Instructions

Gusmer® GH-3 Hydraulic Proportioner

3B0072A
EN

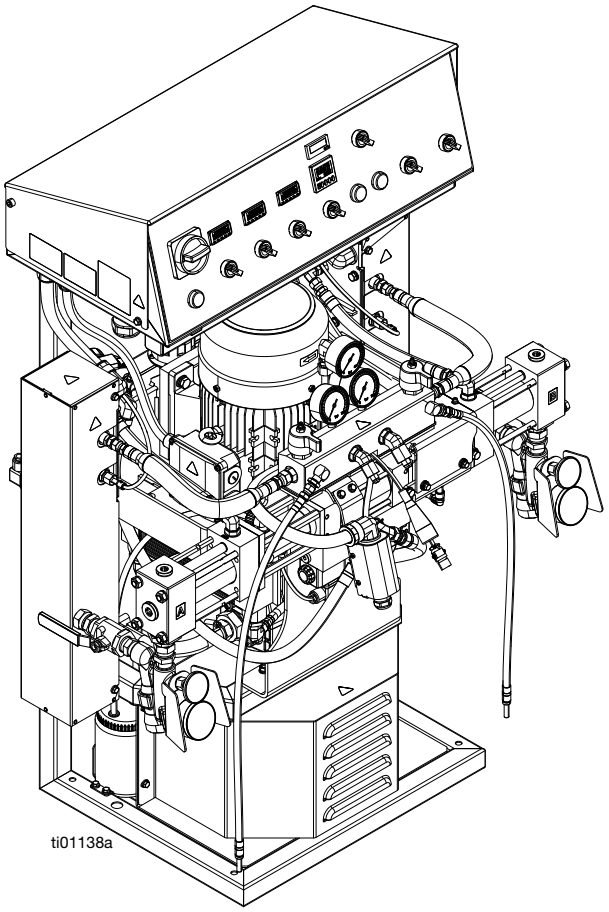
Hydraulic, heated, plural-component proportioner for spraying polyurethane foam. Not for outdoor use. For professional use only.

Not approved for use in explosive atmospheres or hazardous (classified) locations.

See page 3 for model information, including maximum working pressure and approvals.

Important Safety Instructions

Read all warnings and instructions in this manual and in your component manuals before using this equipment. Be familiar with the proper control and useage of the equipment. Save all instructions.



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Contents

Models

NOTE: The GH-3 model requires standard 2-component hose with thermocouple cable.

	GH-3 Models (12 kW)	
Proportioner	GH3	GH-3JP
Voltage Phase (VAC, 50/60 Hz)	400 VAC 3Ø + N 50Hz	230 VAC 3Ø 50/60Hz
Full Load Peak Current*	37	79
Maximum Fluid Working Pressure	3500 psi (24 MPa, 240 bar)	
Approximate Output per Cycle (A + B)	0.063 gal. (0.24 L)	
Maximum Flow Rate	33 lb/min, 15 kg/min	
Total System Load†	20,000 W	
Agency Approvals	CE	

* Full load amps with all devices operating at maximum capabilities. Fuse requirements at various flow rates and mix chamber sizes may be less.

† Total system watts used by system, based on maximum heated hose length for each unit.

- GH-3 series: 305 ft (93 m) maximum heated hose length, including whip hose.

Voltage Configurations Key	
Ø	PHASE
Δ	DELTA
Y	WYE

System Packages

Standard System Packages*

Proportioner Configuration			Single Hose Package (15 m)	Multi-Hose Package (60 m)	Whip Hose (3 pack)	Heated Hose (3 pack)	Agency Approvals
GH-3	350-415V (3 Phase+N)	2001752	HS01752	HH01752	2003625	2003627	CE
GH-3	200-240 V (3 Phase)	2002016	HS02016	HH02016			

* Base GH-3 models do not include hoses. These numbers are provided for reference when ordering.

Accessories

Kit Number	Description
17G340	Caster Kit
24M174	Drum Level Sticks

Supplied Manuals

The following manuals are shipped with the Gusmer Hydraulic Proportioner. Refer to these manuals for detailed equipment information.

Manuals are also available at www.graco.com.

Manual	Description
3B0072	Gusmer Hydraulic Proportioner Manual

Related Manuals

The following manuals are for accessories used with the Gusmer Hydraulic Proportioner.

Component Manuals in English

Manual in English	Description
Pump Manual	
3A3085	Pump, Repair-Parts
312071	Seal Kit
Hose Manuals	
3B0133	Heated Hose, Instructions-Parts
Feed System Manuals	
309852	Circulation and Return Tube Kit, Instructions-Parts
309815	Feed Pump Kits, Instructions-Parts
309827	Feed Pump Air Supply Kit, Instructions-Parts
Spray Gun Manuals	
309550	Fusion® AP Gun
312666	Fusion CS Gun
3A7314	Fusion PC Gun
313213	Probler® P2 Gun
Accessory Manuals	
3A3010	Caster Kit, Instructions-Parts
Component Manuals	
312070	Circulation Valve Kit

Safety Symbols

The following safety symbols appear throughout this manual and on warning labels. Read the table below to understand what each symbol means.

Symbol	Meaning
	Burn Hazard
	Cleaning Solvent Hazard
	Electric Shock Hazard
	Equipment Misuse Hazard
	Fire and Explosion Hazard
	Moving Parts Hazard
	Skin Injection Hazard
	Skin Injection Hazard
	Splash Hazard

Symbol	Meaning
	Tipping Hazard
	Toxic Fluid or Fumes Hazard
	Eliminate Ignition Sources
	Ground Equipment
	Follow Pressure Relief Procedure
	Read Manual
	Ventilate Work Area
	Wear Personal Protective Equipment

Safety Alert Symbol
This symbol indicates: Attention! Become Alert! Look for this symbol throughout the manual to indicate important safety messages.

General Warnings

The following warnings apply throughout this manual. Read, understand, and follow the warnings before using this equipment. Failure to follow these warnings can result in serious injury.

⚠ DANGER

SEVERE ELECTRIC SHOCK HAZARD

This equipment can be powered by more than 240 V. Contact with this voltage will cause death or serious injury.

- Turn off and disconnect all power before disconnecting any cables and before servicing equipment.
- This equipment must be grounded. Connect only to grounded power source.
- All electrical wiring must be done by a qualified electrician and comply with all local codes and regulations.
- Do not expose to rain. Store indoors.

⚠ WARNING

TOXIC FLUID OR FUMES HAZARD

Toxic fluids or fumes can cause serious injury or death if splashed in the eyes or on skin, inhaled or swallowed.

- Read Safety Data Sheets (SDSs) for handling instructions and to know the specific hazards of the fluids you are using, including the effects of long-term exposure.
- When spraying, servicing equipment, or when in the work area, always keep work area well-ventilated and always wear appropriate personal protective equipment. See **Personal Protective Equipment** warnings in this manual.
- Store hazardous fluid in approved containers, and dispose of it according to applicable guidelines.

PERSONAL PROTECTIVE EQUIPMENT

Always wear appropriate personal protective equipment and cover all skin when spraying, servicing equipment, or when in the work area. Protective equipment helps prevent serious injury, including long-term exposure; inhalation of toxic fumes, mists or vapors; allergic reaction; burns; eye injury and hearing loss. This protective equipment includes but is not limited to:

- A properly fitting respirator, which may include a supplied-air respirator, chemically impermeable gloves, protective clothing and foot coverings as recommended by the fluid manufacturer and local regulatory authority.
- Protective eyewear and hearing protection.

⚠WARNING

SKIN INJECTION HAZARD

High-pressure fluid from dispensing device, hose leaks, or ruptured components will pierce skin. This may look like just a cut, but it is a serious injury that can result in amputation. **Get immediate surgical treatment.**

- Engage trigger lock when not dispensing.
- Do not point dispensing device at anyone or at any part of the body.
- Do not put your hand over the fluid outlet.
- Do not stop or deflect leaks with your hand, body, glove, or rag.
- Follow the **Pressure Relief Procedure** when you stop dispensing and before cleaning, checking, or servicing equipment.
- Tighten all fluid connections before operating the equipment.
- Check hoses and couplings daily. Replace worn or damaged parts immediately.

FIRE AND EXPLOSION HAZARD

Flammable fumes, such as solvent and paint fumes, in **work area** can ignite or explode. Paint or solvent flowing through the equipment can cause static sparking. To help prevent fire and explosion:

- Use equipment only in well-ventilated area.
- Eliminate all ignition sources; such as pilot lights, cigarettes, portable electric lamps, and plastic drop cloths (potential static sparking).
- Ground all equipment in the work area. See **Grounding** instructions.
- Never spray or flush solvent at high pressure.
- Keep work area free of debris, including solvent, rags and gasoline.
- Do not plug or unplug power cords, or turn power or light switches on or off when flammable fumes are present.
- Use only grounded hoses.
- Hold gun firmly to side of grounded pail when triggering into pail. Do not use pail liners unless they are anti-static or conductive.
- **Stop operation immediately** if static sparking occurs or you feel a shock**.** Do not use equipment until you identify and correct the problem.
- Keep a working fire extinguisher in the work area.

⚠WARNING

THERMAL EXPANSION HAZARD

Fluids subjected to heat in confined spaces, including hoses, can create a rapid rise in pressure due to the thermal expansion. Over-pressurization can result in equipment rupture and serious injury.

- Open a valve to relieve the fluid expansion during heating.
- Replace hoses proactively at regular intervals based on your operating conditions.

EQUIPMENT MISUSE HAZARD

Misuse can cause death or serious injury.

- Do not operate the unit when fatigued or under the influence of drugs or alcohol.
- Do not exceed the maximum working pressure or temperature rating of the lowest rated system component. See **Technical Specifications** in all equipment manuals.
- Use fluids and solvents that are compatible with equipment wetted parts. See **Technical Specifications** in all equipment manuals. Read fluid and solvent manufacturer's warnings. For complete information about your material, request Safety Data Sheets (SDSs) from distributor or retailer.
- Do not leave the work area while equipment is energized or under pressure.
- Turn off all equipment and follow the **Pressure Relief Procedure** when equipment is not in use.
- Check equipment daily. Repair or replace worn or damaged parts immediately with genuine manufacturer's replacement parts only.
- Do not alter or modify equipment. Alterations or modifications may void agency approvals and create safety hazards.
- Make sure all equipment is rated and approved for the environment in which you are using it.
- Use equipment only for its intended purpose. Call your distributor for information.
- Route hoses and cables away from traffic areas, sharp edges, moving parts, and hot surfaces.
- Do not kink or over bend hoses or use hoses to pull equipment.
- Keep children and animals away from work area.
- Comply with all applicable safety regulations.

BURN HAZARD

Equipment surfaces and fluid that is heated can become very hot during operation. To avoid severe burns:

- Do not touch hot fluid or equipment.

MOVING PARTS HAZARD

Moving parts can pinch, cut or amputate fingers and other body parts.

- Keep clear of moving parts.
- Do not operate equipment with protective guards or covers removed.
- Pressurized equipment can start without warning. Before checking, moving, or servicing equipment, follow the **Pressure Relief Procedure** and disconnect all power sources.

⚠WARNING

PLASTIC PARTS CLEANING SOLVENT HAZARD

Many cleaning solvents can degrade plastic parts and cause them to fail, which could cause serious injury or property damage.

- Use only compatible solvents to clean plastic structural or pressure-containing parts.
- See **Technical Specifications** in all equipment manuals for materials of construction. Consult the solvent manufacturer for information and recommendations about compatibility.

PRESSURIZED ALUMINUM PARTS HAZARD

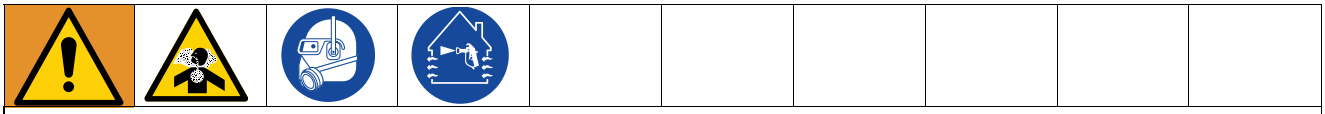
Use of fluids that are incompatible with aluminum in pressurized equipment can cause serious chemical reaction and equipment rupture. Failure to follow this warning can result in death, serious injury, or property damage.

- Do not use 1,1,1-trichloroethane, methylene chloride, other halogenated hydrocarbon solvents or fluids containing such solvents.
- Do not use chlorine bleach.
- Many other fluids may contain chemicals that can react with aluminum. Contact your material supplier for compatibility.

Important Isocyanate (ISO) Information

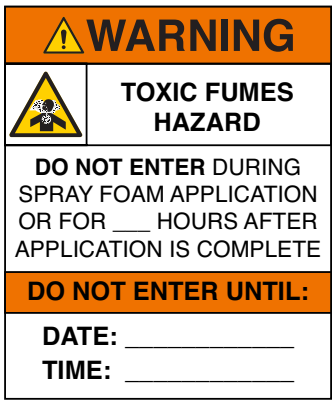
Isocyanates (ISO) are catalysts used in two component materials.

Isocyanate Conditions



Spraying or dispensing fluids that contain isocyanates creates potentially harmful mists, vapors, and atomized particulates.

- Read and understand the fluid manufacturer's warnings and Safety Data Sheets (SDSs) to know specific hazards and precautions related to isocyanates.
- Use of isocyanates involves potentially hazardous procedures. Do not spray with this equipment unless you are trained, qualified, and have read and understood the information in this manual and in the fluid manufacturer's application instructions and SDSs.
- Use of incorrectly maintained or mis-adjusted equipment may result in improperly cured material, which could cause off gassing and offensive odors. Equipment must be carefully maintained and adjusted according to instructions in the manual.
- To prevent inhalation of isocyanate mists, vapors and atomized particulates, everyone in the work area must wear appropriate respiratory protection. Always wear a properly fitting respirator, which may include a supplied-air respirator. Ventilate the work area according to instructions in the fluid manufacturer's SDSs.
- Avoid all skin contact with isocyanates. Everyone in the work area must wear chemically impermeable gloves, protective clothing and foot coverings as recommended by the fluid manufacturer and local regulatory authority. Follow all fluid manufacturer recommendations, including those regarding handling of contaminated clothing. After spraying, wash hands and face before eating or drinking.
- Hazard from exposure to isocyanates continues after spraying. Anyone without appropriate personal protective equipment must stay out of the work area during application and after application for the time period specified by the fluid manufacturer. Generally this time period is at least 24 hours.
- Warn others who may enter work area of hazard from exposure to isocyanates. Follow the recommendations of the fluid manufacturer and local regulatory authority. Posting a placard such as the following outside the work area is recommended:



Material Self-ignition

Some materials may become self-igniting if applied too thick. Read material manufacturer's warnings and material Safety Data Sheet (SDS).

Keep Components A and B Separate

NOTE: A-side material is isocyanate (ISO). B-side material is resin (RES).

Cross-contamination can result in cured material in fluid lines which could cause serious injury or damage equipment. To prevent cross-contamination:

- Never interchange component A and component B wetted parts.
- Never use solvent on one side if it has been contaminated from the other side.

Moisture Sensitivity of Isocyanates

Exposure to moisture (such as humidity) will cause ISO to partially cure, forming small, hard, abrasive crystal that become suspended in the fluid. Eventually a film will form on the surface and the ISO will begin to gel, increasing in viscosity.

NOTICE

Partially cured ISO will reduce performance and the life of all wetted parts.

- Always use a sealed container with a desiccant dryer in the vent, or a nitrogen atmosphere. **Never** store ISO in an open container.
- Keep the ISO pump wet cup or reservoir (if installed) filled with appropriate lubricant. The lubricant creates a barrier between the ISO and the atmosphere.
- Use only moisture-proof hoses compatible with ISO.
- Never use reclaimed solvents, which may contain moisture. Always keep solvent containers closed when not in use.
- Always lubricate threaded parts with an appropriate lubricant when reassembling.

NOTE: The amount of film formation and rate of crystallization varies depending on the blend of ISO, the humidity, and the temperature.

Foam Resins with 245 fa Blowing Agents

Some foam blowing agents will froth at temperatures above 90°F (33°C) when not under pressure, especially if agitated. To reduce frothing, minimize preheating in a circulation system.

Changing Materials

NOTICE

Changing the material types used in your equipment requires special attention to avoid equipment damage and downtime.

- When changing materials, flush the equipment multiple times to ensure it is thoroughly clean.
- Always clean the fluid inlet strainers after flushing.
- Check with your material manufacturer for chemical compatibility.
- When changing between epoxies and urethanes or polyureas, disassemble and clean all fluid components and change hoses. Epoxies often have amines on the B (hardener) side. Polyureas often have amines on the B (resin) side.

Typical Installation

Without circulation

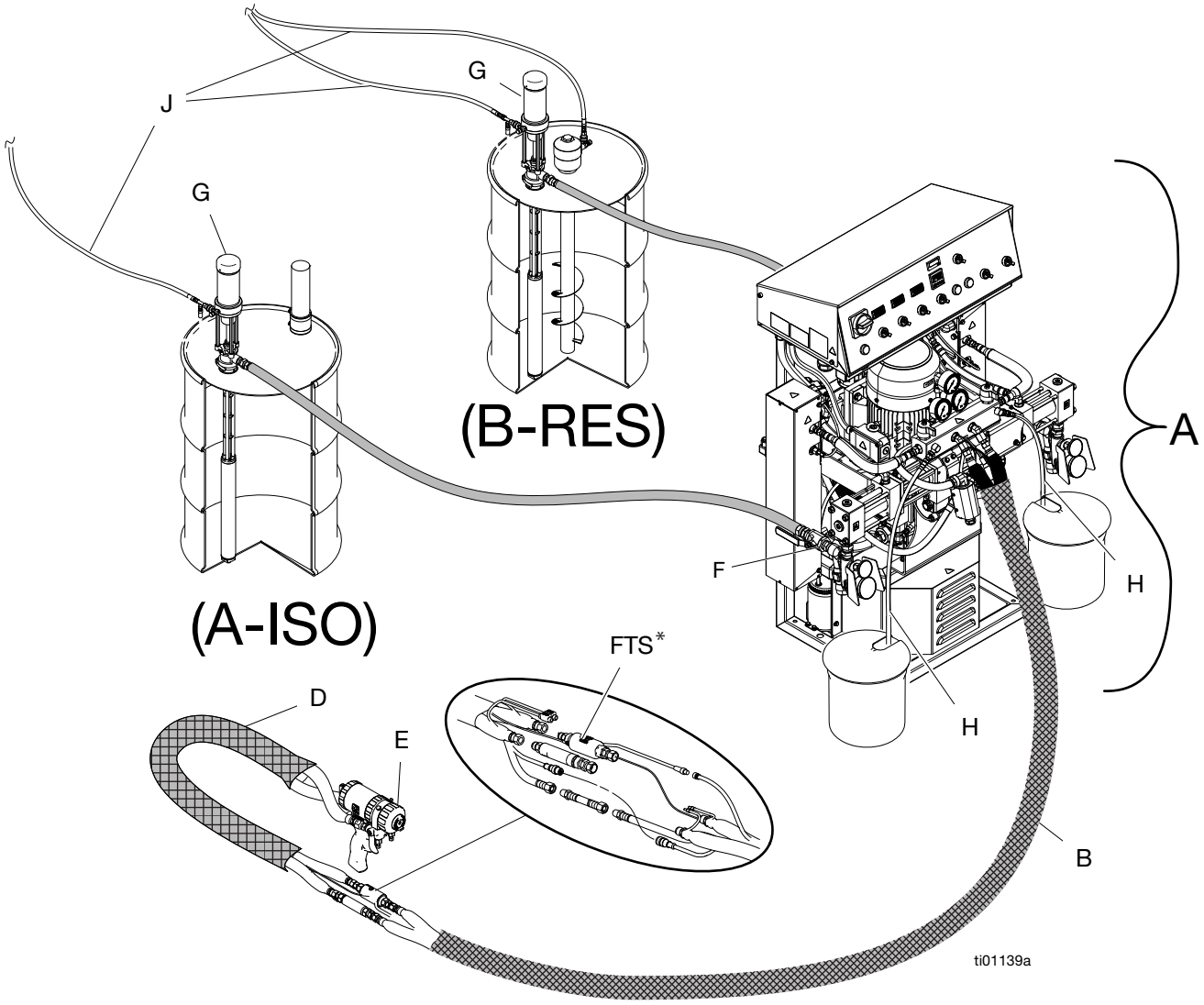


FIG. 1: Typical Installation

**Shown exposed for clarity. Wrap with tape during operation.*

Ref.	Description
A	Gusmer Hydraulic Proportioner
FTS	Fluid Temperature Sensor (FTS)
B	Heated Hose
D	Heated Whip Hose
E	Spray Gun
F	Fluid Inlets A and B (B side not shown)
G‡	Feed Pumps A and B
H	Pressure Relief Lines
J‡	Air Supply Lines

† *Included in some proportioner packages.*
‡ *Customer-supplied.*

With proportioner manifold to drum circulation

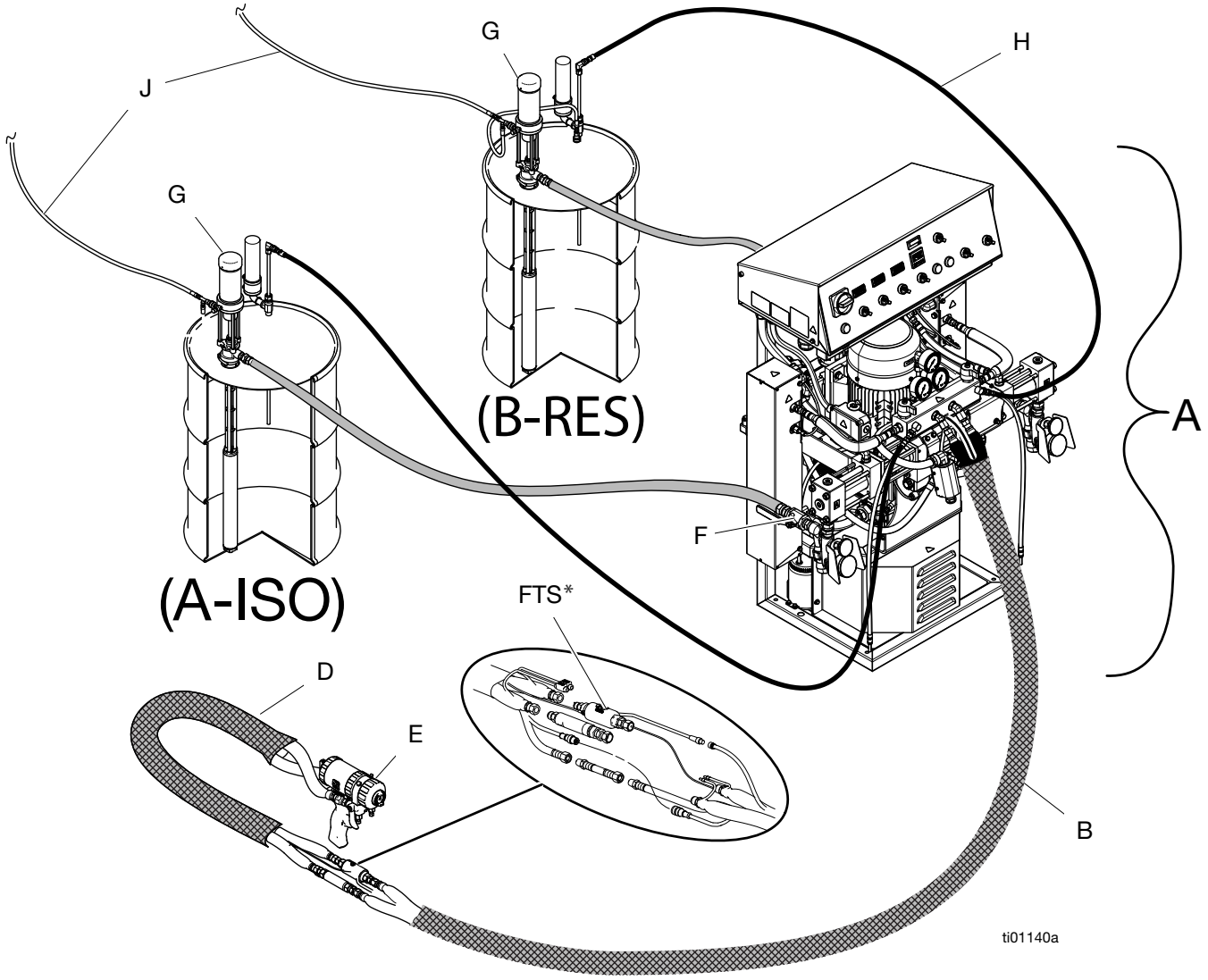


FIG. 2: Typical Installation

**Shown exposed for clarity. Wrap with tape during operation.*

Ref.	Description
A	Gusmer Hydraulic Proportioner
FTS	Fluid Temperature Sensor (FTS)
B†	Heated Hose
D†	Heated Whip Hose
E	Spray Gun
F	Fluid Inlets A and B (B side not shown)
G‡	Feed Pumps A and B
H	Pressure Relief Lines
J‡	Air Supply Lines

† *Included in some proportioner packages.*
‡ *Customer-supplied.*

With gun manifold to drum circulation

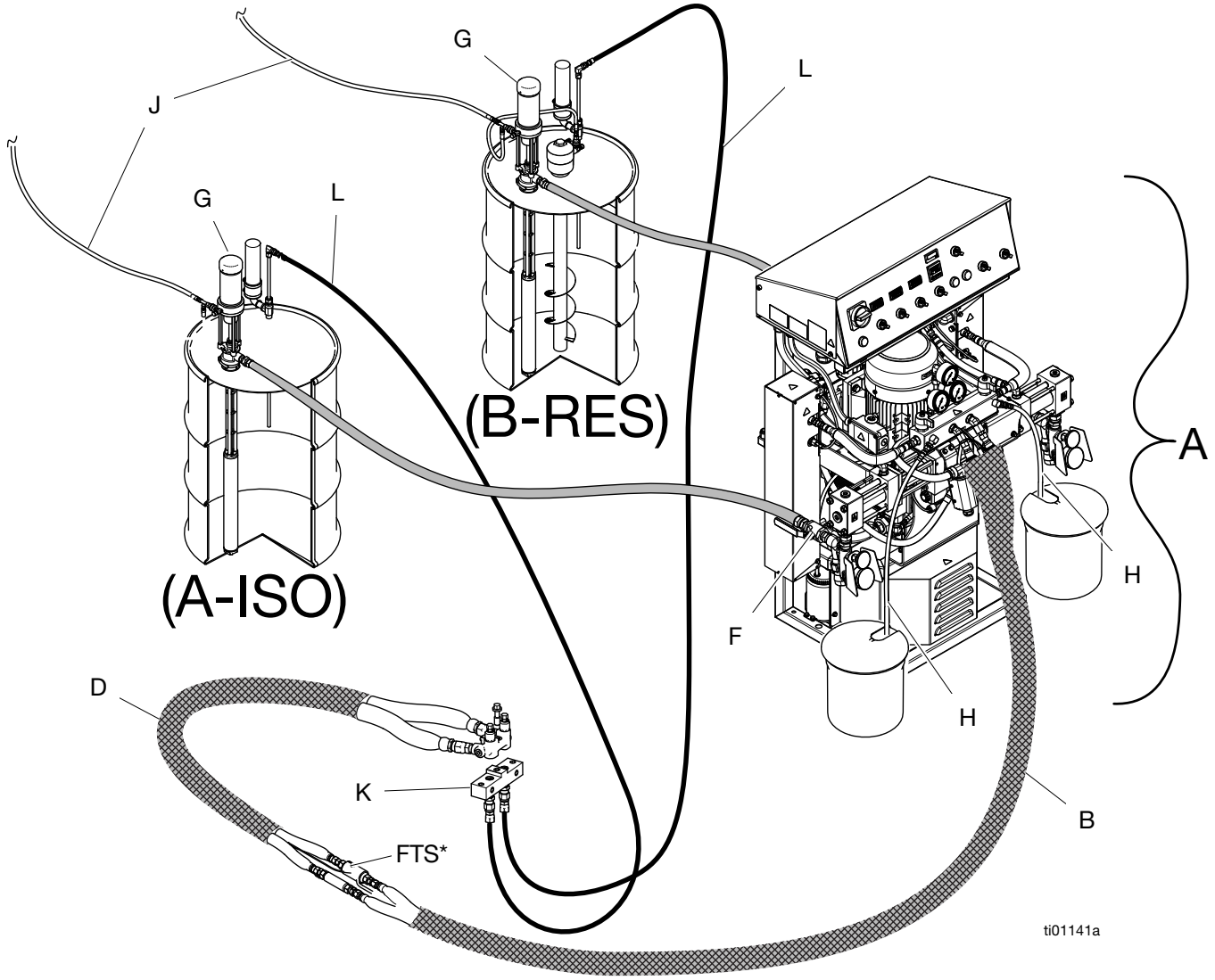


FIG. 3: Typical Installation

**Shown exposed for clarity. Wrap with tape during operation.*

Ref.	Description
A	Gusmer Hydraulic Proportioner
FTS	Fluid Temperature Sensor (FTS)
B†	Heated Hose
D†	Heated Whip Hose
F	Fluid Inlets A and B (B side not shown)
G‡	Feed Pumps A and B
H	Pressure Relief Lines
J	Air Supply Lines
K	Gun Recirculation Adapter
L	Gun Recirculation Lines A and B

† *Included in some proportioner packages.*
‡ *Customer-supplied.*

Component Identification

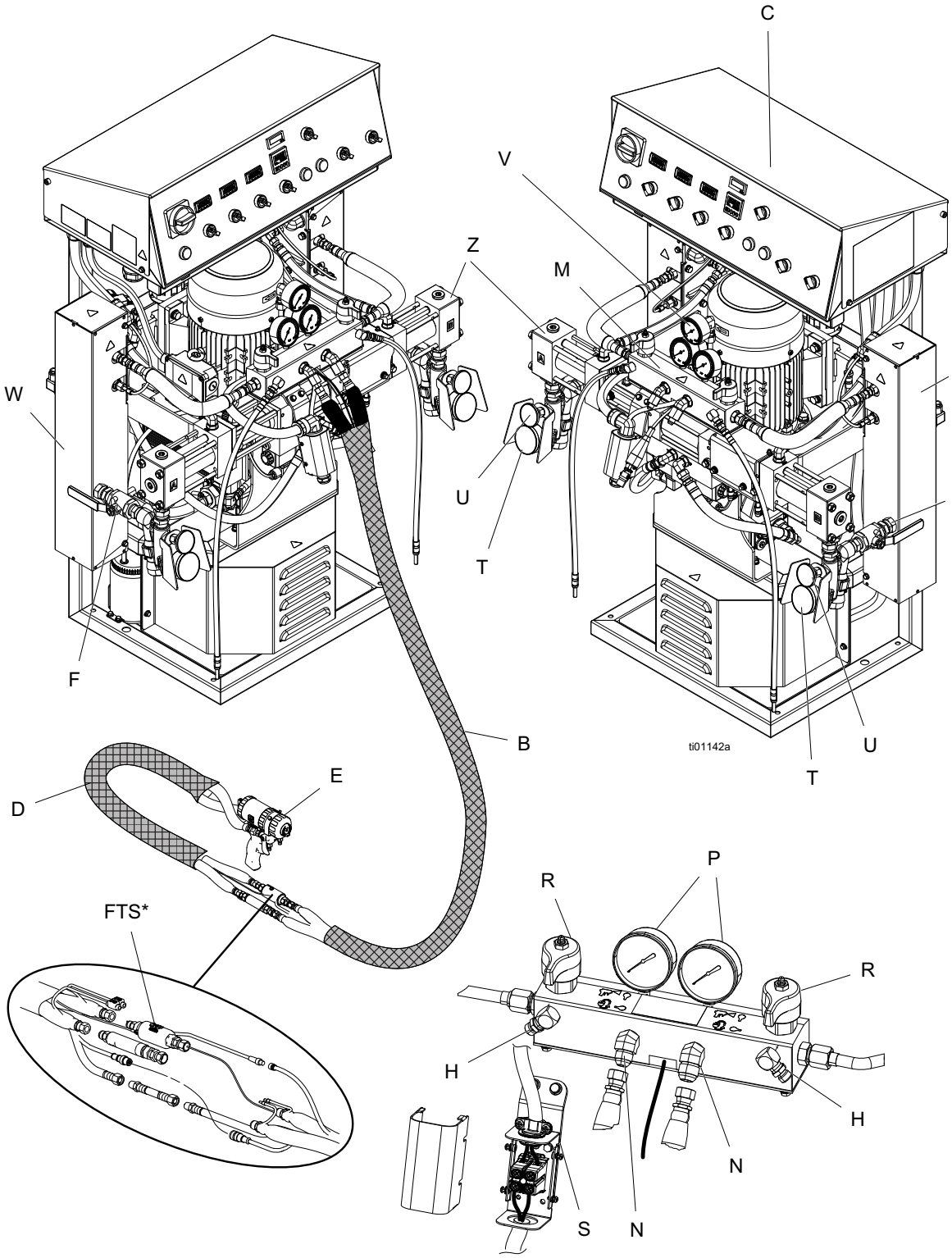


FIG. 4: Component Identification

**Shown exposed for clarity. Wrap with tape during operation.*

Ref.	Description
B†	Heated Hose
C	Electrical Enclosure
D†	Heated Whip Hose
FTS	Fluid Temperature Sensor (FTS)
E	Spray Gun
F	Fluid Inlet A and B
H	Pressure Relief Lines A and B
M	Proportioner Manifold
N	Outlet A and B
P	Outlet Pressure Gauge A and B
R	Pressure Relief Valve A and B
S	Electrical Junction Box
T	Inlet Pressure Gauge A and B
U	Inlet Temperature Gauge A and B
V	Hydraulic Pressure Gauge
W*	Primary Heater A and B
Z	Proportioning Pump A and B

* *Located behind shroud.*

† *Included in some proportioner packages.*

Control Panel

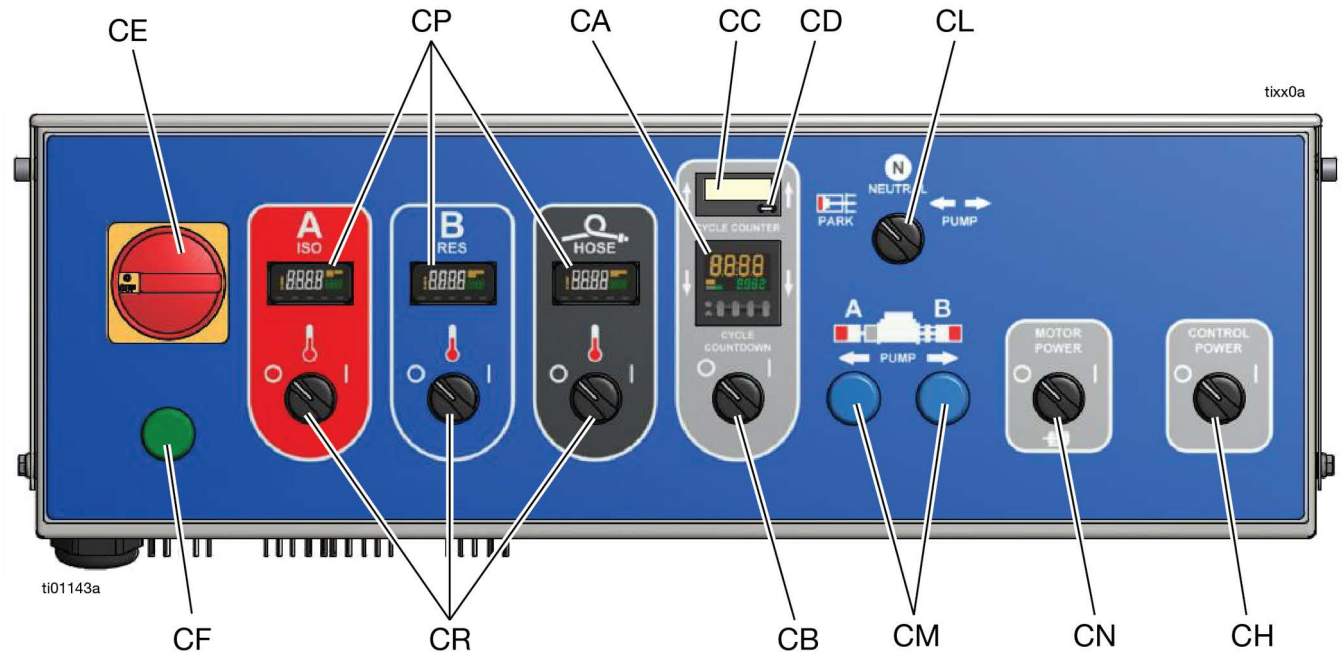


FIG. 5: Control Panel

Ref.	Description
CA	Cycle Countdown
CB	Cycle Countdown Switch (ENABLE/DISABLE)
CC	Cycle Counter
CD	Cycle Counter Reset Button
CE	Main Power Disconnect (ON/OFF)
CF	Main Power Indicator Light
CH	Control Power Switch (ON/OFF)
CL	Pump Control Switch (PARK/NEUTRAL/PUMP)
CM	Pump Direction Indicator Lights
CN	Motor Power Switch (ON/OFF)
CP	Temperature Controllers A, B, and Hose
CR	Heat Zone Switches A, B, and Hose (ON/OFF)

Installation

Mounting the System

To prevent serious injury due to system tipping over, make sure the proportioner (A) is secured to the floor.

NOTE: Wall mounting brackets are not included with the system. Evaluate the installation to determine if additional support is required beyond the floor mounting screws.

1. See **Dimensions**, page 100, for mounting hole specifications.
2. Use a minimum of 4 of the 6 mounting holes, evenly spaced in the base of the system frame, to secure base to the floor.

NOTE: Bolts are not included.

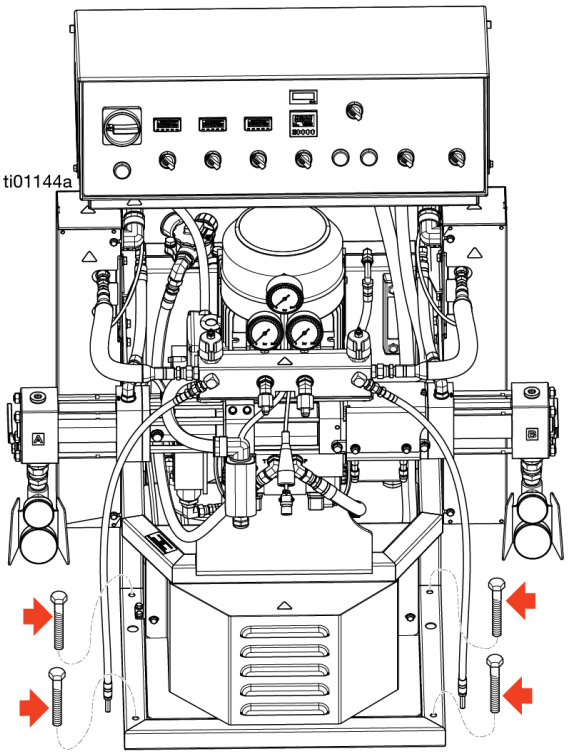


FIG. 6: Mount to the Floor

Setup

Grounding

The equipment must be grounded to reduce the risk of static sparking and electric shock. Electric or static sparking can cause fumes to ignite or explode. Improper grounding can cause electric shock. Grounding provides an escape wire for the electric current.

Gusmer Hydraulic Proportioner: grounded through the power cord.

Spray gun: connect the grounded wire of the heated whip hose (D) to the fluid temperature sensor (FTS). See **Install Fluid Temperature Sensor**, page 22. Do not disconnect ground wire or spray without whip hose.

Fluid supply container: follow local code.

Object being sprayed: follow local code.

Solvent pails used when flushing: follow local code. Use only conductive metal pails, placed on a grounded surface. Do not place the pail on a non-conductive surface, such as paper or cardboard, which interrupts grounding continuity.

To maintain grounding continuity when flushing or relieving pressure: hold metal part of the spray gun (E) firmly to the side of a grounded metal pail, then trigger the gun.

General Equipment Guidelines

NOTICE

Failure to properly size the electric generator for equipment will cause voltage fluctuations that may result in equipment damage. To avoid damage to equipment, follow the guidelines listed below.

- Determine the correct size generator. Using the correct size generator and proper air compressor will enable the proportioner (A) to run at peak load. See **Models**, page 3. Ensure that the generator matches the voltage and phase of the proportioner.

Use the following procedure to determine the correct size generator.

1. List peak wattage requirements of all system components.
2. Add the wattage required by the system components.
3. Perform the following equation:

   Total watts x 1.25 = kVA (kilovolt-amperes)

4. Select a generator size that is equal to or greater than the determined kVA.

NOTICE

Voltage fluctuations can damage electrical equipment. To avoid voltage fluctuations, follow the guidelines listed below.

- Use correctly sized power cords for the proportioner. Refer to the amperage listed in **Models** (page 3) to select the correct power cord.
- Use an air compressor with continuous run head unloading devices. Do not use direct online air compressors that start and stop during a job.
- Maintain and inspect the generator, air compressor, and other equipment per the manufacturer recommendations to avoid an unexpected shutdown.

Connect Power

All electrical wiring must be done by a qualified electrician and comply with all local codes and regulations.

NOTICE

350-415 VAC Gusmer Hydraulic Proportioners are not designed to operate from a 480 VAC power source. To avoid damage to equipment, follow the guidelines listed below.

1. Select correctly sized power cord. Refer to the amperage listed in **Models** (page 3) to select the correct power cord.
2. Turn main power disconnect (CE) to OFF.
3. Open the electrical enclosure door (AH) by loosening the bolts (BH) and lifting the door upwards. See FIG. 8.
4. Route power cable through power inlet cord grip (AL) in electrical enclosure (C). Tighten cord grip (AL). See FIG. 8.
5. Connect incoming power wires to main disconnect terminals (AJ) and main ground lug (AK) as shown in FIG. 8. Torque to 55 in-lbs (6.2 N•m). Gently pull on all connections to verify they are properly secured.
6. Verify all items are connected properly as shown in FIG. 8. Close the electrical enclosure door (AH) and tighten the bolts (BH).

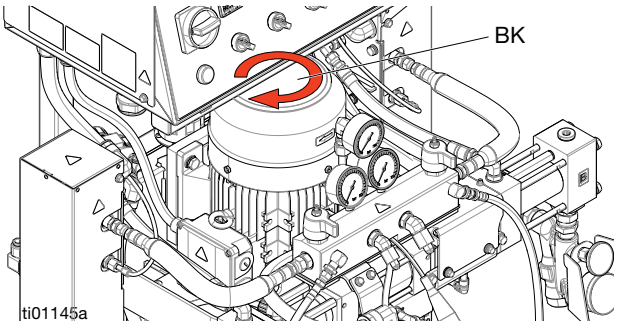


FIG. 7: Electric Motor Rotation

7. Verify electric motor fan (BK) rotation is correct.
   a. Turn the main power disconnect (CE) to ON.
   b. Turn the control power switch (CH) to ON. Verify the pump control switch (CL) is in NEUTRAL.
   c. Briefly turn the motor power switch (CN) to ON. Observe the direction the electric motor fan (BK) rotates. See FIG. 7.
8. If the motor fan rotation is not correct:
   a. Immediately turn the motor power switch (CN) to OFF.
   b. Turn the control power switch (CH) to OFF.
   c. Turn the main power disconnect (CE) to OFF.
   d. Repeat **Connect Power**. Swap the incoming power wires between L1 and L2.

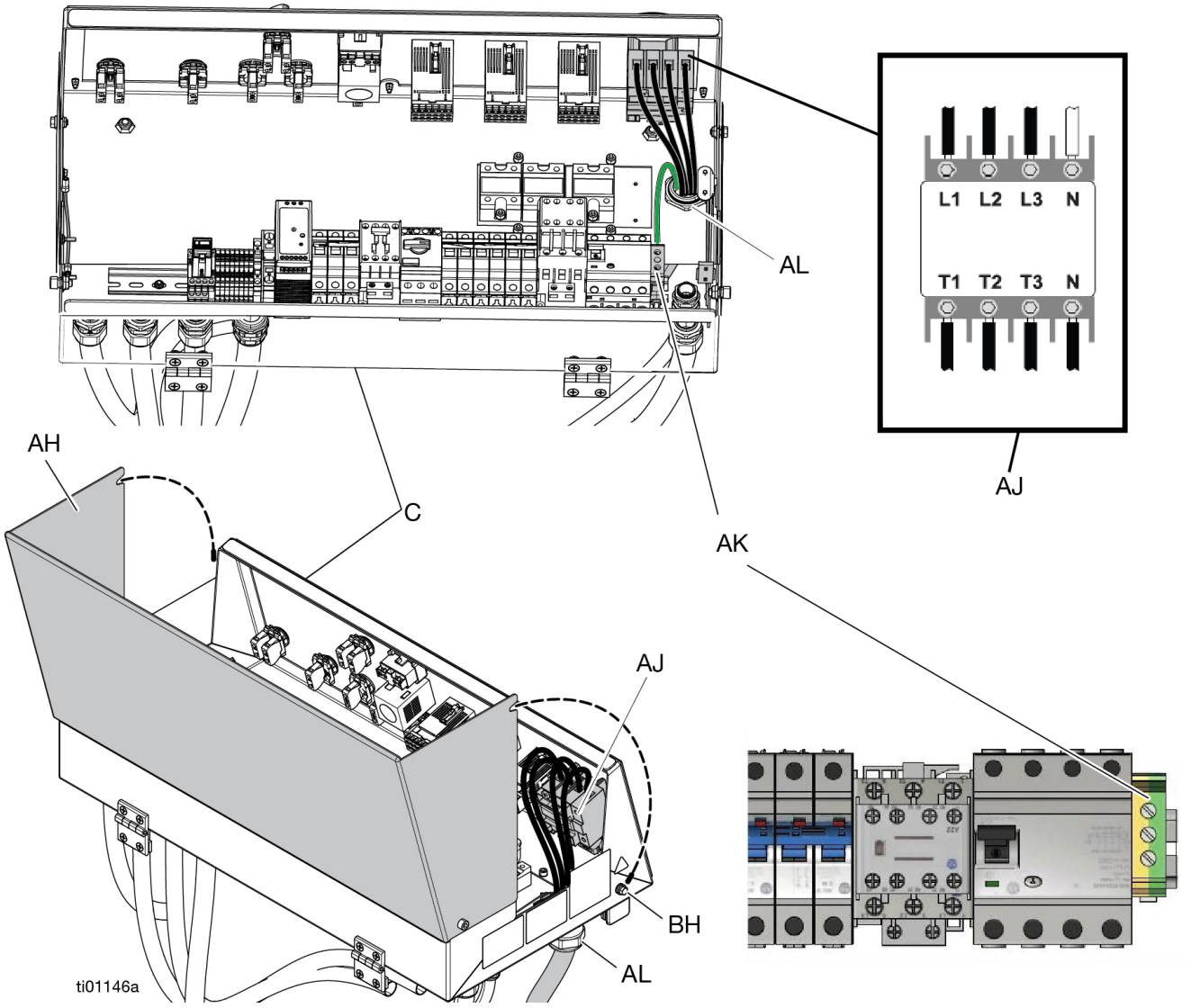


FIG. 8: Connect Incoming Power Wires

NOTE: 200V model does not use NEUTRAL wire.

TSL Pump Lubrication System Setup

Component A (ISO) Pump: Fill TSL reservoir (AM) with Graco TSL (Throat Seal Liquid), part 206995 (supplied).

1. Lift the TSL lubricant reservoir (AM) out of the reservoir bracket (AN) and remove the cap.

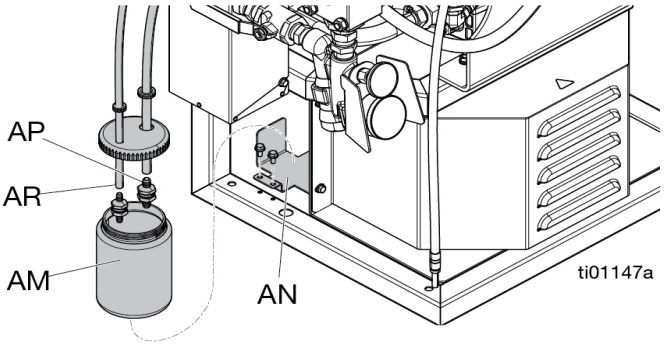


FIG. 9

2. Fill with fresh Graco TSL. Thread the TSL reservoir (AM) onto the cap and place it in the reservoir bracket (AN).

3. Push the TSL inlet filter (AP) approximately 1/3 of the way into the reservoir.

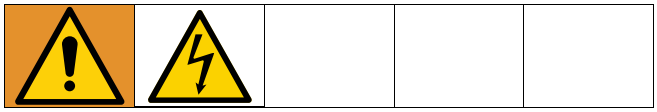
4. Push the TSL outlet tube (AR) into the reservoir until it reaches the bottom.

NOTE: The TSL outlet tube (AR) must reach the bottom of the reservoir to ensure that isocyanate crystals will settle to the bottom and not be siphoned into the TSL inlet filter (AP). No priming is required.

Install Fluid Temperature Sensor

The fluid temperature sensor (FTS) is supplied. Install the FTS between the heated hose (B) and the heated whip hose (D). Refer to your heated hose manual for instructions. Add any additional sections of heated hose if desired. Be sure cables have slack when hose bends. Wrap cable and electrical connections with electrical tape.

Install Heated Hose to Proportioner



1. Turn main power disconnect (CE) to OFF.

NOTE: The Gusmer Hydraulic Proportioner (A) is only compatible with standard, two-component heated hoses using a thermocouple. See heated hose manual for detailed instructions on connecting heated hoses.

NOTE: The fluid temperature sensor (FTS) and heated whip hose (D) must be used with the heated hose (B). Hose length, including heated whip hose (D), must be at least 60 ft (18.3 m) minimum.

2. Connect heated hose to proportioner.

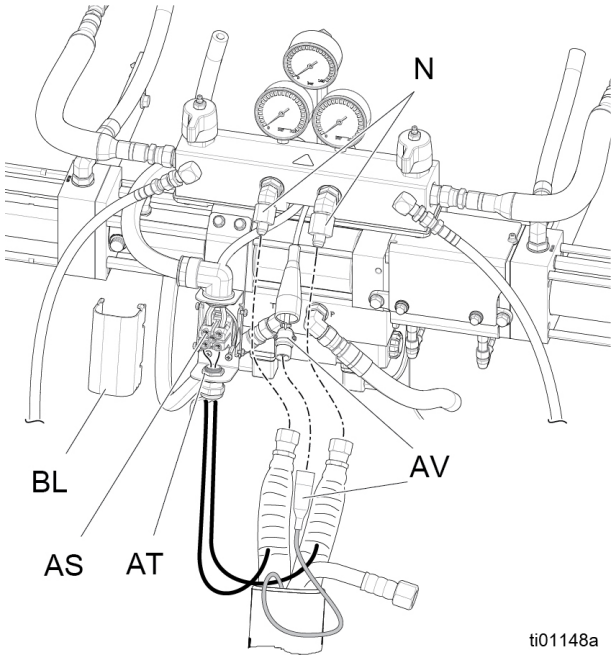


FIG. 10: Heated Hose Electrical Junction Box

   a. Connect fluid hoses to proportioner fluid manifold.

NOTE: Fluid outlets (N) come with adapter fittings to allow use of 1/4 in. and 3/8 in. ID fluid hoses. To use 1/2 in. (13 mm) ID fluid hoses, remove adapters.

   b. Remove box cover (BL) and loosen lower strain relief (AT). Connect hose power wires to terminal block (AS). A and B hose wire positions are not important. Torque to 35-50 in-lb (4.0-5.6 N•m).

   c. Fully tighten lower strain relief (AT) screws and replace cover.

   d. Connect FTS cable connectors (AV).

3. Close both needle valves (AB) on gun manifold (AA).

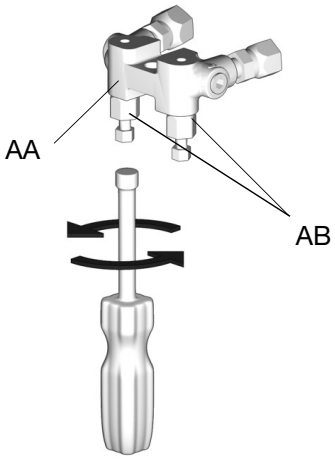


FIG. 11: Gun Manifold

4. Connect heated whip hose (D) to gun manifold (AA). Do not connect manifold to gun.

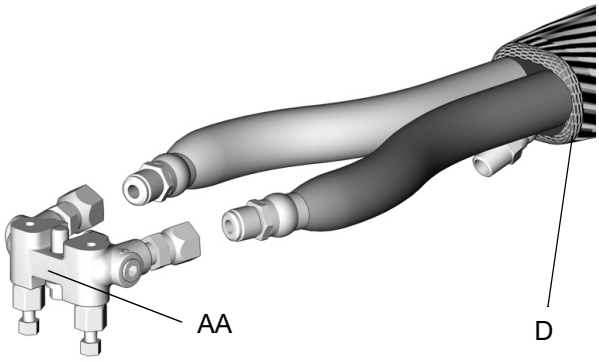


FIG. 12

Adjust Hose Transformer Wiring

NOTE: The fluid temperature sensor (FTS) and heated whip hose (D) must be used with the heated hose. Hose length, including whip hose, must be at least 60 ft (18.3 m) minimum. GH-3 proportioners can be used with a maximum of 305 ft (93 m) of hose.

1. Turn main power disconnect (CE) to OFF.
2. Verify that power is disconnected.
3. Remove the transformer cover. See FIG. 13.

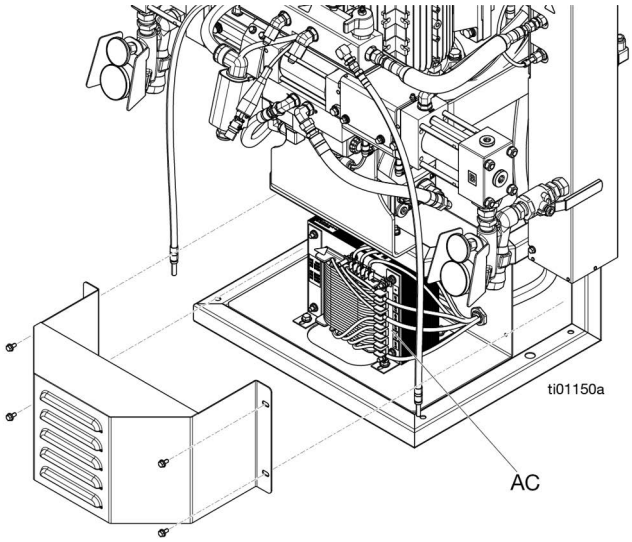


FIG. 13: Hose Transformer Cover

4. Move the wire on the hose transformer (AC) to the terminal that matches the length of hose installed. Wire is factory-set to 60 ft. See FIG. 14.

NOTE: The transformer terminals are labeled with the corresponding total length of hose, including the whip hose. Always use a whip hose and select the transformer tap that matches the total hose length. If using a whip hose longer than 10 ft (3.0 m), round the total length of hose down to determine the correct terminal setting.

NOTICE

The maximum amount of heat generated by the heated hose depends on the input voltage to the proportioner. If possible, adjust the generator voltage within the marked voltage range. This will increase or decrease the maximum current (and heat) available to the hose. To avoid damage to the proportioner and hose, do not exceed the maximum voltage rating of the system. Do not exceed a hose current of 50 A.

5. Reinstall the transformer cover. See FIG. 13.

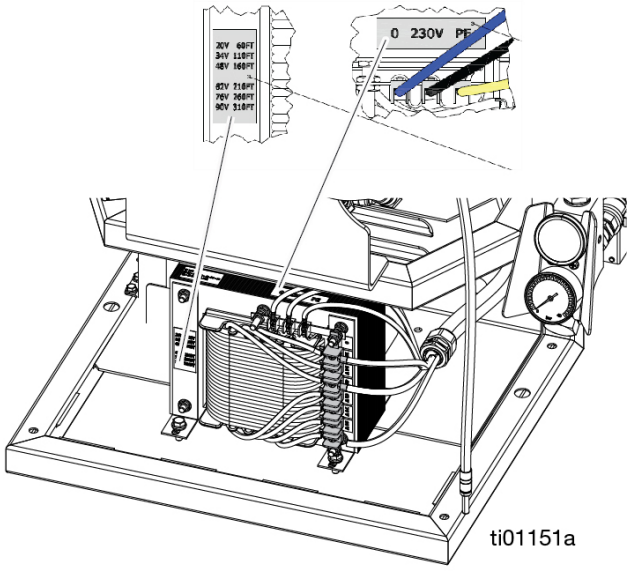


FIG. 14: Hose Transformer Wiring

Flush Before Using Equipment

The equipment was tested with lightweight oil, which is left in the fluid passages to protect parts. To avoid contaminating your fluid with oil, flush the equipment with a compatible solvent before using the equipment. See **Flushing**, page 39.

Connect Feed Pumps

1. Install feed pumps (G) in component A and B supply drums. See **Typical Installation**, page 12.

   NOTE: A minimum feed pressure of 50 psi (0.35 MPa, 3.5 bar) is required at both inlet pressure gauges (T). Maximum feed pressure is 250 psi (1.75 MPa, 17.5 bar). Maintain A and B feed pressures within 10% of each other.

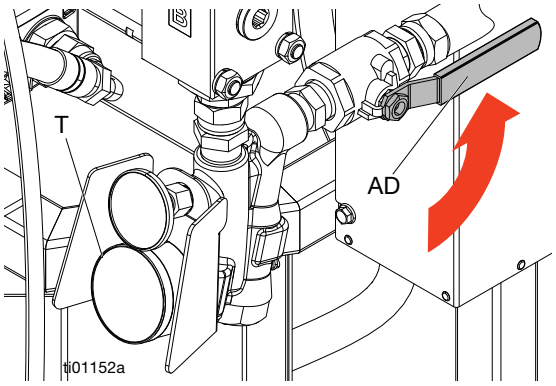


FIG. 15: Inlet Pressure Gauge on Inlet Assembly

2. Seal component A drum. If used, install desiccant dryer in drum vent. Desiccant dryer sold separately.
3. Install agitator in component B drum, if necessary. Agitator sold separately.
4. Ensure A and B inlet valves (AD) are closed.

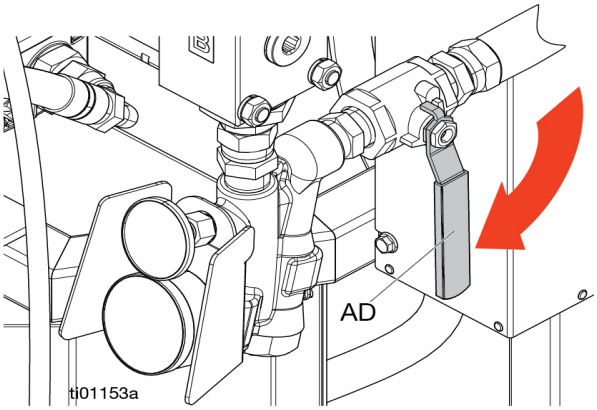


FIG. 16: Inlet Valve on Inlet Assembly

NOTE: Fluid inlet (F) hoses from feed pumps (G) should be 3/4 in. (19 mm) ID.

Startup

To prevent serious injury from electric shock, hot surfaces or moving parts, only operate the proportioner with all covers and shrouds in place.

NOTICE

Proper system setup, startup, and shutdown procedures are critical to electrical equipment reliability. The following procedures ensure steady voltage. Failure to follow these procedures will cause voltage fluctuations that can damage electrical equipment and void the warranty.

1. Verify that all **Setup** steps are complete. See page 19.
2. Check that the fluid inlet filter (AE) is clean before daily startup.

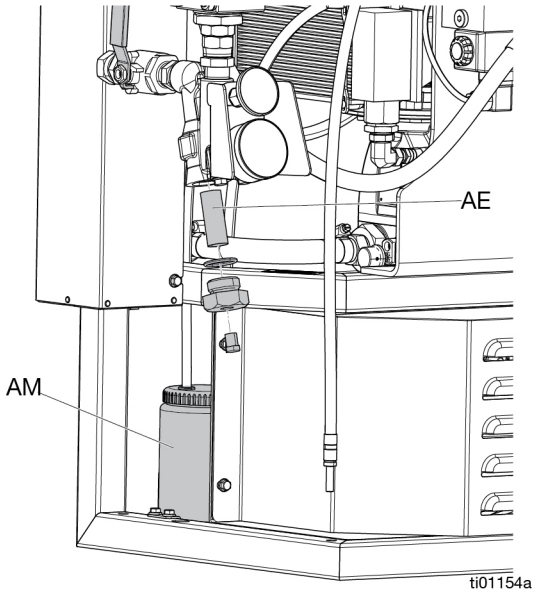


FIG. 17: Fluid Inlet Filters

3. Check TSL reservoir (AM). Check level and condition of lubrication daily. See **TSL Pump Lubrication System**, page 43.
4. Measure the material level in each drum. A and B drum level sticks (24M174) sold separately.
5. Hydraulic oil is not included from the factory. Fill and check fluid level when operating the first time, and weekly thereafter. See **Maintenance**, page 40.
6. If using a generator:
   a. Check generator fuel level.

NOTICE

Running out of fuel will cause voltage fluctuations that can damage equipment and void the warranty. Do not run out of fuel.

   b. Confirm main power disconnect (CE) is OFF before starting generator.

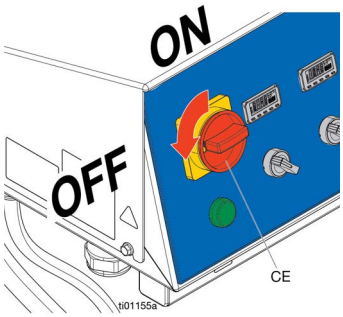


FIG. 18: Main Power Disconnect

   c. Ensure the main breaker on the generator is in the off position.
   d. Start the generator. Allow it to reach full operating temperature.
7. Switch on the air compressor, air dryer, and breathing air, if equipped.

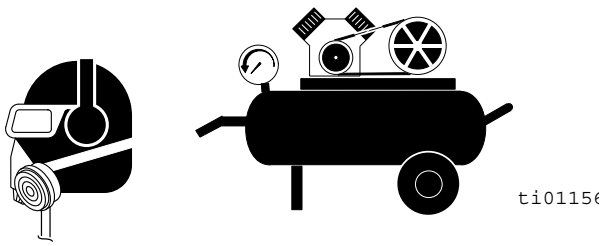


FIG. 19

8. For first startup of new system, load fluid with feed pumps (G). See **Component Identification**, page 15.
   a. Turn on agitator, if equipped.
   b. Turn both pressure relief valves (R) to SPRAY  .

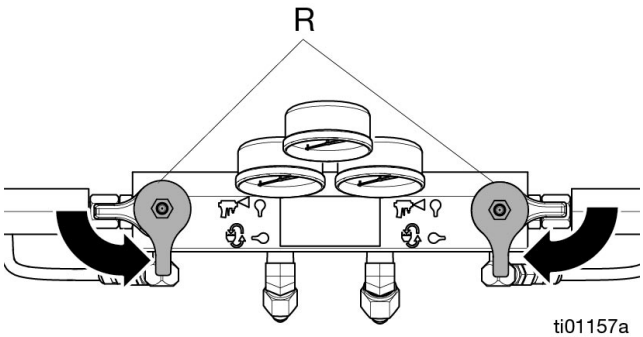


FIG. 20

   c. Turn on feed pumps (G).
   d. Open inlet valves (AD). Check for leaks.

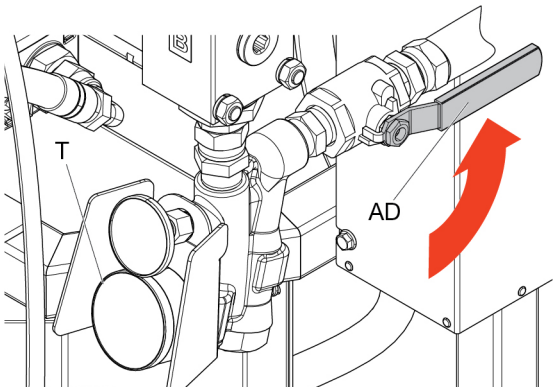
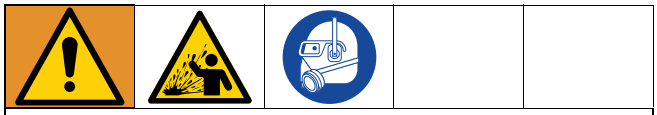


FIG. 21



Cross contamination can result in cured material in fluid lines which could cause injury from splashing fluid or damage equipment. To prevent cross-contamination:

- **Never** interchange component A and component B wetted parts.
- Never use solvent on one side if it has been contaminated from the other side.
- Always provide two waste containers to keep component A and component B fluids separate.

   e. Hold gun manifold (AA) over two grounded waste containers. Open needle valves (AB) A and B until clean, air-free fluid comes from valves. Close valves.

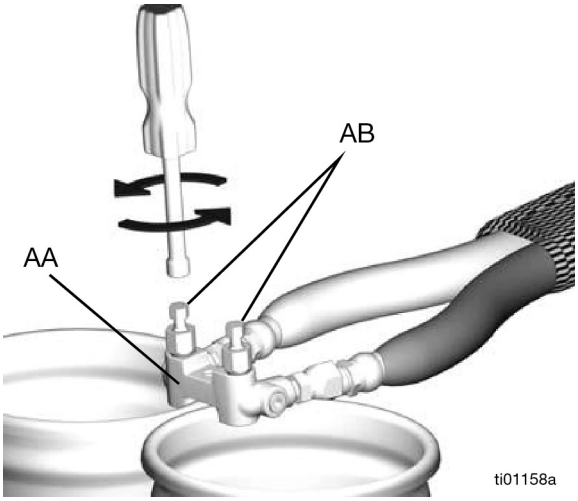


FIG. 22

9. Turn the motor power switch (CN) OFF and turn the pump control switch (CL) to NEUTRAL.

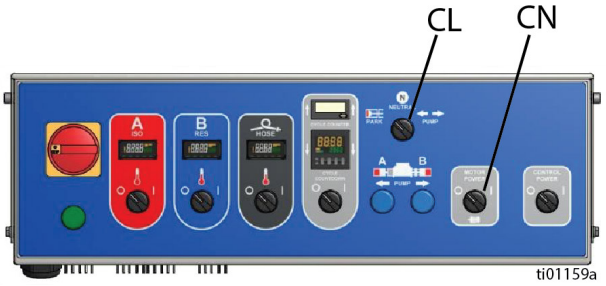


FIG. 23

10. Set temperature controllers (CP). See **Digital Temperature Controllers**, page 29, and **Adjust Temperature Set Point (SP)** page 29.

This equipment is used with heated fluid which can cause equipment surfaces to become very hot. To avoid severe burns:

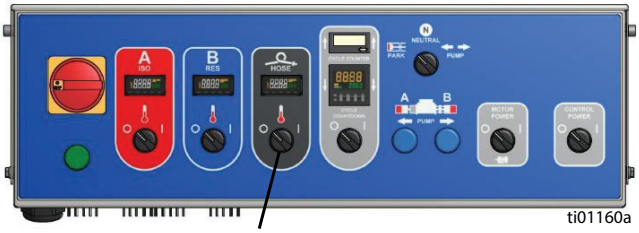
- Do not touch hot fluid or equipment.
- Do not turn on hose heat without fluid in hoses.
- Allow equipment to cool completely before touching it.
- Wear gloves if fluid temperature exceeds 110° F (43° C).

Thermal expansion can cause over-pressurization, resulting in equipment rupture and serious injury, including fluid injection. Do not pressurize system when preheating hose.

11. Preheat the system:

    a. If you need to circulate fluid through the system to preheat the drum supply, see **Connect Proportioner Manifold to Drum Circulation**, page 31. If you need to circulate material through the heated hose to the gun manifold, see **Connect Gun Manifold to Drum Circulation**, page 32.

    b. Turn hose heat zone switch on.



Hose Heat Zone Switch

FIG. 24: Heat Zone Switch for Hose

    c. Wait for the hose to reach set point (SP) temperature.

    NOTE: Hose heat-up time may increase at voltages less than nominal 230 VAC when maximum hose length is used. Hose transformer wiring must match hose length (see **Adjust Hose Transformer Wiring**, page 24).

    d. Turn on A and B heat zones by turning on heat zone switches (CR). Wait until the heat zone actual temperatures reach the temperature set points (SP).

Hose Heat Zone Switch

FIG. 25

12. If desired, **Set Cycle Countdown**, page 30.

13. The proportioner is ready for operation. See **Spraying**, page 34.

Digital Temperature Controllers

Temperature controls are factory-programmed. The only user-programmable parameters are temperature set point “SP” and temperature units “DU” (°C or °F).

The proportioner has three temperature controllers (CP) that automatically manage the temperature for the A and B primary heaters (W) and the heated hose (B).

Thermal expansion can cause over-pressurization, resulting in equipment rupture and serious injury from splashing fluid and skin injection. Do not pressurize system when preheating hose.

To avoid fire and explosion, use only Graco-supplied, pre-programmed temperature controllers (CP). If you encounter a problem with a temperature controller, order a replacement.

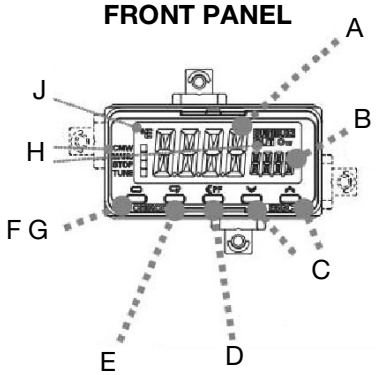
NOTICE

Heated hoses and primary heaters must always contain fluid when hose power is on. Never turn on heat zone switches while a heated hose or primary heater is empty. Powering empty hoses and heaters may cause equipment damage.

NOTICE

Always completely unroll and bleed the air from the hose before each use. If the air is not bled from the hose, heat transfer from the heating conductor will not be uniform. In the worst case, the conductor can be damaged. The warranty is void in such cases.

FRONT PANEL



Ref.	Description
A	No. 1 display. PV or specified parameter.
B	No. 2 display. SP or specified parameter value.
C	Use up/down arrow keys to set the parameter.
D	Use PF Key to change the digit (default setting).
E	Use Key to Change to another parameter.
F	Press Key for at least three seconds to go to initial setting level.
G	Press Key once to go to adjustment level.
H	Operation indicators.
J	Temperature Unit

Adjust Temperature Set Point (SP)

1. Turn off all heat zone switches (CR) and motor power switch (CN).
2. Set pump control switch (CL) to neutral.
3. Ensure the main power disconnect (CE) is ON. Main power indicator light (CF) will illuminate.
4. Start machine by turning control power switch (CH) to ON. Light in switch and temperature controllers (CP) will illuminate.
5. Press key (LEVEL) once to go to the Adjustment level.
6. Select the Set Point (SP).

Operation Display

Set point (SP): 500° C (example)

Press the Up and Down keys and the Shift Key to change the value.

7. The new set point (SP) is selected three seconds after the new value has been specified. The hose is now controlling temperature to the desired set point (SP).

NOTE: Temperature controllers (CP) normally display actual temperature. When illuminated, the red “O1” on the temperature controller indicates that the controller is on and actively trying to heat the heater to match the temperature set point (SP). The heat zone switch must be in the ON position for the heater relay (605) to receive a signal from the controller and cause the temperature to increase. The “O1” disappears when the controller is OFF and not actively heating. The “O1” cycles on and off to indicate temperature maintenance.

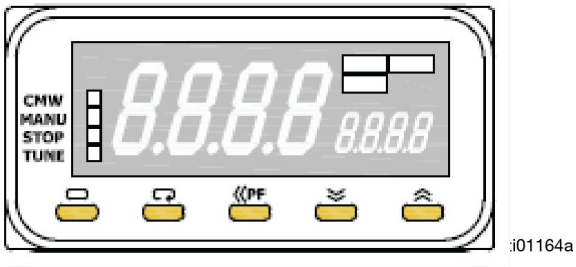


FIG. 26: Temperature Controller

Change Between Fahrenheit and Celsius

The temperature controllers (CP) are factory-set to display Fahrenheit units.

1. Enter the setup menu by pressing for at least three seconds.
2. Press (SCROLL) repeatedly until “D-U” is shown on the display.
3. Press (UP) or (DOWN) arrow until the desired unit of “C” or “F” is shown on the display.
4. Press the key for at least three seconds to exit the setup menu.

Set Cycle Countdown

1. Turn the pump control switch (CL) to NEUTRAL.
2. Turn the motor power switch (CN) to OFF.
3. Turn the main power disconnect (CE) to ON. Then turn the control power switch (CH) to ON.
4. Enable cycle countdown by turning the cycle countdown switch (CB) to ON. When cycle countdown is enabled, the pump shuts off automatically after a set number of cycles.
5. Change the preset cycle countdown value to the number of cycles for the pump to complete before automatically shutting off. See table for approximate cycles by volume.

Table 1: Nominal Volume/Cycle

Pump Size	Cycles by Volume
120 (GH-3)	15.9 cycles/gal 4.2 cycles/L

   a. Press the digit key associated with the number you would like to change.
   b. Press the reset key or wait 3 seconds to accept the new value. When new value has been accepted, the cycle countdown is set.

NOTE: To reset the counter to the preset value, press the reset key again.

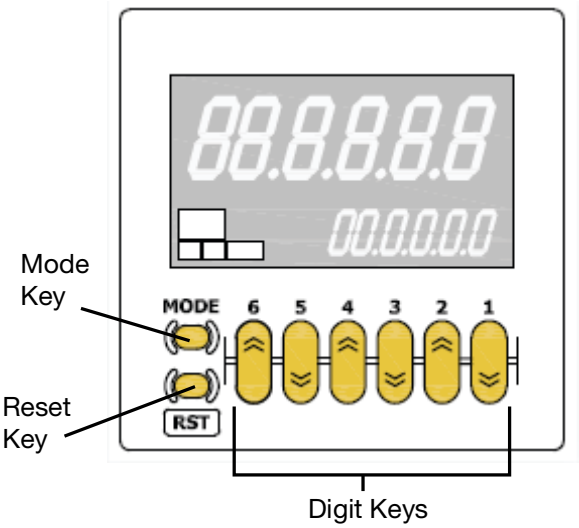


FIG. 27: Cycle Countdown

Fluid Circulation

To avoid injury from skin injection and and splashing fluidProportioning Pump, do not install shutoffs downstream of the pressure relief valves (R). The valves function as overpressure relief valves when set to SPRAY .

Pressure relief lines (H) and gun recirculation lines (L) must be rated for the maximum working pressure of the proportioner. See **Technical Specifications**, page 101. Pressure relief lines must be open so valves can automatically relieve pressure when machine is operating.

NOTICE

To prevent equipment damage, do not circulate fluid containing a blowing agent without consulting with your material supplier regarding fluid temperature limits.

NOTE: Optimum heat transfer is achieved at lower fluid flow rates with temperature set points (SP) at desired drum temperature.

Connect Proportioner Manifold to Drum Circulation

To circulate through gun manifold (AA) and preheat hose, see **Connect Gun Manifold to Drum Circulation**, page 32.

1. Follow **Pressure Relief Procedure**, page 38.
2. Install A-side and B-side pressure relief lines (H) back to component A and B supply drums. See **Typical Installation With proportioner manifold to drum circulation**, page 13.

NOTE: Use hoses rated for the maximum working pressure of this equipment. See **Technical Specifications**, page 101.

3. Set pressure relief valves (R) to PRESSURE RELIEF/CIRCULATION .

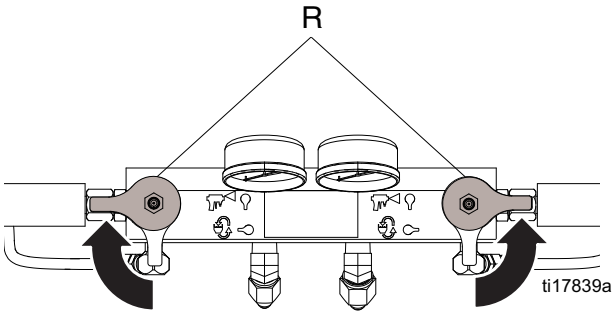


FIG. 28

4. Follow **Reduce Hydraulic Pressure**, page 33.

Connect Gun Manifold to Drum Circulation

NOTE: The Fusion gun manifold is shown.

Circulating fluid through the gun manifold (AA) allows rapid preheating of the heated hose (B).

1. Follow **Pressure Relief Procedure**, page 38.
2. Install gun manifold (AA) on gun recirculation adapter (K). Connect gun recirculation lines (L) to gun recirculation adapter (K).

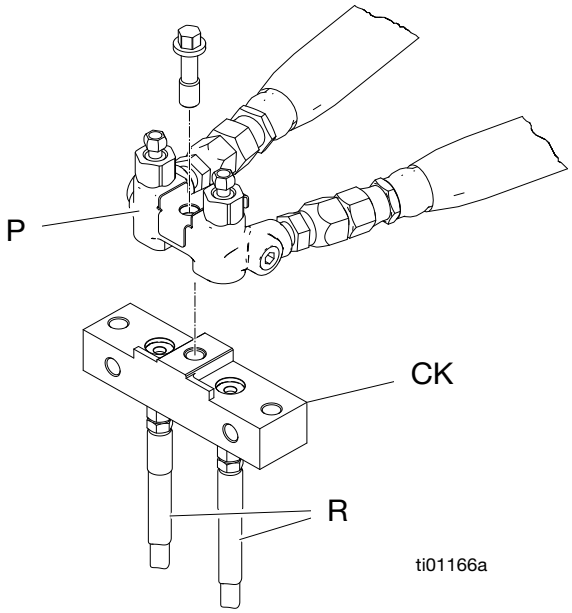


FIG. 29: Gun Recirculation Adapter Installation

NOTE: Use hoses rated for the maximum working pressure of this equipment. See **Technical Specifications**, page 101.

Gun Recirculation Adapter (K) Kit	Gun	Manual in English
246362	Fusion AP	309818
256566	Fusion CS	313058
246362	Fusion PC	3A7314

3. Route gun recirculation lines (L) back to respective component A or B supply drum.
4. Set pressure relief valves (R) to SPRAY.

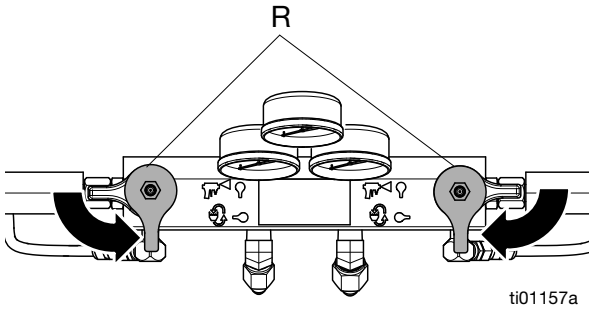


FIG. 30

5. Follow **Reduce Hydraulic Pressure**, page 33.

Reduce Hydraulic Pressure

1. Turn pump control switch (CL) to NEUTRAL position and verify motor power switch (CN) is OFF. Turn main power disconnect (CE) ON. Then start machine by turning control power switch (CH) to START.

2. Before starting the hydraulic motor, rotate the adjuster knob counter-clockwise until it ceases to move to set at lowest possible pressure.

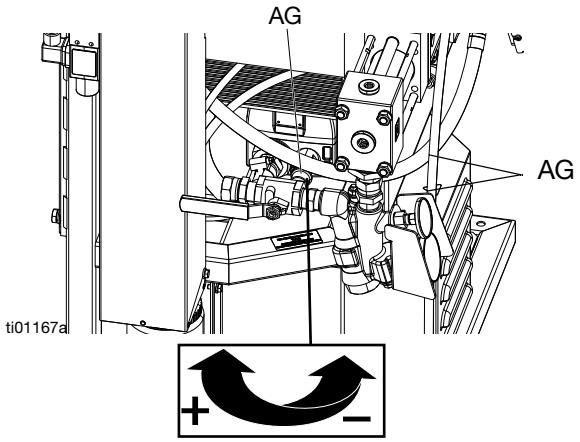


FIG. 31: Hydraulic Pressure Adjustment

3. Verify cycle countdown switch (CB) is set to OFF.
4. Turn motor power switch (CN) to ON. Then turn pump control switch (CL) to PUMP. Circulate fluid at lowest possible pressure.

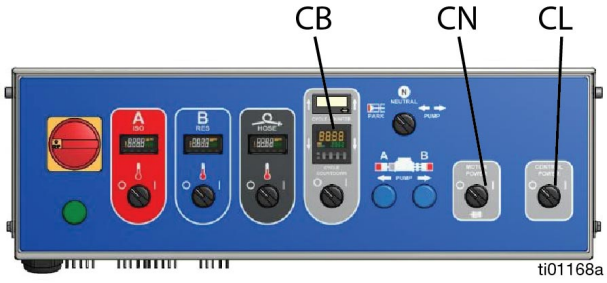


FIG. 32

5. If preheating system:
   a. Verify temperature targets. See **Digital Temperature Controllers**, page 29.
   b. Turn on all 3 heat zone switches (CR).

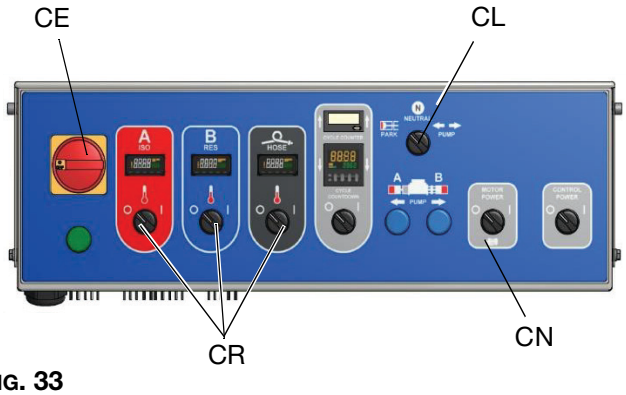


FIG. 33

   c. Wait until the inlet temperature gauges (U) reach the minimum chemical temperature from the supply drums. Turn pump control switch (CL) to NEUTRAL. Then turn the motor power switch (CN) to OFF.

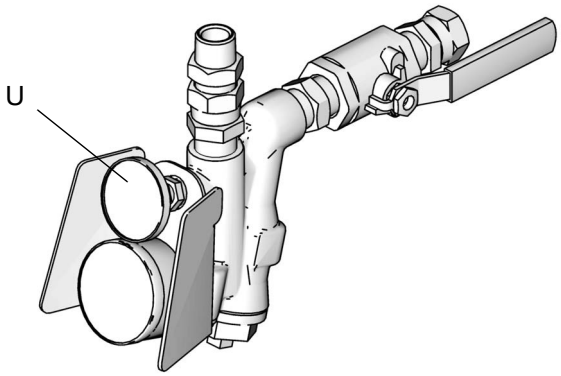


FIG. 34: Inlet Pressure Gauge on Inlet Assembly

6. Return to step 12 of **Startup**, page 26.

Spraying

1. Follow **Startup**, page 26.
2. Turn pump control switch (CL) to NEUTRAL. Turn motor power switch (CN) to OFF.
3. Engage gun piston safety lock and close gun fluid inlet valves A and B.

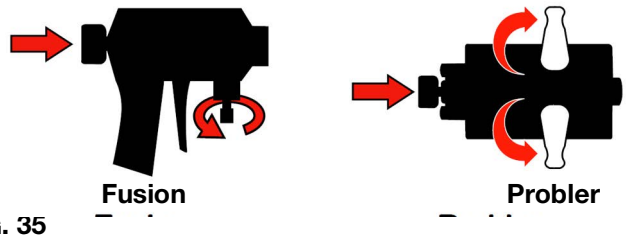


FIG. 35

4. Attach gun manifold (AA). Connect gun air line. Open air line valve.

NOTE: The Fusion AP gun is shown.

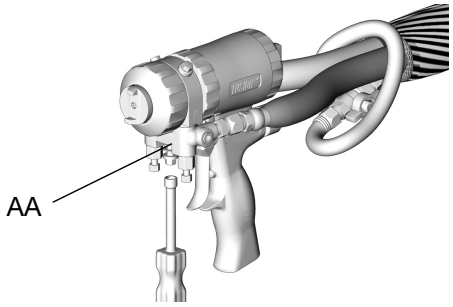


FIG. 36: Attach Gun Manifold

5. Adjust the gun air pressure. Do not exceed 130 psi (0.2 MPa, 2 bar).
6. Set pressure relief valves (R) to SPRAY

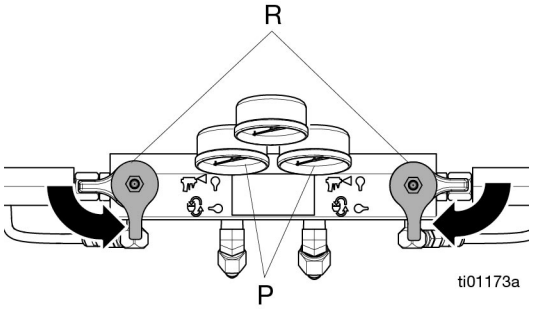


FIG. 37

7. Verify heat zone switches (CR) are on and temperatures are on target. See **Digital Temperature Controllers**, page 29, to read and operate temperature controllers (CP).
8. Verify inlet valves (AD) on both proportioning pProportioning Pumpumps (Z) are open.

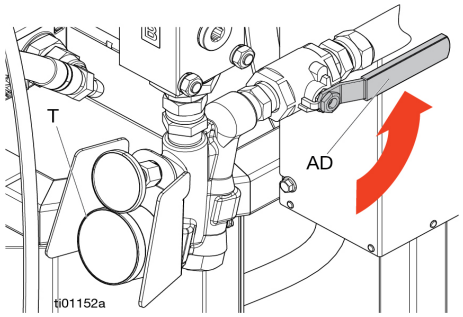


FIG. 38: Inlet Valve Assembly

9. Start hydraulic motor by turning on motor power switch (ON). Then turn pump control switch (CL) to PUMP

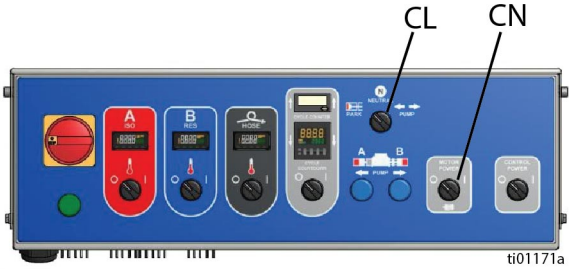
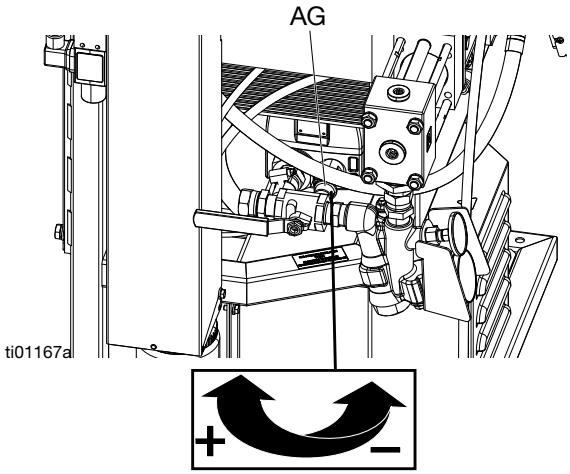


FIG. 39

10. Set hydraulic pressure adjuster (AG) to desired fluid stall pressure. Turn adjuster clockwise to increase pressure and counter-clockwise to decrease pressure. Use hydraulic pressure gauge (V) to view hydraulic pressure.



FOR PRESSURE REGULATION
TURN CLOCKWISE TO INCREASE
COUNTERCLOCKWISE TO DECREASE

FIG. 40

NOTE: Component A and B fluid outlet pressures will be higher than the hydraulic set pressure. See **Technical Specifications**, page 91, for the oil pressure ratio of your model. Component A and B fluid outlet pressures may be viewed on the outlet pressure gauges (P).

NOTE: If not installed with proportioner manifold recirculation, ensure pressure relief lines (H) have been routed to a suitable waste container to catch excess fluid.

11. Check fluid outlet pressure gauges (P) to ensure proper pressure balance. If imbalanced, reduce pressure of higher component by slightly turning pressure relief valve (R) for that component toward PRESSURE RELIEF/CIRCULATION until gauges show balanced pressures.

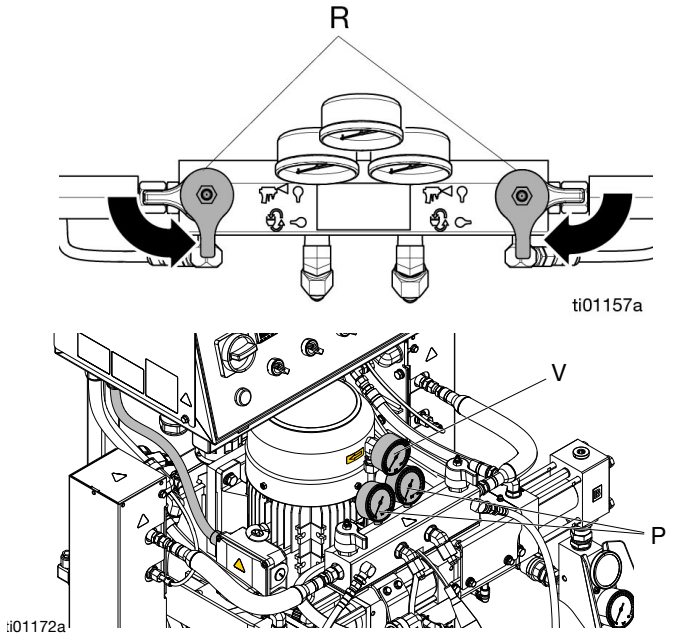


FIG. 41

12. Open gun fluid inlet valves A and B.

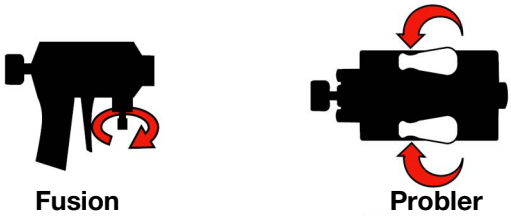


FIG. 42

NOTICE

To prevent material crossover in spray gun (E), **never** open gun fluid inlet valves or trigger gun (E) if pressures are imbalanced.

13. Disengage piston safety lock on spray gun (E).

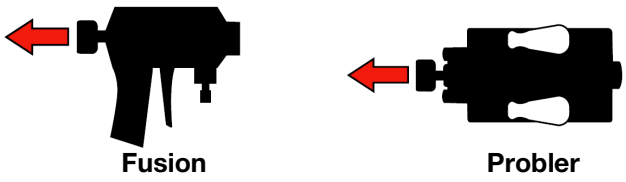


FIG. 43

14. Pull gun trigger to test spray onto cardboard. If necessary, adjust pressure and temperature to get desired results.

Spray Adjustments

Flow rate, atomization, and amount of overspray are affected by four variables.

- **Fluid pressure setting.** Too little pressure results in an uneven pattern, coarse droplet size, low flow, and poor mixing. Too much pressure results in excessive overspray, high flow rates, difficult control, and excessive wear.
- **Fluid temperature.** Similar effects to fluid pressure setting. The A and B temperatures can be offset to help balance the fluid pressure.
- **Mix chamber size.** Choice of mix chamber is based on desired flow rate and fluid viscosity.
- **Clean-off air adjustment.** Too little clean-off air results in droplets building up on the front of the nozzle, and no pattern containment to control overspray. Too much clean-off air results in air-assisted atomization and excessive overspray.

Standby

If you stop spraying for a period of time, either:

- **Shutdown** unit (page 37) and follow **Pressure Relief Procedure** (page 38).
- Or recirculate at low pressures. See **Fluid Circulation**, page 31.

Shutdown

NOTICE

Proper system setup, startup, and shutdown procedures are critical to electrical equipment reliability. The following procedures ensure steady voltage. Failure to follow these procedures will cause voltage fluctuations that can damage electrical equipment and void the warranty.

1. Turn pump control switch (CL) to PARK. Trigger the gun or relieve pressure using the pressure relief valves (R) on the proportioner manifold (M).
2. Turn motor power switch (CN) to OFF when the pump is in the leftmost position.
3. Turn all heat zone switches (CR) to OFF.

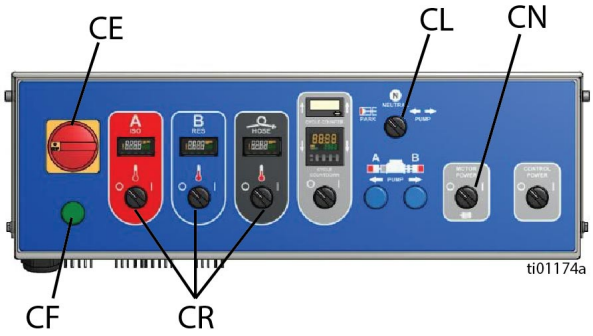


FIG. 44

4. Turn main power disconnect (CE) to OFF. The main power indicator light (CF) will turn off.
5. Turn off the air compressor, air dryer, and breathing air, if equipped.
6. Turn off feed pumps (G).
7. Close both fluid inlet valves (AD).

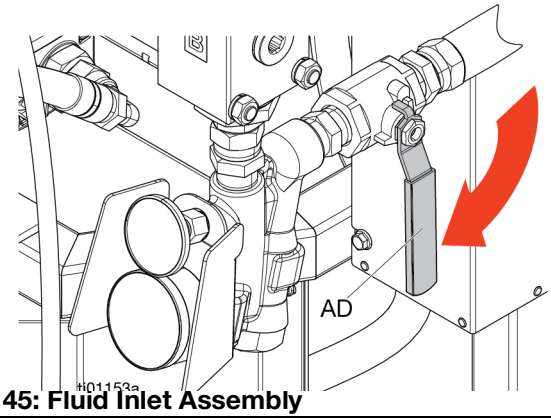
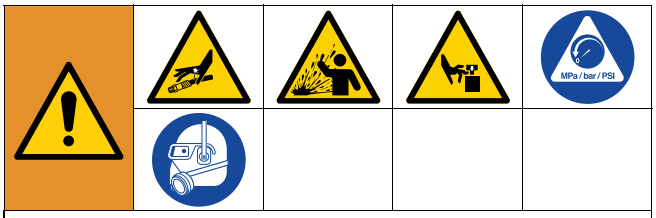


FIG. 45: Fluid Inlet Assembly

8. Relieve any remaining pressure. Follow **Pressure Relief Procedure**, starting with step 2, page 38.

Pressure Relief Procedure

Follow the Pressure Relief Procedure whenever you see this symbol.



This equipment stays pressurized until pressure is manually relieved. To help prevent serious injury from pressurized fluid, such as skin injection, splashing fluid and moving parts, follow the Pressure Relief Procedure when you stop spraying and before cleaning, checking, or servicing the equipment.

1. Follow **Shutdown**, page 37.
2. Relieve pressure in spray gun (E) and perform gun shutdown procedure. See your gun manual.
3. Verify gun piston safety lock is engaged.

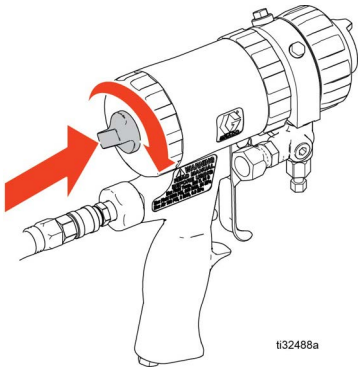


FIG. 46

4. Close gun fluid inlet valves A and B.

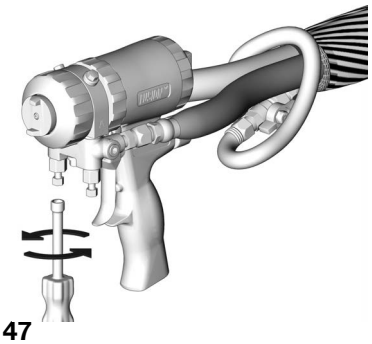


FIG. 47

5. Shut off feed pumps (G) and drum agitator, if used.
6. Route pressure relief lines (H) to waste containers or back to supply drums. Turn pressure relief valves (R) to PRESSURE RELIEF/CIRCULATION. Ensure both fluid outlet pressure gauges (P) drop to 0.

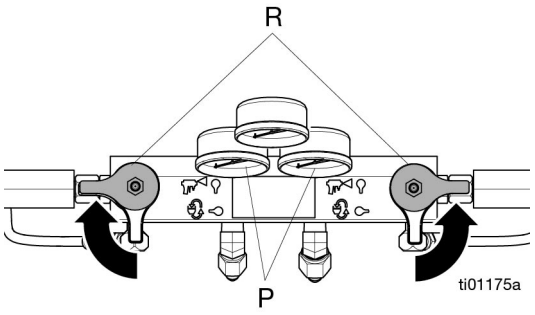


FIG. 48

7. Set pressure relief valves (R) to SPRAY on proportioner manifold (M) to seal out moisture.
8. Disconnect gun air hose and remove gun manifold (AA).

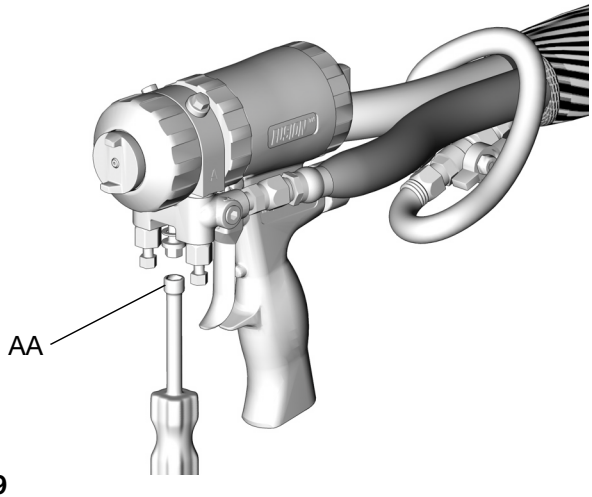


FIG. 49

Flushing

To avoid fire and explosion, always ground equipment and waste container. To avoid static sparking and injury from splashing, always flush at the lowest possible pressure.

Hot solvent may ignite. To avoid fire and explosion:

- Flush equipment only in a well-ventilated area
- Ensure all heat zone switches (CR) are set to OFF and heaters are cool before flushing.
- Do not turn on heater until fluid lines are clear of solvent

To flush fluid inlet (F) hoses, feed pumps (G), and primary heaters (W) separately from heated hoses:

- Set pressure relief valves (R) to PRESSURE RELIEF/CIRCULATION  . Flush through pressure relief lines (H).

  NOTE: Make sure pressure relief lines (H) are routed to appropriate waste container before flushing.

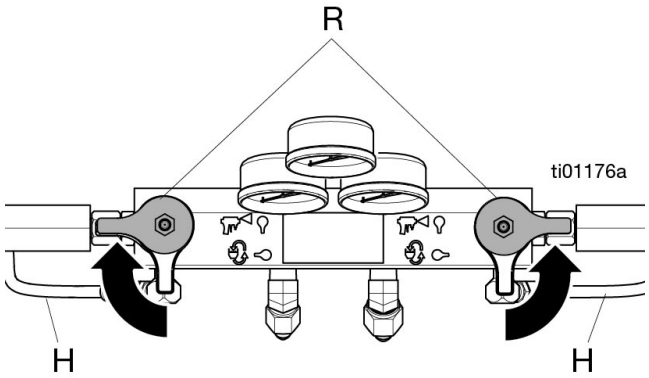


FIG. 50

To flush entire system:

- Circulate at low pressures through gun manifold (AA) with manifold removed from gun.

NOTICE

To prevent damage to check valves and seals as a result of moisture reacting with isocyanate, always leave the proportioner system filled with a moisture-free plasticizer or oil. Do not use water. Never leave the system dry. See **Important Isocyanate (ISO) Information**, page 10.

Maintenance

Prior to performing any maintenance procedures, follow **Pressure Relief Procedure**, page 38.

Preventative Maintenance Schedule

The operating conditions of your particular system determine how often maintenance is required. Establish a preventative maintenance schedule by recording when and what kind of maintenance is needed, and then determine a regular schedule for checking your system.

- Inspect hydraulic and fluid lines for leaks daily.
- Clean up all hydraulic leaks; identify and repair the cause of the leak.
- Inspect both fluid inlet filters (AE) daily. See **Clean Fluid Inlet Filters**, page 42.
- Keep component A from exposure to moisture to prevent crystallization.
- Check hydraulic fluid level weekly. Check hydraulic fluid level in the window (BN). Fluid level must be between indent marks in the window. Refill as required with approved hydraulic fluid, see **Change Hydraulic Fluid and Filter** (page 57) and the **Approved Anti-Wear (AW) Hydraulic Oils Table** (page 58). If hydraulic fluid is dark in color, change fluid and filter.

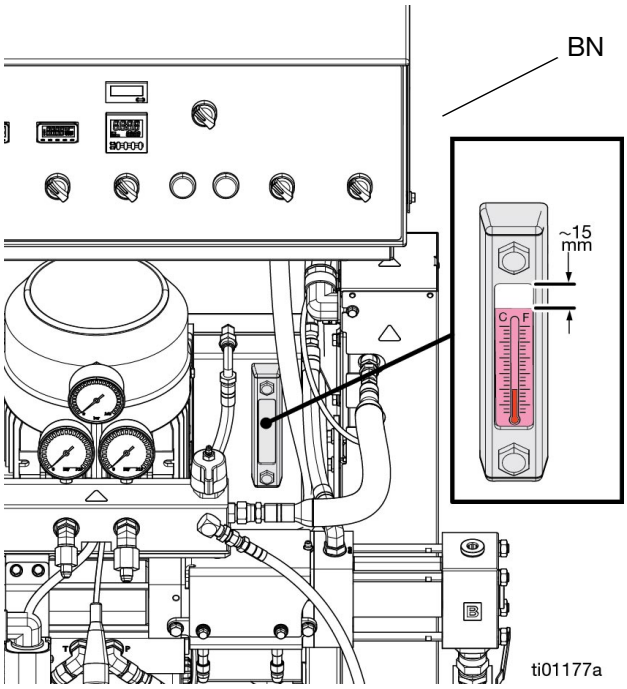


FIG. 51

- Change break-in oil in a new unit until after the first 250 hours of operation or within 3 months, whichever comes first. See Table 2: **Frequency of Oil Changes** for recommended frequency of oil changes.

Table 2: Frequency of Oil Changes

Ambient Temperature	Recommended Frequency
0° to 90° F (-17° to 32° C)	1000 hours or 12 months, whichever comes first
90° F and above (32° C and above)	500 hours or 6 months, whichever comes first

Proportioner Maintenance

Fluid Inlet Filters

- Inspect fluid inlet filters daily, see **Clean Fluid Inlet Filters**, page 42.

Grease Pressure Relief Valves

- Grease pressure relief valves (R) with Graco Fusion grease (117773) weekly. Grease sold separately.

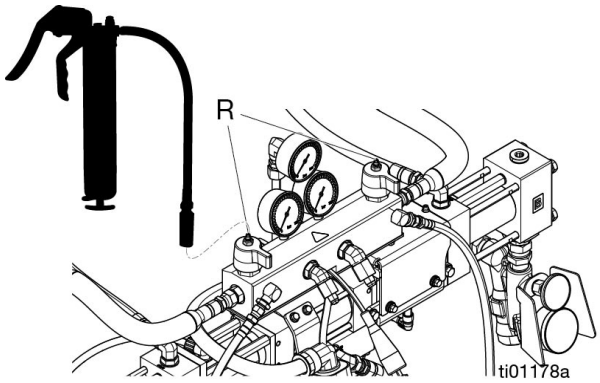


FIG. 52

TSL Lubrication Level

Inspect TSL lubricant level and condition daily. Refill or replace as needed. See **TSL Pump Lubrication System**, page 43.

Moisture

To prevent crystallization, do not expose component A to moisture in air.

Gun Mix Chamber Ports

Clean mix chamber ports on gun (E) regularly. See gun manual.

Gun Check Valve Filters

Clean gun check valve filters regularly. See gun manual.

Dust Protection

Use clean, dry, oil-free compressed air to prevent dust buildup on control modules, fans, and electric motor fan.

Vent Holes

Keep vent holes on proportioner shrouds, electrical enclosure (C), and hose transformer (128) cover open.

Clean Fluid Inlet Filters

The fluid inlet filters (AE) remove particles that can plug the pump and valves. Inspect the filters daily as part of the startup routine and clean as required.

Isocyanate can crystallize from moisture contamination or from freezing. If the chemicals used are clean and the proper storage, transfer, and operating procedures are followed, there should be minimal contamination of the component A filter.

NOTE: Clean the component A filter only during daily startup. This minimizes moisture contamination by immediately flushing out any isocyanate residue at the start of dispensing operations.

1. Close the fluid inlet valve (AD). Then shut off the appropriate feed pump (G). This prevents material from being pumped while cleaning the fluid inlet filter (AE).
2. Place a container under the filter base (AW) to catch drain-off when removing the filter plug (AY).
3. Remove the fluid inlet filter (AE) from the housing. Thoroughly flush the filter with compatible solvent and shake it dry. Inspect the filter. No more than 25% of the filter should be restricted. If more than 25% of the filter is blocked, replace the screen. Inspect the filter gasket (AZ) and replace as required.
4. Ensure the filter plug (AY) is screwed into the filter base (AW).

NOTICE

Do not over-tighten the filter plug (AY). Over-tightening can cause damage to filter plug threads. Let the o-ring make the seal.

5. Open the fluid inlet valve (AD), ensure that there are no leaks.

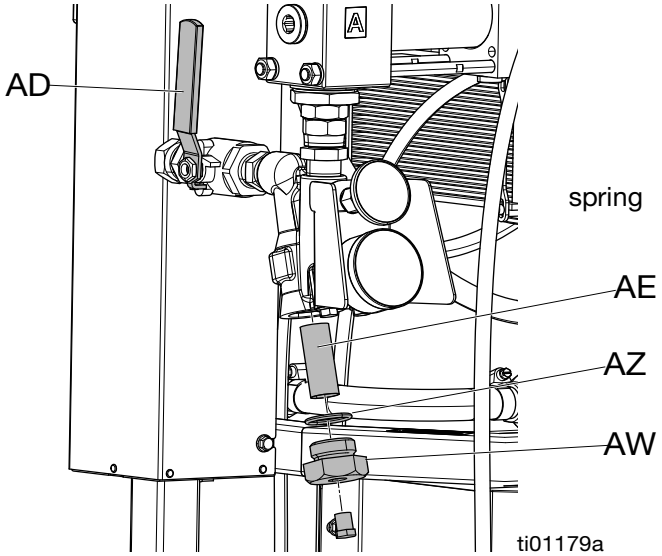


FIG. 53: Inlet Filter Assembly

TSL Pump Lubrication System

Check the condition of the TSL lubricant daily. Change the lubricant if it becomes a gel, its colors darkens, or it becomes diluted with isocyanate.

Gel formation is due to moisture absorption by the TSL lubricant. The interval between changes depends on the environment in which the equipment is operating. The TSL lubrication system minimizes exposure to moisture, but some contamination is still possible.

TSL lubricant discoloration is due to continual seepage of small amounts of isocyanate past the pump seals during operation. If the seals are operating properly, TSL lubricant replacement due to discoloration should not be necessary more often than every 3 or 4 weeks.

To change TSL lubricant:

1. Lift the TSL reservoir (AM) out of the reservoir bracket (AN) and remove the cap. While holding the cap over a suitable waste container, remove the TSL inlet filter (AP) and allow the TSL to drain.

NOTE: TSL inlet filter (AP) contains a check valve inside. The check valve also must be flushed clean.

2. Drain the TSL reservoir (AM) and flush it with clean lubricant.
3. When the reservoir is flushed clean, fill with fresh lubricant.
4. Thread the TSL reservoir (AM) onto the cap and place it in the reservoir bracket (AN).
5. Push the TSL inlet filter (AP) tube approximately 1/3 of the way into the TSL reservoir.
6. Push the TSL outlet tube (AR) into the reservoir until it reaches the bottom.

NOTE: The TSL outlet tube (AR) must reach the bottom of the TSL reservoir to ensure that isocyanate crystals will settle to the bottom and not be siphoned into the TSL inlet filter (AP).

NOTE: No priming is required.

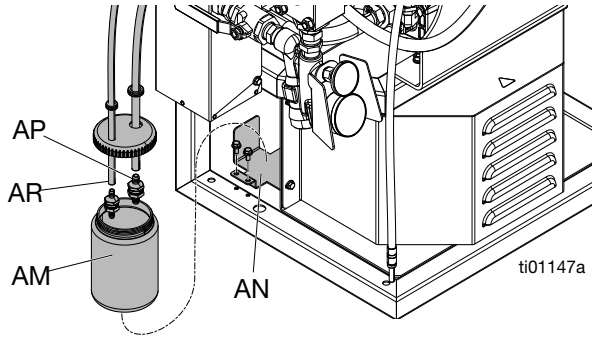


FIG. 54: Pump Lubrication System

Troubleshooting

DANGER

SEVERE ELECTRIC SHOCK HAZARD

This equipment can be powered by more than 240 V. Contact with this voltage will cause death or serious injury.

- Turn off and disconnect power before disconnecting any cables and before servicing equipment.
- All electrical wiring must be done by a qualified electrician and comply with all local codes and regulations.

1. Follow **Pressure Relief Procedure**, page 38, before checking or repairing proportioner.
2. Turn main power OFF.
3. Allow equipment to cool.

NOTE: To avoid unnecessary repairs, try the recommended solutions in the order given for each problem. Before assuming there is a problem, determine that wiring is correct and all circuit breakers, switches, and control are properly set.

Online Troubleshooting

To quickly view online help for troubleshooting, scan the QR code with your smartphone or visit help.graco.com.

Hydraulic Drive System

Problem	Cause	Solution
Electric motor will not start or electric motor stops during operation.	Motor or wiring circuit issue	Check the position of the motor guard (F2). If the relay is in the down position, check the motor. If the relay is in the up position, check wiring.
	Loose connections and/or relay (RLY2) is not activating	Check wiring between the following components: • motor junction box and KM2 • KM2 and F2
	Motor circuit breaker tripped	Confirm wiring is correct and insulation is intact. Reset F2 within the electrical enclosure.

Problem	Cause	Solution
Hydraulic pump develops low or no pressure. Pump makes screeching noise.	Pump is not primed or lost its prime	Motor (43) must operate clockwise looking the machine head-on. Swap the incoming power wires between L1 and L2.
		Check oil level (20) to ensure that hydraulic reservoir is properly filled. See **Preventative Maintenance Schedule**, page 40.
		Check that inlet fittings (31, 34, 35) are fully tight to ensure no air is leaking into the pump inlet.
	Screeching noise is characteristic of cavitation and is normal during the first 30 seconds of initial startup	If noise continues longer than 30 seconds, shut off motor by turning the motor power switch (CN) to OFF position. Check that the inlet fittings (33, 34, 35, 39) are tight and that the pump has not lost its prime.
	Hydraulic fluid is too hot	Clean ventilation of radiator (25) to allow more efficient heat dissipation.
	Electric motor operating in wrong direction	Motor (43) must operate clockwise looking the machine head-on. Swap the incoming power wires between L1 and L2.
	Inlet filter (16e) in hydraulic reservoir (16) is obstructed	Remove inlet filter from reservoir (16). Clean or replace filter.

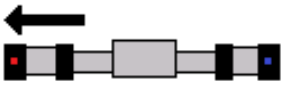
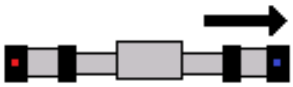
Proportioning System

Problem	Cause	Solution
Proportioning pump does not hold pressure when stalled	Proportioning pProportioning Pumppump (202) piston or rod seal is leaking	1. Observe outlet pressure gauges (P) to determine which pump is losing pressure. 2. Determine where the pump has stalled by checking the directional indicator light (CM). 3. Repair the worn seal or check valve. See your pump manual.
	One or both check valves are leaking or stuck open	
Material imbalance. See **Pressure/Material Imbalance**, page 47.	Restriction at the gun.	Clean the gun. See your gun manual.
	Inadequate flow from feed pump (G); cavitation.	Increase fluid supply to proportioning pump: • Use 2:1 or greater supply pump • Use minimum 3/4 in. (19 mm) ID supply hose, as short as practical
		Fluid is too thick. Consult your material supplier for the recommended fluid temperature to maintain a viscosity of 250-1500 centipoise
		Clean fluid inlet filter (AE). See FIG. 17, page 26.
		Worn pump inlet valve ball/seat or gasket. Replace pump.
	Pressure relief/circulation valve (R) leaking back to supply	Remove pressure relief line (H) and determine if flow is present while in SPRAY mode.
	Loose or broken clevis pin (213).	Reinstall or replace clevis pin (213)
Pump do not reverse direction or pumps do not move	Loose reversing proximity switch	See **Pumps Do Not Reverse Direction**, page 48.
	Loose piston packing bolt	See **Pumps Do Not Reverse Direction**, page 48.
	Faulty hydraulic directional valve (207)	See **Pumps Do Not Reverse Direction**, page 48.

Problem	Cause	Solution
Erratic pump movement	Pump cavitation	Feed pump pressure is too low. Adjust pressure to maintain 100 psi (0.7 MPa, 7 bar) minimum.
		Fluid is too thick. Consult your material supplier for the recommended fluid temperature to maintain a viscosity of 250-1500 centipoise
	Loose reversing proximity switch	See **Pumps Do Not Reverse Direction**, page 48.
	Faulty directional valve	Replace directional valve (207).
Pump output low	Obstructed fluid hose or gun; fluid inlet (F) hose ID too small	Open fluid hose to clear obstruction or use hose with larger ID.
	Worn piston valve or intake valve in displacement pump	See pump manual.
	Inadequate feed pump pressure	Check feed pump pressure and adjust to 100 psi (0.7 MPa, 7 bar) minimum.
Fluid leak at pump rod seal	Worn throat seals	Replace. See pump manual.
No pressure on one side	Inadequate feed pump pressure	Check feed pump pressure and adjust to 100 psi (0.7 MPa, 7 bar) minimum.

NOTE: The **Determine Valve Leak Location Table** is related to the troubleshooting problem, “Proportioning pump does not hold pressure when stalled.”

Table 3: Determine Valve Leak Location

	
B-side pump discharge valve is dirty or damaged.	B-side pump inlet valve is dirty or damaged.
A-side pump inlet valve is dirty or damaged.	A-side pump discharge valve is dirty or damaged.

Pressure/Material Imbalance

To determine which component is out of balance, check the color of some sprayed material. Two-component materials are usually a mix of light and dark fluids, so the under-proportioned component can often be readily determined.

When you have determined which component is under-proportioned, spray off-target, focusing on the pressure gauge for that component.

For example: If component B is under-proportioned, focus on the B-side pressure gauge. If the B gauge reads considerably higher than the A gauge, the problem is at the gun. If the B gauge reads considerably lower than the A gauge, the problem is at the pump.

Pumps Do Not Reverse Direction

For proportioning pumps to reverse direction, the proximity switches (211) must sense the switching plate (319) to reverse the directional valve (207).

Voltage is still present inside the directional valve. Improper testing of the proximity switch connections inside directional valve may cause injury or electric shock. Check the proximity switch connections as instructed. Measure voltage across correct terminals. See **Electrical Schematics**, page 87.

The switching plate moves from side to side during operation. Keep hands away from the switching plate while checking the functionality of the directional valve to prevent pinching hands.

1. Check the functionality of each proximity switch (211).
   a. Remove the clear front cover (170) by loosening bolts (19) and sliding cover upwards.
   b. With the motor powered off, confirm that the indicating lights on the body of each proximity switch (211) turns on when a metallic item, such as the shaft of a screwdriver, is placed on the face of each switch.
   c. If the indicating lights on the proximity switches (211) turn on, the proximity switches and switch cables are likely operating correctly; proceed to step 2. If the indicating lights do not turn on, proceed to step 6.

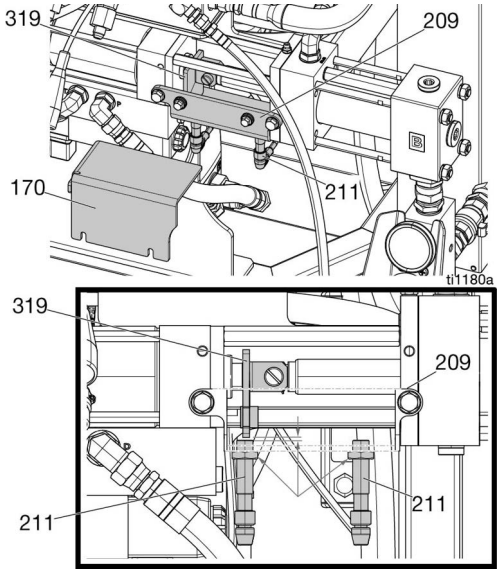
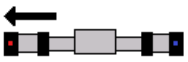
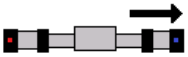


FIG. 55

2. Confirm the proximity switches (211), switch bracket (209), and switching plate (319) are firmly mounted and not damaged.
3. Check distance between the proximity switches (211) and the switching plate (319).
   a. Park the pump.
   b. Confirm that the proximity switch (211) nearest the A-side of the pump is backed out 0.5 to 1.5 turns from being in contact with the switching plate (319).
   c. Disconnect the cable from the proximity switch (211) nearest the B-side of the pump. Operate the pump until the switching plate (319) is located above the B-side proximity switch, then turn off the motor/pump.
   d. Confirm that the proximity switch (211) nearest the B-side of the pump is backed out 0.5 to 1.5 turns from being in contact with the switching plate (319).
   e. Reconnect the cable to the B-side proximity switch (211).
4. Check functionality of the directional valve (207).
   a. Inspect wiring inside the cover of the directional valve (207). See **Electrical Schematics**, page 87.
   b. During operation, the direction indicator lights on the directional valve body (207) should switch on based on the valve that is open.
   c. Turn on the motor and stall the pumps at the lowest pressure setting (compensator knob turned fully counter-clockwise). The pump will travel in either the A or B direction until the pressure setting is reached.
   d. Identify the solenoid that is operating by viewing the direction indicator lights on the cover of the directional valve (207). Measure voltage across the associated terminals to determine if proper voltage is reaching the valve (approximately 200 to 240 VAC). See **Electrical Schematics**, page 87, and the **Pump Position Table** to identify the proper terminals to measure across.
   e. Trigger each proximity switch (211) with the shaft of a screwdriver, confirming each solenoid within the directional valve (207) operations as described in Table 4: **Pump Position**.

f. If one or both sides are not operating properly, according to Table 4: **Pump Position**, first reconfirm wiring to directional valve (207) per **Electrical Schematics**, page 87, then replace directional valve.

Table 4: Pump Position

For given pump movement direction	**Pump driving left (toward park position)**	**Pump driving right (away from park position)**
Pump direction indicator light (CM) indicates direction of pump movement		
Last proximity switch triggered	Right side proximity switch	Left side proximity switch
Terminals in directional valve energized	Terminals associated with red and orange wires	Terminals associated with black and white wires

NOTE: For diagnostic purposes, it is possible to manually override the directional valve (207) by using a small screwdriver to depress the button in the center of either directional valve end cap. Depressing the button in the right end cap should cause the pump to travel to the right. Depressing the left button should cause the pump to travel to the left.

5. If you have determined that the cause is none of the above, check for a loose piston packing retaining bolt (825). This causes the piston to contact the inner face of the pump inlet flange before the switching plate (319) activates the proximity switch (211). Shut down the unit and disassemble the appropriate pump (202) for repair.

6. Following step one, if the proximity switch indicating lights do not light:

   a. Check for loose or faulty proximity switch cable or connections. Confirm the connections to the proximity switches are tight and internally free from oil and other contaminates.

   b. Swap the cables to the proximity switches to see if the problem follows the switch or is in the cable. Replace either the failed switch or the cable.

7. Replace clear front cover (170) and tighten bolts (19).

Hose Heat System

Problem	Cause	Solution
No hose heat		Turn the hose heat zone switch ON. **NOTE:** Ensure the wire insulation is not pinched in the terminal. Pinched insulation may prevent good electrical contact.
	Wrong hose transformer tap setting	The hose transformer tap setting must match the actual hose length installed. See **Adjust Hose Transformer Wiring**, page 24.
	The temperature controller (731) is not actively trying to heat. The display does not read “O1”	Verify the temperature set point (SP) is correct. See **Digital Temperature Controllers**, page 29. If the temperature set point (SP) is very close to the ambient temperature, increase the set point (SP) by a few degrees.
	One of the two hose circuit breakers is off or has been tripped	Reset the hose transformer primary circuit breaker (CB3) and reset the hose secondary circuit breaker (CB5). **NOTE:** The hose secondary circuit breaker (CB5) is designed to trip if there is too much current in the hose. This can happen if there is a short in the hose or if the hose tap setting exceeds the actual length of the hose installed. See **Adjust Hose Transformer Wiring**, page 24.

Problem	Cause	Solution
No hose heat (continued)	The temperature controller (712) output signal is not reaching the hose heat solid state relay. The green light on the hose heat solid state relay (V3) is off.	Turn the hose heat zone switch ON. **NOTE:** Even when the hose heat zone switch is off, the temperature controller will appear as though it is actively trying to heat (and will display “OUT”).
		Verify the temperature controller output signal wires are connected properly and secured according to the schematic. Reconnect wires and secure loose connections.
		Verify the temperature controller is displaying “OUT” constantly and not blinking. Check the output signal of the temperature controller by measuring the voltage between terminal 3 and 4. If the output voltage is not between 4-6 V, replace the temperature controller.
	The wrong temperature controller is installed	The hose temperature controller (731) is factory-programmed with different internal settings than the A and B primary temperature controllers (706). See **Control Panel Parts**, page 84, for the temperature controller part numbers.
	Electrical connections between heated hose sections are loose or damaged or the electrical element in the hose is damaged	Check for continuity between the electrical terminals inside the hose electrical junction box (S). Make sure terminals and heated hose electrical connections at each hose connection are secure. Replace any damaged hose sections.
	FTS is not installed correctly or has failed	The FTS should be installed near the end of the hose and in the same environment as the gun. See **Install Fluid Temperature Sensor**, page 22, and your heated hose manual.
	Faulty solid state relay (SSR) failed in the off position	Replace SSR.

Problem	Cause	Solution
Low hose heat or hose temperature drops when gun is triggered.	Low input voltage to the proportioner	The maximum amount of heat generated by the heated hose depends on the input voltage to the proportioner. The hose transformer lowers the voltage by a fixed percentage. If possible, adjust your generator voltage within the marked voltage range. This will increase or decrease the maximum current (and heat) available to the hose. **NOTICE:** To avoid damage to the proportioner and hose, do not exceed the maximum voltage rating of the system. Do not exceed a hose current of 50 A.
	Wrong hose transformer tap setting	The hose transformer tap setting must match the actual hose length installed. See **Adjust Hose Transformer Wiring**, page 24.
	Hose heat is set significantly above one or both primary heater temperature set points (SP)	The heated hose is not designed to increase the fluid temperature while fluid is flowing. The hose only maintains the temperature of the fluid while it travels through the hose. Adjust the hose heat set point (SP) so it is at or slightly below the primary heater temperature.
	The wrong temperature controller is installed	The hose temperature controller (731) is factory-programmed with different internal settings than the A and B primary temperature controllers (706). See **Control Panel Parts**, page 84, for the temperature controller part numbers.
	Electrical connections between heated hose sections are loose or damaged or the electrical element in the hose is damaged	Check for continuity between the electrical terminals inside the hose electrical junction box (S). Make sure terminals and heated hose electrical connections at each hose connection are secure. Replace any damaged hose sections.
	FTS is not installed correctly or has failed	The FTS should be installed near the end of the hose and in the same environment as the gun. See **Install Fluid Temperature Sensor**, page 22, and your heated hose manual for more information.

Problem	Cause	Solution
Hose temperature is erratic	The internal programming parameters inside the temperature controller are not correct	The hose temperature controller (712) is factory -programmed with different internal settings than the A and B primary temperature controllers (720) See #Control Panel, page # for the temperature controller part numbers NOTE: Using temperature controllers that are not programmed with the correct internal settings can damage equipment. Only use genuine Graco parts.
	Wrong hose transformer tap setting	The hose transformer tap setting must match the actual hose length installed. See **Adjust Hose Transformer Wiring**, page 24.
	Hose heat is set significantly above one or both primary heater temperature set points (SP)	The heated hose is not designed to increase the fluid temperature while fluid is flowing. The hose only maintains the temperature of the fluid while it travels through the hose. Adjust the hose heat set point (SP) so it is at or slightly below the primary heater temperature.
	Electrical connections between heated hose sections are loose or damaged or the electrical element in the hose is damaged	Check for continuity between the electrical terminals inside the hose electrical junction box (S). Make sure terminals and heated hose electrical connections at each hose connection are secure. Replace any damaged hose sections.
	FTS is not installed correctly or has failed	The FTS should be installed near the end of the hose and in the same environment as the gun. See **Install Fluid Temperature Sensor**, page 22, and your heated hose manual for more information.
	Faulty solid state relay (SSR)	Solid state relays typically fail in the ON position. Turn the hose heat zone switch (CR) to OFF. Measure continuity between: • V3-L1 and V3-T1 Replace V3 if there is continuity.
	Material temperature at the pump inlet is too low	Increase the temperature of the material before use.

Primary Heater

Problem	Cause	Solution
Primary heater (W) does not heat	Heat zone turned off	Turn heat zone switch (CR) to ON.
	Breaker tripped	Check F3 for A-side heater and F4 for B-side heater
	Primary heater temperature controller (706)	The two primary heater controllers (706) are interchangeable. To test for a faulty controller, turn off the main power disconnect and disconnect incoming power. Replace the suspect controller and retest.
	RTD	If there is a signal failure from the RTD, the temperature controller will prevent the heaters from operating. If this occurs, replace the thermocouple. See **Replace RTD Sensor**, page 62.
		RTD position is critical to proper operation of the heater. Two conditions must be satisfied: • Thermocouple must make contact with the heater cartridge. • Heater cartridge must be functioning properly. Lack of either of these conditions may cause erratic temperature control and possible overheating. To check thermocouple position, see **Replace RTD Sensor**, page 62.
	Heater cartridge	See **Replace Heater Element**, page 60.
	Faulty solid state relay (SSR) failed in the off position.	Replace SSR.

Problem	Cause	Solution
Primary heat controller has abnormally high temperature overshoots	Damaged RTD connections or wire	Check RTD connections and wire for damage. Replace if necessary.
	RTD does not touch the heater element	Reinstall the RTD. See **Replace RTD Sensor**, page 62.
	Failed heater element	See **Replace Heater Element**, page 60.
	Failed controller	Verify failed controller by switching A and B temperature controllers (720). If the issue follows the controller, replace the faulty controller. **NOTE:** The A-side and B-side temperature controllers (720) are different than the hose temperature controller (712). Hose temperature and A- and B-side temperature controllers have different internal programming and are not interchangeable. **NOTICE:** Using temperature controllers that are not programmed with the correct internal settings can damage equipment. Only use genuine Graco parts.
	Faulty A-side solid state relay (V1) or B-side solid state relay (V2)	Solid state relays typically fail in the on position. Turn heat zone switch (R) to OFF. Measure continuity between: • V1-L1 and V1-L2 (A-side) • V2-L1 and V2-L2 (B-side) If there is continuity for the A-side or B-side solid state relay, replace that relay.

Repair

NOTICE

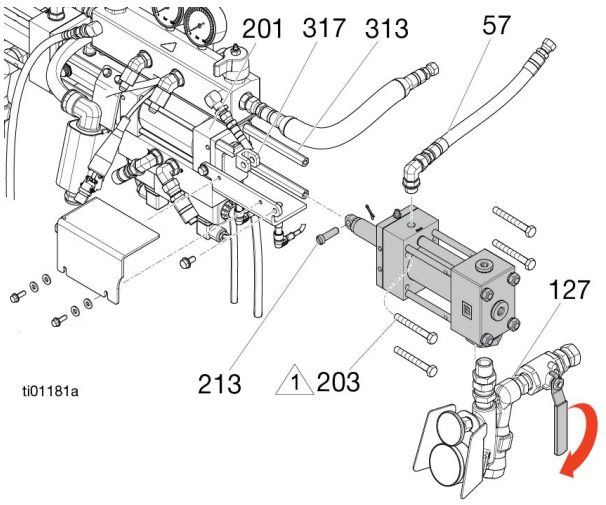
Proper system setup, startup, and shutdown procedures are critical to electrical equipment reliability. The following procedures ensure steady voltage. Failure to follow these procedures will cause voltage fluctuations that can damage electrical equipment and void the warranty.

Repair Proportioning Pumps

1. Perform **Flushing**, page 39.
2. Perform **Shutdown**, page 37.
3. Perform **Pressure Relief Procedure**, page 38.

NOTE: Use drop cloth or rags to protect the proportioner and surrounding area from spills.

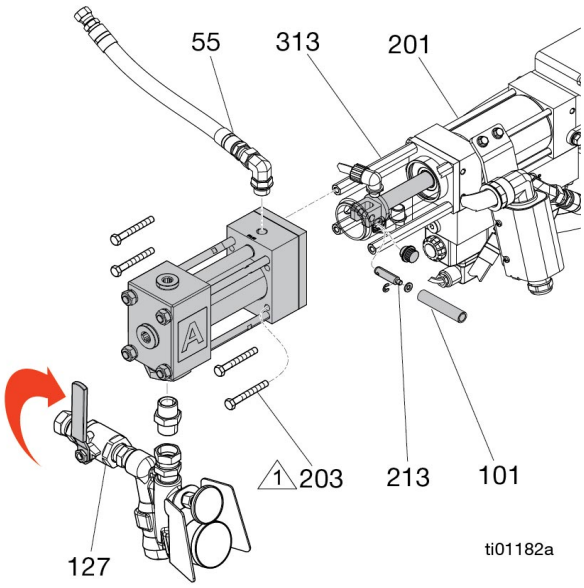
4. Disconnect the B (resin) side fluid inlet (F) line, the inlet y-strainer (127), and hard tube (57). Remove the pin (213) from the clevis (317) to disconnect the pump from the hydraulic cylinder (201). Remove the four screws (203) holding the pump to the spacers (313) of the cylinder. Take the pump assembly to a workbench.



1 Torque to 200 in.-lb (22.6 N•m)

FIG. 56

5. Disconnect the A (ISO) side fluid inlet (F) line, the inlet y-strainer (127), and the flex pipe (55). Use the pin extractor tool (101) to remove the pin (213), which disconnects the pump from hydraulic cylinder (201). Remove the four screws (203) holding the pump to the spacers (313) of the cylinder. Take the pump assembly to a workbench.



1 Torque to 200 in.-lb (22.6 N•m)

FIG. 57

6. See proportioning pump (Z) manual (3A3085) for repair instructions.
7. Reconnect the proportioning pump (Z) in the reverse order. Torque the screws (203) to 200 in.-lb (22.6 N•m).

Change Hydraulic Fluid and Filter

NOTE: Change break-in oil in a new system after the first 250 hours of operation or within 3 months, whichever comes first.

Table 5: Frequency of Oil Changes

Ambient Temperature	Recommended Frequency
0 to 90°F (-17 to 32°C)	1000 hours or 12 months, whichever comes first
90°F and above (32°C and above)	500 hours or 6 months, whichever comes first

1. Follow **Shutdown**, page 37.
2. Follow **Pressure Relief Procedure**, page 38.
3. Allow hydraulic fluid to cool.
4. Place a pan under the reservoir drain plug (16f) to catch oil.

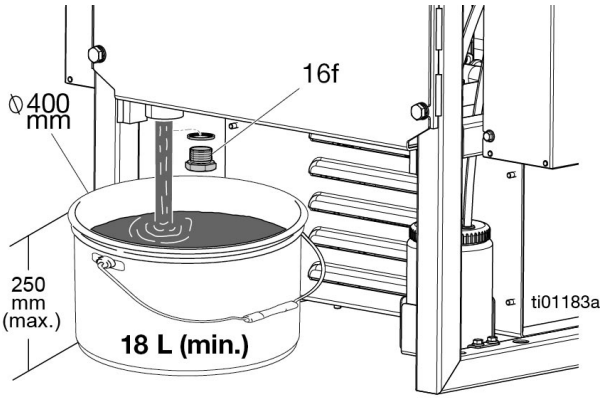


FIG. 58

5. Remove the drain plug (16f).
6. Wait for tank to drain the oil. For faster draining, unscrew the filler cap (119) on the tank.
7. Reinstall drain plug (16f).
8. Refill reservoir with approved hydraulic fluid. See Table 6: **Approved Anti-Wear (AW) Hydraulic Oils** (page 58). Verify oil level in window (BN).

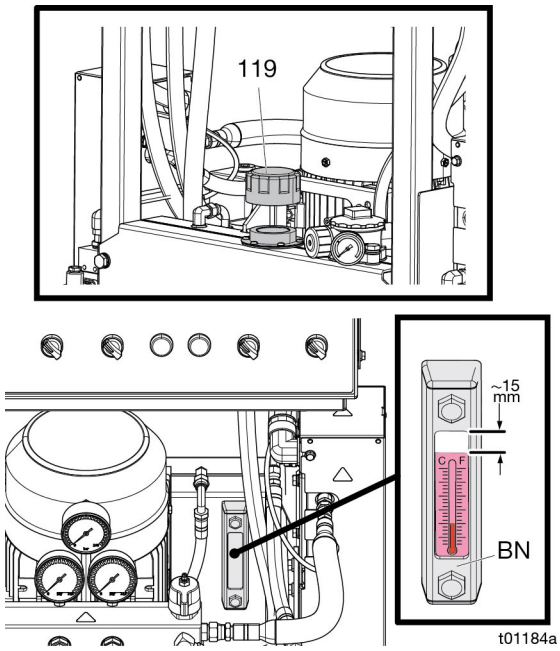


FIG. 59

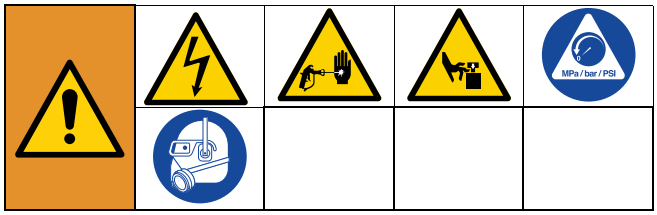
9. Proceed with normal operation.

NOTE: Upon starting motor, hydraulic pump may make a screeching noise until primed. If this noise continues for more than 30 seconds, switch off motor control.

Table 6: Approved Anti-Wear (AW) Hydraulic Oils

Supplier	Name
Citgo	A/W ISO Grade 46
Amsoil	AWI ISO Grade 46 (synthetic*)
BP Oil International	Energol® HLP-HM, ISO Grade 46
Carl Bechem GmbH	Staroil HVI 46
Castrol	Hyspin AWS 46
Chevron	Rykon® AW, ISO 46
Exxon	Humble Hydraulic H, ISO Grade 46
Mobil	Mobil DTE 25, ISO Grade 46
Shell	Shell Tellus, ISO Grade 46
Texaco	Texaco AW Hydraulic, ISO Grade 46
**Do not mix mineral-based and synthetic hydraulic oils. Completely drain oil from reservoir and pump prior to converting between oils.*	
If the approved oils are not available in your area, use an alternative hydraulic oil meeting the following requirements:	
Oil Type	Anti-Wear (AW) Hydraulic
ISO Grade	46
Viscosity, cSt at 40°C	43.0–47.0
Viscosity, cSt at 100°C	6.5–9.0
Viscosity Index	95 or higher
Pour Point, ASTM D 97	-15°F (-26°C) or lower
Other essential properties	Formulated for anti-wear, anti-foaming, oxidation stability, corrosion protection, and water separation.

Replace Electric Motor



Remove Shrouds

NOTICE

To prevent dropping the electric motor, two people may be required to remove the motor from the system.

1. Perform **Shutdown**, page 37.
2. Perform **Pressure Relief Procedure**, page 38.
3. Remove mounting bolts (not provided) from the bottom frame and move the system away from the wall.

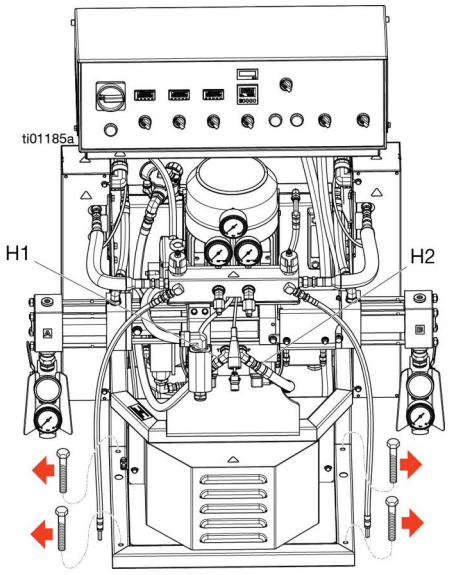


FIG. 60

4. Remove flexible hoses H1 and H2 from the hydraulic manifold. Place a pan under the manifold to catch oil.
5. Remove electric motor junction box cover (BT), see Fig. 61.
6. Disconnect the motor cables, see **Electrical Schematics**, page 87.
7. Note or label wire connections, see **Electrical Schematics**, page 87.

8. Remove four oil tank bolts (H3) from the frame. If possible, use a chain hoist to remove the tank, motor, and pump system. Place the system on a stable surface with the motor facing upwards.

NOTICE

To prevent damage to cables, do not crush or strain any cables near the point where the frame halves hinge.

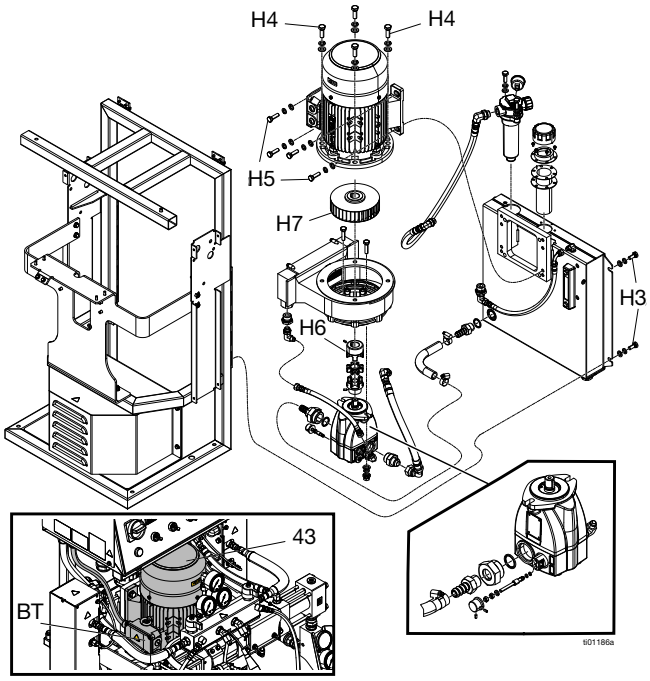


FIG. 61

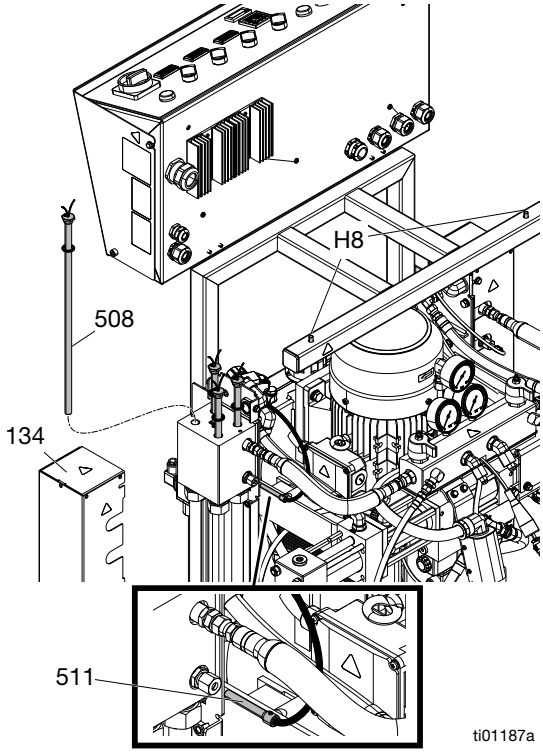
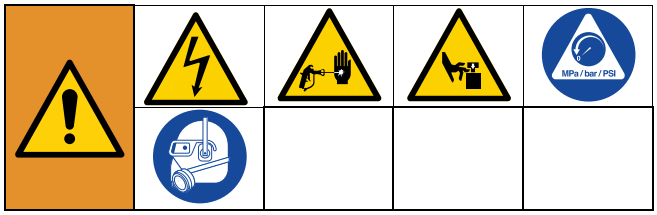


FIG. 62

9. Remove four bolts (H4) and four bolts (H5), see Fig. 61 and Fig. 62.
10. Remove the motor coupling (H6) and the fan (H7).
11. Place the new motor (43) on the unit.
12. Proceed in reverse order of dimantling.
13. Return to service.

Replace Heater Element



Replace Heater Element

1. Flush. See **Flushing**, page 39.
2. Perform **Shutdown**, page 37.
3. Perform **Pressure Relief Procedure**, page 38.
4. Wait for heaters to cool.
5. Remove heater cover (134 or 135).
6. Disconnect heater element wires from heater wire connector inside the electrical enclosure (C). See **Electrical Schematics**, page 87. Test with ohmmeter.

Table 7: Heater Resistance

System	Total Heater Wattage	Element	Ohms per Element
GH-3	12 kW	1500	35
GH-3JP	12kW	1500	27.6

7. If the thermocouple is on the heater element, remove the thermocouple (511 or 512) to avoid damage. See **Replace RTD Sensor**, page 62.
8. Remove two bolts (H8) and tilt backwards the electric cabinet.
9. Use a wrench to remove the heater element (508). Inspect element. It should be relatively smooth and shiny. Replace element if there is a crusted, burnt ash-like material adhered to the element, or if the sheath shows pitting marks.
10. Install the new heater elements (508). Torque to 120 ft-lbs (163 N•m).
11. Install the thermocouple (511 or 512), if removed earlier. See **Replace RTD Sensor**, page 62.
12. Reconnect the wires inside the electrical enclosure. See **Electrical Schematics**, page 87.
13. Replace heater cover (134 or 135).

Line Voltage

The heater outputs its rated wattage at 230 VAC (200VAC GH-3JP). Low line voltage will reduce power available and the heater will not perform at full capacity.

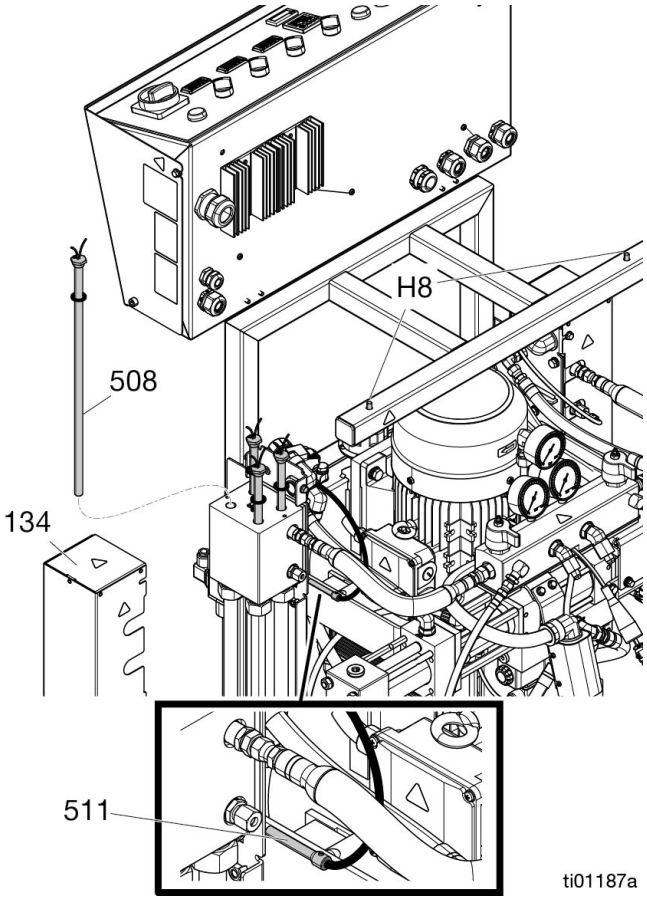


FIG. 63

Repair Heater Over-temperature Switch

1. Perform **Shutdown**, page 37.
2. Wait for heaters to cool.
3. Disconnect over-temperature switches (509) from cable. Test across spade terminals with ohmmeter.

NOTE: If the resistance is not approximately 0 ohms, the over-temperature switch (509) needs to be replaced.

4. If the switch fails the test, remove the screws. Discard the failed switch. Apply a thin layer of thermal compound 110009, install a new switch (509) in the same location on housing (501). Secure with screws (513) and reconnect cables (88 or 89).

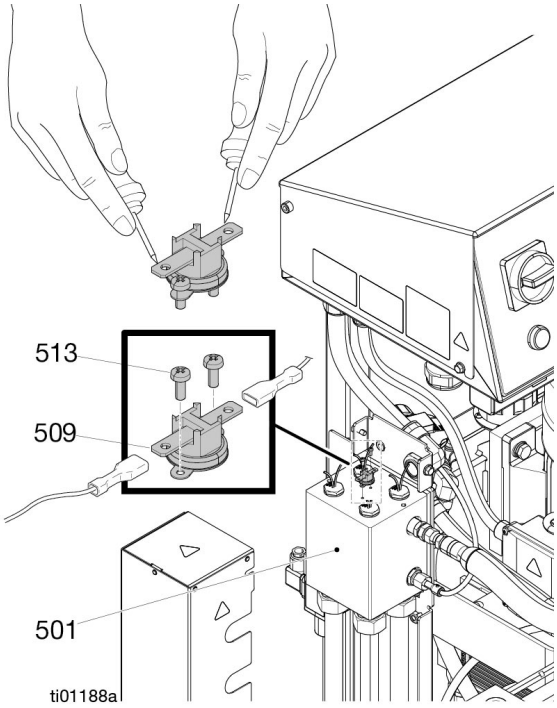
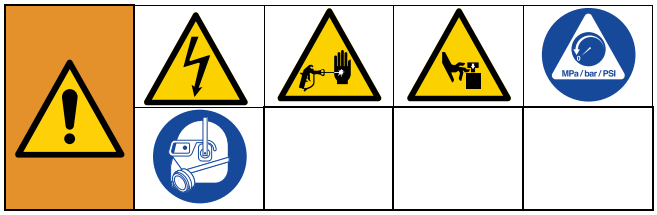


FIG. 64

Replace RTD Sensor



1. Perform **Shutdown**, page 37.
2. Follow **Pressure Relief Procedure**, page 38.
3. Wait for heaters to cool.
4. Remove heater shroud (134 or 135).
5. Disconnect thermocouple wires from temperature control module. See **Control Power Wiring 400 V (1 of 4)**, page 91.
6. Feed thermocouple wires out of electrical enclosure (C). Note path as wires must be replaced in the same way.
7. See FIG. 65, page 62. Loosen ferrule nut (BV). Remove RTD (511) from heater housing (501). Do not remove the fitting.
8. Replace thermocouple. See FIG. 65.
   a. Remove protective tape from thermocouple (511) tip.
   b. Apply PTFE tape and thread sealant to male threads and tighten thermocouple housing (BR) into adapter (506).
   c. Push in thermocouple (511) so tip contacts heater element (508).
   d. Holding thermocouple (511) against heater element, tighten ferrule nut (BV) 1/4 turn past finger-tight.
9. Route thermocouple wires into electrical enclosure (C) and thread into bundle as before. Reconnect wires to board.
10. Replace heater shroud.
11. Turn on heaters A and B simultaneously to test. Temperatures should rise at the same rate. If one heater is low, loosen ferrule nut (BV) and tighten thermocouple housing (BR) to ensure the thermocouple (511) tip contacts element (508).

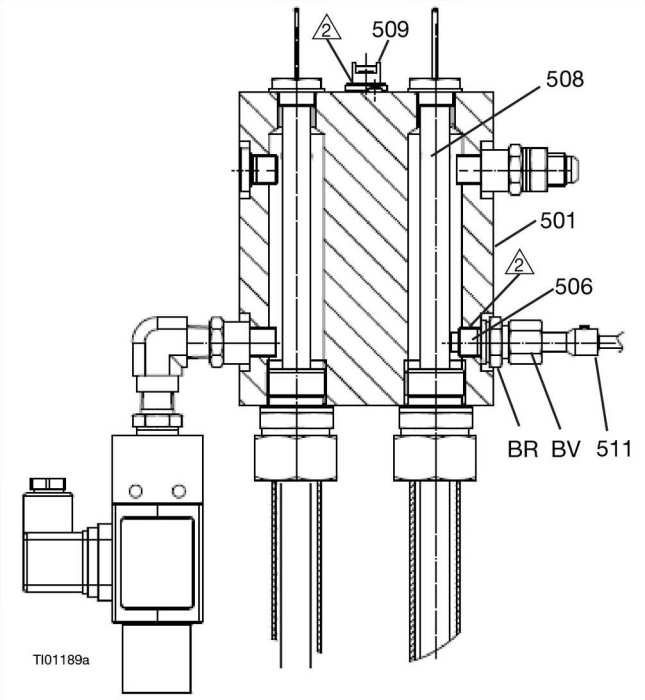


FIG. 65: RTD

Diagnose Heated Hose

Refer to your heated hose manual for hose replacement parts.

Check Hose Wires

1. Perform **Shutdown**, page 37.

NOTE: Whip hose must be connected.

2. Remove cover (71). See FIG. 67.
3. Disconnect system wires (139) from the proportioner.
4. Disconnect hose wires from terminal block (AS).

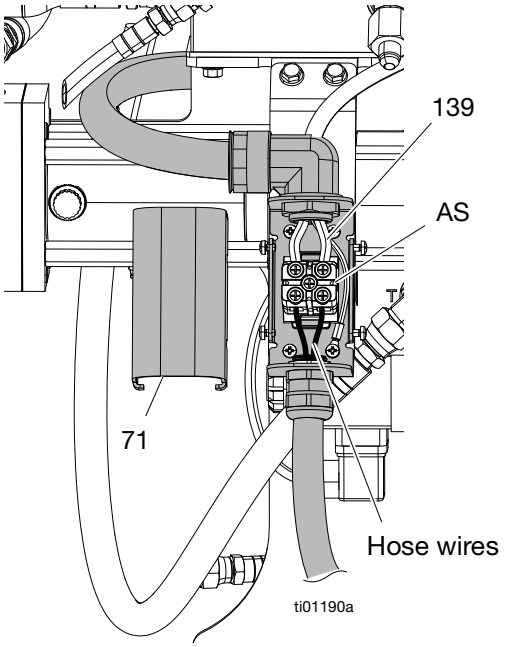


FIG. 66

5. Using an ohmmeter, check between the hose wires. There should be continuity.
6. If hose fails test, retest at each length of hose from the system out to the gun, including whip hose, until failure is isolated.
7. Reconnect wires and install cover (71).

Check Hose Power Connectors

1. Perform **Shutdown**, page 37.

NOTE: Whip hose must be connected.

2. Disconnect power wire harness from terminal block (AS).

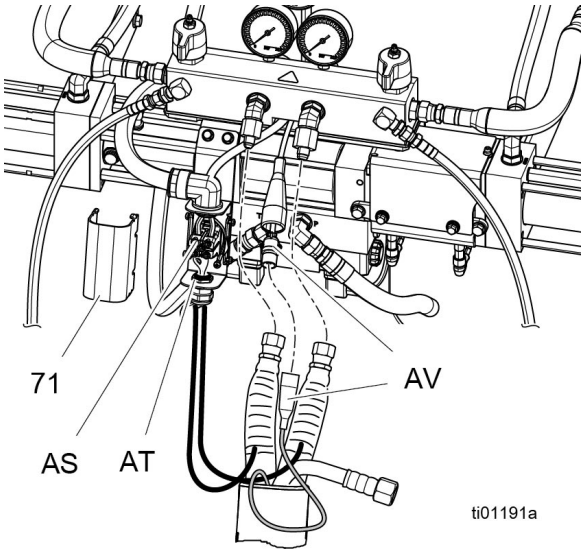


FIG. 67: Heated Hose Electrical Junction Box

3. Use an ohmmeter to check for continuity between the two terminals on the terminal block.
4. If the hose fails the test, re-test at each length of hose, including whip hose, until the failure is identified.

Check FTS Cables

1. Perform **Shutdown**, page 37.
2. Disconnect FTS cable (163) at proportioner. See FIG. 68.

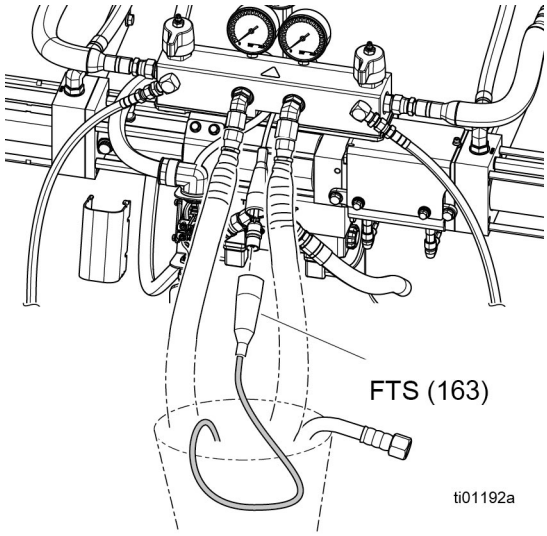


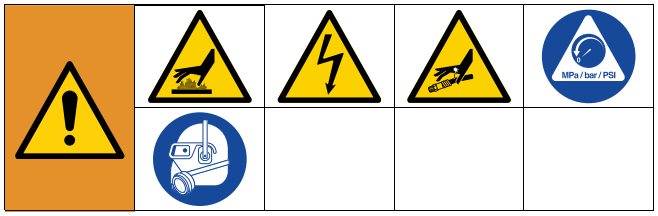
FIG. 68: Disconnect FTS Cable

3. Test with ohmmeter between pins of cable connector.

Pins	Result
1 to 2	Approximately 35 ohms per 50 ft (15.2 m) of hose, plus approximately 10 ohms for FTS
1 to 3	Infinity

4. If cable fails test, see **Repair Fluid Temperature Sensor (FTS)**, page 65.

Repair Fluid Temperature Sensor (FTS)



Installation

The fluid temperature sensor (FTS) is supplied with heated hose. Install FTS between main hose and whip hose. Refer to your heated hose manual for instructions.

Test/Removal

1. Perform **Shutdown**, page 37.
2. Follow **Pressure Relief Procedure**, page 38.
3. Remove tape and protective covering from FTS. Disconnect sensor cable (BC). Test with ohmmeter between pins of cable connector.

Pins	Result
1 to 2	Approximately 10 ohms
1 to 3	Infinity
3 to FTS groundscrew	0 ohms
1 to FTS component A fitting (ISO)	Infinity

4. If FTS fails, replace FTS.
   a. Disconnect air hoses (BB) and electrical connectors (BA).
   b. Disconnect FTS from fluid hoses (BE).
   c. Remove ground wire (BF) from ground screw on underside of FTS.
   d. Remove FTS probe (BG) from component A (ISO) side of hose.

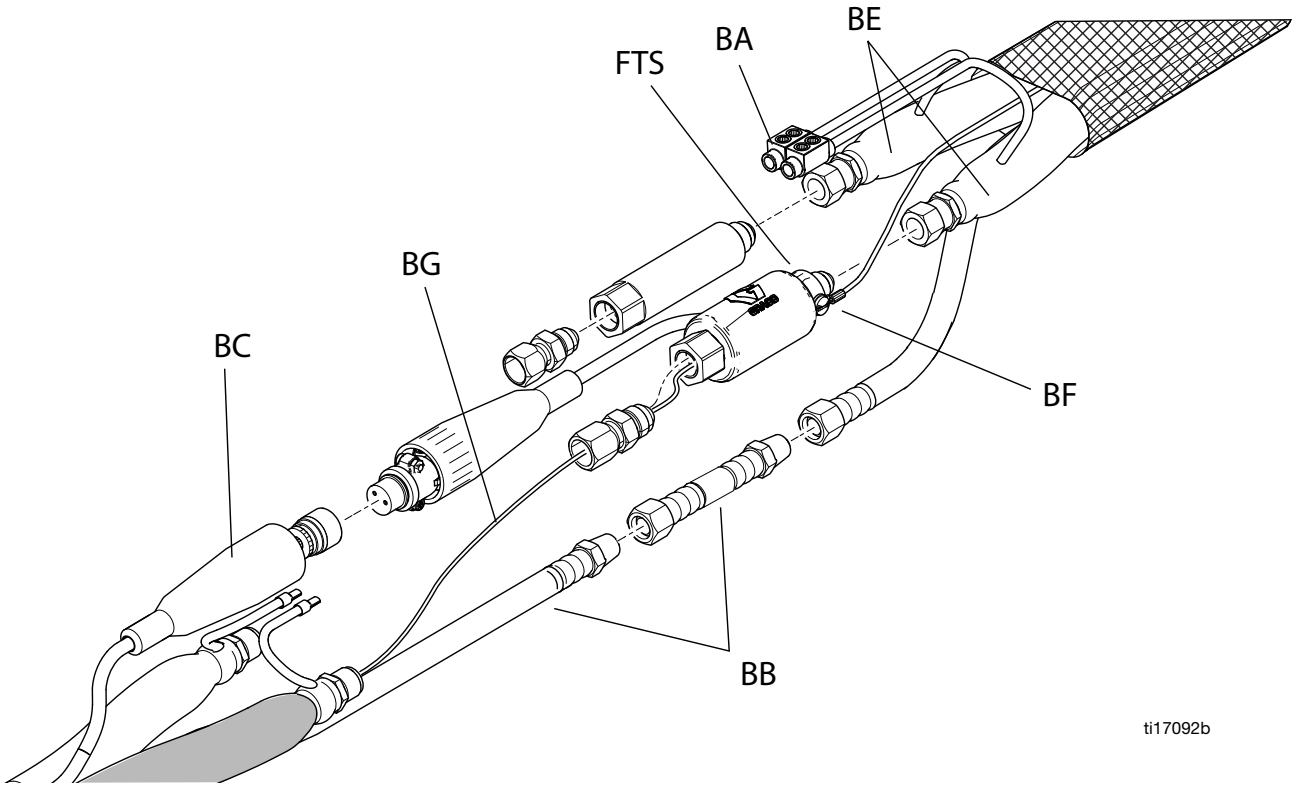


FIG. 69

Diagnose and Replace Hose Transformer

Transformer Primary Check

NOTE: Refer to **Electrical Schematics**, page 87, for circuit breaker and wire identification.

1. Perform **Shutdown**, page 37.
2. Open the electrical enclosure door (99) by loosening the bolts (19) and lifting the door upwards.
3. Turn off circuit breaker F5.
4. Use an ohmmeter to test for continuity between the 106 and 107 wires; there should be continuity.
   a. If there is no continuity, **Replace Transformer**.
   b. If there is continuity, follow **Transformer Secondary Check**.
5. Turn on circuit breaker F5.

Transformer Secondary Check

NOTE: Refer to **Electrical Schematics**, page 87, for circuit breaker and wire identification.

1. Perform **Shutdown**, page 37.
2. Open the electrical enclosure door (99) by loosening the bolts (19) and lifting the door upwards.
3. Turn off circuit breaker F5 and disconnect the hose wires in the hose electrical junction box. See FIG. 66, page 63.
4. Use an ohmmeter to test for continuity between the 111 and the terminal for each hose length; there should be continuity.
   a. If there is no continuity, **Replace Transformer**.
   b. If there is continuity, reconnect the hose wires in the electrical junction box. See FIG. 66, page 63. Turn on circuit breaker F5. Close the electrical enclosure door (99) and tighten the bolts (19).

Replace Transformer

1. Perform **Shutdown**, page 37.
2. Remove the transformer cover (93). See **Proportioner Parts**, page 69, and FIG. 13, page 24.
3. Remove transformer mounting bolts (7).
4. Disconnect the transformer wires. See **Electrical Schematics**, page 87, and **Adjust Hose Transformer Wiring**, page 24.
5. Replace transformer and reconnect transformer wires. Refer to **Electrical Schematics**, page 87, and **Adjust Hose Transformer Wiring**, page 24.
6. Reinstall transformer mounting bolts (7).
7. Reinstall transformer cover (93).

Replace Power Supply

1. Perform **Shutdown**, page 37.
2. Open electrical enclosure (C).
3. Disconnect input and output cables from both sides of the power supply. See **Electrical Schematics**, page 87.
4. Insert a flat head screw driver in the mounting tab on the bottom of the power supply to remove from the din rail.
5. Install new power supply in reverse order.
6. Close electrical enclosure (C).

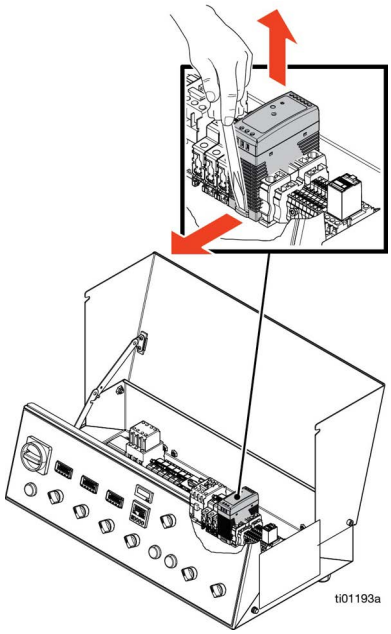
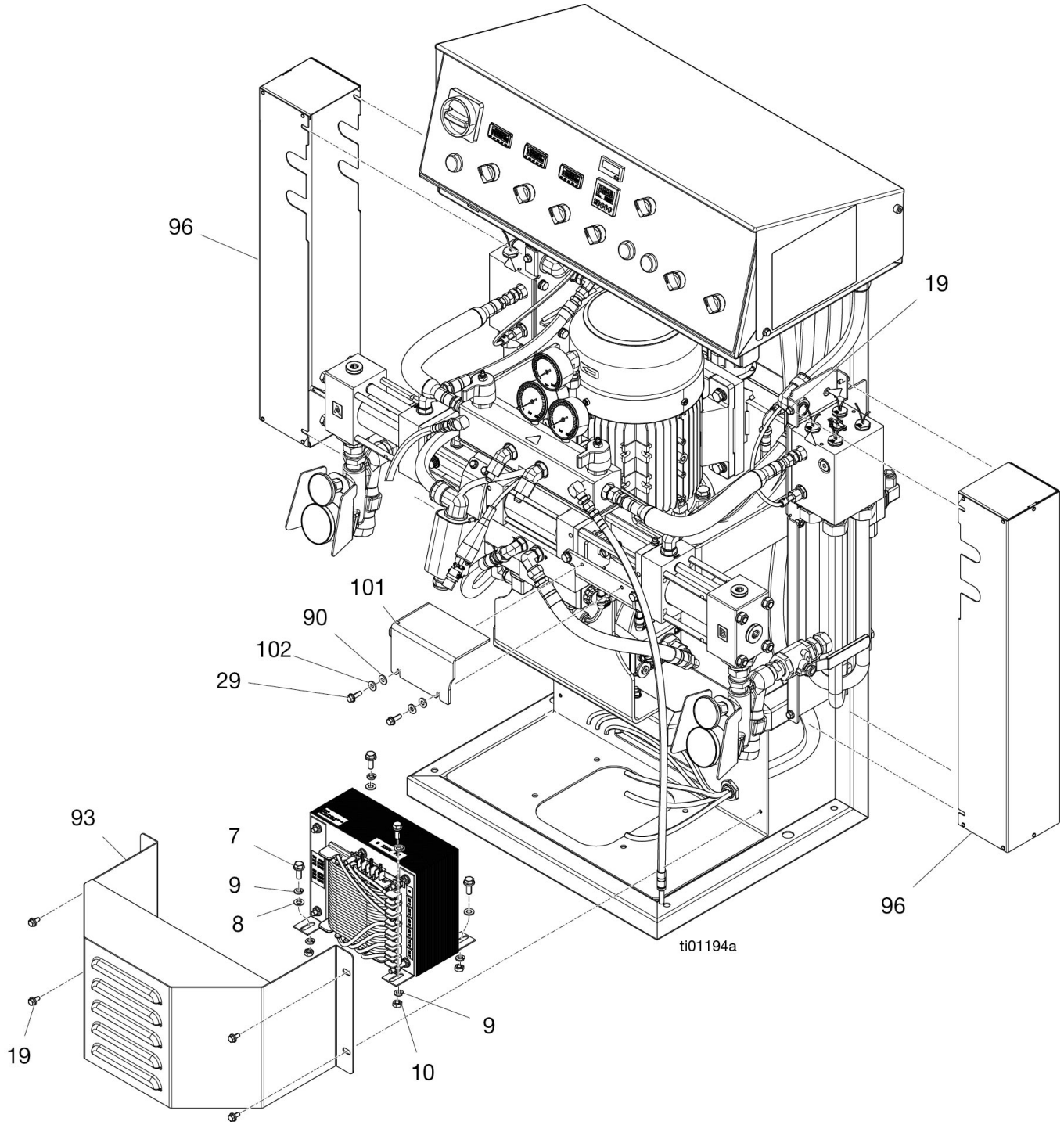


FIG. 70

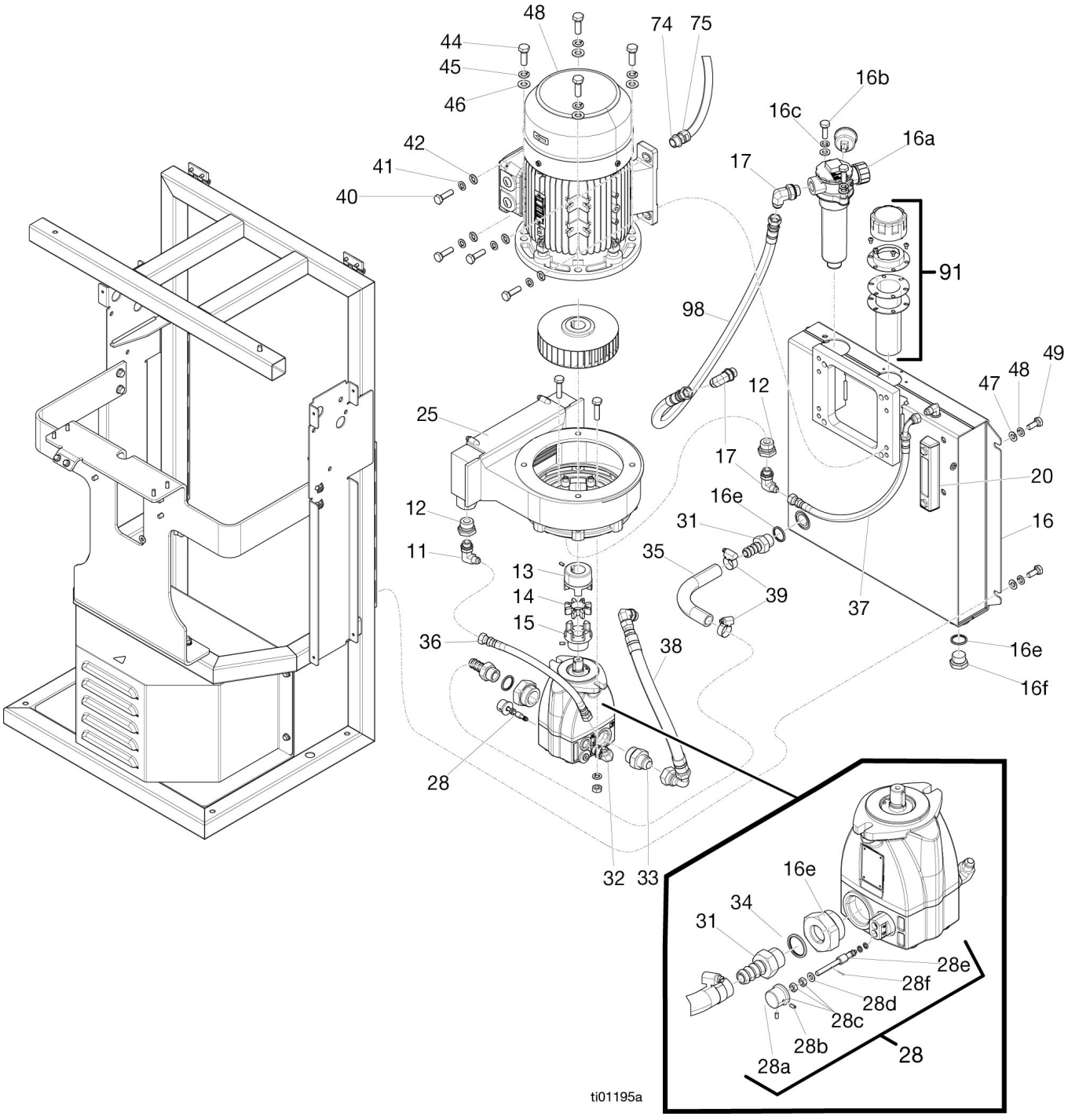
Notes

Parts

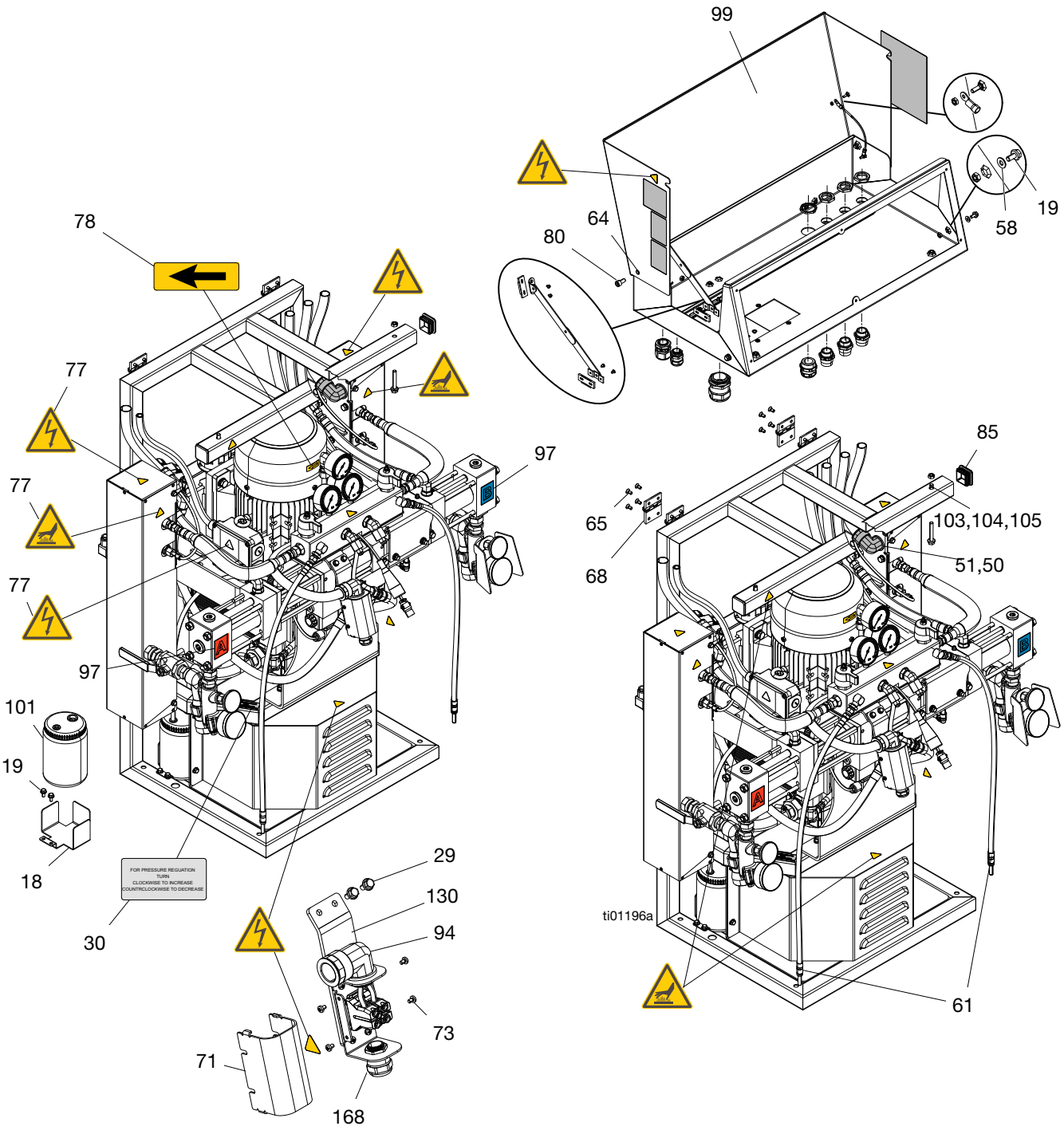
Proportioner



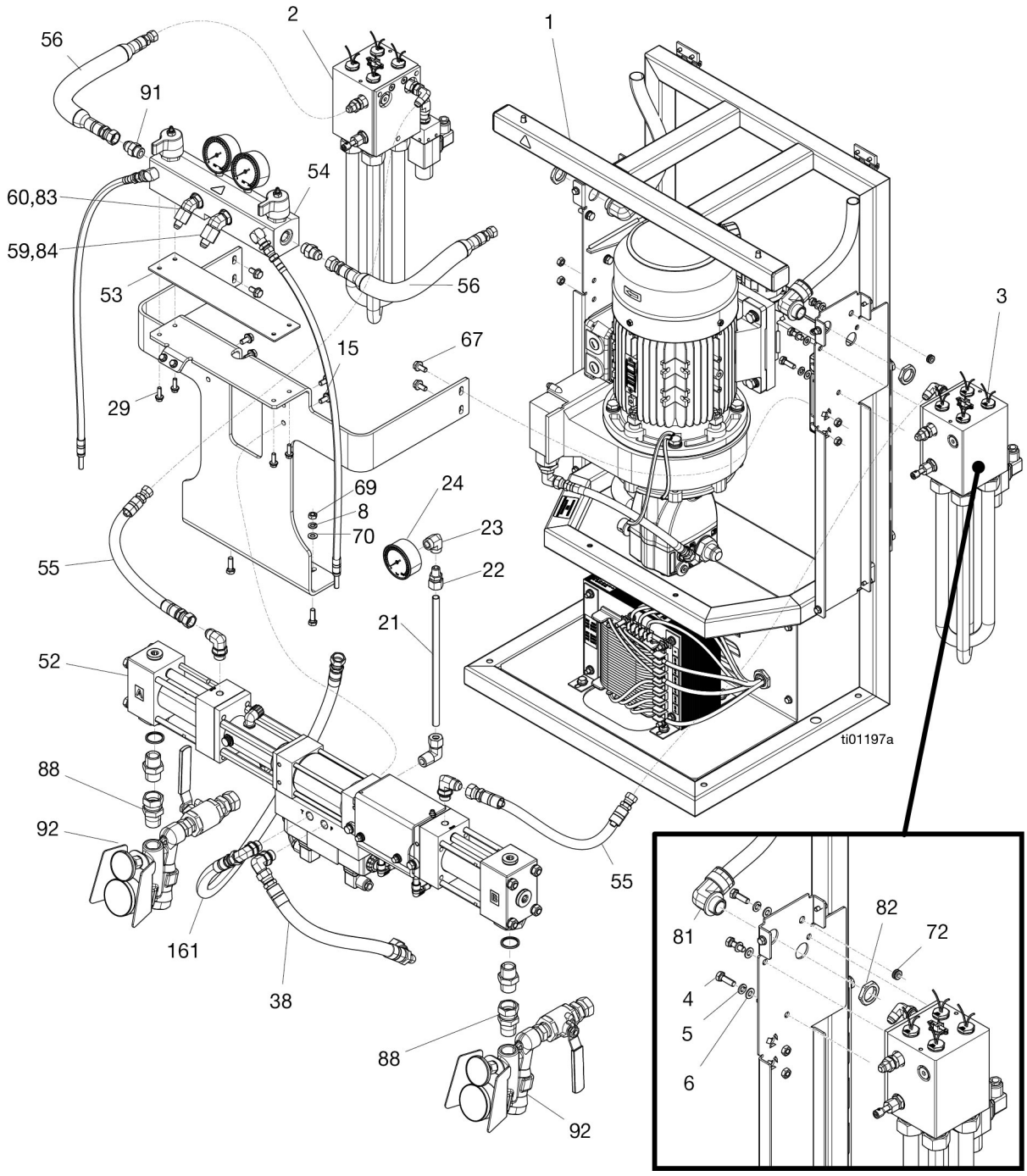
Proportioner



Proportioner



Proportioner



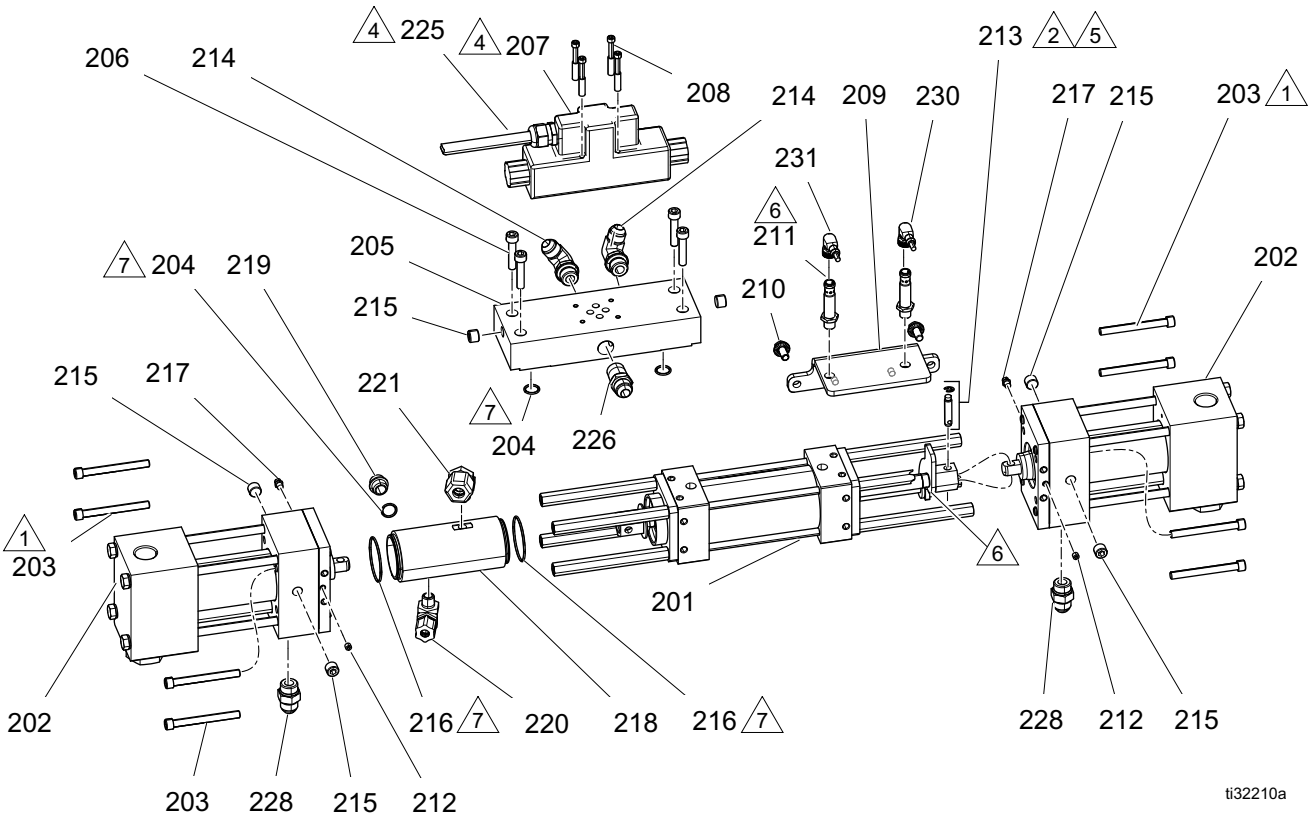
Parts List

Ref.	Part	Description	Qty.
1		CART, weldment, paint	1
2	2003616	A heater, 6 kw	1
	2003921*	A heater gh-3jp, assembly	1
3	2003617	R heater, 6 kw	1
	2003922*	R heater GH-3jp, assembly	1
4	2003531	SCREW	8
5	2003507	WASHER	12
6	2003508	WASHER	12
7	2003532	SCREW	4
8	2003509	WASHER	2
9	2003510	WASHER	4
10	2003527	NUT	5
11	2003552	FITTING, elbow	2
12	2003553	FITTING, adapter	2
13	2003603	MOTOR coupling	1
14	2003604	SPIDER coupling	1
16	2003571	RESERVOIR, assembly, hydraulic	1
16a	2003572	RETURN filter	1
16b	2003533	SCREW	1
16c	2003511	AET washer	8
16d	2003534	SCREW	6
16e	2003548	SEAL	3
16f	2003554	FITTING, plug	1
17	2003555	FITTING	1
18	2003549	BRACKET, retaining, tank, paint	1
19	2003535	SCREW	16
20	2003610	ADAPTER, hydraulic gage	1
21	2003598	TUBE, gauge, pressure	0.27
22	2003556	FITTING	1
23	2003557	FITTING, elbow	1
25	2003551	COOLER, hydraulic, complete	1
26	2003550	ELBOW	1
27	2003607	PUMP, hydraulic	1
28	2003727	COMPENSATOR	1
28a	2003668	KNOB	1
28b	2003536	SOCKED hex screw	2
28d	2003512	WASHER	1
28e	2003670	SHAFT	1
30	2003719	LABEL, control	1
31	2003611	ADAPTER	2
32	2003558	FITTING	1
33	2003559	FITTING	1
34	2003560	FITTING	1
35	2003593	HOSE, inlet	0.25
36	2003594	HOSE	1
37		HOSE	1
38		HOSE, hydraulic supply	1
39		HOSE clamp	2
40		SCREW	1
41	2003513	WASHER	4
42	2003514	WASHER	10
43	2003606	MOTOR, 4 kw	1
	2003919	MOTOR 4 kw 1740rpm 60hz 200v b3/b5 painted	1
44	2003538	SCREW	4
45	2003515	WASHER	4
46	2003516	WASHER	4
47	2003545	SCREW	4
48	2004019	NUT	2
49	2003539	SCREW	4
55	2003599	TUBE, fluid, heater, outlet	2
56a	2003608	PUMP-heater hose, a-side	1
56b	2003609	PUMP-heater hose, r-side	1
57	2003667	PUMP cooling	1
58	2003517	WASHER, electrical cabinet	2
64	2003518	WASHER, electrical cabinet	2
65	2003540	SCREW	4
68	2003672	HINGE, ELECTRICAL cabinet	2
69	2003541	SCREW	8
72	2003684	GROMMET, rubber	2
74	2003685	THREAD reducer	1
75	2003529	CONNECTOR	1
76▲	2003717	LABEL, safety (not shown)	4
77▲	2003718	LABEL, safety	6
78	2003720	LABEL, arrow	1
79	2003562	CONNECTOR	1
80	2003542	SCREW	2
81	2003563	CABLE gland	2
85	2003580	CAP, tube, square	2
86	2003687	CAP, breather filler	1
87	2004020	SCREW	4
93	2003662	COVER, transformer, paint	1
95	2003688	TRANSFORMER, 5000 VA	1
	2003920	TRANSFORMER, 200/20-34-48-62-76-90v 50a5000va	1
96	2003663	COVER, heater, paint	2
98	2003597	HOSE, hydraulic supply	1
99	2003664	ENCLOSURE, electrical, paint	1
100	2003665	LINKAGE	1
101	2003686	RESERVOIR, lube hose assembly	1
103	2003543	SCREW	2
104	2003520	WASHER	4

▲ *Replacement safety labels, tags, and cards are available at no cost.*

** These parts are for Japanese model 2002016 only.*

Proportioner Assembly (P/N 2001741)



1 Torque to 200 in.-lbs (22.6 N•m).

2 Pin (213) to be clocked vertical as shown.

3. Apply sst pipe sealant to all non-swiveling pipe threads.

4 Remove cover from directional valve (207) and attach solenoid harness wires (225). See **Electrical Schematics**, page 87.

5 Fully seat clevis pin with a hammer and punch. Insert cotter pin into B-side/RES clevis pin. Clevis pins and cotter pin included in 213.

6 Thread in proximity switch (211) all the way until it contacts the clocking plate, then back off a 1/4-1/2 turn.

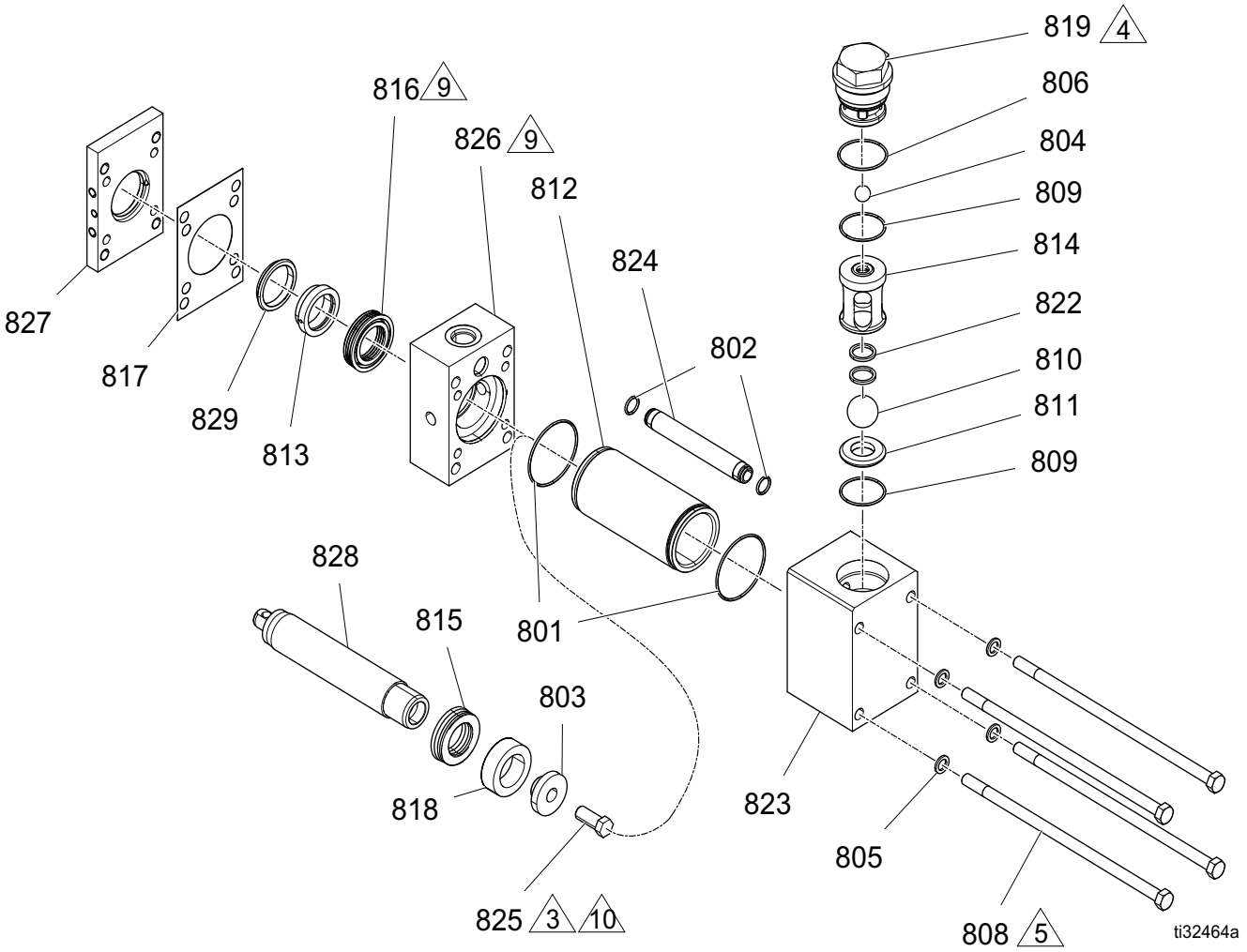
7 Apply grease to o-rings (204, 216) before assembly.

Proportioner Assembly

Ref.	Part	Description	Qty.
201	17G499	CYLINDER, hydraulic, w/ spacers	1
202	247377	PUMP, proportioner, 120	2
203	295824	SCREW, cap, sh, 5/16 x 3	8
204	112793	PACKING, o-ring	3
205	17G531	MANIFOLD, hyd, hr2	1
206	113467	SCREW, cap, socket hd	4
207	2003689	VALVE, DIRECTIONAL, HYDRAULIC	1
208	2003544	SCREW, CAP, SOCKET HD	4
209	17V466	BRACKET, prox switch	1
210	111800	SCREW, cap, hex hd	2
211	2003612	SENSOR, PROX SWITCH, HR2	2
212		SCREW, SET, SOCKET (1/4 28 X .19)	4
213	296653	KIT, clevis pin	2
214	121312	FITTING, elbow, SAE X JIC	2
215	295225	PLUG, pipe, flush	6
216	106258	PACKING, o-ring	2
217	295229	FITTING, grease, 1/4-28	2
218	2003785	CYLINDER, LUBE	1
219	295829	FITTING, plug, 3/8mpt x .343 lg	1
220	295826	FITTING, elbow, 90, 1/4 mpt x 3/8 in.	1
221	295397	FITTING, elbow, 3/8 mpt x 1/2 in.	1
225	2003691	VALVE, DIRECTIONAL, HYDRAULIC, CONNECTOR	2
226	121319	FITTING, adapter, npt x jic	1
228	121309	FITTING, adapter, sae-orb x jic	1
230	2003692	CABLE, M12, B PROX	2

** Parts inclued in Kit 261863 (purchased separately).*

Proportioner Assembly (continued) (P/N 247179)



3 Apply (113500) to threads.

4 Torque (819) to 75 ft-lbs (102 N•m).

5 Apply thread lube and torque (808) to 38 ft-lbs (52 N•m). If threads are dry, torque to 45 ft-lbs (61 N•m).

9 Seal (816) must be pressed straight into housing (826).

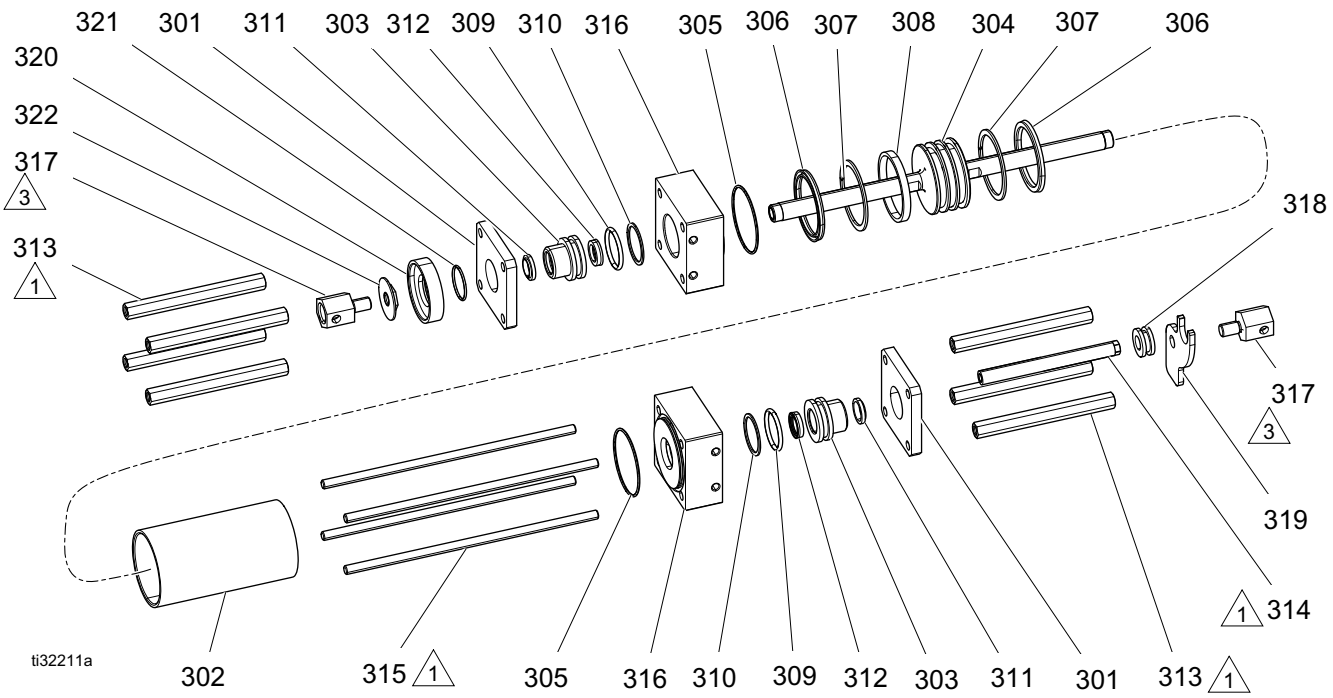
10 Torque to 45 ft-lbs (61 N•m).

Proportioner Assembly (continued)

Ref.	Part	Description	Qty.
801	110492	PACKING, o-ring	2
802	104319	PACKING, o-ring	2
803‡†	261885	CAP, piston	1
804	105445	BALL, (0.5 in.)	1
805	261866	WASHER, flat	4
806	107078	PACKING, o-ring	1
808	261865	SCREW, 9 x 0.38 in., hex hd cap	4
809	107098	PACKING, o-ring	2
810	107167	BALL, sst	1
811	193395	SEAT, carbide	1
812	261890	CYLINDER, 120 proportioner	1
813	‡	BEARING, throat, 120	1
814	261899	GUIDE, 1 in. ball, seat assembly	1
815	‡	SEAL, piston, 120 proportioner	1
816	‡	SEAL, throat, 120 proportioner	1
817◆	295145	GASKET	1
818★	❖	BUSHING, piston, 120	1
819	261867	GUIDE, 0.5 in. ball, cap	1
822	261897	SPRING, valve	1
823	261903	PUMP, base, proportioner	1
824	261898	TUBE, crossover	1
825❖★		SCREW	1
826	261901	FLANGE, outlet	1
827	261875	RETAINER, flange	1
828†	‡	ROD, piston, 120	1
829	261868	ADAPTER, throat, 120	1

◆ *Parts included in Kit 261876 (purchased separately)*
† *Parts included in Kit 247585 (purchased separately)*
‡ *Parts included in Kit 261747 (purchased separately)*
✚ *Parts included in Kit 247581 (purchased separately)*
❖ *Parts included in Kit 261845 (purchased separately)*
★ *Parts included in Kit 247579 (purchased separately)*

Hydraulic Cylinder (P/N 2001740)



1 Torque spacers (313, 314) and rod (315) to 200 in-lbs (22.5 N•m).

3 Torque to 40 +/- 5 ft-lbs (345 +/- 54 N•m).

4. Apply grease to all soft parts before assembly.

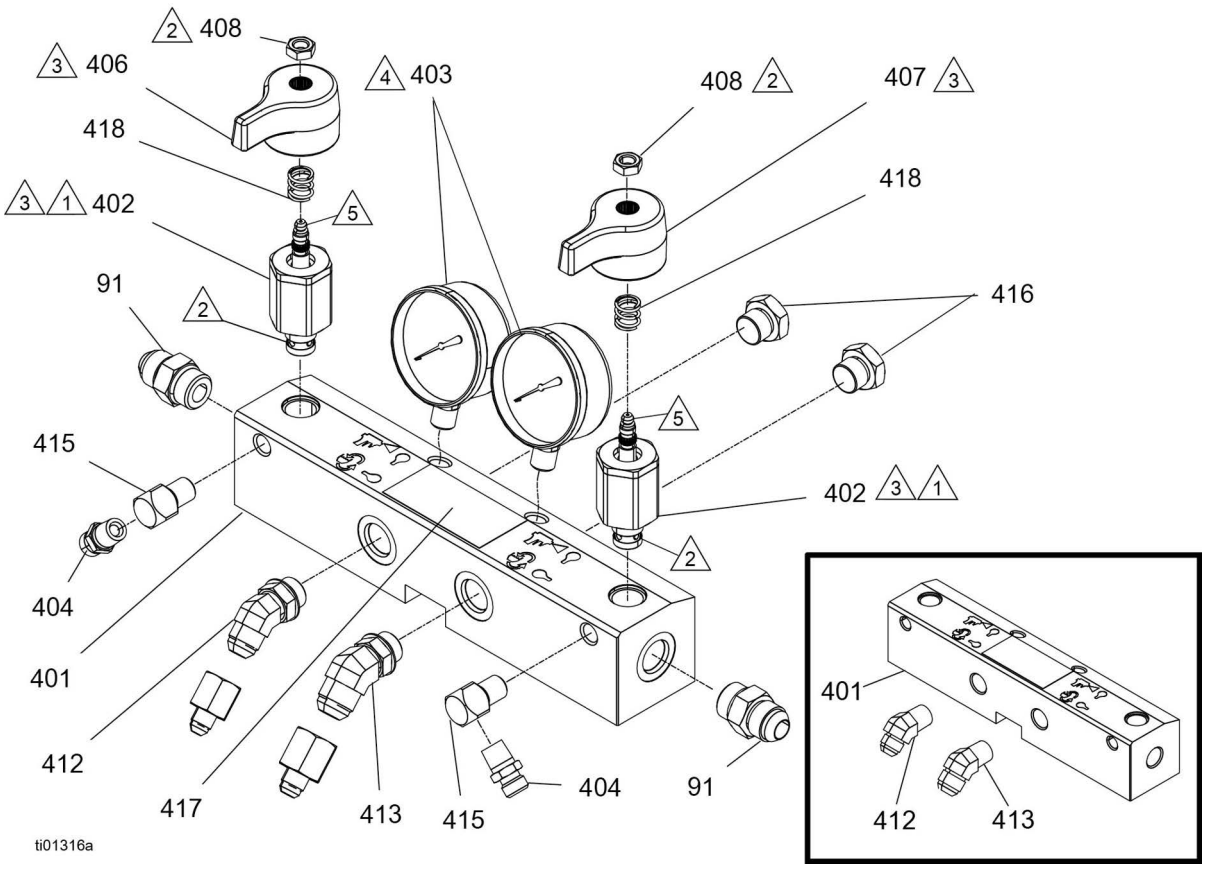
Ref.	Part	Description	Qty.
301	295029	PLATE, retainer	2
302	295030	CYLINDER	1
303*	295031	BUSHING, rod	2
304	296642	PISTON, cylinder, hydraulic	1
305*	295640	O-RING	2
306*	295641	SEAL, u-cup	2
307*	295642	RING, back up	2
308*	296643	RING, wear	1
309*	158776	PACKING, o-ring	2
310*	295644	RING, back up	2
311*	295645	WIPER, rod	2
312*	296644	SEAL, shaft	2
313	295032	SPACER, proportioner pump	7

Ref.	Part	Description	Qty.
314	261502	SPACER, reversing switch	1
315	295034	ROD, TIE, hydraulic cylinder	4
316	295035	BLOCK, port	2
317	261864	CLEVIS, hex, proportioner	2
318	17G527	BUSHING, clocking, hr2	1
319	17G529	PLATE, clocking, driver, hr2	1
320†		ADAPTER, lube, cylinder	1
321	177156	PACKING, o-ring	1
322	295852	NUT, jam, baffle	1

** Parts included in Kit 296785 (purchased separately)*

† Parts included in Kit 261863 (purchased separately)

Fluid Manifold (P/N 2001731)



1 Torque to 355-395 in-lbs (40-44.6 N•m).

2 Apply sealant (113500) to threads.

3 Valve must be closed with handle position as shown on drawing.

4 Apply PTFE tape and thread sealant to gauge threads.

5 Apply grease on valve.

6. Apply PTFE tape or thread sealant to all tapered threads.

Ref.	Part	Description	Qty.
401◆	255228	MANIFOLD, fluid, inlet, etched	1
402*†‡	247824	VALVE, drain valve	2
403	102814	GAUGE, press, fluid	2
404	162453	FITTING, (1/4 npsm x 1/4 npt)	2
405		PLUG	2
406†‡	247788	HANDLE, red	1
407*†	247789	HANDLE, blue	1
408*†‡	112309	NUT, hex, jam	2
412❖	17Y236	FITTING, 3/4 orb x #8 jic	1
	117556	FITTING, nipple, #8 jic x 1/2 npt	1
413❖	17Y235	FITTING, 3/4 orb x #10 jic	1
	117557	FITTING, nipple, #10 JIC x 1/2 npt	1
415	100840	FITTING, elbow, street	2
417▲	189285	LABEL, safety, burn	
418*†‡	150829	SPRING, compression	

▲ *Replacement safety labels, tags, and cards are available at no cost.*

* *Parts included in Kit 255150 (purchased separately)*

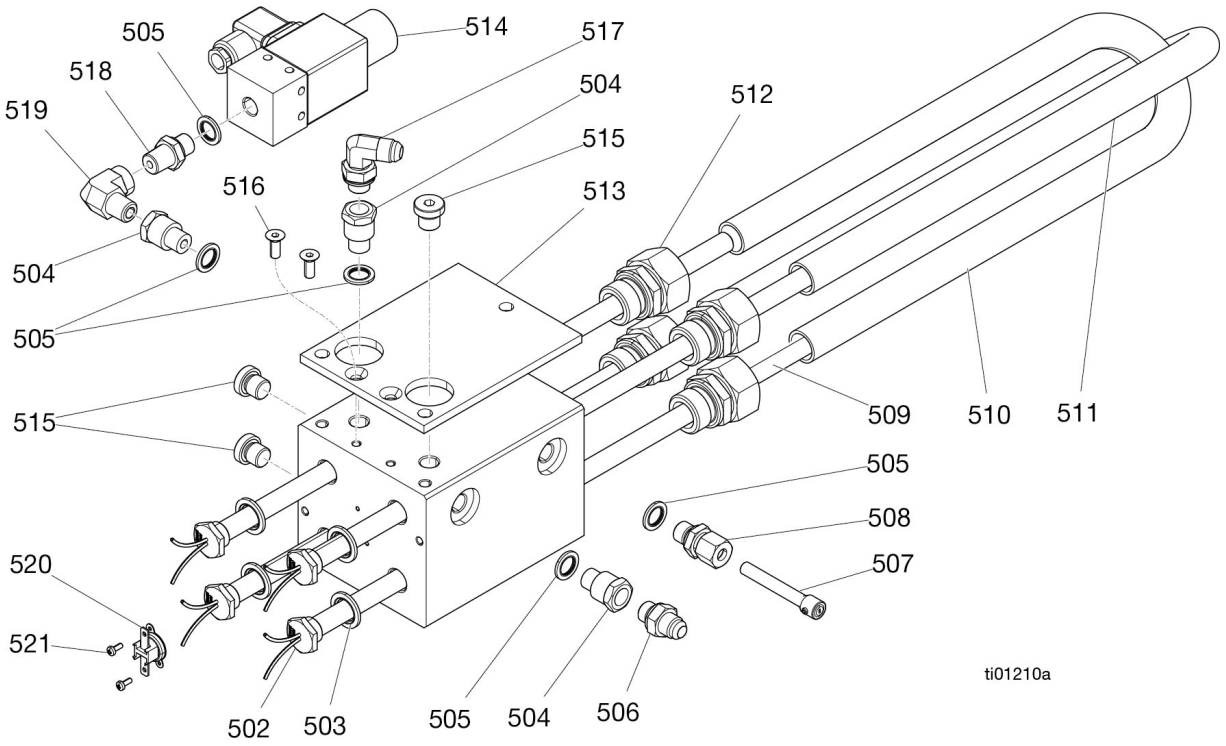
† *Parts included in Kit 255149 (purchased separately)*

‡ *Parts included in Kit 255148 (purchased separately)*

◆ *Parts included in replacement ORB fittings (part 412 and 413)*

❖ *To order a replacement part, verify the type of fitting used with your fluid manifold (1/2 npt or 3/4 ORB fitting)*

Heater (ISO 2003616 or 2003921*)(RES 2003617 or 2003922*)



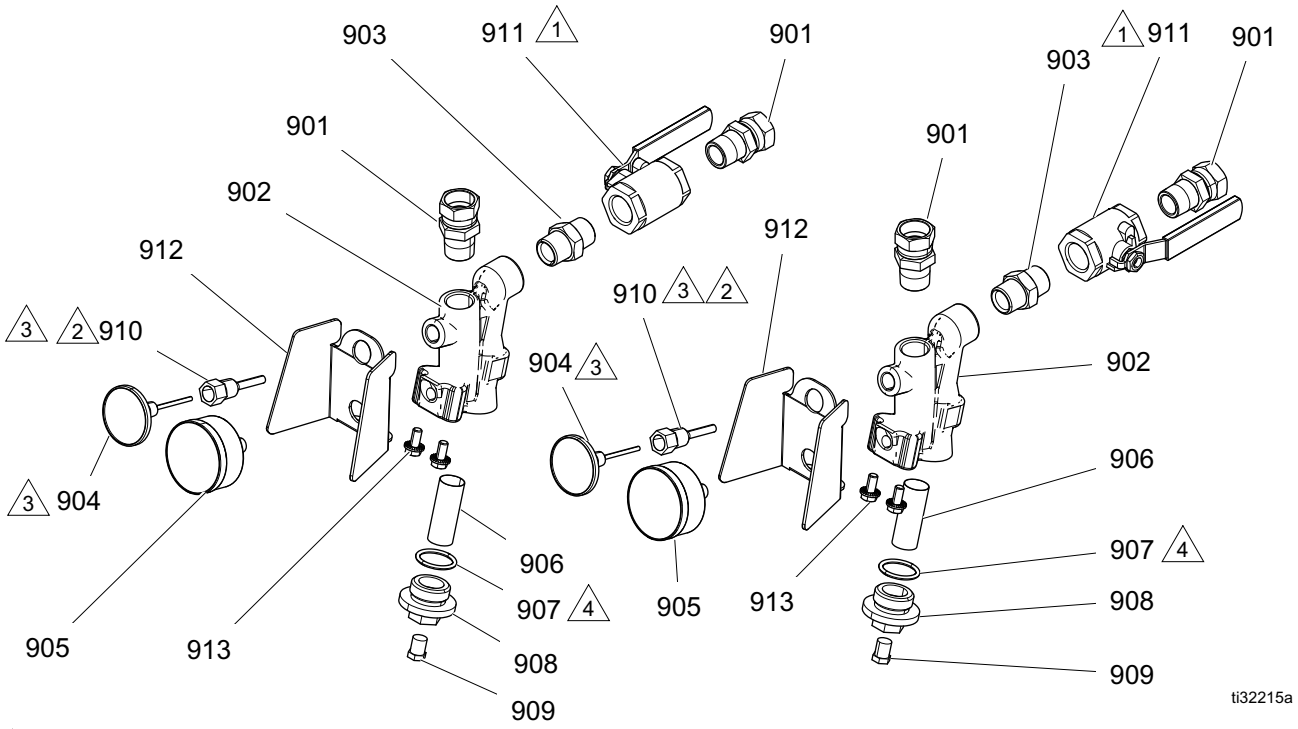
Ref.	Part	Description	Qty.
501	2003693	HEATER, machined	1
502	2003694	HEATING ROD, 1500W @ 230V	4
	2003923*	HEATING ROD 1500W 200V	4
503	2003695	O-RING	4
504	2003564	FITTING, adapter	3
505	2003696	O-RING	5
506	2003565	FITTING	1
507	2003613	SENSOR	1
508	2003566	FITTING	1
509	2003666	SCREW	4
510	2003601	TUBE, short	1
511	2003602	TUBE, long	1

Ref.	Part	Description	Qty.
512	2003567	FITTING	4
513	2003697	INSULATION	1
514	2003585	SWITCH, over pressure	1
515	2003698	PLUG	3
517	2003568	FITTING, elbow 90°	1
518	2003569	FITTING	1
519	2003570	FITTING, elbow 90°	1
520	2003586	SWITCH, over temperature	1
521	2003546	SCREW	2

** Japanese model only*

Fluid Inlet Kits

17G644



1 Position ball valves as shown.

2 Apply tape to threads of housing.

3 Apply thermal lubricant completely covering thermometer probe (904) before inserting into housing (910).

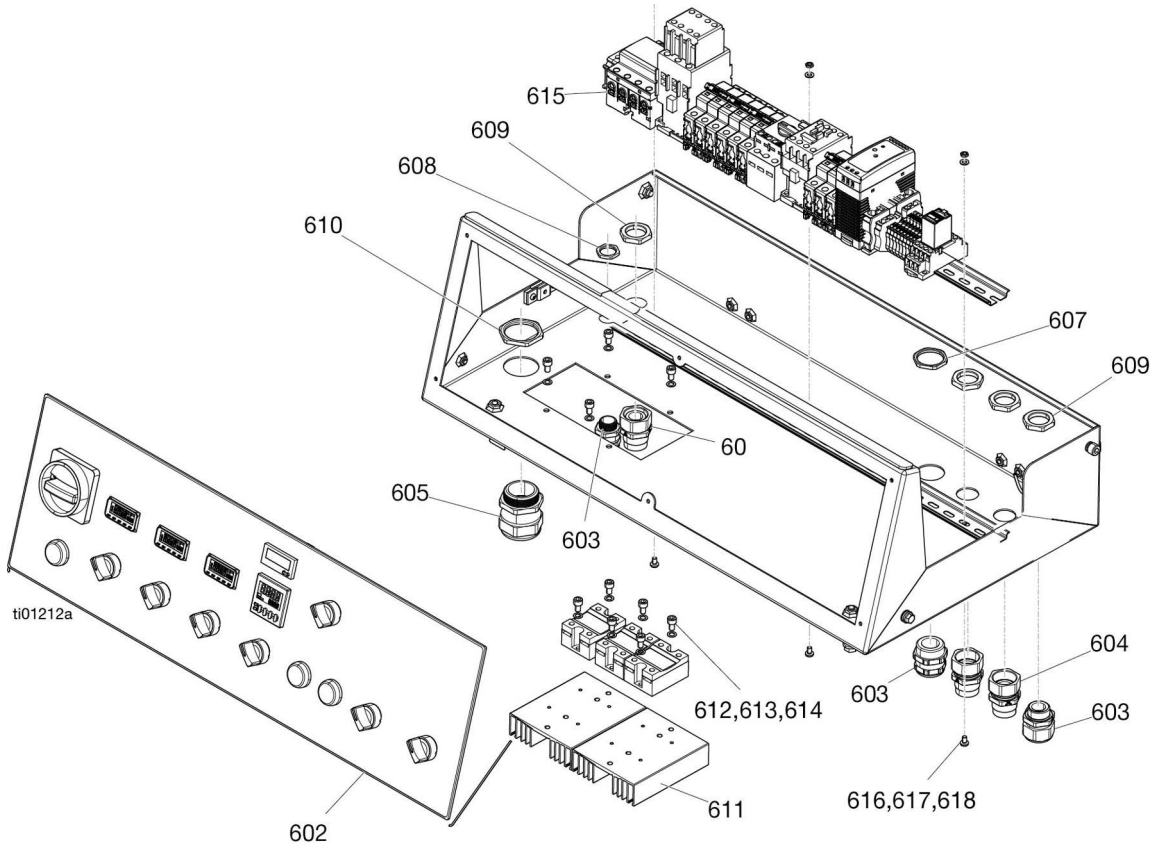
4 Apply grease to o-ring (907).

5. Apply sealant to all tapered pipe threads. Apply sealant to female threads. Brush into at least the first four threads and approximately 1/4 turn wide.

6. Position gauges vertically within assembly.

Ref.	Part	Description	Qty.
901	118459	FITTING, union, swivel, 3/4 in.	4
902	16W714	MANIFOLD, strainer, inlet	2
903	C20487	FITTING, nipple, hex	2
904	16W117	THERMOMETER, dial	2
905	16T872	GAUGE, press, fluid	2
906	180199	FILTER, replacement	2
907	128061	PACKING, o-ring, fx75	2
908	16V879	CAP, filter	2
909	555808	PLUG, 1/4mp w/ hex hd	2
910	15D757	HOUSING, thermometer	2
911	109077	VALVE, ball 3/4 npt	2
912	253481	GUARD, gauge, wye strainer, painted	2
913	111800	SCREW, cap, hex hd	4

Electrical Enclosure (P/N 2003664 or 2003924*)



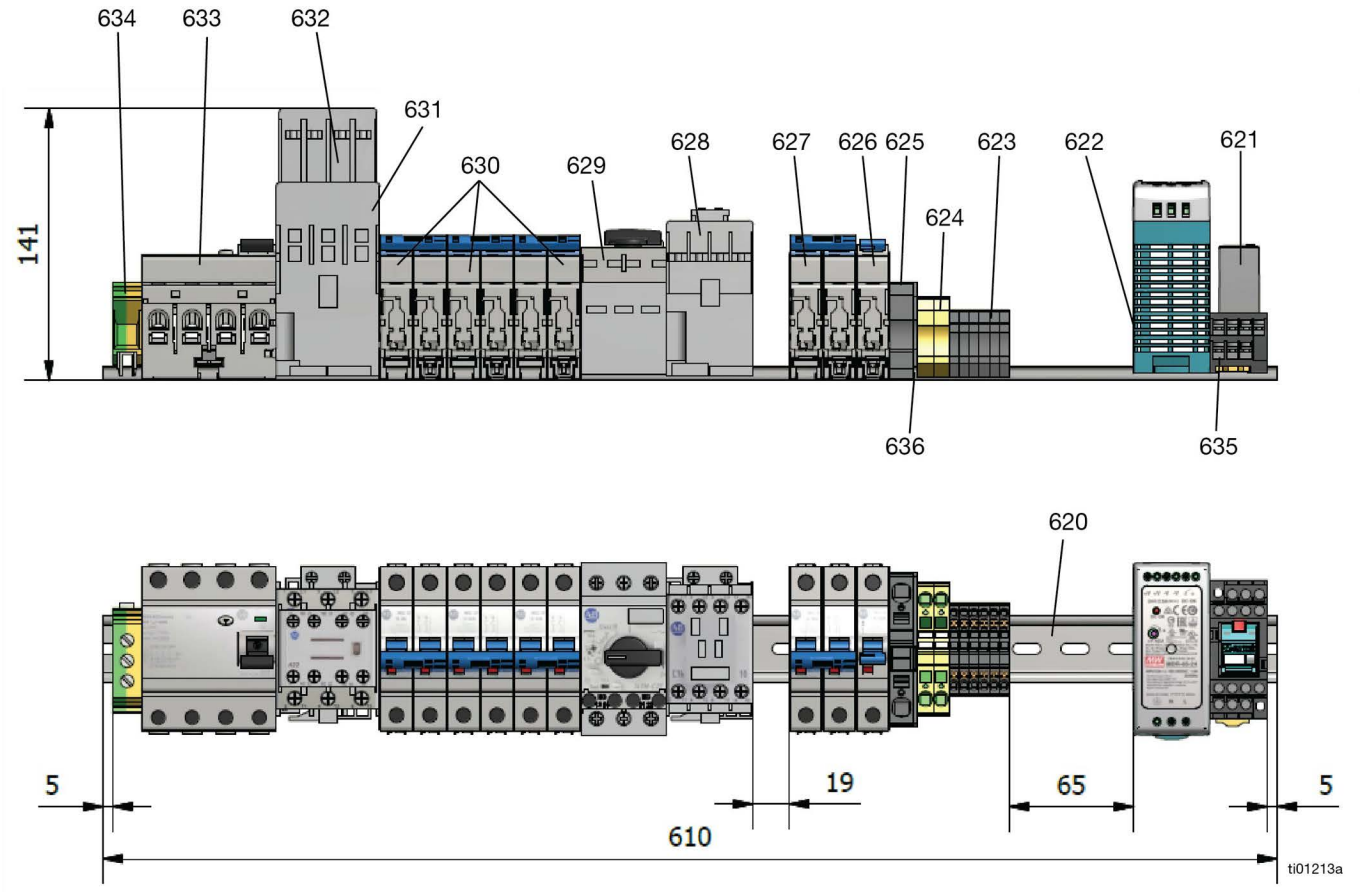
⚠1 Apply even distribution of thermal lubricant on the bottom machined surface of (604) to a thickness of 0.003 min.

Ref.	Part	Description	Qty.
601	2003699	**FITTING, M32???**	1
602	2003700	PANEL, FRONT	1
603	2003721	FITTING, M20	1
605	2003724	CABLE CONNECTOR	1
606	2003725	FITTING, M25	4
607	2003521	WASHER	1
608	2003522	WASHER M20	1
609	2004021	WASHER M25	6

Ref.	Part	Description	Qty.
610	2003523	WASHER	1
611	2003701	HEAT SINK	2
612	2003547	SCREW	9
613	2003524	WASHER	9
614	2003530	NUT	17
619	2003702	RELAY	3

** Japanese model only*

Breaker Module



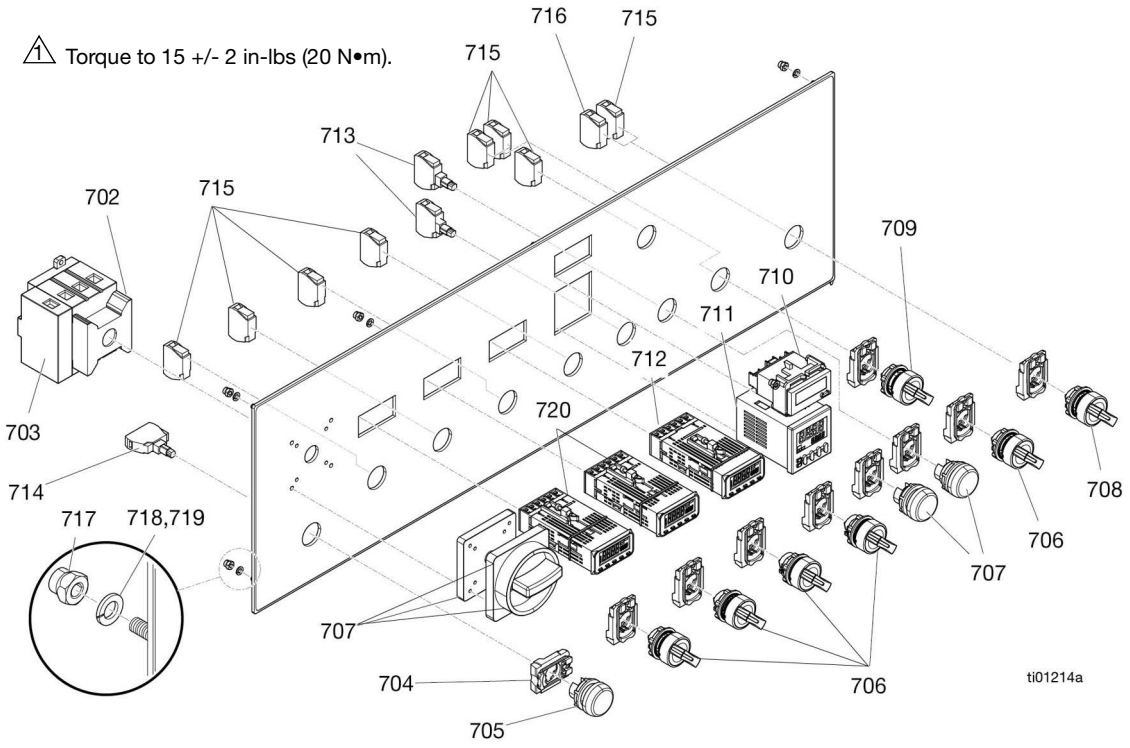
Ref.	Part	Description	Qty.
620	2003703	RAIL, mounting, din35	0.64
621	2003704	RELAY, 24VDC 5A	1
622	2003705	POWER SUPPLY	1
623	2003573	BLOCK, terminal	8
624	2003574	BLOCK, terminal ground	2
625	2003575	BLOCK, TERMINAL	1
626	2003581	CIRCUIT, breaker, 1P 50A	1
627	2003582	CIRCUIT, breaker, 2P 3A	1
628	2003706	CONTACTOR, 7.5KW	1
	2003929*	CONTACTOR 11kW 24Vdc	1
629	2003587	SWITCH, motor, safety	1
	2004022*	SWITCH, motor, safety	1
630	2003583	CIRCUIT BREAKER, 2P 32A	3
	2003928*	CIRCUIT BREAKER, 18-25A	1
631	2003707	CONTACTOR, 22KW	1
632	2003708	AUXILIARY CONTACT 22 KW	1
	2003927*	CB 18-25A + auxiliar contact	1
633	2003584	CIRCUIT BREAKER, residual current, 4p	1
	2003926*	CIRCUIT BREAKER, residual current 80a 0.3a	1
634	2003576	BLOCK, terminal ground	1
635	2003709	RELAY, holder	1
636	2003577	BLOCK, clamp end	1

** Japanese model only*

NOTICE

Do not use tools to insert, remove, or inspect the relay. Tool use may cause damage. Instead, remove the relay using the included plastic ejector.

Control Panel



Ref.	Part	Description	Qty
701	2003669	KNOB, main switch	1
702	2003588	MAIN switch	1
	2003925*	MAIN SWITCH 3 p 100a	1
703	2003589	MAIN SWITCH, additional pole	1
704	2003710	HOLDER, light, switch	10
705	2003711	LIGHT, indicating green lens	1
706	2003590	SWITCH, 2 position	5
707	2003712	LIGHT, indicating, blue lens	2
708	2003591	SWITCH, momentary, 3 position	1
709	2003592	SWITCH, 3 position	1
710	2003713	COUNTER	1

Ref.	Part	Description	Qty
711	2003714	COUNTER, count down	1
712	2003715	CONTROL, temperature, hose	1
713	2003614	MODULE, led, blue 24vdc	2
714	2003615	MODULE, led, green 230 vac	1
715	2003578	CONTACT, block, na	8
716	2003579	CONTACT, block, nc	1
718	2003525	WASHER	8
719	2003526	WASHER, aet	4
720	2003716	CONTROL, temperature, a-b	2

** Japanese model only*

Performance Charts

Use this chart to help identify the proportioner that will work most efficiently with each mix chamber. Flow rates are based on a material viscosity of 60 cps.

NOTICE

To prevent system damage, do not pressurize the system above the line for the gun tip size being used.

Foam Performance Chart

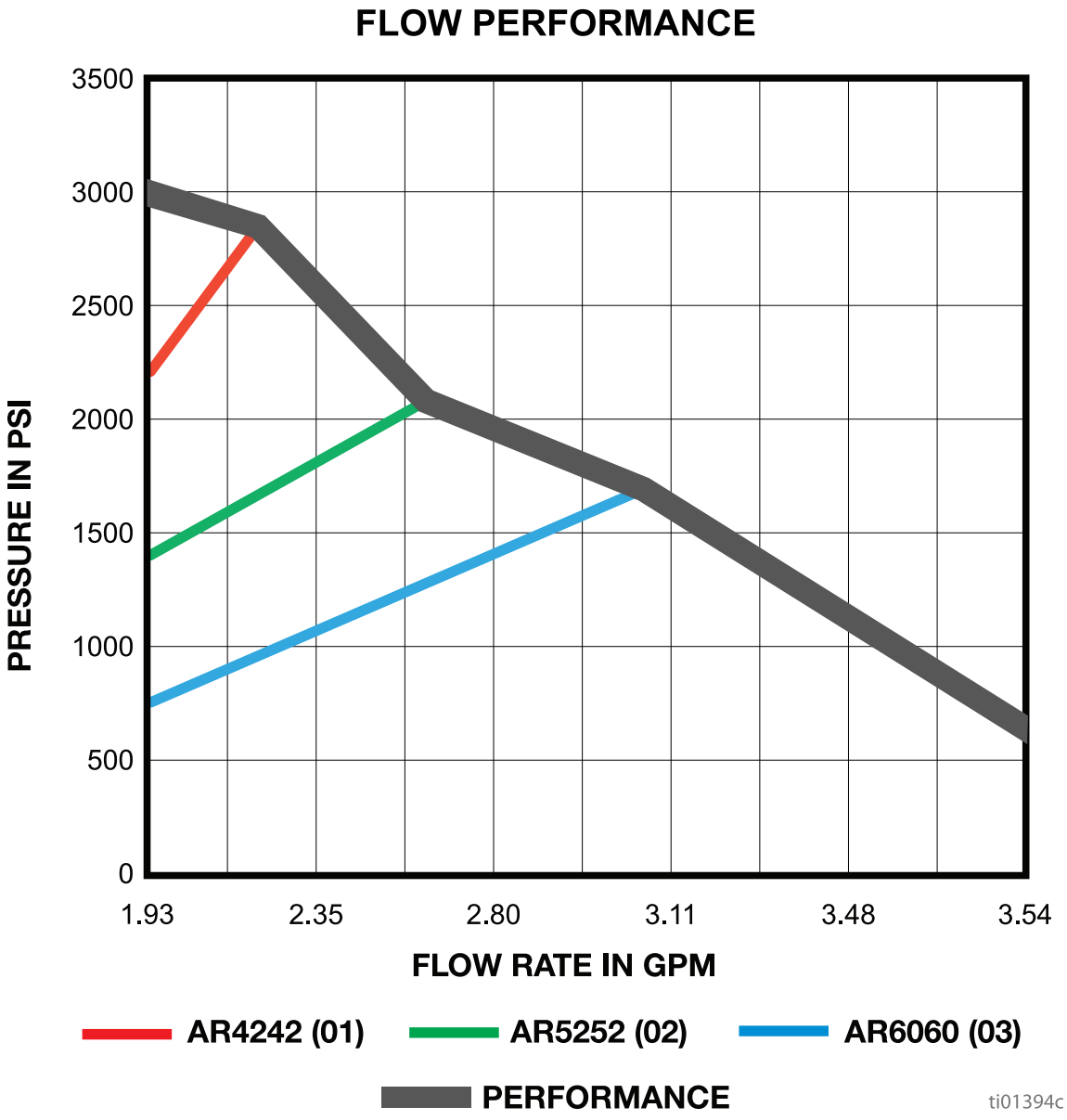
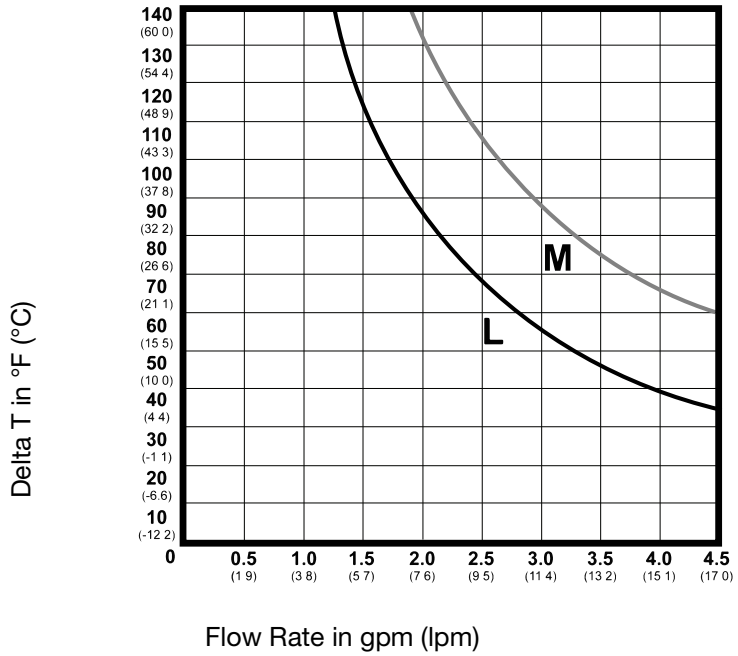


FIG. 71: GH-2 and GH-4 Foam Performance

Heater Performance Chart



KEY:

L: 10.2 kW (GH-2 models only)
M: 15.3 kW (GH-4 models only)

FIG. 72: Heater Performance

Electrical Schematics

400 V Wire Information

WIRE #	OUT	PIN	IN	PIN	SECTION mm^2
L1	I1	1	D1	2	10 BLACK
L2	I1	3	D1	4	10 BLACK
L3	I1	5	D1	6	10 BLACK
N	I1	N	D1	N	10 BLUE
1L3	D1	5	H1	X1	1,5 BLACK
1N	D1	N	H1	X2	1,5 BLUE
1L3	D1	5	F1	1	2,5 BLACK
1N	D1	N	F1	3	2,5 BLUE
1L1	D1	1	F2	1	6 BLACK
1L2	D1	3	F2	3	6 BLACK
1L3	D1	5	F2	5	6 BLACK
1L1	D1	1	KM1	1	6 BLACK
1L2	D1	3	KM1	3	6 BLACK
1L3	D1	5	KM1	5	6 BLACK
2L1	KM1	2	F3	1	6 BLACK
1N	D1	N	F3	3	10 BLUE
2L2	KM1	4	F4	1	6 BLACK
1N	F3	3	F4	3	10 BLUE
2L3	KM1	6	F5	1	6 BLACK
1N	F4	3	F5	3	6 BLUE
3L1	F2	2	KM2	2	6 BLACK
3L2	F2	4	KM2	4	6 BLACK
3L3	F2	6	KM2	6	6 BLACK
U	KM2	1	M1	U	6 BLACK
V	KM2	3	M1	V	6 BLACK
W	KM2	5	M1	W	6 BLACK
4L3	F1	2	G1	L	2,5 BLACK
4N	F1	4	G1	N	2,5 BLUE
100	F3	2	V1	L1	6 BLACK
101	V1	T1	ISO HEATER	CI	6 BLACK
102	ISO HEATER	DI	F3	4	6 BLUE
103	F4	2	V2	L1	6 BLACK
104	V2	T1	POL HEATER	CP	6 BLACK
105	POL HEATER	DP	F4	4	6 BLUE
106	F5	2	TA1	230V	6 BLACK
107	F5	4	TA1	0V	6 BLUE
108	TA1	90V	V3	L1	16 BLACK

WIRE #	OUT	PIN	IN	PIN	SECTION mm^2
109	V3	T1	F6	1	16 BLACK
110	F6	2	HOSE	ISO	16 BLACK
111	HOSE	POL	TA1	0V	16 BLACK
+	G1	+	S1,1	21	1 BLUE
+	S1,1	21	KM1	53	1 BLUE
-	G1	-	KM2	A2	1 BLUE
1	S1,1	22	B1	1	0,25 BROWN
2	B1	2	B2	1	0,25 WHITE
3	B2	2	S1,2	3	0,25 BROWN
3	B2	2	KM1	83	0,25 WHITE
4	S1,2	4	KM1	84	1 BLUE
4	S1,2	4	KM1	A1	1 BLUE
5	KM1	54	B3	21	1 BLUE
5	KM1	54	F2	21	1 BLUE
6	F2	22	S2	3	1 BLUE
7	S2	4	KM2	A1	1 BLUE
-	KM1	A2	KM2	A2	1 BLUE
9	B3	22	B4	21	1 BLUE
10	B4	22	S3	3	1 BLUE
10	S3	3	S7	3	1 BLUE
10	S7	3	P3	1	1 BLUE
10	P3	1	P4	1	1 BLUE
10	P4	1	P5	1	1 BLUE
8	S3	4	H3	X1	1 BLUE
8	H3	X1	Y1	A1	0,5 BROWN
8	H3	X1	K3	1	1 BLUE
28	S3	5	P2	3	1 BLUE
11	P2	4	K3	9	1 BLUE
16	K3	5	H4	X1	1 BLUE
16	H4	X1	P1	1	1 BLUE
16	H4	X1	Y2	A1	0,5 BROWN
-	KM2	A2	H3	X2	1 BLUE
-	H3	X2	Y1	A2	0,5 BLUE
-	H3	X2	Y2	A2	0,5 BLUE
-	H3	X2	H4	X2	1 BLUE
-	H4	X2	P1	2	1 BLUE
-	P2	12	K3	14	1 BLUE
-	K3	14	P3	2	1 BLUE

WIRE #	OUT	PIN	IN	PIN	SECTION mm^2
-	P3	2	P4	2	1 BLUE
-	P4	2	P5	2	1 BLUE
-	K3	-	B5	-	0,5 BLUE
-	K3	-	B6	-	0,5 BLUE
11	P2	4	B5	+	0,25 BROWN
11	P2	4	B6	+	0,25 BROWN
12	K3	8	P2	9	1 BLUE
17	B5	BK	K3	13	1 BLUE
18	B6	BK	K3	10	1 BLUE
19	P3	4	S4	3	1 BLUE
20	V1	+	P3	3	1 BLUE
21	S4	4	V1	-	1 BLUE
22	P4	4	S5	3	1 BLUE
23	V2	+	P4	3	1 BLUE

WIRE #	OUT	PIN	IN	PIN	SECTION mm^2
24	S5	4	V2	-	1 BLUE
25	P5	4	S6	3	1 BLUE
26	V3	+	P5	3	1 BLUE
27	S6	4	V3	-	1 BLUE
28	S3	5	P2	3	1 BLUE
29	S7	4	P2	2	1 BLUE
30	P3	12	R13	+	0,25 GREEN
31	P3	10	R13	-	0,25 YELLOW
32	P4	12	R14	+	0,25 GREEN
33	P4	10	R14	-	0,25 YELLOW
34	P5	11	E1	+	0,5 PURPLE
35	P5	12	E1	-	0,5 WHITE

200 V Wire Information

WIRE #	OUT	PIN	IN	PIN	SECTION mm^2
L1	I1	1	D1	2	25 mm^2 BLACK
L2	I1	3	D1	4	25 mm^2 BLACK
L3	I1	5	D1	6	25 mm^2 BLACK
1L2	D1	3	H1	X1	1.5 mm^2 BLACK
1L3	D1	5	H1	X2	1.5 mm^2 BLACK
1L1	D1	1	F1	1	2.5 mm^2 BLACK
1L3	D1	5	F1	3	2.5 mm^2 BLACK
1L1	D1	1	F2	1	6 mm^2 BLACK
1L2	D1	3	F2	3	6 mm^2 BLACK
1L3	D1	5	F2	5	6 mm^2 BLACK
1L1	D1	2	KM1	1	16 mm^2 BLACK
1L2	D1	3	KM1	3	16 mm^2 BLACK
1L3	D1	5	KM1	5	16 mm^2 BLACK
2L1	KM1	2	F3	1	6 mm^2 BLACK
2L2	KM1	4	F3	3	6 mm^2 BLACK
2L2	KM1	4	F4	1	6 mm^2 BLACK
2L3	KM1	6	F4	3	6 mm^2 BLACK
2L1	KM1	2	F5	1	6 mm^2 BLACK
2L3	KM1	6	F5	3	6 mm^2 BLACK
3L1	F2	2	KM2	1	6 mm^2 BLACK
3L2	F2	4	KM2	3	6 mm^2 BLACK
3L3	F2	6	KM2	5	6 mm^2 BLACK
U	KM2	2	M1	U	6 mm^2 BLACK
V	KM2	4	M1	V	6 mm^2 BLACK
W	KM2	6	M1	W	6 mm^2 BLACK
4L1	F1	2	G1	L	2.5 mm^2 BLACK
4L3	F1	4	G1	N	2.5 mm^2 BLACK
100	F3	2	V1	L1	6 mm^2 BLACK
101	V1	T1	ISO HEATER	C1	6 mm^2 BLACK
102	F3	4	ISO HEATER	D1	6 mm^2 BLACK
103	F4	2	V2	L!	6 mm^2 BLACK
104	V2	T1	POL HEATER	CP	6 mm^2 BLACK
105	F4	4	POL HEATER	DP	6 mm^2 BLACK
106	F5	2	TA1	230V	6 mm^2 BLACK
107	F5	4	TA1	0V	6 mm^2 BLACK
108	TA1	90V	V3	L1	16 mm^2 BLACK
109	V3	T1	F6	1	16 mm^2 BLACK
110	F6	2	HOSE	ISO	16 mm^2 BLACK
111	TA1	0V	HOSE	POL	16 mm^2 BLACK
+	G1	+	S1, 1	21	1 mm^2 BLUE

WIRE #	OUT	PIN	IN	PIN	SECTION mm^2
+	S1, 1	21	KM1	53	1 mm^2 BLUE
-	G1	M	KM1	A1	1 mm^2 BLUE
1	S1, 1	22	B1	1	0.25 mm^2 BROWN
2	B1	2	B2	1	0.25 mm^2 WHITE
3	B2	2	S1, 2	3	0.25 mm^2 BROWN
3	B2	2	KM1	83	0.25 mm^2 WHITE
4	S1, 2	4	KM1	84	1 mm^2 BLUE
4	S1, 2	4	KM1	A1	1 mm^2 BLUE
5	KM1	54	B3	21	1 mm^2 BLUE
5	KM1	54	F2	21	1 mm^2 BLUE
6	F2	22	S2	3	1 mm^2 BLUE
7	S2	4	KM2	A1	1 mm^2 BLUE
-	KM1	A2	KM2	A2	1 mm^2 BLUE
9	B3	22	B4	21	1 mm^2 BLUE
10	B4	22	S3	3	1 mm^2 BLUE
10	S3	3	S7	3	1 mm^2 BLUE
10	S7	3	P3	1	1 mm^2 BLUE
10	P3	1	P4	1	1 mm^2 BLUE
10	P4	1	P5	1	1 mm^2 BLUE
8	S3	4	H3	X1	1 mm^2 BLUE
8	H3	X1	Y1	A1	0.5 mm^2 BROWN
8	H3	X1	K3	1	1 mm^2 BLUE
11	P2	4	K3	9	1 mm^2 BLUE
16	K3	5	H4	X1	1 mm^2 BLUE
16	H4	X1	P1	1	1 mm^2 BLUE
16	H4	X1	Y2	A1	0.5 mm^2 BROWN
16	H4	X1	K3	5	1 mm^2 BLUE
-	KM2	A2	H3	X2	1 mm^2 BLUE
-	H3	X2	Y1	A2	0.5 mm^2 BLUE
-	H3	X2	Y2	A2	0.5 mm^2 BLUE
-	H3	X2	H4	X2	1 mm^2 BLUE
-	H4	X2	P1	2	1 mm^2 BLUE
-	P1	2	P2	*6/12	1 mm^2 BLUE
-	P2	6	K3	14	1 mm^2 BLUE
-	K3	14	P3	2	1 mm^2 BLUE
-	P3	2	P4	2	1 mm^2 BLUE
-	P4	2	P5	2	1 mm^2 BLUE
-	K3	-	B5	-	0.25 mm^2 BLUE
-	K3	-	B6	+	0.25 mm^2 BLUE
11	P2	4	B5	+	0.25 mm^2 BROWN
11	P2	4	B6	9	0.25 mm^2 BROWN
12	K3	8	P2		1 mm^2 BLUE

WIRE #	OUT	PIN	IN	PIN	SECTION mm^2
17	B5	BK	K3	13	0.25 mm^2 BLACK
18	B6	BK	K3	10	0.25 mm^2 BLACK
19	P3	4	S4	3	1 mm^2 BLUE
20	V1	+	P3	3	1 mm^2 BLUE
21	S4	4	V1	-	1 mm^2 BLUE
22	P4	3	S5	3	1 mm^2 BLUE
23	V2	+	P4	3	1 mm^2 BLUE
24	S5	4	V2	-	1 mm^2 BLUE
25	P5	3	S6	3	1 mm^2 BLUE
26	V3	+	P5	3	1 mm^2 BLUE

WIRE #	OUT	PIN	IN	PIN	SECTION mm^2
27	S6	4	V3	-	1 mm^2 BLUE
28	S3	5	P2	3	1 mm^2 BLUE
29	S7	4	P2	2	1 mm^2 BLUE
30	P3	10	R13	+	0.25 mm^2 GREEN
31	P3	11/12	R13	-	0.25 mm^2 YELLOW
32	P4	10	R14	+	0.25 mm^2 GREEN
33	P4	11/12	R14	-	0.25 mm^2 YELLOW
34	P5	11	E1	+	0.5 mm^2 PURPLE
35	P5	12	E1	_	0.5 mm^2 WHITE

Control Power Wiring 400 V (1 of 4)

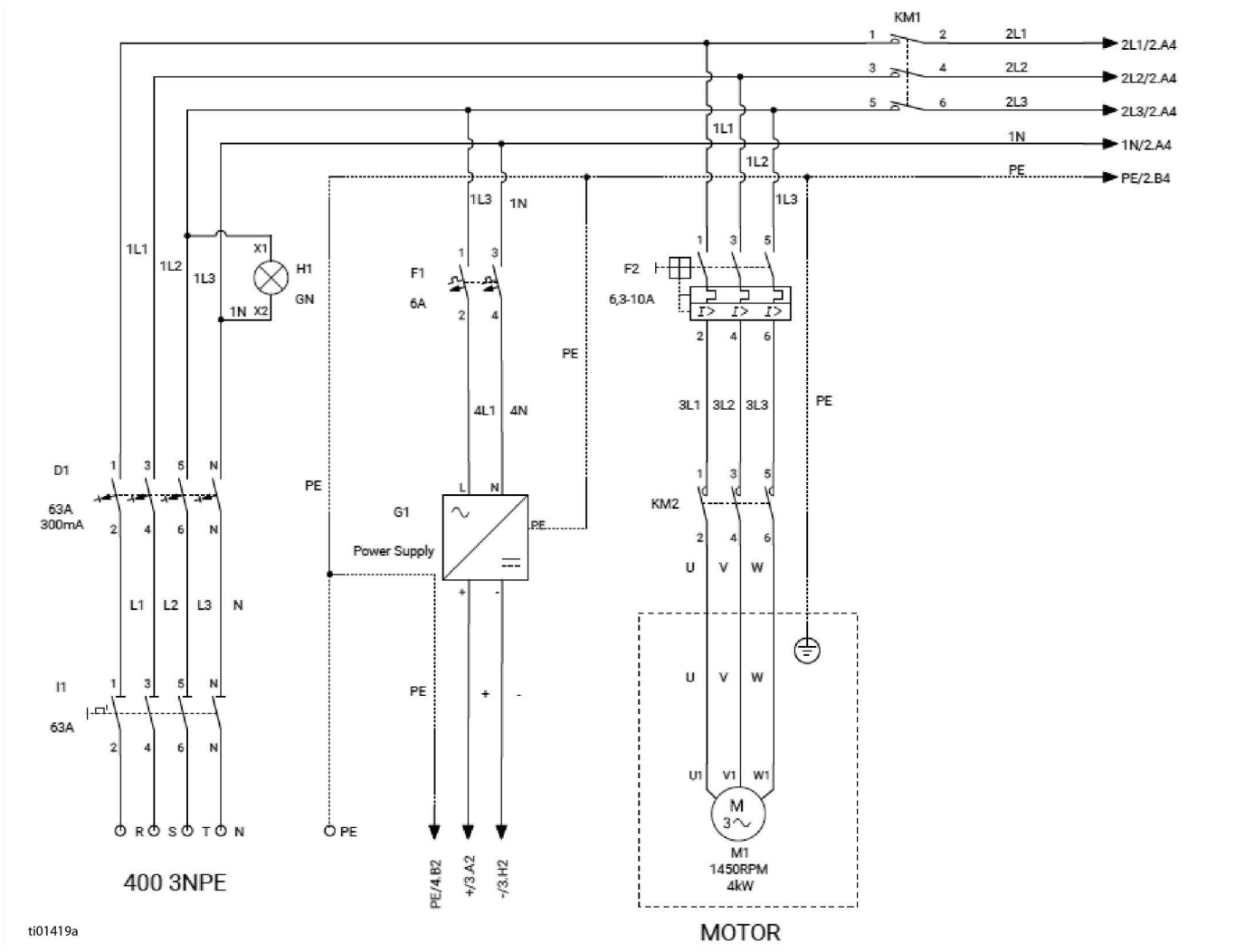


FIG. 73

Control Power Wiring 400 V (2 of 4)

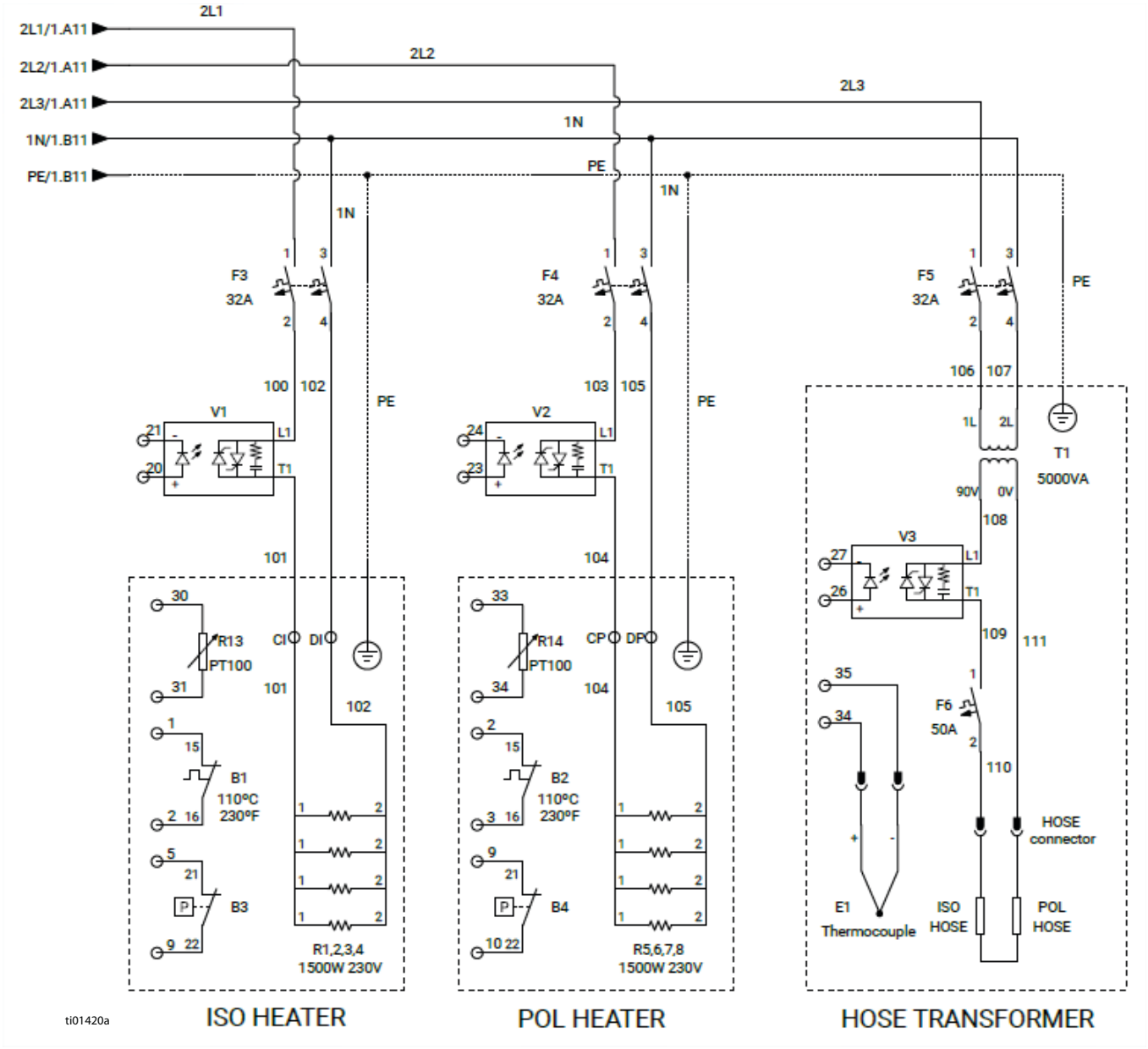


FIG. 74

Control Power Wiring 400 V (3 of 4)

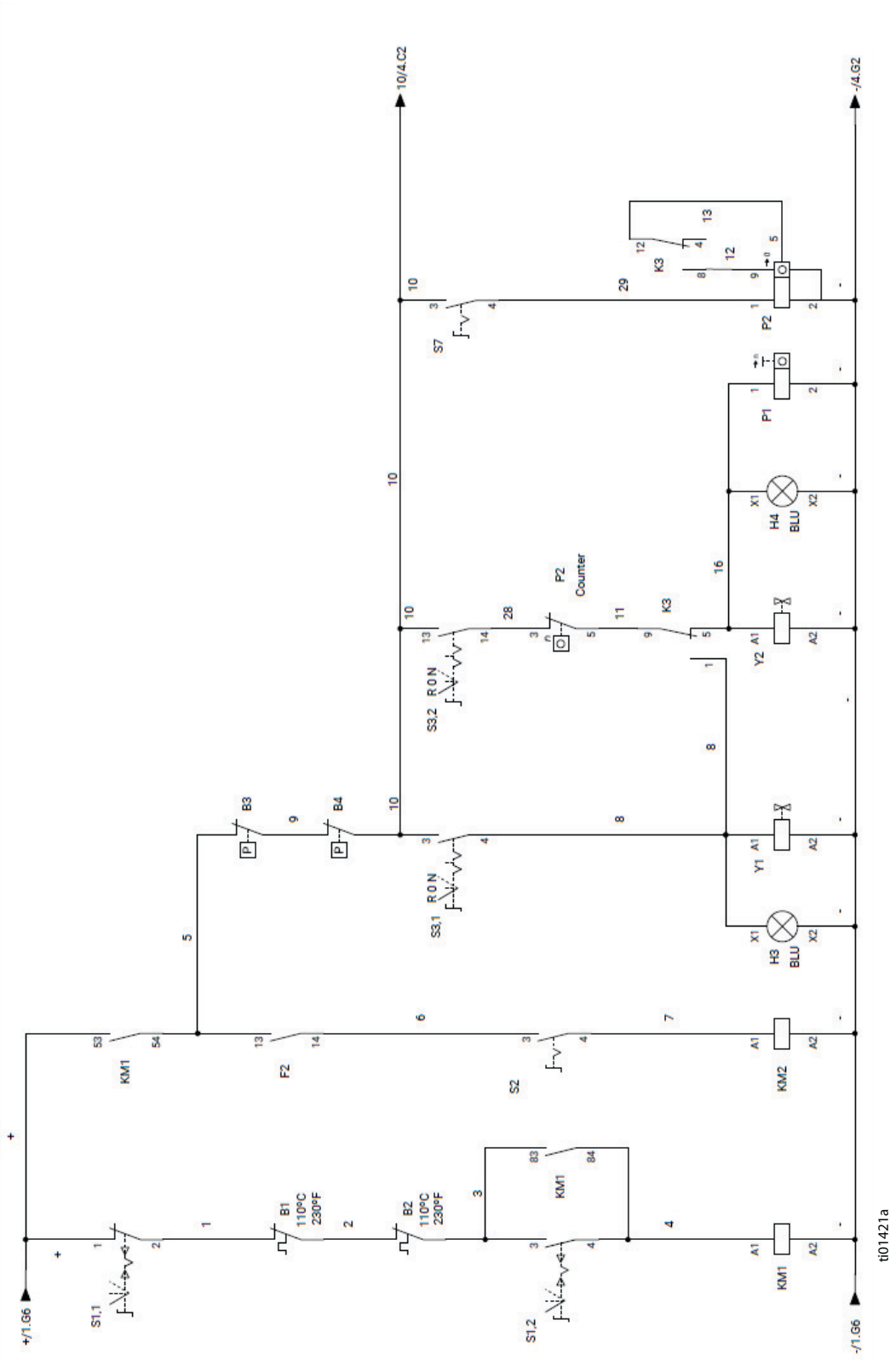


FIG. 75

Control Power Wiring 400 V (4 of 4)

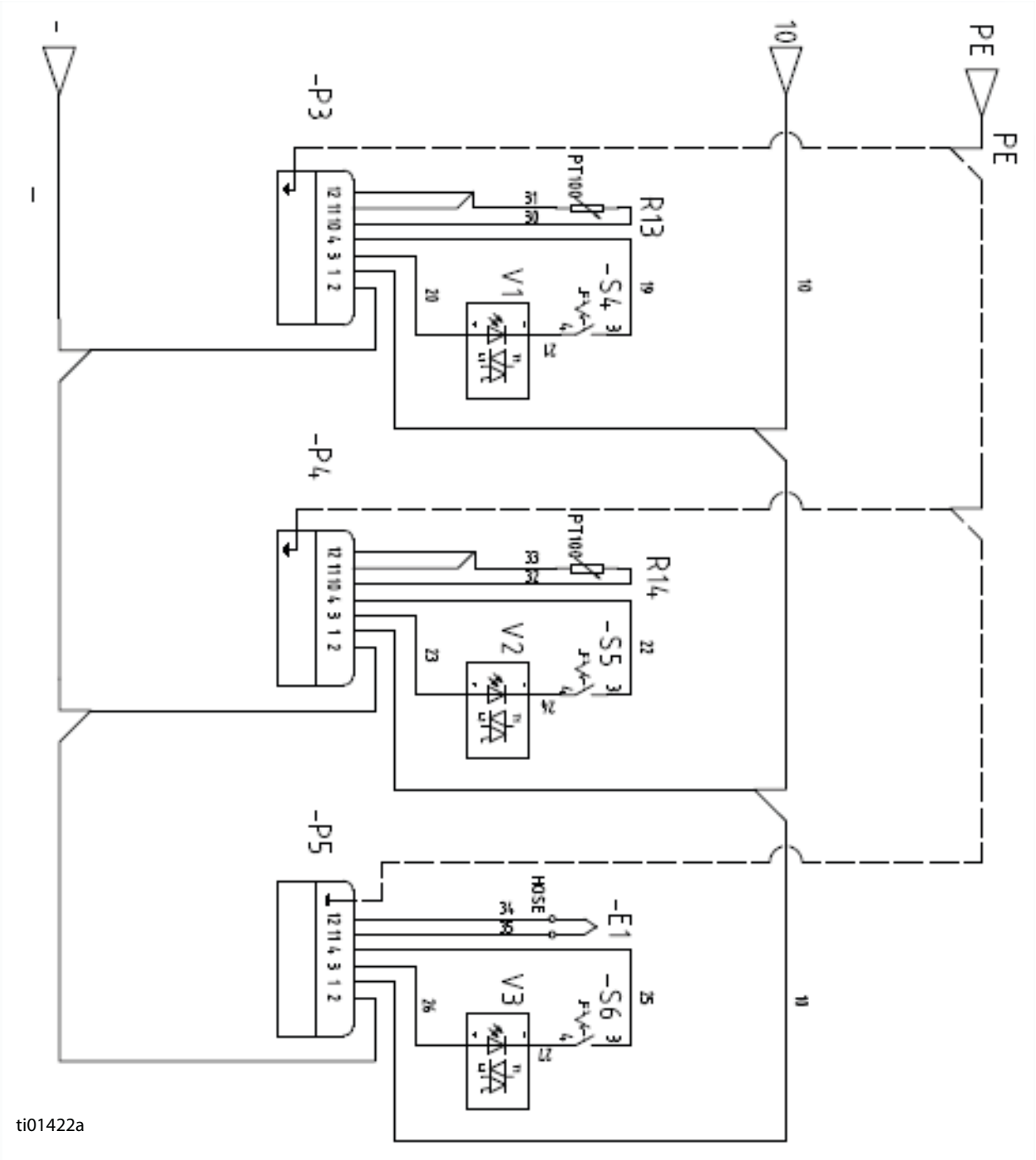


FIG. 76

Control Power Wiring 200 V (1 of 4)

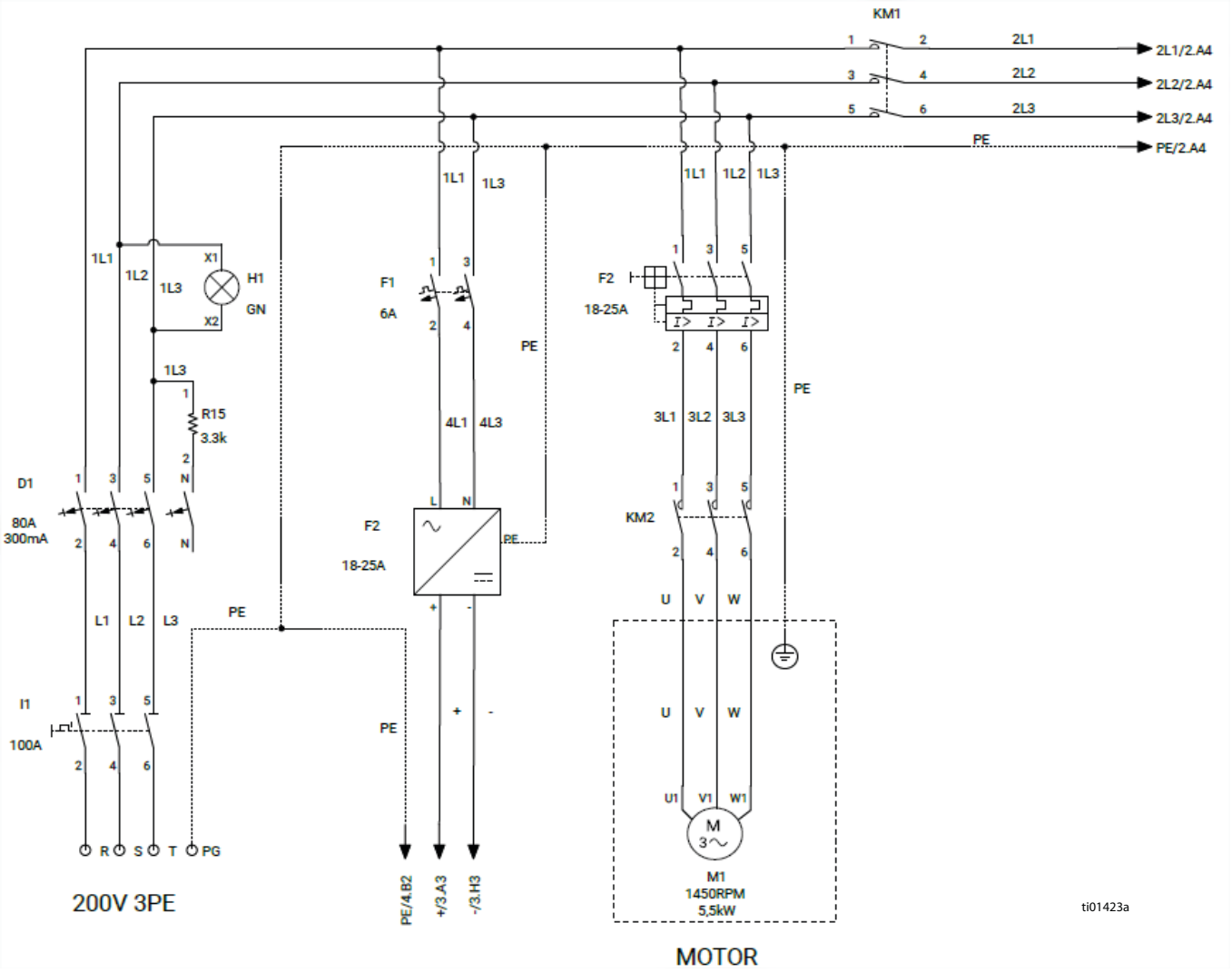


FIG. 77

Control Power Wiring 200 V (2 of 4)

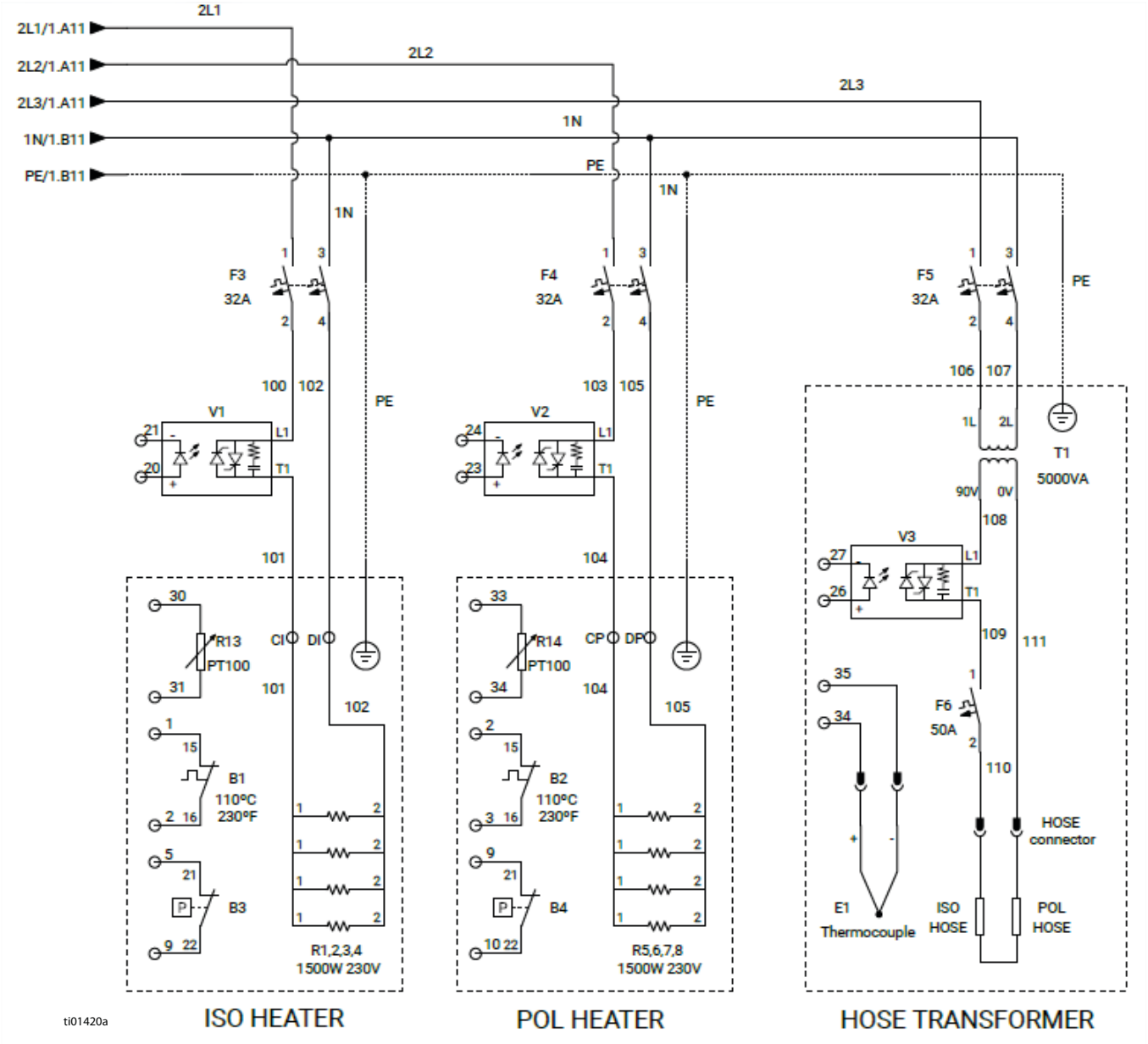


FIG. 78

Control Power Wiring 200 V (3 of 4)

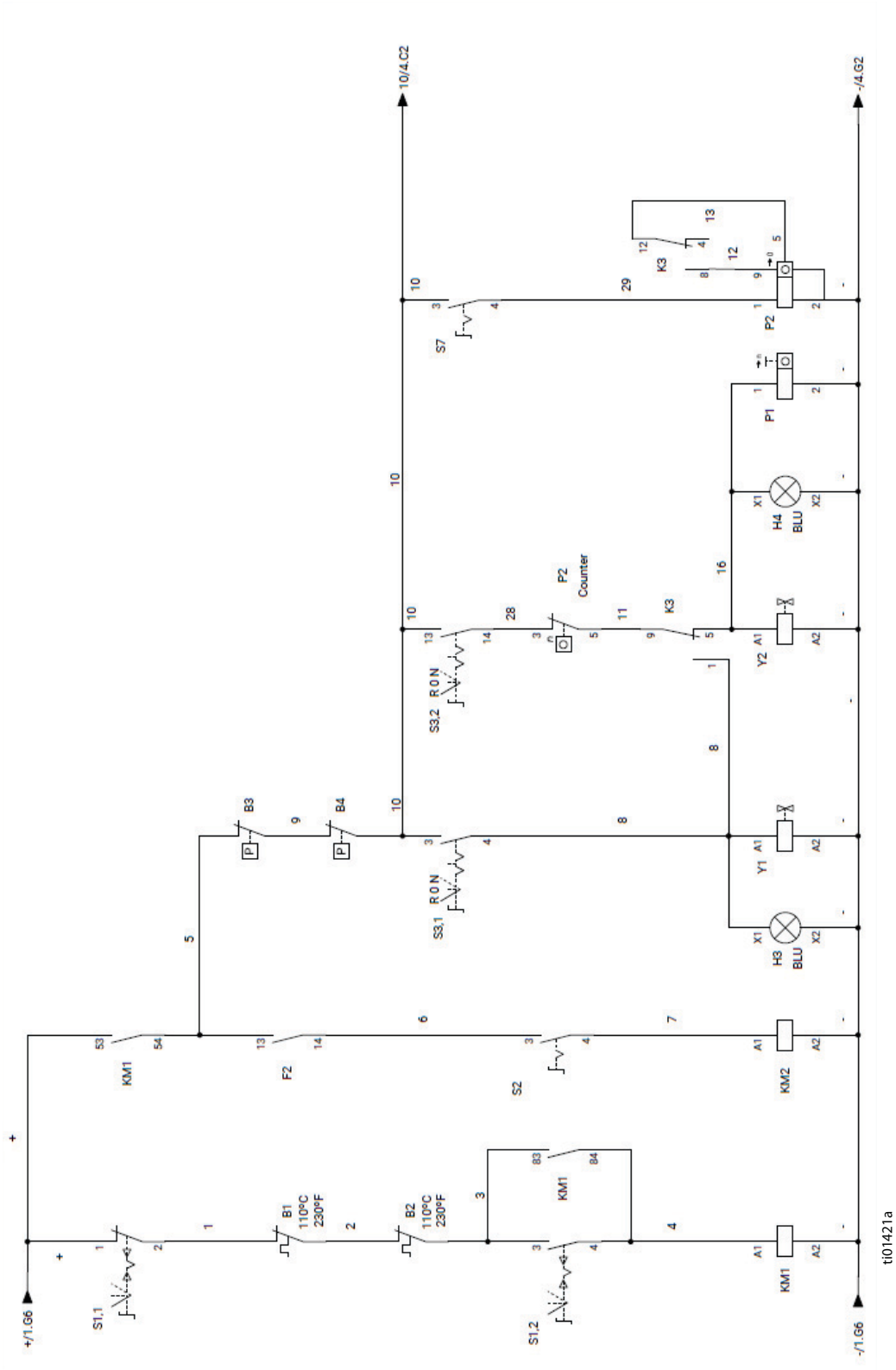


FIG. 79

Control Power Wiring 200 V (4 of 4)

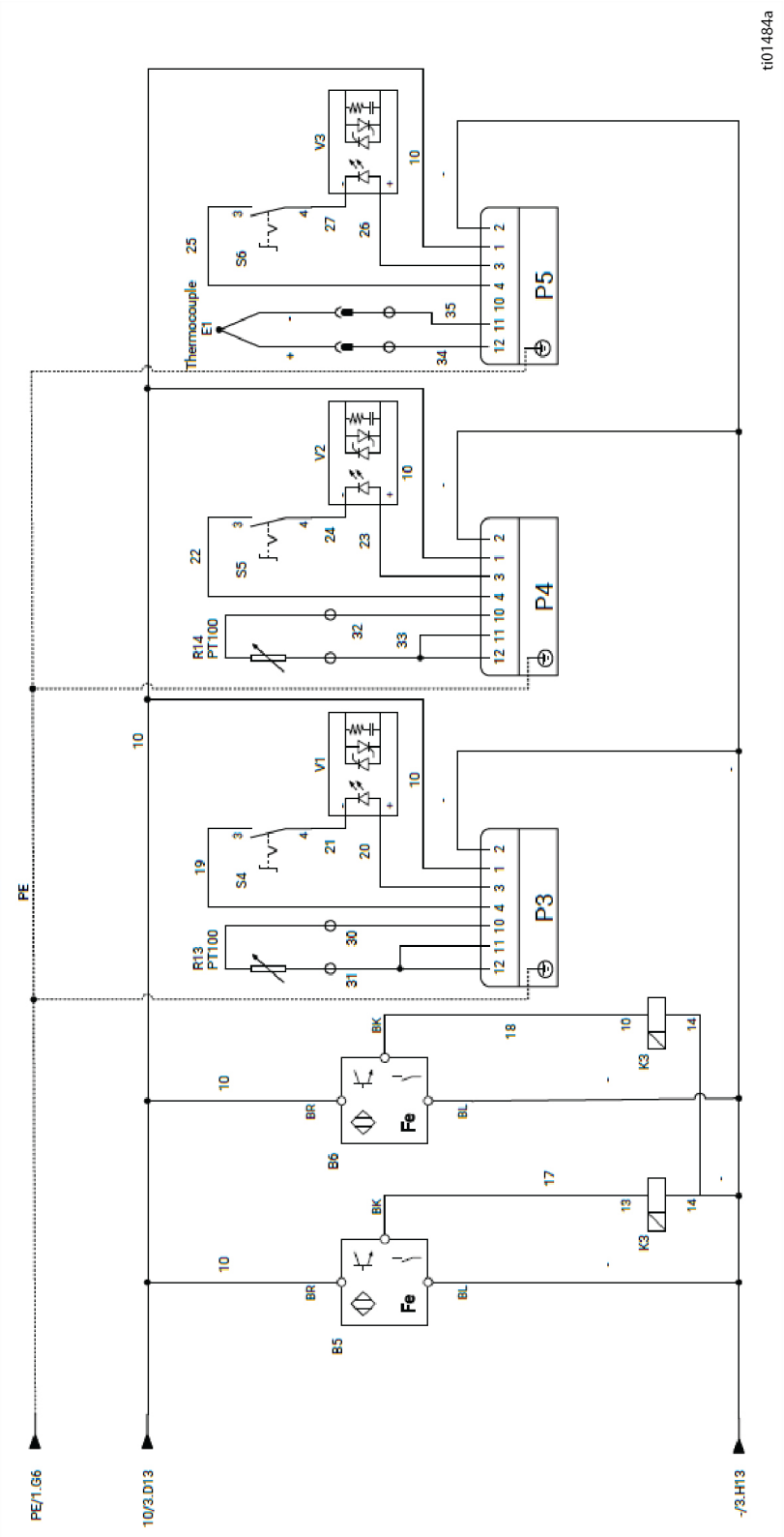


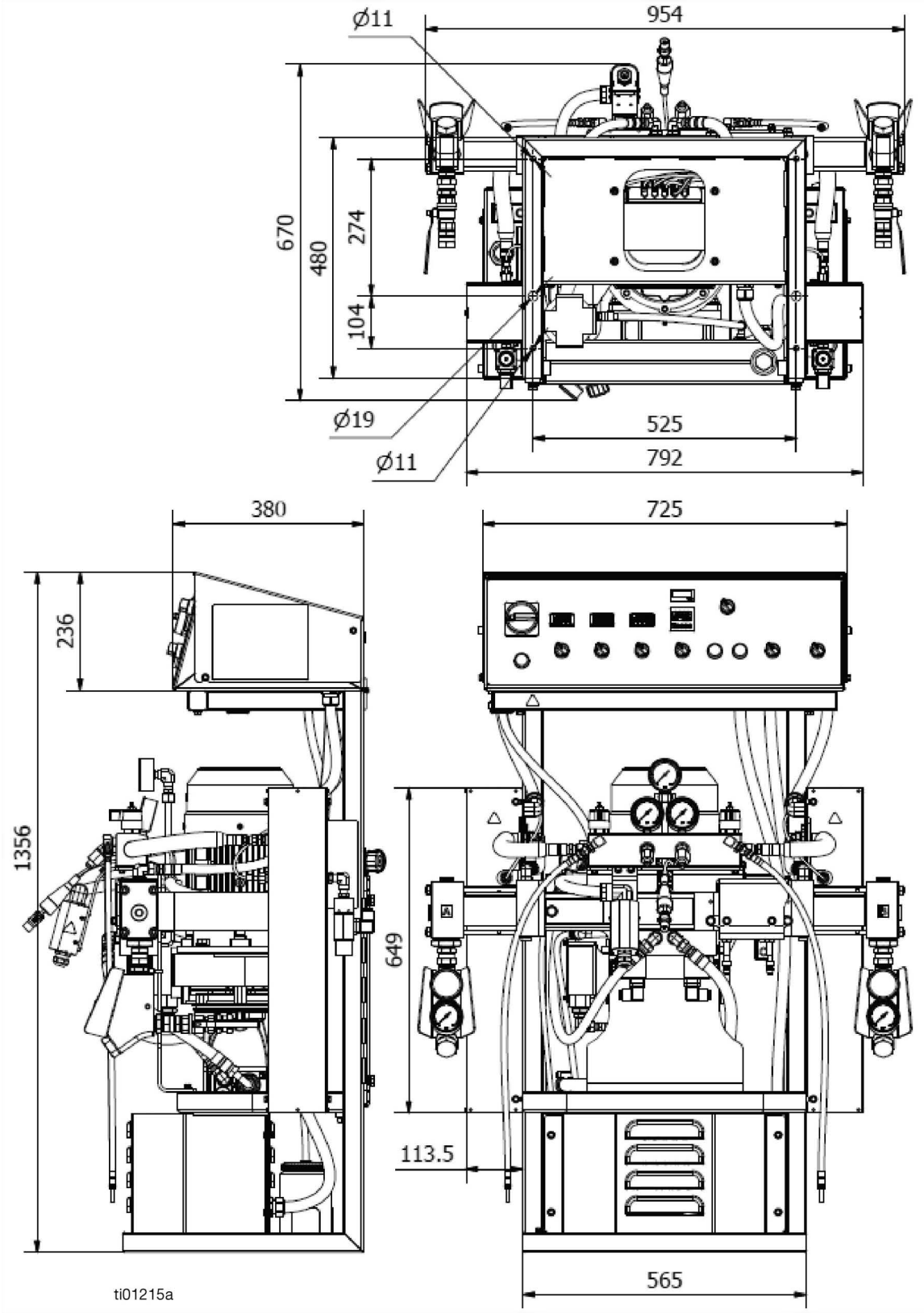
FIG. 80

Control Power Wiring

Ref.	Part	Description	Qty.
B1, B2	2003586	THERMOSTAT	2
B3, B4	2003585	PRESSURE SWITCH	2
B5, B6		INDUCTIVE SENSOR	2
D1	2003584	CIRCUIT, BREAKER, RESIDUAL CURRENT, 4P 63A	1
	2003926*	CIRCUIT, BREAKER, RC, 4P 80A	1
F1	2003582	CIRCUIT, BREAKER, 2P 3A	1
F2	2003587	SWITCH, MOTOR, SAFETY	1
	2004022*	SWITCH, MOTOR, SAFETY	1
F3, F4, F5	2003583	CIRCUIT, BREAKER, 2P 32A	3
F6	2003581	CIRCUIT, BREAKER, 1P 50A	1
G1	2003705	POWER SUPPLY	1
H1	2003615	MODULE, LED, GREEN 230VAC	1
H3	2003614	MODLUE, LED, BLUE 24VDC	2
I1	2003669	KNOB, MAIN SWITCH	1
	2003588	MAIN SWITCH	1
	2003925*	MAIN SWITCH, 3P 100A	1
	2003589	MAIN SWITCH, ADDITIONAL POLE	1
K3	2003704	RELAY, 24VDC 5A	1
	2003709	RELAY, HOLDER	1
KM1	2003707	CONTACTOR, 22kW	1
	2003708*	AUXILIARY CONTACT, 22kW	1
KM2	2003706	CONTACTOR, 7,5kW	1
M1	2003706	MOTOR, 4kW	1
	2003919*	MOTOR, 4kW, 200V, 60Hz	1
P1	2003713	COUNTER	1
P2	2003714	COUNTER, COUNT DOWN	1
P3,4,5	2003716	CONTROL, TEMPERATURE, A-B HOSE	3
R1,2,3,4	2003694	HEATING ROD, 1500W, 230V	4
	2003923*	HEATING ROD, 1500W, 200V	4
R5,6,7,8	2003694	HEATING ROD, 1500W, 230V	4
	2003923*	HEATING ROD, 1500W, 200V	4
R13,14	2003613	SENSOR	2
S1	2003591	SWITCH, MOMENTARY, 3 POSITION	1
S2,4,5,6,7	2003591	SWITCH, 2 POSITION	5
S3	2003590	SWITCH, 3 POSITION	1
TA1	2003688	TRANSFORMER, 5000VA	1
	2003920*	TRANSFORMER, 5000VA	1
V1,2,3	2003702	RELAY	3
Y1,2	2003689	VALVE, DIRECTIONAL, HYDRAULIC	1

* *Japanese models only*

Dimensions


Ø11
954
670
480
274
104
Ø19
Ø11
525
792
380
236
1356
725
649
113.5
565
ti01215a

Technical Specifications

Gusmer GH-3 Hydraulic Proportioner		
	US	**Metric**
Maximum Fluid Working Pressure	3500 psi	24.0 MPa, 240 bar
Minimum Fluid Working Pressure	700 psi	4.8 MPa, 48 bar
Fluid: Oil Pressure Ratio	1.64 : 1	
Fluid Inlets:		
Component A (ISO)	3/4 npt(f), 300 psi maximum	3/4 npt(f), 2.07 MPa, 20.7 bar max
Component B (RES)	3/4 npt(f), 300 psi maximum	3/4 npt(f), 2.07 MPa, 20.7 bar max
Fluid Outlets:		
Component A (ISO)	#8 1/2 in. JIC with #5 5/16 JIC adapter	
Component B (RES)	#10 5/8 in. JIC with #6 3/8 in. JIC adapter	
Fluid Circulation Ports:		
1/4 npsm(m)	250 psi	1.75 MPa, 17.5 bar
Maximum Fluid Temperature	190 °F	88 °C
Maximum Output (10 weight oil at ambient temperature)		
	28 lb/min (60 Hz)	13 kg/min (60 Hz)
Output per Cycle (A and B)	0.063 gallon	0.24 liter
Supply Voltage Tolerance:		
400 V nominal, 3 phase + Neutral	350-415 V, 50 Hz	
200 V nominal, 3 phase + Neutral	200-240 V, 50/60 Hz	
Amperage Requirement	37 A, 79 A	
Heater Power (A and B heaters total)	12000 W	
Hydraulic Reservoir Capacity	4.6 gallon	18 liters
Recommended Hydraulic Fluid	Hydraulic Oil, ISO Grade 46	
Weight	569 lb	258 kg
Wetted Parts	Aluminum, stainless steel, zinc-plated carbon steel, brass, carbide, chrome, fluoroelastomer, PTFE, ultra-high molecular weight, polyethylene, chemically resistant O-rings	
Noise (dBs)		
Sound power - 92 dB(A) Sound pressure - 76.6 dB(A) Sound pressure measured 3.28 feet (1 meter) from equipment Based on the considerations of ISO 3746. 1995 in on-site conditions and application of UNE-EN ISO 14462-2015.		
Notes:		
All trademarks or registered trademarks are the property of their respective owners.		

California Proposition 65

CALIFORNIA RESIDENTS

⚠ **WARNING:** Cancer and reproductive harm – www.P65warnings.ca.gov.

Graco Extended Warranty

Graco warrants all equipment referenced in this document which is manufactured by Graco and bearing its name to be free from defects in material and workmanship on the date of sale to the original purchaser for use. Graco will, for a period as defined in the table below from the date of sale, repair or replace any part of the equipment determined by Graco to be defective. This warranty applies only when the equipment is installed, operated and maintained in accordance with Graco's written recommendations.

Part	Description	Warranty Period
All Other Parts		12 Months

This warranty does not cover, and Graco shall not be liable for general wear and tear, or any malfunction, damage or wear caused by faulty installation, misapplication, abrasion, corrosion, inadequate or improper maintenance, negligence, accident, tampering, or substitution of non-Graco component parts. Nor shall Graco be liable for malfunction, damage or wear caused by the incompatibility of Graco equipment with structures, accessories, equipment or materials not supplied by Graco, or the improper design, manufacture, installation, operation or maintenance of structures, accessories, equipment or materials not supplied by Graco.

This warranty is conditioned upon the prepaid return of the equipment claimed to be defective to an authorized Graco distributor for verification of the claimed defect. If the claimed defect is verified, Graco will repair or replace free of charge any defective parts. The equipment will be returned to the original purchaser transportation prepaid. If inspection of the equipment does not disclose any defect in material or workmanship, repairs will be made at a reasonable charge, which charges may include the costs of parts, labor, and transportation.

THIS WARRANTY IS EXCLUSIVE, AND IS IN LIEU OF ANY OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO WARRANTY OF MERCHANTABILITY OR WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE.

Graco's sole obligation and buyer's sole remedy for any breach of warranty shall be as set forth above. The buyer agrees that no other remedy (including, but not limited to, incidental or consequential damages for lost profits, lost sales, injury to person or property, or any other incidental or consequential loss) shall be available. Any action for breach of warranty must be brought within two (2) years of the date of sale.

GRACO MAKES NO WARRANTY, AND DISCLAIMS ALL IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, IN CONNECTION WITH ACCESSORIES, EQUIPMENT, MATERIALS OR COMPONENTS SOLD BUT NOT MANUFACTURED BY GRACO.

These items sold, but not manufactured by Graco (such as electric motors, switches, hose, etc.), are subject to the warranty, if any, of their manufacturer. Graco will provide purchaser with reasonable assistance in making any claim for breach of these warranties.

In no event will Graco be liable for indirect, incidental, special or consequential damages resulting from Graco supplying equipment hereunder, or the furnishing, performance, or use of any products or other goods sold hereto, whether due to a breach of contract, breach of warranty, the negligence of Graco, or otherwise.

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Graco reserves the right to make changes at any time without notice.

Original instructions. This manual contains English. MM 3B0072
Graco Headquarters: Minneapolis
International Offices: Belgium, China, Japan, Korea

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