For metering and dispensing ambient or high-temperature, high-viscosity single-component materials. For professional use only.

Not approved for use in European explosive atmosphere locations.

2500 psi (17.2 MPa, 172 bar) Maximum Working Outlet Pressure
1500 psi (10.3 MPa, 103 bar) Maximum Working Inlet Pressure
See Technical Specifications on page 103 for temperature ranges

See page 4 for model information.

Important Safety Instructions
Read all warnings and instructions in this manual. Save these instructions.
Contents

Related Manuals ........................................... 3
Models .................................................. 4
Bulk Melt (Therm-O-Flow 20 + Therm-O-Flow 200)
and Ambient Hoses ................................. 4
Remote Dispense Valves ......................... 5
Fixed Dispense Valves .......................... 5
Accessories ........................................ 5
Warnings ........................................... 6
Overview ............................................. 8
System Configurations ............................ 8
Component Identification ....................... 10
System Overview ................................ 11
Typical Applications ............................. 11
Installation ......................................... 12
Before Installation ............................... 12
Overview ......................................... 12
Install Control Center ............................ 13
Install Gear Meter Assembly ................. 14
Install Cable Assemblies ....................... 17
System Setup .................................... 18
Overview ......................................... 18
Configure Control Settings ................. 19
Configure Mode Settings ....................... 19
Configure Delay Settings ...................... 20
Adjust Pressure Sensors ...................... 20
Configure Errors ................................ 21
Operation ......................................... 22
Startup ............................................. 22
Load Material ................................... 22
Maintenance Mode Operation ............... 23
Calibration ......................................... 24
Dispense from Maintenance Screen ........ 25
Automation Control (Normal) Operation .... 25
Typical Automation Cycle ..................... 25
Pressure Relief Procedure ....................... 26
Shutdown ......................................... 28
Troubleshooting ................................... 29
Dispense Valves .................................. 30
Errors ............................................... 31
View Errors ....................................... 31
Diagnose Errors ................................ 31
Clear Errors and Reset Control Unit ....... 31
Error Codes and Troubleshooting .......... 32

Maintenance ....................................... 34
Maintenance Schedule .......................... 34
Repair ............................................... 35
Gear Meter Assembly ............................ 35
PGM-6 Pump Repair .............................. 40
PGM-20 Pump Repair ............................ 44
Gear Pump Maintenance Guide .............. 47
Installing new heater units and RTD sensors .... 48
Parts ............................................... 49
PGM-20 Mounting Frame ....................... 49
PGM-20 Lower Assembly Block ............... 50
PGM-20 Pump Heat Kit .......................... 51
PGM Drive - 20 cc Pump ....................... 52
EnDure Dispense Valve Fix Mounted ....... 53
Gear Meter Assembly Panel ................. 54
PGM Back Panel .................................. 56
Remote Mount Amplifiers .................... 57
PGM Remote Dispense Valve ................. 58
PGM Ambient Transducer 24E474 ........... 59
PGM Ambient Transducer 25E231 ........... 59
PGM-6 Mounting Frame ......................... 60
PGM-6 Drive Kit .................................. 61
PGM-6 Lower Assembly Block ............... 62
PGM-6 Pump Heat Kit ............................ 63
Schematics ....................................... 64
Accessory Parts ................................... 74
Automation Interface Cable Assembly ..... 74
Dynamic Regulators (98****) ............... 75
EnDure Valve Nozzles ......................... 81
Heater Nests ..................................... 81
Appendix A - User Interface Display ......... 82
Screen Navigation Diagram .................... 82
Main Screen .................................... 83
Calibrate Screen ................................ 84
Home Screen .................................... 85
Maintenance Screen ......................... 86
Robot I/O Screen ................................ 87
Setup #1 Screen ................................ 88
Setup #2 Screen ................................ 89
Setup #3 Screen ................................ 90
Setup #4 Screen ................................ 91
Setup #5 Screen ................................ 92
Setup #6 Screen ................................ 93
Supply Pump Screen ......................... 94
Pressure Trend Screen ....................... 95

3A5185G
Related Manuals

<table>
<thead>
<tr>
<th>Part</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>309376</td>
<td>EnDure® Automatic Dispense Valves Instructions-Parts List</td>
</tr>
<tr>
<td>310538</td>
<td>Therm-O-Flow® Automatic Dispense Valves Instructions-Parts List</td>
</tr>
<tr>
<td>334130</td>
<td>Therm-O-Flow 200 (P/N UH****) Instructions-Parts</td>
</tr>
<tr>
<td>311208</td>
<td>Therm-O-Flow 200 (P/N 98****) Instructions</td>
</tr>
<tr>
<td>313296</td>
<td>Warm Melt Supply Systems Instructions-Parts</td>
</tr>
<tr>
<td>309213</td>
<td>Therm-O-Flow Accessory Heat Zone Controls Instructions-Parts List</td>
</tr>
<tr>
<td>313526</td>
<td>Ambient Supply Systems Operation</td>
</tr>
</tbody>
</table>
### Models

**NOTE:** This manual covers a series change to the PGM system. For systems built prior to 2016, refer to manual 3A0260.

Check the identification (ID) plate for the 6-digit part number of the fluid metering system. Use the following matrix to define the construction of the system, based on the six digits. For example, Part PG0111 represents a PGM fluid metering system (PG), with a 6cc system (0), unheated (1), with controls/3m (1), and an EnDure snuff-back (1).

**NOTE:** To order replacement parts, see Parts section in this manual. The digits in the matrix do not correspond to the Ref. Nos. in the Parts drawings and lists.

<table>
<thead>
<tr>
<th>PG (Precision Gear Meter)</th>
<th>0</th>
<th>1</th>
<th>2</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>First and Second Digits</strong></td>
<td><strong>Third Digit</strong></td>
<td><strong>Fourth Digit</strong></td>
<td><strong>Fifth Digit</strong></td>
</tr>
<tr>
<td><strong>Size</strong></td>
<td><strong>Heat</strong></td>
<td>**Controls ***</td>
<td><strong>Valve</strong></td>
</tr>
<tr>
<td>Description</td>
<td>Description</td>
<td>Description</td>
<td>Description</td>
</tr>
<tr>
<td><strong>PG</strong></td>
<td>0</td>
<td>6cc</td>
<td>Unheated</td>
</tr>
<tr>
<td><strong>2</strong></td>
<td>20cc</td>
<td>Heated</td>
<td>1</td>
</tr>
<tr>
<td><strong>3</strong></td>
<td>Controls / 6m</td>
<td>2</td>
<td>Controls / 9m</td>
</tr>
<tr>
<td><strong>4</strong></td>
<td>Controls / 15m</td>
<td>3</td>
<td>Controls / 9m</td>
</tr>
<tr>
<td><strong>5</strong></td>
<td>No Controls / 104mV transducer</td>
<td>4</td>
<td>Controls / 15m</td>
</tr>
</tbody>
</table>

* **PGM Control Center does not include heat controls. Heat loads are configured to be controlled by Therm-O-Flow Controllers.**

### Bulk Melt (Therm-O-Flow 20 + Therm-O-Flow 200) and Ambient Hoses

**Hose Diameter**

<table>
<thead>
<tr>
<th>Hose Diameter</th>
<th>- 8 3/4 in. - 16 JIC</th>
<th>- 10 7/8 in. - 14 JIC</th>
<th>- 12 1-1/16 in. - 12 JIC</th>
<th>- 16 1-5/16 in. - 12 JIC</th>
<th>Non-Heated Hoses</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Length</strong></td>
<td>6 ft</td>
<td>19M404</td>
<td>None</td>
<td>19M416</td>
<td>109163</td>
</tr>
<tr>
<td></td>
<td>17J654</td>
<td>17J655</td>
<td>17J662</td>
<td>17J667</td>
<td>626720</td>
</tr>
<tr>
<td></td>
<td>19M417</td>
<td>19M418</td>
<td>19M419</td>
<td>19M420</td>
<td>190451</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(1/2 in. x 5 ft)</td>
</tr>
<tr>
<td></td>
<td>10 ft</td>
<td>19M402</td>
<td>19M405</td>
<td>19M412</td>
<td>None</td>
</tr>
<tr>
<td></td>
<td>17J652</td>
<td>17J655</td>
<td>17J662</td>
<td>17J667</td>
<td>215441</td>
</tr>
<tr>
<td></td>
<td>19M417</td>
<td>19M418</td>
<td>19M419</td>
<td>19M420</td>
<td>190451</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(1/2 in. x 5 ft)</td>
</tr>
<tr>
<td></td>
<td>15 ft</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>109165/685602*</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>511381*</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Fittings</th>
<th>PGM Inlet (-16 SAE)</th>
<th>None</th>
<th>None</th>
<th>124238</th>
<th>124239</th>
<th>124239/124243</th>
<th>None</th>
<th>None</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>PGM Outlet (3/4 in. npt)</td>
<td>124286</td>
<td>C20595</td>
<td>15M883</td>
<td>107127</td>
<td>124290</td>
<td>124299</td>
<td>190451</td>
</tr>
<tr>
<td></td>
<td>Valve Inlet</td>
<td>124287</td>
<td>C20768</td>
<td>107052</td>
<td>124288</td>
<td>158256</td>
<td>194051</td>
<td></td>
</tr>
</tbody>
</table>

* **Indicates PTFE hose, all others Buna-N.**

† **Therm-O-Flow part number 98xxxx models.**

† **Indicates swivel.**
### Remote Dispense Valves

<table>
<thead>
<tr>
<th>Part</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>243694</td>
<td>Heated Dispense Valve</td>
</tr>
<tr>
<td>244951</td>
<td>EnDure Valve, Heated, 1/2 in. npt male outlet</td>
</tr>
<tr>
<td>244909</td>
<td>EnDure Valve, Heated</td>
</tr>
</tbody>
</table>

### Fixed Dispense Valves

<table>
<thead>
<tr>
<th>Part</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>244907</td>
<td>EnDure Valve snuff-back</td>
</tr>
</tbody>
</table>

### Accessories

<table>
<thead>
<tr>
<th>Part</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>24D824</td>
<td>Automation I/O Cable</td>
</tr>
<tr>
<td>24E654</td>
<td>Ribbon Nozzle Kit, 10 x 1.5 mm</td>
</tr>
<tr>
<td>24E655</td>
<td>Bead Nozzle Kit, 3 mm dia.</td>
</tr>
<tr>
<td>25A055</td>
<td>Dynamic Air Regulator for Therm-O-Flow (P/N UH****)</td>
</tr>
<tr>
<td>24E575</td>
<td>Dynamic Air Regulator for Therm-O-Flow (P/N 98****)</td>
</tr>
<tr>
<td>24E607</td>
<td>Gear Pump Seals, 6 cc</td>
</tr>
<tr>
<td>24E619</td>
<td>Gear Pump Seals, 20 cc</td>
</tr>
<tr>
<td>24E677</td>
<td>O-ring Kit, 6 cc</td>
</tr>
<tr>
<td>24E626</td>
<td>O-ring Kit, 20 cc</td>
</tr>
<tr>
<td>24E678</td>
<td>Heated Nest, Pilot</td>
</tr>
<tr>
<td>24E679</td>
<td>Heated Nest, Ribbon or Bead</td>
</tr>
<tr>
<td>16E242</td>
<td>Nozzle Heater Insert</td>
</tr>
<tr>
<td>16E256</td>
<td>Ported Nozzle Heater Insert</td>
</tr>
<tr>
<td>25E204</td>
<td>Kit, Key, Coupler, 6 cc</td>
</tr>
<tr>
<td>25E205</td>
<td>Kit, Key, Coupler, 20 cc</td>
</tr>
<tr>
<td>124267</td>
<td>Seal Housing, 6 cc</td>
</tr>
<tr>
<td>24E826</td>
<td>Gear Shaft Repair Kit, 6 cc</td>
</tr>
<tr>
<td>24E827</td>
<td>Seal Shaft Repair Kit, 6 cc</td>
</tr>
<tr>
<td>124266</td>
<td>Pump Seal Housing, 20 cc</td>
</tr>
<tr>
<td>24E824</td>
<td>Gear Shaft Repair Kit, 20 cc</td>
</tr>
<tr>
<td>24E825</td>
<td>Seal Shaft Repair Kit, 20 cc</td>
</tr>
<tr>
<td>124235</td>
<td>Elbow Fitting, 90 degree, 3/4 in. tube x 16 SAE</td>
</tr>
<tr>
<td>124236</td>
<td>Elbow Fitting, 90 degree, 1 in. tube x 16 SAE</td>
</tr>
<tr>
<td>124237</td>
<td>Elbow Fitting, 90 degree, 16 SAE x 20 JIC</td>
</tr>
<tr>
<td>124238</td>
<td>Adapter Fitting, 3/4 in. Tube x 16 SAE</td>
</tr>
<tr>
<td>124239</td>
<td>Adapter Fitting, 1 in. Tube x 16 SAE</td>
</tr>
<tr>
<td>124240</td>
<td>Adapter Fitting, 1-1/4 in. Tube x 16 SAE</td>
</tr>
<tr>
<td>124241</td>
<td>Adapter Fitting, 16 SAE x 1 in. NPTF</td>
</tr>
<tr>
<td>124242</td>
<td>Swivel, 16 SAE x 1 in. NPTF</td>
</tr>
<tr>
<td>124243</td>
<td>Swivel, 16 SAE x 1 in. tube</td>
</tr>
<tr>
<td>124244</td>
<td>Swivel, 1/2 NPTM x 10 JIC</td>
</tr>
<tr>
<td>124245</td>
<td>Swivel, 1/2 NPTM x 1/2 NPTF</td>
</tr>
<tr>
<td>124286</td>
<td>Adapter Fitting, 3/4 NPTM x 8 JICM</td>
</tr>
<tr>
<td>124287</td>
<td>Adapter Fitting, 1/2 NPTM x 8 JICM</td>
</tr>
<tr>
<td>124288</td>
<td>Adapter Fitting, 1/2 NPTM x 16 JICM</td>
</tr>
<tr>
<td>124289</td>
<td>Swivel Fitting, 3/4 NPTM x 1/2 NPS</td>
</tr>
<tr>
<td>124290</td>
<td>Swivel Fitting, 3/4 NPTM x 3/8 NPS</td>
</tr>
</tbody>
</table>
# Warnings

The following warnings are for the setup, use, grounding, maintenance, and repair of this equipment. The exclamation point symbol alerts you to a general warning and the hazard symbols refer to procedure-specific risks. When these symbols appear in the body of this manual or on warning labels, refer back to these Warnings. Product-specific hazard symbols and warnings not covered in this section may appear throughout the body of this manual where applicable.

<table>
<thead>
<tr>
<th><img src="image" alt="WARNING" /></th>
<th>ELECTRIC SHOCK HAZARD</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="Exclamation Point" /></td>
<td>This equipment must be grounded. Improper grounding, setup, or usage of the system can cause electric shock.</td>
</tr>
<tr>
<td><img src="image" alt="Grounding Symbol" /></td>
<td>• Turn off and disconnect power at main switch before disconnecting any cables and before servicing or installing equipment.</td>
</tr>
<tr>
<td><img src="image" alt="Grounding Symbol" /></td>
<td>• Connect only to grounded power source.</td>
</tr>
<tr>
<td><img src="image" alt="Grounding Symbol" /></td>
<td>• All electrical wiring must be done by a qualified electrician and comply with all local codes and regulations.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><img src="image" alt="WARNING" /></th>
<th>SKIN INJECTION HAZARD</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="Exclamation Point" /></td>
<td>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. <strong>Get immediate surgical treatment.</strong></td>
</tr>
<tr>
<td><img src="image" alt="No Touching Symbol" /></td>
<td>• Engage trigger lock when not dispensing.</td>
</tr>
<tr>
<td><img src="image" alt="No Touching Symbol" /></td>
<td>• Do not point dispensing device at anyone or at any part of the body.</td>
</tr>
<tr>
<td><img src="image" alt="No Touching Symbol" /></td>
<td>• Do not put your hand over the fluid outlet.</td>
</tr>
<tr>
<td><img src="image" alt="No Touching Symbol" /></td>
<td>• Do not stop or deflect leaks with your hand, body, glove, or rag.</td>
</tr>
<tr>
<td><img src="image" alt="Pressure Relief Symbol" /></td>
<td>• Follow the <strong>Pressure Relief Procedure</strong> when you stop dispensing and before cleaning, checking, or servicing equipment.</td>
</tr>
<tr>
<td><img src="image" alt="No Touching Symbol" /></td>
<td>• Tighten all fluid connections before operating the equipment.</td>
</tr>
<tr>
<td><img src="image" alt="No Touching Symbol" /></td>
<td>• Check hoses and couplings daily. Replace worn or damaged parts immediately.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><img src="image" alt="WARNING" /></th>
<th>BURN HAZARD</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="Hot Surface Symbol" /></td>
<td>Equipment surfaces and fluid that is heated can become very hot during operation. To avoid severe burns:</td>
</tr>
<tr>
<td><img src="image" alt="Hot Surface Symbol" /></td>
<td>• Do not touch hot fluid or equipment.</td>
</tr>
</tbody>
</table>
# Warnings

## 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.

## 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.

## 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) to know the specific hazards of the fluids you are using.
- Store hazardous fluid in approved containers, and dispose of it according to applicable guidelines.

## PERSONAL PROTECTIVE EQUIPMENT
Wear appropriate protective equipment when in the work area to help prevent serious injury, including eye injury, hearing loss, inhalation of toxic fumes, and burns. Protective equipment includes but is not limited to:

- Protective eyewear, and hearing protection.
- Respirators, protective clothing, and gloves as recommended by the fluid and solvent manufacturer.
Overview

System Configurations

Typical Heated System Installation

**Key:**
- AA *Control Center (User Interface)*
- AB *Gear Meter Assembly*
- AC Applicator/Dispense Valve†
- AD Automation Robot
- AE Automation Interface Cable †
- AF *Gear Meter Cables*
- AG Heated Fluid Supply System
- AH Fluid Supply Hose
- AJ Heat Control
- AK Automation Controller
- AL Air Filter Assembly
- AM Remote Dispense Hose †
- AN Heated Manifold
- AO Dynamic Regulator †

* Included
† Accessory

**Fig. 1: Typical Heated System Installation**
Typical Ambient System Installation

FIG. 2: Typical Ambient System Installation

Key:
A  *Control Center (User Interface)            F  *Gear Meter Cables
B  *Gear Meter Assembly                      G  Fluid Supply System
C  *Applicator/Dispense Valve                  H  Fluid Supply Hose
D  Automation Robot                             J  Automation Controller
E  Automation Interface Cable†               K  Air Filter Assembly

* Included
† Accessory
Component Identification

Key:
1  Gear Meter
2  System Controls Box
3  User-Interface Touch Display
4  External Control Interface Connections
5  Power Input
6  Main Power Switch
7  Emergency Stop
8  Pump Fault Indicator Light
9  Control Power On/Off buttons
10 Pump Ready Light
11 Manual Purge Button
12 Dispense Valve

Fig. 3
System Overview

The PGM system provides positive displacement metering for precision bead control. The control accepts automation signals to provide accurate and consistent output flow. The gear meter can achieve high flow rates with high viscosity materials.

Control Power On/Off

Control Power is the power for the signals to the gear meter which control gear meter rotation. When Control Power is off, the gear meter cannot rotate.

Pump Ready Light

The Pump Ready light displays when the pump is ready for Automatic Mode dispensing. When Manual mode is enabled, this light will not turn on.

Pump Fault Light

The Pump Fault light is illuminated whenever a pump fault is active.

Manual Purge Button

The Manual Purge button initiates a shot.

Typical Applications

- Solar Panel
- Perimeter Seal
- Desiccant
- Edge Seal
- Automotive Manufacturing
- Window and Door General Assembly

Fig. 4: Control Center Dimensions
Installation

Before Installation

- Have all system and component documentation available during installation.
- See component manuals for specific data on component requirements. Data presented here applies to the PGM assemblies only.
- Be sure all accessories are adequately sized and pressure-rated to meet system requirements.
- Use the PGM control center only with the PGM metering assembly.

Overview

The basic steps to install a PGM system are shown below. See the separate component manuals for detailed information on supply systems and dispense valves.

<table>
<thead>
<tr>
<th>NOTICE</th>
</tr>
</thead>
<tbody>
<tr>
<td>To avoid damaging the PGM system, use at least two people to lift, move, or disconnect the system. The system is too heavy for one person to lift or move.</td>
</tr>
</tbody>
</table>

Installation Steps

1. Mount control center.
2. Connect and ground control center.
3. Mount gear meter assembly.
4. Ground gear meter assembly.
5. Check ground continuity.
6. Connect fluid line between gear meter and dispense valve. For remote mount dispense valves, connect fluid supply line and air supply to gear meter.
7. Plumb filter assembly near air drop site that will be used for gear meter assembly.
8. Connect other fluid and air lines to additional system components as instructed in their manuals.
9. Install cable assemblies.
Install Control Center

Mount

Ensure the following criteria are met before mounting the PGM control center:

- Select a location for the control center that allows adequate space for installation, service, and use of the equipment.

- For best viewing, the user interface should be 60-64 in. (152-163 cm) from the floor.

- Ensure there is sufficient clearance around the control unit to run cables to other components.

- Ensure there is easy access to an appropriate electrical power source. The National Electric Code requires 3 ft. (0.91 m) of open space in front of the control center.

- Ensure there is easy access to the power switch.

- Ensure the mounting surface can support the weight of the control center and the cables attached to it.

Secure the control center with appropriate size bolts through the 0.50 in. (13 mm) diameter holes. See the mounting dimensions in the following table and FIG. 5.

### Control Center Assembly Measurement

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>24.0 in. (610 mm)</td>
</tr>
<tr>
<td>B</td>
<td>22.5 in. (572 mm)</td>
</tr>
<tr>
<td>C</td>
<td>30.0 in. (762 mm)</td>
</tr>
<tr>
<td>D</td>
<td>28.5 in. (724 mm)</td>
</tr>
</tbody>
</table>

FIG. 5: Control Center Dimensions
Electrical Connections

Follow these precautions when grounding, connecting cables, connecting to a power source or making other electrical connections.

To reduce the risk of fire, explosion, or electric shock:

- The control center must be electrically connected to a true earth ground; the ground in the electrical system may not be sufficient.
- A qualified electrician must complete all grounding and wiring connections.
- For wiring, refer to Fig. 6.

Refer to your local code for the requirements for a “true earth ground” in your area.

Install Gear Meter Assembly

To install the PGM metering assembly:

- Mount the gear meter assembly.
- Ground gear meter assembly.
- Connect the gear meter assembly to the control center.
- Connect fluid lines and cables.

Mount

Before Mounting Assembly

- See component manuals for specific information on component requirements. Information presented here pertains to the PGM gear meter assembly only.
- Have all system and subassembly documentation available during installation.
- Be sure all accessories are adequately sized and pressure-rated to meet the system's requirements.
- Use only the Graco PGM gear meter assembly with the Graco PGM control center.

Mount Assembly

1. Select a location for the gear meter assembly. Keep the following in mind:

   - Allow sufficient space for installing the equipment.
   - Make sure all fluid lines, cables and hoses easily reach the components to which they will be connected.
   - Make sure the gear meter assembly allows the automation unit to move freely along all axis.
   - Make sure the gear meter assembly provides easy access for servicing its components.
2. Mount and secure the gear meter assembly to the automation unit (or other mounting surface) with mounting plate. The mounting plate is tapped with M10 x 1.5 bolts. Maximum bolt length through plate is 0.75 in. (19 mm). See the mounting dimensions in Table 4 and FIG. 7.

### Table 4: Gear Meter Assembly Measurement

<table>
<thead>
<tr>
<th></th>
<th>6 cc Pump</th>
<th>20 cc Pump</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>2.00 in. (50.8 mm)</td>
<td>3.00 in. (76.2 mm)</td>
</tr>
<tr>
<td>B</td>
<td>5.00 in. (127 mm)</td>
<td>3.875 in. (98.43 mm)</td>
</tr>
<tr>
<td>C</td>
<td>2.375 in. (60.33 mm)</td>
<td>2.313 in. (58.75 mm)</td>
</tr>
<tr>
<td>D</td>
<td>NA</td>
<td>1.063 in. (27.00 mm)</td>
</tr>
</tbody>
</table>

**Fig. 7: Gear Meter Assembly Dimensions**
Grounding

![Caution Symbol]

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.

**NOTICE**

If power and grounding connections are not done properly, the equipment will be damaged and the warranty voided.

Gear Meter

Ground the gear meter assembly as instructed here and in the individual component manuals. Make sure the gear meter assembly and its components are installed correctly to ensure proper grounding.

Air and Fluid Hoses

For static dissipation, use only electrically conductive hoses or ground the applicator / dispense valves.

Dispense Valve

Follow the grounding instructions in the dispense valve manual.

Connect Fluid and Air Lines

**NOTICE**

Route all fluid and air lines carefully. Avoid pinching and premature wear due to excessive flexing or rubbing. Hose life is directly related to how well they are supported.

Follow the instructions in your separate component manuals to connect air and fluid lines. The following are only general guidelines.

- The PGM gear meter assembly should be installed on the automation unit or in another appropriate place, as close as practical to the dispense valve.

- **For a remote mount dispense valve**, connect a fluid line between the gear meter outlet and the dispense valve. Shorter fluid lines (hoses) will provide better fluid system response.

- See page 4 for list of inlet fittings.

**Fig. 8: Inlet Fitting**

- Air must be clean and dry, between 60-100 psi (0.41-0.68 MPa, 4.14-6.89 bar). Flush air line before plumbing in air filter assembly (234967). Plumb in air filter assembly near air drop site (upstream of PGM). Adding an air regulator to this line will provide more consistent dispense valve response times.

- Connect a 1/4 in. OD air supply line to the inlet port on the PGM air supply inlet.

**NOTE:** To maximize system performance keep the dispense hose length as short as the application will allow.
Install Cable Assemblies

1. Connect servo motor power and feedback cables.
2. Connect pressure transducer cable.
3. Connect dispense valve solenoid cable.

*NOTE:* Models with 15 meter cables include a remote junction box to be mounted in the field.

**Fig. 9: Cable Installation Diagram**
System Setup

Overview

The PGM system compensates for temperature, flow, or pressure fluctuations. However, if there is a hardware change on the supply system or the dispense material is changed, the PGM system must be setup again.

After material is loaded into the supply system, set up the PGM system using the Setup screens. Fig. 10 shows the major system setup steps. The following sub-sections provide instructions to complete each setup step. Once these steps are complete the module is ready for operation.

NOTE: See Appendix A - User Interface Display on page 82 for detailed operating instructions for each user interface screen.
Configure Control Settings

Set the controls for the dispense source, how dispense commands are sent, and auto mode settings.

1. From the Home screen, select the Setup icon.

   ![Setup Icon]

   NOTE: The Setup screens are password protected. Enter password “PGM17” to access the following screens.

2. Select Display or Remote from the Command Value Source Options.

3. If Command Value Source is set to Remote, enter the Remote Max Flow (cc/min) for the 10 VDC command source.

4. Select Enable or Disable for Run Mode Bead Adjust Options. Default is Disable.

5. Select Display or Remote for Job End Mode Options.

6. If Job End Mode is set to Display, press Job End Delay Display field and enter desired delay time in seconds.

Configure Mode Settings

Set the dispense mode (bead or shot). The bead scale and pre-charge are also adjustable from the Mode Settings screen.

NOTE: See Appendix A - User Interface Display on page 82 for a description of each feature.

1. With the system in setup mode, press to navigate to the Mode Settings screen.

2. Select Bead or Shot for the Dispense Mode.

3. If Command Value Source is set to Display, enter the flow rate in cc/min in the Fixed Command Flow Rate. See Configure Control Settings for instructions to set the Command Value Source value.

4. If Shot Time is displayed, enter the Shot Time in Seconds.

   NOTE: Shot Time is only displayed if Dispense Mode is set to Shot.
Configure Delay Settings

Set on and off delays (in milliseconds) for the dispense valve.

1. With the system in setup mode, press 3 to navigate to the Delay Settings screen.

2. Press the On Delay field and enter a desired delay value in milliseconds. Default is zero milliseconds.

3. Press the Off Delay field and enter a desired value in milliseconds. Default is zero milliseconds.

Adjust Pressure Sensors

Set pressure offsets and pressure limits.

1. With the system in setup mode, press 5 to navigate to the Pressure Sensor screen.

2. Set the desired offset for the inlet and outlet pressures. Remove all pressure on the sensors, and then adjust the offset so the measured value reads 0.

   NOTE: Offsets are set at the factory.

3. Set the desired minimum and maximum pressure limits for the inlet and outlet.

   NOTE: These values may need changed after the system has gone through the Startup procedure.
Configure Errors

Set the error type (error or deviation) that will be issued if the pressure or drive torque goes outside the set high and/or low limits. See Appendix A - User Interface Display on page 82 for information on the purpose of each error type.

**NOTE**: When an alarm is set to Error the machine will be disabled when the alarm occurs.

1. With the system in setup mode, press 6 to navigate to the Errors screen.

2. Select Enable or Disable for the Error Reset.

3. Select Error or Deviation for the Inlet Pressure.

4. Select Error or Deviation for the Outlet Pressure.

5. Select Error or Deviation for the Drive Torque.
Operation

Startup

Initial Startup
1. Ensure the PGM control enclosure and all of the proper connections to and from the control enclosure have been made. Ensure fittings are tight.

2. Read and understand the Operation and User Interface sections of this manual along with the related manuals.

3. Continue startup with Step 2 in Standard Startup.

Standard Startup
1. Carefully inspect the entire system for signs of leakage or wear. Replace or repair any worn or leaking components before operating the system.

2. Press the Stop button on the control enclosure.

3. Turn on air and electrical power to the system.

4. Turn on the main power to supply power to the PGM.

5. Check Interface Signals: If this is a new installation, power on each system input and verify that each input is being received. See Appendix B - I/O on page 98.

6. For heated systems, open the dispense valve over a waste container while the system is heating up. This will prevent a pressure build-up caused by fluids or gases expanding from the heat.

7. Turn on the material supply system.

Load Material
Before using the system, material must be loaded into the supply system.

1. If this is a new installation, follow the Initial Startup procedure. Otherwise, follow the Standard Startup procedure.

2. Turn on the fluid supply pressure to the fluid inlet block for the PGM.

3. Place the dispense valve over a waste container.


5. Select Manual Control Mode.

6. Enter the minimum flow rate to prime the system. See the following table.

<table>
<thead>
<tr>
<th>Pump Size cc / revolution</th>
<th>Min Flow Rate cc / minute</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>12</td>
</tr>
<tr>
<td>20</td>
<td>40</td>
</tr>
</tbody>
</table>

7. Press and hold the manual start button. Dispense fluid until clean, air-free fluid flows from the dispense valve.

   NOTE: The manual purge button on the user-interface panel can be used to prime the system.

8. If desired, press to navigate to the Home screen.
Maintenance Mode Operation
Operating from maintenance mode enables the pump to begin dispensing when the user presses .

Dispense parameters and duration depend on the selected control.

Verify System Operation
Use maintenance mode to manually check the operation of the PGM system components before switching over to automation control (normal operation).

NOTE: Perform any of the following procedures while in maintenance mode.

Set Inlet Pressure
The inlet pressure reading should be in the range of 300 psi (2.1 MPa, 21 bar) to 1500 psi (10.3 MPa, 103 bar). The recommended inlet pressure should be 500 psi (3.4 MPa, 34 bar) lower than the outlet pressure.

Follow steps in the supply system manual to set the inlet pressure.

NOTICE
Excessive inlet pressure will cause accelerated wear on the gear meter seals and the pump feed system.

Feed System Pressure Drop
During material flow, the PGM inlet pressure decreases. The amount the pressure decreases is the amount of pressure lost between the feed pump and the PGM inlet.

With high viscosity fluids, long line lengths, or small diameter line sizes this pressure decrease can be thousands of psi (hundreds of bar). This means that the static pump pressure is set much higher than the PGM needs at its inlet. To prevent excessive static pressure at the inlet of the PGM, a dynamic regulator is recommended on air motor supply air. During dispense the normal pump regulator is active. During a stalled condition the dynamic regulator is active.

Dispense Weight Verification
1. From maintenance screen, select Shot mode.
2. Enter a 10 second shot time.
3. Enter the desired flow rate.
4. Record a minimum of 5 shot weights.
5. If shot weights are inconsistent check feed pressure or reduce flow rate and repeat shot test.

NOTE: Regular weight checks are recommended to ensure system is performing properly.
Calibration

1. Perform **Startup** procedure, page 22. Verify all system components are at desired pressures and temperatures. Adjust as desired.

2. Navigate to the Calibrate screen. See **Screen Navigation Diagram** on page 82 in the **Appendix A - User Interface Display** section.

**NOTE:** PGM systems are calibrated at the factory. Perform calibration after pump maintenance or during troubleshooting (see page 29 for troubleshooting matrix).

3. Press the Enable Calibration button.

4. Weigh one disposable container and tare the scale.

5. Place container below dispense tip.

6. Press the Start Low Speed Calibration button.

7. Weigh the container.

8. Divide the weight of the dispensed material by the specific gravity to determine the volume.

9. Enter the volume into the Low Speed Calibration Actual Volume input box.

10. Weigh a second disposable container and tare the scale.

11. Place container below dispense nozzle.

12. Press the Start High Speed Calibration button.

13. Weigh the container.

14. Divide the weight of the dispensed material by the specific gravity to determine the volume.

15. Enter the volume into the High Speed Calibration Actual Volume input box.

16. Press the Done button.

17. If desired, press to navigate to the Main screen.
Dispense from Maintenance Screen


2. Select Manual Control Mode.

3. Select Bead or Shot from the Manual Mode Option.

Manually Dispense Fluid

1. Press and verify the dispense valve opens.

2. Continue to press as long as needed to load or dispense material. Release to stop dispensing.

3. If desired, press to navigate to the Home screen.

Automation Control (Normal) Operation

During automation control (normal operation) the PGM automatically dispenses when it receives a command from the automation unit.

NOTE: See Appendix B - I/O on page 98.

To enter Auto mode, select Auto (A) Control Mode.

Typical Automation Cycle

In order for the system to run it must be in Auto mode. Before a cycle begins the robot outputs should have the following values:

- Job Complete: 0
- Dispense Trigger: 0

A typical cycle consists of the following dispensing sequence.

1. The robot checks that Dispenser Ready signal is set to On (High). If On, a cycle can begin.

2. If command source is set to Remote, robot sends 0-10 VDC Flow Rate signal.

NOTE: See Setup Screen 1 information in the Appendix A - User Interface Display section beginning on page 82.

3. Robot turns on dispense trigger.

4. PGM turns on In Cycle.

5. Robot removes dispense trigger.

6. If Job Complete is set to Remote, robot turns on Job Complete.

7. Robot removes Job Complete before starting the next cycle.

NOTE: In the event of a deviation alarm, the Dispense Ready signal will remain on along with the alarm signal. In the event of an error alarm, the Dispense Ready signal will turn off and the alarm signal will remain on.
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, follow the Pressure Relief Procedure when you stop dispensing and before cleaning, checking, or servicing the equipment.

1. Shut off the fluid supply to the PGM inlet block.

2. If equipped, place a waste container beneath the fluid drain valve under the filter.

3. Place a waste container beneath the dispense valve.

4. Slowly open the drain valve at each fluid filter to relieve fluid pressure. Close valve when pressure gauge reads zero.


6. Perform the following steps to perform a low flow dispense:
   a. From the Mode drop-down menu, select Bead mode.
   b. Enter the minimum flow rate for your system. For example, 12 cc/min or 40 cc/min depending on the size of the gear meter.
   c. Press Manual Start or the Purge button on the control enclosure to begin the low flow dispense.
   d. Continue to dispense until the inlet pressure on the PGM is near zero.
   e. Visually locate the plug installed at the back of the inlet block.
   f. Place a container under the plug and slowly remove the plug to relieve remaining inlet pressure.

7. In maintenance mode, select Open Dispense Valve Control mode, which opens the dispense valve. Press the manual dispense button until fluid flow stops.
8. If the dispense device cannot be actuated from the control center, refer to Fig. 16 and perform the following steps to open the dispense valve and relieve fluid pressure:

   a. Manually actuate the plunger on the solenoid, that opens the dispense valve to relieve fluid pressure. Refer to Fig. 16.

   b. Continue actuating the plunger until all pressure is purged from the system between the needle and dispense valve before proceeding to the next step.

9. If you suspect that a valve, hose, or dispense nozzle is clogged or that pressure has not been fully relieved:

   a. Very slowly remove the dispense tip, clean the orifice, and continue relieving pressure as described in steps 6-8.

   b. If this does not remove the obstruction, very slowly loosen the hose end coupling to relieve pressure gradually, then loosen the coupling completely. Clear the valves or hose. Do not pressurize the system until the blockage is cleared.

10. Shut off power and air to the fluid supply system.

Fig. 16: Dispense Valve Air Solenoid
Shutdown

1. Press the Stop button. See Fig. 17.

2. Shut off the material supply to the gear meter/meter.


4. For heated systems, open the dispense valve over a waste container while the system is cooling down. This will prevent a pressure build-up caused by fluids or gases expanding from the heat.

5. Shut off power and air to the fluid supply system.

6. Turn off the main power supply.

Fig. 17: Stop Button
Troubleshooting

NOTE: Check all possible solutions in the chart below before you disassemble the system.

Refer to Supply Systems manual for additional troubleshooting; refer to Related Manuals on page 3. Also refer to Error Codes and Troubleshooting, page 32.

PGM Fluid Assembly

<table>
<thead>
<tr>
<th>Problem</th>
<th>Cause</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Inlet Pressure</td>
<td>No air pressure on supply system</td>
<td>Verify supply system pressure</td>
</tr>
<tr>
<td></td>
<td>Leak in supply system</td>
<td>Check supply lines and connections</td>
</tr>
<tr>
<td></td>
<td>False signal being sent to control</td>
<td>Check inlet pressure sensor output; verify that it corresponds to zero pressure; replace sensor and/or amplifier</td>
</tr>
<tr>
<td></td>
<td>Leak at PGM drive shaft</td>
<td>Replace drive shaft seals</td>
</tr>
<tr>
<td>No Outlet Pressure</td>
<td>Dispense motor not rotating</td>
<td>Refer to Error code section of the manual; Cycle power and perform startup</td>
</tr>
<tr>
<td></td>
<td>Dispense Off delay set too long</td>
<td>Verify Dispense valve delays in setup screens</td>
</tr>
<tr>
<td></td>
<td>Dispense valve solenoid stuck open</td>
<td>Verify function of dispense valve</td>
</tr>
<tr>
<td></td>
<td>False signal being sent to control</td>
<td>Check outlet pressure sensor output; verify that it corresponds to zero pressure; replace sensor and/or amplifier</td>
</tr>
<tr>
<td>High Outlet Pressure</td>
<td>Blocked dispense tip</td>
<td>Replace dispense tip</td>
</tr>
<tr>
<td></td>
<td>Flow rate too high for application</td>
<td>decrease flow rate</td>
</tr>
<tr>
<td></td>
<td>Dispense valve On delay set too long</td>
<td>Verify Dispense valve delays in setup screens</td>
</tr>
<tr>
<td></td>
<td>Dispense valve solenoid stuck closed</td>
<td>Verify function of dispense valve</td>
</tr>
</tbody>
</table>
## Troubleshooting

### Dispense Valves

<table>
<thead>
<tr>
<th>Problem</th>
<th>Cause</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Valve not opening</td>
<td>Air not getting to open port</td>
<td>Verify air pressure solenoid</td>
</tr>
<tr>
<td></td>
<td>No Dispense Trigger signal from automation unit</td>
<td>Check input from automation unit</td>
</tr>
<tr>
<td>Valve not shutting off</td>
<td>Air not getting to close port (except AutoPlus valve)</td>
<td>Verify air pressure to solenoid</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Verify solenoid operation</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Verify air line routing and connections</td>
</tr>
<tr>
<td></td>
<td>Dispense Trigger signal from automation unit is on</td>
<td>Check input from automation unit</td>
</tr>
<tr>
<td>Sluggish open/close</td>
<td>Air pressure low</td>
<td>Verify air pressure is above 60 psi (0.4 MPa, 4 bar)</td>
</tr>
<tr>
<td></td>
<td>Needle/seat worn</td>
<td>Rebuild valve; replace needle/seat</td>
</tr>
<tr>
<td></td>
<td>Pressurized material past the valve shut-off is escaping</td>
<td>Reduce running pressure</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Reduce nozzle length</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Increase nozzle orifice size</td>
</tr>
<tr>
<td>Material leaks from back of valve</td>
<td>Shaft seal is worn</td>
<td>Rebuild valve; replace seals</td>
</tr>
<tr>
<td>Air leaks from dispense valve</td>
<td>Loose air connections</td>
<td>Check air connections; tighten if necessary</td>
</tr>
<tr>
<td></td>
<td>Worn piston o-ring</td>
<td>Rebuild valve; replace piston o-ring</td>
</tr>
</tbody>
</table>
Errors

View Errors

Errors can be viewed from the Home screen or from the Alarm View screen.

There are three levels of errors: alarms, deviations, and advisories. Alarms are critical and require immediate correction; therefore the system automatically shuts down. Deviations are important and require attention but not immediately. Advisories are not critical but still require attention.

NOTE:

- Errors set the dispenser ready signal LOW.
- Advisories and deviations do not set the dispenser ready signal LOW.

Diagnose Errors

See Error Codes and Troubleshooting for valid error codes, possible causes, and solutions.

Clear Errors and Reset Control Unit

From the Alarm View screen, perform the following steps to clear an error before restarting the control unit:

1. Press Acknowledge All List
2. Press Clear All Alarms

NOTE: Acknowledging alarms does not clear them.

NOTE: See the Configure Errors section on page 21.
# Error Codes and Troubleshooting

<table>
<thead>
<tr>
<th>Error No.</th>
<th>Error Name</th>
<th>Error Description</th>
<th>Error Type</th>
<th>Cause</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1</strong></td>
<td>Control Power Off</td>
<td>Control power has been removed</td>
<td>Advisory</td>
<td>Stop button or E-stop</td>
<td>Press Control Power button</td>
</tr>
<tr>
<td><strong>2</strong></td>
<td>Inlet Pressure Deviation</td>
<td>Inlet material pressure outside limits</td>
<td>Deviation</td>
<td>Feed pressure set too high or too low. Limits are not set correctly</td>
<td>Verify pressure limits in Setup Screen 5. Verify supply pressures during dispense.</td>
</tr>
<tr>
<td><strong>3</strong></td>
<td>Inlet High Pressure Error</td>
<td>Inlet material pressure above max limit</td>
<td>Alarm</td>
<td>Feed pressure too high. Limits are not set correctly</td>
<td>Verify pressure limits in Setup Screen 5. Verify supply pressures during dispense.</td>
</tr>
<tr>
<td><strong>4</strong></td>
<td>Inlet Low Pressure Error</td>
<td>Inlet material pressure below min limit</td>
<td>Alarm</td>
<td>Feed pressure too low. Limits are not set correctly</td>
<td>Verify pressure limits in Setup Screen 5. Verify supply pressures during dispense.</td>
</tr>
<tr>
<td><strong>5</strong></td>
<td>Outlet Pressure Deviation</td>
<td>Outlet material pressure outside limits</td>
<td>Deviation</td>
<td>Back pressure is too high or too low. Limits are not set correctly</td>
<td>Verify pressure limits in Setup Screen 5. Verify outlet pressures during dispense.</td>
</tr>
<tr>
<td><strong>6</strong></td>
<td>Outlet High Pressure Error</td>
<td>Outlet material pressure above max limit</td>
<td>Alarm</td>
<td>Back pressure is too high. Limits are not set correctly</td>
<td>Verify pressure limits in Setup Screen 5. Verify outlet pressures during dispense.</td>
</tr>
<tr>
<td><strong>7</strong></td>
<td>Outlet Low Pressure Error</td>
<td>Outlet material pressure below min limit</td>
<td>Alarm</td>
<td>Outlet pressure too low. Limits are not set correctly</td>
<td>Verify pressure limits in Setup Screen 5. Verify outlet pressures during dispense.</td>
</tr>
<tr>
<td><strong>8</strong></td>
<td>Inlet Max Pressure Fault - Relieve Pressure and Cycle Power</td>
<td>Inlet material pressure exceeds max rated pressure</td>
<td>Alarm</td>
<td>Feed system pressure is set too high. Pressure sensor damaged.</td>
<td>Perform pressure relief procedure. Change inlet supply pressure. Cycle power; Verify Pressure sensor is working properly.</td>
</tr>
<tr>
<td>Error No.</td>
<td>Error Name</td>
<td>Error Description</td>
<td>Error Type</td>
<td>Cause</td>
<td>Solution</td>
</tr>
<tr>
<td>----------</td>
<td>-----------------------------------------------</td>
<td>------------------------------------------------------------------------</td>
<td>------------</td>
<td>----------------------------------------------------------------------</td>
<td>--------------------------------------------------------------------------</td>
</tr>
<tr>
<td>9</td>
<td>Outlet Max Pressure Fault - Relieve Pressure and Cycle Power</td>
<td>Outlet material pressure exceeds max rated pressure</td>
<td>Alarm</td>
<td>Dispense valve not opening. Flow rate too high. Material not at temperature.</td>
<td>Perform pressure relief procedure; Cycle Power; Verify Dispense valve function; Perform weight check verification; Reduce flow rate.</td>
</tr>
<tr>
<td>10</td>
<td>Drive Torque Deviation</td>
<td>Motor exceeds continuous rated torque</td>
<td>Deviation</td>
<td>Flow rate too high. Dispense Valve not opening. Material not at temperature.</td>
<td>Lower flow rate; reduce outlet pressure drop; Verify material temperature.</td>
</tr>
<tr>
<td>11</td>
<td>Drive Torque Error</td>
<td>Motor exceeds continuous rated torque</td>
<td>Alarm</td>
<td>Flow rate too high. Dispense Valve not opening. Material not at temperature.</td>
<td>Lower flow rate; reduce outlet pressure drop; Verify material temperature.</td>
</tr>
<tr>
<td>12</td>
<td>Drive Peak Torque Error - Drive disabled, Cycle Power</td>
<td>Motor exceeds peak torque rating</td>
<td>Alarm</td>
<td>Flow rate too high. Dispense Valve not opening. Material not at temperature.</td>
<td>Cycle Power Lower flow rate; reduce outlet pressure drop; Verify material temperature.</td>
</tr>
<tr>
<td>13</td>
<td>Pre-Charge Timeout</td>
<td>Pre-Charge Pressure was not reached after dispense</td>
<td>Advisory</td>
<td>Pre-Charge value not set correctly.</td>
<td>Set Pre-Charge to zero. Monitor outlet pressure; Adjust Pre-Charge pressure.</td>
</tr>
<tr>
<td>14</td>
<td>High Pressure Interlock OFF</td>
<td>Pressure limit is bypassed</td>
<td>Advisory</td>
<td>Pressure sensors are disabled.</td>
<td>Contact Graco customer service.</td>
</tr>
<tr>
<td>15</td>
<td>Dispense Valve Open (Auto Default)</td>
<td>Dispense valve is open</td>
<td>Advisory</td>
<td>Dispense valve open button has been selected.</td>
<td>From the Maintenance screen select Dispense valve Auto.</td>
</tr>
<tr>
<td>16</td>
<td>Calibration is enabled complete calibration procedure</td>
<td>Calibration mode enabled</td>
<td>Advisory</td>
<td>Calibration enabled selected from the calibrate screen.</td>
<td>Complete calibration procedure.</td>
</tr>
<tr>
<td>17</td>
<td>Drive Fault, Cycle Power</td>
<td>Motor drive is disabled</td>
<td>Alarm</td>
<td>Various conditions.</td>
<td>Cycle Power verify motor torque during dispense.</td>
</tr>
<tr>
<td>18</td>
<td>Calibration out of range</td>
<td>Calibration values are out of range or flow rate is too low for current K factor</td>
<td>Advisory</td>
<td>Improper calibration, flow rate too low, or pump wear.</td>
<td>Perform calibration procedure.</td>
</tr>
</tbody>
</table>
Prior to performing any maintenance procedures, follow the **Pressure Relief Procedure** on page 26.

### Maintenance Schedule

The following tables list the recommended maintenance procedures and frequencies to operate the equipment safely. The maintenance is divided between mechanical and electrical tasks. Maintenance must be performed by trained personnel per this schedule to assure safety and reliability of the equipment.

#### Mechanical

<table>
<thead>
<tr>
<th>Task</th>
<th>Daily</th>
<th>Weekly</th>
<th>Monthly</th>
<th>3-6 months or 125,000 cycles</th>
<th>18-24 months or 500,000 cycles</th>
<th>36-48 months or 1,000,000 cycles</th>
<th>As Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inspect system for leaks</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Depressurize fluid, after operation</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Remove heat from system, after operation</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inspect filter (234967) bowls and drain</td>
<td></td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Check hoses for wear</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Check/tighten fluid connections</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Check/tighten air connections</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lubricate dispense valves*</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Replace gear meter seals</td>
<td></td>
<td></td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rebuild dispense valve*</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Replace air filter</td>
<td></td>
<td></td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Replace Solenoid</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>Replace gear meter drive shaft</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>Replace gear head</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>✓</td>
</tr>
</tbody>
</table>

* Check component manual for more detailed maintenance information.

#### Electrical

<table>
<thead>
<tr>
<th>Task</th>
<th>Weekly</th>
</tr>
</thead>
<tbody>
<tr>
<td>Check cables for wear</td>
<td>✓</td>
</tr>
<tr>
<td>Verify cable connections</td>
<td>✓</td>
</tr>
<tr>
<td>Verify operation of “System Stop” button</td>
<td>✓</td>
</tr>
</tbody>
</table>

* Check Component Manual for more detailed maintenance information.
Repair

NOTE: Refer to Parts section beginning on page 49 for part reference number identification.

Gear Meter Assembly

This section describes how to remove and replace components on the gear meter assembly.

Prepare Gear Meter Assembly for Repair

2. Disconnect main power at the control box.
3. If present, remove power from the heat control.
4. Remove servo power cable and servo feed back cable. See gear meter assembly parts; see Parts section starting on page 49.
5. Remove heat cables.
6. Remove pressure transducer cables and dispense valve cable.
7. Remove supply air pressure from solenoid.
8. Remove front guard.
9. Remove material hoses if necessary.

Replace Servo Motor or Gear Head

Replacing either the Servo Motor or Gear Head requires the following procedure.

Remove Servo Motor and Gearhead

1. Prepare gear meter assembly for repair.
2. Remove support gussets (9, 1106).
3. Remove bolts (1, 1103) connecting top mounting plate (8, 1105) to vertical mounting plate (10, 1107).
4. Remove servo motor, gear head, and top plate. Coupling (303, 1203) will separate.
5. Remove coupling half.
6. Remove 4 screws (3, 1110) that mount to plate to gear head.
7. Remove gear head coupling covers (302a, 1202a).
8. Loosen gearhead coupling on gearhead shaft.
9. Remove 4 bolts connecting servo motor to gearhead.
10. Remove servo motor from gear head.
Install Servo Motor or Gearhead

1. Remove key from motor shaft.

**NOTICE**

Use caution when handling servo motor to prevent damage. Do not use tools that could cause damage.

2. Slide the gear head, bushing into the drive coupling and align slots in drive coupling and bushing. See Fig. 19.

3. Rotate the drive coupling to align clamping bolts with access holes.

4. Place motor on work surface with motor shaft facing straight up then mount the gear head. Mounting the gear head in any other orientation will usually lead to misalignment and excessive noise.

5. Pre-torque drive coupling to the following torque:

<table>
<thead>
<tr>
<th>Pump Size (cc / revolution)</th>
<th>Torque, in-lb (N•m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>2 (.2)</td>
</tr>
<tr>
<td>20</td>
<td>4 (.4)</td>
</tr>
</tbody>
</table>

6. Bolt gear head to the motor with fasteners provided.

7. Final torque drive coupling to the following torque in three steps increasing torque each time.

<table>
<thead>
<tr>
<th>Pump Size (cc / revolution)</th>
<th>Torque, in-lb (N•m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>39 (4.4)</td>
</tr>
<tr>
<td>20</td>
<td>76 (8.5)</td>
</tr>
</tbody>
</table>

8. Do not tighten coupling to gear head output shaft until drive assembly is mounted in frame.

   **NOTE:** Orient servo motor so that the motor connections do not interfere with material inlet hose.

9. Install gussets with shoulder bolts (5, 1104).
Remove Coupling

1. Prepare Gear Meter Assembly for Repair, page 35.

2. Remove support gussets (9, 1106).

3. Remove bolts (1, 1103) connecting top mounting plate (8, 1105) to vertical mounting plate (10, 1107).

4. Remove servo motor, gear head, and top plate.

5. Loosen clamping bolts on each side of coupling and remove coupling.

NOTE: Pump shaft key may fall out during coupling removal. Secure pump shaft key until coupling is replaced.

Install Coupling

4. Slide drive coupling so it is evenly spaced between pump and gearhead. Both sides of coupling should slide easily on each shaft. If coupling does not slide freely, loosen pump bolts (103, 1303) and align pump until coupling moves freely. Tighten pump to pump block to 430-480 in-lb (48.58-54.23 N•m).

5. Separate coupling until proper gap is created. Fig. 21. See the following table.

<table>
<thead>
<tr>
<th>Pump Size</th>
<th>Gap (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>18</td>
</tr>
<tr>
<td>20</td>
<td>20</td>
</tr>
</tbody>
</table>

4. Slide drive coupling so it is evenly spaced between pump and gearhead. Both sides of coupling should slide easily on each shaft. If coupling does not slide freely, loosen pump bolts (103, 1303) and align pump until coupling moves freely. Tighten pump to pump block to 430-480 in-lb (48.58-54.23 N•m).

5. Separate coupling until proper gap is created. Fig. 21. See the following table.

<table>
<thead>
<tr>
<th>Pump Size</th>
<th>Torque, in-lb (N•m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>132 (15)</td>
</tr>
<tr>
<td>20</td>
<td>309 (35)</td>
</tr>
</tbody>
</table>

7. Install gussets with shoulder bolts (5, 1104).
Remove Dispense Valve

1. **Prepare Gear Meter Assembly for Repair,** page 35.
2. Manually actuate solenoid to ensure pressure has been removed.
3. Verify air supply is off.
4. Remove air lines from dispense valve.
5. Remove four dispense valve mounting bolts and remove dispense valve.

**NOTE:** For remote mount dispense valves, remove supply hose at inlet block of dispense valve.
6. Refer to dispense valve manual for complete dispense valve repair instructions; refer to Related Manuals on page 3.

Install Dispense Valve

1. For direct mounted dispense valves, replace o-ring (409) if necessary.
2. Align dispense valve with mounting pins on front block.
3. Install four mounting bolts (408) torque to 50-60 in-lb (5.6-6.7 N•m).
4. Connect air lines.
5. Apply air to the solenoid.
6. Manually shuttle solenoid, see Fig. 22. Verify dispense valve is open when solenoid is depressed.

Replace Solenoid

1. **Prepare Gear Meter Assembly for Repair,** page 35.
2. Disconnect solenoid cable. Remove mating screws (405) from gusset.
3. Remove the dispense valve solenoid (410) and replace it with a new solenoid.
4. Reconnect solenoid cable.

Gear Meter O-Ring Replacement

Refer to Parts section starting on page 49 for o-ring kits.

1. **Prepare Gear Meter Assembly for Repair,** page 35.
2. Remove pump block shoulder bolts (4, 1102). See Fig. 23.

---

**NOTICE**

Pump section should be fully supported to prevent damage being dropped. It is recommended that the gear meter assembly be located on a work bench for service.
3. Remove drive assembly. See Fig. 23.

4. Perform **Remove Dispense Valve** procedure.

5. Loosen 4 bolts (407) and remove front block (412).

6. Loosen 4 bolts and remove inlet block (110, 1302).

7. Loosen pump bolts (3, 1303) and remove pump (108, 1309).

8. Replace front block o-ring (105, 1305).

9. Install front block (412) onto pump block (109, 1308).

10. Replace inlet block o-ring (107, 1306).

11. Install inlet block (102, 1302) onto pump block.

12. Replace pump block o-rings (106, 104; 1304). See Fig. 24.

13. Place pump (109, 1308) onto pump block. Install bolts (103, 1303) and tighten to 430 in-lb (48.58 N•m).

14. Locate drive assembly on top of pump assembly.

15. Tighten pump block mounting shoulder bolts to frame (4, 1102).

16. Replace all electrical connections and fluid connections before applying fluid pressure and power.

* Provided in o-ring kit 24E626.
PGM-6 Pump Repair

† Parts included in kit 24E607.
◆ Parts included in kit 24E827.
★ Parts included in kit 24E826.
PGM-6 Pump Disassembly

1. Prepare Gear Meter Assembly for Repair, page 35.

2. Refer to Gear Pump Maintenance Guide on page 47 for special notes regarding gear pump repair.

3. Remove four pump block shoulder bolts (1102).

4. Remove drive assembly. See Fig. 23.

5. Remove seal retainer fasteners (1614) and seal retainers (1611).

6. Remove pump dowel pins (1610) using an arbor press.

7. Remove the pump plate screws (1613).

8. Separate the pump front plate (1601), gear case (1602) and back plate (1603).

9. To remove the drive shaft (1605) from the bottom plate (1603) press the shaft and gear from the bottom pump plate towards the coupling end.

10. To remove the drive gear (1607) from the drive shaft (1605), support the drive gear at the lower end to allow the shaft to be pressed through the gear from the top or coupling end. Make sure to leave clearance for the drive key.

11. The stud (1606) for the driven gear (1608) is press fit into the back plate (1603) and need not be removed if not worn.

12. Clean all components thoroughly before reassembly. The use of an ultrasonic cleaner is recommended.

NOTE: Notches on the pump plates can be used to separate the plates.

NOTICE

Pump section should be fully supported to prevent damage being dropped. It is recommended that the gear meter assembly be located on a work bench for service.

NOTICE

Thicker materials may require heating prior to disassembly. Do not expose the pump to thermal shock. Raise temperature at a maximum rate of 180°F (100°C) per hour. Do not exceed 400°F (204°C). Exceeding this temperature could promote leakage in the pump. Gradually cool the pump to room temperature.

NOTICE

Do not use a hammer to remove dowel pins as this will damage the pump.

NOTICE

The PGM pump design relies on a lap fit between components for performance and sealing. Be careful not to drop the gears (1607, 1608) or damage the mating surfaces of the pump plates (1601, 1603) and gear case (1602). To prevent damage, do not use pliers or screwdrivers to remove the gears.
PGM-6 Pump Assembly

1. Place the back plate (1603) on a table inside facing up.

2. Place the driven gear (1608) on its stud (1606).

3. Place gear case (1602) onto back plate (1603). Check orientation of dowel pin holes to assure they align with the ones in the back plate.

4. Slide drive gear (1607) onto drive shaft (1605). Verify shaft key (1609) is installed properly.

5. Install drive gear (1607) and drive shaft (1605) into back plate (1603).

6. Position top plate (1601) over drive shaft (1605) and place onto gear case (1602).

7. Rotate the gears several times to ensure free rotation.

8. Insert the dowel pins (1610) and rotate the gears several times to ensure free rotation.

NOTE: Dowel pins are not a press fit and may be installed using a plastic hammer if necessary.

9. Install pump plate screws (1613) and tighten to 85-105 in-lb (9.6-11.8 N•m).

10. Rotate the gears several times to ensure free rotation.

11. Apply a heat resistant, non-evaporating lubricant to the seal area of the drive shaft (1605).

12. Install new seals (1612). See Fig. 26 and Fig. 27.

13. Install seal retainers (1611) and seal retainer screws (1614). Tighten screws to 85-105 in-lb (9.6-11.8 N•m).

14. Align pump shaft key and slide coupling onto pump shaft. Tighten coupling bolt just enough to hold it’s position.

15. Attach servo motor, gear head, and top plate to pump assembly. See Fig. 20.

16. Separate coupling until proper gap is created. See Fig. 21.

17. Tighten pump block mounting shoulder bolts to frame (1102).

18. Replace all electrical connections and fluid connections before applying fluid pressure and power.

NOTICE
Do not hammer or force components together or damage may occur. Parts will drop into place if properly cleaned and aligned. Use of a compatible oil is recommended during assembly.
PGM-20 Pump Repair

† Parts included in kit 24E619.
◆ Parts included in kit 24E825.
★ Parts included in kit 24E824.

Fig. 28: PGM-20
PGM-20 Pump Disassembly

1. Prepare Gear Meter Assembly for Repair, page 35.

2. Refer to Gear Pump Maintenance Guide on page 47 for special notes regarding gear pump repair.

3. Remove six pump block shoulder bolts (4).

4. Remove drive assembly. See Fig. 23.

5. Remove seal retainer fasteners (1515), seal retainers (1512), spacers (1510) and (1511).

6. Remove pump dowels (1509) using an arbor press.

7. Remove the pump plate screws (1514).

8. Separate the pump front plate (1501), gear case (1502) and back plate (1503).

NOTE: Notches on the pump plates can be used to separate the plates.

9. To remove drive shaft (1504) from the drive gear (1506) several flat spacers 1/8 in. (3 mm) thick will be needed. These will provide clearance for the drive shaft key (1508) and the top plate (1501).

10. Support pump top plate (1501) and press drive shaft (1504) through drive gear (1506). Stop when there is enough clearance between the drive gear (1506) and top plate (1501) to insert one spacer. Be sure to allow clearance for drive key (1508).

11. Continue pressing the drive shaft (1504) and inserting spacers until the shaft is free from the drive gear (1506).

12. The stud (1505) for the driven gear (1507) is press fit into the back plate (1503) and need not be removed if not worn.

13. Clean all components thoroughly before reassembly. The use of an ultrasonic cleaner is recommended.
PGM-20 Pump Assembly

**NOTICE**

Do not hammer or force components together, or damage may occur. Parts will drop into place if properly cleaned and aligned. Use of a compatible oil is recommended during assembly.

1. Place back plate (1503) on a table inside face up.
2. Install the driven gear (1507) on stud (1505).
3. Place gear case (1502) onto back plate (1503). Check orientation of dowel pin holes to assure they align with the ones in the back plate.
4. Place the top plate (1501) on its edge on a table. Pass the drive shaft (1504) through the top plate from the seal side so that the boss on the shaft rests on the top plate.
5. Rotate the drive shaft (1504) to position the drive key slot at the top. Insert the drive key (1508) and driven gear (1506).
6. Grasp the top plate (1501), drive shaft (1504) and driven gear (1506) to prevent them from separating and carefully lower them into position onto the gear case (1502).
7. Rotate the gears several times to ensure free rotation.
8. Insert the dowel pins (1509) and check again for free rotation.

**NOTE:** Dowel pins are not a press fit and may be installed using a plastic hammer if necessary.

9. Install pump plate screws (1514) and tighten to 85-105 in-lb (9.6-11.8 N•m).
10. Rotate the gears several times to ensure free rotation.
11. Apply a heat resistant, non-evaporating lubricant to the seal area of the drive shaft (1504).
12. Install new seals (1513). See Fig. 26 and Fig. 27.
13. Install spacers (1510, 1511), seal retainers, (1512) and seal retainer screws (1515). Tighten screws to 85-105 in-lb (9.6-11.8 N•m).
14. Align pump shaft key and slide coupling onto pump shaft. Tighten coupling bolt just enough to hold it's position.
15. Attach servo motor, gear head, and top plate to pump assembly. See Fig. 20.
16. Separate coupling until proper gap is created. See Fig. 21.
17. Tighten pump block mounting shoulder bolts to frame (4).
18. Replace all electrical connections and fluid connections before applying fluid pressure and power.
Gear Pump Maintenance Guide

Review these guidelines prior to performing any maintenance on the pumps.

- Do not run pump dry.
- Do not pull from a vacuum or negative suction head.
- Do not flush with water or other non-lubricating fluid.
- Do not pump corrosives, abrasives and/or fluids carrying particles that may harm the pump.
- Do not heat or cool pump faster than 180°F (100°C) per hour.
- Do not drop disassembled parts on a hard surfaces and do not let parts knock together.
- Never strike the pump parts with an iron hammer. The parts are designed to drop in place if properly aligned. Use arbor press to insert or remove press fit components.
- Do not use pliers to lift the gears.
- Never use a screwdriver to pry the gears upward.
- Apply clean oil or compatible fluid during assembly.
Installing new heater units and RTD sensors

1. Prepare Gear Meter Assembly for Repair, page 35.

2. Disconnect the power cables from the heaters.

3. Remove two M3 screws to remove the kit from the inlet block.

4. Remove two M6 screws to remove the kit from the pump block.

5. Remove the two M8 heater nuts and M6 sensor nut.

6. Remove the heaters and sensor from the block.

**NOTICE**

The heaters may be difficult to remove and removal depends on the system type. To ensure proper heat transfer and to avoid premature heater failure,

**System with through hole:**
Press out the heater element using an 0.125" (3 mm) diameter pin.

**System without through hole:**
Drill out the heater element using a 5mm (0.203 in.) drill bit. Do not increase the hole diameter.

7. Clean any residue from both heater and sensor ports.

8. Installation is the reverse of removal.
Parts

PGM-20 Mounting Frame

<table>
<thead>
<tr>
<th>Ref</th>
<th>Part</th>
<th>Description</th>
<th>Qty</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>124164</td>
<td>SCREW, shcs, M6-1.0 x 25</td>
<td>4</td>
</tr>
<tr>
<td>2</td>
<td>124165</td>
<td>SCREW, bhcs, M5-0.6 x 10</td>
<td>4</td>
</tr>
<tr>
<td>3</td>
<td>124166</td>
<td>SCREW, bhcs, M6-1.0 x 10</td>
<td>4</td>
</tr>
<tr>
<td>4</td>
<td>124167</td>
<td>SCREW, shoulder, 10x30, M8-1.25</td>
<td>6</td>
</tr>
<tr>
<td>5</td>
<td>124168</td>
<td>SCREW, shoulder, 8 x 6, M6-1.0</td>
<td>8</td>
</tr>
<tr>
<td>8</td>
<td>16D840</td>
<td>PLATE, mounting</td>
<td>1</td>
</tr>
<tr>
<td>9</td>
<td>16D841</td>
<td>GUSSET</td>
<td>2</td>
</tr>
<tr>
<td>10</td>
<td>16D842</td>
<td>PLATE</td>
<td>1</td>
</tr>
<tr>
<td>11</td>
<td>16D843</td>
<td>INSULATOR</td>
<td>1</td>
</tr>
<tr>
<td>12</td>
<td>16V444</td>
<td>GUARD, drive</td>
<td>1</td>
</tr>
</tbody>
</table>
### PGM-20 Lower Assembly Block

![Diagram of PGM-20 Lower Assembly Block]

<table>
<thead>
<tr>
<th>Ref</th>
<th>Part</th>
<th>Description</th>
<th>Qty</th>
</tr>
</thead>
<tbody>
<tr>
<td>101</td>
<td>101970</td>
<td>PLUG, pipe, headless</td>
<td>2</td>
</tr>
<tr>
<td>102</td>
<td>124173</td>
<td>SCREW, M6-1.0 x 90</td>
<td>4</td>
</tr>
<tr>
<td>103</td>
<td>124174</td>
<td>SCREW, M10-1.5 x 75</td>
<td>6</td>
</tr>
<tr>
<td>104†</td>
<td></td>
<td>O-RING</td>
<td>1</td>
</tr>
<tr>
<td>105†</td>
<td></td>
<td>PACKING, o-ring</td>
<td>1</td>
</tr>
<tr>
<td>106†</td>
<td></td>
<td>PACKING, o-ring</td>
<td>1</td>
</tr>
<tr>
<td>107†</td>
<td></td>
<td>PACKING, o-ring</td>
<td>1</td>
</tr>
<tr>
<td>108*</td>
<td>16D827</td>
<td>METER, gear, precision, 20cc/rev</td>
<td>1</td>
</tr>
<tr>
<td>109</td>
<td>16D915</td>
<td>BLOCK, pump, mounting</td>
<td>1</td>
</tr>
<tr>
<td>110</td>
<td>16D916</td>
<td>BLOCK, inlet, PGM</td>
<td>1</td>
</tr>
<tr>
<td>111†</td>
<td></td>
<td>DRIVE KEY</td>
<td>1</td>
</tr>
</tbody>
</table>

† Part included in o-ring kit 24E626, or drive key kit 25E205.

* For part breakdown and repair kits, refer to PGM-20 Pump Repair, page 44.
PGM-20 Pump Heat Kit

\[\text{Ground location.}\]

<table>
<thead>
<tr>
<th>Ref</th>
<th>Part</th>
<th>Description</th>
<th>Qty</th>
</tr>
</thead>
<tbody>
<tr>
<td>201</td>
<td>117764</td>
<td>SENSOR, pressure</td>
<td>2</td>
</tr>
<tr>
<td>202</td>
<td>24E412</td>
<td>KIT, heat, pump, PGM-20</td>
<td>1</td>
</tr>
<tr>
<td>203</td>
<td>24E413</td>
<td>KIT, heat, PGM, inlet</td>
<td>1</td>
</tr>
<tr>
<td>204</td>
<td>125363</td>
<td>LABEL, heat/burn, warning</td>
<td>2</td>
</tr>
<tr>
<td>205</td>
<td>16D923</td>
<td>INSULATOR</td>
<td>1</td>
</tr>
<tr>
<td>206</td>
<td>124175</td>
<td>SCREW</td>
<td>3</td>
</tr>
</tbody>
</table>

\[\text{Replacement Danger and Warning labels, tags, and cards are available at no cost.}\]
PGM Drive - 20 cc Pump

<table>
<thead>
<tr>
<th>Ref</th>
<th>Part</th>
<th>Description</th>
<th>Qty</th>
</tr>
</thead>
<tbody>
<tr>
<td>301</td>
<td>16D947</td>
<td>MOTOR, PGM drive, servo, 4 frame</td>
<td>1</td>
</tr>
<tr>
<td>302</td>
<td>16D946</td>
<td>GEAR REDUCER, PGM drive, 50:1, 80mm frame</td>
<td>1</td>
</tr>
<tr>
<td>302a</td>
<td></td>
<td>COVER</td>
<td>1</td>
</tr>
<tr>
<td>303</td>
<td>16D945</td>
<td>COUPLING, PGM drive, 18x20mm</td>
<td>1</td>
</tr>
<tr>
<td>304†</td>
<td></td>
<td>DRIVE KEY</td>
<td>1</td>
</tr>
</tbody>
</table>

† Part included in drive key kit 25E205.
# EnDure Dispense Valve Fix Mounted

<table>
<thead>
<tr>
<th>Ref</th>
<th>Part</th>
<th>Description</th>
<th>Qty</th>
</tr>
</thead>
<tbody>
<tr>
<td>401</td>
<td>597151</td>
<td>FITTING, elbow, 1/4 tube x 1/8 NPT, male</td>
<td>1</td>
</tr>
<tr>
<td>402</td>
<td>117820</td>
<td>SCREW, cap, socket head, M3</td>
<td>2</td>
</tr>
<tr>
<td>403</td>
<td>124200</td>
<td>SCREW, socket head cap screw, M6-1.0 x 30, stainless steel</td>
<td>4</td>
</tr>
<tr>
<td>404</td>
<td>124201</td>
<td>SCREW, socket head cap screw, M5-0.8 x 60, stainless steel</td>
<td>4</td>
</tr>
<tr>
<td>405</td>
<td>116768</td>
<td>PACKING, o-ring</td>
<td>1</td>
</tr>
<tr>
<td>406</td>
<td>124403</td>
<td>FITTING, adapter, 1/8 NPTM x 03 JICM, mild steel</td>
<td>4</td>
</tr>
<tr>
<td>407</td>
<td>124405</td>
<td>SWIVEL, elbow, 90 deg, 03 JICF x 03 JICM, mild steel</td>
<td>2</td>
</tr>
<tr>
<td>408</td>
<td>198446</td>
<td>VALVE, dispense, closer</td>
<td>1</td>
</tr>
<tr>
<td>409</td>
<td>244907</td>
<td>VALVE, EnDure</td>
<td>1</td>
</tr>
<tr>
<td>410</td>
<td>16D943</td>
<td>BLOCK, mounting</td>
<td>1</td>
</tr>
<tr>
<td>411</td>
<td>16E899</td>
<td>HOSE, assembly, stainless steel braid, 3/16 x 12</td>
<td>2</td>
</tr>
<tr>
<td>412</td>
<td>C32089</td>
<td>RETAINER, seat</td>
<td>1</td>
</tr>
</tbody>
</table>
Gear Meter Assembly Panel
Replacement Danger and Warning labels, tags, and cards are available at no cost.

<table>
<thead>
<tr>
<th>Ref</th>
<th>Description</th>
<th>Qty</th>
</tr>
</thead>
<tbody>
<tr>
<td>601</td>
<td>ENCLOSURE, control, gear meter painted</td>
<td>1</td>
</tr>
<tr>
<td>602</td>
<td>MODULE, HMI, PGM</td>
<td>1</td>
</tr>
<tr>
<td>603</td>
<td>HANDLE, disconnect, electric</td>
<td>1</td>
</tr>
<tr>
<td>604</td>
<td>BUTTON, dual, grn/red, w/pl-wht P/11</td>
<td>1</td>
</tr>
<tr>
<td>605</td>
<td>BUTTON, operator, pl, red R/11</td>
<td>1</td>
</tr>
<tr>
<td>606</td>
<td>BUTTON, operator, pl, green G/11</td>
<td>1</td>
</tr>
<tr>
<td>607</td>
<td>LABEL, legend, panel, PGM</td>
<td>1</td>
</tr>
<tr>
<td>608</td>
<td>BUTTON, operator, pb, flush, black</td>
<td>1</td>
</tr>
<tr>
<td>609</td>
<td>FITTING, bulkhead, gland, 9wire</td>
<td>1</td>
</tr>
<tr>
<td>610</td>
<td>GRIP, cord, .35-.63, 3/4</td>
<td>1</td>
</tr>
<tr>
<td>611</td>
<td>CONNECTOR, sq, 14pw/key, 7a, 14/25 panel m</td>
<td>1</td>
</tr>
<tr>
<td>612</td>
<td>FASTENER, shc, 4-40x0.25, ms, e 12 99</td>
<td>12</td>
</tr>
<tr>
<td>613</td>
<td>COVER, dust, amp17 conn w/chain</td>
<td>1</td>
</tr>
<tr>
<td>614</td>
<td>LATCH, operator</td>
<td>4</td>
</tr>
</tbody>
</table>

Cables

<table>
<thead>
<tr>
<th>Description</th>
<th>3 Meter</th>
<th>6 Meter</th>
<th>9 Meter</th>
<th>15 Meter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Servo Power Cable</td>
<td>17R673</td>
<td>17R674</td>
<td>17R675</td>
<td>17R676</td>
</tr>
<tr>
<td>Feedback Cable</td>
<td>17R677</td>
<td>17R678</td>
<td>17R679</td>
<td>17R680</td>
</tr>
<tr>
<td>Dispense Valve</td>
<td>24E571</td>
<td>24E572</td>
<td>24E573</td>
<td>24U020</td>
</tr>
</tbody>
</table>

▲ Replacement Danger and Warning labels, tags, and cards are available at no cost.
<table>
<thead>
<tr>
<th>Ref</th>
<th>Part</th>
<th>Description</th>
<th>Qty</th>
</tr>
</thead>
<tbody>
<tr>
<td>701</td>
<td>---</td>
<td>PANEL, back, for 30x24 encl, conduit</td>
<td>1</td>
</tr>
<tr>
<td>702</td>
<td>123361</td>
<td>SWITCH, disconnect, 32a</td>
<td>1</td>
</tr>
<tr>
<td>703</td>
<td>124228</td>
<td>EXTENSION, disconnect, 230-350mm</td>
<td>1</td>
</tr>
<tr>
<td>704</td>
<td>117666</td>
<td>TERMINAL, ground</td>
<td>1</td>
</tr>
<tr>
<td>705</td>
<td>U70077</td>
<td>TERMINAL, lug, ground, bus type</td>
<td>1</td>
</tr>
<tr>
<td>706</td>
<td>123298</td>
<td>CIRCUIT, breaker, 2p, 20a, ul489</td>
<td>1</td>
</tr>
<tr>
<td>707</td>
<td>123296</td>
<td>CIRCUIT, breaker, 2p, 1a, ul489</td>
<td>1</td>
</tr>
<tr>
<td>708</td>
<td>123359</td>
<td>RELAY, contactor, 30a, 3p, 24vdc, co</td>
<td>1</td>
</tr>
<tr>
<td>709</td>
<td>130185</td>
<td>FILTER</td>
<td>1</td>
</tr>
<tr>
<td>710</td>
<td>121808</td>
<td>POWER SUPPLY, 24vdc, 4.0a, 100w</td>
<td>1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Ref</th>
<th>Part</th>
<th>Description</th>
<th>Qty</th>
</tr>
</thead>
<tbody>
<tr>
<td>711</td>
<td>123718</td>
<td>FILTER, emi, 6a, spade con</td>
<td>1</td>
</tr>
<tr>
<td>712</td>
<td>25M865</td>
<td>MODULE, plc, 14di/10do, 24dc</td>
<td>1</td>
</tr>
<tr>
<td>713</td>
<td>129709</td>
<td>MODULE, analog in</td>
<td>1</td>
</tr>
<tr>
<td>714</td>
<td>U70899</td>
<td>MODULE, ana-out</td>
<td>1</td>
</tr>
<tr>
<td>715</td>
<td>25C834</td>
<td>DRIVE, indexer (PGM-06 only)</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>25C835</td>
<td>DRIVE, indexer (PGM-20 only)</td>
<td>1</td>
</tr>
<tr>
<td>716</td>
<td>---</td>
<td>STRIP, terminal, PGM, control</td>
<td>1</td>
</tr>
<tr>
<td>717</td>
<td>---</td>
<td>RAIL, din</td>
<td>1</td>
</tr>
<tr>
<td>718</td>
<td>---</td>
<td>WIREWAY, panduit, 1.5&quot;x3.0&quot;x6'</td>
<td>6</td>
</tr>
<tr>
<td>719</td>
<td>---</td>
<td>WIREWAY, panduit, 1&quot;x3&quot;x6'</td>
<td>6</td>
</tr>
<tr>
<td>720</td>
<td>---</td>
<td>COVER, panduit, 1.5&quot;x6'</td>
<td>6</td>
</tr>
<tr>
<td>721</td>
<td>---</td>
<td>WIREWAY, cover, panduit, 1&quot;x6'</td>
<td>6</td>
</tr>
</tbody>
</table>

**PGM Back Panel**

![Diagram of PGM Back Panel]
Replacement Danger and Warning labels, tags, and cards are available at no cost.

Remote Mount Amplifiers

Only for control centers with 15 m cables.
# PGM Remote Dispense Valve

![Diagram of PGM Remote Dispense Valve]

<table>
<thead>
<tr>
<th>Ref</th>
<th>Part</th>
<th>Description</th>
<th>Qty</th>
</tr>
</thead>
<tbody>
<tr>
<td>804</td>
<td></td>
<td>FITTING</td>
<td>1</td>
</tr>
<tr>
<td>805</td>
<td>117820</td>
<td>SCREW, cap, socket head, M3</td>
<td>2</td>
</tr>
<tr>
<td>807</td>
<td>124200</td>
<td>SCREW, shsc, M6-1.0 x 30, stainless steel</td>
<td>4</td>
</tr>
<tr>
<td>808</td>
<td>198446</td>
<td>VALVE, dispense, closer</td>
<td>1</td>
</tr>
<tr>
<td>809</td>
<td>16E055</td>
<td>BLOCK, outlet, PGM, 3/4 NPTF, stainless steel</td>
<td>1</td>
</tr>
</tbody>
</table>
PGM Ambient Transducer 24E474

NOTE: Ambient sensors are used on models PGx1xx (unheated). See technical page for ambient operating temperature range.

Ref | Part | Description | Qty
--- | --- | --- | ---
901 | 124517 | SENSOR, pressure | 2

PGM Ambient Transducer 25E231

NOTE: This kit is used for PGM systems that are independent of the Graco PGM control box. Refer to Appendix D - Transducer 25E231 Connection on page 102 for information about making connections.

Ref | Part | Description | Qty
--- | --- | --- | ---
901a | 17X995 | ADAPTER, pressure transducer | 2
902a | 121399 | PACKING, o-ring, 012 f x 75 | 2
903a | 16A093 | SENSOR, pressure | 2
PGM-6 Mounting Frame

Ref | Part | Description | Qty  
--- |------|-------------|------
1101 | 124165 | SCREW, bhcs, M5-0.8 x 10, stainless steel | 7   
1102 | 124167 | SCREW, shoulder, 10 x 30, M8-1.25, stainless steel | 4   
1103 | 124313 | SCREW, shcs, M6-1 x 16 mm, stainless steel | 3   
1104 | 124314 | SCREW, shoulder, 6 x 8, M5 - 0.8, carbon steel | 8   
1105 | 16E327 | PLATE, mounting, drive, PGM-6 | 1   
1106 | 16E328 | GUSSET, drive, PGM-6 | 2   
1107 | 16E329 | PLATE, mounting, pump, PGM-6 | 1   
1108 | 16E330 | INSULATOR, pump, PGM-6 | 1   
1109 | 16E331 | GUARD, drive, PGM-6 | 1   

Parts
# PGM-6 Drive Kit

<table>
<thead>
<tr>
<th>Ref</th>
<th>Part</th>
<th>Description</th>
<th>Qty</th>
</tr>
</thead>
<tbody>
<tr>
<td>1201</td>
<td>16E367</td>
<td>COUPLING, PGM drive, 12 mm x 14 mm</td>
<td>1</td>
</tr>
<tr>
<td>1202</td>
<td>16E368</td>
<td>GEAR REDUCER, PGM drive, 50:1, 60 mm frame</td>
<td>1</td>
</tr>
<tr>
<td>1202a</td>
<td></td>
<td>COVER</td>
<td>1</td>
</tr>
<tr>
<td>1203</td>
<td>16E369</td>
<td>MOTOR, PGM drive, frame</td>
<td>1</td>
</tr>
<tr>
<td>1203a</td>
<td></td>
<td>SCREW</td>
<td>4</td>
</tr>
<tr>
<td>1203b</td>
<td></td>
<td>WASHER</td>
<td>4</td>
</tr>
<tr>
<td>1204†</td>
<td></td>
<td>DRIVE KEY</td>
<td>1</td>
</tr>
</tbody>
</table>

† *Part included in drive key kit 25E204.*
PGM-6 Lower Assembly Block

<table>
<thead>
<tr>
<th>Ref</th>
<th>Part</th>
<th>Description</th>
<th>Qty</th>
</tr>
</thead>
<tbody>
<tr>
<td>1301</td>
<td>101970</td>
<td>PLUG, pipe, headless</td>
<td>2</td>
</tr>
<tr>
<td>1302</td>
<td>124173</td>
<td>SCREW, shcs, M6-1.0 x 90, stainless steel</td>
<td>4</td>
</tr>
<tr>
<td>1303</td>
<td>124174</td>
<td>SCREW, shcs, M10-1.5 x 75, stainless steel</td>
<td>4</td>
</tr>
<tr>
<td>1304†</td>
<td>---</td>
<td>PACKING, o-ring</td>
<td>2</td>
</tr>
<tr>
<td>1305†</td>
<td>---</td>
<td>O-RING</td>
<td>1</td>
</tr>
<tr>
<td>1306†</td>
<td>---</td>
<td>PACKING, o-ring</td>
<td>1</td>
</tr>
<tr>
<td>1307</td>
<td>16D916</td>
<td>BLOCK, inlet, PGM</td>
<td>1</td>
</tr>
<tr>
<td>1308</td>
<td>16E340</td>
<td>BLOCK, pump mounting, PGM-6</td>
<td>1</td>
</tr>
<tr>
<td>1309*</td>
<td>24E832</td>
<td>METER, gear, precision, 6cc/rev</td>
<td>1</td>
</tr>
<tr>
<td>1310</td>
<td>16K738</td>
<td>WASHER, split, lock, M10, sst</td>
<td>4</td>
</tr>
<tr>
<td>1311†</td>
<td>---</td>
<td>DRIVE KEY</td>
<td>1</td>
</tr>
</tbody>
</table>

† Parts are available in o-ring kit 24E677, or drive key kit 25E204.

* For part breakdown and repair kits, refer to PGM-6 Pump Repair, page 40.
PGM-6 Pump Heat Kit

<table>
<thead>
<tr>
<th>Ref</th>
<th>Part</th>
<th>Description</th>
<th>Qty</th>
</tr>
</thead>
<tbody>
<tr>
<td>1401</td>
<td>117764</td>
<td>SENSOR, pressure</td>
<td>2</td>
</tr>
<tr>
<td>1402</td>
<td>24E732</td>
<td>KIT, heat, pump, PGM-6</td>
<td>1</td>
</tr>
<tr>
<td>1403</td>
<td>24E413</td>
<td>KIT, heat, PGM, inlet</td>
<td>1</td>
</tr>
<tr>
<td>1404</td>
<td>125363</td>
<td>LABEL, heat, warning</td>
<td>2</td>
</tr>
<tr>
<td>1405</td>
<td>16E366</td>
<td>INSULATOR</td>
<td>1</td>
</tr>
<tr>
<td>1406</td>
<td>124166</td>
<td>SCREW</td>
<td>2</td>
</tr>
</tbody>
</table>

⚠️ Replacement Danger and Warning labels, tags, and cards are available at no cost.
CUSTOMER MUST SUPPLY BRANCH CIRCUIT PROTECTION

230V/1PH/50-60Hz

L1
L2
GND

CB1A
10 AWG
2 AWG
12 AWG

FIL-1
LINE
LOAD
CRM

100
101
102
103
104
105

DVS-1
DVS-2

104
105

HARNESS
175895
14 AWG

HARNESS
175930
14 AWG

X3
AC POWER

PE
LG
RB
DC

CRM
110
111
112
113
114
115
116
117
118

PS-1
PG-PS1

24V DC

DC COM

CABLE FROM PS-1

HARNESS 120997

FIL-2
LINE
LOAD
CRM

104
105

HARNESS
120997

PS-1
PG-PS1

24V DC

DC COM

CABLE FROM PS-1

HARNESS 120997

Fig. 29: Schematics, Page 1 of 10
Fig. 30: Schematics, Page 2 of 10
Fig. 31: Schematics, Page 3 of 10
FIG. 33: Schematics, Page 5 of 10
Fig. 36: Schematics, Page 8 of 10
Fig. 37: Schematics, Page 9 of 10
GROUNDING NOTES:
1. GROUND ALL DISTRIBUTION BARS.
2. GROUND ALL DOORS.
3. DO NOT JUMPER GROUND WIRES.

FIGURE 1
NTS

FIGURE 2
NTS

Fig. 38: Schematics, Page 10 of 10
Accessory Parts

Automation Interface Cable Assembly

The cable length of automation interface cable assembly 24D824 is 40 ft (12.2 m). This figure shows the cable and identifies the cable interface signals. See Appendix B - I/O on page 98 for wiring details. See Appendix C - Theory of Operation on page 101.

<table>
<thead>
<tr>
<th>Pin #</th>
<th>Wire #</th>
<th>Color</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>208</td>
<td>Black</td>
<td>Dispense Start</td>
</tr>
<tr>
<td>2</td>
<td>210</td>
<td>Red</td>
<td>Job Complete</td>
</tr>
<tr>
<td>3</td>
<td>SPARE</td>
<td>White</td>
<td>N/C</td>
</tr>
<tr>
<td>4</td>
<td>SPARE</td>
<td>White/Black</td>
<td>N/C</td>
</tr>
<tr>
<td>5</td>
<td>125</td>
<td>Orange</td>
<td>24 VDC from PGM</td>
</tr>
<tr>
<td>6</td>
<td>130</td>
<td>Blue</td>
<td>24 VDC common</td>
</tr>
<tr>
<td>7</td>
<td>404</td>
<td>Red/Black</td>
<td>Analog flow command</td>
</tr>
<tr>
<td>8</td>
<td>130</td>
<td>Green</td>
<td>Analog common</td>
</tr>
<tr>
<td>9</td>
<td>SPARE</td>
<td>Green/Black</td>
<td>N/C</td>
</tr>
<tr>
<td>10</td>
<td>302</td>
<td>Blue/Black</td>
<td>Dispenser ready</td>
</tr>
<tr>
<td>11</td>
<td>300</td>
<td>Red/White</td>
<td>Fault present</td>
</tr>
<tr>
<td>12</td>
<td>304</td>
<td>Orange/Black</td>
<td>In cycle</td>
</tr>
<tr>
<td>13</td>
<td>SPARE</td>
<td>Green/White</td>
<td>N/C</td>
</tr>
<tr>
<td>14</td>
<td>310</td>
<td>Blue/White</td>
<td>24 VDC thru E-stop</td>
</tr>
</tbody>
</table>
NOTE: This kit is intended for Therm-O-Flow units built prior to 2016, which includes part numbers that start with 98xxxx. See Accessories on page 5 for the latest version of the Therm-O-Flow which includes part number UHxxxx.

Ref | Part | Description | Qty
--- | --- | --- | ---
1001 | 112699 | TUBE, 1/4 OD | 2
1002 | C20466 | FITTING, nipple, hex | 1
1003 | 112307 | FITTING, elbow, street | 1
1004 | 100139 | PLUG, pipe | 2
1005 | 112781 | FITTING, elbow, swivel | 1
1006 | 054776 | TUBE, nylon, round, 5/16 in/ 8 mm | 2
1007 | 110321 | BRACKET, mounting | 1
1008 | 297612 | SCREW, cap, button head | 2
1009 | 110318 | REGULATOR, air, 1/4 in. npt | 1
1010 | 110319 | GAUGE, pressure, air, 1/8 npt | 1
1011 | 115948 | FITTING, elbow, 1/4 nptM, 5/16T OD | 1
1012 | 107110 | NUT, lock | 2
1013 | 121022 | FITTING, elbow, male, 1/4 npt | 1
1014 | 198171 | FITTING, elbow | 1
1015 | 198446 | VALVE, dispense, closer | 1
1016 | 24E574 | CABLE, feed regulator, PGM, 9 meter | 1
1017 | 080226 | VALVE, quick exhaust, 3/4 in. nptf | 1
1018 | C20461 | FITTING, nipple, reducing, hex | 1
1019 | 125466 | FITTING, swivel, elbow, 1/2 nptf | 1
1020 | 100896 | FITTING, bushing, pipe | 1
1021 | 111530 | MUFFLER | 1

Dynamic Regulators (98****)

Kit 24E575
Dynamic Regulator Setup and Installation
(P/N 98****) 24E575

1. Remove air pressure from Therm-O-Flow supply system. See Pressure Relief Procedure in manual 311208.

2. Install dynamic regulator kit. See Fig. 39 on page 77.

3. Apply air to the Therm-O-Flow supply. Check for air leaks.

4. Set the secondary regulator for a low operating pressure, for example 20-25 psi.

5. Adjust the panel mount Therm-O-Flow regulator to zero psi.

6. Connect the dynamic regulator cable from the Therm-O-Flow to the PGM control box.


8. Select ON mode for the Primary or Tandem Pump drop-down menu.

9. Set the appropriate press for the panel mount regulator on the Therm-O-Flow. For example, 30-40 psi.

10. Select AUTO mode for the Primary or Tandem Pump drop-down menu.

11. Verify operation of the new regulator and adjust pressure as needed to achieve a maximum static pressure of 1500 psi (103 bar) when the system is not dispensing.
Dynamic Regulator Installation 24E575

The dynamic regulator kit is used to control the static pressure of a Therm-O-Flow (98****). The PGM has a maximum inlet pressure of 1500 psi. During dispense the dynamic regulator kit will activate the normal regulator located on the front panel of the Therm-O-Flow. When the system is idle the secondary regulator will control static pressure.

Remove plug and attach supplied tubing to regulator inlet.

Holes required for mounting. See detail A.

5/32 in. tubing removed from Therm-O-Flow regulator to be attached here.

Regulator pilot port will have an existing 5/32 in. air line. This air line and its fitting are to be removed from the regulator and replaced with the fitting supplied with dynamic regulator. The existing pilot tube will be connected to the 5/32 fitting on the diverting valve supplied with 24E575.

To Therm-O-Flow regulator pilot port.

Regulator inlet.

Thread existing air line with 1/2 in. npt coupling to 90° swivel fitting.

Attach to PGM control panel.
**Dynamic Regulators (UH****)**

Kit 25A055

<table>
<thead>
<tr>
<th>Ref</th>
<th>Part</th>
<th>Description</th>
<th>Qty</th>
</tr>
</thead>
<tbody>
<tr>
<td>1001</td>
<td>158491</td>
<td>FITTING, nipple</td>
<td>1</td>
</tr>
<tr>
<td>1002</td>
<td>120435</td>
<td>REGULATOR, remote piloted</td>
<td>1</td>
</tr>
<tr>
<td>1003</td>
<td>121022</td>
<td>FITTING, elbow, male, 1/4 npt</td>
<td>2</td>
</tr>
<tr>
<td>1004</td>
<td>C20461</td>
<td>FITTING, nipple, reducing, hex</td>
<td>1</td>
</tr>
<tr>
<td>1005</td>
<td>080226</td>
<td>VALVE, quick exhaust, 3/4” nptf</td>
<td>1</td>
</tr>
<tr>
<td>1006</td>
<td>111530</td>
<td>MUFFLER</td>
<td>1</td>
</tr>
<tr>
<td>1007</td>
<td>121282</td>
<td>FITTING, swivel, straight, 1/2 fx3/4 m</td>
<td>1</td>
</tr>
<tr>
<td>1008</td>
<td>24E574</td>
<td>CABLE, feed regulator, pgm, 9 mtr</td>
<td>1</td>
</tr>
<tr>
<td>1009</td>
<td>112781</td>
<td>ELBOW, swivel, 90 deg</td>
<td>2</td>
</tr>
<tr>
<td>1010</td>
<td>112307</td>
<td>FITTING, street elbow</td>
<td>1</td>
</tr>
<tr>
<td>1011</td>
<td>C20466</td>
<td>FITTING, nipple, hex</td>
<td>1</td>
</tr>
<tr>
<td>1012</td>
<td>100139</td>
<td>PLUG, pipe</td>
<td>2</td>
</tr>
<tr>
<td>1013</td>
<td>110318</td>
<td>REGULATOR, air, 1/4&quot; npt</td>
<td>1</td>
</tr>
<tr>
<td>1014</td>
<td>123257</td>
<td>FITTING, nipple, hex, 1/4 npt, brs</td>
<td>2</td>
</tr>
<tr>
<td>1015</td>
<td>113264</td>
<td>CROSS, pipe</td>
<td>1</td>
</tr>
<tr>
<td>1016</td>
<td>110319</td>
<td>GUAGE, press, air, 1/8&quot; npt</td>
<td>1</td>
</tr>
<tr>
<td>1017</td>
<td>198446</td>
<td>VALVE, dispense, closer</td>
<td>1</td>
</tr>
<tr>
<td>1018</td>
<td>054130</td>
<td>TUBE, plyeth .250 od</td>
<td>3</td>
</tr>
</tbody>
</table>

**NOTE:** This kit is for the current series of Therm-O-Flow which contains part number UHxxxx.

---

**Accessory Parts**

---

**NOTE:** This kit is for the current series of Therm-O-Flow which contains part number UHxxxx.
Dynamic Regulator Setup and Installation  
(P/N UH****) 25A055

1. Remove air pressure from Therm-O-Flow supply system. See Pressure Relief Procedure in manual 334130.

2. Install dynamic regulator kit. See Fig. 40 on page 80.

3. Apply air to the Therm-O-Flow supply. Check for air leaks.

4. Set the secondary regulator for a low operating pressure, for example 20-25 psi.

5. Adjust the air motor regulator at the top of the air tree to zero psi.

6. Connect the dynamic regulator cable from the Therm-O-Flow to the PGM control box.


8. Select ON mode for the Primary or Tandem Pump drop-down menu.

9. Set the appropriate pressure for the air motor regulator at the top of the air tree on the Therm-O-Flow. For example, 30-40 psi.

10. Select AUTO mode for the Primary or Tandem Pump drop-down menu.

11. Verify operation of the new regulator and adjust pressure as needed to achieve a maximum static pressure of 1500 psi (103 bar) when the system is not dispensing.
Dynamic Regulator Installation

Disconnect red airline from air tree.
Remove pressure relief safety valve from air tree.
Screw in the cross with adjustable air pressure regulator into the pressure relief safety valve hole.
Attach the dynamic regulator assembly to the hose connection on the air tree.

Attach the red hose to the dynamic regulator assembly.
Attach the pressure relief safety valve to open port on the cross fitting.
Attach to PGM control panel.

The dynamic regulator kit is used to control the static pressure of a Therm-O-Flow (UH****). The PGM has a maximum inlet pressure of 1500 psi. During dispense the dynamic regulator kit will activate the normal regulator located on the front panel of the Therm-O-Flow. When the system is idle, the secondary regulator will control static pressure.
**EnDure Valve Nozzles**

<table>
<thead>
<tr>
<th>Part</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>24E654</td>
<td>10 x 1.5 mm Ribbon Nozzle</td>
</tr>
<tr>
<td>24E655</td>
<td>1/8 in. Bead Nozzle</td>
</tr>
</tbody>
</table>

**Heater Nests**

<table>
<thead>
<tr>
<th>Part</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>24E678</td>
<td>Heater Nest with Blank Insert</td>
</tr>
<tr>
<td>24E679</td>
<td>Heater Nest with Ported Insert</td>
</tr>
</tbody>
</table>
Appendix A - User Interface Display

Screen Navigation Diagram

START MACHINE

Main → Calibrate

Main → Home

Home → Maintenance → Robot I/O → Setup Screens → Supply Pump → Alarm Screen

Setup Screens Flow

Current Setup Screen

1 → Screen #1
2 → Screen #2
3 → Screen #3
4 → Screen #4
5 → Screen #5
6 → Screen #6
Main Screen

Press the appropriate button to navigate to either the Home or Calibration screen. To access the Calibration screen, select the login button and enter user “setup” and password “PGM17”.

Key:
A Navigate to the Home screen
B Navigate to the Calibrate screen
Calibrate Screen


Key:
- C: Enable Calibration button (Begin Calibration)
- D: Done button (Finish Calibration)
- E: Calibration Shot Time Input Box
- F: Calibration K Factor (Automatically Calculated)
- G: Start Low Speed Calibration button
- H: Low Speed Calibration Shot Volume Input Box
- J: Start High Speed Calibration button
- K: High Speed Calibration Shot Volume Input Box
- L: Navigate to Main Screen
- M: Pump RPM during low speed calibration
- N: Pump RPM during high speed calibration
**Home Screen**

**Manual Mode**
In Manual Mode, the machine only accepts signals from the User Interface touch screen and the physical buttons on the machine. All signals from an External Control Interface to initiate a shot will be ignored.

**Automatic Mode**
In Automatic Mode, the machine only accepts initiate shot signals from an external machine. All signals to initiate a shot using the User Interface touch screen or the physical buttons on the machine will be ignored.

**Bead Scale**
The bead scale function adjusts the quantity dispensed by the scale percent value shown. For example, if the system is setup to dispense 100 cc/min and the bead scale setting is 110 then the machine will dispense 100 cc/min x 110% scale =110 cc/min.

The primary purpose of the bead scale is to be able to quickly adjust volume dispensed to be able to find that actual desired volume. Once the correct volume is found, the flow rate should be adjusted accordingly.

**Screens Navigation**
Access to the Setup screens requires the setup password.

**Flow Rate Display**
The Home screen will display the commanded Flow Rate from 1 of 3 sources:

- 1 - Maintenance Flow Rate (see Maintenance Screen on page 86)
- 2 - Auto Mode Display Flow (see Setup #2 Screen on page 89)
- 3 - Remote 0-10 VDC Command Flow (see Appendix B - I/O on page 98)
Maintenance Screen

Dispense Valve Control
When Automatic Dispense Valve Control is enabled, the dispense valve will open and close as needed to dispense material.

When Open the Dispense Valve is selected, the dispense valve will open and remain open until Automatic Dispense Valve Control is enabled.

Dispense Settings
Dispense Mode: Options include Bead and Shot.

- In Bead mode, dispensing begins when the initiate shot button is pressed and dispensing ends when the initiate shot button is released.
- In Shot mode, dispensing begins when the initiate shot button is pressed and released. Dispensing ends when the Dispense Duration (AF) elapses.

Dispense Duration: This is the amount of time the machine will dispense at the given flow rate. This value is only used in Shot Mode.

Flow Rate: This is the rate at which the machine will dispense for the given dispense duration.

Manual Start Dispense
After adjusting the settings, the user can press the Manual Start Dispense button (AH) to dispense material using the current settings.

NOTE: This button performs the same function as the manual purge button located on the control panel.
# Robot I/O Screen

## Overview

This screen is for settings related to an external machine setup to control the dispense operation of this system. See Appendix B - I/O on page 98 for more information.

## Robot Outputs

These are signals sent by the external machine when the related action should occur. The Job Complete signal is sent to stop the In Cycle signal. The Dispense Trigger is sent to begin dispensing. The Command Voltage is a display of the voltage of the command cable and is for troubleshooting only. See Appendix B - I/O on page 98 for more information.

## Robot Inputs

These are signals sent to the external machine to notify it of system conditions. The Dispense Ready signal tells the external machine that the system is ready to dispense and a dispense can be initiated. The No Alarm signal tells the machine that there are currently no active alarms. The In Cycle signal tells the external machine that the system is currently busy so dispensing cannot be initiated.

**NOTE:** Dispense Ready remains on while in Auto Mode. If a deviation alarm occurs the Dispense Ready and Alarm signal will remain ON. If an error alarm occurs the Dispense Ready will be removed.
Setup #1 Screen

#1 to #6 Buttons
Press to navigate to the Setup Screen with that number. For example, press #3 to navigate to Setup Screen #3.

Command Value Source
Command Values can be controlled by the user-interface touch screen or by an external machine connected to the system via the External Control Interface.

Run Mode Bead Adjust
When this option is enabled the Bead Scale function appears on the Home Screen. See the Home Screen on page 85 for more information.

Job End Mode
The In Cycle signal can be dropped when the dispense trigger is removed when Display is selected.

If Remote is selected the Job Complete signal is required to remove the In Cycle signal.

Job End Delay (sec)
When Job End mode is set to Display the In Cycle signal is removed after the time in this field.
Setup #2 Screen

Overview
The Dispense Mode, Flow Rate, and Dispense Duration settings apply to Automatic Control Mode only. Values changed on this screen independent of changes made on the Maintenance screen.

The Bead Scale value is a duplicate to the Bead Scale setting on the Home Screen, which can be enabled or disabled from the Setup #1 screen. See Setup #1 Screen on page 88 for more information.

Fixed Command cc/min
Flow rate can be entered here. This field is only used when command value source is set to Display on Setup Screen 1. See Setup #1 Screen on page 88 for more information.

#1 to #6 Buttons
Press to navigate to the Setup Screen with that number. For example, press #3 to navigate to Setup Screen #3.

Pre-Charge
This is the pressure between the meter and the dispense valve when the dispense valve is closed. If the pre-charge setting is non-zero then, immediately after dispensing, the gear meter will continue to rotate after the dispense valve closes until the pre-charge pressure value is achieved. The maximum Pre-Charge value is 2500 psi (17.2 MPa, 172 bar).

Larger values for the On Delay setting lead to larger pressures in the system. If a value too large is input, the machine could over-pressurize leading to ruptured components and serious injury.
Setup #3 Screen

#1 to #6 Buttons
Press to navigate to the Setup Screen with that number. For example, press #3 to navigate to Setup Screen #3.

Delay Settings

Larger values for the On Delay setting lead to larger pressures in the system. If a value too large is input, the machine could over-pressurize leading to ruptured components and serious injury.

The Delay Settings affect the timing of the Dispense Valve opening and closing when a shot is initiated.

The On Delay is the amount of time, in milliseconds, between a shot being initiated and the dispense valve opening. If the On Delay is set to 100 the machine will wait 100 milliseconds after a shot is initiated before opening the dispense valve. This will lead to a pressure build up between the meter and dispense valve until the dispense valve opens.

Drive Information

Motor Torque
Display motor torque during dispense. If motor torque climbs above continuous torque an alarm is issued. See Errors on page 31.

Cont. Torque
Continuous torque rating of the motor.

NOTE: The motor torque display is a good way to determine the maximum flow rate with a given viscosity.
Setup #4 Screen

#1 to #6 Buttons
Press to navigate to the Setup Screen with that number. For example, press #3 to navigate to Setup Screen #3.

Pump Settings

**Snuff Back:** This enables the gear meter to rotate in reverse, immediately following dispensing, to pull material back from the dispense valve to minimize or eliminate material drooling. The Snuff Back Time and Snuff Back Pump RPM are the settings used when Snuff Back is enabled. These settings should be adjusted to work best for your material.

**NOTE:** Not recommended for very viscous materials.

**Pump Hour Totalizer:** This field will record the total dispense time on the machine in hours. This field is non-resettable.

**Pump Hour Meter:** This field displays total dispense time in hours. This field is resettable.
Setup #5 Screen

Overview
This screen controls settings for the pressure sensors. These values are used for triggering errors.

#1 to #6 Buttons
Press to navigate to the Setup Screen with that number. For example, press #3 to navigate to Setup Screen #3.

Inlet, Outlet Offset
The inlet, outlet offset values are used to tune the pressure transducer. If the pressure transducers do not register zero pressure when there is no material in the system, enter a value to shift the pressure value to zero. For example, if 15 psi is shown, enter -15 psi to shift the value to 0.

Min/Max Inlet/Outlet Limits
These limit values are used to set the acceptable range of values for dispensing. If values are outside of this range during dispensing the machine will issue an alarm. See Errors on page 31.

PSI, BAR
Set the unit of measure for pressure system-wide.
Setup #6 Screen

Fault Settings

Error Reset: If set to Disable, errors cannot be reset. If set to Enable, errors can be reset.

Inlet/Outlet Pressure, Drive Torque: If set to Error, an error will be generated when the out-of-limit condition occurs. The machine will be disabled until the error is reset. If set to deviation, an error will be generated when the out-of-limit condition occurs. The machine will not be disabled until the error is reset.

If set to Deviation, an error will be generated when the out-of-limit condition occurs. The machine will not be disabled. See Errors on page 31.
Supply Pump Screen

NOTE: This screen is used to control the optional dynamic regulator kit for a Therm-O-Flow. See Accessory Parts section on page 74 for additional information on the dynamic regulator kit option.

Supply Pumps (Dynamic Analog Regulator)

Primary Supply Pump Mode

• **Auto Mode**: During normal operation this mode will activate the dynamic regulator solenoid when the dispense valve solenoid is activated.

• **On Mode**: This will activate the dynamic regulator solenoid.

• **Off Mode**: The dynamic regulator option is disabled.

Secondary Supply Pump Mode

• Same control features as primary pump.
Pressure Trend Screen

Overview
The Pressure Trend screen allows the user to view both inlet and outlet pressures in real time. The pressures displayed on this screen are the same values shown on the Home and Maintenance screens.
Torque Trend Screen

Overview
The Torque Trend screen allows the user to view the pump torque and motor torque in real time.

Pump Torque
The Pump Torque shows the effective torque on the pump during operation.

Motor Torque
The Motor Torque shows the torque on the motor during operation and is measured in in/lbs.
Alarm Screen

Refer to Error Codes and Troubleshooting on page 32 for information on possible errors.

Acknowledge All List

When pressed, the Acknowledge All List button acknowledges all errors listed on the Alarm Screen and adds to the screen the time when the errors were acknowledged. This button must be pressed prior to pressing the Clear All Alarms button.

**NOTE:** Acknowledging alarms does not clear them.

Clear All Alarms

When pressed, the Clear All Alarms button will remove all errors listed on the Alarm Screen. Before pressing the Clear All Alarms button, all alarms must be acknowledged.

**NOTE:** The Clear All Alarms button can only be pressed if Error Reset is Enabled (see Configure Errors on page 21).
Appendix B - I/O

Using the PGM I/O

The gear meter uses several I/O signals to communicate with plant automation controllers. There are two digital inputs, three digital outputs, and one analog input. All of these signals are routed to the I/O connector on the top of the controller.

Other pins on the I/O connector include 24 VDC power, 24 VDC common, analog common, and a signal which is 24 VDC power only when the controller E-Stop switch is latched in. None of the signals are isolated; all are referenced to the ground plane of the control box. The following paragraphs describe typical connection methods for the automation controller signals.

Digital Inputs

The two digital inputs are Dispense Start and Job Complete. These inputs require a 24 VDC current sourcing output from the automation controller. See Fig. 41.

If the automation controller uses relay contacts to activate I/O signals, the 24 VDC available at the gear meter I/O connector (pin 5) should be used to drive the inputs. If the automation controller uses high-side switching of 24 VDC, the automation outputs can be directly connected to the inputs as long as the 24 VDC common (pin 6) of the gear meter is able to be connected to the automation controller common. If the automation controller outputs are low-side switching (open collector) or a voltage other than 24 VDC, relays must be used as shown in Fig. 41.
**Digital Outputs**

The three digital outputs are Dispenser Ready, Fault Present and In Cycle. These outputs perform high-side switching of 24 VDC and require a 24 VDC current sinking input at the automation controller. See Fig. 42. If the automation controller uses 24 VDC relay coils to receive I/O signals, the signals should be connected as shown in Fig. 42.

If the automation controller inputs are current sourcing or use a voltage other than 24 VDC, relays with 24 VDC coils must be used as shown in Fig. 42.
**Analog Inputs**

The PGM receives a flow rate analog command from the automation. The 0 to 10 VDC analog input is referenced to analog common on the control. See Fig. 43. The reference for the automation controller analog output must be connected to the PGM analog reference (pin 8) for this signal to function properly.

![Fig. 43](image)

**24 VDC From E-Stop**

The PGM provides a signal that can be used by the automation controller to monitor the emergency stop switch position of the PGM controller. See Fig. 44.

![Fig. 44](image)

**Relays**

If the use of relays is required to condition the digital I/O signals, these are some examples of part numbers that could be used.

**For 24 VDC Coils:**
- Relay: Phoenix Contact Part Number: 2966171

**For 120 VAC Coils:**
- Relay: Phoenix Contact Part Number: 2966197
Appendix C - Theory of Operation

Theory of Operation

Input and Output Signals

Terminology

For the purpose of this document a digital signal is said to be SET when voltage is present (or above the minimum threshold). A signal is said to be RESET when the signal voltage is not present (below minimum threshold). Devices are referred to as SET when they are in their energized or active state.

Digital Inputs

Dispense Start - This is the Dispense Signal. The PGM unit will attempt to dispense at either the commanded flow rate while this signal is SET, dependent on mode.

Control On - This input is reset when the E-stop button is pressed.

Job Complete - This input can be used to signal a job end.

NOTE: The dispenser ready signal is an important signal for the automation to monitor. When the dispenser ready output is not on, the LT may not be responding to requests from the automation. This could create the situation where the automation is running production, but the PGM is not dispensing any material.

Dispense Valve Solenoid - This signal will be set to energize the dispense valve solenoid at the beginning of a dispense cycle.

Fault Present - This bit is RESET under the following conditions:

• No Faults (alarms or warnings) are active.

In Cycle - In Cycle signal is set at the beginning of a dispense cycle. It is reset at the end of the dispense cycle. The dispense cycle can end in two ways, depending on how the Job End mode is set:

• If the Job End mode is set to remote, dispense cycle ends when the job complete signal is received from the automation I/O.

• If the Job End mode is set to Display, dispense cycle ends when the Job End delay timer expires. See Appendix A - User Interface Display on page 82.

Analog Input

Flow Command - The flow command signal input represents flow requests. The voltage must be between 0 and 10 volts DC. The 0-10 volt signal is interpreted as a relative 0-100% flow command signal. The system must be in Remote Mode for this input to be used.

See the Accessory Parts on page 74.
Appendix D - Transducer 25E231 Connection

The PGM Ambient Transducer kit 25E231 is used for PGM systems that are independent of the Graco PGM control box. These transducers can be connected to a customer-supplied amplifier or signal conditioner. Refer to these specifications when making connections.

### Cable Pinout Connection

<table>
<thead>
<tr>
<th>Part Number</th>
<th>16A093</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electrical</td>
<td></td>
</tr>
<tr>
<td>Type</td>
<td>4 wire full bridge</td>
</tr>
<tr>
<td>Input Voltage</td>
<td>5 VDC</td>
</tr>
<tr>
<td>Span at 3000</td>
<td>104 mV</td>
</tr>
<tr>
<td>Span at 5000</td>
<td>173 mV</td>
</tr>
<tr>
<td>Zero Offset</td>
<td>4 +/- 2 mV</td>
</tr>
<tr>
<td>Input Resistance</td>
<td>&lt; 9K Ω</td>
</tr>
<tr>
<td>Output Resistance</td>
<td>3 - 6 K Ω</td>
</tr>
</tbody>
</table>

**Mechanical**

| Operating Range | 0-5000 psi |
| Max Pressure    | 5000 psi   |
| Proof Pressure  | 10,000 psi |
| Burst Pressure  | 20,000 psi |
| Temperature Range | 0-85°C (32-185°F) |
| Cable Length    | 56 inches  |
| Connector End   | M12 male reverse keyed, Reference Turck P/N WASW 4.5-... |

### Adapter Cable

**NOTE:** Adapter cable 128427 can be purchased to adapt the transducer cable to flying leads. Refer to the cable details below.

<table>
<thead>
<tr>
<th>Pin</th>
<th>Cable Color</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Brown</td>
</tr>
<tr>
<td>2</td>
<td>White</td>
</tr>
<tr>
<td>3</td>
<td>Blue</td>
</tr>
<tr>
<td>4</td>
<td>Black</td>
</tr>
<tr>
<td>5</td>
<td>Green/Yellow</td>
</tr>
</tbody>
</table>

---

**M12 Pinout Details**

<table>
<thead>
<tr>
<th>Pin</th>
<th>Description</th>
<th>Cable Color</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>+ EXE (5 VDC)</td>
<td>Red</td>
</tr>
<tr>
<td>2</td>
<td>- Signal</td>
<td>Green</td>
</tr>
<tr>
<td>3</td>
<td>- EXE (COM)</td>
<td>Black</td>
</tr>
<tr>
<td>4</td>
<td>+ Signal</td>
<td>White</td>
</tr>
<tr>
<td>5</td>
<td>Shield Drain</td>
<td>Shield Drain</td>
</tr>
</tbody>
</table>
## Technical Specifications

<table>
<thead>
<tr>
<th>Equipment Name</th>
<th>US</th>
<th>Metric</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volume repeatability</td>
<td>+/- 1%</td>
<td></td>
</tr>
<tr>
<td>Maximum Fluid Working Inlet Pressure</td>
<td>1500 psi</td>
<td>10.3 MPa, 103 bar</td>
</tr>
<tr>
<td>Maximum Fluid Working Outlet Pressure</td>
<td>2500 psi</td>
<td>17.2 MPa, 172 bar</td>
</tr>
<tr>
<td>Air Supply Pressure Range</td>
<td>60-100 psi (filtration required)</td>
<td></td>
</tr>
<tr>
<td>Fluid Filtration Recommended</td>
<td>Up to 200 mesh, depending on viscosity</td>
<td></td>
</tr>
<tr>
<td>Viscosity Range of Fluids</td>
<td>1,000-1,000,000 Centipoise</td>
<td></td>
</tr>
<tr>
<td>Wetted Parts</td>
<td>Stainless Steel, Tool Steel, Chrome, Carbide, Acetal Plastic, PTFE, Chemical Resistant O-Rings</td>
<td></td>
</tr>
<tr>
<td>Power Requirements</td>
<td>Full Load: 18.5A, Fuse Rating: 21A</td>
<td></td>
</tr>
<tr>
<td>Power Supply Voltage Range</td>
<td>240VAC, 50-60 Hz, single phase</td>
<td></td>
</tr>
</tbody>
</table>

### Minimum Flow Rate

<table>
<thead>
<tr>
<th></th>
<th>6 cc/rev model</th>
<th>20 cc/rev model</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>30 cc/min</td>
<td>40 cc/min</td>
</tr>
</tbody>
</table>

* **Maximum Flow Rate**

<table>
<thead>
<tr>
<th></th>
<th>6 cc/rev model</th>
<th>20 cc/rev model</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>480 cc/min</td>
<td>1600 cc/min</td>
</tr>
</tbody>
</table>

### Minimum Dispensed Shot Size

<table>
<thead>
<tr>
<th></th>
<th>6 cc/rev model</th>
<th>20 cc/rev model</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>8 cc</td>
<td>10 cc</td>
</tr>
</tbody>
</table>

### Sound Pressure Level at Maximum Flow Rate

<table>
<thead>
<tr>
<th></th>
<th>6 cc/rev model</th>
<th>20 cc/rev model</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>58 dB(A)</td>
<td>72 dB(A)</td>
</tr>
</tbody>
</table>

### Sound Power Level at Maximum Flow Rate

<table>
<thead>
<tr>
<th></th>
<th>6 cc/rev model</th>
<th>20 cc/rev model</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>68 dB(A)</td>
<td>79 dB(A)</td>
</tr>
</tbody>
</table>

### Operating Temperature Range

<table>
<thead>
<tr>
<th></th>
<th>Control</th>
<th>Heated Pump</th>
<th>Ambient Pump</th>
<th>Operating Humidity Range</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>40-104°F</td>
<td>40-400°F</td>
<td>40-120°F</td>
<td>10-90% non-condensing</td>
</tr>
</tbody>
</table>

### Weight

<table>
<thead>
<tr>
<th></th>
<th>6 cc/rev model</th>
<th>20 cc/rev model</th>
<th>Controls</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>30 lb</td>
<td>60 lb</td>
<td>100 lb</td>
</tr>
</tbody>
</table>

### Overall Dimensions

<table>
<thead>
<tr>
<th></th>
<th>6 cc/rev model</th>
<th>20 cc/rev model</th>
<th>Control</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>19.75 H x 9.38 W x 6.6 D in.</td>
<td>21.75 H x 9.5 W x 8.9 D in.</td>
<td>30 H x 24 W x 12D in.</td>
</tr>
<tr>
<td></td>
<td>(50.17 H x 23.83 W x 16.76 D mm)</td>
<td>(55.25 H x 24.13 W x 22.6 D mm)</td>
<td>(76.2 H x 60.96 W x 30.48 D mm)</td>
</tr>
</tbody>
</table>

* Flow rates and viscosities are general estimates. Flow rates drop as viscosity increases. Fluids are expected to shear under pressure. New applications or fluids should always be tested to determine proper line sizes and equipment selections. See your Graco Authorized distributor for other capabilities.
Graco Standard 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. With the exception of any special, extended, or limited warranty published by Graco, Graco will, for a period of twelve months 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.

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.

FOR GRACO CANADA CUSTOMERS
The Parties acknowledge that they have required that the present document, as well as all documents, notices and legal proceedings entered into, given or instituted pursuant hereto or relating directly or indirectly hereto, be drawn up in English. Les parties reconnaissent avoir convenu que la rédaction du présent document sera en Anglais, ainsi que tous documents, avis et procédures judiciaires exécutés, donnés ou intentés, à la suite de ou en rapport, directement ou indirectement, avec les procédures concernées.

Graco Information
Sealant and Adhesive Dispensing Equipment

For the latest information about Graco products, visit www.graco.com.
For patent information, see www.graco.com/patents.

TO PLACE AN ORDER, contact your Graco distributor, go to www.graco.com and select “Where to Buy” in the top blue bar, or call to find the nearest distributor.
  If calling from the US: 800-746-1334
  If calling from outside the US: 0-1-330-966-3000

All written and visual data contained in this document reflects the latest product information available at the time of publication. Graco reserves the right to make changes at any time without notice.

Original instructions. This manual contains English. MM 3A5185
Graco Headquarters: Minneapolis
International Offices: Belgium, China, Japan, Korea
GRACO INC. AND SUBSIDIARIES • P.O. BOX 1441 • MINNEAPOLIS MN 55440-1441 • USA
Copyright 2017, Graco Inc. All Graco manufacturing locations are registered to ISO 9001.

www.graco.com
Revision G, August 2018