



RIGID IN-TANK MOUNTED MODEL KTR MAGNETOSTRICTIVE TRANSMITTER

The in-tank liquid level transmitter is a continuous multi-functional magnetostrictive transmitter that provides product level, interface level, and temperature to the user via Analog (4-20mA) with HART®, Modbus RTU (Remote Terminal Unit) or DDA (Direct Digital Access). Magnetostrictive technology is one of the most accurate and repeatable level technologies available to date. Once the transmitter is installed and calibrated, there is no requirement for scheduled maintenance or recalibration.

FEATURES

- Simultaneous Measurement of Multiple Process Conditions
 - Product Level
 - Interface Level
 - Temperature
 - Volume
- No Scheduled Maintenance or Recalibration
- Field Repairable
- Inherent Accuracy $\pm 0.039''$ (± 1 mm)
- 200 Point Strap Table
- API Temperature Corrected Volumes
- Integral Display
- Password Protected Data Entry
- Hazardous Area Certified
- Intrinsically Safe

INDUSTRIES

- Petroleum
- Chemical
- Pulp & Paper
- Liquid Petroleum Gas
- Water/ Wastewater
- Power
- Aerospace
- Mining

APPLICATIONS

- Tank Farms
- Separator Tanks
- LPG Terminals
- Solvent Extraction
- Battery Tanks
- Bullet Tanks
- Storage Tanks

SERVICES

- Hydrocarbons
- Acids
- Solvents
- Clean Liquids
- Caustics
- Foaming Liquids
- Water
- Condensate



PRINCIPLE OF OPERATION

The principles of magnetostriction are used to create a reliable position measurement system for use in industrial environments. Inside the sensor, a torsional strain pulse is induced in a specially designed magnetostrictive waveguide by the momentary interaction of two magnetic fields. One field comes from a magnet located inside a float, which moves up and down the outside of the transducer tube. The other field is generated from a current pulse which is applied to the waveguide. The interaction between these two magnetic fields produces a strain pulse which travels at sonic speed along the sensor waveguide until the pulse is detected at the head of the transducer. The position of the moving float magnet is precisely determined by measuring the elapsed time between the application of the current pulse and the arrival of the strain pulse. As a result, a reliable position measurement system is created that is capable of providing an accurate and repeatable measurement.

COMPONENTS

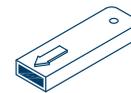
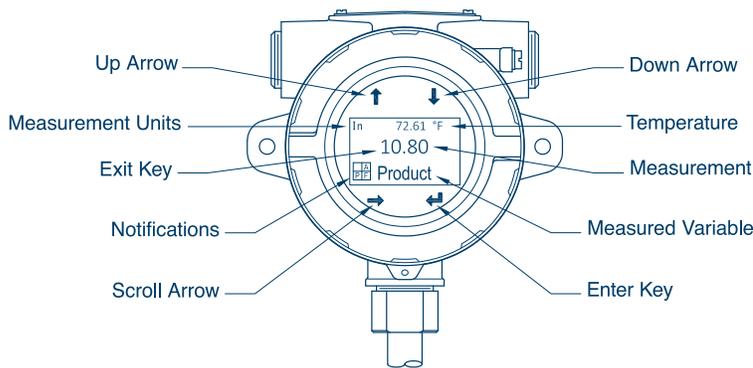
The in-tank liquid level transmitter consists of four main components: a housing, internal electronics, sensor tube, and float. Varying the components of the transmitter allows it to be customized to almost any application.

HOUSING

The transmitter housing is available with an explosion-proof single cavity or an explosion-proof dual cavity configuration. The single cavity housing is available in epoxy coated aluminum or 316 stainless steel while the dual cavity housing is available in epoxy coated aluminum.

INTERNAL ELECTRONICS

All transmitters come with two electronic components: a sensing element and a board set. The sensing element on the model KTR is rigid, but a transmitter with a flexible sensing element is available upon request. The board set consists of up to three electronic boards and an LCD display. The display is password protected and is capable of displaying the product level, interface level, and temperature. The product level and interface level measurement unit options are length, current, percent, and volume. The temperature unit options are degrees Fahrenheit and degrees Celsius. Designed into the display are five buttons for local setup of the level transmitter. Each transmitter is supplied with a menu stylus used to activate the display buttons during local setup to allow programming without removing the transmitter housing cover. A temperature sensing function is optional. The temperature sensing device is a digital thermometer mounted inside the outer sensor tube assembly. The KTR can be ordered with 1, 5, 12, or 16 temperature points depending on the output option chosen.



Menu Stylus
Used to activate the display buttons during local setup to allow programming without removing the transmitter housing cover.

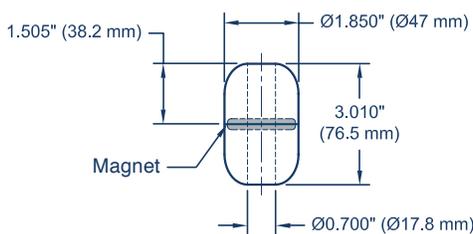
SENSOR TUBE

The sensor tube can be constructed in a variety of materials and configurations. The model KTR is available with a rigid sensor tube. Please consult Kenco for other options such as the KTF (in-tank transmitter with a flexible sensor tube) and the KTC (chamber mounted transmitter with a rigid sensor tube).

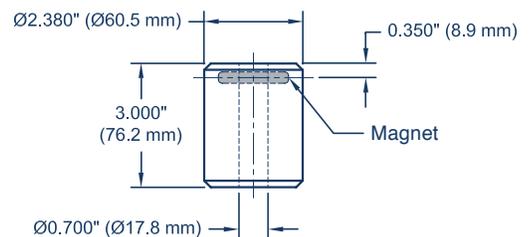
FLOAT

Kenco offers numerous floats for both total product level measurement and interface level measurement. Floats are available with specific gravities as low as 0.45 and pressures as high as 1000 psig (69 bar). Materials available are 316L Stainless Steel, Hastelloy C, Teflon® and Nitrophyl®. Product viscosity, specific gravity, pressure, temperature, corrosiveness and process opening size can vary widely in a process or tank gauging application. Because of these variables, no one float can meet all requirements. Therefore, a variety of float types are available and Kenco will assist you in choosing the one that best meets your requirements.

When choosing a float for your application, Kenco will recommend a float that has a specific gravity of at least 0.05 less than that of the measured liquid. For interface measurement, a minimum of 0.05 specific gravity differential is recommended between upper and lower liquids. Below are specifications on a few of the more frequently used floats:



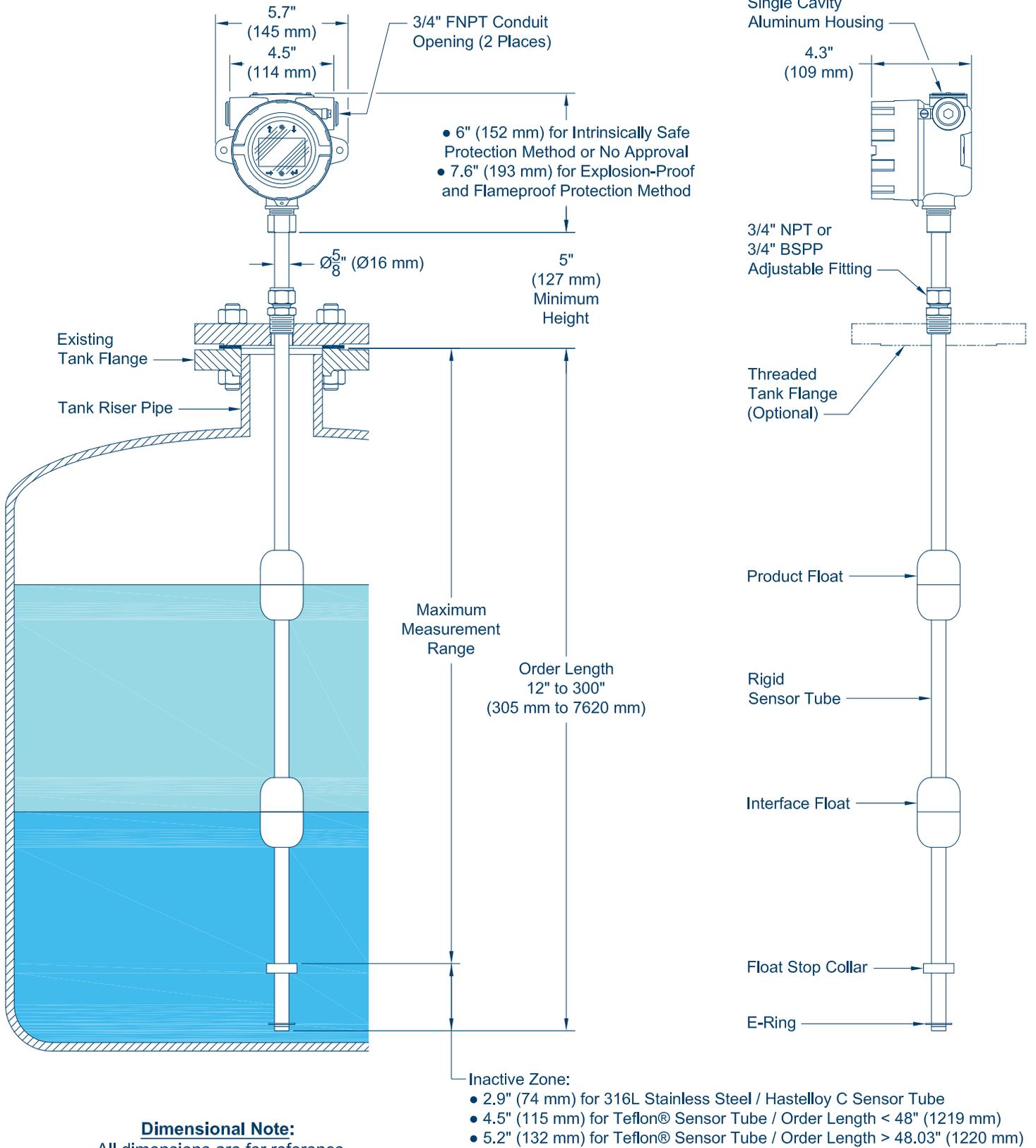
Dimensional Note:
All dimensions are for reference purposes only and are subject to change at any time without notice.



Part Number	Specific Gravity	Float Material	Maximum Pressure	Maximum Temperature
76562	0.67	316L Stainless Steel	425 PSIG (29.3 Bar)	300° F (149° C)
76563	0.71	Hastelloy C		
76564	0.93	316L Stainless Steel		
76565	0.93	Hastelloy C		

Part Number	Specific Gravity	Float Material	Maximum Pressure	Maximum Temperature
76566	0.86	Teflon®	25 PSIG (1.7 Bar)	100° F (38° C)
76567	0.93			
76568	1.06			

TECHNICAL DRAWING



Dimensional Note:
All dimensions are for reference purposes only and are subject to change at any time without notice.

PRODUCT SPECIFICATIONS

LEVEL OUTPUT		SPECIFICATIONS
Measured Variable		Product level and interface level
Output Signal / Protocol		Analog (4-20mA) with HART® / Modbus RTU / DDA
Order Length (Measurement Range Plus Inactive Zone)		12" to 300" (305 mm to 7620 mm); Contact factory for longer lengths.
Inherent Accuracy		±0.039" (±1 mm)
Repeatability (Any Direction)		0.001% F.S. or 0.015" (0.381 mm); whichever is greater

TEMPERATURE OUTPUT		SPECIFICATIONS
Measured Variable	Analog (4-20mA) with HART®	Single point temperature
	Modbus RTU / DDA	Average and multipoint temperatures
Temperature Accuracy	Analog (4-20mA) with HART®	±0.5° F from -40° F to 221° F (±0.28° C from -40° C to 105° C)
		±0.4° F from -40° F to -4° F (±0.2° C from -40° C to -20° C)
	Modbus RTU / DDA	±0.2° F from -4° F to 158° F (±0.1° C from -20° C to 70° C)
		±0.3° F from 158° F to 212° F (±0.15° C from 70° C to 100° C)
		±0.9° F from 212° F to 221° F (±0.5° C from 100° C to 105° C)

ELECTRONICS		SPECIFICATIONS
Input Voltage		10.5 to 28 Vdc
Fail Safe	Analog (4-20mA) with HART®	Low (3.5 mA default) or High (22.8 mA)
	Modbus RTU / DDA	High, Full scale
Reverse Polarity Protection		Series diode
EMC (Electromagnetic Compatibility)		EN 61326-1, EN 61326-2-3, EN 61326-3-2, EN 61000-6-2, EN 61000-6-3, EN 61000-4-2, EN 61000-4-3, EN 61000-4-4, EN 61000-4-5, EN 61000-4-6, EN 61000-4-8, EN 61000-4-11

ENVIRONMENTAL		SPECIFICATIONS
Enclosure Rating		IP65
Humidity		0 to 100% relative humidity, non-condensing
Operating Temperatures	Electronics	-40° F to 160° F (-40° C to 71° C)
	Sensing Element	-40° F to 257° F (-40° C to 125° C); Contact factory for specific temperature ranges.
	Temperature Element	-40° F to 221° F (-40° C to 105° C)
Vessel Pressure	Metal Sensor Tube	1000 psig (69 bar)
	Teflon® Sensor Tube	25 psig (1.75 bar)
Materials	Wetted Parts	316L stainless steel, Hastelloy C, Teflon®; Contact factory for other materials.
	Non-Wetted Parts	Epoxy coated aluminum or 316 stainless steel

ELECTRICAL HOUSING DIMENSIONS		SPECIFICATIONS
Single Cavity (Epoxy Coated Aluminum)		5.7" W x 5" D x 4.3" H (145 mm W x 127 mm D x 109 mm H)
Dual Cavity (Epoxy Coated Aluminum)		4.6" W x 5" D x 8.1" H (117 mm W x 127 mm D x 206 mm H)
Single Cavity (316 Stainless Steel)		7" W x 5.3" D x 6" H (178 mm W x 135 mm D x 152 mm H)

MOUNTING CONNECTIONS		SPECIFICATIONS
Rigid Sensor Tube		3/4" NPT adjustable fitting, 3/4" BSPP adjustable fitting or pipe flange

WIRING		SPECIFICATIONS
Connections		4-wire shielded cable or twisted pair, Daniel Woodhead 6-pin male connector, 180" (4570 mm) integral cable with pigtail

ELECTRICAL HOUSING CONNECTIONS		SPECIFICATIONS
Single and Dual Cavity		3/4" FNPT conduit opening

ELECTRICAL HOUSING LCD DISPLAY		SPECIFICATIONS
Measured Variables		Product level, interface level, and temperature

ORDERING GUIDE

REQUESTED BY: _____ COMPANY: _____
 ADDRESS: _____ CITY: _____ STATE: _____ ZIP: _____
 PHONE: _____ FAX: _____ EMAIL: _____

KTR			1
Kenco Transmitter Style KTR = Rigid In-Tank Mounted Sensor Housing	Output 1 = 1 Loop with HART@ 2 = 2 Loop with HART@ 5 = 1 Loop with HART@ and SIL2 7 = 2 Loop with HART@ and SIL2 Loop 1 only M = Modbus RTU D = DDA (Direct Digital Access)	Housing Type D = Single Cavity with Display (Epoxy Coated Aluminum) E = Dual Cavity with Display (Epoxy Coated Aluminum) L = Single Cavity with Display (316 Stainless Steel)	Electronics Mounting 1 = Standard
B			
Sensor Housing B = Rigid Sensor Tube	*Wetted Materials 1 = 316L Stainless Steel 3 = Hastelloy C A = Teflon® C = 316L Stainless Steel with CRN (Canadian Registration Number for Notified Body "C" only) *Contact Kenco for other materials.	*Mounting Connection Type 1 = NPT Adjustable Fitting 2 = BSPP Adjustable Fitting X = None *Flanged Mounting Connection available upon request. See Ordering Notes below.	*Mounting Connection Size A = 3/4" X = None *See Ordering Notes below for Flanged Mounting Connection.
Digital Thermometer Quantity 0 = None 1 = One 5 = Five (Modbus / DDA only) K = Twelve (Modbus only) M = Sixteen (Modbus only)	Digital Thermometer Placement F = Evenly Spaced per API *C = Custom X = None *Location to be specified by customer.	*Notified Body C = CEC (FMC) F = NEC (FM) X = None *Other certifications available upon request.	Protection Method F = Explosion-Proof and Flameproof I = Intrinsically Safe X = No Approval
			S
Gas Group A = Group A (Not available with Notified Body "C" and Protection Method "F") B = Group B C = Group C D = Group D 3 = IIC (Intrinsically Safe only) 4 = IIB+H2 (Explosion-Proof and Flameproof only) X = None	Order Length Unit of Measure U = US Customary (Inches) M = Metric (Millimeters)	*Order Length XXXXX = Inches (12 to 300) Enter Length Code as 01200 to 30000 XXXXX = mm (305 to 7620) Enter Length Code as 00305 to 07620 *Order Length equals measurement range plus inactive zone.	Special S = Standard Product

Example Model Designation: KTR-1-D-1-B-1-1-A-0-X-X-X-U-01200-S

Ordering Notes: Accessories such as cables, remote displays, float(s) and mounting connection flange to be ordered as separate line items. Information below will need to be filled out by customer when requesting a quote:

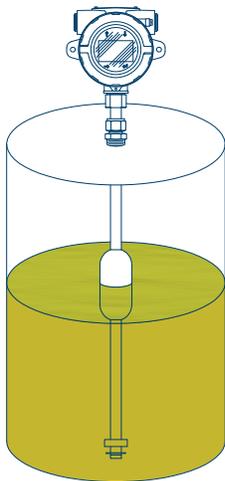
		PSIG		
Specific Gravity of Upper Liquid in Tank	Specific Gravity of Lower Liquid in Tank	Max. Working Pressure	*Mounting Connection Flange Size: 2.00 = 2" 4.00 = 4" 2.50 = 2-1/2" 5.00 = 5" 3.00 = 3" 6.00 = 6" X = None	*Mounting Connection Flange Rating / Type: 150 = 150 Lb. R.F. ANSI 300 = 300 Lb. R.F. ANSI 600 = 600 Lb. R.F. ANSI X = None
<ul style="list-style-type: none"> Float will be designed for lower liquid in all interface applications unless otherwise specified. Two floats can only be used with 2 Loop Analog, Modbus RTU or DDA outputs. 			*Other flange sizes available upon request.	*Other flange ratings & types available upon request.
Note: Contact Kenco for desired options not shown.		Max. Operating Temperature		

AGENCY APPROVALS

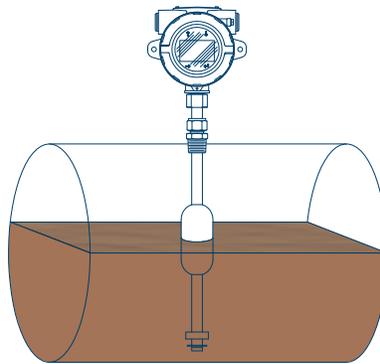
NOTIFIED BODY	PROTECTION METHOD	CLASSIFICATIONS	STANDARDS
CEC (Canadian Electrical Code)	Intrinsic Safety	Class I, Division 1, Groups A, B, C, D T4; Class I, Zone 0/1; Ex ia IIC T4; Ta = -50° C to +71° C; IP65	CAN C22.2 No. 157-92: 2012; CSA C22.2 No. 1010.1: 2004; CAN/CSA C22.2 No. 60079-0: 2011; CAN/CSA C22.2 No. 60079-11: 2014; CAN/CSA C22.2 No. 60529: 2005
	Explosion-Proof and Flameproof	Class I, Division 1, Groups B, C, D T6...T3; Ex db IIB+H2 T6...T3 Ga/Gb; Ta = -40° C to +71° C; IP65	CSA C22.2 No. 0.4-04: R2013; CSA C22.2 No. 0.5: R2012; CSA C22.2 No. 0-10: R2015; CSA C22.2 No. 30: R2012; CAN/CSA C22.2 No. 60079-0: 2015; CAN/CSA C22.2 No. 60079-1: 2016; CAN/CSA C22.2 No. 60079-26: 2016; CAN/CSA C22.2 No. 61010.1: 2012; CSA C22.2 No. 60529: R2010
NEC (National Electrical Code)	Intrinsic Safety	Class I, Division 1, Groups A, B, C, D T4; Class I, Zone 0/1; AEx ia IIC T4; Ta = -50° C to +71° C; IP65	FM 3600: 2011; FM 3610: 2010; FM 3810: 2005; ANSI/ISA 60079-0: 2013; ANSI/ISA 60079-11: 2014; ANSI/IEC 60529: 2004
	Explosion-Proof and Flameproof	*Class I, Division 1, Groups A, B, C, D T6...T3; *Class I, Division 1, Groups B, C, D T6...T3; Class I, Zone 0/1; AEx db IIB+H2 T6...T3 Ga/Gb; Ta = -40° C to +71° C; IP65	FM 3600: 2011; FM 3615: 2006; FM 3810: 2005; ANSI/ISA 60079-0: 2013; ANSI/UL 60079-1: 2015; ANSI/UL 60079-26: 2017; ANSI/IEC 60529: 2004

***Note:** Epoxy Coated Aluminum Housings are rated for Groups A, B, C, & D while 316 Stainless Steel Housing is rated for Groups B, C, & D.

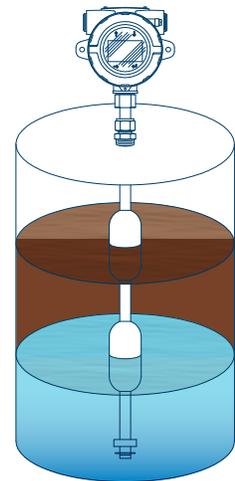
APPLICATION EXAMPLES



Acid Processing



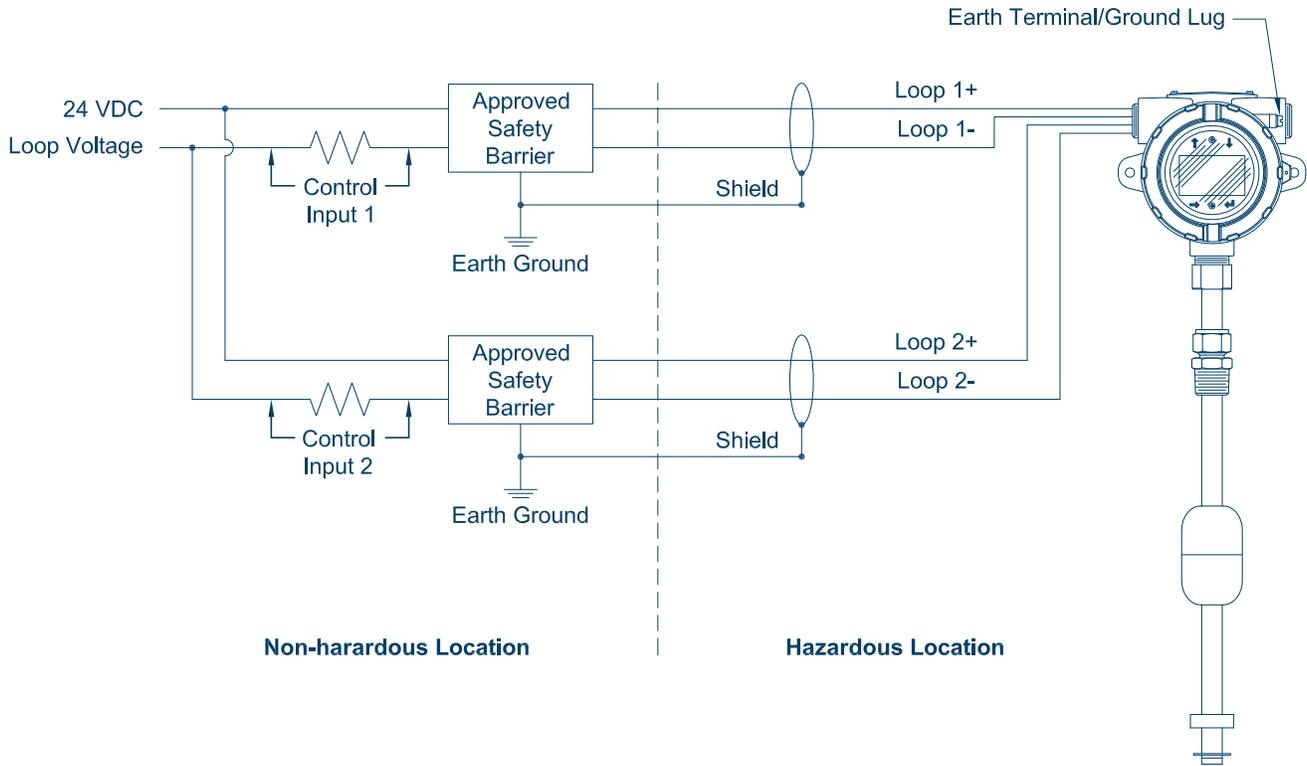
Hydrocarbon Storage



Oil / Water Interface

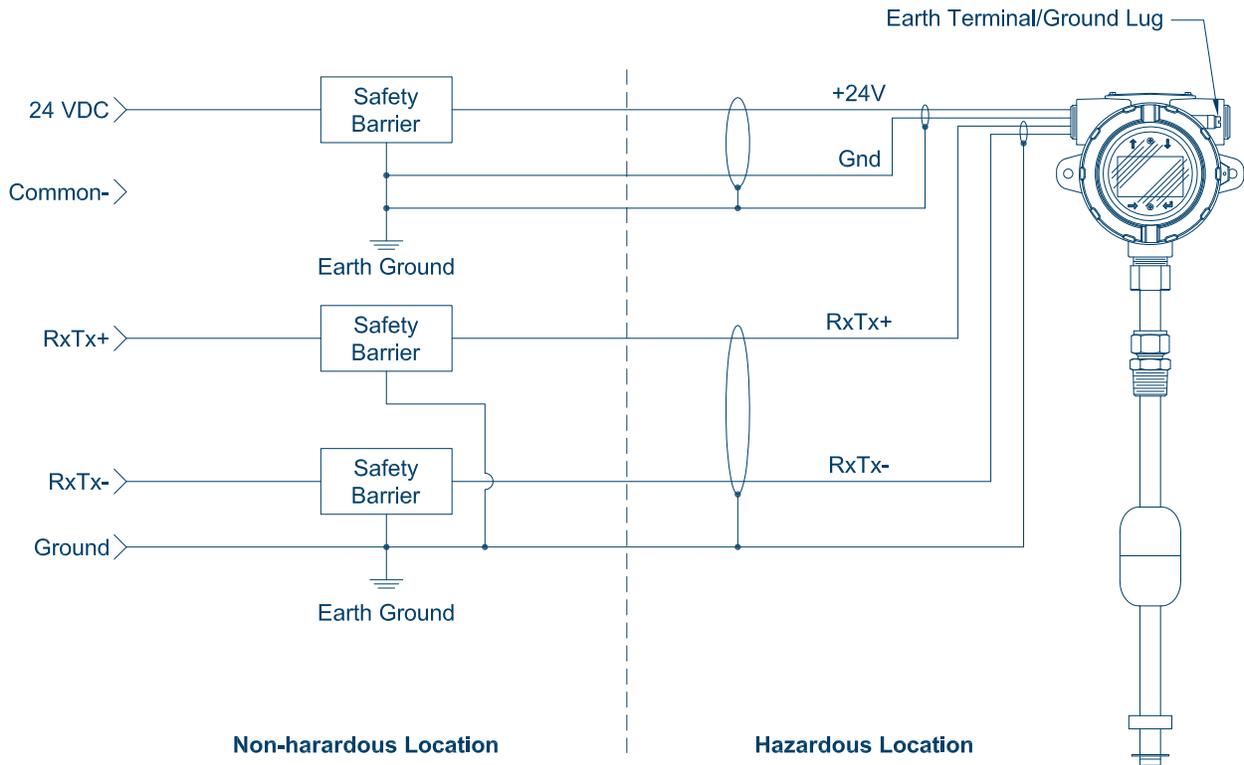
WIRING SCHEMATIC

Intrinsically Safe Analog Output



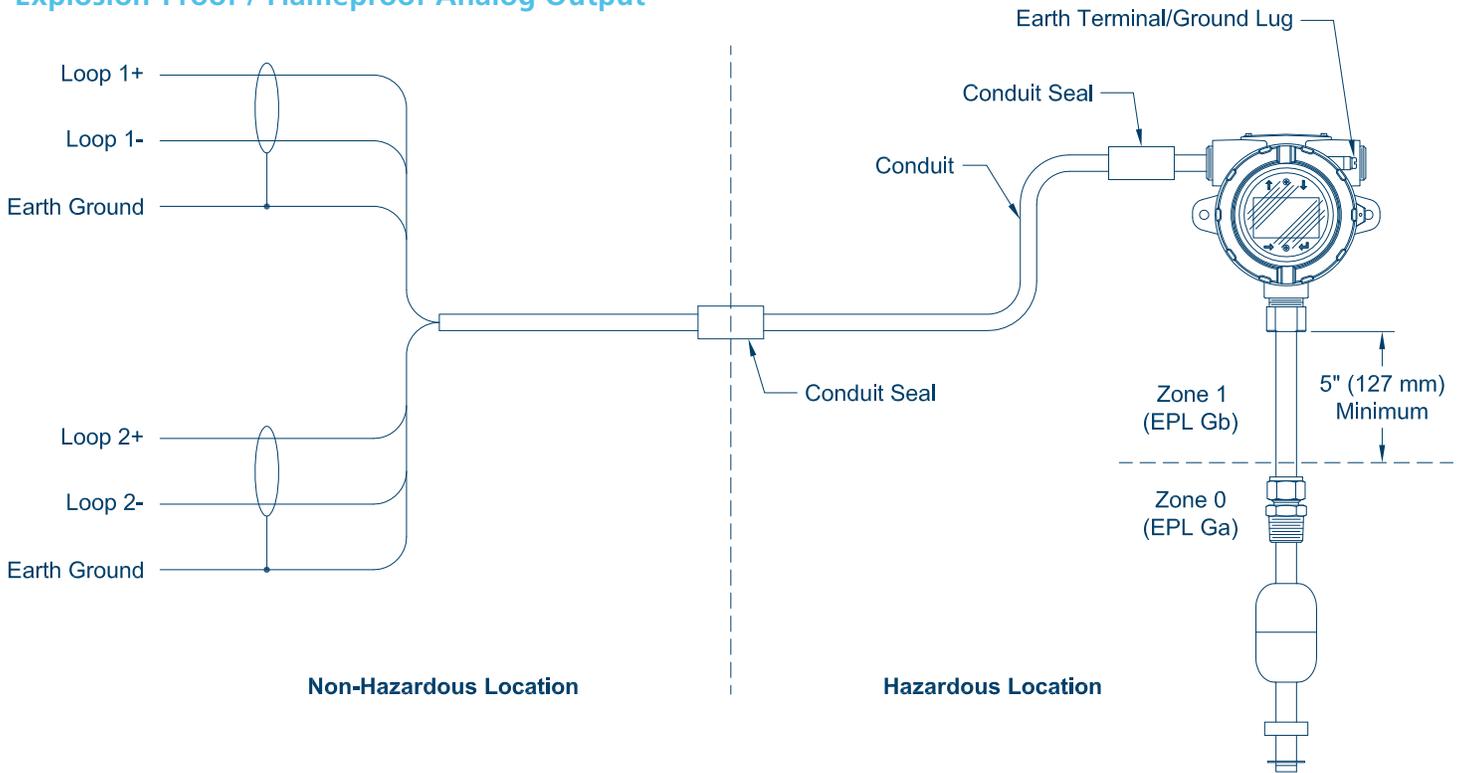
WIRING SCHEMATIC

Intrinsically Safe Digital Output



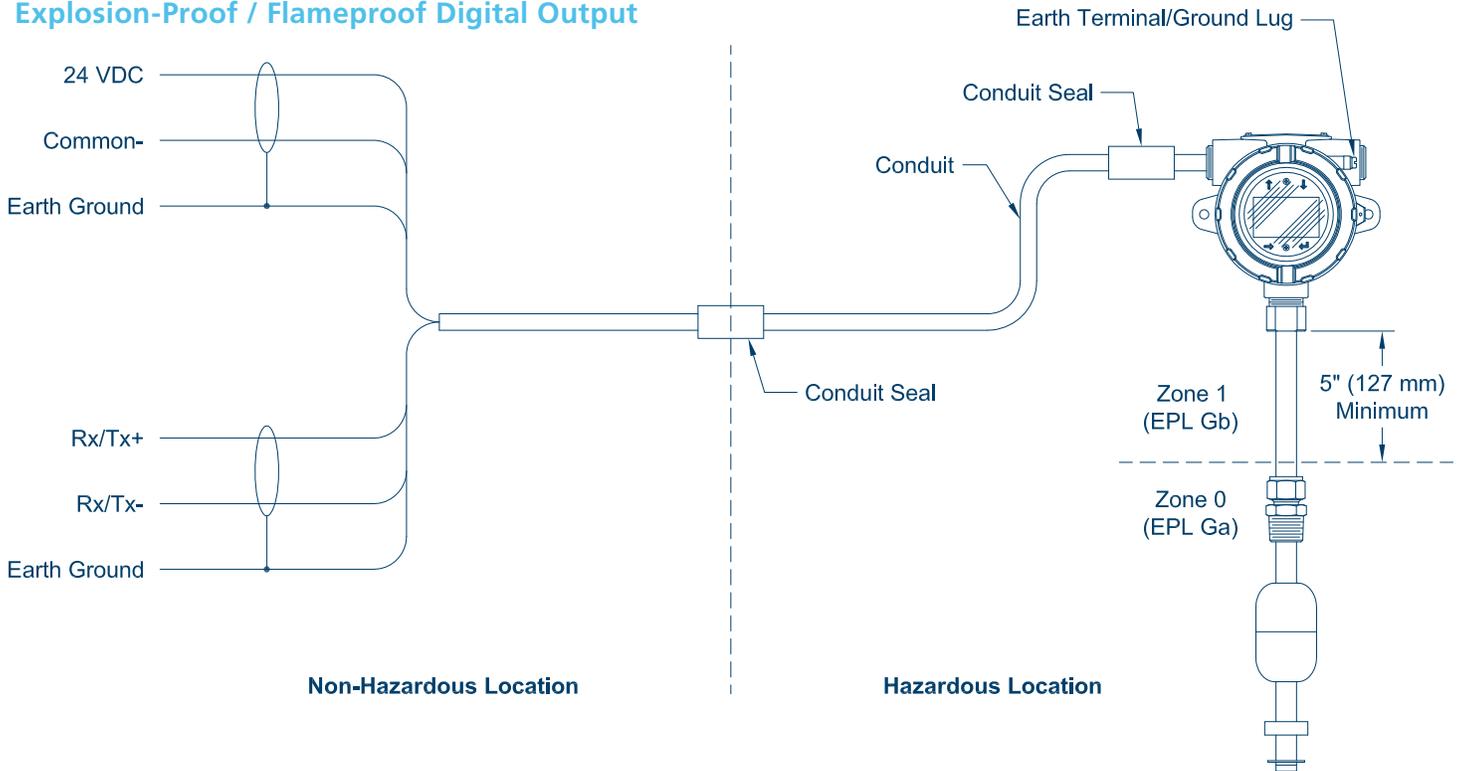
WIRING SCHEMATIC

Explosion-Proof / Flameproof Analog Output



WIRING SCHEMATIC

Explosion-Proof / Flameproof Digital Output



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