



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 22UKEX1305X** Issue: **2**

4 Product: **Raman Probe**

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

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:

Refer to the schedule for the marking

Name: Michelle Halliwell
Title: Director of Operations



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Marking



II 1 G

Ex ia op is IIA or IIB or IIB + H2 or IIC T3 or T4 or T6 Ga (Rxn 20 Probe with ambient range -20°C to +40°C)

Ex ia op is IIA or IIB or IIB + H2 or IIC T3 or T4 Ga (Rxn 30, Rxn 40 and Rxn 41 Probe with ambient range -20°C to +70°C)

Ex ia op is IIA or IIB or IIB + H2 or IIC T3 or T4 or T6 Ga (Rxn 30, Rxn 40 and Rxn 41 Probe with ambient range -20°C to +65°C)

Gas Group and temperature class is to be marked on the probe using the following table:

Apparatus group	IIA		IIB Only		IIB+H2	IIC	
	T3	T4	T3	T4	T3	T4	T6
Temperature Class							
Temperature Class (°C)							
Power (mW) Rxn-41 Series Probe	150	35	35	35	35	35	15
Power (mW) Rxn-40 Series Probe	150	35	35	35	35	35	15
Power (mW) Rxn-30 Series without sintered filter	150	35	35	35	35	35	15
Power (mW) Rxn-30 Series with sintered filter (20 µm)	150	35	115	35	100	35	15
Power (mW) Rxn-20 Series Probe	150	35	35	35	35	35	15

Alternative markings:

When the probe is in contact with a process that is zoned as non-hazardous and the emitting optical power is greater than the limits set out in the above table the marking of the probe shall be:



II 2 G

Ex ia IIC T6 Gb (Rxn 20 Probe with ambient range -20°C to +40°C)

Ex ia IIC T4 Gb (Rxn 30, Rxn 40 and Rxn 41 Probe with ambient range -20°C to +70°C)

Ex ia IIC T6 Gb (Rxn 30, Rxn 40 and Rxn 41 Probe with ambient range -20°C to +65°C)

OR

When the probe window is submerged in a liquid sample and when the surrounding area will become hazardous only when the liquid is not present. Additional redundant interlocking is to be utilized to ensure that a sufficient liquid level is maintained as to only keep the system output on while adequately submerged (see Specific Conditions of Use). In this situation the marking of the probe shall be:



II 1 G

Ex ia IIA or IIB or IIB+H2 or IIC T3 or T4 or T6 Ga (Rxn 20 Probe with ambient range -20°C to +40°C)

Ex ia IIA or IIB or IIB+H2 or IIC T3 or T4 Ga (Rxn 30, Rxn 40 and Rxn 41 Probe with ambient range -20°C to +70°C)

Ex ia IIA or IIB or IIB+H2 or IIC T3 or T4 or T6 Ga (Rxn 30, Rxn 40 and Rxn 41 Probe with ambient range -20°C to +65°C)

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13 DESCRIPTION OF PRODUCT

The Endress+Hauser Optical Analysis, Inc. Raman probe system consists of the separate probes, their connecting cable and I.S. barrier. The construction includes a small connection board at the termination end of the cable, being populated only with trace paths and physical cable termination points. The barrier is to be mounted: either in a non-hazardous (unclassified) location, or in a hazardous location (Classified) if it is suitably protected by another protection technique.

The following components are critical to the operation and performance of this equipment:

I.S. Barrier: GM Intl., Cat. No. D 1032 Q is a 4-channel switch / proximity detector repeater, Ex ec [ia Ga] IIC T4 Gc/ [Ex ia Ga] IIC and II (1)G [Ex ia Ga] IIC; Rated: Tamb = -20°C to +60°C (Refer to drawing 4002396) (Note: The IS barrier, located in the base unit analyzer, provides intrinsically safe outputs to the probes.) Note: The I.S. Barrier is not part of this certification.

Raman Fiber Cable Part 2011635: Optical Cable Corporation, Type AWM, Group I/II, cCSAus, stranded copper conductors imbedded in cable with optical fibers, Rated: 30 V max., 24 AWG copper conductors, 80°C, maximum length: 258,920 feet. Note: The Raman Fiber Cable is not part of this certification.

Probes: The following are stainless steel liquid probes, leak and burst tested, with the resistor mounted in series with the LED (simple apparatus from an intrinsically safe perspective). The LED's purpose is to provide indication of whether the conductors/fibre is energized / cut or not. Refer to probe drawings for examples.

The Rxn-41 and Rxn-40 Raman Probes are for Process Control and allow direct installation into reaction vessels or process streams.

Rxn-41 Series Probe: (Refer to Drawing 2009483)

LED: Leecraft, L75R-R2-2211, mounted with 6-inch wire leads CSA/UL rated for 105°C, Red, Rated: 2 Vdc

Through-hole Metal Film Resistor: Dale, SFR25 series
(Alternate: Resistor): Yageo, MFR-25 series

Rxn-40 Series Probe: (Refer to Drawing 2013340)

LED: Lumex, SSL-LXA228SRC-TR11, Rated: 5V, 60 mW
Surface-mount Thick Metal Film Resistor: Yageo, RC0805
(Alternate: Resistor): Rohm, MCR10 0805
(Alternate: Resistor): Panasonic ERJ60805

The Rxn-30 Probe has been designed to meet sensing needs of gas-phase chemistries. A sintered filter may be included to exclude dust particles greater than 20µm in diameter, permitting an increase in optical power.

Rxn-30 Series Probe: (Refer to Drawing 2013339)

LED: Lumex, SSL-LXA228SRC-TR11, Rated: 5V, 60 mW
Surface-mount Thick Metal Film Resistor: Yageo, RC0805
(Alternate: Resistor): Rohm, MCR10 0805
(Alternate: Resistor): Panasonic ERJ60805

The Rxn-20 Probe has been designed to meet sensing needs requiring a large spot size.

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The optical output of the laser within the analyser is connected by a fibre optical cable with fibre breakage detection mechanism to the Probe which is in contact with the process. The laser power is controlled by the analyzer which incorporates the Endress+Hauser Optical Analysis, Inc. Integrated Invictus Interlock System. The laser power provided by the analyzer is adjusted and subsequently monitored to ensure that the laser power exiting the probe is within the following limits:

Apparatus Group	IIA		IIB Only		IIB + H2	IIC	
	T3	T4	T3	T4	T3	T4	T6
Temperature Class							
Temperature Class (°C)							
Power (mW) Rxn-41 Series Probe	150	35	35	35	35	35	15
Power (mW) Rxn-40 Series Probe	150	35	35	35	35	35	15
Power (mW) Rxn-30 Series without sintered filter	150	35	35	35	35	35	15
Power (mW) Rxn-30 Series with sintered filter (20 µm)	150	35	115	35	100	35	15
Power (mW) Rxn-20 Series Probe	150	35	35	35	35	35	15

Above table includes the maximum optical power to be supplied for the probe (optical connector)

The maximum optical power is supplied to the probe by an external controller that is not covered under this certificate. The final installation shall be subjected to acceptance of local authority having jurisdiction.

The tabulated power levels refer to surface areas not exceeding 400mm².

Ambient temperature rating range of the probes:

- 20°C to +40°C (Rxn 20 series)
- 20°C to +70°C (Rxn 30, 40 and 41 series Temp class T4)
- 20°C to +70°C (Rxn 30, 40 and 41 series Temp class T6)

Intrinsic safety parameters are as follows:

The probe IS input parameters for the fibre breakage loop are as follows:

Ui = 9.6 V, Ii = 10 mA, Pi = 24 mW, Ci = 0, Li = 0

A temperature measurement RTD (Resistance Temperature Detector) may be provided. This device is in thermal contact with the probe case adjacent to the sapphire window.

The probe IS input parameters for the temperature measurement circuit are as follows:

Ui = 10.8 V, Ii = 9 mA, Pi = 24 mW, Ci = 0, Li = 0

Variation 1 - This variation introduced the following change:

- i. Update drawing 4002396 to change units of length back to the initial correct units of "foot" rather than "meter".

Variation 2 - This variation introduced the following change:

- i. Modified ambient range for Rxn 30, 40 and 41 series, the product description and marking was amended accordingly.

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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	R80082515A	The release of the prime certificate.
1	28 July 2023	R80176242A	The introduction of Variation 1.
2	07 May 2024	R80204198A	The introduction of Variation 2.

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

- 15.1 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.
- 15.2 The fibre optic cable shall be installed in a manner such that the cable is not subjected to strain or pulling at the entry of the optical cable into to the probe assembly.
- 15.3 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 (for EPL Ga / Category 1G) a fault tolerance of 2. Where the EPL required for the area of installation is lower than Ga / Category 1G, the reliability of the control mechanism may also be reduced. 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, commensurate with the required EPL.
- 15.4 When the probe is manufactured from Titanium, the probe shall be installed so that it cannot be subjected to impact or friction.
- 15.5 Rxn-20 probe focusing optics must not reduce the beam diameter below 3.4mm.
- 15.6 Laser power interlocks must be set for the Rxn-20 probe without focusing optics installed.

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



Certificate Annexe

Certificate Number: CSAE 22UKEX1305X
Product: Raman Probe
Manufacturer: Endress+Hauser Optical Analysis, Inc.

Issue 0

Drawing	Sheets	Rev.	Date (Stamp)	Title
2007871-101	1 of 1	R2	04 Mar 21	Jumper, Interlock
2009483	1 of 2	X3	04 Mar 21	Probe GA
2010986	1 of 1	X2	04 Mar 21	Assembly, Probe Type ER1082, ATEX
2011965	1 of 1	X7	04 Mar 21	Integrated Invictus Interlock System
2013259	1 of 1	X4	04 Mar 21	Schedule Drawing, ATEX PhAT Probe
2013339	1 of 1	X1	04 Mar 21	Schedule Drawing, Gas Phase Probe (AirHead)
2013340	1 of 1	X3	04 Mar 21	Schedule Drawing, WetHead-Mini-Max
4000188	1 to 2	R3	04 Mar 21	ATEX justification for Pilot probe type E temperature sensor
4002017	1 to 5	X1	04 Mar 21	Laser Power control and safety interlock
4002019	1 to 6	X1	04 Mar 21	Safety statement, RXN Invictus Laser, IS Barrier, Interlock connector and probe system.
2011635	1 of 1	X5	14 Mar 22	Composite Fiber cable, 2 Fiber 2 Wire, 103/125 UM
4002396	1 of 1	X5	05 Aug 22	Hazardous Area Installation Diagram
2011127	1 of 1	X2	04 Mar 21	Outline Drawing Engineering 1.00" Pilot-E
4002252	1 to 2	R4	23 Sept 22	Hazardous Location label, Probes Schematic

Issue 1

Drawing	Sheets	Rev.	Date (Stamp)	Title
4002396	1 of 1	X6	16 Jun 23	Hazardous Area Installation Diagram

Issue 2

Drawing	Sheets	Rev.	Date (Stamp)	Title
4002252	1 to 3	01.24	25 Apr 24	Hazardous Location Label Requirements for Probes

