



UNITED KINGDOM CONFORMITY ASSESSMENT

1 **UK TYPE EXAMINATION CERTIFICATE**

2 Equipment Intended for use in Potentially Explosive Atmospheres  
UKSI 2016:1107 (as amended) – Schedule 3A, Part 1

3 Certificate Number: **CSAE 23UKEX1058X** Issue: **1**

4 Product: **Rxn Series RAMAN Analyzers**

5 Manufacturer: **Endress+Hauser Optical Analysis, Inc.**

6 Address: **371 Parkland Plaza  
Ann Arbor  
Michigan 48103  
United States of America**

7 This product and any acceptable variation thereto is specified in the schedule to this certificate and the documents therein referred to.

8 CSA Group Testing UK Limited, Approved Body number 0518, in accordance with Regulation 42 of the Equipment and Protective Systems Intended for Use in Potentially Explosive Atmospheres Regulations 2016, UKSI 2016:1107 (as amended), certifies that this product has been found to comply with the Essential Health and Safety Requirements relating to the design and construction of products intended for use in potentially explosive atmospheres given in Schedule 1 of the Regulations. The examination and test results are recorded in the confidential reports listed in Section 14.2.

9 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

Except in respect of those requirements listed at Section 16 of the schedule to this certificate. The above standards may not appear on the UKAS Scope of Accreditation, but have been added through flexible scope of accreditation, which is available on request.

10 If the sign 'X' is placed after the certificate number, it indicates that the product is subject to Specific Conditions of Use identified in the schedule to this certificate.

11 This UK TYPE EXAMINATION CERTIFICATE relates only to the design and construction of the specified product. Further requirements of the Regulations apply to the manufacturing process and supply of this product. These are not covered by this certificate.

12 The marking of this product shall be in accordance with Regulation 41 and include the following:

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Ex [ia Ga] [op sh Gb] IIC

Name: Michelle Halliwell  
Title: Director of Operations



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#### 13 DESCRIPTION OF PRODUCT

Rxn2 and Rxn4 series of analyzers is designed to monitor, analyze, or optimize reaction chemistry in multiple vessels using the analytical technique of "Raman" spectroscopy. The equipment utilizes a computer controlled spectrometer and laser to accomplish this.

##### Model Similarity

The Rxn2 and Rxn4 models have the same internal components with only a slight difference in the enclosure. The Rxn4 has a rack-mount type enclosure, while the Rxn2 has a desk-top type enclosure. Rxn2 IoT and Rxn4 IoT utilize the same components as Rxn2 and Rxn4 respectively. The only difference is an added embedded controller, different mains switch and a different enclosure. The laser output is the same as on the Rxn2 and Rxn4.

##### General

The analyzer consists of a stamped aluminium enclosure which is mounted in a non-hazardous location and provides intrinsically safe and fibre-optical signals to up to 4 probes located in a hazardous area, therefore this equipment may be considered as "associated apparatus".

The power inlet is provided within the connection box so that power may be applied to the system when the enclosure is located in a non-hazardous location.

##### Main Enclosure Laser Output & Spectrometer Input

The laser beam within the enclosure is routed through various optical instruments before being made available at up to 4 bulkhead connectors contained within the connector box compartment. From here, fibre optic cables take the laser light to the process probe which is in contact with the process being monitored. Up to 4 probes may be connected.

##### Fibre Breakage Interlock

The fibre breakage interlock is also part of the analyser controls, and is formed around an IS repeater (GM Intl., D 1032 Q 4 channel switch / proximity detector repeater) with galvanic isolation of a rating of SIL2, the relay output of which is used to directly interrupt the laser electrical supply (Note: The IS barrier is not part of this work or of this certification as it has its own certification). This was considered as suitably reliable for EPL Gb, based on the SIL2 rating.

##### Laser Power Interlock

The input optical power to the probes is set by the analyser providing the laser source. The laser power is adjusted for each application so that the appropriate optical power level exits the probe. The power of the laser beam is variable under the control of a computer within the enclosure. A dual channel laser power monitoring circuit is provided that checks the power level produced by the laser and turns off the laser should the power exceed the pre-set maximum limit.

The output of the laser is routed through a beam splitter that divides the light between 2 photo detectors and the main output. The interlock circuitry provides 2 separate paths where the voltage generated by the current through the photo detectors is compared against a pre-set voltage. Provided that the generated voltage is lower than the pre-set voltage, and the corresponding to the laser power being lower than the limit, the power to the laser shall remain connected. Consequently, if either channel of the circuit detects that the power exceeds the limit, the laser is turned off.

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Status indicators are provided to assist in the detection of failures in the interlock circuit.

**Calibration Switching Module**

The Calibration Switching Module (CSM) provides for a method of monitoring the interlock status on up to 4 probes separately and provide shutdown of the optical power to individual probes, without shutting down the signal to the remaining probes where the interlock is not activated.

**Variation 1** - This variation introduced the following changes:

- i. Addition of SAFT battery for RXN2 and RXN4.
- ii. Update drawing to add path for purge tube for RXN4 enclosure.

**14 DESCRIPTIVE DOCUMENTS**

**14.1 Drawings**

Refer to Certificate Annexe.

**14.2 Associated Reports and Certificate History**

Issue	Date	Report number	Comment
0	17 April 2023	R80082515B	The release of the prime certificate.
1	12 October 2023	R80175907A	The introduction of Variation 1.

**15 SPECIFIC CONDITIONS OF USE (denoted by X after the certificate number)**

15.1 The fibre 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.

15.2 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.

15.3 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.

**16 ESSENTIAL HEALTH AND SAFETY REQUIREMENTS (REGULATIONS SCHEDULE 1)**

In addition to the Essential Health and Safety Requirements covered by the standards listed in Section 9, all other requirements are demonstrated in the relevant reports.

**17 PRODUCTION CONTROL**

17.1 Holders of this certificate are required to comply with production control requirements defined in Schedule 3A, as applicable, and CSA Group Testing UK Regulations for Certificate Holders.





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- 17.2 The laser power interlock and fibre-breakage interlock systems operation shall be verified.
- 17.3 Each unit will have a Dielectric Voltage Withstand test performed on it with a test voltage of 1400VAC for 2 seconds.
- 17.3 Each unit will have a Ground Bond/Continuity test performed on it.





## Certificate Annexe

Certificate Number: CSAE 23UKEX1058X  
Product: Rxn Series RAMAN Analyzers  
Manufacturer: Endress+Hauser Optical Analysis, Inc.

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### Issue 0

Drawing	Sheets	Rev.	Date (Stamp)	Title
2007871-101	1 of 1	R2	26 April 2021	Jumper, interlock
2009234	1 of 1	R6	04 Oct 2021	Block Diagram, laser and AC power interlocks
2011685	1 of 1	X3	26 April 2021	Rxn4, ATEX KIT
2011965	1 of 1	X7	26 April 2021	Integrated Invictus Interlock System
2012000	1 of 1	X2	26 April 2021	Rxn2, 4 CHANNEL ATEX KIT
2012006	1 of 1	X1	26 April 2021	Assembly, Rxn3L, ATEX KIT
2013443	1 of 1	X3	04 Oct 2022	Rxn Interlock System, Laser Power Interlock, GEN II CSM
4002017	1 to 5	X1	26 April 2021	Laser Power Control and safety interlock
4002019	1 to 6	X1	26 April 2021	Safety statement, Rxn Invictus Laser, IS Barrier, Interlock connector and probe system
2017750	1 of 1	X2	16 Sept 2022	Rear Panel
4002251	1 of 1	R4	22 Sep 22	Haz Label, Base Non-Haz Zone Schematic

### Issue 1

Drawing	Sheets	Rev.	Date (Stamp)	Title
4002251	1 to 2	02.23	04 Oct 23	Haz Label, Base Non-Haz Zone Schematic
2022055	1 to 2	B	04 Oct 23	ATEX Kit, RXN2 and RXN4 IoT

