MPI Magnetostrictive Level Sensors

For the Series MPI-F
Intrinsically Safe, Flexible, Stainless Steel and PVDF Stems

User Manual

APG®

Doc #9005623
Part #200337
Rev D, 06/2024

CONTENTS

INTRODUCTION

Thank you for purchasing an MPI series magnetostrictive level sensor from APG. We appreciate your business and your trust. Please take a few minutes to familiarize yourself with your MPI and this manual.

The MPI series magnetostrictive level sensor provides highly accurate and repeatable level readings in a wide variety of liquid level measurement applications. It is certified for installation in Class I, Division 1, and Class I, Zone 0 hazardous areas in the US and Canada by CSA, and ATEX and IECEx for Europe and the rest of the world. The MPI-F's flexible stem allows for installation in tanks up to 50 feet tall, without needing a crane or an extra-long truck and trailer for delivery. APG's proprietary-PVDF-formulation stem provides increased flexibility and impact resistance during cold-weather installation, along with compatibility in a wider range of corrosive media—including H2S—in larger tanks.

Reading your label

Every APG instrument comes with a label that includes the instrument's model number, part number, and serial number. Please ensure that the part number on your label matches your order. The following electrical ratings and approvals are also listed on the label. Please refer to the product page on APG's website for relevant certificates.

C 237484 US

8-24 VDC, Imax = 280 mA
Class I, Division 1, Groups C, D, T4; IP65
Class I, Zone 0, Ex/AEX ia, IIB, T4, Ga
Ex ia IIB, T4 ,Ga
(Ta = -40°C to 85°C)

Intrinsically Safe Wiring Requirements:
U_i= 28 VDC, I_i = 280 mA, P_i = 0.850 W , L_i = 3.50 µH, C_i = 0.374 µF

ATEX Certificate Number: Sira 19ATEX2072X

II 1G
Ex ia IIB T4 Ga
Ta: -40°C to 85°C

Ui = 28 V, Ii = 280 mA, Pi = 0.850 W, Li = 3.50 µH, Ci = 0.374 µF

IECEx SIR 19.0026X
Ex ia IIB T4 Ga
Ta: -40°C to 85°C

IMPORTANT: MPI-F level sensor MUST be installed according to drawing 9009451 (Intrinsically Safe Installation Drawing for Hazardous Locations) on pages 36-37 to meet listed approvals. Faulty installation will invalidate all safety approvals and ratings.

DANGER: OPEN CIRCUIT BEFORE REMOVING COVER or KEEP COVER TIGHT WHILE CIRCUITS ARE ALIVE;
AVERTISSEMENT — COUPER LE COURANT AVANT D'ENLEVER LE COUVERCLE, ou GARDER LE COUVERCLE FERME TANT QUE LES CIRCUITS SONT SOUS TENSION.

DANGER: WARNING — EXPLOSION HAZARD — SUBSTITUTION OF COMPONENTS MAY IMPAIR INTRINSIC SAFETY;
AVERTISSEMENT — RISQUE D'EXPLOSION — LA SUBSTITION DE COMPOSANT PEUT AMELIORER LA SECURITE INTRINSIQUE.

DANGER: WARNING — EXPLOSION HAZARD — DO NOT DISCONNECT EQUIPMENT UNLESS POWER HAS BEEN SWITCHED OFF OR THE AREA IS KNOWN TO BE NON-HAZARDOUS;
AVERTISSEMENT — RISQUE D'EXPLOSION — AVANT DE DECONNECTER L'EQUIPEMENT, COUPER LE COURANT OU S'ASSURER QUE L'EMPLACEMENT EST DESIGNE NON DANGEREUX.

IMPORTANT: Only the combustion gas detection performance of the instrument has been tested.

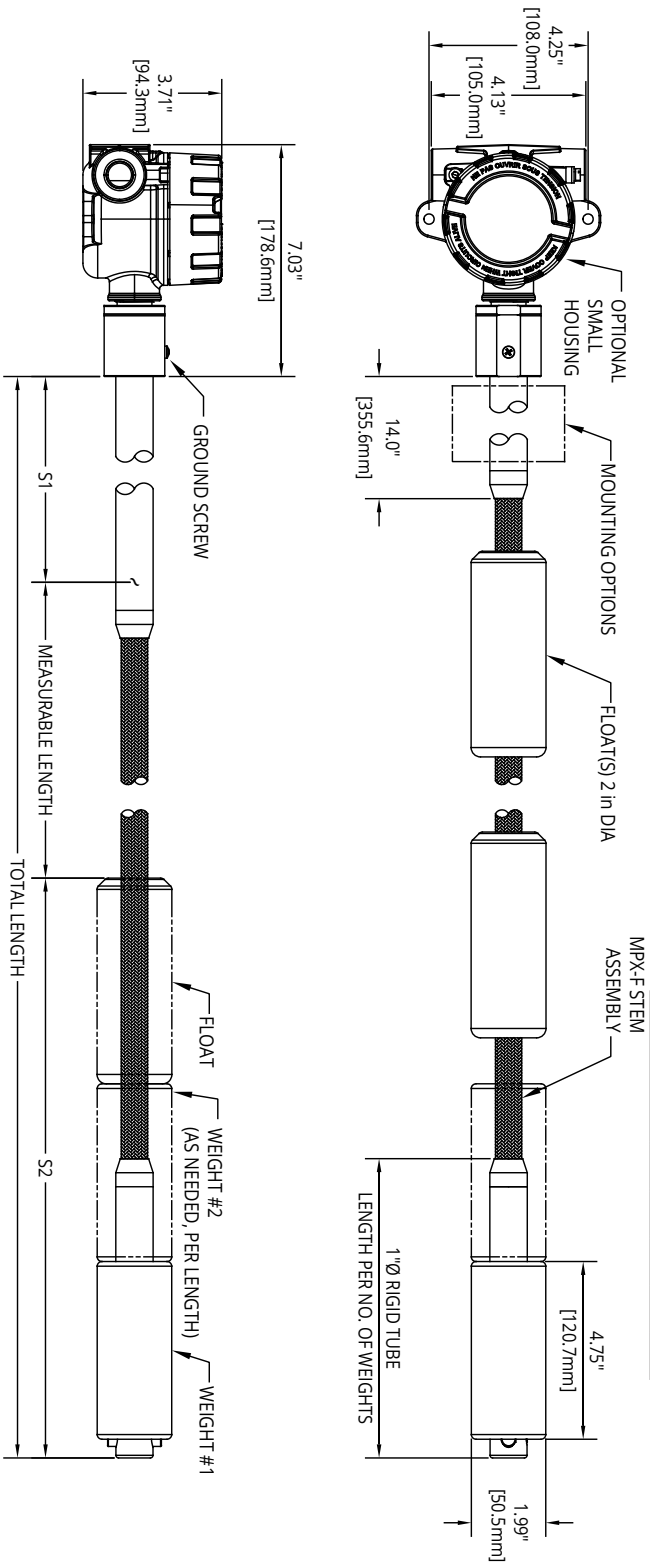
WARRANTY AND WARRANTY RESTRICTIONS

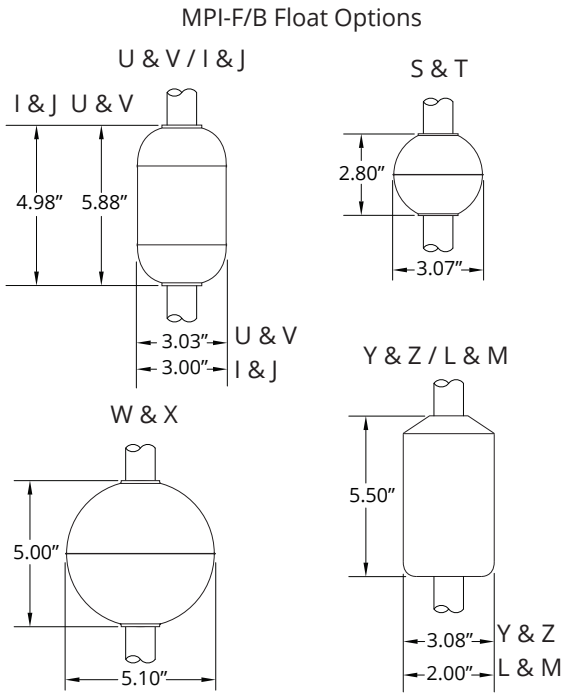
This product is covered by APG's warranty to be free from defects in material and workmanship under normal use and service of the product for 24 months. For a full explanation of our Warranty, please visit https://www.apgsensors.com/resources/warranty-certifications/warranty-returns/. Contact Technical Support to receive a Return Material Authorization before shipping your product back.

CHAPTER 1: SPECIFICATIONS AND OPTIONS

Dimensions

MPI-F/B (SS Stem) Sensor Dimensions with 2”Ø Stem Weights





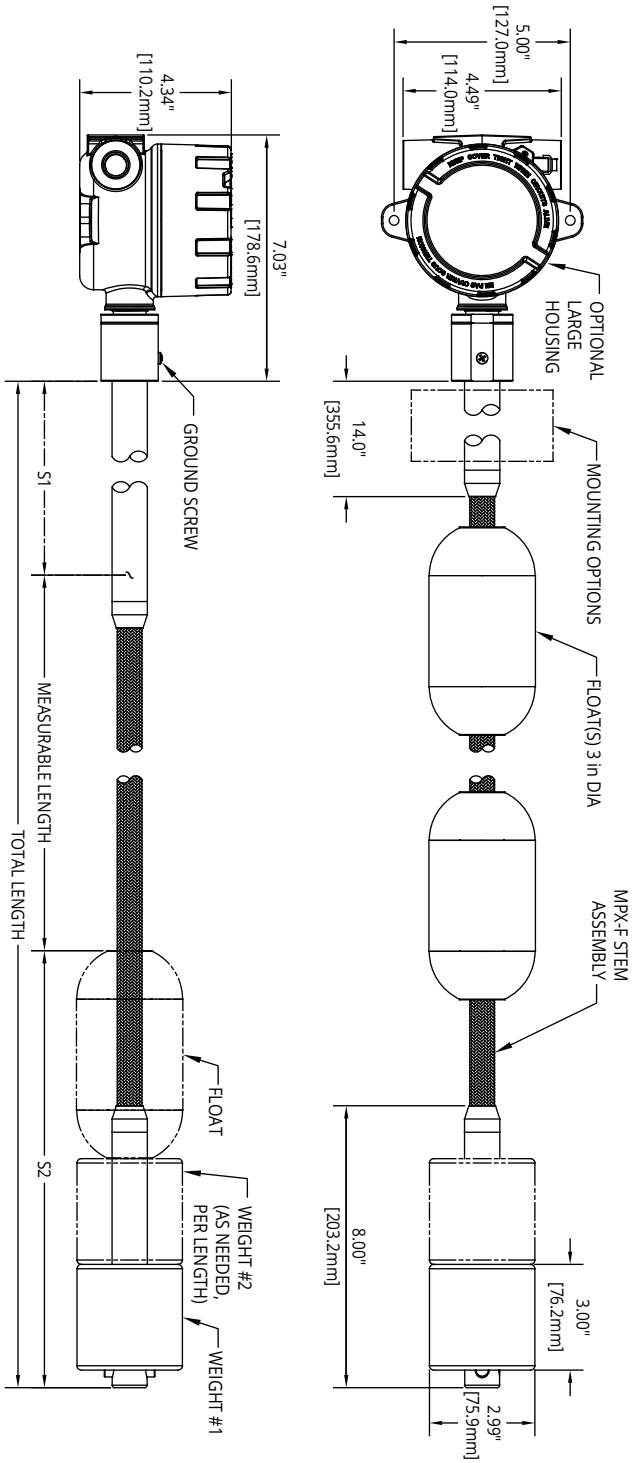
Probe Length in Inches	S1 Top Deadband Length	Number & Total Height of 2”Ø Stem Weights		Length of 1”Ø Tubing
L ≤ 96”	6”	1	4.75”	8”
97” ≤ L ≤ 144”	6”	2	9.5”	8”
145” ≤ L ≤ 192”	8”	2	9.5”	8”
193” ≤ L ≤ 300”	8”	3	14.25”	14”
301” ≤ L	10”	3	14.25”	14”

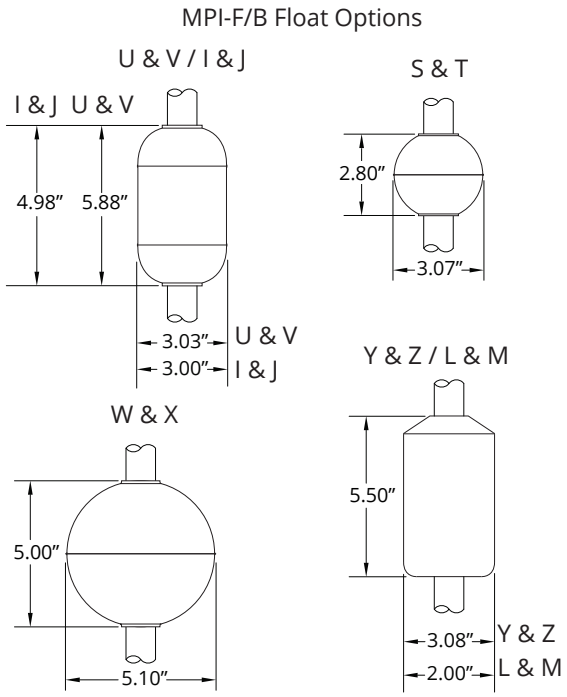
Measurable Length = Total Length – S1 – S2

S1 = Top Deadband

S2 = 1 Float Height + Weight(s) Height + 0.5”

MPI-F/B (SS Stem) Sensor Dimensions with 3”Ø Stem Weights





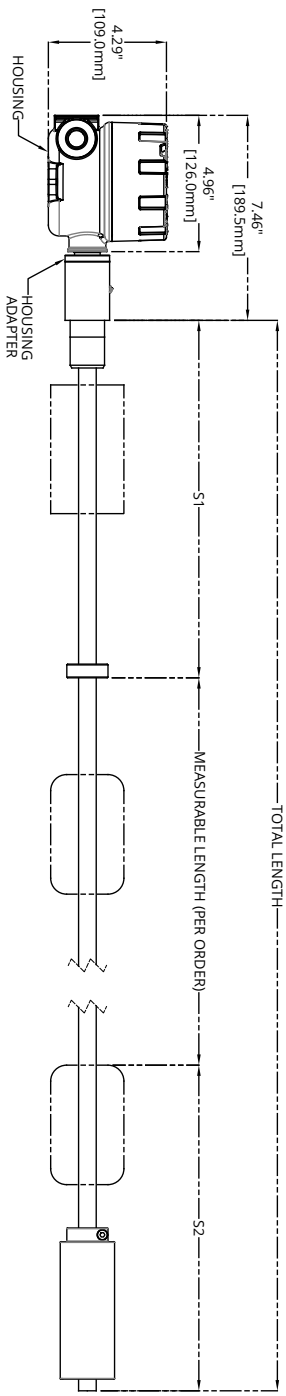
Probe Length in Inches	S1 Top Deadband Length	Number & Total Height of 3”Ø Stem Weights	
L ≤ 144”	6”	1	3”
145” ≤ L ≤ 192”	8”	1	3”
193” ≤ L ≤ 300”	8”	2	6”
301” ≤ L	10”	2	6”

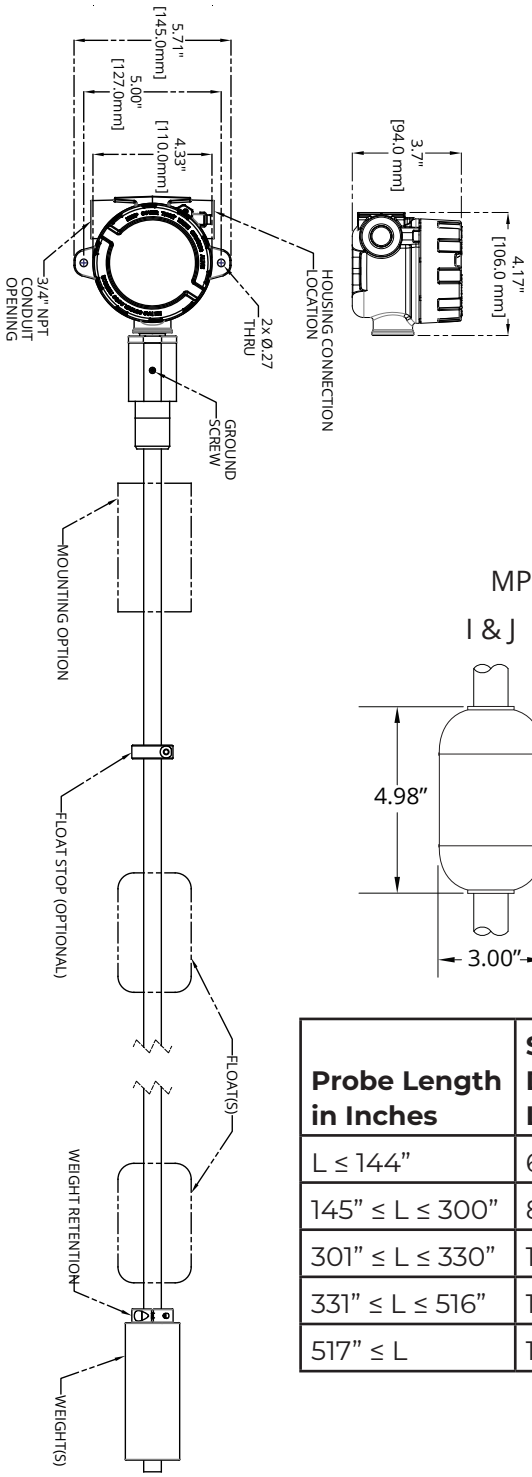
Measurable Length = Total Length – S1 – S2

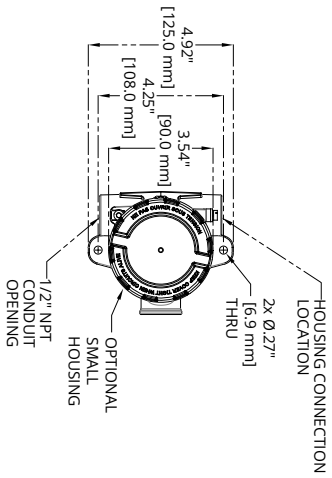
S1 = Top Deadband

S2 = 1 Float Height + Weight(s) Height + 0.5”

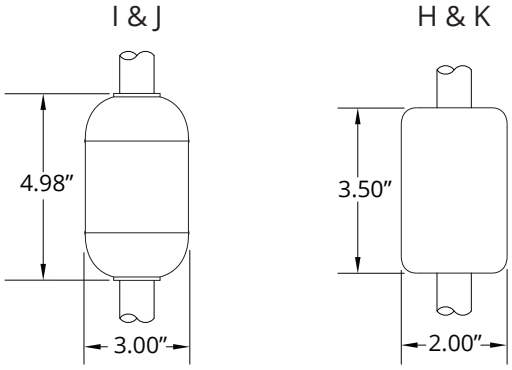
MPI-F/K (PVDF Stem) Sensor Dimensions







MPI-F/K Float Options



Probe Length in Inches	S1 Top Deadband Length†	Number & Total Height of Stem Weights	
L ≤ 144"	6"	1	5"
145" ≤ L ≤ 300"	8"	2	10"
301" ≤ L ≤ 330"	10"	2	10"
331" ≤ L ≤ 516"	10"	3	15"
517" ≤ L	10"	4	20"

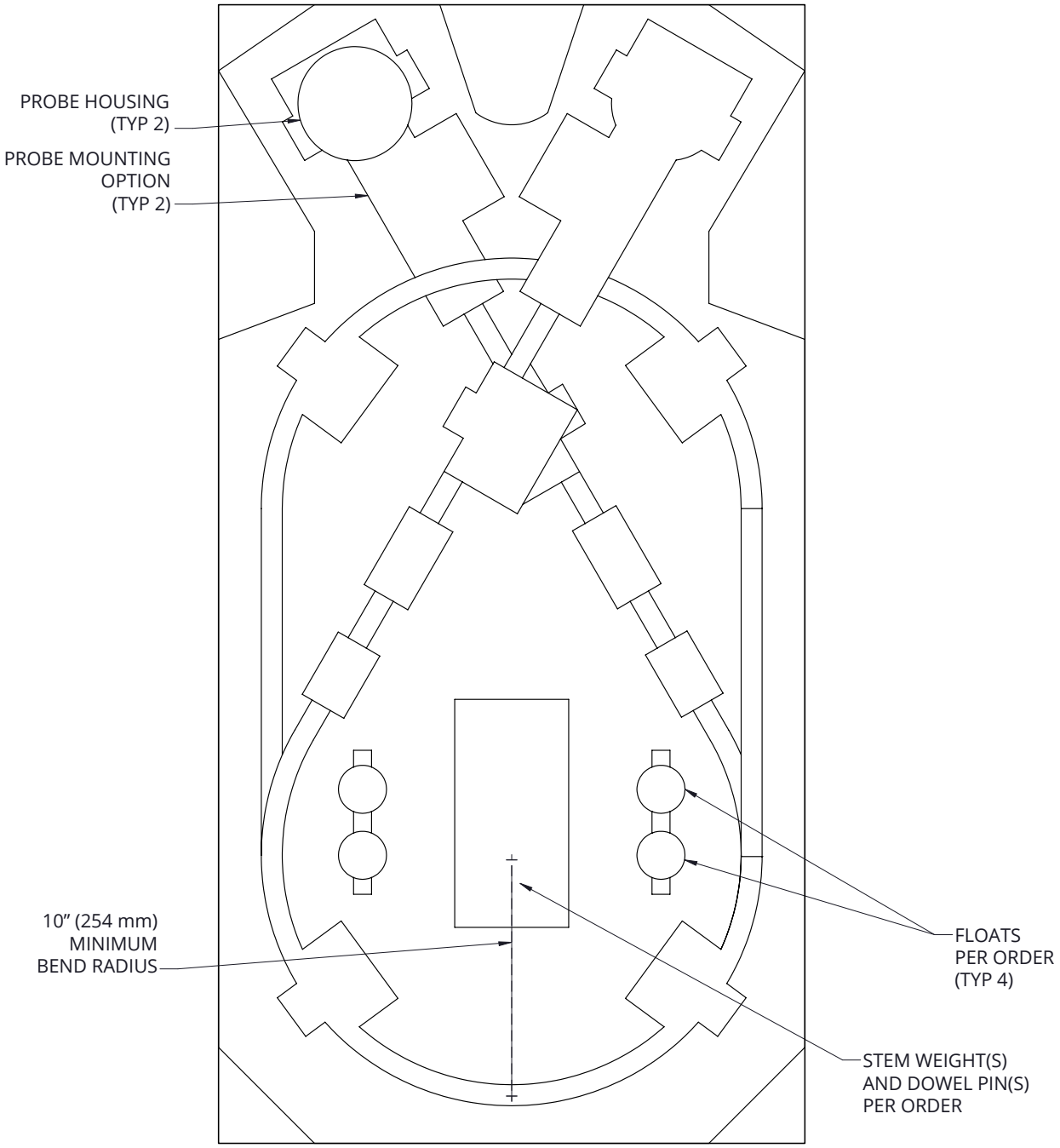
Measurable Length = Total Length – S1 – S2

S1 = Top Deadband

S2 = 1 Float Height + Weight(s) Height + 0.8625"

MPI-F/K Shipping Box Contents

MPI-F/K Shipping Box



Specifications

Performance

Resolution	4-20 mA:	14 bit DAC (1 mm)
	Modbus:	0.04 in. (1 mm)
Accuracy	4-20 mA:	Greater of ±0.05% of FS or 1 mm
	Modbus:	±0.04 in. (±1 mm)
Digital Temp Sensor	Accuracy:	±1°C
API 18.2 Temp Sensor	Accuracy:	±0.25°C over -40° to 85° C
		±0.13°C over +20° to 70° C
Stem Bend Radius (minimum)	PVDF:	10” (254 mm)

Environmental

Operating Temperature	-40° to 185° F (-40° to 85° C)
Enclosure Protection	NEMA 4X, IP65
Maximum Pressure	PVDF stem: 300 psi
	PVDF float:50 psi

Electrical

Supply Voltage	Modbus (RS-485):	8-24 VDC on sensor
	4-20 mA:	12-24 VDC on sensor
Current Draw	Modbus (RS-485):	15 mA (typical)
	4-20 mA:	22 mA single / 44 mA dual (max)
Protection	Reverse Polarity and CE compliant to EN 61326	

Materials of Construction

Housing	Cast aluminum, epoxy coated	
Stem	Stainless Steel:	7/8”Ø 316L SS Flexible Tubing with Braid
	PVDF:	5/8”Ø proprietary formulation PVDF Flexible Tubing
Mounting (slide)	316L SS	
Compression Fitting (slide)	Aluminum with Neoprene bushing	
Stem Weights	316L SS	

Connectivity

Output	Modbus RTU (RS-485), optional temperature sensors
	2-wire, loop-powered 4-20 mA
	4-wire, loop-powered dual 4-20 mA

Programming

RS-485	Optional RST-6001 USB-to-RS-485 converter
4-20 mA	Optional RST-4100 programming module

Model Number Configurator

Model Number: MPI – _F_ ____ ____ – ____ ____ – ____ ____ ____ _B_ – ____ – ____ – ____ _2_ ____ ____

A B C D E F G H I J K L M N O

A. Stem Type
- **F** Flexible Tubing

B. Output
- **6** Single float, loop-powered 4-20 mA, 2-wire
- **7** Dual float, loop-powered 4-20 mA, 4-wire
- **8▲** Modbus RTU, with optional temperature sensors

C. Housing Type
All Housing Die-cast Aluminum, NEMA 4X, IP65, Blue
- **__▲** Large Housing
- **A** Small Housing

D. Float 1 (Top Float)
- **Z/Y** 5.5h x 3d in. Red Polyurethane (0.65 SG / 0.94 SG)
- **X/W** 5 in. Round 316L SS (0.52 SG / 0.92 SG)
- **V/U** 6h x 3d in. Oval 316L SS (0.58 SG / 0.94 SG)
- **T/S** 3 in. Round 316L SS (0.60 SG / 0.94 SG)
- **M/L** 5.5h x 2d in. Red Polyurethane (0.57 SG / 0.94 SG)
- **J/I** 5h x 3d in. Oval Titanium 2 (0.60 SG / 0.94 SG)
- **N** None

E. Float 2 (optional)
- **N** None
- **Y** 5.5h x 3d in. Blue Polyurethane (0.94 SG)
- **W** 5 in. Round 316L SS (0.92 SG)
- **U** 6h x 3d in. Oval 316L SS (0.94 SG)
- **S** 3 in. Round 316L SS (0.94 SG)
- **L** 5.5h x 2d in. Blue Polyurethane (0.94 SG)
- **I** 5h x 3d in. Oval Titanium 2 (0.94 SG)

F. Mounting Type
- **P▲** NPT Plug 150#
- **N** None

G. Mounting Size
- **2▲** 2 in. (welded or slide connection)
- **3** 3 in. (slide connection)
- **N** None

H. Mounting Connection
- **W** Welded (fixed)
- **S▲** Slide with Compression Fitting (adjustable)

I. Stem Material
- **B** 316L SS

J. Total Stem Length in Inches
- **__** Min. 48 in. – Max. 384 in.

K. Temperature Sensor Options
MPI-F8
- **N** None
- **1D▲** Digital Temperature Sensor A, 12 in. from bottom of probe
- **2D** Digital Temperature Sensors A, B
- **3D** Digital Temperature Sensors A, B, C
- **4D** Digital Temperature Sensors A, B, C, D
- **5D** Digital Temperature Sensors A, B, C, D, E
- **6D** Digital Temperature Sensors A, B, C, D, E, F
- **7D** Digital Temperature Sensors A, B, C, D, E, F, G
- **AP** Sensor Quantity and Placement per API 18.2 Standard

Note: Temperature sensors B – G are spaced evenly between A and probe's zero reference.

L. Custom Housing-Electrical Connection†
- **N▲** None
- **B** Cable Gland (Cable sold separately)
- **C** 4-pin M12 Micro Connector Female
- **D** 4-pin M12 Micro Connector Male – 90°
- **F** 4-pin M12 Micro Connector Female – 90°
- **G** 90° Elbow
- **M** 4-pin M12 Micro Connector Male

M. End Plug
- **2▲** Keyhole for weight locking pin

N. Float Stop
- **A3▲** 1-piece top float stop, held with set screw
- **F3** 2-piece clamp top float stop
- **N** None

O. Stem Weights
- **W7** 316L SS, 3 lb, 2"Ø x 4.75"H; modular
- **W8** 316L SS, 5 lb, 3"Ø x 3"H; modular

Note: ▲This option is standard.
Note: †Connectors available for use with Small Housing only. For Large Housing, choose N None.

Model Number: MPI – _F_ _____ _____ – _____ _____ – _____ _____ _____ _K_ – _____ – _____ – ____ _2_ _____ __W6_
A B C D E F G H I J K L M N O

A. Stem Type
- **F** Flexible Tubing

B. Output
- **6** Single float, loop-powered 4-20 mA, 2-wire
- **7** Dual float, loop-powered 4-20 mA, 4-wire
- **8▲** Modbus RTU, with optional temperature sensors

C. Housing Type
All Housing Die-cast Aluminum, NEMA 4X, IP65, Blue
- **__▲** Large Housing
- **A** Small Housing

D. Float 1 (Top Float)
- **K/H▲** 3.5h x 2d in. PVDF (0.58 SG / 0.94 SG)
- **J/I** 5h x 3d in. Oval Titanium 2 (0.60 SG / 0.94 SG)
- **N** None

E. Float 2 (optional)
- **N▲** None
- **H** 3.5h x 2d in. PVDF (0.94 SG)
- **I** 5h x 3d in. Oval Titanium 2 (0.94 SG)

F. Mounting Type
- **P▲** NPT Plug 150#
- **N** None

G. Mounting Size
- **2▲** 2 in. (welded or slide connection)
- **N** None

H. Mounting Connection
- **W** Welded (fixed)
- **S▲** Slide with Compression Fitting (adjustable)

I. Stem Material
- **K** Proprietary PVDF formulation

J. Total Stem Length in Inches
- **__** Min. 120 in. – Max. 600 in.

K. Temperature Sensor Options
MPI-F8
- **N** None
- **1D▲** Digital Temperature Sensor A, 12 in. from bottom of probe
- **2D** Digital Temperature Sensors A, B
- **3D** Digital Temperature Sensors A, B, C
- **4D** Digital Temperature Sensors A, B, C, D
- **5D** Digital Temperature Sensors A, B, C, D, E
- **6D** Digital Temperature Sensors A, B, C, D, E, F
- **7D** Digital Temperature Sensors A, B, C, D, E, F, G
- **AP** Sensor Quantity and Placement per API 18.2 Standard

Note: Temperature sensors B – G are spaced evenly between A and probe's zero reference.

L. Custom Housing-Electrical Connection†
- **N▲** None
- **B** Cable Gland (Cable sold separately)
- **C** 4-pin M12 Micro Connector Female
- **D** 4-pin M12 Micro Connector Male – 90°
- **F** 4-pin M12 Micro Connector Female – 90°
- **G** 90° Elbow
- **M** 4-pin M12 Micro Connector Male

M. End Plug
- **2▲** Keyhole for dowel pin

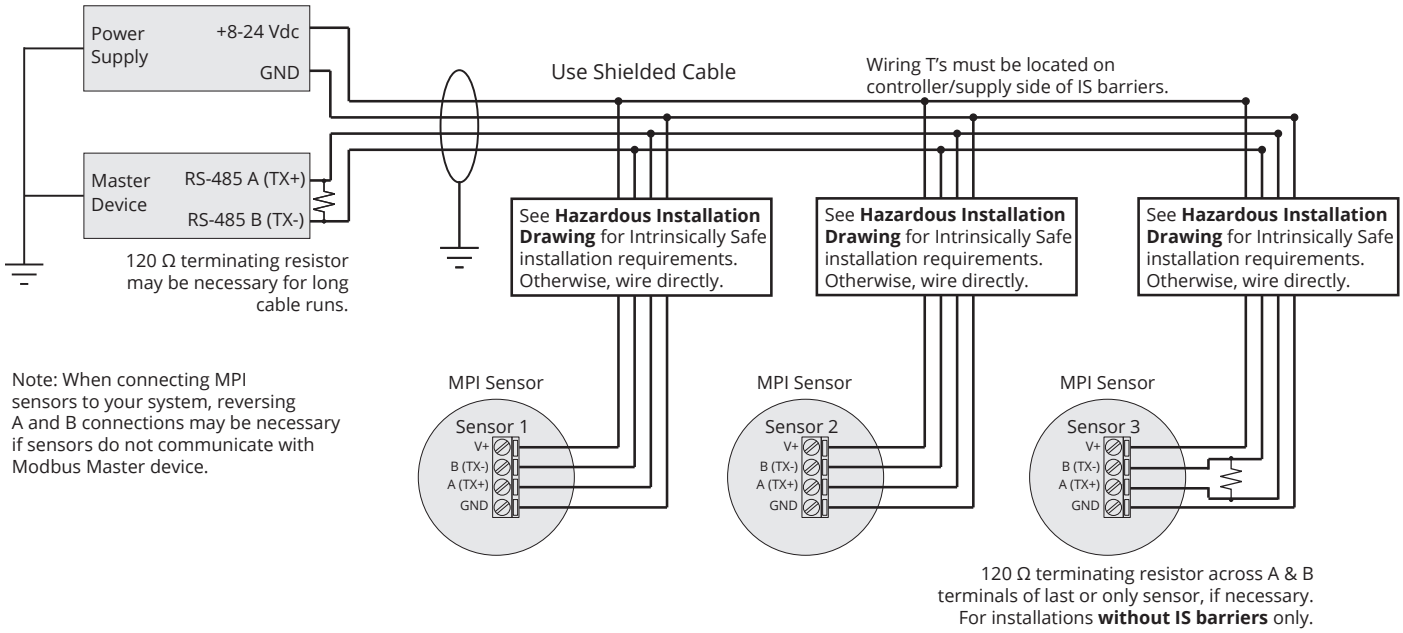
N. Float Stop
- **E3** 1-piece clamp, top float stop only
- **N▲** None

O. Stem Weights
- **W6▲** 316L SS, 3.75 lb, 2"Ø x 5"H; modular

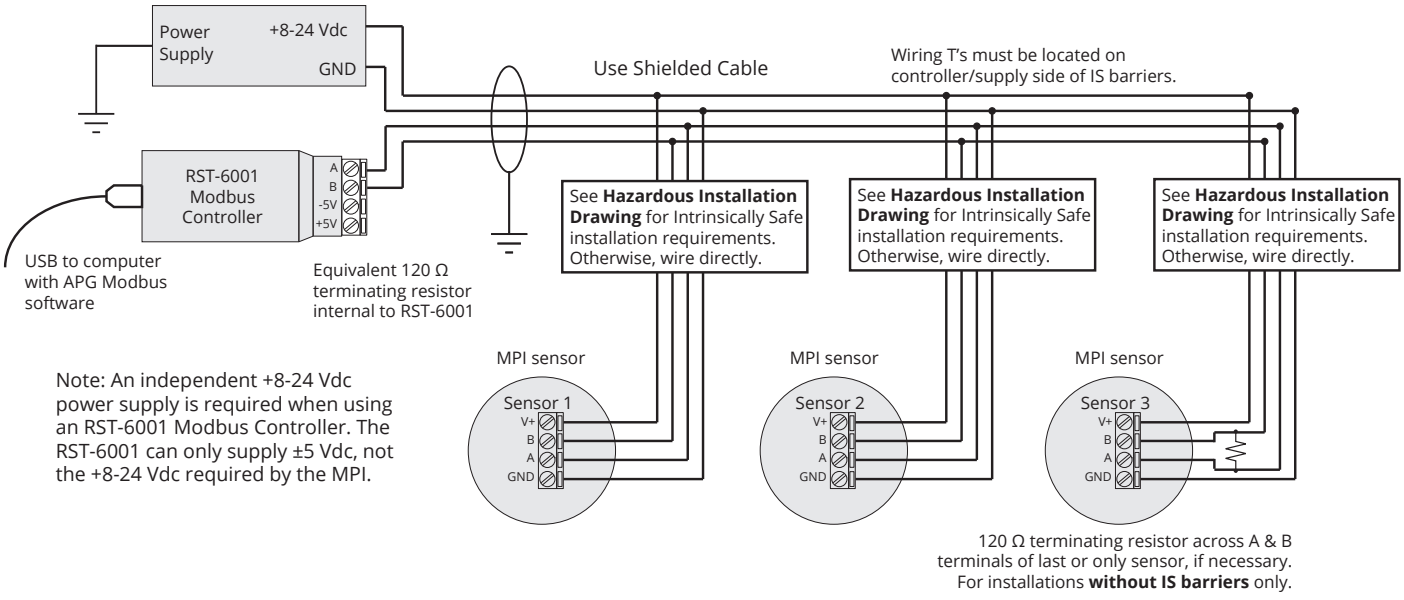
Note: ▲This option is standard.
Note: †Connectors available for use with Small Housing only. For Large Housing, choose N None.

System Wiring Diagrams and IS Use Case Diagrams

Modbus System Wiring For MPI-F Sensors



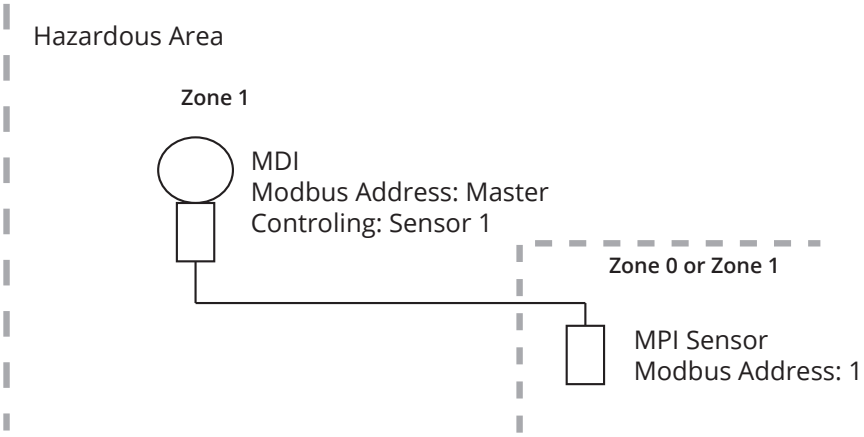
Modbus System Wiring with RST-6001 For MPI-F Sensors



IMPORTANT: Refer to Chapter 5 for Intrinsically Safe Installation Drawing for Hazardous Locations.

IMPORTANT: For EMI protection, either connect the ground screw (see pages 1-3) to an earth ground, or ensure that tank mounting of the MPI-F is grounded.

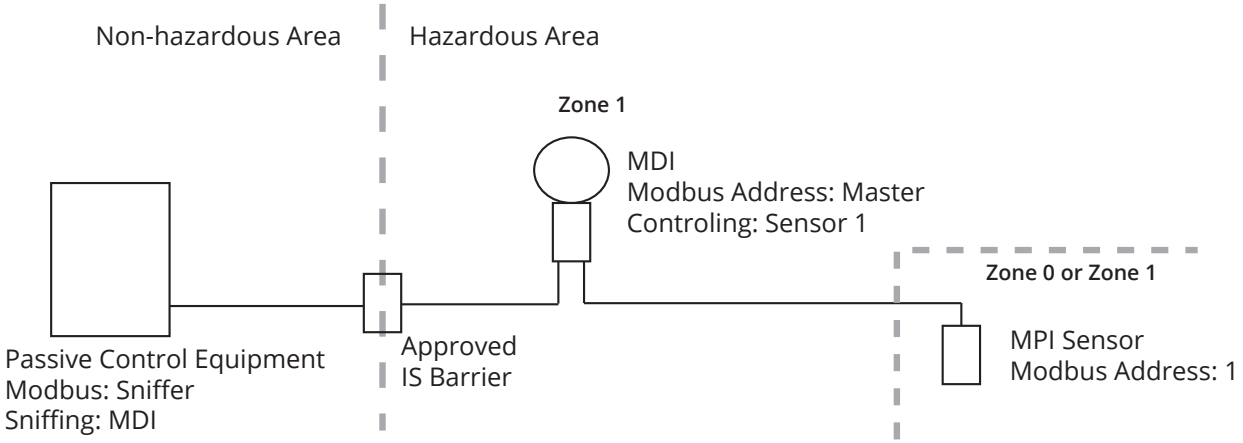
MPI – MDI Use Case Diagram (Modbus Output Only)



Single MDI controlling a single MPI sensor

- MDI is located in Zone 1 area. MPI can be in Zone 0 or Zone 1 without additional barriers.
- MDI is battery powered; allows for software-based switchable power for MPI.
- MPI is powered by MDI battery.
- No external controller.
- No IS barrier required.
- Any changes to MPI settings done via MDI buttons.

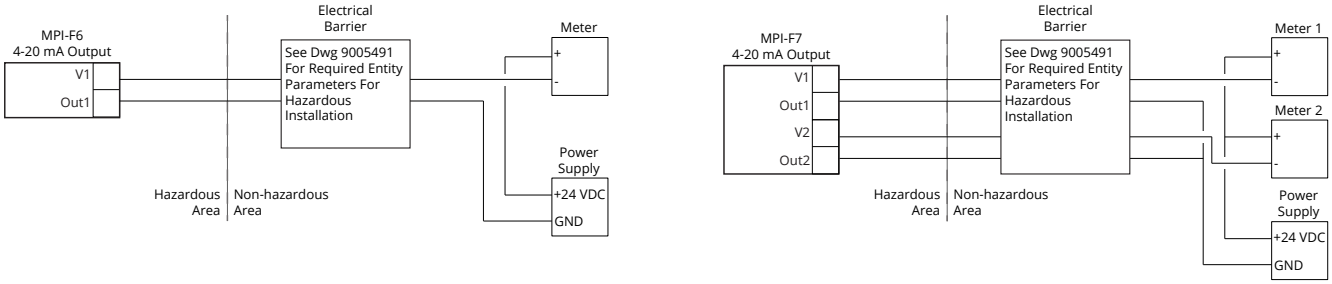
MPI – MDI with Passive Controller Use Case Diagram (Modbus Output Only)



Single MDI controlling a single MPI sensor with Passive Control Equipment

- MDI is located in Zone 1 area. MPI can be in Zone 0 or Zone 1 without additional barriers.
- MDI is battery powered; allows for software-based switchable power for sensor.
- MPI is powered by MDI battery.
- External controller passively reads (Sniffs) readings from MDI.
- External controller can activate MDI.
- Approved IS Barrier required between Passive Control Equipment and MDI.
- Auxiliary connection required for MDI.
- Any changes to MPI settings done via MDI buttons.

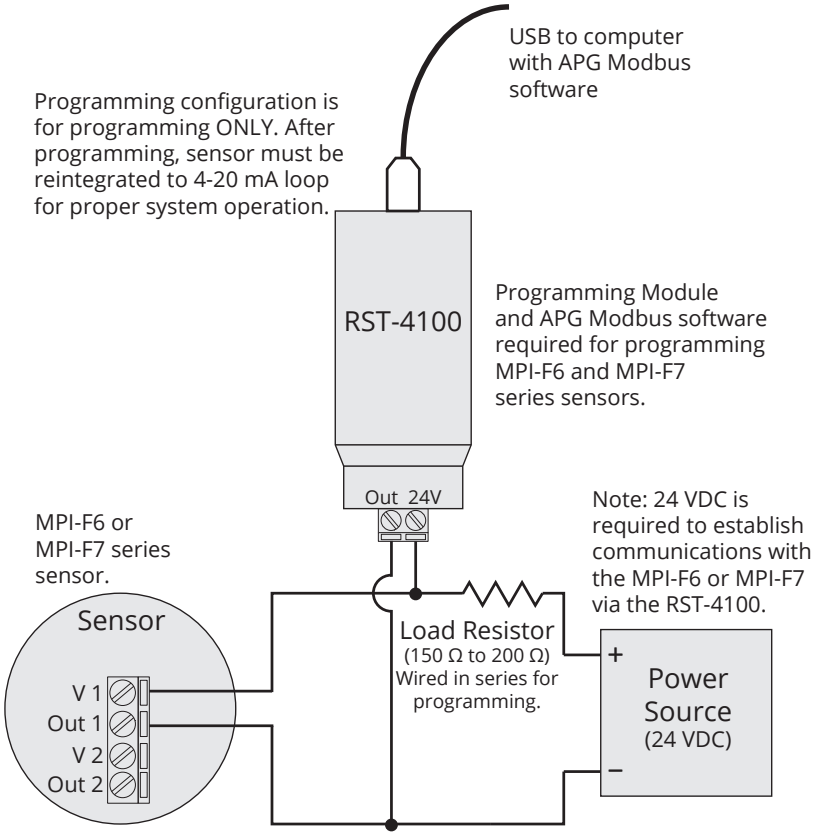
4-20 mA Loop Wiring



IMPORTANT: Refer to Chapter 5 for Intrinsically Safe Installation Drawing for Hazardous Locations.

IMPORTANT: For EMI protection, either connect the ground screw (see pages 1-3) to an earth ground, or ensure that tank mounting of the MPI-F is grounded.

4-20 mA Programming Wiring



NOTE: For MPI-F7 series sensors, – VDC from power source must be connected to Out1 on sensor for correct sensor programming.

CHAPTER 2: INSTALLATION AND REMOVAL PROCEDURES AND NOTES

Tools Needed

You will need the following tools to install your MPI level sensor:

- Wrench sized appropriately for MPI mounting
- Wrench sized appropriately for conduit connections
- Flat-head screwdriver for wire terminals
- Channel lock pliers for tightening compression fitting
- 1/8" Hex Allen wrench for set screws

ATEX Stated Conditions of Use

- Under certain extreme circumstances, the non-metallic parts incorporated in the enclosure of this equipment may generate an ignition-capable level of electrostatic charge. Therefore the equipment shall not be installed in a location where the external conditions are conducive to the build-up of electrostatic charge on such surfaces. In addition, the equipment shall only be cleaned with a damp cloth.
- The enclosure is manufactured from aluminum. In rare cases, ignition sources due to impact and friction sparks could occur. This shall be considered during installation.

IMPORTANT: Only the combustion gas detection performance of the instrument has been tested.

Physical Installation Notes

The MPI-F should be installed in an area—indoors or outdoors—which meets the following conditions:

- Ambient temperature between -40°C and 85°C (-40°F to +185°F)
- Relative humidity up to 100%
- Altitude up to 2000 meters (6560 feet)
- IEC-664-1 Conductive Pollution Degree 1 or 2
- IEC 61010-1 Measurement Category II
- No chemicals corrosive to stainless steel (such as NH_3, SO_2, Cl_2, etc.) (Not applicable to plastic-type stem options)
- Ample space for maintenance and inspection

Additional care must be taken to ensure:

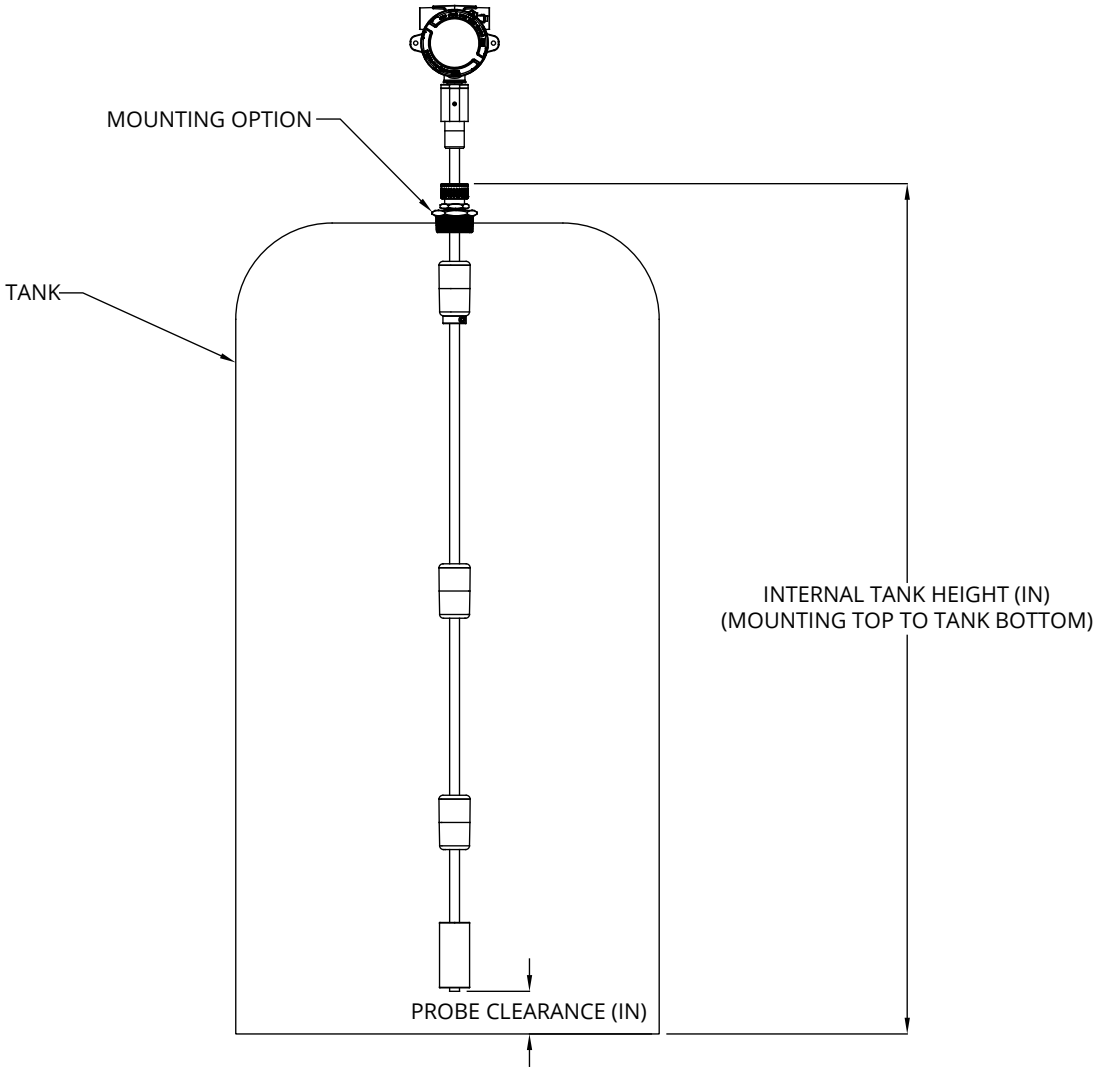
- The probe is located away from strong magnetic fields, such as those produced by motors, transformers, solenoid valves, etc.
- The medium is free from metallic substances and other foreign matter.
- The probe is not exposed to excessive vibration.
- The float(s) fit through the mounting hole. If the float(s) does/do not fit, it/they must be mounted on the stem from inside the vessel being monitored.
- The float(s) is/are oriented properly on the stem (See Figure 2.2). MPI-F floats are installed by customer.

PVDF Installation Temperature Requirements

Prior to installing a PVDF-stem MPI-F, the interior, mid-column temperature of the tank must be measured to determine the amount clearance needed at the bottom of the probe for thermal expansion. See Figure 2.1

1. Determine interior, mid-column temperature in °F.
2. Determine interior tank height from top of probe mounting to tank interior bottom, in inches.
3. Use formula in Figure 2.1 to determine necessary clearance from bottom of probe to interior tank bottom.
4. If necessary, adjust placement of slide mount on probe to accommodate required clearance.

Contact factory with any PVDF-stem thermal expansion requirement questions.



PROBE CLEARANCE = .000108 * (185 - INSTALL TEMPERATURE) * INTERNAL TANK HEIGHT

† TEMPERATURE IN DEG. F
LENGTH IN INCHES

Figure 2.1

Physical Installation Instructions

Ensure that all components have been received, including:

- MPI-F sensor (head and stem, slide mount if purchased)
- Float or floats, if float(s) purchased from APG
- Stem Weight(s); Weight-Locking Pin and Set Screw for SS; Top Weight Retention Ring (with two screws), Dowel Pin for PVDF
- Assembly drawing

Assemble sensor mounting, float(s), weight and pins at installation location, if possible.

- If not already attached, slide mounting option onto stem. Loosen compression cap so it will slide easily on stem. For probes with PVDF stems, be sure to account for thermal expansion clearance (see page 10) when placing slide mount on stem.
- For SS sensors with float stops, refer to the assembly drawing included with the sensor for float stop installation locations. PVDF float stops are installed at the factory.
- Note: If the floats do not fit through the tank/vessel mounting hole, mount them on the stem from inside the vessel being monitored. Then secure the sensor to the vessel.
- Slide floats onto stem. If using two floats, slide the lighter float on first. Tops of floats will be indicated by sticker, taper, or etching on float. (See Figure 2.2) After ensuring top of float is toward MPI-F sensor head, remove sticker(s).
- For PVDF stem:
  - Slide weight retention ring onto stem and then insert weight(s) on end of stem
  - Secure dowel pin in end of stem (use hammer/mallet if necessary)
  - Slide weight(s) down onto dowel pin
  - Lock weight(s) in place by sliding weight retention ring down to top weight and tighten
- For SS stem:
  - Insert weight(s) on end of stem
  - Insert weight-locking pin into end plug hole
  - Lock into place with set screw, using 1/8” allen wrench

Install MPI-F sensor on tank

- When lifting and installing the sensor be sure to minimize the bending angle between the rigid stem at the top and bottom of the sensor and the flexible stem in-between. Sharp bends at those points could damage the sensor. The 10” bend radius of the PVDF probe’s shipping box can be used as a guide for the smallest allowable bend for the PVDF stem (see MPI-F/K Shipping Box Contents on page 4).
- If your sensor’s stem and float(s) fit through the mounting hole, insert the weight and the floats into the mount opening.
- Carefully unroll and feed the MPI-F sensor stem into the tank, being careful to not let the float(s) drop uncontrolled on the stem. Slide the mount up to the top of the stem.
- For PVDF stem:
  - When the weight is on the bottom of the tank, secure the mounting option to the vessel
  - Take any slack out of the flexible stem, raising bottom of stem to previously calculated clearance height (see page 12).
  - Tighten the compression fitting to hold stem in place.
- For SS stem:
  - When the weight is on the bottom of the tank, secure the mounting option to the vessel.
  - Take any slack out of the flexible stem.
  - Tighten the compression fitting to hold stem in place.

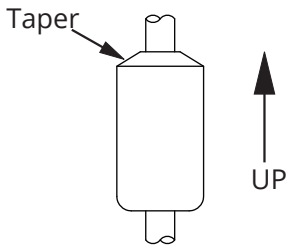


Figure 2.2

IMPORTANT: Floats must be oriented properly on the stem, or sensor readings will be inaccurate and unreliable. Untapered floats will have a sticker or etching indicating the top of the float. Remove sticker prior to use.

IMPORTANT: MPI-F level sensor MUST be installed according to drawing 9009451 (Intrinsically Safe Installation Drawing for Hazardous Locations) on pages 36-37 to meet listed approvals. Faulty installation will invalidate all safety approvals and ratings.

Electrical Installation

- Remove the housing cover of your MPI.
- Feed system wires into MPI through the NPT conduit openings. Any fittings used must be UL/CSA Listed for CSA installation.
- Connect wires to MPI terminals. Use crimped ferrules on wires, if possible.
- Replace the housing cover.

See System Wiring Diagrams and IS Use Case Diagrams (pages 8-10) for wiring examples.

IMPORTANT: For EMI protection, either connect the ground screw (see pages 1-3) to an earth ground, or ensure that tank mounting of the MPI-F is grounded.

Removal Instructions

Removing your MPI-F level sensor from service should be done with care.

- Ensure that all circuits are turned off and hazardous atmosphere around sensor head has been cleared.
- Remove housing cover and disconnect wires. Replace housing cover.
- If the floats on your sensor fit through the mounting hole, carefully lift the entire sensor assembly out of and away from the vessel.
- If the floats on your sensor do not fit through the mounting hole, they will need to be removed from the stem before the sensor can be removed. Be sure to drain the vessel being monitored to allow access to the floats and stem for removal.
- Clean the stem and floats of any build up or debris and inspect for damage.
- Store your sensor in a dry place, at a temperature between -40° F and 180° F.

IMPORTANT: Contact factory for shipping instructions prior to returning probe for any reason.

CHAPTER 3: PROGRAMMING

Modbus Programming

MPI-F8 series sensors use standard Modbus RTU protocol (RS-485). The sensors can only operate as client devices. Sensor default transmission settings are **9600 Baud, 8 Bits, 1 Stop Bit, No Parity**, and require a minimum delay of 300 ms between transactions. See MPI-F8 Modbus Register Lists on pages 16 and 17.

NOTE: For more information about Modbus RTU, please visit www.modbus.org.

Modbus Programming with RST-6001 and APG Modbus Software

An APG RST-6001 Modbus Controller can be used in tandem with APG Modbus software to program and control up to 20 MPI-F8 series sensors. Through APG Modbus, you can monitor the raw readings from the sensor, configure the data for distance, level, volume, or weight, and enter measurements for a strapping chart. See MPI-F8 Modbus Register Lists on pages 16 and 17.

NOTE: For APG Modbus programming instructions, or to download APG Modbus software, please visit https://www.apgsensors.com/resources/product-resources/software-downloads/

4-20 mA Programming with RST-4100 and APG Modbus Software

An APG RST-4100 Programming Module can be used in tandem with APG Modbus software to program a single MPI-F6/7 series sensor. Through APG Modbus, you can configure the 4 mA and 20 mA output setpoints and calibration settings. If your monitoring equipment (PLC, etc.) can be configured to interpret the 4-20 mA output(s) of the MPI-F as volume, then the MPI-F can be configured accordingly via APG Modbus. See MPI-F6 and F7 Modbus Register Lists on pages 23 and 23.

However, the RST-4100 is not designed to be used for continuous monitoring of a sensor. After programming your MPI-F sensor, the RST-4100 must be removed and the wiring returned to normal. See 4-20 mA Loop Wiring and 4-20 mA Programming Wiring on page 10.

Modbus Register Lists for MPI-F8

The registers listed below are reference addresses. To convert a reference address to an offset address, remove the first digit then subtract one.

Example 1: Reference address = 30300 → Offset register = 299

Example 2: Reference address = 40400 → Offset register = 399

Input Registers (0x04)

Register	Returned Data
30299	Model Type
30300	Raw Top Float Reading (in mm, unsigned)
30301	Raw Bottom Float Reading (in mm, unsigned)
30302	Temperature Reading (in °C, signed)
30303-30304	Calculated Top Float Reading (in selected Units)
30305-30306	Calculated Bottom Float Reading (in selected Units)
30307	Version
30308	API 18.2 TEMP (in °C, signed)

NOTE: The Calculated Readings will be returned without a decimal place. In order to obtain the true result, the Decimal Place setting must be taken into account.

Holding Registers (0x03)

Register	Function	Value Range
40400	Device Address	1 to 247
40401	Units	1, 2, 3
40402	Application Type	0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11
40403	Volume Units	1, 2, 3, 4, 5, 6, 7
40404	Decimal Place	0, 1, 2, 3
40405	†Max Distance	0 to 32,768 mm
40406	Full Distance	0 to 32,768 mm
40407	Empty Distance	0 to 32,768 mm
40408	†Sensitivity	0 to 100
40409	†Pulses	5 to 20
40410	†Blanking	0 to 10,364 mm
40411	NA	NA
40412	†Averaging	1 to 50
40413	†Filter Window	0 to 10,364 mm
40414	†Out of Range Samples	1 to 255
40415	†Sample Rate	50 to 1,000 msec.
40416	†Multiplier	1 to 1,999 (1000 = 1.000)
40417	†Offset	-10,364 to 10,364 mm
40418	†Pre filter	0 to 10,364 mm
40419	†Noise limit	0 to 255
40420	Temperature Select	0 to 8
40421	†RTD Offset (°C)	NA*
40422	†Float Window	0 to 1,000 mm 0=1 float
40423	†1st Float Offset	-10,364 to 10,364
40424	†2nd Float Offset	-10,364 to 10,364
40425	†Gain Offset	0 to 255
40426	4 mA Set Point	NA*
40427	20 mA Set Point	NA*
40428	4 mA Calibration	NA*
40429	20 mA Calibration	NA*
40430	t1d	NA*
40431	t1w	NA*
40432	t1t	NA*
40433	t2d	NA*
40434	t2w	NA*
40435	t2t	NA*
40436-40437	Parameter 1 Data	0 to 1,000,000 mm
40438-40439	Parameter 2 Data	0 to 1,000,000 mm
40440-40441	Parameter 3 Data	0 to 1,000,000 mm
40442-40443	Parameter 4 Data	0 to 1,000,000 mm
40444-40445	Parameter 5 Data	0 to 1,000,000 mm
40446	Baud Rate	0, 1, 2, 3, 4
40201	Restore to Factory Defaults	1

*These registers are not used by the MPI-F8, even though they are labeled in the APG Modbus software.
†Setting is factory calibrated. Do not adjust.

MPI-F8 Modbus Sensor Parameters

40401 – Units

Determines the units of measure for the Calculated Reading when Application Type is set to 0, 1, or 7.

1 = Feet 2 = Inches 3 = Meters

40402 – Application Type

Determines the type of Calculated Reading performed by the sensor.

0 = Distance
1 = Level
2 = Standing Cylindrical Tank with or without Hemispherical Bottom
3 = Standing Cylindrical Tank with or without Conical Bottom
4 = Standing Rectangular Tank with or without Chute Bottom
5 = Horizontal Cylindrical Tank with or without Spherical Ends
6 = Spherical Tank
7 = Pounds (Linear Scaling)
8 = N/A
9 = Vertical Oval Tank
10 = Horizontal Oval Tank
11 = Strapping Chart

See MPI-F Application Type Parameters pages 30-34.

40403 – Volume Units

Determines the units of measure for the Calculated Reading when Application Type is set to 2 – 6 or 9 – 11.

1 = Feet^3
2 = Million Feet^3
3 = Gallons
4 = Meters^3
5 = Liters
6 = Inches^3
7 = Barrels

40404 – Decimal Place

Determines the number of decimal places included in the Calculated Reading(s). The Calculated Reading will always be returned as a whole number.

For example, a Calculated Reading of 1126.658 (gallons, ft^3, etc.) will be returned as follows:

Decimal Place = 0 Volume = 1127 (rounded to nearest whole number)
Decimal Place = 1 Volume = 11267 (divide by 10 to get true result)
Decimal Place = 2 Volume = 112666 (divide by 100 to get true result)
Decimal Place = 3 Volume = 1126658 (divide by 1000 to get true result)

40405 – Maximum Distance (Factory Calibrated)

Sets the distance (beginning from the Zero Reference) to the point where the sensor will stop looking for float signals, usually the bottom of the stem. A float beyond the Maximum Distance value will not be detected.

40406 – Full Distance

Sets the positive distance (beginning from the sensor Zero Reference) to the point where the monitored vessel is considered full.

40407 – Empty Distance

Sets the positive distance (beginning from the Zero Reference) to the point where the monitored vessel is considered empty (usually the bottom of the stem).

40408 – Sensitivity (Factory Calibrated)

Sets the level of gain that is applied to the returning float signal.

40409 – Pulses (Factory Calibrated)

Controls the duration of the signal being sent down the magnetostrictive wire.

40410 – Blanking (Factory Calibrated)

Sets the blanking distance, which is the zone from the Zero Reference of the sensor to the point from which the first signal will be valid. Signals from a float in the blanking area will be ignored.

40412 – Averaging (Factory Calibrated)

Sets the number of qualified received float signals to average for the raw reading. Qualified received signals are placed in a first-in, first-out buffer, the contents of which are averaged for the raw reading. The larger the number of qualified received signals being averaged, the smoother the reading will be, and the slower the reading will be to react to quickly changing targets.

40413 – Filter Window (Factory Calibrated)

Determines the physical range (0 – 10,364 mm) of qualified received signals, based on the current raw reading. Signals beyond the +/- Filter Window range of the current reading will not qualify unless the average moves. Signals outside the extents of the Filter Window are written to the Out of Range samples buffer (Holding Register 40414). See Figure 3.1.

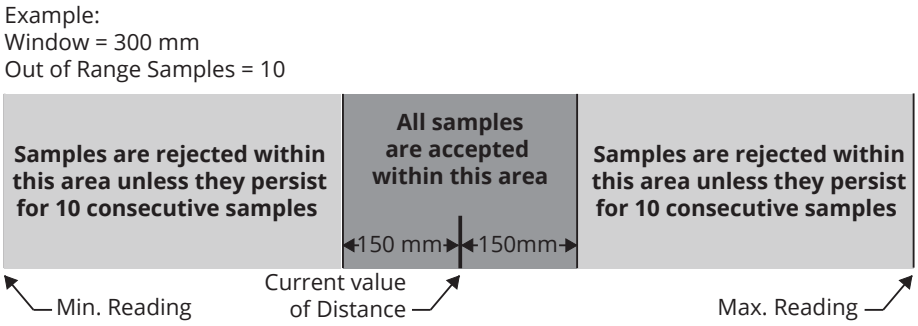


Figure 3.1

40414 – Out of Range Samples (Factory Calibrated)

Sets the number of consecutive samples outside the Filter Window (Holding Register 40413) necessary to automatically adjust the current reading and move the Filter Window.

40415 – Sample Rate (Factory Calibrated)

Sets the update rate of the sensor (between 50 – 1000 ms). Shorter time delays allow for quicker sensor response times to changing levels. Typical setting is 200 ms. Settings under 200 ms are not recommended.

40416 – Multiplier (Factory Calibrated)

Calibrates the distance reading span. The Multiplier is shown by the values 1 – 1999, but these values are understood to represent 0.001 – 1.999. The default of 1000 (i.e. 1.000) is used for most applications.

40417 – Offset (Factory Calibrated)

Sets the Zero Reference of the sensor, the point from which the calculated distance is measured.

40418 – Pre filter

Defines the physical range (0 – 10,364 mm) of the start up (pre-filter) window. Four sample readings must be found within the Pre filter window for the MPI sensor to successfully start up.
This register is only to be used for diagnostics under factory direction.

40419 – Noise Limit

Sets the limit for number of signals (0-255) outside the Pre filter range for the MPI at start up. If the Noise Limit is reached before four readings register within the Pre filter window, the MPI will not start up.
This register is only to be used for diagnostics under factory direction.

40420 – Temperature Select

Selects the temperature sensor reading to be displayed in Input Register 30302.

MPI-F8 sensors can accommodate up to seven digital temperature sensors in the stem.

0 = Average of sensors A – G
1 = Digital Temperature Sensor A
2 = Digital Temperature Sensor B
3 = Digital Temperature Sensor C
4 = Digital Temperature Sensor D
5 = Digital Temperature Sensor E
6 = Digital Temperature Sensor F
7 = Digital Temperature Sensor G
8 = N/A

40422 – Float Window (Factory Calibrated)

Sets the distance (0 – 1000 mm) between the first (i.e. top) float and the point at which the sensor will begin looking for the second (bottom) float. 0 indicates a single float.

40423 – 1st Float Offset (Factory Calibrated)

Used to calibrate top float reading (-10,364 – 10,364 mm).

40424 – 2nd Float Offset (Factory Calibrated)

Used to calibrate bottom float reading (-10,364 – 10,364 mm).

40425 – Gain Offset (Factory Calibrated)

Used to move the centerline of the float response signal to optimize signal strength (0 – 255).

40446 – Baud Rate

Selects the communication speed between the sensor and the Server Device. All devices on the network must use the same Baud Rate.

APG Modbus Server and Client devices default to 9600 Baud.

0 = 9600
1 = 19200
2 = 38400
3 = 57600
4 = 115200

40201 – Restore To Factory Defaults

Writing a 1 to this Holding Register will erase any settings changes and restore the factory default settings.

APG Modbus Register Lists for MPI-F6 and MPI-F7

Input Registers (0x04)

Register	Returned Data
30299	Model Type
30300	Raw Top Float Reading (in mm, unsigned)
30301	Raw Bottom Float Reading (in mm, unsigned)
30302	Version
30303-30304	Calculated Top Float Reading (in selected Units)
30305-30306	Calculated Bottom Float Reading (in selected Units)
30307	N/A

NOTE: Input Register values for MPI-F6 and MPI-F7 are only visible while programming via the RST-4100.

NOTE: Input Registers 30300 and 30301 also display Loss of Signal error codes. See Fail Safe (Holding Register 40411).

Holding Registers (0x03)

Register	Function	Value Range
40400	Device Address	1 to 247*
40401	Units	1, 2, 3
40402	Application Type	0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11
40403	Volume Units	1, 2, 3, 4, 5, 6, 7
40404	Decimal Place	0, 1, 2, 3*
40405	†Max Distance	0 to 15,240 mm
40406	Full Distance	0 to 15,240 mm
40407	Empty Distance	0 to 15,240 mm
40408	†Sensitivity	0 to 100
40409	†Pulses	0 to 20
40410	†Blanking	0 to 10,364 mm
40411	Fail Safe	0 = Disable, 1 = 3.8 mA, 2 = 22 mA
40412	Averaging	1 to 31
40413	Filter Window	0 to 10,364 mm
40414	Out of Range Samples	1 to 255
40415	Sample Rate	10 to 1,000 msec.
40416	†Multiplier	1 to 1,999 (1000 = 1.000)
40417	†Offset	-10,364 to 10,364 mm
40418	†Pre filter	0 to 10,364 mm
40419	†Noise limit	0 to 255
40420	†1st Output 4 mA Calibration	0 – 1,000
40421	†1st Output 4 mA Calibration	0 – 1,000
40422	†Float Window	0 to 1,000 mm 0=1 float
40423	1st Float Offset	-10,364 to 10,364
40424	2nd Float Offset	-10,364 to 10,364
40425	†Gain Offset	0 to 255
40426	4 mA Set Point	0 – 10,364 mm
40427	20 mA Set Point	0 – 10,364 mm
40428	†2nd Output 4 mA Calibration	0 – 1,000
40429	†2nd Output 20 mA Calibration	0 – 1,000
40430	t1d	NA*
40431	t1w	NA*
40432	t1t	NA*
40433	t2d	NA*
40434	t2w	NA*
40435	t2t	NA*
40436-40437	Parameter 1 Data	0 to 1,000,000 mm
40438-40439	Parameter 2 Data	0 to 1,000,000 mm
40440-40441	Parameter 3 Data	0 to 1,000,000 mm
40442-40443	Parameter 4 Data	0 to 1,000,000 mm
40444-40445	Parameter 5 Data	0 to 1,000,000 mm

*These registers are not used by the MPI-F6 or MPI-F7, even though they are labeled in the APG Modbus software.
†Setting is factory calibrated. Do not adjust.

MPI-F6 and MPI-F7 APG Modbus Sensor Parameters

40401 – Units

Determines the units of measure for the Calculated Reading when Application Type is set to 0, 1, or 7.

1 = Feet 2 = Inches 3 = Meters

For MPI-F6 and MPI-F7, this is seen only when using APG Modbus to program the MPI-F. This setting does not affect the 4-20 mA output.

40402 – Application Type

Determines the type of Calculated Reading performed by the sensor.

0 = Distance
1 = Level
2 = Standing Cylindrical Tank with or without Hemispherical Bottom
3 = Standing Cylindrical Tank with or without Conical Bottom
4 = Standing Rectangular Tank with or without Chute Bottom
5 = Horizontal Cylindrical Tank with or without Spherical Ends
6 = Spherical Tank
7 = Pounds (Linear Scaling)
8 = N/A
9 = Vertical Oval Tank
10 = Horizontal Oval Tank
11 = Strapping Chart

See MPI-F Application Type Parameters pages 30-34.

For the MPI-F6 and MPI-F7, the 4-20 mA output can be scaled for linear output over distance/level (Application Type 0 or 1) or scaled for linear output over volume (Application Type 2 – 11). When setup in any of the volumetric application types, the 4-20mA output becomes linear with regards to the calculated volume (linear mA change per gallon, liter, etc.), rather than the raw distance/level reading.

40403 – Volume Units

Determines the units of measure for the Calculated Reading when Application Type is set to 2 – 6 or 9 – 11.

1 = Feet^3
2 = Million Feet^3
3 = Gallons
4 = Meters^3
5 = Liters
6 = Inches^3
7 = Barrels

40404 – Decimal Place

Determines the number of decimal places included in the Calculated Reading(s). For MPI-F6 and –F7, this is seen only when using APG Modbus to program the MPI-F. This setting does not affect the 4-20 mA output.

40405 – Maximum Distance (Factory Calibrated)

Sets the distance (beginning from the Zero Reference) to the point where the sensor will stop looking for float signals, usually the bottom of the stem. A float beyond the Maximum Distance value will not be detected.

40406 – Full Distance

Sets the positive distance (beginning from the sensor Zero Reference) to the point where the monitored vessel is considered full.

40407 – Empty Distance

Sets the positive distance (beginning from the Zero Reference) to the point where the monitored vessel is considered empty (usually the bottom of the stem).

40408 – Sensitivity (Factory Calibrated)

Sets the level of gain that is applied to the returning float signal.

40409 – Pulses (Factory Calibrated)

Controls the duration of the signal being sent down the magnetostrictive wire.

40410 – Blanking (Factory Calibrated)

Sets the blanking distance, which is the zone from the Zero Reference of the sensor to the point from which the first signal will be valid. Signals from a float in the blanking area will be ignored.

40411 – Fail Safe

Sets the output condition (Input Registers 30300 and 30301) that the MPI-F will revert to in the event of a loss of signal condition.

0 = Disable (no fail safe output)
1 = 3.8 mA
2 = 22 mA

For Application Type (Holding Register 40402) 0 and disabled fail safe, Loss of Signal defaults to 20 mA.
For Application Type 1 – 11 and disabled fail safe, Loss of Signal defaults to 4 mA.

40412 – Averaging

Sets the number of qualified received float signals to average for the raw reading. Qualified received signals are placed in a first-in, first-out buffer, the contents of which are averaged for the raw reading. The larger the number of qualified received signals being averaged, the smoother the reading will be, and the slower the reading will be to react to quickly changing targets.

40413 – Filter Window

Determines the physical range (0 – 10,364 mm) of qualified received signals, based on the current raw reading. Signals beyond the +/- Filter Window range of the current reading will not qualify unless the average moves. Signals outside the extents of the Filter Window are written to the Out of Range samples buffer (Holding Register 40414). See Figure 3.2.

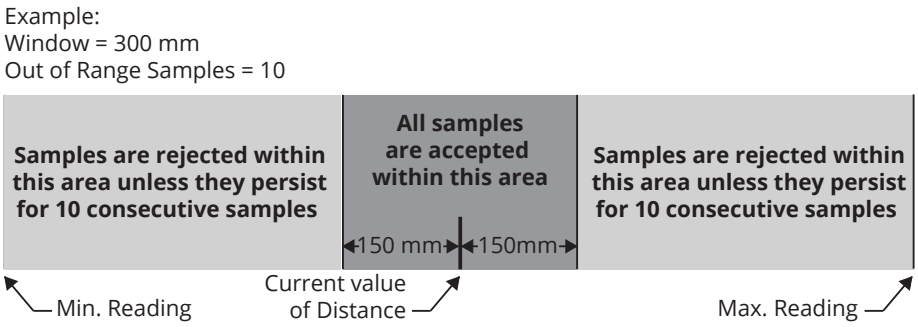


Figure 3.2

40414 – Out of Range Samples

Sets the number of consecutive samples outside the Filter Window (Holding Register 40413) necessary to automatically adjust the current reading and move the Filter Window.

40415 – Sample Rate

Sets the update rate the sensor (10 – 1000 ms). Shorter time delays allow for quicker sensor response times to changing levels. Typical setting is 200 ms. Settings under 200 ms are not recommended.

40416 – Multiplier (Factory Calibrated)

Calibrates the distance reading span. The Multiplier is shown by the values 1 – 1999, but these values are understood to represent 0.001 – 1.999. The default of 1000 (i.e. 1.000) is used for most applications.

40417 – Offset (Factory Calibrated)

Sets the Zero Reference of the sensor, the point from which the calculated distance is measured.

40418 – Pre filter

Defines the physical range (0 – 10,364 mm) of the start up (pre-filter) window. Four sample readings must be found within the Pre filter window for the MPXI-F sensor to successfully start up.
This register is only to be used for diagnostics under factory direction.

40419 – Noise limit

Sets the limit for number of signals (0-255) outside the Pre filter range for the MPXI-F at start up. If the Noise Limit is reached before four readings register within the Pre filter window, the MPXI-F will not start up.
This register is only to be used for diagnostics under factory direction.

40420 – 1st Output 4mA Cal (Factory Calibrated)

Used to calibrate the 4 mA output of the MPI-F6 or 1st (upper float) 4 mA output of the MPI-F7.

40421 – 1st Output 20mA Cal (Factory Calibrated)

Used to calibrate the 20 mA output of the MPI-F6 or the 1st (upper float) 20 mA output of the MPI-F7.

40422 – Float Window (Factory Calibrated)

Sets the distance (0 – 1000 mm) between the first (i.e. top) float and the point at which the sensor will begin looking for the second (bottom) float. This essentially functions as a secondary blanking distance for the minimum depth of the top fluid. Set to 0 for single float.

40423 – 1st Float Offset

Used to calibrate top float reading (-10,364 – 10,364 mm). Differences in fluid specific gravity can change the level at which a float rests in the liquid. Use this parameter to match probe reading to confirmed liquid level.

40424 – 2nd Float Offset

Used to calibrate bottom float reading (-10,364 – 10,364 mm). Differences in fluid specific gravity can change the level at which a float rests in the liquid. Use this parameter to match probe reading to confirmed liquid level.

40425 – Gain Offset (Factory Calibrated)

Used to move the centerline of the float response signal to optimize signal strength (0 – 255).

40426 – 4mA Set

Used to set the distance which will correspond to an output of 4 mA. For Application 1 (Distance), this is measured from the Zero Reference. For all other applications (Level & Volumetric) this is measured from the bottom of the probe. See Figure 3.3.

40427 – 20mA Set

Used to set the distance which will correspond to an output of 20 mA. For Application 1 (Distance), this is measured from the Zero Reference. For all other applications (Level & Volumetric) this is measured from the bottom of the probe. See Figure 3.3.

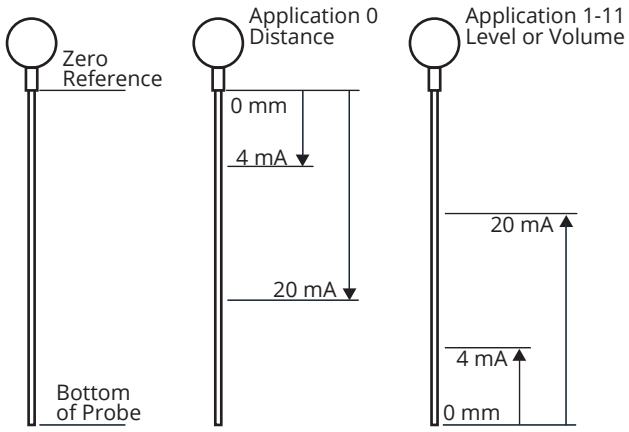


Figure 3.3

40428 – 2nd Output 4mA Cal (Factory Calibrated)

Used to calibrate the 2nd (lower float) 4 mA output of the MPI-F7.

40429 – 2nd Output 20mA Cal (Factory Calibrated)

Used to calibrate the 2nd (lower float) 20 mA output of the MPI-F7.

MPI-F Application Type Parameters

Application 0 – Distance

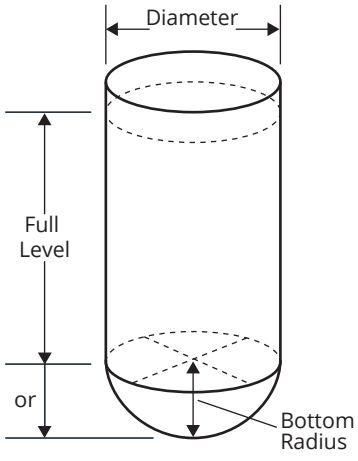
Register	Function	Value Range
40400	Device Address	1 to 247
40401	Units	1 = Feet, 2 = Inches, 3 = Meters
40402	Application Type	0
40403	Volume Units	—
40404	Decimal (Calculated)	0 – 3

Application 1 – Level

Register	Function	Value Range
40400	Device Address	1 to 247
40401	Units	1 = Feet, 2 = Inches, 3 = Meters
40402	Application Type	1
40403	Volume Units	—
40404	Decimal (Calculated)	0 – 3
40405	Max Distance	(factory set)
40406	Full Distance	0 – 32,768 mm
40407	Empty Distance	0 – 32,768 mm

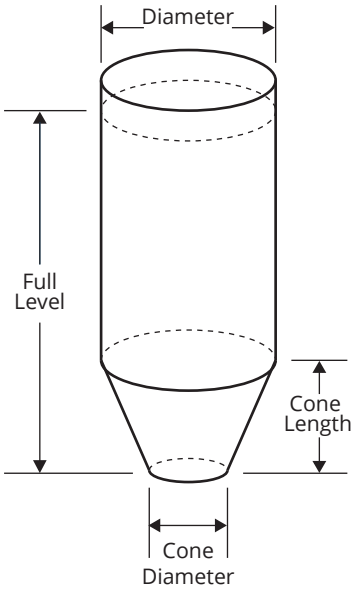
Application 2 – Volume of Standing Cylindrical Tank ± Hemispherical Bottom

Register	Function	Value Range
40400	Device Address	1 to 247
40401	Units	—
40402	Application Type	2
40403	Volume Units	1 – 7
40404	Decimal (Calculated)	0 – 3
40405	Max Distance	(factory set)
40406	Full Distance	0 – 32,768 mm
40407	Empty Distance	0 – 32,768 mm
40436-40437	Tank Diameter	0 – 1,000,000 (mm)
40438-40439	Radius of Bottom Hemisphere	0 – 1,000,000 (mm)



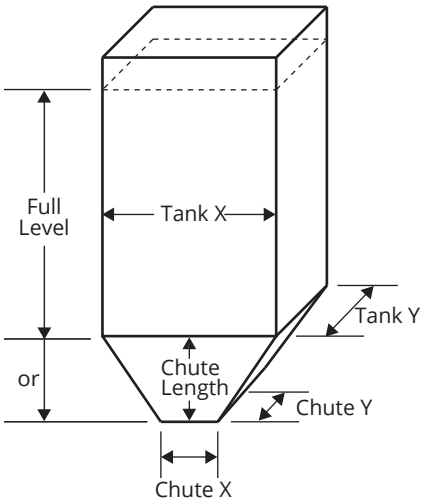
Application 3 – Volume of Standing Cylindrical Tank ± Conical Bottom

Register	Function	Value Range
40400	Device Address	1 to 247
40401	Units	—
40402	Application Type	3
40403	Volume Units	1 – 7
40404	Decimal (Calculated)	0 – 3
40405	Max Distance	(factory set)
40406	Full Distance	0 – 32,768 mm
40407	Empty Distance	0 – 32,768 mm
40436-40437	Tank Diameter	0 – 1,000,000 (mm)
40438-40439	Cone Diameter (at bottom of cone)	0 – 1,000,000 (mm)
40440-40441	Length (height) of Cone	0 – 1,000,000 (mm)



Application 4 – Volume of Standing Rectangular Tank ± Chute Bottom

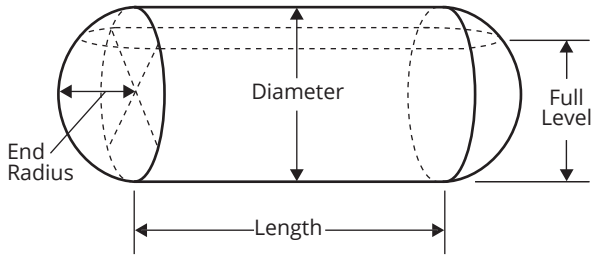
Register	Function	Value Range
40400	Device Address	1 to 247
40401	Units	—
40402	Application Type	4
40403	Volume Units	1 – 7
40404	Decimal (Calculated)	0 – 3
40405	Max Distance	(factory set)
40406	Full Distance	0 – 32,768 mm
40407	Empty Distance	0 – 32,768 mm
40436-40437	Tank X Dimension	0 – 1,000,000 (mm)
40438-40439	Tank Y Dimension	0 – 1,000,000 (mm)
40440-40441	Chute X Dimension	0 – 1,000,000 (mm)
40442-40443	Chute Y Dimension	0 – 1,000,000 (mm)
40444-40445	Length (height) of Chute	0 – 1,000,000 (mm)



NOTE: For all applications other than Distance, Empty Distance is usually the same as Max Distance.

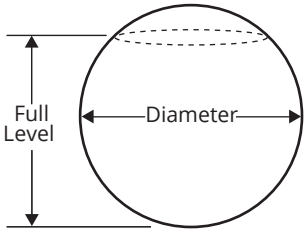
Application 5 – Volume of Horizontal Cylindrical Tank ± Hemispherical Ends

Register	Function	Value Range
40400	Device Address	1 to 247
40401	Units	—
40402	Application Type	5
40403	Volume Units	1 – 7
40404	Decimal (Calculated)	0 – 3
40405	Max Distance	(factory set)
40406	Full Distance	0 – 32,768 mm
40407	Empty Distance	0 – 32,768 mm
40436-40437	Tank Length	0 – 1,000,000 (mm)
40438-40439	Tank Diameter	0 – 1,000,000 (mm)
40440-40441	Radius of End Hemispheres	0 – 1,000,000 (mm)



Application 6 – Volume of Spherical Tank

Register	Function	Value Range
40400	Device Address	1 to 247
40401	Units	—
40402	Application Type	6
40403	Volume Units	1 – 7
40404	Decimal (Calculated)	0 – 3
40405	Max Distance	(factory set)
40406	Full Distance	0 – 32,768 mm
40407	Empty Distance	0 – 32,768 mm
40436-40437	Tank Diameter	0 – 1,000,000 (mm)



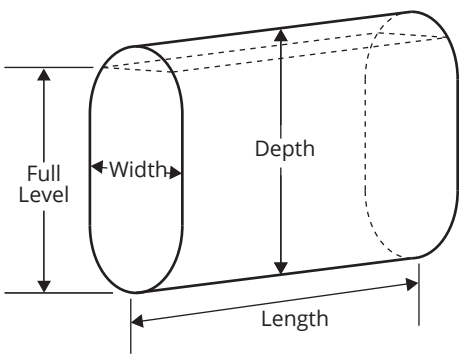
Application 7 – Pounds (Linear Scaling)

Register	Function	Value Range
40400	Device Address	1 to 247
40401	Units	1 = Feet, 2 = Inches, 3 = Meters
40402	Application Type	7
40403	Volume Units	—
40404	Decimal (Calculated)	0 – 3
40405	Max Distance	(factory set)
40406	Full Distance	0 – 32,768 mm
40407	Empty Distance	0 – 32,768 mm
40436-40437	Multiplier (linear scalar)	0 – 1,000,000 (1000 = 1.000)

Application 8 – N/A

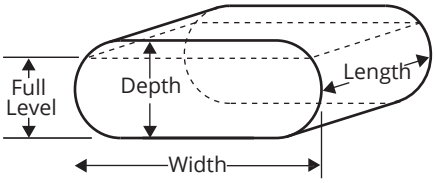
Application 9 – Volume of Vertical Oval Tank

Register	Function	Value Range
40400	Device Address	1 to 247
40401	Units	—
40402	Application Type	9
40403	Volume Units	1 – 7
40404	Decimal (Calculated)	0 – 3
40405	Max Distance	(factory set)
40406	Full Distance	0 – 32,768 mm
40407	Empty Distance	0 – 32,768 mm
40436-40437	Tank Length	0 – 1,000,000 (mm)
40438-40439	Tank Depth	0 – 1,000,000 (mm)
40440-40441	Tank Width	0 – 1,000,000 (mm)



Application 10 – Volume of Horizontal Oval Tank

Register	Function	Value Range
40400	Device Address	1 to 247
40401	Units	—
40402	Application Type	10
40403	Volume Units	1 – 7
40404	Decimal (Calculated)	0 – 3
40405	Max Distance	(factory set)
40406	Full Distance	0 – 32,768 mm
40407	Empty Distance	0 – 32,768 mm
40436-40437	Tank Length	0 – 1,000,000 (mm)
40438-40439	Tank Depth	0 – 1,000,000 (mm)
40440-40441	Tank Width	0 – 1,000,000 (mm)



Application 11 – Strapping Chart (Polynomial Values)

Register	Function	Value Range
40400	Device Address	1 to 247
40401	Units	1 = Feet, 2 = Inches, 3 = Meters
40402	Application Type	11
40403	Volume Units	1 – 7
40404	Decimal (Calculated)	0 – 3
40405	Max Distance	(factory set)
40406	Full Distance	0 – 32,768 mm
40407	Empty Distance	0 – 32,768 mm
40436-40437	X^3 Coefficient	0 – 1,000,000
40438-40439	X^2 Coefficient	0 – 1,000,000
40440-40441	X^1 Coefficient	0 – 1,000,000
40442-40443	X^0 Coefficient	0 – 1,000,000

CHAPTER 4: MAINTENANCE

General Care

Your MPI-F level sensor is very low maintenance and will need little care as long as it was installed correctly. However, in general, you should:

- Periodically inspect your MPI-F to ensure the stem and floats are free of any heavy buildup that might impede the movement of the floats. If sediment or other foreign matter becomes trapped between the stem and float(s), detection errors can occur.
- If you need to remove the float(s) from the stem of your MPI-F, be sure to note the orientation of the float(s) prior to removal. This will help ensure proper re-installation of the float(s).
- Ensure the housing cover is snugly secured. If the cover becomes damaged or is misplaced, order a replacement immediately.

Repair and Returns

Should your MPI-F level sensor require service, please contact the factory via phone, email, or online chat. We will issue you a Return Material Authorization (RMA) number with instructions.

- Phone: 888-525-7300
- Email: sales@apgsensors.com
- Online chat at www.apgsensors.com

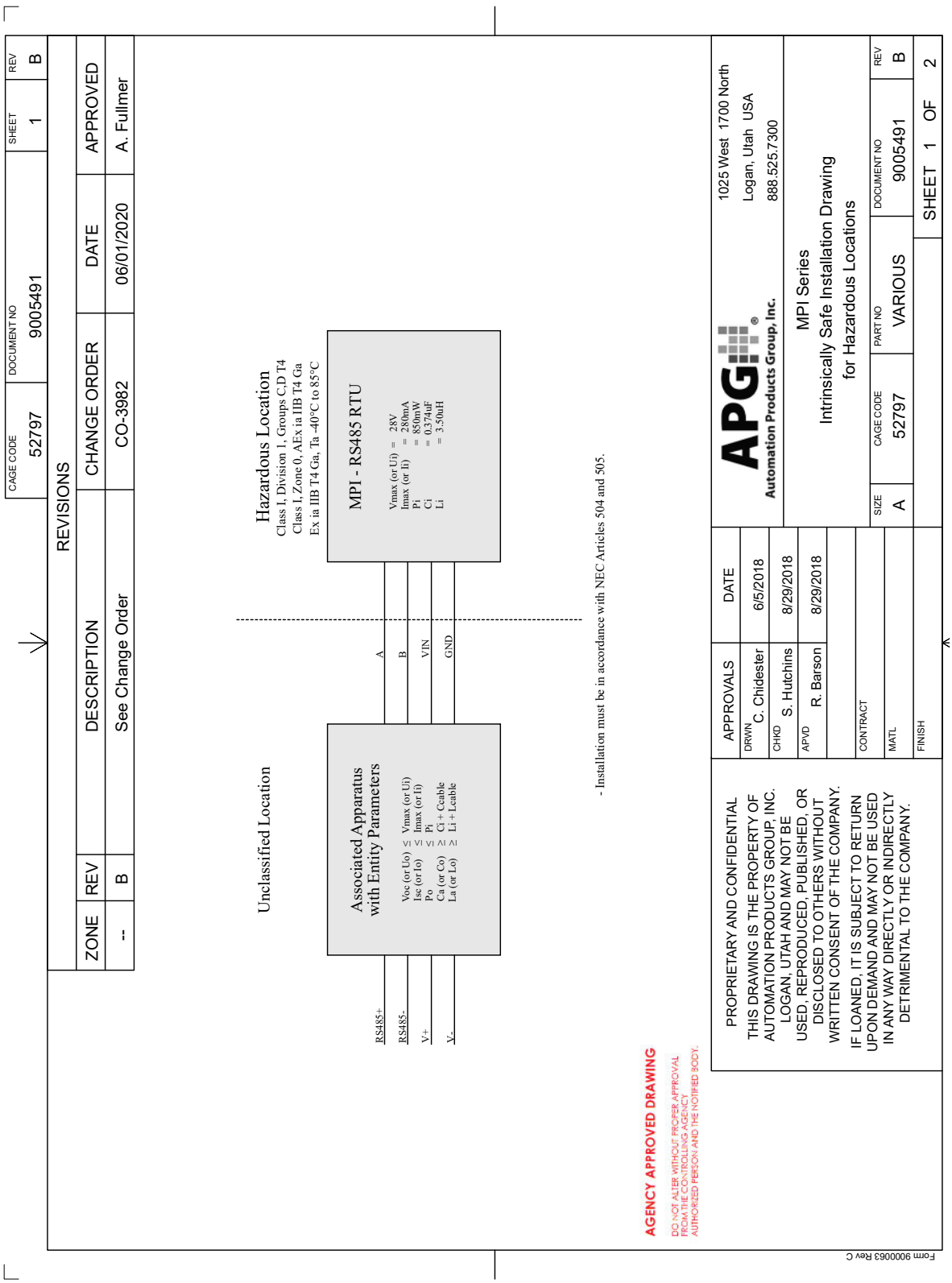
Please have your part number and serial number available. See Warranty and Warranty Restrictions for more information.

IMPORTANT: All repairs and adjustments of the MPI level sensor must be made by the factory. Modifying, disassembling, or altering the MPI on site is strictly prohibited.

IMPORTANT: Contact factory for shipping instructions prior to returning probe for any reason.

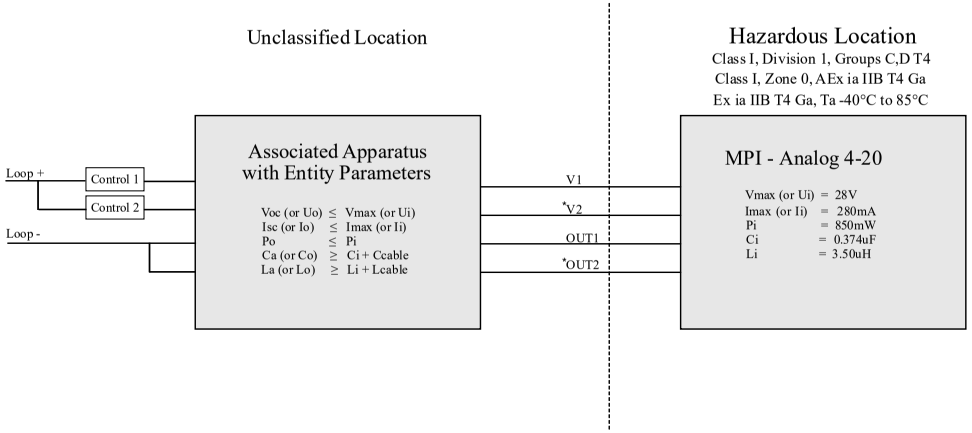
CHAPTER 5: HAZARDOUS LOCATION INSTALLATION AND CERTIFICATION

Intrinsically Safe Installation Drawing for Hazardous Locations



CAGE CODE	DOCUMENT NO	SHEET	REV
52797	9005491	2	B

REVISIONS					
ZONE	REV	DESCRIPTION	CHANGE ORDER	DATE	APPROVED
--	B	See Change Order	CO-3982	06/01/2020	A. Fullmer



- Installation must be in accordance with NEC Articles 504 and 505.
* Connections 'V2' and 'OUT2' are only applicable for Output 7

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APPROVALS	DATE
DRWN C. Chidester	6/5/2018
CHKD S. Hutchins	8/29/2018
APVD R. Barson	8/29/2018
CONTRACT	
MATL	
FINISH	

Automation Products Group, Inc.
1025 West 1700 North
Logan, Utah USA
888.525.7300

MPI Series
Intrinsically Safe Installation Drawing
for Hazardous Locations

SIZE	CAGE CODE	PART NO	DOCUMENT NO	REV
A	52797	VARIOUS	9005491	B

SHEET 2 OF 2

Form 9000063 Rev C

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