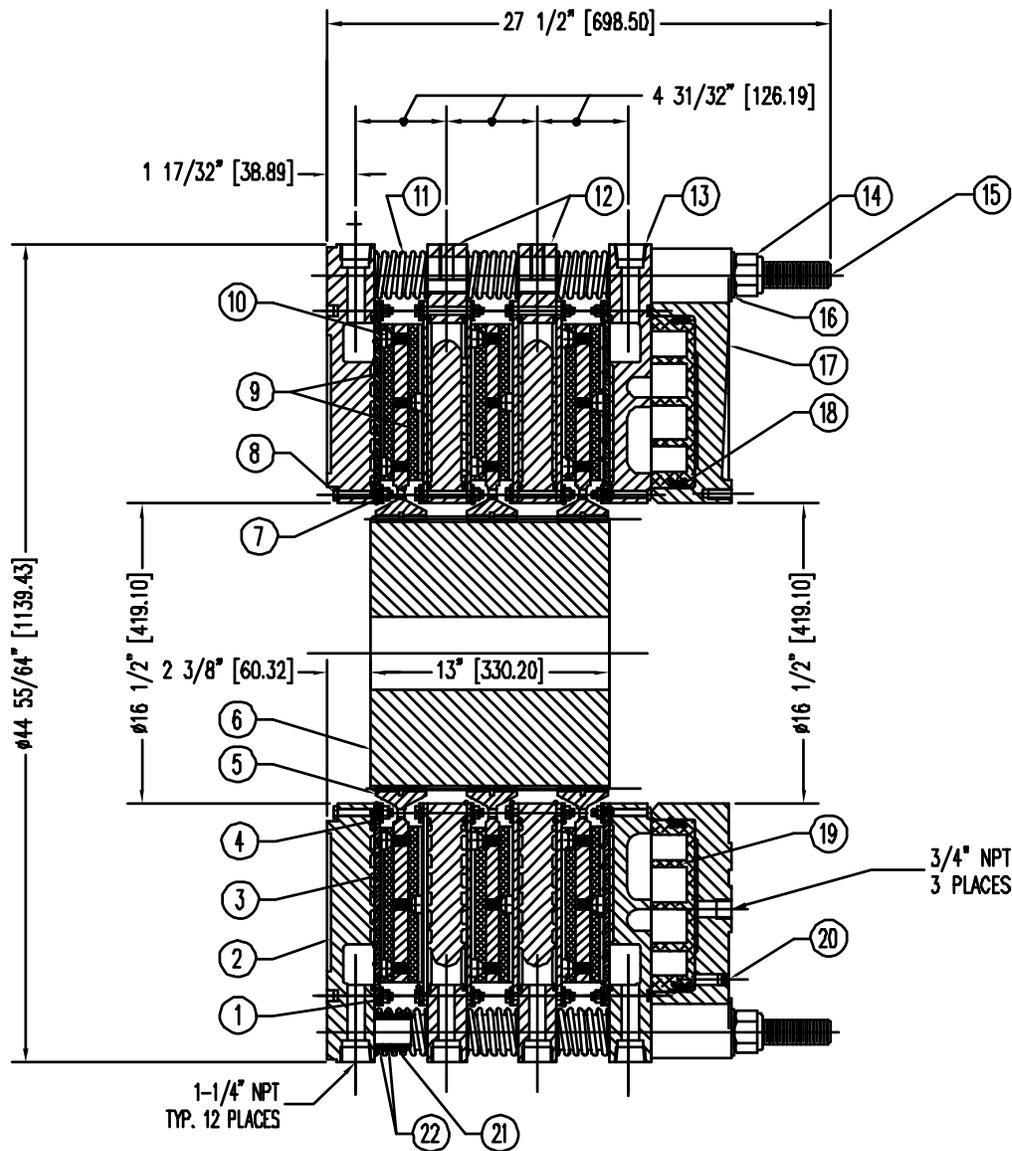


36" DOUBLE DRIVE PLATE - AIR TUBE TYPE

TABLE 1

WPT Copper Water Cooled Brake Parts Identification

Item	Description	Item	Description	Item	Description
1	Support Ring Segment - OD	8	Bolt - Copper Mounting	15	Stud
2	Backplate Water Jacket	9	Friction Disc	16	Flat Washer
3	Copper Wear Plate	10	Flat Head Screw	17	Airtube Holding Plate
4	Support Ring Segment - ID	11	Release Spring	18	Pressure Plate
5	Drive Plate	12	Center Water Jacket	19	Airtube
6	Hub	13	Floating Water Jacket	20	Clamp Tube
7	Nut - Copper Mounting	14	Locking Nut	21	Wear Spacer

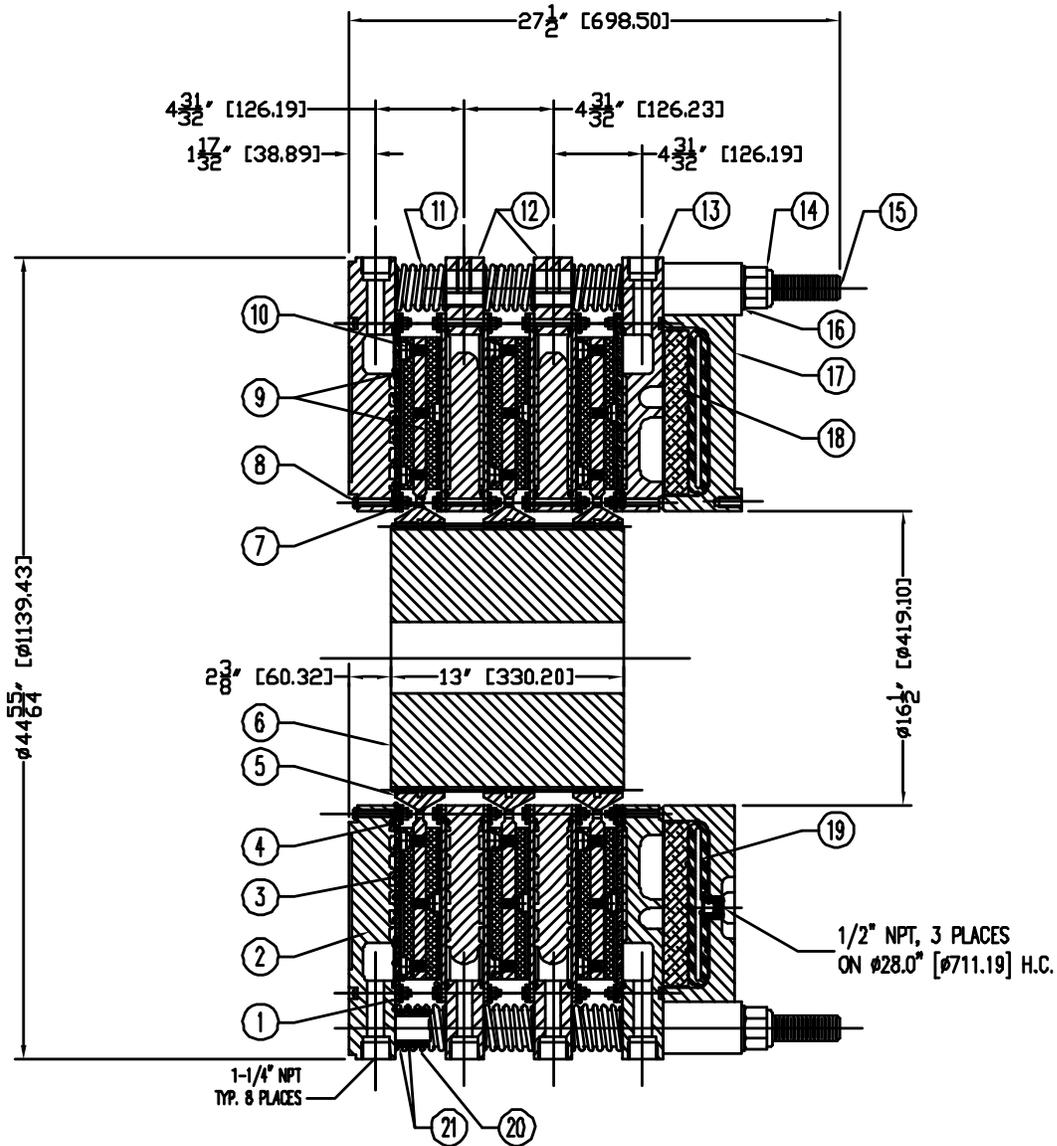


36" TRIPLE DRIVE PLATE - PISTON TYPE

TABLE 5

WPT Copper Water Cooled Brake Parts Identification

Item	Description	Item	Description	Item	Description
1	Support Ring Segment - OD	9	Friction Disc	17	Cylinder Plate
2	Backplate Water Jacket	10	Flat Head Screw	18	Seal
3	Copper Wear Plate	11	Release Spring	19	Piston
4	Support Ring Segment - ID	12	Center Water Jacket	20	Plug
5	Drive Plate	13	Floating Water Jacket	21	Clamp Tube
6	Hub	14	Locking Nut	22	Wear Spacer
7	Nut - Copper Mounting	15	Stud	23	
8	Bolt - Copper Mounting	16	Flat Washer	24	

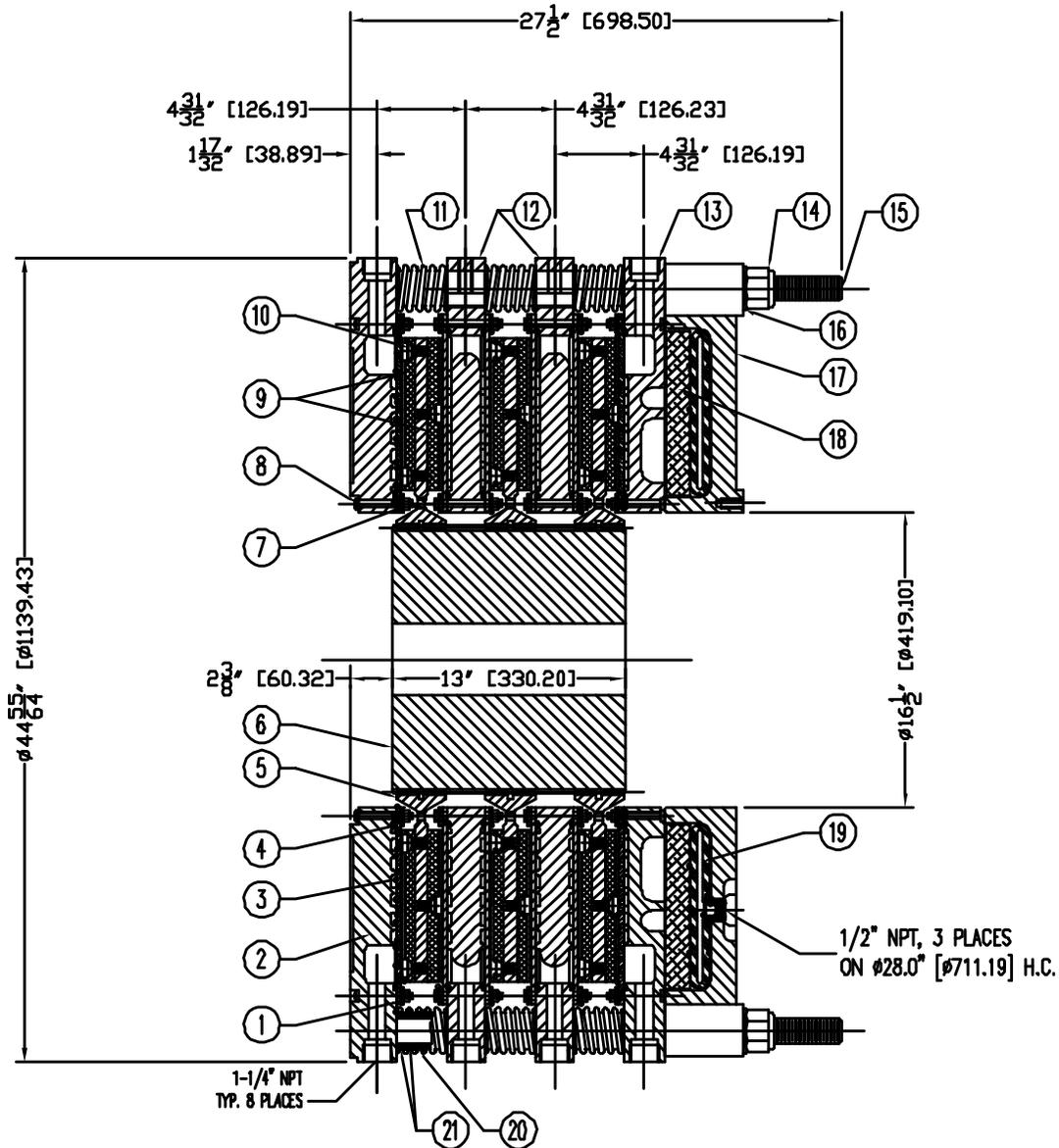


36" TRIPLE DRIVE PLATE – AIR TUBE TYPE

TABLE 1

WPT Copper Water Cooled Brake Parts Identification

Item	Description	Item	Description	Item	Description
1	Support Ring Segment - OD	8	Bolt - Copper Mounting	15	Stud
2	Backplate Water Jacket	9	Friction Disc	16	Flat Washer
3	Copper Wear Plate	10	Flat Head Screw	17	Airtube Holding Plate
4	Support Ring Segment - ID	11	Release Spring	18	Pressure Plate
5	Drive Plate	12	Center Water Jacket	19	Airtube
6	Hub	13	Floating Water Jacket	20	Clamp Tube
7	Nut - Copper Mounting	14	Locking Nut	21	Wear Spacer

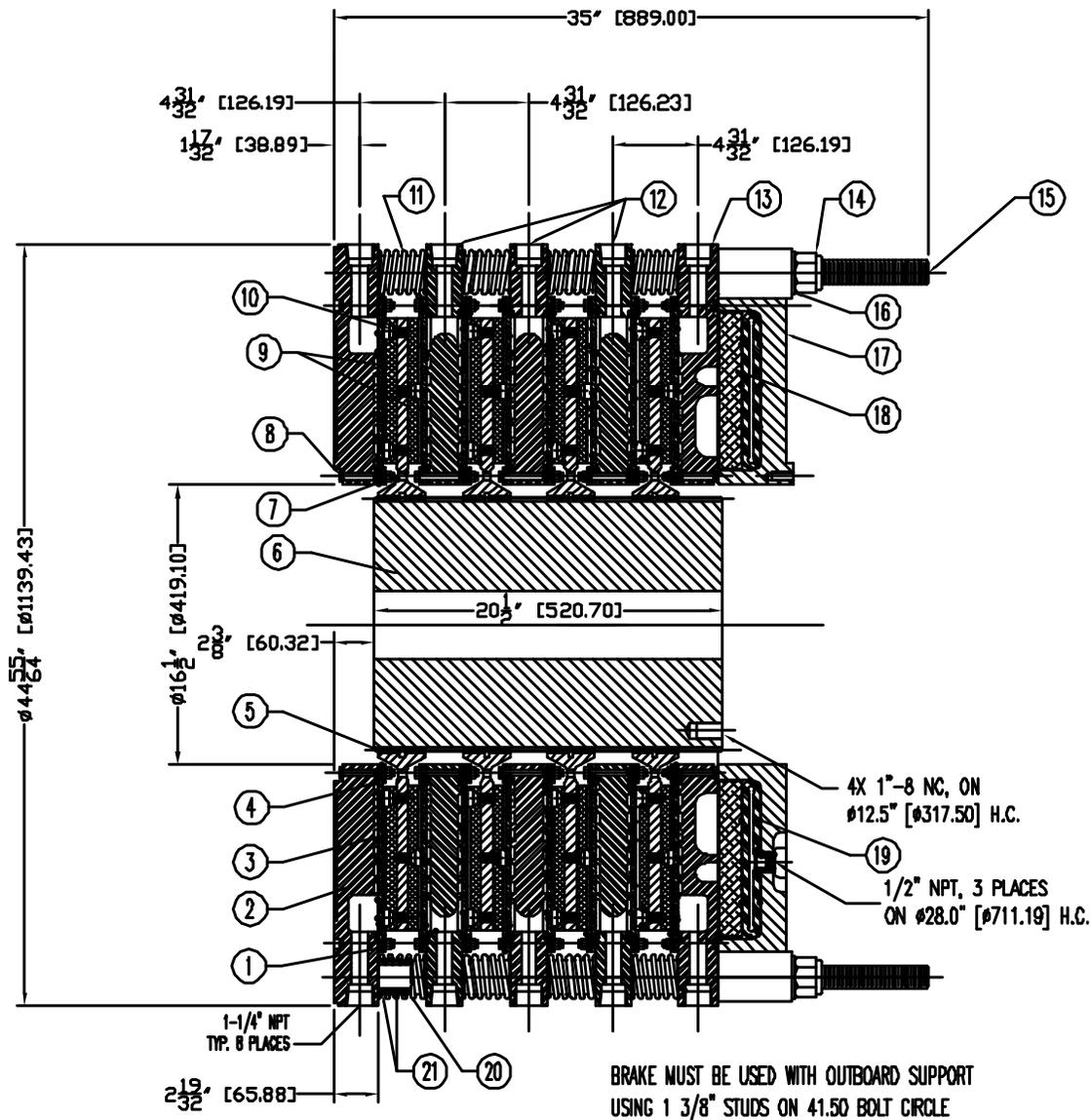


36" QUAD DRIVE PLATE - PISTON TYPE

TABLE 5

WPT Copper Water Cooled Brake Parts Identification

Item	Description	Item	Description	Item	Description
1	Support Ring Segment - OD	9	Friction Disc	17	Cylinder Plate
2	Backplate Water Jacket	10	Flat Head Screw	18	Seal
3	Copper Wear Plate	11	Release Spring	19	Piston
4	Support Ring Segment - ID	12	Center Water Jacket	20	Plug
5	Drive Plate	13	Floating Water Jacket	21	Clamp Tube
6	Hub	14	Locking Nut	22	Wear Spacer
7	Nut - Copper Mounting	15	Stud	23	
8	Bolt - Copper Mounting	16	Flat Washer	24	



36" QUAD DRIVE PLATE - AIR TUBE TYPE

TABLE 1

WPT Copper Water Cooled Brake Parts Identification

Item	Description	Item	Description	Item	Description
1	Support Ring Segment - OD	8	Bolt - Copper Mounting	15	Stud
2	Backplate Water Jacket	9	Friction Disc	16	Flat Washer
3	Copper Wear Plate	10	Flat Head Screw	17	Airtube Holding Plate
4	Support Ring Segment - ID	11	Release Spring	18	Pressure Plate
5	Drive Plate	12	Center Water Jacket	19	Airtube
6	Hub	13	Floating Water Jacket	20	Clamp Tube
7	Nut - Copper Mounting	14	Locking Nut	21	Wear Spacer

4.0 PREPARATION AND ALIGNMENT



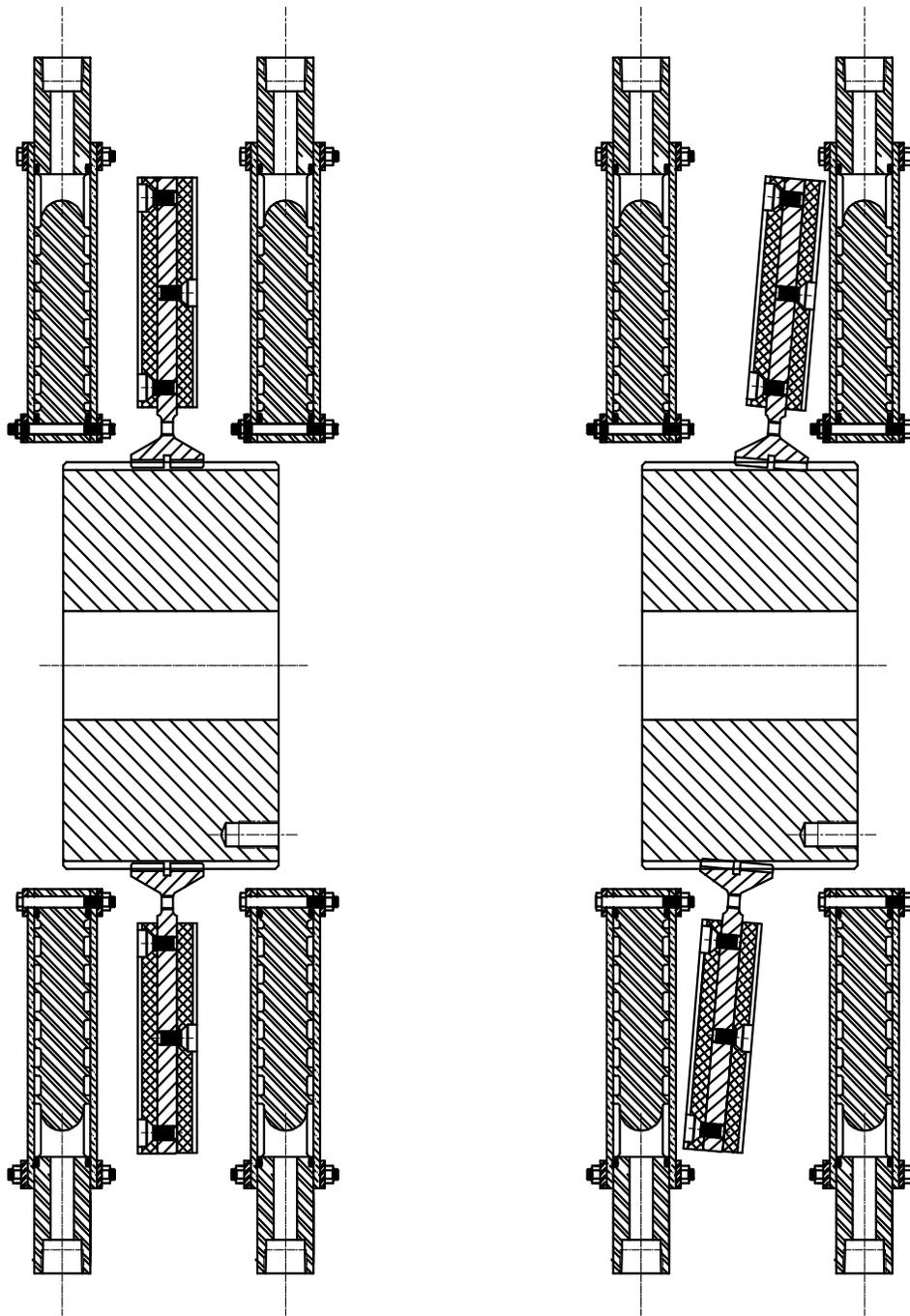
CAUTION

Proper alignment is necessary to ensure that the friction discs track properly. Improper alignment will result in excessive wear to the friction material and the mating surfaces. Improper alignment will also overstress the gear and the splined bore of the friction disc assemblies.

- 4.1 Refer to the appropriate catalog information (available upon request) for the appropriate envelope dimensions, mounting register diameters, mounting bolt circles and positions, and stud supports brackets recommendations for each brake.
- 4.2 The brake reaction member (such as the machine frame) should have a machined register to allow for the mounting and alignment control of the brake. The mounting surface should be designed to provide full support of the face of the mounting flange in order to prevent any deflection during operation.
- 4.3 For proper operation and service life, the brake reaction member must be aligned to the shaft within the limits shown on the table below.

TABLE 6		
ALIGNMENT REQUIREMENTS		
SIZE	CONCENTRICITY	PERPENDICULARITY
118	0.010 (0.25)	0.010 (0.25)
218	0.010 (0.25)	0.010 (0.25)
318	0.010 (0.25)	0.010 (0.25)
418	0.010 (0.25)	0.010 (0.25)
124	0.010 (0.25)	0.012 (0.30)
224	0.010 (0.25)	0.012 (0.30)
324	0.010 (0.25)	0.012 (0.30)
424	0.010 (0.25)	0.012 (0.30)
524	0.010 (0.25)	0.012 (0.30)
136	0.010 (0.25)	0.019 (0.48)
236	0.010 (0.25)	0.019 (0.48)
336	0.010 (0.25)	0.019 (0.48)
436	0.010 (0.25)	0.019 (0.48)

- 4.4 Refer to the proper brake drawing for the setup dimension between the brake mounting surface and the end of the gear. Gears should be positioned to ensure that the disc splines will not overhang the end of the gear when the brake is mounted. The brake gear should be checked for overhang with new and worn conditions. The gear is typically bored and keyed for a Class FN2S interference fit for inch shafting and ISO System S7h6 for metric shafting. Contact the WPT Engineering department for specific recommendations.



CORRECT

INCORRECT

FIGURE 1

5.0 INSTALLATION – PISTON TYPE



CAUTION

Alignment is necessary to ensure the brake will function properly.



CAUTION

Water inlets and outlets must be located as close as possible to the six o'clock and twelve o'clock positions, respectively. This will help to prevent air pockets in the water cavities, which would allow the brake to overheat.

- 5.1 The brake should be mounted to a solid part of the machine which has a pilot boss or bore that will mate with the back plate water jacket and is concentric with the shaft. This can be checked with a shaft mounted dial indicator, placing the indicator tip on the diameter of the pilot and rotating the shaft. The indicator should not vary more than ± 0.0005 [0.013mm] per inch of pilot diameter.
- 5.2 With the dial indicator mounted to the shaft, place the indicator tip on the face of the mounting bracket to check perpendicularity and rotate the shaft. The indicator should not vary more than ± 0.0005 [0.013mm] per inch of diameter.
- 5.3 Brakes with three or more drive plates should have an additional support on the actuator end, to keep the brake from twisting under heavy torque loads. Consult WPT for mounting dimensions.
- 5.4 Position the hub on the shaft in relation to the unit, as shown in the drawing in this manual. It is important that the hub be accurately mounted to insure proper clearance in the brake during operation. The hub should be locked in this position to prevent axial movement during operation.
- 5.5 If the unit is to be mounted while completely assembled, be sure that the splines on the drive plate(s) are aligned with the splines on the hub. This is accomplished by installing the hub in the drive plates to align the splines. Center the hub and drive plates in the brake and apply and maintain 25 PSIG (1.7 bar) air pressure to engage the piston. Keep air pressure on the piston until the brake is completely installed. Slide the complete unit over the pilot on the mounting bracket. Insert grade 8 mounting bolts and tighten, See chart on section 19.0 for torque requirements. The water inlets must be at the lowest level of the water chamber, and the water outlets at the highest level. This is necessary in order to insure a full chamber of water at all times.
- 5.6 If the unit is disassembled for installation, see Brake Disassembly Section 8.0 and Brake Assembly-Piston type Section 16.0.

IMPORTANT

- 5.7 Even though the units are properly set before shipment from the factory, they should be checked for proper clearance before being put into operation, see Table 11.
- 5.8 Install all flexible water connections to the unit. Be sure that all floating water jackets are free to move. See Table 9 for the inlet and outlet thread sizes in the water jackets.

TABLE 7

Fastener Description and Assembly Torque - Ft.-Lbs. (Nm)				
Descript.	Spec.	18" Brake	24" Brake	36" Brake
Water jacket Bolt & Locknut	Size	5/16"-18 NC (GR. 8)	5/16"-18 NC (GR. 8)	3/8"-16 NC2 (GR. 8)
	Torque (Dry)	12 (16.2)	12 (16.2)	25 (33.9)
Assembly Locknut	Size	3/4"-10 NC-3 (GR. 8)	1 1/8"-7 NC (GR. 8)	1 3/8"-6 NC (GR. 8)
	Torque (Lubed)	150 (203)	500 (677)	500 (677)
Mounting Bolt	Size	5/8"-11 NC-2 (GR8)	5/8"-11 NC-2 (GR8)	1"-8 NC (GR8)
	Quantity	10	10	14
	Torque (Lubed)	150 (203)	150 (203)	660 (895)

**CAUTION**

Use only the proper number and grade of fasteners shown on the table above. Use only commercial grade fasteners where Grade 8 fasteners are specified. Failure to do so may result in a fastener failure and/or a sudden and drastic reduction in brake torque.

- 5.9 Ensure that the shaft of the equipment is free of nicks and/or burrs. Ensure that the key will fit properly in the shaft and the gear.
- 5.10 Apply a light coat of anti-seize compound to the shaft and the key. Tap the key into the shaft.
- 5.11 Heat the gear uniformly to 250 Deg. F (121Deg.C) to expand the bore and ease the assembly. Press the gear onto the shaft, making sure that the dimension between the gear and the brake mounting surface is maintained. Allow the gear to cool.
- 5.12 Apply a thin coat of MOLUB-ALLOY OG Heavy Grease or equivalent to the splines of the gear. For Corrosion Resistance units, use MOLUB-ALLOY 412 ES.
- 5.13 Pre-fill the grease channel in the drive plates (if applicable) with MOLUB-ALLOY OG Heavy grease or equivalent as shown in the detail below. Use MOLUB-ALLOY 412 ES for Corrosion resistance units. Fill the grease channel for 360 Deg. and to within .125" of the top of the grease channel as shown **FIGURE 2**.
- 5.14 Lift the brake into position and slide it over the gear. Avoid placing lifting straps or cables directly on the release springs. Remove any excess grease from the gear to avoid contamination of the friction disc.

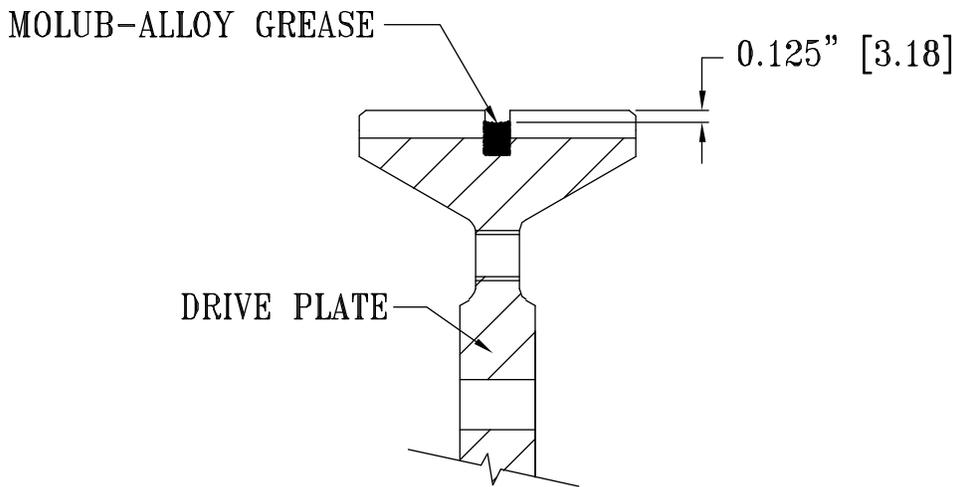


FIGURE 2

- 5.15 Attach the mounting flange to the mounting surface of the equipment using the appropriate fasteners. If applied pressure was used to help position the disc during mounting, release the air pressure prior to tightening the fasteners. Tighten the fasteners to the specified torque. See the Torque chart.
- 5.16 The water cooled brake should be covered to protect the unit from dirt, overspray and any other sources of external contamination. In extreme environments, use of a sealed enclosure with an internal heater strip is recommended to prevent moisture from collecting on the unit.



CAUTION

Maximum allowable air pressure is 150 PSIG (10.2 bar) for the piston style and 135 PSIG (9.2 bar) for the air tube style. Application of air pressure exceeding the maximum allowable may result in damage to the brake.

- 5.17 Air inlet sizes are shown on the table below. Air inlets are located on the face of the cylinder plate or the air holding plate. With units that have three air ports, the lowest port should be at or near the six o'clock position to facilitate the purging of any moisture that may accumulate in the air system.
- 5.18 All pipes should be free of metal chips, cutting compound and any other foreign matter. Pipe ends should be reamed after cutting to eliminate any possible restrictions or burrs. For optimum air system response, a minimum number of bend and elbows should be used.
- 5.19 The water cooled brake does not require lubricated air. However some of the associated control valves may. Consult the appropriate valve manufacturer's recommendations.
- 5.20 Maximum allowable coolant pressure within the water cavity is 45 PSI for the 18" and 24" brakes and 40 PSI in the 36" brake. See the chart below for the coolant pressure limitations as measured at the inlets and outlets of the water jacket. Note that inlet pressures exceeding the maximum allowable static pressures are only permissible under dynamic flow conditions, provided that the average pressure between the inlet and the outlet does not exceed the maximum allowable pressure stated above. The use of a accumulator or pressure relief valve may be desirable to reduce the effects of pressure spikes in the coolant system during operation.

- 5.21 The coolant supply and discharge hose, pipe and fitting sizes, along with minimum flow rates for the brake, are listed below.
- 5.22 Coolant supply connections to the brake should provide a parallel flow through each section of the brake. Series flow is not recommended, as it can lead to overheating of the brake.
- 5.23 Inlet and outlet coolant manifolds must be provided. Manifolds should be constructed to allow for even flow through all of the ports. On all of the brakes, two hoses can be routed to the reaction plates to assist with balancing the flow to each wear plate.
- 5.24 Use flexible connecting hose(s) at each brake coolant section is recommended to allow for axial travel of the pressure plate, reaction plate and the end plate during the brake's operation. This will allow the brake to operate without restricting the movement of the components. When determining hose lengths, consideration should be given to movement and location of the pressure plate and reaction plate as the friction material wears. Hose lengths running between the manifolds and the inlet or outlet ports should be equal in length, if possible. Reductions in the recommended line diameter should be avoided to prevent excessive line pressures.
- 5.25 Avoid the use of sharp bends and elbows that will restrict the water flow. Loops and bends in the lines may create air pockets, which substantially reduce the flow of the coolant and can contribute to overheating.
- 5.26 Coolant and coolant supply lines should be free of foreign material (a 500 micron water filter is recommended). In the event that contaminated water is used as a coolant, which is not recommended, the use of a multi-stage filter/strainer may be desirable to avoid the need for frequent cleaning of the fine mesh filter.
- 5.27 The coolant supply temperature at the inlet should be 100 Deg. F. or lower. The coolant outlet temperature should not exceed the values given in the chart below. However, in no event should there be more than a 50 Deg. F rise between the inlet and the outlet. See the table below for the maximum allowable outlet coolant temperature with various water/ethylene glycol mixtures and other cooling media.
- 5.28 Connect an air supply to one of the ports in the cylinder plate. Plug all remaining air ports.
- 5.29 Perform an air test. Apply 80 PSIG [5.5bar] to engage the brake. Shut off air supply. If the air pressure Does not drop below 70 PSIG [4.8 bar] after 10 minutes then the seals have been properly installed. If Excessive leaking is found, disassemble the piston and cylinder plate and inspect the seals and the sealing surfaces for damage. Repair or replace any components that show any signs of damage.

Table 8	
Air Inlet Size	
Model	Thread Size
18" Brake	2X ½-14 NPT (airtube)
24" Brake	3X ½-14 NPT (piston) 2X ½-14 NPT (airtube)
36" Brake	3X ¾-14 NPT (piston) 3X ½-14 NPT (airtube)

TABLE 9						
Coolant Supply Data						
Size	Thermal Rate ¹ HP (kW)	Water Inlet and Outlet Pipe Size	Min. Flow Rate ² GPM (L/min) 100% Water	Min. Flow Rate ² GPM (L/min) 70% Water; 30% Ethylene Glycol by Vol.	Min. Flow Rate ² GPM (L/min) 60% Water; 40% Ethylene Glycol by Vol.	Min. Flow Rate ² GPM (L/min) 50% Water, 50% Ethylene Glycol by Vol.
118	120 (89.4)	1/2-14 NPT	12 (46)	14 (53)	16 (59)	18 (68)
218	240 (179)	1/2-14 NPT	24 (91)	28 (106)	31 (117)	36 (136)
318	360 (268)	1/2-14 NPT	36 (136)	42 (162)	47 (177)	54 (204)
418	480 (358)	1/2-14 NPT	48 (182)	56 (212)	62 (234)	72 (272)
124	270 (201)	1/2-14 NPT	27 (102)	32 (121)	35 (132)	40 (151)
224	540 (402)	3/4-14 NPT	54 (204)	64 (242)	70 (265)	80 (303)
324	810 (603)	3/4-14 NPT	81 (306)	96 (363)	105 (396)	120 (453)
424	1080 (804)	3/4-14 NPT	108 (408)	128 (484)	140 (528)	160 (604)
524	1350 (1811)	3/4-14 NPT	135 (508)	160 (601)	175 (658)	200 (752)
136	650 (485)	1 1/4-11 NPT	65 (246)	76 (288)	84 (318)	98 (371)
236	1300 (970)	1 1/4-11 NPT	130 (492)	152 (576)	168 (636)	196 (742)
336	1950 (1454)	1 1/4-11 NPT	195 (738)	228 (863)	253 (985)	294 (1113)
436	2600 (1940)	1 1/4-11 NPT	260 (984)	304 (1152)	336 (1272)	392 (1484)
¹ Thermal rating based on 70° F (21° C) coolant temperature rise between inlet and outlet (water).						
² Flow rate is based on requirement of 1 U.S. GPM per 10 HP thermal dissipation (water). Flow rate is the minimum for the maximum power dissipation						

TABLE 10	
Maximum Outlet Coolant Temperature	
Water/Ethylene Glycol Mixture % by Volume	Maximum Outlet Coolant Temperature Deg. F (Deg. C)
100/0	150 (66)
70/30	165 (74)
60/40	165 (74)
50/50	170 (77)

6.0 INSTALLATION – AIR TUBE TYPE

CAUTION

Alignment is necessary to ensure the brake will function properly. See Figure 1.

CAUTION

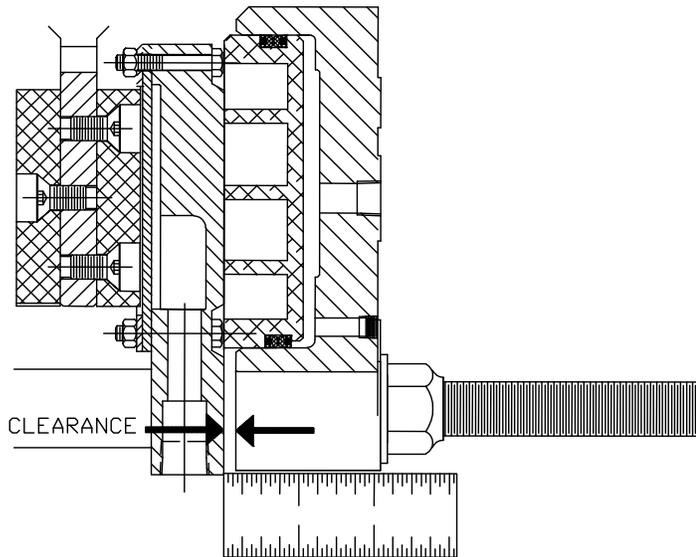
Water inlets and outlets must be located as close as possible to the six o'clock and twelve o'clock positions, respectively. This will help to prevent air pockets in the water cavities, which would allow the brake to overheat.

- 6.1 The back plate water jacket of the brake is usually fixed to a mounting surface. A pilot diameter on the mounting surface will locate the brake concentric with the shaft. This can be checked with a dial indicator by placing the indicator tip on the pilot of the mounting surface and rotating the shaft. The indicator should not read more than $\pm .0005$ " per inch of brake diameter. Example: A 24" brake would then have a maximum run out of .012 in (.30 mm)
- 6.2 With the dial indicator on the shaft, place the indicator tip on the face of the mounting surface and rotate the shaft. The indicator should not read more than $\pm .0005$ " per inch of brake diameter.
- 6.3 If the unit is to be mounted while completely assembled, be sure that the splines on the drive plate(s) are aligned with the splines on the hub. This is accomplished by installing the hub in the drive plates to align the splines. Center the hub and drive plates in the brake and apply and maintain 25 PSIG (1.7 bar) air pressure to engage the air tube. Keep air pressure on the air tube until the brake is completely installed. Slide the complete unit over the pilot on the mounting bracket. Insert grade 8 mounting bolts and tighten, See chart on section 20.0 for torque requirements. The water inlets must be at the lowest level of the water chamber, and the water outlets at the highest level. This is necessary in order to insure a full chamber of water at all times.
- 6.4 Even though the units are properly set before shipment from the factory, they should be checked for proper clearance before being put into operation.
- 6.5 Operating clearance is obtained by measuring the distance moved by the pressure plate while applying operating pressure to the air tube. Do not apply air pressure to the air tube if it is unrestrained.
- 6.6 Clearance should be as follows for the various units

TABLE 11

Brake Operating Clearance

Model	118	218	318	418	124	224	324	424	524	136	236	336	436
Minimum Clearance	0.08 (2.39)	0.19 (4.78)	0.28 (7.16)	0.38 (9.65)	0.08 (2.39)	0.19 (4.78)	0.28 (7.16)	0.38 (9.65)	0.44 (11.11)	0.08 (2.39)	0.19 (4.78)	0.28 (7.16)	0.38 (9.65)



**CLEARANCE MEASUREMENT
(PISTON TYPE SHOWN)
FIGURE 3**

- 6.7 Install all flexible water connections to the unit. Be sure that all center and floating water jackets are free to move. Insure water flow through the brake at all times during use.
- 6.8 As the unit wears, clearance may be adjusted by removal of wear spacers. See "Maintenance. Section 18.0
- 6.9 If the unit is disassembled before mounting, follow steps #1 thru #13 of "Section 17.0 Brake Assembly - Air Tube Type" section and steps #4 thru #8 in this section.

TABLE 12				
Fastener Description and Assembly Torque - Ft.-Lb. (Nm)				
Descript.	Spec.	18" Brake	24" Brake	36" Brake
Water jacket Bolt & Locknut	Size	5/16"-18 NC (GR. 8)	5/16"-18 NC (GR. 8)	3/8"-16 NC2 (GR. 8)
	Torque (Dry)	12 (16)	12 (16)	25 (34)
Assembly Locknut	Size	3/4"-10 NC-3 (GR. 8)	1 1/8"-7 NC (GR. 8)	1 3/8"-6 NC (GR. 8)
	Torque (Lubed)	150 (203)	500 (677)	500 (677)
Mounting Bolt	Size	5/8"-11 NC-2 (GR8)	5/8"-11 NC-2 (GR8)	1"-8 NC (GR8)
	Quantity	10	10	14
	Torque (Lubed)	150 (203)	150 (203)	660 (895)



CAUTION

Use only the proper number and grade of fasteners shown on the table above. Use only commercial grade fasteners where Grade 8 fasteners are specified. Failure to do so may result in a fastener failure and/or a sudden and drastic reduction in brake torque.

- 6.11 Ensure that the shaft of the equipment is free of nicks and/or burrs. Ensure that the key will fit properly in the shaft and the gear.
- 6.12 Apply a light coat of anti-seize compound to the shaft and the key. Tap the key into the shaft.
- 6.13 Heat the gear uniformly to 250 Deg. F (121Deg.C) to expand the bore and ease the assembly. Press the gear onto the shaft, making sure that the dimension between the gear and the brake mounting surface is maintained. Allow the gear to cool.
- 6.14 Apply a thin coat of MOLUB-ALLOY OG Heavy Grease or equivalent to the splines of the gear. For Corrosion Resistance units, use MOLUB-ALLOY 412 ES.
- 6.15 Pre-fill the grease channel in the drive plates (if applicable) with MOLUB-ALLOY OG Heavy Grease or equivalent as shown in the detail below. Use MOLUB-ALLOY 412 ES for Corrosion Resistance units. Fill the grease channel for 360 Deg. and to within .125" of the top of the grease channel as shown in **FIGURE 4**.
- 6.16 Lift the brake into position and slide it over the gear. Avoid placing lifting straps or cables directly on the release springs. Remove any excess grease from the gear to avoid contamination of the friction disc.

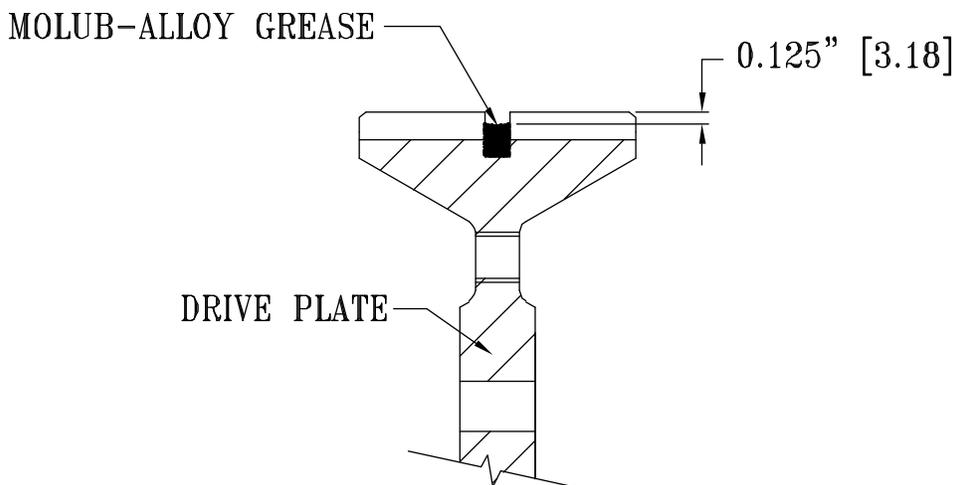


FIGURE 4

- 6.17 Attach the mounting flange to the mounting surface of the equipment using the appropriate fasteners. If applied pressure was used to help position the disc during mounting, release the air pressure prior to tightening the fasteners. Tighten the fasteners to the specified torque. See the Torque chart.
- 6.18 The water cooled brake should be covered to protect the unit from dirt, overspray and any other sources of external contamination. In extreme environments, use of a sealed enclosure with an internal heater strip is recommended to prevent moisture from collecting on the unit.



CAUTION

Maximum allowable air pressure is 150 PSIG (10.2 bar) for the piston style and 135 PSIG (9.2 bar) for the air tube style. Application of air pressure exceeding the maximum allowable may result in damage to the brake.

- 6.19 Air inlet sizes are shown on the table below. Air inlets are located on the face of the cylinder plate or the air holding plate. With units that have three air ports, the lowest port should be at or near the six o'clock position to facilitate the purging of any moisture that may accumulate in the air system.
- 6.20 All pipes should be free of metal chips, cutting compound and any other foreign matter. Pipe ends should be reamed after cutting to eliminate any possible restrictions or burrs. For optimum air system response, a minimum number of bend and elbows should be used.
- 6.21 The water cooled brake does not require lubricated air. However some of the associated control valves may. Consult the appropriate valve manufacturer's recommendations.
- 6.22 Maximum allowable coolant pressure within the water cavity is 45 PSI for the 18" and 24" brakes and 40 PSI in the 36" brake. See the chart below for the coolant pressure limitations as measured at the inlets and outlets of the water jacket. Note that inlet pressures exceeding the maximum allowable static pressures are only permissible under dynamic flow conditions, provided that the average pressure between the inlet and the outlet does not exceed the maximum allowable pressure stated above. The use of an accumulator or pressure relief valve may be desirable to reduce the effects of pressure spikes in the coolant system during operation.
- 6.23 The coolant supply and discharge hose, pipe and fitting sizes, along with minimum flow rates for the brake, are listed below.
- 6.24 Coolant supply connections to the brake should provide a parallel flow through each section of the brake. Series flow is not recommended, as it can lead to overheating of the brake.
- 6.25 Inlet and outlet coolant manifolds must be provided. Manifolds should be constructed to allow for even flow through all of the ports. On all of the brakes, two hoses can be routed to the reaction plates to assist with balancing the flow to each wear plate.
- 6.26 Use flexible connecting hose to each brake coolant section to allow axial travel of the pressure plate, reaction plate and the end plate during the brake's operation. This will allow the brake to operate without restricting the movement of the components. When determining hose lengths, consideration should be given to movement and location of the pressure plate and reaction plate as the friction material wears. Hose lengths running between the manifolds and the inlet or outlet ports should be equal in length, if possible. Reductions in the recommended line diameter should be avoided to prevent excessive line pressures.
- 6.27 Avoid the use of sharp bends and elbows that will restrict the water flow. Loops and bends in the lines may create air pockets, which substantially reduce the flow of the coolant and can contribute to overheating.
- 6.28 Coolant and coolant supply lines should be free of foreign material (a 500 micron water filter is recommended). In the event that contaminated water is used as a coolant, which is not recommended the use of a multi-stage filter/strainer may be desirable to avoid the need for frequent cleaning of the fine mess filter.
- 6.29 The coolant supply temperature at the inlet should be 100 Deg. F. or lower. The coolant outlet temperature should not exceed the values given in the chart below. However, in no event should there be more than a 50 Deg. F rise between the inlet and the outlet. See the table below for the maximum allowable outlet coolant temperature

6.30 Connect an air supply to one of the ports in the air tube holding plate. Plug all remaining air ports.

6.31 Perform an air test. Apply 80 PSIG [5.5bar] to engage the brake. Shut off air supply. If the air pressure drops inspect for leaks. Repair or replace any components that show any signs of damage.

Table 13	
Air Inlet Size	
Model	Thread Size
18" Brake	2X ½-14 NPT (airtube)
24" Brake	3X ½-14 NPT (piston) 2X ½-14 NPT (airtube)
36" Brake	3X ¾-14 NPT (piston) 3X ½-14 NPT (airtube)

Maximum Outlet Coolant Temperature	
Water/Ethylene Glycol Mixture % by Volume	Maximum Outlet Coolant Temperature Deg. F (Deg. C)
100/0	150 (66)
70/30	165 (74)
60/40	165 (74)
50/50	170 (77)

TABLE 9**Coolant Supply Data**

Size	Thermal Rate ¹ HP (kW)	Water Inlet and Outlet Pipe Size	Min. Flow Rate ² GPM (L/min) 100% Water	Min. Flow Rate ² GPM (L/min) 70% Water; 30% Ethylene Glycol by Vol.	Min. Flow Rate ² GPM (L/min) 60% Water; 40% Ethylene Glycol by Vol.	Min. Flow Rate ² GPM (L/min) 50% Water, 50% Ethylene Glycol by Vol.
118	120 (89.4)	1/2-14 NPT	12 (46)	14 (53)	16 (59)	18 (68)
218	240 (179)	1/2-14 NPT	24 (91)	28 (106)	31 (117)	36 (136)
318	360 (268)	1/2-14 NPT	36 (136)	42 (162)	47 (177)	54 (204)
418	480 (358)	1/2-14 NPT	48 (182)	56 (212)	62 (234)	72 (272)
124	270 (201)	1/2-14 NPT	27 (102)	32 (121)	35 (132)	40 (151)
224	540 (402)	3/4-14 NPT	54 (204)	64 (242)	70 (265)	80 (303)
324	810 (603)	3/4-14 NPT	81 (306)	96 (363)	105 (396)	120 (453)
424	1080 (804)	3/4-14 NPT	108 (408)	128 (484)	140 (528)	160 (604)
524	1350 (1811)	3/4-14 NPT	135 (508)	160 (601)	175 (658)	200 (752)
136	650 (485)	1 1/4-11 NPT	65 (246)	76 (288)	84 (318)	98 (371)
236	1300 (970)	1 1/4-11 NPT	130 (492)	152 (576)	168 (636)	196 (742)
336	1950 (1454)	1 1/4-11 NPT	195 (738)	228 (863)	253 (985)	294 (1113)
436	2600 (1940)	1 1/4-11 NPT	260 (984)	304 (1152)	336 (1272)	392 (1484)

¹ Thermal rating based on 70° F (21° C) coolant temperature rise between inlet and outlet.

² Flow rate is based on requirement of 1 U.S. GPM per 10 HP thermal dissipation.
Flow rate is the minimum for the maximum power dissipation.

7.0 OPERATION – PISTON & AIR TUBE TYPE



WARNING

Protective means must be used to prevent oil, grease, dirt and/or coolant from coming in contact with the surfaces of the friction disc, or the wear plates. Oil and /or grease on these parts will significantly reduce the torque capacity of the unit. Dirt and/or coolant will produce erratic torque. Do not risk personal injury or damage to the equipment.



WARNING

At initial start up, running the equipment at 50% of the rated horsepower for a period of four hours is recommended for the desired break-in of the friction disc to be able to achieve the desired rated torque. Verify proper operation before putting the product into service.



CAUTION

Failure to provide adequate coolant flow will severely damage the brake.



WARNING

Maximum freewheeling speed must not exceed the speeds listed below. Exposure to speeds in excess of these values may cause the friction discs to burst and result in extensive damage to the brake and/or personal injury.



CAUTION

For operation in subfreezing temperatures, ethylene glycol antifreeze must be added to the water. The antifreeze content of the mixture is critical and should not exceed 50% by volume. Excessive amounts of antifreeze will reduce the cooling capacity and can cause coolant leakage due to overheating.



CAUTION

Maximum ambient temperature is 110 Deg. F. (43 Deg. C.). Minimum ambient temperature for a closed looped water system using ethylene Glycol antifreeze is 0 Deg. F. (-18 Deg. C.). For an open looped water system using water as a coolant, the minimum ambient temperature is 45 Deg. F. (7 Deg. C.).

- 7.1 Insure that there is the recommended cooling water flow before rotating the brake (see chart section 19.0). Braking torque is directly proportional to air pressure supplied to the piston.
- 7.2 Maximum air pressure is 150 PSI [10.2 bar] for the piston style and 135 PSIG (9.2 bar) for air tube style.
- 7.3 Maximum water pressure at the water jackets is 45 PSI [3.03 bar] for 18 and 24" brakes and 40 PSI [2.7 bar] for the 36" brakes.
- 7.4 Observe the water jacket discharge temperature. This should not be above 150°F [65.5°C]. Absence of water flow when engaging the brake will immediately warp the copper wear plates and destroy the seal between wear plates and water jacket.
- 7.5 **It is recommended that coolant flow be monitored by use of a flow switch or flow meter. See chart, section 18.0 for volume requirements. Temperature measurement of the coolant discharge will give additional indications of brake performance.**
- 7.6 Protect against freezing by use of anti-freeze (ethylene glycol). Anti-freeze will also provide a measure of corrosion protection. A 50/50 mixture of water and ethylene glycol has approximately 80% of the heat carrying capacity of pure water. If this is used, increase water flow accordingly. Ethylene Glycol conforming to SAE Standard J1034 should be used. Water low in corrosive ions such as chlorides and sulfates and a pH of 7.5 to 10.5 should be used.
- 7.7 If an open loop water system is used (ie. rig water or pond), a strainer and filter should be placed in the line to prevent the jackets from becoming clogged. Excessive water hardness may cause the buildup of scale in the water jackets. Electrolytic corrosion may occur between the dissimilar metals in the brake if the water supply has a high acidic content. A water treatment should be considered if the equivalent calcium carbonate hardness exceeds 100 PPM or the pH value is outside the 7.0 – 9.0 range.
- 7.8 If a closed looped system, ethylene glycol coolant conforming to SAE Standard J1034 should be used. For preparation of the proper concentration of a water/ethylene glycol mixture, use make-up water which is low in corrosive ions such as chlorides and sulfates. Recommended pH value of water/ethylene glycol mixture: 7.5 to 10.5
- 7.9 Install air connections to the cylinder holding plate or the air tube holding plate. Cylinder holding plate and air tube holding plate connections are ½" NPT for the 18" and 24" brakes and ¾" NPT for the 36" brakes.
- 7.10 Maximum water jacket inlet temperature is 100°F [37.8 C]
- 7.11 As the friction material wears, the operating clearance of the brake will increase. This causes the actuator to travel further before closing the brake. Wear spacers are provided to return the brake to the original clearance. When the total clearance has reached a value equal to the initial clearance plus the thickness of a wear spacer, a set wear spacers should be removed. See 'Table 15' in the "Maintenance" section 18.0.

7.12 Wear indicating grooves are provided in the friction material. When friction material is worn to the depth of this groove, replacement should be scheduled.

7.13 Inspect the water passages and if necessary, use a wire brush to clean them. If re-painting is required, sand blast the water passages and re-paint the surfaces with Epoxy Polyamine coating. Dry film thickness should be 8 to 12 mils (0.2 to 0.3 mm). Be careful not to allow the paint to get into the seal grooves or the face of the support nubs.

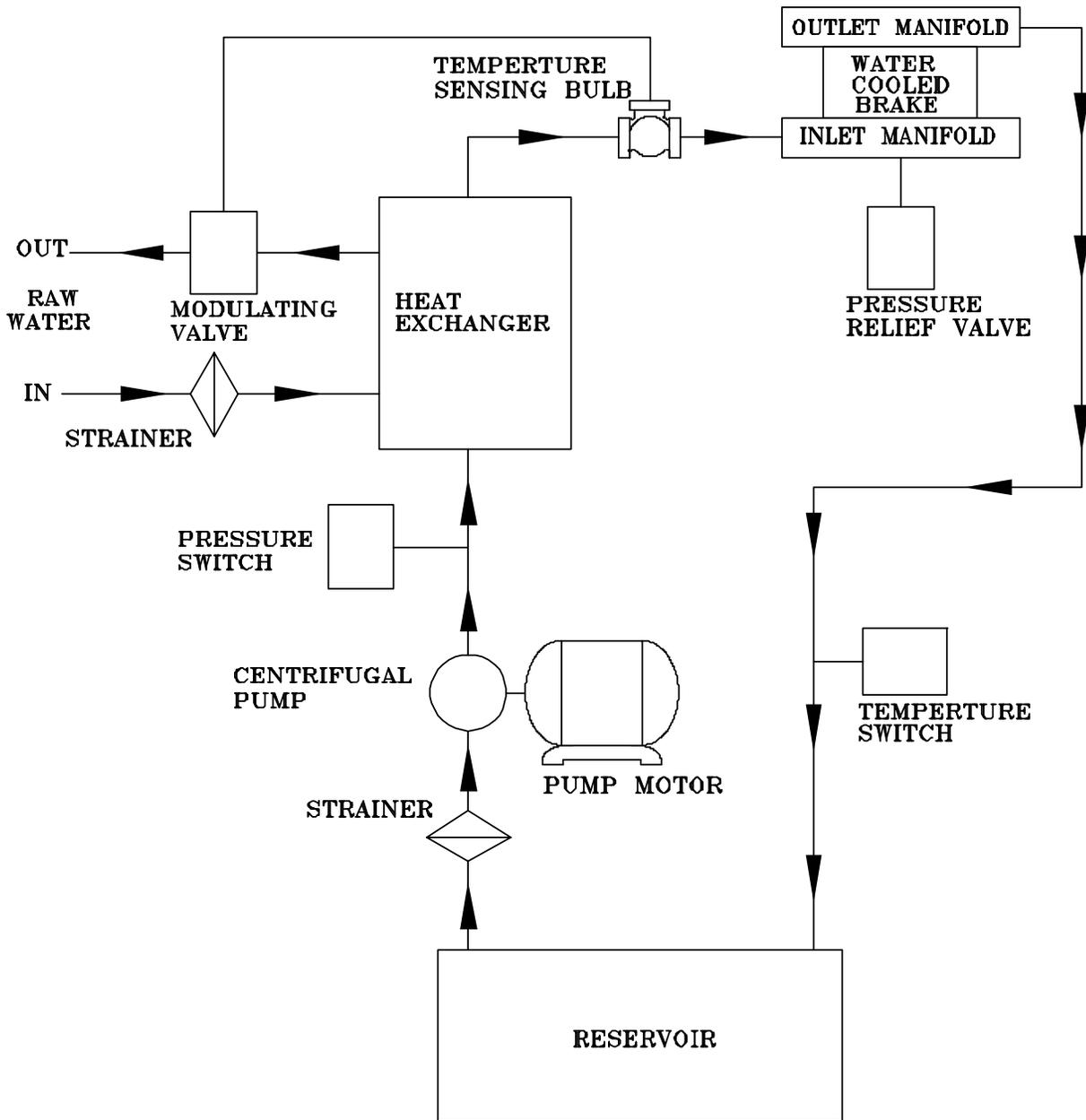
7.14 See table below for the maximum slip and freewheeling speeds.



CAUTION

Excessive slip speeds will result in rapid friction material wear. To extend the life of the friction and wear materials, the values listed on the table should not be exceeded.

Maximum Disc Speeds		
Size	Max. Slip Speed RPM	Max. Freewheeling Speed RPM
18" WCB	955	1600
24"WCB	715	1200
36"WCB	475	700



FLOW CONTROL SETTINGS

SINGLE DRIVE PLATE	DUAL DRIVE PLATE	TRIPLE DRIVE PLATE	QUAD DRIVE PLATE
OUTLET MANIFOLD	OUTLET MANIFOLD	OUTLET MANIFOLD	OUTLET MANIFOLD
50% 50%	25% 50% 25%	16% 34% 34% 16%	12.5% 25% 25% 25% 12.5%

Typical Closed Loop Water System Diagram

FIGURE 5

8.0 BRAKE DISASSEMBLY – PISTON TYPE



CAUTION

Ensure that the machinery is and will remain in a locked and safe position prior to loosening fasteners or removing the brake.

- 8.1 Remove all flexible hose connections (air & water) from unit.
- 8.2 If the unit is to be repaired in place, use a suitable lifting device for support while removing the cylinder holding plate assembly, water jacket assemblies and drive plate assemblies. If the unit is to be removed and repaired off the equipment, use soft slings to support the unit and gently slide the unit off of the equipment's shaft. The soft slings must not be located on the release springs as the unit is being removed from the equipment.
- 8.3 Remove the fasteners that hold the unit to the equipment, if the unit is going to be repaired off of the equipment. Transport the unit to a clean working area. Place the unit with the mounting plate face down on a flat clean surface.
- 8.4 Check the hub. If the hub requires replacement, then remove it from the shaft of the equipment using a portable jack. Use the threaded holes in the end of the hub for puller holes. Heating the hub maybe required to ease the process of removing the hub from the equipment's shaft.
- 8.5 Match-mark the mounting flange, center water jacket plates, floating water jackets, pressure plate and the cylinder plate's relationship to each other before disassembling the unit.
- 8.6 Remove the locking nuts from the studs, which secure the cylinder holding plate assembly to the unit. Turn each locknut a small amount at a time and in a criss-cross pattern until the release springs are no longer acting on the cylinder plate assembly.
- 8.7 Remove the cylinder plate and the piston from the unit. Set the assembly in a clean flat area with the piston facing down. The assembly should be set on 6" high blocks. The blocks must only support the cylinder plate. The piston should be free to move. Make sure to avoid damaging the face of the piston.
- 8.8 If regulated air is available, the piston can be partially ejected from the cylinder plate by applying a maximum of 15 PSIG [1.0 bar] to the cylinder plate.
- 8.9 To complete the removal of the piston from the cylinder plate, open all the air inlets. Insert 1/2" [12mm] diameter x 6" [150mm] long wooden dowel rods into each air inlet. Gently tap the wooden rod with a mallet using an alternating method to insure that the piston moves evenly out of the cylinder plate. Be careful not to damage the sealing surfaces of the piston or the cylinder plate by cocking the piston in the cylinder plate.
- 8.10 After removing the piston, note the relationship of the lips of the seals are orientated in the piston grooves. Remove the seals from the piston.
- 8.11 Inspect the cylinder plate's sealing surface condition for any nicks or scratches or any other defect which may prevent the seals from being effective. Check the wear limits of the sealing surface of the cylinder plate and the piston. Replace either cylinder plate or the piston if either is below the limits listed in this manual.
- 8.12 Slide the floating water jacket assembly off the studs and set aside being careful not to damage the copper wear plate.

- 8.13 Slide the outer most drive plate from the studs and set aside.
- 8.14 Remove release springs from the studs.
- 8.15 Repeat steps 8.8 through 8.10 until all water jackets, drive plates and springs are removed.
- 8.16 If the copper wear surface on the back plate water jacket is to be replaced, support the back plate and remove the mounting bolts. Remove the back plate.
- 8.17 Inspect all components and wear surfaces. Use tables supplied in this manual to determine which components need to be replaced.
- 8.18 Studs which may have backed out during disassembly should be cleaned and re-installed using a permanent thread locking compound. Insure that they do not project through the back plate.

9.0 BRAKE DISASSEMBLY – AIR TUBE TYPE



CAUTION

Ensure that the machinery is and will remain in a locked and safe position prior to loosening fasteners or removing the brake.

- 9.1 Remove all air and water flexible hose connections from the unit.
- 9.2 If the unit is to be repaired in place, use a suitable lifting device for support while removing the cylinder holding plate assembly, water jacket assemblies and drive plate assemblies. If the unit is to be removed and repaired off the equipment, use soft slings to support the unit and gently slide the unit off of the equipment's shaft. The soft slings must not be located on the release springs as the unit is being removed from the equipment.
- 9.3 Remove the fasteners that hold the unit to the equipment, if the unit is going to be repaired off of the equipment. Transport the unit to a clean working area. Place the unit with the mounting plate face down on a flat clean surface.
- 9.4 Check the hub. If the hub requires replacement, then remove it from the shaft of the equipment using a portable jack. Use the threaded holes in the end of the hub for puller holes. Heating the hub may be required to ease the process of removing the hub from the equipment's shaft.
- 9.5 Match-mark the mounting flange, center water jacket plates, floating water jackets, pressure plate and the air tube holding plate's relationship to each other before disassembling the unit.
- 9.6 Remove the locking nuts from the studs, which secure the air tube holding plate assembly to the unit. Turn each locknut a small amount at a time and in a criss-cross pattern until the release springs are no longer acting on the air tube holding plate assembly.
- 9.7 Remove the air tube holding plate and the air tube from the unit. Set the assembly in a clean flat area. Make sure to avoid damaging the air tube.
- 9.8 Slide the floating water jacket assembly off the studs and set aside being careful not to damage the copper wear plate.
- 9.9 Slide the outer most drive plate from the studs and set aside.
- 9.10 Remove release springs from the studs.
- 9.11 Repeat steps 9.8 through 9.10 until all water jackets, drive plates and springs are removed.
- 9.12 If the copper wear surface on the back plate water jacket is to be replaced, support the back plate and remove the mounting bolts. Remove the back plate.
- 9.13 Inspect all components and wear surfaces. Use tables supplied in this manual to determine which components need to be replaced.
- 9.14 Studs which may have backed out during disassembly should be cleaned and re-installed using a permanent thread locking compound. Insure that they do not project through the back plate.

10.0 DRIVE PLATE DISASSEMBLY

REBUILDING DRIVE PLATES FOR WATER COOLED BRAKES AND/OR CLUTCHES

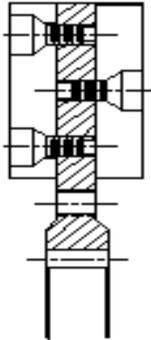


FIGURE 6

10.1 Remove all flat head bolts and friction material from the drive plate.

10.2 Use of a pinpoint torch to heat the screws will soften the thread locking compound and ease bolt removal.

10.2 Thoroughly clean the drive plate of oil, rust, and dirt. Use a tap to clean out the threaded holes in the drive plate and inspect the drive plate teeth for damage. Slight damage may be corrected with a fine file.

10.3 If the hub teeth appear worn, lay a straight edge along the teeth to check the wear. Wear should not exceed .015 in [0.38mm]. Wear greater than this would indicate the need for hub replacement.

10.4 Insure that the drive plate is flat by using a straight edge on the friction mounting surface.

11.0 DRIVE PLATE ASSEMBLY



WARNING

Failure to grind surfaces could result in erratic or reduced torque.

- 11.1 Clean all burrs, corrosion from the friction material and/or mounting surface.
- 11.2 Position the friction material on the drive plate. Install several screws loosely at several of the outermost screw hole locations to properly align the friction material.
- 11.2 Fasten in place using the $\frac{1}{4}$ "-20 flat head bolts on 18" units and $\frac{1}{2}$ "-13 flat head bolts on 24" and 36" units. Use thread locking compound (W00-00-902) and torque to 15 Ft lbs [20 Nm] for a 24" and/or 36" unit and 75 In-lbs [8.5 Nm] for an 18" unit. Be sure to use thread locking compound on all bolts and that each is drawn down to approximately the same level. When installing the screws on the 18" and 24" units, use a criss-cross pattern to tighten the screws. On the 36" units, install and tighten the screws from the inner most position and progress towards the outer edge.
- 11.3 Following the above mentioned pattern, install one screw at a time by applying Loctite to the screw threads. Use Loctite #262 on 24" and 36" units and Loctite #242 on 18" units. Tighten the screw to the proper torque value. See 11.2 for the proper torque values for these screws. Install and torque each of the remaining screws immediately after applying Loctite. Be sure and remove the initial screws that were installed to locate the friction material and reinstall them with Loctite and torque them to the recommended torque setting.
- 11.3 After replacement of friction material on 36" units, it is recommended that both friction surfaces be ground (preferred) or machined to a flatness of .003" [0.08mm] perpendicular to the bore splines and parallel to the opposite face within .010" [0.25mm]. Remove as little material as possible to get entire surfaces flat. Minimum thickness after grinding surfaces should not exceed 2.220" [56.39mm]. This process is not required on the 18" and 24" units.
- 11.4 Inspect the drive plate and proceed to Brake Assembly, section 16.0 and/or section 17.0.



WARNING

Loctite may cure prior to properly tightening the screw if not tightened to the proper torque value immediately after installation.

12.0 WATER JACKET DISASSEMBLY

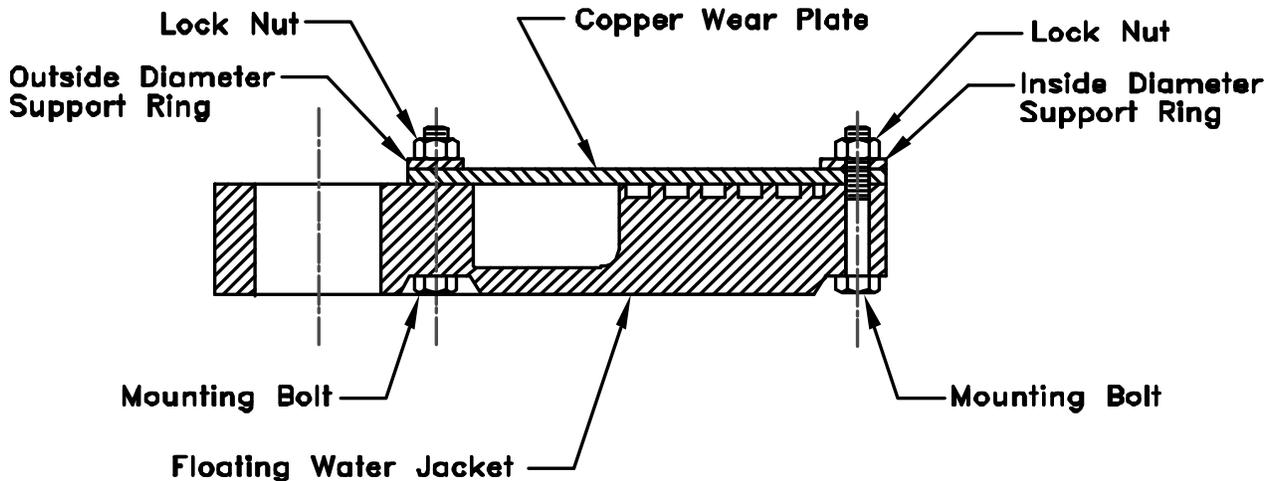


FIGURE 7

IMPORTANT: If using old copper wear plates with new friction disc, copper wear surface should be machined to a flatness of .003" [0.08mm] and parallel to the opposing copper wear plate within .005" [0.13mm]. Machine surface to within .120" [3.05mm] of the I.D. and O.D. support rings. Remove as little material as possible to get the entire surface flat. If allowable wear dimension of 0.030" [0.76mm] for an 18" units, 0.045" [1.14mm] for 24" unit and 0.050" [1.27mm] for a 36" unit is exceeded after machining, copper should be replaced.



WARNING

Failure to machine surfaces could result in erratic or reduced torque

- 12.1 Inspect copper wear plates. Allowable wear is .030" [0.76mm] for 18" units, 0.045" [1.14 mm] for 24" units and 0.050" [1.27mm] for the 36" units. This wear pattern may be a flat circular area or grooves.
- 12.2 Remove all bolts and nuts from the water jacket. Remove the worn copper wear plate being careful not to damage the sealing surfaces. A sharp putty knife may help break any bond between copper and water jacket. Measure the clamp tube holes in the water jackets. All measurements should be within .031" [.79 mm] of the nominal bore. Nominal bore is 2.25" [57.15] for 18" units, 3.00" [76.2] on 24" units and 5.00" [127.0] on 36" units.
- 12.3 Wire brush or scrape the sealing surfaces of the water jacket to remove all old sealing materials. Thoroughly clean the water jacket of oil, rust, and dirt. Inspect the water jacket for excessive pitting or damage to sealing surfaces. Inspect the support nubs. If severely corroded, the copper will not be supported and the water jacket should be replaced. Corrosion can be controlled by application of epoxy paint.
- 12.4 Inspect the new copper wear plate for shipping damage. There should be no burrs or raised areas that would prevent obtaining a good seal. Be sure the copper seal surfaces are clean.

13.0 WATER JACKET ASSEMBLY – O-RING VERSION

- 13.1 Clean and completely dry the sealing surfaces at the inside diameter and outer diameter on the pressure plate, floating water jackets, center water jackets and the back plate water jacket. These surfaces should be free of nicks and scratches to prevent leaks. Minor nicks and scratches may be filled with Loctite #596 sealant during assembly.
- 13.2 Position the copper wear plates on the water jacket. It may be necessary to line up the inside holes first and then mark the position of the copper wear plate on the water jacket.
- 13.3 Remove the copper wear plate. Apply a uniform bead of Dow Corning® 3451 or 3452 o-ring lubricant in the grooves of the pressure plate, floating water jacket, center water jacket and the back plate water jacket. Wipe a film of this lubricant on the o-ring. The recommended bead diameter is 0.060" to 0.090" [1.5mm to 2.3mm] for all size of units.
- 13.4 Install the inner and outer o-ring in the corresponding grooves in the water jacket. Temporarily fasten the copper plate in place using a pattern of 16 hex head bolts, locking nuts and support ring segments. If the jacket has two copper wear plates, turn the water jacket over and support it on the copper plate with blocks. Repeat the process for the other side. Install all bolts, nuts & support ring segments. Insure the bolts are installed in the correct orientation. Torque the nuts according to TABLE 12, Page 32, alternating between inside and outside and in a crossing pattern, see diagram below.

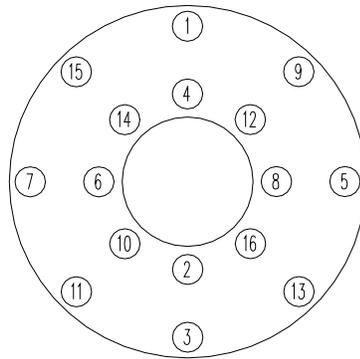


FIGURE 8

- 13.5 Using lifting straps, hold the jackets vertically with the outlet at the top, (12 o'clock position) connect a supply of water at the bottom (inlet) (6 o'clock position) and fill the water jacket. Seal any other outlets with the proper size plug.
- 13.6 Slowly fill the jacket with water allowing the air to purge itself out of all the cavities of the water jacket.
- 13.7 Install a pipe plug in the outlet port at the top of the jacket. Apply the appropriate water pressure. The maximum pressure is 45 PSIG [3.03 bar] for the 18" and 24" units and 40 PSI [2.7 bar] for the 36" units. There should be no leaks. Pressure test for 1 hour at the maximum allowable pressure.
- 13.4 If leaks are found, re-torque the bolts. If the leak persists, dismantle the water jacket and inspect the copper wear plate, seal surfaces, and o-ring condition.
- 13.5 Repeat steps 13.1 through 13.4.

14.0 WATER JACKET ASSEMBLY – SEALANT VERSION

- 14.1 Clean all sealing grooves by brushing all corrosion and old sealant from the grooves, being careful not to damage or nick the surfaces.
- 14.2 With the water jacket in a horizontal position and with the water cavity facing up, lay a .060”-.090” bead of Loctite Superflex 596 high temperature silicon sealant (or equivalent) in the O.D. and I.D. sealant grooves.
- 14.3 Within 10 minutes of applying silicon sealer, position the copper wear plate onto the water jacket, being careful that the sealant bead is not disturbed prior to the copper wear plate being properly located and lowered into position.
- 14.4 Replace O.D. and I.D. retaining rings.
- 14.5 Replace all locknuts and bolts on the O.D. and I.D. retaining rings and torque locknuts to 21 ft-lbs on 18” and 24” units and 40 ft-lbs on 36” units.
- 14.6 Allow silicon sealant to cure for 24 hours before leak testing unit.
 - 14.7 To leak test unit: Connect the water supply to the assembled water jacket and test for leaks before reinstalling into unit. **CAUTION: Water pressure should not exceed 45 PSI on 18” and 24” units and 40 PSI on 36” units. If leakage occurs, disassemble and reassemble as described previously.**
- 14.8 Replace the drive plate assembly onto the splined hub, pushing the drive plate assembly until it makes contact with the copper wear plate on the back water jacket.
- 14.9 Install release springs on studs.
- 14.10 Install remaining water jackets, drive plate assemblies, and release springs, while ensuring that the water inlet and outlet locations of each water jacket are aligned with one another.
- 14.11 Install cylinder and piston on brake.
- 14.12 Install washers and locknuts to studs. Turn each nut one turn at a time in a criss-cross pattern until cylinder is seated against clamp tubes.
- 14.13 Replace all flexible water and air connections to the unit. Be sure that all floating water jackets are free to move. Check all air and water lines for leaks before putting the unit back in operation.

15.0 REPLACING PISTON SEALS

- 15.1 Thoroughly clean the seal grooves in the piston and apply a thin even coat of Dow Corning #55 o-ring lubricant to the piston seal grooves and the chamfer on the piston and the sealing surfaces of the cylinder plate and the seals themselves.
- 15.2 Install new seals in to the grooves in the piston, noting the orientation of the seal lips. Note: the seals should be place in a back to back configuration.
- 15.3 The cylinder plate should be placed on a clean and flat area with the piston cavity facing upward.
- 15.4 Carefully place the piston onto the cylinder plate cavity with the chamfered edge of the piston downward. Take special care to avoid damaging the lips of the seals.
- 15.5 Gradually apply an evenly distributed force to press the piston into the cylinder plate cavity. Make sure that piston does not cock because this may damage the sealing surface and/or the seals themselves. **Do not use a tool with sharp edges which could damage the seal lips.** C-clamps or a press will help with piston installation.
- 15.6 Once the piston is installed in the cylinder plate, proceed with Brake Assembly Section 16.0

16.0 Brake Assembly – PISTON TYPE



WARNING

Do not paint the clamp tubes, wear spacers or the release springs as this may hinder the engagement or disengagement of the brake.



CAUTION

After replacement of friction material, a minimum wear-in period is recommended. Running the equipment at 50% of the rated horsepower for a period at four hours is recommended for the friction disc to be able to achieve the desired rated torque.

- 16.1 If the back plate was removed, replace it in the correct orientation. Studs should be screwed into the back plate at this time. Studs which may have backed out during disassembly should be cleaned and re-installed using a permanent thread locking compound.
- 16.2 Mount the back plate water jacket assembly on the pilot diameter of the base using correctly sized mounting hardware. A bolt torque chart is provided in section 20.0 of this manual for imperial size hardware.
- 16.3 Install the wear spacers and clamp tubes on the studs. If the wear spacers were broken out from around the studs in previous adjustments, new ones will have to be obtained. Consult your original bill of materials for the correct quantity. A light coating of grease on the clamp tubes will help prevent wear and corrosion.
- 16.4 Install the first drive plate assembly on the hub teeth, pushing the drive plate assembly until it makes contact with the copper wear plate on the back plate water jacket. Drive plate teeth have a circular groove which is filled with thick grease. This grease lubricates and helps prevent corrosion. Excess grease may be thrown onto the friction material which will reduce brake torque. Wipe away any excess grease.
- 16.5 Install release springs over the clamp tubes on each stud.
- 16.6 Install the first center water jacket, aligning the water inlet and outlet locations with the back plate inlet and outlet. Push the water jacket assembly back until it makes contact with the release springs.
- 16.7 Install remaining water jacket assemblies, drive plate assemblies and release springs, while ensuring that the water inlet and outlet locations of each water jacket are aligned with one another.
- 16.8 Install the cylinder holding plate and piston over the studs and start several locking nuts to hold it in place. Use “Never-seize” or some anti-galling thread lubricant on these threads. Install the rest of the locking nuts and gradually tighten, using an alternating pattern to keep the cylinder holding plate assembly square to the studs. Tighten the cylinder holding plate against the clamp tubes. Torque the locknuts to the proper value. 18” units the locknuts should be torque to 150 ft/lbs [203 Nm] and for the 24” units they should be 500 ft/lbs [677 Nm] and for the 36” units they should be 750 ft/lbs [1016 Nm].
- 16.9 Proceed with assembly as outlined in “INSTALLATION”, Section 5.0

17.0 Brake Assembly – AIR TUBE TYPE



WARNING

Do not paint the clamp tubes, wear spacers or the release springs as this may hinder the engagement or disengagement of the brake.



CAUTION

After replacement of friction material, a minimum wear-in period is recommended. Running the equipment at 50% of the rated horsepower for a period at four hours is recommended for the friction disc to be able to achieve the desired rated torque.

- 17.1 If the back plate water jacket was removed from the equipment, replace the back plate water jacket making sure the water inlet is at the bottom and the water outlet is at the top, otherwise proceed to step
- 17.2 If the hub has been removed from the shaft, reinstall the hub. Be sure that it is in the correct location.
- 17.3 Replace the drive plate assembly onto the splined hub, pushing the drive plate assembly until it makes contact with the copper wear plate on the back water jacket.
- 17.4 Replace clamp tubes, wear spacers and one set of release springs onto the studs
- 17.5 If the brake is a single drive plate assembly unit, proceed to step 10 but if the unit is a multiple drive plate assembly unit, proceed to step 6.
- 17.6 Replace the center water jacket onto the studs until water jacket makes contact with the release springs, being sure that inlet and outlet are in proper orientation.
- 17.7 Replace the next drive plate assembly in the same manner as step 3.
- 17.8 Replace a second set of release springs.
- 17.9 Continue this procedure until all drive plate assemblies and center water jackets have been installed
- 17.10 Replace the floating water jacket onto the studs until it makes contact with the release springs, ensuring that the water inlet and outlet locations of each water jacket are aligned with one another.
- 17.11 Thoroughly clean the air tube, pressure plate and air tube cavity in the air tube holding plate before replacing the air tube and pressure plate into the air tube holding plate.
- 17.12 Using proper lifting equipment replace the actuator assembly onto the studs until the pressure plate makes contact with the floating water jacket.
- 17.13 Install washers and locknuts to studs. Turn each nut one turn at a time in a criss-cross pattern until actuator assembly is seated against clamp tubes.
- 17.14 Replace all flexible water and air connections to the unit. Be sure that all floating water jackets are free to move. Check all air and water lines for leaks before putting the unit back in operation.

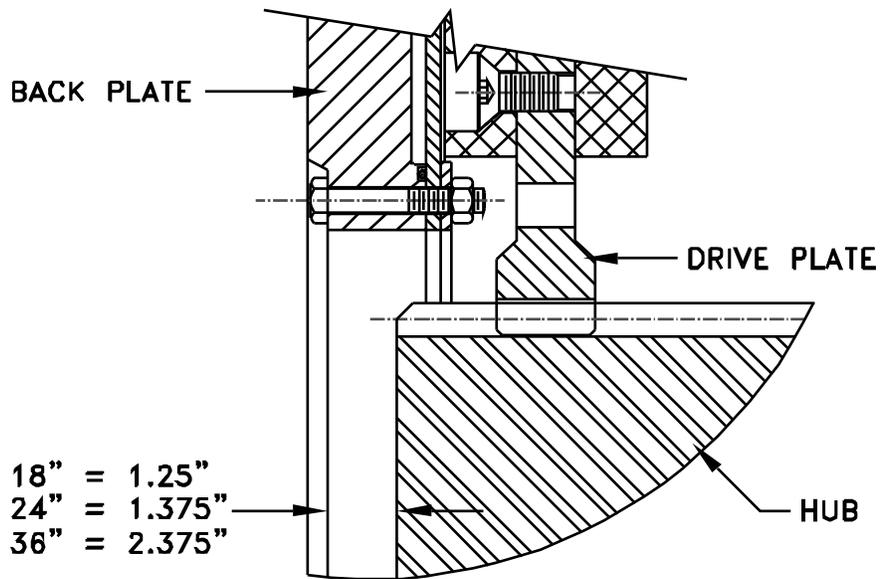


FIGURE 9

18.0 MAINTENANCE



WARNING

Only qualified personnel should install, adjust and/or repair the WPT water cooled brake. Faulty workmanship could result in faulty installation, dangerous operation of the brake, repeated costly maintenance and greatly shorten the life of the brake.



WARNING

Read these instructions thoroughly and review until you fully understand the parts replacement steps before proceeding with the work described in this section. Failure to follow these instructions can result in unreasonable exposure to hazardous conditions or personal injury.



WARNING

Failure to remove wear spacers in complete sets of spacers at one time could cause brake to malfunction.



CAUTION

Periodically examine the brake for wear of the friction material and the wear plates. Failure to perform this examination periodically may result in excessive wear to components, improper operation or a significant reduction in torque and may result in personal injury and/or damage to the machinery.



WARNING

If a wear adjustment is not made when required, the brake torque may deteriorate to the point where the equipment will not stop.

- 18.1 Provision is made to return the brake to its original clearances by removing wear spacers from the studs. Remove wear spacers when total clearance reaches the value in the chart. Check clearance as shown in the diagram below.
- 18.2 Before doing any maintenance work on the WCB unit, make sure that the machinery will remain in a safe position. Failure to do so could result in serious injury or possibly death.
- 18.3 On all units, the friction material must be replaced when worn to the bottom of the wear groove on the friction lining. See Table 15 for new wear groove depth. On multi-disc units, a wear adjustment is required when the maximum "X" dimension has been reached and the "Y" and/or "Z" dimensions are still within tolerance. The adjustment can be accomplished by removing wear spacers from around the studs.
- 18.4 There is no adjustment for single disc units. When brake torque decreases, inspect the friction material, wear plates and replace any worn components. See BRAKE DISASSEMBLY and REBUILDING DRIVE PLATES.
- 18.5 Dual disc, triple disc and quad disc units have wear adjustments. When brake's torque decreases or the maximum stroke has been reached, remove the wear spacers (See Note 18.10).

TABLE 15	
Original Friction Disc Wear Groove Depth	
18"	.250" (6.35)
24"	.250" (6.35)
36"	.210" (5.33)

- 18.6 As the friction material wears, adjustment of the brake may be required to keep the piston and/or the pressure plate within the proper operating distance. See this section for wear measurements, adjustment procedures and component wear limits.
- 18.7 To check the "X", "Y" and "Z" dimension on single drive plate units, apply approximately 25 PSIG (1.7 bar) air pressure to the cylinder plate and/or air tube holding plate to engage the brake. Measure the "X" gap between the cylinder plate and/or the air tube holding plate and the pressure plate. Also check The "Y" dimension that is between the pressure plate and the mounting flange as shown in the detail below. If either dimension exceed the limits of what is listed in the chart shown below, the friction disc and/or the wear plates must be inspected to ensure that the wear limits listed have not been exceeded.
- 18.8 On multi-disc units, apply approximately 25 PSIG (1.7 bar) air pressure to the cylinder plate and/or air tube holding plate to engage the brake. Measure the "X" gap between the cylinder plate and/or the air tube holding plate to determine if an adjustment may be required. Measure the "Y" dimension between the pressure plate and the reaction plate and the "Y" dimension between the reaction plate and the mounting flange and the "Z" dimension between reaction plates. If the maximum "X" dimension has been reached or exceeded and the "Y" or "Z" dimensions have not been reached and none of the friction disc are worn to the bottom of the wear groove, then a wear spacer adjustment is required. It is also recommended that the wear plates be inspected to ensure that the wear limits have not been exceeded. If the minimum "Y" or the "Z" dimension have been reached or if any of the friction disc are worn to the bottom of the groove, then the brake should be removed from service and rebuilt with new components.

- 18.9 Wear adjustments can be conducted without fully disassembling the brake. The wear adjustment spacers are slotted to allow for easy removal with a chisel.
- 18.10 Wear spacers must be removed as a complete set only (One per each stud location). Mark the spacers that are to be removed to ensure that the right quantity are removed.
- 18.11 If required, remove any type of support from the end of the brake.
- 18.12 Loosen the locknuts, evenly (ONE TURN AT A TIME METHOD) and in an alternating (Cross wise) pattern to prevent binding of the cylinder plate and/or the air tube holding plate on the studs. continue to loosen the locknuts until the force of the release springs is relieved, allowing for access to the wear spacers. It may be necessary to push the pressure plate and the reaction plate away from mounting flange so that the release springs can be moved to gain access to the wear spacers.
- 18.13 Wear spacers are slotted to allow for in-place removal. Using a narrow chisel, wedge the chisel into the slot in the spacer and pry on the spacer until it fractures and is clear to be removed from of the stud. (REMEMBER: ONE SPACER AT EACH STUD LOCATION)
- 18.14 While supporting the weight of the cylinder plate and/or the air tube holding plate and piston assembly tighten the locknuts. **MAKE SURE TO TIGHTEN ONE TURN AT A TIME AND USE A CROSS WISE PATTERN.** Continue until the cylinder plate and/or air tube holding plate is seated firmly against the clamp tubes. Torque the locknuts to the appropriate value as listed in the table below.



WARNING

Be sure to collect ALL wear spacer pieces as they are removed. Spacer pieces could lodge in the brake components and could prevent the brake from properly engaging and releasing.



CAUTION

The locknuts must be tightened gradually and evenly to prevent damage to the brake components

- 18.15 Reinstall any support bracket, if required.
- 18.16 Reinstall any piping and/or covers that were removed prior to the brake being adjusted.
- 18.17 Periodically check for external air leakage in the area of the piston seals and/or the air tube.
- 18.18 Moisture that may accumulate in the cylinder plate can be purged. After releasing all the air pressure from the cylinder, remove the pipe plug at the 6 o'clock position on the cylinder and apply low air pressure to assist in expelling any excess moisture. After draining the cylinder and/or air tube holding plate, reinstall the pipe plug, applying a pipe thread sealant on the threads prior to installation.
- 18.19 Periodically observe the rotating disc while the brake is fully released. Dragging discs may be caused by wear or contamination of the gear or the disc splines, lack of spline lubrication, disc imbalance, wrapped discs or misalignment. Immediately correct as required.
- 18.20 Pneumatic and electrical control interlocks should be periodically checked for proper settings and operation.



CAUTION

Do not apply an air pressure greater than 10 PSI to purge moisture from the cylinder plate. Precautions should be taken to avoid contact with any moisture that is being purged from the cylinder plate.

18.21 If leakage or blockage of any water cooled chamber is suspected, a static or dynamic test may be performed as follows:

Static Pressure Test

- (A) Release the brake by exhausting all the air pressure from the cylinder and/or the air tube holding plate.
- (B) Bleed all air from within the coolant cavity. Air bleeding must be accomplished by running coolant through the cavity with the brake secured in it's proper operating position.
- (C) After the air has been removed, install a pipe plug or plugs in the outlet or outlets, and apply maximum allowable coolant pressure measured at the inlet to the water cavity. Maximum allowable is 45 PSI for the 18" and 24" brakes and 40 PSI for the 36" brakes. Maintain this pressure for 30 minutes. Check for leakage at the outside diameter and the inside diameter sealing areas.

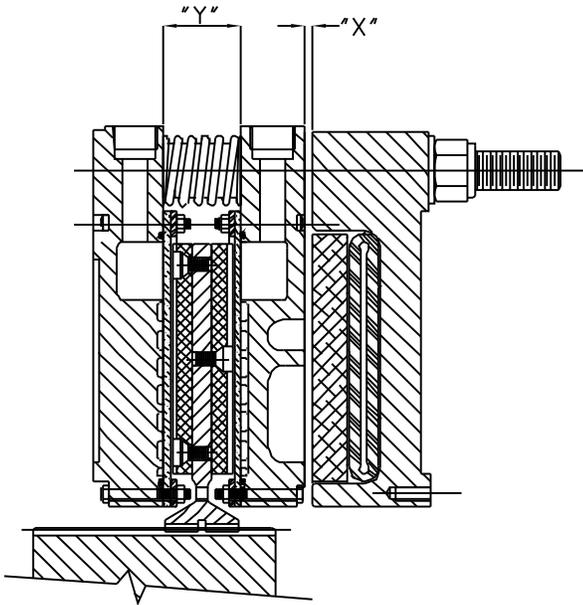
Note: Avoid contaminating the friction material with coolant

Dynamic Pressure Test

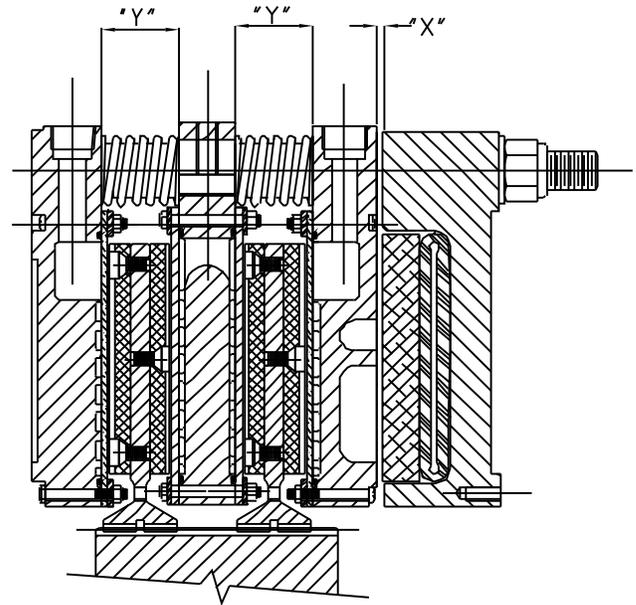
- (A) Dynamic flow testing of the brake should be conducted at the required flow rate for the rated HP dissipation and coolant quality, as given in the chart. Inlet and outlet pressures for the appropriate brake size as listed in the chart. These settings should not be exceeded.
- (B) There should be no restrictions on the outlet side of the brake to cause any back pressure to the unit. Coolant inlet and outlet sizes are listed in the chart. Full size hoses and piping should be used. Check for low flow and/or leakage at the outside diameter and/or the inside diameter of the seal areas

TABLE FOR THE "X", "Y" AND "Z" DIMENSIONS

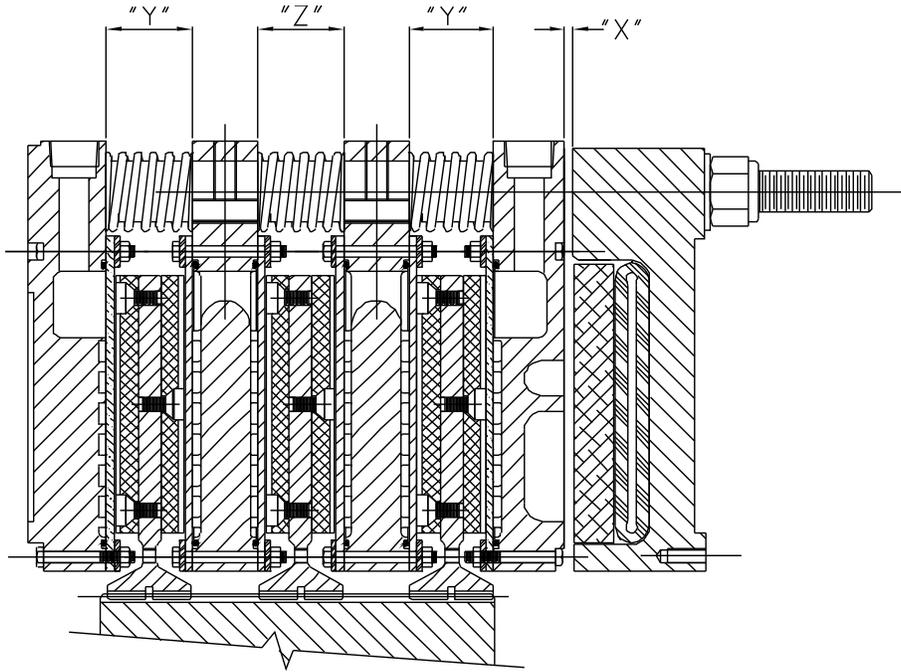
BRAKE SIZE	NO. OF DISC	"X" NEW	"X" MAX.	"Y" NEW	"Y" MIN.	"Z" NEW	"Z" MIN.
18"	1	0.08	0.58	1.95	1.45	-----	-----
18"	2	0.16	0.66	1.95	1.45	-----	-----
18"	3	0.24	0.74	1.95	1.45	2.04	1.75
18"	4	0.32	0.82	1.95	1.45	2.04	1.75
24"	1	0.09	0.59	2.92	2.42	-----	-----
24"	2	0.18	0.68	2.92	2.42	-----	-----
24"	3	0.27	0.77	2.92	2.42	2.58	2.08
24"	4	0.36	0.86	2.92	2.42	2.58	2.08
24"	5	0.48	0.95	2.92	2.42	2.58	2.08
36"	1	0.12	0.68	2.75	2.31	-----	-----
36"	2	0.24	0.77	2.75	2.31	-----	-----
36"	3	0.36	0.86	2.75	2.31	2.75	2.31
36"	4	0.48	0.95	2.75	2.31	2.75	2.31



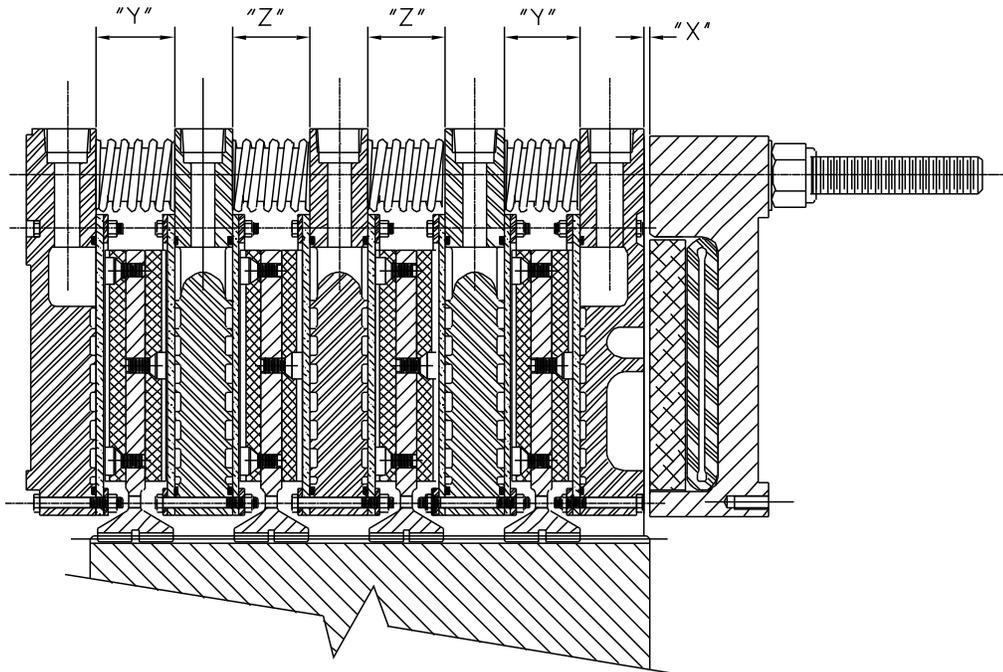
SINGLE DRIVE PLATE BRAKE



DOUBLE DRIVE PLATE BRAKE



TRIPLE DRIVE PLATE BRAKE



QUAD DRIVE PLATE BRAKE

19.0 WATER FLOW CAPACITIES AND CLEARANCE

Size	Heat Dissipation Capacity		Water Flow Minimum (water)		Water Flow Minimum (50/50 water + ethylene glycol)		New clearance (minimum)		Remove Wear spacers when clearance reaches	
	HP	KW	GPM	L/m	GPM	L/m	in.	mm	in.	mm
118-A	120	89.5	12	45	15	57	0.09	2.3	0.46	11.7
218-A	240	179.0	24	91	30	114	0.12	3.2	0.46	11.7
318-A	360	268.6	36	136	45	170	0.15	4.0	0.46	11.7
418-A	480	358.1	48	182	60	227	0.24	6.3	0.46	11.7
124-A	270	201.4	27	102	34	128	0.09	2.3	0.59	15.0
124-P	270	201.4	27	102	34	128	0.09	2.3	0.59	15.0
224-A	540	402.8	54	204	68	255	0.19	4.8	0.69	17.5
224-P	540	402.8	54	204	68	255	0.19	4.8	0.69	17.5
324-A	810	604	81	307	101	384	0.28	7.1	0.78	19.8
324-P	810	604	81	307	101	384	0.28	7.1	0.78	19.8
424-A	1080	806	108	409	135	511	0.38	9.7	0.88	22.4
424-P	1080	806	108	409	135	511	0.38	9.7	0.88	22.4
136-A	650	485	65	246	81	308	0.09	2.3	0.51	13.0
136-P	650	485	65	246	81	308	0.09	2.3	0.51	13.0
236-A	1300	970	130	492	163	615	0.19	4.8	0.61	15.5
236-P	1300	970	130	492	163	615	0.19	4.8	0.61	15.5
336-A	1950	1455	195	738	244	923	0.28	7.1	0.70	17.8
336-P	1950	1455	195	738	244	923	0.28	7.1	0.70	17.8
436-A	2600	1940	260	984	325	1230	0.38	9.7	0.80	20.3
436-P	2600	1940	260	984	325	1230	0.38	9.7	0.80	20.3

Examples:

324P = a brake with 3-24" drive plates and piston operated

324A = a brake with 3-24" drive plates and air tube operated

1-Thermal rating based on 70° F (21° C) coolant temperature rise between inlet and outlet. (water)

2-Flow rate is based on requirement of 1 U.S. GPM per 10 HP (1.97 kW per L/min.) thermal dissipation (water)

20.0 BOLT TORQUE VALUES

TORQUE VALUES FOR SOCKET HEAD AND HEX HEAD CAPSCREWS						
SOCKET HEAD CAP SCREWS						
BOLT SIZE IN INCHES	As Received			Lubricated**		
	LB - FT	LB - IN	Nm	LB - FT	LB - IN	Nm
1/4	13	150	17	10	120	13
5/16	23	305	34	18	244	27
3/8	45	545	62	36	436	49
7/16	70	840	95	56	672	76
1/2	108	1300	147	86	1040	117
9/16	155	1860	210	124	1488	168
5/8	211	2530	286	168	2024	228
3/4	367	4400	497	293	3520	397
7/8	583	7000	791	466	5600	632
1	867	10400	1175	693	8320	940
1 1/8	1242	14900	1684	993	11920	1347
1 1/4	1750	21000	2374	1400	16800	1899
1 3/8	2317	27800	3142	1853	22240	2513
1 1/2	3042	36500	4125	2433	29200	3300
1 3/4	4950	59400	6714	3960	47520	5371
2	7492	89900	10161	5993	71920	8128
HEX HEAD CAP SCREWS - Grade 8						
BOLT SIZE IN INCHES	As Received			Lubricated**		
	LB - FT	LB - IN	Nm	LB - FT	LB - IN	Nm
1/4	8	100	11	6	80	9
5/16	17	200	23	13	160	18
3/8	30	360	41	24	288	32
7/16	48	570	64	38	456	51
1/2	83	990	112	66	792	89
9/16	107	1285	145	85	1028	116
5/8	143	1714	194	114	1371	155
3/4	256	3070	347	204	2456	277
7/8	417	5000	565	333	4000	452
1	625	7500	848	500	6000	678
HEX HEAD CAP SCREWS - Grade 5						
BOLT SIZE IN INCHES	As Received			Lubricated**		
	LB - FT	LB - IN	Nm	LB - FT	LB - IN	Nm
1/4	6	71	8	5	56	6
5/16	12	142	16	9	113	12
3/8	22	260	29	17	208	23
7/16	34	410	46	27	328	36
1/2	53	636	72	42	508	57
9/16	74	890	101	59	712	80
5/8	104	1250	141	83	1000	112
3/4	183	2200	249	146	1760	199
7/8	298	3570	403	238	2856	322
1	440	5280	597	352	4224	477
1 1/8	553	6640	750	442	5312	600
1 1/4	775	9300	1051	620	7440	840
1 3/8	1012	12140	1372	809	9712	1097
1 1/2	1350	16200	1831	1080	12960	1464

** NOTE: For loctite use lubricated values

21.0 RECOMMENDED SPARE PARTS

- 21.1 Recommended spare parts should be held by the customer. This will greatly reduce the possibility of 'Costly Downtime'. The only exception is the air tubes which have a limited shelf life as it is. The air tube may deteriorate quicker on the shelf than the one in service. Air tubes are normally stocked at the factory or by your local distributor and can be shipped quickly from stock.
- 21.2 Due to the variations obtainable in a basic type and size of clutches, spare part lists are issued using specific part numbers. Anytime you require information about your unit or place an order for parts from the factory or your local distributor, please furnish the serial number of the unit, which is located on the face of the air tube holding plate.

Recommended Spare Parts:

- (A) Friction Disc – Discs (pucks) should be replaced when the maximum clearance has been reached. Discs (pucks) should be kept clean, dry, and free from oil and/or grease and stored on a flat surface to prevent warping.
- (B) Release Springs – It is strongly recommended that a complete set of new release springs kept in stock and that a new set be installed every time the friction disc are replaced.
- (C) Air Tubes – Failures may occasionally occur if the air tube becomes excessively hot, over-expanded or saturated by lubricating oil. Over-expansion is usually due to excessively worn friction disc. Store air tubes in a cool, dry and flat location.
- (D) Quick Release Valves – If quick release valves are fitted, they should be dismantled and cleaned every six months.

To Dismantle:

Hold valve body with spanner and disconnect air hose. Unscrew valve from the air tube. Place body of the valve in a vice and remove the cap. **DO NOT** attempt to remove the end cap while the valve is fitted to the air tube as the valve may break at the thread neck. Keep a complete set of replacements in stock.

- (E) Roto-Coupling – Roto-couplings are sometimes damaged by an external blow and/or can prematurely wear out if restrained by a non-flexible hose connections. It is recommended that a replacement unit be kept in stock at all times.