Your Global Automation Partner

TURCK

EZ-track™
R16 Liquid Level Sensor

Manual

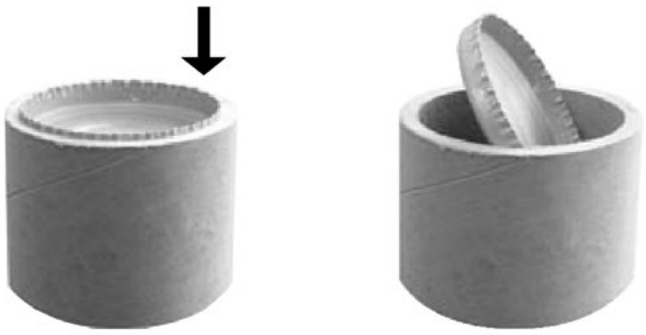
EZ-track® R16 Analog Output

The ***EZ-track*** line from **Turck** is a line of magnetostrictive linear displacement transducers. These devices detect the position of an external magnet along the active stroke of the sensor without causing any wear on the sensor parts. Because there are no parts to wear or break, the sensors can offer better performance over a longer life than competing technologies. They also offer an alternative when a continuous, absolute reading is necessary in the application.
The EZ-track R16 Series Liquid Level Sensor takes field proven sensing technology and incorporates intrinsic safety and a field programmable zero and span. Packaging is a patented low clearance design, making the R16 ideal for level monitoring in a variety of liquids and tank designs.

Multiple Variations
Sensors are available in rigid 316 SS, flexible PVDF or sanitary designs. The stainless steel version has a choice of a mini-connector (7/8-16UN ***minifast***®) or an optional housing which includes terminal connectors with zero and span adjustments. All offer totally welded construction. The flexible (PVDF) version offers a variety of mounting options and provides cost effective, high accuracy inventory monitoring in tanks up to 70 ft. A variety of floats and mounting accessories are available to fit virtually any application, including a sanitary stainless steel version. ContactTurck to match your needs today. All of the sensor's electronics are integrated within the 5/8 in. diameter sensing tube. This breakthrough in package design eliminates the electronics enclosure at the top of the sensor, which reduces cost and offers greater options for insertion and mounting.
The R16 is a 2-wire loop powered intrinsically safe sensor with a configurable 4-20 mA span.

Unpacking
Carefully remove the contents of the shipping carton and check each item against the packing list before destroying the packing materials. The stainless steel probes and PVDF probes under 16 ft., are shipped in a tube. To remove the metal end cap, use a large, flat blade screw driver or metal rod and tap on the inner edge of the cap until it pivots. Grab the cap and pull it out. Use caution, as the edge of the metal cap may be sharp. The PVDF Probes over 16 ft. are shipped coiled in a box. It is important to follow the handling instructions to avoid damaging the probe and voiding the warranty. During the unpacking and installation of the PVDF Probe, always keep the diameter of the coils between 40 and 48 in. (about 1 meter).

1.Do not cut the tie-wraps holding the PVDF Probe together before installation!
2.Always keep the coils parallel! When the tie wraps are removed, **DO NOT** lift one coil separately from the other coils! Never twist one coil 90° from the other coils!
3.Do not bend the top 2 ft. of the probe!
4.Do not assemble the weight and floats on the flex probe until ready to be installed in the riser. Carry the Flex Probe and other parts to the top of the tank before assembling the probe components.



Level Probe Part Number Key

Sensor Family
LT = Linear Transducer

Measurement Span
Length of span

Length Units
E = Inches (whole 1" increments)
M = Millimeters (25mm increments)

Housing Style
R = Rod Style

Rod Diameter
Diameter in mm

Probe Style
S = Sanitary - 240 grit finish (max. span is 110 in.)
F = Food Grade - 180 grit finish (max. span is 110 in.)
P = PVDF
3 = 316 stainless steel (standard finish)

High Temp. Applications (Not approved for use in hazardous areas)
A = 316 stainless steel (standard finish)
B = Sanitary - 240 grit finish (max. span is 110 in.)
C = Food Grade - 180 grit finish (max. span is 110 in.)

Flange Adapter
Blank = No adapter[1]
20 = 2 in. Tri-Clamp[2]
25 = 2.5 in. Tri-Clamp[2]
30 = 3 in. Tri-Clamp[2]
40 = 4 in. Tri-Clamp[2]
C = 3 in. Dead Band temperature limited (0 to 40°C)[3]

Output Configuration
LI = Current

Output Type (bottom to top)
0 = 4 to 20 mA
1 = 20 to 4 mA

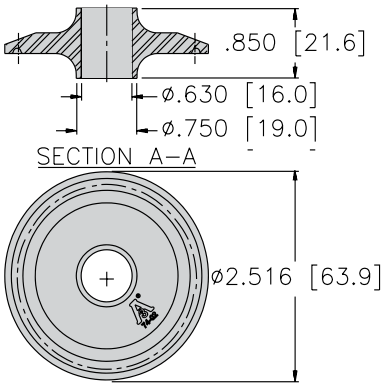
Intrinsically Safe
EX[5] (must be connected to appropriate barrier)
Blank = Not approved for hazardous areas

Connector Type
D = Dual 3/4 in. NPT
B1140 = 4-pin, ***minifast*** ®[4]
S = Single 3/4 in. NPT (steel) Single 1/2 in. NPT[3] (PVDF, with flange "C" only)

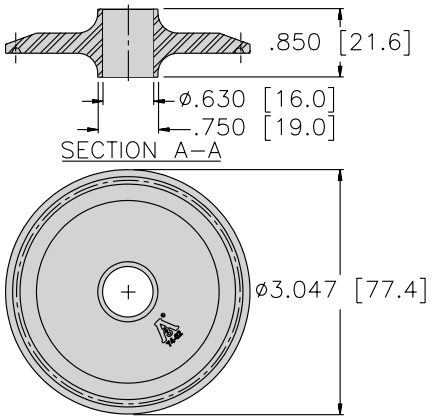
Special Approvals
3A = 3A approved sensor with float removable[6]

Notes:
1. Available on probe styles 3 or P only.
2. Not available on probe styles A, P, or 3.
3. Available on probe styles P only.
4. Not available on probe style P.
5. Not available on probe styles A, B, or C.
6. Available on probe styles S only.

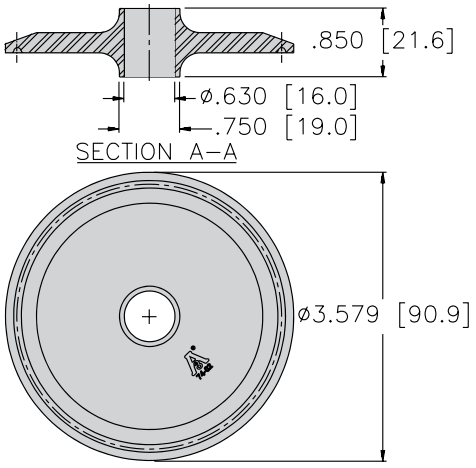
Level Probe Accessories



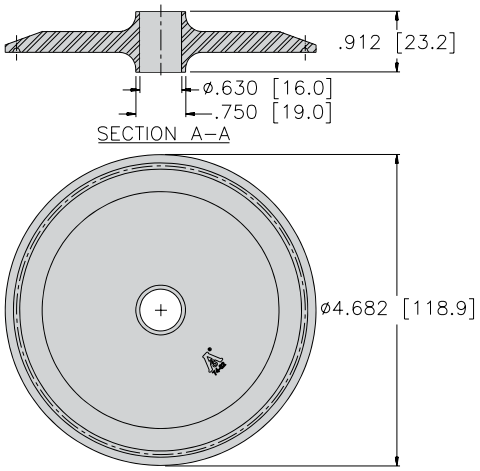
Flange, 2 Inch Tri-clamp



Flange, 2.5 Inch Tri-clamp

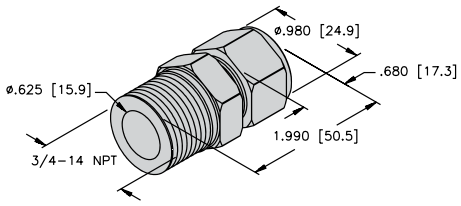


Flange, 3 Inch Tri-clamp



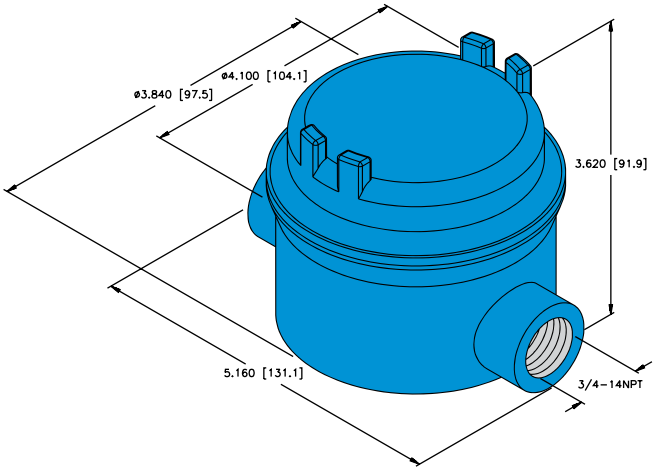
Flange, 4 Inch Tri-clamp

Tube Coupling



TC-R16-SS
(LT0305)

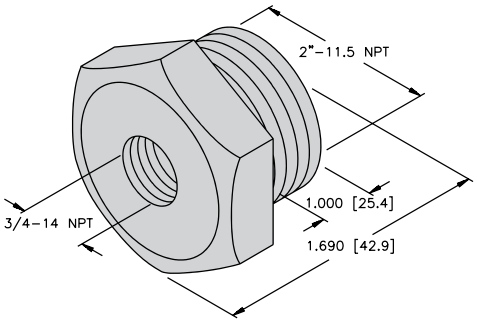
Junction Box



TB-R16S
(LT0294)

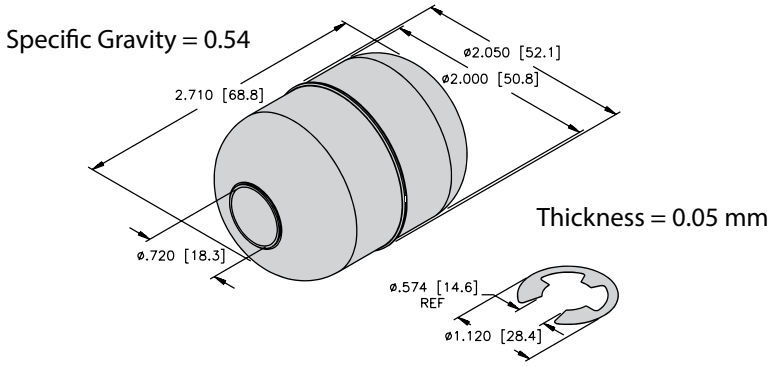
Level Probe Accessories

Bushing (316 Stainless Steel)



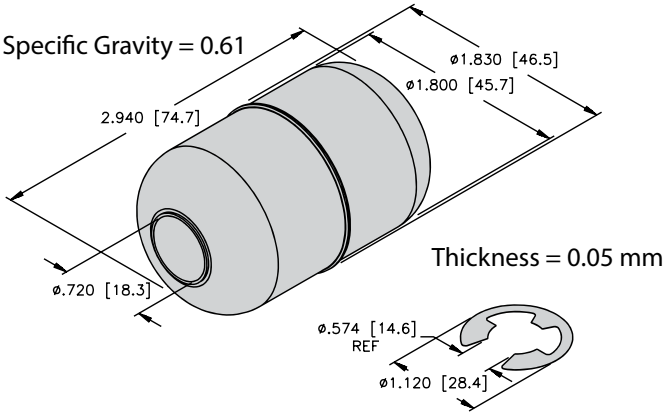
BU-R16-2x3/4 NPT-SS (LT0306)

Float Kit (316 Stainless Steel), general applications



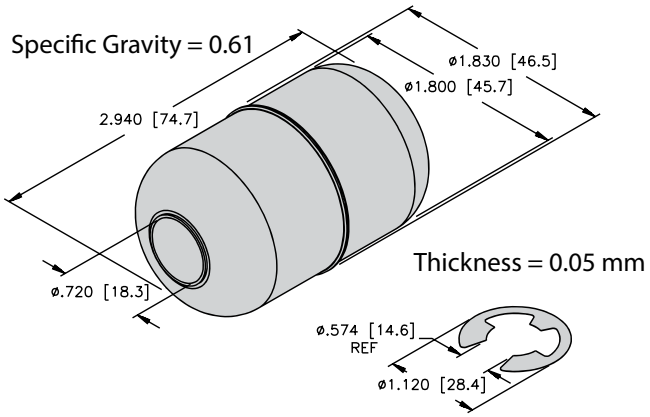
FK-R16-205-SSES (LT0299)

Float Kit (316 Stainles Steel), general applications



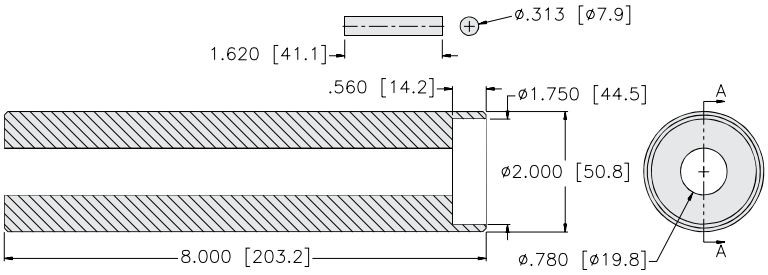
FK-R16-183-SSES (LT0296)

Float Kit (316 Stainles Steel), food grade and sanitary applications



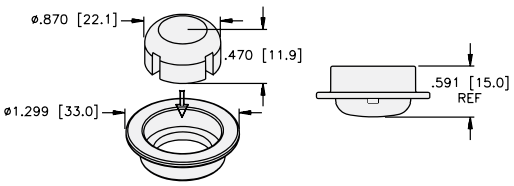
FK-R16-183-SSFE (LT0302)

Weight Kit (316 Stainless Steel)



WK-R16 Weight Kit (LT0295)

Probe Foot (ECTFE)

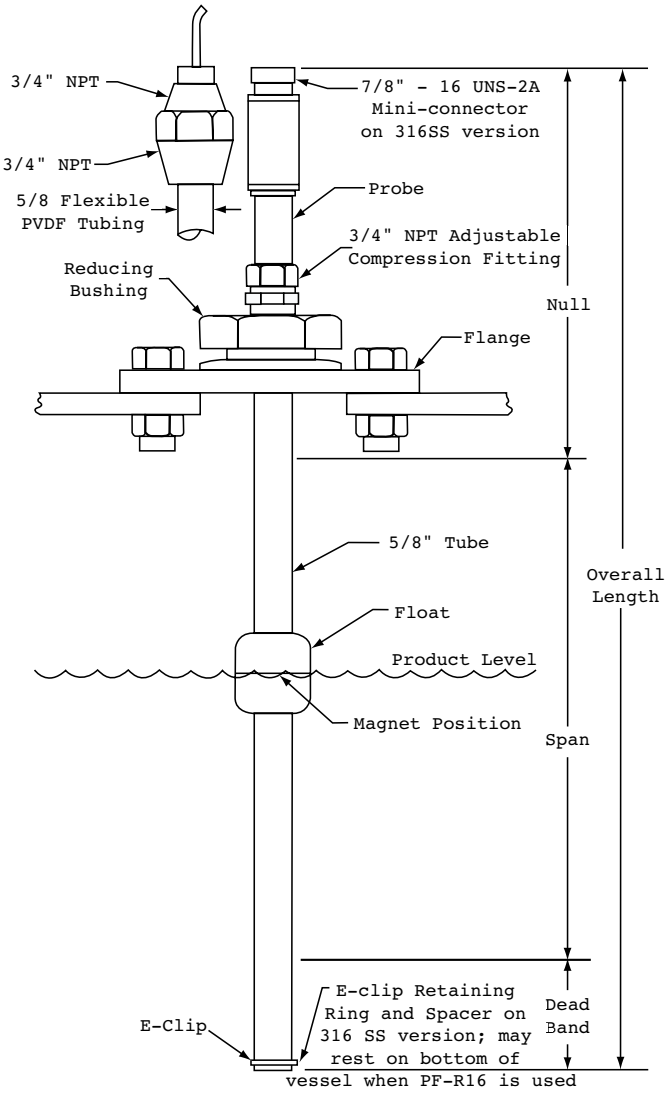


PF-R16 (LT0292)

Required on PVDF probes up to 288 inches long.
For PVDF probes longer than 288 inches, contact factory for appropriate weight kit.

Typical Installation

Probe Style (See Part Key, page 3)	Overall Length (O.A.L)	Null	Dead Band
3 or **A**(316 SS, standard finish)	18-288 in. (457-7315 mm)	8 in. (203 mm)	2 in. (51mm)
S,F,B, or **C**(316SS, Sanitary or Food Grade finish)	18-120 in. (457-3048 mm)	8 in. (203 mm)	2 in. (51 mm)
S with 3A approval (316SS, Sanitary finish)	18-120 in. (457-3048 mm)	8.5 in. (216 mm)	2.5 in. (64 mm)
P(PVDF)	25-144 in. (635-3658 mm)	12 in. (305 mm)	6 in. (152 mm)
	145-288 in. (3683-7315 mm)	12 in. (305 mm)	8 in. (203 mm)
	289-432 in. (7340-10973 mm)	12 in. (305 mm)	12 in. (305 mm)
	433-600 in. (10998-15240 mm)	12 in. (305 mm)	15 in. (381 mm)
	601-720 in. (15265-18288 mm)	12 in. (305 mm)	17 in. (432 mm)
	721-840 in. (18313-21336 mm)	12 in. (305 mm)	19 in. (483 mm)
P with flange C(PVDF)	20-192 in. (508-4877 mm)	9 in. (229 mm)	3 in. (76 mm)



Mounting Conditions

1.The R16 Level Probe is designed for industrial applications, but should be mounted in a location where it will not be affected by vibration, corrosive atmospheres or any possibility of mechanical damage.
2.Mount the probe in an accessible location away from agitation.
3.Ambient measurement temperature should be between -40°C and +70°C (-40°F to +158°F).
4.Mount the probe perpendicular to gravity so that the float will move freely along the probe.
5.The float retention clip (included with stainless steel float kits) or the stainless steel pin (included with the PVDF weight kit) must be in place at the base of the probe after the float has been installed.

Installation

Stainless Steel Probe

1.If you have a probe with a ***minifast*** ® quick disconnect or a single ended 3/4 in. NPT style probe, slide on the tube coupling (TC-R16-SS). If you have a probe with a dual ended 3/4 in. NPT style probe, slide on a bushing (BU-R16-2 x 3/4 NPT-SS), or a customer supplied flange.
2.Slide the float onto the probe. The magnet is located in the middle of the float, so the orientation of the float is irrelevant.
3.Slide the spacer (included with float kit) onto the tube.
4.Attach the E-clip (included with stainless steel float kits), to secure the above parts to the probe.
5.Insert the bottom end of the probe into the tank. Do not allow the float to drop suddenly as it can damage the retainer at the end of the probe.
6.Thread the bushing into the tank or flange, and then bolt the flange into position.
7.Thread the tube coupling (TC-R16-SS) into the bushing or flange.
8.Hand tighten fitting. To insure that the coupling is properly sealed, turn the fitting 1/4 turn after hand tightening.
9.Make sure that all bolts and screws are in proper position and the probe is securely tightened.

Caution:

Do not bend the stainless steel probe during installation. Permanent damage may result. Stainless steel probes longer than 10 ft. must be supported at both ends while handling. The electronic circuits are sealed inside of the probe, so do not attempt to open the probe or weld anything onto the probe, as this will damage the circuitry.

PVDF Probe

1.Cut the tie wrap at the end of the tube. To prevent the coil from unwinding, leave the other tie wraps intact until installation.
2.Install a 4 x 3/4 in. or 2 x 3/4 in. female, NPT threaded fitting (customer supplied) as an adapter for the process connection on the probe.
3.Attach the float to the probe.
4.Attach a stainless steel weight kit (WK-R16).
5.Insert the stainless steel pin in the hole at the end of the probe.
6.Holding the weighted end with the coil over your shoulder, slowly feed the probe into the riser. Cut the remaining tie wraps as you encounter them. The tie wraps are numbered sequentially for your convenience.
7.Feed the weight while you uncoil the probe. Do not drop the weight the full length of the probe as this can cause damage to the end of the probe.
8.The coils of the probe must remain parallel; do not twist the probe during installation.
9.The coil must remain at least one meter (40 in.) in diameter while uncoiling.
10. The electrical components are located in the top 24 in. of the probe. This part of the probe must remain straight throughout the installation or the probe will be damaged. The electrical cable should not be used to lift the probe, as this will also cause damage to the probe.
11. When the probe has been fully inserted into the tank, thread and tighten the 4 x 3/4 in. or 2 x 3/4 in. adapter to the top of the probe and mount it into the riser.

Setting the Span

Correlating Level
Once the magnetostrictive Level Probe has been installed, the output may not be scaled properly for the application. The actual level and the position of the probe in the tank needs to be correlated. You might need to adjust the span to be consistent with actual tank conditions by using a reference value. No other "calibration" is required.

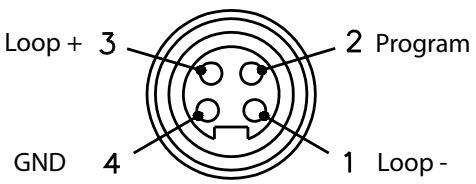
Caution:
Before setting the span in a hazardous area, make sure that the programming wire is properly protected through a safety barrier. See the wiring instructions and Control Drawing IS-1.111 for proper connections.

The probe is shipped from the factory with the span preset based on the probe length. Re-setting of the span is not required unless different 4 mA and/or 20 mA points are required by the application. The 4 mA or 20 mA position can be at either the top or bottom of the probe, and can be set in any order.
The span can be set with either the probe outside or inside the vessel. When the span is set in the vessel, the actual level position in the vessel is used to set the 4 mA and 20 mA positions. If this is not practical, then the probe can be calibrated outside the tank (i.e. "bench calibrated").
There is a **timing sequence** that is used to unlock the probe for programming. This is to insure that the span cannot be accidentally re-programmed in the field.

Manual Setting of Span
1.Place the float at desired 4 mA position and power up the probe.
2.The 4 mA position is set by connecting the **White** Programming Wire (pin 2) to the **Black "Loop -"** (pin 1) Wire for 3 seconds, disconnecting the contact for 3 seconds, reconnecting the **White** and **Black** wires for 2 seconds, and then removing the connection.
3.Place the float at desired 20 mA position.
4.The 20 mA position is set by connecting the **White** Programming Wire (pin 2) to the **Black "Loop – "** (pin 1) Wire for 3 seconds, disconnecting the connection for 3 seconds, connecting the **White** (pin 1) and **Red "Loop +"** (pin3) wires for 2 seconds, and then removing the connection.
5.During normal operation, electrically insulate the White Program wire to prevent accidental setting of span.

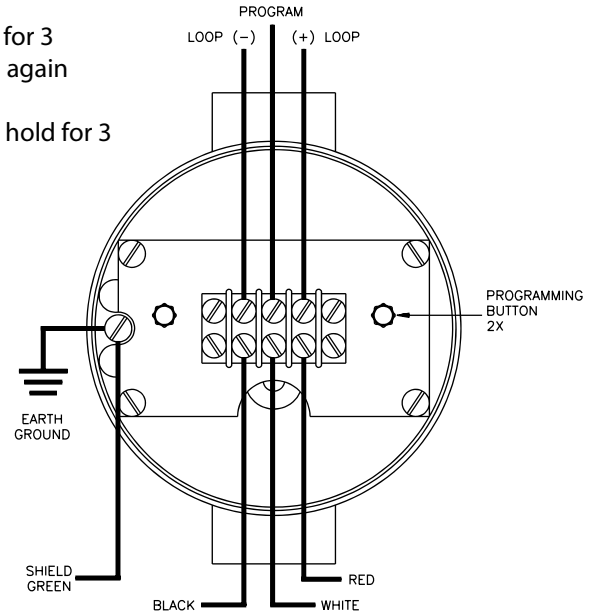
Connection Type	Loop -	Program	Loop +	GND
minifast®	1	2	3	4
Cable	BK	WH	RD	GN

Optional Push Button Setting of SPAN
An optional housing with ZERO and SPAN push buttons is available.
1.Place the float at 4 mA position and push the ZERO button and hold for 3 seconds, release the button for 3 seconds, then push the ZERO button again for 2 seconds.
2.Place the float to the 20 mA position and push the ZERO button and hold for 3 seconds, release for 3 seconds, and then push the SPAN button for 2 seconds.



4-pin *minifast* ® Male View

TB-R16 Wiring Diagram



Diagnostics and Symptoms

Diagnostic Outputs (All diagnostic values with tolerances ±0.02 mA)

1. Float magnet is outside of the programmed span.
   a. Beyond 4 mA set point is indicated as **3.9 mA.**
   b. Beyond 20 mA set point is indicated as **20.1 mA.**
2. Loss of signal, sensor failure, or float outside active range (top or bottom) is indicated as **3.8 mA.**

Symptoms	Troubleshooting Tips
No signal received at controller	• Check that power is applied to controller. • Check wiring connection to probe.
Output is 3.8 mA	• Be sure float retention clip is in place at base of probe and float is installed. • Be sure float is in active region and not stuck in Null or Dead Zone. • Reset Gain (see below). • Check temperature of process. Cannot be greater than +70°C (+158°F).
Output appears erratic	• Be sure probe is mounted perpendicular with gravity. • Check float for free movement along probe. • Reset Gain (see below).
Output appears to be going down, yet tank is filling	• Check configuration of 4 mA and 20 mA points.
Output appears to be going up, yet tank is emptying	• Check configuration of 4 mA and 20 mA points.
Output is not scaled properly	• Reset both Zero (4 mA) and Span (20 mA) points.
Panel Meter error	• Check to see if the panel meter being used is "confused" by an output of less than 4 mA or more than 20 mA. 3.9 mA or 20.1 mA are diagnostic outputs and should be used for alarms.

Gain Control

The internal signal gain is set at the factory and should not need to be adjusted in the field. However, if the output signal is unstable (i.e. the output goes to 3.8 mA with the float in place), or the probe is being applied in a high temperature application, the internal signal gain may be reset as follows.

Manual Setting of Gain

1. Place the float near the end of the probe.
2. Power down the probe.
3. Short the White "Program" (pin 2) wire to the Black "Loop -" (pin 1) wire and apply power with the wires shorted.
4. Output goes from 12 mA to 20 mA if successful.
5. Output will go to 3.8 mA if gain setting failed.
6. Power down the probe and remove the short between the White "Program" (pin 2) wire and the Black "Loop - " (pin 1) wire.
7. Apply power, the probe will return in normal 4 to 20 mA mode with the new gain set.
8. If the signal does not return to normal, and the problem was not solved, contact your distributer, or TURCK application support at 1-800-544-PROX.

Gain Control (continued)

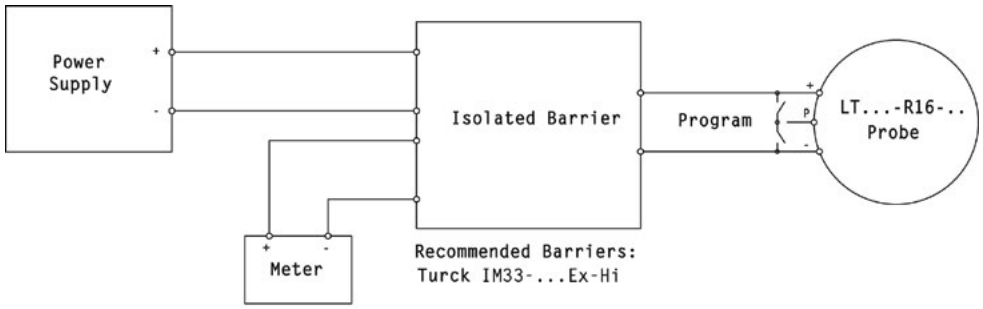
Optional Push Button Setting of Gain

1. Place the float near the top end of probe but still within the active span.
2. Power down the probe.
3. Hold down the Zero button and apply power.
4. Output goes from 12 mA to 20 mA if successful.
5. Output will go to 3.8 mA if AGC failed.
6. Power down the probe and release the Zero button. 20 mA mode with the new gain set.
7. Apply power, the probe will return in normal 4 to 20 mA mode with the new gain set.

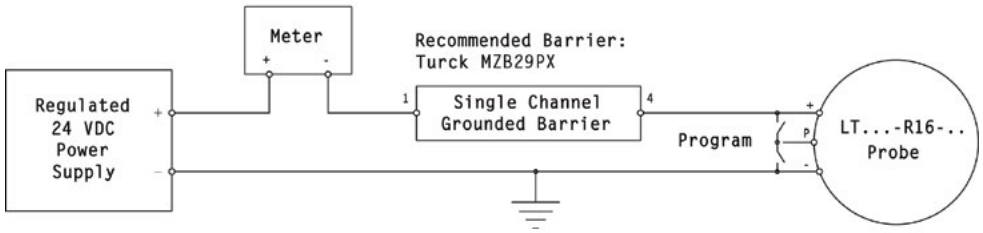
Wiring: Intrinsically Safe Barriers

If the sensor is located in a hazardous location, do not make any electrical connections without first disconnecting electrical power at the source. Select and install intrinsic safety barriers in accordance with the Control Drawing IS-1.111. Ensure that all wiring methods conform to electrical codes for the specific location and area classification. The TURCK barrier recommendations below were selected to comply with the requirements of the Control Drawing as well as to have the appropriate performance characteristics.

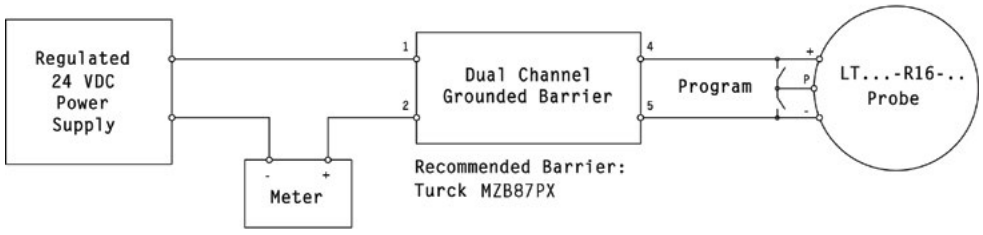
Isolated repeater barriers are the simplest, most flexible solution if programming is accomplished in the hazardous location.



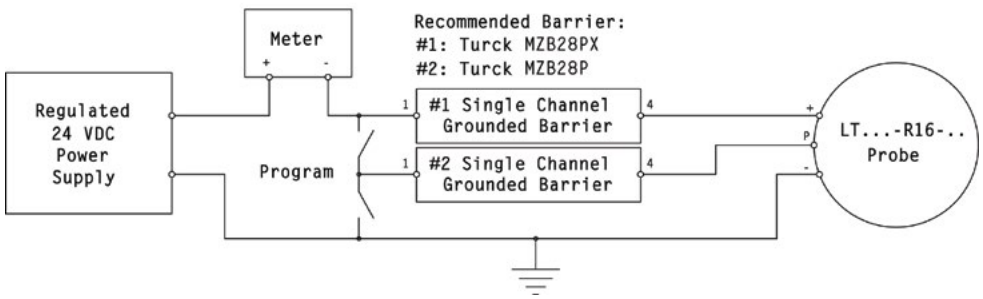
A single channel grounded barrier can only be used if the meter (resistive load) is placed in the positive leg of the loop and the meter has a differential input.



If the meter (resistive load) is in the return leg of the loop and may be grounded, then two grounded barrier channels (e.g. - one dual channel barrier or two single channel barriers) must be used.



Programming may be accomplished in the nonhazardous area if a second barrier channel is used for the programming wire.



Specifications

Operating Voltage	13.5 to 30 VDC
Output	
Operating Output	4 to 20 mA; 20 to 4 mA
Diagnostic Output	3.9 mA for oat outside 4 mA end of span. 20.1 mA for oat outside 20 mA end of span, 3.8 mA for no signal received. Note: Diagnosostic Tolerance ±0.02 mA
Operating Temperature	
Hazardous Locations	-40°C to 70°C
Non Hazardous Location	
Sensing Area	-40°C to 100°C
Electronic Area	-40°C to 70°C
Pressure Rating	Stainless Steel 1000 psi max. / PVDF 150 psi
Resolution	0.025% of programmable span or 0.014 in. (whichever is greater)
Repeatability	0.014 in. + 0.05% of span (typical)
Maximum	0.014 in. +0.4% of span (maximum)
Accuracy	0.1% of programmable span or 0.050 in. (whichever is greater)
Null Zone	Stainless Steel: 8 in.; PVDF: 12 in. (9 in. for ange adapter "C")
Dead Band	Stainless Steel: 2 in.; PVDF; 3-19 in. (see page 6)
Intrinsic Safety Barrier	See control drawing (page 12)
Enclosure Rating	IP 68
Material	316 Stainless Steel or PVDF (probe)
Hazardous Areas Approvals	
cFMus	-40° Tamb +70°C; Class I, II, III, Div. 1; Groups C, D, E, F, G, T4; Class I, Div. 2; Groups A, B, C, D, T4; Class I, Zone O, A Ex ia IIB T4 Ga
ATEX	ATEX Ex ia IIB T4 Ga; FM FM13ATEX0061X (See PVDF installation note); Ex II 1 G
Other Approvals	
Sanitary	3A (74-07)

CE 0102 FM APPROVED 3A

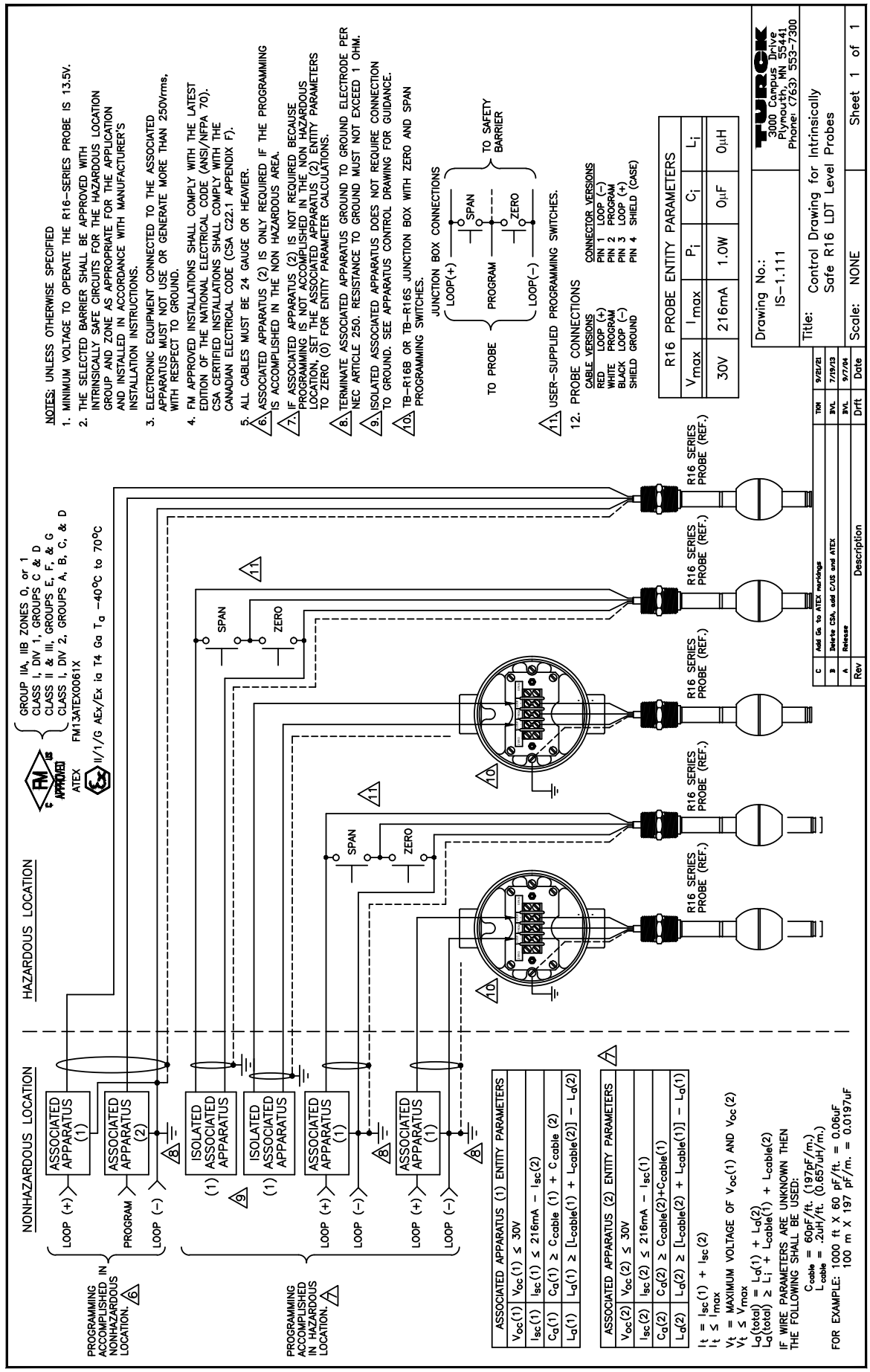
Specific Conditions of Use:

The equipment contains non-metallic enclosure parts, to prevent the risk of electrostatic sparking the non-metallic surface should only be cleaned with a damp cloth.

Caution:

Disconnect Power Before Servicing. The R16 Liquid Level Probe Contains No Serviceable Components. Consult Factory for Repair or Replacement.

Control Drawing for Intrinsically Safe R16 LDT Level Probes



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B1400 12/21

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