

Safety Instructions

Raman Rxn5



Raman Rxn5

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Warnings

Structure of Information	Meaning
<p>⚠ WARNING</p> <p>Causes (/consequences) 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>⚠ CAUTION</p> <p>Causes (/consequences) 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>NOTICE</p> <p>Cause/situation 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 analyzer.
	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 CSA 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 CSA 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
ATEX Declaration of Conformity - Raman Rxn5 Analyzer	Raman Rxn5, RXN5	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 2010 EN 61326 2013 EN 60079-2 2014 EN 60079-28 2015 EN 61000-3-2 2014 IEC 60825-1 2014 EN 60079-11 2012 EN 50495 2010 EN 61000-3-3 2013 EN 60079-0 2012+A11:2013 EN 60079-26 2015	CE-Type Examination Certificate No. ITS11ATEX17307X Issued by Intertek (0359) Quality assurance TÜVRheinland (0035)

Table 4. Declarations of Conformity for analyzers

1.3 Certificates and approvals – analyzers

1.3.1 CSA Certificate of Compliance: Raman Rxn5 analyzer (Certificate # 2438730)

The Raman Rxn5 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 1. Label showing equipment is approved for use in hazardous areas in the United States and Canada

Products:	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
Marking:	Class I, Division 2, Groups B, C, or D, T4 Class I, Zone 2; IIB + H ₂ , T4

Conditions of certification:

None

Applicable requirements/standards:

- CAN/CSA Standard C22.2 No. 0-10 Tenth Edition (2010) General Requirements – Canadian Electrical Code, Part II
- CAN/CSA Standard C22.2 No.157-92 Third Edition (Reaffirmed 2006) Intrinsically Safe and Non-Incendive Equipment for Use in Hazardous Locations
- CSA LTR E-010-2005 Purged and Pressurized Enclosures for Use in Class I, Division 1 or 2 Hazardous Locations
- CAN/CSA-C22.2 No. 61010-1-12 (Third Edition) Safety requirements for electrical equipment for measurement, control, and laboratory use – Part 1: General requirements
- NFPA 496:2008 Standard for Purged and Pressurized Enclosures for Electrical Equipment
- UL Standard 913 (Sixth Edition) Intrinsically Safe Apparatus and Associated Apparatus for Use in Class I, II, and III, Division 1, Hazardous (Classified) Locations
- UL 61010-1, May 11, 2012 (Third Edition) Electrical Equipment For Measurement, Control, and Laboratory Use; Part 1: General Requirements
- CSA Standard C22.2 No. 14 Eleventh Edition (2010) Industrial Control Equipment
- CSA Standard C22.2 No.142-M1987 Third Edition (Reaffirmed 2009) Process Control Equipment Industrial Products
- UL Standard 916 (Fourth Edition) Energy Management Equipment

1.3.2 ATEX Certificate of Conformity: Raman Rxn5 analyzers (Certificate # ITS11ATEX17307X)


The Raman Rxn5 analyzer have been third-party approved for use in hazardous areas in accordance with Article 9 of the Council Directive 94/9/EC of 23 March 1994, certifies that this equipment or protective system has been found to comply with the Essential Health and Safety Requirements relating to the design and construction of equipment and protective systems intended for use in potentially explosive atmospheres given in Annex II to the Directive.



Figure 2. ATEX label for use in hazardous areas

Products: Raman Rxn5 / RXN5 RAMAN Analyser

Marking: Ex ec ic [ia Ga] [op sh Gb] pzc IIC T4 Gc

CE 0035  || 3/(2)/(1) G

Tambient: -20°C to +50°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. The functional safety of this arrangement has not been assessed as part of this certification and it is the responsibility of the installer I user to ensure that an appropriate mechanism is in place.

NOTICE

- ▶ See *Special Condition No. 2 on page 10* for more information about the conditions of certification.
3. The user shall purge the enclosure prior to start-up and upon loss of pressurization in accordance with the instructions marks on the Raman Rxn5 enclosure. An appropriate means of isolation shall be provided by the user, appropriately certified for the area of use and correctly installed.
 4. 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 $e_{o\bullet}c$. 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 60079-0:2012
- EN 60079-2:2007
- EN 60079-11:2012
- EN 60079-28:2007
- EN 50495:2010 except in respect of those requirements referred to at item 16 of the Schedule.

1.3.3 IECEx Certificate of Conformity: Raman Rxn5 analyzers (Certificate # IECEx ITS 14.0014X)

The Raman Rxn5 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: Raman Rxn5 / RXN5 with Airhead Analyser

Marking: Ex ec ic [ia Ga] [op sh Gb] pzc IIC T4 Gc

Tambient: Ta -20°C to +50°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 equipment protection level Fa. 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 10* for more information about the conditions of certification.
3. The user shall purge the enclosure prior to start-up and upon loss of pressurization in accordance with the instructions marked on the Raman Rxn5 enclosure. An appropriate means of isolation shall be provided by the user, appropriately certified for the area of use and correctly installed.
 4. 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 60°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 electrical apparatus 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 60079-0:2011 Edition:6.0 Explosive atmospheres - Part 0: General requirements
- IEC 60079-11:2011 Edition:6.0 Explosive atmospheres - Part 11: Equipment protection by intrinsic safety "i"
- IEC 60079-15:2010 Edition:4 Explosive atmospheres - Part 15: Equipment protection by type of protection "n"
- IEC 60079-2:2007-02 Edition:5 Explosive Atmospheres - Part 2: Equipment protection by pressurized enclosure "p"
- IEC 60079-28:2006-08 Edition:1 Explosive atmospheres - Part 28: Protection of equipment and transmission systems using optical radiation

1.3.4 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 waive** the use of switch 1 identified above.
- b. **Category 3** This would allow the end user **to waive** 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

2 Raman Rxn5 safety information

2.1 Construction materials

Materials used in the construction of the Raman Rxn5 enclosure, including all sealing materials, are compatible with the chemicals that the enclosure would typically encounter in the field. The enclosure surfaces have been designed and evaluated to ensure that they do not present hazards such as static buildup.

2.2 Protective gas

The protective gas shall be essentially free of contaminants or foreign matter and shall contain no more than trace amounts of flammable gas or vapor. If using compressed air, the air intake of the compressor must be located in a non-hazardous zone. The temperature of the protective gas shall not exceed 40°C.

⚠ WARNING

- ▶ The protective gas supply shall have an alarm that is located at a constantly attended location.
- ▶ Power must not be restored after enclosure has been opened until enclosure has been purged for 9.5 minutes with a minimum pressure of 2.0 psi as read at the inlet regulator.
- ▶ FOLLOW INSTRUCTIONS BEFORE CLOSING THE PROTECTIVE GAS SUPPLY VALVE.

If the protective gas supply to this enclosure has an isolation valve, that valve must have the following label:

PROTECTIVE GAS SUPPLY VALVE – This valve must be kept open unless the area atmosphere is known to be below the ignitable concentration of combustible materials, or unless all equipment within the protected enclosure is de-energized.

NOTICE

- ▶ The protective gas pressure shall be set between 2.0 psi and 2.5 psi at the inlet regulator. Pressure below 2.0 psi will result in inadequate purge rates.
- ▶ Pressure above 2.5 psi may result in exceeding the maximum rated overpressure as specified on the nameplate.
- ▶ Inlet pressure must be monitored at all times during the purging operation.

2.3 Pressurizing system

Refer to the Purge Solutions CYCLOPS Y&Z Purge Indicator User's Manual for additional information on installation, operating, and maintenance instructions for the pressurizing system. For ease of use it is recommended that the installation instructions found in this section be utilized.

2.4 Purge inlet connection and purge alarm connection

The purge indicator installed on the Raman Rxn5 analyzer is of the Z-Purge variety from Purge Solutions, Inc. The indicator is certified for use in Division 2/Zone 2 hazardous areas. The Z-purge indicator has a green indicator light that indicates that the pressure inside the enclosure is above 0.20" water column. The indicator provides a dry contact alarm relay for a remote alarm if needed; it is the installer's and/or customer's responsibility to interface to the alarm contacts.

2.5 Purge inlet connection

The Z-Purge indicator is paired with a Purge Solutions manual leakage compensation valve. There are two modes of operation for the valve—purging and leakage compensation. For purging, the dial on the valve should be turned so the slot in the dial is horizontal and lined up with the "ON" position. Once the purging has been performed for the specified time, the valve may be switched to the leakage compensation mode by turning the dial so the slot in the dial is vertical. Leakage compensation mode allows the enclosure to remain pressurized with a much smaller usage of air after the purging has occurred.

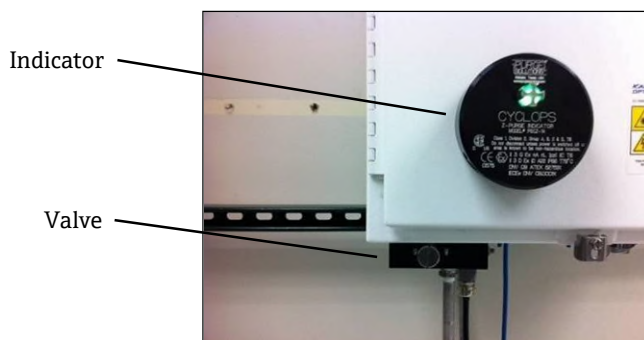


Figure 3. Purge inlet connection

The Raman Rxn5 is shipped without the purge regulator and filter assembly installed. It is the installer's responsibility to install the purge regulator and filter assembly and interface the air supply to the assembly. The inlet to the filter is ¼-18 NPT. Use appropriate thread sealant.

2.6 Air supply requirements

- **Inlet Fitting.** ¼-18 NPT.
- **ISA Grade.** Hydrocarbon free.
- **Water and Oil Free.** -40°C dew-point.
- **Particle Size.** 5 micron maximum.
- **Pressure Range.** 50 – 120 psi.
- **Max Flow Rate for Purging.** 2.0 SCFM.
- **Max Flow Rate for Leakage Compensation.** 0.75 SCFM.

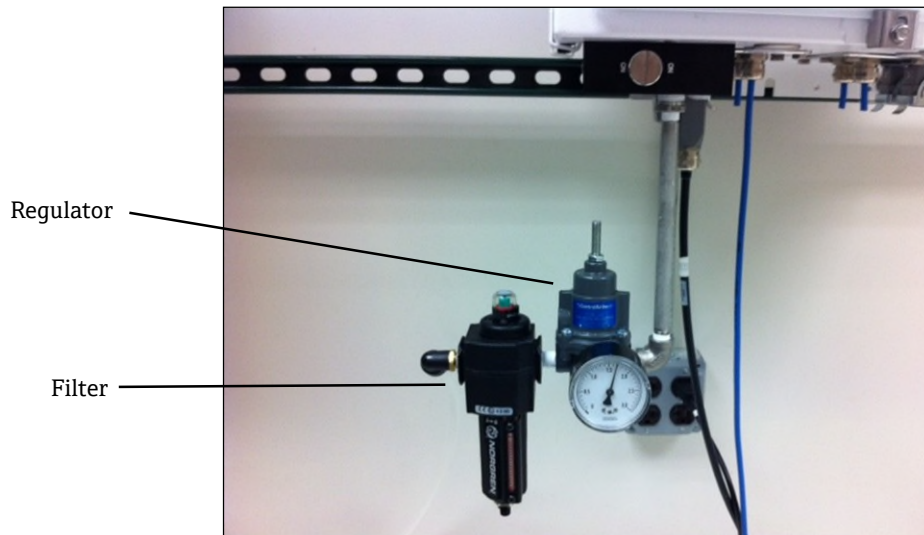


Figure 4. Purge regulator and filter assembly

NOTICE

- ▶ Commissioning of the system is required to validate that the protective gas supply system is functioning properly after initial installation. This procedure must be followed after initial installation and after any maintenance operation requiring removal or replacement of protective gas system components.
- ▶ The procedure must be followed after initial commissioning is complete and any operation requiring opening the enclosure is performed. This procedure must be followed prior to re-energizing the system.

2.7 Maintenance

The Raman Rxn5 must be located in a non hazardous zone in order for maintenance to safely take place. You should also make sure the Raman Rxn5 is shut down and cooled before attempting to open it to perform internal maintenance.

4 Safety-related specifications

The following are specifications for the Raman Rxn5 analyzer. Specifications may change without notice.

4.1 Electrical and communications

Item	Description
Input Voltage	100 – 240VAC, 50-60 Hz standard
Max Power	<300 Watts max (startup), 200 watts typical
Sound Level (from operator's perspective)	60.1 dB Max, A-weighted

Table 6. Electrical and communications

4.2 Physical

Item	Description
Operating Temperature (base unit)	-20 to 50 °C
Operating Temperature (cable and connector)	-40 to +80 °C
Operating Humidity	95% RH Non-condensing
Environmental Temp Range	-20 °C to 50 °C (solid state cooling – no vortex or external cooling)

Table 7. Physical

4.3 Purge air supply

Item	Description
Purge Air Maximum Temperature	40 °C
Purge Air Dewpoint	-40 °C
Purge Air Pressure Range	20-120 psi

Table 8. Purge air supply

www.addresses.endress.com
