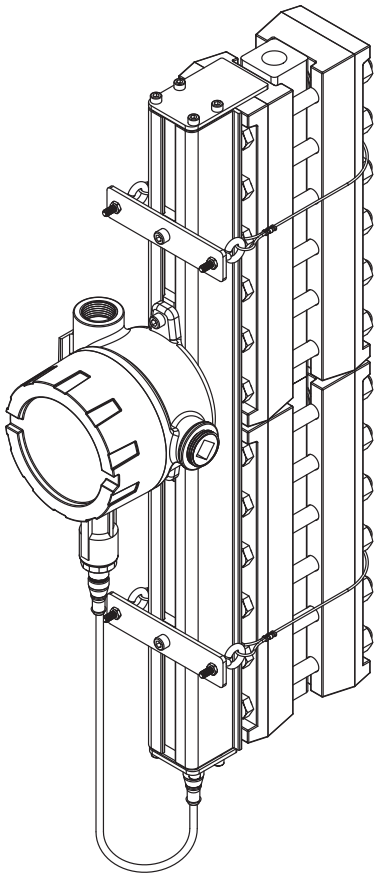
EMERSON™

PENBERTHY LED ILLUMINATOR FOR FLAT GLASS GAUGES, HAZARDOUS LOCATION

INSTALLATION, OPERATION AND MAINTENANCE INSTRUCTIONS

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



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Tables and figures

1 SAFETY INFORMATION

IMPORTANT
It is the user's responsibility to ensure that all connections and wiring comply with all applicable codes, specifications, sales contracts or public laws.

IMPORTANT
The sales order lists the required operating voltage. Operation at a voltage other than specified will cause equipment damage.

The Flat Glass gauges operate at high temperatures. High surface temperature can be expected where this equipment connects to the gauge.

WARNING
Do not touch until the unit has cooled.

The Flat Glass gauge must be adequately supported to hold the weight of the LED illuminator. Shut-off LED illuminator before doing any maintenance or repairs.

2 INTRODUCTION

Penberthy LED illuminators are designed to be readily mounted and able to fit any style of Penberthy flat glass liquid level gauges, as well as most competitor's flat glass gauges. Penberthy LED illuminators provide uniform light distribution over the entire length of liquid level gauge assemblies. Penberthy LED illuminators are available in lengths from 6" to 104" in multiples of 2" (for flat glass gauges).

2.1 System description

Penberthy LED illuminators are comprised of four main components. Use the exploded diagram view in Sections 13-15 as additional reference material.
Illuminator: light source. It is composed of an anodized, rigid, extruded aluminum that protects the PC boards.
Bracket: used to mount illuminator to level gauge. There are three types of brackets: standard transparent, reflex, and TSL/TSM. The brackets can be moved up and down along the extruded body making assembly and disassembly quick and easy.
Power supply: provides intrinsically safe power to the LED illuminator. Power supply is mounted inside an explosion proof enclosure that is mounted to the illuminator body.
Cordset: used to connect the power supply to the illuminator. The cordset consists of a straight female connector and a straight male connector.

3 AVAILABLE MODELS

Penberthy LED illuminators are available with white LED's only and are made to fit/cover the whole length of the gauge up to 104 inches. One power supply is required per 208 LED's (104 inches).
On average an LED will give the user 100,000 hours of use compared to 1000 hours for a standard light bulb.

3.1 Power requirements and specifications

Input: 115/230 VAC ±10%, 50/60 Hz
Power consumption:
up to 400 mA max at 115/230 VAC
Max distance from power supply to LED illuminator: 200 ft. (consult Emerson if longer distance is required)
Ambient temperature range for general location:
-40 to 158°F (-40 to 70°C)
Ambient temperature range for hazardous location:
-40°F ≤ Ta ≤ +140°F (-40°C ≤ Ta ≤ +60°C)
Ingress protection: IP66
Max altitude: 6.561 ft.
Electrical connection size:
¾" FNPT for US and Canada
M20 for ATEX and IECEx

- Unit must be wired with 14 AWG wire minimum, with a maximum wire length of 1000 feet.
- An external switch or circuit-breaker and external overcurrent protection is recommended to be installed near the unit.
- Unit can be use indoors and outdoors.
- Maximum relative humidity 80% for temperatures up to 88°F (31°C) decreasing linearly to 50% relative humidity at 104°F (40°C).

WARNING
Do not tamper with Penberthy's power supply or its components.

3.2 Approvals

General location
UL61010-1/CSA C22.2 No. 61010-1

Explosion-proof with intrinsically safe output

MET Certified for US and Canada
Class I Division 1 Groups A*, B, C, D T4
* only for Mounting Option 2

ATEX Approved
Ⓔx II 2G (Power Supply)
Ex d [ia Ga IIC] IIC T4 Gb
Ⓔx II 1G (Illuminator)
Ex ia IIC T4 Ga

IECEx Approved
Ex d [ia Ga IIC] IIC T4 Gb (Power Supply)
Ex ia IIC T4 Ga (Illuminator)

When installed in accordance with Emerson Control Drawings:
- For Division Locations - 18WL4-009 (Figure 5A)
- For ATEX/IECEx - 18WR6-009 (Figure 5B)

Conditions of Use for Ex Component	
1	Tserv according to use seal: TPE: -40÷100/85°C - lower temperature for housing with sight glass VMO: -40÷100/85°C - lower temperature for housing with sight glass FKM: -20÷200/85°C - lower temperature for housing with sight glass
2	Max number, size and position of apertures - are given in Application manual N-L2237 dated 31.03.2016
3	For information on the dimensions of the flameproof joints the manufacturer shall be contacted.
4	Apparatus installed inside of enclosure can have any lay-out, which ensures that in any cross section area will be at least 40% (group IIC) of area free
5	The enclosure with Ex component certificate can be applicate only by assumption of filling requests of the standard IEC 60079-1:2014, cl. D.3.10
6	Appropriately certified cable glands for direct entry have to be used
7	IP 68 max (h=1 m)
8	The max overpressure static test of housing: 50 bar/10 s
9	Max power dissipation for temperature class, see ANNEX to IECEx Certificate No. IECEx FTZU 12.0017U Issue No. 0

TABLE 1 - MODEL STRUCTURE

Example:				**ILFG**	**1**	**T**	**1**	**S**	**1**	**D**	**S**
Model description											
ILFG	Illuminator LED flat glass										
ILFGO	Illuminator LED flat glass offshore										
No of sections (1-7)											
Number of gauge sections (1-7)											
Gauge type											
R	Reflex	**L**	TSL								
T	Transparent	**M**	TSM								
Glass size (1-9)											
Glass size of gauge (1-9)											
Extension type											
S	Standard										
F	Frost										
Input power											
1	115 V AC 50/60 Hz (¾ NPT inlet)	**3**	115 V AC 50/60 Hz (M20 inlet)								
2	230 V AC 50/60 Hz (M20 inlet)	**4**	230 V AC 50/60 Hz (¾ NPT inlet)								
Application location											
G	General locations										
D	Division locations (MET for US and Canada)										
Z	Zone locations (ATEX and IECEx)										
Installation configuration											
S	Standard										
C	Chain connection (staggered gauges)										
R	Remote mount power supply										
A	Chain connection (staggered gauges) and remote mount power supply										

4 INSPECTION

SAFETY INSTRUCTIONS

Exercise care in handling illuminator parts to avoid scratching, denting or otherwise damaging the protective glass. Any marks on the protective glass, as well as dirt, paint or tape will result in a reduction of light output. Upon receipt of an illuminator, check all components carefully for damage incurred in shipping. If damage is evident or suspected, do not attempt installation. Notify carrier immediately and request damage inspection. Refer to the exploded view diagram in Sections 13-15 to inventory parts.

5 INSTALLATION

Installation should only be undertaken by qualified personnel who are familiar with this equipment. They should have read and understood all of the instructions in this manual. The user should refer to Penberthy dimension sheets or Penberthy product proposal to obtain dimensional information for the specific size and model illuminator.
It is the user's responsibility to assure that knowledgeable installation personnel plan and carry out the installation in a safe manner.
The following procedures are some of the guidelines that should be employed.

5.1 Inspection and cleaning of glass

Penberthy recommends that prior to installation of an illuminator to a gauge, that the gauge glass be cleaned and inspected per instructions as follows:

1. Clean glass within vision slot using a non-abrasive household cleaner. DO NOT use a wire brush, metal scraper or any devise which could scratch the glass.
2. Inspect the surface of the glass for any signs of clouding, etching, scratching or physical damage such as bruises, chips or erosion that penetrates the outer surface of the glass. Shining a light at approximately a 45º angle will aid in detecting some of these conditions. Light will glisten more brightly on glass imperfections than the surrounding glass when reflecting light. Detection of any such problem areas or surface wear is sufficient evidence of damage. Do not proceed with installation with damaged glass. See appropriate Installation, operation and maintenance manual and replace glass.

5.2 Installation of unit to gauge

Become familiar with the illuminator components before proceeding with installation. Refer to the exploded parts diagram, ISO and top views in Section 13 for transparent gauges, Section 14 for reflex gauges, and Section 15 for TSL/TSM gauges. As well as Figure 4A for general locations, 4B for division locations, and 4C for ATEX/IECEx when performing the following installation instructions.
To assemble the illuminator to a transparent style gauge, follow the steps below:

1. Screw the attachment plate to the slider bracket (leave two slider brackets in the middle-lower half of the illuminator for the power supply).
2. Insert the eyebolt/wire assembly on one side of the attachment plate only and fix with the nut/wing-nut provided.
3. Position the illuminator on the gauge so that the top end cap of the illuminator rests on the top end of the gauge cover.
4. Position the mounting brackets with wires where desired (3 ft. max distance between brackets is suggested) and wrap the wire around the gauge. Insert the other eyebolt on the opposite side of the attachment plate and fix with the nut/wing-nut provided.
5. Center the illuminator and firmly tighten down the wire to hold the illuminator to the gauge.
6. Open the cover of the power supply enclosure and make sure the AC input voltage selector switch in the power supply matches the input voltage provided to the unit (115 VAC or 230 VAC).
7. After voltage selector switch is selecting the correct input voltage, connect/plug in the AC wires to Terminal Block 1.
8. Fully close the cover of the enclosure by hand tightening it.
9. Mount power supply to the illuminator body using the last two slider brackets you set aside from step 1.
10. Connect the power supply to the LED illuminator using the cordset provided.

IMPORTANT
For Hazardous Location Only

- *A flame path seal-off shall be installed within 18 in. of enclosure, see Figure 5A for Division Locations.*
- *A flame path seal-off shall be installed directly to threaded entry of enclosure, see or Figure 5B for ATEX/IECEx.*
- *The LED Illuminator contains material composition capable of igniting the explosive atmosphere due to physical impact or friction. Installation shall provide inherent protection from potential impacts risks by means of installation location, guards, and/or barriers.*

To assemble the illuminator to a reflex style gauge, follow the steps below:

1. Mount illuminator to reflex style flat glass gauge as shown in Figures 2B and 2C.
2. Remove the appropriate nuts from the gauge bolts. There are two gauge brackets, one will be mounted on the top and the other one on the bottom part of the gauge. If the illuminator length is over 48 inches, make sure to space the extra gauge brackets evenly (3 ft. max distance between brackets is suggested). Each gauge bracket is mounted onto 2 gauge bolts.
3. Install gauge bracket over gauge bolts and secure to gauge cover with gauge nuts. Torque gauge nuts to the proper torque as specified in the gauge Installation, Operation and Maintenance Instructions provided with the gauge.
4. Attach illuminator mounting bracket to gauge bracket using screws, lock washers and nuts provided.
5. Attach the LED illuminator body to the reflex mounting bracket using the screws and the slider bracket provided (leave two slider brackets in the middle-lower half of the illuminator for the power supply). The Illuminator should be centered with respect to the vision slot of the gauge.
6. Open the cover of the power supply enclosure and make sure the AC input voltage selector switch in the power supply matches the input voltage provided to the unit (115 VAC or 230 VAC).
7. After voltage selector switch is selecting the correct input voltage, connect/plug in the AC wires to Terminal Block 1.
8. Fully close the cover of the enclosure by hand tightening it.
9. Mount power supply to the illuminator body using the last two slider brackets you set aside from step 5.
10. Connect the power supply to the LED illuminator using the cordset provided.

IMPORTANT
For Hazardous Location Only

- *A flame path seal-off shall be installed within 18 in. of enclosure, see Figure 5A for Division Locations.*
- *A flame path seal-off shall be installed directly to threaded entry of enclosure, see or Figure 5B for ATEX/IECEx.*
- *The LED Illuminator contains material composition capable of igniting the explosive atmosphere due to physical impact or friction. Installation shall provide inherent protection from potential impacts risks by means of installation location, guards, and/or barriers.*

To assemble the illuminator to a TSL/TSM gauge, follow the steps below:

1. Attach the TSL/TSM mounting bracket, plate bracket, and power supply to the illuminator body using the screws and the slider brackets provided. Power supply should be mounted to the illuminator body that will be mounted to the lower gauge section.
2. Hand tight the screws to prevent TSL/TSM bracket from sliding.
3. Insert the eyebolt/wire assembly on one side of the plate bracket only and fix with the nut/wing-nut provided.
4. Position the illuminator on the gauge so that is centered with respect to the vision slot of the gauge.
5. Wrap the SAS wire around the gauge and the TSL/TSM mounting bracket (place wire rope through the tabs on the bracket to keep it straight) . Insert the other eyebolt on the opposite side of the plate bracket and fix with the nut/wing-nut provided.
6. Center the illuminator and firmly tighten down the wire assembly to hold the illuminator to the gauge.
7. Open the cover of the power supply enclosure and make sure the AC input voltage selector switch in the power supply matches the input voltage provided to the unit (115 or 230 VAC).
8. After voltage selector switch is selecting the correct input voltage, connect/plug in the AC wires to Terminal Block 1.
9. Fully close the cover of the enclosure by hand tightening it.
10. Connect the power supply to the LED illuminator using the cordset provided.

IMPORTANT
For Hazardous Location Only

- *A flame path seal-off shall be installed within 18 in. of enclosure, see Figure 5A for Division Locations.*
- *A flame path seal-off shall be installed directly to threaded entry of enclosure, see or Figure 5B for ATEX/IECEx.*
- *The LED Illuminator contains material composition capable of igniting the explosive atmosphere due to physical impact or friction. Installation shall provide inherent protection from potential impacts risks by means of installation location, guards, and/or barriers.*

5.3 Electrical installation

WARNING
DO NOT proceed with electrical installation unless the illuminator has been mounted to the gauge according to instructions in Section 5.2. Only qualified electricians who have read and understood local and national electrical code should connect the illuminator to an electrical source. Failure to follow any of these instructions may result in death, severe personal injury, property damage or damage to the illuminator and gauge.

The electrical installation should be performed by a qualified electrician and comply with applicable codes (U.S. - refer to National Electrical Code NFPA current edition; Canada - refer to Electrical Code CSA C22) or other regulations as applicable. The conduit must run in such a manner that it is not supported by or does not serve as a support for the illuminator. Unit must be grounded before it is operated.

6 OPERATION

Check that all installation procedures have been completed. Use only qualified, experienced personnel who are familiar with illuminators and thoroughly understand the implications of all the instructions. If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

7 MAINTENANCE

The user must create maintenance schedules, safety manuals, and inspection details for each specific installation of an illuminator.

7.1 Preventative maintenance

On all installations the following items should be regularly evaluated by the user for purposes of maintenance:

1. Protective glass, for signs of dirt build up, scratches or breakage.
2. Mounting bracket for signs of loosening.

The user must determine upon evaluation of his or her own operating experience an appropriate maintenance schedule necessary for his or her specific application. Realistic maintenance schedules can only be determined with full knowledge of the services and application situation involved.

7.2 Maintenance procedures

Cleaning the protective glass - wash with a non-abrasive soap or detergent and water using a soft, grit-free cloth or sponge. When cleaning grease and oil from the protective glass, use a chemical compatible with silicone rubber only and a soft, grit-free cloth. DO NOT use solvents such as acetone, benzene, carbon tetrachloride, dry cleaning fluid or lacquer thinners since they will attack the surface of the protective glass and or the gaskets. After surface has been cleaned and rinsed of foreign particles, it may be dried with a clean, soft, damp chamois or grit-free cloth.

IMPORTANT

DO NOT use hard, rough cloths on edge of protective glass because they can scratch the surface. The scratches will result in reduced light output from the illuminator.

7.3 Troubleshooting

1. Internal or external corrosion could be an indication of a harsh service environment. An investigation should immediately be carried out to determine the cause of the problem. It is the user's responsibility to choose a material of construction compatible with both the contained fluid and the surrounding atmosphere.
2. All LED's off could be an indication of power failure. Check the power supply and connections.

IMPORTANT

Contact manufacturer if any part needs to be replaced.

7.4 Allowable modifications

The LED illuminator are not to be modified in any way. Any modifications will void warranty and could result in equipment damage or serious personal injury.

8 REMOVAL - DISASSEMBLY - REASSEMBLY

8.1 Disassembly

Refer to the exploded parts diagram in Sections 13-15 for additional reference during disassembly and reassembly of the illuminator.

Transparent gauge

1. Disconnect the electrical power source from the illuminator.
2. Hold the illuminator firmly. Loosen the wire assembly. Completely remove the eyebolts from the plate bracket (one side only).
3. Move wires out of the way and remove the illuminator.

Reflex gauge

1. Disconnect the electrical power source from the illuminator.
2. Hold the illuminator firmly. Remove the screws on the back of the illuminator body that hold the mounting bracket.
3. Remove the illuminator from the mounting bracket.

TSL/TSM gauge

1. Disconnect the electrical power source from the illuminator
2. Hold the illuminator firmly. Loosen the wire assembly. Completely remove the eyebolts for the plate bracket (only side only).
3. Move wires out of the way and remove the illuminator.

8.2 Reassembly
Refer to the exploded parts diagram in Sections 13-15 for additional reference during disassembly and reassembly of the illuminator.

Transparent gauge
1. Position the illuminator on the gauge so that the top end cap of the illuminator rests on the top end of the gauge cover.
2. Position the mounting brackets with wires where desired and wrap wire around the gauge. Insert other eyebolt on opposite side of attachment plate.
3. Center the illuminator and firmly tighten down the wire to hold the illuminator to the gauge.
4. Connect electrical power source to the illuminator.

Reflex gauge
1. Replace the screws on the back of the LED illuminator body.
2. Illuminator should be centered with respect to the vision slot of the gauge. Tighten screws to secure illuminator to the bracket.
3. Connect electrical power source to the illuminator.

TSL/TSM gauge
1. Position the illuminator on the gauge so that is centered with respect to the vision slot of the gauge.
2. Wrap the SAS wire around the gauge and the TSL/TSM mounting bracket (place wire rope through the tabs on the bracket to keep it straight) . Insert the other eyebolt on the opposite side of the plate bracket and fix with the nut/wing-nut provided.
3. Center the illuminator and firmly tighten down the wire assembly to hold the illuminator to the gauge.
4. Connect electrical power source to the illuminator.

9 PACKAGING, STORAGE AND TRANSPORTATION

9.1 Packaging
The LED illuminator contains fragile components and must be handled with care. These units must be packed to prevent damage during transportation. If damage to the glass should occur during shipment contact the factory.

9.2 Storage
The LED illuminator can be stored outside. These units are not affected by temperature or humidity.

9.3 Transportation
Since the LED illuminator contains fragile parts, care should be taken to ensure that the unit arrives undamaged. After unpacking unit, it should be inspected and any damaged parts should be replaced before assembly and installation.

10 DISPOSAL AT END OF USEFUL LIFE

Penberthy illuminator's metal and polymers should be recycled whenever possible. Refer to order and Penberthy's material specification sheets for materials of construction.

11 WARRANTY

See sales order acknowledgements for terms and conditions of sale.

12 TELEPHONE ASSISTANCE

If you are having difficulty with your illuminator, notify your local Penberthy distributor. You may also contact the factory direct at (281) 274-4400 and ask for an applications engineer. So that we may assist you more effectively, please have as much of the following information as possible when you call:
- Model #
- Name of the company from whom you purchased your illuminator
- Invoice # and date
- Operating temperatures
- A brief description of the problem
- Troubleshooting procedures that failed

If attempts to solve your problem fail, you may be requested to return your illuminator to the factory for intensive testing. You must obtain a Return Authorization (RA) number from Penberthy prior to returning anything. Failure to do so will result in the unit being returned to you, without being tested, freight collect. To obtain a R.A. number, the following information (in addition to that above) is needed:
- Reason for return
- Person to contact at your company
- 'Ship-to' address

There is a minimum charge for evaluation of non-warranty units. You will be contacted before any repairs are initiated should the cost exceed the minimum charge. If you return a unit under warranty, but is not defective, the minimum charge will apply.

13 TRANSPARENT GAUGE

FIGURE 1A
LED ILLUMINATOR EXPLODED VIEW

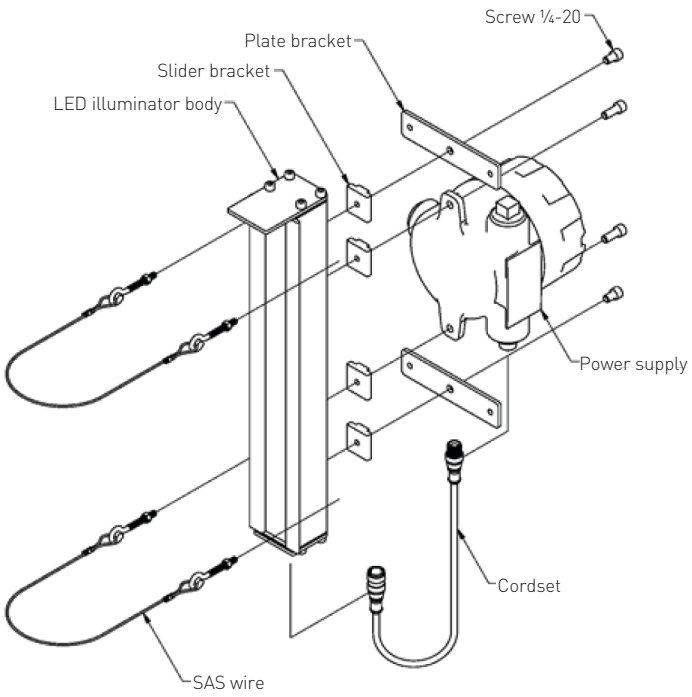


FIGURE 1B
LED ILLUMINATOR ISO VIEW

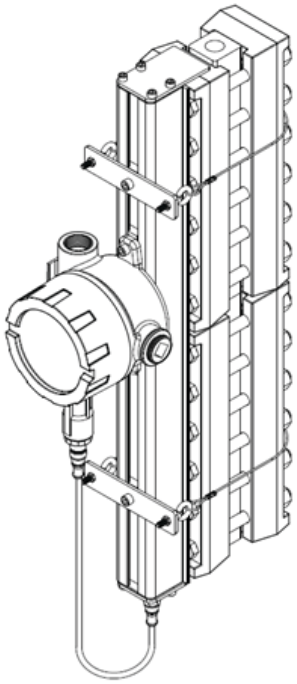
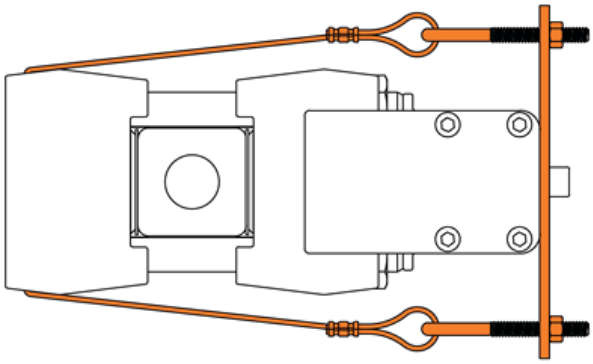


FIGURE 1C
LED ILLUMINATOR TOP VIEW



14 REFLEX GAUGE

FIGURE 2A
LED ILLUMINATOR EXPLODED VIEW

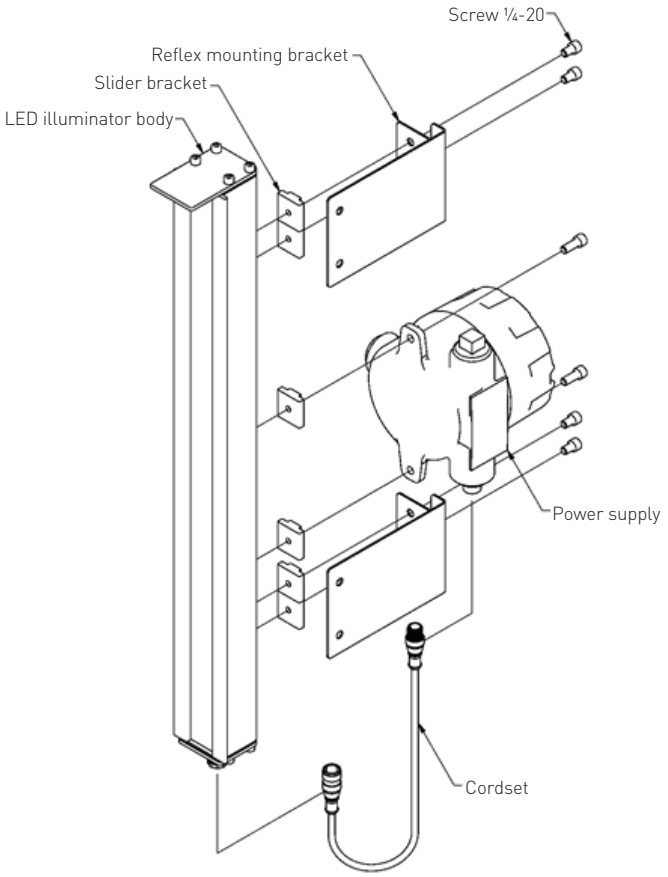


FIGURE 2B
LED ILLUMINATOR ISO VIEW

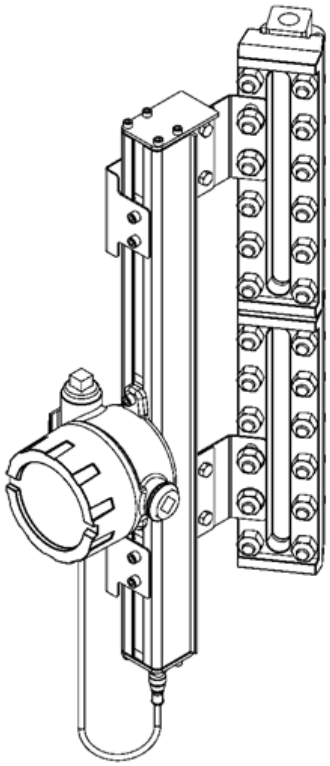
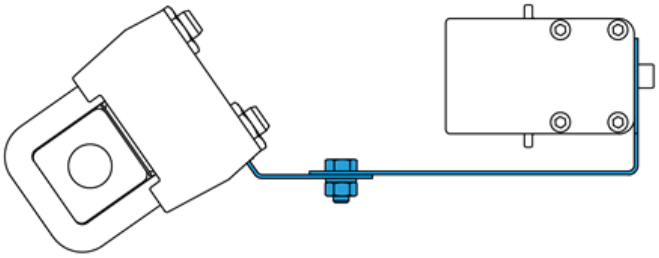


FIGURE 2C
LED ILLUMINATOR TOP VIEW



15 TSL/TSM GAUGE

FIGURE 3A
LED ILLUMINATOR EXPLODED VIEW

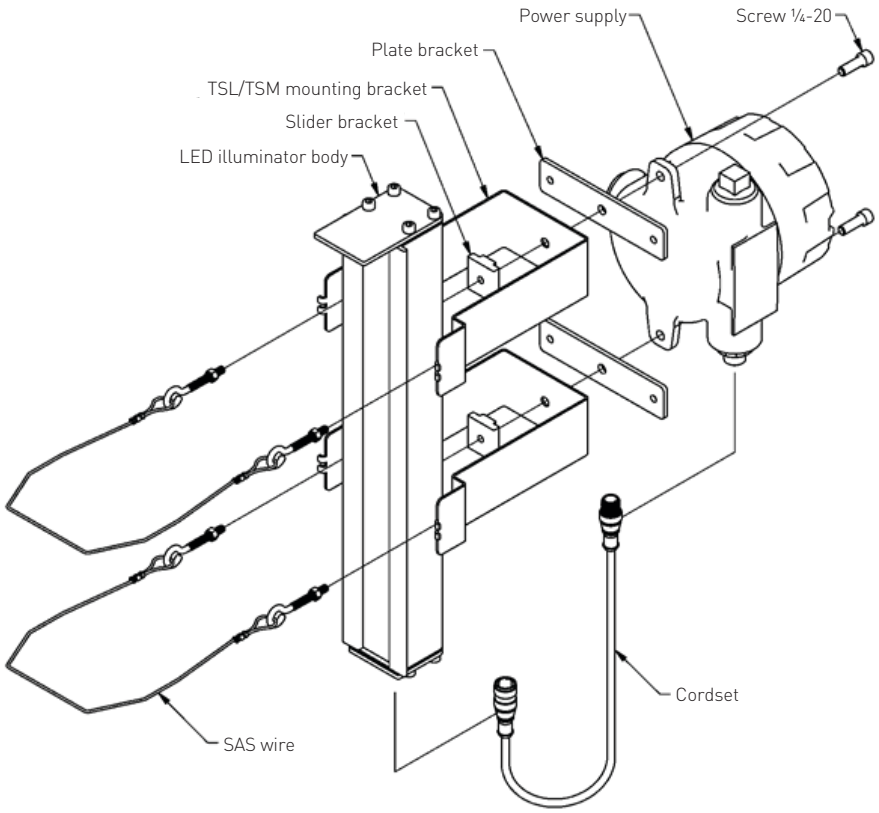


FIGURE 3B
LED ILLUMINATOR ISO VIEW

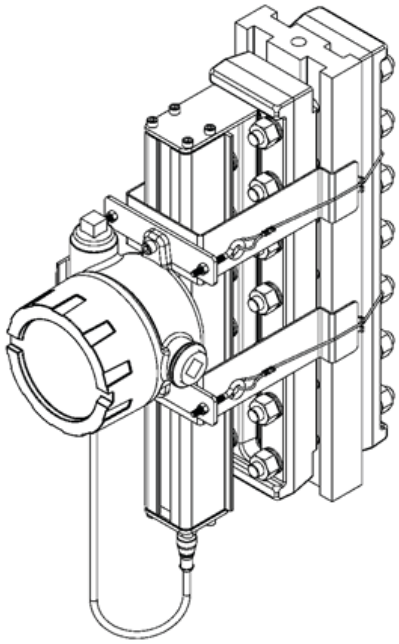


FIGURE 3C
LED ILLUMINATOR TSL TOP VIEW

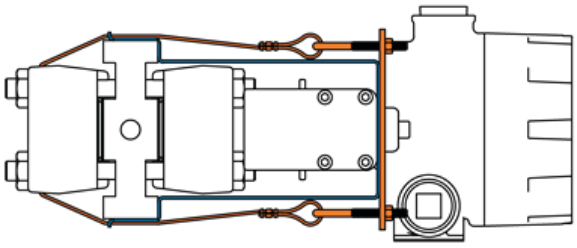


FIGURE 3D
LED ILLUMINATOR TSM TOP VIEW

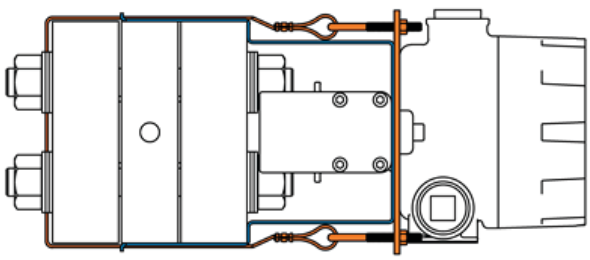


FIGURE 4A
WIRING INSTALLATION - GENERAL LOCATIONS

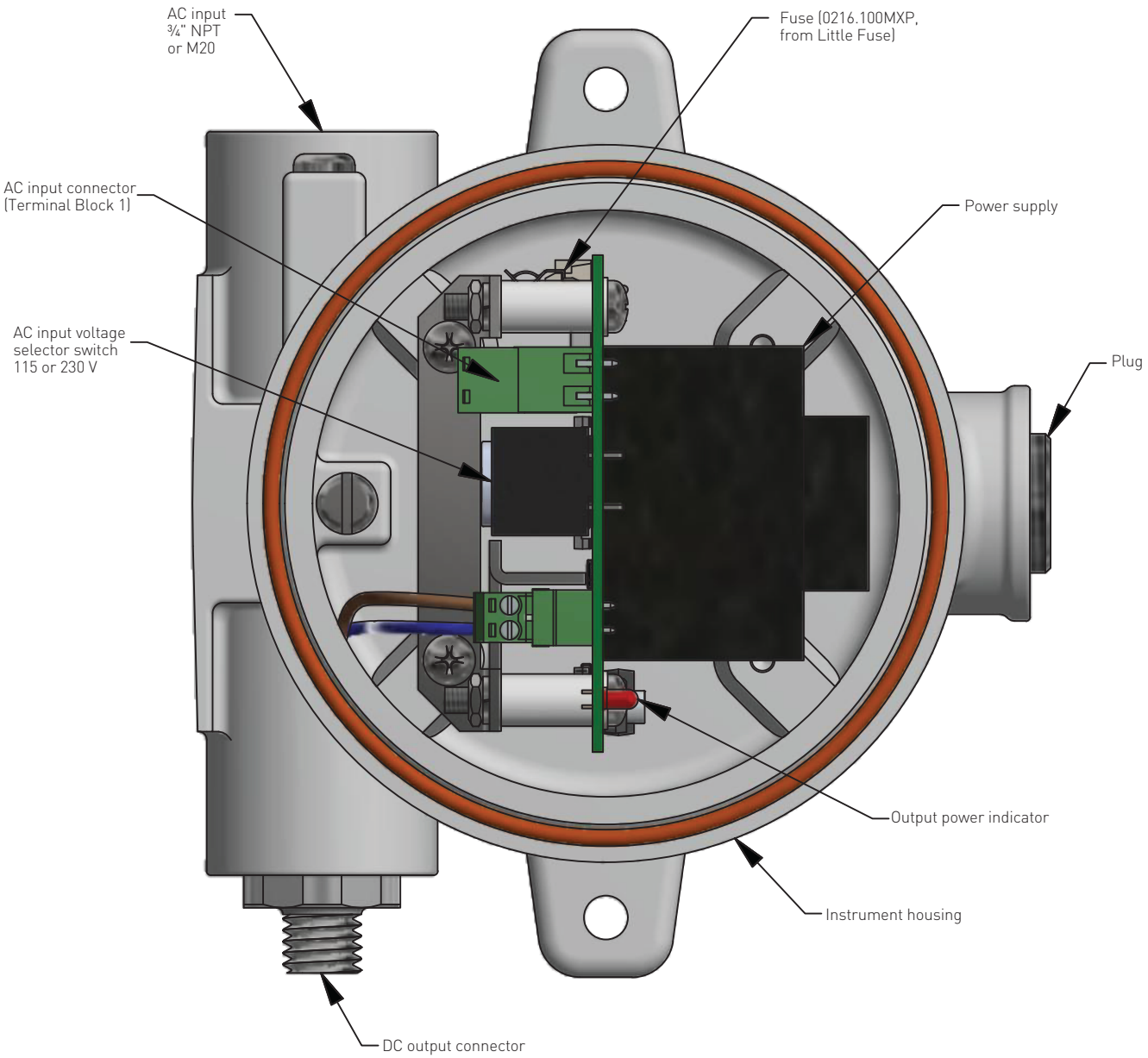


FIGURE 4B
WIRING INSTALLATION - DIVISION LOCATIONS

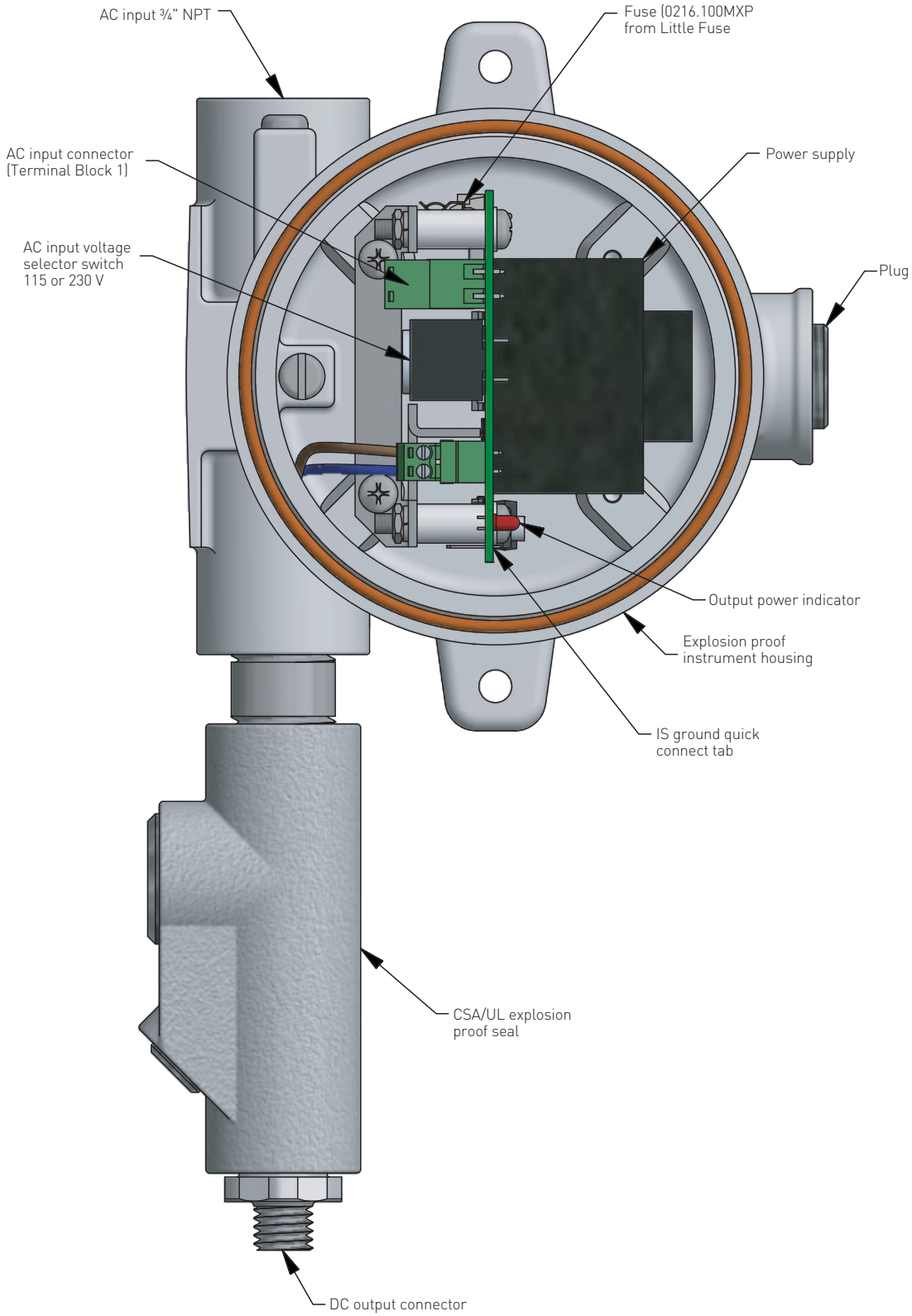


FIGURE 4C
WIRING INSTALLATION - ATEX/IECEX LOCATIONS

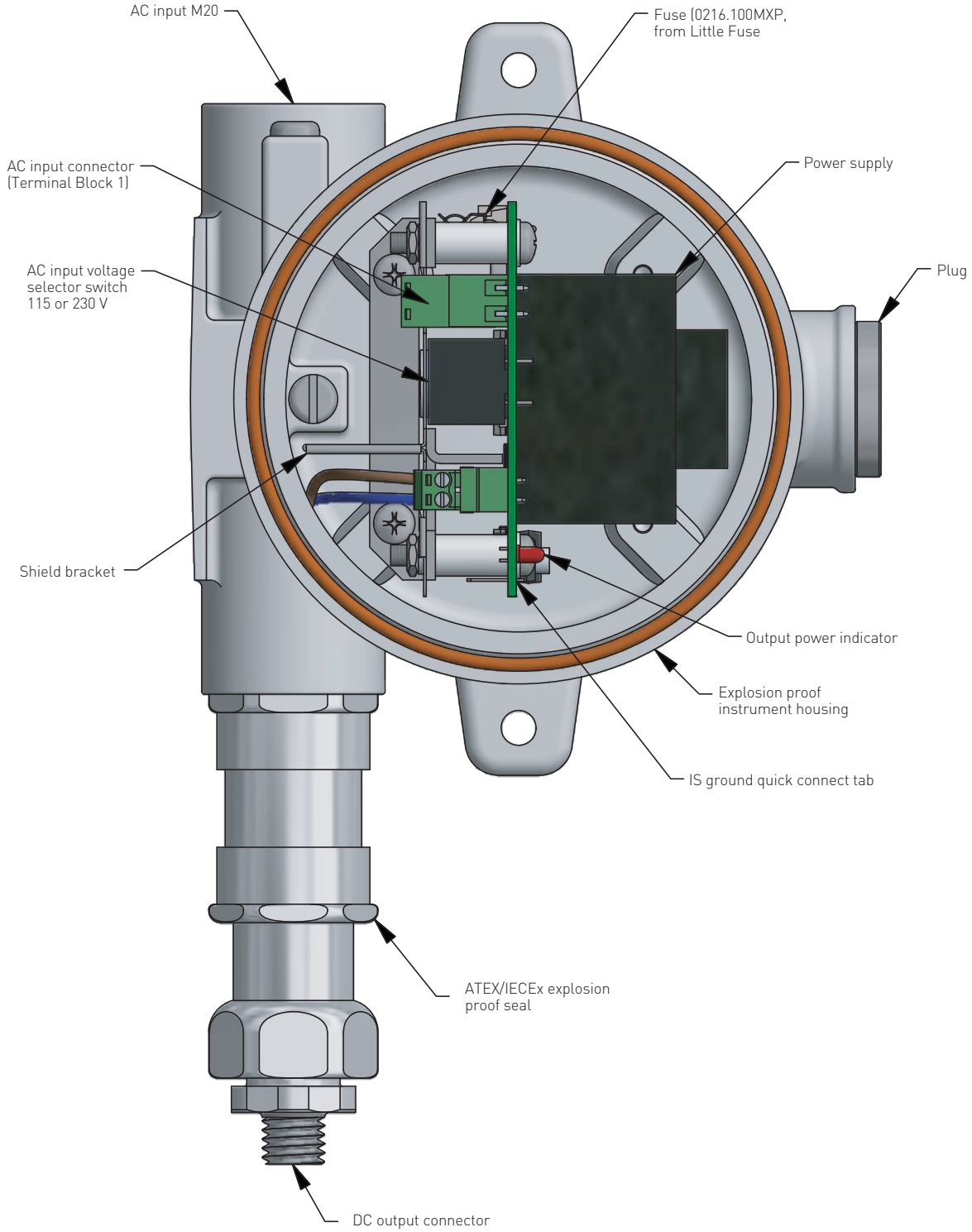
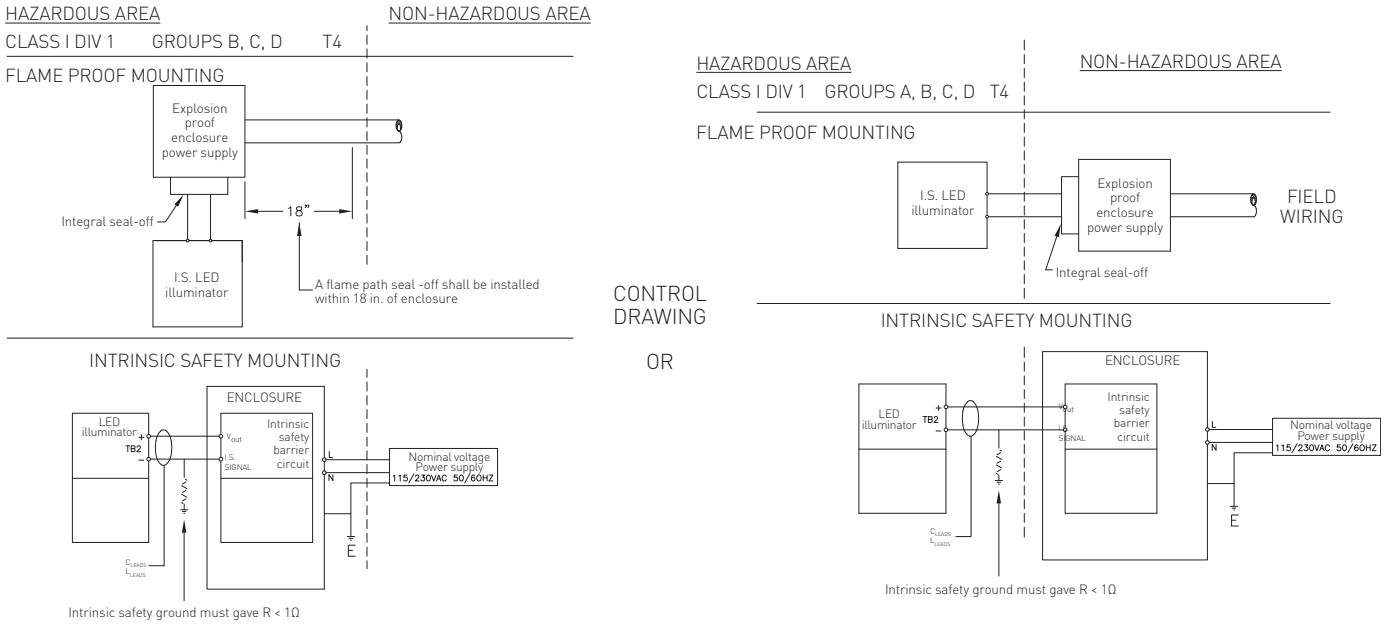


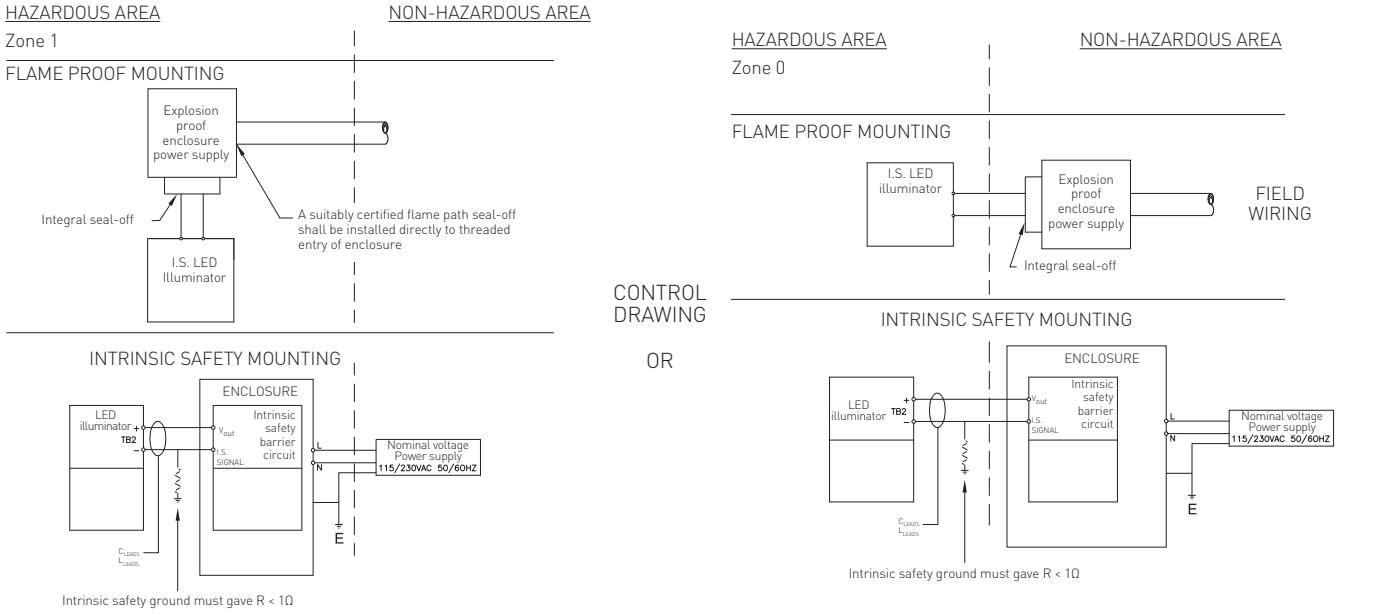
FIGURE 5A
CONTROL DRAWING FOR DIVISION LOCATIONS



MOUNT OPTION 1 MOUNT OPTION 2

NOTES: Equipment supplying intrinsic system must not produce more than 125/250 V_{rms}.
Loop wire distance not to exceed 200 ft. using C_{Leads} = 60 pF/ft. L_{Leads} = µH/ft.
Consult Emerson if longer distance needed.
Barrier ground shall be connected to a grounding electrode by redundant, 12 AWG or larger insulated conductors.
The installation must be in accordance with Canadian Electric Code CSA C22.1 Part 1, Appendix F.
The installation must be in accordance with National Electric Code, NFPA 70, Articles 504 and 505, and ANSI/ISA-RP12.06.01.

FIGURE 5B
CONTROL DRAWING ATEX/IECEX



MOUNT OPTION 1 MOUNT OPTION 2

NOTES: Equipment supplying intrinsic system must not produce more than 125/250 V_{rms}.
Loop wire distance not to exceed 200 ft. using C_{Leads} = 60 pF/ft. L_{Leads} = µH/ft.
Consult Emerson if longer distance needed.
The installation must be in accordance with National Electric Code, NFPA 70, Articles 504 and 505, and ANSI/ISA-RP12.06.01.

FIGURE 6A
NAMEPLATE - GENERAL LOCATIONS

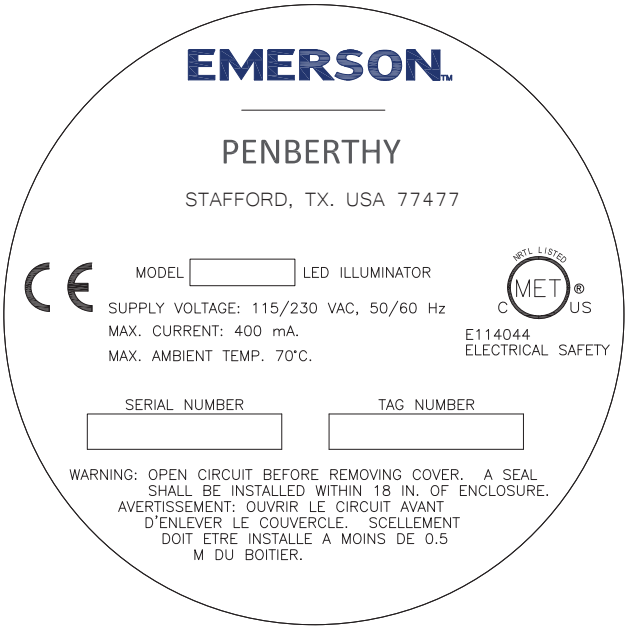


FIGURE 6B
NAMEPLATE - DIVISION LOCATIONS

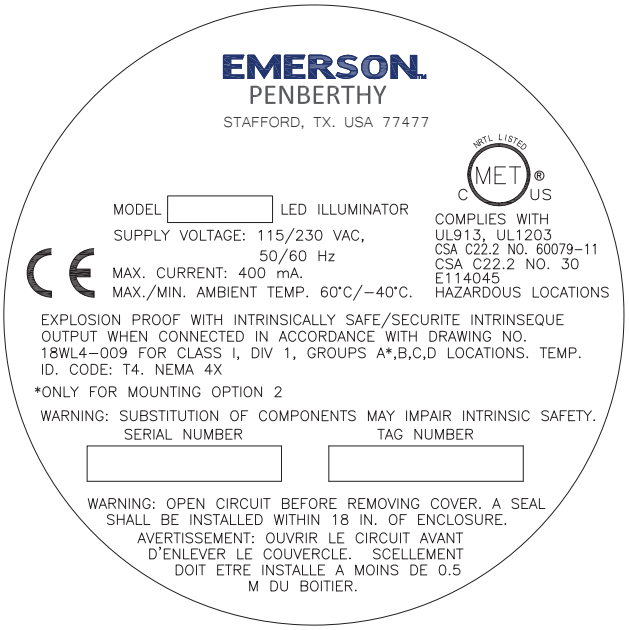


FIGURE 6C
NAMEPLATE - ATEX/IECEX

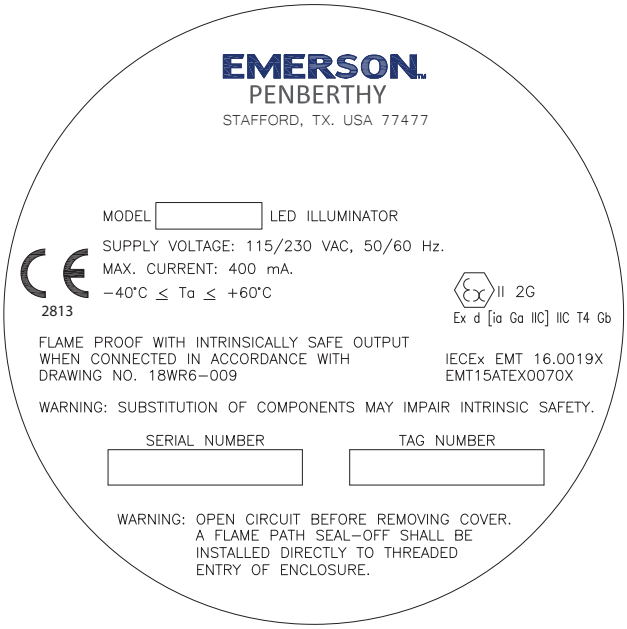


FIGURE 6D
NAMEPLATE - LED ILLUMINATOR BODY - ATEX/IECEX