MPX Magnetostrictive Level Sensors User Manual

For The MPX-E and MPX-R

BINMASTER®

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Introduction

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

The MPX level sensor provides highly accurate and repeatable level readings in a wide variety of liquid level measurement applications. It is certified for installation in hazardous areas in the US and Canada by CSA for Class I, Division 1 & 2 and Class I, Zones 1 and 2 environments. The MPX-R's large, bouyant, and robust floats allow it to be used in harsh applications where fouling or buildup might otherwise be of concern. The smaller, lighter weight floats of the MPX-E allow it to be used in applications where space is limited.

Reading your label

The MPX 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 request the Certificate of Compliance for further details.

Electrical ratings

Input: 12 - 24 VDC; Output: 4-20 mA / 80 mA
Class I, Division 1 & 2, Groups C, and D
Ex d IIB
Ex nA IIB
Class I, Zone 1; AEx d IIB
Class I, Zone 2; AEx na IIB

Non-Incendive Wiring Requirements: Vmax U_i= 26VDC, Imax I_i = 200ma, C_i = 0nF, L_i = 0µH

IMPORTANT: MPX level sensor MUST be installed according to drawing 9003468 (Hazardous Installation and Non-Incendive Wiring Drawing) on page 11 to meet listed approvals. Faulty installation will invalidate all safety approvals and ratings.

Warranty and Warranty Restrictions

BinMaster warrants this product against defects in material and workmanship for two (2) years according to the following terms;

1.) This warranty extends to the original purchaser only and commences on the date of original purchase.

2.) BinMaster's sole obligation under said warranty is to repair, or at its option replace the defective parts. The buyer shall have no other remedy. All special, incidental and consequential damages are excluded. The buyer must deliver the product under warranty prepaid to the factory. BinMaster's obligation is limited to the cost of material and labor to repair or replace, and does not include transportation expenses.

3.) This warranty shall be voided, in our sole judgment, by alterations of equipment except by BinMaster, or tampering with, improper installation or maintenance, accident or misuse, or act of God. This warranty expressly excludes all damage to the product resulting from careless or neglectful packaging or transportation. The warranty does not extend to repairs made necessary by normal wear.

4.) This warranty is in lieu of all other warranties, expressed or implied including any implied warranties or merchantability or fitness for particular purpose. No employee, agent, franchise dealer or other person is authorized to give any warranties of any nature on behalf of BinMaster.

5) BinMaster shall in no event be responsible for any warranty work done without first obtaining BinMaster's written consent.

6) Except as provided herein, BinMaster shall have no liability, loss or damage caused or alleged to be caused directly or indirectly by this equipment.

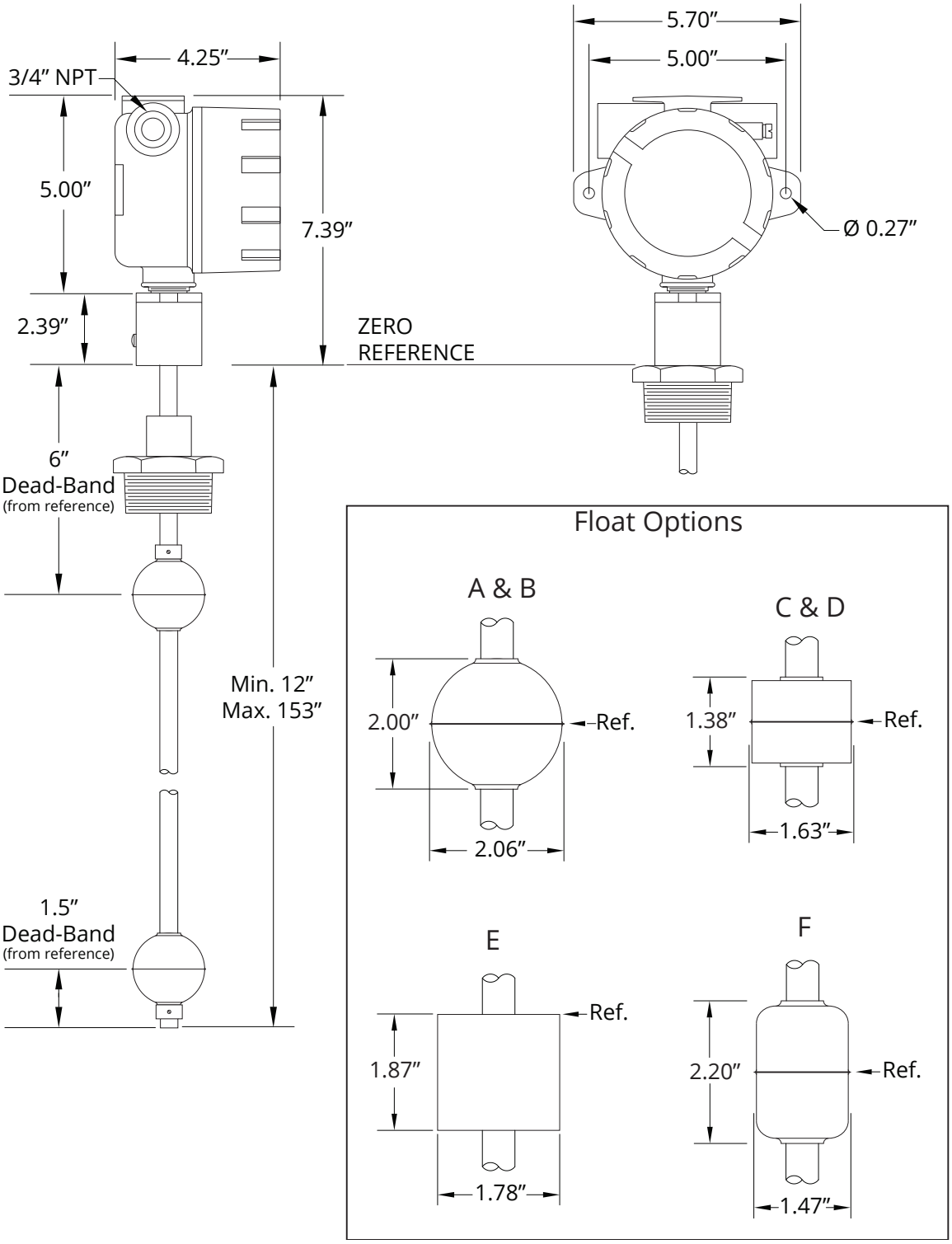
7) This warranty gives the buyer specific legal rights, and you may also have other rights which vary from state to state.

8) For service, please call 402-434-9102.

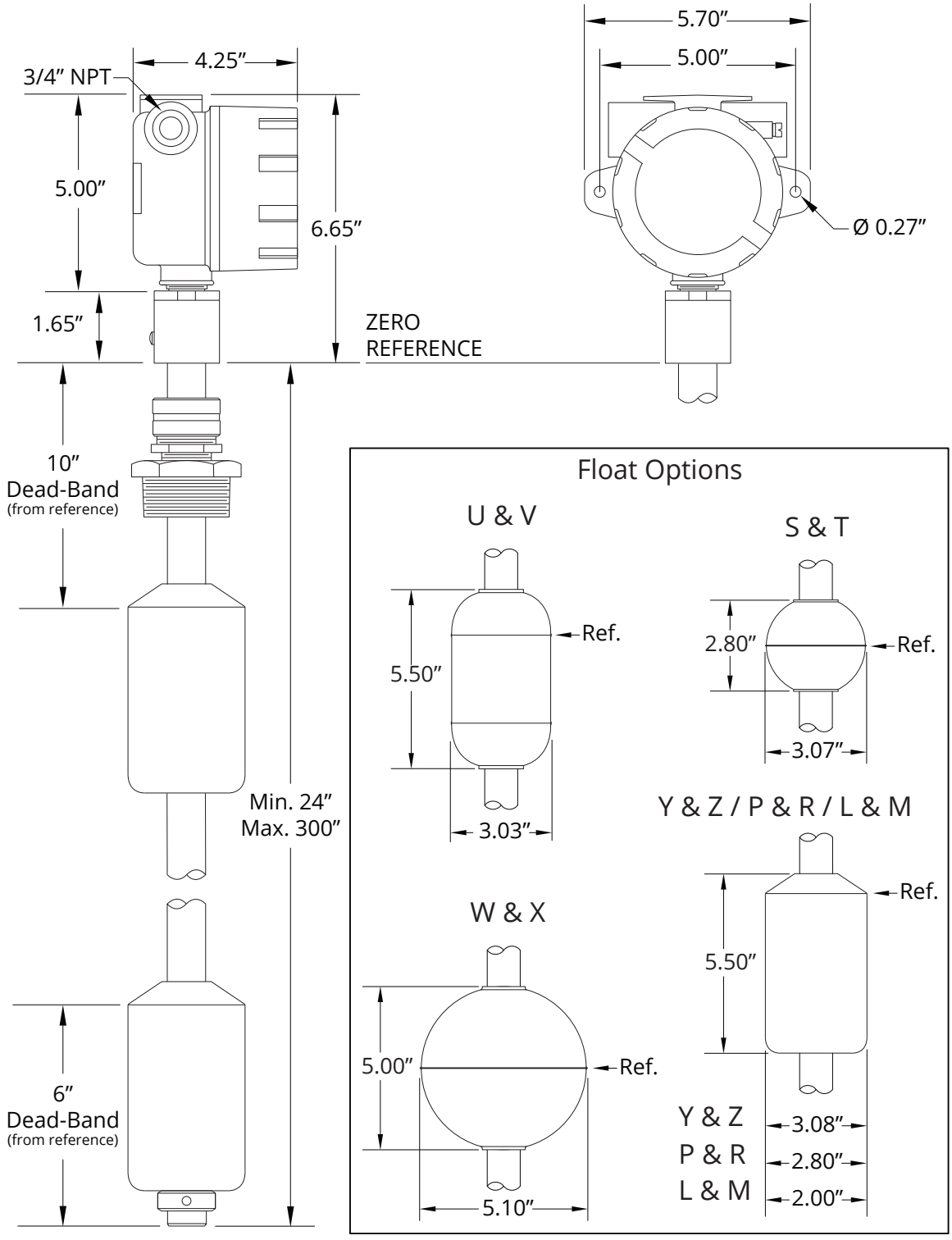
Chapter 1: Dimensions and Specifications

- **Dimensions**

MPX-E Sensor and Float Dimensions



MPX-R Sensor and Float Dimensions



• Specifications

Performance

Resolution	4-20 mA: 14 bit DAC Modbus: 0.04 in. (1 mm)
Accuracy	±0.05% of Full Scale

Environmental

Operating Temperature	-40 to 85°C	(-40 to 185°F)
Enclosure Protection	NEMA 4X, IP65	

Electrical

Supply Voltage	12-24 VDC on sensor
Current Draw	4-20 mA: 22 mA single / 44 mA dual Modbus (RS-485): 25 mA (MPX-E) 28 mA (MPX-R)

Materials of Construction

Housing	Cast aluminum, epoxy coated
Stem	304 SS or 316L SS

Connectivity

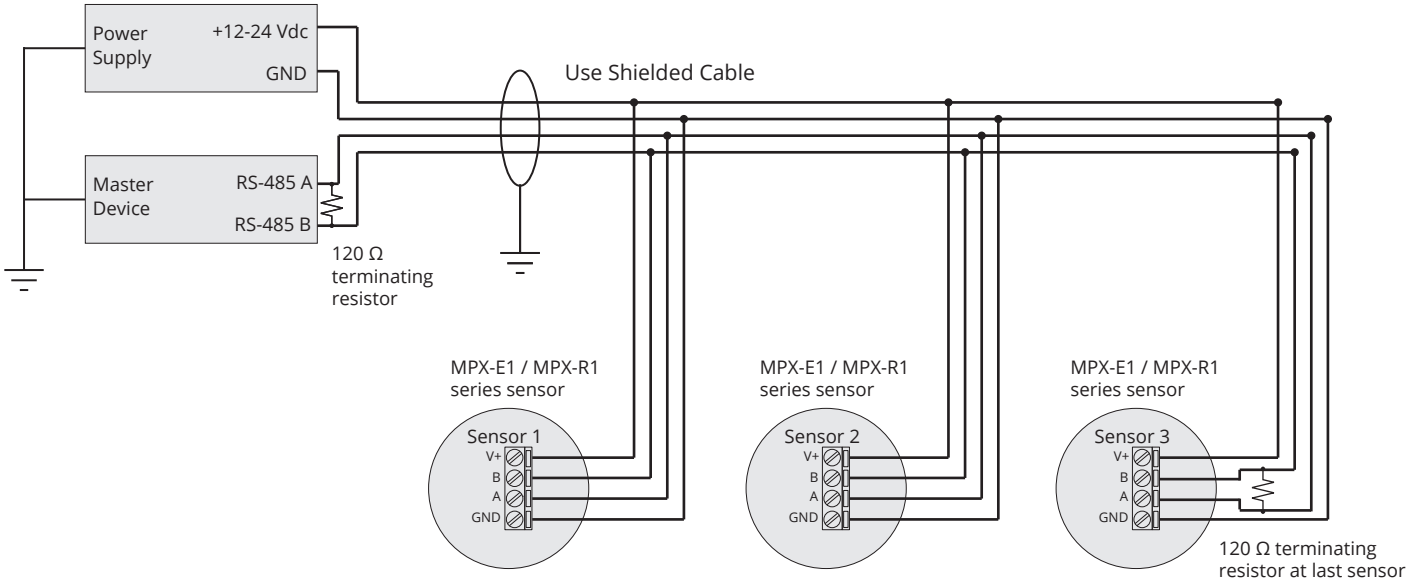
Output	2 wire, loop-powered 4-20 mA 3 wire, loop-powered dual 4-20 mA Modbus RTU (RS-485)

Programming

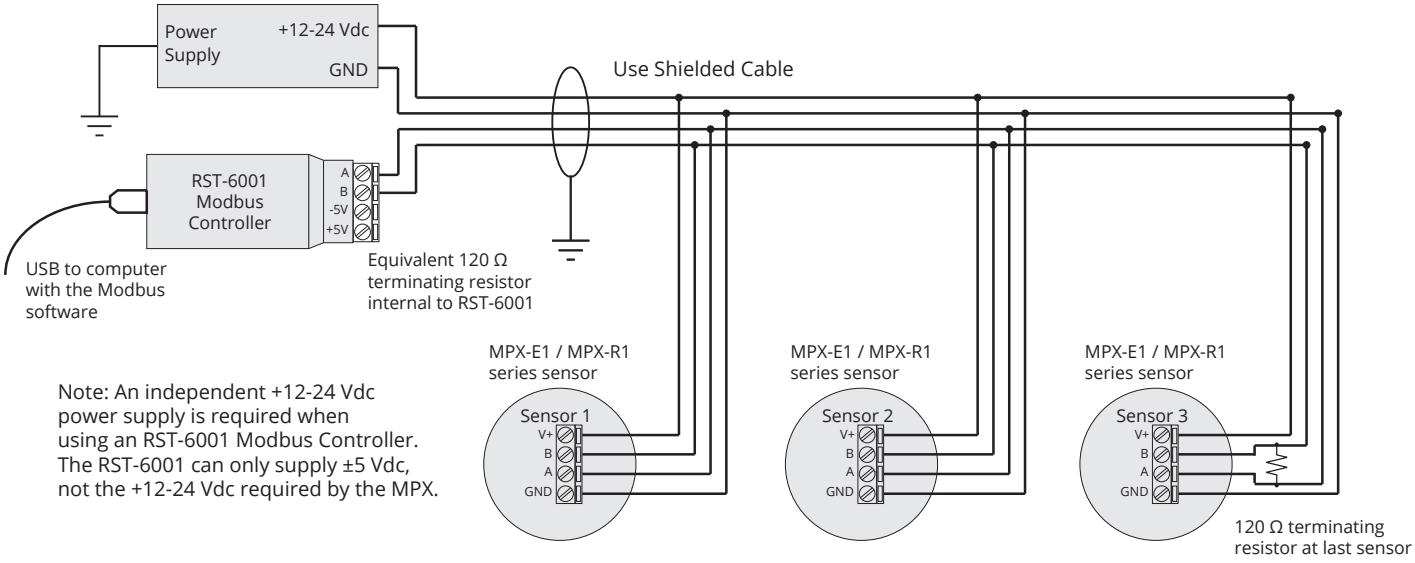
RS-485	Optional RST-6001 USB-to-RS-485 converter
4-20 mA	Optional RST-4100 programming module

- **Electrical Connections and System Wiring Diagrams**

Modbus System Wiring



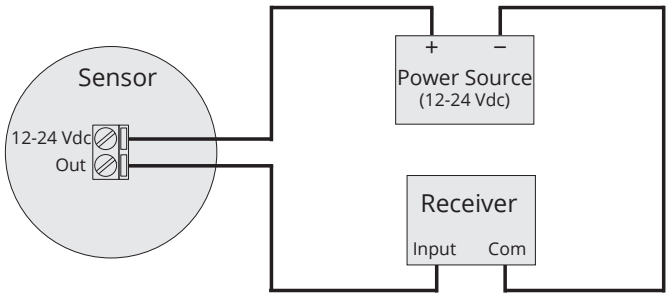
Modbus System Wiring with RST-6001



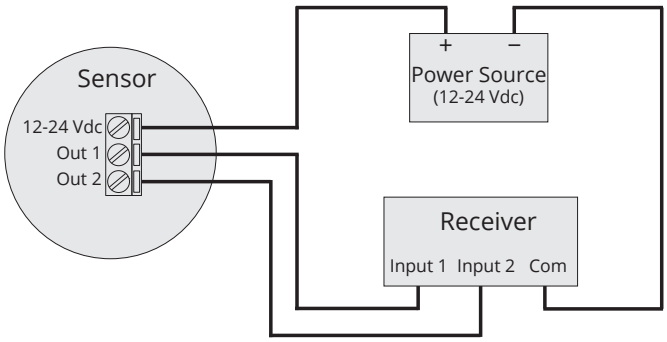
IMPORTANT: Refer to Chapter 5 for Hazardous Location and Non-Incendive Wiring diagrams.

4-20 mA Loop Wiring

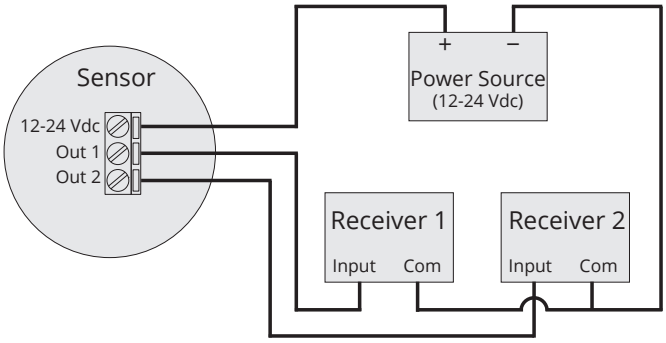
4-20 mA Single Float Loop Wiring
(MPX-E2 and MPX-R2 Series)



4-20 mA Dual Float Loop Wiring
(MPX-E3 and MPX-R3 Series)

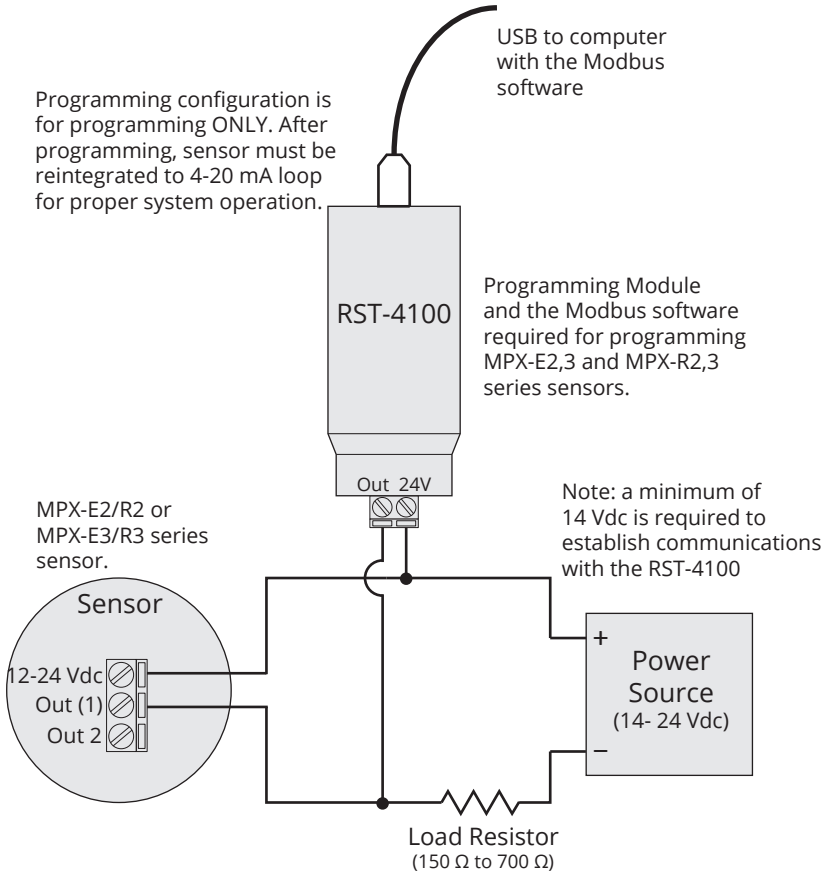


OR



IMPORTANT: Refer to Chapter 5 for Hazardous Location and Non-Incendive Wiring diagrams.

4-20 mA Programming Wiring



NOTE: For MPX-E3/R3 series sensors, - Vdc from power source must be connected to Output1 on sensor through a Load Resistor for correct sensor programming.

Chapter 2: Installation and Removal Procedures and Notes

• Tools Needed

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

- Wrench

• Physical Installation Notes

The MPX 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 corrosive gases such as NH_3, SO_2, Cl_2, etc.
- 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 2.1 below). MPX-E floats will be installed by the factory. MPX-R floats are typically installed by customer.

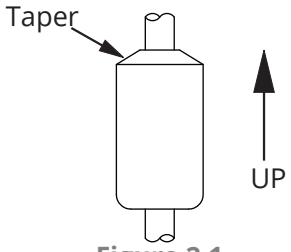


Figure 2.1

IMPORTANT: Floats must be oriented properly on the stem, or sensor readings will be inaccurate and unreliable.

- ## Physical Installation Instructions

  - If your sensor's stem and floats fit through the mounting hole, carefully lower the assembly into the vessel, then secure the sensor to the vessel.
  - If the floats do not fit, mount them on the stem from inside the vessel being monitored. Then secure the sensor to the vessel.

- ## Electrical Installation

  - Remove the housing cover of your MPX.
  - Feed system wires into MPX through 3/4" NPT conduit openings.
  - Connect wires to MPX terminals.
  - Replace the housing cover.

  See Electrical Connections and System Wiring Diagrams (pages 4 and 5) for Modbus and 4-20 mA wiring examples.

- ## Removal Instructions

Removing your MPX level sensor from service should be done with care.

- 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.

Chapter 3: Programming

- ## Modbus Programming

MPX-E1 and MPX-R1 series sensors use standard Modbus RTU protocol (RS-485). The sensors can only operate as slave 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 MPX Modbus Register Lists on pages 8 and 9.

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

• Modbus Programming with RST-6001 and Modbus Software

The RST-6001 Modbus Controller can be used in tandem with the Modbus software to program and control up to 20 MPX-E1 or MPX-R1 series sensors. Through the Modbus software, 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 MPX Modbus Register Lists on pages 8 and 9.

NOTE: For the Modbus software programming instructions, or to download the Modbus software, please visit www.binmaster.com/literature.

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

The RST-4100 Programming Module can be used in tandem with the Modbus software to program a single MPX-E2/3 or MPX-R2/3 series sensor. Through the Modbus software, you can configure the 4 mA and 20 mA output setpoints and sensor sensitivity settings. If your monitoring equipment (PLC, etc.) can be configured to interpret the 4-20 mA output(s) of the MPX as volume or weight, then the MPX can be configured accordingly via the Modbus software.

However, the RST-4100 is not designed to be used for continuous monitoring of a sensor. After programming your MPX 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 5.

• Modbus Software Register Lists

Input Registers (0x04)

Register	Returned Data
30300	Raw Top Float Reading (in mm, unsigned)
30301	Raw Bottom Float Reading (in mm, unsigned)
30302	Temperature Reading (in ^{0}C, signed) [MPX-R; Optional on MPX-E]
30303-30304	Calculated Top Float Reading (in selected Units)
30305-30306	Calculated Bottom Float Reading (in selected Units)

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 255
40401	Units	1 to 3
40402	Application Type	0-10
40403	Volume Units	0 to 6
40404	Decimal Place	0 to 3
40405	Max Distance	0 to 10364 mm
40406	Full Distance	0 to 10364 mm
40407	Empty Distance	0 to 10364 mm
40408	Sensitivity	0 to 100
40409	Pulses	0 to 20
40410	Blanking	0 to 10364 mm
40411	Reserved	n/a
40412	Averaging	0 to 100
40413	Filter Window	0 to 10364 mm
40414	Out of Range Samples	0 to 255
40415	Sample Rate	50 to 1000 msec.
40416	Multiplier	1 to 1999
40417	Offset	+/- 10364 mm
40418-40420	Reserved	n/a
40421	RTD Offset (^{0}C)	-100 to 100
40422	Float Window	0 to 1000 mm
40423	Top Float Offset	-10364 to 10364
40424	Bottom Float Offset	-10364 to 10364
40425	Gain Offset	0 to 255
40426	4 mA Set Point	0 to 10364 mm
40427	20 mA Set Point	0 to 10364 mm
40428	4 mA Calibration	0 to 1000
40429	20 mA Calibration	0 to 1000
40430	Web Alarm 1 Distance	
40431	Web Alarm 1 Window	
40432	Web Alarm 1 Type	
40433	Web Alarm 2 Distance	
40434	Web Alarm 2 Window	
40435	Web Alarm 2 Type	
40436-40437	Parameter 1 Data	0 to 100,000 mm
40438-40439	Parameter 2 Data	0 to 100,000 mm
40440-40441	Parameter 3 Data	0 to 100,000 mm
40442-40443	Parameter 4 Data	0 to 100,000 mm
40444-40445	Parameter 5 Data	0 to 100,000 mm

Chapter 4: Maintenance

• General Care

Your MPX level sensor is designed to be low maintenance. However, in general, you should:

- Periodically inspect your MPX to ensure the stem and floats are free of any heavy buildup that might impede the movement of the floats.
- Ensure the housing cover is snuggly secured. If the cover becomes damaged or is misplaced, order a replacement immediately.

• Repair and Returns

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

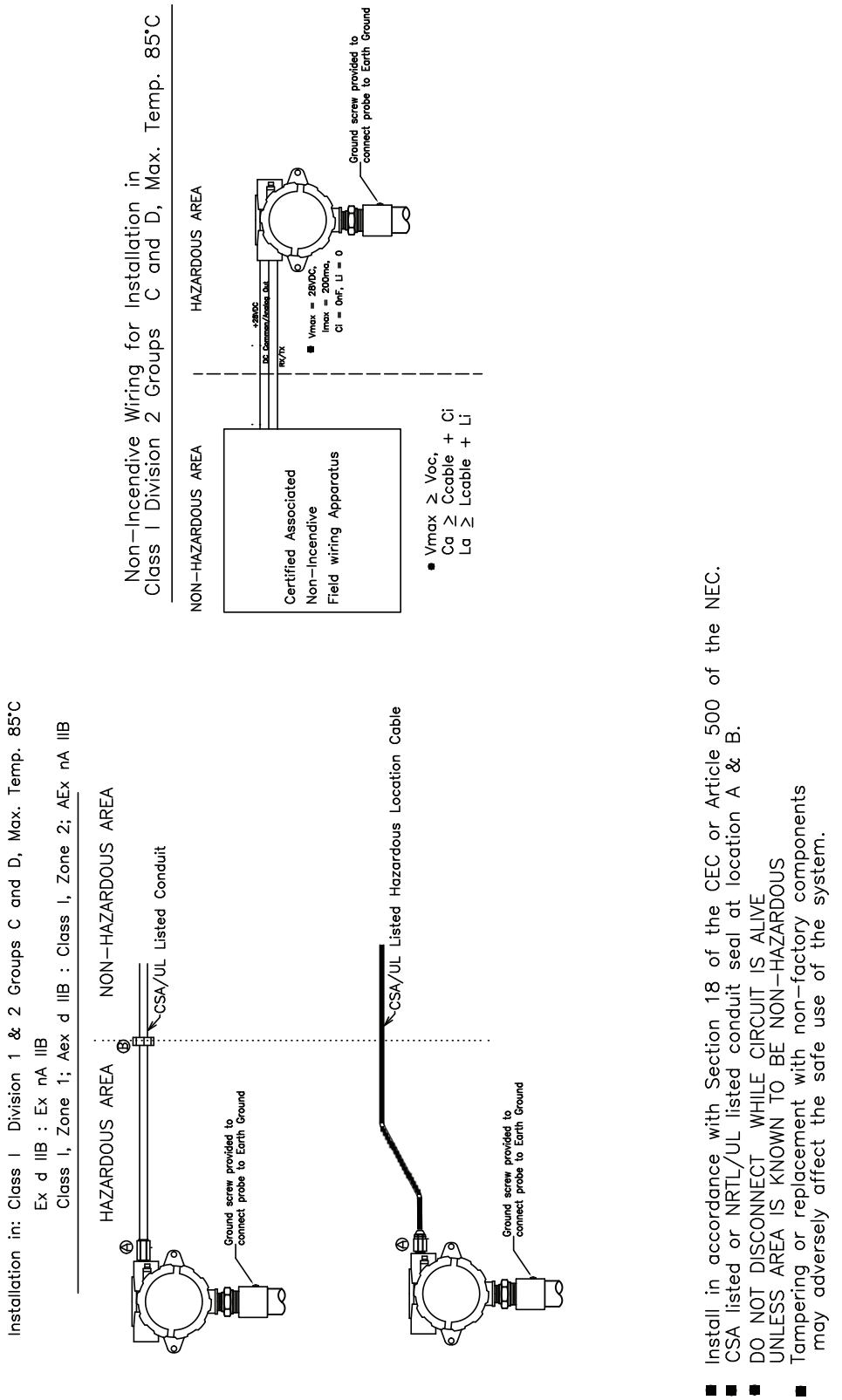
- Phone: 402-434-9102
- Email: info@binmaster.com

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

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

Chapter 5: Hazardous Location Installation and Certification

- **Hazardous Location and Non-Incendive Wiring Diagram**



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