



AMI LIQUID LEVEL SENSOR INSTALLATION, OPERATION, AND MAINTENANCE INSTRUCTIONS

I. INTRODUCTION

The AMI Liquid Level Sensor is designed to be used with an AMI Liquid Level Instrument to measure the level of most¹ cryogenic liquids. The sensor is constructed with two concentric, electrically insulated stainless steel tubes to form a cylindrical capacitor. The sensor allows measurement of level by allowing the target cryogenic fluid to become the dielectric between these two concentric cylinders. The instrument measures the sensor capacitance, which is directly proportional to the percentage of the sensor immersed in the cryogenic liquid.

II. SPECIFICATIONS

| Specifications | | | | | |
|--|----------------------------|-------|-----|------|-----|
| Sensor Outer Tube Diameter (inches) | | 1/4 | 3/8 | 1/2 | 3/4 |
| Sensor Active Length (L_A) (inches) | Minimum | 1 | | | |
| | Maximum | 255.9 | | | |
| Sensor Overall Length (OAL) (inches) | Up to 20 feet ^a | | | | |
| Sensor Capacitance ^b (pF/inch) | 6.0 | 5.3 | 7.3 | 13.6 | |
| Capacitance shift for LN ₂ (pF/inch) | 1.4 | 1.8 | 2.9 | 3.8 | |
| Insulation Resistance ^c (M Ω) | >10 | | | | |

- a. Longer multi-section lengths available upon request
- b. Approximation; measurement made in air at room temperature
- c. Inner to outer tube, measurement made with sensor in air at room temperature

1. For liquid helium applications, use an AMI Liquid Helium Level Sensor and associated instrument.



III. INSTALLATION

- A. Carefully remove the sensor from the shipping container and remove all packaging material.

Note

If there is any shipping damage, save all packaging material and contact the shipping representative to file a damage claim. Do not return the instrument to AMI unless prior authorization has been received (refer to Section VIII).

- B. Install the sensor in the vessel using techniques consistent with the type of fitting on the sensor.



Caution

Ensure the sensor is mounted with the top vent hole inside the cryostat.

Note

Avoid installing the sensor in a location where icing may occur. Ice formations or moisture buildup in the BNC connector or inside the sensor may cause the sensor to read incorrectly or completely stop working due to reduction in sensor electrical resistance.



Caution

Exercise care when installing the sensor since dents, crimps, bends or other physical distortions in the sensor's thin wall tubing will change electrical characteristics causing calibration errors and/or instrument measurement errors. Before installing the sensor, the user may want to review the Calibration and Operation sections of the level instrument manual to determine what, if any, calibration procedures may be necessary.

- C. If an Oscillator/Transmitter (O/T) is to be used, connect the O/T to the sensor using a supplied 6 foot long RG-59/U coaxial cable. Ensure the O/T is connected in the correct orientation (see figure). Do not replace this cable with another type of cable since this cable is part of the level measurement circuit and is engineered to be as stable as possible.



Caution

The sensor to O/T interconnecting coaxial cable and the O/T itself are affected by temperature changes and therefore should be mounted in such a manner as to minimize temperature changes such as those encountered in the path of dewar vents.



Caution

Moisture or contaminants in any of the BNC coaxial connectors can short out the sensor and cause a false 'full' level indication or other erroneous readings. A pack of non-conductive Electrical Connection Lubricant (ECL), also called Dielectric Tune-up



Grease, has been included with the liquid level sensor packaging to use to reduce the possibility of this occurring. Apply a small amount of ECL to the mating contacts of any of the BNC connectors that may be exposed to moisture (typically the BNC connection at the end of the sensor). Mate the doped connectors; then apply ECL to the exterior of the mated BNC connectors. Spread the ECL around the entire exterior of the BNC connectors, working the ECL into all connector and coaxial cable seams. Cover the doped connections with the supplied short section of heat-shrink tubing, and shrink with a heat-shrink heat gun. (If a heat-shrink gun is not available, any device that will heat the tubing to between 90°- 125°C will work).

Note

MSDS sheets for the ECL are available upon request. To request MSDS sheet, ask for AMI part # MS-1910.

IV. MAINTENANCE

The liquid level sensor will provide years of useful service and requires no maintenance if installed and operated in accordance with these instructions. The sensor is a welded assembly and internal repair or service is not possible.

Should the sensor become contaminated, it is suggested that the internals of the sensor be cleaned with alcohol and completely dried before placing back into service,

V. TROUBLESHOOTING

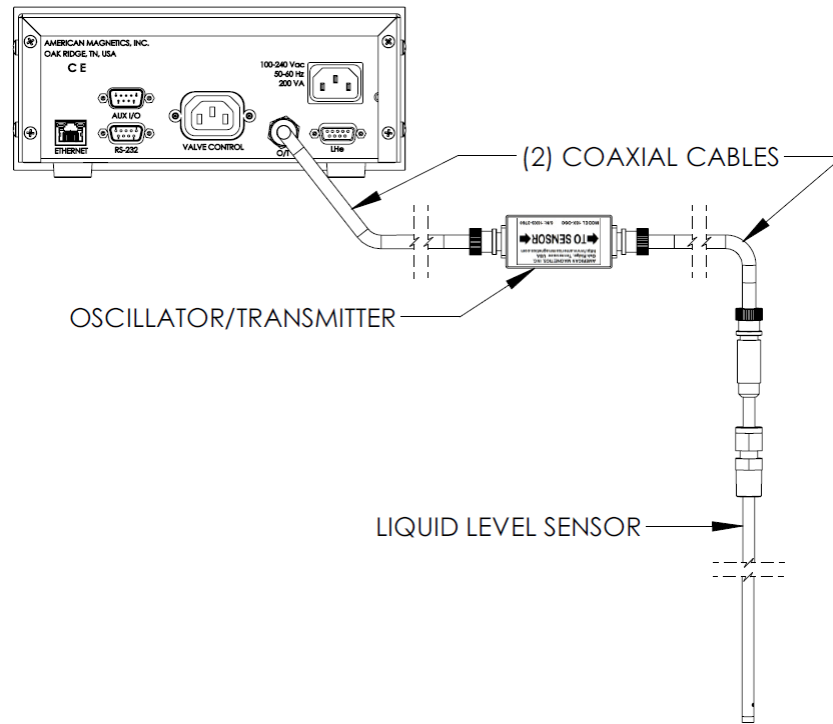
A. The associated instrument will not display level:

Ensure the orientation of the O/T is correct.

B. Erratic or erroneous level reading indicated on the level instrument):



1. Verify that the sensor is properly connected to the O/T cable and the extension cable (see figure).



2. Ensure the O/T is not exposed to large temperature changes such as near dewar vents. Significant temperature changes of the O/T can cause readout errors.
3. Verify the sensor is free of contaminants and not subject to any physical distortion. Disconnect the BNC connector at the top of the sensor and measure the sensor resistance by placing an ohmmeter across the center pin and the outer barrel of the connector. The resistance of the sensor should typically be $>10\text{ M}\Omega$.
4. Ensure there is no ice formation or moisture buildup at the top of the sensor.

Note

If the level instrument suddenly reads 100% without a corresponding liquid level, there is a possibility of moisture in the connector at the top of the sensor. Disconnect the BNC connection and remove any moisture. Moisture or contaminants in any of the BNC coaxial connectors can short out the sensor and cause a false 'full' level indication or other erroneous readings. A pack of non-conductive Electrical Connection Lubricant (ECL), also called Dielectric Tune-up Grease, has been included with the liquid level sensor packaging to use to reduce the possibility of this occurring. Apply a small amount of ECL to the mating contacts of any of the BNC connectors that may be exposed to moisture (typically the BNC connection at the top of the sensor). Mate the doped connectors; then apply ECL to the exterior of the mated BNC connectors. Spread the ECL around the entire exterior of the BNC connectors, working the ECL into all connector and coaxial cable seams. Cover the doped connections with the supplied short section of heat-shrink tubing,



and shrink with a heat-shrink heat gun. (If a heat-shrink gun is not available, any device that will heat the tubing to between 90°- 125°C will work).

Note

MSDS sheets for the ECL are available upon request. To request MSDS sheet, ask for AMI part # MS-1910.

5. Ensure the sensor has no condensation or debris between the inner and outer tubes.
6. Verify the interconnecting cabling has no breaks or cuts.
7. Rapidly varying or sloshing liquids will sometimes make one think the instrument is in error when it is actually operating properly.

III. WARRANTY

All products manufactured by AMI are warranted to be free of defects in materials and workmanship and to perform as specified for a period of fifteen months from date of shipment. In the event of a failure occurring during normal use, AMI, at its option, will repair or replace all products or components that fail under warranty, and such repair or replacement shall constitute a fulfillment of all AMI liabilities with respect to its products. All warranty repairs are F.O.B. Oak Ridge, Tennessee, USA.

IV. RETURN AUTHORIZATION

Items to be returned to AMI for repair (warranty or otherwise) require a return authorization number to ensure your order will receive the proper attention. Please call an AMI representative at +1 (865) 482-1056 or contact technical support at support@americanmagnetics.com for a return authorization before returning any item to AMI.