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TEST REPORT
IEC 60529
Degrees of protection provided by enclosures (IP Code)

Report reference No. ..... :	2406050STO-201
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Approved by (+ signature)..... :	Daniel Pimenov
Date of issue..... :	5 August 2024
Contents ..... :	11 Pages

Testing laboratory

Name..... :	Intertek Semko AB
Address ..... :	Torshamnsgatan 43, SE-164 22 Kista, Sweden
Testing location..... :	As above
Test date..... :	8-9 July 2024

Client

Name..... :	FLIR Systems AB
Address ..... :	Antennvägen 6 ,187 66 Täby ,Sweden
Contact person ..... :	Magnus Wärle

Test specification

Standard..... :	IEC 60529:2013 (Ed 2.2), EN 60529:2014
Specified IP-code ..... :	IP54

Equipment Under Test (EUT)

Type of test object..... :	Infrared Camera
Arrival date of EUT..... :	4 July 2024
Model/Article No ..... :	Flir-E1330
S/N ..... :	13308600

General description:

According to IEC 60529:2013 (Ed 2.2), EN 60529:2014 EUT was tested for IP54.

Note; Upon customer request it was decided IP5X was going to be performed for category II.

SUMMARY OF ENCAPSULATION TESTS ACCORDING TO IEC 60 529: 2013:

Conclusion of the IP54 test: Pass

The test fulfils the requirements of the standard According to IEC 60529:2013 (Ed 2.2), EN 60529:2014.

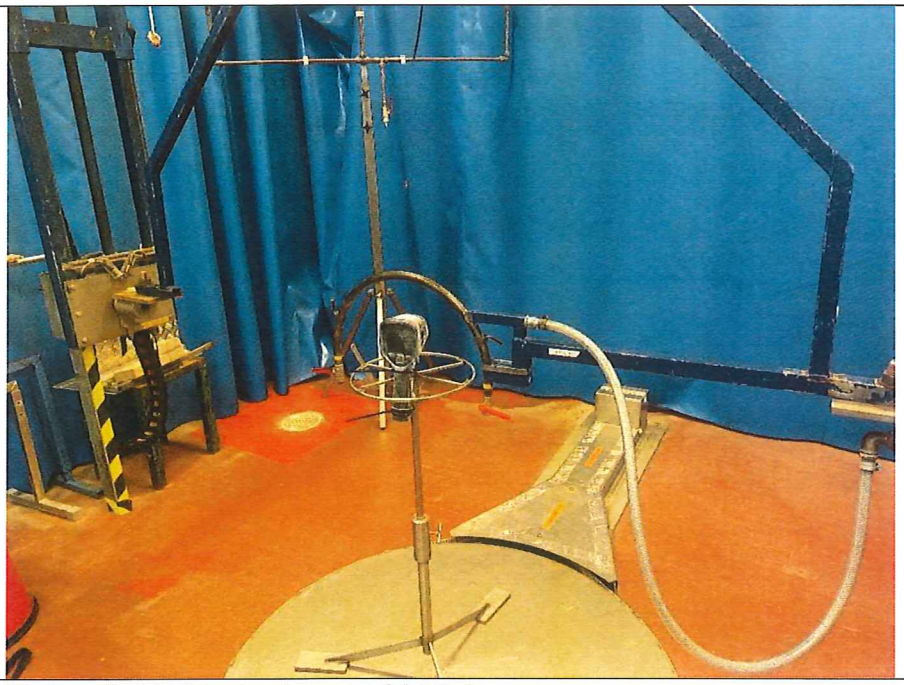
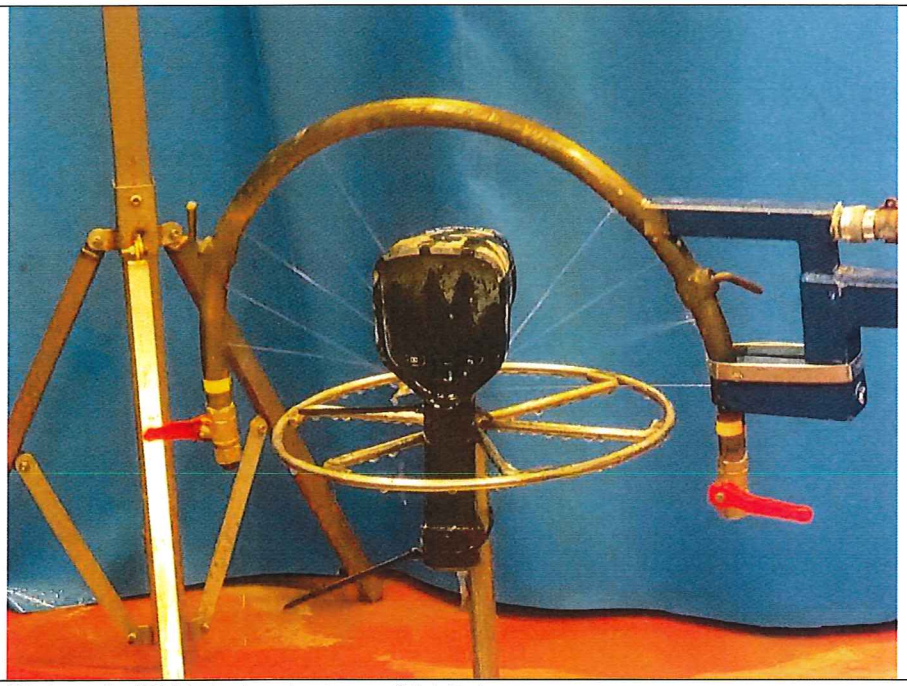
10	**Marking**		
	Marking		N/A
11	**General requirement for tests.**		
11.1	Tests should be carried out under the standard atmospheric conditions described in IEC 60068-1		P
11.2	Test samples shall be in a clean and new condition.		P
	The relevant product standard shall specify details such as:The number of samples to be tested;		N/A
	-conditions for mounting, assembling and positioning of the samples;	As in normal use	P
	-the pre-conditioning, if any, which is to be used;		N/A
	-whether to be tested energized or not;	Not energized	N/A
	-whether to be tested with its parts in motion or not;		N/A
11.5	**Empty enclosures**		
	If the enclosure is tested without equipment inside, the manufacturer shall ensure that after the electrical equipment is enclosed the enclosure meets the declared degree of protection of the final product.		N/A
12	**Tests for protection against access to hazardous parts indicated by the first characteristic numeral.**		
	Test conditions for IP 0X:	No test required	N/A
	Test conditions for IP 1X: The sphere of 50 mm ∅	The access probe, sphere of 50 mm ∅, shall have adequate clearance from hazardous parts	N/A
	Test conditions for IP 2X: The jointed test finger may penetrate up to its 80 mm length ,but adequate clearance shall be kept.	The jointed test finger of 12 mm ∅, 80 mm length, shall have adequate clearance form hazardous parts	N/A
	Test conditions for IP 3X: The test rod of 2.5 mm ∅ shall not penetrate and adequate clearance shall be kept.	The probe of 2.5 mm ∅ did not penetrate the EUT	N/A
	Test conditions for IP 4X: The test wire of 1.0 mm ∅ shall not penetrate and adequate clearance shall be kept.	The probe of 1.0 mm ∅ did not penetrate the EUT	N/A
	Test conditions for IP 5X:	The probe of 1.0 mm ∅ did not penetrate the EUT	P
	Test conditions for IP 6X:	The probe of 1.0 mm ∅ did not penetrate the EUT	N/A

13	**Tests for protection against solid foreign objects indicated by the first characteristic numeral.**				
First, characteristic numeral.	Test means (object probes and dust chamber)	Test force	Test conditions,see		-
0	No test required	-	-		N/A
1	Rigid sphere without handle or guard $50_0^{+0.05}$ mm diameter.	50 N ± 10%	13.2	The object probe, sphere of 50 mm ø, shall not fully penetrate	N/A
2	Rigid sphere without or guard $12.5_0^{+0.2}$ mm diameter.	30 N ± 10%	13.2	The object probe, sphere of 12.5 mm ø, shall not fully penetrate	N/A
3	Rigid steel rod $2.5_0^{+0.05}$ mm diameter with edges free from burrs	3 N ± 10%	13.2	The test wire (Ø 2.5 mm) is pushed into places of possible penetration. Test force: 3 N	N/A
4	Rigid steel wire $1.0_0^{+0.05}$ mm diameter with edges free from burrs.	1N ± 10%	13.2	The test wire (Ø 1.0 mm) is pushed into places of possible penetration. Test force: 1 N	N/A
5	Dust chamber, with or without underpressure	-	13.4+13.5	Ingress of dust is not totally prevented, but dust shall not penetrate in a quantity to interfere with satisfactory operation of the apparatus or to impair safety	N/A
6	Dust chamber, with underpressure	-	13.4+13.6	No ingress of dust	N/A
13.3	**Acceptance conditions for the first characteristic numeral 5.** The protection is satisfactory if the full diameter of the probe does not pass through any opening.			1mm test probe did not pierce through any possible angle.	P
13.4	**Category 1:** Enclosures where the normal working cycle of the equipment causes reductions in air pressure within the enclosure below that of the surrounding air, for example, due to thermal cycling effects				N/A
	Category 2: Enclosures where no pressure difference relative to the surrounding air is present.			Continiously running 8h in dust chamber without presence of negative gauge pressaure.	P

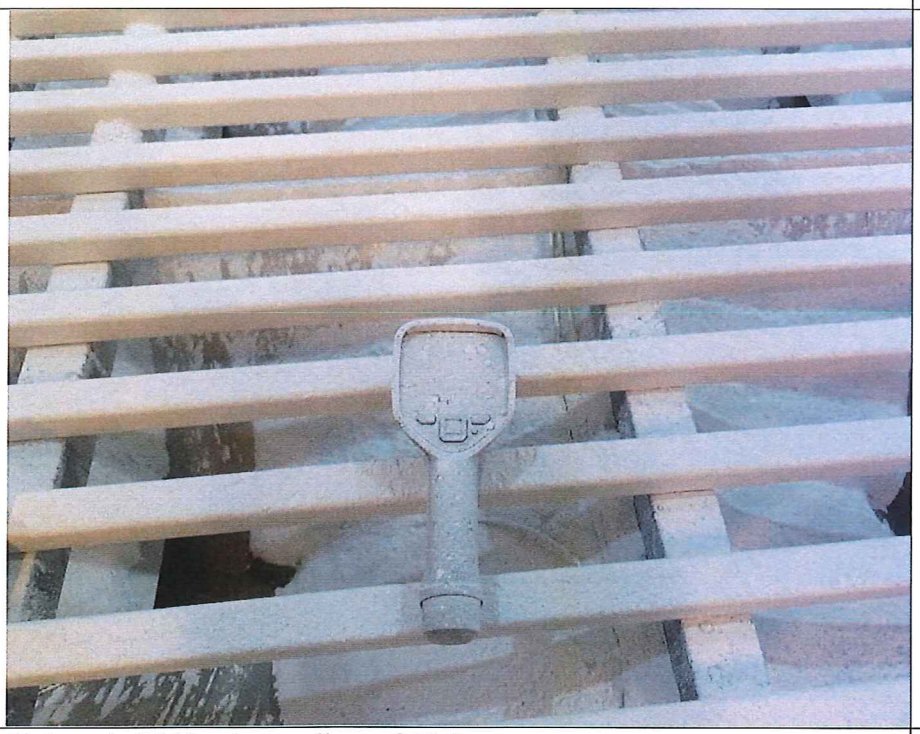
13.5.2	**Acceptance conditions for the first characteristic numeral 5.** The protection is satisfactory if, on inspection, talcum powder has not accumulated in a quantity or location such that, as with any other kind of dust, it could interfere with the correct operation of the equipment or impair safety. Except for special cases to be clearly specified in the relevant product standard, no dust shall deposit where it could lead to tracking along the creepage distances	Ingress of dust but not enough to interfere with function or safety.	P
13.6.2	**Acceptance conditions for the first characteristic numeral 6.** The protection is satisfactory if no deposit of dust is observable inside the enclosure at the end of the test.		N/A

14	**Tests for protection against water indicated by the second characteristic numeral.**		
14.2.0	No test required		N/A
14.2.1	Test for second characteristic numeral 1 with a drip box.	Drip box Enclosure on turntable 1 mm/min 10 min	N/A
14.2.2	Test for second characteristic numeral 2 with a drip box.	Drip box Enclosure in 4 fixed positions of 15° tilt 3 mm/min 2.5 min for each position of tilt	N/A
14.2.3	Test for second characteristic numeral 3 with an oscillating tube or spray nozzle.	Oscillating tube Ø 40 cm ± 60° from vertical Distance max. 200 mm Flow 0.56 l/min Duration 10 minutes	N/A
14.2.4	Test for second characteristic numeral 4 with oscillating tube or spray nozzle.	Oscillating tube Ø 40 cm ± 180° from vertical Distance max. 200 mm Flow 0.84 l/min Duration 10 minutes	P
14.2.5	Test for second characteristic numeral 5 with a 6.3-mm nozzle,tested with a spraying nozzle.	Water jet hose nozzle Ø 6.3 mm Water flow 12.5 L/min Duration: 3min during rotation Distance 2.5 to 3 m	N/A
14.2.6	Test for second characteristic numeral 6 with a 12.5-mm nozzle	Water jet hose nozzle Nozzle 12,5 mm diameter Distance 2.5 m to 3 m 100 l/min, 1 min/m² at least 3 min	N/A
14.2.7	Test for second characteristic numeral 7: Temporary immersion between 0.15 m and 1 m	Immersion tank Water-level on enclosure: 0.15 m above top 1 m above bottom Duration 30 min	N/A
14.2.8	Test for second characteristic numeral 8: Continuos immersion subject to agreement.	Immersion tank Water-level: by agreement – by agreement	N/A
14.2.9	Test for second characteristic numeral 9 by high pressure and temperature water jetting.		N/A
14.3	**Acceptance conditions second characteristic 4.** The protection is satisfactory if any water has entered, it shall not be sufficient to interfere the correct operation or impair the safety of the equipment.	No water inside defined enclosure(bottom layer). No water inside or vicinity of circuitboards.	P
15.	Tests for protection against access to parts indicated by the additional letter.		N/A

Possible test case verdicts:
Test case does not apply to the test object ..... : N/A (Not Applicable)
Test object does meet the requirement..... : P (Pass)
Test item does not meet the requirement..... : F (Fail)
Test case has not been checked ..... : Not Checked

	Pictures	
		
	Picture 1, IPX4 test setup see §14.2.4.	
		
	Picture 2, IPX4 during test see §14.2.4.	

Picture 3, IP5X category II see §13.4.



Picture 4, IP5X category II see §13.4.

MAX OVERALL UNCERTAINTY

Statement concerning the measurement uncertainty and decision rules

			Max overall uncertainty k=2
Voltage	≤ 7000V	DC	±0,5%
	≤ 1500V	45Hz - 66Hz	±4,6%
	1500V – 4000V	45Hz - 66Hz	±3,3%
Current	50mA - 63A	DC	±0,7%
	50mA - 63A	10-45Hz	±0,8%
	50mA - 63A	45-66 Hz	±0,4%
	50mA - 63A	66-1000Hz	±0,8%
	50mA - 63A	1-10 kHz	±0,9%
	50mA - 63A	10-50 kHz	±1,6%
Resistance	< 200mΩ		±2,0%
	200mΩ - 20Ω		±0,7%
	> 20 Ω		±0,2%
	2mΩ - 20kΩ	Four-wire resistance	±1,2%
Electric power	≤ 3kW	DC	±1,4%
		10-45 Hz	±1,6%
		45-65 Hz	±0,7%
		66Hz-1kHz	±1,6%
		1-10kHz	±2,0%
		10-20kHz	±3,6%
		20-50kHz	±3,8%
	≥ 3kW	45 Hz ≤f ≤66 Hz	±0,4%
Electric power (precision power meter)	≤ 3kW	45 Hz ≤f ≤66 Hz	±0,2%
Oscilloscopes	peak value	1mV – 35 V	±3,8%
		35 V – 7kV	±4,4%
Leakage current	0- 30mA	10Hz-1MHz	±11,8%
Temperature	-40 ≤ 900°C		±3,8°C
Environment Kista	23°C ±5°C		±2,7°C
Linear dimensions			
Micrometre	0 - 25mm		±0,1%
calliper	0 - 150mm		±0,1%
Meas. tape	5m		±0,1%
Steel rule	1m		±0,2%
Gauge rods (Inst. of calliper)	≤10mm		±1,2%
Mass, scale resolution	Resolution 0,001g		±0,02g
	Resolution 0,01g		±0,1g
	Resolution 0,1g		±0,5g
	Resolution 1g		±4,8g
Relative humidity, Kista	10-95%RH		±6,5%
Time	100ms – 1s		±1,3%
	> 1s – 1min		±2,0%
	> 1min		±3,2%
Ph value	4-7Ph		±0,1Ph
Flow	l/min		±8,4%
Pressure	Pa		±3,3%

Revision: 2022-06-10

Decision rule applied

"Simple Acceptance" rule, also called "Shared Risk Approach" of ILAC-G8:09/2019 guide

The statements of conformity are reported as:

Passed – When the measured values are within the specified limits

Failed – When one or more measures values are outside the specified limits