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MODEL H-2000-E/H-3500-E

HIGH PRESSURE PROPORTIONING UNIT

Operating Manual

GUSMER EUROPE, S.A.

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NOTICE: This manual contains important operating information for your GUSMER Machine. Read and retain for future reference.

NOTICE:

The equipment described in this technical manual must only be operated or serviced by properly trained individuals, thoroughly familiar with the operating instructions and limitations of the equipment. For technical service, call your local distributor.



NOTICE:

All statements, information and data given herein are believed to be accurate and reliable but are presented without guarantee, warranty or responsibility of any kind expressed or implied. Statements or suggestions concerning possible use of GUSMER EUROPE equipment are made without representation or warranty that any such use is free of patent infringement, and are not recommendations to infringe any patent. The user should not assume that all safety measures are indicated or that other measures may not be required



CONTENTS

CONTENTS	3
LIST OF FIGURES	4
LIST OF TABLES	4
WARRANTY	5
GENERAL SAFETY INFORMATION	6
ACCEPTABLE EQUIPMENT USES.....	6
SOLVENTS AND CHEMICALS.....	7
HIGH VOLTAGE.....	7
HIGH PRESSURE.....	7
PERSONAL PROTECTION.....	7
HIGH TEMPERATURE.....	7
OPERATIONAL SAFETY PROCEDURES-WARNINGS.....	8
KEY FEATURES	9
PROPORTIONING PUMP.....	9
PRIMARY HEATER.....	9
HOSE HEATER.....	10
GENERAL DESCRIPTION	11
DESCRIPTION OF CONTROLS	12
SPECIFICATIONS	14
INITIAL MACHINE SET-UP	17
NORMAL OPERATING PROCEDURE	26
DAILY START-UP PROCEDURE.....	26
DAILY SHUT-DOWN PROCEDURE.....	27
TROUBLE SHOOTING PROCEDURES	29
GENERAL INFORMATION	29
HOSE HEAT.....	30
PRIMARY HEATER.....	33
PROPORTIONING SYSTEM.....	36
HYDRAULIC DRIVE SYSTEM	42
MAINTENANCE	44
PUMP LUBE SYSTEM	44
INLET STRAINER SCREEN.....	45
HYDRAULIC SYSTEM.....	46
PROPORTIONING PUMPS.....	47
PUMP BASES	48
PRIMARY HEATERS.....	49
PROPORTIONING RATIOS.....	50
APPENDIX	52
ELECTRICAL SCHEMATIC DIAGRAMS.....	53
INSTRUCTION MANUAL DISCREPANCY REPORT	57

LIST OF FIGURES

FIGURE 1. H-2000-E AND H-3500-E MODELS HIGH PRESSURE PROPORTIONING UNIT.....	11
FIGURE 2. TYPICAL H-2000-E AND H-3500-E INSTALLATION	17
FIGURE 3. HYDRAULIC FLUID LEVEL.....	19
FIGURE 4. HYDRAULIC FLUID LEVEL.....	19
FIGURE 5. ISOLATION HOSES	19
FIGURE 6. HOSE CONNECTION STEP (A).....	20
FIGURE 7. HOSE CONNECTION STEP (B).....	20
FIGURE 8. HOSE CONNECTION STEP (C).....	20
FIGURE 9. HOSE CONNECTION STEP (D).....	20
FIGURE 10. TEMPERATURE SENSING UNIT.....	21
FIGURE 11. BELL HOUSING.....	22
FIGURE 12. SCHEMATIC TAP SETTINGS.....	24
FIGURE 13. TEMPERATURE CONTROLLER REF. 047-00015-000	24
FIGURE 14. DIRECTIONAL INDICATOR LIGHTS & REVERSING SWITCH ROCKER ARM	27
FIGURE 15. FUSE HOSE TRANSFORMER	31
FIGURE 16. HOSE HEAT SOLID STATE RELAY.....	31
FIGURE 17. TSU CONNECTION	32
FIGURE 18. PRIMARY HEATER	33
FIGURE 19. PRIMARY HEATER SOLID STATE RELAY.....	34
FIGURE 20. PROPORTIONING SYSTEM.....	36
FIGURE 21. HYDRAULIC MANIFOLD	40
FIGURE 22. LUBE HOSE	45
FIGURE 23. STRAINER.....	46
FIGURE 24. HYDRAULIC SYSTEM.....	47
FIGURE 25. THERMOCOUPLE.....	50
FIGURE 26. H-2000-E/H-3500-E SCHEMATIC DIAGRAM, SHEET 1 OF 3.....	53
FIGURE 27. H-2000-E/H-3500 E SCHEMATIC DIAGRAM, SHEET 2 OF 3	54
FIGURE 28. H-2000-E/H-3500-E SCHEMATIC DIAGRAM, SHEET 3 OF 3.....	55

LIST OF TABLES

TABLE 1. MODEL H-2000-E/H-3500-E PROPORTIONER PUMP SPECIFICATIONS.....	51
TABLE 2. PUMP CYCLE COUNTER CHART (CYCLE TO PROPORTIONING PUMP RATIO RELATIONSHIP).....	51
TABLE 3. H-2000-E/H-3500-E SCHEMATIC DIAGRAM, PARTS LIST.....	56



WARRANTY

GUSMER EUROPE provides a limited warranty to the original purchaser (Customer) of GUSMER EUROPE manufactured parts and equipment (Product) against any defects in material or workmanship for a period of one year from the date of shipment from GUSMER EUROPE facilities.

In the event Product is suspected to be defective in material or workmanship, it must be returned to GUSMER EUROPE, freight prepaid. If Product is found to be defective in material or workmanship, as determined solely by GUSMER EUROPE, GUSMER EUROPE will issue full credit to Customer for the freight charges incurred in returning the defective Product, and either credit will be issued for the replacement cost of the Product or a replacement part will be forwarded no-charge, freight prepaid to Customer.

This warranty shall not apply to Product GUSMER EUROPE finds to be defective resulting from: installation, use, maintenance, or procedures not accomplished in accordance with our instructions; normal wear; accident; negligence; alterations not authorized in writing by GUSMER EUROPE; or Product used in conjunction with any other manufacturer's pumping or proportioning equipment. Further, the terms and conditions of this warranty shall not apply to services or repairs made to Product by any third party not authorized in writing by GUSMER EUROPE. For such Product, a written estimate will be submitted to Customer, except as approved in writing by GUSMER EUROPE at a nominal service charge, itemizing the cost for repair. Disposition of Product will be done in accordance with the terms stated on the written estimate.

The warranty provisions applied to Product that are not manufactured by GUSMER EUROPE will be solely in accordance with the warranty provided by the original manufacturer of the Product.

GUSMER EUROPE MAKES NO WARRANTY WHATSOEVER AS TO THE MERCHANTABILITY OF, OR SUITABILITY FOR, ITS PRODUCT TO PERFORM ANY PARTICULAR PURPOSE. CREDIT FOR, OR REPLACEMENT OF, PRODUCT DEFECTIVE IN MATERIAL OR WORKMANSHIP SHALL CONSTITUTE COMPLETE FULFILLMENT OF GUSMER EUROPE OBLIGATIONS TO CUSTOMER. NO OTHER WARRANTY, EXPRESSED OR IMPLIED ON ANY PRODUCT IT MANUFACTURES AND/OR SELLS, WILL BE RECOGNIZED BY GUSMER EUROPE UNLESS SAID WARRANTY IS IN WRITING AND APPROVED BY AN OFFICER OF GUSMER EUROPE.

Under no circumstances shall GUSMER EUROPE be liable for loss of prospective or speculative profits, or special indirect, incidental or consequential damages. Further, GUSMER EUROPE shall have no liability for any expenses including, but not limited to personal injury or property damage resulting from failure of performance of the Product, use of the Product, or application of the material dispensed through the Product. Any information provided by GUSMER EUROPE that is based on data received from a third source, or that pertains to Product not manufactured by GUSMER EUROPE, while believed to be accurate and reliable, is presented without guarantee, warranty, or responsibility of any kind, expressed or implied..

GUSMER EUROPE through the sale, lease, or rental of Product in no way expresses or implies a license for the use of, nor encourages the infringement of any patents or licenses.



GENERAL SAFETY INFORMATION

The instructions in this manual must be understood and followed to insure proper and safe operation of the Model H-2000-E/H-3500-E Proportioning Unit.

As with most mechanical equipment, certain safety precautions must be taken when the equipment discussed in this manual is operated or serviced. If the instructions and precautions listed throughout this manual are not followed, severe bodily injury or damage to equipment and property may result.

Needless to say, sufficient guidelines cannot be developed to eliminate the need for good common sense in the use and servicing of this equipment, and in the use and application of the products this equipment has been designed to process. Users of this equipment must therefore, make their own determination as to the suitability of the information contained in this manual to their specific operation and requirements. There should be no assumption made that the safety measures and instructions contained herein are all-inclusive, and that other safety measures may not be required for specific use or application.

The following safety guidelines are generally applicable to the safe and efficient use of the Model H-2000-E/H-3500-E Proportioning Unit

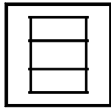
Acceptable Equipment Uses

The Model H-2000-E/H-3500-E Proportioning Unit is designed for the proportioning and dispensing of two-component urethane foam, or coating systems and some two-component epoxy systems. Under no circumstances should any acid or corrosive chemicals be used in the unit. Consult GUSMER EUROPE if there is any doubt about the compatibility of the system to be used in this equipment.

The electrical circuitry of this equipment is not of explosion-proof design and, therefore, the equipment must not be used in any environment requiring this design.

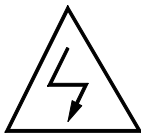
Any use of this equipment other than as indicated above constitutes misuse unless express written approval is obtained from GUSMER EUROPE.

Solvents and Chemicals



It is the users responsibility to insure that adequate personal protective measures are taken so as not to exceed the Threshold Limit Value (TLV) of the products being used, as established by the Occupational Safety and Health Administration or other qualified agency. The user must be aware of the exposure limits specified for the products being used, and must use them in accordance with the recommendations specified by their manufacturer.

High Voltage



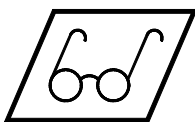
The electrical service should be installed by a qualified electrician. Entry into any of the electrical components should be made only by trained and qualified personnel.

High Pressure



The Hydraulic system of the Model H-2000-E/H-3500 E can develop pressures up to 136 bars (2000 psi) / 238 bars (3500 psi). Anyone using a spray gun or mix head must use extreme caution to insure the gun or head is never pointed at or near any persons, and that the head is never actuated with the outlet tip blocked or restricted by any part of the body.

Personal Protection



The use of solvents and chemicals will be required when operating, servicing or cleaning. To prevent excessive exposure to the chemicals and solvents to which will be used when operating this equipment, appropriate personal protective gear such as eye and face protection, respiratory protection, and protective gloves and clothing may be required.

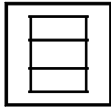
High Temperature



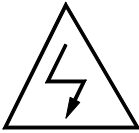
There are high temperature components, particularly the primary heater. Before performing maintenance, allow the component to cool to avoid bodily injury from hot fluid or hot metal.

Operational Safety Procedures-WARNINGS**NOTE:**

These warnings will not be repeated in the text of this manual. The symbols pertaining to these warnings will appear where appropriate to alert the operator to potential hazards.

**RAW MATERIALS AND SOLVENTS**

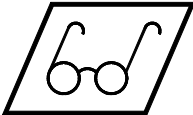
WARNING: THE RAW MATERIALS AND SOLVENTS USED WITH THIS EQUIPMENT EXPOSE THE OPERATOR TO CERTAIN HAZARDS. IN ORDER TO PREVENT BODILY INJURY, INFORMATION CONCERNING PERSONAL PROTECTION AND PROPER HANDLING OF THESE CHEMICALS MUST BE OBTAINED FROM THE SUPPLIER OF SUCH CHEMICALS.

**ELECTRICAL SHOCK**

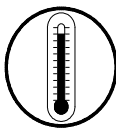
WARNING: TO PREVENT SERIOUS BODILY INJURY FROM ELECTRICAL SHOCK, NEVER OPEN THE ELECTRIC CONSOLES OR OTHERWISE SERVICE THE EQUIPMENT BEFORE SWITCHING OFF THE MAIN POWER SWITCH AND INTERRUPTING SUPPLY VOLTAGE AT THE SOURCE. ELECTRICAL SERVICE MUST BE INSTALLED BY A QUALIFIED ELECTRICIAN.

**HYDRAULIC PRESSURE**

WARNING: THE HYDRAULIC COMPONENTS OF THE MODEL H-2000-E/H-3500-E PROPORTIONING UNIT ARE UNDER EXTREMELY HIGH PRESSURE 136 bars (2000 PSI) / 238 bars (3500 PSI) RESPECTIVELY. TO AVOID SERIOUS BODILY INJURY FROM HYDRAULIC INJECTION OF FLUID, NEVER OPEN ANY HYDRAULIC CONNECTIONS OR SERVICE HYDRAULIC COMPONENTS BEFORE ALL PRESSURES HAVE BEEN BLED TO ZERO.

**PROPER PROTECTIVE GEAR**

WARNING: TO AVOID SERIOUS BODILY INJURY, PROPER PROTECTIVE GEAR MUST BE WORN WHEN OPERATING, SERVICING, OR BEING PRESENT IN THE OPERATIONAL ZONE OF THIS EQUIPMENT. THIS INCLUDES, BUT IS NOT LIMITED TO, EYE PROTECTION, GLOVES, SAFETY SHOES AND RESPIRATORY EQUIPMENT AS REQUIRED.

**TEMPERATURE**

WARNING: TO PREVENT SERIOUS BODILY INJURY FROM HOT FLUID OR HOT METAL, NEVER ATTEMPT TO SERVICE THE EQUIPMENT BEFORE ALLOWING IT TO COOL.



KEY FEATURES

The Gusmer Model H-2000-E Proportioning Unit is designed to process a wide range of plural component systems, each with their unique characteristics. The H-2000-E incorporates the proven principles of its predecessors enhanced by many technical innovations specifically developed to provide high pressure for mixing and atomizing, precise temperature control, and ease of maintenance.

The Gusmer Model H-3500-E Proportioning Unit is designed to process high performance plural component coating systems where increased operating pressures are necessary to process a higher viscosity and tougher to mix chemical system.

Proportioning Pump

The proportioning pumps are positive displacement, double acting piston pumps featuring Gusmer's "Opposed" Piston design. This unique feature provides equal pressure on each stroke while the direct drive on centerline eliminates the asymmetrical forces that cause structural failure and packing wear.

The pump base is remotely located from the main assembly to facilitate servicing and to allow flexibility in regulating the plural component system. A key feature of the pump base is the externally accessible valve balls and replaceable ball seats.

Protection of the environment on the external side of the pump cylinder packings is very important. The A-proportioning pump contains a continuous flow, liquid lubrication system. In addition, a RETRACT switch provides for shutdown of the proportioning unit with the Isocyanate pump shaft completely retracted within the pump cylinder.

Primary Heater

The primary heating system consists of two 6000-Watt primary heaters designed specifically to accommodate the unique characteristics of plural component systems. The primary heater is designed to produce efficient, even, and accurate temperature control with an unprecedented simplicity of maintenance. The direct heating principle provides virtually instantaneous warm-up, maximizes heat transfer during flow conditions, and minimizes temperature fluctuations. Temperature control of the primary heater is completely automatic and requires no operator adjustment to compensate for changes in surrounding air temperature. The operator simply dials in the desired temperature at start-up, and the Gusmer heating system takes over from there.

Maintenance of the heater is basic. The heating elements are externally accessible and if necessary, the entire heater can be disassembled, cleaned, and reassembled without the need for replacement parts.

Hose Heater

The hose heating system is the proven safe and reliable Gusmer LOW VOLTAGE hose heater. The power for the system is supplied by an isolation transformer, which is designed to physically separate the high voltage from the operator. The uniquely designed hose heating system serves a three fold purpose which includes (1) providing heat right to the gun; (2) isolating the gun from the low voltage circuit; and (3) bleeding off any static charges.

Temperature control of the hose heater is completely automatic and, as in the primary heater, requires no operator adjustment to compensate for changes in surrounding air temperature. The heart of the system is the temperature sensing unit (TSU). The TSU is strategically located in the liquid near the gun, providing the most accurate control of chemical temperature available. The Gusmer system provides **temperature control** where it is the most accurate, **in the liquid, near the gun.**



GENERAL DESCRIPTION

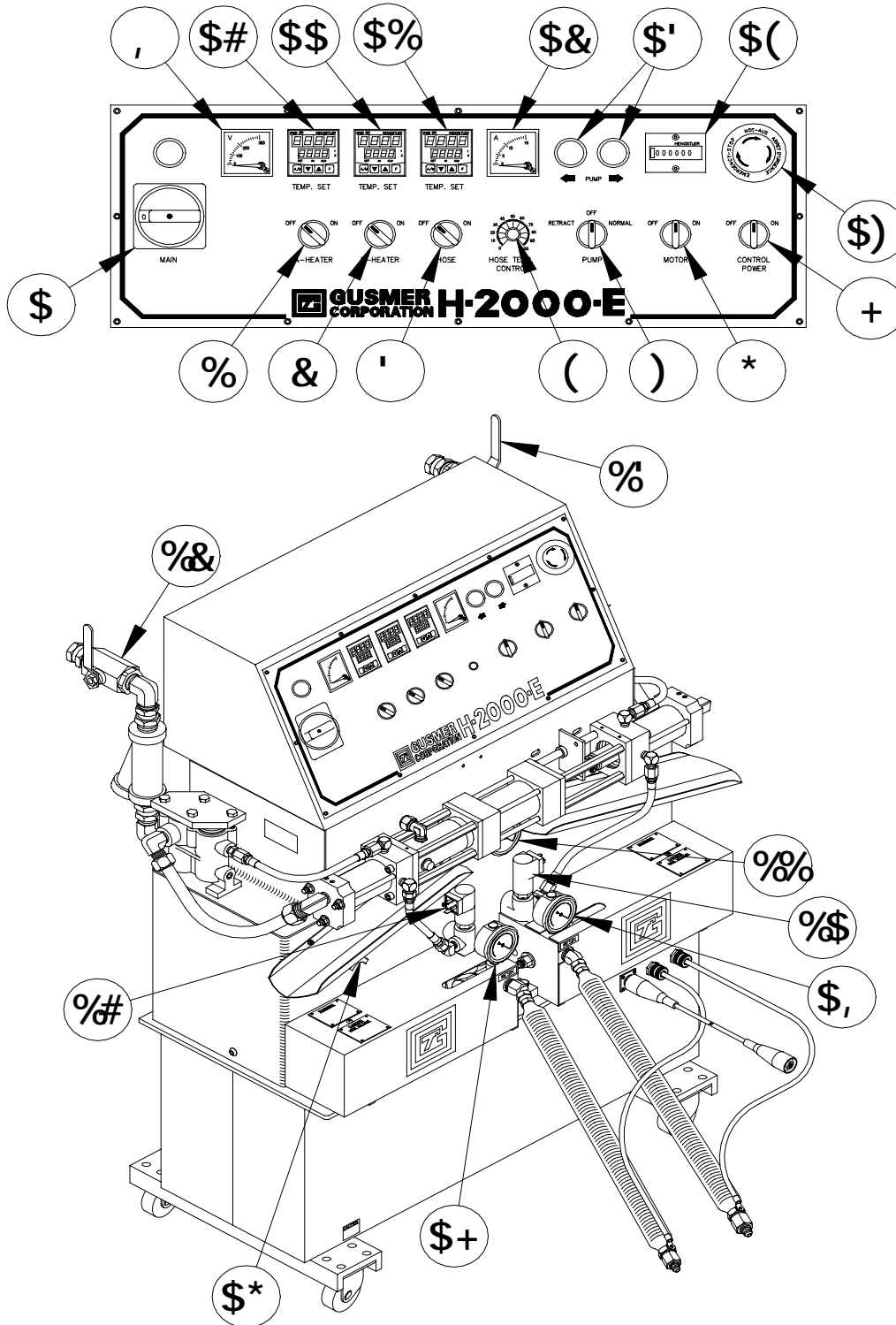


Figure 1. H-2000-E and H-3500-E Models High Pressure Proportioning Unit.

Description of Controls

1. MAIN POWER SWITCH - Controls main power to the machine, must be ON for any function of the proportioning unit to operate.

Pilot light (Green) - Indicates the main power switch is ON.

2. A-PRIMARY HEATER SWITCH - Controls power to the A-primary heater; must be ON for the A-primary heater to operate.

Switch and Controller are illuminated when power is available to the A-primary heater.

3. R-PRIMARY HEATER SWITCH - Controls power to the R-primary heater; must be ON for the R-primary heater to operate.

Switch and Controller are illuminated when power is available to the R-primary heater.

4. HOSE HEATER SWITCH - Controls hose heater circuit; must be ON for the hose heater to operate.

Switch and Controller are illuminated when power is available to the hose heater.

5. HOSE HEATER POWER SET - Controls the amount of power delivered to the hose heater. Adjust as required for different hose lengths to maintain the maximum recommended amperage.

6. PUMP SWITCH - Controls operation of the hydraulic drive system.

OFF - Hydraulic directional drive system is OFF, and hydraulic pressure cannot be generated in this position.

NORMAL - Must be in this position for the proportioning pumps to operate.

RETRACT - This position should be used for shutdown and will stop the hydraulic drive system with the A-Proportioning Pump in the retracted position.

7. MOTOR CONTROL SWITCH - Controls power to the electric motor; must be ON for the hydraulic drive system to operate.

Switch is illuminated when electric motor is ON.

8. CONTROL POWER SWITCH - Controls power to all circuits; must be ON for any function of the proportioning unit to operate.

9. VOLTMETER - Indicates voltage delivered to the power circuit.

10. A-PRIMARY HEATER CONTROLLER - Controls the temperature of the liquid maintained by the A-primary heater; set control selector to the desired temperature. From this point, the temperature control is completely automatic.
11. R-PRIMARY HEATER CONTROLLER - Controls the temperature of the liquid maintained by the R-primary heater; set control selector to the desired temperature. From this point, the temperature control is completely automatic.
12. HOSE HEATER CONTROLLER - Controls the temperature of the liquid maintained by the hose heater; set control selector to the desired temperature. From this point, the temperature control is completely automatic.
13. HOSE HEATER AMMETER - Indicates the amount of heating power delivered to the hose heater.
14. PUMP DIRECTIONAL INDICATOR LIGHTS (Amber) - Indicates the direction of the proportioning pump travel; both lights will be off when the pump switch is OFF or when either proportioning pump exceeds its safe operating pressure limitation.
15. COUNTER - Records the cycle count of the proportioning pumps; one cycle count equals two (2) strokes (one in each direction).
16. EMERGENCY STOP - Disconnects power to all circuits in case of emergency.
17. HYDRAULIC PRESSURE CONTROL - Controls the hydraulic pressure available to the hydraulic drive system.
18. ISOCYANATE PRESSURE GAUGE - Indicates the pressure in the isocyanate proportioning system.
19. RESIN PRESSURE GAUGE - Indicates the pressure in the resin proportioning system.
20. ISOCYANATE OVER-PRESSURE SAFETY SWITCH - Turns off the hydraulic drive system when the isocyanate proportioning pump exceeds the safe pressure limitation.
21. RESIN OVER-PRESSURE SAFETY SWITCH - Turns off the hydraulic drive system when the resin proportioning pump exceeds the safe pressure limitation.
22. HYDRAULIC PRESSURE GAUGE - Indicates the pressure in the hydraulic drive system.
23. A-INLET SUPPLY BALL VALVE
24. R-INLET SUPPLY BALL VALVE



SPECIFICATIONS

ENVIRONMENT:

The equipment is not of explosion-proof design and should never be used in an atmosphere requiring this design.

RECOMMENDED USE:

The equipment is designed for use with “standard” spray, pour, and froth pour, urethane foams, and approved coating systems. Other use of the equipment, or any part thereof, constitutes misuse unless expressed written approval is obtained from Gusmer Europe.

Some plural component systems available for use with this equipment contain abrasives. Although the equipment is abrasion resistant, it is **not abrasion proof** and those parts damaged as a result of using abrasive materials **will not be covered** under warranty.

SAFETY EQUIPMENT:

When servicing or operating the equipment, sufficient protective clothing must be worn to prevent skin and eye contact with the chemicals or solvents used in or with this equipment.

Approved safety glasses or goggles must always be worn when servicing or operating the equipment.

Respiratory protection, capable of providing sufficient filtration to prevent inhalation of toxic vapors emitted from the chemical system being used, must be worn by any and all persons in the vicinity of any operation where Gusmer Europe equipment is operated. In poorly ventilated areas, it is recommended that a fresh air type respirator system be used.

APPLICATION:

Due to the potential fire hazard of exposed urethane foam, all procedural and safety directives for the storage, handling, and application of chemicals that are used in this equipment must be followed.

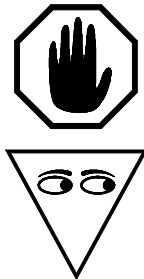


WARNING: INFORMATION CONCERNING PERSONAL PROTECTION AND PROPER HANDLING AND APPLICATION PROCEDURES OF THE CHEMICALS AND SOLVENTS USED WITH THIS EQUIPMENT MUST BE OBTAINED FROM THE SUPPLIERS OF SUCH CHEMICALS AND SOLVENTS.

Electric Requirements are as follows:

(5CV), 3 x 400 V, 50/60 HZ, AC 36 A at 3 x 400 V, 50/60 HZ, AC current 27 Kw peak power at 400 Volts.

A terminal block is located in the main electric console for easy connection of the main power cord (not supplied).



WARNING: THE ELECTRIC SERVICE TO THE MODEL H-2000-E AND H-3500-E MUST BE INSTALLED BY A QUALIFIED ELECTRICIAN IN ACORDANCE TO THE EFFECTIVE REGULATION IN THE COUNTRY.

CAUTION: Damage to the equipment could result if the unit is operated at other than the name plate voltage.

AIR:

The Models H-2000-E/H-3500-E are hydraulically driven. There are no air requirements for the proportioner itself.

MATERIAL SUPPLY:

The temperature of the chemical supply must be as specified by your chemical supplier.

The chemical supply must be protected from moisture in the atmosphere by a blanket of dry nitrogen or desiccated air.

Resin Inlet-3/4" NPT (FE) swivel

Isocyanate Inlet-1/2" NPT (FE) swivel

CHEMICAL VISCOSITY:

No maximum limitation has been established and, assuming adequate supply, viscosity's of 5.000 cps or more may be possible.

HYDRAULIC SERVICING:

48 Liters

Recommended operating temperature: 48° C (120° F)

Maximum operating temperature: 71° C (160° F)

WEIGHT:

Empty: 175 kg (385 pounds)

Serviced: 219 kg (482 pounds)

DIMENSIONS:

Height: 119 cm (47 inches)

Width: 102 cm (40 inches)

Depth: 56 cm (22 inches)

OPERATING PRESSURE:

H-2000-E: 136 bars (2000 psi) maximum

H-3500-E: 238 bars (3500 psi) maximum

SUPPLY PRESSURE:

70 bars (1000 psi) maximum

OUTPUT:

H-2000-E: 14 kg/min. (30 lb./min.) maximum

H-3500-E: 9 kg/min. (20 lb./min.) maximum

INLET FILTER: 80 Mesh Standard (Optional - 60/40 Mesh)
PRIMARY HEATER: 6000 Watts per heater at 230 V
HOSE LENGTH: 93 meters (305 feet) maximum for heating purposes.

INITIAL MACHINE SET-UP

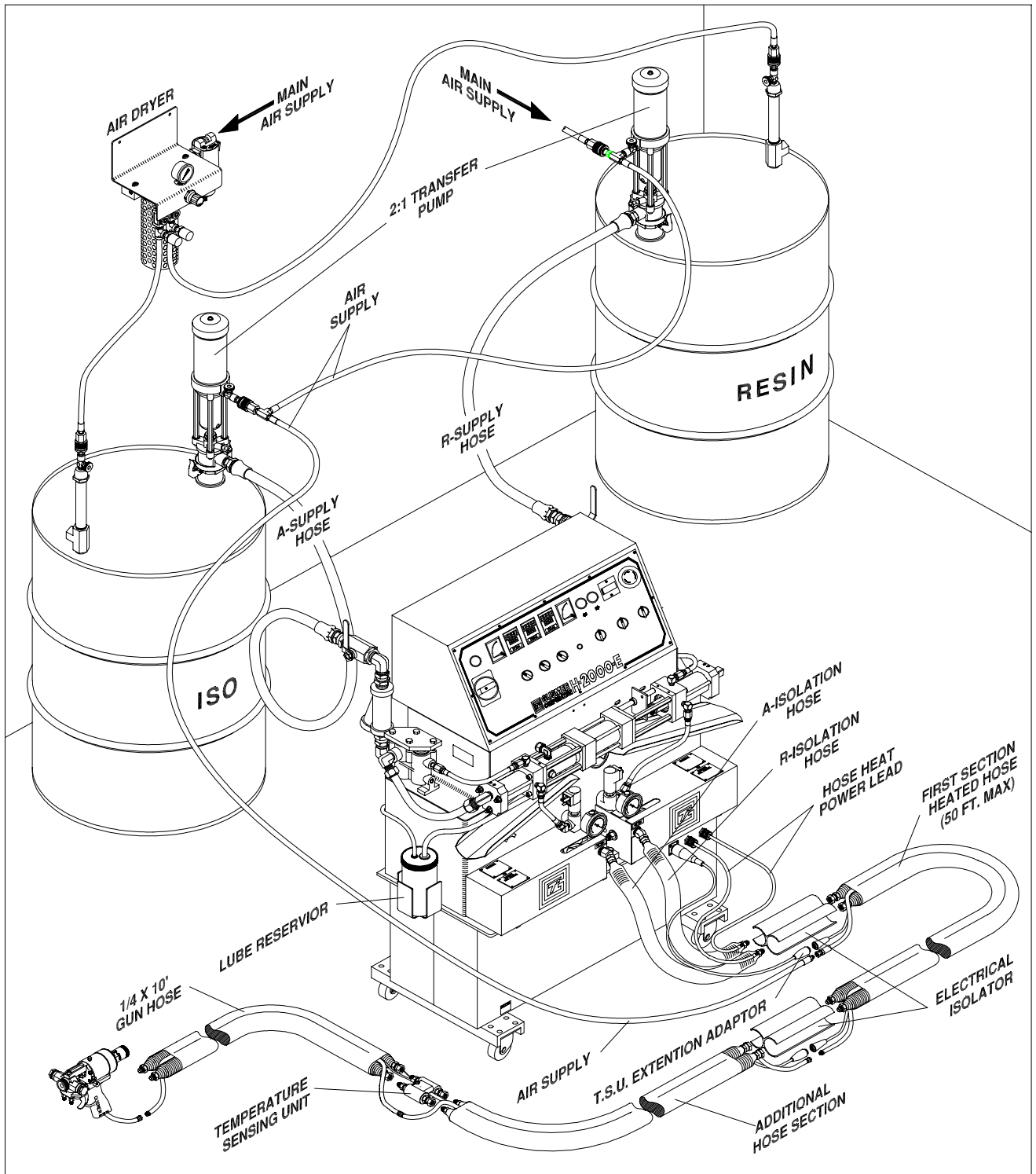
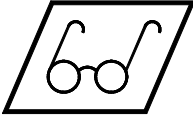


Figure 2. Typical H-2000-E and H-3500-E Installation

Initial Machine Set-up

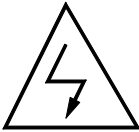


WARNING: PROPER PROTECTIVE GEAR AS SPECIFIED BY THE CHEMICAL AND SOLVENT SUPPLIES MUST BE WORN WHEN SERVICING OR OPERATING THIS EQUIPMENT, WHICH INCLUDES BUT IS NOT LIMITED TO GLOVES, EYE PROTECTION, AND RESPIRATORY PROTECTION. REFER TO THE SAFETY BULLETIN IN THIS MANUAL.

An Accessory Package is included with the unit and contains the following parts that are required for setup:

- a) Isolation hose (Blue - Resin; Red - Isocyanate)
- b) TSU extension adapter
- c) Temperature Sensing Unit (TSU)
- d) Electrical isolator
- e) Lube Reservoir Bracket and Lube Bottle
- f) 1 roll electrical tape
- g) Fittings/Adapters/Screws

* Refer to Figure 2 for additional parts required for set-up.

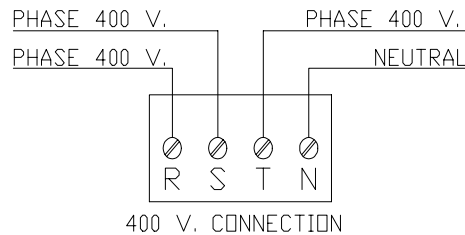


WARNING: THE ELECTRIC SERVICE TO THE MODELS H-2000-E/H-3500-E MUST BE INSTALLED BY A QUALIFIED ELECTRICIAN IN ACORDANCE TO THE EFFECTIVE REGULATION IN THE COUNTRY.

NOTE:

To obtain the best possible results, the power source must be capable of meeting the electrical requirements specified on the nameplate and must be provided with a dedicated fused disconnect.

1. Connect the main power cord (not supplied) to the electrical console. Feed the power cord through the strain relief.



G E881C, 4F8'6BAA86G8A

NOTE:

The material supply valves are loosely assembled to the unit so that they may be oriented in the position that best suits the setup.

2. Set up the supply and moisture control systems as required. Refer to the individual instruction manuals for the proper procedures.
3. Fill the hydraulic reservoir through the vented filler neck with approximately 48 Liters of hydraulic fluid. Refer to the listing in Appendix for the recommended types of fluid.

IMPORTANT: DO NOT overfill. Check that the filler neck is approximately 1/2 filled with liquid.

4. Check the hydraulic pump to insure that it is filled with hydraulic fluid. Remove the 90° elbow fitting from the top of the pump and determine that the fluid level is to the top of the threaded hole. Add fluid as required and reattach fitting.

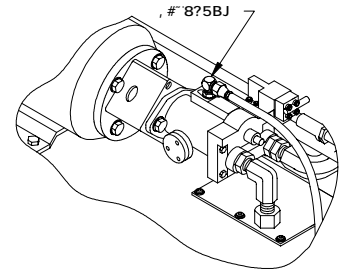


Figure 3. Hydraulic Fluid Level

Note:
 If the pumps that have been assembled onto the machine are smaller size than the standard, the iso pump lube should be introduced manually.

Due to, it will not have enough power to do it automatically.

5. Install the pump lube reservoir and bracket. Thread it onto the reservoir cap assembly and place it into the bracket. No priming of the system is required.

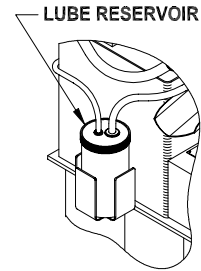


Figure 4. Hydraulic Fluid Level

6. Connect the isolation hoses to their respective primary heaters.

IMPORTANT: The Resin hoses are color-coded blue and the Isocyanate hoses are color coded red for easy identification. In addition, the Resin and Isocyanate hose fittings are different sizes, making it virtually impossible to improperly connect the hoses.

7. Connect the hose heater wire leads from the low voltage power pack to each isolation hose. It does not matter which wire is connected to which hose. Take care to make the connection tight. It is recommended that electrical tape be applied to the connection to prevent loosening from vibration.

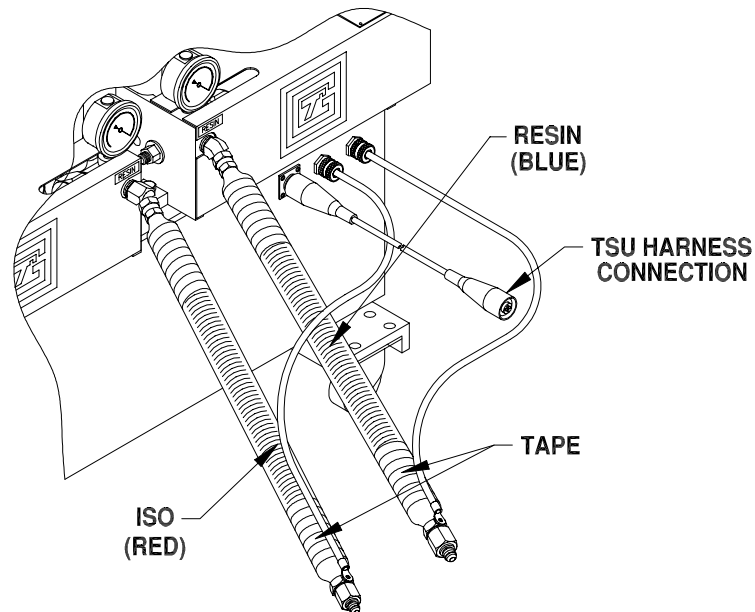


Figure 5. Isolation Hoses

NOTE:

The hose assemblies are connected end to end during shipment to protect them from moisture intrusion. Do not separate the hoses until they are ready to be coupled to the proportioning unit.

8. Connect the heated hose assemblies.

IMPORTANT: The importance of making proper hose connections cannot be overly emphasized. The connection points are a potential source of chemical and air leaks and are also the points, which are exposed to damage from scuffing and snagging on abrasive surfaces. A liberal amount of duct tape can be used in this area to make the bundle as compact as possible. It is also strongly recommended that the optional scuff jacket be installed to protect the hose insulation and TSU extension from damage. A proper hose connection is shown in sequence on the following page.

The key areas of extra attention during installation are as follows:

- a) DO NOT interchange the hoses: Resin hoses are color coded BLUE, Isocyanate hoses are color coded RED.

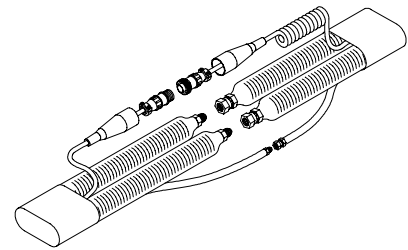


Figure 6. Hose Connection Step (a)

- b) To assure a leak proof chemical connection: take care not to cross thread the fitting and DO NOT over-tighten.

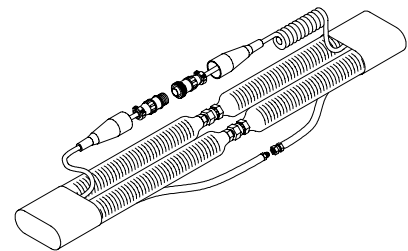


Figure 7. Hose Connection Step (b)

- c) Tape the electrical isolator securely in place between the hydraulic fittings: failure to do so will cause a short circuit in the hose heating system.

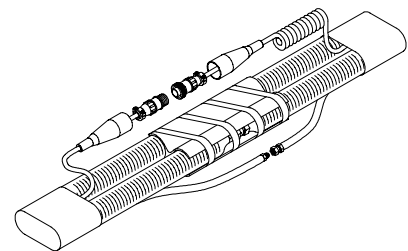


Figure 8. Hose Connection Step (c)

- d) To assure a secure electrical connection: place the protective electrical isolator boot over each plug and tape together.

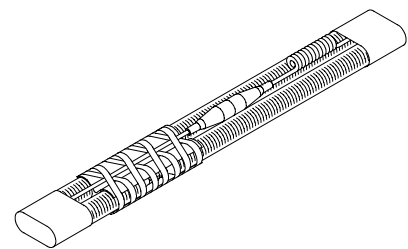


Figure 9. Hose Connection Step (d)

*** Repeat Step 8 for adding additional hoses. ***

9. With the insulator in place, slide the sponge insulation back over the hose fittings so that the ends of the sponge butt together. Tighten the reusable fasteners to keep the sponge in place.

Install the optional scuff jacket.

10. Install the Temperature Sensing Unit (TSU) onto the gun hose. Pull out and carefully straighten the LOOSE END of the temperature probe from the TSU. Insert the temperature probe into the Isocyanate hose. Connect the ground wire on the gun hose to the ground lug on the TSU.

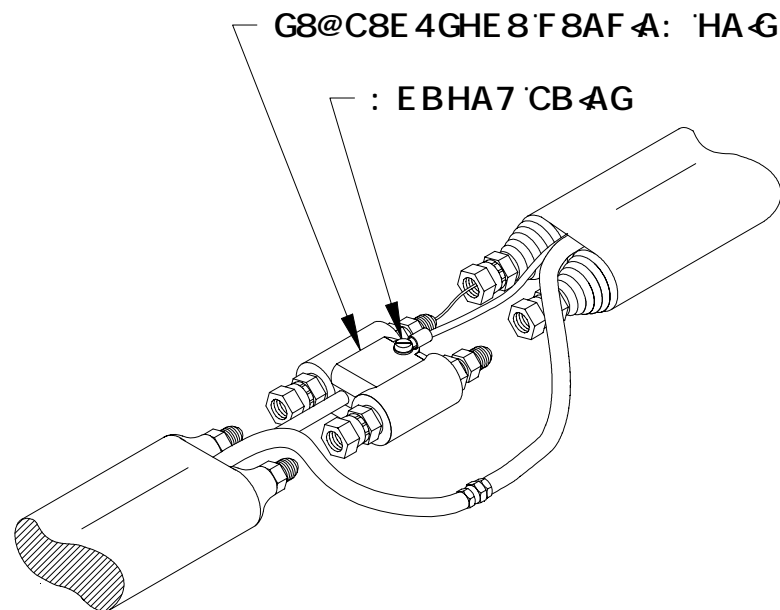
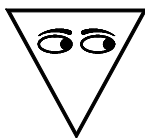


Figure 10. Temperature Sensing Unit



CAUTION: The temperature sensor extends approximately 200 mm (8 inches) into the Isocyanate hose and although it is a ruggedly built assembly it will not withstand repeated abuse. Care must be taken not to crush the hose or subject it to severe bending in the area where the sensor is located. Take care not to coil the hose tighter than the recommended 0,9 mts. (3 ft.) minimum bend radius.

11. Connect the TSU extension harness to the proportioning unit using the adapter furnished in the provided package. Connect the main air source to the heated hose.

IMPORTANT: At this point it is necessary to check the rotation of the electric motor. An arrow located on the hydraulic pump and also on the bell housing indicates the correct direction of rotation. Perform steps 12, 13, 14, 15.

12. Remove the bell housing safety plug to allow you to see the shaft coupling. Turn the hydraulic pressure control counter clockwise to the end. Make sure the pump switch is in the OFF position.
13. Determine that all switches, on the main console, are OFF. Turn the main power switch ON.
14. While observing the shaft coupling, cycle the motor ON and OFF. The rotation of the coupling must agree with the directional indicator. If the rotation does not agree, turn off all switches and disconnect the main power at the source. Open the electric console and switch any two of the three power leads. Recheck the rotation.

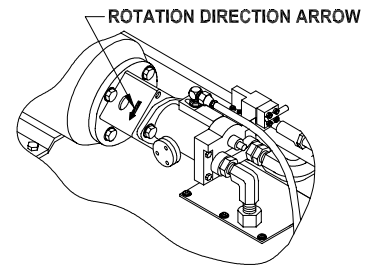


Figure 11. Bell Housing

15. Replace the plug in the motor bell housing.
16. Connect the coupling block to the gun hose and determine that the manual valves are closed.
17. Determine that all equipment is properly grounded. The high velocity flow of fluid can create static sparking which may cause fire or explosion. Certain solvents, which are commonly in use with this equipment are flammable and may present a flash danger to the operator.
 - a) The Gusmer 2:1 Transfer Pump has a ground lug. This pump must be grounded in accordance with the instructions provided with the pump.
 - b) Connect the material supply system to the inlet of the proportioning unit. Exercise caution to ensure chemicals are connected to the appropriate proportioning pumps. We now have the proportioner, heated hose, and material supply system set up. Before the equipment is ready for use, it is necessary to purge the entire system of air and mineral oil that may be left from the functional testing of the equipment conducted at the factory.
18. To purge the machine proceed as follows:
 - a) Pressurize the Transfer Pumps and open the A and R-inlet supply valves. It is a good practice at this point to check for hydraulic leaks.
 - b) Determine that the hydraulic pressure control is full decrease (counter clockwise).

- c) Turn ON the main power switch, the control power switch and motor control switch.
- d) Remove the gun from the coupling block. With the coupling block ports held over separate containers, open both manual valves.
- e) Turn the pump switch to the NORMAL Position.
- f) Allow both materials to flow out the coupling block simultaneously until all spitting of air stops and all traces of residual material have disappeared and a solid flow of each material is seen.
- g) Turn the pump switch to RETRACT.
- h) Close both manual valves and wipe clean any residual material from the coupling block.
- i) Mount the gun to the coupling block.
- j) Refer to the gun manual for gun operating instructions.

NOTE:

Properly discard both materials in accordance with applicable environmental regulations.

IMPORTANT: *During the initial start-up, slowly increase the hydraulic pressure and check all fittings for signs of hydraulic and chemical leakage. Tighten as required.*

Hose Heater

NOTE:

These procedures are not required on a daily basis but may have to be executed periodically as part of the daily start-up routine

The hose heater transformer tap settings must be adjusted to match the length of hose in use. Therefore, this procedure will have to be executed during the initial installation or at any time the hose length is changed, according to the figure below (*See Figure 12*).

- a) Loosen the shaft lock on the hose heater power control to zero (full counter clockwise).
- b) Turn ON the main power switch, the control power switch and the hose heater switch. The hose heater ammeter should be zero.
- c) Set the hose temperature controller to 65° C (149° F). The green pilot light, on the hose heater switch, should be on.
- d) Adjust the hose heater power control (clockwise) until the ammeter reads 8-9 Amps with the hoses installed. Tighten the shaft lock nut, as no further adjustments to this control will be required. Reset the temperature controller to the desired temperature setting.

NOTE:

As the hose heater warms-up, the amperage will drop slightly and need not be readjusted.

When the liquid in the hose reaches the desired temperature, the ammeter will cycle on and off and temperature control is automatic from this point.

NOTE:
With the controller full ON,
the amperage of the primary
should not exceed 10 A.

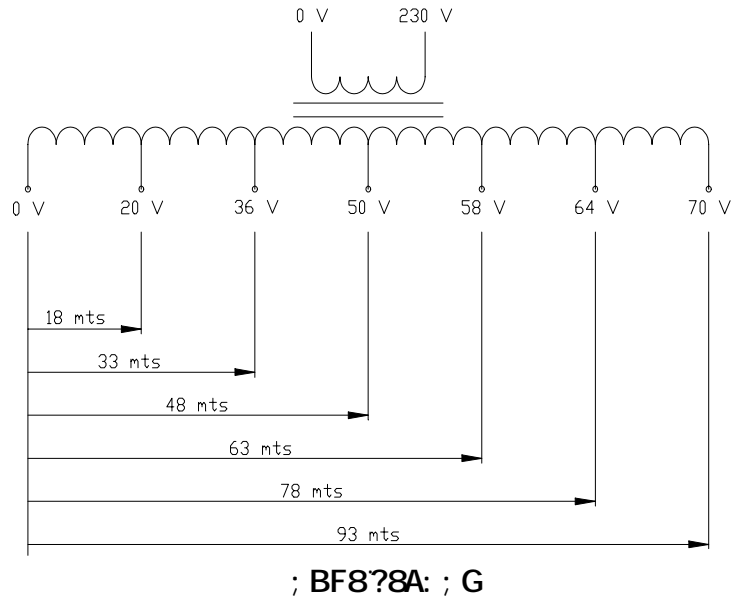
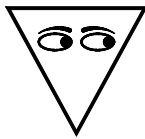


Figure 12. Schematic Tap Settings

IMPORTANT: The power pack must be set to match the length of the hose being used. Too much power will cause the circuit fuse to open and too little power will result in insufficient hose heating (See Figure 12).

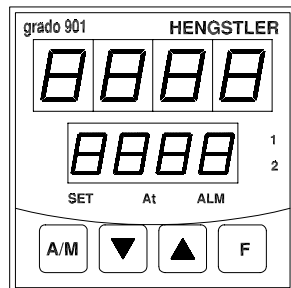
Temperature Controller

The Model H-2000-E and H-3500 E utilizes digital temperature display controller ref. 047-00015-000 for automatically controlling the selected temperature of the Hose and Primary Heater circuits. (See Figure 13)



CAUTION: DO NOT turn ON the Primary or Hose Heat Controller(s) until all purging procedures are completed and the preheater and hose(s) are completely filled with chemical.

NOTE:
Normally digits show
process temperature.



- ▼ Press together to decrease setpoint
- ▲ Press together to increase setpoint
- Top display (red colour) shows the hoses or heaters real temperature.
- Bottom display (yellow colour) shows the chosen temperature.
- LED n° 1 (red colour) lighted when the hose or heaters are performing.

Figure 13. Temperature controller ref. 047-00015-000



WARNING: THE PROGRAM IN THIS CONTROLLER HAS BEEN SET AT THE FACTORY AND IS NOT FIELD SETTABLE. SHOULD YOU ENCOUNTER PROBLEMS WITH THE CONTROLLER CONTACT A GUSMER-EUROPE AUTHORIZED DISTRIBUTOR OR GUSMER-EUROPE FOR A REPLACEMENT. DO NOT SUBSTITUTE THIS CONTROLLER WITH ONE SUPPLIED BY AN ALTERNATE SUPPLIER AS ITS USE MAY RESULT IN DAMAGE TO THE EQUIPMENT AND/OR BODILY INJURY.



NORMAL OPERATING PROCEDURE

Daily Start-Up Procedure

NOTE:

The daily start-up procedures will describe normal operation and will assume that all calibrations have been properly executed and that the heating system is NOT up to required temperatures.

1. **SERVICING** - Check the condition of the hydraulic and pump lubrication systems and service as required. Should be replaced generally, the lube when colour changes or solidification appear.
2. **SUPPLY** - Determine that the chemical system is at the proper temperature as recommended by the chemical supplier and that the moisture protection system, is properly set for operation.
3. Check the inlet screens and service as required.
4. Pressurize the Transfer Pumps and open both A and R-inlet supply valves.
5. Verify that the Emergency Stop switch it is not ON. If necessary turn on the direction of the arrows to release it.
6. Turn ON the main power switch. The green pilot light should be on. Check that the voltmeter reads 220-240 V.
7. Switch ON the control power switch. The green pilot light should be on.
8. Turn ON the hose heater switch and set the temperature controller as required.

The temperature controller will start. The green pilot light will illuminate as well as the temperature controller red LED n°1 every time that the heater is performing.

9. When the liquid in the hose reaches the temperature selected, the green pilot light will go off as well as the temperature controller red LED n°1 and the ammeter will begin to cycle.
10. Turn ON the A and R-primary heater switch and set the temperature controllers as required.

The temperature controller will start. The green pilot light will illuminate as well as the temperature controller red LED n°1 every time that the heater is performing.

11. When the liquid in the primary heaters reaches the temperature selected, the green pilot light will go off as well as the temperature controller red LED n°1.

NOTE:

To prevent excessive pressure build-up in the heated hoses, always bring the hose and preheater up to the temperature before the hydraulic system is turned on.

NOTE:

Primary heating is virtually instantaneous and therefore, the primary heaters should not be turned until required for operation. It is also a good practice to turn off the primary heaters during shutdowns exceeding one half-hour.

NOTE:

The pump switch must be in the RETRACT or NORMAL position to adjust the hydraulic pressure.

12. Switch ON the motor control switch and set the hydraulic pressure as required.
13. Set the pump switch to the NORMAL position. One of the amber directional indicator lights should be ON and the proportioning pumps should move a short distance and pressurize.
14. Check the pressure of each proportioning pump.

After setting the pump switch to NORMAL, observe both pressure gauges. The Resin and Isocyanate pressures should be approximately equal and the pressures must remain fixed. Observe the directional indicator lights and manually depress the reversing switch rocker arm, which corresponds to the light, which is off. Observe the pressures again; they must remain fixed. If the pressure bleeds off on either stroke, consult the Trouble Shooting Procedures before continuing.

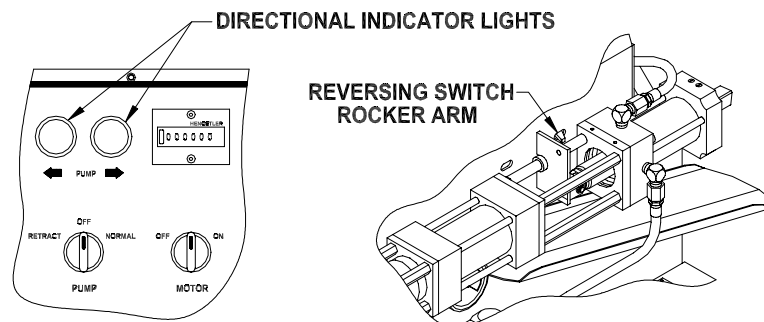


Figure 14. Directional Indicator Lights & Reversing Switch Rocker Arm

15. Connect air to the gun, open the manual valves, and test spray. Your proportioning unit is now ready for operation.

Daily Shut-Down Procedure

1. Set the pump switch to the RETRACT position.
2. Trigger the gun off target until the Isocyanate proportioning pump stops in the retracted position and the proportioning pump pressures bleed off to a point where the spray pattern begins to diminish. It is not a good practice to bleed the pressure to zero. Some pressure is required to keep the packings operating normally and prevent seepage during shutdown.
3. Press ON the Emergency Stop switch.
4. Switch OFF the motor control switch.

5. Turn OFF the pump switch.
6. Turn OFF the hose heater and primary heater switches.
7. Switch OFF the control power switch.
8. Turn OFF the main power switch.
9. Close both inlet supply valves.
10. SUPPLY - Shut down the supply system as required.
11. GUN - Close both manual valves, shut down and service the gun as stated in the gun service manual.



TROUBLE SHOOTING PROCEDURES

General Information

When properly maintained and operated, Gusmer-Europe equipment will provide long and faithful service. However, occasional problems will arise which must be resolved before operation can continue. This section of the manual is to provide the operator with an explanation of some of the problems that may arise, how to detect them, and how to resolve them.

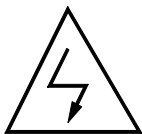
As when operating any piece of machinery, it is imperative to know what is normal operation, so that abnormal operation can be detected. Perhaps the best way to acquire a knowledge of what is normal performance of Gusmer-Europe equipment is through experience in operating it "according to the book". Once this experience is obtained, equipment malfunctions can be readily detected.

After the ability to recognize a malfunction has been acquired, and before one is able to fix the problem, a knowledge of how the equipment operates is mandatory. This manual is written to give the operator an overview of the operation of the equipment, therefore, it is imperative that before any trouble shooting process begins, the operators have read and understood the applicable portions of this manual.

Gusmer-Europe maintains a competent staff of Technical Representatives and authorized Distributors who can resolve almost any problem you may encounter with Gusmer-Europe equipment. Feel free to call on these people for assistance when you need it.

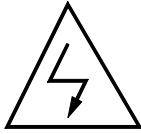


WARNING: THE TROUBLE SHOOTING SECTION OF THIS MANUAL ASSUMES THAT THE INDIVIDUAL PERFORMING THE WORK ON THE EQUIPMENT IS QUALIFIED TO DO SO. THIS INDIVIDUAL MUST HAVE A WORKING KNOWLEDGE OF BASIC HYDRAULICS; MUST FOLLOW ALL GENERALLY ACCEPTED SAFETY PRECAUTIONS USED WHEN WORKING WITH HYDRAULICS AND ELECTRICAL EQUIPMENT; MUST HAVE READ AND UNDERSTOOD THE APPLICABLE SECTIONS OF THIS MANUAL; AND MUST WEAR PERSONAL PROTECTION APPROPRIATE TO THE TASK BEING UNDERTAKEN.



WARNING: ALL ELECTRICAL TROUBLE SHOOTING DESCRIBED IN THIS MANUAL MUST BE DONE WITH POWER OFF TO AVOID SEVERE BODILY INJURY FROM ELECTRICAL SHOCK. THIS MEANS, IN ADDITION THAT ALL THE SWITCHES SHOULD BE ON THE OFF POSITION, THE EMERGENCY STOP SWITCH ON AND THE MAIN POWER SWITCH MUST BE DISCONNECTED AT THE SOURCE. ANY ELECTRICAL TROUBLE SHOOTING REQUIRED BEYOND THE SCOPE OF THIS MANUAL MUST BE DONE BY A QUALIFIED ELECTRONIC TECHNICIAN, THOROUGHLY FAMILIAR WITH THE OPERATION OF GUSMER-EUROPE EQUIPMENT.

Hose Heat



WARNING: BEFORE PERFORMING THESE TROUBLE SHOOTING PROCEDURES, DETERMINE THAT ALL THE SWITCHES SHOULD BE ON THE OFF POSITION, THE EMERGENCY STOP SWITCH ON AND THE MAIN POWER SWITCH MUST BE DISCONNECTED AT THE SOURCE TO AVOID SEVERE BODILY INJURY FROM ELECTRICAL SHOCK. DO NOT ENTER THE ELECTRICAL CONSOLE WITH POWER ON.

Try the recommended solutions in the order given for each problem to avoid unnecessary repairs. Also, determine that all circuit breakers, switches, and controls are properly set before assuming there is a problem.

<u>Problems</u>	<u>Solutions</u>
Hose warms but does not reach temperature or takes too long to reach temperature.	1, 2, 8
Hose does not heat; red light on the Hose Heater Controller is lit.	2, 3, 4, 5
“OPEN” shows on digital display.	6
Hose heat circuit breaker trips or fuse blows.	2
Hose temperature not maintained during flow.	2, 7, 8
Hose or hoses adjacent to the unit are warm-hoses downstream are cold.	5

Solutions

1. HOSE LENGTH - The H-2000-E/H-3500-E hose heater is designed to operate with up to 93 mts. (305 feet) of hose. Hose lengths greater than that reduce the ability of the hose heat to reach temperature (See Initial Machine Set-up). Also, if chemical or ambient temperature is too cold, the hose circuit may not have enough power to bring the chemical up to temperature.
2. HOSE HEATER POWER SET - The power set should be adjusted, clockwise, to achieve maximum amperage.

The low voltage power pack is adjustable to accommodate 18 mts. (59 ft.) to 93 mts. (305 ft.) of hose. If the power pack is set to low the hose will not heat or take too long to heat. If set to high the hose heat fuse will open. Set the hose heater power control to 8-9 A.

3. HOSE HEAT FUSE - With electrical power disconnected at the source, and the power OFF, the fuse is located inside the transformer, open the cover for access, remove the fuse and check it for continuity or simply replace it with one known to be good.

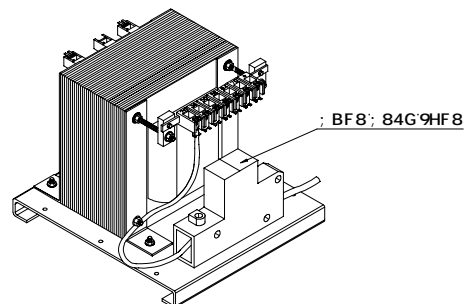
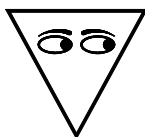


Figure 15. Fuse Hose Transformer



CAUTION: The fuse must be replaced with one of the same rating. A substitute may damage the equipment and would create a potential source of injury to the operator.

4. HOSE HEAT SOLID STATE RELAY (SSR) - It is not possible to check for normal operation of the power cube without electric power. Therefore, if all other testing fails to determine the source of problem, assume the power cube is inoperative and replace it.

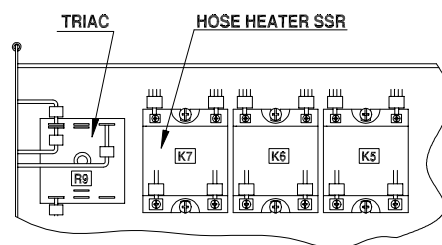


Figure 16. Hose Heat Solid State Relay

5. HOSE HEATING ELEMENT - First check to see that the screw terminals on the isolation hoses and all electrical connections are tight. If these connections are secure, then, with the main electrical supply disconnected at the source and the power OFF, remove one of the isolation hose transformer leads to permit continuity testing of the hose heating element. If continuity is not present, then a systematic search for the failed hose or connection must be made.

To check for improper electrical isolation, just remember that the low voltage hoses are electrically connected in series, and that the hose fittings make the electrical connection between hoses. Thus, if the resin fittings come into contact with the isocyanate fittings either because the electrical insulator was not installed between them, or because the insulator has slipped out of position, all hoses from the point of contact out to the gun will be “cold” while those hoses back to the Proportioner will be heated. If this occurs, it is a matter of finding where the fittings are in contact and isolating them.

6. **TEMPERATURE SENSOR** - Two conditions must be satisfied for proper operation: the sensor must be functional and the signal must travel uninterrupted from the sensor to the control unit. Unplug the TSU extension at the gun hose. Without undoing any hydraulic connections, transport the gun hose to the proportioning unit and plug the TSU directly into the 3 foot TSU extension harness at the hose connection. If control is not restored, change the TSU. If control is restored then a systematic check of the TSU extension harness must be made.

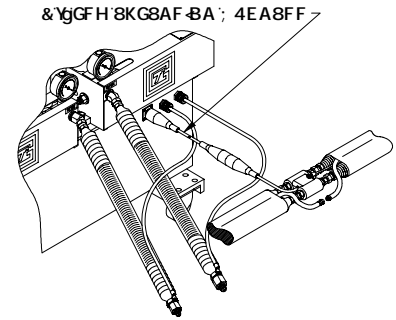


Figure 17. TSU Connection

7. The purpose of the hose heater is not to add heat but rather to maintain the temperature developed by the primary heater. If conditions indicate that the hose heater is not maintaining temperature during flow (Red Hose Heat Controller light on the console stays lit continuously), check that the primary heater and hose heater controllers are set for the same temperature or reduce the output.
8. The hose heater has been designed to operate at 230 volts. Low line voltage will significantly reduce power available and the heater will not perform to its full capability. Increase the line voltage up to 240 volts if possible, or reduce flow.

Primary Heater

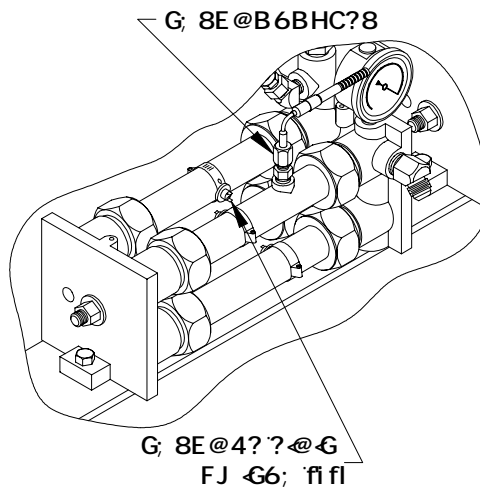
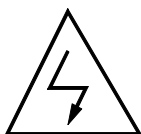
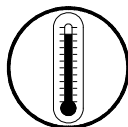


Figure 18. Primary Heater



WARNING: BEFORE PERFORMING THESE TROUBLE SHOOTING PROCEDURES, DETERMINE THAT ALL THE SWITCHES SHOULD BE ON THE OFF POSITION, THE EMERGENCY STOP SWITCH ON AND THE MAIN POWER SWITCH MUST BE DISCONNECTED AT THE SOURCE TO AVOID SEVERE BODILY INJURY FROM ELECTRICAL SHOCK. DO NOT ENTER THE ELECTRICAL CONSOLE WITH THE POWER ON.

THERE IS HIGH VOLTAGE INSIDE THE PRIMARY HEATER COVER BOX. DO NOT REMOVE THE COVER BOX WITH POWER ON.



THERE IS HIGH TEMPERATURE INSIDE THE PRIMARY HEATER COVER BOX. NEVER OPERATE THE HEATER WITH COVER BOX REMOVED.

COOL THE FLUID IN THE HEATER BY PUMPING UNHEATED FLUID THROUGH THE HEATER WITH THE HEATER OFF TO AVOID BODILY INJURY FROM HOT FLUID AND HOT METAL.

Try the recommended solutions in the order given for each problem to avoid unnecessary repairs. Also, determine that all circuit breakers, switches, and controls are properly set and wiring is correct before assuming there is a problem.

Problems

Solutions

Primary Heater does not heat; red light on the Primary Heater Controller is lit and switch pilot light is off.	1, 2
Primary Heater does not heat; red light on the Primary Heater Controller is lit and switch pilot light is on.	4, 6
“OPEN” shows on digital display.	3
Primary Heater partially heats but red light on the Primary Heater Controller is lit continuously.	4, 5

Solutions

1. A completely independent, over-temperature, safety circuit has been provided and consists of four (4) thermal limit safety switches attached to the heating tube(s). When the surface temperature of the tube(s) exceeds 100° C (212° F) the thermal limit safety switch will automatically turn off the pilot heater switch and it will stop performing. The system cannot be reset until the temperature of the Primary Heater has cooled down to within limits. You must determine the cause of the problem and correct it.
2. PRIMARY HEATER SOLID STATE RELAY (SSR) - It is not possible to check for normal operation of the power cube without electric power. Therefore, if all other testing fails to determine the source of problem, assume the power cube is inoperative and replace it.
3. THERMOCOUPLE - The temperature controller units are designed with a fail-safe feature, which prevents the heating system from operating in the event that there is no signal from the thermocouple. In this case the thermocouple must be replaced. Refer to the Maintenance section of this manual for the proper procedures.
4. HEATING ELEMENTS - If the heater turns on as it should, but takes excessively long to reach the temperature desired, has abnormally long “on” cycles, or does not turn off during dispensing, it is possible that one or more of the four heating elements are not working.

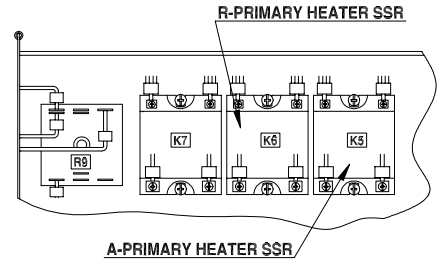


Figure 19. Primary Heater Solid State Relay

The heater contains four 1500-watt (32 ohms each) Heating elements wired in parallel. To check that all elements are operational, proceed as follows:

With power OFF and the primary heater switch OFF, read the resistance across the four Heating elements.

The resistance should be 8 ohms. A higher resistance indicates that one or more heating elements are inoperative (see chart below) and a systematic search must be made to determine which one. To do this, disconnect each heating element and check for continuity. If continuity is not present, then the heating element is inoperative and must be replaced.

4	operational	8 ohms
3	operational	10,6 ohms
2	operational	16 ohms

1 operational 32 ohms

The heating elements are rated for full output at 230 volts. Operation at 210 volts will reduce the heating power available by 16,6 % or 1128 watts. By the same respect, operation at up to 240 volts is acceptable and would increase the heating power available by 8,8% or 603 watts.

The positioning of the thermocouple in the outlet heat exchanger is critical to the proper operation of the primary heater. Therefore, two conditions must be satisfied:

- a) The thermocouple must make positive contact with the heating element.
- b) The heating element must be functioning properly.

If either of these conditions is not satisfied, it could cause erratic temperature control and possibly overheating. The thermocouple is properly positioned at the factory and mechanically locked into place. However, during maintenance or changing of the thermocouple, the positioning may have changed. Refer to the Maintenance section of the manual for proper thermocouple positioning. Check the resistance of the heating element; it should be 32 ohms.

5. The H-2000-E/H-3500-E primary heater has been designed to be very efficient and maximize the heat transfer from the power available. However, under certain conditions, the heater will not be able to reach the required temperature and then the flow must be reduced.
6. Circuit breaker controls power to heating elements. The circuit breaker is located inside the electrical console. Refer to electrical diagram for breaker identification.

Proportioning System

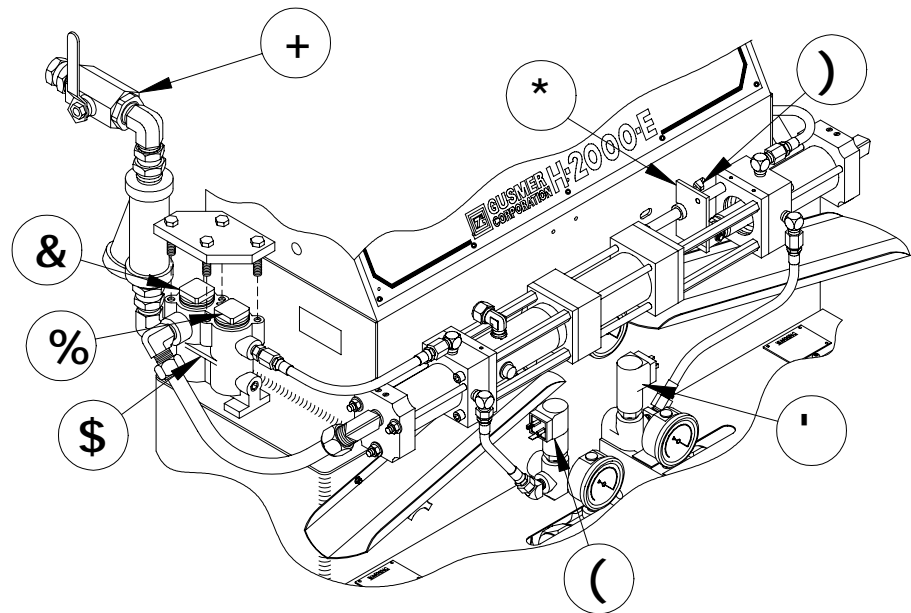
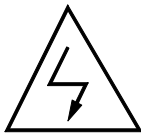
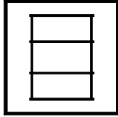
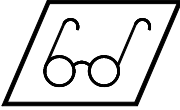


Figure 20. Proportioning System

- | | |
|---|---|
| 1. A-Pump Base
R-Pump Base
(Not shown, located on far side) | 6. Rocker Arm |
| 2. A-Discharge Ball Check Valve
R-Discharge Ball Check Valve
(Not shown, located on far side) | 7. Reversing Plate |
| 3. A-Inlet Ball Check Valve
R-Inlet Ball Check Valve
(Not shown, located on far side) | 8. A-Material Supply Ball Valve
R-Material Supply Ball Valve
(Not shown, located on far side) |
| 4. R-Over-pressure Safety Switch | |
| 5. A-Over-pressure Safety Switch | |



WARNING: BEFORE PERFORMING THESE TROUBLE SHOOTING PROCEDURES, DETERMINE THAT ALL THE SWITCHES SHOULD BE ON THE OFF POSITION, THE EMERGENCY STOP SWITCH ON AND THE MAIN POWER SWITCH MUST BE DISCONNECTED AT THE SOURCE TO AVOID SEVERE BODILY INJURY FROM ELECTRICAL SHOCK. DO NOT ENTER THE ELECTRICAL CONSOLE WITH THE POWER ON.



WARNING: MODEL H-2000-E/H-3500-E PROPORTIONING UNIT CAN PERFORM WITH PRESSURE UP TO 136 bars (2000 PSI) / 238 bars (3500 PSI) RESPECTIVELY. BEFORE OPENNING ANY HYDRAULIC CONNECTIONS OR SERVICING THE PUMP OR PUMP BASE, THE OPERATOR MUST USE EXTREME CAUTION TO INSURE THAT THE PRESSURE IN BOTH THE SUPPLY AND DELIVERY SIDES OF THE PUMP HAS BEEN BLED OFF TO ZERO TO AVOID SERIOUS BODILY INJURY FROM FLUID INJECTION. NEVER SERVICE COMPONENTS CONTAINING CHEMICALS WITHOUT WEARING PROPER PROTECTIVE EQUIPMENT.

Try the recommended solutions in the order given for each problem to avoid unnecessary repairs. Also, determine that all circuit breakers, switches, and controls are properly set before assuming there is a problem.

Problems	Solutions
Proportioning pump does not hold pressure when stalled.	1
Pressure unbalance between pumps.	1, 2, 3, 4
Cavitation in the proportioning pumps.	1, 2, 3, 4
Failure of the pump to reverse.	5
Pumps do not move, and both directional indicator lights are out.	5, 6, 7
Pump movement is erratic.	5

Solutions

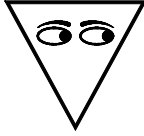
1. LEAKING BALL CHECK VALVE -
 - a) Determine which pump is losing pressure by observing the gauges.
 - b) Determine which direction the pump has stalled by observing which directional indicator light is lit.

Refer to the Figure below to isolate the problem:

Lighted	Lighted
R-Discharge Ball Check Valve or components fouling.	R- Pump Inlet Ball Check Valve or components fouling.
A-Inlet Discharge Ball Check Valve or components fouling	A-Pump Discharge Ball Check Valve or components fouling

To service perform the following procedure:

- a) Shut OFF all electrical switches, breakers, and the main power supply.
- b) Close the appropriate inlet material supply valve and disconnect the air supply to the Transfer Pump.



CAUTION: Allow the hose(s) and primary heater(s) to cool prior to servicing the unit.

- c) Bleed off all chemical until the pressure gauge(s) read zero.
 - d) Remove the appropriate ball guide. Inspect the ball seat gasket and replace as required. Flush and wipe clean the valve ball and ball seat of all residual material.
 - e) Using the ball seat removal tool, check the seat for proper seat compression. Snug the seat up to a ¼ turn maximum. The gasket should extend beyond the seat by approximately 1,5 mm (1/16 of an inch). If this does not resolve the problem, then the seat must be removed, the gasket inspected and replaced as required.
 - f) In most cases, the leaking valve will be caused by a particle of foreign material preventing the ball from seating properly. If cleaning the valve ball and seat does not resolve the problem, then these parts along with the gasket should be replaced.
2. PRESSURE UNBALANCE - The success of the trouble shooting procedure for this problem will depend on the determination of two points:

First - Which chemical did not reach the mixing chamber?

Second - Why did the chemical fail to get there?

The first determination can usually be made by observing the color of the material as it exits the gun. Foam systems are usually a combination of light and dark material. Therefore, by observing the color of the liquid exiting the gun, you can determine which material is missing. The determination as to why the chemical did not reach the gun may be more difficult to resolve. The reason for the lack of material is either because of a restriction in the gun or because the proportioning pump did not perform properly to pump its designed volume.

Once you have determined which chemical is missing, the chemical pressure gauges on the Proportioner will tell you if the malfunction is due to a restriction in the gun or a lack of material produced by the pump. To prevent misinterpretation, the focus must be on the pressure gauge corresponding to the missing chemical.

Assume that the R-component is not reaching the gun. Note the resin pressure gauge. If the resin gauge is considerably lower than the isocyanate gauge then the problem is either within the pump or a lack of adequate material supply to the pump. If the resin gauge is considerably higher than the isocyanate gauge then the problem is usually in the gun and must be resolved by referring to the gun manual.

3. CAVITATION - Cavitation is the formation of a partial vacuum or void that is created within the pump cylinder during the fill stroke.

It is actually a "short fill" since the fill chamber is not completely filled with liquid when the pump reverses to start the discharge stroke. This void is created when the proportioning pump demands a greater volume of material during its fill stroke than can be supplied.

The most common causes of cavitation are as follows:

- a) The Transfer Pump is not properly sized to handle the supply requirement or is malfunctioning. The GUSMER 2:1 Transfer Pump is recommended for use with the H-2000-E/H-3500-E.
Also recommended is a minimum of 20 mm (3/4") diameter supply hose, as short as practical.
 - b) The chemical is too viscous (thick) to pump properly. Consult your Chemical Supplier for the recommended supply temperature.
 - c) Inlet strainer screen is restricted. Service as described in the Maintenance section of this manual.
4. LEAKING INLET VALVE BALL - An inlet valve ball and/or a leaking seat gasket that does not properly seat will permit some of the proportioned material to flow back towards the supply drum. When this happens the proper volume of material will not be pumped during the discharged stroke and an off-ratio condition will result. This malfunction will evidence itself identically to cavitation, perhaps somewhat less severe however.
 5. REVERSING MALFUNCTION - For the proportioning pumps to change direction or reverse, the Activator plate must contact the rocker arm to activate the reversing switch. Failure of the activator plate to make proper contact is usually caused by something physical such as a bent or loose activator plate.

Should the above not be the cause, the problem is likely to be a result of the pump piston packing retaining bolt having loosened. This would cause the piston to contact the inner face of the pump inlet flange before the activator plate contacts the rocker arm. To resolve this, the unit must be shut down and the appropriate pump disassembled for repair.

Failure of the directional valve to shift is readily seen because the activator plate will have passed the rocker arm and not reversed. When this happens, the first thing to do is to relocate the activator plate so that it is situated between the arms of the rocker arm as follows:

- a) Determine in which direction the plate must move: this is predicated upon which stroke is overrun.
- b) Go to the hydraulic manifold and locate the manual operator centered in the end of the housing of the coil on the same side of the machine toward which the activator plate must go. For example: The plate over ran to the left and must be moved to the right toward the Resin pump: go to coil on the Resin side.

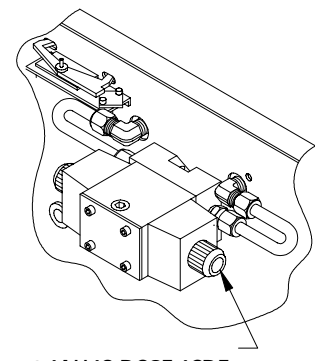


Figure 21. Hydraulic Manifold

- c) With the gun (or coupling block) open, the main power switch and motor control switch ON, and the pump switch OFF, push in the manual operator (a 3/16 Allen wrench is ideal for this) and hold it in until the activator plate is approximately centered. Release it and close the gun or coupling block.
- d) If the spool seemed to move freely when it was pushed, the overrun was probably caused by an electrical problem. Turn off the motor and place the pump switch in the NORMAL position. Push in each end of the rocker arm, listen for the shifting of the spool, and note the direction indicators light as appropriate. If the spool does not shift, or if the lights do not light there is an electrical problem with the reversing switch, directional valve coil, or pump switch.

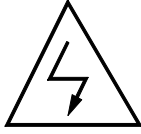
Should the spool hang up or be hard to push, it is likely that there is a mechanical problem within the directional valve, which will necessitate shutting down the unit and disassembling the directional valve for service.

6. OVER-PRESSURE PROTECTION - Each proportioning pump is protected by a pressure limit switch factory set to 136 bars (2000 psi) on model H-2000-E and 238 bars (3500 psi) on model H-3500-E. When this pressure is reached, the switch automatically removes power from the directional valve causing the pumps to stall. When the power is removed, both directional indicator lights will go off which is the indication to the operator of an over-pressure shutdown.

This is not a lockout type of system and when the pressure bleeds off approximately 14 bars (200 psi), the proportioning pumps will be restored to normal operation; however, the cause of the over-pressure should be determined and corrected. The three most likely causes of over-pressure are:

- a) Restriction in the gun.
 - b) Cavitation of the opposite pump.
 - c) Hydraulic pressure set too high.
7. CONTROL TRANSFORMER - A circuit breaker protects the control transformer. Refer to electrical drawing for proper identification. With the electrical power OFF, open the electric console and check that the circuit breaker is on the ON position, if not, switch it on.

Hydraulic Drive System



WARNING: BEFORE PERFORMING THESE TROUBLE SHOOTING PROCEDURES, DETERMINE THAT ALL THE SWITCHES SHOULD BE ON THE OFF POSITION, THE EMERGENCY STOP SWITCH ON AND THE MAIN POWER SWITCH MUST BE DISCONNECTED AT THE SOURCE TO AVOID SEVERE BODILY INJURY FROM ELECTRICAL SHOCK. DO NOT ENTER THE ELECTRICAL CONSOLE WITH POWER ON.

Try the recommended solutions in the order given for each problem to avoid unnecessary repairs. Also determine that all circuit breakers, switches, and controls are properly set before assuming there is a problem.

Problems

Solutions

Electric motor will not start or stops during operation.	1
Hydraulic pump does not develop pressure.	2
Low or zero pressure with screeching noises.	2, 3

Solutions

1. **CIRCUIT BREAKER** - The electric motor is protected by a motor safety circuit breaker that trips once the motor receives a tension increment. To restore the motor to operation, allow it to cool and with electrical power OFF, open the electric console and reset the button. It is also important to determine the cause of the trip. Improper low line voltage can also cause harm to the motor due to overheating which will cause the circuit breaker to trip.
2. **ZERO OR LOW PRESSURE** - Remember hydraulic pressure cannot be generated with the motor or pump switch in the OFF position.

Assuming the pump is in proper working order, and the pump switch is set to NORMAL, the major factors, which can cause it not to produce pressure, are that the pump is either not primed or loses its prime. To assure a positive prime, check the following:

- a) Hydraulic reservoir serviced to the proper level including a check that the cartridge strainer and hydraulic fluid are clean.
- b) Pump case is filled with hydraulic fluid.
- c) Inlet fitting is fully tight to insure no air is leaking into the pump case.

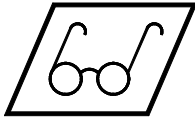
3. SCREECHING - The screeching noise is a characteristic of cavitation and is normal at initial start-up for a maximum of 30 seconds. If the screeching continues for more than 30 seconds, check that the inlet fittings are tight and that the pump has not lost its prime.

A second cause of screeching can be excessive hydraulic oil temperature. Determine that the reservoir is properly serviced and if necessary provide better ventilation to permit the reservoir to dissipate heat more efficiently.

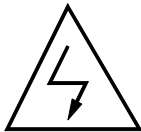


MAINTENANCE

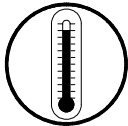
To realize full productivity from the Model H-2000-E/H-3500-E, it is necessary that certain maintenance be performed daily or periodically.



WARNING: WHENEVER WORKING ON THE EQUIPMENT, INSURE THAT EYE PROTECTION IS WORN AND THAT SKIN IS PROTECTED AGAINST EXPOSURE TO THE CHEMICALS AND SOLVENTS BEING USED. WORK SHOULD ALWAYS BE DONE IN A WELL VENTILATED AREA TO PREVENT EXPOSURE TO HARMFUL FUMES AND VAPORS. INFORMATION CONCERNING THE TOXICITY AND PROPER HANDLING PROCEDURES OF YOUR CHEMICALS AND SOLVENTS IS AVAILABLE FROM YOUR SUPPLIER.



UNLESS OTHERWISE SPECIFIED, THAT ALL THE SWITCHES SHOULD BE ON THE OFF POSITION, THE EMERGENCY STOP SWITCH ON AND THE MAIN POWER SWITCH MUST BE DISCONNECTED AT THE SOURCE TO AVOID SEVERE BODILY INJURY FROM ELECTRICAL SHOCK. DO NOT ENTER THE ELECTRICAL CONSOLE WITH POWER ON.



THERE IS HIGH TEMPERATURE ON THE PRIMARY HEATER. BEFORE PERFORMING MAINTENANCE, ALLOW THE HEATER TO COOL TO AVOID BODILY INJURY FROM HOT FLUID OR HOT METAL.



THE HYDRAULIC COMPONENTS OF THE MODEL H-2000-E/H-3500-E PROPORTIONING UNIT ARE PRESSURIZED UP TO 136 bars (2000 PSI) / 238 bars (3500 PSI) RESPECTIVELY. BEFORE OPENING ANY HYDRAULIC CONNECTIONS OR SERVICING HYDRAULIC COMPONENTS, USE EXTREME CAUTION TO INSURE THAT ALL PRESSURES HAVE BEEN BLED TO ZERO TO AVOID SERIOUS BODILY INJURY FROM FLUID INJECTION.

Pump Lube System

To insure that the pump lube will do its job, its condition must be checked daily. Change the pump lube before it becomes a gel, when its color turns cloudy, or when its color becomes the same as the Isocyanate.

The gel formation is due to moisture absorption by the pump lube. The time interval between changes due to gel formation depends entirely upon the environment in which the equipment is operating. Because of the enclosed pump lube system in the H-2000-E/H-3500-E, the exposure to moisture is minimized, but moisture contamination is still a possibility.

Discoloration of the pump lube is inevitable due to the continual seepage of Isocyanate during pump operation. However, if the packing within the Isocyanate pump is functioning properly, pump lube replacement due to discoloration should not be more frequent than 3 to 4 week intervals.

To change the pump lube proceed as follows:

1. Position the Isocyanate proportioning pump to the extreme right by jogging the pump switch with the gun or coupling block open.
2. Place a container underneath the drip pan on the Isocyanate side. Loosen the hex nut on the inlet hose fitting (bottom) and carefully remove the lube hose from the fitting and allow the lube cylinder to drain.

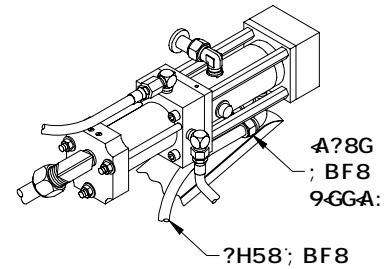
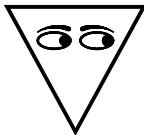


Figure 22. Lube Hose

3. Lift the lube reservoir out of the bracket and remove the cap from the container. Now drain the reservoir, flush it with pump lube and refill it with fresh pump lube.



CAUTION: Do not fill the lube cylinder with pump lube. This would over service the system and may cause the lube reservoir to burst. The system is self-priming and the lube cylinder will fill during normal operation of the machine.

Inlet Strainer Screen

A strainer screen has been provided in each proportioning pump, to filter out solid matter that could adversely effect the operation of the ball check valves in the pump base. You will note that the Daily Start-up Procedure indicates these screens should be inspected daily.

For the first week or so of operation, you should clean both pump screens on a daily basis. However, you will probably find that the resin pump screen remains clean and that weekly checking of this part will be sufficient.

The Isocyanate pump screen presents another matter. The Isocyanate component can crystallize from either moisture contamination or from freezing. If proper storage, transfer, and operating procedures are followed and if the chemicals you receive are clean, you should have little problem with the Isocyanate screen. In practice though, it has been found that daily cleaning of the Isocyanate screen is good preventative maintenance. It is important to note that the Isocyanate pump screen should NEVER be cleaned during shut-down operation. This is because the cleaning of the screen exposes it and its related parts to moisture and solvent, which can cause the Isocyanate to crystallize. By accomplishing the cleaning operation during the Start-up Procedure, contamination problems will be minimized because the Isocyanate residue will be flushed out immediately when dispensing commences.

Removal and cleaning of the strainer screen is accomplished as follows:

1. Close the material supply valve at the inlet of the appropriate proportioning pump. This prevents material from being pumped when the strainer screw is removed.
2. Place a container beneath the strainer base to catch the drain-off of chemical when the strainer screw is removed.
3. Remove the screen screw from the strainer base. Thoroughly flush the screen screw and the screen with the gun cleaner, and shake them dry. Inspect the screen to insure that no more than 25 % of the mesh is restricted. Inspect the strainer screw gasket and replace as required.

NOTE:
 More than 25 % restriction of the screen can prevent proper filling of the pump during operation. If more than 25 % is blocked, the screen should be replaced.

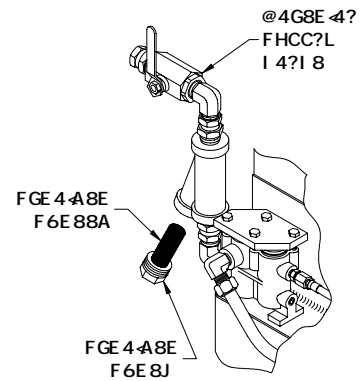


Figure 23. Strainer

4. Install the strainer screw with the strainer in place and tighten. Important: Take care not to over-tighten, let the gasket make the seal.
5. Open the material supply valve; insure there are no leaks and wipe the equipment clean.
6. Proceed with operation.

Hydraulic System



WARNING: THE HYDRAULIC COMPONENTS OF THE MODEL H-2000-E/H-3500-E PROPORTIONING UNIT ARE PRESSURIZED UP TO 136 bars (2000 PSI) / 238 bars (3500 PSI) RESPECTIVELY. BEFORE OPENING ANY HYDRAULIC CONNECTIONS OR SERVICING HYDRAULIC COMPONENTS, USE EXTREME CAUTION TO INSURE THAT ALL PRESSURES HAVE BEEN BLED TO ZERO TO AVOID SERIOUS BODILY INJURY FROM FLUID INJECTION.

The hydraulic system should be checked annually for cleanliness as follows:

1. Thoroughly clean the tank top, the access cover plate, and the components in the area of the cover plate. This will insure that no foreign matter will enter the hydraulic reservoir when the cover plate is removed.

NOTE:

Upon starting the motor, the hydraulic pump may make a screeching noise for a short time upon initial start-up. Should this noise continue for more than 30 seconds, switch off the motor control and refer to the troubleshooting section of this manual.

2. Remove the six (6) cover plate mounting screws. Separate the hydraulic suction pipe from the fitting connecting the pipe to the hydraulic pump.

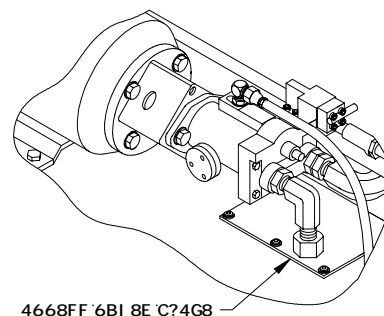


Figure 24. Hydraulic System

3. Remove the cover and pipe from the hydraulic reservoir.
4. Inspect the bottom of the reservoir for sediment. If sediment is present, the hydraulic fluid should be drained; the tank thoroughly cleaned and refilled with new fluid. The strainer on the suction pipe should be replaced (with 200 mesh screening) to insure free flow of hydraulic fluid to the pump.
5. Replace the cover and the suction pipe; connect and tighten the suction pipe to the fitting on the hydraulic pump; and secure the cover in place with the mounting screws.
6. Check to insure the hydraulic pump is filled with hydraulic fluid.
7. Proceed with normal operation.

Proportioning Pumps



WARNING: THE HYDRAULIC COMPONENTS OF THE MODEL H-2000-E/H-3500-E PROPORTIONING UNIT ARE PRESSURIZED UP TO 136 bars (2000 PSI) / 238 bars (3500 PSI) RESPECTIVELY. BEFORE OPENING ANY HYDRAULIC CONNECTIONS OR SERVICING HYDRAULIC COMPONENTS, USE EXTREME CAUTION TO INSURE THAT ALL PRESSURES HAVE BEEN BLED TO ZERO TO AVOID SERIOUS BODILY INJURY FROM FLUID INJECTION.

Both proportioning pumps should be disassembled and cleaned annually. The pistons and cylinders should be inspected for marks or scratches, which may cause leakage or damage to packings. It is also recommended that the piston and cylinder packings, expanders, and packing springs be replaced on an annual basis as a preventative maintenance precaution. (Refer to the Proportioning Pump Assembly section of the Parts I.D. for reference).



WARNING: TO AVOID SERIOUS BODILY INJURY. BOTH PROPORTIONING PUMPS OPERATE UNDER HIGH PRESSURE. IT IS IMPERATIVE THAT THE PUMP TIE RODS BE PRECISELY TORQUED AFTER SERVICING: H-2000-E TORQUE TO 2,5 Kg/Mt (17 FT. LBS.) / H-3500-E TORQUE TO 4 Kg/Mt (30 FT. LBS.)

Pump Bases



WARNING: BOTH PUMP BASES OPERATE UNDER HIGH PRESSURE. TO AVOID SERIOUS BODILY INJURY, BEFORE SERVICING THE PUMP BASE ASSEMBLY, USE EXTREME CAUTION TO INSURE ALL PRESSURE FROM BOTH THE SUPPLY AND DELIVERY SIDE OF THE PUMP BASE HAVE BEEN BLED TO ZERO.

Both Pump Bases should be disassembled and cleaned annually.

To do so follow these steps:

(Refer to the Pump Base Assembly section of the Parts I.D. for reference).

1. De-pressurize the system.
2. Remove the valve cover bracket and the ball guides. A groove has been provided in the ball guide to facilitate the removal by use of a screwdriver. If the ball guide is particularly difficult to remove, use a wrench to turn the guide back and forth while applying upward leverage with a screwdriver.
3. Check the chamfer around the cavity to insure that there are no sharp edges, which could damage the o-ring and prevent proper seal. Inspect the ball guide o-ring and replace as required. It is a good practice to liberally coat the o-ring with grease prior to inserting the ball guide back into the pump base cavity.
4. Using the ball seat removal tool, (5/8 hex stock) unthread and remove the ball seat.
 - Clean the gasket seating surfaces on the underside of the seat and inside the pump base cavity.
 - Inspect the seat gasket and replace as required.
 - Inspect the ball seat for nicks or scratches. Replace as required.
 - Thoroughly clean the thread on the seat before replacement. It is also a good practice to coat the threads with a liberal amount of lubricant.
 - Install the seat with gasket by threading the seat into the base by hand until the gasket bottoms inside the pump base. Use a 6" adjustable wrench to snug the seat approximately ¼ turn.
 - DO NOT OVERTIGHTEN. It may be necessary to periodically retighten the seat throughout the life of the gasket.
5. Wipe the valve ball clean and inspect it for nicks. Replace as required and complete the Pump Base Assembly.

Primary Heaters



WARNING: THE HYDRAULIC COMPONENTS OF THE MODEL H-2000-E/H-3500-E PROPORTIONING UNIT ARE PRESSURIZED UP TO 136 bars (2000 PSI) / 238 bars (3500 PSI) RESPECTIVELY. BEFORE OPENING ANY HYDRAULIC CONNECTIONS OR SERVICING HYDRAULIC COMPONENTS, USE EXTREME CAUTION TO INSURE THAT ALL PRESSURES HAVE BEEN BLED TO ZERO TO AVOID SERIOUS BODILY INJURY FROM FLUID INJECTION.



WARNING: THERE IS HIGH TEMPERATURE INSIDE THE PRIMARY HEATER COVER BOX. BEFORE PERFORMING MAINTENANCE, ALLOW THE HEATER TO COOL TO AVOID BODILY INJURY FROM HOT FLUID OR HOT METAL.

The sheath on the H-2000-E and H-3500-E heating rods are made from a special alloy designed to be resistant to corrosion and erosion. However, eventually the service life of the rod will be reached and if the sheath should fail, fluid under pressure will leak into the heating element. This may result in leakage through the potting at the junction end of the rod. Therefore, it is imperative that the unit **NEVER** be operated with the guard removed and furthermore, you must never remove the guard for servicing without bleeding the material pressure in the heater to zero and disconnecting all electrical power.

The heating element can be conveniently replaced without disassembly of the heater. With the power OFF, disconnect the lead wires, and using an open-end wrench, loosen the heating element and remove it. Since each element is surrounded by fluid, be prepared to catch the residual fluid as the element is withdrawn. Inspect the removed element, it should be relatively smooth and shiny. If there is crusted burnt ash like material adhered to the rod, or the sheath shows pitting marks, the heating elements should be replaced.

Reinstall the heating element using a thread sealant.

THERMOCOUPLE - The thermocouple includes the compression nut and ferrule, and once the ferrule has been locked in place, it becomes a permanent part of the thermocouple and cannot be relocated or removed. The location of the thermocouple is critical to the operation of the heater and it must be properly positioned before the compression nut is tightened.

Proper installation procedures are as follows:

1. Determine that the body of the compression fitting is securely tightened into the heat exchanger tube to prevent any leakage. Remember, once the ferrule has been set, the position of the body cannot be changed.

2. Determine that the heat exchanger spring is not obstructing placement of the thermocouple. Place the thermocouple into the body and continue to insert until positive contact is made with the heating element.
3. Firmly hold the thermocouple in place against the element while tightening the locknut. Note the correct ferrule positioning

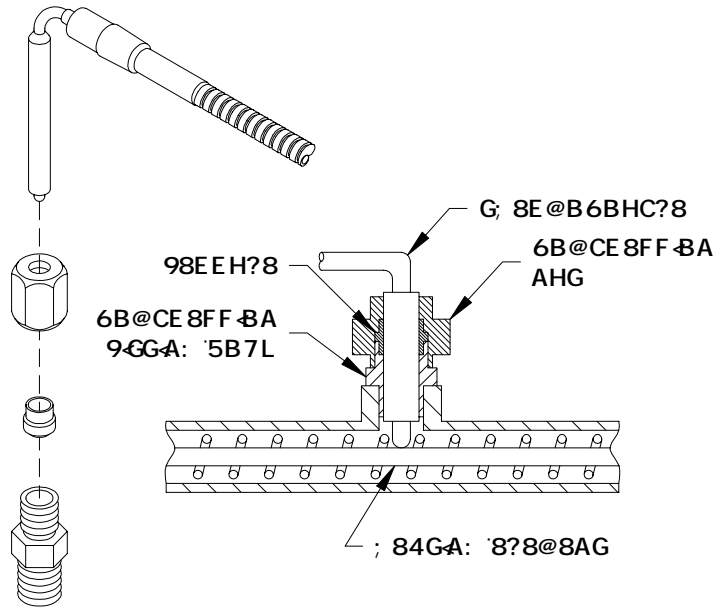


Figure 25. Thermocouple

Proportioning Ratios

PROPORTIONING RATIOS: Established by volume in accordance with pump sizes. Pump size designation is determined by the piston rod's cross-section area. For instance, the designation #120 would indicate a pump having a piston rod with a cross-section of 774,2 mm² (1,2 square inches) with a displacement of 19,7 cm³ (1,2 cubic inches) per 25,4 mm (1 inch) of stroke. The #120 pump is considered to be the basic pump for Model H-2000-E and the #80 pump for Model H-3500-E and if they are matched with another #120 and #80 respectively it will be reach 1:1 ratio proportions. Pump sizing has been achieved by varying piston and cylinder bore.

TABLE 1. MODEL H-2000-E/H-3500-E PROPORTIONER PUMP SPECIFICATIONS

Pump Size	Cross-Sectional Area		Displacement per Stroke cm ³	Displacement per Stroke Cubic Inches	Ratio with #60 Pump
	mm ²	Square Inches			
#120	774,2	1,20	58,99	3,60	50 – 50
#112	722,6	1,12	55,06	3,36	52 – 48
#104	671,0	1,04	51,12	3,12	53,5 – 46,5
#96	619,3	0,96	47,19	2,88	55,5 – 44,5
#88	567,7	0,88	43,26	2,64	57,5 – 42,5
#80	516,1	0,80	39,32	2,40	60 – 40
#60	387,1	0,60	29,50	1,80	66,7 – 33,3
#48	309,7	0,48	23,59	1,44	71 – 29
#44	283,9	0,44	21,63	1,32	73,2 – 26,8
#40	258,1	0,40	19,66	1,20	75 – 25
#30	193,6	0,30	14,74	0,90	80 – 20
#24	154,9	0,24	7,37	0,45	83,3 – 16,7

TABLE 2. PUMP CYCLE COUNTER CHART (CYCLE TO PROPORTIONING PUMP RATIO RELATIONSHIP)

Pump Ratio	Number of Cycles Required to Dispense Approximately	
	1 lb. (0.5 kg.) of Mixed Material	1 Gal (3.8 l) of Mixed Material
50 – 50	1,6 cycles	16 cycles
52 – 48	1,7 cycles	16 1/2 cycles
53,5 – 46,5	1,7 cycles	17 cycles
55,5 – 44,5	1,8 cycles	18 cycles
57,5 – 42,5	1,9 cycles	18 1/2 cycles
60 – 40	1,9 cycles	19 1/2 cycles
66,7 – 33,3	2,2 cycles	21 1/2 cycles
71 – 29	2,3 cycles	23 cycles
73,2 – 26,8	2,4 cycles	23 1/2 cycles
75 – 25	2,4 cycles	24 cycles
80 – 20	2,6 cycles	26 cycles
83,3 – 16,7	2,7 cycles	27 cycles



APPENDIX

Recommended Hydraulic fluid or equivalent to be used:

1. Mobil DTE 24
2. Mobil DTE 25
3. Cooks Albavis 10
4. Agip ARNICA S 46

The H-2000-E and H-3500-E have been designed to interface with all of the following Equipment:

Equipment	Max. Pressure Rating
GX-7 High Pressure Spray Guns	238 bars (3500 psi)
GX-7 Auto High Pressure Spray Gun	238 bars (3500 psi)
GX10 Pour Head	200 bars (3000 psi)
AR-C/D High Pressure Pour Gun	136 bars (2000 psi)
Model D High Pressure Spray Gun	70 bars (1000 psi)
P 50 Automatic Shot Timer/Counter	

IMPORTANT: It is incumbent upon the user to ensure that the maximum pressure rating of components, such as hoses, guns, etc. Are never exceeded.

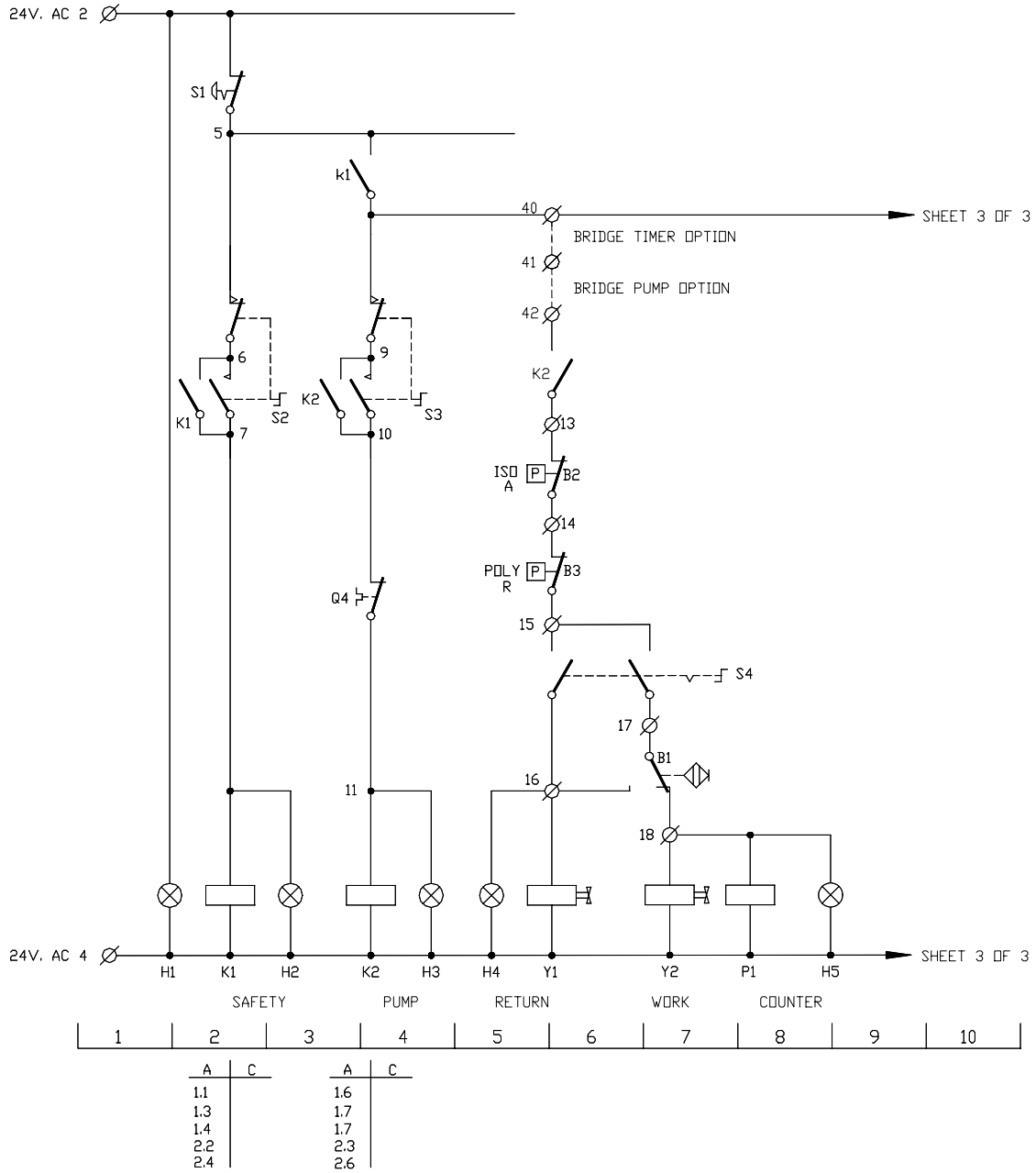


Figure 27. H-2000-E/H-3500 E Schematic Diagram, Sheet 2 of 3

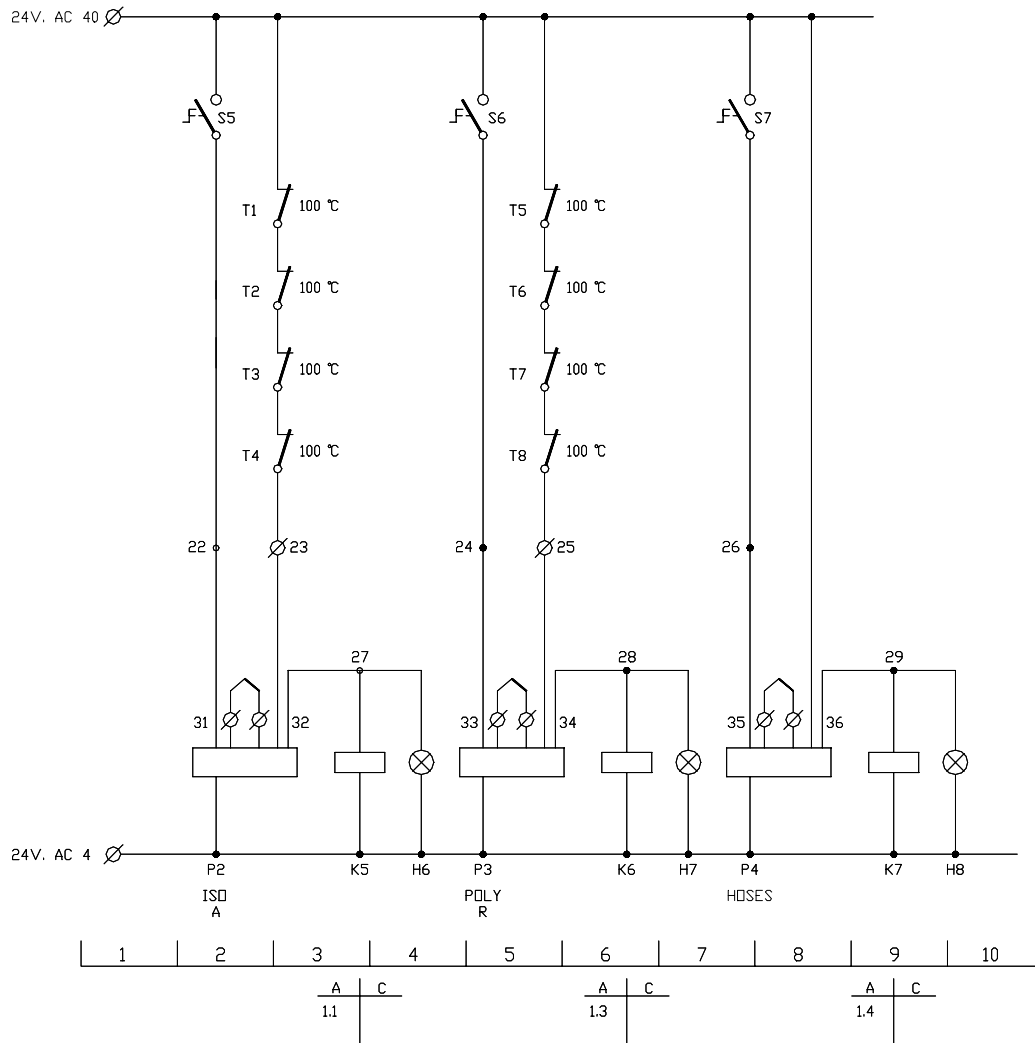


Figure 28. H-2000-E/H-3500-E Schematic Diagram, Sheet 3 of 3

TABLE 3. H-2000-E/H-3500-E SCHEMATIC DIAGRAM, PARTS LIST

Reference Letter	Part Number	Description	Quantity
A	047-00002-000	AMMETER	1
B1	0578A	REVERSING SWITCH	1
B2-B3	6690-16-772200R	PRESSURE SWITCH	2
D1	050-00008-000	VOLTAGE DIFFERENTIAL SWITCH	1
F1	050-00011-000	FUSE	1
F2	040-00003-004	FUSE TRANSFORMER	1
H1	042-00019-000	PILOT LIGHT: GREEN	1
H1	042-00020-000	LAMP HOLDER	1
H1	042-00001-000	LAMP	1
H2-H3	042-00001-000	LAMP	2
H4-H5	042-00018-000	PILOT LIGHT: AMBER	2
H4-H5	042-00020-000	LAMP HOLDER	2
H4-H5	042-00001-000	LAMP	2
H6-H7-H8	042-00001-000	LAMP	3
I1	042-00002-000	SWITCH	1
K1	041-00005-000	CONTACTOR	1
K2	041-00002-000	CONTACTOR	1
K5-K6-K7	041-00011-000	STATIC RELAY	3
P1	047-00005-000	COUNTER	1
P2-P3-P4	047-00015-000	TEMPERATURE CONTROLLER	3
Q1-Q2	050-00009-000	CIRCUIT BREAKER: 30A.	2
Q3	050-00005-000	CIRCUIT BREAKER: 10A.	1
Q4	050-00010-000	CIRCUIT BREAKER: 6-10A.	1
Q5	050-00006-000	CIRCUIT BREAKER: 3A.	1
R10	6690-5-17	POTENTIOMETER	1
R9	6690-26-18	TRIAC	1
S1	042-00006-000	EMERGENCY SWITCH	1
S2-S3	042-00007-000	LIGHTED SWITCH BODY	2
S2-S3	042-00016-000	SWITCH CONTACT	2
S4	042-00012-000	LIGHTED SWITCH BODY	1
S4	042-00015-000	SWITCH CONTACT	1
S5-S6-S7	042-00013-000	LIGHTED SWITCH BODY	3
S5-S6-S7	042-00014-000	SWITCH CONTACT	3
T1-T8	15310-5-1	THERMOSTAT	8
TR1	040-00002-000	TRANSFORMER	1
TR2	040-00004-000	TRANSFORMER	1
V	047-00003-000	VOLTMETER	1
Y1-Y2	077-00001-002	DIRECTIONAL VALVE	2

Field Number	Field Title	Description
1	Date	Enter date report is submitted.
2	Name	Enter name of person making report.
3	IM Number	Enter the Part Number of the Instruction Manual from the title page.
4	Issue Number	Enter the Issue number of the Instruction Manual from the title page. If there is no issue number enter NONE .
5	Date of Issue	Enter the date of Issue of the Instruction Manual from the title page. If there is no issue date enter NONE .
6	Page Number	Enter the page number containing the discrepancy
7	Discrepancy	Provide a brief description of discrepancy

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