Smag62

Electromagnetic flowmeter

Smag62 GB

Features

- Pipe dimension range: DN10 ÷ DN150
- Measure range: <0,6m³/h ÷ >300m³/h
- Fluid conductivity: >5µS/cm
- Sensor material: SS321
- Lining materials: PTFE; PFA
- Housing material: epoxy printing aluminum
- Electrodes materials: SS321; SS316; Hastelloy B/C; Titanium
- Remote version operating temperature: PTFE <120°C / 150C°
- Compact version operating temperature: -40÷75°C
- Max. accuracy: ±0,5%
- Max. repeatability: ±0,1%
- Fluid velocity: ±10m/s
- Analog output: 4÷20mA; max. load 1000Ω
- Protocol communication: Modbus (optional) Profibus (optional) HART (optional) RS485 (optional)
- Pulse output: 0÷5000Hz
- Power supply: 90÷250Vac or 18÷36Vdc
- Consumption: <10W
- Protection compact version : IP67 with 2 cable gland M20x1,5 and 1 M16x1,5 for elect. connection
- Protection remote version : IP67/IP68 (only pipe)

- ***Compact digital system, for conductive liquids (>5µS/cm), even with a limitated content of suspended solids.***
- ***Measurement range: from <0,6m³/h to >300m³/h***
- ***Best measurement accuracy: ±0.5%***
- ***Power supply: 85÷265Vac or 24Vdc***

General

A complete magnetic flowmeter system consists of two components: the Smag62 microprocessor-based integral-mount magneti flowmeter transmitter and a flowtube.The flowtube is installed in-line with process piping, either vertically or horizontally. Coils located on opposite sides of the flowtube create a magnetic field, and conductive liquid moving through the magnetic field generates a voltage that is detected by two electrodes.The transmitter controls the generation of the magnetic field and senses the voltage detected by the electrodes. Based on the sensed voltage, the transmitter calculates a flow rate and produces analog and frequency output signals proportional to this flow rate.

1. FUNCTIONAL SPECIFICATIONS

1.1 Flow Rate Range

Capable of processing signals from fluids that are traveling between to 10 m/s for both forward and reverse flow in all flowtube sizes.
Full scale continuously adjustable between -10 to +10 m/s.

1.2 Fluid Conductivity

Fluid must have conductivity of at least 5 microsiemen/cm.

1.3 Power Supply

90÷250Vac or 18÷36Vdc depends on the model.

1.4 Power Consumption

10 watts maximum.

1.5 Ambient Temperature Limits

Operating:-40 to 165 °F (-40 to 75 °C).

Storage: -40 to 185 °F (-40 to 85 °C).

1.6 Output Signals

4-20 mA: 0÷1000 ohm load.
Frequency output: 0÷10000 Hz
Pulse output: 0÷5000 Hz

1.7 Reverse Flow

Allow measure reverse flow.

1.8 Output Testing

Current Source: Transmitter can be commanded to supply a specified current between 4.0 and 20.0 mA.

Frequency Source: Transmitter can be commanded to supply a specified frequency between 0.1 and 10000 Hz

1.9 Turn-on Time

Fluid must have conductivity of at least 5 microsiemen/cm.

1.10 Start-up Time

0.5 seconds from zero flow.

1.11 Low Flow Cutoff

Adjustable between 0.0 and 9.9%Qmax. Below selected value, output is driven to the zero flow rate signal level.

1.12 Humidity Limits

0-100% RH to 150 °F (65 °C), not condensing.

1.13 Overrange Capability

Signal output continues to 110% of upper range value setting, then remains constant. Out of range message displayed on LOI.

1.14 Damping

Adjustable between 0.1 and 99 seconds

2. PERFORMANCE SPECIFICATIONS

2.1 Accuracy

System accuracy is ±0.5% of rate from 0.2 to 10 m/s.
Analog output has the same accuracy as frequency output plus an additional 0.05% of span.

2.2 Repeatability

±0.1% of reading

2.3 Response Time

0.2 seconds maximum response to step change in input.

2.4 Stability

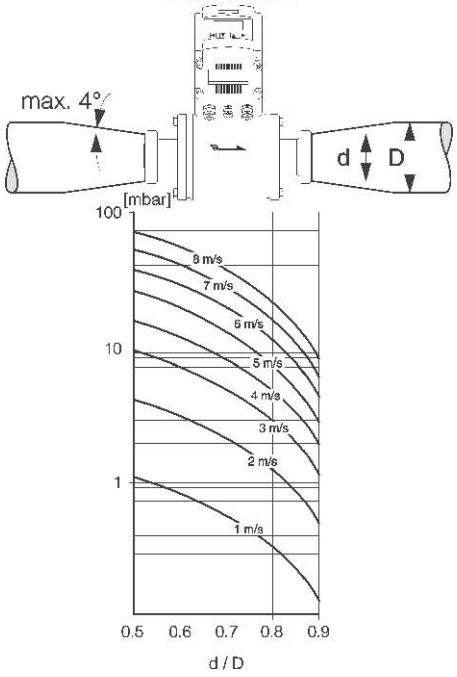
±0.1% of rate over six months.

2.5 Ambient Temperature Effect

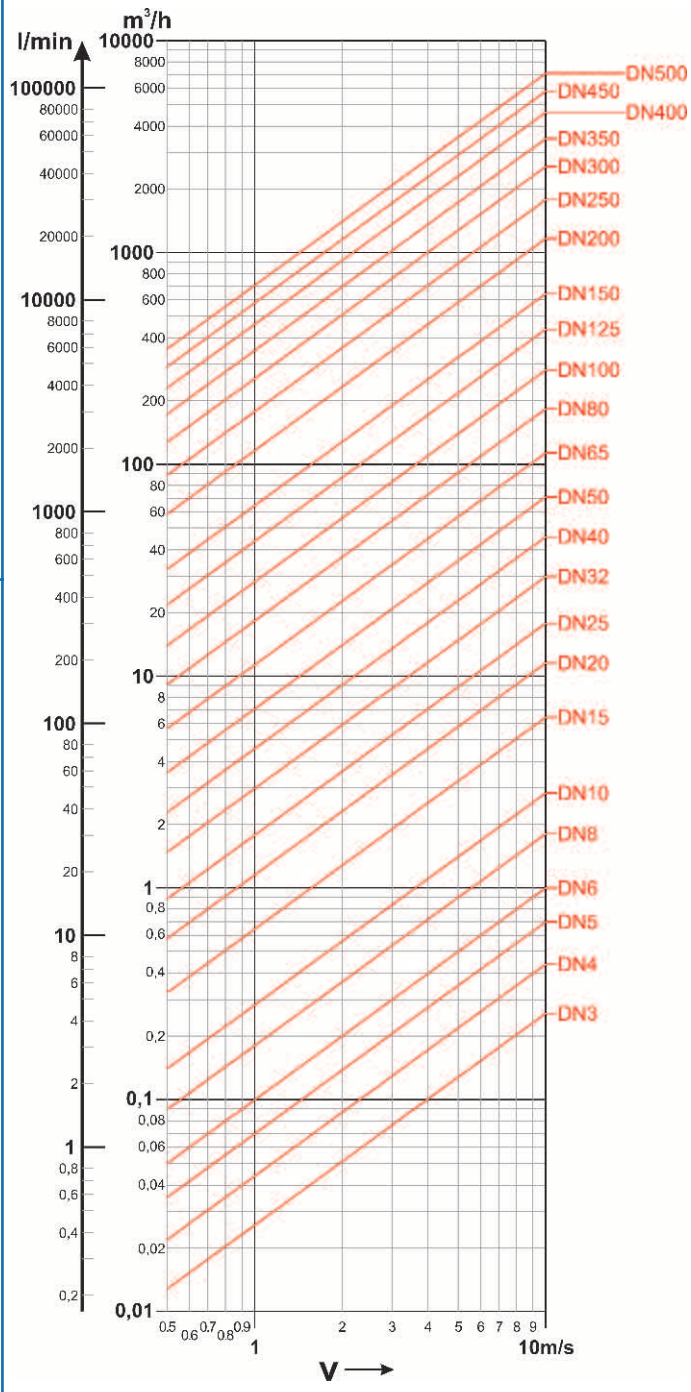
±0.25% change over operating temperature range

3. FLOW TABLES

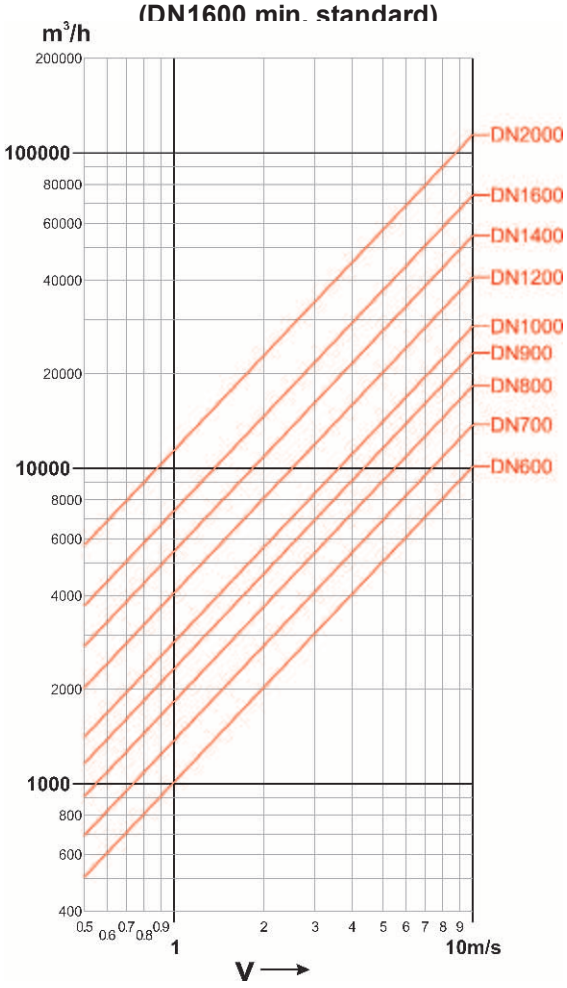
Load losses



Flow range from DN3 to DN500
(DN15 min. standard)

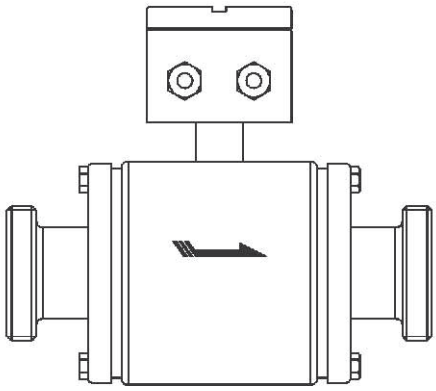


Flow range from DN600 to DN2000
(DN1600 min. standard)

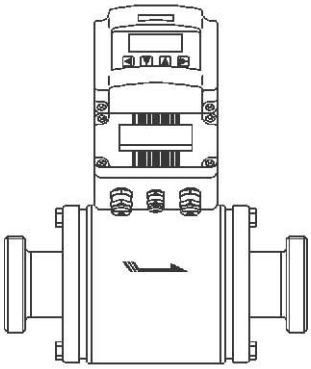


4. STRUCTURE

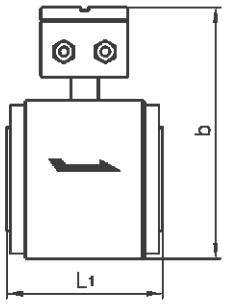
Remote version

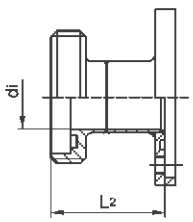


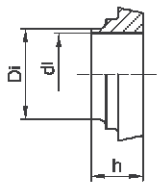
Compact version

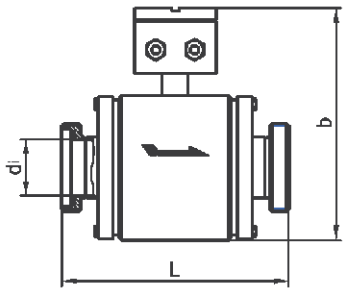


5. DIMENSION

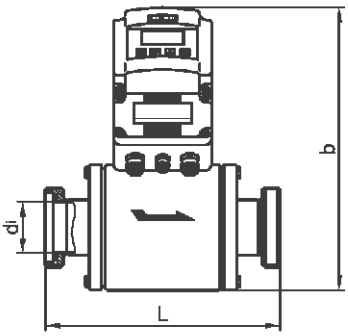
SANITARY DIMENSIONS mm	DN (mm)	PN (bar)	L1 (mm)	b (mm)
	25	16	100	161
	32	16	100	167
	40	16	140	218
	50	16	140	219
	65	16	140	235
	80	16	200	250
	100	16	200	270

Coupling DIN 11851	DN (mm)	di (mm)	L2 (mm)
	25	25	45
	32	31	45
	40	39	72
	50	50	74
	65	66	78
	80	81	83
	100	100	92

Weld pipe for DIN 11850	DN (mm)	Di (mm)	h (mm)
	25	28	16
	32	34	19
	40	42	19
	50	53	20
	65	70	22
	80	85	22
	100	104	24

SANITARY DIMENSIONS (Remote)	DN (mm)	PN (bar)	di (mm)	L (mm)	b (mm)
	25	16	25	190	161
	32	16	31	190	167
	40	16	39	284	218
	50	16	50	288	219
	65	16	66	296	235
	80	16	81	366	250
	100	16	100	384	270

* Fitting length = $L_1+2\times L_2$

SANITARY DIMENSIONS (Compact)	DN (mm)	PN (bar)	di (mm)	L (mm)	b (mm)
	25	16	25	190	229
	32	16	31	190	235
	40	16	39	284	286
	50	16	50	288	287
	65	16	66	296	303
	80	16	81	366	318
	100	16	100	384	338

* Fitting length = $L_1+2\times L_2$

6. INSTALLATION

This section covers the installation procedures for the Smag62 Magnetic Flowmeter System .

6.1 Safety measure

Instructions and procedures in this section may require special precautions to ensure the safety of the personnel performing the operations. Information that raises potential safety issues is indicated by a warning symbol ⚠. Please refer to the following safety messages before performing an operation preceded by this symbol.

6.2 WARNINGS

6.2.1 Explosions could result in death or serious injury

- Verify that the operating atmosphere of the flowtube and transmitter is consisten with the appropriate hazardous locations certifications.
- Do not remove the transmitter cover in explosive atmospheres when the circuit is alive.
- Before connecting a HART-based communicator in an explosive atmosphere, make sure the instruments in the loop are installed in accordance with intrinsically safe or non-incendive field wiring practices.
- Both transmitter covers must be fully engaged to meet explosion-proof requirements.

6.2.2 Failure to follow safe installation and servicing guidelines could result in death or serious injury

- Make sure only qualified personnel perform the installation.
- Do not perform any service other than those contained in this manual unless qualified.

6.2.3 High voltage that may be present on leads could cause electrical shock

- Avoid contact with leads and terminals.

6.3 PRE-INSTALLATION

There are several pre-installation steps that make the installation process easier. They include identifying the options and configurations that apply to your application, setting the hardware switches if necessary, and consideration of mechanical, electrical, and environmental requirements. Please remember that the flowtube liner is vulnerable to handling damage. Never place anything through the flowtube for the purpose of lifting or gaining leverage.Liner damage can render the flowtube useless.

6.3.1 Identify Options and Configurations

Standard application of the Smag62 includes control of the flowtube coils and one or more following configurations or options:

- 4-20 mA Output
- Pulse Output

Be sure to identify the options and configurations that apply to your situation, and keep a list of them nearby during the installation and configuration procedures.

6.3.2 Mechanical Considerations

The mounting site for the Smag62 Integral Mount Transmitter should provide enough room for secure mounting, easy access to the conduit ports, full opening of the transmitter covers, and easy readability of the local operator interface (LOI) screen (see Figure 2-1).The LOI can be rotated in 90° increments. This should be performed prior to installing the magnetic flowmeter system.

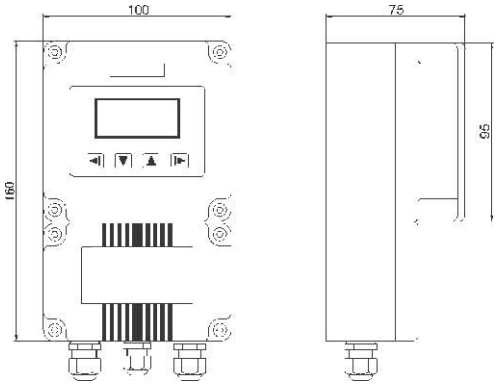


Figure 2-1 Rpmag62 Dimensional Drawings

6.4 Requirement for electric connection

Before making any electrical connections to the Smag62, consider the following standards and be sure to have proper power supply, conduit, and other accessories.

6.4.1 Conduit Connections

The Smag62 Integral Mount Magnetic Flowmeter Transmitter has a M20*1.5 conduit connections.

6.4.2 Transmitter Input Power

The Smag62 Transmitter is designed to be powered by voltages ranging 90÷250Vac (50 to 60 Hz) or 18÷36Vdc. Units powered with an Vac power supply should be connected to standard Vac connections for 90Vac or 250Vac. Units powered by a 18÷36Vdc power supply have special considerations.

6.4.3 DC Power Requirements

Units powered with 18÷36V DC may draw up to 2 amps of current. As a result, the input power wire must meet certain gauge requirements.

6.4.4 Disconnects

The supply wires should be connected to the device through an external disconnect or circuit breaker. The disconnect or circuit breaker should be clearly labeled and located near the transmitter.

6.4.5 Overcurrent Protection

Smag62 requires overcurrent protection of the supply lines. Maximum rating of overcurrent devices are as follows:

Power System	Fuse Rating
110 V ac	250 V; 1 Amp, Quick Acting
220 V ac	250 V; 1 Amp, Quick Acting
18 to 36 V dc	250 V; 2 Amp, Quick Acting

6.5 ENVIRONMENTAL CONSIDERATIONS

To ensure maximum transmitter life, avoid excessive heat and vibration.Typical problem areas include high-vibration lines with integrally Mounted transmitters, warm-climate installations in direct sunlight, and outdoor installations in cold climates. Because the Smag62 System requires external power, access to a
suitable power source must be ensured. Overheating will damage the flowtube. Do not
encapsulate the flowtube with heating elements

6.6 Mounting

Sanitary electric magnetic flow meter has a threaded connector for quick connection, and meets standard DIN11851. You only have to solder the tube provided with the meter to your pipeline. Concentricity of the tube and pipeline must be guaranteed and there is no leakage around the soldering seam. Then connect the nut tight on the sensor to make sure there is no leakage.

6.7 Environment of the installation

Based upon the instrument operation principle and specification, attentions must be paid when mount this meter.

1) This meter must by mounted in dry and well ventilated site. Not install the instrument in the place where the water is easily accumulated.
2) The instrument should not be exposed. Shelter is needed where the instrument is installed outside.
3) Vibration should be avoided in the place where the instrument is to be installed.
4) Keep the instrument away from strong magnetic field where big electric motor or transformer are installed.
5) The place where the instrument is installed shall be accessible for maintenance

6.8 Selecting the place for installation

Be aware of the followings before mount the instrument onto the pipeline.

1) The arrow mark on the sensor must be in accordance with the medium flow direction in the pipeline.
2) The sensor must be full with the medium all the time.
3) The straight length of the upstream pipeline must not be less than 5xD, and the downstream 3x3D, where D is the inner diameter of the pipe, and the middle of the sensor can be a point of the lengths

Figure.3 **On the top of the pipeline**
(It is false mounting, where the air bubbles may easily accumulate.)

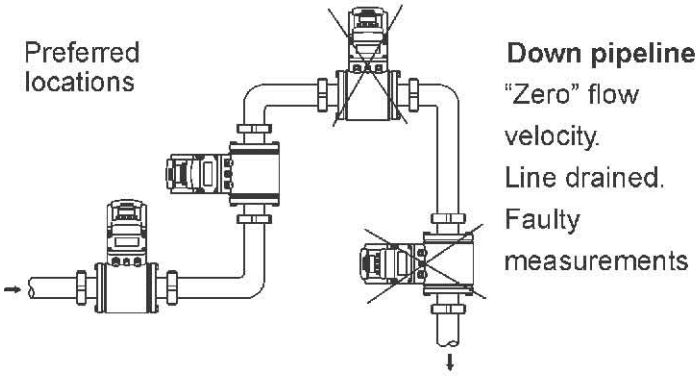


Figure.3

Figure.4 **Falling down pipeline**
If the downpipe length is greater than 5m, a air valve for vent must be installed in the downstream of the flowmeter.

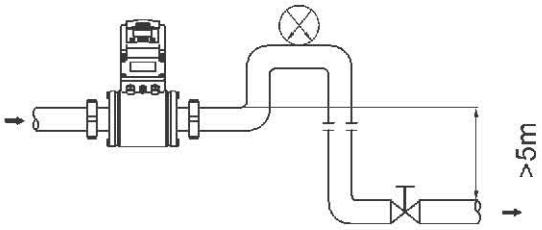


Figure. 4

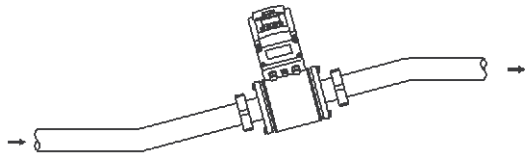


Figure. 5

Figure.5 **Horizontal pipe line**

Install in slightly pipe section .if not possible, assure adequate velocity to prevent air, gas or vapor from collecting inupper part of flow tube.

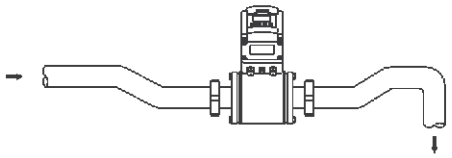


Figure.6

Figure.6 **Open feed or discharge**

The meter should be installed on the lowe section of the pipeline

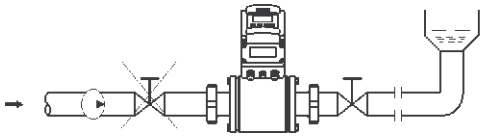


Figure.7

Figure.7 **Long pipeline**

Always install control valve and shutoff valves downstream of the flowmeter.

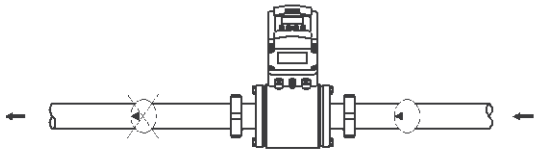


Figure 8

Figure.8 **Pumps**

Never install flowmeter on pumps suction side

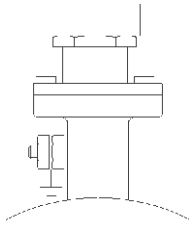


Figure 9

6.9 Grounding

The grounding of the instrument must be satisfied because the signal the instrument measured is very weak, only a few milli-voltages, even at its full range. See figure 9 for the grounding position.

There are two requirements for grounding:

the groundings of the sensor and the converter must be the same potential based upon electromagnetic flow meter's operation principle and the analysis of the signal loop.

1) Based upon the operation principle of electric magnetic flow meter and the signal loop analyzing, the electric potential of the groundings of the sensor and converter must be identical with the medium.

2) To eliminate the disturbance from the environment, the grounding electric potential is zero. In general, pipelines are all metal which makes it easier to meet the request for grounding. But special grounding fitting must be assembled when electromagnetic disturbance is greater. Total section area of the wires for grounding shall be greater than 4mm2 with multicore threads of copper. Grounding wire cannot be connected on electric motor or common grounding's for all other equipment in case of the influence occurred from any electric current leakage. The resistance of grounding shall be less than 10 ohm. See figure 10.

The sensor must be assembled with grounding rings or flanges on its both sides, or a short pipe on which there is an electrode for grounding when the sensor shall be installed on plastic pipeline or the pipeline has insulated liner.

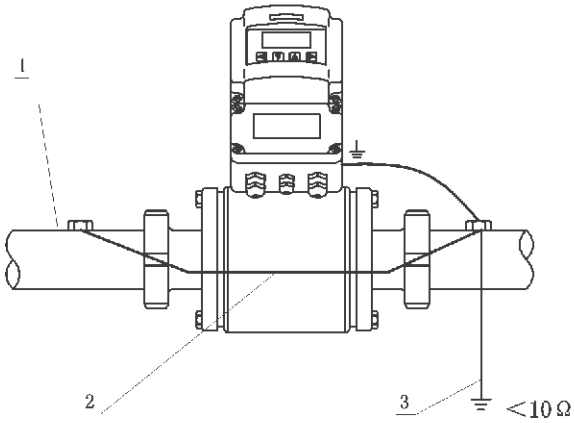


Figure10

Figure 10. schematic drawing of grounding

1. when the sensor is installed on metal pipelines.
2. Grounding wire (accompanied with the instrument)
3. Grounding fittings for grounding when environrthen disturbance is greater.

6.9 Preparation for operation

Strictly check the installment and wirings before it gets into operation!

It shall be pointed out that the instrument, including the sensor and converter has been fully adjusted, calibrated with actual flow, and inspected under strict measures. All shipped units are certified. No further adjustments are required when put it into operation. Observing the contents in this manual, to check and analyze the malfunction and so to debar it if any problem occurs when the instrument is in its first operation. It is forbidden to do adjustment blindly, which may change, ever worse to damage the instrument.

The following steps are to be followed to get the instrument into operation.

1) Open the valves in front and behind the instrument first, to let the sensor to be filled fully with medium.
2) Turn on the power supply. One minute late, the value displayed in the indicator will reach some amount, which means the connections of wires are correct. If the flow direction is wrong, then change the connection on tow electrodes or change the flow direction on the converter.
3) Correct the Zero. Shut off the valve tight in downstream first and then the valve in upstream, to let the medium in the pipeline stops. Make sure there is no leakage. The value displayed is 0. The value displayed can be corrected at the converter if the value is more or less than 0.

6.10 Grounding

Generally speaking, timely maintenance for electric magnetic flow meter is not necessary but the inner wall of the sensor and its electrodes must be clean out in scheduled time if the medium is adhesive.

Be careful, not to damage the liner and electrodes.

7. ELECTRIC CONNECTION

7.1 Install Conduit

Transmitter junction boxes have ports for M20*1.5 conduit connections.

1) Connect the M20*1.5 conduit to the transmitter in accordance with local or plant electrical codes.
2) Seal unused ports to prevent moisture or other contamination from entering the junction box.

Do not overtighten metal plugs used to seal wiring compartment ports,overtightening can damage the housing.

7.2 Power Connections

To connect power to the transmitter, complete the following steps:

1) Ensure that the power source and connecting cable meet the requirements outlined in Table 2-1.
2) Turn off the power source.
3) Open the power terminal cover.
4) Run the power cable through the conduit to the transmitter.
5) Loosen the terminal cable guard for the input power terminals L and N or + and -.
6) Connect the power cable leads as follows:
   For an AC-powered transmitter:
   - Connect AC Ground to a grounding lug.
   - Connect AC Neutral to terminal N.
   - Connect AC Line to terminal L.

   For a DC-powered transmitter:
   - Connect DC Ground to a grounding lug.
   - Connect + DC.
   - Connect - DC.

The DC-powered transmitter has a different terminal block and different electronics that are not compatible with an AC-powered transmitter.

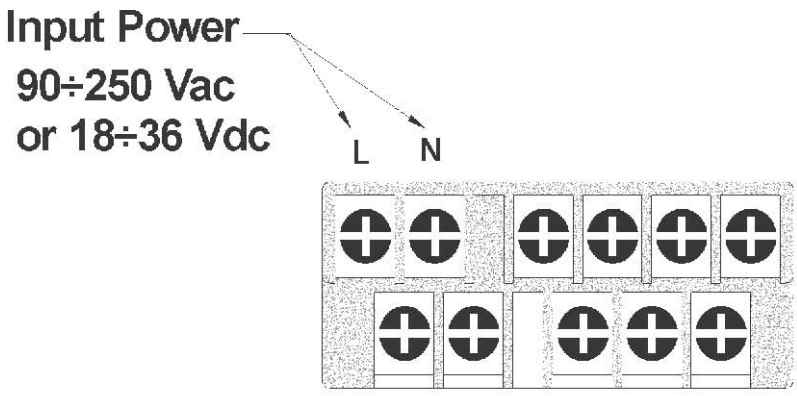


FIGURE 2-13 Power Connections.

7.3 OUTPUT

If your application of the Smag62 includes an externally powered 4÷20mA loop, or pulse output, certain requirements may apply in addition to those previously listed. Satisfy these requirements before attempting to install and operate the Smag62.

7.4.1 Analog output

The loop may be powered from the transmitter itself. Resistance in the loop must be 1,000 ohms or less. If a HART-based communicator or a distributed control system (DCS) is used, it must be connected across a minimum of 250 ohms resistance in the loop.

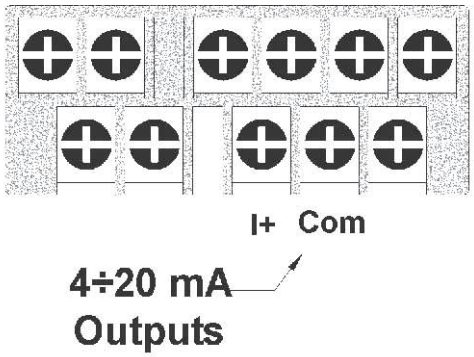


Figure 2-14 4÷20 mA Loop Power Connections.

7.4.2 Pulse Output

The Pulse Output function provides an isolated switch-closure frequency output signal that is proportional to the flow through the flowtube. The signal is normally used in conjunction with an external totalizer or control system. If your application uses the pulse output option, complete the following steps to connect the signal cable to the transmitter:

1) Ensure that the power source and connecting cable meet the requirements outlined above and in Table2-1.

2) Turn off the transmitter power sources.

3) Run the signal cable into the transmitter.

4) Connect the two wires that convey switch closure information to the + and - terminals

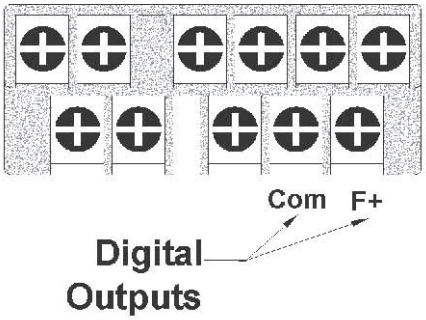


Figure 2-15 Pulse Output Connections

7.5 QUICK START-UP

Once the magnetic flowmeter system is installed and communication is established, final configuration of the transmitter must be completed. You may perform these functions with the LOI. Specific instructions regarding these functions are provided in (Section 3: Local Operator Interface).

To initiate a basic flowmeter system start-up, only two parameters are required:

1. Set Units
2. Output Range

If your application of the magnetic flowmeter system involves more advanced functions such as multidrop or pulse output, additional configuration steps may be required to enable full functionality. See section 3: Local Operator Interface.

7.5.1 Installation Check and Guide

Use this guide to check new installations of Magnetic Flowmeter Systems that appear to malfunction.

Before You Begin

Be sure that power to your system is off before beginning these checks.

Transmitter

1. Check for correct flowtube line size entered in the software. (The line size value is listed on the flowtube nameplate.)
2. Check that the analog range of the transmitter matches the analog range in the control system.

Flowtube

1. For horizontal flow installations, ensure that the electrodes are in a plane such that they remain covered by process fluid.
2. For vertical or inclined installations, ensure that process fluid is flowing up into the flowtube to keep the electrodes covered by process fluid.
3. Ensure that the grounding straps on the flowtube are connected to grounding rings, lining protectors, or the adjacent pipe flanges. Improper grounding will cause erratic operation of the system.

Process Fluid

1. Process fluid conductivity should be 5 microS, minimum.
2. Process fluid must be free of air and gasses.
3. Flowtube should be full of process fluid.

8. LOCAL OPERATOR INTERFACE (LOI)

The LOI option is an operator communications center for the Smag62. Through the LOI, the operator can access any transmitter function for changing configuration parameter settings, checking totalized values, or other functions.

8.1 SAFETY MESSAGES

Instructions and procedures in this section may require special precautions to ensure the safety of the personnel performing the operations. Information that raises potential safety issues is indicated by a warning symbol: . Please refer to the following safety messages before performing an operation preceded by this symbol.

8.2 WARNINGS

Explosions could result in death or serious injury:

- Verify that the operating atmosphere of the flowtube and transmitter is consistent with the appropriate hazardous locations certifications.
- Do not remove the transmitter cover in explosive atmospheres when the circuit is alive.
- Before connecting a HART-based communicator in an explosive atmosphere, make sure the instruments in the loop are installed in accordance with intrinsically safe or non-incendive field wiring practices.
- Both transmitter covers must be fully engaged to meet explosion-proof requirements.

Failure to follow safe installation and servicing guidelines could result in death or serious injury:

- Make sure only qualified personnel perform the installation.
- Do not perform any service other than those contained in this manual unless qualified

High voltage that may be present on leads could cause electrical shock:

- Avoid contact with leads and terminals

8.3 LOI FEATURES

The LOI option contains a four-line, 16-character liquid crystal display (LCD) that is back-lit and visible from any angle. There are four touch keys on the pad, and a infrared decoder to receive keys that on the remote encoder.Table 3-1 lists and details the functions of the LOI keys.

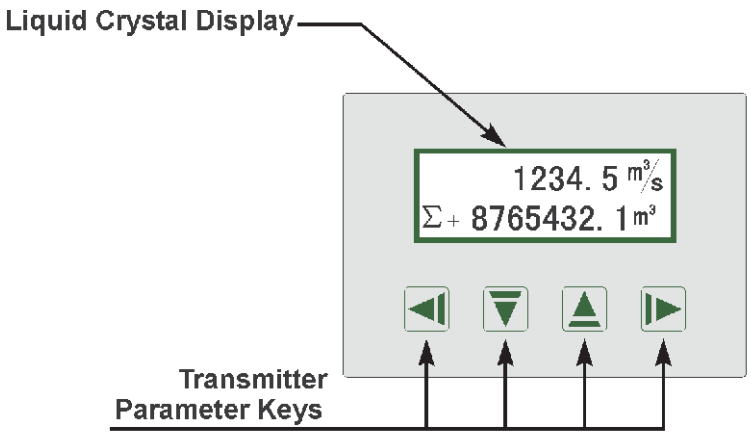


Figure 3-1 Smag62 Local Operator Interface

LOI Key	Function Performed
←	Enter,Moves to the previous display field. Save parameters
↑	Moves the cursor to the next higher field. Changes user-selected variables in a field to next higher value. Changes parameters on a predefined list. Change display page Change parameters page when browsing parameters
↓	Moves the cursor to the next lower field. Changes user-selected variables in a field to next lower value. Changes parameters on a predefined list. Change display page Change parameters page when browsing parameters
↓ (3 s)	Toggle keypad lock
→	Enter menu Moves cursor to next user-selected variable. Changes parameters on a predefined list. Aborts a chosen operation. Aborts browse parameters
← →	Zero trim

8.4 LOI ROTATION

Each magnetic flowmeter installation is different from application to application; therefore, the LOI display can be rotated to accommodate various setups using the following procedure:

1. Remove power from the transmitter.
2. ⚠ Unscrew and remove the LOI cover. Do not remove the cover in explosive atmospheres when the circuit is alive.
3. Unfasten the 4 screws that attach the LOI assembly to the main circuit assembly.
4. Carefully remove the LOI assembly by pulling it away from the transmitter.
5. Position the LOI in a preferred 90° rotation.
6. Fasten the 4 screws that attach the LOI to the main circuit assembly.
7. Replace the LOI cover

8.5 DATA ENTRY

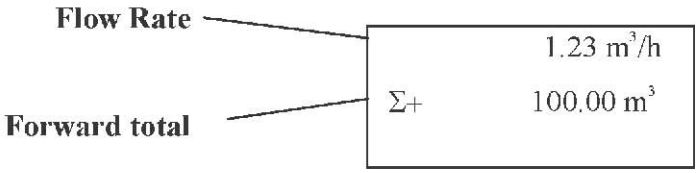
The LOI keypad has no numerical keys. Enter numerical data using the following procedure:

1. Access the appropriate function.
2. Use → to highlight the digit you want to enter or change.
3. Use ↑ or ↓ to change the highlighted value.
   For numerical data, ↑ or ↓ toggles through the digits 0÷9,decimal point. For alphabetical data, they toggle through the letters of the alphabet A-Z, digits 0÷9, and the symbols &, +, -, *, /, $, @, %, and the blank space (↑ or ↓ is also used to toggle through pre-determined choices that do not require data entry.)
4. Use → to highlight and change other digits you want to change.
5. Press ← when the desired choice is displayed on the screen

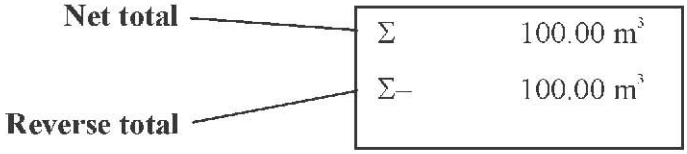
8.6 DISPLAY PAGE

The Smag62 has three pages to display data and status, Press ↑ or ↓ to change page

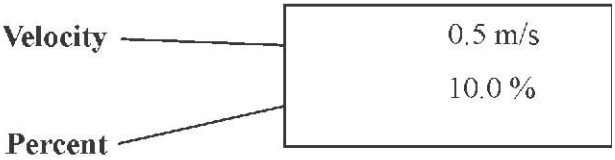
- **Primary page**



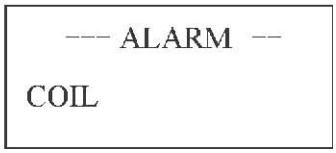
- **Secondary page**



- **Third page**

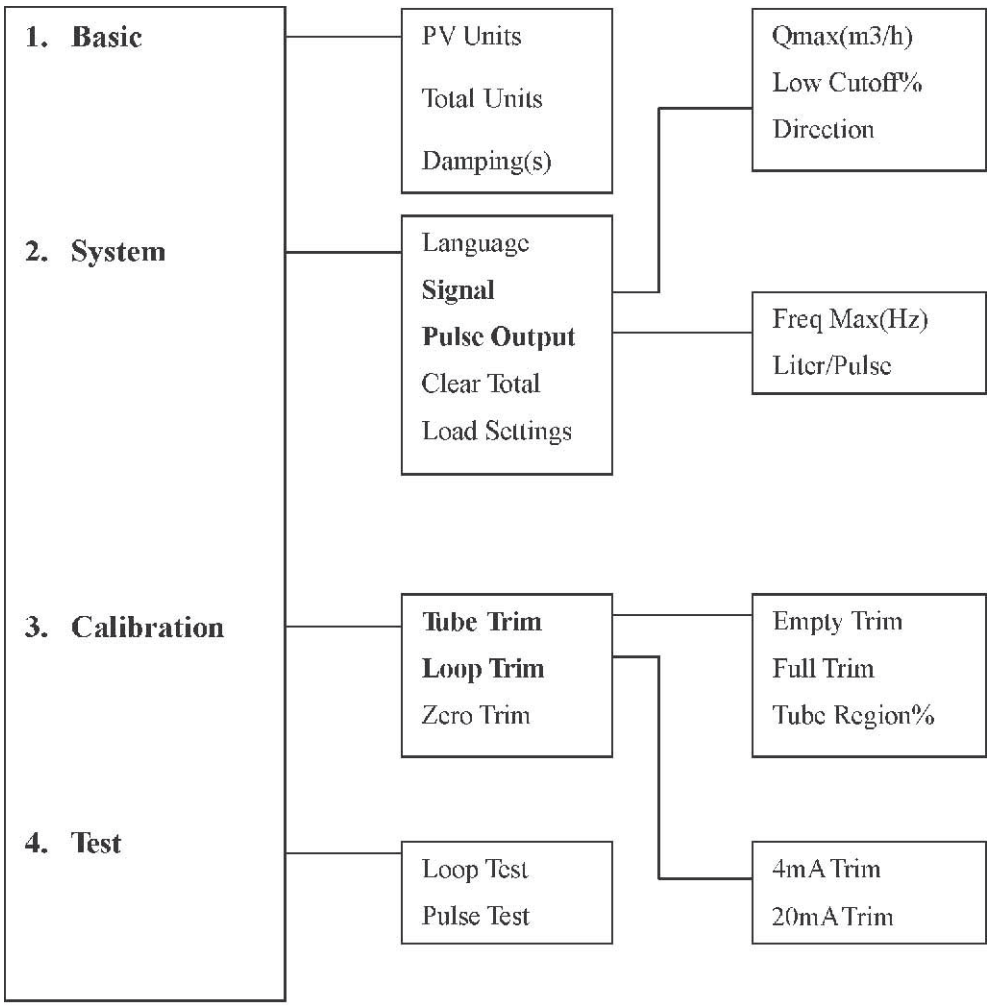


- **Alarm page**



If there is no alarm, this page will not appear

8.7 LOI MENU



8.7.1 Basic Configuration

- *Basic* ⟶ *PV Units*
  PV Units variable specifies the format in which the flow rate will be displayed. Units should be selected to meet your particular metering needs. The choices are shown below:

L/s:	Liter/Sec	m3/s:	CuMetre/Sec	G/s:	gal/Sec
L/m:	Liter/Min	m3/m:	CuMetre/Min	G/m:	gal/Min
L/h:	Liter/Hour	m3/h:	CuMetre/Hour	G/h:	gal/Hour

- *Basic* ⟶ *Total Units*
  Total Units variable specifies the format in which the total will be displayed. Units should be selected to meet your particular metering needs. The choices are shown below:

  L: Liter m3: CuMetre G: gal

- *Basic* ⟶ *Damping*(s)
  Damping(S) allows selection of a response time, in seconds, to a step change in flow rate. It is most often used to smooth fluctuations in output.

8.7.2 System Configuration

- *System* → *Language*
  Language allows selection of a language for operate interface, The choices are shown below:

  CHINESE ENGLISH

- *System* → *Signal* → *Qmax*(m3/h)
  Reset the Qmax(m3/h) to change the size of the range (or span). Under normal circumstances, the Qmax should be set to a value near the maximum expected flow rate. This value relative to 20mA output and maximum frequency output.

- *System* → *Signal* → *LowCutoff %*
  Low Cutoff allows you to specify the flow, between 0.0÷9.9%Qmax, below which the outputs are driven to zero flow. The units format for low flow cutoff cannot be changed. It is always displayed as percent of Qmax regardless of the format selected. The low cutoff value applies to both forward and reverse flows.

- *System* → *Signal* → *Direction*
  This parameter allows you to specify the flow Direction, The choices are shown below:

  Fwd: FORWARD Rev: REVERSE

- *System* → *Pulse Output* → *Freq Max*(Hz)
  This parameter allows you to specify the maximum frequency output relative to Qmax. For example:

  Qmax=100L/h FreqMax=2000Hz

  FlowRate = 50L/h

  Frequency output = (FlowRate / Qmax)*FreqMax = 1000Hz

- *System* → *Pulse Output* → *Liter/Pulse*
  This parameter allows you to specify volume pass through the flowtube every pulse time. If this parameter equal to 0.0, then this output mode is invalid, transmitter automatically use Freq Max to determine pulse output. When selecting pulse output scaling, remember that the maximum pulse rate is 5000 Hz. With the 110 percent overrange capability, the absolute limit is 5500 Hz. For example, if you want the Smag62 to pulse every time 0.01L pass through the flowtube, and the flow rate is 5000 L/min, you will exceed the 5000 Hz full-scale limit: (5000L/min)/(60sec/min * 0.01L/p) = 8333.33Hz
  The best choice for this parameter depends upon the required resolution, the number of digits in the totalizer, the extent of range required, and the maximum counter input frequency.

- *System* → *Clear Total*

  Run this function to clear Forward,Reverse,and Net Total.

- *System* → *Load Settings*

  If some parameter is corrupted, induce transmitter can not work correctly, run this function to restore all parameters.

8.7.3 Calibration Configuration

- *Calibration* → *Tube Trim* → *Empty Trim*
  In order to check flowtube whether empty or full, must perform empty trim before use this function, confirm the flowtube is empty and dry, then run this function. The transmitter completes the procedure automatically in about 15 seconds, and record eigenvalue of empty flowtube.

- *Calibration* → *Tube Trim* → *Full Trim*
  In order to check flowtube whether empty or full, must perform Full trim before use this function, confirm the flowtube is full, then run this function. The transmitter completes the procedure automatically in about 15 seconds, and record eigenvalue of full flowtube.

- *Calibration* → *Tube Trim* → *Tube Region %*
  This parameter allows you to specify the sensitivision of checking the flowtube whether empty or full. The value more great, would be more easy to check the flowtube whether empty or full. If this parameter equal to 0.0, this function would be disabled.

- *Calibration* → *Tube Trim* → *4mA Trim/20mA Trim*
  For maximum accuracy, the analog output should be calibrated and, if necessary, trimmed for your system loop. The 4÷20 mA Output Trim procedure alters the conversion of the digital signal into an analog 4÷20 mA output. Use the following steps to complete this function:

  1. Set the loop to manual, if necessary.
  2. Connect a precision ammeter to the 4÷20 mA loop.
  3. Initiate the Output Trim function with the LOI
  4. Enter the 4 mA meter value when prompted to do so.
  5. Enter the 20 mA meter value when prompted to do so.
  6. Return the loop to automatic control, if necessary.

  The 4÷20 mA trim is now complete. You may repeat the 4÷20 mA trim to check the results, or use the analog output test.

- *Calibration* → *Zero Trim*
  Run this function only with the transmitter and flowtube installed in the process. The flowtube must be filled with process fluid at zero flow. Then, begin the auto zero procedure. The transmitter completes the procedure automatically in about 15 seconds.

8.7.4 Test Configuration

- *Test* → *Loop Test*
  The Loop Test allows you to drive the transmitter output to a desired electric current output on the 4÷20 mA terminals. This capability allows you to check the entire current loop prior to start-up.

- *Test* → *Pulse Test*
  The Pulse Test allows you to drive the frequency output at digital output terminals to a desired value. This capability allows you to check auxiliary equipment prior to start-up.

9. TROUBLESHOOTING

Problems in the magnetic flowmeter system are usually indicated by incorrect output readings from the system, error messages, or failed tests. Consider all sources when identifying a problem in your system.

9.1 BASIC TROUBLESHOOTING

Symptom	Potential Cause	Corrective Action
Output at 0 mA.	No power to transmitter.	Check power source and connections to the transmitter.
	Analog output improperly configured.	Check the analog power switch. See **Hardware Switches** for proper settings.
	Electronics failure.	Replace the electronics boards.
Output at 4 mA	Transmitter in multidrop mode.	Configure Poll Address to 0 to take transmitter out of multidrop mode.
	Low Flow Cutoff set too high.	Configure Low Flow Cutoff to a lower setting or increase flow to a value above the low flow cutoff.
	Flow is in reverse direction.	Enable Reverse Flow function.
	Shorted coil.	Coil check.
	Empty pipe.	Fill pipe.
	Electronics failure.	Replace the electronics boards.
Pulse output at zero, regardless of flow.	No power to transmitter.	Check power source and connection to the transmitter.
	Wiring error.	Check pulse output wiring at digital output terminals. Refer to wiring diagram for pulse output.
	Reverse flow.	Enable Reverse Flow function.
	Electronics failure.	Replace the electronics boards.

9.2 ADVANCED TROUBLESHOOTING

If your system is experiencing problems and the basic troubleshooting steps do not address your problem, use the following advanced troubleshooting procedures or call your service representative. The procedure for advanced troubleshooting is as follows:

1. Consider symptoms in the basic troubleshooting table.
2. Consider symptoms in the advanced troubleshooting table.
3. Perform the flowtube tests to see if flowtube must be removed from the process line.
4. If the problem persists, contact your sales or service representative.

Process Noise:
In some circumstances, process conditions themselves can cause the meter output to be unstable. The basic procedure for addressing a noisy process situation is outlined below. Complete them in order. When the output attains the desired stability, no further steps are required.

Noisy Conditions Basic Procedure:

1. Change coil drive to 33 Hz.
2. Increase the damping.
3. Activate signal processing.

Symptom	Potential Cause	Corrective Action
Reading doesn't appear to be within rated accuracy	Transmitter, control system, or other receiving device not configured properly.	Check all configuration variables for the transmitter,flowtube, communicator, and/or control system.,Perform a loop test to check the integrity of the circuit.
	Electrode Coating.	Use replaceable electrodes Downsize flowtube to increase flow rate above 3 ft/s. Periodically clean flowtube.
	Air in line.	Move the flowtube to another location in the process line to ensure that it is full under all conditions.
	Flow rate is below 1 ft/s (specification issue).	See accuracy specification for specific transmitter and flowtube.
	Auto zero was not performed when the flowtube is full,or flowrate is zero.	Perform the auto zero function
	Flowtube failure–Shorted electrode.	Perform flowtube tests electrode.
	Flowtube failure–Shorted or open coil.	Perform flowtube tests coil
	Transmitter failure.	Replace the electronics boards.

Noisy Process	Chemical additives upstream of magnetic flowmeter.	Move injection point downstream of magnetic flowmeter, or move magnetic flowmeter.
	Sludge flows–Mining/Coal/Sand/ Slurries (other slurries with hard particles).	Decrease flow rate below 10 ft/s.
	Styrofoam or other insulating particles in process.	Consult factory.
	Electrode coating.	Use replaceable electrodes Downsize flowtube to increase flow rate above 3 ft/s. Periodically clean flowtube.
	Air in line.	Move the flowtube to another location in the process line to ensure that it is full under all conditions.
Meter output is unstable.	Electrode incompatibility.	Check Magnetic Flowmeter Material Selection Guide for chemical compatibility with electrode material.
	Improper grounding.	Check ground wiring. See wiring and grounding procedures.
	High local magnetic or electric fields.	Move magnetic flowmeter (20–25 ft. away is usually acceptable).
	Control loop improperly tuned.	Check control loop tuning.
	Sticky valve (look for periodic oscillation of meter output).	Correct valve sticking.
	Flowtube failure.	Perform Flowtube Tests.
	Analog output loop problem.	Check that the 4–20 mA loop matches the digital value. Perform loop test.