TEST REPORT
IEC 60950-1
Information technology equipment - Safety - Part 1: General requirements

Report Reference No ..... :	E234884-A416-IT-5
Date of issue ..... :	2019-09-26
Total number of pages ..... :	56
Applicant's name ..... :	ZHEJIANG DAHUA VISION TECHNOLOGY CO LTD
Address ..... :	NO.1199 BIN'AN RD. BINJIANG DISTRICT HANGZHOU ZHEJIANG 310053 CHINA
Test specification:	
Standard ..... :	IEC 60950-1:2005 (Second Edition); Am1:2009 + Am2:2013
Test procedure ..... :	Informative
Non-standard test method ..... :	N/A
Test Report Form No. ..... :	IEC60950_1F
Test Report Form originator ..... :	SGS Fimko Ltd
Master TRF ..... :	Dated 2014-02

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Test item description ..... :	IP CAMERA
Trade Mark ..... :	
Manufacturer ..... :	ZHEJIANG DAHUA VISION TECHNOLOGY CO.,LTD. NO.1199, BIN'AN ROAD, BINJIANG DISTRICT, HANGZHOU, P.R. CHINA
Model/Type reference ..... :	1. DH-IPC-HDBW5241RP-S; DH-IPC-HDBW5241RN-S; IPC-HDBW5241RP-S; IPC-HDBW5241RN-S; DH-IPC-HDBW5241R-S; IPC-HDBW5241R-S; IPC-HDBW5241R-S-0280B; IPC-HDBW5241R-S-0360B; IPC-HDBW5241R-S-0600B; 2. DH-IPC-HDBW5241RP-ASE; DH-IPC-HDBW5241RN-ASE; IPC-HDBW5241RP-ASE; IPC-HDBW5241RN-ASE; DH-IPC-HDBW5241R-ASE; IPC-HDBW5241R-ASE;IPC-HDBW5241R-ASE-0280B; IPC-HDBW5241R-ASE-0360B; IPC-HDBW5241R-ASE-0600B; N25DM62; N25DM63; 3. DH-IPC-HDBW5442RP-ASE; DH-IPC-HDBW5442RN-ASE; IPC-HDBW5442RP-ASE; IPC-HDBW5442RN-ASE; DH-IPC-HDBW5442R-ASE; IPC-HDBW5442R-ASE; IPC-HDBW5442R-ASE-0280B; IPC-HDBW5442R-ASE-0360B; IPC-HDBW5442R-ASE-0600B; N45DM62; N45DM63; DH-IPC-HDBW5442RP-S; DH-IPC-HDBW5442RN-S; IPC-HDBW5442RP-S; IPC-HDBW5442RN-S; DH-IPC-HDBW5442R-S; IPC-HDBW5442R-S; IPC-HDBW5442R-S-0280B; IPC-HDBW5442R-S-0360B; IPC-HDBW5442R-S-0600B;DH-IPC-HDBW5541RP-S; DH-IPC-HDBW5541RN-S; IPC-HDBW5541RP-S; IPC-HDBW5541RN-S; DH-IPC-HDBW5541R-S; IPC-HDBW5541R-S; IPC-HDBW5541R-S-0280B; IPC-HDBW5541R-S-0360B; IPC-HDBW5541R-S-0600B; DH-IPC-HDBW5541RP-ASE; DH-IPC-HDBW5541RN-ASE; IPC-HDBW5541RP-ASE; IPC-HDBW5541RN-ASE; DH-IPC-HDBW5541R-ASE; IPC-HDBW5541R-ASE; IPC-HDBW5541R-ASE-0280B; IPC-HDBW5541R-ASE-0360B; IPC-HDBW5541R-ASE-0600B; N55DM62; N55DM63; N85DM62; N85DM64. 5. DH-IPC-HDBW5241RP-ASE-NI; DH-IPC-HDBW5241RN-ASE-NI; IPC-HDBW5241RP-ASE-NI; IPC-HDBW5241RN-ASE-NI; DH-IPC-HDBW5241R-ASE-NI; IPC-HDBW5241R-ASE-NI; DH-IPC-HDBW5241RP-ASE-NI-0360B; IPC-HDBW5241R-ASE-NI-0360B; N25EM63; 6. DH-IPC-HDBW5442RN-ASE-NI; DH-IPC-HDBW5442RP-ASE-NI; IPC-HDBW5442RN-ASE-NI; IPC-HDBW5442RP-ASE-NI; DH-IPC-HDBW5442R-ASE-NI; IPC-HDBW5442R-ASE-NI; DH-IPC-HDBW5442RP-ASE-NI-0360B; IPC-HDBW5442R-ASE-NI-0360B; N45EM63; 7.DH-IPC-HDBW2431RP-ZAS-S2; DH-IPC-HDBW2431RN-ZAS-S2; IPC-HDBW2431RP-ZAS-S2; IPC-HDBW2431RN-ZAS-S2; DH-IPC-HDBW2431R-ZAS-S2; IPC-HDBW2431R-ZAS-S2;DH-IPC-HDBW2431RP-ZS-S2; DH-IPC-HDBW2431RN-ZS-S2; IPC-HDBW2431RP-ZS-S2; IPC-HDBW2431RN-ZS-S2; DH-IPC-

HDBW2431R-ZS-S2; IPC-HDBW2431R-ZS-S2;
DH-IPC-HDBW2231RP-ZAS-S2; DH-IPC-HDBW2231RN-ZAS-S2;
IPC-HDBW2231RP-ZAS-S2; IPC-HDBW2231RN-ZAS-S2; DH-IPC-HDBW2231R-ZAS-S2; IPC-HDBW2231R-ZAS-S2;DH-IPC-HDBW2231RP-ZS-S2; DH-IPC-HDBW2231RN-ZS-S2; IPC-HDBW2231RP-ZS-S2; IPC-HDBW2231RN-ZS-S2; DH-IPC-HDBW2231R-ZS-S2; IPC-HDBW2231R-ZS-S2;
DH-IPC-HDBW2531RP-ZAS-S2; DH-IPC-HDBW2531RN-ZAS-S2;
IPC-HDBW2531RP-ZAS-S2; IPC-HDBW2531RN-ZAS-S2; DH-IPC-HDBW2531R-ZAS-S2; IPC-HDBW2531R-ZAS-S2;DH-IPC-HDBW2531RP-ZS-S2; DH-IPC-HDBW2531RN-ZS-S2; IPC-HDBW2531RP-ZS-S2; IPC-HDBW2531RN-ZS-S2; DH-IPC-HDBW2531R-ZS-S2; IPC-HDBW2531R-ZS-S2;
DH-IPC-HDBW2831RP-ZAS-S2; DH-IPC-HDBW2831RN-ZAS-S2;
IPC-HDBW2831RP-ZAS-S2; IPC-HDBW2831RN-ZAS-S2; DH-IPC-HDBW2831R-ZAS-S2; IPC-HDBW2831R-ZAS-S2;DH-IPC-HDBW2831RP-ZS-S2; DH-IPC-HDBW2831RN-ZS-S2; IPC-HDBW2831RP-ZS-S2; IPC-HDBW2831RN-ZS-S2; DH-IPC-HDBW2831R-ZS-S2; IPC-HDBW2831R-ZS-S2;
IPC-HDBW2231R-ZS-27135-S2; IPC-HDBW2231R-ZS-27135; IPC-HDBW2231R-ZAS-27135-S2; IPC-HDBW2231R-ZAS-27135; IPC-HDBW2431R-ZS-27135-S2; IPC-HDBW2431R-ZS-27135; IPC-HDBW2431R-ZAS-27135-S2; IPC-HDBW2431R-ZAS-27135; IPC-HDBW2531R-ZS-27135-S2; IPC-HDBW2531R-ZS-27135; IPC-HDBW2531R-ZAS-27135-S2; IPC-HDBW2531R-ZAS-27135; IPC-HDBW2831R-ZS-27135-S2; IPC-HDBW2831R-ZS-27135; IPC-HDBW2831R-ZAS-27135-S2; IPC-HDBW2831R-ZAS-27135;
N22AM3Z; N22AM6Z; N42BM3Z; N42BM6Z; N52BMAZ; N52BM6Z;
N82AM3Z; N82AM5Z; DR2431-ZS; DR2531-ZS; DR2831-ZAS;DH-IPC-HDBW1431RP-ZS-S4; DH-IPC-HDBW1431RN-ZS-S4; IPC-HDBW1431RP-ZS-S4; IPC-HDBW1431RN-ZS-S4; DH-IPC-HDBW1431R-ZS-S4;
IPC-HDBW1431R-ZS-2812-S4; IPC-HDBW1431R-ZS-2812;
IPC-HDBW1431R-ZS-S4; IPC-CD2C40M-ZS-2812; IPC-CD2C40M-ZS-2812-S2;

8.IPC-HDBW3441RP-ZAS; DH-IPC-HDBW3241RP-ZS; DH-IPC-HDBW3241RP-ZAS; DH-IPC-HDBW3241RN-ZS; DH-IPC-HDBW3241RN-ZAS; IPC-HDBW3241RP-ZS; IPC-HDBW3241RP-ZAS;IPC-HDBW3241RN-ZS; IPC-HDBW3241RN-ZAS; IPC-HDBW3241R-ZS; IPC-HDBW3241R-ZAS; DH-IPC-HDBW3241R-ZS; DH-IPC-HDBW3241R-ZAS;
DH-IPC-HDBW3441RP-ZS; DH-IPC-HDBW3441RP-ZAS; DH-IPC-HDBW3441RN-ZS; DH-IPC-HDBW3441RN-ZAS; IPC-HDBW3441RP-ZS; IPC-HDBW3441RP-ZAS; IPC-HDBW3441RN-ZS; IPC-HDBW3441RN-ZAS; IPC-HDBW3441R-ZS; IPC-HDBW3441R-ZAS; DH-IPC-HDBW3441R-ZS; DH-IPC-HDBW3441R-ZAS;
DH-IPC-HDBW3541RP-ZS; DH-IPC-HDBW3541RP-ZAS; DH-IPC-HDBW3541RN-ZS; DH-IPC-HDBW3541RN-ZAS; IPC-HDBW3541RP-ZS; IPC-HDBW3541RP-ZAS; IPC-HDBW3541RN-ZS; IPC-HDBW3541RN-ZAS; IPC-HDBW3541R-ZS; IPC-HDBW3541R-ZAS; DH-IPC-HDBW3541R-ZS; DH-IPC-

	HDBW3541R-ZAS; DH-IPC-HDBW4231RP-Z-S4; DH-IPC-HDBW4431RP-Z-S4; DH-IPC-HDBW4231RP-Z-S4-UAE; DH-IPC-HDBW4431RP-Z-S4-UAE; N23AM3Z; N23AM5Z; N43AM3Z; N43AM5Z; N53AM3Z; N53AM5Z; IPC-HDBW3241R-ZS-27135; IPC-HDBW3241R-ZAS-27135; IPC-HDBW3441R-ZS-27135; IPC-HDBW3441R-ZAS-27135; IPC-HDBW3541R-ZS-27135; IPC-HDBW3541R-ZAS-27135; DH-IPC-HDBW4443R-AS; DH-IPC-HDBW4443R-S; DH-IPC-HDBW4443DR-AS; DH-IPC-HDBW4443DR-S; IPC-HDBW4443R-AS; IPC-HDBW4443R-S; IPC-HDBW4443DR-AS; IPC-HDBW4443DR-S; DH-IPC-HDBW5443R; DH-IPC-HDBW5443R-AS; DH-IPC-HDBW5443DR; DH-IPC-HDBW5443DR-AS; IPC-HDBW5443R; IPC-HDBW5443R-AS; IPC-HDBW5443DR; IPC-HDBW5443DR-AS; 9.DH-IPC-HDBW5242RP-ASE-MF; DH-IPC-HDBW5242RN-ASE-MF; IPC-HDBW5242RP-ASE-MF; IPC-HDBW5242RN-ASE-MF; DH-IPC-HDBW5242R-ASE-MF; IPC-HDBW5242R-ASE-MF; IPC-HDBW5242R-ASE-0280B; IPC-HDBW5242R-ASE-0360B; IPC-HDBW5242R-ASE-0600B; 10.DH-IPC-HDBW5242RP-ASE-NI;DH-IPC-HDBW5242RN-ASE-NI;IPC-HDBW5242RP-ASE-NI;IPC-HDBW5242RN-ASE-NI;DH-IPC-HDBW5242R-ASE-NI;IPC-HDBW5242R-ASE-NI;DH-IPC-HDBW5241RN-ASE-NI-0360B-USA;N25EM63;IPC-HDBW5249R-ASE-NI-0360B;IPC-HDBW5241R-ASE-NI-0360B;
Ratings ..... :	(optional) 12Vdc/1A, POE(802.3af) (optional) 12Vdc/0.5A, POE(802.3af) for Series 5, 6, 9, 10.

Testing procedure and testing location:			
	Testing location / address .....:	UL-CCIC Company Limited No. 2, Chengwan Road, Suzhou Industrial Park, Suzhou 215122, China	
	Tested by (name + signature) .....:	Austin Huang/Yuan Yuan	
	Approved by (+ signature).....:	Jie Qian	

List of Attachments

National Differences (33 pages)

Enclosures (203 pages)

Summary of Testing:

No tests were conducted

Summary of Compliance with National Differences:

Countries outside the CB Scheme membership may also accept this report.

List of countries addressed: AT, BE, BG, BY, CA, CH, CS, CZ, DE, DK, EU, FI, FR, GB, GR, HU, IT, NL, NO, PL, RO, SE, SI, SK, UA, US

The product fulfills the requirements of: EN 60950-1:2006 + A1:2010 + A11:2009 + A12:2011 + A2:2013

Copy of Marking Plate - Refer to Enclosure titled Marking Plate for copy.

Test item particulars :	
Equipment mobility ..... :	stationary
Connection to the mains ..... :	No direct connection
Operating condition ..... :	continuous
Access location ..... :	restricted access location
Over voltage category (OVC) ..... :	OVC IV
Mains supply tolerance (%) or absolute mains supply values ..... :	N/A
Tested for IT power systems ..... :	No
IT testing, phase-phase voltage (V) ..... :	N/A
Class of equipment ..... :	Class III (supplied by SELV)
Considered current rating of protective device as part of the building installation (A) ..... :	20A
Pollution degree (PD) ..... :	PD 2
IP protection class ..... :	IP X0
Altitude of operation (m) ..... :	no more than 2000
Altitude of test laboratory (m) ..... :	no more than 2000
Mass of equipment (kg) ..... :	0.475 kg
Possible test case verdicts:	
- test case does not apply to the test object ..... :	N / A
- test object does meet the requirement ..... :	P(Pass)
- test object does not meet the requirement ..... :	F(Fail)
Testing:	
Date(s) of receipt of test item ..... :	2019-03-15, 2019-06-28
Date(s) of Performance of tests ..... :	2019-03-15, 2019-03-18, 2019-06-28
General remarks:	
"(see Enclosure #)" refers to additional information appended to the report. "(see appended table)" refers to a table appended to the report. Throughout this report a point is used as the decimal separator.	
Name and address of Factory(ies):	ZHEJIANG DAHUA VISION TECHNOLOGY CO.,LTD. NO.1199, BIN'AN ROAD, BINJIANG DISTRICT, HANGZHOU, P.R. CHINA ZHEJIANG DAHUA ZHILIAN CO.,LTD. NO.28, DONGQIAO ROAD, DONGZHOU STREET, FUYANG DISTRICT, HANGZHOU,P.R.CHINA.

GENERAL PRODUCT INFORMATION:

Report Summary

Product Description

The unit consists of electronic components mounted on a V-1 PWB, housed in a metal enclosure and plastic enclosure, supplied by external approved adapter which comply with L.P.S 12Vdc or POE(802.3af).

Model Differences

1. model DH-IPC-HDBW5241RP-S, DH-IPC-HDBW5442RP-ASE and model DH-IPC-HDBW5241RP-ASE are same to each other except sensor board.
2. model DH-IPC-HDBW5241RP-S is same as model DH-IPC-HDBW5241RN-S; IPC-HDBW5241RP-S; IPC-HDBW5241RN-S; DH-IPC-HDBW5241R-S; IPC-HDBW5241R-S; IPC-HDBW5241R-S-0280B; IPC-HDBW5241R-S-0360B; IPC-HDBW5241R-S-0600B except model names.
3. model DH-IPC-HDBW5241RP-ASE is same as model DH-IPC-HDBW5241RN-ASE; IPC-HDBW5241RP-ASE; IPC-HDBW5241RN-ASE; DH-IPC-HDBW5241R-ASE; IPC-HDBW5241R-ASE; IPC-HDBW5241R-ASE-0280B; IPC-HDBW5241R-ASE-0360B; IPC-HDBW5241R-ASE-0600B; N25DM62; N25DM63 except pix2el.
4. model DH-IPC-HDBW5442RP-ASE is same as model DH-IPC-HDBW5442RP-ASE; DH-IPC-HDBW5442RN-ASE; IPC-HDBW5442RP-ASE; IPC-HDBW5442RN-ASE; DH-IPC-HDBW5442R-ASE; IPC-HDBW5442R-ASE; IPC-HDBW5442R-ASE-0280B; IPC-HDBW5442R-ASE-0360B; IPC-HDBW5442R-ASE-0600B; N45DM62; N45DM63;DH-IPC-HDBW5442RP-S; DH-IPC-HDBW5442RN-S; IPC-HDBW5442RP-S; IPC-HDBW5442RN-S; DH-IPC-HDBW5442R-S; IPC-HDBW5442R-S; IPC-HDBW5442R-S-0280B; IPC-HDBW5442R-S-0360B; IPC-HDBW5442R-S-0600B;DH-IPC-HDBW5541RP-S; DH-IPC-HDBW5541RN-S; IPC-HDBW5541RP-S; IPC-HDBW5541RN-S; DH-IPC-HDBW5541R-S; IPC-HDBW5541R-S; IPC-HDBW5541R-S-0280B; IPC-HDBW5541R-S-0360B; IPC-HDBW5541R-S-0600B;DH-IPC-HDBW5541RP-ASE; DH-IPC-HDBW5541RN-ASE; IPC-HDBW5541RP-ASE; IPC-HDBW5541RN-ASE; DH-IPC-HDBW5541R-ASE; IPC-HDBW5541R-ASE; IPC-HDBW5541R-ASE-0280B; IPC-HDBW5541R-ASE-0360B; IPC-HDBW5541R-ASE-0600B; N55DM62; N55DM63; N85DM62; N85DM64 except model names.

Series 5 is same as model DH-IPC-HDBW5241RP-ASE except model name, rating and without infrared lamp.

Series 6 is same as model DH-IPC-HDBW5442RP-ASE except model name, rating and without infrared lamp.

Model DH-IPC-HDBW3441RP-ZAS and model DH-IPC-HDBW2431RP-ZAS-S2 are same to each other except main board.

Model DH-IPC-HDBW2431RP-ZAS-S2 is same as model DH-IPC-HDBW2431RN-ZAS-S2; IPC-HDBW2431RP-ZAS-S2; IPC-HDBW2431RN-ZAS-S2; DH-IPC-HDBW2431R-ZAS-S2; IPC-HDBW2431R-ZAS-S2;DH-IPC-HDBW2431RP-ZS-S2; DH-IPC-HDBW2431RN-ZS-S2; IPC-HDBW2431RP-ZS-S2; IPC-HDBW2431RN-ZS-S2; DH-IPC-HDBW2431R-ZS-S2; IPC-HDBW2431R-ZS-S2;
DH-IPC-HDBW2231RP-ZAS-S2; DH-IPC-HDBW2231RN-ZAS-S2; IPC-HDBW2231RP-ZAS-S2; IPC-HDBW2231RN-ZAS-S2; DH-IPC-HDBW2231R-ZAS-S2; IPC-HDBW2231R-ZAS-S2;DH-IPC-HDBW2231RP-ZS-S2; DH-IPC-HDBW2231RN-ZS-S2; IPC-HDBW2231RP-ZS-S2; IPC-HDBW2231RN-ZS-S2; DH-IPC-HDBW2231R-ZS-S2; IPC-HDBW2231R-ZS-S2;
DH-IPC-HDBW2531RP-ZAS-S2; DH-IPC-HDBW2531RN-ZAS-S2; IPC-HDBW2531RP-ZAS-S2; IPC-HDBW2531RN-ZAS-S2; DH-IPC-HDBW2531R-ZAS-S2; IPC-HDBW2531R-ZAS-S2;DH-IPC-HDBW2531RP-ZS-S2; DH-IPC-HDBW2531RN-ZS-S2; IPC-HDBW2531RP-ZS-S2; IPC-HDBW2531RN-ZS-S2; DH-IPC-HDBW2531R-ZS-S2; IPC-HDBW2531R-ZS-S2;
DH-IPC-HDBW2831RP-ZAS-S2; DH-IPC-HDBW2831RN-ZAS-S2; IPC-HDBW2831RP-ZAS-S2; IPC-HDBW2831RN-ZAS-S2; DH-IPC-HDBW2831R-ZAS-S2; IPC-HDBW2831R-ZAS-S2;DH-IPC-HDBW2831RP-

ZS-S2; DH-IPC-HDBW2831RN-ZS-S2; IPC-HDBW2831RP-ZS-S2; IPC-HDBW2831RN-ZS-S2; DH-IPC-HDBW2831R-ZS-S2; IPC-HDBW2831R-ZS-S2;
IPC-HDBW2231R-ZS-27135-S2; IPC-HDBW2231R-ZS-27135; IPC-HDBW2231R-ZAS-27135-S2; IPC-HDBW2231R-ZAS-27135; IPC-HDBW2431R-ZS-27135-S2; IPC-HDBW2431R-ZS-27135; IPC-HDBW2431R-ZAS-27135-S2; IPC-HDBW2431R-ZAS-27135; IPC-HDBW2531R-ZS-27135-S2; IPC-HDBW2531R-ZS-27135; IPC-HDBW2531R-ZAS-27135-S2; IPC-HDBW2531R-ZAS-27135; IPC-HDBW2831R-ZS-27135-S2; IPC-HDBW2831R-ZS-27135; IPC-HDBW2831R-ZAS-27135-S2; IPC-HDBW2831R-ZAS-27135;
N22AM3Z; N22AM6Z; N42BM3Z; N42BM6Z; N52BMAZ; N52BM6Z; N82AM3Z; N82AM5Z; DR2431-ZS; DR2531-ZS; DR2831-ZAS;DH-IPC-HDBW1431RP-ZS-S4; DH-IPC-HDBW1431RN-ZS-S4; IPC-HDBW1431RP-ZS-S4; IPC-HDBW1431RN-ZS-S4; DH-IPC-HDBW1431R-ZS-S4;
IPC-HDBW1431R-ZS-S4; IPC-CD2C40M-ZS-2812; IPC-CD2C40M-ZS-2812-S2 except sensor board.

Model IPC-HDBW3441RP-ZAS is same as model DH-IPC-HDBW3241RP-ZS; DH-IPC-HDBW3241RP-ZAS; DH-IPC-HDBW3241RN-ZS; DH-IPC-HDBW3241RN-ZAS; IPC-HDBW3241RP-ZS; IPC-HDBW3241RP-ZAS;IPC-HDBW3241RN-ZS; IPC-HDBW3241RN-ZAS; IPC-HDBW3241R-ZS; IPC-HDBW3241R-ZAS; DH-IPC-HDBW3241R-ZS; DH-IPC-HDBW3241R-ZAS;
DH-IPC-HDBW3441RP-ZS; DH-IPC-HDBW3441RP-ZAS; DH-IPC-HDBW3441RN-ZS; DH-IPC-HDBW3441RN-ZAS; IPC-HDBW3441RP-ZS; IPC-HDBW3441RP-ZAS; IPC-HDBW3441RN-ZS; IPC-HDBW3441RN-ZAS; IPC-HDBW3441R-ZS; IPC-HDBW3441R-ZAS; DH-IPC-HDBW3441R-ZS; DH-IPC-HDBW3441R-ZAS;
DH-IPC-HDBW3541RP-ZS; DH-IPC-HDBW3541RP-ZAS; DH-IPC-HDBW3541RN-ZS; DH-IPC-HDBW3541RN-ZAS; IPC-HDBW3541RP-ZS; IPC-HDBW3541RP-ZAS; IPC-HDBW3541RN-ZS; IPC-HDBW3541RN-ZAS; IPC-HDBW3541R-ZS; IPC-HDBW3541R-ZAS; DH-IPC-HDBW3541R-ZS; DH-IPC-HDBW3541R-ZAS;
DH-IPC-HDBW4231RP-Z-S4; DH-IPC-HDBW4431RP-Z-S4; DH-IPC-HDBW4231RP-Z-S4-UAE; DH-IPC-HDBW4431RP-Z-S4-UAE; N23AM3Z; N23AM5Z; N43AM3Z; N43AM5Z; N53AM3Z; N53AM5Z;
IPC-HDBW3241R-ZS-27135; IPC-HDBW3241R-ZAS-27135; IPC-HDBW3441R-ZS-27135; IPC-HDBW3441R-ZAS-27135; IPC-HDBW3541R-ZS-27135; IPC-HDBW3541R-ZAS-27135;
DH-IPC-HDBW4443R-AS; DH-IPC-HDBW4443R-S; DH-IPC-HDBW4443DR-AS; DH-IPC-HDBW4443DR-S; IPC-HDBW4443R-AS; IPC-HDBW4443R-S; IPC-HDBW4443DR-AS; IPC-HDBW4443DR-S;
DH-IPC-HDBW5443R; DH-IPC-HDBW5443R-AS; DH-IPC-HDBW5443DR; DH-IPC-HDBW5443DR-AS; IPC-HDBW5443R; IPC-HDBW5443R-AS; IPC-HDBW5443DR; IPC-HDBW5443DR-AS except sensor board.

Models in Series 9 is similar to original model IPC-HDBW5442RP-ASE except model name.

Models in Series 10 is similar to original model IPC-HDBW5241RP-ASE except model name.

ModelsIPC-HDBW1431R-ZS-2812-S4; IPC-HDBW1431R-ZS-2812 are identical to the original model DH-IPC-HDBW1431RP-ZS-S4 except the model names.

Additional Information

For test record 2:
1.Add new models:
DH-IPC-HDBW2431RP-ZAS-S2; DH-IPC-HDBW2431RN-ZAS-S2; IPC-HDBW2431RP-ZAS-S2; IPC-HDBW2431RN-ZAS-S2; DH-IPC-HDBW2431R-ZAS-S2; IPC-HDBW2431R-ZAS-S2;DH-IPC-HDBW2431RP-ZS-S2; DH-IPC-HDBW2431RN-ZS-S2; IPC-HDBW2431RP-ZS-S2; IPC-HDBW2431RN-ZS-S2; DH-IPC-HDBW2431R-ZS-S2; IPC-HDBW2431R-ZS-S2;
DH-IPC-HDBW2231RP-ZAS-S2; DH-IPC-HDBW2231RN-ZAS-S2; IPC-HDBW2231RP-ZAS-S2; IPC-HDBW2231RN-ZAS-S2; DH-IPC-HDBW2231R-ZAS-S2; IPC-HDBW2231R-ZAS-S2;DH-IPC-HDBW2231RP-ZS-S2; DH-IPC-HDBW2231RN-ZS-S2; IPC-HDBW2231RP-ZS-S2; IPC-HDBW2231RN-ZS-S2; DH-IPC-HDBW2231R-ZS-S2; IPC-HDBW2231R-ZS-S2;
DH-IPC-HDBW2531RP-ZAS-S2; DH-IPC-HDBW2531RN-ZAS-S2; IPC-HDBW2531RP-ZAS-S2; IPC-

HDBW2531RN-ZAS-S2; DH-IPC-HDBW2531R-ZAS-S2; IPC-HDBW2531R-ZAS-S2;DH-IPC-HDBW2531RP-ZS-S2; DH-IPC-HDBW2531RN-ZS-S2; IPC-HDBW2531RP-ZS-S2; IPC-HDBW2531RN-ZS-S2; DH-IPC-HDBW2531R-ZS-S2; IPC-HDBW2531R-ZS-S2;
DH-IPC-HDBW2831RP-ZAS-S2; DH-IPC-HDBW2831RN-ZAS-S2; IPC-HDBW2831RP-ZAS-S2; IPC-HDBW2831RN-ZAS-S2; DH-IPC-HDBW2831R-ZAS-S2; IPC-HDBW2831R-ZAS-S2;DH-IPC-HDBW2831RP-ZS-S2; DH-IPC-HDBW2831RN-ZS-S2; IPC-HDBW2831RP-ZS-S2; IPC-HDBW2831RN-ZS-S2; DH-IPC-HDBW2831R-ZS-S2; IPC-HDBW2831R-ZS-S2;
IPC-HDBW2231R-ZS-27135-S2; IPC-HDBW2231R-ZS-27135; IPC-HDBW2231R-ZAS-27135-S2; IPC-HDBW2231R-ZAS-27135; IPC-HDBW2431R-ZS-27135-S2; IPC-HDBW2431R-ZS-27135; IPC-HDBW2431R-ZAS-27135-S2; IPC-HDBW2431R-ZAS-27135; IPC-HDBW2531R-ZS-27135-S2; IPC-HDBW2531R-ZS-27135; IPC-HDBW2531R-ZAS-27135-S2; IPC-HDBW2531R-ZAS-27135; IPC-HDBW2831R-ZS-27135-S2; IPC-HDBW2831R-ZS-27135; IPC-HDBW2831R-ZAS-27135-S2; IPC-HDBW2831R-ZAS-27135;
N22AM3Z; N22AM6Z; N42BM3Z; N42BM6Z; N52BMAZ; N52BM6Z; N82AM3Z; N82AM5Z; DR2431-ZS; DR2531-ZS; DR2831-ZAS;DH-IPC-HDBW1431RP-ZS-S4; DH-IPC-HDBW1431RN-ZS-S4; IPC-HDBW1431RP-ZS-S4; IPC-HDBW1431RN-ZS-S4; DH-IPC-HDBW1431R-ZS-S4;
IPC-HDBW1431R-ZS-S4; IPC-CD2C40M-ZS-2812; IPC-CD2C40M-ZS-2812-S2;

IPC-HDBW3441RP-ZAS; DH-IPC-HDBW3241RP-ZS; DH-IPC-HDBW3241RP-ZAS; DH-IPC-HDBW3241RN-ZS; DH-IPC-HDBW3241RN-ZAS; IPC-HDBW3241RP-ZS; IPC-HDBW3241RP-ZAS;IPC-HDBW3241RN-ZS; IPC-HDBW3241RN-ZAS; IPC-HDBW3241R-ZS; IPC-HDBW3241R-ZAS; DH-IPC-HDBW3241R-ZS; DH-IPC-HDBW3241R-ZAS;
DH-IPC-HDBW3441RP-ZS; DH-IPC-HDBW3441RP-ZAS; DH-IPC-HDBW3441RN-ZS; DH-IPC-HDBW3441RN-ZAS; IPC-HDBW3441RP-ZS; IPC-HDBW3441RP-ZAS; IPC-HDBW3441RN-ZS; IPC-HDBW3441RN-ZAS; IPC-HDBW3441R-ZS; IPC-HDBW3441R-ZAS; DH-IPC-HDBW3441R-ZS; DH-IPC-HDBW3441R-ZAS;
DH-IPC-HDBW3541RP-ZS; DH-IPC-HDBW3541RP-ZAS; DH-IPC-HDBW3541RN-ZS; DH-IPC-HDBW3541RN-ZAS; IPC-HDBW3541RP-ZS; IPC-HDBW3541RP-ZAS; IPC-HDBW3541RN-ZS; IPC-HDBW3541RN-ZAS; IPC-HDBW3541R-ZS; IPC-HDBW3541R-ZAS; DH-IPC-HDBW3541R-ZS; DH-IPC-HDBW3541R-ZAS;
DH-IPC-HDBW4231RP-Z-S4; DH-IPC-HDBW4431RP-Z-S4; DH-IPC-HDBW4231RP-Z-S4-UAE; DH-IPC-HDBW4431RP-Z-S4-UAE; N23AM3Z; N23AM5Z; N43AM3Z; N43AM5Z; N53AM3Z; N53AM5Z;
IPC-HDBW3241R-ZS-27135; IPC-HDBW3241R-ZAS-27135; IPC-HDBW3441R-ZS-27135; IPC-HDBW3441R-ZAS-27135; IPC-HDBW3541R-ZS-27135; IPC-HDBW3541R-ZAS-27135;
DH-IPC-HDBW4443R-AS; DH-IPC-HDBW4443R-S; DH-IPC-HDBW4443DR-AS; DH-IPC-HDBW4443DR-S; IPC-HDBW4443R-AS; IPC-HDBW4443R-S; IPC-HDBW4443DR-AS; IPC-HDBW4443DR-S;
DH-IPC-HDBW5443R; DH-IPC-HDBW5443R-AS; DH-IPC-HDBW5443DR; DH-IPC-HDBW5443DR-AS; IPC-HDBW5443R; IPC-HDBW5443R-AS; IPC-HDBW5443DR; IPC-HDBW5443DR-AS;

2. The difference between models see model difference in details.

For test record 3:(for project 4789104155)
Add new models DH-IPC-HDBW5242RP-ASE-NI;DH-IPC-HDBW5242RN-ASE-NI;IPC-HDBW5242RP-ASE-NI;IPC-HDBW5242RN-ASE-NI;DH-IPC-HDBW5242R-ASE-NI;IPC-HDBW5242R-ASE-NI;DH-IPC-HDBW5241RN-ASE-NI-0360B-USA;N25EM63;IPC-HDBW5249R-ASE-NI-0360B;IPC-HDBW5241R-ASE-NI-0360B;DH-IPC-HDBW5242RP-ASE-MF; DH-IPC-HDBW5242RN-ASE-MF; IPC-HDBW5242RP-ASE-MF; IPC-HDBW5242RN-ASE-MF; DH-IPC-HDBW5242R-ASE-MF; IPC-HDBW5242R-ASE-MF; IPC-HDBW5242R-ASE-0280B; IPC-HDBW5242R-ASE-0360B; IPC-HDBW5242R-ASE-0600B; the difference refer to model differences.

For project 4789178804(Test record 3):
ModelsIPC-HDBW1431R-ZS-2812-S4; IPC-HDBW1431R-ZS-2812 are identical to the original model DH-IPC-HDBW1431RP-ZS-S4 except the model names.

Technical Considerations

- The product was submitted and evaluated for use at the maximum ambient temperature (Tma) permitted by the manufacturer's specification of: 60°C
- The following circuit locations (with circuit/schematic designation) were investigated as a limited power source (LPS): All output connectors.
- The following are available from the Applicant upon request: Installation (Safety) Instructions / Manual

Abbreviations used in the report:

- normal condition	N.C.	- single fault condition	S.F.C
- operational insulation	OP	- basic insulation	BI
- basic insulation between parts of opposite polarity:	BOP	- supplementary insulation	SI
- double insulation	DI	- reinforced insulation	RI

Indicate used abbreviations (if any)

IEC 60950-1			
Clause	Requirement + Test	Result - Remark	Verdict

1	**GENERAL**		Pass
1.5	Components		Pass
1.5.1	General		Pass
	Comply with IEC 60950-1 or relevant component standard	(see appended table 1.5.1)	Pass
1.5.2	Evaluation and testing of components	-Components certified to IEC harmonized standard and checked for correct application. -Components, for which no relevant IEC-Standard exist, have been tested under the conditions occurring in the equipment, using applicable parts of IEC 60950-1. -Components not certified are used in accordance with their ratings and they comply with applicable parts of IEC 60950-1 and the relevant component Standard.	Pass
1.5.3	Thermal controls		N/A
1.5.4	Transformers		N/A
1.5.5	Interconnecting cables	Interconnecting cables comply with the relevant requirements of this standard.	Pass
1.5.6	Capacitors bridging insulation		N/A
1.5.7	Resistors bridging insulation		N/A
1.5.7.1	Resistors bridging functional, basic or supplementary insulation		N/A
1.5.7.2	Resistors bridging double or reinforced insulation between a.c. mains and other circuits		N/A
1.5.7.3	Resistors bridging double or reinforced insulation between a.c. mains and antenna or coaxial cable		N/A
1.5.8	Components in equipment for IT power systems		N/A
1.5.9	Surge suppressors		N/A
1.5.9.1	General		N/A
1.5.9.2	Protection of VDRs		N/A
1.5.9.3	Bridging of functional insulation by a VDR		N/A

IEC 60950-1			
Clause	Requirement + Test	Result - Remark	Verdict
1.5.9.4	Bridging of basic insulation by a VDR		N/A
1.5.9.5	Bridging of supplementary, double or reinforced insulation by a VDR		N/A
1.6	**Power interface**		Pass
1.6.1	AC power distribution systems		N/A
1.6.2	Input current	The steady state input current of the equipment did not exceed the RATED CURRENT under NORMAL LOAD.	Pass
1.6.3	Voltage limit of hand-held equipment	The unit is not a hand-held equipment.	N/A
1.6.4	Neutral conductor		N/A

IEC 60950-1			
Clause	Requirement + Test	Result - Remark	Verdict
1.7	**Marking and instructions**		Pass
1.7.1	Power rating and identification markings		Pass
1.7.1.1	Power rating marking		Pass
	Multiple mains supply connections ..... :		N/A
	Rated voltage(s) or voltage range(s) (V) ..... :	Refer to the Rating information at the beginning of this Test Report.	Pass
	Symbol for nature of supply, for d.c. only ..... :	IEC 60417 No. 5031 provided on marking label.	Pass
	Rated frequency or rated frequency range (Hz) .... :		N/A
	Rated current (mA or A) ..... :	Refer to the Rating information at the beginning of this Test Report.	Pass
1.7.1.2	Identification markings		Pass
	Manufacturer's name or trademark or identification mark..... :	ZHEJIANG DAHUA TECHNOLOGY CO LTD or E234884	Pass
	Model identification or type reference ..... :	Refer to the Model information at the beginning of this Test Report.	Pass
	Symbol for Class II equipment only..... :		N/A
	Other markings and symbols..... :		N/A
1.7.1.3	Use of graphical symbols		N/A
1.7.2	Safety instructions and marking	Operating/safety instructions made available to the user.	Pass
1.7.2.1	General		Pass
1.7.2.2	Disconnect devices		N/A
1.7.2.3	Overcurrent protective device		N/A
1.7.2.4	IT Power distribution systems		N/A
1.7.2.5	Operator access with a tool		N/A
1.7.2.6	Ozone		N/A
1.7.3	Short duty cycles		N/A
1.7.4	Supply voltage adjustment ..... :		N/A
	Method and means of adjustment; reference to installation instructions ..... :		N/A
1.7.5	Power outlets on the equipment..... :	No standard power outlets are provided.	N/A
1.7.6	Fuse identification (marking, special fusing		N/A

IEC 60950-1			
Clause	Requirement + Test	Result - Remark	Verdict
	characteristics, cross-reference) ..... :		
1.7.7	Wiring terminals		N/A
1.7.7.1	Protective earthing and bonding terminals ..... :		N/A
1.7.7.2	Terminals for a.c. mains supply conductors		N/A
1.7.7.3	Terminals for d.c. mains supply conductors		N/A
1.7.8	Controls and indicators		Pass
1.7.8.1	Identification, location and marking ..... :	No controls will affect safety .	N/A
1.7.8.2	Colours ..... :	Only functional indicators use color.	Pass
1.7.8.3	Symbols according to IEC 60417 ..... :		N/A
1.7.8.4	Markings using figures..... :		N/A
1.7.9	Isolation of multiple power sources ..... :		N/A
1.7.10	Thermostats and other regulating devices ..... :		N/A
1.7.11	Durability	DURABILITY OF MARKING TEST was done	Pass
1.7.12	Removable parts	No removable part provided.	N/A
1.7.13	Replaceable batteries..... :		N/A
	Language(s) ..... :		-
1.7.14	Equipment for restricted access locations..... :		N/A

IEC 60950-1			
Clause	Requirement + Test	Result - Remark	Verdict
2	**PROTECTION FROM HAZARDS**		Pass
2.1	Protection from electric shock and energy hazards		Pass
2.1.1	Protection in operator access areas	Class III unit.	Pass
2.1.1.1	Access to energized parts	The operator has access to bare parts of SELV CIRCUITS.	Pass
	Test by inspection..... :		N/A
	Test with test finger (Figure 2A) ..... :		N/A
	Test with test pin (Figure 2B)..... :		N/A
	Test with test probe (Figure 2C)..... :	No TNV present.	N/A
2.1.1.2	Battery compartments		N/A
2.1.1.3	Access to ELV wiring		N/A
	Working voltage (Vpeak or Vrms); minimum distance through insulation (mm) ..... :		-
2.1.1.4	Access to hazardous voltage circuit wiring		N/A
2.1.1.5	Energy hazards ..... :	Units supplied by LPS.	N/A
2.1.1.6	Manual controls		N/A
2.1.1.7	Discharge of capacitors in equipment		N/A
	Measured voltage (V); time-constant (s) ..... :		-
2.1.1.8	Energy hazards - d.c. mains supply		N/A
	a) Capacitor connected to the d.c. mains supply .. :		N/A
	b) Internal battery connected to the d.c. mains supply ..... :		N/A
2.1.1.9	Audio amplifiers..... :		N/A
2.1.2	Protection in service access areas	No bare parts operating at HAZARDOUS VOLTAGES in a service access area.	Pass
2.1.3	Protection in restricted access locations		N/A
2.2	**SELV circuits**		Pass
2.2.1	General requirements	SELV levels are maintained after single fault condition.	Pass
2.2.2	Voltages under normal conditions (V) ..... :	Class III equipment.	Pass
2.2.3	Voltages under fault conditions (V) ..... :	Class III equipment.	Pass
2.2.4	Connection of SELV circuits to other circuits ..... :	SELV circuits are only connected to other secondary circuits.	Pass

IEC 60950-1			
Clause	Requirement + Test	Result - Remark	Verdict
2.3	**TNV circuits**		N/A
2.3.1	Limits		N/A
	Type of TNV circuits ..... :		-
2.3.2	Separation from other circuits and from accessible parts		N/A
2.3.2.1	General requirements		N/A
2.3.2.2	Protection by basic insulation		N/A
2.3.2.3	Protection by earthing		N/A
2.3.2.4	Protection by other constructions ..... :		N/A
2.3.3	Separation from hazardous voltages		N/A
	Insulation employed..... :		-
2.3.4	Connection of TNV circuits to other circuits		N/A
	Insulation employed..... :		-
2.3.5	Test for operating voltages generated externally		N/A
2.4	**Limited current circuits**		N/A
2.4.1	General requirements	No limited current circuits.	N/A
2.4.2	Limit values		N/A
	Frequency (Hz) ..... :		-
	Measured current (mA)..... :		-
	Measured voltage (V) ..... :		-
	Measured circuit capacitance (nF or µF)..... :		-
2.4.3	Connection of limited current circuits to other circuits		N/A
2.5	**Limited power sources**		Pass
	a) Inherently limited output		Pass
	b) Impedance limited output		N/A
	c) Regulating network or IC current limiter, limits output under normal operating and single fault condition		N/A
	Use of integrated circuit (IC) current limiters ..... :		-
	d) Overcurrent protective device limited output		N/A
	Max. output voltage (V), max. output current (A), max. apparent power (VA)..... :	See table 2.5	-
	Current rating of overcurrent protective device (A) :		-

IEC 60950-1			
Clause	Requirement + Test	Result - Remark	Verdict
2.6	**Provisions for earthing and bonding**		N/A
2.6.1	Protective earthing		N/A
2.6.2	Functional earthing		N/A
	Use of symbol for functional earthing ..... :		N/A
2.6.3	Protective earthing and protective bonding conductors		N/A
2.6.3.1	General		N/A
2.6.3.2	Size of protective earthing conductors		N/A
	Rated current (A), cross-sectional area (mm²), AWG ..... :		-
2.6.3.3	Size of protective bonding conductors		N/A
	Rated current (A), cross-sectional area (mm²), AWG ..... :		-
	Protective current rating (A), cross-sectional area (mm²), AWG..... :		-
2.6.3.4	Resistance of earthing conductors and their terminations; resistance (ohm), voltage drop (V), test current (A), duration (min) ..... :		N/A
2.6.3.5	Colour of insulation..... :		N/A
2.6.4	Terminals		N/A
2.6.4.1	General		N/A
2.6.4.2	Protective earthing and bonding terminals		N/A
	Rated current (A), type, nominal thread diameter (mm) ..... :		-
2.6.4.3	Separation of the protective earthing conductor from protective bonding conductors		N/A
2.6.5	Integrity of protective earthing		N/A
2.6.5.1	Interconnection of equipment		N/A
2.6.5.2	Components in protective earthing conductors and protective bonding conductors		N/A
2.6.5.3	Disconnection of protective earth		N/A
2.6.5.4	Parts that can be removed by an operator		N/A
2.6.5.5	Parts removed during servicing		N/A
2.6.5.6	Corrosion resistance		N/A
2.6.5.7	Screws for protective bonding		N/A
2.6.5.8	Reliance on telecommunication network or cable distribution system		N/A

IEC 60950-1			
Clause	Requirement + Test	Result - Remark	Verdict
2.7	**Overcurrent and earth fault protection in primary circuits**		N/A
2.7.1	Basic requirements		N/A
	Instructions when protection relies on building installation		N/A
2.7.2	Faults not simulated in 5.3.7		N/A
2.7.3	Short-circuit backup protection		N/A
2.7.4	Number and location of protective devices ..... :		N/A
2.7.5	Protection by several devices		N/A
2.7.6	Warning to service personnel..... :		N/A
2.8	**Safety interlocks**		N/A
2.8.1	General principles	No Safety interlocks	N/A
2.8.2	Protection requirements		N/A
2.8.3	Inadvertent reactivation		N/A
2.8.4	Fail-safe operation		N/A
	Protection against extreme hazard		N/A
2.8.5	Moving parts		N/A
2.8.6	Overriding		N/A
2.8.7	Switches, relays and their related circuits		N/A
2.8.7.1	Separation distances for contact gaps and their related circuits (mm)..... :		N/A
2.8.7.2	Overload test		N/A
2.8.7.3	Endurance test		N/A
2.8.7.4	Electric strength test		N/A
2.8.8	Mechanical actuators		N/A
2.9	**Electrical insulation**		Pass
2.9.1	Properties of insulating materials	Class III unit.	N/A
2.9.2	Humidity conditioning		N/A
	Relative humidity (%), temperature (°C)..... :		-
2.9.3	Grade of insulation	Functional insulation.	Pass
2.9.4	Separation from hazardous voltages		N/A
	Method(s) used..... :		-

IEC 60950-1			
Clause	Requirement + Test	Result - Remark	Verdict
2.10	**Clearances, creepage distances and distances through insulation**		Pass
2.10.1	General		Pass
2.10.1.1	Frequency..... :		N/A
2.10.1.2	Pollution degrees..... :	PD2	Pass
2.10.1.3	Reduced values for functional insulation	see 5.3.4	Pass
2.10.1.4	Intervening unconnected conductive parts		N/A
2.10.1.5	Insulation with varying dimensions		N/A
2.10.1.6	Special separation requirements		N/A
2.10.1.7	Insulation in circuits generating starting pulses		N/A
2.10.2	Determination of working voltage		N/A
2.10.2.1	General		N/A
2.10.2.2	RMS working voltage		N/A
2.10.2.3	Peak working voltage		N/A
2.10.3	Clearances		N/A
2.10.3.1	General		N/A
2.10.3.2	Mains transient voltages		N/A
	a) AC mains supply ..... :		N/A
	b) Earthed d.c. mains supplies ..... :		N/A
	c) Unearthed d.c. mains supplies ..... :		N/A
	d) Battery operation ..... :		N/A
2.10.3.3	Clearances in primary circuits		N/A
2.10.3.4	Clearances in secondary circuits	See 5.3.4 method c.	N/A
2.10.3.5	Clearances in circuits having starting pulses		N/A
2.10.3.6	Transients from a.c. mains supply..... :		N/A
2.10.3.7	Transients from d.c. mains supply..... :		N/A
2.10.3.8	Transients from telecommunication networks and cable distribution systems ..... :		N/A
2.10.3.9	Measurement of transient voltage levels		N/A
	a) Transients from a mains supply		N/A
	For an a.c. mains supply ..... :		N/A
	For a d.c. mains supply ..... :		N/A
	b) Transients from a telecommunication network		N/A
2.10.4	Creepage distances	See 5.3.4 for secondary circuits.	N/A
2.10.4.1	General		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
2.10.4.2	Material group and comparative tracking index		N/A
	CTI tests ..... :		-
2.10.4.3	Minimum creepage distances		N/A
2.10.5	Solid insulation		N/A
2.10.5.1	General		N/A
2.10.5.2	Distances through insulation		N/A
2.10.5.3	Insulating compound as solid insulation		N/A
2.10.5.4	Semiconductor devices		N/A
2.10.5.5	Cemented joints		N/A
2.10.5.6	Thin sheet material - General		N/A
2.10.5.7	Separable thin sheet material		N/A
	Number of layers (pcs) ..... :		-
2.10.5.8	Non-separable thin sheet material		N/A
2.10.5.9	Thin sheet material - standard test procedure		N/A
	Electric strength test ..... :		-
2.10.5.10	Thin sheet material - alternative test procedure		N/A
	Electric strength test ..... :		-
2.10.5.11	Insulation in wound components		N/A
2.10.5.12	Wire in wound components		N/A
	Working voltage ..... :		N/A
	a) Basic insulation not under stress ..... :		N/A
	b) Basic, supplementary, reinforced insulation..... :		N/A
	c) Compliance with Annex U ..... :		N/A
	Two wires in contact inside wound component; angle between 45° and 90° ..... :		N/A
2.10.5.13	Wire with solvent-based enamel in wound components		N/A
	Electric strength test ..... :		-
	Routine test		N/A
2.10.5.14	Additional insulation in wound components		N/A
	Working voltage ..... :		N/A
	- Basic insulation not under stress ..... :		N/A
	- Supplementary, reinforced insulation..... :		N/A
2.10.6	Construction of printed boards		N/A
2.10.6.1	Uncoated printed boards		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
2.10.6.2	Coated printed boards		N/A
2.10.6.3	Insulation between conductors on the same inner surface of a printed board		N/A
2.10.6.4	Insulation between conductors on different layers of a printed board		N/A
	Distance through insulation		N/A
	Number of insulation layers (pcs)..... :		N/A
2.10.7	Component external terminations		N/A
2.10.8	Tests on coated printed boards and coated components		N/A
2.10.8.1	Sample preparation and preliminary inspection		N/A
2.10.8.2	Thermal conditioning		N/A
2.10.8.3	Electric strength test		N/A
2.10.8.4	Abrasion resistance test		N/A
2.10.9	Thermal cycling		N/A
2.10.10	Test for Pollution Degree 1 environment and insulating compound		N/A
2.10.11	Tests for semiconductor devices and cemented joints		N/A
2.10.12	Enclosed and sealed parts		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
3	**WIRING, CONNECTIONS AND SUPPLY**		Pass
3.1	General		Pass
3.1.1	Current rating and overcurrent protection	All internal wiring used in the distribution of primary power protected against overcurrent and short circuit by suitably rated protective devices.	Pass
3.1.2	Protection against mechanical damage	The wires are routed away from sharp edges and parts which could damage insulation.	Pass
3.1.3	Securing of internal wiring	The wires are positioned in such a manner that prevents excessive strain, loosening of terminal connections and damage of conductor insulation.	Pass
3.1.4	Insulation of conductors		Pass
3.1.5	Beads and ceramic insulators		N/A
3.1.6	Screws for electrical contact pressure		N/A
3.1.7	Insulating materials in electrical connections		N/A
3.1.8	Self-tapping and spaced thread screws		N/A
3.1.9	Termination of conductors		N/A
	10 N pull test		N/A
3.1.10	Sleeving on wiring		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
3.2	**Connection to a mains supply**		N/A
3.2.1	Means of connection	Class III unit, supplied by the LPS and SELV adapter.	N/A
3.2.1.1	Connection to an a.c. mains supply		N/A
3.2.1.2	Connection to a d.c. mains supply		N/A
3.2.2	Multiple supply connections		N/A
3.2.3	Permanently connected equipment		N/A
	Number of conductors, diameter of cable and conduits (mm) ..... :		-
3.2.4	Appliance inlets		N/A
3.2.5	Power supply cords		N/A
3.2.5.1	AC power supply cords		N/A
	Type ..... :		-
	Rated current (A), cross-sectional area (mm^2), AWG ..... :		-
3.2.5.2	DC power supply cords		N/A
3.2.6	Cord anchorages and strain relief		N/A
	Mass of equipment (kg), pull (N) ..... :		-
	Longitudinal displacement (mm) ..... :		-
3.2.7	Protection against mechanical damage		N/A
3.2.8	Cord guards		N/A
	Diameter of minor dimension D (mm); test mass (g) ..... :		-
	Radius of curvature of cord (mm) ..... :		-
3.2.9	Supply wiring space		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
3.3	**Wiring terminals for connection of external conductors**		N/A
3.3.1	Wiring terminals		N/A
3.3.2	Connection of non-detachable power supply cords		N/A
3.3.3	Screw terminals		N/A
3.3.4	Conductor sizes to be connected		N/A
	Rated current (A), cord/cable type, cross-sectional area (mm^2) ..... :		-
3.3.5	Wiring terminal sizes		N/A
	Rated current (A), type and nominal thread diameter (mm) ..... :		-
3.3.6	Wiring terminals design		N/A
3.3.7	Grouping of wiring terminals		N/A
3.3.8	Stranded wire		N/A
3.4	**Disconnection from the mains supply**		N/A
3.4.1	General requirement		N/A
3.4.2	Disconnect devices		N/A
3.4.3	Permanently connected equipment		N/A
3.4.4	Parts which remain energized		N/A
3.4.5	Switches in flexible cords		N/A
3.4.6	Number of poles - single-phase and d.c. equipment		N/A
3.4.7	Number of poles - three-phase equipment		N/A
3.4.8	Switches as disconnect devices		N/A
3.4.9	Plugs as disconnect devices		N/A
3.4.10	Interconnected equipment		N/A
3.4.11	Multiple power sources		N/A
3.5	**Interconnection of equipment**		Pass
3.5.1	General requirements		Pass
3.5.2	Types of interconnection circuits ..... :	Interconnection circuits are SELV CIRCUITS.	Pass
3.5.3	ELV circuits as interconnection circuits		N/A
3.5.4	Data ports for additional equipment		Pass

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Clause	Requirement + Test	Result - Remark	Verdict
4	**PHYSICAL REQUIREMENTS**		Pass
4.1	Stability		Pass
	Angle of 10°	Based on construction, the test was deemed not necessary.	Pass
	Test force (N)..... :		N/A
4.2	**Mechanical strength**		Pass
4.2.1	General	The equipment is supplied by SELV and LPS adapter.	N/A
	Rack-mounted equipment		N/A
4.2.2	Steady force test, 10 N		N/A
4.2.3	Steady force test, 30 N		N/A
4.2.4	Steady force test, 250 N		N/A
4.2.5	Impact test		N/A
	Fall test		N/A
	Swing test		N/A
4.2.6	Drop test; height (mm)..... :		N/A
4.2.7	Stress relief test		N/A
4.2.8	Cathode ray tubes		N/A
	Picture tube separately certified ..... :		N/A
4.2.9	High pressure lamps		N/A
4.2.10	Wall or ceiling mounted equipment; force (N) ..... :	Mounting means withstands four times unit weight or 50N minimum.	Pass

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Clause	Requirement + Test	Result - Remark	Verdict
4.3	**Design and construction**		Pass
4.3.1	Edges and corners	All edges and corners are judged to be sufficiently well rounded so as not to constitute a hazard.	Pass
4.3.2	Handles and manual controls; force (N) ..... :		N/A
4.3.3	Adjustable controls		N/A
4.3.4	Securing of parts		N/A
4.3.5	Connection by plugs and sockets	IEC 60083 or IEC 60320 type connectors not used for SELV circuits.	Pass
4.3.6	Direct plug-in equipment		N/A
	Torque ..... :		N/A
	Compliance with the relevant mains plug standard:		N/A
4.3.7	Heating elements in earthed equipment		N/A
4.3.8	Batteries		Pass
	- Overcharging of a rechargeable battery	For model DH-IPC-HDBW2431RP-ZAS-S2: the battery is protected by R1,D1 and R2 For model DH-IPC-HDBW3441RP-ZAS: the battery is protected by R45,D1 and R40	Pass
	- Unintentional charging of a non-rechargeable battery		N/A
	- Reverse charging of a rechargeable battery		Pass
	- Excessive discharging rate for any battery	evaluate in UL 1642	Pass
4.3.9	Oil and grease		N/A
4.3.10	Dust, powders, liquids and gases		N/A
4.3.11	Containers for liquids or gases		N/A
4.3.12	Flammable liquids..... :		N/A
	Quantity of liquid (l)..... :		N/A
	Flash point (°C)..... :		N/A
4.3.13	Radiation		Pass
4.3.13.1	General		N/A
4.3.13.2	Ionizing radiation		N/A
	Measured radiation (pA/kg) ..... :		-

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Clause	Requirement + Test	Result - Remark	Verdict
	Measured high-voltage (kV) ..... :		-
	Measured focus voltage (kV)..... :		-
	CRT markings..... :		-
4.3.13.3	Effect of ultraviolet (UV) radiation on materials		N/A
	Part, property, retention after test, flammability classification ..... :		N/A
4.3.13.4	Human exposure to ultraviolet (UV) radiation ..... :		N/A
4.3.13.5	Lasers (including laser diodes) and LEDs	This product contains only visible indicator LEDs (Class 1) operating in the range of 400 - 700 nm wavelength. No IEC60825-1 evaluation was deemed necessary. Additional review may be required at the discretion of the accepting NCB.	Pass
4.3.13.5.1	Lasers (including laser diodes)		Pass
	Laser class ..... :	(For indicator LEDs, see above statement.)	-
4.3.13.5.2	Light emitting diodes (LEDs)		Pass
4.3.13.6	Other types ..... :		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
4.4	**Protection against hazardous moving parts**		N/A
4.4.1	General		N/A
4.4.2	Protection in operator access areas ..... :		N/A
	Household and home/office document/media shredders		N/A
4.4.3	Protection in restricted access locations ..... :		N/A
4.4.4	Protection in service access areas		N/A
4.4.5	Protection against moving fan blades		N/A
4.4.5.1	General		N/A
	Not considered to cause pain or injury. a) ..... :		N/A
	Is considered to cause pain, not injury. b) ..... :		N/A
	Considered to cause injury. c) ..... :		N/A
4.4.5.2	Protection for users		N/A
	Use of symbol or warning ..... :		N/A
4.4.5.3	Protection for service persons		N/A
	Use of symbol or warning ..... :		N/A
4.5	**Thermal requirements**		Pass
4.5.1	General		Pass
4.5.2	Temperature tests	(see appended table 4.5)	Pass
	Normal load condition per Annex L ..... :	Operated in the most unfavorable way of operation given in the operating instructions until steady conditions established.	-
4.5.3	Temperature limits for materials		Pass
4.5.4	Touch temperature limits		Pass
4.5.5	Resistance to abnormal heat ..... :		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
4.6	**Openings in enclosures**		N/A
4.6.1	Top and side openings	Unit supplied by SELV and LPS.	N/A
	Dimensions (mm) ..... :		-
4.6.2	Bottoms of fire enclosures		N/A
	Construction of the bottom, dimensions (mm)..... :		-
4.6.3	Doors or covers in fire enclosures		N/A
4.6.4	Openings in transportable equipment		N/A
4.6.4.1	Constructional design measures		N/A
	Dimensions (mm) ..... :		-
4.6.4.2	Evaluation measures for larger openings		N/A
4.6.4.3	Use of metallized parts		N/A
4.6.5	Adhesives for constructional purposes		N/A
	Conditioning temperature (°C), time (weeks) ..... :		-

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Clause	Requirement + Test	Result - Remark	Verdict
4.7	**Resistance to fire**		Pass
4.7.1	Reducing the risk of ignition and spread of flame		Pass
	Method 1, selection and application of components wiring and materials		Pass
	Method 2, application of all of simulated fault condition tests		N/A
4.7.2	Conditions for a fire enclosure	No fire enclosure is needed.	Pass
4.7.2.1	Parts requiring a fire enclosure		N/A
4.7.2.2	Parts not requiring a fire enclosure	Circuit supplied by a limited power source complying with 2.5 and with components mounted on materials of Class V-1 or better.	Pass
4.7.3	Materials		Pass
4.7.3.1	General	Unit is supplied by LPS.	Pass
4.7.3.2	Materials for fire enclosures		N/A
4.7.3.3	Materials for components and other parts outside fire enclosures	Decorative parts and parts outside of the fire enclosure are made of minimum HB material.	Pass
4.7.3.4	Materials for components and other parts inside fire enclosures	PWBs are rated min. V-1.Internal wiring is UL Recognized, marked VW-1 or FT-1 and strapped by individual cable ties (where needed).	Pass
4.7.3.5	Materials for air filter assemblies		N/A
4.7.3.6	Materials used in high-voltage components		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
5	**ELECTRICAL REQUIREMENTS AND SIMULATED ABNORMAL CONDITIONS**		Pass
5.1	Touch current and protective conductor current		N/A
5.1.1	General	Supplied by the SELV and LPS adapter.	N/A
5.1.2	Configuration of equipment under test (EUT)		N/A
5.1.2.1	Single connection to an a.c. mains supply		N/A
5.1.2.2	Redundant multiple connections to an a.c. mains supply		N/A
5.1.2.3	Simultaneous multiple connections to an a.c. mains supply		N/A
5.1.3	Test circuit		N/A
5.1.4	Application of measuring instrument		N/A
5.1.5	Test procedure		N/A
5.1.6	Test measurements		N/A
	Supply voltage (V) ..... :		-
	Measured touch current (mA)..... :		-
	Max. allowed touch current (mA)..... :		-
	Measured protective conductor current (mA)..... :		-
	Max. allowed protective conductor current (mA)... :		-
5.1.7	Equipment with touch current exceeding 3,5 mA		N/A
5.1.7.1	General..... :		N/A
5.1.7.2	Simultaneous multiple connections to the supply		N/A
5.1.8	Touch currents to telecommunication networks and cable distribution systems and from telecommunication networks		N/A
5.1.8.1	Limitation of the touch current to a telecommunication network or to a cable distribution system		N/A
	Supply voltage (V) ..... :		-
	Measured touch current (mA)..... :		-
	Max. allowed touch current (mA)..... :		-
5.1.8.2	Summation of touch currents from telecommunication networks		N/A
	a) EUT with earthed telecommunication ports ..... :		N/A
	b) EUT whose telecommunication ports have no reference to protective earth		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
5.2	**Electric strength**		N/A
5.2.1	General		N/A
5.2.2	Test procedure		N/A
5.3	**Abnormal operating and fault conditions**		Pass
5.3.1	Protection against overload and abnormal operation		N/A
5.3.2	Motors		N/A
5.3.3	Transformers		N/A
5.3.4	Functional insulation ..... :	Functional insulation complies with the requirements (a), (b), or (c).	Pass
5.3.5	Electromechanical components		N/A
5.3.6	Audio amplifiers in ITE..... :		N/A
5.3.7	Simulation of faults		N/A
5.3.8	Unattended equipment		N/A
5.3.9	Compliance criteria for abnormal operating and fault conditions		N/A
5.3.9.1	During the tests		N/A
5.3.9.2	After the tests		N/A
6	**CONNECTION TO TELECOMMUNICATION NETWORKS**		N/A
6.1	Protection of telecommunication network service persons, and users of other equipment connected to the network, from hazards in the equipment		N/A
6.1.1	Protection from hazardous voltages		N/A
6.1.2	Separation of the telecommunication network from earth		N/A
6.1.2.1	Requirements		N/A
	Supply voltage (V) ..... :		-
	Current in the test circuit (mA)..... :		-
6.1.2.2	Exclusions..... :		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
6.2	**Protection of equipment users from overvoltages on telecommunication networks**		N/A
6.2.1	Separation requirements		N/A
6.2.2	Electric strength test procedure		N/A
6.2.2.1	Impulse test		N/A
6.2.2.2	Steady-state test		N/A
6.2.2.3	Compliance criteria		N/A
6.3	**Protection of the telecommunication wiring system from overheating**		N/A
	Max. output current (A) ..... :		-
	Current limiting method ..... :		-
7	**CONNECTION TO CABLE DISTRIBUTION SYSTEMS**		N/A
7.1	General		N/A
7.2	Protection of cable distribution system service persons, and users of other equipment connected to the system, from hazardous voltages in the equipment		N/A
7.3	Protection of equipment users from overvoltages on the cable distribution system	No cable distribution systems.	N/A
7.4	Insulation between primary circuits and cable distribution systems		N/A
7.4.1	General		N/A
7.4.2	Voltage surge test		N/A
7.4.3	Impulse test		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
A	**ANNEX A, TESTS FOR RESISTANCE TO HEAT AND FIRE**		N/A
A.1	Flammability test for fire enclosures of movable equipment having a total mass exceeding 18 kg, and of stationary equipment (see 4.7.3.2)		N/A
A.1.1	Samples ..... :		-
	Wall thickness (mm) ..... :		-
A.1.2	Conditioning of samples; temperature (°C) ..... :		N/A
A.1.3	Mounting of samples ..... :		N/A
A.1.4	Test flame (see IEC 60695-11-3)		N/A
	Flame A, B, C or D ..... :		N/A
A.1.5	Test procedure		N/A
A.1.6	Compliance criteria		N/A
	Sample 1 burning time (s) ..... :		-
	Sample 2 burning time (s) ..... :		-
	Sample 3 burning time (s) ..... :		-
A.2	Flammability test for fire enclosures of movable equipment having a total mass not exceeding 18 kg, and for material and components located inside fire enclosures (see 4.7.3.2 and 4.7.3.4)		N/A
A.2.1	Samples, material ..... :		-
	Wall thickness (mm) ..... :		-
A.2.2	Conditioning of samples; temperature (°C) ..... :		N/A
A.2.3	Mounting of samples ..... :		N/A
A.2.4	Test flame (see IEC 60695-11-4)		N/A
	Flame A, B or C ..... :		-
A.2.5	Test procedure		N/A
A.2.6	Compliance criteria		N/A
	Sample 1 burning time (s) ..... :		-
	Sample 2 burning time (s) ..... :		-
	Sample 3 burning time (s) ..... :		-
A.2.7	Alternative test acc. to IEC 60695-11-5, cl. 5 and 9		N/A
	Sample 1 burning time (s) ..... :		-
	Sample 2 burning time (s) ..... :		-
	Sample 3 burning time (s) ..... :		-
A.3	Hot flaming oil test (see 4.6.2)		N/A
A.3.1	Mounting of samples		N/A
A.3.2	Test procedure		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
A.3.3	Compliance criterion		N/A
B	**ANNEX B, MOTOR TESTS UNDER ABNORMAL CONDITIONS (see 4.7.2.2 and 5.3.2)**		N/A
B.1	General requirements	No motors.	N/A
	Position ..... :		-
	Manufacturer ..... :		-
	Type ..... :		-
	Rated values ..... :		-
B.2	Test conditions		N/A
B.3	Maximum temperatures		N/A
B.4	Running overload test		N/A
B.5	Locked-rotor overload test		N/A
	Test duration (days) ..... :		-
	Electric strength test: test voltage (V) ..... :		-
B.6	Running overload test for d.c. motors in secondary circuits		N/A
B.6.1	General		N/A
B.6.2	Test procedure		N/A
B.6.3	Alternative test procedure		N/A
B.6.4	Electric strength test; test voltage (V) ..... :		N/A
B.7	Locked-rotor overload test for d.c. motors in secondary circuits		N/A
B.7.1	General		N/A
B.7.2	Test procedure		N/A
B.7.3	Alternative test procedure		N/A
B.7.4	Electric strength test; test voltage (V) ..... :		N/A
B.8	Test for motors with capacitors		N/A
B.9	Test for three-phase motors		N/A
B.10	Test for series motors		N/A
	Operating voltage (V) ..... :		-

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Clause	Requirement + Test	Result - Remark	Verdict
C	**ANNEX C, TRANSFORMERS (see 1.5.4 and 5.3.3)**		N/A
	Position ..... :		-
	Manufacturer ..... :		-
	Type ..... :		-
	Rated values ..... :		-
	Method of protection ..... :		-
C.1	Overload test		N/A
C.2	Insulation		N/A
	Protection from displacement of windings ..... :		N/A
D	**ANNEX D, MEASURING INSTRUMENTS FOR TOUCH-CURRENT TESTS (see 5.1.4)**		N/A
D.1	Measuring instrument		N/A
D.2	Alternative measuring instrument		N/A
E	**ANNEX E, TEMPERATURE RISE OF A WINDING (see 1.4.13)**		N/A
F	**ANNEX F, MEASUREMENT OF CLEARANCES AND CREEPAGE DISTANCES (see 2.10 and Annex G)**		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
G	**ANNEX G, ALTERNATIVE METHOD FOR DETERMINING MINIMUM CLEARANCES**		N/A
G.1	Clearances		N/A
G.1.1	General		N/A
G.1.2	Summary of the procedure for determining minimum clearances		N/A
G.2	Determination of mains transient voltage (V)		N/A
G.2.1	AC mains supply..... :		N/A
G.2.2	Earthed d.c. mains supplies ..... :		N/A
G.2.3	Unearthed d.c. mains supplies ..... :		N/A
G.2.4	Battery operation ..... :		N/A
G.3	Determination of telecommunication network transient voltage (V) ……..:		N/A
G.4	Determination of required withstand voltage (V)		N/A
G.4.1	Mains transients and internal repetitive peaks ..... :		N/A
G.4.2	Transients from telecommunication networks..... :		N/A
G.4.3	Combination of transients		N/A
G.4.4	Transients from cable distribution systems		N/A
G.5	Measurement of transient voltages (V)		N/A
	a) Transients from a mains supply		N/A
	For an a.c. mains supply		N/A
	For a d.c. mains supply		N/A
	b) Transients from a telecommunication network		N/A
G.6	Determination of minimum clearances……..:		N/A
H	**ANNEX H, IONIZING RADIATION (see 4.3.13)**		N/A
J	**ANNEX J, TABLE OF ELECTROCHEMICAL POTENTIALS (see 2.6.5.6)**		N/A
	Metal(s) used..... :		-

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Clause	Requirement + Test	Result - Remark	Verdict
K	**ANNEX K, THERMAL CONTROLS (see 1.5.3 and 5.3.8)**		N/A
K.1	Making and breaking capacity		N/A
K.2	Thermostat reliability; operating voltage (V) ..... :		N/A
K.3	Thermostat endurance test; operating voltage (V) :		N/A
K.4	Temperature limiter endurance; operating voltage (V) ..... :		N/A
K.5	Thermal cut-out reliability		N/A
K.6	Stability of operation		N/A
L	**ANNEX L, NORMAL LOAD CONDITIONS FOR SOME TYPES OF ELECTRICAL BUSINESS EQUIPMENT (see 1.2.2.1 and 4.5.2)**		Pass
L.1	Typewriters		N/A
L.2	Adding machines and cash registers		N/A
L.3	Erasers		N/A
L.4	Pencil sharpeners		N/A
L.5	Duplicators and copy machines		N/A
L.6	Motor-operated files		N/A
L.7	Other business equipment		Pass
M	**ANNEX M, CRITERIA FOR TELEPHONE RINGING SIGNALS (see 2.3.1)**		N/A
M.1	Introduction		N/A
M.2	Method A		N/A
M.3	Method B		N/A
M.3.1	Ringing signal		N/A
M.3.1.1	Frequency (Hz) ..... :		-
M.3.1.2	Voltage (V) ..... :		-
M.3.1.3	Cadence; time (s), voltage (V) ..... :		-
M.3.1.4	Single fault current (mA) ..... :		-
M.3.2	Tripping device and monitoring voltage ..... :		N/A
M.3.2.1	Conditions for use of a tripping device or a monitoring voltage		N/A
M.3.2.2	Tripping device		N/A
M.3.2.3	Monitoring voltage (V) ..... :		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
N	**ANNEX N, IMPULSE TEST GENERATORS (see 1.5.7.2, 1.5.7.3, 2.10.3.9, 6.2.2.1, 7.3.2, 7.4.3 and Clause G.5)**		N/A
N.1	ITU-T impulse test generators		N/A
N.2	IEC 60065 impulse test generator		N/A
P	**ANNEX P, NORMATIVE REFERENCES**		Pass
Q	**ANNEX Q, Voltage dependent resistors (VDRs) (see 1.5.9.1)**		N/A
	- Preferred climatic categories..... :		N/A
	- Maximum continuous voltage..... :		N/A
	- Combination Pulse current..... :		N/A
	Body of the VDR Test according to IEC60695-11-5 ..... :		N/A
	Body of the VDR. Flammability class of material (min V-1) ..... :		N/A
R	**ANNEX R, EXAMPLES OF REQUIREMENTS FOR QUALITY CONTROL PROGRAMMES**		N/A
R.1	Minimum separation distances for unpopulated coated printed boards (see 2.10.6.2)		N/A
R.2	Reduced clearances (see 2.10.3)		N/A
S	**ANNEX S, PROCEDURE FOR IMPULSE TESTING (see 6.2.2.3)**		N/A
S.1	Test equipment		N/A
S.2	Test procedure		N/A
S.3	Examples of waveforms during impulse testing		N/A
T	**ANNEX T, GUIDANCE ON PROTECTION AGAINST INGRESS OF WATER (see 1.1.2)**		N/A
	..... :		-
U	**ANNEX U, INSULATED WINDING WIRES FOR USE WITHOUT INTERLEAVED INSULATION (see 2.10.5.4)**		N/A
	..... :		-
V	**ANNEX V, AC POWER DISTRIBUTION SYSTEMS (see 1.6.1)**		Pass
V.1	Introduction		Pass
V.2	TN power distribution systems		Pass

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Clause	Requirement + Test	Result - Remark	Verdict
W	**ANNEX W, SUMMATION OF TOUCH CURRENTS**		N/A
W.1	Touch current from electronic circuits		N/A
W.1.1	Floating circuits		N/A
W.1.2	Earthed circuits		N/A
W.2	Interconnection of several equipments		N/A
W.2.1	Isolation		N/A
W.2.2	Common return, isolated from earth		N/A
W.2.3	Common return, connected to protective earth		N/A
X	**ANNEX X, MAXIMUM HEATING EFFECT IN TRANSFORMER TESTS (see clause C.1)**		N/A
X.1	Determination of maximum input current		N/A
X.2	Overload test procedure		N/A
Y	**ANNEX Y, ULTRAVIOLET LIGHT CONDITIONING TEST (see 4.3.13.3)**		N/A
Y.1	Test apparatus..... :		N/A
Y.2	Mounting of test samples..... :		N/A
Y.3	Carbon-arc light-exposure apparatus..... :		N/A
Y.4	Xenon-arc light-exposure apparatus ..... :		N/A
Z	**ANNEX Z, OVERVOLTAGE CATEGORIES (see 2.10.3.2 and Clause G.2)**		Pass
AA	**ANNEX AA, MANDREL TEST (see 2.10.5.8)**		N/A
BB	**ANNEX BB, CHANGES IN THE SECOND EDITION**		Pass
CC	**ANNEX CC, EVALUATION OF INTEGRATED CIRCUIT (IC) CURRENT LIMITERS**		N/A
CC.1	General		N/A
CC.2	Test program 1 ..... :		N/A
CC.3	Test program 2 ..... :		N/A
CC.4	Test program 3 ..... :		N/A
CC.5	Compliance..... :		N/A

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DD	**ANNEX DD, REQUIREMENTS FOR THE MOUNTING MEANS OF RACK-MOUNTED EQUIPMENT**		N/A
DD.1	General		N/A
DD.2	Mechanical strength test, variable N ..... :		N/A
DD.3	Mechanical strength test, 250 N, including end stops ..... :		N/A
DD.4	Compliance..... :		N/A
EE	**ANNEX EE, HOUSEHOLD AND HOME/OFFICE DOCUMENT/MEDIA SHREDDERS**		N/A
EE.1	General		N/A
EE.2	Markings and instructions		N/A
	Use of markings or symbols ..... :		N/A
	Information of user instructions, maintenance and/or servicing instructions..... :		N/A
EE.3	Inadvertent reactivation test ..... :		N/A
EE.4	Disconnection of power to hazardous moving parts		N/A
	Use of markings or symbols ..... :		N/A
EE.5	Protection against hazardous moving parts ..... :		N/A
	Test with test finger (Figure 2A)		N/A
	Test with wedge probe (Figure EE1 and EE2) ..... :		N/A

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1.5.1	**TABLE: list of critical components**				Pass
object/part or Description	manufacturer/ trademark	type/model	technical data	standard (Edition or year)	mark(s) of conformity[1])
1. Metal Enclosure	--	--	Metal	--	--, --
2. Plastic Enclosure	Interchangeable	Interchangeable	Min HB	UL94, UL 746	UL, --
3a. Power adaptor (optional)	Interchangeable	Interchangeable	Output: min 12VDC, 1A; POE(36-57VDC),0.35A ; Min 60 degree C, LPS output.	IEC/EN 60950-1	--, Approved by certification body.
4. Internal wiring, secondary	Interchangeable	Interchangeable	FEP, PTFE, PVC, TFE, neoprene, polyimide or marked VW-1; minimum 60V, 80 degree C	UL758	UL, --
5. Interconnecting Cable (Optional)	Interchangeable	Interchangeable	Minimum 80 degree C, 60V, maximum 3.05m long, jacketed, marked "VW-1" or "FT-1".	UL 758	UL, --
6.Connectors and Receptacles (secondary ELV/SELV circuits)	Interchangeable	Interchangeable	Copper alloy pins housed in bodies of plastic rated V-2 minimum	UL94, UL746C	UL, --
6a. Connectors and Receptacles (secondary ELV/SELV circuits) (Alternate)	Interchangeable	Interchangeable	Metal/Plastic	UL498, UL1977	UL, --
7. RTC battery	SEIKO INSTRUMENTS INC MICRO ENERGY DIV	ML414H	Max Charging current: 300mA, Max Charging Voltage: 3.4Vdc	UL1642	UL MH15628, --
8. Label	-	-	Pressure sensitive label secured by adhesive	-	-, --
9. Printed wiring board	Interchangeable	Interchangeable	Minimum V-1, minimum 130°C	UL796	UL, --
10. Flexible PWB	Interchangeable	Interchangeable	V-1 or better, minimum 105	UL 796F	UL, --

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			degree C		
Supplementary information: [1]) Provided evidence ensures the agreed level of compliance. See OD-CB2039.					

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1.5.1	**TABLE: Opto Electronic Devices**			N/A
Manufacturer				
Type				
Separately tested				
Bridging insulation				
External creepage distance				
Internal creepage distance				
Distance through insulation				
Tested under the following conditions				
Input				
Output				
supplementary information:				
Additional devices may be described in Enclosure - Miscellaneous				

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1.6.2	**TABLE: Electrical data (in normal conditions)**					Pass
U (V)	I (A)	I rated (A)	P (W)	Fuse #	I fuse (A)	condition/status
For model: DH-IPC-HDBW5241RP-S	--	--	--	--	--	--
12Vdc	0.283	1	3.396	--	--	Maximum normal load
36Vdc	0.109	0.35	3.924	--	--	Maximum normal load
57Vdc	0.070	0.35	3.990	--	--	Maximum normal load
For model: DH-IPC-HDBW5442RP-ASE	--	--	--	--	--	--
12Vdc	0.352	1	4.224	--	--	Maximum normal load
36Vdc	0.137	0.35	4.932	--	--	Maximum normal load
57Vdc	0.087	0.35	4.959	--	--	Maximum normal load
For model: DH-IPC-HDBW5241RP-ASE	--	--	--	--	--	--
12Vdc	0.317	1	3.804	--	--	Maximum normal load
36Vdc	0.121	0.35	4.356	--	--	Maximum normal load
57Vdc	0.077	0.35	4.389	--	--	Maximum normal load
For test reocrd 2	--	--	--	--	--	--
For model: DH-IPC-HDBW3441RP-ZAS	--	--	--	--	--	--
12Vdc	0.367	1	4.40	--	--	Maximum normal load
36Vdc	0.142	0.35	5.11	--	--	Maximum normal load
57Vdc	0.090	0.35	5.13	--	--	Maximum normal load
For model: DH-IPC-HDBW2431RP-ZAS-S2	--	--	--	--	--	--
12Vdc	0.312	1	3.74	--	--	Maximum normal load
36Vdc	0.120	0.35	4.32	--	--	Maximum normal load
57Vdc	0.076	0.35	4.33	--	--	Maximum normal load
supplementary information:						
Maximum normal load : Unit normal operated, all IR light are on						

2.1.1.5 c) 1)	**TABLE: max. V, A, VA test**				N/A
Voltage (rated) (V)	Current (rated) (A)	Voltage (max.) (V)	Current (max.) (A)	VA (max.) (VA)	

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supplementary information:

2.1.1.5 c) 2)	**TABLE: stored energy**		N/A
Capacitance (µF)	Voltage U (V)	Energy E (J)	
supplementary information:			

2.2	**TABLE: evaluation of voltage limiting components in SELV circuits**		N/A
Component (measured between)	max. voltage (V) (normal operation)		Voltage limiting components
	V peak	V d.c.	
Fault test performed on voltage limiting components	Voltage measured (V) in SELV circuits (V peak or V d.c.)		
supplementary information:			

2.5	**TABLE: Limited power sources**					Pass
Circuit output tested:		See below				
Note: Measured Uoc (V) with all load circuits disconnected:		See below				
Components	Test condition (Single fault)	Uoc (V)	Isc (A)		VA	
			Meas.	Limit	Meas.	Limit

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For model: DH-IPC-HDBW5241RP-S	--	--	--	--	--	--
J4(RJ45 and DC in port, Pin 5, 6: GND, Pin 7,8: DC in)	--	--	--	--	--	--
Pin 1, 2, 3, 4, 9, 10, 11, 12 to GND	1#	0	0	8	0	100
For model: DH-IPC-HDBW5442RP-ASE	--	--	--	--	--	--
J16(RJ45 and DC in port, Pin 5, 6: GND, Pin 7,8: DC in)	--	--	--	--	--	--
Pin 1, 2, 3, 4, 9, 10, 11, 12 to GND	1#	0	0	8	0	100
J4(Alarm in/out, audio in/out, Pin 2, 5, 6, 8: GND, Pin 4, 10, 11, 12, 13, 14: NC)	--	--	--	--	--	--
Pin 3 to GND	1#	3.3	0	8	0	100
Pin 1, 7, 9 to GND	1#	0	0	8	0	100
For model: DH-IPC-HDBW5241RP-ASE	--	--	--	--	--	--
J4(RJ45 and DC in port, Pin 5, 6: GND, Pin 7,8: DC in)	--	--	--	--	--	--
Pin 1, 2, 3, 4, 9, 10, 11, 12 to GND	1#	0	0	8	0	100
J6(Alarm in/out, audio in/out, Pin 2, 5, 6, 8: GND, Pin 4, 10, 11, 12, 13, 14: NC)	--	--	--	--	--	--
Pin 3 to GND	1#	3.3	0	8	0	100
Pin 1, 7, 9 to GND	1#	0	0	8	0	100

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For test record 2	--	--	--	--	--	--
For model: DH-IPC-HDBW3441RP-ZAS	--	--	--	--	--	--
J2(DC IN & RJ45 port, Pin 5, 6: GND)	--	--	--	--	--	--
Pin 1, 2, 3, 4, 7, 8, 9, 10, 11, 12 to GND	1#	0	0	8	0	100
J4(Alarm in & out and audio in & out port, Pin 2, 5, 6, 8, 10, 14 :GND)	--	--	--	--	--	--
Pin 3, 4, 12 to GND	1#	3.0	0	8	0	100
Pin 1, 7, 9, 11, 13 to GND	1#	0	0	8	0	100
For model: DH-IPC-HDBW2431RP-ZAS-S2	--	--	--	--	--	--
J1(DC IN & RJ45 port, Pin 5, 6: GND)	--	--	--	--	--	--
Pin 1, 2, 3, 4, 7, 8, 9, 10, 11, 12 to GND	1#	0	0	8	0	100
J10(Alarm in & out and audio in & out port, Pin 2, 5, 6, 8, 10, 14 :GND)	--	--	--	--	--	--
Pin 3, 4, 12 to GND	1#	3.0	0	8	0	100
Pin 1, 7, 9, 11, 13 to GND	1#	0	0	8	0	100
supplementary information:						
N/A						

2.10.2	**TABLE: working voltage measurement**			N/A
Location		RMS voltage (V)	Peak voltage (V)	Comments
supplementary information:				

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2.10.3 and 2.10.4	**TABLE: Clearance and creepage distance measurements**					N/A
Clearance (cl) and creepage distance (cr) at/of/between:	U peak (V)	U r.m.s. (V)	Required cl (mm)	cl (mm)	Required cr (mm)	cr (mm)
Functional:						
Clearance (cl) and creepage distance (cr) at/of/between:	U peak (V)	U r.m.s. (V)	Required cl (mm)	cl (mm)	Required cr (mm)	cr (mm)
Basic/supplementary:						
Clearance (cl) and creepage distance (cr) at/of/between:	U peak (V)	U r.m.s. (V)	Required cl (mm)	cl (mm)	Required cr (mm)	cr (mm)
Reinforced:						
Clearance (cl) and creepage distance (cr) at/of/between:	U peak (V)	U r.m.s. (V)	Required cl (mm)	cl (mm)	Required cr (mm)	cr (mm)
supplementary information:						

2.10.5	**TABLE: Distance through insulation measurements**				N/A
Distance through insulation (DTI) at/of:	Upeak (V)	Urms (V)	Test voltage (V)	Required DTI (mm)	DTI (mm)
supplementary information:					

4.3.8	**TABLE: Batteries**							Pass	
The tests of 4.3.8 are applicable only when appropriate battery data is not available.									
Is it possible to install the battery in a reverse polarity position?									
	Non-rechargeable batteries			Rechargeable batteries					
	Discharging		Un-intentional charging	Charging		Discharging		Reversed charging	
	Meas. current	Manuf. specs.		Meas. current	Manuf. specs.	Meas. current	Manuf. specs.	Meas. current	Manuf. specs.
Test results:								Verdict	
- Chemical leaks								N/A	
- Explosion of the battery								N/A	
- Emission of flame or expulsion of molten metal								N/A	
- Electric strength tests of equipment after completion of tests								N/A	
supplementary information:									

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4.3.8	**TABLE: Batteries**			N/A
Battery category (lithium, NiMh, NiCad, lithium ion, etc.)				
Manufacturer				
Type / model				
Voltage				
Capacity (mAh)				
Tested and Certified by (incl. Ref. No.)				
Circuit protection diagram (Refer to indicated supplement of Enclosure - Miscellaneous)				
MARKINGS AND INSTRUCTIONS (1.7.12, 1.7.15)				
Location of replaceable battery				
Language(s)				
Close to the battery				
In the servicing instructions				
In the operating instructions				
In the operating instructions				
supplementary information:				
Additional devices may be described in Enclosure - Miscellaneous				

4.5	**TABLE: Thermal requirements**						Pass
	Supply voltage (V) :	--	--	--	--	--	---
	Ambient Tmin (°C) :	--	--	--	--	--	---
	Ambient Tmax (°C) :	--	--	--	--	--	---

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Maximum measured temperature T of part/at:	T (°C) #1	T (°C) #2	T (°C) #3	T (°C) #4	T (°C) #5	Allowed Tmax (°C)
For model: DH-IPC-HDBW5241RP-S	12Vdc	12Vdc Shift to Amb	--	--	--	--
PCB near U1	36.6	72.9	--	--	--	130
PCB near U2	34.2	70.5	--	--	--	130
BT1 body	38.0	74.3	--	--	--	100
PCB near HD3&HD4	34.6	70.9	--	--	--	130
PCB near D12	36.8	73.1	--	--	--	130
PCB near T2	35.6	71.9	--	--	--	130
Sensor board	52.8	89.1	--	--	--	130
LED board	69.5	105.8	--	--	--	130
Plastic case near LED	38.6	74.9	--	--	--	95
Metal case near LED	30.2	66.5	--	--	--	70
Ambient	23.7	60.0	--	--	--	--
For model: DH-IPC-HDBW5241RP-S	36Vdc	36Vdc Shift to Amb	--	57Vdc	57Vdc Shift to Amb	--
PCB near U1	38.5	75.7	--	39.0	75.8	130
PCB near U2	36.0	73.2	--	36.5	73.3	130
BT1 body	39.8	77.0	--	40.3	77.1	100
PCB near HD3&HD4	44.6	81.8	--	43.0	79.8	130
PCB near D12	39.0	76.2	--	39.3	76.1	130
PCB near T2	45.5	82.7	--	46.9	83.7	130
Sensor board	54.4	91.6	--	54.7	91.5	130
LED board	70.5	107.7	--	70.9	107.7	130
Plastic case near LED	39.8	77.0	--	39.1	75.9	95
Metal case near LED	31.7	68.9	--	32.1	68.9	70
Ambient	22.8	60.0	--	23.2	60.0	--
For model: DH-IPC-HDBW5442RP-ASE	12Vdc	12Vdc Shift to Amb	--	--	--	--
PCB near U1	41.3	77.7	--	--	--	130
PCB near U14	38.3	74.7	--	--	--	130
BT2 body	43.2	79.6	--	--	--	100
PCB near HD5&HD6	38.0	74.4	--	--	--	130
PCB near D6	40.9	77.3	--	--	--	130
PCB near T3	39.6	76.0	--	--	--	130
Sensor board	53.7	90.1	--	--	--	130
LED board	72.8	109.2	--	--	--	130
Plastic case near LED	33.6	70.0	--	--	--	95
Metal case near LED	32.0	68.4	--	--	--	70
Ambient	23.6	60.0	--	--	--	--

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For model: DH-IPC-HDBW5442RP-ASE	36Vdc	36Vdc Shift to Amb	--	57Vdc	57Vdc Shift to Amb	--
PCB near U1	44.0	81.2	--	44.3	81.1	130
PCB near U14	41.1	78.3	--	41.4	78.2	130
BT2 body	46.1	83.3	--	46.4	83.2	100
PCB near HD5&HD6	47.7	84.9	--	45.8	82.6	130
PCB near D6	43.4	80.6	--	43.5	80.3	130
PCB near T3	51.4	88.6	--	51.9	88.7	130
Sensor board	56.2	93.4	--	56.5	93.3	130
LED board	74.5	111.7	--	74.8	111.6	130
Plastic case near LED	32.6	69.8	--	33.8	70.6	95
Metal case near LED	32.0	69.2	--	32.3	69.1	70
Ambient	22.8	60.0	--	23.2	60.0	--
For model: DH-IPC-HDBW5241RP-ASE	12Vdc	12Vdc Shift to Amb	--	--	--	--
PCB near U1	38.9	75.2	--	--	--	130
PCB near U2	37.9	74.2	--	--	--	130
PCB near D12	40.2	76.5	--	--	--	100
PCB near HD3&HD4	37.2	73.5	--	--	--	130
BT1 body	40.1	76.4	--	--	--	130
PCB near T2	38.7	75.0	--	--	--	130
Sensor board	54.5	90.8	--	--	--	130
LED board	73.2	109.5	--	--	--	130
Plastic case near LED	39.0	75.3	--	--	--	95
Metal case near LED	32.3	68.6	--	--	--	70
Ambient	23.7	60.0	--	--	--	--
For model: DH-IPC-HDBW5241RP-ASE	36Vdc	36Vdc Shift to Amb	--	57Vdc	57Vdc Shift to Amb	--
PCB near U1	40.6	77.8	--	41.0	77.8	130
PCB near U2	39.8	77.0	--	40.2	77.0	130
PCB near D12	41.9	79.1	--	42.0	78.8	100
PCB near HD3&HD4	47.2	84.4	--	45.1	81.9	130
BT1 body	41.8	79.0	--	42.2	79.0	130
PCB near T2	49.2	86.4	--	50.4	87.2	130
Sensor board	56.0	93.2	--	56.2	93.0	130
LED board	74.0	111.2	--	74.2	111.0	130
Plastic case near LED	39.8	77.0	--	40.2	77.0	95
Metal case near LED	32.3	69.5	--	32.6	69.4	70
Ambient	22.8	60.0	--	23.2	60.0	--
For test record 2	--	--	--	--	--	--
For model: DH-IPC-HDBW3441RP-ZAS	12Vdc	12Vdc	--	--	--	--

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		Shift to Amb				
PWB near sensor	54.9	89.1	--	--	--	130
PWB near U1	44.5	78.7	--	--	--	130
PWB near T2	46.3	80.5	--	--	--	130
RTC body	44.5	78.7	--	--	--	100
PWB near LED	72.7	106.9	--	--	--	130
Plastic enclosure outside near LED	38.7	72.9	--	--	--	95
Metal enclosure outside near T2	34.9	69.1	--	--	--	90
Ambient	25.8	60	--	--	--	--
For model: DH-IPC-HDBW3441RP-ZAS	36Vdc	36Vdc Shift to Amb	--	57Vdc	57Vdc Shift to Amb	--
PWB near sensor	58.4	92.9	--	58.4	92.8	130
PWB near U1	47.9	82.4	--	47.8	82.2	130
PWB near T2	53.7	88.2	--	54.1	88.5	130
RTC body	47.6	82.1	--	47.4	81.8	100
PWB near LED	74.1	108.6	--	73.8	108.2	130
Plastic enclosure outside near LED	39.3	73.8	--	38.6	73	95
Metal enclosure outside near T2	36.4	70.9	--	35.9	70.3	90
Ambient	25.5	60	--	25.6	60	--
For model: DH-IPC-HDBW2431RP-ZAS-S2	12Vdc	12Vdc Shift to Amb	--	--	--	
PWB near sensor	52.9	87	--	--	--	130
PWB near U1	37.7	71.8	--	--	--	130
PWB near T2	39.3	73.4	--	--	--	130
PWB near LED	72.5	106.6	--	--	--	130
Plastic enclosure outside near LED	36.2	70.3	--	--	--	95
Metal enclosure outside near T2	32.4	66.5	--	--	--	90
Ambient	25.9	60	--	--	--	--
For model: DH-IPC-HDBW2431RP-ZAS-S2	36Vdc	36Vdc Shift to Amb	57Vdc	57Vdc Shift to Amb	--	--
PWB near sensor	55.2	89.5	--	54.9	89.3	130
PWB near U1	39.8	74.1	--	39.5	73.9	130
PWB near T2	48.9	83.2	--	49.5	83.9	130
PWB near LED	73.7	108	--	73.1	107.5	130
Plastic enclosoure outside near LED	36.7	71	--	36.4	70.8	95
Metal enclosure outside near T2	33.6	67.9	--	33.2	67.6	90
Ambient	25.7	60	--	25.6	60	--

Temperature T of winding:	t1 (°C)	R1 (ohm)	t2 (°C)	R2 (ohm)	T (°C)	Allowed Tmax (°C)	Insulation class

IEC 60950-1			
Clause	Requirement + Test	Result - Remark	Verdict

-	-	-	-	-	-	-	-
supplementary information:							
The temperatures were measured under worst case normal mode defined in 1.2.2.1 and as described in 1.6.2 at voltages as described in 1.4.5. Tma=60 degree C All temperatures above for T(degree C) have been retrieved by measurement and have been calculated/adjusted to Tma as follows: T + (Tma – Tamb), where T is the maximum temperature measured during test, Tamb is the ambient temperature during test and Tma is the maximum ambient temperature by the manufacturer's specification. Accessible part temperature limit is according to Table 4C, and others are according to maximum operation temperature of certificated component.							

4.5.5	**TABLE: Ball pressure test of thermoplastic parts**		N/A
	allowed impression diameter (mm) :	less than or equal to 2.0	---
part		test temperature (°C)	impression diameter (mm)
supplementary information:			

4.7	**TABLE: Resistance to fire**				Pass
Part	Manufacturer of material	Type of material	Thickness (mm)	Flammability class	Evidence
--	--	--	--	--	--
supplementary information:					
See table 1.5.1					

5.1	**TABLE: touch current measurement**		N/A
Measured between	Measured (mA)	Limit (mA)	Comments/conditions
supplementary information:			

IEC 60950-1			
Clause	Requirement + Test	Result - Remark	Verdict

5.2	**TABLE: Electric strength tests, impulse tests and voltage surge tests**			N/A
Test voltage applied between:		Voltage shape (AC, DC, impulse, surge)	Test voltage (V)	Breakdown Yes / No
-		--	--	--
Functional:				
Test voltage applied between:		Voltage shape (AC, DC, impulse, surge)	Test voltage (V)	Breakdown Yes / No
--		--	--	--
Basic/supplementary:				
Test voltage applied between:		Voltage shape (AC, DC, impulse, surge)	Test voltage (V)	Breakdown Yes / No
--		--	--	--
Reinforced:				
Test voltage applied between:		Voltage shape (AC, DC, impulse, surge)	Test voltage (V)	Breakdown Yes / No
--		--	--	--
supplementary information:				
--				

5.3	**TABLE: Fault condition tests**						Pass
	Ambient temperature (°C) :					-	---
	Power source for EUT: Manufacturer, model/type, output rating :					-	---
Component No.	Fault	Supply voltage (V)	Test time	Fuse #	Fuse current (A)	Observation	
supplementary information:							
Results Key: IP = Internal protection operated (component indicated) CT = Constant temperatures were obtained TW = Transformer winding opened CD = Components damaged (damaged components indicated) NB = No indication of dielectric breakdown YB = Dielectric breakdown (time and location indicated) NC = Cheesecloth remained intact YC = Cheesecloth charred or flamed NT = Tissue paper remained intact YT = Tissue paper charred or flamed Functional insulation complies with the requirements (a), (b), or (c).							

C.2	**TABLE: transformers**						N/A
Loc.	Tested insulation	Working voltage peak / V (2.10.2)	Working voltage rms / V (2.10.2)	Required electric strength (5.2)	Required clearance / mm (2.10.3)	Required creepage distance / mm (2.10.4)	Required distance thr. insul. (2.10.5)

IEC 60950-1			
Clause	Requirement + Test	Result - Remark	Verdict

Loc.	Tested insulation	Test voltage / V	Measured clearance / mm	Measured creepage dist. / mm	Measured distance thr. insul. / mm; number of layers

Transformer type number	Enclosure - Miscellaneous ID

supplementary information:

Enclosure

National Differences

Austria**
Belarus*
Belgium**
Bulgaria**
Czech Republic**
Denmark
Finland
France**
Germany
Greece**
Group
Hungary**
Italy**
Netherlands**
Norway
Poland**
Romania**
Serbia**
Slovakia**
Slovenia**
Sweden
Switzerland
USA / Canada
Ukraine*
United Kingdom

* No National Differences Declared
** Only Group Differences

IEC 60950-1:2005			
SubClause	Difference + Test	Result - Remark	Verdict
Denmark - Differences to IEC 60950-1:2005 (Second Edition); Am1:2009 + Am2:2013			
1.2.4.1	In Denmark, certain types of Class I appliances (see sub-clause 3.2.1.1) may be provided with plug not establishing earthing continuity when inserted into Danish socket-outlets.		N/A
1.7.2.1	CLASS I PLUGGABLE EQUIPMENT TYPE A intended for connection to other equipment or a network shall, if safety relies on connection to protective earth or if surge suppressors are connected between the network terminals and accessible parts, have a marking stating that the equipment must be connected to an earthed mains socket-outlet. The marking text in the applicable countries shall be as follows: : “Apparatets stikprop skal tilsluttes en stikkontakt med jord, som giver forbindelse til stikproppens jord.”		N/A
1.7.5	In Denmark, socket-outlets for providing power to other equipment shall be in accordance with the Heavy Current Regulations, Section 107-2-D1, Standard Sheet DK 1-3a, DK 1-5a or DK 1-7a, when used on Class I equipment. For stationary equipment, the socket-outlet shall be in accordance with Standard Sheet DK 1-1b or DK 1-5a.		N/A
1.7.5	For CLASS II EQUIPMENT the socket outlet shall be in accordance with Standard Sheet DKA 1-4a. (Heavy Current Regulations, Section 107-2-D1)		N/A
3.2.1.1	Supply cord of single-phase equipment having a rated current not exceeding 13 A shall be provided with a plug according to the Heavy Current Regulations, Section 107-2-D1. CLASS I EQUIPMENT provided with socket-outlets with earth contact or which are intended to be used in locations where protection against indirect contact is required according to the wiring rules shall be provided with a plug in accordance with standard sheet DK 2-1a or DK 2-5a. If poly-phase equipment and single-phase equipment having a RATED CURRENT exceeding 13 A is provided with a supply cord with a plug, this plug shall be in accordance with the Heavy Current		N/A

IEC 60950-1:2005			
SubClause	Difference + Test	Result - Remark	Verdict
	Regulations, Section 107-2-D1 or EN 60309-2.		

IEC 60950-1:2005			
SubClause	Difference + Test	Result - Remark	Verdict
Finland - Differences to IEC 60950-1:2005 (Second Edition); Am1:2009 + Am2:2013			
1.5.7.1	Resistors bridging BASIC INSULATION in CLASS I PLUGGABLE EQUIPMENT TYPE A must comply with the requirements in 1.5.7.1. In addition when a single resistor is used, the resistor must withstand the resistor test in 1.5.7.2.		N/A
1.5.9.4	The third dashed sentence is applicable only to equipment as defined in 6.1.2.2 of this annex.		N/A
1.7.2.1	CLASS I PLUGGABLE EQUIPMENT TYPE A intended for connection to other equipment or a network shall, if safety relies on connection to protective earth or if surge suppressors are connected between the network terminals and accessible parts, have a marking stating that the equipment must be connected to an earthed mains socket-outlet. The marking text shall be: "Laite on liitettävä suojakoskettimilla varustettuun pistorasiaan"		N/A
2.3.2	Requirements according to this annex, 6.1.2.1 and 6.1.2.2 apply.		N/A
2.10.5.3	Requirements according to this annex, 6.1.2.1 and 6.1.2.2 apply.		N/A
5.1.7.1	Touch current measurement results exceeding 3,5 mA r.m.s are permitted only for the following equipment: - STATIONARY PLUGGABLE EQUIPMENT TYPE A that: (1) is intended to be used in a RESTRICTED ACCESS LOCATION where equipotential bonding has been applied, for example, in a telecommunication centre; and (2) has provision for a permanently connected PROTECTIVE EARTHING CONDUCTOR; and (3) is provided with instructions for the installation of that conductor by a SERVICE PERSON; - STATIONARY PLUGGABLE EQUIPMENT TYPE B - STATIONARY PERMANENTLY CONNECTED EQUIPMENT		N/A
6.1.2.1	Add the following text between the first and second paragraph of the compliance clause: If this insulation is solid, including insulation forming part of a component, it shall at least consist		N/A

IEC 60950-1:2005			
SubClause	Difference + Test	Result - Remark	Verdict
	of either - two layers of thin sheet material, each of which shall pass the electric strength test below, or - one layer having a distance through insulation of at least 0,4 mm, which shall pass the electric strength test below. Alternatively for components, there is no distance through insulation requirement for the insulation consisting of an insulating compound completely filling the casing, so that CLEARANCES and CREEPAGE DISTANCES do not exist, if the component passes the electric strength test in accordance with the compliance clause below and in addition - passes the tests and inspection criteria of 2.10.11 with an electric strength test of 1,5 kV multiplied by 1,6 (the electric strength test of 2.10.10 shall be performed using 1,5 kV), and - is subject to ROUTINE TESTING for electric strength during manufacturing, using a test voltage of 1,5 kV. It is permitted to bridge this insulation with an optocoupler complying with 2.10.5.4 b). It is permitted to bridge this insulation with a capacitor complying with EN 132400:1994 (EN 60384-14:2005), subclass Y2. A capacitor classified Y3 according to EN 132400 [EN 60384-14:2005], may bridge this insulation under the following conditions: - the insulation requirements are satisfied by having a capacitor classified Y3 as defined by EN 132400 [EN 60384-14], which in addition to the Y3 testing, is tested with an impulse test of 2,5 kV defined in EN 60950-1:2006, 6.2.2.1; - the additional testing shall be performed on all the test specimens as described in EN 132400 [EN 60384-14]; - the impulse test of 2,5 kV is to be performed before the endurance test in EN 132400 [EN 60384-14], in the sequence of tests as described in EN 132400 [EN 60384-14].		
6.1.2.2	The exclusions are applicable for PERMANENTLY CONNECTED EQUIPMENT, PLUGGABLE EQUIPMENT TYPE B and equipment intended to		N/A

IEC 60950-1:2005			
SubClause	Difference + Test	Result - Remark	Verdict
	be used in a RESTRICTED ACCESS LOCATION where equipotential bonding has been applied, e.g. in a telecommunication center, and which has provision for a permanently connected PROTECTIVE EARTHING CONDUCTOR and is provided with instructions for the installation of that conductor by a SERVICE PERSON.		
7.2	Requirements according to this annex 6.1.2.1 and 6.1.2.2 apply with the term TELECOMMUNICATION NETWORK in 6.1.2 being replaced by the term CABLE DISTRIBUTION SYSTEM.		N/A
Germany - Differences to IEC 60950-1:2005 (Second Edition); Am1:2009 + Am2:2013			
1.7.2.1	If for the assurance of safety and health certain rules during use, amending or maintenance of a technical labour equipment or readymade consumer product are to be followed, a manual in German language has to be delivered when placing the product on the market. Of this requirement, rules for use even only by SERVICE PERSONS are not exempted.		N/A

IEC 60950-1:2005			
SubClause	Difference + Test	Result - Remark	Verdict
Group - Differences to IEC 60950-1:2005 (Second Edition); Am1:2009 + Am2:2013			
General	Group Differences also includes the requirements in A11:2009 and A12:2011		N/A
1.3	A12:2011 - In EN 60950-1:2006/A12:2011 Delete the addition of 1.3.Z1 / EN 60950-1:2006 Delete the definition 1.2.3.Z1 / EN 60950-1:2006 /A1:2010		N/A
1.5.1	Add the following NOTE Z1: The use of certain substances in electrical and electronic equipment is restricted within the EU: see Directive 2002/95/EC		N/A
1.7.2.1	Delete NOTE Z1 and the addition for Portable Sound System Add the following Zx clauses and annex to the existing standard and amendments		N/A
2.7.1	Replace the subclause as follows: Basic requirements To protect against excessive current, short-circuits and earth faults in PRIMARY CIRCUITS, protective devices shall be included either as integral parts of the equipment or as parts of the building installation, subject to the following, a), b) and c): a) except as detailed in b) and c), protective devices necessary to comply with the requirements of 5.3 shall be included as parts of the equipment; b) for components in series with the mains input to the equipment such as the supply cord, appliance coupler, r.f.i. filter and switch, short-circuit and earth fault protection may be provided by protective devices in the building installation; c) it is permitted for PLUGGABLE EQUIPMENT TYPE B or PERMANENTLY CONNECTED EQUIPMENT, to rely on dedicated overcurrent and short-circuit protection in the building installation, provided that the means of protection, e.g. fuses or circuit breakers, is fully specified in the installation instructions. If reliance is placed on protection in the building installation, the installation instructions shall so state, except that for PLUGGABLE EQUIPMENT TYPE A the building installation shall be regarded as providing protection in accordance with the rating of the wall socket outlet.		N/A
2.7.2	Void		N/A

IEC 60950-1:2005			
SubClause	Difference + Test	Result - Remark	Verdict
3.2.3	Delete the NOTE and conduit sizes in parentheses in Table 3A		N/A
3.2.5.1	Add the following Note: NOTE Z1 The harmonised code designations corresponding to the IEC cord types are given in Annex ZD. In Table 3B, replace the first four lines by the following: Up to and including 6 0.75 a) Over 6 up to and including 10 0.75 b) 1.0 Over 10 up to and including 16 1.0 c) 1.5 In the conditions applicable to table 3B, delete the words "in some countries" in condition a). In Note 1, applicable Table 3B, to delete the second sentence.		N/A
3.3.4	In table 3D, delete the fourth line: conductor sizes for 10 to 13 A, and replace with the following: "Over 10 up to and including 16 1.5 to 2.5 1.5 to by 4" Delete the fifth line: conductor sizes for 13 to 16A.		N/A
4.3.13.6	Replace the existing NOTE by the following: NOTE Z1 Attention is drawn to 1999/519/EC: Council Recommendation on the limitation of exposure of the general public to electromagnetic fields 0 Hz to 300 GHz and 2006/25/EC: Directive on the minimum health and safety requirements regarding the exposure of workers to risks arising from physical agents (artificial optical radiation). Standards taking into account this Recommendation which demonstrate compliance with the applicable EU Directive are indicated in the OJEC.		N/A
H	Replace the last paragraph of this annex by: At any point 10 cm from the surface of the OPERATOR ACCESS AREA, the dose rate shall not exceed 1 µSv/h (0,1 mR/h) (see NOTE). Account is taken of the background level. Replace the notes as follows: NOTE - These values appear in Directive 96/29/Euratom. Delete NOTE 2.		N/A
Zx	Protection against excessive sound pressure from personal music players		N/A

IEC 60950-1:2005			
SubClause	Difference + Test	Result - Remark	Verdict
Zx.1	General - This sub-clause specifies requirements for protection against excessive sound pressure from personal music players that are closely coupled to the ear. It also specifies requirements for earphones and headphones intended for use with personal music players. A personal music player is a portable equipment for personal use, that: - is designed to allow the user to listen to recorded or broadcast sound or video; and - primarily uses headphones or earphones that can be worn in or on or around the ears; and - allows the user to walk around while in use. NOTE 1 Examples are hand-held or body-worn portable CD players, MP3 audio players, mobile phones with MP3 type features, PDA's or similar equipment. A personal music player and earphones or headphones intended to be used with personal music players shall comply with the requirements of this sub-clause. The requirements in this sub-clause are valid for music or video mode only. The requirements do not apply: - while the personal music player is connected to an external amplifier; or - while the headphones or earphones are not used. NOTE 2 An external amplifier is an amplifier which is not part of the personal music player or the listening device, but which is intended to play the music as a standalone music player. The requirements do not apply to: - hearing aid equipment and professional equipment; NOTE 3 Professional equipment is equipment sold through special sales channels. All products sold through normal electronics stores are considered not to be professional equipment. - analogue personal music players (personal music players without any kind of digital processing of the sound signal) that are brought to the market before		N/A

IEC 60950-1:2005			
SubClause	Difference + Test	Result - Remark	Verdict
	the end of 2015. NOTE 4 This exemption has been allowed because this technology is falling out of use and it is expected that within a few years it will no longer exist. This exemption will not be extended to other technologies. For equipment which is clearly designed or intended for use by young children, the limits of EN 71-1 apply.		
Zx.2	Equipment Requirements - No safety provision is required for equipment that complies with the following: - equipment provided as a package (personal music player with its listening device), where the acoustic output LAeq,T is ≤ 85 dBA measured while playing the fixed “programme simulation noise” as described in EN 50332-1; and - a personal music player provided with an analogue electrical output socket for a listening device, where the electrical output is ≤ 27 mV measured as described in EN 50332-2, while playing the fixed “programme simulation noise” as described in EN 50332-1. NOTE 1 Wherever the term acoustic output is used in this clause, the 30 s A-weighted equivalent sound pressure level LAeq,T is meant. See also Zx.5 and Annex Zx. All other equipment shall: a) protect the user from unintentional acoustic outputs exceeding those mentioned above; and b) have a standard acoustic output level not exceeding those mentioned above, and automatically return to an output level not exceeding those mentioned above when the power is switched off; and c) provide a means to actively inform the user of the increased sound pressure when the equipment is operated with an acoustic output exceeding those mentioned above. Any means used shall be acknowledged by the user before activating a mode of operation which allows for an acoustic output exceeding those mentioned above. The acknowledgement does not need to be repeated		N/A

IEC 60950-1:2005			
SubClause	Difference + Test	Result - Remark	Verdict
	more than once every 20 h of cumulative listening time; and NOTE 2 Examples of means include visual or audible signals. Action from the user is always required. NOTE 3 The 20 h listening time is the accumulative listening time, independent how often and how long the personal music player has been switched off. d) have a warning as specified in Zx.3; and e) not exceed the following: 1) equipment provided as a package (player with Its listening device), the acoustic output shall be ≤ 100 dBA measured while playing the fixed “programme simulation noise” described in EN 50332-1; and 2) a personal music player provided with an analogue electrical output socket for a listening device, the electrical output shall be ≤ 150 mV measured as described in EN 50332-2, while playing the fixed “programme simulation noise” described in EN 50332-1. For music where the average sound pressure (long term LAeq,T) measured over the duration of the song is lower than the average produced by the programme simulation noise, the warning does not need to be given as long as the average sound pressure of the song is below the basic limit of 85 dBA. In this case T becomes the duration of the song. NOTE 4 Classical music typically has an average sound pressure (long term LAeq,T) which is much lower than the average programme simulation noise. Therefore, if the player is capable to analyse the song and compare it with the programme simulation noise, the warning does not need to be given as long as the average sound pressure of the song is below the basic limit of 85 dBA. For example, if the player is set with the programme simulation noise to 85 dBA, but the average music level of the song is only 65 dBA, there is no need to give a warning or ask an acknowledgement as long as the average sound level of the song is not above the basic limit of 85 dBA.		
Zx.3	Warning - The warning shall be placed on the		N/A

IEC 60950-1:2005			
SubClause	Difference + Test	Result - Remark	Verdict
	equipment, or on the packaging, or in the instruction manual and shall consist of the following: - the symbol of Figure 1 (IEC 60417-6044) with a minimum height of 5 mm; and - the following wording, or similar: “To prevent possible hearing damage, do not listen at high volume levels for long periods.” Alternatively, the entire warning may be given through the equipment display during use, when the user is asked to acknowledge activation of the higher level		
Zx.4	Requirements for Listening devices (headphones and earphones)		N/A
Zx.4.1	Wired listening devices with analogue input With 94 dBA sound pressure output LAeq,T, the input voltage of the fixed “programme simulation noise” described in EN 50332-2 shall be ≥ 75 mV. This requirement is applicable in any mode where the headphones can operate (active or passive), including any available setting (for example built-in volume level control). NOTE The values of 94 dBA – 75 mV correspond with 85dBA – 27 mV and 100 dBA – 150 mV.		N/A
Zx.4.2	Wired listening devices with digital input With any playing device playing the fixed “programme simulation noise” described in EN 50332-1 (and respecting the digital interface standards, where a digital interface standard exists that specifies the equivalent acoustic level), the acoustic output LAeq,T of the listening device shall be ≤ 100 dBA. This requirement is applicable in any mode where the headphones can operate, including any available setting (for example built-in volume level control, additional sound feature like equalization, etc.). NOTE An example of a wired listening device with digital input is a USB headphone.		N/A
Zx.4.3	Wireless listening devices In wireless mode: - with any playing and transmitting device playing the fixed programme simulation noise described in		N/A

IEC 60950-1:2005			
SubClause	Difference + Test	Result - Remark	Verdict
	EN 50332-1; and - respecting the wireless transmission standards, where an air interface standard exists that specifies the equivalent acoustic level; and - with volume and sound settings in the listening device (for example built-in volume level control, additional sound feature like equalization, etc.)set to the combination of positions that maximize the measured acoustic output for the abovementioned programme simulation noise, the acoustic output LAeq,T of the listening device shall be ≤ 100 dBA. NOTE An example of a wireless listening device is a Bluetooth headphone.		
Zx.5	Measurement Methods Measurements shall be made in accordance with EN 50332-1 or EN 50332-2 as applicable. Unless stated otherwise, the time interval T shall be 30 s. NOTE Test method for wireless equipment provided without listening device should be defined.		N/A

IEC 60950-1:2005			
SubClause	Difference + Test	Result - Remark	Verdict
Norway - Differences to IEC 60950-1:2005 (Second Edition); Am1:2009 + Am2:2013			
General	Norway has national differences declared for 60950-1:2005, Am 1:2009 (below).		N/A
1.2.13.14	For requirements see 1.7.2.1 and 7.3.		N/A
1.5.7.1	Resistors bridging BASIC INSULATION in CLASS I PLUGGABLE EQUIPMENT TYPE A must comply with the requirements in 1.5.7.2. In addition when a single resistor is used, the resistor must withstand the resistor test in 1.5.7.2.		N/A
1.5.8	Due to the IT power system used (see annex V, figure V.7), capacitors are required to be rated for the applicable line-to-line voltage (230 V).		N/A
1.5.9.4	The third dashed sentence is applicable only to equipment as defined in 6.1.2.2 of this annex.		N/A
1.7.2.1	CLASS I PLUGGABLE EQUIPMENT TYPE A intended for connection to other equipment or a network shall, if safety relies on connection to protective earth or if surge suppressors are connected between the network terminals and accessible parts, have a marking stating that the equipment must be connected to an earthed mains socket-outlet. The marking text shall be: "Apparatet må tilkoples jordet stikkontakt"		N/A
1.7.2.1	In Norway, the screen of the cable distribution system is normally not earthed at the entrance of the building and there is normally no equipotential bonding system within the building. Therefore the protective earthing of the building installation need to be isolated from the screen of a cable distribution system. It is however accepted to provide the insulation external to the equipment by an adapter or an interconnection cable with galvanic isolator, which may be provided by e.g. a retailer. The user manual shall then have the following or similar information in Norwegian and Swedish language respectively, depending on in what country the equipment is intended to be used in: "Equipment connected to the protective earthing of the building installation through the mains connection or through other equipment with a connection to protective earthing - and to a cable distribution system using coaxial cable, may in		N/A

IEC 60950-1:2005			
SubClause	Difference + Test	Result - Remark	Verdict
	some circumstances create a fire hazard. Connection to a cable distribution system has therefore to be provided through a device providing electrical isolation below a certain frequency range (galvanic isolator, see EN 60728-11)." NOTE: In Norway, due to regulation for installations of cable distribution systems, and in Sweden, a galvanic isolator shall provide electrical insulation below 5 MHz. The insulation shall withstand a dielectric strength of 1,5 kV r.m.s., 50 Hz or 60 Hz, for 1 min. Translation to Norwegian (the Swedish text will also be accepted in Norway): "Utstyr som er koplet til beskyttelsesjord via nettplugg og/eller via annet jordtilkoplet utstyr - og er tilkoplet et kabel-TV nett, kan forårsake brannfare. For å unngå dette skal det ved tilkopling av utstyret til kabel-TV nettet installeres en galvanisk isolator mellom utstyret og kabel-TV nettet."		
2.2.4	Requirements according to this annex, 1.7.2.1, 6.1.2.1 and 6.1.2.2 apply.		Pass
2.3.2	Requirements according to this annex, 6.1.2.1 and 6.1.2.2 apply.		N/A
2.3.4	Requirements according to this annex, 1.7.2.1, 6.1.2.1 and 6.1.2.2 apply.		Pass
2.10.5.13	Requirements according to this annex, 6.1.2.1 and 6.1.2.2 apply.		N/A
5.1.7.1	TOUCH CURRENT measurement results exceeding 3,5 mA r.m.s are permitted only for the following equipment: - STATIONARY PLUGGABLE EQUIPMENT TYPE A that: (1) is intended to be used in a RESTRICTED ACCESS LOCATION where equipotential bonding has been applied, for example, in a telecommunication centre; and (2) has provision for a permanently connected PROTECTIVE EARTHING CONDUCTOR; and (3) is provided with instructions for the installation of that conductor by a SERVICE PERSON; - STATIONARY PLUGGABLE EQUIPMENT TYPE B - STATIONARY PERMANENTLY CONNECTED EQUIPMENT		N/A

IEC 60950-1:2005			
SubClause	Difference + Test	Result - Remark	Verdict
6.1.2.1	Add the following text between the first and second paragraph of the compliance clause: If this insulation is solid, including insulation forming part of a component, it shall at least consist of either - two layers of thin sheet material, each of which shall pass the electric strength test below, or - one layer having a distance through insulation of at least 0,4 mm, which shall pass the electric strength test below. Alternatively for components, there is no distance through insulation requirement for the insulation consisting of an insulating compound completely filling the casing, so that CLEARANCES and CREEPAGE DISTANCES do not exist, if the component passes the electric strength test in accordance with the compliance clause below and in addition - passes the tests and inspection criteria of 2.10.11 with an electric strength test of 1,5 kV multiplied by 1,6 (the electric strength test of 2.10.10 shall be performed using 1,5 kV), and - is subject to ROUTINE TESTING for electric strength during manufacturing, using a test voltage of 1,5 kV. It is permitted to bridge this insulation with an optocoupler complying with 2.10.5.4 b). It is permitted to bridge this insulation with a capacitor complying with EN 132400:1994, subclass Y2. A capacitor classified Y3 according to EN 123400 [EN 60384-14:2005], may bridge this insulation under the following conditions: - the insulation requirements are satisfied by having a capacitor classified Y3 as defined by EN 132400 [EN 60384-14], which in addition to the Y3 testing, is tested with an impulse test of 2,5 kV defined in EN 60950-1:2006, 6.2.2.1; - the additional testing shall be performed on all the test specimens as described in EN 132400 [EN 60384-14]; - the impulse test of 2,5 kV is to be performed before the endurance test in EN 132400 [EN 60384-14], in the sequence of tests as described in EN 132400 [EN 60384-14.]		N/A

IEC 60950-1:2005			
SubClause	Difference + Test	Result - Remark	Verdict
6.1.2.2	The exclusions are applicable for PERMANENTLY CONNECTED EQUIPMENT and PLUGGABLE EQUIPMENT TYPE B and equipment intended to be used in a RESTRICTED ACCESS LOCATION where equipotential bonding has been applied, e.g. in a telecommunication centre, and which has provision for a permanently connected PROTECTIVE EARTHING CONDUCTOR and is provided with instructions for the installation of that conductor by a SERVICE PERSON.		N/A
7.2	Requirements according to this annex, 6.1.2.1 and 6.1.2.2 apply with the term TELECOMMUNICATION NETWORK in 6.1.2 being replaced by the term CABLE DISTRIBUTION SYSTEM.		N/A
7.3	Refer to EN 60728-11:2005 for installation conditions		N/A
7.3	Requirements according to this annex 1.2.13.14 and 1.7.2.1 apply.		N/A

IEC 60950-1:2005			
SubClause	Difference + Test	Result - Remark	Verdict
Sweden - Differences to IEC 60950-1:2005 (Second Edition); Am1:2009 + Am2:2013			
1.2.13.14	For requirements see 1.7.2.1 and 7.3.		N/A
1.5.1	(Ordinance (1990:944)) Add NOTE: Switches containing mercury are not permitted.		N/A
1.5.7.1	Resistors bridging BASIC INSULATION in CLASS I PLUGGABLE EQUIPMENT TYPE A must comply with the requirements in 1.5.7.2. In addition when a single resistor is used, the resistor must withstand the resistor test in 1.5.7.2.		N/A
1.5.9.4	The third dashed sentence is applicable only to equipment as defined in 6.1.2.2 of this annex.		N/A
1.7.2.1	CLASS I PLUGGABLE EQUIPMENT TYPE A intended for connection to other equipment or a network shall, if safety relies on connection to protective earth or if surge suppressors are connected between the network terminals and accessible parts, have a marking stating that the equipment must be connected to an earthed mains socket-outlet. The marking text shall be:"Apparaten skall anslutas till jordat uttag"		N/A
1.7.2.1	In Sweden, the screen of the cable distribution system is normally not earthed at the entrance of the building and there is normally no equipotential bonding system within the building. Therefore the protective earthing of the building installation need to be isolated from the screen of a cable distribution system. It is however accepted to provide the insulation external to the equipment by an adapter or an interconnection cable with galvanic isolator, which may be provided by e.g. a retailer. The user manual shall then have the following or similar information in Norwegian and Swedish language respectively, depending on in what country the equipment is intended to be used in: "Equipment connected to the protective earthing of the building installation through the mains connection or through other equipment with a connection to protective earthing - and to a cable distribution system using coaxial cable, may in some circumstances create a fire hazard. Connection to a cable distribution system has therefore to be provided through a device providing electrical isolation below a certain frequency range		N/A

IEC 60950-1:2005			
SubClause	Difference + Test	Result - Remark	Verdict
	(galvanic isolator, see EN 60728-11)." NOTE: In Norway, due to regulation for installations of cable distribution systems, and in Sweden, a galvanic isolator shall provide electrical insulation below 5 MHz. The insulation shall withstand a dielectric strength of 1,5 kV r.m.s., 50 Hz or 60 Hz, for 1 min. Translation to Swedish: "Utrustning som är kopplad till skyddsjord via jordat vägguttag och/eller via annan utrustning och samtidigt är kopplad till kabel-TV nät kan i vissa fall medföra risk för brand. För att undvika detta skall vid anslutning av utrustningen till kabel-TV nät galvanisk isolator finnas mellan utrustningen och kabel-TV nätet."		
2.3.2	Requirements according to this annex, 6.1.2.1 and 6.1.2.2 apply.		N/A
2.10.5.13	Requirements according to this annex, 6.1.2.1 and 6.1.2.2 apply.		N/A
5.1.7.1	TOUCH CURRENT measurement results exceeding 3,5 mA r.m.s are permitted only for the following equipment: STATIONARY PLUGGABLE EQUIPMENT TYPE A that: (1) is intended to be used in a RESTRICTED ACCESS LOCATION where equipotential bonding has been applied, for example, in a telecommunication centre; and (2) has provision for a permanently connected PROTECTIVE EARTHING CONDUCTOR; and (3) is provided with instructions for the installation of that conductor by a SERVICE PERSON; - STATIONARY PLUGGABLE TYPE B - STATIONARY PERMANENTLY CONNECTED EQUIPMENT		N/A
6.1.2.1	Add the following text between the first and second paragraph of the compliance clause: If this insulation is solid, including insulation forming part of a component, it shall at least consist of either - two layers of thin sheet material, each of which shall pass the electric strength test below, or - one layer having a distance through insulation of at least 0,4 mm, which shall pass the electric strength test below. Alternatively for components, there is no distance		N/A

IEC 60950-1:2005			
SubClause	Difference + Test	Result - Remark	Verdict
	through insulation requirement for the insulation consisting of an insulating compound completely filling the casing, so that CLEARANCES and CREEPAGE DISTANCES do not exist, if the component passes the electric strength test in accordance with the compliance clause below and in addition - passes the tests and inspection criteria of 2.10.11 with an electric strength test of 1,5 kV multiplied by 1,6 (the electric strength test of 2.10.10 shall be performed using 1,5 kV), and - is subject to ROUTINE TESTING for electric strength during manufacturing, using a test voltage of 1,5 kV. It is permitted to bridge this insulation with an optocoupler complying with 2.10.5.4 b). It is permitted to bridge this insulation with a capacitor complying with EN 132400:1994, subclass Y2. A capacitor classified Y3 according to EN 132400 [EN 60384-14:2005], may bridge this insulation under the following conditions: - the insulation requirements are satisfied by having a capacitor classified Y3 as defined by EN 132400 [EN 60384-14], which in addition to the Y3 testing, is tested with an impulse test of 2,5 kV defined in EN 60950-1:2006, 6.2.2.1; - the additional testing shall be performed on all the test specimens as described in EN 132400 [EN 60384-14]; - the impulse test of 2,5 kV is to be performed before the endurance test in EN 132400 [EN 60384-14], in the sequence of tests as described in EN 132400 [EN 60384-14.]		
6.1.2.2	The exclusions are applicable for PERMANENTLY CONNECTED EQUIPMENT and PLUGGABLE EQUIPMENT TYPE B and equipment intended to be used in a RESTRICTED ACCESS LOCATION where equipotential bonding has been applied, e.g. in a telecommunication centre, and which has provision for a permanently connected PROTECTIVE EARTHING CONDUCTOR and is provided with instructions for the installation of that conductor by a SERVICE PERSON.		N/A
7.2	Requirements according to this annex, 6.1.2.1 and		N/A

IEC 60950-1:2005			
SubClause	Difference + Test	Result - Remark	Verdict
	6.1.2.2 apply with the term TELECOMMUNICATION NETWORK in 6.1.2 being replaced by the term CABLE DISTRIBUTION SYSTEM.		
7.3	Requirements according to this annex 1.2.13.14 and 1.7.2.1 apply.		N/A

IEC 60950-1:2005			
SubClause	Difference + Test	Result - Remark	Verdict

Switzerland - Differences to IEC 60950-1:2005 (Second Edition); Am1:2009 + Am2:2013			
General	Includes update from 60950-1:2005, AC:2011		N/A
1.5.1	Ordinance on environmentally hazardous substances SR 814.81, Annex 1.7, Mercury - Annex 1.7 of SR 814.81 applies for mercury. Switches containing mercury such as thermostats, relays and level controllers are not allowed.		N/A
1.7.13	Ordinance on chemical hazardous risk reduction SR 814.81, Annex 2.15, Batteries - Annex 2.15 of SR 814.81 applies for batteries containing cadmium and mercury. Note: Ordinance relating to environmentally hazardous substances, SR 814.013 of 1986-06-09 is no longer in force and superseded by SR 814.81 of 2009-02-01 (ChemRRV).		Pass
3.2.1.1	Supply cords of portable electrical appliances having a rated current not exceeding 10 A shall be provided with a plug complying with IEC 60884-1 (3rd Ed.) + Amd. 1, SEV 1011 and one of the following dimension sheets: - SEV 6533-2:2009, Plug type 11, L+N, 250 V, 10 A - SEV 6534-2:2009, Plug type 12, L+N+PE, 250 V, 10 A - SEV 6532-2:2009, Plug type 15, 3P+N+PE, 250/400 V, 10 A Supply cords of portable electrical appliances having a rated current not exceeding 16 A shall be provided with a plug complying with IEC 60884-1 (3rd Ed.) + Amd. 1, SEV 1011 and one of the following dimension sheets: - SEV 5933-2:2009, Plug type 21, L+N, 250 V, 16 A - SEV 5934-2:2009, Plug type 23, L+N+PE, 250 V, 16 A - SEV 5932-2:2009, Plug type 25, 3P+N+PE, 230/400 V, 16 A NOTE: 16 A plugs are not often used in Swiss domestic installation systems.		N/A
3.2.4	Requirements according to this annex 3.2.1.1		N/A

IEC 60950-1:2005			
SubClause	Difference + Test	Result - Remark	Verdict
	apply.		

IEC 60950-1:2005			
SubClause	Difference + Test	Result - Remark	Verdict
USA / Canada - Differences to IEC 60950-1:2005 (Second Edition); Am1:2009 + Am2:2013			
1.1.1	Equipment able to be installed in accordance with the National Electrical Code ANSI/NFPA 70 and the Canadian Electrical Code, Part1, and when applicable, the National Electrical Safety Code, IEEE C2.		Pass
1.1.1	Equipment able to be installed in accordance with ANSI/NFPA 75 and NEC Art. 645 unless intended for use outside of computer room and provided with such instructions.		Pass
1.1.2	Baby monitors are required to additionally comply with ASTM F2951, Consumer Safety Specification for Baby Monitors.		N/A
1.1.2	Equipment in wire-line communication facilities serving high-voltage electric power stations operating at greater than 1kV are excluded.		N/A
1.1.2	Special requirements apply to equipment intended for use outdoors.		N/A
1.4.14	For PLUGGABLE EQUIPMENT TYPE A, the protection in the installation is assumed to be 20 A.		N/A
1.5.1	All IEC standards for components identified in Annex P.1 replaced by the relevant requirements of CSA and UL component standards in Annex P.1.		Pass
1.5.1	All IEC standards for components identified in Annex P.2 alternatively satisfied by the relevant requirements of CSA and UL component standards in Annex P.2.		Pass
1.5.5	Interconnecting cables acceptable for the application regarding voltage, current, temperature, flammability, mechanical serviceability and the like.		Pass
1.5.5	For other than limited power and TNV circuits, the type of output circuit identified for output connector.		N/A
1.5.5	External cable assemblies that exceed 3.05 m in length to be types specified in the NEC and CEC.		N/A
1.5.5	Detachable external interconnecting cables 3.05 m or less in length and provided with equipment marked to identify the responsible organization and the designation for the cable.		Pass
1.5.5	Building wiring and cable for use in ducts, plenums and other air handling space subject to special requirements and excluded from scope.		N/A

IEC 60950-1:2005			
SubClause	Difference + Test	Result - Remark	Verdict
1.5.5	Telephone line and extension cords and the like comply with UL 1863 and CSA C22.2 No. 233.		N/A
1.6.1.2	Equipment intended for connection to a d.c. power (mains) distribution system is subject to special circuit classification requirements (e.g., TNV-2)		N/A
1.6.1.2	Earthing of d.c. powered equipment provided.		N/A
1.7	Lamp replacement information indicated on lampholder in operator access area.		N/A
1.7.1	Special marking format for equipment intended for use on a supply system with an earthed neutral and more than one phase conductor.		N/A
1.7.1	Equipment voltage rating not higher than rating of the plug except under special conditions.		N/A
1.7.6	Special fuse replacement marking for operator accessible fuses.		N/A
1.7.7	Identification of terminal connection of the equipment earthing conductor.		N/A
1.7.7	Connectors and field wiring terminals for external Class 2 or Class 3 circuits provided with marking indicating minimum Class of wiring to be used.		N/A
1.7.7	Marking located adjacent to terminals and visible during wiring.		N/A
2.1.1.1	Bare TNV conductive parts in the interior of equipment normally protected against contact by a cover intended for occasional removal are exempt provided instructions include directions for disconnection of TNV prior to removal of the cover.		N/A
2.3.1.b	Other telecommunication signaling systems (e.g., message waiting) than described in 2.3.1(b) are subject to M.4.		N/A
2.3.1.b	For TNV-2 and TNV-3 circuits with other than ringing signals and with voltages exceeding 42.4 Vp or 60 V d.c., the maximum current limit through a 2000 Ohm or greater resistor with loads disconnected is 7.1 mA peak or 30 mA d.c. under normal conditions.		N/A
2.3.1.b	Limits for measurements across 5000 ohm resistor in the event of a single fault are replaced after 200 ms with the limits of M.3.1.4.		N/A
2.3.2.1	In the event of a single fault, the limits of 2.2.3 apply to SELV circuits and accessible conductive parts.		N/A

IEC 60950-1:2005			
SubClause	Difference + Test	Result - Remark	Verdict
2.5	Overcurrent protection device required for Class 2 and Class 3 limiting in accordance with the NEC, or for a Limited Power Source, not interchangeable with devices of higher ratings if operator replaceable.		N/A
2.6	Equipment having receptacles for output a.c. power connectors generated from an internal separately derived source have the earthed (grounded) circuit conductor suitably bonded to earth.	Class III unit.	N/A
2.6.2	Equipment with functional earthing is required to be marked with the functional earthing symbol (IEC 60417-6092).		N/A
2.6.3.3	For PLUGGABLE EQUIPMENT TYPE A, if a) b) or c) are not applicable, the current rating of the circuit is taken as 20 A		N/A
2.6.3.3	The first column on Table 2D requirement: “Smaller of the RATED CURRENT of the equipment or the PROTECTIVE CURRENT RATING of the circuit under consideration."		N/A
2.6.3.4	Capacity of connection between earthing terminal and parts required to be earthed subject to special conditions based on the current rating of the circuit.		N/A
2.6.3.4	Protective bonding conductors and their terminals of non-standard constructions (e.g. PWB traces) evaluated to limited short-circuit test of CSA C22.2 No.0.4.		N/A
2.6.4.1	Field wiring terminals for earthing conductors suitable for wire sizes (gauge) used in US and Canada.		N/A
2.7.1	Data for selection of special external branch circuit overcurrent devices marked on the equipment.		N/A
2.7.1	Standard supply outlets protected by overcurrent device in accordance with the NEC, and CEC, Part 1.		N/A
2.7.1	Overcurrent protection for individual transformers that distribute power to other units over branch circuit wiring.		N/A
2.7.1	Additional requirements for overcurrent protection apply to equipment provided with panelboards.		N/A
2.7.1	Non-motor-operated equipment requiring special overcurrent protective device marked with device rating.		N/A

IEC 60950-1:2005			
SubClause	Difference + Test	Result - Remark	Verdict
2.10.5.12	Multi-layer winding wire subject to UL component wire requirements in addition to 2.10.5.12 and Annex U.		N/A
3.1.1	Permissible combinations of internal wiring/external cable sizes for overcurrent and short circuit protection.		N/A
3.1.1	All interconnecting cables protected against overcurrent and short circuit.		Pass
3.2	Wiring methods permit connection of equipment to primary power supply in accordance with the NEC and CEC, Part 1.		N/A
3.2.1	Permitted use for flexible cords and plugs.		N/A
3.2.1	Flexible cords provided with attachment plug rated 125% of equipment current rating.		N/A
3.2.1	Any Class II equipment provided with 15 or 20 A standard supply outlets, Edison-base lampholders or single pole disconnect device provided with a polarized type attachment plug.		N/A
3.2.1.2	Equipment intended for connection to DC mains supply power systems complies with special wiring requirements (e.g., no permanent connection to supply by flexible cord).		N/A
3.2.1.2	Equipment with one pole of the DC mains supply connected to both the equipment mains input terminal and the main protective earthing terminal provided with special instructions and construction provisions for earthing.		N/A
3.2.1.2	Equipment with means for connecting supply to earthing electrode conductor has no switches or protective devices between supply connection and earthing electrode connection.		N/A
3.2.1.2	Special markings and instructions for equipment with provisions to connect earthed conductor of a DC supply circuit to earthing conductor at the equipment.		N/A
3.2.1.2	Special markings and instructions for equipment with earthed conductor of a DC supply circuit connected to the earthing conductor at the equipment.		N/A
3.2.1.2	Terminals and leads provided for permanent connection of DC powered equipment to supply marked to indicate polarity if reverse polarity may		N/A

IEC 60950-1:2005			
SubClause	Difference + Test	Result - Remark	Verdict
	result in a hazard.		
3.2.3	Permanently connected equipment has provision for connecting and securing a field wiring system (i.e. conduit, or leads etc.) per the NEC and CEC, Part 1.		N/A
3.2.3	Permanently connected equipment may have terminals or leads not smaller than No. 18 AWG (0.82 mm²) and not less than 150 mm in length for connection of field installed wiring.		N/A
3.2.3	If supply wires exceed 60 °C, marking indicates use of 75 °C or 90 °C wiring for supply connection as appropriate.		N/A
3.2.3	Equipment compatible with suitable trade sizes of conduits and cables.		N/A
3.2.5	Power supply cords are required to be no longer than 4.5 m in length. Minimum cord length is required to be 1.5 m, with certain constructions such as external power supplies allowed to consider both input and output cord lengths into the requirement. Flexible power supply cords are required to be compatible with Article 400 of the NEC, and Tables 11 and 12 of the CEC.		N/A
3.2.5	Conductors in power supply cords sized according to NEC and CEC, Part I.		N/A
3.2.5	Power supply cords and cord sets incorporate flexible cords suitable for the particular application.		N/A
3.2.6	Strain relief provided for non-detachable interconnecting cables not supplied by a limited power source.		N/A
3.2.9	Adequate wire bending space and volume of field wiring compartment required to properly make the field connections.		N/A
3.2.9	Equipment intended solely for installation in Restricted Access Locations using low voltage d.c. systems may not need provision for connecting and securing a field wiring system. A method of securing wiring or instructions provided to ensure the wiring is protected from abuse.		N/A
3.3	Field wiring terminals provided for interconnection of units for other than LPS or Class 2 circuits also		N/A

IEC 60950-1:2005			
SubClause	Difference + Test	Result - Remark	Verdict
	comply with 3.3.		
3.3	Interconnection of units by LPS or Class 2 conductors may have field wiring connectors other than those specified in 3.3 if wiring is reliably separated.		N/A
3.3.1	Terminals for the connection of neutral conductor identified by a distinctive white marking or other equally effective means.		N/A
3.3.3	Wire binding screw terminal permitted for connection of No. 10 AWG (5.3 mm^2) or smaller conductor if provided with upturned lugs, cupped washer or equivalent retention.		N/A
3.3.4	Terminals accept wire sizes (gauge) used in the U.S. and Canada.		N/A
3.3.4	Terminals accept current-carrying conductors rated 125% of the equipment current rating.		N/A
3.3.5	First column of Table 3E revised to require “Smaller of the RATED CURRENT of the equipment or the PROTECTIVE CURRENT RATING of the circuit under consideration."		N/A
3.3.6	Field wiring terminals marked to indicate the material(s) of the conductor appropriate for the terminals used.		N/A
3.3.6	Connection of an aluminum conductor not permitted to terminal for equipment earthing conductor.		N/A
3.3.6	Field wiring connections made through the use of suitable pressure connectors (including set screw type), solder lugs or splices to flexible leads.		N/A
3.4.2	Separate motor control device(s) required for cord-connected equipment rated more than 12 A, or with motor rated more than 1/3 hp or more than 120 V.		N/A
3.4.8	Vertically mounted disconnect devices oriented so up position of handle is "on".		N/A
3.4.11	For computer-room applications, equipment with battery systems capable of supplying 750 VA for 5 min require battery disconnect means.		N/A
4.2.8.1	Special opening restrictions for enclosures around CRTs with face dimension of 160 mm or more.		N/A
4.2.9	Compartment housing high-pressure lamp marked to indicate risk of explosion.		N/A

IEC 60950-1:2005			
SubClause	Difference + Test	Result - Remark	Verdict
4.3.2	Loading test for equipment with handle(s) used to support more than 9 kg tested at four times the weight of the unit.		N/A
4.3.6	In addition to the IEC requirements, Direct Plug-in Equipment complies with UL 1310 or CSA 223 mechanical assembly requirements.		N/A
4.3.8	Battery packs for both portable and stationary applications are required to comply with special component requirements.		N/A
4.3.12	The maximum quantity of flammable liquid stored in equipment complies with ANSI/NFPA 30(Table NAE.6).		N/A
4.3.12	Equipment using replenishable liquids marked to indicate type of liquid to be used.		N/A
4.3.13.2	Equipment that produces x-radiation and does not comply with 4.3.12 under all conditions of servicing marked to indicate the presence of radiation where readily visible.		N/A
4.3.13.5.1	Requirements contained in the applicable national codes and regulations apply to lasers (21 CFR 1040 and REDR C1370).		N/A
4.7	Automated information storage equipment intended to contain more than 0.76 m^3 of combustible media requires provision for automatic sprinklers or a gaseous agent extinguishing system.		N/A
4.7.3.1	Equipment for use in environmental air space other than ducts or plenums provided with metal enclosure or with non-metallic enclosure having adequate fire-resistance and low smoke producing characteristics. Low smoke-producing characteristics evaluated according to UL 2043. Equipment for installation in space used for environmental air as described in Sec. 300-22(c) of the NEC provided with instructions indicating suitability for installation in such locations.		N/A
4.7.3.1	Flame spread rating for external surface of combustible material with exposed area greater than 0.9 m^2 or a single dimension greater than 1.8 m; 50 or less for computer room applications or 200 or less for other applications.		N/A
4.7.3.4	Wire marked "VW-1" or "FT-1" considered equivalent.		Pass
5.1.8.2	Special earthing provisions and instructions for		N/A

IEC 60950-1:2005			
SubClause	Difference + Test	Result - Remark	Verdict
	equipment with high touch current due to telecommunication network connections.		
5.1.8.3	Touch current due to ringing voltage for equipment containing telecommunication network leads.		N/A
5.3.7	Overloading of SELV connectors and printed wiring board receptacles accessible to the operator.		N/A
5.3.7	Tests interrupted by opening of a component repeated two additional times.		N/A
5.3.9.1	Test interrupted by opening of wire or trace subject to certain conditions.		N/A
6	Specialized instructions provided for telephones that may be connected to a telecommunications network.		N/A
6	Marking identifying function of telecommunication type connectors not used for connection to a telecommunication network.		N/A
6.3	Equipment remotely powered over telecommunication wiring systems provided with specialized markings adjacent to the connection.		N/A
6.3	Overcurrent protection incorporated into equipment to provide power over telecommunication wiring system not interchangeable with devices of higher ratings if operator replaceable.		N/A
6.4	Additional requirements for equipment intended for connection to a telecommunication network using cable subject to overvoltage from power line failures (Fig. 6C).		N/A
6.4	Where 26 AWG line cord required by Fig. 6C, either the cord is provided with the equipment or described in the safety instructions.		N/A
7	Equipment associated with the cable distribution system may need to be subjected to applicable parts of Chapter 8 of the NEC.		N/A
H	Ionizing radiation measurements made under single fault conditions in accordance with the requirements of the Code of Federal Regulations 21 CFR 1020 and the Canadian Radiation Emitting Devices Act, REDR C1370.		N/A
M.2	Continuous ringing signals evaluated to Method A subjected to special accessibility considerations.		N/A
M.4	Special requirements for message waiting and similar telecommunications signals.		N/A

IEC 60950-1:2005			
SubClause	Difference + Test	Result - Remark	Verdict
NAC	Equipment intended for use with a generic secondary protector marked with suitable instructions.		N/A
NAC	Equipment intended for use with a specific primary or secondary protector marked with suitable instructions.		N/A
NAD	Acoustic pressure from an ear piece less than 140 dBA for short duration disturbances, and less than 125 dBA for handsets, 118 dBA for headsets and insert earphones, for long duration disturbances.		N/A
NAD	Equipment connected to a telecommunication and cable distribution networks and supplied with an earphone intended to be held against, or in the ear is required to comply with special acoustic pressure requirements.		N/A
EE.5	UL articulated accessibility probe (Fig. EE.3) required for assessing accessibility to document/media shredders, instead of Figure 2A test finger.		N/A

IEC 60950-1:2005			
SubClause	Difference + Test	Result - Remark	Verdict
United Kingdom - Differences to IEC 60950-1:2005 (Second Edition); Am1:2009 + Am2:2013			
2.6.3.3	The current rating of the circuit shall be taken as 13 A, not 16 A.		N/A
2.7.1	To protect against excessive currents and short-circuits in the PRIMARY CIRCUIT of DIRECT PLUG-IN EQUIPMENT, tests according to 5.3 shall be conducted, using an external protective device rated 30 A or 32 A. If these tests fail, suitable protective devices shall be included as integral parts of the DIRECT PLUG-IN EQUIPMENT, so that the requirements of 5.3 are met.		N/A
3.2.1.1	Apparatus which is fitted with a flexible cable or cord and is designed to be connected to a mains socket conforming to BS 1363 by means of that flexible cable or cord and plug, shall be fitted with a "standard plug" in accordance with Statutory Instrument 1786: 1994 - The Plugs and Sockets etc. (Safety) Regulations 1994, unless exempted by those regulations. NOTE: "Standard plug" is defined in SI 1786: 1994 and essentially means an approved plug conforming to BS 1363 or an approved conversion plug.		N/A
3.2.5.1	A power supply cord with conductor of 1.25 mm^2 is allowed for equipment with a rated current over 10A and up to and including 13A.		N/A
3.3.4	The range of conductor sizes of flexible cords to be accepted by terminals for equipment with a rated current of over 10 A up to and including 13 A is 1.25 mm^2 to 1.5 mm^2 nominal cross-sectional area.		N/A
4.3.6	The torque test is performed using a socket outlet complying with BS 1363 and the plug part of DIRECT PLUG-IN EQUIPMENT shall be assessed to BS 1363: Part 1, 12.1, 12.2, 12.3, 12.9, 12.11, 12.12, 12.16 and 12.17, except that the test of 12.17 is performed at not less than 125°C.		N/A
4.3.6	Where the metal earth pin is replaced by an Insulated Shutter Opening Device (ISOD), the requirements of clauses 22.2 and 23 also apply.		N/A

Enclosures

Type	Supplement Id	Description
Marking Plate	13-03	Label for model DH-IPC-HDBW5241RP-ASE
Marking Plate	13-04	Label for model DH-IPC-HDBW5241RP-S
Marking Plate	13-05	Label for model DH-IPC-HDBW5442RP-ASE
Marking Plate	13-06	Label for model DH-IPC-HDBW5442RP-S
Marking Plate	13-07	Label for model DH-IPC-HDBW5541RP-ASE
Marking Plate	13-08	Label for model DH-IPC-HDBW5541RP-S
Marking Plate	13-09	Label for model DH-IPC-HDBW2431RP-ZAS-S2
Marking Plate	13-10	Label for model IPC-HDBW3441RP-ZAS
Photographs	3-51	Ports view of model DH-IPC-HDBW5442RP-ASE
Photographs	3-52	Front view of model DH-IPC-HDBW5442RP-ASE
Photographs	3-53	Rear view of model DH-IPC-HDBW5442RP-ASE
Photographs	3-54	01 Internal view of model DH-IPC-HDBW5442RP-ASE
Photographs	3-55	02 Internal view of model DH-IPC-HDBW5442RP-ASE
Photographs	3-56	03 Internal view of model DH-IPC-HDBW5442RP-ASE
Photographs	3-57	Front view of mainboard of model DH-IPC-HDBW5442RP-ASE
Photographs	3-58	Rear view of mainboard of model DH-IPC-HDBW5442RP-ASE
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Enclosures

MarkingPlate ID 13-03

Enclosures

MarkingPlate ID 13-04

Enclosures

MarkingPlate ID 13-05

Enclosures

MarkingPlate ID 13-06

Enclosures

MarkingPlate ID 13-07

Enclosures

MarkingPlate ID 13-08

Enclosures

MarkingPlate ID 13-09

Enclosures

MarkingPlate ID 13-10

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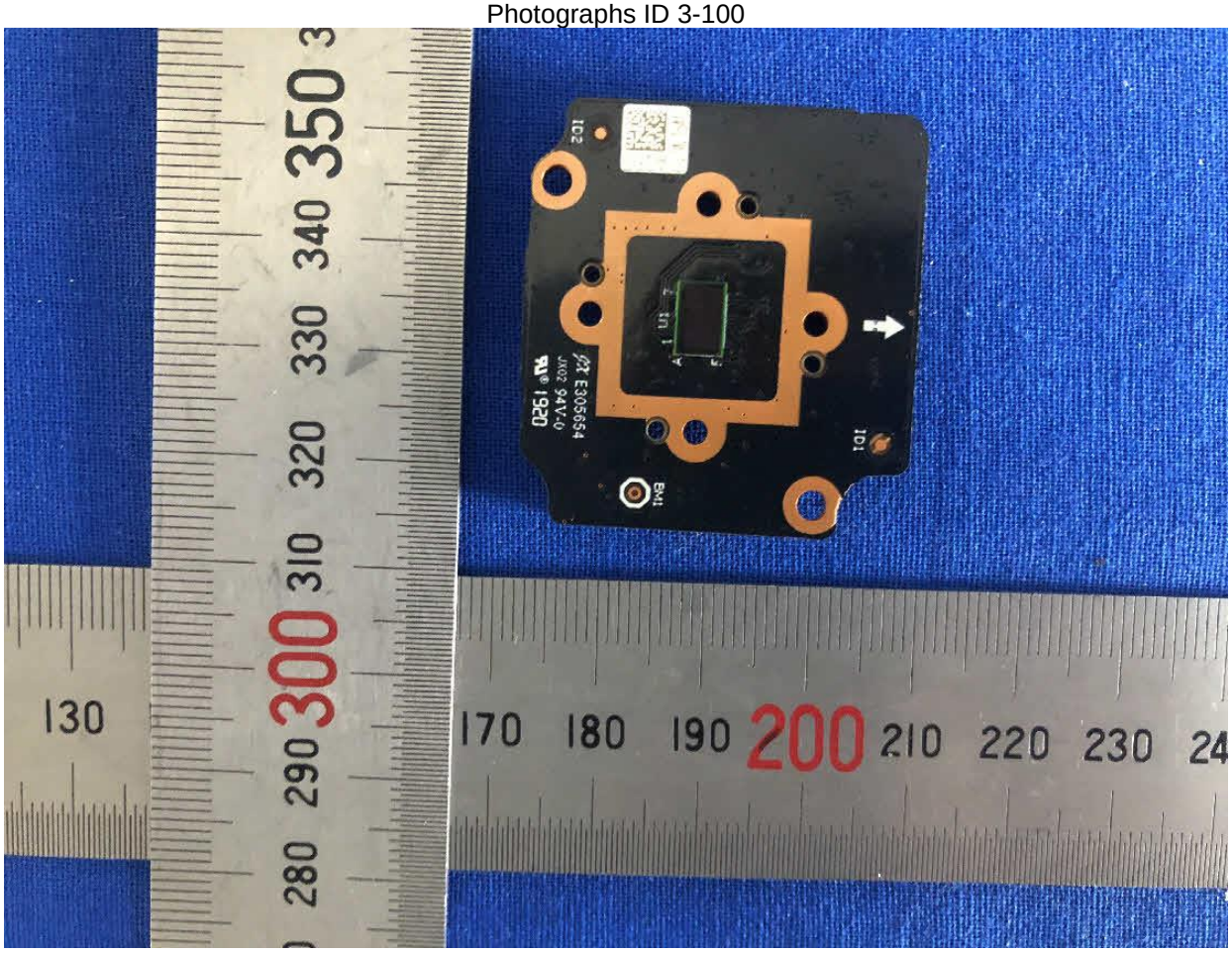

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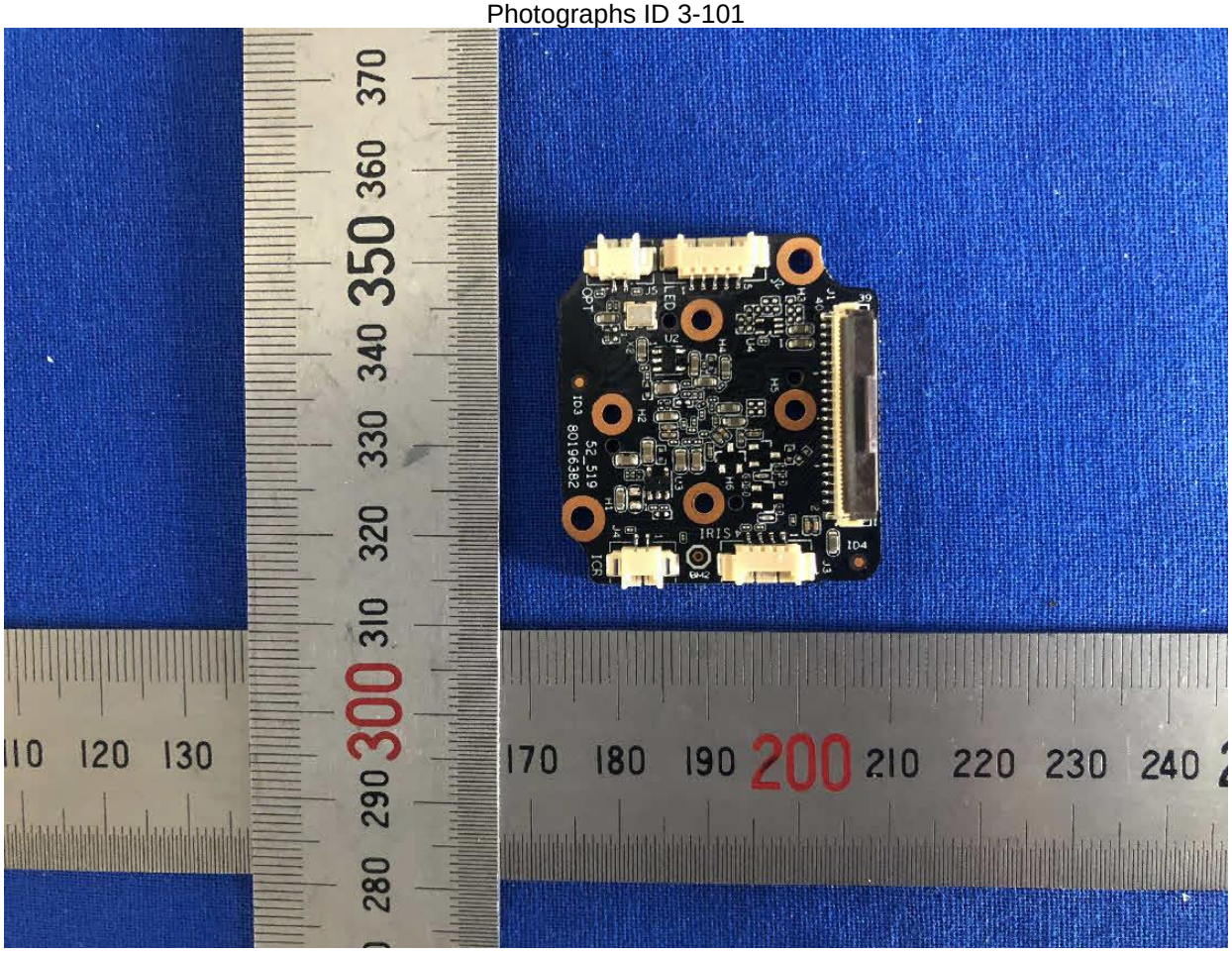

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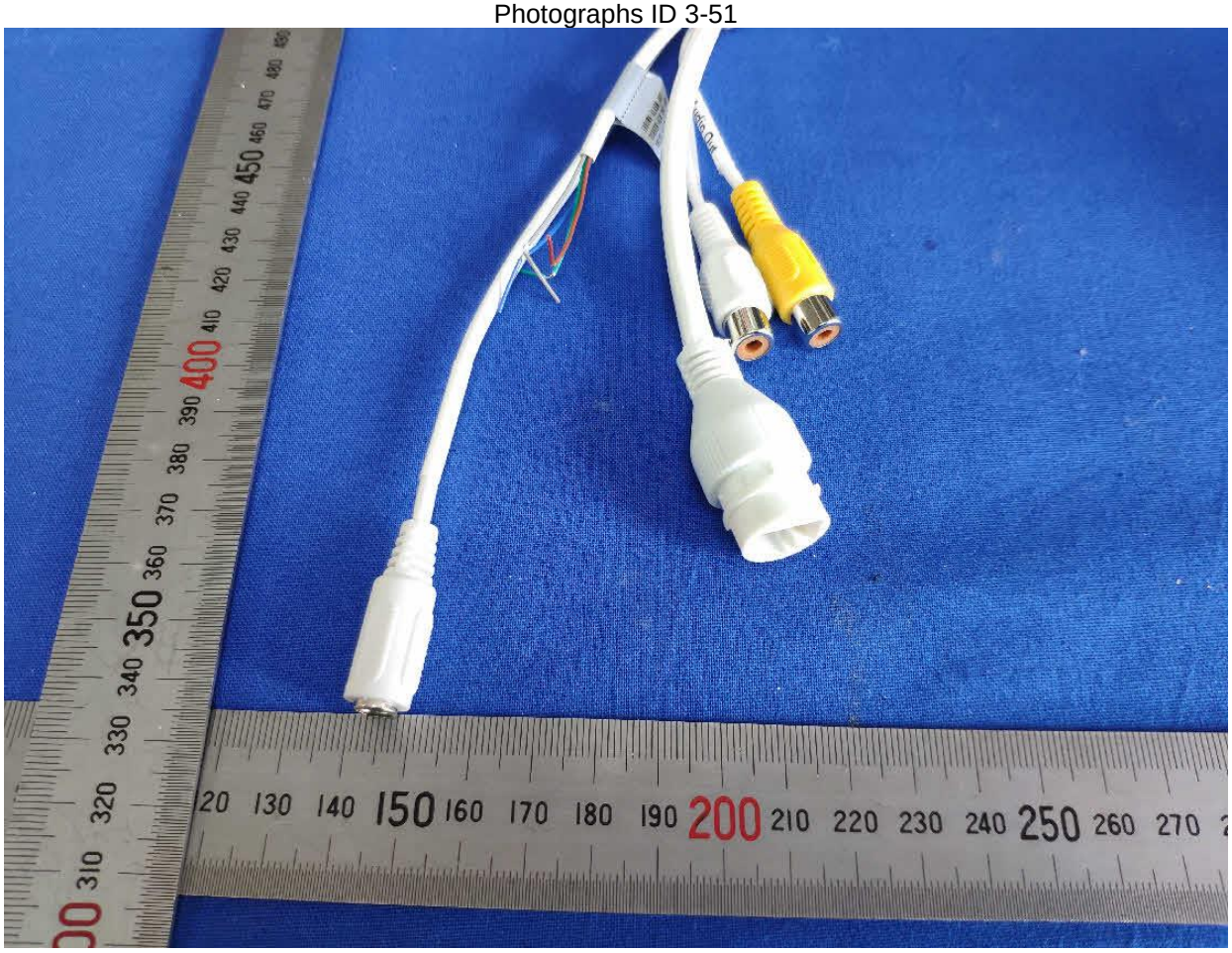

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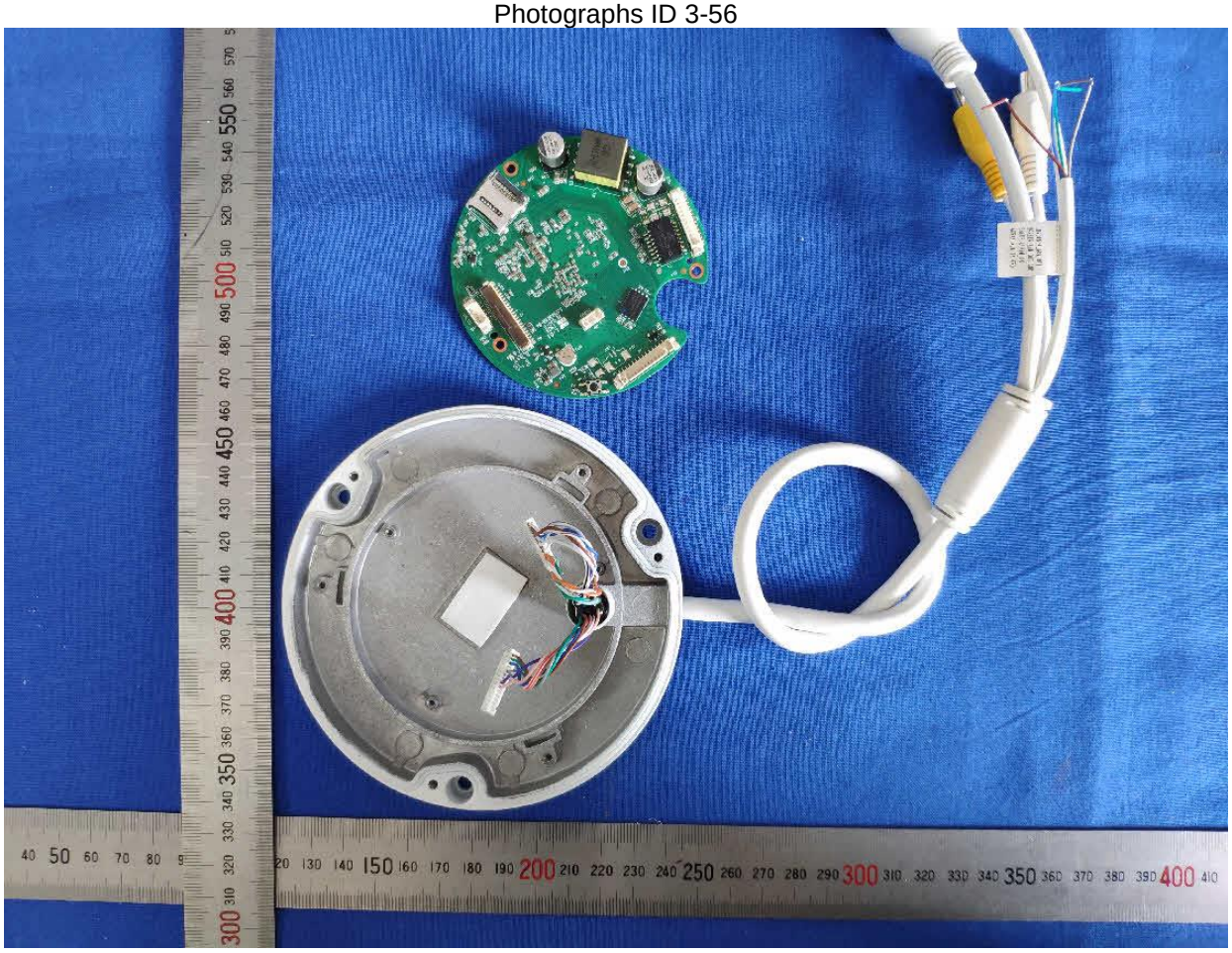
Photographs ID 3-53

Photographs ID 3-54

Photographs ID 3-55

Photographs ID 3-56



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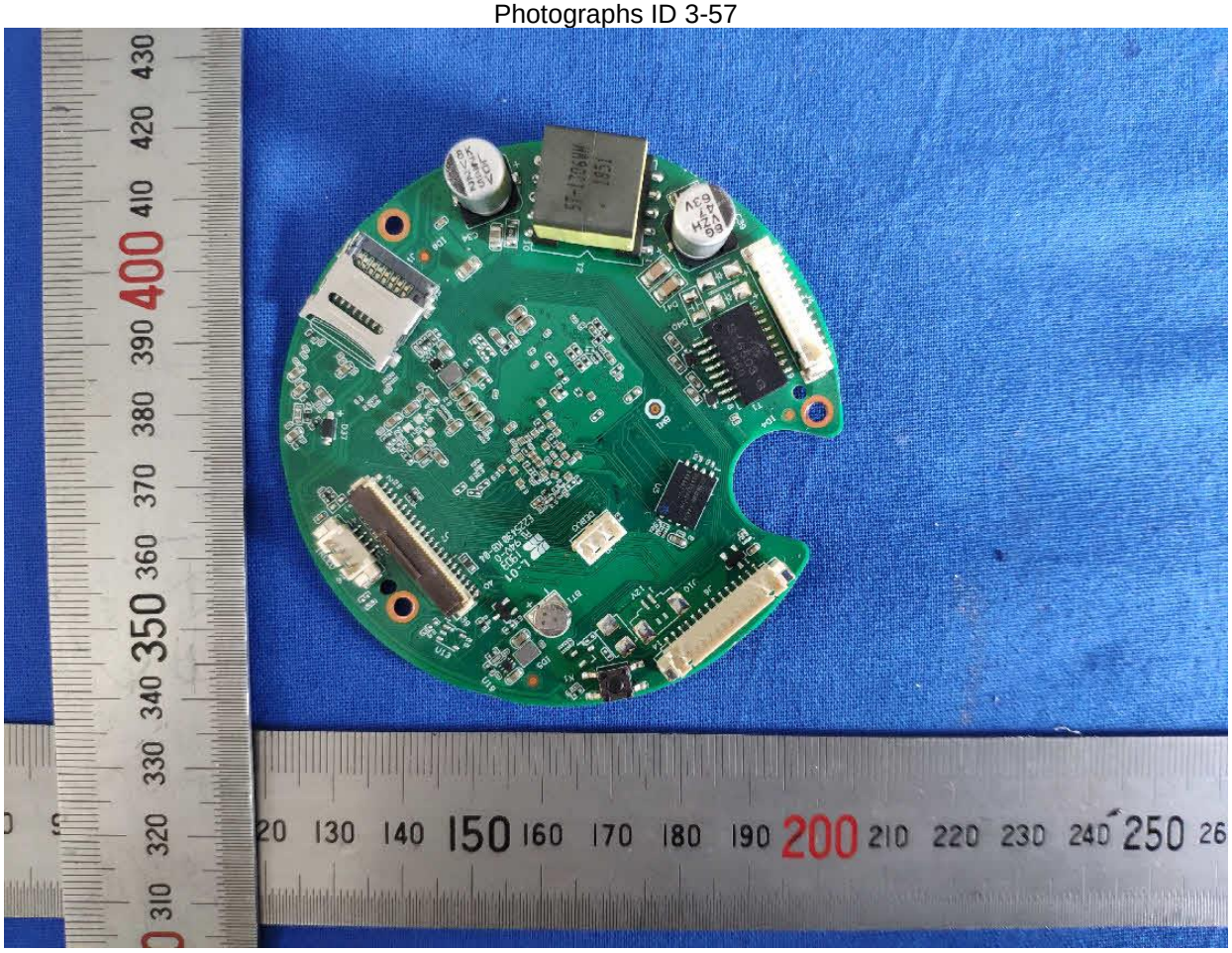

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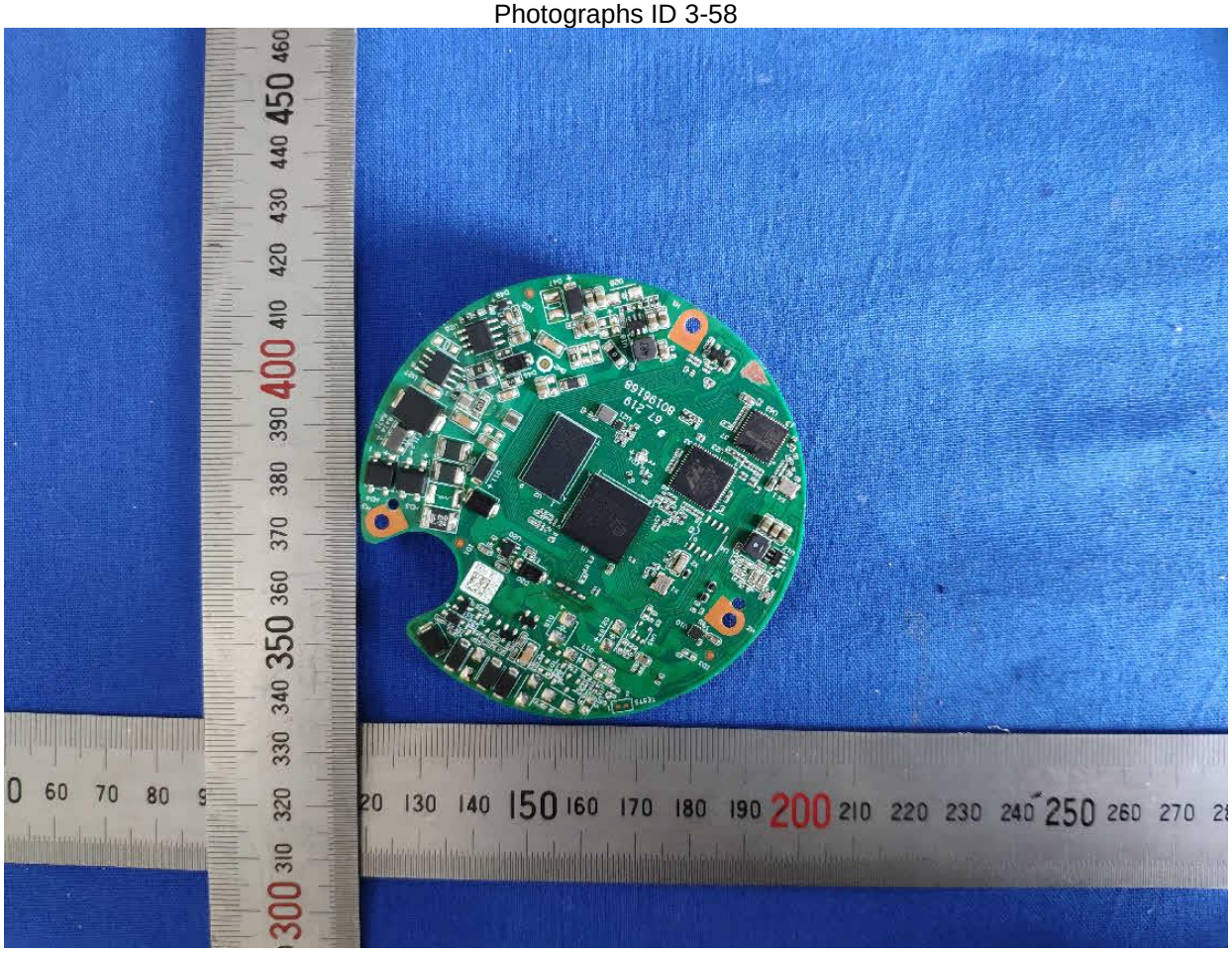

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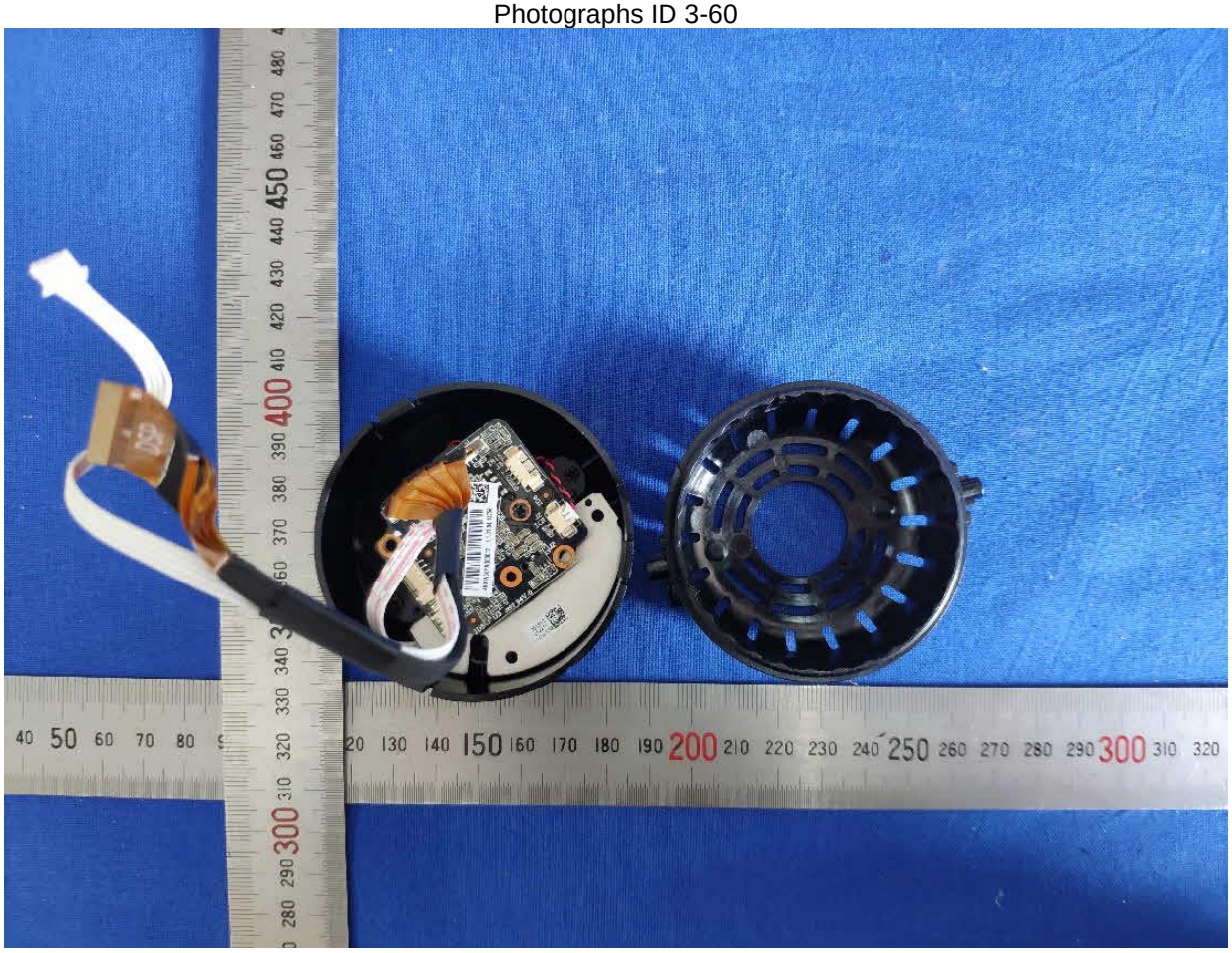

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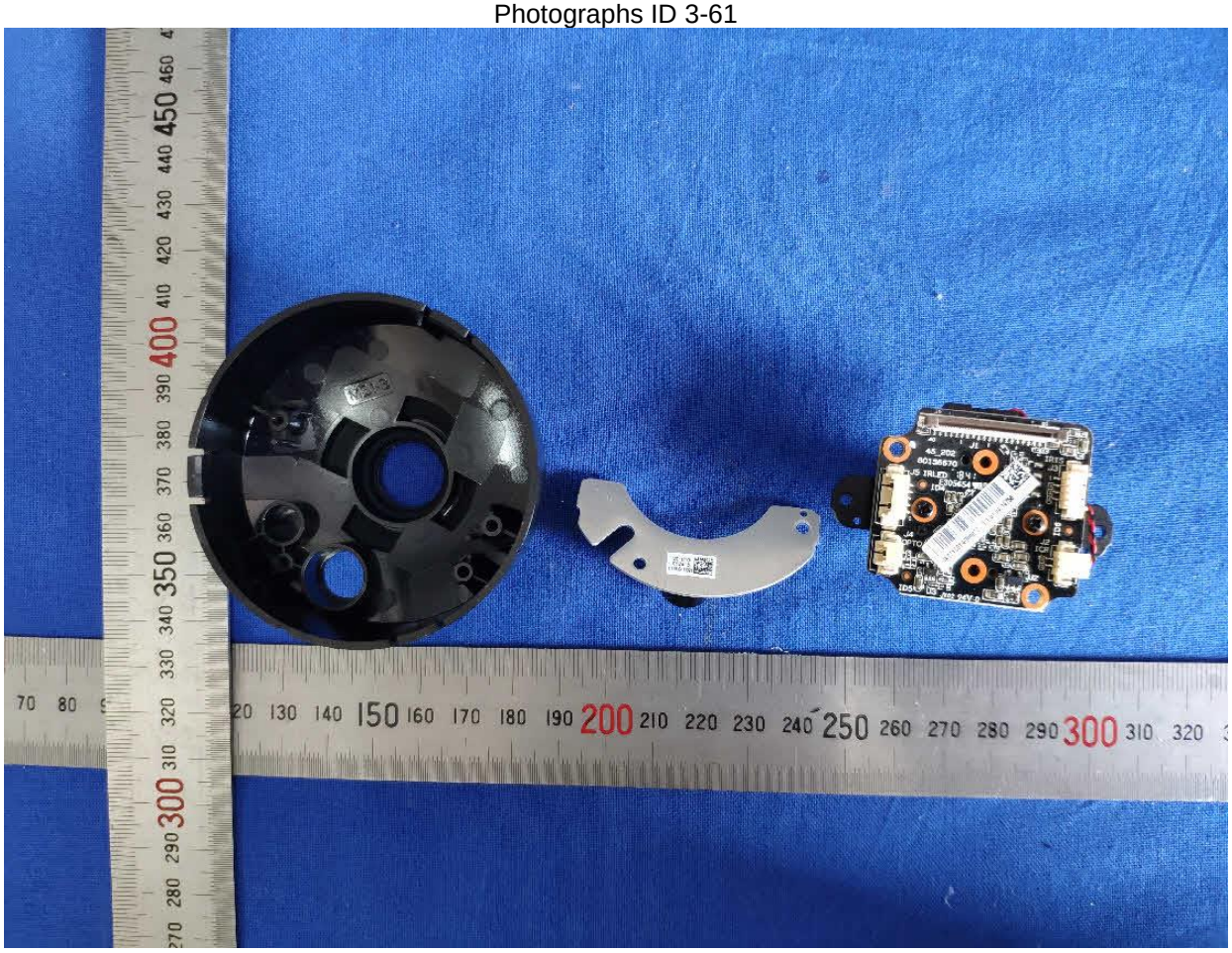

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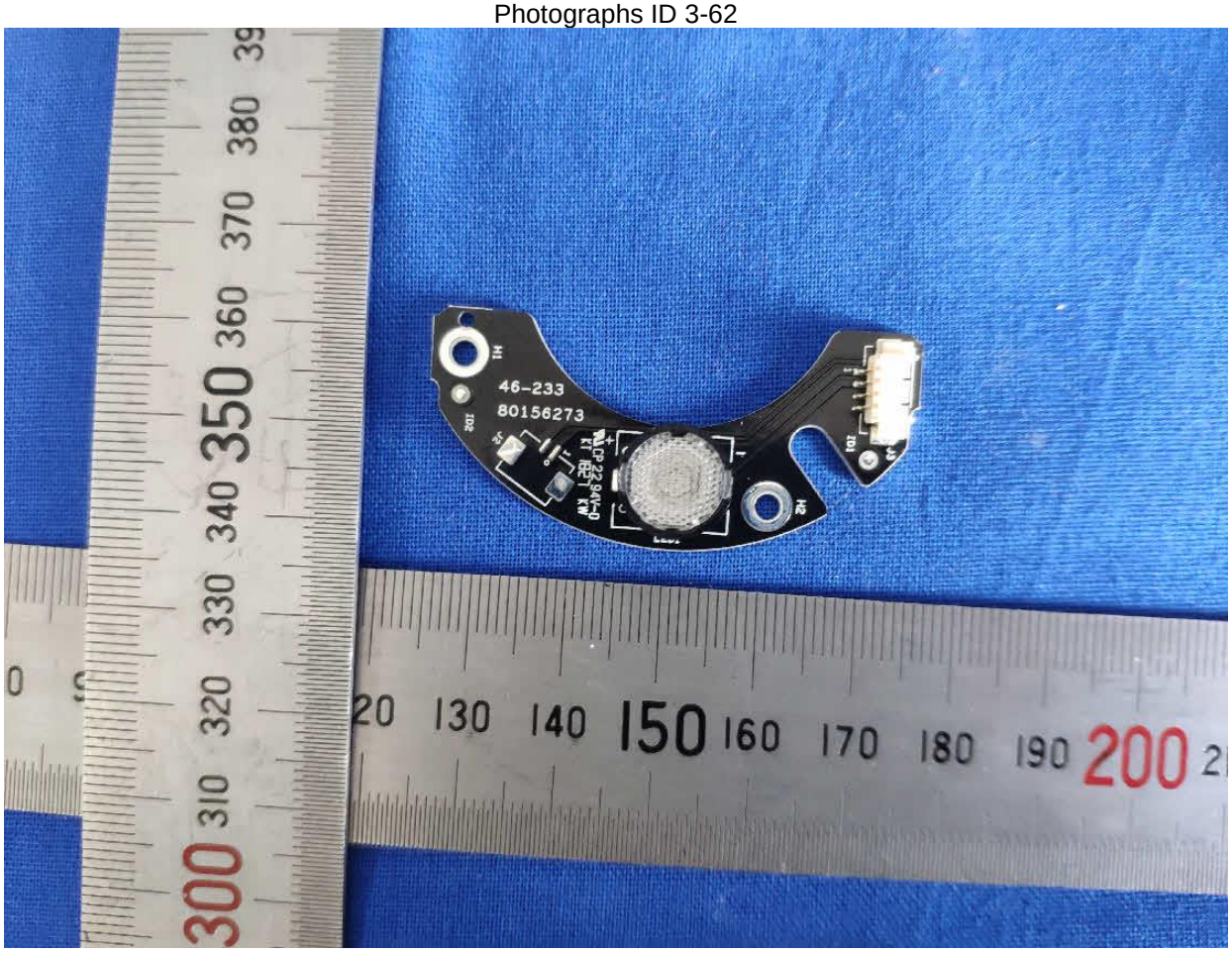

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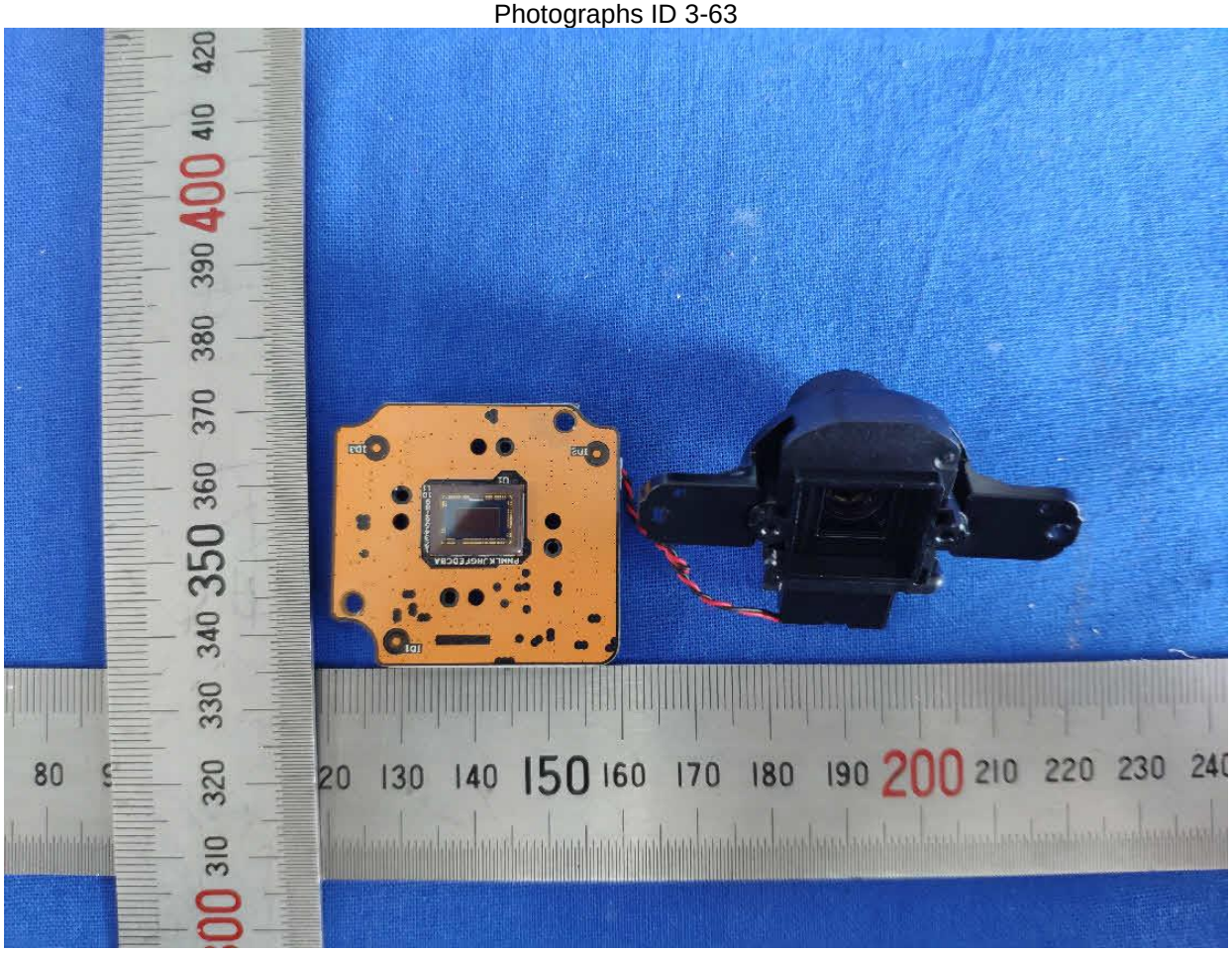

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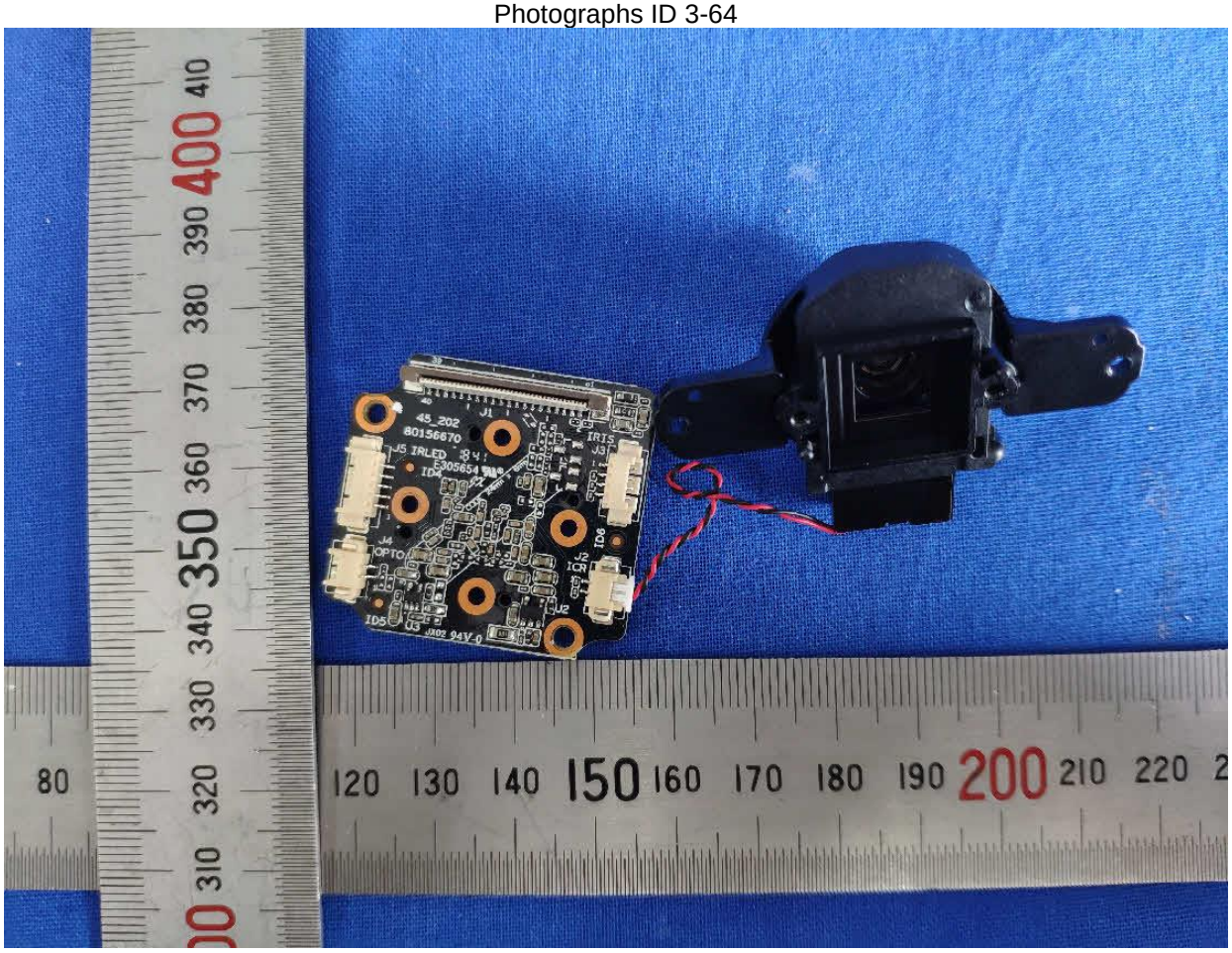

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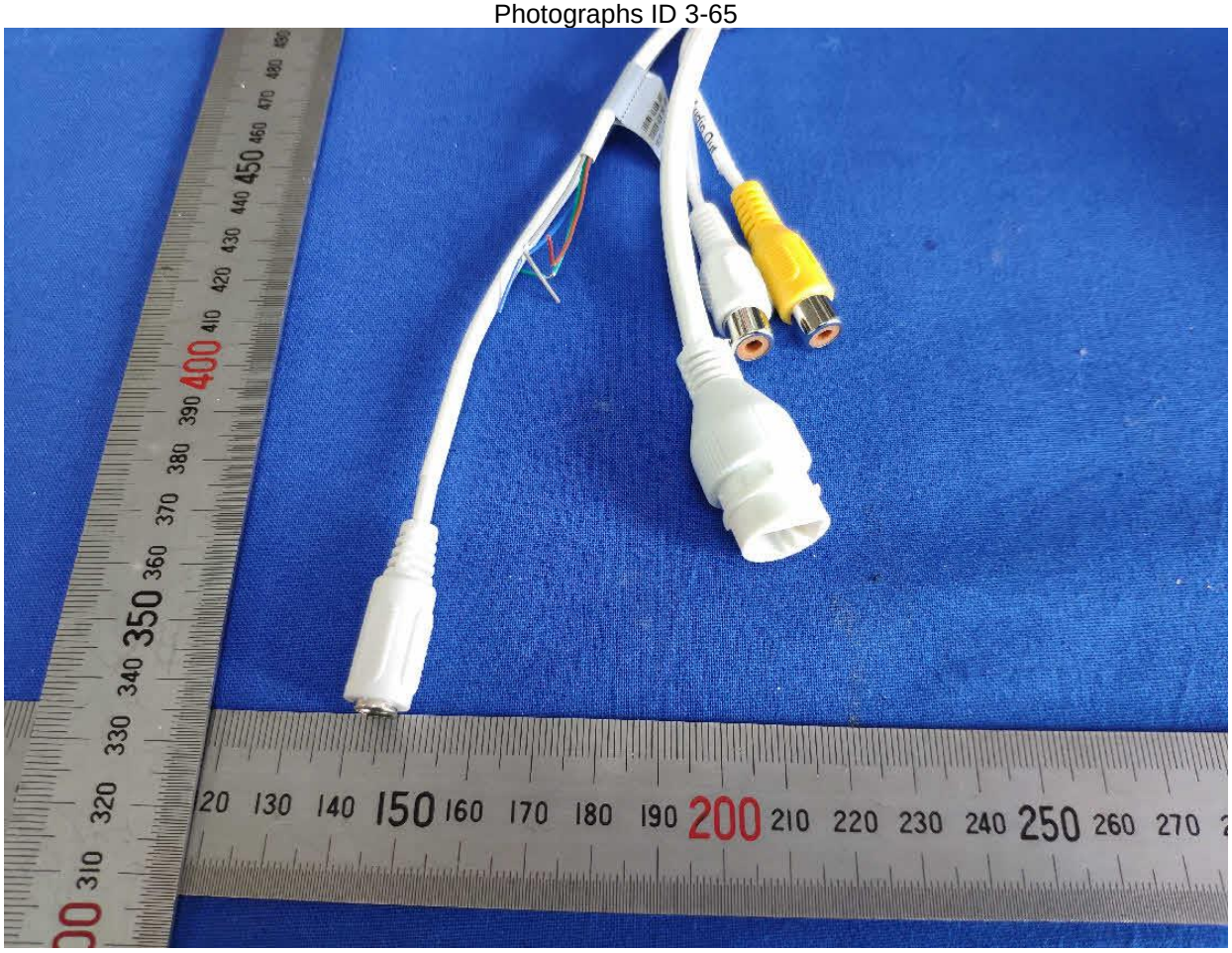

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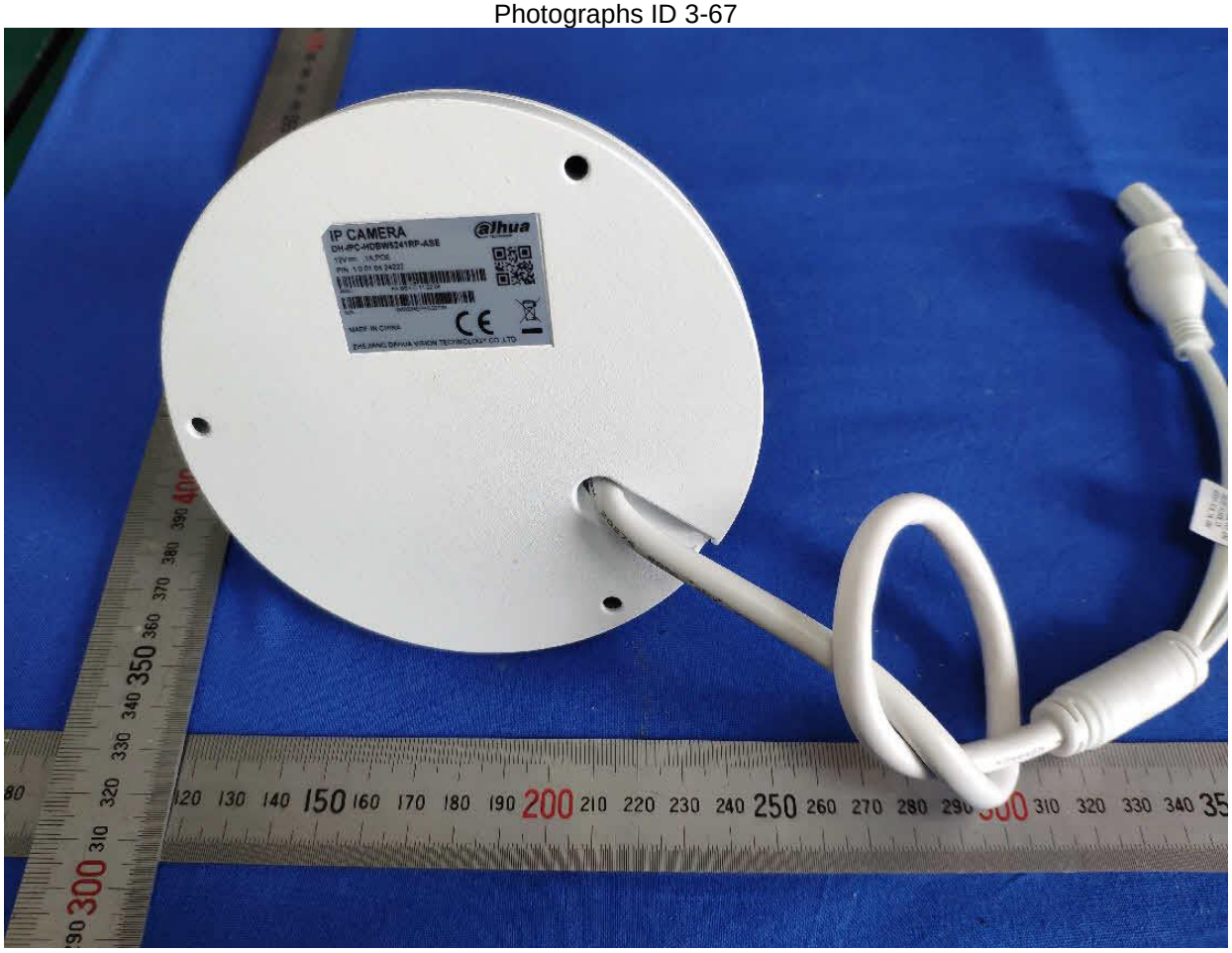

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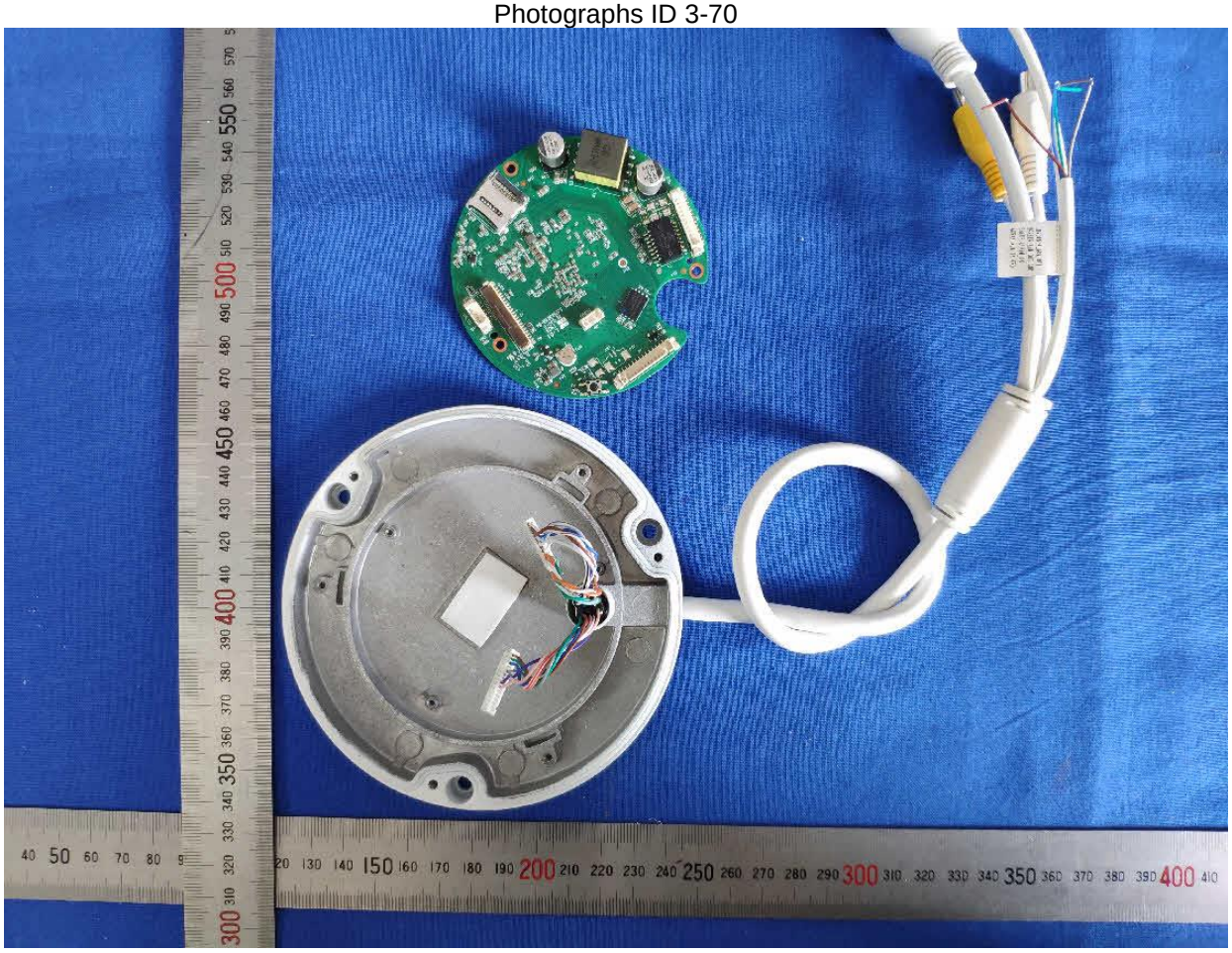

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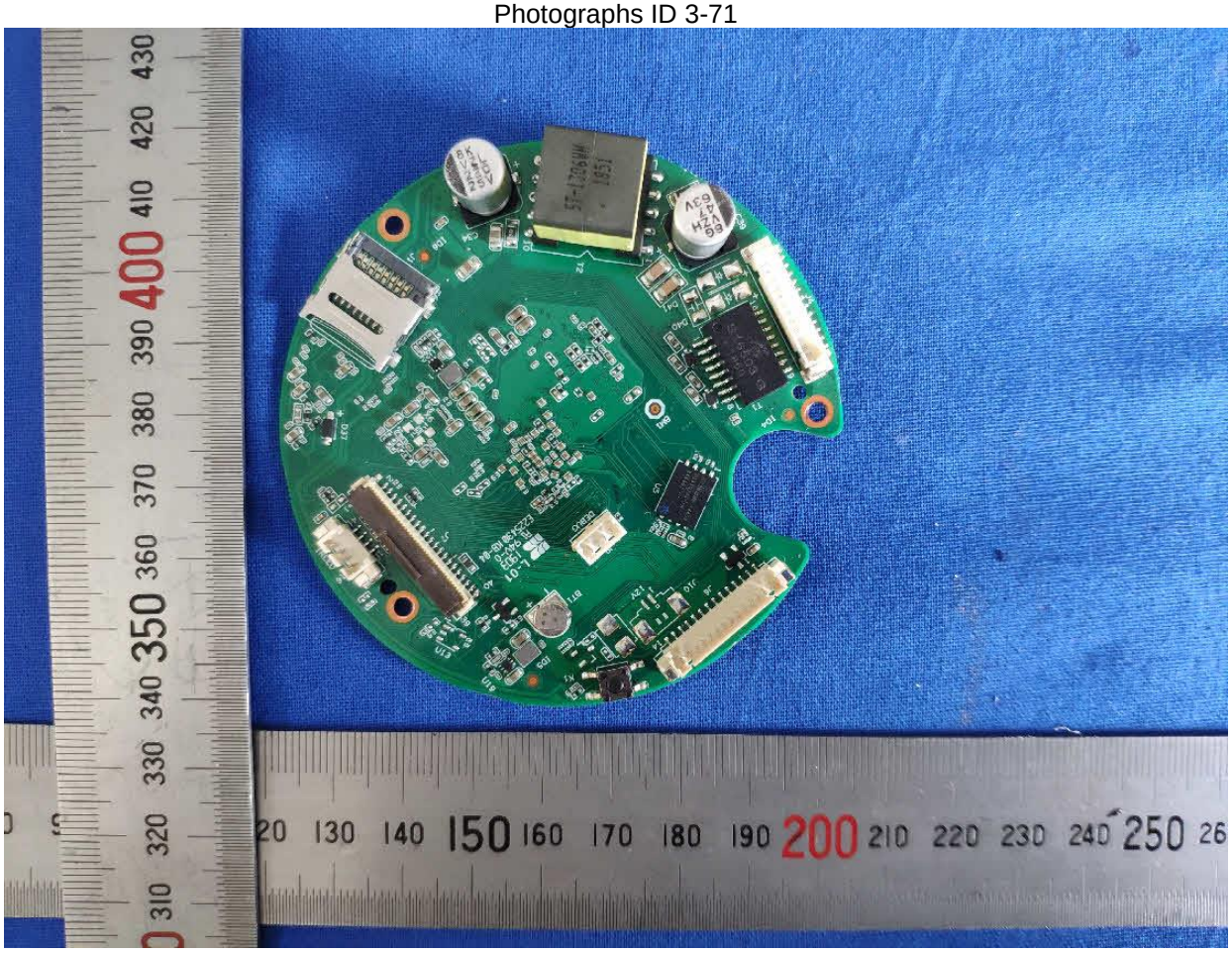

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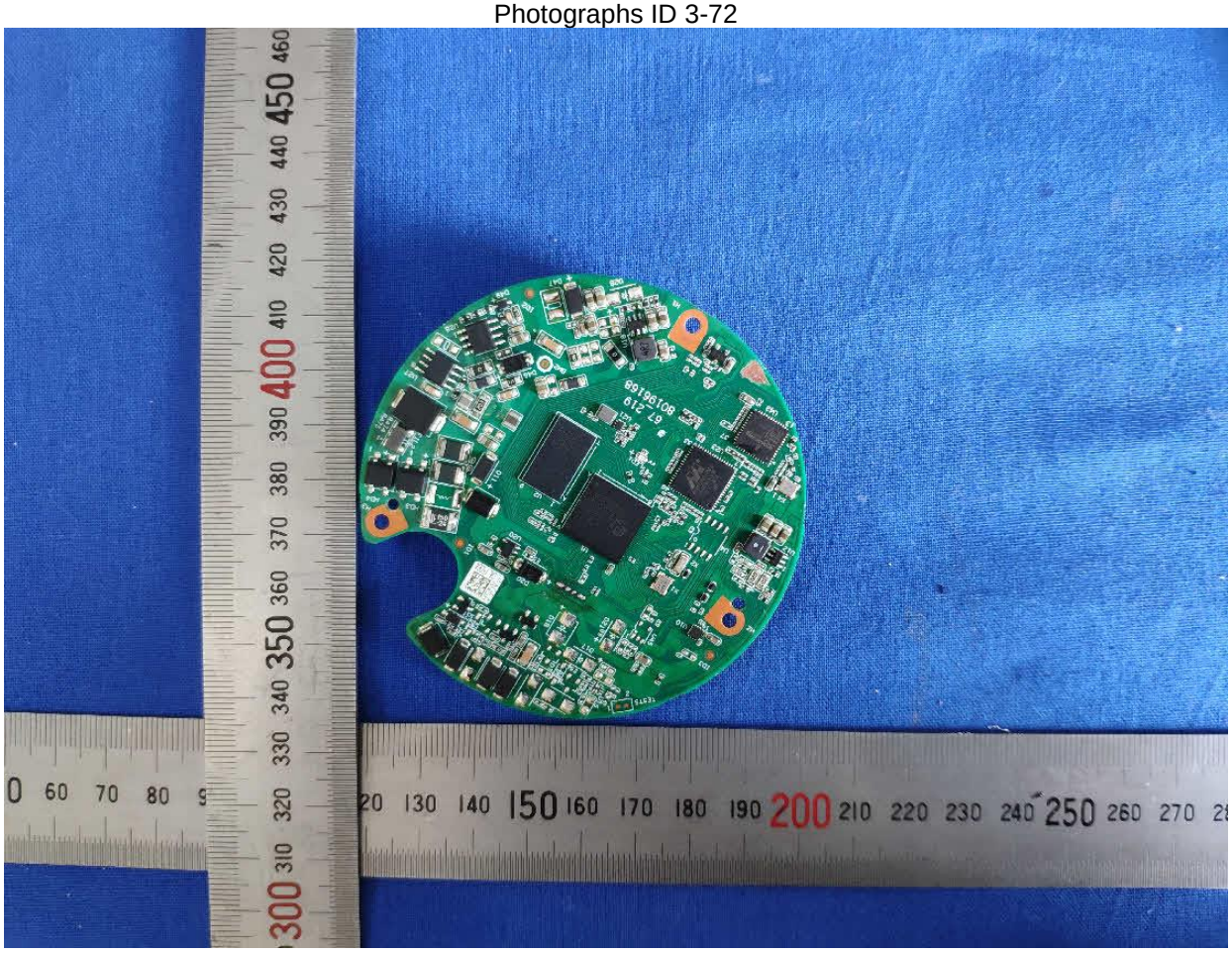

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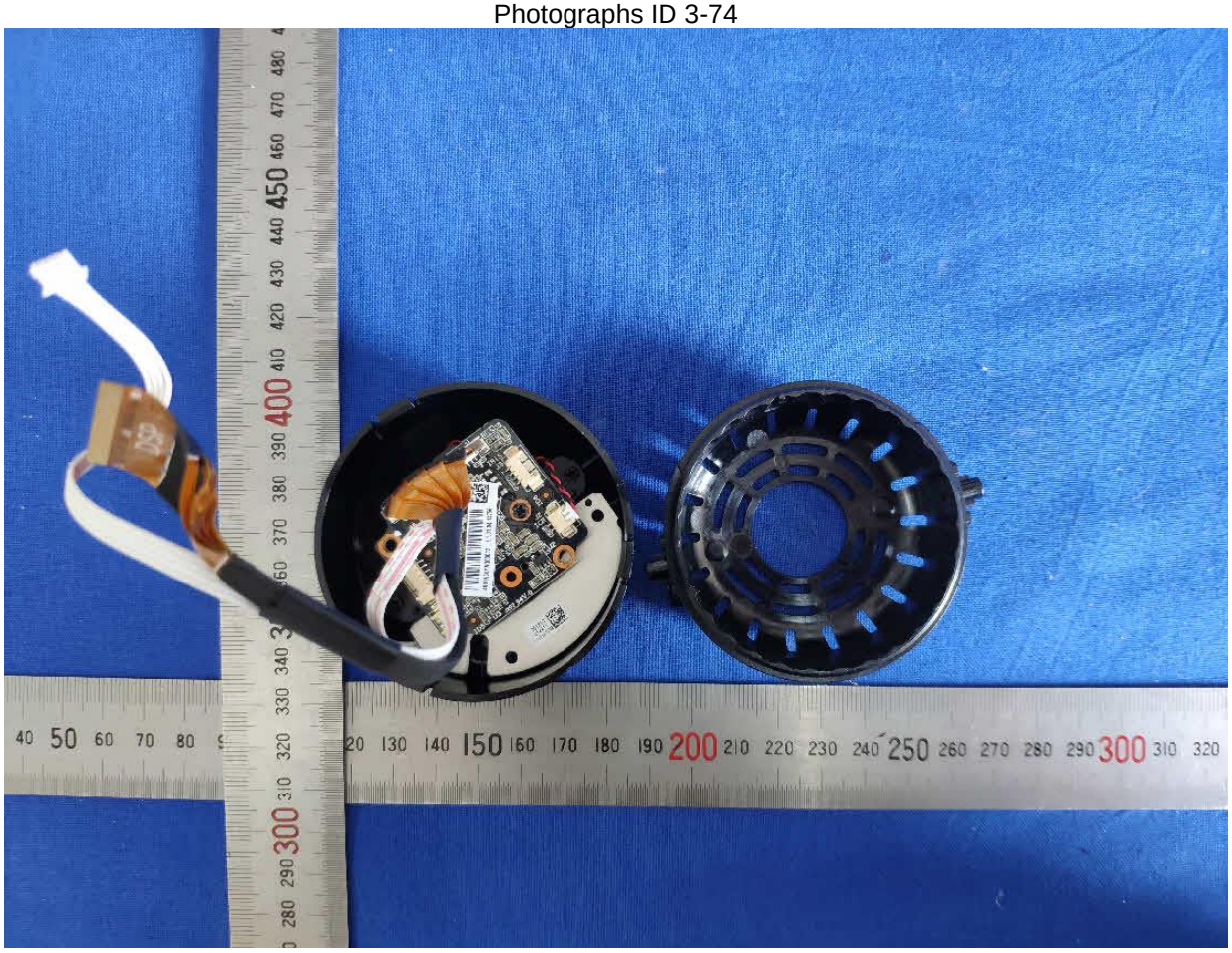

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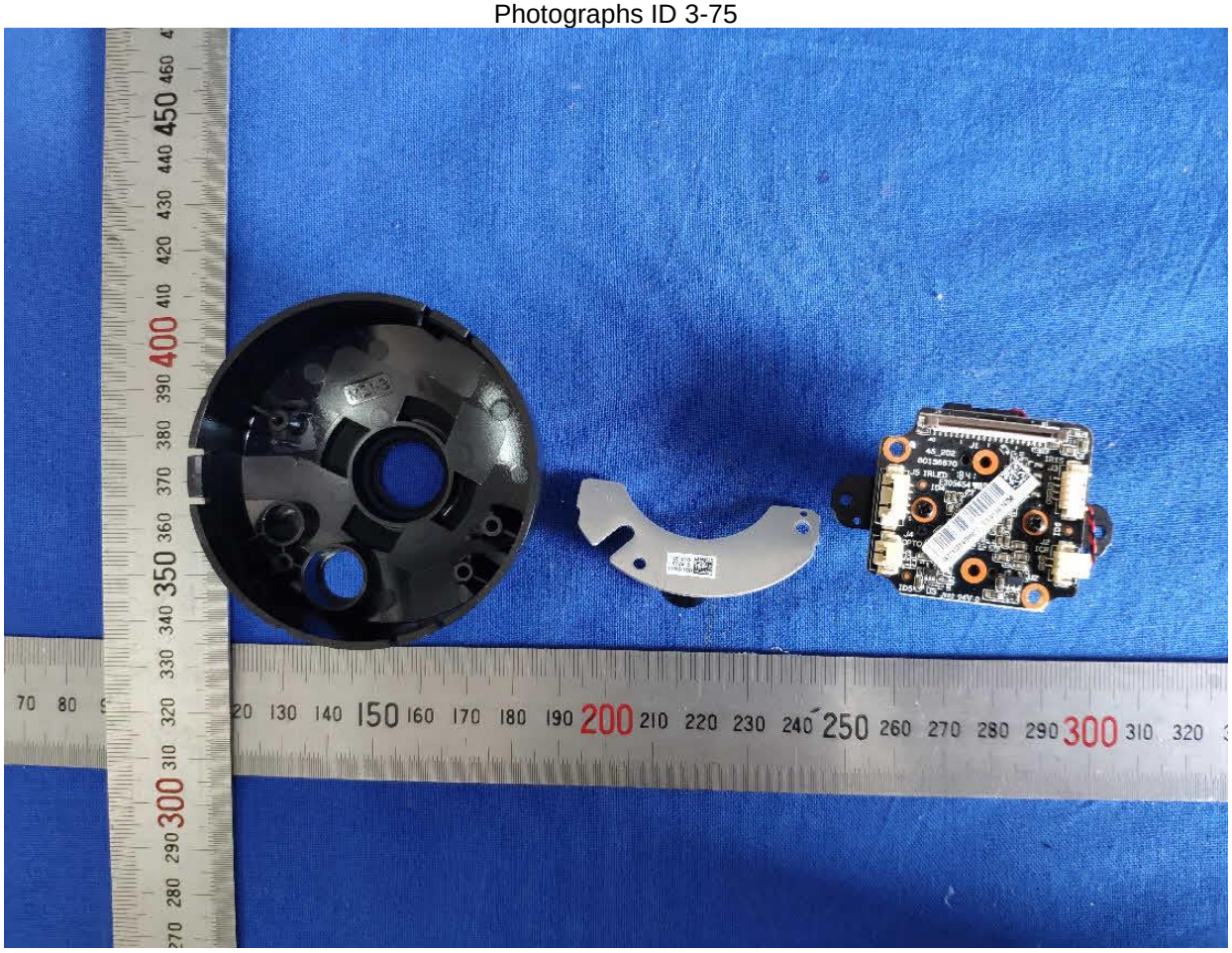

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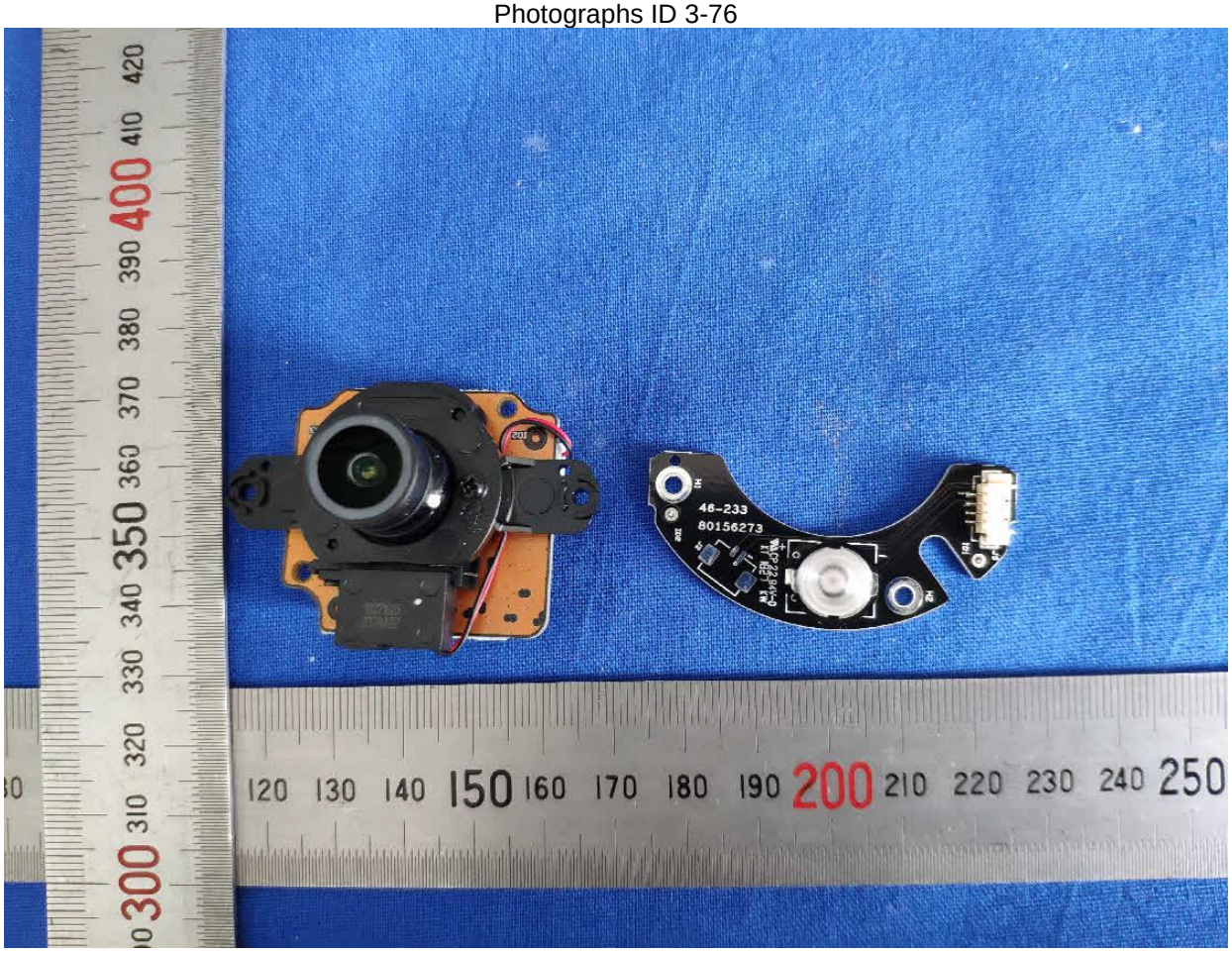

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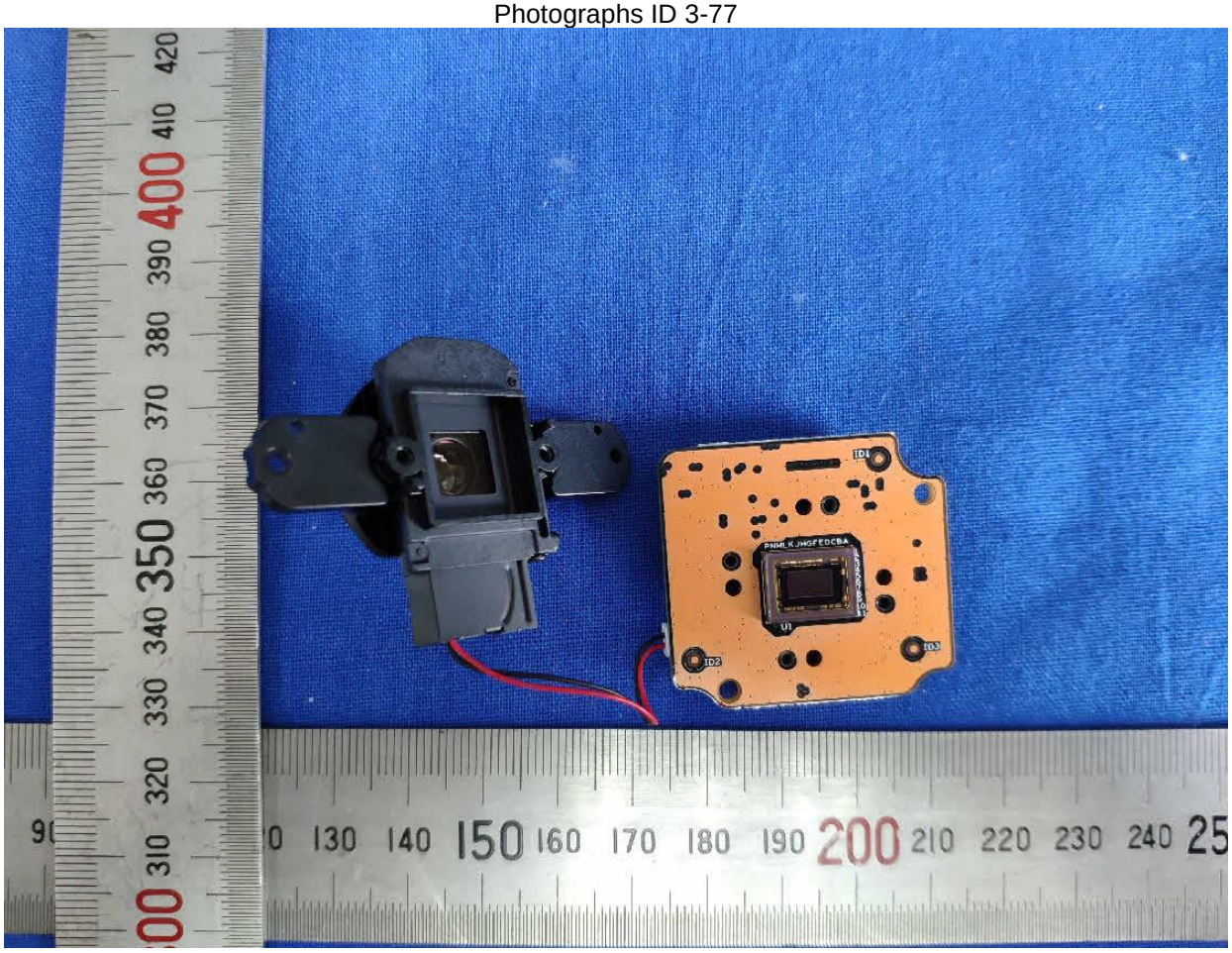

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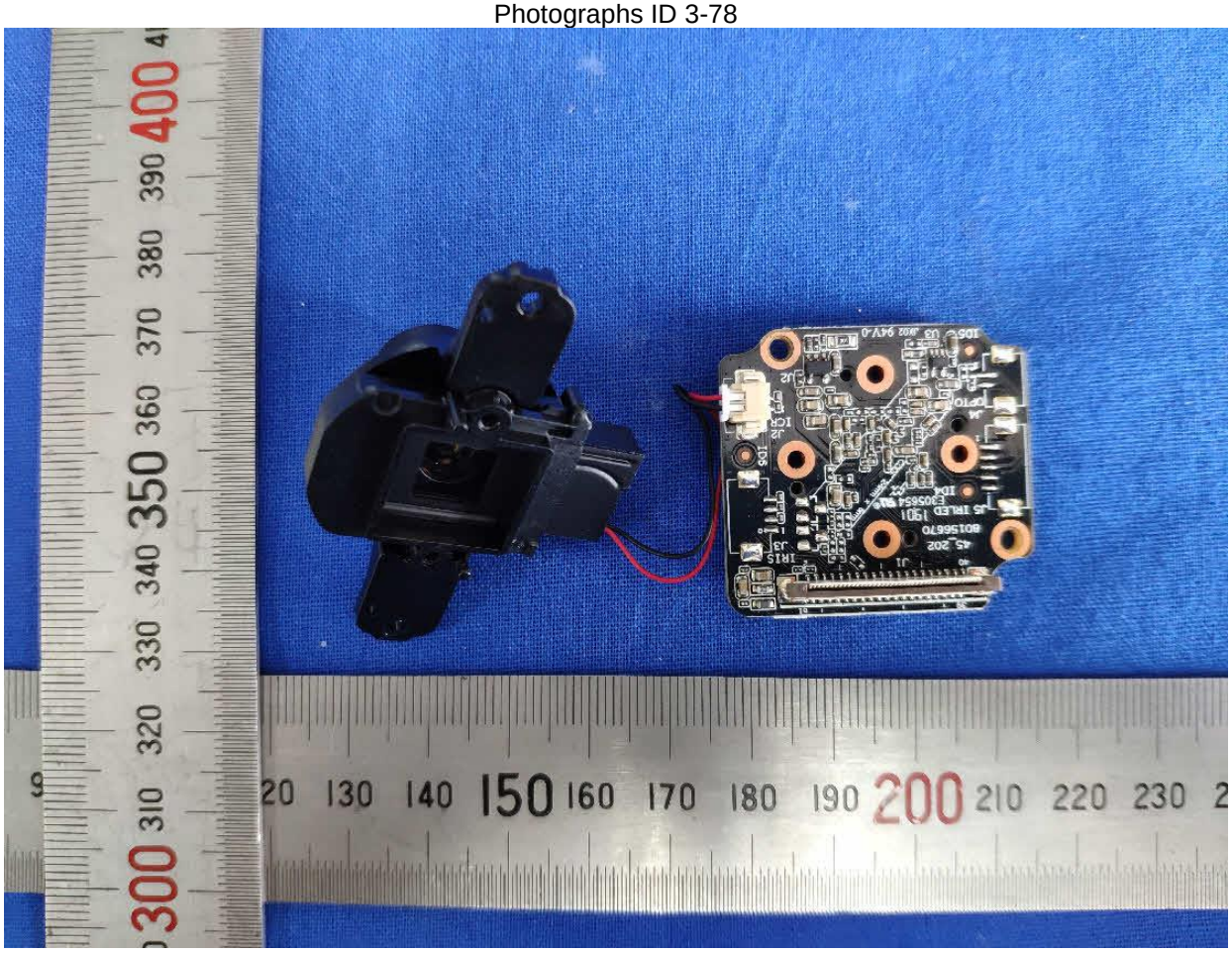

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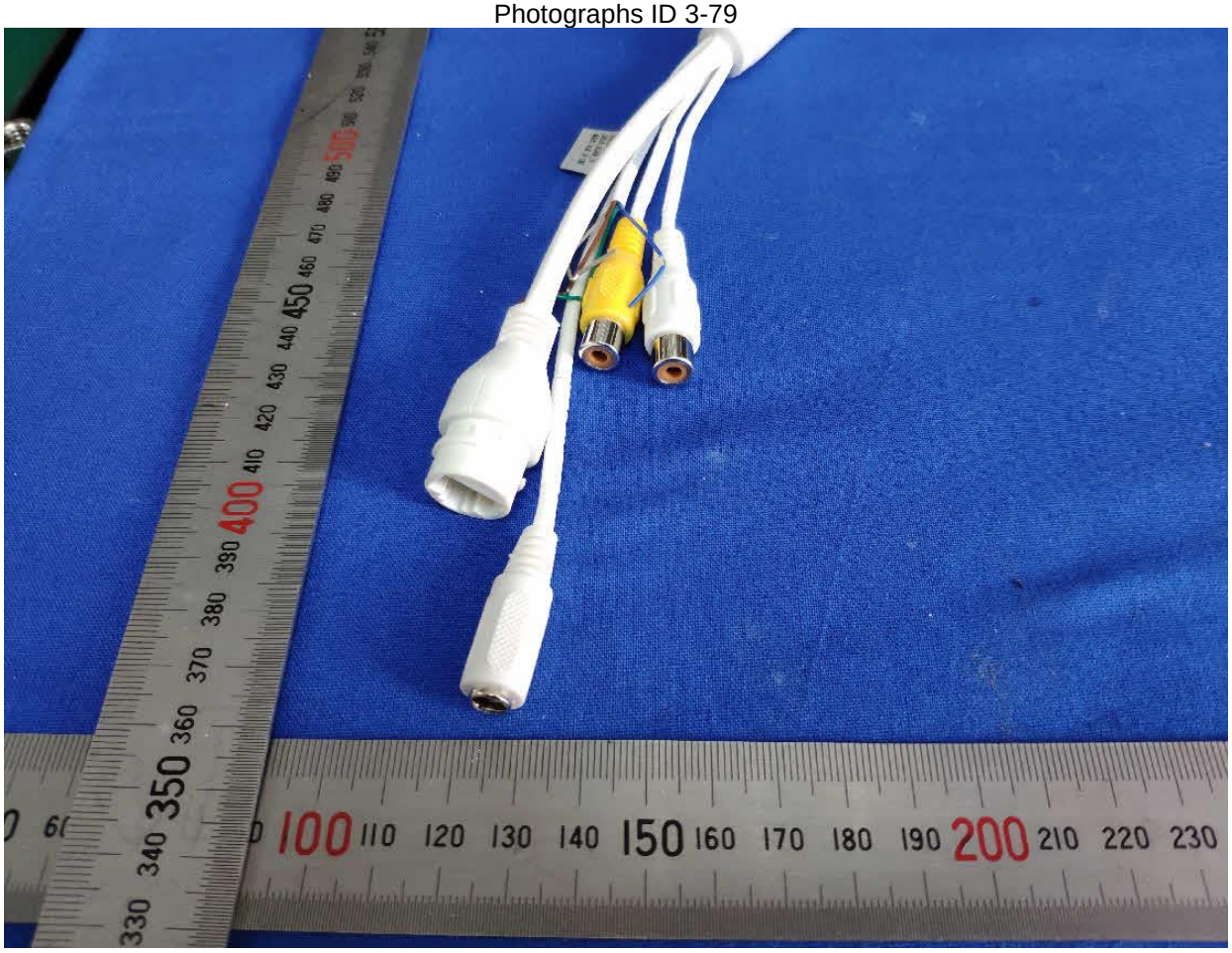

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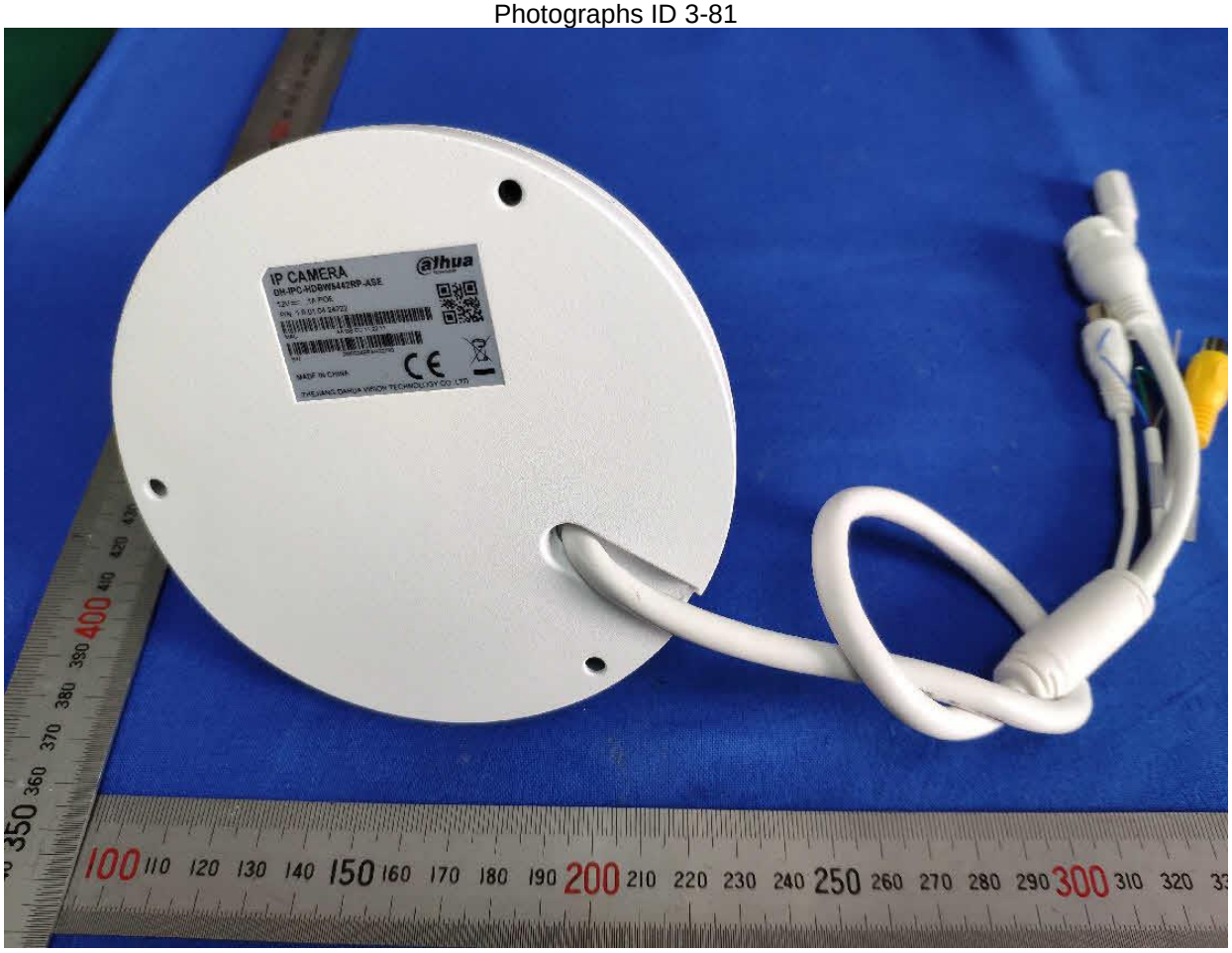

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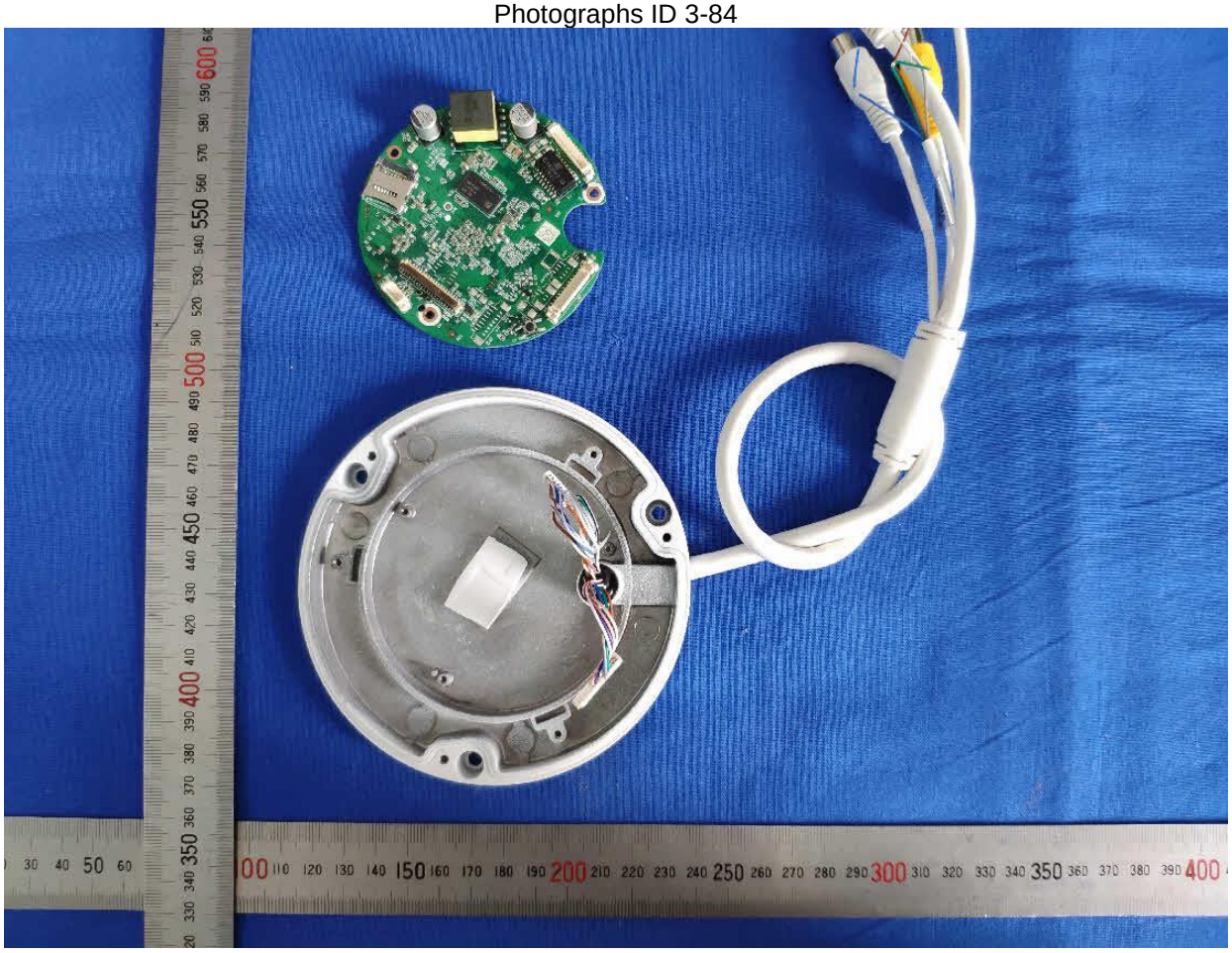

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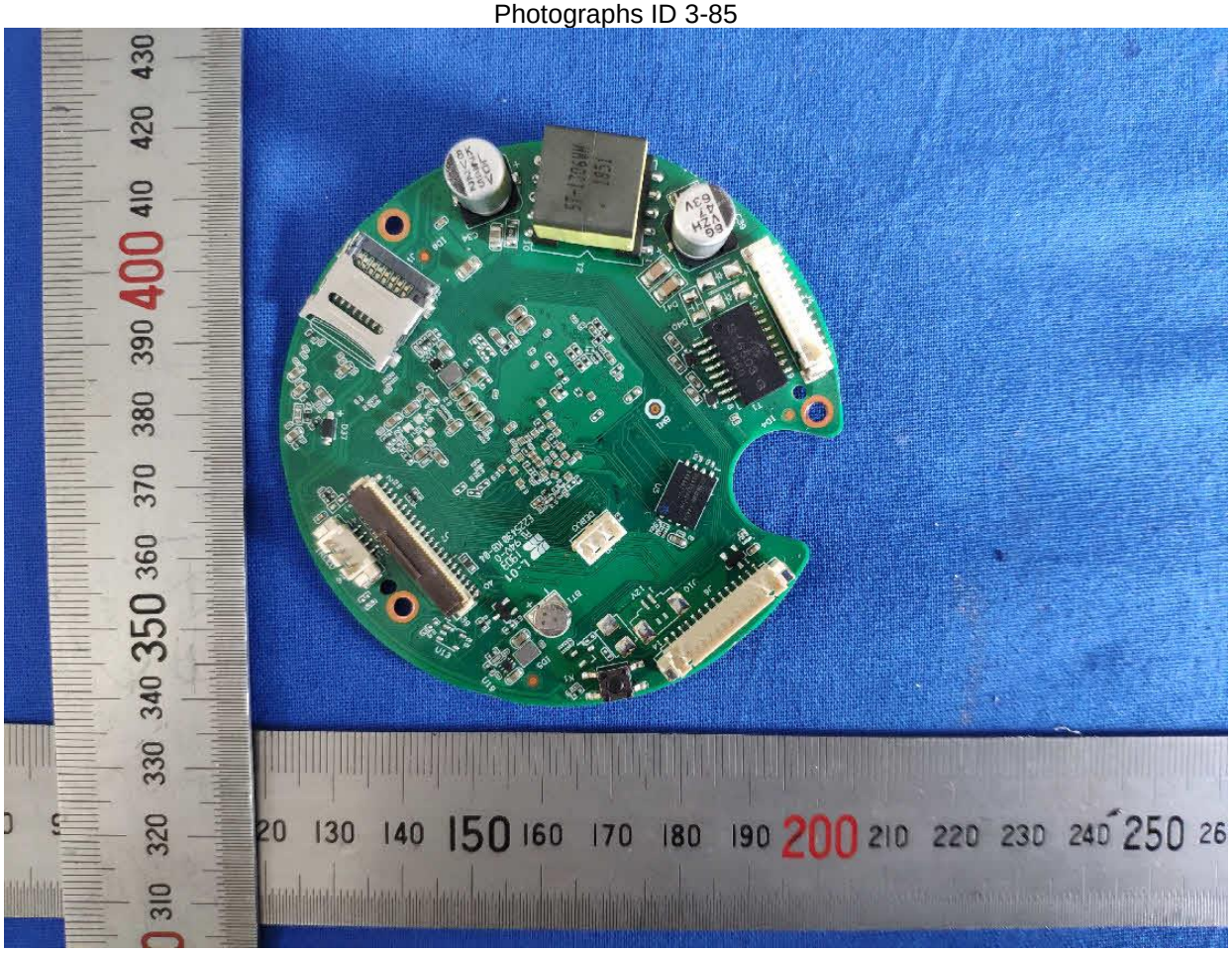

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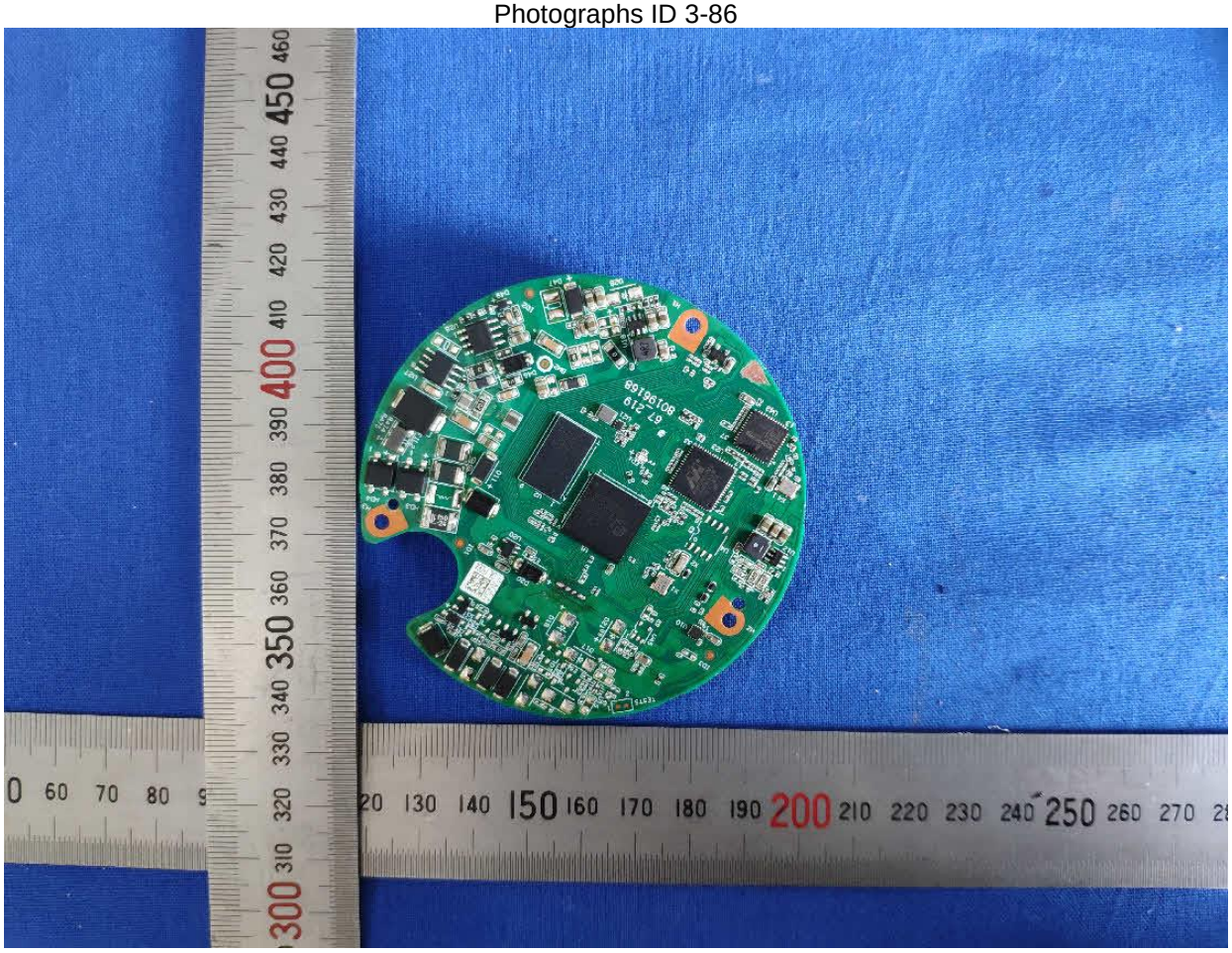

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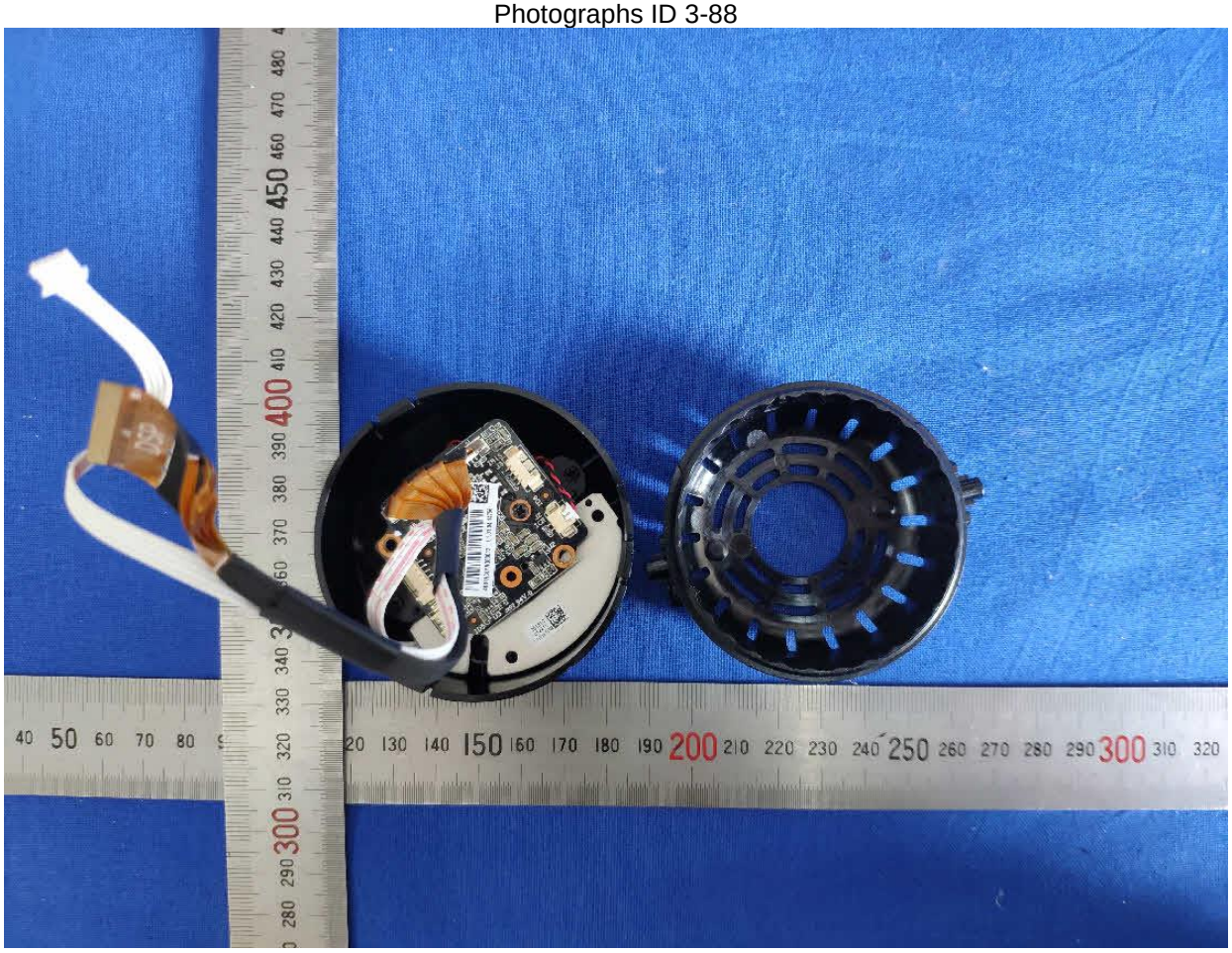

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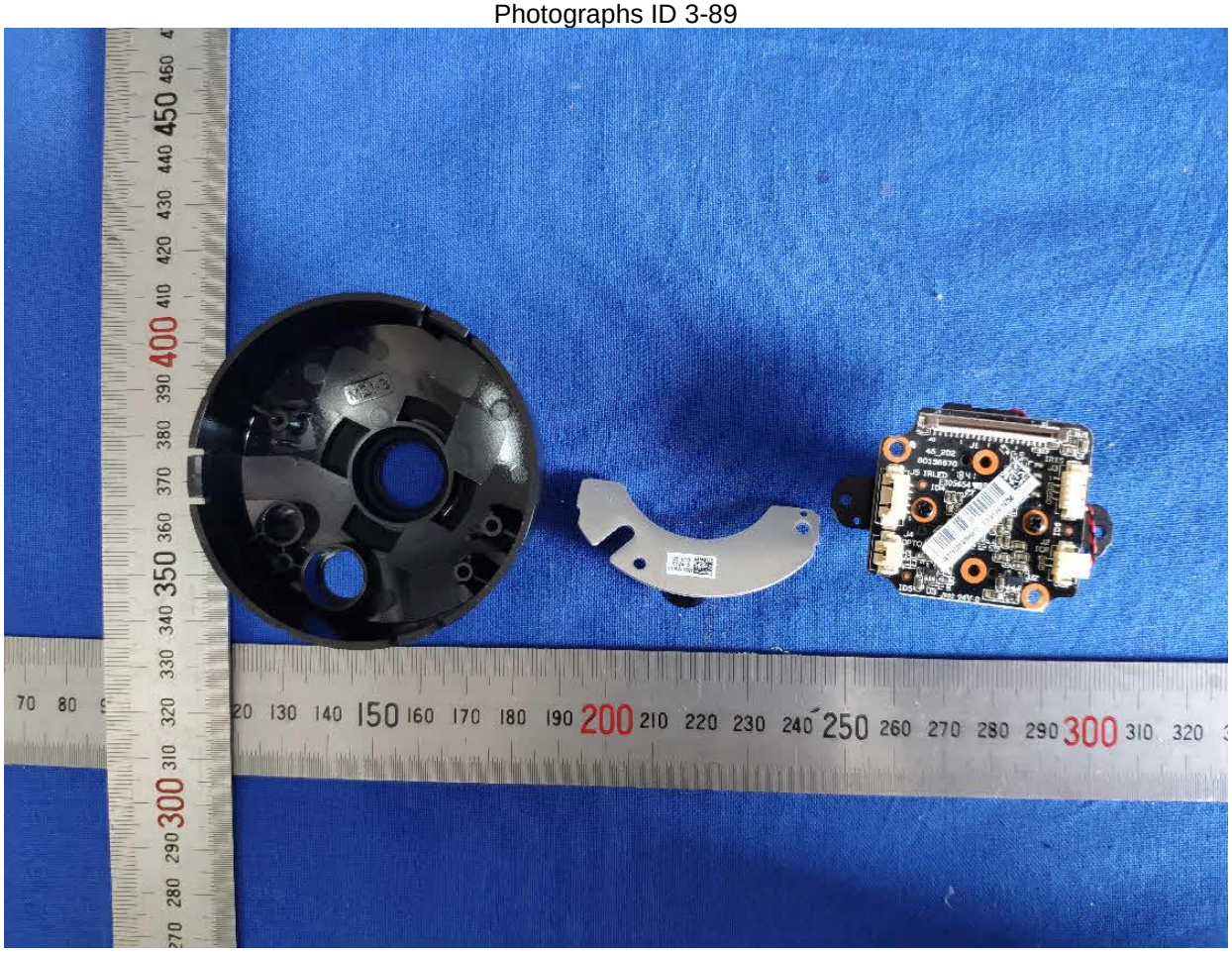

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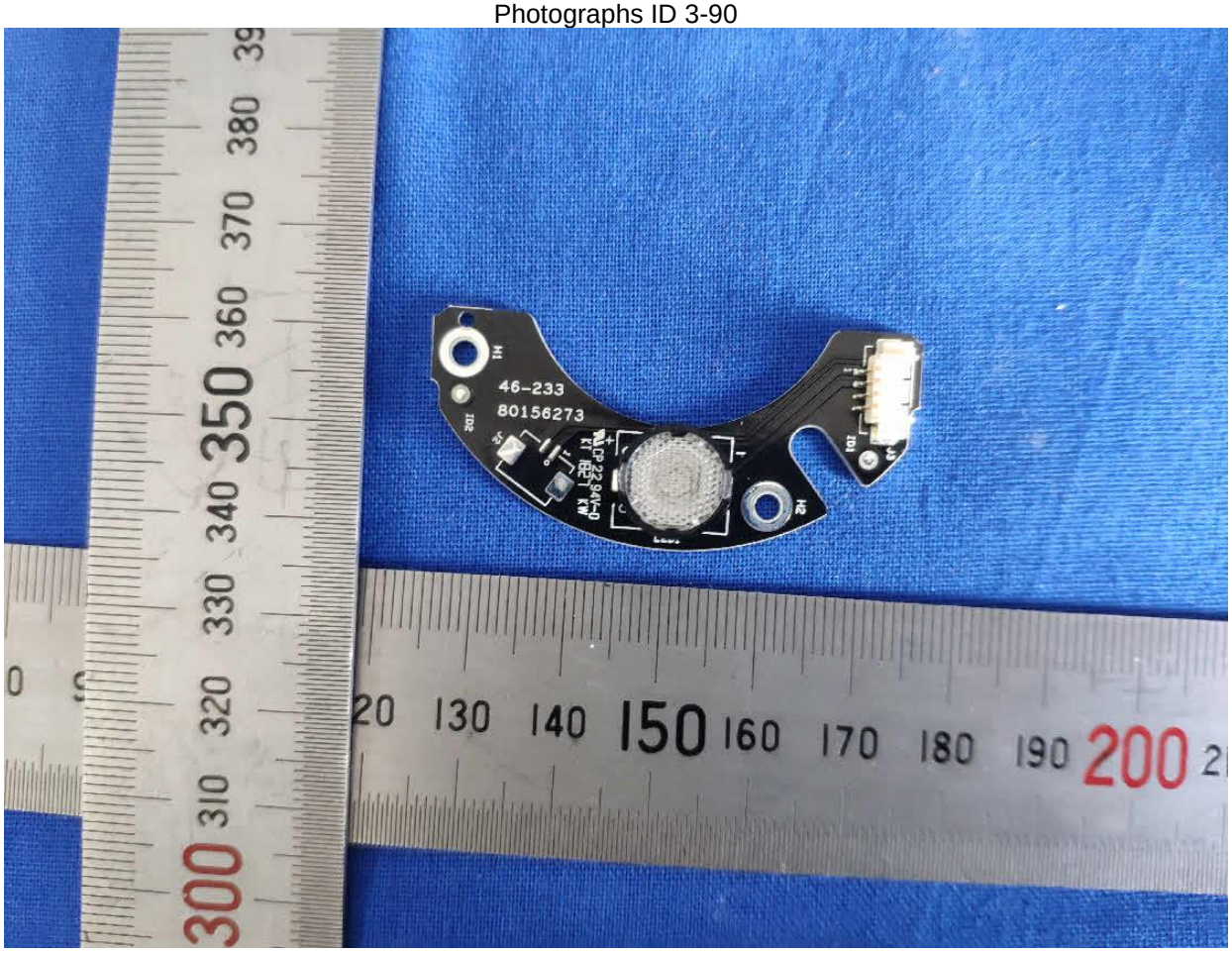

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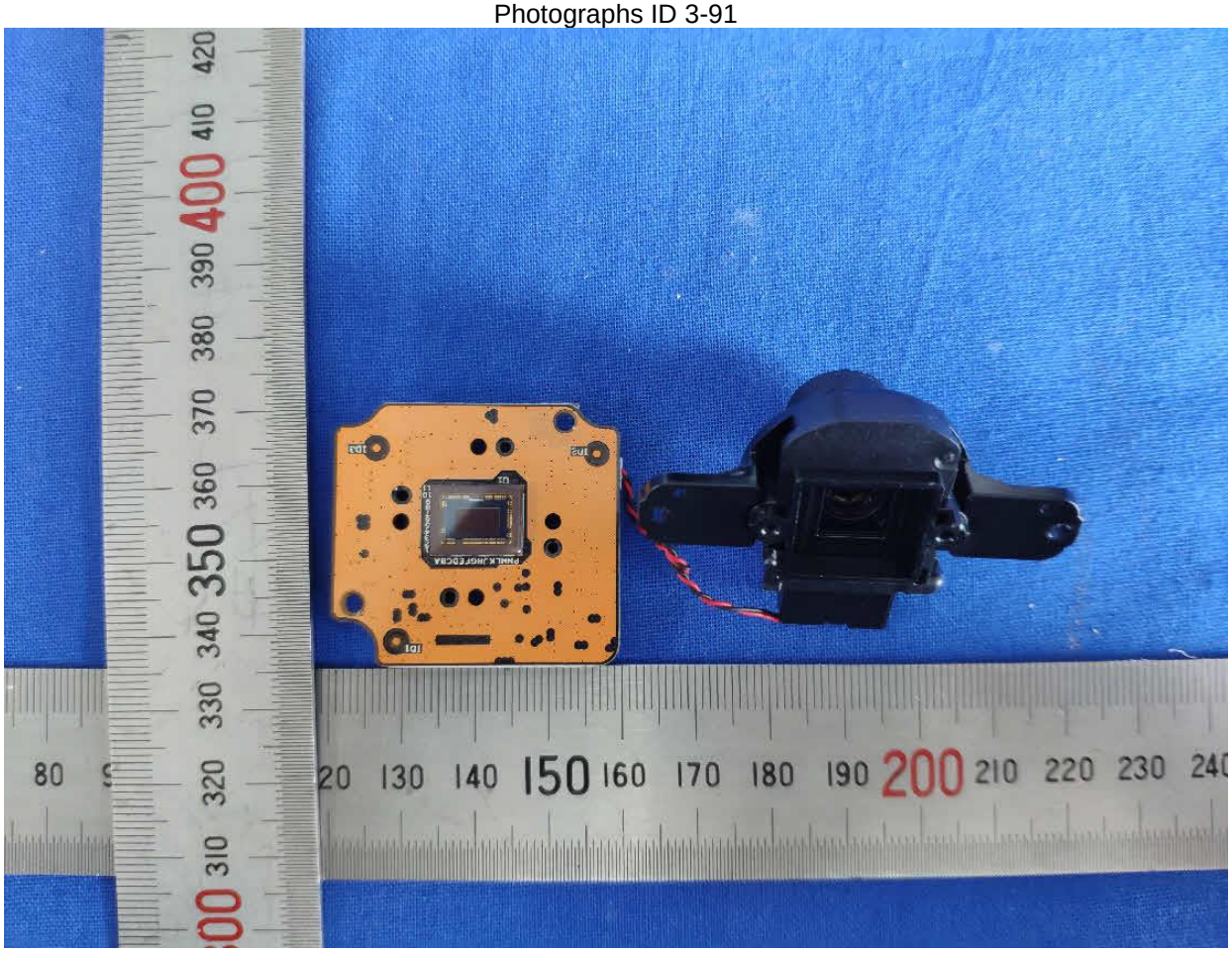

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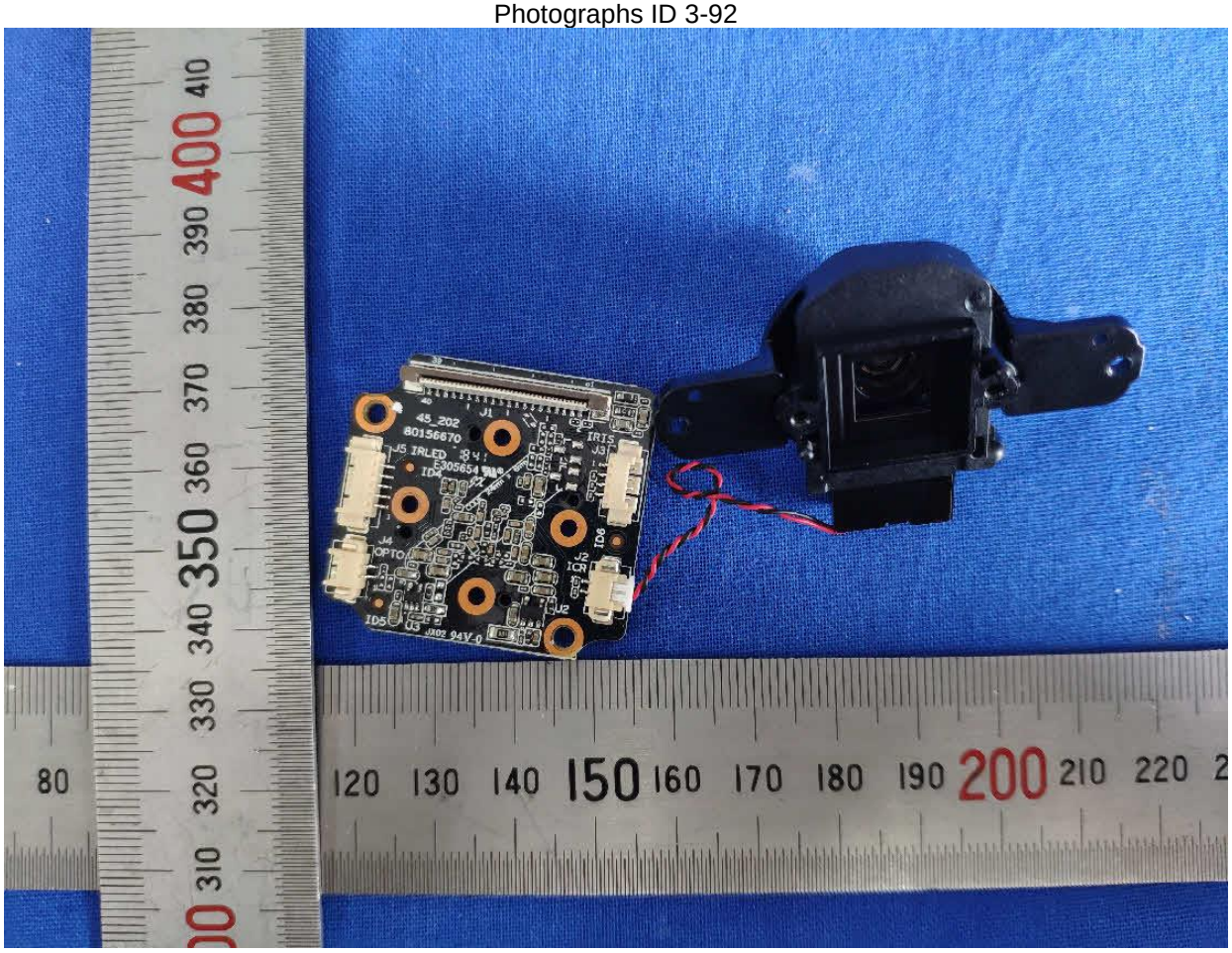

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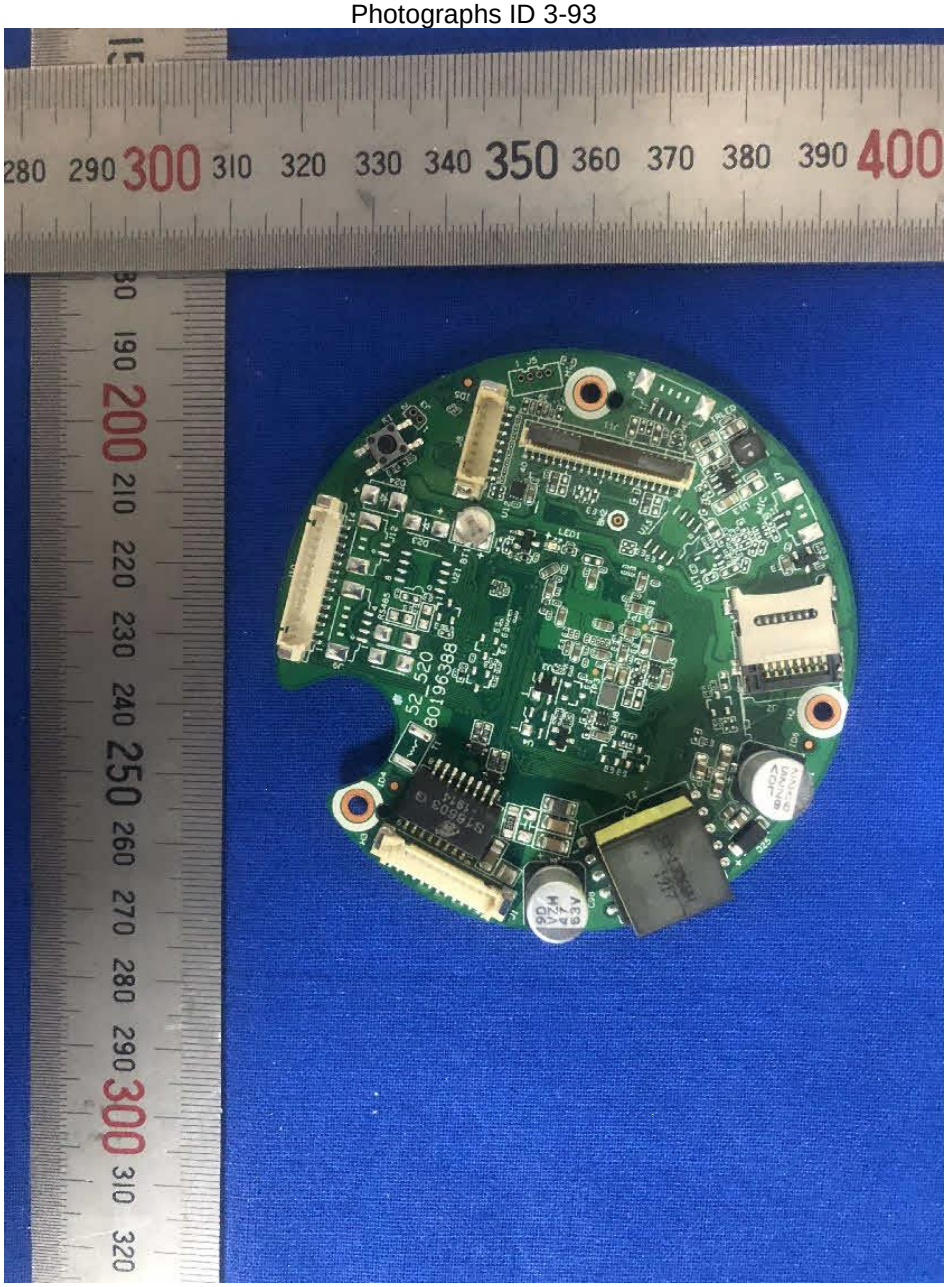

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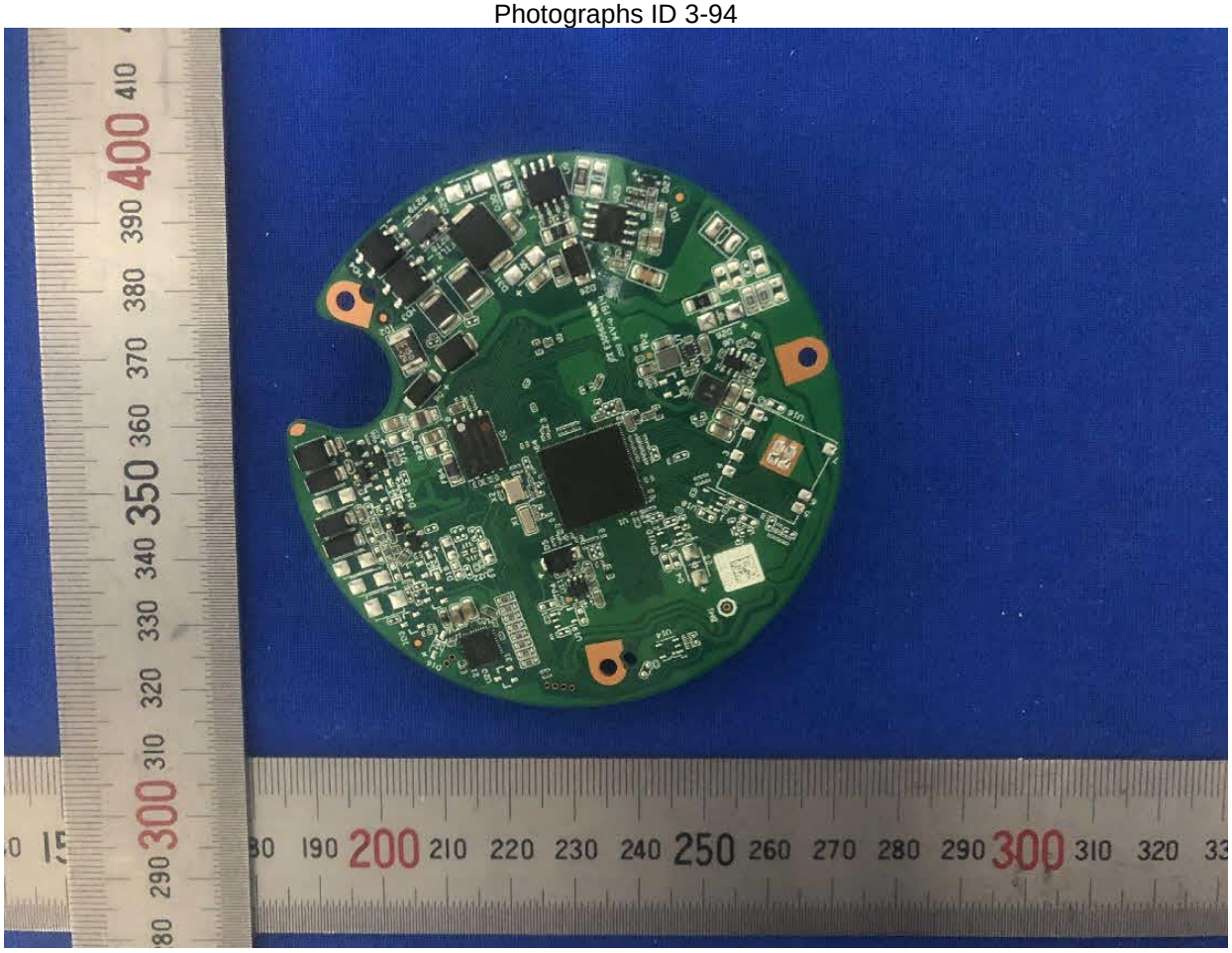

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Photographs ID 3-97

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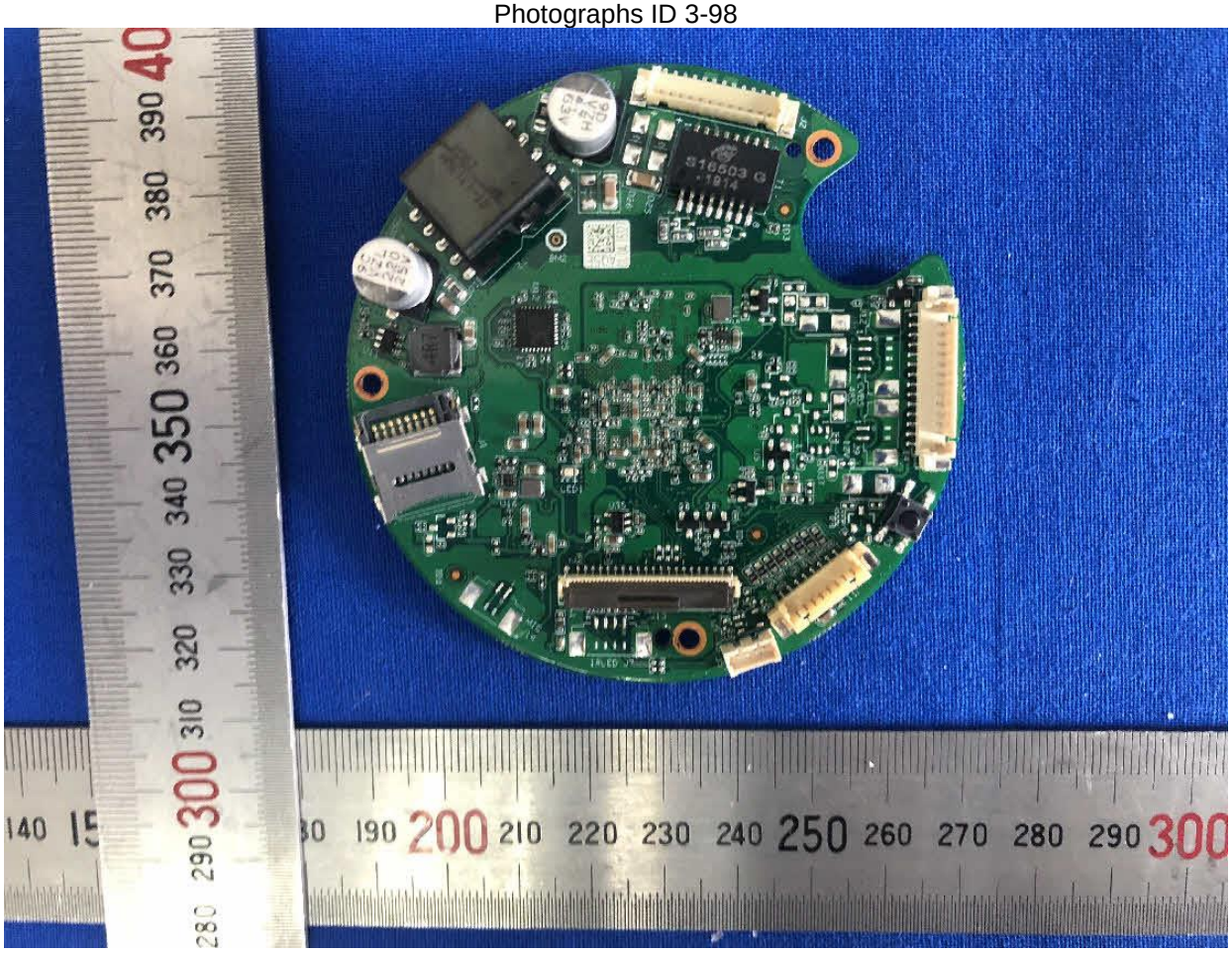

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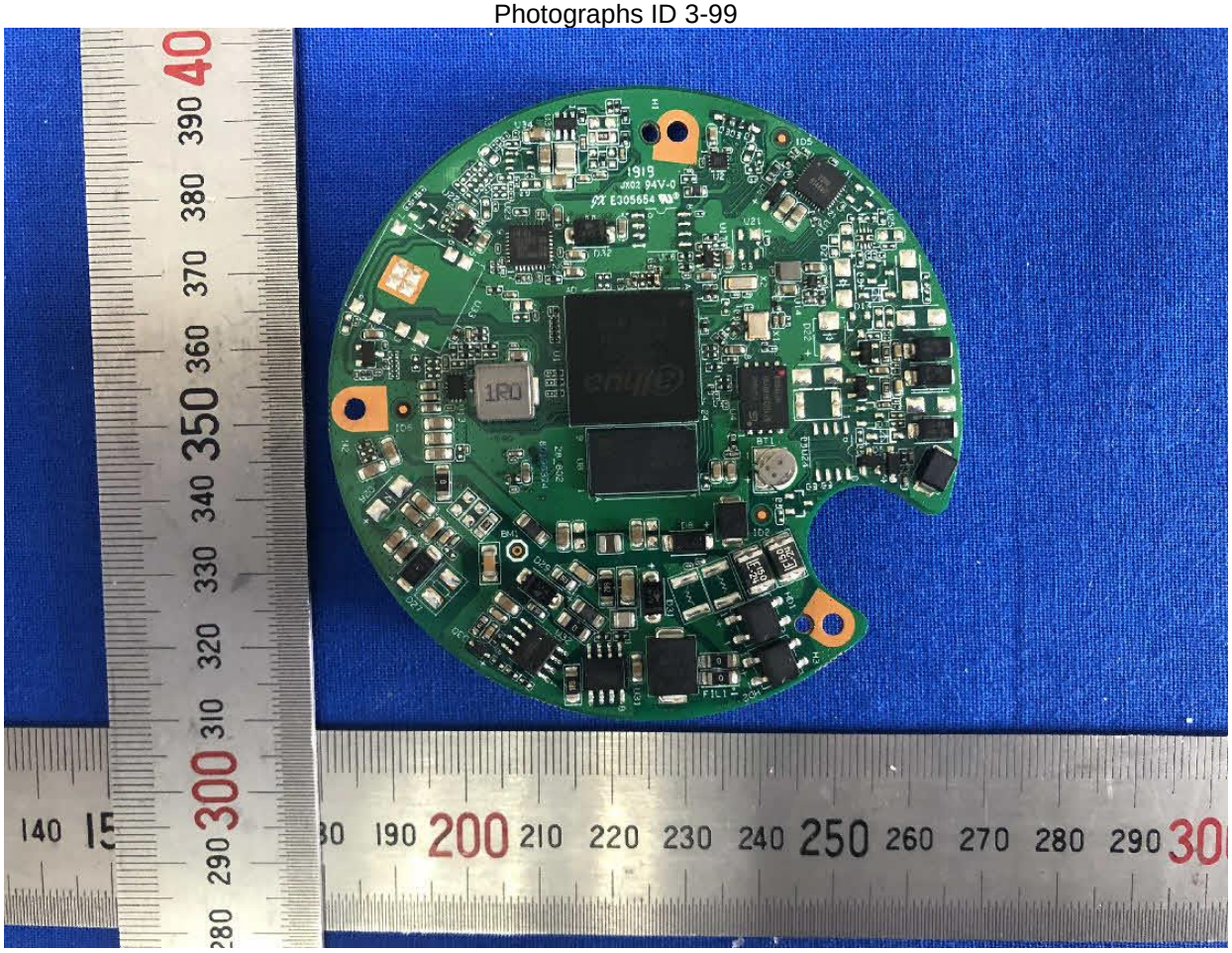
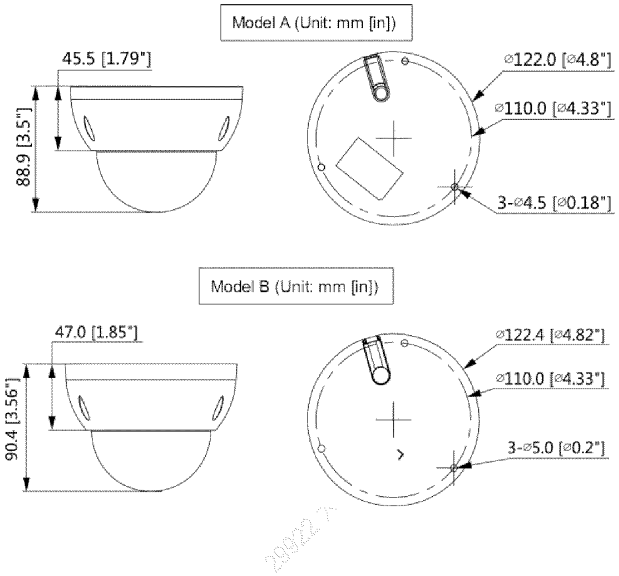


Diagrams ID 4-06



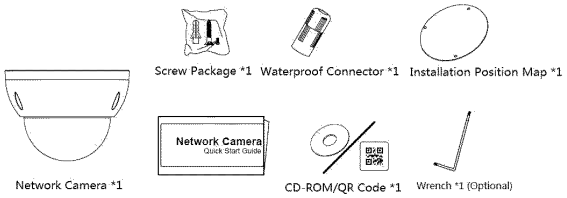
Diagrams ID 4-07

3 Installation

3.1 Packing List

NOTE

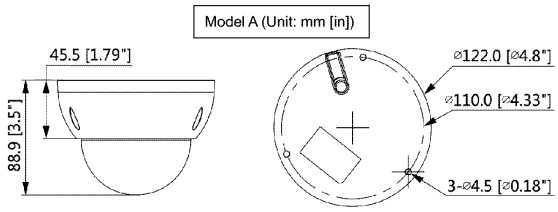
- The tool required for the installation such as electric drill is not provided in the packing.
- The operation manual and related tool are contained in the disk or the QR code, and the actual packing shall prevail.



3.2 Dimension

NOTE

Following figures are for reference only, the actual product shall prevail.



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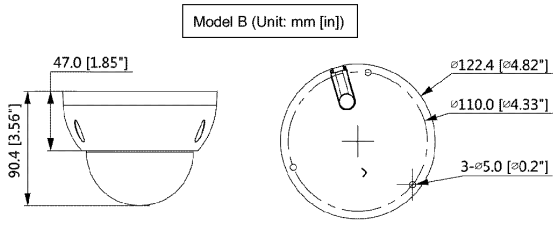
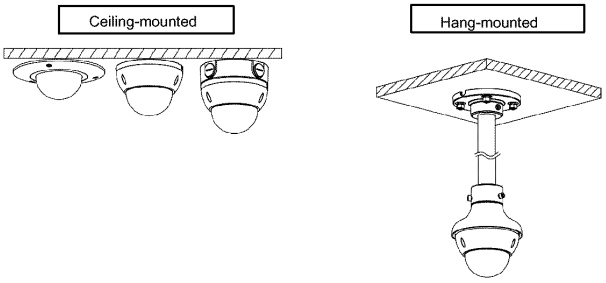
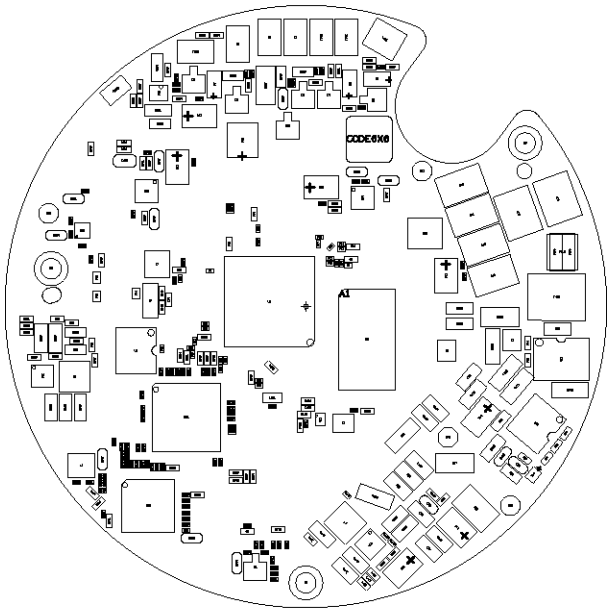


3.3 Installing Device

3.3.1 Installation method

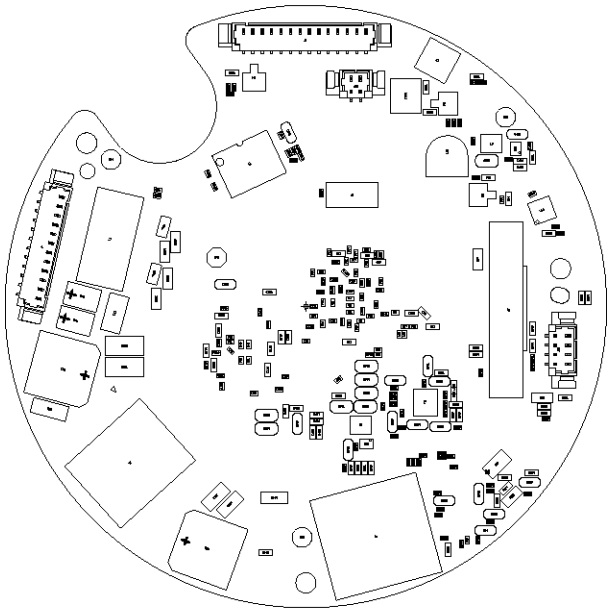


Schematics ID 5-03
ART FILM - ASS-TOP



ART FILM - ASS-TOP

Schematics ID 5-03
ART FILM - ASS-BOTTOM

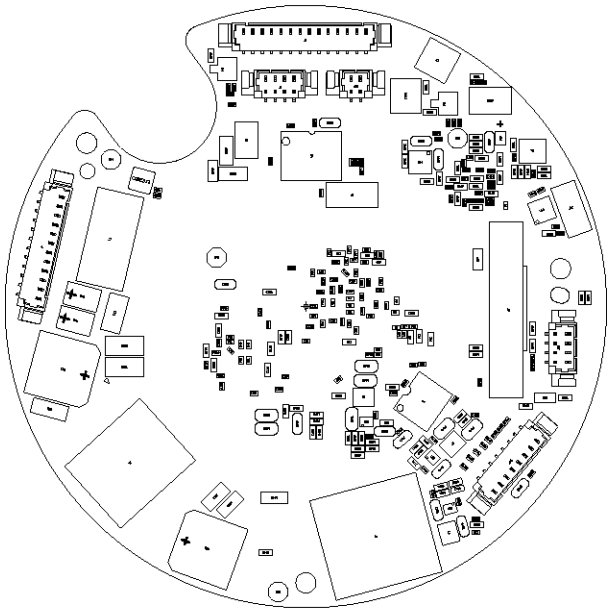


ART FILM - ASS-BOTTOM

Schematics ID 5-04
ART FILM - ASS-TOP

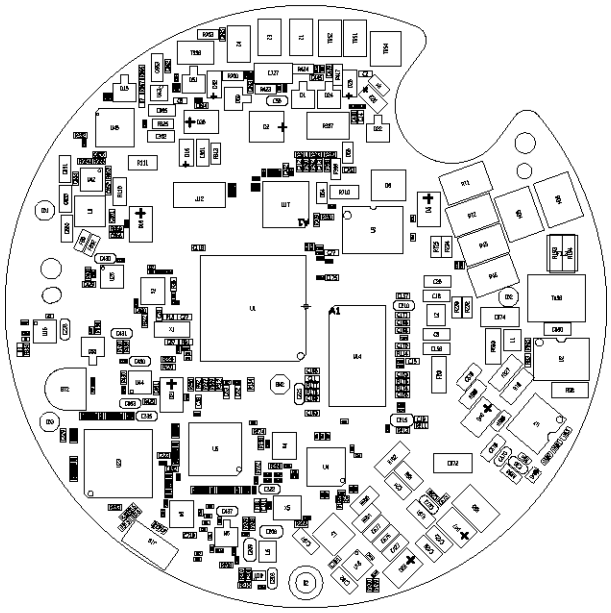
ART FILM - ASS-TOP

Schematics ID 5-04
ART FILM - ASS-BOTTOM



ART FILM - ASS-BOTTOM

Schematics ID 5-05
ART FILM - ASS-TOP



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Schematics ID 5-05

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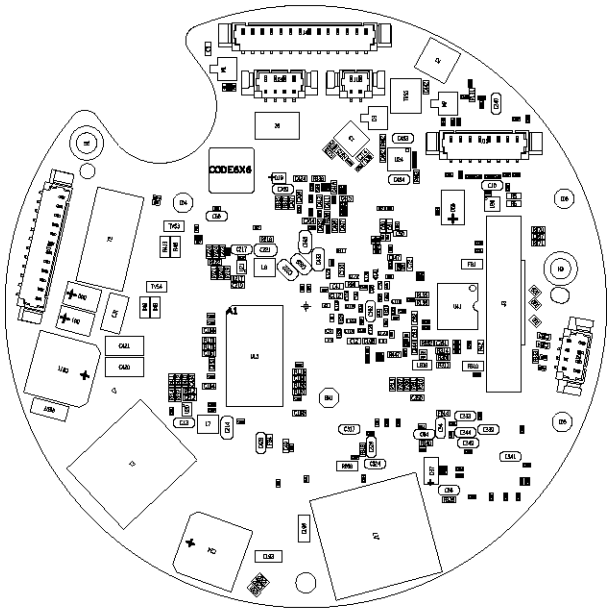
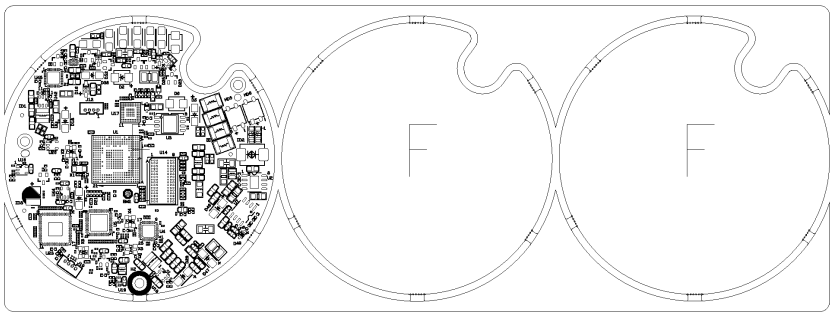


ART FILM - ASS-BOTTOM

Schematics ID 5-05

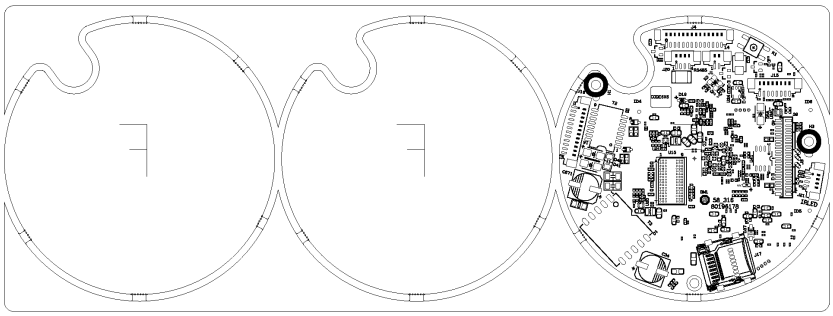
ART FILM - ADT



ART FILM - ADT

Schematics ID 5-05

ART FILM - ADB



ART FILM - ADB

Manuals ID 6-02

Vari-focal Dome Network Camera

Quick Start Guide

V1.0.0

ZHEJIANG DAHUA VISION TECHNOLOGY CO., LTD

Manuals ID 6-02

Foreword

General

This Quick Start Guide (hereinafter referred to be "the Guide") introduces the functions, installation and operations of the camera.

Safety Instructions

The following categorized signal words with defined meaning might appear in the guide.

Signal Words	Meaning
WARNING	Indicates a medium or low potential hazard which, if not avoided, could result in slight or moderate injury.
CAUTION	Indicates a potential risk which, if not avoided, may result in property damage, data loss, lower performance, or unpredictable result.
NOTE	Provides additional information as the emphasis and supplement to the text.

Revision History

No.	Version	Revision Content	Release Date
1	V1.0.0	First release.	2018.03

Privacy Protection Notice

As the device user or data controller, you might collect personal data of others' such as face, fingerprints, car plate number, Email address, phone number, GPS and so on. You need to be in compliance with the local privacy protection laws and regulations to protect the legitimate rights and interests of other people by implementing measures include but not limited to: providing clear and visible identification to inform data subject the existence of surveillance area and providing related contact.

About this Guide

- The Guide is for reference only. If there is inconsistency between the Guide and the actual product, the actual product shall prevail.
- We are not liable for any loss caused by the operations that do not comply with the Guide.
- The Guide would be updated according to the latest laws and regulations of related regions. For detailed information, see the paper Quick Start Guide, CD-ROM, QR code or our official website. If there is inconsistency between paper User's Guide and the electronic version, the electronic version shall prevail.

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- All the designs and software are subject to change without prior written notice. The product updates might cause some differences between the actual product and the Guide. Please contact the customer service for the latest program and supplementary documentation.
- There still might be deviation in technical data, functions and operations description, or errors in print. If there is any doubt or dispute, please refer to our final explanation.
- Upgrade the reader software or try other mainstream reader software if the Guide (in PDF format) cannot be opened.
- All trademarks, registered trademarks and the company names in the Guide are the properties of their respective owners.
- Please visit our website, contact the supplier or customer service if there is any problem occurred when using the device.
- If there is any uncertainty or controversy, please refer to our final explanation.

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Important Safeguards and Warnings

Electrical safety

- All installation and operation should conform to your local electrical safety codes.
- The power source shall conform to the Safety Extra Low Voltage (SELV) standard, and supply power with rated voltage which conforms to Limited power Source requirement according to IEC60950-1. Please note that the power supply requirement is subject to the device label.
- Make sure the power supply is correct before operating the device.
- A readily accessible disconnect device shall be incorporated in the building installation wiring.
- Prevent the power cable from being trampled or pressed, especially the plug, power socket and the junction extruded from the device.

Environment

- Do not aim the device at strong light to focus, such as lamp light and sun light; otherwise it might cause over brightness or light marks, which are not the device malfunction, and affect the longevity of Complementary Metal-Oxide Semiconductor (CMOS).
- Do not place the device in a damp or dusty environment, extremely hot or cold temperatures, or the locations with strong electromagnetic radiation or unstable lighting.
- Keep the device away from any liquid to avoid damage to the internal components.
- Keep the indoor device away from rain or damp to avoid fire or lightning.
- Keep sound ventilation to avoid heat accumulation.
- Transport, use and store the device within the range of allowed humidity and temperature.
- Heavy stress, violent vibration or water splash are not allowed during transportation, storage and installation.
- Pack the device with standard factory packaging or the equivalent material when transporting the device.
- Install the device in the location where only the professional staff with relevant knowledge of safety guards and warnings can access. The accidental injury might happen to the non-professionals who enter the installation area when the device is operating normally.

Operation and Daily Maintenance

- Do not touch the heat dissipation component of the device to avoid scald.
- Carefully follow the instructions in the Guide when performing any disassembly operation about the device; otherwise, it might cause water leakage or poor image quality due to unprofessional disassemble. Please contact after-sale service for desiccant replacement if there is condensed fog found on the lens after unpacking or when the desiccant turns green. (Not all models are included with the desiccant).
- It is recommended to use the device together with lightning arrester to improve lightning

protection effect.

- It is recommended connect the grounding hole to the ground to enhance the reliability of the device.
- Do not touch the image sensor directly (CMOS). Dust and dirt could be removed with air blower, or you can wipe the lens gently with soft cloth that moistened with alcohol.
- Device body can be cleaned with soft dry cloth, which can also be used to remove stubborn stains when moistened with mild detergent. To avoid possible damage on device body coating which could cause performance decrease, do not use volatile solvent such as alcohol, benzene, diluent and so on to clean the device body, nor can strong, abrasive detergent be used.
- Dome cover is an optical component, do not touch or wipe the cover with your hands directly during installation or operation. For removing dust, grease or fingerprints, wipe gently with moisten oil-free cotton with diethyl or moisten soft cloth. You can also air blower to remove dust.

WARNING

- Please strengthen the protection of network, device data and personal information by adopting measures which include but not limited to using strong password, modifying password regularly, upgrading firmware to the latest version, and isolating computer network. For some device with old firmware versions, the ONVIF password will not be modified automatically along with the modification of the system password, and you need to upgrade the firmware or manually update the ONVIF password.
- Use standard components or accessories provided by manufacturer and make sure the device is installed and maintained by professional engineers.
- The surface of the image sensor should not be exposed to laser beam radiation in an environment where a laser beam device is used.
- Do not provide two or more power supply sources for the device unless otherwise specified. A failure to follow this instruction might cause damage to the device.

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Regulatory Information

FCC Information

CAUTION

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

FCC conditions:

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions:

- This device may not cause harmful interference.
- This device must accept any interference received, including interference that may cause undesired operation.

FCC compliance:

This equipment has been tested and found to comply with the limits for a digital device, pursuant to part 15 of the FCC Rules. This equipment generate, uses and can radiate radio frequency energy and, if not installed and used in accordance with the guide, may cause harmful interference to radio communication.

- For class A device, these limits are designed to provide reasonable protection against harmful interference in a commercial environment. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.
- For class B device, these limits are designed to provide reasonable protection against harmful interference in a residential installation. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:
  - Reorient or relocate the receiving antenna.
  - Increase the separation between the equipment and receiver.
  - Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
  - Consult the dealer or an experienced radio/TV technician for help.

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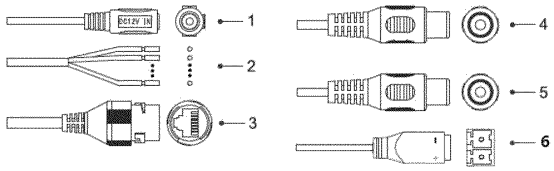
1 Introduction

1.1 Cable

NOTE

- Cable type might vary with different devices, and the actual product shall prevail.
- Please waterproof all the cable joints with insulating tape and waterproof tape to avoid short circuit and water damage. For the detailed operation, see the FAQ manual.

Figure 1-1 Cable list



For more information about cable ports, see Table 1-1.

Table 1-1 Cable Information

Port	Port Name	Note
1	DC 12V/AC 24V power input	Inputs DC 12V/AC 24V power. Please be sure to supply power as instructed in the Guide. CAUTION • When using AC 24V power, please connect the power input port to 2PIN converter first. • Device abnormity or damage could occur if power is not supplied correctly.
2	Alarm I/O	Includes alarm signal input and output ports, the number of I/O ports might vary on different devices. For detailed information, see Table 1-2.
3	Ethernet port	• Connects to network with network cable. • Provides power to the device with PoE. NOTE PoE is available on select model.
4	Audio input	Connects to sound-pick-up device to receive audio signal.
5	Audio output	Connects to speaker to output audio signal.
6	Power output	Supplies 12V DC 2W power for external devices.

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For more information about I/O port, see Table 1-2.

Table 1-2 Alarm Information

Port	Port Name	Function
Alarm I/O	ALARM_OUT	Outputs alarm signal to alarm device.
	ALARM_IN	Receives the switch signal of external alarm source.
	ALARM_GND	Ground connection.

1.2 Connecting Alarm Input/output

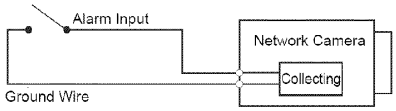
NOTE

Alarm input/output is available on select models.

Step 1 Connect alarm input device to the alarm input end of the I/O port, see Figure 1-2. Device collects different states of alarm input port when the input signal is idling and being grounded.

- Device collects logic "1" when input signal is connecting to +3V to +5V or idling.
- Device collects logic "0" when input signal being grounded.

Figure 1-2 Alarm input



Step 2 Connect alarm output device to the alarm output end of the I/O port. The alarm output is open-drain output, which works in the following modes.

- Mode A: Level application. Alarm outputs high and low level, and the alarm outlet is OD, which requires external pull-up resistance (10K Ohm typical) to work. The maximum external pull-up level is 12V, maximum port current is 300mA and the default output signal is high level (external pull-up voltage). The default output signal switches to low level when there is alarm output (As long as the operating current below 300mA, the output low level voltage is lower than 0.8V).
- Mode B: Switch application. Alarm output is used to drive external circuit, the maximum voltage is 12V and the maximum current is 300mA. If the voltage is higher than 12V, please use an additional electric relay.

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Figure 1-3 Mode A

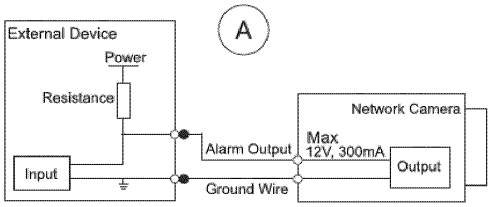
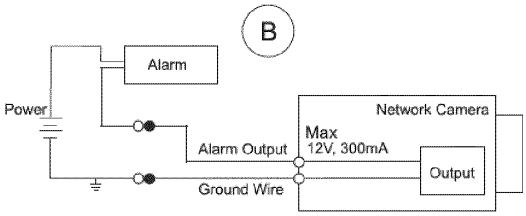


Figure 1-4 Mode B



Step 3 Log in web interface, and configure alarm input and alarm output in alarm setting.

- The alarm input in the web interface is corresponding to the alarm input end of the I/O port. There will be high level and low level alarm signal generated by the alarm input device when alarm occurs, set the input mode to "NO" (default) if the alarm input signal is logic "0" and to "NC" if the alarm input signal is logic "1".
- The alarm output in the web interface is corresponding to the alarm output end of the device, which is also alarm output end of the I/O port.

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2 Network Configuration

Device initialization and IP setting can be finished with the "ConfigTool" or in web interface. For more information, see the *WEB operation manual*.

NOTE

- Device initialization is available on select models, and it is required at first use and after device is being reset.
- Device initialization is available only when the IP addresses of the device (192.168.1.108 by default) and the PC stays in the same network segment.
- Planning useable network segment properly to connect the device to the network.
- The following figures and interfaces are for reference only, and the actual product shall prevail.

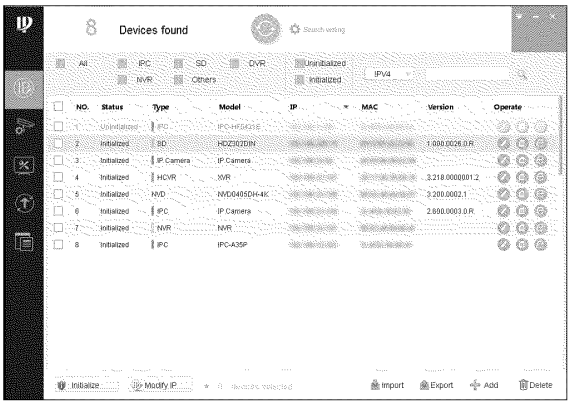
2.1 Initializing Device

Step 1 Double-click "ConfigTool.exe" to open the tool.

Step 2 Click .

The **Modify IP** interface is displayed. See Figure 2-1.

Figure 2-1 Modify IP interface



Step 3 Click **Search setting**.

The **Setting** interface is displayed.

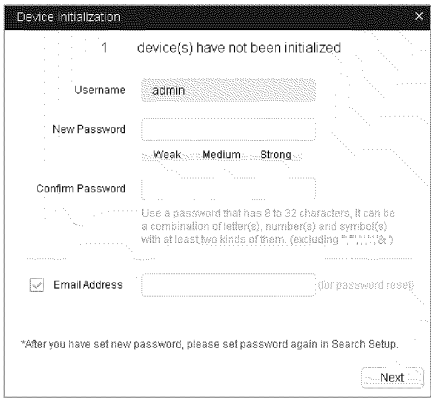
Step 4 Enter the start IP and end IP of the network segment in which you want to search devices, and then click **OK**.

All the devices found in the network segment are listed.

Step 5 Select one or several devices which **Status** are **Uninitialized**, and then click **Initialize**.
The **Device initialization** interface is displayed.

Step 6 Select the devices that need initialization, and then click **initialize**.
The password setting interface is displayed. See Figure 2-2.

Figure 2-2 Password setting interface



Step 7 Set and confirm the password of the devices, and then enter a valid email address. Click **Next**.
The final setting interface is displayed.

NOTE

Password can be modified or reset in **System Settings**.

Step 8 Select the options according to your needs and then click **OK**.
The **Initialization** interface is displayed after initializing is completed. Click the success icon ( ) or the failure icon ( ) for the details.

Step 9 Click **Finish**.
The device status in the **Modify IP** interface (Figure 2-1) turns to **Initialized**.

2.2 Modifying Device IP Address

NOTE

- You can modify IP address of one or multiple devices in one time. This section is based on modifying IP addresses in batch.
- Modifying IP addresses in batch is available only when the corresponding devices have the same login password.

Step 1 Double-click "ConfigTool.exe" to open the tool.

Step 2 Click .
The **Modify IP** interface is displayed. See Figure 2-1.

Step 3 Select the devices which IP addresses need to be modified, and then click **Modify IP**.
The **Modify IP Address** interface is displayed. See Figure 2-3.

Figure 2-3 Modify IP Address interface

Step 4 Select **Static** mode and enter start IP, subnet mask and gateway.

NOTE

- IP addresses of multiple devices will be set to the same if you select **Same IP**.
- If DHCP server is available in the network, devices will automatically obtain IP addresses from DHCP server when you select **DHCP**.

Step 5 Click **OK**.

2.3 Logging in Web Interface

Step 1 Open IE browser, enter the IP address of the device in the address bar and press Enter.
If the setup wizard is displayed, follow the instructions to finish the settings.

Step 2 Enter user name and password in the log in box, and then click **Login**.

Step 3 For first time login, click **Click Here to Download Plugin** and install the plugin as instructed.
The main interface is displayed when the installation is finished. See Figure 2-4.

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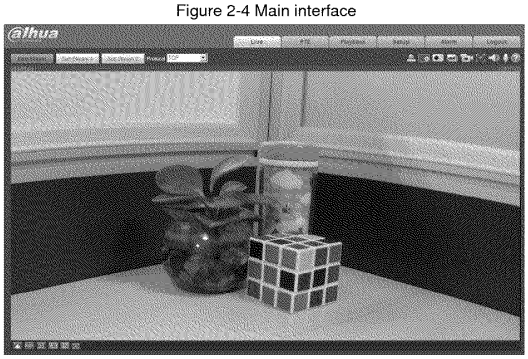
Figure 2-4 Main interface



Network Configuration 7

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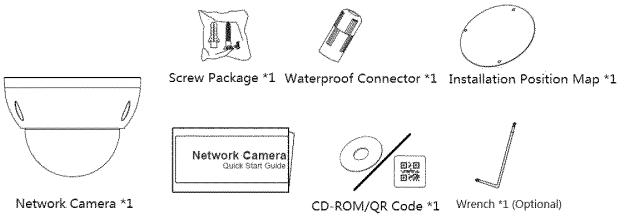
3 Installation

3.1 Packing List

NOTE

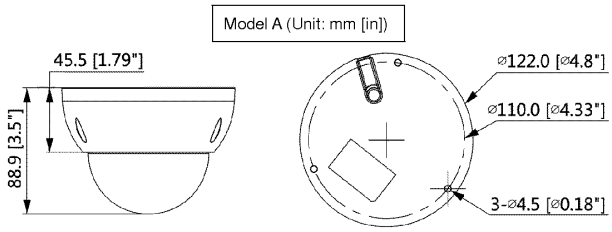
- The tool required for the installation such as electric drill is not provided in the packing.
- The operation manual and related tool are contained in the disk or the QR code, and the actual packing shall prevail.



3.2 Dimension

NOTE

Following figures are for reference only, the actual product shall prevail.



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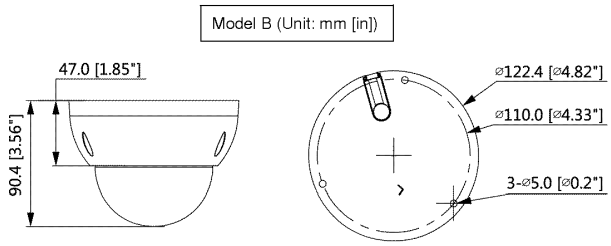
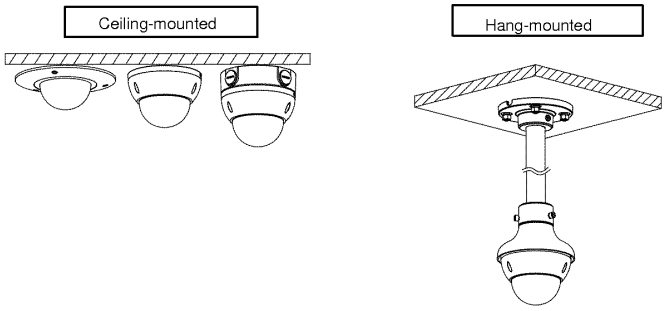


3.3 Installing Device

3.3.1 Installation method



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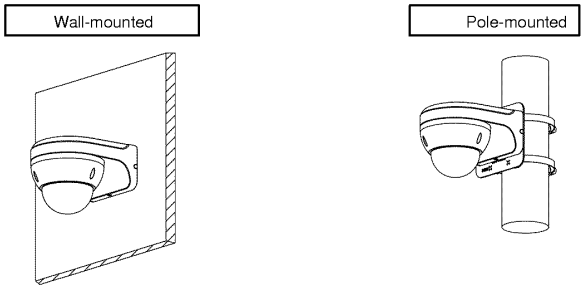
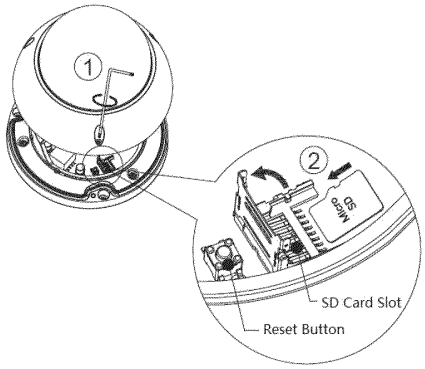


3.3.2 Installing SD Card (Optional)

NOTE

- SD card slot is available on select models.
- Please disconnect the power from the device before installing the SD card.
- Short press reset button for 1~2s, press WPS button on the router and the device can be connected to corresponding router within 1 minute (only supported by some models).
- Press the reset button for 10 seconds to reset the device.



3.3.3 Attaching Device

CAUTION

Make sure the mounting surface is strong enough to hold at least three times of the device weight.

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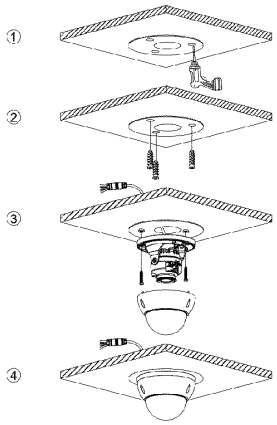
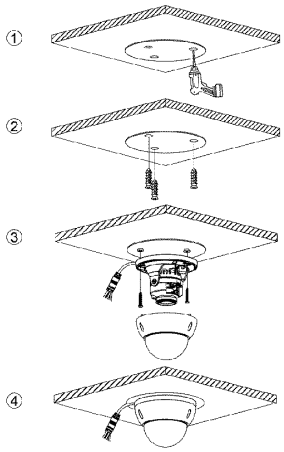
Cable going through the mounting surface



Cable going through the side cable tray



3.3.4 Installing Waterproof Connector

NOTE

This part is only needed when there is waterproof connector come with the device and the

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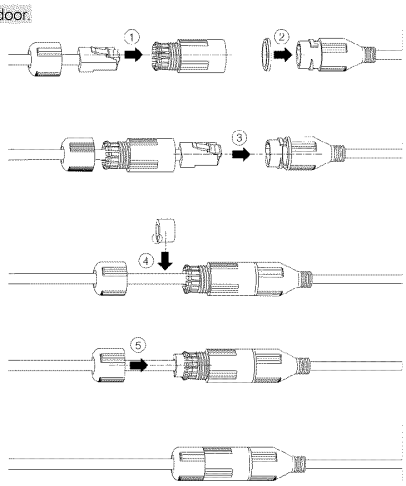
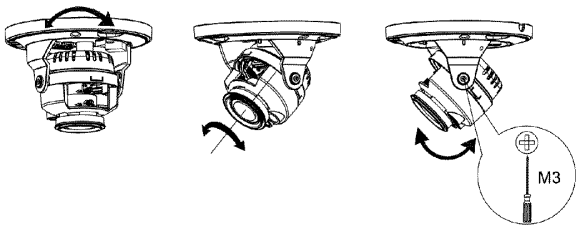
device is used outdoor.



3.3.5 Adjusting Angle

NOTE

It needs to loosen the screw slightly first during vertical adjustment; tighten the screw after adjustment is completed.



3.3.6 Adjusting Focal Length

NOTE

It doesn't have to adjust focal length for motorized vari-focal lens. For manual vari-focal lens, first it has to adjust focusing lever and then the zoom lever. It needs to tighten the focusing lever after adjustment is completed.

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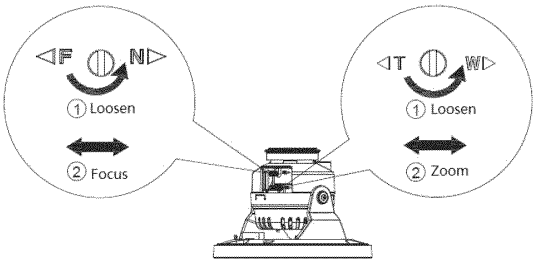

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SOCIAL SECURITY IS OUR RESPONSIBILITY

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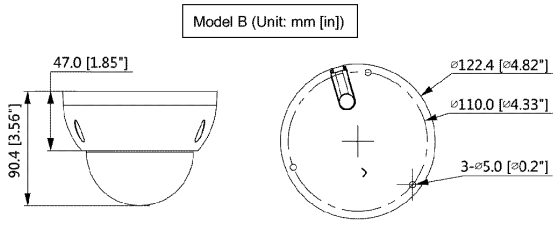
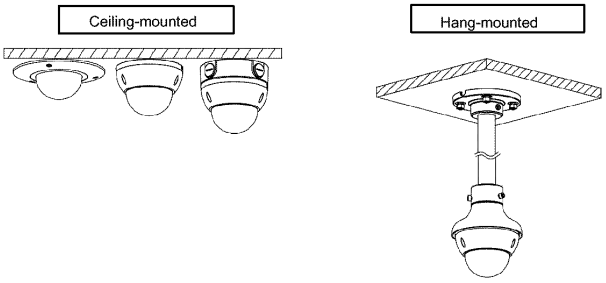
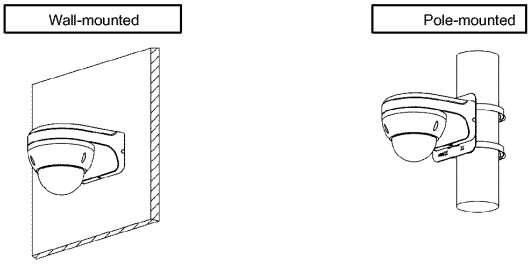


3.3 Installing Device

3.3.1 Installation method



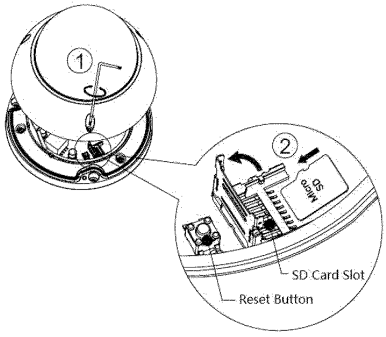
Manuals ID 6-03



3.3.2 Installing SD Card (Optional)

NOTE

- SD card slot is available on select models.
- Please disconnect the power from the device before installing the SD card.
- Short press reset button for 1~2s, press WPS button on the router and the device can be connected to corresponding router within 1 minute (only supported by some models).
- Press the reset button for 10 seconds to reset the device.



3.3.3 Attaching Device

CAUTION

Make sure the mounting surface is strong enough to hold at least three times of the device weight.

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SHENZHEN XUSHENG INDUSTRY CO.,LTD.

样 品 承 认 书

安 全 操 作 手 册

客户名称： 浙江大华技术股份有限公司

产品型号： SE03-HP6070M（35mil）

送样日期： _____

我司确认栏:

制样工程师	销售工程师	审批

客户确认栏：

工程（研发）确认	采购确认	审批

地址：广东省深圳市宝安区石岩镇塘头一路中运泰科技工业园 10 栋 3 楼
电话：0755-29361800/29361900 传真：0755-29169390
网址：www.xssy-led.com

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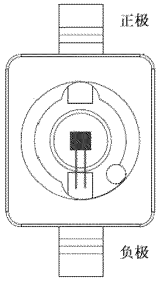
■ **特点:**
- **•高辐射强度**
- **•高可靠性**
- **•高输出功率在 850nm**

■ **应用：**
- **•用于红外探照灯**
- **•用于 CCD 照明**
- **•用于夜视照明**



■ **电性能特点：**

项目	符号	最大额定值	单位	环境温度
功耗	Pd	1.8	W	Ta=25°C
正向电流	IF	≤1000	mA	Ta=25°C
反向电压	VR	5.0	V	Ta=25°C
工作温度	TOPR	-25℃ to +80℃	°C	-
存储温度	TSTG	-25℃ to +80℃	°C	-
焊接温度	TSOL	260℃ for 5sec	°C	-

■ **光性能特点：**

项目	符号	条件	最小	平均	最大	单位
辐射强度	Ee	IF=1000mA	-	190	-	Mw/sr
视角	$2\theta_{1/2}$	-	-	120	-	Deg
光线光谱	λp	IF=1000mA	-	850	-	nm
光谱线半波宽	Δλ	IF=1000mA	-	20	-	nm
正向电压	VF	IF=1000mA	-	1.8	2.2	V
反向电压	IR	VR=5.0V	-	-	10	μA

■ **电压的分档：**

	档位 电压	**MIN**	**MAX**
I=800mA	**I**	**1.6V**	**1.7V**
	II	**1.7V**	**1.8V**
	III	**1.8V**	**1.9V**
	IV	**1.9V**	**2.0V**

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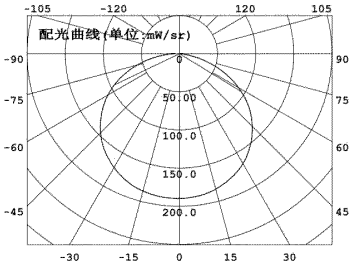
■ **光学特性曲线：**

Fig.1-Radition Diagram



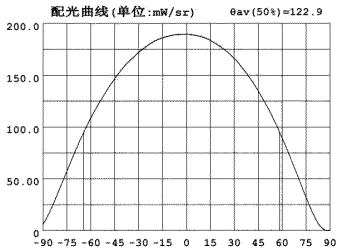
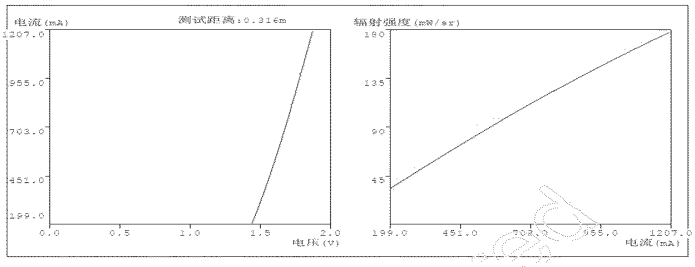


Fig.2-Relative Radiant vs Electronic



辐射强度分布数据:(角度° ， 辐射强度mW/sr) C0-180

角度	强度	角度	强度	角度	强度	角度	强度	角度	强度	角度	强度
-90.0	5.945	-58.0	114.5	-26.0	177.0	6.0	188.4	38.0	151.2	70.0	51.91
-88.0	11.24	-56.0	120.0	-24.0	179.3	8.0	187.8	40.0	146.9	72.0	43.98
-86.0	17.32	-54.0	125.4	-22.0	181.2	10.0	186.9	42.0	142.2	74.0	36.22
-84.0	24.14	-52.0	130.3	-20.0	183.0	12.0	185.7	44.0	137.5	76.0	28.57
-82.0	31.29	-50.0	135.3	-18.0	184.5	14.0	184.5	46.0	132.4	78.0	21.18
-80.0	38.72	-48.0	140.0	-16.0	185.6	16.0	182.7	48.0	127.1	80.0	14.53
-78.0	46.28	-46.0	144.5	-14.0	186.6	18.0	180.9	50.0	121.7	82.0	8.579
-76.0	53.70	-44.0	148.8	-12.0	187.6	20.0	178.9	52.0	116.0	84.0	4.035
-74.0	61.18	-42.0	152.9	-10.0	188.3	22.0	176.7	54.0	109.8	86.0	1.279
-72.0	68.58	-40.0	156.7	-8.0	188.9	24.0	174.5	56.0	103.4	88.0	0
-70.0	75.78	-38.0	160.3	-6.0	189.2	26.0	172.1	58.0	96.67	90.0	0
-68.0	82.99	-36.0	163.5	-4.0	189.5	28.0	169.4	60.0	89.59		
-66.0	89.77	-34.0	166.3	-2.0	189.5	30.0	166.3	62.0	82.45		
-64.0	96.45	-32.0	169.3	0.0	189.6	32.0	163.0	64.0	75.03		
-62.0	102.7	-30.0	172.0	2.0	189.4	34.0	159.2	66.0	67.36		
-60.0	108.7	-28.0	174.7	4.0	189.9	36.0	155.2	68.0	59.68		

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■ LED 芯片特性曲线：

Fig. 1-Relative Radiant Flus vs. Forward Current

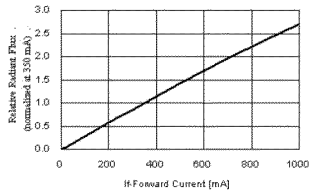


Fig. 1-Forward Current vs. Forward Voltage

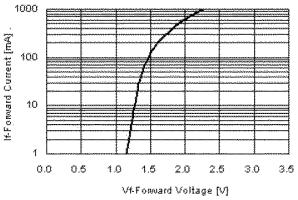


Fig. 3-Relative Radiant Flus(350mA) vs. Ambient Temperature

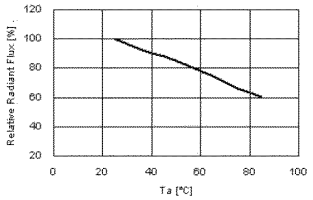


Fig. 4- Forward Voltage Flus(@350mA) vs. Ambient Temperature

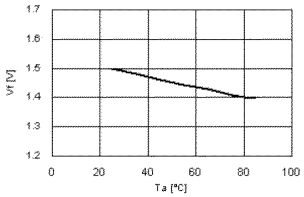


Fig. 5-Peak Wavelengh(@350mA) vs. Ambient Temperature

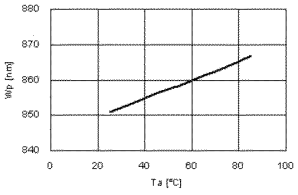
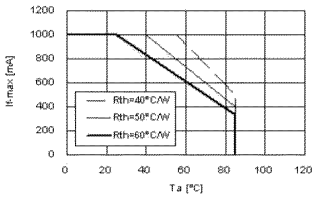


Fig. 6-Maximum Dirving Forward DC Current vs. Ambient Temperature(Derating based on Tj max.=115°)



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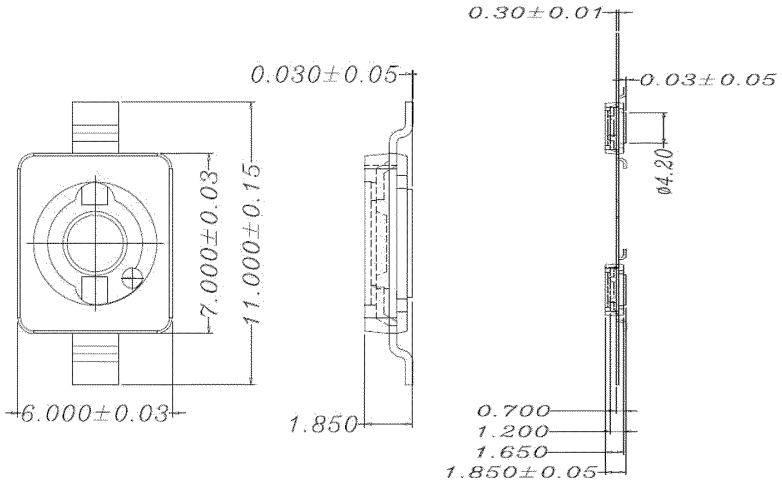
■ **外观尺寸：**



Notes:
1. All dimensions are in millimeters(所有尺寸以毫米为单位)

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■ **可靠性试验：**

寿命测试：

测试项目	测试条件	持续时间	测试数量	评估 ok 标准	评估等级
光衰老化测试	正常电流	1000H	10pcs	平均辐射强度衰减≤5%	*
加速光衰老化测试	1.5 倍/2.0 倍正常电流	200H	10pcs	平均辐射强度衰减≤5%	*
抗氧化测试	衰减老化后	---	---	衰减前后不变色	*

机械测试：

测试项目	测试条件	持续时间	测试数量	评估 ok 标准	评估等级
手动焊接测试	400℃/5 秒	5S	100pcs	0 失效	*
回流焊接测试	260℃	1 次回流焊	1000pcs	0 失效	*

环境测试：

测试项目	测试条件	持续时间	测试数量	评估 ok 标准	评估等级
硅胶支架结合度	260℃	1 次回流焊	1000pcs	0 失效	*
冷热冲击	-35℃~90℃	1H/100T	100pcs	0 失效	*
高温存储	150℃	24 小时	100pcs	0 失效	*
低温存储	-30℃	24 小时	100pcs	0 失效	*

电性能测试：

测试项目	测试条件	持续时间	测试数量	评估 ok 标准	评估等级
正向电流	正常电流的 2 倍	24H	10pcs	0 死灯，0 漏电	*
反向电压	15V 反向加电压	---	10pcs	0 死灯，0 漏电	*
发光角度	配光曲线测试仪	---	10pcs	10%波动范围	
辐射强度	辐射强度测试仪	---	10pcs	10%波动范围	

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XSSY® 旭晟實業

LED 安全使用手册 R&D:2012.12.17
USER MANUAL

尊敬的客户：

感谢您使用本公司的产品。为了增进您对我司 LED 产品的了解，方便您安全地掌握本公司产品的操作方法，安全规范的使用本公司产品，尽量避免，减少人为因素而造成的产品损坏，使本公司产品能更好的为您服务。

我们会根据您的需要为您提供完善的技术支持以及售前售后服务。

在使用我司 LED 产品前，请您先仔细阅读本手册，了解所用的 LED 的使用方法和相关参数，以及注意事项。

同时需要补充的是：即便是相同规格的 LED，在实际应用中其可靠性与整体系统设计水平，作业方式，使用条件息息相关，本手册中的内容未能涵盖所有的问题，由此带来的不便，敬请谅解！为此，我们会继续完善，不定期的更新本使用手册，期间如发生相关信息更改，将不作另行通知。

深圳市旭晟实业有限公司 工程部

地址：广东省深圳市宝安区石岩镇塘头一路中运泰科技工业园 10 栋 3 楼
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第一章：产品介绍
1.1 仿流明系列----------
1.2 贴片系列----------
第二章：装运与保存
2.1 仿流明系列的装运与保存----------
2.2 贴片系列的装运与保存----------
第三章：静电防护
3.1 静电的原理与产生----------
3.2 静电对 LED 的危害----------
第四章：LED 应用线路设计
4.1 LED 应用线路设计----------
第五章：组装方式
5.1 作业前准备工作----------
5.2 车间环境以及物料安全管控----------
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6.1 各种产品的焊接方式----------
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6.3 仿流明产品烙铁焊工艺----------
6.4 仿流明产品回流焊工艺----------
6.5 贴片产品焊接工艺----------
第七章：导热管理
7.1 散热外壳需要----------
7.2 有效散热表面积----------
7.3 散热片的连接方法----------
第八章：清洗方法
8.1 仿流明产品清洗方法----------
8.2 贴片产品清洗方法----------
第九章：电性测试须知----------

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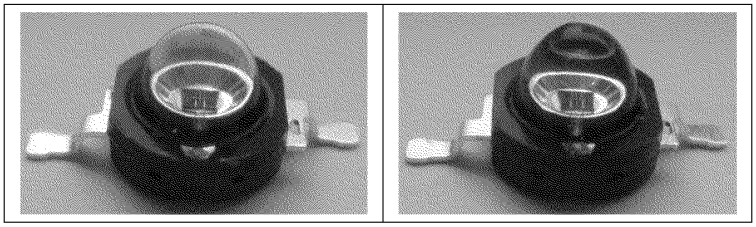
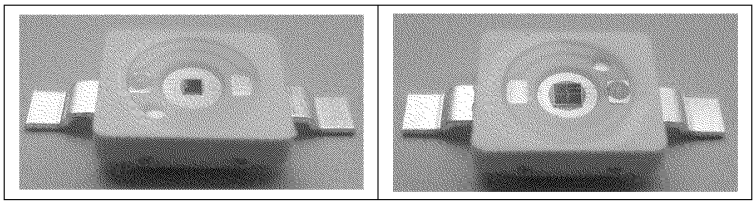
第一章：产品介绍

1.1 仿流明产品系列



1.2 贴片产品系列



第二章：装运与保存

2.1 仿流明产品系列的装运与保存

2.1.1 仿流明产品的装运

此系列 LED 产品采用料管装料，然后用防尘，防潮，防静电铝箔袋真空包封，搬运过程中应避免挤压，刺穿包装袋的情况发生，同时做好必要的静电防护措施，如上线作业前 LED 包装袋已经破损，漏气，请直接停止使用，将该包装产品进行测试与除湿作业后再进行使用。

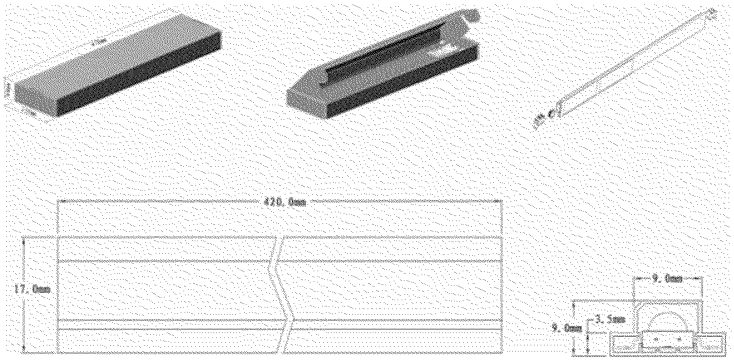
2.1.2 仿流明产品的包装规格

Misc ID 7-02

(1)每盒内有 1 静电包装袋；

(2)每包静电袋中 20 管料管

(3)每管料管中 50pcs 产品；



2.1.3 仿流明产品开封前存储

LED 属于潮湿敏感性元件，在高温状态下，渗入其中的湿气快速膨胀产生足够的蒸汽压力损伤 LED 元件，从而出现材料内部结构发生变化，造成可靠性失效问题。为避免由吸潮引发的可靠性失效问题，需要做好 LED 产品焊接前的存储与防潮措施。

如果铝箔袋未打开，产品的保存环境需要控制在 20-30℃/60%RH 内。

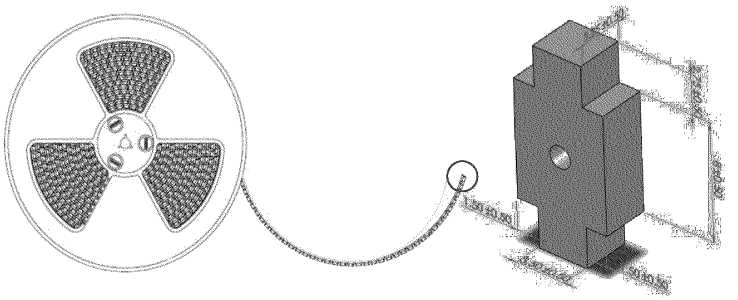
2.2 贴片产品系列的装运与保存

2.2.1 此系列 LED 产品采用料盘装料，然后用防尘，防潮，防静电铝箔袋真空包封，其余运输与保存方法与仿流明产品一致。

2.2.2 贴片产品的包装规格

贴片产品包装参考以下图片，具体包装请与实际情况为准。

Misc ID 7-02



第三章：静电防护

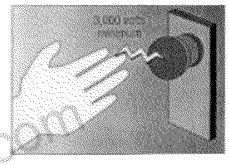
3.1 静电的原理与产生

3.1.1 静电特点：高电位，低电量，小电流，短作用时间。

LED 属于 SSD 半导体器件，需要在半成品，成品装配过程中加强对静电的防范（尤其是在干燥的冬季）

3.1.2 几种常见的静电对照表

静电来源	湿度对静电电位的影响	
	10%-25%RH	65%-90%RH
行走在地毯上	35000V	15000V
行走在胶地板上	12000V	250V
在工作台上操作	6000V	100V
捡起塑料胶袋	20000V	1200V
推动发泡胶椅子	18000V	1500V



3.1.3 静电击穿本质

当带电的物体接触 LED 器件，并通过器件对地放电，不论 LED 是正向还是反向状态，静电电流均会在十分之一微秒的时间通过人体和器件电阻释放，形成平均脉冲功率达几万瓦。是以产生高温，超过芯片本征温度形成热击穿。

3.1.4 静电产生

摩擦：日常生活中，任何 2 个不同的材质接触再分离，即可以产生静电，一般材料的绝缘性越好，越容易摩擦生电；

感应：在电场中，由于同性相斥，异性相吸，正负离子就会转移，在其表面产生电荷；

传导：带电物体相互接触，发生电荷转移。

3.2 静电对 LED 的危害

3.2.1 静电的危害

(1)瞬间的电场或者电流产生的热，使 LED 局部受伤，表现为漏电流迅速增加，且能工作，但亮度降低，寿命变短；

(2)静电吸附灰尘，降低 LED 产品的绝缘电阻（缩短寿命）；

(3)电场或者电流击穿绝缘层，使 LED 器件无法工作，表现为死灯；

(4)静电放电产生的电磁场很大，频谱很宽，对 LED 产品造成干扰甚至损坏（电磁干扰）。

3.2.2 静电防护以及消除措施

对所有工序（生产，测试，包装等）所有直接接触 LED 的员工都要做好防护和消除静电措施，主要有:

(1)车间铺设防静电地板并做好接地工作，工作台采用防静电工作台，要求工作台及与产品相接触之处使用表面电阻为 10^6-$10^9\Omega$ 的桌垫。

(2)生产的机台，所有的设备，电烙铁以及检测设备均需要良好的接地，接地交流阻抗小于 1.0Ω。在易产生静电的环境和设备上，需要安装离子风扇，作业过程中，操作员穿静电服，带静电环，取放材料时不可触碰胶体部分。

(3)盛装 LED 需要使用静电元件盒，包装则采用防静电材料。

(4)请保持环境湿度在 50%左右，以免空气过于干燥产生静电。

第四章：LED 应用线路设计

4.1 LED 在线路中的设计方式

在应用产品的电路设计中，根据驱动电压，电流的不同，会选择不同的串并联组合方式，应充分了解 LED 的电，热，光的特性，以确保 LED 产品长期工作的可靠性，为降低串

联线路中单灯出现故障后，对整个支路带来使用风险，应尽量避免支路中串联数量过多的LED，单灯并联应用市场，如果采用恒压供电模式，应实际评估各LED的伏安曲线的差异对光强产生变化所带来的影响，并采用一定措施平衡各单灯之间的电流值。

LED属于恒流型元器件，避免选用定电压的方式点亮LED，否则会产生亮度不一致，且当环境温度升高LED结温上升使内阻减小，稳压电源供电则使LED电压升高，影响其寿命，严重的使LED内部结构破坏，故最好使用恒流电源供电，以保证产品不受外界影响，保证品质。

第五章：组装方式

5.1 作业前准备工作

对于整个工序（生产，测试，包装等）所有与LED直接接触的员工都要做好防护和消除静电措施，正式生产前需要做一下自检动作：

(1)检查机台设备，工作台接地线是否正常。

(2)检查人员佩戴静电环是否都正常。

(3)插件时最好要求作业员佩戴静电手套或者静电指套。

(4)作业台前面要求铺好静电皮。

(5)检查测试仪器，驱动电源是否存在漏电或者静电释放的情形。

(6)检查机台，设备参数，是否调试电性能合格输出。

5.2 车间环境以及物料安全管控

(1)车间环境最好保证在20-30℃，50%湿度范围内（采用温度计实时监控环境变化），并且接触LED检查时需要静电手套或者指套，包装袋开口后及时封口，防止不明气体或者液体影响LED外观。

(2)避免LED暴露在偏酸性的车间环境中，对于采购的其他LED组装配套物料，可要求生产厂家提供物料MSDS报告（物质安全数据表），确认其中是否含硫（如PCB板，橡胶手套，橡皮筋，硫磺香皂中均含有硫），卤素类物质（如玻璃胶，低端双组份树脂胶），以防止其与LED材料发生化学反应或者物理反应，例如LED与含硫，含卤物质接触或者存在酸性环境下，极易造成LED成品镀银层腐蚀，LED硅胶，银光粉物料性能发生改变，从而导致

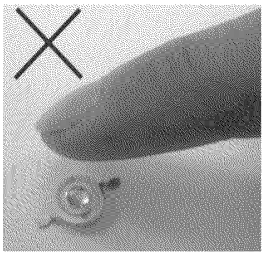
LED 光电性能失效。

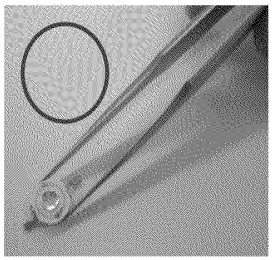
(3)LED 产品的硫化危害

LED 硫化现象在整个 LED 应用行业都是比较容易忽略的大问题，当 LED 产品接触到含硫物质，由于硅胶本身的高度的透氧透湿特性，硫元素极易渗透到支架的功能区，与镀银层发生化学反应。通常含有硫物质的物品有：PCB 板，橡胶手套，橡皮筋，硫磺香皂，橡胶操作台等橡胶制品。

通常 LED 发生硫化都是在产品贴装，回流焊接完成后，放置一段时间才逐渐发现，硫化后的产品表现为支架功能区发黑，光衰严重。

5.3 材料的取拿方式





正确的方式是用镊子夹住支架 2 边，切勿触碰硅胶部分和引脚部分，否则可能造成产品电路不良和引脚变形。

第六章：焊接条件

6.1 各种产品的焊接方式

产品类型	烙铁焊	回流焊	波峰焊	共晶焊
仿流明系列	√	√	×	√
贴片系列	√	√	×	√

6.2 仿流明产品焊接前提条件

产品拆封后未按照要求除湿作业可能会产生的不良：

(1)材料胶体产生剥离，导致产品出光强度下降，严重的导致死灯；

(2)材料胶体产生胶裂，导致材料死灯。

6.3 仿流明产品烙铁焊工艺

(1)在铝基板产品散热处涂抹散热硅胶，只需薄薄一层，不能太多或溢出，否则不但增加不了导热作用，反而会形成隔热层；

(2)很好的清洁焊点，取用 LED 产品时用镊子夹住 LED 支架两侧；

(3)调节烙铁焊接温度控制在 400℃以内，烙铁必须接地，焊接台最好是要有离子吹风机；

(4)焊接时，烙铁焊头不可碰及胶体；焊接时间少于 5 秒，当引脚受热至 85℃或高于此温度时,胶体不可受外界压力，否则金线会断开；

(5)焊好一点后，焊该 LED 的另一点的间隔时间不能太短；

(6)焊接完成后，检查产品是否虚焊，漏焊。

6.4 仿流明产品回流焊工艺

(1)回流焊温度曲线图及对应的湿敏等级要求：

序号	回流焊温度	湿敏等级	环境要求
1	低温（200+/-5 度 5S）	3	≤30℃/60%RH
2	中温（215+/-5 度 5S）	4	≤30℃/60%RH
3	高温（260+/-5 度 5S）	5	≤30℃/60%RH

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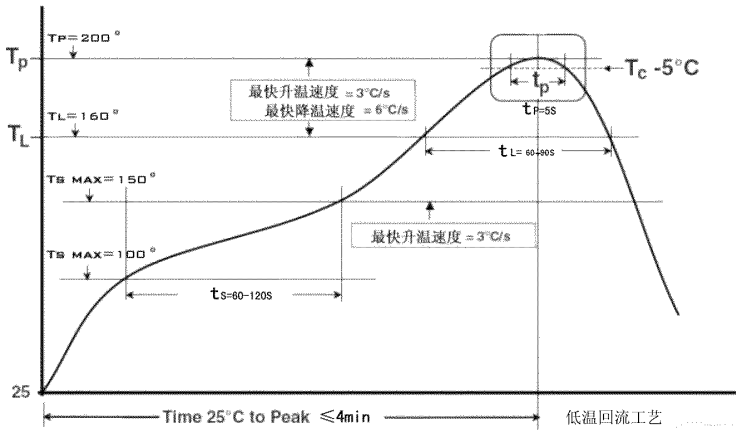
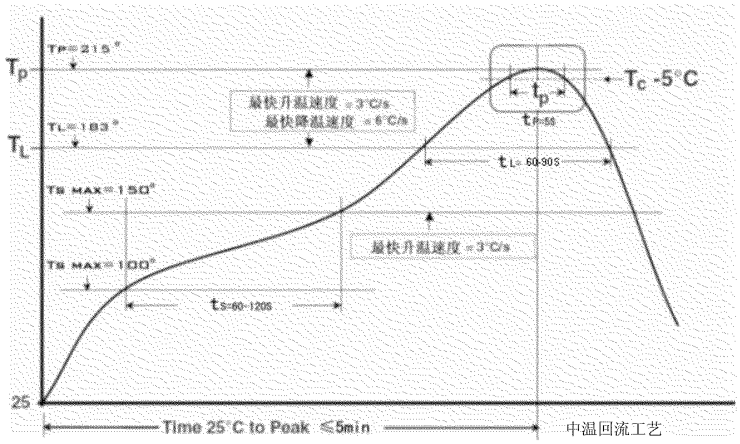


低温回流工艺



中温回流工艺

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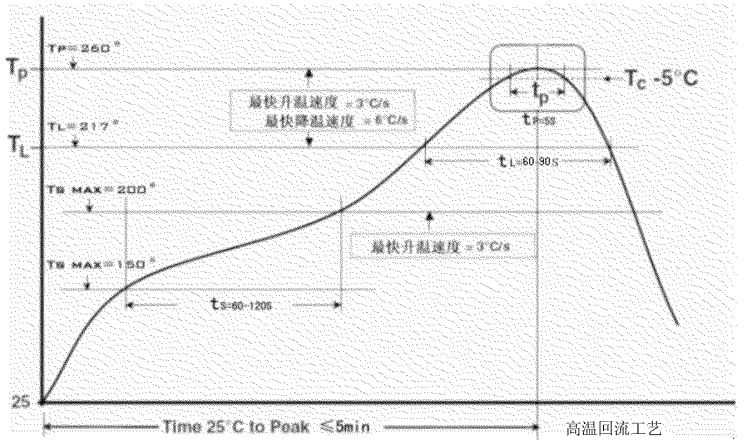

回流焊曲线说明：

回流焊接工艺	低温回流焊接工艺	中温回流焊接工艺	高温回流焊接工艺
温度曲线特点	无铅低温锡膏（153℃熔点锡膏）	无铅锡膏（183℃熔点锡膏）	无铅锡膏（217℃熔点锡膏）
最快升温速度	最大 3℃/S	最大 3℃/S	最大 3℃/S
预热温度：最小温度（Ts min）	100℃	100℃	150℃
预热温度：最大温度（Ts max）	150℃	150℃	200℃
预热时间：（ts）	60-120S	60-120S	60-180S
焊接温度（TL）	160℃	183℃	217℃
以上温度保持：（tL）	40S	40S	20-30S
峰值温度	200℃	215℃	260℃
实际维持最高温度±5℃内时间	5S	5S	5S
温度允许下降最大斜率	6℃/S	6℃/S	6℃/S
常温到峰值温度时间	4 分钟	5 分钟	5 分钟

注意事项：

(1)在量产之前，必须先小批量 100pcs 试产，待试产 100%合格，方可进行大批量投产；

(2)LED 回流焊工艺参考如上图，不论如何更改回流参数，最高温度不能太长，否则高温下可能导致 LED 产品功能失效；

(3)回流焊作业完成后，LED 内部温度仍然维持在较高状态，此时不能马上对 LED 单灯或者成品进行通电，必须等 LED 冷却常温后再通电测试；

(4)LED 灯回流焊只允许过一次；

(5)回流焊过程中不要对硅胶施加压力；

(6)建议选用熔点偏低的锡膏；

(7)以上参考图是 153℃无铅锡膏，183℃无铅锡膏和 217℃无铅锡膏的回流焊工艺图，需要其他熔点的锡膏则需要加上锡膏熔点差的温度，注意使用高温焊接时必须确定真空包装完好或产品未吸潮。

6.5 贴片产品焊接工艺

(1)贴片回流焊接工艺参考仿流明产品。

(2)手工焊接工艺参考仿流明产品。

第七章：热学管理

7.1 散热外壳要求：

外形与材质：如果成品密封性不高，可与外界空气环境直接发生对流，建议采用带鳍片或者单面铝基板。

7.2 有效散热表面积：

对于大功率 1w 的 LED，我司推荐散热片有效散热面积≥30 平方厘米，对于 3w 的产品，推荐散热片有效散热面积≥80 平方厘米，尽量保证散热片温度不超过 50℃。

功率	散热器连接面积	散热器连接面厚度	散热鳍片		
1W	9-25cm²	≥1.5mm	鳍片厚度	鳍片距离	鳍片高度

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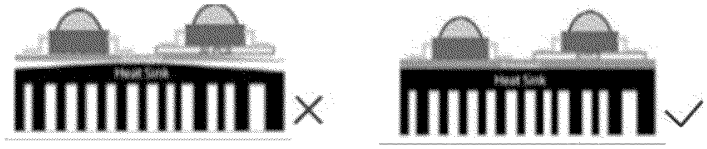
2W	36-80cm²	≥3.5mm	≥1.5mm	1.5-2.5mm	≥20mm
3W	90-170cm²	≥5mm			

7.3 散热片的连接方法：

大功率 LED 基板与散热片连接时请保证两接触面平整，接触良好，加强两接触面的结合程度，建议在 LED 基板底部或散热片表面涂覆一层导热硅胶（导热系数≥3.0W/m.k）或者锡膏，厚度要求 100um 以下，请勿采用劣质硅胶或者其他粘结物质（不但起不到导热作用，反而形成隔热层）。



第八章：清洗方法

8.1 仿流明产品的清洗：

在使用过程中，尽量避免助焊剂，应用防水密封胶，粘接胶，油污等异物附着在胶体表面，需要清洁灯体时，可以用无尘布轻擦拭赃污部位。如果使用无尘布很难擦拭干净，则用干净的无尘布（或者软质的棉纱布）吸取适量的酒精轻力擦拭（酒精不能使用太多，因为过多的酒精挥发会造成透镜表面模糊）。先将灯体表面的杂质轻轻擦拭干净后（防止用力过大，破坏 LED 内部结构），常温下自然干燥，再开始使用，同时注意避免将贴片 LED 浸泡在乙醇溶液中。

避免使用不明化学液体，酸性溶剂作为清洗剂，在使用溶剂前（如洗板水），请先确认其所含化学成份是否会对硅胶，支架，支架镀银层等造成腐蚀，并由此导致 LED 特性改变或者功能损坏。

8.2 贴片产品的清洗：

贴片产品的清洗参考上述仿流明产品的清洗。

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第九章：电性测试与应用须知

9.1 电性能测试注意事项

(1)LED 不允许反向驱动，且线路之间产生脉冲的电流应远小于 LED 规格上线，以避免可能导致芯片击穿；

(2)测试时候，限流措施是必须的，否则轻微的电压变化会导致较大的电流变化，可能导致 LED 失效，建议客户在焊接后用偏小电流，电压进行测试（例如 140B 产品，建议使用 1.7V,800mA 进行电性能测试）；

(3)员工在测试灯板的过程中，必须严格规定先连接灯板的电路，再给驱动电路供电，否则将会造成芯片 PN 结击穿漏电等不良；

(4)注意避免 LED 应用产品在酸性，硫浓度较高的环境下使用。

(5)LED 应用产品在组装，防水处理也要避免接触到 PH＜7 的酸性防水胶，酸性热焊性溶剂等；

(6)针对户外使用 LED 应用产品，应做好接地保护，以防止漏电或者雷击对产品带来破坏。

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深圳市旭晟实业有限公司

SHENZHEN XUSHENG INDUSTRY CO.,LTD.

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安 全 操 作 手 册

客户名称： 浙江大华技术股份有限公司

产品型号： SE03-HP6070M（35mil）

送样日期： _____

我司确认栏:

制样工程师	销售工程师	审批

客户确认栏：

工程（研发）确认	采购确认	审批

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网址：www.xssy-led.com

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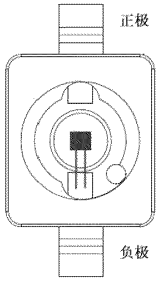
XSSY® 旭成鑫荣

■ **特点:**

- **•高辐射强度**
- **•高可靠性**
- **•高输出功率在 850nm**

■ **应用：**

- **•用于红外探照灯**
- **•用于 CCD 照明**
- **•用于夜视照明**



■ **电性能特点：**

项目	符号	最大额定值	单位	环境温度
功耗	Pd	1.8	W	Ta=25°C
正向电流	IF	≤1000	mA	Ta=25°C
反向电压	VR	5.0	V	Ta=25°C
工作温度	TOPR	-25℃ to +80℃	°C	-
存储温度	TSTG	-25℃ to +80℃	°C	-
焊接温度	TSOL	260℃ for 5sec	°C	-

■ **光性能特点：**

项目	符号	条件	最小	平均	最大	单位
辐射强度	Ee	IF=1000mA	-	190	-	Mw/sr
视角	$2\theta_{1/2}$	-	-	120	-	Deg
光线光谱	λp	IF=1000mA	-	850	-	nm
光谱线半波宽	Δλ	IF=1000mA	-	20	-	nm
正向电压	VF	IF=1000mA	-	1.8	2.2	V
反向电压	IR	VR=5.0V	-	-	10	μA

■ **电压的分档：**

	档位 电压	**MIN**	**MAX**
I=800mA	**I**	**1.6V**	**1.7V**
	II	**1.7V**	**1.8V**
	III	**1.8V**	**1.9V**
	IV	**1.9V**	**2.0V**

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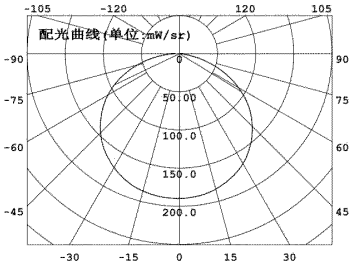
■ **光学特性曲线：**

Fig.1-Radition Diagram



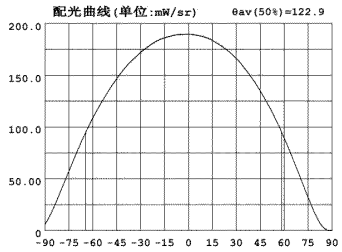
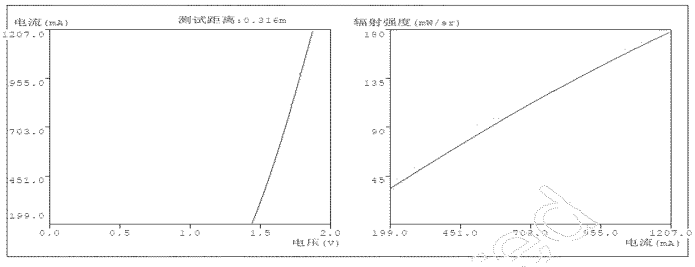


Fig.2-Relative Radiant vs Electronic



辐射强度分布数据:(角度° ， 辐射强度mW/sr) C0-180

角度	强度	角度	强度	角度	强度	角度	强度	角度	强度	角度	强度
-90.0	5.945	-58.0	114.5	-26.0	177.0	6.0	188.4	38.0	151.2	70.0	51.91
-88.0	11.24	-56.0	120.0	-24.0	179.3	8.0	187.8	40.0	146.9	72.0	43.98
-86.0	17.32	-54.0	125.4	-22.0	181.2	10.0	186.9	42.0	142.2	74.0	36.22
-84.0	24.14	-52.0	130.3	-20.0	183.0	12.0	185.7	44.0	137.5	76.0	28.57
-82.0	31.29	-50.0	135.3	-18.0	184.5	14.0	184.5	46.0	132.4	78.0	21.18
-80.0	38.72	-48.0	140.0	-16.0	185.6	16.0	182.7	48.0	127.1	80.0	14.53
-78.0	46.28	-46.0	144.5	-14.0	186.6	18.0	180.9	50.0	121.7	82.0	8.579
-76.0	53.70	-44.0	148.8	-12.0	187.6	20.0	178.9	52.0	116.0	84.0	4.035
-74.0	61.18	-42.0	152.9	-10.0	188.3	22.0	176.7	54.0	109.8	86.0	1.279
-72.0	68.58	-40.0	156.7	-8.0	188.9	24.0	174.5	56.0	103.4	88.0	0
-70.0	75.78	-38.0	160.3	-6.0	189.2	26.0	172.1	58.0	96.67	90.0	0
-68.0	82.99	-36.0	163.5	-4.0	189.5	28.0	169.4	60.0	89.59		
-66.0	89.77	-34.0	166.3	-2.0	189.5	30.0	166.3	62.0	82.45		
-64.0	96.45	-32.0	169.3	0.0	189.6	32.0	163.0	64.0	75.03		
-62.0	102.7	-30.0	172.0	2.0	189.4	34.0	159.2	66.0	67.36		
-60.0	108.7	-28.0	174.7	4.0	189.9	36.0	155.2	68.0	59.68		

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■ LED 芯片特性曲线:

Fig. 1-Relative Radiant Flus vs. Forward Current

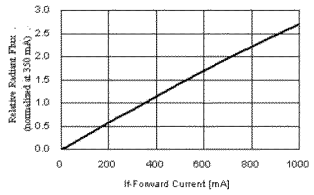


Fig. 1-Forward Current vs. Forward Voltage

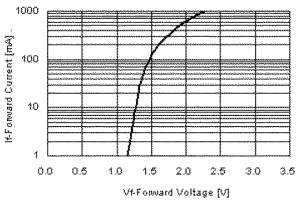


Fig. 3-Relative Radiant Flus(350mA) vs. Ambient Temperature

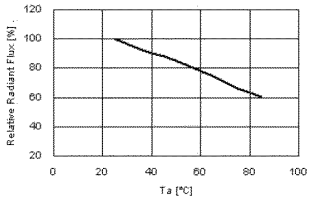


Fig. 4- Forward Voltage Flus(@350mA) vs. Ambient Temperature

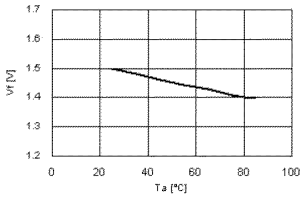


Fig. 5-Peak Wavelengh(@350mA) vs. Ambient Temperature

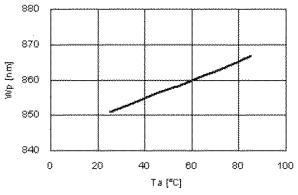
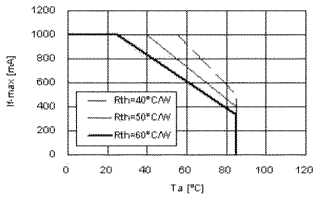


Fig. 6-Maximum Dirving Forward DC Current vs. Ambient Temperature(Derating based on Tj max.=115°)



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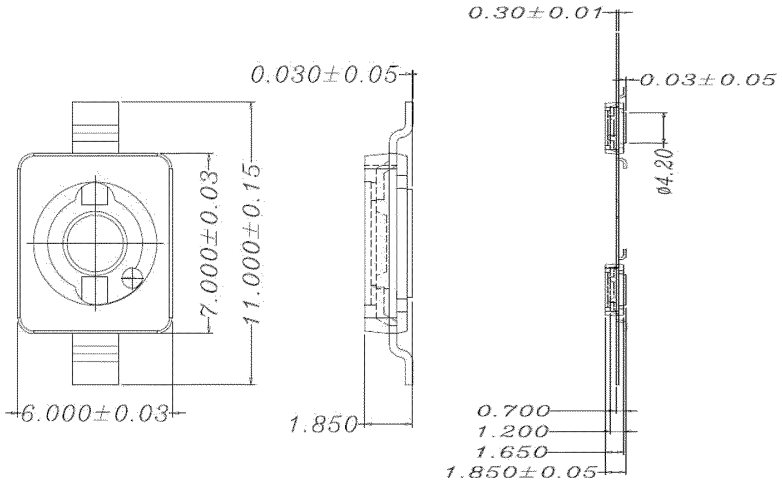
■ **外观尺寸：**



Notes:
1. All dimensions are in millimeters(所有尺寸以毫米为单位)

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■ **可靠性试验：**

寿命测试：

测试项目	测试条件	持续时间	测试数量	评估 ok 标准	评估等级
光衰老化测试	正常电流	1000H	10pcs	平均辐射强度衰减≤5%	*
加速光衰老化测试	1.5 倍/2.0 倍正常电流	200H	10pcs	平均辐射强度衰减≤5%	*
抗氧化测试	衰减老化后	---	---	衰减前后不变色	*

机械测试：

测试项目	测试条件	持续时间	测试数量	评估 ok 标准	评估等级
手动焊接测试	400℃/5 秒	5S	100pcs	0 失效	*
回流焊接测试	260℃	1 次回流焊	1000pcs	0 失效	*

环境测试：

测试项目	测试条件	持续时间	测试数量	评估 ok 标准	评估等级
硅胶支架结合度	260℃	1 次回流焊	1000pcs	0 失效	*
冷热冲击	-35℃~90℃	1H/100T	100pcs	0 失效	*
高温存储	150℃	24 小时	100pcs	0 失效	*
低温存储	-30℃	24 小时	100pcs	0 失效	*

电性能测试：

测试项目	测试条件	持续时间	测试数量	评估 ok 标准	评估等级
正向电流	正常电流的 2 倍	24H	10pcs	0 死灯，0 漏电	*
反向电压	15V 反向加电压	---	10pcs	0 死灯，0 漏电	*
发光角度	配光曲线测试仪	---	10pcs	10%波动范围	
辐射强度	辐射强度测试仪	---	10pcs	10%波动范围	

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LED 安全使用手册 R&D:2012.12.17
USER MANUAL

尊敬的客户：

感谢您使用本公司的产品。为了增进您对我司 LED 产品的了解，方便您安全地掌握本公司产品的操作方法，安全规范的使用本公司产品，尽量避免，减少人为因素而造成的产品损坏，使本公司产品能更好的为您服务。

我们会根据您的需要为您提供完善的技术支持以及售前售后服务。

在使用我司 LED 产品前，请您先仔细阅读本手册，了解所用的 LED 的使用方法和相关参数，以及注意事项。

同时需要补充的是：即便是相同规格的 LED，在实际应用中其可靠性与整体系统设计水平，作业方式，使用条件息息相关，本手册中的内容未能涵盖所有的问题，由此带来的不便，敬请谅解！为此，我们会继续完善，不定期的更新本使用手册，期间如发生相关信息更改，将不作另行通知。

深圳市旭晟实业有限公司 工程部

地址：广东省深圳市宝安区石岩镇塘头一路中运泰科技工业园 10 栋 3 楼
电话：0755-29361800/29361900 传真：0755-29169390
网址：www.xssy-led.com

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第一章：产品介绍
1.1 仿流明系列----------
1.2 贴片系列----------
第二章：装运与保存
2.1 仿流明系列的装运与保存----------
2.2 贴片系列的装运与保存----------
第三章：静电防护
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5.1 作业前准备工作----------
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6.3 仿流明产品烙铁焊工艺----------
6.4 仿流明产品回流焊工艺----------
6.5 贴片产品焊接工艺----------
第七章：导热管理
7.1 散热外壳需要----------
7.2 有效散热表面积----------
7.3 散热片的连接方法----------
第八章：清洗方法
8.1 仿流明产品清洗方法----------
8.2 贴片产品清洗方法----------
第九章：电性测试须知----------

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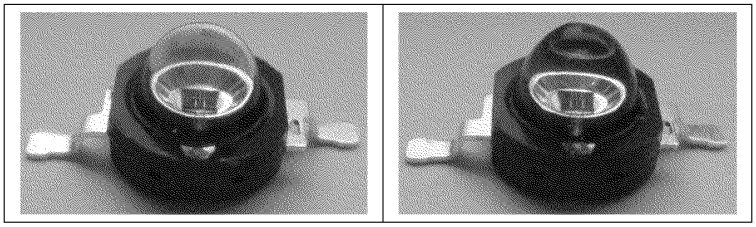
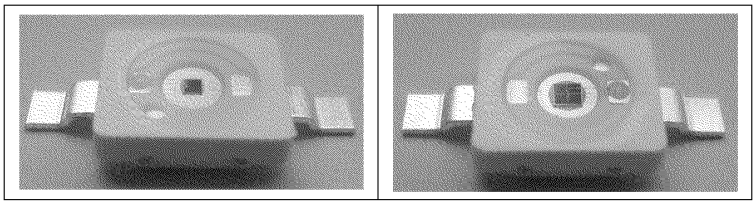
第一章：产品介绍

1.1 仿流明产品系列



1.2 贴片产品系列



第二章：装运与保存

2.1 仿流明产品系列的装运与保存

2.1.1 仿流明产品的装运

此系列 LED 产品采用料管装料，然后用防尘，防潮，防静电铝箔袋真空包封，搬运过程中应避免挤压，刺穿包装袋的情况发生，同时做好必要的静电防护措施，如上线作业前 LED 包装袋已经破损，漏气，请直接停止使用，将该包装产品进行测试与除湿作业后再进行使用。

2.1.2 仿流明产品的包装规格

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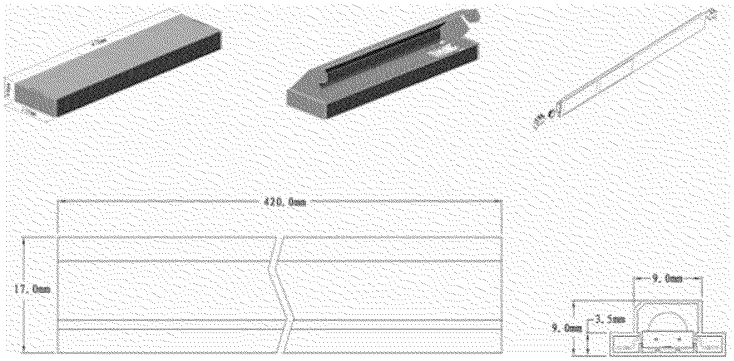
(1)每盒内有 1 静电包装袋；

(2)每包静电袋中 20 管料管

(3)每管料管中 50pcs 产品；



2.1.3 仿流明产品开封前存储

LED 属于潮湿敏感性元件，在高温状态下，渗入其中的湿气快速膨胀产生足够的蒸汽压力损伤 LED 元件，从而出现材料内部结构发生变化，造成可靠性失效问题。为避免由吸潮引发的可靠性失效问题，需要做好 LED 产品焊接前的存储与防潮措施。

如果铝箔袋未打开，产品的保存环境需要控制在 20-30℃/60%RH 内。

2.2 贴片产品系列的装运与保存

2.2.1 此系列 LED 产品采用料盘装料，然后用防尘，防潮，防静电铝箔袋真空包封，其余运输与保存方法与仿流明产品一致。

2.2.2 贴片产品的包装规格

贴片产品包装参考以下图片，具体包装请与实际情况为准。

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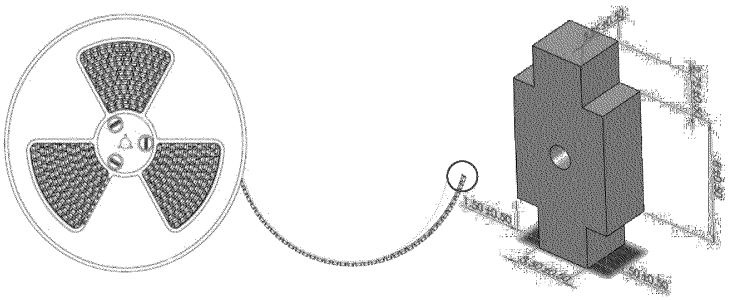


第三章：静电防护

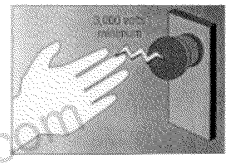
3.1 静电的原理与产生

3.1.1 静电特点：高电位，低电量，小电流，短作用时间。

LED 属于 SSD 半导体器件，需要在半成品，成品装配过程中加强对静电的防范（尤其是在干燥的冬季）

3.1.2 几种常见的静电对照表

静电来源	湿度对静电电位的影响	
	10%-25%RH	65%-90%RH
行走在地毯上	35000V	15000V
行走在胶地板上	12000V	250V
在工作台上操作	6000V	100V
捡起塑料胶袋	20000V	1200V
推动发泡胶椅子	18000V	1500V



3.1.3 静电击穿本质

当带电的物体接触 LED 器件，并通过器件对地放电，不论 LED 是正向还是反向状态，静电电流均会在十分之一微秒的时间通过人体和器件电阻释放，形成平均脉冲功率达几万瓦。是以产生高温，超过芯片本征温度形成热击穿。

3.1.4 静电产生

摩擦：日常生活中，任何 2 个不同的材质接触再分离，即可以产生静电，一般材料的绝缘性越好，越容易摩擦生电；

感应：在电场中，由于同性相斥，异性相吸，正负离子就会转移，在其表面产生电荷；

传导：带电物体相互接触，发生电荷转移。

3.2 静电对 LED 的危害

3.2.1 静电的危害

(1)瞬间的电场或者电流产生的热，使 LED 局部受伤，表现为漏电流迅速增加，且能工作，但亮度降低，寿命变短；

(2)静电吸附灰尘，降低 LED 产品的绝缘电阻（缩短寿命）；

(3)电场或者电流击穿绝缘层，使 LED 器件无法工作，表现为死灯；

(4)静电放电产生的电磁场很大，频谱很宽，对 LED 产品造成干扰甚至损坏（电磁干扰）。

3.2.2 静电防护以及消除措施

对所有工序（生产，测试，包装等）所有直接接触 LED 的员工都要做好防护和消除静电措施，主要有:

(1)车间铺设防静电地板并做好接地工作，工作台采用防静电工作台，要求工作台及与产品相接触之处使用表面电阻为 10^6-$10^9\Omega$ 的桌垫。

(2)生产的机台，所有的设备，电烙铁以及检测设备均需要良好的接地，接地交流阻抗小于 1.0Ω。在易产生静电的环境和设备上，需要安装离子风扇，作业过程中，操作员穿静电服，带静电环，取放材料时不可触碰胶体部分。

(3)盛装 LED 需要使用静电元件盒，包装则采用防静电材料。

(4)请保持环境湿度在 50%左右，以免空气过于干燥产生静电。

第四章：LED 应用线路设计

4.1 LED 在线路中的设计方式

在应用产品的电路设计中，根据驱动电压，电流的不同，会选择不同的串并联组合方式，应充分了解 LED 的电，热，光的特性，以确保 LED 产品长期工作的可靠性，为降低串

联线路中单灯出现故障后，对整个支路带来使用风险，应尽量避免支路中串联数量过多的LED，单灯并联应用市场，如果采用恒压供电模式，应实际评估各LED的伏安曲线的差异对光强产生变化所带来的影响，并采用一定措施平衡各单灯之间的电流值。

LED属于恒流型元器件，避免选用定电压的方式点亮LED，否则会产生亮度不一致，且当环境温度升高LED结温上升使内阻减小，稳压电源供电则使LED电压升高，影响其寿命，严重的使LED内部结构破坏，故最好使用恒流电源供电，以保证产品不受外界影响，保证品质。

第五章：组装方式

5.1 作业前准备工作

对于整个工序（生产，测试，包装等）所有与LED直接接触的员工都要做好防护和消除静电措施，正式生产前需要做一下自检动作：

(1)检查机台设备，工作台接地线是否正常。

(2)检查人员佩戴静电环是否都正常。

(3)插件时最好要求作业员佩戴静电手套或者静电指套。

(4)作业台前面要求铺好静电皮。

(5)检查测试仪器，驱动电源是否存在漏电或者静电释放的情形。

(6)检查机台，设备参数，是否调试电性能合格输出。

5.2 车间环境以及物料安全管控

(1)车间环境最好保证在20-30℃，50%湿度范围内（采用温度计实时监控环境变化），并且接触LED检查时需要静电手套或者指套，包装袋开口后及时封口，防止不明气体或者液体影响LED外观。

(2)避免LED暴露在偏酸性的车间环境中，对于采购的其他LED组装配套物料，可要求生产厂家提供物料MSDS报告（物质安全数据表），确认其中是否含硫（如PCB板，橡胶手套，橡皮筋，硫磺香皂中均含有硫），卤素类物质（如玻璃胶，低端双组份树脂胶），以防止其与LED材料发生化学反应或者物理反应，例如LED与含硫，含卤物质接触或者存在酸性环境下，极易造成LED成品镀银层腐蚀，LED硅胶，银光粉物料性能发生改变，从而导致

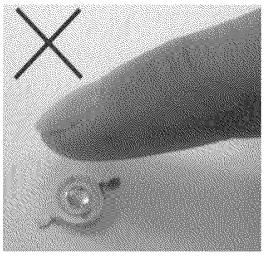
LED 光电性能失效。

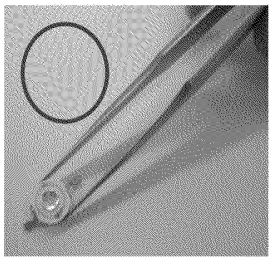
(3)LED 产品的硫化危害

LED 硫化现象在整个 LED 应用行业都是比较容易忽略的大问题，当 LED 产品接触到含硫物质，由于硅胶本身的高度的透氧透湿特性，硫元素极易渗透到支架的功能区，与镀银层发生化学反应。通常含有硫物质的物品有：PCB 板，橡胶手套，橡皮筋，硫磺香皂，橡胶操作台等橡胶制品。

通常 LED 发生硫化都是在产品贴装，回流焊接完成后，放置一段时间才逐渐发现，硫化后的产品表现为支架功能区发黑，光衰严重。

5.3 材料的取拿方式





正确的方式是用镊子夹住支架 2 边，切勿触碰硅胶部分和引脚部分，否则可能造成产品电路不良和引脚变形。

第六章：焊接条件

6.1 各种产品的焊接方式

产品类型	烙铁焊	回流焊	波峰焊	共晶焊
仿流明系列	√	√	×	√
贴片系列	√	√	×	√

6.2 仿流明产品焊接前提条件

产品拆封后未按照要求除湿作业可能会产生的不良：

(1)材料胶体产生剥离，导致产品出光强度下降，严重的导致死灯；

(2)材料胶体产生胶裂，导致材料死灯。

6.3 仿流明产品烙铁焊工艺

(1)在铝基板产品散热处涂抹散热硅胶，只需薄薄一层，不能太多或溢出，否则不但增加不了导热作用，反而会形成隔热层；

(2)很好的清洁焊点，取用 LED 产品时用镊子夹住 LED 支架两侧；

(3)调节烙铁焊接温度控制在 400℃以内，烙铁必须接地，焊接台最好是要有离子吹风机；

(4)焊接时，烙铁焊头不可碰及胶体；焊接时间少于 5 秒，当引脚受热至 85℃或高于此温度时,胶体不可受外界压力，否则金线会断开；

(5)焊好一点后，焊该 LED 的另一点的间隔时间不能太短；

(6)焊接完成后，检查产品是否虚焊，漏焊。

6.4 仿流明产品回流焊工艺

(1)回流焊温度曲线图及对应的湿敏等级要求：

序号	回流焊温度	湿敏等级	环境要求
1	低温（200+/-5 度 5S）	3	≤30℃/60%RH
2	中温（215+/-5 度 5S）	4	≤30℃/60%RH
3	高温（260+/-5 度 5S）	5	≤30℃/60%RH

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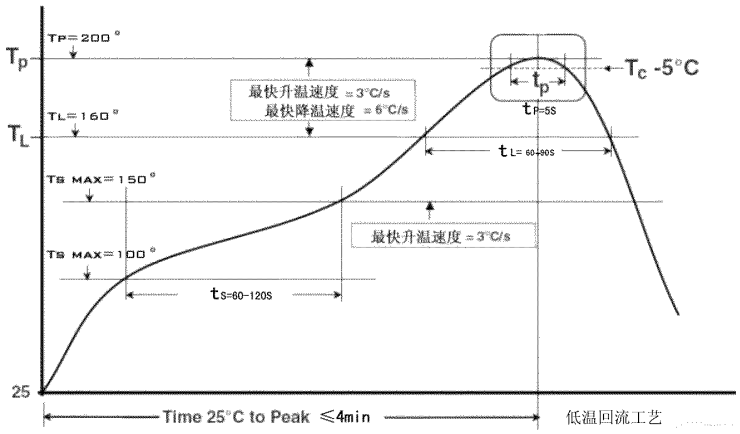
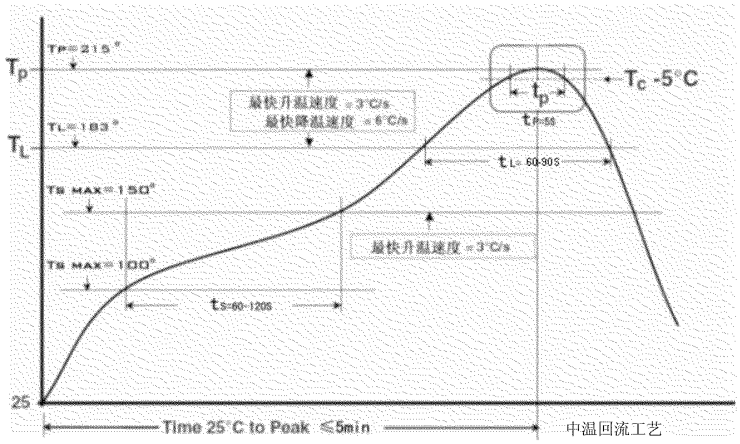


低温回流工艺



中温回流工艺

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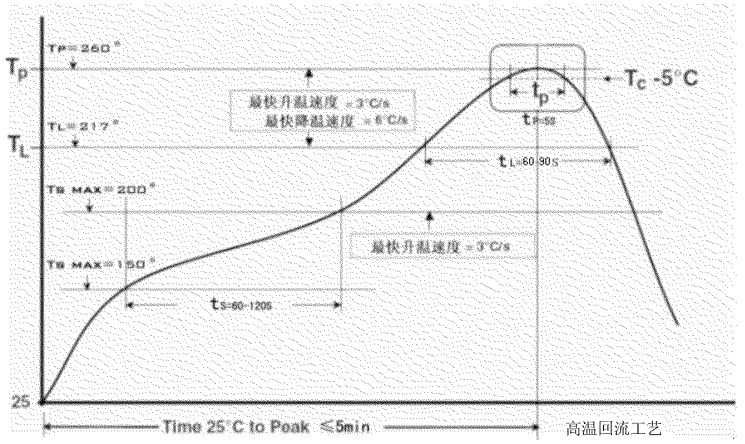

回流焊曲线说明：

回流焊接工艺	低温回流焊接工艺	中温回流焊接工艺	高温回流焊接工艺
温度曲线特点	无铅低温锡膏（153℃熔点锡膏）	无铅锡膏（183℃熔点锡膏）	无铅锡膏（217℃熔点锡膏）
最快升温速度	最大 3℃/S	最大 3℃/S	最大 3℃/S
预热温度：最小温度（Ts min）	100℃	100℃	150℃
预热温度：最大温度（Ts max）	150℃	150℃	200℃
预热时间：（ts）	60-120S	60-120S	60-180S
焊接温度（TL）	160℃	183℃	217℃
以上温度保持：（tL）	40S	40S	20-30S
峰值温度	200℃	215℃	260℃
实际维持最高温度±5℃内时间	5S	5S	5S
温度允许下降最大斜率	6℃/S	6℃/S	6℃/S
常温到峰值温度时间	4 分钟	5 分钟	5 分钟

注意事项：

(1)在量产之前，必须先小批量 100pcs 试产，待试产 100%合格，方可进行大批量投产；

(2)LED 回流焊工艺参考如上图，不论如何更改回流参数，最高温度不能太长，否则高温下可能导致 LED 产品功能失效；

(3)回流焊作业完成后，LED 内部温度仍然维持在较高状态，此时不能马上对 LED 单灯或者成品进行通电，必须等 LED 冷却常温后再通电测试；

(4)LED 灯回流焊只允许过一次；

(5)回流焊过程中不要对硅胶施加压力；

(6)建议选用熔点偏低的锡膏；

(7)以上参考图是 153℃无铅锡膏，183℃无铅锡膏和 217℃无铅锡膏的回流焊工艺图，需要其他熔点的锡膏则需要加上锡膏熔点差的温度，注意使用高温焊接时必须确定真空包装完好或产品未吸潮。

6.5 贴片产品焊接工艺

(1)贴片回流焊接工艺参考仿流明产品。

(2)手工焊接工艺参考仿流明产品。

第七章：热学管理

7.1 散热外壳要求：

外形与材质：如果成品密封性不高，可与外界空气环境直接发生对流，建议采用带鳍片或者单面铝基板。

7.2 有效散热表面积：

对于大功率 1w 的 LED，我司推荐散热片有效散热面积≥30 平方厘米，对于 3w 的产品，推荐散热片有效散热面积≥80 平方厘米，尽量保证散热片温度不超过 50℃。

功率	散热器连接面积	散热器连接面厚度	散热鳍片		
1W	9-25cm²	≥1.5mm	鳍片厚度	鳍片距离	鳍片高度

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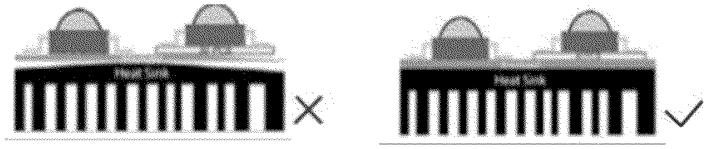
2W	36-80cm²	≥3.5mm	≥1.5mm	1.5-2.5mm	≥20mm
3W	90-170cm²	≥5mm			

7.3 散热片的连接方法：

大功率 LED 基板与散热片连接时请保证两接触面平整，接触良好，加强两接触面的结合程度，建议在 LED 基板底部或散热片表面涂覆一层导热硅胶（导热系数≥3.0W/m.k）或者锡膏，厚度要求 100um 以下，请勿采用劣质硅胶或者其他粘结物质（不但起不到导热作用，反而形成隔热层）。



第八章：清洗方法

8.1 仿流明产品的清洗：

在使用过程中，尽量避免助焊剂，应用防水密封胶，粘接胶，油污等异物附着在胶体表面，需要清洁灯体时，可以用无尘布轻擦拭赃污部位。如果使用无尘布很难擦拭干净，则用干净的无尘布（或者软质的棉纱布）吸取适量的酒精轻力擦拭（酒精不能使用太多，因为过多的酒精挥发会造成透镜表面模糊）。先将灯体表面的杂质轻轻擦拭干净后（防止用力过大，破坏 LED 内部结构），常温下自然干燥，再开始使用，同时注意避免将贴片 LED 浸泡在乙醇溶液中。

避免使用不明化学液体，酸性溶剂作为清洗剂，在使用溶剂前（如洗板水），请先确认其所含化学成份是否会对硅胶，支架，支架镀银层等造成腐蚀，并由此导致 LED 特性改变或者功能损坏。

8.2 贴片产品的清洗：

贴片产品的清洗参考上述仿流明产品的清洗。

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第九章：电性测试与应用须知

9.1 电性能测试注意事项

(1)LED 不允许反向驱动，且线路之间产生脉冲的电流应远小于 LED 规格上线，以避免可能导致芯片击穿；

(2)测试时候，限流措施是必须的，否则轻微的电压变化会导致较大的电流变化，可能导致 LED 失效，建议客户在焊接后用偏小电流，电压进行测试（例如 140B 产品，建议使用 1.7V,800mA 进行电性能测试）；

(3)员工在测试灯板的过程中，必须严格规定先连接灯板的电路，再给驱动电路供电，否则将会造成芯片 PN 结击穿漏电等不良；

(4)注意避免 LED 应用产品在酸性，硫浓度较高的环境下使用。

(5)LED 应用产品在组装，防水处理也要避免接触到 PH＜7 的酸性防水胶，酸性热焊性溶剂等；

(6)针对户外使用 LED 应用产品，应做好接地保护，以防止漏电或者雷击对产品带来破坏。

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深圳市旭晟实业有限公司

SHENZHEN XUSHENG INDUSTRY CO.,LTD.

样 品 承 认 书

安 全 操 作 手 册

客户名称： 浙江大华技术股份有限公司

产品型号： SE03-HP6070M（35mil）

送样日期： _____

我司确认栏:

制样工程师	销售工程师	审批

客户确认栏：

工程（研发）确认	采购确认	审批

地址：广东省深圳市宝安区石岩镇塘头一路中运泰科技工业园 10 栋 3 楼
电话：0755-29361800/29361900 传真：0755-29169390
网址：www.xssy-led.com

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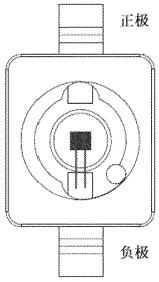
XSSY® 旭成鑫荣

■ **特点:**
- **•高辐射强度**
- **•高可靠性**
- **•高输出功率在 850nm**

■ **应用：**
- **•用于红外探照灯**
- **•用于 CCD 照明**
- **•用于夜视照明**



■ **电性能特点：**

项目	符号	最大额定值	单位	环境温度
功耗	Pd	1.8	W	Ta=25°C
正向电流	IF	≤1000	mA	Ta=25°C
反向电压	VR	5.0	V	Ta=25°C
工作温度	TOPR	-25℃ to +80℃	°C	-
存储温度	TSTG	-25℃ to +80℃	°C	-
焊接温度	TSOL	260℃ for 5sec	°C	-

■ **光性能特点：**

项目	符号	条件	最小	平均	最大	单位
辐射强度	Ee	IF=1000mA	-	190	-	Mw/sr
视角	$2\theta_{1/2}$	-	-	120	-	Deg
光线光谱	λp	IF=1000mA	-	850	-	nm
光谱线半波宽	Δλ	IF=1000mA	-	20	-	nm
正向电压	VF	IF=1000mA	-	1.8	2.2	V
反向电压	IR	VR=5.0V	-	-	10	μA

■ **电压的分档：**

	档位 电压	**MIN**	**MAX**
I=800mA	**I**	**1.6V**	**1.7V**
	II	**1.7V**	**1.8V**
	III	**1.8V**	**1.9V**
	IV	**1.9V**	**2.0V**

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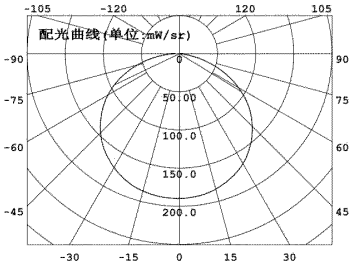
■ **光学特性曲线：**

Fig.1-Radition Diagram



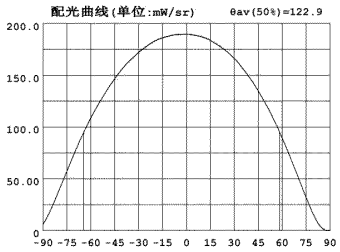
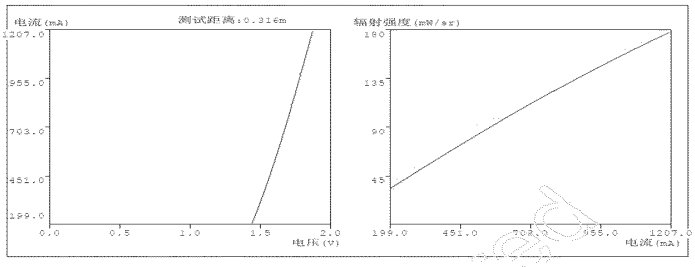


Fig.2-Relative Radiant vs Electronic



辐射强度分布数据:(角度° ， 辐射强度mW/sr) C0-180

角度	强度	角度	强度	角度	强度	角度	强度	角度	强度	角度	强度
-90.0	5.945	-58.0	114.5	-26.0	177.0	6.0	188.4	38.0	151.2	70.0	51.91
-88.0	11.24	-56.0	120.0	-24.0	179.3	8.0	187.8	40.0	146.9	72.0	43.98
-86.0	17.32	-54.0	125.4	-22.0	181.2	10.0	186.9	42.0	142.2	74.0	36.22
-84.0	24.14	-52.0	130.3	-20.0	183.0	12.0	185.7	44.0	137.5	76.0	28.57
-82.0	31.29	-50.0	135.3	-18.0	184.5	14.0	184.5	46.0	132.4	78.0	21.18
-80.0	38.72	-48.0	140.0	-16.0	185.6	16.0	182.7	48.0	127.1	80.0	14.53
-78.0	46.28	-46.0	144.5	-14.0	186.6	18.0	180.9	50.0	121.7	82.0	8.579
-76.0	53.70	-44.0	148.8	-12.0	187.6	20.0	178.9	52.0	116.0	84.0	4.035
-74.0	61.18	-42.0	152.9	-10.0	188.3	22.0	176.7	54.0	109.8	86.0	1.279
-72.0	68.58	-40.0	156.7	-8.0	188.9	24.0	174.5	56.0	103.4	88.0	0
-70.0	75.78	-38.0	160.3	-6.0	189.2	26.0	172.1	58.0	96.67	90.0	0
-68.0	82.99	-36.0	163.5	-4.0	189.5	28.0	169.4	60.0	89.59		
-66.0	89.77	-34.0	166.3	-2.0	189.5	30.0	166.3	62.0	82.45		
-64.0	96.45	-32.0	169.3	0.0	189.6	32.0	163.0	64.0	75.03		
-62.0	102.7	-30.0	172.0	2.0	189.4	34.0	159.2	66.0	67.36		
-60.0	108.7	-28.0	174.7	4.0	189.9	36.0	155.2	68.0	59.68		

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■ LED 芯片特性曲线:

Fig. 1-Relative Radiant Flus vs. Forward Current

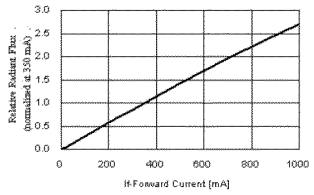


Fig. 1-Forward Current vs. Forward Voltage

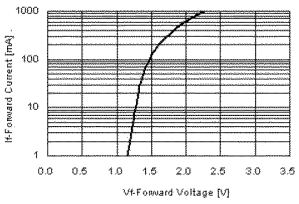


Fig. 3-Relative Radiant Flus(350mA) vs. Ambient Temperature

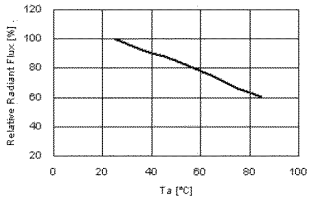


Fig. 4- Forward Voltage Flus(@350mA) vs. Ambient Temperature

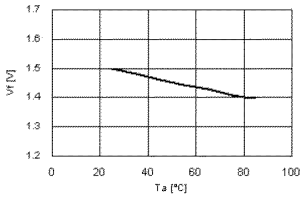


Fig. 5-Peak Wavelengh(@350mA) vs. Ambient Temperature

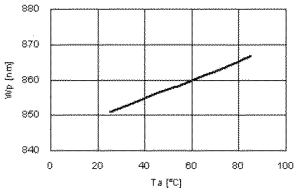
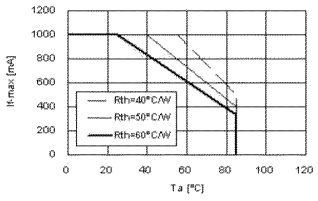


Fig. 6-Maximum Dirving Forward DC Current vs. Ambient Temperature(Derating based on Tj max.=115°)



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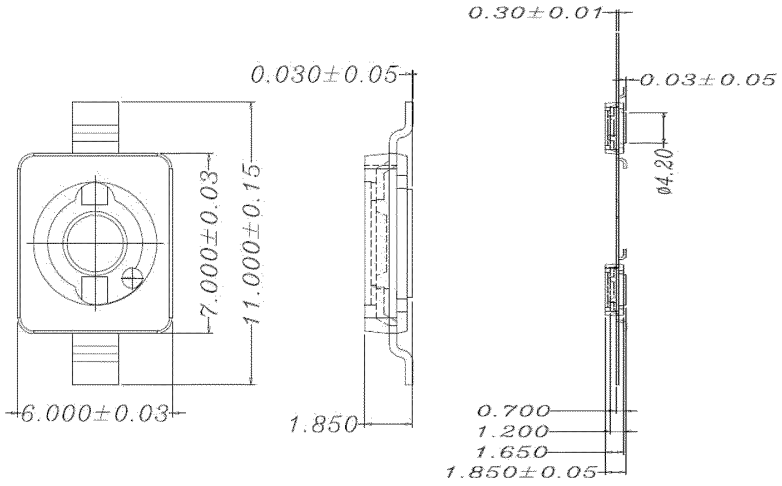
■ **外观尺寸：**



Notes:
1. All dimensions are in millimeters(所有尺寸以毫米为单位)

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■ **可靠性试验：**

寿命测试：

测试项目	测试条件	持续时间	测试数量	评估 ok 标准	评估等级
光衰老化测试	正常电流	1000H	10pcs	平均辐射强度衰减≤5%	*
加速光衰老化测试	1.5 倍/2.0 倍正常电流	200H	10pcs	平均辐射强度衰减≤5%	*
抗氧化测试	衰减老化后	---	---	衰减前后不变色	*

机械测试：

测试项目	测试条件	持续时间	测试数量	评估 ok 标准	评估等级
手动焊接测试	400℃/5 秒	5S	100pcs	0 失效	*
回流焊接测试	260℃	1 次回流焊	1000pcs	0 失效	*

环境测试：

测试项目	测试条件	持续时间	测试数量	评估 ok 标准	评估等级
硅胶支架结合度	260℃	1 次回流焊	1000pcs	0 失效	*
冷热冲击	-35℃~90℃	1H/100T	100pcs	0 失效	*
高温存储	150℃	24 小时	100pcs	0 失效	*
低温存储	-30℃	24 小时	100pcs	0 失效	*

电性能测试：

测试项目	测试条件	持续时间	测试数量	评估 ok 标准	评估等级
正向电流	正常电流的 2 倍	24H	10pcs	0 死灯，0 漏电	*
反向电压	15V 反向加电压	---	10pcs	0 死灯，0 漏电	*
发光角度	配光曲线测试仪	---	10pcs	10%波动范围	
辐射强度	辐射强度测试仪	---	10pcs	10%波动范围	

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XSSY® 旭晟實業

LED 安全使用手册 R&D:2012.12.17
USER MANUAL

尊敬的客户：

感谢您使用本公司的产品。为了增进您对我司 LED 产品的了解，方便您安全地掌握本公司产品的操作方法，安全规范的使用本公司产品，尽量避免，减少人为因素而造成的产品损坏，使本公司产品能更好的为您服务。

我们会根据您的需要为您提供完善的技术支持以及售前售后服务。

在使用我司 LED 产品前，请您先仔细阅读本手册，了解所用的 LED 的使用方法和相关参数，以及注意事项。

同时需要补充的是：即便是相同规格的 LED，在实际应用中其可靠性与整体系统设计水平，作业方式，使用条件息息相关，本手册中的内容未能涵盖所有的问题，由此带来的不便，敬请谅解！为此，我们会继续完善，不定期的更新本使用手册，期间如发生相关信息更改，将不作另行通知。

深圳市旭晟实业有限公司 工程部

地址：广东省深圳市宝安区石岩镇塘头一路中运泰科技工业园 10 栋 3 楼
电话：0755-29361800/29361900 传真：0755-29169390
网址：www.xssy-led.com

Enclosures

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XSSY® 旭成賓業

第一章：产品介绍
1.1 仿流明系列----------
1.2 贴片系列----------
第二章：装运与保存
2.1 仿流明系列的装运与保存----------
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8.1 仿流明产品清洗方法----------
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第九章：电性测试须知----------

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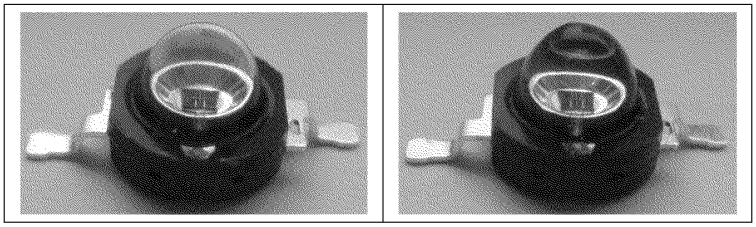
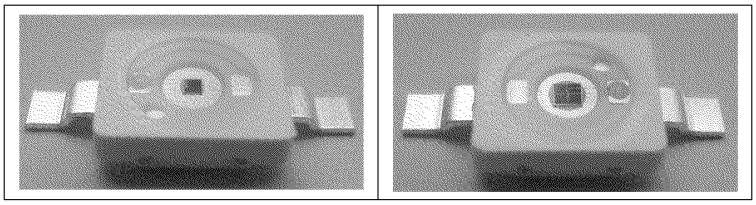
第一章：产品介绍

1.1 仿流明产品系列



1.2 贴片产品系列



第二章：装运与保存

2.1 仿流明产品系列的装运与保存

2.1.1 仿流明产品的装运

此系列 LED 产品采用料管装料，然后用防尘，防潮，防静电铝箔袋真空包封，搬运过程中应避免挤压，刺穿包装袋的情况发生，同时做好必要的静电防护措施，如上线作业前 LED 包装袋已经破损，漏气，请直接停止使用，将该包装产品进行测试与除湿作业后再进行使用。

2.1.2 仿流明产品的包装规格

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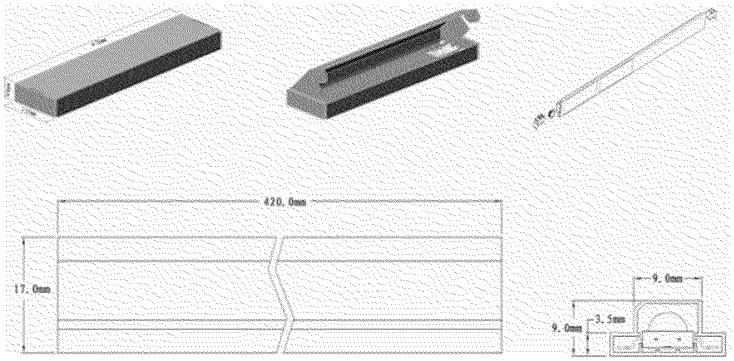
(1)每盒内有 1 静电包装袋；

(2)每包静电袋中 20 管料管

(3)每管料管中 50pcs 产品；



2.1.3 仿流明产品开封前存储

LED 属于潮湿敏感性元件，在高温状态下，渗入其中的湿气快速膨胀产生足够的蒸汽压力损伤 LED 元件，从而出现材料内部结构发生变化，造成可靠性失效问题。为避免由吸潮引发的可靠性失效问题，需要做好 LED 产品焊接前的存储与防潮措施。

如果铝箔袋未打开，产品的保存环境需要控制在 20-30℃/60%RH 内。

2.2 贴片产品系列的装运与保存

2.2.1 此系列 LED 产品采用料盘装料，然后用防尘，防潮，防静电铝箔袋真空包封，其余运输与保存方法与仿流明产品一致。

2.2.2 贴片产品的包装规格

贴片产品包装参考以下图片，具体包装请与实际情况为准。

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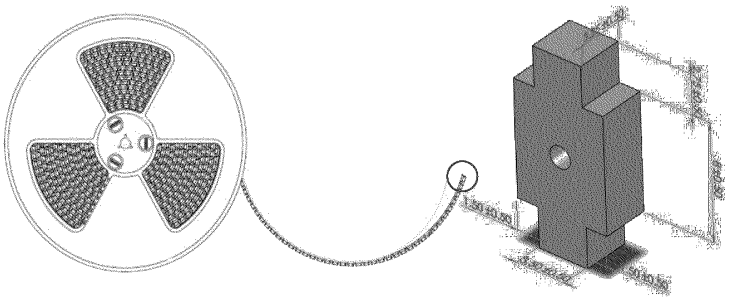


第三章：静电防护

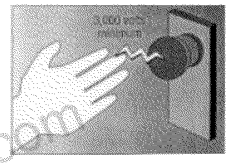
3.1 静电的原理与产生

3.1.1 静电特点：高电位，低电量，小电流，短作用时间。

LED 属于 SSD 半导体器件，需要在半成品，成品装配过程中加强对静电的防范（尤其是在干燥的冬季）

3.1.2 几种常见的静电对照表

静电来源	湿度对静电电位的影响	
	10%-25%RH	65%-90%RH
行走在地毯上	35000V	15000V
行走在胶地板上	12000V	250V
在工作台上操作	6000V	100V
捡起塑料胶袋	20000V	1200V
推动发泡胶椅子	18000V	1500V



3.1.3 静电击穿本质

当带电的物体接触 LED 器件，并通过器件对地放电，不论 LED 是正向还是反向状态，静电电流均会在十分之一微秒的时间通过人体和器件电阻释放，形成平均脉冲功率达几万瓦。是以产生高温，超过芯片本征温度形成热击穿。

3.1.4 静电产生

摩擦：日常生活中，任何 2 个不同的材质接触再分离，即可以产生静电，一般材料的绝缘性越好，越容易摩擦生电；

感应：在电场中，由于同性相斥，异性相吸，正负离子就会转移，在其表面产生电荷；

传导：带电物体相互接触，发生电荷转移。

3.2 静电对 LED 的危害

3.2.1 静电的危害

(1)瞬间的电场或者电流产生的热，使 LED 局部受伤，表现为漏电流迅速增加，且能工作，但亮度降低，寿命变短；

(2)静电吸附灰尘，降低 LED 产品的绝缘电阻（缩短寿命）；

(3)电场或者电流击穿绝缘层，使 LED 器件无法工作，表现为死灯；

(4)静电放电产生的电磁场很大，频谱很宽，对 LED 产品造成干扰甚至损坏（电磁干扰）。

3.2.2 静电防护以及消除措施

对所有工序（生产，测试，包装等）所有直接接触 LED 的员工都要做好防护和消除静电措施，主要有:

(1)车间铺设防静电地板并做好接地工作，工作台采用防静电工作台，要求工作台及与产品相接触之处使用表面电阻为 10^6-$10^9\Omega$ 的桌垫。

(2)生产的机台，所有的设备，电烙铁以及检测设备均需要良好的接地，接地交流阻抗小于 1.0Ω。在易产生静电的环境和设备上，需要安装离子风扇，作业过程中，操作员穿静电服，带静电环，取放材料时不可触碰胶体部分。

(3)盛装 LED 需要使用静电元件盒，包装则采用防静电材料。

(4)请保持环境湿度在 50%左右，以免空气过于干燥产生静电。

第四章：LED 应用线路设计

4.1 LED 在线路中的设计方式

在应用产品的电路设计中，根据驱动电压，电流的不同，会选择不同的串并联组合方式，应充分了解 LED 的电，热，光的特性，以确保 LED 产品长期工作的可靠性，为降低串

联线路中单灯出现故障后，对整个支路带来使用风险，应尽量避免支路中串联数量过多的LED，单灯并联应用市场，如果采用恒压供电模式，应实际评估各LED的伏安曲线的差异对光强产生变化所带来的影响，并采用一定措施平衡各单灯之间的电流值。

LED属于恒流型元器件，避免选用定电压的方式点亮LED，否则会产生亮度不一致，且当环境温度升高LED结温上升使内阻减小，稳压电源供电则使LED电压升高，影响其寿命，严重的使LED内部结构破坏，故最好使用恒流电源供电，以保证产品不受外界影响，保证品质。

第五章：组装方式

5.1 作业前准备工作

对于整个工序（生产，测试，包装等）所有与LED直接接触的员工都要做好防护和消除静电措施，正式生产前需要做一下自检动作：

(1)检查机台设备，工作台接地线是否正常。

(2)检查人员佩戴静电环是否都正常。

(3)插件时最好要求作业员佩戴静电手套或者静电指套。

(4)作业台前面要求铺好静电皮。

(5)检查测试仪器，驱动电源是否存在漏电或者静电释放的情形。

(6)检查机台，设备参数，是否调试电性能合格输出。

5.2 车间环境以及物料安全管控

(1)车间环境最好保证在20-30℃，50%湿度范围内（采用温度计实时监控环境变化），并且接触LED检查时需要静电手套或者指套，包装袋开口后及时封口，防止不明气体或者液体影响LED外观。

(2)避免LED暴露在偏酸性的车间环境中，对于采购的其他LED组装配套物料，可要求生产厂家提供物料MSDS报告（物质安全数据表），确认其中是否含硫（如PCB板，橡胶手套，橡皮筋，硫磺香皂中均含有硫），卤素类物质（如玻璃胶，低端双组份树脂胶），以防止其与LED材料发生化学反应或者物理反应，例如LED与含硫，含卤物质接触或者存在酸性环境下，极易造成LED成品镀银层腐蚀，LED硅胶，银光粉物料性能发生改变，从而导致

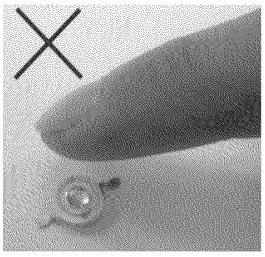
LED 光电性能失效。

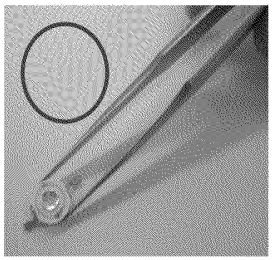
(3)LED 产品的硫化危害

LED 硫化现象在整个 LED 应用行业都是比较容易忽略的大问题，当 LED 产品接触到含硫物质，由于硅胶本身的高度的透氧透湿特性，硫元素极易渗透到支架的功能区，与镀银层发生化学反应。通常含有硫物质的物品有：PCB 板，橡胶手套，橡皮筋，硫磺香皂，橡胶操作台等橡胶制品。

通常 LED 发生硫化都是在产品贴装，回流焊接完成后，放置一段时间才逐渐发现，硫化后的产品表现为支架功能区发黑，光衰严重。

5.3 材料的取拿方式





正确的方式是用镊子夹住支架 2 边，切勿触碰硅胶部分和引脚部分，否则可能造成产品电路不良和引脚变形。

第六章：焊接条件

6.1 各种产品的焊接方式

产品类型	烙铁焊	回流焊	波峰焊	共晶焊
仿流明系列	√	√	×	√
贴片系列	√	√	×	√

6.2 仿流明产品焊接前提条件

产品拆封后未按照要求除湿作业可能会产生的不良：

(1)材料胶体产生剥离，导致产品出光强度下降，严重的导致死灯；

(2)材料胶体产生胶裂，导致材料死灯。

6.3 仿流明产品烙铁焊工艺

(1)在铝基板产品散热处涂抹散热硅胶，只需薄薄一层，不能太多或溢出，否则不但增加不了导热作用，反而会形成隔热层；

(2)很好的清洁焊点，取用 LED 产品时用镊子夹住 LED 支架两侧；

(3)调节烙铁焊接温度控制在 400℃以内，烙铁必须接地，焊接台最好是要有离子吹风机；

(4)焊接时，烙铁焊头不可碰及胶体；焊接时间少于 5 秒，当引脚受热至 85℃或高于此温度时,胶体不可受外界压力，否则金线会断开；

(5)焊好一点后，焊该 LED 的另一点的间隔时间不能太短；

(6)焊接完成后，检查产品是否虚焊，漏焊。

6.4 仿流明产品回流焊工艺

(1)回流焊温度曲线图及对应的湿敏等级要求：

序号	回流焊温度	湿敏等级	环境要求
1	低温（200+/-5 度 5S）	3	≤30℃/60%RH
2	中温（215+/-5 度 5S）	4	≤30℃/60%RH
3	高温（260+/-5 度 5S）	5	≤30℃/60%RH

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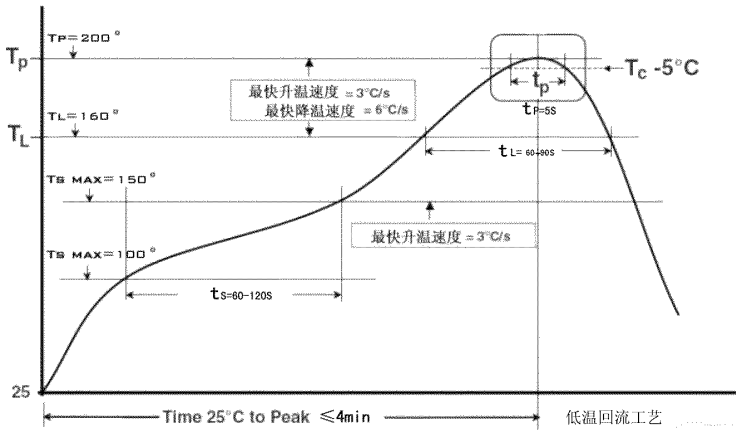
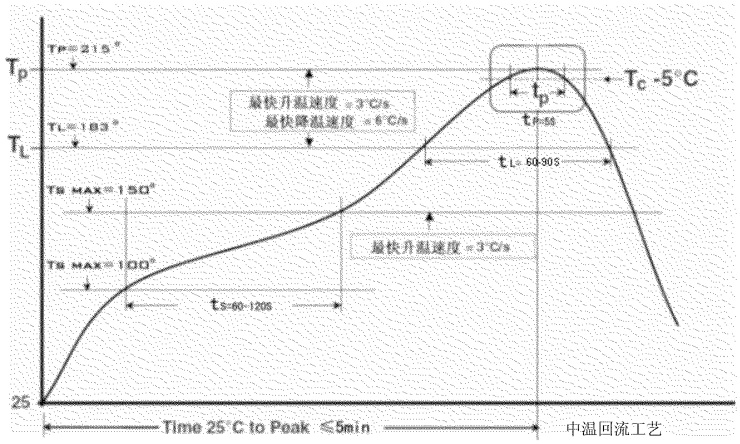
XSSY® 旭成实業



低温回流工艺

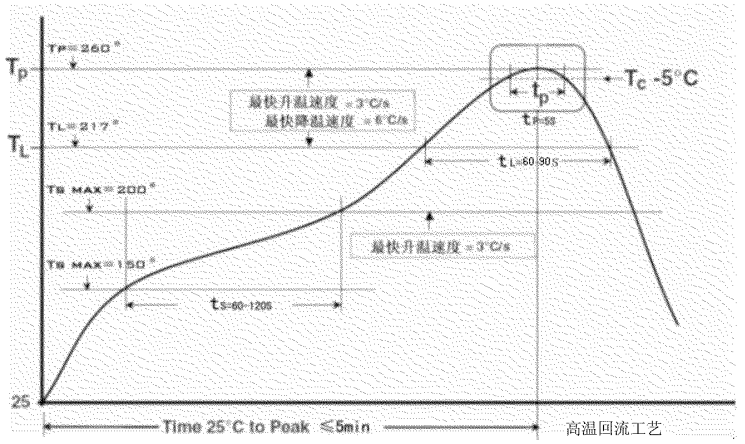


中温回流工艺

地址：广东省深圳市宝安区石岩镇塘头一路中运泰科技工业园 10 栋 3 楼
电话：0755-29361800/29361900 传真：0755-29169390
网址：www.xssy-led.com

Misc ID 7-04

XSSY® 旭成實業



回流焊曲线说明：

回流焊接工艺	低温回流焊接工艺	中温回流焊接工艺	高温回流焊接工艺
温度曲线特点	无铅低温锡膏（153℃熔点锡膏）	无铅锡膏（183℃熔点锡膏）	无铅锡膏（217℃熔点锡膏）
最快升温速度	最大 3℃/S	最大 3℃/S	最大 3℃/S
预热温度：最小温度（Ts min）	100℃	100℃	150℃
预热温度：最大温度（Ts max）	150℃	150℃	200℃
预热时间：（ts）	60-120S	60-120S	60-180S
焊接温度（TL）	160℃	183℃	217℃
以上温度保持：（tL）	40S	40S	20-30S
峰值温度	200℃	215℃	260℃
实际维持最高温度±5℃内时间	5S	5S	5S
温度允许下降最大斜率	6℃/S	6℃/S	6℃/S
常温到峰值温度时间	4 分钟	5 分钟	5 分钟

注意事项：

(1)在量产之前，必须先小批量 100pcs 试产，待试产 100%合格，方可进行大批量投产；

(2)LED 回流焊工艺参考如上图，不论如何更改回流参数，最高温度不能太长，否则高温下可能导致 LED 产品功能失效；

(3)回流焊作业完成后，LED 内部温度仍然维持在较高状态，此时不能马上对 LED 单灯或者成品进行通电，必须等 LED 冷却常温后再通电测试；

(4)LED 灯回流焊只允许过一次；

(5)回流焊过程中不要对硅胶施加压力；

(6)建议选用熔点偏低的锡膏；

(7)以上参考图是 153℃无铅锡膏，183℃无铅锡膏和 217℃无铅锡膏的回流焊工艺图，需要其他熔点的锡膏则需要加上锡膏熔点差的温度，注意使用高温焊接时必须确定真空包装完好或产品未吸潮。

6.5 贴片产品焊接工艺

(1)贴片回流焊接工艺参考仿流明产品。

(2)手工焊接工艺参考仿流明产品。

第七章：热学管理

7.1 散热外壳要求：

外形与材质：如果成品密封性不高，可与外界空气环境直接发生对流，建议采用带鳍片或者单面铝基板。

7.2 有效散热表面积：

对于大功率 1w 的 LED，我司推荐散热片有效散热面积≥30 平方厘米，对于 3w 的产品，推荐散热片有效散热面积≥80 平方厘米，尽量保证散热片温度不超过 50℃。

功率	散热器连接面积	散热器连接面厚度	散热鳍片		
1W	9-25cm²	≥1.5mm	鳍片厚度	鳍片距离	鳍片高度

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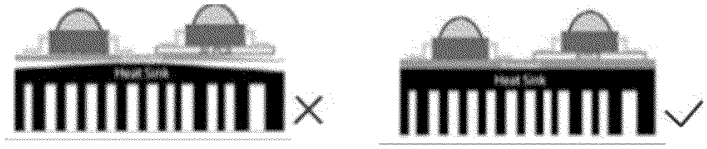
2W	36-80cm²	≥3.5mm	≥1.5mm	1.5-2.5mm	≥20mm
3W	90-170cm²	≥5mm			

7.3 散热片的连接方法：

大功率 LED 基板与散热片连接时请保证两接触面平整，接触良好，加强两接触面的结合程度，建议在 LED 基板底部或散热片表面涂覆一层导热硅胶（导热系数≥3.0W/m.k）或者锡膏，厚度要求 100um 以下，请勿采用劣质硅胶或者其他粘结物质（不但起不到导热作用，反而形成隔热层）。



第八章：清洗方法

8.1 仿流明产品的清洗：

在使用过程中，尽量避免助焊剂，应用防水密封胶，粘接胶，油污等异物附着在胶体表面，需要清洁灯体时，可以用无尘布轻擦拭赃污部位。如果使用无尘布很难擦拭干净，则用干净的无尘布（或者软质的棉纱布）吸取适量的酒精轻力擦拭（酒精不能使用太多，因为过多的酒精挥发会造成透镜表面模糊）。先将灯体表面的杂质轻轻擦拭干净后（防止用力过大，破坏 LED 内部结构），常温下自然干燥，再开始使用，同时注意避免将贴片 LED 浸泡在乙醇溶液中。

避免使用不明化学液体，酸性溶剂作为清洗剂，在使用溶剂前（如洗板水），请先确认其所含化学成份是否会对硅胶，支架，支架镀银层等造成腐蚀，并由此导致 LED 特性改变或者功能损坏。

8.2 贴片产品的清洗：

贴片产品的清洗参考上述仿流明产品的清洗。

Misc ID 7-04

第九章：电性测试与应用须知

9.1 电性能测试注意事项

(1)LED 不允许反向驱动，且线路之间产生脉冲的电流应远小于 LED 规格上线，以避免可能导致芯片击穿；

(2)测试时候，限流措施是必须的，否则轻微的电压变化会导致较大的电流变化，可能导致 LED 失效，建议客户在焊接后用偏小电流，电压进行测试（例如 140B 产品，建议使用 1.7V,800mA 进行电性能测试）；

(3)员工在测试灯板的过程中，必须严格规定先连接灯板的电路，再给驱动电路供电，否则将会造成芯片 PN 结击穿漏电等不良；

(4)注意避免 LED 应用产品在酸性，硫浓度较高的环境下使用。

(5)LED 应用产品在组装，防水处理也要避免接触到 PH＜7 的酸性防水胶，酸性热焊性溶剂等；

(6)针对户外使用 LED 应用产品，应做好接地保护，以防止漏电或者雷击对产品带来破坏。

Misc ID 7-05

DH KKYP(S) 021-09 Calibration Equipment List NO.P021-09(S) 20190301 01

Calibration Equipment List

Used No.	Cat.	Equip. No.	Name	Mfr.	Type	Serial No.	Count	Purchase Date	Status	Cal. No.	Range	Max. Accuracy Limits	Cal. Range	Cal. Date	Valid Date	Cal. Loc.	Used Department	Admin	User	Loc.	Assets No.	Note
1	A	TESI-00001	Leakage Current Tester	Kikusui	TOS5101	KE000818	1	2017/12/21	正常	ME-00002	277V, 6mA	电压±1.5% 电流±1.5%	277V, 6mA	2019/1/22	2020/1/21	Centre	ENG&Safety Group	Yan Wang	Safety Engineers	Safety Lab	VCSTES 00006	
2	A	TESI-00002	Electrical Safety Tester	GW INSTEK	GPT-9603	GEB552429	1	2017/12/21	正常	ME-00042	AC:5kV/DC:6kV, 100mA, 3-40A	电压: ±4% 电流: ±4% 时间: ±1% 电弧: ±20%	AC:5kV/DC:6kV, 100mA, 3-40A	2018/8/22	2019/8/20	Ceprei	ENG&Safety Group	Yan Wang	Safety Engineers	Safety Lab	DH-3502 00012 00	
3	A	TESI-00004	Temperature Humidity Chamber	Fcant	SMC-80PF	2x5211	1	2017/4/24	正常	ME-00917	Temp.:-40℃~+150℃; Humidity: 23~98%RH	Temp.:+-2 Humidity: +-3	Temp.:-40℃~150℃ Humidity: 20℃~95%RH	2018/9/24	2019/9/23	Centre	ENG&Safety Group	Yan Wang	Safety Engineers	Safety Lab	DH-3501 00013 00	
4	A	TESI-00005	Digital Resistance	ZHIYU	ZY2520	ZY2520DM1 80818 2	1	2017/4/24	正常	ME-00818	20mΩ~1MΩ	10 rdg ± 200mΩ ±2% (20Ω rng ± 1.5 ±1Ω rng) ±5%	20mΩ~1MΩ	2017/4/24	2018/4/23	Centre	ENG&Safety Group	Yan Wang	Safety Engineers	Safety Lab	DH-3501 00013 00	
5	A	TESI-00006	Standard Test Finger	ZhiHeng	ZT-D2	DZ18031	1	2018/1/5	正常	ME-00031	IEC 60950 Fig 2A	Angular: ±1° Linear dimensions: ±1 mm ≤25mm ±5% >25mm: ±0.5%	IEC 60950 Fig 2A	2018/1/10	2021/1/9	Ceprei	ENG&Safety Group	Yan Wang	Safety Engineers	Safety Lab	DH-3501 00023 00	
6	A	TESI-00007	Test Hook	ZhiHeng	ZT-41B	T0A1714	1	2018/1/5	正常	ME-00820	IEC 60065 Fig 4	Angular: ±1° Linear dimensions: ±1 mm ≤25mm ±0.5% >25mm: ±2%	IEC 60065 Fig 4	2018/1/10	2021/1/9	Ceprei	ENG&Safety Group	Yan Wang	Safety Engineers	Safety Lab	DH-3501 00023 00	
7	A	TESI-00008	test Pin	Hongsheng	H-B06	--	1	2018/5/24	正常	ME-00821	IEC 61032 Probe D	± 0.05 mm	IEC 61032 Probe D	2018/1/10	2021/1/9	Ceprei	ENG&Safety Group	Yan Wang	Safety Engineers	Safety Lab	DH-3501 00023 42	
8	A	TESI-00009	Impact Hammer	ZhiHeng	ZT-10	C011901	1	2018/1/5	正常	ME-00927	0.5 J	±10%	0.5 J	2019/1/10	2022/1/9	Ceprei	ENG&Safety Group	Yan Wang	Safety Engineers	Safety Lab	DH-3501 00023 42	
9	A	TESI-00011	Pull Push Tester	HANDPI	HP-500	2SKC16033 0235	1	2017/4/24	正常	ME-00824	500 N	±1%	500 N	2019/1/10	2022/1/9	Centre	ENG&Safety Group	Yan Wang	Safety Engineers	Safety Lab	DH-3501 00023 42	
10	A	TESI-00012	Steel Ball Impacting	ZhiHeng	ZT-D5	DS1715	1	2017/12/14	正常	ME-00826	200 g 50 mm	mass: ±25 g diameter: ±0.5% mass: ±5 g diameter: ±0.5%	500 g 50 mm	2019/1/10	2022/1/9	Ceprei	ENG&Safety Group	Yan Wang	Safety Engineers	Safety Lab	DH-3501 00023 42	
11	A	TESI-00013	Steel Ball Impacting	ZhiHeng	ZT-D5	DS1715	1	2017/12/14	正常	ME-00826	500 g 50 mm	mass: ±5 g diameter: ±0.5%	500 g 50 mm	2019/1/10	2022/1/9	Ceprei	ENG&Safety Group	Yan Wang	Safety Engineers	Safety Lab	DH-3501 00023 42	
12	A	TESI-00014	Digital Height Gauge	Shanghai	0-600mm	--	1	2018/5/24	正常	ME-00822	0-600mm	±0.03mm	0-600mm	2018/1/10	2021/1/9	Centre	ENG&Safety Group	Yan Wang	Safety Engineers	Safety Lab	DH-3501 00023 42	

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ZHEJIANG DA-HUA TECHNOLOGY CO.,LTD.

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Misc ID 7-07

DH KKYP(S) 021-09 Calibration Equipment List NO.P021-09(S) 20190301 01

Ed.V1.0 Page 3, Total 4

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Enclosures

Misc ID 7-08

DH KKYP(S) 021-09 Calibration Equipment List NO.P021-09(S) 20190301 01

40	A	TEST-0003-8	Power Analyzer	YOKOGAWA	PA3004-1E8	1	2017/7/14	正常	NEW-0838	3000V 20A 20KHz	U:±0.5% I: F:	3000V 20A 20KHz	2017/7/14	Current	Dongguan Safety Group	Yan Wang	Safety Test Engineers	Safety Lab	DH-3502-00023	88			
41	A	TEST-0003-1	Test Finger	Shanghai Taiding Finger	ZST-1274	1	2016/1/5	正常	NEW-0839	Angle: ±1° Straightness: ±0.1mm Diameter: ±0.1mm Length: ±0.5mm	Angle: ±1° Straightness: ±0.1mm Diameter: ±0.1mm Length: ±0.5mm	IEC 60529 Fig 2A	2015/12/10	ZST-1274	Current	Dongguan Safety Group	Yan Wang	Safety Test Engineers	Safety Lab	DH-3501-00023-7	99			
42	A	TEST-0004-2	30.4VDC Power & thermocouple	OMEGA	TT-K-30-1000	1	2017/12/14	正常	NEW-0840	-40~200℃	±2℃	0~200℃	2018/12/12	\	Current	Dongguan Safety Group	Yan Wang	Safety Test Engineers	Safety Lab	--				
43	A	TEST-0004-3	FMC Humidity System	东莞市	PCH-280SD-FM1259WP	1	2017/7/14	正常	NEW-0841	-70℃~+150℃	U: ±3% I: ±2.5%	-80℃~180℃ 0%~100%RH	2018/9/14	2018/9/26	Current	Dongguan Safety Group	Yan Wang	Safety Test Engineers	Safety Lab	DH-3501-00023-8				
44	A	TEST-0004-4	Temperature & Humidity Meter	Extech	445715	1	2018/6/14	正常	NEW-0842	-50℃~70℃ 0%~100%RH	1.2℃ 2.5% 3.6% 4.0%	-50℃~70℃ 0%~100%RH	2018/9/27	2019/9/26	Current	Dongguan Safety Group	Yan Wang	Safety Test Engineers	Safety Lab	DH-3501-00023-9				
45																							

编制人: Yali Wang 日期: 2019.03.01

审核人: Jun Xie 日期: 2019.03.01

Ed.V1.0 Page 4, Total 4

浙江大华技术股份有限公司
ZHEJIANG DA-HUA TECHNOLOGY CO.,LTD.

License ID 8-01

PHOTOBIOLOGICAL SAFETY OF LAMPS AND LAMP SYSTEMS
Test report of

ShenZhen XuSheng Industry Co.,Ltd.
For
Power infrared light
Model No.: SE03-HP6070H/6075S

Prepared for : ShenZhen XuSheng Industry Co.,Ltd.
F3,Tower 10, Workshop,Zhongyuntai Science & Technology Industry Plant, Songbai Road, Shiyan Street, Bao an District, Shen Zhen City

Prepared By : Shenzhen AOV Testing Technology Co., Ltd.
1-6/F, No.5, Yuantou Lane, Tanglang, Taoyuan Street, Nanshan District, Shenzhen, Guangdong, China

Date of Test: Nov 01, 2013
Date of Report: Nov 05 , 2013
Report No.: A001E131031011

License ID 8-01

AOV 安姆特检测 AOV TESTING

Report No.:A001E131031011

TEST REPORT

IEC 62471-2006

Photobiological safety of lamps and lamp systems

Reference No.....:	A001E131031011
Prepared by:.....	Reviewed by:..... Approved by:.....
Liuyahuan, Teddy Project Engineer	Yan Wei, Barry Project Supervisor
	Lv Jie Hua, Jeewah Technical Director
Date of issue.....:	Nov 01, 2013
Contents.....:	14 Pages
Testing laboratory	
Name.....:	Shenzhen AOV Testing Technology Co., Ltd.
Address.....:	1-6/F, No.5, Yuantou Lane, Tanglang, Taoyuan Street, Nanshan District, Shenzhen, Guangdong, China
Testing location.....:	Same as above
Applicant	
Name..... :	ShenZhen XuSheng Industry Co.,Ltd.
Address.....:	F3,Tower 10, Workshop,Zhongyuntai Science & Technology Industry Plant, Songbai Road, Shiyan Street, Bao an District, Shen Zhen City
Manufacture	
Name..... :	N/A
Address.....:	N/A
Test specification	
Standard.....:	IEC62471-2006
Test procedure .....:	LVD Scheme
Procedure deviation.....:	N/A.
Test item	
Description.....:	Power infrared light
Trademark.....:	N/A
Model and/or type reference.....:	SE03-HP6070H/6075S

License ID 8-01

Particulars: test item vs. test requirements		
Tested lamp	:	Continuous wave lamps
Tested lamp system	:	N/A
Lamp classification group	:	Exempt Group
Lamp cap	:	N/A
Bulb	:	N/A
Rated of the lamp	:	5V, 1.8W, 1000mA
Furthermore marking on the lamp	:	N/A
Seasoning of lamps according IEC standard	:	N/A
Used measurement instrument	:	Spectroradiometer
Temperature by measurement	:	24.5℃
Information of safety use	:	--
Test case verdicts		
Test case does not apply to the test object	:	N(.A.)
Test item does meet the requirement	:	P(ass)
Test item does not meet the requirement	:	F(ail)
Testing		
Date of receipt of test item	:	Oct 31, 2013
Date(s) of performance of test	:	Nov 01, 2013

General remarks

This test report shall not be reproduced except in full without the written approval of the testing laboratory.

The test results presented in this report relate only to the item tested.

"(see remark #)" refers to a remark appended to the report.

"(see appended table)" refers to a table appended to the report.

Throughout this report a comma is used as the decimal separator.

License ID 8-01

AOV 安姆特检测 AOV TESTING Report No.: A001E131031011

IEC 62471-2006			
Clause	Requirement + Test	Result – Remark	Verdict
4	**EXPOSURE LIMITS**		–
4.1	General		P
	The exposure limits in this standard is not less than 0,01 ms and not more than any 8-hour period and should be used as guides in the control of exposure		P
	Detailed spectral data of a light source are generally required only if the luminance of the source exceeds 104cd.m-2	See clause 4.3	P
4.3	Hazard exposure limits		P
4.3.1	Actinic UV hazard exposure limit for the skin and eye		P
	The exposure limit for effective radiant exposure is 30 J.m-2 with any 8-hour period		P
	To protect against injury of the eye or skin from ul- traviolet radiation exposure produced by a broad- band source, the effective integrated spectral ir- radiance , ES, of the light source shall not exceed the levels defined by:		P
	$E_B \cdot t = \sum_{200}^{400} \sum_{t} E_\lambda(\lambda_B t) \cdot S_{UV}(\lambda) \cdot \Delta t \cdot \Delta\lambda \le 30, J \cdot m^{-2}$		P
	The permissible time for exposure to ultraviolet ra- diation incident upon the unprotected eye or skin shall be computed by:		P
	$t_{max} = \frac{30}{E_S}$ S		P
4.3.2	Near-UV hazard exposure limit for eye		P
	For the spectral region 315 nm to 400 nm (UV-A) the total radiant exposure to the eye shall not exceed 10000 J.m-2 for exposure times less than 1000 s. For exposure times greater than 1000 s (approximately 16 minutes) the UV-A irradiance for the unprotected eye, EUVA, shall not exceed 10 W.m-2.	>1000s	P
	The permissible time for exposure to ultraviolet ra- diation incident upon the unprotected eye for time less than 1000 s, shall be computed by:		P
	$t_{max} \le \frac{1000}{E_{UVA}}$ S		P
4.3.3	Retinal blue light hazard exposure limit		P

License ID 8-01

IEC 62471-2006			
Clause	Requirement + Test	Result – Remark	Verdict
	To protect against retinal photochemical injury from chronic blue-light exposure, the integrated spectral radiance of the light source weighted against the blue-light hazard function, B(λ), i.e., the blue-light weighted radiance , L_B, shall not exceed the levels defined by:	See table 4.2	P
	$L_B \cdot t = \sum_{300}^{700} \sum_{t} L_\lambda(\lambda,t) \cdot \Delta t \cdot \Delta\lambda \le 10^6 \quad J \cdot m^{-2} \cdot sr^{-1}$	$t \le 10^4$ s $t_{max} = \frac{10^6}{L_B}$	P
	$L_B = \sum_{300}^{700} L_\lambda \cdot B(\lambda) \cdot \Delta\lambda \le 100 \quad W \cdot m^{-2} \cdot sr^{-1}$	$t > 10^4$s	P
4.3.4	Retinal blue light hazard exposure limit – small source		P
	Thus the spectral irradiance at the eye E_λ, weighted against the blue-light hazard function B(λ) shall not exceed the levels defined by:		P
	$E_B \cdot t = \sum_{300}^{700} \sum_{t} E_\lambda(\lambda,t) \cdot B(\lambda) \cdot \Delta t \cdot \Delta\lambda \le 100 \quad J \cdot m^{-2}$	t ≤ 100 s	P
	$E_B = \sum_{300}^{700} E_\lambda \cdot B(\lambda) \cdot \Delta\lambda \le 1 \quad W \cdot m^{-2}$	t > 100 s	P
4.3.5	Retinal thermal hazard exposure limit		P
	To protect against retinal thermal injury, the inte- grated spectral radiance of the light source, L_λ, weighted by the burn hazard weighting function R(λ) (from Figure 4.2 and Table 4.2), i.e., the burn hazard weighted radiance, shall not exceed the levels de- fined by:		P
	$L_R = \sum_{380}^{1400} L_\lambda \cdot R(\lambda) \cdot \Delta\lambda \le \frac{50000}{\alpha \cdot t^{0.25}} \quad W \cdot m^{-2} \cdot sr^{-1}$	10 μs ≤ t ≤ 10 s	P
4.3.6	Retinal thermal hazard exposure limit – weak visual stimulus		P
	For an infrared heat lamp or any near-infrared source where a weak visual stimulus is inadequate to acti- vate the aversion response, the near infrared (780 nm to 1400 nm) radiance, L_{IR}, as viewed by the eye for exposure times greater than 10 s shall be limited to:		P
	$L_{IR} = \sum_{780}^{1400} L_\lambda \cdot R(\lambda) \cdot \Delta\lambda \le \frac{6000}{\alpha} \quad W \cdot m^{-2} \cdot sr^{-1}$	t > 10 s	N
4.3.7	Infrared radiation hazard exposure limits for the eye		P
	The avoid thermal injury of the cornea and possible delayed effects upon the lens of the eye (catarac- togenesis), ocular exposure to infrared radiation, E_{IR}, over the wavelength range 780 nm to 3000 nm, for times less than 1000 s, shall not exceed:		P
	$E_{IR} = \sum_{780}^{3000} E_\lambda \cdot \Delta\lambda \le 18000 \cdot t^{-0.75} \quad W \cdot m^{-2}$	t ≤ 1000 s	N

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Clause	Requirement + Test	Result – Remark	Verdict
	For times greater than 1000 s the limit becomes:		P
	$\sum IR = \sum_{780}^{3000} E_\lambda \cdot \Delta\lambda \le 100 \quad W \cdot m^{-2}$	t > 1000 s	P
4.3.8	Thermal hazard exposure limit for the skin		P
	Visible and infrared radiant exposure (380 nm to 3000 nm) of the skin shall be limited to:		P
	$E_M \cdot t = \sum_{380}^{3000} \sum_{t} E_\lambda(\lambda,t) \cdot \Delta t \cdot \Delta\lambda \le 20000 \cdot t^{0.25} \ J \cdot m^{-2}$	t ≤ 10 s	P

5	MEASUREMENT OF LAMPS AND LAMP SYSTEMS		–
5.1	Measurement conditions		P
	Measurement conditions shall be reported as part of the evaluation against the exposure limits and the assignment of risk classification.		P
5.1.1	Lamp ageing (seasoning)		N
	Seasoning of lamps shall be done as stated in the appropriate IEC lamp standard.		N
5.1.2	Test environment		P
	For specific test conditions, see the appropriate IEC lamp standard or in absence of such standards, the appropriate national standards or manufacturer's recommendations.		P
5.1.3	Extraneous radiation		P
	Careful checks should be made to ensure that ex- traneous sources of radiation and reflections do not add significantly to the measurement results.		P
5.1.4	Lamp operation		P
	Operation of the test lamp shall be provided in ac- cordance with:		P
	– the appropriate IEC lamp standard, or		N
	– the manufacturer' s recommendation		P
5.1.5	Lamp system operation		N
	The power source for operation of the test lamp shall be provided in accordance with:		N
	– the appropriate IEC standard, or		N
	– the manufacturer' s recommendation		N
5.2	Measurement procedure		P
5.2.1	Irradiance measurements		P
	Minimum aperture diameter 7mm.		P
	Maximum aperture diameter 50 mm.		P

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Clause	Requirement + Test	Result – Remark	Verdict
	The measurement shall be made in that position of the beam giving the maximum reading.		P
	The measurement instrument is adequate calibrated.		P
5.2.2	Radiance measurements		P
5.2.2.1	Standard method		P
	The measurements made with an optical system.		P
	The instrument shall be calibrated to read in absolute radiant power per unit receiving area and per unit solid angle to acceptance averaged over the field of view of the instrument.		P
5.2.2.2	Alternative method		N
	Alternatively to an imaging radiance set-up, an ir- radiance measurement set-up with a circular field stop placed at the source can be used to perform radiance measurements.		N
5.2.3	Measurement of source size		P
	The determination of α, the angle subtended by a source, requires the determination of the 50% emis- sion points of the source.		P
5.2.4	Pulse width measurement for pulsed sources		N
	The determination of Δt, the nominal pulse duration of a source, requires the determination of the time during which the emission is > 50% of its peak value.		N
5.3	Analysis methods		P
5.3.1	Weighting curve interpolations		P
	To standardize interpolated values, use linear in- terpolation on the log of given values to obtain in- termediate points at the wavelength intervals de- sired.		P
5.3.2	Calculations		P
	The calculation of source hazard values shall be performed by weighting the spectral scan by the appropriate function and calculating the total weighted energy.		P
5.3.3	Measurement uncertainty		P
	The quality of all measurement results must be quantified by an analysis of the uncertainty.	see Annex C in the norm	P

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Clause	Requirement + Test	Result – Remark	Verdict
6	**LAMP CLASSIFICATION**		–
	For the purposes of this standard it was decided that the values shall be reported as follows:	see table 6	P
	– for lamps intended for general lighting service, the hazard values shall be reported as either ir- radiance or radiance values at a distance which produces an illuminance of 500 lux, but not at a distance less than 200 mm		N
	– for all other light sources, including pulsed lamp sources, the hazard values shall be reported at a distance of 200 mm	r = 200.0 mm	P
6.1	Continuous wave lamps		P
6.1.1	Exempt Group		P
	In the exempt group are lamps, which does not pose any photobiological hazard. The requirement is met by any lamp that does not pose:		P
	– an actinic ultraviolet hazard (E_S) within 8-hours exposure (30000 s), nor		P
	– a near-UV hazard (E_{UVA}) within 1000 s, (about 16 min), nor		P
	– a retinal blue-light hazard (L_B) within 10000 s(about 2,8 h), nor		P
	– a retinal thermal hazard (L_R) within 10 s, nor		P
	– an infrared radiation hazard for the eye (E_{IR})within 1000 s		P
6.1.2	Risk Group 1 (Low-Risk)		N
	In this group are lamps, which exceeds the limits for the exempt group but that does not pose:		N
	– an actinic ultraviolet hazard (E_S) within 10000 s, nor		N
	– a near ultraviolet hazard (E_{UVA}) within 300 s, nor		N
	– a retinal blue-light hazard (L_B) within 100 s, nor		N
	– a retinal thermal hazard (L_R) within 10 s, nor		N
	– an infrared radiation hazard for the eye (E_{IR})within 100 s		N
	Lamps that emit infrared radiation without a strong visual stimulus and do not pose a near-infrared reti- nal hazard (L_{IR}), within 100 s are in Risk Group 1.		N
6.1.3	Risk Group 2 (Moderate-Risk)		N

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Clause	Requirement + Test	Result – Remark	Verdict
	This requirement is met by any lamp that exceeds the limits for Risk Group 1, but that does not pose:		N
	– an actinic ultraviolet hazard (E_S) within 1000 s exposure, nor		N
	– a near ultraviolet hazard (E_{UVA}) within 100 s, nor		N
	– a retinal blue-light hazard (L_B) within 0,25 s (aversion response), nor		N
	– a retinal thermal hazard (L_R) within 0,25 s (aver- sion response), nor		N
	– an infrared radiation hazard for the eye (E_{IR})within 10 s		N
	Lamps that emit infrared radiation without a strong visual stimulus and do not pose a near-infrared reti- nal hazard (L_{IR}), within 10 s are in Risk Group 2.		N
6.1.4	Risk Group 3 (High-Risk)		N
	Lamps which exceed the limits for Risk Group 2 are in Group 3.		N
6.2	Pulsed lamps		N
	Pulse lamp criteria shall apply to a single pulse and to any group of pulses within 0,25 s.		N
	A pulsed lamp shall be evaluated at the highest nominal energy loading as specified by the manu- facturer.		N
	The risk group determination of the lamp being tested shall be made as follows:		N
	– a lamp that exceeds the exposure limit shall be classified as belonging to Risk Group 3 (High-Risk)		N
	– for single pulsed lamps, a lamp whose weighted radiant exposure or weighted radiance does is below the EL shall be classified as belonging to the Exempt Group		N
	– for repetitively pulsed lamps, a lamp whose weighted radiant exposure or weighted radiance dose is below the EL, shall be evaluated using the continuous wave risk criteria discussed in clause 6.1, using time averaged values of the pulsed emission		N

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Table 4.1	Spectral weighting function for assessing ultraviolet hazards for skin and eye		P
Wavelength[1] λ, nm	**UV hazard function S$_{UV}$(λ)**	**Wavelength λ, nm**	**UV hazard function S$_{UV}$(λ)**
200	0,030	313*	0,006
205	0,051	315	0,003
210	0,075	316	0,0024
215	0,095	317	0,0020
220	0,120	318	0,0016
225	0,150	319	0,0012
230	0,190	320	0,0010
235	0,240	322	0,00067
240	0,300	323	0,00054
245	0,360	325	0,00050
250	0,430	328	0,00044
254*	0,500	330	0,00041
255	0,520	333*	0,00037
260	0,650	335	0,00034
265	0,810	340	0,00028
270	1,000	345	0,00024
275	0,960	350	0,00020
280*	0,880	355	0,00016
285	0,770	360	0,00013
290	0,640	365*	0,00011
295	0,540	370	0,000093
297*	0,460	375	0,000077
300	0,300	380	0,000064
303*	0,120	385	0,000053
305	0,060	390	0,000044
308	0,026	395	0,000036
310	0,015	400	0,000030

[1] Wavelengths chosen are representative: other values should be obtained by logarithmic interpolation at intermediate wavelengths.
* Emission lines of a mercury discharge spectrum.

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Table 4.2	Spectral weighting functions for assessing retinal hazards from broadband optical sources	P

Wavelength nm	Blue-light hazard function B (λ)	Burn hazard function R (λ)
300	0,01	--
305	0,01	--
310	0,01	--
315	0,01	--
320	0,01	--
325	0,01	--
330	0,01	--
335	0,01	--
340	0,01	--
345	0,01	--
350	0,01	--
355	0,01	--
360	0,01	--
365	0,01	--
370	0,01	--
375	0,01	--
380	0,01	0,1
385	0,013	0,13
390	0,025	0,25
395	0,05	0,5
400	0,10	1,0
405	0,20	2,0
410	0,40	4,0
415	0,80	8,0
420	0,90	9,0
425	0,95	9,5
430	0,98	9,8
435	1,00	10,0
440	1,00	10,0
445	0,97	9,7
450	0,94	9,4
455	0,90	9,0
460	0,80	8,0
465	0,70	7,0
470	0,62	6,2
475	0,55	5,5
480	0,45	4,5
485	0,40	4,0
490	0,22	2,2
495	0,16	1,6
500-600	$10^{[(450-\lambda)/50]}$	1,0
600-700	0,001	1,0
700-1050	--	$10^{[(700-\lambda)/500]}$
1050-1150	--	0,2
1150-1200	--	$0{,}2 \cdot 10^{0{,}02(1150-\lambda)}$
1200-1400	--	0,02

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Table 5.4	Summary of the ELs for the surface of the skin or cornea (irradiance based values)				P
Hazard Name	**Relevant equation**	**Wavelength range nm**	**Exposure duration sec**	**Limiting aperture rad (deg)**	**EL in terms of constant irradiance $W \cdot m^{-2}$**
Actinic UV skin & eye	$E_S = \sum E_\lambda \cdot S(\lambda) \cdot \Delta\lambda$	200 – 400	< 30000	1,4 (80)	30/t
Eye UV-A	$E_{UVA} = \sum E_\lambda \cdot \Delta\lambda$	315 – 400	≤1000 >1000	1,4 (80)	10000/t 10
Blue-light small source	$E_B = \sum E_\lambda \cdot B(\lambda) \cdot \Delta\lambda$	300 – 700	≤100 >100	< 0,011	100/t 1,0
Eye IR	$E_{IR} = \sum E_\lambda \cdot \Delta\lambda$	780 –3000	≤1000 >1000	1,4 (80)	$18000/t^{0,75}$ 100
Skin thermal	$E_H = \sum E_\lambda \cdot \Delta\lambda$	380 – 3000	< 10	2π sr	$20000/t^{0,75}$

Table 5.5	Summary of the ELs for the retina (radiance based values)				P
Hazard Name	**Relevant equation**	**Wavelength range nm**	**Exposure duration sec**	**Field of view radians**	**EL in terms of constant radiance $W \cdot m^{-2} \cdot sr^{-1}$**
Blue light	$L_B = \sum L_\lambda \cdot B(\lambda) \cdot \Delta\lambda$	300 – 700	0,25 – 10 10-100 100-10000 ≥ 10000	$0,011 \cdot \sqrt{(t/10)}$ 0,011 $0,0011 \cdot \sqrt{t}$ 0,1	$10^6/t$ $10^6/t$ $10^6/t$ 100
Retinal thermal	$L_R = \sum L_\lambda \cdot R(\lambda) \cdot \Delta\lambda$	380 – 1400	< 0,25 0,25 – 10	0,0017 $0,011 \cdot \sqrt{(t/10)}$	$50000/(\alpha \cdot t^{0,25})$ $50000/(\alpha \cdot t^{0,25})$
Retinal thermal (weak visual stimulus)	$L_{IR} = \sum L_\lambda \cdot R(\lambda) \cdot \Delta\lambda$	780 – 1400	> 10	0,011	6000/α

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Table 6	Emission limits for risk groups of continuous wave lamps								P
Risk	Action spectrum	Symbol	Units	Emission Measurement					
				Exempt Group		Low risk		Mod risk	
				Limit	Result	Limit	Result	Limit	Result
Actinic UV	$S_{UV}(\lambda)$	E_S	$W \cdot m^{-2}$	0,001	3.7×10^{-5}	0,003	____	0,03	____
Near UV		E_{UVA}	$W \cdot m^{-2}$	10	4.2×10^{-5}	33	____	100	____
Blue light	$B(\lambda)$	L_B	$W \cdot m^{-2} \cdot sr^{-1}$	100	2.5×10^{-2}	10000	____	4000000	____
Blue light, small source	$B(\lambda)$	E_B	$W \cdot m^{-2}$	1,0*	2.6×10^{-3}	1,0	____	400	____
Retinal thermal	$R(\lambda)$	L_R	$W \cdot m^{-2} \cdot sr^{-1}$	28000/α	5.3	28000/α	____	71000/α	____
Retinal thermal, weak visual stimulus**	$R(\lambda)$	L_{IR}	$W \cdot m^{-2} \cdot sr^{-1}$	6000/α	21 α=0.0380rad	6000/α	____	6000/α	____
IR radiation, eye	--	E_{IR}	$W \cdot m^{-2}$	100	0	570	____	3200	____

* Small source defined as one with α < 0,011 radian. Averaging field of view at 10000 s is 0,1 radian.
** Involves evaluation of non-GLS source

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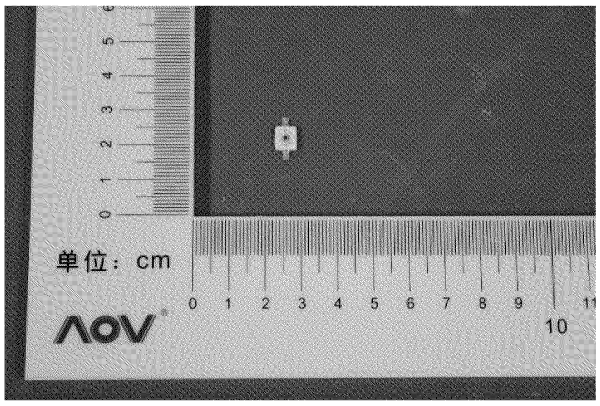
Appendix Figure documentation:



**********END OF THIS REPORT**********

License ID 8-02

PHOTOBIOLOGICAL SAFETY OF LAMPS AND LAMP SYSTEMS
Test report of

ShenZhen XuSheng Industry Co.,Ltd.
For
Power infrared light
Model No.: SE03-HP6070H/6075S

Prepared for :	**ShenZhen XuSheng Industry Co.,Ltd.** **F3,Tower 10, Workshop,Zhongyuntai Science & Technology Industry Plant, Songbai Road, Shiyan Street, Bao an District, Shen Zhen City**
Prepared By :	**Shenzhen AOV Testing Technology Co., Ltd.** **1-6/F, No.5, Yuantou Lane, Tanglang, Taoyuan Street, Nanshan District, Shenzhen, Guangdong, China**
Date of Test:	**Nov 01, 2013**
Date of Report:	**Nov 05 , 2013**
Report No.:	**A001E131031011**

License ID 8-02

AOV 安姆特检测 AOV TESTING

Report No.:A001E131031011

TEST REPORT

IEC 62471-2006

Photobiological safety of lamps and lamp systems

Reference No.....:	A001E131031011
Prepared by:.....	Reviewed by:..... Approved by:.....
Liuyahuan, Teddy Project Engineer	Yan Wei, Barry Project Supervisor
	Lv Jie Hua, Jeewah Technical Director
Date of issue.....:	Nov 01, 2013
Contents.....:	14 Pages
Testing laboratory	
Name.....:	Shenzhen AOV Testing Technology Co., Ltd.
Address.....:	1-6/F, No.5, Yuantou Lane, Tanglang, Taoyuan Street, Nanshan District, Shenzhen, Guangdong, China
Testing location.....:	Same as above
Applicant	
Name..... :	ShenZhen XuSheng Industry Co.,Ltd.
Address.....:	F3,Tower 10, Workshop,Zhongyuntai Science & Technology Industry Plant, Songbai Road, Shiyan Street, Bao an District, Shen Zhen City
Manufacture	
Name..... :	N/A
Address.....:	N/A
Test specification	
Standard.....:	IEC62471-2006
Test procedure .....:	LVD Scheme
Procedure deviation.....:	N/A.
Test item	
Description.....:	Power infrared light
Trademark.....:	N/A
Model and/or type reference.....:	SE03-HP6070H/6075S

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Particulars: test item vs. test requirements		
Tested lamp	:	Continuous wave lamps
Tested lamp system	:	N/A
Lamp classification group	:	Exempt Group
Lamp cap	:	N/A
Bulb	:	N/A
Rated of the lamp	:	5V, 1.8W, 1000mA
Furthermore marking on the lamp	:	N/A
Seasoning of lamps according IEC standard	:	N/A
Used measurement instrument	:	Spectroradiometer
Temperature by measurement	:	24.5℃
Information of safety use	:	--
Test case verdicts		
Test case does not apply to the test object	:	N(.A.)
Test item does meet the requirement	:	P(ass)
Test item does not meet the requirement	:	F(ail)
Testing		
Date of receipt of test item	:	Oct 31, 2013
Date(s) of performance of test	:	Nov 01, 2013

General remarks

This test report shall not be reproduced except in full without the written approval of the testing laboratory.

The test results presented in this report relate only to the item tested.

"(see remark #)" refers to a remark appended to the report.

"(see appended table)" refers to a table appended to the report.

Throughout this report a comma is used as the decimal separator.

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AOV 安姆特检测 AOV TESTING Report No.: A001E131031011

IEC 62471-2006			
Clause	Requirement + Test	Result – Remark	Verdict
4	**EXPOSURE LIMITS**		–
4.1	General		P
	The exposure limits in this standard is not less than 0,01 ms and not more than any 8-hour period and should be used as guides in the control of exposure		P
	Detailed spectral data of a light source are generally required only if the luminance of the source exceeds 104cd.m-2	See clause 4.3	P
4.3	Hazard exposure limits		P
4.3.1	Actinic UV hazard exposure limit for the skin and eye		P
	The exposure limit for effective radiant exposure is 30 J.m-2 with any 8-hour period		P
	To protect against injury of the eye or skin from ul- traviolet radiation exposure produced by a broad- band source, the effective integrated spectral ir- radiance , ES, of the light source shall not exceed the levels defined by:		P
	$E_B \cdot t = \sum_{200}^{400} \sum_{t} E_\lambda(\lambda_B t) \cdot S_{UV}(\lambda) \cdot \Delta t \cdot \Delta\lambda \le 30, J \cdot m^{-2}$		P
	The permissible time for exposure to ultraviolet ra- diation incident upon the unprotected eye or skin shall be computed by:		P
	$t_{max} = \frac{30}{E_S}$ S		P
4.3.2	Near-UV hazard exposure limit for eye		P
	For the spectral region 315 nm to 400 nm (UV-A) the total radiant exposure to the eye shall not exceed 10000 J.m-2 for exposure times less than 1000 s. For exposure times greater than 1000 s (approximately 16 minutes) the UV-A irradiance for the unprotected eye, EUVA, shall not exceed 10 W.m-2.	>1000s	P
	The permissible time for exposure to ultraviolet ra- diation incident upon the unprotected eye for time less than 1000 s, shall be computed by:		P
	$t_{max} \le \frac{1000}{E_{UVA}}$ S		P
4.3.3	Retinal blue light hazard exposure limit		P

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	To protect against retinal photochemical injury from chronic blue-light exposure, the integrated spectral radiance of the light source weighted against the blue-light hazard function, B(λ), i.e., the blue-light weighted radiance , L_B, shall not exceed the levels defined by:	See table 4.2	P
	$L_B \cdot t = \sum_{300}^{700} \sum_{t} L_\lambda(\lambda,t) \cdot \Delta t \cdot \Delta\lambda \le 10^6 \quad J \cdot m^{-2} \cdot sr^{-1}$	$t \le 10^4$ s $t_{max} = \frac{10^6}{L_B}$	P
	$L_B = \sum_{300}^{700} L_\lambda \cdot B(\lambda) \cdot \Delta\lambda \le 100 \quad W \cdot m^{-2} \cdot sr^{-1}$	$t > 10^4$s	P
4.3.4	Retinal blue light hazard exposure limit – small source		P
	Thus the spectral irradiance at the eye E_λ, weighted against the blue-light hazard function B(λ) shall not exceed the levels defined by:		P
	$E_B \cdot t = \sum_{300}^{700} \sum_{t} E_\lambda(\lambda,t) \cdot B(\lambda) \cdot \Delta t \cdot \Delta\lambda \le 100 \quad J \cdot m^{-2}$	t ≤ 100 s	P
	$E_B = \sum_{300}^{700} E_\lambda \cdot B(\lambda) \cdot \Delta\lambda \le 1 \quad W \cdot m^{-2}$	t > 100 s	P
4.3.5	Retinal thermal hazard exposure limit		P
	To protect against retinal thermal injury, the inte- grated spectral radiance of the light source, L_λ, weighted by the burn hazard weighting function R(λ) (from Figure 4.2 and Table 4.2), i.e., the burn hazard weighted radiance, shall not exceed the levels de- fined by:		P
	$L_R = \sum_{380}^{1400} L_\lambda \cdot R(\lambda) \cdot \Delta\lambda \le \frac{50000}{\alpha \cdot t^{0.25}} \quad W \cdot m^{-2} \cdot sr^{-1}$	10 μs ≤ t ≤ 10 s	P
4.3.6	Retinal thermal hazard exposure limit – weak visual stimulus		P
	For an infrared heat lamp or any near-infrared source where a weak visual stimulus is inadequate to acti- vate the aversion response, the near infrared (780 nm to 1400 nm) radiance, L_{IR}, as viewed by the eye for exposure times greater than 10 s shall be limited to:		P
	$L_{IR} = \sum_{780}^{1400} L_\lambda \cdot R(\lambda) \cdot \Delta\lambda \le \frac{6000}{\alpha} \quad W \cdot m^{-2} \cdot sr^{-1}$	t > 10 s	N
4.3.7	Infrared radiation hazard exposure limits for the eye		P
	The avoid thermal injury of the cornea and possible delayed effects upon the lens of the eye (catarac- togenesis), ocular exposure to infrared radiation, E_{IR}, over the wavelength range 780 nm to 3000 nm, for times less than 1000 s, shall not exceed:		P
	$E_{IR} = \sum_{780}^{3000} E_\lambda \cdot \Delta\lambda \le 18000 \cdot t^{-0.75} \quad W \cdot m^{-2}$	t ≤ 1000 s	N

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Clause	Requirement + Test	Result – Remark	Verdict
	For times greater than 1000 s the limit becomes:		P
	$\sum IR = \sum_{780}^{3000} E_\lambda \cdot \Delta\lambda \le 100 \quad W \cdot m^{-2}$	t > 1000 s	P
4.3.8	Thermal hazard exposure limit for the skin		P
	Visible and infrared radiant exposure (380 nm to 3000 nm) of the skin shall be limited to:		P
	$E_M \cdot t = \sum_{380}^{3000} \sum_{t} E_\lambda(\lambda,t) \cdot \Delta t \cdot \Delta\lambda \le 20000 \cdot t^{0.25} \ J \cdot m^{-2}$	t ≤ 10 s	P

5	MEASUREMENT OF LAMPS AND LAMP SYSTEMS		–
5.1	Measurement conditions		P
	Measurement conditions shall be reported as part of the evaluation against the exposure limits and the assignment of risk classification.		P
5.1.1	Lamp ageing (seasoning)		N
	Seasoning of lamps shall be done as stated in the appropriate IEC lamp standard.		N
5.1.2	Test environment		P
	For specific test conditions, see the appropriate IEC lamp standard or in absence of such standards, the appropriate national standards or manufacturer's recommendations.		P
5.1.3	Extraneous radiation		P
	Careful checks should be made to ensure that ex- traneous sources of radiation and reflections do not add significantly to the measurement results.		P
5.1.4	Lamp operation		P
	Operation of the test lamp shall be provided in ac- cordance with:		P
	– the appropriate IEC lamp standard, or		N
	– the manufacturer' s recommendation		P
5.1.5	Lamp system operation		N
	The power source for operation of the test lamp shall be provided in accordance with:		N
	– the appropriate IEC standard, or		N
	– the manufacturer' s recommendation		N
5.2	Measurement procedure		P
5.2.1	Irradiance measurements		P
	Minimum aperture diameter 7mm.		P
	Maximum aperture diameter 50 mm.		P

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IEC 62471-2006			
Clause	Requirement + Test	Result – Remark	Verdict
	The measurement shall be made in that position of the beam giving the maximum reading.		P
	The measurement instrument is adequate calibrated.		P
5.2.2	Radiance measurements		P
5.2.2.1	Standard method		P
	The measurements made with an optical system.		P
	The instrument shall be calibrated to read in absolute radiant power per unit receiving area and per unit solid angle to acceptance averaged over the field of view of the instrument.		P
5.2.2.2	Alternative method		N
	Alternatively to an imaging radiance set-up, an ir- radiance measurement set-up with a circular field stop placed at the source can be used to perform radiance measurements.		N
5.2.3	Measurement of source size		P
	The determination of α, the angle subtended by a source, requires the determination of the 50% emis- sion points of the source.		P
5.2.4	Pulse width measurement for pulsed sources		N
	The determination of Δt, the nominal pulse duration of a source, requires the determination of the time during which the emission is > 50% of its peak value.		N
5.3	Analysis methods		P
5.3.1	Weighting curve interpolations		P
	To standardize interpolated values, use linear in- terpolation on the log of given values to obtain in- termediate points at the wavelength intervals de- sired.		P
5.3.2	Calculations		P
	The calculation of source hazard values shall be performed by weighting the spectral scan by the appropriate function and calculating the total weighted energy.		P
5.3.3	Measurement uncertainty		P
	The quality of all measurement results must be quantified by an analysis of the uncertainty.	see Annex C in the norm	P

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Clause	Requirement + Test	Result – Remark	Verdict
6	**LAMP CLASSIFICATION**		–
	For the purposes of this standard it was decided that the values shall be reported as follows:	see table 6	P
	– for lamps intended for general lighting service, the hazard values shall be reported as either ir- radiance or radiance values at a distance which produces an illuminance of 500 lux, but not at a distance less than 200 mm		N
	– for all other light sources, including pulsed lamp sources, the hazard values shall be reported at a distance of 200 mm	r = 200.0 mm	P
6.1	Continuous wave lamps		P
6.1.1	Exempt Group		P
	In the exempt group are lamps, which does not pose any photobiological hazard. The requirement is met by any lamp that does not pose:		P
	– an actinic ultraviolet hazard (E_S) within 8-hours exposure (30000 s), nor		P
	– a near-UV hazard (E_{UVA}) within 1000 s, (about 16 min), nor		P
	– a retinal blue-light hazard (L_B) within 10000 s(about 2,8 h), nor		P
	– a retinal thermal hazard (L_R) within 10 s, nor		P
	– an infrared radiation hazard for the eye (E_{IR})within 1000 s		P
6.1.2	Risk Group 1 (Low-Risk)		N
	In this group are lamps, which exceeds the limits for the exempt group but that does not pose:		N
	– an actinic ultraviolet hazard (E_S) within 10000 s, nor		N
	– a near ultraviolet hazard (E_{UVA}) within 300 s, nor		N
	– a retinal blue-light hazard (L_B) within 100 s, nor		N
	– a retinal thermal hazard (L_R) within 10 s, nor		N
	– an infrared radiation hazard for the eye (E_{IR})within 100 s		N
	Lamps that emit infrared radiation without a strong visual stimulus and do not pose a near-infrared reti- nal hazard (L_{IR}), within 100 s are in Risk Group 1.		N
6.1.3	Risk Group 2 (Moderate-Risk)		N

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Clause	Requirement + Test	Result – Remark	Verdict
	This requirement is met by any lamp that exceeds the limits for Risk Group 1, but that does not pose:		N
	– an actinic ultraviolet hazard (E_S) within 1000 s exposure, nor		N
	– a near ultraviolet hazard (E_{UVA}) within 100 s, nor		N
	– a retinal blue-light hazard (L_B) within 0,25 s (aversion response), nor		N
	– a retinal thermal hazard (L_R) within 0,25 s (aver- sion response), nor		N
	– an infrared radiation hazard for the eye (E_{IR})within 10 s		N
	Lamps that emit infrared radiation without a strong visual stimulus and do not pose a near-infrared reti- nal hazard (L_{IR}), within 10 s are in Risk Group 2.		N
6.1.4	Risk Group 3 (High-Risk)		N
	Lamps which exceed the limits for Risk Group 2 are in Group 3.		N
6.2	Pulsed lamps		N
	Pulse lamp criteria shall apply to a single pulse and to any group of pulses within 0,25 s.		N
	A pulsed lamp shall be evaluated at the highest nominal energy loading as specified by the manu- facturer.		N
	The risk group determination of the lamp being tested shall be made as follows:		N
	– a lamp that exceeds the exposure limit shall be classified as belonging to Risk Group 3 (High-Risk)		N
	– for single pulsed lamps, a lamp whose weighted radiant exposure or weighted radiance does is below the EL shall be classified as belonging to the Exempt Group		N
	– for repetitively pulsed lamps, a lamp whose weighted radiant exposure or weighted radiance dose is below the EL, shall be evaluated using the continuous wave risk criteria discussed in clause 6.1, using time averaged values of the pulsed emission		N

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Table 4.1	Spectral weighting function for assessing ultraviolet hazards for skin and eye		P
Wavelength[1] λ, nm	**UV hazard function SUV(λ)**	**Wavelength λ, nm**	**UV hazard function SUV(λ)**
200	0,030	313*	0,006
205	0,051	315	0,003
210	0,075	316	0,0024
215	0,095	317	0,0020
220	0,120	318	0,0016
225	0,150	319	0,0012
230	0,190	320	0,0010
235	0,240	322	0,00067
240	0,300	323	0,00054
245	0,360	325	0,00050
250	0,430	328	0,00044
254*	0,500	330	0,00041
255	0,520	333*	0,00037
260	0,650	335	0,00034
265	0,810	340	0,00028
270	1,000	345	0,00024
275	0,960	350	0,00020
280*	0,880	355	0,00016
285	0,770	360	0,00013
290	0,640	365*	0,00011
295	0,540	370	0,000093
297*	0,460	375	0,000077
300	0,300	380	0,000064
303*	0,120	385	0,000053
305	0,060	390	0,000044
308	0,026	395	0,000036
310	0,015	400	0,000030

[1] Wavelengths chosen are representative: other values should be obtained by logarithmic interpolation at intermediate wavelengths.
* Emission lines of a mercury discharge spectrum.

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Clause	Requirement + Test	Result – Remark	Verdict

Table 4.2	Spectral weighting functions for assessing retinal hazards from broadband optical sources	P

Wavelength nm	Blue-light hazard function B (λ)	Burn hazard function R (λ)
300	0,01	--
305	0,01	--
310	0,01	--
315	0,01	--
320	0,01	--
325	0,01	--
330	0,01	--
335	0,01	--
340	0,01	--
345	0,01	--
350	0,01	--
355	0,01	--
360	0,01	--
365	0,01	--
370	0,01	--
375	0,01	--
380	0,01	0,1
385	0,013	0,13
390	0,025	0,25
395	0,05	0,5
400	0,10	1,0
405	0,20	2,0
410	0,40	4,0
415	0,80	8,0
420	0,90	9,0
425	0,95	9,5
430	0,98	9,8
435	1,00	10,0
440	1,00	10,0
445	0,97	9,7
450	0,94	9,4
455	0,90	9,0
460	0,80	8,0
465	0,70	7,0
470	0,62	6,2
475	0,55	5,5
480	0,45	4,5
485	0,40	4,0
490	0,22	2,2
495	0,16	1,6
500-600	$10^{[(450-\lambda)/50]}$	1,0
600-700	0,001	1,0
700-1050	--	$10^{[(700-\lambda)/500]}$
1050-1150	--	0,2
1150-1200	--	$0{,}2 \cdot 10^{0{,}02(1150-\lambda)}$
1200-1400	--	0,02

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Table 5.4	Summary of the ELs for the surface of the skin or cornea (irradiance based values)				P
Hazard Name	**Relevant equation**	**Wavelength range nm**	**Exposure duration sec**	**Limiting aperture rad (deg)**	**EL in terms of constant irradiance $W \cdot m^{-2}$**
Actinic UV skin & eye	$E_S = \sum E_\lambda \cdot S(\lambda) \cdot \Delta\lambda$	200 – 400	< 30000	1,4 (80)	30/t
Eye UV-A	$E_{UVA} = \sum E_\lambda \cdot \Delta\lambda$	315 – 400	≤1000 >1000	1,4 (80)	10000/t 10
Blue-light small source	$E_B = \sum E_\lambda \cdot B(\lambda) \cdot \Delta\lambda$	300 – 700	≤100 >100	< 0,011	100/t 1,0
Eye IR	$E_{IR} = \sum E_\lambda \cdot \Delta\lambda$	780 –3000	≤1000 >1000	1,4 (80)	$18000/t^{0,75}$ 100
Skin thermal	$E_H = \sum E_\lambda \cdot \Delta\lambda$	380 – 3000	< 10	2π sr	$20000/t^{0,75}$

Table 5.5	Summary of the ELs for the retina (radiance based values)				P
Hazard Name	**Relevant equation**	**Wavelength range nm**	**Exposure duration sec**	**Field of view radians**	**EL in terms of constant radiance $W \cdot m^{-2} \cdot sr^{-1}$**
Blue light	$L_B = \sum L_\lambda \cdot B(\lambda) \cdot \Delta\lambda$	300 – 700	0,25 – 10 10-100 100-10000 ≥ 10000	$0,011 \cdot \sqrt{(t/10)}$ 0,011 $0,0011 \cdot \sqrt{t}$ 0,1	$10^6/t$ $10^6/t$ $10^6/t$ 100
Retinal thermal	$L_R = \sum L_\lambda \cdot R(\lambda) \cdot \Delta\lambda$	380 – 1400	< 0,25 0,25 – 10	0,0017 $0,011 \cdot \sqrt{(t/10)}$	$50000/(\alpha \cdot t^{0,25})$ $50000/(\alpha \cdot t^{0,25})$
Retinal thermal (weak visual stimulus)	$L_{IR} = \sum L_\lambda \cdot R(\lambda) \cdot \Delta\lambda$	780 – 1400	> 10	0,011	6000/α

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Table 6	Emission limits for risk groups of continuous wave lamps								P
Risk	Action spectrum	Symbol	Units	Emission Measurement					
				Exempt Group		Low risk		Mod risk	
				Limit	Result	Limit	Result	Limit	Result
Actinic UV	$S_{UV}(\lambda)$	E_S	$W \cdot m^{-2}$	0,001	3.7×10^{-5}	0,003	____	0,03	____
Near UV		E_{UVA}	$W \cdot m^{-2}$	10	4.2×10^{-5}	33	____	100	____
Blue light	$B(\lambda)$	L_B	$W \cdot m^{-2} \cdot sr^{-1}$	100	2.5×10^{-2}	10000	____	4000000	____
Blue light, small source	$B(\lambda)$	E_B	$W \cdot m^{-2}$	1,0*	2.6×10^{-3}	1,0	____	400	____
Retinal thermal	$R(\lambda)$	L_R	$W \cdot m^{-2} \cdot sr^{-1}$	28000/α	5.3	28000/α	____	71000/α	____
Retinal thermal, weak visual stimulus**	$R(\lambda)$	L_{IR}	$W \cdot m^{-2} \cdot sr^{-1}$	6000/α	21 α=0.0380rad	6000/α	____	6000/α	____
IR radiation, eye	--	E_{IR}	$W \cdot m^{-2}$	100	0	570	____	3200	____

* Small source defined as one with α < 0,011 radian. Averaging field of view at 10000 s is 0,1 radian.
** Involves evaluation of non-GLS source

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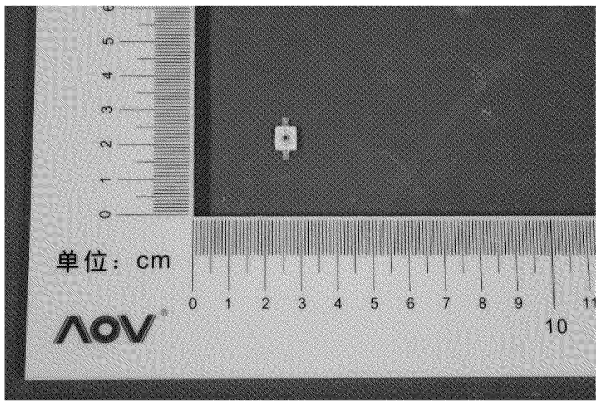
Appendix Figure documentation：



**********END OF THIS REPORT**********

License ID 8-03

PHOTOBIOLOGICAL SAFETY OF LAMPS AND LAMP SYSTEMS
Test report of

ShenZhen XuSheng Industry Co.,Ltd.
For
Power infrared light
Model No.: SE03-HP6070H/6075S

Prepared for : **ShenZhen XuSheng Industry Co.,Ltd.**
F3,Tower 10, Workshop,Zhongyuntai Science & Technology Industry Plant, Songbai Road, Shiyan Street, Bao an District, Shen Zhen City

Prepared By : **Shenzhen AOV Testing Technology Co., Ltd.**
1-6/F, No.5, Yuantou Lane, Tanglang, Taoyuan Street, Nanshan District, Shenzhen, Guangdong, China

Date of Test: **Nov 01, 2013**
Date of Report: **Nov 05 , 2013**
Report No.: **A001E131031011**

License ID 8-03

AOV 安姆特检测 AOV TESTING

Report No.:A001E131031011

TEST REPORT

IEC 62471-2006

Photobiological safety of lamps and lamp systems

Reference No.....:	A001E131031011
Prepared by:.....	Liuyahuan, Teddy Project Engineer
Reviewed by:.....	Yan Wei, Barry Project Supervisor
Approved by:.....	Lv Jie Hua, Jeewah Technical Director
Date of issue.....:	Nov 01, 2013
Contents.....:	14 Pages
Testing laboratory	
Name.....:	Shenzhen AOV Testing Technology Co., Ltd.
Address.....:	1-6/F, No.5, Yuantou Lane, Tanglang, Taoyuan Street, Nanshan District, Shenzhen, Guangdong, China
Testing location.....:	Same as above
Applicant	
Name..... :	ShenZhen XuSheng Industry Co.,Ltd.
Address.....:	F3,Tower 10, Workshop,Zhongyuntai Science & Technology Industry Plant, Songbai Road, Shiyan Street, Bao an District, Shen Zhen City
Manufacture	
Name..... :	N/A
Address.....:	N/A
Test specification	
Standard.....:	IEC62471-2006
Test procedure .....:	LVD Scheme
Procedure deviation.....:	N/A.
Test item	
Description.....:	Power infrared light
Trademark.....:	N/A
Model and/or type reference.....:	SE03-HP6070H/6075S

License ID 8-03

Particulars: test item vs. test requirements		
Tested lamp	:	Continuous wave lamps
Tested lamp system	:	N/A
Lamp classification group	:	Exempt Group
Lamp cap	:	N/A
Bulb	:	N/A
Rated of the lamp	:	5V, 1.8W, 1000mA
Furthermore marking on the lamp	:	N/A
Seasoning of lamps according IEC standard	:	N/A
Used measurement instrument	:	Spectroradiometer
Temperature by measurement	:	24.5℃
Information of safety use	:	--
Test case verdicts		
Test case does not apply to the test object	:	N(.A.)
Test item does meet the requirement	:	P(ass)
Test item does not meet the requirement	:	F(ail)
Testing		
Date of receipt of test item	:	Oct 31, 2013
Date(s) of performance of test	:	Nov 01, 2013

General remarks

This test report shall not be reproduced except in full without the written approval of the testing laboratory.

The test results presented in this report relate only to the item tested.

"(see remark #)" refers to a remark appended to the report.

"(see appended table)" refers to a table appended to the report.

Throughout this report a comma is used as the decimal separator.

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AOV 安姆特检测 AOV TESTING Report No.: A001E131031011

IEC 62471-2006			
Clause	Requirement + Test	Result – Remark	Verdict
4	**EXPOSURE LIMITS**		–
4.1	General		P
	The exposure limits in this standard is not less than 0,01 ms and not more than any 8-hour period and should be used as guides in the control of exposure		P
	Detailed spectral data of a light source are generally required only if the luminance of the source exceeds 104cd.m-2	See clause 4.3	P
4.3	Hazard exposure limits		P
4.3.1	Actinic UV hazard exposure limit for the skin and eye		P
	The exposure limit for effective radiant exposure is 30 J.m-2 with any 8-hour period		P
	To protect against injury of the eye or skin from ul- traviolet radiation exposure produced by a broad- band source, the effective integrated spectral ir- radiance , ES, of the light source shall not exceed the levels defined by:		P
	$E_B \cdot t = \sum_{200}^{400} \sum_{t} E_\lambda(\lambda_B t) \cdot S_{UV}(\lambda) \cdot \Delta t \cdot \Delta\lambda \le 30, J \cdot m^{-2}$		P
	The permissible time for exposure to ultraviolet ra- diation incident upon the unprotected eye or skin shall be computed by:		P
	$t_{max} = \frac{30}{E_S}$ S		P
4.3.2	Near-UV hazard exposure limit for eye		P
	For the spectral region 315 nm to 400 nm (UV-A) the total radiant exposure to the eye shall not exceed 10000 J.m-2 for exposure times less than 1000 s. For exposure times greater than 1000 s (approximately 16 minutes) the UV-A irradiance for the unprotected eye, EUVA, shall not exceed 10 W.m-2.	>1000s	P
	The permissible time for exposure to ultraviolet ra- diation incident upon the unprotected eye for time less than 1000 s, shall be computed by:		P
	$t_{max} \le \frac{1000}{E_{UVA}}$ S		P
4.3.3	Retinal blue light hazard exposure limit		P

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	To protect against retinal photochemical injury from chronic blue-light exposure, the integrated spectral radiance of the light source weighted against the blue-light hazard function, B(λ), i.e., the blue-light weighted radiance , L_B, shall not exceed the levels defined by:	See table 4.2	P
	$L_B \cdot t = \sum_{300}^{700} \sum_{t} L_\lambda(\lambda,t) \cdot \Delta t \cdot \Delta\lambda \le 10^6 \quad J \cdot m^{-2} \cdot sr^{-1}$	$t \le 10^4$ s $t_{max} = \frac{10^6}{L_B}$	P
	$L_B = \sum_{300}^{700} L_\lambda \cdot B(\lambda) \cdot \Delta\lambda \le 100 \quad W \cdot m^{-2} \cdot sr^{-1}$	$t > 10^4$s	P
4.3.4	Retinal blue light hazard exposure limit – small source		P
	Thus the spectral irradiance at the eye E_λ, weighted against the blue-light hazard function B(λ) shall not exceed the levels defined by:		P
	$E_B \cdot t = \sum_{300}^{700} \sum_{t} E_\lambda(\lambda,t) \cdot B(\lambda) \cdot \Delta t \cdot \Delta\lambda \le 100 \quad J \cdot m^{-2}$	t ≤ 100 s	P
	$E_B = \sum_{300}^{700} E_\lambda \cdot B(\lambda) \cdot \Delta\lambda \le 1 \quad W \cdot m^{-2}$	t > 100 s	P
4.3.5	Retinal thermal hazard exposure limit		P
	To protect against retinal thermal injury, the inte- grated spectral radiance of the light source, L_λ, weighted by the burn hazard weighting function R(λ) (from Figure 4.2 and Table 4.2), i.e., the burn hazard weighted radiance, shall not exceed the levels de- fined by:		P
	$L_R = \sum_{380}^{1400} L_\lambda \cdot R(\lambda) \cdot \Delta\lambda \le \frac{50000}{\alpha \cdot t^{0.25}} \quad W \cdot m^{-2} \cdot sr^{-1}$	10 μs ≤ t ≤ 10 s	P
4.3.6	Retinal thermal hazard exposure limit – weak visual stimulus		P
	For an infrared heat lamp or any near-infrared source where a weak visual stimulus is inadequate to acti- vate the aversion response, the near infrared (780 nm to 1400 nm) radiance, L_{IR}, as viewed by the eye for exposure times greater than 10 s shall be limited to:		P
	$L_{IR} = \sum_{780}^{1400} L_\lambda \cdot R(\lambda) \cdot \Delta\lambda \le \frac{6000}{\alpha} \quad W \cdot m^{-2} \cdot sr^{-1}$	t > 10 s	N
4.3.7	Infrared radiation hazard exposure limits for the eye		P
	The avoid thermal injury of the cornea and possible delayed effects upon the lens of the eye (catarac- togenesis), ocular exposure to infrared radiation, E_{IR}, over the wavelength range 780 nm to 3000 nm, for times less than 1000 s, shall not exceed:		P
	$E_{IR} = \sum_{780}^{3000} E_\lambda \cdot \Delta\lambda \le 18000 \cdot t^{-0.75} \quad W \cdot m^{-2}$	t ≤ 1000 s	N

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Clause	Requirement + Test	Result – Remark	Verdict
	For times greater than 1000 s the limit becomes:		P
	$\sum IR = \sum_{780}^{3000} E_\lambda \cdot \Delta\lambda \le 100 \quad W \cdot m^{-2}$	t > 1000 s	P
4.3.8	Thermal hazard exposure limit for the skin		P
	Visible and infrared radiant exposure (380 nm to 3000 nm) of the skin shall be limited to:		P
	$E_M \cdot t = \sum_{380}^{3000} \sum_{t} E_\lambda(\lambda,t) \cdot \Delta t \cdot \Delta\lambda \le 20000 \cdot t^{0.25} \ J \cdot m^{-2}$	t ≤ 10 s	P

5	MEASUREMENT OF LAMPS AND LAMP SYSTEMS		–
5.1	Measurement conditions		P
	Measurement conditions shall be reported as part of the evaluation against the exposure limits and the assignment of risk classification.		P
5.1.1	Lamp ageing (seasoning)		N
	Seasoning of lamps shall be done as stated in the appropriate IEC lamp standard.		N
5.1.2	Test environment		P
	For specific test conditions, see the appropriate IEC lamp standard or in absence of such standards, the appropriate national standards or manufacturer's recommendations.		P
5.1.3	Extraneous radiation		P
	Careful checks should be made to ensure that ex- traneous sources of radiation and reflections do not add significantly to the measurement results.		P
5.1.4	Lamp operation		P
	Operation of the test lamp shall be provided in ac- cordance with:		P
	– the appropriate IEC lamp standard, or		N
	– the manufacturer' s recommendation		P
5.1.5	Lamp system operation		N
	The power source for operation of the test lamp shall be provided in accordance with:		N
	– the appropriate IEC standard, or		N
	– the manufacturer' s recommendation		N
5.2	Measurement procedure		P
5.2.1	Irradiance measurements		P
	Minimum aperture diameter 7mm.		P
	Maximum aperture diameter 50 mm.		P

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Clause	Requirement + Test	Result – Remark	Verdict
	The measurement shall be made in that position of the beam giving the maximum reading.		P
	The measurement instrument is adequate calibrated.		P
5.2.2	Radiance measurements		P
5.2.2.1	Standard method		P
	The measurements made with an optical system.		P
	The instrument shall be calibrated to read in absolute radiant power per unit receiving area and per unit solid angle to acceptance averaged over the field of view of the instrument.		P
5.2.2.2	Alternative method		N
	Alternatively to an imaging radiance set-up, an ir- radiance measurement set-up with a circular field stop placed at the source can be used to perform radiance measurements.		N
5.2.3	Measurement of source size		P
	The determination of α, the angle subtended by a source, requires the determination of the 50% emis- sion points of the source.		P
5.2.4	Pulse width measurement for pulsed sources		N
	The determination of Δt, the nominal pulse duration of a source, requires the determination of the time during which the emission is > 50% of its peak value.		N
5.3	Analysis methods		P
5.3.1	Weighting curve interpolations		P
	To standardize interpolated values, use linear in- terpolation on the log of given values to obtain in- termediate points at the wavelength intervals de- sired.		P
5.3.2	Calculations		P
	The calculation of source hazard values shall be performed by weighting the spectral scan by the appropriate function and calculating the total weighted energy.		P
5.3.3	Measurement uncertainty		P
	The quality of all measurement results must be quantified by an analysis of the uncertainty.	see Annex C in the norm	P

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IEC 62471-2006			
Clause	Requirement + Test	Result – Remark	Verdict
6	**LAMP CLASSIFICATION**		–
	For the purposes of this standard it was decided that the values shall be reported as follows:	see table 6	P
	– for lamps intended for general lighting service, the hazard values shall be reported as either ir- radiance or radiance values at a distance which produces an illuminance of 500 lux, but not at a distance less than 200 mm		N
	– for all other light sources, including pulsed lamp sources, the hazard values shall be reported at a distance of 200 mm	r = 200.0 mm	P
6.1	Continuous wave lamps		P
6.1.1	Exempt Group		P
	In the exempt group are lamps, which does not pose any photobiological hazard. The requirement is met by any lamp that does not pose:		P
	– an actinic ultraviolet hazard (E_S) within 8-hours exposure (30000 s), nor		P
	– a near-UV hazard (E_{UVA}) within 1000 s, (about 16 min), nor		P
	– a retinal blue-light hazard (L_B) within 10000 s(about 2,8 h), nor		P
	– a retinal thermal hazard (L_R) within 10 s, nor		P
	– an infrared radiation hazard for the eye (E_{IR})within 1000 s		P
6.1.2	Risk Group 1 (Low-Risk)		N
	In this group are lamps, which exceeds the limits for the exempt group but that does not pose:		N
	– an actinic ultraviolet hazard (E_S) within 10000 s, nor		N
	– a near ultraviolet hazard (E_{UVA}) within 300 s, nor		N
	– a retinal blue-light hazard (L_B) within 100 s, nor		N
	– a retinal thermal hazard (L_R) within 10 s, nor		N
	– an infrared radiation hazard for the eye (E_{IR})within 100 s		N
	Lamps that emit infrared radiation without a strong visual stimulus and do not pose a near-infrared reti- nal hazard (L_{IR}), within 100 s are in Risk Group 1.		N
6.1.3	Risk Group 2 (Moderate-Risk)		N

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Clause	Requirement + Test	Result – Remark	Verdict
	This requirement is met by any lamp that exceeds the limits for Risk Group 1, but that does not pose:		N
	– an actinic ultraviolet hazard (E_S) within 1000 s exposure, nor		N
	– a near ultraviolet hazard (E_{UVA}) within 100 s, nor		N
	– a retinal blue-light hazard (L_B) within 0,25 s (aversion response), nor		N
	– a retinal thermal hazard (L_R) within 0,25 s (aver- sion response), nor		N
	– an infrared radiation hazard for the eye (E_{IR})within 10 s		N
	Lamps that emit infrared radiation without a strong visual stimulus and do not pose a near-infrared reti- nal hazard (L_{IR}), within 10 s are in Risk Group 2.		N
6.1.4	Risk Group 3 (High-Risk)		N
	Lamps which exceed the limits for Risk Group 2 are in Group 3.		N
6.2	Pulsed lamps		N
	Pulse lamp criteria shall apply to a single pulse and to any group of pulses within 0,25 s.		N
	A pulsed lamp shall be evaluated at the highest nominal energy loading as specified by the manu- facturer.		N
	The risk group determination of the lamp being tested shall be made as follows:		N
	– a lamp that exceeds the exposure limit shall be classified as belonging to Risk Group 3 (High-Risk)		N
	– for single pulsed lamps, a lamp whose weighted radiant exposure or weighted radiance does is below the EL shall be classified as belonging to the Exempt Group		N
	– for repetitively pulsed lamps, a lamp whose weighted radiant exposure or weighted radiance dose is below the EL, shall be evaluated using the continuous wave risk criteria discussed in clause 6.1, using time averaged values of the pulsed emission		N

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Clause	Requirement + Test	Result – Remark	Verdict

Table 4.1	Spectral weighting function for assessing ultraviolet hazards for skin and eye		P
Wavelength[1] λ, nm	**UV hazard function S(λ)**	**Wavelength λ, nm**	**UV hazard function S(λ)**
200	0,030	313*	0,006
205	0,051	315	0,003
210	0,075	316	0,0024
215	0,095	317	0,0020
220	0,120	318	0,0016
225	0,150	319	0,0012
230	0,190	320	0,0010
235	0,240	322	0,00067
240	0,300	323	0,00054
245	0,360	325	0,00050
250	0,430	328	0,00044
254*	0,500	330	0,00041
255	0,520	333*	0,00037
260	0,650	335	0,00034
265	0,810	340	0,00028
270	1,000	345	0,00024
275	0,960	350	0,00020
280*	0,880	355	0,00016
285	0,770	360	0,00013
290	0,640	365*	0,00011
295	0,540	370	0,000093
297*	0,460	375	0,000077
300	0,300	380	0,000064
303*	0,120	385	0,000053
305	0,060	390	0,000044
308	0,026	395	0,000036
310	0,015	400	0,000030

[1] Wavelengths chosen are representative: other values should be obtained by logarithmic interpolation at intermediate wavelengths.
* Emission lines of a mercury discharge spectrum.

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Table 4.2	Spectral weighting functions for assessing retinal hazards from broadband optical sources	P

Wavelength nm	Blue-light hazard function B (λ)	Burn hazard function R (λ)
300	0,01	--
305	0,01	--
310	0,01	--
315	0,01	--
320	0,01	--
325	0,01	--
330	0,01	--
335	0,01	--
340	0,01	--
345	0,01	--
350	0,01	--
355	0,01	--
360	0,01	--
365	0,01	--
370	0,01	--
375	0,01	--
380	0,01	0,1
385	0,013	0,13
390	0,025	0,25
395	0,05	0,5
400	0,10	1,0
405	0,20	2,0
410	0,40	4,0
415	0,80	8,0
420	0,90	9,0
425	0,95	9,5
430	0,98	9,8
435	1,00	10,0
440	1,00	10,0
445	0,97	9,7
450	0,94	9,4
455	0,90	9,0
460	0,80	8,0
465	0,70	7,0
470	0,62	6,2
475	0,55	5,5
480	0,45	4,5
485	0,40	4,0
490	0,22	2,2
495	0,16	1,6
500-600	$10^{[(450-\lambda)/50]}$	1,0
600-700	0,001	1,0
700-1050	--	$10^{[(700-\lambda)/500]}$
1050-1150	--	0,2
1150-1200	--	$0,2 \cdot 10^{0,02(1150-\lambda)}$
1200-1400	--	0,02

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Table 5.4 Summary of the ELs for the surface of the skin or cornea (irradiance based values) — P

Hazard Name	Relevant equation	Wavelength range nm	Exposure duration sec	Limiting aperture rad (deg)	EL in terms of constant irradiance $W \cdot m^{-2}$
Actinic UV skin & eye	$E_S = \sum E_\lambda \cdot S(\lambda) \cdot \Delta\lambda$	200 – 400	< 30000	1,4 (80)	30/t
Eye UV-A	$E_{UVA} = \sum E_\lambda \cdot \Delta\lambda$	315 – 400	≤1000 >1000	1,4 (80)	10000/t 10
Blue-light small source	$E_B = \sum E_\lambda \cdot B(\lambda) \cdot \Delta\lambda$	300 – 700	≤100 >100	< 0,011	100/t 1,0
Eye IR	$E_{IR} = \sum E_\lambda \cdot \Delta\lambda$	780 –3000	≤1000 >1000	1,4 (80)	$18000/t^{0,75}$ 100
Skin thermal	$E_H = \sum E_\lambda \cdot \Delta\lambda$	380 – 3000	< 10	2π sr	$20000/t^{0,75}$

Table 5.5 Summary of the ELs for the retina (radiance based values) — P

Hazard Name	Relevant equation	Wavelength range nm	Exposure duration sec	Field of view radians	EL in terms of constant radiance $W \cdot m^{-2} \cdot sr^{-1}$
Blue light	$L_B = \sum L_\lambda \cdot B(\lambda) \cdot \Delta\lambda$	300 – 700	0,25 – 10 10-100 100-10000 ≥ 10000	$0,011 \cdot \sqrt{(t/10)}$ 0,011 $0,0011 \cdot \sqrt{t}$ 0,1	$10^6/t$ $10^6/t$ $10^6/t$ 100
Retinal thermal	$L_R = \sum L_\lambda \cdot R(\lambda) \cdot \Delta\lambda$	380 – 1400	< 0,25 0,25 – 10	0,0017 $0,011 \cdot \sqrt{(t/10)}$	$50000/(\alpha \cdot t^{0,25})$ $50000/(\alpha \cdot t^{0,25})$
Retinal thermal (weak visual stimulus)	$L_{IR} = \sum L_\lambda \cdot R(\lambda) \cdot \Delta\lambda$	780 – 1400	> 10	0,011	6000/α

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Table 6	Emission limits for risk groups of continuous wave lamps								P
Risk	Action spectrum	Symbol	Units	Emission Measurement					
				Exempt Group		Low risk		Mod risk	
				Limit	Result	Limit	Result	Limit	Result
Actinic UV	$S_{UV}(\lambda)$	E_S	$W \cdot m^{-2}$	0,001	3.7×10^{-5}	0,003	____	0,03	____
Near UV		E_{UVA}	$W \cdot m^{-2}$	10	4.2×10^{-5}	33	____	100	____
Blue light	$B(\lambda)$	L_B	$W \cdot m^{-2} \cdot sr^{-1}$	100	2.5×10^{-2}	10000	____	4000000	____
Blue light, small source	$B(\lambda)$	E_B	$W \cdot m^{-2}$	1,0*	2.6×10^{-3}	1,0	____	400	____
Retinal thermal	$R(\lambda)$	L_R	$W \cdot m^{-2} \cdot sr^{-1}$	28000/α	5.3	28000/α	____	71000/α	____
Retinal thermal, weak visual stimulus**	$R(\lambda)$	L_{IR}	$W \cdot m^{-2} \cdot sr^{-1}$	6000/α	21 α=0.0380rad	6000/α	____	6000/α	____
IR radiation, eye	--	E_{IR}	$W \cdot m^{-2}$	100	0	570	____	3200	____

* Small source defined as one with α < 0,011 radian. Averaging field of view at 10000 s is 0,1 radian.
** Involves evaluation of non-GLS source

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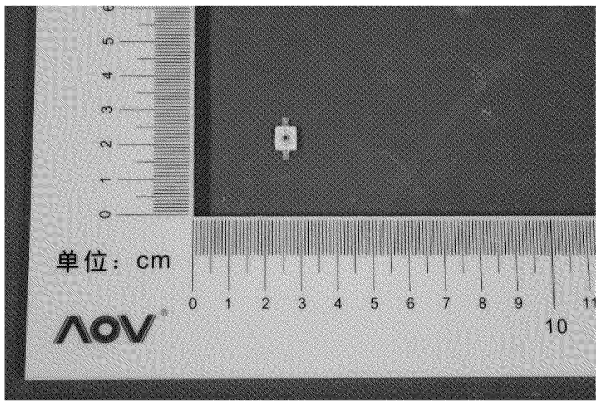
Appendix Figure documentation：



************END OF THIS REPORT************