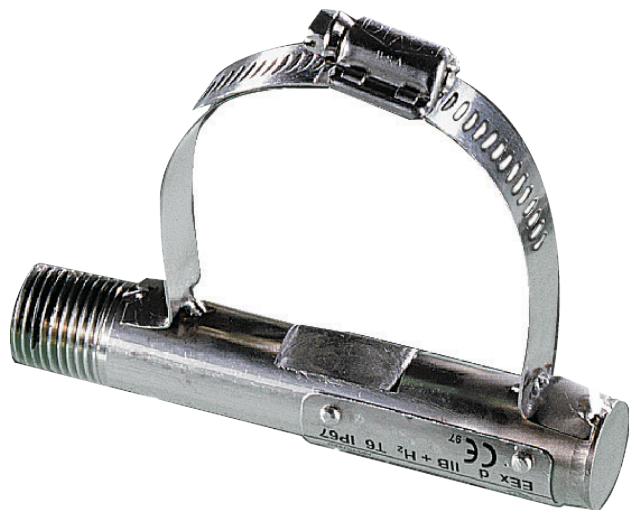




# PENBERTHY MODEL MGS-314L SERIES LEVEL CONTROL SWITCH

## INSTALLATION, OPERATION AND MAINTENANCE INSTRUCTIONS

Before installation, these instructions must be carefully read and understood.



Emerson's responsibility hereunder is limited to repairing or replacing the product at its expense.

Emerson shall not be liable for loss, damage, or expenses directly or indirectly related to the installation or use of its products, or from any other cause or for consequential damages. It is expressly understood that Emerson is not responsible for damage or injury caused to other products, building, property or persons, by reason of the installation or use of its products.

*This is Emerson's sole warranty and in lieu of all other warranties, expressed or implied which are hereby excluded, including in particular all warranties of merchantability or fitness for a particular purpose.*

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### PRODUCT WARRANTY

Emerson warrants its products as designed and manufactured to be free of defects in material and workmanship for a period of one year after the date of installation or eighteen months after date of manufacture, whichever is earliest. Emerson will, at its option, replace or repair any products which fail during the warranty period due to defective material or workmanship.

Prior to submitting any claim for warranty service, the owner must submit proof of purchase to Emerson and obtain written authorization to return the product. Thereafter, the product shall be returned to Emerson, with freight prepaid.

This warranty shall not apply if the product has been disassembled, tampered with, repaired or altered outside of the Emerson factory, or if it has been subjected to misuse, neglect or accident.

This document and the warranty contained herein may not be modified and no other warranty, expressed or implied, shall be made by or on behalf of Emerson unless modified or made in writing and signed by the company's president or a vice president.

### 1 INTRODUCTION

The instructions in this manual pertain to the Penberthy Model MGS-314L Series magnetic level gauge switch.

The Model MGS-314L Series magnetic level gauge switch is designed to detect the passage of the float in a Multiview™ magnetic liquid level gauge, at a specific location. The switch consists of a bi-stable latching reed switch encased in a watertight enclosure.

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## INSTALLATION, OPERATION AND MAINTENANCE INSTRUCTIONS

### 2 SPECIFICATIONS/APPROVALS

#### 2.1 Enclosure

Watertight (Type 4) and Explosion-Proof (Type 7) 316 SST housing

#### 2.2 Switch

##### Output:

MGS-314L Series: SPDT (Form C) switch output: 1 AMP Maximum Switching Current, 150 VDC  
Maximum Switching Voltage non-inductive load, 25 W - Maximum power

**Repeatability:** Better than 0.032 in. (0.81 mm)

**Response time:** <100 milliseconds

**Operating temperature:** -40 to 225°F (-40 to 107°C) with third party approvals

**Ambient temperature:** -4 to 104°F (-20 to 40°C) with third party approvals

**Dead band:** 0.5 in. (13 mm)

#### 2.3 Approvals

##### MGS-314L-C

CSA Approved Ex d

Explosion-proof for: Division 1, 2;

Class I; Groups A, B, C, D

When installed in accordance with control drawing 7E741-008 (Figure 2)

##### MGS-314L-C

CSA Approved

Intrinsically safe for: Division 1, 2;

Class I; Groups A, B, C, D

When installed in accordance with control drawing 7E742-008 (Figure 3)

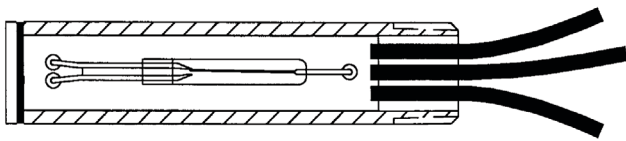
### 3 THEORY OF OPERATION

While reading the theory of operation refer to Figure 1 for the location of the components. The description is based on a side view.

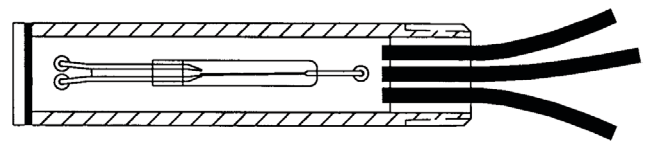
With the liquid level below the switch, the reed should be at position 'A'. The reed is held in this position by a magnetized stop. As the float ascends and passes the switch, it induces a magnetic field in the reed. The reed is coupled to the float and moves with it until contact with the opposite stop is made. The magnetized stop then holds the reed in its new position. The movement of the reed causes the switch to change state.

As the float descends with the liquid level it passes the switch and the process described is reversed. This returns the switch to its original state.

FIGURE 1  
MGS-314L switch positions



Position A



Position B

# PENBERTHY MODEL MGS-314L SERIES LEVEL CONTROL SWITCH

## INSTALLATION, OPERATION AND MAINTENANCE INSTRUCTIONS

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### 4 INSTALLATION

#### 4.1 Unpacking

Upon receiving the Model MGS-314L Series magnetic level gauge switch, check all components carefully for damage incurred in shipping. If damage is evident or suspected, do not attempt installation. Notify the carrier immediately and request a damage inspection. Check each item against the packing list.

#### 4.2 Mounting the switch

Due to shipping vibration, it is possible the switch will not be in the 'normal' position for proper operation. If this occurs, simply cycle the float past the switch once. This will initialize it automatically.

1. Measure the distance from the top of the indicating scale, on the magnetic level gauge, to the top of the communicating chamber. Record this distance.
2. Loosen the clamps holding the indicating scale to the communicating chamber.
3. Open the mounting band supplied with the Model MGS-314L Series.
4. Place the Model MGS-314L Series on the communicating chamber. The cut out in the switch housing should contact the communicating chamber. Place the mounting band around the chamber and under the indicator housing. For optimum performance the cut out should be parallel and the switch housing perpendicular to the communicating chamber.
5. Loosely tighten the mounting band. Move the Model MGS-314L Series either up or down to the desired position and tighten the band.
6. The switch must be mounted within the indication range for the magnetic gauge. The mounting band for the switch should be a minimum of 1 in. (25 mm) inside the indication range. This will insure sufficient float movement to operate the switch.
7. If more than one switch is used on a single magnetic gauge, the minimum recommended distance between mounting bands is 2 in. (51 mm).
8. Adjust the position of the indicating scale so that the distance from the tip of the scale to the top of the communicating chamber is the same as in step 1. Tighten the clamps holding the indicating scale to the communicating chamber.

#### 4.3 Wiring connection

1. If you are using conduit for the switch wiring use conduit seal with a drain or a drip-loop to prevent condensate from entering the housing. Condensate can cause electrical shorts. (The switch housing has a ½ NPT-M connection for the wiring conduit)  
**Note:** attach conduit prior to mounting switch on communicating chamber to relieve mounting stresses.
2. We recommend using aluminum or austenitic stainless steel conduit and nipple, to the conduit opening of the switch housing. This will give you an accessible point to terminate the control wires. DO NOT USE any ferromagnetic material such as: carbon steel, duplex, 400 Series stainless steel or cast iron.

# PENBERTHY MODEL MGS-314L SERIES LEVEL CONTROL SWITCH

## INSTALLATION, OPERATION AND MAINTENANCE INSTRUCTIONS

### 5 SET-UP

#### SAFETY INSTRUCTIONS

Do not apply power to the switch while performing these tests.

#### 5.1 Initial test

Use an ohmmeter to verify the following conditions

**TABLE 1 - Wire conditions at different switch orientations**

Model	Switch orientation	Wire color		
		Black	Red	Blue
MGS-314L Series	Switch at position 'A' (liquid level below switch)	Common	Open	Closed
	Switch at position 'B' (liquid level above switch)	Common	Closed	Open

If these conditions do not exist, proceed to Section 6

### 6 TROUBLESHOOTING

#### 6.1 Introduction

Your Penberthy magnetic level gauge switch is designed to give you years of unattended service. However, failure of electrical equipment can occur. Sound maintenance practices require periodic inspection of the instrument to ensure it is in good working order.

#### SAFETY INSTRUCTIONS

Do not apply power to the switch while performing these tests.

#### 6.2 Switch test

With the switch at position 'A' use an ohmmeter to verify the conditions in Section 5.1. Using a magnet, move the switch to position 'B'. If the switch still doesn't change state, it is defective. Proceed to Section 8.

### 7 DISPOSAL AT END OF USEFUL LIFE

Penberthy Model MGS-314L Series level control switches are used in a variety of fluid applications. By following the appropriate federal and industry regulations, the user must determine the extent of preparation and treatment the switch must incur before their disposal. A Material Safety Data Sheet (MSDS) may be required before disposal services accept certain components.

Metal, glass and polymers should be recycled whenever possible. Refer to order and relevant technical data sheets for materials of construction.

### 8 TELEPHONE ASSISTANCE

If you are having difficulty with your Model MGS-314L Series level control switch, notify your local Penberthy distributor or call the factory direct (281) 274-4400. To help us assist you more effectively, please have as much of the following information as possible when you call:

- Instrument model number
- Name of the company from whom you purchased the switch
- Invoice number and date
- Process material
- Operating process temperature
- Brief description of the problem
- Troubleshooting procedures that failed

If attempts to solve your problem fail, you may be requested to return your instrument to the factory for intensive testing. You must obtain a return authorization (R.A.) number from Emerson prior to returning your unit.

Failure to do so will result in the unit being returned to you without being tested freight collect. To obtain a R.A. number gather the following additional information;

- Reason for return
- Person to contact at your company
- 'Ship-to' address

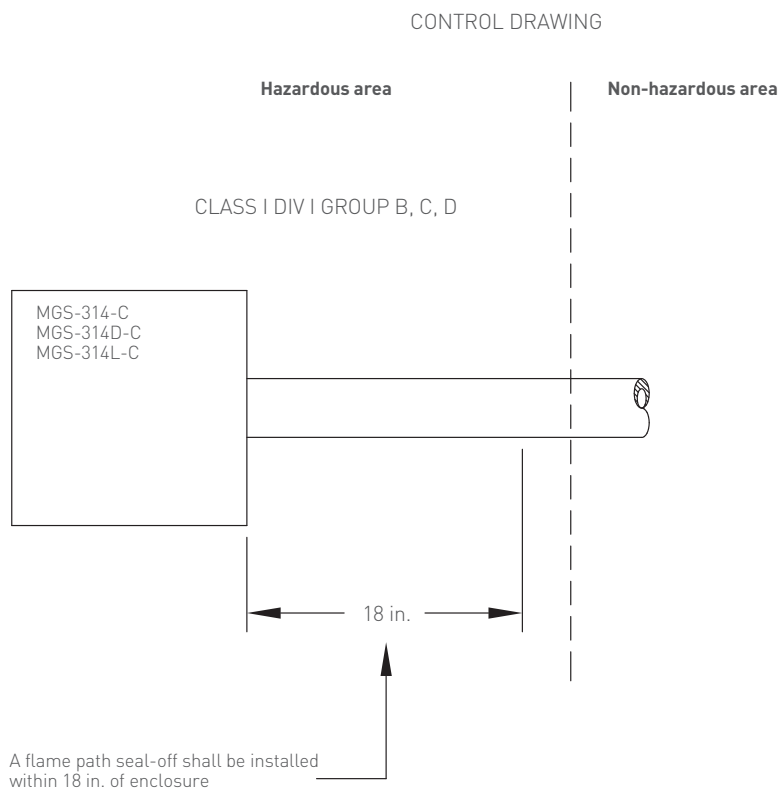
We recommend that you return the entire unit for testing. There will be a minimum charge applied for evaluation of non-warranty units. You will be contacted before we repair the unit if there will be any additional charges in excess of the minimum. If you return a unit that is covered by the warranty, but is not defective, the minimum charge will apply.

# PENBERTHY MODEL MGS-314L SERIES LEVEL CONTROL SWITCH

## INSTALLATION, OPERATION AND MAINTENANCE INSTRUCTIONS

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FIGURE 2  
Control drawing CSA approved explosion-proof for MGS-314L (7E741-008)



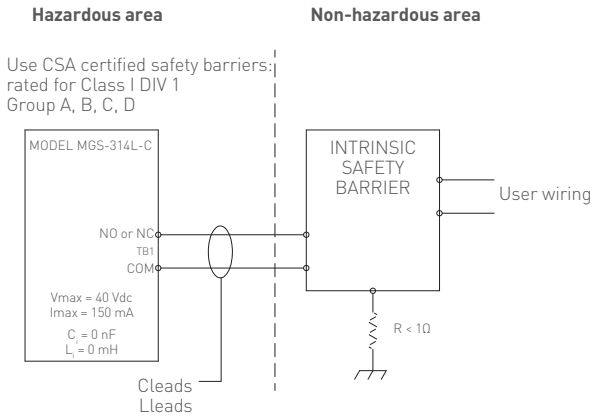
Wiring to be in accordance with National Electrical Code (NEC)  
Pertinent parts of the 500 Series of Article 5 or local codes as applicable.

# PENBERTHY MODEL MGS-314L SERIES LEVEL CONTROL SWITCH

## INSTALLATION, OPERATION AND MAINTENANCE INSTRUCTIONS

FIGURE 3  
Control drawing CSA approved intrinsically safe for MGS-314L (7E742-008)

### TWO-WIRE ENTITY CONTROL DRAWING

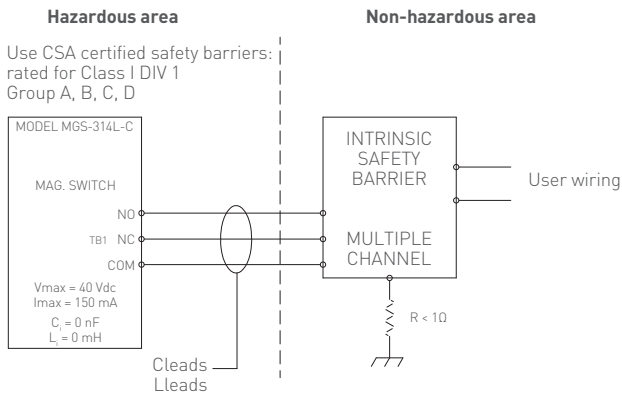


Unused NO or NC lead shall be blind terminated and insulated.

The intrinsic safety barrier parameters must meet the following requirements:  
 $V_{oc} \leq 40 \text{ V}$  or  $I_{sc} \leq 150 \text{ mA}$ ;  $C_a \geq C_{cleads}$ ;  $L_a \geq L_{leads}$

OR

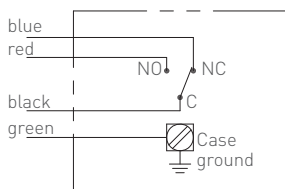
### THREE-WIRE ENTITY CONTROL DRAWING



One multiple channel intrinsic safety barrier must be used.

The barrier parameters must meet the following requirements:  
 $V_t \leq 40 \text{ V}$  or  $I_t \leq 150 \text{ mA}$ ;  $C_a \geq C_{cleads}$ ;  $L_a \geq L_{leads}$

### MGS-314L-C Connections



Installation shall conform to the manufacturer's instructions supplied with the intrinsic safety barrier as well as the National Electric Code and ANSI/ISA-RP 12.6 or CSA C22 "Installation of intrinsically safe instrument systems in hazardous (classified) locations."

Maximum non-hazardous area voltage must not exceed 250 Vrms or Vdc.

For I.S. installation, temperature shall not exceed 225°F (107°C).

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