

# Safety Instructions

## Raman Rxn4





# Raman Rxn4

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## Warnings




Structure of Information	Meaning
<p> <b>WARNING</b></p> <p><b>Causes (/consequences)</b> If necessary, consequences of non-compliance (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><b>Causes (/consequences)</b> If necessary, consequences of non-compliance (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><b>Cause/situation</b> If necessary, consequences of non-compliance (if applicable) ▶ Action/note</p>	<p>This symbol alerts you to situations which may result in damage to property.</p>

Table 1. Warnings

## 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 ETL Listed Mark provides proof of product compliance with North American safety standards. Authorities Having Jurisdiction (AHJ) and code officials across the US and Canada accept the ETL Listed Mark as proof of product compliance to published industry standards.
	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).

Table 2. Symbols

## 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.

# 1 Certificates and approvals

## 1.1 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 ANSI/AIHA Z10:2012
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 RNX2, RXN3, RXN4 and Raman Rxn5 Analyzer Base Units and Rxn-20, Rxn-30, Rxn-40, and Rxn-41 Probes Types of protection: "d", "p", "I", "op is"	Directive 2014/34/EU Annex IV
IECEX Quality Assessment Report (QAR) Certificate	QAR Reference No. DE/TUR/QAR11.0001/03 Related Certificates for previous versions IECEX ITS 14.0014X issue: 0 IECEX ITS 14.0014X issue: 1 IECEX ITS 14.0015X issue: 0 IECEX ITS 14.0015X issue: 1	Analyzer Base Units and Rxn-30 and Rxn-40 Probes, Endress+Hauser, Analyzer Base Units, Rxn-20, Rxn-30, and Rxn-40 probes Protection concept Flameproof enclosure - Ex d;; 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

Table 3. Production center certifications

## 1.2 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 61326 2013 EN 60079-11 2012 EN 61000-3-2 2014 IEC 60825-1 2014 EN 60079-28 2015 EN 61000-3-3 2013 EN 60079-0 2018 EN 50495 2010	CE-Type Examination Certificate No. ITS10ATEX17080X Issued by Intertek (2575) 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: $+5^{\circ}\text{C} \leq T_{\text{amb}} \leq 35^{\circ}\text{C}$ RXN2 IoT, RXN4 IoT	UL 913 Issued: 2006/07/31 Ed: 7 Rev: 2011/09/23 Intrinsically Safe Apparatus and Associated Apparatus for Use in Class I, II, and III, Division I, Hazardous (Classified) Locations Intrinsically Safe And Non-Intendive Equipment For Use In Hazardous Locations (R2016) [CSA C22.2#157:1992 Ed.3+G1;U2] Safety Requirements For Electrical Equipment For Measurement, Control, And Laboratory Use Part 1: General Requirements [CSA C22.2#61010-1-12:2012 Ed.3] Safety Requirements For Electrical Equipment For Measurement, Control, And Laboratory Use - Part 1: General Requirements [UL 61010-1:2012 Ed.3]		Intertek Testing Services

Table 4. Declarations of Conformity for analyzers


## 1.3 Certificates and approvals – analyzers

### 1.3.1 ATEX Certificate of Conformity: Endress+Hauser Raman analyzers (Certificate # ITS10ATEX17080X)

The Raman Rxn2 analyzer have been third-party approved for use in hazardous areas in accordance with Article 17 of Directive 2014/34/EU 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 1. ATEX label for use in hazardous areas

<b>Products:</b>	RXN4 Analyzers including IoT versions
<b>Marking:</b>	Ex [ia Ga] [op sh Gb] IIC CE 0035  II (2)(1) G
<b>Tamb:</b>	+5 °C to +35 °C

#### Conditions of certification:

1. The fibre optic cable linking the laser output to the Rxn-41 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.

#### NOTICE

- ▶ See *Special Condition No. 2 on page 9* for more information about the conditions of certification.
- 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. 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 minimum bend radii (~6 inches). Permanent damage may result if this occurs.

### 1.3.2 IECEx Certificate of Conformity: Endress+Hauser Raman analyzers (Certificate # IECEx ITS 20.0050X)

The Raman Rxn2 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).

**Type of Protection:** RXN2, RXN3, and RXN4 Analyzers including IoT versions

**Marking:** Ex [ia Ga] [op sh Gb] IIC  
IECEx ITS 20.0050X

**Type of Protection:** Intrinsic Safety, Optical Radiation

#### Conditions of certification:

1. The fibre optic cable linking the laser output to the Rxn-41 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.

#### NOTICE

- ▶ See *Special Condition No. 2 on page 9* for more information about the conditions of certification.
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. 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 Edition:7.0: Explosive atmospheres – Part 0: Equipment – General requirements
- IEC 60079-11:2011 Edition:6.0: Explosive atmospheres – Part 11: Equipment protection by intrinsic safety ""i""
- IEC 60079-28:2015 Edition:2: Explosive atmospheres – Part 28: Protection of equipment and transmission systems using optical radiation



### 1.3.3 Special Condition No. 2

#### Category 1 Environment

To ensure that the optical beam is not exposed to a potentially explosive atmosphere, the optical beam must be switched off with a safety interlock if the process level decreases below the probe window (level too low). To comply with Ex category 1 equipment, the controlled Rxn-10 probe must provide a Hardware Fault Tolerance (HFT) of HFT=2. This is achieved with the following interlock architecture:

1. A level switch 1 (FTL5x or equivalent\*, HFT=0, SIL2-rated) controls the process level and switches off the laser beam if the process level is too low.
2. A level switch 2 (FTL8x or equivalent\*, HFT=1, SIL3-rated) controls the process level additionally and switches off the laser beam if the process level is too low.

Fault considerations:

- a. **One** fault in level switch 1 (switch 1 fails) and **one** fault in level switch 2 (interlock function still ensured, because HFT=1, fault exclusion for sensing fork).
- b. **Two** faults in level switch 2 (interlock function still ensured, because switch 1 still operates correctly).

With this architecture an HFT=2 is achieved for the Rxn-10 probe. The level switches are protected intrinsically safe and are marked Ex ia IIC T6 Ga. This configuration complies with the Type Certificate listed above.

#### Category 2(3) Environment

Should the end user deem that their process only meets the requirements of Zone 1(2) as opposed to Zone 0; it is within their authority to reduce the protection level accordingly. In this instance, the user may choose to reduce the fault tolerance to HFT=1(0) at their own discretion:

- a. **Category 2** This would allow the end user to **wave** the use of switch 1 identified above.
- b. **Category 3** This would allow the end user to **wave** the use of switch 2 identified above.

Although being used in a lesser zone; the Rxn-10 probe would continue to be marked for the more stringent zone in accordance with its ATEX Type certificate, Ex II 2/1 G, Ex ia op sh IIC T6 Ga. Should the end user decide to downgrade the protection from HFT=2 due to the lower risk environment; it is **highly advised** that they document their rationale leading them to the conclusion of using lesser protection.

Equipment	Requirements acc. ATEX 2014/34 (Annex1)	Example Product
	Random Failure	
Category 1	HFT= 2	1x FTL8x or equivalent* and 1x FTL5x or equivalent*
Category 2	HFT=1	1x FTL8x or equivalent* or 2x FTL5x or equivalent*
Category 3	HFT=0	1x FTL5x or equivalent*
*Min-safety		

Table 5. Equipment categories



### 3 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.

#### 3.1 Base unit

Item	Description
Operating temperature (532 nm, 785 nm)	+5 to +35 °C
Operating temperature (1000 nm)	+5 to +30 °C
Storage temperature	-15 to +50 °C
Relative humidity	20–80%, non-condensing
Warm-up time	120 minutes
Operating voltage	100–240 V, 50–60 Hz, ±10%
Transient over-voltages	Over-voltage category 2
Altitude	Up to 2000m
Pollution degree	2

Table 6. Base unit

#### 3.2 Base Unit (w/ NEMA 4x Enclosure Option)

Item	Description
Operating temperature (532 nm, 785 nm, 1000 nm)	+5 to +50 °C
Storage temperature	-15 to +50 °C
Relative humidity	20–80%, non-condensing
Warm-up Time	240 minutes
Operating voltage	120 V ± 10%, 60 Hz OR 230 V ± 10%, 50/60 Hz
Transient over voltages	Over-voltage category 2
Power consumption (maximum)	1560 W

Table 7. Base unit (w/ NEMA 4x enclosure option)

#### 3.3 Laser

Item	Description
<b>532 nm</b> Excitation wavelength Maximum power output Warranty	532 nm 120 mW unlimited hours for 1 year
<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

Table 8. Laser

#### 3.4 Sound levels

Analyzer / Accessory	Sound Level from Operator's Position
Raman Rxn4	58.2 dB

Table 9. Sound levels

[www.addresses.endress.com](http://www.addresses.endress.com)

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