

Level Plus[®]

Magnetostrictive Liquid-Level Transmitters
with Temposonics[®] Technology

OPERATION AND INSTALLATION MANUAL

M-Series Model MR Analog Transmitter



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Model MR Operation and Installation Manual

Reference Information

Notices used in this manual

This manual contains notices to highlight specific information as follows:

Notes:

These notices provide important tips, guidance, or advice.

Important:

These notices provide information that might help you avoid inconvenient or problem situations.

Attention:

These notices indicate possible damage to programs, devices, or data and is placed just before the instruction or situation in which damage could occur.

Caution:

These notices indicate situations that can be potentially hazardous to you. A Caution notice is placed just before a description of a potentially hazardous procedure, step, or situation.

Related publications

The following publications are listed below by part number followed by description and are available in Adobe Acrobat Portable Document Format (PDF) at <http://www.mtssensors.com/>

- 550677 - Product Specification, Model MR Analog Transmitter
- 551103 - Level Plus Accessories Catalog
- 550731 - Component Replacement Guide
- 550904 - Application Datasheet Rigid
- 550905 - Application Datasheet Sanitary
- 550906 - Application Datasheet 7/8" Flex
- 551409 - Brief Operation Manual for Safe Use
- 550791 (PT) - Operation and Installation Manual, Model MG in Portuguese
- 550791 (KOR) - Operation and Installation Manual, Model MG in Korean

For information about safe work procedures, refer to the following documentation:

- National Electric Code ANSI/NFPA 70
- CSA C22.1 Canadian Electrical Code

How this manual is organized

“Introduction”, provides an overview of the manual.

“Terms and Definitions”, provides definitions of terms used in this manual.

“Product Overview”, gives an overall product description for the Level Plus liquid-level transmitter, its specifications, use, output, and electronics.

“Installation and Mounting”, provides detailed installation and mounting information.

“Electrical Connections and Wiring Procedures”, provides engineering specifications and wiring diagrams to assist in the installation process.

“Maintenance and Field Service”, provides guidelines for general float maintenance and procedures required for replacing the Model MR electronic module or level transmitter.

“Troubleshooting”, provides a list of symptoms, their possible cause and the action to be taken when troubleshooting the transmitter.

Setup using keypad display - describes modes of operation, LCD display functionality, alarm settings and how to calibrate the unit manually.

Setup using HART® Field Communicator - provides procedures for setting 4 and 20 mA set points

Setup using MTS Field Setup Software - provides software installation, parameter setup, and calibration procedures.

“Agency Information” provides comprehensive listings of agency approvals and standards, installation drawings, labels and applicable protocols.

Getting information, help, and service

You can get the latest ordering information and software updates by visiting www.mtssensors.com website

General contact information, shipping and office hours are available on page i.

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Introduction

MTS is recognized as the pioneer, innovator and leader in magnetostrictive sensing. The new Level Plus® M-Series transmitter design represents a continuation of our on-going effort to provide effective, innovative and reliable products to the Liquid Level marketplace.

This manual will provide the following information about the Level Plus Model MR analog transmitter:

- Terms and definitions
- Product overview
- Installation and mounting
- Electrical connections and wiring procedures
- Maintenance and field service
- Troubleshooting
- Quick start-up guide
- Setup using the keypad display
- Setup using a HART® Field Communicator
- Setup using MTS Field Setup Software
- Agency information
- Product certifications

Public website support portal

Visit our support portal at <http://www.mtssensors.com> for:

- Building Level Plus M-Series Model MR analog transmitter model numbers
- Latest documentation releases
- Detailed ordering information
- Latest software updates

Terms and definitions reference

E

Explosion-proof – Type of protection based on enclosure in which the parts which can ignite an explosive gas atmosphere are placed within, and which can withstand the pressure developed during an internal explosion of an explosive mixture, and which prevents the transmission of the explosion to the explosive gas atmosphere surrounding the enclosure.

F

Flameproof – Type of protection based on enclosure in which the parts which can ignite an explosive gas atmosphere are placed within, and which can withstand the pressure developed during an internal explosion of an explosive mixture, and which prevents the transmission of the explosion to the explosive gas atmosphere surrounding the enclosure.

H

HART® – a *Bidirectional communication protocol* that provides data access between intelligent field instruments and host systems.

I

Interface – *Noun*; The measurement of the level of one liquid when that liquid is below another liquid.

Interface – *Adj.*; The *Software Graphical User Interface (GUI)* that allows the user to access software protocols (*HART*).

Intrinsic safety – ‘Intrinsically safe’ - Type of protection based on the restriction of electrical energy within apparatus of interconnecting wiring exposed to potentially explosive atmosphere to a level below that which can cause ignition by either sparking or heating effects.

N

NEMA Type 4X – A product *Enclosure* intended for indoor or outdoor use primarily to provide a degree of protection against corrosion, windblown dust and rain, splashing water, and hose-directed water; and to be undamaged by the formation of ice on the enclosure. They are not intended to provide protection against conditions such as internal condensation or internal icing.

NPT – *U.S. standard* defining tapered pipe threads used to join pipes and fittings.

S

Specific Gravity – The *density ratio* of a liquid to the density of water at the same conditions.

Model MR Operation and Installation Manual

Product Overview, Components

Model MR product overview

The Level Plus Model MR Liquid-Level transmitter is a continuous multi-functional magnetostrictive transmitter that provides product level, interface level, and temperature to the user via 4 to 20 mA current loops or HART. Magnetostrictive technology is one of the most accurate and repeatable level technologies available to date. MTS is the inventor and purveyor of magnetostrictive technology and has been serving the level industry for over 30 years.

INDUSTRIES

- Petroleum
- Liquid petroleum gas
- Pharmaceutical
- Food & beverage
- Chemical
- Wastewater
- Mining

APPLICATIONS

- Tank farms
- Terminals
- Bullet tanks
- Separator tanks
- Battery tanks
- Storage tanks
- Solvent extraction

FEATURES

- 3-in-1 measurement
 - Product level
 - Interface level
 - Temperature
- No scheduled maintenance or recalibration
- Field repairable
- AMS Aware

Components

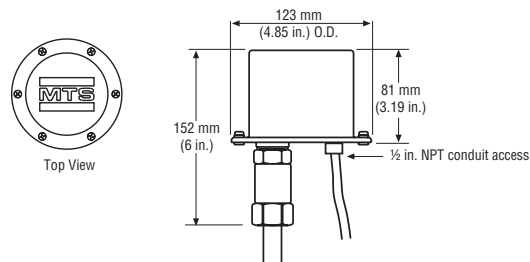
The Level Plus Model MR liquid level transmitter consists of four main components; a housing, outer pipe, float, and electronics. Varying the components of the transmitter allows the transmitter to be customized to almost any application.

HOUSINGS

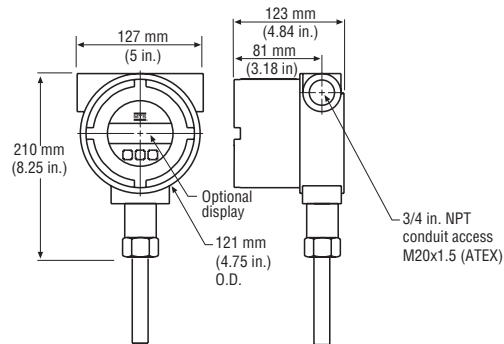
Level Plus Model MR transmitters are available in three housing configurations; NEMA Type 4X 316L stainless steel, explosion-proof single and dual-cavity housings as shown below:



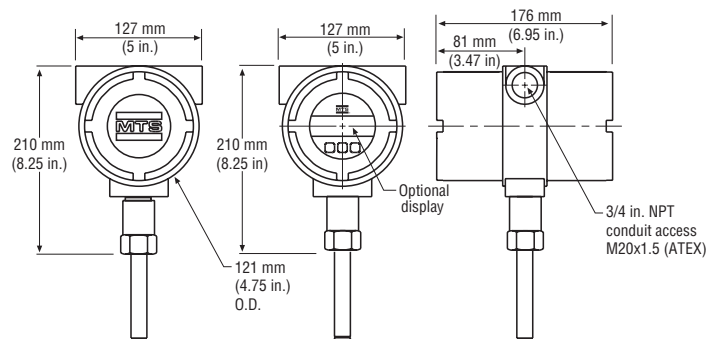
NEMA Type 4X 316L stainless-steel housing



Single cavity explosion-proof housing



Dual cavity explosion-proof housing



Model MR Operation and Installation Manual

Product Overview, Components

OUTER PIPE CONFIGURATIONS

The outer pipe is constructed of a variety of configurations, shown below. Contact factory for other materials (such as Hastelloy C or Teflon).

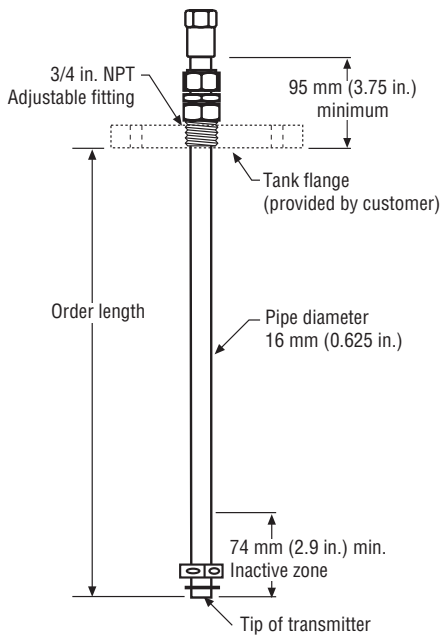


Figure 1. 5/8 in. diameter rigid outer pipe of 316L stainless steel

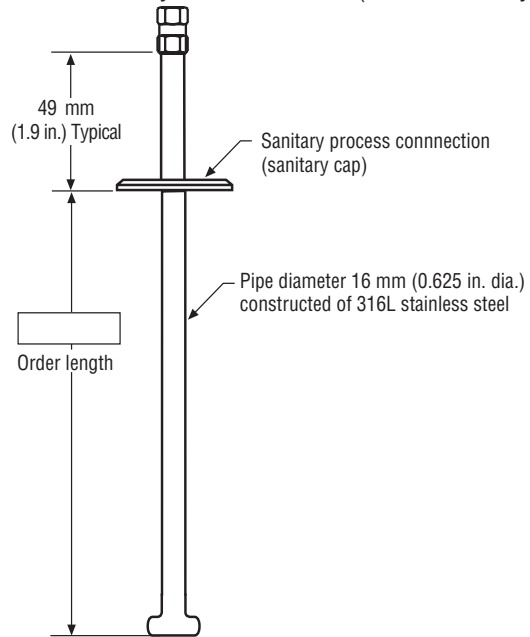


Figure 2. 5/8 in. diameter rigid outer pipe of polished 316L stainless steel with sanitary process connection and end plug

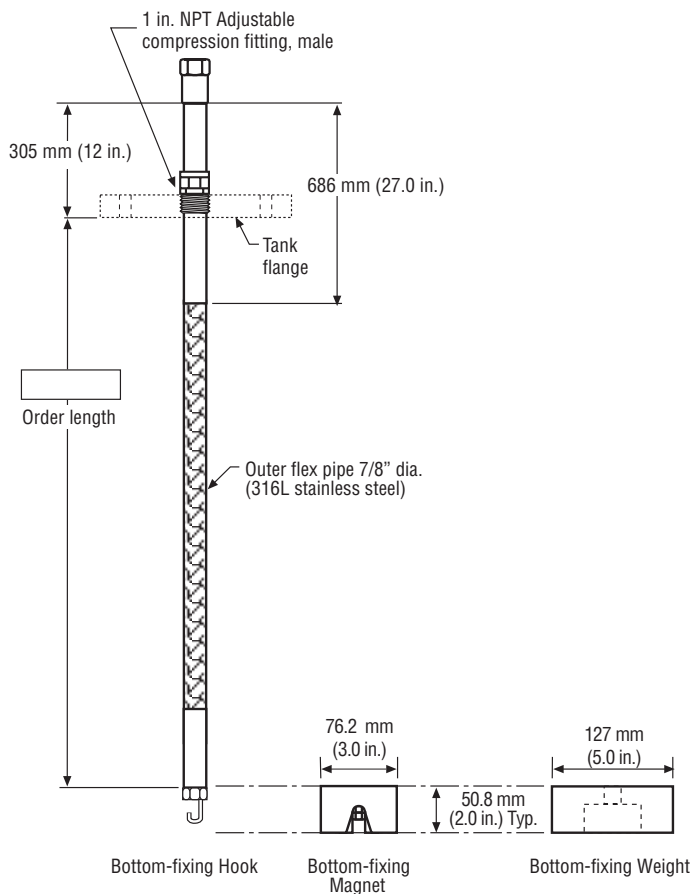


Figure 3. 7/8 in. diameter flexible pipe of 316L stainless steel

FLOATS

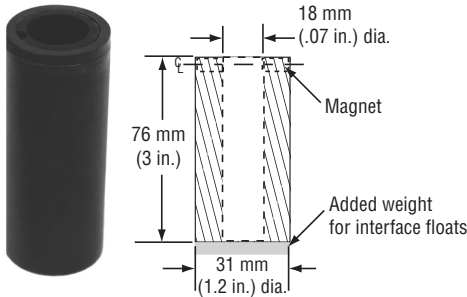
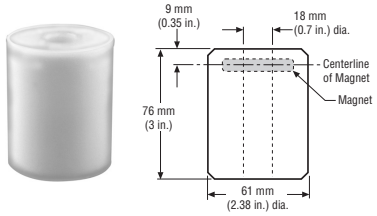
Model MR transmitters offer numerous floats for different applications such as stainless steel, 3-A sanitary, hastelloy, Teflon, and Nitrophyl for both product level and interface level. To be able to accurately detect the interface level there needs to be a difference of at least 0.05 in specific gravities between the product and interface liquids. For detailed information about floats, refer to the 'Accessories Catalog', MTS part number 551103.

For assistance with selecting a specific float for your application, please contact *Technical Support* with the following information:

- Specific gravity of liquid(s) being measured
- Process temperature
- Process Opening Size
- Vessel pressure

For ATEX, IECEx, and CCoE approvals, Model MR transmitters should be used with a float having an offset weight and made of stainless steel or Hastelloy C. This allows the float to stay in contact with the pipe to prevent the buildup of an electrostatic charge. For detailed information about floats, refer to the 'Accessories Catalog', MTS part number 551103.

Non-metallic floats with a projected surface area of less than 5,000 mm² should only be used in Zone 0, Gas group IIA such as float part numbers 201643-2, 201649-2, 201650-2, 201109, 251115 and 251116. All other non-metallic floats offered by MTS such as, 251939, 251119, 251120 and 252999, should not be used in a hazardous area application.

NITROPHYL FLOATS Float and dimension reference	Projected surface area	Part number
	2356 mm ²	201643-2
		201649-2
		201650-2
TEFLON FLOATS Float and dimension reference	Projected surface area	Part number
	4635 mm ²	201109
		251115
		251116

INTERNAL ELECTRONICS

All transmitters come with two electronic components of a sensing element and a board set. All sensing elements up to 300 inches (7620 mm) are rigid and greater lengths have flexible sensing elements. Flexible sensing elements are only available under 300 inches (7620 mm) as special orders. The board set consists of an electronic puck and interconnect board. The board set can be configured for single or dual loop output offering the ability to output the product level, interface level, and temperature. All three variables can be communicated via HART.

The electronic puck can be ordered with or without a display. The optional display is capable of displaying the product level, interface level, and temperature. Designed into the optional display are three push buttons for local setup of 4 and 20 mA set points.

A temperature sensing function is optional with the Model MR transmitter. The temperature sensing device is a Resistive Temperature Device (RTD) mounted inside the transmitter's outer pipe assembly. The RTD is a 1000 ohm platinum film device.

ACCESSORIES

MTS also offers a series of displays, housings, converters, and other accessories, please refer to the 'Accessories Catalog', MTS part number 551103.

Theory of operation

Magnetostrictive M-Series transmitters precisely sense the position of an external float by applying an interrogation pulse to a waveguide medium. This current pulse causes a magnetic field to instantly surround the waveguide. The magnet installed within the float also creates a magnetic field. Where the magnetic fields from the waveguide and float intersect, a rotational force is created (waveguide twist). This, in turn, creates a torsional-sonic pulse that travels along the waveguide as shown in *Figure 4*.

The head of the transmitter houses the sensing circuit, which detects the torsional-sonic pulse and converts it to an electrical pulse. The distance from a reference point to the float is determined by measuring the time interval between the initiating current pulse and the return pulse and precisely knowing the speed of these pulses. The time interval is converted into a level measurement.

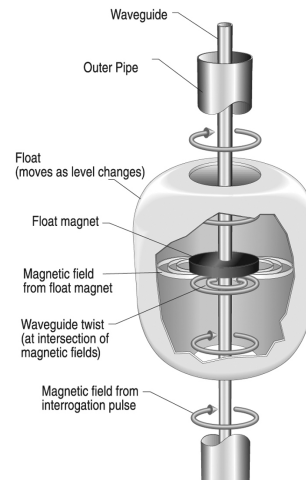


Figure 4. Theory of operation

Accuracy

For magnetostrictive transmitters inherent accuracy is measured in terms of non-linearity. Non-linearity is a measurement of any imperfections in the waveguide that are reflected in the linearity of the transmitter's output. MTS tolerances reflect a maximum non-linearity of 0.02% of full scale. MTS is able to achieve such strict tolerances by manufacturing all of its own waveguide from a proprietary alloy and testing 100% of all transmitters before shipping.

Warranty

Important:

Contact Technical Support or Customer Service for assistance if you suspect that the transmitter is not working correctly. Technical support can assist you with troubleshooting, part replacement, and *Returned Material Authorization* (RMA) information if required.

All M-Series transmitters come with a two year limited warranty from the factory shipment date. A *Return Materials Authorization* (RMA) number is required and must accompany any transmitter returns. Any unit that was used in a process must be properly cleaned in accordance with OSHA standards, before it is returned to the factory. A *Material Safety Data Sheet* (MSDS) must also accompany the transmitter that was used in any process.

Model number identification for FM and CSA approvals

TRANSMITTER MODEL		=	<input type="text" value="M"/>	1
M	= Magnetostrictive transmitter			
TYPE		=	<input type="text" value="R"/>	2
R	= Analog output liquid-level transmitter			
AGENCY APPROVAL		=	<input type="text"/>	3
F	= FM	C	= CSA	
3	= 3-A			
OUTPUT		=	<input type="text"/>	4
1	= 4-20 mA Single loop with HART	2	= 4-20 mA Dual loops with HART	
HOUSING TYPE		=	<input type="text"/>	5
A	= NEMA Type 4X, 316L stainless steel with cable (intrinsically safe only)	E	= Dual cavity with display (explosion-proof and intrinsically safe)	
B	= Single cavity (explosion-proof and intrinsically safe)	L	= NEMA Type 4X, 316L SS w/6-pin male connector (intrinsically safe only)	
C	= Dual cavity (explosion-proof and intrinsically safe)	3	= NEMA Type 4X, 316L SS with internal terminal blocks (intrinsically safe only)	
D	= Single cavity with display (explosion-proof and intrinsically safe)			
ELECTRONICS MOUNTING		=	<input type="text"/>	6
1	= Integral electronics			
TRANSMITTER PIPE		=	<input type="text"/>	7
B	= Industrial end-plug with stop collar	F	= Sanitary, drain-in-place, no hole, DN	
C	= Sanitary, T-bar, TB	H	= Flexible w/bottom fixing hook (stainless steel only)	
D	= Sanitary, drain-in-place, DP	J	= Flexible w/bottom fixing weight (stainless steel only)	
E	= Sanitary, clean-in-place, CP	K	= Flexible w/bottom fixing magnet (stainless steel only)	
MATERIALS OF CONSTRUCTION (WETTED PARTS)		=	<input type="text"/>	8
Note: contact factory for other materials				
1	= 316L stainless steel	A	= Teflon	
2	= Electropolished 316L stainless steel Ra 15	C	= CRN Approved	
3	= Hastelloy C			
PROCESS CONNECTION TYPE		=	<input type="text"/>	9
1	= NPT adjustable fitting	6	= 150 lb. welded RF flange	
4	= Sanitary, welded	7	= 300 lb. welded RF flange	
5	= Sanitary, adjustable	8	= 600 lb. welded RF flange	
PROCESS CONNECTION SIZE		=	<input type="text"/>	10
A	= ¾ in. (NPT for 5/8 in. pipe)	F	= 3 in.	
B	= 1 in. (NPT for 7/8 in. hose)	G	= 4 in.	
C	= 1½ in.	H	= 5 in. (except sanitary)	
D	= 2 in.	J	= 6 in.	
E	= 2½ in.			
TEMPERATURE		=	<input type="text"/>	11
0	= None	2	= One RTD, customer defined position ^Δ	
1	= One RTD, fixed position 76 mm (3 in.) from the end of pipe	Note: ^Δ (if this option is selected, position '18 E' must also be selected)		
UNIT OF MEASUREMENT		=	<input type="text"/>	12
M	= Metric (millimeters) Encode length in millimeters if using metric (XXXXX mm)	U	= US Customary (inches) Encode length in inches if ordering in US Customary (XXX.XX in.)	
LENGTH		=	<input type="text"/>	13-17
	= Order length based on unit of measurement		= Teflon 508 mm (20 in.) to 6096 mm (240 in.)	
	= Flexible transmitter: 3048 mm (120 in.) to 12,192 mm (480 in.) (FM IS Group D only)		= Rigid/Sanitary transmitter: 508 mm (20 in.) to 7620 mm (300 in.)	
SPECIAL		=	<input type="text"/>	18
S	= Standard product	E	= Engineering special (not affecting agency controlled parts or features)	

Product Overview

Model MR Operation and Installation Manual
Model Number Identification - ATEX and IECEx

Model number identification for ATEX and IECEx based approval

TRANSMITTER MODEL		=	M	1	
M	= Magnetostrictive transmitter				
TYPE		=	R	2	
R	= Analog output level transmitter				
APPROVAL AGENCY		=		3	
E	= ATEX Approved	P	= CCoE approved	B	= INMETRO approved
H	= IECEx Approved	K	= KC approved		
OUTPUT		=		4	
1	= 4-20 mA Single loop with HART	2	= 4-20 mA Dual loops with HART		
HOUSING TYPE		=		5	
B	= Single cavity (Flameproof IIB)	J	= Single cavity with display (ATEX, Ex ia IIA)		
C	= Dual cavity (Flameproof IIB)	K	= Dual cavity with display (ATEX, Ex ia IIA)		
D	= Single cavity with display (Flameproof IIB)	P	= NEMA Type 4X, 316L stainless steel with cable (ATEX, Ex ia IIB)		
E	= Dual cavity with display (Flameproof IIB)	R	= Single cavity (ATEX, Ex ia IIB)		
F	= NEMA Type 4X, 316L stainless steel with cable (ATEX, Ex ia IIA)	S	= Dual cavity (ATEX, Ex ia IIB)		
G	= Single cavity (ATEX, Ex ia IIA)	T	= Single cavity with display (ATEX, Ex ia IIB)		
H	= Dual cavity (ATEX, Ex ia IIA)	U	= Dual cavity with display (ATEX, Ex ia IIB)		
ELECTRONICS MOUNTING		=		6	
1	= Integral electronics				
TRANSMITTER PIPE/HOSE		=		7	
B	= Industrial end-plug with stop collar	H	= Flexible w/bottom fixing hook (stainless steel only)		
C	= Sanitary, T-bar, TB	J	= Flexible w/bottom fixing weight (stainless steel only)		
D	= Sanitary, drain-in-place, DP	K	= Flexible w/bottom fixing magnet (stainless steel only)		
E	= Sanitary, clean-in-place, CP	L	= Sanitary Special		
F	= Sanitary, drain-in-place, no hole, DN				
MATERIALS OF CONSTRUCTION (WETTED PARTS) (Note: contact factory for other materials)		=		8	
1	= Stainless steel, 1.4404	A	= Teflon / FEP		
2	= Stainless steel, 1.4404 electropolished				
3	= Hastelloy C				
PROCESS CONNECTION TYPE		=		9	
1	= NPT, Adjustable fitting	7	= 300 lbs. Welded RF flange		
4	= Sanitary, welded	8	= 600 lbs. welded RF flange		
5	= Sanitary, adjustable fitting	9	= DIN flange welded according to specification		
6	= 150 lbs. welded RF flange				
PROCESS CONNECTION SIZE		=		10	
A	= ¾ in. (NPT for 5/8 in. pipe)	F	= 3 in.		
B	= 1 in. (NPT for 7/8 in. hose)	G	= 4 in.		
C	= 1½ in.	H	= 5 in. (except sanitary)		
D	= 2 in.	J	= 6 in.		
E	= 2½ in.				
TEMPERATURE		=		11	
0	= None	1	= One RTD, fixed position 76 mm (3 in.) from the end of pipe		
2	= One RTD, customer defined position #				
	Note: #If this RTD option is selected, option '18 E' must also be selected				
UNIT OF MEASUREMENT		=		12	
M	= Metric (millimeters) Encode length in millimeters if using metric (XXXXX mm)	U	= US Customary (inches) Encode length in inches if ordering in US Customary (XXX.XX in.)		

Model number identification for ATEX and IECEx based approval

LENGTH (Order length based on unit of measurement)	=	<input style="width: 20px; height: 15px; border: 1px solid black;" type="text"/> <input style="width: 20px; height: 15px; border: 1px solid black;" type="text"/> <input style="width: 20px; height: 15px; border: 1px solid black;" type="text"/> <input style="width: 20px; height: 15px; border: 1px solid black;" type="text"/> <input style="width: 20px; height: 15px; border: 1px solid black;" type="text"/>	13-17
= Rigid or Sanitary transmitter: 508 mm (20 in.) to 7620 mm (300 in.) = Teflon: 508 mm (20 in.) to 6096 mm (240 in.)			
= Flexible transmitter: 3048 mm (120 in.) to 12,192 mm (480 in.) except ATEX, Ex ia IIB max. length 7620 mm (300 in.)			
SPECIAL	=	<input style="width: 20px; height: 15px; border: 1px solid black;" type="text"/>	18
S = Standard product			
E = Engineering special (not affecting agency controlled parts or features)			

Model MR product specifications

Parameters	Specifications	Parameters	Specifications
LEVEL OUTPUT		ENVIRONMENTAL	
Measured variable:	Product level and interface level	Enclosure rating:	NEMA Type 4X
Output signal / Protocol:	4 to 20 mA with HART®, 1 or 2 loop	Humidity:	0 to 100% relative humidity, non-condensing
Order length:	Flexible hose: (ATEX Ex ia IIB, FM IS Group C, D): 3048 mm (120 in.) to 7620 mm (300 in.) Δ § (All else):** 3048 mm (120 in.) to 12200 mm (480 in.) Δ § * FM I.S. Group D only Rigid pipe: 508 mm (20 in.) to 7620 mm (300 in.) Δ § Sanitary pipe: 508 mm (20 in.) to 7620 mm (300 in.) Δ § Δ Contact factory for longer lengths. § Order length equals the measurement range plus the inactive zone.	Operating temperatures:	Electronics*: -40 °C (-40 °F) to 71 °C (160 °F) Sensing element: -40 °C (-40 °F) to 125 °C (257 °F) ◇ Temperature element: -40 °C (-40 °F) to 105 °C (221 °F) ◇ Contact factory for specific temperature ranges. * Consult Agency Approvals section for approved specific ambient temperature rating
Non-linearity:	0.02% F.S. or 0.794 mm (1/32 in.)* * Whichever is greater	Vessel pressure:	Industrial rigid pipe: 1000 psi (70 bar) Sanitary pipe: 435 psi (30 bar) Teflon pipe: 100 psi (7 bar) Flexible Hose: 260 psi (18 bar)
Repeatability:	0.01% F.S. or 0.381 mm (0.015 in.)* (any direction) † Contact factory for alternative materials.	Materials:	Wetted parts: 316L stainless steel † Non-wetted parts: 316L stainless steel, Epoxy coated aluminum † Contact factory for alternative materials.
TEMPERATURE OUTPUT		FIELD INSTALLATION	
Measured variable:	Single-point temperatures	Housing dimensions:	Single cavity: 127 mm (5 in.) by 133 mm (5.25 in.) 123 mm (4.84 in.) O.D. Dual cavity: 127 mm (5 in.) by 177 mm (6.95 in.) 123 mm (4.84 in.) O.D. NEMA Type 4X: 81 mm (3.2 in.) by 123 mm (4.85 in.) O.D.
Type:	4 to 20 mA from 1000Ω platinum RTD at 0 °C	MOUNTING	
Repeatability:	±0.1 °C (±0.18 °F)	Rigid pipe:	¾ in. Adjustable MNPT fitting Flange or Tri-Clamp® Mount
Temperature accuracy:	±1.5 °C (±2.7 °F)	Flexible hose:	1 in. Adjustable MNPT fitting Flange mount
Drift:	±0.5 °C (±0.9 °F) per year	WIRING	
ELECTRONICS		Connections:	2-wire shielded cable or twisted pair, Daniel Woodhead 6-pin male connector, 4570 mm (180 in.) integral cable with pigtail
Input voltage:	10.5 to 36 Vdc, 28 Vdc maximum for I.S. approval	ELECTRICAL CONNECTIONS	
Fail safe:	High (21.4 mA), or Low (3.8 mA)	Single and Dual Cavity:	¾ in. FNPT conduit opening, M20 for ATEX/IECEX/CCoE version
Reverse polarity protection:	Series diode	NEMA Type 4X:	½ in. FNPT conduit opening
Lightning/Transient protection:	Stage 1: Line-to-ground surge suppression; IEC 61000-4-5 Stage 2: Line-to-line and line-to-ground transient suppressors; IEC 61000-4-4	DISPLAY	
CALIBRATION		Measured variables:	Product level, interface level and temperature
Zero adjust range:	Anywhere within the active length	Size:	13 mm (0.5 in.)
Span adjust range:	Full scale to 152 mm (6 in.) from zero	Number of digits:	16

Installation and mounting

If the installation is going to occur in a hazardous area, completely read the Agency Information section before starting any work. The Agency Information outlines additional regulations that need to be followed in order for the installation to comply with hazardous area regulations.

This section contains information about storing your transmitter (prior to installation) and detailed procedures for installing and mounting your transmitter.

Storage

If storage is required prior to installation, store indoors in a dry environment at ambient temperature range not exceeding -40 °C (-40 °F) to 71 °C (160 °F).

Stilling wells and guide poles

Level Plus transmitters can be mounted in slotted or unslotted stilling wells but a slotted stilling well is always preferred. Using an unslotted stilling well will negatively affect performance of any level device as the level in the stilling well can differ from the level in the tank. The Level Plus transmitter can also be installed to one side of the stilling well to also allow for sampling and manual gauging from the same opening as the automatic tank gauging. Contact *Technical Support* for details.

Level Plus transmitters do not require a stilling well for installation. Our transmitters are installed in numerous tanks without stilling wells with no loss in performance due to our patented flexible waveguide and hose. A stilling well is highly recommended for agitated, turbulent, and/or fast filling tanks.

Installation

The installation procedures below are illustrated using the adjustable NPT fitting for a threaded flange mount. The procedures will have to be slightly adjusted if using a welded flange or sanitary Tri-Clamp mount.

RIGID PROBE

Tools Required:

- Channel lock pliers
- Common screwdriver
- 5/32 in. Hex key (allen wrench)

Caution:

It is recommended that assembly and mounting of this transmitter should not be performed alone. To ensure proper and safe assembly of the Level Plus transmitter, a minimum of two (2) individuals are recommended. Gloves are also recommended. In addition, PPE is required for work areas such as safety shoes, safety glasses, hard hat, and fire resistant clothing.

Perform the following steps to Install the RefineME transmitter:

1. Remove the stop collar and E-ring. With assistance, feed the rigid pipe through the hole of the removed tank flange until the flange is positioned near the top of the transmitter. Insert the threaded portion of the adjustable fitting into the customer supplied flange and tighten (apply pipe thread sealant if required). Be careful not to drop the flange as it can damage the transmitter.
2. Slide the product float onto the rigid pipe. Slide the interface float (optional) onto the rigid pipe. Install stop collar 2 inches from the bottom (see '**Note**' below). Do not drop the float(s) or allow them to free fall along the rigid pipe as damage may result.

Note:

The stop collar can be removed or adjusted based on the float selected for the application. Please consult the factory for more information.

3. Slide float(s) back down to the stop collar to prevent them from free falling during installation into the tank. Insert the rigid pipe (with floats) through the tank opening and lower the transmitter/float assembly into the tank until it rests on the bottom. **DO NOT DROP OR DAMAGE THE PIPE.**
4. Secure the flange onto the tank mount.
5. Pull the transmitter upward so the end plug is just resting on the floor of the tank. Tighten the adjustable fitting to hold the transmitter in place.
6. Terminate the field wire cables noting proper wire orientation.

Model MR Operation and Installation Manual

Installation, Mounting and Storage

FLEXIBLE PROBE

Caution:

When assembling and installing the Model MR transmitter, be careful not to allow the flexible hose to kink or be coiled in less than 16 in. (406.5 mm) diameter. It is recommended that assembly and mounting of this transmitter should not be done alone. To ensure proper and safe assembly of the Model MR transmitter, a minimum of two (2) individuals are recommended. Gloves are also recommended. PPE is required for work areas such as safety shoes, safety glasses, hard hat, and fire resistant clothing.

Tools Required:

- 9/16 in. Socket and ratchet
 - Channel lock pliers
 - 3/16 in. Hex key (allen wrench)
1. Remove the stop collar. With assistance, feed the flexible hose through the hole of the removed tank flange until the flange is positioned at the rigid section of pipe near the top of the transmitter. Insert the threaded portion of the adjustable fitting into the customer supplied flange and tighten (apply pipe thread sealant if required). Be careful not to drop flange on the flexible hose as damage may result.
 2. Slide the product float onto the flexible pipe. Slide the interface float (optional) onto the flexible pipe. Install stop collar 3 inches from the bottom of rigid section (see '**Note**' below). Do not drop float(s) or allow them to free fall along the flexible pipe as damage may result.

Note:

The stop collar can be removed or adjusted based on the float selected for the application. Please consult the factory for more information.

3. Mount the hook, weight, or the magnet to the welded end-plug section of the pipe (this is the bottom rigid section of the pipe) using the supplied nut, spacer and washer, tighten securely as shown in *Figure 5*. **For the magnet, remove washer before installing in tank.**

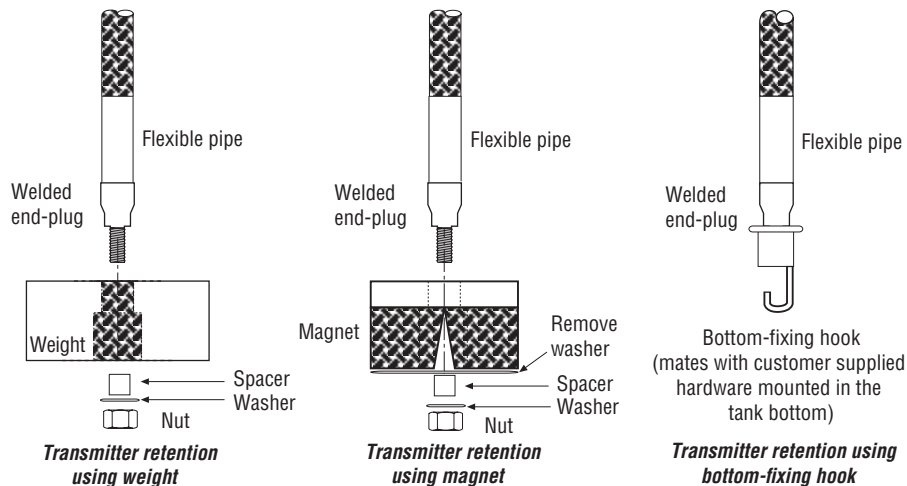


Figure 5. Bottom fixing hardware

DO NOT DROP OR DAMAGE THE PIPE

Important: Avoid kinking or bending the flexible pipe in less than 16 inch (406 mm) diameter or damage may result.

4. Slide float(s) back down to the stop collar to prevent them from free falling during installation into the tank. Insert the flex pipe and floats through the tank riser pipe and lower the transmitter/float assembly into the tank until it rests on the bottom. If you are using a bottom-fixing hook, fasten the hook to the appropriate customer-supplied mating hardware at the tank bottom.
5. Secure the flange onto the tank riser pipe.
6. Pull the transmitter upward to straighten the flexible pipe until the resistance of the weight, magnet, or hook is felt without raising the weight or magnet off the floor of the tank. Tighten the adjustable fitting to hold the transmitter in place.
7. Terminate the field wire cables noting proper wire orientation.

Mounting

The method of mounting the transmitter is dependent on the vessel or tank in which it is being used, and what type of transmitter is being mounted. There are three typical methods for mounting; threaded flange mounting, welded flange mounting, and sanitary Tri-Clamp mounting.

THREADED FLANGE MOUNTING

In most applications, the Model MR transmitter can be mounted directly to the tank or flange via a NPT threaded fitting, assuming there is a proper threaded connection available. If the float will not fit through the flange opening when the flange is removed, there must be some alternative means to mount the float on the transmitter from inside the vessel; this may require an access port nearby the entry point of the transmitter as shown in *Figure 6*.

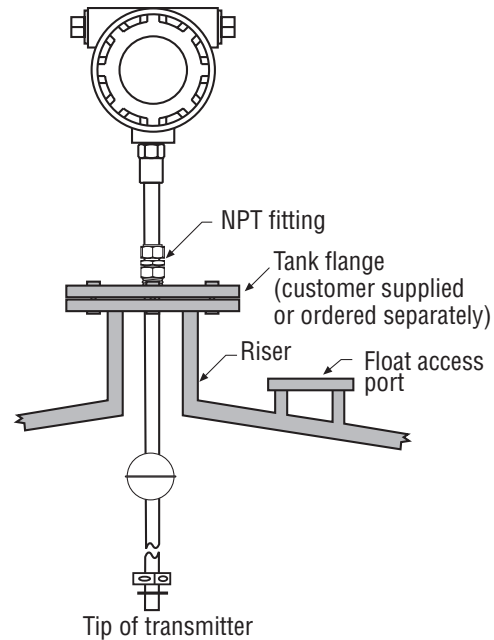


Figure 6. Threaded flange mounting for rigid and flexible pipe

WELDED FLANGE MOUNTING

The Model MR transmitter can also be mounted to a tank flange as shown in *Figure 7*. First, install float(s) onto the transmitter. Second, install the float retaining hardware on the tip of the transmitter. To complete the installation, mount the transmitter, flange and float(s) as a unit in to the tank.

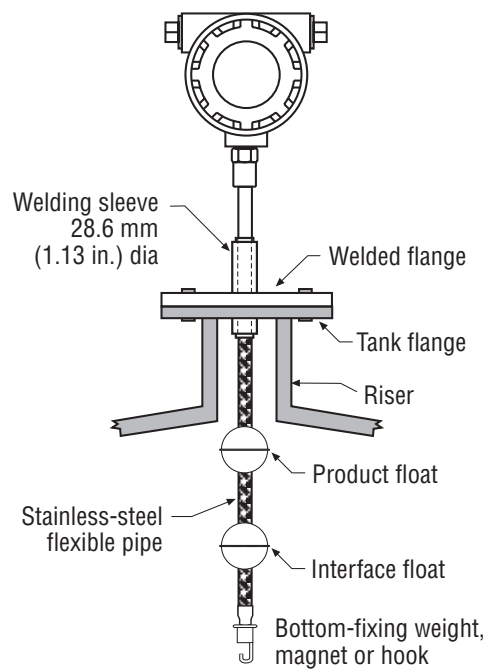


Figure 7. Welded flange mounting for rigid and flexible pipe

Model MR Operation and Installation Manual

Tri-Clamp Mounting

SANITARY TRI-CLAMP MOUNTING

In sanitary applications, the Model MR transmitter is mounted to the tank using a standard sanitary connection and clamp as shown in *Figure 8*. In most cases it is not necessary to remove the float as the sanitary end-plug fitting is sized to allow installation with the float in place. Please note that some sanitary end-plug styles have float(s) permanently mounted as shown in *Figure 9*. To install the clamp, the transmitter and float(s) into the mating process connection and attach the sanitary Tri-Clamp.

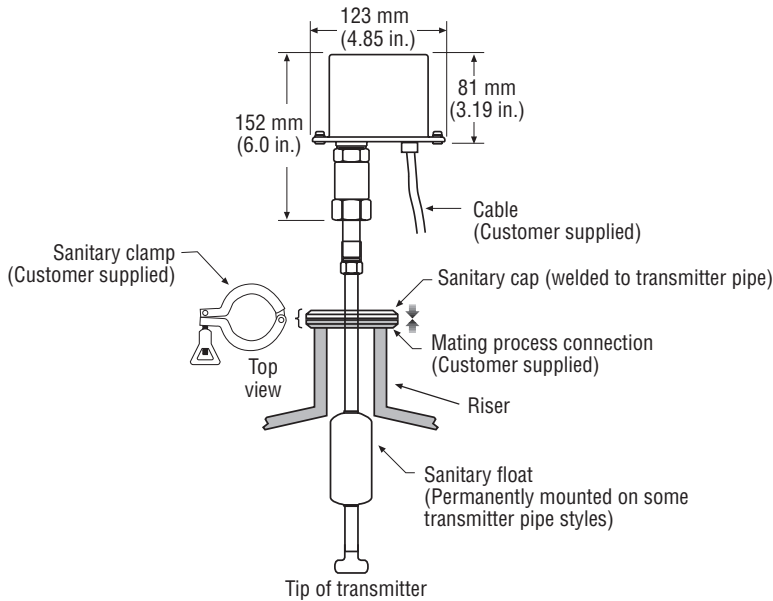
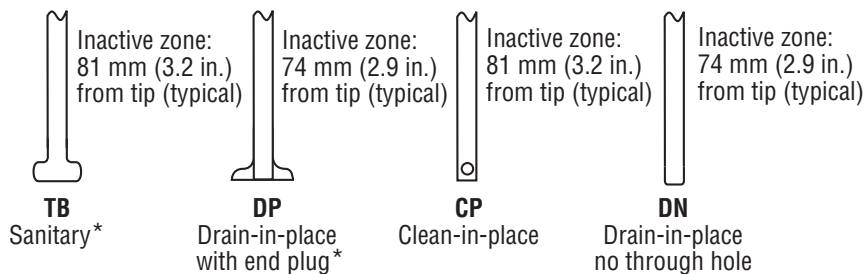


Figure 8. M-Series Model MR transmitter. Tank mounted with sanitary connection



* This end plug style has permanently mounted floats. Floats cannot be removed from pipe.

Figure 9. End-plug options for transmitters in a sanitary pipe application

Electrical connections and wiring procedures

A typical intrinsically safe connection for the Level Plus Model MR transmitter includes protective safety barriers, a power supply and a reading or monitoring device. Refer to *Agency information* and *Brief Operation Manual for Safe Use* for detailed information.

A typical explosion proof connection for the Model MR transmitter includes a power supply and a reading or monitoring device connected using explosion proof conduit. Refer to *Agency information* and *Brief Operation Manual for Safe Use* for detailed information.

Notes:

For explosion proof installation, safety barriers are not required and wiring shall be installed in accordance with the National Electric Code ANSI/NFPA 70, Article 501-30 or the regional equivalent.

Safety recommendations for installation

Be sure to:

1. Always follow applicable local and national electrical codes and observe polarity when making electrical connections.
2. Never make electrical connections to the M-Series transmitter with power turned on.
3. Make sure that no wire strands are loose or sticking out of the terminal block connection which could short and cause a problem.
4. Make sure that no wire strands, including shield, are in contact with the electronic module enclosure.
5. The electronics module enclosure is grounded through internal circuitry and is electronically isolated from the explosion-proof housing.

Refer to the safe operating power chart (see *Figure 10*), which shows the relationship between loop resistance and operating voltage.

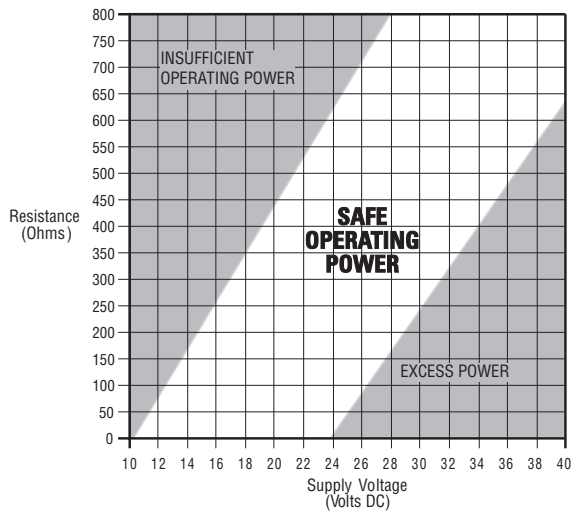


Figure 10. Safe operating power chart

Model MR Operation and Installation Manual
Cable Types and Electrical Conduit Installation

Recommended cable types

Refer to 'Table 1' below for general requirements of cable types for the Level Plus Model MR analog transmitter.

CABLE SPECIFICATIONS

Parameter	Specification
Minimum cable size	24 AWG or heavier (0.51 mm diameter) Contact factory for assistance selecting proper cable.
Cable type	Single pair shielded or multiple pair with overall shield
Maximum cable length	Twisted pair: 10,000 ft. (3,048 m) Multiple twisted pair: 5,000 ft. (1,524 m)
Maximum cable length formula	Use the following formula to determine the maximum cable length for a specific application: Where: $L = [(65 \times 106) \div (R \times C)] - [(Cf + 10,000) \div C]$ L = Length in meters or feet R = Resistance in ohms, current sense resistance plus barrier resistance C = Cable capacitance in pF/ft, or pF/m Cf = Maximum shunt capacitance of smart field devices in pF Example: Assume a high performing smart transmitter, a control system, and a single pair of shielded wires. R = 250 ohms C = 50 pF/ 0,3 m (ft) Cf = 5,000 pF $L = [(65 \times 106) \div 250 \times 50] - [(5,000 + 10,000) \div 50]$ L = 1,494 m (4,900 ft.)

Table 1. Cable specification and parameters

Electrical conduit installation

Important:

Seal all conduits within 457mm (18 in.)

Notes:

1. Use an explosion proof type conduit sealing fitting.
2. Tighten housing cover (both front and back covers if dual cavity) to full stop against the O-ring.
3. Do not over-tighten compression fittings.
4. Use side conduit entry only.
5. In high humidity areas, use a breather drain type conduit sealing fitting to minimize moisture intrusion.

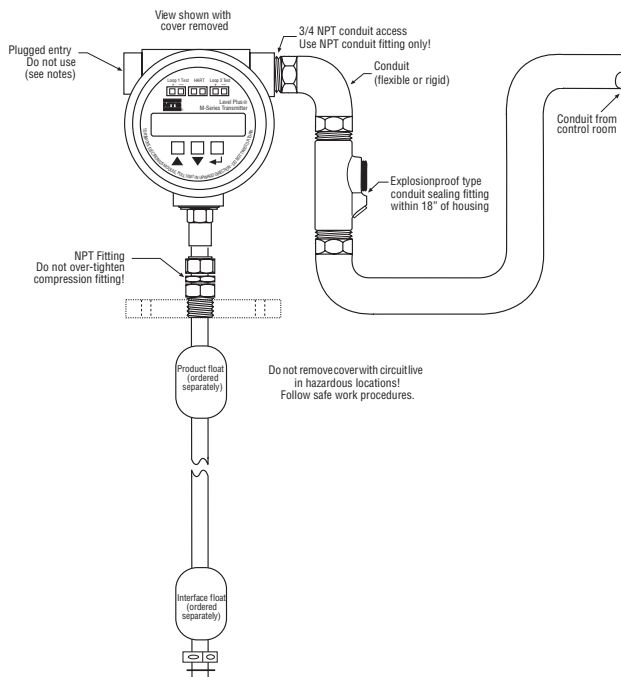


Figure 11. Electrical conduit installation

Grounding

Note:

Grounding the transmitter through a threaded conduit connection does not provide sufficient ground.

There are two methods to provide an earth ground to the earth ground of the electronics. Refer to 'Table 2' for safety barrier references.

- Run an earth ground through the conduit and connect directly to the earth ground lug inside the housing.
- Run an earth ground directly to the ground lug on the outside of the housing.

Safety barriers for IS installation

Refer to Table 2 for entity parameters and Figure 12 for passive and active safety barrier types for Model MR transmitter installations.

Entity parameters						
FM	Vmax = 28 Vdc					
	Imax = 118 mA per loop circuit					
	Ci = 0.0 µF per loop circuit					
	Li = 220 µH per loop circuit					
CSA	Vmax = 36.1 Vdc					
	Imax = 118 mA					
	Ci = 0.0 µF					
	Li = 220 µH					
ATEX	Vmax = 28 Vdc					
	Σ Imax = 118 mA per loop (circuit)					
	Ci = negligibly low					
	Li = 220 µH per loop (circuit)					
Supplier	Type	Maximum voltage	Maximum current (each channel)	Maximum power (each channel)	Maximum resistance (each channel)	Number of channels
STAHL	9001/51-280-091-141	28 Vdc	91 mA	637 mW	350Ω	1

Table 2. Safety barrier entity parameter references

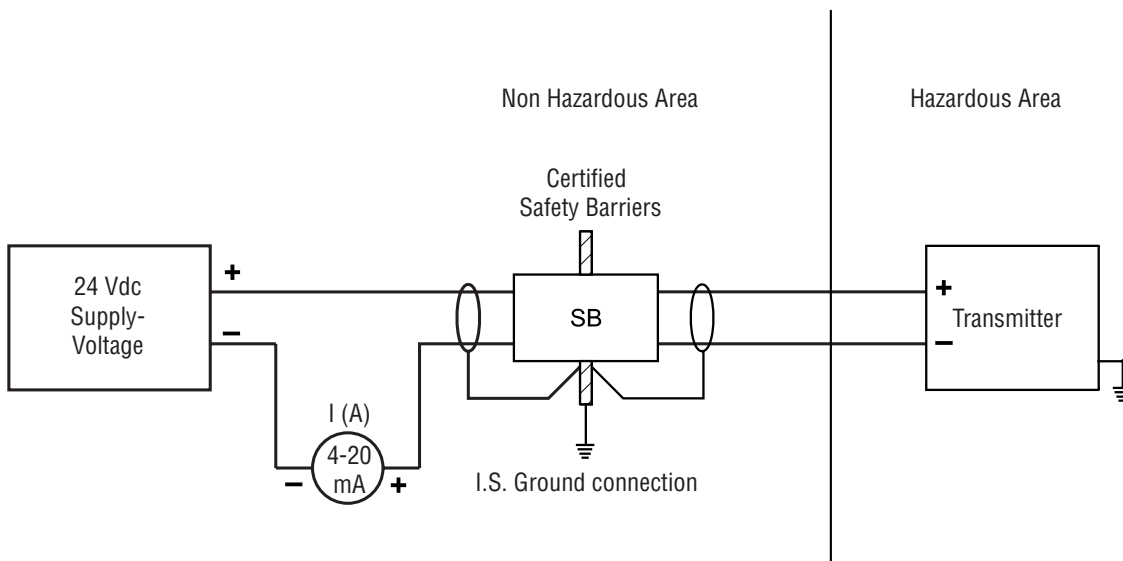


Figure 12. Safety barrier connections

Maintenance and field service

This section contains information about post installation maintenance and provides an overview of MTS Sensors’ repair and replacement procedures.

General maintenance and field service requirements

Notes:

Please contact Technical Support or Customer Service for help when damage occurs in order to obtain a return materials authorization (RMA) number. Packages without a RMA number may be rejected. Any unit that was used in a process must be properly cleaned in accordance with OSHA standards, before it is returned to the factory. A Material Safety Data Sheet (MSDS) must accompany material that was used in any media.

FLOAT MAINTENANCE

Level Plus M-Series transmitters use magnetostrictive technology and only have one moving part—the float. This technology ensures no scheduled maintenance or recalibration is required. However, MTS recommends that you check the transmitter pipe annually for build up of process material. Floats should move freely along the pipe. If they do not, routine cleaning should be performed.

FIELD SERVICE

If damage does occur to a M-Series transmitter, the transmitter can be serviced in the field with replacement parts. All electronic parts can be changed in the field without having to open the process vessel. Please contact Technical Support and refer to the Transmitter Electronics Replacement Guide (MTS part no. 550731) for detailed steps of field replacement.

SERVICE / RMA POLICY

If the customer suspects their transmitter is damaged or not functioning correctly, call *MTS Technical Support* for further instruction. If it is necessary to return the transmitter to the factory, an RMA number is required and can only be issued by Technical Support. Product returns that do not include an RMA will be returned to the customer. MTS evaluates the transmitter and advises the customer whether a repair or replacement is necessary and any cost that might be incurred. If the customer declines repair/replacement or the transmitter has no fault found, the unit is sent back as is and the customer is charged with a standard evaluation fee.

If the transmitter is under warranty and a manufacturer’s defect is detected, there will be no cost to the customer for repair or replacement. If the transmitter is out of warranty or if the customer has damaged the transmitter, a repair or replacement quote will be provided. In specific cases where the transmitter can not be removed and returned to the factory for evaluation, field evaluations can be performed on location by an MTS technician. If field evaluation must be performed, the customer is responsible for all expenses incurred for travel, evaluation, parts and repair time. However, if the transmitter is under warranty and the problem is due to a manufacturer’s defect, there is no cost to the customer for replacement parts. To discuss all service options, contact *Technical Support*.

Troubleshooting

The table below contains troubleshooting information for the Model MR analog transmitter.

TROUBLESHOOTING PROCEDURES

Symptom	Possible Cause	Action
No communication with transmitter	No power	Check voltage at transmitter
	Wiring incorrect	Reference installation drawing (see ‘Electrical connections and wiring’)
	Wrong software	Confirm correct software
Output in Alarm (3.8 mA or 21.4 mA)	Float not recognized	Confirm that the float is attached
	Float is in the dead zone	Raise float to see if the error stops
	Wrong number of floats selected	Confirm that the number of floats on the transmitter and the number of floats the transmitter is attempting to verify are the same.

Table 3. Troubleshooting reference

Quick start-up guide

BEFORE YOU BEGIN

Note:

Output will vary depending on the location of the 4 and 20 mA set points.

Tools Needed:

- 24 Vdc linear regulated power supply
- Current Meter

QUICK START-UP PROCEDURE

1. Connect 24 Vdc power supply
2. Turn on power supply
3. Connect Current Meter to test pins on the front of the puck
4. Move the float to the tip of the pipe and verify 4 mA output
5. Move the float to the top of the pipe and verify 20 mA output
6. If using two floats, repeat steps 4 and 5 for second float
7. Turn off power and disconnect power supply
8. Install in tank
9. Connect power and turn on

Setup using keypad display

The Model MR transmitter can be calibrated by using the HART communications protocol or it may be manually calibrated using the optional *keypad display*. This section explains modes of operation and the steps you need to perform to calibrate your transmitter manually using the keypad display.

OPERATION MODES

The Model MR transmitter runs in one of the following modes of operation. You can use these modes to calibrate and set up various operating parameters.

Run Mode

Run mode is the primary mode of operation. This mode will perform measurements, display data, and respond to HART commands. The run mode can be configured for various output options. The minimum configuration will only perform a single-level measurement. More complex configurations will perform a second float measurement (interface), or temperature measurements. Level measurement. More complex configurations will perform a second float measurement (interface), or temperature measurements.

Program Mode

The program mode is only applicable to Model MR transmitter with the keypad display option. Enter this mode by pressing any of the three keys, *Up keypad*, *Down keypad*, and *Enter keypad* as shown in *Figure 12*. Menus guide the user through various programming options. When in the program mode, HART communications are not functional. An automatic time out feature is provided so that the transmitter does not remain inadvertently in program mode.

Display Test Mode

This mode is invoked through the keypad.

Display / Keypad usage in Program Mode

The Model MR transmitter can be configured by pressing three keys, the Up keypad, Down keypad, and Enter keypad as shown in *Figure 13*. This gives the user a means to calibrate and set up various operating parameters.

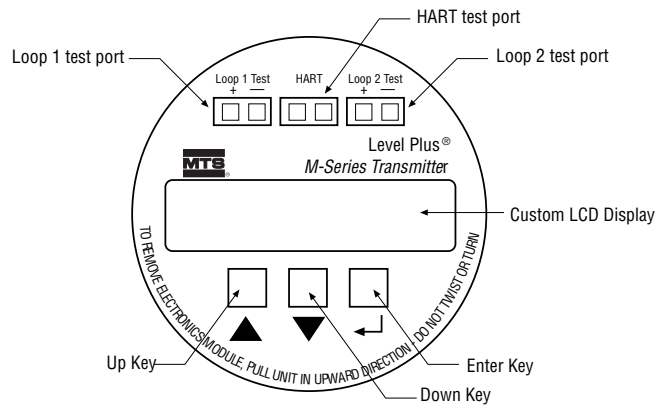


Figure 13. Keypad display

The three keypads are identified with “∇” “Δ”, and “←”. The “Δ” keypad may be used to indicate Up responses, the “∇” symbol indicates Down responses, and “←” indicates an Enter response. Normally, the Model MR transmitter will remain in run mode. When you press any three keys, the transmitter will enter program mode. In program mode, the electronics module menu displays options that you can scroll through using the Up and Down keypads. To select an option, press Enter.

Model MR Operation and Installation Manual

Setup

Notes:

In program mode, the transmitter will not respond to incoming HART commands. This function will prevent a user at a remote terminal from overwriting a parameter that is being entered at the same time from a local site.

Program Mode Timer

After you enter the programming mode, a one-minute timer is started. Each time you press a button, the timer is reset. If you do not press a menu button within one minute, the timer will expire and the transmitter will return to the *run mode*.

Loop 1 and Loop 2 Test Ports

Using a standard multi-meter set the meter to DC current and attach across the terminals, loop current can be read directly from ports 1 and 2 (see *Figure 14*). The current read on the meter should correspond with the data being displayed. These ports allow the loop current to be read directly without having to interrupt power.

HART Port

This port allows for direct connection of the HART field calibrator or other HART host device as long as there is a load on loop 1.

LCD DISPLAY AND KEYPAD (OPTIONAL)

A sixteen character, seven-segment LCD display and three push-button “keypad” option is available. Level and temperature measurements are displayed when in run mode. When power is applied to the unit, a start” message is displayed. Then, while in run mode, the display is updated every three seconds with new data. There are three data fields on the display [Level 1, Level 2, Temperature]. If a measurement is not available, there will be dashes (- - - -) shown in the corresponding field.

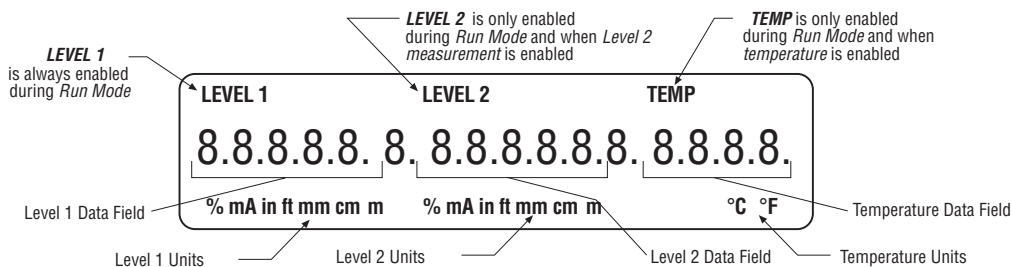


Figure 14. Keypad display LCD display

ALARM SETTINGS

When a fault condition is detected by the internal microprocessor, the 4 to 20 mA current will go to the selected alarm mode. If in the 4 mA alarm mode when a fault is detected, the output will be continuous at 3.8 ± 0.1 mA. If in the 20 mA alarm mode when a fault is detected, the output will be continuous at 21.5 ± 0.2 mA.

MANUAL CALIBRATION

The procedure to enter calibration mode and modify levels 1 and 2, adjust LCD contrast and perform a LCD testis shown in *Figure 15 on the next page*.

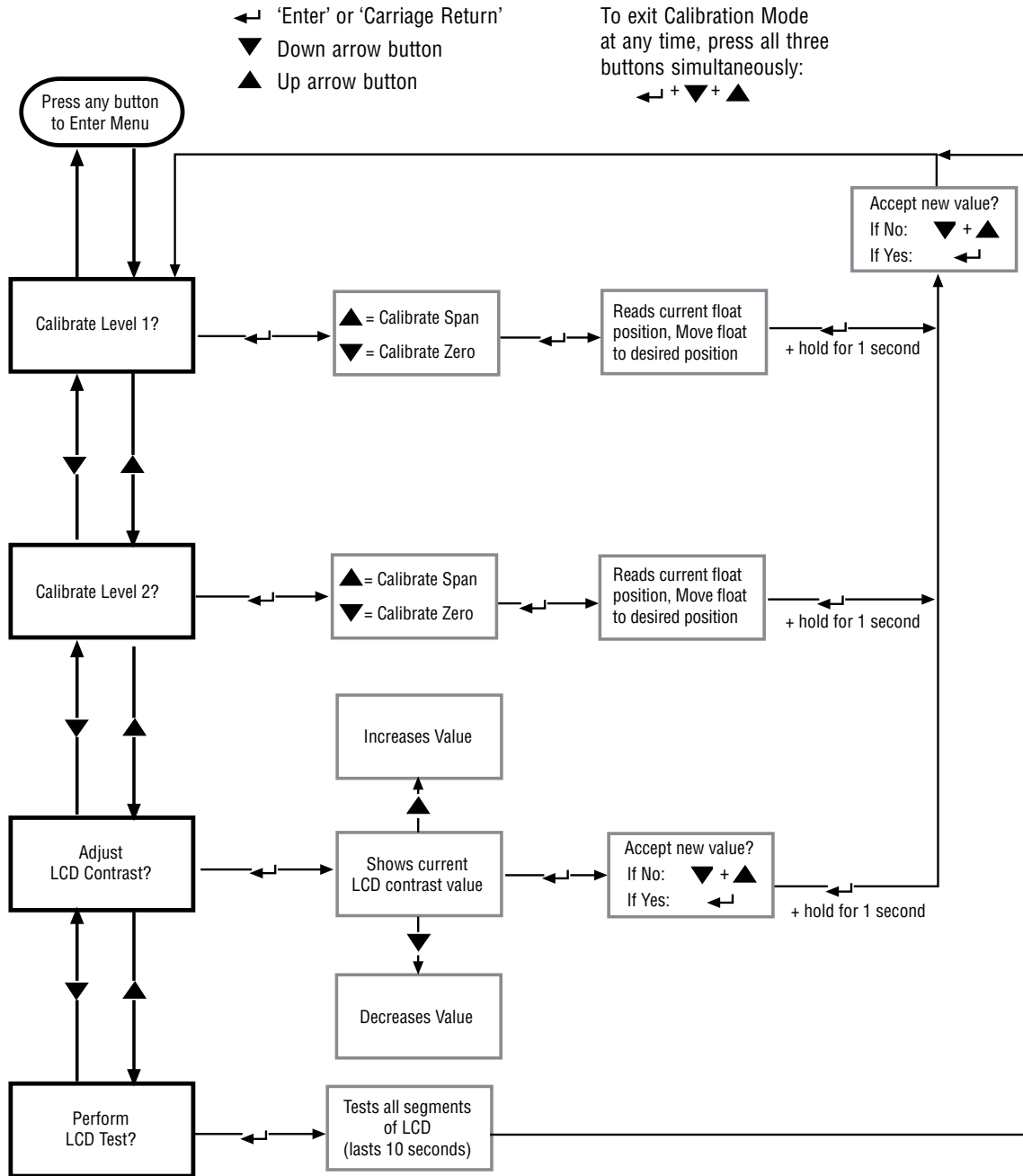


Figure 15. Manual calibration matrix

Setup

Setup using HART Field Communicator

Refer to the documentation that comes with the *Rosemount Model 275 and 375 Field Communicator* for specific sensor calibration information. This section describes how the HART protocol is applied to the Level Plus Model MR transmitter only.

Using the HART interface allows for calibration without having to remove the transmitter from the process and position of the floats. You can perform this function by using HART commands 35 and 65.

Any measured output may be assigned to any variable. Loop #1 is always the primary variable (PV); level 1 is usually assigned to loop 1. Loop 2 is always the Second Variable (SV); usually represents temperature or level 2. The Third Variable (TV) and Fourth Variable (FV) may be assigned to any remaining output such as, level 2, temperature. Analog output codes are 0, 1, and 2 respectively.

Calibration set points for level are given as the absolute displacement (in the appropriate units) from the tip of the sensor pipe. For example, if the Zero (LRV) position for level 1 is given as 5 inches, the transmitter will produce 4 mA when the float is 5 inches from the tip of the sensor pipe. If the Span (URV) position for level 1 is given as 30 inches, the transmitter will produce 20 mA when the float is 35 inches from the top of the sensor pipe. To calibrate the temperature set points, the Zero (LRV) and Span (URV) points are given in degrees. For temperature, the Zero (LRV) value (in degrees) must always be less than the Span (URV) value (in degrees).

PREPARING THE TRANSMITTER FOR RE-CALIBRATION

The Model MR transmitter can be re-calibrated by using the model 275 and 375 Field Communicator. Complete the following procedure to reset the zero and span values for loop 1 (only loop 1 can be calibrated with the HART Field Communicator using the generic XMTR type driver. To access both loops as well as other parameters, the MTS device driver must be purchased and installed in to the 275/375 field communicator. For more information about the HART device driver, go to HARTcomm.org.

Attention:

DO NOT enter a high value that exceeds the active length of the sensor.

Before you begin, perform the following steps:

1. Connect the transmitter to a clean 24 Vdc power supply. Use a linear supply, switching types do not provide ripple-free power. HART cannot tolerate more than a 25 mV voltage ripple.
2. If the unit is installed in a live application, place your automatic controllers in manual mode and be advised that the output current will change during calibration.
3. Follow safe working procedures for working on live equipment in a hazardous location before you remove the housing cover.
4. Connect the HART Field Communicator to the terminals that are labeled HART located on the front panel display of the Level Plus transmitter.
5. Press the black and white I/O button on the HART terminal. The HART terminal will perform an automatic self test. The Main window displays. If the device is not connected properly, the message "No device found" displays.
6. In the Main window, press the **Key #1**, the Device Setup window displays.
7. In the Device setup window, press **Key #3**. The Basic Setup window displays.
8. In the Basic Setup window, press **Key #3**. The Range Values window displays.

SETTING THE LOW VALUE

Complete the following steps to set the low value:

1. To set the low value, Process Variable, Low Range Value (PV LRV) to 4 mA, select Key #1. The PV LRV window displays the current low value. Below the highlighted value located under the current value, key in the low value you want (example 3.00 in. is shown; if 4 inches is the value you want, key in 4.) then, press Enter (F4) located below the LCD display.
2. To write the changed lower value to memory, press the Send key.
3. Two Warning messages will display before the new values take affect; if your new low values are correct, respond to the Warning messages by pressing OK when prompted. This action resets the Low Range Value, or 4 mA position into the transmitter's memory.
4. Go back to the Range Values window to verify that the new parameters have been accepted into the transmitter's memory.
5. **Do one of the following:**
 - 5a. Exit program mode.
 - 5b. To reset the upper value, continue with "Setting the Upper Range Value."

SETTING THE UPPER RANGE VALUE

Complete the following steps to set the Upper Range Value:

Caution:

DO NOT enter a high value that exceeds the active length of the sensor.

1. Open the Range Values window. To set the 20 mA Upper Range Value, press Key #2. The Process Variable, Upper Range Value (PV URV) window displays.
2. As shown the Lower Value window, the current value displays with a highlighted number below the value displayed. To change the upper value, key in the new value. You can use whole numbers or whole numbers and decimals (example, 40 = 40 inches, or 40.5 = 40.50 inches.) Whole numbers will be converted as decimal equivalents automatically by the HART terminal.
3. Key in the new Upper Range Value and press Enter or (F4). The Range Values window displays.
4. Verify that the upper and lower values are correct. If the values are correct, press Send.
5. You will be prompted with two Warning messages, press OK in response to both warnings.

Setup using MTS Field Setup software

Adjustments to the calibration and setup parameters of the transmitter may be done using the MTS Field Setup Software and a RS232 to HART converter (SMAR HI-311, MTS Part # 380068). Be sure to install the latest software package, go to www.mtssensors.com for more information.

USING THE MTS FIELD SETUP SOFTWARE

Tools Required:

- HART adapter/converter
- 24 Vdc power supply
- PC

Complete the following steps to Install Setup Software

1. Insert the software installation CD into computer or go to www.mtssensors.com and download the latest software.
2. Open folder "Setup software Analog_Digital"
3. Open folder "Analog"
4. Open file "M-Series Field Setup"
5. Follow on screen instructions

Complete the following steps to Install the hardware

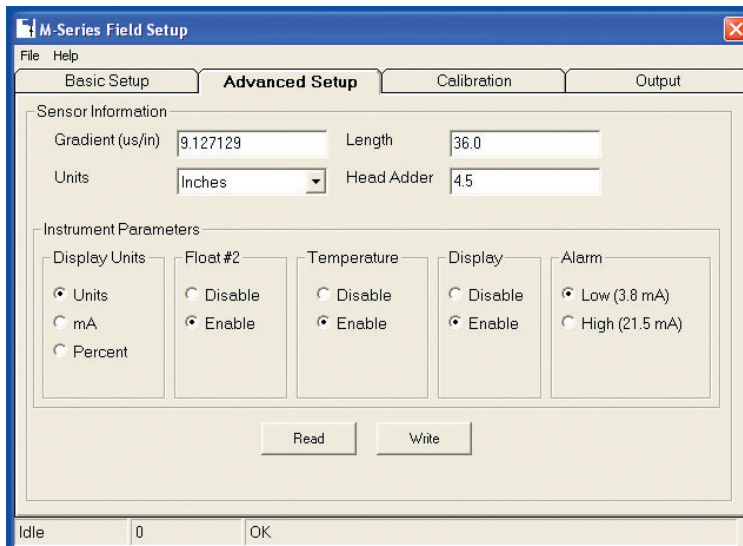
1. Connect Power Supply to level transmitter
2. Connect HART adapter to level transmitter and PC

Attention:

Be sure loop #1 is connected to a load of 250 to 500 ohm. A transmitter installed in a control loop is a good example of the loop load. A 250 ohm load resistor may need to be added to the loop for HART to communicate effectively.

3. Turn on power
4. Open Setup Software. Data should fill in. If no data appears select a different serial communication port.

ADVANCED SETUP TAB



Setup

Gradient : A calibration factor that is specific to each level transmitter. This value should not be changed unless directed to do so by Technical Support.

Length: The order length of the transmitter. This value should not be changed unless directed to do so by Technical Support.

Units: The unit of measure for Length and Head Adder. This is used when writing new values of Length and Head Adder to the transmitter. Use the Output Tab to change units of measure for all data.

Head Adder: The distance between the sensing element and the order length. Each model has a slightly different head adder. This value should not be changed unless directed to do so by Technical Support.

Transmitter style	Length
NEMA 4X housing, standard rigid pipe	4.3 to 4.5 in (109 to 114 mm)
Single or Dual Cavity Housing, standard rigid pipe	5.6 to 5.7 in (142 to 145 mm)
NEMA 4X housing, flexible hose	14.0 to 14.5 in (356 to 368 mm)
Single or Dual Cavity Housing, flexible hose	14.0 to 14.5 in (356 to 368 mm)

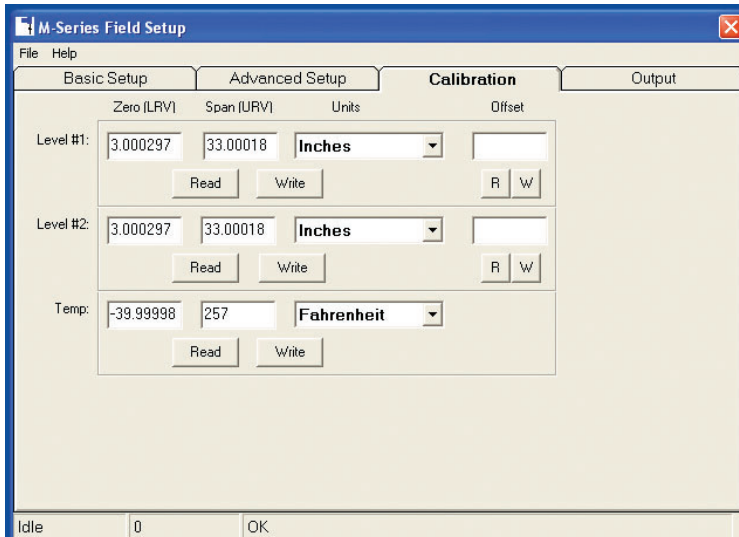
Display Units: Units used only on LCD display of units, mA, or percent
Float #2: The second or interface float that can be enabled or disabled

Temperature: The ability to measure temperature that can be enabled or disabled

Display: The optional LCD display that can be enabled or disabled

Alarm: The output state that the level transmitter enters upon failure. Alarm can be Low (3.8 mA) or High (21.5 mA).

CALIBRATION TAB

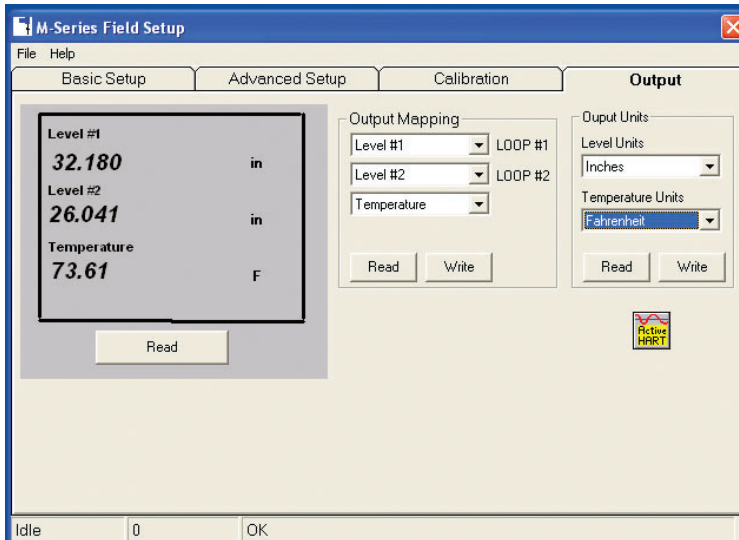


1. Changing the 4 and 20 mA set points occurs on the Calibration Tab. The procedure is the same for Level 1, Level 2 and Temperature.
2. Click 'Read' to determine current set point and units.
3. Select units from drop down menu.
4. Change set point. The 4 mA set point is the Zero or Lower Range Value (LRV). The 20 mA set point is the Span or Upper Range Value (URV).
5. Click 'Write.' Click 'Read' and confirm the new set points are correct.

The Offset field can be used for making adjustments to the optional LCD display, not the current output. This allows the display to be scaled for local viewing only.

1. Click 'R' to determine current offset
2. Enter offset in same units as set points and click 'W'
3. Click 'R' and validate offset is correct. Display should now be adjusted.

OUTPUT TAB



Output Mapping: allows process variables measured by the level transmitter to be mapped to current loops of level transmitter and HART variables. Contact Technical Support for questions.

Output Units: The units of measure for level and temperature may be selected using the pull down menus. When changing units, these selections should be changed on this screen first, prior to changing units on any of the other tabs (Advance Setup or Calibration).

Read: This button sends a single read command to the transmitter and displays the data which the transmitter responds with.

Model MR Operation and Installation Manual

Agency Information

Agency approvals

CSA

CSA SPECIFIC MODEL MR NUMBER REQUIRED AS SHOWN ON PAGE 7.

Model	Approval Type	Classification	Standard
MRC	Explosion Proof	Class I, Division 1, Groups B, C, D Class II, Division 1, Groups E, F, G Class III, Type 4X Ta = 71° C	CSA C22.2 No. 0-10 CSA C22.2 No. 30-M1986 (R2007)
	Intrinsically Safe	Class I, Division 1, Groups A, B, C, D Class II, Division 1, Groups E, F, G Class III, Type 4X Ta = 71° C	C22.2 No. 157-92 (R2006)

FM

FM SPECIFIC MODEL MR NUMBER REQUIRED AS SHOWN ON PAGE 7.

Model	Approval Type	Classification	Standard
MRF	Explosion Proof	Class I, Division 1, Groups B, C, D Class II, Division 1, Groups E, F, G Class III, Type 4X Ta = 71° C	FM 3600:2011 FM 3615:2006
	Intrinsically Safe	Class I, Division 1, Groups C, D Class II, Division 1, Groups E, F, G Class III, Type 4X Ta = 71° C	FM 3610:2010

ATEX

ATEX SPECIFIC MODEL MR NUMBER REQUIRED AS SHOWN ON PAGE 8.

Model	Approval Type	Classification	Standard
MRE	Flame Proof	FMG 13 ATEX 0050X ⊗ II 1/2 G Ex d IIB T4 Ga/Gb Ta = -20° C to 40° C	EN 60079-0:2012 EN 60079-1:2007 EN 60079-26:2007
	Intrinsically Safe	PTB 10 ATEX 2011X ⊗ II 1/2 G bzw. II 2 G Ex ia IIB T4 bzw. EX ia IIA T4 Ta = -20° C to 80° C	EN 60079-0:2009 EN 60079-11:2007 EN 60079-26:2007

IECEX

IECEX SPECIFIC MODEL MR NUMBER REQUIRED AS SHOWN ON PAGE 8.

Model	Approval Type	Classification	Standard
MRH	Flame Proof	IECEX FMG 13.0019X Ex d IIB T4 Ga/Gb Ta = -20° C to 40° C	IEC 60079-0:2011 IEC 60079-1:2007-04 IEC 60079-26:2006

Agency approvals

NEPSI

USES ATEX SPECIFIC MODEL NUMBER AS SHOWN ON PAGE 8.

Model	Approval Type	Classification	Standard
MRE	Intrinsically Safe	GYJ14.1051X Ex ia IIB T4 Ga/Gb bzw Gb Ta = -20° C to 80° C	GB 3836.1-2010 GB 3836.4-2010 GB 3836.20-2010

CCoE

CCoE USES ATEX SPECIFIC MODEL NUMBER AS SHOWN ON PAGE 8.

Model	Approval Type	Classification	Standard
MRP	Flame Proof	P336577/1 Ex d IIB T4 Ga/Gb Ta = -20° C to 40° C	EN 60079-0: 2012 EN 60079-1:2007 EN 60079-26:2007

KC

KC USES IECEX SPECIFIC MODEL NUMBER AS SHOWN ON PAGE 8, CONSULT 550720 (KOR) FOR DETAILS

Model	Approval Type	Classification	Standard
MRK	Flame Proof	14-KB4BO-0300X Ex d IIB T4 Ga/Gb Ta = -20° C to 40° C	Announcement No. 2013-54 of Ministry of Employment and Labor

INMETRO

INMETRO USES ATEX SPECIFIC MODEL NUMBER AS SHOWN ON PAGE 8, CONSULT 550720 (PT) FOR DETAILS

Model	Approval Type	Classification	Standard
MRB	Flame Proof	TÜV 14.0935 Ex d IIB T4 Ga/Gb IP66 Ta = -20° C to 40° C	ABNT NBR IEC 60079-0:2008 ABNT NBR IEC 60079-1:2009 e ABNT NBR IEC 60079-26:2008 Portaria INMETRO no 179 de 18/05/2010

Hazardous area installation

CSA

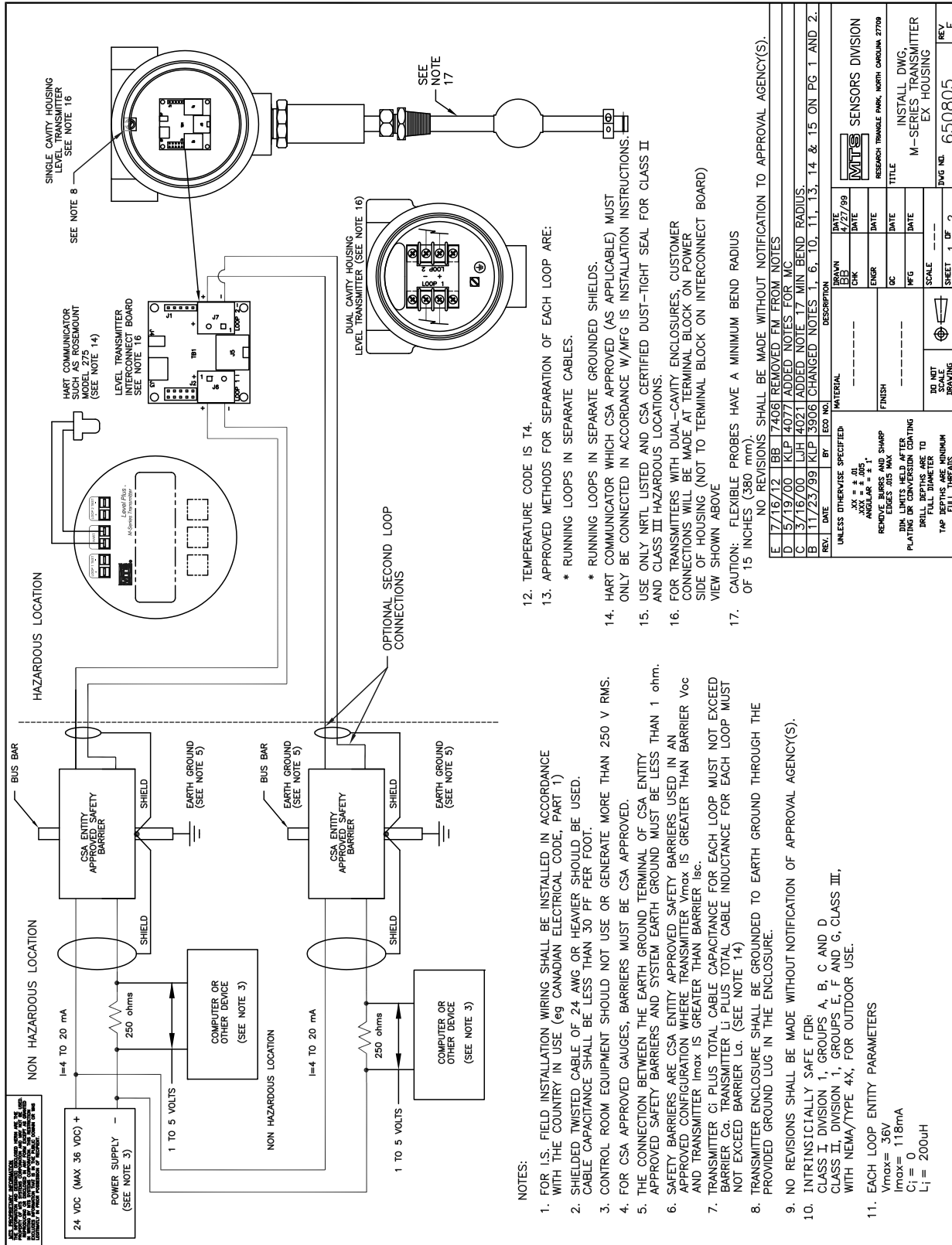


Figure 16. CSA installation drawing (Reference only, see 650805)

INSTALLATION DRAWING (FIGURE 17)

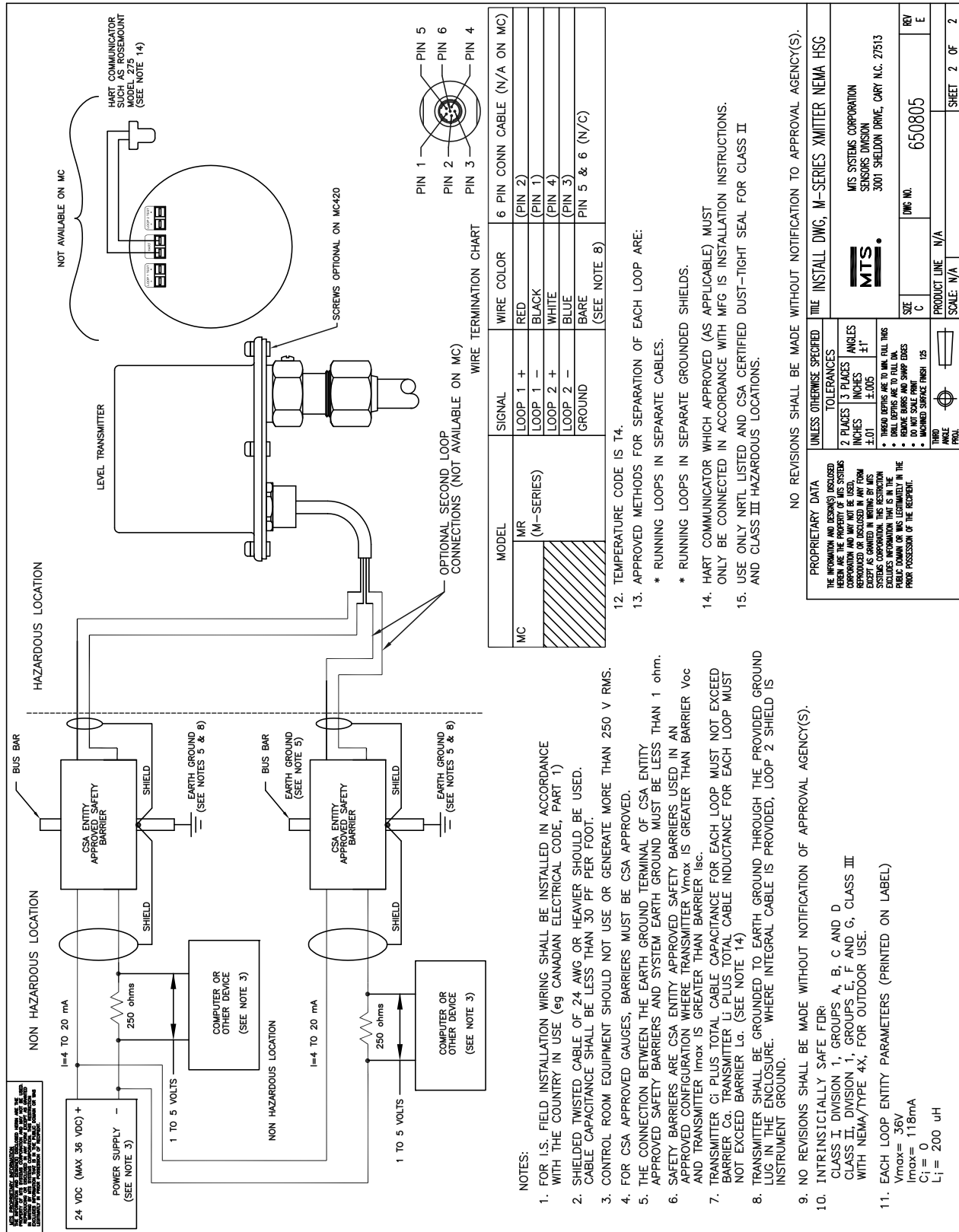


Figure 17. CSA installation drawing (Reference only, see 650805)

Model MR Operation and Installation Manual
Agency Information, CSA

CSA

INSTALLATION DRAWING NOTES (FIGURE 17)

Model number	Approval agency	Approval type		Approval classification	Ground connection (Figure reference)
	CSA	Intrinsically Safe	Explosion Proof		
MRC_A	X	X		Class I, Division 1, Groups A, B, C, D Class II, Division 1, Groups E, F, G Division 1, Type 4X	Figure 18
MRC_B	X		X	Class I, Division 1, Groups B, C, D Class II, Division 1, Groups E, F, G Class III, Type 4X	Figure 21
MRC_D	X	X		Class I, Division 1, Groups A, B, C, D Class II, Division 1, Groups E, F, G Class III, Type 4X	
MRC_C	X		X	Class I, Division 1, Groups B, C, D Class II, Division 1, Groups E, F, G Class III, Type 4X	Figure 22
MRC_E	X	X		Class I, Division 1, Groups A, B, C, D Class II, Division 1, Groups E,F,G Class III, Type 4X	
MRC_L	X	X		Class I, Division 1, Groups A, B, C, D Class II, Division 1, Group E, F, G Class III, Type 4X	Figure 19
MRC_3	X	X		Class I, Division 1, Group A, B, C, D Class II, Division 1, Groups E, F, G Class III, Type 4X	Figure 20

Table 4. CSA model number approval classification

Wiring and connections

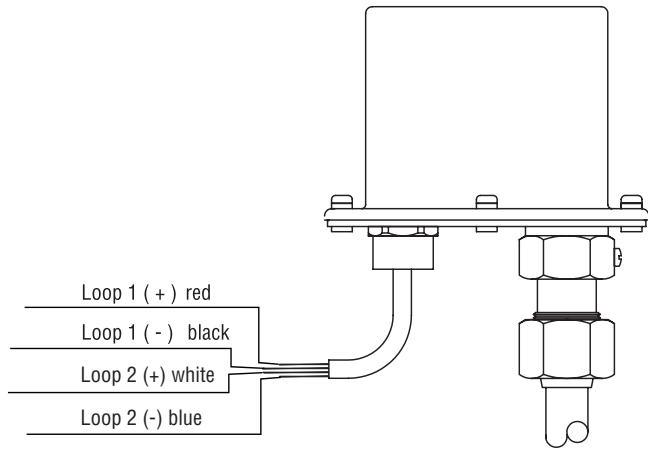


Figure 18. NEMA 4X housing with integrated cable.

Wiring diagram (Figure 19)

Pin no.:	Signal
1	Loop 1 (-)
2	Loop 1 (+)
3	Loop 2 (-)
4	Loop 2 (+)
5	Not used
6	Not used

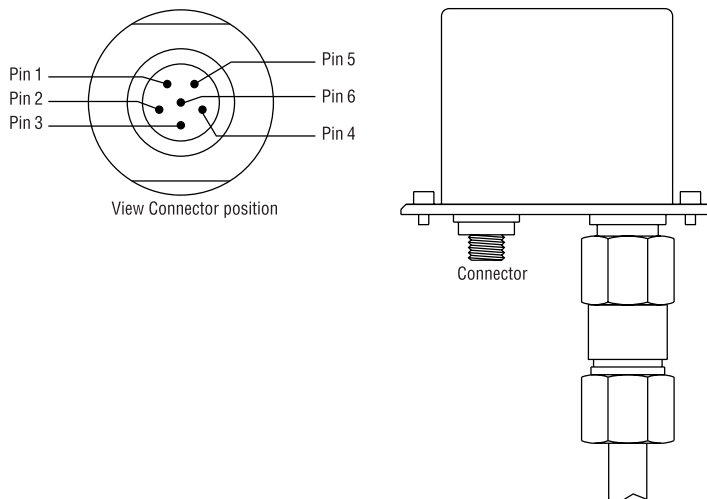


Figure 19. NEMA 4X housing with 6-pin connection

WIRING AND CONNECTIONS (CONTINUED)

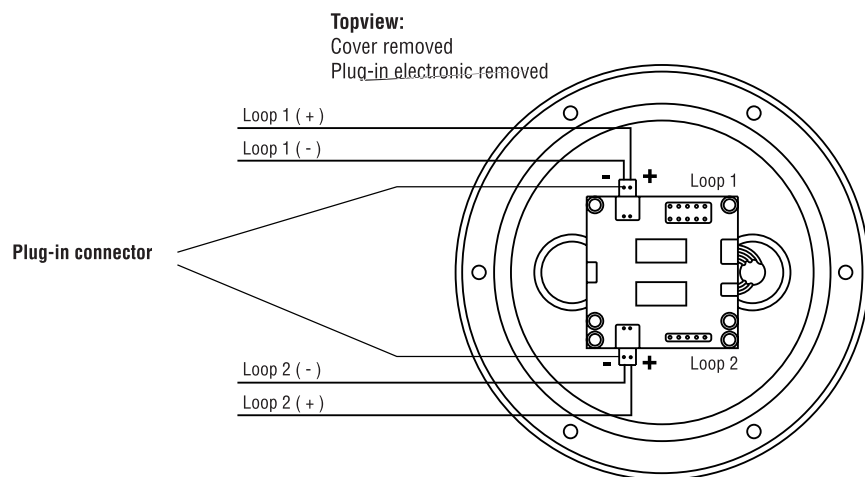


Figure 20. NEMA 4X housing

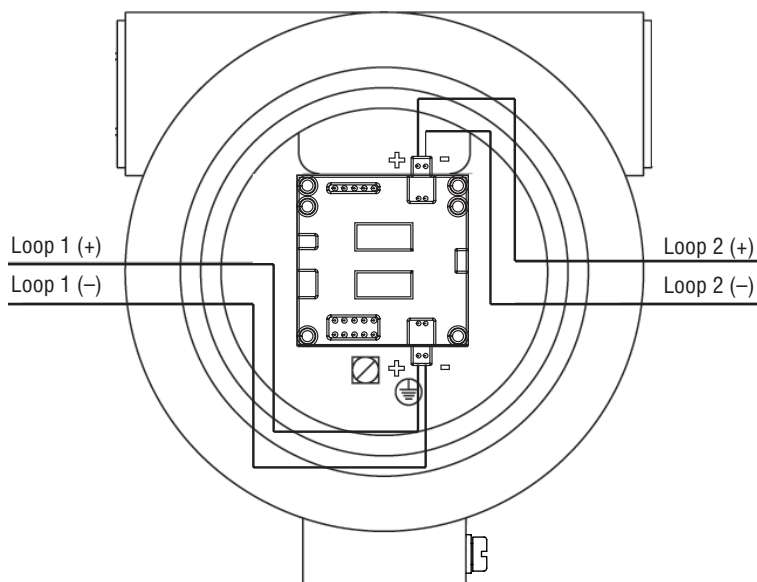


Figure 21. Single-cavity housing

WIRING AND CONNECTIONS (CONTINUED)

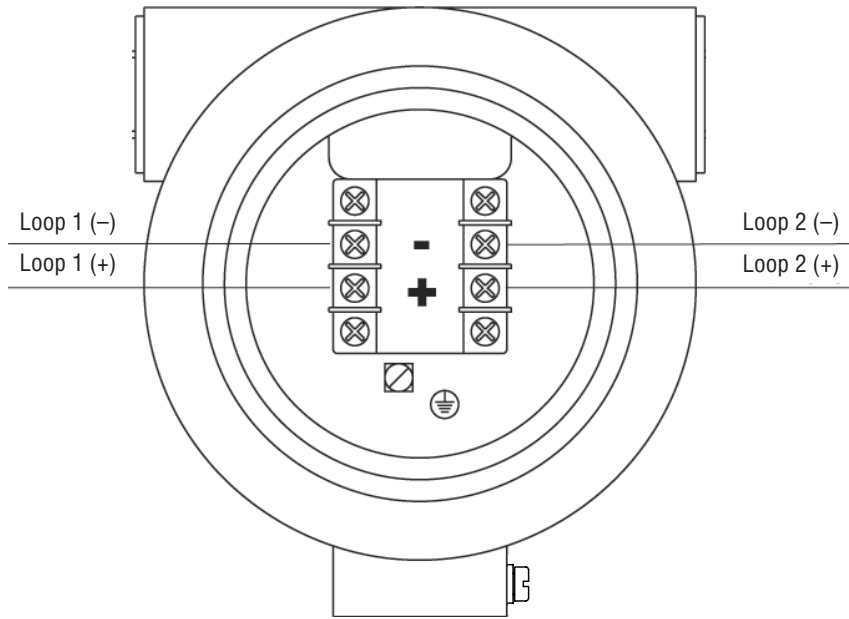


Figure 22. Dual-cavity housing

FM (CONTINUED)

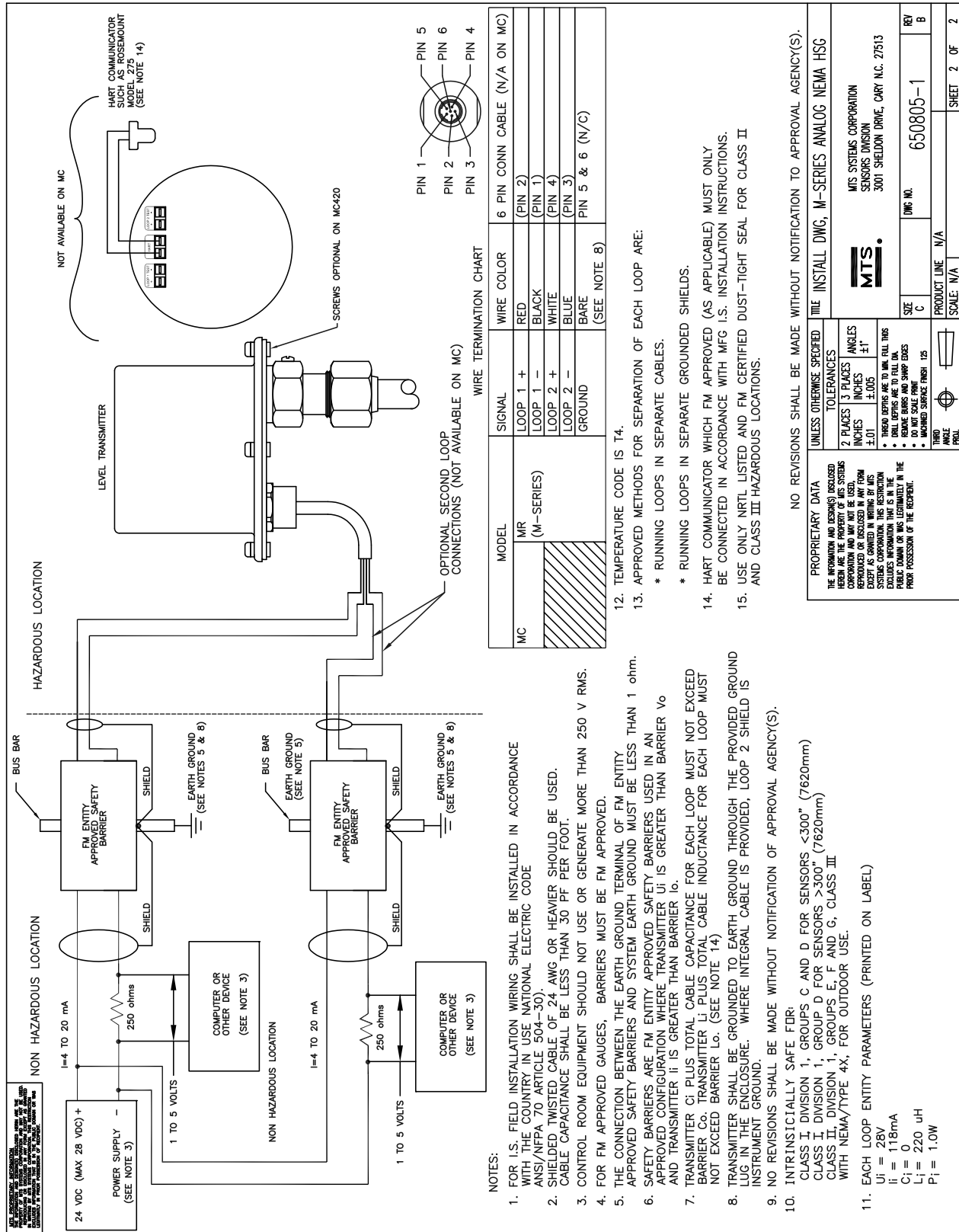


Figure 17. FM installation drawing (Reference only, see 650805-1)

Model MR Operation and Installation Manual
Agency Information, FM

FM

INSTALLATION DRAWING NOTES (FIGURE 17)

Model number	Approval agency	Approval type		Approval classification	Ground connection (Figure reference)
	FM	Intrinsically Safe	Explosion Proof		
MRF_A	X	X		Class I, Division 1, Groups C, D* Class II, Division 1, Groups E, F, G Class III, Type 4X	Figure 23
MRF_B	X		X	Class I, Division 1, Groups B, C, D Class II, Division 1, Groups E, F, G Class III, Type 4X	Figure 26
MRF_D	X	X		Class I, Division 1, Groups C, D* Class II, Division 1, Groups E, F, G Class III, Type 4X	
MRF_C	X		X	Class I, Division 1, Groups B, C, D Class II, Division 1, Groups E, F, G Class III, Type 4X	Figure 27
MRF_E	X	X		Class I, Division 1, Groups C, D* Class II, Division 1, Groups E, F, G Class III, Type 4X	
MRF_L	X	X		Class I, Division 1, Groups C, D* Class II, Division 1, Group E, F, G Class III, Type 4X	Figure 24

Table 5. FM model number approval classification

Note:

Group D, only for gauges over 300 inches.

Table 5. CSA model number approval classification

Wiring and connections

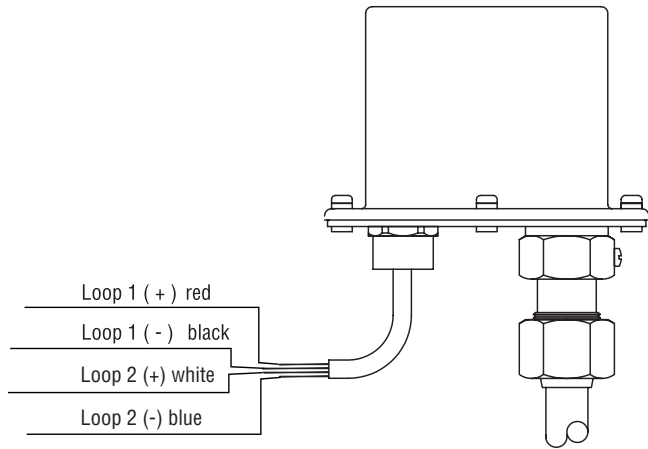


Figure 23. NEMA 4X housing with integrated cable.

Wiring diagram (Figure 19)

Pin no.:	Signal
1	Loop 1 (-)
2	Loop 1 (+)
3	Loop 2 (-)
4	Loop 2 (+)
5	Not used
6	Not used

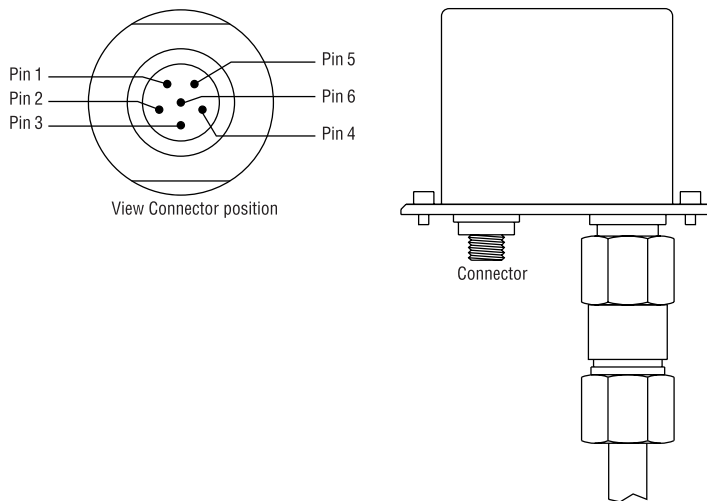


Figure 24. NEMA 4X housing with 6-pin connection

WIRING AND CONNECTIONS (CONTINUED)

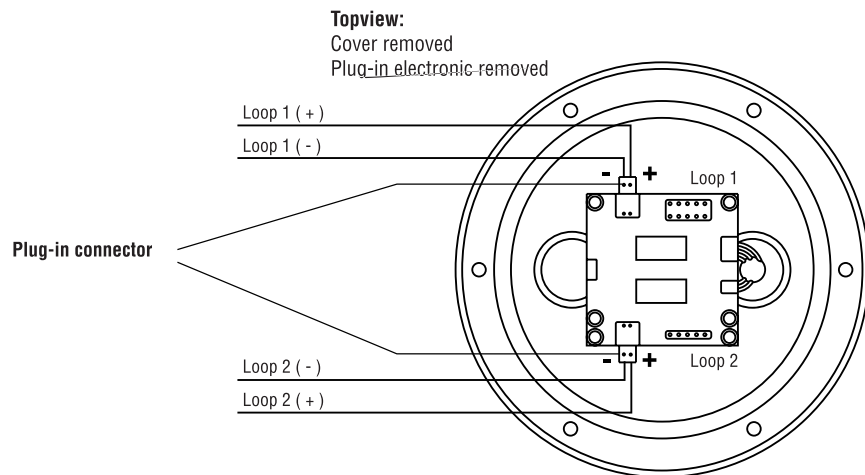


Figure 25. NEMA 4X housing

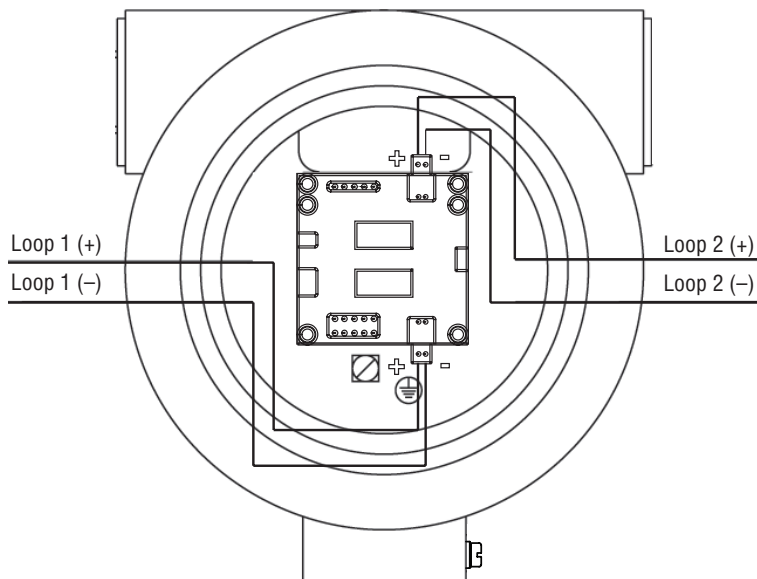


Figure 26. Single-cavity housing

WIRING AND CONNECTIONS (CONTINUED)

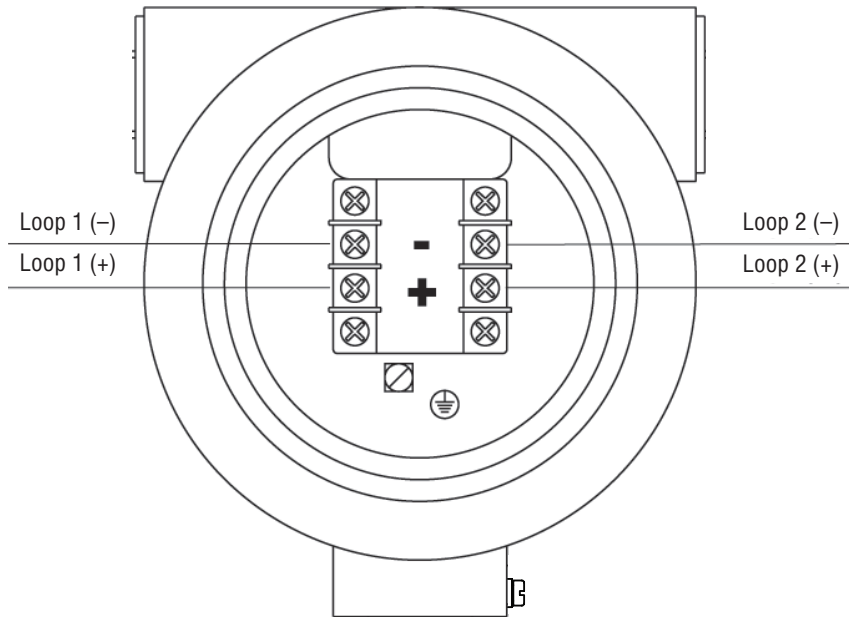


Figure 27. Dual-cavity housing

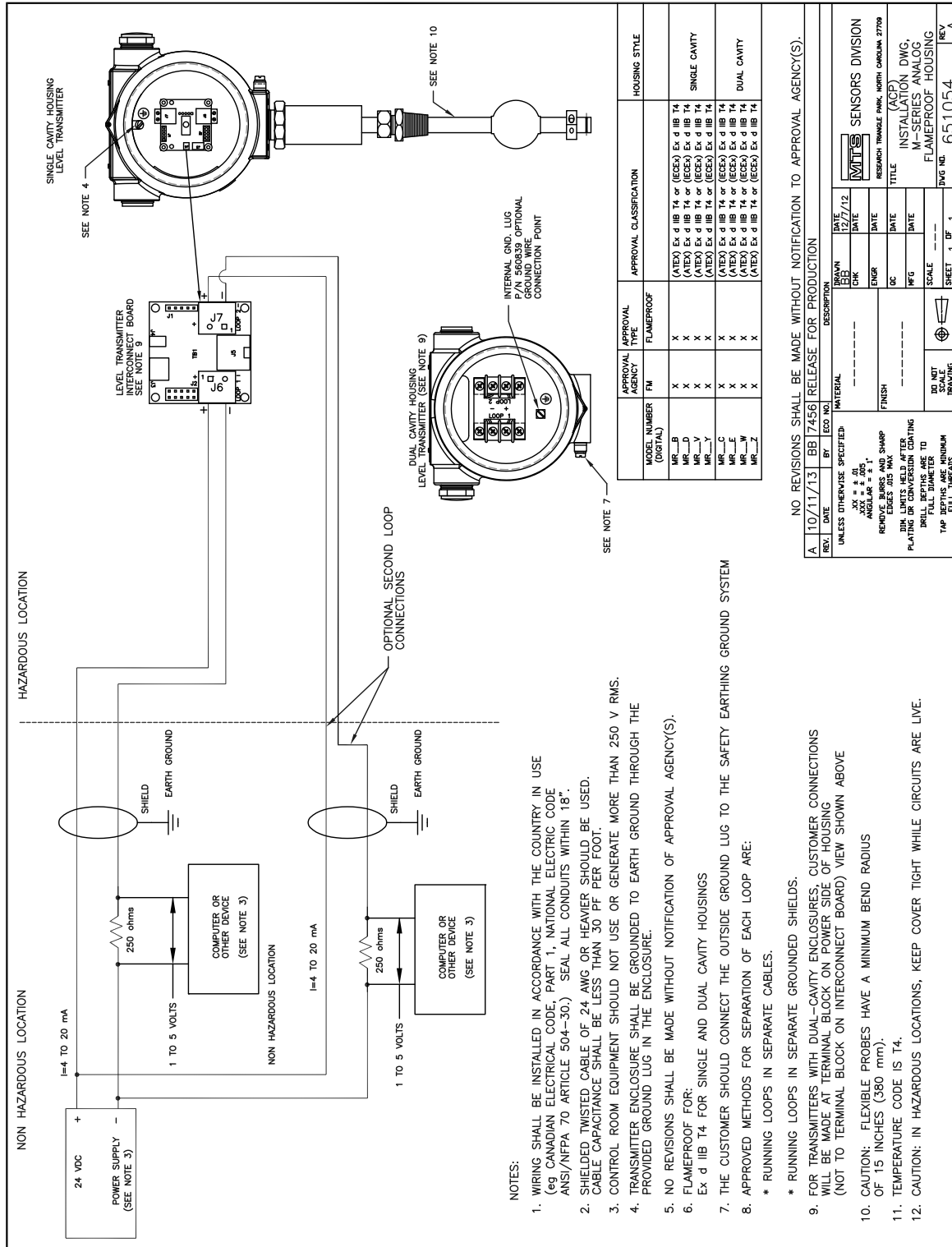


Figure 26. ATEX, IECEx, and CCoE Flameproof installation drawing

ATEX/IECEX

INSTALLATION DRAWING NOTES

Model number	Approval agency				Approval type		Approval classification	Wiring connection (Figure reference)
	PTB (ATEX)	FM (ATEX)	FM (IECEX)	PESO (CCoE)	Intrinsically Safe	Flame Proof		
MRH_B MRH_D			X			X	Ex d IIB T4 Ga/Gb	Figure 28
MRH_C MRH_E			X			X	Ex d IIB T4 Ga/Gb	Figure 29
MRE_B MRE_D		X				X	⊕ II 1/2 G Ex d IIB T4 Ga/Gb	Figure 28
MRE_C MRE_E		X				X	⊕ II 1/2 G Ex d IIB T4 Ga/Gb	Figure 29
MRP_B MRP_D				X		X	Ex d IIB T4 Ga/Gb	Figure 28
MRP_C MRP_E				X		X	Ex d IIB T4 Ga/Gb	Figure 29
MRE_F	X				X		⊕ II 1/2 G or II 2 G Ex ia IIA T4	Figure 27
MRE_G MRE_J	X				X		⊕ II 1/2 G or II 2 G Ex ia IIA T4	Figure 28
MRE_H MRE_K	X				X		⊕ II 1/2 G or II 2 G Ex ia IIA T4	Figure 29
MRE_P	X				X		⊕ II 1/2 G or II 2 G Ex ia IIB T4	Figure 27
MRE_R MRE_T	X				X		⊕ II 1/2 G or II 2 G Ex ia IIB T4	Figure 28
MRE_S MRE_U	X				X		⊕ II 1/2 G or II 2 G Ex ia IIB T4	Figure 29

Table 5. ATEX and IECEx model number approval classification

Wiring and connections

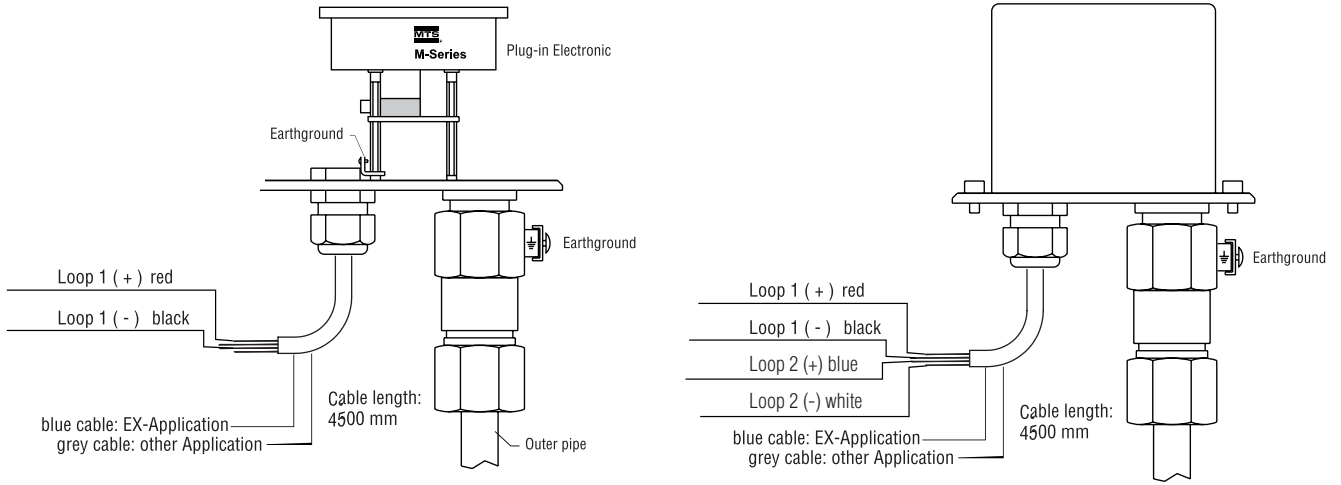


Figure 27. NEMA 4X housing with integrated cable.

WIRING AND CONNECTIONS (CONTINUED)

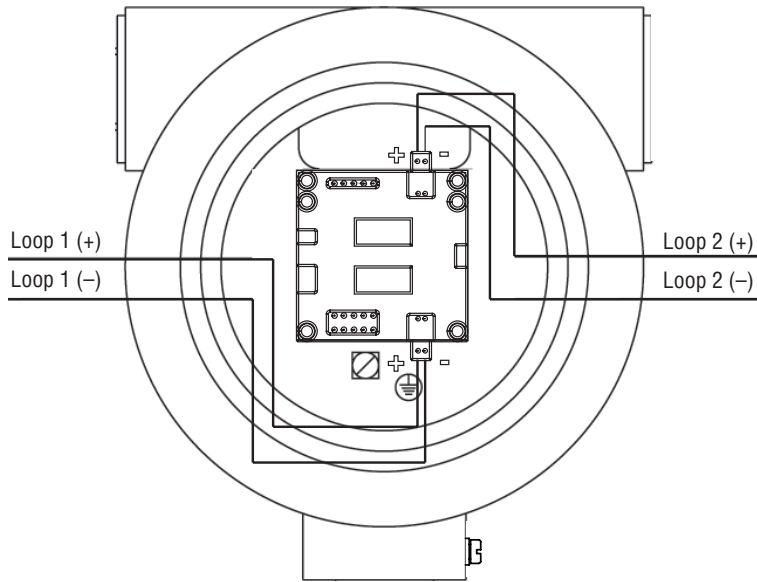


Figure 28. Single-cavity housing

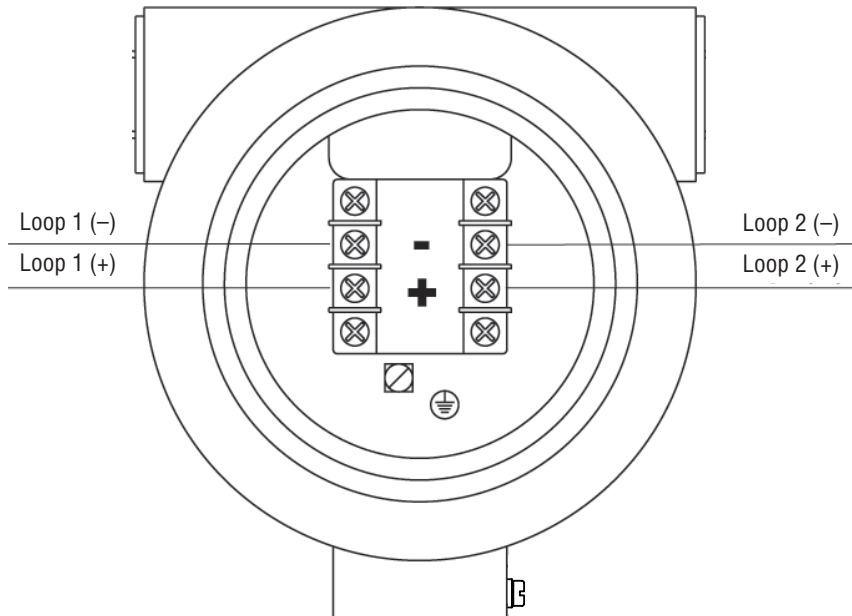


Figure 29. Dual-cavity housing

Model MR Operation and Installation Manual

Agency Information, ATEX, IECEx, and CCoE

SPECIAL CONDITIONS FOR USE

- Model MR sensors may only be connected to certified intrinsically safe circuits (Ex ia or Ex ib).
- The electronics housing is to be installed in zone 1 (category 2G, EPL Gb). The sensor pipe/hose may be installed in zone 0 (category 1, EPL Ga) if not restricted below.
- Equipotential bonding shall be installed inside and outside the hazardous area along the cable for supply and data.
- Float usage:
 - Metallic floats may only be used if they have a weight offset (asymmetric weight distribution).
 - Metallic floats on non-metallic pipes may not be used.
 - Aluminum floats may not be used.
- Plastic floats may only be installed in hazardous areas which require apparatus of category 1G (for zone 0) with explosion group IIA. Plastic floats may not be used on non-metallic pipes.
- Sensors with flexible measuring hoses:
 - The hose has to be mechanically protected from external impacts which may affect its function as separation wall.
 - Avoid kinking or bending the flexible hose in less than 16 inch (406 mm) diameter.
- Consult MTS if dimensional information on flameproof joints are necessary.
- For XP keep covers tight when circuits energized. Note: seal conduits within 18”.

ATEX APPROVAL

Physikalisch-Technische Bundesanstalt
Braunschweig und Berlin



(1) **EC-TYPE-EXAMINATION CERTIFICATE**
(Translation)

(2) Equipment and Protective Systems Intended for Use in Potentially Explosive Atmospheres - **Directive 94/9/EC**



(3) EC-type-examination Certificate Number:

PTB 10 ATEX 2011 X

(4) Equipment: Level sensors Level Plus M-Series, types MRA... and MC420...

(5) Manufacturer: MTS Sensor Technologie GmbH & Co. KG

(6) Address: Auf dem Schüffel 9, 58513 Lüdenscheid, Germany

(7) This equipment and any acceptable variation thereto are specified in the schedule to this certificate and the documents therein referred to.

(8) The Physikalisch-Technische Bundesanstalt, notified body No. 0102 in accordance with Article 9 of the Council Directive 94/9/EC of 23 March 1994, certifies that this equipment has been found to comply with the Essential Health and Safety Requirements relating to the design and construction of equipment and protective systems intended for use in potentially explosive atmospheres, given in Annex II to the Directive.

The examination and test results are recorded in the confidential test report PTB Ex 10-29149.

(9) Compliance with the Essential Health and Safety Requirements has been assured by compliance with:

EN 60079-0:2009 EN 60079-11:2007 EN 60079-26:2007

(10) If the sign "X" is placed after the certificate number, it indicates that the equipment is subject to special conditions for safe use specified in the schedule to this certificate.

(11) This EC-type-examination Certificate relates only to the design, examination and tests of the specified equipment in accordance to the Directive 94/9/EC. Further requirements of the Directive apply to the manufacturing process and supply of this equipment. These are not covered by this certificate.

(12) The marking of the equipment shall include the following:

II 1/2 G or II 2 G Ex ia IIA T4 or Ex ia IIB T4 Ga/Gb or Gb

Zertifizierungssektor Explosionsschutz
On behalf of PTB:

Braunschweig, May 12, 2011

(signature)

Dr.-Ing. U. Johannsmeyer
Direktor und Professor

4 pages, correct and complete as regards content.
By order:

Dr.-Ing. Johannsmeyer Braunschweig, April 24, 2014
Direktor und Professor

sheet 1/4

ZSEx10100e.dotm ZSEx001e

EC-type-examination Certificates without signature and official stamp shall not be valid. The certificates may be circulated only without alteration. Extracts or alterations are subject to approval by the Physikalisch-Technische Bundesanstalt. In case of dispute, the German text shall prevail.

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Physikalisch-Technische Bundesanstalt

Braunschweig und Berlin



SCHEDULE

(13)

(14) **EC-TYPE-EXAMINATION CERTIFICATE PTB 10 ATEX 2011 X**

(15) Description of equipment

The level sensors Level Plus M-Series, types MRA... and MC420... are applied in tanks for the continuous level measurement of liquids or for the interface detection in liquids. The level sensors Level Plus M-Series of types MRA... are furthermore used to detect the liquid temperature. The level sensors Level Plus M-Series of types MRA... can be equipped with a display for the visualization of measurement data.

The level sensors consist of an enclosure for the associated evaluation electronics, the process connection element and the sensor element with float. Depending on the design the level sensors are used in hazardous areas of

explosion group II A (marking Ex II 1/2 G or 2 G Ex ia IIA T4 Ga/Gb or Gb) or

explosion group II B (marking Ex II 1/2 G or 2 G Ex ia IIB T4 Ga/Gb or Gb)

For the respective variants, reference is made to the type code.

Category-1/2-equipment

The enclosure for the electronics system is installed in the hazardous area for category-2-equipment. The process connection elements are installed in the partition separating areas from each other where equipment of category 2 or 1 is required. The sensor element is installed in areas requiring equipment of category 1.

Category-2-equipment

The level sensors are installed in hazardous areas for category-2-equipment.

For relationship between maximum permissible ambient temperature and supplied power, reference is made to the table given below.

Electrical data

Supply and
data circuits

Types MC420...

type of protection Intrinsic Safety Ex ia IIB
or Ex ib IIB

Only for connection to certified intrinsically safe circuits.

Maximum values:

$U = 28 \text{ V}$

$\Sigma I = 118 \text{ mA}$

C_i negligibly low

$L_i = 0.2 \text{ mH}$

sheet 2/4

EC-type-examination Certificates without signature and official stamp shall not be valid. The certificates may be circulated only without alteration. Extracts or alterations are subject to approval by the Physikalisch-Technische Bundesanstalt. In case of dispute, the German text shall prevail.

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ATEX APPROVAL

Physikalisch-Technische Bundesanstalt



Braunschweig und Berlin

SCHEDULE TO EC-TYPE-EXAMINATION CERTIFICATE PTB 10 ATEX 2011 X

Total power ΣP_i	Ambient temperature at the electronics
1.3 W	- 20 ... +40 °C
1.2 W	- 20 ... +60 °C
1.0 W	- 20 ... +80 °C

For applications requiring category-1 equipment the process pressure of the media shall range from 0.8 bar up to 1.1 bar and the process temperatures from -20 °C up to +60 °C. In case of a deviation from these abovementioned operating conditions it shall be observed that the sensor does not show any self-heating (not even in the event of a fault) and that the operating company is responsible for the safe operation of the system with respect to the pressures / temperatures of the media used. The manufacturer's specifications shall be observed here.

Types MRA...
type of protection Intrinsic Safety Ex ia IIB or Ex ia IIA
or Ex ib IIB or Ex ib IIA
Only for connection to certified intrinsically safe circuits.
Maximum values per circuit:
 $U_i = 28 \text{ V}$
 $I_i = 118 \text{ mA}$
 C_i negligibly low
 $L_i = 0.2 \text{ mH}$

Power P_i	Ambient temperature at the electronics
1.3 W	- 20 ... +40 °C
1.2 W	- 20 ... +60 °C
1.0 W	- 20 ... +80 °C

For applications requiring category-1 equipment the process pressure of the media shall range from 0.8 bar up to 1.1 bar and the process temperatures from -20 °C up to +60 °C. In case of a deviation from these abovementioned operating conditions it shall be observed that the sensor does not show any self-heating (not even in the event of a fault) and that the operating company is responsible for the safe operation of the system with respect to the pressures / temperatures of the media used. The manufacturer's specifications shall be observed here.

(16) Test report PTB Ex 10-29149

(17) Special conditions for safe use

1. Since the supply and data circuits of the level-transmitters are operationally grounded equipotential bonding shall be provided along the entire cable run of the supply and data circuits inside and outside of the hazardous area.

sheet 3/4

EC-type-examination Certificates without signature and official stamp shall not be valid. The certificates may be circulated only without alteration. Extracts or alterations are subject to approval by the Physikalisch-Technische Bundesanstalt. In case of dispute, the German text shall prevail.

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Physikalisch-Technische Bundesanstalt



Braunschweig und Berlin

SCHEDULE TO EC-TYPE-EXAMINATION CERTIFICATE PTB 10 ATEX 2011 X

2. Level-transmitters which are equipped with plastic floats shall only be installed in hazardous areas requiring equipment of category 1 with equipment group II A.

(18) Essential health and safety requirements

met by compliance with the standards mentioned above

Zertifizierungssektor Explosionsschutz
On behalf of PTB:

Braunschweig, May 12, 2011

(signature)

Dr.-Ing. U. Johannsmeyer
Direktor und Professor

sheet 4/4

EC-type-examination Certificates without signature and official stamp shall not be valid. The certificates may be circulated only without alteration. Extracts or alterations are subject to approval by the Physikalisch-Technische Bundesanstalt. In case of dispute, the German text shall prevail.

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Physikalisch-Technische Bundesanstalt
Braunschweig und Berlin



EG-Baumusterprüfbescheinigung

- (1)
- (2) Geräte und Schutzsysteme zur bestimmungsgemäßen Verwendung in explosionsgefährdeten Bereichen - **Richtlinie 94/9/EG**
- (3) EG-Baumusterprüfbescheinigungsnummer



PTB 10 ATEX 2011 X

- (4) Gerät: Füllstandsensoren Level Plus M-Serie Typen MRA... und MC420...
- (5) Hersteller: MTS Sensor Technologie GmbH & Co. KG
- (6) Anschrift: Auf dem Schüffel 9, 58513 Lüdenscheid, Deutschland
- (7) Die Bauart dieses Gerätes sowie die verschiedenen zulässigen Ausführungen sind in der Anlage und den darin aufgeführten Unterlagen zu dieser Baumusterprüfbescheinigung festgelegt.
- (8) Die Physikalisch-Technische Bundesanstalt bescheinigt als benannte Stelle Nr. 0102 nach Artikel 9 der Richtlinie des Rates der Europäischen Gemeinschaften vom 23. März 1994 (94/9/EG) die Erfüllung der grundlegenden Sicherheits- und Gesundheitsanforderungen für die Konzeption und den Bau von Geräten und Schutzsystemen zur bestimmungsgemäßen Verwendung in explosionsgefährdeten Bereichen gemäß Anhang II der Richtlinie.
Die Ergebnisse der Prüfung sind in dem vertraulichen Bewertungs- und Prüfbericht PTB Ex 10-29149 festgehalten.
- (9) Die grundlegenden Sicherheits- und Gesundheitsanforderungen werden erfüllt durch Übereinstimmung mit
EN 60079-0:2009 EN 60079-11:2007 EN 60079-26:2007
- (10) Falls das Zeichen „X“ hinter der Bescheinigungsnummer steht, wird auf besondere Bedingungen für die sichere Anwendung des Gerätes in der Anlage zu dieser Bescheinigung hingewiesen.
- (11) Diese EG-Baumusterprüfbescheinigung bezieht sich nur auf Konzeption und Prüfung des festgelegten Gerätes gemäß Richtlinie 94/9/EG. Weitere Anforderungen dieser Richtlinie gelten für die Herstellung und das Inverkehrbringen dieses Gerätes. Diese Anforderungen werden nicht durch diese Bescheinigung abgedeckt.
- (12) Die Kennzeichnung des Gerätes muss die folgenden Angaben enthalten:

Ex II 1/2 G bzw. II 2 G Ex ia IIA T4 bzw. Ex ia IIB T4 Ga/Gb bzw. Gb

Zertifizierungssektor Explosionschutz
Im Auftrag

Braunschweig, 12. Mai 2011

Dr.-Ing. U. Johannsmeyer
Direktor und Professor



ZSEEx10100d.dot

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Physikalisch-Technische Bundesanstalt

Braunschweig und Berlin

Agency Information

- (13) **Anlage**
- (14) **EG-Baumusterprüfbescheinigung PTB 10 ATEX 2011 X**

(15) Beschreibung des Gerätes

Die Füllstandsensoren Level Plus M-Serie Typen MRA... und MC420... werden in Behältern zur kontinuierlichen Füllstandmessung von Flüssigkeiten oder zur Messung von Trennschichten in Flüssigkeiten verwendet. Weiterhin wird bei den Füllstandsensoren Level Plus M-Serie Typen MRA... die Temperatur der Flüssigkeiten erfasst. Zur Visualisierung der Messdaten können die Füllstandsensoren Level Plus M-Serie Typen MRA... mit einem Display bestückt werden.

Die Füllstandsensoren bestehen aus einem Elektronikgehäuse mit der zugehörigen Auswertelektronik, dem Prozessanschlusselement und dem Sensorelement mit Schwimmer. Je nach Ausführung werden die Füllstandsensoren in explosionsgefährdeten Bereichen der Explosionsgruppe II A (Kennzeichnung Ex II 1/2 G bzw. 2 G Ex ia IIA T4 Ga/Gb bzw. Gb) oder der Explosionsgruppe IIB (Kennzeichnung Ex II 1/2 G bzw. 2 G Ex ia IIB T4 Ga/Gb bzw. Gb) verwendet. Die Varianten sind den jeweiligen Typschlüsseln zu entnehmen.

Kategorie-1/2-Betriebsmittel

Das Elektronikgehäuse wird im explosionsgefährdeten Bereich für Kategorie-2-Betriebsmittel errichtet. Die Prozessanschlusselemente werden in die Trennwand errichtet, die die Bereiche voneinander trennt, in denen Betriebsmittel der Kategorie 2 oder 1 erforderlich sind. Das Sensorelement wird in Bereichen errichtet, die Betriebsmittel der Kategorie 1 erfordern.

Kategorie-2-Betriebsmittel

Die Füllstandsensoren werden in explosionsgefährdeten Bereichen für Kategorie-2-Betriebsmittel errichtet.

Die Zuordnung zwischen höchstzulässiger Umgebungstemperatur und zugeführter Leistung ist der u.a. Tabelle zu entnehmen.

Elektrische Daten

Versorgungs- und Datenstromkreise

Typen MC420...

in Zündschutzart Eigensicherheit Ex ia IIB bzw. Ex ib IIB

Nur zum Anschluss an bescheinigte eigensichere Stromkreise.

Höchstwerte:

U = 28 V

$\Sigma I = 118 \text{ mA}$

C_i vernachlässigbar klein

L_i = 0,2 mH

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Physikalisch-Technische Bundesanstalt

Braunschweig und Berlin

Anlage zur EG-Baumusterprüfbescheinigung PTB 10 ATEX 2011 X

Summenleistung ΣP_i	Umgebungstemperatur an der Elektronik
1,3 W	- 20 ... +40 °C
1,2 W	- 20 ... +60 °C
1,0 W	- 20 ... +80 °C

Der Prozessdruck der Medien bzw. die Mediumtemperatur muss bei Anwendungen, die Kategorie-1-Betriebsmittel erfordern, zwischen 0,8 bis 1,1 bar bzw. -20 ... +60 °C liegen. Wird von diesen oben genannten Einsatzbedingungen am Messfühler abgewichen, ist zu beachten, dass der Messfühler (auch im Störfall) keine eigene Erwärmung aufweist und dass der sichere Betrieb der Anlage im Hinblick auf Drücke/Temperaturen der verwendeten Stoffe dem Betreiber obliegt. Hierbei sind die Kenndaten des Herstellers zu beachten.

Typen MRA...
in Zündschutzart Eigensicherheit Ex ia IIB bzw. Ex ia IIA
bzw. Ex ib IIB bzw. Ex ib IIA
Nur zum Anschluss an bescheinigte eigensichere Stromkreise.
Höchstwerte je Stromkreis:
 $U_i = 28 \text{ V}$
 $I_i = 118 \text{ mA}$
 C_i vernachlässigbar klein
 $L_i = 0,2 \text{ mH}$

Leistung P_i	Umgebungstemperatur an der Elektronik
1,3 W	- 20 ... +40 °C
1,2 W	- 20 ... +60 °C
1,0 W	- 20 ... +80 °C

Der Prozessdruck der Medien bzw. die Mediumtemperatur muss bei Anwendungen, die Kategorie-1-Betriebsmittel erfordern, zwischen 0,8 bis 1,1 bar bzw. -20 ... +60 °C liegen. Wird von diesen oben genannten Einsatzbedingungen am Messfühler abgewichen, ist zu beachten, dass der Messfühler (auch im Störfall) keine eigene Erwärmung aufweist und dass der sichere Betrieb der Anlage im Hinblick auf Drücke/Temperaturen der verwendeten Stoffe dem Betreiber obliegt. Hierbei sind die Kenndaten des Herstellers zu beachten.

(16) Bewertungs- und Prüfbericht PTB Ex 10-29149

(17) Besondere Bedingungen

- Da die Versorgungs- und Datenstromkreise der Füllstand-Transmitter betriebsmäßig gerundet sind, ist längs des Leitungszuges der Versorgungs- und Datenstromkreise innerhalb und außerhalb des explosionsgefährdeten Bereiches Potentialausgleich zu errichten.

Seite 3/4

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Physikalisch-Technische Bundesanstalt

Braunschweig und Berlin

Anlage zur EG-Baumusterprüfbescheinigung PTB 10 ATEX 2011 X

2. Werden die Füllstand-Transmitter mit Kunststoffschwimmern ausgerüstet, so dürfen sie nur in explosionsgefährdeten Bereichen errichtet werden, die Betriebsmittel der Kategorie 1 mit der Betriebsmittelgruppe IIA erfordern.

(18) Grundlegende Sicherheits- und Gesundheitsanforderungen

erfüllt durch die Übereinstimmung mit den vorgenannten Normen

Zertifizierungssektor Explosionsschutz
Im Auftrag

Braunschweig, 10. Mai 2011



Dr.-Ing. U. Johannshofer
Direktor und Professor



Seite 4/4

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ATEX APPROVAL

1 EC-TYPE EXAMINATION CERTIFICATE 

2 **Equipment or Protective systems intended for use in Potentially Explosive Atmospheres - Directive 94/9/EC**

3 **EC-Type Examination Certificate No:** FM13ATEX0050X

4 **Equipment or protective system:** Model MG and MR Liquid Level Transmitters
(Type Reference and Name)

5 **Name of Applicant:** MTS Systems Corporation

6 **Address of Applicant:** 3001 Sheldon Drive
Cary, NC 27513
USA

7 This equipment or protective system and any acceptable variation thereto is specified in the schedule to this certificate and documents therein referred to.

8 FM Approvals Ltd, notified body number 1725 in accordance with Article 9 of Directive 94/9/EC of 23 March 1994, certifies that this equipment has been found to comply with the Essential Health and Safety Requirements relating to the design and construction of equipment intended for use in potentially explosive atmospheres given in Annex II to the Directive.


The examination and test results are recorded in confidential report number:
3047518 dated 11th November 2013


9 Compliance with the Essential Health and Safety Requirements, with the exception of those identified in item 15 of the schedule to this certificate, has been assessed by compliance with the following documents:
EN60079-0: 2012, EN60079-1: 2007, EN60079-26: 2007, EN60529:1991 + A1: 2000

10 If the sign 'X' is placed after the certificate number, it indicates that the equipment is subject to specific conditions of use specified in the schedule to this certificate.

11 This EC-Type Examination certificate relates only to the design, examination and tests of the specified equipment or protective system in accordance to the directive 94/9/EC. Further requirements of the Directive apply to the manufacturing process and supply of this equipment or protective system. These are not covered by this certificate.

12 The marking of the equipment or protective system shall include:

 II 1/2 G Ex d IIB T4 Ga/Gb Ta = -20°C to +40°C; IP66


Mick Gower
cm@mick.gower, or@FM Approvals, ou,
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cncb
2014.07.28 09:13:37 +0100
Member of the FM Global Group

Mick Gower
Certification Manager, FM Approvals Ltd.

Issue date: 28th July 2014

THIS CERTIFICATE MAY ONLY BE REPRODUCED IN ITS ENTIRETY AND WITHOUT CHANGE

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F ATEX 020 (Apr/14)

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ATEX APPROVAL

SCHEDULE

to EC-Type Examination Certificate No. FM13ATEX0050X

13 Description of Equipment or Protective System:

The Model MG and MR Liquid Level Transmitters are 4-20 mA level transmitters. The electronics are housed in either a single cavity or dual cavity enclosure manufactured by Adalet and ATEX-certified under DEMKO 07 ATEX 0622294U as Ex d IIC/IIB+H2 Gb; IP66. The enclosures are supplied with either blind or window covers.

The sensor housing (probe) are of two constructions: rigid or flexible. Both assemblies feature a welded end cap and a welded stainless steel adapter which provides a ¼ inch NPT connection to the electronics enclosure. The rigid probe is constructed of either stainless steel, Hastelloy C-276 or Monel K-500. The flex probe is a stainless steel, all welded annularly corrugated hose with a stainless steel overbraid. An independent float containing permanent magnets rides on the outside of the sensor housing.

The Model MG and MR Liquid Level Transmitters operate on 10.5 to 30 Vdc (100 mA maximum). The transmitters are intended for use in an ambient temperature of -20°C to +40°C and with process temperatures up to +125°C at a pressure of 1000 psi (rigid probes) or 435 psi (flex probes).

MGabcdehijkl. Liquid Level Transmitter.

a = Agency approval E, H or P.

b = Output M, D, F, S, T or X.

c = Housing type B, C, V or W.

d = Electronics mounting 1, 3, 4, 5 or 6.

e = Sensor pipe B, C, D, E, F, M, N, P or R.

f = Material of construction 1, 2, 3, 9 or A.

g = Process connection type 1, 4, 5, 6, 7, 8, 9 or X.

h = Process connection size A, B, C, D, E, F, G, H, J or X.

i = Digital thermometer 0, 1, 2, 5, 6, 7, 8, 9, A, B, C, D, E, F, G, H, J, K or L.

j = Unit of measure M or U.

k = Length (five digits maximum representing sensor length in millimeters or inches).

l = Special E or S.

MRabcdehijkl. Liquid Level Transmitter.

a = Agency approval E, H or P.

b = Output 1, 2, 3, 4 or X.

c = Housing type B, C, D, E, V, W, Y or Z.

d = Electronics mounting 1, 3, 4, 5 or 6.

e = Sensor pipe B, C, D, E, F, H, J, K or R.

f = Material of construction 1, 2, 3, 9 or A.

g = Process connection type 1, 4, 5, 6, 7, 8, 9 or X.

h = Process connection size A, B, C, D, E, F, G, H, J or X.

i = RTD 0, 1 or 2.

j = Unit of measure M or U.

k = Length (five digits maximum representing sensor length in millimeters or inches).

l = Special E or S.

14 Specific Conditions of Use:

Consult the manufacturer if dimensional information on the flameproof joints is necessary.

15 Essential Health and Safety Requirements:

The relevant EHSRs that have not been addressed by the standards listed in this certificate have been identified and assessed in the confidential report identified in item 8.

THIS CERTIFICATE MAY ONLY BE REPRODUCED IN ITS ENTIRETY AND WITHOUT CHANGE

FM Approvals Ltd. 1 Windsor Dials, Windsor, Berkshire, UK. SL4 1RS

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F ATEX 020 (Apr/14)

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ATEX APPROVAL

SCHEDULE



to EC-Type Examination Certificate No. FM13ATEX0050X

16 Test and Assessment Procedure and Conditions:

This EC-Type Examination Certificate is the result of testing of a sample of the product submitted, in accordance with the provisions of the relevant specific standard(s), and assessment of supporting documentation. It does not imply an assessment of the whole production.

Whilst this certificate may be used in support of a manufacturer's claim for CE Marking, FM Approvals Ltd accepts no responsibility for the compliance of the equipment against all applicable Directives in all applications.

This Certificate has been issued in accordance with FM Approvals Ltd's ATEX Certification Scheme.

17 Schedule Drawings

A list of the significant parts of the technical documentation is annexed to this certificate and a copy has been kept by the Notified Body.

18 Certificate History

Details of the supplements to this certificate are described below:

Date	Description
12 th November 2013	Original Issue.
28 th July 2014	<u>Supplement 1:</u> Report Reference: 3047518rev140406 dated 23 rd July 2014 Description of the Change: Minor documentation and model code revision (added Agency approval code 'P') not affecting the equipment safety.

THIS CERTIFICATE MAY ONLY BE REPRODUCED IN ITS ENTIRETY AND WITHOUT CHANGE

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F ATEX 020 (Apr/14)

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CSA APPROVAL



Certificate: 1002006 (LR 81728)

Master Contract: 156704

Project: 2472822

Date Issued: February 6, 2012

Class I, Groups A, B, C and D; Class II, Groups E, F and G; Class III; Enclosure 4X:

- M-SERIES Level Gauge, Types MRAabcdefghijjjk, rated 36V dc max., 4-20 mA; intrinsically safe when connected per installation Drawing 650805, Temp. Code T4; suffixes in Type number denote electronics options, housing type, mounting, materials, process connections and sensor length.

- MC420 Level Gauge, rated 36V dc, 4-20 mA; intrinsically safe when connected per installation Drawing 650805, Temp. Code T4.

- M-SERIES Digital Level Gauge, Types MGAX#xxxxxxxxxxxx, where # = A, B, C, D, E, L, 3, 6, 7, 8, or 9 (MGAXL and MGAX8 suitable for Class I locations only); rated 30 Vdc max., 100 mA; intrinsically safe when connected per installation drawing 650838, temp. code T4; suffixes in Type number denote electronics options, output, mounting, materials, process connections and sensor length.

Class I, Groups A, B, C and D; Enclosure 4X:

- M-SERIES USTD/PTM Level Gauge, Type MUAXUxxxxxxxxxxxx; rated 30 Vdc max., 100 mA; intrinsically safe when connected per installation drawing 650844, temp. code T4; suffixes in Type number denote electronics options, output, mounting, materials, process connections and sensor length.

Class I, Groups A, B, C and D:

- M-SERIES Digital Level Gauge, Type MVUxxxS; rated 30 Vdc max., 100 mA; intrinsically safe when connected per installation drawing 650838, temp. code T4; xxx in Type number denotes sensor length.

APPLICABLE REQUIREMENTS

CSA Std C22.2 No. 0-10- General Requirements - Canadian Electrical Code Part II

CSA Std C22.2 No. 25-1966 (R 2009) - Enclosures for Use in Class II, Groups E, F and G Hazardous Locations

CSA Std C22.2 No. 30-M1986 (R 2007) - Explosion-Proof Enclosures for Use in Class I Hazardous Locations

CAN/CSA-C22.2 No. 94-M91(R 2006) - Special Purpose Enclosures

CSA Std C22.2 No. 142-M1987 (R 2009) - Process Control Equipment

CAN/CSA-C22.2 No. 157-92 (R 2006) - Intrinsically Safe and Non-incendive Equipment for Use in Hazardous Locations

CSA Std C22.2 No. 213-M1987 (R 2008)- Non-Incendive Electrical Equipment for Use in Class I Division 2 Hazardous Locations

MR CE DECLARATION OF CONFORMITY



EC13.017A

EC Declaration of Conformity
EG-Konformitätserklärung
Déclaration CE de Conformité

MTS Systems Corporation • 3001 Sheldon Drive • Cary, NC 27513 • USA

declares as manufacturer in sole responsibility that the liquid level sensor type
erklärt als Hersteller in alleiniger Verantwortung, dass der Füllstandsensor Typ
déclaré en qualité de fabricant sous sa seule responsabilité que le capteur de niveau type

Level Plus **MR**abcd... a = E, H; b = 1, 2, 3, 4, X; c = B, C, D, E, V, W, Y, Z;
d = 1, 3, 4, 5, 6;

comply with the regulations of the following European Directives:
den Vorschriften folgender Europäischen Richtlinien entsprechen:
sont conformes aux prescriptions des directives européennes suivantes :

94/9/EC Equipment and protective systems for use in potentially explosive atmospheres
Geräte und Schutzsysteme zur Verwendung in explosionsgefährdeten Bereichen
Appareils et systèmes de protection à être utilisés en atmosphères explosibles

2004/108/EC Electromagnetic Compatibility
Elektromagnetische Verträglichkeit
Compatibilité électromagnétique

Applied harmonized standards:
Angewandte harmonisierte Normen:
Normes harmonisées appliquées :

EN 60079-0:2012, EN 60079-1:2007, EN 60079-26:2007, EN 60529:1991 + A1:2000
EN 61326-1:2006, EN 61326-2-3:2006

EC Type Examination Certificate:
EG-Baumusterprüfbescheinigung:
Certificat de l'examen CE de type:
ausgestellt durch / issued by / exposé par:

FM 13 ATEX 0050 X

FM Approvals Ltd., Windsor, Berkshire, UK (1725)

Notified body for quality assurance control:
Benannte Stelle für Qualitätsüberwachung:
Organisme notifié pour l'assurance qualité:

Physikalisch-Technische Bundesanstalt (PTB)
Braunschweig, Germany (0102)

Kennzeichnung / Marking / Marquage:

II 1/2G Ex d IIB T4 Ga/Gb
-20°C ≤ T_{amb} ≤ +40°C; IP66

Lüdenscheid, 2013-12-17

MTS Sensor Technologie GmbH & Co. KG

Dipl.-Ing. Thomas Muckenhaupt
Quality Management
ATEX Representative



Handelsregister: Amtsgericht Iserlohn HRA 3314 • Geschäftsführer: Saiful Islam Ahmad
MTS Sensor Technologie ist ein Unternehmen der MTS Systems Corporation, Minneapolis, USA



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Agency
Information

CERTIFICATE OF COMPLIANCE

HAZARDOUS (CLASSIFIED) LOCATION ELECTRICAL EQUIPMENT

This certificate is issued for the following equipment:

MGAabcdefghijkl. M-Series Digital Level Transmitters.

XP / I / 1 / BCD / T6 Ta = 71°C; DIP / II,III / EFG / T6 Ta = 71°C; Type 4X

IS / I,II,III / 1 / ABCDEFG / T4 Ta = 71°C - 650838; Entity; Type 4X

NI / I / 2 / ABCD / T4 Ta = 71°C; Type 4X

Entity Parameters:

$V_{Max} = 28 V$, $I_{Max} = 200 mA$, $C_i = 0 \mu F$, $L_i = 0 mH$.

a = Output M, D, O, N or T.

b = Housing Type A, B, C, D, E, L, 3, 6, 7, 8 or 9 (A, 3, 9 are IS only) (L, 8 are IS, Class I only) (B, C, D, E, 6, 7 are XP or IS).

c = Electronics Mounting 1, 3, 4, 5 or 6.

d = Sensor Pipe B, C, D, E, F, M, N, P, R, S, T, U, 1, 2 or 3.

e = Material of Construction 1, 2, 3, 9, A or C.

f = Process Connection Type 1, 4, 5, 6, 7, 8 or X.

g = Process Connection Size A, B, C, D, E, F, G, H, J or X.

h = DT 0, 1, 2, 5, 6, 7, 8, 9, A, B, C, D, E, F, G, H, J, K or L.

i = Unit of Measure M or U.

j = Length.

k = Special S, E or R.

MGAabcdefghijkl. M-Series Digital Level Transmitters.

XP / I / 1 / BCD / T6 Ta = 71°C; DIP / II,III / 1 / EFG / T6 Ta = 71°C; Type 4X

a = Output M, D, F, O, N, S or T.

b = Housing Type B, C, D, E, 6 or 7.

c = Electronics Mounting 1, 3, 4, 5 or 6.

d = Sensor pipe B, C, D, E, F, M, N, P, R, S, T, U, 1, 2, or 3.

e = Material of Construction 1, 2, 3, 9, A or C.

f = Process Connection Type 1, 4, 5, 6, 7, 8 or X.

g = Process Connection Size A, B, C, D, E, F, G, H, J or X.

h = DT 0, 1, 2, 5, 6, 7, 8, 9, A, B, C, D, E, F, G, H, J, K or L.

i = Unit of Measure M or U .

j = Length.

k = Special S, E or R.

FM APPROVAL



USTD II abcdef M-Series Digital Level Transmitters.

IS / I / 1 / ABCD / T4 Ta = 71°C - 650838; Entity; Type 4X

Entity Parameters:

$V_{Max} = 28\text{ V}$, $I_{Max} = 200\text{ mA}$, $C_i = 0\text{ }\mu\text{F}$, $L_i = 0\text{ mH}$.

a = Unit of Measure. M or U.

b = Length (X through XXXX).

c = Process connection type H or A.

d = Cable S or C.

e = Output D or M.

MRabcdeghijkl. M-Series Level Transmitters.

XP / I / 1 / BCD / T6 Ta = 71°C

DIP / II,III / 1 / EFG / T6 Ta = 71°C; Type 4X

IS / I,II,III / 1 / CDEFG / T4 Ta = 71°C – 650805-1 Entity; Type 4X

Entity Parameters:

$V_{Max} = 28\text{ V}$, $I_{Max} = 118\text{ mA}$, $C_i = 0\text{ }\mu\text{F}$, $L_i = 220\text{ }\mu\text{H}$.

a = Agency Approval A, F, X.

b = Output 1, 2, 3 or 4.

c = Housing type A, B, C, D, E, L, M or 3, V, W, Y or Z (A, L, M or 3 intrinsically safe only).

d = Electronics mounting 1, 2, 3, 4, 5, 6.

e = Sensor pipe B, C, D, E, F, H, J, K, L, R, S, T, U, 1, 2 or 3.

f = Material of construction 1, 2, 3, 9, A or C.

g = Process connection type 1, 3, 4, 5, 6, 7, 8 or X.

h = Process connection size A, B, C, D, E, F, G, H, J or X.

i = RTD 0, 1 or 2.

j = Unit of measure M or U.

k = Length

l = Special S or E.

MRabcdeghijkl. M-Series Level Transmitters.

XP / I / 1 / BCD / T6 Ta = 71°C

DIP / II,III / 1 / EFG / T6 Ta = 71°C; Type 4X

IS / I,II,III / 1 / DEFG / T4 Ta = 71°C – 650805-1 Entity; Type 4X

Entity Parameters:

$V_{Max} = 28\text{ V}$, $I_{Max} = 118\text{ mA}$, $C_i = 0\text{ }\mu\text{F}$, $L_i = 220\text{ }\mu\text{H}$.

a = Agency Approval A, F, X.

b = Output 1, 2, 3 or 4.

c = Housing type A, B, C, D, E, L, M or 3, V, W, Y or Z (A, L, M or 3 intrinsically safe only).

d = Electronics mounting 1, 2.

e = Sensor pipe B, C, D, E, F, H, J, K, L, R, S, T, U, 1, 2 or 3.

f = Material of construction 1, 2, 3, 9, A or C.

g = Process connection type 1, 3, 4, 5, 6, 7, 8 or X.

h = Process connection size A, B, C, D, E, F, G, H, J or X.

i = RTD 0, 1 or 2.

j = Unit of measure M or U.

k = Length

l = Special S or E.

MC420abc. M-Series Level Transmitters.

IS / I,II,III / 1 / CDEFG / T4 Ta = 71°C – 650805-1 Entity; Type 4X

Entity Parameters: $V_{Max} = 28\text{ V}$, $I_{Max} = 118\text{ mA}$, $C_i = 0\text{ }\mu\text{F}$, $L_i = 220\text{ }\mu\text{H}$.

a = Length 011 to 216.

b = Agency Approval F.

c = Options S, N, 1, 2, 3.

FM APPROVAL



Equipment Ratings:

MGA – Explosionproof for Class I, Division 1, Groups B, C, D; Dust-Ignitionproof for Class II, III Division 1, Groups E, F & G; Intrinsically Safe for Class I, II, III Division 1, Groups A, B, C, D, E, F & G Hazardous (Classified) outdoor (Type 4X) locations in accordance with Entity requirements and MTS Installation Drawing 650838

USTD II - Intrinsically Safe for Class I, Division 1, Groups A, B, C, D Hazardous (Classified) outdoor (Type 4X) locations in accordance with Entity requirements and MTS Installation Drawing 650838

MR - Explosionproof for Class I, Division 1, Groups B, C, D; Dust-Ignitionproof for Class II, III Division 1, Groups E, F & G; Intrinsically Safe for Class I, II, III Division 1, Groups C, D, E, F & G Hazardous (Classified) outdoor (NEMA Type 4X) locations in accordance with Entity requirements and MTS Installation Drawing 650805-1

MR - Explosionproof for Class I, Division 1, Groups B, C, D; Dust-Ignitionproof for Class II, III Division 1, Groups E, F & G; Intrinsically Safe for Class I, II, III Division 1, Groups D, E, F & G Hazardous (Classified) outdoor (NEMA Type 4X) locations in accordance with Entity requirements and MTS Installation Drawing 650805-1

MC420 - Intrinsically Safe for Class I, II, III Division 1, Groups C, D, E, F & G Hazardous (Classified) outdoor (NEMA Type 4X) locations in accordance with Entity requirements and MTS Installation Drawing 650805-1

FM Approved for:

MTS Systems Corporation
Sensors Division
Cary, NC
USA

FM APPROVAL



This certifies that the equipment described has been found to comply with the following Approval Standards and other documents:

Class 3600	2011
Class 3610	2010
Class 3615	2006
Class 3810	2005
ANSI/NEMA 250	1991


Original Project ID: 3006790

Approval Granted: March 27, 2000

Subsequent Revision Reports / Date Approval Amended

Report Number	Date	Report Number	Date
3008314	July 17, 2000	3041372	March 26, 2012
3008777	September 8, 2000	3045596	June 14, 2013
3009320	October 23, 2000		
3011770	September 24, 2001		
3010813	November 26, 2001		
3013732	March 18, 2002		
3014667	October 25, 2002		
031113	November 26, 2003		
040115	February 2, 2004		
040624	July 7, 2004		
040830	October 1, 2004		
050915	September 22, 2005		
060424	May 4, 2006		
060619	August 9, 2006		
070917	September 20, 2007		
071024	October 29, 2007		
080310	March 31, 2008		
080430	July 24, 2008		
100720	August 31, 2010		

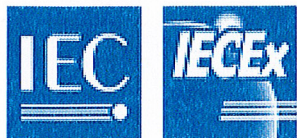
FM Approvals LLC



J.E. Marquedant
Group Manager, Electrical

14 June 2013

Date



IECEX Certificate of Conformity

INTERNATIONAL ELECTROTECHNICAL COMMISSION IEC Certification Scheme for Explosive Atmospheres

for rules and details of the IECEx Scheme visit www.iecex.com

Certificate No.:	IECEX FMG 13.0019X	Issue No: 0	<u>Certificate history:</u> Issue No. 0 (2013-11-15)
Status:	Current	Page 1 of 3	
Date of Issue:	2013-11-15		
Applicant:	MTS Systems Corp 3001 Sheldon Drive Cary, NC 27513 United States of America		
Electrical Apparatus:	Model MG and MR Liquid Level Transmitters		
<i>Optional accessory:</i>			
Type of Protection:	Flameproof, "d"		
Marking:	Ex d IIB T4 Ga/Gb Ta = -20°C to +40°C; IP66		

*Approved for issue on behalf of the IECEx
Certification Body:*

J.E.Marquedant

Position:

Group Manager - Electrical

*Signature:
(for printed version)*

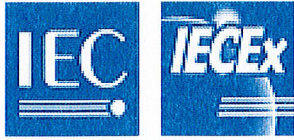
Date:

1. This certificate and schedule may only be reproduced in full.
2. This certificate is not transferable and remains the property of the issuing body.
3. The Status and authenticity of this certificate may be verified by visiting the [Official IECEx Website](#).

Certificate issued by:

FM Approvals LLC
1151 Boston-Providence Turnpike
Norwood, MA 02062
United States of America





IECEx Certificate of Conformity

Certificate No: IECEx FMG 13.0019X Issue No: 0
Date of Issue: 2013-11-15 Page 2 of 3
Manufacturer: **MTS Systems Corp**
3001 Sheldon Drive
Cary, NC 27513
United States of America

Additional Manufacturing
location(s):

This certificate is issued as verification that a sample(s), representative of production, was assessed and tested and found to comply with the IEC Standard list below and that the manufacturer's quality system, relating to the Ex products covered by this certificate, was assessed and found to comply with the IECEx Quality system requirements. This certificate is granted subject to the conditions as set out in IECEx Scheme Rules, IECEx 02 and Operational Documents as amended.

STANDARDS:

The electrical apparatus and any acceptable variations to it specified in the schedule of this certificate and the identified documents, was found to comply with the following standards:

IEC 60079-0 : 2011 Explosive atmospheres - Part 0: General requirements
Edition:6.0
IEC 60079-1 : 2007-04 Explosive atmospheres - Part 1: Equipment protection by flameproof enclosures "d"
Edition:6
IEC 60079-26 : 2006 Explosive atmospheres - Part 26: Equipment with equipment protection level (EPL) Ga
Edition:2

*This Certificate **does not** indicate compliance with electrical safety and performance requirements other than those expressly included in the Standards listed above.*

TEST & ASSESSMENT REPORTS:

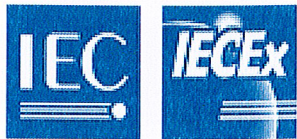
A sample(s) of the equipment listed has successfully met the examination and test requirements as recorded in

Test Report:

[US/FMG/ExTR13.0018/00](#)

Quality Assessment Report:

[DE/PTB/QAR13.0006/00](#)



IECEx Certificate of Conformity

Certificate No: IECEx FMG 13.0019X

Issue No: 0

Date of Issue: 2013-11-15

Page 3 of 3

Schedule

EQUIPMENT:

Equipment and systems covered by this certificate are as follows:

MGabcdefghijkl. **Liquid Level Transmitter.**

a = Agency approval E or H.

b = Output M, D, F, S, T or X.

c = Housing type B, C, V or W.

d = Electronics mounting 1, 3, 4, 5 or 6.

e = Sensor pipe B, C, D, E, F, M, N, P or R.

f = Material of construction 1, 2, 3, 9 or A.

g = Process connection type 1, 4, 5, 6, 7, 8, 9 or X.

h = Process connection size A, B, C, D, E, F, G, H, J or X.

i = Digital thermometer 0, 1, 2, 5, 6, 7, 8, 9, A, B, C, D, E, F, G, H, J, K or L.

j = Unit of measure M or U.

k = Length (five digits maximum representing sensor length in millimeters or inches).

l = Special E or S. **MR**abcdefghijkl. **Liquid Level Transmitter.**a = Agency approval E or H.b = Output 1, 2, 3, 4 or X.c = Housing type B, C, D, E, V, W, Y or Z.d = Electronics mounting 1, 3, 4, 5 or 6.e = Sensor pipe B, C, D, E, F, H, J, K or R.f = Material of construction 1, 2, 3, 9 or A.g = Process connection type 1, 4, 5, 6, 7, 8, 9 or X.h = Process connection size A, B, C, D, E, F, G, H, J or X.i = RTD 0, 1 or 2.j = Unit of measure M or U.k = Length (five digits maximum representing sensor length in millimeters or inches).l = Special E or S.

CONDITIONS OF CERTIFICATION: YES as shown below:

Consult the manufacturer if dimensional information on the flameproof joints is necessary.



EXPLOSION PROTECTION CERTIFICATE OF CONFORMITY

Cert NO.GYJ14.1051X

This is to certify that the product

Liquid Level Transmitter

manufactured by **Auf dem Schuffel 9, 58513 Ludenscheid, Deutschland**

(Address:Auf dem Schuffel 9, 58513 Ludenscheid, Deutschland)

which model is **MRA series**

Ex marking **Ex ia II A T4 Ga/Gb Ex ia II A T4 Gb
Ex ia II B T4 Ga/Gb Ex ia II B T4 Gb**

product standard /

drawing number **280190**

has been inspected and certified by NEPSI, and that it conforms

to **GB 3836.1-2010,GB 3836.4-2010,GB 3836.20-2010**

This Approval shall remain in force until **2019.02.23**

Remarks 1.Conditions for safe use are specified in the attachment to this certificate.
2.Symbol "X" placed after the certification number denotes specific conditions of use,
which are specified in the attachment to this certificate.
3.Model designation is specified in the attachment to this certificate.
4.Intrinsic safety parameters specified in the attachment to this certificate.

Director



National Supervision and Inspection Centre for
Explosion Protection and Safety of Instrumentation
Issued Date 2014.02.24

This Certificate is valid for products compatible with the documents and samples approved by NEPSI.

103 Cao Bao Road
Shanghai 200233, China

<http://www.nepsi.org.cn>
Email: info@nepsi.org.cn

Tel: +86 21 64368180
Fax: +86 21 64844580



防爆合格证

证号: GYJ14.1051X

由 MTS Sensor Technologie GmbH & Co. KG
(地址: MTS Sensor Technologie GmbH & Co. KG)

制造的产品:

名称 液位变送器

型号规格 MRA系列

防爆标志 Ex ia II A T4 Ga/Gb Ex ia II A T4 Gb
Ex ia II B T4 Ga/Gb Ex ia II B T4 Gb

产品标准 /

图样编号 280190

经图样及技术文件的审查和样品检验, 确认上述产品符合 GB 3836.1-2010、GB 3836.4-2010、GB 3836.20-2010 标准, 特颁发此证。

本证书有效期: 2014年2月24日至2019年2月23日

- 备注
1. 安全使用注意事项见本证书附件。
 2. 证书编号后缀“X”表明产品具有安全使用特殊条件, 内容见本证书附件。
 3. 型号规格说明见本证书附件。
 4. 本安电气参数见本证书附件。

站长

国家级仪器仪表防爆安全监督检验站

颁发日期二〇一四年二月二十四日

本证书仅对与认可文件和样品一致的产品有效。

地址: 上海市漕宝路103号
邮编: 200233

网址: www.nepsi.org.cn
Email: info@nepsi.org.cn

电话: +86 21 64368180
传真: +86 21 64844580

国家级仪器仪表防爆安全监督检验站

National Supervision and Inspection Centre for Explosion Protection and Safety of Instrumentation

(GYJ14.1051X)

(Attachment I)

Attachment I to GYJ14.1051X

MRA series Liquid Level Transmitter, manufactured by MTS Sensor Technologie GmbH & Co.KG, has been certified by National Supervision and Inspection Center for Explosion Protection and Safety of Instrumentation (NEPSI). The Liquid Level Transmitter accords with following standards:

GB3836.1-2010 Explosive atmospheres-Part 1: Equipment – General requirements

GB3836.4-2010 Explosive atmospheres-Part 4: Equipment protection by intrinsic safety "i"

GB3836.20-2010 Explosive atmospheres-Part 20: Equipment with equipment protection level (EPL) Ga

Liquid Level Transmitter has the Ex marking Ex ia II A T4 Ga/Gb or Ex ia II A T4 Gb or Ex ia II B T4 Ga/Gb or Ex ia II B T4 Gb.

The certificate number is GYJ14.1051X.

The certified type codes are:

MRA~~abcdefghijklmnop~~

~~a~~ indicates output, which could be 1 to 4.

~~b~~ indicates housing type, which could be F, G, H, J, K, P, R, S, T or U.

~~c~~ indicates electronic mounting, which could be 1.

~~d~~ indicates transmitter pipe/hose, which could be A, B, C, D, E, F, H, J, K, L or R.

~~e~~ indicates materials of construction(wetted parts), which could be 1, 2, 3, 5, 6, 7, 9, A or B.

~~f~~ indicates process connetion type, which could be 1, 4, 5, 6, 7, 8 or 9.

~~g~~ indicates process connetion size, which could be A, B, C, D, E, F, G, H or J.

~~h~~ indicates temperature measurement, which could be 0 to 2.

~~j~~ indicates unit of measurement, which could be M or U.

~~klmn~~ indicates length, which is specified in the instruction manual.

~~o~~ indicates optional specification, which could be S or E.

1. Special conditions for safe use

The suffix "X" placed after the certificate number indicates that this product is subject to special conditions for safe use:

(GYJ14.1051X)

(Attachment I)

- Ground potential balance is required when used in hazardous location.
- For applications in area where the use of EPL Ga apparatus is required, electrostatic charges on the non-metallic parts of Liquid Level Transmitter shall be avoided.
- The relationship between Ex marking and *b, c* specified in the model specification are as following:

code <i>b</i>	code <i>c</i>	Ex marking
F, G, H, J, K	1, 2, 3	Ex ia II A T4 Ga/Gb
	5, 6, 7, 9 (SST float)	Ex ia II A T4 Ga/Gb
	5, 6, 7, 9 (Non-metallic float, 201643-2, 201649-2 or 201650-2)	Ex ia II A T4 Ga/Gb
	5, 6, 7, 9 (float other than specified above)	Ex ia II A T4 Gb
	A	Ex ia II A T4 Gb
	B	Ex ia II A T4 Gb
P, R, S, T, U	1, 2, 3	Ex ia II B T4 Ga/Gb
	5, 6, 7, 9 (SST float)	Ex ia II B T4 Ga/Gb
	5, 6, 7, 9 (Non-metallic float, 201643-2, 201649-2 or 201650-2)	Ex ia II A T4 Ga/Gb
	5, 6, 7, 9 (float other than specified above)	Ex ia II B T4 Gb
	A	Ex ia II A T4 Gb
	B	Ex ia II B T4 Gb

2. Conditions for safe use

2.1 The relationship between intrinsic safety parameters and ambient temperature range are as following:

T _{amb.}	U _i	I _i	C _i	L _i	P _i
-20°C~+40°C	28V	118mA	≈0μF	0.2mH	1.3W
-20°C~+60°C					1.2W
-20°C~+80°C					1.0W

2.2 The Liquid Level Transmitter must be used together with safety barriers to form an intrinsic safety system thus can be used in hazardous locations. The wiring and installation must fulfil the requirements from instruction manuals of the Liquid Level Transmitter and chosen safety barriers.

2.3 The connection cable between the transmitter and associated apparatus should be two-core shielded cable with insulating sheath. The shielding layer should be grounded in safe area and insulated from the enclosure.

2.4 Forbid end user to change the configuration to ensure the equipment's explosion protection performance.


(GYJ14.1051X)

(Attachment i)

2.5 When installation, use and maintenance of Liquid Level Transmitter, observe following standards
GB3836.13-1997 "Electrical apparatus for explosive gas atmospheres Part 13:Repair and overhaul for apparatus used in explosive gas atmospheres"
GB3836.15-2000 "Electrical apparatus for explosive gas atmospheres Part 15:Electrical installations in hazardous area (other than mines)"
GB3836.16-2006 "Electrical apparatus for explosive gas atmospheres Part 16:Inspection and maintenance of electrical installation (other than mines)"
GB50257-1996 "Code for construction and acceptance of electric device for explosion atmospheres and fire hazard electrical equipment installation engineering"

3. Manufacturer's Responsibility

- 3.1 Special condition for safe use specified above should be included in the instruction manual.
- 3.2 Manufacturing should be done according to the documentation approved by NEPSI.
- 3.3 Following items should be added to the nameplate:

- a) NEPSI logo 
- b) Ex marking
- c) Certificate number
- d) Ambient temperature range
- e) Intrinsic safety parameters

National Supervision and Inspection Center
for Explosion Protection and Safety of Instrumentation

2014.02.24

国家级仪器仪表防爆安全监督检验站

National Supervision and Inspection Centre for
Explosion Protection and Safety of Instrumentation

(GYJ14.1051X)

(Attachment I)

GYJ14.1051X防爆合格证附件 I

由MTS Sensor Technologie GmbH & Co.KG生产的MRA系列液位变送器（以下简称变送器），经国家级仪器仪表防爆安全监督检验站（NEPSI）检验，符合以下国家标准的规定：

GB3836.1-2010 爆炸性环境 第1部分：设备 通用要求

GB3836.4-2010 爆炸性环境 第4部分：由本质安全型“i”保护的的设备

GB3836.20-2010 爆炸性环境 第20部分：设备保护级别（EPL）为Ga级的设备

产品防爆标志为Ex ia II A T4 Ga/Gb或Ex ia II A T4 Gb或Ex ia II B T4 Ga/Gb或Ex ia II B T4 Gb，防爆合格证号为GYJ14.1051X。

本次认可的产品型号为MRA`abcdefghijklmno`，其中：

`a`代表输出信号，可为1~4

`b`代表外壳类型，可为F, G, H, J, K, P, R, S, T或U；

`c`代表电子安装，可为1；

`d`代表测量管结构，可为A, B, C, D, E, F, H, J, K, L或R；

`e`代表接液部件材质，可为1, 2, 3, 5, 6, 7, 9, A或B；

`f`代表过程连接类型，可为1, 4, 5, 6, 7, 8或9；

`g`代表过程连接尺寸，可为A, B, C, D, E, F, G, H或J；

`h`代表热电阻，可为0, 1或2；

`i`代表长度单位，可为M或U；

`jklmn`代表测量管长度，详见使用说明书；

`o`代表定制产品，可为S或E。

一、产品安全使用特殊条件

防爆合格证编号后的X表示其安全使用特殊条件，具体如下：

- 变送器在现场使用时必须保证地电位平衡。
- 当产品的测量元件作为设备保护等级（EPL）为Ga级使用时，应采取措施以防静电点燃危险。

(GYJ14.1051X)

(Attachment I)

● 产品防爆标志与产品型号中**b**, **e**代码的关系如下:

代码 b	代码 e	防爆标志
F, G, H, J, K	1, 2, 3	Ex ia IIA T4 Ga/Gb
	5, 6, 7, 9 (配不锈钢浮子)	Ex ia IIA T4 Ga/Gb
	5, 6, 7, 9 (配塑料浮子, 浮子代码 201643-2, 201649-2 及 201650-2)	Ex ia IIA T4 Ga/Gb
	5, 6, 7, 9 (配除上述代码外的塑料浮子)	Ex ia IIA T4 Gb
	A	Ex ia IIA T4 Gb
	B	Ex ia IIA T4 Gb
P, R, S, T, U	1, 2, 3	Ex ia IIB T4 Ga/Gb
	5, 6, 7, 9 (配不锈钢浮子)	Ex ia IIB T4 Ga/Gb
	5, 6, 7, 9 (配塑料浮子, 浮子代码 201643-2, 201649-2 及 201650-2)	Ex ia IIA T4 Ga/Gb
	5, 6, 7, 9 (配除上述代码外的塑料浮子)	Ex ia IIB T4 Gb
	A	Ex ia IIA T4 Gb
	B	Ex ia IIB T4 Gb

二、 产品使用注意事项

1. 变送器的最大输入参数 (LOOP1, LOOP2) 与使用环境温度范围的关系如下:

使用环境温度	U _i	I _i	C _i	L _i	P _i
-20°C~+40°C	28V	118mA	≈0μ F	0.2mH	1.3W
-20°C~+60°C					1.2W
-20°C~+80°C					1.0W

2. 变送器必须与已通过防爆认证的关联设备配套共同组成本安防爆系统方可用于现场存在爆炸性气体混合物的危险场所。其系统接线必须同时遵守产品和所配关联设备的使用说明书要求, 接线端子不得接错。
3. 变送器与关联设备的连接电缆应为带绝缘护套的屏蔽电缆, 其屏蔽层应接地。
4. 用户不得自行随意更换该产品的电气零部件, 应会同产品制造商共同解决运行中出现的故障, 以免影响防爆性能和损坏现象的发生。
5. 产品的安装、使用和维护应同时遵守产品使用说明书、GB3836.13-1997“爆炸性气体环境用电气设备 第13部分: 爆炸性气体环境用电气设备的检修”、GB3836.15-2000

(GYJ14.1051X)

(Attachment I)

“爆炸性气体环境用电气设备 第15部分：危险场所电气安装（煤矿除外）”、
GB3836.16-2006 “爆炸性气体环境用电气设备 第16部分：电气装置的检查和维护（煤
矿除外）”及GB50257-1996 “电气设备安装工程爆炸和火灾危险环境电气装置施工及
验收规范”的有关规定。

三、制造厂责任

1. 产品制造厂必须将上述产品安全使用特殊条件及使用注意事项纳入该产品的使用说明
书中。
2. 制造厂必须严格按照NEPSI认可的文件资料生产。
3. 产品铭牌中应至少包括下列内容：

a) NEPSI认可标志



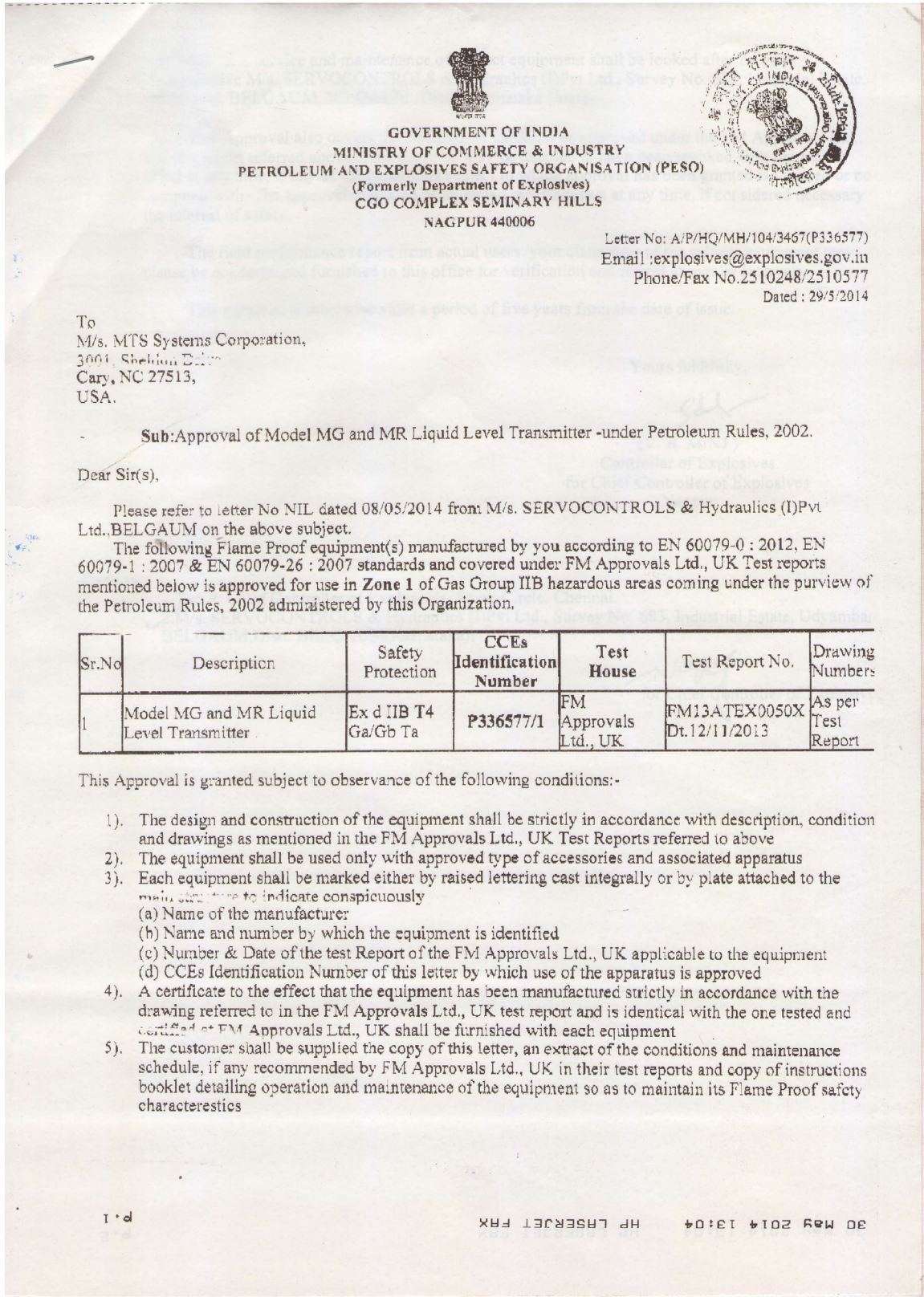
b) 产品防爆标志


c) 防爆合格证号

d) 使用环境温度范围

e) 本质安全参数

国家级仪器仪表防爆安全监督检验站
二〇一四年二月二十四日




GOVERNMENT OF INDIA
MINISTRY OF COMMERCE & INDUSTRY
PETROLEUM AND EXPLOSIVES SAFETY ORGANISATION (PESO)
 (Formerly Department of Explosives)
CGO COMPLEX SEMINARY HILLS
NAGPUR 440006



Letter No: A/P/HQ/MH/104/3467(P336577)
 Email :explosives@explosives.gov.in
 Phone/Fax No.2510248/2510577
 Dated : 29/3/2014

To
 M/s. MTS Systems Corporation,
 3001 Sheldon Drive
 Cary, NC 27513,
 USA.

Sub:Approval of Model MG and MR Liquid Level Transmitter -under Petroleum Rules, 2002.

Dear Sir(s),

Please refer to letter No NIL dated 08/05/2014 from M/s. SERVOCONTROLS & Hydraulics (I) Pvt Ltd., BELGAUM on the above subject.

The following Flame Proof equipment(s) manufactured by you according to EN 60079-0 : 2012, EN 60079-1 : 2007 & EN 60079-26 : 2007 standards and covered under FM Approvals Ltd., UK Test reports mentioned below is approved for use in **Zone 1** of Gas Group IIB hazardous areas coming under the purview of the Petroleum Rules, 2002 administered by this Organization.

Sr.No	Description	Safety Protection	CCEs Identification Number	Test House	Test Report No.	Drawing Numbers
1	Model MG and MR Liquid Level Transmitter	Ex d IIB T4 Ga/Gb Ta	P336577/1	FM Approvals Ltd., UK	FM13ATEX0050X Dt.12/11/2013	As per Test Report

This Approval is granted subject to observance of the following conditions:-

- 1). The design and construction of the equipment shall be strictly in accordance with description, condition and drawings as mentioned in the FM Approvals Ltd., UK Test Reports referred to above
- 2). The equipment shall be used only with approved type of accessories and associated apparatus
- 3). Each equipment shall be marked either by raised lettering cast integrally or by plate attached to the main structure to indicate conspicuously
 - (a) Name of the manufacturer
 - (b) Name and number by which the equipment is identified
 - (c) Number & Date of the test Report of the FM Approvals Ltd., UK applicable to the equipment
 - (d) CCEs Identification Number of this letter by which use of the apparatus is approved
- 4). A certificate to the effect that the equipment has been manufactured strictly in accordance with the drawing referred to in the FM Approvals Ltd., UK test report and is identical with the one tested and certified at FM Approvals Ltd., UK shall be furnished with each equipment
- 5). The customer shall be supplied the copy of this letter, an extract of the conditions and maintenance schedule, if any recommended by FM Approvals Ltd., UK in their test reports and copy of instructions booklet detailing operation and maintenance of the equipment so as to maintain its Flame Proof safety characteristics

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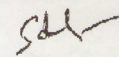
4. The after sales service and maintenance of subject equipment shall be looked after by your representative M/s. SERVOCONTROLS & Hydraulics (I)Pvt Ltd., Survey No. 683, Industrial Estate, Udyambag, BELGAUM,BELGAUM (Dist.), Karnataka (State)

This Approval also covers the permissible variation as approved under the FM Approvals Ltd., UK test report referred above. This approval may be deemed to have been revoked with immediate effect at any time, if any of the conditions subject to which approval has been granted is violated or not complied with. The approval may also be amended or withdrawn at any time, if considered necessary in the interest of safety.

The field performance report from actual users /your customers of the subject equipment may please be collected and furnished to this office for verification and record at regular intervals.

This approval is otherwise valid a period of five years from the date of issue.

Yours faithfully,

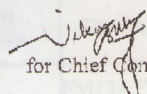


(V. B. MINJ)
Controller of Explosives
for Chief Controller of Explosives
Nagpur

Copy to :

1. ~~Chief Controller of Explosives, South Circle, Chennai.~~
2. M/s. SERVOCONTROLS & Hydraulics (I)Pvt Ltd., Survey No. 683, Industrial Estate, Udyambag, BELGAUM,Distt. BELGAUM(Karnataka).

Sl. No.	Particulars	Remarks
1	Approved	11/12/2013


 for Chief Controller of Explosives

Document Part number:
550720 Revision K (EN) 02/2016

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