



1. **EC-TYPE EXAMINATION CERTIFICATE**

2. **Equipment or Protective System Intended for use in Potentially Explosive Atmospheres Directive 94/9/EC**

3. EC-Type Examination Certificate Number: **ITS10ATEX17085X**

4. Equipment or Protective System: **Raman Probes**

5. Manufacturer: **KAISER OPTICAL SYSTEMS, INC.**

6. Address: **371 Parkland Plaza
Ann Arbor
MI 48103, USA**

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

8. Intertek Testing and Certification Limited, notified body number 0359 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.

The examination and test results are recorded in confidential Intertek Report Ref 10044753 Issue 2 dated July 2013.

9. Compliance with the Essential Health and Safety Requirements has been assured by compliance with EN 60079-0:2009, EN 60079-11:2007, EN 6079-26:2007 and EN 60079-28:2007 except in respect of those requirements referred to at item 18 of the Schedule.

10. If the sign "X" is placed after the certificate number, it indicates that the equipment or protective system is subject to special conditions for safe use specified in the schedule to this certificate.


11. This EC Type examination certificate relates only to the design, examination and tests of the specified equipment or protective system in accordance to the directive 94/9/EC. Further requirements of the Directive apply to the manufacturing process and supply of this equipment or protective system. These are not covered by this certificate.

12. The marking of the equipment or protective system shall include the following:-



II 2/1 G Ex ia op is IIA or IIB or IIB + H2 or IIC T3 or T4 or T6 Ga

For alternative markings, refer to schedule.


V K Varna
Certification Officer
26 July 2013

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Registered No 3272281 Registered Office: Academy Place, 1-9 Brook Street, Brentwood, Essex, CM14 5NQ, UK

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13. SCHEDULE

14. EC-TYPE EXAMINATION CERTIFICATE NUMBER ITS10ATEX17079X

15. DESCRIPTION OF EQUIPMENT OR PROTECTIVE SYSTEM

The Kaiser Optical Systems, Inc. Raman Probes comprise 4 probe types:

The Pilot and WetHead Raman Probes are for Process Control and allow direct installation into reaction vessels or process streams.

The AirHead Probe has been designed to meet the 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.

The PhAT 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 the **RXN3 Hazardous Location Analyser**, certificate number ITS10ATEX17079X or **RXN2, RXN3 or RXN4 Analyser**, certificate number ITS10ATEX17080X or similar analyzer incorporating the appropriate safety controls. 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 + H ₂	IIC	
	T3	T4	T3	T4	T3	T4	T6
Temperature Class	T3	T4	T3	T4	T3	T4	T6
Temperature Class (°C)	<200	<135	<200	<135	<200	<135	<85
Power (mW) Pilot Series Probe	150	35	35	35	35	35	15
Power (mW) WetHead Series Probe	150	35	35	35	35	35	15
Power (mW) AirHead Series without sintered filter.	150	35	35	35	35	35	15
Power (mW) AirHead Series with sintered filter (20 µm).	150	35	125	35	100	35	15
Irradiance (mW/mm ²)	5/20*	5	5/15*	5	5/12*	5	5
Power (mW) PhAT Series Probe	152	38	38	38	38	38	15
Irradiance(mW/mm ²) PhAT Series Probe	20	20	5	5	5	5	5

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

*For irradiated areas greater than 30mm² where combustible materials may intercept the beam, the 5mW/mm² limit applies.

Alternatively, when the probe window is submerged in liquid with safety interlock via level sensing or similar means, the probe may be marked:

⊕ II 2/1 G, Ex ia op sh IIA or IIB or IIC T6 Ga

Or, where the probe window is not in contact with a hazardous area:

⊕ II 2 G, Ex ia IIC T6 Gb

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15. DESCRIPTION OF EQUIPMENT OR PROTECTIVE SYSTEM cont...

The probe may incorporate an RTD temperature sensor.

Intrinsic safety parameters are as follows:

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

$U_i = 9.6 \text{ V}$
 $I_i = 10 \text{ mA}$
 $P_i = 24 \text{ mW}$
 $C_i = 0$
 $L_i = 0$

A temperature measurement RTD 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:

$U_i = 10.8 \text{ V}$
 $I_i = 9 \text{ mA}$
 $P_i = 24 \text{ mW}$
 $C_i = 0$
 $L_i = 0$

16. REPORT NUMBER

Intertek Report Ref 10044753 Issue 2 dated July 2013.

17. SPECIAL CONDITIONS FOR SAFE USE

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.
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 / user to ensure that an appropriate mechanism is in place.
3. When the probe is manufactured from Titanium, the probe shall be installed so that it cannot be subjected to impact or friction.
4. PhAT probe focusing optics must not reduce the beam diameter below 3.4mm.
5. Laser power interlocks must be set for the PhAT probe without focusing optics installed.

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18. ESSENTIAL HEALTH AND SAFETY REQUIREMENTS (EHSR'S)

The relevant EHSR's have been identified and assessed in Intertek Report Ref 10044753 Issue 2 dated July 2013.

19. DRAWINGS

Drawing no	Sheets	Title	REV
2009483	1	Probe GA	R2
2007871-101	1	Jumper, interlock	R2
2010986	1	ASSEMBLY, PROBE TYPE ER1082, ATEX	X2
4000188	2	ATEX justification for Pilot probe type E temperature sensor	R3
4001944	1	Liquid Phase probe hazardous area requirements, base unit in non-hazardous zone.	X3
4001936	1	Gas Phase probe hazardous area requirements, base unit in non-hazardous zone.	X3
2011965	1	Integrated Invictus Interlock System	X7
4002017	5	Laser Power control and safety interlock	X1
4002019	6	Safety statement, RXN Invictus Laser, IS barrier, Interlock connector and probe system.	X1
4002252	2	ATEX Label, Probes Schematic	R1
2013259	1	Schedule Drawing, ATEX PhAT Probe	X3

20. REVISIONS

September 2010

Issue 1 - Original certificate issue.

July 2013

Issue 2 - Introduction of the PhAT probe. (G101150319)
Update to interlock system

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