

# MS-100 Series Installation / Operation Manual For Ultrasonic Point Level Switches



MAGNE-SONIC

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# UNPACKING INSTRUCTIONS

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Remove the Packing List and verify that you have received all equipment, including the following (quantities in parentheses):

Ultrasonic Level Switch (1)

Operator's Manual (1)

If you have any questions about the shipment, please call the MAGNE-SONIC Customer Service Department. When you receive the shipment, inspect the container and equipment for signs of damage. Note any evidence of rough handling in transit. Immediately report any damage to the shipping agent.

*Note:*

*The carrier will not honor damage claims unless all shipping material is saved for inspection. After examining and removing contents, save packing material and carton in the event reshipping is necessary.*

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## GENERAL DESCRIPTION

The MS-100 Series Liquid Level Detection systems are ideal, low cost ultrasonic liquid level detection systems for many applications. They operate in a broad spectrum of viscous to light liquids.

The Pointsense Model MS-394 **Sludge Level Switch** is the ideal solution to a host of liquid level sensing applications: **municipal sewage sludge, industrial waste supply, water softening sludge, process slurry, clarifier and setting tanks** in waste water treatment plants. It uses proven ultrasonic technology with a sensor fabricated completely from **316 Stainless Steel**, which allows it to operate in virtually any liquid. Sensitivity adjustment allows the monitoring of percentage solids in the contents of the liquid. Its small size standard 3/4" NPT mounting fitting, and ability to be installed vertically or horizontally makes it the perfect choice for new or existing applications.

MODEL	FUNCTION	TYPE	INPUT	OUTPUT	AGENCY APPROVAL
MS-100	Point Level w/ Tip Sensor	Integral & Remote	115VAC/230VAC 9VDC to 36VDC	10A DPDT Two Wire 4-20mA	FM, CSA, CE
MS-101	Standard Point Level Gap Sensor	Integral & Remote	115VAC/230VAC 24VDC/12VDC	10A DPDT	FM, CSA, CE
MS-102	Point Level With Demand Self Test	Integral & Remote	115VAC/230VAC 24VDC/12VDC	10A DPDT	FM, CSA, CE
MS-103	Point Level With Continuous Self Test and Separate Self Test Output Relay	Integral & Remote	115VAC/230VAC 24VDC/12VDC	10A DPDT	—
MS-104	Loop Power Point Level	Integral	9VDC to 30VDC	Two Wire 4-20mA	FM, CSA, CE
MS-105	Loop Power Point Level with Continuous Self-test	Integral	9VDC to 30VDC 4-20mA	Two Wire	FM, CSA
MS-106	Point Level for High Temperature	Integral (450°F) Remote (550°F & 750°F)	115VAC/230VAC 24VDC/12VDC	10A DPDT Two Wire, 4-20mA	FM, CSA, CE
MS-107	Interface Sensor	Integral & Remote	115VAC/230VAC 24VDC/12VDC	10A DPDT Two Wire, 4-20mA	FM, CSA, CE
MS-108	Cryogenic Temp Liquid Level Sensor	Integral (-100°C) Remote (-300°C)	115VAC/230VAC 24VDC/12VDC	10A DPDT Two Wire, 4-20mA	CE
MS-394	Sludge Blanket Liquid Level Sensor	Integral Remote	115VAC/230VAC 24VDC/12VDC	10A DPDT Two Wire, 4-20mA	FM, CSA, CE

# 2

## PRINCIPLES OF OPERATION

The MS-100 Series operates using ultrasonic sound wave propagation. Ultrasonic sound waves are greatly attenuated when transmitted through air. Conversely, when liquid is present, transmission of the sound waves is greatly enhanced. The electronic control unit, either integral or remote to the sensor, generates electrical signals that are converted to bursts of ultrasonic energy at the sensor. The ultrasonic bursts are transmitted across the liquid sensing gap of the sensor. Upon receipt of a valid signal at the receiver, the solid state electronics generate a “data enable” condition indicating liquid is present. This signal energizes a relay and provides an output condition.

# 3

## INSTALLATION

### GENERAL

All units are easy to install. A sensor with an integral electronic control unit or a sensor with a remote control unit can be mounted in any position or orientation desired.

Make sure that all wiring, conduit and electrical fittings conform to local electrical codes for the location selected.

### VISUAL INSPECTION

Unpack the control unit and sensor assemblies. Visually inspect them for any damage. Advise Magne-Sonic immediately if either assembly is damaged.

### PRELIMINARY OPERATIONAL CHECK

Before installing the unit, a simple operational checkout should be performed as follows:

**WARNING: In a hazardous environment never open the housing cover or connect the power leads without first disconnecting the electrical power at its source.**

1. Fill a container with liquid.
2. Open the control unit housing cover and connect the power to the control unit (see appropriate wiring diagram for your unit).
3. Apply power from the source.
4. Place the sensor in the liquid. The relay should energize, or output will switch to  $20.0 \pm 1.0 \text{mA}$ .
5. Remove the sensor from the liquid. The relay will de-energize or output will switch back to  $4.0 \pm 1.0 \text{mA}$  indicating that the system is functioning properly. If you do not experience the results indicated in Steps 4 and 5, contact Magne-Sonic immediately.
6. Disconnect the power to the control unit.
7. Proceed to final installation.

## CONTACT MODELS

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Follow the instructions below:

1. Drill a suitable hole in the vessel or pipe wall and tap for 3/4" NPT. If this walled vessel or material is not suitable for threading, weld or braze a bushing to accept the sensor.
2. Screw the sensor in the threaded section and make sure that there is a good seal. Use a pipe compound or sealing tape compatible with the materials and avoid excessive tightening.
3. Run the power and control wiring cable to the electronic control unit. Observing all applicable electrical codes and proper wiring procedures.

## CONTROL UNIT

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Refer to the typical installation diagram and control unit dimensions when installing the control unit. Follow steps 1 and 2 below for remote mounted electronic units. Steps 3 through 7 are common for both the integral electronic units and remote electronic units.

1. Mount the remote control unit on any suitable wall, panel, etc. making sure there is adequate clearance for wiring.
2. Remove the PC board by removing the screws. Drill a suitable size hole in the control unit housing for a conduit fitting (if so required).
3. Remove the cover from housing. To complete wiring, either leave or remove the electronics printed circuit board in the housing on remote units and remove the encapsulate electronics in integral units.

**CAUTION: Never remove unit from a vessel with power and/or output control cables connected to the electronic control unit inside the housing to avoid cable damage.**

4. Wire the unit as desired. Refer to the wiring diagram inside the cover.

**Note: All wiring conduit and fittings should conform to local electrical codes. In a hazardous location, a conduit seal should be installed within 18 inches of the control unit housing. Use a drain seal in vertical conduit run to prevent condensation from entering the control unit. MAGNE-SONIC assumes no responsibility for improperly wired units.**

5. Replace the printed circuit board, if removed, or the encapsulated electronics. Make certain that the wires are dressed carefully to prevent pinching between the cover and the housing.
6. Replace the housing cover.

**CALIBRATION PROCEDURE**

(IF REQUIRED, OTHERWISE DO NOT ADJUST THE POTENTIOMETER - MS-107, MS-108, MS-394)

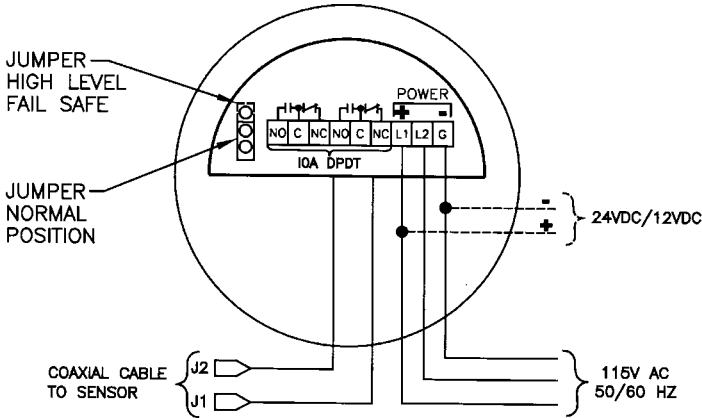
After the installation is complete, the system must be calibrated for the proper operation.

1. Connect the sensor cable to electronics at jacks J1 & J2. Either cable can be connected to either jack.
2. Connect power as per wiring diagram.
3. Turn the power on.
4. Allow the liquid or sludge to rise above the sensing point, adjust the potentiometer clockwise, until the relay is energized or output will switch to  $20.0 \pm 1.0$  mA. Turn the potentiometer one more turn clockwise.
5. Allow the liquid or sludge to fall below the sensing point, relay should be de-energized or output will switch back to  $4.0 \pm 1.0$  mA. If not, turn the potentiometer counter clockwise until the relay is de-energized. Turn the potentiometer counter clockwise one half turn.
6. Repeat Steps 4 and 5 for a final adjustment.
8. Unit is now calibrated. When the liquid level is above the sensing point, the relay will be energized or output will switch to  $20.0 \pm 1.0$  mA. When the liquid level is below the sensing point, the relay will be de-energized or output will switch back to  $4.0 \pm 1.0$  mA.



## WIRING DIAGRAM

MODEL LL-100-1-1, LL100-2-1, LL100-3-1  
 LL101-1-1, LL101-2-1, LL101-3-1, LL101-4-1  
 TIP SENSOR & GAP SENSOR-STANDARD

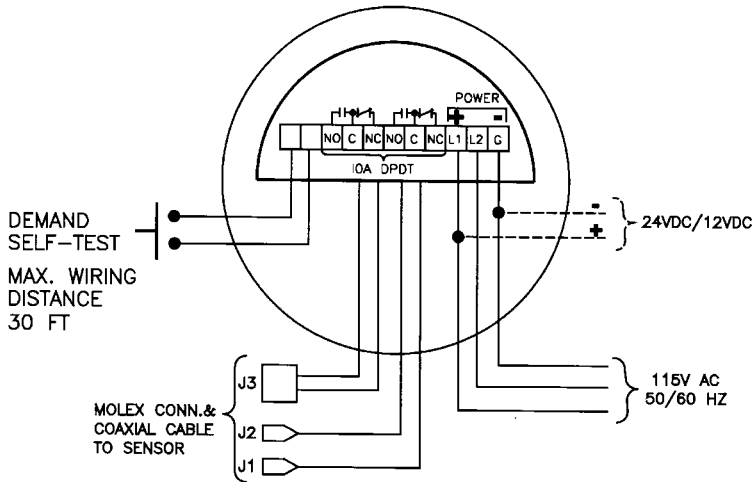


NOTE: 24V DC OR 12V DC  
 CONNECT POSITIVE (+) TO L1-TERMINAL  
 CONNECT GROUND (-) TO G-TERMINAL



# SYSTEM WIRING DIAGRAM

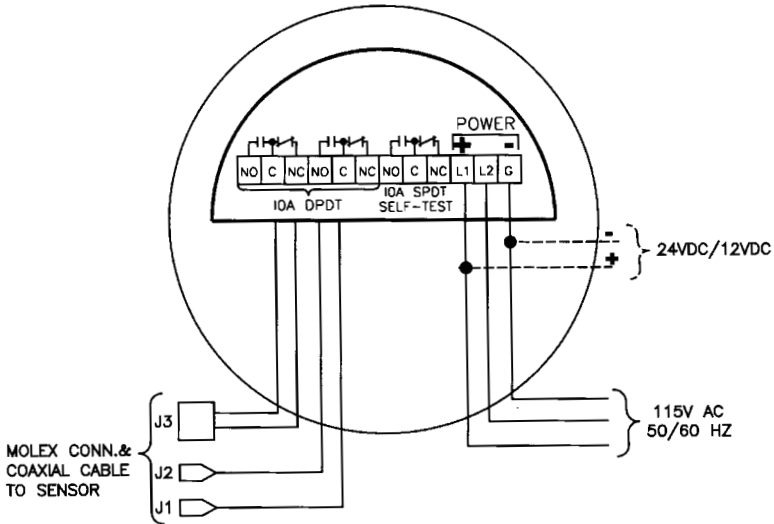
## WIRING DIAGRAM MODEL LL-102 DEMAND SELF-TEST



NOTE: 24V DC OR 12V DC  
CONNECT POSITIVE (+) TO L1-TERMINAL  
CONNECT GROUND (-) TO G-TERMINAL



## WIRING DIAGRAM MODEL LL-103 CONTINUOUS SELF-TEST

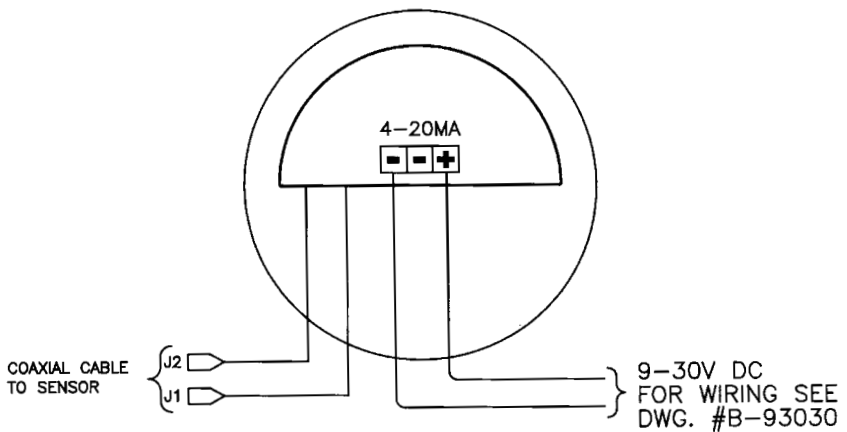


NOTE: 24V DC OR 12V DC  
CONNECT POSITIVE (+) TO L1-TERMINAL  
CONNECT GROUND (-) TO G-TERMINAL



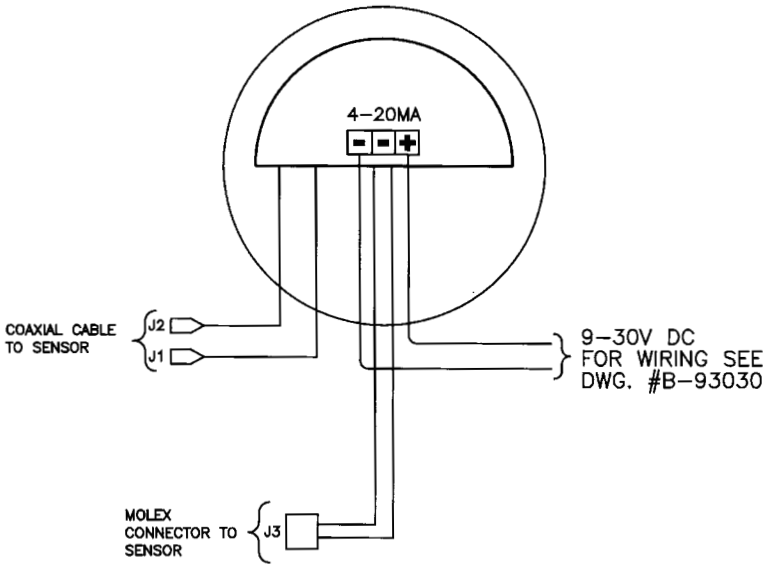
# SYSTEM WIRING DIAGRAM

## WIRING DIAGRAM MODEL LL-104, LL100-32 LOOP POWER



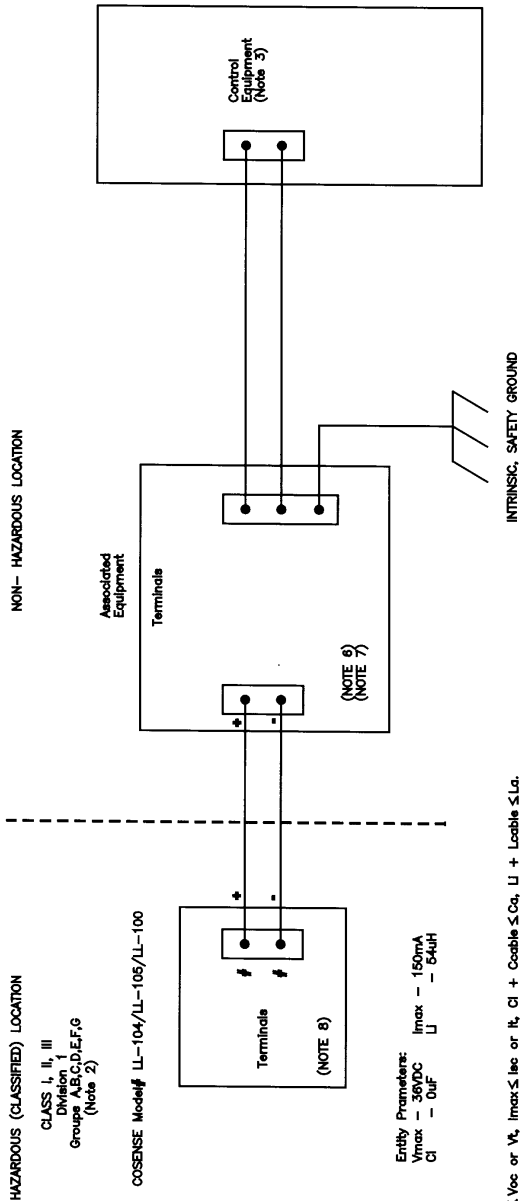


WIRING DIAGRAM  
MODEL LL-105  
LOOP POWER WITH CONTINUOUS SELF-TEST





# SYSTEM WIRING DIAGRAM

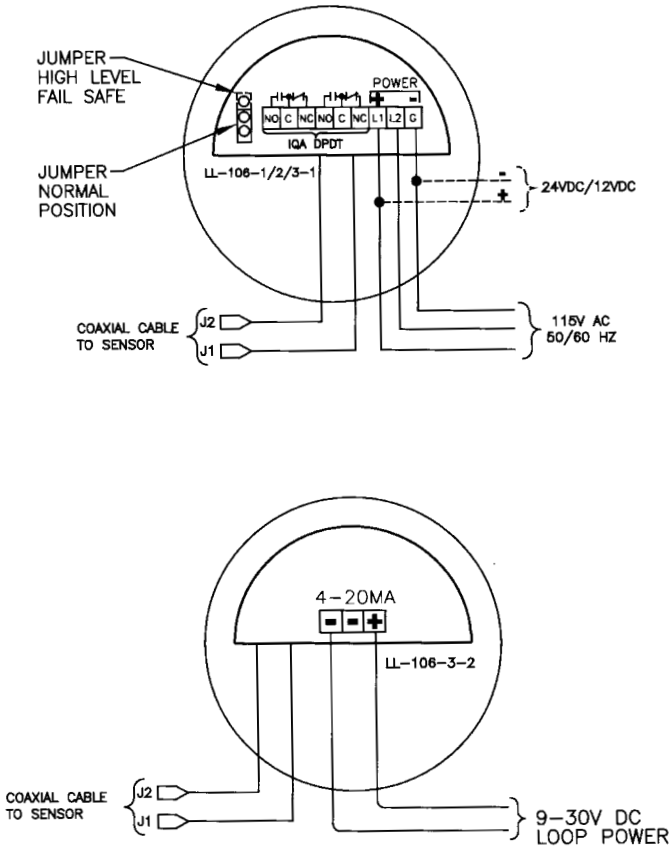


B-93030

- NOTES**
1.  $V_{max} \leq V_{oc}$  or  $V_A$ ,  $I_{max} \leq I_{sc}$  or  $I_A$ ,  $C_I$  + Coable  $\leq C_{Co}$ ,  $L_I$  + Lcable  $\leq L_A$ .
  2. Dust-tight conduit seal must be used when installed in Class II and Class III environments.
  3. Control equipment connected to barriers must not use or generate more than 250V.
  4. All wiring must be installed in accordance with NEC Article 501, Part IZ.6 and the NEC AISI/NFPA 70.
  5. No revision to drawings without prior FLIRC Approval.
  6. Associated equipment must be FLIRC Approved.
  7. Associated equipment manufacturer's installation drawing must be followed when installing this equipment.
  8. For wiring of Cosense, Inc. Model# LL-104/LL-105/LL-100 refer to Installation/Operation Manual.



## WIRING DIAGRAM MODEL LL-106 HIGH TEMPERATURE SERIES

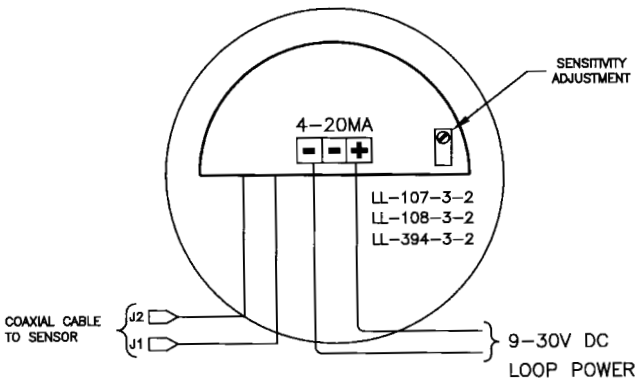
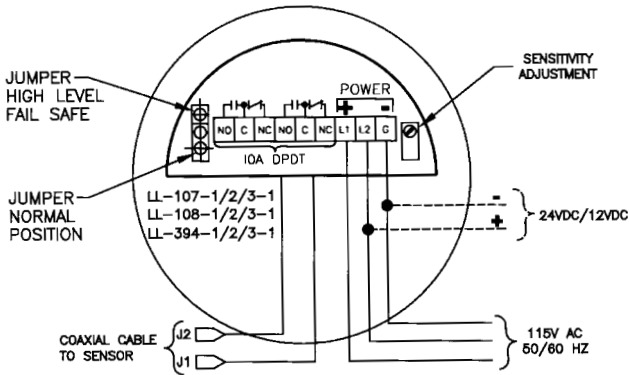


NOTE: 24V DC OR 12V DC  
CONNECT POSITIVE (+) TO L1-TERMINAL  
CONNECT GROUND (-) TO G-TERMINAL



# SYSTEM WIRING DIAGRAM

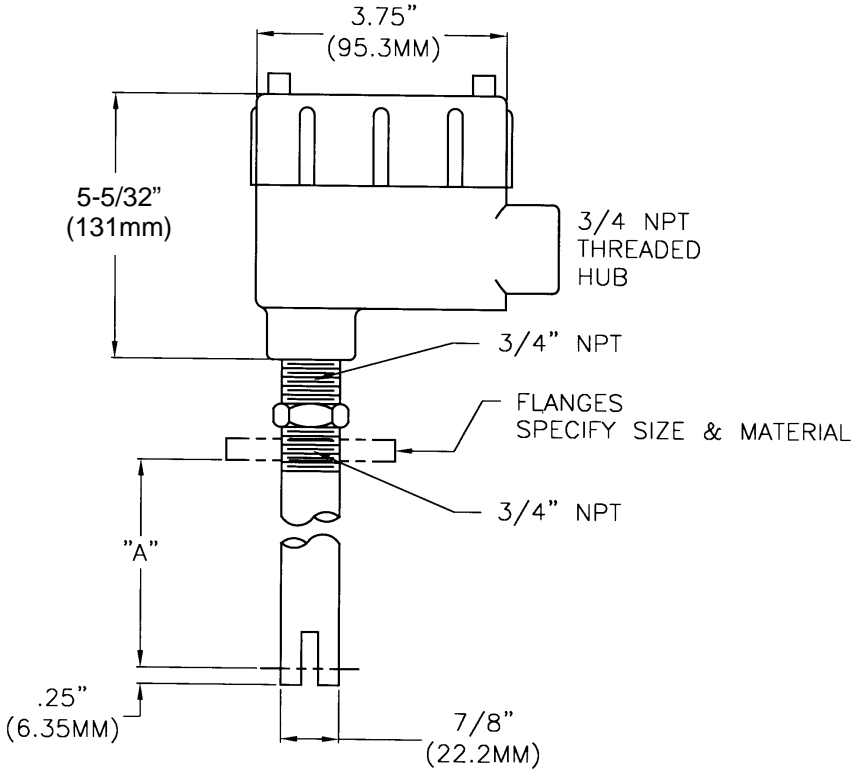
## WIRING DIAGRAM MODEL LL-107/LL-108/LL-394 INTERFACE/CRYOGENIC/SLUDGE BLANKET



NOTE: 24V DC OR 12V DC  
CONNECT POSITIVE (+) TO L1-TERMINAL  
CONNECT GROUND (-) TO G-TERMINAL



LL-100 SERIES



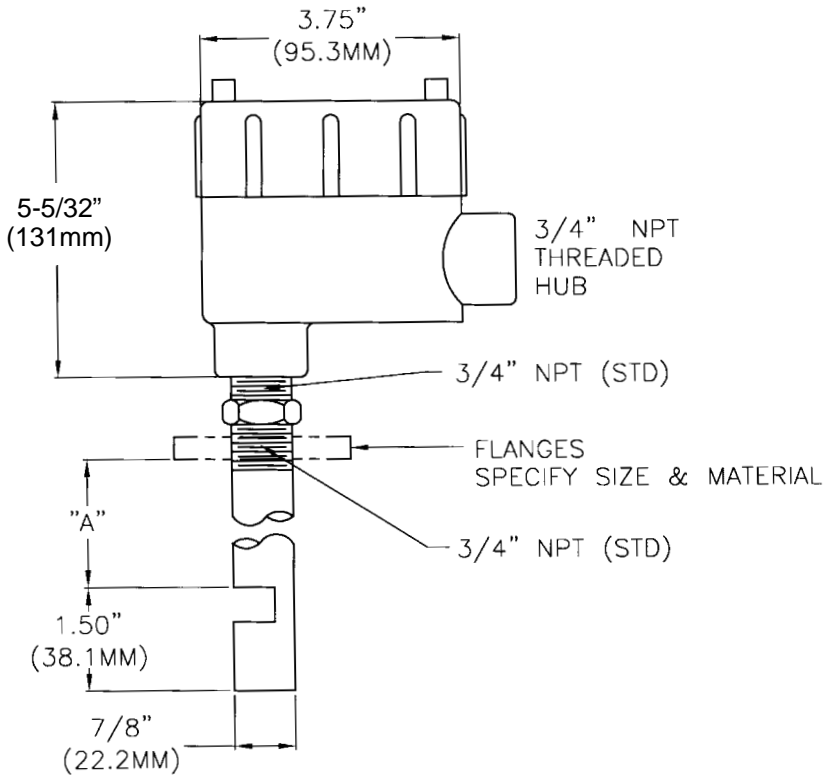
NOTES:

1. MATERIAL: 316SS,TEFZEL
2. "A"– STANDARD: 2.25" (57.2MM)



## DIMENSIONAL DRAWINGS

LL-101, LL-102, LL-103  
LL-104, LL-105, LL-107

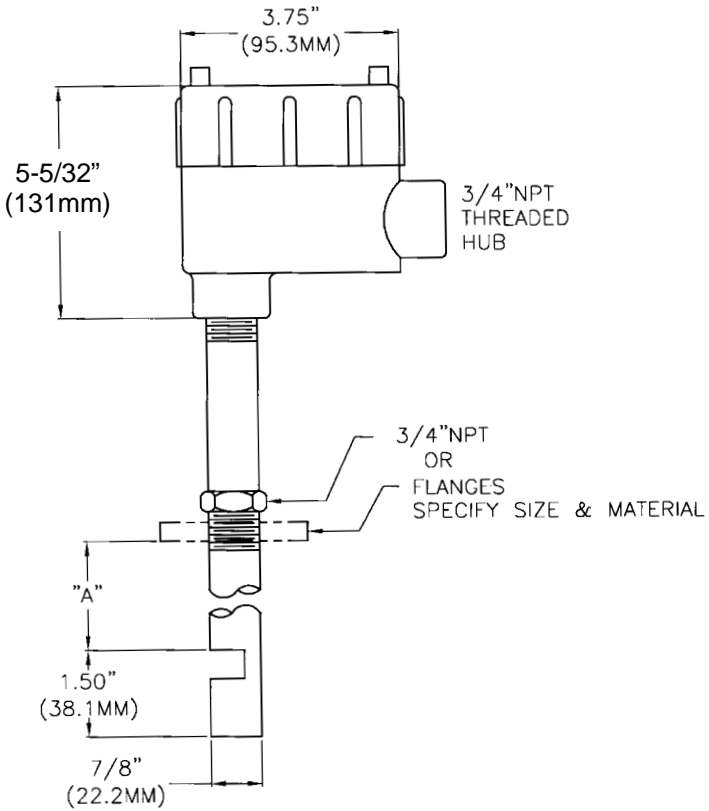


### NOTES:

1. MATERIAL: 316SS, MONEL, HASTALLOT B/C, TEFLON, KYNAR, CPVC.
2. "A" DIM "STANDARD" 1" (25.4MM)
3. LL-107 INTERFACE SENSOR GAP WILL BE 6" (152.4MM).



HIGH TEMPERATURE SENSOR  
LL-106



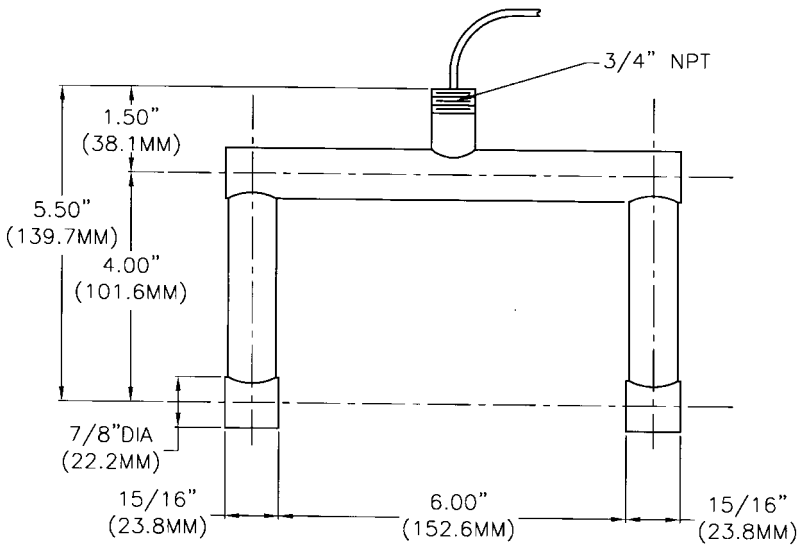
NOTES:

1. MATERIAL: 316SS,TITANIUM
2. "A" DIM "STANDARD"= 1" (25.4MM)



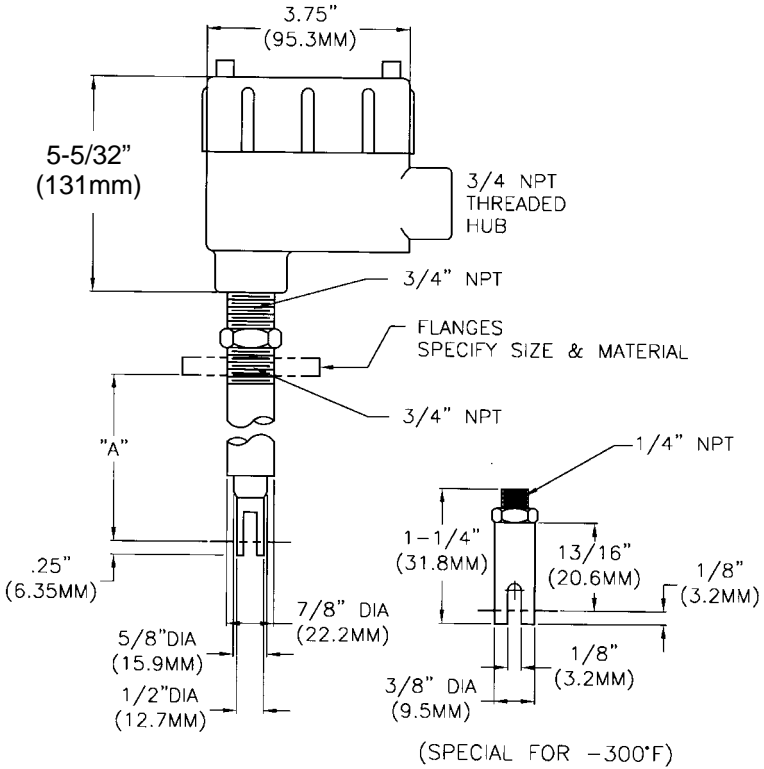
# DIMENSIONAL DRAWINGS

LL-394



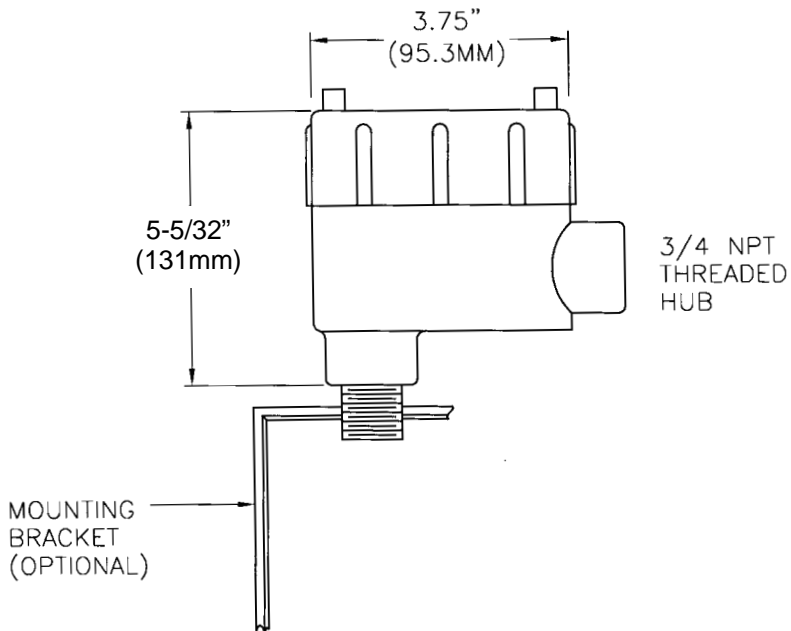


## LL-108 SERIES



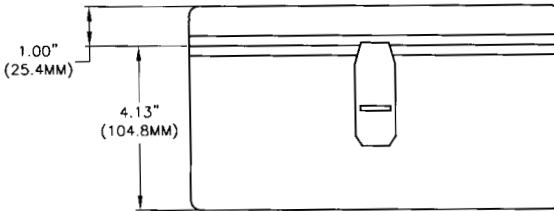
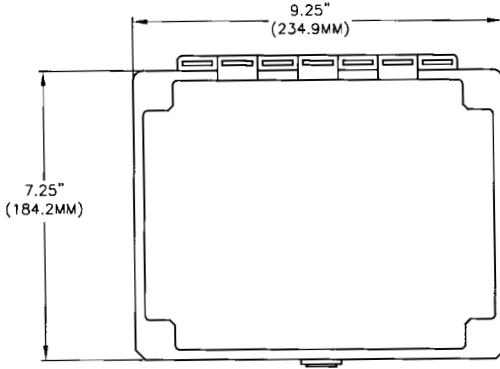
**NOTES:**

1. MATERIAL: 316SS BODY WITH CRYOGENIC EPOXY TIP.
2. "A" - STANDARD: 2.25" (57.2MM)  
SPECIFY EXTENSION FOR LONGER LENGTH.



## REMOTELY MOUNTED ELECTRONICS

LL-100,LL-101,LL-102,LL-103,  
LL-104,LL-105,LL-106,LL-107,  
LL-108,LL-394



DIMENSIONAL DRAWING  
CONTROL UNIT ENCLOSURE (NEMA 4X)  
(OPTIONAL)

**PREVENTATIVE MAINTENANCE**

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Electronics are constructed with solid state components and are epoxy encapsulated. Periodically check and clean the sensor when used with liquids which cause a coating build up on the sensor. No other maintenance is required.

**CLEANING**

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If the pipe or vessel to which the unit is mounted is to be steam cleaned or cleaned with abrasive detergents, remove the entire unit before cleaning by:

1. Disconnecting the power at the source.
2. Opening the housing cover.
3. Removing the power and control wiring cable.
4. Unthreading the sensor.

To reinstall, follow the installation procedures.

**SYSTEM MALFUNCTION**

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Should the system malfunction, notify MAGNE-SONIC or our Representative immediately.

## WARRANTY

All components of Magne-Sonic are warranted to be free from defects in material and workmanship for a period of three years from the date of shipment to the original purchaser. This warranty applies to general purchaser and to components installed, serviced and operated according to Magne-Sonic Installation Manuals. Magne-Sonic will repair or replace, at its option, F.O.B. at its plant or any other location designated, any part which proves to be defective in manufacture or workmanship.

All claims must be made within the warranty period. No claims outside of the warranty period will be honored.

Warranties are not applied to any components which have been damaged by improper installation, use exposure to unusual atmospheric conditions or components which have been mis-used, misapplied, abused and/or damaged by neglect or accident. This warranty shall not apply to any components which may have been altered or repaired without the prior written consent of Magne-Sonic.

Magne-Sonic assumes no responsibility or liability for any labor, material, or back charges, without written authorization. Any products returned must be with prior written authorization.

The foregoing is in lieu of all other warranties, expressed or implied, including any warranties of merchantability and/or for fitness for particular purpose. Magne-Sonic assumes no other liabilities express or implied. Magne-Sonic shall not be liable for normal wear and tear, nor for direct, incidental or consequential damages. In no event shall Magne-Sonic's liability exceed the price of its product at the time of purchase.