

# Instruction Manual

Vaisala K-PATENTS® Process Refractometer  
**PR-43-...-IA/AX/CU**



**VAISALA**

PUBLISHED BY

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Visit our Internet pages at [www.vaisala.com](http://www.vaisala.com).

## General safety considerations



The process medium may be hot or otherwise hazardous. Use **shields and protective clothing** adequate for the process medium - do not rely on avoidance of contact with the process medium.



**Precautions when removing a refractometer from the process line :**

- Check first that the process line is depressurized and drained.
- Ensure you stay clear of any possible spillage and you have a clear emergency escape path.

It is the user's responsibility to follow manufacturer's safety and operating instructions. The client's organization has the responsibility to develop and maintain occupational safety and create a safety culture where individuals are expected to follow safety instructions at all times. Any negligence towards safety instructions or failure to comply with safe practices should not be tolerated. It is the manufacturer's responsibility to produce goods that are safe to use when instructions are followed.

## Disposal

When wishing to dispose of an obsolete refractometer or any parts of a refractometer, please observe local and national regulations and requirements for the disposal of electrical and electronic equipment.



## Symbols and terms used in this manual:



This indicates a **warning**. It provides safety precaution information needed to avoid injury while operating the refractometer system.



This indicates that something is **important** for the operation of the refractometer system.

**Note.** Notes contain additional information and hints.

This product manual is delivered to the end user with a Vaisala K-PATENTS<sup>®</sup> product. Information in this manual is subject to change without notice. When the manual is changed, a revised copy is published at <http://www.kpatents.com/>

## Warranty

For standard warranty terms and conditions, see [www.vaisala.com/warranty](http://www.vaisala.com/warranty).

Please observe that any such warranty may not be valid in case of damage due to normal wear and tear, exceptional operating conditions, negligent handling or installation, or unauthorized modifications. Please see the applicable supply contract or Conditions of Sale for details of the warranty for each product.

## Technical support

Contact Vaisala technical support at [helpdesk@vaisala.com](mailto:helpdesk@vaisala.com). Provide at least the following supporting information:

- Product name, model, and serial number
- Name and location of the installation site
- Name and contact information of a technical person who can provide further information of the problem

For more information, see [www.vaisala.com/support](http://www.vaisala.com/support).



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# PR-43-...-IA/AX/CU instruction manual

# 1 Introduction

Hazardous locations are places where a possibility of fire or explosion exists because of flammable gases, vapors or fine dust.

**Zone 0:** An area in which an explosive gas-air mixture is continuously present or present for long periods of time.

**Zone 1:** An area in which an explosive gas-air mixture is likely to occur in normal operation.

The Vaisala K-PATENTS® Intrinsically Safe Process Refractometer PR-43-...-IA can be installed in hazardous locations in Zone 0 and Zone 1 areas. The PR-43-...-IA refractometers have been certified by Eurofins Expert Services Oy under the European Union ATEX directive 2014/34/EU for ATEX Ex II 1G/Ex ia IIC T4 Ga, Ex I M1/Ex ia I Ma (refractometer) and Ex II 3(1)G/Ex nA [ia Ga] IIC T4 Gc (isolator) and under IECEx scheme for Ex ia IIC T4 Ga and Ex ia I Ma (refractometer) and Ex nA [ia Ga] IIC T4 Gc (isolator). The EU-Type examination Certificate number is EESF 19 ATEX 056X and the IECEx Certificate number is IECEx EESF 19.0024X. These certifications cover the following Ex standards: EN 60079-0:2012/IEC 60079-0:2011, EN 60079-11:2012/IEC 60079-11:2011, EN 60079-15:2010/IEC 60079-15:2010 and EN 60079-25:2010/IEC 60079-25:2010-02.

**Zone 2:** An area in which an explosive gas-air mixture is not likely to exist under normal conditions, but may be present under abnormal conditions.

The PR-43-...-AX/CU refractometers can be installed in Zone 2 or unclassified zone.

The PR-43-...-AX refractometers have been certified by Eurofins Expert Services Oy under the European Union ATEX directive 2014/34/EU for ATEX Ex II 3G / Ex nA IIC T4 Gc and under the IECEx scheme for Ex nA IIC T4 Gc. The EU-Type examination Certificate number is EESF 19 ATEX 058X and the IECEx Certificate number is IECEx EESF 19.0026X. These certifications cover the following Ex standards: EN 60079-0:2012 / IEC 60079-0:2011, EN 60079-15:2010 / IEC 60079-15:2010.

The PR-43-...-CU refractometers are certified by Canadian Standards Association (CSA) for Class I, Division 2/Zone 2 environments for use in Canada and USA, the certificate number is CSA 17.70081253. Equipment ratings:

1. Nonincendive for use in Class I, Div 2, Groups A, B, C, D, Hazardous Locations, Temperature rating T4,  $T_{amb} = -40...+65^{\circ}\text{C}$
2. Ex nA IIC T4 Gc (Zone 2), AEx nA IIC T4 Gc (Zone 2), Non-sparking

This certification covers the following Ex standards:

CAN/CSA 60079-0:15 (IEC 60079-0:2011)	Explosive atmospheres - Part 0; General Requirements
CAN/CSA 60079-15:16(IEC 60079-15:2010)	Explosive atmospheres - Part 15; Equipment protection by type of protection "n"
UL 60079-0:13 (IEC 60079-0:2011)	Explosive atmospheres - Part 0; General Requirements
UL 60079-15:13 ((IEC 60079-15:2010)	Explosive atmospheres - Part 15; Equipment protection by type of protection "n"

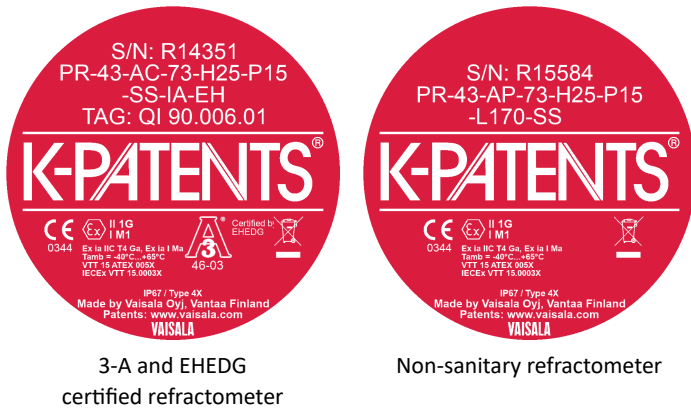
**Note:** Servicing of the PR-43-...-IA and PR-43-...-AX/CU refractometers is only allowed for trained service personnel of Vaisala and its representatives. Servicing must be done according to separate instructions defined by Vaisala and must be reported to Vaisala.



## 2 Equipment

### 2.1 PR-43-...-IA intrinsically safe refractometer

The system consists of a modified refractometer PR-43, a refractometer connection cable PR-8436-... and an isolator PR-10930. The ATEX/IECEx certified refractometers and isolators are identified by the nameplate, see Figures 2.1 and 2.2.



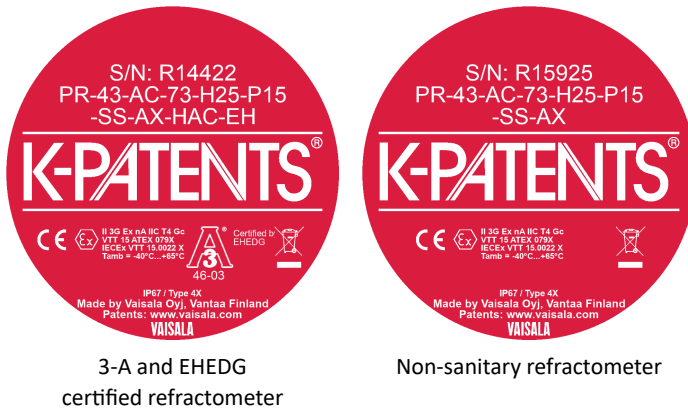
**Figure 2.1** Refractometer PR-43-...-IA nameplates



**Figure 2.2** Isolator nameplate

## 2.2 PR-43-...-AX/CU refractometers for potentially explosive atmosphere

The Vaisala K-PATENTS® refractometer system for potentially explosive atmosphere locations consists of a modified refractometer PR-43 and a connecting cable. The ATEX/IECEx and CSA certified refractometers are identified by the refractometer nameplate, see Figure 2.3 and Figure 2.4 below.



**Figure 2.3** Refractometer PR-43-...-AX nameplates



**Figure 2.4** Nameplate for a PR-43-...-CU refractometer

## 3 Mounting

### 3.1 Mounting PR-43-...-IA system

Choose the mounting location of the refractometer and the isolator so that they are protected from sudden impact and friction. If any of the system parts is affected by a sudden impact, power it off immediately and have it checked by trained Vaisala service personnel before it is used again.



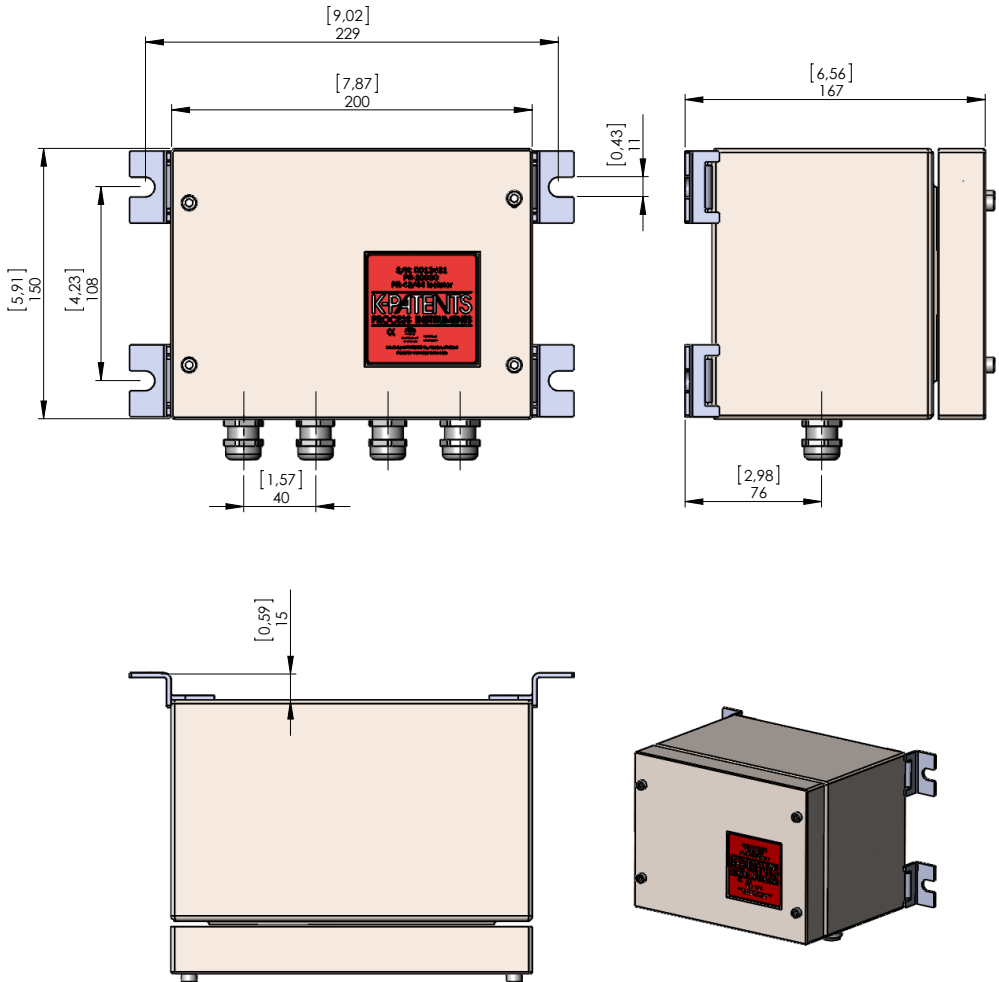
**Warning!** Choose the mounting location of the refractometer so that it's not subjected to any mechanism that would cause electrostatic charge on the marking label of the sensor.



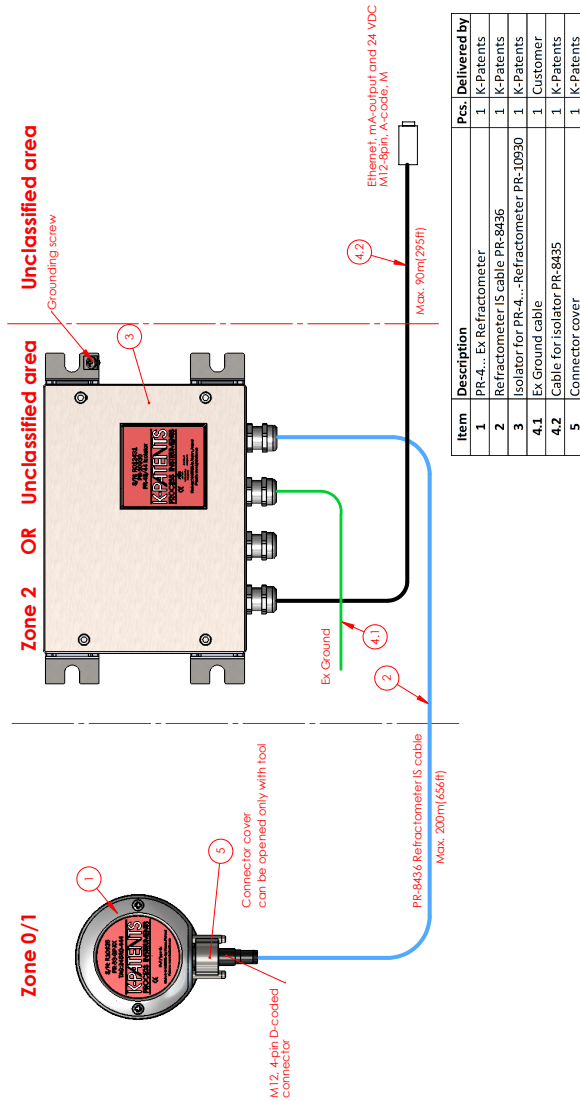
**Important:** Cleaning of the refractometer sensor shall be done only with a damp cloth to avoid electrostatic charging.

#### 3.1.1 Mounting isolator PR-10930

The isolator PR-10930 can be mounted either in safe area or in Zone 2 area.

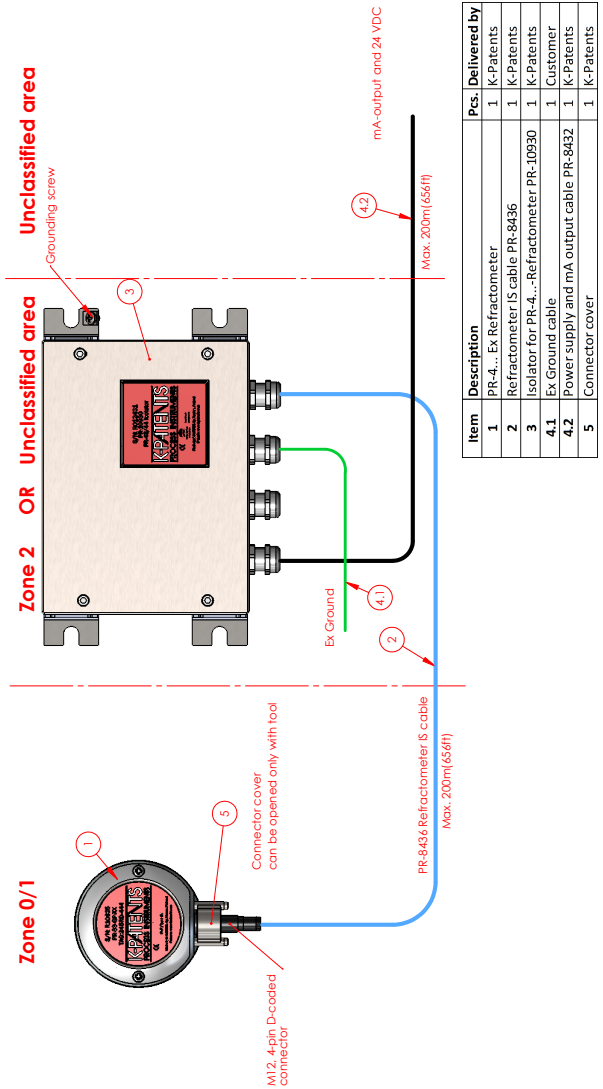


**Figure 3.1** Isolator dimensions (drawing 3785)



**Figure 3.2** Mounting PR-43...-IA with isolator and PR-8435 cable for Ethernet, mA output and power

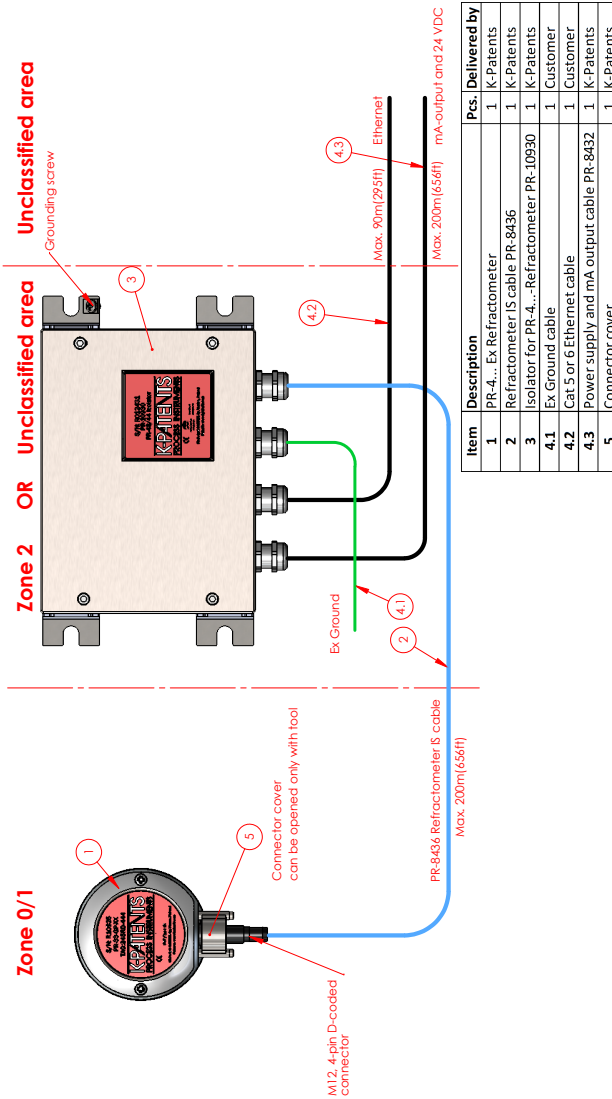




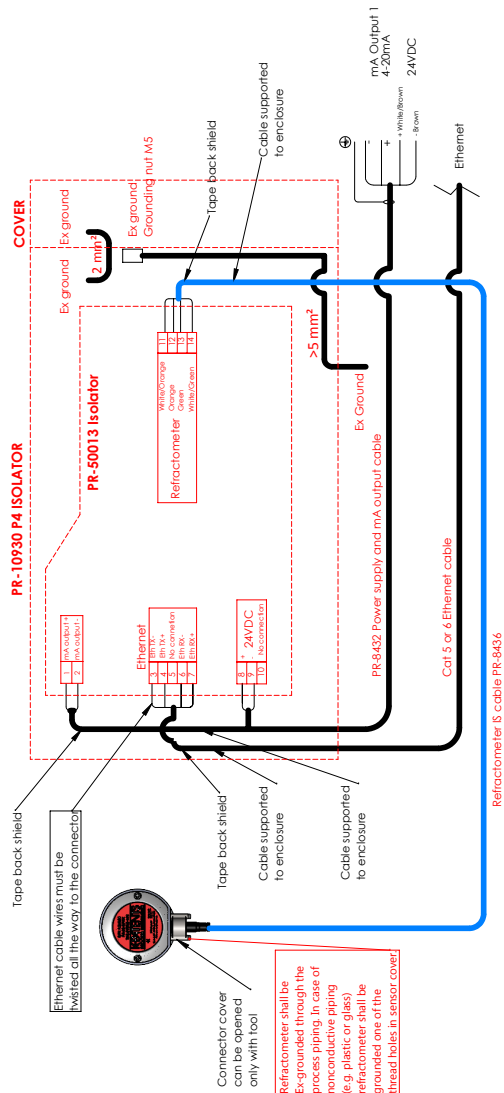
**Figure 3.4** Mounting PR-43...-IA with isolator and PR-8432 cable for mA output and power



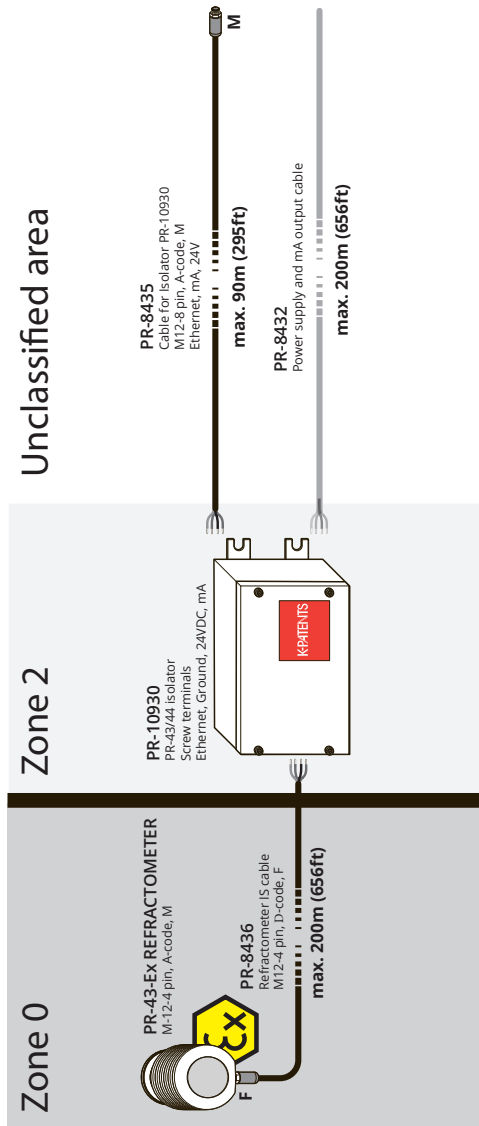




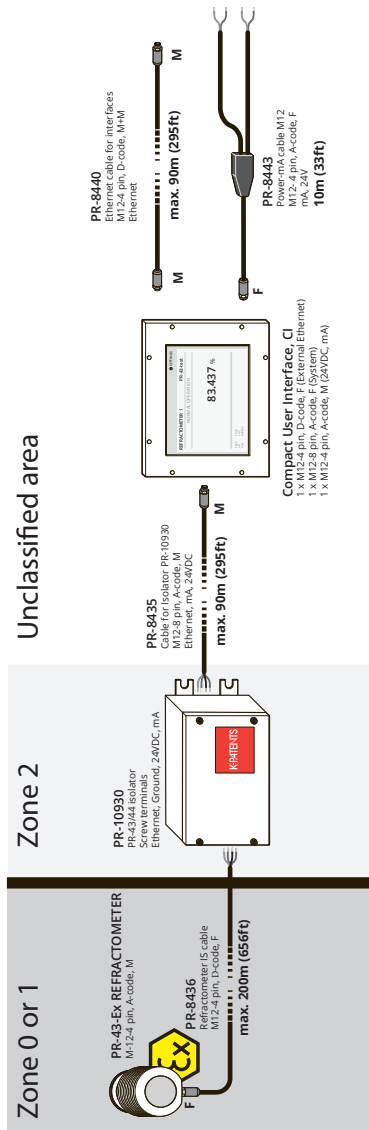
**Figure 3.6** Mounting PR-43...-IA with isolator, PR-8432 cable for mA and power, and a separate Ethernet cable



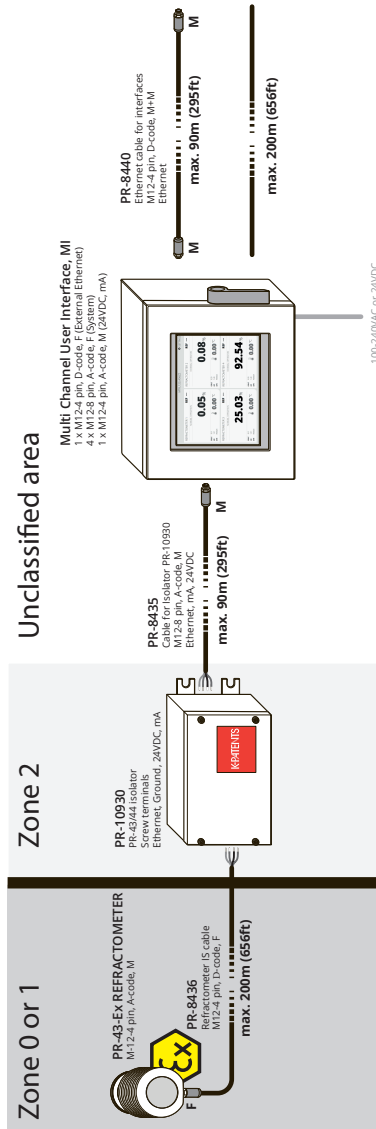
**Figure 3.7** Wiring PR-43-...-IA with isolator, PR-8432 cable for mA and power, and a separate Ethernet cable



**Figure 3.8** Refractometer cabling



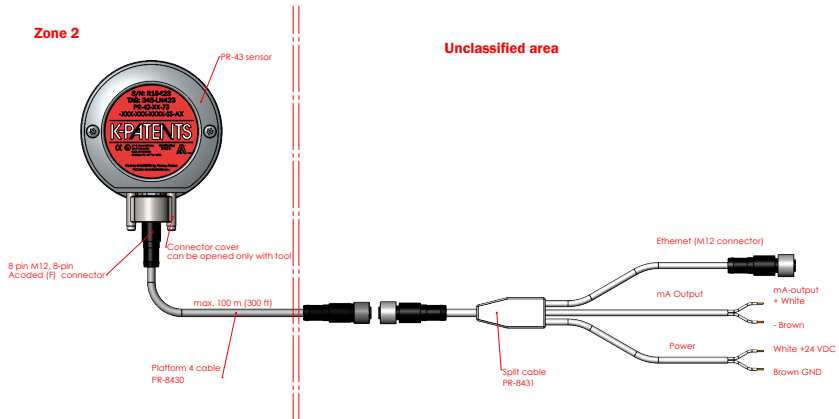
**Figure 3.9** Refractometer cabling when using Compact user interface CI



**Figure 3.10** Refractometer cabling when using Multichannel user interface MI

## 3.2 Mounting PR-43-...-AX system

The refractometer can be installed in a hazardous area up to Zone 2. Use either platform cable PR-8430 or split cable PR-8431 as needed to connect the refractometer e.g. to a DCS.



**Figure 3.11** Installing a stand-alone PR-43-...-AX refractometer

The refractometer can also be connected to a Compact user interface CI (Figure 3.13) or to a Multichannel user interface MI (Figure 3.14). The CI/MI is installed in the safe area and connected to the refractometer with platform cable PR-8430.

**Note:** An external mains switch must be installed for the MI.

Refractometer wiring must follow Figure 3.12 (stand-alone refractometer) or Figure 3.13 (refractometer with CI) or Figure 3.14 (refractometer with MI).

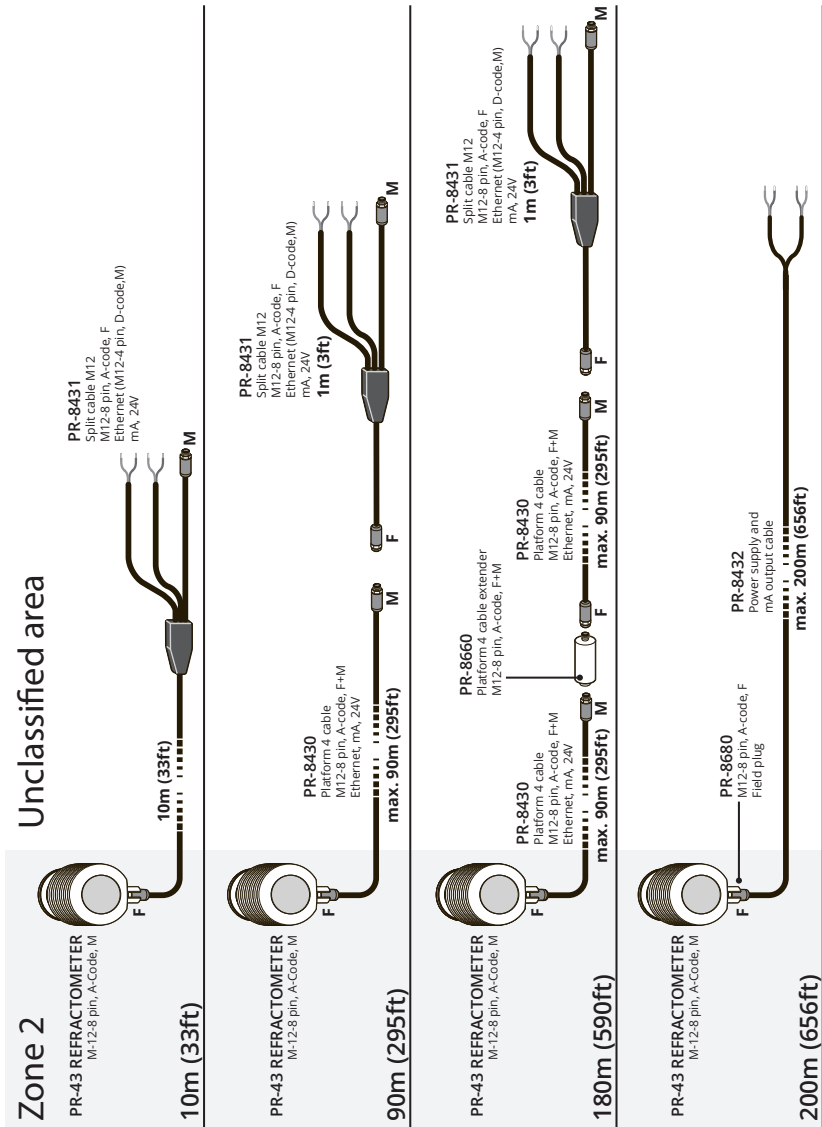
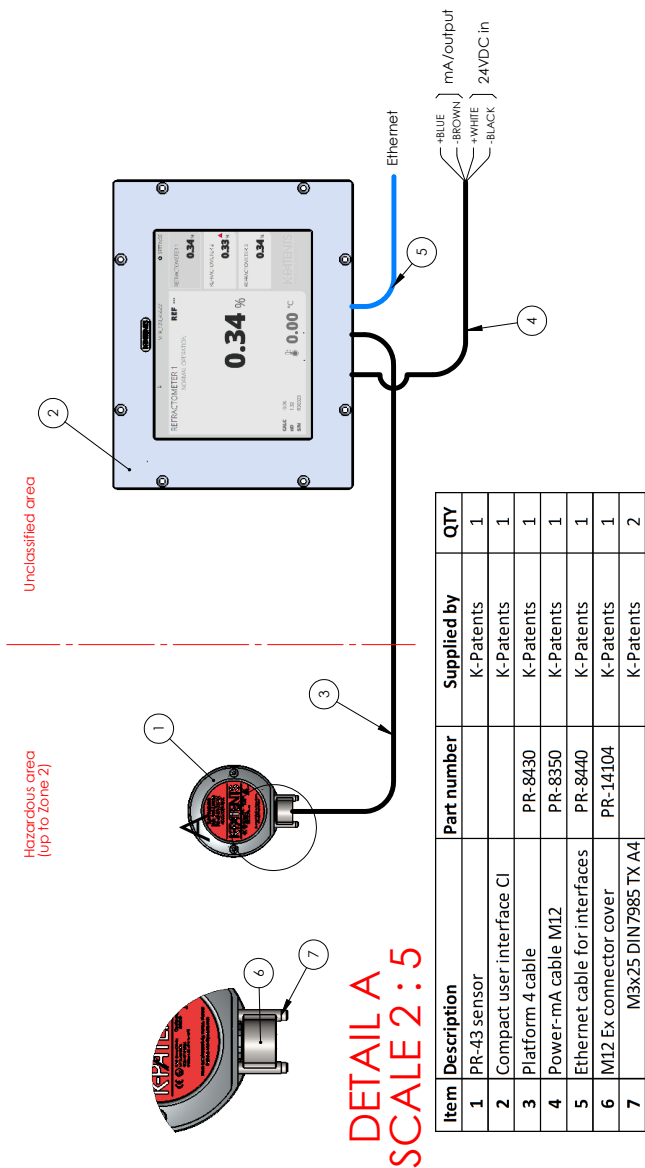
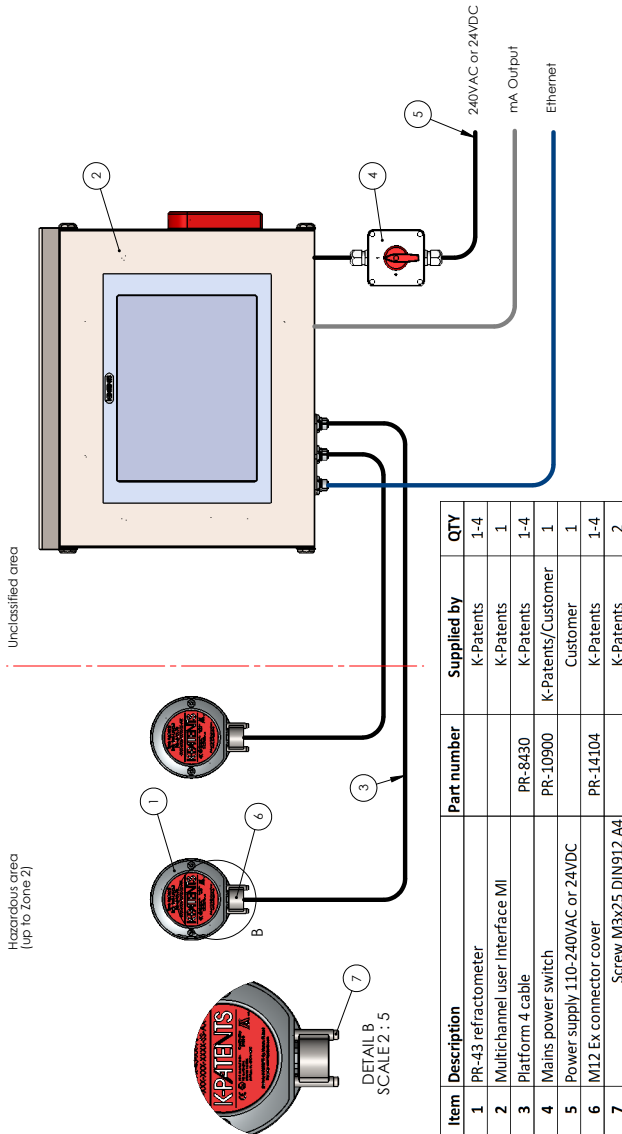


Figure 3.12 Connection options for a stand-alone refractometer



**Figure 3.13** Installing a PR-43-...-AX system with a CI





**Figure 3.14** Installing a PR-43-...-AX system with a MI



**Important:** Tampering and replacement with other than Vaisala K-PATENTS® original components is not allowed because this may affect adversely the safe use of the system.



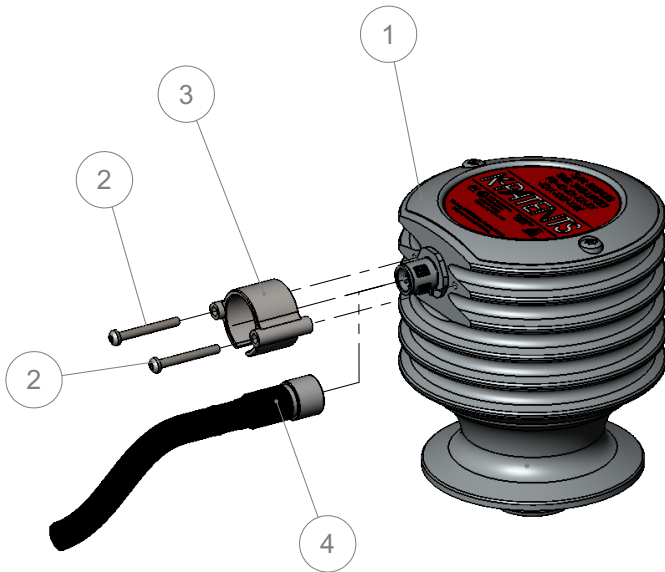
**Warning!** Refractometer connector shall not be connected or disconnected when the circuits are energized. Make sure that the connector cover is fastened before turning power on.

### 3.3 Connector cover for PR-43-...-IA and PR-43-...-AX

Models PR-43-...-IA and PR-43-...-AX require a connector cover over the refractometer connection. The cover must be mounted before the system is powered.

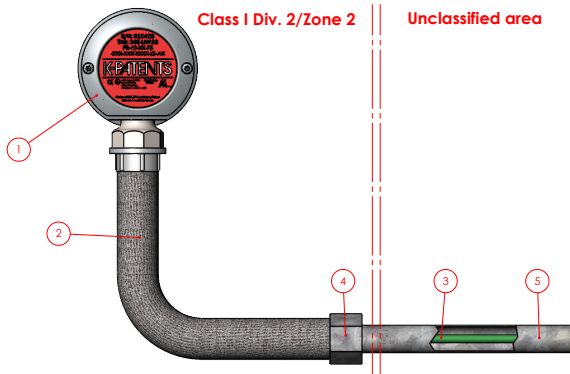
### 3.4 Mounting PR-43-...-CU system

The refractometer can be installed in a hazardous area up to Zone 2. In North America for a Div. 2/Zone 2 installation all the electrical cables will be installed inside metal conduits as per CEC and NEC requirements.



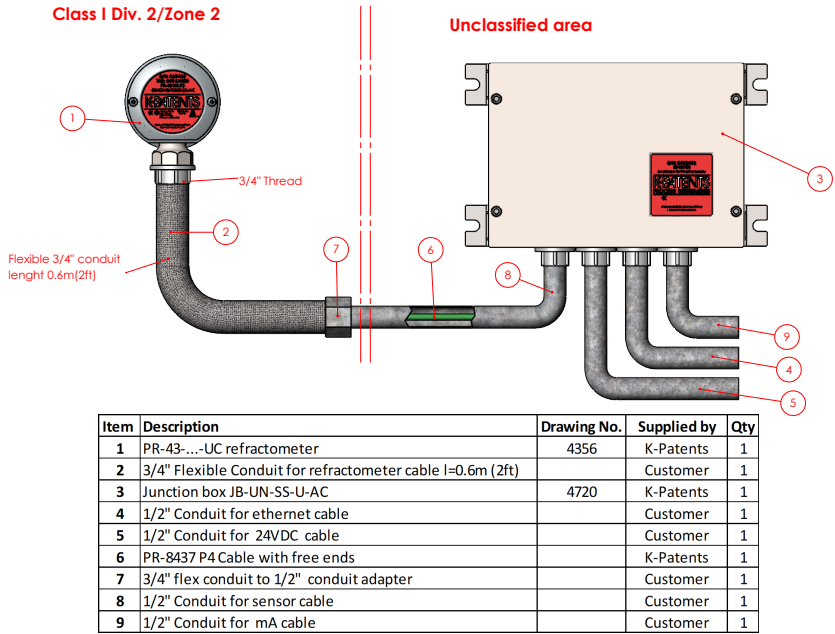
Item	Description	Qty.	Spare part nr.
1	PR-43-AC/AP/PC refractometer	1	
<b>Ex Connector cover with screws</b>			<b>PR-14104</b>
2	M3x25 DIN 7985 TX	2	
3	M12 Ex connector cover	1	
4	M12 8 pin (F) connector	1	

**Figure 3.15** Mounting the connector cover



Item	Description	Drawing No.	Supplied by	Qty
1	PR-43-...-UC refractometer	4356	K-Patents	1
2	3/4" Flexible conduit for refractometer cable		Customer	1
3	PR-8437 Platform 4 cable with free ends		K-Patents	1
4	3/4" flexible Conduit to 1/2" adapter		Customer	1
5	1/2" conduit for refractometer cable		Customer	1

**Figure 3.16** Cabling in a conduit tube



**Figure 3.17** Cabling in conduits with a junction box

**Note for Canada and USA (stand-alone refractometer):** The 24 V DC supply for the refractometer has to be supplied by a Class 2 circuit or Limited Energy Source in accordance with CSA 61010-1-12.

**Note for USA:** The CU unit installation must comply with the relevant requirements of National Electrical Code (ANSI/NFPA 70) for Division 2 Hazardous (Classified) Locations and all instructions in this manual. **All wiring of PR-43-...-CU must run in a conduit.**

**Warnings for Canada:**



**WARNING!** - EXPLOSION HAZARD - DO NOT DISCONNECT WHILE THE CIRCUIT IS LIVE OR UNLESS THE AREA IS FREE OF IGNITIBLE CONCENTRATIONS.



**AVERTISSEMENT!** - RISQUE D'EXPLOSION. NE PAS DÉBRANCHER SI LE CIRCUIT EST TOUS TENSION, À MOINS QUE LE MILIEU SOIT LIBRE DE SUBSTANCES INFLAMMABLES CONCENTRÉES.



**WARNING!** - EXPLOSION HAZARD - Substitution of components may impair suitability for Class I, Division 2.



**AVERTISSEMENT!** - RISQUE D'EXPLOSION - La substitution de composants peut rendre ce matériel inacceptable pour les emplacements de Classe I, Division 2.

## 4 Regulatory compliance

### 4.1 EU declaration of conformity for PR-43-...-IA (ATEX)



2019-09-01M/JAMO

1 (1)

#### EU DECLARATION OF CONFORMITY

Manufacturer: Vaisala Oyj  
Mail address: P.O. Box 26, FI-00421 Helsinki, Finland  
Street Address: Vanha Nurmijärventie 21, Vantaa, Finland

This declaration of conformity is issued under the sole responsibility of the manufacturer.

Object of the declaration:

**K-Patents Process Refractometer PR-43-...-IA combined with PR-10930 Isolator**

The object of the declaration described above is in conformity with Directives:

RoHS Directive (2011/65/EU)  
EMC Directive (2014/30/EU)  
ATEX Directive (2014/34/EU)

The conformity is declared using the following standards:

**EN 50581:2012** Technical documentation for the assessment of electrical and electronic products with respect to the restriction of hazardous substances

**EN 60079-0:2012** Explosive atmospheres – Part 0: Equipment – General requirements

**EN 60079-11:2012** Explosive atmospheres – Part 11: Equipment protection by intrinsic safety 'i'

**EN 60079-15:2010** Explosive atmospheres – Part 15: Equipment protection by type of protection "n"

**EN 60079-25:2010** Explosive atmospheres – Part 25: Intrinsically safe electrical systems

**EN 61010-1:2010** Safety requirements for electrical equipment for measurement, control and laboratory use – Part 1: General requirements

**EN 61326-1:2013** Electrical equipment for measurement, control and laboratory use – EMC requirements – intended for use in industrial locations

Notified body Eurofins Expert Services Oy (number 0537) has issued EU-type examination certificate EESF 19 ATEX 056X for this product.

Signed for and on behalf of Vaisala Oyj, in Vantaa, on 1<sup>st</sup> September 2019

Jari-Pekka Mörsky  
Quality Manager, Standards and Approvals





## 4.2 EU declaration of conformity for PR-43-...-AX (ATEX)



2019-09-01/LJAMO

1 (1)

### EU DECLARATION OF CONFORMITY

Manufacturer: Vaisala Oyj  
Mail address: P.O. Box 26, FI-00421 Helsinki, Finland  
Street Address: Vanha Nurmiyarventie 21, Vantaa, Finland

This declaration of conformity is issued under the sole responsibility of the manufacturer.

Object of the declaration:

#### **K-Patents Process Refractometer PR-43-...-AX**

The object of the declaration described above is in conformity with Directives:

RoHS Directive (2011/65/EU)  
EMC Directive (2014/30/EU)  
ATEX Directive (2014/34/EU)

The conformity is declared using the following standards:

**EN 50581:2012** Technical documentation for the assessment of electrical and electronic products with respect to the restriction of hazardous substances

**EN 60079-0:2012 + A11:2013** Explosive atmospheres - Part 0: Equipment - General requirements

**EN 60079-15:2010** Explosive atmospheres - Part 15: Equipment protection by type of protection "n"

**EN 61010-1:2010** Safety requirements for electrical equipment for measurement, control and laboratory use – Part 1: General requirements

**EN 61326-1:2013** Electrical equipment for measurement, control and laboratory use – EMC requirements – intended for use in industrial locations

Notified body Eurofins Expert Services Oy (number 0537) has issued EU-type examination certificate EESF 19 ATEX 058X for this product.

Signed for and on behalf of Vaisala Oyj, in Vantaa, on 1<sup>st</sup> September 2019

Jari-Pekka Mörsky  
Quality Manager, Standards and Approvals





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