



**POLYURETHANE
MACHINERY
CORPORATION**



Classic
**PH/PHX-25
PH/PHX-40
Proportioners**

**Hydraulic, Heated, Plural Component
Proportioner**

**For spraying Polyurethane Foam and
Coatings**

For Professional Use Only

**Not approved for use in explosive
atmosphere locations**

Service Manual

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Before installing the PH Series Proportioner and start-up, carefully read all the technical and safety documentation included in this manual. Pay special attention to the information in order to know and understand the operation and the conditions of use of the PH Series Proportioner. All of the information is aimed at improving user safety and avoiding possible breakdowns from the incorrect use of the PH Series Proportioner.

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WARRANTY

WARRANTY

Polyurethane Machinery Corporation (hereinafter “PMC”) provides this **LIMITED WARRANTY** (hereinafter “Warranty”) to the original purchaser (hereinafter “Customer”) covering this equipment and the original PMC manufactured accessories delivered with the equipment (hereinafter “Product”) against defects in material or workmanship of the Product (hereinafter “Defect” or “Defective”) for a period of one (1) year from the date of first purchase as shown on the original PMC invoice (hereinafter “Warranty Period”).

If during the Warranty Period under normal use, the Product is suspected by Customer to be Defective in material or workmanship, it is Customer’s responsibility to contact PMC and return the Product to PMC as directed by PMC, freight prepaid. If PMC determines that the Product is Defective and that such Defect is covered by this Warranty, PMC will credit Customer for the reasonable freight charges incurred by Customer in returning the Defective Product to PMC, and PMC (or its authorized agent) will, at PMC’s option, repair or replace the Product, subject to the following:

Original Invoice: The original invoice must be kept as proof of the date of first sale and the Product serial number. The Warranty does not cover any Product if the Original Invoice appears to have been modified or altered, or when the serial number on the Product appears to have been altered or defaced.

Product Maintenance: It is the Customer’s responsibility to maintain the Product properly. See your maintenance schedule and owner’s manual for details. The Warranty does not cover an improperly maintained Product.

Non-PMC Components and Accessories: Non-PMC manufactured components and accessories that are used in the operation of the Product are not covered by this Warranty. Such components and accessories shall be subject to the warranty offered to the Customer, if any, by the original manufacturer of such component or accessory.

Other Warranty Exclusions: The Warranty does not cover any Product that PMC determines has been damaged or fails to operate properly due to misuse, negligence, abuse, carelessness, neglect, or accident. By way of example only, this includes:

- Normal wear and tear.
- Improper or unauthorized installation, repair, alteration, adjustment or modification of the product.
- Use of heating devices, pumping equipment, dispensers, or other parts or accessories with the product that have not been approved or manufactured by PMC.
- Failure to follow the operating instructions and recommendations provided by PMC.
- Cosmetic damage.
- Fire, flood, “acts of God,” or other contingencies beyond the control of PMC.

THE WARRANTY DESCRIBED HEREIN IS THE EXCLUSIVE REMEDY FOR THE CUSTOMER AND IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESS, IMPLIED, STATUTORY OR OTHERWISE, AND THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE AND ALL OTHER WARRANTIES ARE HEREBY DISCLAIMED. TO THE FULLEST EXTENT PERMITTED BY LAW, PMC SHALL NOT BE RESPONSIBLE, WHETHER BASED IN CONTRACT, TORT (INCLUDING, WITHOUT LIMITATION, NEGLIGENCE), WARRANTY OR ANY OTHER LEGAL OR EQUITABLE GROUNDS, FOR ANY CONSEQUENTIAL, INDIRECT, INCIDENTAL, LOST PROFITS, SPECIAL, PUNITIVE OR EXEMPLARY DAMAGES, WHETHER TO PERSON OR PROPERTY, ARISING FROM OR RELATING TO THE PRODUCT, EVEN IF PMC HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH LOSSES OR DAMAGES.

Non-Warranty Service by PMC: If PMC determines that the suspected Defect of the Product is not covered by this Warranty, disposition of the Product will be made pursuant to the terms and conditions of PMC's written estimate on a time and materials basis.

Continuing Warranty for Products Repaired or Replaced under Warranty: Following the repair or replacement of a Product covered by this Warranty, such Product will continue to be subject to the original Warranty for the remainder of original Warranty Period or for three (3) months from the repair or replacement date, whichever is longer.

No Rights Implied: Nothing in the sale, lease or rental of any Product by PMC shall be construed to grant any right, interest or license in or under any patent, trademark, copyright, trade secret or other proprietary right or material owned by anyone; nor does PMC encourage the infringement of same.

Exclusive Warranty: This writing is the final, complete, and exclusive expression of the Warranty covering the Product. Any statements made by PMC, its employees or agents that differ from the terms of this Warranty shall have no effect. It is expressly understood that Customer's acceptance of this Warranty, by performance or otherwise, is upon and subject solely to the terms and conditions hereof, and any additional or different terms and conditions proposed or expressed by Customer or anyone, whether in writing or otherwise, are null and void unless specifically agreed to in writing by an Officer of PMC.

SAFETY AND HANDLING

SAFETY AND HANDLING

This chapter contains important information on the safety, handling, and use of your *Classic* PH Series Proportioner.



Before installing the PH Series Proportioner and start-up, carefully read all the technical and safety documentation included in this manual. Pay special attention to the information in order to know and understand the operation and the conditions of use of the PH Series Proportioner. All of the information is aimed at improving user safety and avoiding possible breakdowns from the incorrect use of the PH Series Proportioner.

WARNING! Presents information to alert of a situation that might cause serious injuries if the instructions are not followed.

CAUTION! Presents information that indicates how to avoid damage to the equipment or how to avoid a situation that could cause minor injuries.

NOTE! Is relevant information of a procedure being carried out.

Careful study of this manual will enable the operator to know the characteristics of the PH Series Proportioner and the operating procedures. By following the instructions and recommendations contained herein, you will reduce the potential risk of accidents in the installation, use or maintenance of the PH Series Proportioner; you will provide a better opportunity for incident-free operation for a longer time, greater output and the possibility of detecting and resolving problems quickly and simply.

Keep this Operations Manual for future consultation of useful information at all times. If you lose this manual, ask for a new copy from your PMC Distributor or go online and visit our web site at www.polymac-usa.com.

The *Classic* PH Series Proportioner has been designed and built for the application of polyurea chemical systems, polyurethane foam chemical systems, and some two-component epoxy systems.

WARNING! The design and configuration of the PH Series Proportioner does not allow its use in potentially explosive atmospheres, or the pressure and temperature limits described in the technical specifications of this manual to be exceeded.

Always use liquids and solvents that are compatible with the unit. If in doubt, consult your PMC Distributor.

When working with the PH Series Proportioner, it is recommended that the operator wear suitable clothing and elements of personal protection, including, without limitation, gloves, protective goggles, safety footwear, and face masks. Use breathing equipment when working with the PH Series Proportioner in enclosed spaces or in areas with insufficient ventilation. The introduction and follow-up of safety measures must not be limited to those described in this manual. Before starting up the PH Series Proportioner, a comprehensive analysis must be made of the risks derived from the products to be dispensed, the type of application, and the working environment.



To prevent possible injury caused by incorrect handling of the raw materials and solvents used in the process, carefully read the Material Safety Data Sheet (MSDS) provided by your supplier.

Deal with the waste caused according to current regulations.



To avoid damage caused by the impact of pressurized fluids, do not open any connection or perform maintenance work on components subject to pressure until the pressure has been completely eliminated.



Use suitable protection when operating, maintaining or being present in the area where the equipment is functioning. This includes, but is not limited to, the use of protective goggles, gloves, shoes and safety clothing and breathing equipment.



The equipment includes components that reach high temperatures and can cause burns. Hot parts of the equipment must not be handled or touched until they have cooled completely.



To prevent serious injury through crushing or amputation, do not work with the equipment without the safety guards installed on the moving parts. Make sure that all the safety guards are correctly reinstalled at the end of the repair or maintenance work of the equipment.

CHARACTERISTICS

CHARACTERISTICS

The *Classic* PH Series Proportioner has been designed and built for the application of polyurea chemical systems, polyurethane foam chemical systems, and some specific two-component epoxy systems.

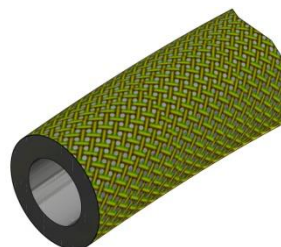
PRINCIPAL HEATING SYSTEM

The Proportioners consist of two (2) independent Material Heaters without internal seals. Each heater for the PH(X)-25 Proportioner has four (4) Heating Elements rated at 1,000, 1,250 or 1,500 watts, each giving the Proportioner a total heat of 8,000, 10,000, or 12,000 watts. Each heater for the PH(X)-40 Proportioner has six (6) Heating Elements rated at 1,250 1,500 or 1,750 watts each, giving the Proportioner a total heat of 15,000, 18,000 or 21,000 watts. The Material Heater systems for all PH Series Proportioners contain the necessary control and safety components for their precise operation. The Material Heater design allows a temperature differential (ΔT) of 90°F (32°C) and material application temperatures of up to 190°F (88°C) under normal ambient temperatures.

HOSE HEATING SYSTEM

The PH(X)-25 Proportioner is designed with a 3 KVA (90 V) Isolation Transformer that enables effective heating of up to a total hose length of 310 feet (94 meters). The PH(X)-40 Proportioner is designed with a 5 KVA (120 V) Isolation Transformer that enables effective heating of up to a total hose length of 410 feet (123 meters). Both systems include an innovative hose heating concept in which the continuous braid tinned-copper jacket is distributed evenly around the circumference of the hose providing a uniform heating watt density and precise control of the material application temperature. This hose heating element design is extremely resistant to fatigue failure.

100% circumferential coverage produces the most uniform distribution of heat available.



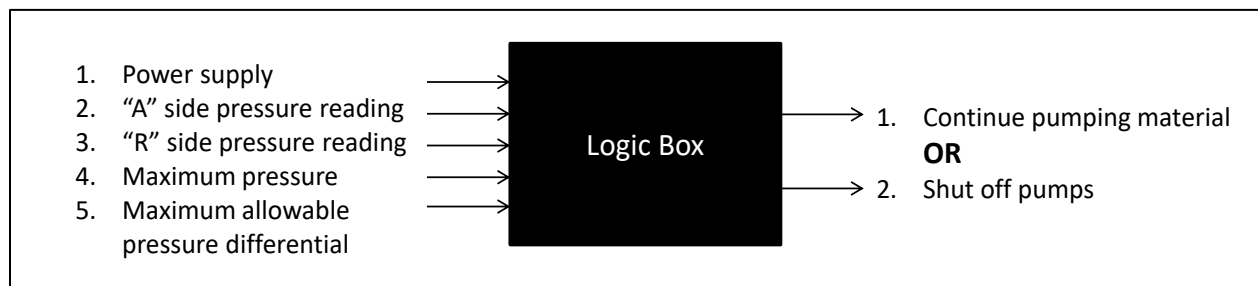
DOUBLE ACTING OPPOSED PISTON METERING PUMPS

The opposed double acting Pump Line is driven by a dual rod Hydraulic Cylinder. The in-line pump system with opposed piston pumps provides a constant volume and guarantees uniform pressures in both directions of pump movement. Different sized pumps allow for various volumetric ratios to be achieved (1:4 to 1:1 to 4:1) between the chemical components used in the process.

PRESSURE BALANCE CONTROL SYSTEM

The Pressure Balance Control (PBC) system provides better control over a chemical pressure imbalance. When the system is turned off, the Proportioner will perform as if there is no PBC system and will continue pumping material. When the system is turned on, it will continually monitor the pressure between the two chemicals (known as the **pressure differential**). If the pressure differential becomes equal to or greater than the **maximum allowable pressure differential**, the pumps will be shut off.

The Pressure Balance Control system can be simplified into a logic box diagram with inputs and outputs. There are five inputs: the power supply from the main console, the pressure readings from each chemical, the maximum pressure, and the maximum allowable pressure differential. Inside the logic box, the actual pressure differential of the chemicals is compared to the maximum allowable pressure differential. Depending on the circumstances of all five inputs, there are only two possible outputs: either the pumps will continue to pressurize and move material, or the pumps will shut off and flow will be lost.



Logic Box Representation

PH(X)-25 TECHNICAL SPECIFICATIONS

PH(X)-25 TECHNICAL SPECIFICATIONS

ELECTRICAL

Main Voltage: _____ **3 PHASE x 208-230V, 50/60Hz**

Electrical Consumption: 8 kW Heaters (4.0 kW/side) _____ 43 A

Electrical Consumption: 10 kW Heaters (5.0 kW/side) _____ 48 A

Electrical Consumption: 12 kW Heaters (6.0 kW/side) _____ 53 A

Electrical Consumption: 14 kW Heaters (7.0 kW/side) _____ 58 A

Main Voltage: _____ **1 PHASE x 208-230V, 60Hz**

Electrical Consumption: 8 kW Heaters (4.0 kW/side) _____ 71 A

Electrical Consumption: 10 kW Heaters (5.0 kW/side) _____ 79 A

Electrical Consumption: 12 kW Heaters (6.0 kW/side) _____ 88 A

Electrical Consumption: 14 kW Heaters (7.0 kW/side) _____ 97 A

Main Voltage: _____ **3 PHASE x 400V, 50/60Hz**

Electrical Consumption: 8 kW Heaters (4.0 kW/side) _____ 28 A

Electrical Consumption: 10 kW Heaters (5.0 kW/side) _____ 31 A

Electrical Consumption: 12 kW Heaters (6.0 kW/side) _____ 34 A

Electrical Consumption: 14 kW Heaters (7.0 kW/side) _____ 37 A

Material Heater Power: 4.0 kW Heaters (x2) _____ 8 kW

Material Heater Power: 5.0 kW Heaters (x2) _____ 10 kW

Material Heater Power: 6.0 kW Heaters (x2) _____ 12 kW

Material Heater Power: 7.0 kW Heaters (x2) _____ 14 kW

Hose Transformer Power: 70V _____ 2 kVA

Hose Transformer Power: 90V _____ 3 kVA

Hose Transformer Power: 120V _____ 5 kVA

Electrical Motor Power: _____ 3 hp

Frequency: (Single Phase) _____ 60 Hz

Frequency: (Three Phase) _____ 50/60 Hz



CAUTION! Inside the console is a Terminal Strip for connecting the main power (wire not supplied) to the PH Series Proportioner. This electrical connection must be made only by a qualified electrician.

PH(X)-40 TECHNICAL SPECIFICATIONS

ELECTRICAL

Main Voltage: _____ **3 PHASE x 208-230V, 50/60Hz**

Electrical Consumption: 12 kW Heaters (6.0 kW/side) _____ 62 A

Electrical Consumption: 15 kW Heaters (7.5 kW/side) _____ 70 A

Electrical Consumption: 18 kW Heaters (9.0 kW/side) _____ 77 A

Electrical Consumption: 21 kW Heaters (10.5 kW/side) _____ 85 A

Main Voltage: _____ **1 PHASE x 208-230V, 60Hz**

Electrical Consumption: 12 kW Heaters (6.0 kW/side) _____ 105 A

Electrical Consumption: 15 kW Heaters (7.5 kW/side) _____ 118 A

Electrical Consumption: 18 kW Heaters (9.0 kW/side) _____ 131 A

Electrical Consumption: 21 kW Heaters (10.5 kW/side) _____ 144 A

Main Voltage: _____ **3 PHASE x 400V, 50/60Hz**

Electrical Consumption: 12 kW Heaters (6.0 kW/side) _____ 41 A

Electrical Consumption: 15 kW Heaters (7.5 kW/side) _____ 46 A

Electrical Consumption: 18 kW Heaters (9.0 kW/side) _____ 50 A

Electrical Consumption: 21 kW Heaters (10.5 kW/side) _____ 55 A

Material Heater Power: 6.0 kW Heaters (x2) _____ 12 kW

Material Heater Power: 7.5 kW Heaters (x2) _____ 15 kW

Material Heater Power: 9.0 kW Heaters (x2) _____ 18 kW

Material Heater Power: 10.5 kW Heaters (x2) _____ 21 kW

Hose Transformer Power: 90V _____ 3 kVA

Hose Transformer Power: 120V _____ 5 kVA

Electrical Motor Power: _____ 5 hp

Frequency: (Single Phase) _____ 60 Hz

Frequency: (Three Phase) _____ 50/60 Hz



CAUTION! Inside the console is a Terminal Strip for connecting the main power (wire not supplied) to the PH Series Proportioner. This electrical connection must be made only by a qualified electrician.

MECHANICAL

PH(X)-25

Maximum working pressure (with 120 pumps): _____ 2,000 psi (138 bar)
Maximum working pressure (with 80 pumps): _____ 3,000 psi (207 bar)
Maximum production ratio 1:1 (with 120 pumps): _____ 25 lbs/min (12.5 kg/min)
Maximum production ratio 1:1 (with 80 pumps): _____ 1.4 GPM (5.6 L/min)
Minimum production: _____ 2 lb/min (1kg/min)
Maximum hose length: _____ 310 ft (93 m)
Approximate weight (Hydraulic Tank empty): _____ 420 lbs (190 kg)
Approximate weight (Hydraulic Tank full @ 20 gal, 76 liters): _____ 594 lbs (269 kg)
Dimensions: _____ 30in W x 26in D x 45in H
Dimensions (Metric): _____ 76cm W x 66cm D x 114cm H

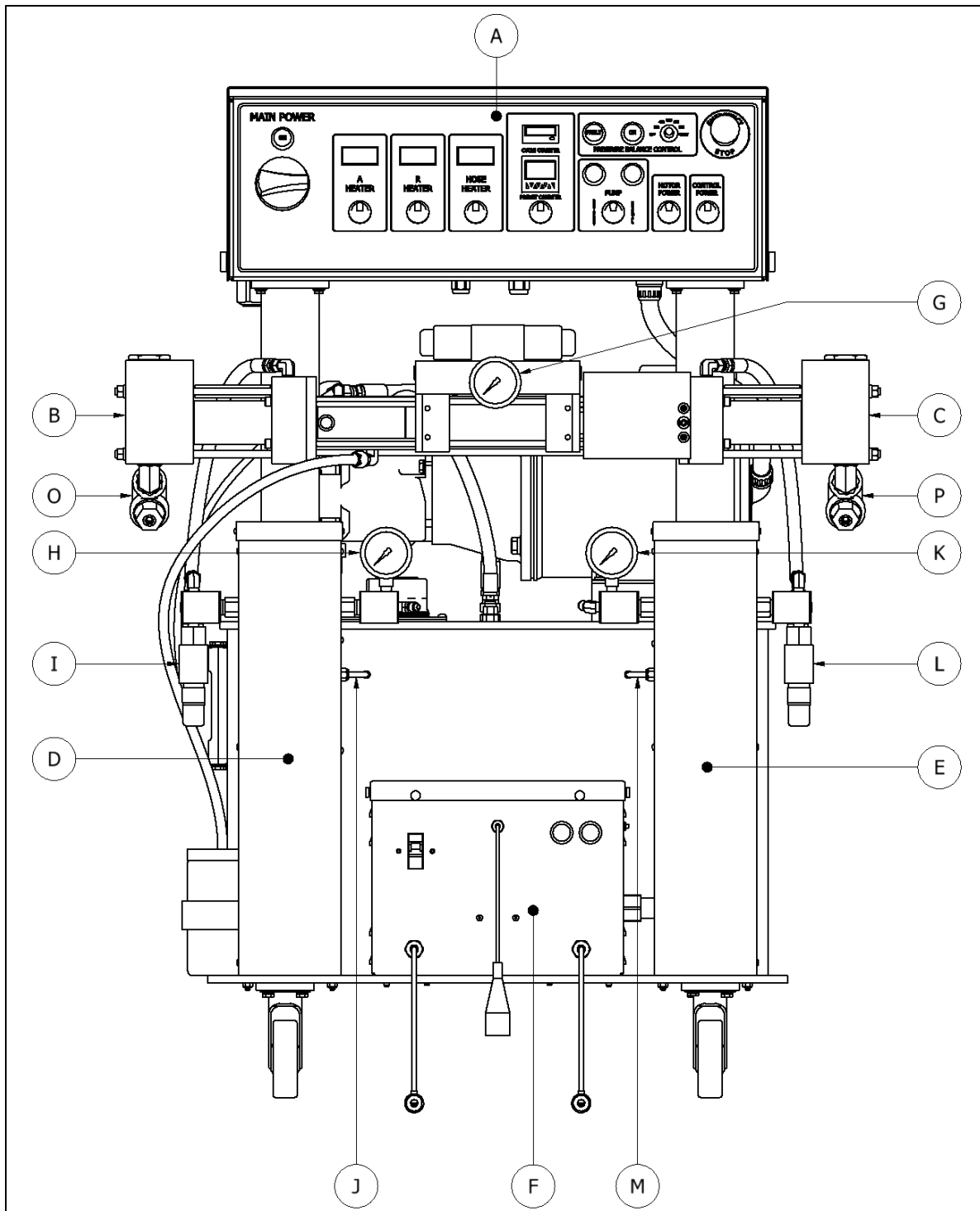
MECHANICAL

PH(X)-40

Maximum working pressure (with 120 pumps): _____ 2,000 psi (138 bar)
Maximum working pressure (with 80 pumps): _____ 3,500 psi (241 bar)
Maximum production ratio 1:1 (with 120 pumps): _____ 40 lbs/min (20 kg/min)
Maximum production ratio 1:1 (with 80 pumps): _____ 2.5 GPM (1.0 L/min)
Minimum production: _____ 2 lb/min (1 kg)
Maximum hose length: _____ 410 ft (123 m)
Approximate weight (Hydraulic Tank empty): _____ 420 lbs (190 kg)
Approximate weight (Hydraulic Tank full @ 20 gal (76 liters) _____ 594 lbs (269 kg)
Dimensions: _____ 40in W x 26in D x 45in H
Dimensions (Metric) _____ (76cm W x 66cm D x 114cm H)

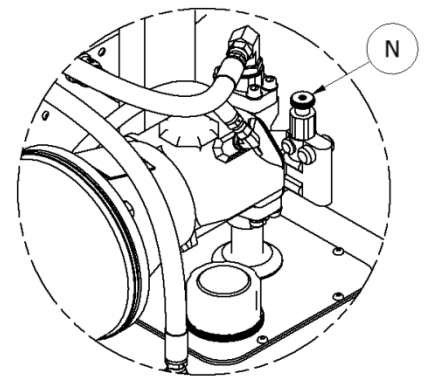
DESCRIPTION

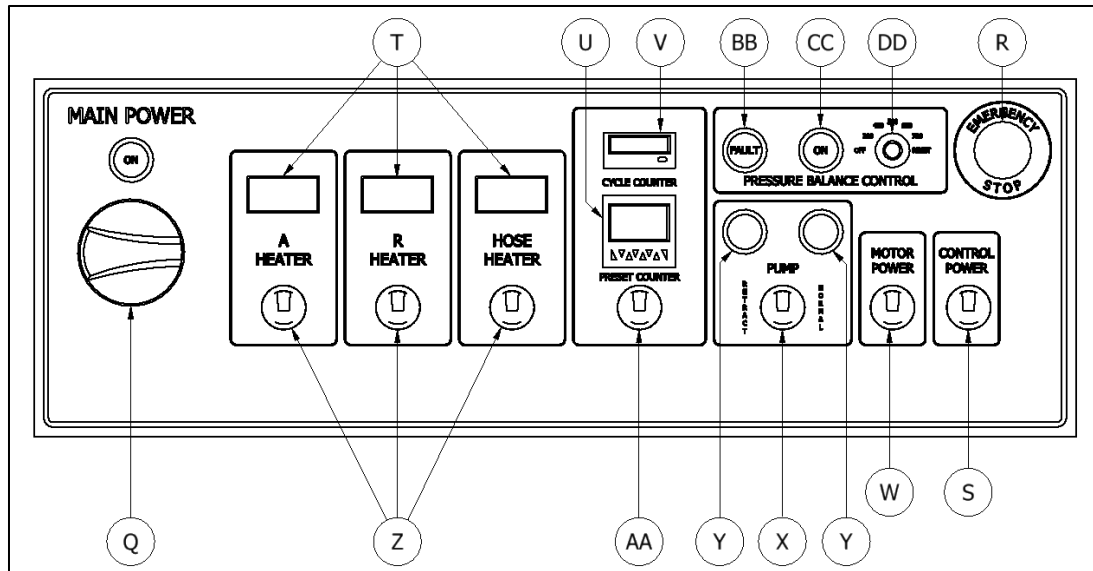
DESCRIPTION



**CLASSIC PH-SERIES
PROPORTIONER**

- A. Control Panel**
Controls and regulates the operation of the PH Series Proportioner.
- B. Isocyanate (Iso, A) Metering Pump**
Meters the Isocyanate material.
- C. Polyol (Poly, R) Metering Pump**
Meters the Polyol material.
- D. Isocyanate (Iso, A) Heater**
Heats the incoming Isocyanate to a temperature set by the operator.
- E. Polyol (Poly, R) Heater**
Heats the incoming Polyol to a temperature set by the operator.
- F. Hose Heating Transformer**
Supplies the required voltage for material Heated Hoses.
- G. Hydraulic Pressure Gauge**
Indicates the pressure in the Hydraulic Drive System.
- H. Isocyanate (Iso, A) Pressure Gauge**
Indicates the pressure in the Isocyanate system.
- I. Isocyanate (Iso, A) Safety Pressure Switch**
Disables the pump circuit in the event of excessive pressure in the Isocyanate system.
- J. Isocyanate (Iso, A) Thermocouple**
Provides temperature information of the Isocyanate to its Temperature Controller.
- K. Polyol (Poly, R) Pressure Gauge**
Indicates the pressure in the Polyol system.
- L. Polyol (Poly, R) Safety Pressure Switch**
Disables the pump circuit in the event of excessive pressure in the Polyol system.
- M. Polyol (Poly, R) Thermocouple**
Provides temperature information of the Polyol to its Temperature Controller.
- N. Hydraulic Pressure Control**
Allows the pressure of the hydraulic system to be increased or decreased. Turn clockwise to increase the pressure and counterclockwise to decrease. To regulate the pressure of the hydraulic system, the NORMAL or RETRACT Pump Switch position must be selected.
- O. Isocyanate (Iso, A) Inlet Material Strainer**
Screens (60 mesh) material from bulk supply.
- P. Polyol (Poly, R) Inlet Material Strainer**
Screens (60 mesh) material from bulk supply.





**CLASSIS PH-SERIES
CONTROL PANEL**

- Q. Main Power** - Turns ON and OFF main power to the control panel. It must be turned ON for any operation to be performed with the unit. When turned ON, the green pilot light will be lit.
- R. Emergency Stop** - Interrupts the PH Series control power circuit to stop all motion and heating.
- S. Control Power** - Turns ON and OFF the control power to the complete electrical circuit including Heaters and Hose Heater.
- T. Heater Temperature Zones, A (Iso), R (Poly), HOSE** - Turns ON and OFF power to the specific Heaters. See page 23 for detailed Temperature Controller instructions.
The Hose Heater Controller automatically controls the Hose Heater only when using the TSU (Temperature Sensing Unit) probe.
- U. Count Down Counter** – Used to set the amount of cycles required to prevent the chemical drums from running dry, the machine will shut down when the preset cycles expires. There is an on/off switch to either activate this feature or deactivate and not use it.
- V. Cycle Counter** – Indicates the number of pump cycles to calculate material usage.

PUMP SIZE	CYCLES PER GAL (3.79 L)
120	16
80	24

- W. Motor Switch** - Turns ON and OFF the Electric/Hydraulic Motor. When turned ON the switch will be lit. In the event of an overload of the Motor, pilot light will turn OFF and Motor will stop.
- X. Pump Switch**
Off - Removes power from the pump circuit. The directional indicator lights will not be lit.
Normal - Activates the normal operation of the machine. When the switch is ON, the directional light corresponding to the stroke direction will light.
Retract - Sets the Piston Rod of the Iso (A) metering pump to the retract position and prevents the crystallization of Iso (A) on the Piston Rod. Turn the switch to RETRACT position every time the unit is stopped by the operator (see Shut-Down, page 27).
- Y. Direction Indicator Light** - Indicates the direction of movement of the Metering Pumps. If excessive pressure occurs in the system, the pump circuit will be disabled and the directional lights will be OFF.
- Z. Heater Temperature Switch – A (Iso), R (Poly), HOSE** – Turns ON and OFF power to the specific Heaters and Hose.
- AA. Auto Shut Down Switch** - Turns ON and OFF power to the Auto Shut Down unit.
- BB. Pressure Balance Control “FAULT” Light** – Indicates that the pressure differential is equal to or greater than the maximum allowable pressure differential.
- CC. Pressure Balance Control “ON” Light** – Indicates that the Pressure Balance Control system is on and functioning.
- DD. Pressure Balance Control Knob** – Used to set the maximum allowable pressure differential (in PSI) between the A (Iso) and R (Poly) pumps. See page 22 for more information.

INSTALLATION

INSTALLATION

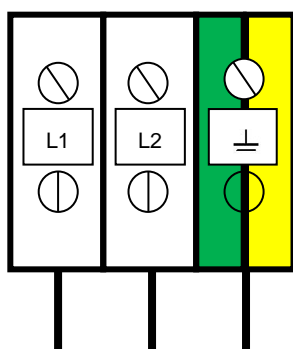
WARNING! Use suitable protection and follow the recommendations in the Safety Information enclosed and provided by material suppliers when installing or working with the Proportioner.



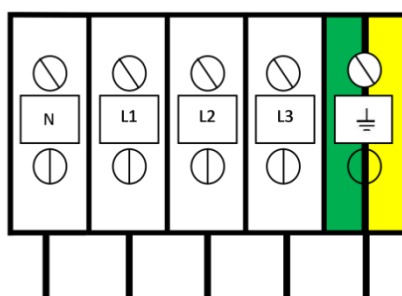
CAUTION! Inside the console is a Terminal Strip for connecting the main power (wire not supplied) to the PH Series Proportioner. This electrical connection must be made only by a qualified electrician.

CAUTION! Make sure the power cable is disconnected from the main power source before connecting to the Terminal Strip in the Console.

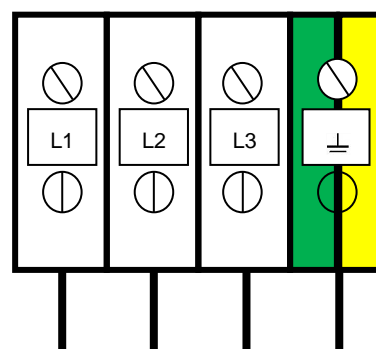
NOTE! To ensure the PH Series Proportioner works correctly, the electrical supply must meet the specifications indicated on the Serial Number Placard affixed to the Electrical Console.



1 phase x 230 Volt



3 phase x 380 Volt



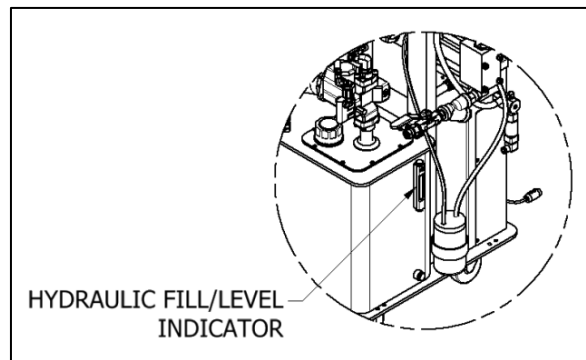
3 phase x 230 Volt

Follow the recommended procedure in the indicated order to install the Proportioner:

1. Insert the main power cable by passing it through the strain relief at the bottom of the Electrical Console and connect as shown in the above diagram.
2. Fill the Hydraulic Reservoir with 20 gallons (76 Liters) of approved hydraulic fluid. See page 52 for specifications.

NOTE! Do not fill the tank to maximum capacity; use the Visual Level Indicator on the tank to make sure the amount of hydraulic fluid is not more than 20 gallons (76 liters) or 80% of the tank max capacity.

3. Check the level of the hydraulic fluid in the Hydraulic Pump Case: Disconnect the Hydraulic Hose from the 90° fitting and remove the Fitting from Hydraulic Case. Add fluid as required to the top of threaded hole. Reattach Fitting and Hydraulic Hose.

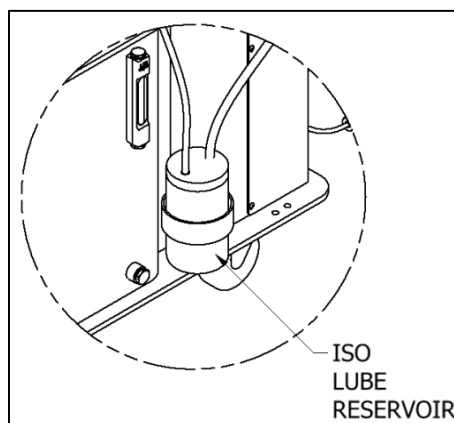


NOTE! Ensure that the Emergency Stop is not engaged.

4. **Three-phase Proportioner Only:** Check the Electric Motor to ensure rotation is **clockwise** when viewing the end of the Electric Motor. A counter clockwise rotation indicates two of the incoming power leads need to be reversed. Recheck rotation before proceeding with Installation.

CAUTION! Ensure Main Power Switch is OFF and incoming power is locked OFF before reversing power leads.

5. Fill the Lube Reservoir with PMC Pump Lube or suitable diluents. It is not necessary to prime the system.



HEATED HOSE INSTALLATION

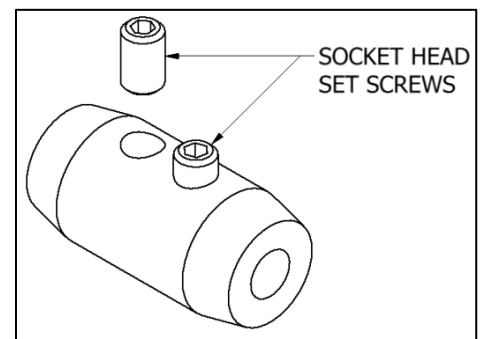
CAUTION! *The material delivery Heated Hoses are color coded Red and Blue allowing the user to recognize them. The Red corresponds to the Isocyanate (Iso, A) and the Blue to the Polyol (Poly, R). To avoid connection errors the Coupling Connections of the Iso (A) and Poly (R) Heated Hoses are also different sizes, which makes it difficult to swap connections.*

NOTE! *The material delivery Heated Hoses are capped at the ends to prevent absorbing moisture. Do not remove caps until the Heated Hoses are going to be installed on the Proportioner.*

1. Lay out all the Heated Hose assemblies end to end aligning the Iso “A” (red) and Poly “R” (blue) and connect the respective Coupling Connections using the appropriate sized open-end wrench after ensuring Heated Hose assemblies lay flat.

CAUTION! *Take care to not cross-thread or over-tighten the Coupling Connections. Thread seal tape or compound is not required for this tapered seat Coupling Connections.*

2. Connect the material Heated Hoses to the outlets of the respective Heaters i.e. Iso (A) Heated Hose to the Iso (A) Heater and the Poly (R) Heated Hose to the Poly (R) Heater ensuring Heated Hose assemblies lay flat.
 - a. For half inch hose assemblies, all required fittings and instructions are included in kit 200212
3. Connect Air Hose Coupling Connections.
4. Connect the Heated Hose power wires to the “Fast-Lock” Connector (Part # KT-00029A) coming from the Hose Heat Transformer as follows:
 - a. Loosen the Socket Head Set Screw to allow insertion of the Heated Hose electrical wire Terminal.
 - b. Insert the Terminal into the “Fast-Lock” Connector Body.
 - c. Securely tighten the Socket Head Set Screw.
 - d. Install electrical tape around Connector Body.



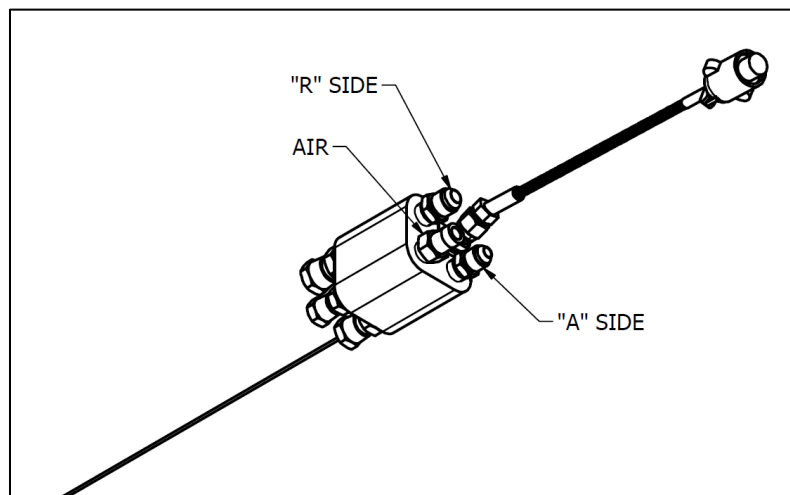
NOTE! A good practice is to add some dielectric grease (Permatex 67VR or equivalent) to the outside of the Terminal prior to insertion.

5. Repeat the above steps to connect the “Fast-Lock” Connectors that you will find on all Heated Hose power wire.

CAUTION! Ensure the proper mechanical and electrical connections of the Heated Hoses are made to avoid possible material leakage and Hose heat problems.

6. It is recommended the TSU be installed between the last section of Heated Hose and the Gun Whip. Carefully straighten the sensing wire, inserting it in the Iso (A) Heated Hose and tighten fluid fittings with appropriate sized open-end wrenches.

CAUTION! To protect the TSU sensor, pay special attention not to kink or excessively bend the Heated Hoses. Do not coil the Heated Hoses with a diameter of less than 4 feet (1.22 meters).



*Temperature Sensing Unit
(TSU) Part # EL-51A-4
Replacement Sensor Part # EL-51A-2*

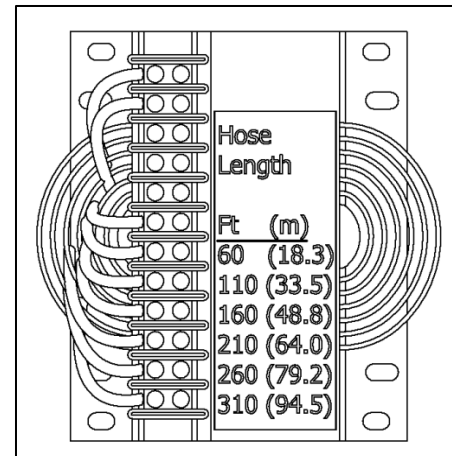
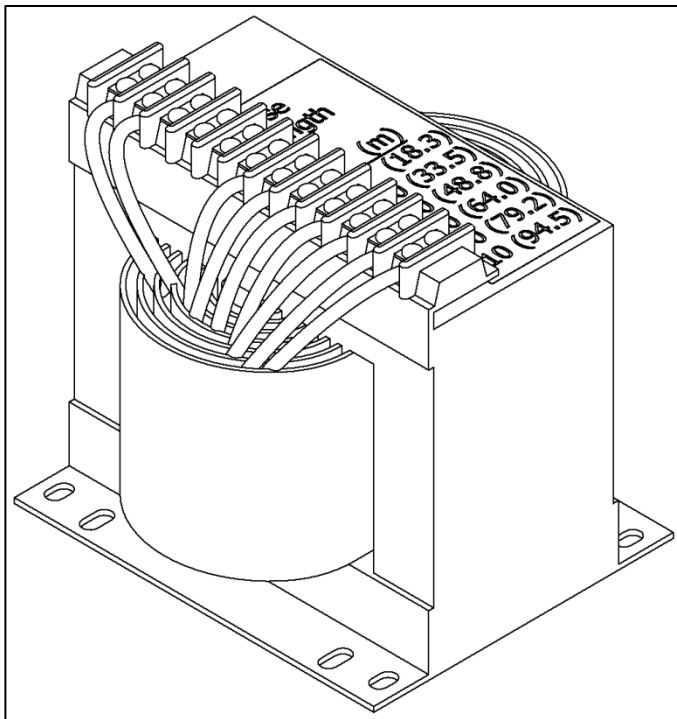
CAUTION! Connecting the TSU between the first and second section of Heated Hose results in the TSU sensing the material temperature exiting the Heater and not the inside of the Heated Hose near the Spray Gun.

TRANSFORMER SETTINGS

The Hose Heat Transformer offers the ability of connecting to different output voltages depending on the total length of the Heated Hose in use, maximizing the heating ability of the Heated Hose. The factory setting is 18 volts for use with 60 feet (18 Meters) of Heated Hose¹. Before starting the Proportioner, ensure the setting matches the Heated Hose length installed. If Heated Hose sections are added or removed, the Tap setting must be changed to a setting which will limit the maximum amperage in the Heated Hose to 52 amps. The suggested tap settings are tabled below²:

RECOMMENDED TAP SETTINGS¹

Tap	Feet	Meters
120V	410	125.0
105V	360	109.7
90V	310	94.5
75V	260	79.5
60V	210	64.0
45V	160	48.8
30V	110	33.5
18V	60	18.3



¹ 90V transformers (shown above) allow for a maximum hose length of 310 ft (94.5 m). 120V transformers allow for a maximum hose length of 410 ft (125 m).

² 90V Transformers (shown above) are standard on all PH(X)-25 Proportioners. 120V Transformers are standard for all PH(X)-40 Proportioners, and are also optional for PH(X)-25 Proportioners

7. Ensure the Manual Valves are CLOSED and connect the Coupling Block to the Heated Gun Whip.

CAUTION! *Excessive force closing or opening the Manual Valves may result in damage to the Manual Valves and/or Coupling Block.*

8. Connect the Transfer Pump/Heated Hose Assemblies air supply and air dryer systems as required. Review the Installation Instructions for each to ensure proper set-up and operation.
9. Install the Material Transfer Pumps as follows:

WARNING! *If Transfer Pumps have been previously used, pay special attention to connect each Pump to “its” specific material. Inadvertently changing the Transfer Pumps will cause a chemical reaction rendering them useless.*

NOTE! *Placing tape of the same color as of the Material Delivery Hoses (red for the Iso (A), blue for the Poly (R)) on each Transfer Pump would be a good method for minimizing errors in connection.*

- a. Make sure that the Inlet Valves on the Proportioner are closed.
- b. Connect one end of the Polyol (R) Material Delivery Hose ($\frac{3}{4}$ " thread) to the Proportioner Polyol (R) Inlet Valve and the other end to the Polyol (R) Transfer Pump.
- c. Connect one end of the Iso (A) Material Delivery Hose ($\frac{1}{2}$ " thread) to the Proportioner Iso (A) Inlet Valve and the other end to the Iso Transfer Pump.
- d. Connect the air hose to the Transfer Pumps after ensuring each Transfer Pump Shut-Off Valve is CLOSED.

NOTE! *To avoid errors in connection, the Coupling connections of the Iso (A) and Poly (R) Material Delivery Hoses are different sizes, making it difficult to swap connections.*

10. Ground the Transfer Pump as recommend by the material supplier. The movement of product inside the Hoses can cause static electricity and produce electrical discharges.



PROPORTIONER PURGING

WARNING! Use suitable Personal Protection Equipment (PPE) and follow the recommendations in the Safety Information provided by product suppliers when installing or working with the unit.

NOTE! Before using the Proportioner it is necessary to purge the entire system, including Heated Hoses of mineral oil and air left over from Quality Control testing. The following procedure is also followed to purge air entrapped by running out of material in the supply Drum/Reservoirs resulting in a significant material pressure imbalance as indicated by the Pressure Gauges and sprayed material.

1. Ensure the following before proceeding:
 - a. Air supply to Transfer Pumps is 90 - 110 psi (6-8 Bar).
 - b. Proportioner Inlet Valves are CLOSED.
 - c. All connections are tight.
 - d. Material should be stored to the material suppliers' recommended temperatures.
2. Slowly OPEN the Poly (R) Transfer Pump Air Shut-Off Valve allowing Pump to cycle slowly as it fills the Material Delivery Hose to the Proportioner. Check for leaks.
3. OPEN Poly (R) Coupling Block Manual Valve over a waste container.
4. Slowly OPEN Proportioner Poly (R) Inlet Valve allowing the Transfer Pump to move material through the system. When all air spitting stops and all traces of mineral oil have disappeared, CLOSE Poly (R) Coupling Block Manual Valve. Clean Coupling Block.
5. Repeat steps 2 to 4 for Iso (A) side.

CAUTION! Properly dispose of all waste chemicals in accordance with all applicable local, state and federal codes.

NOTE! Do not turn on the Count Down Counter.

6. Turn Hydraulic Pressure Control (N, page 11) full COUNTERCLOCKWISE.
7. Turn ON Main Power (Q, page 12). Green pilot will light.
8. Turn ON Control Power (S, page 12). Switch will light.

9. Turn ON Motor Power (W, page 13). Switch will light.
10. Set Pump Switch (X, page 12) to NORMAL. Turn Hydraulic Pressure Control CLOCKWISE (N, page 11) increasing material pressure to 400 psi (27 bar). Both Material Pressure Gauges (H, K, page 11) should read the same.
11. Check all connections for leaks.
12. Bundle all Heated Hose Connections ensuring that there are NO kinks in the TSU Cable or Air Hose. Wrap with Electrical Tape to securely hold all components in place and minimize places for bundle to snag onto job site protrusions.

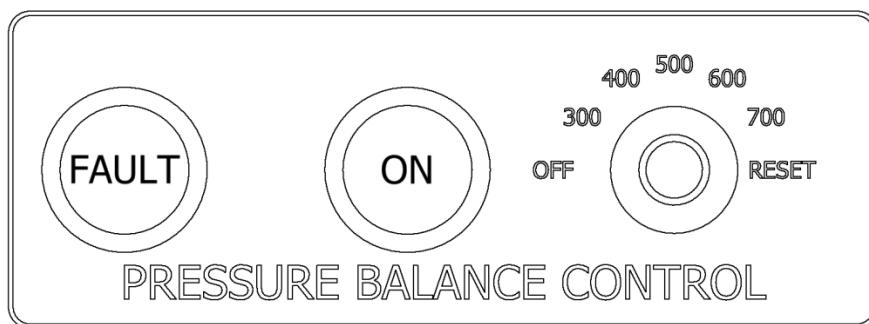
PRESSURE BALANCE CONTROL

PRESSURE BALANCE CONTROL

The PH Series Proportioner has been designed with a pressure balance control system. This system will give the operator of this machine the ability to control a pressure imbalance within certain predetermined parameters.

The system consists of:

- Selector Switch
- Fault Light
- On Light
- Control Unit
- Pressure Transducers
- Relay



OPERATION

Position the selector switch on one of the three options:

- **Pressure differential number** – these consist of 300, 400, 500, 600, and 700 PSI. Selecting any of these numbers with the switch will activate the green ON light. While the pressure differential numbers are selected, the control box will continually monitor pressure on both sides of the Proportioner. In the event that the pressure differential between both sides of the Proportioner is equal to or larger than the selected number, a fault is given (the red fault light is turned on and the active green light is turned off) and shuts down.
- **Off** – if the selector switch is placed in this position, the Proportioner will operate as though there is NO PRESSURE BALANCE CONTROL SYSTEM (neither the red fault light nor the active green light will be lit). The over pressure system will remain active for the machine and personnel protection.
- **Reset** – in the event of a pressure imbalance, resolve the Proportioner imbalance, position the selector switch on reset to clear the fault light and restore power to the Proportioner. After the fault has been cleared, position the switch in either a Pressure Differential number or in the Off Position to continue operations.








DIGITAL TEMPERATURE CONTROLLER

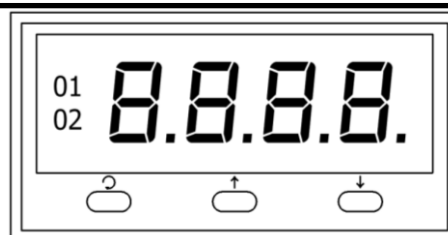
DIGITAL TEMPERATURE CONTROLLER

The PH Series has three Digital Temperature Controllers to manage the temperatures for the Primary Heaters (Iso (A), Poly (R)) and the Heated Hose. The Hose Heater Controller is programmed different from the Iso (A) and Poly (R) Controllers and therefore not interchangeable with them.

WARNING! Do not turn the Temperature Controllers ON until the Proportioner Purging procedure is complete and the Primary Heaters and Heated Hoses are filled with material.

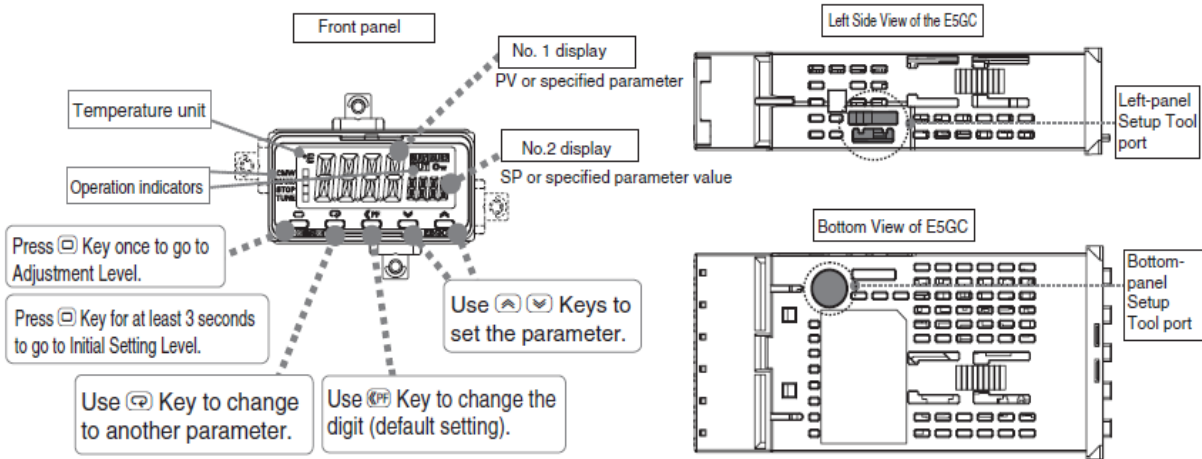
EATON CONTROLLER

1. Ensure Main Power (Q, page 12) is ON, Control Power (S, page 12) is ON, and **01** Display light is lit.
2. Press and release  button. The display will read **SP1**.
3. Press and release  or  button to display the **current material temperature set-point**.
4. Press and hold the  or  to **increase** or **decrease** the material temperature set-point to the desired value as determined by the material supplier or application conditions.
5. Press and release  and  together to return to the **actual material temperature** in the Primary Heater/Hose Heater.



NOTE! The Temperature Controller normally displays the actual material temperature. When lit, the “01” display in the upper left indicates power is sent to the designated heating system. The “01” display goes out when the material temperature has reached its set-point. The “01” display will continue to cycle on and off indicating the Controller is maintaining the material temperature set-point.

OMRON CONTROLLER



Displays

Name	Description
No. 1 display	Displays the process value or a monitor/setting item.
No. 2 display	Displays the set point or the value of a monitor/setting item.

1. Press and hold the **↑** or **↓** to **increase** or **decrease** the material temperature set-point to the desired value as determined by the material supplier or application conditions.

*The three buttons on the left of the controller are not used for normal operation.



NOTE! The Temperature Controller displays the actual material temperature and the set point. The **YELLOW** box with the word **OUT** indicates that the heaters are being powered.

WARNING! The Controllers are factory programmed and are not field re-programmable. If a problem is encountered, contact your PMC Distributor. Do not attempt to change any of the programmed parameters. Do not substitute a Controller from an alternate supplier as its use may result in equipment damage and/or bodily injury.

START-UP

NOTE! *Follow the recommended procedures in the order shown.*

CAUTION! *The Start-up procedures assume that all of steps in Proportioner purging have been performed and no problems found.*

1. Check the condition of the PMC pump lube in the Iso (A) Lube Reservoir (page 15). Replace the PMC pump lube if you see significant changes in the color or signs of solidification. Ensure inside of Reservoir is wiped clean.
2. Check the hydraulic fluid level and service as required.
3. Make sure the materials have been stored at the manufacturer's recommended temperature. Ask your material supplier for information (Material Data Sheet) on the minimum storage temperature.
4. Connect air supply to the two Transfer Pumps and ensure Air Valves are in the full OPEN position. OPEN both Proportioner Material Inlet Ball Valves.

CAUTION! *Remove all Heated Hose sections from coiled storage and lay flat to eliminate heat build-up and possible Heated Hose failure.*

5. Turn ON Main Power (Q page 12).
6. Turn ON Control Power (S, page 12).
7. Turn ON Hose Heater (T, page 12) and confirm material set-point temperature as recommended by the material supplier or application conditions.

CAUTION! *To avoid excessive pressure in the Proportioner, wait for the Hose Heater to reach its set-point temperature before continuing.*

8. Turn ON each Primary Heater and confirm material set-point temperature as required by the material supplier or application conditions has been reached.
9. Turn ON Motor Power (W, page 13).
10. Set Pump Switch (X, page 12) to NORMAL. One of the Directional Indicator Lights (Y, page 13) will light indicating Metering Pump direction and the Metering Pump Shafts will begin to move.

NOTE! *The Material Pressure Gauges (H, K, page 11) should be approximately equal and remain constant throughout the Metering Pump cycle. If not, refer to Trouble Shooting section.*

NOTE! *Directional Indicator Lights must indicate Metering Pump direction when Pump Switch is in the NORMAL position. If not, refer to Trouble Shooting section.*

11. Using the Hydraulic Pressure Control, adjust to the required stall pressure¹ and check each Material Pressure Gauge.

12. COUNT DOWN COUNTER

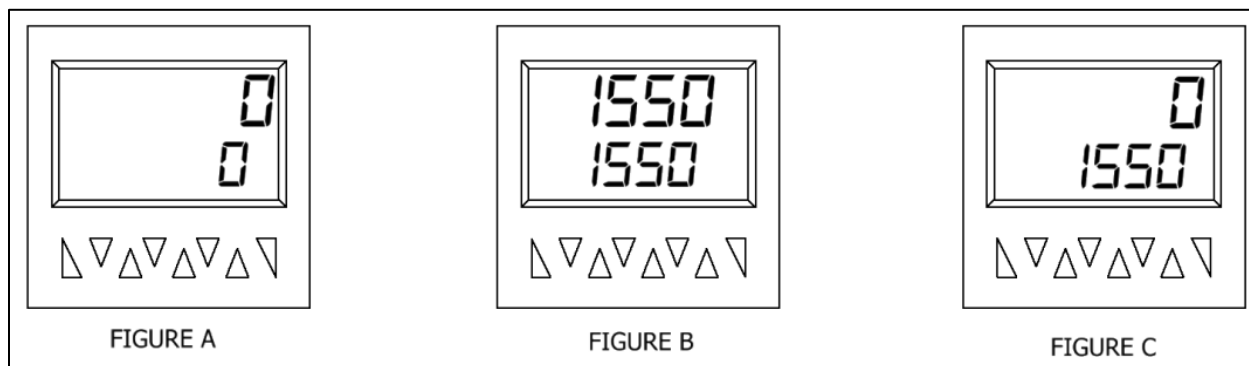
NOTE! *If this function is not needed, leave it in the off position.*

To set the Auto Shut Down Counter:

- a. Turn the switch to the on position, the green light will illuminate.
- b. Insert the number of cycles desired to disable the pump circuit by pushing in on the white triangles to set the cycle count. Push in on the red button until the data is replicated on the top row, the top row will count down. Figure B

120 Pumps	80 Pumps
16 cycles = 1 gal (3.79 L)	24 cycles = 1 gal (3.79 L)

- c. When the counter counts down to zero the machine will stop and the pump directional light will be off, push in on the red button to reset. Figure C



13. Proceed with Installation and Start-up of the Spray Gun as per the Gun manual.

¹ Stall pressure: When materials are at recommended application temperature and Metering Pumps are pressurized but not moving. This pressure is normally 100 – 200 psi (7-14 Bar) greater than the developed spray pressure as recommended by the material supplier.

SHUT-DOWN

SHUT-DOWN

SHORT TERM

Follow the procedure below for temporary shut-downs, such as **lunch breaks**:

1. Set Pump Switch (X, page 12) to OFF position.
2. Turn each Heater OFF. Hose Heater should remain ON. Never leave Proportioner ON if unattended.
3. CLOSE Spray Gun Manual Valves.

CAUTION! *Excessive force opening or closing the Manual Valves may result in damage to the Manual Valves and/or Coupling Block.*

LONG TERM

Follow the procedure below for shut-downs when work is **stopped for the day**:

1. Set the Pump Switch (X, page 12) to RETRACT.
2. Spray off the application surface until Material Pressure Gauges (H, K, page 11) readings begin to fall.

CAUTION! *To avoid possible Proportioning Pump Seal seepage and moisture vapor drive into the Heated Hoses, the system pressure should not be reduced to zero. It is recommended to lower the system pressure to a minimum of 400 psi (27 Bar).*

3. CLOSE the Spray Gun Coupling Block Manual Valves.

CAUTION! *Excessive force opening or closing the Manual Valves may result in damage to the Manual Valves and/or Coupling Block.*

4. Turn OFF Motor Power (W, page 13).
5. Turn OFF the A and R Heaters and Hose Heater (T, page 12).
6. Turn OFF the Auto Shut down switch.
7. Turn OFF the Control Power (S, page 12).
8. Turn OFF the Main Power (Q, page 12).
9. Disconnect the air supply to the two Transfer Pumps and CLOSE the Proportioner Material Inlet Valves.

TROUBLESHOOTING

TROUBLESHOOTING

The PH Series Proportioner has been designed and built to withstand severe working conditions with a high degree of reliability, provided that it is used in a suitable application by a properly trained operator. This chapter contains information on possible faults that may interrupt the operation of the PH Series Proportioner. The information provided will serve as a guideline to detect and resolve problems. In any case, feel free to contact your authorized PMC Distributor, where a qualified technician will advise you.

CAUTION! All repairs performed by unqualified personnel or the use of spares other than originals may cause damage to the unit and put the operator at risk.



To prevent possible injury caused by incorrect handling of the raw materials and solvents used in the process, carefully read the Material Safety Data Sheet (MSDS) provided by your supplier.

Deal with the waste caused according to current regulations.



To avoid damage caused by the impact of pressurized fluids, do not open any connection or perform maintenance work on components subject to pressure until the pressure has been completely eliminated.



Use suitable protection when operating, maintaining or being present in the area where the equipment is functioning. This includes, but is not limited to, the use of protective goggles, gloves, shoes and safety clothing and breathing equipment.



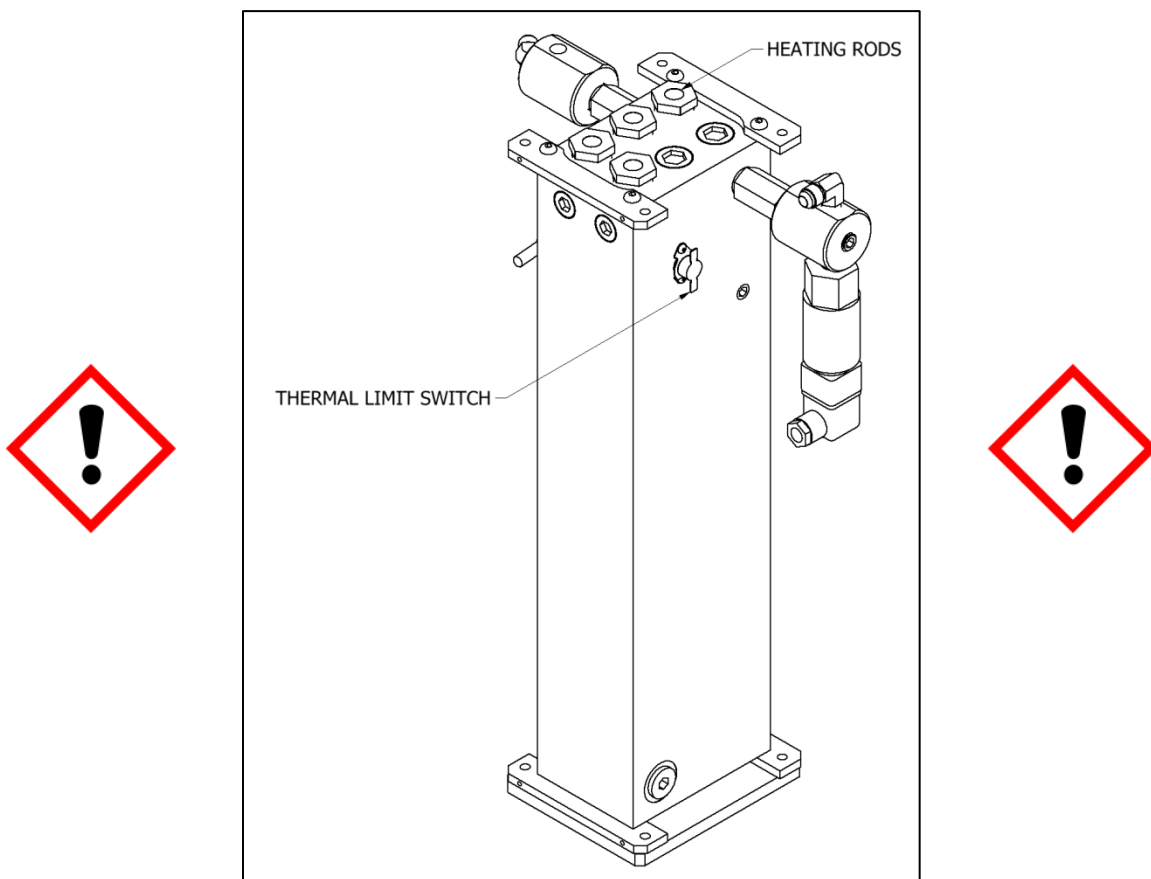
The equipment includes components that reach high temperatures and can cause burns. Hot parts of the equipment must not be handled or touched until they have cooled completely.



To prevent serious injury through crushing or amputation, do not work with the equipment without the safety guards installed on the moving parts. Make sure that all the safety guards are correctly reinstalled at the end of the repair or maintenance work of the equipment.

HEATERS

WARNING! Before troubleshooting make sure the Main Power Switch is OFF and incoming power is locked OFF. NEVER access the inside of the Control Panel with the Proportioner power supply ON. The Heaters are components that reach high temperatures; you must wait until they cool before handling.



NOTE! The Thermal Limit Switch is a safety switch in contact with the Heater body. If the surface temperature exceeds 220° F (109° C), the Limit Switch will shut off the Heater power. The Limit Switch will not re-set until the temperature in the Heater is below 190° F (88° C). The system is designed that in case of an over temperature a contactor will open, disabling power to both Heaters and the Hose.

Follow the recommended procedure in the indicated order to solve the problem and avoid unnecessary repairs. Make sure all Switches are in the correct position and Indicator Lights ON before determining the existence of a fault.

PROBLEM

Primary heater does not heat and the display on the controller shows ambient temperature.

SOLUTIONS

1. Check that the light on the on/off switch is lit when the heater is turned on, if not replace the switch.

If the light is on, move to the next step.

2. Check the heater breaker in the main console, reset the breaker, if it continues to trip, wrap an Amp Clamp around one of the wires coming off the breaker. If the Amperage reading does not exceed the rating of the breaker, the breaker needs to be replaced. If the breaker draws more than its rating the most likely cause is that one or more of the fire rods are shorted. Remove the heater cover, disconnect the wires and check each rod for resistance. Refer to page 32.

If the breaker is not tripped, move on to the next step.

3. Open the console top and locate the solid state relays for the heaters, looking over the console top from the front of the machine. There are two relays to the left bottom of the console, the one to the far left is for the "A" heater and the one to the right is for the "R" heater. With the heater on look to see if a LED light is lit on the relay.

If there is no LED light on the solid state relay, move to the next step.

4. With a DC volt meter read across position A1 and A2 on the solid state relay (smaller wires) if you have a reading of 4-6 volts DC and the AC reading across L1 and L2 (Heavy wires) reads 208-230 volts AC replace the solid state relay. With 24 volt DC at A1 and A2 the proper reading should be 1 volt AC across L1 and L2. If the AC reading across L1 and L2 is .025 volts check the over temperature switches in the heaters. A defective over temperature switch will open a contactor disabling both Heaters and the Hose.

If there is no DC voltage to the relay, move to the next step.

5. Using a DC volt meter measure across position 5 and 6 on the back of the heater controller this is the output of the controller and sends power to the solid state relay. On an Eaton controller, your reading will be 4-6 volts DC. On an Omron Controller, your reading will be 12 volts DC. If there is no reading check to make sure that the set temperature on the controller is above the actual temperature reading on the controller. Before replacing the controller read

across position 1 and 2 to make sure that the controller is powered up, your reading will be 208 to 230 volts AC. If no voltage is present check for loose wires or a malfunction of the heater circuit breaker.

PROBLEM

Primary heater does not heat and the display on the controller shows a flashing error message SbEr.

SOLUTIONS

1. Check position 9 and 10 on the heater controller for loose wires.

If the wires are tight, move to the next step.

2. Remove the heater cover and check that the thermocouple wires are secure to the harness going up to the controller.

If there are no loose connections, replace the thermocouple.

PROBLEM

Primary heater controller shows excessive temperature and the circuit has turned off.

CAUTION! The heater must be allowed to cool down before continuing.

SOLUTIONS

1. Set the controller set point at least 20°F (7°C) lower than the temperature shown on the controller. Briefly turn on the heater and look for the LED light on the solid state relay to be on.

If the light is on, replace the controller.

If the light is off, replace the solid state relay.

PROBLEM

Primary Heater Temperature drops excessively while spraying.

POSSIBLE CAUSE

1. Temperature of the chemical in the containers is too cold.
2. Exceeding the flow rate specification of the machine.

CAUTION! Disconnect power to the machine before proceeding.

3. One or more of the fire rods in the heater have malfunctioned. Remove the heater cover and disconnect the wires to measure the resistance across each rod. Installing a smaller mixing chamber in the gun may allow you to spray until a new rod(s) is installed.

CAUTION! If the rod that is used in conjunction with the thermocouple is defective, do not operate the heater until the rod is replaced.

INDIVIDUAL OHMS MEASUREMENT	
1000 WATT	45.9 Ω
1250 WATT	39.0 Ω
1500 WATT	32.4 Ω
1750 WATT	27.5 Ω

HYDRAULIC DRIVE SYSTEM

Follow the recommended procedure in the indicated order to solve the problem and avoid unnecessary repairs. Make sure all Switches are in the correct position and Indicator Lights ON before determining the existence of a fault.

WARNING! Before correcting any kind of defect, make sure the Main Power Switch is OFF and the incoming power is locked OFF. NEVER access the inside of the Control Panel with the Proportioner power supply ON. The Hydraulic Unit is a component that works under pressure. Do not open any connection or carry out maintenance on components subject to pressure until all pressure has been bled to zero.

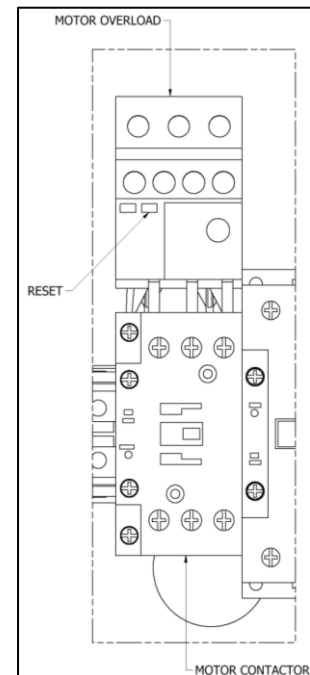
CAUTION! Do not attempt to reset the Motor Contactor more than twice. Failure of the Motor Contactor safety mechanism will occur and the Contactor will become inoperable and/or the Motor will be damaged. The cause of the problem must be determined and corrected.

PROBLEM:

Motor does not run and Hydraulic Pump does not develop pressure.

SOLUTIONS:

1. The Electric Motor is protected from excessive current by an Overload Safety Switch. After allowing the Motor to cool, open the Control Panel and reset Motor Contactor Safety.



PROBLEM:

Motor runs but Hydraulic Pump does not develop pressure

SOLUTIONS:

NOTE! Hydraulic pressure is not generated if the Motor Power Switch (W, page 13) is OFF or the Pump Switch (X, page 12) is in the OFF position.

With the Pump Switch in the NORMAL position, the failure of the Hydraulic Pump to develop pressure is loss of pump suction (prime). To ensure positive prime, check the following:

1. Motor rotation (page 15).
2. Hydraulic Reservoir is filled to the correct level (page 15).
3. Hydraulic Pump Case is filled with the proper hydraulic fluid (page 52).
4. Loose Inlet Plumbing: Check that all inlet plumbing to the Hydraulic Pump is tight ensure there is no air leakage into the hydraulic system.

PROBLEM:

Low or zero hydraulic pressure with unusual Hydraulic Pump noises.

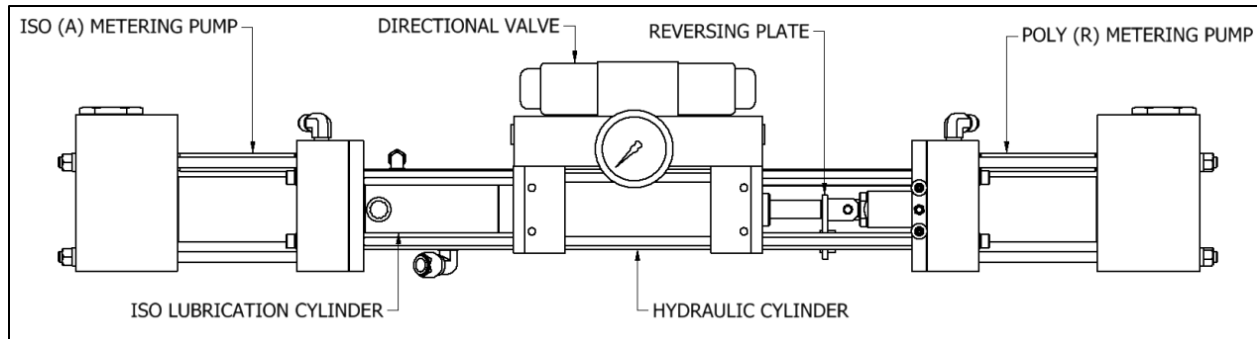
SOLUTION:

The use of an incorrect hydraulic fluid can result in unusual noises from the pump, excessive wear and moisture absorption. Ensure the hydraulic oil used is from the list on page 52. In addition to the above, continuous excessive hydraulic oil temperature as well as failure to change the hydraulic oil on a yearly basis will cause the oil to fail and result in excessive Hydraulic Pump wear and unusual noises.

1. Loose Inlet Plumbing: Check that all inlet plumbing to Hydraulic Pump is tight ensuring no air leakage into the hydraulic system.

NOTE! Hydraulic Pressure will not be developed in the off position if the pump switch is in the off position or if there is a malfunction in the pump circuit.

METERING PUMP LINE



Follow the recommended procedures in the indicated order to solve the problem and avoid unnecessary repairs. Make sure all Switches are in the correct position and Indicator Lights ON before determining the existence of a fault.

PROBLEM:

Metering pumps do not change direction and the pressures on both of the chemical gauges are lower than normal.

SOLUTIONS:

1. The Metering Pump Line has a Reversing Plate which actuates two Proximity Switches, one at each end of the stroke. The Prox Switches in turn actuate the appropriate Directional Valve Solenoid. Failure to make contact with either PROX Switch may be caused by:
 - a. Deformation of the Reversing Plate.
 - b. Foreign material preventing the Reversing Plate from contacting the Prox Switches. **If this is not the problem, go to the next step**
2. Passing of the Reversing Plate beyond the Prox Switch may be caused by:
 - a. Failure of the Prox Switch and related components on the side of the over-run.
 - b. Failure of a component of the Directional Valve.
 - c. Mounting Plate and/or Prox Switch is out of adjustment.

NOTE! IF THE DIRECTIONAL INDICATOR LIGHT IS ON CHECK THE REVERSING VALVE COIL ON THE SIDE THAT THE LIGHT IS ON. IF YOU HAVE 24 VOLTS DC AT THE PLUG CHECK THE OHM'S RESISTANCE OF THE COIL, IT SHOULD READ APPROXIMATELY 19 OHM's, IF NOT REPLACE THE COIL OR REVERSING VALVE.

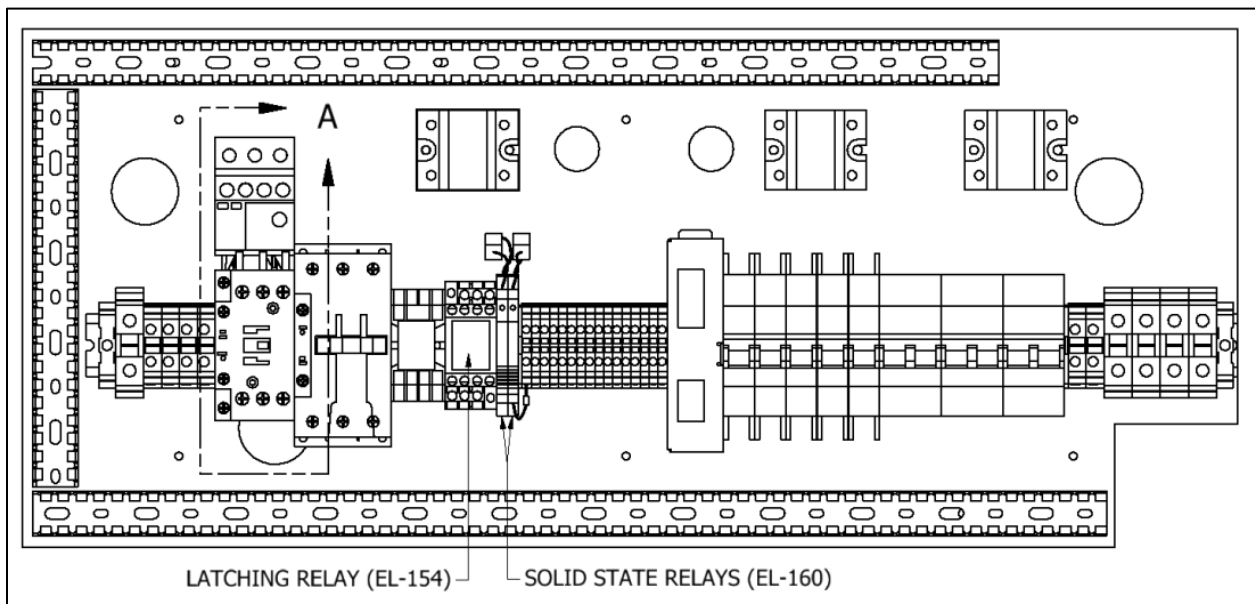
NOTE! IF THE DIRECTIONAL LIGHT IS **OFF** PROCEED BELOW

NOTE! BEFORE TROUBLESHOOTING, THE REVERSING SWITCH PLATE MUST BE MOVED AWAY FROM THE SWITCH.











- d. Bleed down the chemical pressures.
- e. Ensure Pump Switch (X, page 12) is **OFF**.
- f. Turn on the motor (W, page 13).
- g. Go to the Directional Valve and locate the Actuation Coils. Located in the middle of each coil is a small round tab that can be pushed in to manually shift the spool to move the pumps. If the Reversing plate is all the way to the left, push in on the right side coil. If it's all the way to the right, push in on the left side coil.

WARNING! THE MOTOR MUST BE OFF AND THE PUMP SWITCH IN THE NORMAL POSITION.

- h. Take a small screw driver or a thin piece of metal and move it across the front of each Prox switch. A red light on the back of the switch should illuminate. If not, replace the switch that does not light.
- i. If the Prox switches light up, turn off all power and check for continuity on both over pressure switches, pin 1 and 2. If the pressure switches are good, go to the two solid state relays inside the console and interchange them (they can be pulled from their housing). With the motor OFF and the pump switch in the normal position, power-up the unit. If the directional light comes on replace the defective solid state relay. If not, replace the Latching relay.



2. **Safety Pressure Switch** - Each Metering Pump has a Safety Pressure Switch (I, L, page 11). For PH-25 and PH-40 Proportioners, the Safety Pressure Switch is set to 2,200 PSI (152 bar). For PH(X)-25 Proportioners, the Safety Pressure Switch is set to 3,200 PSI (221 bar). For PH(X)-40 Proportioners, the Safety Pressure Switch is set to 3750 PSI (221 bar). When the material system reaches this pressure, the Safety Pressure Switch will remove power from the Directional Valve and Direction Indicator Lights (Y, page 13). Lack of Direction Indicator Lights along with high pressure indicated on one or both of the material Pressure Gauges (H, K) is an indication of a over-pressure condition. The Safety Pressure Switches are a momentary design; when the pressure bleeds off the Metering Pump Line will resume normal operation. However, the cause of the over-pressure should be determined and corrected. The three most common causes are:
 - a. Cavitation of the Metering Pump on the low pressure side causing high pressure on the opposite side.
 - b. A restriction in the Spray Gun on the high pressure side.
 - c. Hydraulic pressure set too high for Spray Gun Mixing Chamber.
3. **Pressure/Material Imbalance** - In summary troubleshooting this problem requires the applicator to:
 - a. Know what the NORMAL spray pressures are for the application in progress.
 - b. Determine what material is NOT exiting the Mixing Chamber.
 - c. Read the Pressure Gauge on the problem side and interpret the reading.

MATERIAL CONDITION	“A” GAUGE	“R” GAUGE
NORMAL		
LACK OF ISO (A)		
LACK OF POLY (R)		
RESTRICTION OF ISO (A)		
RESTRICTION OF POLY (R)		

4. **Cavitation** - Cavitation occurs when the Metering Pump (B, or C, page 11) requires a larger volume of material than the supply system (Transfer Pump) can furnish. This creates a "void" of material in the Metering Pump. The most common causes of cavitation are:
 - a. Material temperature too low causing increased material viscosity resulting in the inability of the Transfer Pump to maintain sufficient supply to the Metering Pump. This is most common with today's blown systems. Ensure the material temperature in the drums is no lower than the material suppliers' recommendation.
 - b. Failure to vent the material drum while drawing material out with the Transfer Pump causes a vacuum and cavitation in the Transfer Pump. Ensure the drum is vented to the atmosphere or a Desiccant Air Dryer Kit is installed as recommended by the material supplier.
 - c. Air volume is insufficient for the Transfer Pump or if the Transfer Pump Air Valve is partially closed, this will limit the ability of the Transfer Pump to operate at its maximum capability.
 - d. Inlet Material Screen (O) obstructed (See MAINTENANCE section).
 - e. Metering Pump Inlet Ball does not seat properly allowing material to flow back into the Material Delivery Hose when the Metering Pump is on the "Discharge" stroke. This causes the volume of material on that Metering Pump to be less on the discharge stroke resulting in intermittent off-ratio material and Pressure Gauge fluctuation.
5. **Pressure Loss: Discharge/Inlet Ball** - Simultaneous observation of the material Pressure Gauge (H, K, page 11) and Directional Indicator Light (Y page 13) is necessary to determine which direction the Metering Pump fails to maintain pressure. Refer to the chart to determine the problem:

	Left Directional Indicator Light ON	Right Directional Indicator Light ON
Iso Pressure Gauge FALLS	Iso Inlet Ball does not seat properly	Iso Discharge Ball does not seat properly
Poly Pressure Gauge FALLS	Poly Discharge Ball does not seat properly	Poly Inlet Ball does not seat properly

In most cases the cause of a leaking Inlet/Discharge Ball is foreign material preventing the Ball from seating properly. If the above steps do not resolve the problem, replace the appropriate Ball, Ball Seat, Ball Seat Gasket and the O-ring on the cage.

For service see [MAINTENANCE/METERING PUMP LINE \(Page 48\)](#).

HOSE HEATING

WARNING! Before correcting any kind of defect, make sure the Main Power Switch is OFF and incoming power is locked OFF. NEVER access the inside of the Control Panel with the Proportioner power supply ON. The Heated Hoses are components which reach high temperatures. Wait until they have cooled before handling.

CAUTION! All electrical testing must be done by a qualified electrician.

Follow the recommended procedure in the indicated order to solve the problem and avoid unnecessary repairs. Make sure all Switches are in the correct position and Indicator Lights ON before determining the existence of a fault.

PROBLEM:

A-Heated hose does not heat and the display on the controller shows ambient temperature.

SOLUTIONS:

1. Check that the light on the on/off switch is lit when the heater is turned on, if not replace the switch.

If the light is on, move on to the next step.

2. Check the Hose Heat Breaker in the main console reset the breaker. If it continues to trip wrap an Amp Clamp around one of the wires coming off the breaker. If it does not draw more than the rated value of the breaker, the breaker needs to be replaced.

If the breaker is not tripped, move on to the next step.

3. Check the circuit breaker mounted on the transformer and reset the breaker if necessary. If it continues to trip wrap an Amp Clamp around one of the wires from the transformer going to the heated hose. If it does not draw more than the rated value of the breaker, the breaker needs to be replaced.

If the AMP draw is less than the rated value, move on to the next step.

4. Check that the tap setting on the transformer is set for the proper hose length.

If it is set correctly, move to the next step.

5. Look at the two lights located on the front of the transformer. If the voltage light is lit and the AMP light is off the problem could in the heated hoses. If the voltage light is on there is power to the primary side of the transformer. To check the secondary side of the transformer you must take an AC volt reading across the two leads coming out of the transformer that are connected to the "A" and "R" hose leads. If you are reading voltage (your voltage reading will vary depending on what tap setting is used) most likely the problem is in the heated hose. Either a connector has come loose or there is a broken wire.
6. Remove one of the wires coming out of the transformer that is connected to either the "A" or "R" side of the heated hose. Using an ohms meter perform a continuity reading across the two lead wires coming off the machine end of the heated hose. If there is no continuity through the hose check for loose or broken connection between each section of hose. If all the connections are secure and there are no visible broken wires it is possible that the element on the hose or the lead wire has broken at its connection. Each hose must be checked individually for continuity. Because the gun whip takes the most abuse it is most likely that the problem is in the hose whip up at the gun end.

If no voltage is coming out of the transformer to the heated hose, move on to the next step.

7. Open the console top and locate the solid state relay for the hose circuit (see page 36), looking over the console top (front of machine) it is the relay to the right. With the hose turned on and there is a LED light lit on the relay, take a volt meter set on DC and measure across position A1 and A2 your reading should be 24 volts, then take an AC volts measurement across position L1 and L2 (heavy wires). With the relay functioning properly you should have a 1 volt reading, if the reading is 18 to 90 volts AC the relay has malfunctioned and needs to be replaced. If the AC Reading across L1 and L2 is .025 volts check the over temperature switches in the heaters. A defective over temperature switch will open a contactor disabling both Heaters and the Hose.

If there is no light on the solid state relay, move to the next step.

8. Using a DC volt meter measure across position 5 and 6 on the back of the hose controller, this is the output of the controller and sends power to the solid state relay, your reading will be **4-6 volts DC**. If there is no voltage check to make sure that the set temperature of the controller is above ambient temperature. Before replacing the controller read across position 1 and 2 to make sure that the controller is powered up, your reading will be 208 to 230 volts AC.

PROBLEM:

Hose does not heat and the display on the controller shows a flashing error message "SbEr."

SOLUTIONS:

1. Check position 9 and 10 on the heater controller for loose wires.

If the wires are tight, move to the next step.

2. Remove the transformer cover and check that the thermocouple wires are secure to the harness going up to the controller. If there are no loose connections, disconnect the wire from the TSU and connect it directly to the thermocouple harness coming out of the hose transformer.

If the controller still shows the error code, replace the hose thermocouple.

If the error code goes away and temperature is now shown on the display of the controller, then all the TSU harnesses from the TSU to the transformer need to be checked for loose connectors or one or more of the harnesses are defective.

PROBLEM:

Heated hose controller shows excessive temperature.

SOLUTIONS:

1. Set the controller set point at least 20°F (7°C) lower than the temperature shown on the controller. Briefly turn on the Hose Heater Switch and look for the LED light on the solid state relay to be lit.

If the light is on, replace the controller.

If the light is off, replace the solid state relay.

PROBLEM:

Hose will heat but does not come up to set temperature.

SOLUTIONS:

1. Check the tap setting on the transformer to ensure that the correct position has been selected for the length of hose being used. Depending on the machines incoming voltage, you may have to move the tap setting higher (up one).

CAUTION! Do not exceed the trip value of the transformer hose breaker.

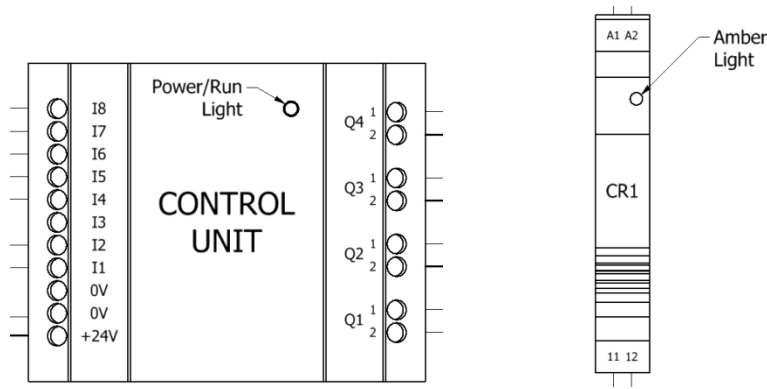
WARNING! Before correcting any kind of defect, make sure the Main Power Switch is OFF and incoming power is locked OFF. NEVER access the inside of the Control Panel with the Proportioner power supply ON.

NOTE! In the event an equipment problem cannot be solved after following the detailed instructions contained in this manual, please contact your PMC authorized distributor and they have direct contact with PMC Technical Service Department.

NOTE! For all parts and field service, contact your PMC authorized distributor.

PRESSURE BALANCE CONTROL

If the Pressure Balance Control box is not working properly, follow these steps to resolve the potential issue:



1. With the Main Power **ON**, check the Power/Run light on the Control Unit:
 - a. If **OFF**, the Control Unit is not getting power. Check for loose or poor wire connections. If the Power/Run light still does not turn on, contact your authorized PMC distributor.
 - b. If **SOLID**, the Control Unit has power but no program. Contact your authorized PMC distributor.
 - c. If **BLINKING**, the Control Unit has power and is programmed properly. Proceed to the next step.
2. With Main Power **ON**, turn the Rotary Switch to a Pressure Differential Number and check the Amber light on CR1:
 - a. If **OFF**, CR1 is not activating properly. Check for loose or poor wire connections between the Control Unit and CR1.
 - b. If **ON**, CR1 is activating, but the mechanical switch inside the relay may not be functioning properly. If the system has faulted (i.e. a pressure imbalance exists, the ON light turns off, and the FAULT light turns on), but the pumps do not shut off, check for continuity between contacts 11 and 12 on CR1. If there is continuity, contact your authorized PMC distributor. If there is discontinuity, proceed to the next step.
3. With Main Power **OFF**:
 - a. Check all remaining wires to ensure secure and proper connections.
 - b. Check for continuity across the ON light terminals and the FAULT light terminals. If there is discontinuity, switch the leads of the meter and check again.
4. Contact your authorized PMC distributor for further assistance.

MAINTENANCE

MAINTENANCE

To achieve maximum output from the PH Series Proportioner, a daily or regular maintenance schedule is required.



To prevent possible injury caused by incorrect handling of the raw materials and solvents used in the process, carefully read the Material Safety Data Sheet (MSDS) provided by your supplier.

Deal with the waste caused according to current regulations.



Disconnect the unit from the power supply before carrying out any operation inside the electrical console.

The electrical maintenance of the machine must only be performed by a qualified electrician.



To avoid damage caused by the impact of pressurized fluids, do not open any connection or perform maintenance work on components subject to pressure until the pressure has been completely eliminated.



Use suitable protection when operating, maintaining or being present in the area where the equipment is functioning. This includes, but is not limited to, the use of protective goggles, gloves, shoes and safety clothing and breathing equipment.



The equipment includes components that reach high temperatures and can cause burns. Hot parts of the equipment must not be handled or touched until they have cooled completely.



To prevent serious injury through crushing or amputation, do not work with the equipment without the safety guards installed on the moving parts. Make sure that all the safety guards are correctly reinstalled at the end of the repair or maintenance work of the equipment.

CAUTION! *All repairs performed by unqualified personnel or the use of parts other than supplied by PMC may cause damage to the unit and put the operator at risk.*

INLET MATERIAL SCREENS

Inspection of the Inlet Material Screens on a daily basis is no longer necessary as long as the following conditions are met.

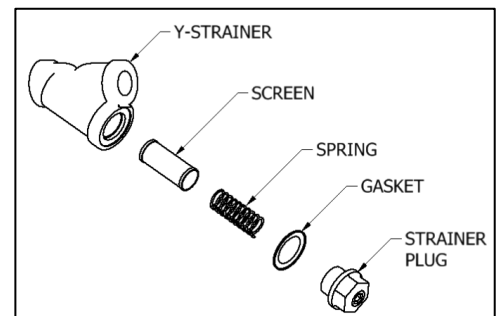
1. Material drums are stored within the recommended material storage temperature range and drums are not opened prior to installing the Proportioner Material Transfer Drum Pumps.
2. Desiccant air dryers are used to dry replacement air as material is removed from the drums to the Proportioner.
3. Consolidation of old material into a common drum for use is minimized especially the Iso (A).

If the above conditions are met, inspection of the Inlet Material Screens may be done on a **bi-weekly** basis. To check the Inlet Material Screens, proceed as follows:

NOTE! *Inspect and clean Inlet Material Screens before Proportioner start-up. They should not be cleaned after the days operation as the Proportioner should be purged (see page 20) immediately after inspection and cleaning. This is to reduce the risk of moisture contamination and contamination through the reaction with any solvent used in the cleaning operation and cross-over at the Spray Gun due to air entrapment.*

CAUTION! *Make sure the Main Power Switch is OFF and incoming power is locked OFF.*

1. CLOSE the Poly (R) Proportioner Inlet Valve.
2. Place a suitable container under the Material Inlet Strainer to collect the residual material. Carefully loosen the Strainer Plug to drain material into the container.
3. Completely unscrew the Strainer Plug.
4. Remove the Seal, Spring and Screen and clean them with a suitable solvent. Dry the parts and ensure the Screen is not obstructed. Replace the Screen if more than 20% of the Screen surface is obstructed by residue.
5. Reinstall the Screen, Spring and Seal. Screw on the Strainer Screw and screw in Plug.
6. OPEN the Poly (R) Proportioner Inlet Valve, pressurize the Material Transfer Pump, check for leaks and wipe Y-strainer clean.
7. Repeat above for the Iso (A) side.
8. Proceed with Proportioner Purging operation (page 20).

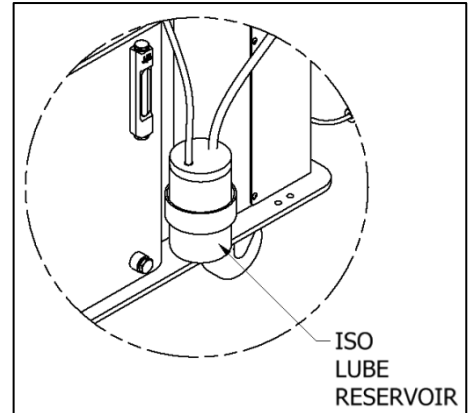


ISO LUBRICATION SYSTEM

Daily: Check the condition of the PMC Lube Oil in the Iso Lube Reservoir. Replace the PMC Lube Oil if you see significant changes in the color or signs of solidification. Ensure inside of Reservoir is wiped clean.

To replace the Lube Oil, proceed as follows:

1. Remove the Lube Reservoir from its support, unscrew the Lid and remove the Check Valve from the Suction Hose.
2. Empty the contaminated Lube Oil in a waste container and refit the Check Valve in the Suction Hose.



NOTE! *Valve is directional.*

3. Clean the Reservoir, refill with Lube Oil, and screw on the Lid and place the Reservoir in its support.

The system is auto-suction and does not need priming.

HYDRAULIC DRIVE SYSTEM

WARNING! Before performing any maintenance, make sure the Main Power Switch is OFF and incoming power is locked OFF. The Hydraulic Unit is a component that works under pressure. Do not open any connection or carry out maintenance on components subject to pressure until all press has been bled to zero.

The hydraulic unit should be serviced **yearly**:

1. Completely drain the Tank of hydraulic fluid.
2. Clean the Tank Top to prevent foreign material from falling into the Tank when the Lid is removed.
3. Unscrew the Suction Pipe from its connection with the Hydraulic Pump.
4. Remove the Lid and Suction Pipe from the Hydraulic Tank. Take care not to damage Tank Lid Gasket.
5. Inspect the bottom of the Tank for sediment and clean as required. Clean the Suction Pipe and its connections.
6. Insert the Suction Pipe into the Tank and replace the Lid. Again, take care not to damage Tank Lid Gasket. Connect the Suction Pipe securely to the Hydraulic Pump using thread sealant.
7. Fill the Tank with 20 gallons (76 Liters) of approved hydraulic fluid. See page 52 for recommendations.
8. Ensure the Hydraulic Pump Case is full of fluid (Installation, page 14) and proceed with the normal operation.

METERING PUMP LINE

WARNING! Before performing any maintenance, make sure the Main Power Switch is OFF and incoming power is locked OFF. Allow material temperature to cool below 80°F (27°C) and bleed all material pressure to zero.



Weekly: When the Proportioning Pumps are functioning properly it is not unusual for a small amount of Poly (R) material to appear on the Pump Shaft. This material should be wiped away so dirt does not accumulate on the Pump Shaft and the Pump Shaft Packings are not damaged.



Yearly or as required: Assuming the Iso (A) and Poly (R) is free from contaminants, the maintenance of the Iso Lube Reservoir (page 46) is performed, and the maintenance of the Poly (R) Pump Shaft (above) is followed, the Proportioning Pumps will perform for many maintenance free cycles. However, it is not unusual for those who use the PH Series Proportioner on a regular basis to rebuild the Proportioning Pumps on a yearly basis and service the Hydraulic Drive System at the same time, when the Proportioner is out of service.

PUMP BASE SERVICE

To service Discharge/Inlet Ball:

1. CLOSE appropriate Proportioner Inlet Material Supply Valve and remove Air Line from Transfer Pump.
2. Ensure all material pressure in the Proportioner system is zero and remove appropriate Retainer Nut.
3. For Inlet Ball:
 - a. Remove Inlet Ball with a Magnet (DO NOT USE ANY SHARP OBJECTS), clean Ball and Ball Seat, and inspect for foreign material and any flat spots on Ball.
 - b. Using supplied Ball Seat Tool (TL-02), check for proper Ball Seat/Ball Seat Gasket compression. Snug Seat up to ¼ turn maximum 110 ft-lbs (149 N-m).
4. For Discharge Ball:
 - a. Perform steps 1 & 2 from above.
 - b. Remove Cage and Spring.
 - c. Remove Discharge Ball with a Magnet, clean Ball and Ball Seat, and inspect for foreign material and any flat spots on Ball.

- d. Using supplied Ball Seat Tool (TL-02), check for proper Ball Seat/Ball Seat Gasket compression. Snug Seat up to ¼ turn maximum 30 ft-lbs (41 N-m).

PUMP SEAL REPLACEMENT

NOTE! Refer to *Parts Identification Drawing* for reference.

- ✓ When the Iso (A) Proportioning Pump Cylinder is disassembled for service, all parts included in the Pump Rebuild Kit (KT-07000, KT-07002, KT-07004, KT-07006) should be replaced.
- ✓ When the Poly (R) Proportioning Pump Cylinder is disassembled for service, all parts included in the Pump Rebuild Kit (KT-07001, KT-07003, KT-07005, KT-07007) should be replaced.
- ✓ When assembling Proportioning Pump lubricate all Seals, Piston Rod and Pump Cylinder with #1 Lithium Grease to assist in assembly and minimize Seal damage during re-assembly.
- ✓ When the Pump Line End Block is disassembled for service, all O-rings included in the O-ring Kit (KT-05009) should be replaced.
- ✓ After reassembly of the Proportioning Pumps torque the Assembly Bolts to 30 ft-lbs (41 N-m)

CAUTION! Use *wooden or plastic tools or a brass brush for cleaning. Do not use metal or abrasive tools that can scratch the contact surfaces.*

METERING PUMP REMOVAL

NOTE! If removing the Polyol side pump, skip steps 3 (three) and 4 (four).

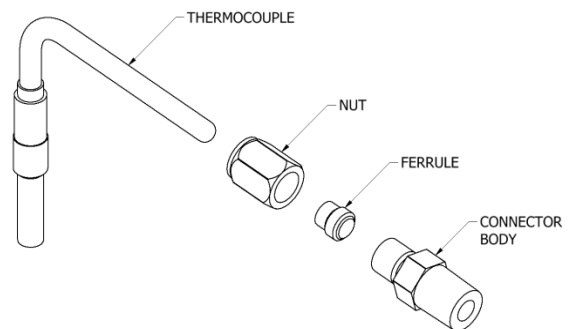
1. Put machine in retract position.
2. Turn off main power and discharge all pressure gauges to 0 (zero).
3. Disconnect the bottom elbow on the Iso lube cylinder and drain all Iso lube.
4. Disconnect the top hose going to Iso lube cylinder then uninstall red plug.
5. Remove clevis pin.
6. Disconnect the hose on the pump flange.
7. Disconnect the Y-strainer from elbow.
8. Carefully remove the 4 (four) bolts and washers while holding the pump in place.

MATERIAL HEATER

WARNING! Before performing any maintenance, make sure the Main Power Switch is OFF and incoming power is locked OFF. NEVER access the inside of the Control Panel with the Proportioner power supply ON. The Heaters are components that reach high temperatures; you must wait until they have cooled before handling and bleed all material pressure to zero.

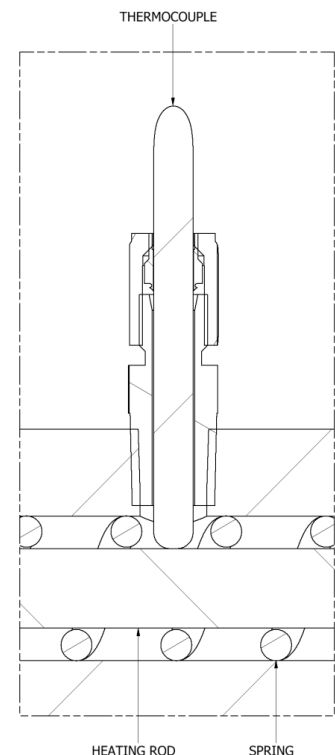


NOTE! The Thermocouple is assembled into the Connector Body with a Ferrule and Nut. Once inserted into the Body and the Nut is tightened, the Ferrule locks to the Thermocouple and does not allow it to be relocated or moved. The location of the Thermocouple is very important and must be done correctly before tightening the Nut.



THERMOCOUPLE REPLACEMENT

1. Unscrew the Nut that holds the defective Thermocouple and remove from the Body. Disconnect Thermocouple wiring located under the Top Cover of the Heater. Remove Body and discard.
2. Install Connector Body into Heater using an open-end wrench and tighten to prevent leakage. Teflon Tape or appropriate Thread Sealant should be used.
3. Slide the Nut and the Ferrule over the Thermocouple and insert this assembly into the Connector Body until it comes into **positive physical contact** with the Heating Rod. Make sure the Spring does not prevent the Thermocouple from making contact with the Heating Rod.
4. Slowly tighten the Nut using an open-end wrench (9/16"), ensuring the Thermocouple maintains positive physical contact with the Heating Rod.
5. Reinstall the Thermocouple wires.



WARNING! Before performing any maintenance, make sure the Main Power Switch is OFF and incoming power is locked OFF. NEVER access the inside of the Control Panel with the Proportioner power supply ON. The Heaters are components that reach high temperatures; you must wait until they have cooled before handling and bleed all material pressure to zero.

HEATING ROD

To replace a defective Heating Rod, proceed as follows:

1. Ensure Main Power Switch is OFF and incoming power is locked OFF. Depressurize the proportioner and remove the Cover from the Heater.

WARNING! If the Heating Rod to be replaced is the one in contact with the Thermocouple, it is necessary to remove the Thermocouple first (see page 50). Do not loosen or tighten Thermocouple Body.

2. Disconnect the suspect Heating Rod from the wire connections and test Heating Rod for proper electrical resistance.

HEATING ROD	INDIVIDUAL OHMS	TOTAL OHMS
1000 WATT	45.9 Ω	7.6 Ω
1250 WATT	39.0 Ω	6.5 Ω
1500 WATT	32.4 Ω	5.4 Ω
1750 WATT	27.5 Ω	4.6 Ω

*Measurements taken at room temperature.

3. Unscrew the Heating Rod and remove from the Heater Block along with its Spring and inspect; it must be smooth and shiny in appearance. If it is blackened or has material adhered to it replace the Heating Rod even if ohm reading is acceptable.
4. Apply Teflon Tape or appropriate Thread Sealant to the Heating Rod thread and assemble Heating Rod and Spring into the Heater Block. Tighten to 110 ft/lbs (149 N-m).
5. If necessary carefully re-install Thermocouple ensuring **positive physical contact** with the Heating Rod. Make sure the Spring does not prevent the Thermocouple from making contact with the Heating Rod. Tighten Nut with open-end wrench (9/16").
6. Reconnect wire connections and reinstall Heater Cover.
7. Ensure Heater is full of material prior to electrical testing.

HYDRAULIC OIL SPECIFICATIONS

HYDRAULIC OIL SPECIFICATIONS

Recommended Hydraulic Oil Specification:

ISO/ASTM Viscosity Grade 32

Viscosity: 28.8 – 35.2 SSU@ 104° F

Rust and Oxidation Inhibited

LIST OF MANUFACTURERS:

- Mobile DTE24 **(Recommended)**
- Cook's Albavis 8
- Ashland-Valvoline AW15
- Shell – Tellus 32(25)
- Sun Oil- Sunvis 706
- Chevron ISO32
- American Oil & Supply – PQ Iso 32
- Gulf Oil – Harmony 32AW (43AW)
- Atlantic Richfield – Duro AWS-150
- BP Oil – Energol HLP-C32
- Exxon – Nuto H-32(44)
- Margolis – T.I.P.100-15-7
- Fiske Bros. – Lubriplate Hyd. #0
- SW – Alemite Hydraulic HD#0
- Texaco – Rando HD32 (HD A0)
- White & Bagley – EP Hyd. 150

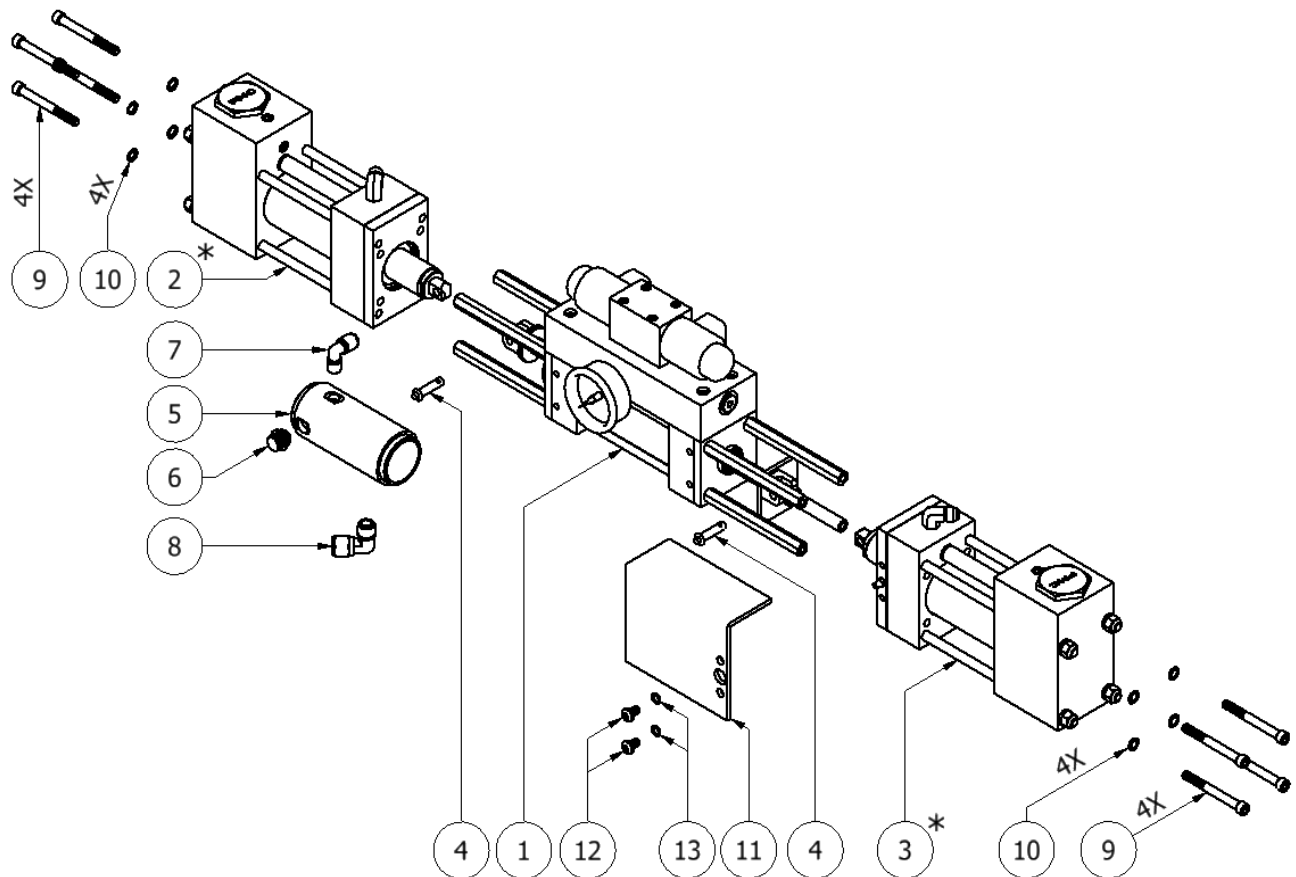
PART IDENTIFICATION

PART IDENTIFICATION

PUMPLINE ASSEMBLY

(PL-1A/PL-2)

*Pump Line O-Ring Kit is on page.



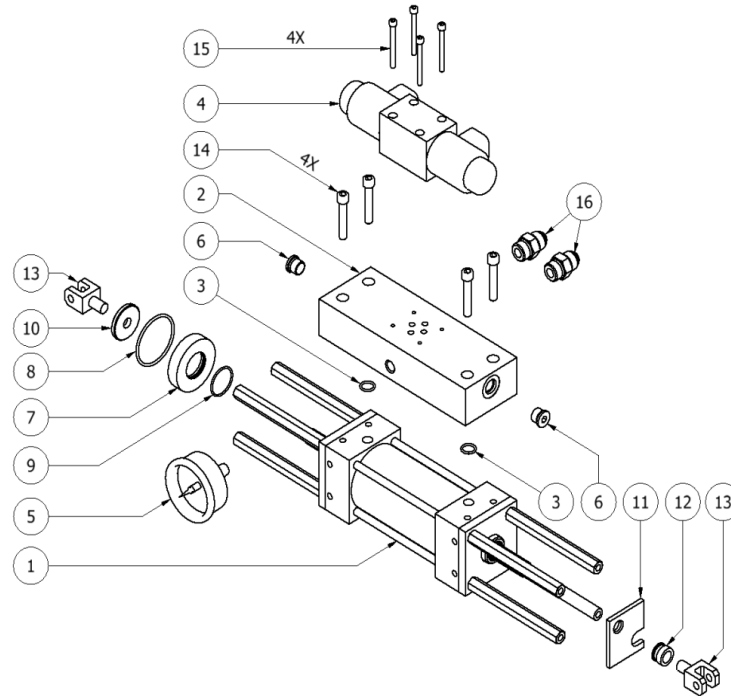
PUMPLINE ASSEMBLY (PL-1A/PL-2)				
ITEM	QTY	PART NUMBER	DESCRIPTION	FOR PUMPLINE
1	1	HI-01	HYDRAULIC CYLINDER COMPLETE (SEE PAGE 54)	ALL
2*	1	PU-05001-120	"A" PUMP ASSEMBLY, SIZE 120 (SEE PAGE 62)	PL-1A
	1	PU-05001-80	"A" PUMP ASSEMBLY, SIZE 80 (SEE PAGE 66)	PL-2
3*	1	PU-05002-120	"R" PUMP ASSEMBLY, SIZE 120 (SEE PAGE 59)	PL-1A
	1	PU-05002-80	"R" PUMP ASSEMBLY, SIZE 80 (SEE PAGE 59)	PL-2
4	2	PU-05007	CLEVIS PIN	ALL
5	1	PU-05003	LUBE CYLINDER	ALL
6	1	RA-00065A	PUMP CYLINDER PLUG	ALL
7	1	RA-00066A	CBMB 90° MALE ELBOW NPT	ALL
8	1	RA-00067A	CBMB 90° MALE ELBOW NPT	ALL
9	8	PU-05008	MOUNTING BOLT	ALL
10	8	PU-05008-1	SERRATED WASHER 5/16	ALL
11	1	PU-01027	ACTIVATOR PLATE COVER	ALL
12	2	FLOOR STOCK	5/16-18 X 1/2 BHCS	ALL
13	2	FLOOR STOCK	011 O-RING	ALL

PROPORTIONING PUMP LINE O-RING KIT

PROPORTIONING PUMP LINE O-RING KIT (KT-05009)		
PART NUMBER	QTY	DESCRIPTION
OR-00011A	4	O-ring
OR-00046A	4	O-ring
OR-00051B	2	O-ring
PU-01013A	2	Gasket
OR-00044A	1	O-ring
OR-00020A	2	O-ring

HYDRAULIC CYLINDER COMPLETE

(HI-01)

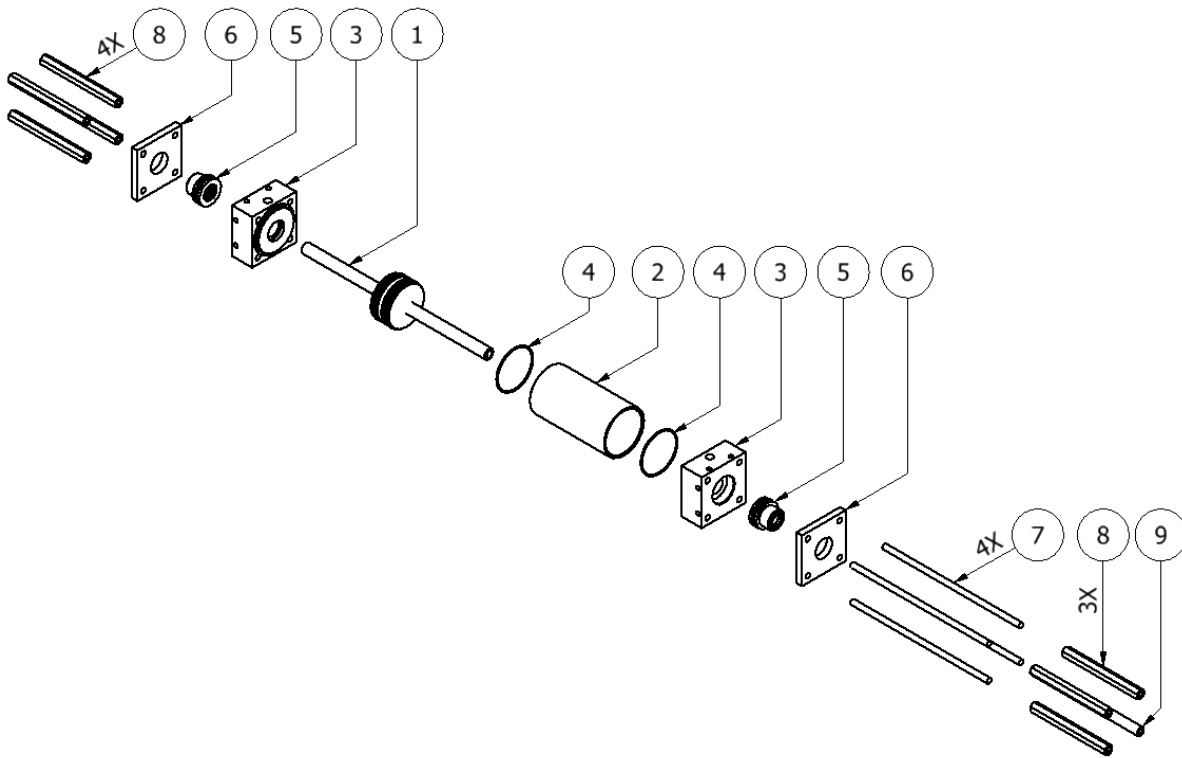


HYDRAULIC CYLINDER COMPLETE (HI-01)			
ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	HI-05025A	HYDRAULIC CYLINDER ASSEMBLY (SEE PAGE 56)
2	1	HI-05070	HYDRAULIC MANIFOLD; CLASSIC
3	2	OR-00038A	2MMX12.5MM 75 VITON BROWN
4	1	HI-05003	DIRECTIONAL VALVE
5	1	HI-05040	PRESS GAUGE 0-2000 PSI
6	2	HI-05070-4	6 ORB PLUG
7	1	PU-05004	END CAP; CYLINDER
8	1	OR-00020A	#136 VITON LUBE CYLINDER O-RING
9	1	OR-00044A	O-RING #024; LUBE CYLINDER
10	1	PU-05005	BAFFLE
11	1	PU-05009	PLATE; REVERSING SWITCH
12	1	PU-05010	BUSHING
13	2	PU-05006	CLEVIS; HYDRAULIC
14	4	FLOOR STOCK	5/16-18 X 3/4 HEX SCHS
15	4	FLOOR STOCK	#10-24 X 2 HEX SHCS
16	2	HI-05012	3/4-16 O-RING X 3/4-16 JIC NIP

HYDRAULIC CYLINDER ASSEMBLY

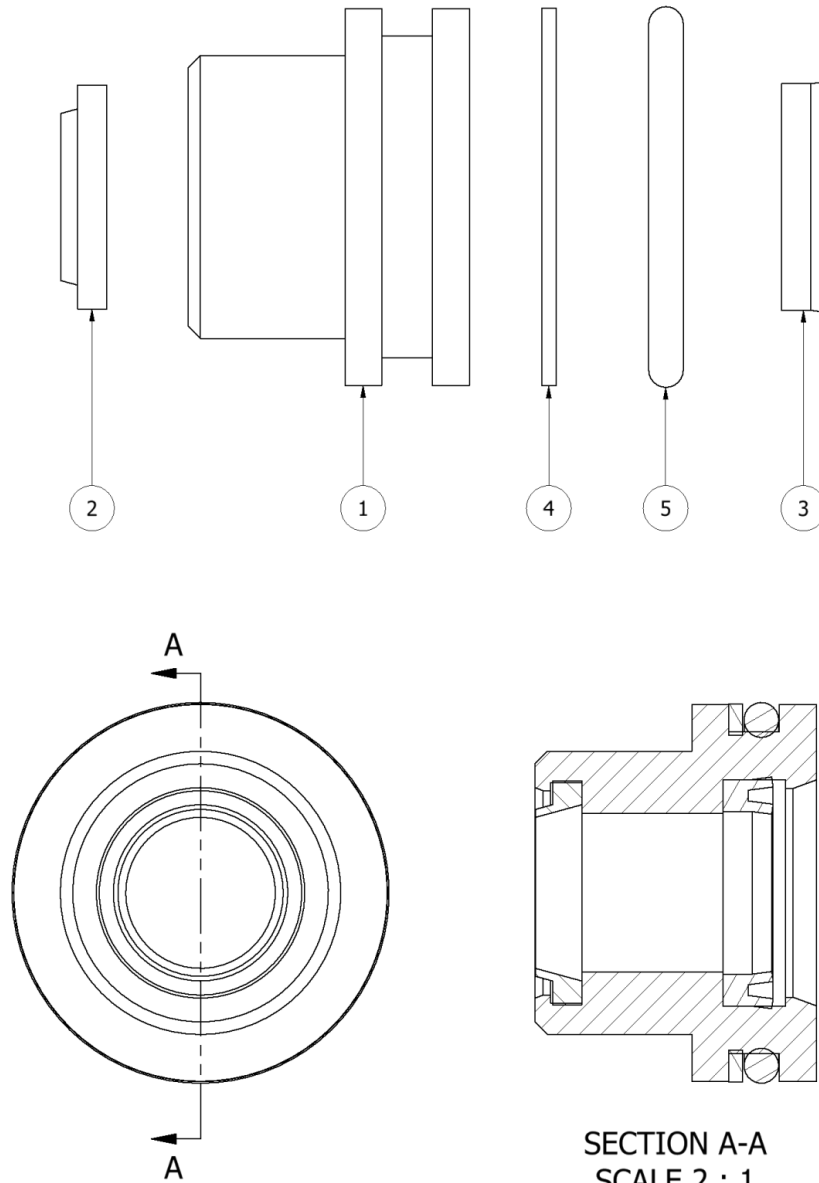
(HI-05025A)

*HYDRAULIC CYLINDER REBUILD KIT IS ON PAGE 59



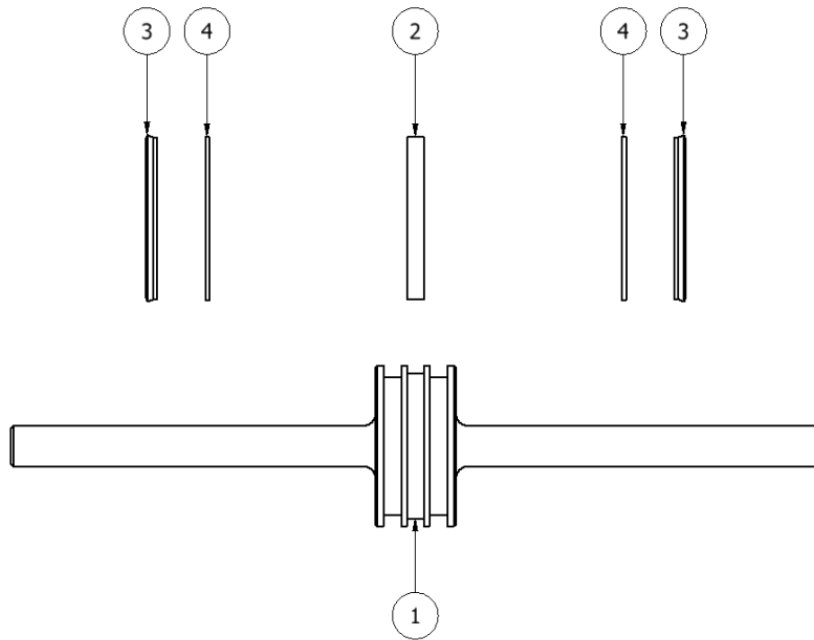
HYDRAULIC CYLINDER ASSEMBLY (HI-05025A)			
ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	-	HYDRAULIC PISTON ASSEMBLY (SEE PAGE 58)
2	1	HI-05025-8	HYDRAULIC CYLINDER
3	2	HI-05025-9	PORT BLOCK; HYDRAULIC
4	2	OR-00040A	O-RING #036 VITON
5	2	-	HYDRAULIC SEAL ASSEMBLY (SEE PAGE 57)
6	2	HI-05025-10	RETAINER FLANGE
7	4	HI-05025-14	TIE ROD; 5/16-24
8	7	HI-05025-11	HYDRAULIC STANDOFF
9	1	HI-05025-12	REVERSING SWITCH STANDOFF

HYDRAULIC SEAL ASSEMBLY

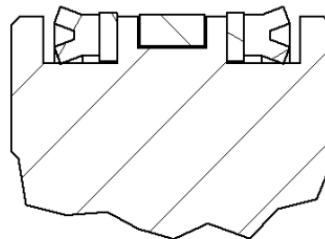


HYDRAULIC SEAL ASSEMBLY			
ITEM	QTY	PART NUMBER	DESCRIPTION
1	2	HI-05025-13	BUSHING; ROD
2	2	HI-05025-4	ROD WIPER
3	2	HI-05025-5	SHAFT SEAL
4	2	HI-05025-6	BACK-UP RING; BUSHING
5	2	OR-00039A	O-RING #218 HYD CYLINDER ROD

HYDRAULIC PISTON ASSEMBLY



SEAL SECTION DETAIL



HYDRAULIC PISTON ASSEMBLY			
ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	HI-05025-7	HYDRAULIC PISTON
2	1	HI-05025-3	WEAR RING
3	2	HI-05025-1	U CUP
4	2	HI-05025-2	BACK UP RING; PISTON

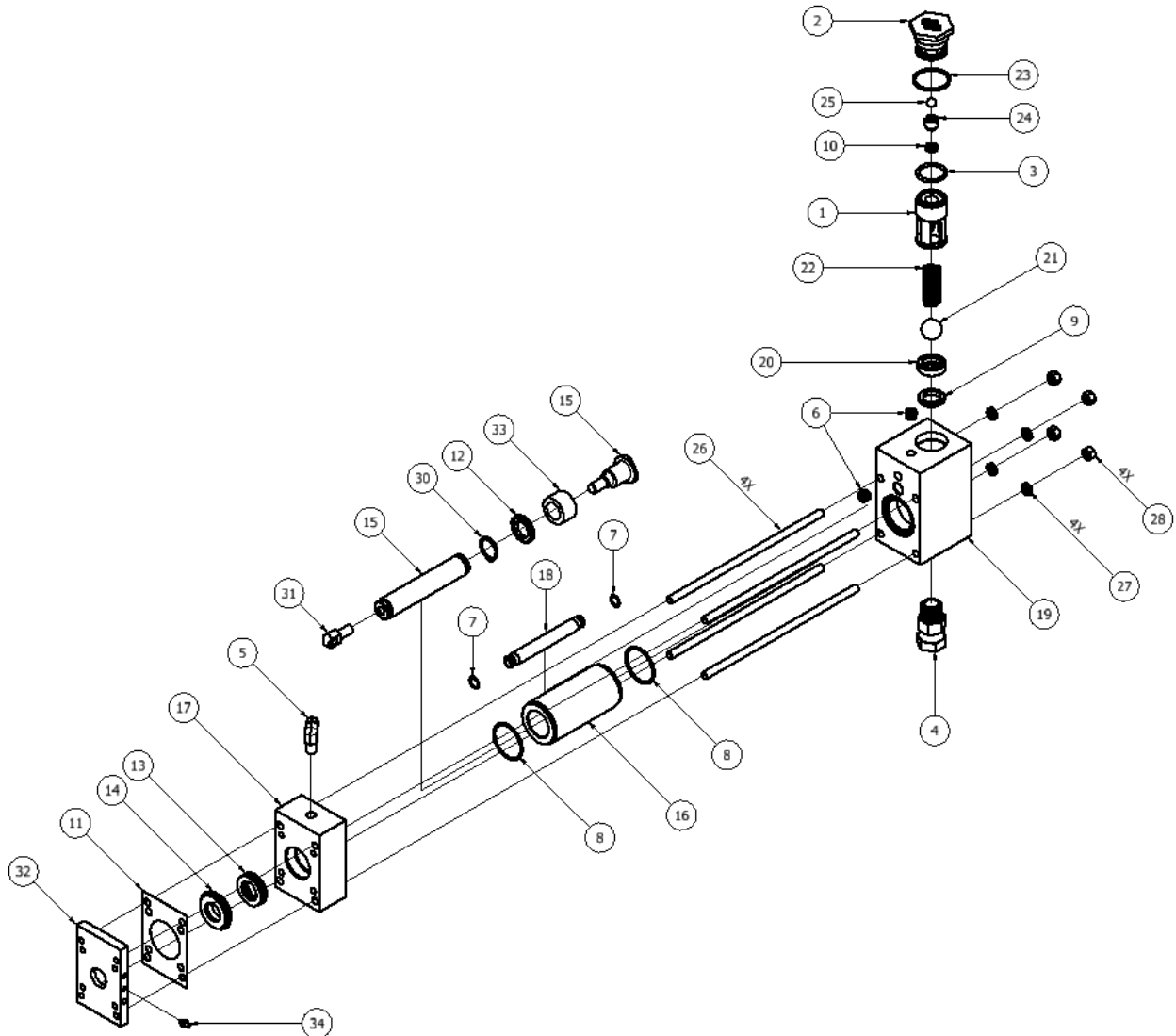
HYDRAULIC CYLINDER REBUILD KIT

HYDRAULIC CYLINDER REBUILD KIT (KT-05025)		
PART NUMBER	QTY	DESCRIPTION
HI-05025-1	2	U-Cup
HI-05025-2	2	Back-up Ring, Piston
HI-05025-3	1	Wear Ring
HI-05025-4	2	Rod Wiper
HI-05025-5	2	Shaft Seal
HI-05025-6	2	Back-up Ring, Bushing
OR-00038A	2	O-ring
OR-00039A	2	O-ring
OR-00040A	2	O-ring

"R" PUMP ASSEMBLY; SIZE XXX

(PU-05002-40)/(PU-05002-60)/(PU-05002-80)/(PU-05002-120)

*Rebuilds Kits for R Pumps are on pages 62, 63 and 64 respectfully.



"R" PUMP ASSEMBLY (PU-05002-XXX)			
ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	202220	SLEEVE, PUMP BASE, CLSC
2	1	202221	RETAINING NUT, PUMP BASE, CLSC
3	1	202228	O-RING,TEFLON, -218, 55D
4	1	HI-05016	3/4 NPTM X 3/4 NPTF SW
5	1	HI-05038	1/4 NPT X 9/16-18 JIC 90 DEG E
6	2	HI-05067	PIPE PLUG 1/4"-18; 7/8 TAPER S
7	2	OR-00011A	O-RING; CROSSOVER TUBE #014
8	2	OR-00046A	O-RING #133; VITON 90D PUMP CYL
9	1	PU-01003-DG	INLET BALL SEAT GASKET
10	1	PU-01003-IG	GASKET, DISCHARGE BALL SEAT, CLSC
11	1	PU-01013A	CYLINDER FLANGE GASKET
12*	1	PU-01016A-XXX	Piston Seal, XXX Pump
13	1	PU-03001	Triple Lip Seal, XXX Pump
14	1	PU-03011	SHAFT BEARING, 80, R
15*	1	PU-05011-XXX	PUMP SHAFT ASSY
16*	1	PU-05012-XXX	CYLINDER
17*	1	PU-05014-XXX	PUMP FLANGE
18	1	PU-05017	CROSSOVER TUBE
19	1	PU-05018	PUMP BASE
20	1	PU-05019	SEAT, INLET
21	1	PU-05020	BALL, INLET
22	1	PU-05021	SPRING
23	1	PU-05023-1	GASKET, PUMP RETAINER NUT, CLSC
24	1	PU-05024	SEAT, DISCHARGE, CLSC
25	1	PU-05025	BALL, DISCHARGE, CLSC
26	4	PU-05026	TIE ROD; 3/8-24 X 10-3/8
27	4	PU-05027	WASHER
28	4	PU-05028	NUT
29*	1	PU-05029-XXX	PIN
30*	1	PU-05030-XXX	SNAP RING
31*	1	PU-05031-XXX	PISTON CLEVIS, MALE
32*	1	PU-05032-XXX	Flange, R Packing Retainer
33	1	PU-05042	PISTON BEARING, 80
34	1	TN-04186	GREASE FITTING

VARIABLE ITEMS (PU-05002-XXX)				
ITEM	PU-05002-40	PU-05002-60	PU-05002-80	PU-05002-120
12	PU-01016A-004	PU-01016A-006	PU-01016A-008	PU-01016A-012
15	PU-05011-40	PU-05011-60	PU-05011-80	PU-05011-120
16	PU-05012-40	PU-05012-60	PU-05012-80	PU-05012
17	PU-05014-40	PU-05014-60	PU-05014-80	PU-05014-120
29	PU-05029-40	PU-05029-60	PU-05029-80	PU-05029
30	PU-05030-40	PU-05030-60	PU-05030-80	PU-05030
31	PU-05031-40	PU-05031-60	PU-05031-80	PU-05031
32	PU-05032-40	PU-05032-60	PU-05032-80	PU-05032

“R” PUMP REBUILD KITS

*Assembly instructions included in kit.

120 “R” PUMP REBUILD KIT* (KT-07001)		
PART NUMBER	QTY	DESCRIPTION
PU-03000	1	Triple Lip Seal, 120 Pump
PU-01016A-012	1	Piston Seal; 120 Pump
PU-01013A	1	Cylinder Flange Gasket
PU-03010	1	Shaft Bearing, 120, "R" Side
PU-05041	1	Piston Bearing, 120
PU-05029	1	Pin
PU-03019	1	Bullet, 120
OR-00011A	2	O-Ring; 12x2mm ID
OR-00046A	2	O-Ring #133; Viton 90D Pump Cy
PU-05030	1	Snap Ring
TN-04199	2	SHCS, Bolt, 3/8-24 x 2.5
OR-00045A	2	O-Ring #028 Viton 90D
OR-00051B	1	O-Ring #218 Alfes 80D
PU-01003-IG	1	Discharge Ball Seat Gasket
PU-01003-DG	1	Inlet Ball Seat Gasket
PU-05023-1	1	Gasket; Pump Retainer Nut

80 "R" PUMP REBUILD KIT* (KT-07003)		
PART NUMBER	QTY	DESCRIPTION
PU-03001	1	Triple Lip Seal, 80 Pump
PU-03011	1	Shaft Bearing, 80, "R" Side
PU-01016A-008	1	Piston Seal; 80 Pump
PU-01013A	1	Cylinder Flange Gasket
PU-05029-80	1	Pin
PU-05042	1	Piston Bearing, 80
PU-03020	1	Bullet, 80
OR-00011A	2	O-Ring; 12x2mm ID
OR-00046A	2	O-Ring #133; Viton 90D Pump Cy
PU-05030-80	1	Snap Ring
TN-04199	2	SHCS, Bolt, 3/8-24 x 2.5
OR-00045A	2	O-Ring #028 Viton 90D
OR-00051B	1	O-Ring #218 Alfes 80D
PU-01003-IG	1	Discharge Ball Seat Gasket
PU-01003-DG	1	Inlet Ball Seat Gasket
PU-05023-1	1	Gasket; Pump Retainer Nut

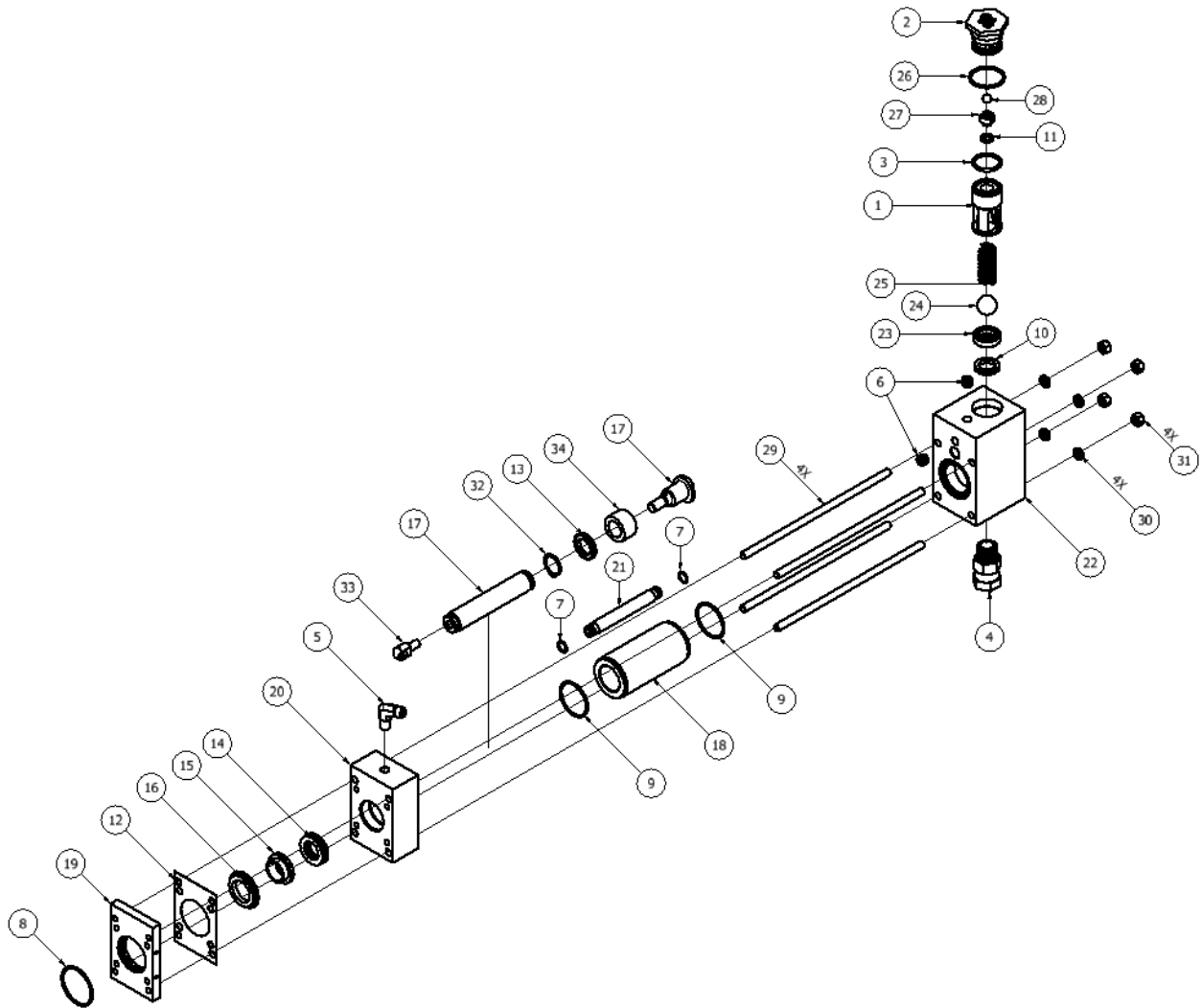
60 "R" PUMP REBUILD KIT* (KT-07005)		
PART NUMBER	QTY	DESCRIPTION
PU-03002	1	Triple Lip Seal, 60 Pump
PU-03012	1	Shaft Bearing, 60, "R" Side
PU-01016A-006	1	Piston Seal; 60 Pump
PU-01013A	1	Cylinder Flange Gasket
PU-05029-60	1	Pin
PU-05043	1	Piston Bearing, 60
PU-03022	1	Bullet, 60
OR-00011A	2	O-Ring; 12x2mm ID
OR-00046A	2	O-Ring #133; Viton 90D Pump Cy
PU-05030-60	1	Snap Ring
TN-04199	2	SHCS, Bolt, 3/8-24 x 2.5
OR-00045A	2	O-Ring #028 Viton 90D
OR-00051B	1	O-Ring #218 Alfes 80D

40 "R" PUMP REBUILD KIT* (KT-07007)		
PART NUMBER	QTY	DESCRIPTION
KT-01016A-004	1	Piston Seal; 40 Pump Kit
OR-00011A	2	O-Ring, 12x12mm ID
OR-00046A	2	O-Ring #133, Viton 90D Pump Cy
OR-00051B	1	O-Ring, #218 Aflas 80D
PU-01013A	1	Cylinder Flange Gasket
PU-05029-40	1	Pin
PU-03013	1	Shaft Bearing, 40, R-Side
PU-05044	1	Piston Bearing, 40
PU-03003	1	Triple Lip Seal, 40 Pump
PU-03023	1	Bullet, 40
TN-04199	2	SHCS, Bolt, 3/8-24 x 2.5
OR-00045A	2	O-Ring #028 Viton 90D
OR-00051B	1	O-Ring #218 Aflas 80D
PU-01003-IG	1	Discharge Ball Seat Gasket
PU-01003-DG	1	Inlet Ball Seat Gasket
PU-05023-1	1	Gasket, Pump Retainer Nut

"A" PUMP ASSEMBLY; SIZE XXX

(PU-05001-40)/(PU-05001-60)/(PU-05001-80)/(PU-05001-120)

*Rebuild kit for 120 A Pump is on page 67 (assembly instructions included)



"A" PUMP ASSEMBLY (PU-05001-XXX)			
ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	202220	SLEEVE, PUMP BASE, CLSC
2	1	202221	RETAINING NUT, PUMP BASE, CLSC
3	1	202228	O-RING, TEFLON, -218, 55D
4	1	HI-05016	3/4 NPTM X 3/4 NPTF SW
5	1	HI-05038	1/4 NPT X 9/16-18 JIC 90 DEG E
6	2	HI-05067	PIPE PLUG 1/4"-18; 7/8 TAPER S
7	2	OR-00011A	O-RING; CROSSOVER TUBE #014
8	1	OR-00020A	#136 VITON LUBE CYLINDER O-RING
9	2	OR-00046A	O-RING #133; VITON 90D PUMP CYL
10	1	PU-01003-DG	INLET BALL SEAT GASKET
11	1	PU-01003-IG	GASKET, DISCHARGE BALL SEAT, CLSC
12	1	PU-01013A	CYLINDER FLANGE GASKET
13*	1	PU-01016A-XXX	Piston Seal, XXX Pump
14	1	PU-03001	Triple Lip Seal, 80 Pump
15	1	PU-03006	SHAFT BEARING, 80, A
16	1	PU-03016	RETAINING RING, 80, 60, A
17*	1	PU-05011-XXX	PUMP SHAFT ASSY
18*	1	PU-05012-XXX	CYLINDER
19	1	PU-05013	"A" PACKING RETAINER FLANGE
20*	1	PU-05014-XXX	PUMP FLANGE
21	1	PU-05017	CROSSOVER TUBE
22	1	PU-05018	PUMP BASE
23	1	PU-05019	SEAT, INLET
24	1	PU-05020	BALL, INLET
25	1	PU-05021	SPRING
26	1	PU-05023-1	GASKET, PUMP RETAINER NUT, CLSC
27	1	PU-05024	SEAT, DISCHARGE, CLSC
28	1	PU-05025	BALL, DISCHARGE, CLSC
29	4	PU-05026	TIE ROD; 3/8-24 X 10-3/8
30	4	PU-05027	WASHER
31	4	PU-05028	NUT
32*	1	PU-05030-XXX	SNAP RING
33*	1	PU-05031-XXX	PISTON, CLEVIS, MALE
34	1	PU-05042	PISTON BEARING, 80

VARIABLE ITEMS (PU-05001-XXX)				
ITEM	PU-05001-40	PU-05001-60	PU-05001-80	PU-05001-120
13	PU-01016A-004	PU-01016A-006	PU-01016A-008	PU-01016A-012
17	PU-05011-40	PU-05011-60	PU-05011-80	PU-05011-120
18	PU-05012-40	PU-05012-60	PU-05012-80	PU-05012
20	PU-05014-40	PU-05014-60	PU-05014-80	PU-05014-120
32	PU-05030-40	PU-05030-60	PU-05030-80	PU-05030
33	PU-05031-40	PU-05031-60	PU-05031-80	PU-05031

“A” PUMP REBUILD KITS

*Assembly instructions included in kit.

120 “A” PUMP REBUILD KIT* (KT-07000)		
PART NUMBER	QTY	DESCRIPTION
PU-03000	1	Triple Lip Seal, 120 Pump
PU-03005	1	Shaft Bearing, 120, "A" Side
PU-01016A-012	1	Piston Seal; 120 Pump
PU-01013A	1	Cylinder Flange Gasket
PU-05029	1	Pin
PU-05041	1	Piston Bearing, 120
PU-03019	1	Bullet, 120
OR-00011A	2	O-Ring; 12x2mm ID
OR-00046A	2	O-Ring #133; Viton 90D Pump Cy
OR-00044A	1	O-Ring #024; Lube Cylinder
OR-00020A	2	#136 Viton Lube Cylinder O-Rin
TN-04199	2	SHCS, Bolt, 3/8-24 x 2.5
PU-05030	1	Snap Ring
PU-03021	1	A Side Seal Tool
OR-00045A	2	O-Ring #028 Viton 90D
OR-00051B	1	O-Ring #218 Alfas 80D
PU-01003-IG	1	Discharge Ball Seat Gasket
PU-01003-DG	1	Inlet Ball Seat Gasket
PU-05023-1	1	Gasket; Pump Retainer Nut
RA-00065A	1	Plug; Pump Cylinder

80 "A" PUMP REBUILD KIT* (KT-07002)		
PART NUMBER	QTY	DESCRIPTION
PU-03001	1	Triple Lip Seal, 80 Pump
PU-03006	1	Shaft Bearing, 80, "A" Side
PU-01016A-008	1	Piston Seal; 80 Pump
PU-01013A	1	Cylinder Flange Gasket
PU-05029-80	1	Pin
PU-05042	1	Piston Bearing, 80
PU-03020	1	Bullet, 80
PU-03016	1	Retaining Ring, 80, "A" Side
OR-00011A	2	O-Ring; 12x2mm ID
OR-00046A	2	O-Ring #133; Viton 90D Pump Cy
OR-00020A	2	#136 Viton Lube Cylinder O-Rin
OR-00044A	1	O-Ring #024; Lube Cylinder
TN-04199	2	SHCS, Bolt, 3/8-24 x 2.5
PU-05030-80	1	Snap Ring
PU-03021	1	A Side Seal Tool
OR-00045A	2	O-Ring #028 Viton 90D
OR-00051B	1	O-Ring #218 Alfas 80D
PU-01003-IG	1	Discharge Ball Seat Gasket
PU-01003-DG	1	Inlet Ball Seat Gasket
PU-05023-1	1	Gasket; Pump Retainer Nut
RA-00065A	1	Plug; Pump Cylinder

60 "A" PUMP REBUILD KIT* (KT-07004)		
PART NUMBER	QTY	DESCRIPTION
PU-03002	1	Triple Lip Seal, 80 Pump
PU-03007	1	Shaft Bearing, 80, "A" Side
PU-01017A-006	1	Piston Seal; 60 Pump
PU-01013A	1	Cylinder Flange Gasket
PU-05029-60	1	Pin
PU-05043	1	Piston Bearing, 60
PU-03022	1	Bullet, 60
PU-03016	1	Retaining Ring, 80, "A" Side
OR-00011A	2	O-Ring; 12x2mm ID
OR-00046A	2	O-Ring #133; Viton 90D Pump Cy
OR-00020A	2	#136 Viton Lube Cylinder O-Rin
OR-00044A	1	O-Ring #024; Lube Cylinder
TN-04199	2	SHCS, Bolt, 3/8-24 x 2.5
PU-03021	1	A Side Seal Tool
OR-00045A	2	O-Ring #028 Viton 90D
OR-00051B	1	O-Ring #218 Alfas 80D
PU-01003-IG	1	Discharge Ball Seat Gasket
PU-01003-DG	1	Inlet Ball Seat Gasket
PU-05023-1	1	Gasket; Pump Retainer Nut
RA-00065A	1	Plug; Pump Cylinder

40 "A" PUMP REBUILD KIT* (KT-07006)		
PART NUMBER	QTY	DESCRIPTION
PU-03003	1	Triple Lip Seal, 40 Pump
PU-03008	1	Shaft Bearing, 40, "A" Side
PU-01016A-004	1	Piston Seal; 60 Pump
PU-01013A	1	Cylinder Flange Gasket
PU-05029-40	1	Pin
PU-05044	1	Piston Bearing, 40
PU-03023	1	Bullet, 40
PU-03017	1	Retaining Ring, 40, "A" Side
OR-00011A	2	O-Ring; 12x2mm ID
OR-00046A	2	O-Ring #133; Viton 90D Pump Cy
OR-00020A	2	#136 Viton Lube Cylinder O-Rin
OR-00044A	1	O-Ring #024; Lube Cylinder
TN-04199	2	SHCS, Bolt, 3/8-24 x 2.5
PU-03021	1	A Side Seal Tool
OR-00045A	2	O-Ring #028 Viton 90D
OR-00051B	1	O-Ring #218 Alfas 80D
PU-01003-IG	1	Discharge Ball Seat Gasket
PU-01003-DG	1	Inlet Ball Seat Gasket
PU-05023-1	1	Gasket; Pump Retainer Nut
RA-00065A	1	Plug; Pump Cylinder

PUMP BASE REPAIR KITS

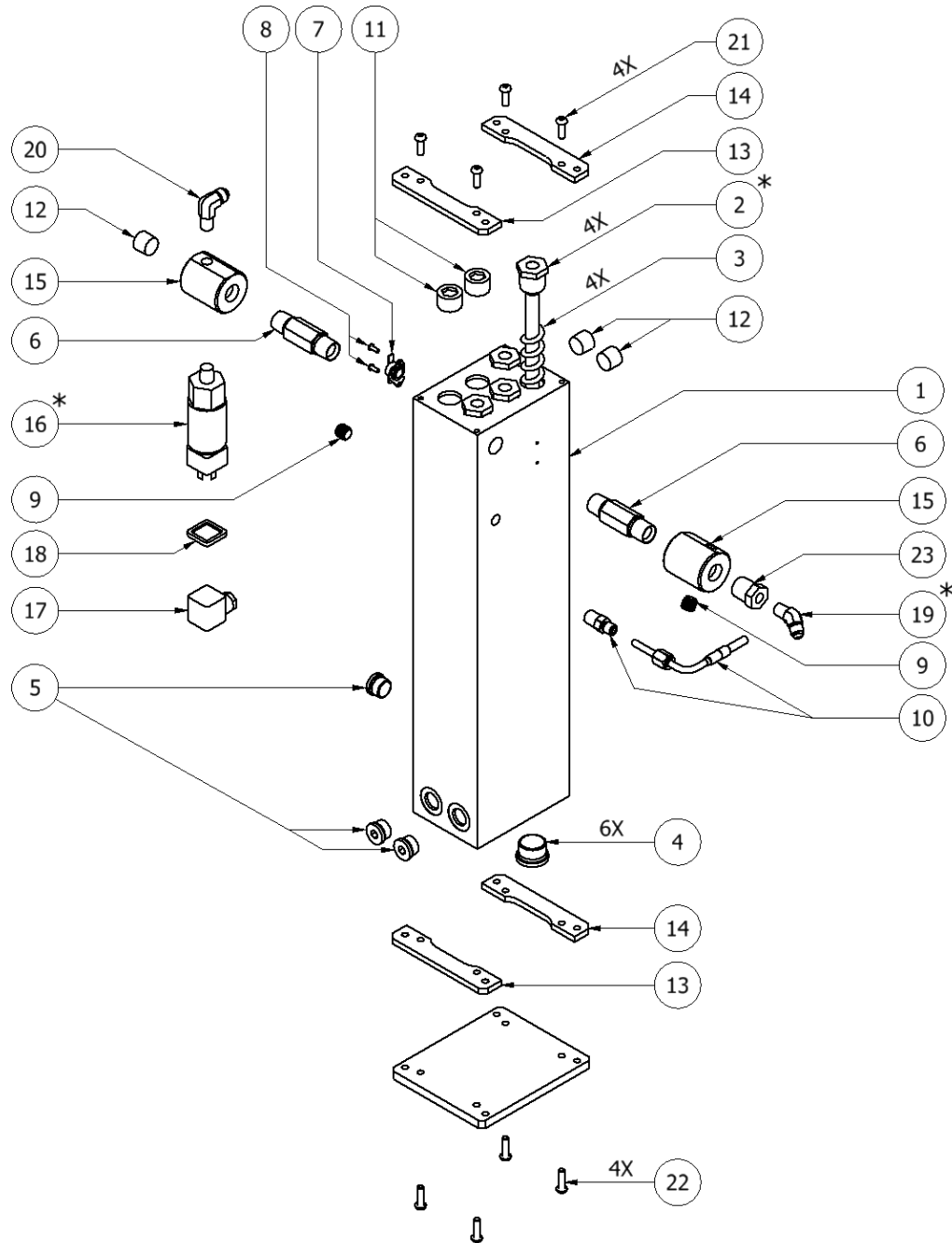
Pump Base Repair Kit (200716)		
QTY	PART NUMBER	DESCRIPTION
1	200706	CHECK VALVE REMOVAL TOOL, PUMP
2	HI-05067	PIPE PLUH 1/4-18 ; 7/8 TAPER
2	OR-00045A	O-RING #028 VITON 90D
1	OR-00051B	O-RING #218 AFLAS 80D
1	PU-01003-DG	INLET BALL SEAT GASKET
1	PU-01003-IG	DISCHARGE BALL SEAT GASKET
1	PU-05019	SEAT, INLET
1	PU-05020	BALL, INLET
1	PU-05021	SPRING
1	PU-05022A	SLEEVE
1	PU-05023-1	GASKET, PUMP RETAINER NUT
1	PU-05024	SEAT, DISCHARGE
1	PU-05025	BALL, DISCHARGE
1	TL-02	TOOL, BALL SEAT REMOVAL

Pump Base Repair Kit, Split Sleeve (202355)		
QTY	PART NUMBER	DESCRIPTION
1	200706	CHECK VALVE REMOVAL TOOL, PUMP
2	HI-05067	PIPE PLUG 1/4-18 ; 7/8 TAPER
2	OR-00045A	O-RING #028 VITON 90D
1	202228	O-RING, TEFLON, -218, 55D
1	PU-01003-DG	INLET BALL SEAT GASKET
1	PU-01003-IG	DISCHARGE BALL SEAT GASKET
1	PU-05019	SEAT, INLET
1	PU-05020	BALL, INLET
1	PU-05021	SPRING
1	202220	SLEEVE, PUMP BASE
1	PU-05023-1	GASKET, PUMP RETAINER NUT
1	PU-05024	SEAT, DISCHARGE
1	PU-05025	BALL, DISCHARGE
1	TL-02	TOOL, BALL SEAT REMOVAL

PH(X)-25 HEATER ASSEMBLY

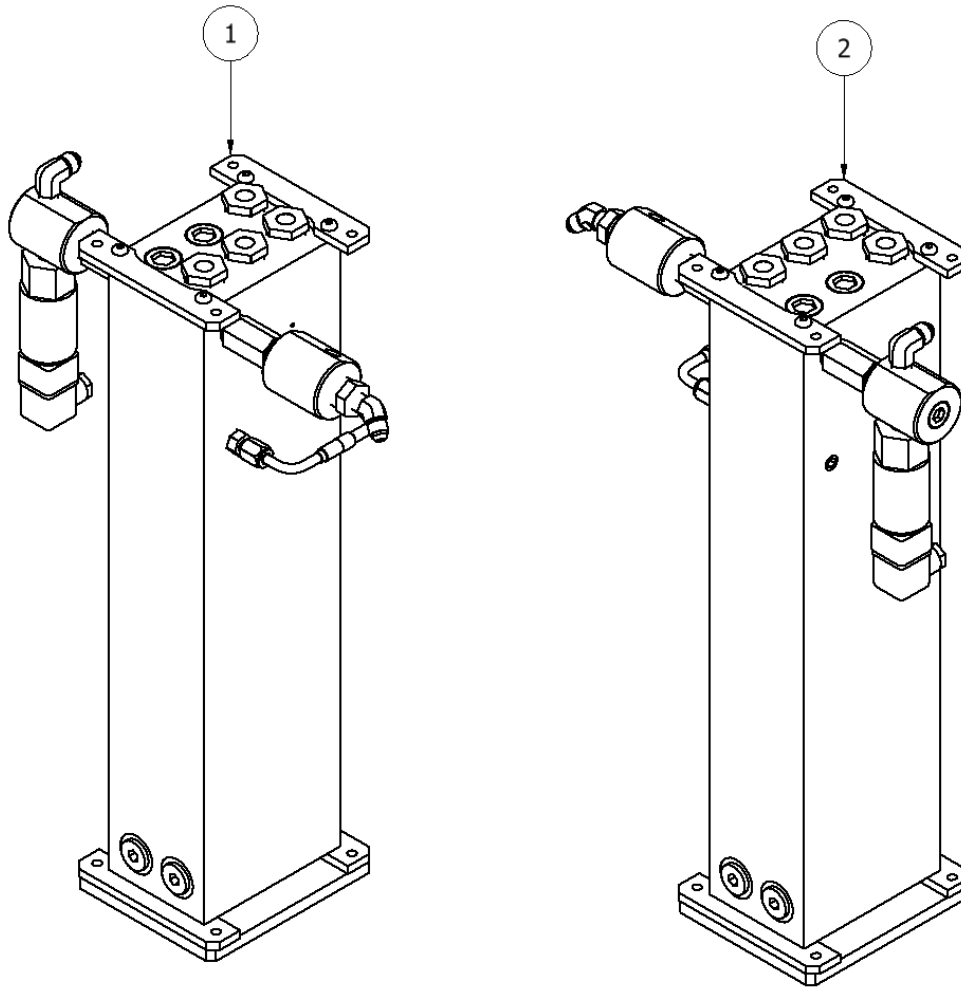
(PH-1/PH-3/PH-11 & PH-2/PH-4/PH-12)

*Heater Thermocouple Rebuild Kit is on page 78.



PH(X)-25 HEATER ASSEMBLY (PH-1/PH-3/PH-11 & PH-2/PH-4/PH-12)				
ITEM	QTY	PART NUMBER	DESCRIPTION	FOR HEATER/ PROPORTIONER
1	1	GM-05423-1	HEATER BODY	ALL
2*	4	GM-05423-1000	FIRE ROD; 1000W, 3/4 NPT, 17.5"	PH-11 PH-12
	4	GM-05423-1250	FIRE ROD; 1250W, 3/4 NPT, 17.5"	PH-1 PH-2
	4	GM-05423-1500	FIRE ROD; 1500W, 3/4 NPT, 17.5"	PH-3 PH-3
3	4	GM-05423-7	SPRING 18"	ALL
4	6	HI-05034	12 ORB PLUG	ALL
5	3	HI-05033	3/4-16 O-RING PLUG	ALL
6	2	EL-05032	1/2 NPT LONG HEX NIPPLE	ALL
7	1	EL-00006A	OVERTEMP SWITCH	ALL
8	2	FLOOR STOCK	#6-32 X 3/8 BHCS	ALL
9	2	HI-05036	1/4 NPT FLUSH SEAL PIPE PLUG	ALL
10	1	HI-05021	THERMOCOUPLE; TYPE E	ALL
11	2	HI-05037	3/4 NPT FLUSH SEAL PIPE PLUG	ALL
12	3	HI-05035	1/2 NPT FLUSH SEAL PIPE PLUG	ALL
13	2	GM-05423-9	PHENOLIC STANDOFF; BOTTOM FRONT	ALL
14	2	GM-05423-10	PHENOLIC STANDOFF; BOTTOM BACK	ALL
15	2	HI-05046-1/2	GAUGE MANIFOLD, 1/2	ALL
16*	1	EL-42-2200	PRESSURE SWITCH, 2200 PSI	PH-25
	1	EL-42-3200	PRESSURE SWITCH, 3200 PSI	PHX-25
17	1	EL-00052	SOLENOID VALVE CONNECTOR	ALL
18	1	EL-00053	SOLENOID VALVE GASKET	ALL
19*	1	HI-05026	OUTLET HEATER FITTING "R"	PH-2 PH-4 PH-12
	1	HI-05027	OUTLET HEATER FITTING "A"	PH-1 PH-3 PH-11
20	1	HI-05038	1/4 NPT X 9/16-18 JIC 90 DEG E	ALL
21	4	FLOOR STOCK	1/4-20 X 3/4 BHCS	ALL
22	4	FLOOR STOCK	1/4-20 X 7/8 BHCS	ALL
23	1	200219	1/2 NPTF MALE X 1/4 NPTF FEMALE	ALL

**Pressure Transducers (EL-195) are not included in the Heater Assemblies. See Page 78 for details.



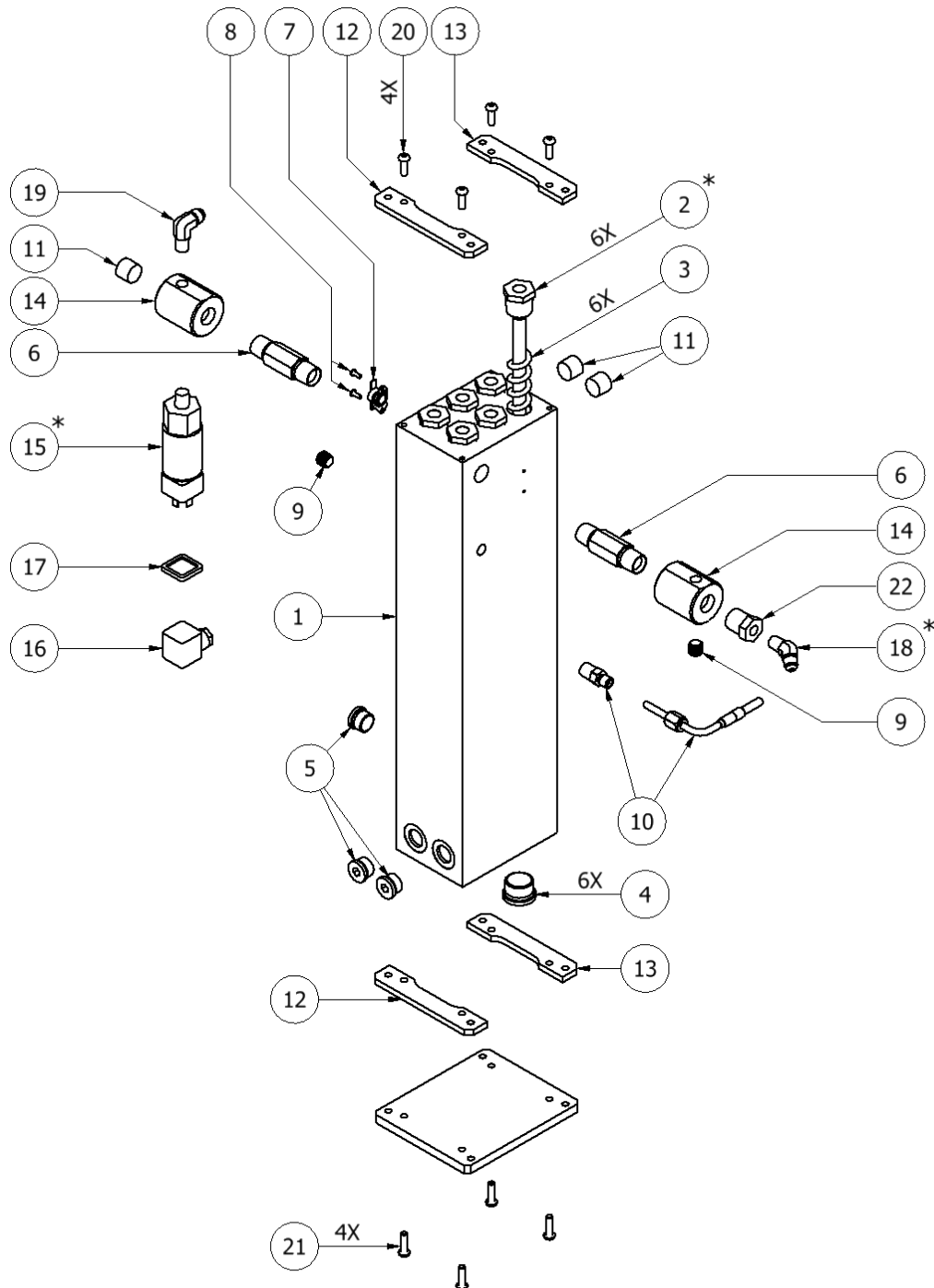
PH(X)-25 HEATER ASSEMBLY			
ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	PH-1	HEATER ASSEMBLY "A" SIDE; 5 KW
	1	PH-3	HEATER ASSEMBLY "A" SIDE; 6 KW
	1	PH-11	HEATER ASSEMBLY "A" SIDE; 4 KW
2	1	PH-2	HEATER ASSEMBLY "R" SIDE; 5 KW
	1	PH-4	HEATER ASSEMBLY "R" SIDE; 6 KW
	1	PH-12	HEATER ASSEMBLY "R" SIDE; 4 KW

NOTE: "A" AND "R" SIDE HEATERS ARE MIRRORED. THE ONLY DIFFERENCE IN PARTS IS THE OULET FITTING (ITEM 19)

PH(X)-40 HEATER ASSEMBLY

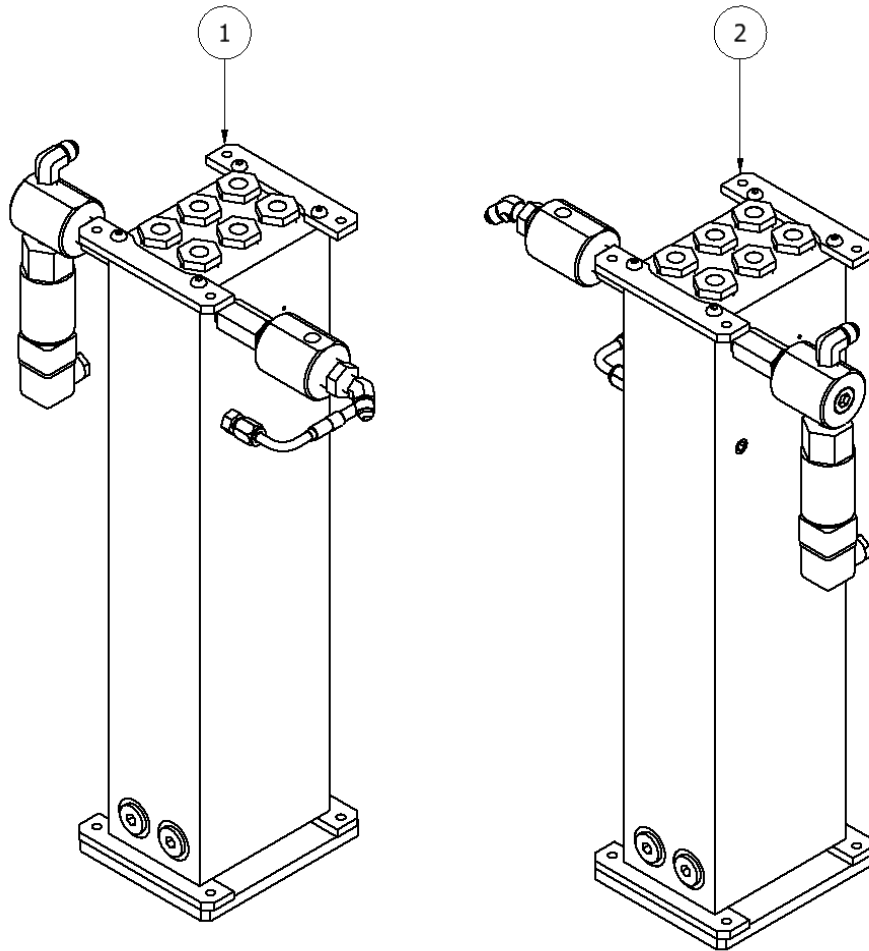
(PH-5/PH-7/PH-9 & PH-6/PH-8/PH-10)

***HEATER THERMOCOUPLE KIT IS ON PAGE 78 .**



PH(X)-40 HEATER ASSEMBLY (PH-5/PH-7/PH-9 & PH-6/PH-8/PH-10)				
ITEM	QTY	PART NUMBER	DESCRIPTION	FOR HEATER/ PROPORTIONER
1	1	GM-05423-1	HEATER BODY	ALL
2*	6	GM-05423-1250	FIRE ROD; 1250W, 3/4 NPT, 17.5"	PH-5 PH-6
	6	GM-05423-1500	FIRE ROD; 1500W, 3/4 NPT, 17.5"	PH-7 PH-8
	6	GM-05423-1750	FIRE ROD; 1750W, 3/4 NPT, 17.5"	PH-9 PH-10
3	6	GM-05423-7	SPRING 18"	ALL
4	6	HI-05034	12 ORB PLUG	ALL
5	3	HI-05033	3/4-16 O-RING PLUG	ALL
6	2	EL-05032	1/2 NPT LONG HEX NIPPLE	ALL
7	1	EL-00006A	OVERTEMP SWITCH	ALL
8	2	FLOOR STOCK	#6-32 X 3/8 BHCS	ALL
9	2	HI-05036	1/4 NPT FLUSH SEAL PIPE PLUG	ALL
10	1	HI-05021	THERMOCOUPLE; TYPE E	ALL
11	3	HI-05035	1/2 NPT FLUSH SEAL PIPE PLUG	ALL
12	2	GM-05423-9	PHENOLIC STANDOFF; BOTTOM FRONT	ALL
13	2	GM-05423-10	PHENOLIC STANDOFF; BOTTOM BACK	ALL
14	2	HI-05046-1/2	GAUGE MANIFOLD, 1/2	ALL
15*	1	EL-42-2200	PRESSURE SWITCH, 2200 PSI	PH-40
	1	EL-42-3750	PRESSURE SWITCH, 3750 PSI	PHX-40
16	1	EL-00052	SOLENOID VALVE CONNECTOR	ALL
17	1	EL-00053	SOLENOID VALVE GASKET	ALL
18*	1	HI-05026	OUTLET HEATER FITTING "R"	PH-6 PH-8 PH-10
	1	HI-05027	OUTLET HEATER FITTING "A"	PH-5 PH-7 PH-9
19	1	HI-05038	1/4 NPT X 9/16-18 JIC 90 DEG E	ALL
20	4	FLOOR STOCK	1/4-20 X 3/4 BHCS	ALL
21	4	FLOOR STOCK	1/4-20 X 7/8 BHCS	ALL
22	1	200219	1/2 NPTF MALE X 1/2 NPTF FEMALE	ALL

**Pressure Transducers (EL-195) are not included in the Heater Assemblies. See Page 78 for details.



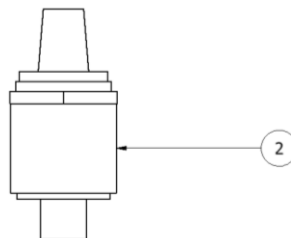
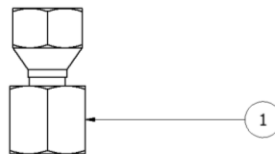
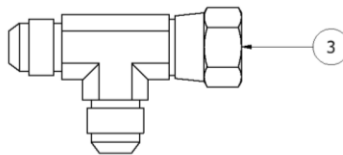
PH(X)-40 HEATER ASSEMBLY			
ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	PH-5	HEATER ASSEMBLY "A" SIDE; 7.5 KW
	1	PH-7	HEATER ASSEMBLY "A" SIDE; 9 KW
	1	PH-9	HEATER ASSEMBLY "A" SIDE; 10.5 KW
2	1	PH-6	HEATER ASSEMBLY "R" SIDE; 7.5 KW
	1	PH-8	HEATER ASSEMBLY "R" SIDE; 9 KW
	1	PH-10	HEATER ASSEMBLY "R" SIDE; 10.5 KW

NOTE: "A" AND "R" SIDE HEATERS ARE MIRRORED. THE ONLY DIFFERENCE IN PARTS IS THE OULET FITTING (ITEM 19)

HEATER THERMOCOUPLE KIT

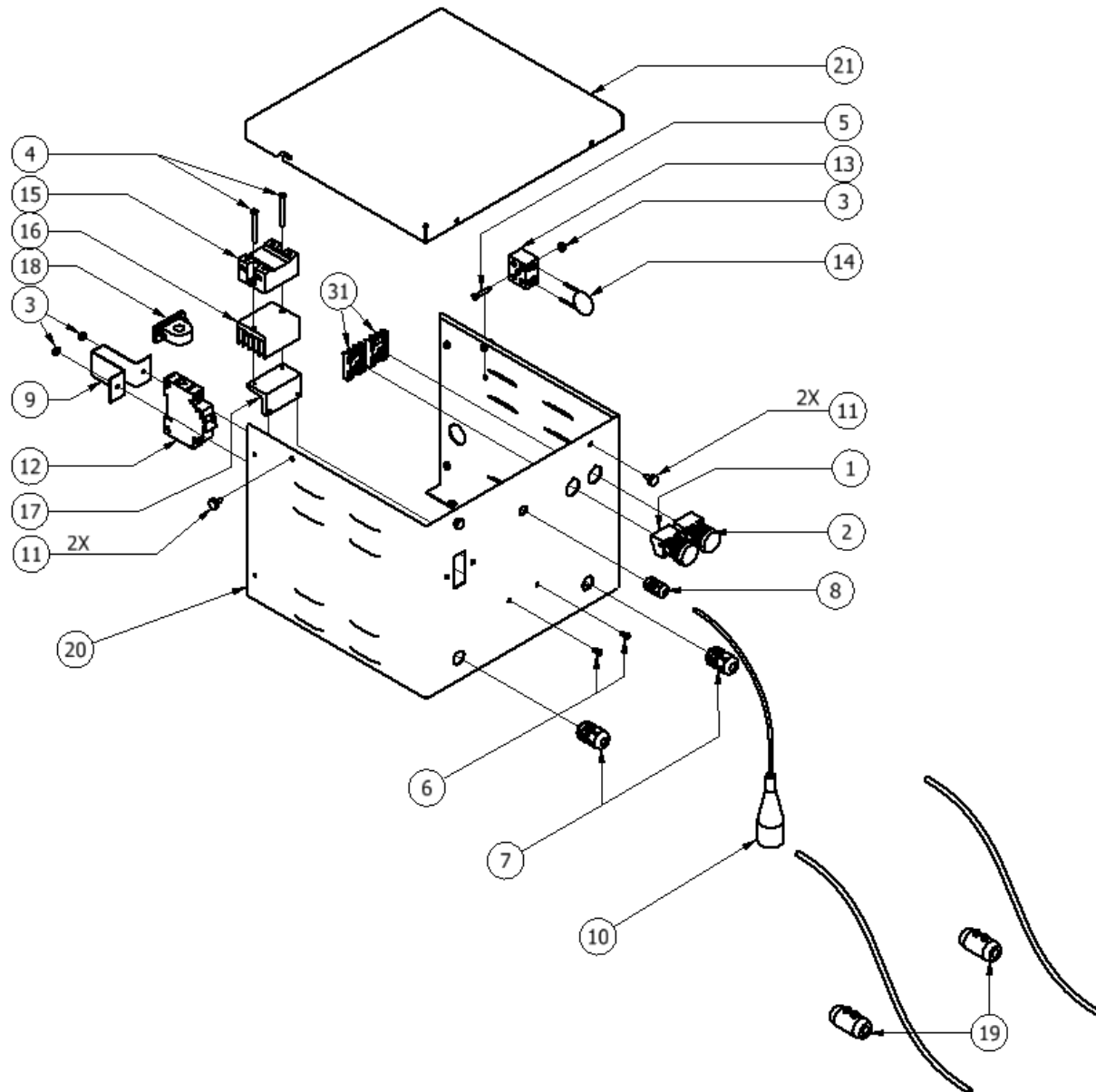
HEATER THERMOCOUPLE KIT (KT-05021)		
PART NUMBER	QTY	DESCRIPTION
HI-05020	1	Body, Nut, Ferrule
HI-05021	1	Thermocouple

PRESSURE TRANSDUCER ASSEMBLY



PRESSURE TRANSDUCER ASSEMBLY			
ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	HI-05006-6	1/4 NPT X 6 JIC GAUGE FITTING
2	1	EL-195	0-5000 PRESSURE TRANSDUCER
3	1	HI-05006-5	6 JIC SWIVEL NUT RUN TEE

TRANSFORMER COVER ASSEMBLY

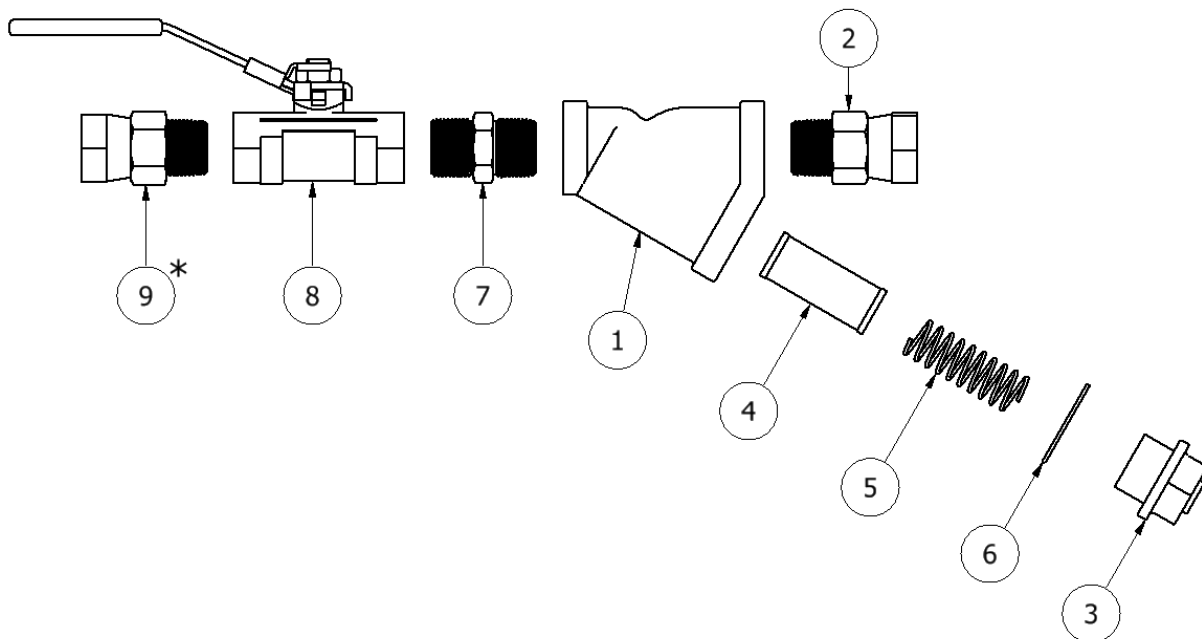


TRANSFORMER COVER ASSEMBLY			
ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	201242	LIGHT UNIT, RED, 120VAC
2	1	201243	LIGHT UNIT, WHITE, 120VAC
3	3	FLOOR STOCK	8-32 Hex Nut
4	2	FLOOR STOCK	8-32 x 1 3/4 Pan Head Machine Screw
5	1	FLOOR STOCK	8-32 x 1 Pan Head Machine Screw
6	2	FLOOR STOCK	8-32 x 3/8 Button Head Cap Screw
7	2	EL-000P12	HAYCO #6 AWG SR
8	1	EL-000P7	HAYCO SR THERMOCOUPLE
9	1	EL-00118A-00-1	HOSE BREAKER MOUNTING PLATE
10	1	EL-05235	THERMOCOUPLE HARNESS; 24"
11	4	EL-05700-27	TRANSFORMER KNOB
12	1	EL-150	CIRCUIT BRAKER, 63AMP
13	1	EL-192	TERMINAL BLOCK
14	1	EL-193	INRUSH CURRENT LIMITER
15	1	EL-35	HOSE HEAT RELAY
16	1	EL-35-1	HEAT SINK
17	1	EL-35-2	RELAY BRACKET
18	1	EL-37	TRANSFORMER; SIGNAL
19	2	KT-00029A-1	HOSE HEAT; CONNECTOR BODY
20	1	RM-05700-25	TRANSFORMER COVER; SIDES
21	1	RM-05700-26	TRANSFORMER COVER; TOP

Y-STRAINER ASSEMBLY

(YS-1 & YS-2)

*Inlet Monitoring Kit is on page 82



Y-STRAINER ASSEMBLY (YS-1 & YS-2)				
ITEM	QTY	PART NUMBER	DESCRIPTION	FOR Y-STRAINER
1	1	RA-00074-00A	Y-STRAINER	ALL
2	1	HI-05016	3/4" SWIVEL FITTING	ALL
3	1	RA-00074-04	Y-STRAINER NUT	ALL
4	1	RA-00074-03-30A	REPLACEMENT SCREEN; 30 MESH	ALL
	1	RA-00074-03-60A	REPLACEMENT SCREEN; 60 MESH (STANDARD)	ALL
	1	RA-00074-03-80A	REPLACEMENT SCREEN; 80 MESH	ALL
5	1	SP-00009A	REPLACEMENT SPRING	ALL
6	1	RA-00074-02A	REPLACEMENT GASKET	ALL
7	1	HI-05017	3/4" HEX NIPPLE	ALL
8	1	RA-00078A	3/4" BALL VALVE	ALL
9*	1	HI-05016	3/4" X 3/4" SWIVEL FITTING "R" SIDE	YS-2
	1	HI-05018	3/4" X 1/2" SWIVEL FITTING "A" SIDE	YS-1

INLET MONITORING KIT

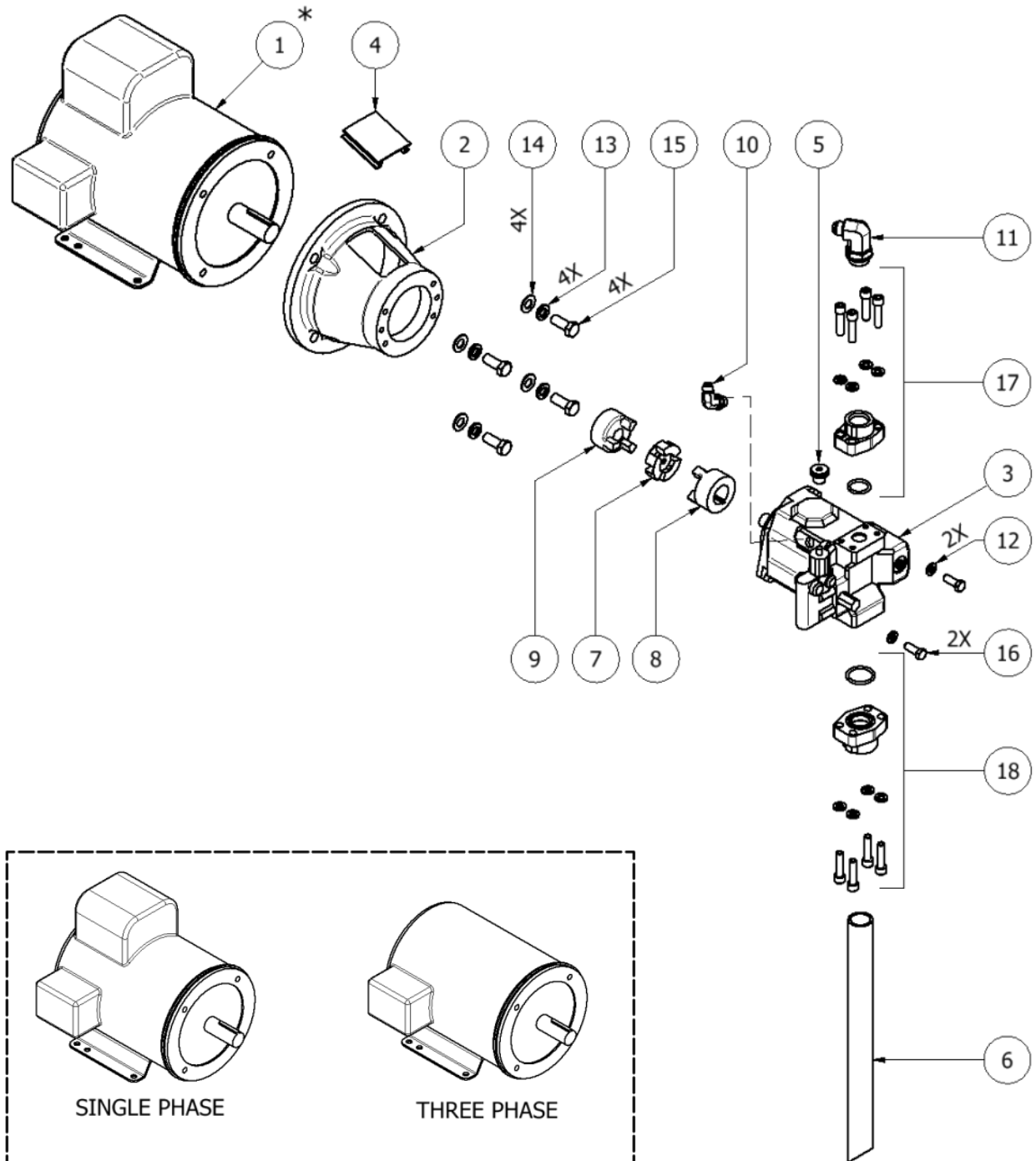
INLET MONITORING KIT (KT-05005)		
PART NUMBER	QTY	DESCRIPTION
HI-05016	2	3/4 MPT X 3/4 FPT SW
HI-05017	2	3/4 MPT Hex Nipple
HI-05051	2	Parker Pipe Fit Male Run Tee M
HI-05052	2	Parker Pipe Fit Female Pipe Tee
HI-05053	4	Parker Pipe Fit Pipe Thread
HI-05054	2	Pressure Gauge 0-400 PSI
HI-05055	2	Temp Gauge 0-200 Deg F/C

This exploded view diagram illustrates the assembly of a laboratory instrument. The main components are numbered 1 through 18. Part 1 is the central rectangular body. Part 2 is a small square plate. Part 3 is a square frame. Part 4 is a vertical assembly of four rings. Part 5 is a circular disc. Part 6 is a vertical rod. Part 7 and 8 are long vertical rods. Part 9 is a small circular component. Part 10 is a circular ring. Part 11 is a small bracket. Part 12 is a small rectangular plate. Part 13 is a set of eight small screws. Part 14, 15, and 16 are sets of four small screws. Part 17 is a set of sixteen small screws. Part 18 is a set of sixteen small screws. The diagram shows the relative positions and assembly sequence of these parts, with dashed lines indicating the alignment of screws and rods.

FRAME/TANK ASSEMBLY (FR-1)			
ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	FR-2	UPRIGHT ASSEMBLY
2	4	TN-05704	4" CASTER
3	1	HI-00014-03A	TANK TOP GASKET
4	1	HI-00047A	HYDRAULIC FILL STRAINER
5	1	HI-00002-A-1	TANK TOP GROMMET
6	1	HI-00001A	SIGHT GAUGE
7	1	HI-05041	CASE DRAIN RETURN TUBE 3/8
8	1	HI-05042	CASE DRAIN RETURN TUBE 1/2
9	1	HI-05048	DRAIN PLUG
10	1	MQ-01008A	LUBE BOTTLE BRACKET
11	2	FLOOR STOCK	#8-32 X 1/2 BHCS
12	4	FLOOR STOCK	3/8-16 X 2-1/4 SHCS
13	8	FLOOR STOCK	1/4-20 X 5/8 BHCS
14	8	FLOOR STOCK	1/4 PLAIN WASHER
15	8	FLOOR STOCK	1/4 LOCK WASHER
16	8	FLOOR STOCK	1/4-20 X 5/8 HEX CAP SCREW
17	16	FLOOR STOCK	5/16 LOCK WASHER
18	16	FLOOR STOCK	5/16-18 X 1/2 HEX CAP SCREW

MOTOR LINE ASSEMBLY

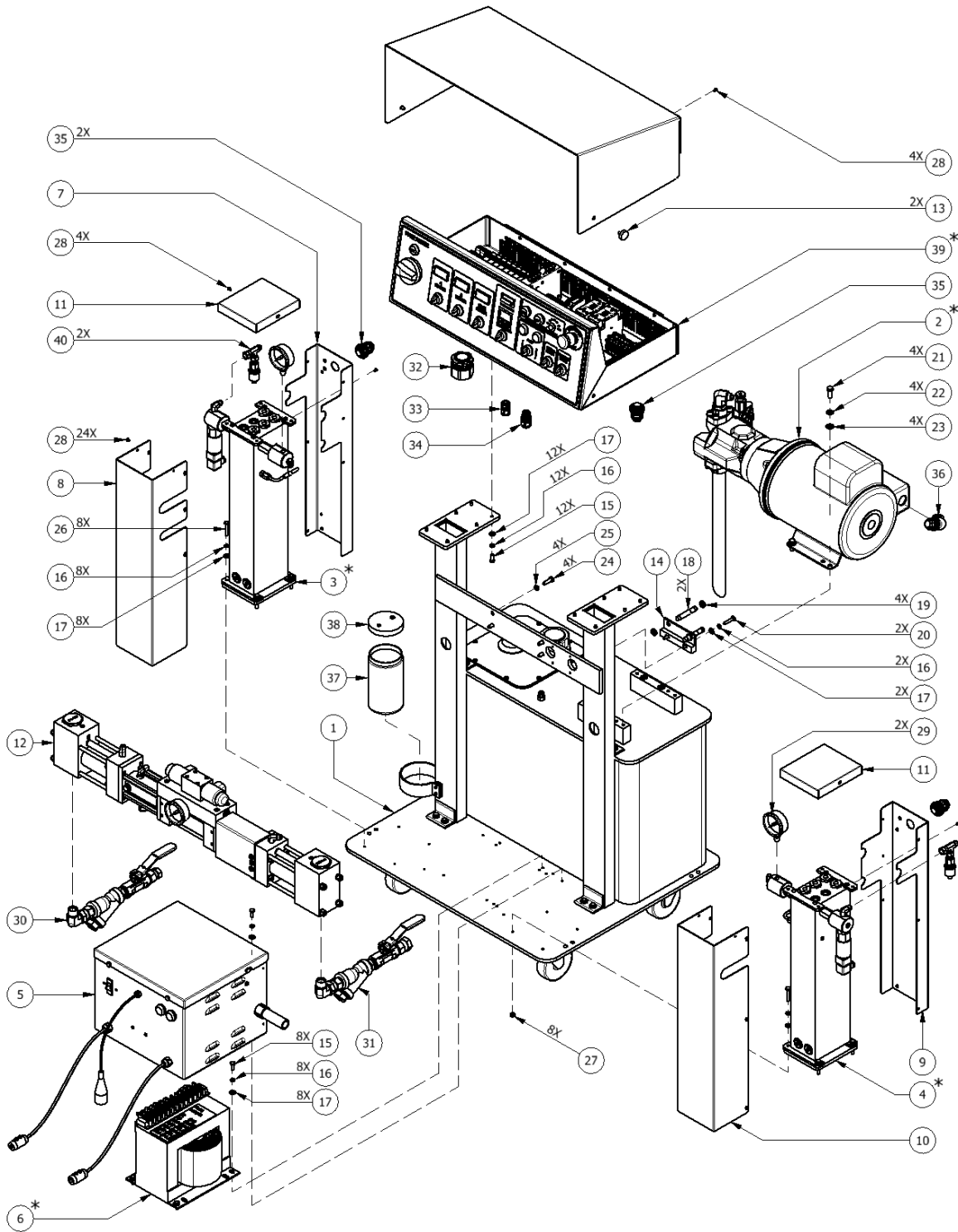
(ML-1)/(ML-2)/(ML-3)/(ML-4)



MOTOR LINE ASSEMBLY				
ITEM	QTY	PART NUMBER	DESCRIPTION	FOR MOTOR
1*	1	EL-05224	ELECTRIC MOTOR, 3HP, 3PH, 50/60HZ	ML-1
	1	EL-05221	ELECTRIC MOTOR, 3HP, 1PH, 60HZ	ML-2
	1	EL-05222	ELECTRIC MOTOR, 5HP, 1PH, 60HZ	ML-3
	1	EL-05223	ELECTRIC MOTOR, 5HP, 3PH, 50/60HZ	ML-4
2	1	HI-05001	BELL HOUSING	ALL
3	1	HI-05004	HYDRAULIC PUMP; 18CC	ALL
4	1	HI-00005-03	ACCESS COVER	ALL
5	1	HI-05004-1	CONTROL KNOB; HYDRAULIC PUMP	ALL
6	1	HI-00049A	1X16 BLACK PIPE FOR HYDRAULIC	ALL
7	1	HI-00067	MAGNALOY INSERT 9.45HP	ALL
8	1	HI-00065-03	MAGNALOY HUB; 3/4 X 3/16	ALL
9	1	HI-00065-02	MAGNALOY HUB; 1-1/8 X 1/4	ALL
10	1	HI-05007	6 ORB X 6 JIC 90 DEGREE	ALL
11	1	HI-05008	FITTING 1-1/16 O-RING X 3/4-16 JIC	ALL
12	2	FLOOR STOCK	3/8 LOCK WASHER	ALL
13	4	FLOOR STOCK	1/2 LOCK WASHER	ALL
14	4	FLOOR STOCK	1/2 PLAIN WASHER	ALL
15	4	FLOOR STOCK	1/2-13 X 1-1/4 HEX CAP SCREW	ALL
16	2	FLOOR STOCK	3/8-16 X 1 HEX CAP SCREW	ALL
17	1	HI-05009	HYDRAULIC PUMP OUTLET FLANGE	ALL
18	1	HI-05010	HYDRAULIC PUMP INLET FLANGE	ALL

PH-SERIES PROPORTIONER

(PH(X)-25 & PH(X)-40)

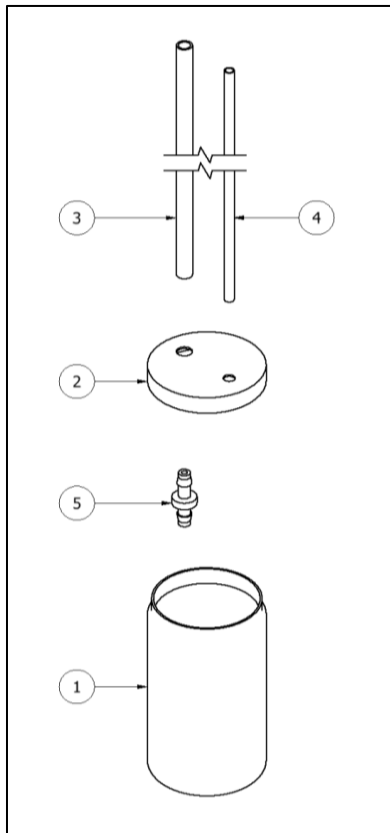


PH SERIES PROPORTIONER (PH(X)-25 & PH(X)-40)				
ITEM	QTY	PART NUMBER	DESCRIPTION	FOR MACHINE
1	1	FR-1	FRAME/TANK ASSEMBLY (PAGE 82)	ALL
2*	1	ML-1	MOTOR LINE ASSY; 3HP, 3PH, 50/60HZ (PAGE 85)	PH(X)-25
	1	ML-2	MOTOR LINE ASSY; 3HP, 1PH, 60HZ (PAGE 85)	
	1	ML-3	MOTOR LINE ASSY; 5HP, 1PH, 60HZ (PAGE 85)	PH(X)-40
	1	ML-4	MOTOR LINE ASSY; 5HP, 3PH, 50/60HZ (PAGE 85)	
3*	1	PH-1	"A" SIDE HEATER; 5KW (PAGE 72)	PH(X)-25
	1	PH-3	"A" SIDE HEATER; 6KW (PAGE 72)	
	1	PH-11	"A" SIDE HEATER; 4KW (PAGE 72)	
	1	PH-5	"A" SIDE HEATER; 7.5 KW (PAGE 75)	PH(X)-40
	1	PH-7	"A" SIDE HEATER; 9.0 KW (PAGE 75)	
	1	PH-9	"A" SIDE HEATER; 10.5 KW (PAGE 75)	
4*	1	PH-2	"R" SIDE HEATER; 5KW (PAGE 72)	PH(X)-25
	1	PH-4	"R" SIDE HEATER; 6KW (PAGE 72)	
	1	PH-12	"R" SIDE HEATER; 4KW (PAGE 72)	
	1	PH-6	"R" SIDE HEATER; 7.5 KW (PAGE 75)	PH(X)-40
	1	PH-8	"R" SIDE HEATER; 9.0 KW (PAGE 75)	
	1	PH-10	"R" SIDE HEATER; 10.5 KW (PAGE 75)	
5	1	-	TRANSFORMER COVER ASSEMBLY (PAGE 79)	ALL
6*	1	EL-05225	90V TRANSFORMER	PH(X)-25
	1	EL-05226	120V TRANSFORMER	PH(X)-40
7	1	CL-02001-05A	"A" HEATER COVER; BACK	ALL
8	1	CL-02001-06A	"A" HEATER COVER; FRONT	ALL
9	1	CL-02002-05A	"R" HEATER COVER; BACK	ALL
10	1	CL-02002-06A	"R" HEATER COVER; FRONT	ALL
11	2	CL-02001-07A	HEAT COVER; TOP	ALL
12	1	PL-1A	PUMPLINE ASSEMBLY; 120 PUMPS (PAGE 53)	ALL
	1	PL-2	PUMPLINE ASSEMBLY; 80 PUMPS (PAGE 53)	ALL
13	2	EL-05220-01	CONSOLE KNOBS	ALL
14	1	MQ-01005A	REVERSING SWITCH; MOUNTING PLATE	ALL
15	20	FLOOR STOCK	1/4-20 X 3/4 HEX CAP SCREW	ALL
16	30	FLOOR STOCK	1/4 LOCK WASHER	ALL
17	30	FLOOR STOCK	1/4 PLAIN WASHER	ALL
18	2	EL-153	12MM PROX SWITCH	ALL
19	4	FLOOR STOCK	M10 X 1.5 HEX JAM NUT	ALL
20	2	FLOOR STOCK	1/4-20 X 1-1/4 HEX CAP SCREW	ALL
21	4	FLOOR STOCK	3/8-16 X 1 HEX CAP SCREW	ALL
22	4	FLOOR STOCK	3/8 LOCK WASHER	ALL
23	4	FLOOR STOCK	3/8 PLAIN WASHER	ALL
24	4	FLOOR STOCK	5/16-18 X 1 HEX CAP SCREW	ALL

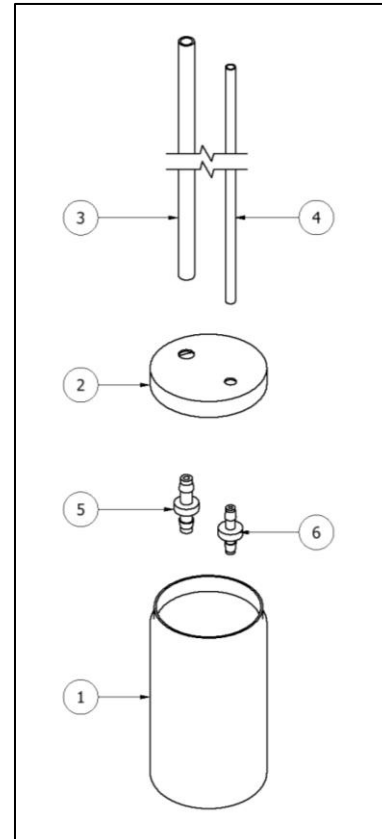
PH SERIES PROPORTIONER (PH(X)-25 & PH(X)-40)				
ITEM	QTY	PART NUMBER	DESCRIPTION	FOR MACHINE
25	4	FLOOR STOCK	5/16 LOCK WASHER	ALL
26	8	FLOOR STOCK	1/4-20 X 1-1/2 HEX CAP SCREW	ALL
27	8	FLOOR STOCK	1/4-20 HEX NUT	ALL
28	32	FLOOR STOCK	#8-32 X 1/4 HEX BHCS	ALL
29	2	HI-05028	PRESSURE GAUGE 0-3000 PSI	PH-25 PH-40
	2	HI-00035	PRESSURE GAUGE 0-5000 PSI	PHX-25 PHX-40
30	1	YS-1	Y-STRAINER ASSEMBLY "A" SIDE (PAGE 81)	ALL
31	1	YS-2	Y-STRAINER ASSEMBLY "R" SIDE (PAGE 81)	ALL
32	1	EL-00088-01A	HEYCO SR INCOMING POWER	ALL
33	1	EL-000P12	HAYCO #6	ALL
34	1	EL-000P13	STRAIN RELIEF	ALL
35	3	EL-05230-02	STRAIGHT CONDUIT CONNECTOR	ALL
36	1	EL-05230-03	RT ANGLE CONDUIT CONNECTOR	ALL
37	1	MQ-01009-01A	LUBE BOTTLE (PAGE 90 FOR ALL COMPONENTS)	ALL
38	1	MQ-01009-02A	LUBE BOTTLE LID (PAGE 90 FOR ALL COMPONENTS)	ALL
39*	1	EL-502-33	CONSOLE ASSEMBLY; 3HP, 3PH	PH(X)-25
	1	EL-501-31	CONSOLE ASSEMBLY; 3HP, 1PH	
	1	EL-504-53	CONSOLE ASSEMBLY; 5HP, 3PH	PH(X)-40
	1	EL-503-51	CONSOLE ASSEMBLY; 5HP, 1PH	
40	2	-	PRESSURE TRANSDUCER ASSEMBLY (PAGE 78)	ALL

LUBE BOTTLE COMPONENTS

PH-25/PH-40



PHX-25/PHX-40



LUBE BOTTLE ASSEMBLY

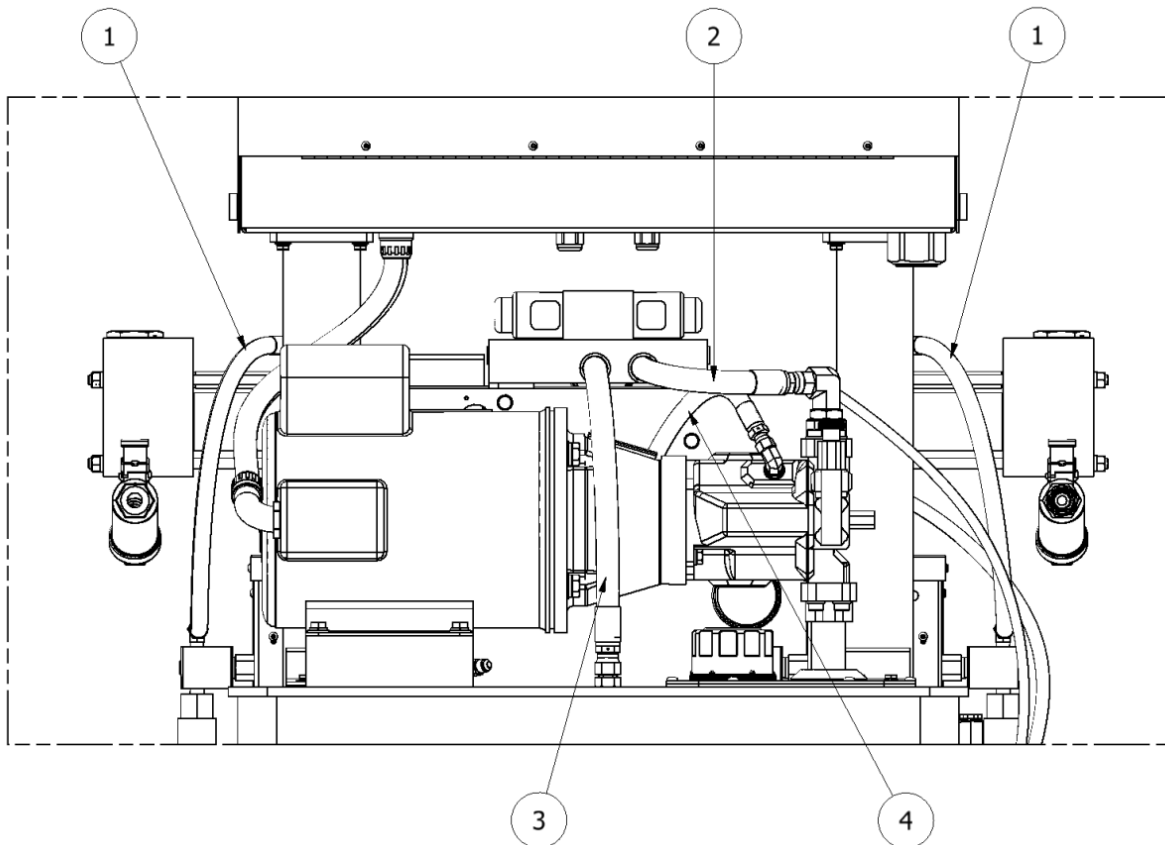
ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	MQ-01009-01A	LUBE BOTTLE
2	1	MQ-01009-02A	LUBE BOTTLE LID
3	1	MA-00024A	1/2" X 3' PLASTIC TUBING SUPPLY
4	1	MA-00025A	3/8" X 3' PLASTIC TUBING RETURN
5	1	RA-00068A	CHECK VALVE
6	1	RA-06008	CHECK VALVE (PHX-25/PHX-40 ONLY)
-	1	GP-00960-1-GAL	PUMP LUBE GALLON (NOT SHOWN)
-	1	GP-00960-1-QRT	PUMP LUBE QUART (NOT SHOWN)

PMC RECOMMENDED LUBE

PMC RECOMMENDED LUBE		
PART NUMBER	QTY	DESCRIPTION
GP-00960-1-QRT	1	Pump Lube Quart
GP-00960-1-GAL	1	Pimp Lube Gallon

HOSES

***Hose kits are on page 922.**



HOSES			
ITEM	QTY	PART NUMBER	DESCRIPTION
1	2	HI-05047	PUMP TO HEATER HOSE
2	1	HI-05014	HYDRAULIC PUMP OUTPUT HOSE 1/2
3	1	HI-05013	HYDRAULIC PUMP RETURN HOSE 1/2
4	1	HI-05047-1	HYDRAULIC PUMP DRAIN HOSE 3/8

HALF INCH HOSE KIT

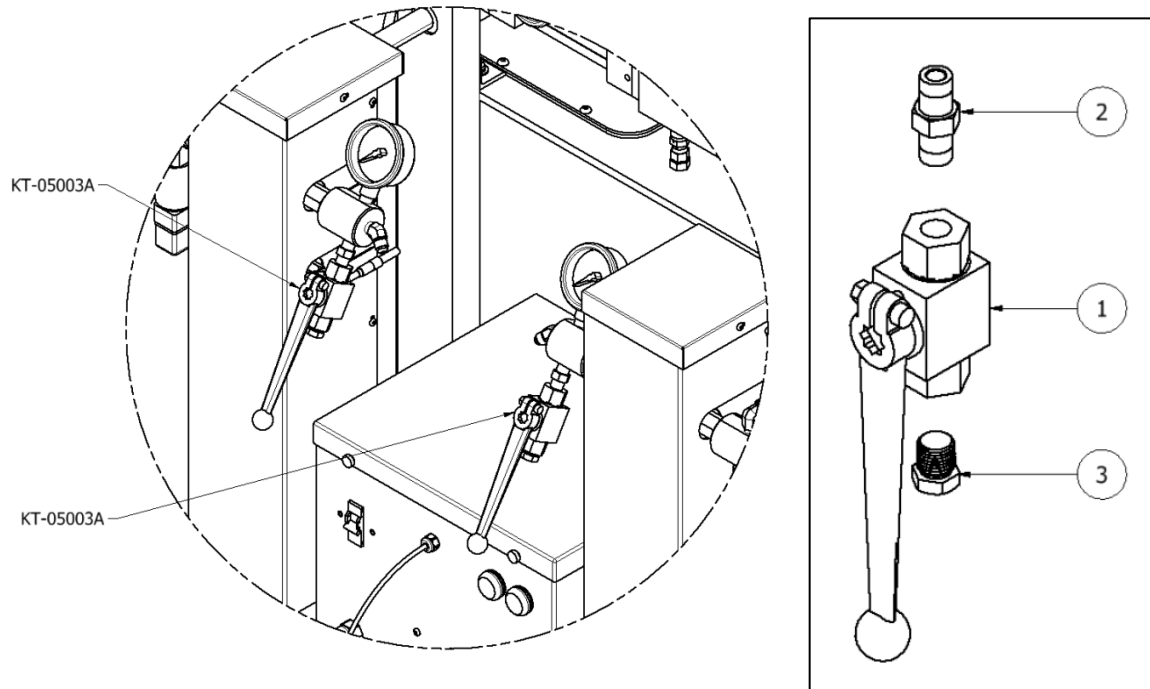
HALF INCH HOSE KIT (200212)		
PART NUMBER	QTY	DESCRIPTION
RA-00010	1	ISO MALE MANIFOLD FITTING
RA-00011	1	POLY MALE MANIFOLD FITTING
RA-00019	1	JIC REDUCER 7/8-14 X 9/16-18
RA-00020	1	JIC REDUCER 3/4-16 X 1/2-20

ISO LUBE RESERVOIR/HOSE KIT

ISO LUBE RESERVOIR/HOSE KIT (KT-05004)		
PART NUMBER	QTY	DESCRIPTION
RA-00068A	1	Check Valve
TN-04196	1	Hose Clamp
MQ-01009-01A	1	Reservoir Bottle
MQ-01009-02A	1	Reservoir Bottle Lid
MA-00024A	1	Supply Tubing
MA-00025A	1	Return Tubing

BLEED SYSTEM

KT-05003A



BLEED SYSTEM			
ITEM	QTY	PART NUMBER	DESCRIPTION
1	2	GP-00100-2	BALL VALVE, 5,000 PSI
2	2	GP-00100-1	PIPE NIPPLE
3	2	GP-00100-4	PIPE PLUG