Echotel®
Model 919

Installation and Operating Manual

Ultrasonic

Level

Switch

Model 919
with ¾" NPT

Model 919
with sanitary fitting

Magnetrol®

STI

Read this Manual Before Installing

This manual provides information on the Echotel Model 919 Ultrasonic Liquid Level Switch. 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 Model 919 is 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.

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.

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.

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Magnetrol reserves the right to make changes to the product described in this manual at any time without notice. Magnetrol makes no warranty with respect to the accuracy of the information in this manual.

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.

Quality Assurance

The quality assurance system in place at Magnetrol/STI guarantees the highest level of quality throughout the company. Magnetrol/STI is committed to providing full customer satisfaction both in quality products and quality service.

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.

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1.0 Introduction

1.1 Description

Echotel Model 919 ultrasonic level switches are compact integral units that utilize pulsed signal technology to perform high or low level measurement in a wide variety of liquid applications. These switches feature a 316 stainless steel tip sensitive transducer, and surface mount electronics housed in a watertight, corrosion resistant Valox® enclosure.

1.2 Principle of Operation

Echotel 919 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 919 uses this ultrasonic technology to perform liquid level measurement in a wide variety of process media and application conditions.

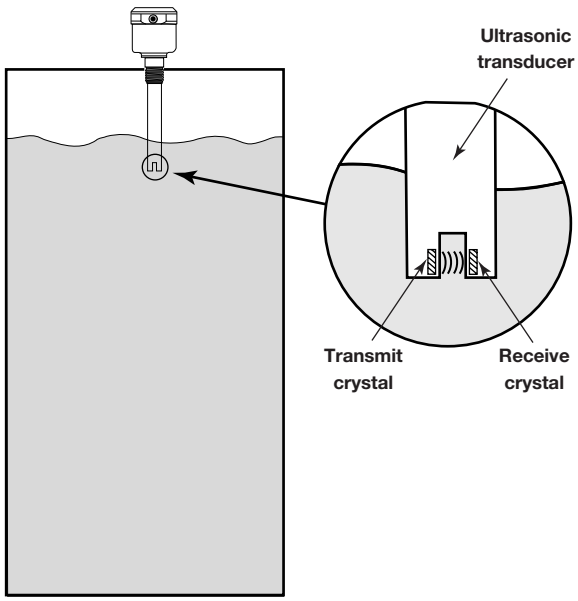


Figure 1
Ultrasonic signal transmission across transducer gap

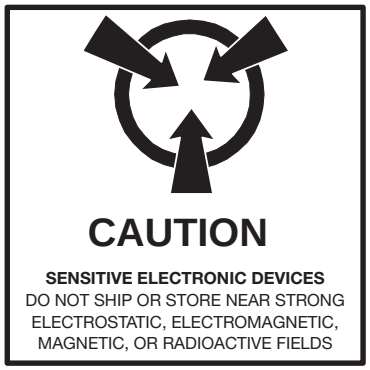
The transducer uses a pair of piezoelectric crystals that are encapsulated in epoxy at the tip of the transducer. The crystals are made of a ceramic material that vibrates at a given frequency when subjected to an applied voltage. The transmit crystal converts the applied voltage from the electronics 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.

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 Before You Begin

Each Model 919 is built to match the specific physical specifications of the required installation. Make sure the transducer process connection is correct for the threaded or flanged mounting on the vessel or tank where the switch will be located. *See Mounting, Section 2.4*.

For the relay version of the Model 919, make sure that the input power will be 24 VDC ±10%. The all voltage version of the 919 must be used in series with a load. *See Wiring, Section 2.5*.

2.4 Mounting

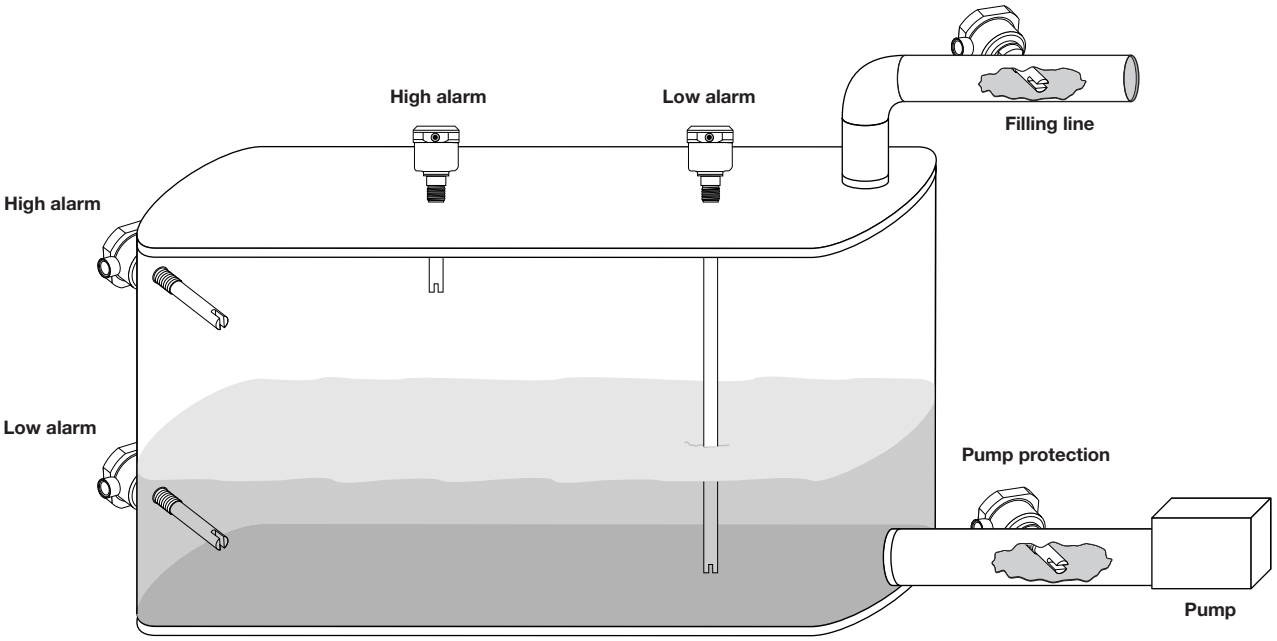


Figure 2
Typical Mounting Orientations

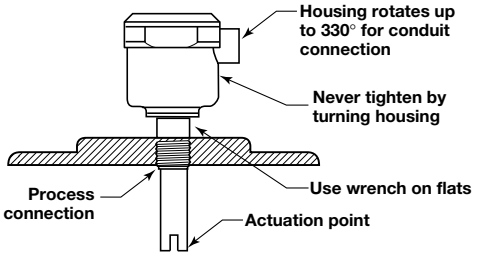


Figure 3
Vertical Mounting

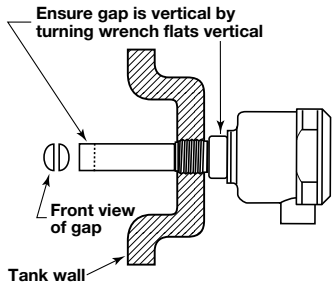


Figure 4
Horizontal Mounting

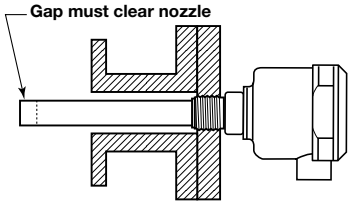


Figure 5
Nozzle Mounting

Model 919 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 . The wrench flats on the mounting nut are aligned with the transducer gap; therefore, proper transducer mounting can be achieved by aligning the mounting nut flats in a vertical orientation. 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. The Valox housing can be rotated up to 330 degrees to align with the conduit.

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

2.5.1 Relay Version

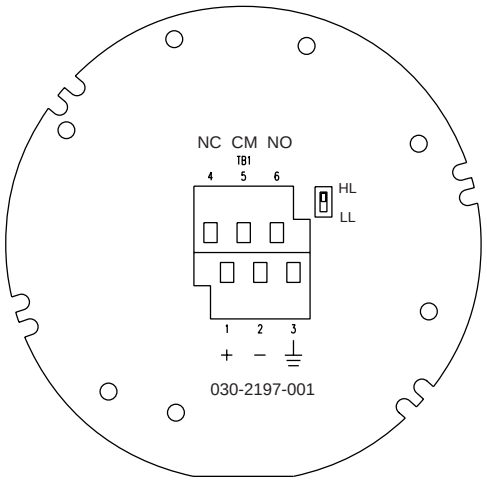


Figure 6
Model 919 relay PC board

Wiring connections for the relay version of the Model 919 are made at TB1, which is a dual level six position terminal block. The lower three positions are used for input power, and the upper three are used for terminating the relay wiring. The use of 14 to 22 AWG wire is recommended for power and relay wiring.

OBSERVE ALL APPLICABLE ELECTRICAL CODES AND PROPER WIRING PROCEDURES.

1. Make sure the power is turned off.
2. 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 wires through the conduit connection.
5. Connect power wiring to the terminals marked + , – , and ⏚ as shown in Figure 6.
6. Connect relay wiring to the terminals marked NC, CM, and NO as shown in Figure 6.
7. Dress wiring to guard against interference or contact with housing cover or base.
8. Installation is complete. Replace housing cover.

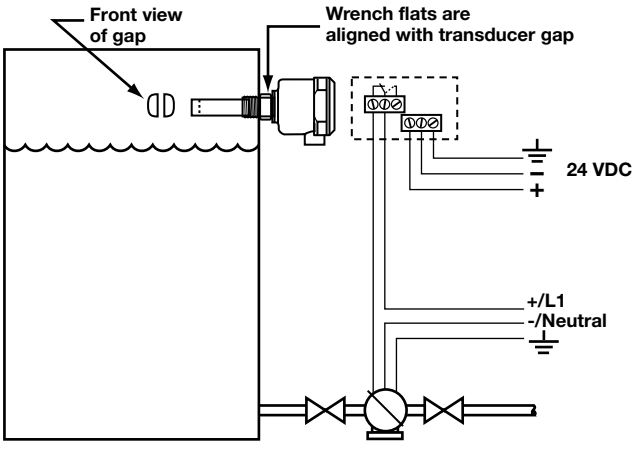


Figure 7
Typical 919 relay unit wiring

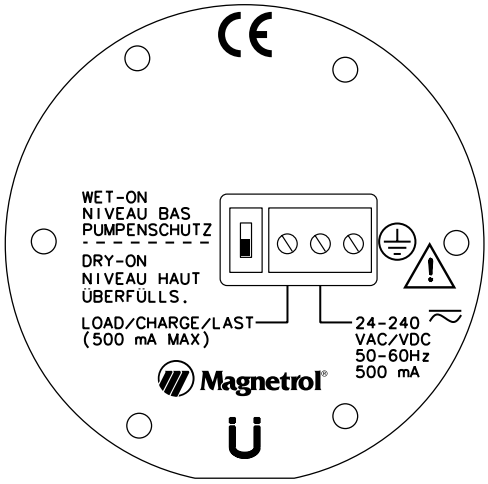


Figure 8
Model 919 All voltage PC board

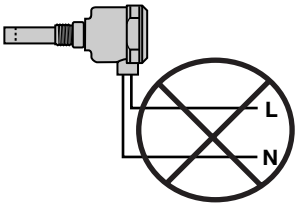


Figure 9
Improper All voltage wiring

Caution: Operation of the all voltage unit without a load will cause damage to the circuitry. Refer to Figure 10.

2.5.2 All Voltage

Note: To prevent damage to the circuitry, the all voltage unit must always be used in series with a load. Refer to Figure 10.

Wiring connections for the all voltage version are made at the three-position terminal block within the electronics enclosure. Use of 14-22 AWG twisted shielded pair wire is recommended.

OBSERVE ALL APPLICABLE ELECTRICAL CODES AND PROPER WIRING PROCEDURES.

1. Make sure the power is turned off.
2. 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.
5. Connect the hot lead from the power supply to the middle (24-240 VAC/VDC) position of the terminal block.
6. Connect the return lead to the terminal block designated as LOAD/CHARGE/LAST, and to the load.
7. Connect the return side of the load to the negative lead of the power supply.
8. Connect ground wire to the terminal marked ⏚ .
9. Dress wiring to ensure no interference or contact with cover or circuit board components.

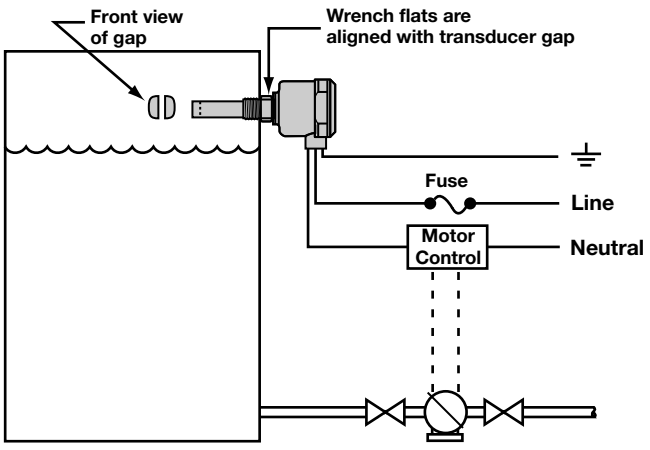


Figure 10
Typical Model All voltage unit wiring

2.6 Configuration

Configuration for Model 919 relay units is made by selecting either HL (high level), or LL (low level) via the two-position switch on the PC board. Figure 11 can be used for proper failsafe configuration.

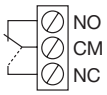
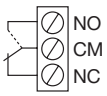
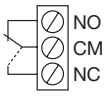
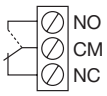
Mode	Level	Relay	Current
"HL" (High level failsafe)		Energized	
		De-energized	
"LL" (Low level failsafe)		Energized	
		De-energized	

Figure 11
Failsafe Relay Configuration

Configuration for the all voltage version is made by selecting either DRY-ON for high level failsafe, or WET-ON for low level failsafe. Figure 12 can be used for proper failsafe configuration.

Mode	Level	Load	Current
"DRY-ON" (High level failsafe)		Energized	between 7 and 500 mA
		De-energized	less than 7 mA
"WET-ON" (Low level failsafe)		Energized	between 7 and 500 mA
		De-energized	less than 7 mA

Figure 12
Failsafe All voltage Configuration

3.0 Reference Information

3.1 Troubleshooting

1. No signal with level change
   a. Check wiring to make sure proper input voltage is supplied.
   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.

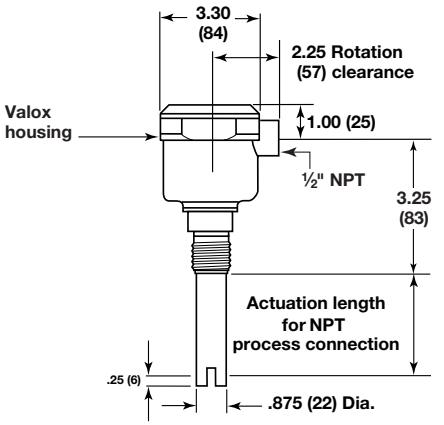
2. No change in output between wet gap or dry gap.
   a. Check to see if transducer gap is plugged with solids.
   b. Check for dense foam in gap.

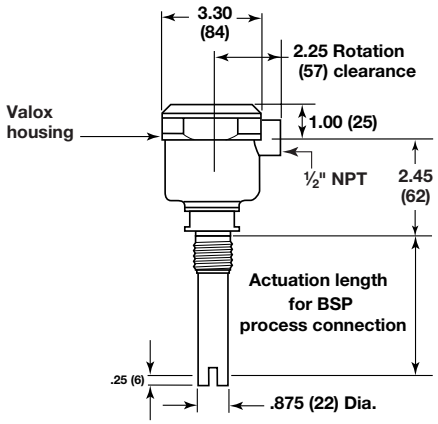
3. The switch is chattering.
   a. Check for proper input voltage supply.
   b. Check for turbulence. Relocate switch or isolate from the turbulence.
   c. Check for excessive aeration.

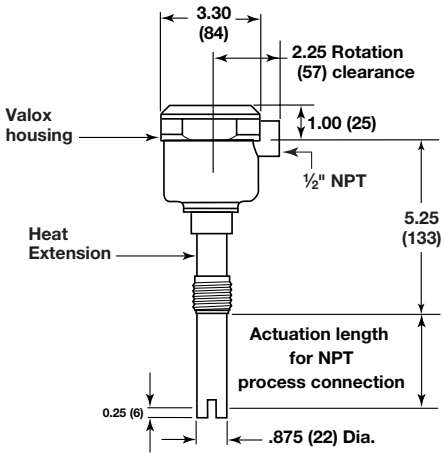
3.2 Specifications

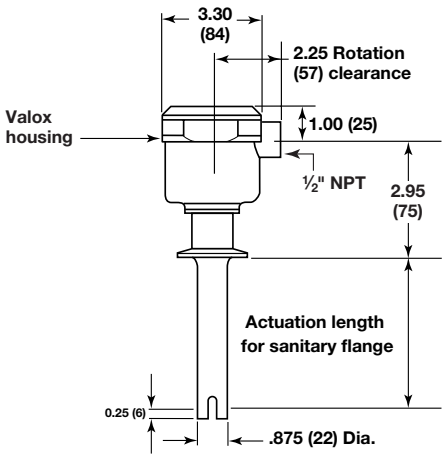
3.2.1 Physical

Inches (mm)









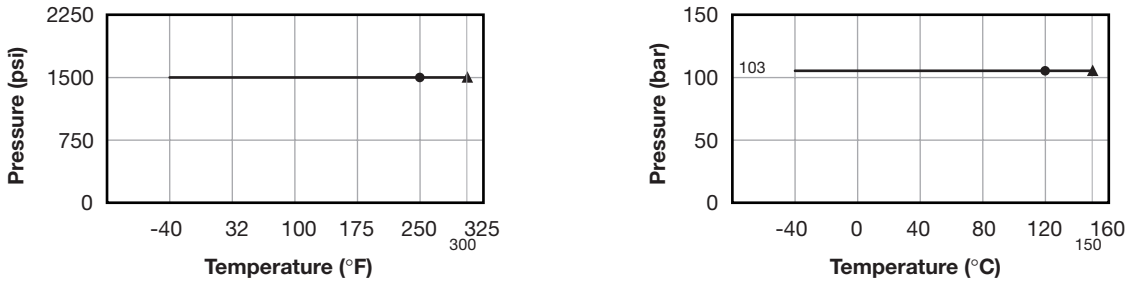
3.2.2 Electrical

Power Supply:	All Voltage:	24-240 VAC ± 10% 50-60 Hz (load always required)
		24-240 VDC ± 10% (load always required)
	Relay:	24 VDC (±10%)
Power Consumption:	All Voltage:	0.1 VA maximum
	Relay:	Less than 1 Watt
Signal Output:	All Voltage:	500 mA (0.5 amp) maximum continuous load
		7.5 mA minimum continuous load
	Relay:	SPDT 3 amp @ 30 VDC resistive and 3 amp @ 125 VAC resistive
		Maximum switching voltage of 270 VAC, 30 VDC
		Minimum switching load of 10mA at 5 VDC
Repeatability:		0.078'' (2 millimeters)
Response Time:		½ second typical

3.2.3 Environmental

Ambient Temperature:	Electronics: -40° to +160° F (-40° to +70° C)
Process Pressure:	1500 psig (103 bar) maximum
Process Temperature:	Without heat extension: -40° to +250° F (-40° to +120° C)
	With heat extension: -40° to +300° F (-40° to +150° C)
Housing Material:	Valox® (PBT)
Ingress Protection:	NEMA 4X (IP67)
Shock	ANSI/ISA-S71.03 Class SA1
Vibration	ANSI/ISA-S71.03 Class VC2

Temperature / Pressure Rating



● **Standard version**

▲ **High temperature version**

3.3 Agency Approvals

MODEL NUMBERS	RATING
919-XXXX-XXX	NEMA 4X (IP67)
919-XXS3-XXX & 919-XXS4-XXX	3-A (Authorization #596)

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

3.4 Replacement Parts

The Model 919 has no replacement parts. A new unit must be ordered. Consult factory.

3.5 Model Numbers

ELECTRONICS VERSION

C	All voltage version with single PG 13.5 conduit connection
F	All voltage version with single ½" NPT conduit connection
M	Relay version with single PG 13.5 conduit connection
R	Relay version with single ½" NPT conduit connection

TRANSDUCER VERSION

0	English (actuation length in inches)
1	Metric (actuation length in centimeters)
G	English (actuation length in inches) with heat extension
H	Metric (actuation length in cm) with heat extension

TRANSDUCER MATERIAL

2	316/316L stainless steel
S	316/316L stainless steel with 20 R_a sanitary finish

PROCESS CONNECTION

1	¾" NPT
2	1" NPT
3	1½" sanitary fitting, 16 AMP
4	2" sanitary fitting, 16 AMP
9	1" BSP
B	1" 150 lb. ASME flange
D	2" 150 lb. ASME flange

ACTUATION LENGTH

1 to 130 inches in 1 inch increments Example: 4 inches = 004
3 to 330 centimeters in 1 centimeter increments Example: 6 centimeters = 006

Note: 1'' (3 cm) minimum with NPT threaded process connections.

2'' (5 cm) minimum with ASME flange, sanitary fitting, or BSP process connections

9	1	9	—					—			

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.

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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