

# Safety Instructions

## Raman Rxn4







# Raman Rxn4

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## Warnings

Structure of Information	Meaning
<p> <b>WARNING</b></p> <p>Causes (/consequences)                      Consequences of noncompliance (if applicable)                      ▶ Corrective action</p>	<p>This symbol alerts you to a dangerous situation. Failure to avoid the dangerous situation can result in a fatal or serious injury.</p>
<p> <b>CAUTION</b></p> <p>Causes (/consequences)                      Consequences of noncompliance (if applicable)                      ▶ Corrective action</p>	<p>This symbol alerts you to a dangerous situation. Failure to avoid this situation can result in minor or more serious injuries.</p>
<p><b>NOTICE</b></p> <p>Cause/situation                      Consequences of noncompliance (if applicable)                      ▶ Action/note</p>	<p>This symbol alerts you to situations which may result in damage to property.</p>

## Symbols

Symbol	Description
	The Laser Radiation symbol is used to alert the user to the danger of exposure to hazardous visible laser radiation when using the Raman Rxn4 system.
	The High Voltage symbol that alerts people to the presence of electric potential large enough to cause injury or damage. In certain industries, high voltage refers to voltage above a certain threshold. Equipment and conductors that carry high voltage warrant special safety requirements and procedures.
	The WEEE symbol indicates that the product should not be discarded as unsorted waste but must be sent to separate collection facilities for recovery and recycling.
	The CE Marking indicates conformity with health, safety, and environmental protection standards for products sold within the European economic area (EEA).
	The RCM marking indicates regulatory compliance with EESS and ACMA's labelling requirements for products sold within the Australian communications media authority (ACMA)
	The FCC mark indicates that the electromagnetic radiation from the device is below the limits specified by the Federal Communications Commission and the manufacturer has followed the requirements of the Supplier's Declaration of Conformity authorization procedures.

## U.S. export compliance

The policy of Endress+Hauser is strict compliance with U.S. export control laws as detailed in the website of the [Bureau of Industry and Security](#) at the U.S. Department of Commerce. The export classification for the Rxn4 is EAR99.

# 1 Warning labels

The warning labels attached to the Raman Rxn4 are shown.

<p style="text-align: center;">WARNING</p> <p>CONTROLLER ASSEMBLY CONTAINS A BATTERY MFR/TYPE: SAFT/LS 14500 CELL TYPE: 3.6V AA-SIZED Li-SOCI2 REPLACEMENT BATTERIES MUST BE IDENTICAL. FAILURE TO OBSERVE THIS WARNING WILL INVALIDATE THE GOVERNING CERTIFICATES.</p>	<p style="text-align: center;">CAUTION</p> <p style="text-align: center;">ELECTRIC SHOCK HAZARD</p> <p style="text-align: center;">THIS EQUIPMENT TO BE SERVICED BY TRAINED PERSONNEL ONLY</p>	<p style="text-align: center;">VISIBLE AND/OR INVISIBLE LASER RADIATION AVOID EXPOSURE TO BEAM CLASS 3B LASER PRODUCT</p> <p style="text-align: center;">THIS PRODUCT COMPLIES WITH 21 CFR SUBCHAPTER J AND IEC 60825-1:2014 ED 3</p>
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## 2 Basic safety instructions

### 2.1 Requirements for personnel

- Installation, commissioning, operation, and maintenance of the measuring system may be carried out only by specially trained technical personnel.
- Technical personnel must be authorized by the plant operator to carry out the specified activities.
- Technical personnel must have read and understood these Safety Instructions and must follow the instructions contained herein.
- Faults at the measuring point may only be rectified by properly authorized and trained personnel. Repairs not described in this document must be carried out only directly at the manufacturer's site or by the service organization.

### 2.2 Intended use

The Raman Rxn4 analyzer is recommended for use in the following applications:

- **Chemical:** Reaction monitoring, blending, feed, and final product monitoring
- **Polymer:** Polymerization reaction monitoring, polymer blending
- **Pharmaceutical:** Active pharmaceutical ingredient (API) reaction monitoring, crystallization, polymorph, drug substance production unit operation
- **Oil and Gas:** Any hydrocarbon analysis

Use of the device for any purpose other than that described poses a threat to the safety of people and of the entire measuring system and invalidates any warranty.

### 2.3 Electrical safety

As the user, you are responsible for complying with the following safety conditions:

- Installation guidelines
- Local standards and regulations for electromagnetic compatibility

The product has been tested for electromagnetic compatibility in accordance with the applicable international standards for industrial applications.

The electromagnetic compatibility indicated on equipment or in documentation applies only to a product that has been properly connected.

### 2.4 Operational safety

Before commissioning the entire measuring point:

1. Verify that all connections are correct.
2. Ensure that electrical cables and optical fiber connections are not damaged.
3. Do not operate damaged products. Protect them against unintentional operation.
4. Label damaged products as defective.

During operation:

1. If faults cannot be rectified, products must be taken out of service and protected against unintentional operation.
2. Keep the door closed and properly sealed on the optional enclosure when not carrying out service and maintenance work.

#### CAUTION

**Activities while the analyzer is in operation introduce risk of exposure to hazardous materials.**

- ▶ Follow standard procedures for limiting exposure to hazardous chemical or biological materials.
- ▶ Follow workplace policies on personal protective equipment including wearing protective clothing, goggles, and gloves and limiting physical access to analyzer location.
- ▶ Clean any spills following the appropriate site policies and cleaning procedures.

#### CAUTION

**There is risk of injury from the analyzer door stop mechanism.**

- ▶ If the optional analyzer enclosure needs to be open, always open the enclosure door fully to ensure the doorstop engages properly.

## 2.5 Lifting provisions for non-cart-mounted Raman Rxn4

The Raman Rxn4 is not provided with integrated handles intended to support the entire weight of the base unit. The front-mounted rack handles are only meant for use in sliding the base unit in and out of the rack in which it is installed. The rear mounted fiber strain relief brackets are NOT intended for use as lifting handles.


### ⚠ CAUTION

- ▶ Two people are required to lift and move the Raman Rxn4 instrument. One person must be on each side of the analyzer, lifting from only the bottom edge of the base unit.

### ⚠ CAUTION

- ▶ Disconnect fiber cables from the Raman Rxn4 whenever moving the base unit.

## 2.6 Product safety

The product is designed to meet local safety requirements for the intended application, and has been tested accordingly, leaving the factory in a condition in which it is safe to operate. All applicable regulations and international standards have been observed. Devices connected to the analyzer must also comply with the applicable safety standards, and users should follow the probe-specific product safety instructions. See *Laser safety* →  for additional details.

## 2.7 Important safeguards

- Do not use the Raman Rxn4 for anything other than its intended use.
- Do not drape the power cord over counters, on hot surfaces, or in areas where damage to the integrity of the power cord may occur.
- Do not open the Raman Rxn4 unless you have been specifically trained on service and maintenance of the unit.
- Do not look directly into the laser beam.
- Do not allow emitted laser light to reflect off mirrored or shiny surfaces in an uncontrolled way.
- Minimize the presence of shiny surfaces in the working area and always use a laser beam block to prevent uncontrolled transmission of the laser light.
- Do not leave unused probes uncapped or unblocked while they are still attached to the analyzer.

## 2.8 Health and safety considerations

It is the user's responsibility to understand and comply with all applicable safety regulations, which will vary depending on the installation location of the analyzer. Endress+Hauser takes no responsibility for determining a complete list of safe operating practices at any given installation site and leaves that responsibility to the local user or owner of the equipment.

However, the following actions and laser safety precautions must always be observed while using the Raman Rxn4:

- The Raman Rxn4 is a [Center for Devices and Radiological Health \(CDRH\)](#) Class 3B device. The user should wear appropriate eye protection in areas where exposure to the laser light is possible. The Raman Rxn4 is also classified as a Class 3B device under IEC 60825-1.
- The Raman Rxn4 should only be used in a location with a suitable and stable power supply.
- If an interlock is required to meet local safety regulations, all doors and entryways to the room or area housing the Rxn4 analyzer must be fitted with clearly visible Class 3B laser area warning signs.

## 2.9 Safety and handling notice

Raman Rxn4 analyzers incorporate a 532 nm, 785 nm, or 993 nm laser excitation source. Take the following precautions when handling the analyzer and probes when the laser is **ON**:

- Before making fiber connections and probe inspections, use the key on the front of the Raman Rxn4 to turn **OFF** the laser power.
- Follow the laser safety instructions for the probe in use.
- Do not look directly into the fiber probe output (when the optic is disconnected) or the output (window) of any probes.

## 2.10 Laser safety

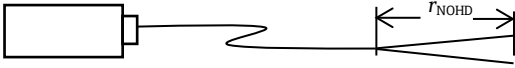
Laser light presents special safety hazards not associated with other light sources. All laser users, and others present, need to be aware of the special properties and dangers involved in laser radiation. Familiarity with the Raman Rxn4 and the properties of intense laser radiation will aid in the safe operation of the Raman Rxn4. The Raman Rxn4 may contain a 532 nm, 785 nm, or 993 nm laser. Refer to your system specification information to determine which laser you have. The combination of intense monochromatic light concentrated in a small area means that, under certain conditions, exposure to laser light is potentially hazardous. In workplace environments, a laser safety program provides environmental, training, and safety controls which may reduce the risk of laser-related injuries or workplace damage. For more assistance with taking appropriate precautions and setting the proper controls when dealing with lasers and their hazards, refer to the most current version of [ANSI Z136.1 for Safe Use of Lasers](#) or [IEC 60825-14 for Safety of](#)



**laser products.** The Raman Rxn4 analyzer has hardware safety controls to reduce the risk of laser-based injuries, including an interlock and a spring-loaded protective cap covering the laser output of the fiber-optic cables.

The beam is routed from the rear panel of the instrument via a fiber-optic patch-cord. In the unlikely event that the fiber-optic probe cable is removed, the interlock is overridden, and the spring-loaded protective cap is overridden, there will be a laser beam exiting the analyzer unit. This beam has a beam diameter of 103  $\mu\text{m}$  and a numerical aperture (NA) of 0.29.

The table below provides the fiber core size and mode and the nominal ocular hazard distance equation for the case of laser exiting directly from the analyzer unit.

Base Unit Used	Fiber Core Size and Mode	Nominal ocular hazard distance (NOHD) Equation
		
Raman Rxn4	103 $\mu\text{m}$ multi-mode (NA =0.29)	$r_{\text{NOHD}} = 1.7/\text{NA} (\Phi/\pi\text{MPE})^{1/2}$ multimode equation
MPE at 532 nm continuous viewing: $1 \times 10^{-3} \text{ W}\cdot\text{cm}^{-2}$ MPE at 785 nm continuous viewing: $1.479 \times 10^{-3} \text{ W}\cdot\text{cm}^{-2}$ MPE at 993 nm continuous viewing: $3.854 \times 10^{-3} \text{ W}\cdot\text{cm}^{-2}$		
$\Phi$ = Maximum Power in Watts (W)		

Another nominal hazard zone calculation needs to be performed to account for the scenario when the analyzer is equipped with a probe. Depending upon the probe utilized, the beam diameter, numerical aperture of the fiber-optical cable to the probe head and focusing characteristics of the probe head, the nominal hazard zone calculation will change depending upon if the potential exposure point is at the tip of the probe or at a broken optical fiber. Refer to the specifications section in the pertinent Endress+Hauser Raman probe operating instructions for the appropriate information to complete the nominal hazard zone calculations pertaining to other exposure points.

#### **CAUTION**

- ▶ Laser beams can cause ignition of certain substances such as volatile chemicals. The two possible mechanisms for ignition are direct heating of the sample to a point causing ignition and the heating of a contaminant (such as dust) to a critical point leading to ignition of the sample.

#### **WARNING**

- ▶ The Raman Rxn4 uses a Class 3B laser as defined in [ANSI Z136.1](#). Direct eye contact with the output beam from the laser will cause severe damage and possible blindness.
- ▶ Use of controls or adjustments or performance of procedures other than those specified in this manual may result in hazardous radiation exposure.

For more assistance on appropriate precautions and setting the proper controls when dealing with lasers and their hazards, refer to the most current version of ANSI Z136.1 for Safe Use of Lasers.

### 2.10.1 Optical safety

The Raman Rxn4 is outfitted with a Class 3B laser. Lasers at 785 nm and 993 nm present further safety concerns because the radiation is nearly invisible. Always be aware of the initial direction and possible scattering paths of the laser. The use of OD3 or greater safety glasses is highly recommended for 532 nm and 785 nm excitation wavelengths and OD4 or greater for a 993 nm excitation wavelength.

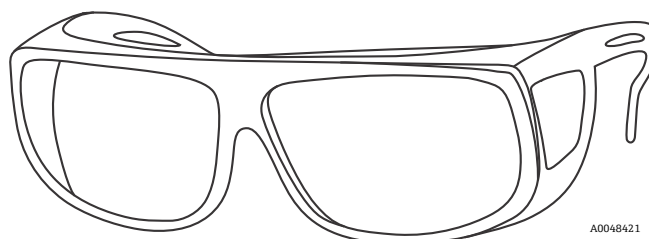


Figure 1. Laser safety glasses

### 2.10.2 Electrical safety

The Raman Rxn4 utilizes AC and DC voltages inside the enclosure. Do not disassemble the laser enclosure as there are no serviceable parts inside the laser assembly. Only qualified personnel familiar with high voltage electronics should open the system enclosure to perform necessary maintenance or service.

### 2.10.3 CDRH compliance

The Raman Rxn4 is designed and built to meet the laser performance requirements of [U.S. 21 CFR, Chapter I, Subchapter \(J\)](#) and is registered with the CDRH.

The product report for the Raman Rxn4 can be found under accession number 1110128.

#### 2.10.3.1 Protective housing

The Raman Rxn4 is enclosed in a protective housing to prevent human access in excess of the limits of Class I radiation as specified in U.S. 21 CFR Section 1040.10 (f) (1) except for the output, which is Class 3B.

#### 2.10.3.2 Remote interlock connector

The Raman Rxn4 is supplied with a remote interlock connector for each channel. This connector allows the operator to utilize an external interlock circuit in conjunction with Raman Rxn4 operations. Design and function of an external interlock circuit should meet the capability and intent of the most current revision of the ANSI Z136.1 standard. No laser radiation for a particular channel is emitted unless both the fiber and remote interlock connectors are connected.

#### 2.10.3.3 Key control

The Raman Rxn4 utilizes a key control system. The laser radiation will not be accessible until the system key switch is in the **ON** position. The key cannot be removed when the switch is in the **ON** position.

#### 2.10.3.4 Compliance labels

The Raman Rxn4 analyzer is certified to comply with U.S. 21 CFR, Chapter I, Subchapter (J), as administered by the CDRH.

### 2.10.4 EMC mitigation measures

Per CFR 47 Chapter I subchapter A part 15 subpart B the Rxn4 is designed and built to meet EMC requirements for unintentional radiators with Class A limits. In areas with high Radio Frequency (RF) interference the Rxn4 requires the use of a grounding cable to help mitigate unwanted events from occurring with the analyzer. In some cases, in areas with high radio frequency exposure, the analyzer may start a self-recovery mode where the LED indicator on the front blinks once and the display turns off and then start again. There are extreme cases where the analyzer's LED blinks continuously, requiring the user's manual intervention to restart. In all cases, the removal of the RF disturbances results in the Rxn4 returning to normal operation. This also fulfills the requirement to the end user per IEC/EN 61326.

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy, and if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user is required to correct the interference at their own expense.

### 2.10.5 WEEE directive compliance

The Raman Rxn4 complies with the [waste electrical and electronic equipment](#) (WEEE) Directive 2012/19/EU. The WEEE Symbol shown below is placed on all WEEE-compliant assemblies.




Figure 2. WEEE symbol

If no other means of disposal are available, Endress+Hauser offers a “Take Back” disposal program at no cost. To participate in the “Take Back” disposal program, refer to our website (<https://endress.com/contact>) for the list of local sales channels in your area.

### 2.10.6 Specific conditions of use

1. The fiber-optic cable linking the laser output to the probe shall be installed so that the minimum bend radius specified by the cable manufacturer is not exceeded.
2. Sometimes it is necessary to monitor the level of a liquid process sample to ensure that the optical beam is not inadvertently exposed to a potentially explosive atmosphere. In these situations, the devices used to monitor the level shall be intrinsically safe or classed as simple apparatus or be installed so as to provide a fault tolerance of 2 for equipment protection level (EPL) Ga

equipment or a fault tolerance of 1 for EPL Gb equipment. The functional safety of this arrangement has not been assessed as part of the certification for the Raman Rxn4 analyzer and it is the responsibility of the installer to ensure that an appropriate mechanism is in place. See *Hazardous area certification* →  for more information.

3. Where intrinsically safe (IS) galvanic isolators are added to the main enclosure to produce IS signals to external apparatus not covered by this certification, the IS galvanic isolators shall have an ambient working temperature upper limit of at least 55 °C (131 °F). The IS parameters pertaining to these isolators shall be conveyed to the user in an appropriate manner. The IS nature of any such circuits has not been assessed as part of the certification for the Raman Rxn4 analyzer and this certificate is not to be taken as indication that these IS circuits comply with relevant requirements.

## 3 Certificates and approvals

### 3.1 Certificates and approvals: production center

Document	Document Number	Products / Processes	Standards / Requirements
ISO 14001:2015 Declaration of Conformance	4002039 (manufacturer)	Manufacture of Raman Spectrographic Instruments including Software; Specialty Holographic Assemblies, Elements and Components	ISO 14001:2015
ISO 9001:2015 Certificate	Certificate Registration No. 74 300 2705	Design and Manufacture of Raman Spectrographic Instruments including Software; Specialty Holographic Assemblies, Elements and Components	ISO 9001:2015
Quality assurance notification (QAN) Raman Analyzers and Probes	Certificate Registr. No. 01 220 093059	Production, final inspection and testing of Endress+Hauser Rxn* analyzer base units as well as Rxn-20, Rxn-30, Rxn-40, and Rxn-41 Probes Types of protection: "p", "i", "op is"	Directive 2014/34/EU Annex IV
IECEX Quality assessment report (QAR) Certificate	QAR Reference No. DE/TUR/QAR11.0001/ XX* Related Certificates for previous versions Endress + Hauser Raman analyzers	Endress+Hauser, Analyzer Base Units, Rxn-20, Rxn-30, and Rxn-40 probes Protection concept-Pressurized enclosures "p"; Intrinsic safety "i"; Optical radiation "op is"	Related QARs DE/TUR/QAR11.0001/00 DE/TUR/QAR11.0001/01 DE/TUR/QAR11.0001/02 DE/TUR/QAR11.0001/03

\*The last two numbers change depending on the newest report.

#### NOTICE

- ▶ While the Raman Rxn4 unit is certified for explosive atmospheres, please note that only the analyzer output is certified. The analyzer itself is not.

### 3.2 Declarations of conformity: analyzers

Document (Manufacturer Doc #)	Products	Regulations	Standards	Certification
EU Declaration of Conformity: Rxn4 IoT ATEX	RXN4-532 IoT, RXN4-785 IoT, RXN4-1000 IoT	European Directives: EMC 2014/30/EU ATEX 2014/34/EU LVD 2014/35/EU RoHS 2011/65/EU	Applied harmonized standards or normative documents: IEC 61010-1 2017 EN IEC 61326 2021 EN 60079-11 2012 IEC 60825-1 2014 EN 60079-28 2015 EN 60079-0 2018 EN 50495 2010	CE-Type Examination Certificate No. CSANe 22ATEX 1037 X issued by CSA(2813) Quality assurance TÜVRheinland (0035)
Raman Rxn analyzers – Authorization to Mark (hazardous area)	Raman Analyzer with: Intrinsically Safe output for probe and sensors used in Class I, Division 1, Groups A, B, C, and D Ambient Temperature Range: 5 °C (41 °F) ≤ Tamb ≤ 35 °C (95 °F) RXN2 IoT, RXN4 IoT	CSA-C22.2 No. 61010-1-12 Ed. 3 CAN/CSA C22.2 No. 60079-0:19 CAN/ CSA C22.2 No. 60079-11:14 CAN/ CSA C22.2 No. 60079-28:16 ANSI/UL 913-2019, Eighth Edition UL 61010-1, 3 <sup>rd</sup> edition (2012) + R:15Jul2015 UL 60079-0 Seventh Edition UL 60079-11 Sixth Edition ANSI/UL 60079-28 Second Edition		CSA Group

## 3.3 Certificates and approvals: Endress + Hauser Raman analyzers

### 3.3.1 CSA Certificate of Compliance: Raman Rxn4 analyzer

The Raman Rxn4 analyzer has been approved for use in hazardous areas in the United States and Canada by the [Canadian Standards Association](#) when installed in accordance with the Hazardous Area Installation Drawing (4002396).

The products listed are eligible to bear the CSA Mark shown with adjacent indicators 'C' and 'US' for Canada and US (indicating that products have been manufactured to the requirements of both Canadian and U.S. Standards) or with adjacent indicator 'US' for US only or without either indicator for Canada only.



Figure 3. Label showing equipment is approved for use in hazardous areas in the United States and Canada

<b>Products:</b>	Raman Rxn4 analyzer CLASS - C225804 - PROCESS CONTROL EQUIPMENT-Intrinsically Safe, Entity - For Hazardous Locations CLASS - C225884 - PROCESS CONTROL EQUIPMENT - Intrinsically Safe, Entity - For Hazardous Locations - Certified to US Standards
<b>Marking:</b>	Class I, Division 1, Groups A, B, C and D or [Ex ia] Class I, Division 1, Groups A, B, C, and D: [Ex ia Ga] IIC Class I, Division 2, Groups A, B, C and D: [Ex ia Ga] [op sh Gb] IIC
<b>Tambient:</b>	5 to 35 °C (41 to 95 °F)

#### Conditions of certification:

- To be installed in accordance with all applicable local and national codes, and in accordance with control drawing 4002396.
- This product is intended for indoor, non-hazardous locations only.
- Sensor probes and other associated apparatus are not included under the scope of this project.
- The manufacturer is responsible for conformity with suitable laser safety standards.
- The fiber-optic cable linking the laser output to the pilot probe shall be installed so that the minimum bend radius specified by the cable manufacturer is not exceeded.
- Where it is necessary to monitor the process level to ensure that the optical beam is not exposed to a potentially explosive atmosphere, the devices used to monitor the level shall be intrinsically safe or classed as simple apparatus and be installed so as to provide a fault tolerance of 2 for Category 1 equipment or fault tolerance of 1 for Category 2 equipment. The functional safety of this arrangement has not been assessed as part of this certification and it is the responsibility of the installer/user to ensure that an appropriate mechanism is in place.
- Where IS galvanic isolators are added to the main enclosure in order to produce IS signals to external apparatus not covered by this certification, the IS galvanic isolators shall have an ambient working temperature upper limit of at least 55 °C (131 °F). The IS parameters pertaining to these isolators shall be conveyed to the user in an appropriate manner. The IS nature of any such circuits has not been assessed as part of this certification and this certificate is not to be taken as indication that these IS circuits comply with relevant requirements.

#### Applicable requirements/standards:

- CSA-C22.2 No. 61010-1-12 Ed. 3 Safety requirements for electrical equipment for measurement, control, and laboratory use - Part 1: General requirements
- CAN/CSA C22.2 No. 60079-0:19 Explosive atmospheres - Part 0: Equipment - General requirements
- CAN/ CSA C22.2 No. 60079-11:14 (Sixth Edition) Equipment protection by intrinsic safety
- CAN/ CSA C22.2 No. 60079-28:16 Explosive atmospheres - Part 28: Protection of equipment and transmission systems using optical radiation

#### NOTICE

#### Handle probes and cables with care.


- Fiber cables should NOT be kinked and should be routed to maintain the minimum bend radius of 152.4 mm (6 in).
- Permanent damage to the cables may result if they are bent beyond the minimum radius.

### 3.3.2 ATEX Certificate of Conformity: Endress+Hauser Raman analyzers

The Raman Rxn4 analyzer has been third-party approved for use in hazardous areas in accordance with Article 17 of [Directive 2014/34/EU Annex IV](#) of the European Parliament and of the Council dated 26 February 2014. The analyzer has been certified to the ATEX Directive for use in Europe, as well as in other countries accepting ATEX-certified equipment.



Figure 4 ATEX label for use in hazardous areas

<b>Products:</b>	Raman RXN4 Analyzers
<b>Marking:</b>	Ex [ia Ga] [op sh Gb] IIC CE 0035  II (2)(1) G
<b>Tambient:</b>	5 to 35 °C (41 to 95 °F)

#### Conditions of certification:

1. The fiber-optic cable linking the laser output to the probe shall be installed so that the minimum bend radius specified by the cable manufacturer is not exceeded.
2. Where it is necessary to monitor the process level to ensure that the optical beam is not exposed to a potentially explosive atmosphere, the devices used to monitor the level shall be intrinsically safe or classed as simple apparatus and be installed so as to provide a fault tolerance of 2 for Category 1 equipment or fault tolerance of 1 for Category 2 equipment. The functional safety of this arrangement has not been assessed as part of this certification and it is the responsibility of the installer / user to ensure that an appropriate mechanism is in place.
3. Where IS galvanic isolators are added to the main enclosure in order to produce IS signals to external apparatus not covered by this certification, the IS galvanic isolators shall have an ambient working temperature upper limit of at least 55 °C (131 °F). The IS parameters pertaining to these isolators shall be conveyed to the user in an appropriate manner. The IS nature of any such circuits has not been assessed as part of this certification and this certificate is not to be taken as indication that these IS circuits comply with relevant requirements.

#### Applicable requirements/standards:

Compliance with the Essential Health and Safety Requirements has been assured by compliance with:

- [EN IEC 60079-0:2018](#)
- [EN 60079-11:2012](#)
- [EN 60079-28:2015](#)
- [EN 50495:2010](#)

#### NOTICE

#### Handle probes and cables with care.

- ▶ Fiber cables should NOT be kinked and should be routed to maintain the minimum bend radius of 152.4 mm (6 in).
- ▶ Permanent damage to the cables may result if they are bent beyond the minimum radius.

### 3.3.3 IECEx Certificate of Conformity: Endress+Hauser Raman analyzers

The Raman Rxn4 analyzer can also be marked for [International Electrotechnical Commission](#) (IEC) Certification Systems for Explosive Atmospheres when installed in accordance with the Hazardous Area Installation Drawing (4002396).

<b>Product:</b>	Raman RXN4 Analyzer
<b>Marking:</b>	Ex [ia Ga] [op sh Gb] IIC IECEx CSAE 22.0024X
<b>Type of Protection:</b>	Intrinsic Safety “ia” & Interlock Shut-off “op sh”
<b>Tambient:</b>	5 to 35 °C (41 to 95 °F)

**Conditions of certification:**

1. The fiber-optic cable linking the laser output to the probe shall be installed so that the minimum bend radius specified by the cable manufacturer is not exceeded.
2. Where it is necessary to monitor the process level to ensure that the optical beam is not exposed to a potentially explosive atmosphere, the devices used to monitor the level shall be intrinsically safe or classed as simple apparatus, and be installed so as to provide a fault tolerance of 2 for EPL Ga equipment or a fault tolerance on 1 for EPL Gb equipment. The functional safety of this arrangement has not been assessed as part of this certification and it is the responsibility of the installer / user to ensure that an appropriate mechanism is in place.
3. Where IS galvanic isolators are added to the main enclosure in order to produce IS signals to external apparatus not covered by this certification, the IS galvanic isolators shall have an ambient working temperature upper limit of at least 55 °C (131 °F). The IS parameters pertaining to these isolators shall be conveyed to the user in an appropriate manner. The IS nature of any such circuits has not been assessed as part of this certification and this certificate is not to be taken as indication that these IS circuits comply with relevant requirements.

**Applicable requirements/standards:**

The equipment and any acceptable variations to it specified in the schedule of this certificate and the identified documents, was found to comply with the following standards

- IEC 60079-0:2017
- IEC 60079-11:2011
- IEC 60079-28:2015

**3.3.4 UKCA Certificate of Conformity: Endress+Hauser Raman analyzers**

The Raman Rxn4 analyzer has been third-party approved for use in hazardous areas in accordance with Regulation 42 of the Equipment and Protective Systems Intended for Use in Potentially Explosive Atmospheres Regulations 2016, UKSI 2016:1107 and been found to comply when installed in accordance with the Hazardous Area Installation Drawing (4002396).



*UK product certification label*

<b>Products:</b>	RXN4 Analyzers
<b>Marking:</b>	Ex [ia Ga] [op sh Gb] IIC CE 0035 UKCA II (2)(1) G
<b>Tambient:</b>	5 to 35 °C (41 to 95 °F)

**Conditions of certification:**

1. The fiber-optic cable linking the laser output to the probe shall be installed so that the minimum bend radius specified by the cable manufacturer is not exceeded.
2. Where it is necessary to monitor the process level to ensure that the optical beam is not exposed to a potentially explosive atmosphere, the devices used to monitor the level shall be intrinsically safe or classed as simple apparatus and be installed so as to provide a fault tolerance of 2 for Category 1 equipment or fault tolerance of 1 for Category 2 equipment. The functional safety of this arrangement has not been assessed as part of this certification and it is the responsibility of the installer / user to ensure that an appropriate mechanism is in place.
3. Where IS galvanic isolators are added to the main enclosure in order to produce IS signals to external apparatus not covered by this certification, the IS galvanic isolators shall have an ambient working temperature upper limit of at least 55 °C (131 °F). The IS parameters pertaining to these isolators shall be conveyed to the user in an appropriate manner. The IS nature of any such circuits has not been assessed as part of this certification and this certificate is not to be taken as indication that these IS circuits comply with relevant requirements.

**Applicable requirements/standards:**

Compliance with the Essential Health and Safety Requirements has been assured by compliance with:

- EN IEC 60079-0:2018
- EN 60079-11:2012
- EN 60079-28:2015
- EN 50495:2010

**NOTICE**

**Handle probes and cables with care.**

- ▶ Fiber cables should NOT be kinked and should be routed to maintain the minimum bend radius of 152.4 mm (6 in).
- ▶ Permanent damage to the cables may result if they are bent beyond the minimum radius.

**3.3.5 JPEX Certificate of Conformity: Endress+Hauser Raman analyzers**

The Raman Rxn4 analyzer has been third-party approved for use in hazardous areas and been found to comply when installed in accordance with the Hazardous Area Installation Drawing (4002396).



Figure 4. JPEX label for use in hazardous areas

#	Name
1	Date of approval year (Japanese calendar) and month
2	Certificate number
3	Number of manufacturer

**Products:** RXN4 Analyzers

**Marking:** Ex [ia Ga] [op sh Gb] IIC

**Tambient:** 5 to 35 °C (41 to 95 °F)

**Conditions of certification:**

1. The fiber-optic cable linking the laser output to the probe shall be installed so that the minimum bend radius specified by the cable manufacturer is not exceeded.
2. Where it is necessary to monitor the process level to ensure that the optical beam is not exposed to a potentially explosive atmosphere, the devices used to monitor the level shall be intrinsically safe or classed as simple apparatus and be installed so as to provide a fault tolerance of 2 for Category 1 equipment or fault tolerance of 1 for Category 2 equipment. The functional safety of this arrangement has not been assessed as part of this certification and it is the responsibility of the installer / user to ensure that an appropriate mechanism is in place.
3. Where IS galvanic isolators are added to the main enclosure in order to produce IS signals to external apparatus not covered by this certification, the IS galvanic isolators shall have an ambient working temperature upper limit of at least 55 °C (131 °F). The IS parameters pertaining to these isolators shall be conveyed to the user in an appropriate manner. The IS nature of any such circuits



has not been assessed as part of this certification and this certificate is not to be taken as indication that these IS circuits comply with relevant requirements.

**Applicable requirements/standards:**

Compliance with the Essential Health and Safety Requirements has been assured by compliance with:

- EN IEC 60079-0:2018
- EN 60079-11:2012
- EN 60079-28:2015
- EN 50495:2010

**NOTICE****Handle probes and cables with care.**

- ▶ Fiber cables should NOT be kinked and should be routed to maintain the minimum bend radius of 152.4 mm (6 in).
- ▶ Permanent damage to the cables may result if they are bent beyond the minimum radius.

## 4 Hazardous area installation

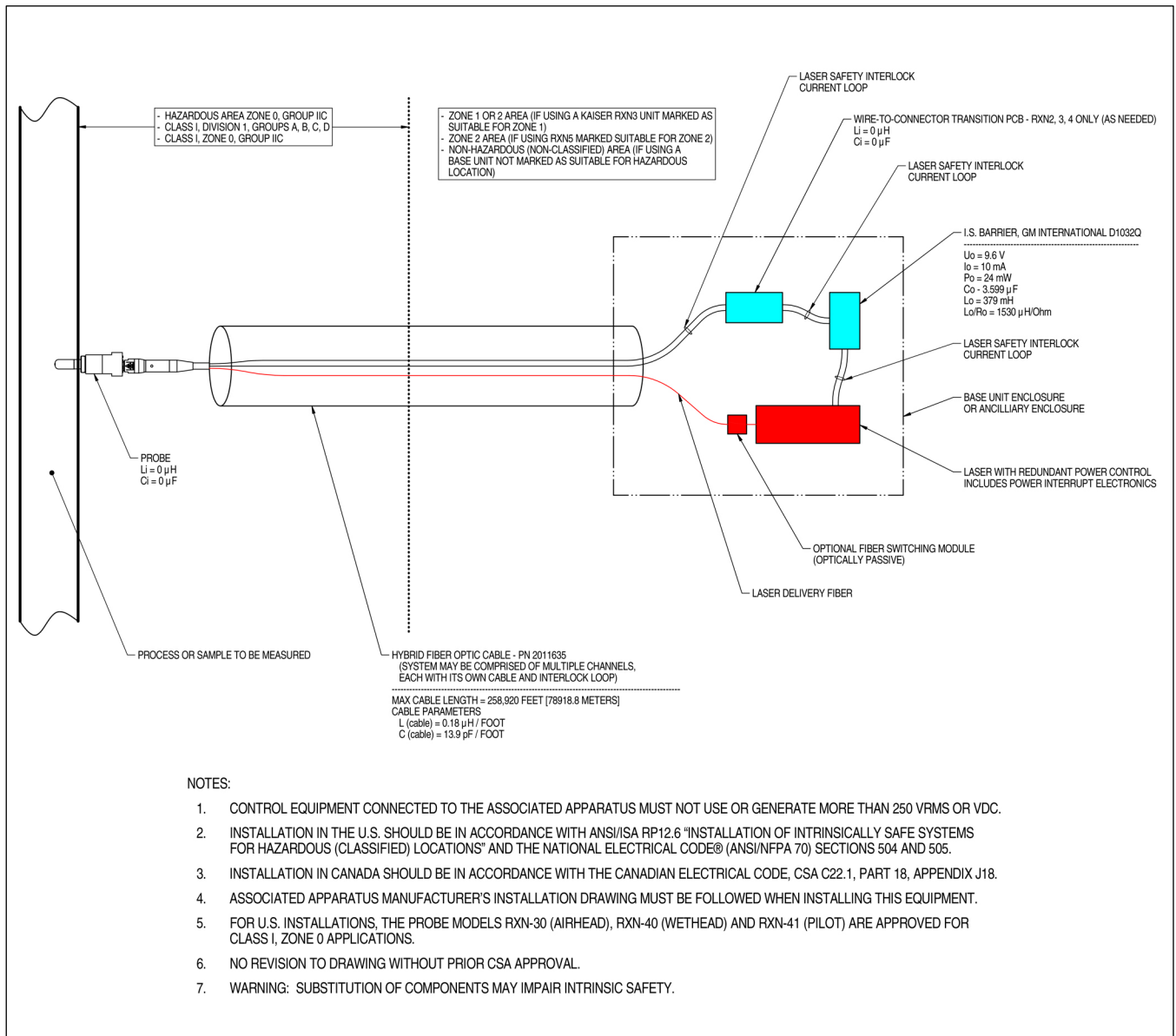


Figure 5. Hazardous area equipment installation drawing

A0049010

## 5 Safety-related specifications

Raman Rxn4 analyzers may be configured to operate with one of several different laser wavelengths. Currently, Raman Rxn4 analyzers may be equipped with a 532 nm, 785 nm, or 1000 nm laser as standard.

### 5.1 Base unit

Item	Description
Operating temperature (532 nm, 785 nm)	5 to 35 °C (41 to 95 °F)
Operating temperature (993 nm)	5 to 30 °C (41 to 86 °F)
Storage temperature	-15 to 50 °C (5 to 122 °F)
Relative humidity	20 to 80 %, non-condensing
Warm-up time	120 minutes
Operating voltage	100 to 240 V, 50 Hz to 60 Hz, ±10 %
Transient over-voltages	Over-voltage category 2
Power consumption (maximum) (typical startup) (typical running)	400 W 250 W 120 W
Altitude	Up to 2000 m
Pollution degree	2
Ingress protection rating	IP20

### 5.2 Laser

Item	Description
<b>532 nm</b> Excitation wavelength Maximum power output Warranty	532 nm 120 mW 1 year or 5000 hours
<b>785 nm</b> Excitation wavelength Maximum power output Warranty	785 nm 400 mW unlimited hours for 1 year
<b>1000 nm</b> Excitation wavelength Maximum power output Warranty	993 nm 400 mW unlimited hours for 1 year

### 5.3 Sound levels

Analyzer / Accessory	Sound level from operator's position
Raman Rxn4	58.2 dB

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