



Operation Manual for Hydraulic System

SunSource Fluid Power Systems
5750 Hillside Avenue
Cincinnati OH 45233
(800) 289-7770

Customer Purchase Order Number 4382

SunSource Job Number PJ43A

AFS TECHNOLOGY

ISO 9001:2015 Certified

Your Partner in Fluid Power

Dear Valued Customer,

SunSource is pleased to provide your custom made hydraulic system.

Our Quality Statement is as follows:

SunSource will provide our customers with the highest quality products and services focused on continuous improvement of our processes to provide on-time and error-free product and performance.

We are happy to meet your needs and are looking forward to continuing an ongoing partnership in the future

.

The following page is an ISO-Customer Complaint form. If there is anything that you are not satisfied with – either in the product or service, it is vital that you we receive your feedback. Please complete the following customer complaint document and fax or mail to:

*SunSource Fluid Power Systems Group
5750 Hillside Ave.*

Cincinnati, OH 45233

Fax#: 513-941-0583

Your feedback is needed not only to rectify the current situation, but to also ensure we meet all your future needs.



ISO-Customer Complaint Form

Documenting Complaint: WHEN COMPLETED FAX TO: 513-941-0583	Date:
Customer Name, Phone, etc.:	
Description of Problem/Complaint:	
Next Step:	

Preface

Hydraulic systems cannot be operated and maintained without following certain guidelines. We have attempted to compile a list of the most common precautions in use today.

This information is not intended as being all inclusive of recommended hydraulic practices, however the data provided should be considered general good practices to facilitate operation of your hydraulic equipment.

Installation

1. The most important practice to observe in assembling hydraulic systems is cleanliness. Serious damage can result quickly from foreign material in the system.
2. While in transit or during installation, both hydraulic units and hydraulic components may be subject to many usual conditions. Always inspect for damage or contamination (open ports, cracked or missing plugs, etc.) All hydraulic unit or component parts must be kept tightly plugged until final system connections are made.
3. Install components with secure mounting as required. Follow the schematic provided for piping. A pipe-sizing data sheet is enclosed for reference. Please refer to the chart located in the Flushing Procedures section. Careful attention must be paid to sizing and layout of hydraulic piping. Improper sizing or an excessive number of fittings can lead to loss of power and overheating. Additions to and deletions from the system must be designed into the system. A hydraulic system cannot be added to or capped off like a water system.
4. The importance of cleanliness in installations cannot be overemphasized. Be sure that all pipes are free of dirt, scale and rust. Field-fabricated reservoirs should be wiped down with an oiled, lint-free rag. No visible contaminants should remain in the reservoir. All pipes should be capped during installation to prevent sand and weld spatter from getting into the system.
5. Piping Recommendations: Hydraulic system piping must be clean and adequately sized for satisfactory system operation. If a schematic is provided, it will probably show suggested minimum sizing. Length of runs and practical experience should also be considered. Piping materials such as tubes, hoses and fittings must be clean. Iron pipe is usually the most troublesome. The best way to ensure you are starting with clean pipe is to use pipe that has been cleaned, pickled, lightly oiled and capped. Galvanized pipe should not be used. Be sure to use the proper tubing for your system pressure and pipe rating. Note: All hydraulic lines must be thoroughly flushed prior to connection of the components to the system.
6. Use compressed air to clean fittings as required in accordance with applicable safety precautions.
7. Examine pipe, fittings, hoses and tubing to be certain there are no scale, nicks, burrs or dirt present. Hoses, pipes, and tubing should be capped when stored.
8. Ream pipe and tubing ends to prevent swaged-over material from restricting flow or causing turbulence. Remove loose particles generated by reaming.
9. Never use high-pressure piping on pump inlet lines. The inside diameter is smaller and may restrict flow from reservoir to pump.
10. No burning or welding should be done near open hydraulic systems.
11. When using pipe sealing compound, leave the first two threads (inward) bare to keep sealing material from migrating into the system.

12. Do not use pipe compound on straight threads as this type of fitting depends on an "O" ring for sealing.
13. Select hoses adequate for the working pressures involved in the system. Refer to the schematic.

Hoses should:

Not be applied in configurations less than the published minimum bend radius for each style;

Be clamped at reasonable intervals in a manner to prevent chafing or rubbing between hoses or machine parts;

Be routed around or shielded from hot engine parts or exhaust manifolds or pipes;

Be protected by a grommet or other suitable material when penetrating a deck bulkhead;

Be limited in use to allow flexibility for vibration isolation and to facilitate awkward piping connections.

14. When field-fabricated reservoirs are used, construction should incorporate recognized hydraulic practices. Review selection and installation of hydraulic filters to be sure they meet the minimum recommended guidelines by the system component's manufacturer.
15. Always seal all reservoir openings after cleaning the reservoir. Periodic cleaning and oil changes should be part of every maintenance schedule.

General Cleaning and Flushing Requirements

To Achieve and Retain Satisfactory Initial Cleanliness Level

1. Chemically clean and treat internal system surfaces (components, tubes and hoses).
2. Perform hot oil flushing to reach target cleanliness level.
3. Inspect and verify that the cleanliness level was achieved.
4. Follow the proper steps when disassembling the flushing loops to prevent contaminants from penetrating the cleaned system. Seal off all components with plugs, blind flanges, etc.
5. Perform routine maintenance to stabilize contaminant levels to within control targets.

Strategy for Maintaining Cleanliness After Flushing

1. Prevent new contaminants from entering.
2. Select suitable system filters. New oil should be filled through a system filter or another suitable filter.

All new components and/or modules to be connected to the system must meet the preceding requirements. Perform new cleaning and hot oil flushing after component changes, assembly, disassembly or similar procedures have occurred.

Flushing Strategy Tips

- Connect circuits in series.
- Components that can be damaged by high fluid velocity or by fluids containing moisture, particles or flushing chemicals should be isolated from the flushing circuit and cleaned individually.
- Components that restrict the flow rate, and thereby increase the pressure drop, should be isolated from the flushing circuit and cleaned individually.
- Manifolds, blocks, pump stations, motors, reservoirs, assemblies and components should be delivered clean according to a specific procedure. If not clean, they must be flushed separately. This also applies where space does not allow flushing of installed piping system.

Component Cleanliness Level

Some components and assemblies are often connected to the main system after flushing. Their level of cleanliness must be at least as good as the desired cleanliness of the main system. The supplier should provide a cleanliness certificate with the components. The system assembler must clean these components according to specified procedures if cleanliness certificates are not available from the supplier. Cleanliness certificates should not be considered valid if the cleaning has not been performed to these requirements.

NOTE: If components contain anticorrosion agents not compatible with the system fluid, flush the components using system oil with 5 to 10 percent degreasing agents added to the flushing fluid. The degreasing agent should be selected to ensure no harm to component seals.

System Cleaning Preparation

Mechanical Tube Cleaning

Precision steel tubes - cut, graded and free from scale and corrosion - should be subjected only to chemical cleaning and hot oil flushing. Welded tubes should be mechanically cleaned inside by a plastic pig. A pig, also referred to as a go-devil or rabbit, is a plug with brushes, scrapers and rollers on its periphery. It moves under the oil pressure through a pipeline and cleans it. This ensures the tubes and tube flanges are smooth and free from slag, welding beads (spatter) and foreign particles.

All tubes and hoses should be inspected and blown with highly filtered industrial compressed air. This removes most of the larger particles made by the cutting of tubes and hoses as well as the mounting of fittings.

Components Dismantled Prior to Flushing

To ensure proper cleaning is achieved in all parts of the system and to avoid damage to sensitive components, certain parts should be by-passed or dismantled during cleaning. Each component or subsystem should be cleaned to the required cleanliness level as a part of a flushing circuit or in separate circuits. Partitioning of the overall system is typically needed to achieve this. To clean the pipe system, disconnect all components and subsystems that restrict the flow and those components that can be damaged during cleaning and flushing.

Chemical Cleaning and Hot Oil Flushing

Each circuit should be connected to achieve the specified fluid velocity and Reynolds number, as well as the fluid pressure in all components, lines and fittings. Avoid flushing configurations that can lead to settling of particles in quiescent zones, dead legs, etc. The pressure and flow capacity of the cleaning/flushing rig must also be considered.

Chemical Cleaning

Chemical cleaning, according to the DEWA DPI System, consists of a specially developed group of chemicals that can be used in series in the same pickling reservoir. DEWA is Greek for “green and vigorous.” DPI stands for degreasing, pickling and inhibiting. Developed by the Norwegian company DPI Chemical Industries AS, this patented system is used in the United Kingdom and other countries. All the chemicals are water-soluble, environmentally friendly and inorganic.

The cleaning sequence is divided into five phases:

Phase I -Alkaline Degreasing and Pickling

Fill the reservoir with pure water. Heat it to 122°F (50°C), up to a maximum of 176°F (80°C). Add Chemical A until it reaches pH 14. By circulating maximum flow rate for 30 minutes, any grease and oil film should have been removed. Control pH and temperature during processing.

Phase II - Pickling

Reduce the fluid pH to 5.5 by adding chemical B. Then add Chemical C until 10 percent (volume) is reached. Circulate maximum flow rate for 60 minutes. Control pH and temperature during processing.

Phase III - Neutralizing

Continue to circulate the fluid as you add Chemical D until reaching pH 7.5. Keep the temperature as in Phase I. Circulate maximum flow rate for 30 minutes. Control pH and temperature.

Phase IV - Preservation (corrosive steel)

A corrosion inhibitor is not required if the time between chemical cleaning and hot oil flushing is less than 24 hours. If this condition is not fulfilled, add 2 to 4 percent (volume) of Chemical E. Continue circulation for 30 minutes without

heating. The fluid is thinned out with 4 to 5 percent water before it drains into the standard sewers. Control pH before draining.

Phase V -Drying

Dry the tubes with warm, dry air within 30 minutes after neutralization. Use high quality filtered and oil/water separated compressed air or cleaned nitrogen. The easiest way to control achieved dryness is to check moisture content during the following hot oil flushing.

Minimum Process Equipment Required

- The pickling unit requires a reservoir, pump, filter and heating facility. It is preferred to have a fluid velocity of 3 m/sec. (106 ft./sec.). The filter should be selected according to the same requirements as for the hot oil flushing rig.
- A supply of dry, clean and warm air or nitrogen is needed. It is important that the air is absolutely free of any oil content.
- Special flanges, manifolds and connectors may be needed to assemble the components to be cleaned in series.

Process Control

To verify proper chemical cleaning, the following measurements must be documented during the process:

- pH analyses
- Temperature
- Volume of chemicals in each phase
- Flow rate

Hot Oil Flushing

Generally speaking, the required cleanliness level to target during flushing is half the level during normal operation. For example, if the normal operation level is ISO 15/13/11, flush to an ISO14/12/10. Requirements for cleanliness levels of both solid particles and moisture should be achieved.

"...the required cleanliness level to target during flushing is half the level required during normal operation."

Flushing Fluids

The flushing fluid should be compatible with the fluid used during normal system operation as specified by the client. The viscosity of the fluid at different temperature levels should be specified. As a guideline, standard flushing units normally provide sufficient turbulent flow if the viscosity is in the 10 to 15 cSt range at 104°F (40°C). Ideally, the flushing fluid should obtain that viscosity at no higher than 158°F (70°C).

Turbulent Flow, Fluid Velocity, Temperature and Pressure

With a Reynolds number equal to or greater than 4,000, the fluid is certain to have turbulent flow. This is required to remove particles from the surface inside tubes. To also prevent remaining contaminants from becoming suspended during operation, it is required that: Re-flushing number is equal or greater than 1.2 x Re-in service, but always a minimum of 4,000.

Example: a hydraulic system has a flow rate and tube diameter to achieve $Re=3,400$ in normal service. Flushing requires a minimum of $Re=4,080$. The fluid velocity (V) should not be less than 2 to 3 m/sec. (106 ft./sec.) in any part of the flushing loop. This prevents settling of particles inside tubes and hoses.

The coldest part in the flushing loop should have a minimum temperature of 122°F (50°C). This can be achieved by using a minimum flushing fluid supply of 140°F (60°C). In certain cases, this can be achieved only by insulating certain parts of the loop.

The pressure should be held to a minimum 3 to 5 bar (22 to 73 psi), measured downstream from the flushing circuit, before the return line filter and sampling port. Cleaning of ball, plug, butterfly and needle valves is an important part of the hot flush process. To ensure cleanliness has been reached in all zones, the hydraulic valves should be actuated to full-stroke movement during each step of the cleaning process.

Flushing Reservoirs, Filter Housings, Cylinders, Accumulators, Pumps and Motors

Each of these components should be cleaned in separate loops.

- Reservoirs - This is one of the most difficult components of a system to flush. The system reservoir should be cleaned manually then filled with flushing fluid. Use a flushing pump with an in-line filter to circulate and flush the reservoir.

- Filter housings - These units can be connected to the flushing loop or cleaned separately as in the case of the reservoir.
- Cylinders, accumulators, motors and pumps - Clean these separately. The components that have bidirectional movement must be actuated to full movement (stroke) to achieve volume flow of at least 10 times their internal volume.

Minimum Flushing Time

Once samples from the system indicate the specified cleanliness level has been reached, continue flushing for at least 30 more minutes at turbulent flow. This increases the probability of removing adherent particles from tube walls.

Verify Flushing Results

Each flushing loop should be unique and traceable. Create individual drawings or use suitable piping and instrumentation diagrams (P&IDs). Mark position of sampling points for temperature, flow and oil samples.

Document all parameters such as startup time, temperature, flow, particle contamination level and moisture and finish time. It is recommended that a uniform and consistent method of documentation be used.

Third-party verification may be needed to confirm the cleanliness level of the final flushing loop and the complete system.

Flushing Skid

A flushing procedure should be adapted to the conditions of the flushing rig. To obtain sufficient results, the following criteria must be met:

- The filter system should have sufficient capacity and performance to remove both solid particles and moisture to the required level, within a reasonable time.
- The original filters in the system to be flushed should not be used as flushing filters. The flushing filter is important for two essential reasons: 1) it determines the final cleanliness level, and 2) it determines the rate at which this level can be reached.

- A common practice seen lately is to over-specify the filters. A filter with B3>100 with a pressure differential indicator is suitable as long as the dirt-holding capacity is sufficient. Also, it is important for the indicator to provide a warning long before actual fluid by-pass.
- There are several options for moisture removal. These include water-absorbing filter elements, coalescing filters, oil purifiers (such as vacuum distillation), and simply replacing the oil.
- In normal conditions, a water-absorbing filter should be sufficient, assuming the moisture levels are low. Certain synthetic fluids must be dehydrated with oil purifiers.

NOTE: Flushing filters to remove solid particles should not be replaced by the water-removing filters.

- The pump unit should deliver flushing fluid with flow, velocity, viscosity and pressure ratings sufficient to clean the internal surfaces in the system. It should also transport the contaminants out of the system and into the downstream flushing filter.
- The fluid temperature should be monitored and controlled to verify that the oil viscosity provides sufficient turbulent flow in all parts of the flushing loop and at values within the specification for the actual flushing pumps.

Although system flushing can be a time-consuming and expensive process, it is often required, especially at the completion of construction and after a catastrophic component failure during service. Additionally, flushing should be performed as part of a periodic proactive maintenance activity for systems in service. Both the duration and cost of the flushing can be reduced if the system is designed for flushing by the equipment builder. Seek to optimize the flushing procedure for all subsystems and components. But first, systemize and manage the flushing as a complete process for all lines and components throughout the entire system. This will provide reliable service that performs according to design specifications.

References

1. Ito, T. (1984). Hydraulic System Flushing. FRH Journal.
2. Gibbons, Tom. (1998). Improved Flushing Techniques for Turbine Lube Systems. Pall Corporation Presentation.
3. ISO5910 Hydraulic Fluid Power. Cleaning of Hydraulic Pipe Systems.
4. ISO5911 Hydraulic Fluid Power. Methods for Coding Levels of Contamination by Solid Particles.
5. Mator Procedure FP104E rev.01. (1) Pipe System Cleaning and Testing. (2) Chemical Cleaning, Hot Oil Flushing and Pressure Decay Testing.
6. Molen Kjemi AS, DEWA DPI Chemical Cleaning System.
7. Tom Odden, Mator AS, "Cleaning and Flushing Basics for Hydraulic Systems and Similar Machines". Machinery Lubrication Magazine. July 2001

Start-Up

1. Fill the reservoir with fluid as recommended by the pump manufacturer (see pump data) which usually requires a premium grade hydraulic fluid with a viscosity index of 90 or higher. For applications with temperatures to 130° F, a fluid viscosity of 150 SSU at 100° F will provide a maximum pump service life. Automatic transmission fluid (Dextron Type D2) will usually prove satisfactory.

The reservoir filling should always be done through a 10 or finer micron filter. This may be a fill-line filter or possibly the system return filter. In any case, do not put unfiltered oil into your clean reservoir!

2. Connect electric motors to the proper electrical source, checking the motor nameplate for proper wiring of dual-voltage motors. Jog the motor to check rotation. Polyphase motors are bi-directional and proper rotation can be established by reversing any two power leads. Size the motor wiring for proper motor amperage and voltage per information on the motor nameplate.
3. All pumps and motors with external case drains should have cases filled with hydraulic fluid before running. Just as you would not crank an engine without crankcase oil, these components should not be run without pre-filling and should be plumbed so as not to drain the case.

Check levels and fill all gear boxes where applicable.

Caution!

Many engine-driven hydraulic pumps are ruined during engine start up. Be sure that the pump is disengaged or is ready to pump with an adequate supply of oil prior to engine start up.

4. Make sure all suction valves are open and all compensator and relief valves are backed up to the minimum setting. Caution: Relief valves on hydraulic units are preset at pressure shown on the schematics prior to shipment.
5. During start up of the pump, verify that it is priming properly. If the pump fails to prime, shut down immediately, vent discharge pipe to atmosphere and restart to establish fluid flow. Check suction valves to assure that they are open. Loosen hose or pipe connection on pressure side of pump. Jog pump drive and note oil flow to assure prime. Retighten loosened connections after priming. Unusual pump noise is often caused by air entering the pump suction line. The tightening of suction fittings will usually eliminate such problems.

6. Adjust pressure controls to settings recommended on the circuit drawings.
7. The electrical characteristics for electrically-operated valves are shown on the solenoid valve covers.
8. Important: After hydraulic unit has been started and all lines filled, replenish the oil in the reservoir to the proper level. This will insure that the oil cools properly and prevent cavitation of the pump.
9. After the first two (2) hours of system operation, inspect and clean or replace all filter elements to remove any contamination flushed out of the system components. Replacement elements are readily available from SunSource. Repeat this task every two (2) hours for the next eight (8) hours of operation then as needed. (See the Oil Maintenance section.)

Caution!

Simultaneously energizing both solenoids on double solenoid valves will cause coil burnout!

Important!

For most applications an operating temperature of 150° is considered maximum. At higher temperatures difficulty is often experienced in maintaining reliable and consistent hydraulic control. Component service life is also reduced, hydraulic fluid deteriorates and potential danger to operating personnel is created.

Fluid Maintenance / Filtration

Contamination in hydraulic fluid has been given a lot of attention by the industry. Research and testing of the effects of dirt, water, wear products, oil deterioration products and other contaminants in the oil are important factors in today's high performance hydraulic equipment.

Why Cleanliness?

The demand for even greater performance from smaller packages has greatly increased the need for keeping the oil clean. Wear occurs in all hydraulic systems. If dirt particles remain suspended in the oil, they act like a grinding compound and increase wear. Other foreign particles, particularly metal, have the same effect.

Hydraulic components are affected by contamination. Sticking and sluggishness can occur. Small controlling passages may become plugged. Dirt can prevent valves from seating, resulting in leakage and loss of control.

Hydraulic oil, itself, is affected by contamination. Water has a tendency to separate certain inhibitors from high-performance hydraulic oil, reducing its usable life. Other contaminants seem to be a catalyst or "helping hand" effect on oil oxidation. It has been demonstrated that fine particulate contamination actually reduces the safe operating temperature of a system. Extremely clean fluids can operate as much as 25° to 50° hotter than contaminated fluids without oxidation.

Hydraulic oil is kept clean by the filters. The periodic replacement of filter elements is mandatory for satisfactory operation. Replace elements immediately upon indication of an installed bypass indicator or every 500 hours of operation once the system is in production.

Hydraulic systems are precision units and their continued smooth operation depends on proper care. Keep them clean, change the oil filter at established intervals and follow prescribed maintenance.

Maintenance Instructions

Periodic Procedures

1. Check the reservoir oil level and add oil as required. The level must be maintained between the high and low marks on the sight gauge.
2. Check the operating temperature. 150° is considered maximum for most industrial applications.
3. If an external suction filter is used, check the filter indicator for dirty elements every two (2) hours for the first eight (8) hours of operation then clean or replace when necessary. Check the filter indicator once every day for the next five (5) days of operation and clean or replace when necessary. Check periodically thereafter at intervals that will prevent the filter from bypassing or cavitating the pumps.
4. Check the return filters as in Step 3. These are usually finer mesh filters and will require more frequent element changes or cleansing than the suction filter. Always change filters when the oil is changed.
5. At least once a year or every 4,000 operating hours the reservoir, pump, suction filter (if one is used) and air vent filter should be cleaned. Check the entire system at this time for possible future difficulties. Some applications or environmental conditions may dictate such maintenance is performed at more frequent intervals.
6. Make visual checks of all hose and tube connections. Regular checking and tightening of all hydraulic connections will help to assure trouble-free operation.
7. Periodically check pressure settings. The system was designed to operate at a specific pressure and increasing the pressure above that level will result in motor overload. The system should be operated at the minimum pressure required to do the intended function. The lower the system pressure, the longer system components can be expected to last.
8. Check pump/motor coupling periodically for misalignment. A flexible coupling should always be used with the shafts accurately aligned – parallel and angularly. Check set screws in couplings for loosening and tighten as required.
9. The reservoir cover should remain tightly sealed at all times except in the case of in-tank maintenance and periodic checks for in-tank leaks. This will prevent atmospheric contamination from entering the system.

Safety Precautions

Required for Hydraulic Machinery Operation & Maintenance

Although the scope of this manual covers only the hydraulic operation of the equipment, these safety precautions also apply to pneumatically-powered equipment and should be observed when appropriate.

The hydraulic equipment has been constructed using the highest standards of workmanship with industry accepted, state-of-the-art techniques, components and designs and has been inspected and tested for defects, workmanship and proper operation prior to shipment.

This equipment, however, may develop problems due to normal use, unforeseeable circumstances or abuse. It requires, therefore, proper operation and maintenance. In the course of performing these functions, personnel may be required to work on or near the equipment. The following precautions are given to avoid injury.

All safety requirements listed below are those generally applicable to hydraulically-powered machinery but are **not** intended to be an all-inclusive list. They are intended as **guidelines only** and will assist in avoiding risk of injury when followed by qualified, experienced personnel who understand the hazards of machinery operation and maintenance. These precautions should be included in the comprehensive safety program for the particular machinery, equipment, plant or process and overseen by personnel capable of analyzing any hazards associated with operating and maintaining the equipment.

1. Return all movable machine members to their normal startup condition, if possible, before starting unit.

Note: Many types of equipment may have parts of the machinery which may start rotating, rising, falling, reciprocating, etc. out of their proper sequence as soon as the hydraulic or pneumatic circuit is filled and pressurized which could result in injury to personnel or damage to machinery.

2. Be sure all personnel, product, etc. are clear of machinery before starting hydraulic unit.
3. Check to make sure any hydraulic connections which may have been removed, replaced or disconnected during shut down have been reconnected securely before starting hydraulic unit.

4. Return all valves (manual and control system operated) which may have been changed from their normal start-up condition during shut down back to start up condition before starting hydraulic unit.
5. Before shutting down hydraulic unit, block or lock in position any machine members which may move and cause injury to personnel or damage to product or equipment upon loss of hydraulic flow and pressure.
6. Clear all personnel and product from machinery before shutting down the hydraulic unit.
7. If hydraulic system has oil accumulators in circuit, drain pressurized oil from all accumulators as soon as hydraulic unit is shut down (if automatic drainage is not built into the circuit). If the accumulator has a shut off valve, close that valve also.
8. Shut down the hydraulic unit and relieve pressure from all pressurized accumulators, actuators and lines before removing, tearing down or performing maintenance on any remotely-located actuators, hoses, filters, valves, piping, etc.
9. Keep in place and maintain any equipment guards including coupling and chain guards and protective cowling. Do not wear loose clothing or jewelry that could get caught in moving parts.
10. In addition to any other company-mandated safety equipment worn by your personnel, make sure anyone in the vicinity of the hydraulic system during operation wears eye protection to reduce the risk of injury in the event of a hydraulic line rupture and high-velocity oil leak.
11. Check noise levels in the vicinity of the equipment and have personnel wear ear protection, if required, as set forth in OSHA regulations.
12. Any personnel observing or working on or adjacent to hydraulically-powered equipment must never place themselves in a location or position that could produce an injury in the event of:
 - a. A hydraulic line failure either with the unit running or shut down,
 - b. Power blackout, or electrical outage,
 - c. Pump or motor failure or,
 - d. Movement of machine members during a normal operating cycle or as a result of a component malfunction or failure.

13. Before removing or performing maintenance on any hydraulic system components containing electrical components (i.e. solenoid valves, switches, electric motors, etc.), shut off and padlock electrical power to the unit and/or control system. See Paragraphs 5 and 12 above before shutting off power. This applies to pneumatically controlled equipment as well.
14. Avoid locating equipment in any environment for which it was not designed and which may create a dangerous operating condition such as an explosive atmosphere (e.g., gas, dust), high heat (e.g., molten metal, furnace), chemicals, extreme moisture, etc.
15. Certain hydraulic fluids may be irritating or injurious to the eyes and skin. Check with your fluid suppliers to obtain this information. Avoid bodily contact with such fluids. Fire resistant or synthetic fluids should be especially guarded against.
16. Avoid the use of unauthorized or substitute parts and materials when servicing the equipment. Substitute parts or materials could produce a hazardous operating condition.
17. When piping your equipment, use only materials of adequate size and strength to suit the flows and pressures of the system. If a schematic has been provided, it will normally note the minimum suggested line sizes and lengths of runs. Practical experience may indicate use of line sizes larger than shown on the schematic. Consider all safety factors when selecting the strength of materials to allow for shock and over-pressure conditions which could occur.

Trouble Shooting Your Hydraulic System (Pg 1)

PROBLEM	POSSIBLE CAUSES	REMEDY
<u>Failure of pump to deliver fluid</u>	Low fluid level in reservoir	Add recommended oil and check level to be certain pump suction line inlet is submerged deeply enough to prevent air entering directly or by the formation of a vortex.
	Oil intake pipe or strainer plugged	Clean or replace
	Air leak in suction line, prevent priming or causing noise and irregular action of control circuit	Repair leaks
	Oil viscosity too heavy to pick up prime (especially in cold weather)	Use lighter viscosity oil or install a low density immersion heater (with steel element only)
	Wrong direction of rotation	Must be reversed to prevent damage to pump
	Broken pump shaft or parts broken inside pump	Replace
<u>Pump making noise</u>	Intake line, suction filter or pipe restricted	Clean intake, filter or eliminate restriction. Be sure suction line is completely open
	Air leaks 1) At pump intake piping joints 2) At pump shaft packing (if present) or seals 3) Air drawn in through inlet pipe opening	1) Tighten as required 2) Repair or replace 3) Be sure suction and return lines are below oil level in reservoir
	Reservoir air vent plugged	Air must be allowed to breathe in the reservoir. Clean or replace reservoir breather.
	Too high oil viscosity	Use lower viscosity oil. Check recommendations in start-up information
	Coupling misalignment	Re-align
	Worn or broken parts	Replace

Trouble Shooting Your Hydraulic System (Pg 2)

PROBLEM	POSSIBLE CAUSES	REMEDY
No pressure in the system	Pump does not deliver	Follow the remedies given for "Failure of Pump to Deliver Fluid"
	Bad pump-to-motor shaft connection	Check pump/motor coupling for breakage, stripped key or keyway and replace or repair
No pressure in circuit with Variable Volume Piston Pumps	Relief Valve Malfunction	
	1) Incorrect valve setting	1) Reset to specifications
	2) Valve leading or by-passing	2) Check main valve seat and pilot valve for scoring and dirt. Replace and clean
	3) Valve spring broken	3) Replace spring and reset
	Free re-circulation of oil to tank being allowed through system.	Check or relief valve may be stuck in open position or return line open unintentionally Vent Valve* is dumping flow through relief valve at low pressure. Bypass valve to tank is open.
		Open center 4-way Valve* is not shifted, dumping oil to tank. See "Solenoid Valve not Shifting" if valve is solenoid operated.
	Pressure compensated pump not compensating properly.	Check compensator for broken spring or contamination and repair as required.
	Relief valve setting is lower than pump compensator setting	Set relief to max system pressure and pump compensator to operating pressure at least 250 psi below relief.
	Hydrostatic drive not building torque (no system pressure)	See remedies in "Hydrostatic Troubleshooting" provided by the pump manufacturer.

Trouble Shooting Your Hydraulic System (Pg 3)

PROBLEM	POSSIBLE CAUSES	REMEDY
<u>Excessive wear of pump parts</u>	Sustained high-pressure above maximum pump rating Drive misalignment Air recirculation causing chatter in system Abrasive material in the oil Viscosity of oil too low at working conditions	Check relief valve maximum setting. Check and correct. Check air problems in pump making noise. Clean or replace filter and change oil. Check recommendations.
<u>Breakage of inside pump Housing</u>	Excessive pressure above pump rating Seizure due to lack of oil	Check relief valve maximum setting. Check reservoir level, oil filter and possibility of restriction in suction line. Replace.
<u>External oil leakage around pump shaft or housing</u>	Shaft packing or seals worn Damaged head packing seals excessive case pressure due to restricted case drain flow (back to tank) Excessive case pressure due to excessive drain flow Cracked housing	Replace. Check case drain line for a restriction and remove. Drain line may be too small; if small, line is creating back pressure, replace with larger line. Repair pump for excessive leakage from pumping element to case. Replace all damaged parts and seals.

Trouble Shooting Your Hydraulic System (Pg 4)

PROBLEM	POSSIBLE CAUSES	REMEDY
<u>Solenoid valve problem</u>	Solenoid burned out	<p>Replace solenoid coil. Check control voltage (high or low voltage will burn out coil).</p> <p>For double solenoid valves, check to see if both solenoids are being energized at the same time. Correct control circuit if this occurs.</p>
	No pilot pressure for shifting main spool	If valve is externally piloted, check pilot pressure source for adequate pressure.
	No pilot pressure for shifting main spool (continued)	<p>Check valve for proper internal plugs for ext. pilot.</p> <p>If valve is internally piloted, check for proper internal plugs for internal pilot.</p> <p>Clean all internal pilot passages and orifices of foreign particles and clogging.</p>
	No pilot drain	<p>Check to see if valve has proper internal plugs and orifices for inter. or ext. drain.</p> <p>If externally drained, check drain line and clear of any clogging.</p>
	Spool jammed by foreign particles of silt	Disassemble pilot valve and main valve and remove all foreign particles and silt. If a contamination or silting problem continues to reoccur, install filtration in the system to remove particles.
	Internal breakage or damage	Disassemble, examine and replace any damaged parts in pilot valve or main valve.

Trouble Shooting Your Hydraulic System (Pg 5)

PROBLEM	POSSIBLE CAUSES	REMEDY
<u>Cylinder won't develop full force or hold position when valve closes lines</u>	Leaking piston packing	Apply pump flow to one end and stroke cylinder until it bottoms out at end of stroke. Loosen return line at opposite end (from pressurized end) and measure leakage flow coming out. Any flow more than slow dripping requires new piston packing. Repeat for opposite end and stroke.
	Worn 4-way control valve	Disconnect cylinder lines at 4-way valve and plug. Shift valve to either position and check to see if full pressure builds up. If relief is not built into 4-way valve, check to see how much flow is leaking across to the tank port.
	Loss of system pressure	See previous trouble shooting guide.
<u>Cylinder loses force at some intermediate point in stroke</u>	Scored barrel	Repeat above except mechanically stop piston rod so piston is at point where force drops off. If leakage is determined, barrel must be repaired or replaced.
	Dented barrel	Examine barrel tube for dents at point where it loses force. Replace if tube is dented.

Trouble Shooting Your Hydraulic System (Pg 6)

PROBLEM	POSSIBLE CAUSES	REMEDY
<u>Excessive heating because of component conditions</u>	Relief valve set incorrectly	Readjust valve to system specifications pressure; usually 100-150 psi above compensator setting. Repair or replace pump.
	Internal oil leakage (pump)	
	Viscosity of oil too high	Check recommendations to start-up information. Repair or replace.
	Leaking valves	
	Improper functioning of oil cooler (if installed)	Inspect cooler and see that it is working properly.
	Restricted lines	If lines are crimped, replace; if partially plugged for any reason, remove obstruction.
	Scored or damaged rotor, valve plate, pistons and piston bores, or other internal moving parts	Check case drain line for excessive drain flow; if possible filter drain flow and check for metal (brass or steel) filings or particles; replace damaged parts.

Electric Motor Trouble Shooting (Pg 1)

PROBLEM	POSSIBLE CAUSES	REMEDY
<u>Motor runs excessively hot</u>	Overloaded	Reduce load or load peaks and number of starts in cycle.
	Blocked ventilation	Clean external ventilation system-check fan.
	a. TEFC's	Blow out internal ventilation passages.
	b. O.D.P.'s	Eliminate external interference to motor ventilation.
	High ambient temperature over 40 C (104 F)	Reduce ambient temperature or provide outside source of cooler air.
	Unbalanced input current	Balance supply voltage. Check motor leads for tightness.
<u>Won't start (just hums and heats up)</u>	Single Phased	Eliminate single ph. condition.
	Single Phased	Shut power off. Eliminate single phasing. Check motor leads for tightness.
	Rotor or bearings locked.	Shut power off. Check shaft for freeness of rotation. Be sure proper sized overload relays are in each of the 3 phases of starter. Refer to National Electrical Code.
<u>Runs noisy under load (excessive electrical noise or chatter under load)</u>	Single Phases	Shut power off. If motor cannot be restarted, it is single phased. Eliminate single phasing. Be sure proper sized overload relays are in each of the 3 phases of the starter. Refer to National Electrical Code.
<u>Excessive voltage drop (more than 2 or 3% of nominal supply voltage)</u>	Excessive starting or running load	Reduce load.
	Inadequate power supply. Undersized supply lines. High resistance connections.	Consult power company. Increase line sizes. Check motor leads and eliminate poor connections.

Electric Motor Trouble Shooting (Pg 2)

PROBLEM	POSSIBLE CAUSES	REMEDY
Overload relays tripping upon starting	Slow starting (10-15) seconds or more) due to high inertia load.	Reduce starting load. Increase motor size if necessary.
Running loaded	<p>Low voltage at motor Terminals Overload</p> <p>Unbalanced input current</p> <p>Single phasing</p> <p>Excessive voltage drop</p> <p>Too frequent starting or intermittent overloading</p> <p>High ambient starter temperature</p> <p>Wrong size relays</p>	<p>Improve power supply and/or increase line size. Reduce load or increase motor size. Balance supply voltage.</p> <p>Eliminate.</p> <p>Eliminate (see below).</p> <p>Reduce frequency of starts and overloading or increase motor size Reduce ambient temperature or provide outside source of cooler air. Correct size per nameplate current of motor. Relays have built in allowances for service factor current. Refer to National Electrical Code.</p>
Excessive vibration (mechanical)	<p>Out of balance:</p> <p>a. Motor mounting</p> <p>b. Load</p> <p>c. Sheaves or coupling</p> <p>d. Motor</p> <p>e. Misalignment on close coupled application</p>	<p>Be sure motor mounting is tight and solid. Disconnect belt or coupling- restart motor-if vibration stops, the unbalance was in load.</p> <p>Remove sheave or coupling-securely tape 1/2 key in shaft keyway and restart motor-if vibration stops, the unbalance was in the sheave or coupling. If the vibration does not stop after checking a, b, and c above, the unbalance is in the motor-replace the motor.</p> <p>Check and realign motor to the driven machine.</p>

Electric Motor Trouble Shooting (Pg 3)

PROBLEM	POSSIBLE CAUSES	REMEDY
<p>Noisy Bearings: (listen to bearings for the following)</p> <hr/>		
Smooth mid range hum	Normal fit	Bearing OK.
High whine	Internal fit of bearing too tight	Replace bearing-check fit.
Low rumble	Internal fit of bearing too loose	Replace bearing-check fit.
Rough clatter	Bearing destroyed	Replace bearing-avoid: <ol style="list-style-type: none"> a. mechanical damage b. excessive greasing c. wrong grease d. solid contaminants e. water running into motor f. misalignment on close coupled application g. excessive belt tension
<hr/>		
High input current (all three Phases)	Accuracy of ammeter readings	First check accuracy of ammeter readings on all three phases.
<hr/>		
Running idle (disconnected from load)	High line voltage 5 to 10% over nameplate	Consult power company-possibly decrease by using lower transformer tap.
<hr/>		
Running loaded	Motor overload	Reduce load or use larger motor.
	Motor voltage rating does not match power system voltage	Replace motor with one of correct voltage rating. Consult power company-Possibly correct by using a different transformer tap.

CUSTOMER:

AFS TECHNOLOGY

JOB #:

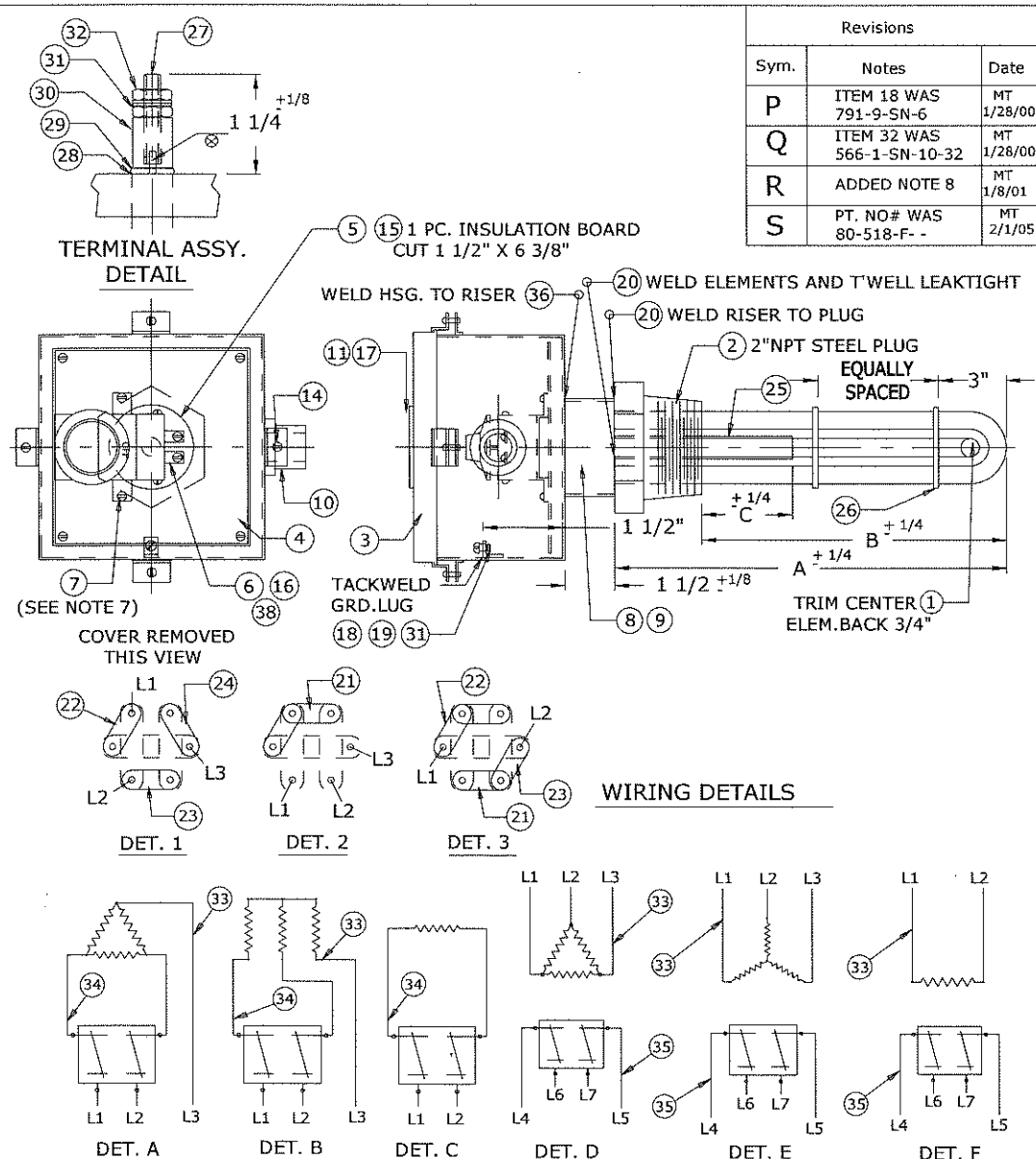
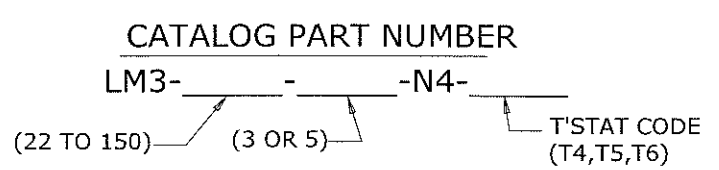
PJ43A

Description		Component Document Enclosed
LM3-30-5-N4T4	ACCUATHERM	X
B40030AFD2C605	ACT	X
LV2BS#12-2T	ANCHOR	X
A03SPS6S	DAMAN	X
BVAL-1500S-4321IEZN	DMIC	X
CVH05-1000S	DMIC	X
DMGV-S41	DMIC	X
CF-1P-210-A-SAE	DYNAMIC	X
DG4V3SOBLMFWB560	EATON VICKERS	X
RV510S035	EATON VICKERS	X
LFBN-HC280IE10C1.0-12B6	HYDAC	X
PX3111	IFM EFECTOR	X
K3VL60-B-1NRSS-PO	KAWASAKI	X
5201	LDI	X
ALG-5T	LDI	X
M182602B	MAGNALOY	X
M30012012	MAGNALOY	X
M300A1516	MAGNALOY	X
M370H5	MAGNALOY	X
7000-12341-0140500	MURR	X
700018141-0180500	MURR	X
KLT10QBSGS24TP	PARKER ARLON	X
SCE-20EL1606SSLP	SAGINAW CONTROLS	X
SCE-20P16	SAGINAW CONTROLS	X
02018ET3H256TC-W22	WEG	X
75-TH2R-025-CC	WIKA	X
30025D0006G4	WIKA	X

BILL OF MATERIAL					ITEM QUANTITY																			
ITM	DWG	PART NUMBER	DESCRIPTION	PSA	-1	-2	-3	-4	-5	-6	-7	-8	-9	-10	-11	-12	-13	-14	-15	-16	-17	-18	-19	-20
1	B	55-502-N-19	STOCK .430 ELEM.	S	3																			
1	B	55-502-N-20	STOCK .430 ELEM.	S		3																		
1	B	N-21					3																	
1	B	N-22						3																
1	B	N-23							3															
1	B	N-24								3														
1	B	N-25									3													
1	B	N-26										3												
1	B	N-27											3											
1	B	N-28												3										
1	B	N-29													3									
1	B	N-30														3								
1	B	N-31															3							
1	B	N-32																3						
1	B	N-44																	3					
1	B	N-45																		3				
1	B	N-46																			3			
1	B	N-47																				3		
1	B	N-48	STOCK .430 ELEM.	S																			3	
1	B	55-502-N-49	STOCK .430 ELEM.	S																				3
2	A	606-2-S-1	DRILLED PLUG	S	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
3	A	436-16-S-4	DRILLED HOUSING	S	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
4	A	583-4-F-2	SUB PANEL	S	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
5	A	456-1-F-19	INSULATION BOARD (IN/2)	P	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6
6	A	256-7-F-	T'STAT (SEE CODE)	P	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
7	A	681-5-SN-16-32	#8-32 SCREW	P	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
8	A	481-3-2-HA1	INSULATION SLEEVE (IN)	P	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
9	A	866-1-S-28	RISER TUBE	S	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
10	A	1007190	3/4" MEYERS HUB	P	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
11	A	556-20-A-1	NAMEPLT.	P	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

VOLT	240	480	240	480	240	480	240	480	240	480	240	480	240	480	240	480	240	480	240	480	240	480	240	480
PH	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
KW	2.25	2.25	3	3	3.75	3.75	4.5	4.5	6	6	7.5	7.5	9	9	10	10	12.5	12.5	15	15	15	15	15	15
DIM. A	13.5	13.5	19.06	19.06	21.38	21.38	26.25	26.25	34.25	34.25	41.75	41.75	49	49	53	53	66	66	79	79	79	79	79	79
DIM. B	11.94	11.94	17.5	17.5	19.81	19.81	24.69	24.69	32.69	32.69	40.19	40.19	47.44	47.44	51.44	51.44	64.44	64.44	77.44	77.44	77.44	77.44	77.44	77.44
DIM. C	6.44	6.44	6.44	6.44	6.44	6.44	6.44	6.44	6.44	6.44	6.44	6.44	6.44	6.44	6.44	6.44	6.44	6.44	6.44	6.44	6.44	6.44	6.44	6.44
WIRE DETAIL	1/A	1/D	1/A	1/D	1/A	1/D	1/A	1/D	1/A	1/D	1/A	1/D	1/A	1/D	1/A	1/D	1/A	1/D	1/A	1/D	1/A	1/D	1/A	1/D

- NOTES:
- 1.) STAMP NAMEPLATE WITH VOLT, WATT, PH, CATALOG NO. & DATECODE.
 - 2.) PAINT RISER & WELD AREAS CLASS B, PER PAINT PROCEDURE - 619-75-F-1.
 - 3.) PRESSURE CHECK & INSPECT PER PROCEDURE - 619-16-F-1.
 - 4.) TEST 240V UNITS AT 1200 BDV FOR 1 SEC. TEST 480V UNITS AT 2352 BDV FOR 1 SEC.
 - 5.) SEND T'STAT WIRING SCHEMATICS AS FOLLOWS:
926-153-F-1 ON UNITS -17,-19
926-409-F-1 ON UNITS -2,-4,-6,-8,-10,-12,-14,-16,-18,-20
 - 7.) DRILL OUT BRACKET ON T-STAT TO 7/32" DIA.



HSG./T'STAT CODE INFO:

(NEMA 4 HSG.W/RANCO 2-POLE 277V 25A)

T'STAT MFG. CODE	CATALOG HSG/T-STAT CODE	T'STAT TEMP. RANGE	T'STAT PART NO.
R	N4T4	0-100 F	256-7-F-2
S	N4T5	60-250 F	256-7-F-1
T	N4T6	150-550 F	256-7-F-3

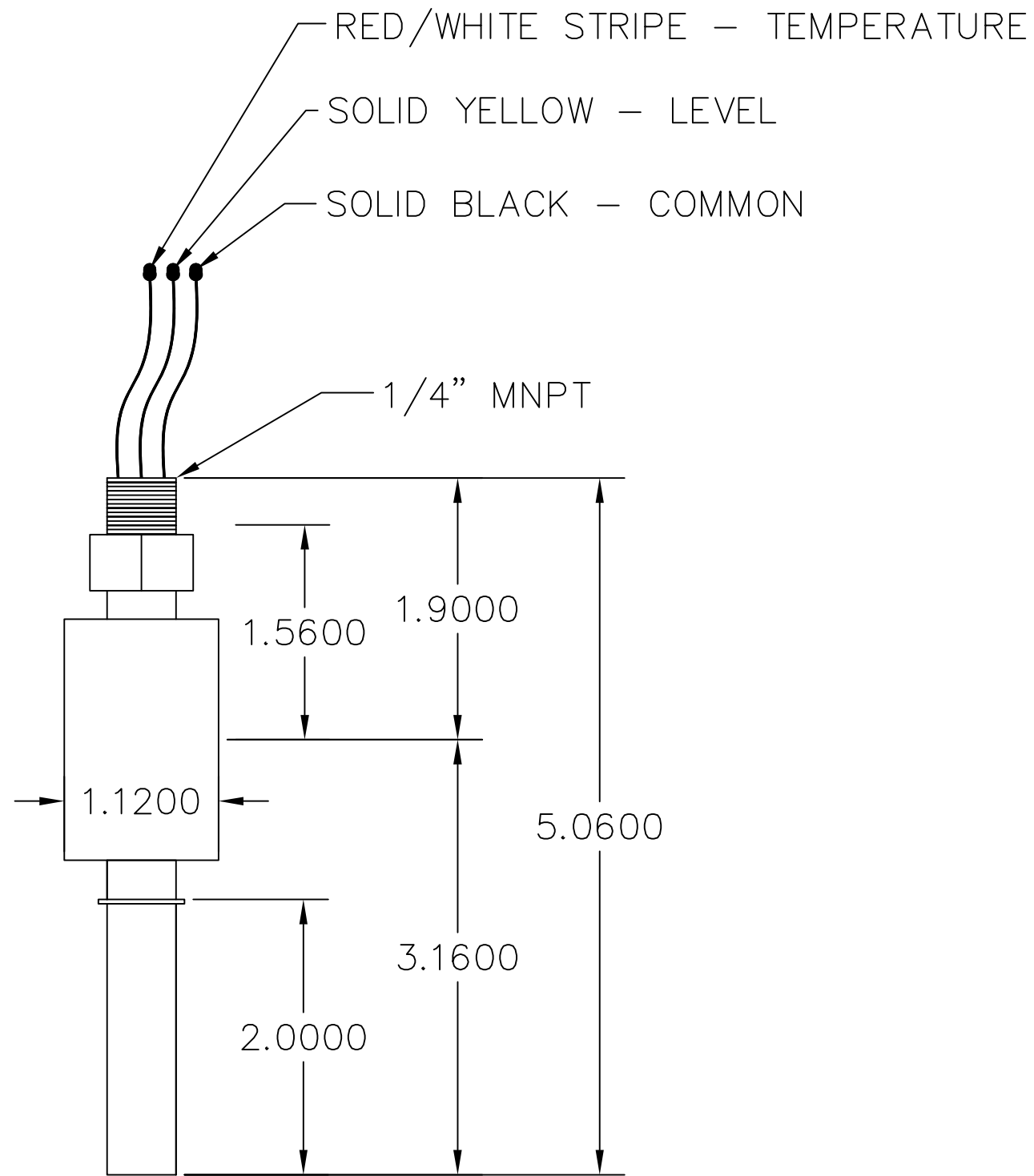
ASPEQ
HOLDINGS, INC.

Title **2"NPT (3).430D ELEM. (STEEL) PLUG HEATER W/NEMA 4 & T'STAT**

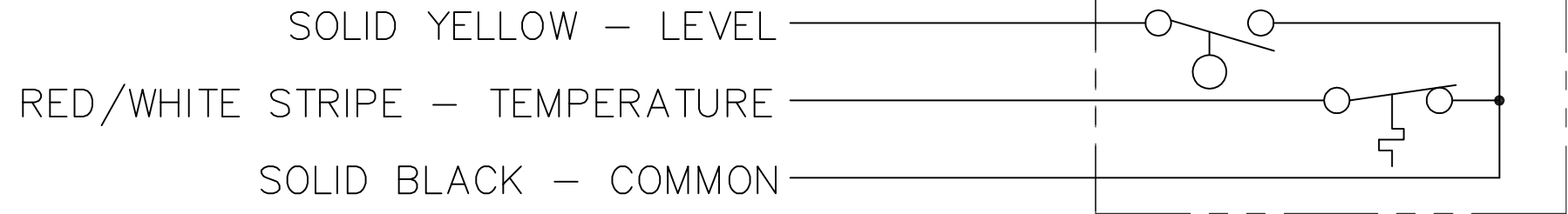
Do not scale dwg. tolerances unless otherwise specified.
Decimals .XX = +/- .010
.XXX = +/- .005 Angles = +/- 2
Fractions +/- 1/16

Confidential-This dwg. is the exclusive property of Accu Therm, Inc. not to be disclosed or reproduced in whole or in part without consent of Accu Therm, Inc. and is to be returned upon request.

Mtd.	Ref. CATALOG	Ref. No.	BM
DAH 2-14-96	Dwg. No.	80-518-N- -	Rev. Sht.
Approved Date		(R,S, or T)	S or
MT 1-28-00			



- * INVERT FLOAT TO CHANGE LEVEL SWITCH FUNCTION N.O. TO N.C. OR VICE VERSA.
- * TEMPERATURE CONTACT SPST N.C. OPEN ON RISE - 6.0C OR 140 F SETPOINT
- * ELECTRICAL LOAD RATINGS:
 - LEVEL SWITCH 70 VA, SPST
AC MAXIMUM, SWITCHING VOLTAGE 250
SWITCHING CURRENT 0.7 AMPS
 - TEMPERATURE SWITCH 1.0 AMPS @ 120 VAC ON SPST

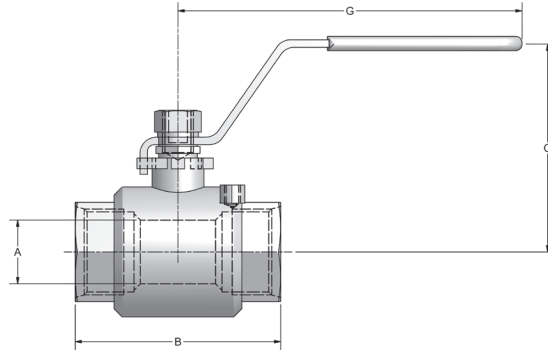
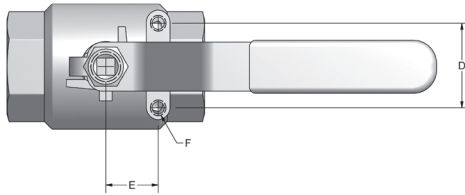


HYDRAULIC BALL VALVES

LV2B Series - 1000 WOG Stainless Steel



- All stainless steel construction
- Locking handles standard
- Ideal for suction, pressure and return lines
- Available in NPT & SAE threads
- Mounting holes standard on SAE #16 - #64



LV2B SERIES - NPT							
SIZE	A	B	C	D	E	F UNC	G
1/4"	.36	2.13	2.13	1.12	.49	N/A	4.33
3/8"	.50	2.13	2.17	1.12	.49	N/A	4.33
1/2"	.59	2.24	2.28	1.12	.49	N/A	4.53
3/4"	.79	2.68	2.40	1.12	.49	N/A	4.53
1"	.98	3.15	3.03	1.38	.91	N/A	5.04
1-1/4"	1.26	3.58	3.19	1.48	1.00	N/A	5.04
1-1/2"	1.50	4.06	3.54	1.48	1.00	N/A	6.10
2"	1.97	4.88	4.25	1.50	1.00	N/A	6.10
2-1/2"	2.56	6.30	5.20	N/A	N/A	N/A	9.06
3"	3.15	7.28	5.71	N/A	N/A	N/A	9.06

LV2B SERIES - SAE							
SIZE	A	B	C	D	E	F UNC	G
1/4"	.35	2.40	2.13	1.12	.49	N/A	4.33
3/8"	.47	2.40	2.17	1.12	.49	N/A	4.33
1/2"	.59	2.52	2.28	1.12	.49	N/A	4.53
3/4"	.79	3.23	2.40	1.12	.49	N/A	4.53
1"	.98	3.62	3.03	1.38	.91	1/4-20	5.04
1-1/4"	1.26	3.96	3.19	1.48	1.00	1/4-20	5.04
1-1/2"	1.50	4.23	3.54	1.48	1.00	1/4-20	6.10
2"	1.97	4.90	4.25	1.50	1.00	1/4-20	6.10
2 1/2"	2.56	6.30	5.20	2.25	1.18	1/4-20	9.06
3"	3.15	7.28	5.71	2.76	1.18	1/4-20	9.06
*4"	3.93	8.80	7.11	2.76	1.18	1/4-20	13.00

MODEL CODE:

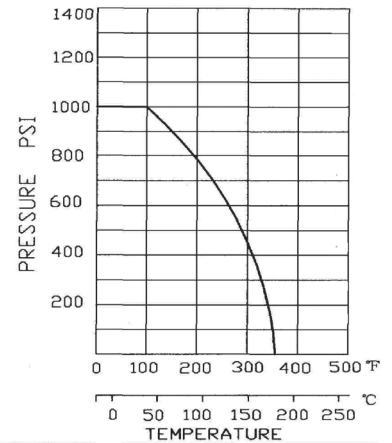
LV2B N 1/2" -2T

THREAD TYPE (N-NPT; S-SAE)

THREAD SIZE (EX. N1/2"; S#8)

COMPONENT MATERIALS		
COMPONENT	MATERIAL	QTY
VALVE BODY	ASTM A351 GR CF8M	1
TAILPIECE	ASTM A351 GR CF8M	1
BALL	ASTM A351 GR CF8M	1
STEM	316	1
BALL SEAT	PTFE	2
STEM SEAT	PTFE	1
STEM PACKING	PTFE	1
STEM GLAND	304	1
HANDLE	304	1
STEM LOCK WASHER	304	1
STEM NUT	304	1
HANDLE SLEEVE	VINYL	1
LOCK	304	1

PRESSURE-TEMPERATURE RATING



* 4"SAE - 500 PSI max for LV2BS#64-2T-MH

** For WOG Accessories refer to pages 67



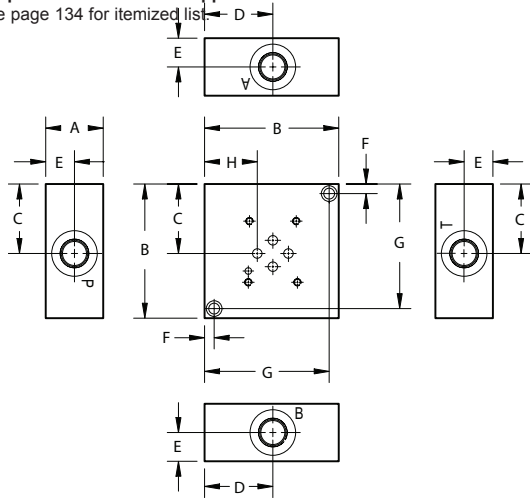
866-FLANGES | 513.527.4444 | Fax 513.527.4449

sales@anchorfluidpower.com | anchorfluidpower.com

D03 Subplates

Side Ported Subplate

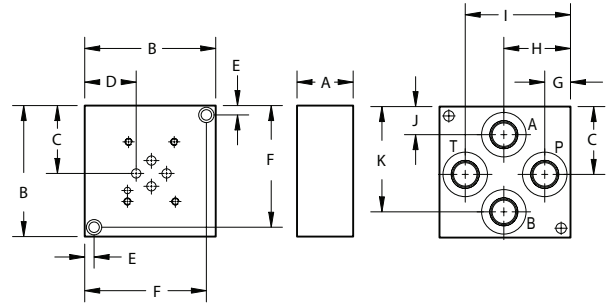
Valve mtg: UNC #10-24 x 0.63 DP or
Metric M5-0.8mm ISO 6H x [16] DP
Subplate hardware kit is supplied.
See page 134 for itemized list.



Dimension	A	B	C	D	E	F	G	H
*D03SPS4P	1.00	2.50	1.31	1.25	0.50	0.25	2.25	0.88
D03SPS6	[25.4]	[63.5]	[33.3]	[31.8]	[12.7]	[6.4]	[57.2]	[22.4]
D03SPS8	1.50	3.50	1.81	1.78	0.75	0.25	3.25	1.38
	[38.1]	[88.9]	[46.0]	[45.2]	[19.1]	[6.4]	[82.6]	[34.9]
D03SPS12	1.75	4.00	2.06	2.03	0.88	0.38	3.63	1.63
	[44.5]	[101.6]	[52.4]	[51.6]	[22.2]	[9.5]	[92.1]	[41.3]

Back Ported Subplate

Valve mtg: UNC #10-24 x 0.63 DP or
Metric M5-0.8mm ISO 6H x [16] DP
Subplate hardware kit is supplied.
See page 134 for itemized list.



Dimension	A	B	C	D	E	F	G	H	I	J	K
*D03SPB4P	1.00	2.50	1.31	0.88	0.25	2.25	0.66	1.28	1.91	0.75	1.88
	[25.4]	[63.5]	[33.3]	[22.4]	[6.4]	[57.2]	[16.7]	[32.5]	[48.4]	[19.1]	[47.6]
*D03SPB6B	1.00	2.50	1.25	0.84	0.25	2.25	0.51	1.25	1.98	0.52	1.97
	[25.4]	[63.5]	[31.8]	[21.4]	[6.4]	[57.2]	[13.0]	[31.8]	[50.4]	[13.2]	[50.0]
*D03SPB6[M,P,S,T]	1.00	2.50	1.31	0.88	0.25	2.25	0.59	1.28	1.97	0.69	1.94
	[25.4]	[63.5]	[33.3]	[22.4]	[6.4]	[57.2]	[15.1]	[32.5]	[50.0]	[17.5]	[49.2]
D03SPB8	1.50	3.50	1.81	1.38	0.25	3.25	0.69	1.78	2.81	0.75	2.81
	[38.1]	[88.9]	[46.0]	[34.9]	[6.4]	[82.6]	[17.5]	[45.2]	[71.4]	[19.1]	[71.4]
D03SPB12	1.50	4.50	2.31	1.88	0.38	4.13	0.94	2.28	3.56	0.94	3.56
	[38.1]	[114.3]	[58.8]	[47.6]	[9.5]	[104.8]	[23.8]	[57.9]	[90.5]	[23.8]	[90.5]

Specifications, descriptions, and dimensional data are subject to correction or change without notice or incurring obligation. Download latest catalog page revisions at www.daman.com.

Ordering Information



For coating options see pages 245-246.

Material	
A	Aluminum - 6061-T6 3000† psi • 20.7 MPa
D	Ductile Iron - D4512 5000† psi • 34.5 MPa

† Working pressure should be considered in accordance with ISO 4413 to determine appropriate material type.

Product Type	
SP	Subplate

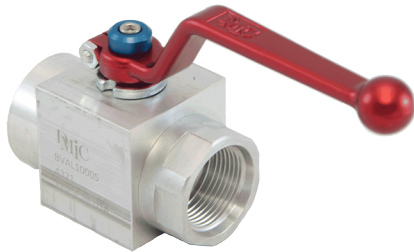
Port Location	
S	Side ported
B	Back Ported

Valve Pattern	
D03	ISO 4401-03-02 NFPA T3.5.1-D03 See Tech Information

Port Threads					
4P	0.25-18 NPTF ANSI B1.20.3				
6P	0.38-18 NPTF ANSI B1.20.3	8P	0.50-14 NPTF ANSI B1.20.3	12P	0.75-14 NPTF ANSI B1.20.3
6S	-6 SAE ISO 11926; SAE 1926	8S	-8 SAE ISO 11926; SAE 1926	12S	-12 SAE ISO 11926; SAE 1926
6B	0.38-19 BSPP ISO 1179; BS 2779	8B	0.50-14 BSPP ISO 1179; BS 2779	12B	0.75-14 BSPP ISO 1179; BS 2779
6M	M14 x 1.5 ISO 6149	8M	M18 x 1.5 ISO 6149	12M	M27 x 2.0 ISO 6149
6T	0.38-19 BSPT ISO 7; BS 21	8T	0.50-14 BSPT ISO 7; BS 21	12T	0.75-14 BSPT ISO 7; BS 21

BVAL LOW PRESSURE

Ideal from suction to 600 PSI; NPT/SAE/6149/BSP ; PTFE Ball Seals
Optimized for DMIC's "SSW" System - All sizes unrestricted bore.

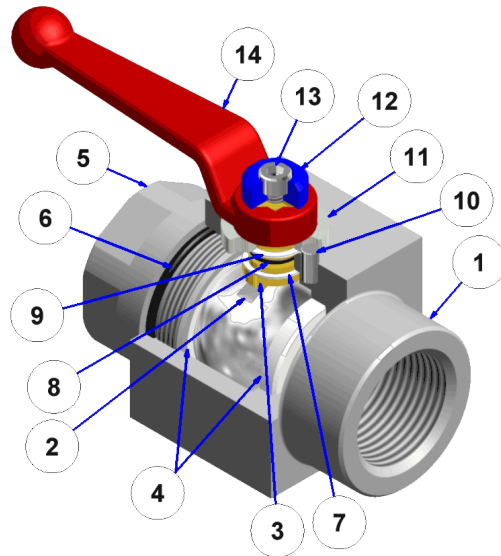


Most large bore valves sold in the hydraulic market today are simply "plumbing" valves, suitable primarily for low pressure, cold water use. DMIC's 'BVAL' is the first ball valve of its kind, specifically designed for leak-free Hydraulic Suction, Vacuum to 29" & Return line durability to 6" full bore.

- Built to take the pressure spikes, temperatures, & elevated demands of hydraulic service
- Uses top grade ball seals, with O-Ring sealing throughout.
- Suitable for actuation and panel mounting and accepts the full range of DMIC Ball Valve Accessories & Actuation Packages
- A reliable choice for Phosphate Esters, Water Glycols and other unusual media (std model ships with Teflon™ ball seals / Buna-N O-rings)
- ¼" to 2" rated at 600 PSI, 2½" + rated at 400 PSI.
- Valve series rating valid for near zero leak design.

Valve Cutaway View & Service Parts BOM

BVAL	SERVICE PARTS BOM	
Index	Qty	Description
1	1	Valve Body
2	1	Ball, Brass
3	1	Spindle, Brass
4	2	Ball Seal
5	1	End Connection
6	1	End Connection O-Rings
7	1	Internal Thrust Washer
8	1	Spindle O-Rings
9	1	External Glide Washer
10	1	Stop Pin
11	1	Stop Washer
12	1	Color Code Cap
13	1	Top Cap Screw
14	1	Handle



BVAL LOW PRESSURE

Ordering Codes Summary

See page 14 for accessory codes

BVAL ******** **S** **4** **3** **2** **1** * * * * *

Size Codes	
Code	Port Size
0250	¼"
0375	⅜"
0500	½"
0750	¾"
1000	1"
1250	1¼"
1500	1½"
2000	2"
*2500	2½"
*3000	3"
*4000	4"
*5000	5"
*6000	6"

Connection Types	
Imperial Threads	
Code	Description
S	SAE ORB
N	NPT
Metric Threads	
B	BSPP
T	BSPT (Tapered Pipe)
ISO Threads	
IU	ISO6149
Welded	
W4	Sch. 40 Socket Weld
Flanged	
AA	Class 150# (290 PSI @ 100°F)
FM	C. 61 SAE 4-Bolt UNC
GM	C.61 SAE 4-Bolt Metric
SM	C.61 SAE Split
CM	SAE Flange/Split Combo

O-Ring Material	
Code	Description
1	Buna-N (Standard)
2	EPR
3	Viton™

Seals, Bushings, Washers	
Code	Description
1	Delrin™
2	PTFE Teflon™
4	High Temp PEEK
6	Delrin™ AF (Low Friction)

Ball & Spindle Mat'l	
Code	Description
3	Brass

Body Material	
Code	Description
4	Aluminum

Call Factory for larger sizes 18"+

* rated to 400 PSI

Note: Changes from Standard Materials may result in changes to temperature and/or pressure rating.

Due to our policy of continual product improvement, the specifications in this catalog may change without notice. When designing by spec, please request a certified print.

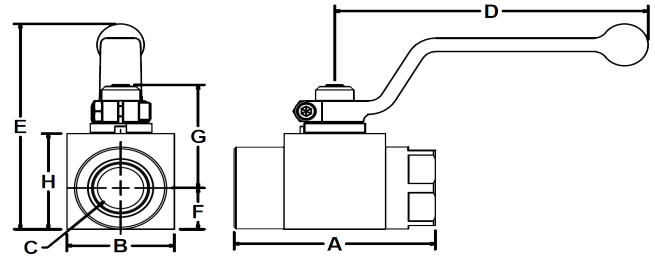


BVAL LOW PRESSURE

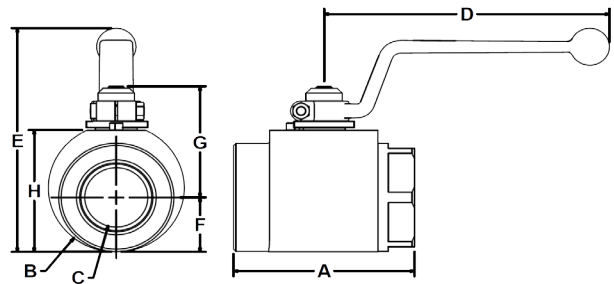
BVAL valves with flange and socket weld connections are composite valves, built using threaded valves and "SSW" adapters. To harness the full capabilities of DMIC's "SSW" Power Unit Layout system please call DMIC Helpline at 1-800-248-3642 to obtain the SSW Catalog.

BVAL		Dependent Dimensions				
Threaded Connections						
Dimension (inches)		A	E	F	G	H
Port Code(s)	Port Size	Overall Length	Overall Height	Bot to Port Ctr	Port Ctr to Top	Valve Height
N S B IU IA Threaded Connections	3/4"	2.63	2.70	0.63	1.66	1.50
	3/8"	2.63	2.70	0.63	1.66	1.50
	1/2"	2.63	2.70	0.63	1.66	1.50
	3/4"	3.27	3.76	0.76	1.89	1.75
	1"	3.47	4.01	0.88	2.01	2.00
	1 1/4"	3.90	5.24	1.19	2.58	2.66
	1 1/2"	4.32	5.68	1.39	2.82	3.10
	2"	4.90	6.41	1.82	3.12	3.83
	2 1/2"	5.99	8.07	2.55	4.18	5.40
	3"	7.31	9.01	3.03	4.65	6.34
4"	8.89	10.03	3.50	5.19	7.36	
SAE 4-Bolt Flange Connection						
Dimension (inches)		A	A	-	-	-
Port Code(s)	Port Size	Overall Length FM/GM	Overall Length FL	Flg Pad Long	Flg Pad Short	UNC Bolt Thrd
FM GM FL SAE 4-Bolt Comp/Std Flg Conn	3/4"	7.59	8.84	1.88	0.88	3/8"
	1"	7.80	9.04	2.06	1.03	3/8"
	1 1/4"	8.47	9.72	2.31	1.19	7/8"
	1 1/2"	8.89	9.89	2.75	1.41	1/2"
	2"	9.47	11.22	3.06	1.69	1/2"
	2 1/2"	10.93	12.67	3.50	2.00	1/2"
	3"	12.64	15.14	4.19	2.44	5/8"
	4"	14.22	16.72	5.13	3.06	5/8"
SAE Split Flange Connection						
Dimension (inches)		A	-	-	-	A _{CM}
Port Code(s)	Port Size	Overall Length SM	O-Ring No.	DMIC Split Flange Kit	Length A (Combo) CM	
SM CM SAE Split & Combo Flange Connections	3/4"	8.14	2-214	FSL-0750SK	7.87	
	1"	8.26	2-219	FSL-1000SK	8.03	
	1 1/4"	9.33	2-222	FSL-1250SK	8.90	
	1 1/2"	9.77	2-225	FSL-1500SK	9.33	
	2"	10.85	2-228	FSL-2000SK	10.16	
	2 1/2"	12.36	2-232	FSL-2500SK	11.65	
	3"	13.68	2-237	FSL-3000SK	13.16	
	4"	15.77	2-245	FSL-4000SK	15.00	
ANSI Flange Conn.						
Dimension (inches)		A	ANSI 150# FLANGE			
Port Code(s)	Port Size	Overall Length	Flg Diam	B/Ctr Diam	BoltHole Dia	# Bolt Holes
AA ANSI 150# Flange Connections (290 PSI nominal)	1/2"	5.83	3.50	2.38	0.62	4
	3/4"	6.90	3.88	2.75	0.62	4
	1"	7.42	4.25	3.12	0.62	4
	1 1/4"	8.15	4.62	3.50	0.62	4
	1 1/2"	8.74	5.00	3.88	0.62	4
	2"	9.56	6.00	4.75	0.75	4
	2 1/2"	11.01	7.00	5.50	0.75	4
	3"	12.46	7.50	6.00	0.75	4
4"	14.19	9.00	7.50	0.75	8	
Fixed Socket Weld Connection						
Dimension (inches)		A	-	-	-	-
Port Code(s)	Port Size	Overall Length	Pipe OD	Socket Depth		
W4 Socket Weld Connections	3/4"	5.84	1.05	0.38		
	1"	6.04	1.31	0.38		
	1 1/4"	6.72	1.66	0.38		
	1 1/2"	7.14	1.91	0.38		
	2"	7.72	2.38	0.38		
	2 1/2"	8.93	2.88	0.38		
	3"	10.64	3.50	0.50		
	4"	12.22	4.50	0.50		

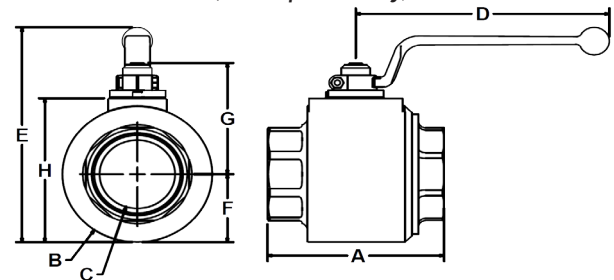
BVAL Block Body, 1/4" - 1"



BVAL Round Body, 1 1/4" - 2"



BVAL Round Body, 2 1/2" - 4" (5" and up call Factory)

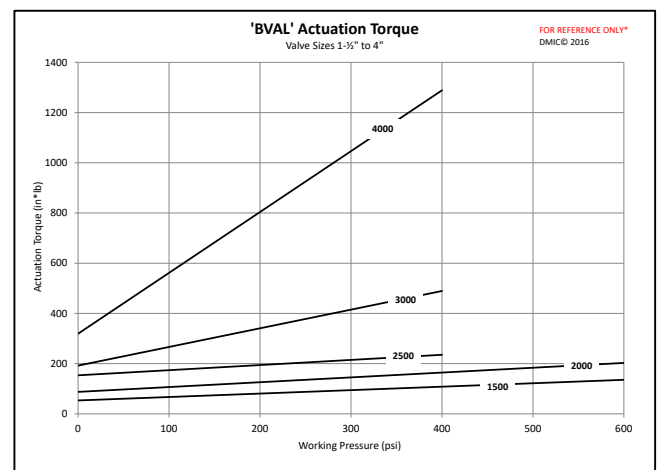
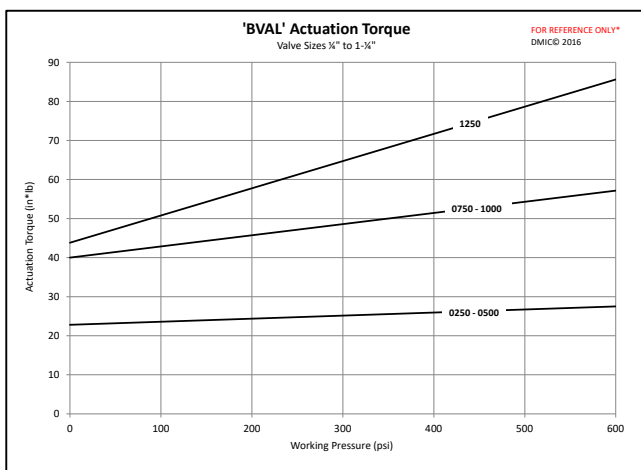
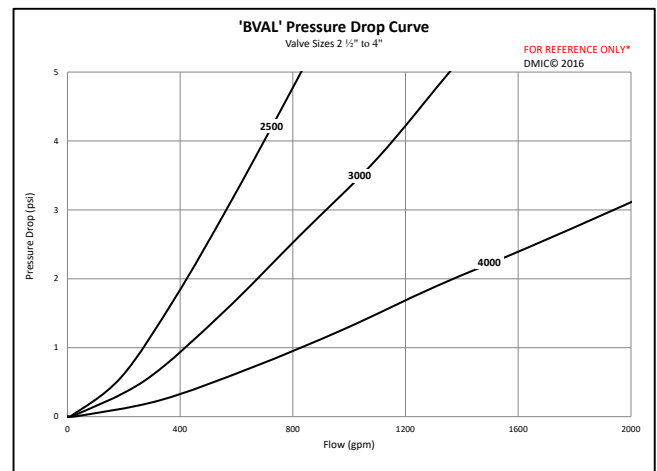
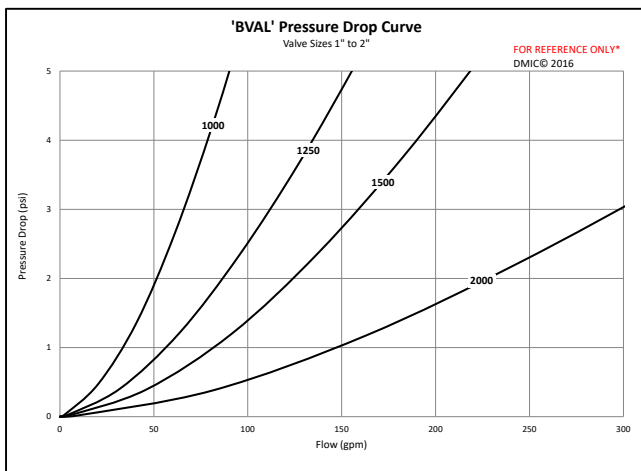
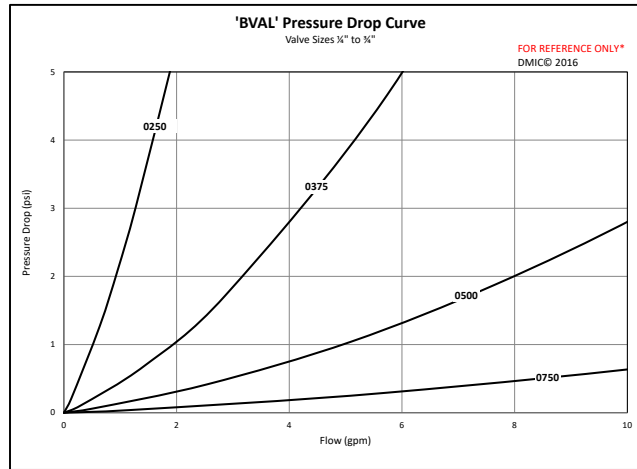


BVAL Part Number	Port Size	Rated Pressure PSI	Common Dimensions IN		
			Valve Width B	Valve Bore C	Handle Length D
BVAL-0250****	1/4"	600	1.50	0.38	3.35
BVAL-0375****	3/8"	600	1.50	0.47	3.35
BVAL-0500****	1/2"	600	1.50	0.50	3.35
BVAL-0750****	3/4"	600	1.75	0.75	5.09
BVAL-1000****	1"	600	2.00	.97	5.09
BVAL-1250****	1 1/4"	600	2.75	1.25	6.81
BVAL-1500****	1 1/2"	600	3.25	1.50	6.81
BVAL-2000****	2"	600	4.00	1.97	6.81
BVAL-2500****	2 1/2"	400	5.10	2.56	8.61
BVAL-3000****	3"	400	6.06	3.15	8.61
BVAL-4000****	4"	400	7.00	3.94	8.61



BVAL LOW PRESSURE

Flow Characteristic and Actuation Torque Curves



Due to our policy of continual product improvement, the specifications in this catalog may change without notice. When designing by spec, please request a certified print.



CVH CHECK VALVES

Guided poppet design and precision ground surfaces for 10,000 PSI service, 1/4" to 2" NPT/SAE/BSPP/BSPT/6149



The DMIC **CVH** Check Valve is a quality leader in the worldwide marketplace. Computer optimized flow passages and super heavy duty construction results in a 10,000 PSI rated product which will provide greatly extended service in 3,000 and 5,000 PSI applications.

- **Precision ground** oversize poppet landing zone for longevity, factory tested for zero leakage - install with confidence
- Designed for **10,000 PSI maximum operating pressure** in carbon steel and 10,000 PSI in stainless steel
- **Standard 5 PSI & 65 PSI cracking pressures**, with rapid delivery for 0, 15, 30, 75, and 135 PSI - call with your custom requirement
- Hybrid models with **SAE Code 61 4-Bolt** and **Split Flange** available
- Spring laid out such that it never fully packs, extending life expectancy
- One piece steel construction eliminates leakage from joints

CVH	Nominal Size	Port Thread	Performance Data		Dimensions (inches/mm)		
			Flow GPM	Working Pressure	A Hex	B Length	Lbs. kg
CVH**-0250N	1/4"	1/4" NPT	5 GPM 19 l/m	10,000 PSI 680 Bar	0.75 19.1	2.14 54.4	0.24 0.11
CVH**-0250S		#4 SAE					
CVH**-0250B		1/4" BSPP					
CVH**-0250IU		12mm ISO6149					
CVH**-0375N	3/8"	3/8" NPT	8 GPM 30 l/m	10,000 PSI 680 Bar	0.88 22.4	2.50 63.5	0.48 0.22
CVH**-0375S		#6 SAE					
CVH**-0375B		3/8" BSPP					
CVH**-0375IU		16mm ISO6149					
CVH**-0500N	1/2"	1/2" NPT	15 GPM 57 l/m	10,000 PSI 680 Bar	1.13 28.6	3.13 79.4	0.64 0.29
CVH**-0500S		#8 SAE					
CVH**-0500B		1/2" BSPP					
CVH**-0500IU		18mm ISO6149					
CVH**-0750N	3/4"	3/4" NPT	25 GPM 95 l/m	10,000 PSI 680 Bar	1.50 38.1	3.81 96.7	1.03 0.47
CVH**-0750S		#12 SAE					
CVH**-0750B		3/4" BSPP					
CVH**-0750IU		22mm ISO6149					
CVH**-1000N	1"	1" NPT	40 GPM 152 l/m	10,000 PSI 680 Bar	1.75 44.5	4.31 109.6	2.18 0.99
CVH**-1000S		#16 SAE					
CVH**-1000B		1" BSPP					
CVH**-1000IU		33mm ISO6149					
CVH**-1250N	1 1/4"	1 1/4" NPT	70 GPM 266 l/m	10,000 PSI 680 Bar	2.25 57.2	5.04 128.0	4.19 1.90
CVH**-1250S		#20 SAE					
CVH**-1250B		1 1/4" BSPP					
CVH**-1250IU		42mm ISO6149					
CVH**-1500N	1 1/2"	1 1/2" NPT	100 GPM 380 l/m	10,000 PSI 680 Bar	2.50 63.5	5.50 139.7	5.16 2.34
CVH**-1500S		#24 SAE					
CVH**-1500B		1 1/2" BSPP					
CVH**-1500IU		48mm ISO6149					
CVH**-2000N	2"	2" NPT	150 GPM 570 l/m	10,000 PSI 680 Bar	3.25 82.6	6.75 171.5	11.00 4.99
CVH**-2000S		#32 SAE					
CVH**-2000B		2" BSPP					
CVH**-2000IU		60mm ISO6149					

CVH Stainless Steel*	Port Size	Working Pressure	
		PSI	Bar
CVH**-0250*-22	1/4"	10,000 PSI	680 Bar
CVH**-0375*-22	3/8"		
CVH**-0500*-22	1/2"		
CVH**-0750*-22	3/4"		
CVH**-1000*-22	1"		
CVH**-1250*-22	1 1/4"		
CVH**-1500*-22	1 1/2"		
CVH**-2000*-22	2"		

*CVH shares external dimensions with the CVH Carbon Steel Series (see Table to left).

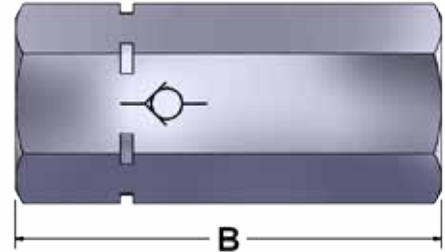
For water & Gas applications contact DMIC



CVH CHECK VALVES



CVH	Physical Parameters
BODY	Carbon Steel (Opt. all Stainless Steel)
POPPET	Hardened Carbon Steel (Opt. all S/S) Precision Ground Hard Seat
SPRING	Helical, Spring Steel
POPPET LANDING ZONE	Carbon Steel, Oversize (Opt. All S/S)
RETAINER	Spiral, Spring Steel
SEALING	Metallic Hard Seat
TEMP RANGE	-20°F/400°F (-29°C/204°C)



For complete ordering information and option availability please see page 28.

CVH 65 - 2000 S 1 1 031

Model	
CVH	Carbon Steel 10,000 PSI
CVH	Stainless Steel, 10,000 PSI

Cracking Pressure	
Stock Options	
05	5 PSI (0.35 Bar)
65	65 PSI (4.5 Bar)
Rapid Delivery Options	
15	15 PSI (1.03 Bar)
30	30 PSI (2.1 Bar)
75	75 PSI (5.2 Bar)
135	135 PSI (9.3 Bar)

Nominal Size	
Expressed in 1/1000" units	
Example: 0375=3/8", 1 1/2=1500	

Inlet Port Thread	
Standard US/Canada	
N	NPT
S	SAE ORB
Metric Standard	
B	BSPP
Optional Threads (Call DMIC)	
T	BSPT
IU	ISO6149

Internal	
1	Carbon Steel
2	Stainless Steel

Body	
1	Carbon Steel
2	Stainless Steel

Orifice (optional)	
031	1/32"
062	1/16"
093	3/32"
125	1/8"
156	5/32"
188	3/16"

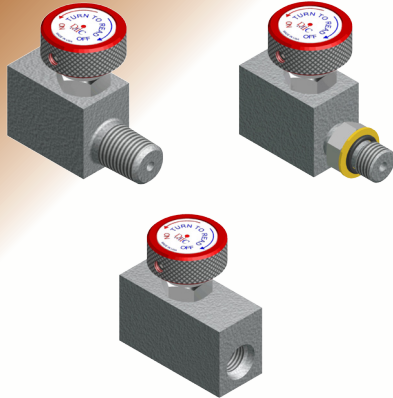
New Curves to Come

This valve series is factory sealed and disassembly will destroy the valve and void the warranty. Due to our policy of continual product improvement, the specifications in this catalog may change without notice. When designing by spec, please request a certified print.



'DMGV' GAUGE VALVE/SNUBBER

Models for 3000 PSI & 10000 PSI

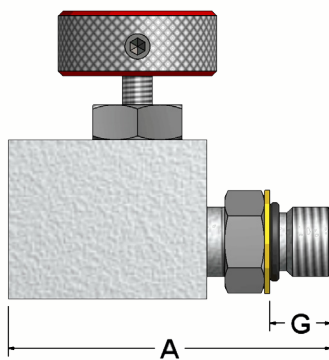


The 'DMGV' Gauge Valve is a simple, inexpensive "Turn to Read" on-off isolator valve.

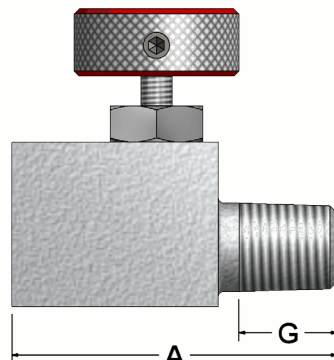
This design uses no drain line, therefore the system pressure must be released with 'DMGV' in the "ON" position to clear gauge reading

- ¼" NPT/SAE/BSP Thread
- Saves time and cost compared to a needle valve
- Built-in snubber

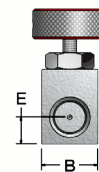
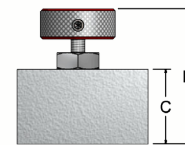
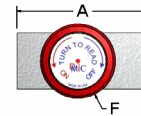
Dimension Views



DMGV-SMS



DMGV-NMN



DMGV-S

DMGV	Dimensions (inches)						
	A Overall Length	B Body Width	C Body Height	D Overall Height	E Bottom To Port Center	F Knob O.D.	G Thread Engagement
DMGV-N(4/1)	1.75	0.75	1.00	1.81	0.36	1.00	--
DMGV-S(4/1)							
DMGV-SMS(4/1)	2.03	0.75	1.00	1.81	0.36	1.00	0.39
DMGV-NMN(4/1)	1.97	0.75	1.00	1.81	0.36	1.00	0.60

DMGV - S MS 4 1

Gauge Side	
Code	Description
S	¼" SAE
N	¼" NPT

System Side	
Code	Description
MS	¼" Male SAE
MN	¼" Male NPT

Material	
Code	Description
1	Steel 10,000 PSI
2	Stainless 10,000 PSI
4	Aluminum 3,000 PSI

Sealing	
Code	Description
1	Buna-N
2	EPR
3	Viton





CF Series Gauges

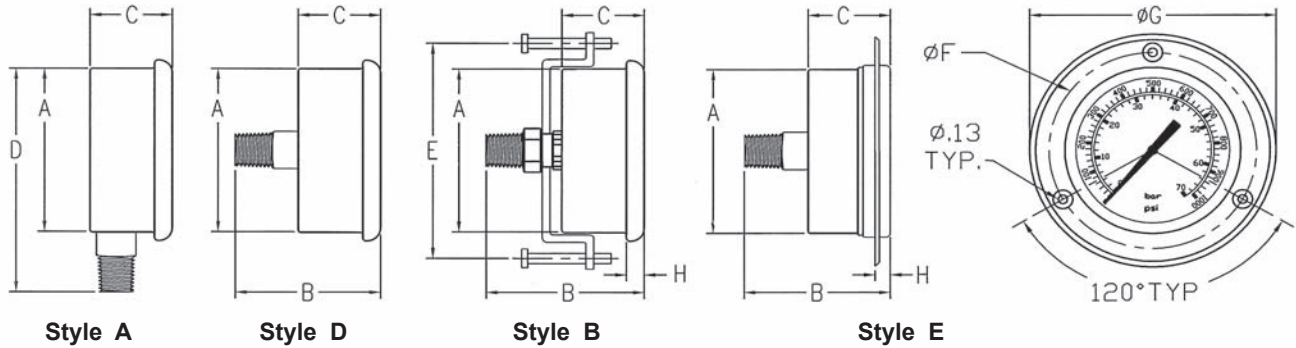
1 1/2", 2" and 2 1/2" • Glycerine-Filled

Features

- 304 Stainless Steel Case & Bezel
- Phosphor Bronze Bourdon Tube
- Bronze Connection
- Polycarbonate Lens
- Built-in Snubber
- Range: Vacuum to 10,000 psi
- Dual Scale: psi & bar
- Accuracy: ± 1.6% FSD
- Temperature Range: -40° to 180°F
- Certificate of Accuracy Available (see page 15 for details)



Installation Data



Size	A	B	C	D	E	F	G	H	Port Size
1 1/2"	1.58"	1.98"	1.02"	2.47"	2.30"	-	-	.20"	1/8" NPT
2"	1.98"	2.21"	1.19"	3.05"	2.28"	2.40"	2.76"	.24"	1/4" NPT*
2 1/2"	2.40"	2.25"	1.18"	3.45"	3.18"	2.90"	3.42"	.25"	1/4" NPT*

* 1/8" NPT available w/ min. order. Add -8N to end of model #.

Ordering Example:

Model	Size	Type	Range	Style
CF	1	P	- 350	A

Model	Size	Type	Pressure Range	Style
CF =	*4 = 1 1/2" dia.	C = Compound	002 = 30" Hg - 30 psi**	A = Stem
Glycerine-filled	5 = 2" dia.	V = Vacuum	000 = 30" Hg - 0 psi	B = Panel Clamp
Gauge	1 = 2 1/2" dia.	P = Pressure	001 = 15 psi	D = Center Back
			002 = 30 psi	E = Panel Flange
			004 = 60 psi	
			007 = 100 psi	
			010 = 160 psi	
			015 = 200 psi	
			020 = 300 psi	
			040 = 600 psi	
			070 = 1000 psi	
			100 = 1500 psi	
			140 = 2000 psi	
			210 = 3000 psi	
			280 = 4000 psi	
			350 = 5000 psi	
			420 = 6000 psi	
			700 = 10,000 psi	

Some size/range combinations may only be available by special order.

*Note: 1 1/2" dia. is limited to 6000 psi

**Additional compound ranges may be available by special order.

Logo and custom gauge faces available with minimum 100 piece order. Call for details.



CF Series (SAE) Gauges

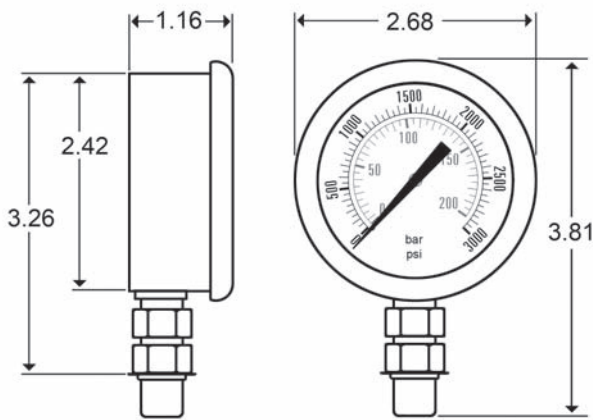
2 1/2" • Glycerine-Filled • SAE Swivel Mount

Features

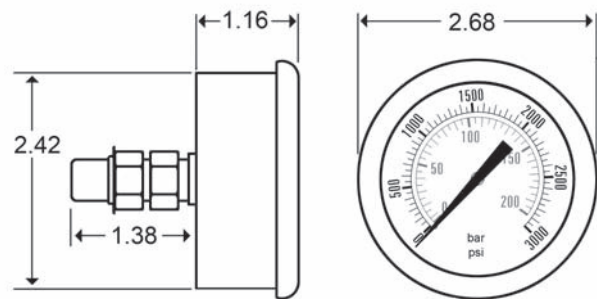
- 304 Stainless Steel Case & Bezel
- Phosphor Bronze Bourdon Tube
- SAE 7/16-20 Bronze Connection
- Polycarbonate Lens
- Built-in Snubber
- Range: Vacuum to 10,000 psi
- Dual Scale: psi & bar
- Accuracy: $\pm 1.6\%$ FSD
- Temperature Range: -40° to 180°F
- Certificate of Accuracy Available (see page 15 for details)



Installation Data



Style A



Style D

Ordering Example:

Model	Size	Type	Range	Style	Port Size
CF	1	P	210	A	SAE

Model	Size	Type	Pressure Range	Style	Port Size
CF = Glycerine-filled Gauge	1 = 2 1/2"	C = Compound V = Vacuum P = Pressure	002 = 30" Hg - 30 psi** 000 = 30" Hg - 0 psi 001 = 15 psi 002 = 30 psi 004 = 60 psi 007 = 100 psi 010 = 160 psi 015 = 200 psi 020 = 300 psi 040 = 600 psi	A = Stem D = Center Back*	7/16-20 SAE
			070 = 1000 psi 100 = 1500 psi 140 = 2000 psi 210 = 3000 psi 280 = 4000 psi 350 = 5000 psi 420 = 6000 psi 700 = 10,000 psi		

*Special order - minimum quantities may apply.

**Additional compound ranges may be available by special order.

Logo and custom gauge faces available with minimum 100 piece order. Call for details.

Vickers®
Solenoid Operated Directional Valves
Catalog

DG4V-3 flows
to 80 l/min
(21 USgpm),
6* design

DG4V-3S flows
to 40 l/min
(10.5 USgpm),
6* design

ISO 4401,
size 03; ANSI/
B93.7M-D03



EATON

Powering Business Worldwide

General description

Solenoid operated directional control valves are for directing and stopping flow at any point in a hydraulic system.

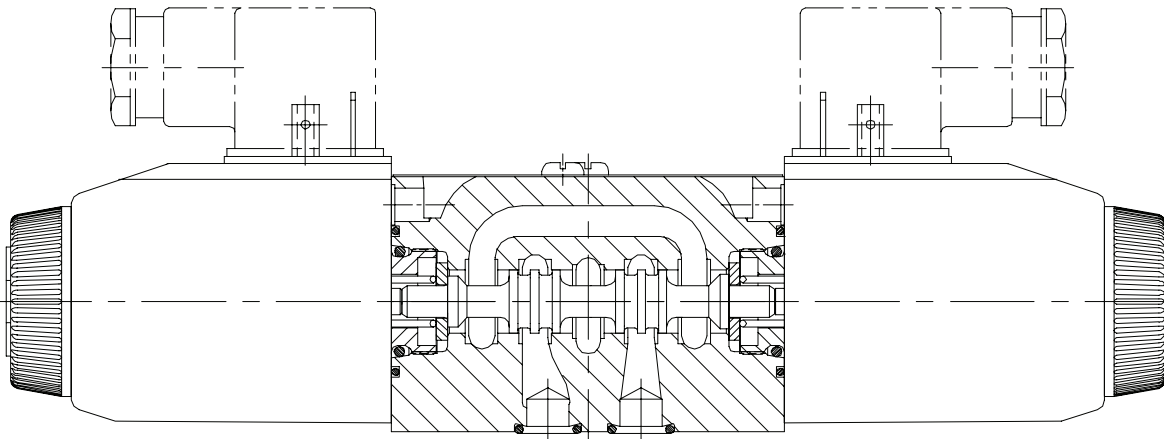
- Efficient control of greater hydraulic powers without increasing solenoid power consumption.
- Installed cost and space savings from higher power/weight-and-size ratios.
- Installation flexibility resulting from choice of numerous combinations of solenoid connectors and locations.
- Viton seals as standard for multi-fluid capability. Nitrile seals available as a model code option.
- Higher sustained machine productivity and higher uptime because of proven fatigue life and endurance, tested over 20 million cycles.
- Solenoid coils can be changed quickly and easily without leakage from hydraulic system.
- Compact, cost effective system design when used with Eaton® SystemStak™ valves and subplates.

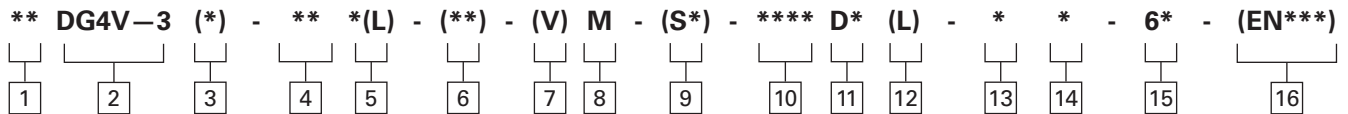
DG4V-3-S/R - High performance and standard performance valves

- Minimum pressure drop 2.5 bar at 30 l/min
- Range of coil connectors including DIN, Deutsch, AMP and terminal box
- Range of coil voltages and power options
- Up to 80 l/min (21 USgpm) and up to 40 l/min (10.5 USgpm) respectively at 350 bar (5000 psi).
- Offers designers the opportunity to select the optimum value package for each application.
- International standard interface. The valve mounting face conforms to ISO 4401, size 03 and is compatible with related international standards.

Bolt kit and seal kit:

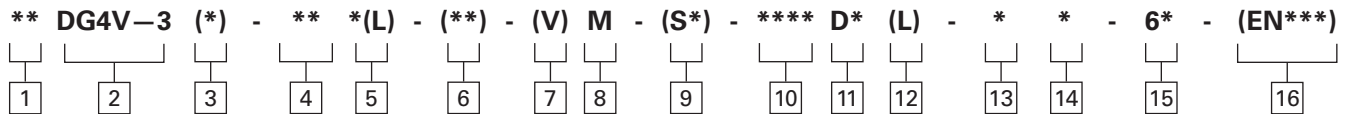
- Interface Seal Kit number 02-147573
- Full Seal Kit part number for DG4V-3 with U or KU coils 858995
- Full Seal Kit part number for DG4V-3 with Flying lead F coils 858995
- Bolt Kit number 616452 (Metric) and 590716 (Inches)





1	Seal type	<p>Blank Viton</p> <p>F6 Buna Nitrile/High CAN</p>
2	Model series	<p>4 – Solenoid operated</p> <p>V – Pressure rating 350 bar (5000 psi) on P, A & B ports</p> <p>3 – ISO4401 Size 03</p>
3	Performance	<p>Blank High performance</p> <p>S Standard performance</p>
4	Spool type	Please refer functional symbols on Page 37 for spool types.
5	Spool spring arrangement	<p>A Spring offset, end-to-end</p> <p>AL Same as "A" but left hand build</p> <p>B Spring offset, end to center</p> <p>BL Same as "B" but left hand build</p> <p>C Spring centered</p> <p>N No-spring detented</p>
6	Manual override option	<p>Blank Plain override(s) in solenoid end(s) only ▲</p> <p>H Water-resistant override(s) on solenoid end(s) ▲</p> <p>Z No overrides at either end</p> <p>W Twist and lock override in solenoid ends•</p> <p>▲ No override in non-solenoid end of single solenoid valves</p> <p>• DC high performance only</p>
7	Solenoid Energization identity	<p>Blank None</p> <p>V Solenoid "A" is at port "A" end and/ or solenoid "B" is at port "B" end, independent of spool type</p> <p>Note: Used to select the identification of the solenoid. Refer to table on page 36.</p>

8	Flag symbol	<p>M Electrical options and features</p>
9	Spool indicator switch	<p>S3 Switch, wired normally open</p> <p>S4 Switch, wired normally closed</p> <p>S7 Spool position monitoring switch. Single solenoid valves only.</p> <p>Note Refer page 38 and 42 for further details</p>
10	Coil type	<p>U ISO4400, DIN43650 connector</p> <p>U1 ISO4400 fitted with PG11 plug</p> <p>KU Top exit flying lead (150mm)</p> <p>KUP4 Junior timer (Amp) connector</p> <p>KUP5 Integral Deutsch connector</p> <p>FPM4 4-Pin micro - (12mm) brad Harrison connector</p> <p>KUPM4L Integral M12, 4-Pin connector</p> <p>FW Flying lead with 1/2" NPT thread wiring housing</p> <p>FTW Fly. Lead wired terminal block & 1/2" NPT thread wiring housing</p> <p>FPA3W Fly. Lead, 3 Pin connector & 1/2" NPT thread wiring housing</p> <p>FPA5W Fly. Lead, 5 pin connector & 1/2" NPT thread wiring housing</p> <p>KUP6 Flying lead external to coil with Deutsch connector</p> <p>KUP7 Packard connector pins (male)</p> <p>KUP8 Special packard connector pins with seals (female)</p> <p>X5 Atex approved coil, 'd' type ▲ ▲ Also CSA and UL approved</p>
11	Solenoid indicator lights	<p>Blank None</p> <p>L Solenoid indicator lights ▲ ▲ Flying lead coil type only</p>



12 **Surge suppressor/ damper**

D1 Diode positive bias
D2 Negative bias
D7 Transorb type
 See Page 45 for circuit details

15 **Design number**

60 Basic design
61 Type 8 spool

13 **Coil rating**

B 110V AC 50Hz/120V AC 60 Hz
D 220V AC 50 Hz/240V AC 60 Hz
DS 28V DC 30 watt
G 12V DC
GL -12V DC
H 24V DC
HL 24V DC
HM 24V DC 8 watt
 *HM COIL IS DG4V-3-R Standard performance with 8 Watt coil

16 **Special features**

“EN*”** Code number assigned as required.
EN21 CSA approved models with 1/2” NPT entry conduit box, type FW and solenoid coil letter B,D,G, or H.
EN38 Low leakage version. Typical leakage 5ml/ min/land at 100 bar.
Note: EN38 valve spools have additional overlap and resulting 2X pressure drop compared to standard valve spools.

14 **Tank pressure rating**

Refer to “Operating Data” for port T pressure ratings.

4 70 bar (1000 psi) ▲
5 100 bar (1500 psi) for standard performance models, DG4V-3S, with AC or DC solenoids.
6 207 bar (3000 psi) for AC high performance models, DG4V-3, including spool position indicator type S6.
7 207 bar (3000 psi) for DC high performance models, DG4V-3, including spool position indicator type S6.
 ▲ X5 coil type only

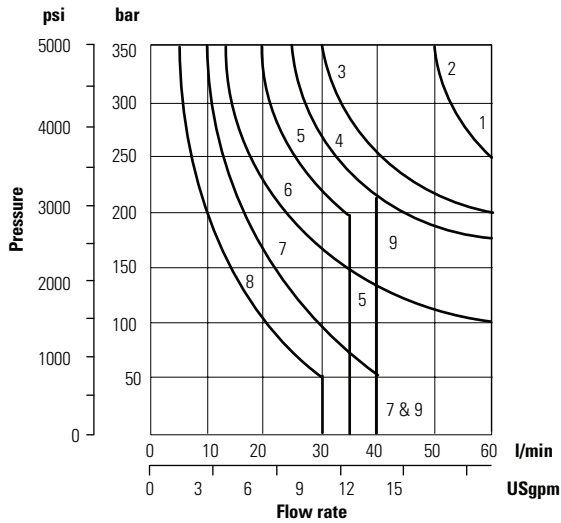
Feature	DG4V-3	DG4V-3S	DG4V-3R			
Pressure limits P, A and B ports	350 bar (5075 psi)	350 bar (5075 psi) ■	350 bar (5075 psi)			
T port:	210 bar (3045 psi)	100 bar (1450 psi)	210 bar (3045 psi)			
Flow rating	See performance data	See performance data	See performance data			
Relative duty factor	Continuous; ED = 100%	Continuous; ED = 100%	Continuous; ED = 100%			
Type of protection: ISO 4400 coils with plug fitted correctly	IEC 144 class IP65	IEC 144 class IP65	IEC 144 class IP65			
Coil winding	Class H	Class H	Class H			
Lead wires (coils type F***)	Class H	Class H	Class H			
Coil encapsulation	Class F	Class F	Class F			
Maximum	Permissible voltage fluctuation: Refer to temperature limits. Refer to temperature limits. Refer to Temperature Limits					
Minimum	90% rated	90% rated	90% rated			
Typical response times at 100% rated volts measured from application/removal of voltage to full spool displacement of "2C" spool at:						
Flow rate P-A, B-T	40 l/min (10.6 USgpm)	20 l/min (5.3 USgpm)	20 l/min (5.3 USgpm)			
Pressure	175 bar (2537 psi)	175 bar (2537 psi)	175 bar (2527 PSI)			
AC (-) energizing	15 ms	18 ms	18 ms			
AC (-) de-energizing	23 ms	32 ms	32 ms			
DC (=) energizing	45 ms	60 ms	60 ms			
DC (=) de-energizing	28 ms	40 ms	40 ms			
Power consumption, AC solenoids (for coils listed in model code).	Initial VA (RMS) ▲	Holding VA (RMS)	Initial VA (RMS) ▲	Holding VA (RMS)	Initial VA (RMS)	Holding VA (RMS)
Full power coils:						
Dual frequency coils at 50 Hz	265	49	280	61	N/A	
Dual frequency coils at 60 Hz	260	48	300	58	N/A	
Low power coils, "BL" and "DL": (Not available with "N" – No-spring detented models)	Low power coils not usable with DG4V-3S valves.		170	37	N/A	
Dual frequency coils at 50 Hz	–	–	190	37	N/A	
Dual frequency coils at 60 Hz	–	–	–	–	N/A	
Power consumption, DC solenoids at rated voltage and 20 C (68 F).						
Full power coils:						
12V, model type "G"	30W	–	30W	–	N/A	
24V, model type "H"	30W	–	30W	–	N/A	
Low power coils:						
12V, model type "GL"	Low power coils not usable with DG4V-3S valves.		–	18W	N/A	
24V, model type "HL"			18W	–	N/A	
24V, HM Coil			8W	–	N/A	

■ For applications where valves are to remain pressurized (either energized or de-energized) at pressures over 210 bar (3045 psi) without frequent switching, it is recommended to use the high performance model, DG4V-3.

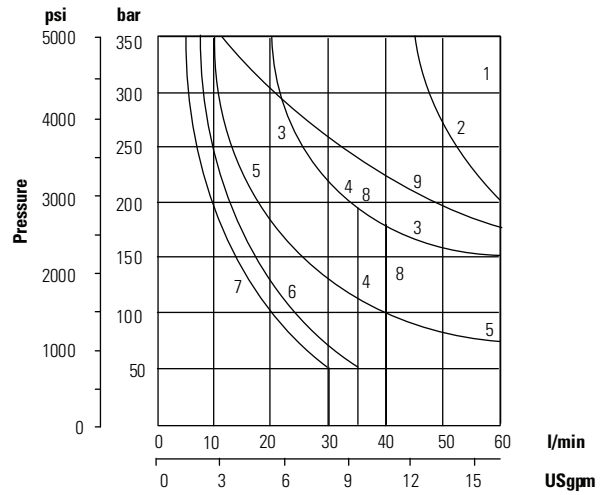
▲ 1st half cycle; armature fully retracted.

DG4V-3 models (high performance)

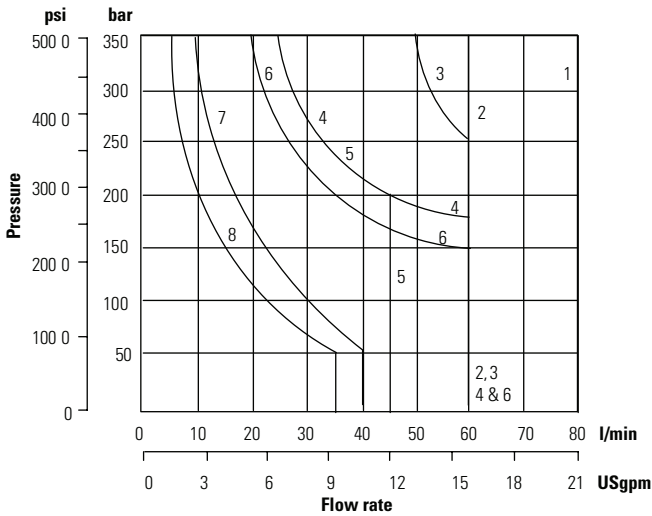
Graph 1
AC solenoid valves operating at 50 Hz



Graph 2
AC solenoid valves operating at 60 Hz



Graph 3
DC solenoid valves



Spool / spring code	Graph 1 curve	Graph 2 curve	Graph 3 curve
0A(L)	2	2	3
0B(L) & 0C	1	1	2
2A(L)	2	2	3
2B(L) & 2C	1	1	1
2N	1	1	2
6B(L) & 6C	6	5	6
8B(L) & 8C	5 ▲	4 ▲	5 ▲
22A(L)	8	7	8
22B(L) & 22C	7	6	7
33B(L) & 33C	4	3	4
52BL, 52C	6	5	6
521B	6	5	6

▲ Consult Eaton regarding each application that will jointly have flow rates approaching this curve and a pressurized volume exceeding 2000 cm³ (122 cu.in.)

Performance data

DG4V-3S models (standard performance)

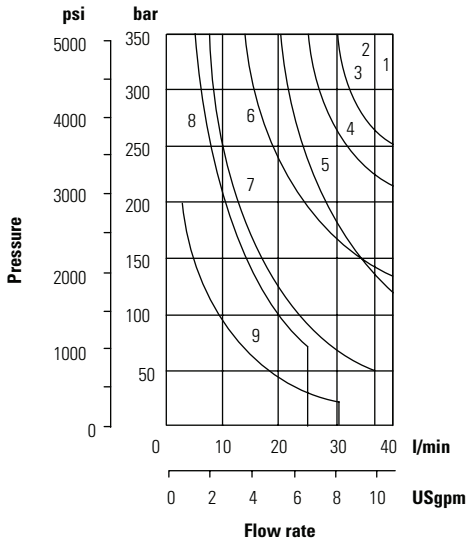
II-B

Typical with mineral oil at 36 cSt (168.6 SUS) and a specific gravity of 0.87.

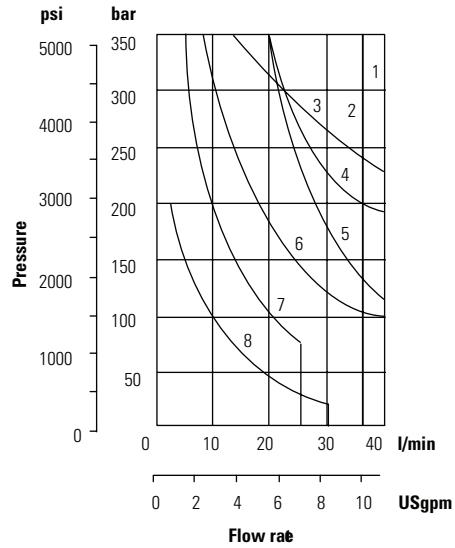
Maximum flow rates

Performance based on full power solenoid coils wand operating at 90% rated voltage. See note at bottom of next page when using low power coils (DG4V-3 models only.)

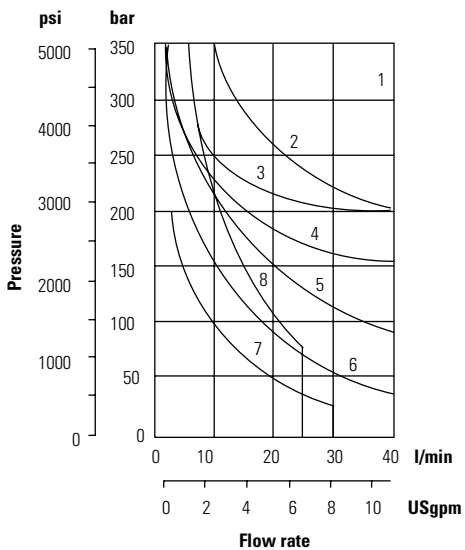
Graph 4
AC solenoid valves operating at 50 Hz



Graph 5
AC solenoid valves operating at 60 Hz



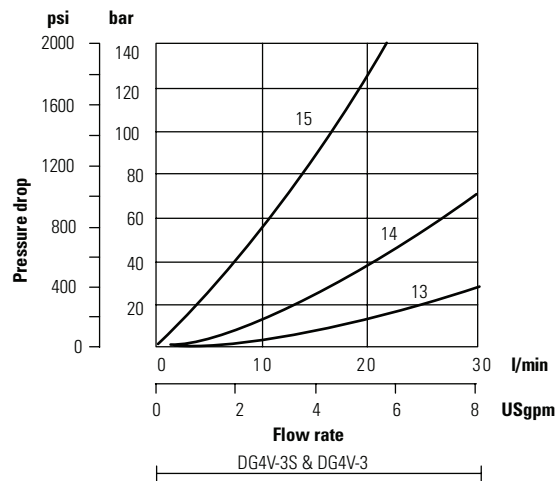
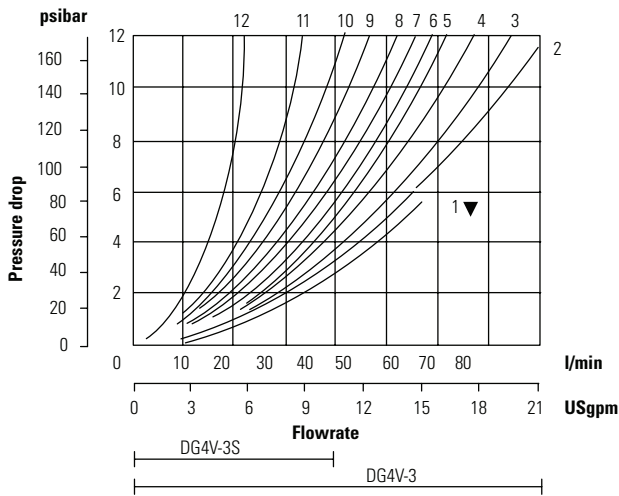
Graph 6
DC solenoid valves



Spool / spring code	Graph 1 curve	Graph 2 curve	Graph 3 curve
0A(L)	1	1	3
0B(L) & 0C	1	1	1
2A(L)	5	5	3
2B(L) & 2C	2	2	3
2N	1	1	1
6B(L) & 6C	6	6	5
8B(L) & 8C	8 ▲	7 ▲	8 ▲
22A(L)	9	8	7
22B(L) & 22C	7	7	6
33B(L) & 33C	4	4	4
52BL, 52C	6	6	5
521B	6	6	5

▲ Consult Eaton regarding each application that will jointly have flow rates approaching this curve and a pressurized volume exceeding 2000 cm³ (122 cu.in.)

Pressure drops



▼ Curve for spool type 6: not recommended for flows in excess of 60 l/min (15.8 USgpm).

Pressure drips in offset positions except where otherwise indicated

Spool / spring code	Spool positions covered	P to A	P to B	A to T	B to T	P to T	B to A or A to B
0A(L)	Both	5	5	2	2	-	-
0B(L) & 0C	De-energized	-	-	-	-	4 ▲ Δ	-
	Energized	4	4	2	2	-	-
2A(L)	Both	6	6	5	5	-	-
2B(L) & 2C	Energized	5	5	2	2	-	-
2N	Both	6	6	3	3	-	-
6B(L) & 6C	De-energized	-	-	3 ▲	3 Δ	-	-
	Energized	6	6	1	1	-	-
	Energized	4	4	3 ▲	3	-	-
8B(L) & 8C	All	9	9	5	5	3	-
22A(L), 22B(L) & 22C	All	6	6	-	-	-	-
33B(L) & 33C	De-energized	-	-	15 ▲	15 Δ	-	-
	Energized	5	5	2	2	-	-
52BL & 52C	Energized	6 ▲	6 Δ	2	-	-	10 ○
	Energized	6 ▲	6 Δ	2	-	-	10 ○
521B	All	6 ▲	6 Δ	-	-	-	10 ○
	De-energized	-	-	10 ▲	11 Δ	-	10 ○
	Energized	6	6 Δ	-	-	-	10 ○

▲ B" plugged Δ "A" plugged ○ "P" plugged

Viscosity cSt (SUS)

14 (71.75)	20 (97.8)	43 (200)	54 (251)	65 (302)	76 (352)	85 (399)
% of ΔP (Approx.)						
81	88	104	111	116	120	124

For other viscosities, pressure drops approximate to:

A change to another specific gravity will yield an approximately proportional change in pressure drop. The specific gravity of a fluid may be obtained from its producer. Fire resistant fluids usually have higher specific gravities than oil.

Models for use with ISO 4400 (DIN 43650) connectors

II-B

Double solenoid models

DG4V-3(S)-*C-**-*(V)M-U-**-60
 DG4V-3(S)-*N-**-*(V)M-U-**-60

Single solenoid models

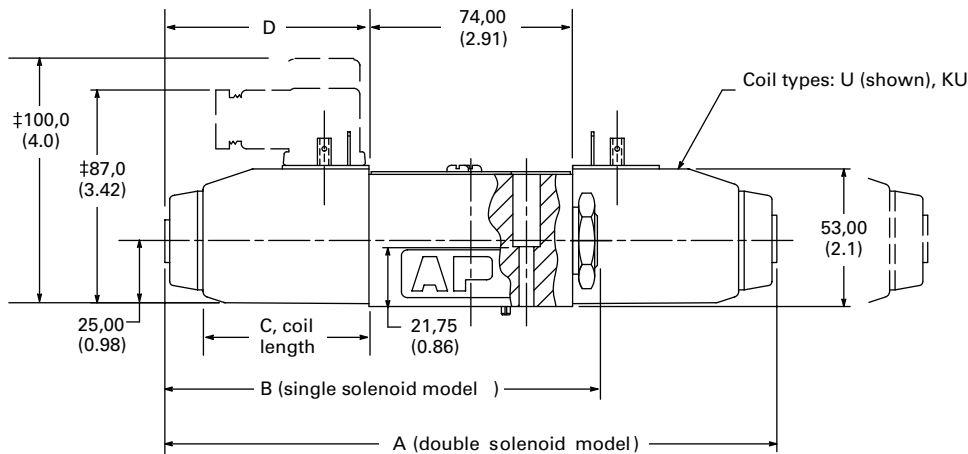
DG4V-3(S)-*A(-**) ■
 DG4V-3(S)-*B(-**) ■
 DG4V-3(S)-8BL(-**) ■

As shown

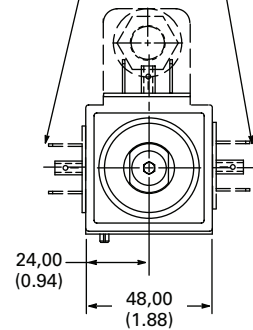
DG4V-3(S)-*AL(-**) ■
 DG4V-3(S)-*BL(-**) ■
 DG4V-3(S)-8B(-**) ■

Solenoid and end cap interchanged

3rd angle projection



Alternative plug positions by loosening knurled nut, turning coil, and re-tightening



■ Not applicable to type "8" spool.

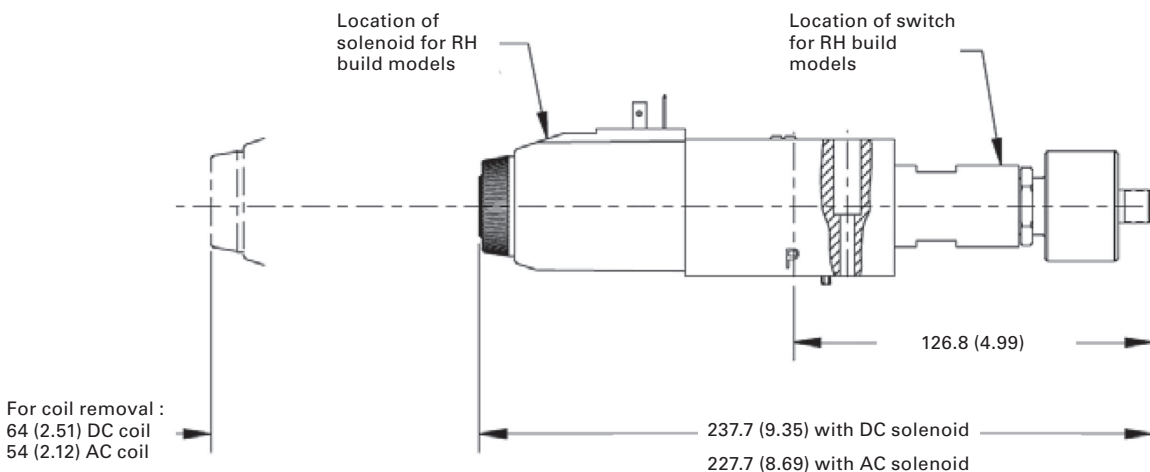
‡ Can vary dependent on source of plug.

Dimensions in mm (in).

Model type	AC or DC	A Dim.	B Dim.	C Dim.	D Dim.
All	DC =	220 (8.66)	156 (6.14)	61 (2.5)	73 (2.87)
DG4V-3	AC ~	200 (7.87)	146 (5.75)	51 (2.1)	63 (2.48)
DG4V-3S	AC ~	200 (7.87)	146 (5.75)	45 (1.7)	63 (2.48)

DG4V-3-*A/B(L)-(V)M-S7-U-**-60

Single solenoid models with Inductive type switch indicating when the spool is in the spring off-set position. Refer Page 38 connection to switch.



Models with “F” type coils (lead wires) and conduit box.

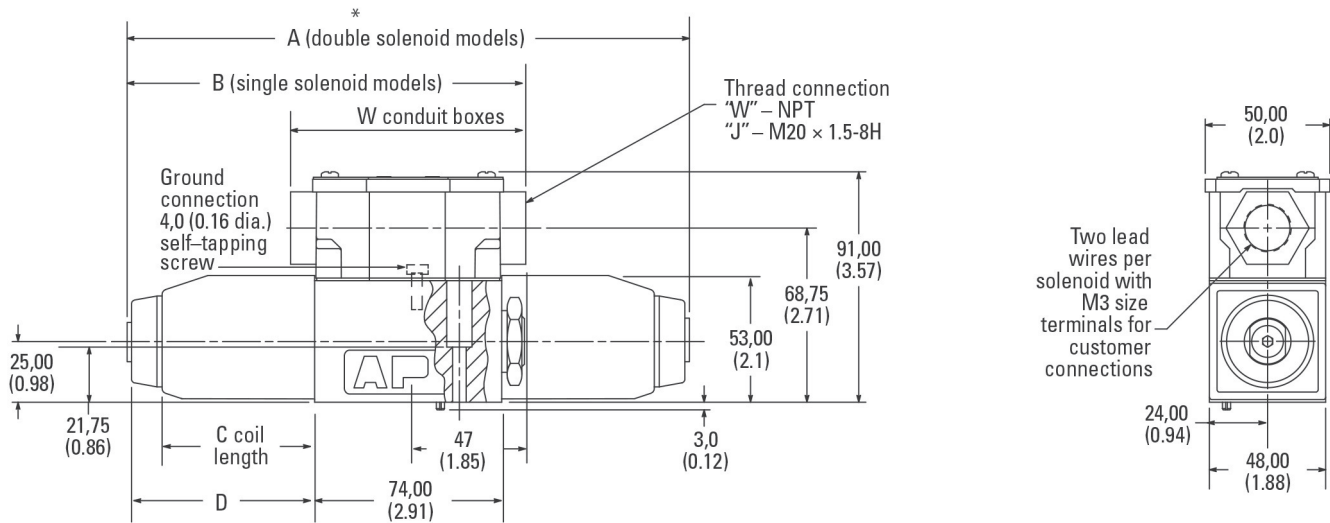
Double solenoid models
 DG4V-3(S)-*C-**-*(V)M-F-**-60
 DG4V-3(S)-*N-**-*(V)M-F-**-60

Single solenoid models
 DG4V-3(S)-*A(-**)
 DG4V-3(S)-*B(-**)
 DG4V-3(S)-8BL(-**)

As shown

Single solenoid models
 DG4V-3(S)-*AL(-**)
 DG4V-3(S)-*BL(-**)
 DG4V-3(S)-8B(-**)

Solenoid and end cap interchanged



* 89 (3.5) for FPB – W conduit boxes
 104 (4.0) All plug-in conduit boxes

Dimensions in mm(in).

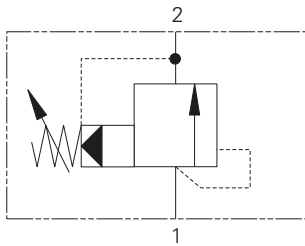
Model type	AC or DC	A Dim.	B Dim.	C Dim.	D Dim.
All	DC =	220 (8.66)	156,5 (6.14)	61 (2.5)	73 (2.87)
DG4V-3	AC ~	200 (7.87)	146,5 (5.75)	51 (2.1)	63 (2.48)
DG4V-3S	AC ~	200 (7.87)	146,5 (5.75)	45 (1.7)	63 (2.48)

Codes FJ” and “FW”: 2 lead wires for each solenoid, approximately 150,00 (6.00) long. M3 (#6) terminals provided for customer connection.

Codes “FTJ” and “FTW”: Valve supplied with lead wires connected into terminal strip suitable for M3 (#6) terminals for customer connection.

RV5-10 - Relief valve

Spool, pilot operated
114 L/min (30 USgpm) • 350 bar (5000 psi)



Operation

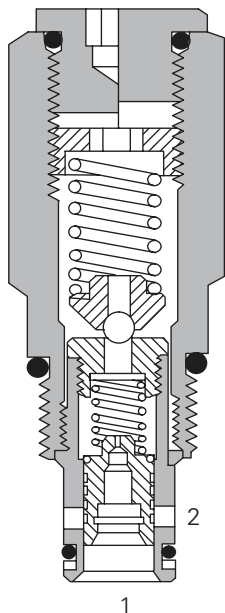
When the inlet pressure exceeds the setting of the valve, the pilot section opens, causing a small flow across the orifice in the main spool.

The subsequent pressure drop moves the spool against a light spring opening a ring of radial holes in the sleeve, allowing relief flow to tank.

Features

High accuracy of pilot operated design. Hardened working parts give long, reliable, trouble-free life. Cartridge construction for installation into your own manifold.

Sectional view



Performance data

Ratings and specifications

Performance data is typical with fluid at 21,8 cSt (105 SUS) and 49° C (120° F)

Typical application pressure (all ports)	350 bar (5000 psi)
Cartridge fatigue pressure (infinite life)	350 bar (5000 psi)
Rated flow	114 L/min (30 USgpm)
Internal leakage, port 1 to port 2	114 cc/min (7cu in/min @ 350 bar (5000 psi))
Cavity	C-10-2
Standard housing materials	Aluminum or steel
Temperature range	-40° to 120°C (-40° to 248°F)
Fluids	All general purpose hydraulic fluids such as: MIL-H-5606, SAE 10, SAE 20, etc.
Filtration	Cleanliness Code 18/16/13
Weight cartridge only	0,22 kg (0.48 lbs)
Seal kits – RV5	565803 Buna-N 566086 Viton®
– RV5A	565806 Buna-N 889627 Viton®

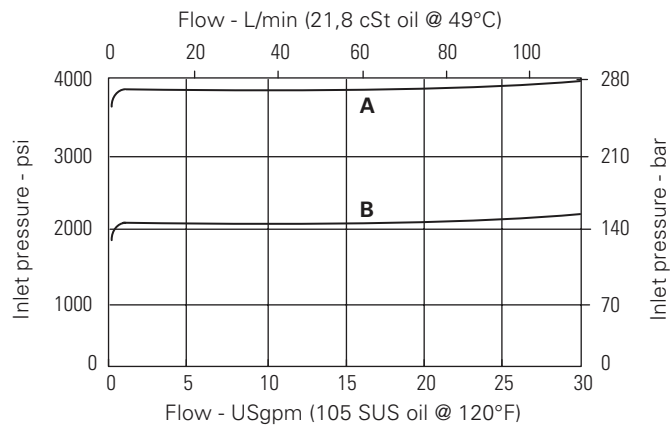
Viton is a registered trademark of E.I. DuPont

Description

To limit pressure in a system. Good for continuous duty and accurate pressure control with constant or varying flows.

Pressure override curves

Cartridge only
Tank pressure = 0



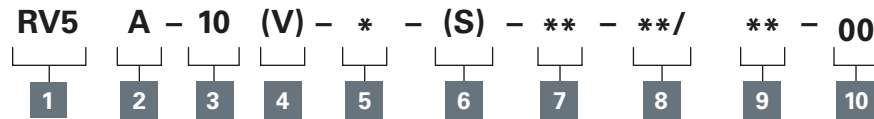
A - 50 spring
B - 20 spring

Where measurements are critical request certified drawings. We reserve the right to change specifications without notice.

RV5-10 - Relief valve

Spool, pilot operated
114 L/min (30 USgpm) • 350 bar (5000 psi)

Model code



1 Function

RV5 - Relief valve

2 Cage seals

Blank - Single back-up ring as shown
A - 1/2 thickness back-up ring on each side of o-ring (for cross port relief applications)

3 Size

Blank - Buna-N

4 Seal material

Blank - Buna-N
V - Viton®

5 Adjustment

C - Cap
F - Factory set
I - Internal
K - Knob
S - Screw

6 Valve housing material

Blank - Aluminum
S - Steel

7 Port size

Code	Port size	Housing number		
		Aluminum light duty	Aluminum fatigue rated	Steel fatigue rated
0	Cartridge only			
3B	3/8" BSPP	02-175462	-	-
2G	1/4" BSPP	-	876702	02-175102
3G	3/8" BSPP	-	876703	02-175103
6H	SAE 6	-	876700	-
8H	SAE 8	-	876701	-
6T	SAE 6	566151	-	02-175100
8T	SAE 8	-	-	02-175101
H10H	SAE 10*	-	4997062-001	-
2K10H	SAE 10**	-	4997060-001	-

* Bolt on, dual cross over relief valve package for **Eaton H or T series motors**

** Bolt on, dual cross over relief valve package for **Eaton 2000 series motors**

(Note: Two cartridges are installed in this special housing, both are set to the same crack pressure specified in model Code position 9, maximum allowed setting is 210 bar (3000 psi), only available with RV5A option and aluminum housing.)

See section J for housing details.

8 Cracking pressure range

Note: Code based on pressure in psi.

3 - 3,4-20 bar (50-300 psi)
20 - 7-140 bar (100-2000 psi)
35 - 17-240 bar (250-3500 psi)
50 - 35-350 bar (500-5000 psi)

9 Setting pressure

Within ranges in **8**

Blank - Normal factory setting at approximate mid-range. User requested settings in 3,45 bar (50 psi) steps, Coded as in the following examples:

10 - 70 bar (1000 psi)
10.5 - 72,4 bar (1050 psi)

10 Special features

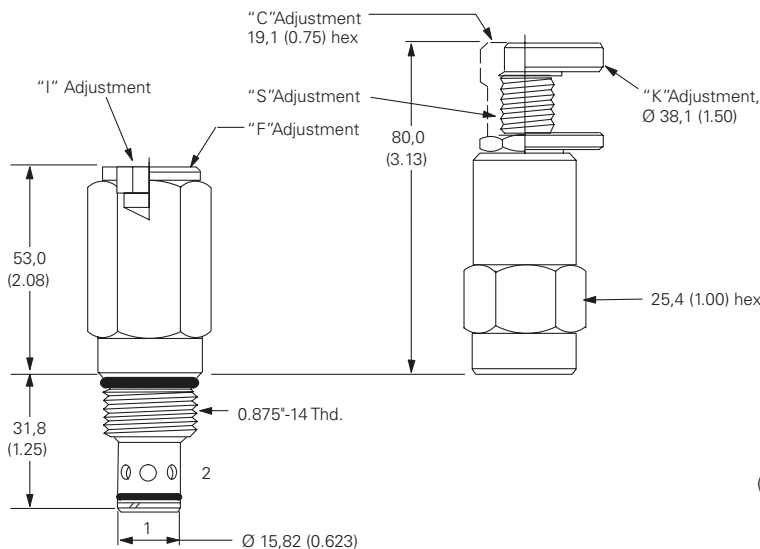
00 - None
(Only required if valve has special features, omitted if "00.")

SS - 316 Stainless Steel external components

Dimensions

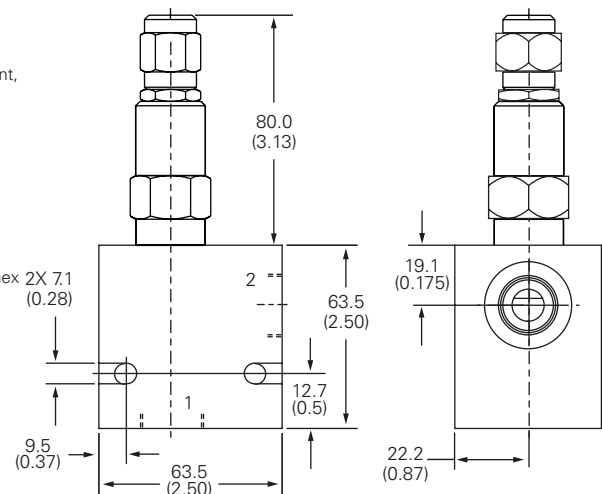
mm (inch)

Cartridge only



Torque cartridge in housing
A - 47-54 Nm (35-40 ft. lbs)
S - 68-75 Nm (50-55 ft. lbs)

Installation drawing (Steel)



Warning

Aluminum housings can be used for pressures up to 210 bar (3000 psi). Steel housings must be used for operating pressures above 210 bar (3000 psi).

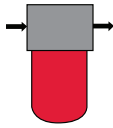
Where measurements are critical request certified drawings. We reserve the right to change specifications without notice.

MEDIUM PRESSURE FILTERS

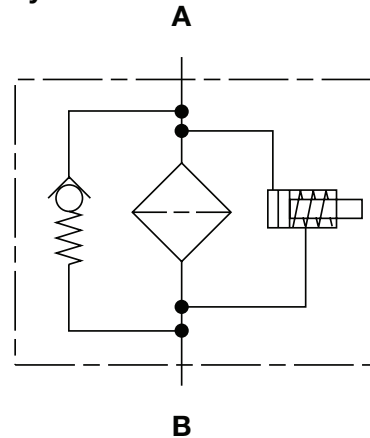
LF Series

Inline Filters

1500 psi • up to 180 gpm



Hydraulic Symbol



Features

- Non-welded housing design reduces stress concentrations and prevents fatigue failure.
- Aluminum alloy is water tolerant - anodization is not required for water based fluids (HWBF).
- Inlet & outlet port options include NPT, BSPP and SAE straight thread O-ring boss to allow easy installation with maximum flexibility.
- O-ring seals are used to provide positive, reliable sealing. Choice of O-ring materials (nitrile rubber, fluorocarbon elastomer, ethylene propylene rubber) provides compatibility with petroleum oils, synthetic fluids, water-glycols, oil/water emulsions, and high water based fluids.
- Screw-in bowl mounted below the filter head requires minimal clearance to remove the element for replacement, and contaminated fluid cannot be washed downstream when element is serviced.
- HYDAC differential Pressure Indicators have no external dynamic seal. This results in a high system reliability due to magnetic actuation, thus eliminating a potential leak point.
- A poppet-type bypass valve (optional) is separate from the main flow path, in the filter head, to provide positive sealing during normal operation and fast opening during cold starts and flow surges.
- For special finishes and coatings – consult HYDAC for minimum quantities, availability and pricing.

Technical Specifications

Mounting Method	4 mounting holes	
Port Connection	30 SAE-8, 1/2" NPT, 1/2" BSPP 60/110 SAE-12, 3/4" NPT, 3/4" BSPP 160/240/280 SAE-20, 1 1/4" NPT, 1 1/4" BSPP 330/660 SAE-24, 1 1/2" NPT, 1 1/2" BSPP	
Flow Direction	Inlet: Side	Outlet: Side
Construction Materials	Head Cast Aluminum Bowl Aluminum Extrusion (sizes 30 - 660) Steel (size 280)	
Flow Capacity	30 8 gpm (30 lpm) 60 16 gpm (60 lpm) 110 29 gpm (110 lpm) 160 42 gpm (160 lpm) 240 63 gpm (240 lpm) 280 74 gpm (280 lpm) 330 84 gpm (330 lpm) 660 174 gpm (660 lpm)	
Housing Pressure Rating	Max. Operating Pressure 1500 psi (100 bar) Fatigue Pressure 1500 psi (100 bar) Burst Pressure size 30 5510 psi (380bar) sizes 60 - 660 > 6090 psi (420 bar)	
Element Collapse Pressure Rating	BH4HC, V 3045 psid (210 bar) ON, W/HC 290 psid (20 bar)	
Fluid Temperature Range	-22°F to 212°F (-30°C to 100°C) Consult HYDAC for applications operating below -22°F (-30°C)	
Fluid Compatibility	Compatible with all hydrocarbon based, synthetic, water glycol, oil/water emulsion, and high water based fluids when the appropriate seals are selected	
ΔP Indicator Trip Pressure	ΔP = 29 psid (2 bar) -10% (optional) ΔP = 72 psid (5 bar) -10% (standard)	
Bypass Valve Cracking Pressure	ΔP = 43 psid (3 bar) +10% (optional) ΔP = 87 psid (6 bar) +10% (standard)	

Applications



Agricultural



Automotive



Construction



Industrial



Railways



Steel / Heavy Industry

Model Code

LF ON 30 I B 3 B 1 . 0 / 12

Filter Type _____
 LF = Inline filter

Element Media _____
 ON = Optimicron® (low collapse) BH/HC = Betamicon® (High Collapse)
 W/HC = Wire Mesh V = Metal Fiber

Size _____
 30, 60, 110, 160, 240, 280, 330, 660

Operating Pressure _____
 I = 1500 psi (100 bar)

Type of Connection _____
 B = 1/2" Threaded (size 30 only) E = 1 1/4" Threaded (sizes 160 - 280 only)
 C = 3/4" Threaded (sizes 60 & 110 only) F = 1 1/2" Threaded (sizes 330 - 660 only)

Filtration Rating (microns) _____
 1, 3, 5, 10, 15, 20 = ON 3, 5, 10, 20 = BH/HC 25, 50, 74, 100, 149, 200 = W/HC 3, 5, 10, 20 = V

Type of ΔP Clogging Indicator _____
 A, B, BM, C, D (others available upon request)

Type Number _____
 1 = Sizes 30 to 660

Modification Number (latest version always supplied) _____

Port Configuration _____
 0 = BSPP
 3 = NPT Ports (with adapters)
 12 = SAE Straight Thread O-Ring Boss Ports

Seals _____
 (omit) = Nitrile rubber (NBR) (standard) V = Fluorocarbon elastomer (FKM) EPR = Ethylene propylene rubber (EPR)

Bypass Valve _____
 (omit) = Non-Bypass – Critical applications (high collapse element required)
 B3 = 43 psid (3 bar) (optional)
 B6 = 87 psid (6 bar) (standard setting for pressure filters)

Supplementary Details _____
 L24, L48, L110, L220 = Lamp for D-type clogging indicator (LXX, XX = voltage)
 SO263H = Modification of ON & W/HC elements for Skydrol or HYJET phosphate ester fluids
 SO155H = Modification of BH4HC (High Collapse) Element For Phosphate Esters
 SO184 = G-1/2 Drain in Bowl Option For Sizes 60 - 280 (comes standard for sizes 330, 660, & 1320)
 T100 = Indicator Thermal Lockout, 100°F (C and D indicators only)
 W = Modification of "V" elements for use with oil water emulsions (HFA) and water polymer solutions (HFC)
 SFREE = Element specially designed to minimize electrostatic charge generation
 cRUus = Electrical Indicator with underwriter's recognition

Replacement Element Model Code

0030 D 003 ON / V

Size _____
 0030, 0060, 0110, 0160,
 0240, 0280, 0330, 0660

Filtration Rating (micron) _____
 1, 3, 5, 10, 15, 20 = ON 3, 5, 10, 20 = BH4HC
 25, 74, 149 = W/HC 3, 5, 10, 20 = V

Element Media _____
 ON, BH4HC, W/HC, V

Seals _____
 (omit) = Nitrile rubber (NBR)
 V = Fluorocarbon elastomer (FKM)
 EPR = Ethylene propylene rubber (EPR)

Supplementary Details _____
 SO263H = Same as above
 SO155H = Same as above
 W = Same as above
 SFREE = Element specially designed to minimize electrostatic charge generation

Clogging Indicator Model Code

VM 2 B . X /

Indicator Prefix _____
 VM = G 1/2 3000 psi

Trip Pressure _____
 2 = 29 psid (2 bar)] (optional)
 5 = 72 psid (5 bar)]

Type of Indicator _____
 A = No indicator, plugged port
 B = Pop-up indicator (auto reset)
 BM = Pop-up indicator (manual reset)
 C = Electric switch - SPDT
 D = Electric switch and LED light - SPDT

Modification Number _____

Supplementary Details _____
Seal _____
 (omit) = Nitrile rubber (NBR)
 V = Fluorocarbon elastomer (FKM)
 EPR = Ethylene propylene rubber (EPR)

Light Voltage (D type indicators only) _____
 L24 = 24V L110 = 110V

Thermal Lockout (VM, VD types C, D, J, and J4 only) _____
 T100 = Lockout below 100°F

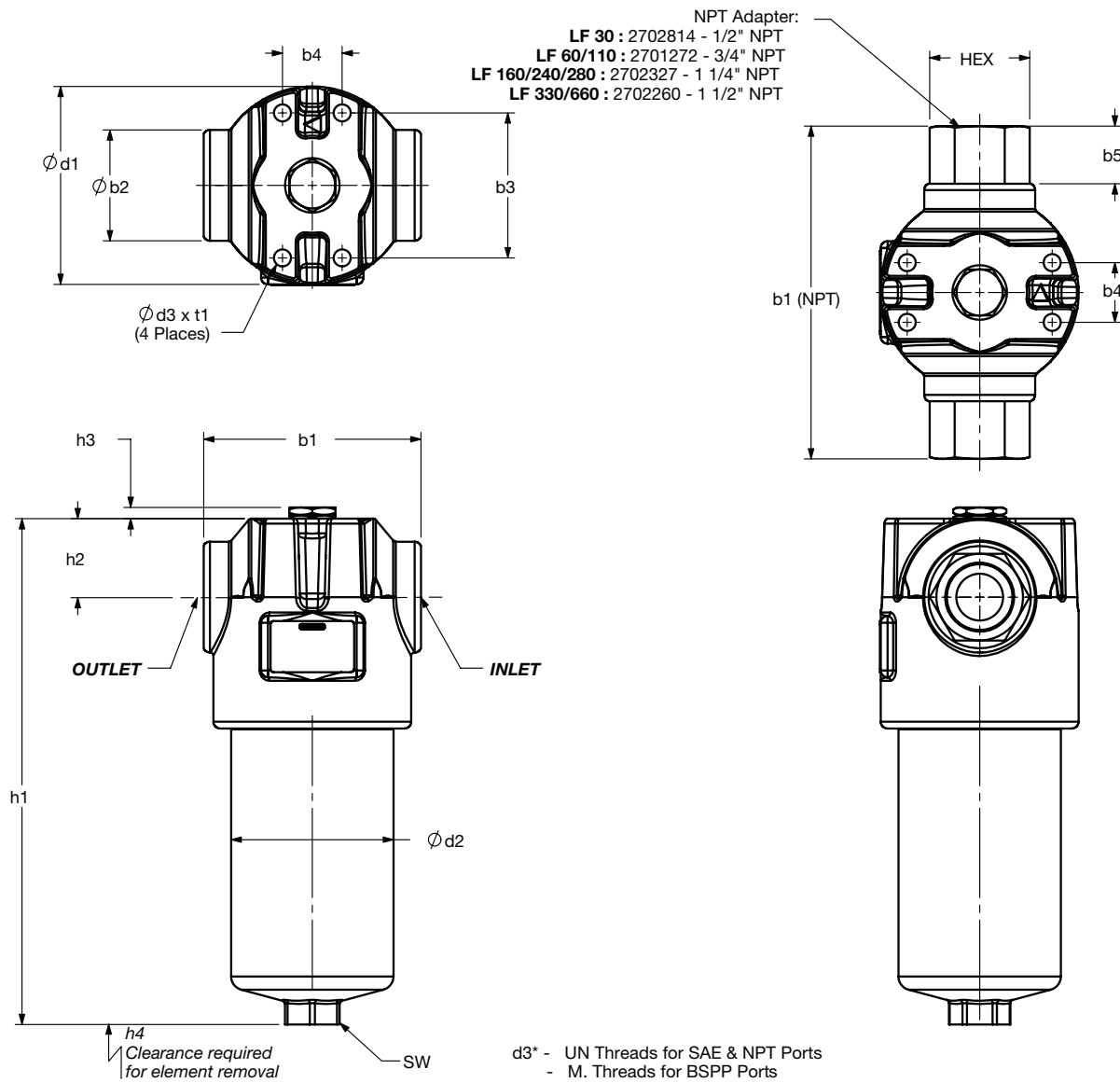
Underwriters Recognition (VM, VD types C, D, J, and J4 only) _____
 cRUus = Electrical Indicator with underwriter's recognition
 (For additional details and options, see Section G - Clogging Indicators.)

Model Codes Containing RED are non-stock items – Minimum quantities may apply – Contact HYDAC for information and availability

MEDIUM PRESSURE FILTERS

Dimensions

LF 30 - 660



Size	b1	b1 (NPT)	b2	b3	b4	b5	d1	d2	d3*	h1	h2	h3	h4	SW	t1	HEX
30	(2.72) 69	(4.84) 123	(1.42) 36	(1.77) 45	(1.18) 30	(1.062) 27	(2.64) 67	(2.05) 52	10-32UNF-2B M5 X 0.8	(6.16) 156	(1.22) 31	(0.28) 7	(2.95) 75	(0.94) 24	(0.24) 6	(1.125) 28.6
60	(3.54) 90	(5.80) 147.2	(1.89) 48	(2.20) 56	(1.26) 32	(1.126) 28.6	(3.31) 84	(2.68) 68	1/4-28UNF-2B M6 X 1.0	(6.95) 176.5	(1.54) 39	(0.24) 6	(2.95) 75	(1.06) 27	(0.35) 9	(1.38) 34.93
110	(3.54) 90	(5.80) 147.2	(1.89) 48	(2.20) 56	(1.26) 32	(1.126) 28.6	(3.31) 84	(2.68) 68	1/4-28UNF-2B M6 X 1.0	(9.68) 246	(1.54) 39	(0.24) 6	(2.95) 75	(1.06) 27	(0.35) 9	(1.38) 34.93
160	(4.92) 125	(7.67) 194.9	(2.56) 65	(3.35) 85	(1.38) 35	(1.376) 34.95	(4.57) 116	(3.74) 95	3/8-24UNF-2B M10 X 1.5	(9.29) 236	(1.81) 46	(0.24) 6	(3.74) 95	(1.26) 32	(0.55) 14	(2.00) 50.8
240	(4.92) 125	(7.67) 194.9	(2.56) 65	(3.35) 85	(1.38) 35	(1.376) 34.95	(4.57) 116	(3.74) 95	3/8-24UNF-2B M10 X 1.5	(11.67) 296.5	(1.81) 46	(0.24) 6	(3.74) 95	(1.26) 32	(0.55) 14	(2.00) 50.8
280	(4.92) 125	(7.67) 194.9	(2.56) 65	(3.35) 85	(1.38) 35	(1.376) 34.95	(4.57) 116	(3.74) 95	3/8-24UNF-2B M10 X 1.5	(18.98) 482	(1.81) 46	(0.24) 6	(3.74) 95	(1.26) 32	(0.55) 14	(2.00) 50.8
330	(6.26) 159	(9.07) 230.4	(3.35) 85	(4.53) 115	(2.36) 60	(1.406) 35.71	(6.3) 160	(5.12) 130	1/2-20UNF-2B M12 X 1.75	(11.90) 302.5	(1.97) 50	(0.24) 6	(4.13) 105	(1.42) 36	(0.67) 17	(2.25) 57.15
660	(6.26) 159	(9.07) 230.4	(3.35) 85	(4.53) 115	(2.36) 60	(1.406) 35.71	(6.3) 160	(5.12) 130	1/2-20UNF-2B M12 X 1.75	(18.40) 467.5	(1.97) 50	(0.24) 6	(4.13) 105	(1.42) 36	(0.67) 17	(2.25) 57.15

Size	30	50	110	160	240	330	660
Weight (lbs.)	1.8	3.4	4	8.2	9.5	17.7	24.3

Dimensions shown are [inches] millimeters for general information and overall envelope size only. Weights listed include element.
 For complete dimensions please contact HYDAC to request a certified print.

Sizing Information

Total pressure loss through the filter is as follows:

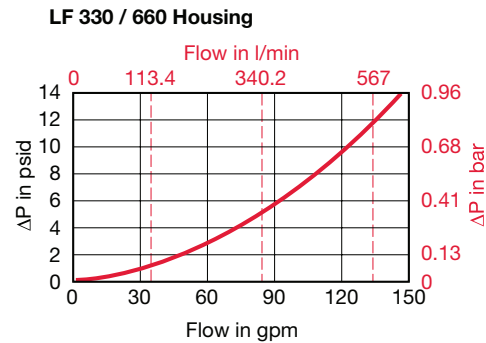
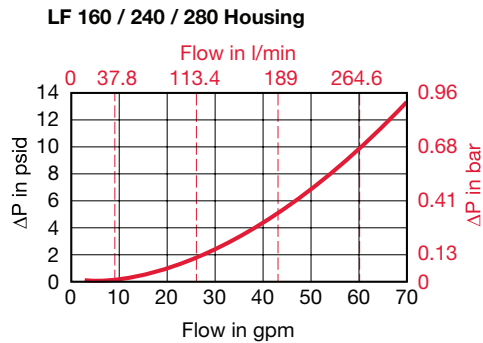
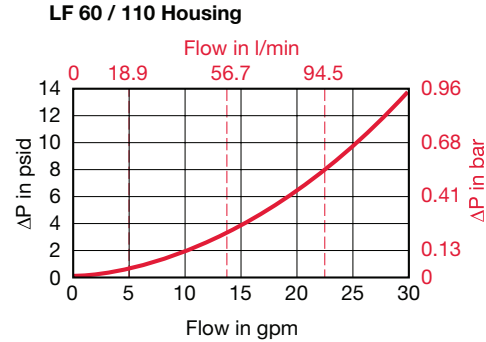
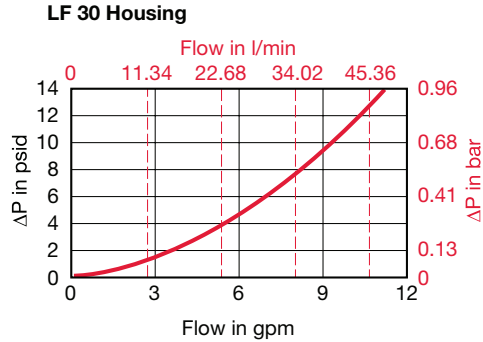
$$\text{Assembly } \Delta P = \text{Housing } \Delta P + \text{Element } \Delta P$$

Housing Curve:

Pressure loss through housing is as follows:

$$\text{Housing } \Delta P = \text{Housing Curve } \Delta P \times \frac{\text{Actual Specific Gravity}}{0.86}$$

Adjustments must be made for viscosity & specific gravity of the fluid to be used! (see "Sizing HYDAC Filter Assemblies" in Section B - Overview)



Element K Factors

$$\Delta P \text{ Elements} = \text{Elements (K) Flow Factor} \times \text{Flow Rate (gpm)} \times \frac{\text{Actual Viscosity (SUS)}}{141 \text{ SUS}} \times \frac{\text{Actual Specific Gravity}}{0.86}$$

(From Tables Below)

"ON" Pressure Elements:	...D...ON (Optimicron Pressure Elements)					
Size	1 μm	3 μm	5 μm	10 μm	15 μm	20 μm
0030 D XXX ON	4.27	3.507	2.376	1.251	0.768	0.62
0060 D XXX ON	2.936	1.427	1.004	0.664	0.537	0.347
0110 D XXX ON	1.416	0.735	0.527	0.333	0.254	0.164
0160 D XXX ON	1.015	0.604	0.423	0.225	0.204	0.175
0240 D XXX ON	0.631	0.379	0.293	0.175	0.134	0.115
0280 D XXX ON	0.304	0.185	0.15	0.082	0.075	0.064
0330 D XXX ON	0.452	0.23	0.185	0.135	0.085	0.067
0660 D XXX ON	0.207	0.106	0.086	0.051	0.039	0.031

"D" Pressure Elements	...D...BH4HC (Betamicron High Collapse)			
Size	3 μm	5 μm	10 μm	20 μm
0030 D XXX BH4HC	5.005	2.782	1.992	1.043
0060 D XXX BH4HC	3.216	1.789	0.993	0.670
0110 D XXX BH4HC	1.394	0.818	0.489	0.307
0160 D XXX BH4HC	0.922	0.571	0.324	0.241
0240 D XXX BH4HC	0.582	0.373	0.214	0.159
0280 D XXX BH4HC	0.313	0.187	0.099	0.088
0330 D XXX BH4HC	0.423	0.247	0.154	0.110
0660 D XXX BH4HC	0.181	0.104	0.055	0.049

Wire Mesh	...D...W/HC Elements (Low Collapse)
Size	25, 50, 74, 100, 149, 200 μm
0030 D XXX W/HC	0.166
0060 D XXX W/HC	0.042
0110 D XXX W/HC	0.230
0160 D XXX W/HC	0.016
0240 D XXX W/HC	0.010
0280 D XXX W/HC	0.009
0330 D XXX W/HC	0.008
0660 D XXX W/HC	0.004

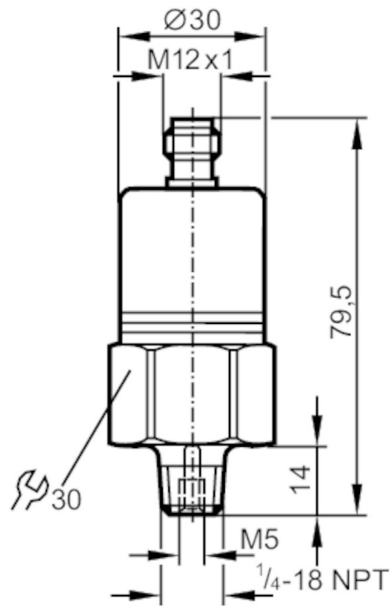
All Element K Factors in psi / gpm.

PX3111



Pressure transmitter with ceramic measuring cell

PA-300PSBN14-A-ZVG/US/ IV



Application	
Media	liquids and gases
Conditionally suitable for	use in gases at pressures > 25 bar only on request
Medium temperature [°C]	-25...90
Pressure rating [psi]	5800
Min. bursting pressure [psi]	12300
Type of pressure	relative pressure
Electrical data	
Operating voltage [V]	9.6...32 DC
Min. insulation resistance [MΩ]	100; (500 V DC)
Protection class	III
Reverse polarity protection	yes
Inputs / outputs	
Number of inputs and outputs	Number of analog outputs: 1
Outputs	
Total number of outputs	1
Output signal	analog signal
Number of analog outputs	1
Analog current output [mA]	4...20
Max. load [Ω]	720; (U _b = 24 V; (U _b - 9,6 V) / 20 mA)
Overload protection	yes
Measuring/setting range	
Measuring range [psi]	0...3000

PX3111



Pressure transmitter with ceramic measuring cell

PA-300PSBN14-A-ZVG/US/ IV

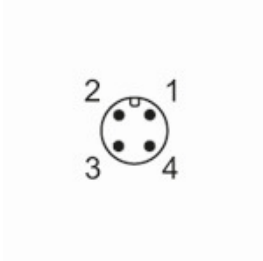
Accuracy / deviations		
Repeatability [% of the span]	< 0,15; (with temperature fluctuations < 10 K)	
Characteristics deviation [% of the span]	< ± 0,35 (BFSL) / < ± 0,75 (LS); (BFSL = Best Fit Straight Line; LS = limit value setting)	
Long-term stability [% of the span]	< ± 0,05; (per 6 months)	
Temperature coefficient zero point [% of the span / 10 K]	0,2; (0...80 °C)	
Temperature coefficient span [% of the span / 10 K]	0,3; (0...80 °C)	
Reaction times		
Step response time analogue output [ms]	3	
Operating conditions		
Ambient temperature [°C]	-25...80	
Storage temperature [°C]	-40...100	
Protection	IP 68; IP 69K	
Tests / approvals		
EMC	EN 61000-4-2 ESD	4 kV CD / 8 kV AD
	EN 61000-4-3 HF radiated	30 V/m
	EN 61000-4-4 Burst	2 kV
	EN 61000-4-6 HF conducted	10 V
	radiation of interference	according to the automotive directive 2004/104/EC / CISPR 25
	noise immunity	according to the automotive directive 2004/104/EC / ISO 11452-2
	HF radiated	100 V/m
pulse resistance	ISO 7637-2 / severity level 3	
Shock resistance	DIN IEC 68-2-27	50 g (11 ms)
Vibration resistance	DIN IEC 68-2-6	20 g (10...2000 Hz)
MTTF [years]	555	
Mechanical data		
Weight [g]	213	
Material	stainless steel (1.4404 / 316L); FKM; PA; EPDM/X	
Materials (wetted parts)	stainless steel (1.4305 / 303); ceramics; FKM	
Min. pressure cycles	100 million	
Process connection	threaded connection 1/4 NPT external thread Internal thread M5	
Remarks		
Pack quantity	1 pcs.	
Electrical connection		
Connector: 1 x M12; Contacts: gold-plated		

PX3111

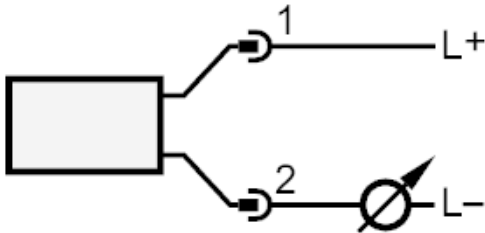


Pressure transmitter with ceramic measuring cell

PA-300PSBN14-A-ZVG/US/ IV

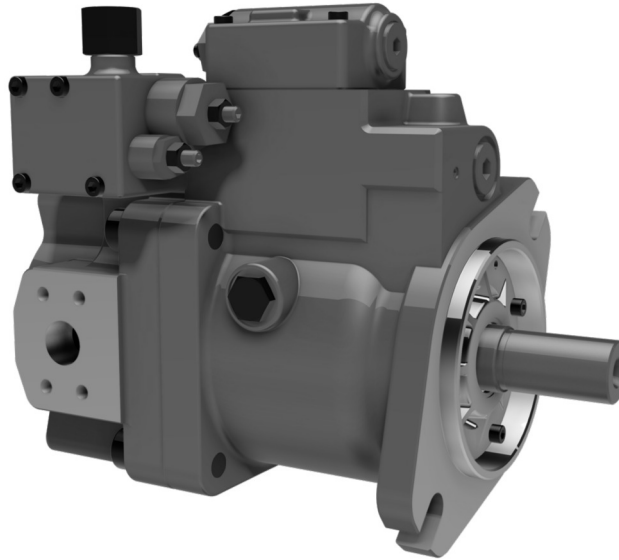


Connection



K3VL Series

Swash-plate Axial Piston Pump



■ General Descriptions

The K3VL series Swash Plate Type Axial Piston Pumps are designed to satisfy the marine, mobile and industrial markets where a medium/high pressure variable displacement pump is required.

K3VL pumps are available in nominal displacements ranging from 28 to 200 cm³/rev with various pressure, torque limiter, and combination of load sensing control options.

Pump Type	Capacity (cm ³ /rev)	Rated pressure (bar)	Maximum self-priming speed (rpm)
K3VL28	28	320	3,000
K3VL45	45	320	2,700
K3VL60	60	250	2,400
K3VL80	80	320	2,400
K3VL112	112	320	2,300
K3VL140	140	320	2,200
K3VL200	200	320	1,900
K3VL200H	200	320	2,200

■ Features

320 bar continuous pressure rating (250 bar for K3VL60)

350 bar peak pressure (280 bar for K3VL60)

High overall efficiency (>90% peak)

Exceptional self priming capability

SAE and ISO mounting and shaft

Excellent reliability and very long service life

High power to weight ratio

Numerous control options

Highly responsive controls

Low pulsation and noise emissions

Integral unloading or proportional pressure relief valves available

High speed version with integral impeller (K3VL200H)

1-1 Pump Options

1	2		3	4	5	6	7	8	9		10	11	12	13	14	15
K3VL	200	/	B	-	1	N	R	M	M	-	LN	24D	B	/1	-H**	

8. Mounting Flange & Shaft		28	45	60	80	112	140	200	200H
K	SAE Key & Mount	●	●	●	●	●	●	●	-
M	ISO Key & Mount	-	●	●	●	●	●	-	-
S	SAE Spline & Mount	●	●	●	●	●	●	●	●
R	SAE-C Spline & SAE-D Mount	-	-	-	-	●	●	-	-
C	SAE-C Spline & SAE-C2 Mount	-	-	-	-	●	●	-	-
X	SAE-C Key & SAE-C2 Mount	-	-	-	-	●	●	-	-
Y	SAE-CC Key & SAE-C2 Mount	-	-	-	-	●	●	-	-
W	SAE-CC Spline & SAE-C2 Mount	-	-	-	-	●	●	-	-
F	SAE-F Spline & SAE-E Mount	-	-	-	-	-	-	●	●
T	SAE-B Spline & SAE-B, 2 Bolt Mount	-	●	●	-	-	-	-	-
	SAE-CC Spline & SAE-D, 4 Bolt Mount	-	-	-	-	●	●	-	-

9. Porting Threads									
M	Metric Threads	●	●	●	●	●	●	●	●
S	UNC Thread (Not Available with 'M' ISO Key Shaft & Mount)	●	●	●	●	●	●	●	●

10. Regulator Type									
L0	Load Sense + Pressure Cut-Off (With LS Bleed)	●	●	●	●	●	●	●	●
L1	Load Sense + Pressure Cut-Off (With LS Bleed Blocked)	●	●	●	●	●	●	●	●
LM	Load Sense & Intergral Unload (Normally Open)	-	●	●	●	●	●	●	●
LN	Load Sense & Intergral Unload (Normally Closed)	-	●	●	●	●	●	●	●
LV	Load Sense & Intergral Proportional Relief	-	●	●	●	●	●	●	●
LV2	Load Sense & Intergral Proportional Relief	-	●	●	●	●	●	●	●
P0	Pressure Cut-Off	●	●	●	●	●	●	●	●
PM	Pressure Cut-Off & Intergral Unload (Normally Open)	-	●	●	●	●	●	●	●
PN	Pressure Cut-Off & Intergral Unload (Normally Closed)	-	●	●	●	●	●	●	●
PV	Pressure Cut-Off & Intergral Proportional Relief	-	●	●	●	●	●	●	●
PV2	Pressure Cut-Off & Intergral Proportional Relief	-	●	●	●	●	●	●	●
PR	Inverse Proportional Electronic Pressure Control (Only with 24V DC)	○	○	○	○	-	-	-	-

11. Unloader Solenoid									
Blank	For all other options except PN/PM/LN/LM/PV2/LV2	-	●	●	●	●	●	●	●
115A	115V AC, 50, 60 Hz - DIN 43550 Plug	-	○	○	○	○	○	○	○
230A	230V AC, 50, 60 Hz - DIN 43550 Plug	-	○	○	○	○	○	○	○
12D	12V DC - DIN 43550 Plug	-	●	●	●	●	●	●	●
24D	24V DC - DIN 43550 Plug	-	●	●	●	●	●	●	●

2 Technical Information

2-1 Specifications

Pump Model		K3VL28	K3VL45	K3VL60	K3VL80	K3VL112	K3VL140	K3VL200	K3VL200H	
Capacity	cc/rev	28	45	60	80	112	140	200	200	
Pressure ratings	Rated	320		250	320					
	Peak *1	350		280	350					
Speed ratings	Self prime *2	rpm	3,000	2,700	2,400	2,400	2,200	2,200	1,900	2,200
	Max. boosted*3	rpm	3,600	3,250	3,000	3,000	2,700	2,500	2,200	2,200
Minimum operating speed	rpm	600								
Case drain pressure	Max. continuous	bar								
	Peak	bar								
Weight	kg	20	27	27	35	65	65	95	130	
Case fill capacity	L	0.6	0.6	0.6	0.8	1.5	1.5	3.0	3.2	
Temperature range	°C	-20 to 95								
Viscosity range	cSt	10 to 1,000 - viscosities greater than 200 will require a no load warm up								
Maximum contamination level		ISO 4406 18/15								
Standard SAE mounting flange and shaft	Mounting	2 - bolt SAE B			2 - bolt SAE C	4 - bolt SAE D		4 - bolt SAE E		
	Shaft	SAE B spline or key	SAE B-B spline or key		SAE C spline or key	SAE D spline or key		SAE D spline or key		
Optional SAE mounting flange and shaft	Mounting	-				2 - bolt SAE C		-		
	Shaft	-	SAE B spline	SAE B spline	-	SAE C or C-C spline or key		SAE F spline		
Standard ISO mounting flange and shaft	Mounting	-	2 bolt ISO 100	2 bolt ISO 100	2 bolt ISO 100	4 bolt ISO 180		-		
	Shaft	-	ISO 25mm key	ISO 25mm key	ISO 25mm key	ISO 45mm key		-		
Input shaft torque rating		refer to table on page 16								
Through drive torque rating (Nm)	SAE A	61	123							
	SAE B	155	290		340					
	SAE B-B	-	290		550					
	SAE C	-			400	700		990		
	SAE C-C	-				700		990		
	SAE D	-				700		990		
	SAE E *4	-							990	

*1 : The instant allowable surge pressure as defined by DIN24312. Life and durability of the pump will be affected.

*2 : Steady state inlet pressure should be greater or equal to 0.9 bar absolute.

*3 : Steady state inlet pressure should be greater or equal to 1.3 bar absolute. The maximum boost pressure should not exceed 10 bar.

2-1 Specifications (cont)

◆◆ Input Shaft Torque Ratings

SAE Splined Shafts						
Shaft Designation	SAE B	SAE B-B	SAE C	SAE C-C	SAE D/E	SAE F
Input Torque Rating (Nm)	171	272	552	925	1,470	1,950

SAE Keyed Shafts					
Shaft Designation	SAE B	SAE B-B	SAE C	SAE C-C	SAE D/E
Input Torque Rating (Nm)	145	230	430	700	1,250

ISO Keyed Shafts			
Shaft Designation	ISO 25mm	ISO 32mm	ISO 45 mm
Input Torque Rating (Nm)	230	430	980

Note:

The shaft surface will have a finite life due to wear unless adequate lubrication is provided.

#1 Maximum allowable shaft torques are based on achieving an infinite life for a coupling assembly that is lubricated and completely clamped and utilises the full spline/key length as engagement.

The following points therefore need to be fully considered:-

- i)** Lubrication of shaft couplings should be in accordance with the coupling manufacturers instructions.
- ii)** The maximum allowable input shaft torque is based on ensuring an infinite life condition by limiting the resultant combined shaft bending and torsional stress.
- iii)** This allowable input shaft torque can be further increased dependant on the resultant surface stress at the spline interface which is highly dependant on coupling selection and the provision of adequate spline lubrication.

If you have an application that requires higher input torque please consult KPM UK.

#2 Allowable through drive torques are based on the achieving an infinite life for a fully lubricated coupling and full spline engagement with a mineral oil based anti-wear hydraulic fluid.

2-1 Specifications (cont)

Notes:

Rated Pressure

Pressure at which life and durability will not be affected.

Peak Pressure

The instant allowable surge pressure as defined by BS ISO 2944:2000. Life and durability however will be shortened.

Maximum Self Priming Speed

Values are valid for an absolute suction pressure of 0.9 bar. If the flow is reduced and the inlet pressure is increased the speed may also be increased.

Maximum Boosted Speed

Values stated are the absolute maximum permitted speed for which an increased inlet pressure will be required.

Weight

Approximate dry weights, dependant on exact pump type.

Hydraulic Fluid

Mineral anti wear hydraulic fluid - for other fluid types please consult KPM UK.

Viscosity Range

If viscosity is in range 200 to 1,000 cSt, then warming up is necessary before commencing full scale running.

2-2 Technical Data (cont)

◆ Working Fluid Types

Anti-Wear Type Hydraulic fluid

It is generally recommended to use an anti-wear hydraulic fluid like mineral oil when the operating pressure exceeds 210 bar.

Fire-resistant Fluids

Some kind of fire-resistant fluids require special materials for seals, paint and metal finishing. Please consult KPM UK and provide details of the particular fluid specification and the working conditions so that any special requirements can be ascertained.

In general, fire-resistant fluids have a low viscosity index and their viscosity also changes significantly with operating temperature and service life. For this reason, the circuit should be provided with an adequately sized cooler or forced cooling so that temperatures can be stabilised. Due to the inherent water content of some of these fluids the minimum allowable suction pressure will be higher than that of an equivalent mineral oil and so needs to be fully evaluated by KPM UK. The following table provides an overview of the precautions and characteristics that can be expected with these types of fluids.

Fluid Type Parameter	Mineral Oil	Water Glycol
Maximum Pressure (bar)	320	210
Recommended Temperature Range (deg C)	20 ~ 60	10 ~ 50
Cavitation susceptability	○	△
Expected life expectancy compared to mineral oil	100%	20-80%

◆ Pump Start Up Precautions

Piping & Circuit Checking

Check to see that the piping and full hydraulic circuit is completed and that any gate valves etc. are open.

Direction of Rotation

Check to ensure that direction of rotation is correct and that the inlet and delivery lines are connected correctly.

Start Up

Jog start the motor and check once more for correct rotation. Run the pump unloaded for a period to ensure that all residual air within the system is released. Check for external leakage, abnormal noise and vibrations.

End of Life

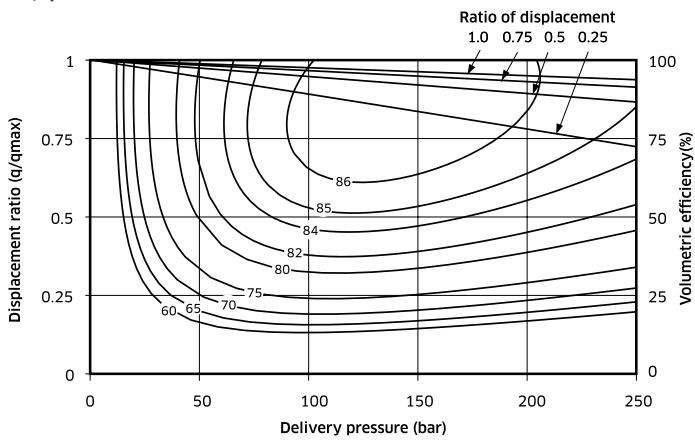
The pump unit, hydraulic fluid and packaging must be disposed of carefully to avoid pollution to the environment. The pump unit must be completely empty upon disposal, it must be disposed of according to national regulations and you must also follow safety information for disposal of the hydraulic fluid.

All individual parts of the pump unit must be recycled. Separate the pump unit parts according to: cast parts, steel, aluminium, non-ferrous metal, electronic waste, plastic, and seals.

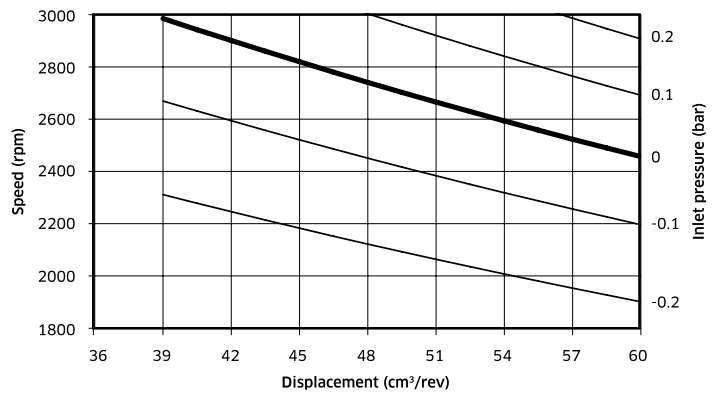
2-3 Performance Data (cont)

K3VL60

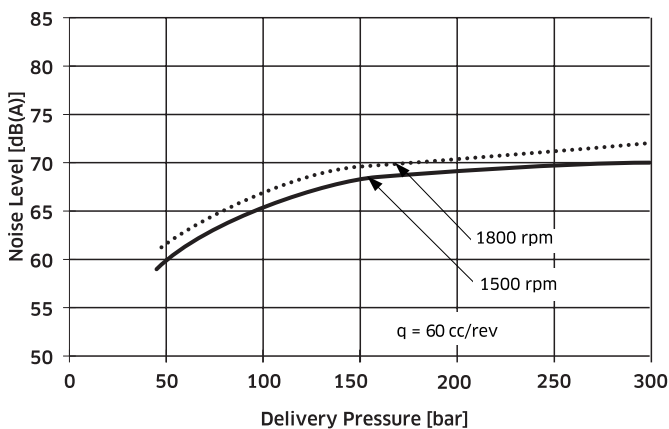
◆ Pump Efficiency (%)



◆ Self Priming Capability



◆ Noise Levels



Performance Note:

All performance curves are based on the following conditions:

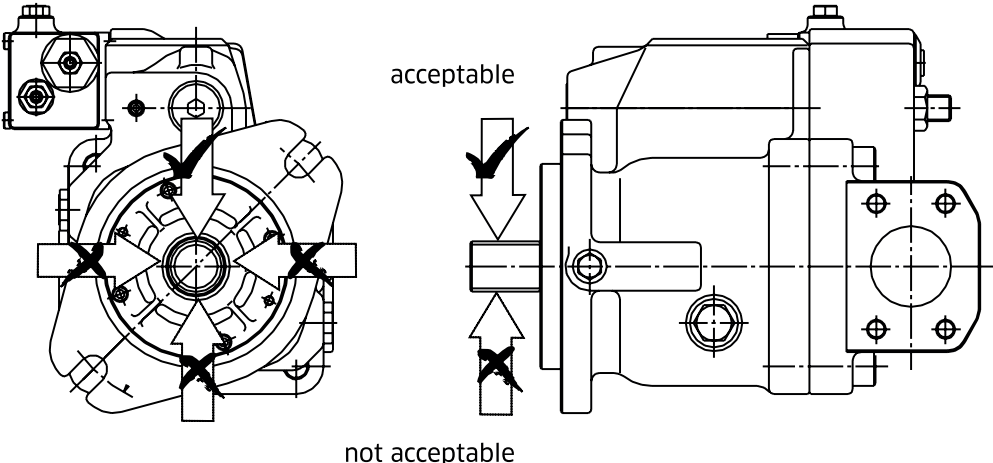
- 1,500 rpm
- ISO VG46 mineral oil
- 50°C oil temperature

2-4 Radial Loading Capacity

No axial shaft loading possible, radial loading is achievable but in specific orientation:-

Radial shaft loading can be allowed provided that its orientation is such that the front bearing takes the additional load (see diagram below).

Note: In this case bearing life will be reduced.

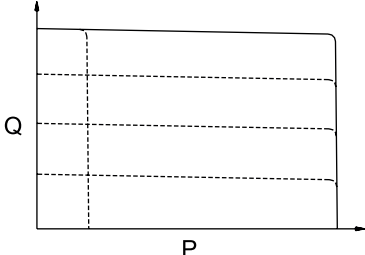
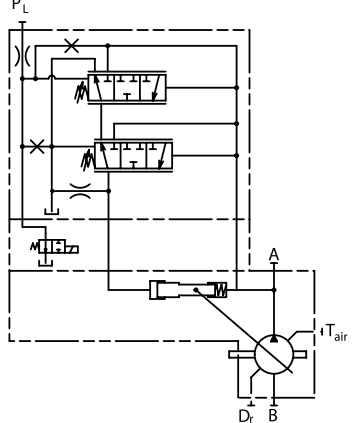
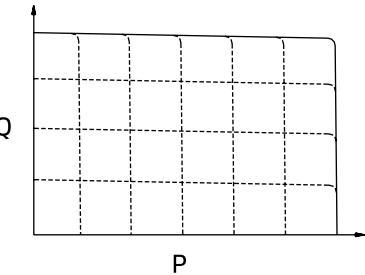
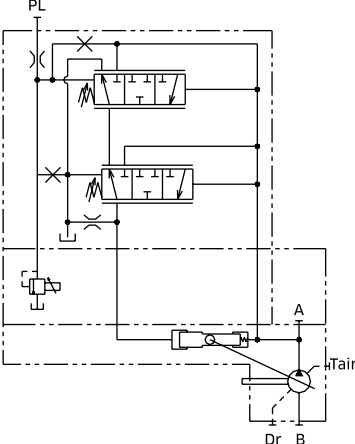
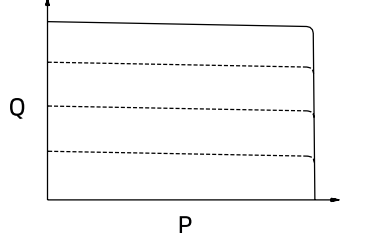
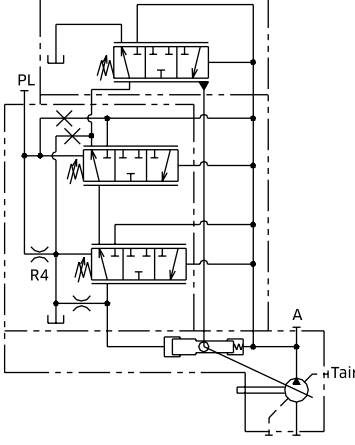


2-5 Functional Description of Regulator

Key to Hydraulic Circuit Annotations	
Annotations	Description
A	Main pump delivery
A1	Auxillary pump delivery
B1	Gear pump inlet
B	Main pump inlet
Dr	Drain
Pc	Remote pilot port, Pressure compensator
PI	Pilot port displacement control
PL	Load sense port
Tair	Air bleed port
P _f	Hydraulic power shift
P _{sv}	Servo assist

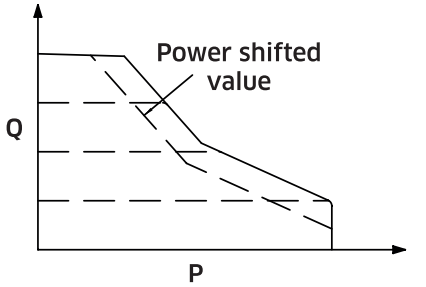
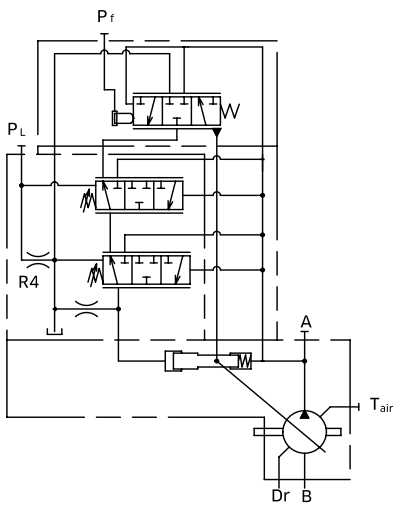
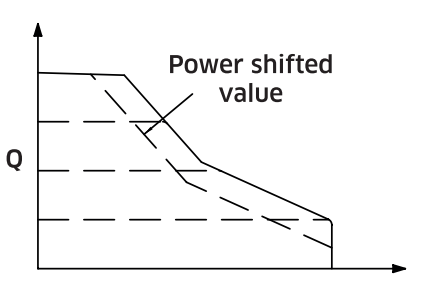
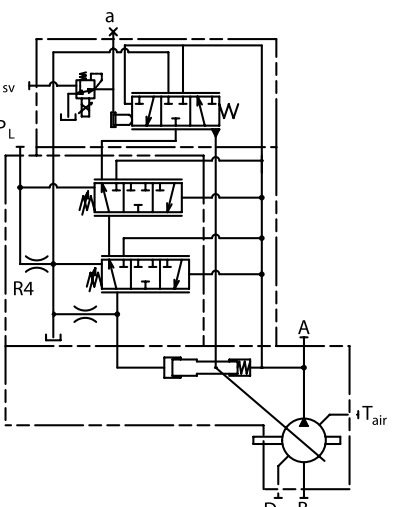

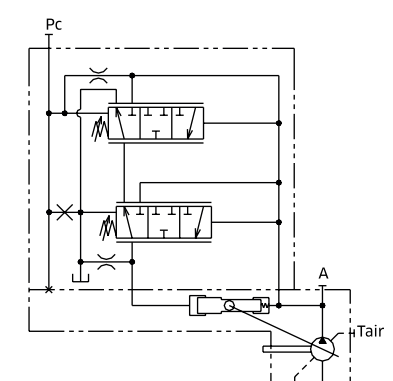
Regulator Code	Control Curves	Hydraulic Circuit
<p>L0/L1 Load Sense and Pressure Cut-off</p> <p>Pump displacement is controlled to match the flow requirement as a function of the system differential pressure (load pressure vs delivery pressure). In addition, there is a pressure cut off function incorporated into the control with the L1 option, the bleed-off orifice R4 is plugged.</p>		
<p>LN Load Sense and Pressure Cut-off with Integrated Unloading Valve (Normally Closed)</p> <p>An integrated unloading valve is sandwiched between the Load Sense regulator and pump to effectively de-stroke and swashplate when an electric signal is provided.</p>		

2-5 Functional Description of Regulator (cont)

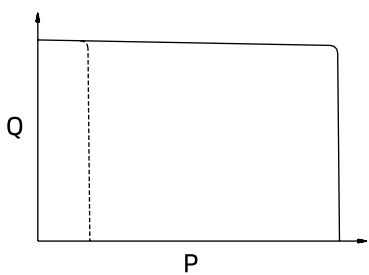
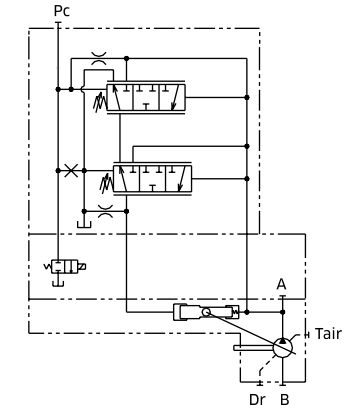
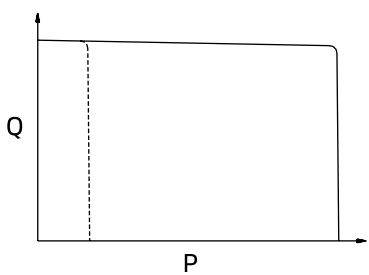
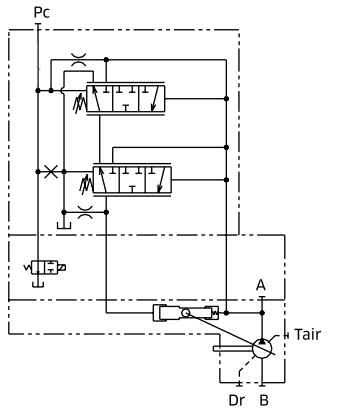
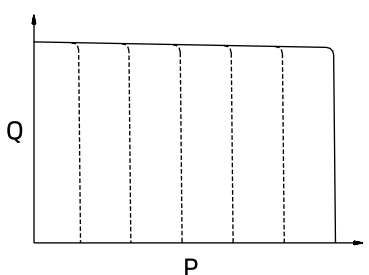
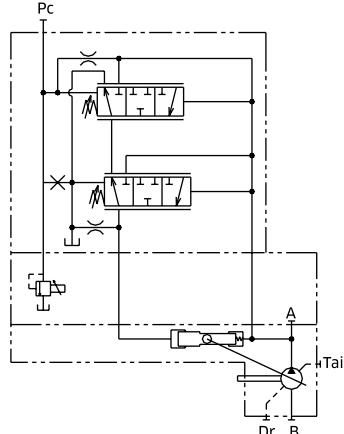
Regulator Code	Control Curves	Hydraulic Circuit
<p>LM Load Sense and Pressure Cut-off with Integrated Unloading Valve (Normally Open)</p> <p>An integrated unloading valve is sandwiched between the Load Sense regulator and the pump. An electrical signal must be provided to prevent the Load Sense line from draining.</p>		
<p>LV/LV2 Load Sense and Pressure Cut-off with Integrated Proportional Relief Valve</p> <p>An integrated proportional relief valve is sandwiched between the Load Sense regulator and pump to control the maximum pressure setting by varying an electric signal to the valve.</p> <p>A separate amplifier is required.</p> <p>Note: LV has improved control characteristic.</p>		
<p>L0/L1 Load Sense and Pressure Cut-off with Torque Limiting</p> <p>In response to a rise in delivery pressure the swashplate angle is decreased, restricting the input torque. This regulator prevents excessive load against the prime mover.</p> <p>The torque limit control module is comprised of two springs that oppose the spool force generated by the system pressure. By turning an outer and inner spring adjustment screw, the appropriate input torque limit can be set.</p>		

*1

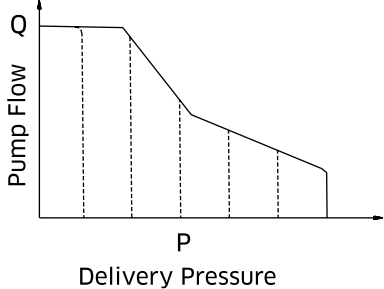
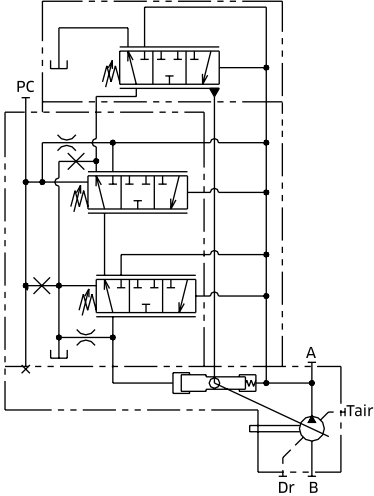
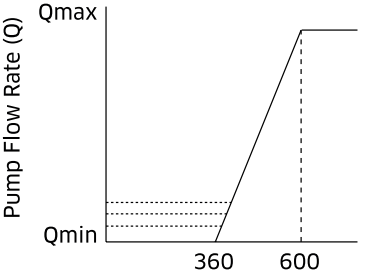
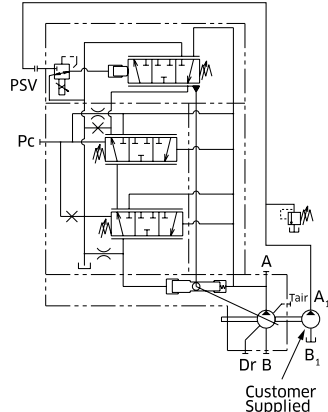
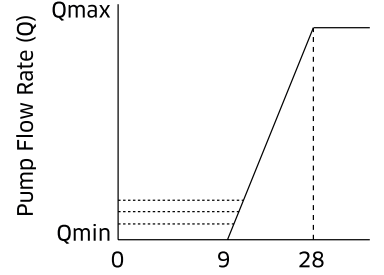
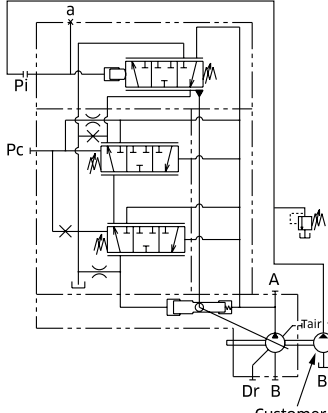
2-5 Functional Description of Regulator (cont)

Regulator Code	Control Curves	Hydraulic Circuit
<p>/2-** Hydraulic Power Shift with Load Sensing</p> <p>This function, as with the /1 type can be used with Pressure compensation, Load sense and additional control options such as unloader functions. The control has the same function as standard torque limit option. In response to a rise in delivery pressure the swashplate angle is reduced, restricting input torque.</p> <p>However if a pilot pressure is applied to the Pf port on the regulator, the torque setting can be further reduced proportionally to the pilot pressure applied. The input torque can be reduced by approximately 40% .</p>		 <p>*1</p>
<p>/3-** Electronic Power Shift with Load Sensing</p> <p>This function, as with the /1 type can be used with Pressure compensation, Load sense and additional control options such as unloader functions. The control has the same function as standard torque limit. In response to a rise in delivery pressure the swashplate angle is reduced, restricting input torque. However a constant pressure of 40 bar is required, applied to the Psv port of the regulator. The torque setting can be further reduced proportionally to a 24VDC electrical signal applied to the proportional valve on the regulator.</p>		 <p>*1</p>
<p>P0 Pressure Cut-off</p> <p>As system pressure rises to the cutoff setting, the swashplate de-strokes to prevent the system pressure from exceeding the compensator setting. It is imperative that a safety relief valve be installed in the system.</p> <p>Note: By connecting the Pc port to a remote pressure control, variable pump pressure control can be achieved.</p>		 <p>*1</p>

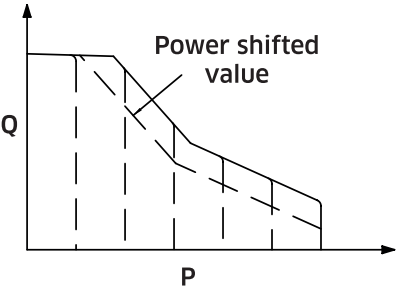
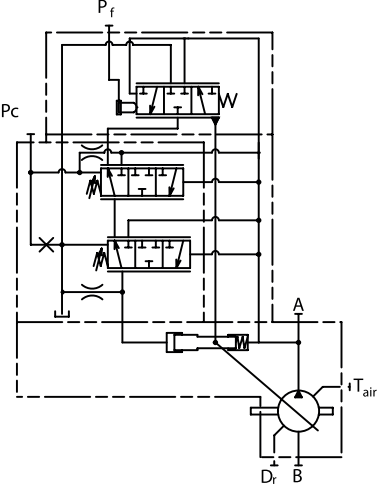
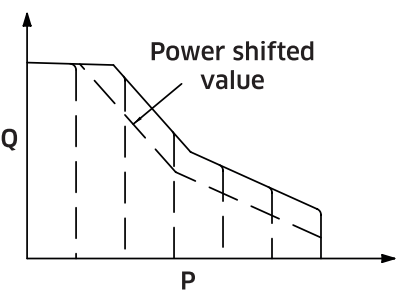
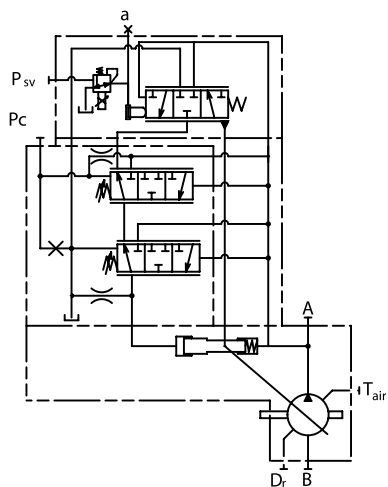
2-5 Functional Description of Regulator (cont)

Regulator Code	Control Curves	Hydraulic Circuit
<p>PN Pressure Cut-off with Integrated Unloading Valve (Normally Closed)</p> <p>An integrated unloading valve is sandwiched between the Pressure Cut-off regulator and pump to effectively de-stroke the washplate when an electric signal is provided.</p>		
<p>PM Pressure Cut-off with Integrated Unloading Valve (Normally Open)</p> <p>An integrated unloading valve is sandwiched between the Pressure Cut-off regulator and the pump. An electrical signal must be provided to prevent the Pc line from draining.</p>		
<p>PV/PV2 Pressure Cut-off with Integrated Proportional Relief Valve</p> <p>An integrated proportional relief valve is sandwiched between the Pressure Cut-off regulator and the pump to control the maximum pressure setting by varying an electric signal to the valve. A separate amplifier is required. Note: PV has improved control characteristic</p>		

2-5 Functional Description of Regulator (cont)

Regulator Code	Control Curves	Hydraulic Circuit
<p>P0/1 Pressure Cut-off with Torque Limiting</p> <p>P0/1 control functions as previously noted. In response to a rise in delivery pressure the swashplate angle is reduced, restricting the input torque. This regulator prevents excessive load against the prime mover.</p> <p>Note: By connecting the Pc port to a remote pressure control, variable pump pressure control can be achieved.</p>	 <p>Pump Flow Q</p> <p>Delivery Pressure P</p>	
<p>/1-E0 Electrical Displacement Control</p> <p>Varying the input current signal to the pump controller's electronic proportional pressure reducing valve (PPRV) allows the user to control the pump displacement. As the current signal to the PPRV increases, the pump displacement increases proportionally.</p> <p>Note: An external pressure supply of 40 bar is required at the PSV Port (50 bar max).</p>	 <p>Pump Flow Rate (Q)</p> <p>Input Current (mA) of Proportional Pressure Reading Valve</p>	 <p>Customer Supplied</p>
<p>/1-Q0 Pilot Operated Displacement Control</p> <p>Varying the input pressure signal to the Pi port allows the user to control the pump displacement. As the pressure signal to the Pi increases, the pump displacement increases proportionally.</p> <p>Note: An external pressure supply of up to 40 bar is required at the Pi Port (50 bar max).</p>	 <p>Pump Flow Rate (Q)</p> <p>Pilot Pressure (bar)</p>	 <p>Customer Supplied</p>

2-5 Functional Description of Regulator (cont)

Regulator Code	Control Curves	Hydraulic Circuit
<p>/2-** Hydraulic Power Shift with Pressure Compensation</p> <p>This function, as with the /1 type can be used with Pressure compensation, Load sense and additional control options such as unloader functions. The control has the same function as standard torque limit option. In response to a rise in delivery pressure the swashplate angle is reduced, restricting input torque. However if a pilot pressure is applied to the Pf port on the regulator, the torque setting can be further reduced proportionally to the pilot pressure applied. The input torque can be reduced by approximately 40% .</p>		
<p>/3-** Electronic Power Shift with Pressure Compensation</p> <p>This function, as with the /1 type can be used with Pressure compensation, Load sense and additional control options such as unloader functions. The control has the same function as standard torque limit. In response to a rise in delivery pressure the swashplate angle is reduced, restricting input torque. However a pilot pressure of 40 bar is required, applied to the PSV port of the regulator. The torque setting can be further reduced proportionally to a 24VDC electrical signal applied to the proportional valve on the regulator.</p>		

2-6 Torque Limiter Settings

The following tables show the power limitation at various electric motor speeds for a specific frame size of pump. When selecting a control setting please ensure that the power limitation of a particularly sized electric motor to your national standard is not exceeded.

K3VL45				
KW	970	1150	1450	1750
3.7	S3	S4	-	-
5.5	L3	S1	S3	S4
7.5	L1	L2	L4	S2
11	M1	M3	L1	L2
15	H3	H4	M2	M4
18.5	-	H2	H4	M2
22	-	-	H3	H4
30	-	-	-	H1
37	-	-	-	-
45	-	-	-	-
55	-	-	-	-
75	-	-	-	-
90	-	-	-	-
110	-	-	-	-
132	-	-	-	-

K3VL60				
KW	970	1150	1450	1750
3.7	-	-	-	-
5.5	S2	S2	-	-
7.5	L4	S1	S3	-
11	M4	L2	S1	S2
15	M2	M3	L2	L3
18.5	H2	M1	M3	L1
22	-	H2	M2	M3
30	-	-	H2	H3
37	-	-	-	H1
45	-	-	-	-
55	-	-	-	-
75	-	-	-	-
90	-	-	-	-
110	-	-	-	-
132	-	-	-	-

K3VL80				
KW	970	1150	1450	1750
3.7	-	-	-	-
5.5	S2	S4	-	-
7.5	L6	S1	S3	-
11	L2	L4	L6	S1
15	M4	L1	L3	L5
18.5	M1	M3	L1	L3
22	H3	M1	M4	L1
30	H1	H2	H4	M2
37	-	-	H2	H4
45	-	-	H1	H2
55	-	-	-	H1
75	-	-	-	-
90	-	-	-	-
110	-	-	-	-
132	-	-	-	-

K3VL112				
KW	970	1150	1450	1750
3.7	-	-	-	-
5.5	-	-	-	-
7.5	S5	S6	-	-
11	S1	S3	S5	S6
15	L3	L4	S2	S4
18.5	M4	L2	L4	S2
22	M2	M4	L3	L4
30	H4	M1	M3	L1
37	H2	H3	M1	M3
45	-	H2	H4	M1
55	-	-	H2	H4
75	-	-	-	H1
90	-	-	-	-
110	-	-	-	-
132	-	-	-	-

K3VL140				
KW	970	1150	1450	1750
3.7	-	-	-	-
5.5	-	-	-	-
7.5	-	-	-	-
11	S2	S4	-	-
15	L6	S1	S3	-
18.5	L3	L5	S1	S3
22	L1	L3	L6	S1
30	M2	M3	L2	L4
37	H4	M1	M3	L2
45	H2	H4	M2	M3
55	-	H2	H4	M2
75	-	-	H1	H3
90	-	-	-	H1
110	-	-	-	-
132	-	-	-	-

K3VL200				
KW	970	1150	1450	1750
3.7	-	-	-	-
5.5	-	-	-	-
7.5	-	-	-	-
11	-	-	-	-
15	-	-	-	-
18.5	S1	-	-	-
22	L4	S1	-	-
30	L2	L3	L5	S2
37	M3	L1	L3	L5
45	M1	M3	L2	L3
55	H5	M1	M3	L2
75	H1	H3	H6	M2
90	-	H1	H4	H6
110	-	-	H2	H4
132	-	-	-	H2

-6 Torque Limiter Settings (cont)

◆ Torque Limiter Control - Setting Table

K3VL frame size	Primmer Input Torque (Nm)																														
	30	36	41	46	49	53	61	73	82	91	100	107	121	146	154	163	182	200	216	246	298	307	367	409	450	492	540	610	618	711	752
45	S4	S3	S2	S1	L4	L3	L2	L1	M4	M3	M2	M1	H4	H3	H2	H1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
60	-	-	-	S4	S3	S2	S1	L4	L3	L2	L1	M4	M3	M2	H3	H2	H1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
80	-	-	-	S4	S3	S2	S1	L6	L5	L4	L3	L2	L1	M4	M3	M2	M1	H4	H3	H2	H1	-	-	-	-	-	-	-	-	-	-
112	-	-	-	-	-	-	S6	S5	S4	S3	S2	S1	L4	L3	L2	L1	M4	M3	M2	M1	H4	H3	H2	H1	-	-	-	-	-	-	-
140	-	-	-	-	-	-	-	-	-	S4	S3	S2	S1	L6	L5	L4	L3	L2	L1	M3	M2	M1	H4	H3	H2	H1	-	-	-	-	-
200 & 200H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	S2	S1	L5	L4	L3	L2	L1	M3	M2	M1	H6	H5	H4	H3	H2	H1	

Note: Highlighted options show power shift

◆ Power Shift Control - Setting Table

/2 Hydraulic Spring Setting		K3VL80				K3VL112				K3VL140				K3VL200(H)					
		H4	H3	H2	H1	H4	H3	H2	H1	H4	H3	H2	H1	H6	H5	H4	H3	H2	H1
Pf Pressure (bar)	0	200	216	246	298	298	307	367	409	367	409	450	492	492	540	610	618	711	752
	10	167	183	209	252	252	255	309	349	309	349	383	421	421	453	517	524	610	648
	20	138	152	175	210	210	208	256	292	256	292	322	356	356	374	432	439	517	553
	30	111	123	145	173	173	167	209	241	209	241	266	298	298	303	355	361	433	465

/3 Electric Spring Setting		K3VL80				K3VL112				K3VL140				K3VL200(H)					
		H4	H3	H2	H1	H4	H3	H2	H1	H4	H3	H2	H1	H6	H5	H4	H3	H2	H1
Current (mA)	0	200	216	246	298	298	307	367	409	367	409	450	492	492	540	610	618	711	752
	336	167	183	209	252	252	255	309	349	309	349	383	421	421	453	517	524	610	648
	473	138	152	175	210	210	208	256	292	256	292	322	356	356	374	432	439	517	553
	595	111	123	145	173	173	167	209	241	209	241	266	298	298	303	355	361	433	465

2-7 Installation

◆ Moment of Inertia and Torsional Stiffness

Frame Size	Moment of Inertia		Torsional Stiffness (N m/rad)
	I (kg.m ²)	GD ² (kgf.m ²)	
K3VL28	2.09x10 ⁻³	8.36-10 ⁻³	2.20 x 10 ⁴
K3VL45	3.85x10 ⁻³	1.54-10 ⁻²	3.59 x 10 ⁴
K3VL60	3.83x10 ⁻³	1.53-10 ⁻²	3.59 x 10 ⁴
K3VL80	7.30x10 ⁻³	2.92-10 ⁻²	4.83 x 10 ⁴
K3VL112	2.02x10 ⁻²	8.06-10 ⁻²	9.33 x 10 ⁴
K3VL140	2.02x10 ⁻²	8.06-10 ⁻²	9.33 x 10 ⁴
K3VL200	4.58x10 ⁻²	1.83-10 ⁻¹	1.54 x 10 ⁵
K3VL200H	4.58x10 ⁻²	1.83-10 ⁻¹	1.54 x 10 ⁵

◆ Through Drive Limitations

Pump over all length (LPX) (mm)	
Frame size	Single pump type N
K3VL28	219
K3VL45	244
K3VL60	244
K3VL80	272
K3VL112	307
K3VL140	307
K3VL200	359
K3VL200H	424

Frame size	Maximum Permissible Bending Moment
K3VL28	137
K3VL45	137
K3VL60	137
K3VL80	244
K3VL112	462
K3VL140	462
K3VL200	930
K3VL200H	930

2-7 Installation (cont)

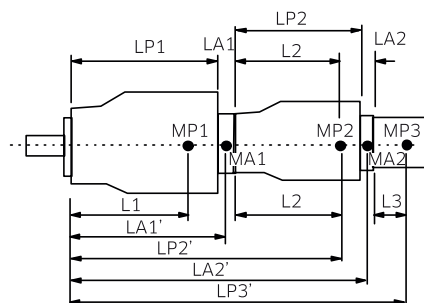
◆ Through Drive Limitations (cont)

Frame size	Pump approx weight (MPX)(Kg)	
	Single pump type N	
	Without Torque Limitor	With Torque Limitor
K3VL28	20	na
K3VL45	27	29
K3VL60	27	29
K3VL80	35	37
K3VL112	65	67
K3VL140	65	67
K3VL200	95	97
K3VL200H	130	132

Frame size	Pump CofG from mount (Lx) (mm)
	Single pump type N
K3VL28	115
K3VL45	120
K3VL60	120
K3VL80	130
K3VL112	150
K3VL140	150
K3VL200	190
K3VL200H	223

Adaptor Kits Weights (MAX) & Width (LAX)			
Frame Size	Adaptor Kit	Weight (MAX) Kg	Width (LAX) mm
K3VL28	SAE 'A'	0	0
	SAE 'B'	2	20
K3VL45 & 60	SAE 'A'	0	0
	SAE 'B' & 'BB'	2	20
K3VL80	SAE 'A'	0	0
	SAE 'B' & 'BB'	3	20
	SAE 'C', 'CC' & 'C4'	4	24.5
K3VL112 & 140	SAE 'A'	0	0
	SAE 'B' & 'BB'	3	25
	SAE 'C', 'CC' & 'C4'	5	30
	SAE 'D'	10	43
K3VL200	SAE 'A'	1	6
	SAE 'B' & 'BB'	8	25
	SAE 'C', 'CC' & 'C4'	8	30
	SAE 'D'	10	38
	SAE 'E'	15	38

Apart from predefined maximum throughput limitations, one must also ensure that to prevent a possible excessive bending moment occurring that the maximum combined bending moment of the combination is not exceeded as determined in the following expression.



MPX = mass of pump [kg]
 LPX = length of pump [mm]
 Lx = distance of CofG from pump mounting face [mm]
 MAX = mass of adaptor kit [kg]
 LAX = width of adaptor kit [mm]

$$\text{Bending Moment} = \frac{((L1.mP1) + (LA1'.mA1) + (LP2'.mP2) + (LA2'.mA2) + LP3'.mP3) + \dots}{102} \text{[Nm]}$$

$$+ ((L1.mP1) + (LP1 + (LA1/2)).mA1)$$

2-7 Installation (cont)

◆ Response times

Pressure Cut-off Dynamic Response

50 to 280 bar

	$t_{\text{off-stroke}}$	$t_{\text{on-stroke}}$
Unit	mS	
K3VL28	20	40
K3VL45/60	60	100
K3VL80	95	170
K3VL112/140	90	140
K3VL200/H	110	210

Test conditions:

Pump speed = 1800 rpm
 Inlet Condition = 0 bar
 Oil Type = ISO VG46
 Oil Temperature = 50°C
 Compressed oil volume = 5 litres

220 to 280 bar

	$t_{\text{off-stroke}}$	$t_{\text{on-stroke}}$
Unit	mS	
K3VL28	20	40
K3VL45/60	60	70
K3VL80	100	110
K3VL112/140	100	120
K3VL200/H	110	220

Test conditions:

Pump speed = 1800 rpm
 Inlet Condition = 0 bar
 Oil Type = ISO VG46
 Oil Temperature = 50°C
 Compressed oil volume = 5 litres

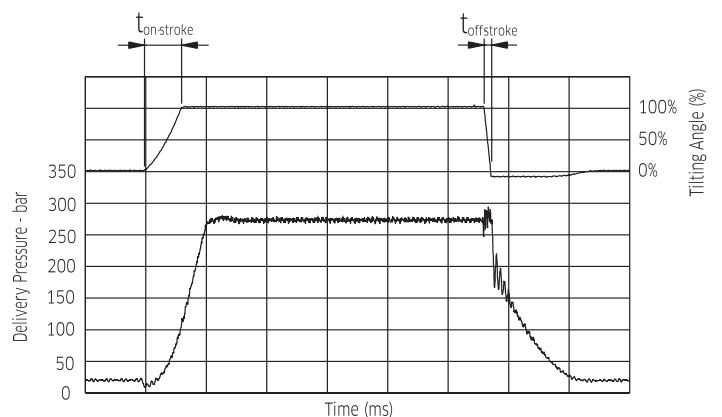
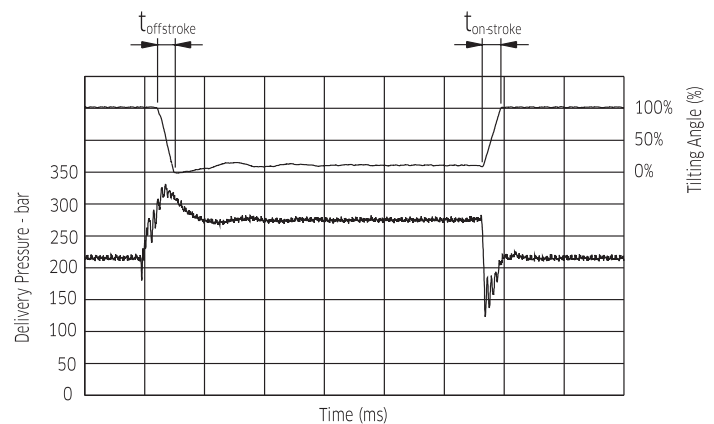
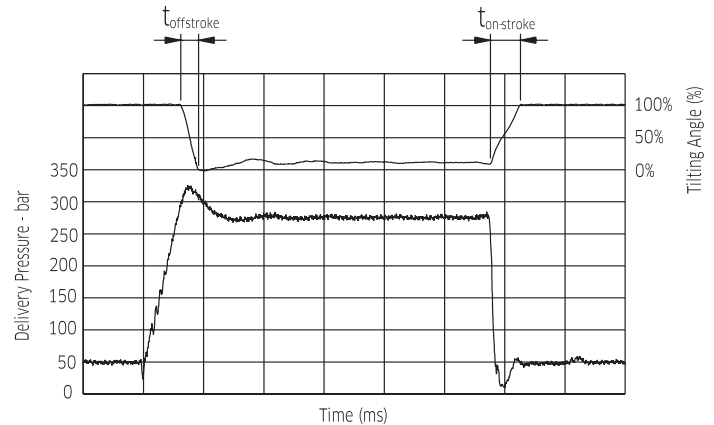
Load Sensing Dynamic Response

20 to 280 bar

	$t_{\text{off-stroke}}$	$t_{\text{on-stroke}}$
Unit	mS	
K3VL28	20	70
K3VL45/60	20	115
K3VL80	55	155
K3VL112/140	55	195
K3VL200/H	65	190

Test conditions:

Pump speed = 1800 rpm
 Inlet Condition = 0 bar
 Oil Type = ISO VG46
 Oil Temperature = 50°C
 Compressed oil volume = 5 litres



2-7 Installation (cont)

Electrical and Pilot Operated Displacement Control (Type E0, E1, E2, E3 & Q0)

Type E0 - In order for the electronic displacement control to function, a pilot pressure of 40 bar must be supplied to the Pi port on the regulator. A gear pump attached to the rear of the K3VL pump or an external pressure source can be used to provide the required pilot pressure.

Type Q0 - In order for the Q0 displacement control to function, a variable pilot pressure between 0 and 40 bar is required to be supplied to the Pi port on the regulator.

Proportional Pressure Reducing Valve Specification

Maximum Pilot Pressure : 50 bar (if higher pressure
required contact KPM UK)

Max Flow: : 10 l/min

Hydraulic oil : Mineral oil

Oil temp range : -20~+90°C

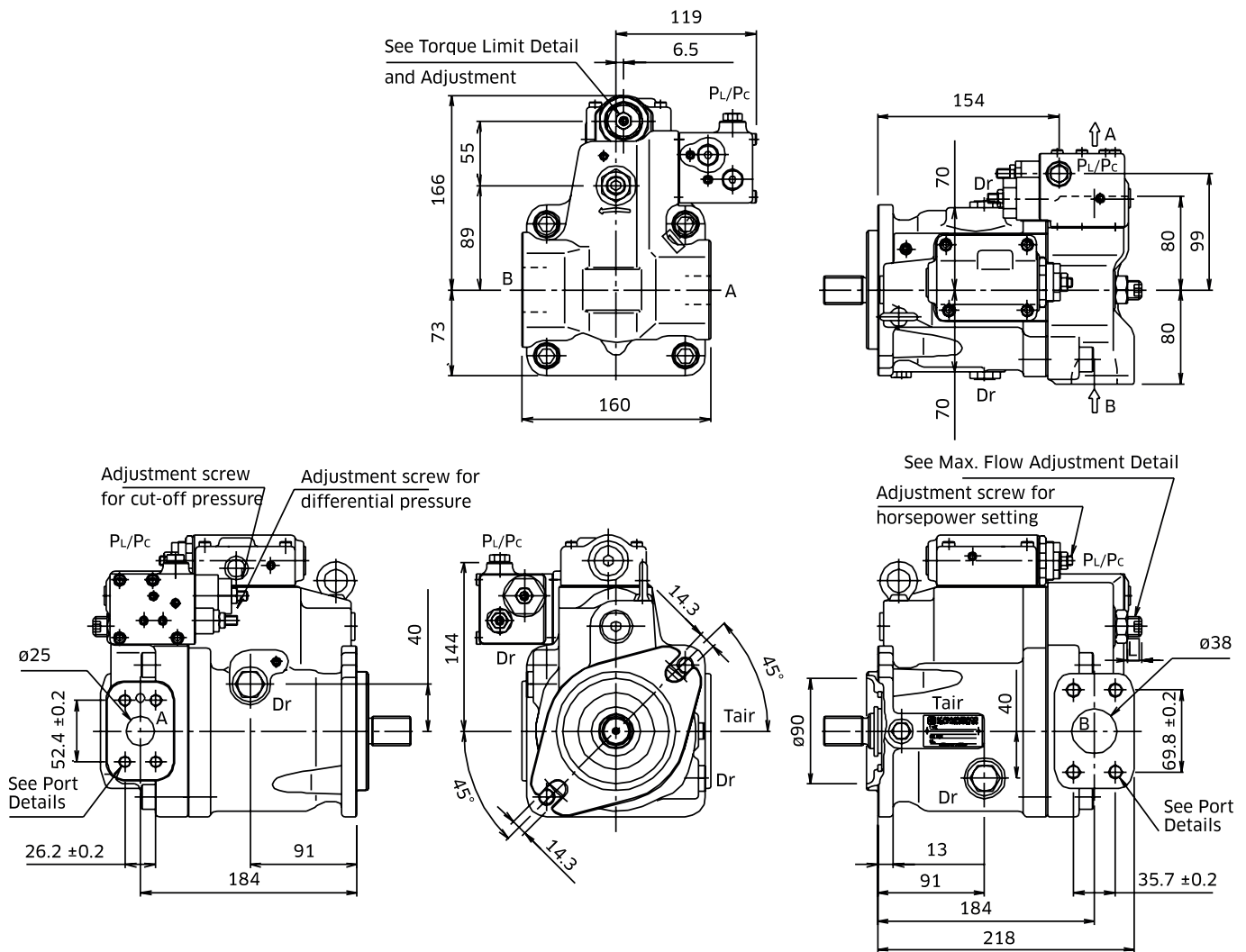
Viscosity range : 5~500 cSt

Electrical Specifications

	E0, E1, E2 24V DC	E3 12V DC
Rated Current	700 mA	1,400 mA
Recommended Dither	80 Hz/200 mAp-p	80 Hz/200 mAp-p
Coil Resistance	17.5 Ω	3.2 Ω
Ambient Temperature Range	-30 ~+95°C	-30 ~+95°C
Water Resistance	According to JIS D 0203 S2 SAE J575	According to JIS D 0203 S2 SAE J575
IP Rating	IPX6	IPX6

3-2 K3VL45/60 Installation

◆ K3VL45/60 with Cut-Off / Load Sense Control & Torque Limit Module (Clockwise Rotation)

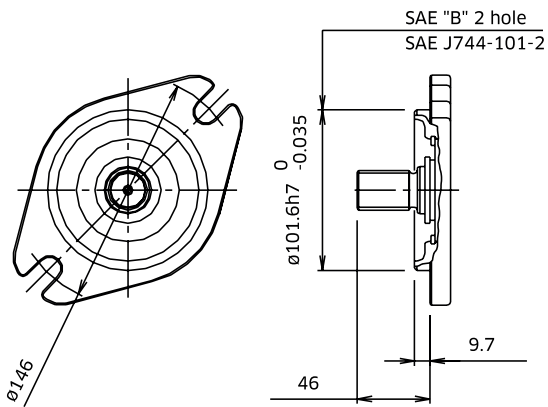


Note: for counter clockwise rotation, the inlet port 'B' and the delivery port 'A' are reversed.

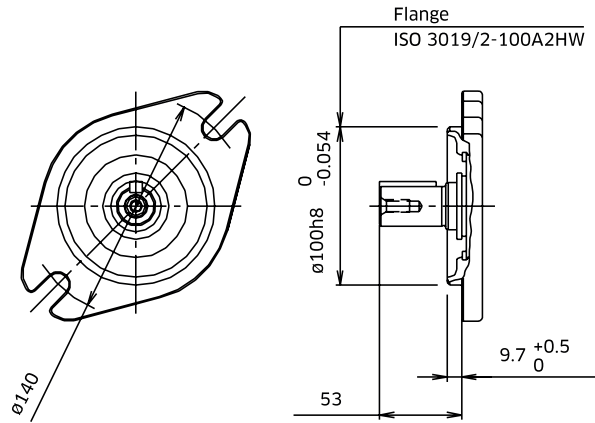
3-2 K3VL45/60 Installation (cont)

◆ K3VL45/60 Mounting Flange and Shaft Options

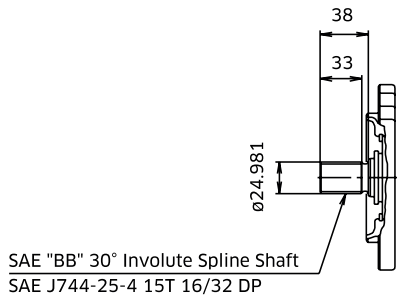
SAE Type



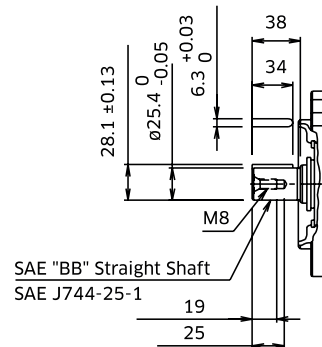
ISO Type



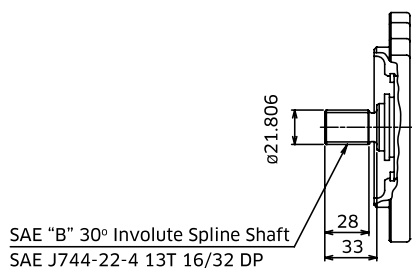
SAE 'BB' Spline Shaft - Option 'S'



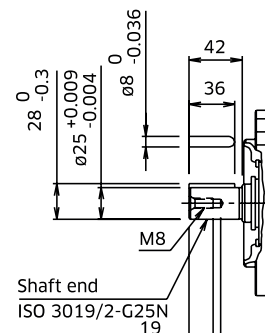
SAE 'BB' Straight Shaft - Option 'K'



SAE 'B' Spline Shaft - Option 'T'

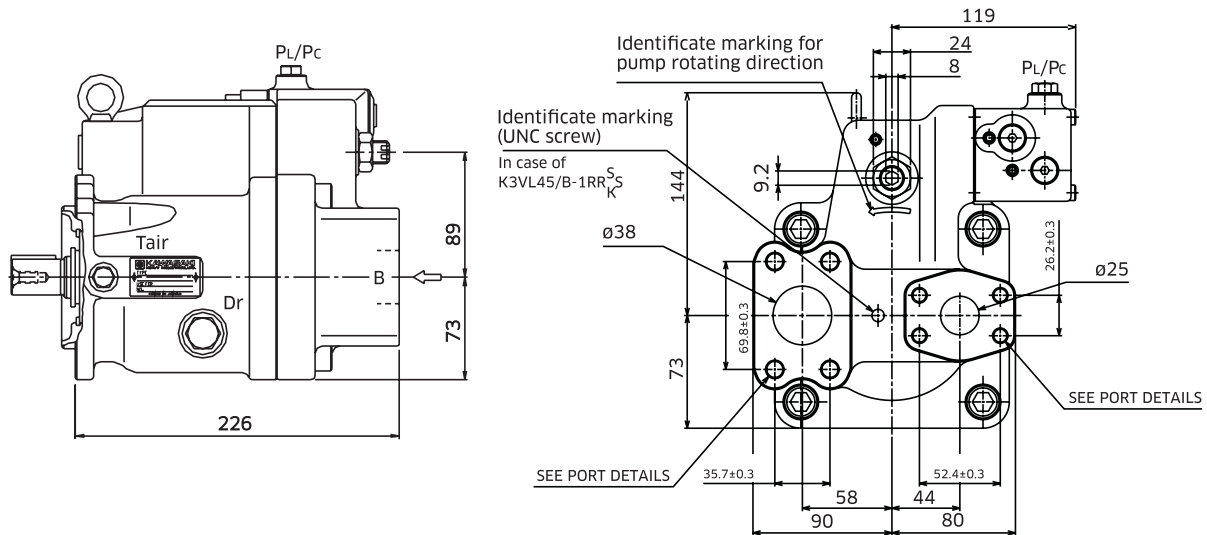


ISO Straight Shaft - Option 'M'



3-2 K3VL45/60 Installation (cont)

◆ K3VL45/60 Rear Port



◆ K3VL45/60 Porting Details

Main SAE Flanged Ports

Des.	Port Name	Port Size	Tightening Torque (Nm)	Flange Threads
------	-----------	-----------	------------------------	----------------

UNF Threaded Version ('S' in position 9 of model code)

A	Delivery Port	SAE J518C Std pressure (code 61) 1"	57	3/8-16UNC-2B x 18 mm
B	Suction Port	SAE J518C Std pressure (code 61) 1.5"	98	1/2-13UNC-2B x 22 mm

Metric Version ('M' in position 9 of model code)

A	Delivery Port	SAE J518C Std pressure (code 61) 1"	57	M10 x 17
B	Suction Port	SAE J518C Std pressure (code 61) 1.5"	98	M12 x 20

Auxillary Ports

Des.	Port Name	Port Size	Tightening Torque (Nm)
------	-----------	-----------	------------------------

SAE Version ('S', 'K', or 'T' in position 8 of model)

Dr	Drain Port (x2)	3/4-16UNF-2B-14.3 (ISO11926-1:1995)	98
P _L /P _C	Load Sensing Port Pressure Control Port	7/16-20UNF-2B-14 (ISO11926-1:1995)	12
T _{air}	Air Bleeder Port	7/16-20UNF-2B-14 (ISO11926-1:1995)	12

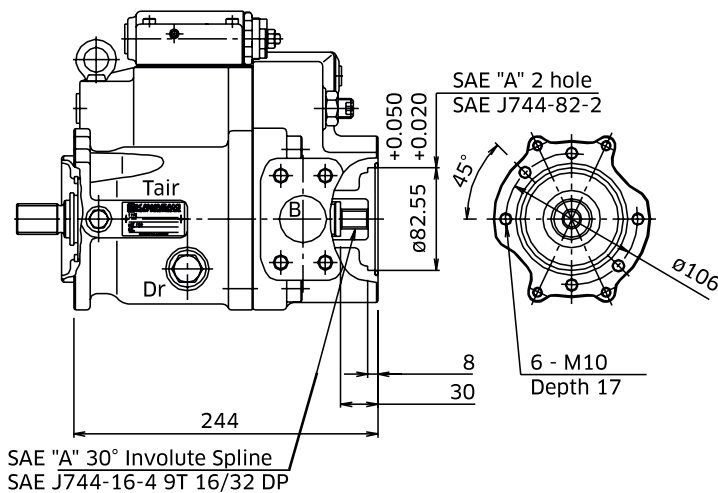
ISO Version ('M' in position 8 of model code)

Dr	Drain Port (x2)	M22 x 1.5-14.5 DIN 3852	98
P _L /P _C	Load Sensing Port	M14 x 1.5-12.5 DIN 3852	25

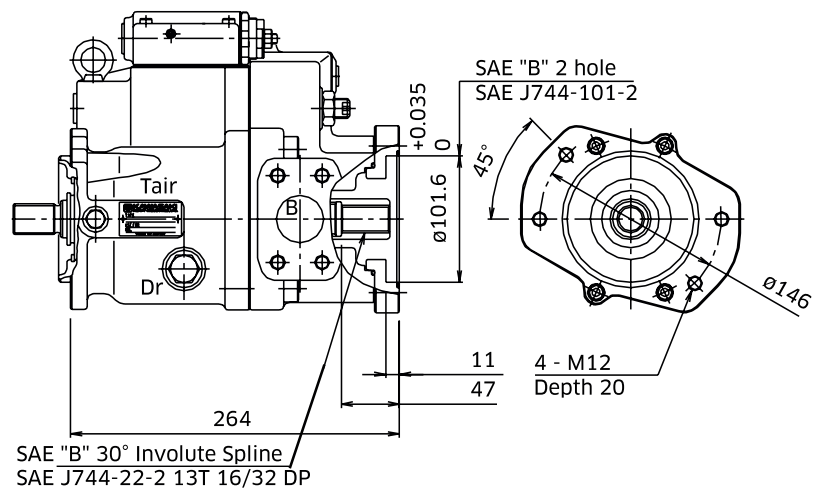
3-2 K3VL45/60 Installation (cont)

◆ K3VL45/60 Through Drive Options

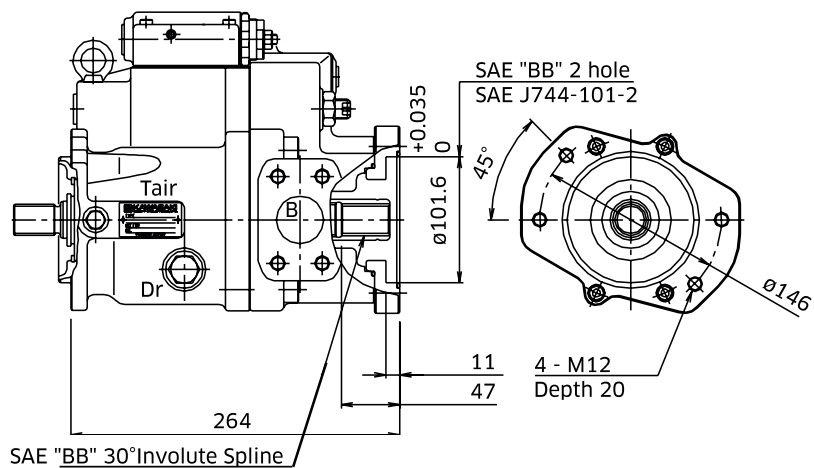
Through Drive 'A'



Through Drive 'B'

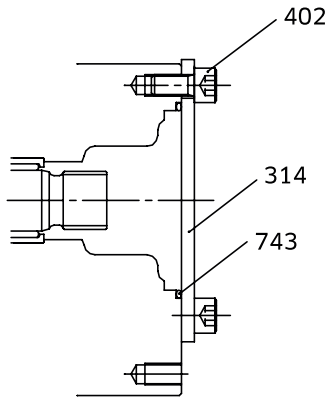


Through Drive 'BB'

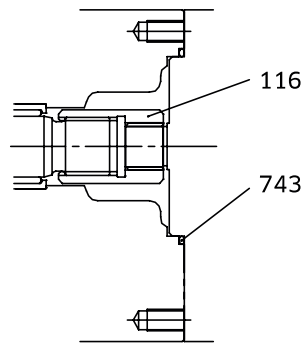


3-2 K3VL45/60 Installation (cont)

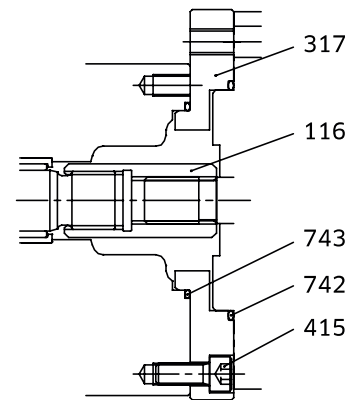
◆ K3VL45/60 Adaptor Kits



COVER KIT



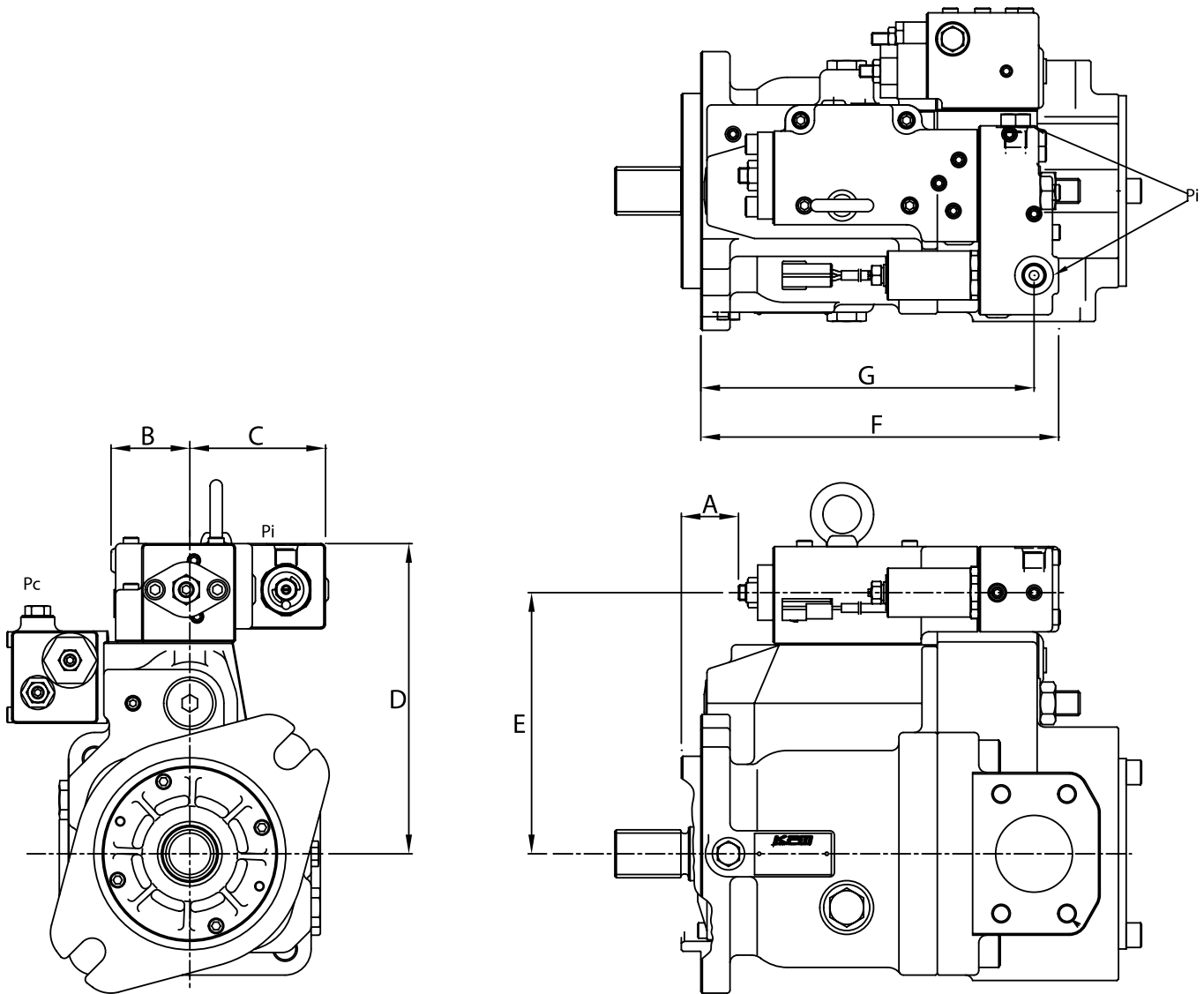
SAE 'A' T/D KIT



SAE 'B' & 'BB' T/D KIT

Part Name	Qty	Cover Kit	SAE 'A' T/D Kit	SAE 'B' T/D Kit	SAE 'BB' T/D Kit
T/D	-	29L8TN	29L4TA	29L4TB	29L4T2
O-Ring	1	Item 743	Item 743	Item 743	Item 743
O-Ring	1	-	-	Item 742	Item 742
Screw Hex SHC	4	-	-	Item 415	Item 415
Screw Hex SHC	2	Item 402	-	-	-
Subplate	1	-	-	Item 317	Item 317
Cover	1	Item 314	-	-	-
Coupling	1	-	Item 116	Item 116	Item 116

3-7 Electrical & Hydraulic Displacement Control Installation (Type Q0, E*)



Installation Dimensions (mm)

Pump Size	A	B	C	D	E	F	G
K3VL45/60	21	52	90	187	157	226	210
K3VL80	25	59	83	202	172	233	217
K3VL112/140	38	64	78	244	214	247	231
K3VL200(H)	57	61	80	258	229	257	249

3-8 Unloading & Proportional Pressure Control Installation

Unloading valve module (Type N, M)

Pump Size	A	B
K3VL45/60	169	155
K3VL80	169	166
K3VL112/140	202	190
K3VL200(H)	212	205

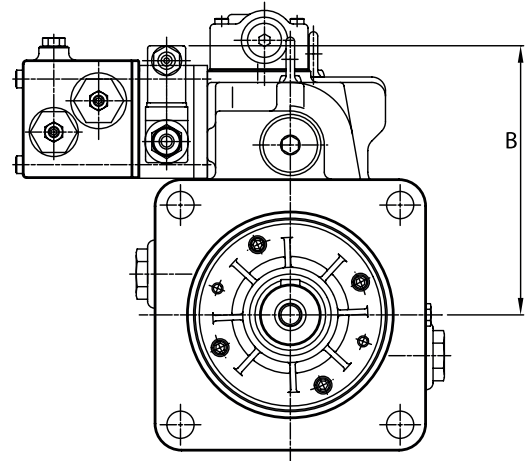
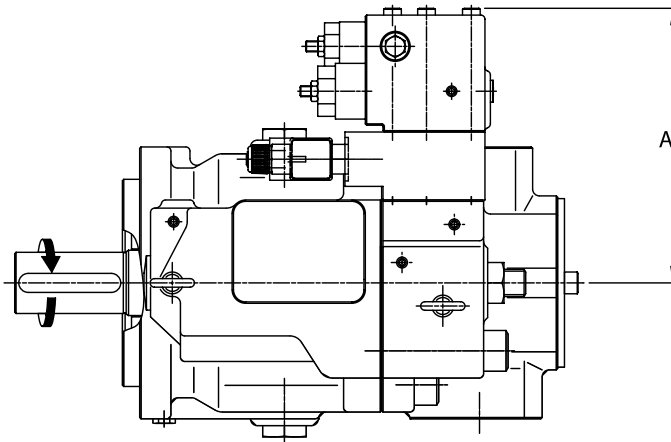
Proportional pressure module (*V)

Pump Size	A	B
K3VL45/60	179	233
K3VL80	179	244
K3VL112/140	212	280
K3VL200(H)	222	295

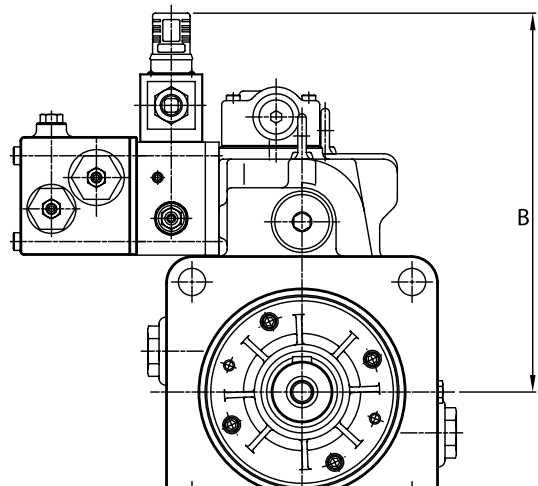
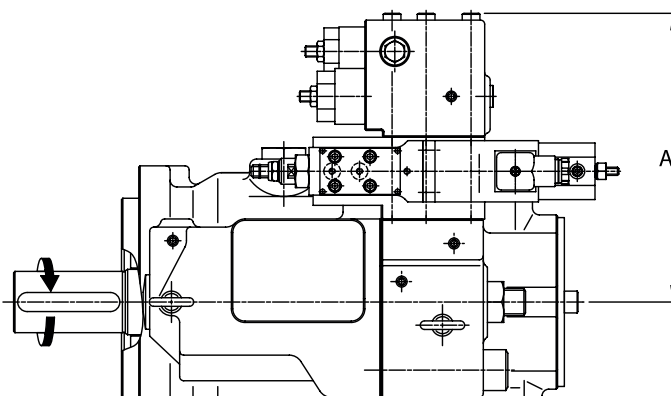
A : Distance between the centre line of the pump and the top of the bolt head for the cut off regulator.

B : Distance between the centre line of the pump and top of the solenoid valve.

Unloading valve module (Type N, M)

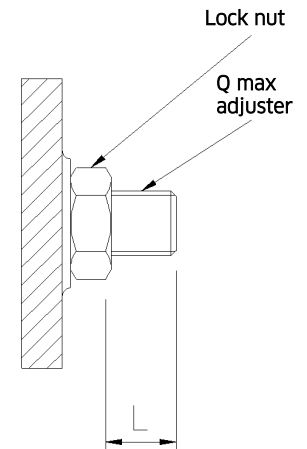


Proportional pressure module (*V)

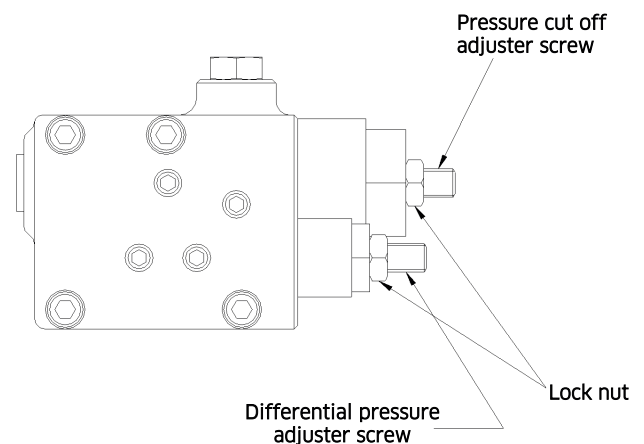


3-10 Pump Adjustments

Max displacement adjustment	Pump	K3VL45	K3VL60	K3VL80	K3VL112	K3VL140	K3VL200(H)
Adj. screw Allen key size	mm	8	8	8	10	10	10
Displacement change per turn	cm ³	4.9	6.1	6.0	11.5	12.0	15.3
Adjustable range of displacement	cm ³	16-45	24-60	35-80	56-112	70-140	100-200
Length of adjustment range (L)	mm	0.5-12.1	0.5-12.1	0.5-15.0	3.8-16	1.0-16	8.9-25.3
Lock nut size	mm	24	24	24	30	30	30
Lock nut tightening torque	Nm	128	128	128	235	235	235



Regulator Adjustment	Pump	K3VL28/45 /60/80	K3VL112 /140/200
Adjustment screw Allen key size	mm	4	4
Pressure cut off change per turn	bar	80	100
Differential pressure change per turn	bar	13	14
Lock nut size (across flats)	mm	8	8
Lock nut tightening torque	Nm	16	16

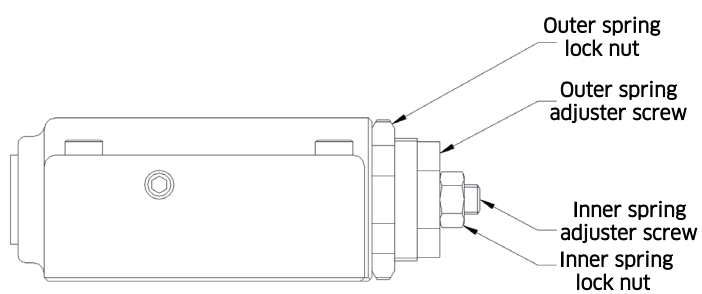


*1 Clockwise rotation of a screw produces an increase of the adjustment

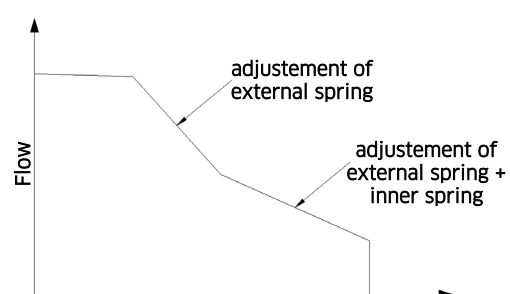
Torque limiter adjustments

Outer spring adjuster screw: external hex	mm	27
Outer spring lock nut size	mm	41
Outer spring lock nut tightening torque	Nm	102
Inner spring adjuster screw: internal hex	mm	4
Inner spring lock nut size	mm	13
Inner spring lock nut tightening torque	Nm	16

Torque limiter module



Torque limiter curve



BREATHERS & FILLER BREATHERS

TOP MOUNT — STANDARD FLOW

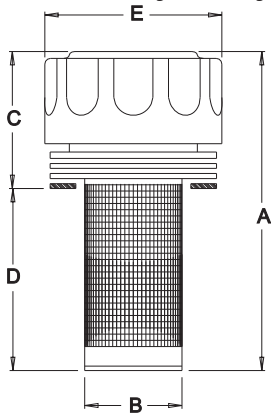
Top Mount Filler Breathers are designed to be used as a filler port for tanks, hydraulic power units or other fluid containers. These units also let the tank breathe while keeping out airborne particles.

Standard Features:

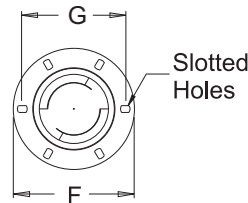
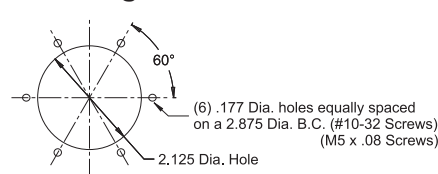
- Bayonet zinc plated steel cap - large capacity
- Twist to lock removable cap breathes and filters air
- Concealed air vents allowing for outdoor applications
- Flute finger inserts for easy gripping (vented style only)
- 10 or 40 micron filtration (vented style only)
- Safety chain - prevents loss of cap
- Heavy duty Cork-Neoprene gasket provides a positive seal between flanges
- Zinc plated flange - bayonet flange (SAE J829)
- Strainer basket
 - 4 inch long Nylon with solid dome bottom to prevent punchout
 - 3 inch long Stainless Steel, 30 mesh
- Thread forming screws -- prevents particles from entering reservoir during installation by forming threads rather than cutting them



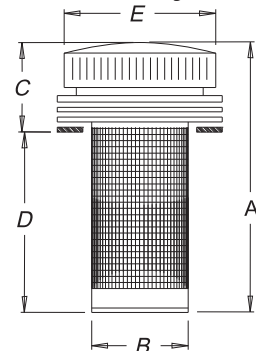
Standard Bayonet Style



Mounting Information



Non Vented Bayonet Style



NOTE: All dimensions are inches

Technical and Dimensional Details

Part No.	Cap Style	Breather (PSI)	Strainer Basket Type	Air Filtration		Air Flow Capacity (CFM)	Oil Transfer Rate (GPM)	Bayonet Flange (inches)														
				Nominal Level	Media			A	B	C	D	E	F	G								
Non-Pressurized, Standard Filler Breather - Bayonet Style																						
5201	Standard	N/A	Nylon	40 Micron	Foam	25	192	6.10	1.90	2.30	3.80	3.00	3.25	2.88								
5204	Standard	N/A	Nylon	10 Micron	Foam	15	115	6.10	1.90	2.30	3.80	3.00	3.25	2.88								
5216	Standard	N/A	Stainless Steel	40 Micron	Foam	25	192	5.10	1.90	2.30	2.80	3.00	3.25	2.88								
5220	Standard	N/A	Stainless Steel	10 Micron	Foam	15	115	5.10	1.90	2.30	2.80	3.00	3.25	2.88								
Pressurized, Standard Filler Breather - Bayonet Style																						
5205	Standard	5	Stainless Steel	10 Micron	Foam	25	192	5.10	1.90	2.30	2.80	3.00	3.25	2.88								
Non-Pressurized, Non-Vented Filler Breather - Bayonet Style																						
5232	Non Vented	N/A	Nylon	N/A	N/A	N/A	N/A	6.10	1.90	1.30	3.80	2.44	3.25	2.88								
5227	Non Vented	N/A	Stainless Steel	N/A	N/A	N/A	N/A	5.10	1.90	1.30	2.80	2.44	3.25	2.88								
Non-Pressurized, Metric Mounting Filler Breather - Bayonet Type																						
5203	Standard	N/A	Nylon	40 Micron	Foam	25	192	6.10	1.90	2.30	3.80	3.00	3.25	2.88								

Ordering Information Options

- For Locking Tabs add LT to part number (3/8 inch dia. hole to accept padlock)(not available in non vented breathers)

Dimensions and specifications are subject to change without notice. Not all items are Made-To-Stock, contact us for availability.

07/17

Ph : 920-682-6877
Fx : 920-684-7210



sales@ldi-industries.com
www.ldi-industries.com



SIGHT LEVEL GAUGES

ALG Series



Part Numbers				Dimensions		
Back Mount Gauges		Front Mount Gauges		A Mounting Centers	B Sight Glass	C Overall Length
Sight Only	with Thermometer	Sight Only	with Thermometer			
ALG-3	ALG-3T	N/A	N/A	3"	1 1/2"	4 5/8"
ALG-5	ALG-5T	FMALG-5	FMALG-5T	5"	3 1/2"	6 5/8"
ALG-10	ALG-10T	FMALG-10	FMALG-10T	10"	8 1/2"	11 5/8"

VESCOR Standard Fluid Sight Level Gauges are available in three sizes 3", 5" and 10". Gauges are available with or without thermometer in standard back mount design or optional front mount design.

Benefits and Features:

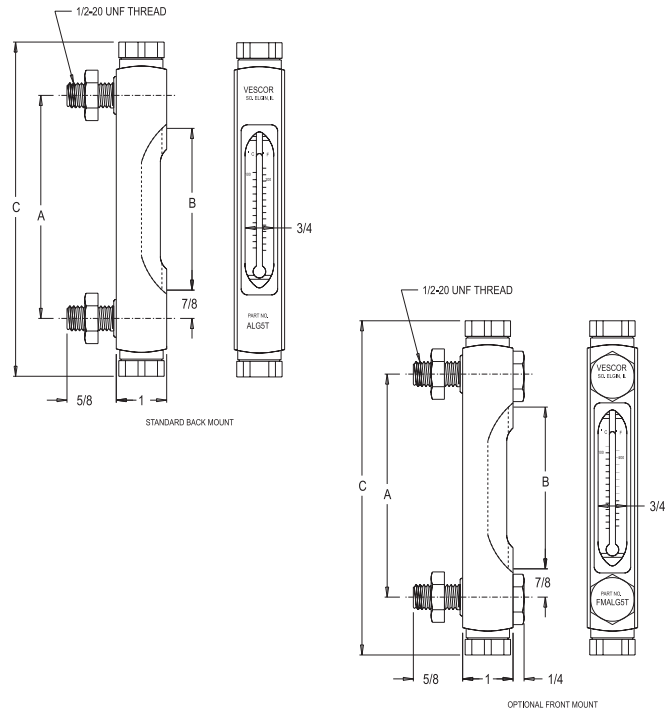
- Provides positive check of fluid level and temperature
- Rugged aluminum construction
- Durable pyrex glass tube
- 70 PSI max. pressure
- Thermometer with readings in centigrade and fahrenheit
- Buna-N O'-ring seals
- 250° F maximum temperature
- Minimum protrusion from reservoir

Mounting Information

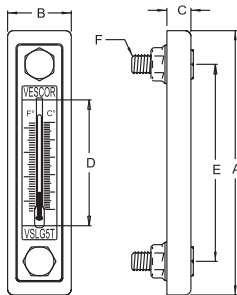
- Standard back mount gauges require access to reservoir. (2) 17/32 diameter holes to match mounting centers are required.
- Standard front mount gauges do not require access to reservoir. Gauge can be installed from the outside on (2) 1/2-20 tapped holes (when wall thickness permits) or (2) 1/2-20 hex nuts welded inside reservoir to match mounting centers.

Ordering Information

- Order sight level gauge by VESCOR part numbers
- For Viton seals add suffix -V (i.e. ALG5T-V)
- For EPDM seals add suffix -EP (i.e. ALG5T-EP)



VSLG (economy) Series



VESCOR VSLG5T (Economy) Series Sight Level Gauges are available in standard 5" size. Standard gauges are available with thermometer only and with standard front mount design.

Benefits and Features:

- Low Cost
- Steel body
- Durable black finish
- Trogamid protection glass
- Available from stock
- Provides positive check of fluid level and temperature
- Galvanized steel mounting bolts
- Thermometer readings in centigrade and fahrenheit
- Buna-N O'Ring seals

Mounting Information

Standard front mount gauge do not require access to reservoir. Gauge can be installed from the outside on (2) 1/2-13NC tapped holes (when wall thickness permit) or (2) 1/2-13NC hex nut welded inside reservoir to match mounting hole centers.

Ordering Information -Order sight level gauge by VESCOR part number

Vescor Part Number	Dimensions					
	A	B	C	D	E	F
VSLG5T	6.97	1.88	.71	2.88	5.00	1/2-13NC

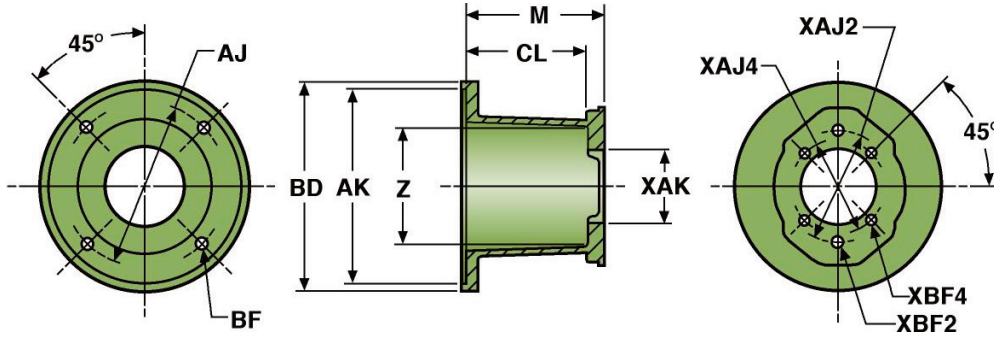
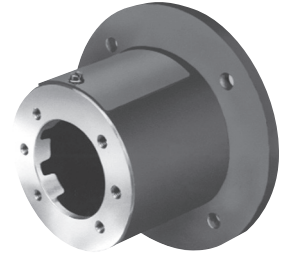


TABLE 8A - NEMA Frames 182TC - 256TC, 213UC - 256UC
Horizontal Mounting (or Vertical Mounting - Option A)



2

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

RADIAL CLEARANCE "Z" = 5.00

182-A Casting

		XAK	XAJ2	XBF2	XAJ4	XBF4	MOUNT NO.	CL	M	MOUNT NO.	CL	M	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
63 2A/B4	2(4) Bolt	63.01mm	100mm	5/16-18	85mm	5/16-18	M1824763M	4.00	4.75	M1825063M	4.31	5.00	M1825263M	4.31	5.25
63 S4	4 Bolt	63.01mm			80mm	11/32	M1824763MS	4.00	4.75	M1825063MS	4.31	5.00	M1825263MS	4.31	5.25
80 2A/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

PUMP FLANGE **PUMP END DATA** **4.75 LENGTH** **5.0 LENGTH** **5.25 LENGTH**

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

RADIAL CLEARANCE "Z" = 5.00

182-B Casting

		XAK	XAJ2	XBF2	XAJ4	XBF4	MOUNT NO.	CL	M	MOUNT NO.	CL	M	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			
63 2A/B4	2(4) Bolt	63.01mm	100mm	5/16-16	85mm	5/16-18	M1825863M	5.06	5.81	M1826863M	6.06	6.81			
63 S4	4 Bolt	63.01mm			80mm	11/32	M1825863MS	5.06	5.81	M1826863MS	6.06	6.81			
80 2A/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			

PUMP FLANGE **PUMP END DATA** **5.81 LENGTH** **6.81 LENGTH**

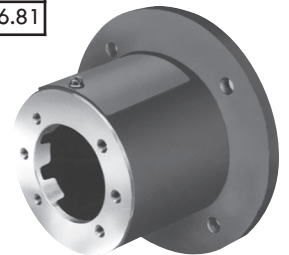


TABLE 8B - NEMA Frames 182TC - 256TC, 213UC - 256UC
Horizontal Mounting

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

RADIAL CLEARANCE "Z" = 5.00

182-B Casting

		XAK	XAJ2	XBF2	XAJ4	XBF4	MOUNT NO.	CL	M	MOUNT NO.	CL	M	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

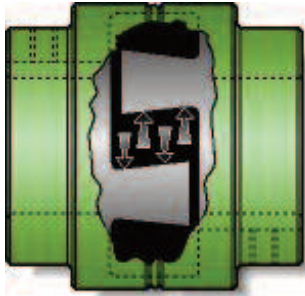
PUMP FLANGE **PUMP END DATA** **5.25 LENGTH** **5.81 LENGTH** **6.00 LENGTH**

SECTION 1

MAGNALOY FLEXIBLE DRIVE COUPLINGS



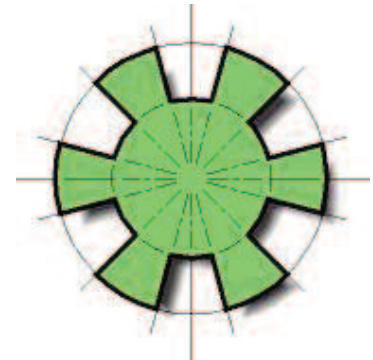
NOTE: Due to Magnaloy's policy of continuous improvement, specifications are subject to change without notice.
Check with the factory or our Web Site at www.magnaloy.com for the latest information.



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

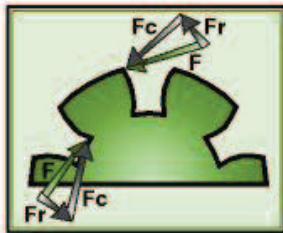
1

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



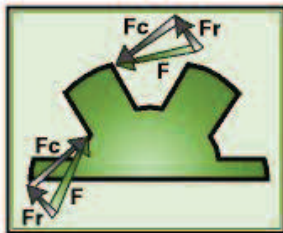
Magnaloy Coupling Design...

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



Conventional Design A...

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



Conventional Design B...

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

A note about Set-Screws ...

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

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



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

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

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

1

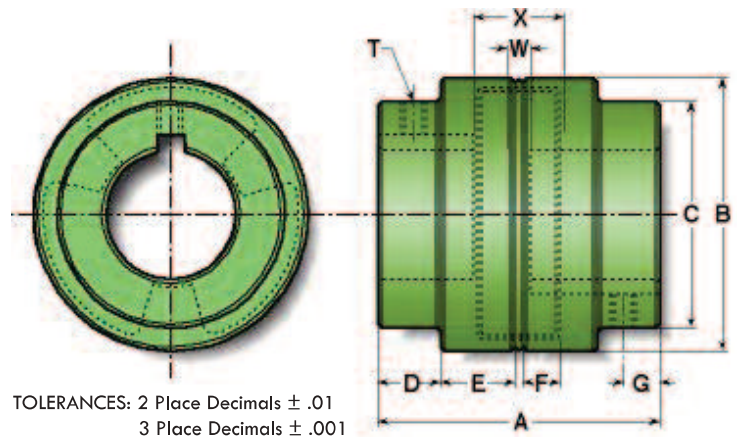
Coupling Performance Specifications

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

Magnaloy Coupling Dimensional Specifications

Models 100, 200, 300, 400

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



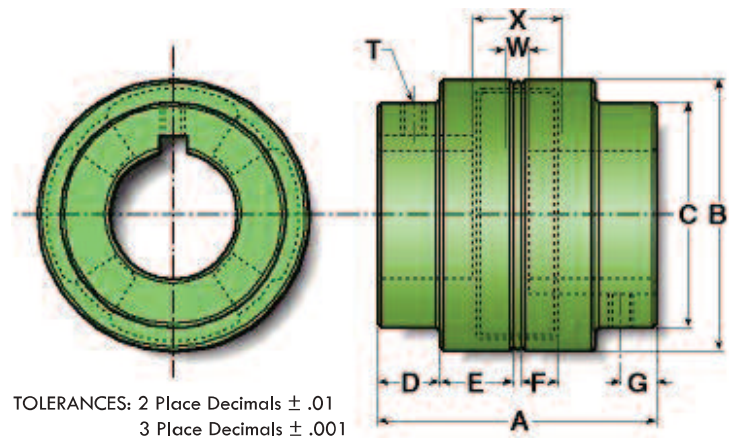
Model 500

	500
A	4.67
B	4.800
C	4.00
D	1.04
E	1.23
F	0.64
G	.070
W	1/16
X	1.41
T	3/8-16

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

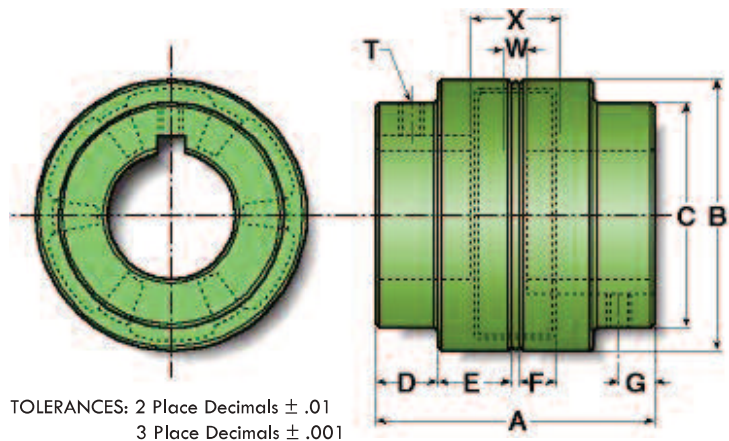
W*: Minimum Space between shaft ends.

* Given for reference only.



Models 600, 600, 800, 900

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





Bore & Keyway Combinations

Standard Bore and Keyway Combinations

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

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

Shaded Area: AGMA semi-standard bore key combinations.

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

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

Bore Tolerances

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

Additional Coupling Specifications

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



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

1



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



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

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

Splined & Clamp Specifications

Spline Coupling Specifications

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

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

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

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

Clamp Type Code: C = Clamp Type.

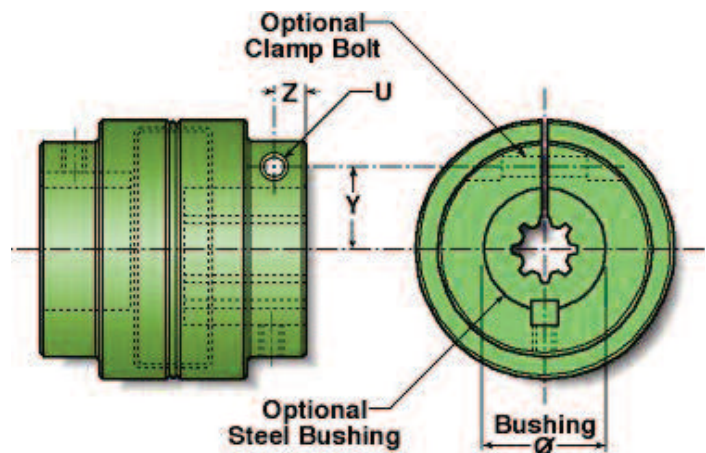
Part Number Usage: Magnaloy Splined Coupling part numbers may be specified using the following format: Start with letter "M" designating Magnaloy, follow with 3 digit Model Code (100, 200, etc.), next use a single letter Spline Type Identifier Code ("A" for regular spline or "B" for steel bushing), then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

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

Clamp Type Coupling Specifications

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

* Model 900 utilizes two bolt clamp design.



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



1



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

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

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

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

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

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

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

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

Service Factors - Load Characteristics

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

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

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

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

* **Recommend use of Hytrel Insert.**

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

Selection Method

- Several specifics must be considered to make the best choice of couplings:**
 - Type of prime mover and load characteristics (see table above)
 - Shaft diameter and key size or spline configuration (No. of teeth, pitch ratio, pressure angle)
 - Horsepower rating of loads to be transmitted.
 - Maximum operating speed (rpm)
 - Maximum operating misalignment
 - Clearance limitations
- Calculate effective hp/100 rpm by use of table above and select the minimum size coupling recommended**
- VERIFY YOUR SELECTION:**
 - Check for maximum bore size
 - Check dimensions for adequate clearance
 - Indicate any special insert specification and/or coupling coating for environmental protection, if required

Equation: Effective HP per 100 RPM = rated HP x Service Factor x 100 / RPM

Example: 150 HP, 4 cyl. Diesel Engine Driving a Reciprocating Irrigation Pump operating at 3250 RPM
 Service Factor - 3.0 (Hytrel Insert Recommended)
 Eff. HP per 100 RPM = 150 HP x 3.0 x 100 / 3250 RPM = 13.85 HP/100 RPM. Model 600 rating with Hytrel Insert is 23.7 HP/100 RPM.

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

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

1



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

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

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

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

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



Secure equipment mounts and recheck alignment for movement.

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

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

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

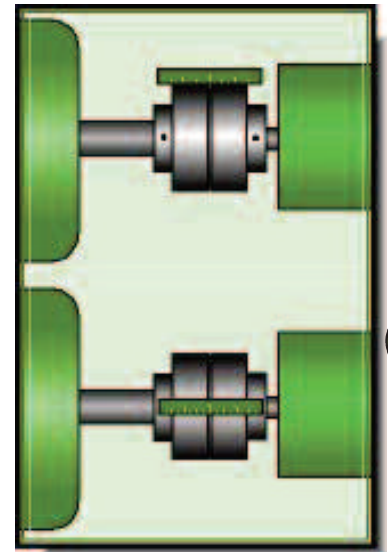
Mis-Alignment Capabilities

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

Recommended Torques for Fasteners

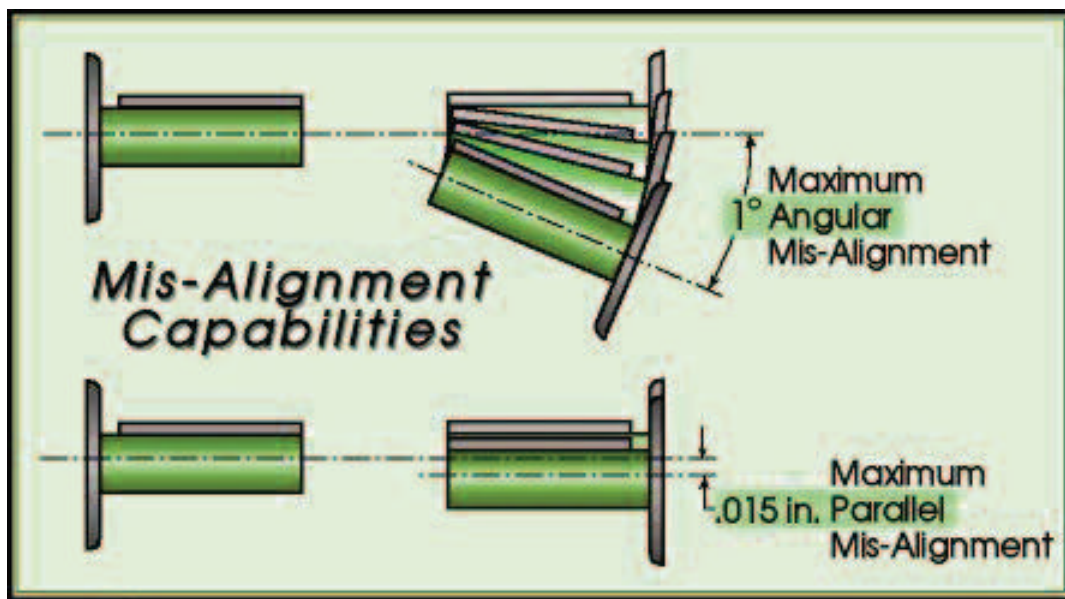
Model	Set Screw	Clamp Screw
100	60 - 70 in lbs	130 - 140 in lbs
200	75 - 85 in lbs	130 - 140 in lbs
300	75 - 85 in lbs	210 - 220 in lbs
400	190 - 200 in lbs	210 - 220 in lbs
500	190 - 200 in lbs	300 - 310 in lbs
600	190 - 200 in lbs	35 - 36 ft lbs
700	300 - 310 in lbs	35 - 36 ft lbs
800	300 - 310 in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

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



1

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



Keystock Interference with Drive Lug

Since the Magnaloy Coupling keyway, in a bored and keyed hub, is broached between the drive lugs, there is a potential for interference with the keystock of the drive hub and the drive lugs of the opposing hub. This interference will result when ALL the following conditions exist:

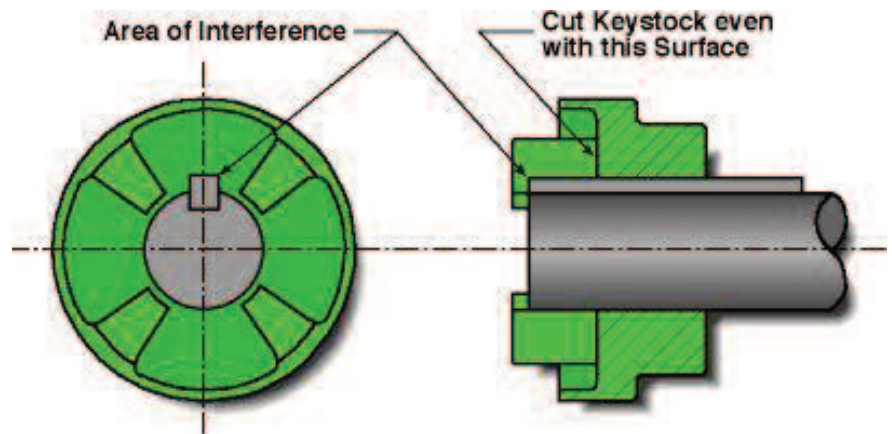
- A) The shaft diameter is Greater than listed below
- B) This shaft extends into the hub insert core area
- C) The keystock on this shaft extends with the shaft into the insert core area

1

The interference condition can be corrected by shortening the keystock so it does not extend into the insert core area. The keystock length should be limited to the length of the coupling hub bore.

Interference Potential exists when shaft diameters are greater than shown in this chart.

Model Size	Shaft Diameter	Key Size
100	7/8	1/4
200	1 3/16	1/4
300	1 5/16	5/16
400	1 1/2	3/8
500	1 15/16	1/2
600	2 1/2	5/8
700	2 3/4	5/8
800	3 1/2	7/8
900	4 1/2	1 1/4



Failure to correct this condition will result in assembly difficulty and could cause damage to the drive or driven equipment. Check our web site at www.magnaloy.com for other bulletins.

Notes														

M12 FEMALE 90°

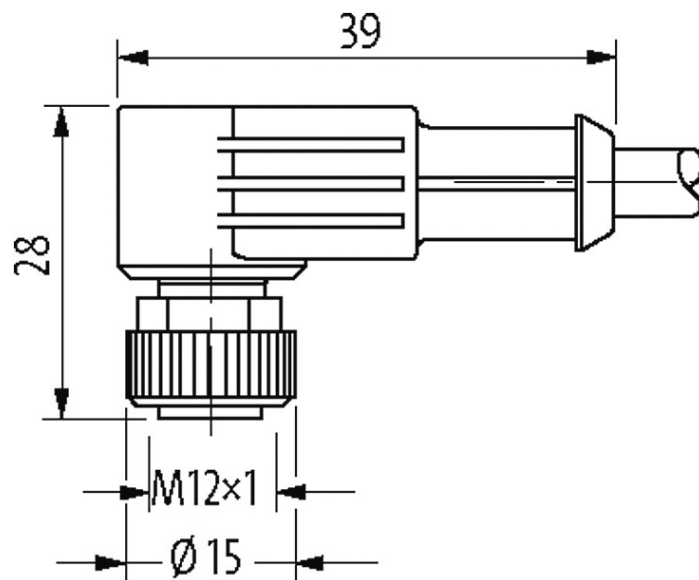
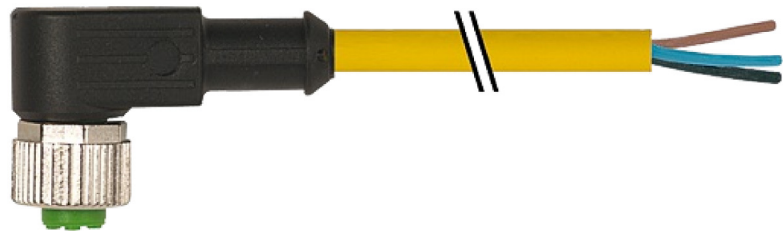
PVC 4X0.34 YELLOW, UL/CSA 5m

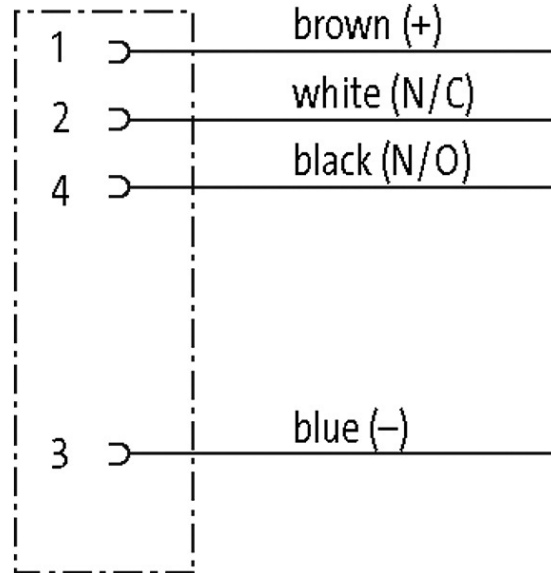
Female 90°

M12, 4-pole

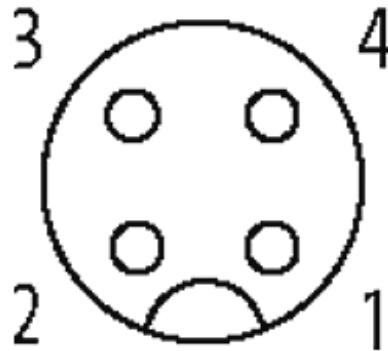
Art-No. 7005 - M12 Lite - (plastic hexagonal screw) on request
with cable sleeves

Plastic housings with good resistance against chemicals and oils. The resistance to aggressive media should be individually tested for your application. Further details on request. Further cable lengths on request.

[Link to Product](#)**Illustration**

stay connected

Female



Product may differ from Image

Approvals



* only for products with UL/CSA approved cable

cCSAus

Form

Form 12341

Cables

No./diameter of wires	4 × 0.34 mm ²
Wire isolation	PVC (br, wh, bl, bk)
Material (jacket)	PVC (UL/CSA)
Outer Ø	5.0 mm ±5%
Bend radius (moving)	10 × outer Ø
Temperature range (fixed)	-30...+80 °C

Temperature range (mobile)	-5...+80 °C
Cable identification	014
Cable Type	1 (PVC)
Approval (cable)	UL (AWM-Style 2464/1731), CSA
Cable weight [g/m]	40,70
Material (wire)	Cu wire, bare
Resistor (core)	max. 60 Ω/km (20 °C)
Single wire Ø (core)	0.15 mm
Construction (core)	19 × 0.15 mm (multi-strand wire class 5)
Diameter (core)	4 × 0.34 mm ²
AWG	similar to AWG 22
Material (wire isolation)	PVC
Material property (wire isolation)	CFC-, cadmium-, silicone- and lead-free
Shore hardness (wire isolation)	45 ±5 D
Wire-Ø incl. isolation	1.25 mm ±5%
Color/numbering of wires	br, bk, bl, wh
Stranding combination	4 wires twisted
Shield	no
Material (jacket)	PVC
Material property (jacket)	CFC-, cadmium-, silicone- and lead-free
Shore hardness (jacket)	85 ±5 A
Outer-Ø (jacket)	5.0 mm ±5%
Color (jacket)	yellow
chemical resistance	good resistance to oil, gasoline and chemicals
Nominal voltage	UL 300 V AC
Test voltage	2 000 V AC
Current load capacity	to DIN VDE 0298-4
Temperature range (fixed)	-30...+80 °C
Temperature range (mobile)	-5...+80 °C
Bend radius (fixed)	5 × outer Ø
Bend radius (moving)	10 × outer Ø
Jacket Color	yellow

Technical Data

Operating voltage	max. 250 V AC/DC
Operating voltage (only UL listed)	max. 30 V AC/DC
Operating current per contact	max. 4 A
Rated surge voltage	2.5 kV
Material group	IEC 60664-1, category I
Coding	A-coded
Locking of ports	Screw thread M12 × 1 mm (recommended torque 0.6 Nm) self-securing
Compression gland	M12 (SW13)

Protection	IP65, IP66K, IP67 inserted and tightened (EN 60529)
Locking material	Zinc die casting, matte nickel plated
Material	PUR
suitable for corrugated tube (internal Ø)	10 mm

General data

Standards	DIN EN 61076-2-101 (M12)
Mounting method	inserted, tightened
Material (contact)	Copper alloy
Material (contact surface)	Au
Material (gasket)	FKM
Pollution Degree	3
Stripping length (jacket)	20 mm
Temperature range	-25...+85 °C, depending on cable quality

Commercial data

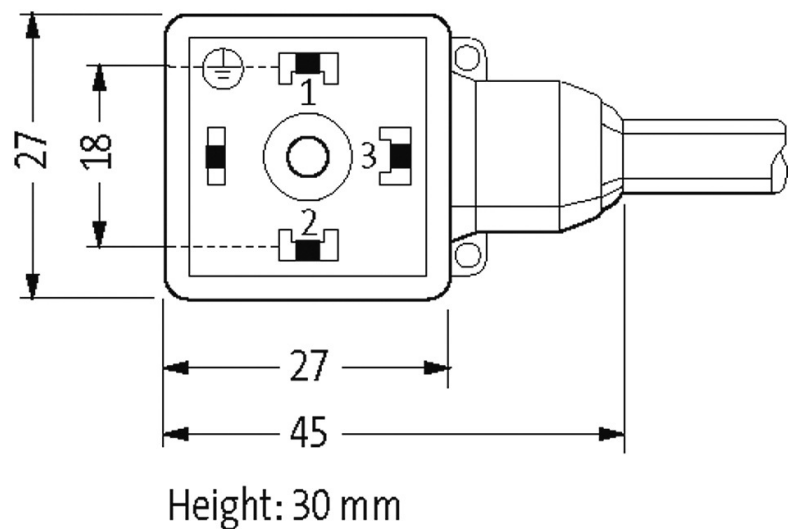
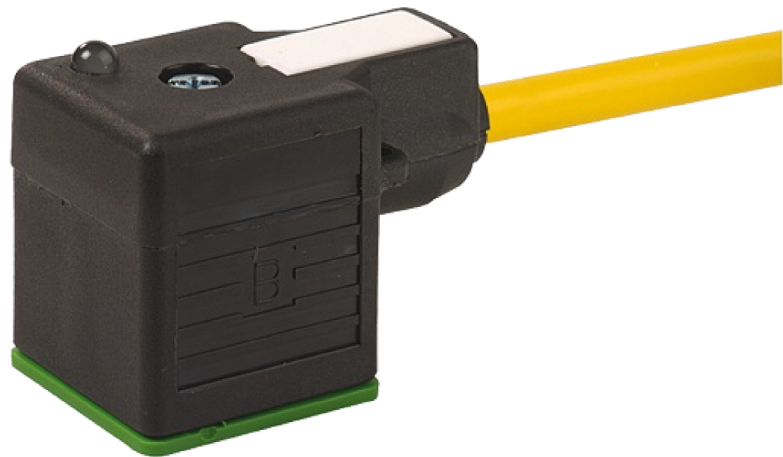
country of origin	DE
customs tariff number	85444290
EAN	4048879207645
eClass	27279218
Packaging unit	1

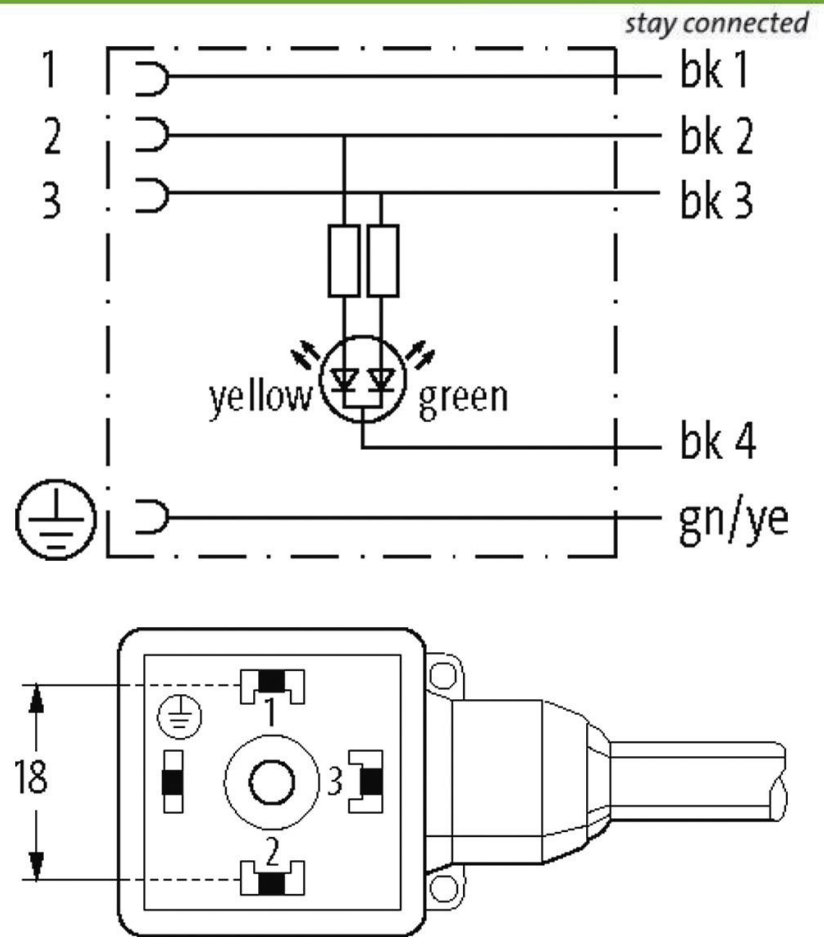
MSUD VALVE PLUG FORM A 18MM

PVC 5X0.75 YELLOW, 5m

MSUD
Form A (18 mm)
24 V DC $\pm 25\%$
LED (yellow/green)
for pressure switches

Further cable lengths on request. Plastic housings with good resistance against chemicals and oils. The resistance to aggressive media should be individually tested for your application. Further details on request.

[Link to Product](#)**Illustration**



Product may differ from Image

Approvals

cCSAus

* only for products with UL/CSA approved cable

Form

Form 18141

Cables

No./diameter of wires	5 × 0.75 mm ²
Wire isolation	PVC (bk num, gnye)
Material (jacket)	PVC
Outer Ø	7.0 mm ±5%
Bend radius (moving)	10 × outer Ø
Temperature range (fixed)	-30...+70 °C
Temperature range (mobile)	-5...+70 °C
Cable identification	018
Cable Type	1 (PVC)
Approval (cable)	CE conform
Cable weight [g/m]	94,60
Material (wire)	Cu wire, bare
Resistor (core)	max. 26 Ω/km (20 °C)

Single wire Ø (core)	0.2 mm
Construction (core)	24 × 0.2 mm (multi-strand wire class 5)
Diameter (core)	to DIN VDE 0298-4
AWG	similar to AWG 18
Material (wire isolation)	PVC
Material property (wire isolation)	CFC-, cadmium-, silicone- and lead-free
Shore hardness (wire isolation)	43 ±5 D
Wire-Ø incl. isolation	1.8 mm ±5%
Color/numbering of wires	bk, numbered, gnye longitudinally striped
Shield	no
Stranding combination	5 wires twisted around central filler
Material (jacket)	PVC
Material property (jacket)	CFC-, cadmium-, silicone- and lead-free
Shore hardness (jacket)	80 ±5 A
Outer-Ø (jacket)	7.0 mm ±5%
Color (jacket)	yellow
chemical resistance	good resistance to oil, gasoline and chemicals
Nominal voltage	300/500 V AC
Test voltage	3 000 V AC
Current load capacity	to DIN VDE 0298-4
Temperature range (fixed)	-30...+70 °C
Temperature range (mobile)	-5...+70 °C
Bend radius (fixed)	5 × outer Ø
Bend radius (moving)	10 × outer Ø
Jacket Color	yellow

Technical Data

Operating voltage	24 V DC ±25%
Operating current per contact	max. 4 A
Locking of ports	M3 (recommended torque 0.4 Nm)
Housing	Black plastic (gray on request)
Protection	IP67 inserted and tightened (EN 60529)

General data

Temperature range	-25...+85 °C, depending on cable quality
-------------------	--

Commercial data

country of origin	CZ
customs tariff number	85444290
EAN	4048879190190
eClass	27279218
Packaging unit	1

KLT/KLS Series

Specifications

Pressure Ratings:

Maximum Allowable Operating Pressure

(MAOP): 150 psi (10.3 bar)

Operating Temperatures:

-40°F (-40°C) to 225°F (107°C)

Element Burst Rating:

150 psid (10.3 bar)

Filtration Rating:

2, 5, 10 & 20 Microns at Beta > 200

Element Condition Indicators:

Gauge: 0-60 psi color coded
Switch: SPDT 5A @ 24 VDC and 250 VAC

Materials:

Head & Cover: Cast Aluminum Alloy

Bypass Valve: Nylon

Filter Media: Microglass III

Element End Caps: Nylon

Weights (approximate):

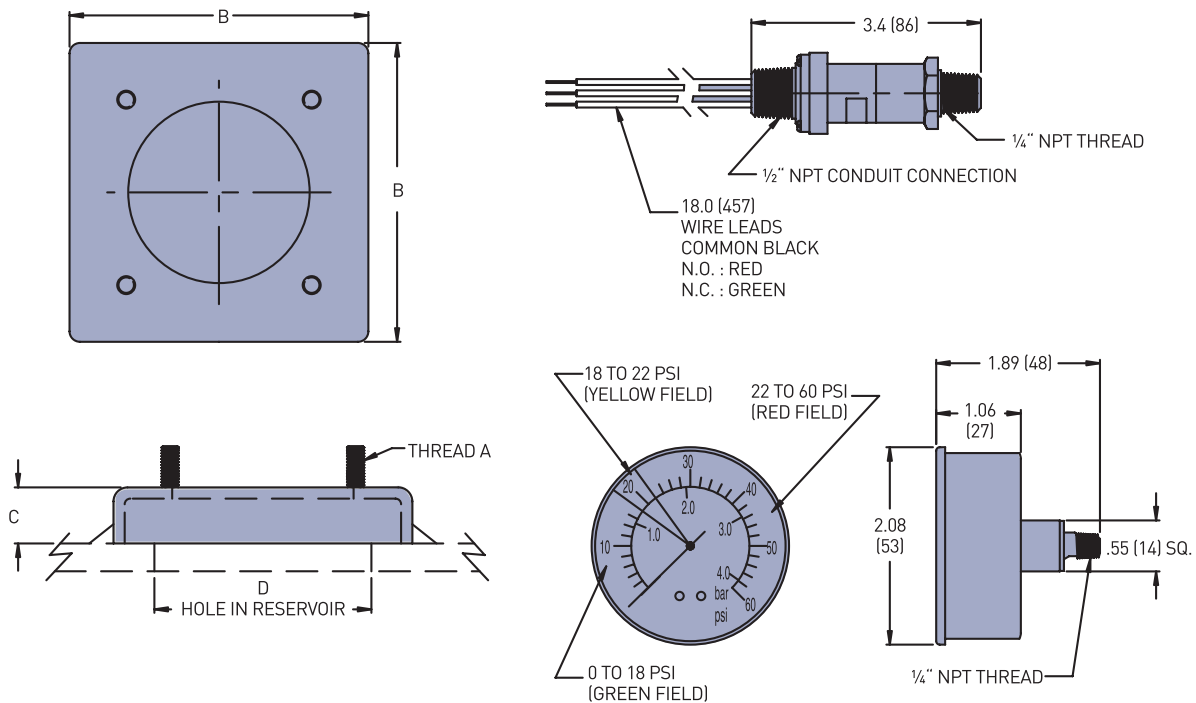
KLT-23 lbs. (1.36 kg)

KLT-44 lbs. (1.81 kg)

KLT(S)-78 lbs. (3.63 kg)

KLT(S)-810 lbs. (4.54 kg)

KLT Weld Plate Drawings



Linear Measure: inch (mm)

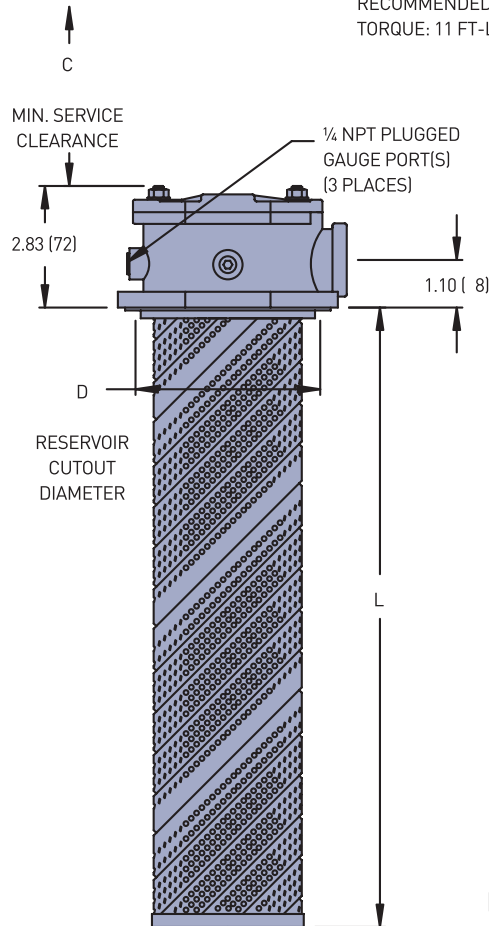
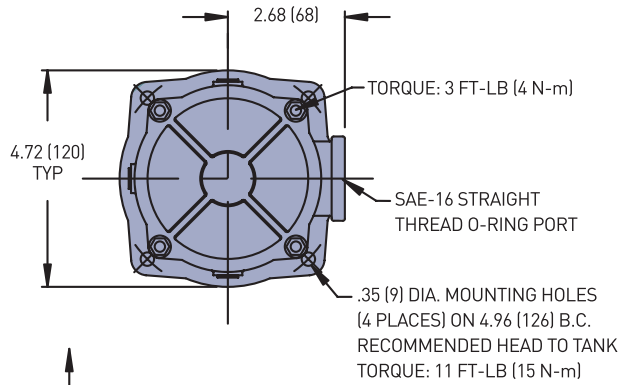
Dimension	KLT Filter Model	
	KLT-2/KLT-4	KLT-7/KLT-8
A	5/16-18 UNC-2A	3/8-16 UNC-2A
B	5.33 [135]	7.15 [182]
C	1.00 [25]	1.00 [25]
D	4.50/3.75 [114/95]	6.25/5.50 [159/140]

Drawings are for reference only.
Contact factory for current version.

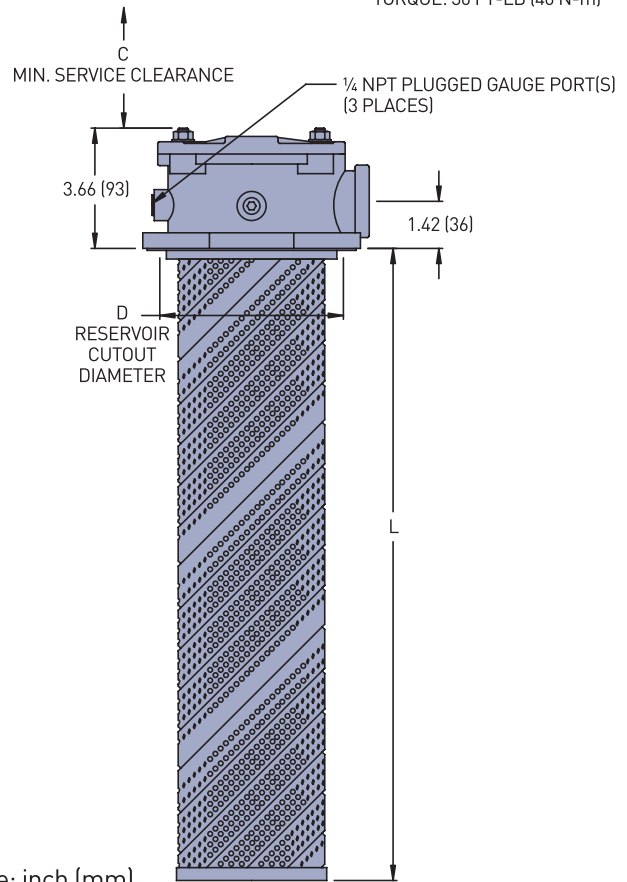
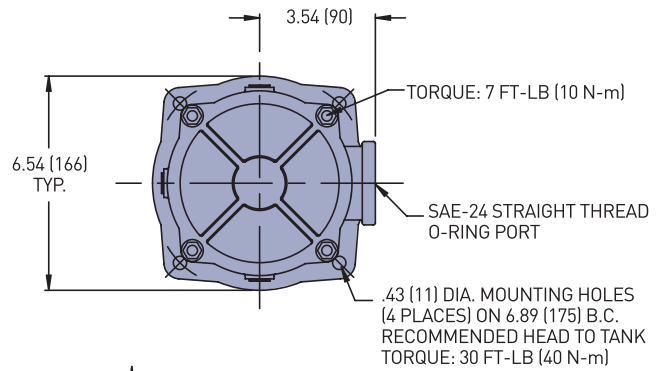
KLT Se e

Dimensional Drawings

KLT 2 / KLT 4



KLT 7 / KLT 8



Linear Measure: inch (mm)

Drawings are for reference only.
Contact factory for current version.

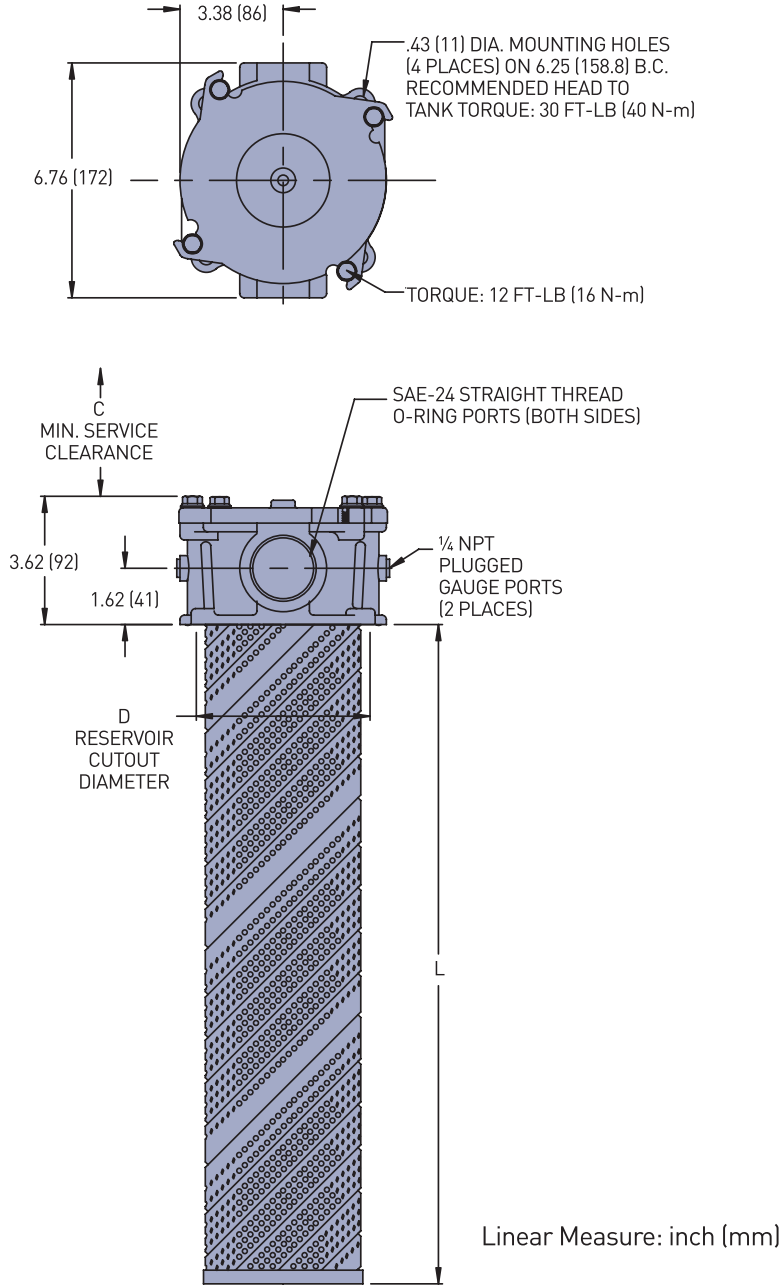
Dimensions	KLT Filter Model	
	KLT-2	KLT-4
C	5.75 (146)	9.50 (241)
L	4.16 (106)	7.75 (197)
D	$\frac{3.6 (93)}{3.56 (90)}$	

Dimensions	KLT Filter Model	
	KLT-7	KLT-8
C	13.00 (330)	19.25 (489)
L	11.46 (291)	17.70 (450)
D	$\frac{5.36 (136)}{5.26 (133)}$	

KLT Series

Dimensional Drawings

KLS 7 / KLS 8



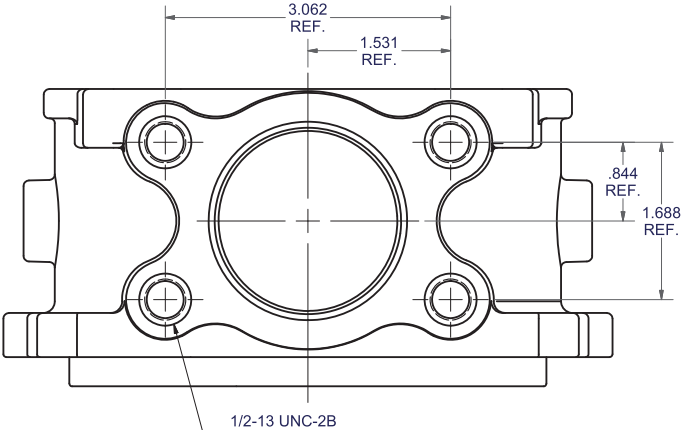
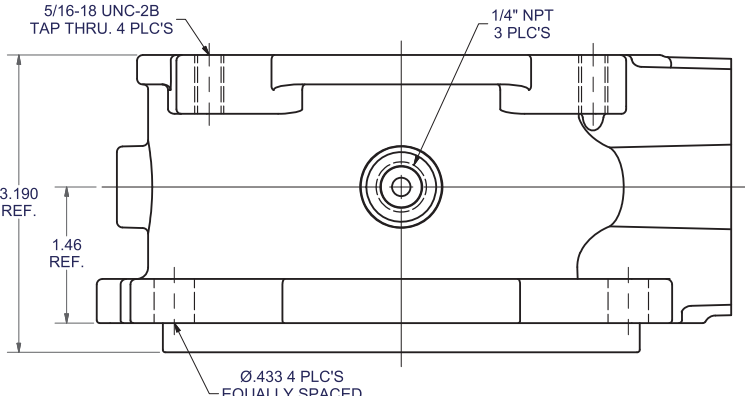
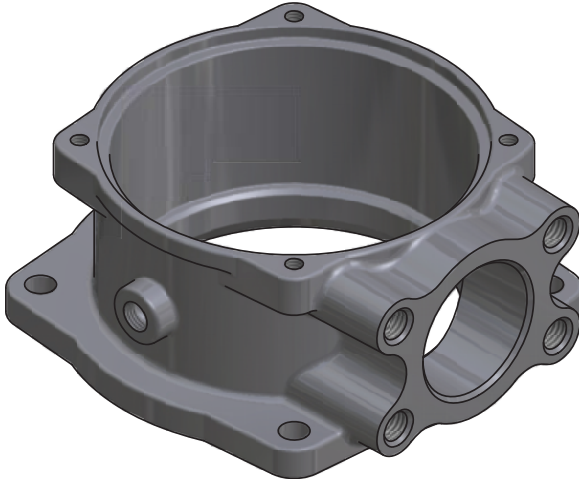
Dimensions	KLS Filter Model	
	KLS-7	KLS-8
C	13.00 [330]	19.25 [489]
L	11.46 [291]	17.70 [450]
D	5.00 [127]	
	4.80 [122]	

Drawings are for reference only. Contact factory for current version.

KLT Se e

Dimens onal Draw ng

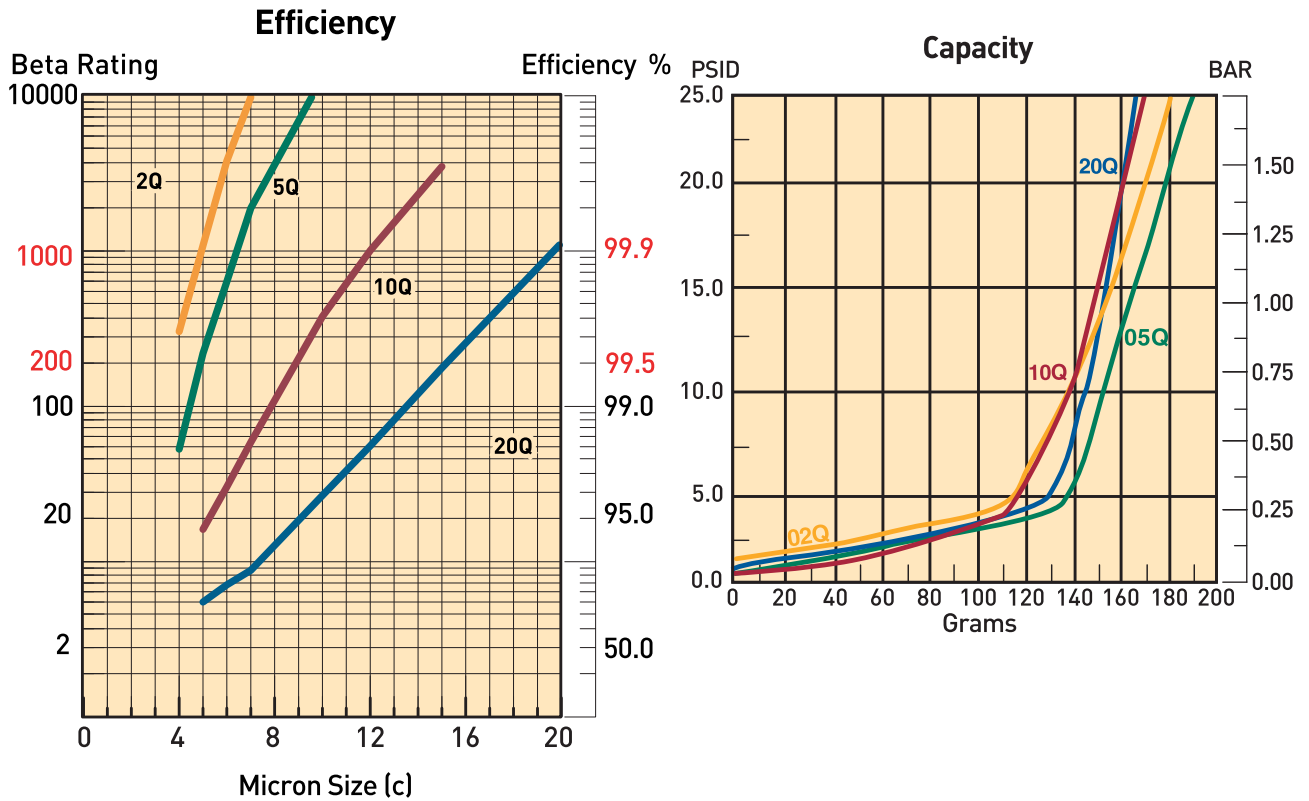
KLT with 2" Port



Drawings are for reference only.
Contact factory for current version.

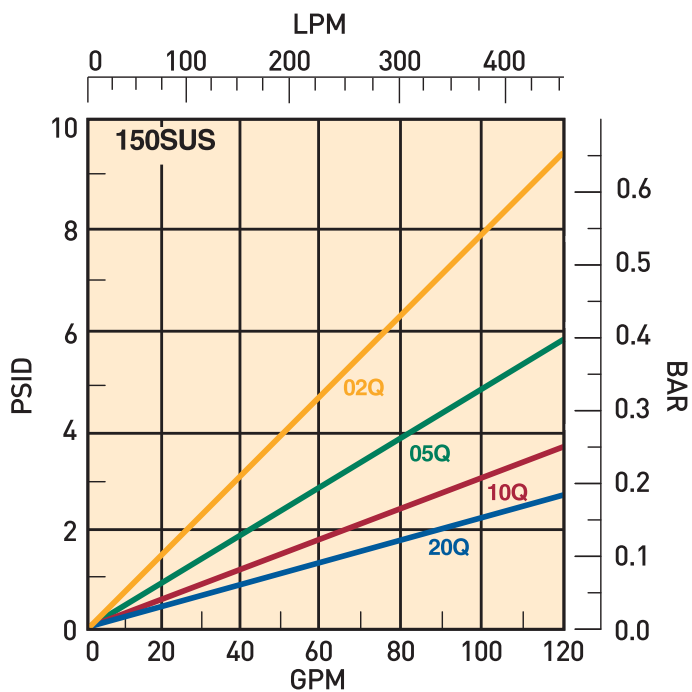
KLT/KLS Series

KLT/KLS-8 Element Performance



Multipass tests run @ 70 gpm to 25 psid terminal - 10 mg/L BUGL

Flow vs. Pressure Loss



KLT and KLS Series

Operating and Maintenance Instructions

A. Mounting

1. Standard mounting.
 - a. Cut proper size hole in the top of the reservoir.
 - b. Drill holes for studs within the proper bolt circle.
 - c. Set the filter into the cutout hole and secure with proper size bolts, nuts and lock washers.
 - d. Torque nuts in accordance with drawing.
2. Mounting procedure using weld plate.
 - a. Rough cut proper size hole in the top of reservoir.
 - b. Weld the weld plate concentric to the rough cut hole.
 - c. Mount the filter onto the studs and secure with nuts and lock washers.
 - d. Torque nuts in accordance with drawing.
3. Utilize proper fittings.

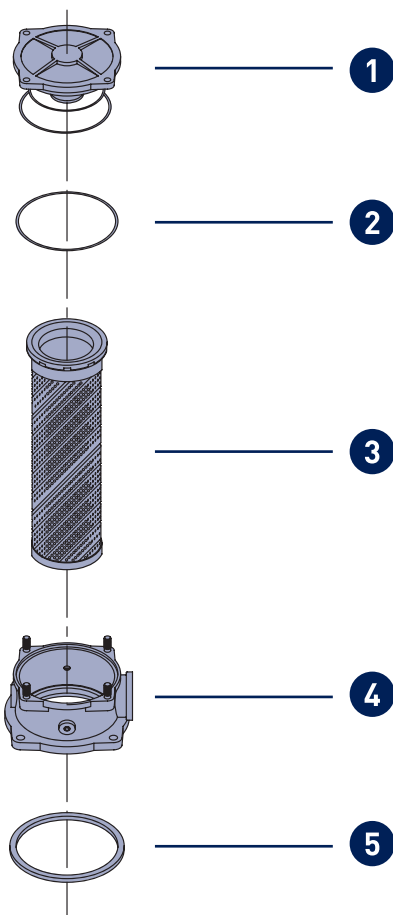
B. Start-Up

1. Check for and eliminate leaks upon system start-up.
2. Check differential pressure indicator, if installed, to monitor element condition.

C. Service

1. An element must be serviced when the indicator indicates service is required.

NOTE: If the filter is not equipped with an indicator, the element should be serviced according to machine manufacturer's instructions.



Parts List

Index	Description	Part Number	Quantity	
1	Cover Assembly (Includes Cover o-ring)			
	KLT2/KLT4	937049	1	
	KLT7/KLT8	937047	1	
2	Cover o-ring	KLS7/KLS8	937048	1
		KLT2/KLT4, Nitrile	N72239	1
		KLT2/KLT4, FKM	V72239	1
3	Element (see How to Order page)	KLT7/KLT8, Nitrile	N72251	1
		KLT7/KLT8, FKM	V72251	1
		KLS7/KLS8, Nitrile	N72251	1
4	Filter Head (Includes gauge plugs & studs)	KLS7/KLS8, FKM	V72251	1
		KLT2/KLT4 (S16)	5841216	1
		KLT7/KLT8 (S24)	5841224	1
5	Tank Gasket	KLS7/KLS8 (S24)	937318	1
		KLS7/KLS8 (2" Flange)	942157	1
		KLT2/KLT4	108x98x5.5B	1
Not Shown	Weld Plate	KLT7/KLT8	152x136x6B	1
		KLT2/KLT4	300041	1
		KLT7/KLT8	300042	1
Not Shown	Pressure Switch	NS-1C-19R/EL	1	
Not Shown	Pressure Gauge	936913	1	

C.F. = Consult Factory

D. Servicing Dirty Element

1. Shut system down to assure that there is NO PRESSURE OR FLOW into the filter housing.
2. Remove the filter cover.
3. Remove and discard the contaminated element cartridge.

E. Before Installing a New Element Cartridge

1. Clean the magnetic core with a lint-free cloth.
2. Check all seals and replace if necessary.

F. To Install a New Element Cartridge

1. Lubricate all seals.
2. Mount new filter cartridge.
3. Re-install the cover.
4. Torque the cover nuts per drawing.

Perform procedures B1 and B2 to ensure no leaks are present.

KLT and KLS Series

How to Order

Select the desired symbol (in the correct position) to construct a model code.

Example:

BOX 1	BOX 2	BOX 3	BOX 4	BOX 5	BOX 6	BOX 7	BOX 8
KLT	7	10Q	B	P	G	S24	1

BOX 1: Filter Series	
Symbol	Description
KLT	Single port return-line filter
KLS	Dual port return-line filter (-7 and -8 models only)

BOX 2: Filter Model	
Symbol	Description
2	30 GPM (115 l/m nominal flow)
4	50 GPM (190 l/m nominal flow)
7	100 GPM (380 l/m nominal flow)
8	120 GPM (455 l/m nominal flow)

BOX 3: Media Code	
Symbol	Description
02Q	Microglass III, 2 micron
05Q	Microglass III, 5 micron
10Q	Microglass III, 10 micron
20Q	Microglass III, 20 micron
WR	Water Removal

BOX 4: Seals	
Symbol	Description
B	Nitrile (NBR)
V	Fluorocarbon
*NOTE: Nitrile tank gasket always supplied.	

BOX 5: Indicator	
Symbol	Description
P	No indicator; plugged pressure port(s)
G	Pressure gauge, 0-60 psig
S	Pressure switch

BOX 6: Bypass	
Symbol	Pressure Setting
G	25 psid (1.7 bar)

BOX 7: Ports	
Symbol	Description
KLT-2/4	
S16	SAE-16 (1 5/16"-12)
KLT-7/8	
S24	SAE-24 (1 7/8"-12)
N24	1 1/2" NPT
Y32	2" Code 61 Flange Face
KLS-7/8	
S24	2 x SAE-24 (1 7/8"-12)
N24	2 x 1 1/2-NPT

BOX 8: Options	
Symbol	Description
1	None
TP	Weld plate (KLT only)

Replacement Elements

Element Code	Nitrile				Fluorocarbon			
	2	4	7	8	2	4	7	8
20Q	936967Q	936971Q	936975Q	936979Q	937269Q	937273Q	937277Q	937281Q
10Q	936966Q	936970Q	936974Q	936978Q	937268Q	937272Q	937276Q	937280Q
05Q	936965Q	936969Q	936973Q	936977Q	937267Q	937271Q	937275Q	937279Q
02Q	936964Q	936968Q	936972Q	936976Q	937266Q	937270Q	937274Q	937278Q
WR	937258	937259	937260	937261	C.F.	C.F.	C.F.	C.F.

C.F. = Consult Factory

Global products as identified are offered worldwide through all Parker locations and utilize a common ordering code.





Your Enclosure Source®

Saginaw Control & Engineering
95 Midland Road
Saginaw, MI 48638-5770
Phone: (800)234-6871
Fax: (989)799-4524
<http://www.saginawcontrol.com>

Part Information - SCE-20EL1606SSLP

→ SCE-20EL1606SSLP

Application -

Designed to house electrical and electronic controls, instruments and components in areas which may be regularly hosed down or are in very wet conditions. Provides protection from dust, dirt, oil, and water. For outdoor application a drip shield is recommended.

Construction -

- 0.075" stainless steel Type 304.
- Seams continuously welded and ground smooth.
- Flange trough collar around all sides of door opening.
- Oil-resistant gasket.
- Collar studs provided for mounting optional panels.
- Stainless steel concealed hinge.
- Removable and interchangeable doors.
- Black quarter turn latches.
- Latches are opened or closed with a screwdriver (optional tamper-resistant inserts are available).
- Mounting holes in back of enclosure.
- Mounting hardware, sealing washer and hole plug included.
- Removable print pocket furnished if height and width of enclosure is greater than 12 inches.
- Ground studs on door and body.

Options -

Optional mounting feet available.
Door hardware available.

Finish -

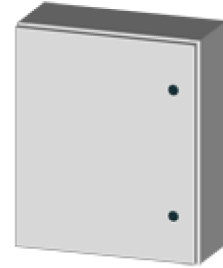
#4 brushed finish on all exterior surfaces.
Optional sub-panels are powder coated white.

Industry Standards - (IS5)

NEMA Type 4, 4X, 12 and Type 13
UL Listed Type 4, 4X and 12
CSA Type 4, 4X and 12
IEC 60529 IP 66

Product Specifications -

Part Number: SCE-20EL1606SSLP
Description: S.S. EL Enclosure
Height: 20.00"
Width: 16.00"
Depth: 6.00"
Price Code: S5
List Price: \$726.19
Catalog Page: 218
Est. Ship Weight: 28.00 lbs



[Download CAD Package](#)
[Add to Bill of Material](#)

Optional Accessories -

[SCE-20P16](#) - Subpanel, Flat
[SCE-BV4XKIT](#) - Kit, Breather Vent
[SCE-DF20EL16LP](#) - Panel, Dead Front (Wall Mount)
[SCE-DS16SS](#) - Shield, S.S. Drip
[SCE-DV4XKIT](#) - Kit, Drain Vent
[SCE-ELFM16WSS](#) - S.S. EL Flush Mount Frame
[SCE-ELFM20HSS](#) - S.S. EL Flush Mount Frame
[SCE-ELMFK4SS](#) - Foot Kit, S.S. EL Mounting (4pc.)
[SCE-ELSP3](#) - KIT, Swing-Out Panel (20 High & Up)

Similar Part Numbers -

[SCE-12EL1206SSLP](#) - S.S. EL Enclosure
[SCE-12EL2406SSLP](#) - S.S. EL Enclosure
[SCE-16EL1206SSLP](#) - S.S. EL Enclosure
[SCE-16EL1208SSLP](#) - S.S. EL Enclosure
[SCE-16EL1606SSLP](#) - S.S. EL Enclosure
[SCE-16EL1608SSLP](#) - S.S. EL Enclosure
[SCE-16EL2008SSLP](#) - S.S. EL Enclosure
[SCE-20EL1608SSLP](#) - S.S. EL Enclosure
[SCE-20EL1610SSLP](#) - S.S. EL Enclosure
[SCE-20EL2006SSLP](#) - S.S. EL Enclosure

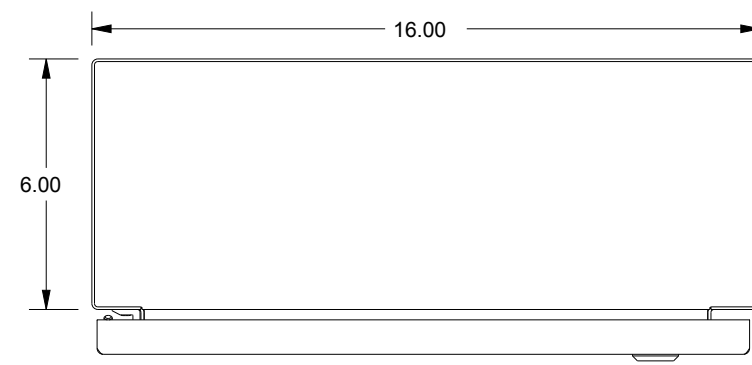
Installation Information -

[Mounting Foot Kit for Enviroline Enclosures](#)
[EL Flush Mount Frame](#)
[Drip Shield Kit Assembly](#)
[Sealing Washer Specifications](#)
[Drain/Vents](#)
[Dead Front Wall Mount Installation Instructions](#)
[Swing Panel Assembly for Enviroline Enclosures](#)
[Dead Front Wall Mount < 20 In Height Installation Instructions](#)
[Swing Panel ELSP for Encl. Height > 16](#)
[Swing Panel ELSP for Encl. Height <= 16](#)

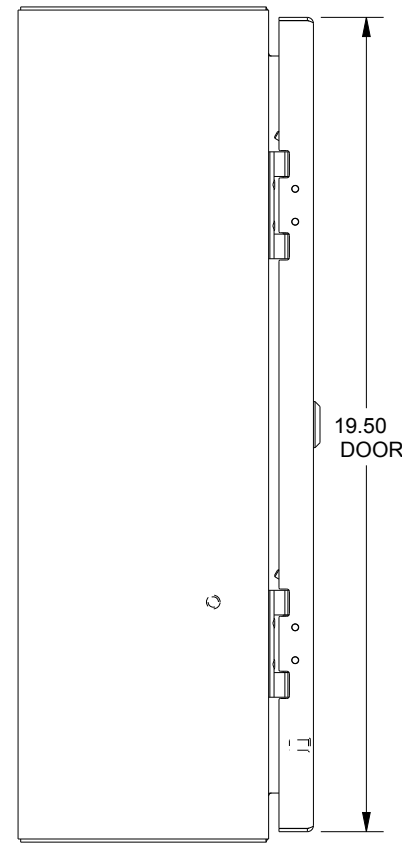
Saginaw Control and Engineering
95 Midland Road
Saginaw, MI 48638-5770
(800)234-6871
Fax: (989)799-4524
SCE@SaginawControl.com

SAGINAW CONTROL & ENGINEERING

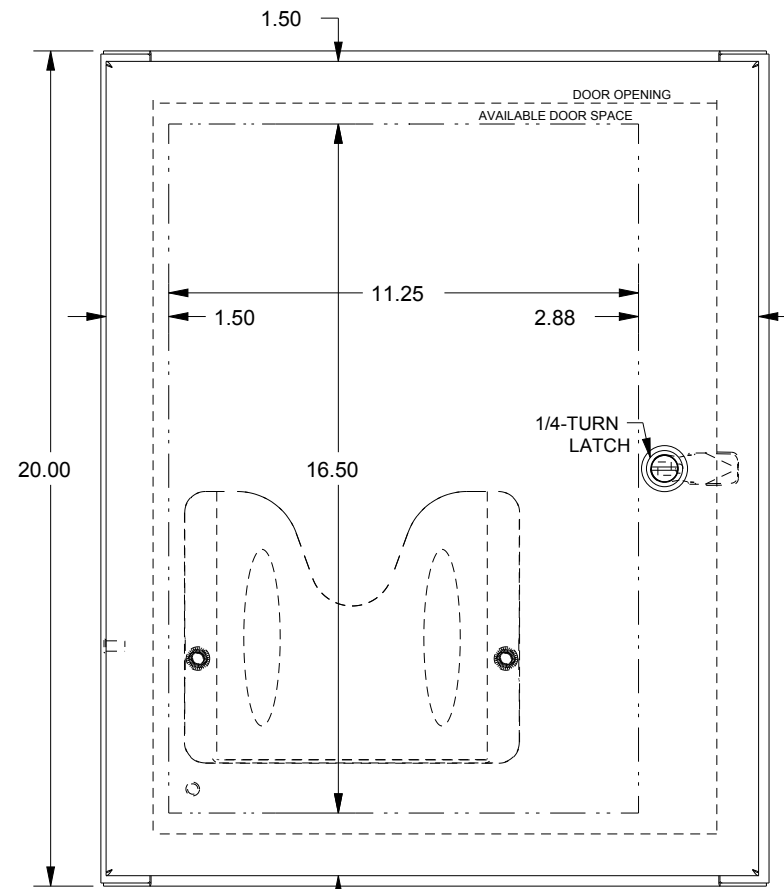
SCE-20EL1606SSLP



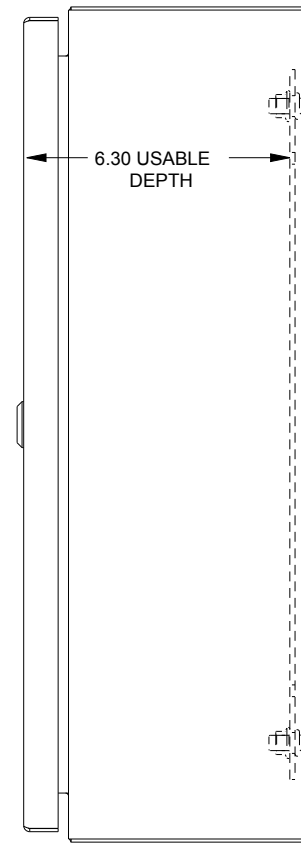
TOP VIEW



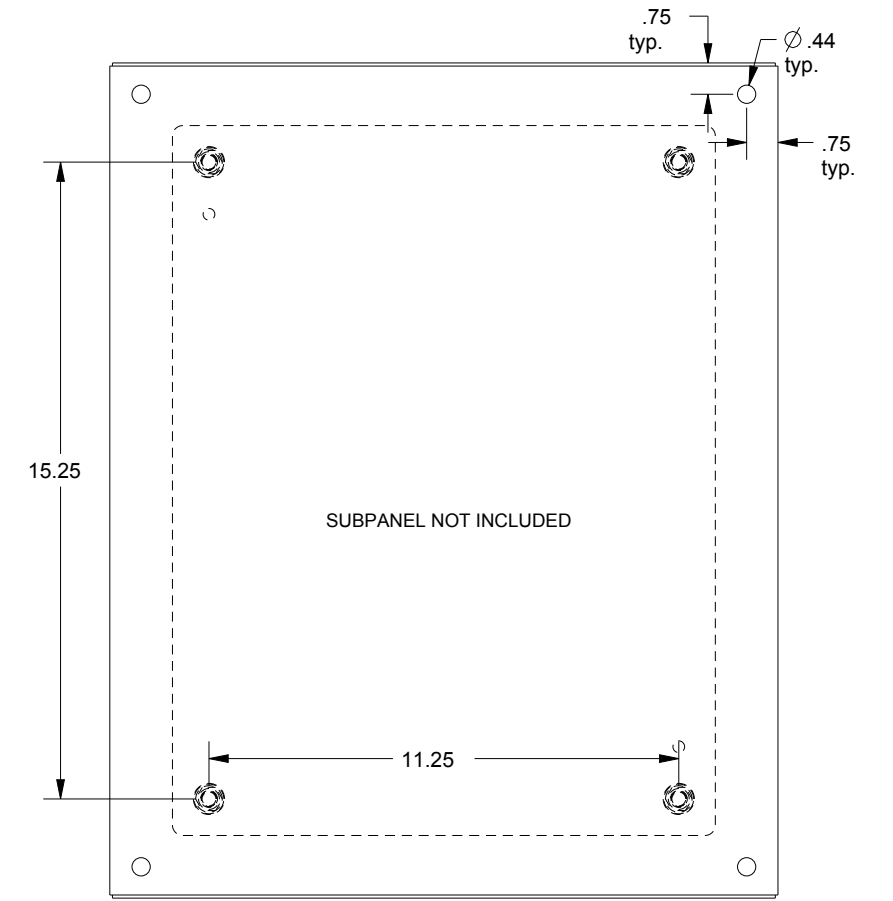
LEFT SIDE VIEW



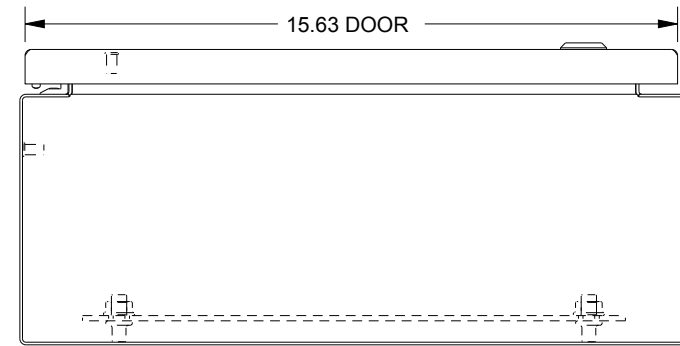
FRONT VIEW



RIGHT SIDE VIEW



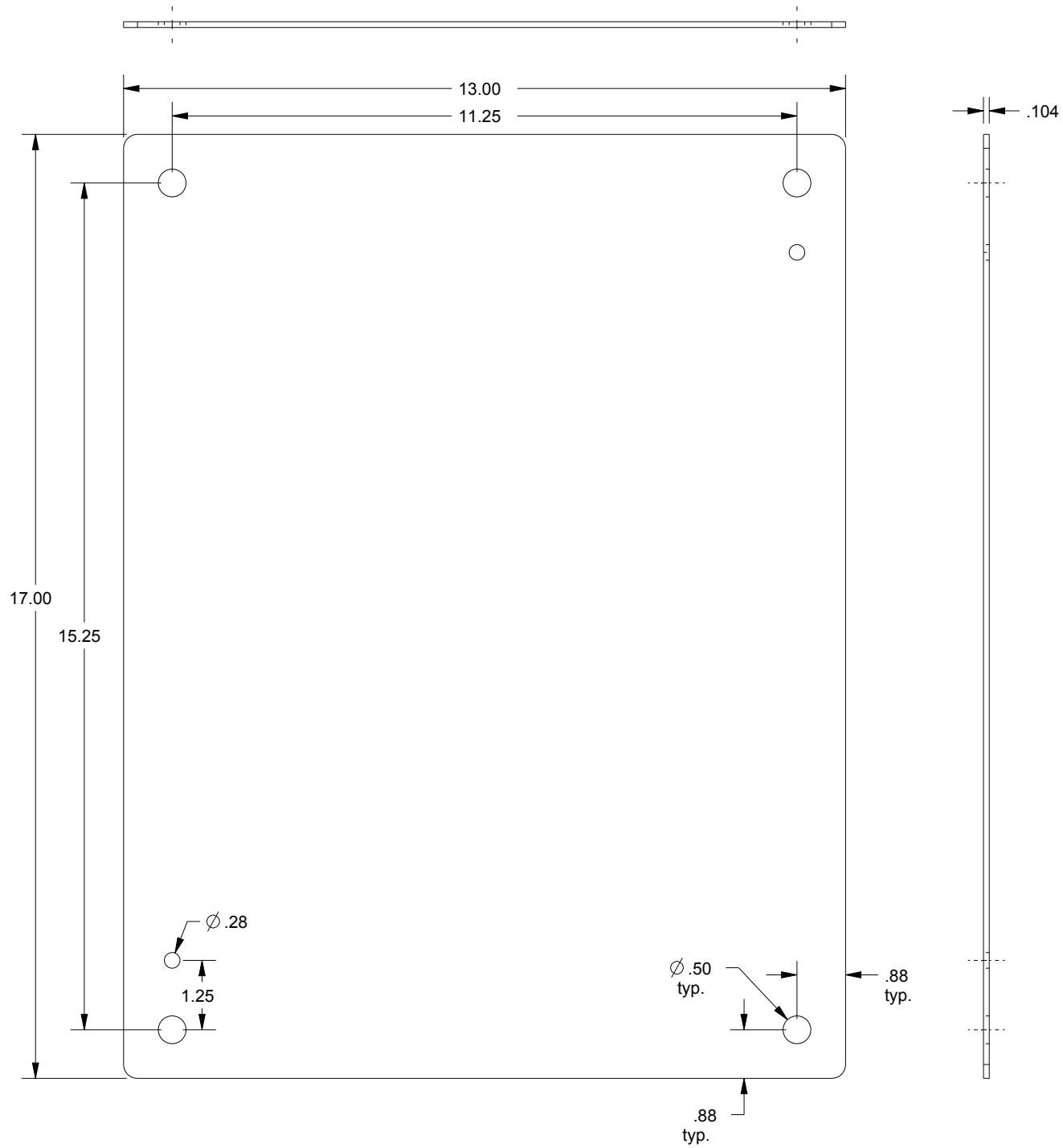
EXTERNAL REAR VIEW



BOTTOM VIEW

SAGINAW CONTROL & ENGINEERING

SCE-20P16



DATA SHEET



Three Phase Induction Motor - Squirrel Cage

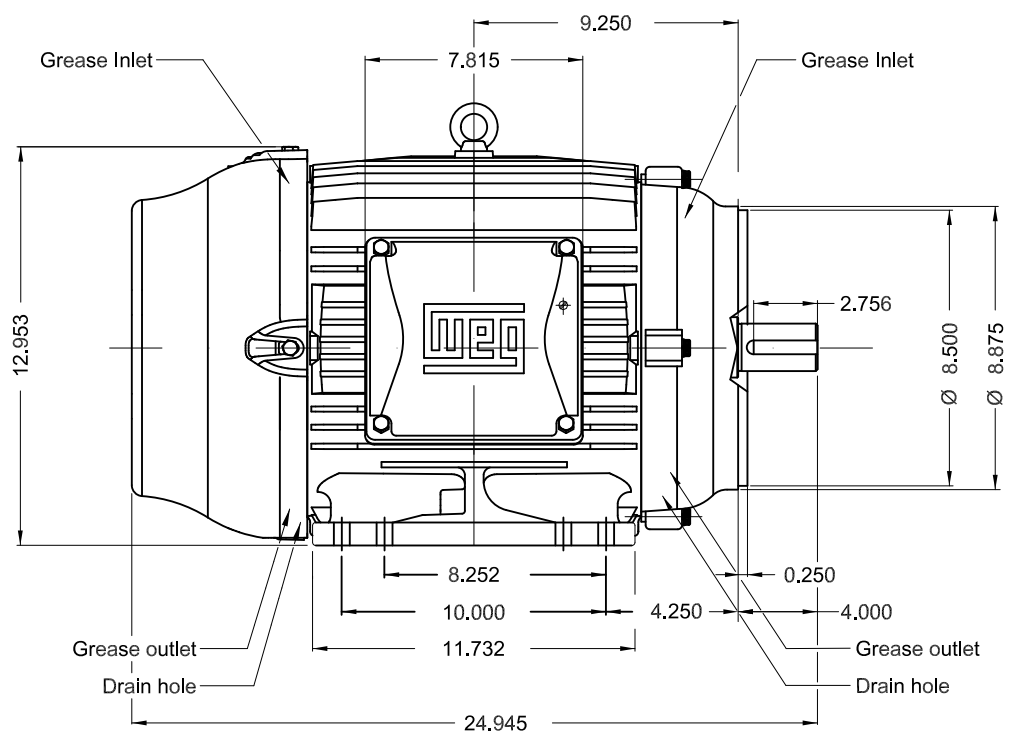
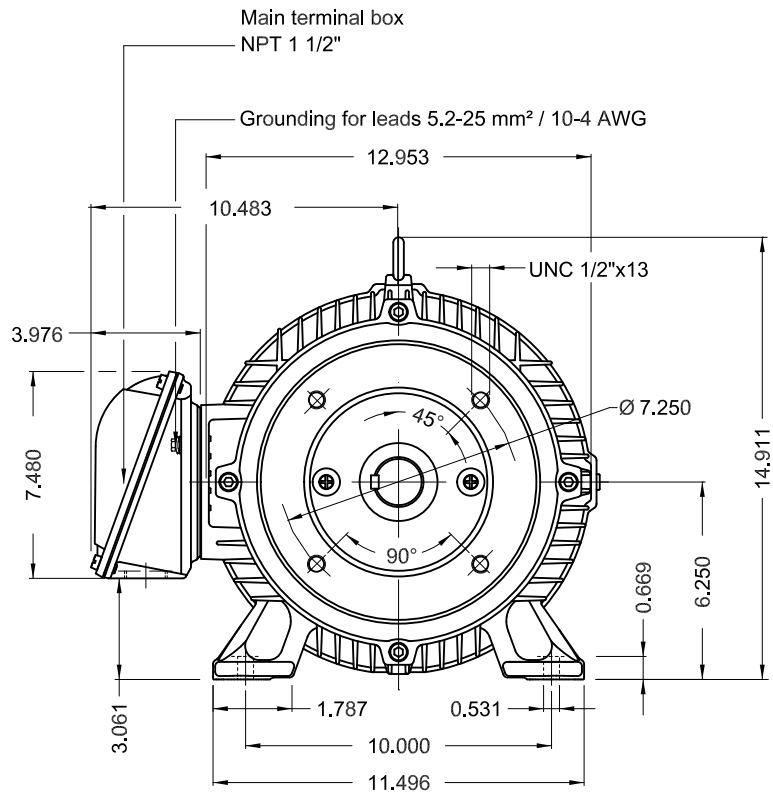
Customer :						
Product line		: W22 NEMA Premium Efficiency Three-Phase		Product code : 11535533		
			Catalog # :	02018ET3H256TC-W22		
Frame	: 254/6TC		Locked rotor time	: 27s (cold) 15s (hot)		
Output	: 20 HP (15 kW)		Temperature rise	: 80 K		
Poles	: 4		Duty cycle	: Cont.(S1)		
Frequency	: 60 Hz		Ambient temperature	: -20°C to +40°C		
Rated voltage	: 575 V		Altitude	: 1000 m.a.s.l.		
Rated current	: 19.3 A		Protection degree	: IP55		
L. R. Amperes	: 133 A		Cooling method	: IC411 - TEFC		
LRC	: 6.9x(Code H)		Mounting	: F-1		
No load current	: 8.00 A		Rotation ¹	: Both (CW and CCW)		
Rated speed	: 1765 rpm		Noise level ²	: 64.0 dB(A)		
Slip	: 1.94 %		Starting method	: Direct On Line		
Rated torque	: 8.11 kgfm		Approx. weight ³	: 164 kg		
Locked rotor torque	: 270 %					
Breakdown torque	: 280 %					
Insulation class	: F					
Service factor	: 1.25					
Moment of inertia (J)	: 0.1305 kgm ²					
Design	: B					
Output	50%	75%	100%	Foundation loads		
Efficiency (%)	91.7	92.4	93.0	Max. traction : 280 kgf		
Power Factor	0.68	0.79	0.84	Max. compression : 444 kgf		
Bearing type	:	<u>Drive end</u> 6309 C3	<u>Non drive end</u> 6209 C3			
Sealing	:	V'Ring	V'Ring			
Lubrication interval	:	20000 h	20000 h			
Lubricant amount	:	13 g	9 g			
Lubricant type	:	Mobil Polyrex EM				
Notes						
This revision replaces and cancel the previous one, which must be eliminated. (1) Looking the motor from the shaft end. (2) Measured at 1m and with tolerance of +3dB(A). (3) Approximate weight subject to changes after manufacturing process. (4) At 100% of full load.			These are average values based on tests with sinusoidal power supply, subject to the tolerances stipulated in NEMA MG-1.			
Rev.	Changes Summary			Performed	Checked	Date
Performed by						
Checked by					Page	Revision
Date	21/05/2019				1 / 1	

1 2 3 4 5 6

A

B

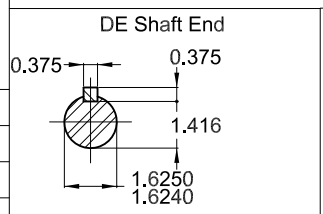
C



D

E

Without vertical jackscrews
 Color RAL 5009
 Painting plan 203A
 Mounting B34R(D)



20 HP 04 Poles 60Hz A

ECM	LOC	SUMMARY OF MODIFICATIONS	EXECUTED	CHECKED	RELEASED	DATE	VER
EXECUTED	USERADMIN	THREE PHASE W22 MOTOR - NEMA PREMIUM EFF					
CHECKED		FRAME 254/6TC IP55 TEFC					
RELEASED							
REL DT.	WMO	Jaragua do Sul	Product Engineering	PREVIEW	WDD	SHEET	1 / 1





Inverter Duty Motor
Severe Duty



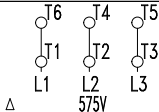
FOR SAFE AREA
MOD.TE1BFOXON



Class I, Div 2, Gr. A, B, C and D - T3
Class I, Zone 2, IIC - T3
Class II, Div 2, Gr. F and G - T4
For use on PWM, Gr. A, B, C, D and F,
VT 1000:1, CT 20:1, 1.0SF, T3A

MODEL: CT020504NPW22
MADE IN BRAZIL
11535533

PH 3	FR 254/6TC	HP(kW) 20(15)		Hz 60
V 575		A 19.3		IP55
NEMA NOM EFF		93.0	%	RPM 1765
ENCL TEFC	DUTY	CONT.		INS. CL. F Δ T 80 K
PF 0.84		DES B	CODE H	AMB. 40°C
SF 1.25	SFA 24.1		ALT 1000 m.a.s.l.	



→ 6309-C3
→ 6209-C3

MOBIL POLYREX EM
13 g 20000 h

362 Lbs

Thermowells

Threaded, Flanged, Sanitary, Socket, Weld, Weld-in

- **Process Type Thermowells**
- **Used on Bimetal Thermometers**
- **Used on Gas Actuated Thermometers**



Thermowells for temperature instruments are recommended for all process systems where pressure, velocity or viscous, abrasive and corrosive materials are present individually or in combination. A properly selected thermowell protects the temperature instrument from possible damage resulting from these process variables. Furthermore, a thermowell permits removal of the temperature instrument for replacement, repair or testing without effecting the process media or the system.

Standard Features

- **Process Connections:** Threaded, Flanged, Sanitary, Socket, Weld, Weld-in
- **Instrument Connection:** ½" NPSM Standard (National Pipe Standard Mechanical; A straight pipe thread for mechanical joints)
- **Shank Configurations:** Reduced, straight, tapered
- **Bore Diameter:** .260", .385"
- **Materials:** Brass, AISI 304, AISI 316
- **Surface Finish:** Brass: 60-100 Ra; AISI 304 & AISI 316: 60-100 Ra
Sanitary (AISI 304 & AISI 316): 16-20 Ra

Data sheets: [TW.FL](#), [TW.SC](#), [TW.SW](#), [TW.TH](#), [TW.VS](#), [TW.WI](#)

Thermowells

For Bimetal Thermometers & Gas Actuated Thermometers

CODING EXAMPLES

Type	Part Number	Process Connection	Bore/Type	Lag	Shank Design	"U" Dim.	Material	Rating	Facing
Threaded	75-TH2R-045-CC	¾" NPT	.260/threaded	None	Stepped	4½"	304SS		
Threaded	75-TH2LT-055-SS-T5	¾" NPT	.260/threaded	5" Lag	Tapered shank	5½"	316SS		
Flanged	15-FL2T-070-SS-150RF	1½" flanged	.260/flanged	None	Tapered shank	7"	316SS	150#	RF
Sanitary	10-SC2R-045-SS	1" sanitary	.260/sanitary	None	Stepped shank	4½"	316SS		
Weld	15-WI2T-075-CS	1½" weld-in	.260/weld in	None	Tapered shank	7½"	CS		
Socket weld	75-SW2R-045-CC	¾" NPT	.260/skt weld	None	Stepped	4½"	304SS		

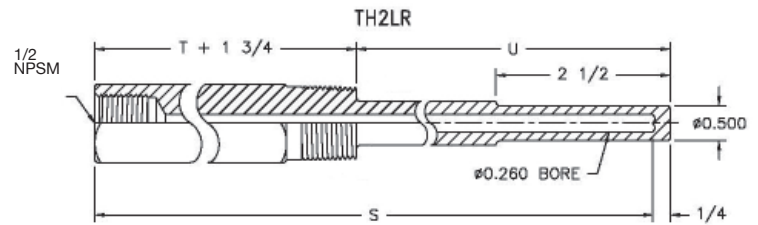
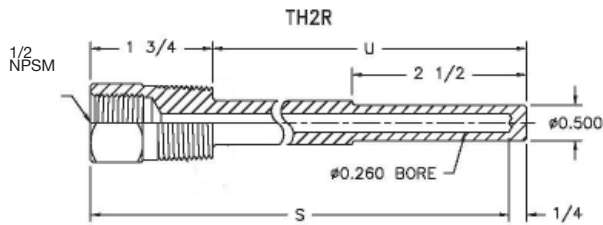
WIKAL THERMOWELL PRODUCT CODING EXPLANATION

Process Connection	Type / Bore Dia.	Lag	Shank Design	Standard "U" Dimensions (No Lag)		For Stem Length	Standard Material	Cap & Chain
				Type FL	All Other Types			
50=1½"	TH2 = Threaded/.260	Blank=No Lag	R = Reduced	N/A	*015 = 1-5/8"	2.5"	BR=Brass	1= Brass
75=¾"	TH3 = Threaded/.385	L=Standard Lag	S = Straight	020 = 2"	025 = 2-1/2"	4"	CC=304SS	2= ST.ST.
10=1"	FL2 = Flanged/.260		T = Tapered	040 = 4"	045 = 4-1/2"	6"	SS=316SS	
12=1-1/4"	FL3 = Flanged/.385			070 = 7"	075 = 7-1/2"	9"	CS=Carbon Steel	
15=1 1/2"	SC2 = Sanitary/.260			100 = 10"	105 = 10-1/2"	12"	MO=Monel	
20=2"	SC3 = Sanitary/.385			130 = 13"	135 = 13-1/2"	15"	CP=Carp.20	
	SW2 = Socket weld/.260			160 = 16"	165 = 16-1/2"	18"	IN=Inconel 600	
	SW3 = Socket weld/.385			220 = 22"	225 = 22-1/2"	24"	NI=Nickel	
				Standard "U" with lag ("T")			HB=Hastelloy B	
				Type FL	All Other Types		HC=Hastelloy C	
				020 = 2" (T=2")	025 = 2.5" (T=2")	6"	TA=Tantalum	
				040 = 4" (T=3")	045 = 4.5" (T=3")	9"	TI=Titanium	
				070 = 7" (T=3")	075 = 7.5" (T=3")	12"	TC= Teflon coated	
				100 = 10" (T=3")	105 = 10.5" (T=3")	15"	Other material, consult factory for pricing.	
				130 = 13" (T=3")	135 = 13.5" (T=3")	18"		
				190 = 19" (T=3")	195 = 19.5" (T=3")	24"		

For Flanged Well, Specify Rating & Facing	
Rating	Facing
150#	
300#	FF=Flat Face Flange
600#	RF=Raised Face Flange
900#	RJ=Ring Joint Flange
1500#	

*Note: For ½" NPT process connection the "U" dimension becomes 1" to accommodate ½" NPSM female thread. Order as "010", i.e. 50TH2R010CC.

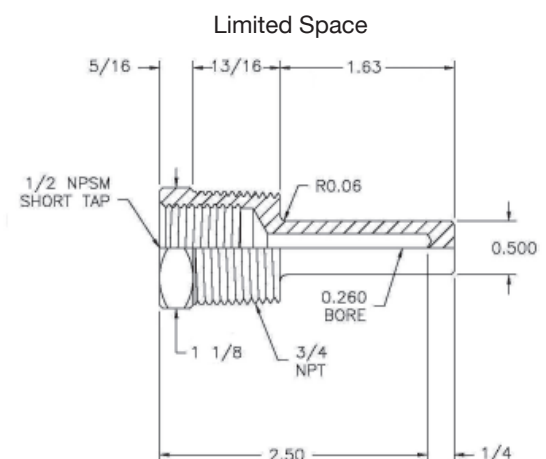
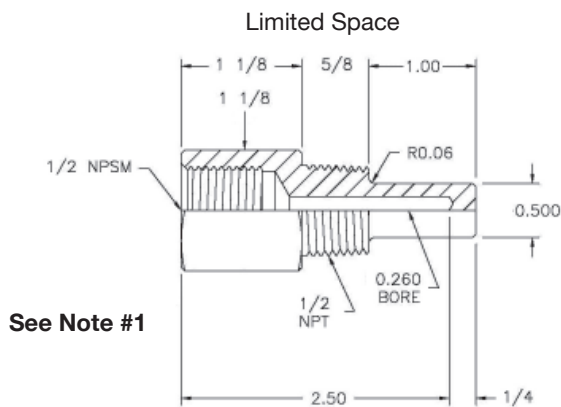
Thermowells TH Threaded Configuration



External Thread P	Stem Length S	Insertion Length U	Shank Diameter B
1/2"	4"	2 1/2"	-
	6"	4 1/2"	.625"
	9"	7 1/2"	.625"
	12"	10 1/2"	.625"
	15"	13 1/2"	.625"
	18"	16 1/2"	.625"
3/4"	2 1/2"	1 5/8"	.5"
	4"	2 1/2"	-
	6"	4 1/2"	.75"
	9"	7 1/2"	.75"
	12"	10 1/2"	.75"
	15"	13 1/2"	.75"
1"	18"	16 1/2"	.75"
	24"	22 1/2"	.75"
	2 1/2"	1 5/8"	.5"
	4"	2 1/2"	-
	6"	4 1/2"	.875"
	9"	7 1/2"	.875"

External Thread P	Stem Length S	Insertion Length U	Lag Extension T	Shank Dia. B
1/2"	6"	2 1/2"	2	-
	9"	4 1/2"	3	.625"
	12"	7 1/2"	3	.625"
	15"	10 1/2"	3	.625"
	18"	13 1/2"	3	.625"
3/4"	24"	19 1/2"	3	.625"
	6"	2 1/2"	2	-
	9"	4 1/2"	3	.75"
	12"	7 1/2"	3	.75"
	15"	10 1/2"	3	.75"
1"	18"	13 1/2"	3	.75"
	24"	19 1/2"	3	.75"
	6"	2 1/2"	2	-
	9"	4 1/2"	3	.875"
	12"	7 1/2"	3	.875"

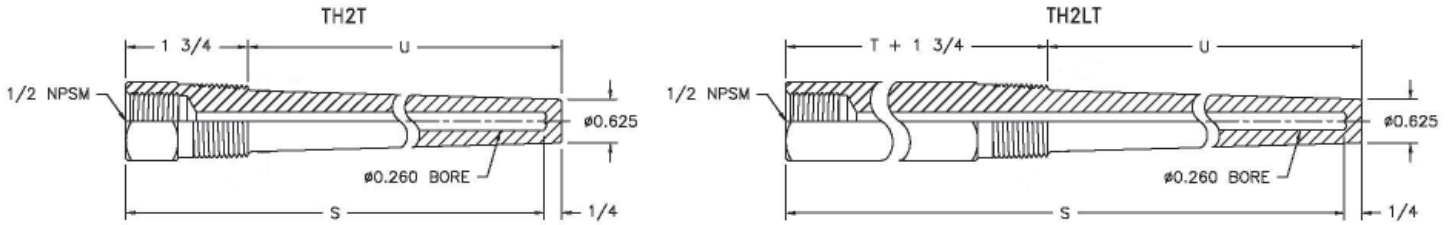
Material	Temperature - °F.						
	70°	200°	400°	600°	800°	1000°	1200°
Brass	5000	4200	1000	-----	-----	-----	-----
Carbon Steel	5200	5000	4800	4600	3500	1500	-----
A.I.S.I. - 304	7000	6200	5600	5400	5200	4500	1650
A.I.S.I. - 316	7000	7000	6400	6200	6100	5100	2500
Monel	6500	6000	5400	5300	5200	1500	-----



Notes:

- Normal "U" dimension on Limited Space well is 1 5/8" for 3/4" NPT and 1" NPT process connection. (For 1/2" NPT process connection, "U" dimension becomes 1" to accommodate 1/2" NPSM female thread. Order as "010", i.e. 50TH2R010CC.

Thermowells TH Threaded Configuration

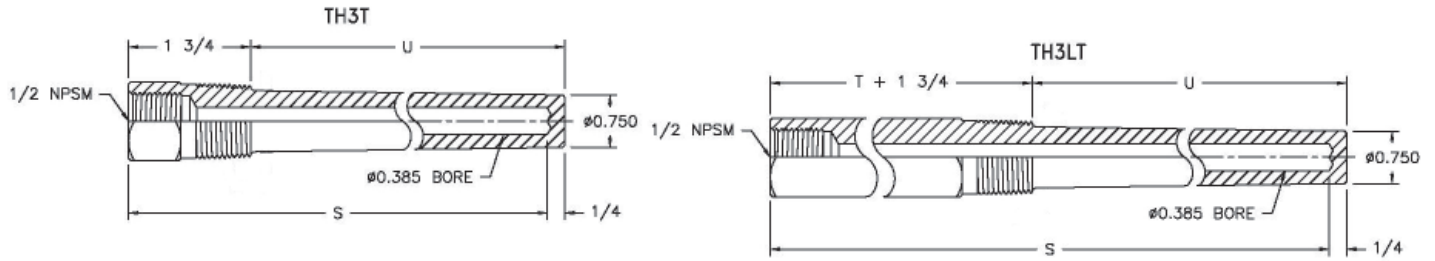


External Thread P	Stem Length S	Insertion Length U	Shank Diameter B
3/4"	4"	2 1/2"	.875"
	6"	4 1/2"	.875"
	9"	7 1/2"	.875"
	12"	10 1/2"	.875"
	15"	13 1/2"	.875"
	18"	16 1/2"	.875"
1"	24"	22 1/2"	.875"
	4"	2 1/2"	1.063"
	6"	4 1/2"	1.063"
	9"	7 1/2"	1.063"
	12"	10 1/2"	1.063"
	15"	13 1/2"	1.063"
	18"	16 1/2"	1.063"
	24"	22 1/2"	1.063"

External Thread P	Stem Length S	Insertion Length U	Lag Extension T	Shank Diameter B
3/4"	6"	2 1/2"	2	.875"
	9"	4 1/2"	3	.875"
	12"	7 1/2"	3	.875"
	15"	10 1/2"	3	.875"
	18"	13 1/2"	3	.875"
	24"	19 1/2"	3	.875"
1"	6"	2 1/2"	2	1.063"
	9"	4 1/2"	3	1.063"
	12"	7 1/2"	3	1.063"
	15"	10 1/2"	3	1.063"
	18"	13 1/2"	3	1.063"
	24"	16 1/2"	3	1.063"

PRESSURE - TEMPERATURE RATING							
Material	Material Temperature - °F.						
	70°	200°	400°	600°	800°	1000°	1200°
Brass	5300	4750	1100	-----	-----	-----	-----
Carbon Steel	5950	5750	5450	5250	4000	1750	-----
A.I.S.I. - 304	7800	7050	6400	6150	6000	5190	1875
A.I.S.I. - 316	7800	7800	7250	7100	6950	5800	2720
Monel	7450	6850	6150	6100	5940	1750	-----

Thermowells TH Threaded Configuration

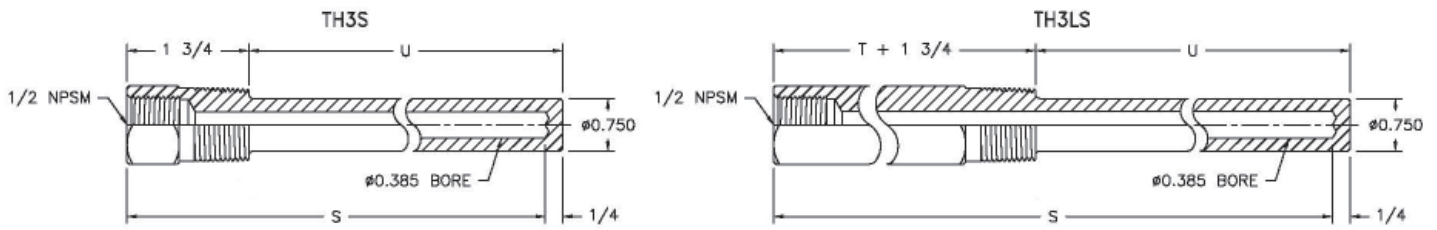


External Thread P	Stem Length S	Insertion Length U	Shank Diameter B
3/4"	4"	2 1/2"	.875"
	6"	4 1/2"	.875"
	9"	7 1/2"	.875"
	12"	10 1/2"	.875"
	15"	13 1/2"	.875"
	18"	16 1/2"	.875"
	24"	22 1/2"	.875"
1"	4"	2 1/2"	1.063"
	6"	4 1/2"	1.063"
	9"	7 1/2"	1.063"
	12"	10 1/2"	1.063"
	15"	13 1/2"	1.063"
	18"	16 1/2"	1.063"
	24"	22 1/2"	1.063"

External Thread P	Stem Length S	Insertion Length U	Lag Extension T	Shank Diameter B
3/4"	6"	2 1/2"	2	.875"
	9"	4 1/2"	3	.875"
	12"	7 1/2"	3	.875"
	15"	10 1/2"	3	.875"
	18"	13 1/2"	3	.875"
	24"	19 1/2"	3	.875"
	1"	6"	2 1/2"	2
9"		4 1/2"	3	1.063"
12"		7 1/2"	3	1.063"
15"		10 1/2"	3	1.063"
18"		13 1/2"	3	1.063"
24"		16 1/2"	3	1.063"

Material	Temperature - °F.						
	70°	200°	400°	600°	800°	1000°	1200°
Brass	5000	4200	1000	-----	-----	-----	-----
Carbon Steel	5200	5000	4800	4600	3500	1500	-----
A.I.S.I. - 304	7000	6200	5600	5400	5200	4500	1650
A.I.S.I. - 316	7000	7000	6400	6200	6100	5100	2500
Monel	6500	6000	5400	5300	5200	1500	-----

Thermowells TH Threaded Configuration



Extended Length P	Stem Length S	Insertion Length U
3/4"	4"	2 1/2"
	6"	4 1/2"
	9"	7 1/2"
	12"	10 1/2"
	15"	13 1/2"
	18"	16 1/2"
1"	24"	22 1/2"
	4"	2 1/2"
	6"	4 1/2"
	9"	7 1/2"
	12"	10 1/2"
	15"	13 1/2"
1"	18"	16 1/2"
	24"	22 1/2"

Extended Lag P	Stem Length S	Insertion Length U	Lag Extension T
3/4"	6"	2 1/2"	2"
	9"	4 1/2"	3"
	12"	7 1/2"	3"
	15"	10 1/2"	3"
	18"	13 1/2"	3"
	24"	19 1/2"	3"
1"	6"	2 1/2"	2"
	9"	4 1/2"	3"
	12"	7 1/2"	3"
	15"	10 1/2"	3"
	18"	13 1/2"	3"
	24"	19 1/2"	3"

Material	Temperature - °F.						
	70°	200°	400°	600°	800°	1000°	1200°
Brass	5000	4200	1000	-----	-----	-----	-----
Carbon Steel	5200	5000	4800	4600	3500	1500	-----
A.I.S.I. - 304	7000	6200	5600	5400	5200	4500	1650
A.I.S.I. - 316	7000	7000	6400	6200	6100	5100	2500
Monel	6500	6000	5400	5300	5200	1500	-----

Thermowells TH Threaded Configuration

Threaded Thermowells - General Use

Models TH2 (.260 Bore) stepped (reduced) shank, without lag ONLY

Size	Model	No Lag U DIM	S DIM	304 SS	316 SS	Size	Model	No Lag U DIM	S DIM	304 SS	316 SS
1/2" NPT or 3/4" NPT	TH2R	1 5/8	2 1/2	\$26.32	\$27.79	1" NPT	TH2R	1 5/8	2 1/2	\$31.91	\$32.79
		2 1/2	4	\$33.81	\$39.19			2 1/2	4	\$37.79	\$43.08
		4 1/2	6	\$42.20	\$47.63			4 1/2	6	\$48.66	\$55.86
		7 1/2	9	\$53.07	\$59.09			7 1/2	9	\$65.13	\$80.85
		10 1/2	12	\$66.74	\$76.01			10 1/2	12	\$85.71	\$97.76
		13 1/2	15	\$135.53	\$141.86			13 1/2	15	\$161.85	\$169.20
		16 1/2	18	\$161.70	\$169.34			16 1/2	18	\$192.58	\$202.13
		22 1/2	24	\$226.83	\$250.05			22 1/2	24	\$226.83	\$250.05

Threaded Thermowells - Special Configuration

Models TH2 (.260 Bore) & TH3 (.385) bore, tapered, stepped (reduced) or straight shank, with or without lag

Size	Model	No Lag U DIM	With Lag		S DIM	Brass	304 SS	316 SS	Carbon ST
			U DIM	T DIM					
1/2" NPT or 3/4" NPT	TH2R	1 5/8	--	--	2 1/2	\$27.50	\$26.32	\$27.79	\$19.99
	TH2S	2 1/2	--	--	4	\$41.16	\$39.40	\$41.16	\$29.99
	TH2LR	4 1/2	2 1/2	2	6	\$59.39	\$56.90	\$59.39	\$43.37
	TH3S	7 1/2	4 1/2	3	9	\$86.88	\$82.91	\$86.88	\$63.36
	TH3LS	10 1/2	7 1/2	3	12	\$114.37	\$109.23	\$114.37	\$83.36
	TH2T	13 1/2	10 1/2	3	15		\$135.53	\$141.86	
	TH2LT	16 1/2	13 1/2	3	18		\$161.70	\$169.34	
	TH3T	22 1/2	19 1/2	3	24		\$226.67	\$250.05	
	TH3LT								
Size	Model	No Lag U DIM	With Lag S		Dim	Brass	304 SS	316 SS	Carbon ST
			U DIM	T DIM					
1" NPT	TH2R	1 5/8	--	--	2 1/2	\$32.79	\$31.91	\$32.79	\$25.58
	TH2S	2 1/2	--	--	4	\$49.10	\$47.04	\$49.10	\$38.81
	TH2LR	4 1/2	2 1/2	2	6	\$71.01	\$67.91	\$71.01	\$56.01
	TH3S	7 1/2	4 1/2	3	9	\$103.78	\$99.08	\$103.78	\$81.73
	TH3LS	10 1/2	7 1/2	3	12	\$136.42	\$130.54	\$136.42	\$107.46
	TH2T	13 1/2	10 1/2	3	15		\$161.85	\$169.30	
	TH2LT	16 1/2	13 1/2	3	18		\$192.57	\$201.98	
	TH3T	22 1/2	19 1/2	3	24		\$226.67	\$250.05	
	TH3LT								

Threaded Thermowell Factory Stock

Part Number	List
75TH2R015BR	\$27.50
75TH2R015CC	\$26.32
75TH2R015SS	\$27.79
75TH2R025BR	\$41.16
75TH2R025CC	\$33.81
75TH2R025SS	\$39.19
75TH2LR025SS	\$59.39
75TH2R045BR	\$59.39
75TH2R045CC	\$42.20
75TH2R045SS	\$47.63
75TH2T045CC	\$56.90
75TH2T045SS	\$59.39
75TH2LR045SS	\$86.88
75TH2R075CC	\$53.07
75TH2R075SS	\$59.09
50TH2R010BR	\$27.50
50TH2R010CC	\$26.32
50TH2R010SS	\$27.79
50TH2R025BR	\$41.16
50TH2R025CC	\$33.81
50TH2R025SS	\$39.19

NOTE: Stock items shown in **bold, blue** print.

Accessories

Description	Part #	Code	List Price
Brass Cap & Chain	N/A	Code 1	\$14.70
SS Cap & Chain	N/A	Code 2	\$23.16
SS Tag Wired on	N/A	-	\$7.61
Stamping on Well	N/A	-	\$9.58
5.3 oz. tube heat transfer compound	2256045	-	\$32.55
Paper Tag	N/A	-	\$2.67

Bimetal Thermometer - Process Grade - All Stainless Steel Construction Type TI.30, 3" Dial Size - Back Connected

Datasheet TI.30

Applications

- General process instrumentation in the chemical, petrochemical, oil and gas, energy and water/wastewater industries
- Temperature measurement in harsh and aggressive environments
- With liquid dampening suitable for applications with high vibrations

Product features

- Process grade design
- All stainless steel case construction
- Back connected with external reset
- Hermetically sealed per ASME B40.3
- Accurate to 1% of full scale value
- Available with silicone case filling for vibration



Pressure Gauge TI.30

Specifications

Sizes

3" (76.2 mm) - Type TI.30

Accuracy

+ 1.0% full scale value per ASME B40.3 Grade A

Ranges

From -100°F (-70°C) to +1000°F (+540°C)

From -50°C to +550°C (as single scale)

Reference table on page 2

Working Range

Steady: full scale value

Short time: 110% of full scale value

Over/Under Range Protection

≤ +500°F (+260°C): Temporary up to 50% of full scale

> +500°F (+260°C): Continuous to 800°F (+427°C)
Intermittant up to 1000°F (+538°C)

Connection

Material: 304 stainless steel

Center back mount (CBM), 1/2" NPT

Measuring Element

Bi-metal helix

Pointer

Black aluminum

Stem

Material: 304 stainless steel

Diameter: 1/4" (6.35 mm)

Length: 2 1/2" to 72" (63.5 mm to 1,828.8 mm)

Case

Material: 304 stainless steel

Hermetically sealed per ASME B40.3 standard

Weather protection NEMA 4X (IP 66)

External reset slotted hex head on back of case

Dial

White aluminum, dished, with black markings

Dampening

Inert gel to minimize pointer oscillation

Standard Scales

Single: Fahrenheit or Celsius

Dual: Fahrenheit (outer) and Celsius (inner)

Window Gasket

Neoprene

Silicone for ranges -100°F (-70°C) and
ranges > +550°F (+260°C)

Window

Flat instrument glass

Weight

7 oz. (200 g) - 3" dial (76.2 mm);

Add 1 oz. (28 g) for every 2" (50 mm) of stem length

Optional Extras

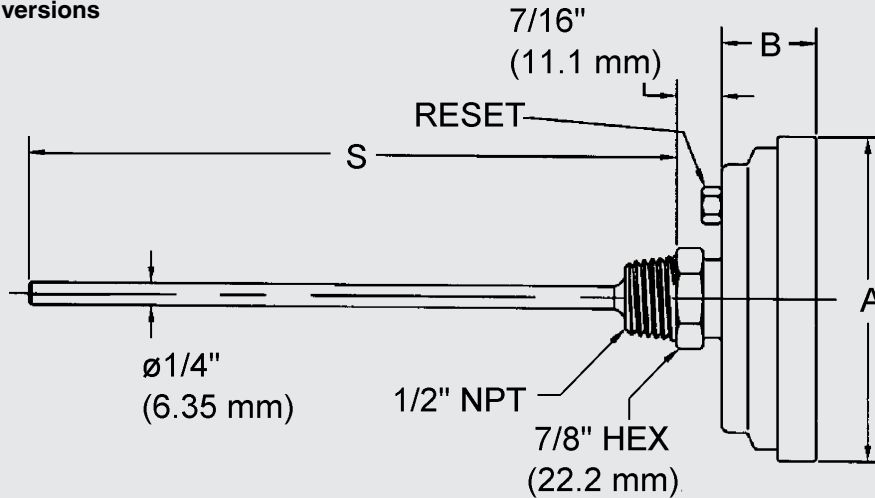
- Thermowells
- Silicone fill
- Dampened Movement
- Special scales and dial markings
- Acrylic and safety glass windows
- Calibration certification traceable to NIST
- Min/max pointer
- DIN standards

STANDARD RANGES		
Fahrenheit Single Scale	Dual Scale F & C F Outer, C Inner	Celsius Single Scale
-100/150 F	-100/150 F & -70/70 C	-50/50 C
-40/120 F	40/120 F & -40/50 C	-20/120 C
0/140 F	0/140 F & -20/60 C	0/50 C ¹
0/200 F	0/200 F & -15/90 C	0/100 C
0/250 F	0/250 F & -20/120 C	0/150 C
20/240 F	20/240 F & -5/115 C	0/200 C
25/125 F	25/125 F & -5/50 C ¹	0/250 C
50/300 F	50/300 F & 10/150 C	0/300 C
50/400 F	50/400 F & 10/200 C	0/450 C ¹
50/550 F	50/500 F & 10/260 C	100/550 C ¹
150/750 F	150/750 F & 65/400 C	
200/1000 F ¹	200/1000 F & 100/540 C ¹	

¹ Not recommended for continuous service over 800°F (425°C)

Dimensions

Standard versions



Stem Length
2½" (63.5 mm)
4" (101.6 mm)
6" (152.4 mm)
9" (228.6 mm)
12" (304.8 mm)
15" (381.0 mm)
18" (457.2 mm)
24" (609.6 mm)

WIKA Type	DIAL SIZE	A	B	S (Stem Length)
30	3" (76.2 mm)	3-1/4" (82.6 mm)	15/16" (23.8 mm)	As Specified

Note: Thermowells for temperature instruments are recommended for all process systems where pressure, velocity, or viscous, abrasive and corrosive materials are present individually or in combination. A properly selected thermowell protects the temperature instrument from possible damage resulting from these process variables. Furthermore, a thermowell permits removal of the temperature instrument for replacement, repair or testing without effecting the process media or the system.

Ordering information

State computer part number (if available) /type number/size/range/connection size and locations/options required. WIKA reserves the right to make changes without prior notice.



WIKA Instrument Corporation
 1000 Wiegand Boulevard
 Lawrenceville, GA 30043
 1-888-WIKA-USA /770-513-8200 (in GA)
 Fax 770-338-5118
 info@wika.com www.wika.com

Status	Part #	Description	Heater Key	Revision
Confirmed	7131DX316205	PT 2NPT 3KW575/3 STL/SST	100016594	0

General Data

KW +5/-10%:	3.00
KW per Circuit:	-
Voltage:	575
Phase:	3
Circuit Quantity:	1
Line Amps:	3.01
Amps Per Circuit:	-
Connection Type:	Wye
Connection:	Permanent Bussing

Element Data

Watts Per Sq.In:	23.31
Moisture Seal Type:	Epoxy Seal
Quantity:	3
Quantity Per Circuit:	3
Sheath Material:	304 SST
O.D. (in):	0.475
Watts:	1000
Volts:	331.98

Fitting Data

Size:	2 NPT
Fitting Material:	Steel
Standard:	ANSI B1.20.1
Gasket Material:	None
Accessories:	None

Suitable Pipe Schedules

5s, 5, 10s, 10, STD, 40, SchXH, 80

Certification Data

UL Recognized & CSA Certified

Enclosure Data

Type 4 - Cast Aluminum
Designed For Outdoor Use

Application Data

Heated Substance:	Other
Process Max Temp. (°F):	100
Process Max Press. (PSIG):	160
Heater Orientation:	Horizontal

Sensor Data

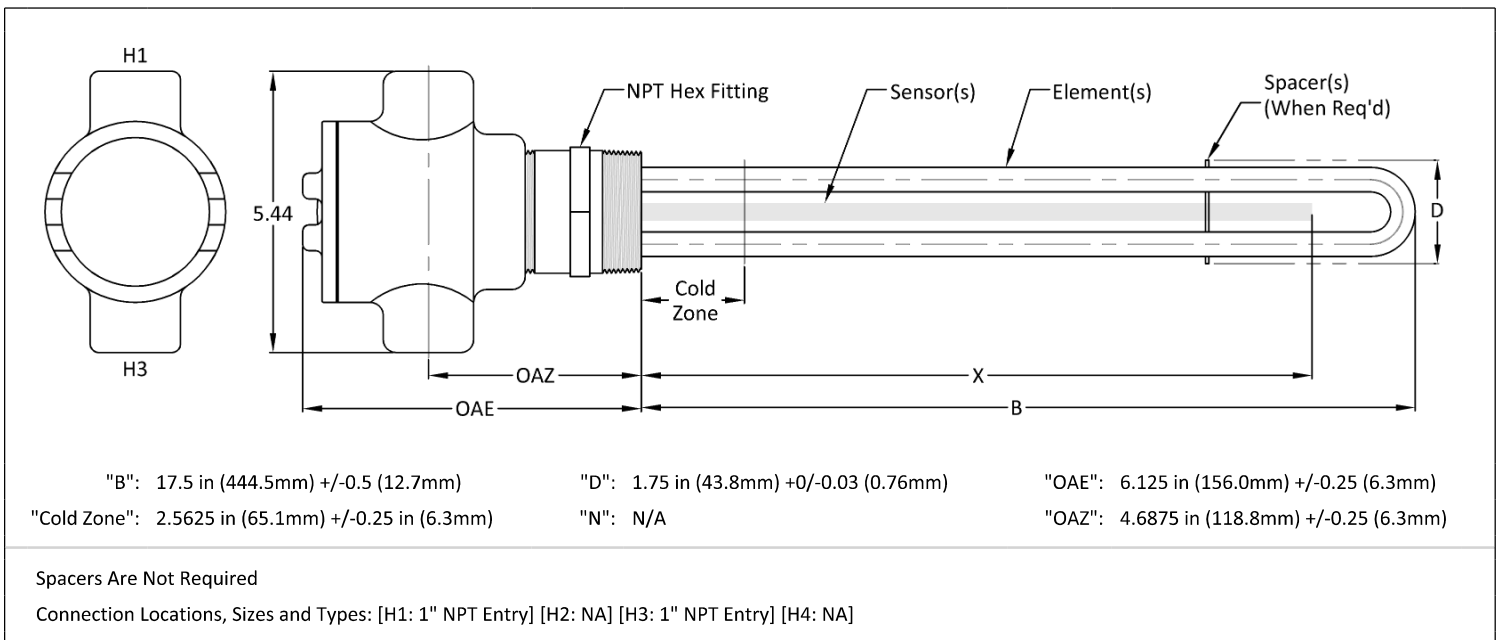
Sensor #1	
Type:	Thermostat 1 Pole 40-120F
Location:	Standard
XDim:	7.19
Control:	Pilot Duty
Sensor #2	
Type:	N/A
Location:	N/A
XDim:	N/A

Wire Connection Data

Power	
Min. Wire Temp. Rating:	90 Deg. C
Wire Size:	14 AWG
Wire Qty:	3
Connection Size:	1" NPT Entry
Connection Qty:	1
Control	
Connection Size:	1" NPT Entry
Connection Qty:	1

Note: See Drawing for referenced XDim Tolerance +/-0.500 in. (12.7mm)

Note: See Drawing for Supplied Location, Size and Type

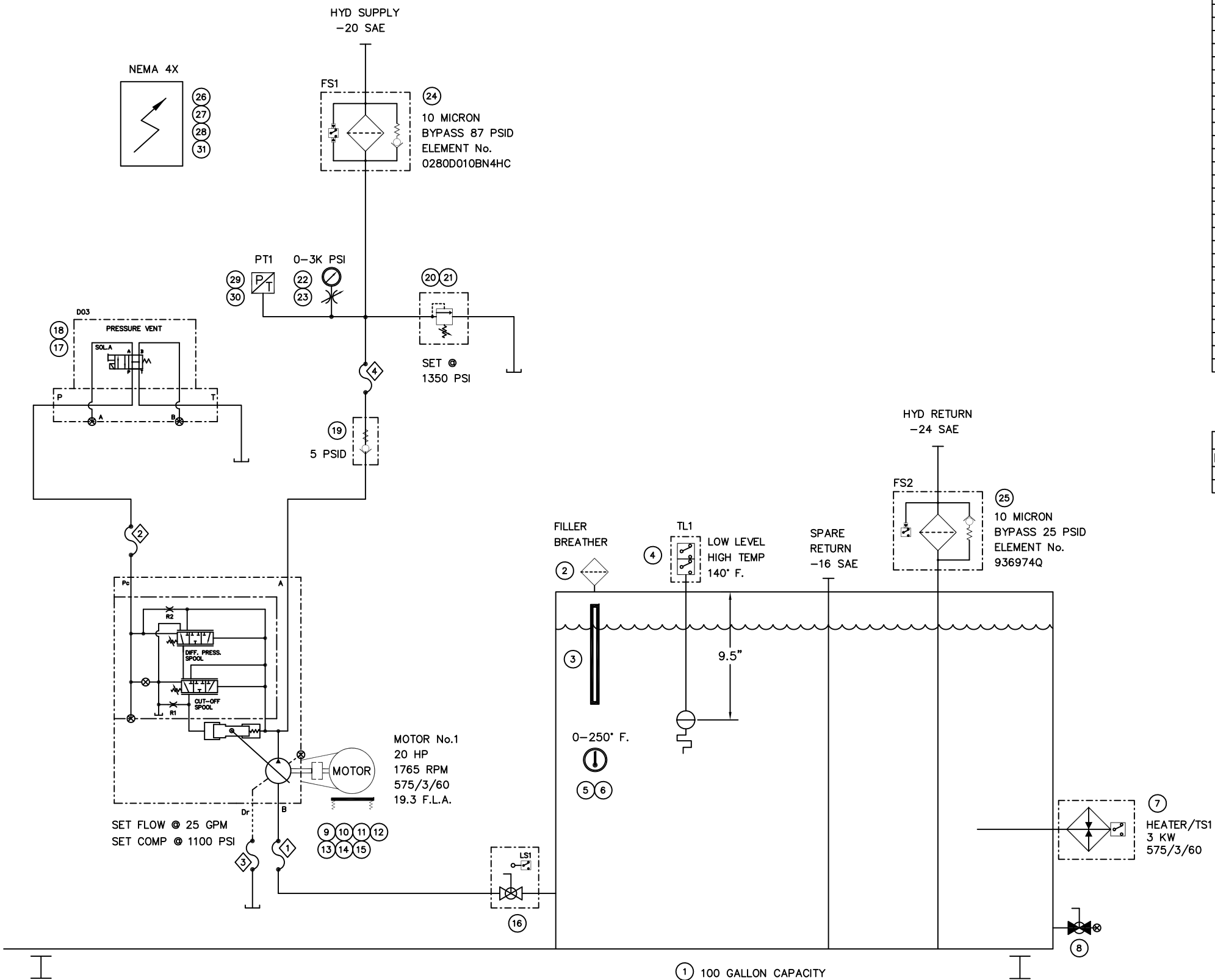
Drawing


MATERIALS			
ITEM	QTY.	DESCRIPTION	PART #
1	1	100 GALLON JIC RESERVOIR	SUNSOURCE L100F
2	1	FILLER BREATHER	LUBE DEVICES INC 5201
3	1	SIGHT LEVEL/TEMP GAUGE	LUBE DEVICES INC ALG-5T
4	1	LEVEL/TEMP SWITCH	ADV CONTROL TECH B40030AFD2C605
5	1	TEMPERATURE DIAL	WIKA 30025D006G4
6	1	THERMOWELL	WIKA 75TH2R025CC
7	1	IMMERSION HEATER 3KW	ACCUTHERM LM3-30-5-N4T4 (7131DX316205)
8	1	BALL VALVE 3/4"	ANCHOR LV2BS#12-2T
9	1	20 HP, 1800 RPM, 256TC, 575/3/60 TEFC MOTOR	WEG 02018ET3H256TC-W22
10	2	MOTOR DAMPENING BAR	HYDRO-CRAFT HC-256TC-W
11	1	PISTON PUMP	KAWASAKI K3VL60/B-1NRSS-P0
12	1	P/M ADAPTER	MAGNALOY M182602B
13	1	COUPLING HALF 1-5/8 X 3/8	MAGNALOY M30012012
14	1	COUPLING HALF 15T 16/32	MAGNALOY M300A1516
15	1	INSERT	MAGNALOY M370H5
16	1	BALL VALVE W/SWITCH	DMIC BVAL-1500S-4321IEZN
17	1	SUBPLATE	DAMAN PRODUCTS AD03SPS6S
18	1	DIRECTIONAL VALVE	VICKERS DG4V3SOBMLFWB560
19	1	CHECK VALVE	DMIC CVH05-1000S
20	1	RELIEF VALVE	VICKERS RV510S035/
21	1	LINE BODY	VICKERS 20058AA8
22	1	PRESSURE GAUGE	DYNAMIC CF-1P-210-A-SAE
23	1	ISOLATOR	DMIC DMGV-S41
24	1	PRESSURE FILTER	HYDAC LFBN/HC280IE10C1.0/12B6
25	1	RETURN FILTER	PARKER ARLON KL710QBSGS24TP
26	1	ENCLOSURE NEMA 4X	SAGINAW CONTROLS SCE-24EL2010SSLP
27	1	SUBPANEL	SAGINAW CONTROLS SCE-24P20
28	1	DIN CABLE X 5 METERS	MURR ELEKTRONIK 7000-18141-0180500
29	1	PRESSURE TRANSMITTER	IFM EFECTOR PX3111
30	1	M12 X 5 PIN CABLE	MURR ELEKTRONIK 7000-12341-0140500
31	50	TERMINAL BLOCK	C3 CONTROLS WTB2-W4

SHIP LOOSE ITEMS			
ITEM	QTY.	DESCRIPTION	PART #
	1	FILTER ELEMENT 10 MICRON	HYDAC 0280D010BN4HC
	1	FILTER ELEMENT 10 MICRON	PARKER ARLON 936974Q

◆ HOSE DETAIL

#	HOSE TYPE	FITTING #1	FITTING #2	S	H.L.	O.A.L.
1	2661-24	CLAMP	CLAMP	A	35.50"	35.50"
2	GH781-6	1AA6FJ6	1AA6FJ6	A	22.00"	24.50"
3	GH781-12	1AA12FJ12	1AA12FJ12	A	29.00"	32.00"
4	GH781-16	1AA16FJ16	1AA16FJ16	A	32.25"	36.00"



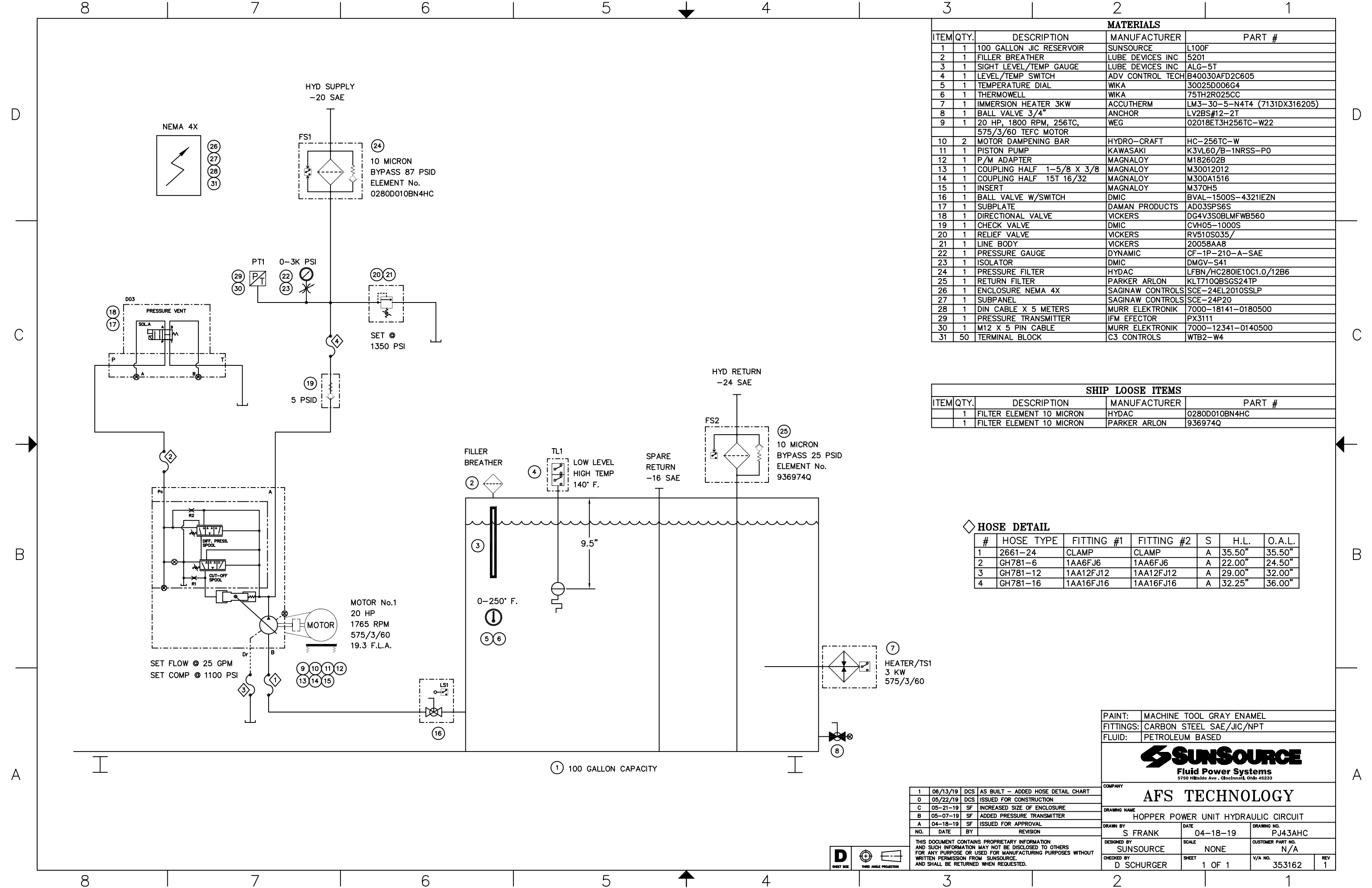
PAINT: MACHINE TOOL GRAY ENAMEL
 FITTINGS: CARBON STEEL SAE/JIC/NPT
 FLUID: PETROLEUM BASED

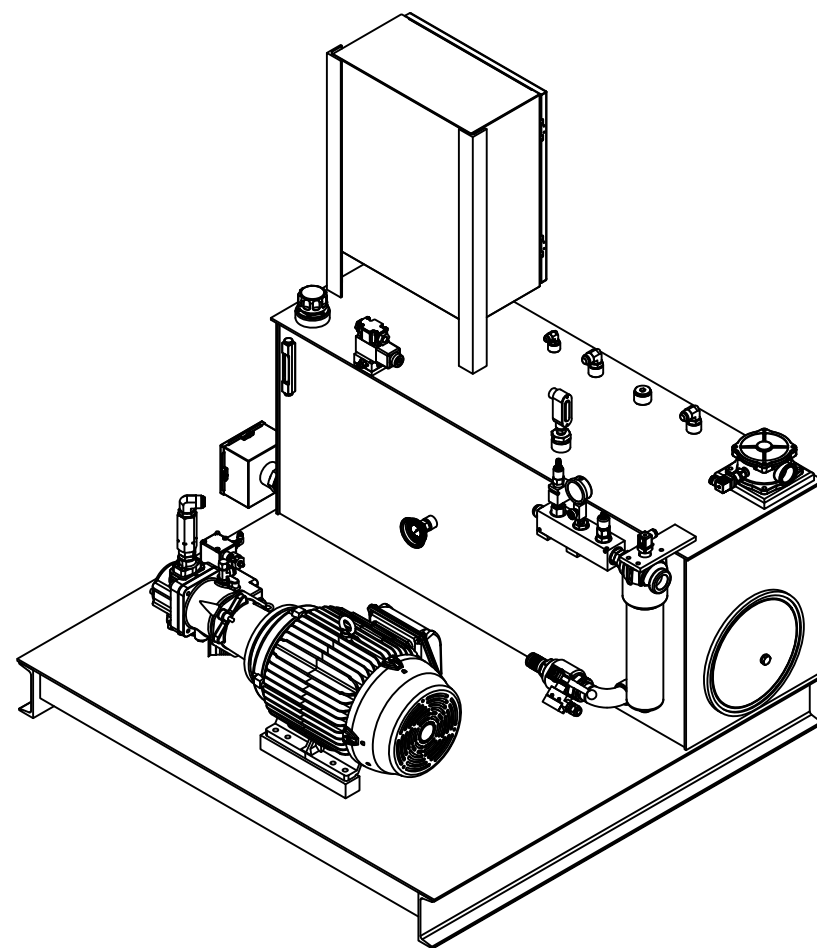
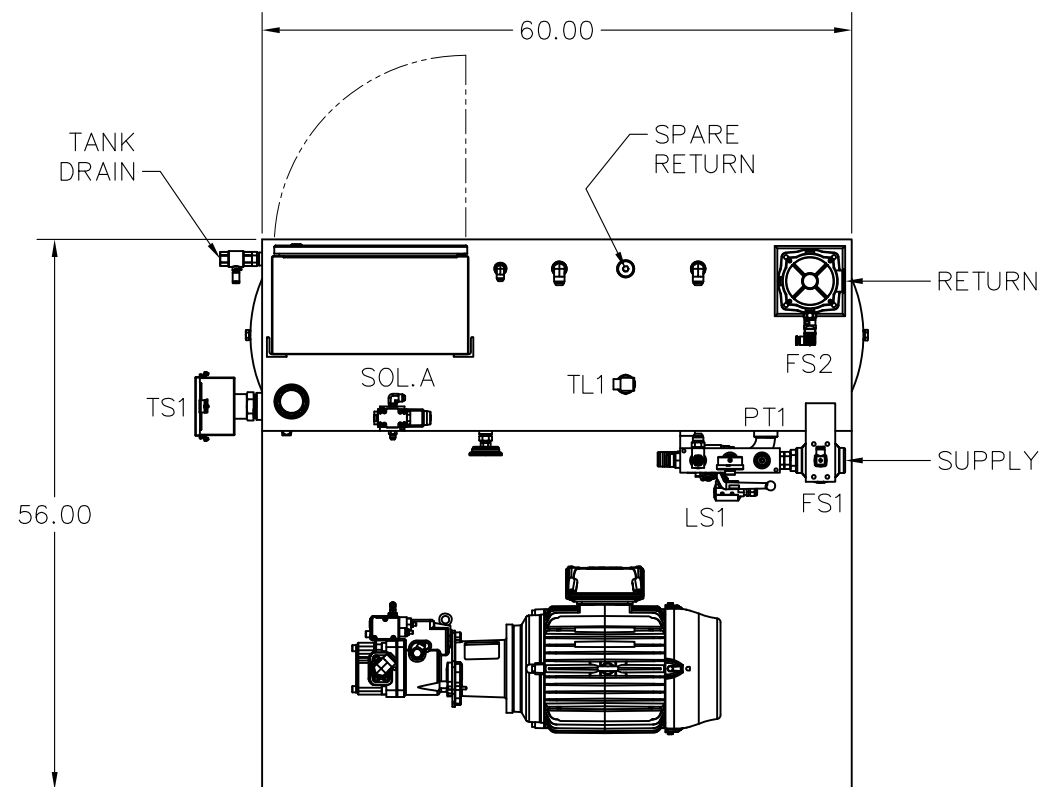


COMPANY		AFS TECHNOLOGY	
DRAWING NAME HOPPER POWER UNIT HYDRAULIC CIRCUIT			
DRAWN BY S FRANK	DATE 04-18-19	DRAWING NO. PJ43AHC	
DESIGNED BY SUNSOURCE	SCALE NONE	CUSTOMER PART NO. N/A	
CHECKED BY D SCHURGER	SHEET 1 OF 1	V/A NO. 353162	REV 1

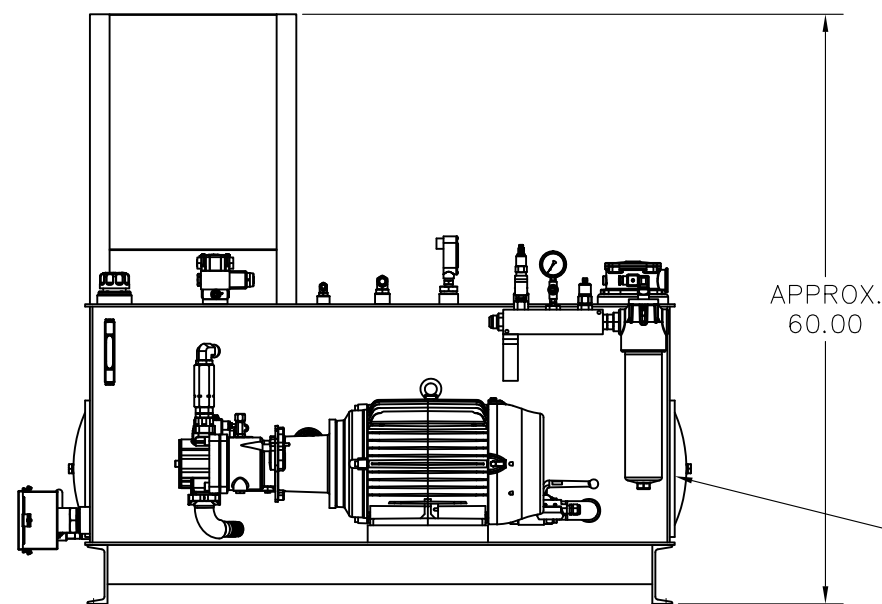
NO.	DATE	BY	REVISION
1	06/13/19	DCS	AS BUILT - ADDED HOSE DETAIL CHART
0	05/22/19	DCS	ISSUED FOR CONSTRUCTION
C	05-21-19	SF	INCREASED SIZE OF ENCLOSURE
B	05-07-19	SF	ADDED PRESSURE TRANSMITTER
A	04-18-19	SF	ISSUED FOR APPROVAL

THIS DOCUMENT CONTAINS PROPRIETARY INFORMATION AND SUCH INFORMATION MAY NOT BE DISCLOSED TO OTHERS FOR ANY PURPOSE OR USED FOR MANUFACTURING PURPOSES WITHOUT WRITTEN PERMISSION FROM SUNSOURCE AND SHALL BE RETURNED WHEN REQUESTED.

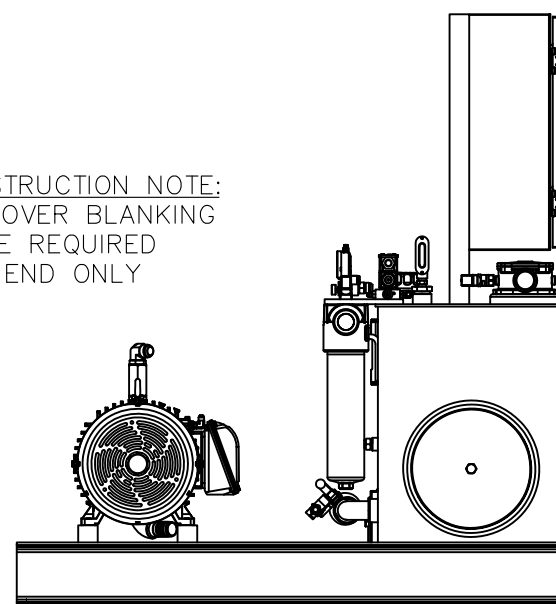




SEE DRAWING PJ43AHC
FOR HYDRAULIC CIRCUIT



CONSTRUCTION NOTE:
ENDCOVER BLANKING
PLATE REQUIRED
THIS END ONLY

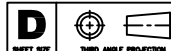


MOUNTING HOLES
4 PLACES

NO.	DATE	BY	REVISION
1	06/13/19	DCS	AS BUILT
0	05/22/19	DCS	ISSUED FOR CONSTRUCTION
B	05/21/19	DCS	UPDATED, ISSUED FOR APPROVAL
A	05/14/19	DCS	ISSUED FOR APPROVAL

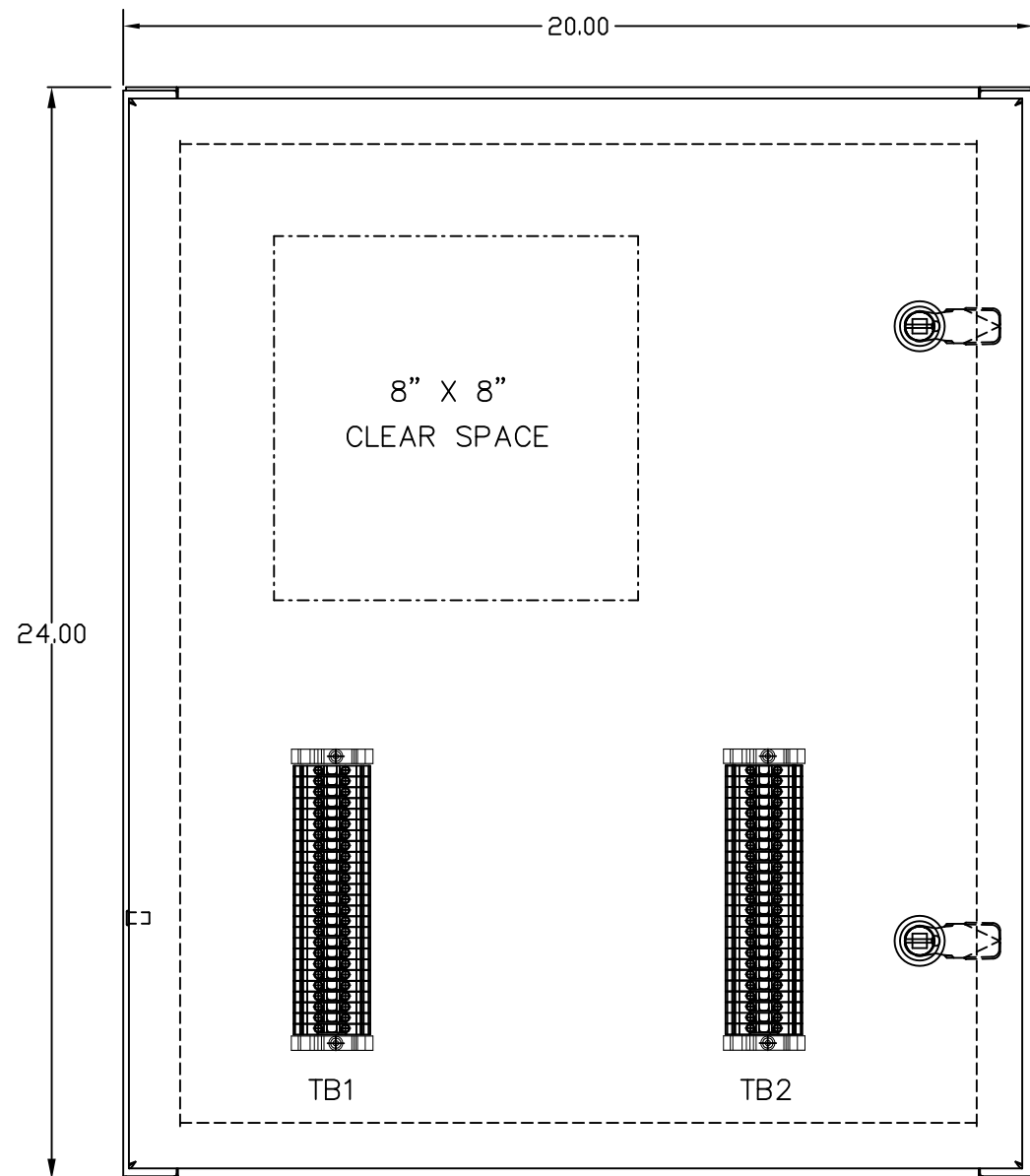
THIS DOCUMENT CONTAINS PROPRIETARY INFORMATION AND SUCH INFORMATION MAY NOT BE DISCLOSED TO OTHERS FOR ANY PURPOSE OR USED FOR MANUFACTURING PURPOSES WITHOUT WRITTEN PERMISSION FROM SUNSOURCE AND SHALL BE RETURNED WHEN REQUESTED.

SUNSOURCE Fluid Power Systems			
COMPANY AFS TECHNOLOGY			
DRAWING NAME CUSTOM POWER UNIT GENERAL ARRANGEMENT			
DRAWN BY D. SCHURGER	DATE 05/13/19	DRAWING NO. PJ43AGA	
DESIGNED BY SUNSOURCE	SCALE NONE	CUSTOMER PART NO. N/A	
CHECKED BY S. FRANK	SHEET 1 OF 1	V/A NO. 353162	REV 1

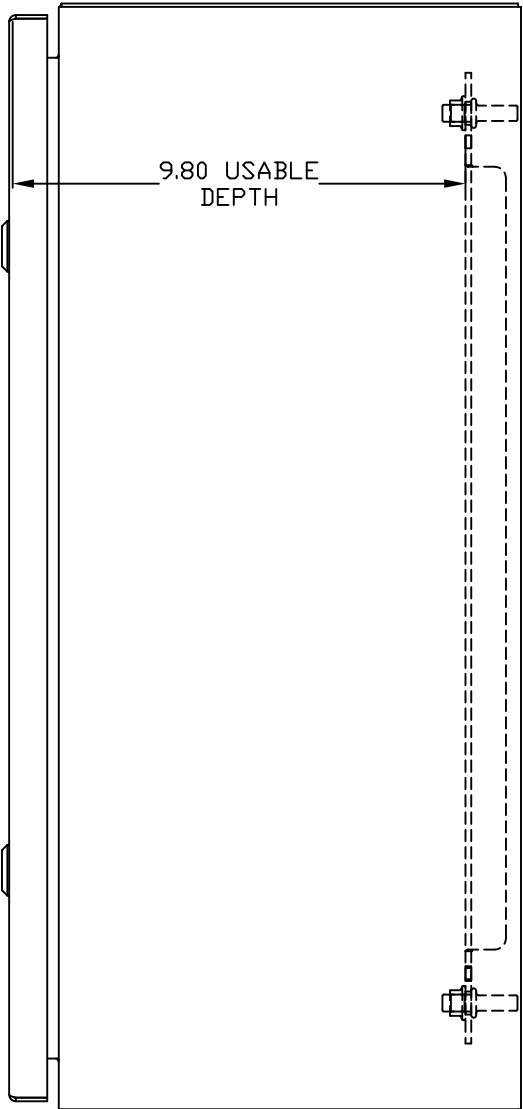


8 7 6 5 4 3 2 1

D

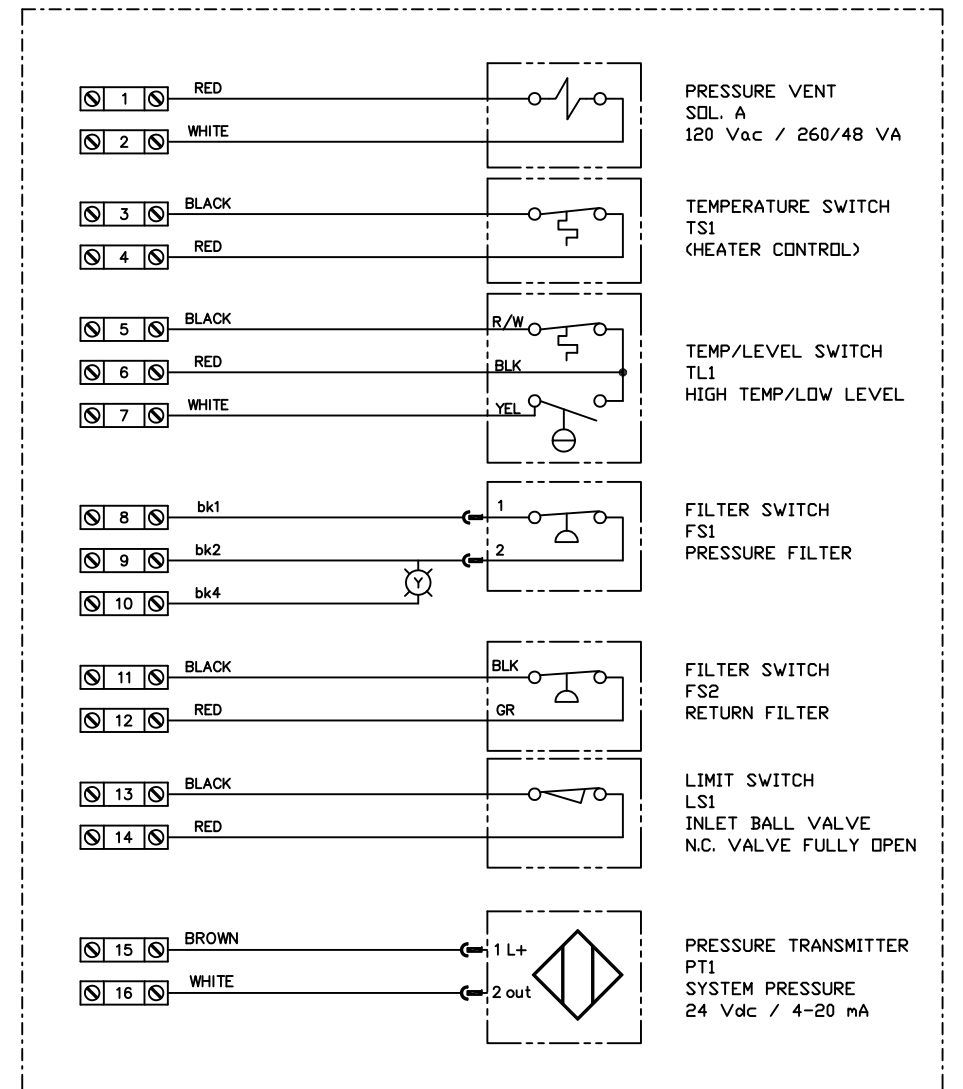


FRONT VIEW



RIGHT SIDE VIEW

TERMINAL DETAIL TB1



CONSTRUCTION NOTES:

- 50 TERMINALS REQUIRED
- CONNECT GROUND WIRES TO SUBPANEL
- 8" X 8" CLEAR SPACE REQUIRED FOR CUSTOMER DEVICES

REFERENCE DRAWING PJ43AHC

A

8 7 6 5 4 3 2 1



1	06/12/19	RSB	AS BUILT
0	05/22/19	DCS	ISSUED FOR CONSTRUCTION
C	05-21-19	SF	INCREASED ENCLOSURE SIZE
B	05-06-19	SF	ADDED TERMINALS & TRANSMITTER
A	04-30-19	SF	ISSUED FOR APPROVAL
NO.	DATE	BY	REVISION



COMPANY			
AFS TECHNOLOGY			
DRAWING NAME			
ELECTRICAL TERMINATION DRAWING			
DRAWN BY		DATE	DRAWING NO.
S FRANK		04-30-19	PJ43ATS
DESIGNED BY		SCALE	CUSTOMER PART NO.
SUNSOURCE		NONE	N/A
CHECKED BY		SHEET	V/A NO.
D SCHURGER		1 OF 1	353162
			REV
			1

THIS DOCUMENT CONTAINS PROPRIETARY INFORMATION AND SUCH INFORMATION MAY NOT BE DISCLOSED TO OTHERS FOR ANY PURPOSE OR USED FOR MANUFACTURING PURPOSES WITHOUT WRITTEN PERMISSION FROM SUNSOURCE. AND SHALL BE RETURNED WHEN REQUESTED.



5750 Hillside Avenue
Cincinnati, Ohio 45233

POWER UNIT TEST REPORT

Voice: 513-941-6200
Fax: 513-941-6201

CUSTOMER: AFS TECHNOLOGY

Job #: PJ43A

VA#: 353162-00

SPECIAL REQUIREMENTS OR DIMENSIONS		YES	NO	YES	NO	YES	NO
1. STANDARD BUILD PER DRAWING	VERIFIED	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>		
2. FITTINGS: CARBON STEEL; JIC & ORB	VERIFIED	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>		
3.	VERIFIED	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
4. PAINT: STANDARD MACHINE TOOL GRAY	VERIFIED	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>		
5.	VERIFIED	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
6. TEST FLUID: STANDARD FOR TEST	VERIFIED	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>		
OUTSIDE TANK CLEANED AND SCRAPED		<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>		
INSIDE TANK CLEANED AND SCRAPED		<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>		
ALL WELDS CLEANED AND CHECKED		<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>		
DEVIATIONS TO B.O.M.		<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
DEVIATIONS TO CIRCUIT		<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
WIRING COMPLETE (IF APPLICABLE)		<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
ARE LOOSE PARTS WITH UNIT		<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
ANY PART SHORTAGES (LIST BELOW)		<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
ARE FILTER ELEMENTS INSTALLED				<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
ALL PORTS PLUGGED AND CAPPED				<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
LEAKS OF ANY KIND						<input type="checkbox"/>	<input checked="" type="checkbox"/>
ARE ALL TAGS AND STICKERS PROPERLY APPLIED						<input checked="" type="checkbox"/>	<input type="checkbox"/>
FINAL PAINT ACCEPTABLE						<input checked="" type="checkbox"/>	<input type="checkbox"/>
IS UNIT SKIDDED PROPERLY						<input checked="" type="checkbox"/>	<input type="checkbox"/>
ELECTRICAL CIRCUIT IN ELECTRIC BOX						<input checked="" type="checkbox"/>	<input type="checkbox"/>

PUMPS	FLOW REQUIRED	PRESS REQUIRED
K3VL60/B-1NRSS-	25 GPM	1100 PSI
PO (KAWASAKI)	@ 1765 RPM	

NOTES: SEE DRAWING FOR SPECIAL NOTES
SEE DRAWING FOR PRESSURE SETTINGS

ISO Cleanliness Target: N/A Actual:

ASSEMBLED AND VERIFIED BY:

DATE: 6-7-19

TESTED AND VERIFIED BY:

DATE: 6/19/19

FINAL INSPECTION BY:

DATE: 6/12/19

TEST RESULTS

A. ELECTRICAL MOTOR(S):

MANUFACTURE	HP	RPM	AMP
WEG: 02018ET3H256TC-W22	20 HP	1765	575V / 3PH / 60Hz 19.3amp
			5F 1.25

B. PUMPS

IDENTIFICATION	GPM@PSI	DBA	AMPS	GPM@TEST PSI	DBA	AMPS	COMP PUMPS 0 GPM@PSI	DBA	AMPS
K3VL60/B (KAWASAKI)	25 gpm @ psi	75	8.6	23 gpm @ 1100 psi	84	18.9	0 gpm @ 1100 psi	72	8.4
							0 gpm	70	8.3
							0 750 PSI		
							0 LP STANDBY		

C. PRESSURE CONTROLS

IDENTIFICATION	LOW P.S.I.	HIGH P.S.I.	CONTROL SET @
K3VL60/B : Comp	////////////////////	1500+	1100 PSI ✓
K3VL60/B : GPM	////////////////////	////////////////////	25 GPM ✓
RV510S035/: Relief Val	////////////////////	1500+	1350 PSI ✓

D. LIST ALL LEAKS AND CORRECTIONS PERFORMED IN COMPLETING THE LIST

TESTED @ 575V / 3PH / 60HZ
 STA 1120 TEST FLUID - 750 PSI

UNIT APPROVED: YES: NO:

DATE: 6/19/19

TEST TECHNICIAN: P. BARCZAK