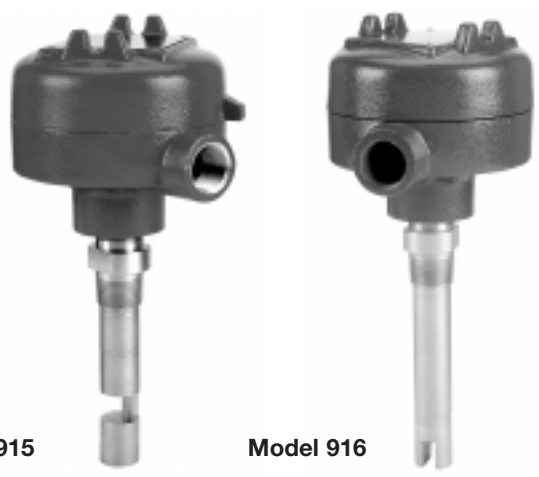




Echotel® Models 915 & 916 Two-Wire, Intrinsically Safe Ultrasonic Level Switch

Instruction Manual and Parts List



Model 915

Model 916

DESCRIPTION

Echotel Models 915/916 ultrasonic, loop-powered level switches utilize state-of-the-art ultrasonic technology to detect a broad range of viscous to light liquids. The 915 features a continuous wave, 1 MHz transducer crystal, in a variety of transducer materials. The 916 features a stainless steel tip-sensitive transducer and a 3 MHz transducer crystal. Both the 915 and 916 consist of a transducer and a solid-state amplifier mounted in a NEMA 7/9 housing. Models 915/916 are intrinsically safe when connected through an approved intrinsically safe barrier.

PRINCIPLE OF OPERATION

A high frequency, ultrasonic signal is transmitted across the transducer gap when it is filled with liquid. This signal is detected by the circuit which establishes a loop current draw of 16 mA. When the transducer is dry, the ultrasonic signal is attenuated by the air and the circuit switches the loop current to 8 mA.

When the transducer becomes dry, a unique continuous self-test feature tests the transducer to ensure that it will respond when the liquid reaches the transducer. This test is performed approximately 10 times every second, however, the loop current will remain at 8 mA during the tests as long as the circuit and transducer are operating properly. If a malfunction is detected, the loop current will be switched to either 5 mA or 19 mA (field selectable) to indicate that a problem exists with the transducer or related circuitry.

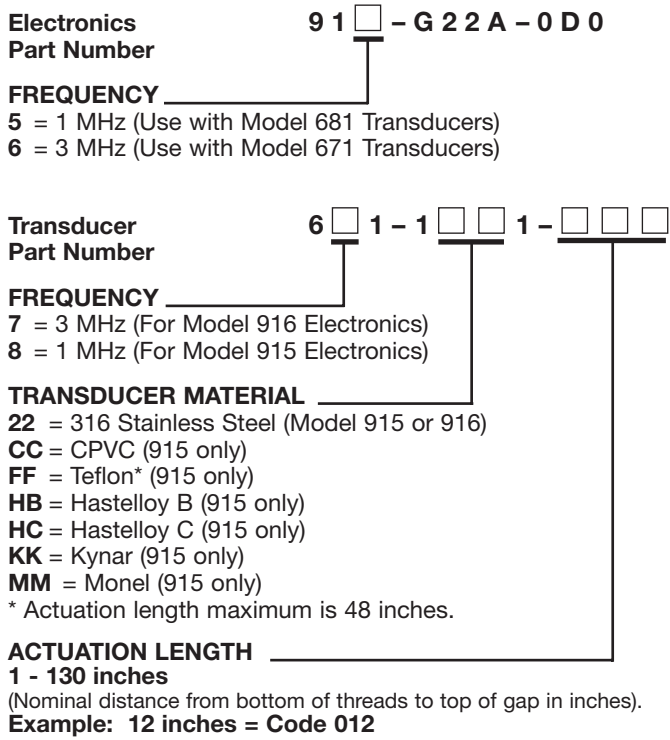
CAUTION: This unit contains CMOS electronics which may be damaged by static electricity. Do not touch any semiconductor devices unless you are properly grounded.

UNPACKING

Unpack the instrument carefully. Make sure all components have been removed from the packing material. Inspect all components for damage. Report any damage to the carrier within 24 hours. Check the contents of the packing slip and report any discrepancies to Magnetrol. Check the nameplate model number to be sure it agrees with the packing slip and purchase order. Check and record the serial number for future reference when ordering parts.

MODEL IDENTIFICATION

Each Model 915/916 ultrasonic level switch has a nameplate on which the model number of the unit is shown. Refer to the model number below, to determine which options the unit contains.



PRELIMINARY OPERATIONAL CHECK

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

1. Fill a suitable container with liquid.
2. In a non-hazardous environment, power the unit with proper voltage. See Wiring on Page 3. The unit should draw 8 mA ± 1 mA and the green LED should be on.
3. Place transducer in the liquid. The unit should draw 16 mA ± 1 mA and the red LED should be on.
4. Remove transducer from the liquid. The loop current should return to 8 mA ± 1 mA, with the green LED on if the unit is operating properly. In case of malfunction, consult Page 3 — Troubleshooting.

INSTALLATION

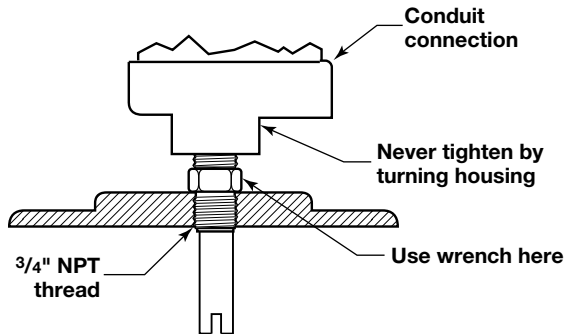
MOUNTING POSITION AND LOCATION

Models 915/916 level switches should be located to allow easy access for service. Units should not be exposed to ambient temperatures above 160° F (71° C) or below -40° F (-40° C). Special precaution should be taken to prevent exposure to corrosive atmosphere, excessive vibration, shock or physical damage.

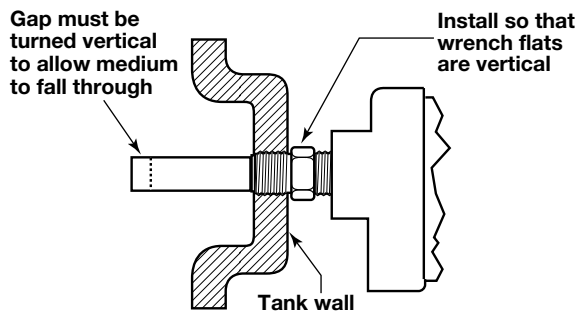
NOTE: Models 915/916 level switches are designed for use in various liquids. For applications with aeration, solids or corrosive conditions, contact factory for information.

GENERAL UNIT MOUNTING REQUIREMENTS

Models 915/916 level switches are shipped assembled to the transducer. Units may be mounted in any position or orientation. See Figures 1 and 2.



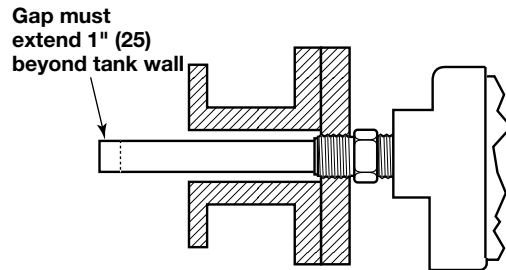
Vertical Mounting
Figure 1



Horizontal Mounting
Figure 2

MOUNTING POSITION AND LOCATION cont.

When installed in a nozzle or pipe, the transducer gap must extend into the tank at least one inch beyond the inside tank wall. See Figure 3.



Horizontal Nozzle Mounting
Figure 3

All wiring, conduit and electrical fittings must conform to local electrical codes for the location selected.

INSTALLATION

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.

ELECTROSTATIC DISCHARGE (ESD) HANDLING PROCEDURE

Magnetrol's electronic instruments are manufactured to the highest quality standards. These instruments utilize electronic components which 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:

1. Ship and store circuit boards in anti-static bags. If an anti-static bag is not available, wrap board in aluminum foil. Do not place boards on foam packing materials.

2. Use a grounding wrist strap when installing and removing circuit boards. A grounded workstation is also recommended.
3. Handle printed circuit boards only by the edges. Do not touch components or connector pins.
4. Ensure that all electrical connections are completely made and none are partial or floating. Ground all equipment to a good, earth ground.

WIRING AND CONFIGURATION

WIRING

All power and control connections are made at the terminal strip within the electronics enclosure. Use of 16-24 AWG twisted shielded pair wire is recommended.

NOTE: Observe all local electrical codes and proper wiring procedures.

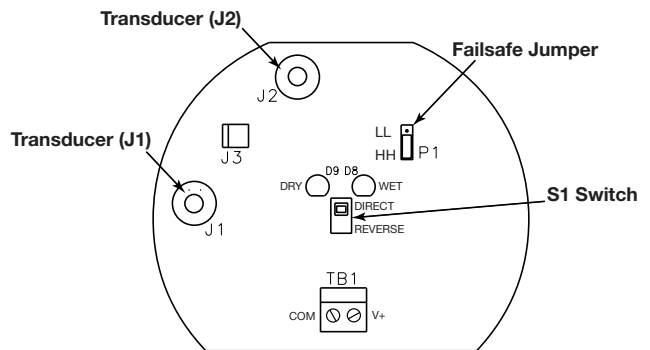
1. Make sure the power is turned off.
2. Unscrew and remove housing cover.
3. Pull twisted shielded pair wire through conduit connection.

NOTE: Transducer phono plugs are factory installed in phono jacks J1 and J2. These connections are not interchangeable, therefore, if they should become disconnected, reinsert the cable marked 1 into jack J1 and the remaining cable into jack J2.

4. Connect wiring to proper terminals of TB1 as shown in Figure 4.
5. Dress wiring to guard against interference or contact with cover or circuit board components.
6. Prevent moisture seepage into housing by installing an approved seal-drain fitting in the conduit run leading to the unit.
7. Installation is complete. Replace housing cover.

CONFIGURATION

1. Select High/Low failsafe setting by placing jumper in desired position. For low level failsafe, position jumper between the middle pin and the pin above the LL mark on P1. In this position the unit will produce 5 mA during a malfunction condition. For high level failsafe, position jumper between the middle pin and the pin above the HL mark on P1. In this position the unit will produce 19 mA during a malfunction condition. See Figure 4 and the Troubleshooting table below.
2. There is an S1 switch located at the center of the board. This two-position switch has a direct (DIR) and a reverse (REV) indication. In the direct position, a dry gap will produce 8 mA and a wet gap produces 16 mA. In the reverse position a dry gap will produce 16 mA and a wet gap produces 8 mA. Normally the switch is kept in the direct (DIR) position.



**Wiring and Configuration
Figure 4**

OPERATIONAL TEST

Bring liquid level to a point above transducer gap. When liquid fills transducer gap, the red LED on the PC board should light and the loop current should read $16 \text{ mA} \pm 1 \text{ mA}$. When liquid falls below gap, the green LED on the PC board should light and the loop current should read $8 \text{ mA} \pm 1 \text{ mA}$. In case of malfunction, consult the Troubleshooting section below.

TROUBLESHOOTING

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

NO SIGNAL WITH LEVEL CHANGE

- A. Check power and control circuit wiring. (10 Vdc min. at TB1)
- B. Make sure liquid is filling the transducer gap.
- C. Check for dense foam on surface or dried product in gap. Unit will not function if either condition exists.

NO CHANGE IN LOOP CURRENT BETWEEN FULL GAP/EMPTY GAP

- A. Check transducer for plugged gap.
- B. Check for dense foam or liquid in gap.

OUTPUT CURRENT AT 0 mA

- A. Check power wiring connections and power source.

| MODE | SENSOR WET | SENSOR DRY | MALFUNCTION |
|-----------------------|---|--|---|
| Low level Failsafe * | Output = 16 mA Wet (red) LED is on Dry (green) LED is off | Output = 8 mA Wet (red) LED is off Dry (green) LED is on | Output = 5 mA Wet (red) LED is off Dry (green) LED is off |
| High level Failsafe * | Output = 16 mA Wet (red) LED is on Dry (green) LED is off | Output = 8 mA Wet (red) LED is off Dry (green) LED is on | Output = 19 mA Wet (red) LED is on Dry (green) LED is on |

* For High/Low level Failsafe Jumper selection, refer to Figure 4 on Page 3.

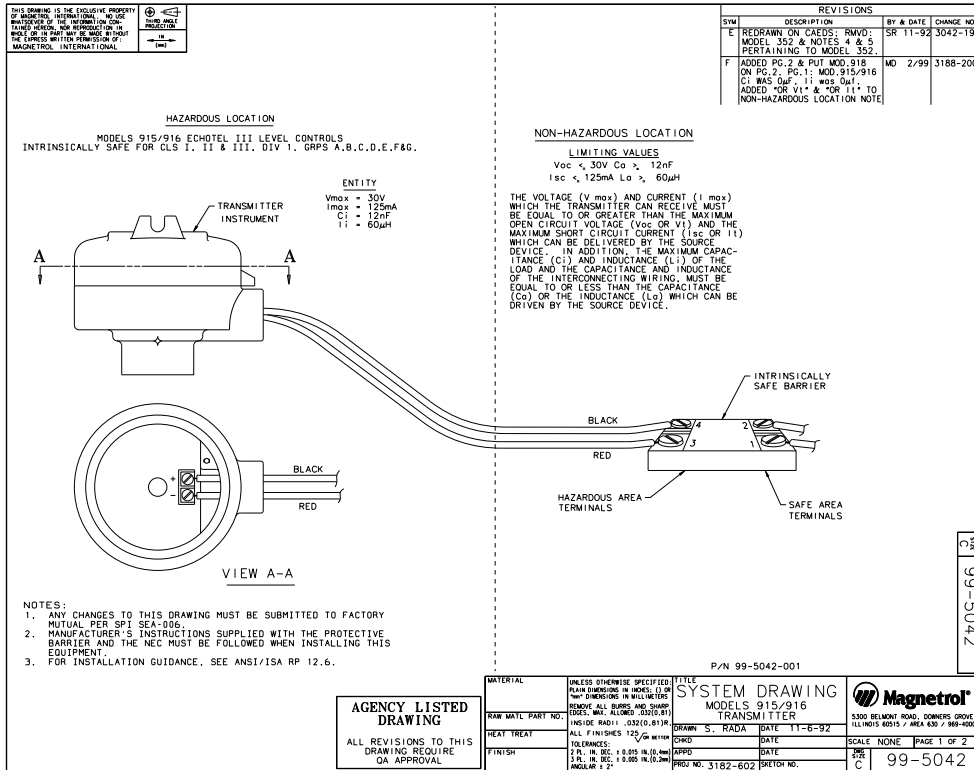
INTRINSIC SAFETY

INTRINSIC SAFETY

The Agency Approvals table on page 5 shows the Model 915/916 units that have been CSA approved for intrinsic safety when connected through a certified zener safety barrier rated 28V or less and 300 Ω or more.

Page 5 shows the Model 915/916 units that have been FM entity approved for use in an intrinsically safe circuit per the instructions on drawing 99-5042 Rev F. Below is a copy of this drawing including the description of the intrinsically safe barrier to be used with this unit.

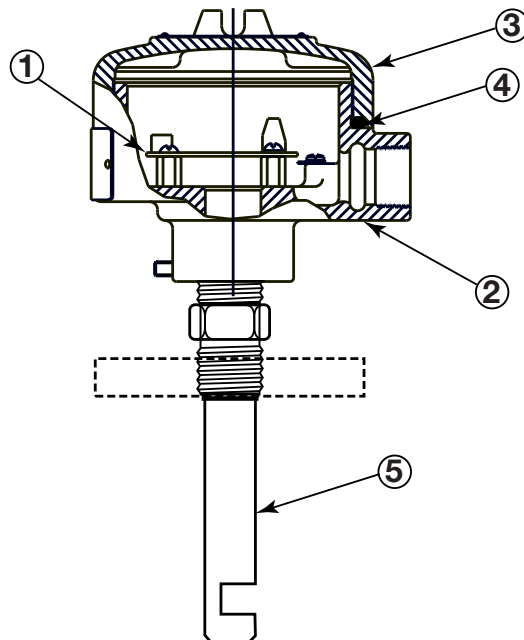
Refer to Agency Approvals on Page 5 for complete information.



REPLACEMENT PARTS

| No. | Description | Part Number |
|-----|------------------------------|---|
| 1 | 915 PC Board 916 PC Board | 030-2168-001* 030-2168-002* |
| 2 | Base | 004-9104-001 |
| 3 | Cover | 004-9105-001 |
| 4 | O-Ring | 012-2101-345 |
| 5 | Transducer | Select from Model Identification on Page 1. |

* Recommended spare parts for either the Model 915 or 916 switch.



SPECIFICATIONS

ELECTRICAL SPECIFICATIONS

| Description | | Specification |
|--|-------------------|---|
| Input Voltage | | 10-35 vDC (24 vDC nominal) |
| Power Consumption | | 1 Watt Maximum |
| Loop Resistance | | 700 Ω at 24 Vdc |
| Ambient Temperature (Electronics) | | -40° F to +160° F (-40° C to +71° C) |
| Process Temp. (Transducer) | | 22, HB, HC, MM, CC: -40 to +250° F (-40 to +121° C) FF: 0° to +250° F (-18° to +121° C) KK: +32 to 250° F (0 to +121° C) |
| Process Pressure (Operating/Non-operating) | | 22, HB, HC, MM: 800/1500 psig (55/103 Bar) FF, CC, KK: 100 psig (7 Bar) |
| Signal Technology | | Continuous wave |
| Transducer Frequency | | 1 MHz (Model 915) 3 MHz (Model 916) |
| Response Time | | 0.1 second typical |
| Repeatability | | ± 0.078" (2 mm) |
| Output | Dry Sensor | 8 mA ± 1 mA |
| | Wet Sensor | 16 mA ± 1 mA |
| | Malfunction, High | 19 mA ± 1 mA |
| | Malfunction, Low | 5 mA ± 1 mA |
| Housing | | NEMA 4X/7/9 polymer powder coated |

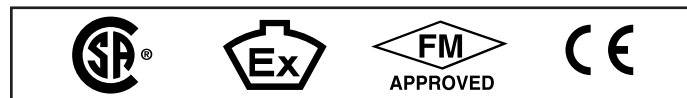
AGENCY APPROVALS

| Agency | Model No. | Approval |
|---------|--|--|
| FM | 916-G22A-0D0 w/ 671-1221-XXX and 915-G22A-0D0 w/ 681-1XX1-XXX1① | IS: I, II, III/1/ABCDEFGF - 99-5042/F; Entity; XP: I, II, III/1/CDEFG; NEMA 4X |
| CSA | 916-G22A-0D0 w/ 671-1221-XXX and 915-G22A-0D0 w/ 681-1XX1-XXX | IS: Class I, Div. 1, Groups A, B, C, & D Class II, Div. 1, Groups E, F, & G Class III, Enclosure Type 4X |
| | 916-G22A-0D0 w/ 671-1221-XXX and 915-G22A-0D0 w/ 681-1XX1-XXX ② | XP: Class I, Div. 1, Groups C & D Class II, Div. 1, Groups E, F, & G Class III, Enclosure Type 4X |
| CENELEC | 916-G22A-0D0 w/ 671-1221-XXX and 915-G22A-0D0 w/ 681-1XX1-XXX ② | EEx ia IIC T4 |

① Excluding Teflon® transducer model 681-1FF1-XXX.

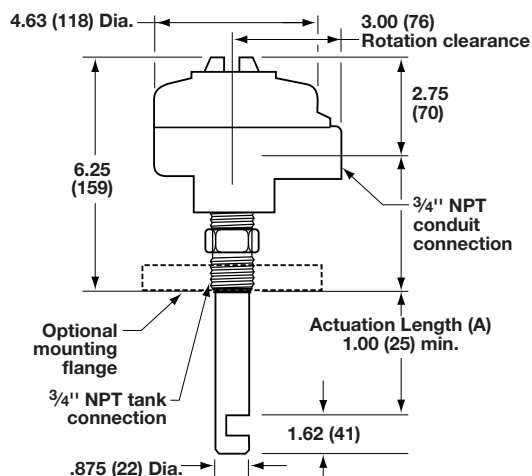
② Excluding transducer models 681-1FF1-XXX (Teflon), 681-1KK1-XXX (Kynar®), and 681-1CC1-XXX (CPVC)

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

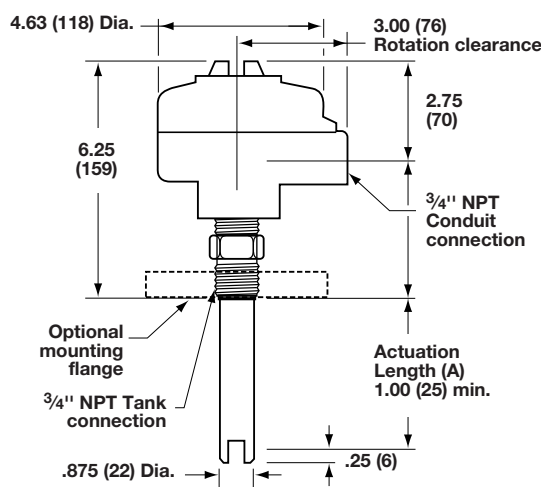


DIMENSIONAL SPECIFICATIONS

Inches (mm)



Model 915



Model 916

NOTES:

1. Allow 4.00 (102) overhead clearance for cover removal.
2. When units are mounted in a flange, the actuation lengths are reduced by the following amounts:
150 lb. flange - .14 (4)
300 lb. flange - .26 (7)
600 lb. flange - .57 (14)

IMPORTANT

PRODUCT WARRANTY

All Magnetrol/STI electronic level and flow controls are warranted free of defects in materials or workmanship for one full year from the date of original factory shipment. Repair parts are warranted free of defects in materials and workmanship for one year from the date of shipment. Materials, specifications, and contents are subject to change without prior written notice.

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.

ASSURED QUALITY & SERVICE COST LESS

SERVICE POLICY

Owners of Magnetrol/STI 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/STI 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/STI'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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