element

Final IECEX And ATEX Report On Equipment For Use In Potentially Explosive Atmospheres

For

FLIR Systems AB

On

GFx320 camera

Report No. GB/EMT/ExTR16.0015/00 (TRA-029115-33-00A)

02 December 2016

Element Materials Technology Warwick Ltd.
Registered in England and Wales. Registered Office: 5 Fleet Place, London, EC4M 7RD
Company Reg No. 02536659

ilac-MRA

UKAS TESTING
0026

IECEx TEST REPORT COVER

ExTR Reference Number..... :	GB/EMT/ExTR16.0015/00
ExTR Free Reference Number ..... :	TRA-029115-33-00A
Compiled by + signature (ExTL) .... :	A Chandrahasan
Reviewed by + signature (ExTL).... :	D Lyden
Approved by + signature (ExCB) ... :	B Trafford
Date of issue ..... :	2016-12-02
Ex Testing Laboratory (ExTL)..... :	Element Materials Technology
Address ..... :	Unit 1, Pendle Place, Skelmersdale, West Lancashire, WN8 9PN, United Kingdom
Ex Certification Body (ExCB)..... :	Element Materials Technology
Address ..... :	Unit 1, Pendle Place, Skelmersdale, West Lancashire, WN8 9PN, United Kingdom
Applicant's name..... :	FLIR SYSTEMS AB
Address ..... :	Antennvägen 6, SE-187 15 Täby, Sweden
Standards associated with this ExTR package ..... :	IEC 60079-0:2011, IEC 60079-11:2011, IEC 60079-15:2010, IEC 60079-28:2015 EN 60079-0:2012/A11:2013, EN 60079-11:2012, EN 60079-15:2010, EN 60079-28:2015
Clauses considered ..... :	All clauses considered for IEC 60079-0:2011, IEC 60079-11:2011, IEC 60079-28:2015 IEC 60079-15:2010 Clauses: 1,2,3,4,19,22,24,25.
Related Amendments, Corrigenda or ISHs ..... :	N/A
Test item description..... :	Optical Gas Imaging Camera
Model/type reference ..... :	GFx320
Code (e.g. Ex _ II_ T_)..... :	Ex ic nC op is IIC T4 Gc ⟨Ex⟩ II 3 G
Rating..... :	8.4 V_{max}, 7.2 V_{nom} (2s2p battery pack)

ExTR Package Contents
Assembled ExTR documents and Additional reference material:
IECEx Test Report Cover
IECEx Test Report: IEC 60079-0:2011 (Edition 6.0)
IECEx Test Report: IEC 60079-11:2011 (Edition 6.0)
IECEx Test Report Addendum: IEC 60079-15:2010 (Edition 4.0)
IECEx Test Report Addendum: IEC 60079-28:2015 (Edition 2.0)
IECEx Test Report of National Differences: EU/EEA differences in relation to ATEX directive 2014/34/EU.
Attachment 1: Photographs
Attachment 2: Test equipment used
Attachment 3: IECEx ISH/ Decision Sheets applied

ExTR Package Contents
Assembled ExTR documents and Additional reference material:
Attachment 4: ATEX Directive (2014/34/EU) - Essential Health and Safety Requirements list

Manufacturer's name .....:	FLIR SYSTEMS AB
Address .....:	Antennvägen 6, SE-187 15 Täby, Sweden
Trademark.....:	FLIR
Certificate No. (optional) .....:	IECEx EMT 16.0016X (IECEx) EMT16ATEX0032X (ATEX)

Particulars: Test item vs. Test requirements

Classification of installation and use ..... :	Hand-held
Ingress protection .....:	IP20
Rated ambient temperature range (°C).....:	-20º to +40ºC

General remarks:

The test results presented in this ExTR package relate only to the item or product tested.

- "(see Attachment #)" refers to additional information appended to the ExTR package.
- "(see appended table)" refers to a table appended to the ExTR package.
- Throughout this ExTR package, a point is used as the decimal separator.
- Throughout this report the date format yyyy-mm-dd is used
- Where the term "N/A" appears in any part of an ExTR package, it indicates that the associated issue was considered "Not applicable" to the involved evaluation.
- In accordance with IECEx 02, a Receiving ExCB may request a sample of the Ex equipment and copies of the documentation referred to in an ExTR Cover.

Abbreviations used within this report:

- OGI – Optical Gas Imaging
- ITAR – International Traffic in Arms Regulations
- LED – Light-emitting diode
- OLED – Organic Light-emitting diode
- IDCA – Infrared Detector Cooler Assembly

The technical content of this ExTR package shall not be reproduced except in full without the written approval of the Issuing ExCB and ExTL.

General remarks pertaining to this programme of test and assessment are detailed at the end of each section of the ExTR.

Photographs of the Test Item are contained in are contained in the Attachments appended within this report.

A list of test equipment used is contained in the Attachments appended within this report.

A list of ExTAG decision sheets (DS) and TC31 Interpretation sheets (I-SH) used in the conduct of the tests and assessments within this ExTR package is given in the Attachments appended to this report.

ATEX only – a list of Essential Health and Safety Requirements from the ATEX directive is contained in the Attachments appended within this report.

Test and assessment dates: 2016-05-20 to 2016-10-28.

The equipment tested complied with the requirements of the test standards listed on page 1 of this report. The manufacturers documentation provided in support of this application satisfied the requirement of the relevant product evaluation annexes of the ATEX directive.

General product information:

The FLIR GFx320 is an IR camera designed for optical gas imaging (OGI) for Zone 2 hazardous area applications. The camera has a LCD flip-out display, OLED viewfinder, visual camera to complement the IR image, GPS module, LASER pointer and LED lighting. The equipment is powered by a rechargeable Li-ion battery pack. The equipment enclosure is metallic, however it has an anti static silicone sleeving in black colour. There are two lens configurations which are 14.5° fixed lens and 24° fixed lens with differing lens sizes, but have identical electronic and mechanical assemblies.

Compliance strategy:

The FLIR GFx320 Optical Gas Imaging Camera consists of 13 printed circuit boards and including 6 different electronic modules (6 'bought-in' components of the camera that are not manufactured by FLIR AB, Sweden). The 6 modules are the GPS module, LASER module, Visual Camera module, Viewfinder module, the LCD Display board and the IDCA component. The IDCA component is manufactured by FLIR Inc. in Santa Barbara, USA. All other internal boards are manufactured by FLIR Sweden.

The equipment is intended for gas environment applications only. Protection concept 'intrinsic safety', level of protection "ic" has been applied throughout majority of electronics of the camera for use in Zone 2 hazardous environments.

However sealed device 'nC' (IEC/EN 60079-15) compliance route has been applied to one of the modules called IDCA module, or known as Infrared detector cooler assembly. The IDCA module is ITAR classified, but its associated electronics that interface within it are not part of ITAR classification and has been covered within this report.

The LASER optical device complies with the requirements of IEC 60825-1: 2014 (Third Edition) & EN 60825-1:2014 with maximum output power limited to 1mW. This is based on IEC 60825-1 report issued by Intertek, report reference number 1611196STO-001, date of issue: 2016-06-29. Wavelength of LASER is 650nm, colour: Red Laser Model. See IEC 60079-28:2015 section of this ExTR for details.

IDCA Cooling Assembly:

The assembly is a metallic enclosure that is completely welded except for wire cable entries and considered as a sealed device. It will be subject to tests for sealed devices in IEC/EN 60079-15 and hence falls under the 'nC' concept.

The module has been assessed and tested as a 'sealed device' in accordance with IEC 60079-15 'nC' by MET Labs. Inc in the USA, the tests and assessment results of which are included as part of this report (partial application of IEC 60079-15, clause).

Sparking/Arcing parts:

All sparking/arcing parts (identified as all the buttons and joysticks on the camera) assessed under the protection concept 'ic' are resistively limited therefore meeting the requirements for resistive spark ignition in accordance with Annex A of IEC/EN 60079-11.

The following modules are considered as 'bulk fault' or 'nonincendive' circuits:

Non-incendive circuits
GPS module
LASER module
Visual camera
Viewfinder module

The above circuits are considered as 'bulk fault' within their respective circuitry, and has been assessed in accordance with Annex A of IEC 60079-11, therefore deemed as non-incendive circuits and contains no infallible components or separations.

All the other internal PCBs designed by FLIR and all components mounted on the boards are 'rated' in accordance with clause 7.1 in IEC 60079-11, hence making the components infallible for Level of Protection 'ic'. All PCBs are conformal coated on both sides in accordance with clause 6.1.2.3 b) in IEC 60079-11 (Apparatus complying with Annex F).

The camera is powered by a rechargeable battery pack consisting of 4 Li-ion type 3.6 Vd.c. cell, manufactured by Samsung SDI CO LTD, P/N ICR18650-22F (UL file number: MH21015). The cells can also be re-branded as VARTA, model no. LIC18650-22FC.

The camera equipment also consists of a coin-cell which is of Li-ion type to power the CPU real-time-clock (RTC) circuit.

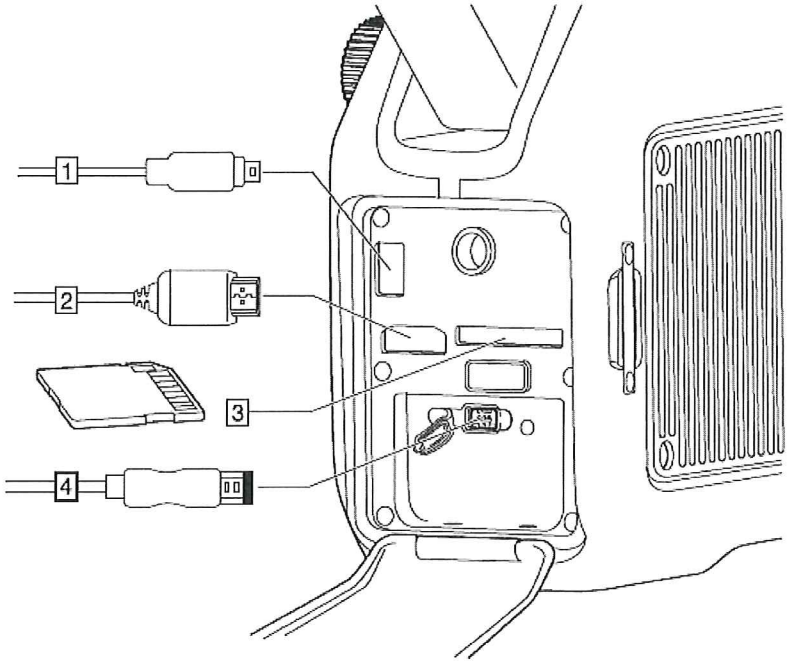
UL file numbers for the types of coin-cells that can be used in the camera:

a) Panasonic ML621: MH12210
b) FDK ML621 (previously Sanyo): MH13421

The camera is not intended to be charged in hazardous area, and also the battery pack is not intended to be removed in hazardous area. The battery pack is intended to be removed from the camera and charged only in safe area using unique charger manufactured by Ten Pao industrial Co. Ltd., IECEE CB reference certificate no. JPTUV-035588-M1 (provided by TUV Rheinland Japan Ltd.).

The equipment consists of the following external interfaces (not permitted for use in hazardous areas):

1. USB mini-B
2. HDMI
3. SD-CARD (or SDHC)
4. Charger (battery charge port)



The user shall only connect ATEX/IECEx approved intrinsically safe equipment to the USB mini-B and HDMI ports. The specific battery charger compatible to charge the battery pack of this camera equipment is a controlled component that is approved to IEC/EN 60950-1.

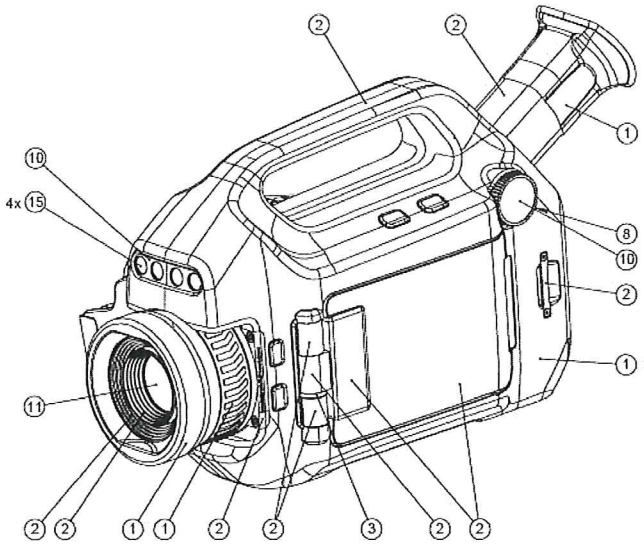
For charging battery pack, only the following charger must be used – Model number: S040EM1200300 manufactured by Ten Pao industrial Co. Ltd., IECEE CB reference certificate no. JPTUV-035588-M1

(provided by TUV Rheinland Japan Ltd.). The charger and battery packs are provided by FLIR with the camera equipment, battery pack provided by FLIR, part number T199183 with this equipment.

The external connectors cannot be accessed in hazardous area. It requires removal of back cover plate that attaches to the body of the camera equipment. There are various special conditions of safe use that have been prescribed with regards to external connection facilities.

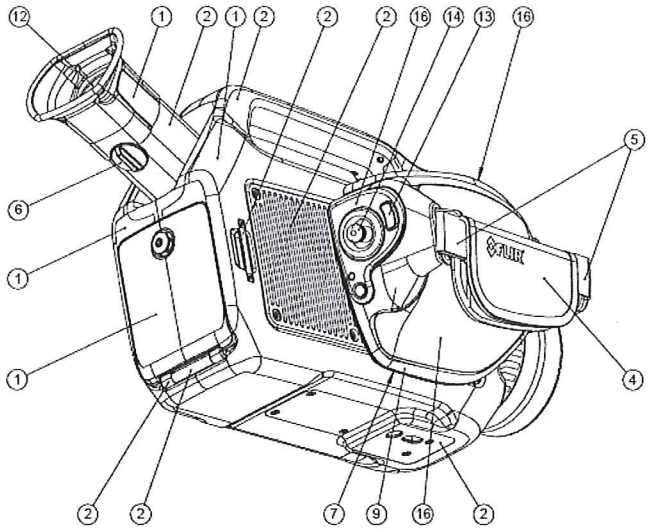
Physical construction

The enclosure of the camera is fully metallic, parts made of anodised aluminium, stainless steel and magnesium, and has an IP rating of minimum IP20. An anti-static silicone cover is used to protect the outer metallic enclosure from impacts and drops.

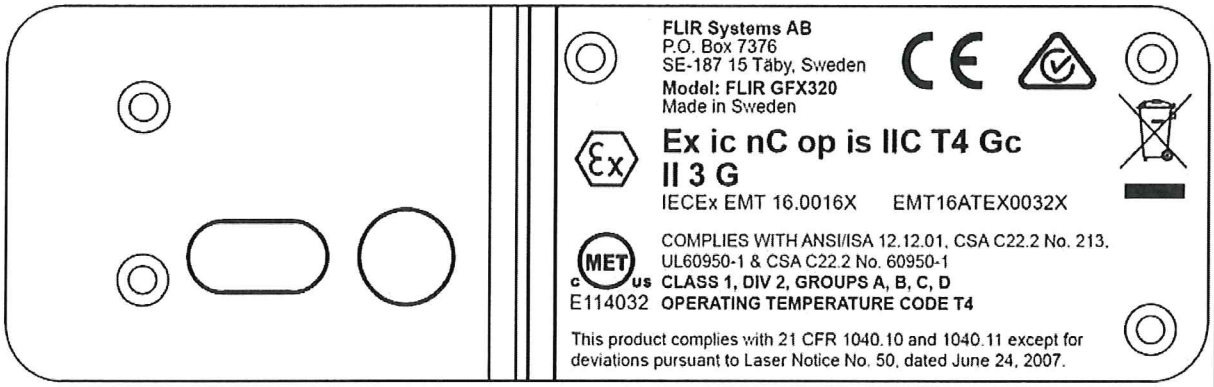


Nbr	Material description
1	Silicone, anti-static
2	Anodised aluminium
3	Stainless steel
4	Leather
5	Textile, anti-static
6	POM
7	Magnesium, coated
8	PA-6
9	PC-ABS, anti-static
10	PC
11	Si
12	PMMA
13	Silicone
14	PC-ABS
15	Glass
16	TPE, anti-static

All screws: Stainless steel



Copy of Marking Plate:



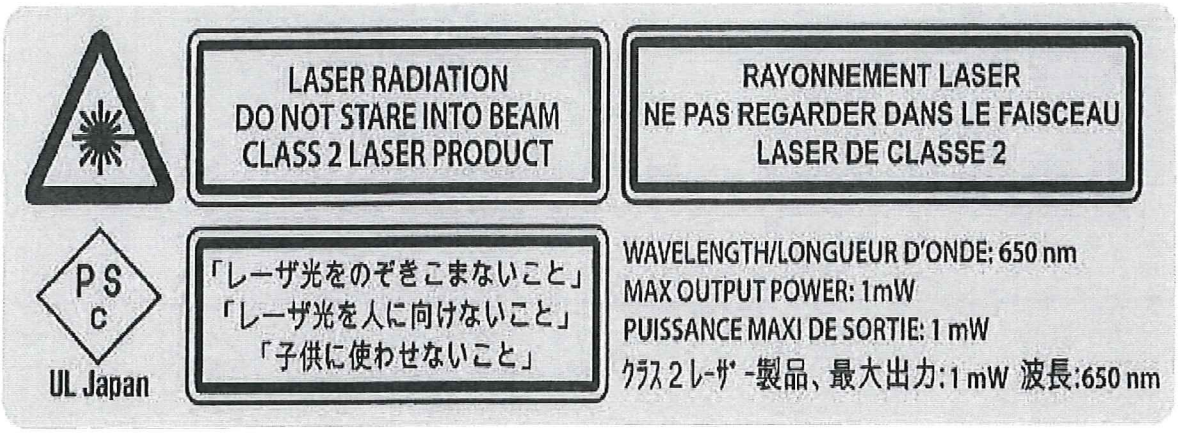
Entity parameters label (behind back cover plate on the rear of camera):

Table of entity parameters			Battery pack charge port
	USB mini-B	HDMI	
U_i	6 V	4 V	-
I_i	5 mA	25 µA	-
U_m	-	-	100 V

WARNING: Please read the user's manual carefully before using this equipment.

ATTENTION: Lisez le manuel d'utilisation attentivement avant d'utiliser cet équipement.

LASER label:



Battery pack Label:

Details regarding 'trade agent' / 'local assembler' application in accordance with OD 203:

Not applicable.

In accordance with OD 024, testing not fully performed by ExTL staff at the above ExTL address:

Thermal rise test was performed on the camera equipment at FLIR, Sweden on 2016-07-07 by Element Materials Technology Project Engineer.

The LASER optical device complies with the requirements of IEC 60825-1 with maximum output power limited to 1mW. This is based on IEC 60825-1 report issued by Intertek Semko AB, Torshamnsgatan 43, Box 1103, SE-164 22 Kista, SWEDEN, report reference number 1611196STO-001, date of issue: 2016-06-29.

The sealed device tests for the IDCA component within the GFx320 was performed by MET Laboratories, Inc., 13501 McCallen Pass, Austin, Texas 78753, in accordance with clause 22.5 in IEC/EN 60079-15:2010 between 2016-05-20 and 2016-06-28.

National differences considered as part of this evaluation:

EU/EEA differences in relation to related EN standards ATEX directive 2014/34/EU.

"Specific Conditions of Use" / "Schedule of Limitations":

1. Connection to the USB mini-B, HDMI and external power/charger shall NOT be made in hazardous area. The equipment must be removed to the safe area before any of these connections are made.
2. Access and removal to SD-CARD is strictly prohibited whilst situated in hazardous area. The equipment must be removed to safe area before accessing SD-CARD.
3. It must be ensured that the equipment back cover is secured before entering and/or using in hazardous areas.
4. It is not intended for the end-user to remove and/or access the equipment battery pack whilst

situated in hazardous areas. The equipment must be removed to the safe area before accessing/removing battery pack.

5. For charging battery pack, only the following charger must be used – Model number: S040EM1200300 manufactured by Ten Pao industrial Co. Ltd., IECEE CB reference certificate no. JPTUV-035588-M1 (provided by TUV Rheinland Japan Ltd.). The charger and battery packs are provided by FLIR with the camera equipment.Use only battery pack provided by FLIR, part number T199183 with this equipment.
6. Use only battery pack provided by FLIR, part number T199183 with this equipment.
7. Access or entry into the camera internals is strictly prohibited in any areas.
8. The user shall only connect ATEX/IECEx approved intrinsically safe equipment to the USB mini-B and HDMI ports.

Routine tests:

None.

Special conditions for manufacture:

None.

Table of entity parameters

Parameter	USB mini-B	HDMI	Battery pack charge port
Ui	6 V	4 V	—
Ii	5 mA	25 µA	—
U_m	—	—	100 V