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 23UKEX1059X** Issue: **1**

4 Product: **Optograf Analyser Raman RXN5 Series Analyser**

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 60079-2: 2015	EN 60079-11: 2012
EN IEC 60079-7: 2015 +A1:2018	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:

II 3(2)(1) G
Ex ec ic [ia Ga] [op sh Gb] pzc IIC T4 Gc
Ta = -20°C to +50°C

Name: M Halliwell
Title: Director of Operations

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SCHEDULE

UK TYPE EXAMINATION CERTIFICATE

CSAE 23UKEX1059X
Issue 1

13 **DESCRIPTION OF PRODUCT**

The Optograf/ Rxn5 analyser 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.

General

The Optograf analyser (which may also be referred to as "Rxn5" in addition to or as an alternative to "Optograph") consists of a steel enclosure, painted mild steel or stainless steel, which is mounted in a Zone 2 hazardous location and provides intrinsically safe and fiber-optical signals up to 4 probes located in either Zone 1 or Zone 0 hazardous areas.

The system enclosure is protected by purge and pressurization, provided by a certified [pzc] purging controller ("CYCLOPS Z" Purge Indicator) manufactured by Purge Solutions, Inc. (not part of this certification).

The purged and pressurized enclosure includes a TFT display touchscreen mounted behind a toughened glass window.

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.

The laser power level is controlled by the computer within the pressurized enclosure and monitored by the power interlock circuitry. This arrangement is 2 fault tolerant and suitable for Category 1 applications / EPL Gb.

Fibre Breakage Interlock

A special condition of safe use is listed on the certificate that the fibre optic cable must be installed taking into account the minimum bend radius specified by the cable manufacturer.

Cutting the wires or shorting them together is detected by an IS Galvanic Isolator (GM International Galvanic Isolator D1032Q – which is not part of this certification as it has its own certification) within the pressurized enclosure, which provides a volt-free relay contact for each probe to the laser power interlock mechanism, which will turn the laser off. Either a single, 4 channel isolator may be used, or up to 2 dual channel units, depending upon the system specification. The output contacts of the isolator's output channel are connected to the interlock input of the respective laser for that channel.

The arrangement for detective fibre breakage is single fault tolerant and considered to be acceptable for category 2 applications, with the exception of the Galvanic Isolator providing the IS signal to the monitoring loop.

Laser Power Interlock

The laser power is adjusted for each application so that the appropriate optical power level exits the probe. Because the length of the fibre optic cable is variable, the power input into the fibre will be higher than the power that exits from the probe.

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The laser power is set by the laser module and 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 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.

Variation 1 - This variation introduced the following changes:

i. Update Rxn5 label by changing minimum overpressure rating from 0.4″ to 0.2″ water column.
ii. Change adhesive label material from "3M-9502″ to "3M-9472LE″.

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	R80082515C	The release of the prime certificate.
1	23 November 2023	R80186982A	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 EPL Ga equipment or a fault tolerance of 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.

15.3 The user shall purge the enclosure prior to start-up and upon loss of pressurization in accordance with the instructions marks on the Optograf enclosure. An appropriate means of isolation shall be provided by the user, appropriately certified for the area of use and correctly installed.

15.4 Parts of the enclosure may represent an electrostatic risk. Refer to the manufacturer's instructions.

15.5 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.

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SCHEDULE

UK TYPE EXAMINATION CERTIFICATE **CSAE 23UKEX1059X**
Issue 1

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

17.2 The pressurized enclosure shall be subject to the routine tests:

- Leakage test
- Functional test of the pressurization controls and purge timer

17.3 The laser power interlock and fibre-breakage interlock systems operation shall be verified.

17.4 The equipment covered by this certificate incorporates previously certified devices; it is therefore the responsibility of the manufacturer to continually monitor the status of the certifications of the following Ex equipment:

- GM Galvanic Isolator (D1032Q) (IECEx BVS 07.0027X)
- Purge Solutions CYCLOPS Z- Purge Indicator (IECEx EXV 19.0006X)
- Hummel AG Cable Gland (IECEx BVS 07.0019X)

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Certificate Annexe

Certificate Number: **CSAE 23UKEX1059X**

Product: **Optograf Analyser Raman RXN5 Series Analyser**

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

Issue 0

Drawing	Sheets	Rev.	Date (Stamp)	Title
2011827	1 to 3	X11	02 Aug 22	Assembly, base unit Optograf
2011828	1 of 1	X6	02 Aug 22	Purge Diagram, Optograf
2011829	1 of 1	X4	02 Aug 22	Block Diagram, Optograf Fan Unit
4002017	1 to 5	X1	02 Aug 22	Laser Power control and safety interlock
4002019	1 to 6	X1	02 Aug 22	Safety statement, Rxn Invictus Laser, IS Barrier, Interlock connector and probe system
2011376	1 of 1	X3	02 Aug 22	Block Diagram, Thermal Interlock System, Optograf
2011881	1 of 1	X3	02 Aug 22	Block Diagram, Laser Interlock System, Optograf
2017540	1 of 1	X1	02 Aug 22	Schematic, Invictus Laser with Laser Power Interlock, Alt Scheme
4002315	1 to 2	R6	06 March 23	Label Requirements Optograf Base in Haz-zone Schematic
BA02179CEN_0121	1 to 116	0121	16 March 23	Optograf ™ Analyzer Operations Manual

Issue 1

Drawing	Sheets	Rev.	Date (Stamp)	Title
4002315	1 to 2	01.23	21 Nov 23	Label Requirements Optograf Base in Haz-Zone Schematic