APPENDIX

Section 10

CUSTOMER RESPONSIBILITIES FOR INSTALLATION AND STARTUP

Listed below are the customer responsibilities for the proper and timely installation of the Oasis XP car wash system.

1) Drawings. The customer must supply a scale drawing of the wash bay in which the Oasis XP system will be installed, as well as the equipment room in which the pump stand and hydraulic and anti-freeze systems will reside. If the wash bay is new construction, this drawing must be confirmed after construction of the bay is complete. If the dimensions provided are not accurate and as a result new wall brackets are required at the time of installation, the customer is responsible for the cost of the wall brackets and air freight to the car wash location.

Oasis will provide the customer with drawings for the placement of the equipment for both the control room and the wash bay within two (2) weeks from receipt of customer's drawings.

2) Fork Lift. Customer is responsible for having a fork lift on the job site at time of delivery for unloading the Oasis XP system, and when the bridge is to be installed. Oasis' delivery and installation fee does not include the rental of this equipment.

3) Floor Heat. The customer is responsible for installation of floor heat, if any, and for marking the location of tubing prior to any drilling required for installation of other equipment. Oasis is not responsible for damages caused by drilling into floor heat tubing whose location was improperly marked.

4) Transition Box Opening. Oasis will supply drawings for the customer that show the proper placement of a 19½" x 12" hole in the wash bay wall for the XP transition box. The proper placement of this opening is the customer's responsibility and must be done before Oasis' installation crew arrives, or on the first day of installation.

5) Cashier. The money acceptor island must be completed before installation of the Oasis system. It must conform to the specifications provided by Oasis or cashier manufacturer.

It is the customer's responsibility to provide three (3) ¾" electrical conduits from the specified location in the equipment room to the money acceptor island. The customer is also responsible for running 115-volt power supply with ground and the low voltage control cable to the money acceptor. Oasis will make the final low voltage connections after the wire has been pulled.

6) Plumbing. The hot, cold and spot free rinse water supply and installation of all plumbing to the pump and control stand must be complete prior to arrival of the Oasis' installation crew. These connections will be shown on plumbing schematics supplied by Oasis prior to delivery of the Oasis XP system.

If the XP has two (2) or more inlet valves, an expansion tank system will be required and must be supplied by the customer. This system is to consist of a diaphragm type accumulator to be plumbed into the incoming supply on the second inlet valve [refer to Oasis Dwg. B-10931]. The accumulator should be charged to a pressure 5-10 PSIG greater than the incoming water supply. A check valve must also be used on incoming water supplies. The check valve cannot be plumbed inline between the accumulator and the inlet valve. Doing this would eliminate the usefulness of the accumulator.

Oasis does not install plumbing for hot water boilers, heat exchangers, or any of the plumbing upstream of the Oasis pump and control module.

7) Electrical. Power supply to the control panel is the customer's responsibility. 3-phase power needs to be brought to the Oasis panel disconnect. A 20 amp, 208-230 volt dedicated circuit to the T1 and T2 for powering the processor must be provided. Conduit and the proper size wire must be installed from the hydraulic motor starter (located in the control panel) to the hydraulic power unit. The 3-phase wires and ground should be #12. The 25HP electric motor must be wired from the motor starter in the Oasis control panel, with proper grounding and rotation checked. For 203 or 230 applications, Oasis recommends #3 wire. For 460 or 575, Oasis recommends #8 wire. However, always follow local code.

IMPORTANT: If the hydraulic power unit or pump stand is to be installed more than 50' from the control panel, please contact the factory. Additional cables, wires and components will be required in order for the equipment to function properly.

The unit must be wired between the bay sign and the control panel with a breakout for the stop station. The stop station requires three (3) wires in addition to the five (5) wires needed for the 3-station sign. If an optional 6-station sign and/or entrance sign is ordered, they will also need to be wired. The 6-station LED sign requires eight (8) conductors. The entrance sign requires four (4) conductors.

The customer is responsible for supplying 115-volt power to the antifreeze circulation pump, which should be wired through Oasis provided thermostat so that pump turns on when temperature drops. A wiring schematic is located inside the thermostat cover.

If adding a sign, dryer, doors, or other non-standard device not being supplied by Oasis, additional relays may need to be added to the control panel. Oasis can add the relay(s) to the control panel if informed at time of order what the items are, how they are to be used, the voltage required by the device, whether the device is to be controlled by the Oasis automatic equipment (i.e. additional signs that will run off of Oasis output signals), the amperage draw of the device, and whether the device has its own power supply (i.e. built-in transformer). **NOTE:** Neglecting to add the necessary relays may cause failure to the Oasis processor or one of its components. Such failure will not be covered under Oasis warranty.

Oasis is not licensed or equipped to install conduit or wiring. The electrical contractor should be informed of his responsibilities.

8) Fluids and Chemicals. The customer is to supply, at time of installation, approximately 28 gallons of antifreeze for each automatic system installed with a 50-gallon hot water tank, or approximately 6 gallons per unit if a heat exchanger is used.

It is the customer's responsibility to provide approximately 13 gallons of Dexron III ATF ISO 32 Hydraulic Fluid to fill the hydraulic reservoir. Additional fluid may be needed to fill lines, especially in extended bay situations.

Startup chemicals are to be supplied by the customer. Oasis can set up proper mixing procedures for your application when installed by Oasis personnel; however, for proper titrations, it is recommended that your chemical supplier set up chemicals at time of startup.

9) Spot Free Rinse. If an Oasis spot free rinse system has been purchased and is to be installed by Oasis, customer must supply Oasis with a hard water sample prior to or at time of order. Customer must have the SFR system plumbed with soft water according to the plumbing schematic supplied by Oasis. Oasis will make the necessary electrical and/or plumbing connections from the Oasis SFR system to the XP system. Oasis does not include installation to any self-serve bays without additional charges as specified by the sale agreement.

10) Lighted Signs. The customer is responsible for providing the wiring and conduit to any and all lighted signs provided by Oasis in accordance with local codes. It is the recommendation of Oasis to use 16-gauge copper conducting wire. Numbered terminal blocks are provided in the signs, and should be wired to the corresponding numbered terminal blocks in the Oasis control panel.

If lighted signage is supplied by anyone other than Oasis, relays to operate these lights must be provided by customer (consult Oasis).

11) Self-Serve Equipment. Customer responsibilities applicable to self serve equipment are covered under a separate document.

12) Extended Bay Requirements. When the unit does not adjoin the equipment room, the following list of materials will need to be provided by the customer in order to complete installation of the Oasis XP system.

Hydraulics:
- (6) ⅜" Black Sch 40 Pipe or ⅜" Stainless Tube
- (12) ⅜" FNPT [Female National Pipe Taper]

High Pressure Water:
- (2) 1" Stainless Pipe or 1" Stainless Tube
- (4) 1" FNPT

Heat Lines:
- (4) ½" CPVC Pipe or ½" Stainless Pipe or ½" Stainless Tube
- (8) ½" FNPT

Chemicals:
- (12) ½" CPVC Pipe or ½" Stainless Pipe or ½" Stainless Tube
- (24) ½" FNPT

Note:
1) Number of conduits is determined by number of options.
2) Equipment room connections must be within 10' of equipment.
3) Transition box connections must be within 3' of transition box.
4) Consult factory for special circumstances and/or alternate requirements.
5) Oasis must be provided with measurements for proper cable lengths.

IMPORTANT

Oasis' installation crew must be able to wash vehicles after the equipment installation is complete. It is Oasis' policy to allow one (1) day of grace for the installation of the Oasis XP systems. If our installation personnel are held up by more than one (1) day during the installation or startup of the Oasis systems because of holdups in the construction, electrical or plumbing of the systems, the customer will be charged eighty dollars ($80) per man hour plus expenses for each additional day. If, due to these holdups, an extra trip is required for startup, the customer will be responsible for travel and expenses to and from the job; however, startup labor will be supplied by Oasis.

I have read and received a copy of the above Customer Responsibilities for Installation and Startup.

_____
Signature

_____
Date

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TERMS AND CONDITIONS OF SALE / WARRANTY

1. GENERAL - The Terms and Conditions of Sale outlined herein shall apply to the sale by Oasis Carwash Systems Inc. (hereinafter referred to as Company) of products, equipment and parts relating thereto (hereinafter referred to as Equipment). Unless prior written agreement is reached, it shall be understood that the Company's proceeding with any work shall be in accordance with the terms and conditions outlined herein.

The Company will comply with applicable laws and regulations in effect on the date of the Company's proposal as they may apply to the manufacture of the Equipment. Compliance with any local governmental laws or regulations relating to the location, use or operation of the Equipment, or its use in conjunction with other equipment, shall be the sole responsibility of the Purchaser.

2. TITLE AND RISK OF LOSS - Title and risk of loss or damage to the Equipment shall pass to the Purchaser upon tender of delivery F.O.B. manufacturing facility unless otherwise agreed upon by the parties, except that a security interest in the Equipment shall remain in the Company, regardless of mode of attachment to realty or other property, until full payment has been made therefore. Purchaser agrees upon request to do all things and acts necessary to perfect and maintain said security interest, and shall protect Company's interest by adequately insuring the Equipment against loss or damage from any cause wherein the Company shall be named as an additional insured.

3. ASSIGNMENT - Neither party shall assign or transfer their contract without the prior written consent of the other party. The Company, however, shall be permitted to assign or transfer, without the prior written consent of the Purchaser, the Company's right to receive all or any portion of the payment due from the Purchaser under this contract.

4. DELIVERY AND DELAYS - Delivery dates shall be interpreted as estimated and in no event shall dates be construed as falling within the meaning of "time is of the essence".

The Company shall not be liable for any loss or delay due to war, riots, fire, flood, strikes or other labor difficulty, acts of civil or military authority including governmental laws, orders, priorities or regulations, acts of the Purchaser, embargo, car shortage, damage or delay in transportation, inability to obtain necessary labor or materials from usual sources, faulty forging or castings, or other causes beyond the reasonable control of the Company. In the event of delay in performance due to any such cause, the date of delivery or time for completion will be adjusted to reflect the actual length of time lost by reason of such delay. The Purchaser's receipt of Equipment shall constitute a waiver of any claims for delay.

5. TAXES - The price does not include any present or future Federal, State, or local property, license, privilege, sales, use, excise, gross receipts or other like taxes or assessments which may be applicable to, measured by, imposed upon or result from this transaction or any services performed in connection therewith. Such taxes will be itemized separately to Purchaser, who shall make prompt payment to the Company.

6. SET OFFS - Neither Purchaser nor any affiliated company or assignee shall have the right to claim compensation or to set off against any amounts which become payable to the Company under this contract or otherwise.

7. WARRANTY - The Company warrants to the original person, association, or corporation which purchases the Company's equipment for final use, (the "Purchaser"), that the Company's products will be free from defects in materials and/or workmanship under normal use and service for a period of one (1) year from date of shipment, and (5) year limited warranty on the drive system including the hydraulic drive motors, cylinders, and hydraulic pump, motor and tank. The Purchaser shall be obligated to promptly report any failure to conform to this warranty in writing to the Company within said period, whereupon the Company shall, at its option, correct such nonconformity by suitable repair to such equipment, or furnish a replacement part FOB shipping point, provided the Purchaser has stored, installed, maintained and operated such equipment in accordance with good industry practices, and has complied with specific recommendations of the Company. All equipment is sold FOB Oasis' factories, and all responsibility for, and risk of , loss or damage in transit shall be borne by Purchaser. Any claims, loss or damage resulting from shipment must be settled between Purchaser and Purchaser's freight carrier.

In case of component failure on Oasis' systems during the warranty period, upon notification from Purchaser, the Company will ship and invoice a replacement component. Purchaser must then return the failed component to the Company, which shall determine if the failure was covered under this warranty. If covered, the Company will then issue a credit memo to cover warranty replacements.

During the first ninety (90) days of the one (1) year warranty period, the Company shall be responsible only for parts. Labor will be provided by the Company's authorized service representatives. Purchaser shall be responsible for all other repair and/or replacement costs including freight, travel costs and reasonable living expenses, if any, incurred by the Company or the Company's authorized service representatives in executing warranty work. During the balance of the one (1) year warranty period the same warranty conditions shall apply, except that the warranty shall cover only the cost of repair or replacement parts, and the Purchaser shall be responsible for all labor costs as well as travel and reasonable living expenses, if any, incurred by the Company or the Company's authorized representative in executing warranty work.

All parts and equipment returned to the Company for repair or replacement under this warranty must be accompanied by a Returned Material Authorization (RMA) issued by the Company, and must include the original unit serial number from which said components or equipment were removed. Purchasers returning parts and equipment without this serial number information will be deemed to have waived any and all claims under this warranty, and parts and equipment will be replaced at established replacement prices. Accessories or equipment furnished by the Company, but manufactured by others, shall carry whatever warranty the manufacturers have conveyed to the Company and which can be passed on to the Purchaser. The Company shall not be liable for any repairs, replacements, or adjustments to the Equipment or any costs of labor performed by the Purchaser or others without the Company's prior written approval.

CONDITIONS AND EXCEPTIONS – The Company shall not be responsible for any expenses incurred for service or repairs performed by any person(s) other than Company authorized service representatives, unless such other person(s) are specifically authorized by Company. Company shall not be responsible for replacement or repair of parts or components which are missing or damaged due to services performed by any person(s) other than Company authorized service representatives. All Company obligations pursuant to this warranty are subject to the following restrictions, limitations and exceptions:

a. This warranty shall be null and void if the covered equipment is abused, operated beyond rated capacities, or not operated and maintained in strict accordance with manuals and instructions.
b. Warranty services are provided by the Company under, and according to, the manufacturer's written warranty, which is incorporated by reference and made a part of all contracts for the sale of such products.
c. The effects of corrosion, erosion and normal wear and tear are specifically excluded. The following components and accessories are considered expendable items and are expressly exempted from this warranty, and are not covered by any other warranty, expressed or implied.
    1. Stainless steel spray nozzles.
    2. Wand covers.
    3. Treadle, hoses, and tape switches.
    4. Water swivel.
    5. Bearings, rollers, and tires.
    6. Hoses and belts.
    7. Fluid seals.
d. This warranty does not apply to any damage or loss to any component and/or equipment caused by alterations by unauthorized, persons, chemicals such as hydrofluoric, ammonium bifluoride or its derivatives, fire, accident, artificially generated electric current, acts of God, misuse or abuse, or any other cause whatsoever other than defects in workmanship and/or materials. Performance warranties are limited to those specifically stated within the Company's proposal. Unless responsibility for meeting such performance warranties is limited to specified shop or field tests, the Company's obligation shall be to correct in the manner and for the period of time provided above.

8. LIMITATION OF LIABILITY - The remedies of the Purchaser set forth herein are exclusive, and the total liability of the Company with respect to this contract or the equipment and services furnished hereunder, in connection with the performance or breach thereof, or from the manufacture, sale, delivery, installation, repair or technical direction covered by or furnished under this contract, whether based on contract, warranty, negligence, indemnity, strict liability or otherwise, shall not exceed the purchase price of the unit of Equipment upon which such liability is based.

The Company and its suppliers shall in no event be liable to the Purchaser, any successors in interest or any beneficiary or assignee of this contract for any consequential, incidental, indirect, special or punitive damages arising out of this contract or any breach thereof, or any defect in, or failure of, or malfunction of the Equipment hereunder, whether based upon loss of use, lost profits or revenue, interest, lost goodwill, work stoppage, impairment of other goods, loss by reason of shutting down or non-operation, increased expenses of operation, cost of purchase of replacement power, or claims of purchaser or customers of purchaser for service based on contract, warranty, negligence, indemnity, strict liability or otherwise.

The Company makes no other warranty or representation of any kind whatsoever, expressed or implied, except that of title, and all implied warranties of merchantability and fitness for a particular purpose are hereby disclaimed.

Correction by the Company of nonconformities, whether patent or latent, in the manner and for the period of time provided above, shall constitute fulfillment of all liabilities of the Company for such nonconformities, whether based on contract, warranty, negligence, indemnity, strict liability or otherwise with respect to or arising out of such Equipment.

The Purchaser shall not operate Equipment which is considered to be defective without first notifying the Company in writing of its intention to do so. Any such use of Equipment will be at the Purchaser's sole risk and liability.

9. MERGER - The warranty described in the above paragraphs shall be in lieu of any other warranties, express or implied, and all other obligations or liabilities on the part of Company, including but not limited to, any implied warranty of merchantability or fitness for a particular purpose. The Company neither assumes, nor authorizes any person to assume for it, any other liability in connection with the sale or use of the Equipment sold hereunder, and there are no oral agreements or warranties collateral to or affecting this agreement.

This Warranty applies only within the boundaries of the United States of America, its territories and possessions, and Canada. This warranty is not assignable.

10. GOVERNING LAW - The rights and obligations of the parties shall be governed by the laws of the State of Kansas.

11. EXECUTION - The Company shall not be bound by any contract or any modification thereto until approved in writing by an officer of the Company, The contract, when so approved, shall supersede all previous communications, either oral or written.

12. TERMS OF PAYMENT - The Company's terms of payment shall be one-third (1/3) of the total purchase price with the execution of the order. This one-third (1/3) will be considered a non-refundable deposit. The final two-thirds (2/3) of the total purchase price, plus the cost of any changes in the product that have been requested by the Purchaser, shall be due and payable prior to the time of shipment or Purchaser's pickup of the order. Purchaser agrees to pick up or accept delivery as scheduled per the terms of the Company's Confirmation of Delivery Date form or incur $500.00 per week storage fee, payable prior to shipment.

Purchaser agrees to pay any and all costs of collection including, but not limited to, attorney, collection agencies, court costs, property recovery, and certified mailings on all accounts past due 30 days. Purchaser agrees that the Company shall maintain an irrevocable security interest in all goods sold until final payment is received and acknowledged by Company. Purchaser agrees not to sell or assign any goods that have been provided by Company until those goods, as well as any prior goods which may

have been provided, have been fully paid for. If Purchaser fails to pay as agreed or otherwise defaults, Company may exercise all rights of the Kansas Commercial Code, or similar statutes in any State where the goods are taken. Upon repossession or cancellation, the Company may without notice sell in any manner those goods which have been repossessed or cancelled. The Company shall not be bound by the terms of any Purchase Orders that are not consistent with the terms of sales contained herein, unless such terms are specifically accepted by the Company in writing prior to acceptance of a Purchase Order.

HYPRO® Model 2535S and Model 2545S

Installation, Operation, Repair and Parts Manual

Form L-1500
(2/09)

Description

The Hypro 2535 and 2545 triplex plunger pumps are designed for durability and top performance. The self-adjusting, spring-loaded V-packings maintain constant high pressure seal compression. Operators will also notice a decrease in the effects of abuse caused by cold start-up and intermittent operation with the robust crankshaft, bearings, and bronze connecting rod.

Operators can also expect an extended life and lower costs from the Model 2535S and Model 2545S. The 316 stainless steel head and two-piece manifold are built to resist washout and corrosion, allowing the highest quality solutions to be pumped with optimum performance. Seal life has also been improved. The stepped plunger rod between the plunger guide and oil seal will eliminate seal failure due to plunger rod wear. V-packings have also been used to extend seal and plunger life.

Best of all, the innovative design offers operators easy service access by bringing all of the maintenance towards the front.

Flow Rate: 38 gpm (Model 2535S)
47 gpm (Model 2545S)

Max. Pressure: 1200 psi

Shaft Diameter: 35mm

Max. Speed: 800 rpm

Ports: 1-1/2” Inlet
1” Outlet

Weight: 141 lbs.

General Safety Information

1. **WARNING: Use a pressure relief device on the discharge side of the pump to prevent damage from pressure buildup when the pump discharge is blocked or otherwise closed and the power source is still running. For trigger gun operation, or where discharge is frequently shut off, pressure unloader valves are recommended. FAILURE TO FOLLOW THIS WARNING MAY RESULT IN PERSONAL INJURY AND/OR PROPERTY DAMAGE AND WILL VOID THE PRODUCT WARRANTY.**
2. **WARNING: Do not pump flammable or explosive fluids such as gasoline, fuel oil, kerosene, etc. Do not use in explosive atmospheres. The pump should be used only with liquids that are compatible with the pump component materials. Failure to follow this warning may result in personal injury and/or property damage and will void the product warranty.**
3. Do not run the pump faster than maximum recommended speed.
4. Do not pump at pressures higher than the maximum recommended pressure.
5. The maximum liquid temperature is 160°F for the 2535S and 2545S.
6. Make certain that the power source conforms to the requirements of your equipment.
7. Provide adequate protection in guarding around the moving parts such as the shaft and pulleys.
8. Disconnect the power before servicing.
9. Release all pressure within the system before servicing any component.
10. Drain all liquids from the system before servicing any component.
11. Secure the discharge lines before starting the pump. An unsecured line may whip, causing personal injury and/or property damage.
12. Check the hose for weak or worn condition before each use. Make certain that all connections are tight and secure.
13. Periodically inspect the pump and the system components. Perform routine maintenance as required. (See Maintenance section.)

WARNING: RISK OF ELECTRIC SHOCK!

To reduce the risk of electric shock, adequately ground the electric motor to a grounded metal raceway system, or use a separate grounding wire that is connected to bare metal on the motor frame or to the grounding screw located inside motor terminal box; or ground by other suitable means. Refer to the most recent National Electric Code (NEC) Article 250 (Grounding) for additional information. ALL WIRING SHOULD BE PERFORMED BY A QUALIFIED ELECTRICIAN.

WARNING: Do not handle a pump or pump motor with wet hands or when standing on a wet/damp surface or in water.

14. Use only pipe, hose and fittings rated for the maximum psi rating of the pump. If an unloader is used, then the pipe should be rated for pressure at which the unloader operates.
15. Do not use these pumps for pumping water or other liquids for human or animal consumption.

Unloader Valve Safety Information

1. Always size your unloader valve to match the capabilities of your system for pressure (psi) and volume (gpm).
2. In rigid-piped systems, a pulsation dampener or accumulator **MUST** be installed in the system. Select a dampener which conforms to the rated capacity.
3. Never replace the main spring with one of heavier tension to increase pressure. Never add washers to increase spring tension.
4. Always replace safety shield caps.
5. Secure all locking devices to eliminate the unloader from vibrating out of adjustment during operation.

Belt/Pulley Drive Installation

This pump was designed for rotation in one direction, which is toward the pump head when looking at the top of the pulley. There is a rotation direction sticker located on crankcase bearing cover. Reverse rotation is acceptable if the oil level is increased by 1/2 quart.

For determining proper pulley sizes, use the formula below as a guideline and use “A” or “B” section belts.

$$\frac{\text{MOTOR RPM}}{\text{PUMP RPM}} = \frac{\text{FLOW (@RATED SPEED)}}{\text{FLOW (DESIRED)}} = \frac{\text{PUMP PULLEY DIA.}}{\text{MOTOR PULLEY DIA.}}$$

EXAMPLE: : Use a 1725 rpm electric motor to drive the pump at 800 rpm.

A typical pulley diameter on the motor is 7.25 inches. The pump pulley diameter can be determined from the formula above:

$$\frac{1725}{800} = \frac{\text{PUMP PULLEY DIAMETER}}{7.25 \text{ INCHES}}$$

$$\frac{1725 \times 7.25 \text{ INCHES}}{800} = 15.6 \text{ INCHES}$$

1. Install the pulley or bushing/sheave combination (See Figure 1) onto the pump and motor shaft. Mount the pump next to the motor making sure the pulleys are lined up properly. Use a straightedge as shown in Figure 2. Rotate to check for runout and bent shafts.
2. Install belt(s) and use slots in the pump mounting rails to tighten the belts. Make sure the belts have proper tension. Belts that are too tight will cause bearing wear, and belts that are too loose will cause slipping. (See Figure 3.)

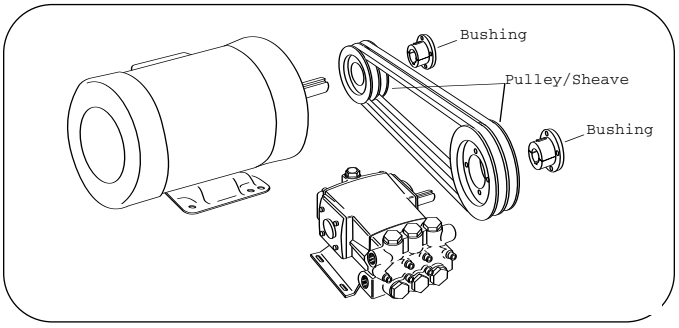
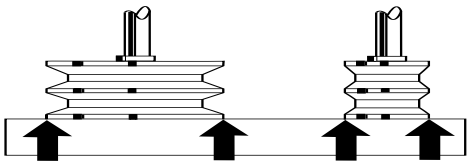


Figure 1



Straightedge touching sheaves at four points indicates alignment.

Figure 2

Push the belt midway between the pulleys, check the deflection (d) and adjust:
d = 0.016 x L

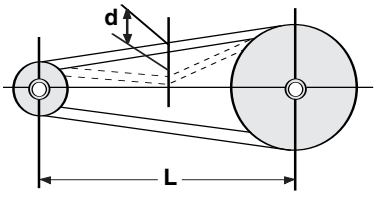


Figure 3

System Installation

1. In general, select an adequate size drive unit to avoid overloading. Avoid unnecessary restrictions in the line such as elbows, check valves, and all extraneous curves and bends.
2. Avoid using a looped section which might permit air to become trapped.
3. Use pipe joint sealant on the pipe threads to assure airtight connections.
4. **Selection of the right type and size of hose is vital to good performance. Be sure to hook the lines to the proper ports on the pump.**
5. Always use genuine suction hose of at least one size larger than the inlet port of the pump. If the suction (inlet) hose is more than four feet long, use the next larger size.
6. Use one or two braid reinforced hose to prevent collapse of suction line.
7. Use only approved, high pressure hose on the discharge side, and make sure all connections are tight.

NOTE: Use only pipe, fittings, accessories, hose, etc. rated for the maximum pressure rating of the pump.

Pump

1. Before installing the pump, clean all fittings and hoses.
2. Rotate the pump by hand to make sure it turns freely.
3. Make sure that all hose connections are tight and use the proper size fittings that are capable of safe operation.

Warning: The pumps are shipped from the factory without Hypro oil. Hypro recommends changing oil after 40 hours of break-in operation and every three months or 500 hours, whichever comes first. Use Hypro Oil (P/N 2160-0047). If not available, use SAE 30 weight non-detergent motor oil. Crankcase capacity: 4.5 Quarts

Discharge Side Installation

From the pump to the discharge hose, the following accessories are recommended: a dampened pressure gauge with a face pressure double the maximum operating pressure, an unloader valve, a pulsation damper, an optional pressure gauge to monitor unloader, and discharge hose.

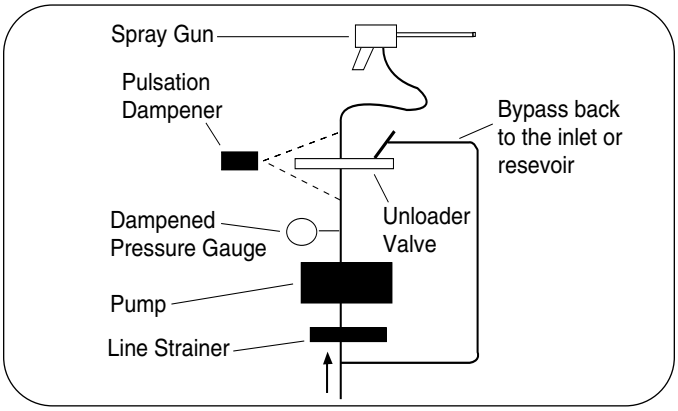


Figure 4

Accessories such as an unloader valve, a pressure gauge, a pulsation dampener - should be installed as close to the pump as possible. A hose must be used right after the accessories. If solid piping is used, a two to four foot section of hose must be installed between the accessories and the piping.

Inlet Side Installation

From the source of liquid to the pump, the following components are recommended: a shut-off valve, a bypass return tee from the unloader, a line strainer, and a compound pressure gauge.

Inlet Water Supply

Inlet filters should be an 80 mesh screen. Only use flexible hose. Do not use rigid pipe. Optimum pump performance is obtained with a positive lead on the inlet - 15 to 20 psi is ideal - but simply flooded is adequate.

Operation

WARNING: DO NOT pump flammable or explosive liquids such as gasoline, kerosene, etc. DO NOT pump corrosive or abrasive liquids because these will cause rapid wear or deterioration of plungers, valves and seals in the pump. The pump should be used only with liquids compatible with pump component materials. Do not exceed the maximum specified rpm and pressure. Observe the lubrication instructions. Failure to follow this warning will void the product warranty.

Lubrication

Before running the pump, check the oil level using the dipstick. Use Hypro Oil (P/N 2160-0047). Hypro oil is a specially-formulated, high grade, SAE 30 weight oil, formulated to prolong pump life.

The crankcase capacity for these pumps is 4.5 quarts.

Priming the Pump

To prime the pump, adjust the unloader valve to its lowest pressure setting. After starting the pump, open and close the gun to aid priming and to clear the valves of air. If the pump does not prime within a few seconds, stop the motor and inspect the installation for suction line leaks and obstructions. In general, keep suction lift to a minimum and avoid unnecessary bends in the suction line. The unloader valve must be readjusted after the prime has been obtained.

Care of the Pump

Generally, after each use, flush the pump with a neutralizing solution for the liquid pumped. Follow with a clear water rinse. For storage under freezing conditions, flush the pump with a 50% mixture of automotive antifreeze and water.

VALVE SERVICE

DISASSEMBLY

1. Remove (6) 41mm hex valve plug (Fig. 5).
2. Remove the coil spring and thread a M10mm bolt into valve assembly (Fig. 6). Use a pliers to grip the bolt and remove valve assembly (Fig. 7). If resistance is encountered, gently rock bolt until valve comes free.
3. After removing, threading bolt more deeply into the assembly will separate the components.

REASSEMBLY

1. Inspect components and replace worn items as necessary.
2. Assemble valve cage, spring retainer, spring, disc, and valve seat by snapping together (Fig. 8).
3. Thread M10 bolt into assembly for installation.
4. Lubricate outer o-ring, back-up ring and walls of valve chamber. Install valve assembly squarely into the chamber. Remove M10 bolt.
5. Examine valve plug components and replace if worn. Lubricate back-up ring and o-ring before installing on valve cap to prevent damage. Install back-up ring first and then o-ring.
6. Place the spring over the top of the spring retainer.
7. Apply anti-seize compound to the threads of the valve cap and carefully thread it into the manifold. Torque to specifications. (See Torque Specification Chart on Page 10.)

WARNING: Anti-seize must be applied to all valve caps to avoid the galling of components.

Figure 5

Figure 6

Figure 7

Figure 8

REMOVING THE DISCHARGE MANIFOLD

1. Using a 10mm hex allen wrench, remove (8) socket head cap screws (Fig. 9).
2. While supporting manifold, tap backside of discharge manifold with soft mallet, removing inlet manifold (Fig. 10).
3. Remove o-rings from the interior face of the inlet manifold.

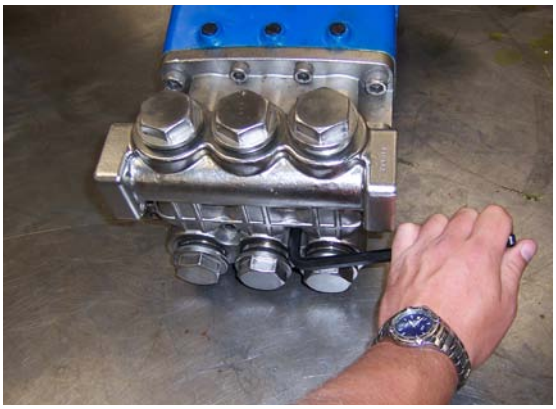


Figure 9

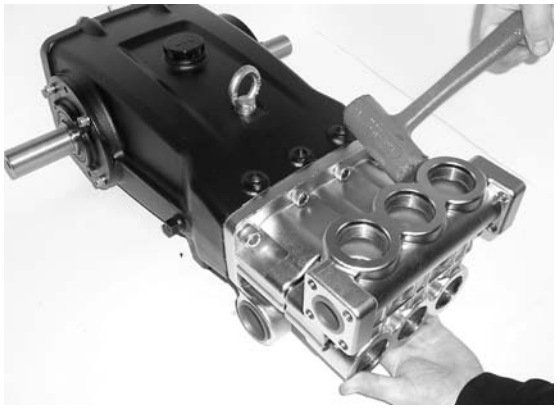


Figure 10

REMOVING THE INLET MANIFOLD

1. Using a 12mm hex allen wrench, remove (4) outer socket head cap screws. Using 10 mm hex allen wrench, remove (4) inner socket head cap screws (Fig. 11).
2. While supporting manifold, tap rear of inlet manifold with soft mallet and gradually work from pump. If necessary, use flat head screwdrivers to gently pry manifold off (Fig. 12).

Figure 11

Figure 12

PACKING SERVICE

DISASSEMBLING THE PACKINGS

1. Place inlet and discharge manifold spacer side up on work surface.
2. Remove the spacer. If spacer is stuck, two screwdrivers may be used on opposite sides to gently pry it out (Fig. 13).
3. Remove spring, spreader, packings and packing retainer from inlet manifold (Fig. 14).
4. Reinstall inlet manifold using proper torque specifications and torquing sequence. Add antiseize to all bolts prior to installation. (See Torque Specification Chart on page 10.)
5. Inspect components and replace worn items as necessary. It is recommended to replace spacer o-rings and back-up rings at this time.
6. Lubricate packing cylinder and reinstall packing retainer.
7. Fit the packings together. Lightly lubricate the outside of the packings and insert, groove up, into the inlet manifold. Turn the crankshaft. Use the spreader and spring to help guide packings around the plunger and into the manifold until seated properly. If packings are tight, they can be started by tapping them into the manifold using the spreader, a 1.5" PVC pipe against the spreader, and a soft mallet.
8. Reinstall spreader so it meshes with packings; then install spring.
9. Lubricate spacer o-rings and back-up rings and install on spacer. Squarely reinstall packing spacer taking care not to damage o-rings.
10. Reinstall 3 o-rings on the interior face of the inlet manifold. Grease may be applied to hold o-rings in place.
11. Reinstall discharge manifold using proper torque specifications and torquing sequence. **Add anti-seize to all bolts prior to re-installation.** (See Torque Specification Chart on page 10.)

Figure 13

Figure 14

REMOVING AND INSTALLING OIL SEALS

1. Remove the seal retainer, wick, plunger retainer, plunger, washer, slinger, and insert. If plunger is not loose, reassemble the plunger retainer a few threads on the stud and tap with a soft mallet until loose (Fig. 15).
2. The oil seal can be removed from the bottom side of the insert using a reverse pliers, or tapped out with a punch and hammer from the plunger side of the insert.
3. If the studs attached to the plunger rod have become loose, remove and buff clean. Reinstall to the plunger rod using high strength threadlocker.
4. Reinstall oil seal by lubricating and pressing into insert. Replace o-ring.
5. Make sure washer is seated properly in the crankcase. Place insert in crankcase and seat in place using the handle of a soft mallet.
6. Install the plunger by sliding the slinger in place, cupped side toward the front, followed by the plunger and washer. Lubricate o-ring and back-up ring. Apply medium strength threadlocker to the plunger retainer and torque to specifications.

(See Torque Specification Chart on page 10.)

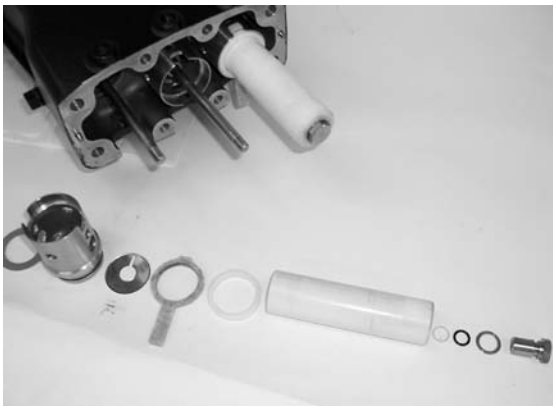
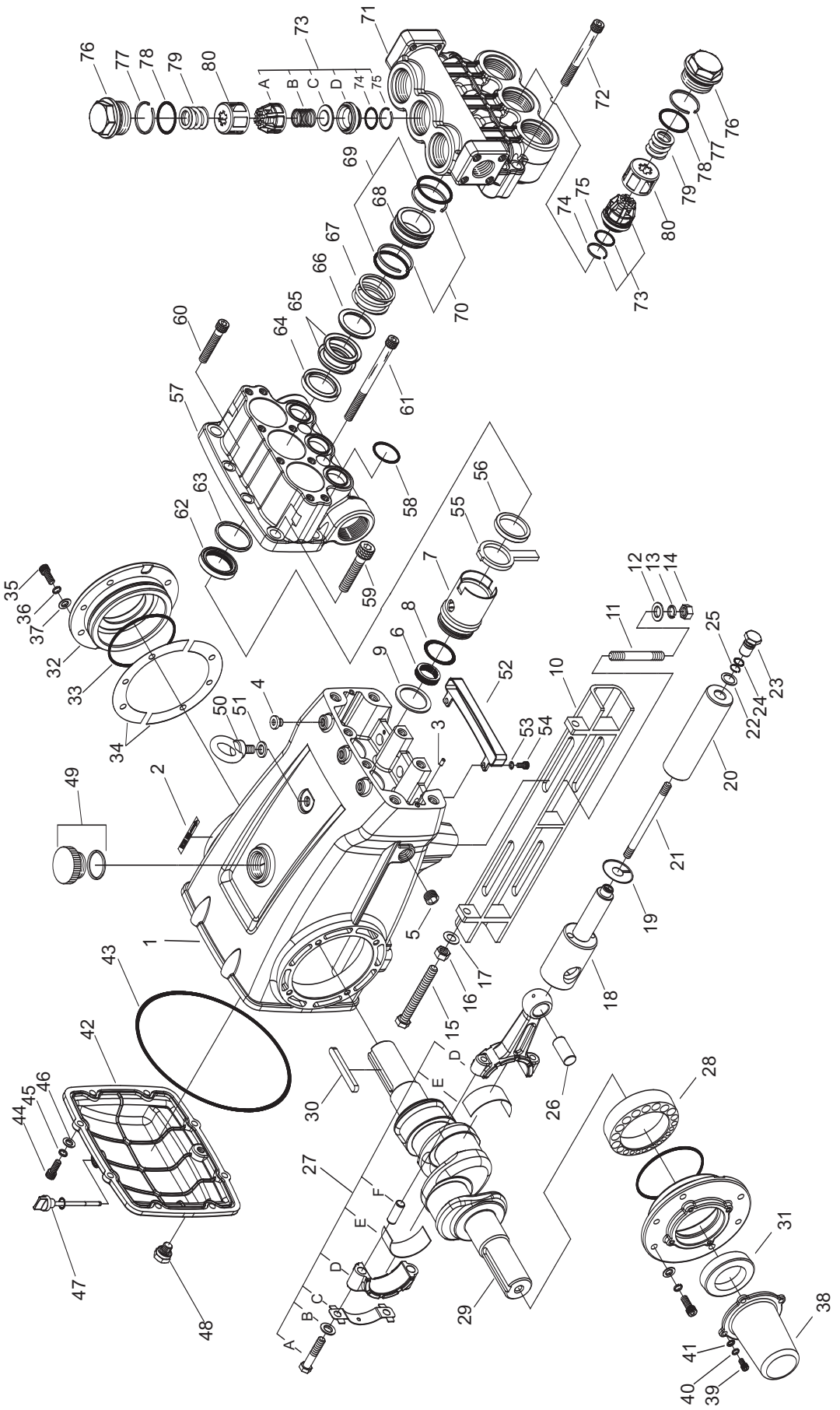


Figure 15

2535S & 2545S Parts Breakdown



Ref. No.	Qty. Req'd	Part No.	Description
1	1	**0100-2535A**	CRANKCASE
2	2	**6031-0438**	DECAL
3	2	**1600-0072**	DOWEL PIN
4	3	**2300-0041**	PLUG
5	1	**2406-0040**	PLUG, PIPE
6	3	**2102-0042**	OIL SEAL
7	3	**0714-2535**	INSERT (Model 2535S)
7	3	**0714-2545**	INSERT (Model 2545S)
8	3	**1720-0232**	O-RING
9	3	**2270-0101**	WASHER
10	2	**1510-0110**	BASE
11	4	**2205-0018**	STUD
12	4	**2270-0102**	WASHER
13	4	**2260-0047**	LOCKWASHER
14	4	**2250-0089**	NUT
15	2	**2210-0147**	BOLT
16	2	**2250-0090**	NUT
17	2	**2270-0103**	WASHER
18	3	**3500-0072**	PLUNGER ROD
19	3	**2270-0104**	SLINGER (Model 2535S)
19	3	**2270-0126**	SLINGER (Model 2545S)
20	3	**3500-0073**	PLUNGER (Model 2535S)
20	3	**3500-0075**	PLUNGER (Model 2545S)
21	3	**2205-0019**	STUD
22	3	**2270-0105**	WASHER
23	3	**1630-0002**	PLUNGER NUT
24	3	**1720-0233**	O-RING
25	3	**1760-0014**	BACK-UP RING
26	3	**1600-0073**	WRIST PIN
27	3	**0500-2535**	CONNECTING ROD ASSY
27-D	3	**N/A**	ROD
27-F	6	**N/A**	DOWEL PIN
27-C	3	**N/A**	RETAINING PLATE
27-B	6	**N/A**	WASHER
27-A	6	**N/A**	BOLT
27-E	3	**N/A**	BEARING
28	2	**2029-0015**	BEARING
29	1	**0501-2535**	CRANKSHAFT
30	1	**1610-0063**	KEY (M10x8x70)
31	2	**2102-0040**	OIL SEAL
32	2	**0700-2535**	BEARING COVER
33	2	**1720-0234**	O-RING
34	2	**1430-0030**	SHIM
35	8	**2220-0108**	BOLT
36	8	**2260-0048**	LOCKWASHER
37	8	**2270-0107**	WASHER
38	1	**0701-2535**	COVER
39	4	**2220-0109**	BOLT
40	4	**2260-0049**	LOCKWASHER
41	4	**2270-0108**	WASHER
42	1	**0702-2535**	REAR COVER
43	1	**1720-0235**	O-RING
44	8	**2220-0110**	BOLT
45	8	**2260-0050**	LOCKWASHER
46	8	**2270-0109**	WASHER
47	1	**2630-0019**	DIPSTICK
48	1	**2406-0039**	DRAIN PLUG 1/4"-18 NPT
49	1	**2630-0020**	OIL CAP

Ref. No.	Qty. Req'd	Part No.	Description
50	1	**2214-0001**	EYE BOLT
51	1	**2270-0110**	WASHER
52	1	**2850-0010**	OIL PAN
53	2	**2270-0111**	WASHER
54	2	**2220-0111**	BOLT
55	3	**1700-0211**	WICK (Model 2535S)
55	3	**1700-0231**	WICK (Model 2545S)
56	3	**1830-0175**	SEAL RETAINER (Model 2535S)
56	3	**1830-0182**	SEAL RETAINER (Model 2545S)
57	1	**0200-2535**	INLET MANIFOLD (Model 2535S)
57	1	**0200-2545**	INLET MANIFOLD (Model 2545S)
58	3	**1720-0239**	O-RING
59	4	**2220-0112**	BOLT
60	2	**2220-0113**	BOLT
61	2	**2220-0114**	BOLT
62	3	**2102-0041**	LOW PRESSURE SEAL (2535S)
62	3	**2102-0045**	LOW PRESSURE SEAL (2545S)
63	3	**1410-0117**	SPACER (Model 2535S)
63	3	**N/A**	SPACER (Model 2545S)
64	3	**1830-0176**	PACKING RETAINER
65	6	**2140-0004**	PACKING (Model 2535S)
65	6	**2140-0005**	PACKING (Model 2545S))
66	3	**1830-0177**	SPREADER (Model 2535S)
66	3	**1830-0181**	SPREADER (Model 2545S)
67	3	**1900-0167**	SPRING (Model 2535S)
67	3	**1900-0181**	SPRING (Model 2545S)
68	3	**1410-0118**	SPACER (Model 2535S)
68	3	**1410-0124**	SPACER (Model 2545S)
69	6	**1720-0240**	O-RING (Model 2535S)
69	6	**1720-0264**	O-RING (Model 2545S)
70	6	**1760-0015**	BACK-UP RING (Model 2535S)
70	6	**1760-0018**	BACK-UP RING (Model 2545S)
71	1	**0201-2535**	DISCHARGE MANIFOLD (2535S)
71	1	**0201-2545**	DISCHARGE MANIFOLD (2545S)
72	8	**2220-0115**	BOLT
73	6	**3400-0169**	VALVE ASSY (Model 2535S)
73	6	**3400-0170**	VALVE ASSY (Model 2545S)
73-A	6	**N/A**	VALVE CAGE
73-B	6	**N/A**	SPRING
73-C	6	**N/A**	DISC
73-D	6	**N/A**	VALVE SEAT
74	6	**1720-0241**	O-RING (Model 2535S)
74	6	**1720-0265**	O-RING (Model 2545S)
75	6	**1760-0016**	BACK-UP RING (Model 2535S)
75	6	**1760-0019**	BACK-UP RING (Model 2545S)
76	6	**2404-0357**	VALVE CAP
77	6	**1760-0017**	BACK-UP RING
78	6	**1720-0242**	O-RING
79	6	**1900-0169**	SPRING
80	6	**3200-0062**	SPRING RETAINER

Plunger Kit No. 3430-0638 (Model 2535S) / 3430-0728 (Model 2545S):
Consists of: (1) Ref. 24 O-Ring, (1) Ref. 25 Back-up Ring, (1) Ref. 19 Slinger, (1) Ref. 22 Washer, (1) Ref. 20 Plunger, & (4) Anti-Seize Tubes

Packing Kit No. 3430-0639 (Model 2535S) / 3430-0729 (Model 2545S):
Consists of: (3) Ref. 62 Low Pressure Seal, (6) Ref. 65 Packing, & (4) Anti-Seize Tubes

Valve Kit No. 3430-0640 (Model 2535S) / 3430-0730 (Model 2545S):
Consists of: (6) Ref. 73 Valve Assembly, (6) Ref. 77 Back-up Ring, (6) Ref. 78 O-Ring, & (3) Anti-Seize Tubes

Packing Rebuild Kit No. 3430-0641 (Model 2535S) / 3430-0731 (Model 2545S):
Consists of: (3) Ref. 58 O-Ring, (6) Ref. 69 O-Ring, (6) Ref. 70 Back-up Ring, (3) Ref. 64 Packing Retainer, (3) Ref. 62 Low Pressure Seal, (6) Ref. 65 Packing, & (4) Anti-Seize Tubes

Valve Seal Kit No. 3430-0642 (Model 2535S) / 3430-0732 (Model 2545S):
Consists of: (6) Ref. 74 O-Ring, (6) Ref. 78 O-Ring, (6) Ref. 75 Back-up Ring, (6) Ref. 77 Back-up Ring, & (3) Anti-Seize Tubes

Plunger Seal Kit No. 3430-0643 (Model 2535S) / 3430-0733 (Model 2545S):
Consists of: (3) Ref. 24 O-Ring, (3) Ref. 25 Back-up Ring, (3) Ref. 19 Slinger, (3) Ref. 22 Washer, & (4) Anti-Seize Tubes

Rod Oil Seal Kit No. 3430-0644 (Model 2535S) / 3430-0734 (Model 2545S):
Consists of: (3) Ref. 55 Wick, (3) Ref. 8 O-Ring, & (3) Ref. 6 Oil Seal, & (4) Anti-Seize Tubes

Mounting Kit No. 3430-0645 (Both Models): Consists of: (2) Ref. 10 Base, (4) Ref. 11 Stud, (2) Ref. 15 Bolt, (4) Ref. 14 Nut, (2) Ref. 16 Nut, (4) Ref. 13 Lockwasher, (4) Ref. 12 Washer, & (2) Ref. 17 Washer

Performance Chart

Model	RPM	GPM	PSI	HP
2535S	800	38	1200	31.2
2545S	800	47	1200	36.1

Torque Specifications

PART DESCRIPTION	REF NO.	TORQUE
Valve Cap **	95	110 ft.lbs.
Inlet Manifold Bolts **	74, 75, 76	40 ft.lbs.
Discharge Manifold Bolts **	87	30 ft.lbs.
Plunger Retainer *	23	18 ft.lbs.
Rear Cover Bolts	50	10 ft.lbs.
Bearing Cover Bolts	38	10 ft.lbs.
Connecting Rod Bolts	32	32 ft.lbs.

* Use Medium Strength Threadlocker on Assembly
** Use Anti-Seize on Assembly

Note: Use the following torquing pattern when mounting the Inlet and Discharge Manifold

8 1 3 5
7 4 2 6

Maintenance Schedule

CHECK	DAILY	WEEKLY	50 hrs	500 hrs	1500 hrs	5000 hrs
Clean Filters	X					
Oil Level	X					
Oil Leaks	X					
Water Leaks	X					
Belts, Pulleys		X				
Plumbing		X				
Initial Oil Change			X			
Oil Change*				X		
Seal Service					X	
Valve Service						X
Accessories					X	

* If other than HYPRO pump oil is used, change frequency should be increased to every 250 hours.

Note: Maintenance cycles will vary by system design. If a negative change in system performance is noticed, promptly check pump and review checklist items.

Troubleshooting

Symptom	Probable Cause(s)	Corrective Action
Pump runs, but produces no flow.	Pump is not primed.	Flood suction, then restart pump.
Pump fails to prime.	Air is trapped inside pump.	Disconnect discharge hose from pump. Flood suction hose, restart pump, and run pump until all air has been evacuated.
Pump loses prime. Chattering noise.	Air leak in suction hose or inlet fittings.	Remove suction hose and test for leaks by pressurizing hose with water.
Pressure fluctuates.		Make sure thread sealant has been used on all fittings.
	Suction line is blocked, collapsed or too small.	Remove suction line and inspect it for a loose liner or debris lodged in hose. Avoid all unnecessary bends. Do not kink hose.
	Clogged suction strainer.	Clean strainer.
Low pressure at nozzle.	Unloader valve is bypassing.	Make sure unloader is adjusted properly and bypass seat is not leaking.
	Incorrect or worn nozzle.	Make sure nozzle is matched to the flow and pressure of the pump. If the nozzle is worn, replace.
	Restricted intake.	Refer to above priming information.
Pressure loss in general.	Screen clogged.	Check the screen for debris and clean or replace.
	Inlet size too small.	Make sure it is big enough.
	Worn or clogged valves are stuck due to corrosion.	Inspect valves for corrosion, wear, pitting and debris, and replace if necessary.
	Unloader bypassing.	Plumbed wrong. See if the flow is diverting out of the bypass line.
	System leaks.	Check for leaks.

Note: Cavitation Will Damage Your Pump!

Cavitation occurs when an inadequate amount of fluid is available for feeding the pump.

If it takes the supply water noticeably longer to fill the test container to the gallons per minute that your system requires, your pump could be experiencing cavitation. Cavitation can severely damage seals, pistons and valves and will shorten the life of all components in the hydraulic system.

To Avoid Cavitation:

- Keep the size of the suction line as large as possible, preferably the same size (or larger) as the inlet port.
- Use high-capacity, clean line strainers.
- Install a fitting at the suction side so you can check the vacuum periodically. The vacuum should not exceed 2-3 inches of Hg to obtain the best operation.
- Protect the pump from overheating.
  - Protect it from direct sunlight in hot weather.
  - Maintain adequate ventilation.
  - Keep lubricating fluids clean and at full levels.
- Protect the pump from severe cold by covering or operating indoors.
- Make sure the pump is secure and can't move around.
- Control the pressure with unloader valves and balanced relief valves. To prevent pressure spikes, don't over tighten the control valves.
- Use a pulsation dampener. Soft hose works well.
- To avoid vacuum leak, prevent the system from flowing against gravity.
- In a gravity-fed system, keep the rate of flow from gravity the same (or more) as the feed requirements of the pump.

Limited Warranty on Hypro Plunger Pumps

Hypro warrants to the original purchaser of its products (the "Purchaser") that oil crankcase plunger pumps will be free from defects in material and workmanship under normal use for the period of five (5) years, and accessories will be free from defects in material and workmanship under normal use for the period of ninety (90) days. In addition, Hypro warrants to the purchaser all stainless steel pump manifolds will be free from defects in material and workmanship under normal use and from damage resulting from environmental conditions for the life of the pump.

"Normal use" does not include use in excess of recommended maximum speeds, pressures, vacuums and temperatures, or use requiring handling of fluids not compatible with component materials, as noted in Hypro product catalogs, technical literature, and instructions. This warranty does not cover freight damage, freezing damage, normal wear and tear, or damage caused by misapplication, fault, negligence, alterations, or repair that affects the performance or reliability of the product.

THIS WARRANTY IS EXCLUSIVE. HYPRO MAKES NO OTHER WARRANTY, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.

Hypro's obligation under this warranty is, at Hypro's option, to either repair or replace the product upon return of the entire product to the Hypro factory in accordance with the return procedures set forth below. **THIS IS THE EXCLUSIVE REMEDY FOR ANY BREACH OF WARRANTY.**

IN NO EVENT SHALL HYPRO BE LIABLE FOR ANY INCIDENTAL OR CONSEQUENTIAL DAMAGES OF ANY KIND, WHETHER FOR BREACH OF ANY WARRANTY, FOR NEGLIGENCE, ON THE BASIS OF STRICT LIABILITY, OR OTHERWISE.

Return Procedures

All pumps or products must be flushed of any chemical (ref. OSHA Section 0910.1200 (d)(e)(f)(g)(h)) and hazardous chemicals must be labeled before being shipped* to Hypro for service or warranty consideration. Hypro reserves the right to request a Material Safety Data sheet from the Purchaser for any pump or product Hypro deems necessary. Hypro reserves the right to "disposition as scrap" pumps or products returned which contain unknown substances, or to charge for any and all costs incurred for chemical testing and proper disposal of components containing unknown substances. Hypro requests this in order to protect the environment and personnel from the hazards of handling unknown substances.

For technical or application assistance, call the **Hypro Technical/Application number: 1-800-445-8360.**
To obtain service or warranty assistance, call the Hypro Service and Warranty number: 1-800-468-3428; or call the Hypro Service and Warranty FAX: (651) 766-6618. Be prepared to give Hypro full details of the problem, including the following information:

1. Model number and the date and from whom you purchased your pump.
2. A brief description of the pump problem, including the following:
   - Liquid pumped. State the pH and any non-soluble materials, and give the generic or trade name.
   - Temperature of the liquid and ambient environment.
   - Suction lift or vacuum (measured at the pump).
   - Discharge pressure.
   - Size, type, and mesh of the suction strainer.
   - Drive type (gas engine/electric motor, direct/belt drive, tractor PTO) and rpm of pump.
   - Viscosity (of oil, or other than water weight liquid).
   - Elevation from the pump to the discharge point.
   - Size and material of suction and discharge line.
   - Type of spray gun, orifice size, unloader/relief valve.

Hypro may request additional information and may require a sketch to illustrate the problem. Contact the factory to receive a return material authorization before sending the product. All pumps returned for warranty work should be sent shipping charges prepaid to:

HYPRO
Attention: Service Department
375 Fifth Avenue NW
New Brighton, Minnesota 55112

* Carriers, including U.S.P.S., airlines, UPS, ground freight, etc., require specific identification of any hazardous materials being shipped. Failure to do so may result in a substantial fine and/or prison term. Check with your shipping company for specific instructions.

Pentair Water
FLOW TECHNOLOGIES GROUP
375 Fifth Avenue NW • New Brighton, MN 55112
Phone: (651) 766-6300 • 800-424-9776 • Fax: 800-323-6496
www.hypropumps.com

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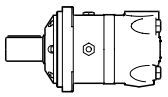
INSTRUCTIONS

Motor with speed sensor OMM EM, OMP EM, OMR EM, OMS EM, OMSW EM, OMT EM, OMV EM



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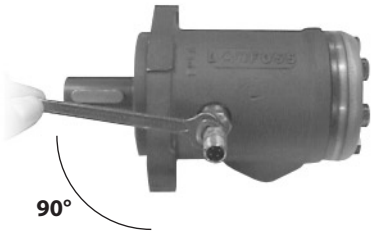
1

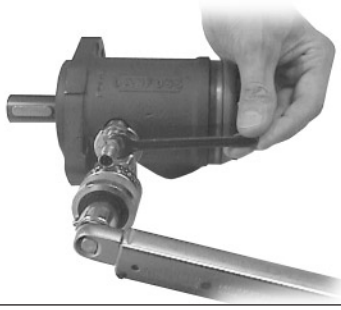
2



3

3a

4



5

1. Fjern den monterede prop og skive på motoren (6 mm unbraco)
1. Remove the plug and washer from the motor (6 mm Allen key)
1. Den Stopfen und Scheibe aus dem Motor entfernen (6 mm Inbussschlüssel)
1. Ôter le bouchon et la rondelle du moteur (clé Allen à 6 cannelures)

2. Skru sensoren i, uden anvendelse af værktøj, til kontakt med motorens aksel / møtrik.
2. Without tools screw in the sensor till it makes contact with the shaft/nut of the motor.
2. Den Drehzahlgeber ohne Anwendung von Werkzeug einschrauben, bis Kontakt mit Welle/Mutter des Motors erreicht wird.
2. Visser le capteur sans utiliser de l'outil jusqu'à ce qu'il y ait contact avec l'axe/l'écrou du moteur.

3. Skru sensoren 1/4 omgang (90°) ud igen som vist på foto 3a.
3. Turn 1/4 revolution back again (90°) as shown on photo 3a.
3. Den Drehzahlgeber wieder 1/4 Umdrehung (90°) ausschrauben. Siehe Photo 3a.
3. Dévisser le capteur d'un quart de tour (90°) comme indiqué sur la photo 3a

4. Skru yderligere ud indtil de 2 gaffelflader (10 mm) er orienteret i samme retning som motorens længdeakse. Tolerance: ± 5°
4. Turn further back until the 10 mm flats of the sensor are aligned with th longitudinal axis of the motor. Tolerance ± 5°.
4. Weiter so ausschrauben, bis die zwei Gabelflächen am Sensor identisch mit der Längsachse vom Motor orientiert sind. Toleranz ± 5°.
4. Continuer à dévisser le capteur jusqu'à ce que les deux plats à fourche (10 mm) soient orientés dans la même direction que l'axe longitudinal du moteur. Tolérance : ± 5°

5. Hold sensoren i denne position, medens omløber spændes med det foreskrevne tilspændingsmoment på 15 - 20 Nm.
5. Keep the sensor in this position while tightening the compression nut to the prescribed torque of 15-20 daNm.
5. Den Drehzahlgeber in dieser Stellung halten während die Überwurfmutter zum vorgeschriebenen Anzugsmoment von 15-20 Nm angezogen wird.
5. Maintenir le capteur dans cette position et serrer l'écrou en appliquant le couple prescrit de 15 – 20 Nm.

For at sikre sensorens funktionsevne, er det nødvendigt at trin 2 til 5 er udført korrekt og i den rigtige rækkefølge.

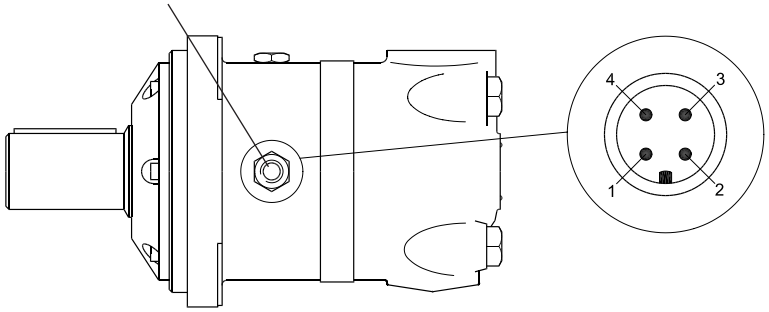
To make the sensor work, be sure to carry out the steps 2 – 5 correctly and in the right order of succession.

Um die korrekte Funktion vom Drehzahlgeber zu sichern, müssen die Anwei-sungen 2 bis 5 genau und in der richtigen Reihenfolge beobachtet werden.

Le bon fonctionnement du capteur est garanti par l'exécution correcte, et dans le bon ordre, des phases de montage 2 à 5.

Tilslutning
Connection
Anschluß
Raccordement

Kabel
Cable
Kabel
Câbles



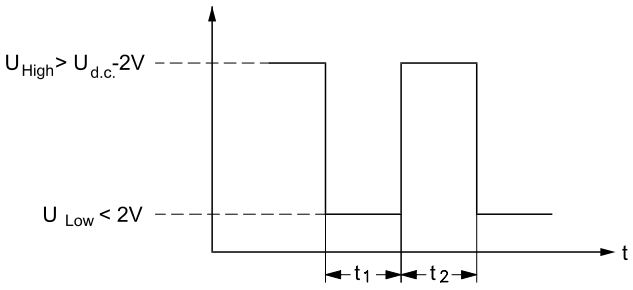
159G35.10

Advarsel: **Drej ikke soklen**
Attention: **Don't turn the socket**
Achtung: **Den Sockel nicht drehen**
Attention: **Ne pas tourner le socle**

Stik: Binder serie 713
Connection: Binder series 713
Stecker: Binder Serie 713
Connecteur: Binder série 713

Stikben / Pin Stiftstecker / Point de fiche	Ledningsfarve / Conductor Leiterfarbe / Codes couleurs	Betegnelse / Designation Bezeichnung / Désignation	Specifikation / Specification Spezifikation / Spécification
1	Brun / Brown / Braun / Brun	Ud.c. Forsyning / supply Versorgung / Alimentation	11 - 30 V ⎓
2	Hvid / White / Weiß / Blanc	Forbindes ikke / Not connected Keine Verbindung / Non connecté	
3	Blå / Blue / Blau / Bleu	Ud.c. Forsyning / supply Versorgung / Alimentation	0 V ⎓
4	Sort / Black / Schwarz / Noir	Signal	Se nedenfor / See below Siehe unten / Voir ci-dessous

Hastighedssignal
Speed signal
Drehzahlsignal
Signal de vitesse



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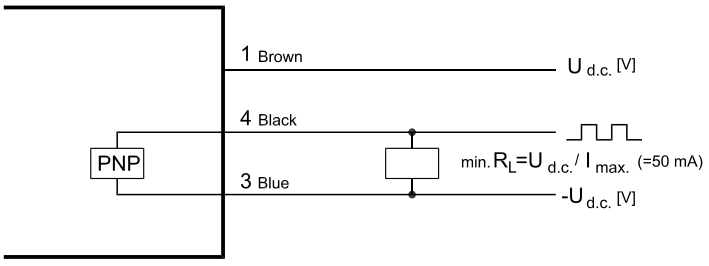
159G33.10

Motortype / Motor type	OMM EM	OMP EM	OMR EM	OMS EM	OMSW EM	OMT EM	OMV EM
Motor Typ / Type de moteur Pulser pr. omdr./ Pulses per rev.	22	35	35	55	55	84	102
Pulsen per Umdr. / Impulsions Par tour Belastning / Load / Belastung / Charge	I_{max} = 50 mA						

Forbindelsesdiagram
Connection diagram
Anschlußschema
Raccordement électrique



159G34.10

OASIS CAR WASH SYSTEMS INC
Hydraulic Power Unit Manual
Model #: OC070605

Manufactured by John Henry Foster Co

OASIS CAR WASH

Thank you for your recent purchase of a John Henry Foster Hydraulic Power Unit. Listed below you will find the initial start-up procedures for your power unit:

1. **Remove all plastic protective cap plugs from components before installation.**

2. Make sure tank is full of oil. **Recommended oil is ISO 32**.

3. Rotate the shaft by hand, in the direction of the cast in arrow, to ensure freedom of rotation.

   On initial start-up, it is imperative to clear all air from the pumping chambers in order to allow the pump to prime. To do this, open center valving should be immediately downstream of the pump outlet port, allowing all flow (fluid and air) to pass directly to tank upon start-up. If open center valving is not included in your circuitry, position you're valving so as to move cylinders and/or motors in a no-load condition (75 to 150 psi, 5.2 to 10.3 bar) until the pump has primed. This "no load" condition is not a pump compensating pressure valve, but is strictly the result of system resistance.

4. Should your pump incorporate the optional screw volume control, BOSCH recommends that it not be used to reduce the pump's output flow by more than 50 percent on the start-up (pump flow is reduced by turning the adjustment screw clockwise). Once the pump is up and running, the volume can be adjusted down to as low as 20 percent of maximum volume at maximum RPM.

5. Jog the motor (no more than 10 revolutions, if possible) and observe the direction of rotation. If the pump shaft is not rotating in the direction the cast arrow on the pump body indicates, the direction of rotation of the motor must be reversed.

   If rotation is correct, continue jogging the motor until the pump has primed. You will notice a definite pump tone change, as well as pressure gauge movement when the pump begins to prime. Once the pump has primed, pressure adjustments can be made.

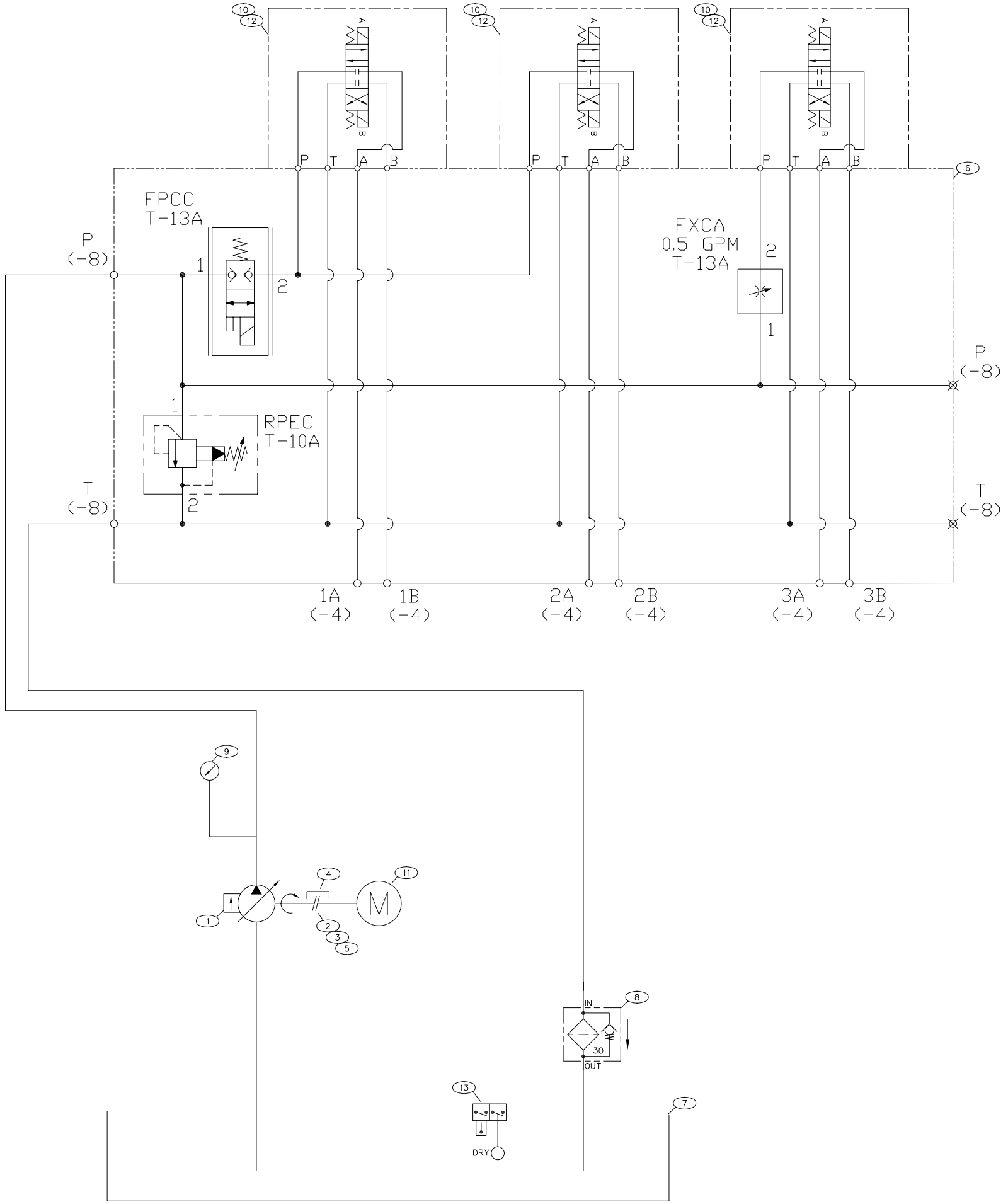
6. Pressure adjustments must be made against a blocked system (cylinders and/or motors stalled or valving shut off). Increase pressure by turning the pressure adjustment knob clockwise. Decrease pressure by turning the pressure adjustment knob counterclockwise. Pump pressure setting should be as low as possible, yet high enough to ensure satisfactory machine performance.

If you have any questions regarding the above procedures, or with your power unit in general, please feel free to call me.

Sincerely,

Scott Derleth
Manufacturing Manager

WARRANTY
John Henry Foster Company warrants the hydraulic power unit to be free from defects in materials or workmanship under normal and proper usage for a period of five years; provided the above start-up procedure has been followed.



BILL OF MATERIAL

PROJECT #	DRAWN BY: JAS	REV.	DATE: 08/15/05		
CUSTOMER: OASIS CAR WASH PURCHASE ORDER # A-24457			FOR: PURCHASE ORDER #		

Item #	Quantity	Component	Description
1	1	R910940516	A10VSO18DR/31R-PKC62N00 PISTON PUMP
2	1	M10010408	100 HUB 1-1/8X1/4
3	1	M10002406	100 HUB 3/4X3/16
4	1	M182472A45	MAGNALOY BRACKET 45 DEG OFFSET
5	1	M170N6	170 INSERT-60A-NEOPRENE
6	1	A310-229-A10	SUN CUSTOM MANIFOLD BLOCK
7	1	VQ39430	SPECIAL 10 GALLON RESERVOIR
8	1	MTB5TBZ10S12Y5	SCHROEDER INTANK FILTER
9	1	25-901-3000 W/ORIF	NOSHOK GAUGE
10	3	R978833365	BK-(4) 10X24X2 BOLT KIT
11	1	ELT5E2GC	5 HP 575V CFACE TEFC
12	3	R900561278	4WE6E6X/EG24N9K4 DIRECTIONAL VALVE
13	1	0777-024	NORGREN - KIP LEVEL SWITCH

JOHN HENRY FOSTER CO.
ST LOUIS, MO.
PHONE: 314-427-0600
FAX : 314-427-3502

CUSTOMER: OASIS CAR WASH

PURCHASE ORDER: A-24457 | DATE: 08/15/05

REFERENCE: | DRAWN BY: JAS | REVISION:

DRAWING NO.: 0C070605 | SHEET 1 OF 1

John Henry Foster Co.
Tel. (314) 427-0600 Fax (314) 427-3502 Toll Free 1-800-444-0522

ESOP

NOSHOK ABS & STAINLESS STEEL LIQUID FILLED PRESSURE GAUGE

900 SERIES


Stainless Steel Bottom Mount


ABS Case Bottom Mount


Stainless Steel Back Mount


ABS Case Back Mount

	Part No.	Range	Part No.	Range
1-1/2" Dial Dual Scale: PSI/KPA ABS Case +/- 2.5% Full Scale 1/8" NPT w/Press Fit Brass Orifice			15-910-60 15-910-100 15-910-160 15-910-200* 15-910-300 15-910-600* 15-910-1000* 15-910-2000 15-910-3000 15-910-5000	0–60 0–100 0–160 0–200 0–300 0–600 0–1000 0–2000 0–3000 0–5000
2-1/2" Dial Dual Scale: PSI/KPA ABS Case +/- 1.5% Full Scale 1/4" NPT w/Press Fit Brass Orifice	25-900-30 VAC 25-900-60 25-900-100 25-900-160 25-900-200 25-900-300 25-900-400 25-900-600 25-900-1000 25-900-2000 25-900-3000 25-900-5000	0–30"Hg 0–60 0–100 0–160 0–200 0–300 0–400 0–600 0–1000 0–2000 0–3000 0–5000	25-910-30 VAC 25-910-60 25-910-100 25-910-160 25-910-200 25-910-300 25-910-400* 25-910-600 25-910-1000 25-910-2000 25-910-3000 25-910-5000	0–30" Hg 0–60 0–100 0–160 0–200 0–300 0–400 0–600 0–1000 0–2000 0–3000 0–5000
2-1/2" Dial Dual Scale: PSI/KPA Stainless Steel Case +/- 1.5% Full Scale 1/4" NPT w/Press Fit Brass Orifice	25-901-30 VAC 25-901-60 25-901-100 25-901-160 25-901-200 25-901-300 25-901-600 25-901-1000 25-901-1500 25-901-2000 25-901-3000 25-901-5000	0–30"Hg 0–60 0–100 0–160 0–200 0–300 0–600 0–1000 0–1500 0–2000 0–3000 0–5000	25-911-30 VAC 25-911-60 25-911-100 25-911-160 25-911-200 25-911-300 25-911-600 25-911-1000 25-911-1500 25-911-2000 25-911-3000 25-911-5000	0–30" Hg 0–60 0–100 0–160 0–200 0–300 0–600 0–1000 0–1500 0–2000 0–3000 0–5000
4" Dial Dual Scale: PSI/KPA Stainless Steel Case +/- 1% Full Scale 1/4" NPT w/Press Fit Brass Orifice	40-901-30 VAC 40-901-60 40-901-100 40-901-160 40-901-200 40-901-300 40-901-600 40-901-1000 40-901-2000 40-901-3000 40-901-5000	0–30"Hg 0–60 0–100 0–160 0–200 0–300 0–600 0–1000 0–2000 0–3000 0–5000	40-911-30 VAC 40-911-60 40-911-100 40-911-160 40-911-200 40-911-300 40-911-600 40-911-1000 40-911-2000 40-911-3000 40-911-5000	0–30" Hg 0–60 0–100 0–160 0–200 0–300 0–600 0–1000 0–2000 0–3000 0–5000

*Subject to minimum quantities and extended lead times. Consult JHF.

Temperature and Level Control

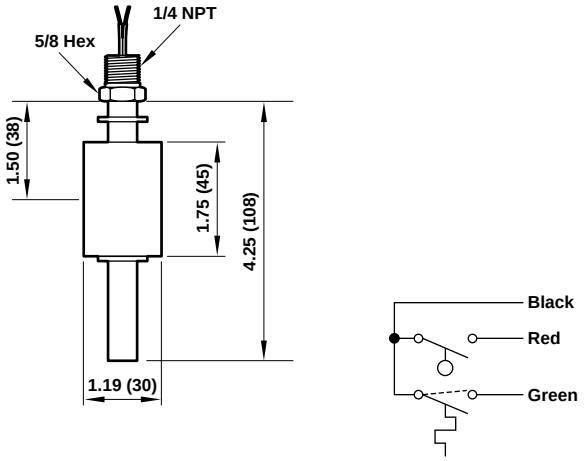
Combined for Ease of Installation. Convenient Switch-Wiring and Installation of the Level and Temperature Switch Through One Opening.

FEATURES:

- Simplifies installation for hydraulic power units
- Materials of construction ideal for water, hydrocarbons
- Available with a variety of switch configurations and temperature settings

Specifications:

Maximum Pressure	150 PSI (10.3 bar)
Operating Temperature	-40° to 225°F (-40 to 107°C) in oil -40° to 180°F (-40 to 82°C) in water
Lead Wires	No. 18 AWG, 24" long
Wetted Materials	Beryllium Copper, epoxy
Thermostat Rating	6A/120V 100VA (Non-inductive) 4A/240V 100VA (Non-inductive)
Recommended Minimum Liquid SP GR	0.58



Liquid Level Switch Ordering Numbers:

Part Number	Stem Material	Float Material	Switch Rating	Temperature Switch
V0777-024	Brass	Buna N	100VA SPST*	N.C. Open on 160°F ±20°F, Increasing
V0778-024	Brass	Buna N	100VA SPST*	N.O. Close on 160°F ±20°F, Increasing
V1430-024	Brass	Buna N	20VA SPDT*	N.C. Open on 160°F ±20°F, Increasing
V1431-024	Brass	Buna N	20VA SPDT*	N.O. Close on 160°F ±20°F, Increasing

REPLACEMENT PARTS

Filler Breathers - SAE Bayonet Flange

VESCOR PART NUMBER	TANK GASKET	STRAINER BASKET	FLANGE GASKET	CHAIN	FLANGE SAE J829	MOUNTING SCREWS	CAP
5201	1319	1300	1321	1304	1310	1303	1327
5204							1326
5208							1329
5212							1328
5216		1325					1327
5220							1326
5224							1329
5228							1328
5201-5P	1319N	1300	1321N				1330
5205		1325					
5203	1319	1300	1321			1303M	1327
5207							1329

VESCOR PART NUMBER	DESCRIPTION
1320	Cap Gasket
5275	Filler Breather Weld Riser

Filler Breathers – Screw-In

VESCOR PART NUMBER	MICRON RATING	NPT THREAD
V-5213	40	3/4"

Filler Breathers - Side Mount

VESCOR PART NUMBER	TANK GASKET	STRAINER BASKET	FLANGE GASKET	CHAIN	FLANGE SAE J829	MOUNTING SCREWS	CAP	1/4-20 BOLTS AND NUTS	HOUSING GASKET
SM-5201	1319	1325	1321	1304	1310	1303	1327	1355	1354
SM-5204							1326		
SM-5208							1329		
SM-5212							1328		

Filler Breathers - Non Vented

VESCOR PART NUMBER	TANK GASKET	STRAINER BASKET	FLANGE GASKET	CHAIN	FLANGE SAE J829	MOUNTING SCREWS	CAP
5232	1319	1300	1321	1304	1310	1303	FCS5557
5227		1325					

Large Air Breathers Replacement Elements

VESCOR MODEL NUMBERS		
POLYESTER ELEMENT	PAPER ELEMENT	WIRE MESH ELEMENT
E19P	E18P	E18S
E31P	E30P	E30S
E231P	E230P	E230S

Air Breather Filter

VESCOR PART NUMBER	TANK GASKET	STRAINER BASKET	FLANGE GASKET	CHAIN	FLANGE SAE J829	MOUNTING SCREWS	FILTER ELEMENTS	ADAPTERS
1306-2	N/A	N/A	N/A	N/A	N/A	N/A	1306	1311
1306-3								1312
1306-4	1319	1300	1321	N/A	1310	1303		

Miniature Tank Breathers

VESCOR PART NUMBER	NPT THREAD
PMB-02-10	1/4"
PMB-05-10	3/8"
PMB-03-10	1/2"
PMB-07-10	3/4"

Large Air Breathers

VESCOR MODEL NUMBERS AB SERIES		
POLYESTER ELEMENT	PAPER ELEMENT	WIRE MESH ELEMENT
AB-E19P-125	AB-E18P-125	AB-E18S-125
AB-E19P-150	AB-E18P-150	AB-E18S-150
AB-E31P-200	AB-E30P-200	AB-E30S-200
AB-E31P-250	AB-E30P-250	AB-E30S-250
AB-E231P-300	AB-230P-300	AB-E230S-300

Large Air Breathers

VESCOR MODEL NUMBERS AF SERIES		
POLYESTER ELEMENT	PAPER ELEMENT	WIRE MESH ELEMENT
AF-E19P-125	AF-E18P-125	AF-E18S-125
AF-E19P-150	AF-E18P-150	AF-E18S-150
AF-E31P-200	AF-E30P-200	AF-E30S-200
AB-E31P-250	AF-E30P-250	AF-E30S-250
AF-E231P-300	AF-230P-300	AF-E230S-300

Hazardous-Location Liquid-Tight Cord Grips

Bring on your toughest cord bending and yanking applications. These aluminum fittings have a corrosion-resistant stainless steel mesh to control bending of cable and prevent cable pull-out. They meet Class I, Div. 2; Class II, Div. 1 and 2; and Class III, Div. 1 and 2 standards for use in hazardous locations. Temperature range is −40° to +300° F. UL listed and CSA certified. Locknut not included.

Note: Trade size is an industry designation for fittings, not an actual measurement. It also designates the NPT thread size of the threaded end. When selecting a fitting, match the trade size of your knockout.

Trade Size, NPT	For Cord Dia.	Mesh Lg.	Straight	90°
1/2"	0.25"-0.38"	3 5/8"	6957K13	6957K29
1/2"	0.38"-0.50"	4 1/8"	6957K15	6957K31
3/4"	0.50"-0.63"	4 3/8"	6957K25	6957K32
3/4"	0.63"-0.75"	6"	6957K26	6957K33
1"	0.50"-0.63"	4 5/8"	6957K27	6957K34
1"	0.63"-0.75"	5 3/4"	6957K28	6957K35

Low Moisture-Absorption Liquid-Tight Cord Grips

Low moisture absorption, chemical resistance, and low warp make these fittings a great choice for outdoor, washdown, and abusive environments. Fittings are made of thermoplastic polyester and include neoprene bushing, nylon washer, zinc-plated steel locknut, and Viton O-ring. Temp. range is −40° to +250° F. Threads are NPS (National Pipe Straight).

Note: Trade size is an industry designation for fittings, not an actual measurement. It also designates the NPS thread size of the threaded end. When selecting a fitting, match the trade size of your knockout.

Trade Size, NPS	For Cord Dia.	Straight	90°
3/8"	0.13"-0.19"	7489K11	—
3/8"	0.19"-0.25"	7489K12	—
1/2"	0.19"-0.25"	7489K17	7489K29
1/2"	0.25"-0.31"	7489K18	7489K31
1/2"	0.31"-0.38"	7489K19	7489K32
1/2"	0.38"-0.44"	7489K21	7489K33
1/2"	0.44"-0.50"	7489K22	7489K34
1/2"	0.5" -0.56"	7489K23	7489K35
3/4"	0.44"-0.56"	7489K25	7489K37
3/4"	0.56"-0.69"	7489K26	7489K38
3/4"	0.69"-0.81"	7489K27	7489K39

Multi-Cord Nylon Liquid-Tight Cord Grips

Run more than one cord or cable into an enclosure through a single liquid-tight nylon fitting. The inner grommet has multiple holes for cables. Temperature range is −40° to +212° F. Fittings include a locknut and Buna-N O-ring. UL recognized, CSA certified, and CE approved. Also rated NEMA 4X for corrosion protection and NEMA 6 for temporary submersion.

Note: Trade size is an industry designation for fittings, not an actual measurement. It also designates the NPT thread size of the threaded end. When selecting a fitting, match the trade size of your knockout.

Trade Size, NPT	For No. of Cords	For Cord Dia.	
3/8"	2	0.10"-0.12"	7807K31
3/8"	4	0.05"-0.06"	7807K32
1/2"	2	0.16"-0.20"	7807K33
1/2"	2	0.20"-0.24"	7807K34
1/2"	3	0.06"-0.08"	7807K35
1/2"	3	0.10"-0.12"	7807K36
1/2"	3	0.13"-0.16"	7807K37
1/2"	3	0.18"-0.22"	7807K38
1/2"	4	0.13"-0.16"	7807K39
1/2"	5	0.13"-0.16"	7807K41
1/2"	6	0.10"-0.12"	7807K42
1/2"	6	0.13"-0.16"	7807K43
3/4"	2	0.27"-0.31"	7807K44
3/4"	3	0.24"-0.28"	7807K45
3/4"	4	0.20"-0.24"	7807K46
1"	4	0.31"-0.35"	7807K47
1"	6	0.22"-0.26"	7807K48
1 1/2"	2	0.55"-0.59"	7807K49
1 1/2"	5	0.31"-0.35"	7807K51
1 1/2"	6	0.27"-0.31"	7807K52
1 1/2"	7	0.31"-0.35"	7807K53

High-Temperature Liquid-Tight Cord Grips

Chemical-resistant PVDF withstands temperatures from −31° to +302° F. Fittings include locknut and Viton rubber seal and O-ring. UL listed (unless noted), CSA certified, and CE approved.

Note: Trade size is an industry designation for fittings, not an actual measurement. It also designates the NPT thread size of the threaded end. When selecting a fitting, match the trade size of your knockout.

Trade Size, NPT	For Cord Dia.	
3/8"	0.08"-0.24"	7799K82♦
3/8"	0.16"-0.31"	7799K81♦
1/2"	0.20"-0.35"	7799K84
1/2"	0.24"-0.47"	7799K83
3/4"	0.35"-0.63"	7799K86
3/4"	0.51"-0.71"	7799K85

♦ UL recognized.

Nylon Liquid-Tight Cord Grips

The Buna-N rubber seal in these black nylon fittings provides liquid-tight entry for cable, wire, and tubing. Temp. range is −40° to +212° F. Fittings include locknuts. UL listed (except for sizes 3/8" and smaller which are UL recognized), CSA certified, and CE approved. Also rated NEMA 4X for corrosion protection and NEMA 6 for temporary submersion. ***Standard*** fittings provide strain relief. ***Flex*** fittings provide strain relief while preventing cable kinking.

Note: Trade size is an industry designation for fittings, not an actual measurement. It also designates the NPT thread size of the threaded end. When selecting a fitting, match the trade size of your knockout.

Trade Size, NPT	For Cord Dia.	Standard	Flex		
Straight					
1/4"	0.08"-0.20"	69915K46	69915K48		
1/4"	0.11"-0.26"	69915K47	69915K49		
3/8"	0.08"-0.24"	69915K52	69915K62		
3/8"	0.16"-0.31"	69915K51	69915K61		
1/2"	0.20"-0.35"	69915K54	69915K64		
1/2"	0.24"-0.47"	69915K53	69915K63		
1/2"	0.39"-0.56"	69915K57	69915K67		
3/4"	0.35"-0.63"	69915K56	69915K66		
3/4"	0.51"-0.71"	69915K55	69915K65		
1"	0.51"-0.79"	69915K72	—	—	—
1"	0.71"-0.98"	69915K71	—	—	—
1 1/4"	0.51"-0.79"	69915K74	—	—	—
1 1/4"	0.71"-0.98"	69915K73	—	—	—
1 1/2"	0.79"-1.02"	69915K77	—	—	—
1 1/2"	0.86"-1.26"	69915K75	—	—	—
90°					
3/8"	0.08"-0.24"	7008K71	7008K81		
[illegible]	[illegible]	[illegible]	7008K82		
1/2"	0.20"-0.35"	7008K73	7008K83		
[illegible]	[illegible]	[illegible]	7008K84		
3/4"	0.35"-0.63"	7008K75	7008K85		
3/4"	0.51"-0.71"	7008K76	7008K86		

Nylon Liquid-Tight Cord Grips with Mesh

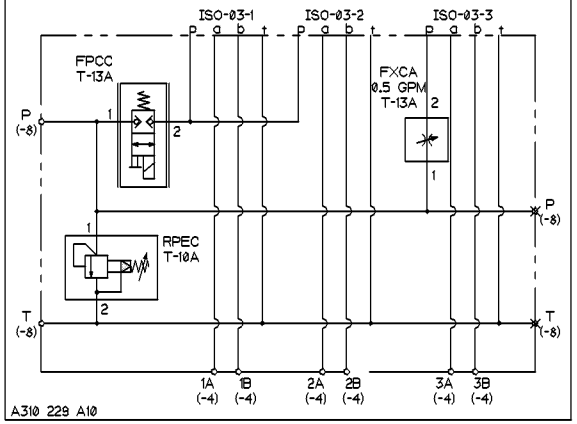
Made of nylon to offer a liquid-tight seal and corrosion resistance. The mesh is nylon and prevents cable kinking. Temp. range is −40° to +221° F. UL listed and CSA certified. Locknut not included.

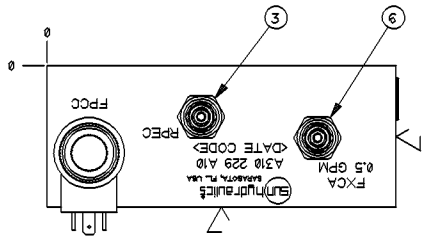
Note: Trade size is an industry designation for fittings, not an actual measurement. It also designates the NPT thread size of the threaded end. When selecting a fitting, match the trade size of your knockout.

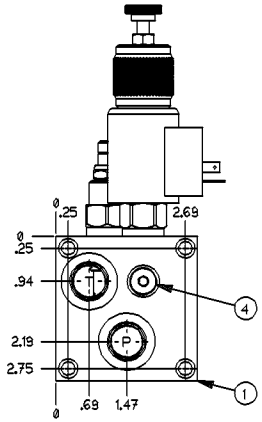
Trade Size, NPT	For Cord Dia.	Mesh Lg.	Straight	90°
1/2"	0.19"-0.25"	4"	8083K11	8083K33
1/2"	0.25"-0.31"	4"	8083K12	8083K34
1/2"	0.31"-0.38"	4"	8083K13	8083K35
1/2"	0.38"-0.44"	5 1/2"	8083K14	8083K36
1/2"	0.44"-0.50"	5 1/2"	8083K15	8083K37
3/4"	0.19"-0.25"	4"	8083K16	8083K38
3/4"	0.25"-0.38"	4"	8083K17	8083K39
3/4"	0.38"-0.44"	5 1/2"	8083K18	8083K41
3/4"	0.44"-0.56"	5 1/2"	8083K19	8083K42
3/4"	0.50"-0.63"	5 3/4"	8083K21	8083K43
3/4"	0.63"-0.75"	9"	8083K23	8083K45
1"	0.44"-0.56"	5 1/2"	8083K24	8083K46
1"	0.50"-0.63"	5 1/2"	8083K25	8083K47
1"	0.63"-0.75"	6"	8083K27	8083K49
1"	0.75"-0.88"	8"	8083K29	8083K52
1"	0.88"-1.00"	7 1/8"	8083K32	8083K54

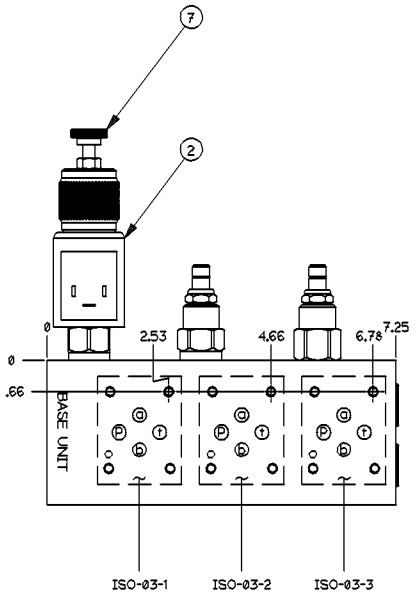
SCHEMATIC

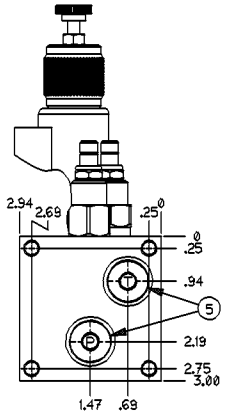
REV C | PART NO. A310 229 A10

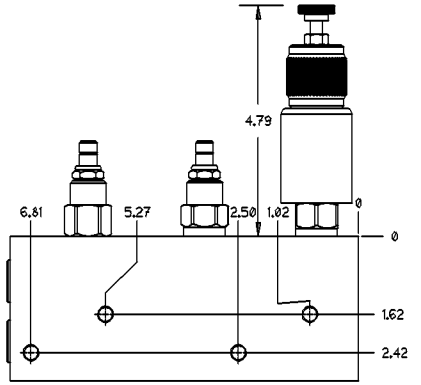


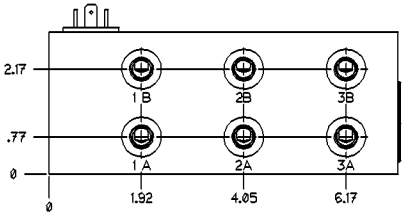












NOTES:
1) SEALS:
   BUNA-N
2) CARTRIDGES:
   REFER TO CURRENT SUN LITERATURE FOR CARTRIDGE RANGES, ADJUSTMENT INSTRUCTIONS, AND TECHNICAL INFORMATION
3) PORTING:
   ALL SAE O-RING PORTING PER ISO 11926
4) MOUNTING PROVISIONS:
   .312-18 UNC-2B THD HOLE x .62 DP
   TYP (8) PLCS
5) DIRECTIONAL VALVE PATTERNS PER ISO 4401
   ISO 03 THREAD: #10-24UNC-2B x .375 DP
6) CONNECTING PROVISIONS:
   .250-20 UNC-2B x .50 DP
   (FOR CONNECTING TO A210 229 A10)
   .41 C-BORE X 1.031 DP
   .28 THRU HOLE
   (FOR CONNECTING TO A411 109 A10)

ITEM	PART NO.	SETTING/ MATERIAL	PART NAME	QTY
7	991-230		MANUAL ADJUSTMENT KNOB	1
6	FXCA LAN	FACTORY SET @ 0.5 GPM	FLOW CONTROL VALVE	1
5	A330-006-008		SAE-8 HEX SOCKET O-RING BOSS PLUG	2
4	A330-006-004		SAE-4 HEX SOCKET O-RING BOSS PLUG	1
3	RPEC LAN	STANDARD SETTING	PILOT OPERATED RELIEF VALVE	1
2	FPCC MCN-224	24V DC ISO/DIN 43650	ELECTRO-PROPORTIONAL FLOW CONTROL VALVE	1
1	155-534	6061-T6 ALUMINUM	BODY	1

REV	ITEM	DATE	DRN	CHK	REL
C	ITEM #6 WAS NCCB	17MAY05	BCL	PV	13998
B	ADDED MANUAL KNOB	08MAR05	BCL	PV	13581
A	ADDED .312-18 UNC THREADED HOLES ADDED NCCB LCN, AND NEW LABEL	3 NOV 04	BCL	PV	13541
LET	REVISION	DATE	DRN	CHK	REL

DIMENSION TOL
XX = ± .05
XXX = ± .005
ANGLE TOL = 1°
FINISH 63 √
REMOVE ALL BURRS
.005 MAX. BREAK

TITLE: FOUR STATION ISO-03 W/ PROPORTIONAL FLOW CONTROL
REVISION C
PART NO. A310 229 A10
SCALE 0.500
REF. A310 239 A10
MATERIAL *SEE BOM*
DRAWN PV
CHECK GCH
RELEASE 12398
HEAT TREAT & FINISH NONE
DATE 12DEC03
DATE 15DEC03
DATE 26DEC03

sun hydraulics CORPORATION
1500 WEST UNIVERSITY PKWY
SARASOTA, FLORIDA 34243, USA
TELEPHONE (941) 362-1200

John Henry Foster Co.
Tel. (314) 427-0600 Fax (314) 427-3502 Toll Free 1-800-444-0522

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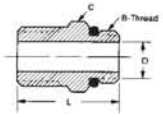
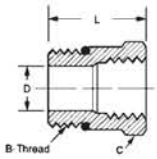
STRAIGHT THREAD O-RING ADAPTERS—STEEL

MALE STRAIGHT THREAD O-RING TO MALE PIPE ADAPTER



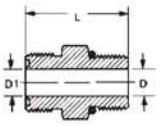
MALE PORT SIZE	MALE PIPE SIZE	PART NO.	STRAIGHT THREAD B	D	L
1/4	1/8	C3249X4X2	7/16-20	.172	1.05
3/8	1/4	C3249X6X4	9/16-18	.281	1.30
1/2	3/8	C3249X8X6	3/4-16	.391	1.36
1/2	1/2	C3249X8X8	3/4-16	.391	1.55
5/8	1/2	C3249X10X8	7/8-14	.434	1.69
3/4	3/4	C3249X12X12	1-1/16-12	.609	1.73
1	1	C3249X16X16	1-5/16-12	.844	2.06
1-1/4	1-1/4	C3249X20X20	1-5/8-12	1.078	2.17
1-1/2	1-1/2	C3249X24X24	1-7/8-12	1.312	2.26
2	2	C3249X32X32	2-1/2-12	1.781	2.47

STRAIGHT THREAD O-RING TO FEMALE PIPE ADAPTER



MALE PORT SIZE	FEM. PIPE THREAD	PART NO.	STRAIGHT THREAD B	D	L
1/4	1/8	C3269X4X2	7/16-20	.172	.97
1/4	1/4	C3269X4X4	7/16-20	.172	1.16
5/16	1/8	C3269X5X2	1/2-20	.234	.94
3/8	1/4	C3269X6X4	9/16-18	.297	1.09
3/8	3/8	C3269X6X6	9/16-18	.281	1.30
3/8	1/2	C3269X6X8	9/16-18	.281	1.44
1/2	1/4	C3269X8X4	3/4-16	.421	1.06
1/2	3/8	C3269X8X6	3/4-16	.421	1.22
1/2	1/2	C3269X8X8	3/4-16	.421	1.50
5/8	1/4	C3269X10X4	7/8-14	.422	.81
5/8	3/8	C3269X10X6	7/8-14	.500	1.25
5/8	1/2	C3269X10X8	7/8-14	.500	1.50
5/8	3/4	C3269X10X12	7/8-14	.500	1.62
3/4	1/2	C3269X12X8	1-1/16-12	.688	1.34
3/4	3/4	C3269X12X12	1-1/16-12	.656	1.66
7/8	3/4	C3269X14X12	1-3/16-12	.718	1.63
1	1/2	C3269X16X8	1-5/16-12	.688	1.00
1	3/4	C3269X16X12	1-5/16-12	.876	1.50
1	1	C3269X16X16	1-5/16-12	.876	1.88
1-1/4	1	C3269X20X16	1-5/8-12	1.080	1.00
1-1/4	1-1/4	C3269X20X20	1-5/8-12	1.080	1.94
1-1/2	1-1/2	C3269X24X24	1-7/8-12	1.312	1.88
2	2	C3269X32X32	2-1/2-12	1.781	1.91

STRAIGHT THREAD O-RING CONNECTOR TO FOR-SEAL



MALE TUBE O.D.	MALE PORT SIZE	PART NO.	D	D1	L
1/4	1/4	4315X4	.172	.172	1.234
1/4	3/8	4315X4X6	.172	.172	1.202
3/8	1/4	4315X6X4	.264	.172	1.343
3/8	3/8	4315X6	.264	.264	1.252
3/8	1/2	4315X6X8	.378	.378	1.331
1/2	3/8	4315X8X6	.378	.264	1.472
1/2	1/2	4315X8	.378	.378	1.441
5/8	5/8	4315X10	.484	.484	1.700
3/4	3/4	4315X12	.609	.609	1.918
3/4	1	4315X12X16	.609	.609	1.928
1	3/4	4315X16X12	.812	.609	2.138
1	1	4315X16	.811	.811	1.978
1	1-1/4	4315X16X20	.812	1.709	2.058
1-1/4	1	4315X20X16	1.024	.843	2.278
1-1/4	1-1/4	4315X20	1.024	1.024	2.058
1-1/2	1-1/2	4315X24	1.260	1.260	2.125

STRAIGHT THREAD O-RING EXTENDED CONNECTOR TO FOR-SEAL

MALE TUBE O.D.	MALE PORT SIZE	PART NO.	D	I	L
3/8	3/8	4316X6	.264	1.46	2.27
1/2	1/2	4316X8	.378	1.75	2.67
3/4	3/4	4316X12	.609	2.52	3.76
1	1	4316X16	.811	2.87	4.138
1-1/4	1-1/4	4316X20	1.024	3.41	4.76
1-1/2	1-1/2	4316X24	1.260	3.82	5.26

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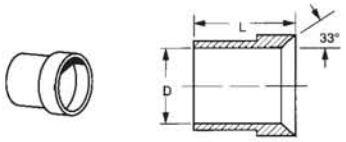
STEEL–SAE 37° JIC FITTINGS

SLEEVE 3 PIECE

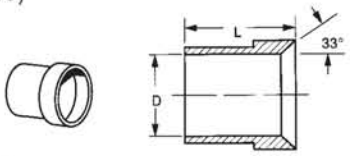
Stainless Steel No. 5177X
(Ref. SAE No. 070115)
(Ref. MS51533)



TUBE O.D.	PART NO.	D	L
1/8	C5165X2	.130	.34
3/16	C5165X3	.193	.34
1/4	C5165X4	.255	.41
5/16	C5165X5	.318	.44
3/8	C5165X6	.380	.50
1/2	C5165X8	.505	.66
5/8	C5165X10	.631	.66
3/4	C5165X12	.756	.68
7/8	C5165X14	.881	.78
1	C5165X16	1.006	.78
1-1/4	C5165X20	1.260	.91
1-1/2	C5165X24	1.510	1.12
2	C5165X32	2.014	1.19

SLEEVE 3 PIECE METRIC

(Ref. SAE No. 070115)

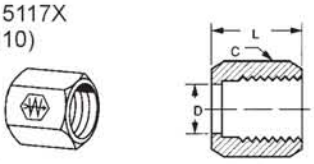


TUBE O.D. (Inch Size)	TUBE O.D. (Metric Size)	PART NO.	D	L
1/4	6MM	C5165X4X6MM	.241	.41
5/16	8MM	C5165X5X8MM	.320	.44
3/8	10MM	C5165X6X10MM	.399	.50
1/2	12MM	C5165X8X12MM	.478	.56
5/8	14MM	C5165X10X14MM	.556	.66
5/8	15MM	C5165X10X15MM	.596	.66
5/8	16MM	C5165X10X16MM	.636	.66
3/4	18MM	C5165X12X18MM	.717	.68
7/8	20MM	C5165X14X20MM	.793	.76
7/8	22MM	C5165X14X22MM	.866	.76
1	25MM	C5165X16X25MM	.990	.78
1-1/4	30MM	C5165X20X30MM	1.191	.91
1-1/4	32MM	C5165X20X32MM	1.270	.91
1-1/2	38MM	C5165X24X38MM	1.510	1.12

Adapts Standard JIC Flare-Twin® Fittings for use with Metric Tubing.

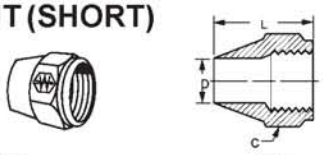
NUT 3 PIECE

Stainless Steel No. 5117X
(Ref. SAE No. 070110)
(Ref. MS51531)



TUBE O.D.	PART NO.	HEX C	D	L
1/8	C5105X2	3/8	.181	.55
3/16	C5105X3	7/16	.243	.61
1/4	C5105X4	9/16	.306	.62
5/16	C5105X5	5/8	.375	.68
3/8	C5105X6	11/16	.441	.73
1/2	C5105X8	7/8	.571	.85
5/8	C5105X10	1	.698	.98
3/4	C5105X12	1-1/4	.835	1.03
7/8	C5105X14	1-3/8	.961	1.09
1	C5105X16	1-1/2	1.089	1.13
1-1/4	C5105X20	2	1.347	1.23
1-1/2	C5105X24	2-1/4	1.617	1.42
2	C5105X32	2-7/8	2.167	1.75

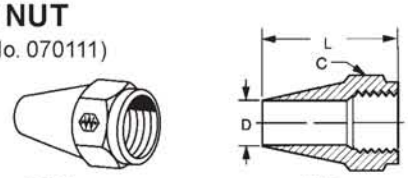
2 PIECE NUT (SHORT)



TUBE O.D.	PART NO.	HEX C	D	L
1/4	C5125X4	9/16	.255	.59
5/16	C5125X5	5/8	.318	.59
3/8	C5125X6	11/16	.380	.66
1/2	C5125X8	7/8	.505	.81
5/8	C5125X10	1	.631	.94
3/4	C5125X12	1-1/4	.756	1.14

2 PIECE NUT

(Ref. SAE No. 070111)



TUBE O.D.	PART NO.	HEX C	D	L
1/4	C5115X4	9/16	.255	1.00
5/16	C5115X5	5/8	.318	1.06
3/8	C5115X6	11/16	.380	1.09
1/2	C5115X8	7/8	.505	1.28
5/8	C5115X10	1	.631	1.48
3/4	C5115X12	1-1/4	.756	1.66
7/8	C5115X14	1-3/8	.881	1.81
1	C5115X16	1-1/2	1.006	1.94
1-1/4	C5115X20	2	1.260	2.19
1-1/2	C5115X24	2-1/4	1.510	2.31

Prices Subject to Change Without Notice

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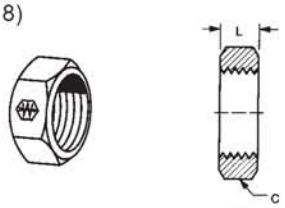
STEEL–SAE 37° JIC FITTINGS

BULKHEAD NUT

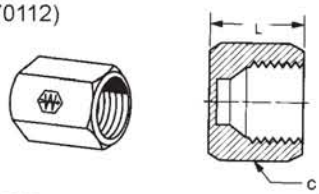
Stainless Steel No. 7936X
(Ref. SAE No. 070118)
(Ref. MS51860)



TUBE O.D.	PART NO.	HEX C	L
1/8	C5924X2	9/16	.22
3/16	C5924X3	5/8	.22
1/4	C5924X4	11/16	.28
5/16	C5924X5	3/4	.28
3/8	C5924X6	13/16	.27
1/2	C5924X8	1	.31
5/8	C5924X10	1-1/8	.36
3/4	C5924X12	1-3/8	.41
7/8	C5924X14	1-1/2	.41
1	C5924X16	1-5/8	.41
1-1/4	C5924X20	1-7/8	.41
1-1/2	C5924X24	2-1/8	.41
2	C5924X32	2-3/4	.41

CAP

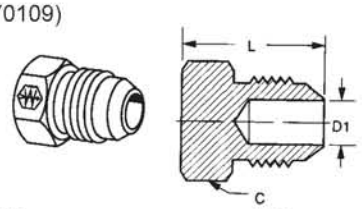
(Ref. SAE No. 070112)
(Ref. MS51532)



TUBE O.D.	PART NO.	HEX C	L
1/8	C5129X2	3/8	.50
3/16	C5129X3	7/16	.56
1/4	C5129X4	9/16	.59
5/16	C5129X5	5/8	.64
3/8	C5129X6	11/16	.62
1/2	C5129X8	7/8	.75
5/8	C5129X10	1	.84
3/4	C5129X12	1-1/4	.91
1	C5129X16	1-1/2	1.02
1-1/4	C5129X20	2	1.06
1-1/2	C5129X24	2-1/4	1.19
2	C5129X32	2-7/8	1.44

PLUG

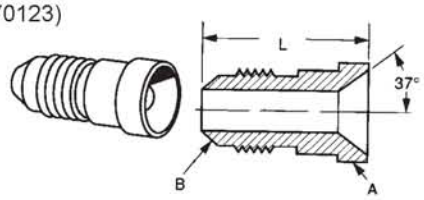
(Ref. SAE No. 070109)
(Ref. MS51518)



TUBE O.D.	PART NO.	HEX C	L	D1 Opt.
1/4	C5229X4	1/2	.80	.172
5/16	C5229X5	9/16	.80	.234
3/8	C5229X6	5/8	.84	.297
1/2	C5229X8	13/16	.94	.391
5/8	C5229X10	15/16	1.10	.484
3/4	C5229X12	1-1/8	1.28	.609
7/8	C5229X14	1-1/4	1.31	.719
1	C5229X16	1-3/8	1.33	.844
1-1/4	C5229X20	1-11/16	1.45	1.078
1-1/2	C5229X24	2	1.65	1.312
2	C5229X32	2-5/8	2.05	1.781

REDUCER

(Ref. SAE No. 070123)
(Ref. MS51534)



TUBE Reduction A	TUBE Reduction B	PART NO.	L
3/8	1/4	C5015X6X4	.97
1/2	1/4	C5015X8X4	1.00
1/2	3/8	C5015X8X6	1.00
5/8	1/4	C5015X10X4	1.47
5/8	3/8	C5015X10X6	1.03
5/8	1/2	C5015X10X8	1.03
3/4	1/4	C5015X12X4	1.09
3/4	3/8	C5015X12X6	1.09
3/4	1/2	C5015X12X8	1.19
3/4	5/8	C5015X12X10	1.58
7/8	3/8	C5015X14X6	1.59
7/8	1/2	C5015X14X8	1.69
7/8	5/8	C5015X14X10	1.73
7/8	3/4	C5015X14X12	1.80
1	1/2	C5015X16X8	1.72
1	5/8	C5015X16X10	1.79
1	3/4	C5015X16X12	1.47
1	7/8	C5015X16X14	1.87
1-1/4	3/4	C5015X20X12	1.50
1-1/4	1	C5015X20X16	2.00
1-1/2	1-1/4	C5015X24X20	2.15
2	1-1/2	C5015X32X24	2.61

NOTE: Order 3-piece nut C5105X to use reducer. No sleeve necessary.

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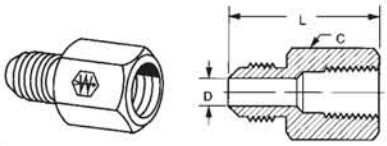
STEEL–SAE 37° JIC FITTINGS

FEMALE CONNECTOR

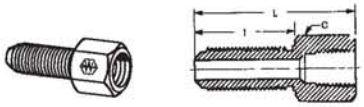
Stainless Steel No. 5267X
(Ref. SAE No. 070103) (Ref. MS51503)



TUBE O.D.	FEM. PIPE THREAD	PART NO.	HEX C	D	L
1/8	1/8	C5255X2	9/16	.062	1.12
3/16	1/8	C5255X3	9/16	.125	1.13
1/4	1/8	C5255X4	9/16	.172	1.19
1/4	1/4	C5255X4X4	3/4	.172	1.39
5/16	1/8	C5255X5	9/16	.234	1.17
5/16	1/4	C5255X5X4	3/4	.234	1.39
3/8	1/4	C5255X6	3/4	.297	1.40
3/8	3/8	C5255X6X6	7/8	.297	1.46
1/2	3/8	C5255X8	7/8	.391	1.56
1/2	1/2	C5255X8X8	1-1/8	.391	1.79
5/8	3/8	C5255X10X6	7/8	.484	1.89
5/8	1/2	C5255X10	1-1/8	.484	1.89
3/4	1/2	C5255X12X8	1-1/8	.609	2.05
3/4	3/4	C5255X12	1-3/8	.609	2.06
1	1	C5255X16	1-5/8	.844	2.35
1-1/4	1-1/4	C5255X20	2	1.078	2.49
1-1/2	1-1/2	C5255X24	2-3/8	1.312	2.62
2	2	C5255X32	2-7/8	1.781	2.97

FEMALE BULKHEAD CONNECTOR

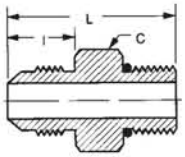
Assembly No. C35725X4, etc.



TUBE O.D.	FEM. PIPE THREAD	PART NO.	HEX C	I	L
1/4	1/8	C5275X4	11/16	1.23	1.84
3/8	1/4	C5275X6	13/16	1.31	2.06
1/2	3/8	C5275X8	1	1.47	2.35
5/8	1/2	C5275X10	1-1/8	1.61	2.66
3/4	3/4	C5275X12	1-3/8	1.78	2.91
1	1	C5275X16	1-5/8	1.78	3.09

STRAIGHT THREAD O-RING CONNECTOR

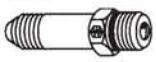
Stainless Steel No. 5327X
(Ref. SAE No. 070120)
(Ref. MS51525)

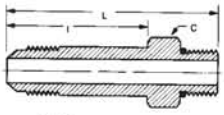


TUBE O.D.	PORT SIZE	PART NO.	HEX C	I	L
1/8	1/8	C5315X2	7/16	.45	1.06
1/4	1/4	C5315X4	9/16	.55	1.23
1/4	3/8	C5315X4X6	11/16	.55	1.29
1/4	1/2	C5315X4X8	7/8	.55	1.37
5/16	1/4	C5315X5X4	9/16	.55	1.23
5/16	5/16	C5315X5	5/8	.55	1.23
5/16	3/8	C5315X5X6	11/16	.55	1.29
3/8	1/4	C5315X6X4	11/16	.56	1.27
3/8	5/16	C5315X6X5	11/16	.56	1.27
3/8	3/8	C5315X6	11/16	.56	1.30
3/8	1/2	C5315X6X8	7/8	.56	1.38
3/8	5/8	C5315X6X10	1	.56	1.50
1/2	3/8	C5315X8X6	13/16	.66	1.44
1/2	1/2	C5315X8	7/8	.66	1.48
1/2	5/8	C5315X8X10	1	.66	1.60
1/2	3/4	C5315X8X12	1-1/4	.66	1.76
5/8	1/2	C5315X10X8	15/16	.76	1.64
5/8	5/8	C5315X10	1	.76	1.70
5/8	3/4	C5315X10X12	1-1/4	.76	1.86
3/4	1/2	C5315X12X8	1-1/8	.86	1.94
3/4	3/4	C5315X12	1-1/4	.86	1.97
3/4	1	C5315X12X16	1-1/2	.86	1.99
3/4	1-1/4	C5315X12X20	1-7/8	.86	2.08
7/8	7/8	C5315X14	1-3/8	.89	1.99
1	5/8	C5315X16X10	1-3/8	.91	2.07
1	3/4	C5315X16X12	1-3/8	.91	2.04
1	1	C5315X16	1-1/2	.91	2.04
1	1-1/4	C5315X16X20	1-7/8	.91	2.12
1-1/4	1	C5315X20X16	1-11/16	.96	2.33
1-1/4	1-1/4	C5315X20	1-7/8	.96	2.17
1-1/4	1-1/2	C5315X20X24	2-1/8	.96	2.24
1-1/2	1-1/4	C5315X24X20	2	1.08	2.58
1-1/2	1-1/2	C5315X24	2-1/8	1.08	2.37
1-1/2	2	C5315X24X32	2-3/4	1.08	2.53
2	1-1/2	C5315X32X24	2-5/8	1.33	2.81

STRAIGHT THREAD O-RING EXTENDED CONNECTOR

(Ref. SAE No. 070122)
(Ref. MS51526)





TUBE O.D.	PORT SIZE	PART NO.	HEX C	I	L
14	1/4	C5316X4	9/16	1.39	2.08
3/8	3/8	C5316X6	11/16	1.56	2.31
1/2	3/8	C5316X8X6	7/8	1.56	2.38
1/2	1/2	C5316X8	7/8	1.88	2.70
5/8	5/8	C5316X10	1	2.09	3.04
3/4	3/4	C5316X12	1-1/4	2.50	3.61
1	1	C5316X16	1-1/2	2.84	3.98
1-1/4	1-1/4	C5316X20	1-7/8	3.47	4.69

Prices Subject to Change Without Notice

GENERAL PURPOSE
THREE PHASE, TEFC SEVERE DUTY
ENERGY EFFICIENT - ALL CAST IRON
C-FACE, FOOTED

e|LINE™

APPLICATIONS :

Designed for severe duty environments found in the pulp & paper, lumber, aggregates, mining, chemical and other industries.

FEATURES:

* Fully comply with EPACT'92 and NRCan efficiency standards
* Inverter Grade insulation to meet NEMA MG-1 Part 31 Specification
* 10:1 variable torque; 5:1 constant torque on inverter power
* 40°C ambient, continuous duty
* Double shielded bearings of same size on both ends
* Lifting provisions
* VPI, Class F insulation system, B rise at full load on sine wave power
* Nema design B performance (1)
* Shaft seal V-ring for IP55 protection
* Field convertible to F-2 mounting
* Suitable for wye-delta start on 210T frame and larger
* Corrosion resistant mill & chemical duty paint
* Stainless steel nameplate and zinc plated hardware
* Dual Voltage nameplated @ 60Hz and 50 Hz
* Full 50 Hz power at rated HP
* DOE Compliance Certification .
* CE mark on nameplate
* CSA 390 Certified
* UL Component Recognized, File # E233211

HP	RPM	Frame	Volts	Catalog #	Model #	Type		DS SYM	SF	Full Load EFF	Full Load PF	Ship WGT	Notes
1	1800	143TC	575	**ELT**1E2GC	EM31	ELT		3ELT	1.40	82.5	75.0	68	C
1	1200	145TC	575	**ELT**1E3GC	EM32	ELT		3ELT	1.40	80.0	73.0	69	
1.5	3600	143TC	575	**ELT**32E1GC	EM33	ELT		3ELT	1.30	82.5	87.0	68	
1.5	1800	145TC	575	**ELT**32E2GC	EM34	ELT		3ELT	1.40	84.0	79.0	71	
1.5	1200	182TC	575	**ELT**32E3GC	EM35	ELT		3ELT	1.40	85.5	72.0	117	C
2	3600	145TC	575	**ELT**2E1GC	EM36	ELT		3ELT	1.40	84.0	87.0	74	
2	1800	145TC	575	**ELT**2E2GC	EM37	ELT		3ELT	1.40	84.0	82.0	73	
2	1200	184TC	575	**ELT**2E3GC	EM38	ELT		3ELT	1.30	86.5	74.0	131	
3	3600	182TC	575	**ELT**3E1GC	EM39	ELT		3ELT	1.40	85.5	86.0	113	
3	1800	182TC	575	**ELT**3E2GC	EM40	ELT		3ELT	1.30	87.5	82.0	124	
3	1200	213TC	575	**ELT**3E3GC	EM41	ELT		3ELT	1.30	87.5	76.0	179	
5	3600	184TC	575	**ELT**5E1GC	EM42	ELT		3ELT	1.40	87.5	87.0	139	
5	1800	184TC	575	**ELT**5E2GC	EM43	ELT		3ELT	1.30	87.5	86.0	141	
5	1200	215TC	575	**ELT**5E3GC	EM44	ELT		3ELT	1.30	87.5	82.0	200	C
7.5	3600	213TC	575	**ELT**7E1GC	EM45	ELT		3ELT	1.30	88.5	92.0	190	
7.5	1800	213TC	575	**ELT**7E2GC	EM46	ELT		3ELT	1.30	89.5	87.0	198	
7.5	1200	254TC	575	**ELT**7E3GC	EM47	ELT		3ELT	1.30	89.5	86.0	354	C
10	3600	215TC	575	**ELT**10E1GC	EM48	ELT		3ELT	1.30	89.5	92.0	213	
10	1800	215TC	575	**ELT**10E2GC	EM49	ELT		3ELT	1.30	89.5	88.0	217	
10	1200	256TC	575	**ELT**10E3GC	EM50	ELT		3ELT	1.20	89.5	85.0	367	C
15	3600	254TC	575	**ELT**15E1GC	EM51	ELT		3ELT	1.30	90.2	86.0	354	
15	1800	254TC	575	**ELT**15E2GC	EM52	ELT		3ELT	1.30	91.0	90.0	363	
15	1200	284TC	575	**ELT**15E3GC	EM53	ELT		3ELT	1.20	90.2	86.0	445	C
20	3600	256TC	575	**ELT**20E1GC	EM54	ELT		3ELT	1.30	90.2	87.0	402	
20	1800	256TC	575	**ELT**20E2GC	EM55	ELT		3ELT	1.20	91.0	91.0	429	C
20	1200	286TC	575	**ELT**20E3GC	EM56	ELT		3ELT	1.20	90.2	86.0	462	C
25	3600	284TSC	575	**ELT**25E1GSC	EM57	ELT		3ELT	1.15	91.0	87.0	429	
25	1800	284TC	575	**ELT**25E2GC	EM58	ELT		3ELT	1.15	92.4	91.0	451	C
30	3600	286TSC	575	**ELT**30E1GSC	EM59	ELT		3ELT	1.15	91.0	88.0	482	
30	1800	286TC	575	**ELT**30E2GC	EM60	ELT		3ELT	1.15	92.4	92.0	489	C

Note C - meet Design C torque

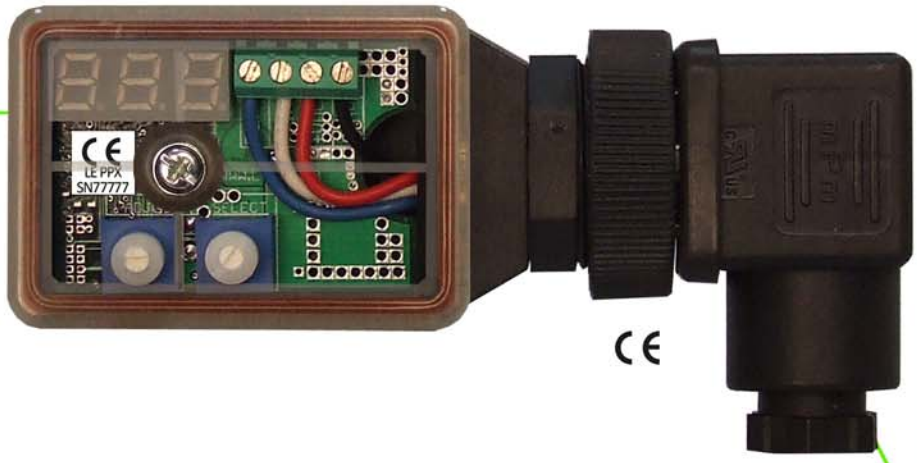
THE NEXT GENERATION

Digital Display Proportional Valve Driver

Lynch™ Electronics
A Division of Lynch Fluid Controls

LE PPX

Direct DIN solenoid mount
DIN cable connector



Features and Benefits

- Microcontroller design
- Independent adjustments (Incl. ramp up & ramp down)
- 3 digit extra bright seven segment LED display
- Large, easy-to-use adjustments and readout
- Display and adjust actual values (Current & Voltage)
- Wide range of supply voltage
- User selectable input type through menu setup (ex: 0 to 5V, 0 to 10V, 4 to 20mA)
- Wide ramp time range (0 to 99.5 Sec)
- Simple control with analog input, Locally supplied reference voltage
- Energy efficient PWM circuit/no heat sink required
- Current sensing maintains output regardless of changes in supply voltage and coil resistance
- Electronic limiting circuit/short circuit proof
- Reverse polarity, Command Input protection
- Load can be connected & disconnected live
- Mounting: DIN 43650-A/ISO 4400 solenoid and cable connector
- Easy troubleshooting/cable length not an issue

LE PPX Standard Specifications

Operating voltage:	9 to 36 VDC
Maximum output current:	3.00Amps
Input signal:	5V, 10V, 4 to 20mA
Maximum ramp time:	99.5 Sec
PWM / Dither frequency:	40-450Hz
Linearity:	1%
Operating Temperature:	-40° to +75° Celsius
Protection Grade:	IP65 (See note on the next page for additional information)

Several Forms Available

NEW

Note: Customization of functionality and enclosure type are available as per customer request.

PART NUMBER SYSTEM Proportional Solenoid Driver, Single, solenoid mount with DIN43650 base. **Example: LE PPX**

TYPE	MODEL	FORM	PARAMETERS = X
LE Lynch Electronics	P Proportional Solenoid Driver	P Single, solenoid mount with DIN43650 base	

COMMAND INPUT	0 to 5V, 0 to 10V, 4 to 20mA
MAX CURRENT OUTPUT	0.20 to 3.00A
RAMP TIME	0 to 99.5 Sec

Contact Us For More Information

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Erlanger, KY 41018

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LE PPX

Direct DIN solenoid mount, DIN cable connector

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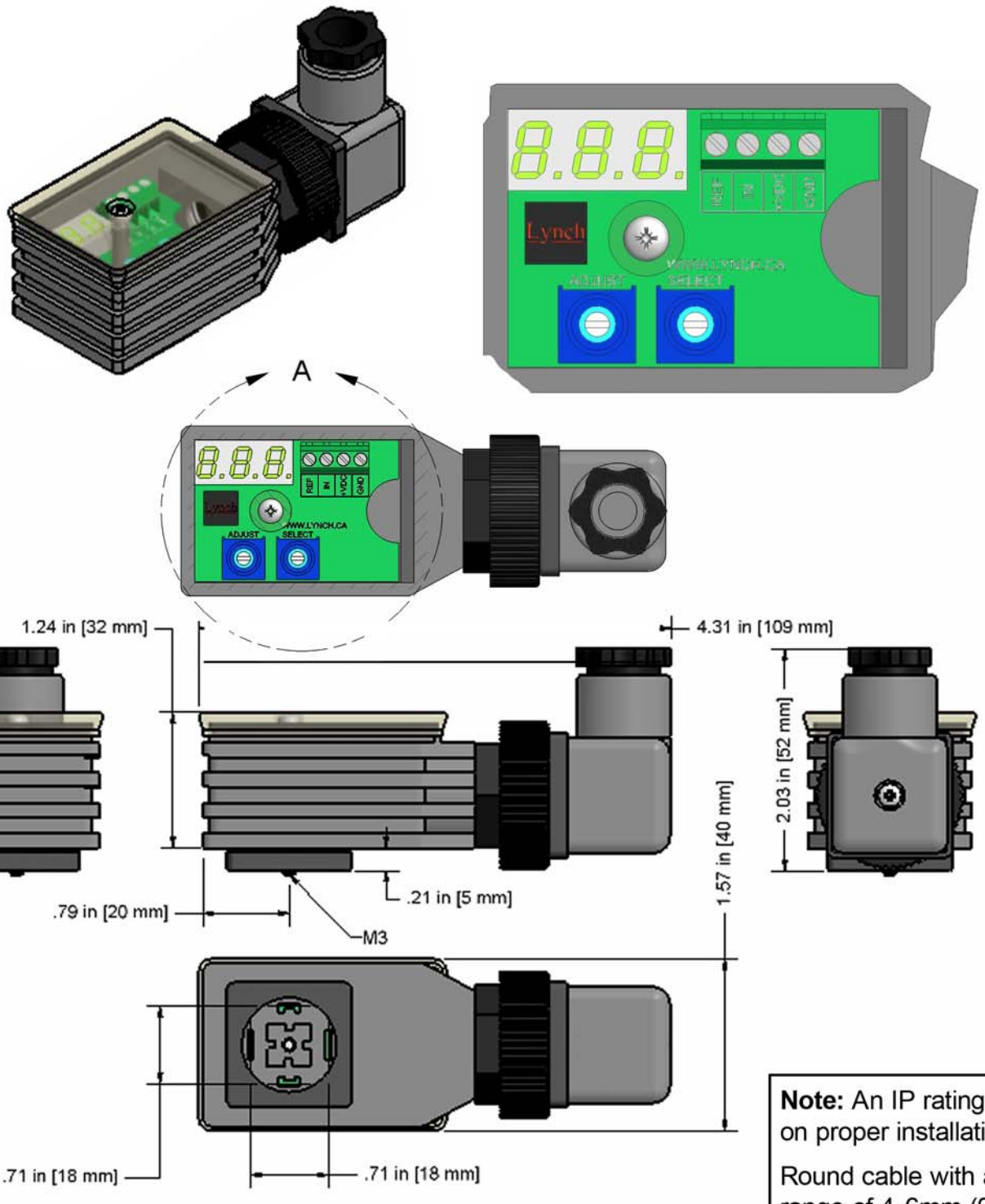
LE PPX DIMENSIONAL DRAWING



Note: An IP rating is dependent on proper installation by the user.

Round cable with a diameter range of 4-6mm (0.15 - 0.25") must be used.

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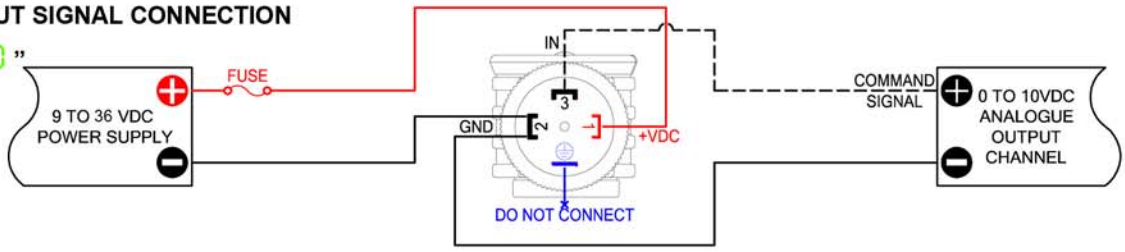
LE PPX SCHEMATICS

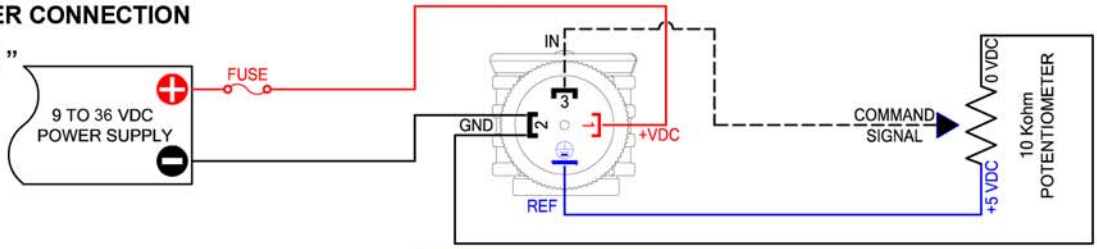
EXTERNAL INPUT SIGNAL CONNECTION

" in " set to " 10 "



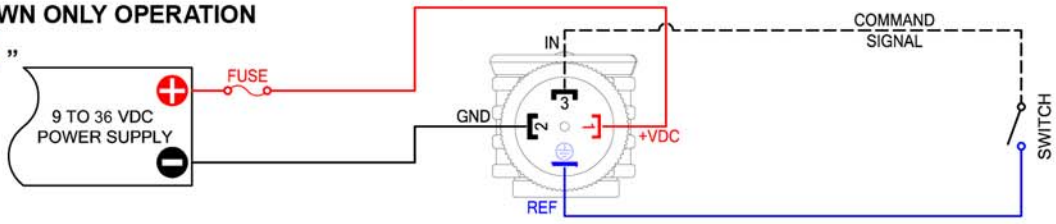
POTENTIOMETER CONNECTION

" in " set to " 5 "



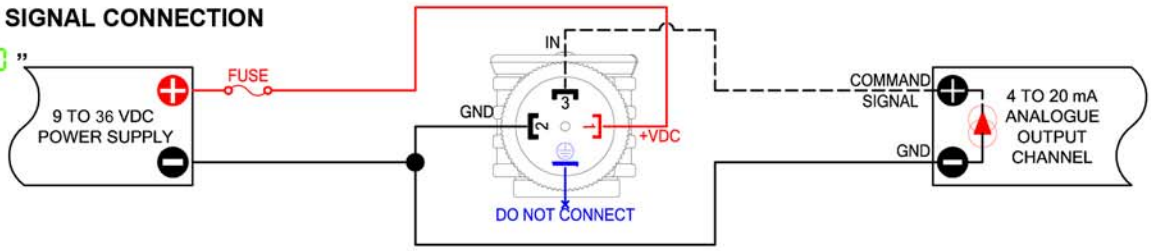
RAMP UP & DOWN ONLY OPERATION

" in " set to " 5 "



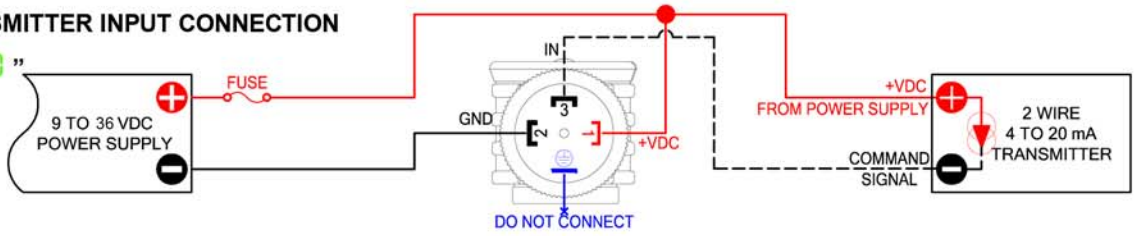
EXTERNAL INPUT SIGNAL CONNECTION

" in " set to " 420 "



TWO WIRE TRANSMITTER INPUT CONNECTION

" in " set to " 420 "



PLEASE NOTE: For "0 to 5 VDC" & "0 to 10 VDC" command input drivers, it is recommended to use independent negative conductors for power supply and analogue output channel (PLC/PC) to maintain command signal accuracy due to voltage drop on long cable runs.

CE

This product has been designed and tested to meet specific standards outlined in the European Electromagnetic Compatibility Directive (EMC) 2004/108/EC
Emission: EN 61000-6-4: 2007
Immunity: EN 61000-6-2: 2005, EN 61000-4-2, EN 61000-4-4, EN 61000-4-6

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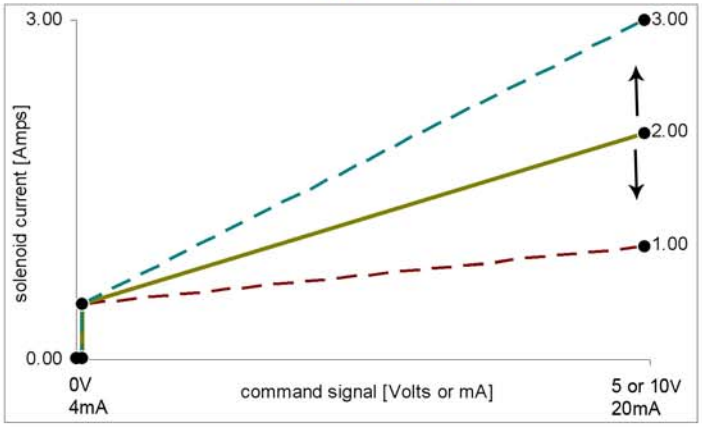
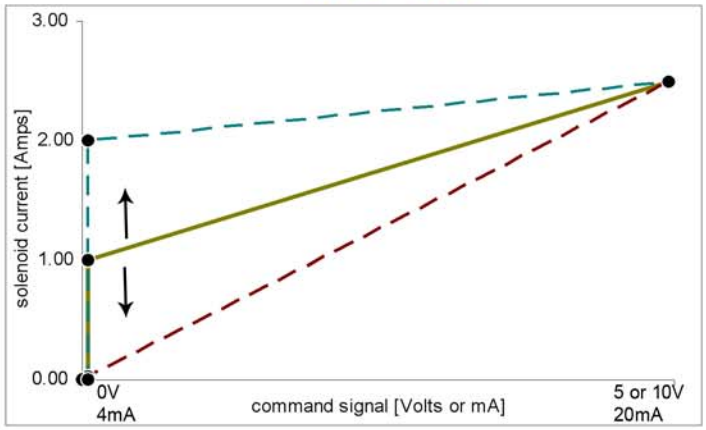
LE PPX SETTING & RANGE GRAPHS

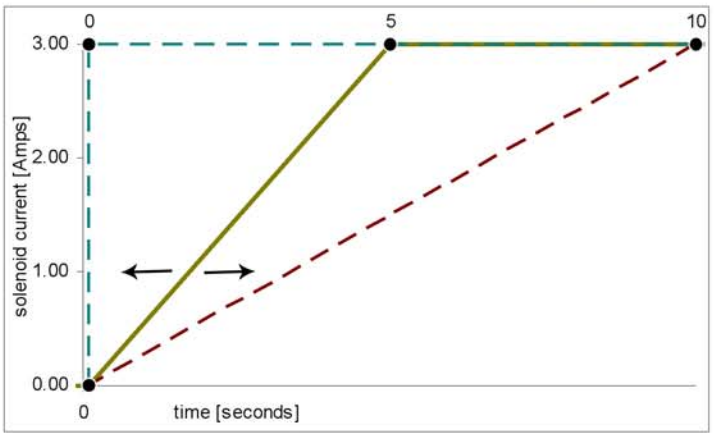
Hi: HIGH,
Maximum Current output, 0.20 to 3.00 [Amps]



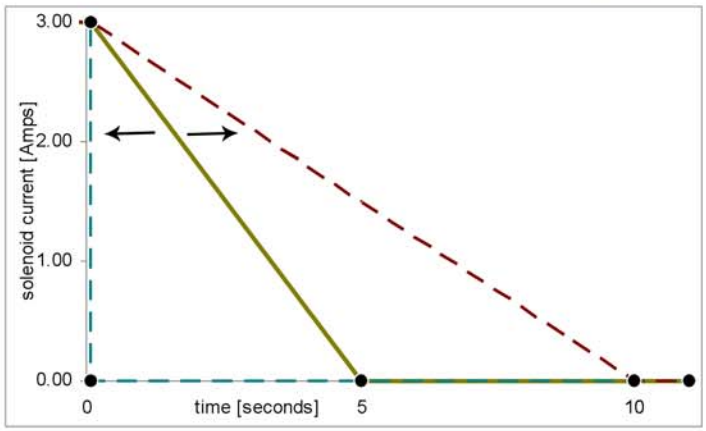
Lo: LOW,
Minimum Current Output, 0.00 to 2.99 [Amps]



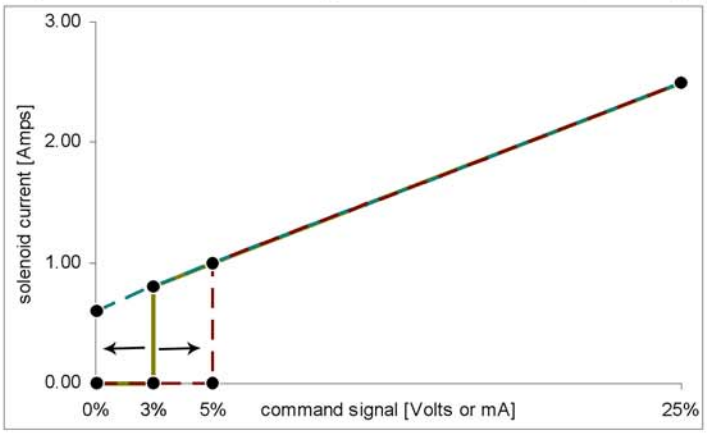
rUP: RAMP UP,
Time for Output to Increase from min to max, 0.0 to 99.5 [SEC]



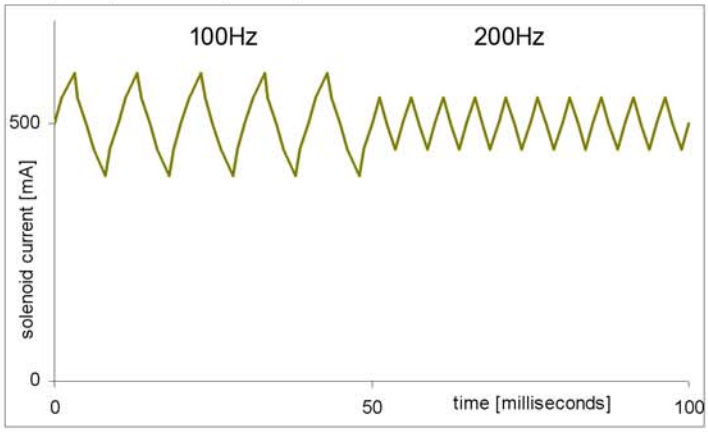
rdn: RAMP DOWN,
Time for Output to Decrease from max to min, 0.0 to 99.5 [SEC]



Cdb: COMMAND DEADBAND,
Output disabled if command signal less than deadband, 0 to 5 [%]



dFr: DITHER FREQUENCY,
40 (40Hz) to 450 (450Hz)



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LE PPX-0109-A

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LE PPX SET-UP PROCEDURE

(NOTE: Prior to setting up parameters, you must select proper Input Signal setting for your system)

Available Input Signal options

- in: I0 (0 to 10V) <=Default
- in: 5 (0 to 5V)
- in: 420 (4 to 20mA)

Applying improper Input Signal to wrong setting on the Driver may be damaging to Driver Unit and may cause driver to fault to Error Status mode

SET-UP

1. At power up, the display will show either the output current signal or the input signal (Default display setting shows the output signal). The decimal point will be flashing.
2. Rotate SELECT to enter the set-up mode
3. When you reach the setting you want to modify, rotate ADJUST up or down to the desired value.
4. To modify another setting, rotate SELECT again and repeat.
5. The Driver is fully functional during the set-up procedure with any adjustments effective immediately.
6. In order to write the new settings in the memory and return to normal mode of operation, rotate SELECT until the display shows SA and then rotate ADJUST or wait for 100 seconds.
7. If you do not want to save the new settings you have just modified, you must disconnect the Driver from the power supply before the end of the 100 seconds to restore the previous settings.
8. After saving parameters to memory, the decimal point will be flashing and the Driver display will be back showing either the output current signal or input signal depending on your di selection.
9. To start over completely, you can restore the factory settings by rotating SELECT to rFP and then rotate ADJUST up past 10 for the display to reset. (NOTE for Step 9: You may have to adjust your Input Signal Setting again if you reset to factory settings.)

LE PPX SETTINGS & RANGE

- Hi: HIGH, Maximum Current Output, 0.20 to 3.00 [Amps]
- Lo: LOW, Minimum Current Output, 0.00 to 2.99 [Amps] (See: NOTE 1)
- rUP: RAMP UP, Time for Output to Increase from min to max, 0.0 to 99.5 [SEC]
- rdn: RAMP DOWN, Time for Output to decrease from max to min, 0.0 to 99.5 [SEC]
- Cdb: COMMAND DEADBAND, Output disabled if command signal less than deadband, 0 to 5 [%]
- dFr: DITHER FREQUENCY, 40 (40Hz) to 450 (450Hz)
- in: INPUT SIGNAL SELECTION, 5 (0 to 5V) or I0 (0 to 10V) or 420 (4 to 20mA)
- di: DISPLAYED SIGNAL FOR TROUBLESHOOTING, 0 (command signal in [Volts] or [milliAmps]) or I (solenoid current in [Amps])
  - **Flashing decimal point is an indicator for present display mode**
  - -Fast Flashing decimal point, several flashes per second indicates di = 0
  - -Slow Flashing decimal point, 1 per second indicates di = I
  - -No Flashing decimal point or No decimal point indicates display in SETTING/ADJUST mode
- SA: SAVE SETTINGS
- rFP: RESET FACTORY PARAMETERS (See: NOTE 2)
- Err: ERROR DETECTION STATE, Short Circuit, Reverse polarity protection and detection
  - Error 0 - No Errors
  - Error 1 - Overcurrent in driver likely due to short circuit in Solenoid
  - Error 2 - Current exceeding 20mA in “4 to 20mA” input mode
- CLr: CLEAR ERROR, Clears Driver of Error State (See: NOTE 2)

NOTE 1: When adjusting the HI and LO parameters, note the HI parameter value cannot be adjusted below the LO parameter value as well the LO parameter value cannot exceed the HI parameter value.

NOTE 2: Adjust Parameter Value up past 9 to operate this command setting

OPTIONAL FEATURES (Please contact us for more information)

Pcd: PASSWORD, Adjust code for Password Protection settings for Lock or Unlock

Loc: LOCK, Locks driver to LOCKED state with Password set in Pcd

UnL: UNLOCK, Unlocks driver with correct Password set in Pcd

Only available in LOCKED state mode

Premium Flexible Drive Couplings

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.

Coupling Performance Specifications

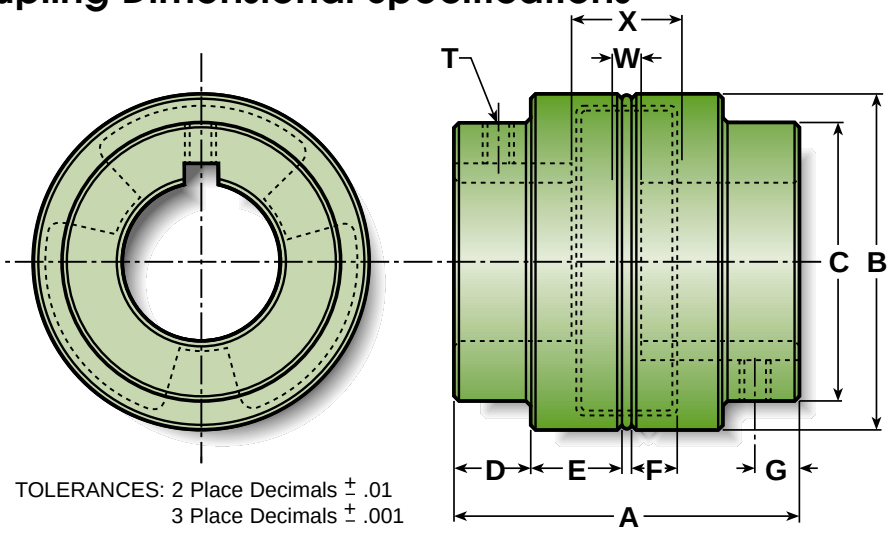
Coupling Model	Maximum Bore	Wr^2 lb.- ft^2.	Insert Number	Rated Torque lb.- in.	Torsional Rigidity lb-in/Deg	Horse Power Rating@ 100 rpm	1200 rpm	1800 rpm
100	1-1/8	.0046	170N 170U 170H	340.7 511.0 1,022.1	42 53 182	.55 .82 1.65	6.5 9.8 19.8	9.8 14.7 29.7
200	1-3/8	.0068	270N 270U 270H	398.3 597.4 1,194.9	55 68 234	.64 .96 1.92	7.6 11.5 23.0	11.5 17.2 34.5
300	1-5/8	.022	370N 370U 370H	701.4 1,052.1 2,104.2	81 148 336	1.12 1.68 3.36	13.5 20.2 40.4	20.2 30.3 60.6
400	1-7/8	.031	470N 470U 470H	1,056.3 1,584.5 3,168.9	138 310 488	1.69 2.5 5.1	20.3 30.4 60.8	30.4 45.6 91.3
500	2-3/8	.071	570N 570U 570H	2,194.8 3,292.2 6,584.4	314 695 1,571	3.5 5.3 10.5	42.1 63.2 126.4	63.2 94.8 189.6
600	2-5/8	.16	670N 670U 670H	4,946.7 7,420.1 14,840.1	676 1,510 2,960	7.9 11.9 23.7	94.9 142.5 284.9	142.5 213.7 427.4
700	2-7/8	.34	770N 770U 770H	11,639.8 17,459.7 29,099.5	1,805 2,104 -	18.6 27.9 46.5	223.5 335.2 558.75	335.2 502.8 838.0
800	3-7/8	.95	870N 870U 870H	21,889.4 32,834.1 47,062.2	3,680 - -	35.0 52.5 75.2	420.3 630.4 903.0	630.4 945.6 1,354.5
900	4-3/4	4.20	970N 970U	47,842.3 71,763.5	8,428 -	76.5 114.8	918.6 1,377.9	1,377.9 2,066.8

magnaloy coupling company P.O. Box 455 Alpena, MI 49707 989-356-2186

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



TOLERANCES: 2 Place Decimals ± .01
3 Place Decimals ± .001

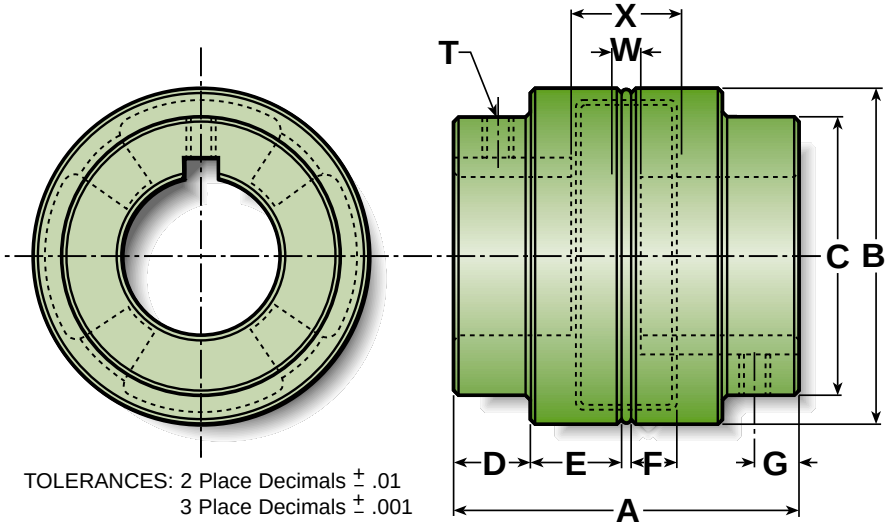
Model 500

	500
A	4.67
B	4.800
C	4.00
D	1.04
E	1.23
F	0.64
G	0.70
W	1/16
X	1.41
T	3/8-16

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

Y*: **Minimum spacing between shaft ends.**

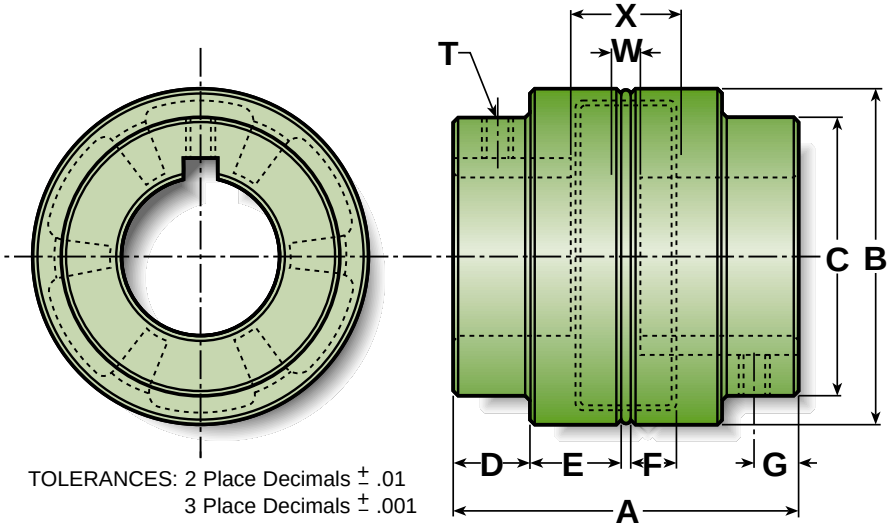
***** Given for reference only.



TOLERANCES: 2 Place Decimals ± .01
3 Place Decimals ± .001

Models 600, 700, 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



TOLERANCES: 2 Place Decimals ± .01
3 Place Decimals ± .001

Standard Bore and Keyway Combinations

Magnaloy "Standard" Bore & Key Combinations											
Model Code	Bore/Key Code	Model → Bore	Key	100	200	300	400	500	600	700	800	900
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 → Bore	Key	100	200	300	400	500	600	700	800	900
M ___ ___ ___	12414	1 3/4	x 7/16				•	•	•	•	•	
M ___ ___ ___	12816	1 7/8	x 1/2				•	•	•	•	•	•
M ___ ___ ___	13016	1 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 3/8 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	+.0008/ +.0003
1	2	+.0013/ +.0005
2	3	+.0018/ +.0008
3	4	+.0020/ +.0010
4	5	+.0023/ +.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. Wght. (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

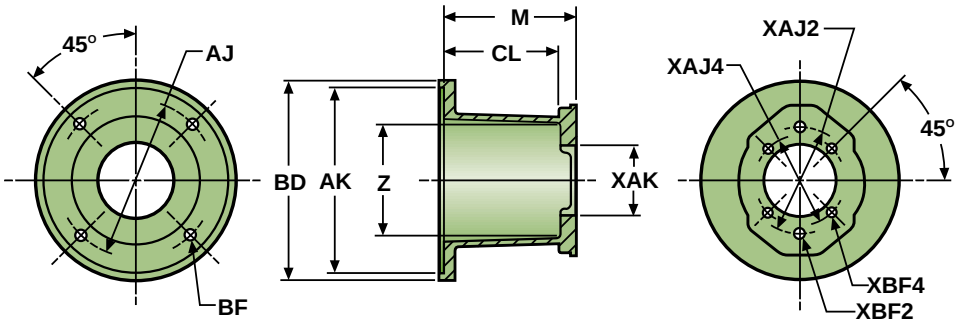


TABLE 8A - NEMA Frames 182TC - 256TC, 213UC/256UC

Horizontal Mounting (or Vertical Mounting - Option A)

MOTOR END DATA — AJ: 7.25 | BF: 17/32 | BD: 9.00 | AK: 8.501

RADIAL CLEARANCE "Z" = 5.00

182-A Casting

PUMP FLANGE		PUMP END DATA XAK	XAJ2	XBF2	XAJ4	XBF4	4.75 LENGTH MOUNT NO.	CL	M	5.00 LENGTH MOUNT NO.	CL	M	5.25 LENGTH MOUNT NO.	CL	M
USA4F17	4 Bolt	1.782			2.84	5/16-18	M182474F	4.00	4.75	M182504F	4.31	5.00	M182524F	4.31	5.25
SAE AA	2 Bolt	2.001	3.25	3/8-16			M182472AA	4.00	4.75	M182502AA	4.31	5.00	M182522AA	4.31	5.25
SAE A	2(4) Bolt	3.251	4.19	3/8-16	4.12	3/8-16	M182472A	4.00	4.75	M182502A	4.31	5.00	M182522A	4.31	5.25
80 A2/B4	2(4) Bolt	80.01mm	109mm	3/8-16	103mm	5/16-18	M1824780M	4.00	4.75	M1825080M	4.31	5.00	M1825280M	4.31	5.25
80 S4	4 Bolt	80.01mm			100mm	5/16-18	M1824780MS	4.00	4.75	M1825080MS	4.31	5.00	M1825280MS	4.31	5.25

MOTOR END DATA — AJ: 7.25 | BF: 17/32 | BD: 9.00 | AK: 8.501

RADIAL CLEARANCE "Z" = 5.00

PUMP FLANGE		PUMP END DATA XAK	XAJ2	XBF2	XAJ4	XBF4	5.81 LENGTH MOUNT NO.	CL	M	6.81 LENGTH MOUNT NO.	CL	M
USA4F17	4 Bolt	1.782			2.84	5/16-18	M182584F	5.06	5.81	M182684F	6.06	6.81
SAE AA	2 Bolt	2.001	3.25	3/8-16			M182582AA	5.06	5.81	M182682AA	6.06	6.81
SAE A	2(4) Bolt	3.251	4.19	3/8-16	4.12	3/8-16	M182582A	5.06	5.81	M182682A	6.06	6.81
80 A2/B4	2(4) Bolt	80.01mm	109mm	3/8-16	103mm	5/16-18	M1825880M	5.06	5.81	M1826880M	6.06	6.81
80 S4	4 Bolt	80.01mm			100mm	5/16-18	M1825880MS	5.06	5.81	M1826880MS	6.06	6.81

TABLE 8B - NEMA Frames 182TC - 256TC, 213UC/256UC

Horizontal Mounting

MOTOR END DATA — AJ: 7.25 | BF: 17/32 | BD: 9.00 | AK: 8.501

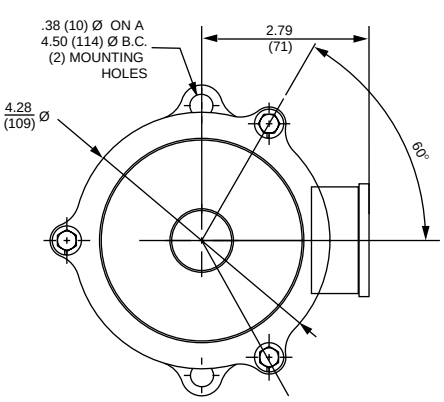
RADIAL CLEARANCE "Z" = 5.00

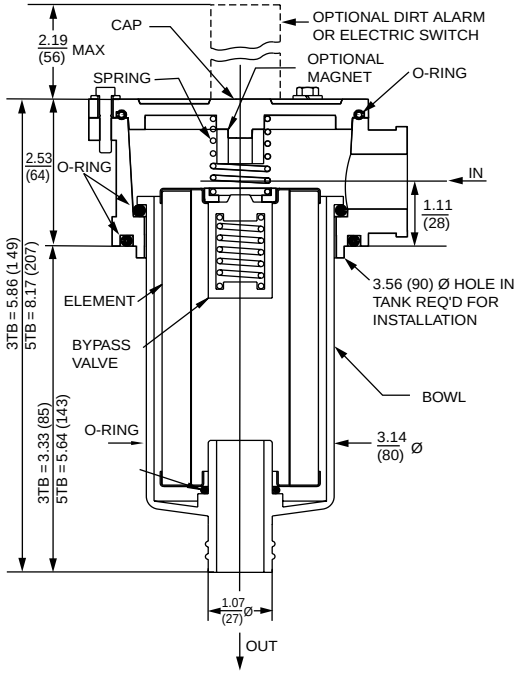
182-A Casting

PUMP FLANGE		PUMP END DATA XAK	XAJ2	XBF2	XAJ4	XBF4	5.25 LENGTH MOUNT NO.	CL	M	5.81 LENGTH MOUNT NO.	CL	M	6.00 LENGTH MOUNT NO.	CL	M
SAE B	2(4) Bolt	4.001	5.75	1/2-13	5.00	1/2-13	M182522B	4.50	5.25	M182582B	5.06	5.81	M182602B	5.25	6.00
SAE C	2(4) Bolt	5.001	7.12	5/8-11	6.38	1/2-13	M182522C	4.50	5.25	M182582C	5.06	5.81	M182602C	5.25	6.00
100 A2/B4	2(4) Bolt	100.01mm	140mm	1/2-13	125mm	3/8-16	M18252100M	4.50	5.25	M18258100M	5.06	5.81	M18260100M	5.25	6.00
125 A2/B4	2(4) Bolt	125.01mm	180mm	5/8-11	160mm	1/2-13	M18252125M	4.50	5.25	M18258125M	5.06	5.81	M18260125M	5.25	6.00

MTB MiniMiser Tank-Mounted Filter

35 gpm
135 L/min
100 psi
7 bar





Metric dimensions in ( ).
Model No. of filter in photograph is MTB5TBZ5P16.

Filter Housing Specifications

Flow Rating:	Up to 25 gpm (95 L/min) for 150 SUS (32 cSt) fluids – MTB-3 Up to 35 gpm (135 L/min) for 150 SUS (32 cSt) fluids – MTB-5
Max. Operating Pressure:	100 psi (7 bar)
Min. Yield Pressure:	229 psi (15 bar)
Rated Fatigue Pressure:	Contact factory
Temp. Range:	-20°F to 225°F (-29°C to 107°C)
Bypass Setting:	Cracking: 25 psi (2 bar) Full Flow: 51 psi (3.5 bar)
Porting Head & Cap: Element Case:	Die Cast Aluminum Glass Filled Nylon
Weight of MTB-3: Weight of MTB-5:	1.8 lbs. (0.8 kg) 2.1 lbs. (1.0 kg)
Element Change Clearance:	3.0" (76 mm) MTB-3 5.0" (127 mm) MTB-5

Element Performance Information

Element	Absolute Rating Per ISO 4572 / NFPA T3.10.8.8 Using automated particle counter (APC) calibrated per ISO 4402 $ß_x \geq 75$	$ß_x \geq 100$	$ß_x \geq 200$	Abs. Rating wrt ISO 16889 Using APC calibrated per ISO 11171 $ß_{x(c)} \geq 200$	$ß_{x(c)} \geq 1000$	Dirt Holding Capacity gm
3TB10	15.5	16.2	18.0	N/A	N/A	N/A
3TBZ3	<1.0	<1.0	<2.0	4.7	5.8	11
3TBZ5	2.5	3.0	4.0	6.5	7.5	9
3TBSZ10	7.4	8.2	10.0	10.0	12.7	11
3TBSZ25	18.0	20.0	22.5	19.0	24.0	11
5TB10	15.5	16.2	18.0	N/A	N/A	N/A
5TBZ3	<1.0	<1.0	<2.0	4.7	5.8	18
5TBZ5	2.5	3.0	4.0	6.5	7.5	15
5TBZ10	7.4	8.2	10.0	10.0	12.7	17
5TBZ25	18.0	20.0	22.5	19.0	24.0	18

Element Collapse Rating: 150 psid (10 bar)
Flow Direction: Outside In
Element Nominal Dimensions: 3TB: 3.0" (76 mm) O.D. x 3.0" (76 mm) long
5TB: 3.0" (76 mm) O.D. x 5.0" (127 mm) long

Fluid Compatibility

Type Fluid	Appropriate Schroeder Media
Petroleum Based Fluids	All Paper (E) and Synthetic (Z) media

For more information, refer to Fluid Compatibility: Fire Resistant Fluids, pages 19 and 20.

10.45

MiniMiser Tank-Mounted Filter MTB

■ Cost effective alternative to spin-on filters. ■ Compact size minimizes space requirements. ■ Special filter design provides aftermarket benefits.

Features

Element Selection
Based on Flow Rate

Pressure	Element Series	Part No.	Element selections are predicated on the use of 150 SUS (32 cSt) petroleum based fluid and a 25 psi (1.7 bar) bypass valve.
Return Line Tank-Mounted	E	10	See MTA / 3TB / 5TB
		25	See MTA / 3TB / 5TB
	Z	Z3	See MTA / 3TBZ3 / 5TBZ3
		Z5	See MTA / 3TBZ5 / 5TBZ5
		Z10	See MTA / 3TBZ10 / 5TBZ10
		Z25	See MTA / 3TBZ25 / 5TBZ25
	Flow	gpm	0 5 10 15 20 25 30 35
		(L/min)	0 (25) (50) (75) (100) (135)

Shown above are the elements most commonly used in this housing.

Pressure Drop Information
Based on Flow Rate and Viscosity

$\Delta P_{filter} = \Delta P_{housing} + \Delta P_{element}$

Exercise:
Determine ΔP at 25 gpm (95 L/min) for MTB5TB25S16CY2 using 200 SUS (44 cSt) fluid.

Solution:

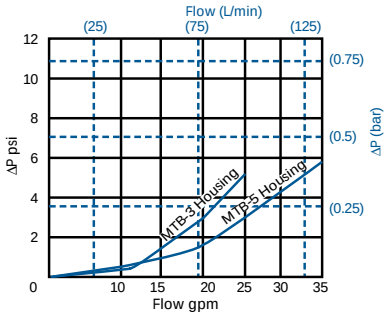
$\Delta P_{housing}$ = 3.0 psi [.21 bar]

$\Delta P_{element}$ = 25 x .08 x (200÷150) = 2.6 psi
or
= [95 x (.08÷54.9) x (44÷32) = .19 bar]

ΔP_{total} = 3.0 + 2.6 = 5.6 psi
or
= [.21 + .19 = .40 bar]

$\Delta P_{housing}$

MTA $\Delta P_{housings}$ for fluids with sp gr = 0.86:



sp gr = specific gravity

$\Delta P_{element}$

$\Delta P_{element}$ = flow x element ΔP factor x viscosity factor

El. ΔP factors @ 150 SUS (32 cSt):

	3"	5"
TB10	.73	.40
TB25	.10	.08
TBZ1	1.17	.70
TBZ3	.66	.36
TBZ5	.45	.25
TBZ10	.49	.25
TBZ25	.33	.16

If working in units of bars & L/min, divide above factor by 54.9.

Viscosity factor:
Divide viscosity by 150 SUS (32 cSt).

Sizing of elements should be based on element flow information provided in the Element Selection chart above.

Filter Model Number Selection

Filter Series	Element Part No. Length	Element Part No. Media	Optional Magnet	Porting Options	Dirt Alarm (See Appendix A for complete list of options)
MTB	3"	TB10 TB25 TBZ3 TBZ5 TBZ10 TBZ25	(Omit) = None M = Magnet	P12 = ¾" NPTF P16 = 1" NPTF S12 = 1 1/16"-12 SAE Straight (SAE-12) S16 = 1 5/16"-12 SAE Straight (SAE-16) B12 = ISO 228 G-¾ (¾-14 BSPP) B16 = ISO 228 G-1 (1-11 BSPP)	Y2C = Bottom Mounted Gauge in Cap Y5 = Back Mounted Gauge in Cap ESC = Electrical Pressure Switch (2 Terminals)
	5"				

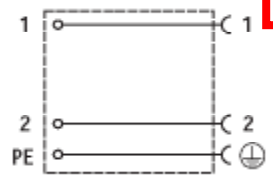
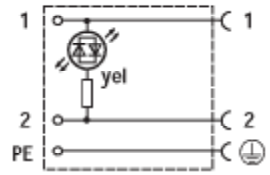
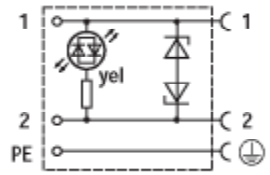
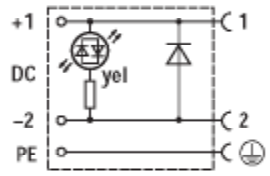
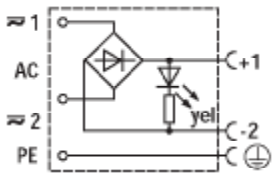
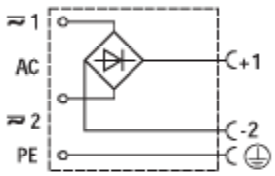
G547 = Two ⅛" gauge ports

Other Available Options

See Appendix B for additional information on these options and instructions on how to order.

Plug-in connectors to DIN 43 650 A and ISO 4400, 2-pin + PE, for electrically actuated valves with component plug model "K4"

Ordering details

Plug-in Connector	Circuit diagram	DC	AC	Color	Valve Side	Electrical Fitting	Model	Part Number
Standard without circuitry		12 – 240 V		gray	A	Pg11	Z4 (A) [1]	**RR00 074 683**
		12 – 240 V		black	B	Pg11	Z4 (B) [2]	**RR00 074 684**
		12 – 240 V		red-brown	A	NPT 1/2"	Z45 (A)	**RR00 004 823**
		12 – 240 V		black	B	NPT 1/2"	Z45 (B)	**RR00 011 039**
With LED only		12 – 240 V		black	A/B	Pg11	Z5L	**RR00 057 292**
		12 – 240 V		black	A/B	NPT 1/2"	Z55L	**RR00 057 453**
With LED and Zener diode supression [3]		24 V		black	A/B	Pg11	Z5L1	**RR00 310 995**
With LED and protective diode [4]		24 V		black	A/B	Pg11	Z5L2	**RR00 310 997**
With LED and rectifier		12 – 240 V		black	A/B	Pg11	RZ5L	**RR00 057 423**
		12 – 240 V		black	A/B	NPT 1/2"	RZ55L	**RR00 057 455**
With rectifier only		12 – 240 V		black	A/B	Pg11	RZ5	**RR00 313 933**
		12 – 240 V		black	A/B	NPT 1/2"	RZ55	**RR00 842 566**

[1] Replaces RR00 008 908

[2] Replaces RR00 008 909

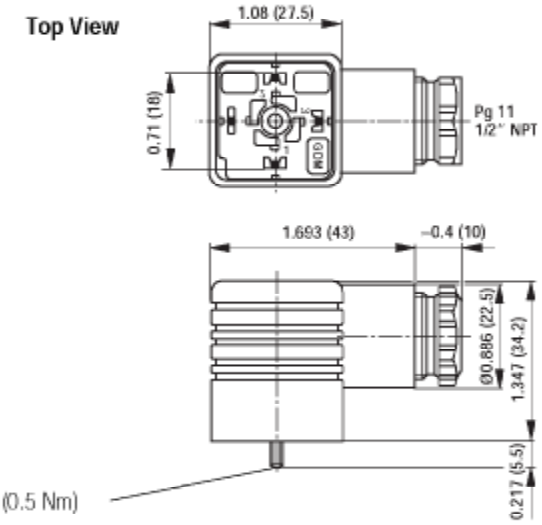
[3] Suppression recommended for switching DC solenoids (fast de-energize time)
Also suitable for most proportional solenoid switch circuits.
Switch off voltage peak approximately 55 V.

[4] Suppression recommended for switching DC solenoids (slow de-energize time, polarity sensitive)

Technical data (for applications outside these parameters, please consult us!)

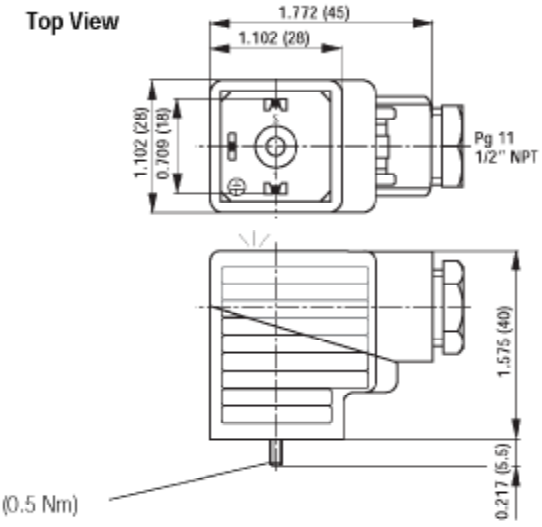
Ambient temperature	• standard	°F (°C)	–40 to +257 (–40 to +125)
	• with indicator display/rectifier	°F (°C)	–4 to +140 (–20 to +60)
Protection to DIN 40 050			IP65 (in place and fastened)
Operating voltages		V	see operating details on page 2
Operating current	• standard	A	16
	• with LED, max.	A	4
	• with bridge rectifier, max.	A	1.5
LED current		mA	<12
LED color			yellow
No. of pins			2 + PE
Recommended max. cable outside diameter		in (mm)	0.4 (10)
Wire size, stranded, max.		AWG (mm^2)	14 (2.5)

Unit dimensions, without circuitry [Z4…]: dimensions in inches (millimeters)



Mounting screw M3,
Tightening torque M_A = 0.4 lb-ft (0.5 Nm)

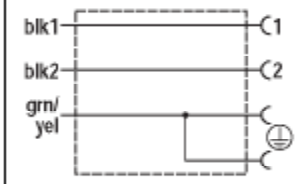
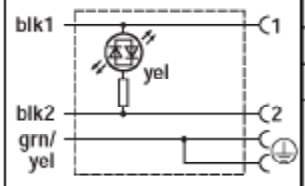
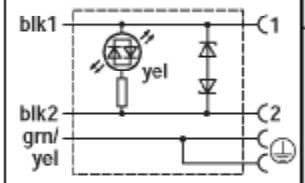
Unit dimensions, with circuitry [Z5…, RZ5…]: dimensions in inches (millimeters)



Mounting screw M3,
Tightening torque M_A = 0.4 lb-ft (0.5 Nm)

Cable assembly with plug-in connectors to DIN 43 650 A and ISO 4400, 2-pin + PE, for electrically actuated valves with component plug model "K4"

Ordering details

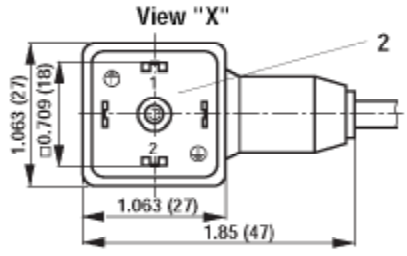
Plug-in connector	Circuit diagram	DC	AC	Plug Color	Part number Cable length 10 ft (3m)	Part number Cable length 16 ft (5m)
Standard		12 – 240 V		black	**RR00 032 020**	**RR00 032 014**
With LED only		24 V		black	**RR00 032 050**	**RR00 032 018**
		90 – 130 V		black	**RR00 032 023**	**RR00 032 012**
		180 – 240 V		black	**RR00 032 024**	**RR00 032 010**
With LED and Zener diode suppression[1]		24 V		black	**RR00 032 021**	**RR00 032 015**

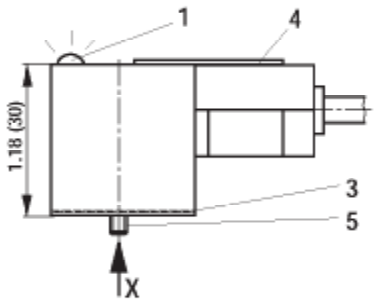
[1] Suppression recommended for switching DC solenoids. Also suitable for most proportional solenoid switch circuits. Switch off voltage peak approximately 55 V.

Technical data (for applications outside these parameters, please consult us!)

Ambient temperature	• plug-in connector housing	°F (°C)	–4 to +230 (–20 to +110)
	• rigidly mounted cable	°F (°C)	–4 to +176 (–20 to +80)
	• flexibly mounted cable	°F (°C)	+23 to +158 (–5 to +70)
Protection to DIN 40 050			IP67 (in place and fastened)
Connection cable			Ölflex 150 PVC, gray cable, UL recognized, approved CSA, VDE, SEV
Cable outside diameter		in (mm)	0.28 (7.2)
Conductor number and size		AWG (mm²)	3 x 18 (3 x 1.0), stranded
Wire identification	• PE, protective earth ground		green/yellow
	• others		black with numbers The 2-pin electrical connections to DIN 43 650 A have the contacts 1 and 2 allocated.
Number of pins			2 + PE

Unit dimensions: dimensions in inches (millimeters)





1 LED yellow
2 DIN contact interface rotatable through 0 + 180°
3 Flat seal (integrated)
4 Identification label
5 Mounting screw M3 (captive), Tightening torque M_A = 0.4 lb-ft (0.5 Nm)

John Henry Foster Co.
Tel. (314) 427-0600 Fax (314) 427-3502 Toll Free 1-800-444-0522

ESOP

Rexroth Bosch Group AXIAL PISTON, VARIABLE DISPLACEMENT PUMP

MODEL AA10VSO

- SAE mounting flange and shaft
- Flange connections SAE
- 2 case drain connections
- Good suction characteristics
- 4000 psi continuous operating pressure
- Low noise level
- Long service life
- Wide range of controls available
- Short response times
- Optional through drive for combination pumps

REXROTH

SIZE: 10

Displacement: 0.61 IN^3/REV
4.75 GPM @ 1800 RPM
Mounting Flange: SAE-A 2-Bolt
Shaft: 0.75 diameter x .187 key
Rotation: Clockwise
Seals: NBR (nitrile rubber)
Port Size: Rear Porting
Suction: 3/4" SAE O-Ring
Pressure: 3/4" SAE O-Ring
Case Drain: 3/8" SAE O-Ring

Max Pressure: 3600 psi continuous
Min. Pressure: 300 psi
Max Case Drain Pressure: 7 psi
Flooded Suction Recommended
Prefill pump case with oil prior to initial start-up
Fill capacity: 0.05 gal.
Approximate Weight: 17.6 lbs

Part No.		Control Device	Through Drive Mounting
A10VSO10DR/52R-PKC64N00		Pressure Comp.	None

SIZE: 18

Displacement: 1.10 IN^3/REV
8.57 GPM @ 1800 RPM
Mounting Flange: SAE-A 2-Bolt
Shaft: 0.75 diameter x .187 key
Rotation: Clockwise
Seals: Buna-N / shaft seal FPM (Fluorocarbon)
Port Size:
Suction: 1" SAE Flange Code 61
Pressure: 3/4" SAE Flange Code 61
Case Drain: 3/8" SAE O-Ring

Max Pressure: 4000 psi continuous
Min. Pressure: 300 psi
Max Case Drain Pressure: 7 psi
Flooded Suction Recommended
Prefill pump case with oil prior to initial start-up
Fill capacity: 0.1 gal.
Approximate Weight: 26 lbs

Part No.		Control Device	Through Drive Mounting
A10VSO18DR/31R-PKC62N00		Pressure Comp.	None
A10VSO18DR/31R-PKC62K40		Pressure Comp.	SAE A 2 Bolt
A10VSO18DRG/31R-PKC62N00		Remote Pressure Comp.	None
A10VSO18DRG/31R-PKC62K40		Remote Pressure Comp.	SAE A 2 Bolt

Code 61 Flanges

Size	2-pc Split Flange Part No.	
3/4"	12SFO	
1"	16SFO	
Size	**NPT Thread Flange Part No.**	
3/4"	W43-12-12U	
1"	W43-16-16U	
Size	**SAE Thread Flange Part No.**	
3/4"	W46-12-12U	
1"	W46-16-16U	

SIZE: 28

Displacement: 1.71 IN^3/REV
13.3 GPM @ 1800 RPM
Mounting Flange: SAE-B 2-Bolt
Shaft: 0.875 diameter x .25 key
Rotation: Clockwise
Seals: Buna-N / shaft seal FPM (Fluorocarbon)
Port Size:
Suction: 1-1/4" SAE Flange Code 61
Pressure: 3/4" SAE Flange Code 61
Case Drain: 1/2" SAE O-Ring

Max Pressure: 4000 psi continuous
Min. Pressure: 300 psi
Max Case Drain Pressure: 7 psi
Flooded Suction Recommended
Prefill pump case with oil prior to initial start-up
Fill capacity: 0.2 gal.
Approximate Weight: 33 lbs

Part No.		Control Device	Through Drive Mounting
AA10VSO28DR/31R-PKC62N00		Pressure Comp.	None
AA10VSO28DR/31R-PKC62K40		Pressure Comp.	SAE A 2 Bolt
AA10VSO28DR/31R-PKC62K03		Pressure Comp.	SAE B 2 Bolt
AA10VSO28DRG/31R-PKC62N00		Remote Pressure Comp.	None
AA10VSO28DRG/31R-PKC62K40		Remote Pressure Comp.	SAE A 2 Bolt
AA10VSO28DRG/31R-PKC62K03		Remote Pressure Comp.	SAE B 2 Bolt

Code 61 Flanges

Size	2-pc Split Flange Part No.	
3/4"	12SFO	
1-1/4"	20SFO	
Size	**NPT Thread Flange Part No.**	
3/4"	W43-12-12U	
1-1/4"	W43-20-20U	
Size	**SAE Thread Flange Part No.**	
3/4"	W46-12-12U	
1-1/4"	W46-20-20U	

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ESOP

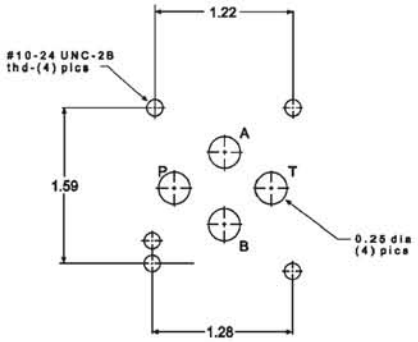
Rexroth Bosch Group D03 [NG6] DIRECTIONAL CONTROL VALVES

Features

- Direct operated, solenoid controlled directional spool valve, heavy duty construction
- Mounting pattern to ISO/DIS 4401-3 NFPA T3.5. MR1 and ANSI B 93.7 D03
- Removable coils for quick replacement, or conversion, in AC or DC voltages
- Dual frequency solenoids AC voltage with 50 or 60 Hz operation
- Wet pin core tubes, with high pressure tank capacity, standard.
- Buna seals standard

Hydraulic				
Operating pressure	Port A, B, P	PSI (bar)	5100 (350)	
	Port T	PSI (bar)	up to 3050 (210) DC; up to 2320 (160) AC	
Flow, max		GPM (L/min)	up to 21 (80) DC; up to 15.8 (60) AC	
Hydraulic fluid			Mineral oil (HL, HLP) to DIN 51 524, Phosphate ester (HFD-R)	
Hydraulic fluid Temperature range		*t* °F	–22 to 176 (Buna seals)	
Electrical				
Type of Voltage			DC voltage	AC voltage
Power consumption		W	30	—
Holding current		VA	—	50
In-rush current		VA	—	220
Duty cycle			continuous	continuous
Shifting frequency		Sw/h	up to 15,000	up to 7,200

D03 [NG6] Mounting Pattern



SYMBOL	DESCRIPTION	CONDUIT CONN. 115/60		DIN HIRSCHMAN † CONNECTION	VOLTS		LEVER OPERATED	
	DOUBLE SOLENOID, 3-POSITION, SPRING CENTERED, ALL PORTS BLOCKED	4WE6E6X/EW110N9DA 4WE6E6X/EW110N9DAL*		4WE6E6X/EW110N9K4 4WE6E6X/EG12N9K4 4WE6E6X/EG24N9K4	115/60 12VDC 24VDC		4WMM6E5X 4WMM6E5X/F**	
	DOUBLE SOLENOID, 3-POSITION, SPRING CENTERED, ALL PORTS CONN.	4WE6H6X/EW110N9DA 4WE6H6X/EW110N9DAL*		4WE6H6X/EW110N9K4 4WE6H6X/EG12N9K4 4WE6H6X/EG24N9K4	115/60 12VDC 24VDC		4WMM6H5X 4WMM6H5X/F**	
	DOUBLE SOLENOID, 3-POSITION, SPRING CENTERED, PRES. TO TANK	4WE6G6X/EW110N9DA 4WE6G6X/EW110N9DAL*		4WE6G6X/EW110N9K4 4WE6G6X/EG12N9K4 4WE6G6X/EG24N9K4	115/60 12VDC 24VDC		4WMM6G5X 4WMM6G5X/F**	
	DOUBLE SOLENOID, 3-POSITION, SPRING CENTERED, A & B TO TANK	4WE6J6X/EW110N9DA 4WE6J6X/EW110N9DAL*		4WE6J6X/EW110N9K4 4WE6J6X/EG12N9K4 4WE6J6X/EG24N9K4	115/60 12VDC 24VDC		4WMM6J5X 4WMM6J5X/F**	
	DOUBLE SOLENOID, 2-POSITION, DETENT	4WE6D6X/OFEW110N9DA 4WE6D6X/OFEW110N9DAL*		4WE6D6X/OFEW110N9K4 4WE6D6X/OFEG12N9K4 4WE6D6X/OFEG24N9K4	115/60 24VDC		4WMM6D5X/F**	
	SINGLE SOLENOID, 2-POSITION, SPRING RETURN	4WE6D6X/EW110N9DA 4WE6D6X/EW110N9DAL*		4WE6D6X/EW110N9K4 4WE6D6X/EG12N9K4 4WE6D6X/EG24N9K4	115/60 12VDC 24VDC		4WMM6D5X	
	SINGLE SOLENOID, 2-POSITION, SPRING RETURN	4WE6GA6X/EW110N9DA 4WE6GA6X/EW110N9DAL*		4WE6GA6X/EW110N9K4 4WE6GA6X/EG12N9K4 4WE6GA6X/EG24N9K4	115/60 12VDC 24VDC			

*VALVE WITH SENTINEL LIGHTS

**DETENTED OPERATION

Bolt Kit - Valve Only

Description	Part No.	
4- 10–24 x 2.00	R978833365	

†Requires 1 or 2 electrical connectors

Description	Part No.	
DIN Connector	1-834-484-058	

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ESOP

Rexroth Bosch Group D03 [NG6] MODULAR VALVES

With modular valves, circuits are easily built by spacing them between the directional valve and the subplate. No piping is required which saves space and reduces the time and work required to build the circuit. This saves money and there are no connections to leak. The circuit can be easily changed by adding or removing modules as needed.

Valve Type	Valve Function	Adjustment Range	Part No.		Figure	Height
Relief Valve	Pressure to Tank	Up to 2900 PSI	**ZDB6VP2-4X/200V**		A	1.57"
Relief Valve	Pressure to Tank	Up to 4600 PSI	ZDB6VP2-4X/315V		A	1.57"
Relief Valve	Crossport: A to B, B to A	Up to 2900 PSI	**Z2DB6VD2-4X/200V**		C	1.57"
Relief Valve	A to Tank	Up to 4600 PSI	**ZDB6VA2-4X/315V**		D	1.57"
Reducing Valve	Reduction on P	Up to 1090 PSI	**ZDR6DP2-4X/75YM/12**		F	1.57"
Reducing Valve	Reduction on P	Up to 2175 PSI	**ZDR6DP2-4X/150YM/12**		F	1.57"
Reducing Valve	Reduction on P	Up to 3050 PSI	ZDR6DP2-4X/210YM/12		F	1.57"
Reducing Valve	Reduction on A	Up to 2175 PSI	**ZDR6DA2-4X/150YM/12**		G	1.57"
Reducing Valve	Reduction on B	Up to 2175 PSI	**ZDR6DB2-4X/150YM/12**		H	1.57"
Flow Control	Meter in OR Out on A and B		**Z2FS6-2-4X/2QV**		J	1.57"
Pilot Operated Check	Dual PO Check Function	3.5:1 Pilot Ratio	**Z2S6-1-6X/V**		K	1.57"
Pilot Operated Check	In A Line, Pilot from B	3.5:1 Pilot Ratio	**Z2S6A1-6X/V**		L	1.57"
Pilot Operated Check	In B Line, Pilot from A	3.5:1 Pilot Ratio	**Z2S6B1-6X/V**		S	1.57"
Counterbalance Valve	On A pilot from B	3:1 Pilot Ratio	**CBCA-LHN-EBA**		O	1.75"
Counterbalance Valve	On B pilot from A	3:1 Pilot Ratio	**CBCA-LHN-EBA**		P	1.75"
Counterbalance Valve	On A and B Cross-Piloted	3:1 Pilot Ratio	**CBCA-LHN-EBY**		Q	1.75"
Sequence Valve	In to P	100-3000 PSI	**RSDC-LAN-EBW**		R	1.75"

BOLT KITS

Description	Part No.	
Valve only	**R978833365**	
Valve + 1 module (1.57")	**J-302**	
Valve + 2 modules (1.57")	**J-346**	
Valve + 3 modules (1.57")	**R978887918**	
Valve + 1 module (1.75")	**J-302**	
Valve + 2 modules (1.75")	**J-343**	
Valve + 1 (1.57") and 1 (1.75") modules	**J-343**	

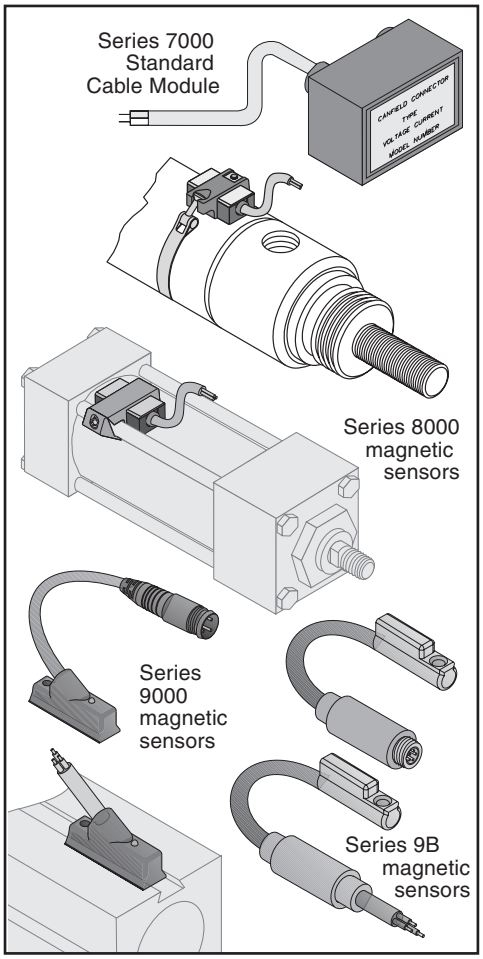
STUD KITS*

Description	Part No.	
4- 10-24 studs (7" long) and 4 stud nuts	**992-011**	
4- 10-24 studs (12" long) and 4 stud nuts	**992-012**	
10- 10-24 studs (36" long) and 50 stud nuts	**992-013**	

*To determine proper stud length, Add 1.65" + total of module heights. Cut to size.

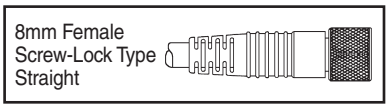
SERIES 7000 AND 8000 - REED SENSOR MAGNETIC CYLINDER SENSORS
SERIES 9000 - REED SENSOR MAGNETIC DOVETAIL SENSORS
SERIES 9B - ELECTRONIC MAGNETIC SENSOR FOR ROUND KEYWAY

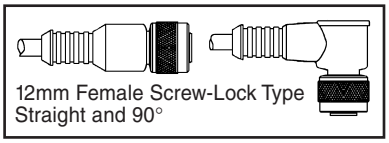
Can-Pak Part Number	Qty	Standard Part Number	Function Normally Open	Switch Type	LED	Page
SERIES 7000 STANDARD						
CP-710-000-004-010	10	710-000-004	SPST	Reed	☑	52
CP-710-000-031-010	10	710-000-031	PNP	Electronic	☑	52
CP-710-000-032-010	10	710-000-032	NPN	Electronic	☑	52
SERIES 8000 STANDARD						
CP-810-000-002-010	10	810-000-002	SPST	Reed	☑	55
CP-810-000-050-010	10	810-000-050	NPN or PNP	Electronic	☑	55
CP-810-200-002-010	10	810-200-002	SPST	Reed	☑	55
CP-810-200-050-010	10	810-200-050	NPN or PNP	Electronic	☑	55
SERIES 8000 QUICK CONNECT						
CP-810-000-102-010	10	810-000-102	SPST	Reed	☑	55
CP-810-000-150-010	10	810-000-150	NPN or PNP	Electronic	☑	55
CP-810-200-102-010	10	810-200-102	SPST	Reed	☑	55
CP-810-200-150-010	10	810-200-150	NPN or PNP	Electronic	☑	55
SERIES 9000 STANDARD						
CP-910-000-002-010	10	910-000-002	SPST	Reed	☑	61
CP-910-000-031-010	10	910-000-031	PNP	Electronic	☑	61
CP-910-000-032-010	10	910-000-032	NPN	Electronic	☑	61
SERIES 9000 QUICK CONNECT						
CP-910-000-302-010	10	910-00-302	SPST	Reed	☑	61
CP-910-000-331-010	10	910-000-331	PNP	Electronic	☑	61
CP-910-000-332-010	10	910-000-332	NPN	Electronic	☑	61
SERIES 9B STANDARD						
CP-9B10-000-031-010	10	9B10-000-031	PNP	Electronic	☑	58
CP-9B10-000-032-010	10	9B10-000-032	NPN	Electronic	☑	58
SERIES 9B QUICK CONNECT						
CP-9B10-000-331-010	10	9B10-000-331	PNP	Electronic	☑	58
CP-9B10-000-332-010	10	9B10-000-332	NPN	Electronic	☑	58

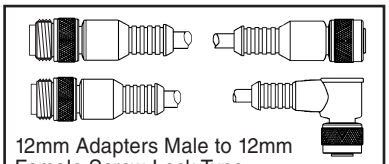


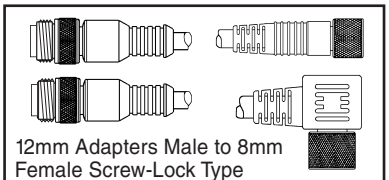
Quick-Ship Bulk Packs

Can-Pak Part Number	Qty	Standard Part Number	Gender M	Gender F	Style S	Style 90°	Length	Poles
8mm Round Connectors								
CP-RC08S-F0M030120-010	10	RC08S-F0M030120	☐	☑	☑	☐	2m	3
CP-RC08S-F0M030150-010	10	RC08S-F0M030150	☐	☑	☑	☐	5m	3
CP-RC08S-F0M040120-010	10	RC08S-F0M040120	☐	☑	☑	☐	2m	4
CP-RC08S-F0M040150-010	10	RC08S-F0M040150	☐	☑	☑	☐	5m	4
12mm Round Connectors								
CP-RC12S-F0M040120-010	10	RC12S-F0M040120	☐	☑	☑	☐	2m	4
CP-RC12S-F0M040150-010	10	RC12S-F0M040150	☐	☑	☑	☐	5m	4
CP-RC12S-F0M050120-010	10	RC12S-F0M050120	☐	☑	☑	☐	2m	5
CP-RC12S-F0M050150-010	10	RC12S-F0M050150	☐	☑	☑	☐	5m	5
CP-RC12S-F1M040120-010	10	RC12S-F1M040120	☐	☑	☐	☑	2m	4
CP-RC12S-F1M040150-010	10	RC12S-F1M040150	☐	☑	☐	☑	5m	4
CP-RC12S-F1M050120-010	10	RC12S-F1M050120	☐	☑	☐	☑	2m	5
CP-RC12S-F1M050150-010	10	RC12S-F1M050150	☐	☑	☐	☑	5m	5
12mm Adapters								
CP-RC-12SM0A-12SF042-010	10	RC-12SM0A-12SF042	☑	☑	☑	☐	2m	4
CP-RC-12SM0A-12SF052-010	10	RC-12SM0A-12SF052	☑	☑	☑	☐	2m	5
CP-RC-12SM1C-12SF042-010	10	RC-12SM1C-12SF042	☑	☑	☑	☑	2m	4
CP-RC-12SM1C-12SF052-010	10	RC-12SM1C-12SF052	☑	☑	☑	☑	2m	5
CP-RC-12SM0I-080F0C2-010	10	RC-12SM0I-080F0C2	☑	☑	☑	☐	2m	4
CP-RC-12SM0J-080F1C2-010	10	RC-12SM0J-080F1C2	☑	☑	☑	☑	2m	4


8mm Female Screw-Lock Type Straight


12mm Female Screw-Lock Type Straight and 90°


12mm Adapters Male to 12mm Female Screw-Lock Type Straight and 90°


12mm Adapters Male to 8mm Female Screw-Lock Type Straight and 90°

John Henry Foster Co.

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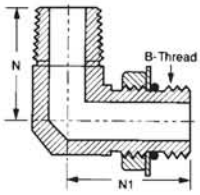
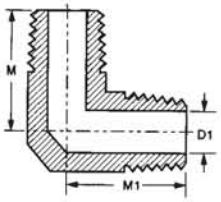
STEEL PIPE FITTINGS

90° STRAIGHT THREAD O-RING MALE ELBOW TO MALE PIPE



MALE PORT SIZE	MALE PIPE THREAD	PART NO.	STRAIGHT THREAD B	N	N1
1/4	1/8	TF3569X4	7/16–20	.78	1.03
5/16	1/8	TF3569X5	1/2–20	.78	1.09
3/8	1/4	TF3569X6	9/16–18	1.09	1.25
1/2	3/8	TF3569X8	3/4–16	1.22	1.45
5/8	1/2	TF3569X10	7/8–14	1.47	1.70
3/4	3/4	TF3569X12	1-1/16–12	1.59	1.94
7/8	3/4	TF3569X14	1-3/16–12	1.69	2.00
1	1	TF3569X16	1-5/16–12	1.97	2.05
1-1/4	1-1/4	TF3569X20	1-5/8–12	2.38	2.25
1-1/2	1-1/2	TF3569X24	1-7/8–12	2.64	2.39
2	2	TF3569X32	2-1/2–12	3.00	2.89

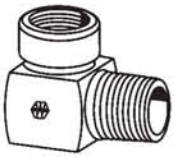
90° MALE ELBOW

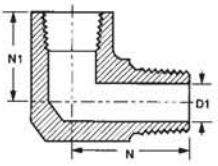


MALE PIPE THREAD	MALE PIPE THREAD	PART NO.	D1	M	M1
1/8	1/8	C3529X2	.188	.78	.78
1/4	1/4	C3529X4	.281	1.09	1.09
3/8	3/8	C3529X6	.406	1.22	1.22
1/2	1/2	C3529X8	.531	1.47	1.47
3/4	3/4	C3529X12	.719	1.59	1.59
1/8	1/8	TF3529X2	.188	.78	.78
1/4	1/4	TF3529X4	.281	1.09	1.09
3/8	1/4	TF3529X6X4	.281	1.28	1.19
3/8	3/8	TF3529X6	.406	1.21	1.21
1/2	3/8	TF3529X8X6	.406	1.47	1.28
1/2	1/2	TF3529X8	.531	1.47	1.47
3/4	1/2	TF3529X12X8	.531	1.59	1.56
3/4	3/4	TF3529X12	.719	1.59	1.59
1	3/4	TF3529X16X12	.719	1.97	1.72
1	1	TF3529X16	.938	1.97	1.97
1-1/4	1-1/4	TF3529X20	1.250	2.38	2.38
1-1/2	1-1/2	TF3529X24	1.938	2.64	2.64

90° STREET ELBOW

(Ref. SAE No. 140239)





MALE PIPE THREAD	FEMALE PIPE THREAD	PART NO.	D1	N	N1
1/8	1/8	C3409X2	.188	.78	.66
1/4	1/4	C3409X4	.281	1.09	.88
3/8	3/8	C3409X6	.406	1.22	1.02
1/2	1/2	C3409X8	.531	1.47	1.23
3/4	3/4	C3409X12	.719	1.59	1.36
1	1	C3409X16	.938	1.97	1.62
1-1/4	1-1/4	C3409X20	1.250	2.38	1.70
1/8	1/8	TF3409X2	.188	.78	.66
1/8	1/4	TF3409X2X4	.188	.91	.88
1/4	1/8	TF3409X4X2	.281	1.09	.67
1/4	1/4	TF3409X4	.281	1.09	.88
1/4	3/8	TF3409X4X6	.281	1.22	1.02
3/8	1/4	TF3409X6X4	.406	1.22	.91
3/8	3/8	TF3409X6	.406	1.22	1.02
3/8	1/2	TF3409X6X8	.406	1.38	1.23
1/2	1/4	TF3409X8X4	.281	1.47	.96
1/2	3/8	TF3409X8X6	.531	1.47	1.05
1/2	1/2	TF3409X8	.531	1.47	1.23
1/2	3/4	TF3409X8X12	.531	1.59	1.23
3/4	3/8	TF3409X12X6	.406	1.59	1.12
3/4	1/2	TF3409X12X8	.719	1.59	1.23
3/4	3/4	TF3409X12	.719	1.59	1.36
3/4	1	TF3409X12X16	.531	1.71	1.63
1	3/4	TF3409X16X12	.719	1.84	1.37
1	1	TF3409X16	.938	1.97	1.62
1-1/4	1	TF3409X20X16	.938	2.38	1.68
1-1/4	1-1/4	TF3409X20	1.25	2.38	1.70
1-1/4	1-1/2	TF3409X20X24	1.25	2.50	2
1-1/2	1-1/2	TF3409X24	1.50	2.64	2.08
2	2	TF3409X32	1.94	3	2.39

Prices Subject to Change Without Notice

John Henry Foster Co.

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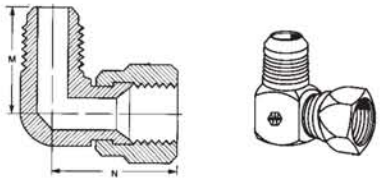
STEEL–SAE 37° JIC FITTINGS

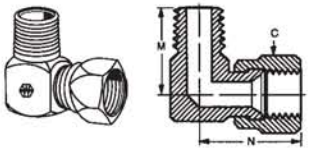
SWIVEL NUT 90° ELBOW

Stainless Steel No. 5518X
(Ref. SAE No. 070221)
(Ref. MS51521)



TUBE O.D.	PART NO.	M	N	ACROSS FLATS
1/4	C5506X4	.89	1.00	7/16
5/16	C5506X5	.95	1.06	9/16
3/8	C5506X6	1.06	1.25	9/16
1/2	C5506X8	1.25	1.42	3/4
5/8	C5506X10	1.43	1.62	7/8
3/4	C5506X12	1.66	1.75	1-1/16
1	C5506X16	1.81	2.00	1-5/16
1-1/4	C5506X20	2.06	2.31	1-5/8
1/4	TF5506X4	.89	1.00	1/2
5/16	TF5506X5	.95	1.06	9/16
3/8	TF5506X6	1.06	1.25	5/8
1/2	TF5506X8	1.25	1.38	13/16
3/4	TF5506X12	1.66	1.75	1-1/8
1	TF5506X16	1.81	2.00	1-3/8
1-1/4	TF5506X20	2.06	2.31	1-3/4
1-1/2	TF5506X24	2.33	2.59	2
2	TF5506X32	3.06	3.38	2-5/8

90° MALE PIPE TO JIC SWIVEL

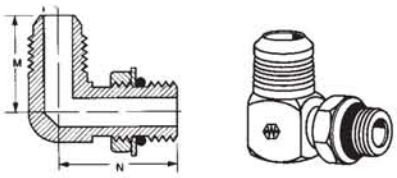


TUBE O.D.	MALE PIPE	PART NO.	M	N	ACROSS FLATS
1/4	1/8	TF5406X4	.78	1.00	1/2
3/8	1/4	TF5406X6	1.09	1.25	5/8
1/2	3/8	TF5406X8	1.22	1.38	13/16
5/8	1/2	TF5406X10	1.47	1.62	15/16
3/4	3/4	TF5406X12	1.59	1.75	1-1/8
1	1	TF5406X16	1.97	2.00	1-3/8
1-1/4	1-1/4	TF5406X20	2.38	2.31	1-3/4
1-1/2	1-1/2	TF5406X24	2.64	2.59	2
2	2	TF5406X32	3.00	3.38	2-5/8

NOTE: Fittings with a "TF" prefix do not meet MS standards; are of brazed construction.

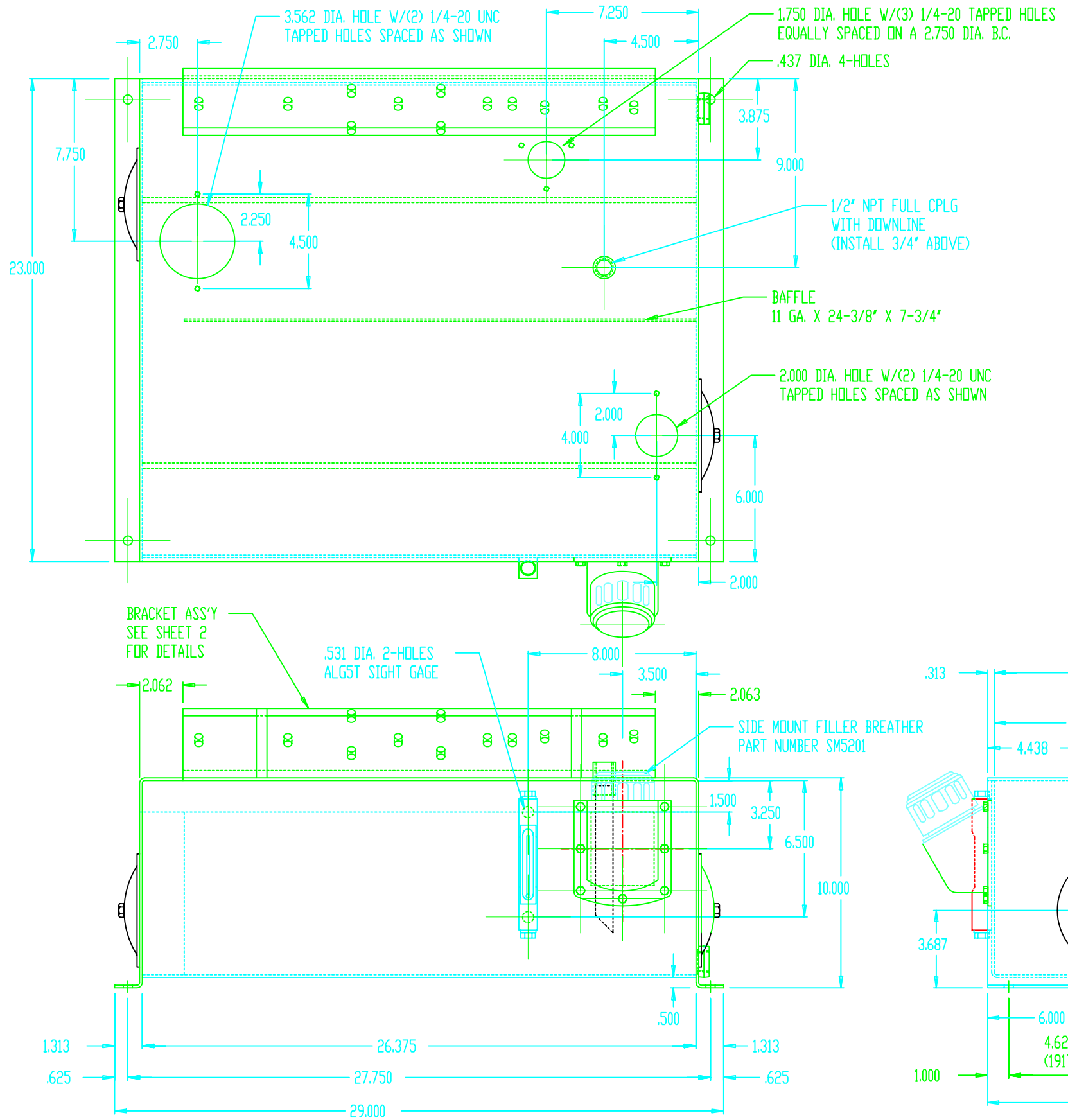
STRAIGHT THREAD O-RING 90° ELBOW

Stainless Steel No. 5527X
(Ref. SAE No. 070220)
(Ref. MS51527)



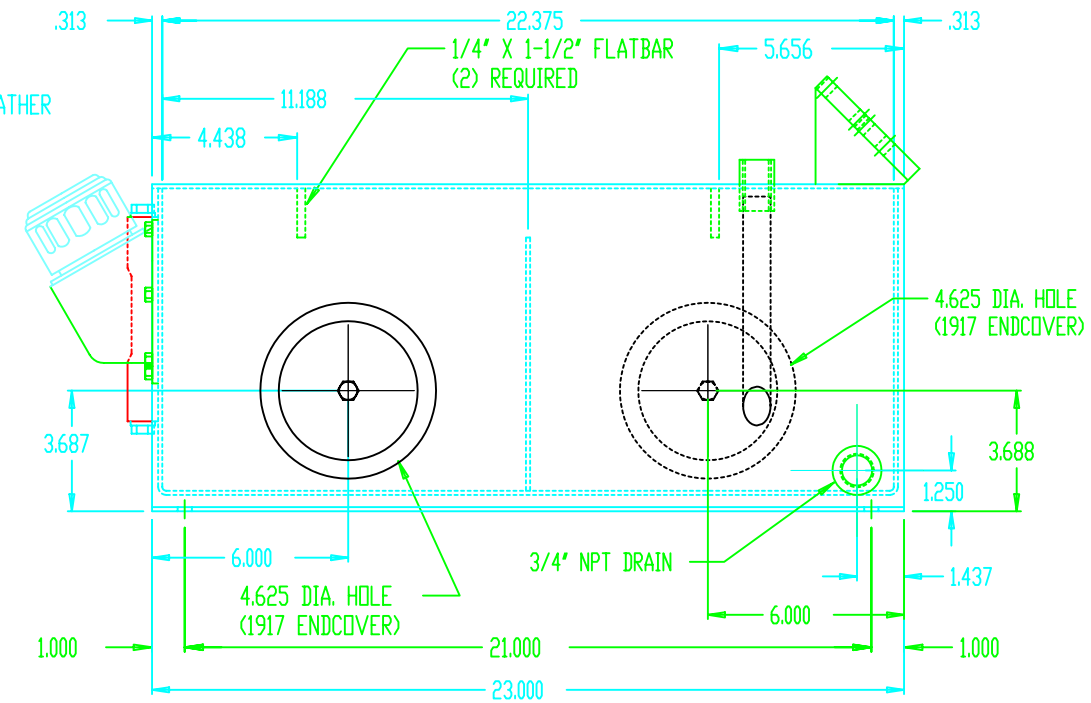
TUBE O.D.	PORT SIZE	PART NO.	M	N	ACROSS FLATS
3/16	3/16	C5515X3	.83	.94	7/16
1/4	1/4	C5515X4	.89	1.03	7/16
5/16	5/16	C5515X5	.95	1.13	9/16
3/8	3/8	C5515X6	1.06	1.25	9/16
3/8	1/2	C5515X6X8	1.14	1.45	3/4
1/2	3/8	C5515X8X6	1.25	1.32	3/4
1/2	1/2	C5515X8	1.25	1.45	3/4
1/2	5/8	C5515X8X10	1.33	1.70	7/8
5/8	5/8	C5515X10	1.45	1.70	7/8
3/4	5/8	C5515X12X10	1.66	1.78	1-1/16
3/4	3/4	C5515X12	1.66	1.94	1-1/16
7/8	7/8	C5515X14	1.73	2.00	1-5/16
1	3/4	C5515X16X12	1.81	2.05	1-5/16
1	1	C5515X16	1.81	2.05	1-5/16
1-1/4	1-1/4	C5515X20	2.06	2.25	1-5/8
1/4	1/4	TF5515X4	.89	1.03	1/2
1/4	5/16	TF5515X4X5	.95	1.12	5/8
1/4	3/8	TF5515X4X6	.95	1.25	5/8
5/16	1/4	TF5515X5X4	.98	1.06	9/16
5/16	5/16	TF5515X5	.95	1.09	9/16
5/16	3/8	TF5515X5X6	.98	1.25	5/8
3/8	1/4	TF5515X6X4	1.06	1.09	5/8
3/8	5/16	TF5515X6X5	1.06	1.12	5/8
3/8	3/8	TF5515X6	1.06	1.25	5/8
3/8	1/2	TF5515X6X8	1.16	1.45	13/16
3/8	5/8	TF5515X6X10	1.22	1.70	15/16
1/2	3/8	TF5515X8X6	1.25	1.34	13/16
1/2	1/2	TF5515X8	1.25	1.45	13/16
1/2	5/8	TF5515X8X10	1.31	1.70	15/16
5/8	1/2	TF5515X10X8	1.45	1.52	15/16
5/8	3/4	TF5515X10X12	1.55	1.94	1-1/8
3/4	5/8	TF5515X12X10	1.66	1.80	1-1/8
3/4	3/4	TF5515X12	1.66	1.94	1-1/8
3/4	7/8	TF5515X12X14	1.72	2.00	1-1/4
3/4	1	TF5515X12X16	1.78	2.05	1-3/8
1	3/4	TF5515X16X12	1.81	2.06	1-3/8
1	7/8	TF5515X16X14	1.81	2.06	1-3/8
1	1	TF5515X16	1.81	2.05	1-3/8
1	1-1/4	TF5515X16X20	2.00	2.25	1-3/4
1-1/4	1	TF5515X20X16	2.06	2.23	1-3/4
1-1/4	1-1/4	TF5515X20	2.06	2.25	1-3/4
1-1/2	1-1/4	TF5515X24X20	2.33	2.37	2
1-1/2	1-1/2	TF5515X24	2.33	2.39	2
2	2	TF5515X32	3.06	2.89	2-5/8

Prices Subject to Change Without Notice



NOTE:
1. ALL MATERIAL 11 GA. UNLESS OTHERWISE SPECIFIED.
2. FILLER BREATHER HOLE PROVIDED.
3. ITEMS FURNISHED AND SHIPPED LOOSE:
   (1) FILLER BREATHER SM5201
   (1) SIGHT GAGE ALGST
4. (2) 6" ENDCOVERS (1917) PROVIDED WITH EACH RESERVOIR.
5. INTERIOR OF RESERVOIR COATED WITH RUST PREVENTIVE OIL.
6. EXTERIOR OF RESERVOIR PRIME PAINTED.

WELD NUTS INSIDE FOR SIGHT GAGE



SHEET 1 OF 2

REV	REVISION DESCRIPTION	DATE	BY

FISCHER NO. ,, | LASER NO. ,,

VESCOR
50 NORTH RIVER STREET SOUTH ELGIN, ILLINOIS 60177
PH. (847)742-7270 FAX. (847)742-5187

SPECIAL NON-J.I.C. RESERVOIR
JOHN HENRY FOSTER COMPANY

SIZE	FSCM NO.	DWG NO.	REV
C	61028	VQ41944	

SCALE: NONE | DATE: 07/25/05 | DRAWN BY: C.V.

10:56

John Henry Foster Co.

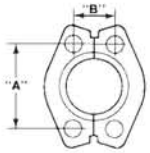
Tel. (314) 427-0600 Fax (314) 427-3502 Toll Free 1-800-444-0522

ESOP

Anchor Flange FLANGE ADAPTORS

Nom. Flange Size	Bolt Hole Spacing "A" (in.)		Bolt Dimensions "B" (in.)	
	Code 61	Code 62	Code 61	Code 62
1/2	1 1/2	1 19/32	11/16	23/32
3/4	1 7/8	2	7/8	15/16
1	2-1/16	2 1/4	1 1/32	1 3/32
1-1/4	2-5/16	2 5/8	1 3/16	1 1/4
1 1/2	2 3/4	3 1/8	1 13/32	1 7/16
2	3 1/16	3 13/16	1 11/16	1 3/4

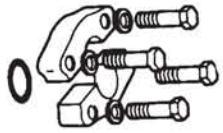
SAE Code 61 and Code 62
Four-Bolt Flange SAE J518



SPLIT FLANGE ADAPTORS

Standard Pressure Code 61

Size	Part No.		Pressure Rating	Bolt Torque [lb-in]
1/2"	8SFO		5000	175-225
3/4"	12SFO		5000	250-350
1"	16SFO		5000	325-425
1-1/4"	20SFO		4000	425-500
1-1/2"	24SFO		3000	550-700
2"	32SFO		3000	650-800
2-1/2"	40SFO		2500	950-1100
3"	48SFO		2000	1650-1800



High Pressure Code 62

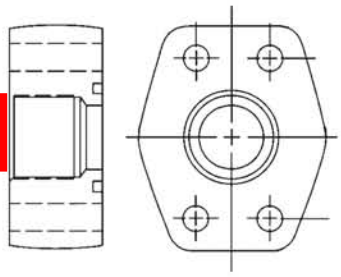
Size	Part No.		Pressure Rating	Bolt Torque [lb-in]
3/4"	12SFXO		6000	300-400
1"	16SFXO		6000	500-600
1-1/4"	20SFXO		6000	750-900
1-1/2"	24SFXO		6000	1400-1600
2"	32SFXO		6000	2400-2600

Split flange adaptors include 2-flange halves, 4-hex bolts with lockwashers and 1-Buna-N O-ring.

NPTF THREAD FLANGE ADAPTORS

Standard Pressure Code 61

Size	Part No.		Pressure Rating	Bolt Torque [lb-in]
1/2"	W43-8-8U		5000	175-225
3/4"	W43-12-12U		5000	250-350
1"	W43-16-16U		5000	325-425
1-1/4"	W43-20-20U		4000	425-500
1-1/2"	W43-24-24U		3000	550-700
2"	W43-32-32U		3000	650-800
2-1/2"	W43-40-40U		2500	950-1100
3"	W43-48-48U		2000	1650-1800



High Pressure Code 62

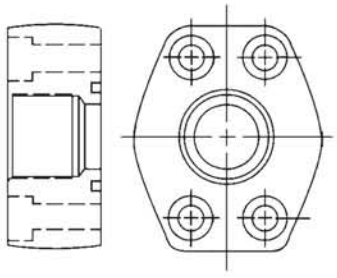
Size	Part No.		Pressure Rating	Bolt Torque [lb-in]
1/2"	W44-8-8U		6000	175-225
3/4"	W44-12-12U		6000	300-400
1"	W44-16-16U		6000	500-600
1-1/4"	W44-20-20U		6000	750-900
1-1/2"	W44-24-24U		6000	1400-1600
2"	W44-32-32U		6000	2400-2600

Threaded flange adaptors include flange adaptor, 4-hex bolts with lockwashers and Buna-N O-ring.

SAE O-RING THREAD FLANGE ADAPTORS

Standard Pressure Code 61

Size	Part No.		Pressure Rating	Bolt Torque [lb-in]
1/2"	W46-8-8U		5000	175-225
3/4"	W46-12-12U		5000	250-350
1"	W46-16-16U		5000	325-425
1-1/4"	W46-20-20U		4000	425-500
1-1/2"	W46-24-24U		3000	550-700



High Pressure Code 62

Size	Part No.		Pressure Rating	Bolt Torque [lb-in]
1/2"	W48-8-8U		6000	
3/4"	W48-12-12U		6000	300-400
1"	W48-16-16U		6000	500-600
1-1/4"	W48-20-20U		6000	750-900
1-1/2"	W48-24-24U		6000	1400-1600
2"	W48-32-32U		6000	2400-2600

Flange adaptors include flange adaptor, 4-hex bolts with lockwashers and Buna-N O-ring.

Installation, commissioning and servicing of hydraulic pumps and motors

(vane pumps, internal gear pumps, radial piston motors, internal gear pumps)

RE 07080/07.05 1/2
Replaces: 02.03

1. General

1.1 To ensure proper operation of pumps and motors, please observe the following information:

- Technical data in the data sheet
- General notes on commissioning of hydraulic systems
- The following notes on installation and operation

2. Installation

2.1 Flushing

- On pumps taken from stock, resin may have formed. This must be removed by means of solvents. Then, the lubricating film must be renewed. In the case of hardly inflammable fluids, no special measures have to be taken.

2.2 Installation

- Observe drawings and/or instructions
- Ensure stress-free installation
- In the case of prime movers, ensure that foundations are level

2.3 Lines and connections

2.3.1 Suction lines

- Design and assemble lines according to the manufacturer's instructions.
- Suction vacuum pressure or feed pressure must be within the limits specified by the manufacturer; filters and valves possibly installed must be taken into account.
- Take care that the suction lines are leak-free.
- The flow velocity in suction lines should not exceed 0.5 m/s.
- Cut the pipe ends at an angle of less than 45° and install them at a distance of at least 2.5 x the pipe diameter from the tank floor in order to prevent the aspiration of deposits from the tank floor.

2.3.2 Leakage drain lines

- Use sufficiently large nominal widths in order to keep the backpressure in the housing within the permissible limits.
- When installing the lines, make sure that the housing is completely filled with fluid, while taking care that a siphoning effect is avoided.
- Pressureless return flow to the tank
- Sufficient cooling and settling of the hydraulic fluid is achieved by directing the fluid to the tank wall.
- Ensure a sufficient distance to temperature switches.

2.3.3 Installation instructions

- All lines have to be submerged at least 2.5 x the pipe diameter below the lowest permissible fluid level, but at least 100 mm in order to prevent foaming.
- Install the leakage drain line higher than the suction line and take precautions that the returning oil cannot be directly re-aspired.
- The ends of the suction, return and leakage drain lines must therefore be installed with a distance of at least 200 mm from each other.
- We recommend seamless precision steel pipes to DIN 2391 and pipe connections that can be loosened.

2.4 Filters

- Whenever possible, use return line or pressure filters.
- Use suction filters only in conjunction with underpressure switches/clogging indicators.
- Depending on the pump type, the required filter rating is 25 µm to 40 µm.
  Recommendation: 10- µm filters prolong the service life under high load conditions.

2.5 Hydraulic media

2.5.1 Mineral oils

- When HL oils without wear-reducing additives are used, vane pumps (V3, V4, PV7, PVV, PVQ) may only be operated at reduced pressure.
- Oils containing polar additives (slide way oils) must not be used for pumps with plain bearings, as the additives precipitate at 70 °C and thus impair cooling and lubrication of the bearings.

2.5.2 HFC fluid (water glycol)

- Internal gear pumps of types PGF and PGH are suitable for operation with HFC fluids.

  Please note the information in the data sheets!

  When using hydraulic media, which are not listed in the technical data, please consult us.

3. Commissioning

3.1 Electrical open and closed-loop control elements

- Observe voltages and current intensity

3.2 Direction of rotation of drive/output shafts

- Observe the arrow of direction of rotation
- Testing of a unit filled with hydraulic fluid:
  Switching the unit briefly on and off prevents damage in the case of the wrong direction of rotation.

3.3 Filling

- Pump types V3, V4, PV7, PVV, PVQ are self-priming, the housings need not to be filled. Internal gear pumps must be filled prior to commissioning! For all other pumps, verify, whether the housing must be filled.

3.4 Start-up

- Observe specific component instructions.
- Set all valves, especially on the suction and supply side, to the free-flow position.
- Switch the motor briefly on and off several times in order to facilitate bleeding. Only operate the pump under full load when it runs properly and smoothly.
- During initial start-up, bleed the pressure line to allow complete filling of the pump.
  Exceptions to this are pump with automatic bleed valve.
- When the system starts up, the fluid level in the tank must not fall below the minimum suction level.

3.5 Pressure limitation / pressure control

- Always select the lowest settings for commissioning.
- Carefully increase the pressure to the required values, but do not set to unnecessarily high values.
- If required, secure settings against unwanted adjustment.

3.6 Temperature

- Check the fluid temperature under normal operating conditions.

4. Routine maintenance

4.1 Frequency

- Loads and operating conditions determine regular maintenance intervals.

4.2 Mounting

- Check the correct orientation of the pumps, motors, cylinders, further energy converters and lines at normal operating pressure and operating temperature.

4.3 Filters

- Observe clogging indicators and check suction filters for operability according to the operating instructions.

4.4 Servicing

- We recommend regular servicing of the complete system by Bosch Rexroth!

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Rexroth
Bosch Group

Petroleum Hydraulic Fluids Recommendations

Industrial Hydraulics

Petroleum Hydraulic Fluids

Recommendations

The attached list of industrial hydraulic oils has been tabulated for use as a reference in assisting Bosch Rexroth customers with an oil selection. The list is comprised of oils which meet or exceed the lubrication requirements of our componentry.

Viscosity Selection

Hydraulic componentry will operate efficiently only within a specific viscosity range. A fluid which is too viscous may prompt cavitation. Conversely, a fluid which is too thin may allow an accelerated rate of wear and additional slip losses. Consequently, it is necessary to establish viscosity limitations.

The following table can be used as a guide in determining the recommended viscosity range for all pumps of our manufacture. If your application dictates the use of fluids whose viscosities are outside of these recommendations, please consult a Bosch Rexroth Sales Engineer.

	Viscosity Temperature Chart	Minimum Operating Viscosity	Optimum Operating Viscosity	Maximum Operating Viscosity	Maximum Start-up Viscosity
FA; Ra; K	#1	80 SUS 15 cSt	125-250 SUS 26-54 cSt	1000 SUS 216 cSt	4000 SUS 864 cSt
Q; Q-6 SV-10, 15, 20, 25 VPV 16, 25, 32	#2	100 SUS 21 cSt	150-250 SUS 32-54 cSt	1000 SUS 216 cSt	4000 SUS 864 cSt
SV-40; 80 &100 VPV 45, 63, 80, 100, 130 & 164	#3	150 SUS 32 cSt	200-300 SUS 43-65 cSt	1000 SUS 216 cSt	4000 SUS 864 cSt
Radial Piston (Seco)	#4	60 SUS 10 cSt	100-250 SUS 21-54 cSt	300 SUS 65 cSt	750 SUS 162 cSt
Gear Pumps	#5	65 SUS 12 cSt	103-460 SUS 20-100 cSt	3800 SUS 800 cSt	9500 SUS 2000 cSt
Valves & Boosters		In general, an oil which matches the viscosity requirements of the pump, will also be satisfactory for valves and boosters.			

Viscosity vs Leakage

In selecting a hydraulic media, keep in mind that leakage is almost proportional to the kinematic (cSt) viscosity of the fluid. The use of a lighter fluid other than required results in increased leakage and decreased efficiencies. For example, using an oil with a viscosity of 80 SUS (15 cSt) will result in approximately 200% of the leakage obtained with an oil having a viscosity of 140 SUS (30 cSt). Leakage with an oil of 300 SUS (65 cST) will be less than half of the leakage obtained with the 140 SUS (30 cSt) oil.

Filtration

The ultimate life of hydraulic componentry is contingent upon system cleanliness. The use of micronic filtration that has been matched to system requirements will reduce component malfunctions as well as extending the life of the componentry and the hydraulic media.

Inlet Conditions

Any restrictions in the suction line decrease the allowable maximum viscosity. In general, pressure drop in the suction line between the tank and pump inlet should not exceed 6" mercury with vane pumps, when pumping full volume at sea level under start-up conditions.

Some radial piston pumps are not self priming, and dictate the use of overhead reservoirs. In this instance the intake line must be unrestricted and sized to allow gravity to supply an adequate volume of oil to the pump.

At altitudes above 5000 feet, the use of overhead reservoirs is recommended for all Bosch Rexroth systems.

Use of Viscosity/Temperature Charts

Under the heading “Viscosity Selection” please note that there are five classes of pumps. For each of these classes there is a mating Viscosity/Temperature chart which can be found on pages 5 through 7 of this publication.

Before referring to these charts, however, it is necessary to look at the listing of approved oils to determine if your intended hydraulic media is ISO viscosity grade 32, 46 or 68. In general, a viscosity grade 32 oil has a viscosity of about 150 SUS (32 cSt) @ 100 °F, grade 46 - 200 SUS (43 cSt) @ 100 °F, and grade 68 - 300 SUS (65 cSt) @ 100 °F.

After noting the viscosity grade, refer to the Viscosity/Temperature Chart which matches the type of pump that is used in your system.

By noting the points at which the viscosity plots intersect the vertical temperature lines, one can quickly determine the temperatures at which the oil reaches: the maximum start-up viscosity; the maximum running viscosity; the optimum viscosity range; and the minimum operating viscosity.

As an example, let us assume that we wish to use Mobil DTE 26 in an SV-80 pump. From the list of approved products we note that DTE 26 is a Grade 68 oil. The correct Viscosity/Temperature Chart for an SV-80 is Chart #3.

Based on the plot for ISO grade 68 oil we then determine that the minimum start-up temperature could be 30 °F (–1 °C) without exceeding the 4000 SUS start-up viscosity; the maximum viscosity for continuous operation is reached at 63 °F (17 °C); the optimum operating viscosity is attained between the temperatures of 100 °F (38 °C) and 118 °F (48 °C); and, at temperatures above 130 °F (54 °C), the minimum operating viscosity will have been exceeded.

Recommended Oils

The following list of industrial hydraulic oils are recommended for use in Bosch Rexroth hydraulic componentry.

Oils sold by listed suppliers under other trade names, or oils which are sold by unlisted suppliers may not be considered to be a satisfactory hydraulic media. Many formulations are being offered which lack certain additives or are formulated for special reasons, such as lower cost, high detergency, leakage control, etc. Some of these specialty fluids can be used successfully, however, others may prompt malfunctions and high rates of wear.

When employing fire resistant fluids, please consult our publication 9 535 233 457 “Fire Resistant Fluids”.

Manufacturer	Fluid Name	ISO Viscosity Grade	Manufacturer	Fluid Name	ISO Viscosity Grade
Amalie	Ama-Oil 100 AW	32	Houghton	Hydro-Drive HP 150	32
	Ama-Oil 200 AW	46		Hydro-Drive HP 200	46
	Ama-Oil 300 AW	68		Hydro-Drive HP 300	68
Amoco	Amoco AW 32	32	Kendall	Kenoil R&O AW 32	32
	Amoco AW 46	46		Kenoil R&O AW 32	46
	Amoco AW 68	68		Kenoil R&O AW 32	68
Ashland	Ultramax AW-15	32	Lubrication	Monolec 6110A	46
	Ultramax AW-20	46	Engineers	Monolec 6120A	68
	Ultramax AW-30	68			
Bel-Ray	Raylene 0	32	Lubriplate	HO-0	32
	Raylene 1	46		HO-1	46
	Raylene 2	68		HO-2	68
Benz	Petraulic 32	32	Lyondell	Duro AW 32	32
	Petraulic 46	46		Duro AW 46	46
	Petraulic 68	68		Duro AW 68	68
BP Oil Inc.	Energol HLP 32	32	Mobil	DTE 24	32
	Energol HLP 46	46		DTE 25	46
	Energol HLP 68	68		DTE 26	68
	Canvis AW 32	32	Petro-Canada	Hydroflo HLP32	32
	Canvis AW 46	46		Hydroflo HLP46	46
	Canvis AW 68	68		Hydroflo HLP68	68
Champlin	Hydrol 150	32	Phillips	Magnus A 150	32
	Hydrol 215	46		Magnus A 215	46
	Hydrol 315	68		Magnus A 315	68
Chevron	Chevron HYD 32	32	Rock Valley	Trojan AW 32	32
	Chevron HYD 46	46		Trojan AW 46	46
	Chevron HYD 68	68		Trojan AW 68	68
Cities Service	Pacemaker XD-32	32	Shell	Tellus 32	32
	Pacemaker XD-46	46		Tellus 46	46
	Pacemaker XD-68	68		Tellus 68	68
	Citgo AW 32	32	Steelco	7410 Hydraulic Oil	32
	Citgo AW 46	46		7420 Hydraulic Oil	46
	Citgo AW 68	68		7430 Hydraulic Oil	68
Conoco	Super Hydraulic 32	32	Sun	Sunvis 816 WR	32
	Super Hydraulic 46	46		Sunvis 821 WR	46
	Super Hydraulic 68	68		Sunvis 831 WR	68
Dryden	Drydene Blue 32	32	Texaco	Rando HD 32	32
	Drydene Blue 46	46		Rando HD 46	46
	Drydene Blue 68	68		Rando HD 68	68
Exxon	Nuto H 32	32	Tower	Hydroil AW-3	32
	Nuto H 46	46		Hydroil AW-4	46
	Nuto H 68	68		Hydroil AW-5	68
Fiske	Lubriplate HO-0	32	Union	Unax AW 150	32
	Lubriplate HO-1	46		Unax AW 215	46
	Lubriplate HO-2	68		Unax AW 315	68
Gulf	Harmony 32 AW	32	Withrow	Withrolube 655	32
	Harmony 46 AW	46		Withrolube 656	46
	Harmony 68 AW	68		Withrolube 657	68

Chart #1
FA, RA & K Vane Pumps

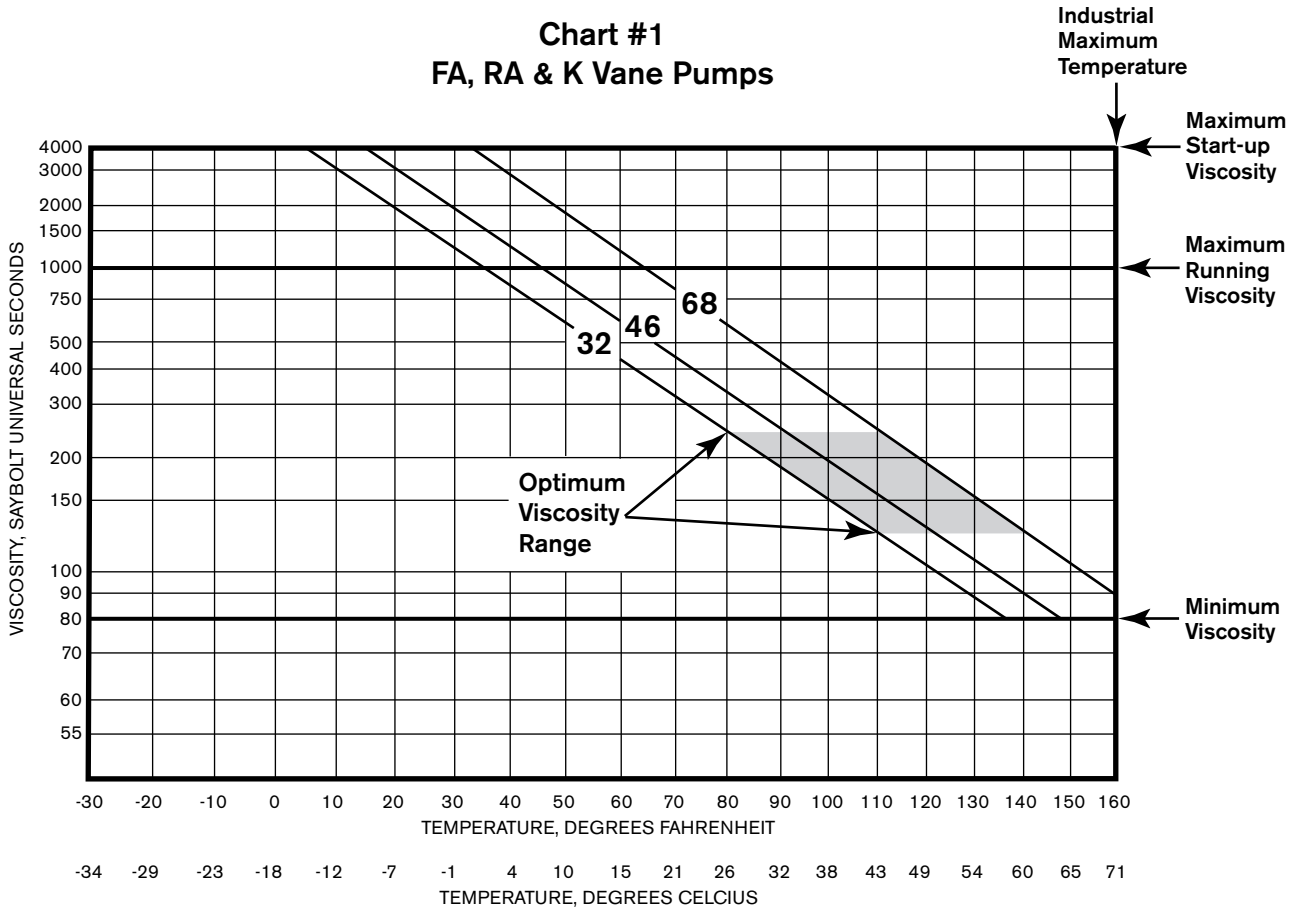


Chart #2
Q, Q-6, SV-10, SV-15, SV-20, SV-25 Vane Pumps
VPV 16, 25, & 32 Vane Pumps

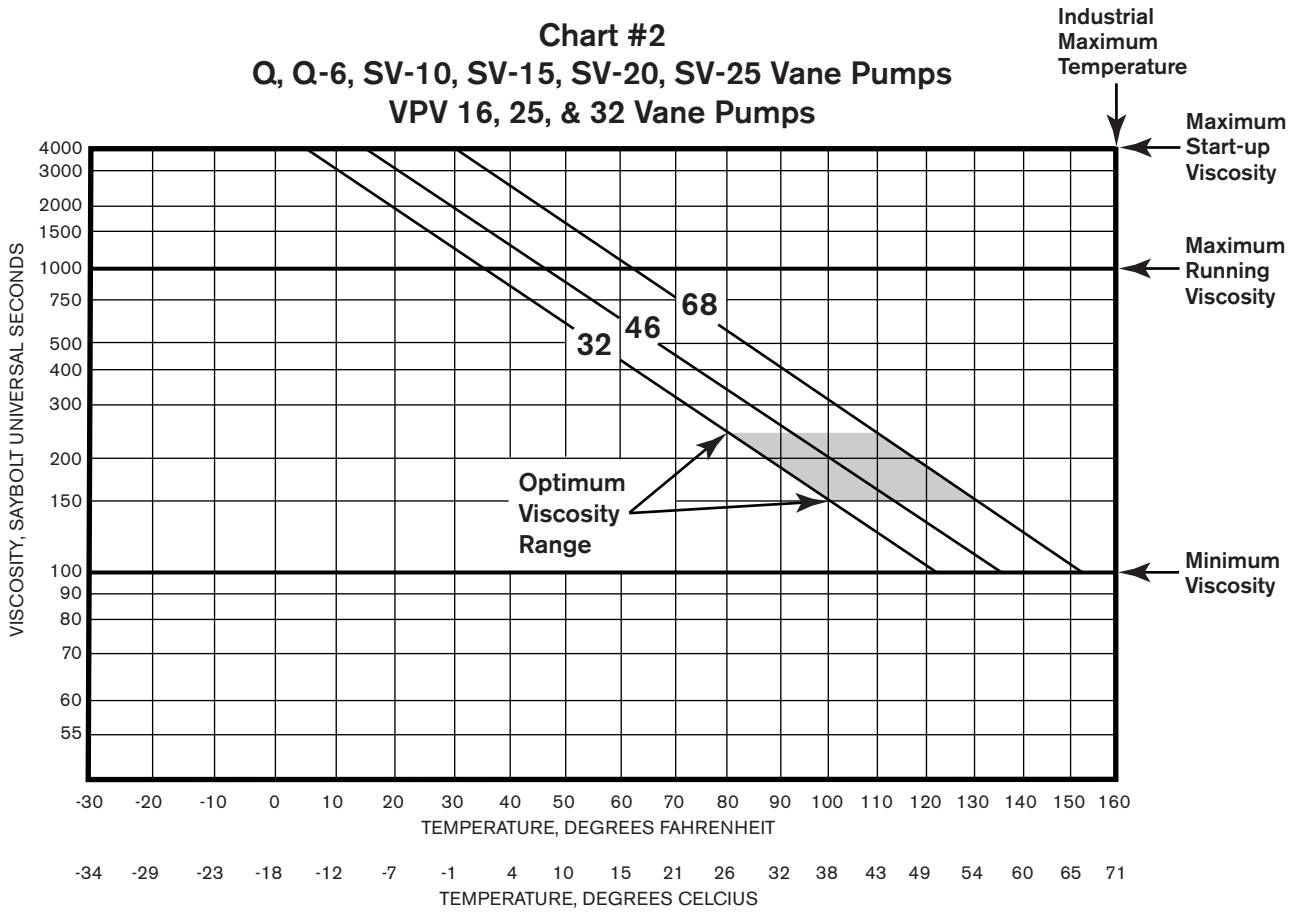


Chart #3
SV-40, SV-80 & SV-100 Vane Pumps
VPV 45, 63, 80, 100, 130 & 164 Vane Pumps

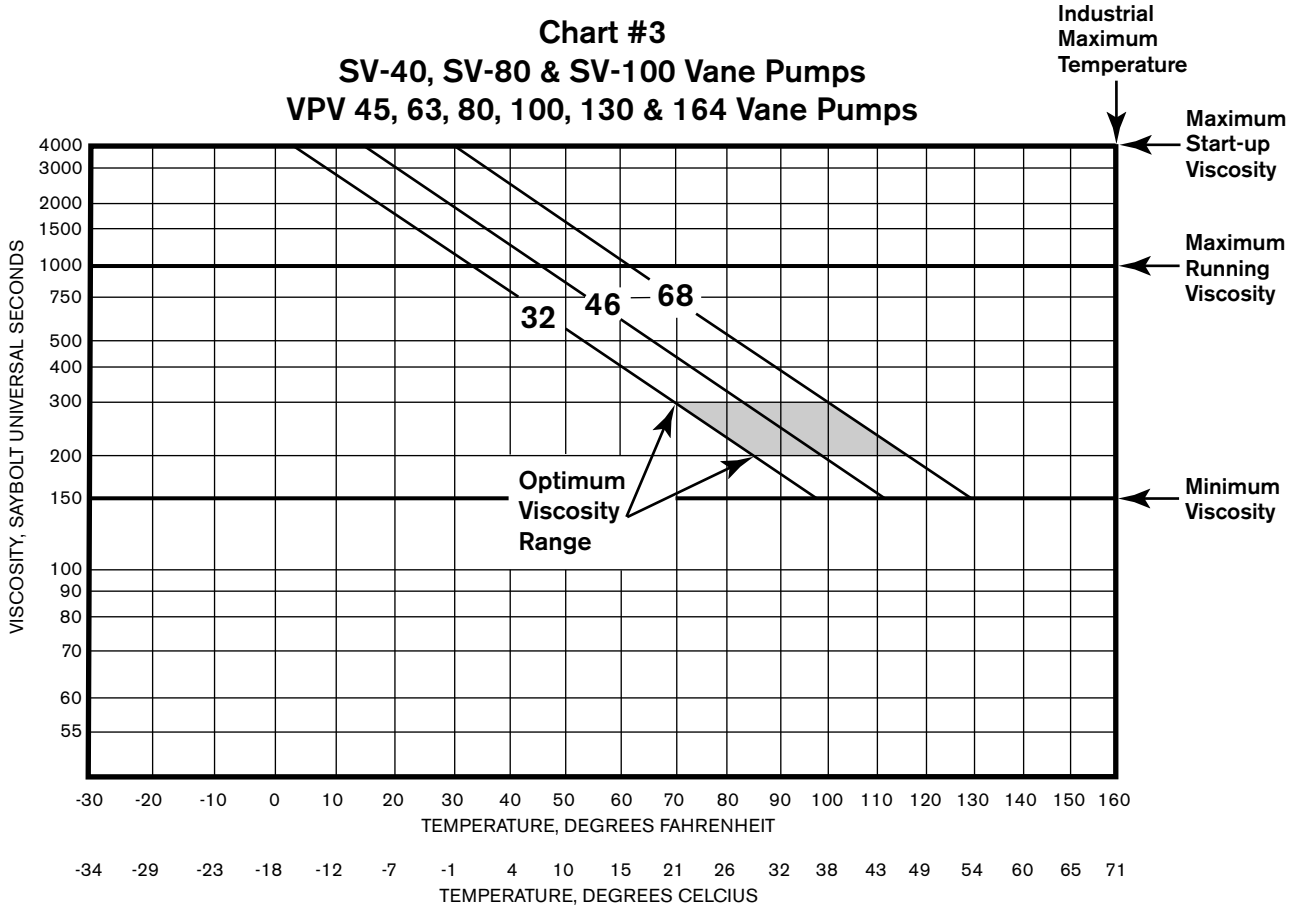


Chart #4
Radial Piston Pumps

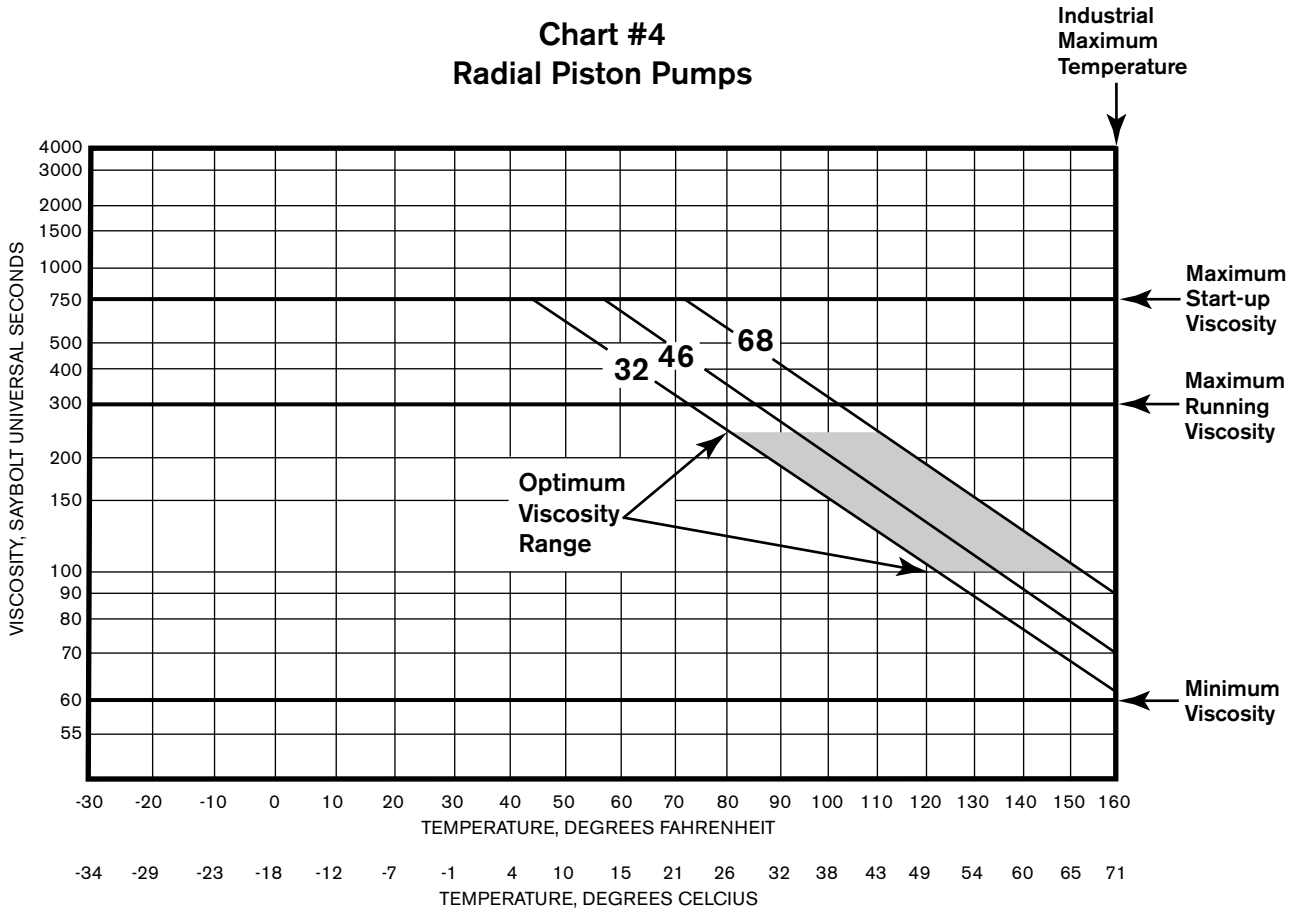
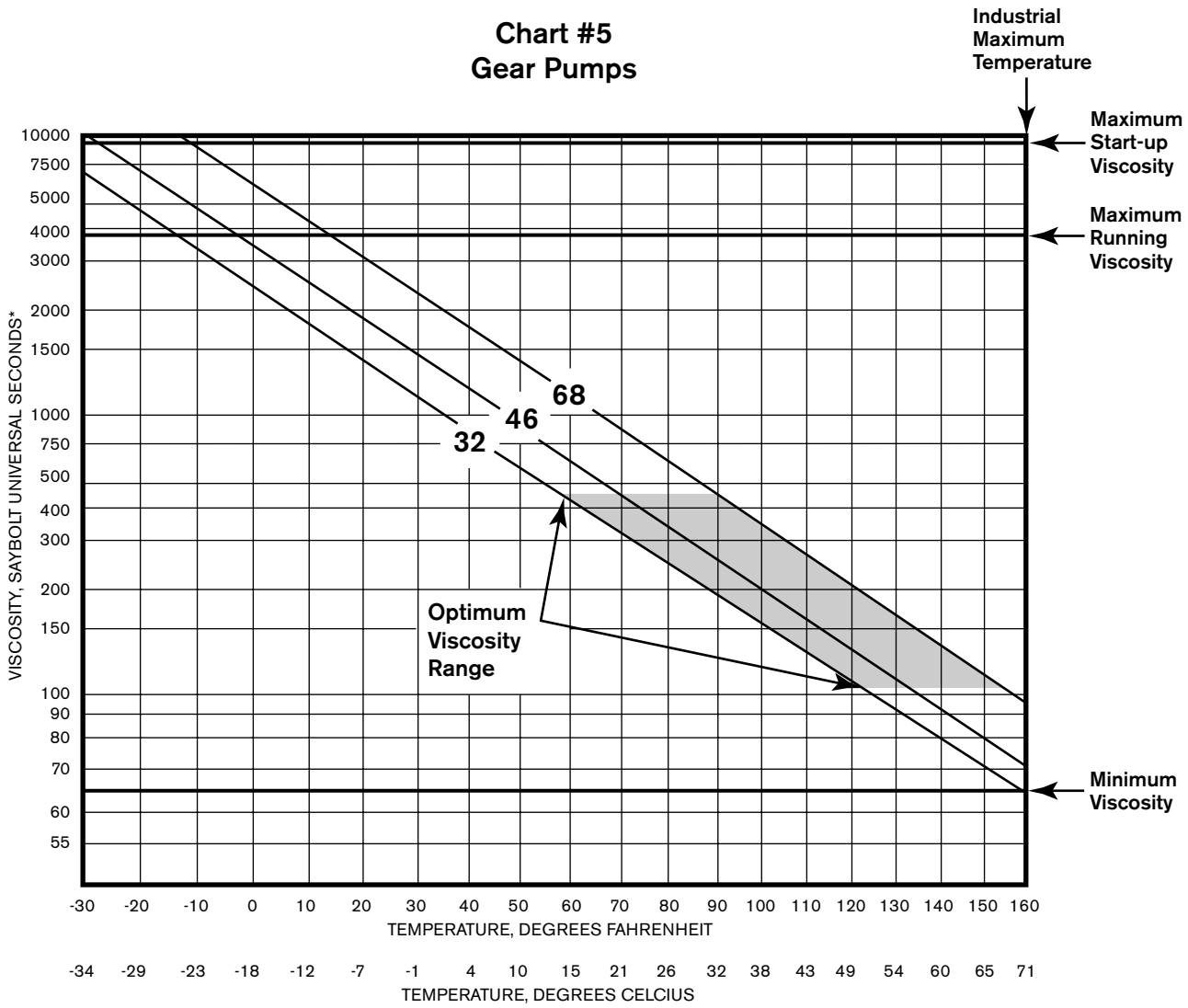


Chart #5
Gear Pumps



* Viscosity values extrapulated at low temperatures may not be acurate. Confirm viscosity values prior to using Bosch Rexroth hydraulic equipment.

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BOSCH

Trouble Shooting Guide

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DIAGNOSIS OF IMPROPER OPERATION
BOSCH HYDRAULIC EQUIPMENT

The following sections list common difficulties which may be experienced with many components in the hydraulic system, and lists possible causes and remedies for each of the troubles listed.

VALVES

TROUBLE	CAUSE	REMEDY
VALVE SPOOL RESPONSE SLUGGISH	1. Dirt in system	Drain and flush system. Disassemble and clean, if necessary.
	2. Restricted drain	Insure drain line size is appropriate.
	3. Pilot pressure too low	Check pilot pressure of system. Increase if necessary
	4. Malfunctions of solenoids	Check for proper source voltage and frequency. Remove solenoid and check fields.
	5. Distortion of valve body	Align body and piping to remove strains.
VALVE SPOOL FAILS TO MOVE	1. Dirt in system	Disassemble, clean and flush.
	2. Blocked drain	Inspect for plugs or foreign matter.
	3. Pilot pressure off	Check source of pilot pressure.
	4. Solenoids inoperative	Check electrical source and solenoid fields.
	5. Distortion	Align body and piping to remove strains.
	6. Improper reassembly after overhaul	Use parts drawing to check proper assembly.
VALVE PRODUCES UNDESIRED RESPONSE IN WORK UNIT	1. Improper installation connections	Check installation drawings.
	2. Improper assembly of valves	Check parts and drawings.
	3. Spool installed backwards	Reverse spool end for end.

VANE PUMPS

TROUBLE	CAUSE	REMEDY
EXCESSIVE PUMP NOISE	1. Wrong direction of pump rotation	Observe arrow on pump case. Direction of rotation must correspond.
	2. Low oil level	Fill reservoir so that surface of oil is well above end of suction line during all of work cycle.
	3. Wrong type of oil	Use a good, clean hydraulic oil having the viscosity in accordance with the Bosch recommendations.
	4. Pump running too fast	Reduce speed. Speeds above rating are harmful and cause early failure of pumps. Refer to pump ratings.
	5. Coupling misalignment	Re-align pump and motor accurately. Align to within .006" total indicator reading.
	6. Reservoirs not vented	Vent reservoir through air filter to allow breathing action for fluctuating oil level.
	7. Air leak in case drain line. Air leak around shaft packing	Pour hydraulic oil on joints and around shaft while listening for change in sound of operation. Tighten as required.
	8. Restricted flow through suction piping	Check suction piping and fittings to make sure full size is used throughout. Make sure suction line is not plugged with rags or other foreign material. Avoid excessively long suction lines.
	9. Air bound pump	Air is locked in pumping chamber and has no way to escape. Stop pump immediately. Before restarting, partially open pressure line or install special by-pass line back to tank so that air can pass out of the pump.
	10. Case drain (slip line) does not terminate below oil level	Extend case drain piping so that it terminates below the oil surface when oil is at its lowest level during any one machine cycle.
	11. Worn Pressure Ring	Replace. This condition caused by hot, thin, dirty oil or no oil at all. An air bound condition (#9 above) will also contribute to the worn pressure ring.
	12. Restricted filter of strainer	Clean filter or strainer. Calculate required size and add 100% to allow for partial blocking by dirt. We do not recommend the use of suction strainers.
	13. Air bubbles in intake line	Provide reservoir with baffles. All return lines to reservoir must be below oil surface, and on opposite side of the baffle from intake lines. A suction strainer also could be the problem. Remove it.
	14. Sticking vane	Remove cover assembly and check rotor and vanes for presence of metal chips or sticky oil. Some pump models have chamfered edges on the vanes. See pump drawings for proper installation.
	15. Two pumps to common manifold	A check valve must be placed in the discharge line of the pump which has the lowest pressure to prevent back flow and surging. This check valve must also be present if an accumulator is in the discharge line.
	16. Reservoir air vent plugged	Air must be allowed to circulate in the reservoir. Clean and/or replace breather.
	17. Worn or broken parts	Replace.

VANE PUMPS (CONTINUED)

TROUBLE	CAUSE	REMEDY
SYSTEM EXCESSIVELY HOT	1. Pump operated at higher pressures than required	Reduce pump pressure.
	2. Pump not unloading during idle periods of machine operating cycle	Use open center valve or two-pressure compensating governor when applicable.
	3. Insufficient cooling facilities	Install oil cooler. Increase reservoir capacity.
	4. Excessive pump slippage	Tighten bolts on cover.
	5. Pump drain line too close to pump suction line returning heated oil back into the pump	Separate the drain and suction lines by a baffle in the reservoir. Place the drain line in a location where it must travel the farthest distance practical before the oil re-enters the pump.
	6. Excessive system leakage through cylinders or valves	Check progressively through the system for excessive leakage.
	7. High ambient or radiant temperature	Relocate power unit or baffle against radiant heat.
	8. Low oil in reservoir	Bring level of oil up to recommended point.
	9. Excessive friction	Internal parts may be too tight. Reshim. Oil viscosity may be too low. Check specifications and change oil if necessary.
	10. Reservoir too small	Increase size or install auxiliary cooling equipment.
	11. Restricted or undersize valves on hydraulic lines	Clean valves and piping. Use adequate pipe sizes.
LEAKAGE AT OIL SEAL	1. Abrasives on pump shaft	Protect shaft from abrasive dust and foreign material.
	2. Packing damaged at installation. Scratched or damaged shaft seal	Replace oil seal assembly. Packing should be eased on shaft carefully avoiding cuts from passing over keyway.
	3. Coupling misalignment	Re-align pump and motor shafts. Align to within .006" total indicator reading.
	4. Pressure in pump case	Inspect case drain line for restriction. Should be full pipe size direct to reservoir.
	5. Oil too hot	See trouble section headed "System Excessively Hot."
BEARING FAILURE	1. Chips or other foreign matter in bearings	Make sure clean oil is used. Essential for efficient operation and long life of bearings.
	2. Coupling misalignment	Re-align pump and motor shafts. Align to within .006" total indicator reading.
	3. Excessive or shock loads	Reduce operating pressure. Observe maximum rating of operating pressure.
	4. System excessively hot	See trouble section headed "System Excessively Hot" (Heat breaks down lubricating qualities of hydraulic oil).
	5. Overhung load	Bosch pumps are not designed to handle any overhung load or side trust on the drive shaft. Make provision for outboard bearings to alleviate this condition.
	6. Electric motor shaft end play or driving or hammering coupling on or off pump shaft	Bosch pumps are not designed to handle end thrusts against the drive shaft. Eliminate all end play on electric motors. Couplings should be a slip fit onto the pump shaft.
	7. Incorrect fluid	See Bosch oil recommendations.

VANE PUMPS (CONTINUED)

TROUBLE	CAUSE	REMEDY
PUMP NOT DELIVERING OIL	1. Adjusting knob for pressure adjustment too loose	Tighten adjusting knob three to five turns after spring tension is felt.
	2. Wrong direction of pump rotation	Observe arrow on pump case or nameplate. Direction of rotation must correspond.
	3. Oil level low in reservoir	Maintain oil level in reservoir well above bottom of suction line at all times.
	4. Pump running too slowly	Increase speed. Check minimum speed recommendations to be sure of proper priming.
	5. Air leak in suction line	Tighten joints and apply good pipe compound, non-soluble in oil.
	6. Oil viscosity too heavy for proper priming	Thinner oil should be used, per recommendations for given temperatures and service.
	7. Maximum volume control turned in too far	Turn counterclockwise on Volume Control adjusting screw to increase delivery.
	8. Bleed-off in other portion of circuit	Check for open center valves or other controls connected with a tank port.
	9. Suction line or suction filter plugged	Filters must be cleaned of lint or dirt soon after the unit is first started. Periodic checks should be made as a preventive maintenance precaution. Bosch does not recommend the use of suction strainers.
	10. Pump cover too loose	Tighten bolts on pump cover.
	11. Broken pump shaft or rotor	Replace broken parts. Check for signs of excessive shock, dirt, or foreign material, or other probable causes of failure.
	12. Sheared key at rotor or coupling	Check and replace where required.
	13. Pump shaft turning too slowly	Check minimum speed recommendations.
	14. Pressure ring sticking	Loosen bolts on cover to prove theory or remove governor assembly and volume control assembly and manually check to see if ring is tight. If pump has no volume control assembly, the thrust block may be removed to expose the ring for checking.
LACK OF VOLUME	1. Dirt or chips under vanes holding pressure ring on center	Pump should be dismantled and inspected for dirt or chips.
	2. Governor piston stuck	Check governor piston for freeness of movement. Inspect for broken piston rings.
	3. Pressure ring sticking	See No. 14 above under “Pump Not Delivering oil”.
PUMP NOT DELIVERING PRESSURE	1. Pump not delivering oil	See trouble section headed “Pump Not Delivering Oil.”
	2. Pressure adjusting knob not set high enough	Set adjusting screw to obtain desired operating pressure.
	3. Oil by-passing to reservoir	Test circuit pressure progressively. Watch for open-center valves or other valves open to reservoir.
	4. Pressure ring sticking	See No. 14 above under “Pump Not Delivering Oil.”

VANE PUMPS (CONTINUED)

TROUBLE	CAUSE	REMEDY
PUMP NOT DELIVERING PRESSURE (Continued)	5. Governor piston sticking	Inspect governor for dirt or excessive scoring.
	6. Defective pressure gauge gauge line is shut off	Install pressure gauge known to be accurate in a line open to pump pressure.
	7. Vane or vanes stuck in rotor slots	Inspect for wedged chips or sticky oil.
	8. Pump running too slowly	Check minimum speed recommendations.
OVERLOADING MOTOR	1. Motor not properly sized for pressure and volume requirements	Contact nearest Bosch representative for recommendations.
	2. Excessive internal slippage in pump	Tighten cover bolts on pump.
	3. Starting pump with full pressure and volume	Use higher starting torque motor or start pump with valve closed so no oil will flow.
	4. Motor overload protection undersize	Install larger capacity unit and bigger heaters.
	5. Low voltage	Larger wire leads.
	6. Motor wired for wrong voltage	Check motor leads for proper voltage connections.
	7. Starting pump with full pressure	Reduce pump pressure before starting motor. Readjust pressure to system requirements after motor is up to required speed.

RADIAL PISTON PUMPS

EXCESSIVE PUMP NOISE	1. Air leak in suction line. Air leak around shaft seal.	Pour hydraulic oil on joints and around shaft seal while watching pressure gauge and listening to sound of pump. Steadying of pressure gauge indicates leakage. Replace seal or tighten joints in suction line.
	2. Low oil level in reservoir	Fill reservoir so that surface of oil is well above end of suction line during all of machine cycle.
	3. Air bubbles in intake line	Provide reservoir with baffles. All return lines must be below oil surface and away from intake line.
	4. Restricted filter	Clean filter. Calculate required size and add 100% for partial blocking by dirt.
	5. Restricted flow through suction line	Check suction piping and fittings to make sure full size is used throughout. Make sure suction line is not plugged with rags or other foreign material.
	6. Reservoir not vented	Vent reservoir through air filter.
	7. Coupling misalignment	Motor and coupling must be aligned to within .006" total indicator reading.
	8. Wrong type oil	Use good, clean hydraulic oil having a viscosity of 100-300 SSU at running temperature.
	9. Piston hanging up	Loosen piston cap while pump is running allowing oil to free piston. Tighten again after piston is moving freely.
	10. Running in wrong direction	If self primer is used rotation must be correct as indicated by arrow.

RADIAL PISTON PUMPS (CONTINUED)

TROUBLE	CAUSE	REMEDY
SYSTEM EXCESSIVELY HOT	1. Pump not unloading during idle periods of machine cycle	Install unloading device in high pressure line. Unload pump whenever possible.
	2. Insufficient cooling facilities	Install heat exchanger of proper size to control temperature of the oil.
	3. Pressure set too high	Use only pressure required to give satisfactory operation of machine.
	4. Excessive system leakage through cylinders or valves	Check progressively through the system for excessive leakage.
	5. High ambient or radiant temperatures	Relocate unit or baffle against radiant heat.
LEAKAGE AT OIL SEAL	1. Abrasive on pump shaft	Protect shaft from abrasive dust and foreign material.
	2. Packing damaged in installation	Replace oil seal.
	3. Excessive inlet pressure	High pressure seal modification must be used.
	4. Improper fluid	Special seals are needed for synthetic fluids.
	5. Oil too hot	Seal breaks up at high temperatures. Reduce temperature.
BEARING FAILURE	1. Coupling misalignment	Re-align pump and motor.
	2. Ships or other foreign material in bearing	Make sure clean oil is used. Essential to efficient operation and long life of bearings.
	3. Incorrect fluid	See Bosch oil recommendations.
	4. Electric motor end play	Do not allow motor shaft to butt up against pump shaft. Allow clearance in coupling.
	5. Pump running too fast	1800 RPM is maximum allowable speed.
PUMP NOT DELIVERING OIL	1. Air leak in suction line	Check and tighten all connections in inlet piping.
	2. Pump not free of air	Back out cylinder sleeves until oil flows freely and pump is free of air.
	3. Hollow piston sticking in cylinder sleeve	Check gauge for erratic flutter and listen for noise in pump.
	4. Insufficient supply of oil in pump	Check volume of oil that will free flow through inlet line at pump.
	5. Sheared key at coupling	Check and replace if required.
PUMP NOT DELIVERING PRESSURE	1. Pump not delivering oil	See above.
	2. Relief valve set too low	Relief valve regulates the maximum pressure the pump will put out.
	3. Relief valve not functioning properly	Seat may be worn or springs may be broken.
	4. Oil bypassing	Test circuit progressively. Watch for open-center valves or other valves open to reservoir.
	5. Excessive system leakage through cylinders and valves	Check progressively through system for excessive leakage.

HYDRAULIC SYSTEMS

EXCESSIVE WEAR	1. Abrasive matter in the hydraulic oil being circulated through the pump	Install adequate filter or replace oil more often.
	2. Viscosity of oil too low at working conditions	Check Bosch minimum viscosity recommendations.
	3. Sustained high pressure above maximum pump rating or higher than system requirements	Reduce pump pressure to minimum required for installation.
	4. Drive misalignment	Check and correct.
	5. Air recirculation causing chatter in system	Remove air from system.

FLUID MOTORS

MOTOR TURNING IN WRONG DIRECTION	1. Incorrect piping between control valve and motor	Check circuit to determine correct piping.
MOTOR NOT TURNING OVER OR NOT DEVELOPING PROPER SPEED OR TORQUE	1. System overload relief valve adjustment not set high enough	Check system pressure and reset relief valve.
	2. Relief valve sticking open	Remove dirt under pressure adjustment ball or piston.
	3. Free recirculation of oil to reservoir being allowed through system	Directional control valve may be in open center neutral or other return line unintentionally open. Repair or replace valve.
	4. Driven mechanism binding because of misalignment	Remove motor and check torque requirement of driven shaft.
	5. Pump not delivering sufficient pressure or volume.	Check pump delivery and pressure.
	6. Motor yoke not set at proper angle (on adjustable motors)	Adjust pump yoke angle by means of hand wheel.
EXTERNAL OIL LEAKAGE FROM MOTOR	1. Gaskets leaking (may be due to reservoir drain not being connected if this is required)	Replace. (If drain line required it must be piped directly to reservoir.)

CYLINDERS

ERRATIC ACTION	1. Valves sticking or binding	Check for dirt or gummy deposit . Check for contamination of oil. Check for air in system. Check for worn parts. Excessive wear may be due to oil contamination.
	2. Cylinder sticking or binding	Check for dirt, gummy deposits or air leaks as above. Check for misalignment, worn parts or defective packing.
	3. Sluggish operation during warm-up period	Viscosity of oil too high or pour point too high at starting temperature. Change to oil with lower viscosity or better viscosity index and lower pour point. An immersion heater placed in the oil may help under severe cold conditions.
	4. Pilot control pressure too low	Control line may be too small, or metering choke valve not working properly.
	5. Internal leakage in cylinder	Repair or replace worn parts and loose packing.Check oil to see that viscosity is not too low. Check for excessive contamination or wear.
	6. Air in system	Bleed air and check for leaks. Check to see that oil intake is well below surface of oil in reservoir. Check pump packings and line connections on intake side by pouring hydraulic oil over suspected leak. If noise stops, the leak has been located. Tighten joints or change packing or gaskets where necessary.

Telephone 1-800-521-2747
Fax 1-401-438-7270

Internet: http://www.igus.com
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QuickSpec: http://www.igus.com/qs/echain.asp

Series E4 Energy Tubes

Opening and Closing Series E4 Energy Tubes

To remove lids

Insert screwdriver into the slot and push down. Repeat this on the opposite side.

To hinge the lid

Remove one lid as shown then, release only one side to hinge the lid.

Installing the lids of Series E4 Energy Tubes

To assemble lids

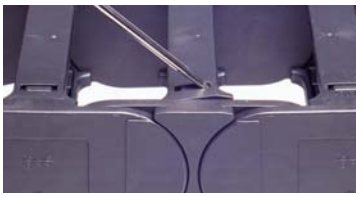
Attach the lid to the connector at an angle. Snap into place by hand.

Series E4/100 Energy Chains®

Opening and Closing Series E4/100 Energy Chains®

To remove snap-open crossbars

Insert screwdriver into slot on top of crossbar and push down on the screwdriver. Repeat this on the other side of the crossbar.



To remove clip (Energy Chains® with crossbars every other link)

Insert the screwdriver into the slot and push down on the screwdriver.

Assembling the side links of Series E4/100 Energy Chains®

Line up two inner side links, side by side. Attach an outer side link between the inner side links. Make sure the igus logo on the outer side links faces the same way.
NOTE: The exception to this rule is the Series 400 Energy Chain® in this instance the logos should alternate between right side up and upside down Attach cross-bars, clips, and lids as described above.

Separating the Series E4/100 Energy Chains®

Remove crossbars, clips and lids.

Series E4/4 Energy Chains®

Opening and Closing Series E4/4 Energy Chains®

To remove snap-open crossbars

Insert screwdriver into slot on top of crossbar and push down on the screwdriver. Repeat this on the other side of the crossbar.

To remove clip

(Energy Chains® with crossbars every other link)

Insert the screwdriver into the slot and push down on the screwdriver.

To assemble two lengths of E4/4

Remove at least 3 of the snap-open crossbars at each connection point. Slide the side links into each other on one side leaving the Energy Chain® fitted at a slight angle. Press the mated side links together.

Join the side links together on the opposite side by applying pressure to the outer link. (When doing this, it may be necessary to move the Energy Chain® slightly along the bending radius).

If possible, it is helpful to place the chain on one side and join the second side link by pressing from the top.

Separating the Series E4/4 Energy Chains®

Remove crossbars, clips, and lids on two adjacent chain links. Guide the screwdriver into the slot between side links and release the side link by levering it out.

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QuickSpec: http://www.igus.com/qs/echain.asp

Telephone 1-800-521-2747
Fax 1-401-438-7270

Internet: http://www.igus.com
email: sales@igus.com
QuickSpec: http://www.igus.com/qs/echain.asp

Series E4 & E4 Light Energy Chains®

Opening and Closing Series E4 & E4 Light Energy Chains®

Series E4 | Series E4 Light

To remove snap-open crossbars

Insert screwdriver into slot on top of crossbar and push down. Repeat this on the other side of the crossbar.

To remove clip (Energy Chains® with crossbars every other link)

Insert the screwdriver into the slot and push down.

To install snap-open crossbars

Attach the snap-open crossbar by hand onto the connector, at an angle. Snap the crossbar in using a screwdriver. You may need to place screwdriver tip under the adjacent crossbar for leverage.

To install clip (Energy Chains® with crossbars every other link)

Attach the clip by hand onto the connector at an angle. Use a screwdriver to snap the clip into place. You may need to place the screwdriver tip under the adjacent crossbar for leverage.

Assembling the Series E4 Energy Chains®

Remove crossbars at the joint. Connect side links by slight tilting. Install crossbars, clips, bottoms and lids.

Separating the Series E4 Energy Chains®

Remove crossbars, clips and lids on a chain link. Position the Energy Chain at an angle and insert a screwdriver between links. Release the side link by levering it out.

Triflex® R Assembly

Assembling Triflex® R

Press outer contours opposed to socket against each other.

Push socket on top of ball and click together.

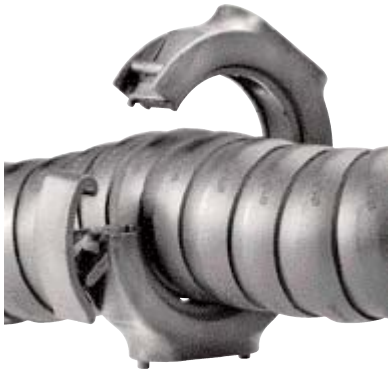
Disassembling Triflex® R

Push screwdriver through perforated window, moving chain links to the maximum bending position on the opposite side.

Remove socket from ball using the screwdriver as a lever.

Mounting Bracket Assembly

Mounting brackets can be installed on the ends, with or without strain relief elements.



Mounting brackets can also be installed at any intermediate point along the carrier for added support.

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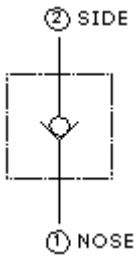
10.80

Free flow nose to side check valve

Capacity:
20 gpm (80 L/min.)

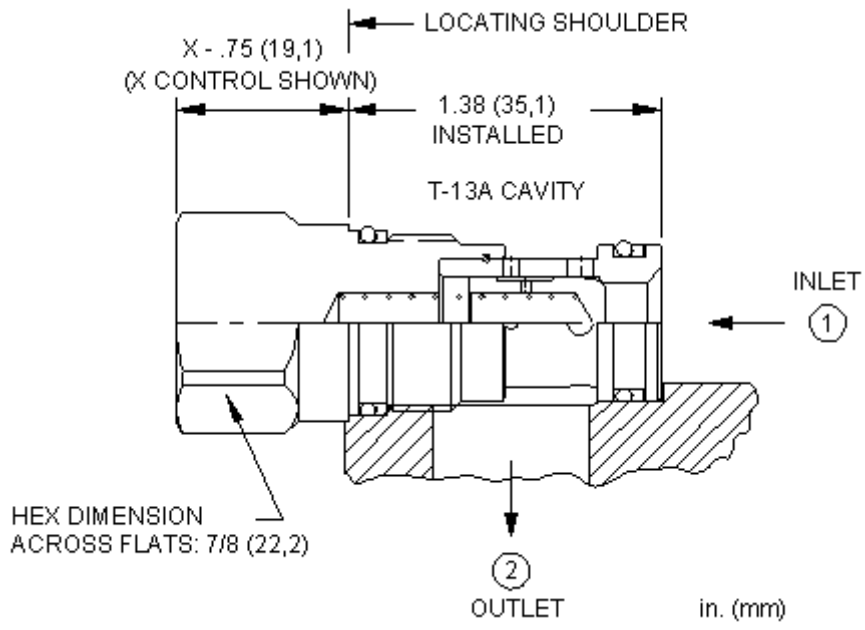
Functional Group:
Products : Cartridges : Check Valve : 2 Port : Free Flow Nose to Side

Model:
CXDA



Product Description

Free-flow, nose-to-side check valves are on/off circuit components that allow free flow from the inlet (port 1) to the outlet (port 2) and block flow in the opposite direction.

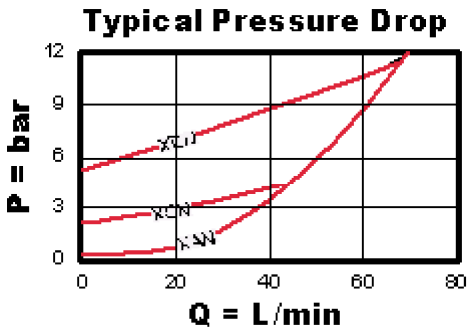


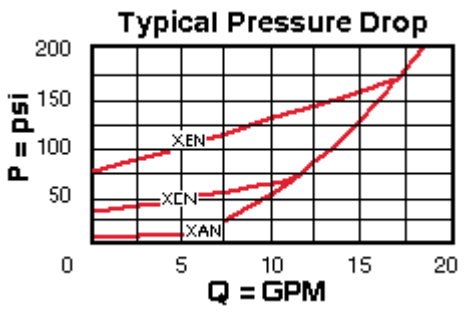
Technical Features

- Two-port check valves share the same cavity for a given frame size, however, pay close attention as flow paths may be in opposite directions.
- Will accept 5000 psi (350 bar) at ports 1 and 2.
- Incorporates the Sun floating style construction to eliminate the effects of internal parts binding due to excessive installation torque and/or cavity/cartridge machining variations.
- Check valves offer extremely low leakage rates with a maximum leakage of less than 1 drop per minute.
- Stainless steel cartridge options P or W are intended for use within corrosive environments with all external components manufactured in stainless steel or titanium. Internal working components remain the same as the standard valves.

Technical Data

	U.S. Units	Metric Units
Cavity	T-13A	
Capacity	20 gpm	80 L/min.
Maximum Operating Pressure	5000 psi	350 bar
Maximum Valve Leakage at 110 SUS (24 cSt)	1 drops/min.	0,07 cc/min.
Valve Hex Size	7/8 in.	22,2 mm
Valve Installation Torque	30 - 35 lbf ft	45 - 50 Nm
Model Weight	.20 lb	0,10 kg
Seal Kits	Buna: 990-010-007	
Seal Kits	Viton: 990-010-006	





Option Selection

CXDA-X C N

Preferred Options

Control	*Cracking Pressure*	*External Material/Seal Material*
X Not Adjustable	A 4 psi (0,3 bar) C 30 psi (2 bar)	N Buna-N

Standard Options

	B 15 psi (1 bar) D 50 psi (3,5 bar) E 75 psi (5 bar) F 100 psi (7 bar)	P Stainless/Buna-N V Viton W Stainless/Viton

Additional Options

The following options are not widely used and may be application specific. Please contact your Sun distributor for application information.

K Handknob	Z 1 psi (0,07 bar)
L Manual Override	

Customer specified setting stamped on hex +$1.10

Direct acting relief valve

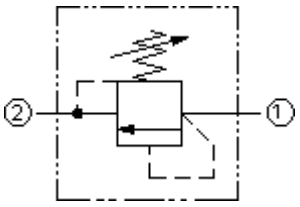
Capacity:
25 gpm (95 L/min.)

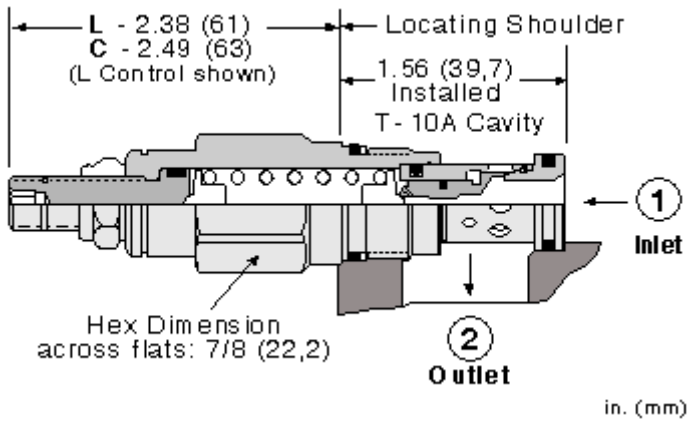
Functional Group:
Products : Cartridges : Relief : 2 Port : Direct Acting

Model:
RDDA

Product Description

Direct-acting relief cartridges are normally closed, pressure-limiting valves used to protect hydraulic components from pressure transients. When the pressure at the inlet (port 1) reaches the valve setting, the valve starts to open to tank (port 2), throttling flow to limit the pressure rise. These valves are smooth and quiet, essentially zero leak, dirt tolerant, immune to silting and are very fast.



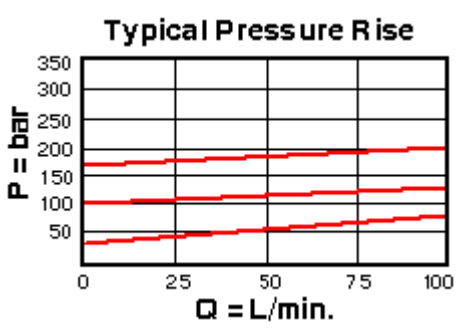


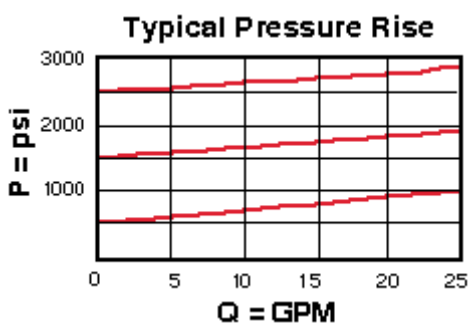
Technical Features

- Will accept maximum pressure at port 2; suitable for use in cross port relief circuits.
- Valve is relatively insensitive to varying oil temperatures and oil borne contamination.
- Suitable for use in load holding applications.
- All 2-port relief cartridges (except pilot reliefs) are physically and functionally interchangeable (same flow path, same cavity for a given frame size).
- The seals on the adjust screw are exposed to system pressure which means this valve can only be adjusted when the pressure is removed. The setting procedure is; check the setting, remove the pressure, adjust the valve, check the new setting.
- Select a spring range where the desired relief setting is approximately mid-range between the minimum and maximum pressure to ensure maximum valve repeatability.
- Back pressure on the tank port (port 2) is directly additive to the valve setting at a 1:1 ratio.
- Incorporates the Sun floating style construction to eliminate the effects of internal parts binding due to excessive installation torque and/or cavity/cartridge machining variations.

Technical Data

	U.S. Units	Metric Units
Cavity	T-10A	
Capacity	25 gpm	95 L/min.
Adjustment - Number of Clockwise Turns to Increase Setting	5	5
Factory Pressure Settings Established at	4 gpm	15 L/min.
Maximum Operating Pressure	5000 psi	350 bar
Maximum Valve Leakage at Reseat	10 drops/min.	0,7 cc/min.
Response Time - Typical	2 ms	2 ms
U.S. Patent #	4,742,846	4,742,846
Reseat	>90 % of Set Pressure	>90 % of Set Pressure
Valve Hex Size	7/8 in.	22,2 mm
Valve Installation Torque	30 - 35 lbf ft	45 - 50 Nm
Adjustment Screw Hex Socket Size	5/32 in.	4 mm
Adjustment Nut Hex Size	9/16 in.	15 mm
Adjustment Nut Torque	108 lbf in.	12 Nm
Model Weight	.30 lb	0,15 kg
Seal Kits	Buna: 990-310-007	
Seal Kits	Viton: 990-310-006	





Option Selection

RDDA-L A N

Preferred Options

Control	*Adjustment Range*	*External Material/Seal Material*
L Standard Screw Adjustment	A 500 - 3000 psi (35 - 210 bar), 1000 psi (70 bar) Standard Setting	N Buna-N
	W 800 - 4500 psi (55 - 315 bar), 1000 psi (70 bar) Standard Setting	

Standard Options

3* Non Adjustable, Fixed Setting	B 300 - 1500 psi (20 - 105 bar), 1000 psi (70 bar) Standard Setting	V Viton
C* Tamper Resistant - Factory Set	C 1000 - 6000 psi (70 - 420 bar), 1000 psi (70 bar) Standard Setting	
	D 200 - 800 psi (14 - 55 bar), 400 psi (30 bar) Standard Setting	
	E 150 - 400 psi (10 - 28 bar), 200 psi (14 bar) Standard Setting	
	S 50 - 200 psi (3,5 - 14 bar), 100 psi (7 bar) Standard Setting	

Additional Options

The following options are not widely used and may be application specific. Please contact your Sun distributor for application information.

F	Hex Head Screw with Locknut
J	Capped Screw Adjustment
K	Handknob
M	Capped Screw Adjustment with Lockwire Holes
Q*	Capped and Lockwired

Customer specified setting stamped on hex +$1.10

*Special Setting required, specify at time of order

Related Information :

- Explanation of Sun cartridge control options - US units.
- Explanation of Sun cartridge control options - metric units.
- Two-piece, floating cartridge construction.

Special Notes :

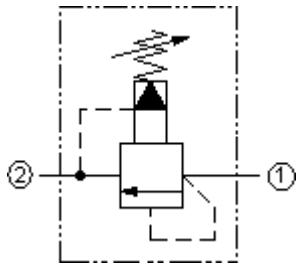
- U.S. Patent #4,742,846; European Patent Pending

Pilot operated, balanced piston relief valve

Capacity:
25 gpm (95 L/min.)

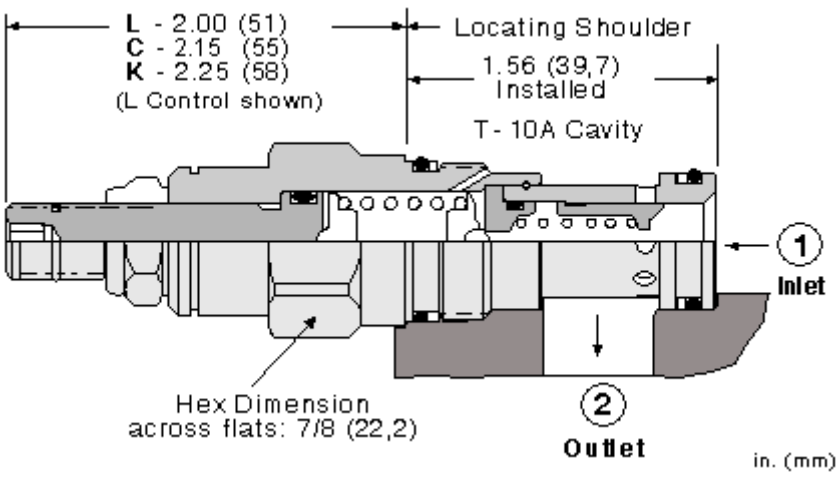
Functional Group:
Products : Cartridges : Relief : 2 Port : Pilot Operated, Balanced Piston

Model:
RPEC



Product Description

Pilot-operated, balanced-piston relief cartridges are normally closed pressure regulating valves. When the pressure at the inlet (port 1) reaches the valve setting, the valve starts to open to tank (port 2), throttling flow to regulate the pressure. These valves are accurate, have low pressure rise vs. flow, they are smooth and quiet, and are moderately fast.



Technical Features

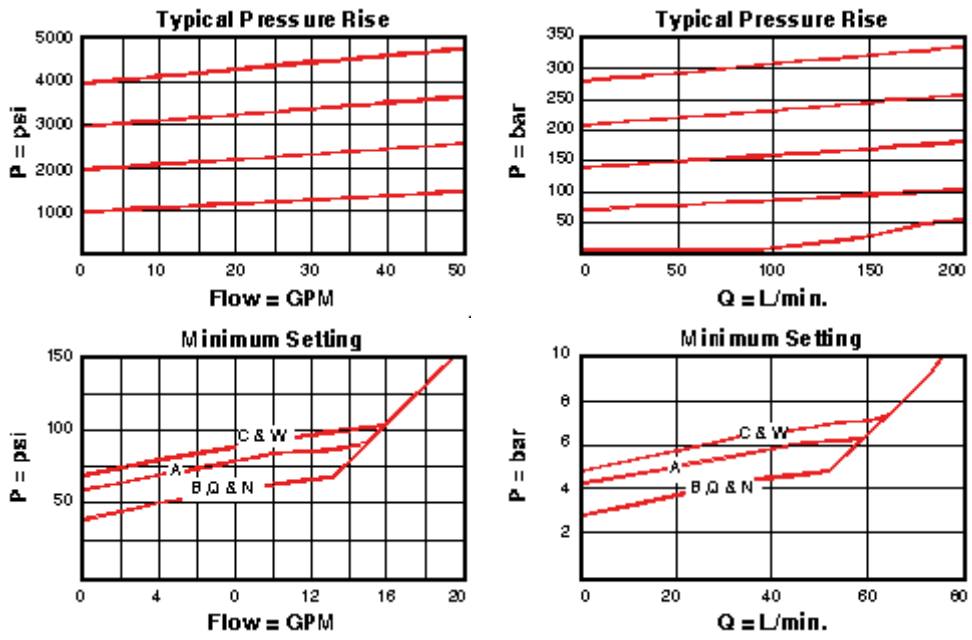
- Will accept maximum pressure at port 2; suitable for use in cross port relief circuits. If used in cross port relief circuits, consider spool leakage.
- Not suitable for use in load holding applications due to spool leakage.
- All 2-port relief cartridges (except pilot reliefs) are physically and functionally interchangeable (same flow path, same cavity for a given frame size).
- Incorporates the Sun floating style construction to eliminate the effects of internal parts binding due to excessive installation torque and/or cavity/cartridge machining variations.
- Main stage orifice is protected by a 150 micron stainless steel screen.
- Back pressure on the tank port (port 2) is directly additive to the valve setting at a 1:1 ratio.
- Stainless steel cartridge options P or W are intended for use within corrosive environments with all external components manufactured in stainless steel or titanium. Internal working components remain the same as the standard valves.

Technical Data

	U.S. Units	Metric Units
Cavity	T-10A	
Capacity	25 gpm	95 L/min.
Adjustment - Number of Clockwise Turns to Increase Setting	5	5
Factory Pressure Settings Established at	4 gpm	15 L/min.
Maximum Operating Pressure	5000 psi	350 bar
Maximum Valve Leakage at 110 SUS (24 cSt)	2 in/min.@1000 psi	30 cc/min.@70 bar
Response Time - Typical	10 ms	10 ms
Valve Hex Size	7/8 in.	22,2 mm
Valve Installation Torque	30 - 35 lbf ft	45 - 50 Nm
Adjustment Screw Hex Socket Size	5/32 in.	4 mm
Adjustment Nut Hex Size	9/16 in.	15 mm
Adjustment Nut Torque	108 lbf in.	12 Nm
Model Weight	.30 lb	0,15 kg
Seal Kits	Buna: 990-010-007	
Seal Kits	Viton: 990-010-006	

Related Information

Materials of Construction



Option Selection

RPEC-L A N

Preferred Options

Control	*Adjustment Range*	*External Material/Seal Material*
L Standard Screw Adjustment	A 100 - 3000 psi (7 - 210 bar), 1000 psi (70 bar) Standard Setting	N Buna-N
	W 150 - 4500 psi (10,5 - 315 bar), 1000 psi (70 bar) Standard Setting	

Standard Options

C* Tamper Resistant - Factory Set	B 50 - 1500 psi (3,5 - 105 bar), 1000 psi (70 bar) Standard Setting	P Stainless/Buna-N
F Hex Head Screw with Locknut	C 150 - 6000 psi (10,5 - 420 bar), 1000 psi (70 bar) Standard Setting	V Viton
K Handknob	N 60 - 800 psi (4 - 55 bar), 400 psi (30 bar) Standard Setting	W Stainless/Viton
O Handknob with Panel Mount	Q 60 - 400 psi (4 - 25 bar), 200 psi (14 bar) Standard Setting	

Additional Options

The following options are not widely used and may be application specific. Please contact your Sun distributor for application information.

J Capped Screw Adjustment	D 25 - 800 psi (1,7 - 55 bar), 400 psi (30 bar) Standard Setting	
M Capped Screw Adjustment with Lockwire Holes	E 25 - 400 psi (1,7 - 28 bar), 200 psi (14 bar) Standard Setting	
Q* Capped and Lockwired	G 60 - 3000 psi (4 - 210 bar), 1000 psi (70 bar) Standard Setting	
R* Lockwired Screw Adjustment	H 30 - 3000 psi (2 - 210 bar), 1000 psi (70 bar) Standard Setting	
W* Max. Setting Limiter	K 75 - 1500 psi (5 - 105 bar), 1000 psi (70 bar) Standard Setting	
Y* Max. Setting Limiter with Handknob	P 40 - 400 psi (2,8 - 28 bar), 200 psi (14 bar) Standard Setting	
	V 150 - 800 psi (10,5 - 55 bar), 400 psi (30 bar) Standard Setting	

Customer specified setting stamped on hex +$1.10

*Special Setting required, specify at time of order

Related Information :

- Explanation of Sun cartridge control options - US units.
- Explanation of Sun cartridge control options - metric units.
- Two-piece, floating cartridge construction.

Functional Group:

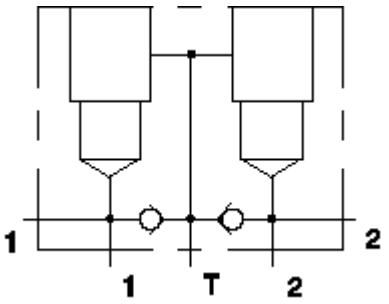
Products : Manifolds : Line mount : Relief : 2 Port : Cross port with make up checks

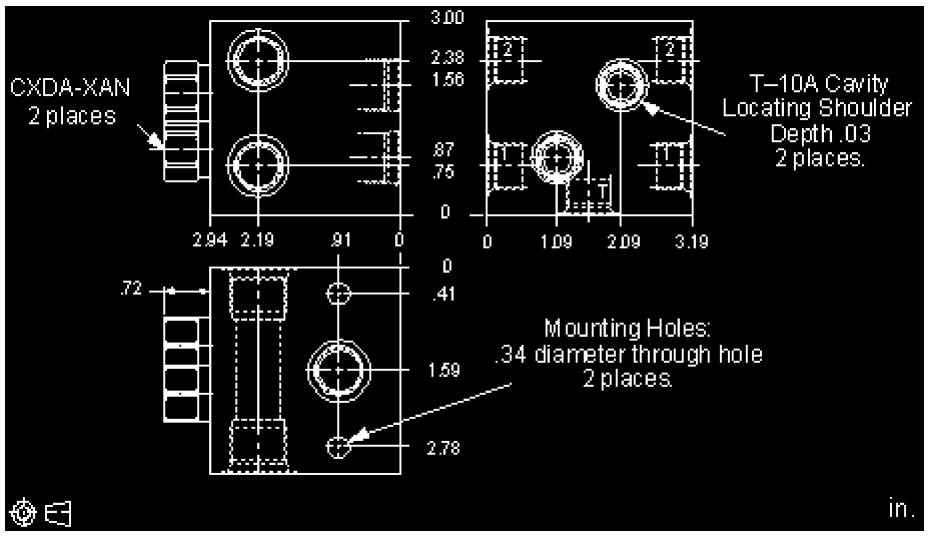
Model:

FMJ

Aluminum Body Pressure Rating: **3000 psi (210 bar)**

Ductile Iron Body Pressure Rating: **5000 psi (350 bar)**





Port Headings and Sizes:

All Ports

SAE 8

Technical Data

	U.S. Units	Metric Units
Cavity	T-10A	
Body Features	Cross port with make up checks	Cross port with make up checks
Body Type	Line mount	Line mount
Interface	None	None
Number of Cavities	2	

Option Selection:

Model Code	Description
FMJ	Aluminum
FMJ/V	Aluminum/Viton
FMJ/S	Iron
FMJ/Y	Iron/Viton

Special Notes :

No Special Notes available for selected Model.

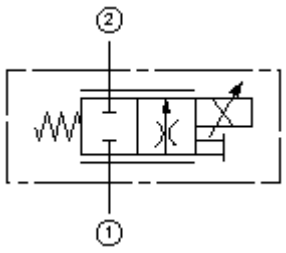
Electro-proportional flow control valve - normally closed

Capacity:
7 gpm (28 L/min.)

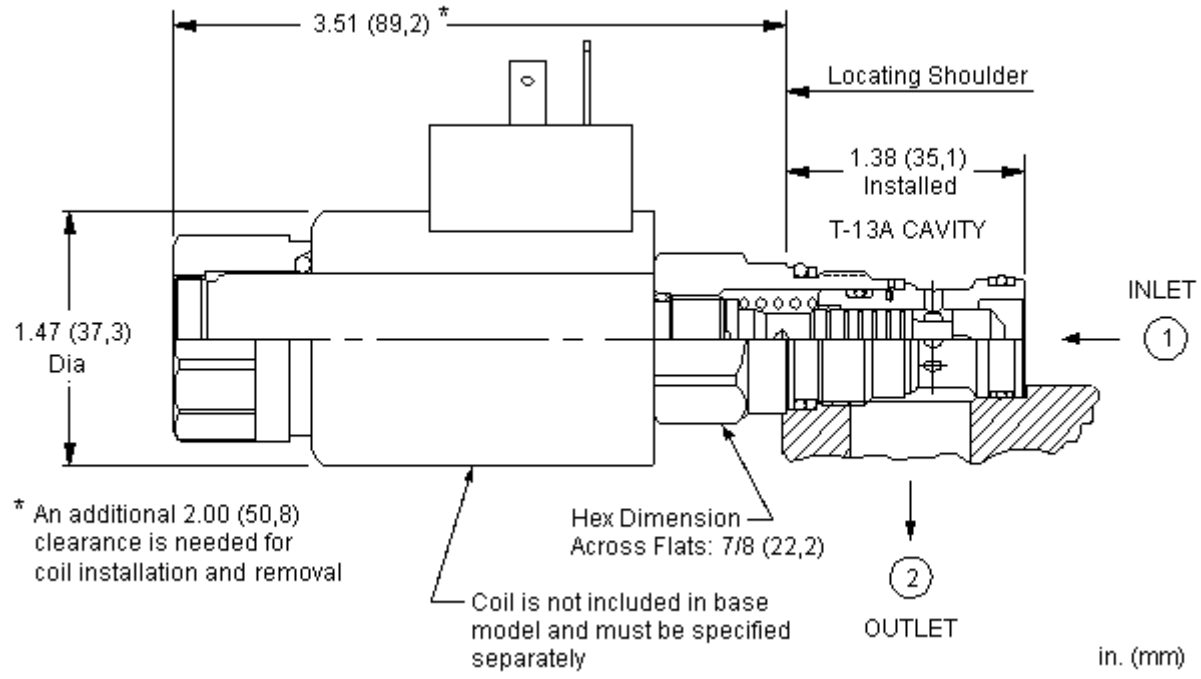
Functional Group:
Products : Cartridges : Flow Control : Electro-Proportional Flow Control : Normally Closed Throttle

Model:
FPCC

Product Description



This valve is a normally-closed, electro-proportional throttle. The valve is spring biased closed. Energizing the coil generates an opening force on the spool proportional to the command current and this force is countered by the spring and flow forces. This force balance creates a metering orifice whose effective size is proportional to the current. The valve exhibits a large degree of self-compensation in the 1 to 2 direction and will provide proportional flow control in the 2 to 1 direction with the addition of an external compensator. Full reverse flow (2 to 1) with 100% command in the 2 to 1 direction is possible without a compensator under all conditions.



Technical Features

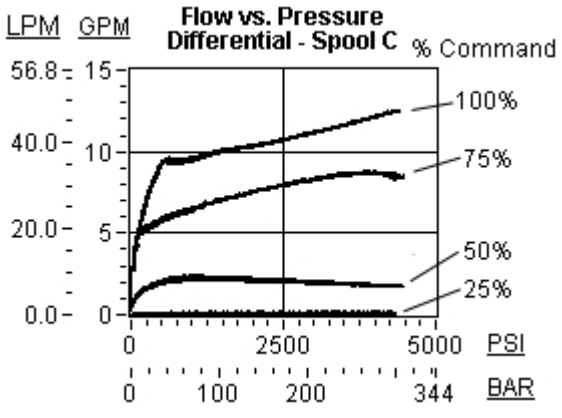
- Available in either a normally open or normally closed configuration with three different capacity ranges.
- Low leakage levels in the closed position.
- A manual push-type override is a standard feature. Additional override options are available.
- Incorporates the Sun floating style construction to eliminate the effects of internal parts binding due to excessive installation torque and/or cavity/cartridge machining variations.
- Capable of operating with pressures up to 5000 psi.
- Coils are interchangeable with Sun‘s other full flow, solenoid-operated valves and can be mounted on the tube in either direction.
- For optimum performance, an amplifier with current sensing and adjustable dither should be used. Dither should be adjustable between 100 - 250 Hz.

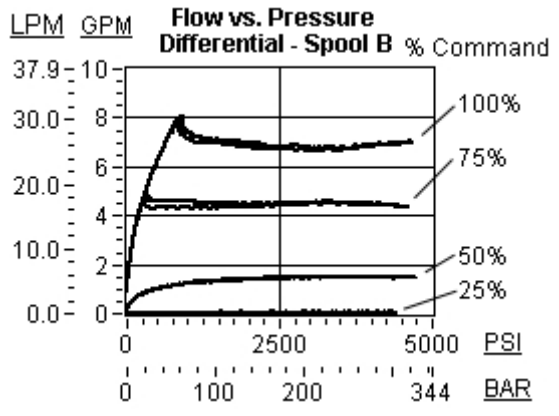
Technical Data

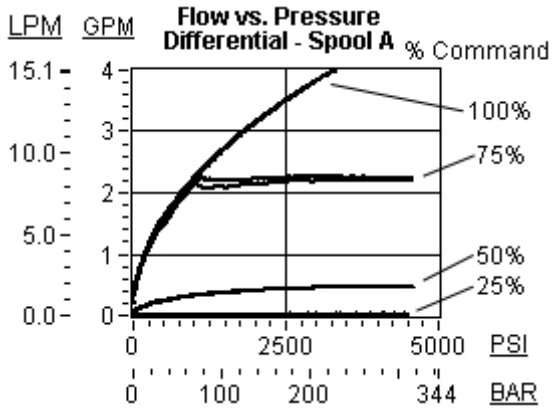
	U.S. Units	Metric Units
Cavity	T-13A	
Capacity	7 gpm	28 L/min.
Hysteresis (with dither)	<4%	<4%
Hysteresis with DC input	<8%	<8%
Linearity (with dither)	<2%	<2%
Repeatibility (with dither)	<2%	<2%
Deadband, nominal (as a percentage of input)	25%	25%
Maximum Valve Leakage at 110 SUS (24 cSt)	6 in/min.@3000 psi	100 cc/min.@210 bar
Solenoid Tube Diameter	.75 in.	19 mm
Valve Hex Size	7/8 in.	22,2 mm
Valve Installation Torque	30 - 35 lbf ft	45 - 50 Nm
Model Weight (with coil)	1.10 lb	0,50 kg
Seal Kits	Buna: 990-413-007	
Seal Kits	Viton: 990-413-006	

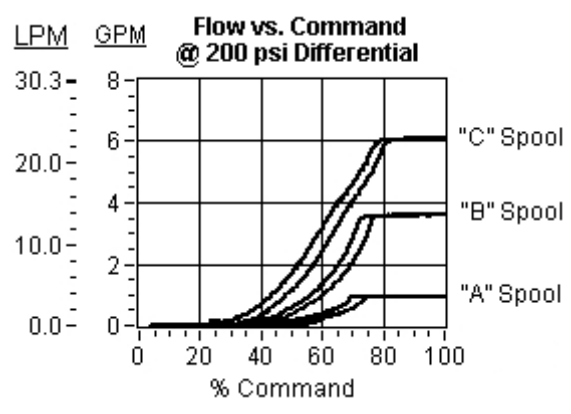
Related Information

Terms and Definitions









Option Selection

FPCC-M C N-***

Preferred Options

Control	*Flow Rate*	*External Material/Seal Material*
M Manual Override (Standard)	C .1 - 7 gpm (0,4 - 28 L/min.)	N Buna-N

Standard Options

D Twist/Lock (Dual) Manual Override	A .1 - 1.5 gpm (0,4 - 6 L/min.)	V Viton
L Twist/Lock (Detent) Manual Override	B .1 - 3.5 gpm (0,4 - 14 L/min.)	
T Twist/Lock (Momentary) Manual Override		

Coil Options

*** {No coil}	624 24 VDC AMP Junior Timer	912 12 VDC Deutsch
212 12 VDC ISO/DIN	712 12 VDC Twin Lead	924 24 VDC Deutsch
224 24 VDC ISO/DIN	724 24 VDC Twin Lead	
524 24 VDC SAE J858	812 12 VDC Metri-Pack	
612 12 VDC AMP Junior Timer	824 24 VDC Metri-Pack	

Additional Coil Options

The following options are not widely used and may be application specific. Please contact your Sun distributor for application information.

512 12 VDC SAE J858

Customer specified setting stamped on hex +$1.10

Related Information

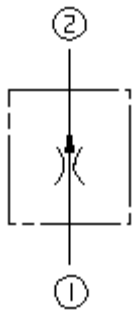
Twist/Lock Override Information

Fixed orifice, pressure compensated flow control valve

Capacity:
6 gpm (23 L/min.)

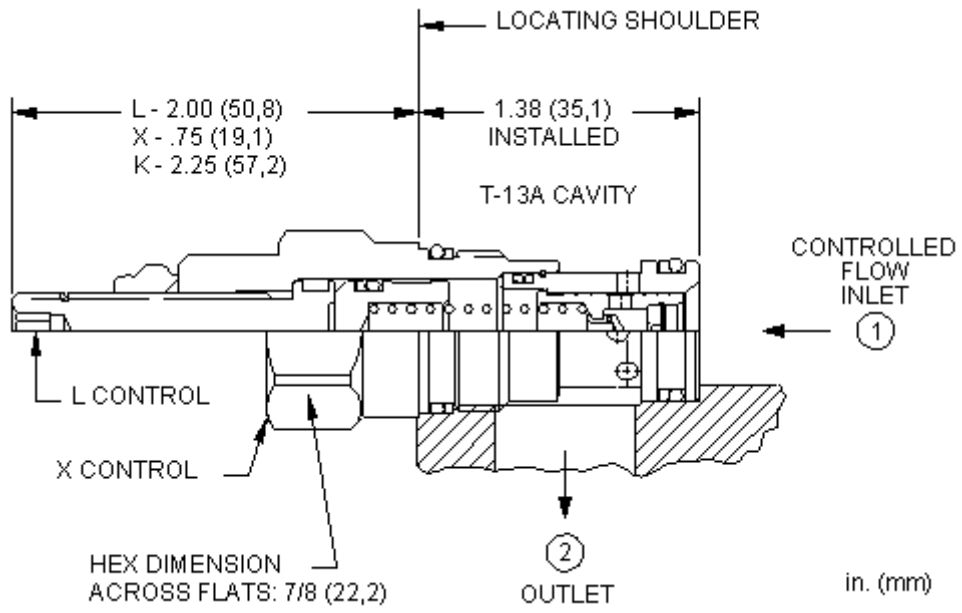
Functional Group:
Products : Cartridges : Flow Control : 2 Port : Fixed Orifice, Pressure Compensated

Model:
FXCA



Product Description

Fixed-orifice, pressure-compensated flow controls provide precise flow regulation for meter-in or meter-out applications where there may be wide pressure fluctuations. The flow setting is specified by the user and is set at the factory.

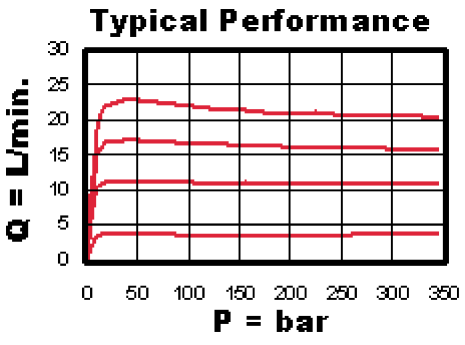


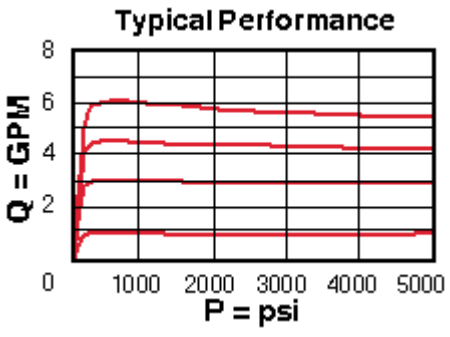
Technical Features

- Customer must specify a flow rating. Factory set flow ratings are within +/- 10% of the requested setting.
- Accurate pressure compensated control requires that a 200 psi (14 bar) minimum pressure differential be maintained across the valve.
- The tuneable control option provides +/- 25% variation from the nominal factory pre-set flow.
- Incorporates the Sun floating style construction to eliminate the effects of internal parts binding due to excessive installation torque and/or cavity/cartridge machining variations.
- All 2-port flow control cartridges are physically and functionally interchangeable (i.e. same flow path, same cavity for a given frame size). However, cartridge extension dimensions from the mounting surface may vary.
- The sharp-edged orifice design minimizes flow variations due to viscosity changes.
- Stainless steel cartridge options P or W are intended for use within corrosive environments with all external components manufactured in stainless steel or titanium. Internal working components remain the same as the standard valves.

Technical Data

	U.S. Units	Metric Units
Cavity	T-13A	
Capacity	6 gpm	23 L/min.
Maximum Operating Pressure	5000 psi	350 bar
Valve Hex Size	7/8 in.	22,2 mm
Valve Installation Torque	30 - 35 lbf ft	45 - 50 Nm
Adjustment Screw Hex Socket Size	5/32 in.	4 mm
Adjustment Nut Hex Size	9/16 in.	15 mm
Adjustment Nut Torque	108 lbf in.	12 Nm
Model Weight	.30 lb	0,15 kg
Seal Kits	Buna: 990-010-007	
Seal Kits	Viton: 990-010-006	





Option Selection

FXCA-X A N

Preferred Options

Control	*Setting Range*	*External Material/Seal Material*
L Tuning Adjustment	A* Replaceable Orifice .1 - 6 gpm (0,4 - 23 L/min.)	N Buna-N

Standard Options

K Handknob

X* Not Adjustable

P Stainless/Buna-N

V Viton

W Stainless/Viton

Additional Options

The following options are not widely used and may be application specific. Please contact your Sun distributor for application information.

C* Tamper Resistant - Factory Set

M* Capped Screw Adjustment with Lockwire Holes

Q* Capped and Lockwired

B* Permanent Orifice .1 - 6 gpm (0,4 - 23 L/min.)

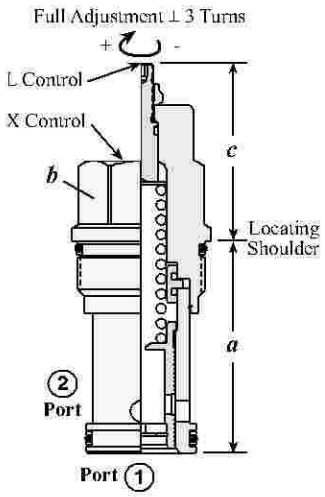
I Incomplete (no orifice) 10 gpm (40 L/min.)

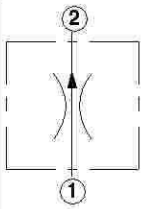
*Special Setting required, specify at time of order

Related Information :

- Explanation of Sun cartridge control options - US units.
- Explanation of Sun cartridge control options - metric units.

FIXED ORIFICE, PRESSURE COMPENSATED



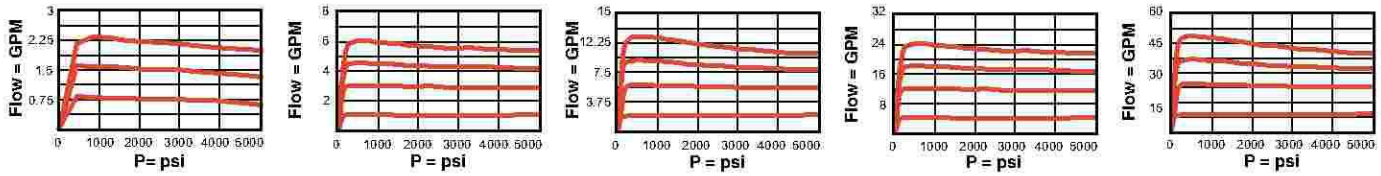


Nominal Capacity	*Typical Cartridge Model Code*	*Cavity*	*Cartridge Dimensions*					*Installation Torque (lb. ft.)*
			a	*b*	*c*			
					X	L	K	
.1-3 GPM	**FXBA – XAN**	T - 162A	1.22	3/4"	.82	2.11	2.55	25/30
.1-6.0 GPM	**FXCA – XAN**	T - 13A	1.38	7/8"	.75	2.00	2.25	30/35
.1-12.0 GPM	**FXDA – XAN**	T - 5A	1.62	1 1/8"	.69	2.12	2.38	45/50
.2-25 GPM	**FXEA – XAN**	T - 16A	2.44	1 1/4"	.97	2.44	2.69	150/160
.2-50 GPM	**FXFA – XAN**	T - 18A	3.13	1 5/8"	1.19	2.81	3.06	350/375

Performance Curves

FXBA **FXCA** **FXDA** **FXEA** **FXFA**

Typical Performance



- Maximum operating pressure = 5000 psi
- Customer must specify flow setting
- Accurate pressure compensated control requires that a 200 psi minimum pressure differential be maintained across the valve.
- The tuneable control option provides +/- 25% variation from the nominal factory pre-set flow.

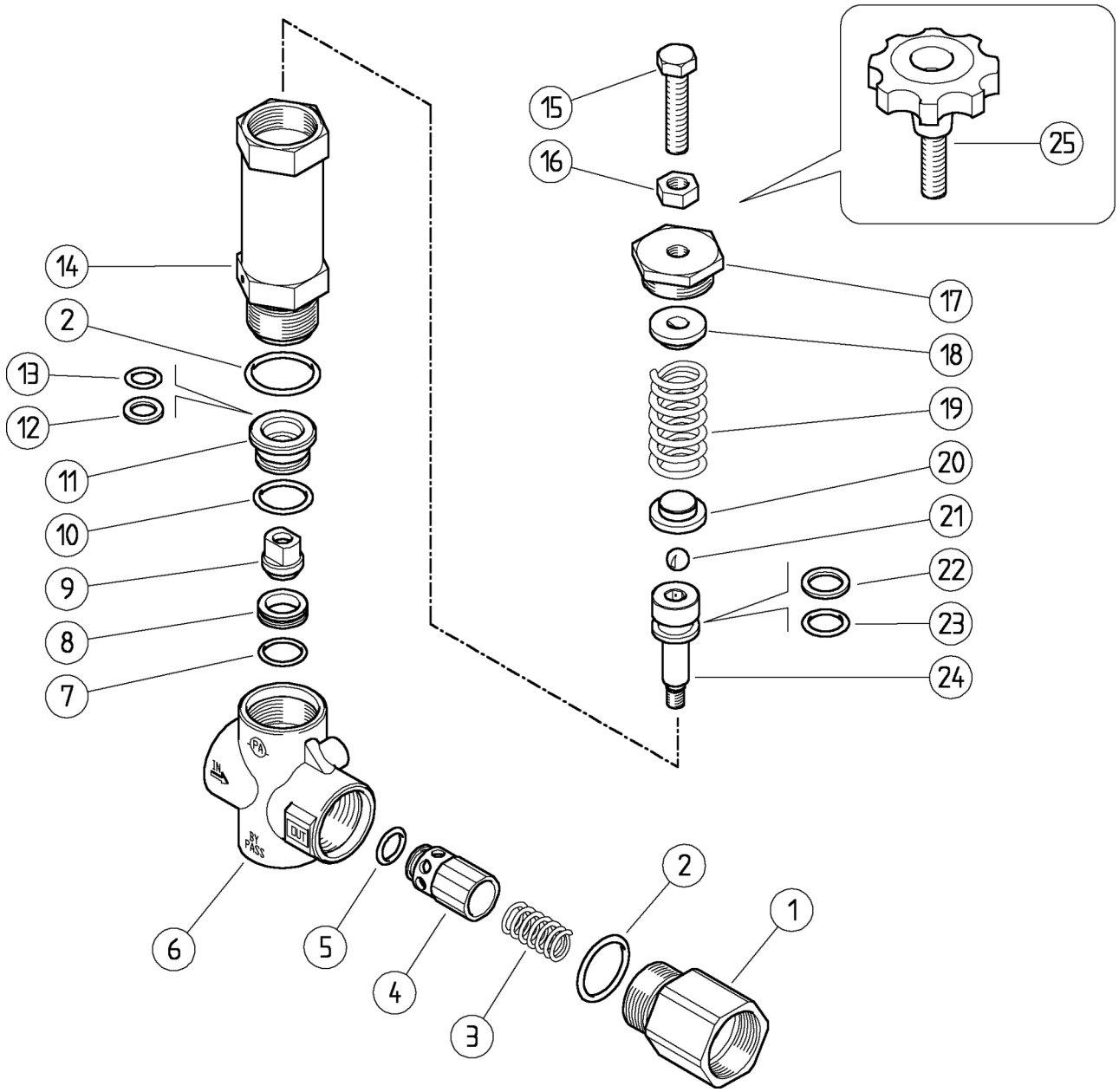
OPTION ORDERING INFORMATION **Model Codes printed in Red are Preferred Versions and most readily available**

FX ✶ A – ✶ A ✶

Nominal Capacity	*Control***	*Adjustment Range*	*Seal*
B .1-3 GPM	**X** Non-adjustable Factory set at customer specified flow	**A** Fixed Orifice	**N** Buna-N
C .1-6.0 GPM	**L** Tuning Adjustment +25% of customer specified flow	**Customer must specify flow**	**V** Viton
D .1-12.0 GPM			
E .2-25 GPM			
F .2-50 GPM	**K** Handknob with **L** control		

** *See page 162 for information on Control Options*

A4490 UNLOADER



Pos.	P/N	Description	Qty
1	60.5014.31	Shutter coupl., 1"Npt M brass	1
1	60.5026.31	Coupling, 1"Bsp F brass (1)	1
2	10.3206.01	O-ring, 2,62x28,25 mm	2
3	60.5013.51	Spring, 1,3x18x29 mm Sst. [Not Used - Remove Before Installing]	
4	60.5012.31	Shutter pin, brass [Not Used - Remove Before Installing]	
5	10.3314.00	O-ring, 5,33x12,06 mm	1
6	60.5001.35	Housing-VB200/60-150, 1"Npt brass	1
6	60.5024.35	Hous.-VB200/150-VRP170-175,1"Bsp FF brs (1)	1
7	10.3072.01	O-ring, 1,78x20,35 mm Ni 85	1
8	60.5002.51	Seat, 15,8x23x6 mm Sst.	1
9	60.5003.51	Shutter pin, M8 Sst.	1
10	10.3195.01	O-ring, 2,62x20,29 mm Ni 90	1
11	60.5010.31	Reduction bushing, brass	1
12	10.4080.00	Back-up ring, 12x18,2x2 mm	1

Pos.	P/N	Description	Qty
13	10.3234.00	O-ring, 3,53x10,69 mm	1
14	60.5009.31	Piston holder, brass	1
15	60.5011.61	Valve regulating screw, M10x44 z.pl. (2)	1
16	11.4629.00	Hex. nut, M10	1
17	60.5008.31	Upper plug, M10 brass	1
18	60.5005.31	Spring guide spacer, brass	1
19	60.5006.61	Spring, 6x30x62 mm z.pl.	1
20	60.5007.31	Spring guide spacer, brass	1
21	14.7461.00	Ball, 13/32" Sst.	1
22	10.4081.00	Back-up ring, 15,8x22x2 mm	1
23	10.3237.00	O-ring, 3,53x15,47 mm	1
24	60.5004.51	Piston, M8 Sst.	1
25	60.5021.22	Handwheel, 70mm -M10x44 (3)	1

GRAINGER
FOR THE ONES WHO GET IT DONE

Water Tank,17 1/2 H x 11 13/32 Dia

Water Tank, Precharged, Tank 5.3 Gal., Standard Tank Equivalent 12, Horizontal Tank Style, Gallons Drawdown @ 20-40 PSI 1.9, Gallons Drawdown @ 40-60 PSI 1.4, Gallons Drawdown @ 60-80 PSI 1.1, Gallons Drawdown @ 80-100 PSI 0.9, Precharge Pressure 20 PSI, Height 17 1/2 In., Dia. 11 13/32 In., Inlet/Outlet NPT (In.) 3/4 M, Max. Working Pressure 125 PSI, Pump Mount, Agency Compliance NSF/WSC, Warranty Length 5 Year

Grainger Item #	3GVT4
Price (ea.)	
Brand	DAYTON
Mfr. Model #	3GVT4
Ship Qty.	1
Sell Qty. (Will-Call)	1
Ship Weight (lbs.)	11.25
Usually Ships	Today
Catalog Page No.	N/A

Price shown may not reflect your price. Log in or register.

Additional Info

There is currently no additional information for this item.

Tech Specs

Item: Water Tank
Type: Precharged
Tank (Gal.): 5.3
Standard Tank Equivalent (Gal.): 12
Tank Style: Horizontal
Gallons Drawdown @ 20-40 PSI: 1.9
Gallons Drawdown @ 30-50 PSI: 1.6
Gallons Drawdown @ 40-60 PSI: 1.4
Gallons Drawdown @ 50-70 PSI: 1.25
Gallons Drawdown @ 60-80 PSI: 1.1
Gallons Drawdown @ 70-90 PSI: 1
Gallons Drawdown @ 80-100 PSI: 0.9
Precharge Pressure (PSI): 20
Acceptance Factor: 0.4
Height (In.): 17 1/2
Dia. (In.): 11 13/32
Inlet/Outlet NPT (In.): 3/4 M
Max. Working Pressure (PSI): 125
Pump Mount: Yes
Construction Material: Steel
Diaphragm: Butyl Rubber
Max. Temp. (F): 140
Agency Compliance: NSF/WSC
Warranty Length: 5 Year

Notes & Restrictions

There are currently no notes or restrictions for this item.

Optional Accessories

There are currently no optional accessories for this item.

Alternate Products

There are currently no alternate products for this item.

Repair Parts

A Repair Part may be available for this item. Visit our Repair Parts Center or contact your local branch for more information.