



## INSTRUCTIONS

# POLARIZATION CELL REPLACEMENT (PCRH)



## INTRODUCTION

The Polarization Cell Replacement for use in Hazardous Locations (PCRH) is a solid-state DC isolation/AC grounding (or coupling) device designed for use in conjunction with cathodically protected equipment located in Class I, Division 1, Zone 1 hazardous (classified) locations. (The less costly PCR is normally used for Class I, Division 2, Zone 2 and non-hazardous locations.) The PCRH is suitable for: (1) AC voltage mitigation, (2) over-voltage protection of isolated joints and similar structures and equipment, (3) DC isolation and AC grounding of cathodically protected structures.

The PCRH can be used in a variety of applications, each of which require specific installation guidelines. These installation instructions cover the following common applications.

- DC isolation/AC grounding of cathodically protected structures containing electrical equipment.
- Over-Voltage protection of isolated joints.
- AC voltage mitigation.

Some applications listed may not apply in some countries due to different codes and practices. If your application is not covered by these installation instructions, contact Dairyland. Application Notes for most applications are also available on the Dairyland website.

## READ ENTIRE DOCUMENT BEFORE INSTALLING

### GENERAL INSTALLATION INSTRUCTIONS

These general instructions apply to all applications.

## **WARNING**

During installation, the voltage on the structure may rise to an unsafe level (i.e., due to induced AC, AC fault or lightning on the structure). Sparking and current flow may occur when connecting or disconnecting decouplers or over-voltage protectors. Assure that this does not occur in hazardous locations where gases or vapors may be present. All necessary safety precautions must be taken by the user to avoid unsafe worker conditions, including arcing, in accordance with applicable industry and/or company-required practices. Dairyland provides suggested procedures for installing and operating this equipment (See the section on Worker Safety). But the user must be responsible for and approve the procedures to be used by its workers when installing the equipment because Dairyland cannot be familiar with each user's safety guidelines.

## **NOTICE**

Note: Explosion Hazard - Substitution of any component may impair suitability for Class I, Division 1, Zone 1.

### Worker Safety

For worker safety during installation or removal, it is recommended that the user obtain certain equipment; namely a pair of electrically isolation gloves, a shorting cable approximately 3 ft (0.91 m) long with isolation clamps on each end, and a multi-meter to measure AC voltage. (Of these items, Dairyland offers a suitable 3 ft long 1/0AWG shorting cable with isolation clamps, Model# BCL-1/0 for all decoupler ratings.) The following installation procedure assumes that these items are available. It is suggested that a grounding jumper be used as a safety precaution in the event the lead to the structure rises to an unsafe potential when it is disconnected during the installation or removal process or if an electrical disturbance occurs while the decoupler is being installed. Be sure to remove the grounding jumper after the decoupler is completely installed. If the structure voltage is not at a safe touch potential (i.e., >15VAC to ground per NACE SP0177), then insulating gloves should be used.

### Mounting

Mount the PCRH so that the total length of conductor to the connection points will be as short as possible if the PCRH is being used to provide over-voltage from lightning. All conductors have inductance which will cause a significant voltage per unit of conductor length when subject to lightning surge current. To minimize the voltage developed between the connection points, install the PCRH as close as practical to the required connection points and cut the conductor to the shortest possible length during installation. For most isolated joint applications the PCRH can, and should, be installed with about 6 inches ( $\approx$  150 mm) of lead. Conductors typically develop 1-3 kV/ft. (approx. 3-10 kV/ meter) of length; hence, the reason leads should be kept as short as possible. Conductor length is not critical for limiting voltage due to 50 Hz or 60 Hz current.



Note: The PCRH enclosure is connected to the positive (+) terminal internally with a bonding jumper. Therefore, when installing, make sure that there is no electrical connection between the enclosure and the negative (-) conductor. Separate grounding of the enclosure is not required when the positive lead is connected to ground.

## Mounting Accessories

Numerous mounting accessories are available from Dairyland to aid in the proper installation of the PCRH. Full details and complete installation instructions are available at Dairyland.com

## Specific Installation Guidance

The Dairyland website contains detailed information on the installation methods specific to a given application. For wiring diagrams and/or application guidance, see Dairyland.com.

## Polarity

If the PCRH purchased has asymmetrical blocking characteristics and it is being connected between a cathodically protected structure and ground, connect the negative terminal of the PCRH to the cathodically protected structure and the positive terminal to ground. If being connected between two different cathodically protected systems, attach the negative terminal to the more negative structure and the positive terminal to the less negative structure, keeping in mind that the positive terminal is normally bonded internally to the metallic enclosure. Consider if the PCRH enclosure mounting could affect the cathodic protection system. The bottom of the nameplate, which is located just above the two conductors, shows the polarity of each conductor.

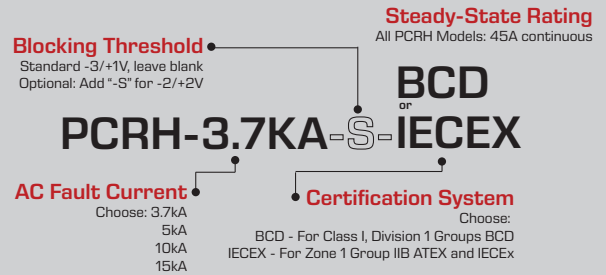
## CONDUCTOR CONNECTIONS

### Conductors Furnished by Dairyland

If conductors have been furnished with the PCRH, they may or may not already be connected, depending on the type of conductor connection ordered and the conductor length.

Axial connected conductors will normally come pre-installed to the PCRH, unless conductors are longer than about 15 ft ( $\approx 4.5$  meters). If not installed, rotate the entire cable with the pre-crimped connector onto the threaded bushing stud until the connector is up to the brass jam nut before attaching the other end of the conductor. Then hold the connector while tightening the jam nut firmly against the end of the connector. (Do not exert torque on the bushing stud with respect to the bushing body during this procedure.) Slide the heat shrink sleeve over the jam nut and the insulating part of the bushing, and shrink in place. Tools required include vise-grips or channel locks to hold the connector, a wrench for a 1/2" nut (a 3/4" open-end wrench or equivalent), and a heat source to shrink the heat shrink sleeve.

## Model Number Chart



## Certifications

The PCRH has been tested by Nationally Recognized Testing Laboratories (NRTLs) for compliance to independent standards in its operation, ratings, and construction. This includes compliance to standards for:

Class I, Div. 1, Groups B, C, D and Zone 1, Group IIB

Class & Division System:  
UL (United States) and C-UL (Canada)

- Effective Ground Fault Current Path per:
  - NFPA 70 (US National Electric Code – NEC): Article 250.4(A)(5)
  - CSA C22.1 (Canadian Electric Code, Part I): 10-100 & 10-500
- Isolation of Objectionable DC Ground Currents per:
  - NFPA 70: Article 250.6(E)
  - CSA C22.1: 10-100 & 10-500
- Hazardous Location Use:
  - Class 1, Division 1 & 2, Groups B,C,D by UL & C-UL per:
    - UL 1203, 5th Ed. & CSA C22.2 No.30, 3rd Ed.
- Safety Requirements for Electrical Equipment per:
  - UL 61010-1, 3rd Ed. & CSA C22.2 No. 61010-1, 3rd Ed.
  - Overvoltage Protection from Impulse (Lightning) Current: 100kA (8 x 20 $\mu$ s)
  - Enclosure Rating: NEMA 4X
  - Temperature Range: -45°C to +65°C (-49°F to +149°F)

Zone System: ATEX / IECEX / UKEx (Europe / International / UK). ATEX per directive 2014/34/EU (Equipment for use in Potentially Explosive Atmospheres):

- Zone 1, Gas Group IIB, Frameproof "db"
- EN IEC 60079-0: 2018
- EN 60079-1: 2014
- IEC 60079-0: 2017
- IEC 60079-1: 2014-06
- Overvoltage Protection from Impulse (Lightning) Current: 100kA (8 x 20 $\mu$ s)
- Temperature Range: -20°C to +60°C
- Enclosure Rating: IP66




To install right angle connected conductors, install with one jam nut on each side of the cable terminal lug per instructions provided with the kit. Securely hold one nut while tightening the other nut. Tools required include two wrenches for a 1/2" nut.

### Conductors User Furnished

If conductors and terminals are user furnished, a terminal with one hole that accommodates a 1/2" diameter stud will be required. Terminals are available to make a right angle or a 45° angled connection to the bushing stud. Connect as described above. Tools required include two wrenches for a 1/2" nut.

### ATEX/IECEX COMMENTS

- The device shall be placed into service in accordance with the ratings and limitations stated in the installation and operating instructions.
- **Warning:** Do not open when an explosive atmosphere may be present.
- No ongoing maintenance is required, as the device is designed to be maintenance free, and is of solid-state construction with no moving, wearing or serviceable parts.
- Regular testing of the device is not required. Users who desire to verify the operating condition of the device should refer to the section entitled "Field Testing." Observe all safety precautions described, in addition to industry or company safety practices.
- This equipment complies with the standards listed on page 1 per certificate numbers: DEMKO 14 ATEX7391121X and IECEx UL 14.0027X and UL21UKEX2251X.
- This equipment is marked:

 II 2 G Ex db IIB T6 Gb (-20°C ≤ Ta ≤ +60°C)  
CE 0539

Contact Dairyland Electrical Industries for information on the dimensions of the flameproof joints.

### Field Testing

Before installation, the following measurements are suggested to confirm that the steady-state conditions imposed on the PCRH will be within its ratings.

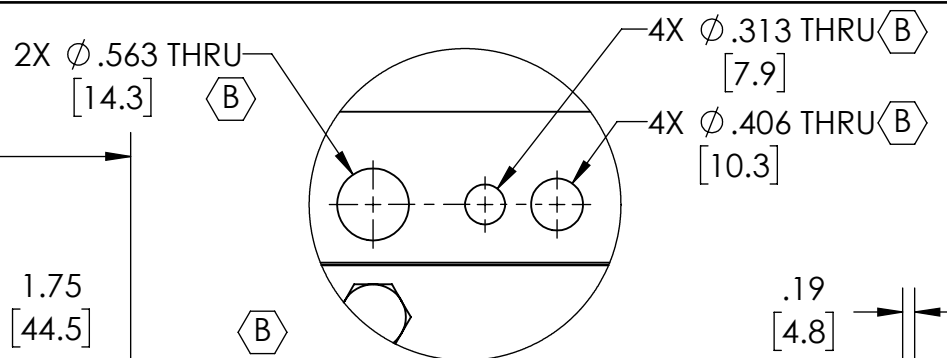
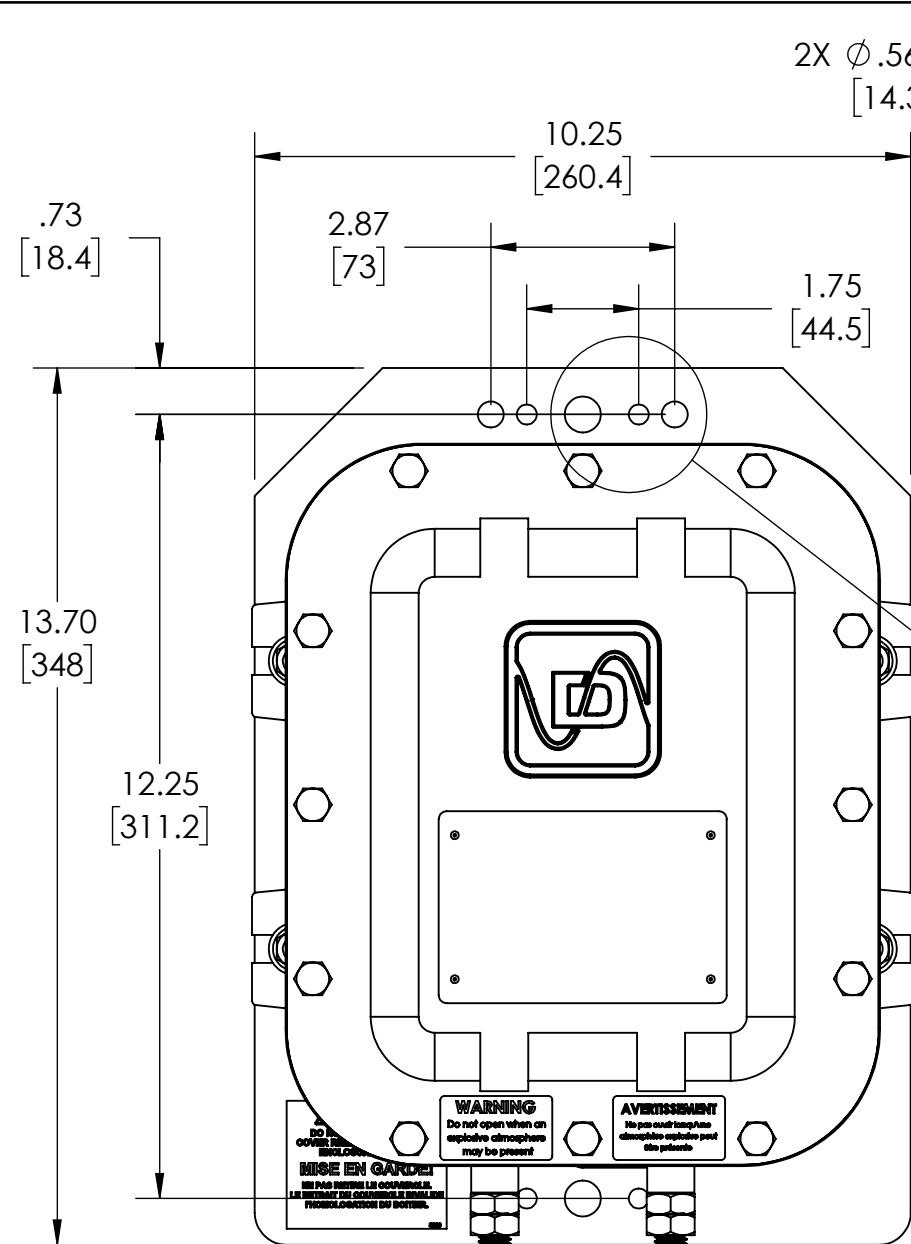
1. Measure the open-circuit DC voltage between the PCRH connection points with a multimeter. The open-circuit DC voltage measured should be within the DC blocking voltage rating of the model selected (i.e., normally -3.0 V/+1.0 V or +/- 2.0 V, unless a custom version has been ordered).
2. Measure the steady-state short-circuit AC-RMS current between the PCRH connection points with a clamp-on ammeter. The short-circuit AC-RMS steady-state current measured should be less than the steady-state AC current rating of the PCR model ordered.

3. After installation, the DC voltage across the PCRH terminals can be measured to confirm that the expected value of cathodic protection voltage exists, assuming the cathodic protection system is ON. (The voltage measured with a voltmeter will be less than the actual cathodic protection voltage because it is not being measured with respect to a reference cell.)
4. After installation, the steady-state AC current through the PCRH conductors can again be measured. The current measured should be comparable to the value measured prior to installation since the AC impedance of the PCRH is negligible (i.e., about 10 milliohms at 60 Hz).
5. To verify correct device operation while in service, measure the pipe to soil voltage using a reference cell. An acceptable CP reading will indirectly indicate correct operation with DC isolation, as device conduction would bond the CP system to ground (or to the other connected structure) and affect the CP reading. While an indirect test, it has proven to be a good indicator of operation. An unacceptable reading may be due to other factors besides the Dairyland device, and if needed perform the following additional tests.
6. The definitive test is one performed with the device out of circuit. If the device is in service, disconnect the CP structure attachment conductor (typically at the negative terminal) so that the product is isolated, but first addressing any safety issues such as adding a current-rated bonding jumper between the two connection points, wearing insulating gloves, etc. Note that if the Dairyland device is performing mitigation of induced AC voltage, disconnecting the device will leave the structure as an open circuit, and the induced voltage on the pipeline may rise to high levels. Therefore, take appropriate safety measures before proceeding. Next, momentarily short the device terminals to remove any residual charge that may be on the internal capacitor. Connect a multi-meter, set to the lowest Ohms scale, across the terminals. If the product is functional, the resistance will start at zero ohms and then very slowly increase as the capacitor in the decoupler begins to charge from the multi-meter. The test may be discontinued at this point, as charging the capacitor can take up to 10 minutes, and it is only necessary to observe this general response briefly. If the product is failed, the reading will remain fixed and at a very low resistance value, typically a fraction of one Ohm.

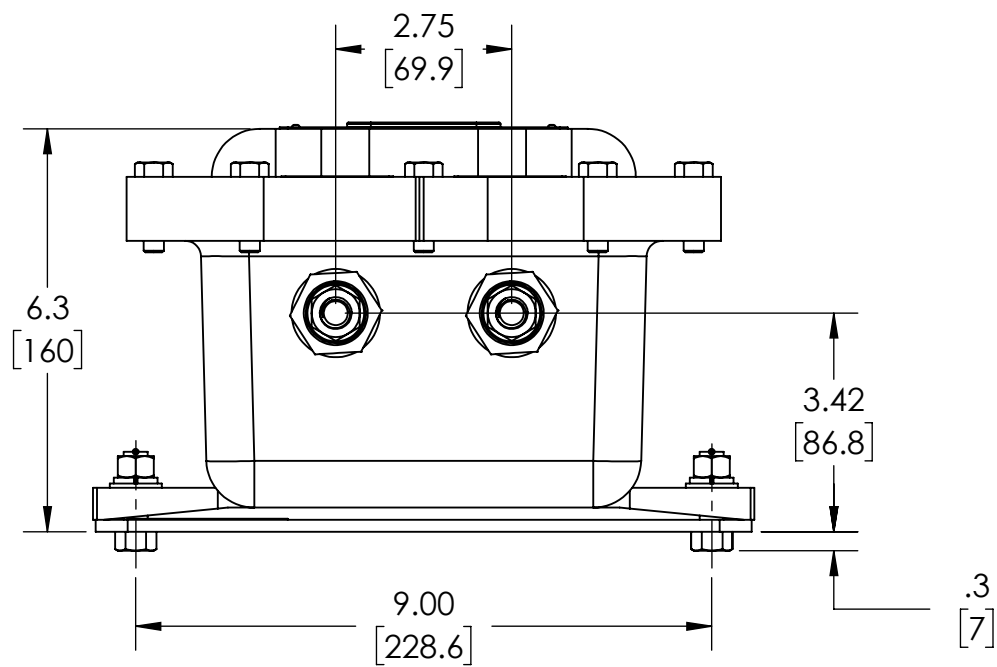
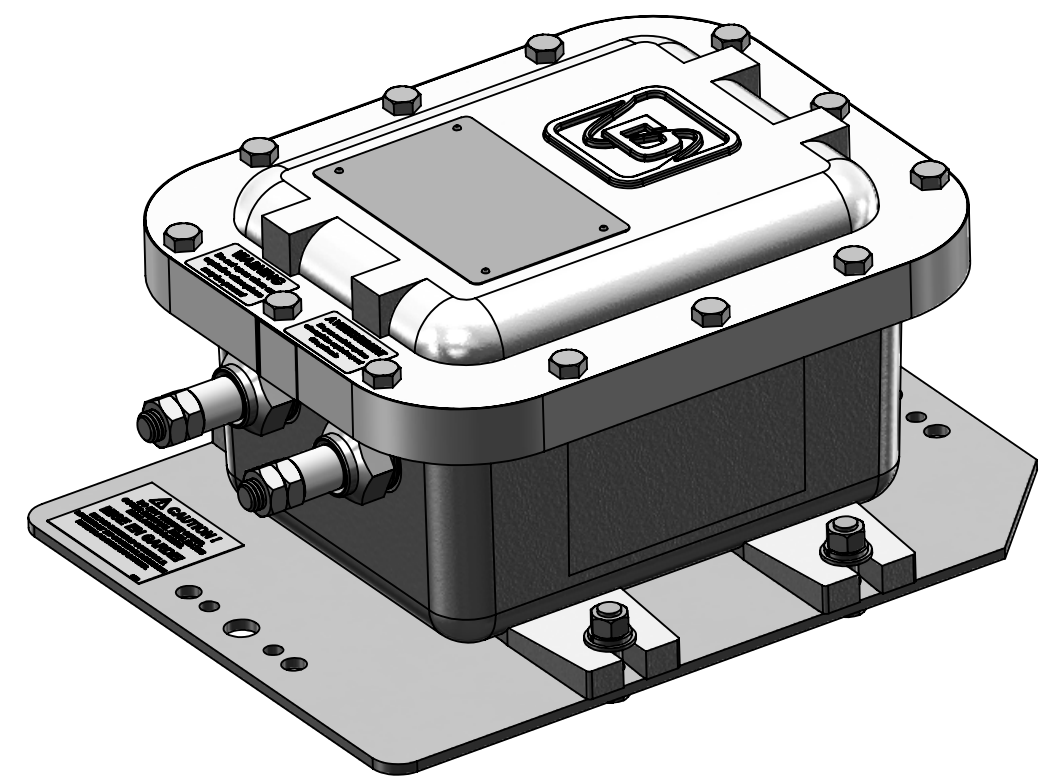
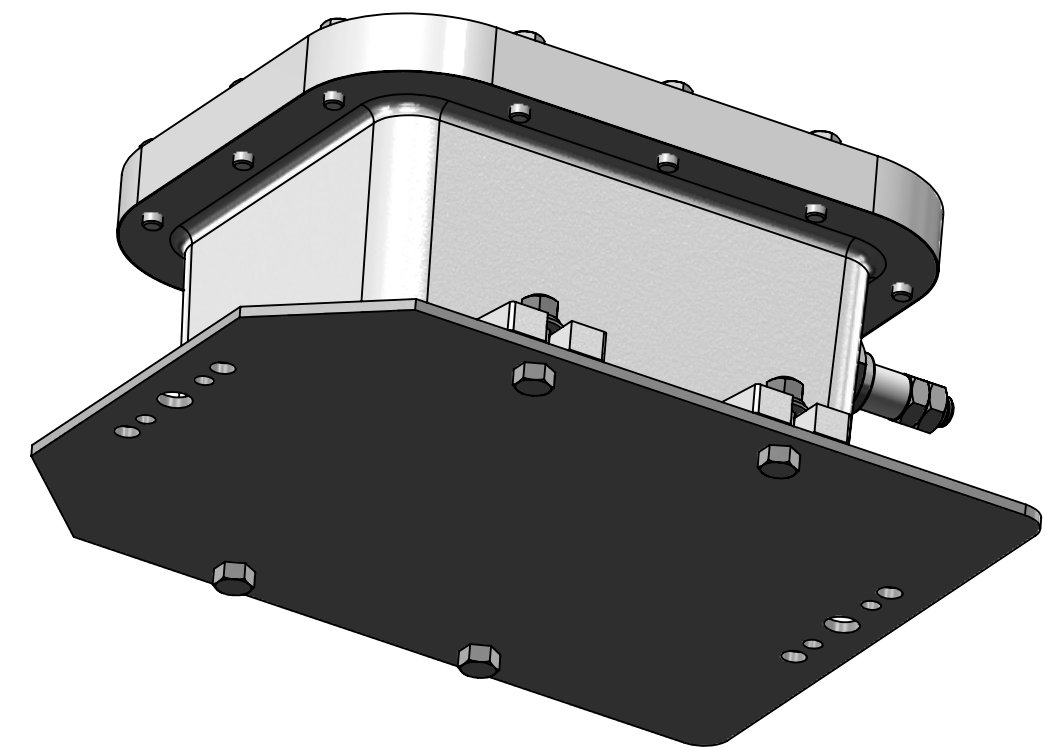
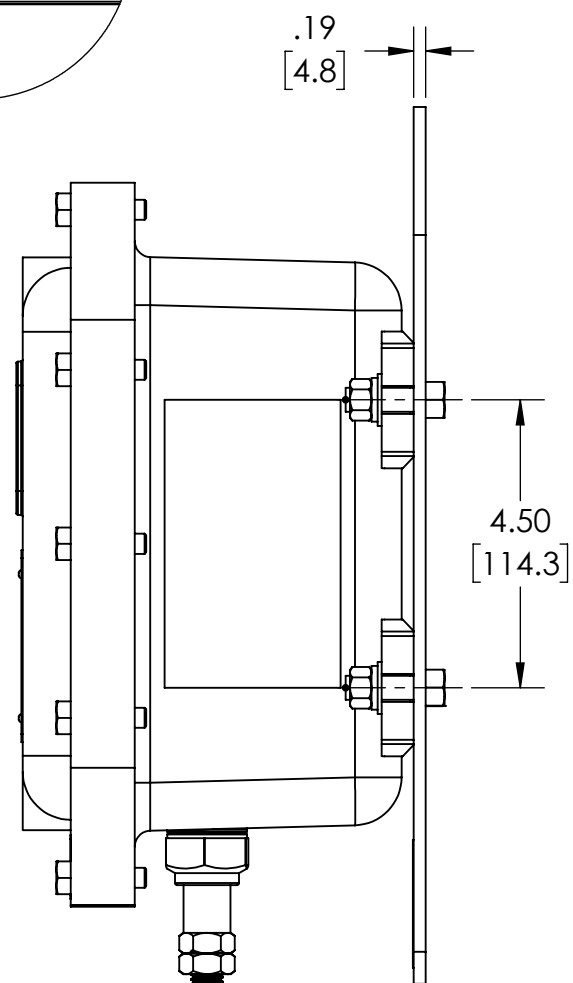
If any measurements do not produce the expected results, contact Dairyland.

[CUSTOMERSERVICE@DAIRYLAND.COM](mailto:CUSTOMERSERVICE@DAIRYLAND.COM)

P.O. Box 187  
Stoughton, WI 53589, USA



**DETAIL A**  
**SCALE 2 : 3**



ASME Y14.5M 2018 APPLIES  UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES. COMPUTER-GENERATED DRAWING DO NOT EDIT MANUALLY.	MATERIAL:	DRAWN: <b>JPW</b> DWG APPROVAL: <b>MAD</b>	DATE DRAWN: <b>2015-08-18</b> DATE APPROVAL: <b>06/24/2022</b>	 <b>DAIRYLAND ELECTRICAL INDUSTRIES, INC.</b> P.O. BOX 187 STOUGHTON, WI 53589 608-877-9900 DAIRYLAND.COM
	FINISH: <b>NA</b>	TITLE: <b>PCRH - 3.5KA THRU 10KA OUTLINE DRAWING</b>		
.XXX = $\pm$ .005" .XX = $\pm$ .01" .X = $\pm$ .03" ANGLES = $\pm$ 1°	THE INFORMATION CONTAINED IN THIS DRAWING IS THE SOLE PROPERTY OF DAIRYLAND ELECTRICAL INDUSTRIES, INC. ANY REPRODUCTION IN PART OR WHOLE, WITHOUT THE WRITTEN PERMISSION OF DAIRYLAND ELECTRICAL INDUSTRIES, INC. IS PROHIBITED.		SHEET: <b>1</b> OF <b>1</b> DWG SIZE: <b>B</b> SCALE: <b>1:3</b>	REV: <b>D</b> PART #: <b>100089</b>

