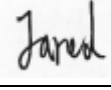
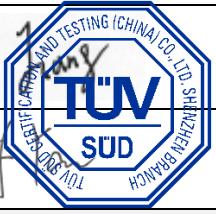


		
TEST REPORT IEC 62471 Photobiological safety of lamps and lamp systems		
Report Reference No. 68140260380001 Date of issue : 2026-07-10 Total number of pages : 21 (not including attachments)		
Name of Testing Laboratory preparing the Report TÜV SÜD Certification and Testing (China) Co., Ltd. Shenzhen Branch		
Applicant's name AOK Industrial Company Limited Address 1/F of 1#Building, East Block of 3/F of Building 1, And 2/F of Building 4, ST George's Science and Technology Industrial Park, Northside of Xinyu Road, Xiangshan Community, Xinqiao Street Baoan District, 518000 Shenzhen, Guangdong, PEOPLE'S REPUBLIC OF CHINA		
Test specification: Standard : IEC 62471:2006 Test procedure : Type test Non-standard test method : N/A		
Test Report Form No. IEC62471B TRF Originator : VDE Testing and Certification Institute Master TRF : Dated 2018-08-16 Copyright © 2018 IEC System for Conformity Testing and Certification of Electrical Equipment (IECEE), Geneva, Switzerland. All rights reserved. This publication may be reproduced in whole or in part for non-commercial purposes as long as the IECEE is acknowledged as copyright owner and source of the material. IECEE takes no responsibility for and will not assume liability for damages resulting from the reader's interpretation of the reproduced material due to its placement and context. If this Test Report Form is used by non-IECEE members, the IECEE/IEC logo and the reference to the CB Scheme procedure shall be removed.		
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Test item description	Luminaires for road and street lighting (LED Street Light)
Trade Mark	
Manufacturer	Same as applicant.
Model/Type reference	AOK-ZWiLH(S)-NV-A5-BB-XXYY-BN-P; AOK-ZWiLH(M)-NV-A5-BB-XXYY-BN-P; AOK-ZWiLH(L)-NV-A5-BB-XXYY-BN-P; AOK-ZWiLH(XL)-NV-A5-BB-XXYY-BN-P; AOK-ZWiLH(XXL)-NV-A5-BB-XXYY-BN-P; AOK-ZWiLH(S)-NV-L2-BB-XXYY-BN-P; AOK-ZWiLH(M)-NV-L2-BB-XXYY-BN-P; AOK-ZWiLH(L)-NV-L2-BB-XXYY-BN-P; AOK-ZWiLH(XL)-NV-L2-BB-XXYY-BN-P; AOK-ZWiLH(XXL)-NV-L2-BB-XXYY-BN-P; AOK-ZWiLH(S)-NV-L3-BB-XXYY-BN-P; AOK-ZWiLH(M)-NV-L3-BB-XXYY-BN-P; AOK-ZWiLH(L)-NV-L3-BB-XXYY-BN-P; ('Z' stands for Rated Power, can be 10-300, in steps of 1W, e.g. 10=10W, 300=300W; 'BB' stands for whether with NEMA socket & short-circuit cap and Zhaga socket & sealing cap, can be 00, PH and SN, 00=without NEMA socket & short-circuit cap and Zhaga socket & sealing cap, PH=with NEMA socket & short-circuit cap, SN=with Zhaga socket & sealing cap; 'XX' stands for CCT of LED, can be 27, 30, 35, 40, 50, 57 and 65, 27=2700K, 30=3000K, 35=3500K, 40=4000K, 50=5000K, 57=5700K, 65=6500K; 'YY' stands for CRI (color rendering index), can be 70, 80 and 90, 70=Ra: 70, 80=Ra: 80, 90=Ra: 90)
Ratings	Rated Voltage: 220-240VAC Rated Frequency: 50/60Hz Rated Power: See 'General product information' for details Protection Class: I Degree of Protection: IP66 Blue Light Hazard Group: BLH-B ta: 55°C

Responsible Testing Laboratory (as applicable), testing procedure and testing location(s):		
☒	Testing Laboratory:	TÜV SÜD Certification and Testing (China) Co., Ltd. Shenzhen Branch
Testing location/ address		Building 6, 12 & 13, Zhiheng Wisdomland Business Park, Guankou Erlu, Nantou, Nanshan District, Shenzhen, Guangdong 518052, China
Tested by (name, function, signature)		Jared Jiang Project Handler
Approved by (name, function, signature) ..		Sunny Yan Designated Reviewer
  		
Testing procedure: CTF Stage 1:		
Testing location/ address		
Tested by (name, function, signature)		
Approved by (name, function, signature) ..		
Testing procedure: CTF Stage 2:		
Testing location/ address		
Tested by (name + signature)		
Witnessed by (name, function, signature) ..		
Approved by (name, function, signature) ..		
Testing procedure: CTF Stage 3:		
Testing procedure: CTF Stage 4:		
Testing location/ address		
Tested by (name, function, signature)		
Witnessed by (name, function, signature) ..		
Approved by (name, function, signature) ..		
Supervised by (name, function, signature) :		

List of Attachments (including a total number of pages in each attachment): Attachment No.1: 1 pages of report for European group differences and national difference for EN 62471:2008. Attachment No.2: 21 pages of photo document.	
Summary of testing:	
Tests performed (name of test and test clause): This applicable tests as described in the compliance checklist were performed at AOK-300WILH(XXL)-NV-A5-PH-6570-BN-P, AOK-300WILH(XXL)-NV-L2-SN-6570-BN-P and AOK-150WILH(L)-NV-L3-00-6570-BN-P. The product was classified as Except Group (for models with LED: TS1-H50FL-1001BC (TYF 5050) and L128-AABBRC3500DDD (Lumileds 2835)) and Risk Group 1 (for models with LED: L130-AABB003000C2D (LUXEON 3030 2D)) according to above test specification.	Testing location: TÜV SÜD Certification and Testing (China) Co., Ltd. Shenzhen Branch Building 6, 12 & 13, Zhiheng Wisdomland Business Park, Guankou Erlu, Nantou, Nanshan District, Shenzhen, Guangdong 518052, China
Summary of compliance with National Differences (List of countries addressed): - European group differences and national difference ☒ The product fulfils the requirements of EN 62471:2008	
Copy of marking plate: --	

Test item particulars	LED Luminaire	
Tested lamp	☒ continuous wave lamps	☐ pulsed lamps
Tested lamp system	N/A	
Lamp classification group	☒ exempt (for models with LED: TS1-H50FL-1001BC (TYF 5050) and L128-AABBRC3500DDD (Lumileds 2835)) ☒ risk 1 (for models with LED: L130-AABB003000C2D (LUXEON 3030 2D)) ☐ risk 2 ☐ risk 3	
Lamp cap	N/A	
Bulb	N/A	
Rated of the lamp	N/A	
Furthermore marking on the lamp	N/A	
Seasoning of lamps according IEC standard	N/A	
Used measurement instrument	Double monochromator	
Temperature by measurement	25,2 °C	
Information for safety use	See test summary	
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 of receipt of test item : 2026-03-30		
Date (s) of performance of tests : 2026-03-30 to 2026-07-10		
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 ☒ comma / ☐ point is used as the decimal separator.		
Name and address of factory (ies) : Same as applicant		

General product information and other remarks:**Measurement uncertainty statement see below:****Measurement uncertainty statement for IEC 62471:2006**

Risk		Units	Expanded Uncertainty; coverage factor (k)
E_s	Actinic UV	$W \cdot m^{-2}$	$U = 9,40\%$; $k=2$
E_{UVA}	Near UV	$W \cdot m^{-2}$	$U = 6,50\%$; $k=2$
L_B	Blue light	$W \cdot m^{-2} \cdot sr^{-1}$	$U = 4,70\%$; $k=2$
E_B	Blue light, small source	$W \cdot m^{-2}$	$U = 6,50\%$; $k=2$
L_R	Retinal thermal	$W \cdot m^{-2} \cdot sr^{-1}$	$U = 4,70\%$; $k=2$
L_{IR}	Retinal thermal, weak visual stimulus	$W \cdot m^{-2} \cdot sr^{-1}$	$U = 4,70\%$; $k=2$
E_{IR}	IR radiation, eye	$W \cdot m^{-2}$	$U = 6,50\%$; $k=2$

Remark:

- Only photobiological hazards have been addressed.
- Decision rule for an upper specification limit (A lower limit or specification with an upper and a lower limit is treated similarly.):
 - Compliance with the requirement: If a specification limit is not breached by a measurement result plus the expanded uncertainty with a 95% coverage probability, then compliance with the specification will be stated (e.g. Pass).
 - Non-compliance with the requirement: If a specification limit is exceeded by the measurement result minus the expanded uncertainty with a 95% coverage probability, then non-compliance with the specification will be stated (e.g. Fail).
 - Inconclusive result: If a measurement result plus/minus the expanded uncertainty with a 95 % coverage probability overlaps the limit it will be stated that it is not possible to state compliance or non-compliance.

The products covered in this report are Class I LED street lights, equipped with non-user replaceable light source is for outdoor use only.

The clamp for locking metal enclosure cannot be opened by a single action with one hand.

The maximum mounting height is 50m.

Products with NEMA socket & short circuit cap and Zhaga socket & sealing cap covered by this report are the luminaires up to the socket. Device connected to the socket may affect the compliance of the full system and are not covered by this report.

Model list for luminaire:

TRF No. IEC62471B

Model No.	'Z' can be 10 to 300 which stands for Rated Power 10W to 300W, in steps of 1W	Rated Power (W)	LED driver			LED type	Size (mm)	Weight (kg)	Max. projected area (m ²)
AOK-ZWiLH(S)-NV-A5-BB-XXYY-BN-P	Z=10 to 30	10-30	EUM-030S050DG	SS-40NH-V300BB	SS-40PA-H80F	TYF 5050	545*200*97	3,0	0,091
	Z=31 to 40	31-40	EUM-050S090DG	SS-40NH-V300BB	SS-40PA-H80F				
	Z=41 to 50	41-50	EUM-050S090DG	SS-60NH-V300BB or SS-100NH-V300BHB	SS-60PA-H120F				
	Z=51 to 60	51-60	EUM-075S053DG	SS-60NH-V300BB or SS-100NH-V300BHB	SS-60PA-H120F				
	Z=61 to 70	61-70	EUM-075S053DG	SS-70NH-V300BB or SS-100NH-V300BHB	SS-80PA-H160F				
	Z=71 to 80	71-80	EUM-100S053DG	SS-80NH-V300BHB or SS-100NH-V300BHB	SS-80PA-H160F				
	Z=81 to 100	81-100	EUM-100S053DG	SS-100NH-V300BHB	SS-120PA-H240F				
AOK-ZWiLH(M)-NV-A5-BB-XXYY-BN-P	Z=101 to 120	101-120	EUM-150S070DG	SS-150NH-V300BHB	SS-120PA-H240F		559*220*97	3,4	0,1
	Z=121 to 150	121-150	EUM-150S070DG	SS-150NH-V300BHB	SS-165PA-H330F				
AOK-ZWiLH(L)-NV-A5-BB-XXYY-BN-P	Z=121 to 150	121-150	EUM-150S070DG	SS-150NH-V300BHB	SS-165PA-H330F		609*235*97	4,0	0,12
	Z=151 to 160	151-160	EUM-200S070DG	SS-200NH-V300BHB	SS-165PA-H330F				
	Z=161 to 200	161-200	EUM-200S070DG	SS-200NH-V300BHB	SS-220PA-314F				
AOK-ZWiLH(XL)-NV-A5-BB-XXYY-BN-P	Z=161 to 200	161-200	EUM-200S070DG	SS-200NH-V300BHB	SS-220PA-314F		609*280*100	5,4	0,143
	Z=201 to 240	201-240	EUM-240S070DG	SS-240NH-V300BHB	SS-120PA-H240F (2pcs)				
AOK-ZWiLH(XXL)-NV-A5-BB-XXYY-BN-P	Z=201 to 240	201-240	EUM-240S070DG	SS-240NH-V300BHB	SS-120PA-H240F (2pcs)		730*300*100	7,1	0,19
	Z=241 to 300	241-300	EUM-320S105DG	SS-320NH-V300BHB	SS-165PA-H330F (2pcs)				
AOK-ZWiLH(S)-NV-L2-BB-XXYY-BN-P	Z=10 to 30	10-30	EUM-030S050DG	SS-40NH-V300BB	SS-40PA-H80F	Lumileds 2835	545*200*97	3,0	0,091
	Z=31 to 40	31-40	EUM-050S090DG	SS-40NH-V300BB	SS-40PA-H80F				

	Z=41 to 50	41-50	EUM-050S090DG	SS-60NH-V300BB or SS-100NH-V300BHB	SS-60PA-H120F					
	Z=51 to 60	51-60	EUM-075S053DG	SS-60NH-V300BB or SS-100NH-V300BHB	SS-60PA-H120F					
	Z=61 to 70	61-70	EUM-075S053DG	SS-70NH-V300BB or SS-100NH-V300BHB	SS-80PA-H160F					
	Z=71 to 80	71-80	EUM-100S053DG	SS-80NH-V300BHB or SS-100NH-V300BHB	SS-80PA-H160F					
	Z=81 to 100	81-100	EUM-100S053DG	SS-100NH-V300BHB	SS-120PA-H240F					
AOK-ZWiLH(M)-NV-L2 -BB-XXYY-BN-P	Z=101 to 120	101-120	EUM-150S070DG	SS-150NH-V300BHB	SS-120PA-H240F					
	Z=121 to 150	121-150	EUM-150S070DG	SS-150NH-V300BHB	SS-165PA-H330F					
AOK-ZWiLH(L)-NV-L2 -BB-XXYY-BN-P	Z=121 to 150	121-150	EUM-150S070DG	SS-150NH-V300BHB	SS-165PA-H330F					
	Z=151 to 160	151-160	EUM-200S070DG	SS-200NH-V300BHB	SS-165PA-H330F					
	Z=161 to 200	161-200	EUM-200S070DG	SS-200NH-V300BHB	SS-220PA-314F					
AOK-ZWiLH(XL)-NV-L 2-BB-XXYY-BN-P	Z=161 to 200	161-200	EUM-200S070DG	SS-200NH-V300BHB	SS-220PA-314F					
	Z=201 to 240	201-240	EUM-240S070DG	SS-240NH-V300BHB	SS-120PA-H240F (2pcs)					
AOK-ZWiLH(XXL)-NV- L2-BB-XXYY-BN-P	Z=201 to 240	201-240	EUM-240S070DG	SS-240NH-V300BHB	SS-120PA-H240F (2pcs)					
	Z=241 to 300	241-300	EUM-320S105DG	SS-320NH-V300BHB	SS-165PA-H330F (2pcs)					
AOK-ZWiLH(S)-NV-L3 -BB-XXYY-BN-P	Z=10 to 30	10-30	EUM-030S050DG	SS-40NH-V300BB	SS-40PA-H80F	LUXEON 3030 2D	545*200* 97	3,0	0,091	
	Z=31 to 40	31-40	EUM-050S090DG	SS-40NH-V300BB	SS-40PA-H80F					
	Z=41 to 50	41-50	EUM-050S090DG	SS-60NH-V300BB or SS-100NH-V300BHB	SS-60PA-H120F					
	Z=51 to 60	51-60	EUM-075S053DG	SS-60NH-V300BB or SS-100NH-V300BHB	SS-60PA-H120F					
	Z=61 to 70	61-70	EUM-075S053DG	SS-70NH-V300BB or SS-100NH-V300BHB	SS-80PA-H160F					

	Z=71 to 80	71-80	EUM-100S053DG	SS-80NH-V300BHB or SS-100NH-V300BHB	SS-80PA-H160F				
	Z=81 to 100	81-100	EUM-100S053DG	SS-100NH-V300BHB	SS-120PA-H240F				
AOK-ZWILH(M)-NV-L3 -BB-XXYY-BN-P	Z=101 to 120	101-120	EUM-150S070DG	SS-150NH-V300BHB	SS-120PA-H240F		559*220* 97	3,4	0,1
	Z=121 to 150	121-150	EUM-150S070DG	SS-150NH-V300BHB	SS-165PA-H330F				
AOK-ZWILH(L)-NV-L3- BB-XXYY-BN-P	Z=121 to 150	121-150	EUM-150S070DG	SS-150NH-V300BHB	SS-165PA-H330F		609*235* 97	4,0	0,12

Remark 1:

'Z' stands for Rated Power, can be 10-300, in steps of 1W, e.g. 10=10W, 300=300W;

'BB' stands for whether with NEMA socket & short-circuit cap and Zhaga socket & sealing cap, can be 00, PH and SN, 00=without NEMA socket & short-circuit cap and Zhaga socket & sealing cap, PH=with NEMA socket & short-circuit cap, SN=with Zhaga socket & sealing cap;

'XX' stands for CCT of LED, can be 27, 30, 35, 40, 50, 57 and 65, 27=2700K, 30=3000K, 35=3500K, 40=4000K, 50=5000K, 57=5700K, 65=6500K;

'YY' stands for CRI (color rendering index), can be 70, 80 and 90, 70=Ra: 70, 80=Ra: 80, 90=Ra: 90.

Remark 2: LED types TYF 5050, Lumileds 2835 and LUXEON 3030 2D stand for different LED type; TYF 5050=TS1-H50FL-1001BC, Lumileds 2835=L128-AABBRC3500DDD, LUXEON 3030 2D=L130-AABB003000C2D

The used LED specification as below:

Model No.	Manufacturer	V _F (V)	I _F (mA)	CCT(K)
TS1-H50FL-1001BC (TYF 5050)	Shenzhen Tongyifang Optoelectronic Technology Co., Ltd.	30V	Max.100mA;	2700-6500K
L128-AABBRC3500DDD (Lumileds 2835)	LUMILEDS	8,4-9,2	Max.120mA;	2700-6500K
L130-AABB003000C2D (LUXEON 3030 2D)	LUMILEDS	5,8-6,6	Max.240mA;	2700-6500K

All models have similar construction except for above difference.

Models AOK-300WILH(XXL)-NV-A5-PH-6570-BN-P, AOK-300WILH(XXL)-NV-L2-SN-6570-BN-P and AOK-150WILH(L)-NV-L3-00-6570-BN-P were chosen as representative models to perform this test.

IEC 62471			
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 $10^4 \text{ cd}\cdot\text{m}^{-2}$	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 $30 \text{ J}\cdot\text{m}^{-2}$ within any 8-hour period		P
	To protect against injury of the eye or skin from ultraviolet radiation exposure produced by a broad-band source, the effective integrated spectral irradiance, E_s , of the light source shall not exceed the levels defined by:		P
	$E_s \cdot t = \sum_{200}^{400} \sum_t E_\lambda(\lambda, t) \cdot S_{UV}(\lambda) \cdot \Delta t \cdot \Delta \lambda \leq 30 \quad \text{J}\cdot\text{m}^{-2}$		P
	The permissible time for exposure to ultraviolet radiation incident upon the unprotected eye or skin shall be computed by:		P
	$t_{\max} = \frac{30}{E_s} \quad \text{s}$		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 $10000 \text{ J}\cdot\text{m}^{-2}$ 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, E_{UVA} , shall not exceed $10 \text{ W}\cdot\text{m}^{-2}$.		P
	The permissible time for exposure to ultraviolet radiation incident upon the unprotected eye for time less than 1000 s, shall be computed by:		P
	$t_{\max} \leq \frac{10\,000}{E_{UVA}} \quad \text{s}$		P
4.3.3	Retinal blue light hazard exposure limit		P
	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, $B(\lambda)$, i.e., the blue-light weighted radiance, L_B , shall not exceed the levels defined by:		P
	$L_B \cdot t = \sum_{300}^{700} \sum_t L_\lambda(\lambda, t) \cdot B(\lambda) \cdot \Delta t \cdot \Delta \lambda \leq 10^6 \quad \text{J} \cdot \text{m}^{-2} \cdot \text{sr}^{-1}$	for $t \leq 10^4 \text{ s}$ $t_{\max} = \frac{10^6}{L_B}$	N/A

IEC 62471			
Clause	Requirement + Test	Result – Remark	Verdict
	$L_B = \sum_{300}^{700} L_{\lambda} \cdot B(\lambda) \cdot \Delta\lambda \leq 100 \quad W \cdot m^{-2} \cdot sr^{-1}$	for $t > 10^4$ s	P
4.3.4	Retinal blue light hazard exposure limit - small source		N/A
	Thus the spectral irradiance at the eye E_{λ} , weighted against the blue-light hazard function $B(\lambda)$ shall not exceed the levels defined by:	see table 4.2	N/A
	$E_B \cdot t = \sum_{300}^{700} \sum_t E_{\lambda}(\lambda, t) \cdot B(\lambda) \cdot \Delta\lambda \leq 100 \quad J \cdot m^{-2}$	for $t \leq 100$ s	N/A
	$E_B = \sum_{300}^{700} E_{\lambda} \cdot B(\lambda) \cdot \Delta\lambda \leq 1 \quad W \cdot m^{-2}$	for $t > 100$ s	N/A
4.3.5	Retinal thermal hazard exposure limit		P
	To protect against retinal thermal injury, the integrated spectral radiance of the light source, L_{λ} , weighted by the burn hazard weighting function $R(\lambda)$ (from Figure 4.2 and Table 4.2), i.e., the burn hazard weighted radiance, shall not exceed the levels defined by:		P
	$L_R = \sum_{380}^{1400} L_{\lambda} \cdot R(\lambda) \cdot \Delta\lambda \leq \frac{50\,000}{\alpha \cdot t^{0.25}} \quad W \cdot m^{-2} \cdot sr^{-1}$	($10 \mu s \leq t \leq 10$ s)	P
4.3.6	Retinal thermal hazard exposure limit – weak visual stimulus		N/A
	For an infrared heat lamp or any near-infrared source where a weak visual stimulus is inadequate to activate 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:		N/A
	$L_{IR} = \sum_{780}^{1400} L_{\lambda} \cdot R(\lambda) \cdot \Delta\lambda \leq \frac{6\,000}{\alpha} \quad W \cdot m^{-2} \cdot sr^{-1}$	$t > 10$ s	N/A
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 (cataractogenesis), 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
	$E_{IR} = \sum_{780}^{3000} E_{\lambda} \cdot \Delta\lambda \leq 18\,000 \cdot t^{-0.75} \quad W \cdot m^{-2}$	$t \leq 1000$ s	N/A
	For times greater than 1000 s the limit becomes:		P
	$E_{IR} = \sum_{780}^{3000} E_{\lambda} \cdot \Delta\lambda \leq 100 \quad W \cdot m^{-2}$	$t > 1000$ 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

IEC 62471			
Clause	Requirement + Test	Result – Remark	Verdict
	$E_H \cdot t = \sum_{380}^{3000} \sum_t E_\lambda(\lambda, t) \cdot \Delta t \cdot \Delta \lambda \leq 20\,000 \cdot t^{0,25} \quad \text{J} \cdot \text{m}^{-2}$		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/A
	Seasoning of lamps shall be done as stated in the appropriate IEC lamp standard.		N/A
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 extraneous sources of radiation and reflections do not add significantly to the measurement results.		P
5.1.4	Lamp operation		N/A
	Operation of the test lamp shall be provided in accordance with:		N/A
	– the appropriate IEC lamp standard, or		N/A
	– the manufacturer's recommendation		N/A
5.1.5	Lamp system operation		P
	The power source for operation of the test lamp shall be provided in accordance with:		P
	– the appropriate IEC standard, or		N/A
	– the manufacturer's recommendation		P
5.2	Measurement procedure		P
5.2.1	Irradiance measurements		P
	Minimum aperture diameter 7mm.		P
	Maximum aperture diameter 50 mm.		P
	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		N/A
	The measurements made with an optical system.		N/A

IEC 62471			
Clause	Requirement + Test	Result – Remark	Verdict
	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.		N/A
5.2.2.2	Alternative method		P
	Alternatively to an imaging radiance set-up, an irradiance measurement set-up with a circular field stop placed at the source can be used to perform radiance measurements.		P
5.2.3	Measurement of source size		P
	The determination of α , the angle subtended by a source, requires the determination of the 50% emission points of the source.		P
5.2.4	Pulse width measurement for pulsed sources		N/A
	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/A
5.3	Analysis methods		P
5.3.1	Weighting curve interpolations		P
	To standardize interpolated values, use linear interpolation on the log of given values to obtain intermediate points at the wavelength intervals desired.	see table 4.1	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.		P
6	LAMP CLASSIFICATION		—
	For the purposes of this standard it was decided that the values shall be reported as follows:	see table 6.1	P
	– for lamps intended for general lighting service, the hazard values shall be reported as either irradiance or radiance values at a distance which produces an illuminance of 500 lux, but not at a distance less than 200 mm		P
	– for all other light sources, including pulsed lamp sources, the hazard values shall be reported at a distance of 200 mm		N/A
6.1	Continuous wave lamps		P
6.1.1	Except Group		P

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Clause	Requirement + Test	Result – Remark	Verdict
	In the except group are lamps, which does not pose any photobiological hazard. The requirement is met by any lamp that does not pose:	for models with LED: TS1-H50FL-1001BC (TYF 5050)	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)		P
	In this group are lamps, which exceeds the limits for the except group but that does not pose:	for models with LED: L130-AABB003000C2D (LUXEON 3030 2D)	P
	– an actinic ultraviolet hazard (E_s) within 10000 s, nor		P
	– a near ultraviolet hazard (E_{UVA}) within 300 s, nor		P
	– a retinal blue-light hazard (L_B) within 100 s, nor		P
	– a retinal thermal hazard (L_R) within 10 s, nor		P
	– an infrared radiation hazard for the eye (E_{IR}) within 100 s		P
	Lamps that emit infrared radiation without a strong visual stimulus and do not pose a near-infrared retinal hazard (L_{IR}), within 100 s are in Risk Group 1.		P
6.1.3	Risk Group 2 (Moderate-Risk)		N/A
	This requirement is met by any lamp that exceeds the limits for Risk Group 1, but that does not pose:		N/A
	– an actinic ultraviolet hazard (E_s) within 1000 s exposure, nor		N/A
	– a near ultraviolet hazard (E_{UVA}) within 100 s, nor		N/A
	– a retinal blue-light hazard (L_B) within 0,25 s (aversion response), nor		N/A
	– a retinal thermal hazard (L_R) within 0,25 s (aversion response), nor		N/A
	– an infrared radiation hazard for the eye (E_{IR}) within 10 s		N/A
	Lamps that emit infrared radiation without a strong visual stimulus and do not pose a near-infrared retinal hazard (L_{IR}), within 10 s are in Risk Group 2.		N/A
6.1.4	Risk Group 3 (High-Risk)		N/A
	Lamps which exceed the limits for Risk Group 2 are in Group 3.		N/A

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Clause	Requirement + Test	Result – Remark	Verdict

6.2	Pulsed lamps		N/A
	Pulse lamp criteria shall apply to a single pulse and to any group of pulses within 0,25 s.		N/A
	A pulsed lamp shall be evaluated at the highest nominal energy loading as specified by the manufacturer.		N/A
	The risk group determination of the lamp being tested shall be made as follows:		N/A
	– a lamp that exceeds the exposure limit shall be classified as belonging to Risk Group 3 (High-Risk)		N/A
	– 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/A
	– 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/A

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Clause	Requirement + Test	Result – Remark	Verdict

Table 4.1	Spectral weighting function for assessing ultraviolet hazards for skin and eye			--
Wavelength ¹ λ , nm	UV hazard function $S_{uv}(\lambda)$	Wavelength λ , nm	UV hazard function $S_{uv}(\lambda)$	
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		--
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)						--
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)						--
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	$6000/\alpha$	

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Clause	Requirement + Test	Result – Remark	Verdict

Table 6.1 Emission limits for risk groups of continuous wave lamps Model: AOK-300WILH(XXL)-NV-A5-PH-6570-BN-P									P
Risk	Action spectrum	Symbol	Units	Emission Measurement					
				Exempt		Low risk		Mod risk	
				Limit	Result	Limit	Result	Limit	Result
Actinic UV	$S_{UV}(\lambda)$	E_s	$W \cdot m^{-2}$	0,001	1,98E-06	0,003	n/a	0,03	n/a
Near UV		E_{UVA}	$W \cdot m^{-2}$	10	2,42E-05	33	n/a	100	n/a
Blue light	$B(\lambda)$	L_B	$W \cdot m^{-2} \cdot sr^{-1}$	100	52,0842	10000	n/a	4000000	n/a
Blue light, small source	$B(\lambda)$	E_B	$W \cdot m^{-2}$	1,0*	0E+00	1,0	n/a	400	n/a
Retinal thermal	$R(\lambda)$	L_R	$W \cdot m^{-2} \cdot sr^{-1}$	$28000/\alpha = 280000$	4,71E+03	$28000/\alpha = 280000$	n/a	$71000/\alpha$	n/a
Retinal thermal, weak visual stimulus**	$R(\lambda)$	L_{IR}	$W \cdot m^{-2} \cdot sr^{-1}$	$6000/\alpha = 60000$	n/a	$6000/\alpha = 60000$	n/a	$6000/\alpha$	n/a
IR radiation, eye		E_{IR}	$W \cdot m^{-2}$	100	7,66E-04	570	n/a	3200	n/a
* Small source defined as one with $\alpha < 0,011$ radian. Averaging field of view at 10000 s is 0,1 radian. ** Involves evaluation of non-GLS source									

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Clause	Requirement + Test	Result – Remark	Verdict

Table 6.1 Emission limits for risk groups of continuous wave lamps Model: AOK-300WiLH(XXL)-NV-L2-SN-6570-BN-P									P
Risk	Action spectrum	Symbol	Units	Emission Measurement					
				Exempt		Low risk		Mod risk	
				Limit	Result	Limit	Result	Limit	Result
Actinic UV	$S_{UV}(\lambda)$	E_s	$W \cdot m^{-2}$	0,001	1,81E-09	0,003	n/a	0,03	n/a
Near UV		E_{UVA}	$W \cdot m^{-2}$	10	3,93E-05	33	n/a	100	n/a
Blue light	$B(\lambda)$	L_B	$W \cdot m^{-2} \cdot sr^{-1}$	100	55,4331	10000	n/a	4000000	n/a
Blue light, small source	$B(\lambda)$	E_B	$W \cdot m^{-2}$	1,0*	0E+00	1,0	n/a	400	n/a
Retinal thermal	$R(\lambda)$	L_R	$W \cdot m^{-2} \cdot sr^{-1}$	$28000/\alpha = 280000$	3,79E+03	$28000/\alpha = 280000$	n/a	$71000/\alpha$	n/a
Retinal thermal, weak visual stimulus**	$R(\lambda)$	L_{IR}	$W \cdot m^{-2} \cdot sr^{-1}$	$6000/\alpha = 60000$	n/a	$6000/\alpha = 60000$	n/a	$6000/\alpha$	n/a
IR radiation, eye		E_{IR}	$W \cdot m^{-2}$	100	6,9E-04	570	n/a	3200	n/a
* Small source defined as one with $\alpha < 0,011$ radian. Averaging field of view at 10000 s is 0,1 radian. ** Involves evaluation of non-GLS source									

IEC 62471			
Clause	Requirement + Test	Result – Remark	Verdict

Table 6.1 Emission limits for risk groups of continuous wave lamps Model: AOK-150WILH(L)-NV-L3-00-6570-BN-P									P
Risk	Action spectrum	Symbol	Units	Emission Measurement					
				Exempt		Low risk		Mod risk	
				Limit	Result	Limit	Result	Limit	Result
Actinic UV	$S_{UV}(\lambda)$	E_s	$W \cdot m^{-2}$	0,001	9,43E-06	0,003	n/a	0,03	n/a
Near UV		E_{UVA}	$W \cdot m^{-2}$	10	0.0053	33	n/a	100	n/a
Blue light	$B(\lambda)$	L_B	$W \cdot m^{-2} \cdot sr^{-1}$	100	5,12E+03	10000	1,06E+03	4000000	n/a
Blue light, small source	$B(\lambda)$	E_B	$W \cdot m^{-2}$	1,0*	0E+00	1,0	0E+00	400	n/a
Retinal thermal	$R(\lambda)$	L_R	$W \cdot m^{-2} \cdot sr^{-1}$	$28000/\alpha = 280233.18$	1,34E+04	$28000/\alpha$	1,34E+04	$71000/\alpha$	n/a
Retinal thermal, weak visual stimulus**	$R(\lambda)$	L_{IR}	$W \cdot m^{-2} \cdot sr^{-1}$	$6000/\alpha$	n/a	$6000/\alpha$	n/a	$6000/\alpha$	n/a
IR radiation, eye		E_{IR}	$W \cdot m^{-2}$	100	6,3E-08	570	6,3E-08	3200	n/a
* Small source defined as one with $\alpha < 0,011$ radian. Averaging field of view at 10000 s is 0,1 radian. ** Involves evaluation of non-GLS source									

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IEC62471B ATTACHMENT			
Clause	Requirement + Test	Result - Remark	Verdict
ATTACHMENT TO TEST REPORT IEC 62471 EUROPEAN GROUP DIFFERENCES AND NATIONAL DIFFERENCES Photobiological safety of lamps and lamps systems			
Differences according to : EN 62471:2008			
TRF template used : IECEE OD-2020-F2:2020, Ed. 1.1			
Attachment Form No. : EU_GD_IEC62471B			
Attachment Originator : OVE			
Master Attachment : Dated 2021-04-29			
Copyright © 2021 IEC System for Conformity Testing and Certification of Electrical Equipment (IECEE), Geneva, Switzerland. All rights reserved.			
	CENELEC COMMON MODIFICATIONS (EN)		—
4	EXPOSURE LIMITS		—
	Contents of the whole Clause 4 of IEC 62471:2006 moved into a new informative Annex ZB		—
	Clause 4 replaced by the following:		P
	The original Clause 4 of IEC 62471:2006 contains provisions governing limiting values for the exposure of persons falling within the area of the health and safety of workers. Within Europe those limiting values are already covered by the Artificial Optical Radiation Directive (2006/25/EC). Thus, the limits of the directive have to be applied instead of those fixed in IEC 62471:2006.		P
	There are no differences in EN 62471:2008 regarding the classification of lamps according Clause 6 of IEC 62471:2006.		—
4.1	General		P
	Delete the first paragraph.		—

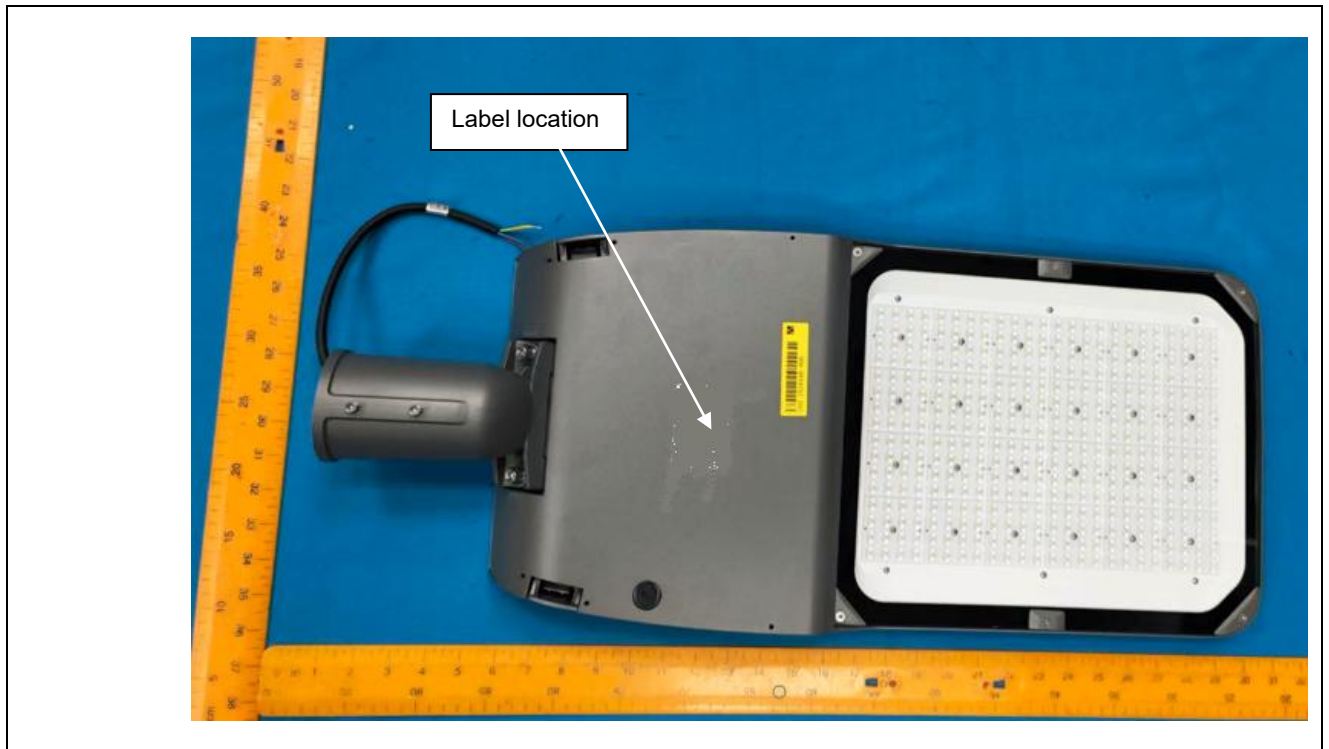
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Photo documentation

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Details of: Front view for AOK-300WiLH(XXL)-NV-A5-00-6570-BN-P (Representative model)



Details of: Back view for AOK-300WiLH(XXL)-NV-A5-00-6570-BN-P (Representative model)



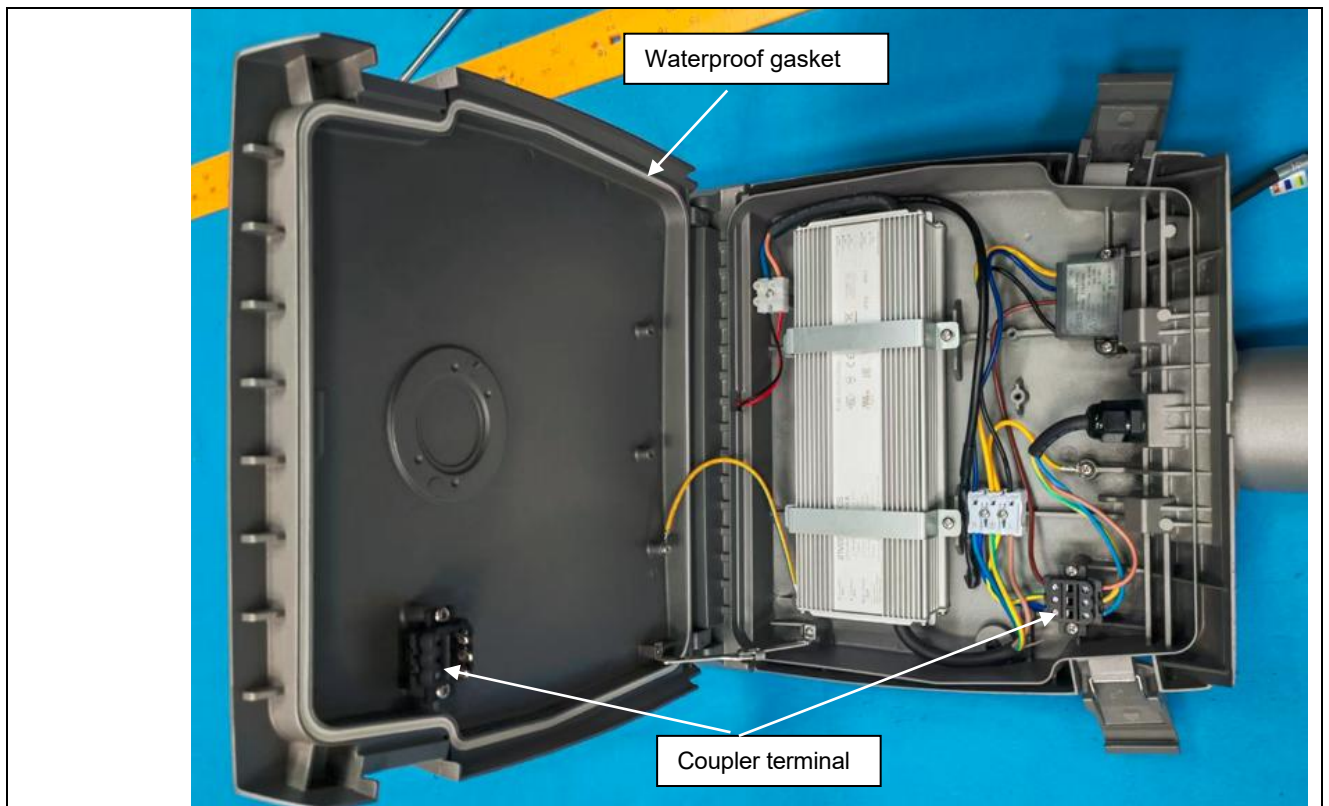
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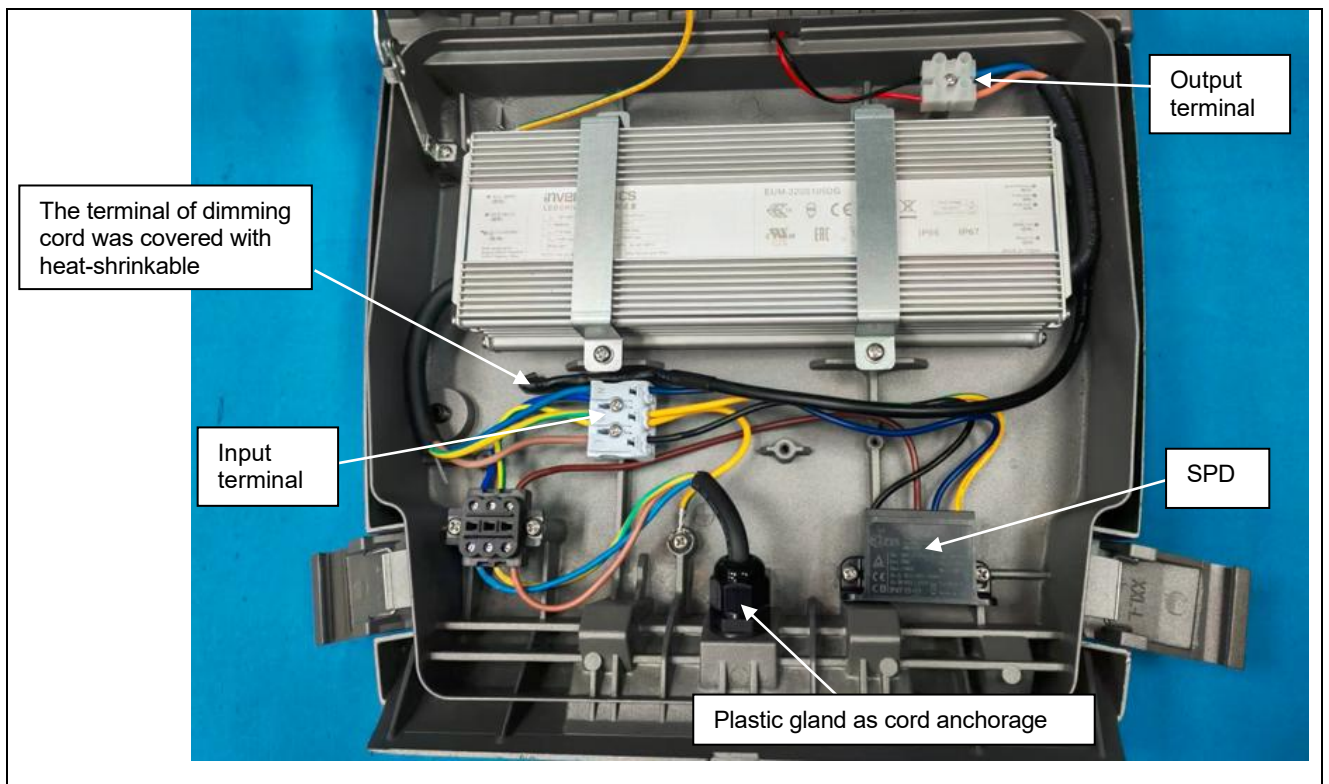
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Details of: Internal view for AOK-300WiLH(XXL)-NV-A5-00-6570-BN-P (Representative model)



Details of: Internal view for AOK-300WiLH(XXL)-NV-A5-00-6570-BN-P (Representative model)



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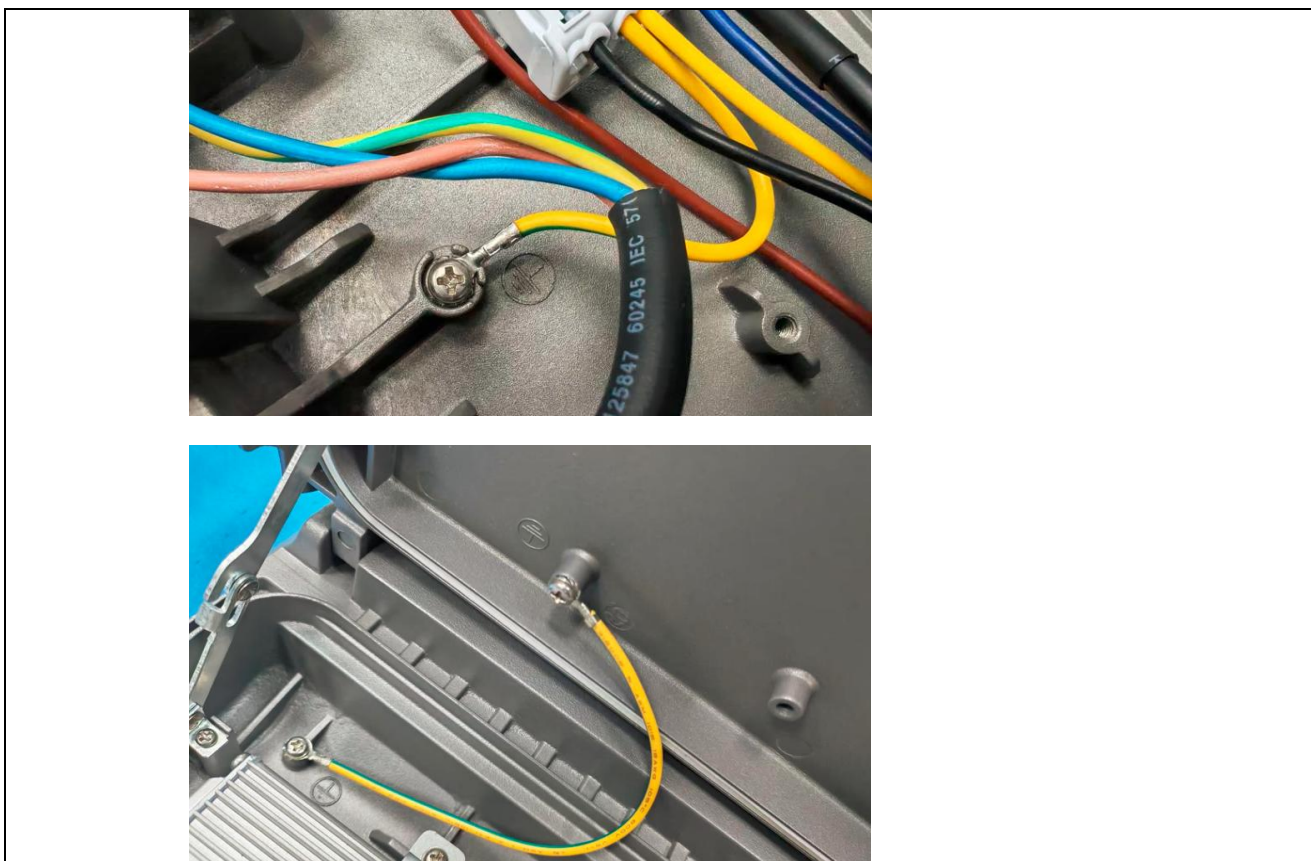
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Details of: Internal view for AOK-300WiLH(XXL)-NV-A5-00-6570-BN-P (Representative model)



Details of: Earthing view for AOK-300WiLH(XXL)-NV-A5-00-6570-BN-P (Representative model)



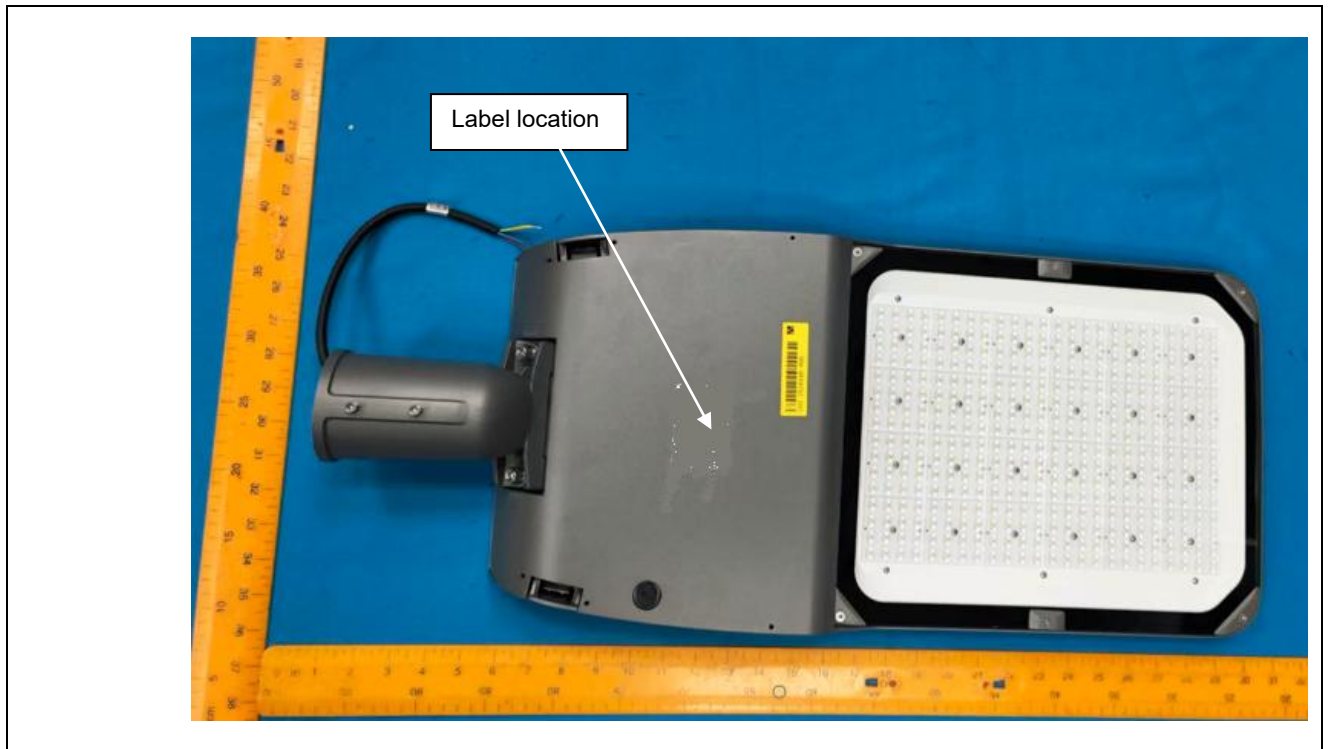
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Details of: Front view for AOK-300WiLH(XXL)-NV-A5-PH-6570-BN-P (Representative model)



Details of: Back view for AOK-300WiLH(XXL)-NV-A5-PH-6570-BN-P (Representative model)



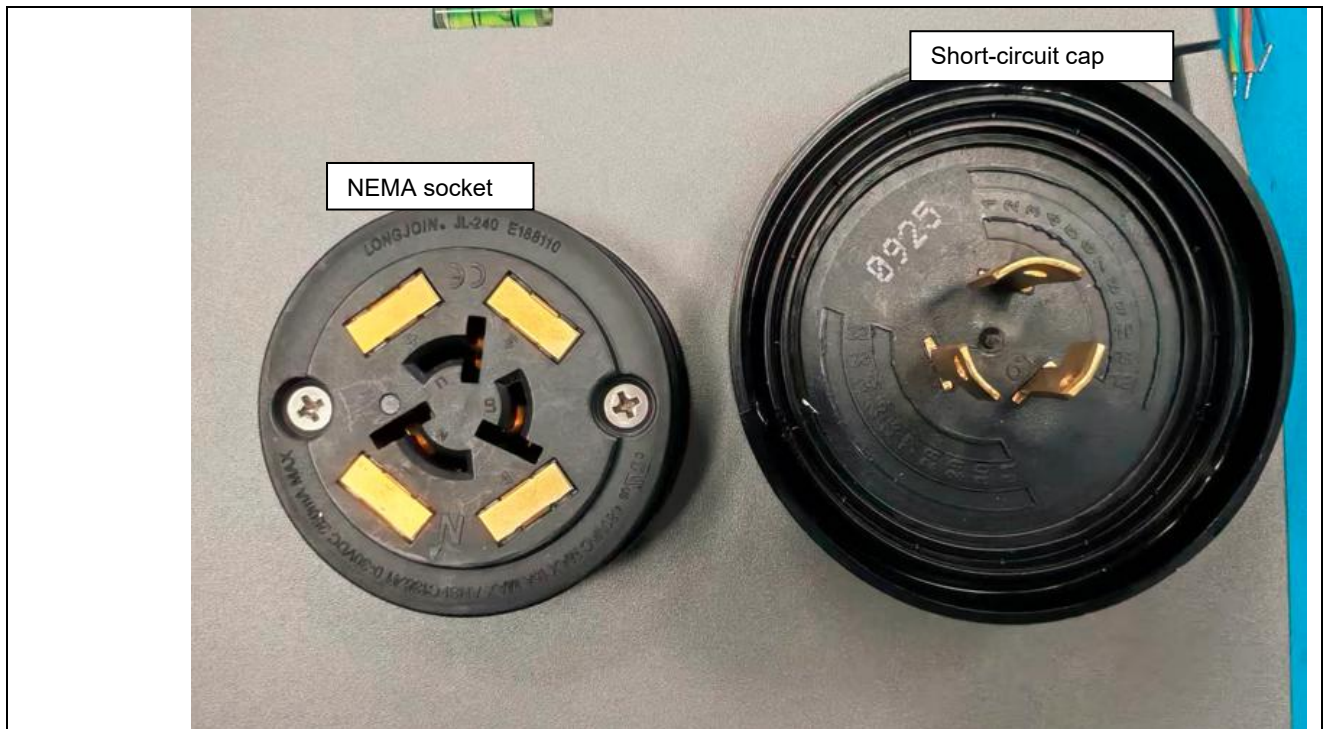
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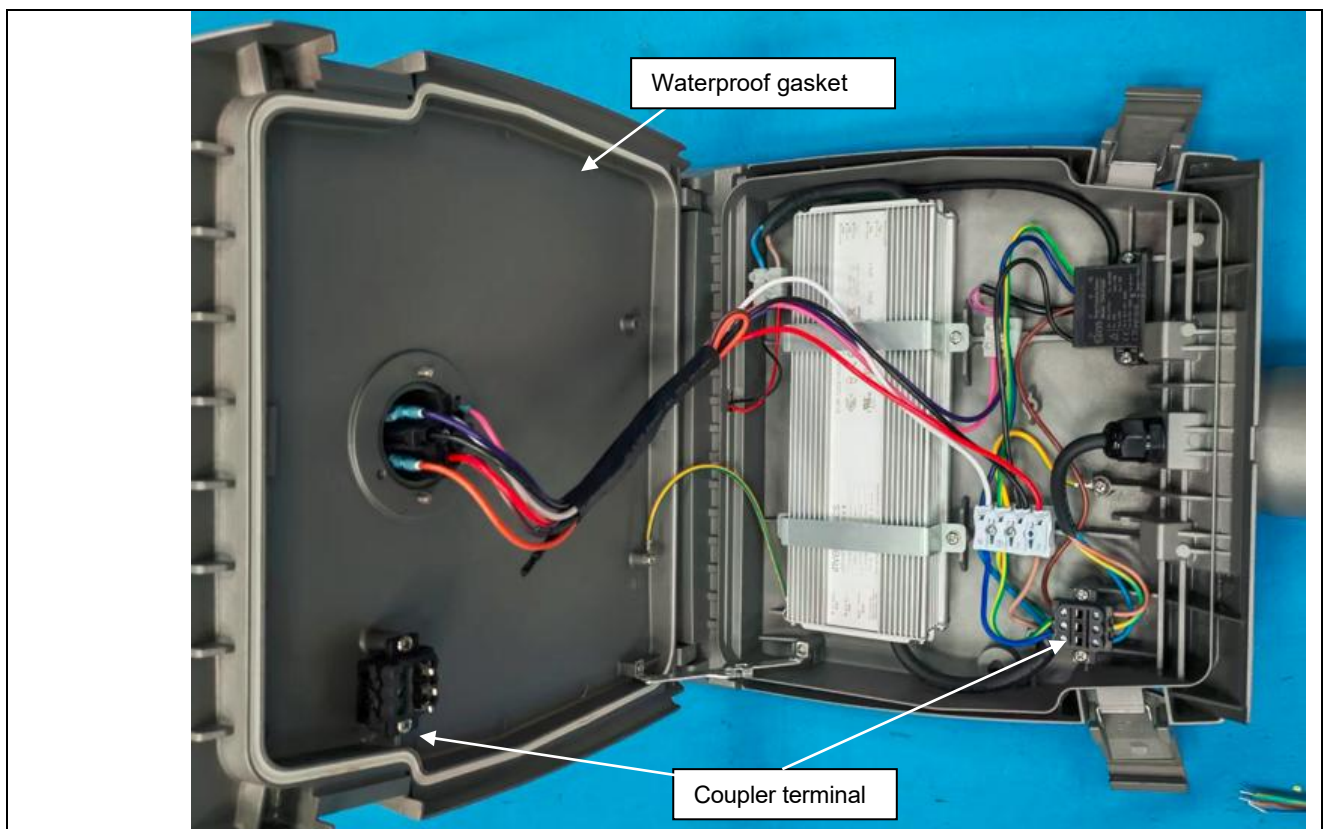
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Details of: Internal view of NEMA socket after removing short-circuit cap for AOK-300WiLH(XXL)-NV-A5-PH-6570-BN-P (Representative model)



Details of: Internal view for AOK-300WiLH(XXL)-NV-A5-PH-6570-BN-P (Representative model)



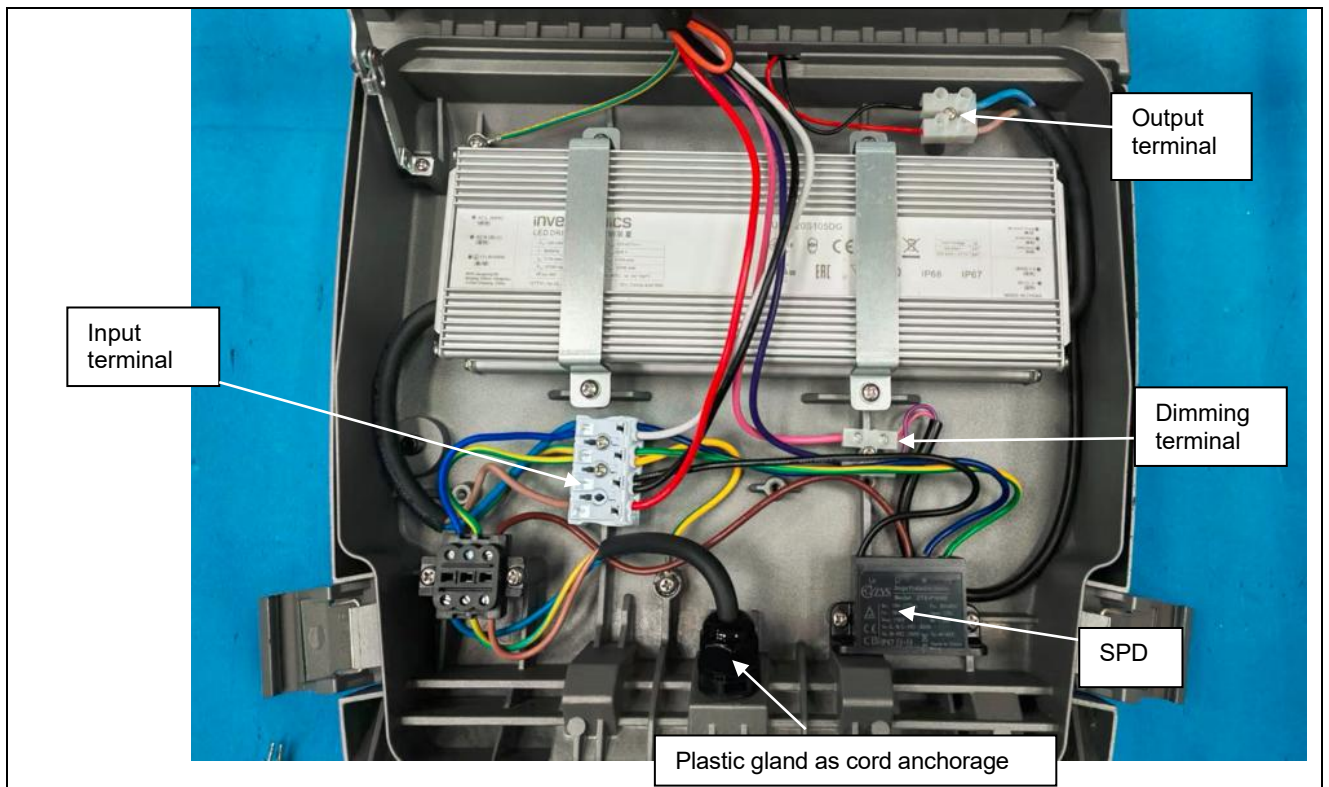
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Details of: Internal view for AOK-300WiLH(XXL)-NV-A5-PH-6570-BN-P (Representative model)



Details of: Internal view for AOK-300WiLH(XXL)-NV-A5-PH-6570-BN-P (Representative model)



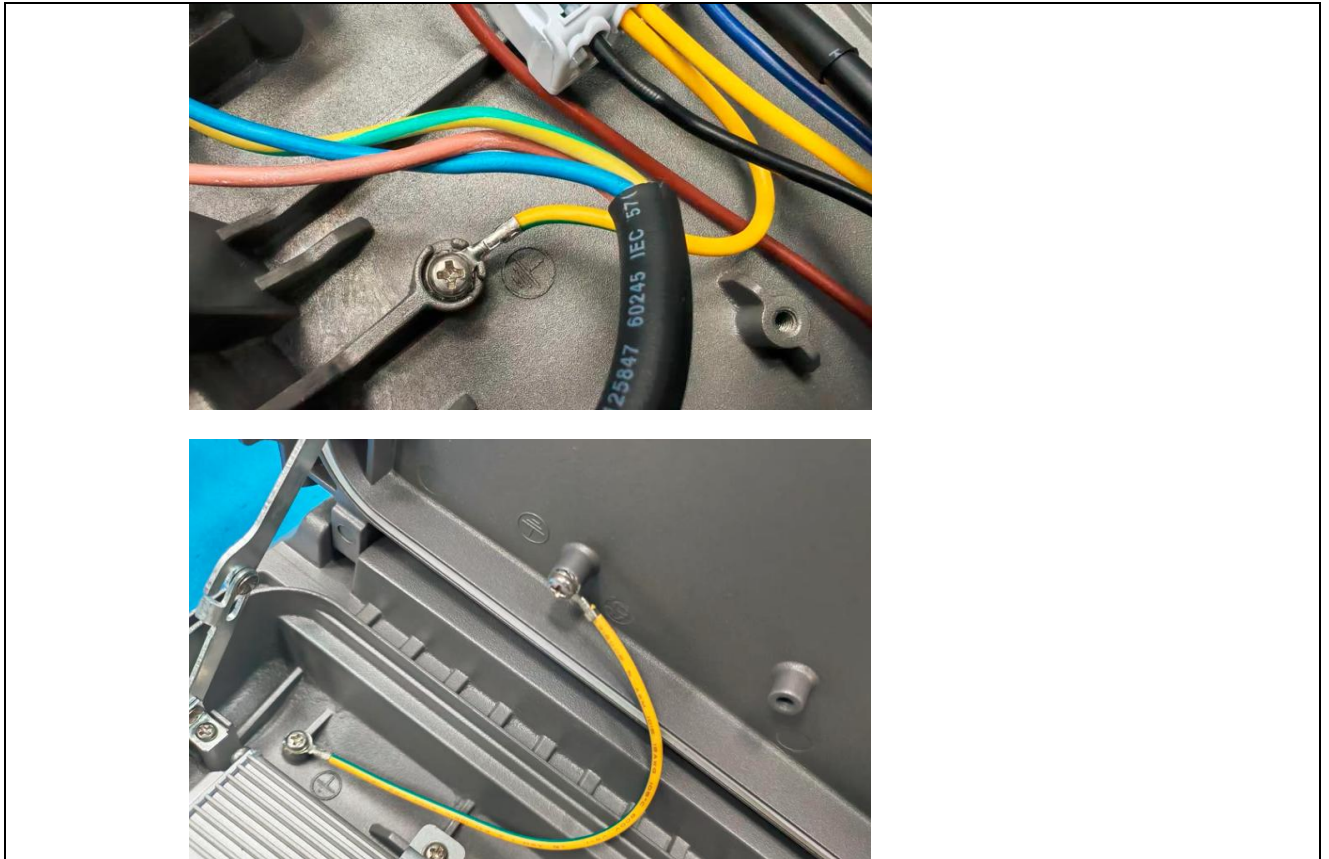
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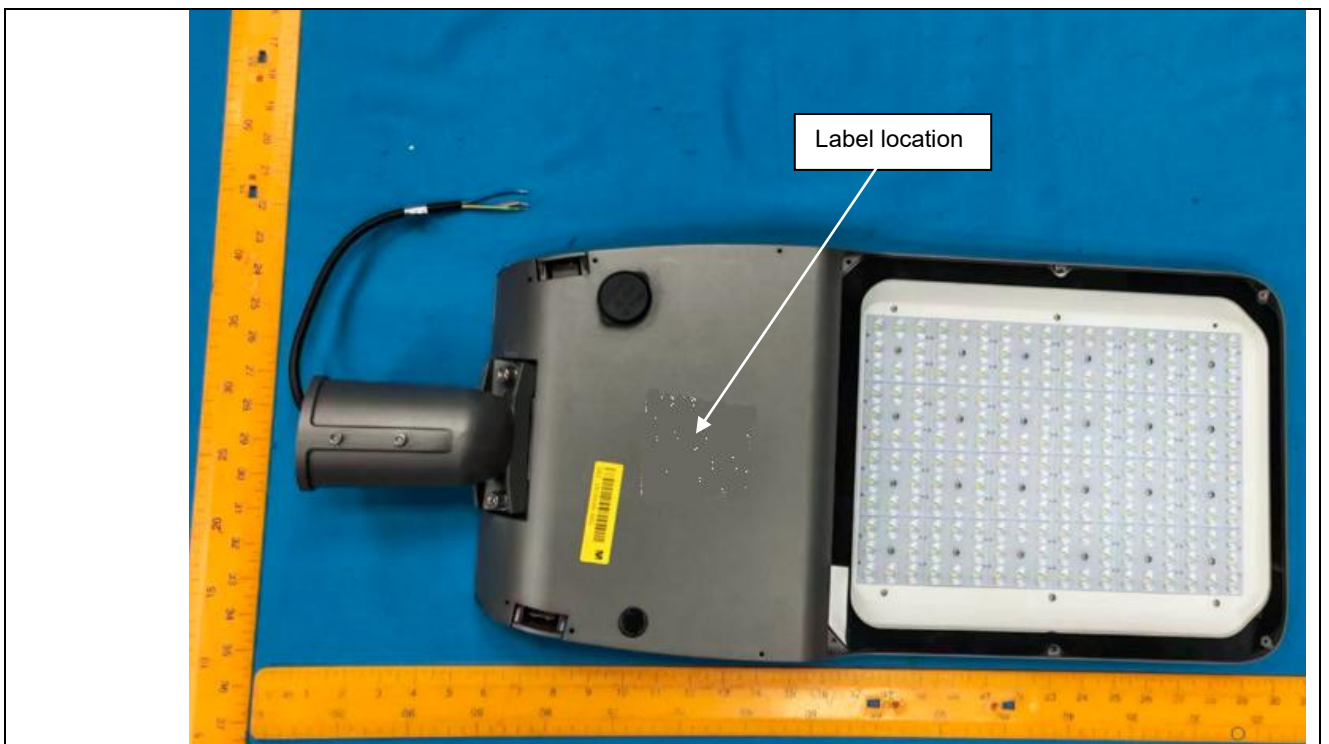
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Details of: Earthing view for AOK-300WiLH(XXL)-NV-A5-PH-6570-BN-P (Representative model)



Details of: Front view for AOK-300WiLH(XXL)-NV-A5-SN-6570-BN-P (Representative model)



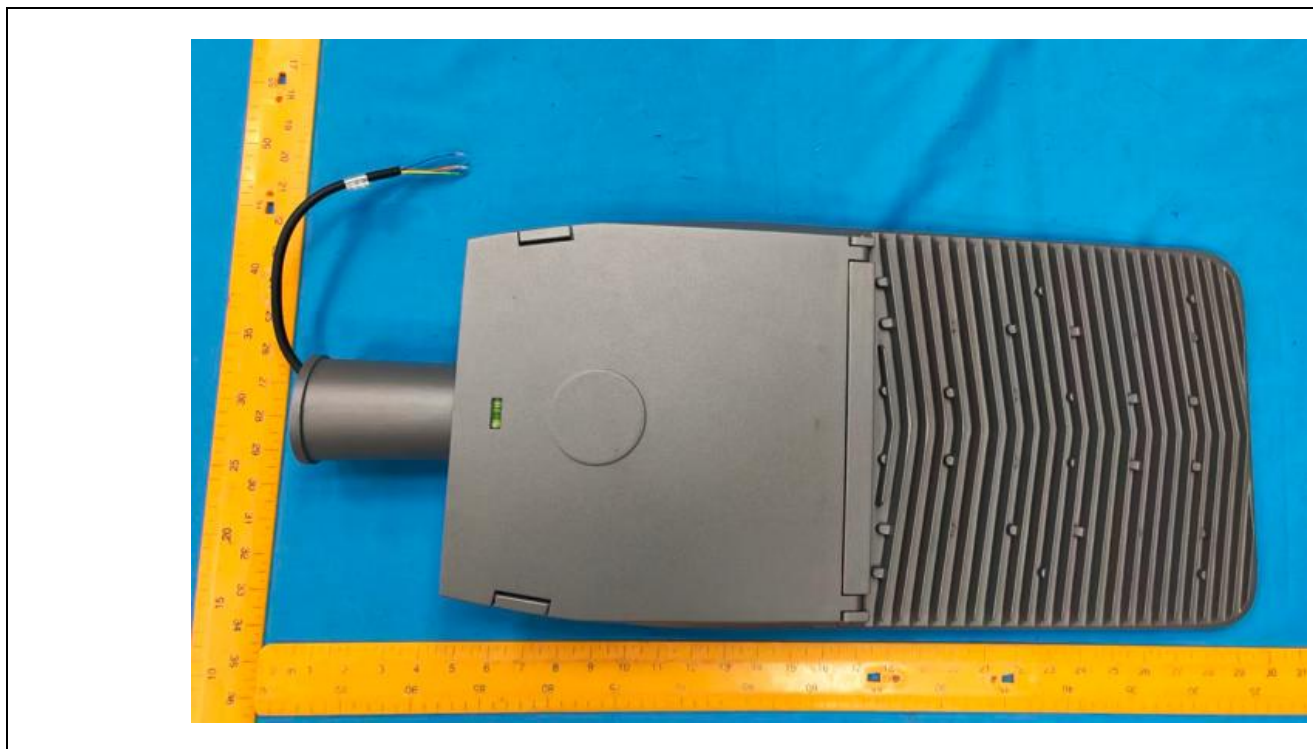
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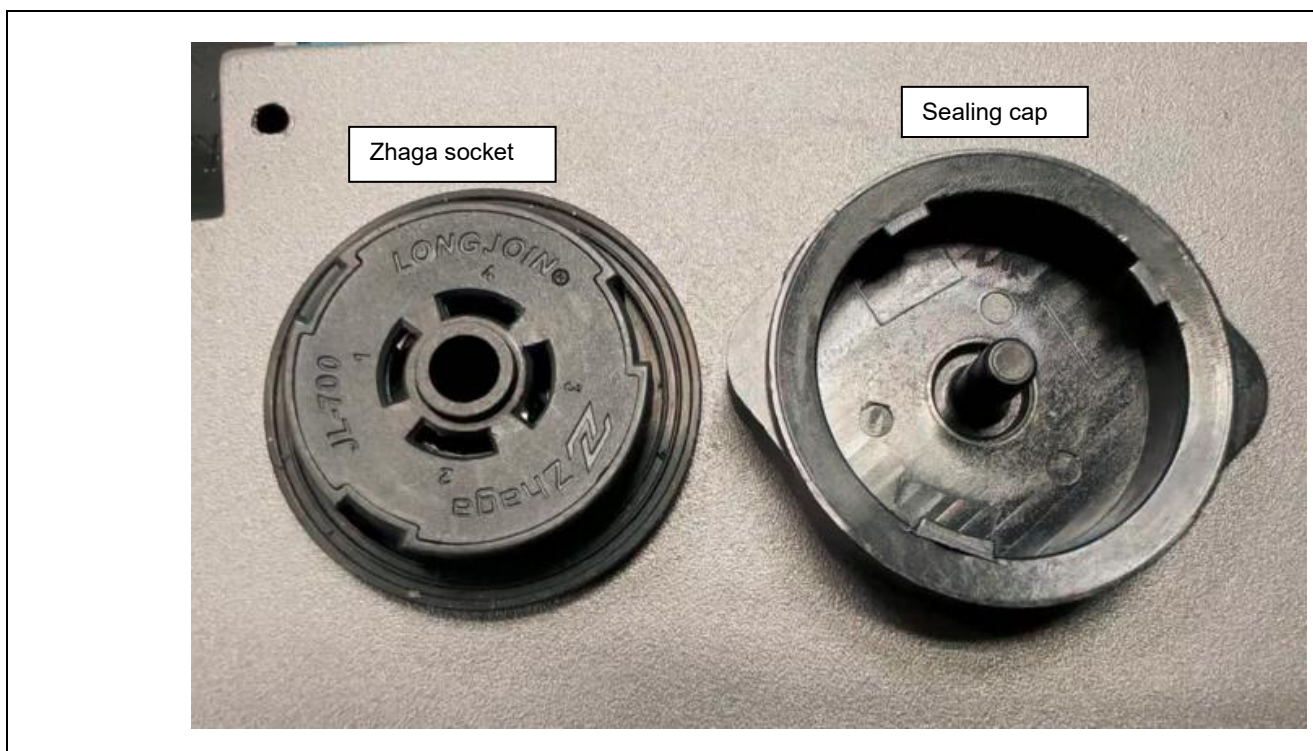
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Details of: Back view for AOK-300WiLH(XXL)-NV-A5-SN-6570-BN-P (Representative model)



Details of: Internal view of Zhaga socket after removed sealing cap for AOK-300WiLH(XXL)-NV-A5-SN-6570-BN-P (Representative model)



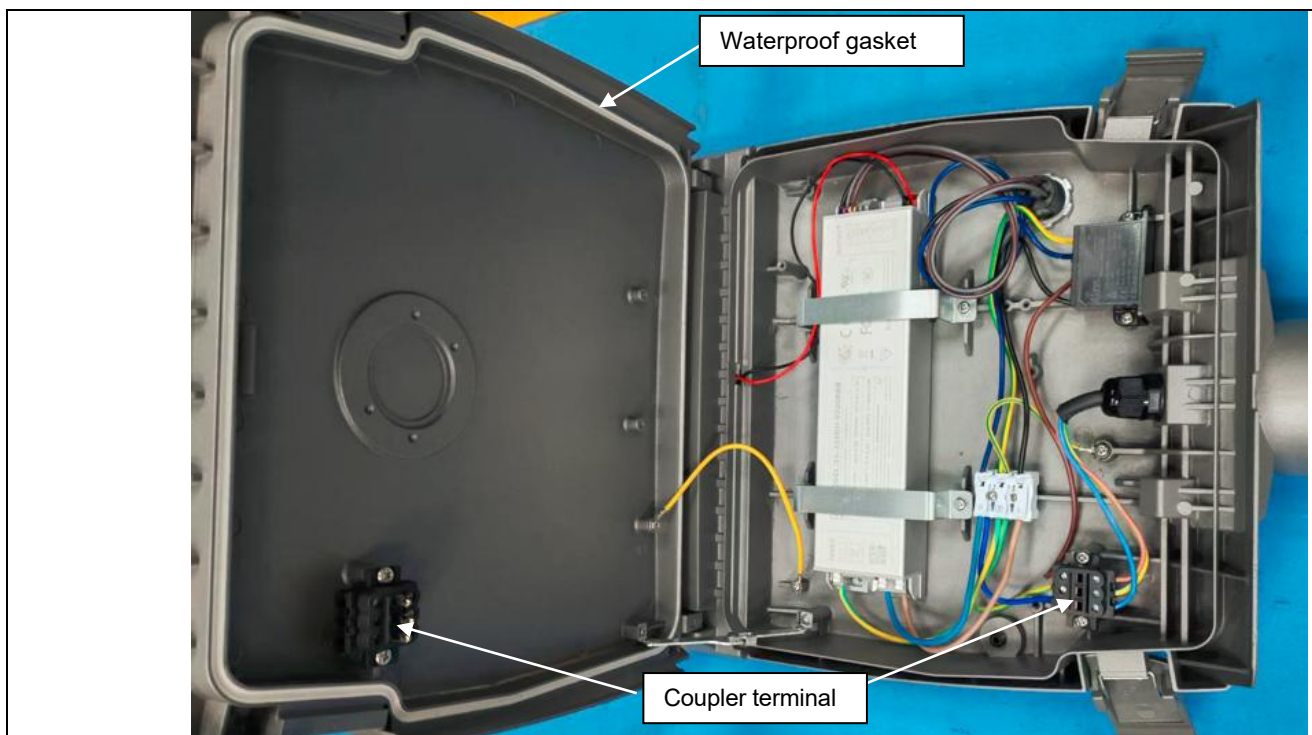
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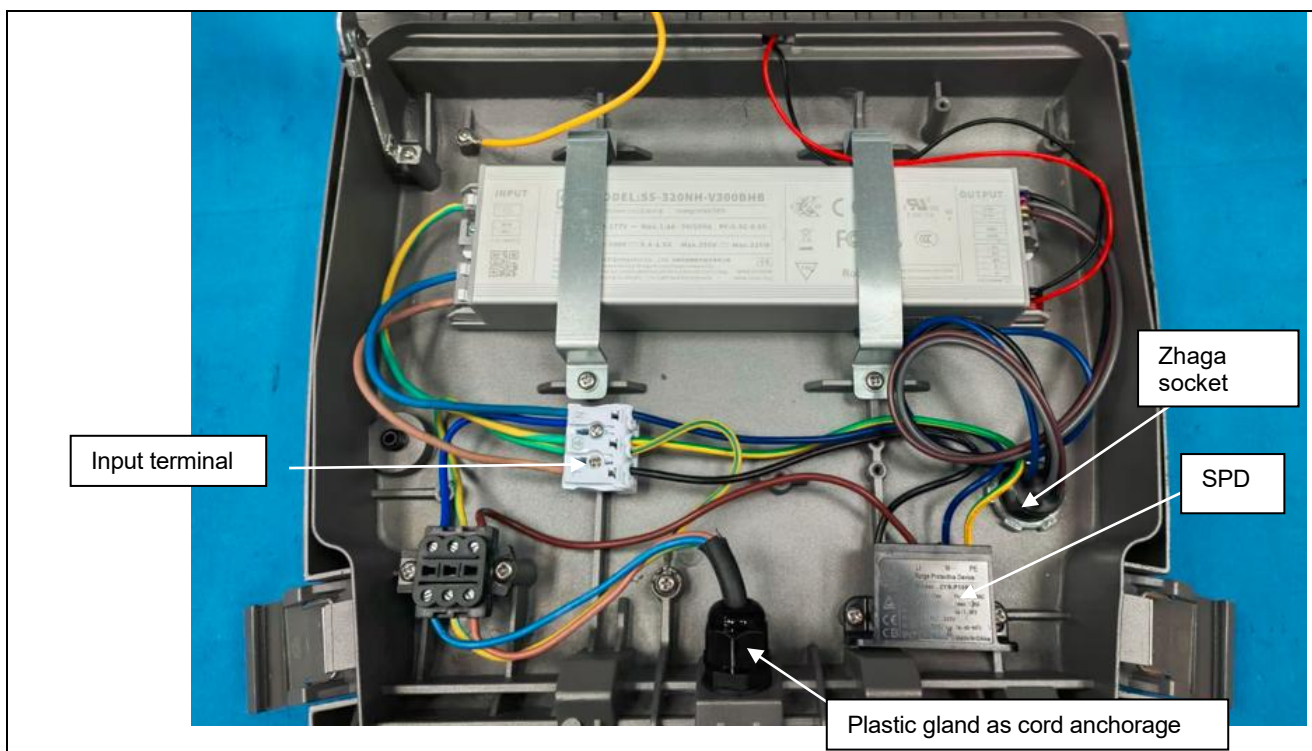
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Details of: Internal view for AOK-300WiLH(XXL)-NV-A5-SN-6570-BN-P (Representative model)



Details of: Internal view for AOK-300WiLH(XXL)-NV-A5-SN-6570-BN-P (Representative model)



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Photo documentation

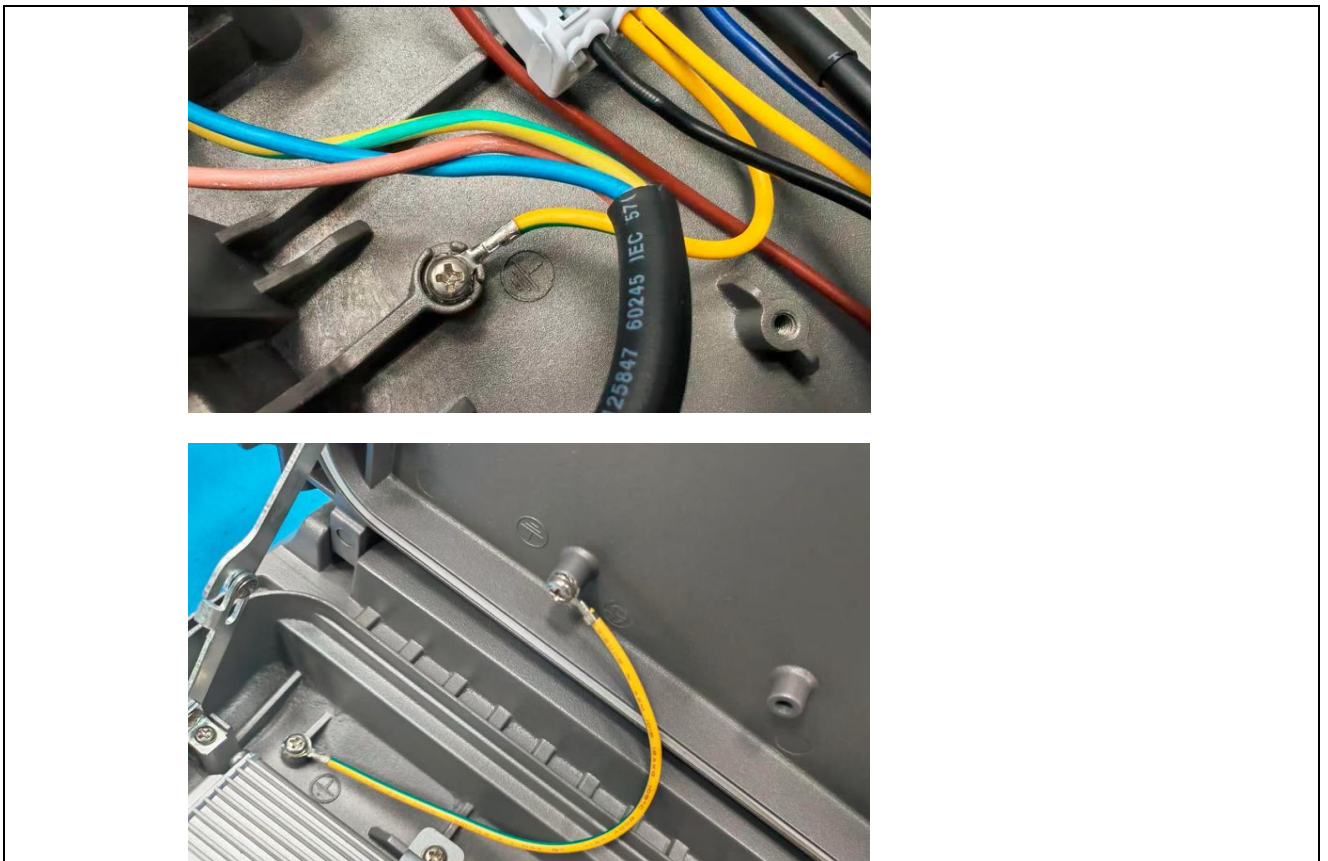
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Details of: Internal view for AOK-300WiLH(XXL)-NV-A5-SN-6570-BN-P (Representative model)



Details of: Earthing view for AOK-300WiLH(XXL)-NV-A5-SN-6570-BN-P (Representative model)



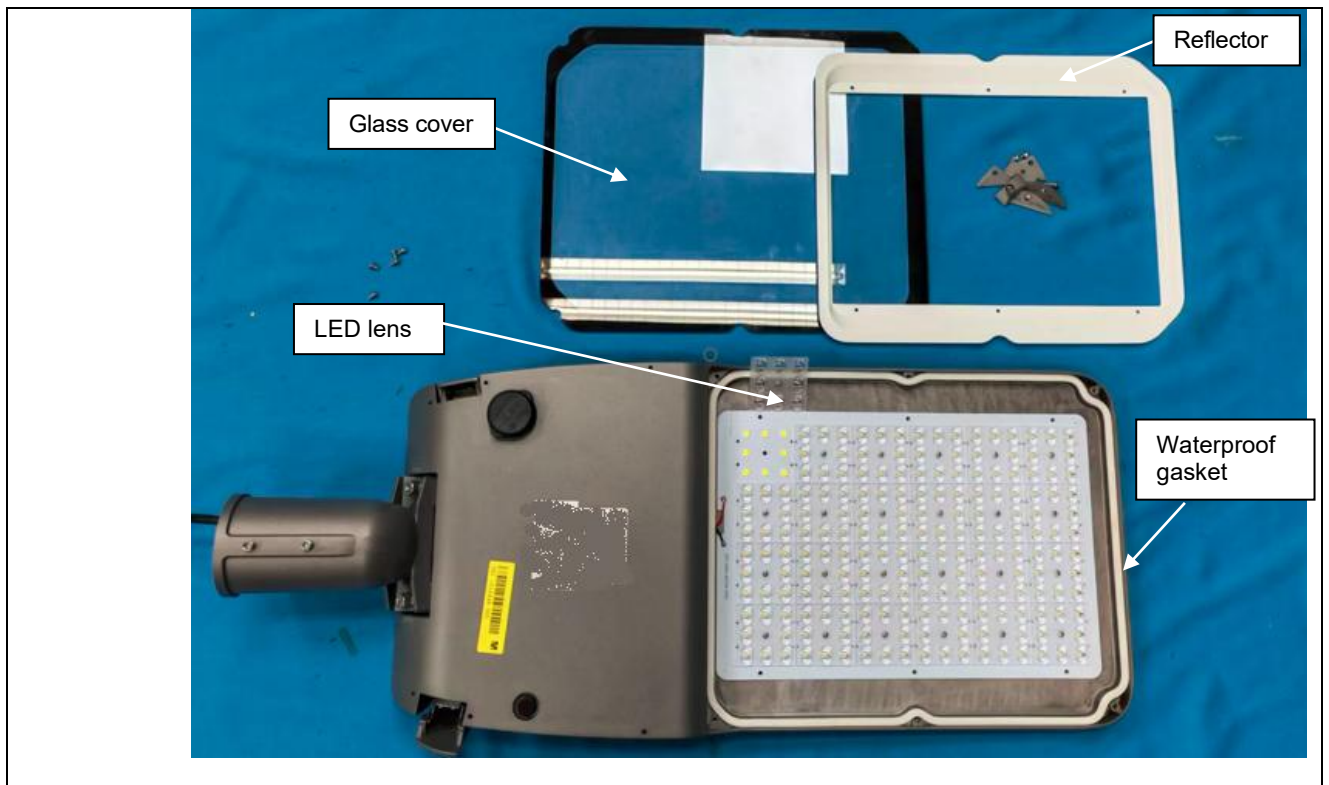
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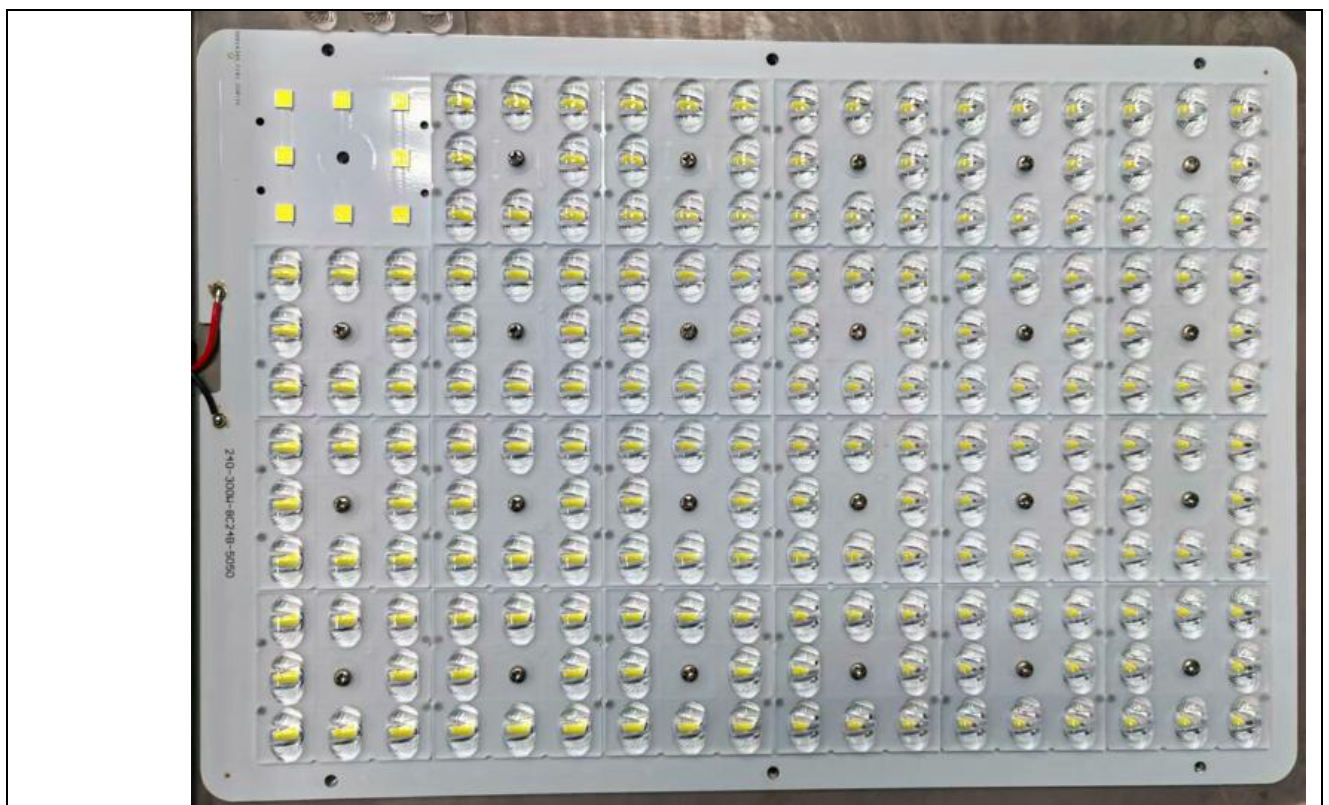
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Details of: Internal view for AOK-300WiLH(XXL)-NV-A5-SN-6570-BN-P (Representative model)



Details of: LED module view for AOK-300WiLH(XXL)-NV-A5-SN-6570-BN-P (Representative model)



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Details of: Surge Protective Device (SPD) view
Representative model: ZYS-P10SD

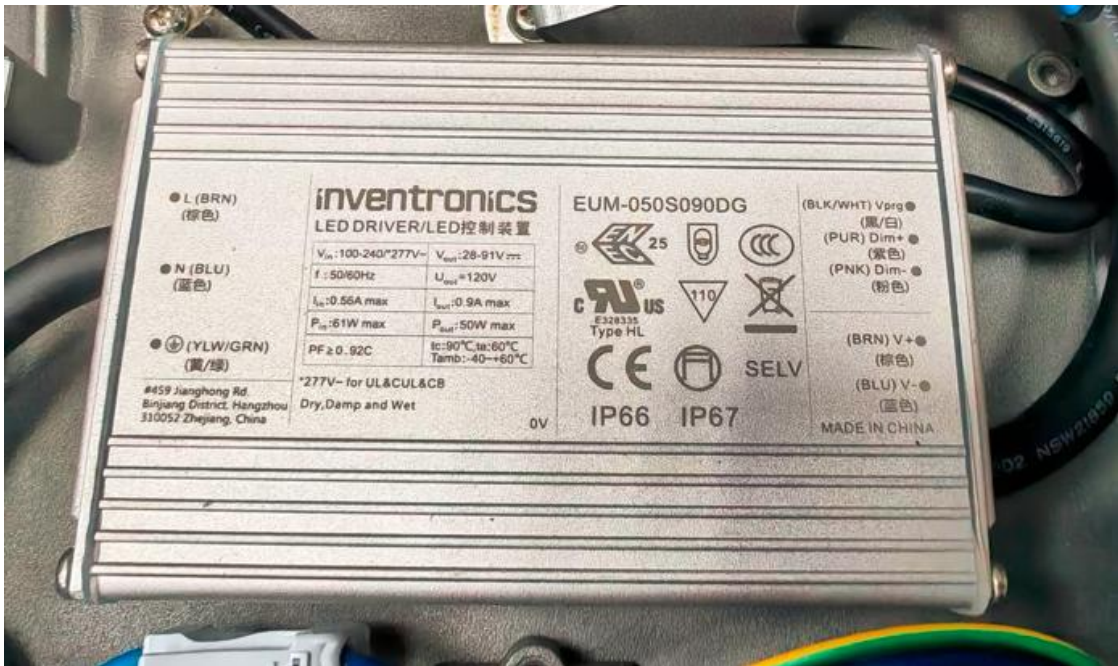


Details of: LED driver view
EUM-030S050DG



Attachment No. 2

Details of: LED driver view
EUM-050S090DG



Details of: LED driver view
EUM-075S053DG



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Details of: LED driver view
EUM-100S053DG



Details of: LED driver view
EUM-150S070DG



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Details of: LED driver view
EUM-200S070DG



Details of: LED driver view
EUM-240S070DG



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Details of: LED driver view
EUM-320S105DG



Details of: LED driver view
SS-70NH-V300BB



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Details of: LED driver view
SS-100NH-V300BHB



Details of: LED driver view
SS-150NH-V300BHB



Attachment No. 2

Photo documentation

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Details of: LED driver view
SS-200NH-V300BHB



Details of: LED driver view
SS-240NH-V300BHB



Attachment No. 2

Details of: LED driver view
SS-320NH-V300BHB



Details of: LED driver view
SS-80PA-H160F



Attachment No. 2

Details of: LED driver view
SS-120PA-H240F



Details of: LED driver view
SS-165PA-H330F



Attachment No. 2

Photo documentation

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Details of: LED driver view
SS-220PA-314F



End of report