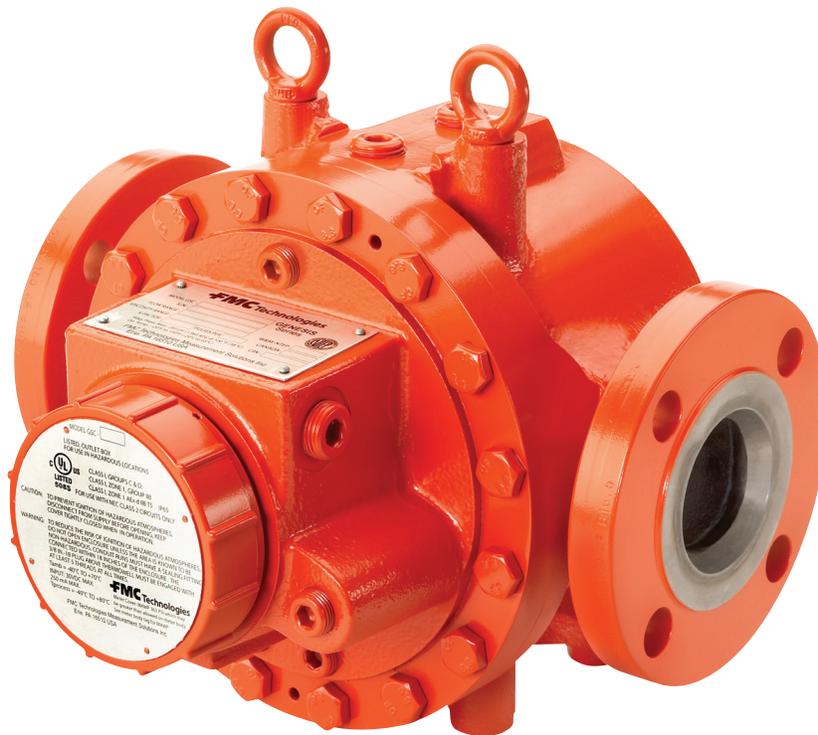


Smith Meter® PD Meter

Genesis™ Series 2" and 3" Steel Meters

Installation / Operation Manual

Bulletin MN01046 Issue/Rev 0.2 (4/17)



Caution

Read instructions carefully before attempting to operate. Claims for damage caused by air, line contamination, or pressure shock waves during start-up will not be accepted by TechnipFMC FMC Technologies Measurement Solutions, Inc.

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Section 1 – Principle of Operation

The Smith Meter® Genesis™ Meter is a single-case, straight-through type, rotary vane positive displacement meter. The Genesis Meter is designed with a horizontal shaft so it can easily be installed in either horizontal or vertical piping. The accurately-machined housing contains a rotor which revolves on ceramic hybrid bearings and carries two evenly-spaced blades. As liquid flows through the meter, the rotor and blades revolve about a fixed cam causing the blades to reciprocate. The successive movement of the blades forms a measuring chamber of precise volume between the two blades, the rotor, the housing, the bottom, and the top covers. A continuous series of these closed chambers is produced as the rotor revolves. Neither blades nor rotor contact the stationary walls of the measuring chamber.

One of the outstanding features of the Smith Meter Genesis Series Meter principle is that the flow transitions smoothly through the meter while it is being metered. Energy is not wasted by unnecessary hydraulic bending of the liquid.

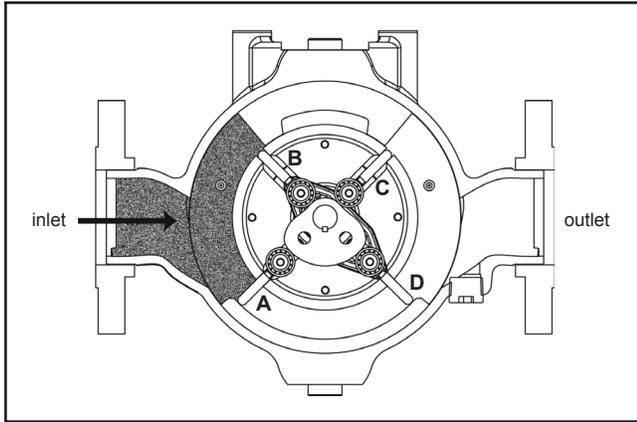


Figure 1

Unmeasured liquid (dotted area) is shown entering and causing the meter rotor and blades to turn counter-clockwise. Blade paddles B and C are fully retracted while the opposite ends, paddles A and D are fully extended, forming the measuring chamber.

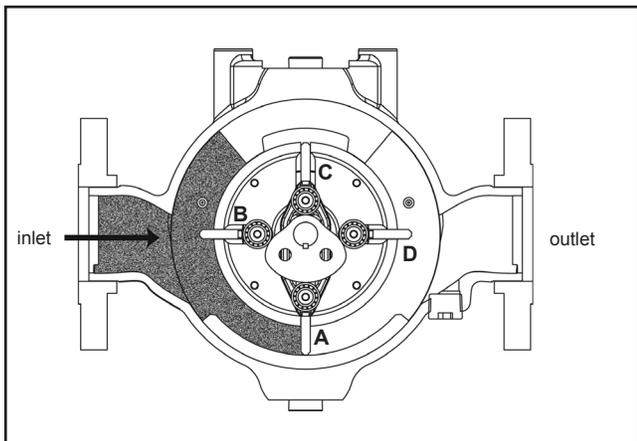


Figure 2

The rotor and blades have made one-eighth revolution. Blade A is fully extended; Blade D is partially drawn back, and the opposite end of blade B is starting to extend.

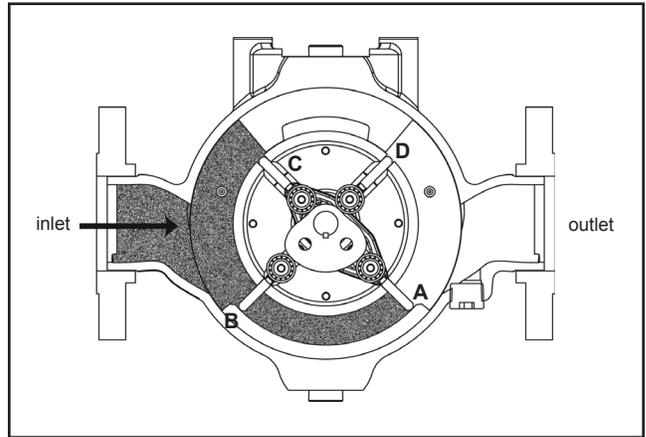


Figure 3

A quarter revolution has been made. Paddles A and B are fully extended and paddles C and D are retracted. An exact known volume of new liquid is now in the measuring chamber formed between paddles A and B.

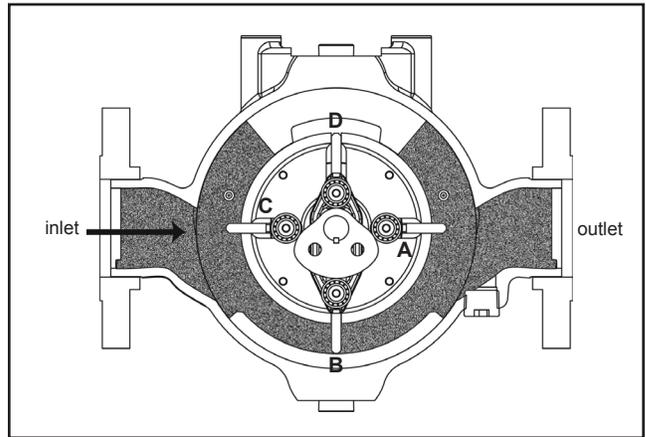


Figure 4

One-eighth of a revolution later, the measured liquid will then move out of the meter. Blade A will retract on the outlet side and paddle C will start to extend which will capture the next successive measured volume which will form between paddles B and C as the rotor rotates around the cam.

In one-half revolutions, two measuring chambers have formed and the third is forming. This cycle is repeated as long as liquid flows.

The rotation of the rotor is converted into electronic pulses by means of a magnet that rotates with the rotor and is sensed by a high-resolution hall-effect sensor located in the cover. The meter pulse output per unit of volume (K-factor) is specified by the customer when the meter is purchased. Once the meter is purchased it is not possible to change the K-factor value.

Section 2 – Mechanical Installation

1. The meter is a precision instrument and should be treated accordingly. Prior to installation, it should be protected from adverse weather conditions and accidental abuse.
2. Adequate pipe support must be provided close to the meter because the meter is supported by the flanges. Piping must not produce an undue strain on the meter.

Dimensional outline drawings of the meter are available.

3. When installing the meter, a carpenter's level should be used on a flat surface of the meter housing (for example on the cover on the nameplate pad) to ensure the rotor is level.

This is important because the meter shaft must be level.

WARNING!
Thermal Pressure

Thermal expansion of liquid in this equipment can cause high pressure damage. A Thermal Pressure Relief Valve may be necessary in the system.

4. When installing the meter, be sure the drain plug is accessible but that the meter cannot be accidentally drained of product.
5. Protect the meter and system against the effects of thermal expansion with a relief valve.
6. Where necessary, a deaerator or air eliminator should be installed to keep air and vapor out of the meter.
7. All piping should be internally cleaned before the meter is put into operation.

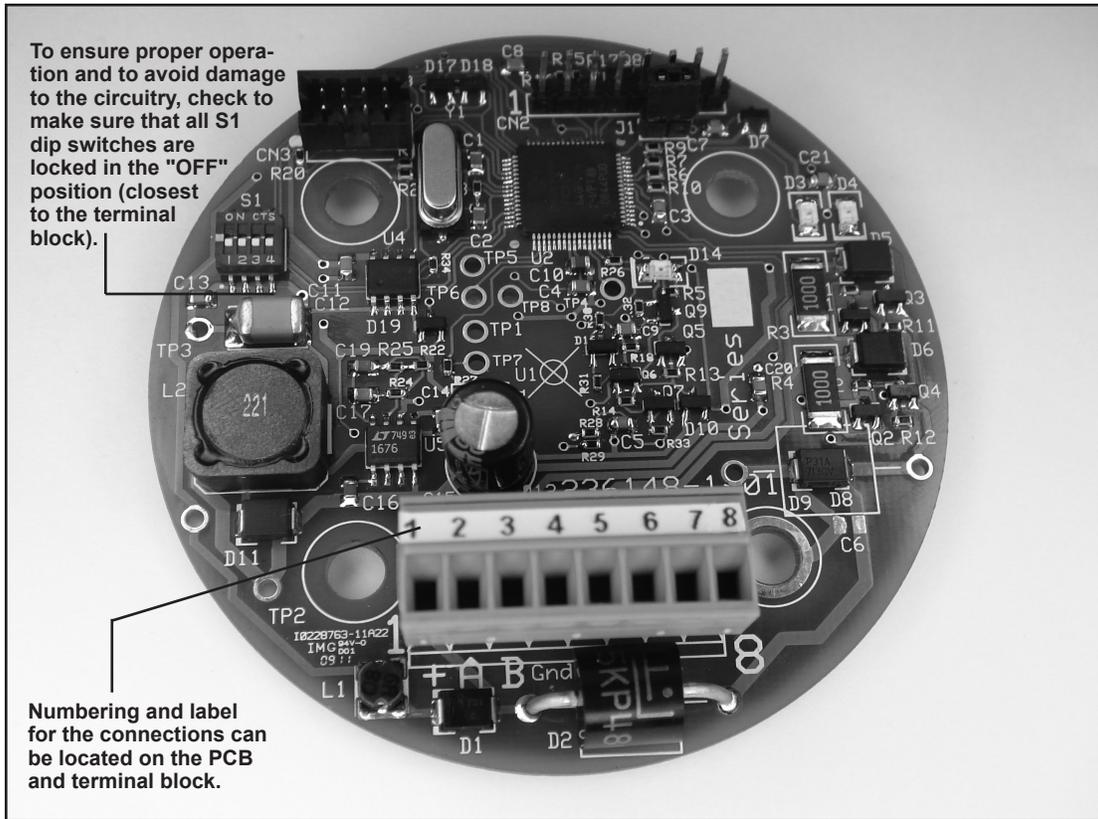
Rust, dirt, welding shot, and other foreign material must be removed completely.

Remove the meter and install a spool piece if the system is to be pressure-tested with water or if debris is to be flushed from the system.

The meter should be protected by at least a 40-mesh strainer.
8. Where necessary, a flow-limiting valve should be installed downstream of the meter to protect it from excessive flow rates.
9. Do not calibrate with water or allow water to stand in the meter.
10. Flush the meter with a light lubricating oil if it is left idle or stored.
11. The meter can measure flow in either direction (forward and reverse).

For standard and reverse flow directions, see meter arrangements on page 5.

Wire Connections



The HRE circuit board (Hall Rotary Encoder) utilizes the rotation of the magnetically coupled PD meter rotor and electronically senses the rotation to produce the Quadrature* output pulses. The encoder is completely isolated from the product and meter internals. Because the encoder and rotor rotation are magnetically coupled, no gear train or thrust bearing maintenance is needed.

*Quadrature (Dual Output Signal) – Two discrete pulse channels are generated 90 electrical degrees out-of-phase with each other. By monitoring these signals with a pulse sequence comparator, (such as that found in the Smith Meter AccuLoad/microLoad series of equipment), the integrity of the pulse transmission system can be checked for pulse transmission errors (noise), malfunctioning transmitter, and faulty transmission cable. Additionally, reverse flow can be detected.

Caution

When handling the HRE board, ensure that proper grounding and static buildup is not present in order to prevent damage to the board. Improper handling and static discharge will cause failure to the board.

Note: the HRE is factory programmed specifically for the characteristics of the meter, and is marked with the serial number of the meter to ensure the link. Consult factory for proper replacement; do not install the HRE from one meter into another as improper measurement may occur. If the HRE circuit board is removed and replaced, be sure that all four screws that hold the HRE board are fully seated and the board is fixed flat and centered on the standoffs in the enclosure.

Terminal Connections: CN1

- Terminal 1 + 10 - 30 Vdc
- Terminal 2 "A" Signal (Leading)
- Terminal 3 "B" Signal (Lagging)
- Terminal 4 Logic Common (Ground)
- Terminal 5
- Terminal 6 No electrical connection on circuit board. These can be used for wiring connections or tie-ins (ex. RTD junction, etc.)
- Terminal 7
- Terminal 8

Electrical Specifications

Electrical Inputs

DC Power Range:

10 to 30 Vdc

Input Current:

Quiescent Current (No Load): 20 mA @ 10 Vdc, 15 mA @ 24 Vdc, 15 mA @ 30 Vdc

Output Signal

10 Vdc Input Power Supply:

No Load: 9.7 ± 0.3 Vp-p square wave

270 Ω Load: 7.6 ± 0.3 Vp-p square wave (minimum)

24 Vdc Input Power Supply:

No Load: 23.7 ± 0.3 Vp-p square wave

270 Ω Load: 16 ± 0.3 Vp-p square wave (minimum)

30 Vdc Input Power Supply:

No Load: 29.7 ± 0.3 Vp-p square wave

270 Ω Load: 21 ± 0.3 Vp-p square wave (minimum)

Output Source Current (A & B @ 270 Load):

70 mA @ 10 Vdc, 130 mA @ 24 Vdc, 160 mA @ 30 Vdc

Output Current per Channel (A & B):

Maximum Sink Current: 300 mA @ 30 Vdc

Maximum Source Current: 80 mA @ 30 Vdc

Electrical Installation

General

The HRE circuit board is mounted in a Flame Proof (Explosion Proof) enclosure. The cable, conduit, and conduit fittings must meet installation requirements, such as hazardous area classifications, humidity, temperature, voltage, current, and others.

For ATEX and IEC Installations

For systems utilizing cable glands the cable entry must be in accordance to EN/IEC 60079-1 section 13. The gland and/or thread adapter must be Exd certified. The cable end must be securely installed and, depending on the cable type, be properly protected from mechanical damage. Wiring conductors and/or cable gland, if used, must have a temperature rating of at least 90°C.

For systems utilizing rigid conduit, the conduit entry must be in accordance to EN/IEC 60079-1 sections 13, and Ex d certified stopping box (sealing device) must be used immediately at the entrance of the enclosure. (i.e.: within 50 mm). It is an end user requirement to ensure that any unused entries must be suitably blocked with an Ex d IIB IP65 certified plug for ATEX and IEC Ex applications.

For North American Installation

Conduit connections must be in accordance to:

USA – National Electric Code (NFPA 70)

Canada – Canadian Electric Code (CSA C22.1)

A listed seal off box must be used immediately at the entrance of the enclosure. (i.e.: within 3 inches) Any unused entry must be blocked with a metal listed plug.

For North American zone applications, the plug must be listed metal close up type. A listed flexible conduit section meeting the requirements of the relevant standards for the area classification of at least 12" in length may be used to join the housing to the rigid conduit system. Additionally it is recommended that a listed conduit union be utilized for the connection to allow the removal of the housing for maintenance purposes.

Section 3 – Electrical Installation

All Installation Notes

Caution: To prevent ignition of hazardous atmospheres, disconnect from supply circuit before opening. Keep tightly closed when circuits are in operation.

Warning: Enclosure contains capacitors, to prevent ignition of hazardous atmospheres. Do not open unless area is known to be non-hazardous.

Important: Cut unused shield back to the jacket insulation and tape. Terminate shield at receiving instrument only to prevent ground loops.

Double check all field wire connections before application of power and operation. Incorrect wiring may damage or destroy circuitry.

Do not short circuit or apply power to the pulse output terminals of the HRE or circuit damage could occur.

Disconnect terminal plug from HRE before applying diagnostic signals to the cable if required for troubleshooting purposes of the cabling.

Warning: Make sure hazardous area is safe by following all locally prescribed safety precautions during the troubleshooting exercise.

Recommended Cable

16-20 AWG stranded copper shielded cable, compatible with local requirements.

Three-wire shielded for single-channel transmission and power.

Four-wire shielded for dual-channel transmission and power.

Four-wire shielded for temperature probe (if supplied), distances below do not apply, distance should be as short as possible and depends on installation conditions, long distance installations may require a user supplied four wire temperature transmitter.

Cable Size and Distances

#20 AWG up to 2,000 ft. (610 m)

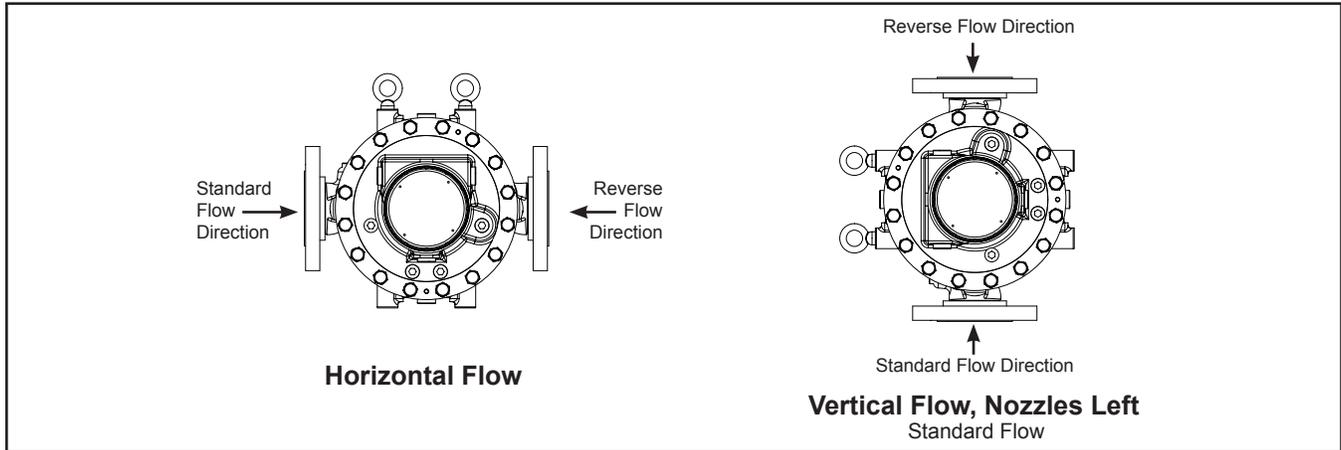
#18 AWG up to 3,000 ft. (915 m)

#16 AWG up to 5,000 ft. (1,525 m)

Note: Resistance between the ground terminal and the power supply ground must not exceed 2 ohms.

Section 4 – Operation

Arrangement



Start-Up Procedure

When the meter is first installed in the line there is air inside the rotor. The air takes some time to work out. If the meter is subjected to hydraulic shock during this vulnerable time, the rotor can pinch down on the blades and cause blade breakage or cam shaft rotation. By following the procedure listed below, the likelihood of meter damage will be greatly reduced.

1. If possible, gravity head should be used to initially fill the meter as air is vented from a high-point vent.
2. Close the upstream isolation valve and energize the pump.
3. Slowly open the upstream isolation valve until the meter and flow control valve are *just* pressurized. It is important that the upstream valve be just barely open to ensure that the meter will be operated at very low flow.
4. Initiate low flow (refer to meter specifications) via the electronic preset.
5. Vent air from the high-point vent until there is no sign of air being vented (30 seconds or more). REMEMBER – air is trapped inside the rotor and takes time to be displaced.
6. Gradually open the isolation valve and initiate normal operation.

This procedure should be used whenever air has been introduced to the line or meter.

General Operating Information

1. The meter was tested with kerosene; the K-factor (pulses/unit of registration) will be indicated on the meter tag. (Meter specific compensation factors are pre-loaded into the electronics, based on user specific viscosity ranges).
2. To obtain maximum service from TechnipFMC, it is suggested that detailed records be maintained. Data such as model, serial number, operating rate, type of product, meter clearances, totalizer readings, meter factor, and other pertinent information should be recorded. Such information is an excellent guide in scheduling a preventive maintenance program.

Reference Publications

American Petroleum Institute
2101 L Street, Northwest
Washington, DC 20037

Manual of Petroleum Measurement Standards.

API Chapter 4 – Proving Systems.

API Chapter 5, Section 5.2 – Measurement of Liquid Hydrocarbons by Displacement Meter Systems.

API Chapter 12, Section 2 Field Manual – Instructions for Calculating Liquid Petroleum Quantities Measured by Turbine or Displacement Meters.

Technical Support

Contact Information:

Field Service Response Center

24/7 Technical Support/Schedule

a Technician: 1-844-798-3819

System Installation Supervision,

Start-Up, Training, and

Commissioning Services Available

Revisions included in MN01046 Issue/Rev. 0.2 (4/17):

Installation section split into separate mechanical and electrical installation. The electrical installation section information is a complete revision.

The specifications contained herein are subject to change without notice and any user of said specifications should verify from the manufacturer that the specifications are currently in effect. Otherwise, the manufacturer assumes no responsibility for the use of specifications which may have been changed and are no longer in effect.

Contact information is subject to change. For the most current contact information, visit our website at TechnipFMC.com and click on the "Contact Us" link.

TechnipFMC.com

FMCTechnologies.com/MeasurementSolutions

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