



**HYDRAULIC SYSTEMS,
CONTROLS, AND SERVICE**

**Hydraulic Power Unit
Part Number 35-16018**



To our Valued Customers

I want to thank you for buying your Fluid Power System from the Wilson Company's Systems Division. This unit has been designed with high quality materials and components and been carefully assembled by our experienced technicians. With proper installation and maintenance, it should provide you with many years of service.

If you have any question about this equipment before startup, contact me or a member of our staff.

If you have other applications for fluid power or fluid connector Products, please contact your local Wilson Company sales associate, or call our Main Office at 800-580-1212.

Thank you again for electing Wilson Company as your source for fluid power equipment.

Sincerely,

Les Jaynes
President

972-931-8666
972-248-1177 Fax
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HYD. POWER UNITS

Maintenance & Installation

WARRANTY

DRAWINGS

Parts List, Schematics, & Specifications

LITERATURE - HYDRAULIC

Hydraulic Motors, Pumps, & Valves

Hydraulic Filters & Strainers

Hydraulic Fittings & Hose

Misc. Components

LITERATURE - ELECTRICAL

Starters, Relays

Transducers, Pressure Switches... etc

ELECTRIC MOTORS

Maintenance & Installation

HYD. POWER UNITS

Maintenance & Installation

Maintenance Manual

Standard Hydraulic Power Units

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Standard Hydraulic Power Units

Introduction

This manual provides descriptive information, operation and maintenance instructions for standard Hydraulic Power Units manufactured by the Power Unit Division of Parker Hannifin Corporation, Orrville, Ohio 44667. Any additional information may be obtained from the Power Unit Division by referencing to the Unit's Model Number and Serial Number stamped on the Reservoir Nameplate, or by contacting your authorized Parker Distributor.

Some of the information in this manual may not apply to your power unit, and information on more custom units may require obtaining service and application information from other sources.

Warning

It is imperative that personnel involved in the installation, service, and operation of the power unit be familiar with how the equipment is to be used, the limitations of the system and its component parts, and have knowledge of good hydraulic practices in terms of safety, installation, and maintenance.

Description

The standard Hydraulic Power Unit usually consists of a JIC reservoir (see figure 1), or "L" shaped reservoir (see figure 2) both of which incorporate a baffle, clean-out access, 3/4 NPT sump drain, oil level gage, filter/breather assembly and spare return connections.

The pump will be coupled to the motor using a flexible shaft coupling and will be mounted using a bell housing (requires NEMA "C" Motor) or will be foot mounted requiring a pump foot bracket, coupling guard, and pump/motor mounting plate. Also included on most standard units is a Pump Suction Filter (or Suction Strainer), Relief Valve, and a Pressure Gauge with Shut-Off Valve.

More custom type power units may have heat exchangers for oil cooling; pressure or return filters, oil immersion heaters, directional valves, and other pressure and flow control valves, or monitoring instrumentation.

Preparation For Use

Unpacking and Checking

The Power Unit is mounted on skids and carefully packed for shipment. Do not remove it from skid until it has been carefully checked for damage that may have occurred in transit. Report all damage immediately to the carrier and send a copy

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to the vendor. All open ports on the Power Unit were plugged at the factory to prevent the entry of contamination. These plugs must not be removed until just before piping connections are made to the unit.

Storage

If the Power Unit is not going to be installed immediately, it should be stored indoors, covered with plastic sheet, and all open ports plugged. If long term storage is expected (6 months or more) we recommend filling the reservoir completely with clean hydraulic fluid to prevent the entry of moisture.

Removing from Shipping Skids

Small JIC style Power Units should be moved with a fork-lift truck, with 2X4 boards under the reservoir belly, to distribute and steady the load. Larger JIC style Power Units have lifting holes in the reservoir end plates. Extra heavy 1 1/2 pipes can be inserted into the lifting holes for allowing movement with a fork-lift truck. L-shaped reservoirs are provided with clearance and cross braces under the base plate for movement with a fork-lift truck.

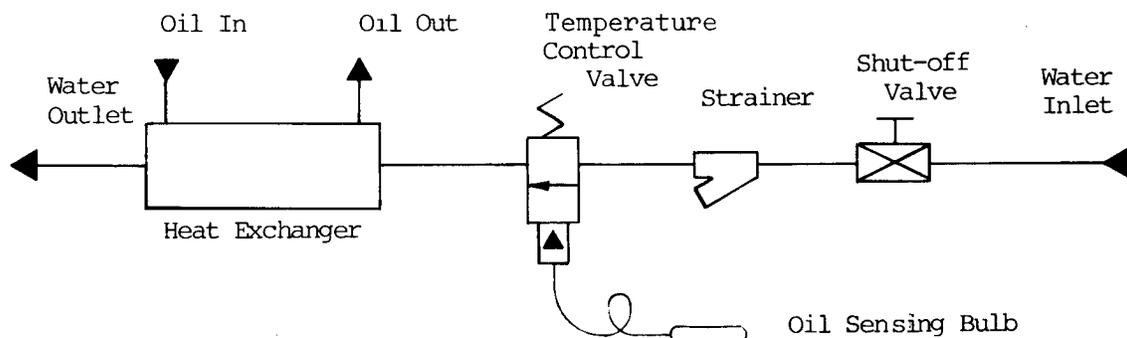
Installation

Locating Power Unit

The unit should be installed indoors, and preferably in a clean dry environment with an ambient temperature of 60 to 100°F. The unit can be installed outdoors if the reservoir was provided with optional weatherproof construction, and provisions were made for extreme temperature conditions. The reservoir can be secured to the floor or base using the four mounting holes located on the reservoir legs.

Service Connections

Water (If water cooled heat exchanger has been provided) Connect the water supply to the inlet of the heat exchanger, with a shut-off valve and strainer (if not supplied by Parker). If a Temperature Control Valve (Model WTC-**) has been provided, it also should be installed on the inlet side. The outlet of the heat exchanger should be connected directly to the facility drain system. On single pass heat exchangers the water connections should be installed as shown below. On multi-pass heat exchanger the water flow direction is not important.



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Electrical Connect the pump motor to the facility power source following good practices as outlined in the National Electric Code and any local codes which may apply. Verify that the available voltage is the same as the voltage identified on the motor nameplate. Most motors have dual voltage ratings, so verify that the leads in the conduit box have been connected together as defined on the motor nameplate to match the facility power source available.

If Solenoid valves, pressure/temperature switches, or oil immersion heaters have been provided on the power unit, refer to the component nametag or other service information in this manual for operating voltage and ratings.

Supply and Return Connections

Complete all necessary interconnecting piping between the power unit and hydraulic actuators. The line sizes should be determined based on oil flow, operating pressure and allowable pressure drop between the power unit and actuator.

Warning

Check to insure that the proper rated hose or pipe is used on pressure lines.

One of the key ingredients for good service and long life from a hydraulic system is cleanliness, and since it has been our experience that most dirt infiltrates a hydraulic system during installation, we recommend the following rules be adhered to:

- a) All open ports on the power unit, cylinders, etc. must remain plugged with tape or plastic plugs until just before the hydraulic connections are made.
- b) All interconnecting tubing, pipe, or hose should be clean, and free of rust, scale and dirt. The ends of all connectors should be plugged until just before they are to be installed in the system.
- c) All openings in the reservoir such as the filler breather or access end covers holes must remain closed during installation.
- d) If Teflon tape, or pipe dope is used, be sure it doesn't extend beyond the first thread of the pipe fitting.

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Reservoir Inspection

The reservoir has been thoroughly cleaned and sprayed with rust inhibitor at Parker prior to shipping. It is suggested, however, to remove the reservoir access covers and re-inspect the tank for cleanliness. JIC reservoirs are provided with a removable baffle for greater access for cleaning.

Note

On JIC reservoirs it is important for the baffle to be centered in the tank, and for the sealing gaskets to take a good set if the end covers are to seal properly.

Reinstall end covers as follows:

- a) Locate the baffle in the center of the tank.
- b) Install end covers hand tight, being careful not to move the baffle.
- c) Torque one cover a small amount, and then torque the opposite end cover a small amount more. Continue going back and forth between the covers until both are torqued equally. (See figure 1 for proper torque value.)

Reservoir Filling

The reservoir must be filled with clean fluid thru the filler cap on the reservoir. The type of fluid must be compatible with the seals used on the power unit, and must comply with the recommendations of the manufacturers of the component parts.

Refer to the component manufacturer's catalog for fluid requirements.

The cleanliness of the fluid going into the reservoir is very important, and in some cases, even new oil out of the drum is not adequate. We recommend that any fluid being transferred into the reservoir be done with a transfer pump with a 10 micron filter installed. A Parker filter cart is available for this purpose.

Coupling Alignment

It is possible for pump/motor shaft alignment to be incorrect because of shock incurred during shipping. The alignment should be re-checked before start-up. If the pump/motor assembly has been foot mounted, the coupling alignment should be checked using the coupling installation instructions provided in the appendices of this manual. If re-aligning is required, the motor mounting bolts should be loosened, and shims inserted. Note, see figure 3 for Lovejoy or Magnaloy couplings.

If the pump/motor assembly has been mounted with a bell-housing, the only check required is to verify that the coupling halves have adequate clearance, and that the coupling set-screws are tight. A slot is provided in the bell housing for this purpose.

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Start-Up Procedure

- 1) Open any ball or gate valve (if applicable) located in the pump suction line.
- 2) Back the system relief valve and/or pump pressure compensator adjustment knob out, so that the pressure will be near zero during the initial start.

Note

If the power unit has been provided with a variable displacement pump or any piston pump, the pump case should be filled with clean oil prior to priming. In most cases this can be accomplished by disconnecting the pump case drain line and pouring the oil into the pump case drain port.

- 3) If the system has been provided with an open center directional valve, the oil during start-up will flow directly back to tank. If the system has a closed centered valve, it may be necessary to loosen a fitting momentarily at the pump discharge, to bleed any air in the pump during the priming operation.
- 4) Jog the pump motor once, and verify that the pump is rotating in the same direction as the arrow tag on the pump case. If the direction is incorrect, reverse two (2) of the three (3) motor leads, and recheck the rotation.
- 5) Jog the pump motor (3) to (6) times to prime the pump and allow the pump to run for several minutes at zero pressure. Check the piping for any leaks and correct immediately. (Leaks in fittings and tubing can be the result of vibration during shipping.)
- 6) Begin adjusting the relief valve and/or pump compensator to increase the pressure gradually. Note; on systems with open center directional valves, it will be necessary to actuate the valve to build pressure.
- 7) Continue increasing pressure until normal operating pressure is obtained, and recheck system for leaks. Lock adjustment screws in place.

Note

If the system has been provided with a pressure compensated pump and a relief valve, adjust the relief valve approximately 10% higher than the compensator so that excessive heat is not generated by the relief valve.

- 8) During the start-up sequence, all filters should be monitored closely. Replace any filters element immediately, as soon as they begin to go into by-pass as indicated on the visual indicator.
- 9) After the entire system has been wetted with fluid, refill the reservoir to the normal operating level.
- 10) Verify that the cooling water to the heat exchanger (if applicable) is flowing. If the power unit has been provided with a water control valve (Model WTC-**), and the oil temperature is exceeding 135°F, adjust the valve to increase the water flow.

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Special Tools

All normal service and maintenance on standard power units can be accomplished with standard handtools. No special tools are required.

General Maintenance

Electric Motors - Lubricate as recommended by the motor manufacturer.

Filters - Change or clean as required or as indicated on filters supplied with visual indicators.

Suction Strainers - Should be cleaned after 10 hours operation and 100 hours thereafter. See appendicies for cleaning instructions.

Reservoirs - Maintain oil level at all times. The oil should be checked after the first 100 hours and verify that the class of oil meet the requirements of the pump being used. Change the oil every 1000 to 2000 hours depending on the application and operation environment.

Components - See component literature in appedicies.

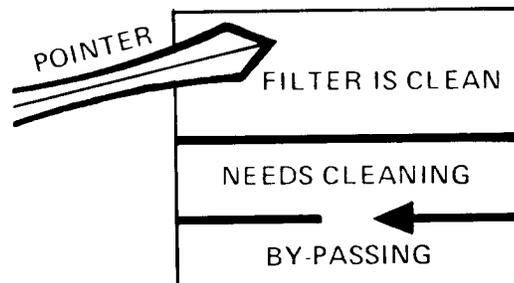
Recommended Spare Parts

Spare filter elements should be purchased with the power unit, and be available during the start-up operation. Other spare parts may be required, and are a function of the duty cycle of the hydraulic system, operation environment, and the acceptable down time of the equipment.

Preventive Maintenance

Filter Service

Filters must be maintained. The key to good filtration is filter maintenance. A machine may be equipped with the best filters available and they may be positioned in the system where they do the most good; but, if the filters are not taken care of and cleaned when dirty, the money spent for the filters and their installation has been wasted. A filter which gets dirty after one day of service and is cleaned 29 days later gives 29 days of non-filtered fluid. A filter can be no better than the maintenance afforded it.



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Maintenance Suggestions

- 1) Set up a filter maintenance schedule and follow it diligently.
- 2) Inspect filter elements that have been removed from the system for signs of failure which may indicate that the service interval should be shortened and of impending system problems.
- 3) Do not return to the system any fluid which has leaked out.
- 4) Always keep the supply of fresh fluid covered tightly.
- 5) Use clean containers hoses, and funnels when filling the reservoir. Use of a filter cart when adding oil is highly recommended.
- 6) Use common sense precautions to prevent entry of dirt into components that have been temporarily removed from the circuit.
- 7) Make sure that all clean-out holes, filler caps, and breather cap filters on the reservoir are properly fastened.
- 8) Do not run the system unless all normally provided filtration devices are in place.
- 9) Make certain that the fluid used in the system is of a type recommended by the manufacturers of the system or components.
- 10) Before changing from one type of fluid to another (e.g., from petroleum base oil to a fire resistant fluid), consult component and filter manufacturers in selection of the fluid and the filters that should be used. Also consult the publication **“Recommended Practice for the use of Fire Resistant Fluids for Fluid Power Systems”** published by the National Fluid Power Association.
- 11) Parker offers an oil sampling kit which can be used to ascertain the condition of the system fluid.

Maintaining Proper Oil Temperature

Hot oil in your equipment's hydraulic system is one of the primary causes of poor operation, component failure and downtime. Here are some pointers on maintaining proper oil temperature.

The oil in your hydraulic system was designed for operation within a specified temperature range. You may be able to run it at hotter temperatures for short periods of time, intermittently, without bad effects. If you run continuously with oil that's too hot, however, your equipment will operate poorly, and eventually key components will fail and halt your machine.

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How Hot is “Too Hot”?

“Hot oil” is a relative term. In most cases, 120°F. at the reservoir is considered an ideal operating temperature. Always take an oil temperature reading at the reservoir, not at a component or any of the piping.

Some hydraulic systems are designed to operate at 130°F. or higher. If you don't know the maximum operating temperature for your equipment, check your component manual for temperature and viscosity limitations.

Measuring Oil Temperature

There are several ways to check the temperature of the oil. The best, most accurate method is by means of a thermometer. On some machines, this is mounted on the reservoir. Make it a habit to check the thermometer periodically, after the equipment has been running for more than an hour.

If your machine doesn't have a reservoir thermometer, use the “palm test.” First check the tank with your fingertip; if it's not too hot to touch, place your palm on the tank. You'll be able to hold it there without discomfort if the oil temperature is about 130°F. or below.

Isolating Trouble-Spots

To determine which components are “running hot” and overheating the oil, feel the outlet fittings and lines at the valves, pumps and motors. If the oil is normal going into a component but hot coming out-that could be one of the trouble-makers.

A sticking valve can cause excessive heat. If a spool does not return promptly to the neutral position, the pump flow will be dumped continuously. This builds up heat rapidly.

If a relief valve is set too low, part of the oil will be dumped across the valve with every cycle. This too, generates excessive heat. Even when all valves are set properly, they may not be operating well because of worn orifices or seals.

Always remove and check the hot components first, before the others.

Look, Smell and Feel

Checking oil temperature periodically is good preventive maintenance. So too is the practice of periodically siphoning an oil sample from the reservoir, and comparing it with a sample of clean, new oil.

Oil that has been running too hot will look darker and feel thinner than new oil. It will also smell burned. Chances are, it will contain more contaminants, because hot oil leads to accelerated wear of component parts.

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Preventive Measures

How can you keep your equipment's hydraulic system from running too hot?

- 1) Set up a regular schedule for checking the oil temperature, appearance, smell and feel. Change oil as recommended by the equipment manufacturer.
- 2) Be prompt about removing, checking and repairing or replacing valves, pumps or other components that are running hot.
- 3) If relief or flow-control valves are running hot, check and adjust their settings. Follow your equipment owner's manual.
- 4) Break in new components gradually. New, close-fittings parts expand at different rates, and are especially prone to seize when they get too hot.
- 5) Start a cold pump or motor on hot oil by jogging just enough to draw the hot oil into the component. Then wait a few minutes to allow the temperature to equalize in all the pump's parts. Repeat until the temperature on the outside of the pump is the same as that on the piping.
- 6) **Keep your equipment clean.** A thick layer of dirt acts as insulation. It will prevent the hydraulic system from getting rid of heat.
- 7) On hot days, and in hot climates, check and change the oil more frequently. Be sure to use an oil recommended for hot-weather operation by the equipment manufacturer or oil supplier.

Troubleshooting

Troubleshooting Areas

Dirty oil

- 1) Components not properly cleaned after servicing.
- 2) Inadequate screening in fill pipe.
- 3) Air breather left off. (No air breather provided... inadequate unit provided... insufficient protection of air breather.)
- 4) Tank not properly gasketed.
- 5) Pipe lines not properly covered while servicing machine.
- 6) Improper tank baffles not providing settling basin for heavy materials.
- 7) Filter dirty or ruptured.

Fire resistant fluids

- 1) Incorrect seals cause binding spools.
- 2) Paint, varnish or enamel in contact with fluids can cause sludge deposits on filters and around seal areas.

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- 3) Electrolytic action is possible with some metals. Usually zinc or cadmium.
- 4) Improper mixtures can cause heavy sludge formations.
- 5) High temperatures adversely affect some of the fluids, particularly the water base fluids.
- 6) Adequate identification of tanks containing these fluids should be provided so that they will be refilled with the proper media.
- 7) As with mineral base oils, nuisance leaks should be remedied at once.
- 8) Make certain replacement parts are compatible with fluid media.

Foaming oil

- 1) Return of tank line not below fluid level. Broken pipe, line left out between a bulkhead coupling and the bottom of the tank after cleaning tank.
- 2) Inadequate baffles in reservoir.
- 3) Fluid contaminated with incompatible foreign matter.
- 4) Suction leak to pump aerating oil.
- 5) Lack of anti-foaming additives.

Moisture in oils

- 1) Cooling coils not below fluid level.
- 2) Cold water lines fastened directly against hot tank causing condensation within tank.
- 3) Soluble oil solution splashing into poorly gasketed tanks or fill pipes left open.
- 4) Moisture in cans used to replace fluid in tanks.
- 5) Extreme temperature differential in certain geographical locations.
- 6) Drain not provided at lowest point in tank to remove water collected over possibly long operating periods.

Overheating of system

- 1) Water shut off or heat exchanger clogged.
- 2) Continuous operation at relief setting.
 - a. Stalling under load, etc.
 - b. Fluid viscosity too high or too low.
- 3) Excessive slippage or internal leakage.
 - a. Check stall leakage past pump, motors and cylinders
 - b. Fluid viscosity too low.
- 4) Reservoir sized too small.

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- 5) Reservoir assembled without baffling or sufficient baffling.
- 6) Case drain line from pressure compensated pump returning oil too close to suction line.
 - a. Repipe case drain line to opposite side of reservoir baffling.
- 7) Pipe, tube or hose I.D. too small causing high velocity.
- 8) Valving too small, causing high velocity.
- 9) Improper air circulation around reservoir.
- 10) System relief valve set too high.
- 11) Power unit operating in direct sunlight or ambient temperature is too high.

Foreign matter sources in the circuit

- 1) Pipe scale not properly removed.
- 2) Sealing compound (pipe dope, teflon tape allowed to get inside fittings.
- 3) Improperly screened fill pipes and air breathers.
- 4) Burrs inside piping.
- 5) Tag ends of packing coming loose.
- 6) Seal extrusions from pressure higher than compatible with the seal or gasket.
- 7) Human element... not protecting components while being repaired and open lines left unprotected.
- 8) Wipers or boots not provided on cylinders or rams where necessary.
- 9) Repair parts and replacement components not properly protected while stored in repair depot. (Rust and other contaminants.)

Troubleshooting Pumps

Pump makes excessive noise

- 1) Check for vacuum leaks in the suction line. (Such as leak in fitting or damaged suction line.
- 2) Check for vacuum leaks in the pump shaft seal if the pump is internally drained. Flooding connections with the fluid being pumped may cause the noise to stop or abate momentarily. This will locate the point of air entry.
- 3) Check alignment with drive mechanism. Misalignment will cause wear and subsequent high noise level in operation.
- 4) Check manufacturers specifications relative to wear possibilities and identification of indications of wear as high operating noise level, etc.

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- 5) Check compatibility of fluid being pumped against manufacturers recommendations.
- 6) Relief or unloading valve set too high. Use reliable gauge to check operating pressure. Relief valve may have been set too high with a damaged pressure gauge. Check various unloading devices to see that they are properly controlling the pump delivery.
- 7) Aeration of fluid in reservoir (return lines above fluid level).
- 8) Worn or sticking vanes (vane type pump).
- 9) Worn cam ring (vane type pump).
- 10) Worn or damaged gears and housing (gear pump).
- 11) Worn or faulty bearing.
- 12) Reversed rotation.
- 13) Cartridge installed backwards or improperly.
- 14) Plugged or restricted suction line or suction strainer.
- 15) Plugged reservoir filter breather.
- 16) Oil viscosity too high or operating temperature too low.
- 17) Oil pour point too high.
- 18) Air leak in suction line or fittings also causing irregular movement of control circuit.
- 19) Loose or worn pump parts.
- 20) Pump being driven in excess of rated speed.
- 21) Air leak at pump shaft seal.
- 22) Oil level too low and drawing air in through inlet pipe opening.
- 23) Air bubbles in intake oil.
- 24) Suction filter too small or too dirty.
- 25) Suction line too small or too long.
- 26) Pump housing bolts loose or not properly torqued.

Pump failure to deliver fluid

- 1) Low fluid level in reservoir.
- 2) Oil intake pipe suction strainer plugged.
- 3) Air leak in suction line and preventing priming.
- 4) Pump shaft turning too slowly.
- 5) Oil viscosity too high.

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- 6) Oil lift too high.
- 7) Wrong shaft rotation.
- 8) Pump shaft or parts broken.
- 9) Dirt in pump.
- 10) Variable delivery pumps. (Improper stroke.)

Oil leakage around pump.

- 1) Shaft seal worn.
- 2) Head of oil on suction pipe connection-connection leaking.
- 3) Pump housing bolts loose or improperly torqued.
- 4) Case drain line too small or restricted. (Shaft seal leaking.)

Excessive pump wear

- 1) Abrasive dirt in the hydraulic oil being circulated through the system.
- 2) Oil viscosity too low.
- 3) System pressure exceeds pump rating.
- 4) Pump misalignment or belt drive too tight.
- 5) Air being drawn in through inlet of pump.

Pump parts inside housing broken

- 1) Seizure due to lack of oil.
- 2) Excessive system pressure above maximum pump rating.
- 3) Excessive torquing of housing bolts.
- 4) Solid matter being drawn in from reservoir and wedged in pump.

Troubleshooting Solenoid Valves

Solenoid failures

- 1) Voltage too low. If voltage will not complete the stroke of alternating current (AC) solenoid it will burn out the coil.
- 2) Signal to both solenoids of a double solenoid valve simultaneously. One or both of the solenoids will be unable to complete their stroke and will burn out. (Make certain the electrical signal is interlocked so that this condition cannot exist.)
- 3) Mechanical damage to leads. (Short circuit, open connections, etc.)

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- 4) Tight spool or other mechanical parts of the valve being actuated can prevent the solenoid from completing its stroke and subsequently burning out.
- 5) Replacement springs too heavy in valve. Overloads solenoid and shortens life.
- 6) Wrong voltage or frequency will either prevent operation because of inadequate capacity to handle the load with the lower voltage or burn out the coil because of improper winding and excessive voltage.
- 7) Dirty contacts may not supply sufficient current to solenoid to satisfy inrush demands.
- 8) Low voltage direct current solenoids may be affected by low battery capacity on cold mornings directly after starting cold engine.
- 9) Long feed lines to low voltage solenoids may cause sufficient voltage drop to cause erratic operation.

Solenoid valve fails to operate

- 1) Is there an electrical signal to the solenoid or operating device? Is the voltage too low? (Check with voltmeter... test light in emergency.)
- 2) If the supply to the pilot body is orificed, is the orifice restricted? (Remove orifice and check for foreign matter. Flushing is sometimes necessary because of floating impediment.)
- 3) Has foreign matter jammed the main spool? (Remove end caps and see that main spool is free in its movement... remember that there will be a quantity of fluid escaping when the cap is removed and provide a container to catch it.)
- 4) Is pilot pressure available? Is the pilot pressure adequate? (Check with gauge on main pressure input port for internally piloted types and in the supply line to the externally piloted type.)
- 5) Is pilot drain restricted? (Remove pilot drain and let the fluid pour into an open container while the machine is again tried for normal operation. Small lines are often crushed by machine parts banging against them causing a subsequent restriction to fluid flow.)
- 6) Is pilot tank port connected to main tank port where pressures are high enough to neutralize pilot input pressure? (Combine pilot drain and pilot tank port and check for operation with the combined flow draining into an open container... block line to main tank from pilot valve... if this corrects the situation, reroute pilot drain and tank line.)
- 7) Are solenoids improperly interlocked so that a signal is provided to both units simultaneously? (Put test light on each solenoid lead in parallel and watch for simultaneous lighting... check electrical interlock. This condition probably burns out more solenoids than any other factor.)

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- 8) Has mounting pad been warped from external heating? (Loosen mounting bolts slightly and see if valve functions. End caps can also be removed and check for tight spool.)
- 9) Is fluid media excessively hot? (Check for localized heating which may indicate an internal leak... check reservoir temperature and see if it is within machine specifications.)
- 10) Is there foreign matter in the fluid media causing gummy deposits? (Check for contamination... make certain seals and plumbing are compatible with the type of fluid being used.)
- 11) Is an adequate supply of fluid being delivered to actuate the load? (Many times there is sufficient pressure to shift the valve but not enough to actuate the work load. Check pump supply pressure and volume if necessary... physical measurement of flow through relief valve with units blocked may be necessary.)
- 12) Check circuit for possible interlocks on pressure sources to valve or to pilot.



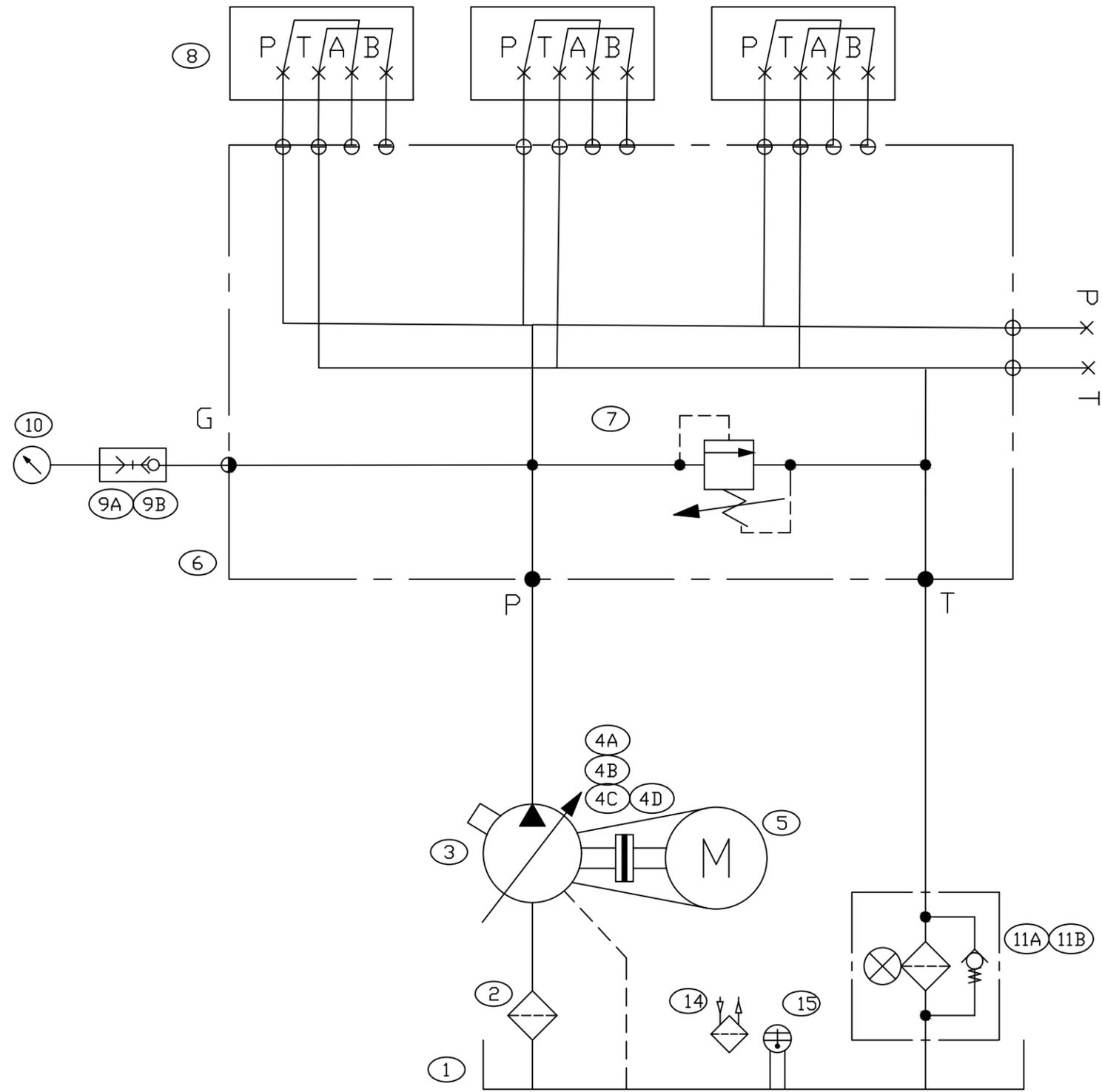
WARRANTY

The Company **MAKES NO WARRANTY WHATSOEVER** concerning products manufactured by others, but will extend to the Buyer such warranties respecting such products as are permissible under the terms thereof. The Company will repair or replace products manufactured by it which prove defective within one (1) year from date of shipment, 6 months of installation or 1000 hours of use, whichever occurs first. Upon return of the same at Buyer's expense when such defects are due to the defective material supplied by the Company or defective workmanship of its employees, provided the products shall have been properly assembled and utilized in accordance with the Company's design thereof and instructions relating thereto, it being understood that the foregoing warranty shall be of no effect whatsoever in the event any changes are made in the products prior to or in connection with their assembly or use.

THE ABOVE WARRANTY COMPRISES SELLER'S SOLE AND ENTIRE WARRANTY OBLIGATION AND LIABILITY TO BUYER, ITS CUSTOMERS AND ASSIGNS IN CONNECTION WITH GOODS SOLD HEREUNDER. ALL OTHER WARRANTIES EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO WARRANTIES OF MERCHANTABILITY AND FITNESS, ARE EXPRESSLY EXCLUDED.

DRAWINGS

Parts List, Schematics, & Specifications



SYM	QTY	PART NUMBER	MFGR	DESCRIPTION
1	1	JIC30-FT	MAGNALOY	30-GALLON RESERVOIR
2	1	SS-010P100-1-0	MAGNALOY	SUCTION STRAINER
3	1	PVP1636R212	PARKER	HYDRAULIC PUMP
4A	1	M182502A	MAGNALOY	PUMP TO MOTOR ADAPTER
4B	1	M20002406	MAGNALOY	SHAFT COUPLING HUB
4C	1	M270H5	MAGNALOY	SHAFT COUPLING SPIDER
4D	1	M20011210	MAGNALOY	SHAFT COUPLING HUB
5	1	CEM2333T	BALDOR	15 HP; ELECTRIC MOTOR
6	1	BM-ASP03S2-03-1-CG	WILSON	MANIFOLD
7	1	RAH101S50	PARKER	RELIEF VALVE
8	3	CP-ACD03E-1/2	PARKER	DD3 COVER PLATE
9A	1	DGA 20-1/4NPT	STAUFF	DIRECT GAUGE ADAPTER
9B	1	SMK201/4NPTVDC6F	STAUFF	PRESSURE TEST COUPLING
10	1	J6D	McDANIEL	LIQUID FILLED GAUGE
11A	1	PT2110QBGGSI21	PARKER	RETURN FILTER ASSEMBLY
11B	1	936752	PARKER	FILTER ELEMENT
14	1	FB-D108Y	MAGNALOY	FILLER BREATHER CAP
15	1	SLLG-05T-C	MAGNALOY	SIGHT GAUGE

GENERAL SPECIFICATIONS	
PART NUMBER	35-16018
SERIAL NUMBER	
RESERVOIR FILL	30 GALLONS
FLOW RATE	7.8 GPM @ 1800 RPM
HORSEPOWER	15HP, 1800 RPM, 3PH, 230/460V
RELIEF SETTING	3300 PSI
COMPENSATOR SETTING	3000 PSI

REV	DATE	DR	ENG	RWVD	DESCRIPTION
A	04/2017		MF	RVL	AS BUILD

USE ENGINEERING STANDARD FOR TOLERANCES
 ALL DIMENSIONS IN INCHES UNLESS OTHERWISE NOTED
 DO NOT SCALE THIS DRAWING

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TITLE
 WILSON HPU
 HYDRAULIC POWER UNIT

SYSTEMS DIVISION
WILSON COMPANY
 4651 RATLIFF LANE, ADDISON, TEXAS, 75001
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CONTRACT	SCALE	SIZE	DRAWING NUMBER	REV
	NONE	B	35-16018	A

FORM 600086-19, REV F

LITERATURE - HYDRAULIC

Hydraulic Motors, Pumps, & Valves

Hydraulic Filters & Strainers

Hydraulic Fittings & Hose

Misc. Components

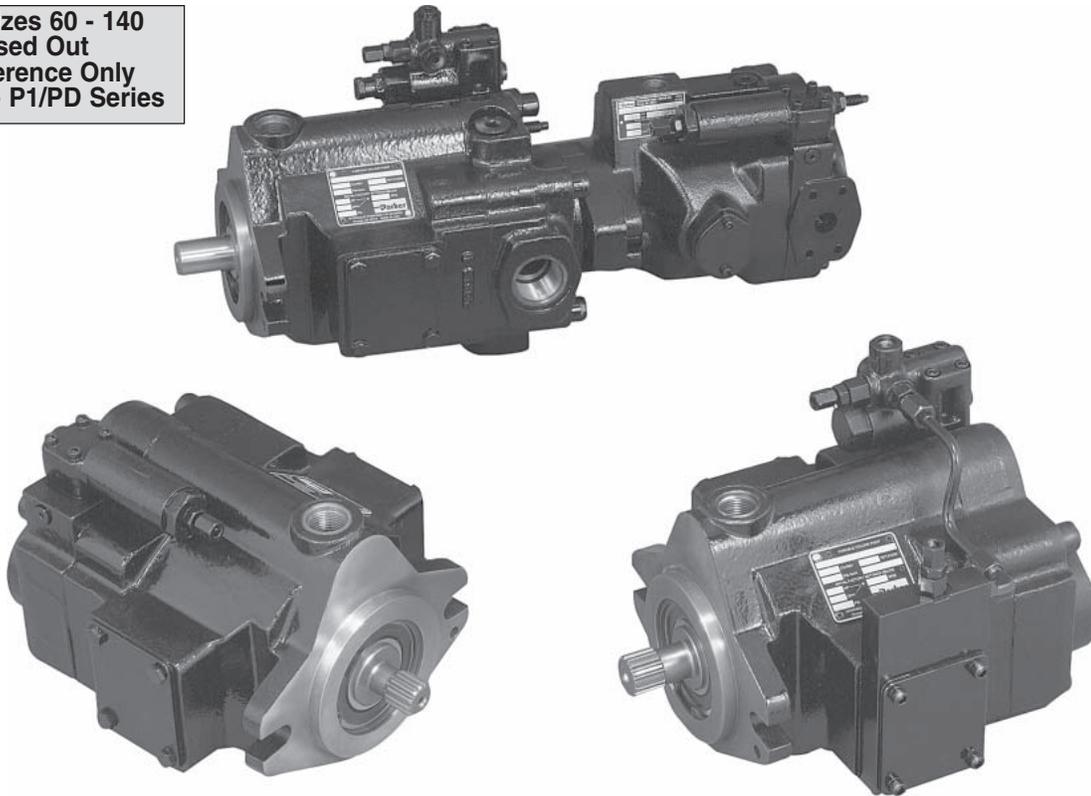


Series PVP Variable Volume Piston Pumps

*Catalog HY28-2662-CD/US
Revised June, 2012*



**Series Sizes 60 - 140
Phased Out
For Reference Only
Please see P1/PD Series**

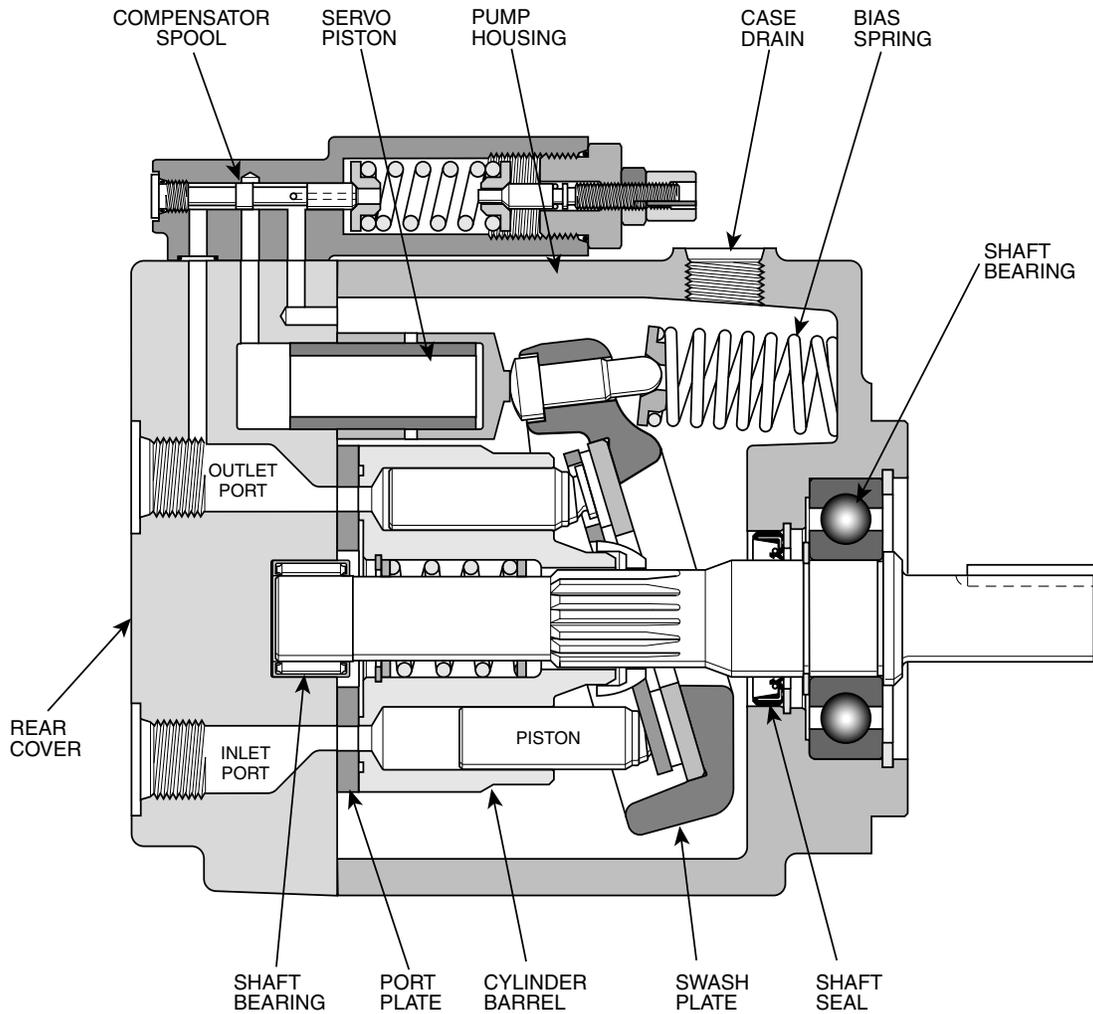


Quick Reference Data Chart

Pump Model	Displacement cc/rev (In ³ /rev)	Pump Delivery @ 21 bar (300 PSI) in LPM (GPM)		† Approx. Noise Levels dB(A) @ Full Flow 1800 RPM (1200 RPM)					Input Power At 1800 RPM, Max. Displacement & 248 bar (3600 PSI)	Operating Speed (RPM) (Maximum)	Pressure bar (PSI) Continuous (Maximum)
				34 bar (500 PSI)	69 bar (1000 PSI)	138 bar (2000 PSI)	207 bar (3000 PSI)	248 bar (3600 PSI)			
		1200 RPM	1800 RPM								
PVP16	16 (.98)	19.7 (5.2)	29.5 (7.8)	53 (47)	55 (50)	59 (54)	62 (56)	65 (59)	13.1 kw (17.5 hp)	3000	248 (3600)
PVP23	23 (1.4)	28.0 (7.4)	42.0 (11.1)	61 (57)	64 (59)	67 (63)	69 (65)	70 (65)	19.7 kw (26.5 hp)	3000	248 (3600)
PVP33	33 (2.0)	39.4 (10.4)	59.0 (15.6)	64 (59)	66 (59)	68 (62)	70 (64)	71 (65)	27.2 kw (36.5 hp)	3000	248 (3600)
PVP41	41 (2.5)	49.2 (13.0)	73.8 (19.5)	68 (60)	70 (61)	73 (65)	74 (67)	75 (69)	33.2 kw (44.5 hp)	2800	248 (3600)
PVP48	48 (2.9)	57.6 (15.2)	86.4 (22.8)	69 (60)	71 (62)	73 (65)	75 (68)	76 (69)	40.3 kw (54.0 hp)	2400	248 (3600)

† Measured in an anechoic chamber to DIN 45635, measuring error ± 2 dB(A).
Fluid used: petroleum oil to ISO VG 46; temperature = 50°C (122°F).

Since many variables such as mounting, tank style, plant layout, etc., effect noise levels, it cannot be assumed that the above readings will be equal to those in the field. The above values are for guidance in selecting the proper pump.



Features

- High Strength Cast-Iron Housing
- Fast Response Times
- Two Piece Housing For Ease of Service
- Metric Pilot, Shaft and Ports Available
- Replaceable Bronze Clad Port Plate
- Thru-Shaft Capability
- Low Noise Levels
- Replaceable Piston Slipper Plate

Controls

- Pressure Compensation
- Load Sensing
- Horsepower Limiting
- Horsepower and Load Sensing
- Remote Pressure Compensation
- Adjustable Maximum Volume Stop
- Hi/Lo Torque (Power) Limiting (PVP 41/48, 60/76, 100/140 Only)
- Low Pressure Standby

General Description

All control is achieved by the proper positioning of the swash plate. This is achieved by a servo piston acting on one end of the swash plate working against the combined effect of the off-setting forces of the pistons and centering spring on the other end. The control spool acts as a metering valve which varies the pressure behind the servo piston.

As shown in Figure 1, the amount of flow produced by the Parker Piston Pump is dependent upon the length of stroke of the pumping pistons. This length of stroke, in turn, is determined by the position of the swash plate. Maximum flow is achieved at an angle of 15-17

degrees. The rotating barrel, driven by the prime mover, moves the pistons in a circular path and the piston slippers are supported hydrostatically against the face of the swash plate. When the swash plate is in a vertical position, perpendicular to the centerline of the piston barrel, there is no piston stroke and consequently no fluid displacement. When the swash plate is positioned at an angle, the pistons are forced in and out of the barrel and fluid displacement takes place. The greater the angle of the swash plate, the greater the piston stroke.

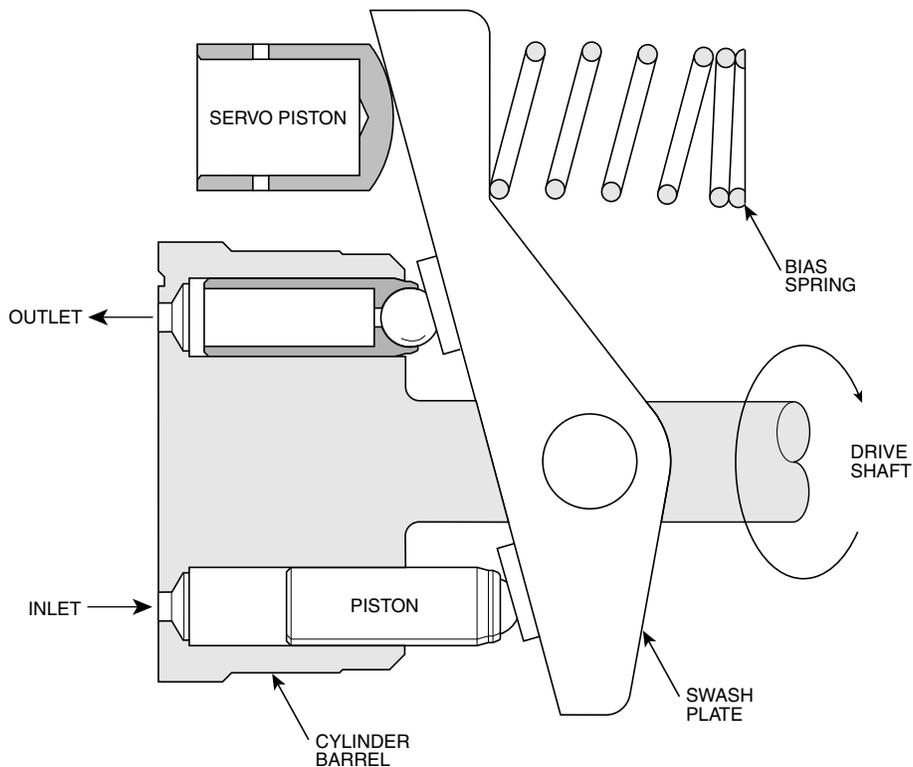


FIGURE 1

Pressure Compensated Control (OMIT)

The swash plate angle controls the output flow of the pump. Swash plate angle is generated by the hydraulic force of the pumping pistons and the mechanical force of the swash plate bias spring.

Control of the pump's outlet flow is obtained by overriding the force of the pumping pistons and bias spring with the hydraulic force of the servo piston by means of internal porting. Pressure is connected from the outlet port to the servo piston via a compensator spool.

The compensator spool is held against the spring guide by the outlet pressure. When the outlet pressure reaches the setting of the compensator control, the compensator spool moves, allowing outlet pressure oil to be metered into the servo piston. This metered oil

provides adequate force to power the servo piston and override swash plate forces. The outlet pressure causes the servo piston to move which reduces the angle of the swash plate and thereby reduces the pump's output flow. When flow is again demanded by the system, the outlet pressure will momentarily fall allowing the compensator spool to move. This movement closes off the outlet pressure to the servo piston and vents the servo piston to case. The result of this venting allows the swash plate forces to move the swash plate angle to maximum displacement, thus responding to the demand for additional flow. Note that the compensator spring chamber is vented to the pump case via a hole internal to the compensator spool.

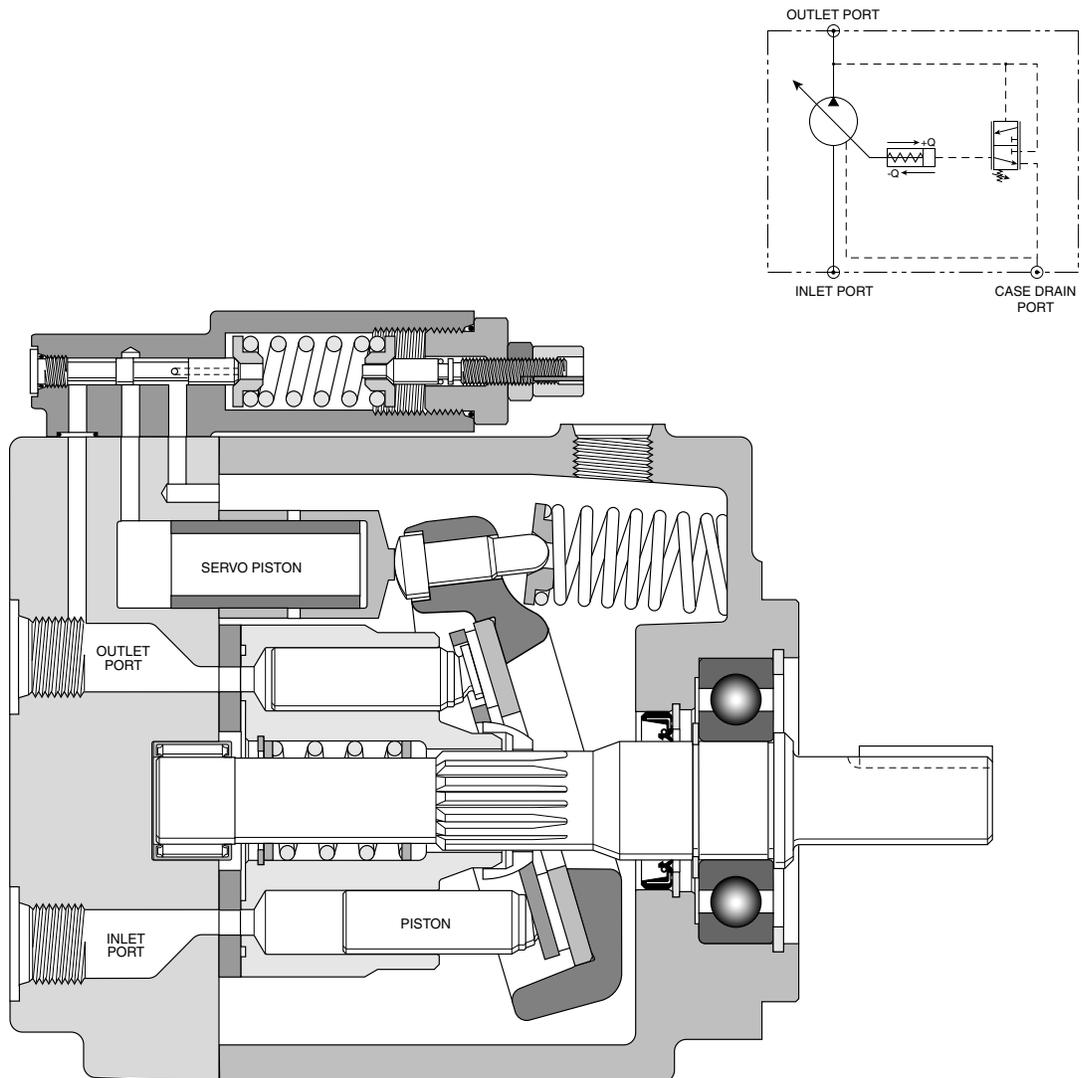


FIGURE 2

Remote Pressure Control (M)

The pump swash plate actuation is identical to the standard pressure compensator but can be controlled via a remote pressure control.

Remote control of the pump output pressure can be achieved by controlling the pressure at port A, Figure 3 on the compensator. Flow is metered through the orifice in the spool from outlet pressure into the spring chamber. The spring chamber pressure is limited by an external relief connected to port A. The controlled pressure at port A is sensed at the differential spring chamber. The compensator spool will move to the right when the pump outlet pressure reaches a force equal to the differential spring setting plus the controlled port

pressure setting. When the spool moves to the right, outlet pressure oil is metered to the servo piston and the pump swash plate angle is controlled accordingly. With this option the pump outlet pressure can be controlled and varied from a remote location.

This control also incorporates a pressure limiting feature preset at the factory. When the pressure in the differential spring chamber reaches the maximum relief setting, the dart unseats allowing the spring chamber to vent to the pump case and limits the maximum pressure attainable.

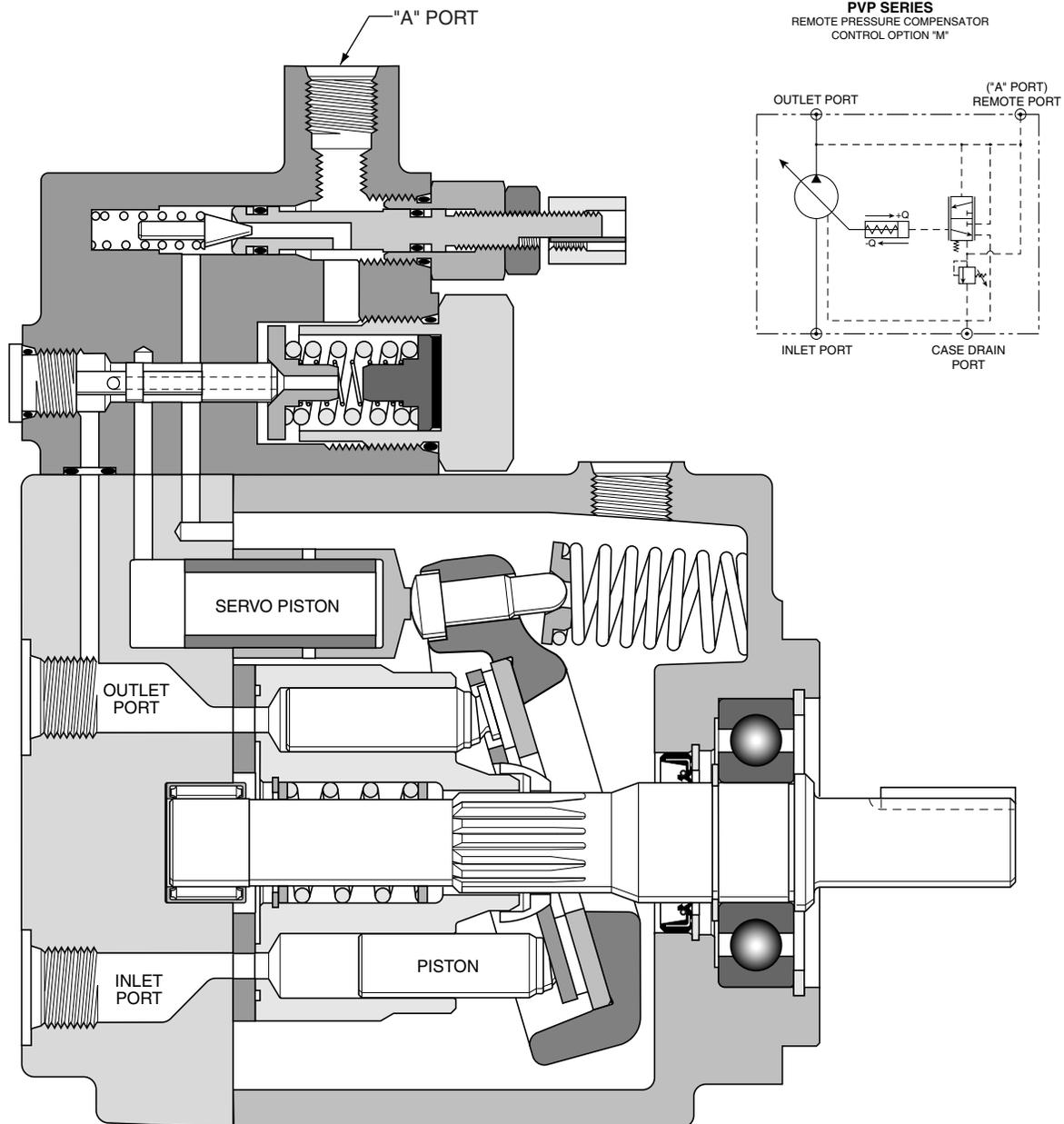


FIGURE 3

Flow Control (Load Sensing) (A)

Figure 4 shows a PVP pump with flow control. The control is identical to the remote pressure compensation control except for an integral orifice, a solid compensator spool and adjustable differential pressure control. Port A is connected downstream of an orifice (variable or fixed) to sense the actual working pressure required. This pressure plus the differential spring force act on the right side of the compensator

spool and will urge the spool to the left until output pressure acting on the left side of the spool balances the forces. As the load increases, output pressure will increase and maintain a constant differential pressure across the orifice and thus a constant flow. Maximum pressure is limited by the internal dart setting. This setting is adjustable up to the maximum preset at the factory.

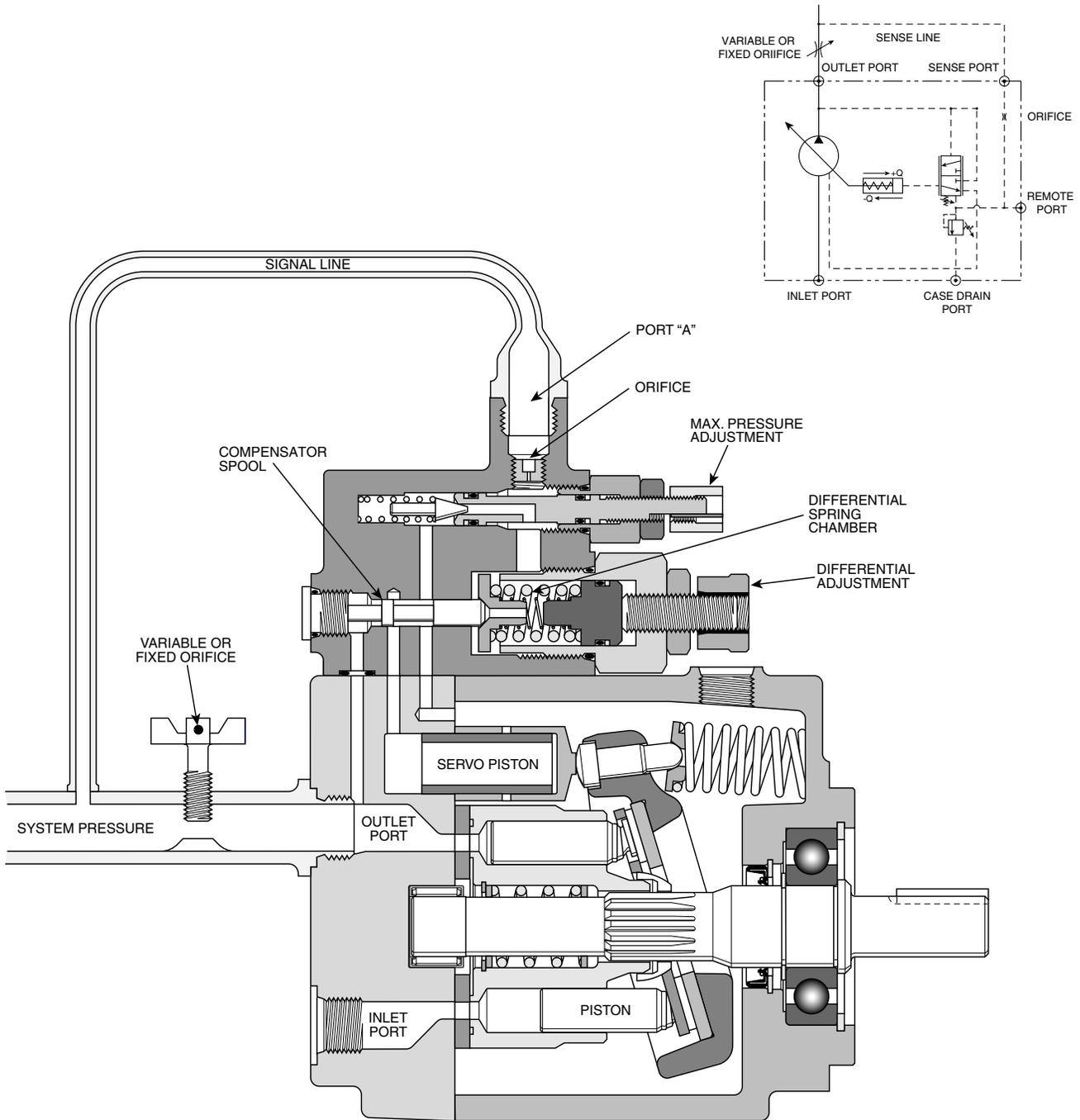


FIGURE 4

Pressure & Power Control (H)

This control option is a Torque Limiting Control, but for constant speed applications it is generally referred to as a Horsepower Control. This control works in conjunction with the Remote Pressure Compensator, control option "M". A second pressure control device called a horsepower control block, is assembled to the main pump housing. The HP block is plumbed to one of the ports on the remote compensator via steel tubing. The control dart in the HP block and the maximum pressure compensator dart in the remote compensator are connected in parallel. What makes the control dart in the HP block different from any other external relief valve is the pressure setting is mechanically linked to the pump swashplate angle.

The cracking pressure of the HP dart is generally lower than the cracking pressure of the remote compensator dart. When the HP dart opens the pressure in the

differential spring cavity is lowered allowing the compensator spool to meter system pressure in the servo piston. As the servo piston extends, it rotates the washplate and in turn rotates the HP cam. As the cam rotates it increases the force on the HP dart control spring. As the system pressure is allowed to increase, the pump gradually reduces its stroke (flow). When the system pressure reaches the setting of the maximum pressure dart the normal action of the remote compensator takes over. If the HP control is set low enough, the pump may reach zero stroke before the system pressure ever gets a chance to open the maximum compensator dart. This should be considered when making low power settings on systems requiring high working pressures.

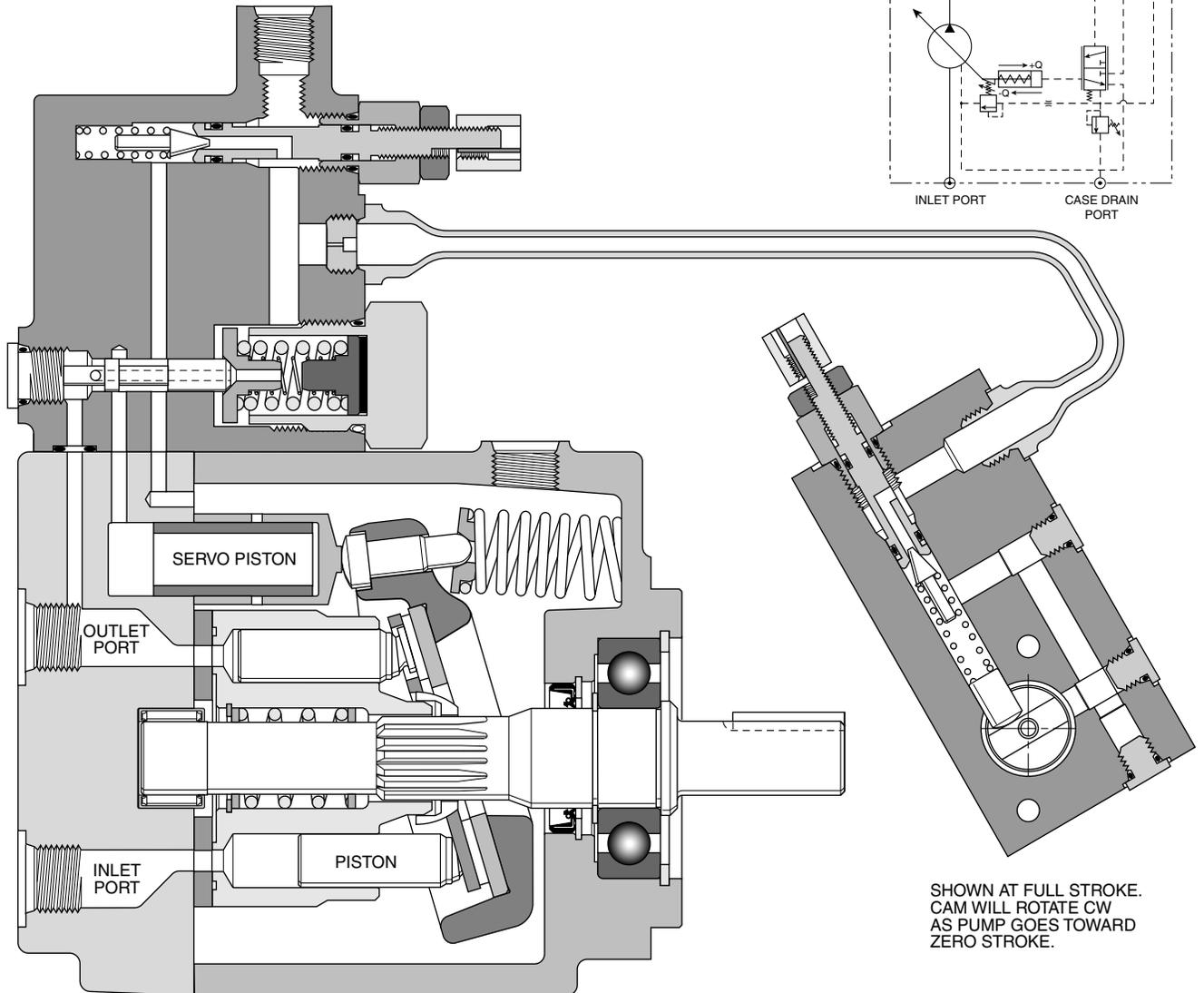


FIGURE 5

Pressure, Power & Flow Control (C)

Refer to the previous section(s) on Flow Control and Power Control. This is another case where multiple controls can be combined in parallel. Since the Power Control is just a special version of Remote Pressure Control, it can be combined with the Flow Control (Load Sense) option. The main point to remember here is that the pressure drop which is required to begin and maintain compensation comes from an external device (such as a proportional valve). This sensed pressure drop will control flow until one of the limits of the other controls has been exceeded. The pump will always respond to the lowest control setting for any given pressure. In addition to Load Sensing, Power Control,

and on-pump Pressure Control, Remote Pressure Control can also be included in this parallel device package. There is a remote port on the compensator body and one on the HP Control body, either of which may be used for remote pressure control. The important concept to remember in load sense circuits is that each pressure control device in and connected to the compensator must be protected from saturation. For this reason, use only the uppermost port on the compensator for connection of the load sense line and insure that an appropriate orifice is installed. All control options using a load sense compensator spool are supplied with this orifice.

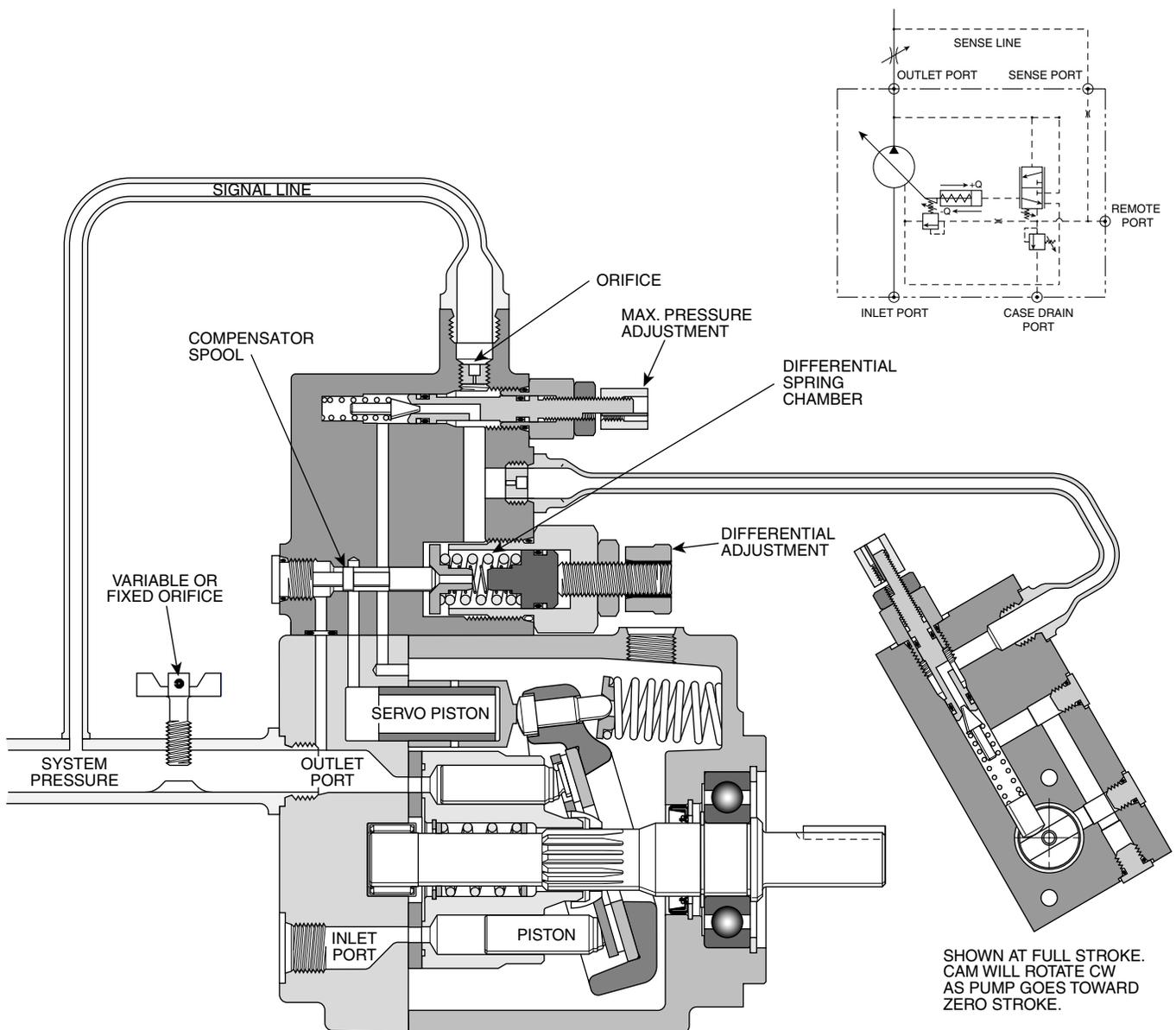


FIGURE 6

hpm102-1.p65, lw, jk

Hi/Lo Power Control (HLM)

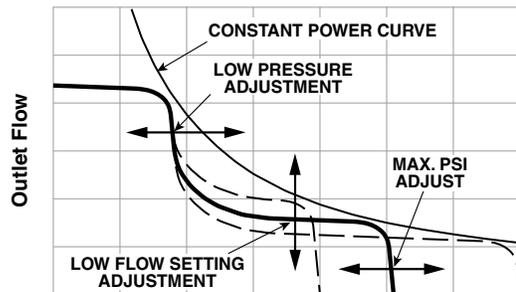
(Available with PVP41 and PVP48 Only)

The graph shown below represents the flow-pressure characteristics of a Hi-Lo control for PVP pumps. There are up to four separate adjustments that must be made with the pump controls to get a particular setting, all of which influence the shape of the curve. To get the proper settings, it is very important that all pertinent information is supplied with each Hi-Lo pump ordered. As you can see from the graph below, there are two peak power points. Our intention is to have the same magnitude of power required for both peaks. Of course many combination of settings are possible but specification of the settings becomes very difficult. To make factory settings, we need to know the required **flow** (applicable if pump has a maximum volume stop), the **shaft speed**, the required **Power limit**, and the **compensation pressure**. Based on these requirements, we will adjust the low pressure set point and the reduced flow set point of the Hi-Lo control to best match the requested parameters called out on the order.

Important note: As with power controls, not all combinations of flow, power, pressure, etc. are possible. The first rule is that the settings must conceptually be achievable (i.e. power out is ALWAYS less than power in). Be careful in assuming efficiencies when estimating the Out/In relationship, since a pump operating at low

pressure or in a de-stroked condition can have a much lower overall efficiency than expected. The other thing to keep in mind is that the pump will require the peak power at only two points. All other operating pressures will require less than maximum power and therefore the pump will deliver less hydraulic power in the appropriate ratio based on the actual pump efficiency at those conditions.

**Typical Hi-Lo Control
Flow/Pressure Characteristics**



System Pressure

PVP SERIES
PRESSURE & POWER COMPENSATOR
CONTROL OPTION "HLM"

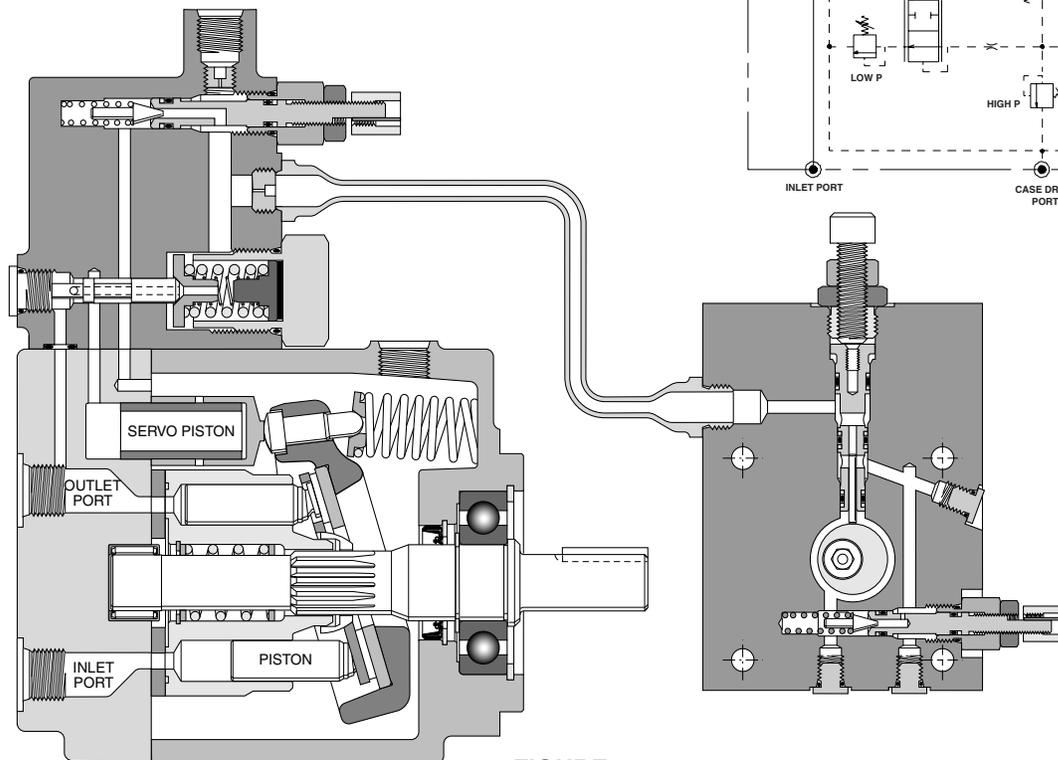
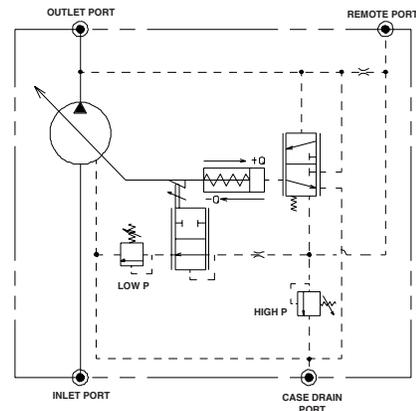


FIGURE 7

Performance Information

Series PVP16 Pressure Compensated,
 Variable Volume, Piston Pump

Features

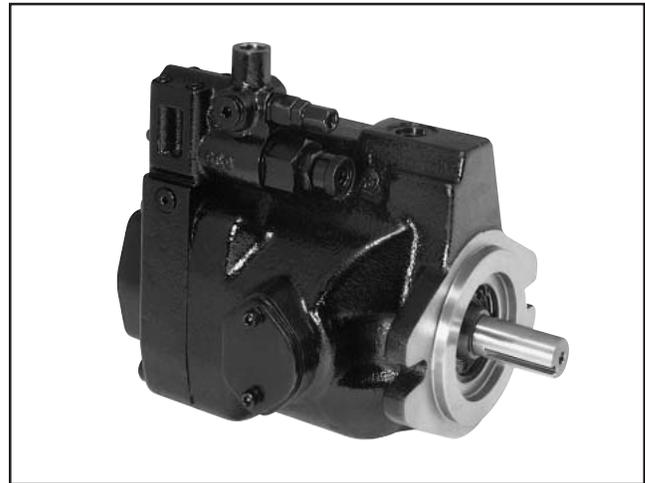
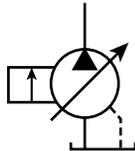
- High Strength Cast-Iron Housing for Reliability and Quiet Operation
- Optional Inlet/Outlet Locations for Ease of Installation
- Replaceable Bronze Port Plate
- Replaceable Piston Slipper Plate
- Thru-Shaft Capability SAE A Pilots Offered
- Low Noise Levels - Promote More Comfortable Operating Environment
- Fast Response Times
- Metric Pilot Shaft and Ports Available

Controls

- Pressure Compensation
- Remote Pressure Compensation
- Load Sensing
- Torque (Power) Limiting
- Adjustable Maximum Volume Stop
- Low Pressure Standby

Schematic Symbol

(Basic Pump)



Specifications

Pressure Ratings

Outlet Port: 248 bar (3600 PSI) Continuous (P1)
 310 bar (4500 PSI) Peak (P3)

Inlet Port: 1.72 bar (25 PSI) Maximum
 .17 bar (5 In. Hg.) Vacuum Minimum
 @ 1800 RPM (See inlet chart for other speeds)

Speed Ratings: 600 to 3000 RPM

Operating Temperature Range: -40°C to 71°C
 (-40°F to 160°F)

Housing Material: Cast-Iron

Filtration: Maintain SAE Class 4,
 ISO 16/13,
 ISO 18/15 Maximum

Mounting: SAE "A" or Metric 2-Bolt
 Flange Mount

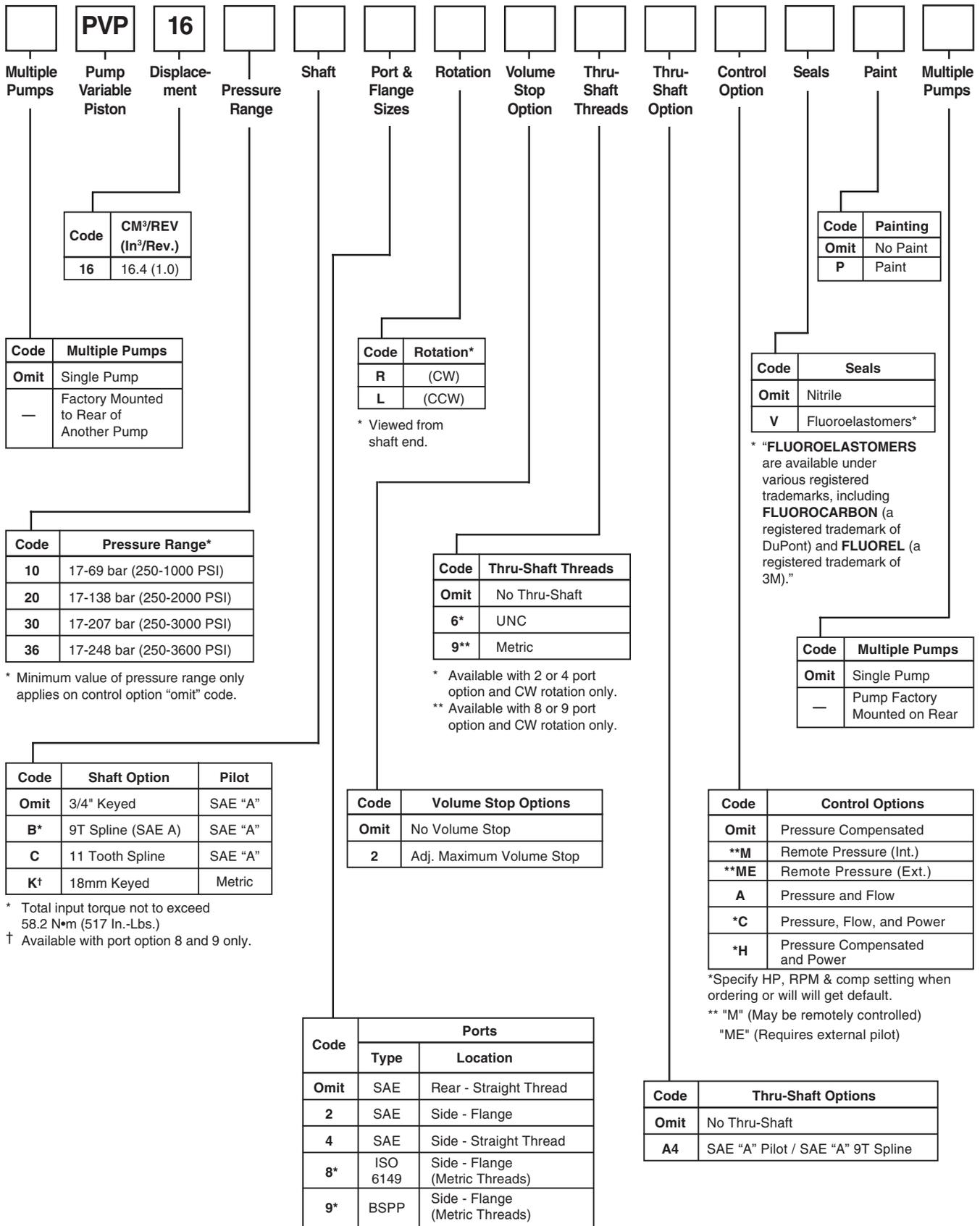
Installation Data: See page 42 of this catalog for specific recommendations pertaining to system cleanliness, fluids, start-up, inlet conditions, shaft alignment, drain line restrictions and other important factors relative to the proper installation and use of these pumps.

Quick Reference Data Chart

Pump Model	Displacement cc/rev (In ³ /rev)	Pump Delivery @ 21 bar (300 PSI) in LPM (GPM)		† Approx. Noise Levels dB(A) @ Full Flow 1800 RPM (1200 RPM)					Input Power At 1800 RPM, Max. Displacement & 248 bar (3600 PSI)
		1200 RPM	1800 RPM	34 bar	69 bar	138 bar	207 bar	248 bar	
				(500 PSI)	(1000 PSI)	(2000 PSI)	(3000 PSI)	(3600 PSI)	
PVP16	16.4 (1.0)	19.7 (5.2)	29.5 (7.8)	53 (47)	55 (50)	59 (54)	62 (56)	65 (59)	13.1 kw (17.5 hp)

† Measured in an anechoic chamber to DIN 45635, measuring error ± 2 dB(A).
 Fluid used: petroleum oil to ISO VG 46; temperature = 50°C (122°F).

Since many variables such as mounting, tank style, plant layout, etc., effect noise levels, it cannot be assumed that the above readings will be equal to those in the field. The above values are for guidance in selecting the proper pump.



Multiple Pumps

PVP

16

Pressure Range

Shaft

Port & Flange Sizes

Rotation

Volume Stop Option

Thru-Shaft Threads

Thru-Shaft Option

Control Option

Seals

Paint

Multiple Pumps

Code	CM ³ /REV (In ³ /Rev.)
16	16.4 (1.0)

Code	Multiple Pumps
Omit	Single Pump
—	Factory Mounted to Rear of Another Pump

Code	Pressure Range*
10	17-69 bar (250-1000 PSI)
20	17-138 bar (250-2000 PSI)
30	17-207 bar (250-3000 PSI)
36	17-248 bar (250-3600 PSI)

* Minimum value of pressure range only applies on control option "omit" code.

Code	Shaft Option	Pilot
Omit	3/4" Keyed	SAE "A"
B*	9T Spline (SAE A)	SAE "A"
C	11 Tooth Spline	SAE "A"
K†	18mm Keyed	Metric

* Total input torque not to exceed 58.2 N•m (517 In.-Lbs.)

† Available with port option 8 and 9 only.

Code	Rotation*
R	(CW)
L	(CCW)

* Viewed from shaft end.

Code	Thru-Shaft Threads
Omit	No Thru-Shaft
6*	UNC
9**	Metric

* Available with 2 or 4 port option and CW rotation only.

** Available with 8 or 9 port option and CW rotation only.

Code	Volume Stop Options
Omit	No Volume Stop
2	Adj. Maximum Volume Stop

Code	Ports	
	Type	Location
Omit	SAE	Rear - Straight Thread
2	SAE	Side - Flange
4	SAE	Side - Straight Thread
8*	ISO 6149	Side - Flange (Metric Threads)
9*	BSPP	Side - Flange (Metric Threads)

* Available with CW rotation only.

Code	Painting
Omit	No Paint
P	Paint

Code	Seals
Omit	Nitrile
V	Fluoroelastomers*

* "FLUOROELASTOMERS are available under various registered trademarks, including FLUOROCARBON (a registered trademark of DuPont) and FLUOREL (a registered trademark of 3M)."

Code	Multiple Pumps
Omit	Single Pump
—	Pump Factory Mounted on Rear

Code	Control Options
Omit	Pressure Compensated
**M	Remote Pressure (Int.)
**ME	Remote Pressure (Ext.)
A	Pressure and Flow
*C	Pressure, Flow, and Power
*H	Pressure Compensated and Power

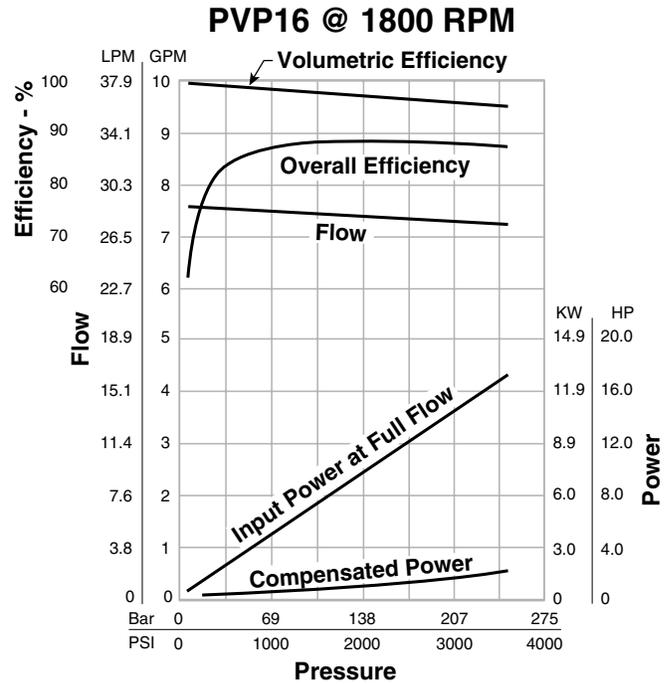
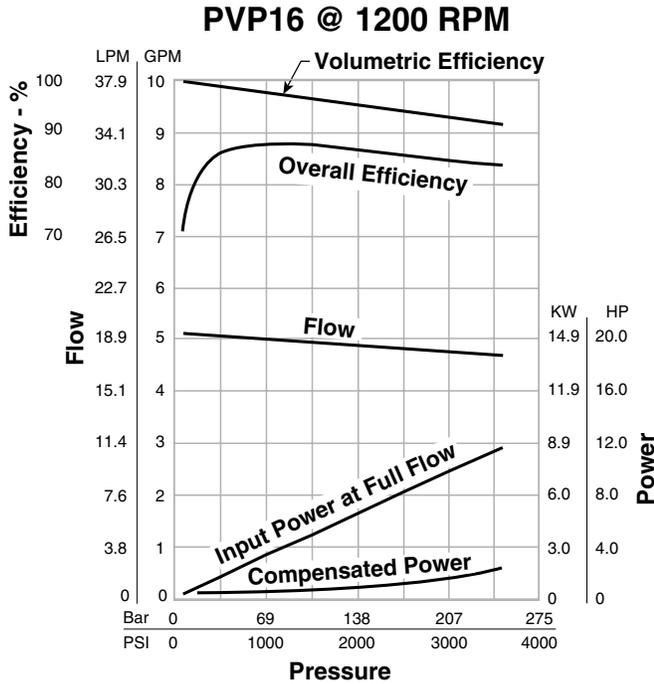
*Specify HP, RPM & comp setting when ordering or will get default.

** "M" (May be remotely controlled)

"ME" (Requires external pilot)

Code	Thru-Shaft Options
Omit	No Thru-Shaft
A4	SAE "A" Pilot / SAE "A" 9T Spline

Typical Performance Data - Fluid: Standard Hydraulic Oil 100 SSU @ 49°C (120°F)



NOTE: The efficiencies and data in the graph are nominal values and good only for pumps running at 1800 RPM and stroked to maximum. To calculate approximate horsepower for the other conditions, use the following formula:

$$HP = \left[\frac{Q \times (PSI)}{1714} \right] + (CHp)$$

Actual GPM is directly proportional to drive speed and maximum volume setting. Flow loss, however, is a function of pressure only.

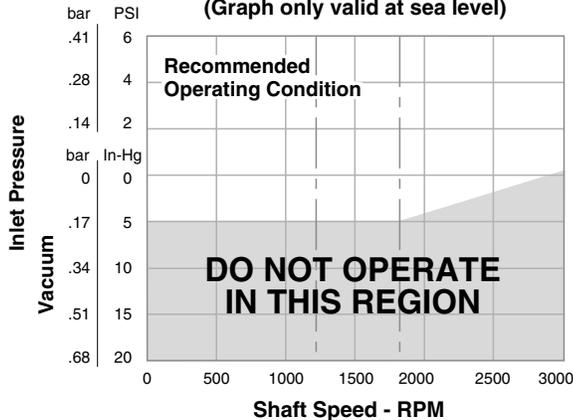
WHERE:

Q = Actual Output Flow in GPM

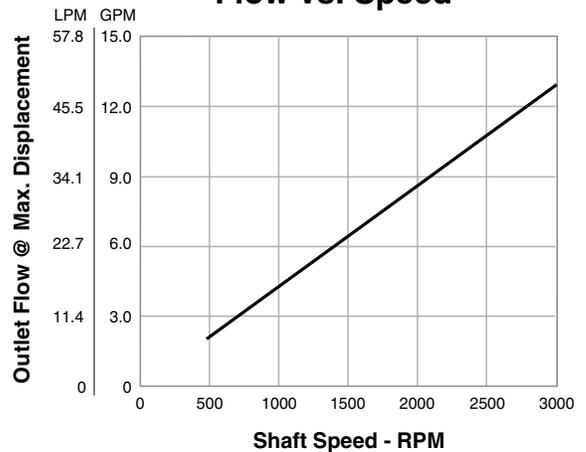
PSI = Pressure At Pump Outlet

CHp = Input Horsepower @ Full Compensation @ 1800 RPM
 (from graph read at operating pressure)

**PVP16
 Inlet Characteristics at Full Displacement
 (Graph only valid at sea level)**

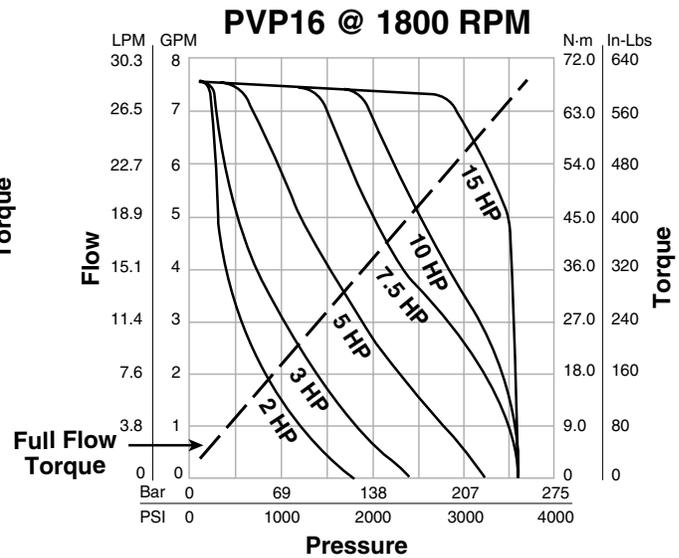
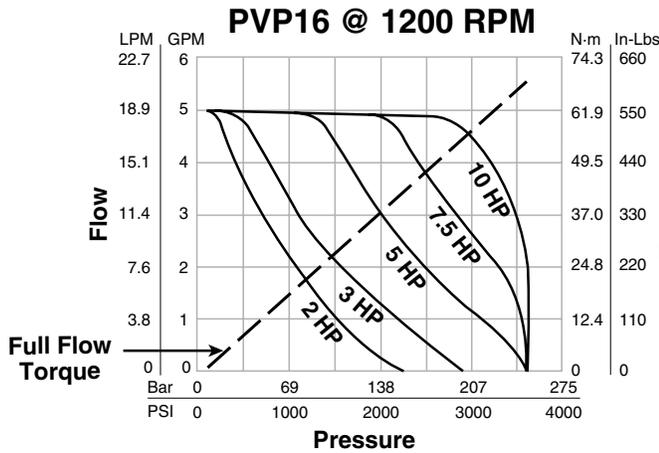


Flow vs. Speed

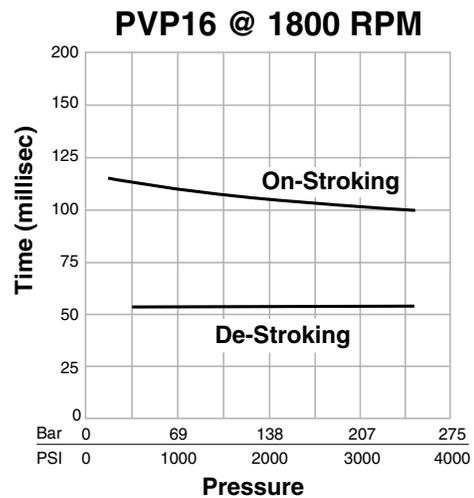
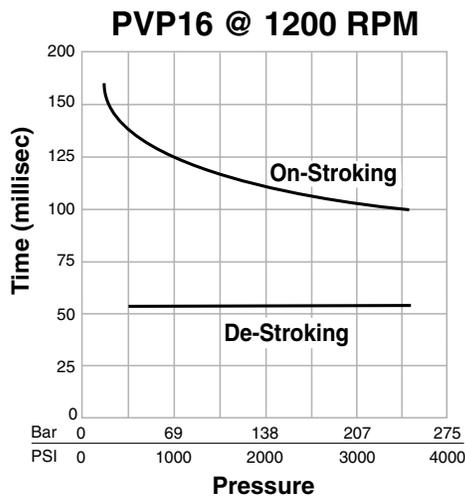


Typical Performance Data - Fluid: Standard Hydraulic Oil 100 SSU @ 49°C (120°F)

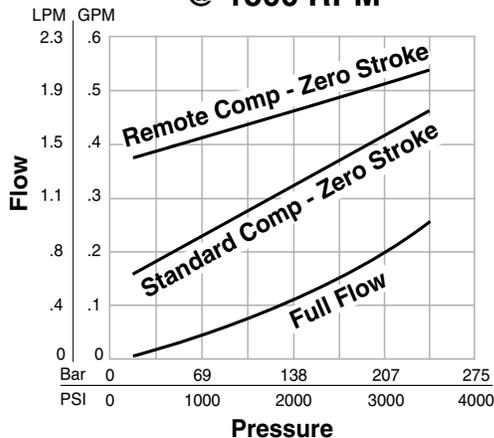
Power Control



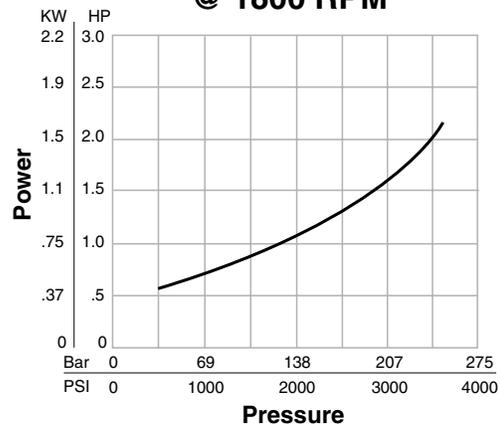
Response Times



**PVP16
 Approximate Case Drain Flow
 @ 1800 RPM**



**PVP16
 Compensated Power
 @ 1800 RPM**



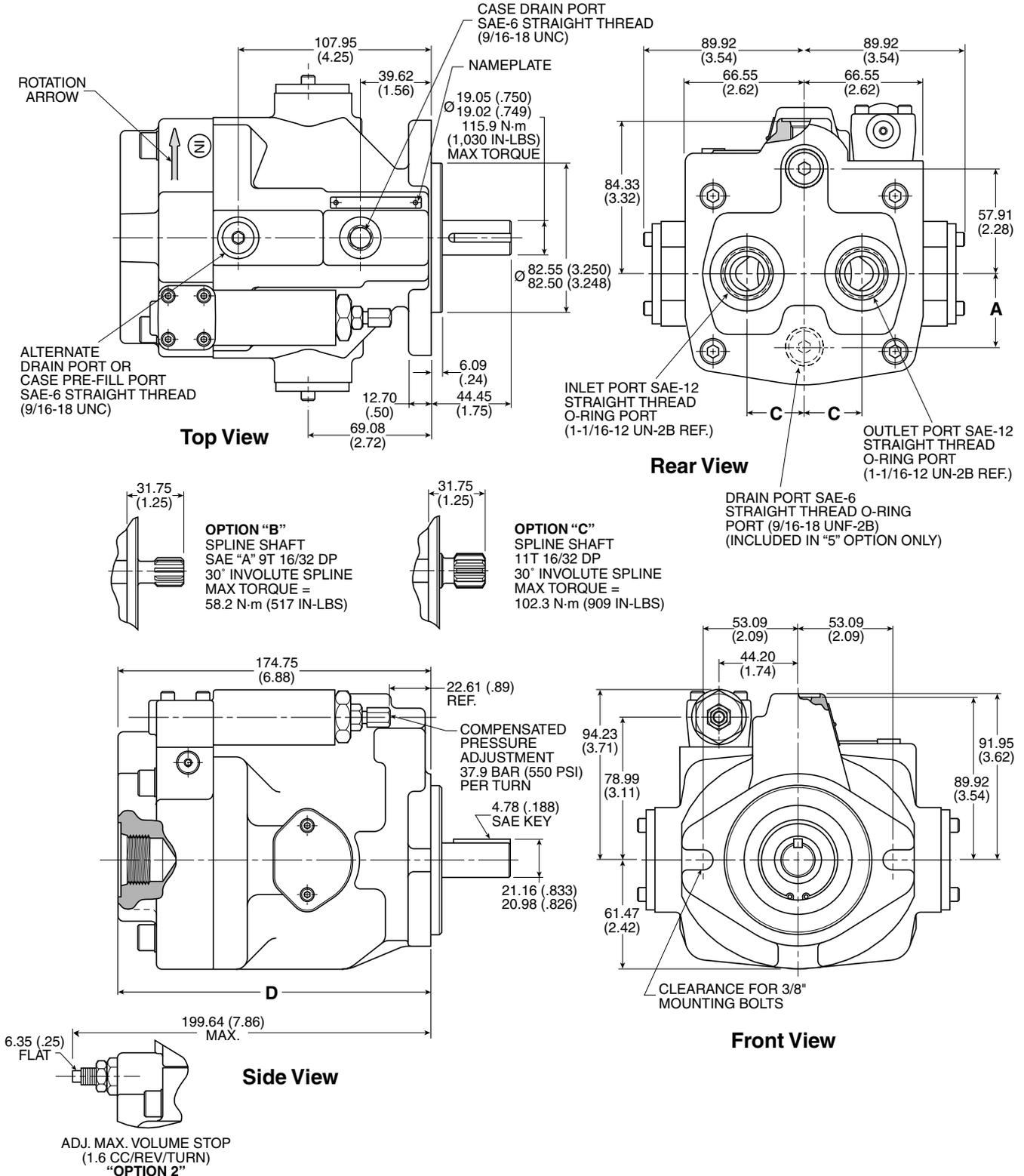
Rear Ported Pump Dimensions

* Inch equivalents for millimeter dimensions are shown in (**).

NOTE:

Illustration shows Righthand (CW) rotation pump. Lefthand (CCW) pumps will have inlet and outlet ports reversed with compensator on outlet side.

Pilot Dimensions			
Pilot Option	A	C	D
OMIT	N/A	32.00 (1.26)	173.23 (6.82)
5	38.10 (1.50)	28.44 (1.12)	144.53 (6.44)



hpm102-1.p65, lw, jk

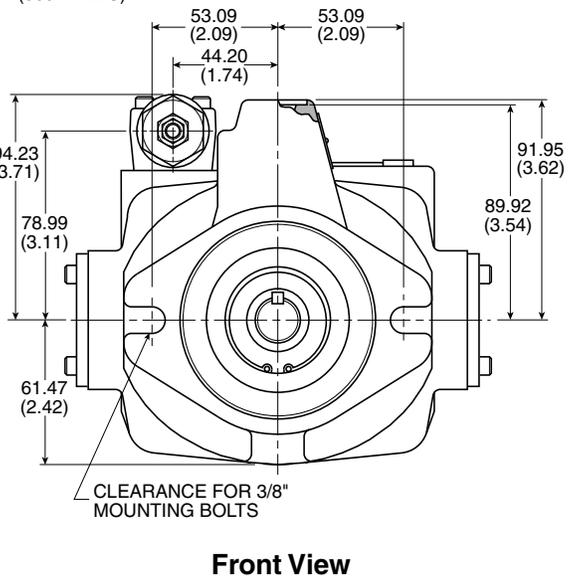
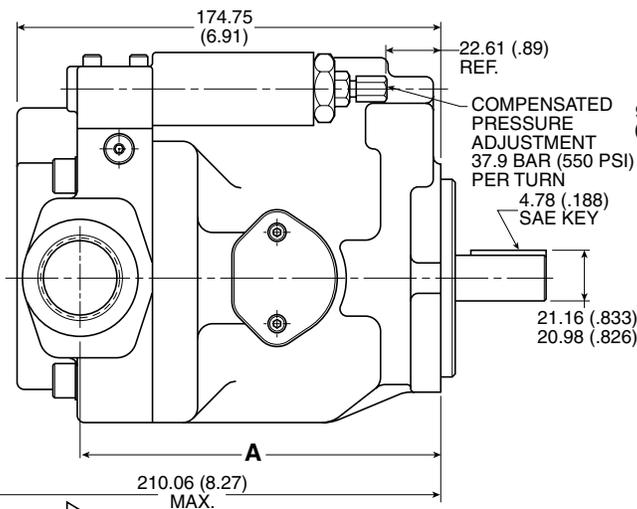
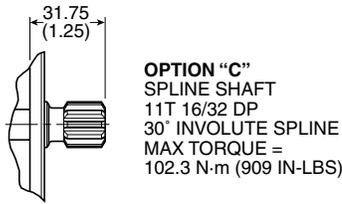
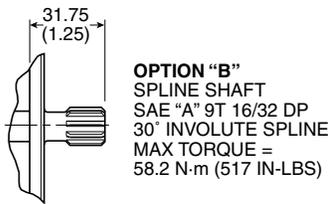
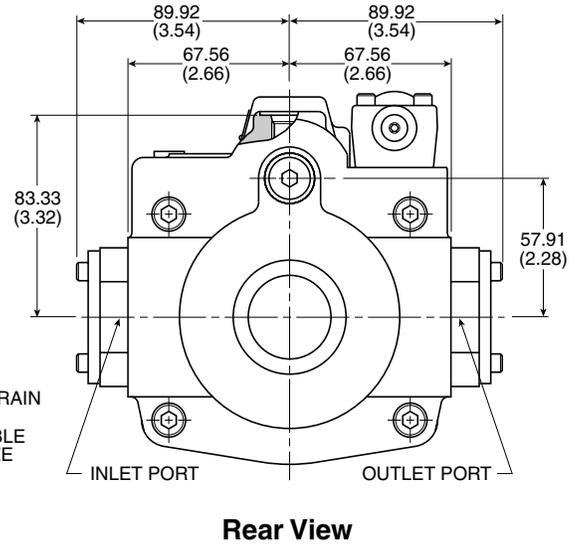
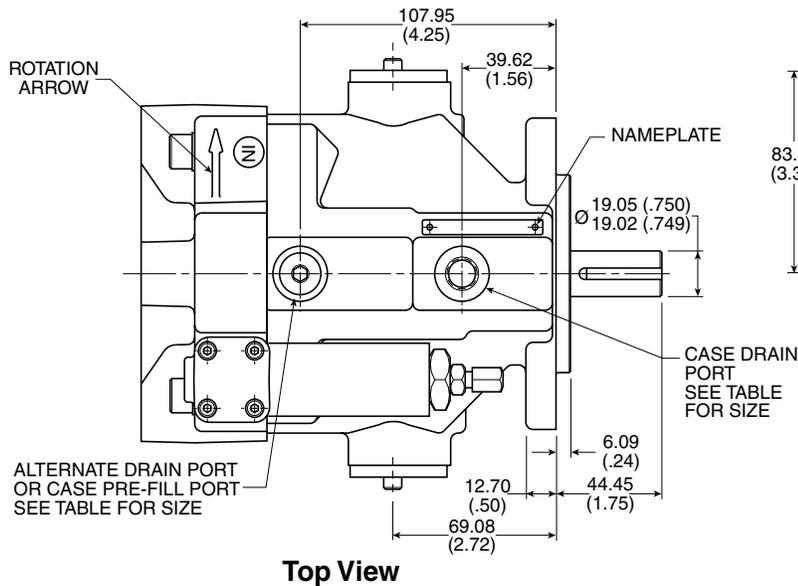
Side Ported – Options 2 & 4
Dimensions

* Inch equivalents for millimeter dimensions are shown in (**).

NOTE:

Illustration shows Righthand (CW) rotation pump.
 Lefthand (CCW) pumps will have inlet and outlet ports reversed with compensator on outlet side.

Port Size Type and Location			
Option	A	Inlet and Outlet Ports	Drain Port
2	148.84 (5.86)	3/4" SAE 4-Bolt Flange 3/8-16 Thread Std PSI Series (Code 61)	SAE-6 Straight Thread (9/16-18UNC)
4	152.40 (6.00)	SAE-16 Straight Thread (1-5/16-12UN-2B)	SAE-6 Straight Thread (9/16-18UNC)



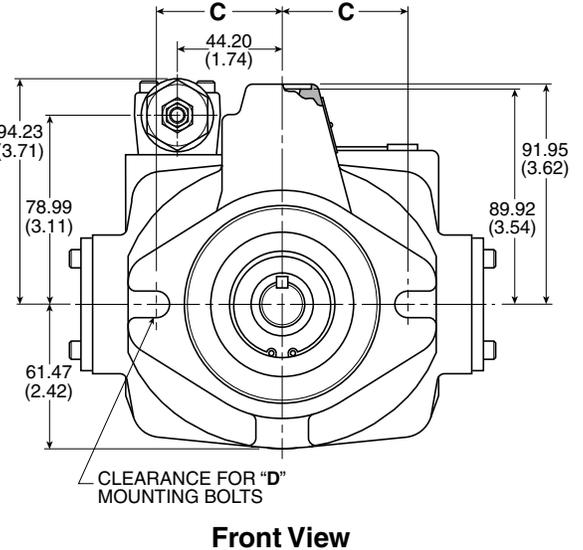
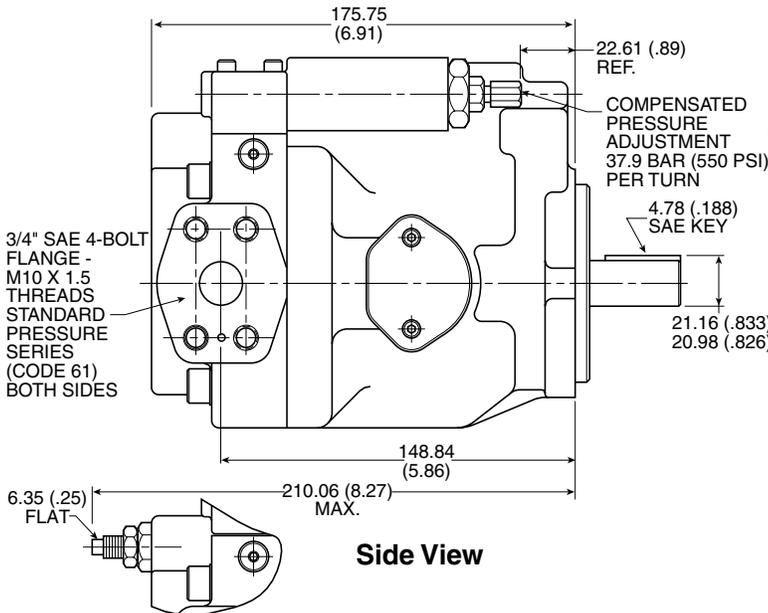
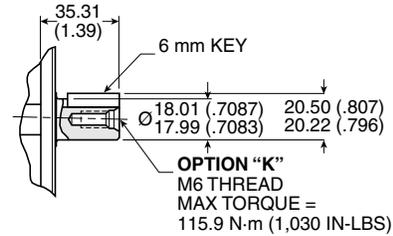
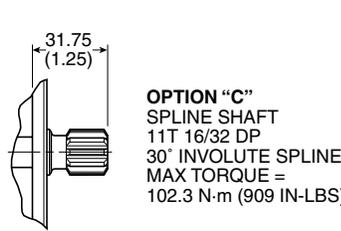
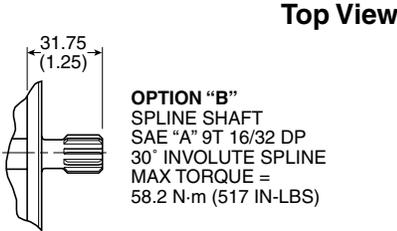
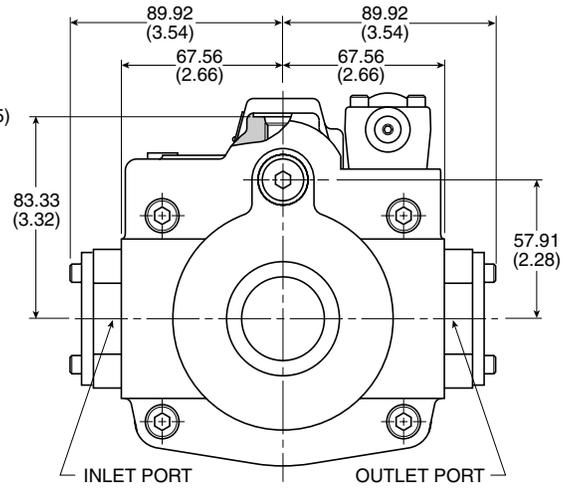
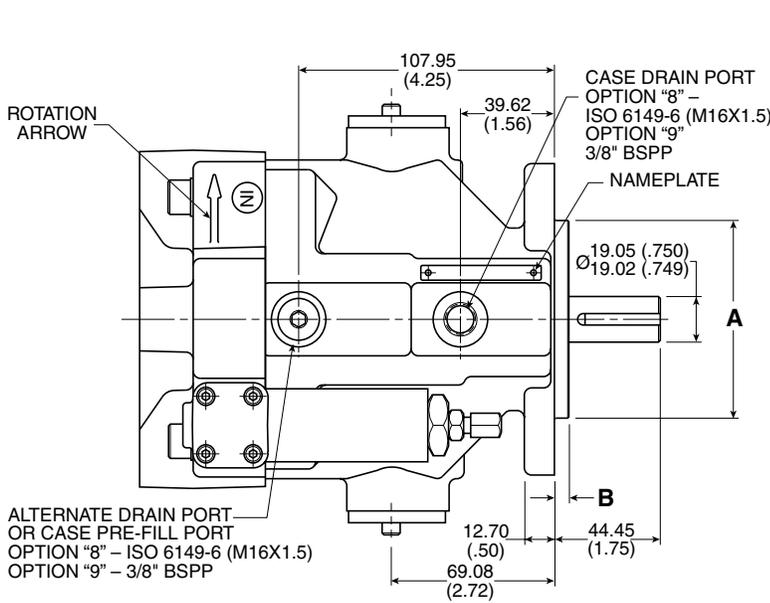
Side Ported – Options 8 & 9 Dimensions

* Inch equivalents for millimeter dimensions are shown in (**).

NOTE:

Illustration shows Righthand (CW) rotation pump.

Shaft Option	Pilot Dimensions			
	A	B	C	D
Omit B, C	∅ 82.55/82.50 (3.250/3.248)	6.10 (.24)	53.09 (2.09)	∅ 3/8"
K	∅ 80.00/79.95 (3.149/3.147)	7.24 (.285)	55.63 (2.19)	∅ 10mm



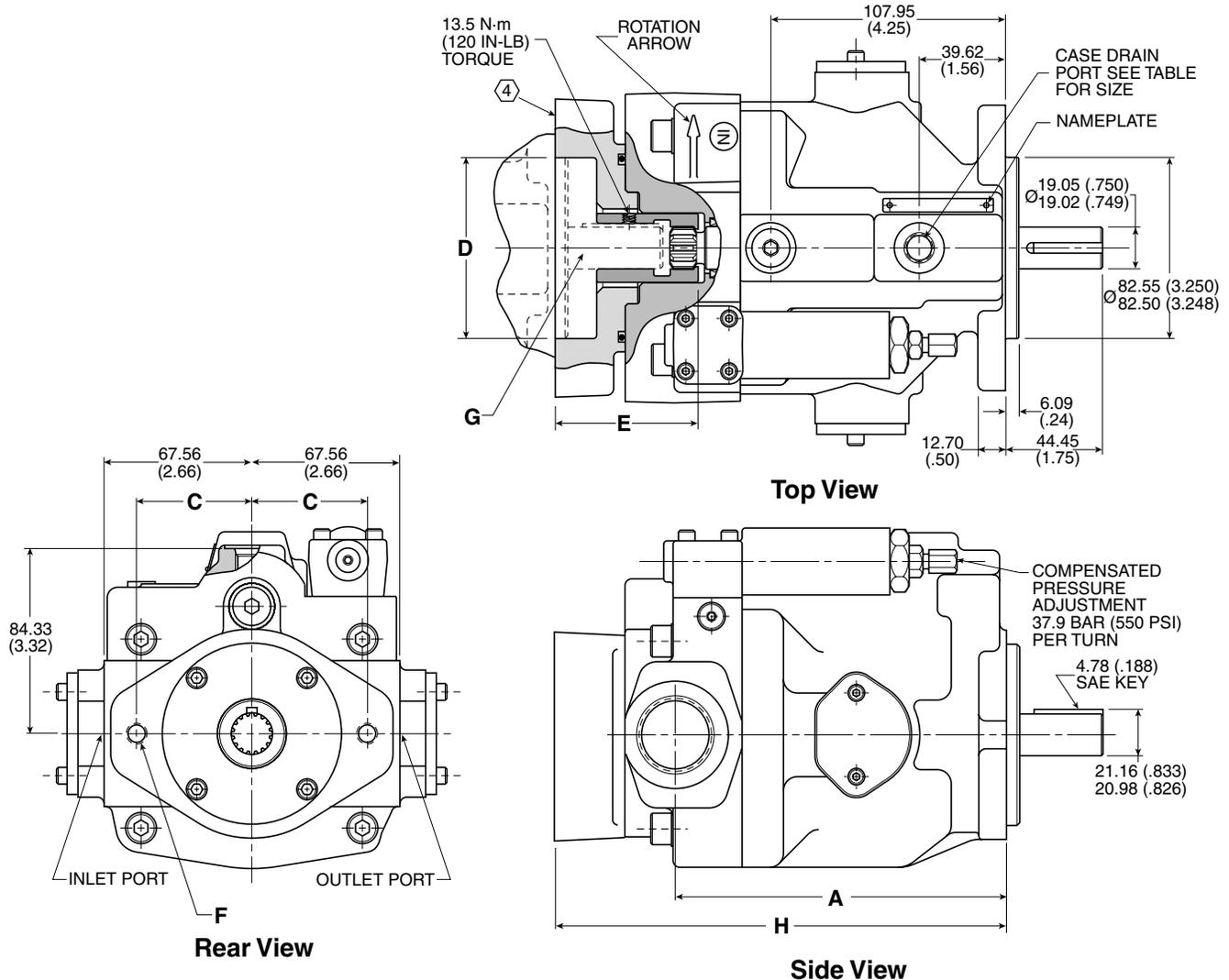
Thru-Shaft Pump Dimensions

* Inch equivalents for millimeter dimensions are shown in (**).

NOTES:

1. Righthand (CW) rotation pump shown above. Counterclockwise (CCW) pump will have inlet and outlet ports reversed with the compensator over the outlet port.
2. Splined shaft (option "B") not recommended with Thru-Shaft pumps.
3. The maximum torque transmitting capacity for rear mounting of pumps is limited by the allowable torque of the input shaft.
- ④ Options 6A4 and 9A4 Design Series 12 have a gasket. All other options incorporate an o-ring seal and have an o-ring groove.

Port Size Type and Location			
Option	A	Inlet and Outlet Ports	Drain Port
2	148.84 (5.86)	3/4" SAE 4-Bolt Flange 3/8-16 Thread Std PSI Series (Code 61)	SAE-6 Straight Thread (9/16-18UNC)
4	152.40 (6.00)	SAE-16 Straight Thread (1-5/16-12UN-2B)	SAE-6 Straight Thread (9/16-18UNC)
8	148.84 (5.86)	3/4" SAE 4-Bolt Flange M10 Thread Std PSI Series (Code 61)	ISO 6149-6 M16 x 1.50
9	148.84 (5.86)	3/4" SAE 4-Bolt Flange M10 Thread Std PSI Series (Code 61)	3/8" - BSPP



Dimensions – Thru Shaft Options

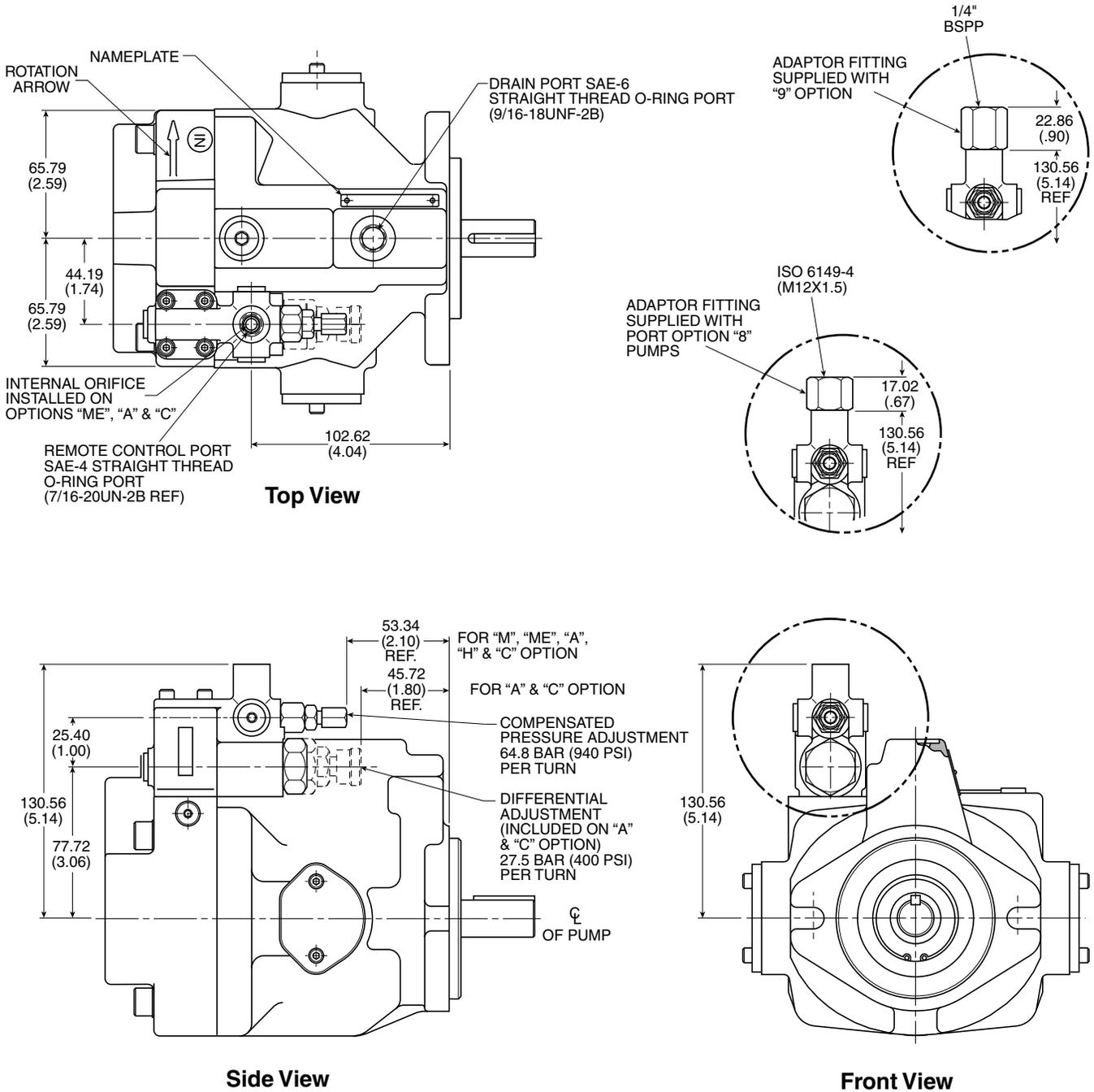
VARIATION	C	D	E	F	G	H
6A4	53.19 (2.09)	82.58/82.60 (3.251/3.252)	N/A	3/8-16UNC-2B	9 Tooth 16/32 Pitch	207.26 (8.16)
9A4	53.19 (2.09)	82.58/82.60 (3.251/3.252)	N/A	M10 x 1.50	9 Tooth 16/32 Pitch	207.26 (8.16)

Remote Compensator Control Pump Dimensions

* Inch equivalents for millimeter dimensions are shown in (**).

NOTES:

1. Righthand (CW) rotation pump shown below. Lefthand (CCW) pumps will have compensator on opposite side.
2. When controlling pump compensator pressure with remote relief valve, remote relief valve must be capable of passing 1.89 LPM (.5 GPM).
3. Remote compensator option "M", "ME" & "A" available on pumps with any port location.

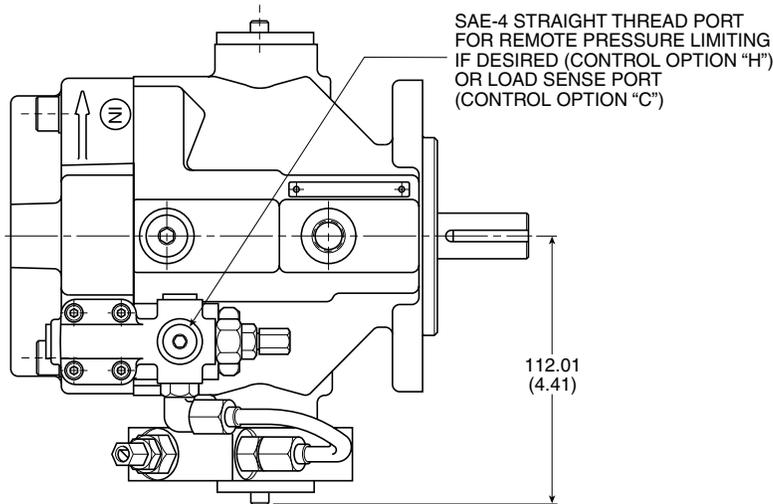


Power (Torque) Control Pump Dimensions

* Inch equivalents for millimeter dimensions are shown in (**).

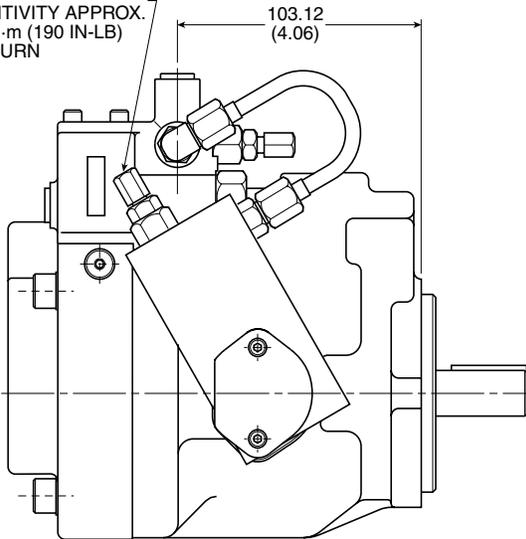
NOTES:

1. Righthand (CW) rotation rear ported pump shown. Counterclockwise (CCW) pumps will have inlet and outlet ports reversed with compensator and power block on outlet side.
2. Power control shown on rear ported pump. Also available on side ported or thru-shaft option pumps.

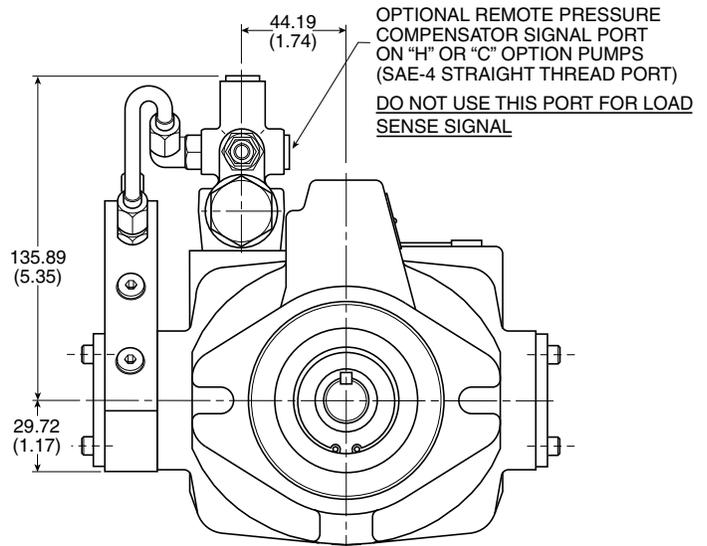


Top View

TORQUE LIMIT ADJUSTMENT CONTROL OPTION "H" SENSITIVITY APPROX. 21.4 N-m (190 IN-LB) PER TURN



Side View



Front View

Use of a Relief Valve

The use of a relief valve, while not mandatory is recommended in the main circuit to suppress hydraulic shock loads and adds additional system protection.

Fluid Recommendations

Premium quality hydraulic oil with a viscosity range between 150-250 SSU (30-50 cst.) at 38°C (100°F). Normal operating viscosity range between 80-1000 SSU (17-180 cst.). Maximum start-up viscosity is 4000 SSU (1000 cst.).

NOTE: Consult Parker when exceeding 71°C (160°F) Inlet Fluid Temperatures. Oil should have maximum anti-wear properties, rust and oxidation treatment.

Filtration

For maximum pump and system component life, the system should be protected from contamination at a level not to exceed 125 particles greater than 10 microns per milliliter of fluid. (SAE Class 4/ISO 16/13.) Due to the nature of variable displacement pumps, variations in pump inlet conditions, fluid acceleration losses, system aeration, and duty cycle we do not recommend suction line filters. We do recommend the use of a properly sized, in-tank, suction strainer. Contact your Parker representative for assistance.

Start-Up

On initial start-up, the case should be filled with oil, pressure adjustments should be reduced and the circuit should be open to permit priming.

Inlet Conditions

Not to exceed .17 bar (5 In. Hg.) Vacuum at 1800 RPM on petroleum base fluids. See recommended speed spectrum for specific inlet conditions.

Shaft Rotation and Line Up

Pump and motor shaft alignment must be within .010 TIR maximum, using a standard floating coupling. Please follow coupling manufacturer's recommended installation instructions to prevent end thrust on pump shaft. Turn pump to assure freedom of rotation. Pump and motor must be on a rigid base.

The coupling should be sized to absorb the peak horsepower developed.

**Installation and Mounting**

When mounting a PVP Series Pump, the “case drain” must be on top of the pump. The “case drain” should be a separate line unrestricted to the reservoir and extend below the oil level as far from the inlet line as possible. The “case drain” line must not exceed **.7 bar (10 PSI)** back pressure. Suggested maximum line length is 10 feet.

Special Installations

Consult your Parker representative for any application requiring the following:

Pressure above rated, drive speed above maximum, indirect drive, fluid other than petroleum oil, oil temperature above 71°C (160°F).

Inlet Pressure

Not to exceed 1.72 bar (25 PSI).

Technical Information

- CV** Check Valves
- SH** Shuttle Valves
- LM** Load/Motor Controls
- FC** Flow Controls
- PC** Pressure Controls
- LE** Logic Elements
- DC** Directional Controls
- MV** Manual Valves
- SV** Solenoid Valves
- PV** Proportional Valves
- CE** Coils & Electronics
- BC** Bodies & Cavities
- TD** Technical Data

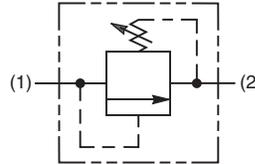
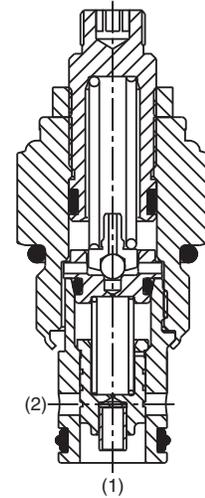
General Description

Pilot Operated Spool-Type Relief Valve
For addition information see Technical Tips on pages PC1-PC6.



Features

- Hardened, precision ground parts for durability
- Low profile adapter for minimal space requirements
- Fully guided poppet for more consistent reseal
- Steel adapters are coated with yellow zinc dichromate for protection from salt spray
- Polyurethane "D"-Ring eliminates backup rings and prevents hydrolysis
- Internal screening protects pilot spring from debris



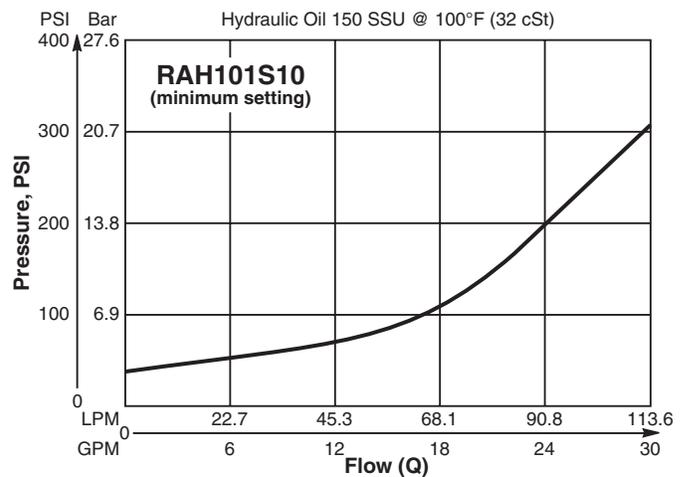
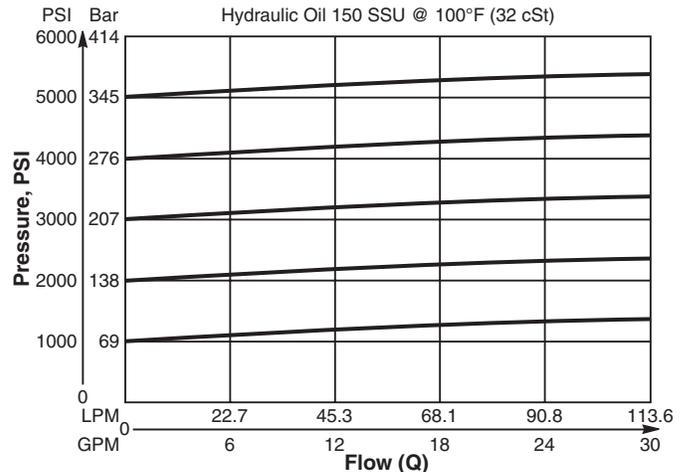
Specifications

Rated Flow	113 LPM (30 GPM)
Maximum Inlet Pressure	380 Bar (5500 PSI)
Maximum Pressure Setting	350 Bar (5000 PSI)
Maximum Tank Pressure	350 Bar (5000 PSI)
Reseat Pressure	90% of crack pressure
Leakage at 150 SSU (32 cSt)	5 cc per 100 PSI (6.8 Bar) setting
Cartridge Material	All parts steel. All operating parts hardened steel.
Operating Temp. Range/Seals	-45°C to +93.3°C ("D"-Ring) (-50°F to +200°F) -31.7°C to +121.1°C (Fluorocarbon) (-25°F to +250°F)
Fluid Compatibility/Viscosity	Mineral-based or synthetic with lubricating properties at viscosities of 45 to 2000 SSU (6 to 420 cSt)
Filtration	ISO Code 16/13, SAE Class 4 or better
Approx. Weight	.23 kg (.50 lbs.)
Cavity	C10-2 (See BC Section for more details)
Form Tool	Rougher None Finisher NFT10-2F

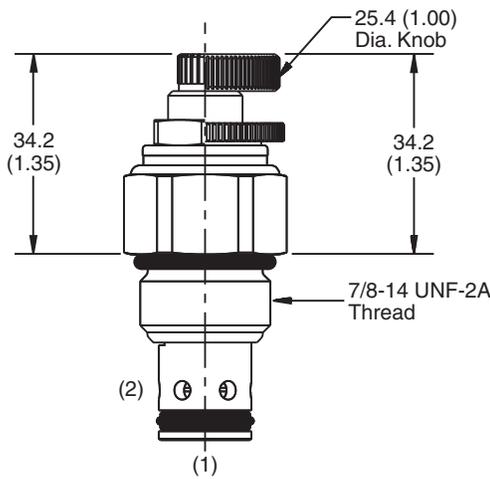
Performance Curves

Flow vs. Inlet Pressure

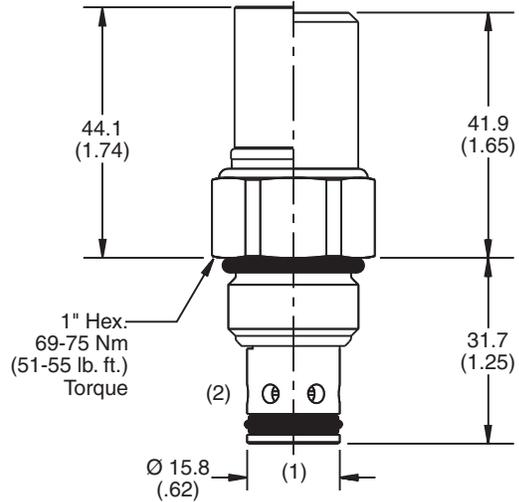
(Pressure rise through cartridge only)



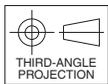
Dimensions Millimeters (Inches)



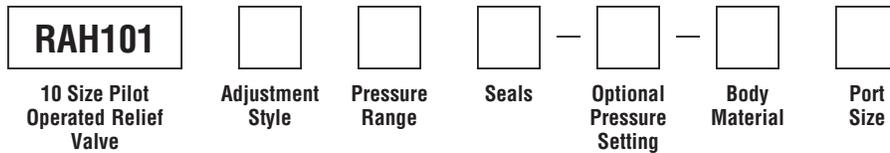
Screw/Knob Version



Fixed Cap/Tamper Resistant Version



Ordering Information



Code	Adjustment Style / Kit No.
F	Fixed style, preset at factory.
K	Knob Adjust (717784-10)
S	Screw Adjust
T	Tamper Resistant Cap (718083)

Code	Seals / Kit No.
Omit	"D"-Ring / (SK10-2)
N	Nitrile / (SK10-2N)
V	Fluorocarbon / (SK10-2V)

Code	Body Material
Omit	Steel
A	Aluminum

Code	Pressure Range
10	6.9 - 69 Bar (100 - 1000 PSI) Standard Setting: 34.5 Bar (500 PSI) @ crack pressure, approximately .95 LPM (.25 GPM)
20	6.9 - 138 Bar (100 - 2000 PSI) Standard Setting: 69 Bar (1000 PSI) @ crack pressure, approximately .95 LPM (.25 GPM)
30	13.8 - 207 Bar (200 - 3000 PSI) Standard Setting: 103.5 Bar (1500 PSI) @ crack pressure, approximately .95 LPM (.25 GPM)
50	13.8 - 345 Bar (200 - 5000 PSI) Standard Setting: 172.4 Bar (2500 PSI) @ crack pressure, approximately .95 LPM (.25 GPM)

Optional Pressure Setting
Pressure ÷ 10 i.e. 235 = 2350 PSI (Omit if standard setting is used)
Setting Range: 100 to 5000 PSI All settings at crack pressure, approximately .95 LPM (.25 GPM)

Code	Port Size	Body Part No.
Omit	Cartridge Only	
4P	1/4" NPTF	(B10-2-*4P)
6P	3/8" NPTF	(B10-2-*6P)
8P	1/2" NPTF	(B10-2-*8P)
6T	SAE-6	(B10-2-*6T)
8T	SAE-8	(B10-2-*8T)
T8T	SAE-8	(B10-2-T8T)†
6B	3/8" BSPG	(B10-2-6B)†

* Add "A" for aluminum, omit for steel.
 † Steel body only.

PT Tank Top Mounted filters

Max. 400 l/min - 10 bar



An economical alternative for quality tank top mounted filtration

In to out flow design avoids re-contamination of the hydraulic system

The PT tank top mounted filter features an aluminium filter head and screw-in style filter elements. This offers the opportunity to use the filter element as screw-in style for co-polymer reservoirs. With a patented design that protects the quality of filtration, the PT offers a modularity and value for money.



Contact Information:

Parker Hannifin
Hydraulic Filter Division Europe

European Product Information Centre
Freephone: 00800 27 27 5374
(from AT, BE, CH, CZ, DE, EE, ES, FI, FR, IE, IT, PT, SE, SK, UK)
filtrationinfo@parker.com

www.parkerhfde.com

Product Features:

- Compact tank top mounted return line filter.
- Filter element can be used for direct screw-in mounting with co-polymer reservoirs.
- Patented filter element.
- In to Out flow avoids re-contamination of the system.
- Flow capability up to 400 l/min at 10 bar working pressure.
- Full options available July 2010.

PT Tank Top Mounted filters

Max. 400 l/min - 10 bar

Features & Benefits

Features	Advantages	Benefits
Aluminium filter head	Low profile, lightweight and durable	Less weight, smaller envelope and cleaner appearance.
In-to-Out filtration	All captured contamination retains inside the element	No recontamination of the system during change of element
Disposable filter cartridge	Easy to change cartridge	New housing cover and seals provided with each element change
Microglass III media	Multi-layered design produces high capacity and efficiency	Reliable performance. Reduced downtime

Typical Applications

- Lorry mounted cranes
- Agricultural equipment
- Grass cutting equipment
- Container hook loaders

The Parker Filtration PT tank top mounted series

The PT Series filter is available in various sizes covering a flow rate up to 400 l/min. Using the Microglass III media in 2, 5, 10 and 20 microns it provides premium particle removal efficiency.

This unique design simply threads into a ported tank ring, which can be bolted to a metal reservoir.

The disposable filter cartridge is a single-piece construction, which incorporates the nylon cover and integral 2 bar bypass valve. The flow path is inside-out and requires no special tools for service.

This concept assures minimal installation costs with the least space requirements for return line applications.



Specification

Pressure ratings:

Max. 10 bar.

Connections

PT2: G $\frac{3}{4}$ " and G1"

PT4: G1" or G1 $\frac{1}{4}$ "

Filter housing:

Aluminium

Filter element:

Patented design including cover for filter housing (one disposable unit)

Seal material:

Nitrile, Fluoroelastomer

Operation temperature:

-20°C to + 100°C

Bypass:

1.7 bar

Degree of filtration:

Determined by multipass test in accordance to ISO16889

Flow fatigue:

Filter media is supported so that the optimal fatigue life is achieved (ISO3724)

Filter Media:

Microglass III

Indicator options:

Visual and electrical switch (NO/NC) type

Fluid compatibility:

Mineral and HEES type fluids

Principle of Filtration

The PT applies In-to-Out Filtration, this ensures that captured contamination is retained in the element during servicing the filter.

Bypass valve is integrated in the filter bottom element end cap. The filter element is completely disposable.

Safety First

Each spare filter element is including seals for the sealing between tank top mounted filter housing and filter element. Because all seals are pre-mounting, no risk that (incorrect) seals are not replaced.

PT Reservoir 'screw-in' solution to reduce costs and space

The PT applies In-to-Out Filtration, this ensures that captured contamination is retained. The PT element can be integrated directly into a co-polymer reservoir. Parker Filtration can provide cavity details to co-polymer reservoir manufacturers to support this innovative solution.

This cavity includes the integrated return line port and optional connection for the pressure switch.

Thanks to the complete screw-in style solution, typically over 30% of the first fit cost can be reduced, the reservoir surface remains flat and hence can support more compact solutions, in particular for mobile applications.

Compared to the traditional tank top mounted filter, improved sealing between the reservoir and the filter can be achieved, eliminating potential leakage areas by 50% typically.

Please consult Parker Filtration for engineered reservoir solutions



Important information when applying airtight funnels

Recommended opening in the tank top plate for the PT

supplied with air tight funnel:

PT2 : 63.5 mm +/- 0.2 mm

PT4 : 98.5 mm +/- 0.2 mm

Installation Information

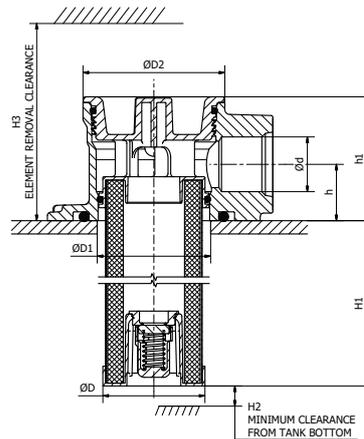
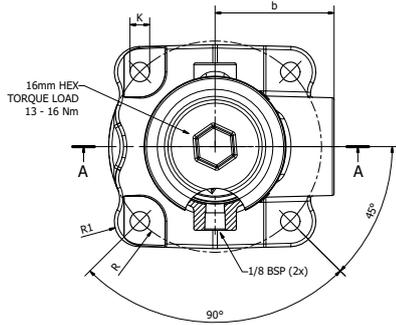
	Build in length in tank (mm)
PT2 Length 1	95
PT2 Length 2	185
PT2 Length 3	280
PT4 Length 1	98
PT4 Length 1	189
PT4 Length 1	310

PT Tank Top Mounted filters

Max. 400 l/min - 10 bar

Specification (cont)

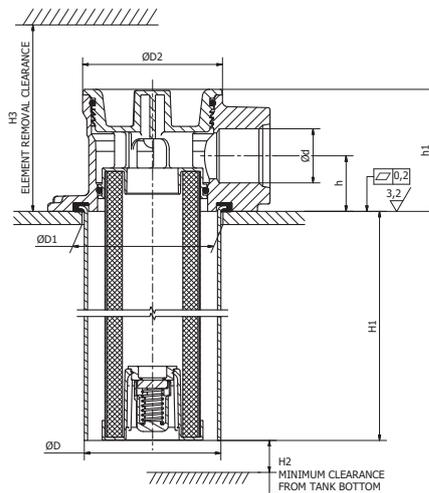
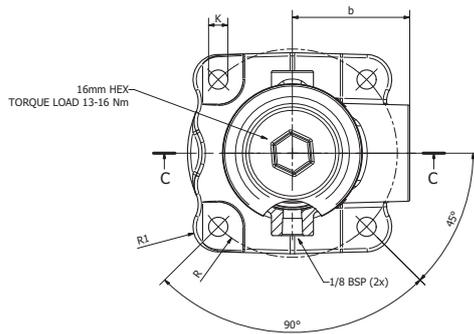
PT2 Assembly without funnel



PT2 Screw-in Filter

Type	Connection Options	H1	H2	H3	h	h1	ØD	ØD1	ØD2	b	R	R1	K
PT2-1	G3/4, G1	78	6,5	190	25,4	56	Ø46	Ø51	Ø64	53	48	12	4x8,8
PT2-2	G3/4, G1	181	6,5	293	25,4	56	Ø46	Ø51	Ø64	53	48	12	4x8,8
PT2-3	G3/4, G1	277	6,5	389	25,4	56	Ø46	Ø51	Ø64	53	48	12	4x8,8

PT2 Assembly with funnel

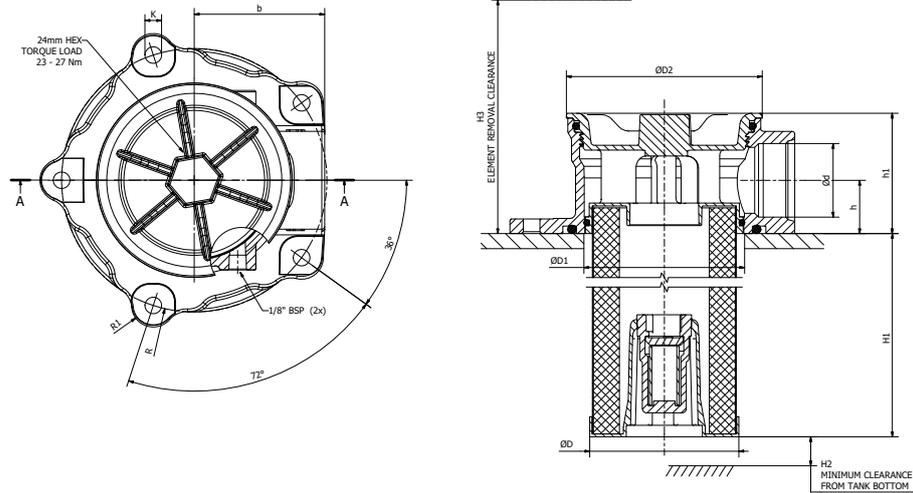


PT2 Screw-in Filter

Type	Connection Options	H1	H2	H3	h	h1	ØD	ØD1 +/-0,5	ØD2	b	R	R1	K
PT2-1	G3/4, G1	78	6,5	190	25,4	56	Ø62	Ø64	Ø64	53	48	12	4x8,8
PT2-2	G3/4, G1	181	6,5	293	25,4	56	Ø62	Ø64	Ø64	53	48	12	4x8,8
PT2-3	G3/4, G1	277	6,5	389	25,4	56	Ø62	Ø64	Ø64	53	48	12	4x8,8

Specification (cont)

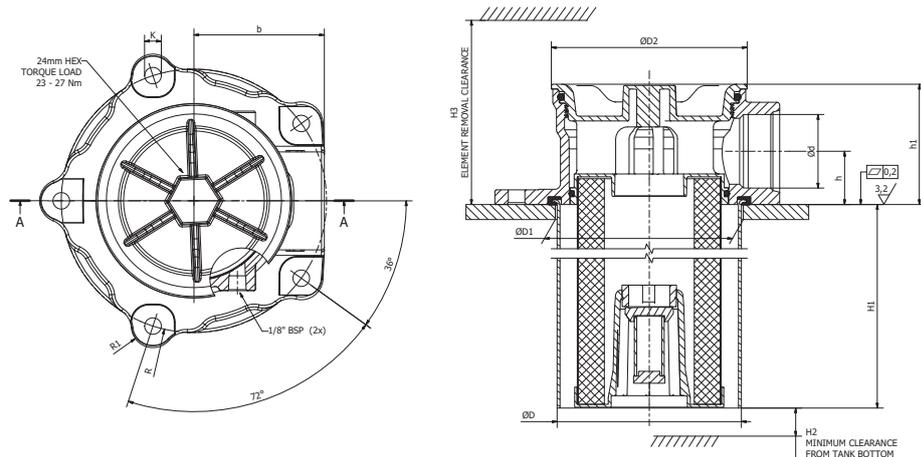
PT4 Assembly without funnel



PT4 Screw-in Filter

Type	Connection Options	H1	H2	H3	h	h1	ØD	ØD1	ØD2	b	R	R1	K
PT4-1	G1, G1-1/4	94	10	222	28.2	64	Ø78.5	Ø85	Ø103	69	70	12	5xØ8,8
PT4-2	G1, G1-1/4	185	10	313	28.2	64	Ø78.5	Ø85	Ø103	69	70	12	4xØ8,8
PT4-3	G1, G1-1/4	306	10	434	28.2	64	Ø78.5	Ø85	Ø103	69	70	12	4xØ8,8

PT4 Assembly with funnel



PT4 Screw-in Filter

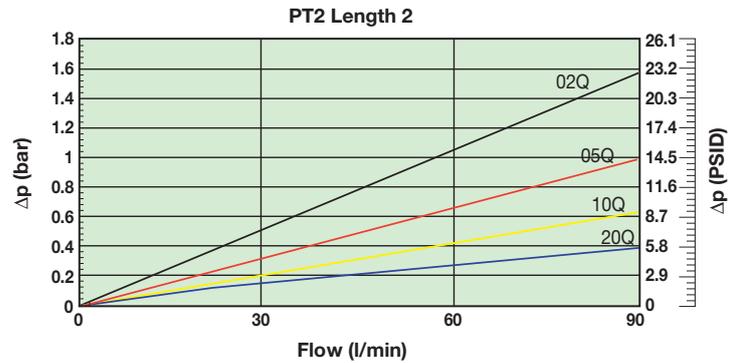
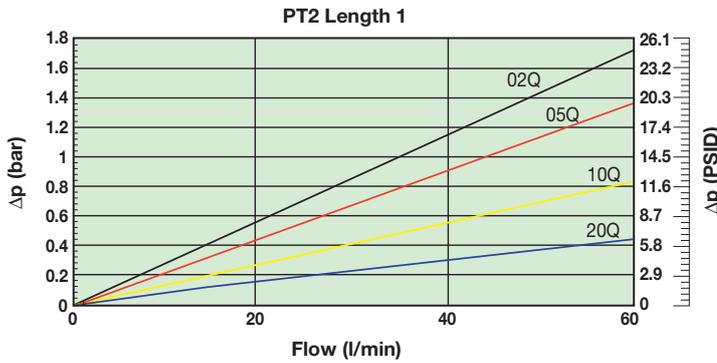
Type	Connection Options	H1	H2	H3	h	h1	ØD	ØD1 +/-0,5	ØD2	b	R	R1	K
PT4-1	G1, G1-1/4	94	10	222	28.2	64	Ø97	Ø99	Ø103	69	70	12	5xØ8,8
PT4-2	G1, G1-1/4	185	10	313	28.2	64	Ø97	Ø99	Ø103	69	70	12	5xØ8,8
PT4-3	G1, G1-1/4	306	10	434	28.2	64	Ø97	Ø99	Ø103	69	70	12	5xØ8,8

PT Tank Top Mounted filters

Max. 400 l/min - 10 bar

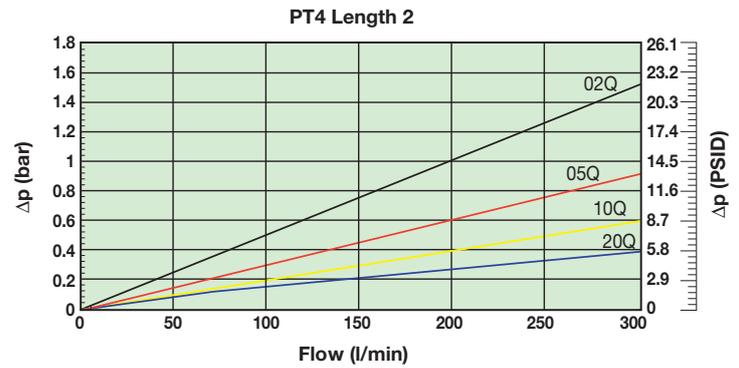
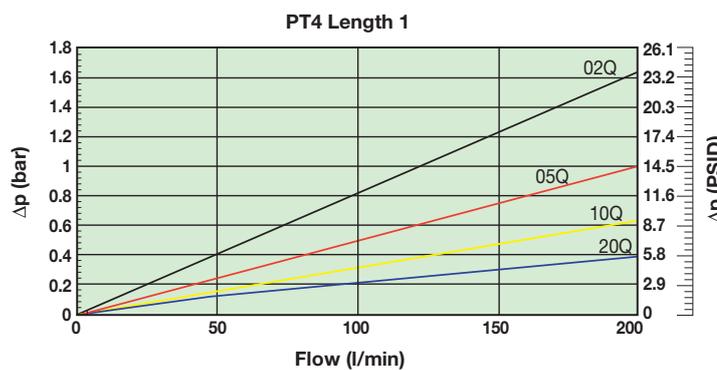
Pressure Drop Curves (Type SR1)

Flow Performance Charts - PT2 Series

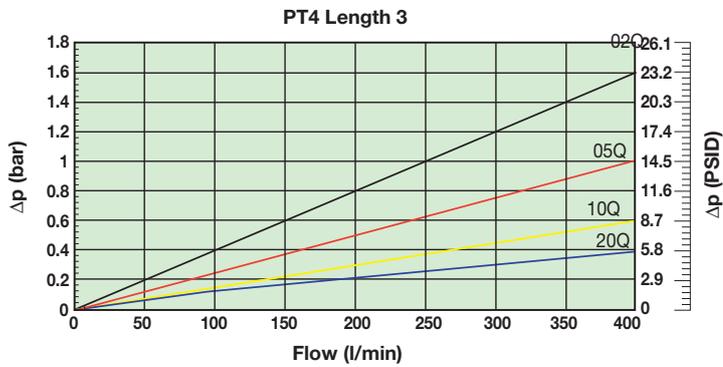


All delta-p values are based on 30 cSt fluid and 0,87 kg/l density

Flow Performance Charts - PT4 Series

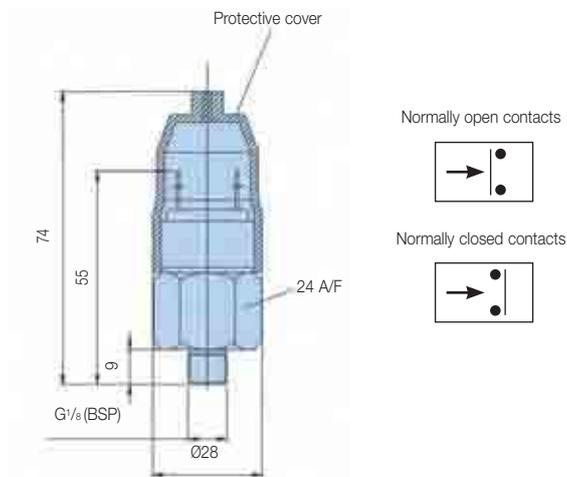


Flow Performance Charts - PT4 Series



Indicator Information

Indicator PS NO/NC pressure switch



Specifications	
Elec. rating	42V / 2A
Thread connection	G ¹ / ₈
Elec. connection	AMP terminal 6.3 x 0.8
Protection	IP65 (terminal IP00)
Switch type	NO or NC
Code	FMUS2EBMG02L (NO switch)
	FMUS3EBMG02L (NC switch)

Ordering Information

Product configurator

Configurator example PT filter

Box 1	Box 2	Box 3	Box 4	Box 5	Box 6	Box 7	Box 8
PT2	1	10Q	B	P	G	G12	I

Box 1

Housing	Code
PT2	PT2
PT4	PT4

Highlights Key (Denotes part number availability)

123	Item is standard
123	Item is standard green option
123	Item is semi standard
123	Item is non standard

Note: Standard items are in stock, semi standard items are available within four weeks

Box 2

Element Length	Code
Length 1	1
Length 2	2
Length 3 (PT4 only)	3

Box 3

Filter media (Microglass III)	Code
2 micron	02Q
5 micron	05Q
10 micron	10Q
20 micron	20Q

Box 4

Seal Material	Code
Nitrile	B
Viton	V

Box 5

Indicator	Code
Plugged port	P
Pressure Switch 24V, 1.2 bar setting, NO	S2
Pressure Switch 24V, 1.2 bar setting, NC	S3

Box 6

Bypass Valve	Code
1.7 bar	G

Box 7

Ports	Code
G ³ / ₄ (PT2 only)	G12
G1	G16
G1 ¹ / ₄ (PT4 only)	G20

Box 8

Options	Code
No diffuser required	1
Airtight diffuser	4

Spare Filter Elements

Media	PT2-1	PT2-2	PT4-1	PT4-2	PT4-3
20Q	936753Q	936757Q	936745Q	936749Q	936879Q
10Q	936752Q	936756Q	936744Q	936748Q	936878Q
05Q	936751Q	936755Q	936743Q	936747Q	936877Q
02Q	936750Q	936754Q	936742Q	936746Q	936876Q

Filter Media Efficiency

Degree of filtration						Media code
Average filtration beta ratio β (ISO 16889) / particle size μm [c]						
$\beta\text{x}(\text{c})=2$	$\beta\text{x}(\text{c})=10$	$\beta\text{x}(\text{c})=75$	$\beta\text{x}(\text{c})=100$	$\beta\text{x}(\text{c})=200$	$\beta\text{x}(\text{c})=1000$	
% efficiency, based on the above beta ratio (βx)						
50.0%	90.0%	98.7%	99.0%	99.5%	99.9%	
N/A	N/A	N/A	N/A	N/A	4.5	02Q/02QL
N/A	N/A	4.5	5	6	7	05Q/05QL
N/A	6	8.5	9	10	12	10Q/10QL
6	11	17	18	20	22	20Q/20QL

Note 1: Part numbers featured with bold highlighted codes will ensure a 'standard' product selection.

Note 2: Alternate displayed part number selection will require you to contact Parker Filtration for availability.



Test



Quality and Service
Worldwide

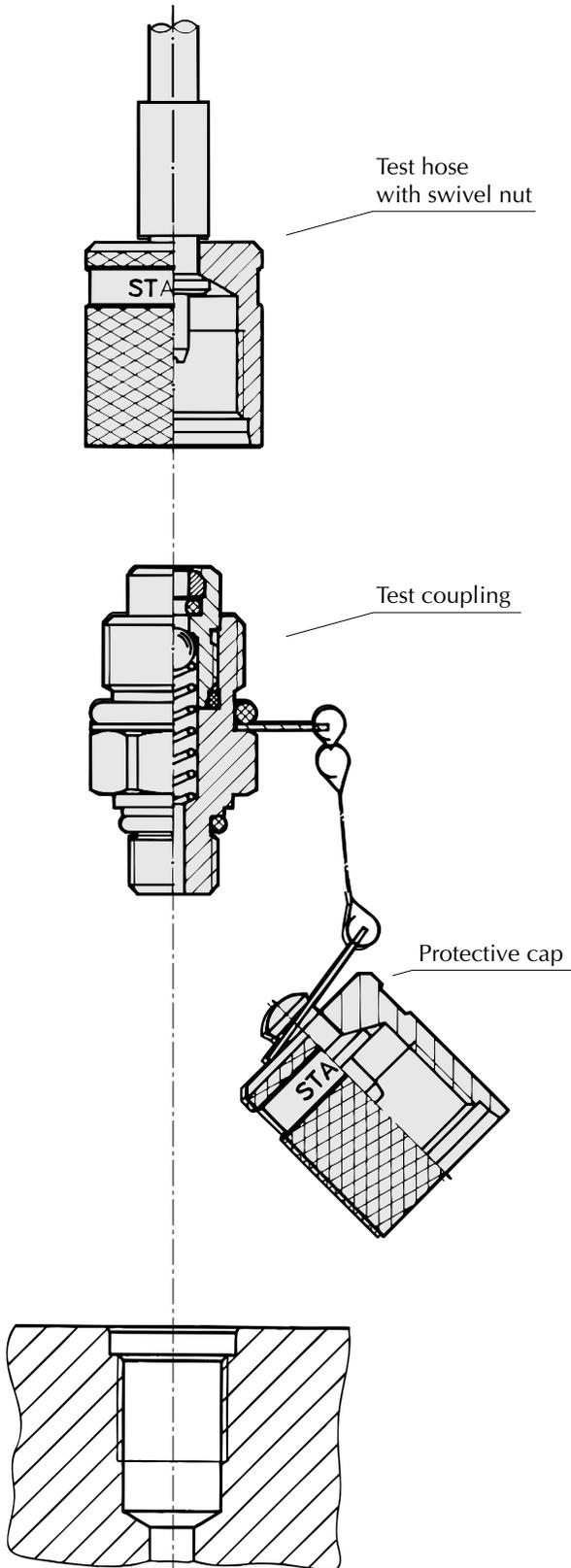


TEST 20

TYPE SMK

CONNECTION THREAD M 16 X 2

TEST



FAST COUPLING FOR:

- Monitoring and control of pressure
- Venting
- Sampling

ADVANTAGES:

- Test system at working pressure
- Connection is leakproof before **ball check** is open
- Simple connection to measurement, control and switching devices
- Self locking metal protective cap
- Minimizes introduction of contamination into hydraulic systems

WORKING PRESSURE:

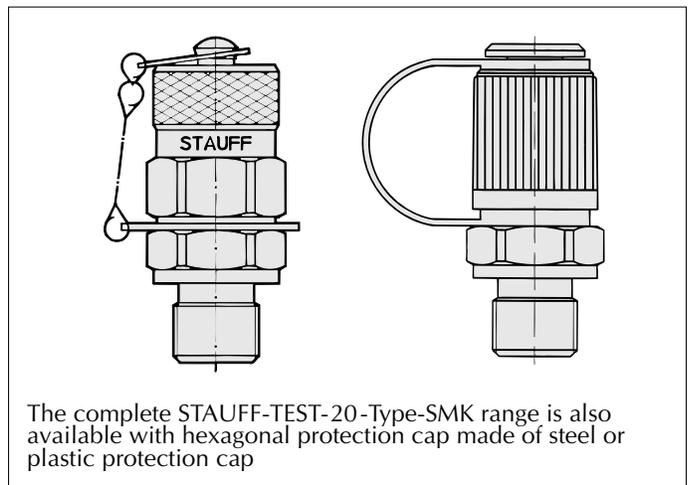
- Max. working pressure 9000 Psi (630 bar)
For SMK style G, K and S the recommended working pressure of fitting manufacturer should be noted
- Connection under pressure up to 5800 Psi (400 bar) max.

MATERIALS:

- Metal parts: Steel, Stainless Steel on request
- Ball: Stainless Steel
- Seals:
 - P = NBR-BUNA Temperature range – 4°F to +195°F
(– 20° C to +90° C)
 - V = FPM-VITON Temperature range – 4°F to +392°F
(– 20° C to +200° C)
 - E = EPDM Ethylene Propylene (for Brake Fluid)
Temperature range – 40°F to +302°F
(– 40° C to + 150° C)
- Hose: Polyamide Temperature range –31°F to +212°F
(–35° C to +100° C)

MEDIA:

- Suitable for hydraulic oils and other mineral oil based fluids (Check compatibility of seal material)
- For use with other liquid media please consult STAUFF for availability of alternate seals



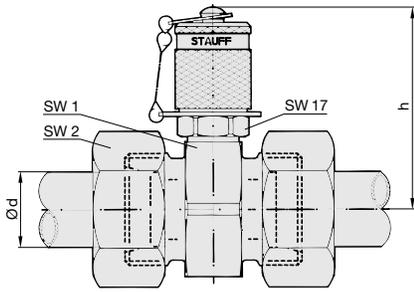
3/00

TEST 20

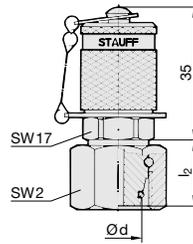
TYPE SMK

CONNECTION THREAD M 16 X 2

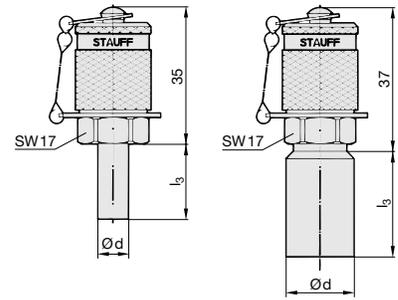
TEST COUPLING SMK (COMPRESSION RING FITTINGS ACC. TO DIN 2353)



Type G Test coupling complete with straight fitting



Type K Test coupling for 24° cone fittings

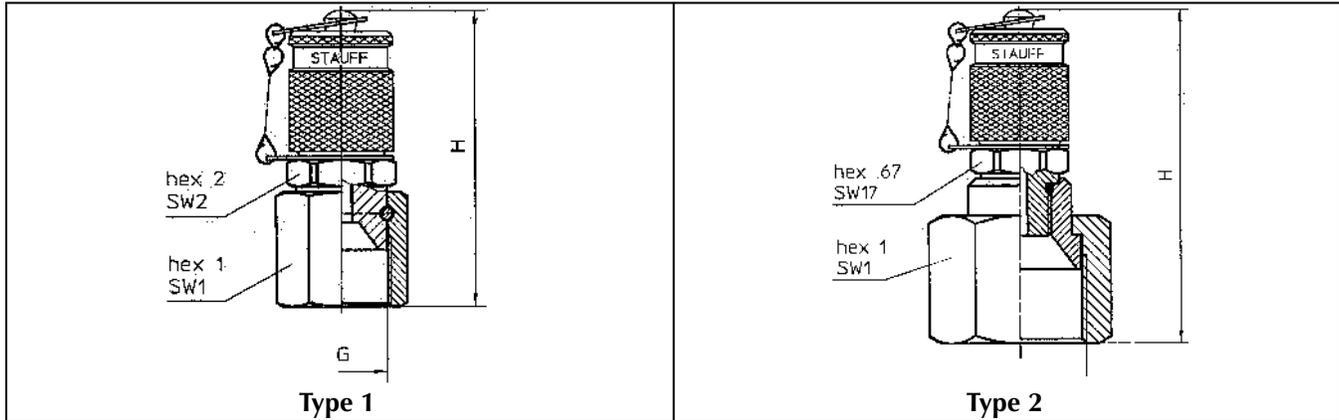


Type S Test coupling for compression ring assembly (not to be used for new constructions)

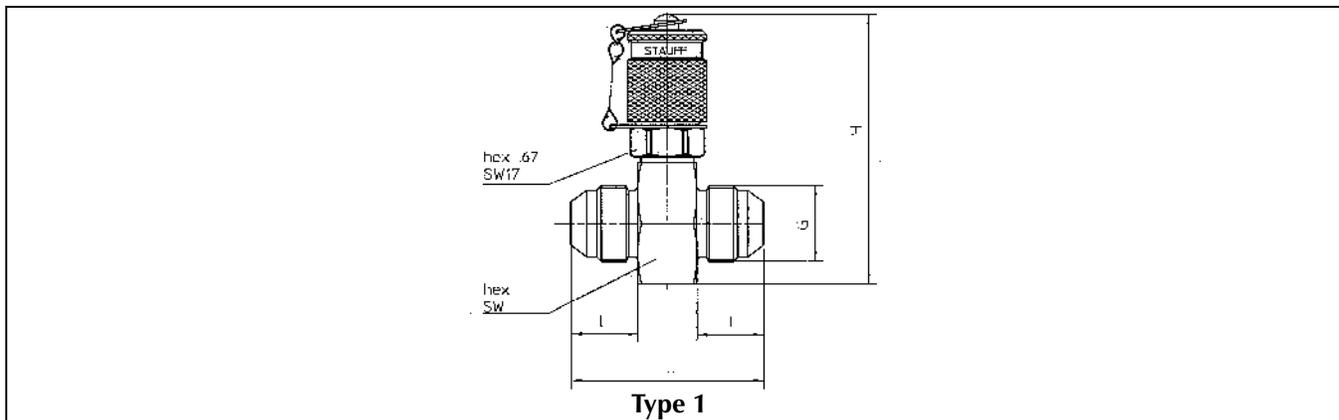
Series	PN	Pipe Ød	I ₂		I ₃		h		SW 1		SW 2		Order No.*		
			mm	in	mm	in	mm	in	mm	in	mm	in	Type G	Type K	Type S
L	315	6	15,5	0.61	20	0.79	49	1.93	24	0.94	14	0.55	SMK 20 – 6L-PG	SMK 20 – 6L-PK	SMK 20 – 6-PS
		8	15,5	0.61	20	0.79	49	1.93	24	0.94	17	0.67	SMK 20 – 8L-PG	SMK 20 – 8L-PK	SMK 20 – 8-PS
		10	16,5	0.65	22	0.87	49	1.93	24	0.94	19	0.75	SMK 20 – 10L-PG	SMK 20 – 10L-PK	SMK 20 – 10-PS
		12	17,5	0.69	22	0.87	50,5	1.99	27	1.06	22	0.87	SMK 20 – 12L-PG	SMK 20 – 12L-PK	SMK 20 – 12-PS
		15	21	0.83	25	0.98	52	2.05	30	1.18	27	1.06	SMK 20 – 15L-PG	SMK 20 – 15L-PK	SMK 20 – 15-PS
		18	19,5	0.77	28	1.10	53	2.09	32	1.26	32	1.26	SMK 20 – 18L-PG	SMK 20 – 18L-PK	SMK 20 – 18-PS
	160	22	20,5	0.81	30	1.18	55	2.17	36	1.42	36	1.42	SMK 20 – 22L-PG	SMK 20 – 22L-PK	SMK 20 – 22-PS
		28	25	0.98	32	1.26	57,5	2.26	41	1.61	41	1.61	SMK 20 – 28L-PG	SMK 20 – 28L-PK	SMK 20 – 28-PS
		35	30	1.18	42	1.65	60	2.36	46	1.81	50	1.97	SMK 20 – 35L-PG	SMK 20 – 35L-PK	SMK 20 – 35-PS
		42	31	1.22	45	1.77	64,5	2.54	55	2.17	60	2.36	SMK 20 – 42L-PG	SMK 20 – 42L-PK	SMK 20 – 42-PS
S	630	6	14,5	0.57	20	0.79	49	1.93	24	0.94	17	0.67	SMK 20 – 6S-PG	SMK 20 – 6S-PK	SMK 20 – 6-PS
		8	16,5	0.65	20	0.79	49	1.93	24	0.94	19	0.75	SMK 20 – 8S-PG	SMK 20 – 8S-PK	SMK 20 – 8-PS
		10	16,5	0.65	22	0.87	49	1.93	24	0.94	22	0.87	SMK 20 – 10S-PG	SMK 20 – 10S-PK	SMK 20 – 10-PS
		12	17,5	0.69	22	0.87	49	1.93	24	0.94	24	0.94	SMK 20 – 12S-PG	SMK 20 – 12S-PK	SMK 20 – 12-PS
		14	19,5	0.77	22	0.87	50,5	1.99	27	1.06	27	1.06	SMK 20 – 14S-PG	SMK 20 – 14S-PK	SMK 20 – 14-PS
	400	16	18	0.71	28	1.10	52	2.05	30	1.18	30	1.18	SMK 20 – 16S-PG	SMK 20 – 16S-PK	SMK 20 – 16-PS
		20	24	0.94	30	1.18	55	2.17	36	1.42	36	1.42	SMK 20 – 20S-PG	SMK 20 – 20S-PK	SMK 20 – 20-PS
		25	26	1.02	36	1.42	57,5	2.26	41	1.61	46	1.81	SMK 20 – 25S-PG	SMK 20 – 25S-PK	SMK 20 – 25-PS
		30	30	1.18	41	1.61	60	2.36	46	1.81	50	1.97	SMK 20 – 30S-PG	SMK 20 – 30S-PK	SMK 20 – 30-PS
		315	38	1.34	48	1.89	64,5	2.54	55	2.17	60	2.36	SMK 20 – 38S-PG	SMK 20 – 38S-PK	SMK 20 – 38-PS

* For ordering VITON seals please replace "P" with "V"
 * For EPDM seals replace "P" with "E"

TEST COUPLING SMK – JIC CONNECTION



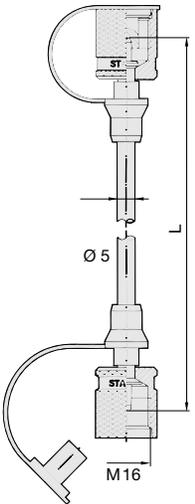
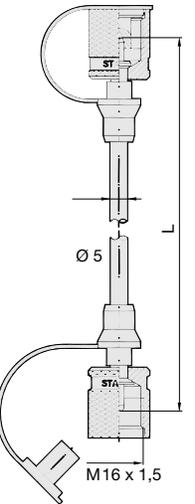
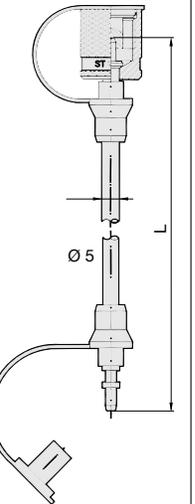
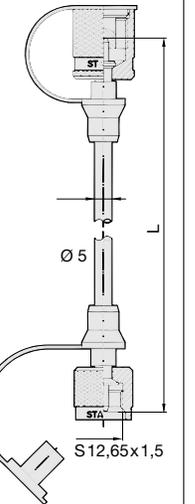
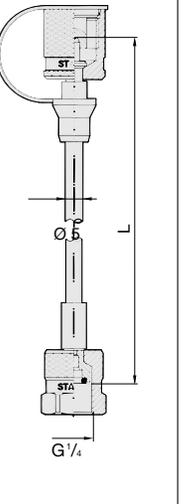
Pipe Size inch	JIC Size	G UNF	H		hex SW		Type	Order No.
			mm	inch	1	2		
1/4"	- 4	7/16" - 20	52	2.047	17	17	1	SMK20-JIC1/4-VK
5/16"	- 5	1/2" - 20	53	2.087	17	17	1	SMK20-JIC5/16-VK
3/8"	- 6	9/16" - 18	55	2.165	19	17	1	SMK20-JIC3/8-VK
1/2"	- 8	3/4" - 16	56	2.205	22	19	1	SMK20-JIC1/2-VK
5/8"	- 10	7/8" - 14	59	2.323	27	22	1	SMK20-JIC5/8-VK
3/4"	- 12	1-1/16" - 12	70	2.756	32		2	SMK20-JIC3/4-VK
1"	- 16	1-5/16" - 12	69	2.716	38		2	SMK20-JIC1-VK
1 1/4"	- 20	1-5/8" - 12	72	2.835	50		2	SMK20-JIC1-1/4-VK
1 1/2"	- 24	1-7/8" - 12	75	2.953	60		2	SMK20-JIC1-1/2-VK



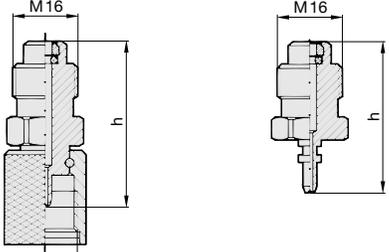
Pipe Nenngröße inch	JIC Size	G UNF	H		hex SW	L	I	Order No.
			mm	inch				
1/4"	- 4	7/16" - 20	61	2.401	24	43	14	SMK20-JIC1/4-VG
5/16"	- 5	1/2" - 20	61	2.401	24	43	14	SMK20-JIC5/16-VG
3/8"	- 6	9/16" - 18	61	2.401	24	43.2	14.1	SMK20-JIC3/8-VG
1/2"	- 8	3/4" - 16	67	2.638	30	48.4	16.7	SMK20-JIC1/2-VG
5/8"	- 10	7/8" - 14	67	2.638	30	53.6	19.3	SMK20-JIC5/8-VG
3/4"	- 12	1-1/16" - 12	73	2.874	36	58.8	21.9	SMK20-JIC3/4-VG
1"	- 16	1-5/16" - 12	78	3.071	41	61.2	23.1	SMK20-JIC1-VG
1 1/4"	- 20	1-5/8" - 12	83	3.268	46	65.6	24.3	SMK20-JIC1-1/4-VG
1 1/2"	- 24	1-7/8" - 12	92	3.622	55	72	27.5	SMK20-JIC1-1/2-VG

3/00 * For EPDM seals replace "P" with "E"

TEST HOSE SMS (formerly HFF)(for gaseous media Specify Type SGS)

<p>Max. working pressure 5800 Psi (400 bar)</p> <p>Test hose: Nominal bore 0.08" (2 mm)</p> <p>Minimum bending radius 0.75" (20 mm)</p> <p>Nominal bore 0.16" 4 mm also available</p> <p>Pressure/t^o factor: to 0°C 122 % at 30°C 110 % at 50°C 100 % at 80°C 86 % at 100°C 77 %</p> <p>Hose construction: Hose-core and -cover PA</p> <p>Reinforcement: Synthetic fibre</p> <p>Bursting pressure: 15,950 Psi (1100 bar)</p>	<p>Stauff-Test 20/20</p>  <p>STAUFF-TEST 20</p>	<p>Stauff-Test 15/20</p>  <p>STAUFF-TEST 15</p>	<p>Stauff-Test 10/20</p>  <p>STAUFF-TEST 10</p>	<p>Stauff-Test 12/20²⁾</p>  <p>STAUFF-TEST 12</p>	<p>Stauff-Test 20/G^{1/4}</p>  <p>GAUGE ADAPTOR</p>	
	Length L ¹⁾	Order No.				
	12"	SMS-20 – 012-A	SMS-15/20 – 012-A	SMS-10/20 – 012-A	SMS-12/20 – 012-A	SMS-20/M ^{1/4} -P-OR – 012-A
	24"	SMS-20 – 024-A	SMS-15/20 – 024-A	SMS-10/20 – 024-A	SMS-12/20 – 024-A	SMS-20/M ^{1/4} -P-OR – 024-A
	36"	SMS-20 – 036-A	SMS-15/20 – 036-A	SMS-10/20 – 036-A	SMS-12/20 – 036-A	SMS-20/M ^{1/4} -P-OR – 036-A
	48"	SMS-20 – 048-A	SMS-15/20 – 048-A	SMS-10/20 – 048-A	SMS-12/20 – 048-A	SMS-20/M ^{1/4} -P-OR – 048-A
	60"	SMS-20 – 060-A	SMS-15/20 – 060-A	SMS-10/20 – 060-A	SMS-12/20 – 060-A	SMS-20/M ^{1/4} -P-OR – 060-A
	72"	SMS-20 – 072-A	SMS-15/20 – 072-A	SMS-10/20 – 072-A	SMS-12/20 – 072-A	SMS-20/M ^{1/4} -P-OR – 072-A
	96"	SMS-20 – 096-A	SMS-15/20 – 096-A	SMS-10/20 – 096-A	SMS-12/20 – 096-A	SMS-20/M ^{1/4} -P-OR – 096-A
	120"	SMS-20 – 120-A	SMS-15/20 – 120-A	SMS-10/20 – 120-A	SMS-12/20 – 120-A	SMS-20/M ^{1/4} -P-OR – 120-A
Custom lengths available on request						
¹⁾ Bending protection and other lengths on request		²⁾ Special thread: buttress thread S 12,65 x 1,5		³⁾ Gauge adaptor 1/4 NPT, G 1/2 and 1/2 NPT on request		

TRANSITION ADAPTOR SAD

 <p>Type A</p> <p>Type B</p>	G	h	Type	Order No.		
		in		mm	NBR (BUNA)	FPM (VITON)
	M16 x 1,5	1.53	39	A	SAD 20/15-P	SAD 20/15-V
	plug in	1.45	37	B	SAD 20/10-P	SAD 20/10-V
S12 ¹⁾	1.53	39	A	SAD 20/12-P	SAD 20/12-V	
¹⁾ Special thread: buttress thread S 12,65 x 1,5						

BULKHEAD SSK (for gaseous medium Type SSK)

	<table border="1"> <thead> <tr> <th rowspan="2">G</th> <th colspan="2">h</th> <th rowspan="2">Type</th> <th colspan="2">Order No.</th> </tr> <tr> <th>mm</th> <th>in</th> <th>NBR (BUNA)</th> <th>FPM (VITON)</th> </tr> </thead> <tbody> <tr> <td>M16</td> <td>72</td> <td>2.8</td> <td>A</td> <td>SSK 20-P</td> <td>SSK 20-V</td> </tr> <tr> <td>M16 x 1,5¹⁾</td> <td>72</td> <td>2.8</td> <td>B</td> <td>SSK 20/08 S-P</td> <td>SSK 20/08 S-V</td> </tr> <tr> <td>M18 x 1,5¹⁾</td> <td>72</td> <td>2.8</td> <td>B</td> <td>SSK 20/12 L-P</td> <td>SSK 20/12 L-V</td> </tr> <tr> <td>7/16 UNF (-4 JIC)</td> <td>63</td> <td>2.48</td> <td>A</td> <td>N/A</td> <td>SSK20-7/16 JIC-MV</td> </tr> </tbody> </table>	G	h		Type	Order No.		mm	in	NBR (BUNA)	FPM (VITON)	M16	72	2.8	A	SSK 20-P	SSK 20-V	M16 x 1,5 ¹⁾	72	2.8	B	SSK 20/08 S-P	SSK 20/08 S-V	M18 x 1,5 ¹⁾	72	2.8	B	SSK 20/12 L-P	SSK 20/12 L-V	7/16 UNF (-4 JIC)	63	2.48	A	N/A	SSK20-7/16 JIC-MV
			G	h		Type	Order No.																												
mm	in	NBR (BUNA)		FPM (VITON)																															
M16	72	2.8	A	SSK 20-P	SSK 20-V																														
M16 x 1,5 ¹⁾	72	2.8	B	SSK 20/08 S-P	SSK 20/08 S-V																														
M18 x 1,5 ¹⁾	72	2.8	B	SSK 20/12 L-P	SSK 20/12 L-V																														
7/16 UNF (-4 JIC)	63	2.48	A	N/A	SSK20-7/16 JIC-MV																														
<p>¹⁾ Compression ring assembly 8 S/12 L acc. to DIN 2353</p>																																			

GAUGE ADAPTOR SMA

	<table border="1"> <thead> <tr> <th rowspan="2">G</th> <th colspan="2">h</th> <th rowspan="2">SW</th> <th colspan="2">Order No.</th> </tr> <tr> <th>mm</th> <th>in</th> <th>NBR (BUNA)</th> <th>FPM (VITON)</th> </tr> </thead> <tbody> <tr> <td>G 1/4</td> <td>54</td> <td>2.12</td> <td>19 .75</td> <td>SMA 20 - G 1/4 - P-OR</td> <td>SMA 20 - G 1/4 - V-OR</td> </tr> <tr> <td>G 1/2</td> <td>64</td> <td>2.52</td> <td>27 1.06</td> <td>SMA 20 - G 1/2 - P-OR</td> <td>SMA 20 - G 1/2 - V-OR</td> </tr> <tr> <td>1/4 NPT</td> <td>54</td> <td>2.12</td> <td>19 .75</td> <td>SMA 20 - 1/4 NPT-P</td> <td>SMA 20 - 1/4 NPT-V</td> </tr> <tr> <td>1/2 NPT</td> <td>64</td> <td>2.52</td> <td>27 1.06</td> <td>SMA 20 - 1/2 NPT-P</td> <td>SMA 20 - 1/2 NPT-V</td> </tr> </tbody> </table>	G	h		SW	Order No.		mm	in	NBR (BUNA)	FPM (VITON)	G 1/4	54	2.12	19 .75	SMA 20 - G 1/4 - P-OR	SMA 20 - G 1/4 - V-OR	G 1/2	64	2.52	27 1.06	SMA 20 - G 1/2 - P-OR	SMA 20 - G 1/2 - V-OR	1/4 NPT	54	2.12	19 .75	SMA 20 - 1/4 NPT-P	SMA 20 - 1/4 NPT-V	1/2 NPT	64	2.52	27 1.06	SMA 20 - 1/2 NPT-P	SMA 20 - 1/2 NPT-V
			G	h		SW	Order No.																												
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G 1/2	64	2.52	27 1.06	SMA 20 - G 1/2 - P-OR	SMA 20 - G 1/2 - V-OR																														
1/4 NPT	54	2.12	19 .75	SMA 20 - 1/4 NPT-P	SMA 20 - 1/4 NPT-V																														
1/2 NPT	64	2.52	27 1.06	SMA 20 - 1/2 NPT-P	SMA 20 - 1/2 NPT-V																														
<p>Damping element on request</p>																																			

DIRECT GAUGE ADAPTOR SMD

	<table border="1"> <thead> <tr> <th rowspan="2">G</th> <th colspan="2">h</th> <th rowspan="2">SW</th> <th colspan="2">Order No.</th> </tr> <tr> <th>mm</th> <th>in</th> <th>NBR (BUNA)</th> <th>FPM (VITON)</th> </tr> </thead> <tbody> <tr> <td>G 1/4</td> <td>41</td> <td>1.61</td> <td>19 .75</td> <td>SMD 20 - G 1/4 - P-OR</td> <td>SMD 20 - G 1/4 - V-OR</td> </tr> <tr> <td>G 1/2</td> <td>51</td> <td>2.0</td> <td>27 1.06</td> <td>SMD 20 - G 1/2 - P-OR</td> <td>SMD 20 - G 1/2 - V-OR</td> </tr> <tr> <td>1/4 NPT</td> <td>41</td> <td>1.61</td> <td>19 .75</td> <td>SMD 20 - 1/4 NPT-P</td> <td>SMD 20 - 1/4 NPT-V</td> </tr> <tr> <td>1/2 NPT</td> <td>51</td> <td>2.0</td> <td>27 1.06</td> <td>SMD 20 - 1/2 NPT-P</td> <td>SMD 20 - 1/2 NPT-V</td> </tr> </tbody> </table>	G	h		SW	Order No.		mm	in	NBR (BUNA)	FPM (VITON)	G 1/4	41	1.61	19 .75	SMD 20 - G 1/4 - P-OR	SMD 20 - G 1/4 - V-OR	G 1/2	51	2.0	27 1.06	SMD 20 - G 1/2 - P-OR	SMD 20 - G 1/2 - V-OR	1/4 NPT	41	1.61	19 .75	SMD 20 - 1/4 NPT-P	SMD 20 - 1/4 NPT-V	1/2 NPT	51	2.0	27 1.06	SMD 20 - 1/2 NPT-P	SMD 20 - 1/2 NPT-V
			G	h		SW	Order No.																												
mm	in	NBR (BUNA)		FPM (VITON)																															
G 1/4	41	1.61	19 .75	SMD 20 - G 1/4 - P-OR	SMD 20 - G 1/4 - V-OR																														
G 1/2	51	2.0	27 1.06	SMD 20 - G 1/2 - P-OR	SMD 20 - G 1/2 - V-OR																														
1/4 NPT	41	1.61	19 .75	SMD 20 - 1/4 NPT-P	SMD 20 - 1/4 NPT-V																														
1/2 NPT	51	2.0	27 1.06	SMD 20 - 1/2 NPT-P	SMD 20 - 1/2 NPT-V																														
<p>Damping element on request</p>																																			

WELDING ADAPTOR SAS

	<table border="1"> <thead> <tr> <th rowspan="2">Coupling thread G</th> <th colspan="2">h</th> <th rowspan="2">Ød</th> <th rowspan="2">Order No.</th> </tr> <tr> <th>mm</th> <th>in</th> <th>mm</th> <th>in</th> </tr> </thead> <tbody> <tr> <td>M10 x 1</td> <td>25</td> <td>.98</td> <td>20 .78</td> <td>SAS - M10 x 1</td> </tr> <tr> <td>G 1/4</td> <td>30</td> <td>1.18</td> <td>22 .86</td> <td>SAS - G 1/4</td> </tr> </tbody> </table>	Coupling thread G	h		Ød	Order No.	mm	in	mm	in	M10 x 1	25	.98	20 .78	SAS - M10 x 1	G 1/4	30	1.18	22 .86	SAS - G 1/4
			Coupling thread G	h			Ød	Order No.												
mm	in	mm		in																
M10 x 1	25	.98	20 .78	SAS - M10 x 1																
G 1/4	30	1.18	22 .86	SAS - G 1/4																
<p>Material: St 37</p>																				

THREAD ADAPTOR SRS

	<table border="1"> <thead> <tr> <th rowspan="2">Thread G</th> <th colspan="2">h</th> <th rowspan="2">SW</th> <th rowspan="2">Order No.</th> <th rowspan="2">Seal</th> </tr> <tr> <th>mm</th> <th>in</th> <th>mm</th> <th>in</th> </tr> </thead> <tbody> <tr> <td>M16 x 1,5</td> <td>8</td> <td>.31</td> <td>22 .86</td> <td>SRS 20 - M16 x 1,5-B</td> <td rowspan="4">Metal joint DIN 3852 Type B</td> </tr> <tr> <td>G 1/8</td> <td>15,5</td> <td>.61</td> <td>17 .67</td> <td>SRS 20 - G 1/8-B</td> </tr> <tr> <td>G 3/8</td> <td>10,5</td> <td>.41</td> <td>22 .86</td> <td>SRS 20 - G 3/8-B</td> </tr> <tr> <td>G 1/2</td> <td>10,5</td> <td>.41</td> <td>27 1.06</td> <td>SRS 20 - G 1/2-B</td> </tr> <tr> <td>R 1/4 taper</td> <td>13</td> <td>.51</td> <td>17 .67</td> <td>SRS 20 - R 1/4 K-D</td> <td>Port Connection Type D</td> </tr> </tbody> </table>	Thread G	h		SW	Order No.	Seal	mm	in	mm	in	M16 x 1,5	8	.31	22 .86	SRS 20 - M16 x 1,5-B	Metal joint DIN 3852 Type B	G 1/8	15,5	.61	17 .67	SRS 20 - G 1/8-B	G 3/8	10,5	.41	22 .86	SRS 20 - G 3/8-B	G 1/2	10,5	.41	27 1.06	SRS 20 - G 1/2-B	R 1/4 taper	13	.51	17 .67	SRS 20 - R 1/4 K-D	Port Connection Type D
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R 1/4 taper	13	.51	17 .67	SRS 20 - R 1/4 K-D	Port Connection Type D																																	

3/00

TEST



McDANIEL

Liquid Filled, Stainless Steel Case Utility Gauges

"For the price-conscious buyer . . .

McDaniel utility gauges are designed for the price-conscious buyer and user who have an emphasis on maintaining quality and accuracy in a general purpose gauge.

Our utility line offers trusted McDaniel quality in an economical package. Special consideration given to rigorous McDaniel standards for durability, accuracy, and quality of construction.

Our Series 6: Glycerin filled, stainless steel case utility gauges with brass internals. Designed for applications with a corrosive atmosphere and where pulsation and/or vibration are present.

Standard features include a restrictor screw (removable) in the inlet port for pulsation dampening.

. . . and quality user."



SPECIFICATIONS

Accuracy:

ASME B40.1 standard (Grade B) (3 - 2 - 3%)

Dial:

White enameled aluminum. Black figures.

Case:

304 Stainless steel.

Pointer:

Black enameled aluminum.

Lens:

Polycarbonate.

Precision Movement

Brass.

Bourdon Tube:

Copper alloy (C Form 600 PSI & below).

Phosphorous bronze (Spiral 800 PSI & above).

Temperature Utilization:

-4 + 176 degrees Farenheit.

-20 + 80 degrees Celsius.

Pressure Utilization:

Static: 75% maximum scale.

Dynamic: 66% maximum scale.

Stem and Socket:

Brass. Restrictor screw standard.

J6 = 1/4" NPT (1/8" special order available)

T6 = 1/4" or 1/8" NPT available

Dial Sizes / Ranges Available

2" - (T6) / Vac, Comp, Rec 3-15, up to 5,000 psi

2 1/2" - (J6) / Vac, Comp, Rec 3-15, up to 15,000 psi

Configurations Available:

Bottom connected standard

(L) = Center-back connected

(U) = U-Clamp mounted, Center-back connected

(P) = Front flange, Center-back connected

McDaniel Controls, Inc.

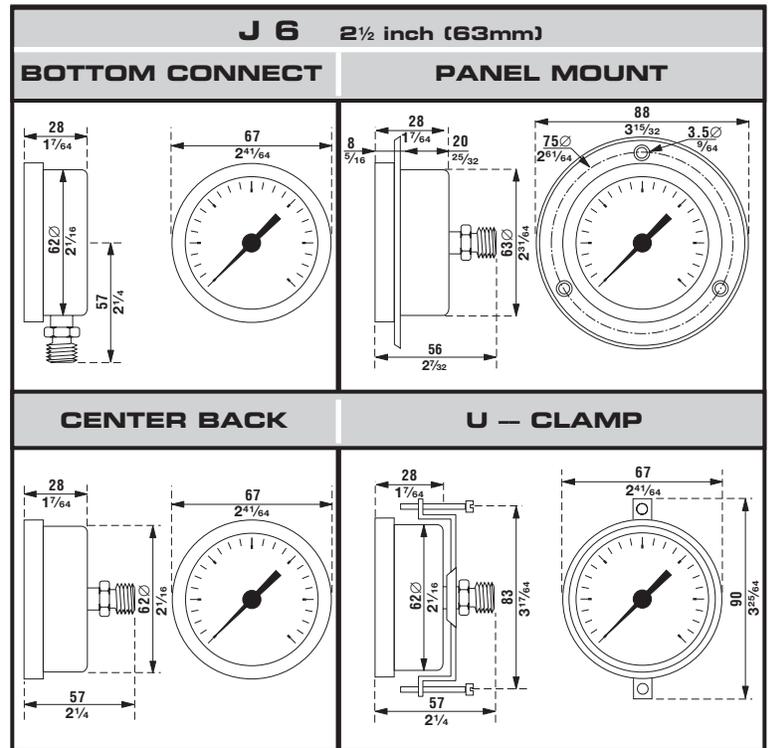
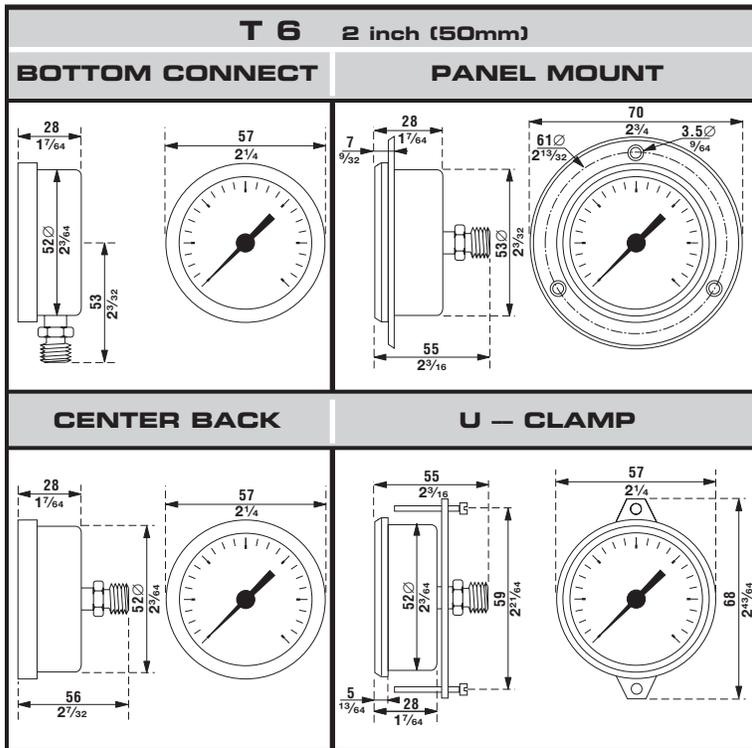
P. O. Box 187, Luling, LA 70070 • 14148 Highway 90, Boutte, LA 70039 U.S.A.

(985) 758-2782 • New Orleans (504) 467-1333 • Fax (985) 758-1688

www.mcdanielcontrols.com

DIMENSIONAL DATA

In millimeters (mm) and inches (in.)



* See website for dimensional data and downloadable AutoCAD files: www.mcdanielcontrols.com

McDaniel also makes gauges in other materials; in sizes and ranges to fit a wide variety of applications, and in many special configurations.

Ask your representative about McDaniel gauges with stainless steel or Monel® internals, all brass or all stainless steel gauges, test gauges, or other requirements.

© Monel is a registered trademark of INCO family of companies.

Range code	Range psi	Minor Increments
A	0 - 15	.5
B	0 - 30	1
C	0 - 60	1
D	0 - 100	2
E	0 - 160	5
F	0 - 200	5
G	0 - 300	10
H	0 - 400	10
I	0 - 600	20
J	0 - 800	20
1K*	0 - 1000	20
L	0 - 1500	50
M	0 - 2000	50
N	0 - 3000	100
4k	0 - 4000	100
O	0 - 5000	100
6k	0 - 6000	200
P	0 - 10000	200
Q	0 - 15000	500
VACUUM	VACUUM	VACUUM
S	VAC 30"Hg - 0	1
RECEIVER	RECEIVER	RECEIVER
T	REC 3 - 15**	2
COMPOUND	COMPOUND	COMPOUND
U	30"Hg + 15	1-0-2
V	30"Hg + 30	1-0-2
W	30"Hg + 60	2-0-5
X	30"Hg + 100	2-0-5
Y	30"Hg + 160	2-0-10
2k	30"Hg + 200	5-0-15
Z	30"Hg + 300	10-0-30

HOW TO ORDER

- Select the model number (**T6** or **J6**)
- Specify range code from list at left.
- Specify mounting code:
 (Bottom connection is standard, no code)
 "L" = (Center-back connection)
 "U" = (U-Clamp, Center-back connection)
 "P" = (Panel mount w/front flange, Center-back connection)
- Specify any other special configurations or options. (special NPT size, dual-scales, etc.)

Special Configuration Adder Codes

- B** = psi/Bar (dual scale) (nonstock)
- K** = psi/kPa (dual scale) (nonstock)
- 1/8** = 1/8" NPT (non stock on J6)

Model #
 (Example: **T6E**: "T6" = 2" (50mm) Dial - "E" = (0 - 160 psi range)
J61kP: "J6" = 2 1/2" (63mm) Dial - "1k" = (1000 psi range) - "P" = (Panel mount)

* Use 1K on T6 and J6 for 0 - 1000 psi range.

** Receiver gauge is dual scale. (0 - 100% primary, 0 - 10 square root secondary)

Limited Warranty

McDaniel warrants our utility gauges to be free of defects in material and workmanship: Replacement of any defective gauge will be made at no cost to the purchaser. Gauge failures determined to be caused by over-range and incompatibility with environment/product media or abuse will not be considered under this warranty.

DISTRIBUTED BY:

It is recommended that users of pressure gauges become familiar with American National Standard ASME B40.1, entitled Gauges, Pressure and Vacuum - Indicating Dial Type - Elastic Element. This specification is available from:

American Society of Mechanical Engineers
 3 Park Avenue
 New York, New York 10016
 Phone: 212-591-7722

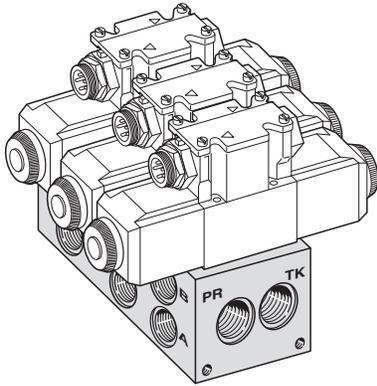
SECTION 3

MAGNALOY HYDRAULIC BAR MANIFOLDS AND MANIFOLDING ACCESSORIES

3



NOTE: Due to Magnaloy's policy of continuous improvement, specifications are subject to change without notice.
Check with the factory or our Web Site at www.magnaloy.com for the latest information.



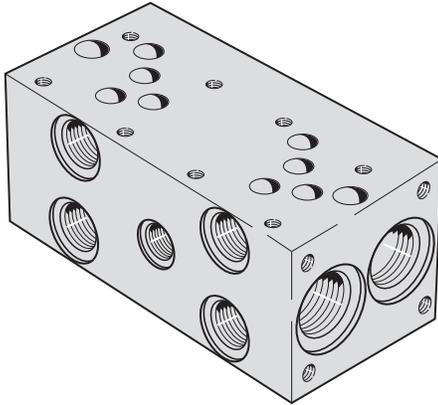
General Information:

Standard Bar Manifold - includes specified NFPA valve pattern mounting on top of the manifold, A & B ports per specified thread type on the face of the manifold and pressure and tank ports per the specified thread type on each end of the manifold. Mounting provisions are included and defined on following manifold pages.

Options:

- Z - No Options** - indicates no options are provided (standard manifold)
- B - Bottom PR -TK ports** - additional pressure and tank ports per specified thread type located on the bottom of the manifold.
- C - Relief Valve Common Cavity** configurations added to the back surface of the manifold.
- G - Gauge Port** - addition of gauge port per specified thread type (see port size chart) to the face of the manifold to allow monitoring of the pressure "PR" passage.
- G4** - With Retro Design Manifolds Only - **#4 SAE Gauge Port** (with "S" thread code). Standard Gauge Port is #6 SAE (with "S" thread code) or 1/4 NPT (with "P" thread code).
- G6** - With Standard Design Manifolds - **#6 SAE Gauge Port** (with "S" thread code). Standard Gauge Port is #4 SAE (with "S" thread code) or 1/4 NPT (with "P" thread code).
- S - Relief Valve Sun Cavity** configuration added to the back surface of the manifold.
- H - Hard Metric Thread** - When British or Metric Thread type is specified, the valve and manifold mounting holes are also Metric Threaded.
- M - Soft Metric Thread** - indicates mixed metric threading. When NPT or SAE thread type is specified, valve mounting holes are metric threaded. No code "M" indicates the valve and manifold mounting holes are English threaded.
- I - Isolation Plug** - addition of an isolation plug(s) in the pressure or tank passage to provide signal isolation for valve operation. The location of the isolation plug is specified by indicating which station it is installed between. With the manifold positioned with the A & B ports facing forward, the valve mounting surfaces up and numbering from left to right, location A is between stations 1 & 2, location B is between stations 2 & 3, location C is between stations 3 & 4, etc. Isolation plugs can be installed in the pressure or tank passages or both. (See Note 1, next page and Reference Section, page 194)
- L - L Port** - addition of a drain port to the valve pattern on top of the manifold with a connecting port outlet on the back surface on the manifold. One port per station.
- O - Oversized A & B Ports** - (D05 High Flow and D05H-Alt.B only) - provides A & B ports machined oversized from the standard port size for additional flow capacity - see port size charts.
- P - Pilot Pressure** (D08 only) - addition of a pilot pressure signal port to the back surface of the manifold. One port per station.

INDEX:



page **Standard Bar Manifolds**

40	NFFPA D03 Directional Valves in Parallel Circuits
42	NFFPA D03 Directional Valves in Series Circuits
44	NFFPA D03 Retro Design Directional Valves in Parallel Circuits
46	NFFPA D03 High Flow Retro Design Directional Valves in Parallel Circuits
48	NFFPA D05 Directional Valves in Parallel Circuits
50	NFFPA D05 Directional Valves in Series Circuits
52	NFFPA D05 High Flow Directional Valves in Parallel Circuits
54	NFFPA D05E Alt.A Directional Valves in Parallel Circuits
56	NFFPA D05H Alt.B Directional Valves in Parallel Circuits
58	NFFPA D08 Directional Valves in Parallel Circuits
60	NFFPA D08 High Flow Retro Design Directional Valves in Parallel Circuits
62	NFFPA D08 Directional Valve in Series Circuits

Bar Manifold Hardware

177	Isolation Plugs for factory and field installation
177	Mounting Bracket Kits

MAGNALOY BAR MANIFOLD PART NUMBER BREAKDOWN

*** B M - A H P 0 3 P 2 - 0 2 - 1 / C**

Product Code
 BM-Inline Bar Manifold
 BMR-Retro Inline Bar Manifold

Material Code
 A - Aluminum
 S - Ductile/Steel

Circuit Code
 HP - High Flow Parallel Circuit
 SP - Standard Flow Parallel Circuit
 SS - Series Circuit

NFFPA Pattern Code
 03 - D03
 05 - D05
 5E - D05E Alt. A
 5H - D05H Alt. B
 08 - D08

Thread Code
 P - NPTF Pipe
 S - SAE O'Ring
 B - BSPP British Parallel
 T - BSPT British Taper
 M - Metric ISO 6149
 (See Port Size Chart for Standard Port Sizes)

Options
 Z - No Option
 B - Bottom PR-TK Ports
 C - Relief Valve Cavity C-10-2, C-16-2
 G - Gauge Port #4 SAE or 1/4" NPTF
 G4 - Gauge Port #4 SAE
 G6 - Gauge Port #6 SAE
 L - L Port
 O - Oversized A and B Ports
 P - Pilot Pressures (Individual Per Station)
 S - Relief Valve Cavity Sun T-10A, T-3A, T-16A
 H - Hard Metric Threading ^{Note 2}
 M - Soft Metric Threading ^{Note 3}
 I - Isolation Plug ^{Note 1} - List as last option designated
 Note: For more than two combined options, Consult Factory.

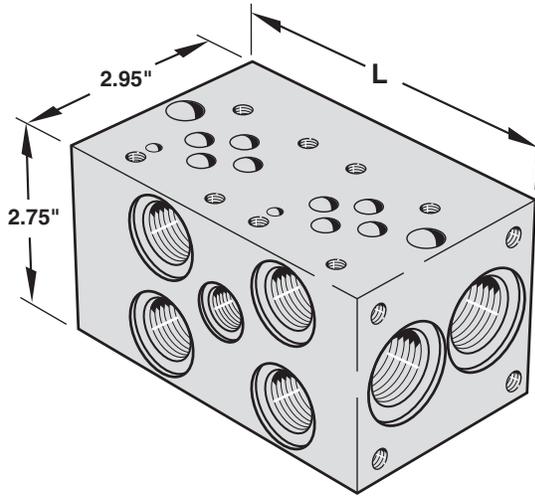
Design Series

Number of Valve Stations
 01 - 1 stations
 02 - 2 stations
 etc.

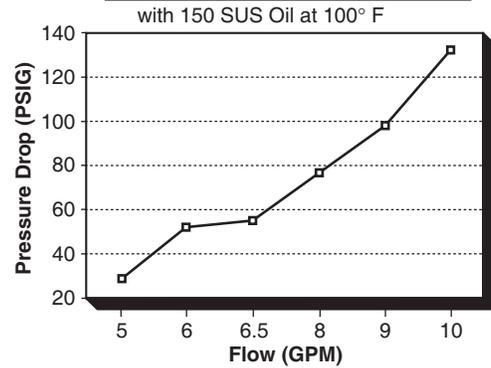
Valve Spacing Code
 D03 2 = 2.00" (2.13" on D03 Retro Design)
 4 = 4.00"
 D05 3 = 3.25"
 5 = 5.00"
 D08 5 = 5.25"
 7 = 7.00"
 (For Special Spacing requirements, please consult factory.)

* Not all codes and options are available in combinations, see following Manifold Pages for specific Magnaloy standard configurations and options.

Notes:	1 - Isolation Plug Location is specified by using the following codes after the "I" option designation: Port Location* P - Pressure Port T - Tank Port	Examples: Option Code for Pressure Isolation between stations 3 & 4 = IPC Option Code for Tank Isolation between stations 1 & 2 = ITA Option Code for Pressure Isolation between stations 1 & 2 and Tank Isolation between stations 2 & 3 = IPATB *Location is determined with A & B ports facing forward, valves up and numbering from left to right
	A - Between Stations 1 & 2 B - Between Stations 2 & 3 C - Between Stations 3 & 4 D - Between Stations 4 & 5 (etc.)	
	2 - Hard Metric Threading - Used with British and Metric Thread Type to indicate Valve Mounting is also Metric Threaded 3 - Soft Metric Threading - Used with NPT or SAE Thread Type to indicate Valve Mounting is Metric Threaded (No Code Designation Indicates Valve Mounting is English Threaded)	



Flow from P to A/B Port



Dimensions

No of Stations	L	E	F
1	2.75" *	2.00"	-
2	4.75"	4.00"	-
3	6.75"	6.00"	-
4	8.75"	8.00"	-
5	10.75"	10.00"	-
6	12.75"	12.00"	-
7	14.75"	14.00"	8.00"
8	16.75"	16.00"	8.00"
9	18.75"	18.00"	8.00"
10	20.75"	20.00"	10.00"
11	22.75"	22.00"	8.00" & 16.00"
12	24.75"	24.00"	8.00" & 16.00"
13	26.75"	26.00"	8.00" & 16.00"
14	28.75"	28.00"	10.00" & 20.00"

Shaded area - Please consult factory for delivery.

* For Single Station with B, C, S, G, or G6 Options, "L" = 3.75"

Features & Advantages

- * The efficient design provides excellent flow rates with minimal pressure drop.
- * Standard end mount and through holes make mounting easy and flexible. Also, (when requested) mounting bracket kit BK-A03 (no charge) or flange mount kit FK-03 (additional cost) is available with the manifold as alternative mounting styles.
- * Available with SAE, NPTF, BSPP, BSPT or Metric Threads to cover a wide range of applications.
- * Options include relief valve cavity, bottom PR & TK ports, and gauge port to fit specific circuit requirements.

3

MAGNALOY D03 PARALLEL BAR MANIFOLD PART NUMBER BREAKDOWN

B M - A S P 0 3 P 2 - 0 2 - 1 / C

Product Code — BM-Inline Bar Manifold

Material Code —
A - Aluminum
S - Ductile/Steel

Circuit Code — SP - Standard Flow Parallel Circuit

NFPA Pattern Code — 03 - D03

Thread Code —
P - NPTF Pipe
S - SAE O'Ring
B - BSPP British Parallel
T - BSPT British Taper
M - Metric - ISO 6149
(See Port Size Chart for Standard Port Sizes)

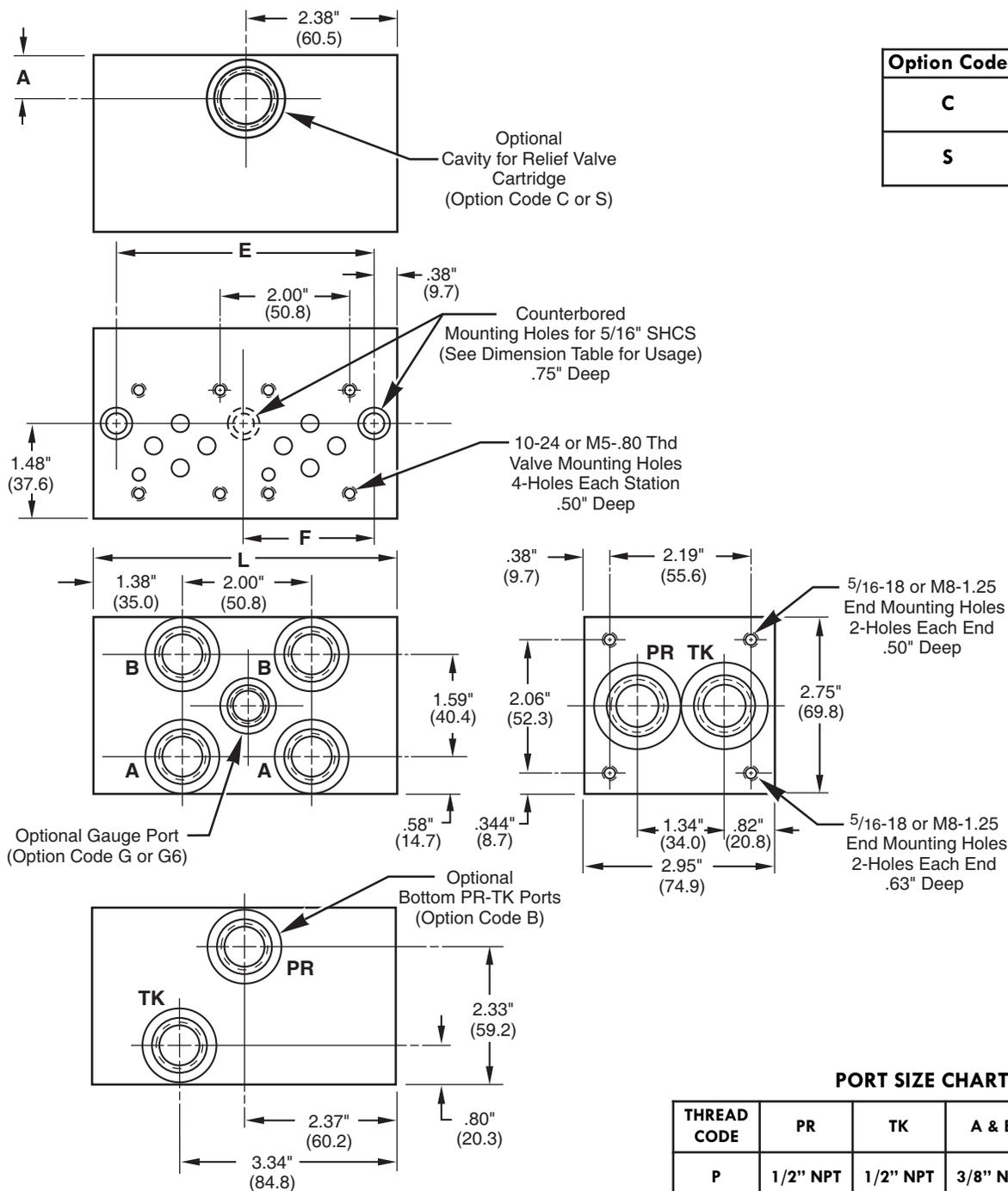
Options
Z - No Option
B - Bottom PR-TK Ports
C - Relief Valve Cavity C-10-2
G - Gauge Port #4 SAE or 1/4" NPTF
G6 - Gauge Port #6 SAE
S - Relief Valve Cavity Sun T-10A
H - Hard Metric Threading (See Note 2, page 47)
M - Soft Metric Threading (See Note 3, page 47)
I - Isolation Plug¹ - List as last option designated (See Note 1, page 47)
Note: For more than two combined options, please consult factory.

Design Series
Number of Valve Stations
01 - 1 stations
02 - 2 stations
etc.

Valve Spacing Code
2 - 2.00"
4 - 4.00"
(For Special Spacing requirements, please consult factory.)

Inline Bar Manifold

D03 Standard Flow Bar Manifold - Parallel



Option Code	A
C	.69" (17.5)
S	.81" (20.6)

NOTE: For End Mounting Bracket Kit (BK-A03) and Mounting Flange Kit (FK-A03) dimensions, see Reference Section, page 193.

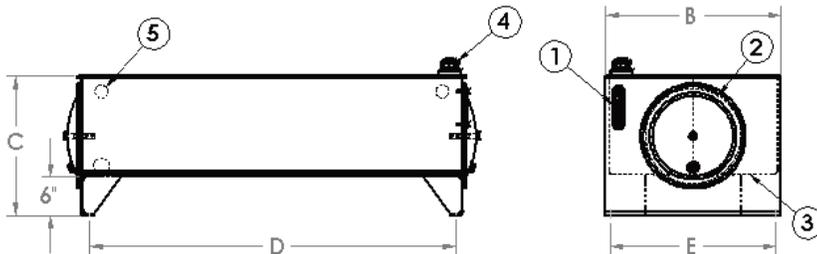
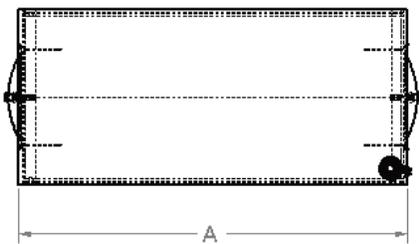
PORT SIZE CHART

THREAD CODE	PR	TK	A & B	OPTIONAL GAUGE PORTS
P	1/2" NPT	1/2" NPT	3/8" NPT	1/4" NPT
S	#10 SAE	#10 SAE	#8 SAE	#4 SAE G6 - #6 SAE
B	1/2" BSPP	1/2" BSPP	3/8" BSPP	-
T	1/2" BSPT	1/2" BSPT	3/8" BSPT	-
M	M22	M22	M18	-

RJICxx-FT* JIC Series Reservoirs:



Size	Ends	Form	Top	Baffle
10 gal	7 ga	11 ga	7 ga	12 ga
15 gal	7 ga	11 ga	7 ga	12 ga
20 gal	7 ga	11 ga	7 ga	12 ga
30 gal	7 ga	11 ga	7 ga	12 ga
40 gal	7 ga	11 ga	7 ga	12 ga
50 gal	7 ga	11 ga	7 ga	12 ga
60 gal	7 ga	11 ga	1/4"	12 ga
80 gal	7 ga	11 ga	3/8"	12 ga
100 gal	7 ga	11 ga	3/8"	12 ga
120 gal	3/8"	11 ga	3/8"	12 ga
150 gal	3/8"	11 ga	3/8"	12 ga
200 gal	3/8"	7 ga	3/8"	12 ga



Includes:

- 1 - Sight Level Gauge (front mount)
(SLLG-05T-C)
 - 2 - End Cover w/3/4" NPT Drain
End Cover w/out Drain (opposite end)
 - 3 - Sloped Bottom
 - 4 - Filler Breather Cap and Riser
(FB-H008)
 - 5 - Baffle w/Circulation Cutout
- Primer Coated Exterior
Rust Inhibitor Coated Interior

Part Number	Capacity Gallons	Reservoir Dimensions (Inches)					End Cover
		A	B	C	D	E	
RJIC010-FT	10	22	18	19	18.25	16.5	12"
RJIC015-FT	15	26	18	19	22.25	16.5	12"
RJIC020-FT	20	30	18	19	26.25	16.5	12"
RJIC030-FT	30	36	24	19.38	32.25	22.5	12"
RJIC040-FT	40	36	24	21	32.25	22.5	12"
RJIC050-FT	50	36	24	23	32.25	22.5	16"
RJIC060-FT	60	48	27	20.69	44.25	25.5	16"
RJIC080-FT	80	60	27	21.5	56.25	25.5	16"
RJIC100-FT	100	60	27	23.5	56.25	25.5	16"
RJIC120-FT	120	60	30	27	56.25	28.5	16"
RJIC150-FT	150	60	30	31	56.25	28.5	16"
RJIC200-FT	200	72	36	29.38	68.25	34.5	18"

NOTE: Couplings, both SAE & NPT can be installed per your specifications

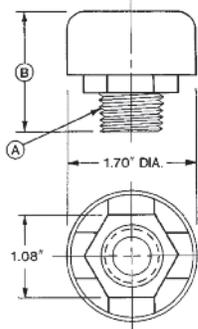
* Also available with Removable Top (substitute RT for FT) and Removable Baffle (substitute RB for FT)

NOTE: Due to Magnaloy's policy of continuous improvement, specifications are subject to change without notice.

Allows Filtered Air to Easily Flow in and out of the Hydraulic Reservoir while Preventing Airborne Contaminants from Entering the System.



MB Type - Mini Breather



Filler Breather Caps

Types & Features:

- A** Cap - 20 GPM, 10 Micron Filter, Stainless Steel
- D** Cap - 30 GPM, 10 Micron Filter, Stainless Steel
- H** Cap - 120 GPM, 10 Micron Filter, Stainless Steel
- K** Cap - Pressure Cap, 20 PSI-no relief, 10 Micron Filter, Chrome Plated
- MB** Cap - 10 GPM, 10 Micron Filter, Shatter Resistant Plastic (Temp Rating 225°F)

Type	Part Number	Mounting Type	Overall Height	Outside Diameter
A	FB-C-A	Bayonet	1.33	2.55
D	FB-C-D	Bayonet	1.30	2.55
H	FB-C-H	Bayonet	1.33	2.55
K	FB-C-K	Bayonet	.94	2.88
MB	FB-C-MB-P004	1/4 NPT	1.80	1.70
MB	FB-C-MB-P006	3/8 NPT	1.50	1.70
MB	FB-C-MB-P008	1/2 NPT	1.60	1.70
MB	FB-C-MB-P012	3/4 NPT	1.60	1.70

Mounting Flanges

Features:

- Blue Zinc Plated
- Available in Three Lengths



Part Number	Height	Description	Code
FB-F-008	.500	008 Mounting Flange	008
FB-F-108	1.50	108 Mounting Flange	108
FB-F-600	6.00	600 Mounting Flange	600

Filler Breather Screens

Materials & Features:



Part Number	Code	Mesh	Material	Length
FB-S-N *	N	200 Mesh	Brass	6.00
FB-S-P	P	30 Mesh	Nylon	4.00
FB-S-R *	R	30 Mesh	Brass	4.00
FB-S-V *	V	30 Mesh	Brass	9.25
FB-S-W	W	30 Mesh	Stainless	3.25
FB-S-X	X	30 Mesh	Stainless	6.25
FB-S-Y	Y	30 Mesh	Stainless	8.25
FB-S-Z	Z	30 Mesh	Stainless	10.25

* Check with factory for availability

Filler Breather Options:



PL - Pad Lock



L - Locking Cap



SM - Side Mounting Kit



D - Dipstick

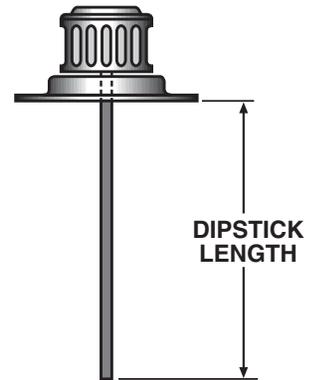
Part Number	Code	Description
FB-O-PL	PL	Pad Lock - not included with locking cap option
FB-O-L	L	Cap Lock Kit
FB-O-SM	SM	Side Mounting Kit
FB-O-D*	D	Dipstick - specify length, measured from bottom of mounting flange to end of dipstick

* Dipstick Option can be ordered as part of a cap assembly ONLY.

How to Order:

Standard Assemblies:

Code	Description
FB-A008W	Stainless Steel, Weatherproof, 10 micron, 20 GPM Cap; 1/2" Mounting Flange; 30 mesh, 3 1/4", Stainless Steel Screen
FB-A008P	Stainless Steel, Weatherproof, 10 micron, 20 GPM Cap; 1/2" Mounting Flange; 30 mesh, 4", Nylon Screen
FB-K008W	Pressurized, Chrome Plated, 20 PSI Cap; 1/2" Mounting Flange; 30 mesh, 3 1/4", stainless steel Screen



5

Custom Assemblies:

Select the components that best meet your particular hydraulic system requirements and custom build the part number as follows:



FB - A 008 Y - D8

Code	Cap Type
A	A Cap
D	D Cap
H	H Cap
K	K Cap

Code	Mounting Flange
008	1/2" Height
108	1 1/2" Height
600	6" Height

Code	Option
Blank	No Options
PL	Pad Lock
L	Locking Cap
SM	Side Mount
D	Dipstick

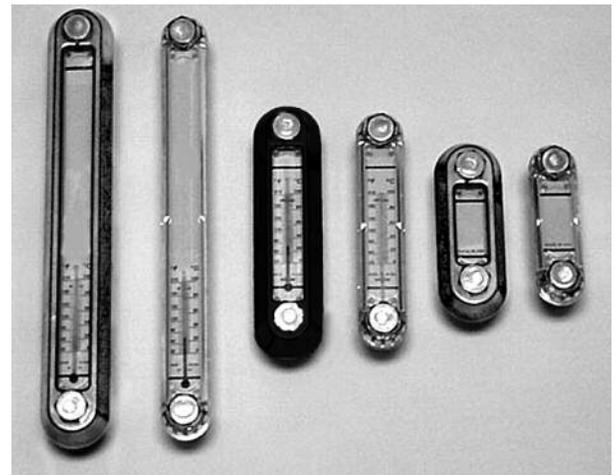
Code	Screen Material
N	6" Brass
P	4" Nylon
R	4" Brass
S	14 1/2" Zinc Plated
V	9 1/4" Brass
W	3 1/4" Stainless
X	6 1/4" Stainless
Y	8 1/2" Stainless
Z	10 1/4" Stainless

For Continuous reading of Fluid Level and Temperature

Standard Line - Liquid Column Series

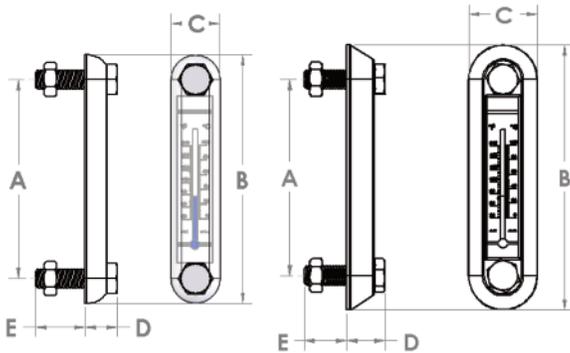
Features:

- UV Resistant Transparent Dupont Grilamid Case
- All-Around Visibility of the Fluid Level
- Buna-N O-ring Seals
- Zinc Plated Bolts
- Available with Optional Cast Aluminum Cover to Provide additional breakage protection
- Includes Thermometer with Blue Fluid for easy readings
- 212° F Maximum Temperature Rating
- For use with Petroleum and Water Base Hydraulic Fluids, consult factory for other fluids



W/Out Cover

With Cover



Part Number	Description	A	B	C	D	E
SLLG-03T	Std 3" w/temp	3.00"	4.22"	1.22"	0.81"	1.16"
SLLG-03T-C	Std 3" w/temp & Cover	3.00"	4.75"	1.75"	0.93"	0.82"
SLLG-05T	Std 5" w/temp	5.00"	6.22"	1.22"	0.81"	1.16"
SLLG-05T-C	Std 5" w/temp & Cover	5.00"	6.75"	1.75"	0.93"	0.82"
SLLG-10T	Std 10" w/temp	10.00"	11.22"	1.22"	0.81"	1.16"
SLLG-10T-C	Std 10" w/temp & Cover	10.00"	11.75"	1.75"	0.93"	0.82"

5 Premium Line - Liquid Column Series

Features:

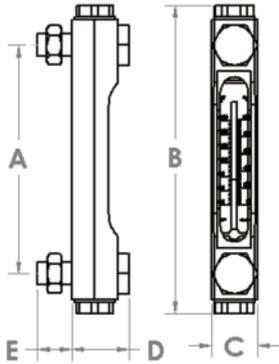
- Borosilicate sight glass compatible with all hydraulic fluids and will not discolor
- 20 PSI maximum working pressure at 250° F
- May be front mounted by threaded tank holes or rear mounted with provided nuts
- Mounting bolts provide 1/16" alignment adjustment to facilitate installation
- Low profile body offers wide sight opening for visibility
- Machined from solid Aluminum bar stock
- Includes internal thermometer - external thermometer available - consult factory



Liquid Level Gauges



Premium Line (continued)



Part Number	Description	A	B	C	D	E
PLLG-03T	Premium 3" w/temp	3.00"	4.63"	1.00"	1.23"	0.75"
PLLG-05T	Premium 5" w/temp	5.00"	6.63"	1.00"	1.23"	0.75"
PLLG-10T	Premium 10" w/temp	10.00"	11.63"	1.00"	1.23"	0.75"

How to Order:

SLLG-03T-C-2

Code	Series
SLLG	Standard Liquid Level Gauge
PLLG	Premium Liquid Level Gauge

Code	Bolt Center Distance
03	3"
05	5"
10	10"

Code	Mounting Bolt Option
Blank	1/2-13 UNC (1)
2	M12 x 1.75 Metric (2)
3	M10 x 1.50 Metric (2)

Code	Cover (Guard) Option
Blank	No Cover
C	with Cover (3)

Notes:

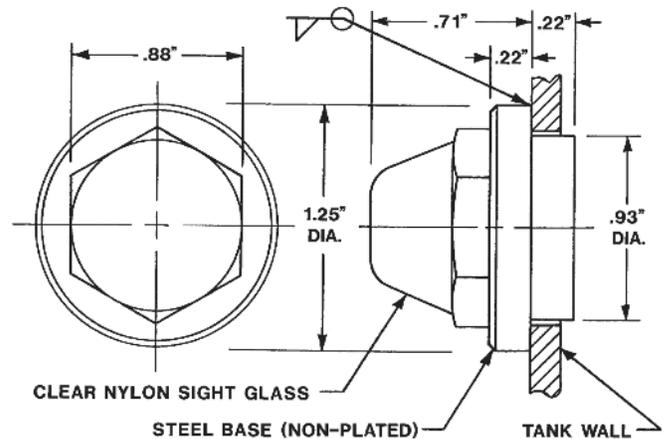
- 1 - 1/2-20 UNF with Premium Line
- 2 - Not Available with Premium Line
- 3 - Premium Line design incorporates integral gauge guard

Sight Glass Series

Features:

- Clear Nylon Fluid Level sight glass with Steel Collar for weld attachment to reservoir
- 400 PSI maximum working pressure
- Temperature Range: -65° F to 150° F for pressure applications
- For use with Petroleum Base and Water Base Hydraulic Fluids

Order Part Number: SLSG-100



Suction Strainers

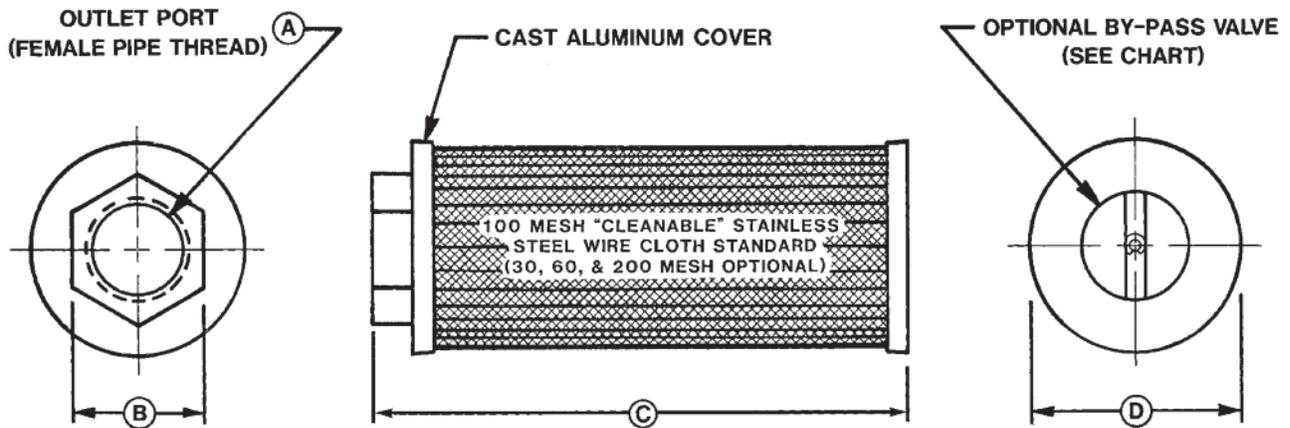


Internally Mounted Tank Filters - your front-line defense against particle contamination



Features:

- Die cast aluminum end covers.
- By-Pass valve available on most models(see tables).
- End caps are designed to provide a positive interlock with epoxy bond to prevent leakage.
- Rated flow capacity at 5 ft/sec.
- Suitable with all petroleum base oils and fire retardant hydraulic fluids, coolants and lubricants.



Part Number	A Outlet Port	B Wrench Flat	C Overall Length	D Outside Diameter	Rated Flow @ 5 ft/sec
SS-003P006-1-0 ¹	3/8" NPT	1.20"	3.00"	2.75"	3 GPM
SS-005P008-1-X ¹	1/2" NPT	1.20"	3.25"	2.75"	5 GPM
SS-008P012-1-X ¹	3/4" NPT	1.50"	3.25"	2.75"	8 GPM
SS-010P100-1-X ¹	1" NPT	1.75"	5.50"	2.75"	10 GPM
SS-023P104-X-X	1 1/4" NPT	2.25"	6.60"	3.20"	23 GPM
SS-032P108-X-X	1 1/2" NPT	2.35"	8.60"	3.20"	32 GPM
SS-053P200-X-X	2" NPT	3.00"	7.20"	4.20"	53 GPM
SS-075P208-X-X	2 1/2" NPT	3.50"	9.30"	4.20"	75 GPM

1 - Standard 100 Mesh, contact factory for other Mesh sizes.

How to Order:

SS-003P006-1-0

Model Code
003P006
005P008
008P012
014P100
023P104
032P108
053P200
075P208

Code	By-Pass Valve Setting
0	No By-Pass Valve
3	3 PSI
5	5 PSI

Code	Wire Cloth Mesh
1	100 Mesh (Std)
2	200 Mesh
3	30 Mesh
6	60 Mesh

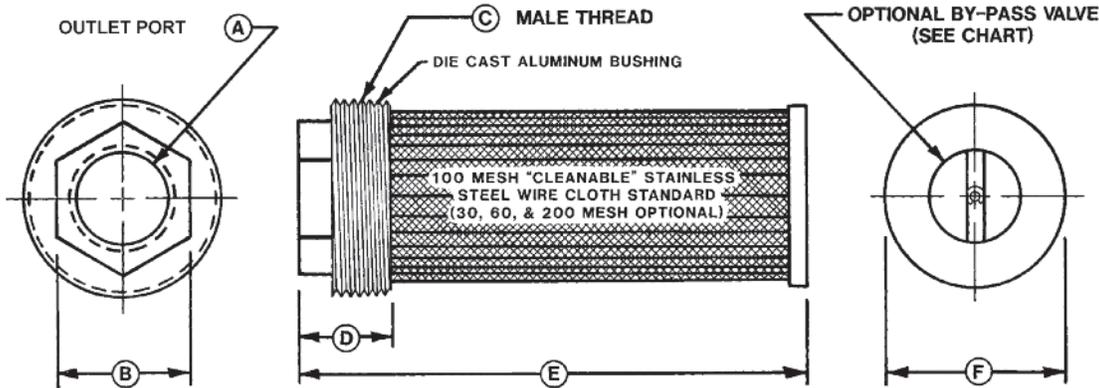
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Externally Mounted Tank Filters - your front-line defense against particle contamination



Features:

- Die cast aluminum end covers.
- By-Pass valve available on most models(see tables).
- End caps are designed to provide a positive interlock with epoxy bond to prevent leakage.
- Rated flow capacity at 5 ft/sec.
- Suitable with all petroleum base oils and fire retardant hydraulic fluids, coolants and lubricants.



Part Number	A Outlet Port	B Hex Size	C Male Thread	D Fitting Length	E Overall Length	F Cover Diameter	Rated Flow @ 5 ft/sec
SS-008P012/P104-X-X	3/4" NPT	1.50"	1 1/4" NPT	1.10"	6.90"	1.50"	8 GPM
SS-014P100/P108-X-X	1" NPT	1.75"	1 1/2" NPT	1.10"	6.90"	1.70"	14 GPM
SS-014P100/P300-X-X	1" NPT	2.50"	3" NPT	1.50"	4.70"	3.20"	14 GPM
SS-014S020/P300-X-X	#20 SAE	2.50"	3" NPT	1.50"	8.70"	3.20"	14 GPM
SS-021S024/P300-X-X	#24 SAE	2.50"	3" NPT	1.50"	8.70"	3.20"	21 GPM
SS-023P104/P200-X-X	1 1/4" NPT	2.10"	2" NPT	1.20"	9.10"	2.20"	23 GPM
SS-023P104/P300-X-X	1 1/4" NPT	2.50"	3" NPT	1.50"	6.70"	3.20"	23 GPM
SS-032P108/P300-X-X	1 1/2" NPT	2.50"	3" NPT	1.50"	8.70"	3.20"	32 GPM
SS-053P200/P300-X-X	2" NPT	3.06"	3" NPT	1.60"	8.80"	3.20"	53 GPM
SS-053P200/P400-X-X	2" NPT	4.13"	4" NPT	1.80"	7.70"	4.20"	53 GPM
SS-075P208/P400-X-X	2 1/2" NPT	4.13"	4" NPT	2.10"	9.70"	4.20"	75 GPM

5

How to Order:

SS-008P012/P104-1-0

Model Code
008P012/P104
014P100/P108
014P100/P300
014S020/P300
021S024/P300
023P104/P200
023P104/P300
032P108/P300
053P200/P300
053P200/P400
075P208/P400

Code	By-Pass Valve Setting
0	No By-Pass Valve
3	3 PSI
5	5 PSI

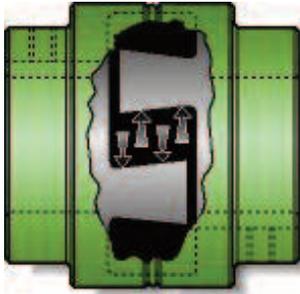
Code	Wire Cloth Mesh
1	100 Mesh (Std)
2	200 Mesh
3	30 Mesh
6	60 Mesh

SECTION 1

MAGNALOY FLEXIBLE DRIVE COUPLINGS



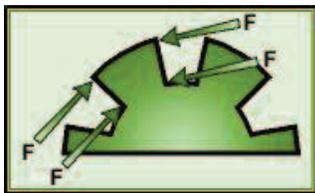
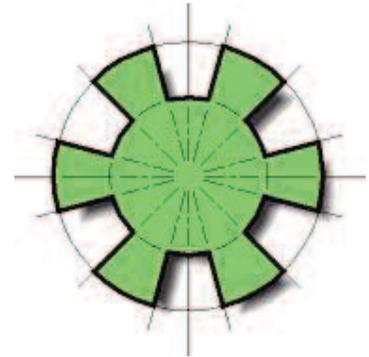
NOTE: Due to Magnaloy's policy of continuous improvement, specifications are subject to change without notice.
Check with the factory or our Web Site at www.magnaloy.com for the latest information.



Load-Lock Design... is simple and effective. The drive lug configuration is tapered from top to base, as are the mating lugs of the opposing coupling hub. Under load, the insert conforms to the tapers, inter-locking the two hubs. This load-lock design protects bearings and equipment by eliminating end thrust in both directions.... and it requires only one set-screw in each hub.

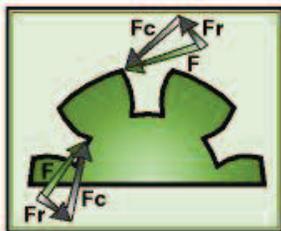
1

Radial Lug Design... is logical and efficient. The most common failure of an elastomeric insert type drive coupling is hysteresis failure of the elastomeric element - breakdown of the elastomer due to cyclical overworking and the associated heat generation. Magnaloy Coupling's drive lugs are in a true radial orientation. Applied forces are evenly distributed in the compressive direction only, eliminating the heat generating radial component. True compressive loading reduces internal heat generation and improves elastomer life.



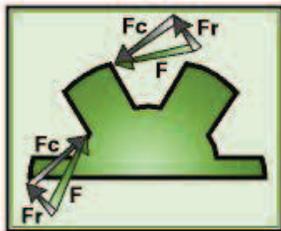
Magnaloy Coupling Design...

Under loaded conditions, the resultant forces applied on the element segments are evenly distributed in the compressive direction only. This results in no radial forces to multiply the internal heat generation.



Conventional Design A...

Under loaded conditions this jaw design results in the applied forces exerting components in the compressive and radial directions. These forces change direction and magnitude along the jaw arc which greatly increase the internal movement of the element which causes heat generation.



Conventional Design B...

This more conventional straight sided jaw design also exerts component forces in the compressive and radial directions when under load. The radial component is outward (acting to extrude the element) and changes in magnitude only, as does the compressive component, along the jaw surface. The component forces resulting from this design also causes increased internal movement in the element.

A note about Set-Screws ...

The Premium Line of Magnaloy Couplings comes standard with a single set-screw over the keyway. Optional **Double Set-Screws** are available at either 45° or 90° to the keyway. Double set-screws help improve shaft gripping forces by increasing the hoop-stresses generated from tightening a single set-screw. Double set-screws at 45° will produce greater forces than double set-screws at 90°. Either are available upon request by specifying 'DSS45' or 'DSS90' following the hub part number. M30011210DSS45

Magnaloy's Clamp feature is also available with bored and keyed hubs, specify 'C' following the hub part number. M30011210C

2



Magnaloy is the original lightweight, heavy-duty flexible drive coupling. Light weight magnesium construction makes Magnaloy couplings 76% lighter than cast iron and 36% lighter than aluminum units... and they're stronger than either!

The benefits are many... Reduced loads on bearings, shafts and pumps, for longer component life. Easier handling and installation. Rust proof and corrosion resistant.

Magnaloy's close machining tolerances (TIR of .002") assures vibration-free operation and easy, accurate alignment without need for special tools. Solid magnesium alloy permanent mold castings are heat treated and offer the highest strength-to-weight ratio available.

1

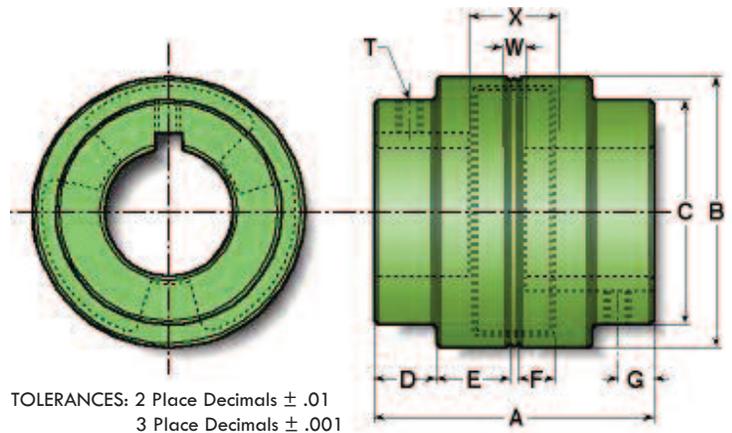
Coupling Performance Specifications

Coupling Model	Maximum Bore	Wr ² lb-ft ²	Insert Number	Rated Torque lb-in	Torsional Rigidity lb-in/Deg	Horse Power Rating @		
						100 rpm	1200 rpm	1800 rpm
100	1 1/8	0.0046	170N	340.7	42	0.55	6.5	9.8
			170U	511.0	53	0.82	9.8	14.7
			170H	1,022.1	182	1.65	19.8	29.7
200	1 3/8	0.0068	270N	398.3	55	0.64	7.6	11.5
			270U	597.4	68	0.96	11.5	17.2
			270H	1,194.9	234	1.92	23.0	34.5
300	1 5/8	0.022	370N	701.4	81	1.12	13.5	20.2
			370U	1,052.1	148	1.68	20.2	30.3
			370H	2,104.2	336	3.36	40.4	60.6
400	1 7/8	0.031	470N	1,056.3	138	1.69	20.3	30.4
			470U	1,584.5	310	2.50	30.4	45.6
			470H	3,168.9	488	5.10	60.8	91.3
500	2 3/8	0.071	570N	2,194.8	314	3.50	42.1	63.2
			570U	3,292.2	695	5.30	63.2	94.8
			570H	6,584.4	1,571	10.50	146.4	189.6
600	2 5/8	0.16	670N	4,946.7	676	7.90	94.9	142.5
			670U	7,420.1	1,510	11.90	142.5	213.7
			670H	14,840.1	2,960	23.70	284.9	427.4
700	2 7/8	0.34	770N	11,639.8	1,805	18.60	223.5	335.2
			770U	17,459.7	2,104	27.90	335.2	502.8
			770H	29,099.5	5,960	46.50	558.8	838.0
800	3 7/8	0.95	870N	21,889.4	3,680	35.00	420.3	630.4
			870U	32,834.1	-	52.50	630.4	945.6
			870H	47,062.2	11,950	75.20	903.0	1,354.5
900	4 3/4	4.20	970N	47,842.3	8,428	76.50	918.6	1,377.9
			970U	71,763.5	-	114.80	1,377.9	2,066.8

Magnaloy Coupling Dimensional Specifications

Models 100, 200, 300, 400

	100	200	300	400
A	2.54	3.10	3.58	4.24
B	2.600	2.900	3.450	3.980
C	2.00	2.25	2.90	3.05
D	0.56	0.68	0.78	1.00
E	0.68	0.84	0.96	1.06
F	0.42	0.42	0.44	0.54
G	0.31	0.43	0.56	0.73
W	1/16	1/16	1/16	1/16
X	0.90	0.90	0.98	1.20
T	1/4-20	5/16-18	5/16-18	3/8-16



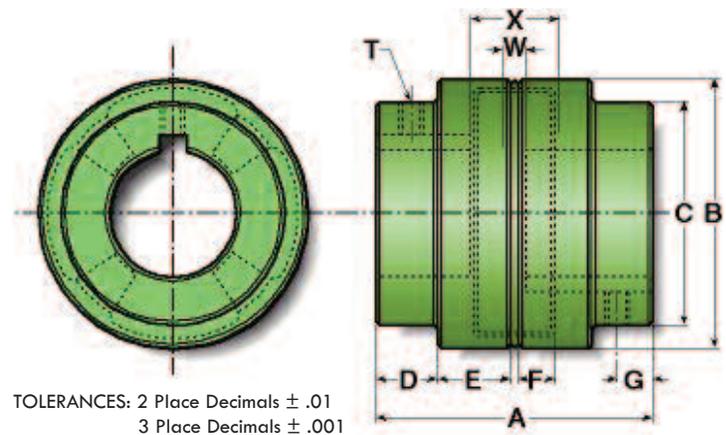
Model 500

	500
A	4.67
B	4.800
C	4.00
D	1.04
E	1.23
F	.064
G	.070
W	1/16
X	1.41
T	3/8-16

X*: Maximum Space between shaft ends to allow full shaft engagement in Hub Bore.

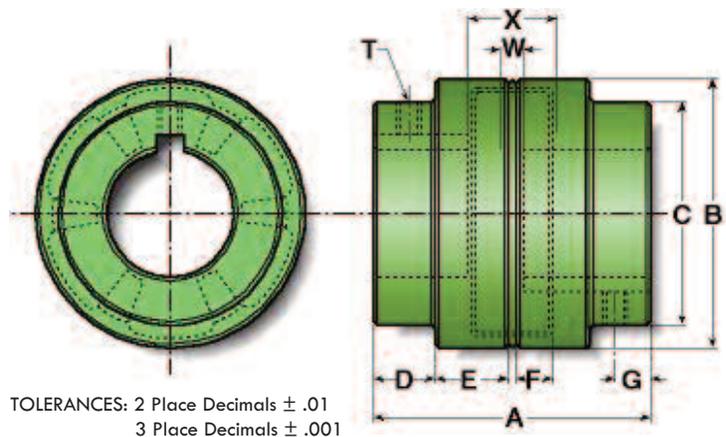
W*: Minimum Space between shaft ends.

* Given for reference only.



Models 600, 600, 800, 900

	600	700	800	900
A	5.98	6.99	7.99	10.15
B	5.975	6.900	8.600	11.400
C	4.50	5.19	7.00	8.30
D	1.60	2.08	2.25	2.75
E	1.33	1.32	1.62	2.20
F	0.62	0.89	1.00	1.32
G	1.13	1.13	1.58	1.88
W	1/16	1/16	1/16	1/16
X	1.36	1.97	2.25	2.89
T	3/8-16	1/2-13	1/2-13	3/4-10





Bore & Keyway Combinations

Standard Bore and Keyway Combinations

Magnaloy "Standard" Bore Key Combinations												
Model Code	Bore/Key Code	Model		100	200	300	400	500	600	700	800	900
		Bore	Key									
M	01203	3/8	x 3/32	*	*							
M	01403	7/16	x 3/32	*	*							
M	01404	7/16	x 1/8	*	*							
M	01604	1/2	x 1/8	*	*	*						
M	01804	9/16	x 1/8	*	*	*						
M	02005	5/8	x 5/32	*	*	*						
M	02006	5/8	x 3/16	*	*	*	*					
M	02206	11/16	x 3/16	*	*	*	*					
M	02404	3/4	x 1/8	*	*	*	*					
M	02406	3/4	x 3/16	*	*	*	*	*				
M	02806	7/8	x 3/16	*	*	*	*	*				
M	02808	7/8	x 1/4	*	*	*	*	*				
M	03008	15/16	x 1/4	*	*	*	*	*				
M	10006	1	x 3/16	*	*	*	*	*	*			
M	10008	1	x 1/4	*	*	*	*	*	*			
M	10408	1 1/8	x 1/4	*	*	*	*	*	*			
M	10608	1 3/16	x 1/4	*	*	*	*	*	*			
M	10808	1 1/4	x 1/4	*	*	*	*	*	*			
M	10810	1 1/4	x 5/16	*	*	*	*	*	*	*		
M	11210	1 3/8	x 5/16	*	*	*	*	*	*	*		
M	11212	1 3/8	x 3/8	*	*	*	*	*	*	*		
M	11412	1 7/16	x 3/8	*	*	*	*	*	*	*		
M	11610	1 1/2	x 5/16	*	*	*	*	*	*	*	*	
M	11612	1 1/2	x 3/8	*	*	*	*	*	*	*	*	
M	12012	1 5/8	x 3/8	*	*	*	*	*	*	*	*	
M	12412	1 3/4	x 3/8	*	*	*	*	*	*	*	*	

Magnaloy "Standard" Bore Key Combinations												
Model Code	Bore/Key Code	Model		100	200	300	400	500	600	700	800	900
		Bore	Key									
M	12414	1 3/4	x 7/16							*	*	*
M	12816	1 7/8	x 1/2							*	*	*
M	13016	15/16	x 1/2							*	*	*
M	20016	2	x 1/2							*	*	*
M	20416	2 1/8	x 1/2							*	*	*
M	20816	2 1/4	x 1/2							*	*	*
M	21220	2 3/8	x 5/8							*	*	*
M	21620	2 1/2	x 5/8							*	*	*
M	22020	2 5/8	x 5/8							*	*	*
M	22420	2 3/4	x 5/8							*	*	*
M	22824	2 7/8	x 3/4							*	*	*
M	30024	3	x 3/4							*	*	*
M	30824	3 1/4	x 3/4							*	*	*
M	31228	3 3/8	x 7/8							*	*	*
M	31628	3 1/2	x 7/8							*	*	*
M	32028	3 5/8	x 7/8							*	*	*
M	32428	3 3/4	x 7/8							*	*	*
M	32832	3 7/8	x 1							*	*	*
M	40032	4	x 1							*	*	*
M	40432	4 1/8	x 1							*	*	*
M	40832	4 1/4	x 1							*	*	*
M	41232	4 3/8	x 1							*	*	*
M	41632	4 1/2	x 1							*	*	*
M	41640	4 1/2	x 1 1/4							*	*	*
M	42040	4 5/8	x 1 1/4							*	*	*
M	42440	4 3/4	x 1 1/4							*	*	*

Shaded Area: AGMA semi-standard bore key combinations.

Part Number Usage: Magnaloy Coupling Hub part numbers may be specified using the following format: Start with letter "M" designating Magnaloy, followed by 3 digit Model Code (100, 200, etc.), then the specific 5 digit Bore/Key Code.

Example: Model 500 Hub with a 1 /38 bore and 5/16 keyway would be specified as: M50011210 - No bore hubs are designated as "R" code, ie. M500R.

Bore Tolerances

Over	Include	Tolerance
--	1	+0.0008/+0.0003
1	2	+0.0013/+0.0005
2	3	+0.0018/+0.0008
3	4	+0.0020/+0.0010
4	5	+0.0023/+0.0010

Additional Coupling Specifications

Model Number	100	200	300	400	500	600	700	800	900
Maximum Bore	1 1/8	1 3/8	1 5/8	1 7/8	2 3/8	2 5/8	2 7/8	3 7/8	4 3/4
Complete Coupling Approx. Weight (Solid Hub)	3/4	1	2	3	4	7	12	18	38
Number of Drive Lugs	3	3	3	3	4	6	6	6	6
Hub Movement for Insert Removal	.74	.74	.75	.98	1.12	1.02	1.50	1.63	2.27
Basic Insert Number	170	270	370	470	570	670	770	870	970

1



Magnaloy Couplings are available with a variety of special features which include splined bores. The “Splined Coupling Specifications” chart on page 6 shows several “In-house” splines available for quick delivery. Many additional splined bores are available by contacting the factory, including straight sided “PTO” type splines and metric splines.



The Clamp-Type Coupling utilized the basic Magnaloy coupling with the addition of the clamp feature. Developed to compensate for variations in spline formation methods and tolerances. Assures centering of the coupling and positive retention on the shaft. The clamp feature is suggested for all splined couplings, but is also available in smooth bored and keyed models.



Magnaloy’s Steel Bushed Splined Bore* Coupling combines all the design and lightweight features of the Magnaloy Coupling with the added spline tooth strength and wear resistance of steel. Under normal conditions the standard “Splined Bore” coupling will perform satisfactorily and the addition of the “Clamp Feature” compensates for various fit conditions. When heavy cyclic loads, reverse loading and high torque loads exist in combination with fit variations, spline tooth failures and fretting can be corrected by utilizing Magnaloy’s steel bushed coupling. Of course, to achieve optimum benefits, Magnaloy’s clamp feature is recommended - assuring accurate centering and positive retention of the coupling on the shaft.

* Although the steel bushing feature was designed primarily for spline bores, it is also available in smooth bored and keyed sizes.

Splined & Clamp Specifications

Spline Coupling Specifications

Spline Size			Pressure Angle (Degrees)	SAE Designation	Major Diameter (Inches)	Std Coupling Available Model Sizes	Steel Bushed Coupling	
Number of Teeth	Pitch Ratio	Spline Code					Bushing Diameter	Available Model Sizes
9	16/32	0916	30°	A	0.625	100 - 900	1.250	200 - 600
13	8/16	1308	30°	D, E	1.750	400 - 900	2.625	600 - 900
13	16/32	1316	30°	B	0.875	100 - 900	1.500	300 - 800
14	12/24	1412	30°	C	1.250	200 - 900	2.250	500 - 900
15	8/16	1508	30°	F	2.000	500 - 900	3.500	800 - 900
15	16/32	1516	30°	BB	1.000	100 - 900	1.750	400 - 800
17	12/24	1712	30°	CC	1.500	300 - 900	2.250	500 - 900
21	16/32	2116	30°		1.375	300 - 900	2.250	500 - 900
23	16/32	2316	30°		1.500	300 - 900	2.250 ¹	500 - 900
27	16/32	2716	30°		1.750	400 - 900	2.625 ²	600 - 900
40	16/32	4016	30°		2.562	600 - 900	3.875	800 - 900

Note: 1 - With Model 600 - 900, Bushing O.D. is 2.625.

2 - With Model 700 & 800, Bushing O.D. is 2.875.

Spline Type Identifier Code: A = Spline, B = Steel Bushing

Clamp Type Code: C = Clamp Type.

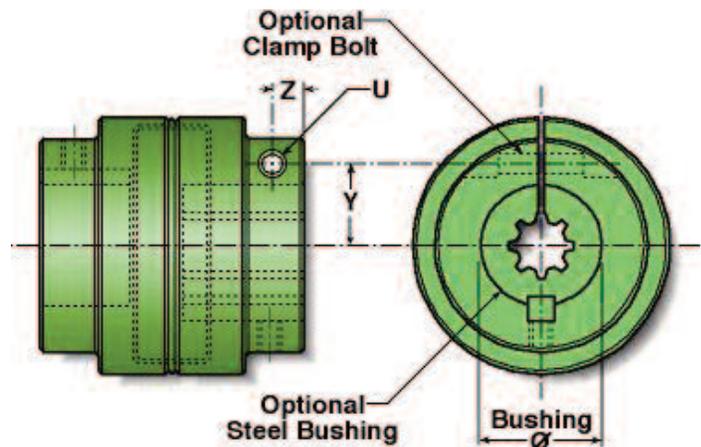
Part Number Usage: Magnaloy Splined Coupling part numbers may be specified using the following format: Start with letter "M" designating Magnaloy, follow with 3 digit Model Code (100, 200, etc.), next use a single letter Spline Type Identifier Code ("A" for regular spline or "B" for steel bushing), then the specific 4 digit Spline Code. If a clamp type coupling is desired, use the letter code "C" after the Spline Code.

Examples: Model 300 hub with 13 tooth 16/32 splined bore: M300A1316. Same item with steel bushing: M300B1316. Same item with steel bushing and clamp: M300B1316C.

Clamp Type Coupling Specifications

Coupling Model	Bolt Location		U	
	Z	Y	Bolt Size	Torque Spec.
100	0.31	0.68	1/4 - 20	130-140 in lbs
200	0.43	0.75	1/4 - 20	130-140 in lbs
300	0.47	0.95	5/16 - 18	210-220 in lbs
400	0.69	0.106	5/16 - 18	210-220 in lbs
500	0.72	1.25	3/8 - 16	300-310 in lbs
600	1.13	1.50	7/16 - 14	35-36 ft lbs
700	1.13	1.75	7/16 - 14	35-36 ft lbs
800	1.30	2.56	1/2 - 13	49-50 ft lbs
900*	0.75 & 2.19	3.00	3/4 - 10	100-110 ft lbs

* Model 900 utilizes two bolt clamp design.



Magnaloy Coupling's full range of flexible inserts permit custom design performance for a wide range of applications. All insert materials offer complete electrical insulation, as Magnaloy's design eliminates all metal-to-metal contact.



1



Part Number Usage: Magnaloy Coupling Insert part numbers may be specified using the following format: Start with the letter "M" for Magnaloy, followed by the 3 digit Basic Insert Number Code (170, 270, etc.), then the specific single letter Insert Material Code. If an optional durometer is being specified, after the Material Code supply the durometer number divided by 10.

Examples: Urethane insert for Model 300: M370U. 80 Durometer Neoprene for Model 200: M270N8.

Neoprene (Code N) - Black material - Standard material with Magnaloy Coupling. Good general purpose material offering good resiliency and load capabilities. Temp range -30°F to +250°F (-34°C to +121°C). Optional 80A durometer (painted Gold) and 90A durometer (painted Silver) are available for slight increased load capability and less resiliency.

Nitrile (Buna N)(Code B) - Painted Blue. Excellent material with petroleum products. Excellent compression set and abrasion resistance characteristics. Temp range -60°F to +250°F (-51°C to +121°C).

Urethane (Code U) - Yellow material. Excellent mechanical and physical properties. Offers good medium duty durability and resiliency. Urethane tends to soften at higher temperatures and humid conditions. Temp range -30°F to +150°F (-34°C to +66°C).

Viton (Fluorocarbon)(Code V) - Red material. Excellent fluid compatibility and high temperature characteristics. Good compression set and resiliency. Temp range -20°F to +350°F (-29°C to +177°C).

Hytrek (Code H) - Blue material. Superior physical and mechanical properties and excellent fluid compatibility and high temperature characteristics. Hardness (50D) approaches that of plastic and offers little resiliency. Excellent performance under heavy duty conditions. Temp range -65°F to +300°F (-54°C to +149°C).

Other materials are available for special applications. Consult factory for recommendations and availability.

Service Factors - Load Characteristics

Load Classification	Type of Prime Mover			
	Standard Motor or Turbine	High Torque Motor	I.C. Engine 6 or more cyl.	I.C. Engine less than 6 cyl.
Uniform (U)	1.0	1.5	1.5	2.0*
Moderate (M)	1.5	2.0	2.0	2.5*
Heavy (H)	2.0*	2.5*	2.5*	3.0*

Uniform Load: Steady loading, non-reversing, torque does not exceed rating.

Moderate Load: Uneven loading with moderate shock, frequent starts, infrequent reversals, peak torque may exceed average rating of prime mover by up to 125%.

Heavy Load: Uneven loading with heavy shock, frequent reversals, peak torque may exceed average rating of prime mover by up to 150%.

* **Recommend use of Hytrel Insert.**

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Drive Unit	Load Sym.
Agitators	U
Blowers	U
Compressors - Centrifugal	U
- Rotary	M
- Reciprocating	H*
Conveyors -	U
- Reciprocating	M
- Screw	M
- Shaker	H
Cranes & Hoists	M
Crushers	H*
Elevators	M
- Freight & Pass.	H*
Fans - Centrifugal	U
- Propeller	M
- Cooling Tower	H
Generators	U
- Welding	H
Mills	H*
Machine Tools	M
Mixers	M
Paper Mill Machinery	M
Pumps - Centrifugal	U
- Rotary	M
- Reciprocating	H*
- On Injection Molding Equip.	H*
Screens - Air & Water Washing	U
- Freight & Pass.	H
Stokers	U
Textile Machinery	M
Woodworking Machinery	M
Winches	H*

Selection Method
<p>1. Several specifics must be considered to make the best choice of couplings:</p> <p>A. Type of prime mover and load characteristics (see table above)</p> <p>B. Shaft diameter and key size or spline configuration (No. of teeth, pitch ratio, pressure angle)</p> <p>C. Horsepower rating of loads to be transmitted.</p> <p>D. Maximum operating speed (rpm)</p> <p>E. Maximum operating misalignment</p> <p>F. Clearance limitations</p> <p>2. Calculate effective hp/100 rpm by use of table above and select the minimum size coupling recommended</p> <p>3. VERIFY YOUR SELECTION:</p> <p>A. Check for maximum bore size</p> <p>B. Check dimensions for adequate clearance</p> <p>C. Indicate any special insert specification and/or coupling coating for environmental protection, if required</p> <p>Equation: Effective HP per 100 RPM = rated HP x Service Factor x 100 / RPM</p> <p>Example: 150 HP, 4 cyl. Diesel Engine Driving a Reciprocating Irrigation Pump operating at 3250 RPM Service Factor - 3.0 (Hytrel Insert Recommended) Eff. HP per 100 RPM = 150 HP x 3.0 x 100 / 3250 RPM = 13.85 HP/100 RPM. Model 600 rating with Hytrel Insert is 23.7 HP/100 RPM.</p>

Note: Above service factors are intended for use as a general guide only.

*Recommend use of Steel Bushing and Clamp with Splined Bores.

1



Shaft spacing should be within range given by dimensions 'W' and 'X' as shown in charts on page 4.

Position each hub on proper size shaft - Magnaloy couplings are bored to standard "push fit" tolerances, if a tight fit exists, check shaft for burrs.

Maximum benefits are obtained with hubs positioned to allow complete shaft engagement within bore. However, some equipment designs do not permit this condition - maximum shaft engagement should be utilized in any case.

Alignment - Place a straight edge (scale) at top and side of coupling. Use a .005 inch feeler gauge under scale for final inspection. This will indicate accurate parallel and angular alignment.

Magnaloy's precision machined outside surfaces permit this simple, but accurate alignment method.



Secure equipment mounts and recheck alignment for movement.

Install the insert in the coupling positioning hubs in contact with lip around outside of insert.

Before tightening set screws, run the coupling and check for separation of hubs or "creep". Recheck alignment and tighten set screws.

With the Steel Bushed/Clamp type couplings, to facilitate installation on the shaft, it may be necessary to slightly loosen the set-screw over the keystone. When securing the coupling on the shaft, first tighten the clamp bolt, then tighten the set-screw against the keystone.

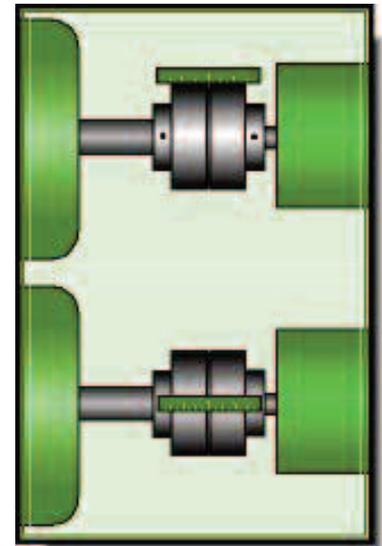
Mis-Alignment Capabilities

Magnaloy Couplings offer four-way flexibility (parallel, angular, axial and torsional) and require no lubrication. They are easily installed and properly aligned without use of special tools or equipment - a straight edge and hex wrench are the only tools required. Magnaloy's insert reduces noise and vibration and permits needed flexibility for proper operation within alignment capabilities.

Recommended Torques for Fasteners

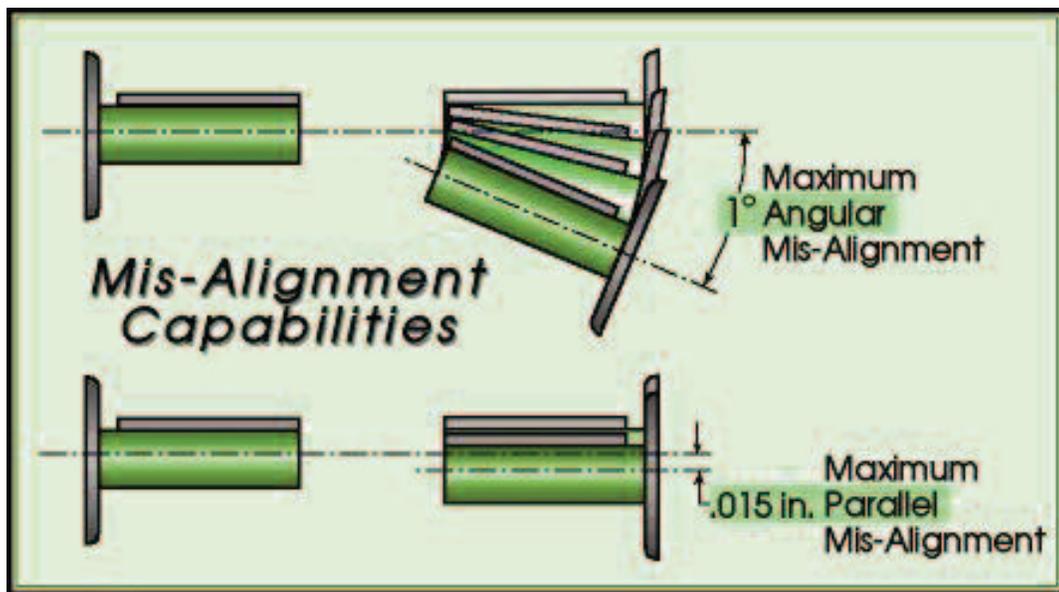
Model	Set Screw	Clamp Screw
100	60 - 70 in lbs	130 - 140 in lbs
200	75 - 85 in lbs	130 - 140 in lbs
300	75 - 85 in lbs	210 - 220 in lbs
400	190 - 200 in lbs	210 - 220 in lbs
500	190 - 200 in lbs	300 - 310 in lbs
600	190 - 200 in lbs	35 - 36 ft lbs
700	300 - 310 in lbs	35 - 36 ft lbs
800	300 - 310 in lbs	49 - 50 ft lbs
900	100 - 110 ft lbs	100 - 110 ft lbs

Intended as a general guide for fastener torques with Magnaloy Couplings.



1

Perfect alignment of equipment shafts, in most cases, is impractical to obtain or maintain, and misaligned equipment produces, excess stress on bearings and the coupling. Magnaloy's insert design will accept misalignment strain and, when excessive, will cause insert wear as a visual and audible indication of misalignment problems. However, Magnaloy's inserts are inexpensive and easily replaces; under normal conditions the insert seldom requires replacement.



Powdered Metal PM90 Coupling

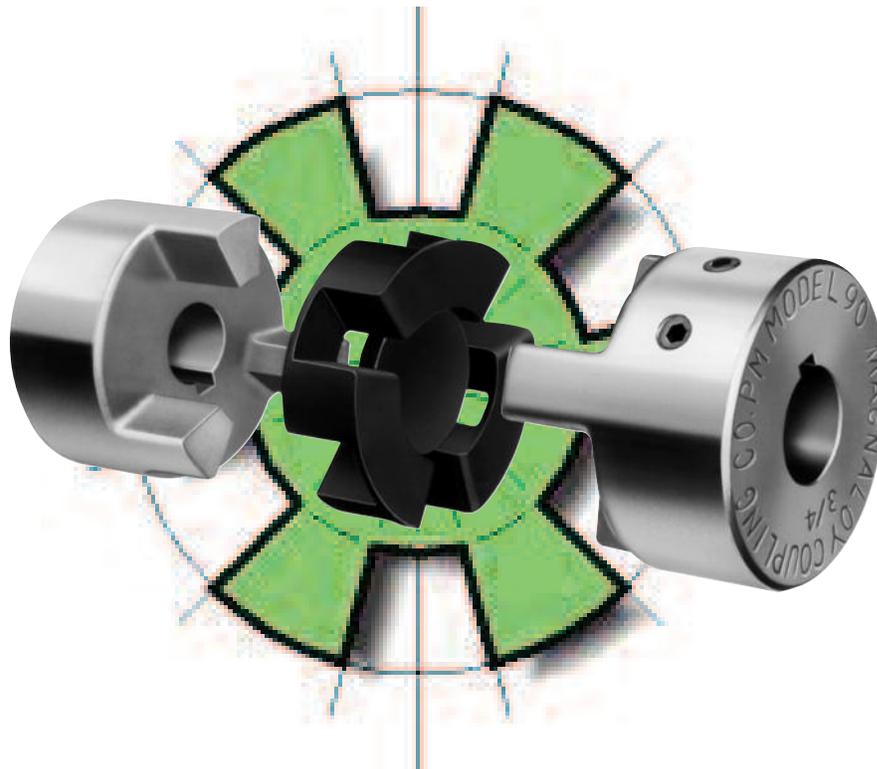
The Strong, High Quality, Low Cost Powdered Metal Coupling from Magnaloy

When your priorities for a coupling are economy and strength... specify the all-new Magnaloy Type PM90.

The PM90 is made from high-density powdered metal and is available in standard bores up to 1 1/8 inch maximum. Double set screws are standard in all bores 1/2 inch and over. The set screws are placed over the keyway and at a 45° angle to the keyway to allow greater hoop-stress generation and maximum shaft gripping. The increased drive lug surface area on the PM90 provides low unit loads on the insert drive segments while insuring more rapid heat dissipation. Magnaloy's exclusive insert design allows easy installation and replacement without hub removal. The drive lug design provides even compressive loading with no radial loading of insert drive elements.



1



It is a well established fact that the major cause of failure in an elastomeric insert type drive coupling is hysteresis failure which results from overworking the insert by application of cyclic loads and the associated heat generation. These cyclic loads can be internal in origin as a result of coupling design (see page 2) and when coupled with externally applied loads can greatly reduce elastomer life. Specifying Magnaloy's Type PM Coupling with radial designed drive lugs results in true compressive loads and improved insert life.

PM90 Specifications

Model PM90 - Standard Bore / Keyway Sizes (per AGMA Class 1, Clearance Fit)

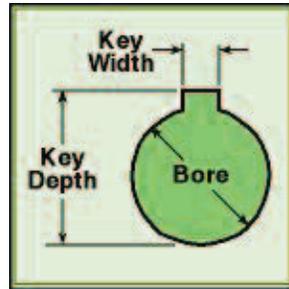
Part Number	Bore & Keyway Combinations	Bore Size**	Key Width	Key Depth	Set Screw	
					Size	Quantity
P090014N	7/16 x No Key	0.4375 / 0.4385	0.0938 / 0.0958	-	1/4-20 UNC	1
P09001403	7/16 x 3/32	0.4375 / 0.4385	0.125 / 0.127	0.484 / 0.495	1/4-20 UNC	1
P09001404	7/16 x 1/8	0.4375 / 0.4385	0.125 / 0.127	0.496 / 0.507	1/4-20 UNC	2
P09001604	1/2 x 1/8	0.500 / 0.501	0.125 / 0.127	0.560 / 0.571	1/4-20 UNC	2
P09001804	9/16 x 1/8	0.5625 / 0.5635	0.125 / 0.127	0.623 / 0.634	1/4-20 UNC	2
P09002005	5/8 x 5/32	0.625 / 0.626	0.1562 / 0.1582	0.698 / 0.709	1/4-20 UNC	2
P09002006	5/8 x 3/16	0.625 / 0.626	0.1875 / 0.1895	0.709 / 0.720	1/4-20 UNC	2
P09002206	11/16 x 3/16	0.6875 / 0.6885	0.1875 / 0.1895	0.773 / 0.784	1/4-20 UNC	2
P09002404	3/4 x 1/8	0.750 / 0.751	0.125 / 0.127	0.812 / 0.823	1/4-20 UNC	2
P09002406	3/4 x 3/16	0.750 / 0.751	0.1875 / 0.1895	0.837 / 0.848	1/4-20 UNC	2
P09002806	7/8 x 3/16	0.875 / 0.876	0.1875 / 0.1895	0.964 / 0.975	1/4-20 UNC	2
P09002808	7/8 x 1/4	0.875 / 0.876	0.250 / 0.252	0.982 / 0.993	1/4-20 UNC	2
P09010006	1 x 3/16	1.000 / 1.001	0.1875 / 0.1895	1.090 / 1.101	1/4-20 UNC	2
P09010008	1 x 1/4	1.000 / 1.001	0.250 / 0.252	1.114 / 1.125	1/4-20 UNC	2
P09010408	1 1/8 x 1/4	1.125 / 1.126	0.205 / 0.252	1.241 / 1.252	1/4-20 UNC	2

* Shaded combinations are Semi-special - see price sheet

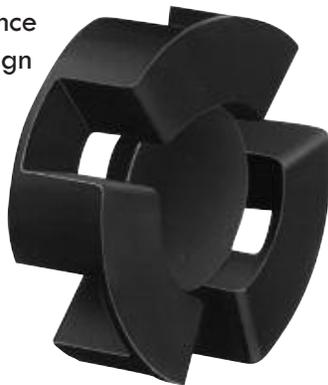
** Other Bore/Keyway combinations are available. Consult factory for quotation.

Model PM90 Bore Tolerances

Feature	Tolerance
Bore	-.000 / +.001
Key Width	-.000 / +.002
Key Depth	+.005 / +.016



As with Magnaloy's standard line of couplings, insert elastomer selection allows variable performance characteristics. Insert design eliminates metal-to-metal contact and assures electrical isolation of shafts.



Nitrile, 70A Durometer....

Standard elastomer material offering excellent resistance to petroleum products and superior compression set characteristics.

Urethane, 90A Durometer....

Excellent mechanical and physical properties. *Note:* Urethane material tends to soften when exposed to elevated temperatures or humid conditions.

Hytrell, 50D Durometer....

Superior mechanical and physical properties and offers excellent fluid compatibility and high temperature characteristics.

Additional insert materials available upon request from factory.

See page 8 for additional information on insert selection.

LITERATURE - ELECTRICAL

Starters, Relays

Transducers, Pressure Switches... etc

Motor Starters & Manual Motor Starters



- Contactors, Control Relays & Overload Relays
- Mini Contactors, Definite Purpose Contactors
- Motor Starters & Manual Motor Starters
- Push Buttons & Pilot Lights
- PiezoElectric & Capacitive Push Buttons
- Control Stations
- Miniature Circuit Breakers
- Disconnect Switches
- Power Supplies
- Screw Connection Terminals
- Wiring Ducts & Din Rails
- Wiring Connectors





MOTOR STARTERS

- 3 Pole Non-Reversing or Reversing Starters available in NEMA Type Enclosures, up to 50hp @ 480V
- Direct-on-Line Starter in Sheet Steel Enclosure up to 50Hp @ 480V
- Direct-on-Line Starter in Plastic Enclosure up to 15Hp @ 480V



MANUAL MOTOR STARTERS

- Sensitive to phase failure in compliance with EN60947-4-1 and IEC947-4-1
- Reliable protection at overloads and short circuits
- Simple & fast mounting by snap fitting on 35mm wide mounting rail
- Convenient to mount in an installation distribution box



FANOX MANUAL MOTOR STARTERS

- Suitable for small size motors in machine tools, conveyor systems
- Modular 45mm size, DIN rail mounting (EN 50022-35)
- Isolating and main switch function (IEC 204-1)
- Current limiter M-SB increases the circuit capacity up to 50kA/400V. Assembly: under the manual motor starter or remote from it

MOTOR STARTERS

How to Order

NEMA Type Enclosures : **Reversing & Non Reversing**
 (Overload Relay not included, sold separately)

TE1-D 8036 - XX



TE1-D=Non-Reversing
 TE2-D=Reversing

COIL SIZE

XX=Replace XX with Voltage Code from Table-1 below

AMPS

- 0936= 9Amps
- 1236= 12Amps
- 1836= 18Amps
- 2536= 25Amps
- 3236= 32Amps
- 4036= 40Amps
- 5036= 50Amps
- 6536= 65Amps
- 8036= 80Amps
- 9536= 95Amps

Replace XX with voltage code from table below.

Table 1 : AC Coil Voltages														
Volts AC	24	48	110	120	208	220	240	277	380	415	440	480	575	600
50 Hz	B5	E5	F5			M5	U5		Q5	N5	R5			
60 Hz	B6	E6	F6	G6	L6	M6	U6	W6	Q6		R6	T6	S6	X6
50-60 Hz	B7	E7	F7	G7		M7	U7		Q7	N7	R7			

Order Information for TE#-D Motor Starter Series:

1. Select Motor Starter (includes Contactor, Wiring & Reset Button)
2. Select Overload Relay
3. Select Push Button & Pilot Light "Quick Kit"



MOTOR STARTERS / NEMA Type Enclosure

Motor Starters

Overload Relay is not included & sold separately.



3Pole Enclosed Full Voltage Starters: Non-Reversing

3Pole Enclosed Full Voltage Starter, NEMA Type Enclosure : Non Reversing							
Max Current		MAXIMUM HP 3Phase			AUX CONTACTS BUILT-IN PER CONTACTOR		Catalog Number
AC-3	AC-1	200V	230V	460V	NO	NC	
9	20	2	2	5	1	0	TE1-D0936-XX
12	25	3	3	7.5	1	0	TE1-D1236-XX
18	32	5	5	10	1	0	TE1-D1836-XX
25	40	5	7.5	15	1	0	TE1-D2536-XX
32	50	7.5	10	20	1	0	TE1-D3236-XX
40	60	10	10	30	1	1	TE1-D4036-XX
50	70	10	15	30	1	1	TE1-D5036-XX
65	80	15	20	40	1	1	TE1-D6536-XX
80	125	20	20	50	1	1	TE1-D8036-XX
95	125	25	25	60	1	1	TE1-D9536-XX

Replace XX with Voltage Code from Table-1 below.



3Pole Enclosed Full Voltage Starters: Reversing

3Pole Enclosed Full Voltage Starter, NEMA Type Enclosure : Reversing							
Max Current		MAXIMUM HP 3Phase			AUX CONTACTS BUILT-IN PER CONTACTOR		Catalog Number
AC-3	AC-1	200V	230V	460V	NO	NC	
9	20	2	2	5	1	0	TE2-D0936-XX
12	25	3	3	7.5	1	0	TE2-D1236-XX
18	32	5	5	10	1	0	TE2-D1836-XX
25	40	5	7.5	15	1	0	TE2-D2536-XX
32	50	7.5	10	20	1	0	TE2-D3236-XX
40	60	10	10	30	1	1	TE2-D4036-XX
50	70	10	15	30	1	1	TE2-D5036-XX
65	80	15	20	40	1	1	TE2-D6536-XX
80	125	20	20	50	1	1	TE2-D8036-XX
95	125	25	25	60	1	1	TE2-D9536-XX

Replace XX with Voltage Code from Table-1 below.

Table 1 : AC Coil Voltages

Volts AC	24	48	110	120	208	220	240	277	380	415	440	480	575	600
50 Hz	B5	E5	F5			M5	U5		Q5	N5	R5			
60 Hz	B6	E6	F6	G6	L6	M6	U6	W6	Q6		R6	T6	S6	X6
50-60 Hz	B7	E7	F7	G7		M7	U7		Q7	N7	R7			

Accessories for NEMA Metal Type Enclosures Only

Push Buttons & Pilot Lights "Quick Kits"

Catalog Number	Description
TA9C6	ON / OFF Selector Switch
TA9C	Hand-OFF-Auto Selector Switch
TA9P12	Red or Green Pilot Light 120V
TA9A	Start / Stop Push Button
TA9C6P12	ON / OFF Selector Switch with Red or Green P/L
TA9AP12	Start / Stop Push Button with Red Light or Green P/L
TA9A1	Forward / Reverse / Stop Push Buttons
TA9CP12	Hand / OFF / Auto Selector Switch with Red or Green P/L 120V
TA9AP5152	Start / Stop Push Button with Red or Green Transformer P/L 120V
TA9P5152	Transformer Red or Green Pilot Light 120V
TA9CP5152	Hand / OFF / Auto Selector Switch with Red or Green Transformer P/L 120V



Overload Relays & Base Plates

- Provides protection against operational overload & single phasing or loss of phase
- Overload is selectable for single phase or three-phase operation
- Built-in single phase protection
- UL, CSA, IEC-approved
- IP20 finger touch proof



TR2-D09307



TA7-D Base Plate

Ordering Information

Relay	Setting Range (A)	Base Plate
TR2-D09301	0.1 TO 0.16	TA7-D0964
TR2-D09302	0.16 TO 0.25	
TR2-D09303	0.25 TO 0.4	
TR2-D09304	0.4 TO 0.63	
TR2-D09305	0.63 TO 1	
TR2-D09306	1 TO 1.6	
TR2-D093X6	1.25 TO 2	
TR2-D09307	1.6 TO 2.5	
TR2-D09308	2.5 TO 4	
TR2-D09310	4 TO 6	
TR2-D09312	5.5 TO 8	
TR2-D09314	7 TO 10	
TR2-D12316	9 TO 13	
TR2-D18321	12 TO 18	
TR2-D25322	17 TO 25	TA7-D3264
TR2-D32353	23 TO 32	
TR2-D32355	28 TO 36	
TR2-D40355	30 TO 40	TA7-D4064
TR2-D65357	37 TO 50	
TR2-D65359	48 TO 65	
TR2-D65361	55 TO 70	
TR2-D80363	63 TO 80	
TR2-D95365	80 TO 93	

Contactors - Motor Starters - Push Buttons & Pilot Lights - Control Stations - Piezo Switches - Mini Circuit Breakers
 Disconnect Switches - Power Supplies - Power Supplies - Screw Connection Terminals - Wiring Ducts & Din Rails - Wiring Connectors

MOTOR STARTERS / DIRECT-ON-LINE

Motor Starters



Direct-On-Line Motor Starters: Sheet Steel Enclosures

Direct-On-Line Motor Starters, Sheet Steel Enclosure					
Max Motor Rating at 415V, 3Phase, 50Hz		Contactor Reference	Contactor AC3 Duty Rating	Overload Relay Range (Amps)	Starter Catalog Number
kW	HP				
0.37	0.5	TC1D12	12A	0.63 TO 1.00	BE1-T1235■305
0.55	0.75	TC1D12	12A	1.00 TO 1.60	BE1-T1235■306
1.1	1.5	TC1D12	12A	1.6 TO 2.50	BE1-T1235■307
1.5	2	TC1D12	12A	2.50 TO 4.00	BE1-T1235■308
2.2	3	TC1D12	12A	4.00 TO 6.00	BE1-T1235■310
3.7	5	TC1D12	12A	5.50 TO 8.00	BE1-T1235■312
4	5.5	TC1D12	12A	7.00 TO 10.0	BE1-T1235■314
5.5	7.5	TC1D12	12A	9.0 TO 13.0	BE1-T1235■316
9	12	TC1D18	18A	12.0 TO 18.0	BE1-T1835■321
11	15	TC1D25	25A	17.0 TO 25.0	BE1-T2535■322
15	20	TC1D32	32A	23.0 TO 32.0	BE1-T3235■353
22	30	TC1D40	40A	30.0 TO 40.0	BE1-T4035■355
25	35	TC1D50	50A	37.0 TO 50.0	BE1-T5035■357
30	40	TC1D65	65A	48.0 TO 65.0	BE1-T6535■359
37	50	TC1D65	65A	55.0 TO 70.0	BE1-T6535■361

■ Replace with voltage code from Table-2 below.



Direct-On-Line Motor Starters: Plastic Enclosures

Direct-On-Line Motor Starters, Plastic Enclosure					
Max Motor Rating at 415V, 3Phase, 50Hz		Contactor Reference	Contactor AC3 Duty Rating	Overload Relay Range (Amps)	Starter Catalog Number
kW	HP				
0.37	0.5	TC1D12	12A	0.63 TO 1.00	LE1-D123■305
0.55	0.75	TC1D12	12A	1.00 TO 1.60	LE1-D123■306
1.1	1.5	TC1D12	12A	1.6 TO 2.50	LE1-D123■307
1.5	2	TC1D12	12A	2.50 TO 4.00	LE1-D123■308
2.2	3	TC1D12	12A	4.00 TO 6.00	LE1-D123■310
3.7	5	TC1D12	12A	5.50 TO 8.00	LE1-D123■312
4	5.5	TC1D12	12A	7.00 TO 10.0	LE1-D123■314
5.5	7.5	TC1D12	12A	9.0 TO 13.0	LE1-D123■316
9	12	TC1D18	18A	12.0 TO 18.0	LE1-D183■321
11	15	TC1D25	25A	18.0 TO 25.0	LE1-D253■322

■ Replace with voltage code from Table-2 below.

Table 2 : AC Coil Voltages

Volts AC	24	48	110	120	208	220	240	277	380	415	440	480	575	600
50 Hz	B5	E5	F5			M5	U5		Q5	N5	R5			
60 Hz	B6	E6	F6	G6	L6	M6	U6	W6	Q6		R6	T6	S6	X6
50-60 Hz	B7	E7	F7	G7		M7	U7		Q7	N7	R7			

MANUAL MOTOR STARTERS

Motor Starters

Shamrock Manual Motor Starters



TCMS32H0.63

Shamrock Manual Motor Starters

3Phase or 1Phase	HP (Horsepower)					Thermal Release Adjustment Range (A)	Catalog Number
	115V	200V	230V	460V	575V		
3Ph	-	-	-	-	-	0.1 - 0.16	TCMS32H0.16
1PH	-	-	-	-	-		
3PH	-	-	-	-	-	0.16 - 0.25	TCMS32H0.25
1PH	-	-	-	-	-		
3PH	-	-	-	-	-	0.25 - 0.4	TCMS32H0.40
1PH	-	-	-	-	-		
3PH	-	-	-	-	-	0.4 - 0.63	TCMS32H0.63
1PH	-	-	-	-	-		
3PH	-	-	-	-	0.5	0.63 - 1	TCMS32H01.0
1PH	-	-	-	-	-		
3PH	-	-	-	0.75	0.75	1 - 1.6	TCMS32H1.60
1PH	-	-	0.1	-	-		
3PH	-	0.5	0.5	1	15	1.6 - 2.5	TCMS32H02.50
1PH	-	0.16	0.16	0.5	0.5		
3PH	0.5	0.75	0.75	2	3	2.5 - 4	TCMS32H4
1PH	0.125	0.25	0.3	1	1.5		
3PH	0.75	1	1.5	3	5	4 - 6.3	TCMS32H6.30
1PH	0.25	0.5	0.5	2	2		
3PH	1	2	3	5	7.5	6.3 - 10	TCMS32H10
1PH	0.5	1	1.5	3	3		
3PH	2	3	5	10	10	9-13	TCMS32H13
1PH	1	2	2	5	7.5		
3PH	3	5	5	10	15	11-17	TCMS32H17
1PH	1.5	3	3	5	10		
3PH	3	5	7.5	15	20	14-22	TCMS32H22
1PH	2	3	3	7.5	10		
3PH	3	5	7.5	15	20	18-26	TCMS32H26
1PH	2	3	3	7.5	10		
3PH	3	5	7.5	15	20	22-32	TCMS32H32*
1PH	2	3	3	7.5	10		

*TCMS32 Motor Protection Switches, Rated ultimate short circuit breaking capacity 1^∞ and max backup fuses if prospective short circuit 1^∞ exceeds 1^∞

MANUAL MOTOR STARTERS

Motor Starters

Shamrock Manual Motor Starter Accessories

Auxiliary Switches



TCHSV01
Front Mount

AUXILIARY SWITCH		
Contact Type	Side Mount Aux Switch Catalog No.	Front Mount Aux Switch Catalog No.
1NC	-	TCHSV01
1NO	-	TCHSV10
1NO + 1NC	TCHS11	-
2NO	TCHS20	-

Accessories

TCHRS10
Contact Block



Enclosures

TCES-T



TCSS3

Catalog Number	Description
Trip Indication Contact Block	
TCHRS10	1NO Aux Contact
TCHRS01	1NC Aux Contact
Enclosure (IP55)	
TCMSHO	Flush Mounted Type
TCMSFP	Surface Mounted Type
Emergency Stop Button	
TCES-T	Red - Emergency Stop
Lamp (Available in 24V, 120V, 240V)	
TCSS1	Signal Lamp - White
TCSS3	Signal Lamp - Green
TCSS4	Signal Lamp - Red
Voltage Releases	
TCMSUR	Under Voltage Release (24-600VAC)
TCMSAR	Short Release (24-600VAC)

MANUAL MOTOR STARTERS

Motor Starters

Fanox Manual Motor Starters & Aux Contacts



M-6.3-35007

Fanox Manual Motor Starters (UL Listed)

Range A	Motor, 3F, AC3 kW - 400V	Catalog Number
0.1 - 0.16	-	M-0.16-35016
0.16-0.25	0.06	M-0.25-35000
0.25-0.4	0.09	M-0.4-35001
0.4-0.63	0.12	M-0.63-35002
0.63-1	0.25	M-1-35003
1-1.6	0.55	M-1.6-35004
1.6-2.5	0.75	M-2.5-35005
2.5-4	1.5	M-4-35006
4-6.3	2.2	M-6.3-35007
6.3-10	4	M-10-35008
10-16	7.5	M-16-35009
16-20	9	M-20-35010
20-25	12.5	M-25-35011
25-32	15	M-32-35012



M-EHS11-03908

Fanox Auxiliary Contacts

Type of Aux contacts	Catalog Number		
	Side Mounting	Inside Mounting	Front Mounting
2 NO	M-HS20-3901	-	-
NO + NC	M-HS11-03900	M-EHS11-03908	FHSM11-03931
NO	M-HS10-39011	M-SHS10-03906	FHSM10-03932
2 NC	M-HS02-03903	-	-
NC	M-HS01-39031	M-SH01-03907	FHSM01-03933
NO* + NC	M-VHS11-03902	-	-

Contactors - Motor Starters - Push Buttons & Pilot Lights - Control Stations - Piezo Switches - Mini Circuit Breakers
 Disconnect Switches - Power Supplies - Screw Connection Terminals - Wiring Ducts & Din Rails - Wiring Connectors

MANUAL MOTOR STARTERS

Accessories

Fanox Manual Motor Starter Accessories

Accessories



M-UN-55-03915

Fanox Manual Motor Starter Remote & Undervoltage trip (Inside Mounting)		
V / Hz	Remote Trip	Undervoltage Trip
24/50-60	M-AS-05	M-UN-05
110/50 120/60	M-AS-15	M-UN-15
220-240/50 240/60	M-AS-25	M-UN-25
380-415/50 440/60	M-AS-45	M-UN-45
500/50	-	M-UN-55-03915

Catalog Number	Description
Enclosures	
M-GE-03950	Surface Mounting Enclosure IP41
M-FP-03940	Flush Mounting IP41
M-BS-03948	Kit IP55 (M-GE & M-FP)
M-GC-04055	Enclosure IP54, 5Poles CEE-17
M-GC1-04056	Idem with Phase Inverter
Emergency Stop-Operation for M-GE & M-FP	
M-PT-03980	Push button Type IP55
M-PV-03981	Self-locking Type IP55
M-PS-39822	Self-locking with key IP55
Other Accessories for M-GE & M-FP	
M-VSL-03988	Padlocking feature (max: 3)
M-N-03949	N-Terminal (indicator lights white, red or green)



M-GE-03950



M-VSL-03988
Padlocking Feature



M-GC-04055



Your business is our Number One priority.



Local Distributor:



13735 Beta Road

Dallas, Texas 75244

Tel. No. (972)233-6712

Fax No. (972)233-8039

www.shamrockcontrols.com

BALDOR® • ***RELIANCE***

Product Information Packet

CEM2333T

15HP, 1765RPM, 3PH, 60HZ, 254TC, 0944M, TEFC, F

Part Detail							
Revision:	L	Status:	PRD/A	Change #:		Proprietary:	No
Type:	AC	Prod. Type:	0944M	Elec. Spec:	09WGZ910	CD Diagram:	CD0005
Enclosure:	TEFC	Mfg Plant:		Mech. Spec:	09C102	Layout:	09LYC102
Frame:	254TC	Mounting:	F1	Poles:	04	Created Date:	11-09-2012
Base:	RG	Rotation:	R	Insulation:	F	Eff. Date:	03-15-2017
Leads:	9#12					Replaced By:	
Literature:		Elec. Diagram:					

Nameplate NP3441LUA										
CAT.NO.	CEM2333T									
SPEC.	09C102Z910G1									
HP	15									
VOLTS	230/460									
AMP	36.2/18.1									
RPM	1765									
FRAME	254TC				HZ	60			PH	3
SER.F.	1.15		CODE	H	DES	A		CL	F	
NEMA-NOM-EFF	92.4		PF	83						
RATING	40C AMB-CONT									
CC	010A				USABLE AT 208V					38
DE	6309				ODE	6208				
ENCL	TEFC		SN							
VPWM INVERTER READY										
CT6-60H(10:1)VT3-60H(20:1										
50Hz 15HP 190/380V 43.2/21.6A									SF1.0	

Parts List		
Part Number	Description	Quantity
SA254029	SA 09C102Z910G1	1.000 EA
RA240840	RA 09C102Z910G1	1.000 EA
HW1002A63	WASHER, 5/8 HI-COLLAR SPRLCKWASHER	1.000 EA
09CB3002SP	CB W/1.38 LEAD HOLE FOR 37, 39, 307 & 30	1.000 EA
09GS1000SP	GASKET-CONDUIT BOX, 1/16 THICK LEXIDE	1.000 EA
10XN2520K12	1/4-20 X.75 GRD 5	2.000 EA
HW1001A25	LOCKWASHER 1/4, ZINC PLT .493 OD, .255 I	2.000 EA
09EP1300A155	PUEP MACH W/309 BRG & "O" DRAIN, SLINGER	1.000 EA
HW4600B44	V-RING SLINGER 1.500 X 1.810 X .28 VITON	1.000 EA
WD1000B17	T&B CX35TN TERMINAL	1.000 EA
11XW1032G06	10-32 X .38, TAPTITE II, HEX WSHR SLTD U	1.000 EA
09FE1100A194	FREP 09EP1100A194 FOR PLANT ROUTING	1.000 EA
HW1001A38	LOCKWASHER 3/8, ZINC PLT .688 OD, .382 I	4.000 EA
XY3816A12	3/8-16 FINISHED NUT	4.000 EA
HW5100A08	W3118-035 WVY WSHR (WB)	1.000 EA
10XN2520K28	1/4-20 X 1.75" HX HD SCRWGRADE 5, ZINC P	2.000 EA
HW1001A25	LOCKWASHER 1/4, ZINC PLT .493 OD, .255 I	2.000 EA
10XN2520K36	1/4-20 X 2.25" HX HD SCRWGRADE 5, ZINC P	4.000 EA
HW1001A25	LOCKWASHER 1/4, ZINC PLT .493 OD, .255 I	4.000 EA
HA3113A02	THRUBOLT 3/8-16 X 16.750	4.000 EA
HW1001A38	LOCKWASHER 3/8, ZINC PLT .688 OD, .382 I	4.000 EA
HA2081A05	SPACER TUBE, 309 FAN HSG, 2.00 LONG	4.000 EA
XY3816A12	3/8-16 FINISHED NUT	4.000 EA
HW1001A38	LOCKWASHER 3/8, ZINC PLT .688 OD, .382 I	4.000 EA

Parts List (continued)		
Part Number	Description	Quantity
09CB3501SP	CONDUIT BOX LID FOR 09CB3001 & 09CB3002	1.000 EA
09GS1013SP	09 GS FOR 09CB3501 LID - LEXIDE	1.000 EA
51XW2520A12	.25-20 X .75, TAPTITE II, HEX WSHR SLTD	2.000 EA
HW2501G25	KEY, 3/8 SQ X 2.875	1.000 EA
LB1115N	LABEL,LIFTING DEVICE (ON ROLLS)	1.000 EA
HW4500A05	1669B ALEM/UNIV860 GR FTG X	1.000 EA
HW4500A17	317400 ALEMITE GREASE RELIEF	1.000 EA
HA4066A01	PUSH IN T-DRAIN FITTING (BLACK)	1.000 EA
MN416A01	TAG-INSTAL-MAINT no wire (1000/bx) 11/14	1.000 EA
MJ1000A02	GREASE, POLYREX EM EXXON (USe 4824-15A)	0.080 LB
HA4051A00	PLASTIC CAP FOR GREASE FITTING	1.000 EA
HA4051A00	PLASTIC CAP FOR GREASE FITTING	1.000 EA
HW4500A03	GREASE FITTING, .125 NPT 1610(ALEMITE) 8	1.000 EA
HW4500A17	317400 ALEMITE GREASE RELIEF	1.000 EA
HA4066A01	PUSH IN T-DRAIN FITTING (BLACK)	1.000 EA
09FH4000SP	FAN COVER, STAMPED	1.000 EA
09FN3001D01	EXTERNAL FAN, PLASTIC	1.000 EA
HW2500A25	WOODRUFF KEY USA #1008 #BLOW CARBON STEE	1.000 EA
51XB1214A20	12-14X1.25 HXWSSLD SERTYB	1.000 EA
MG1000Y03	MUNSELL 2.53Y 6.70/ 4.60, GLOSS 20,	0.050 GA
85XU0407S04	4X1/4 U DRIVE PIN STAINLESS	2.000 EA
LC0005E02	SPL CONN.DIA./WARN.LABEL(LC0005/LB1119)	1.000 EA
NP3441LUA	ALUM SUPER-E VPWM INV READY UL	1.000 EA
09PA1000	PACKAGING GROUP COMBINED PRINT	1.000 EA

AC Induction Motor Performance Data

Record # 40347 - Typical performance - not guaranteed values

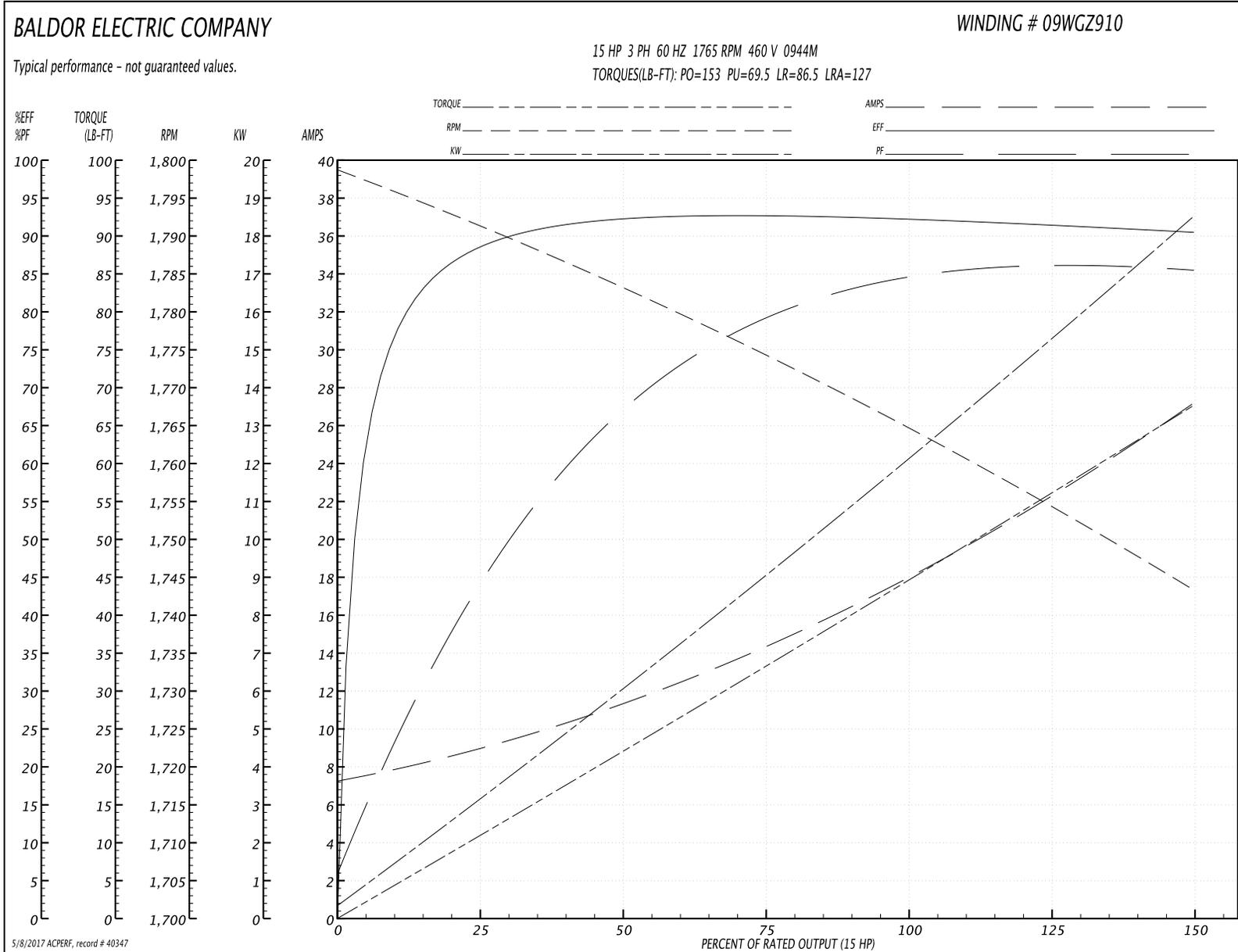
Winding: 09WGZ910-R001	Type: 0944M	Enclosure: TEFC
-------------------------------	--------------------	------------------------

Nameplate Data				460 V, 60 Hz: High Voltage Connection	
Rated Output (HP)	15			Full Load Torque	44.5 LB-FT
Volts	230/460			Start Configuration	direct on line
Full Load Amps	36.2/18.1			Breakdown Torque	153 LB-FT
R.P.M.	1765			Pull-up Torque	69.5 LB-FT
Hz	60	Phase	3	Locked-rotor Torque	86.5 LB-FT
NEMA Design Code	A	KVA Code	H	Starting Current	127 A
Service Factor (S.F.)	1.15			No-load Current	7.56 A
NEMA Nom. Eff.	92.4	Power Factor	83	Line-line Res. @ 25°C	0.59555 Ω
Rating - Duty	40C AMB-CONT			Temp. Rise @ Rated Load	54°C
S.F. Amps				Temp. Rise @ S.F. Load	67°C
				Locked-rotor Power Factor	33.1
				Rotor inertia	1.92 LB-FT ²

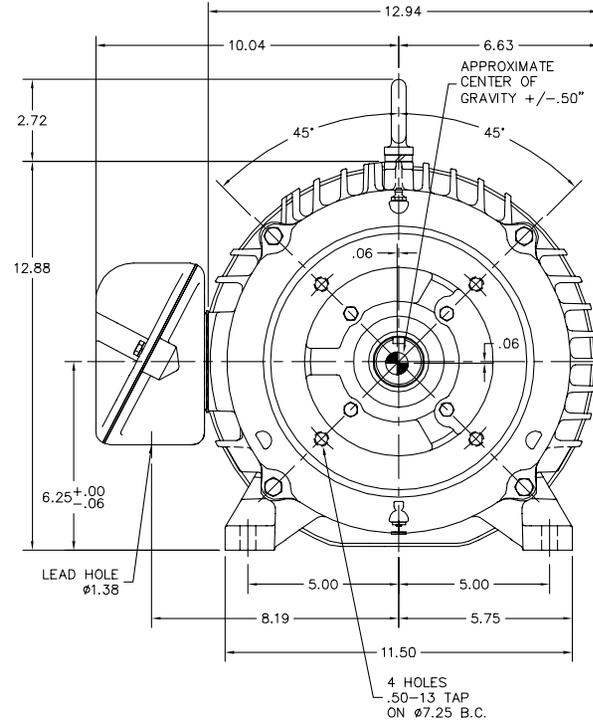
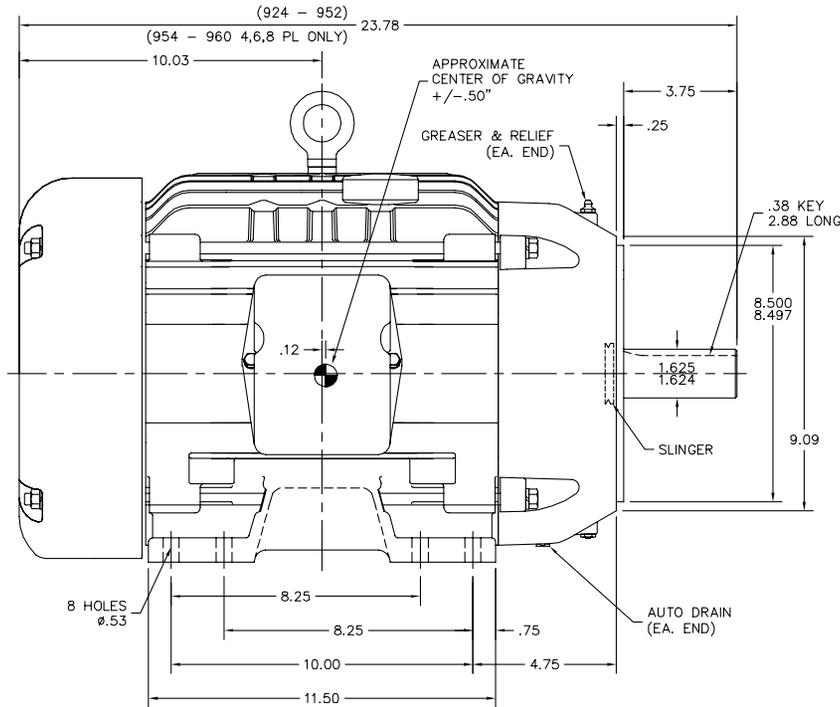
Load Characteristics 460 V, 60 Hz, 15 HP

% of Rated Load	25	50	75	100	125	150	S.F.
Power Factor	45	69	79	83	85	87	84
Efficiency	88.2	92.2	92.7	92.4	91.5	90.4	91.9
Speed	1791.3	1783.1	1774	1765.2	1754.6	1743.1	1759
Line amperes	8.62	11	14.5	18.1	22.6	26.9	20.8

Performance Graph at 460V, 60Hz, 15.0HP Typical performance - Not guaranteed values



09LYC102



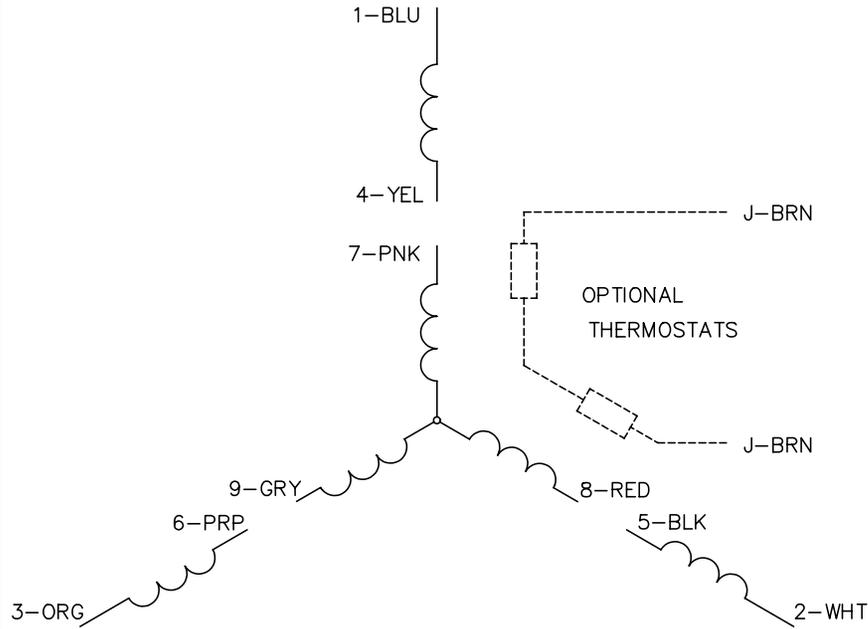
09LYC102

CUSTOMER IS RESPONSIBLE FOR DETERMINING THAT BALDOR'S PRODUCT WILL PERFORM SUITABLY IN THE INTENDED APPLICATION.

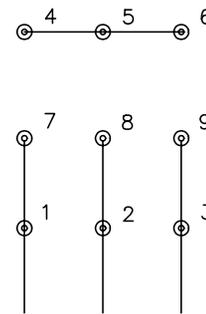
REV. DESC: ADD COG PER CUSTOMER REQUEST	VERSION: 07	TDR: 000000989917
REV. LTR: R	REVISED: 02:00:55 07/26/2016	BY: USODDIL
FILE: \AAA\00000\419		
MTL: -		

BALDOR
HORZ TEFC 254-6TC
SH 1 of 1

CD0005

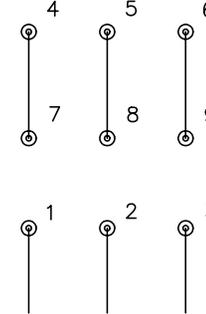


LOW VOLTAGE
(2Y)



LINE

HIGH VOLTAGE
(1Y)



LINE

NOTES:

1. INTERCHANGE ANY TWO LINE LEADS TO REVERSE ROTATION.
2. OPTIONAL THERMOSTATS ARE PROVIDED WHEN SPECIFIED.
3. ACTUAL NUMBER OF INTERNAL PARALLEL CIRCUITS MAY BE A MULTIPLE OF THOSE SHOWN ABOVE.
4. LEAD COLORS ARE OPTIONAL. LEADS MUST ALWAYS BE NUMBERED AS SHOWN.

REV. DESC: REVISE TO SHOW OPTIONAL COLORS			
REV. LTR: E	BY: JLP	REVISED: 01/19/99 10:15	TDR: 0171435
9000D		FILE: AAA00005140	MDL: -
		MTL: -	

BALDOR ELECTRIC Co.

3PH, DV, 9 LEADS

CD0005

ELECTRIC MOTORS

Maintenance & Installation

BALDOR • RELIANCE

**Integral Horsepower
AC Induction Motors
ODP, WPI, WPII Enclosure
TEFC Enclosure
Explosion Proof**

Installation & Operating Manual

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Section 1

General Information

Overview This manual contains general procedures that apply to Baldor Motor products. Be sure to read and understand the Safety Notice statements in this manual. For your protection, do not install, operate or attempt to perform maintenance procedures until you understand the Warning and Caution statements. A Warning statement indicates a possible unsafe condition that can cause harm to personnel. A Caution statement indicates a condition that can cause damage to equipment.

Important: **This instruction manual is not intended to include a comprehensive listing of all details for all procedures required for installation, operation and maintenance. This manual describes general guidelines that apply to most of the motor products shipped by Baldor. If you have a question about a procedure or are uncertain about any detail, Do Not Proceed. Please contact your Baldor distributor for more information or clarification.**

Before you install, operate or perform maintenance, become familiar with the following:

- NEMA Publication MG-2, Safety Standard for Construction and guide for Selection, Installation and Use of Electric Motors and Generators.
- The National Electrical Code
- Local codes and Practices

Limited Warranty

1. Most Baldor products are warranted for 18 months from the date of shipment to Baldor's customer from Baldor's district warehouse or, if applicable, from Baldor's factory. Baldor Standard-E® standard efficient motors are warranted for 24 months. Standard-E is limited to three phase, general purpose, 1-200 HP ratings that fall under the Energy Policy Act (EPA Act). Baldor Super-E® premium efficient motors are warranted for 36 months. Baldor IEEEE841 motors are warranted for 60 months. All warranty claims must be submitted to a Baldor Service Center prior to the expiration of the warranty period.
2. Baldor will, at its option repair or replace a motor which fails due to defects in material or workmanship during the warranty period if:
 - a. the purchaser presents the defective motor at or ships it prepaid to, the Baldor plant in Fort Smith, Arkansas or one of the Baldor Authorized Service Centers and
 - b. the purchaser gives written notification concerning the motor and the claimed defect including the date purchased, the task performed by the Baldor motor and the problem encountered.
3. Baldor will not pay the cost of removal of any electric motor from any equipment, the cost of delivery to Fort Smith, Arkansas or a Baldor Authorized Service Center, or the cost of any incidental or consequential damages resulting from the claimed defects. (Some states do not allow the exclusion or limitation of incidental or consequential damages, so the above exclusion may not apply to you.) Any implied warranty given by laws shall be limited to the duration of the warranty period hereunder. (Some states do not allow limitations on how long an implied warranty lasts, so the above limitation may not apply to you.)
4. Baldor Authorized Service Centers, when convinced to their satisfaction that a Baldor motor developed defects in material or workmanship within the warranty period, are authorized to proceed with the required repairs to fulfill Baldor's warranty when the cost of such repairs to be paid by Baldor does not exceed Baldor's warranty repair allowance. Baldor will not pay overtime premium repair charges without prior written authorization.
5. The cost of warranty repairs made by centers other than Baldor Authorized Service Centers **WILL NOT** be paid unless first authorized in writing by Baldor.
6. Claims by a purchaser that a motor is defective even when a failure results within one hour after being placed into service are not always justified. Therefore, Baldor Authorized Service Centers must determine from the condition of the motor as delivered to the center whether or not the motor is defective. If in the opinion of a Baldor Authorized Service Center, a motor did not fail as a result of defects in material or workmanship, the center is to proceed with repairs only if the purchaser agrees to pay for such repairs. If the decision is in dispute, the purchaser should still pay for the repairs and submit the paid invoice and the Authorized Service Center's signed service report to Baldor for further consideration.
7. This warranty gives you specific legal rights, and you may also have other rights which vary from state to state.

Safety Notice:

This equipment contains high voltage! Electrical shock can cause serious or fatal injury. Only qualified personnel should attempt installation, operation and maintenance of electrical equipment.

Be sure that you are completely familiar with NEMA publication MG-2, safety standards for construction and guide for selection, installation and use of electric motors and generators, the National Electrical Code and local codes and practices. Unsafe installation or use can cause conditions that lead to serious or fatal injury. Only qualified personnel should attempt the installation, operation and maintenance of this equipment.

- WARNING:** Do not touch electrical connections before you first ensure that power has been disconnected. Electrical shock can cause serious or fatal injury. Only qualified personnel should attempt the installation, operation and maintenance of this equipment.
- WARNING:** Be sure the system is properly grounded before applying power. Do not apply AC power before you ensure that all grounding instructions have been followed. Electrical shock can cause serious or fatal injury. National Electrical Code and Local codes must be carefully followed.
- WARNING:** Avoid extended exposure to machinery with high noise levels. Be sure to wear ear protective devices to reduce harmful effects to your hearing.
- WARNING:** This equipment may be connected to other machinery that has rotating parts or parts that are driven by this equipment. Improper use can cause serious or fatal injury. Only qualified personnel should attempt to install operate or maintain this equipment.
- WARNING:** Do not by-pass or disable protective devices or safety guards. Safety features are designed to prevent damage to personnel or equipment. These devices can only provide protection if they remain operative.
- WARNING:** Avoid the use of automatic reset devices if the automatic restarting of equipment can be hazardous to personnel or equipment.
- WARNING:** Be sure the load is properly coupled to the motor shaft before applying power. The shaft key must be fully captive by the load device. Improper coupling can cause harm to personnel or equipment if the load decouples from the shaft during operation.
- WARNING:** Use proper care and procedures that are safe during handling, lifting, installing, operating and maintaining operations. Improper methods may cause muscle strain or other harm.
- WARNING:** Before performing any motor maintenance procedure, be sure that the equipment connected to the motor shaft cannot cause shaft rotation. If the load can cause shaft rotation, disconnect the load from the motor shaft before maintenance is performed. Unexpected mechanical rotation of the motor parts can cause injury or motor damage.
- WARNING:** Disconnect all electrical power from the motor windings and accessory devices before disassembly of the motor. Electrical shock can cause serious or fatal injury.
- WARNING:** Do not use non UL/CSA listed explosion proof motors in the presence of flammable or combustible vapors or dust. These motors are not designed for atmospheric conditions that require explosion proof operation.

Safety Notice Continued

WARNING: Motors that are to be used in flammable and/or explosive atmospheres must display the UL label on the nameplate along with CSA listed logo.

Specific service conditions for these motors are defined in NFPA 70 (NEC) Article 500.

WARNING: UL Listed motors must only be serviced by UL Approved Authorized Baldor Service Centers if these motors are to be returned to a hazardous and/or explosive atmosphere.

Caution: To prevent premature equipment failure or damage, only qualified maintenance personnel should perform maintenance.

Caution: Do not over-lubricate motor as this may cause premature bearing failure.

Caution: Do not lift the motor and its driven load by the motor lifting hardware. The motor lifting hardware is adequate for lifting only the motor. Disconnect the load from the motor shaft before moving the motor.

Caution: If eye bolts are used for lifting a motor, be sure they are securely tightened. The lifting direction should not exceed a 20° angle from the shank of the eye bolt or lifting lug. Excessive lifting angles can cause damage.

Caution: To prevent equipment damage, be sure that the electrical service is not capable of delivering more than the maximum motor rated amps listed on the rating plate.

Caution: If a HI POT test (High Potential Insulation test) must be performed, follow the precautions and procedure in NEMA MG1 and MG2 standards to avoid equipment damage.

If you have any questions or are uncertain about any statement or procedure, or if you require additional information please contact your Baldor distributor or an Authorized Baldor Service Center.

Receiving

Each Baldor Electric Motor is thoroughly tested at the factory and carefully packaged for shipment. When you receive your motor, there are several things you should do immediately.

1. Observe the condition of the shipping container and report any damage immediately to the commercial carrier that delivered your motor.
2. Verify that the part number of the motor you received is the same as the part number listed on your purchase order.

Storage

If the motor is not put into service immediately, the motor must be stored in a clean, dry and warm location. Several precautionary steps must be performed to avoid motor damage during storage.

1. Use a "Megger" periodically to ensure that the integrity of the winding insulation has been maintained. Record the Megger readings. Immediately investigate any significant drop in insulation resistance.
2. Do not lubricate bearings during storage. Motor bearings are packed with grease at the factory. Excessive grease can damage insulation quality.
3. Rotate motor shaft at least 10 turns every two months during storage (more frequently if possible). This will prevent bearing damage due to storage.
4. If the storage location is damp or humid, the motor windings must be protected from moisture. This can be done by applying power to the motors' space heater (if available) while the motor is in storage.

Unpacking

Each Baldor motor is packaged for ease of handling and to prevent entry of contaminants.

1. To avoid condensation inside the motor, do not unpack until the motor has reached room temperature. (Room temperature is the temperature of the room in which it will be installed). The packing provides insulation from temperature changes during transportation.
2. When the motor has reached room temperature, remove all protective wrapping material from the motor.

Handling

The motor should be lifted using the lifting lugs or eye bolts provided.

1. Use the lugs or eye bolts provided to lift the motor. Never attempt to lift the motor and additional equipment connected to the motor by this method. The lugs or eye bolts provided are designed to lift only the motor. Never lift the motor by the motor shaft or the hood of a WP11 motor.
2. When lifting a WP11 (Weather Proof Type 2) motor, do not lift the motor by inserting lifting lugs into holes on top of the cooling hood. These lugs are to be used for hood removal only. A spreader bar should be used to lift the motor by the cast lifting lugs located on the motor frame.
3. If the motor must be mounted to a plate with the driven equipment such as pump, compressor etc., it may not be possible to lift the motor alone. For this case, the assembly should be lifted by a sling around the mounting base. The entire assembly can be lifted as an assembly for installation. Do not lift using the motor lugs or eye bolts provided.

If the load is unbalanced (as with couplings or additional attachments) additional slings or other means must be used to prevent tipping. In any event, the load must be secure before lifting.

Section 2 Installation & Operation

Overview

Installation should conform to the National Electrical Code as well as local codes and practices. When other devices are coupled to the motor shaft, be sure to install protective devices to prevent future accidents. Some protective devices include, coupling, belt guard, chain guard, shaft covers etc. These protect against accidental contact with moving parts. Machinery that is accessible to personnel should provide further protection in the form of guard rails, screening, warning signs etc.

Location

It is important that motors be installed in locations that are compatible with motor enclosure and ambient conditions. Improper selection of the motor enclosure and ambient conditions can lead to reduced operating life of the motor.

Proper ventilation for the motor must be provided. Obstructed airflow can lead to reduction of motor life.

1. **Open Drip-Proof/WPI** motors are intended for use indoors where atmosphere is relatively clean, dry, well ventilated and non-corrosive.
2. **Totally Enclosed and WPII** motors may be installed where dirt, moisture or dust are present and in outdoor locations.

Severe Duty, IEEE 841 and Washdown Duty enclosed motors are designed for installations with high corrosion or excessive moisture conditions. These motors should not be placed into an environment where there is the presence of flammable or combustible vapors, dust or any combustible material, unless specifically designed for this type of service.

Mounting

The motor must be securely installed to a rigid foundation or mounting surface to minimize vibration and maintain alignment between the motor and shaft load. Failure to provide a proper mounting surface may cause vibration, misalignment and bearing damage.

Foundation caps and sole plates are designed to act as spacers for the equipment they support. If these devices are used, be sure that they are evenly supported by the foundation or mounting surface.

After installation is complete and accurate alignment of the motor and load is accomplished, the base should be grouted to the foundation to maintain this alignment.

The standard motor base is designed for horizontal or vertical mounting. Adjustable or sliding rails are designed for horizontal mounting only. Consult your Baldor distributor or authorized Baldor Service Center for further information.

Alignment

Accurate alignment of the motor with the driven equipment is extremely important.

1. **Direct Coupling**
For direct drive, use flexible couplings if possible. Consult the drive or equipment manufacturer for more information. Mechanical vibration and roughness during operation may indicate poor alignment. Use dial indicators to check alignment. The space between coupling hubs should be maintained as recommended by the coupling manufacturer.
2. **End-Play Adjustment**
The axial position of the motor frame with respect to its load is also extremely important. The motor bearings are not designed for excessive external axial thrust loads. Improper adjustment will cause failure.
3. **Pulley Ratio**
The pulley ratio should not exceed 8:1.
4. **Belt Drive**
Align sheaves carefully to minimize belt wear and axial bearing loads (see End-Play Adjustment). Belt tension should be sufficient to prevent belt slippage at rated speed and load. However, belt slippage may occur during starting.

Caution: Do not over tension belts.

5. Sleeve bearing motors are only suitable for coupled loads.

Doweling & Bolting

After proper alignment is verified, dowel pins should be inserted through the motor feet into the foundation. This will maintain the correct motor position should motor removal be required. (Baldor motors are designed for doweling.)

1. Drill dowel holes in diagonally opposite motor feet in the locations provided.
2. Drill corresponding holes in the foundation.
3. Ream all holes.
4. Install proper fitting dowels.
5. Mounting bolts must be carefully tightened to prevent changes in alignment. Use a flat washer and lock washer under each nut or bolt head to hold the motor feet secure. Flanged nuts or bolts may be used as an alternative to washers.

Power Connection

Conduit Box

Motor and control wiring, overload protection, disconnects, accessories and grounding should conform to the National Electrical Code and local codes and practices.

For ease of making connections, an oversize conduit box is provided. The box can be rotated 360° in 90° increments. Auxiliary conduit boxes are provided on some motors for accessories such as space heaters, RTD's etc.

AC Power

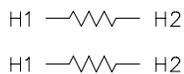
Connect the motor leads as shown on the connection diagram located on the name plate or inside the cover on the conduit box. Be sure the following guidelines are met:

1. AC power is within $\pm 10\%$ of rated voltage with rated frequency. (See motor name plate for ratings).
OR
2. AC power is within $\pm 5\%$ of rated frequency with rated voltage.
OR
3. A combined variation in voltage and frequency of $\pm 10\%$ (sum of absolute values) of rated values, provided the frequency variation does not exceed $\pm 5\%$ of rated frequency.

Performance within these voltage and frequency variations are shown in Figure 2-2.

Figure 2-1 Accessory Connections

HEATERS



One heater is installed in each end of motor.
Leads for each heater are labeled H1 & H2.
(Like numbers should be tied together).

THERMISTERS



Three thermistors are installed in windings and tied in series.
Leads are labeled T1 & T2.

WINDING RTDS



Winding RTDs are installed in windings (2) per phase.
Each set of leads is labeled W1, W2, W3, W4, W5, & W6.

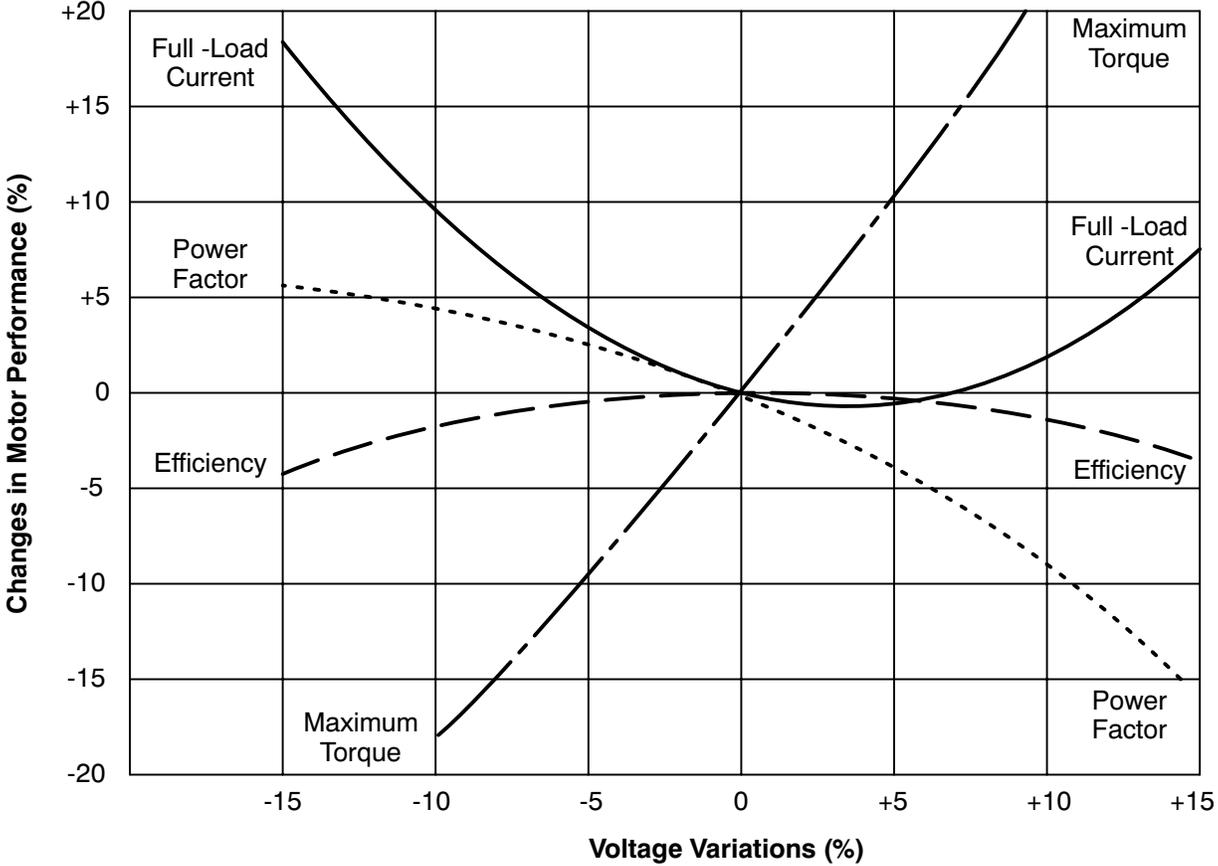
BEARING RTD



- * One bearing RTD is installed in Drive endplate (PUEP), leads are labeled RTDDE.
- * One bearing RTD is installed in Opposite Drive endplate (FREP), leads are labeled RTDODE.

* Note RTD may have 2-Red/1-White leads; or 2-White/1-Red Lead.

Figure 2-2 Typical Motor Performance VS Voltage Variations



First Time Start Up

Be sure that all power to motor and accessories is off. Be sure the motor shaft is disconnected from the load and will not cause mechanical rotation of the motor shaft.

1. Make sure that the mechanical installation is secure. All bolts and nuts are tightened etc.
2. If motor has been in storage or idle for some time, check winding insulation integrity with a Megger.
3. Inspect all electrical connections for proper termination, clearance, mechanical strength and electrical continuity.
4. Be sure all shipping materials and braces (if used) are removed from motor shaft.
5. Manually rotate the motor shaft to ensure that it rotates freely.
6. Replace all panels and covers that were removed during installation.
7. Momentarily apply power and check the direction of rotation of the motor shaft.
8. If motor rotation is wrong, be sure power is off and change the motor lead connections. Verify rotation direction before you continue.
9. Start the motor and ensure operation is smooth without excessive vibration or noise. If so, run the motor for 1 hour with no load connected.
10. After 1 hour of operation, disconnect power and connect the load to the motor shaft. Verify all coupling guards and protective devices are installed. Ensure motor is properly ventilated.

Coupled Start Up

This procedure assumes a coupled start up. Also, that the first time start up procedure was successful.

1. Check the coupling and ensure that all guards and protective devices are installed.
2. Check that the coupling is properly aligned and not binding.
3. The first coupled start up should be with no load. Apply power and verify that the load is not transmitting excessive vibration back to the motor through the coupling or the foundation. Vibration should be at an acceptable level.
4. Run for approximately 1 hour with the driven equipment in an unloaded condition.

The equipment can now be loaded and operated within specified limits. Do not exceed the name plate ratings for amperes for steady continuous loads.

Jogging and Repeated Starts Repeated starts and/or jogs of induction motors generally reduce the life of the motor winding insulation. A much greater amount of heat is produced by each acceleration or jog than by the same motor under full load. If it is necessary to repeatedly start or jog the motor, it is advisable to check the application with your local Baldor distributor or Baldor Service Center.

Heating - Duty rating and maximum ambient temperature are stated on the motor name plate. Do not exceed these values. If there is any question regarding safe operation, contact your local Baldor distributor or Baldor Service Center.

Section 3 Maintenance & Troubleshooting

WARNING: UL Listed motors must only be serviced by UL Approved Authorized Baldor Service Centers if these motors are to be returned to a hazardous and/or explosive atmosphere.

General Inspection

Inspect the motor at regular intervals, approximately every 500 hours of operation or every 3 months, whichever occurs first. Keep the motor clean and the ventilation openings clear. The following steps should be performed at each inspection:

WARNING: Do not touch electrical connections before you first ensure that power has been disconnected. Electrical shock can cause serious or fatal injury. Only qualified personnel should attempt the installation, operation and maintenance of this equipment.

1. Check that the motor is clean. Check that the interior and exterior of the motor is free of dirt, oil, grease, water, etc. Oily vapor, paper pulp, textile lint, etc. can accumulate and block motor ventilation. If the motor is not properly ventilated, overheating can occur and cause early motor failure.
2. Use a "Megger" periodically to ensure that the integrity of the winding insulation has been maintained. Record the Megger readings. Immediately investigate any significant drop in insulation resistance.
3. Check all electrical connectors to be sure that they are tight.

Relubrication & Bearings

Bearing grease will lose its lubricating ability over time, not suddenly. The lubricating ability of a grease (over time) depends primarily on the type of grease, the size of the bearing, the speed at which the bearing operates and the severity of the operating conditions. Good results can be obtained if the following recommendations are used in your maintenance program.

Type of Grease

A high grade ball or roller bearing grease should be used. Recommended grease for standard service conditions is Polyrex EM (Exxon Mobil).

Equivalent and compatible greases include:

Texaco Polystar, Rykon Premium #2, Pennzoil Pen 2 Lube and Chevron SRI.

Relubrication Intervals

Recommended relubrication intervals are shown in Table 3-1. It is important to realize that the recommended intervals of Table 3-1 are based on average use.

Refer to additional information contained in Tables 3-2, 3-3 and 3-4.

Table 3-1 Relubrication Intervals *

NEMA / (IEC) Frame Size	Rated Speed - RPM					
	10000	6000	3600	1800	1200	900
Up to 210 incl. (132)	**	2700 Hrs.	5500 Hrs.	12000 Hrs.	18000 Hrs.	22000 Hrs.
Over 210 to 280 incl. (180)		**	3600 Hrs.	9500 Hrs.	15000 Hrs.	18000 Hrs.
Over 280 to 360 incl. (225)		**	* 2200 Hrs.	7400 Hrs.	12000 Hrs.	15000 Hrs.
Over 360 to 5800 incl. (300)		**	*2200 Hrs.	3500 Hrs.	7400 Hrs.	10500 Hrs.

* Relubrication intervals are for ball bearings.

For vertically mounted motors and roller bearings, divide the relubrication interval by 2.

** For motors operating at speeds greater than 3600 RPM, contact Baldor for relubrication recommendations.

Table 3-2 Service Conditions

Severity of Service	Hours per day of Operation	Ambient Temperature Maximum	Atmospheric Contamination
Standard	8	40° C	Clean, Little Corrosion
Severe	16 Plus	50° C	Moderate dirt, Corrosion
Extreme	16 Plus	>50° C* or Class H Insulation	Severe dirt, Abrasive dust, Corrosion, Heavy Shock or Vibration
Low Temperature		<-29° C **	

* Special high temperature grease is recommended (Dow Corning DC44). Note that Dow Corning DC44 grease does not mix with other grease types. Thoroughly clean bearing & cavity before adding grease.

** Special low temperature grease is recommended (Aeroshell 7).

Table 3-3 Relubrication Interval Multiplier

Severity of Service	Multiplier
Standard	1.0
Severe	0.5
Extreme	0.1
Low Temperature	1.0

Some motor designs use different bearings on each motor end. This is normally indicated on the motor nameplate. In this case, the larger bearing is installed on the motor Drive endplate. For best relubrication results, only use the appropriate amount of grease for each bearing size (not the same for both).

Table 3-4 Bearings Sizes and Types

Frame Size NEMA (IEC)	Bearing Description (These are the "Large" bearings (Shaft End) in each frame size)			
	Bearing	Weight of Grease to add * oz (Grams)	Volume of grease to be added	
			in ³	teaspoon
56 to 140 (90)	6203	0.08 (2.4)	0.15	0.5
140 (90)	6205	0.15 (3.9)	0.2	0.8
180 (100-112)	6206	0.19 (5.0)	0.3	1.0
210 (132)	6307	0.30 (8.4)	0.6	2.0
250 (160)	6309	0.47 (12.5)	0.7	2.5
280 (180)	6311	0.61 (17)	1.2	3.9
320 (200)	6312	0.76 (20.1)	1.2	4.0
360 (225)	6313	0.81 (23)	1.5	5.2
400 (250)	6316	1.25 (33)	2.0	6.6
440 (280)	6319	2.12 (60)	4.1	13.4
5000 to 5800 (315-450)	6328	4.70 (130)	9.2	30.0
5000 to 5800 (315-450)	NU328	4.70 (130)	9.2	30.0
360 to 449 (225-280)	NU319	2.12 (60)	4.1	13.4
AC Induction Servo				
76 Frame 180 (112)	6207	0.22 (6.1)	0.44	1.4
77 Frame 210 (132)	6210	0.32 (9.0)	0.64	2.1
80 Frame 250(160)	6213	0.49 (14.0)	0.99	3.3

* Weight in grams = .005 DB of grease to be added

Note: Not all bearing sizes are listed. For intermediate bearing sizes, use the grease volume for the next larger size bearing.

Caution: To avoid damage to motor bearings, grease must be kept free of dirt. For an extremely dirty environment, contact your Baldor distributor or an authorized Baldor Service Center for additional information.

Relubrication Procedure Be sure that the grease you are adding to the motor is compatible with the grease already in the motor. Consult your Baldor distributor or an authorized service center if a grease other than the recommended type is to be used.

Caution: Do not over-lubricate motor as this may cause premature bearing failure.

With Grease Outlet Plug

1. With the motor stopped, clean all grease fittings with a clean cloth.
2. Remove grease outlet plug.

Caution: Over-lubricating can cause excessive bearing temperatures, premature lubrication breakdown and bearing failure.

3. Add the recommended amount of grease.
4. Operate the motor for 15 minutes with grease plug removed. This allows excess grease to purge.
5. Re-install grease outlet plug.

Without Grease Provisions

Note: Only a Baldor authorized and UL or CSA certified service center can disassemble a UL/CSA listed explosion proof motor to maintain it's UL/CSA listing.

1. Disassemble the motor.
2. Add recommended amount of grease to bearing and bearing cavity. (Bearing should be about 1/3 full of grease and outboard bearing cavity should be about 1/2 full of grease.)
3. Assemble the motor.

Sample Relubrication Determination

Assume - NEMA 286T (IEC 180), 1750 RPM motor driving an exhaust fan in an ambient temperature of 43° C and the atmosphere is moderately corrosive.

1. Table 3-1 list 9500 hours for standard conditions.
2. Table 3-2 classifies severity of service as "Severe".
3. Table 3-4 shows that 1.2 in³ or 3.9 teaspoon of grease is to be added.

Note: Smaller bearings in size category may require reduced amounts of grease.

Table 3-5 Troubleshooting Chart

Symptom	Possible Causes	Possible Solutions
Motor will not start	Usually caused by line trouble, such as, single phasing at the starter.	Check source of power. Check overloads, fuses, controls, etc.
Excessive humming	High Voltage.	Check input line connections.
	Eccentric air gap.	Have motor serviced at local Baldor service center.
Motor Over Heating	Overload. Compare actual amps (measured) with nameplate rating.	Locate and remove source of excessive friction in motor or load. Reduce load or replace with motor of greater capacity.
	Single Phasing.	Check current at all phases (should be approximately equal) to isolate and correct the problem.
	Improper ventilation.	Check external cooling fan to be sure air is moving properly across cooling fins. Excessive dirt build-up on motor. Clean motor.
	Unbalanced voltage.	Check voltage at all phases (should be approximately equal) to isolate and correct the problem.
	Rotor rubbing on stator.	Check air gap clearance and bearings.
		Tighten "Thru Bolts".
	Over voltage or under voltage.	Check input voltage at each phase to motor.
	Open stator winding.	Check stator resistance at all three phases for balance.
	Grounded winding.	Perform dielectric test and repair as required.
	Improper connections.	Inspect all electrical connections for proper termination, clearance, mechanical strength and electrical continuity. Refer to motor lead connection diagram.
Bearing Over Heating	Misalignment.	Check and align motor and driven equipment.
	Excessive belt tension.	Reduce belt tension to proper point for load.
	Excessive end thrust.	Reduce the end thrust from driven machine.
	Excessive grease in bearing.	Remove grease until cavity is approximately $\frac{3}{4}$ filled.
	Insufficient grease in bearing.	Add grease until cavity is approximately $\frac{3}{4}$ filled.
	Dirt in bearing.	Clean bearing cavity and bearing. Repack with correct grease until cavity is approximately $\frac{3}{4}$ filled.
Vibration	Misalignment.	Check and align motor and driven equipment.
	Rubbing between rotating parts and stationary parts.	Isolate and eliminate cause of rubbing.
	Rotor out of balance.	Have rotor balance checked and repaired at your Baldor Service Center.
	Resonance.	Tune system or contact your Baldor Service Center for assistance.
Noise	Foreign material in air gap or ventilation openings.	Remove rotor and foreign material. Reinstall rotor. Check insulation integrity. Clean ventilation openings.
Growling or whining	Bad bearing.	Replace bearing. Clean all grease from cavity and new bearing. Repack with correct grease until cavity is approximately $\frac{3}{4}$ filled.

Suggested bearing and winding RTD setting guidelines

Most large frame AC Baldor motors with a 1.15 service factor are designed to operate below a Class B (80°C) temperature rise at rated load and are built with a Class H winding insulation system. Based on this low temperature rise, RTD (Resistance Temperature Detectors) settings for Class B rise should be used as a starting point. Some motors with 1.0 service factor have Class F temperature rise.

The following tables show the suggested alarm and trip settings for RTDs. Proper bearing and winding RTD alarm and trip settings should be selected based on these tables unless otherwise specified for specific applications.

If the driven load is found to operate well below the initial temperature settings under normal conditions, the alarm and trip settings may be reduced so that an abnormal machine load will be identified.

The temperature limits are based on the installation of the winding RTDs imbedded in the winding as specified by NEMA. Bearing RTDs should be installed so they are in contact with the outer race on ball or roller bearings or in direct contact with the sleeve bearing shell.

Winding RTDs - Temperature Limit In °C (40°C Maximum Ambient)

Motor Load	Class B Temp Rise ≤ 80°C (Typical Design)		Class F Temp Rise ≤ 105°C		Class H Temp Rise ≤ 125°C	
	Alarm	Trip	Alarm	Trip	Alarm	Trip
≤ Rated Load	130	140	155	165	175	185
Rated Load to 1.15 S.F.	140	150	160	165	180	185

Note: • Winding RTDs are factory production installed, not from Mod-Express.

• When Class H temperatures are used, consider bearing temperatures and relubrication requirements.

Bearing RTDs - Temperature Limit In °C (40°C Maximum Ambient)

Bearing Type Oil or Grease	Anti-Friction		Sleeve	
	Alarm	Trip	Alarm	Trip
Standard*	95	100	85	95
High Temperature**	110	115	105	110

Note: * Bearing temperature limits are for standard design motors operating at Class B temperature rise.

** High temperature lubricants include some special synthetic oils and greases.

Greases that may be substituted that are compatible with Polyrex EM (but considered as "standard" lubricants) include the following:

- Texaco Polystar
- Mobilith SHC-100
- Darmex 707
- Rykon Premium #2
- Pennzoil Pennzlube EM-2
- Darmex 711
- Chevron SRI #2
- Chevron Black Pearl
- Petro-Canada Peerless LLG

See the motor nameplate for replacement grease or oil recommendation.

Contact Baldor application engineering for special lubricants or further clarifications.



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