iMAG 4700

Municipal/Industrial Magmeter Instructions

Seametrics

Note: These instructions cover the iMAG 4700. For details on the iMAG 4700p or 4700r, see the *iMAG 4700p* or *iMAG 4700r Municipal/Industrial Magmeter Instructions*.

The **iMAG-Series** is the most economical flanged electromagnetic flowmeter on the market. With electrodes designed to discourage fouling, it is available in 2" to 12" pipe in municipal or industrial water, waste and reclaimed water, pump stations, and packaged plant applications. Minimal straight pipe requirements allow iMAG-Series meters to be used in piping configurations where there is little space between the meter and an elbow.

iMAG-Series meters are CE certified, certified to NSF/ANSI standard 61 and are rated IP68 for applications where the meter may be operated under water to a depth of at least 10 feet (3 meters) continuously.

Rate and total units and pulse scaling can be set via the front panel touch key pad by the user. Bidirectional flow reading is standard with totals available in forward, reverse, net flow, batch forward flow, and batch reverse flow. Batch totals can be reset.

A power/output cable allows outputs for use with a variety of Seametrics and other displays and controls for remote reading and telemetry applications. Pulse output is standard on all models. In addition, 4-20mA passive current loop, HART protocol, high speed digital, and Modbus® protocol outputs are optional.

Battery powered Modbus available in April 2021.

Features

Rate and total indicator with light sensor button controls protected by hinged cover

Power and Output cable port access

Equalization lug

Santoprene/Polypropylene Liner (Polyurethane / Noryl® 2" only)

User access lid

Data logger port (right side, not shown)

Powder-coated diecast aluminum electronics housing

316SS electrodes (Inside)

Welded steel epoxy-coated flow tube

Flanges, 150 lb. ANSI pattern

iMAG 4700

Specifications*

Pipe Sizes	2", 3", 4", 6", 8", 10", 12" *(2" AVAILABLE IN MAY 2021)*	
Flanges	150 lb. ANSI Pattern	
Pressure	150 psi (10.3 bar) line pressure	
Temperature **Operating**	10˚ to 140˚ F (-12˚ to 60˚ C)	
Storage	-40˚ to 158˚ F (-40˚ to 70˚ C)	
Accuracy	±0.75% of reading on iMAG 4700p and 4700r (±1.0% iMAG 4700), ±0.025% of full-scale flow from low flow cutoff to maxi. flow rate of 10 m/sec	
Low Flow Cutoff	0.5% of maximum flow rate	
Material **Body** *(2"-12")*	Welded steel, epoxy-coated	
Liner *(2" & 3")*	Polyurethane/Noryl®	
Liner *(4"-12")*	Santoprene flange/Polypropylene liner body	
Electronics Housing	Powder-coated diecast aluminum	
Electrodes	316 stainless steel	

Display	**Type**	128x64 dot-matrix LCD		
	Digits	5 Digit Rate		8 Digit Total
	Units	Rate Volume Units	Rate Time Units	Total Volume Units
	Please Note: All iMAG meters are factory set for gallons per minute (GPM) rate and gallons total. If other units are required, they can be set in the field.	Gallons / Liters / Barrels(42 gal) / Cubic Feet / Cubic Meters Million Gallons[2] / Mega Liters[2] / Imperial Gallons / Million Imperial Gallons[2]	Second / Minute / Hour / Day	Gallons / Gallons x 10 / Gallons x 100 / Gallons x 1000 / Million Gallons / Liters / Kilo Liters / Mega Liters Barrels (42 gal) / Cubic Meters / Cubic Meters x 1000 / Cubic Feet / Cubic Feet x 1000 / Second Foot Day / Million Cubic Feet Acre Feet / Acre Inches / Imperial Gallons / Imperial Gallons x 1000 / Million Imperial Gallons / Fluid Ounces
	Bidirectional[1]	Forward Total, Reverse Total, Net Total, Batch Forward Total, Batch Reverse Total (Batch totals can be reset)		

Power	**DC Power**	9-36 Vdc @ 250 mA max, 30 mA average
	Battery Backup **(Not for use as primary power)**	DC powered units: One lithium 7.2V 'D' size battery pack, replaceable. AC powered units: One 9V alkaline battery, replaceable.
	AC Power	85-264Vac, 50/60Hz, 0.12A *(iMAG 4700r and 4700p only)*
	Battery	One lithium 7.2V 'D' size battery pack, replaceable. *(iMAG 4700 only)*

Scaled Pulse Output	**Signal**	Current sinking pulse, isolated, 36 Vdc at 10 mA max
	Pulse Rates	User-scalable from 0.1 to 99,999.9 volume units/pulse. Pulse width is one-half of pulse period with minimum pulse width of 2.5 ms, 200 pulses/sec max. For battery option meters, pulse width varies with frequency, 150 pulses/sec max.

Options	**4-20mA Current Loop**	Isolated, passive, 24Vdc, 650 Ω maximum current loop
	HART/4-20mA	HART protocol over 4-20mA line *(iMAG4700p & iMAG4700r only)*
	High Speed Digital	Isolated, open collector, 24 Vdc *(iMAG4700p only)*
	Serial Communications	Isolated, asynchronous serial RS485, Modbus® RTU protocol

Cable	**Power/Output Cable**	20ft (6m) standard length polyurethane jacketed cable—for power and outputs (lengths up to 200' available).
	Remote Display Cable	20ft (6m) standard length polyurethane jacketed cable—for connection between meter and remote display (lengths up to 200' available). *(iMAG 4700r)*

|		
Conductivity	>20 microSiemens/cm	
Empty Pipe Detection	Hardware/software, conductivity-based	
Regulatory	C€ (EN 61326), 2"-12" certified to NSF/ANSI standard 61 60°C (140°F)	
Environmental	NEMA 6P, IP68 (10ft (3m) depth, continuously)	

Modbus is a registered trademark of Schneider Electric.

* Specifications subject to change. Please consult our website for the most current data (www.seametrics.com).

[1] If forward and reverse flow data needs to be sent to another device, either the Digital or Modbus output is required.

[2] Rate Time Unit is available in Day only.

Dimensions
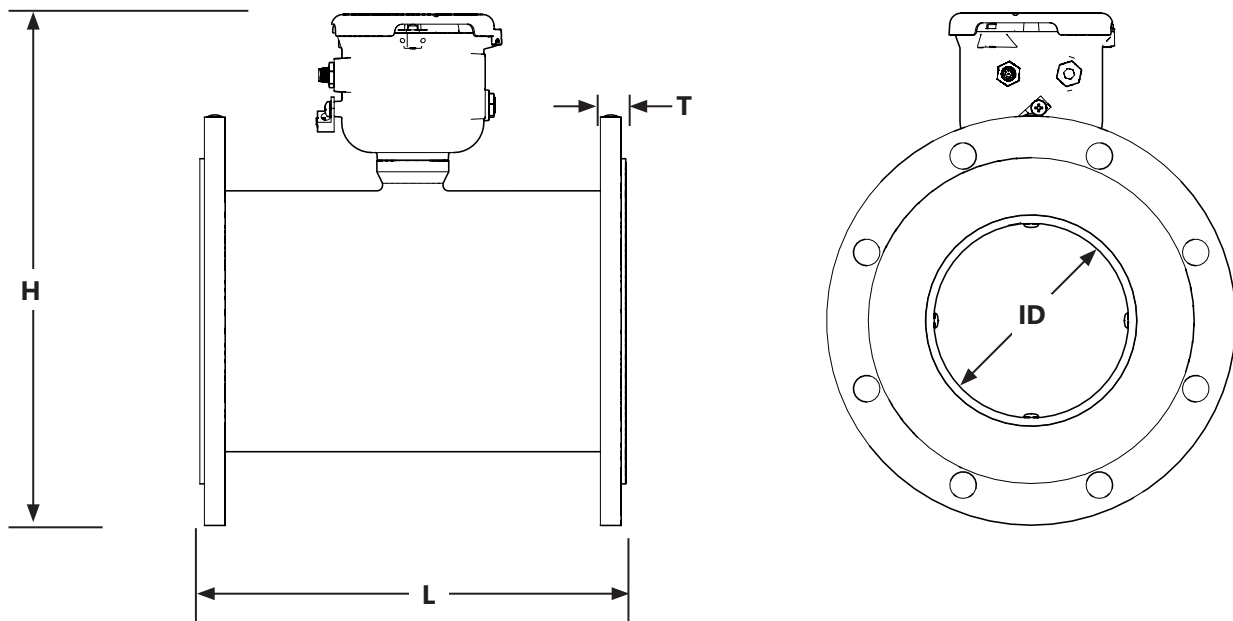
iMAG4700 Meter Size	L		H		T		ID		Shipping Weight	
	inch	mm	inch	mm	inch	mm	inch	mm	lbs	Kg
2"	7.9	200	7.6	193	.62	15.7	1.76*	45*	25	11.3
3"	12.25	311	7.08	179.8	.68	17.25	2.6	66.04	38	17
4"	10.12	257	8.3	211	.62	15.7	3.12	79	33	15
6"	12.09	307	9.1	231	.69	17.5	5.05	128	49	22
8"	14.14	359	10.1	257	.69	17.5	6.44	164	70	32
10"	18.08	459	11.2	284	.69	17.5	8.61	219	130	59
12"	19.68	500	12.2	310	.81	20.6	10.55	268	170	77
Flanges	Standard ANSI 150 lb. drilling								Cable 1 lb.	

Note: 'L' dimension is total from liner face to liner face
*Average ID

iMAG Accuracy
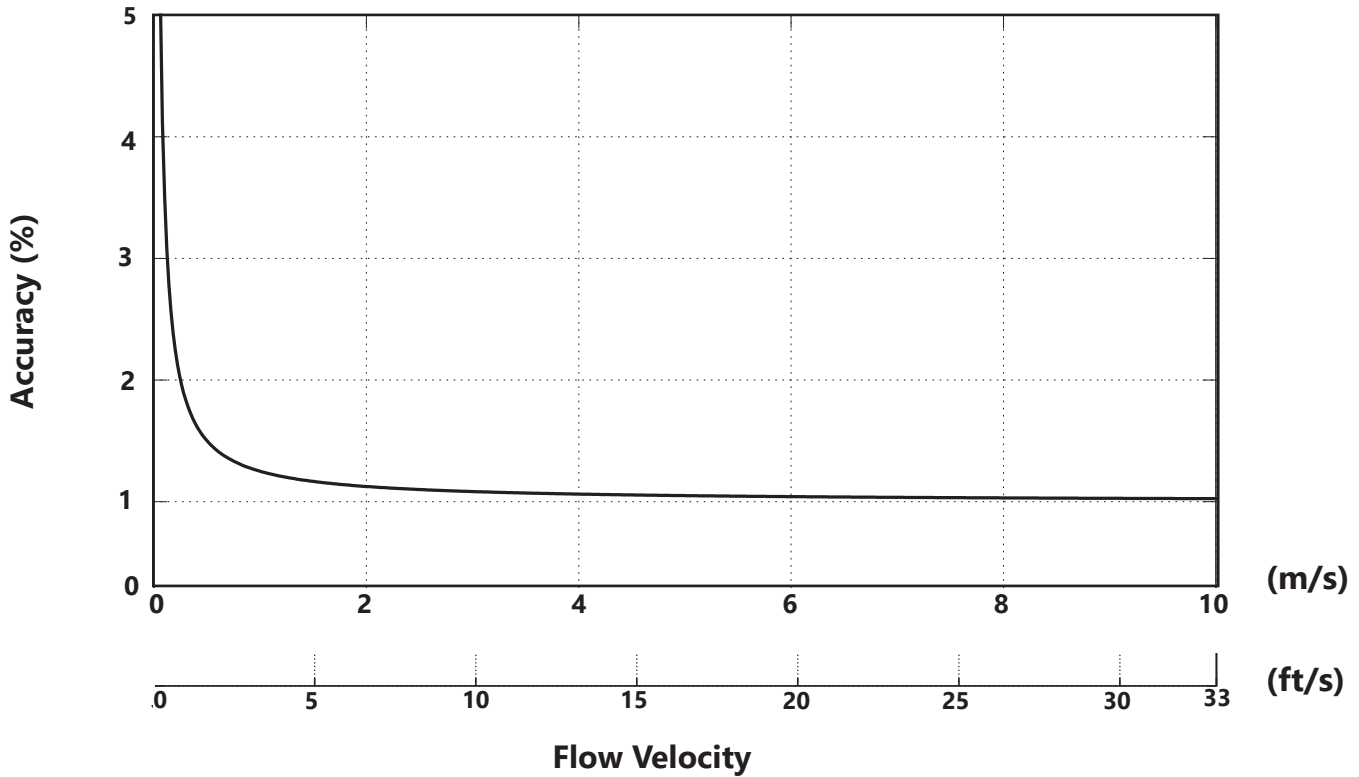
Flow Rate (2" - 12")

Pipe Size (Inches in diameter)	2"	3"	4"	6"	8"	10"	12"
Max Flow Rate (Gallons/Minute)	321	722	1285	2891	5140	8031	11565
Cut-off (min) Flow Rate (Gallons/Minute)	2	4.0	6.43	14.46	25.70	40.15	57.82
Max Flow Rate (Liters/Second)	20.25	46	81	182	324	507	730
Cut-off (min) Flow Rate (Liters/Second)	0.13	0.23	0.41	0.91	1.62	2.54	3.65
Max Flow Velocity (Meters/Second)	10	10	10	10	10	10	10

Straight Pipe Recommendations (X = diameter)

NOTE: These configurations are to be used as general guidelines and do not cover every possible installation. A combination of two or more obstructions will require additional straight pipe. If there is any concern about the length of pipe required for a specific application, please contact your local dealer.

Reduced Pipe

2X   1X

iMAG

Two Elbows In Plane

2X   1X

iMAG

Two Elbows, Out Of Plane

2X   1X

iMAG

Expanded Pipe

5X   1X

iMAG

Swirling Flow: Propeller Meter

5X   1X

iMAG

Swirling Flow: Partially Open Butterfly Valve

5X   1X

iMAG
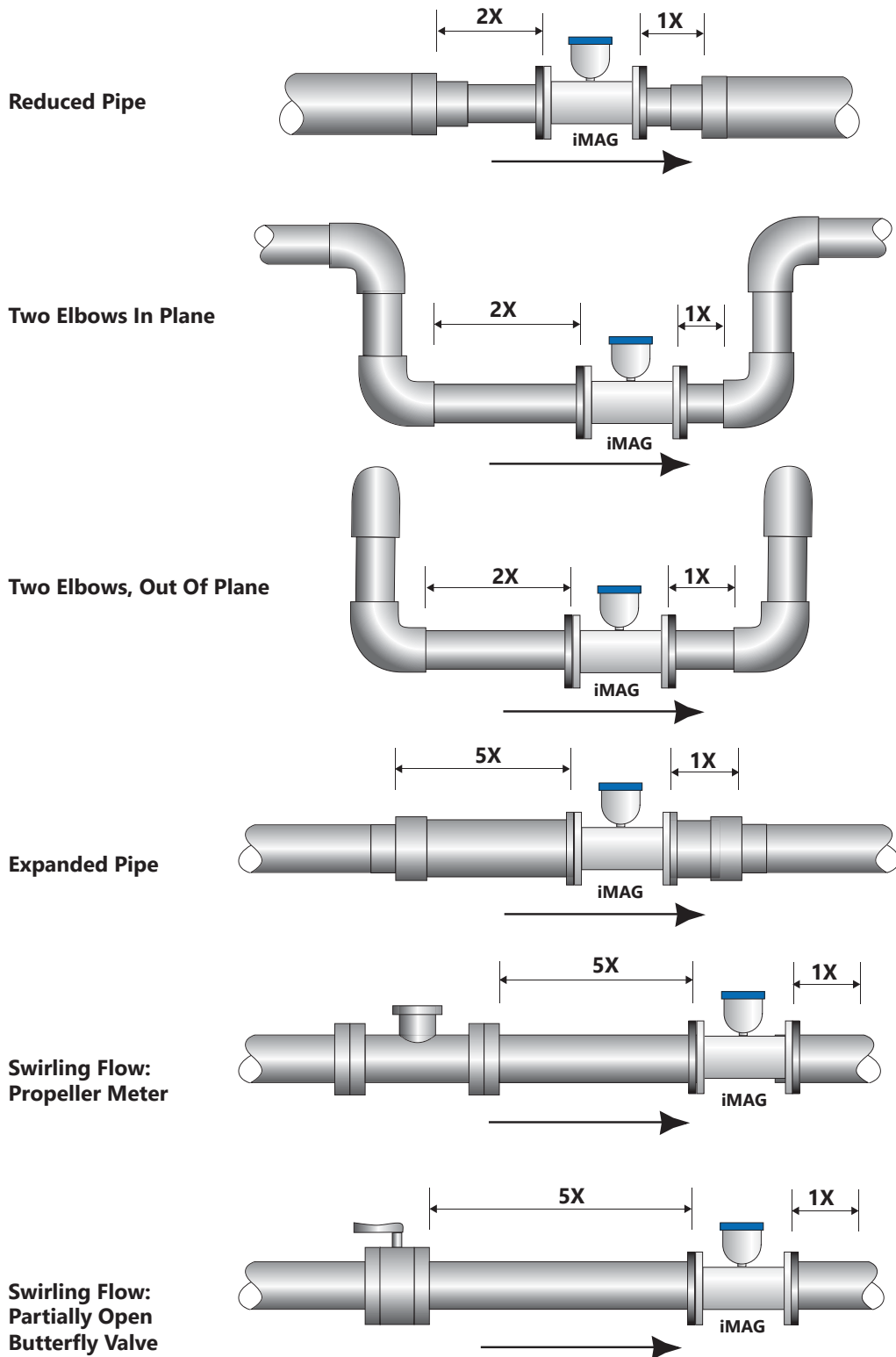
Full Pipe Recommendations
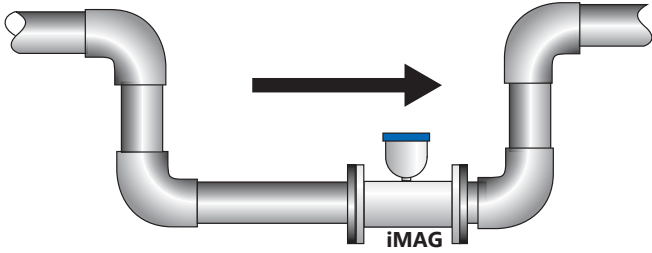
Recommended:
Keep pipe full at meter for accuracy
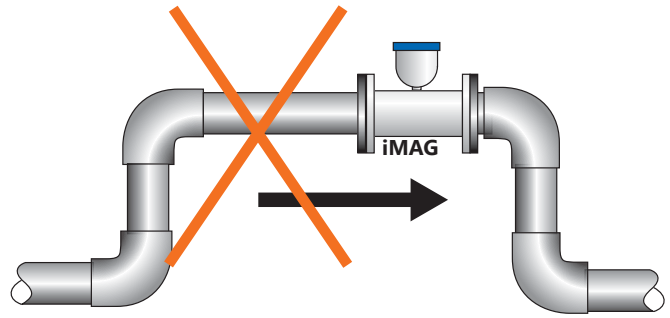
Not Ideal:
Allows air pockets to form at meter
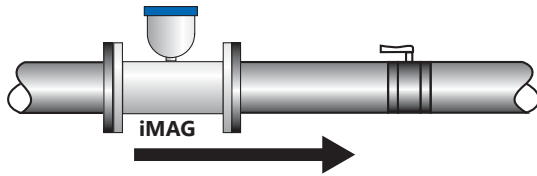
Recommended:
Keeps pipe full at meter for accuracy
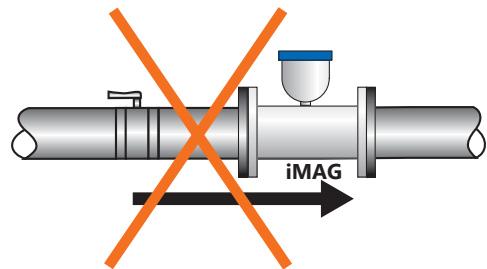
Not Ideal:
Post-valve cavitation can create air pocket
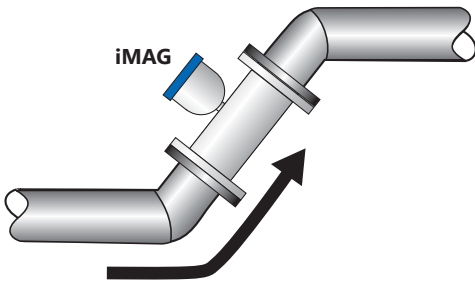
Recommended:
Allows air to bleed off
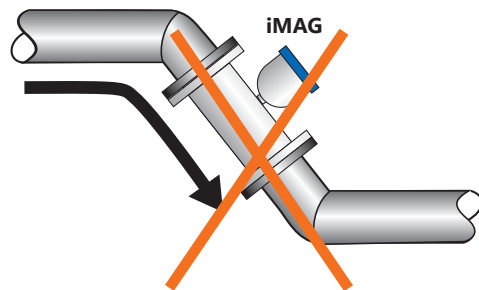
Not Ideal:
Air can be trapped

Intermittent air bubbles miss electrode

Electrode moved from top by rotating meter

iMAG

Electrodes free from sediment build-up

Recommended:
Improved accuracy results from unimpeded electrodes

iMAG
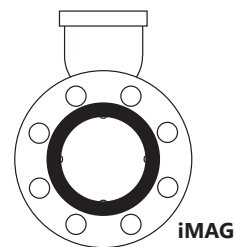
Not Ideal:
Air bubbles and sediment on the electrodes can affect accuracy

Positioning the Meter

> ⚠ **CAUTION:** These flow sensors are not recommended where installation may expose the flow sensor to boiler pressure and temperature. Maximum recommended operating temperature is 130˚ F.

These meters can be installed horizontally, vertically (with upward flow), or in any radial position. **Using a check valve on the upstream side of the meter, and/or an air vent (vacuum relief valve) in the same, unobstructed run of pipe as the meter, is required in any installation where the meter may be exposed to suction when the system is not in normal operation. Suction can cause damage to the liner. Liner damage caused by suction, without the use of a check valve and/or air vent, may void the warranty.**

Straight Pipe Recommendations. The iMAG requires straight pipe before and after the meter for best accuracy. However, the ability of electromagnetic meters to average the flow across the entire pipe allows for shorter straight pipe recommendations than most mechanical meters (see page 7).
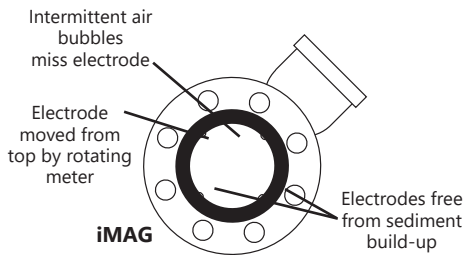
Full Pipe Recommendations. To prevent false readings, this meter is designed to indicate 'EMPTY PIPE' if one or more electrodes is exposed. For highest accuracy, install the meter so that the pipe will be full when there is flow. If air bubbles may be present in the pipe or sludge accumulation is an issue, rotate the meter by one flange hole to position the control housing at a 45˚ angle (see diagrams on page 8).

Fittings. The iMAG has ANSI 150 lb. drilled flanges and will mate with any other ANSI 150 lb. flanges. *See table on page 10 for flange bolt tightening torque specifications.*

Calibration. The iMAG is factory-calibrated before shipping. The frequency of recalibration will depend on the needs of each application and local regulatory policies.

Chemical Injection. When the iMAG is used in a chemical injection application, the chemical injection point must be placed downstream of the magmeter OR far enough upstream for complete mixing to occur before the fluid reaches the meter. When unmixed chemical alternates with water passing through the meter, the rapid changes in conductivity may cause sudden spikes and drops in the meter's reading, resulting in inaccurate measurement. The magmeter will re-stabilize, however, with a steady flow of fluid of uniform conductivity.

> ⚠ **CAUTION:** In chemical injection applications, install chemical injection point downstream of magmeter, or far enough upstream to allow complete mixing of fluids.

Installing Gaskets

> ⚠ **GASKETS**
> Gaskets are required at all junctions.

1. Be sure all mating surfaces are smooth and free of debris.

2. Install Seametrics provided gaskets, or equivalent, on each end of meter as shown in diagrams below. If using grounding rings, install one gasket on each side of the grounding ring.

3. **Failure to install gaskets will void warranty.**

Gaskets
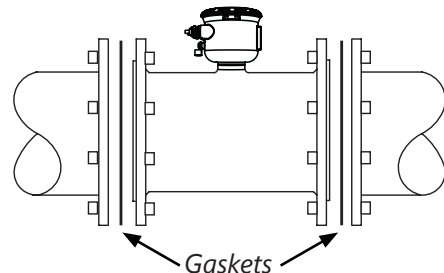
Installation without grounding rings

Grounding Rings

Gaskets
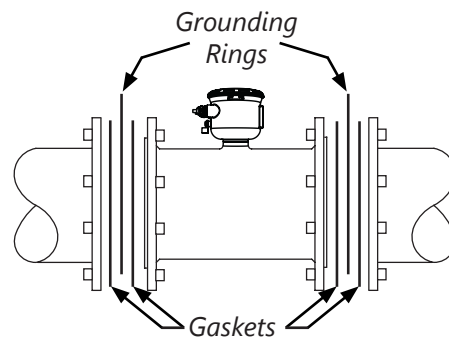
Installation with grounding rings

Tightening Flange Bolts

NOTE: Mating pipe flanges must be ANSI 150# full face (FF) and/or raised face (RF).

1. Tighten flange bolts in an alternating pattern.
   - Tighten left flange bolt-1 to 20% recommended torque.
   - Tighten right flange bolt-1 to 20% of recommended torque.
   - Repeat steps a and b for each bolt in an alternating order, such as shown at right, tightening to 40%, then 60%, then 80%, and then 100%.
2. Test for leaks.
3. If needed, tighten further in 10% increments until leaking stops. **DO NOT over-tighten. Over-tightening can cause serious damage to the flow meter.**
4. Recheck after 24 hours, adjusting if needed.
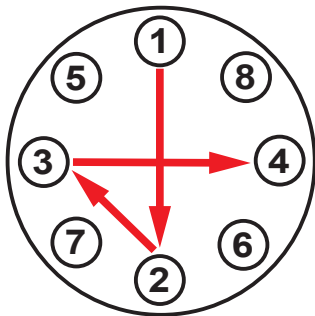
Suggested Tightening Sequence

Caution: Improper tightening sequence can cause serious damage to the flow meter.
- **Do not tighten one side at a time.**
- **Do not tighten each bolt completely at one time.**

SUGGESTED FLANGE BOLT TORQUE

Pipe Size	Liner	
	ft-lb	Nm
2"	18	25
3"	25	34
4"	20	27
6"	42	57
8"	65	88
10"	73	99
12"	97	132

Equalization and Grounding

WARNING: ELECTRICAL SHOCK HAZARD When the iMAG is installed in a plastic piping system, or when externally powered, the piping system must be grounded to meet national and local electrical safety codes. Failure to do so can result in electrocution.

Metal Pipe Installations. To equalize the electrical potential of the fluid, the iMAG meter, and the surrounding pipe, secure the flange plates (factory-installed on the equalization wire) to both pipe flanges at one of the bolt holes, as shown below. Be sure the lock washer fits between the pipe flange and the flange plate. For the best electrical bonding, remove rust and paint to expose clean, bare metal where the equalization flange plate lock washer contacts the pipe flange. Connection must be inspected periodically for corrosion to maintain the necessary low resistance connection.
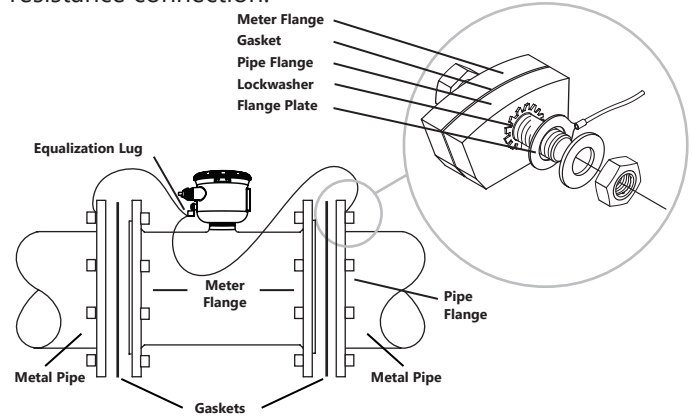
Plastic Pipe and Electronically Noisy Installations. When the iMAG 4700 is installed in plastic pipe or in an electrically noisy system (near a VFD etc.), grounding rings are recommended. As shown in the diagram below, the equalization wires should be solidly connected to the grounding ring tabs instead of the flange bolts as in metal piping installations. Where lightning is a threat, or in severe electrical environments, an optional connection to a nearby equipment ground or ground rod may be advisable.

Grounding Ring Part Numbers:
2" = 104124   6" = 100877
3" = 102157   8" = 100878
4" = 100876   10" = 100879
              12" = 103288
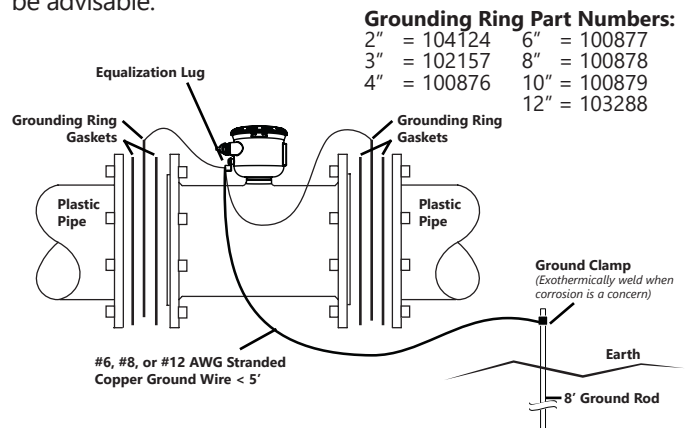
iMAG4700 General Cable Information

In the iMAG 4700 meter has two power/output cables that can be installed. The 4-pin cable contains the wires for DC power and pulse output. The 8-pin cable contains the wires for DC power and pulse, 4-20 mA or Modbus® output options when ordered. See diagrams below for details.

The iMAG 4700 is available in either Battery or external DC versions.

> ⚠️ **WARNING: BACKUP BATTERIES ARE NOT INTENDED AS A PRIMARY POWER SOURCE OF A MAINS (DC or AC) CONFIGURED METER.**

Red (P1) DC+

DC/Battery Power with Pulse Output

Black (P2) DC-

Green (P3) Pulse +

White (P4) Pulse -

Red (P1) DC+
Black (P2) DC-
Green (P3) Pulse +
White (P4) Pulse -

Modbus Output

Gray (P5) Iso-GND
Blue (P6) B(-)
Orange (P7) A(+)
Brown (P8) N/A

Red (P1) DC+
Black (P2) DC-
Green (P3) Pulse +
White (P4) Pulse -

4-20mA Output

Gray (P5) N/A
Blue (P6) 4-20mA-
Orange (P7) 4-20mA+
Brown (P8) N/A

Option IDs

O ID		POWER SOURCE / OUTPUT(S)
BXX	=	BATTERY POWER / PULSE SCALED
BXS	=	BATTERY POWER / PULSE SCALED / MODBUS®
D1X/D2X	**=**	DC POWER / PULSE SCALED
D1L/D2L	=	DC POWER / PULSE SCALED AND 4-20mA
D1S/D2S	=	DC POWER / PULSE SCALED AND MODBUS®

Pulse or Digital Output Application - Sourcing Mode (Recommended for Rin < 30kΩ)

Open Collector Transistor

Pin x

Pin y

Meter Connector

Power Source
+ V_s=3-36Vdc −

i_{out}

47k Ω Pull-down Resistor

V Out

R_{in}

Current Sourcing Pulse Waveform

V_s

V Out

0

| Meter | Cable | User Equipment |
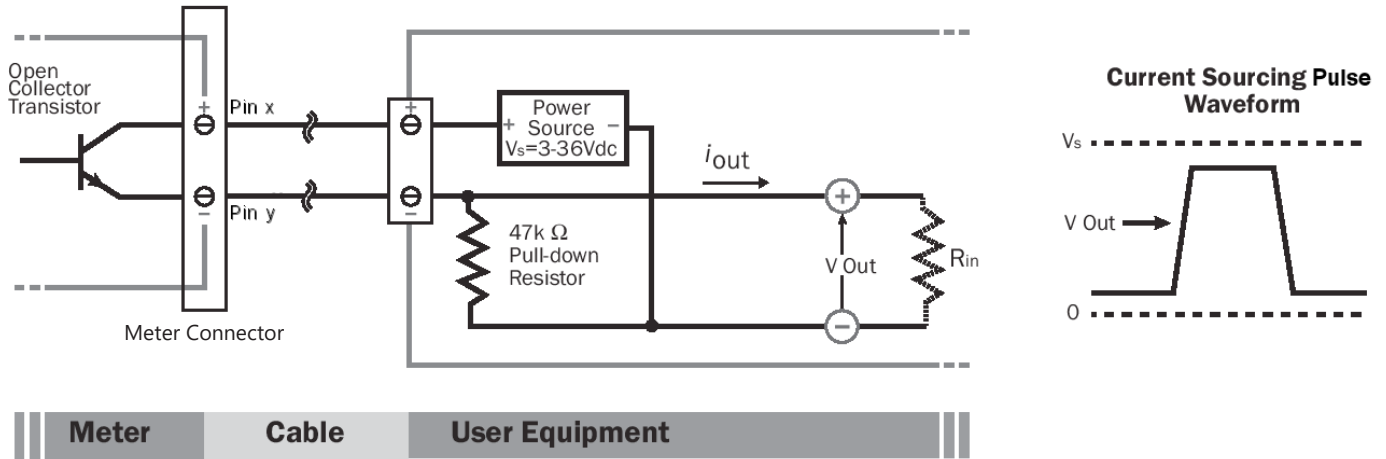
Pulse or Digital Output Application - Sinking Mode (Recommended for Rin > 30kΩ)

Power Source
+ V_s=3-36Vdc −

Pull-up Resistor**

i_{out}

Open Collector Transistor

Pin x

Pin y

V Out R_{in}

Current Sinking Pulse Waveform

V_s

V Out

0

Meter Connector

| Meter | Cable | User Equipment |
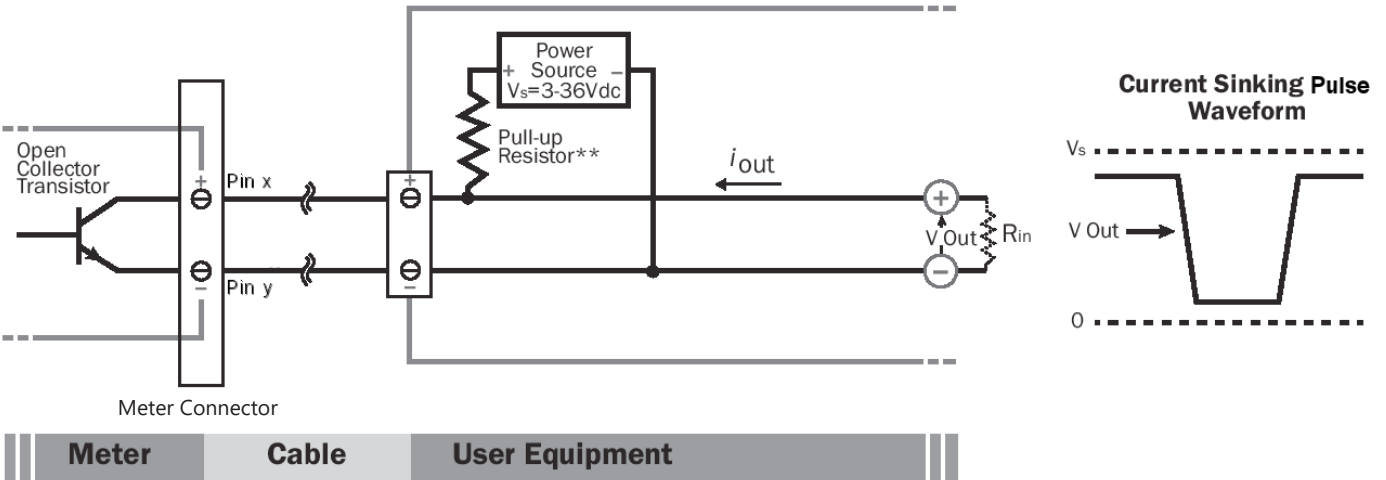
Analog (4-20mA Current Loop) Output Application

Analog Output

Pin x

Pin y

Power Source
+ V_s=6-36Vdc −

R_L***

4-20mA Current Output***

i_{Loop}

Meter Connector

| Meter | Cable | User Equipment |
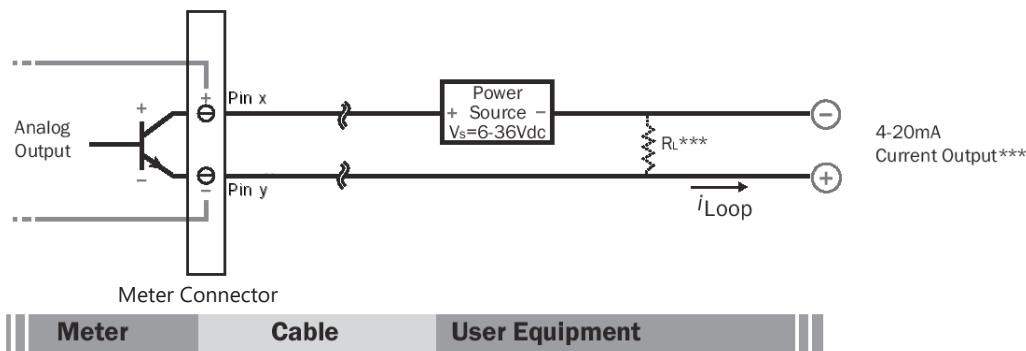
*** Minimum resistor value is (100 x Vs) ohms. Higher resistances maybe used depending on frequency and cable length. Longer cables and high frequencies require lower resistance.*
*** Resistor RL converts 4-20mA current to voltage for voltage input only devices.*

Cable Shield. In general, the cable shield and its bare drain wire should be left unconnected at the user equipment end of the cable to minimize "ground loop" problems.

Pulse Output Configuration. A pulse output is standard on all models. Since this is an isolated output, the external equipment must include a DC power source to regenerate the pulse from the open-collector output (transistor equivalent of a contact closure). A pull-up or pull-down resistor may be needed if not included in the user equipment as shown in the diagrams. Both the power source and resistor may be supplied internally in some types of control and monitoring devices. If not, as for most PLC discrete input modules, they must be added externally at the module input terminals. The pulse output rate in volume units/pulse can be set by the user via the SETP tab on the meter's setup menus.

Because the pulse output of an iMAG 4700 meter is set by the user, care must be taken to assure the output pulses do not exceed the maximum frequency of the meter while also ensuring a reasonable resolution.

K-factor: Remember that SETP is expressed in units totaled per output pulse (G/P if using gallons) while K-factors are expressed in pulses per gallon (P/G.) To determine K-factor from SETP, divide 1 by SETP (if SETP is expressed in gallons.) Conversely, 1 divided by the K-factor equals SETP

iMAG 4700 meters that were initially configured as battery powered units have a maximum output frequency of 150 Hz. Those that were initially configured as powered units have a maximum output frequency of 200 Hz.

Because all pulse outputs (SETP) are configured in (rate) units totaled per pulse, all sizes of meters can be configured with the same SETP values

For example, if your rate is chosen as gallons per minute (GPM) the table below applies. If your rate is different, simply use your rate label in place of (GPM.) The numerical values will remain the same.

Pulse Units. The units of measure of SETP are independently selectable and are not tied to rate or total. Upon change of the SETP unit, the pulse output may take up to 10 seconds, or the duration of one pulse (whichever is longer) to take effect.

If Pulse Output is Inconsistent. The PDAMP filter may need to be increased.

Pulse Width Timing. The unit and value of SETP must be chosen to keep the duration between meter pulse outputs to less than 500 seconds.

Pulse Timing in Battery Powered Units. The output pulse width in battery powered units is short and varies with pulse frequency. (See table)

SETP	Flow Rate at 1 Hz (GPM)	Flow Rate at 200 Hz (GPM) *Powered Meters*	Flow Rate at 150 Hz (GPM) *Battery Powered Meters*
0.1	6	1200	900
0.2	12	2400	1800
0.3	18	3600	2700
0.4	24	4800	3600
0.5	30	6000	4500
0.6	36	7200	5400
0.7	42	8400	6300
0.8	48	9600	7200
0.9	54	10800	8100
1.0	60	12000	9000

Lower frequency output pulses (1 pulse for some particular number of gallons) can also be set.

Any output frequency can be determined by:

Rate (units/minute) ÷ SETP (units/pulse) = pulse/minute
Hz = pulse/minute ÷ 60 seconds / minutes

For reference/comparison only					
K-factors and the equivalent SETP values for old style WMX units are shown below.					
WMX	**4"**	**6"**	**8"**	**10"**	**12"**
K-Factor	16.36	6.31	3.34	2.15	1.53
SETP	0.06*	0.16	0.30	0.47	0.65

*Note that on the iMAG 4700 you would need to choose a SETP value of 0.1 for the 4".

Output Pulse Width of Battery Powered Units		
Output Pulse Frequency	**Output Pulse Width as a Percentage of the Pulse Period** (Pulse period = 1000 milliseconds/frequency)	
Zero to 1 Hz	Multiply the pulse period by 0.01	= Output Pulse Width (ms)
1 to 20 Hz	Multiply the pulse period by 0.05	= Output Pulse Width (ms)
20 to 100 Hz	Multiply the pulse period by 0.1	= Output Pulse Width (ms)
100 to 150 Hz	Multiply the pulse period by 0.15	= Output Pulse Width (ms)

Example: If frequency = 20 Hz then the pulse period = 50 milliseconds and pulse width = (.05 x 50 milliseconds) = 2.5 ms

Analog Output (4-20mA) Configuration.

(Not available on battery only units.)

Since the meter's analog output is isolated and passive, loop power must be supplied externally as shown previously. (In addition, an external resistor R_L will be needed to convert the loop current to voltage for voltage-only input devices.)

The meter's loop transmitter minimum voltage drop is 6Vdc which, with wiring resistance and loop power supply voltage, will determine the maximum resistance for R_L.

The flow rates corresponding to 4 and 20mA can be set by the user via the SET 4 and SET20 tabs on the meter's setup menus.

Note: As configured by the factory, any alarm state will force 22.8mA on the loop.
This can be changed to 3.2mA - see Technical Bulletin, 'iMAG4700/AG3000: Changing the 4-20mA Alarm'

Modbus® Serial Communication Configuration (factory configured**).**

These connections provide a half-duplex, isolated, RS485 serial communications port using the Modbus messaging protocol. The TXD connection is the transmitted data output from the meter and RXD is the received data input to the meter. See Seametric's Modbus Interface Description, LT-103393 (available at www.seametrics.com) for supported Modbus message protocol and electrical interface specifications.

A 120-ohm termination resistor is built into the Modbus option board but is shipped in the unused position. To engage the termination resistor, move the jumper on JP1 from position 3-4 to position 1-2.

Changing Flow Meter Settings

Home Screen and General Navigation

The HOME Screen displays flow volume, direction of the flow total and flow RATE along with status conditions such as Empty Pipe. Two buttons below the LCD display are used to access menu screens for viewing and changing meter setup parameters.

```
1.2345678   TOTAL
            CU FT
            X1000
     100    RATE
            GPM

   FORWARD TOTAL
```
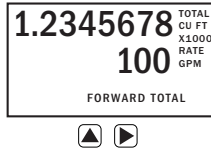
These two buttons are light sensors which can detect when a finger is covering them and activate upon release. Only three button touch actions are needed to control navigation through the menus, settings changes and back to the home screen.

> **HORIZONTAL SCROLLING:**
> Tap right button to scroll horizontally through menu tabs or move horizontally within a tab dialog when applicable.

> **SELECT:**
> Tap left button to change a highlighted item within a tab dialog.

> **ENTER/EXIT:**
> Hold left button while tapping right button once to enter or exit a tab dialog or to navigate between the HOME and other menu screens (continue to hold the left button until after the right button is released.).

Changing Total Direction/Resetting Batch Totalizers

On the Main screen, hold ▶ and tap ▲ 7 times to scroll through the total direction options. Release ▶ to select a total direction.

Once BATCH FORWARD or BATCH REVERSE is selcted, tap ▶ four times to reset batch totalizer.

Entering Menu System

To enter the Menu System perform the hold and tap sequence. The Passcode entry screen will display. The default passcode is 000000. If a different passcode has previously been set, use the ▲ and ▶ to enter that passcode. In either case, hold and tap again to move into the menu system. (*If you enter the wrong passcode, hold and tap again to return to the previous screen. See page 21 for information on how to change a passcode.*)

```
  ENTER PASSCODE
     000000
PRESS ▲ AND ▶ TO CHANGE
```
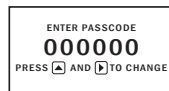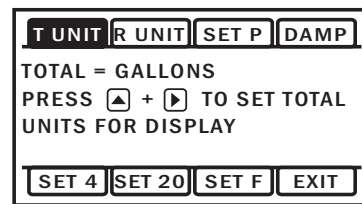
Making Selections

Once in the Menu System, move from tab to tab by tapping the right button. (See the next page for details on the various available tabs.)

Select the parameter. In the screen for the highlighted tab you will see the current parameter value for that tab. Tapping the right button, move to the tab for the parameter you want to change.

In this example, the first line indicates that the current unit for the TOTAL is GALLONS. The next two lines tell you what to do next.

```
 T UNIT  R UNIT  SET P  DAMP

TOTAL = GALLONS
PRESS ▲ + ▶ TO SET TOTAL
UNITS FOR DISPLAY

 SET 4  SET 20  SET F   EXIT
```

If you would like to change the TOTAL units, just perform the hold and tap sequence to bring up a screen to change the setting.

```
 T UNIT  R UNIT  SET P  DAMP

TOTAL:      GALLONS

    PRESS ▲ TO CHANGE
 SET 4  SET 20  SET F   EXIT
```
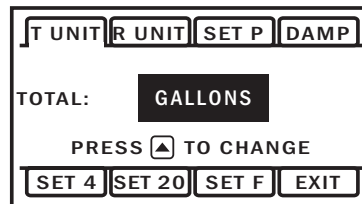
Select a new setting. Select the new setting by scrolling through a list of selections as in the screen illustration below by tapping the left button to find a different TOTAL unit.

Accept changes. To accept any changes you have made, perform the hold and tap sequence.

When finished making changes. When you are finished making changes, move to the EXIT tab using the right button.

To return to the HOME screen, perform the hold and tap sequence.

Standard Menu Options

Note: Available options will depend on specific meter configuration. Not all options are available on all meters. **Options not ordered with your meter will not appear on the meter menu.**

T UNIT
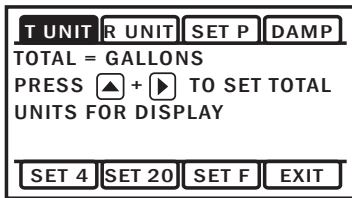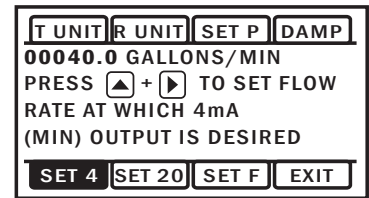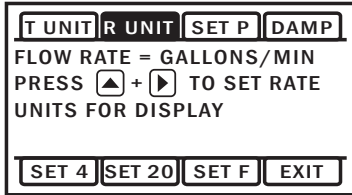View or change TOTAL volume units

T UNIT	R UNIT	SET P	DAMP

TOTAL = GALLONS
PRESS ▲ + ▶ TO SET TOTAL
UNITS FOR DISPLAY

SET 4	SET 20	SET F	EXIT

R UNIT
View or change flow RATE units

T UNIT	R UNIT	SET P	DAMP

FLOW RATE = GALLONS/MIN
PRESS ▲ + ▶ TO SET RATE
UNITS FOR DISPLAY

SET 4	SET 20	SET F	EXIT

SET P
View or change pulse output scaling

T UNIT	R UNIT	SET P	DAMP

00001.0 GALLONS
PRESS ▲ + ▶ TO SET
GALLONS TOTALIZED PER
PULSE SENT OUT PULSE1

SET 4	SET 20	SET F	EXIT

DAMP
View or change # of samples for rolling average.

T UNIT	R UNIT	SET P	DAMP

DAMPING = 1
PRESS ▲ + ▶ TO SET
DAMPING VALUE

SET 4	SET 20	SET F	EXIT

SET 4
View or change flow rate corresponding to 4mA. *(Externally powered units only)*

T UNIT	R UNIT	SET P	DAMP

00040.0 GALLONS/MIN
PRESS ▲ + ▶ TO SET FLOW
RATE AT WHICH 4mA
(MIN) OUTPUT IS DESIRED

SET 4	SET 20	SET F	EXIT

SET 20
View or change flow rate corresponding to 20mA. *(Externally powered units only)*

T UNIT	R UNIT	SET P	DAMP

00200.0 GALLONS/MIN
PRESS ▲ + ▶ TO SET FLOW
RATE AT WHICH 20mA
(MAX) OUTPUT IS DESIRED

SET 4	SET 20	SET F	EXIT

EXIT
Return to HOME SCREEN or enter SUBMENU

T UNIT	R UNIT	SET P	DAMP

PRESS ▲ + ▶ EXIT MENU
AND RETURN TO FLOW
DISPLAY

SET 4	SET 20	SET F	EXIT

Special SUBMENU for Further Options

The EXIT tab in the MAIN MENU has a second function. If, instead of using the hold and tap sequence to return to the HOME screen, you tap ▲ seven times, you will be redirected to a SUBMENU screen from which you can access several more options.

Navigation in this SUBMENU is the same as for the MAIN MENU. Whenever you wish, go to the EXIT tab in the SUBMENU and perform the hold and tap sequence to return to the MAIN MENU.

INFO: Meter model number, serial number, and firmware version.

COMM: Modbus® baud rate and parity.

MBID: Modbus® address

SAMP: Sample rate *(Battery powered version only.)*

EXIT: Return to MAIN MENU or enter next submenu.

INFO	COMM	MBID

PRESS ▲ + ▶ TO VIEW INFO
ABOUT METER

	HPOLL		EXIT

Sub-Menu

INFO

PRESS ▲ + ▶ TO VIEW INFO
ABOUT METER

SAMP		EXIT
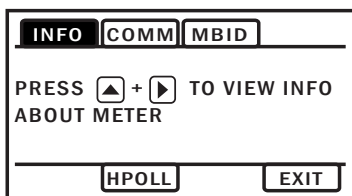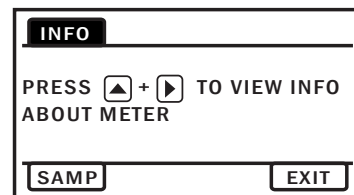
Sub-Menu - Battery Only Version

To Change a Passcode and Decimal Places

The AG3000 has a passcode system for restricting access to the menus. The AG3000 comes from the factory with the passcode set to 000000. When a user attempts to enter the menu system (see details on page 16), the passcode entry screen will be displayed.

```
    ENTER PASSCODE
     000000
PRESS [▲] AND [▶] TO CHANGE
```

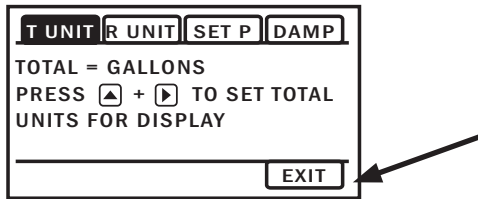The default passcode is 000000. If a different passcode has previously been set, then the user must enter that passcode at this time. After entering the passcode, or leaving it at 000000 if using the default passcode, the user does the tap and hold sequence to move into the menu system.

To change the passcode, you must use the THIRD MENU screen. Access the THIRD MENU screen as follows:

• Enter the main menu system, as described above.

```
T UNIT R UNIT SET P DAMP
TOTAL = GALLONS
PRESS [▲] + [▶] TO SET TOTAL
UNITS FOR DISPLAY
                    EXIT
```

• On the main menu, tab over to the EXIT tab and tap the up arrow five times. A SUBMENU screen will display.

```
INFO COMM MBID
PRESS [▲] + [▶] TO VIEW INFO
ABOUT METER
HPOLL            EXIT
```
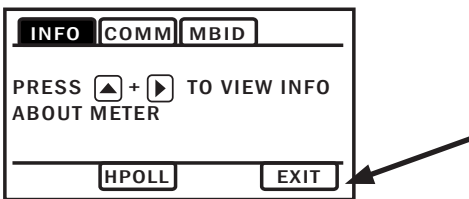
• On the SUBMENU screen tab over to the EXIT tab and tap [▲] five times. The THIRD MENU screen will display.

```
SETCD SETD PDAMP TEST
000000
PRESS [▲] + [▶] TO SET
PASSCODE
                    EXIT
```
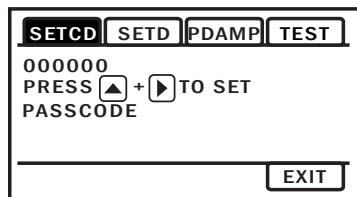
• To set the PASSCODE, hold and tap and then use the [▲] and [▶] to enter the new code.

• Hold and tap again to return to the THIRD MENU screen.

• Tab to EXIT, and then hold and tap to return to the SUBMENU.

To change the number of decimal places in the total

• To set the decimal point, hold and tap on SETD and then use the [▶] to move the decimal point.

• Hold and tap again to return to the THIRD MENU screen.

• Tab to EXIT, and then hold and tap to return to the SUBMENU.

PDAMP

PDAMP is used to view or change the number of samples for rolling average of pulse output.

TEST

TEST allows the user to initiate a fully functional, artificial flow rate for the purpose of testing other connected equipment. When TEST is applied, all features of the meter will function at the stated flow rate (in gallons per second).

For TEST to function, the meter must be filled (not EMPTY PIPE).

To enter a value into the TEST feature, navigate to the TEST tab and enter a flow rate value in the VAL screen (in gallons per second only,) then [▶] to the VAL box and [▲] to the ON screen. This will initiate the TEST feature. The next [▲] would bring you to the OFF screen, but you can 'hold and tap' the arrows to return you to the sub menu while the feature operates.

After use, the TEST feature must be turned OFF. If the TEST feature is not turned OFF, the stated static flow rate (in gallons per second) will be shown any time the meter is full or in a flowing condition. Flow values recorded by the meter while the TEST feature is operating are permanently recorded in the displayed TOTAL. It may be useful to note that these values are only written to permanent memory every 15 minutes and cycling all power within this 15 minute time frame will return the meter to its previous total.

Power Indicators

A power indicator is displayed in the lower left of the main display window.

Any meter powered from an external power source will display a power plug icon when running on external power. If the connection to external power is lost, the meter will switch to the backup battery and the power icon will switch to a battery symbol.

OK on the battery indicator means battery voltage is above 6.4 volts.

LO on the battery indicator means the battery is low and should be replaced soon.
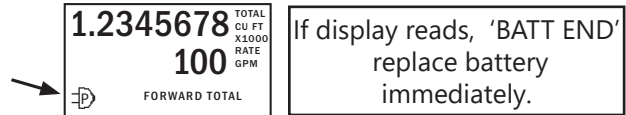
Being powered by external DC or AC

Being powered by battery - voltage is sufficient

Being powered by battery - voltage is low

1.2345678 TOTAL CU FT X1000
100 RATE GPM

FORWARD TOTAL

If display reads, 'BATT END' replace battery immediately.

Battery Powered Units

To 'wake up' a battery powered meter, you may need to hold the up arrow for 5 seconds and release. If the meter does not wake up on the first attempt, repeat the 5 second hold.

The iMAG 4700 meter can come configured with one 7.2V 'D' size replaceable battery pack. In this configuration, the only option/output is the scaled pulse output which comes standard. The scaled output for the battery powered option has a maximum pulse rate of 150 pulses/ second. Be sure to set your P value such that the meter will function properly over the flow range in your application. The sample rate of the meter is user selectable through the SAMP tab in the meter's sub-menu. Sample periods of 1/5, 1/3, 1, 3, 5, 15, 30, and 60 seconds can be selected. (A sample period of 5 seconds—5 year battery life—is the default.)

Larger sample periods will yield longer battery life but slower response time. Care must be taken to select a sample period that is suitable for your application. See the table below for the expected battery life as a function of sample period.

DAMP Settings for Battery Units

If SAMP (sample period) is set to <u>less than one second</u>, the DAMP value represents the number of seconds (plus one) used in the rolling average for the display. For example, if DAMP is set to four, then when the meter begins to show a flow rate, the rate displayed is the average of all the readings taken in <u>seconds</u> one through five (4 plus 1).

If SAMP (sample period) is set to <u>one second or longer,</u> the DAMP value represents the number of sample periods (plus one) used in the rolling average for the display. For example, if SAMP is set at three seconds and DAMP is set to four, then when the meter begins to show a flow rate, the rate displayed is the average of <u>samples</u> one through five (4 plus 1). Note that depending on the settings selected, it

may take up to a minute for the displayed rate to take full advantage of the DAMP filter. When when starting with an EMPTY PIPE it may take at least 30 seconds to register any flow.

Battery Life/Sample Period

(For externally powered meters only.)

Sensor sample period(s) (Seconds)	Expected battery life*
1/5 (0.2)	7 months
1/3 (0.33)	1 year
1	2.25 years
3	4 years
5	5 years
15	6 years
30	6.25 years
60	6.5 years

Based on 75% battery capacity at room temperature with no option cards installed.

NOTE: If a large percentage of the meter's life will be spent below 0.5 meters/second and above cutoff, battery life will be reduced.

⚠️ **BATTERY LIFE WITH MODBUS OPTION! BATTERY LIFE WHEN USED WITH A MODBUS CONFIGURED METER WILL BE REDUCED TO 1 YEAR, OR GREATER, BASED ON USAGE. REDUCE POLLING FREQUENCY AND MINIMIZE DATA COLLECTED IN ORDER TO MAXIMIZE BATTERY LIFE. (AVAILABLE APRIL 2021)**

Troubleshooting

Problem	Probable Causes	Things to try...
Blank Display	Faulty wiring from power source to meter	Check for incorrect wiring. Measure voltage with DMM where red and black wires connect to terminal block TB1 on back side of display. Verify correct polarity and confirm that voltage is steady and between 9Vdc and 32Vdc
	Backup battery has not been plugged in	Plug in the battery
	Dead backup battery	Replace battery
Flow rate reading fluctuates excessively when flow is unchanging	Excessively turbulent or unsteady flow due to partially closed valves or other flow obstructions	Eliminate or minimize causes of flow disturbances or increase meter damping
	Pipe not full	Provide back pressure or other means to ensure pipe is filled
	Pulsing flow due to combining multiple upstream flow sources	Move connection point further upstream
	Insufficient mixing of upstream chemicals	Move chemical injection downstream from meter
	Low fluid conductivity < 20 µS/cm	Replace with different type of meter
	Noisy electrical environment	Improve grounding at meter and nearby potentially noisy electrical equipment. Increase distance between meter and electrical noise sources.
	Defective or noisy AC switching power supply	Replace power supply
Flow Rate appears correct but pulse/ frequency output is low, erratic or absent	Wiring incorrect	Compare wiring with appropriate wiring recommendations
	External device input impedance too low	Use sourcing rather than sinking interface connection
	Cable too long	Reduce interface pull-up resistance
Flow Rate appears correct but pulse/frequency output is erratic and/or too high	Electrical noise sources interfering with pulse frequency signal	Isolate, remove or reduce noise sources. Move meter control cable away from noise sources. Increase pulse damp setting (PDAMP)
	Wrong type of cable	Use only twisted pair cable and ensure both signal wires are on same twisted pair
	Grounding problem	Improve or try different grounding method

Error Messages

Under certain conditions an error message may be displayed.

Message	Description	Notes
INIT	Initialization is occurring during power up.	
EMPTY PIPE	Fluid is not detected between the sensing electrodes.	Loop output = 22.8mA
LO in battery icon	Battery is getting low, replace soon. Meter still functions.	Above 6.4V, OK appears in icon
BATT END	Battery is very low (approx. 6.1V). Totalizer stops updating.	Loop output = 4mA
LOW VOLT	Incoming external power is very low and backup battery is dead or not connected	Loop output = 4mA
COIL FAIL	Coil current too high or too low (short or open).	Loop output = 22.8mA
COMM FAIL	Communication between transmitter and sensor board fails.	Loop output = 22.8mA
OVER RANGE	Rate exceeds number of digits that can be displayed. Adjust units.	Loop output = 4mA

The limited warranty set forth below is given by Seametrics, with respect to Seametrics brand products purchased in the United States of America.

Seametrics warrants that products manufactured by Seametrics, when delivered to you in new condition in their original containers and properly installed, shall be free from defects in material and workmanship. **Seametrics products are warranted against defects for a minimum period of two (2) years from date of installation, unless otherwise specified, with proof of install date. If no proof of install date can be provided, warranty period will be two (2) years from date of shipment from Seametrics, as defined on Seametrics' invoice.** Seametrics' obligation under this warranty shall be limited to replacing or repairing the part or parts, or, at Seametrics' option, the products, which prove defective in material or workmanship. The following are the terms of Seametrics' limited warranty:

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b. Any defective part or parts must be returned to Seametrics' factory or to an authorized service center for inspection.

c. Buyer will prepay all freight charges to return any products to Seametrics' factory, or another repair facility. as designated by Seametrics.

d. Defective products, or parts thereof, which are returned to Seametrics and proved to be defective upon inspection, will be repaired to factory specifications.

e. Seametrics will deliver repaired products or replacements for defective products to the buyer (ground freight prepaid) to the destination provided in the original order.

f. Products returned to Seametrics for which Seametrics provides replacement under this warranty shall become the property of Seametrics.

g. This limited warranty covers all defects encountered in normal use of Seametrics products, and does not apply to the following cases:

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    ii. Failure to follow operating, maintenance, or environmental instructions prescribed in Seametrics' instruction manual

    iii. Products not used for their intended purpose

    iv. Alterations to the product, purposeful or accidental

    v. Electrical current fluctuations

    vi. Corrosion due to aggressive materials not approved for your specific product

    vii. Mishandling, or misapplication of Seametrics products

    viii. Products or parts that are typically consumed during normal operation

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