

Kotron® Tip Sensitive RF Level Sensor

Instruction Manual and Parts List



RF

Level

Sensor

Read this Manual Before Installing

This manual provides information on the Kotron Tip-Sensitive RF Level Sensor. 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.

Safety Messages

Follow all standard industry procedures for servicing electrical equipment when working with or around high voltage. Always shut off the power supply before touching any components.

Low Voltage Directive

For use in Category II Installations. If equipment is used in a manner not specified by the 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 controls 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.



Kotron Tip Sensitive RF Level Sensor

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1.0 Installation

Kotron Tip Sensitive Level Controls can be utilized in liquid or bulk material applications. There are no moving parts in contact with the medium. These units are integral systems with the sensing probe mounted with the electronics.

1.1 Unpacking

Unpack the instrument carefully. Make sure all components have been removed from the packing material. Inspect all components for damage. Report any concealed damage to the carrier within 24 hours. Check the contents against the packing slip and report any discrepancies to the factory. 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.

1.2 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 printed 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.

1.3 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 grounded container with water.
2. In a non-hazardous area, power the unit with proper voltage.
3. Dip the probe in the water. The relay should activate.
4. Withdraw the probe from the water. The relay should deactivate.

1.4 Installation Location

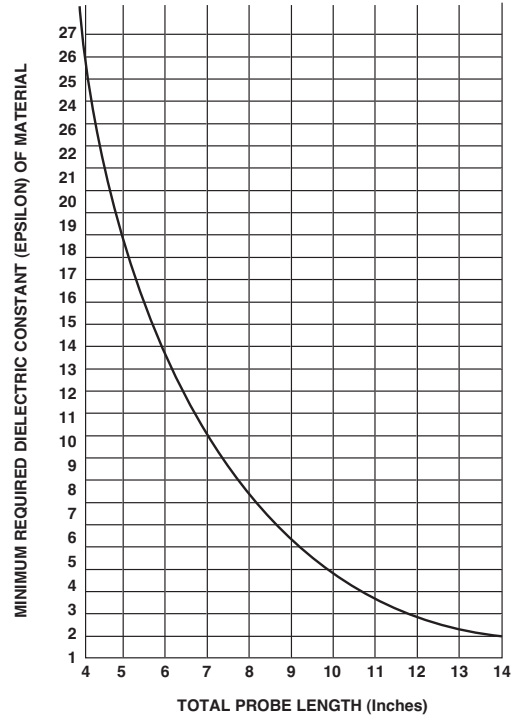
Kotron RF Point Level Switches should be located for easy access for service, calibration and monitoring. Switches should not be exposed to ambient temperatures below -40°F (-40°C) or above $+160^{\circ}\text{F}$ ($+70^{\circ}\text{C}$). Special precaution should be made to prevent exposure to corrosive atmosphere, excessive vibration, shock or physical damage.

Sensing probes should be located close to the tank wall for greatest sensitivity. Probes should be isolated from severe motion in the tank, because surface turbulence may cause signal deviation.

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

1.5 Probe Length

If the geometry of your application requires a probe shorter than 14" (356 mm), refer to the **Probe Length vs. Dielectric Constant** chart below.



A minimum probe length of 4" (102 mm) is permissible in a conductive liquid (dielectric of 24 or greater). The full length should be maintained in a non-conductive liquid or bulk material.

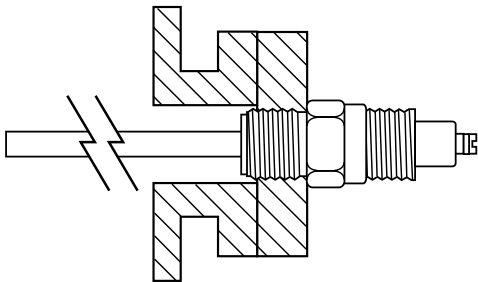


Figure 1
Incorrect horizontal mounting

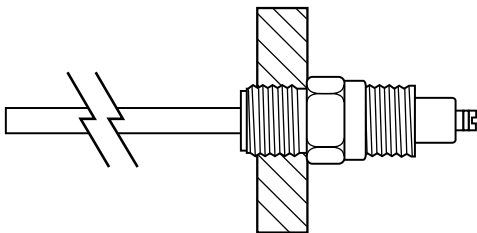


Figure 2
Correct horizontal mounting

1.6 Mounting

Tip Sensitive Point Sensors are shipped assembled to the probe. They may be installed horizontally or vertically.

1.6.1 Horizontal Mounting

Unit will signal at probe level. Refer to Figures 1 and 2.

Caution: Do NOT horizontally mount the unit in a nozzle. Refer to Figure 2. The medium may build up in the nozzle and cause false actuation.

1.6.2 Vertical Mounting

As medium rises on the probe, unit will signal at a point determined by the calibration of the unit and the dielectric constant of the medium. In conductive media, the actuation point will be at the tip of the probe over a wide range of zero calibrations. Refer to Figure 3.

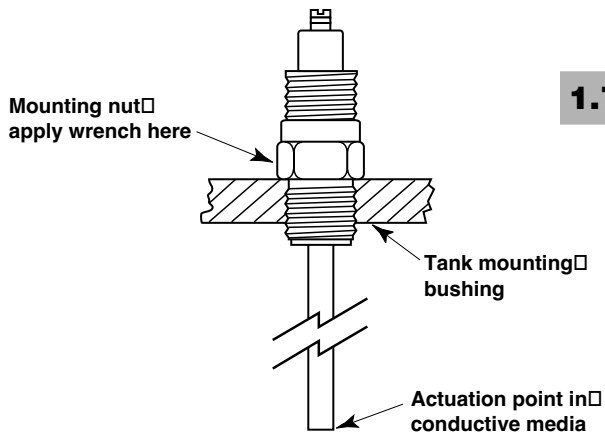


Figure 3
Vertical mounting

1.7 Installation Instructions

1. Thread amplifier assembly into mounting bushing on tank using suitable pipe compound or thread tape. Assembly may also be bolted to a flange with a suitable gasket.
2. Tighten securely, being certain that the wrench is applied **ONLY** to the mounting nut. Refer to Figure 3.

1.8 Wiring

All power and control connections are made at the terminal strip within the amplifier enclosure. 16 AWG wire is recommended for power and control circuit.

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

1. Make sure the power source is turned off.
2. Unscrew and remove housing cover.
3. Pull power supply and control wires through conduit connection.
4. Connect power leads to applicable AC or DC terminals as marked. Refer to Figure 4.
5. Connect control circuit leads to relay terminals. Refer to Figure 4. Make sure the load to be controlled is within the relay's rated capacity.
6. Dress wiring to guard against interference or contact with cover or circuit board components.
7. Prevent moisture seepage into the housing by installing an approved seal-drain fitting in the conduit run leading to the unit.
8. Select operating mode. Refer to Section 1.8.1, *Operating Mode Selection* on page 5 for detailed information. Make sure that the operating mode jumper wire is in the correct position for your selection. Refer to Figure 4.

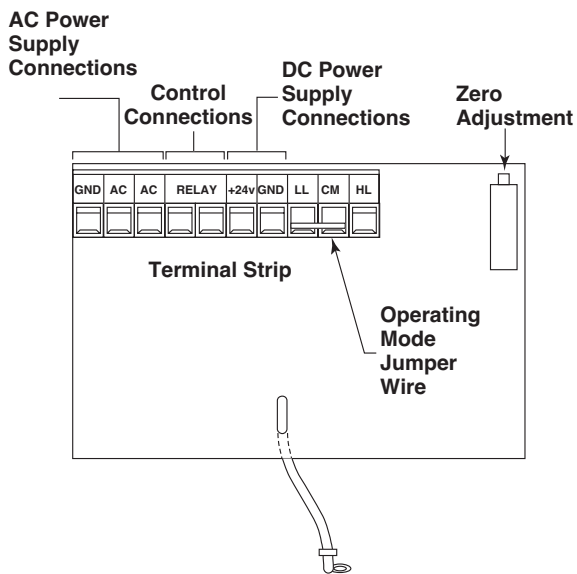


Figure 4
Terminal connections

NOTE: This unit is factory supplied with the jumper wire connecting LL and CM.

Caution: In hazardous areas, do not power the unit until the conduit is sealed and enclosure cover is screwed down securely.

9. Installation is complete. Replace housing cover.

1.8.1 Operating Mode Selection

Low Level (LL) means tank material below the set point

High Level (HL) means tanks material above the set point

Loss of power: The relay contact will open in all mode selections. Relay contact will remain open until power is restored. It will then assume a condition in accordance with the selection table below.

Caution: Connect terminal LL or HL, only to terminal CM. Any other connection may damage the unit.

| Line Power | Material Level | Operating Mode Jumper Wire | |
|------------|-----------------|----------------------------|-----------------|
| | | CM to LL | CM to HL |
| On | Below Set Point | Contacts Closed | Contacts Open |
| | Above Set Point | Contacts Open | Contacts Closed |
| Fail | Below Set Point | Contacts Open | Contacts Open |
| | Above Set Point | Contacts Open | Contacts Open |

1.9 Calibration

Caution: For Hazardous Locations – Extra precautions must be taken during instrument calibration. Before housing cover is removed, power **MUST** be turned off.

1. Turn on power to the instrument.
2. Remove housing cover.
3. Set point locations:

Conductive media — The set point is located at the tip of the probe. Calibration is not required for most conductive liquids. If the unit does not switch on alarm test, then proceed to Step 4.

Non-conductive media — The set point is located at the probe at a point determined by the dielectric constant of the medium. Refer to Figure 1 on page 2. Calibration is required. Proceed to Step 4.

NOTE: An ohmmeter or other indicating device connected across the relay terminals will indicate switch change with level change, simplifying the calibration procedure.

4. Alarm adjustments:

High level alarm (refer to Section 1.8.1, *Operating Mode Selection* for proper jumper wire connection).

- a. With no material on probe, turn zero adjustment control fully counterclockwise 20 turns. Refer to Figure 4 on page 4.
- b. Slowly turn clockwise until relay contact changes.
- c. The unit is now calibrated. The relay contact will change state when the material rises on the probe.

NOTE: The calibration adjustment is more critical in low dielectric media than in high dielectric media. Care must be taken to turn the zero adjustment control just enough to deactivate the alarm. If it is adjusted even 1/4 turn beyond the set point, the zero adjustment band will be out of the operational change.

Low level alarm (refer to Section 1.8.1, *Operating Mode Selection* for proper jumper wire connection).

- a. With material covering the probe, turn zero adjustment control fully clockwise 20 turns. Refer to Figure 4 on page 4.
- b. Slowly turn counterclockwise until relay contact changes.
- c. The unit is now calibrated. The relay contact will change state when the material falls below the probe.

5. Replace housing cover.
6. Bring material to alarm condition and check for relay contact change.

2.0 Reference Information

This section presents an overview of the operation of the Kotron Tip Sensitive RF Level Sensor, information on troubleshooting common problems, listings of agency approvals, a list of replacement parts and electrical and dimensional data.

2.1 Description

Kotron Tip Sensitive Level controls can be utilized in liquid or bulk material applications. There are no moving parts in contact with the medium. These units are integral systems with the sensing probe mounted with the electronics.

2.2 Operating Principle

As the medium covers the sensing probe, the amount of capacitance between the probe and tank wall increases. This capacitance is measured by the electronics. When the capacitance is the same as the setpoint, the relay changes state. As the medium drains from the sensing probe, the relay reverses.

2.3 Troubleshooting

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

2.3.1 General Check

1. Check power and control circuit wiring.
2. Check calibration.
3. Check jumper wire position.
4. Check length of probe against chart in Figure 1 on page 3.
5. Check ground system. Unit must be grounded to calibrate properly. If mounted in non-metallic tank, run grounding strap from mounting nut to earth ground.

NOTE: If remedies above are unsuccessful, consult factory.



2.3.2 Switch Chatter

1. Check for low voltage.
2. Check ground system.
3. Check for turbulence. Relocate probe or isolate from turbulence.

2.3.3 Relay Will Not Reset

Check probe for buildup or fouling. Clean and recalibrate.

2.4 Agency Approvals

| AGENCY | MODEL APPROVED | APPROVAL CATEGORY | APPROVAL CLASSES |
|---|----------------|-------------------|--|
| FM  | 80-8032-3X2 | Explosion Proof | Class I, Groups A, B, C & D Class II, Groups E, F & G Class III, NEMA 4X |
| CSA  | 80-8032-3X2 | Explosion Proof | Class I, Groups C & D Class II, Groups E, F & G Class III, Type 4X |

2.5 Parts

2.5.1 Replacement Parts

| No. | Description | Part Number | |
|-----|-------------|--------------|--------------|
| 1 | PC Board | Z30-2034-001 | |
| 2 | Base | 004-9182-002 | |
| 3 | Cover | 004-9105-001 | |
| 4 | O-Ring | 012-2101-345 | |
| 5 | Transformer | 120 VAC | 009-6223-001 |
| | | 240 VAC | 009-6224-001 |
| 6 | Probe | 041-1105-002 | |

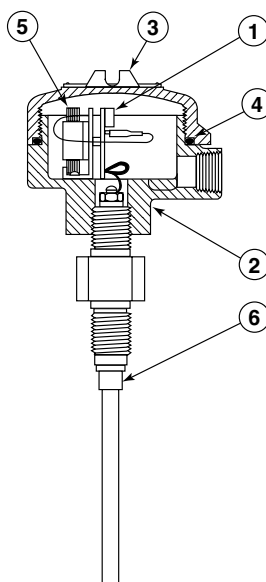


Figure 6

2.6 Specifications

2.6.1 Electrical

| | | |
|-----------------------------------|----------------------------------|--|
| Supply Voltage | | 120 VAC, 50–60 Hz 240 VAC, 50–60 Hz 24 VDC |
| Power Consumption | | 120 or 240 VAC, less than 5 volt-amperes 24 VDC, 1 watt maximum |
| Zero Range | | 0 pF minimum to 350 pF maximum |
| Fixed Minimum Differential | | 0.5 pF minimum |
| Output relays | AC | (1) Reversible SPST, 5 amp @ 120/250 VAC resistive |
| | DC | (1) Reversible SPST, 5 amp @ 30 VDC resistive |
| Response time | | 100 milliseconds |
| Repeatability | | Better than 1.0% |
| Ambient Temperature | Electronics | -40° to +160° F (-40° to +70° C) |
| Operating Process | | |
| Pressure/Temperature | | 3000 psig @ +100° F (205 bar @ +40° C) |
| | Horizontal Mount | 450 psig @ +250° F (31 bar @ +121° C) |
| | Vertical Mount | 450 psig @ +200° F (31 bar @ +93° C) |
| Temperature Coefficient | | |
| of Set Point | -40° to +160° F (-40° to +70° C) | ±0.05 pF per degree F (±0.09 pF per degree C) |

2.6 Specifications

2.6.2 Dimensional Data

inches (mm)

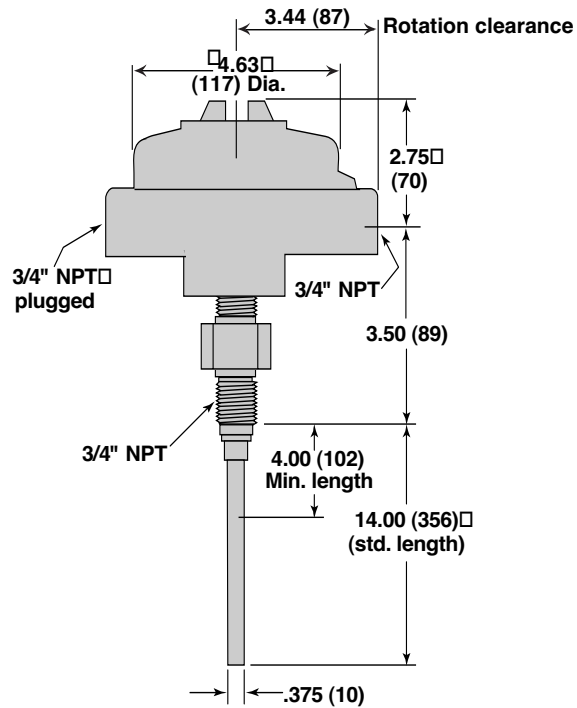


Figure 5

3.0 Model Identification

| Model Number | Voltage |
|--------------|---------|
| 80-8032-302 | 120 VAC |
| 80-8032-312 | 240 VAC |
| 80-8032-322 | 24 VDC |

NOTES

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.

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 1.



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