FILL-RITE®

A GORMAN-RUPP COMPANY

FILL-RITE OVAL GEAR METERS™

TS SERIES ELECTRONIC ASSEMBLY

Installation and Operation Manual

MADE IN USA WITH GLOBAL MATERIALS

GORMAN-RUPP COMPANY

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Thank You!

Thank you for your loyalty to the Fill-Rite brand. Your safety is important, so please read and thoroughly understand the procedures set forth in this manual. Protect yourself as well as those around you by observing all safety instructions and adhering to all danger, warning, and caution symbols. Please save these instructions for future reference and record the model, serial number, and purchase date of your Fill-Rite meter.

IMPORTANT RETURN POLICY

For all warranty and product questions, please contact Fill-Rite Technical Support at 1 (800) 720-5192 or via email at FillRiteTech@fillrite.com (M-F, 8 AM – 5 PM ET).

MODEL #	
SERIAL #	
PURCHASE DATE:	

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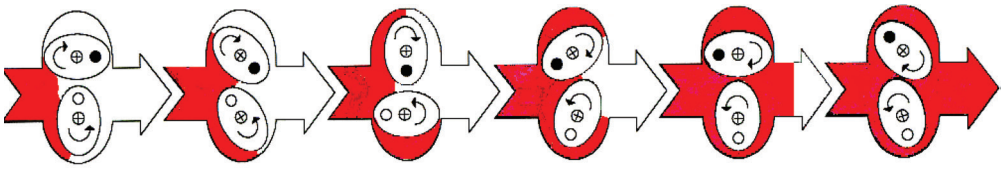
About This Manual

From initial concept and design through its final production, your Fill-Rite Oval Gear Meter product is built to give you years of trouble-free use. To ensure it provides that service, and to avoid injury or death, it is critical that you read this entire manual prior to attempting to install or operate your new product. Become familiar with the terms and diagrams, and pay close attention to the highlighted areas with the following labels:

⚠ DANGER	Indicates a hazardous situation which, if not avoided, will result in death or serious injury.
⚠ WARNING	Indicates a hazardous situation which, if not avoided, could result in death or serious injury.
⚠ CAUTION	Indicates a hazardous situation which, if not avoided, could result in moderate or minor injury.
NOTICE	Indicates information considered important but not directly hazard related.

At Fill-Rite, your satisfaction with our products is paramount to us. If you have questions or need assistance with your product, please contact us at 1 (800) 720-5192 or via email at FillRiteTech@fillrite.com (M-F, 8 AM – 5 PM ET).

Principle of Operation



Positive Displacement meters have a measuring chamber, where inlet & outlet are separated by rotors, a rotating element or sliding vanes. As the liquid passes through the flow meter, it causes the rotors/element/vanes to turn, which forms the basis for volumetric measurement.

The **Oval Gear** metering principle is based on two elliptical (oval) gears, which turn on center on two horizontal shafts inside a measuring chamber formed by two overlapping cylinders. The oval gears have meshing teeth along their entire circumference, ensuring that the gears will maintain correct position in relation to each other at all times, without the use of timing gears.

The volume being transferred from the inlet to the outlet side (= volume measured), forms between the oval gear and the side of the measuring chamber, alternately in the upper and the lower half of the measuring chamber. In a full 360° rotation of the gears, four such known volumes are released to the downstream side of the flow meter.

The flow meter is 100% glandless with static O-ring seals only. Internal magnets are detected by a sensor (pulser) mounted in flow meter case. The pulser generates an electrical on/off signal, which can be used to drive a signal conditioner or an electronic register.

With precision machining and close internal tolerances, the slippage is minimal for superior linearity (accuracy) over a broad turndown ratio. Oval gear meters are largely unaffected by changes in liquid viscosity.

Safety Instructions

Make sure that all necessary safety precautions have been taken, including proper clothing, personal safety equipment and fire safety equipment if required.

Before Start-Up of the Flow Meter, **make certain that**:

1. The meter is properly mounted, secured and piped.
2. All connections are tight.
3. All bleed and drain valves are closed.
4. Do NOT smoke near meter, or use meter near an open flame, when metering flammable liquids. Fire or Explosion could result.
5. This meter is not intended for use on liquids which require 3A Sanitary equipment for human consumption. It may be used on edible liquids which do not spoil easily, such as vegetable oils, liquid sweeteners & similar.

Install the Flow Meter and Accessories in compliance with all applicable Local, State & Federal Construction, Electrical and Safety Codes.

Meters and Accessories are not approved for liquids having a vapor pressure at the maximum allowable temperature of not more than 0.5 BAR (7.25 PSI) above normal atmospheric pressure unless specifically noted.

Operating Temperature

TS Series assemblies are rated for:

F•• assy	See register temperature rating
W•• assy	-15°F/+225°F (-26°C/+107°C)

However:

- *They are not suitable for cryogenic service.*
- *When operating temperature exceeds +120°F (+50°C), pressure rating is reduced. Please refer to Fill-Rite Technical Manual for details.*

Operating Pressure

Maximum **non-shock** operating pressure is:

Flow Meter/Strainer : 400 PSI (28 BAR) } at 100°F
Air Eliminator/Valves : 150 PSI (10 BAR) } (= +38°C)

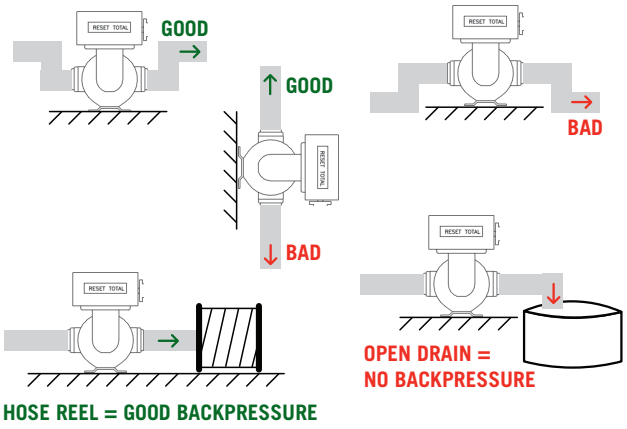
The flow meter should never be operated in excess of this pressure. Care should be taken to eliminate thermal and hydraulic shock conditions, so that system pressure never exceeds the flow meter's Maximum Working Pressure rating.

Installation

For wiring information, refer to the Electronic Oval Gear Meter - SCL and TBB Manual.

- Protective caps installed in flow meter flanges prior to shipment should remain in place until you are ready to install in the piping system.
- Positive Displacement meters are designed to operate full of liquid. The meter should be installed in a manner, so that it ***remains full of liquid at all times.***

  The flow meter is not designed to operate on air, but the design and materials of construction allow for operation on vapor for short periods of time without damage to the oval gears or flow meter internals.
- The ***meter should always be supported*** by bolting firmly to a solid platform or foundation. Never use the connecting pipe as the sole means of support.



- For most accurate measurement, the flow meter should operate with some backpressure (avoid delivering into an open vessel).
- The flow meter can operate with liquid going Left-to-Right, Right-to-Left, or Vertical Up, but it must be installed with ***rotor shafts in horizontal position*** (= with vertical end covers). Failure to observe this will impact negatively on flow meter accuracy and life of meter.
- ***Hydraulic shock*** can be harmful to flow meter and other system components. Consideration to eliminate hydraulic shock should be given in selection of pump and design of the piping system.
- Flow meters are designed to withstand a certain level of ***vibrations***, such as might be experienced on retail delivery tank trucks. If the flow meter will be used in a system with higher levels of vibration, it must be protected with:
  - Vibration isolating pad under the mounting pedestal.
  - Vibration isolators (flexible hose) on both inlet & outlet.
- Apply pipe compound to male threads, to ***install the two companion flanges.*** Tighten to a position, that allows the meter to bolt to the companion flanges, free of pipe stress.
- It is recommended that a ***Strainer*** be installed upstream of each flow meter, to prevent damage from foreign matter, such as welding slag, pipe scale or parts breaking off other equipment.
  - If no fluid is specified, strainer basket comes standard with 40 mesh. We also offer:
    - 20 mesh (std. with HV rotors) for use on high viscosity liquids, such as heavy fuel oil, automotive lube oils, liquid sugars, molasses, etc.
    - 100 mesh for gasoline, alcohol & solvent service.

Installation (Continued)

- Flush the system to remove all debris, scale and welding slag ***prior to flow meter installation.*** If this is not possible, temporarily remove rotors (oval gears), and reinstall after the system has been flushed.
- When installing the flow meter, consider future maintenance of both flow meter and accessories. The meter can be serviced in place, provided block (isolation) valves are included, and adequate space allowed.
- In critical installations a ***by-pass line is recommended***, so flow can continue while flow meter is being serviced.
- When an ***Air Eliminator*** is included in the flow meter assembly, the strainer/air eliminator must be in horizontal position, since the air eliminator operates on a gravity principle. A few drops of liquid may be expelled when the air eliminator vents, so vent ports should be piped back to storage or to a collection tank (sloping towards the tank).
- ***Thermal relief valves are recommended***, and should be installed whenever possible, especially if the flow meter can be blocked (isolated) between two valves. The pressure rise in a closed system, from just a few degrees increase in temperature, can be many times normal working pressure.
- ***Connections for calibration*** should be provided during installation. An easy means for diverting flow into a calibration vessel (or master meter) should be considered. Refer a diagram for the suggested installation is shown below.
- Refer to Electronic Oval Gear Meters - SCL and TTB Manual for wiring information.

Start-Up & Operation

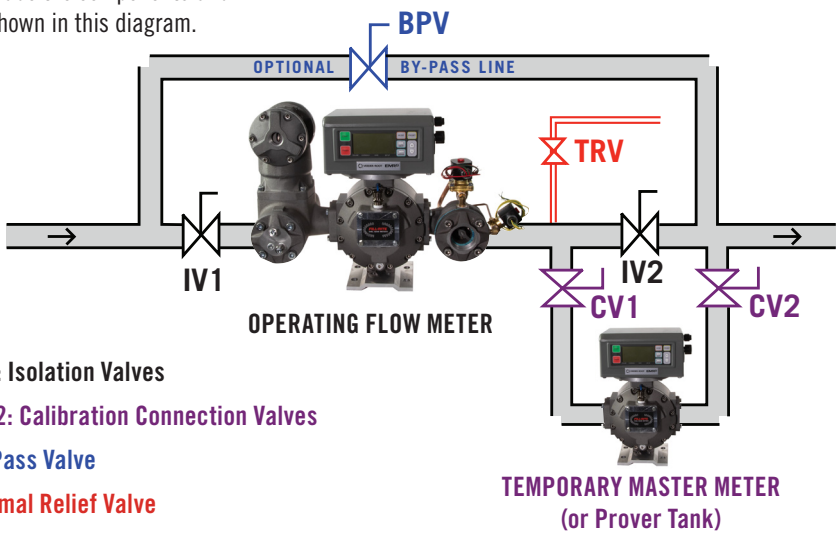
Very slowly fill the system with liquid, to avoid operating the flow meter on air or vapor. This can be accomplished in the following manner:

1. Throttle the meter inlet valve, and allow the system to fill slowly by gravity.
2. Crack open the outlet valve. Start the pump, and then slowly crack open the inlet valve, filling the meter slowly before fully opening the inlet and outlet valves.

In normal operations:

- Avoid sudden changes in temperature.
- Avoid sudden changes in flow rate.
- Gradually increase or decrease the flow rate.

The optimum flow meter installation should include the components and features shown in this diagram.



IV1 & IV2: Isolation Valves

CV1 & CV2: Calibration Connection Valves

BPV: By-Pass Valve

TRV: Thermal Relief Valve

TRV protects portion of system, which can be isolated between valves IV1, CV1 & IV2.

Normal Operation	:	BPV, CV1 & CV2 closed
Service/Maintenance	:	IV1 & IV2 closed (by-pass open)
During Calibration	:	IV2 & BPV closed, other valves open

Refer to TS Series Electronic - SCL & TBB Manual for regulatory information.

Warranty

Fill-Rite Warranty does not extend to damage due to corrosion, salt deposits, or separation of chemicals – whether occurring during periods of operation or storage. Non-Fill-Rite items, such as electronic registers, are covered by the original manufacturer warranty, but will be handled through Fill-Rite if the register was supplied by Fill-Rite. Components added after shipment from Fill-Rite, such as hose, nozzles & similar, are the responsibility of the distributor or contractor selling the installation.

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