



1 **EU-TYPE EXAMINATION CERTIFICATE**

2 Equipment intended for use in Potentially Explosive Atmospheres Directive 2014/34/EU

3 Certificate Number: **CSANe 21ATEX2126X** Issue: **2**

4 Equipment: **Raman Probe**

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

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

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

8 CSA Group Netherlands B.V., notified body number 2813 in accordance with Articles 17 and 21 of Directive 2014/34/EU of the European Parliament and of the Council, dated 26 February 2014, certifies that this equipment has been found to comply with the Essential Health and Safety Requirements relating to the design and construction of equipment intended for use in potentially explosive atmospheres given in Annex II to the Directive.

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, with the exception of those listed in the schedule to this certificate, has been assured by compliance with the following documents:

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

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

11 This EU-Type Examination Certificate relates only to the design and construction of the specified equipment. If applicable, further requirements of this Directive apply to the manufacture and supply of this equipment.

12 The marking of the equipment shall include the following:

Refer to Schedule



Signed: M 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 EQUIPMENT

The Endress+Hauser Optical Analysis, Inc. (formerly Kaiser Optical Systems, 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.

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

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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 400mm<sup>2</sup>.

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, li = 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, li = 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	18 August 2022	R80069335A	The release of the prime certificate.
1	28 July 2023	R80176240A	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 OF ANNEX II (EHSRs)

The relevant EHSRs that are not addressed by the standards listed in this certificate have been identified and individually assessed in the reports listed in Section 14.2.

#### 17 CONDITIONS OF MANUFACTURE

- 17.1 The use of this certificate is subject to the Regulations Applicable to Holders of CSA Group Netherlands B.V. certificates.
- 17.2 Holders of EU-Type Examination Certificates are required to comply with the conformity to type requirements defined in Article 13 of Directive 2014/34/EU.

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# Certificate Annexe



Certificate Number: CSANe 21ATEX2126X  
Equipment: Raman Probe  
Applicant: 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.
4002252	1 to 2	R3	09 Aug 22	ATEX label, Probes Schematic
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	X1	04 Mar 21	Outline Drawing Engineering 1.00" Pilot-E

## 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

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