

Echotel® Models 915P & 915W

Installation and Operating Manual

Ultrasonic
Two-Wire
Level
Switches



Model 915W



Model 915P

Read this Manual Before Installing

This manual provides information on the Echotel Model 915P and 915W Ultrasonic Two-Wire Liquid Level Switches. It is important that all instructions are read carefully and followed in sequence. Detailed instructions are included in the Installation section of this manual.

Conventions Used in this Manual

Certain conventions are used in this manual to convey specific types of information. General technical material, support data, and safety information are presented in narrative form. The following styles are used for notes, cautions, and warnings.

Notes

Notes contain information that augments or clarifies an operating step. Notes do not normally contain actions. They follow the procedural steps to which they refer.

Cautions

Cautions alert the technician to special conditions that could injure personnel, damage equipment, or reduce a component's mechanical integrity. Cautions are also used to alert the technician to unsafe practices or the need for special protective equipment or specific materials. In this manual, a caution box indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.

Warnings

Warnings identify potentially dangerous situations or serious hazards. In this manual, a warning indicates an imminently hazardous situation which, if not avoided, could result in serious injury or death.

Safety Messages

The Echotel Models 915P and 915W are designed for use in Category II, Pollution Degree 2 installations. Follow all standard industry procedures for servicing electrical and computer equipment when working with or around high voltage. Always shut off the power supply before touching any components. Although high voltage is not present in this system, it may be present in other systems.

Electrical components are sensitive to electrostatic discharge. To prevent equipment damage, observe safety procedures when working with electrostatic sensitive components.

This device complies with Part 15 of the FCC rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) This device must accept any interference received, including interference that may cause undesired operation.

WARNING! Explosion hazard. Do not connect or disconnect equipment unless power has been switched off or the area is known to be non-hazardous.

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Warranty

All Magnetrol/STI electronic level and flow products are warranted free of defects in materials or workmanship for one full year from the date of original factory shipment.

If returned within the warranty period; and, upon factory inspection of the control, the cause of the claim is determined to be covered under the warranty; then, Magnetrol/STI will repair or replace the control at no cost to the purchaser (or owner) other than transportation.

Magnetrol/STI shall not be liable for misapplication, labor claims, direct or consequential damage or expense arising from the installation or use of equipment. There are no other warranties expressed or implied, except special written warranties covering some Magnetrol/STI products.

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Magnetrol's quality assurance system is registered to ISO 9001 affirming its commitment to known international quality standards providing the strongest assurance of product/service quality available.



Echotel Model 915P & 915W

Ultrasonic Two-Wire

Liquid Level Switches

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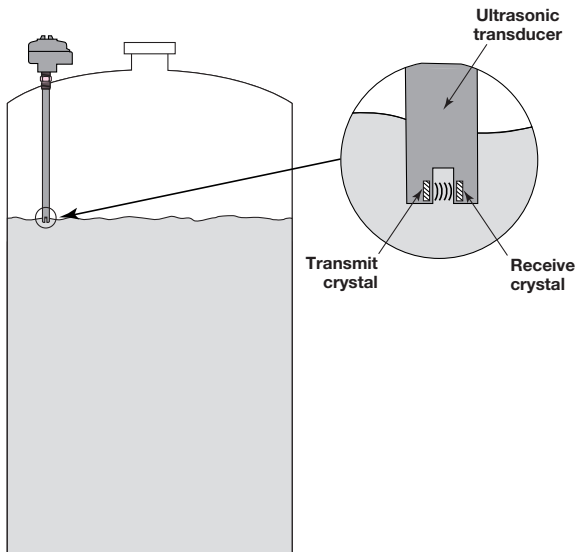
1.0 Introduction

Echotel Model 915P and 915W ultrasonic level switches are two-wire, loop powered integral units, which utilize pulsed signal technology to detect high or low level in a broad range of liquid media applications.

1.1 Principle of Operation

Echotel 915P and 915W level switches utilize ultrasonic energy to detect the presence or absence of liquid in a tip sensitive transducer. The principle behind contact ultrasonic technology is that high-frequency sound waves are easily transmitted across a transducer gap (see Figure 1) in the presence of liquid, but are attenuated when the gap is dry. The Model 915P and 915W use this ultrasonic technology to perform liquid level measurement in a wide variety of process media and application conditions.

The transducer uses a pair of piezoelectric crystals that are encapsulated in epoxy at the tip of the transducer. The crystals are made of a ceramic material that vibrates at a given frequency when subjected to an applied voltage. The transmit crystal converts the applied voltage from the electronics into an ultrasonic signal. When liquid is present in the gap, the receive crystal is able to sense the ultrasonic signal from the transmit crystal and convert it back to an electrical signal. This signal is sent to the electronics to indicate the presence of liquid in the transducer gap. When there is no liquid present the ultrasonic signal is attenuated, and is not detected by the receive crystal.



Ultrasonic signal transmission
across transducer gap

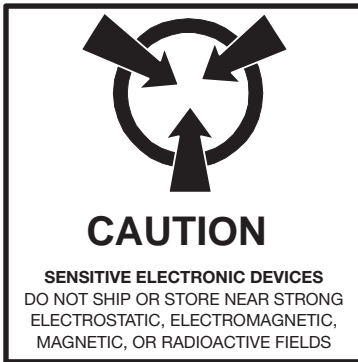
Figure 1

2.0 Installation

2.1 Unpacking

Unpack the instrument carefully. Inspect all units for damage. Report any concealed damage to carrier within 24 hours. Check the contents of the packing slip and purchase order. Check and record the serial number for future reference when ordering parts.

2.2 Electrostatic Discharge (ESD) Handling Procedure



Magnetrol's electronic instruments are manufactured to the highest quality standards. These instruments use electronic components that may be damaged by static electricity present in most work environments.

The following steps are recommended to reduce the risk of component failure due to electrostatic discharge.

- Ship and store circuit boards in anti-static bags. If an anti-static bag is not available, wrap the board in aluminum foil. Do not place boards on foam packing materials.
- Use a grounding wrist strap when installing and removing circuit boards. A grounded workstation is recommended.
- Handle circuit boards only by the edges. Do not touch components or connector pins.
- Make sure that all electrical connections are completely made and none are partial or floating. Ground all equipment to a good, earth ground.

2.3 Preliminary Operational Check

After unpacking and before installation, perform the following operational check on the unit in a non-hazardous area.

1. Set the Hi-Level/Lo-Level Failsafe switch (Figure 6) to the Hi-Level position.
2. In a non-hazardous environment, apply power to the unit with the proper input voltage. Refer to Wiring section 2.5. The unit should draw $16 \text{ mA} \pm 1 \text{ mA}$ and the green LED should be lit.
3. Fill a suitable container with liquid.
4. Place the transducer in the liquid. The unit should draw $8 \text{ mA} \pm 1 \text{ mA}$ and the red LED should be lit.
5. Remove transducer from the liquid. The loop current should return to $16 \text{ mA} \pm 1 \text{ mA}$, with the green LED lit. In case of malfunction, refer to the Troubleshooting section 3.1.

2.4 Mounting

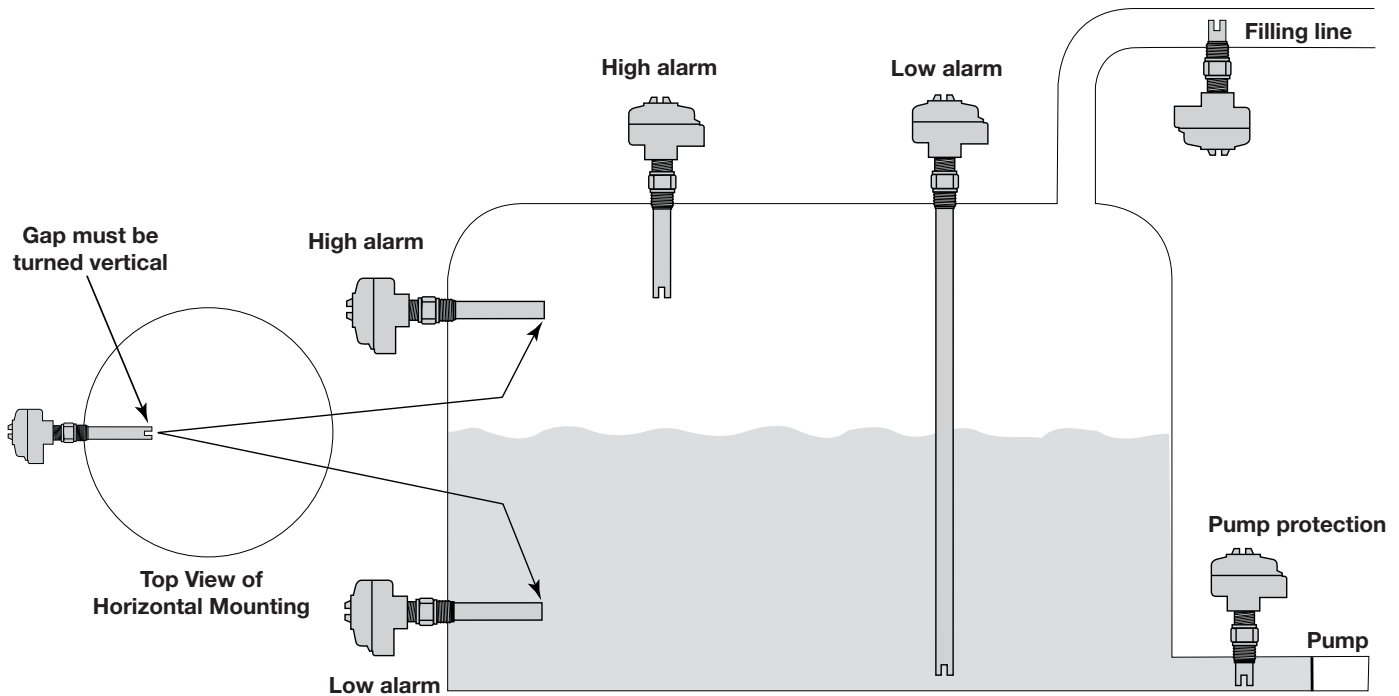


Figure 2: Typical Mounting Orientations

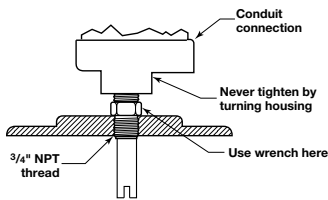


Figure 3
Vertical Mounting

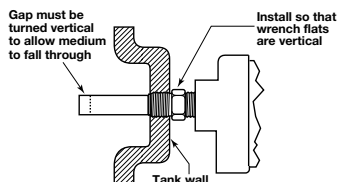


Figure 4
Horizontal Mounting

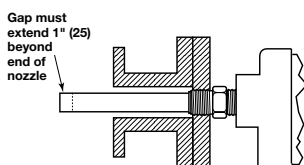


Figure 5
Nozzle Mounting

Models 915P and 915W level switches are shipped as integral units with the electronics assembled to the transducer. They may be mounted in a variety of positions as shown in Figures 2 through 5.

Proper orientation of the transducer gap will facilitate maximum performance in difficult applications. When the switch is mounted horizontally, the transducer gap must be turned vertical to allow proper drainage of the liquid media. See Figures 2 and 4.

Screw transducer into the opening using pipe compound or thread tape. If flanged, bolt unit to mating flange with proper gasket.

CAUTION: Never tighten unit on the tank connection by turning the housing. Use a wrench on the transducer mounting nut flats. Use thread tape or suitable pipe compound on the threads. Do not overtighten.

When installed in a nozzle or pipe, the transducer gap must extend into the tank at least one inch beyond the inside tank wall. Refer to Figure 5.

2.5 Wiring

Wiring connections are made at the two-position terminal strip within the electronics enclosure. Use of 12-22 AWG twisted shielded pair wire is recommended. The wires should be terminated with a #6 spade lug.

OBSERVE ALL APPLICABLE ELECTRICAL CODES AND PROPER WIRING PROCEDURES.

1. Make sure the power is turned off.
2. Unscrew and remove the housing cover.
3. Prevent moisture seepage into housing by installing an approved seal-drain fitting in the conduit run leading to the unit.
4. Pull twisted shielded pair wire through the conduit connection.

NOTE: Transducer phono plugs are factory installed in phono jacks J1 and J2. On the Model 915P these connections are not interchangeable, therefore, if they should become disconnected, reinsert the cable marked P1 into jack J1 and the cable marked P2 into jack J2.

NOTE: The J1 and J2 jacks are interchangeable on the Model 915W electronics. The Model 915W has an additional jack that connects the twisted red and black wires into J3 (see Figure 8). Make sure that this connector is fully inserted into jack J3.

5. Connect wiring to the terminals marked + and – with spade lugs as shown in Figure 6.
6. The shield is not terminated at the unit. The shield should be connected at the power supply end.
7. Dress wiring to guard against interference or contact with housing cover or base.
8. Installation is complete. Replace housing cover.

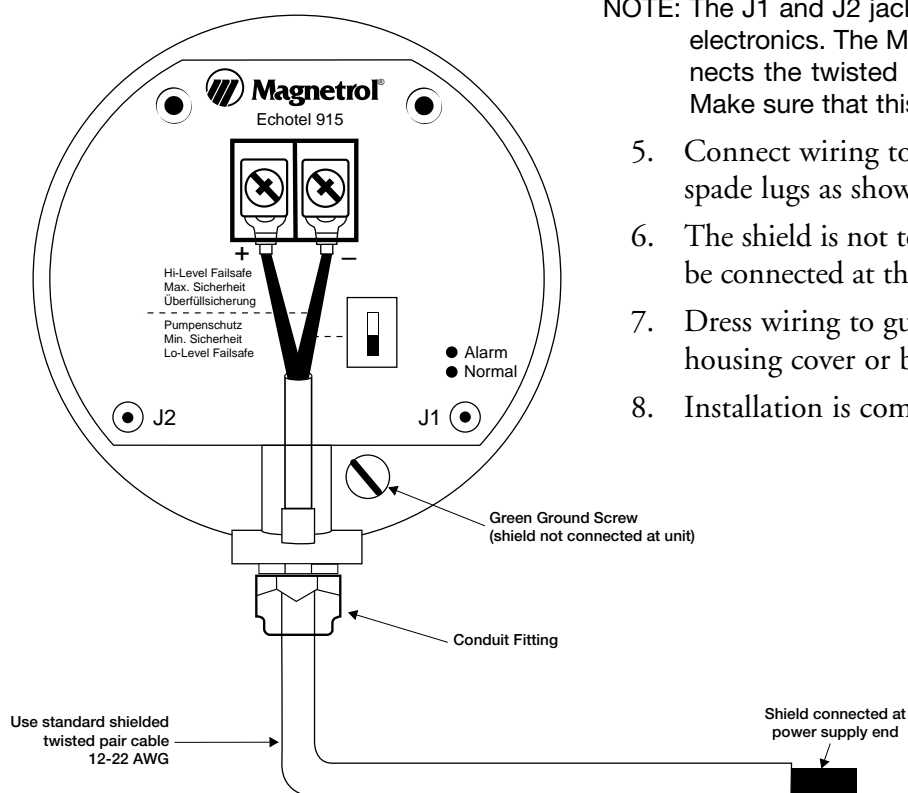


Figure 6
Wiring

2.6 Configuration

Configuration for Model 915P and 915W units is made simply by selecting either Hi-Level Failsafe, or Lo-Level Failsafe via the two-position switch in the middle of the potted module. In the Hi-Level Failsafe position the output is 16 mA when no liquid is in the transducer gap, and 8 mA with liquid in the gap. The Lo-Level Failsafe configuration produces 8 mA with no liquid in the gap, and 16 mA with liquid in the gap.

MODE	DRY GAP	WET GAP	MALFUNCTION
High level Failsafe	Output = 16 mA Alarm LED = Off Normal LED = Green	Output = 8 mA Alarm LED = Red Normal LED = Off	Output = 5 mA Alarm LED = Off Normal LED = Off
Low level Failsafe	Output = 8 mA Alarm LED = Red Normal LED = Off	Output = 16 mA Alarm LED = Off Normal LED = Green	Output = 5 mA Alarm LED = Off Normal LED = Off

Failsafe Configuration Table

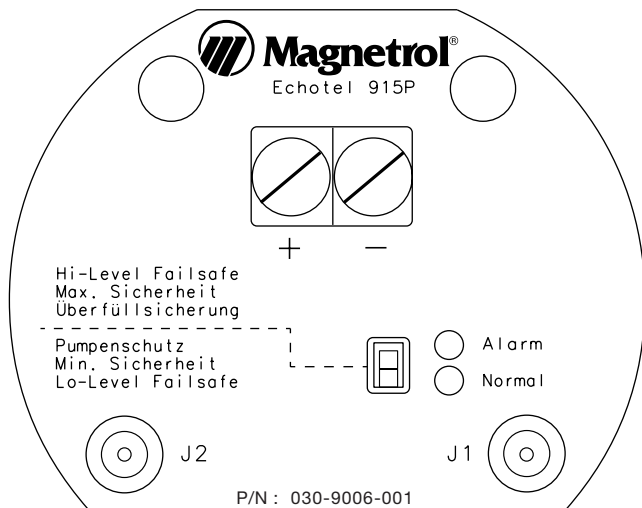


Figure 7
915P Configuration

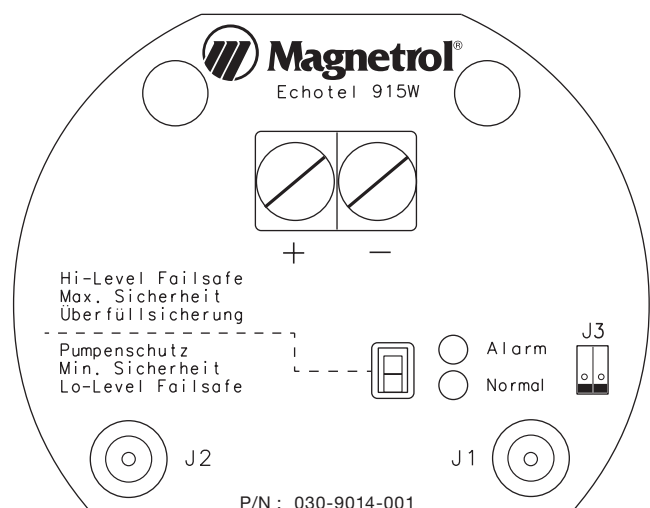














Figure 8
915W Configuration

2.7 Operational Test

The following procedure can be used to make sure that a Model 915P or 915W is operating properly.

1. Fill a suitable container with liquid.
2. Use Figure 9 below to test the mA output and the green and red LED's with a dry transducer gap, and the gap immersed in the liquid.
3. If desired, the malfunction output (5mA) can be checked by unplugging a phono jack from either J1 or J2. Needle nose pliers should be used to unplug the phono jacks.

Mode	Level	Output signal	LED Indication	
			green	red
High Level Failsafe		16 mA ± 1 mA		
		8 mA ± 1 mA		
Low Level Failsafe		16 mA ± 1 mA		
		8 mA ± 1 mA		



 = lit (on)
 = unlit (off)

Figure 9 Failsafe Operation

Consult the Troubleshooting section if the mA current output or LED's differ from what is shown above.




3.0 Reference Information


3.1 Troubleshooting

CAUTION: In hazardous areas, do not remove housing cover until power is disconnected and atmosphere is determined to be safe.

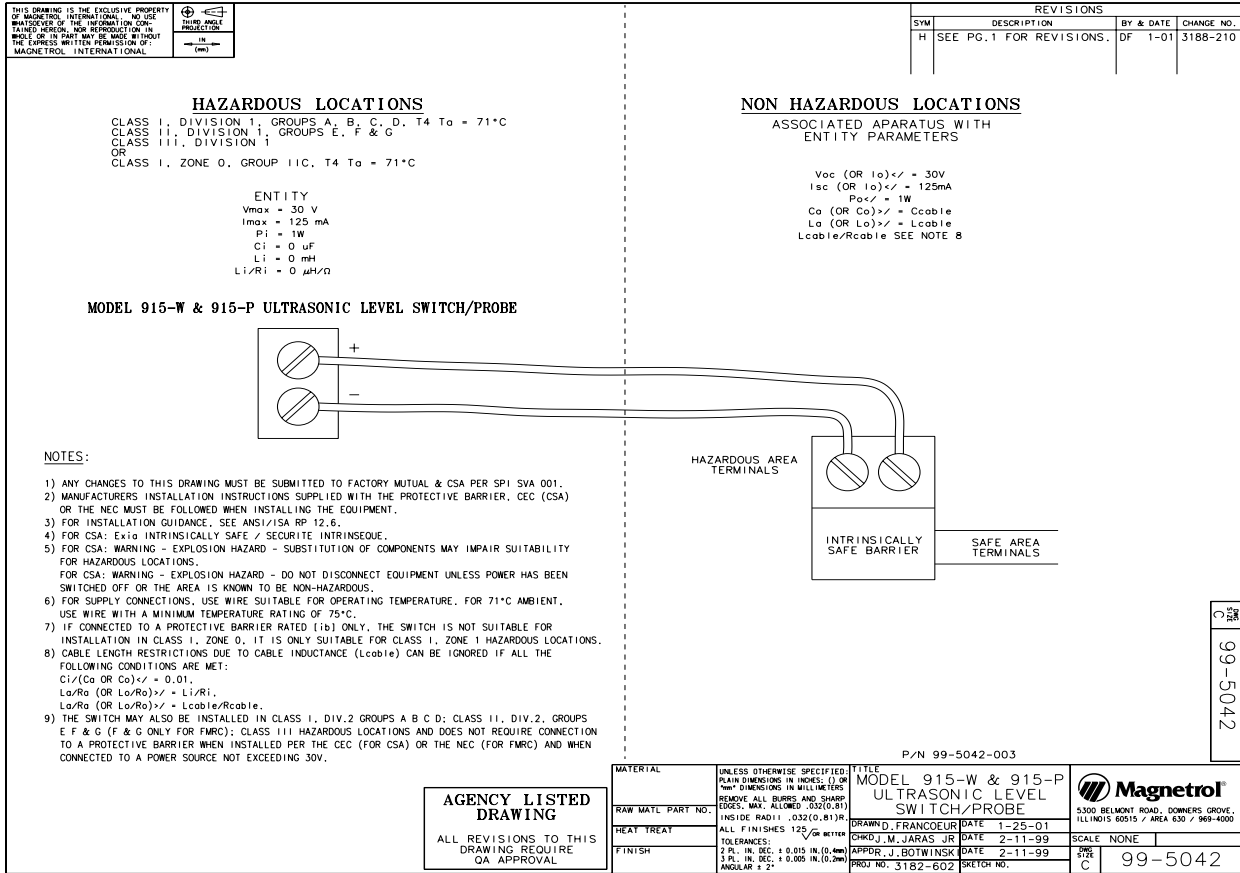
1. No signal with level change
 - a. Check wiring. A minimum of 10 VDC must be at the terminal block.
 - b. Make sure liquid is filling the transducer gap.
 - c. Check for dense foam on surface or dried product in the gap. Unit will not function properly if either condition exists.
2. No change in loop current between wet gap or dry gap.
 - a. Check to see if transducer gap is plugged with solids.
 - b. Check for dense foam in gap.
3. Output current at 0 mA
 - a. Check wiring to make sure input voltage is between 10 – 35 VDC.

3.2 Agency Approvals

AGENCY	APPROVED MODEL	PROTECTION METHOD	AREA CLASSIFICATION
FM 	915-XX2A-0X0 with 9X1-XXXX-XXX	Intrinsically Safe	Class I, Div. 1; Groups A, B, C, & D Class II, Div. 1; Groups E, F, & G Class III, NEMA 4X, IP 65 Entity
	915-PX2A-0X0 with 9X1-XXX1-XXX	Explosion Proof	Class I, Div. 1; Groups C & D Class II, Div. 1; Groups E, F, & G Class III, NEMA 4X, IP 65
	915-XX2A-0X0 with 9X1-XXXX-XXX	Non-incendive	Class I, Div. 2; Groups A, B, C, & D Class II, Div. 2; Groups F & G Class III, NEMA 4X, IP 65
CSA 	915-XX2A-0X0 with 9X1-XXXX-XXX	Intrinsically Safe	Class I, Div. 1; Groups A, B, C, & D Class II, Div. 1; Groups E, F, & G Class III, Type 4X Entity
	915-PX2A-0X0 with 9X1-XXX1-XXX	Explosion Proof	Class I, Div. 1; Groups C & D Class II, Div. 1; Groups E, F, & G Class III, Type 4X
	915-XX2A-0X0 with 9X1-XXXX-XXX	Non-incendive	Class I, Div. 2; Groups A, B, C, & D Class II, Div. 2; Groups E, F, & G Class III, Type 4X
CENELEC 	915-PX2A-0X0 with 9X1-XXX1-XXX	Flame Proof	EEx d II C T6
	915-PX2A-0X0 with 9X1-XXX1-XXX	Intrinsically Safe	EEx ia II C T6


 These units have been tested to EN 50081-2 and EN 50082-2 and are in compliance with the EMC Directive 89/336/EEC.

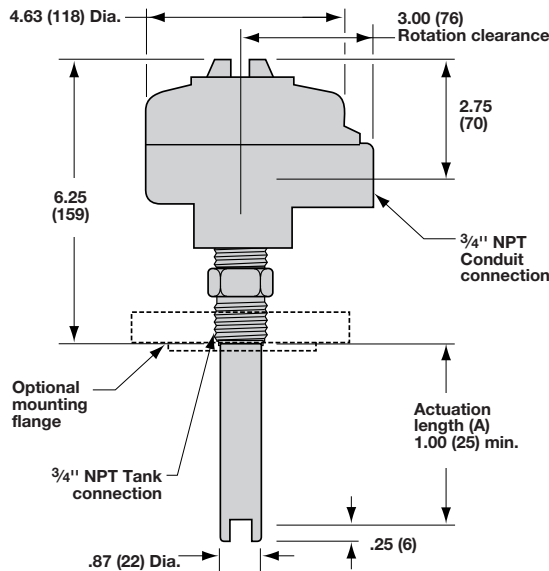
3.3 Intrinsically Safe Installations



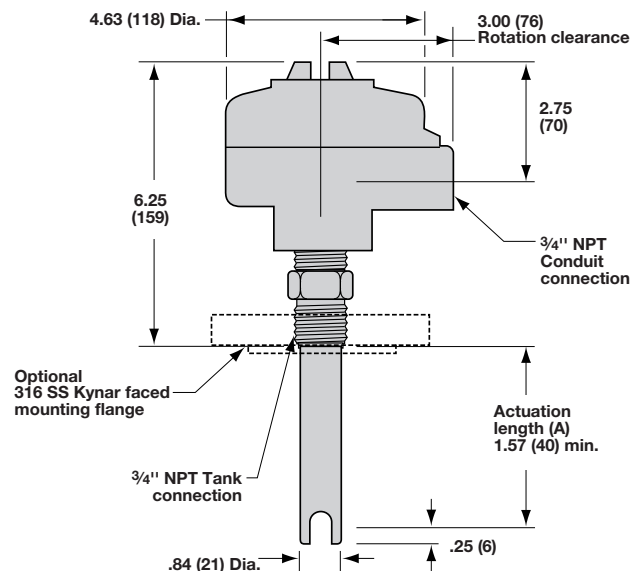
3.4 Specifications

3.4.1 Physical

Inches (mm)



Model 915P



Model 915W

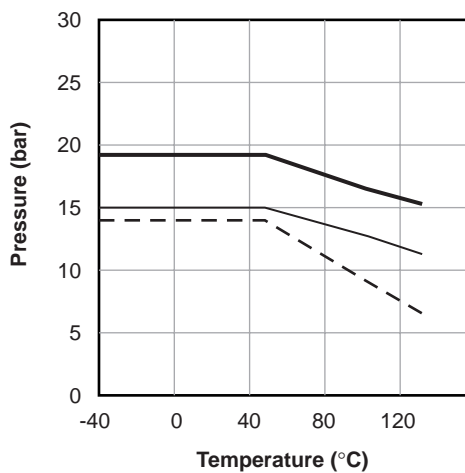
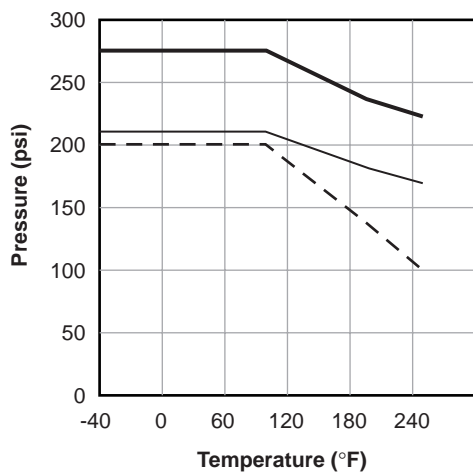
NOTE: Allow 4.00 (102) overhead clearance for cover removal.

3.4.2 Electrical

Input voltage		10–35 Vdc (24 Vdc nominal)
Power consumption		1 watt maximum
Signal technology		Pulse (electronic windowing)
Output	Normal operation	16 mA ± 1 mA
	Alarm condition	8 mA ± 1 mA
	Malfunction	5 mA ± 1 mA
LED indication	Normal operation	Green LED on
	Alarm condition	Red LED on
	Malfunction	No LED's on
Response time		0.15 second typical
Repeatability		±0.078" (2 mm)
Ambient temperature		-40° to +160° F (-40° to +70° C)
Housing material		Cast aluminum, NEMA 4X
Humidity		0-99% non condensing
Shock		ANSI/ISA-S71.03 Class SA1
Vibration		ANSI/ISA-S71.03 Class VC2

3.4.3 Transducer

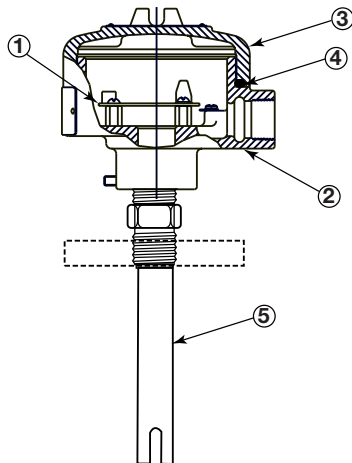
Transducer materials	915P	316/316L stainless steel, Hastelloy C-276, or Monel
	915W	Kynar® (PVDF)
Operating frequency		2 MHz
Operating temperature	915P	-40° to +300° F (-40° to +150° C)
	915W	-40° to +250° F (-40° to +120° C)
Maximum pressure	915P	1500 psig @ +300° F (103 bar @ +150° C)
	915W	100 psig @ +250° F (7 bar @ +120° C) with 3/4" NPT (see below)



- Operating range for 915W Kynar transducer with 150# flange
- Operating range for 915W Kynar transducer with PN16 flange
- - - Operating range for 915W Kynar transducer with 3/4" NPT

NOTE: All 915P transducers are rated to 1500 psig (103 bar) for the entire operating temperature range.

3.5 Replacement Parts



No.	Description	Part Number
1*	915-P22A-0X0 potted module 915-P32A-0X0 potted module 915-W22A-0X0 potted module	030-9006-001 030-9006-002 030-9014-001
2	Base	004-9104-022
3	Cover	004-9105-001
4	O-Ring	012-2101-345
5	Transducer	Select from Model Identification on Page 11 or 12.

*Recommended spare parts for either the Model 915P or 915W Switch.

3.6 Model Numbers

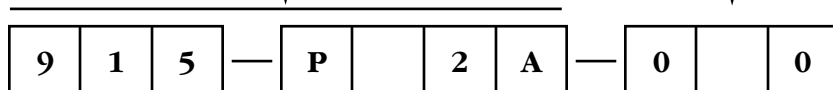
3.6.1 Model 915P

BASIC MODEL NUMBER

915-P22A	Two-wire, loop powered switch with stainless steel transducer (Transducer Material code 22)
915-P32A	Two-wire, loop powered switch with Hastelloy C or Monel transducer (Transducer Material codes HC or MM)

HOUSING

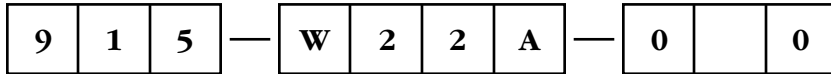
I	Cast aluminum with 3/4" NPT conduit connection
5	Cast aluminum with M20 x 1.5 conduit connection
6	Cast aluminum with PG13.5 conduit connection
7	Cast aluminum with PG16 conduit connection



3.6.2 Model 915W

HOUSING

1	Cast aluminum with 3/4" NPT conduit connection
5	Cast aluminum with M20 x 1.5 conduit connection
6	Cast aluminum with PG13.5 conduit connection
7	Cast aluminum with PG16 conduit connection



PROCESS CONNECTION

1	3/4" NPT
B	1" 150 lb. flange
C	1 1/2" 150 lb. flange
D	2" 150 lb. flange
K	DN 25, PN 16, DIN 2527 Form B
M	DN 50, PN 16, DIN 2527 Form B

TRANSDUCER MATERIAL

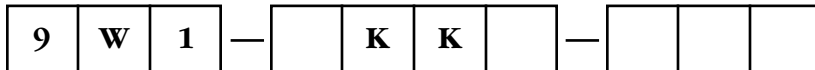
KK	Kynar (PVDF)
----	--------------

UNIT OF MEASURE

E	English, actuation length in inches
M	Metric, actuation length in centimeters

ACTUATION LENGTH (unit of measure specified in seventh digit)

2" to 130" in 1" increments Example: 4 inches = 004
4 cm to 330 cm in 1 cm increments Example: 6 centimeters = 006



Service Policy

Owners of Magnetrol controls may request the return of a control or any part of a control for complete rebuilding or replacement. They will be rebuilt or replaced promptly. Controls returned under our service policy must be returned by Prepaid transportation. Magnetrol will repair or replace the control at no cost to the purchaser (or owner) other than transportation if:

1. Returned within the warranty period; and
2. The factory inspection finds the cause of the claim to be covered under the warranty.

If the trouble is the result of conditions beyond our control; or, is NOT covered by the warranty, there will be charges for labor and the parts required to rebuild or replace the equipment.

In some cases it may be expedient to ship replacement parts; or, in extreme cases a complete new control, to replace the original equipment before it is returned. If this is desired, notify the factory of both the model and serial numbers of the control to be replaced. In such cases, credit for the materials returned will be determined on the basis of the applicability of our warranty.

No claims for misapplication, labor, direct or consequential damage will be allowed.

Low Voltage Directive

For use in Category II installations. If equipment is used in a manner not specified by manufacturer, protection provided by equipment may be impaired.

Return Material Procedure

So that we may efficiently process any materials that are returned, it is essential that a "Return Material Authorization" (RMA) number be obtained from the factory, prior to the material's return. This is available through Magnetrol's local representative or by contacting the factory. Please supply the following information:

1. Company Name
2. Description of Material
3. Serial Number
4. Reason for Return
5. Application

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.

All shipments returned to the factory must be by prepaid transportation.

All replacements will be shipped F.O.B. factory.

NOTE: See Electrostatic Discharge Handling Procedure on page 2.



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