Instructions/Parts List

Helical Gear Fluid Flow Meters

309834 rev.G

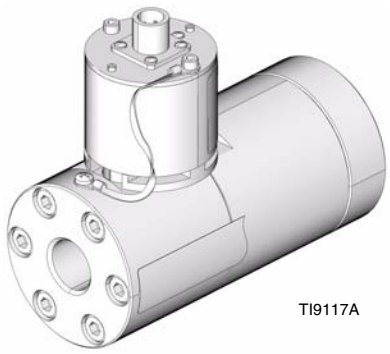
6000 psi (41 MPa, 410 bar) Maximum Fluid Working Pressure

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

HG6000 Meter, Part No. 246190
Standard Resolution
0.013 to 6.0 gpm (50 to 22,712 cc/min) Flow Range
180°F (82°C) Maximum Operating Temperature

HG6000HR Meter, Part No. 246652
High Resolution
0.007 to 2.0 gpm (25 to 7571 cc/min) Flow Range
180°F (82°C) Maximum Operating Temperature

HG6000HT Meter, Part No. 246340
Heated, Standard Resolution
0.013 to 6.0 gpm (50 to 22,712 cc/min) Flow Range
240 VAC, 400 Watts, 1.67 Amps
400°F (204°C) Maximum Operating Temperature



TI9117A

PROVEN QUALITY. LEADING TECHNOLOGY.

Graco Inc. P.O. Box 1441 Minneapolis, MN 55440-1441

Contents

Warnings

⚠ WARNING

EQUIPMENT MISUSE HAZARD

Equipment misuse can cause the equipment to rupture or malfunction and result in serious injury.

- This equipment is for professional use only.
- Use the equipment only for its intended purpose. Call your Graco distributor for information.
- Read all instruction manuals, tags, and labels before operating equipment.
- Check equipment daily. Repair or replace worn or damaged parts immediately.
- Do not alter or modify this equipment. Use only Graco parts and accessories.
- **Do not exceed the maximum working pressure of the lowest rated system component.**
- Be sure that all spray/dispensing equipment and accessories are rated to withstand the maximum working pressure of the pump. Do not exceed the maximum working pressure of any component or accessory used in the system.
- Route hoses and cables away from traffic areas, sharp edges, moving parts, and hot surfaces.
- Do not exceed the maximum temperature rating of any system component.
- Use fluids and solvents that are compatible with equipment wetted parts. See **Technical Data** in all equipment manuals. Read fluid and solvent manufacturer's warnings.
- Always wear protective eyewear, gloves, clothing, and respirator as recommended by the fluid and solvent manufacturer.
- Comply with all applicable local, state, and national fire, electrical, and safety regulations.

FIRE, EXPLOSION, AND ELECTRIC SHOCK HAZARD

Improper grounding, poor air ventilation, open flames, or sparks can cause a hazardous condition and result in fire or explosion and serious injury.

- Ground the equipment and the object being dispensed.
- Do not use this equipment with flammable liquids.
- Keep the dispense area free of debris, including solvent, rags, and gasoline.
- If there is any static sparking or you feel an electric shock while using the equipment, **stop dispensing immediately**. Do not use the equipment until you have identified and corrected the problem.
- Be sure all electrical work is performed by a qualified electrician only.
- Have any checks, installation, or service to electrical equipment performed by a qualified electrician only.
- Be sure all electrical equipment is installed and operated in compliance with applicable codes
- Be sure power is disconnected when servicing and repairing equipment
- Before operating the equipment, extinguish all open flames or pilot lights in the dispense area
- Do not smoke in the dispensing area.
- Keep liquids away from the electrical components
- Disconnect electrical power at the main switch before servicing the equipment.

⚠ WARNING

SKIN INJECTION HAZARD

Spray from the gun, leaks, or ruptured components can inject fluid into your body and cause extremely serious injury, including the need for amputation. Fluid splashed in the eyes or on the skin can also cause serious injury.

- Fluid injected into the skin might look like just a cut, but it is a serious injury. **Get immediate surgical treatment.**
- Do not stop or deflect fluid leaks with you hand, body, glove, or rag.
- Follow the **Pressure Relief Procedure** in your separate equipment manuals whenever you are instructed to: relieve pressure; stop dispensing; clean, check, or service the equipment; or install or clean a nozzle.
- Tighten all the fluid connections before operating the equipment.
- Check the hoses, tubes, and couplings daily. Replace worn, damaged, or loose parts immediately. Permanently coupled hoses cannot be repaired; replace the entire hose.
- Always wear eye protection and protective clothing when installing, operating, or servicing this dispensing equipment.
- Never wipe off build-up around the nozzle or inlet cap until pressure is fully relieved.

TOXIC FLUID OR FUMES HAZARD

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

- Provide fresh air ventilation to avoid the buildup of vapors from the fluid being dispensed.
- Know the specific hazards of the fluid you are using.
- Store hazardous fluid in an approved container. Dispose of hazardous fluid according to all local, state and national guidelines.
- Always wear protective eyewear, gloves, clothing and respirator as recommended by the fluid and solvent manufacturer.
- Avoid exposure to heated material fumes.

HOT SURFACE AND FLUID HAZARD

Heated fluid can cause severe burns and can cause equipment surfaces to become very hot.

- Wear protective gloves and clothing when operating this equipment in a heated system.
- Do not touch the metal heat sink when the surface is hot.
- Allow the equipment to cool thoroughly before servicing.
- Some heated systems are designed to dispense Polyurethane (PUR) heated materials. PUR Systems are supplied with ventilation hoods, and require proper ventilation and specifically designed system components.

Installation

WARNING

Read warnings, page 4.

Dust and Foreign Matter

Avoid having dust or foreign matter enter the flow meter by taking the following precautions:

- Thoroughly flush the fluid supply lines before installing the flow meter.
- When installing fittings, make sure that no sealing tape overlaps into the inside of the pipe.
- Install a 30 mesh fluid filter upstream of the flow meter.
- The flow meter was calibrated in oil. Flush the meter with a compatible solvent prior to use.

CAUTION

The use of PTFE tape or pipe seal on fluid fittings upstream of this meter should be avoided if possible. Contaminants from sealing material may damage the meter.

Installing the Flow Meter

- Flow volume can only be measured at the location where the flow meter is installed.
- Do not use more than 200 ft. (61 m) of cable.
- Refer to FIG. 1 to locate and install the flow meter, connectors, and fluid shutoff valves. Install a check valve to prevent backflow. The arrows on the flow meter and check valve show the direction of fluid flow.
- The shutoff valves allow you to isolate the meter for service.
- Refer to the **Technical Data** and **Dimensional Drawings** for dimension, inlet/outlet size, temperature and other specifications.

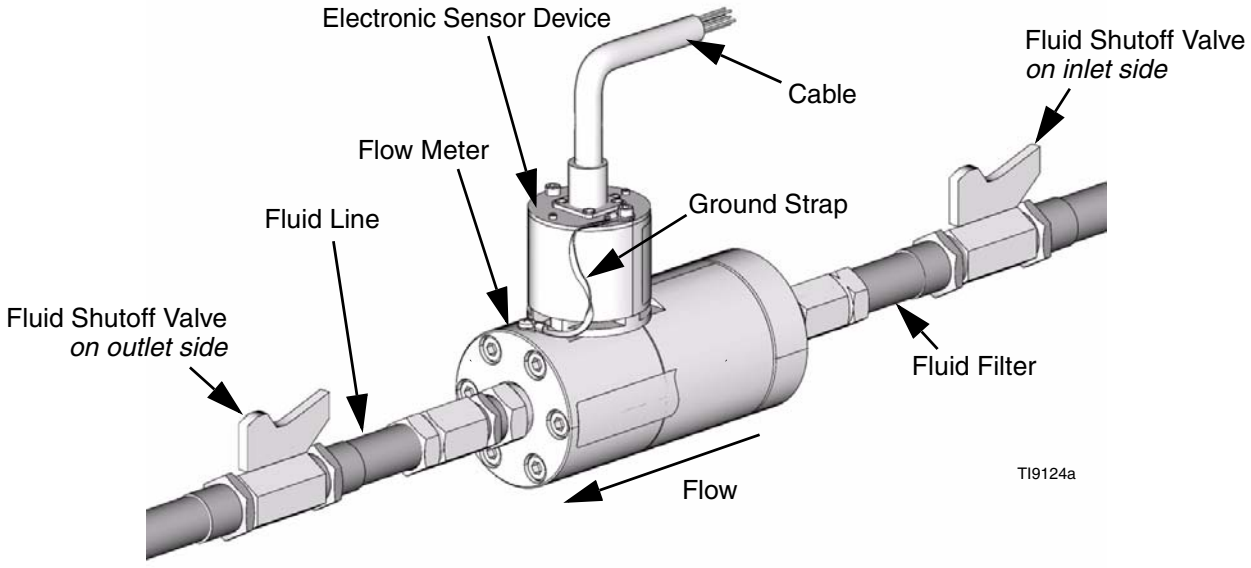


FIG. 1

Grounding

WARNING

Read warnings, page 4.

1. Ground the flow meter by connecting a grounded cable to the sensor.

   Have a qualified electrician check the electrical grounding continuity between the flow meter sensor and a true earth ground; remove the cable connector from the sensor and measure the resistance from the cable connector Pin B to the true earth ground. Refer to FIG. 2.
   If the resistance is greater than 25 ohms, check the cable ground connection. Refer to FIG. 2. Reconnect the ground sheath or replace the cable. Do not operate the system until the problem is corrected.

2. Always ground the fluid supply unit, using one of the following options:

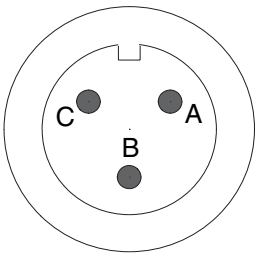
   a. Mount the meter to a grounded conductive surface, or

   b. Connect the conductive fluid hose to the meter inlet and outlet.

   c. Connect a ground wire to the meter's M6 mounting holes.

3. Never use the flow meter with an electrostatic gun isolation stand.

Cable Connector *(Solder Side)*



A +10-30 Vdc Supply *(red)*
B Ground *(black)*
C Signal Out *(white)*

FIG. 2

Operation

WARNING

Read warnings, page 4.

Pressure Relief Procedure

1. Turn off the fluid supply to the meter.
2. Shut off all electrical power to the fluid system.
3. Follow the Pressure Relief Procedure for your fluid system dispensing device.

Flow Meter Function

This is a positive displacement, gear flow meter. The gear flow meter is highly accurate, even with low flow rates. The fluid flowing through the meter rotates the gears. The gear position is monitored by a sensor device. An electrical impulse is produced by the sensor each time a gear tooth moves past it.

Recommended Usage

WARNING

Read warnings, page 4.

- See the **Technical Data** for fluid and ambient temperature limits.
- Only use the flow meter with fluids that are compatible with the “Wetted Parts” listed in the **Technical Data**.

Flow Volume Range

See TECHNICAL DATA on page 18 for flow volume range.

CAUTION

The flow meter gears and bearings can be damaged if they rotate at too high a speed. To avoid high speed rotation, open the fluid valve gradually. Do not over-speed the gear with air or solvent. To prolong meter life, do not use the meter above its maximum flow rate.

Flow Meter Verification

The factory calibration factor (k factor) for the flow meter is stated in the **Technical Data** section of the manual. This calibration factor is the number of flow meter pulses per liter, as determined by a measurement with oil. Most sealant and adhesive materials are compressible and, since the flow meter is measuring the material under high pressure, the actual volume of material may vary slightly from the measured volume due to this compressibility.
To adjust the flow meter k factor to reflect the uncompressed volume dispensed more accurately, perform the following steps:

1. Obtain a beaker, 500 cc or larger, and measure the mass of the empty beaker.
2. Manually dispense material into the beaker.
3. Record both the volume displayed and the current flow meter k factor (pulses per liter).
4. Measure the mass of the full beaker.
5. Subtract the weight of the empty beaker to determine the fluid mass.
6. Calculate the actual volume dispensed:

$$\frac{\text{fluid mass (g)}}{\text{density (g/cc)}} = \text{volume (cc)}$$

7. Calculate the new flow meter k factor:

$$\text{k factor} = \frac{\text{displayed volume (cc) X k factor (old)}}{\text{measured volume (cc)}}$$

8. Repeat steps 1-7 to validate the k factor.

Troubleshooting

The sensor is not a serviceable part. Replace it if it is malfunctioning.

Problem	Cause	Solution
No flow volume displayed at monitoring unit	Flow volume is too low to measure	Increase flow volume.
	Fluid is not flowing	See **Problem:** Fluid is not flowing, below.
	Damaged cable	Replace cable.
	Improper input voltage to sensor	Make sure input power is 10-30 Vdc.
	Damaged sensor	Replace sensor if it is malfunctioning.
Fluid is not flowing	Clogs in fluid line or in meter	Clean fluid line and/or meter; see **Maintenance** section.
	Gears worn or damaged	Service meter; see **Maintenance** section.

Maintenance

WARNING

Read warnings, page 4.

CAUTION

Do not immerse the meter in solvent with the electronic sensor installed. Solvent could damage the electrical components.
Air purge is not recommended for any gear-type flow meter. Air purges do not provide the lubrication the meter gears require.

Residue Build-up on the Meter Gears

Residue build-up may cause the meter gears to bind or stop rotating, which decreases the meter accuracy and makes meter recalibration necessary. As more build-up occurs, recalibration is required more often.
The frequency that your meter requires cleaning depends on the type of fluid being used. Excessive residue build-up usually means that you are using improper cleaning solvents and/or cleaning sequences or processes.

- Check the meter routinely to develop the correct cleaning schedule.
- Use the proper cleaning solvent for the fluid being metered.

Flushing the Meter

WARNING

Read warnings, page 4.

Flush the fluid supply line and meter fluid reservoir daily with a compatible solvent as instructed below.

1. Follow the **Pressure Relief Procedure**, on page 8.
2. Connect the fluid line to the solvent supply unit.
3. Flush the meter until it is clean.
4. Follow the **Pressure Relief Procedure**, then disconnect the fluid line from the solvent supply unit.
5. Reconnect the fluid line to the fluid supply.
6. Turn on the fluid supply.
7. Operate until the meter and fluid line are free of solvent.

CAUTION

It is not recommended that the meter be operated or flushed with water. Should this occur, residual water should be removed with alcohol and the internal components of the meter should be coated with a light film of oil. If the device is to remain inoperative for an extended period of time, internal components of the meter should be coated with a light film of oil.

Disassembly

WARNING

Read warnings, page 4.

Clean and service the meter at a clean work-bench. Use only lint-free cloth on parts.

1. Follow the **Pressure Relief Procedure**, on page 8. Then close the fluid shut-off valve on each side of the meter.
2. Disassemble the sensor assembly (19) and sensor pad (17) from the flow meter housing by removing M4 screws (18 & 20). See page 12.
3. Loosen the six M8 screws (2) from the end housing (1) of the flow meter.
4. Remove four of the six screws (2) from the end housing (1) keeping the two opposite bolts engaged by several threads.

CAUTION

To avoid damaging the shafts (4 & 8), keep the housings parallel to each other when separating them; do not rock the housings from side to side. Do not use chisels or screwdrivers to split and pry apart the housings.

5. Hold the end housing (1) and gently alternately tap on the two screws (2) with a hammer to separate the middle housing (11).
6. Remove the last two screws (2) and carefully separate the end (1) and middle housings (11) completely.
7. Remove and inspect the helical gear assemblies (4 & 8), gear bearings (5 & 7), and gear spacer (9) by lifting the gears straight out.
8. Check that the ball bearings (6) and dowel pins (13) did not fall out of their locations.
9. Unscrew the six M8 screws (15) and remove the end cap (14).

Inspection

1. Inspect the gears, shafts and bearings.
2. Inspect the housings.
3. Check the o-ring (12) condition, replace the o-ring if necessary.
4. Clean the meter parts with compatible solvent.

Assembly

1. With the middle housing (11) inlet side pointing up, check that the o-ring (12) is seated snugly on the end cap (14). Screw the end cap (14) to the middle housing (11) using M8 screws (15) and hand tighten. Make sure the four index holes on the housing line up. Torque the six screws (15) to 350 +/- 15 in-lb. (39.5 +/- 1.7 N•m). Do not overtighten.
2. Flip the middle housing (11) and end cap (14), so the outlet side is facing up. Check that o-ring (12) is seated snugly in its groove.
3. With the end housing (1) facing up, insert the 2-tooth helical gear assembly (4) including the centering spacer bearing into the larger bore of the end housing (1) with the spur gear end going first.
4. Slide the shaft spacer (9) over the 2-tooth helical gear (4) and place it into the large bore of the end housing (1) above the centering spacer bearing.
5. Press the shaft spacer (9) down until it sits flush in the end housing (1).
6. Install the gear bearing (5) into its hole in the end cap (1), lifting the 2-tooth helical gear (4) if necessary.
7. Insert the 3-tooth helical gear (8) into the gear bearing (5), making sure the two helical gears mesh with each other.
8. Line up the holes in the middle housing (11) with the helical gears, and **carefully** slide the housing over the gears.
9. Insert the two opposing screws (2) in the end housing (1) and alternately tighten each down until the two housing parts (1 and 11) are together.
10. Insert and tighten the remaining four screws (2) in the end housing (1).
11. Torque the six screws (2) in the end housing (1) to 350 +/- in-lb (39.5 +/- 1.7 N•m). Do not overtighten.Assemble the sensor assembly (19) and sensor pad (17) to the flow meter using M4 screws (18 & 20). Tighten the M4 screws (18 & 20) to 42 +/- 15 in-lb (4.75 +/- 1.7 N•m). Do not overtighten.

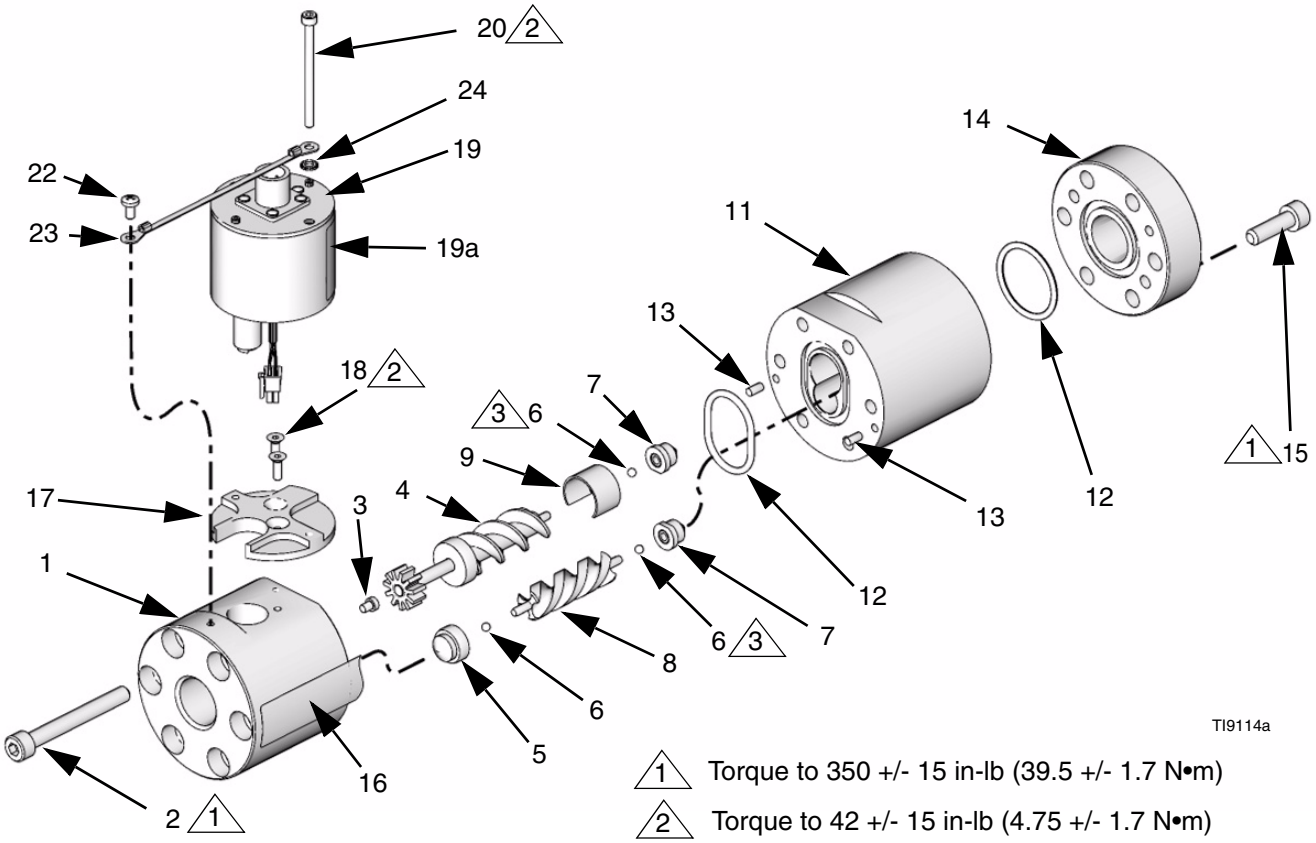
Parts

Model 246190, HG6000 Meter

Ref. No.	Part No.	Description	Qty.
	234134	GEAR METER ASSEMBLY; includes items 1 - 16	1
1		HOUSING, end	1
2	117535	SCREW, socket head; M8 x 65 mm long	6
3		GUIDE, gear	4
4*	234052	GEAR SUB-ASSEMBLY; 2-tooth	1
5†		INSERT, bearing	1
6†	101680	BALL, bearing	3
7†		INSERT, bearing	2
8*	234053	GEAR SUB-ASSEMBLY 3-tooth	1
9*	15B401	SPACER, shaft, gear	1
11†		HOUSING, middle	1
12*†	117541	O-RING, PTFE	2
13	192387	PIN, dowel	2
14		CAP, end	1
15	117536	SCREW, socket head; M8 x 25 mm long	6
16	292545	LABEL, identification	1
17	15B413	PAD, sensor	2
18	106371	SCREW, flat head; M4 x 12 mm long	2
19	246786	SENSOR ASSEMBLY	1
19a	15C551	LABEL, identification	1
20	114100	SCREW, socket head; M4 x 55 mm long	2
21†	070270	GREASE, lubricant; not shown	1
22	195874	SCREW, M4	1
23	120609	STRAP, ground	1
24	115322	WASHER, star	1

*Included in Gear Replacement Kit 246596

†Included in Bearing Replacement Kit 253215



1 Torque to 350 +/- 15 in-lb (39.5 +/- 1.7 N•m)

2 Torque to 42 +/- 15 in-lb (4.75 +/- 1.7 N•m)

3 After ball (6) is placed into bearings, apply grease (21) into bearing area.

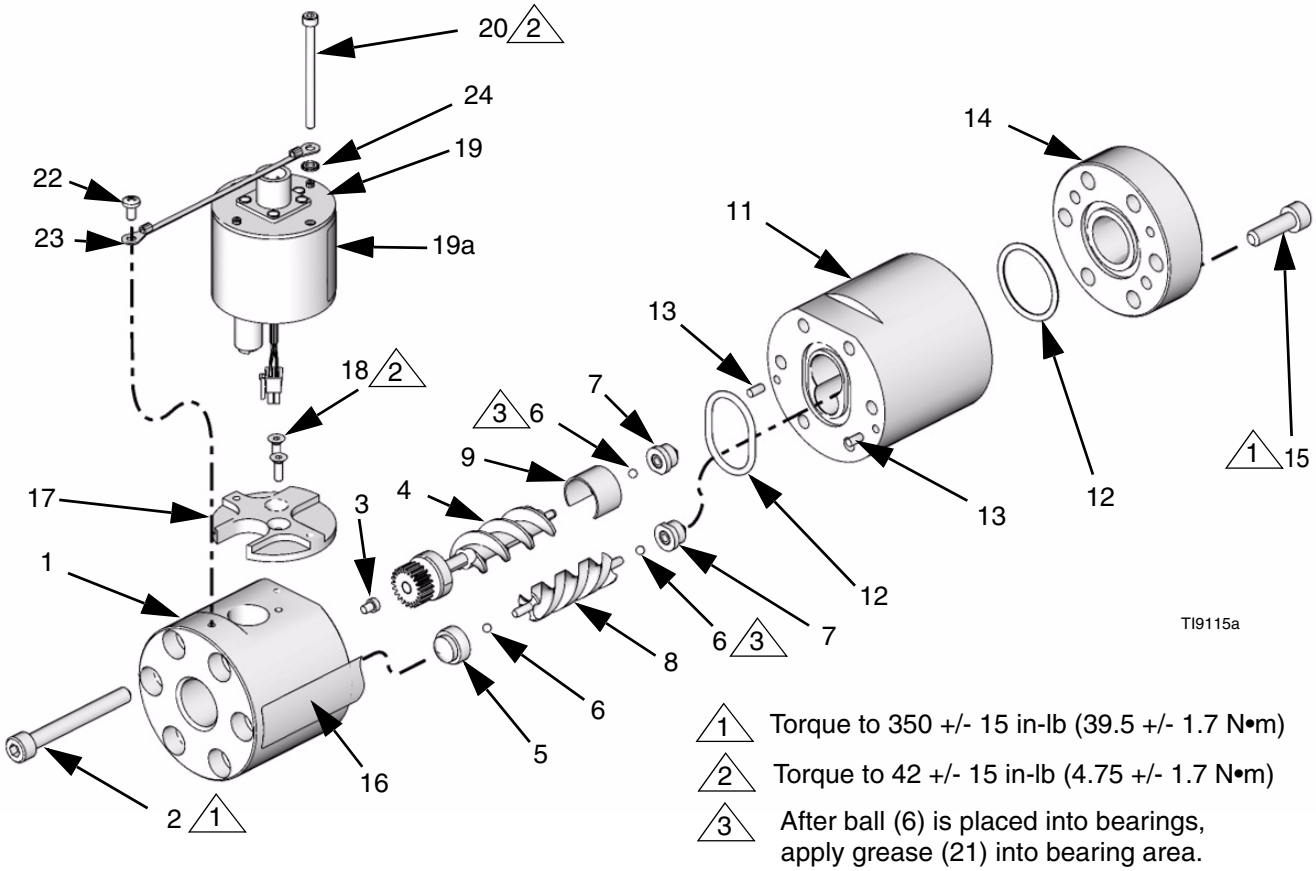
Parts

Model 246652, HG6000HR Meter

Ref. No.	Part No.	Description	Qty.
	246650	GEAR METER ASSEMBLY; includes items 1 - 16	1
1		HOUSING, end	1
2	117535	SCREW, socket head; M8 x 65 mm long	6
3		GUIDE, gear	4
4*	246686	GEAR SUB-ASSEMBLY; 2-tooth	1
5†		INSERT, bearing	1
6†	101680	BALL, bearing	3
7†		INSERT, bearing	2
8*	234053	GEAR SUB-ASSEMBLY 3-tooth	1
9*	15B401	SPACER, shaft, gear	1
11†		HOUSING, middle	1
12*†	117541	O-RING, PTFE	2
13	192387	PIN, dowel	2
14		CAP, end	1
15	117536	SCREW, socket head; M8 x 25 mm long	6
16	292544	LABEL, identification	1
17	15B413	PAD, sensor	2
18	106371	SCREW, flat head; M4 x 12 mm long	2
19	246786	SENSOR ASSEMBLY	1
19a	15C551	LABEL, identification	1
20	114100	SCREW, socket head; M4 x 55 mm long	2
21†	070270	GREASE, lubricant; not shown	1
22	195874	SCREW, M4	1
23	120609	STRAP, ground	1
24	115322	WASHER, star	1

*Included in Gear Replacement Kit 246949

†Included in Bearing Replacement Kit 253215



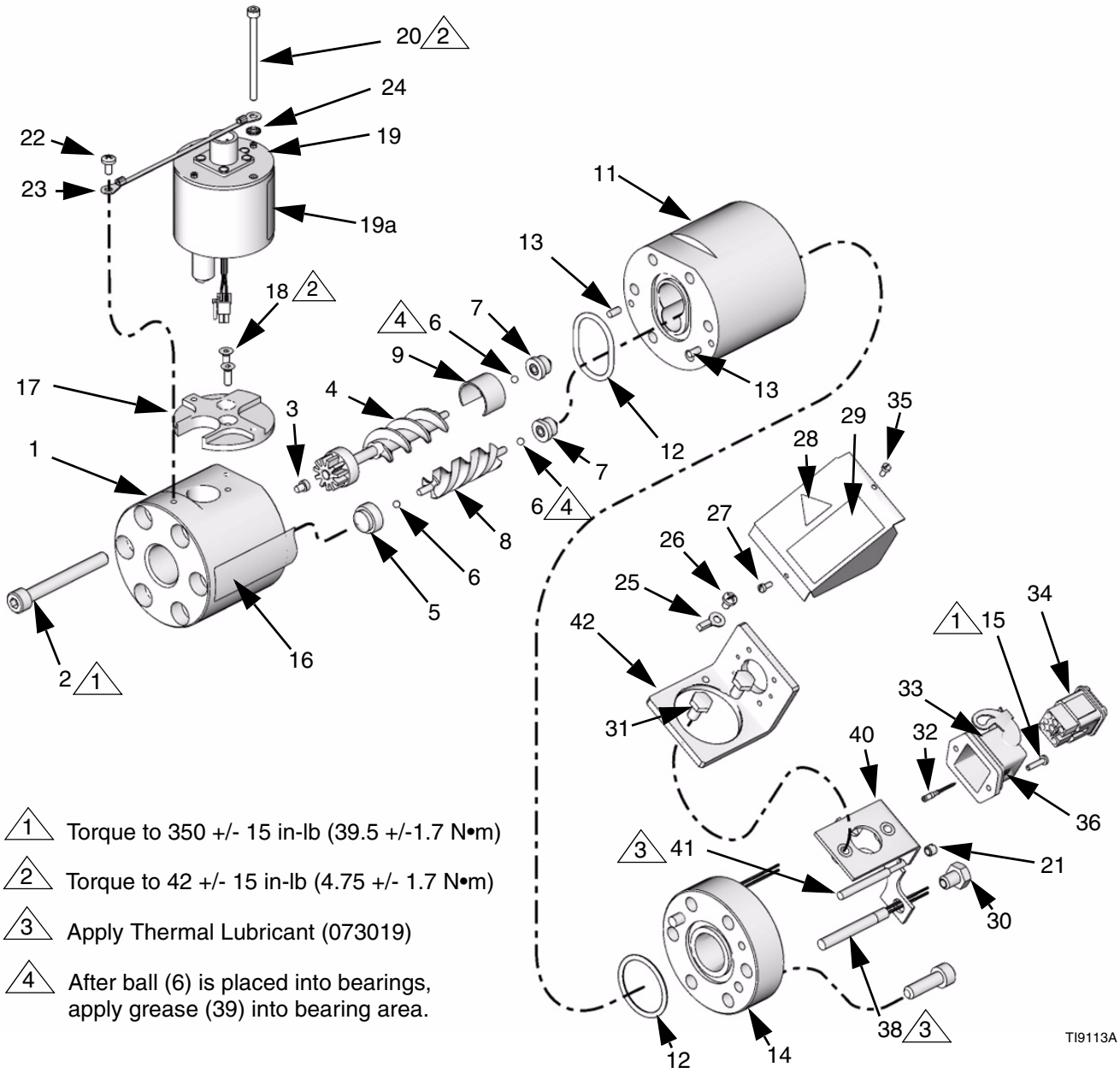
1 Torque to 350 +/- 15 in-lb (39.5 +/- 1.7 N•m)

2 Torque to 42 +/- 15 in-lb (4.75 +/- 1.7 N•m)

3 After ball (6) is placed into bearings, apply grease (21) into bearing area.

Parts

Model 246340, HG6000HT Meter



1 Torque to 350 +/- 15 in-lb (39.5 +/-1.7 N•m)

2 Torque to 42 +/- 15 in-lb (4.75 +/- 1.7 N•m)

3 Apply Thermal Lubricant (073019)

4 After ball (6) is placed into bearings, apply grease (39) into bearing area.

Parts

Model 246340, HG6000HT Meter

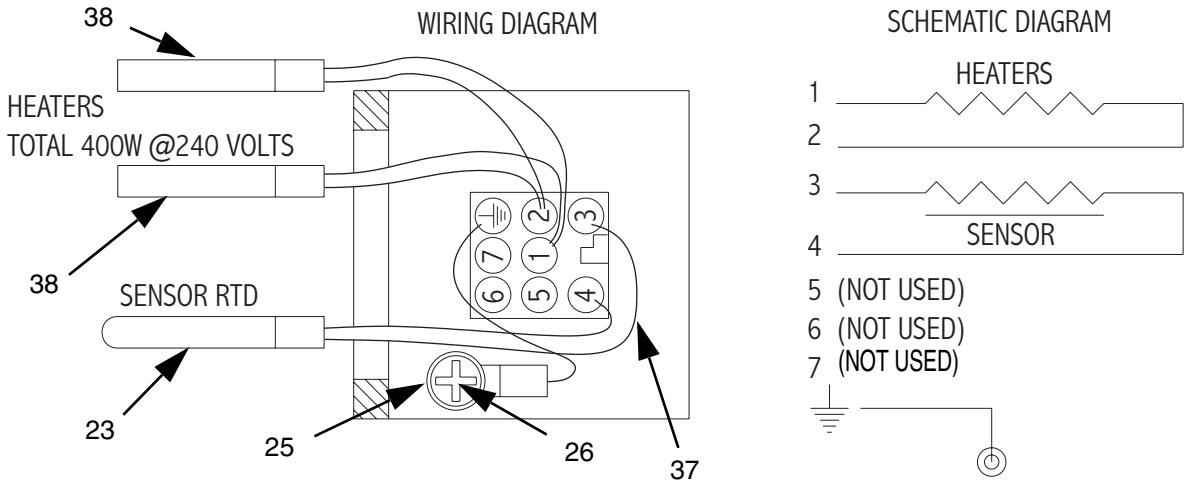
Ref. No.	Part No.	Description	Qty.
	246191	GEAR METER ASSEMBLY; includes items 1 - 16	1
1		HOUSING, end	1
2	117535	SCREW, socket head; M8 x 65 mm long	6
3		GUIDE, gear	4
4*	234052	GEAR SUB-ASSEMBLY; 2-tooth	1
5†		INSERT, bearing	1
6†	101680	BALL, bearing	3
7†		INSERT, bearing	2
8*	234053	GEAR SUB-ASSEMBLY 3-tooth	1
9*	15B401	SPACER, shaft, gear	1
11†		HOUSING, middle	1
12*†	117541	O-RING, PTFE	2
13	192387	PIN, dowel	2
14		CAP, end	1
15	117536	SCREW, socket head; M8 x 25 mm long	6
16	292543	LABEL, identification	1
17	15C506	PAD, sensor	1
18	106371	SCREW, flat head; M4 x 12 mm long	2
19	246786	SENSOR ASSEMBLY	1
19a	15C551	LABEL, identification	1
20	114100	SCREW, socket head; M4 x 55 mm long	2
21	15B774	INSERT, threaded; M6	2
22	195874	SCREW, M4	1
23	120609	STRAP, ground	1
24	115322	WASHER, star	1
25	101674	TERMINAL	1
26	112144	SCREW, mach; #8-32 UNC	1
27	C34040	COVER	1
28	189930	LABEL, caution	1
29	290228	LABEL, caution	1
30	15B773	INSERT, threaded; M8	2
31	112896	SCREW, hex head; 1/4 - 20 UNC	2
32	115862	CONNECTOR, male crimp	5
33	115861	BULKHEAD, housing	1
34	115860	INSERT, male	1
35	C19269	SCREW, mach; #4 - 40 UNC	2
36	100171	SCREW, mach; #4 - 40 UNC	2
37	065345	WIRE: 16 AWG (not shown)	
38	116614	HEATER, cartridge; 240V	2
39†	070270	GREASE, lubricant; not shown	1
40	15C336	BRACKET, mounting	1
41	C32255	SENSOR, temperature	1
42	C34043	BRACKET	1

*Included in Gear Replacement Kit 246596
†Included in Bearing Replacement Kit 253215

Wiring Diagram

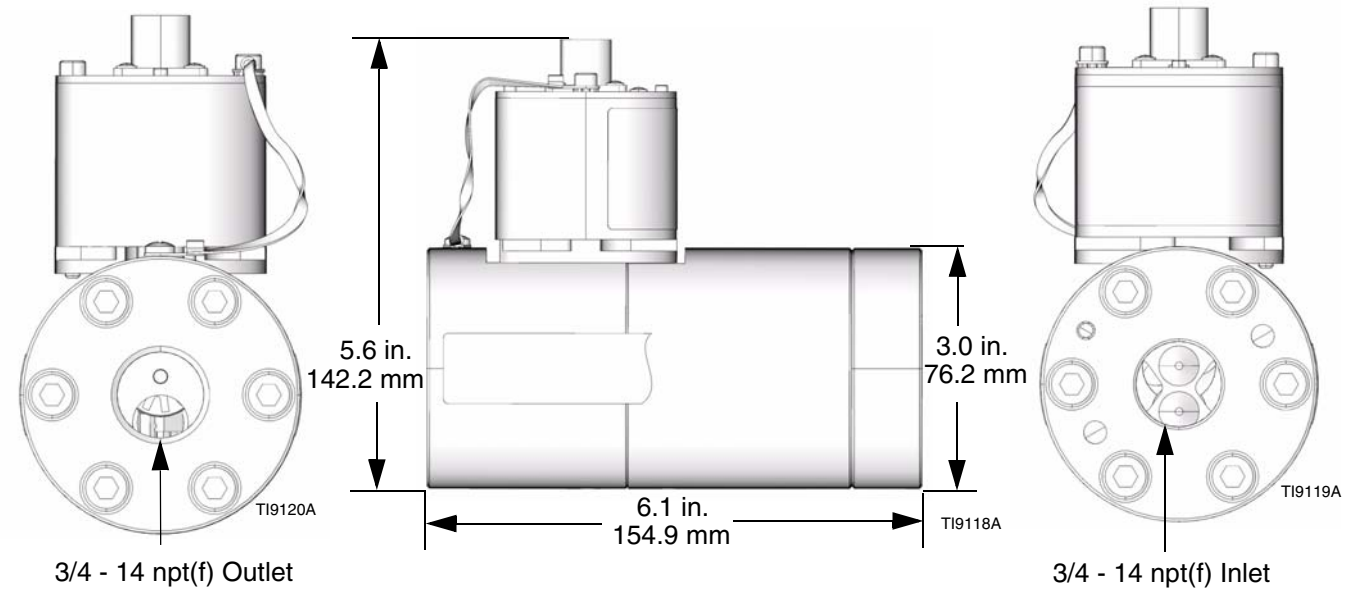
Model No. 246340 HG6000HT Meter Only

This flow meter is controlled by Graco Therm-O-Flow Plus controls.

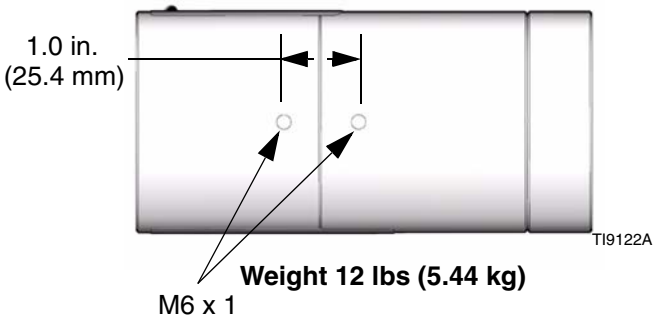


Dimensions

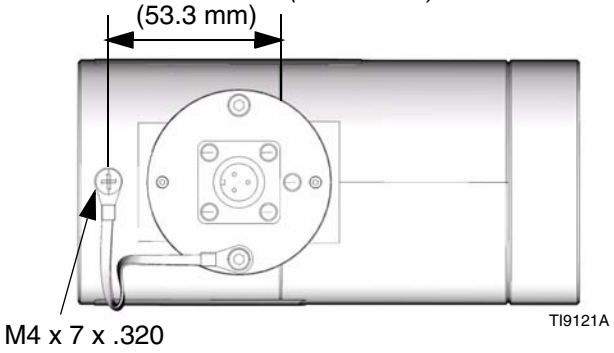
Flow Meter Port Size



Flow Meter Mounting Holes
(BOTTOM VIEW)



Flow Meter Mounting Holes
(TOP VIEW)

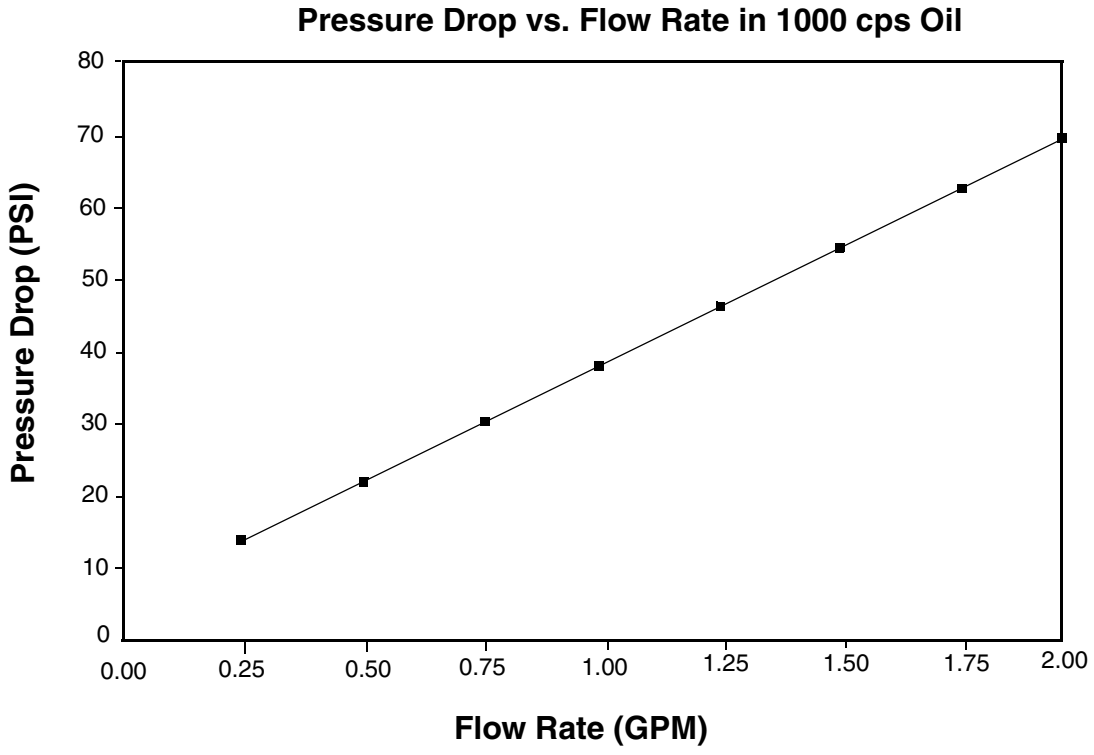


Technical Data

Mechanical Specifications

Category	Data
Maximum Working Fluid Pressure	6000 psi (41 MPa, 410 bar)
Flow Range	Models 246190 and 246340 .013 to 6.0 gpm (50 to 22,712 cc/min) Model 246652 .007 to 2.0 gpm (25 to 7571 cc/min.)
Maximum Operating Temperature	Models: 246190 and 246652, 180° F (82° C) Model: 246340, 400° F (204° C)
Maximum Ambient Temperature	180° F (80° C)
Fluid Viscosity Range	30 - 1,000,000 cps
Maximum Cable Length	200 ft (61 m)
Flow Meter Inlet/Outlet	3/4 npt(f)

Category	Data
Resolution (K-Factor)	Models 246190 and 246340 - (.286 cc/pulse) (3500 pulses/liter) Model 246652 - (.143 cc/pulse) (7000 pulses/liter)
Accuracy	+/- 0.25%*
Repeatability	+/- 0.1%
Supply Voltage	10 - 30 Vdc
Typical Current	15 mA
Approvals	CE
Wetted Parts	303 Stainless Steel, 440 SST, Carpenter Technology 7-mo Plus® Duplex SST, Tungsten Carbide, PTFE
* For most commonly used coatings, the flow meter reading will be accurate to within +/- 0.25%. Accuracy will diminish at low viscosities and low flow rates.	



Accessories

Use Only Genuine Graco Parts and Accessories

Fluid Filter C58997 (30 mesh)

5000 psi (350 bar) Maximum Working Pressure

With stainless steel bowl and polyethylene support

30 Mesh Filter Screen 515222

Recommended for use with Fluid Filter C58997.

Filter Bank C59547

5000 psi (350 bar) *Maximum Working Pressure*

C58997 Filter with Mounting Bracket, Shutoff Valves, and 30 Mesh Filter Screen

Fluid Shutoff Valve

5000 psi (350 bar) Maximum Working Pressure

For shutting off the fluid and isolating the flow meter for service or replacement. See page page 6.

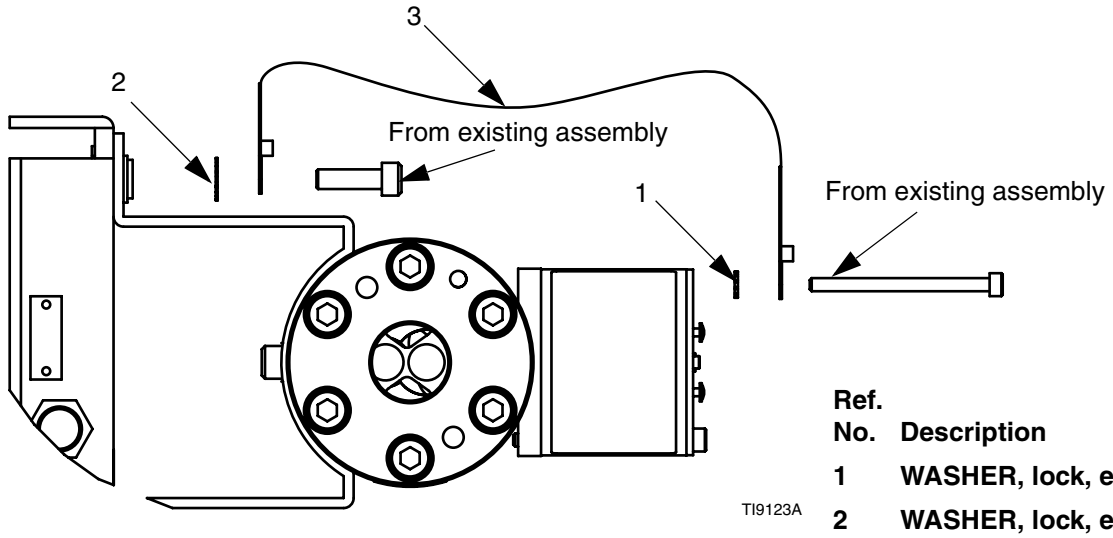
PART NO.	***DESCRIPTION***
521477	1 in. npt(f)

Electrical Cables

For connecting to sensor
Cable 241799
5 ft. (1.5 m) cable with one end terminated for connection to the sensor and the other end is left bare for connection to a junction box or special connector.

Grounding Protection Conversion Kit 255118

For adding ground strap, converting “A” series or earlier meter models.



Ref. No.	Description	Qty.
1	WASHER, lock, external 4mm	1
2	WASHER, lock, external	1
3	STRAP, ground, meter, 6 in.	1

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.

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