PULSE LED
TECNOLOGIA LED

PROCESSO LICITATÓRIO nº 049/2018
Pregão Presencial para Registro de Preços n° 021/2018

PROPOSTA DE PREÇOS

NOME DA EMPRESA: PULSE SISTEMAS ELETRONICOS LTDA

CNPJ: 16.370.273/0001-68

ENDEREÇO: AV. JUSCELINO KUBITSCHEK DE OLIVEIRA, 1964 CIDADE INDUSTRIAL CURITIBA PR

TELEFONE: 41 3097-4450 E-mail: miguel@pulse-se.com.br

Apresentamos nossa proposta para o Registro de Preços para aquisição de luminárias e refletores de LED para manutenção da iluminação pública do Município de Xaxim/SC, conforme Pregão Presencial para Registro de Preços nº 021/2018, acatando todas as condições estipuladas no Edital, conforme planilha de preços anexa e descrição abaixo:

Item	Especificação	Unid.	Quant.	Marca/Modelo	Valor Unitário	Valor Total
01	Luminaria publica de LED máximo 180W. Bivolt automatica; Fonte de energia com controle de corrente em malha fechada; Alto fator de poténcia – igual ou superior a 0,98; distorção Harmonica total de corrente inferior a 10%, indice de reprodusao de cores (IRC) maior ou igual a 70, protetor contra surtos de 10KV /10KA, IP minimo 66 do produto; Estrutura em aluminio injetado com pintura Eletrostatica, sistema de fixaçao para braços de 48 à 60m, Led com vida util igual ou superior a 50.000 hs(L70) sistema de aterramento; eficiéncia energética efetiva maior ou igual a 127 Lm/w, Temperatura média de cor 4000 a 5000K; A luminaria deve conter um Driver (Fonte Chaveada) que mantem a Poténcia constante na faixa de tensao de operação. Disponivel para dimerização 0-10V, preparada para Gestao com tomada para Fotocélula compativel com padrao ANSI C136.41-2013, 5 ou 7 Pinos.	Unid.	200	PULSELED/ T19E-4180	R$1.450,00 (um mil quatrocentos e cinquenta reais)	R$290.000,00 (duzentos e noventa mil reais)
02	Luminária publica de LED máximo 150W, Bivolt automatica; Fonte de energia com controle de corrente em malha fechada; Alto fator de potência — igual ou superior a 0,98; distorção Harmonica total de corrente inferior a 10%, indice de reprodução de cores (IRC) maior ou igual a 70, protetor contra surtos de 10KV /10KA, Grau De	Unid.	500	PULSELED/ T19E-4150	R$1.258,00 (um mil e duzentos e cinquenta e oito reais)	R$629.000,00 (seiscentos e vinte nove mil reais)

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	Proteção minimo IP66 do produto, Proteção contra Impactos mecânicos minimo IK08, Fluxo luminoso efetivo maior ou igual de 18000/lm, e eficiência energética maior ou igual 120 lm/w, Sistema integrado ao corpo da luminária para acionamento e desligamento automatico em função da luminosidade ambiente ou base e rele foto controlador conforme NBR 5123 — Rele . Estrutura em alumínio injetado com pintura eletrostatica, sistema de fixação dos braços de 48mm a 60mm, Led com vida util igual ou superior a 50.000 hs(L70) sistema de aterramento; Temperatura média de cor de 4000 a 5000k; A luminaria deve conter um Driver (Fonte Chaveada) que mantém a Potência constante na faixa de tensão de operação					
03	Luminaria publica de LED maximo 100W, Bivolt automática; Fonte de energia com controle de corrente em malha fechada; Alto fator de potência — igual ou superior a 0,98; distorção Harmonica total de corrente inferior a 10%, indice de reprodução de cores (IRC) maior ou igual a 70, protetor contra surtos de IOKV /IOKA, Grau De Proteção minimo IP66 do produto, Proteção contra Impactos mecanicos minimo 11<08, Fluxo luminoso efetivo maior ou igual de 12000/lm, e eficiência energética maior ou igual 120 lm/w, Sistema integrado ao corpo da luminaria para acionamento e desligamento automatico em função da luminosidade ambiente ou base e rele foto controlador conforme NBR 5123 — Rele Fotoelétrico; Estrutura em aluminio injetado com pintura Eletrostatica, sistema de fixação para braços de 48mm a 60mm, Led com vida util igual ou superior a 50.000 hs(L70) sistema de aterramento; Temperatura média de cor de 4000 a 5000K; A luminaria deve conter um Driver (Fonte Chaveada) que mantém a Potência constante na faixa de tensão de operação.	Unid.	500	PULSELED/ T19E-4090	R$930,00 (novecentos e trinta reais)	R$465.000,00 (quatrocentos e sessenta e cinco mil reais)
04	Luminária pública de LED maximo 80W, Bivolt automática; Fonte de energia	Unid.	500	PULSELED/ T29B-1-75-70	R$580,00 (quinhentos e	R$290.000,00 (duzentos e

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	com controle de corrente em malha fechada; Alto fator de potência — igual ou superior a 0,98; distorção Harmonica total de corrente inferior a 10%, indice de reprodução de cores (IRC) maior ou igual a 70, protetor contra surtos de IOKV /IOKA, Grau De Proteção mínimo IP66 do produto, Proteção contra Impactos mecanicos minimo IK08, Fluxo luminoso efetivo maior ou igual de 9600/lm, e eficiéncia energética maior ou igual 120 lm/w, Sistema integrado ao corpo da luminaria para acionamento e desligamento automatico em função da luminosidade ambiente ou base e rele foto controlador conforme NBR 5123 — Rele Fotoelétrico; Estrutura em aluminio injetado com pintura Eletrostatica, sistema de fixação para braços de 48mm a 60mm, Led com vida util igual ou superior a 50.000 hs(L70) sistema de aterramento; Temperatura média de cor de 4000 a 5000K; A luminaria deve conter um Driver (Fonte Chaveada) que mantém a Potência constante na faixa de tensão de operação.				oitenta reais)	noventa mil reais)
05	Luminária pública de LED maximo 60W, Bivolt automatica; Fonte de energia com controle de corrente em malha fechada; Alto fator de potência — igual ou superior a 0,98; distorção Harmonica total de corrente inferior a 10%, indice de reprodução de cores (IRC) maior ou igual a 70, protetor contra surtos de IOKV /IOKA, Grau De Proteção minimo IP66 do produto, Proteção contra Impactos mecanicos minimo IK08, Fluxo luminoso efetivo maior ou igual de 7200/1m, e eficiência energética maior ou igual 120 lm/w, Sistema integrado ao corpo da luminária para acionamento e desligamento automatico em função da luminosidade ambiente ou base e rele foto controlador conforme NBR 5123 — Rele Fotoelétrico; Estrutura em alumínio injetado com pintura eletrostatica, sistema de fixação para braços de 25mm à 48mm, Led com vida útil igual ou superior a 50.000 hs(L70) sistema de aterramento; Temperatura	Unid.	500	PULSELED/ T29B-1-75-60	R$547,00 (quinhentos e quarenta e sete reais)	R$273.500,00 (duzentos e setenta e três mil e quinhentos reais)

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	média de cor de 4000 a 5000K; A luminária deve conter um Driver (Fonte Chaveada) que mantém a Potência constante na faixa de tensão de operação					
06	Refletor de LED maximo 180W. Bivolt automatico; Fonte de energia com controle de corrente em malha fechada; Alto fator de potência — igual ou superior a 0,98 distorção Harmonica total de corrente inferior a 10%, indice de reprodugao de cores (IRC) maior ou igual a 70, protetor contra surtos de lOKV /IOKA, IP minimo 66 do produto, Estrutura em aluminio injetado com pintura Eletrostatica, Led com vida útil igual ou superior a 50. 000 hs (L 70) sistema de aterramento; fluxo luminoso EFETIVO maior ou igual de 23.000/ Lm 127 Lm/ W, angulo de radiação luminosa 60 0 Temperatura média de cor 4000 a 5000K; Garantia e assisténcia técnica das luminárias LED ofertadas pelo prazo mnimo de 5 (cinco) expedida assinada pelo Fabricante do refletor.	Unid.	50	PULSELED/ FL2H-4180	R$965,00 (novecentos e sessenta e cinco reais)	R$48.250,00 (quarenta e oito mil duzentos e cinquenta reais)

O Valor total da Proposta é de R$1.995.750,00 (um milhão novecentos e noventa e cinco mil setecentos e cinquenta reais)

OBS: Nos preços cotados já estão incluídas eventuais vantagens e/ou abatimentos, impostos, taxas e encargos sociais, obrigações trabalhistas, previdenciárias, fiscais e comerciais, assim como despesas com transportes, deslocamentos, instalações e outras quaisquer que incidam sobre a contratação.

Declaramos para todos os fins, de que os materiais serão fornecidos conforme especificações mínimas exigidas no Termo de Referência.

Validade da Proposta comercial: 60(sessenta) dias.

Pessoa Indicada para Contratos:

Nome: MIGUEL ALBERTO HERNANDEZ VALLECILLA

CPF: 004.313.869-19

E—mail: miguel@pulse-se.com.br

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Dados Bancarios para Pagamento:

Banco: 001 Agéncia: 2456-2 Conta: 54177-X

Xaxim, 15 de junho de 2018

Miguel Alberto Hernandez Vallecilla
Pulse Sistemas Eletronicos Ltda
CPF: 004.313.869-19

PULSE LED

FL2C

LED Refletor

Aplicações

- Quadras esportivas
- Monumentos
- Galpões Industriais



Cores

Branco

Azul

Preto

Cinca

Características

- Patente proprietária dos módulos LED IP68 (máximo nível de proteção) nos compartimentos do LED;
- Várias opções de distribuição de luz disponíveis para diferentes perfis de uso;
- Estrutura em alumínio Injetado para melhor condução térmica, radiação e convecção;
- Várias opções de potência a escolher;
- Assistência técnica no Brasil reduzindo os custos de manutenção;
- Desempenho imbatível com a qualidade Pulse LED;
- Fácil acesso aos componentes para troca ou manutenção;

Características Elétricas e Fotométricas

Modelo	Tensão de Entrada (V) frequência (Hz)	Corrente no Driver (mA)	Potência (w)	Eficiência Luminosa	Lumens (lm)	Fator de Potência	IRC	LED
FL2H-1	AC100-240 50/60	700	40	140	5600	0.95	>70	Cree
		860	50	140	7000			
		1050	60	140	8400			
FL2H-2	AC100-240 50/60	700	80	140	11200			
		860	100	140	14000			
		1050	120	140	16800			
FL2H-3	AC100-240 50/60	700	120	140	16800			
		860	150	140	21000			
FL2H-4	AC100-240 50/60	700	180	140	25200			

Termo de Garantia Produtos Pulse LED

Termos e Condições de Garantia que abrangem os Produtos adquiridos em território nacional.

Limite de Garantia

A Pulse Sistemas Eletrônicos (Fabricante) garante ao Comprador que os produtos abaixo listados estarão cobertos por garantia contra defeitos de fabricação pelo período especificado, a partir da data da compra:

Tipo de Produto	GARANTIA
Lâmpadas T8 LED	3 anos
Lâmpadas Bulbo LED	3 anos
Refletores LED	3 anos
Linha Luminárias LED para Áreas	3 anos
Linha Luminárias Lutece-T LED para iluminação Pública, incluindo acessórios fornecidos para kit (Iincluindo: relés e braços).	5 anos

Termos e Condições

Pulse Sistemas Eletrônicos (Fabricante) garante ao Comprador que a Linha de luminárias LUTECE-T foi concebida e produzida para atender todos os requisitos técnicos da portaria 20 do Inmetro.

Este Termo de Garantia somente aplica-se aos produtos que foram devidamente armazenados, instalados e embalados; operando dentro das especificações elétricas indicadas; operando em condições normais de ambiente (temperatura, por exemplo) dentro das faixas de operação especificadas no datasheet do Produto. A garantia é violada se o comprador ou o usuário não seguirem as instruções de instalação e recomendações do Fabricante; se qualquer componente LED ou não- LED for substituído por componentes de outros fabricantes, e no caso de condições que demonstrem uso anormal, incluindo condições de sobretensão ou subtensão, numero excessivo de ciclos de comutação/acendimento e funcionamento em uma temperatura ambiente superior a faixa de operação considerada normal do sistema.

O Fabricante não será responsável por nenhum defeito de seus produtos que resultem de causas externas, como catástrofes naturais, inundações, raios, picos ou falhas de energia; fonte de alimentação fora das especificações indicados: culpa ou negligência do comprador ou usuário, uso improprio ou manutenção, instalação, manuseio ou armazenamento inadequados; formas de uso que violem quaisquer normas, códigos ou instruções de instalação /utilização, incluindo as normas relativas o segurança da Associação Brasileira de Normas Técnicas (ABNT); ou qualquer outra causo que não seja um defeito no material ou na fabricação do produto em si.
Não obstante, qualquer disposição em contrário neste documento de garantia, o modulo LED do produto será caracterizado como defeito, incluindo-se nos termos e garantias acima, se 10% ou mois dos LEDs no modulo não acenderem.

Recurso

Se o produto não cumprir as garantias acima, o Fabricante deverá corrigir o defeito, e o seu critério, (i) reparar qualquer componente(s) com defeito dos Produtos, ou (ii) disponibilizar FOB (planta do fabricante) qualquer componente que tenha a necessidade de ser reparado ou substituído. O Fabricante não é responsável pelo serviço e outros custos e despesas adicionais.

Solicitação de Serviço de Garantia

Paro fazer uma solicitação de garantia, recolher os produtos que apresentarem defeito e notificar a Pulse Sistemas Eletrônicos ou o Serviço de Atendimento ao Cliente no prozo de trinta (30) dias após a falha através do SAC: (41)-3097- 4450 ou via e-mail: contato@pulse-se.com.br. Apos entrar em contato, o Comprador deverá devolver o produto ou peça de acordo com as instruções que receber. O produto ou peça deve ser devolvido no prazo de 10 dias após o primeiro contato com o Fabricante. O não cumprimento deste procedimento anulará esta garantia.

A Pulse Sistemas Eletrônicos detém se o direito de examinar todos os componentes do produto para determinar o causa do defeito e os padrões de uso.

Limites de Responsabilidade

OS TERMOS E CONDIÇÕES DE GARANTIA ACIMA SAO EXCLUSIVAS E SUBSTITUEM TODAS AS OUTRAS GARANTIAS, ESCRITAS, ORAIS OU IMPLÍCITAS. NENHUMA GARANTIA OU COMERCIALIZAÇÃO OU ADEQUAÇÃO A UM DETERMINADO FIM PODE SER APLICADA.

Em nenhum caso, a Pulse Sistemas Eletrônicos será responsável por quaisquer outros custos ou danos, incluindo lucros cessantes ou rendimentos, danos especiais, incidentais ou consequentes.

Cordialmente,

Miguel Patino Baptista
Diretor
Pulse Sistemas Eletrônicos

0196

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Technical Report No. 704021705551

Rev. 00

Dated 2017-12-25

Client	:	Hangzhou Hpwinner Opto. Corporation No.18 Kangzhong Road, Gongshu District, 310015 Hangzhou City, Zhejiang Province, PEOPLE'S REPUBLIC OF CHINA
Manufacturing place	:	Same as applicant
Type of Product	:	Product: LED street light
Model/Type	:	T29A-1-20, T29A-1-30, T29A-1-40, T29B-1-40, T29B-1-50, T29B-1-60, T29B-1-70, T29B-1-75
Test methods	:	IK 08 and IK 09 tests according to IEC 62262 and IEC 60068-2-75
Purpose of examination	:	IK 09 test for T29A series enclosure and IK 08 test for T29B series enclosure
Test result	:	**Pass**

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TÜV SÜD Group

No.151 Heng Tong Road, Shanghai 200070, P.R.China.

1 Description of the test subject

1.1 Technical Data

Model	:	T29A-1-20, T29A-1-30, T29A-1-40, T29B-1-40, T29B-1-50, T29B-1-60, T29B-1-70, T29B-1-75
Rated Voltage	:	100-240V~
Rated Frequency	:	50/60Hz
Protection Class	:	Class I
Construction	:	LED street light
Supply connection	:	Supply cords

2 Order

2.1 Date of Purchase Order, Customer's Reference

2017-12-07

2.2 Receipt of Test Sample, Location

2017-12-07, TUV SUD Shanghai Branch

2.3 Date of Testing

2017-12-08 to 2017-12-18

2.4 Location of Testing

TUV SUD Shanghai Branch

2.5 Points of Non-compliance or Exceptions of the Test Procedure

None

3 Test Results

Positive

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4 Remark

Model list:

Model	Wattage (W)	IK
T29A-1-20	20	IK 09
T29A-1-30	30	IK 09
T29A-1-40	40	IK 09
T29B-1-40	40	IK 08
T29B-1-50	50	IK 08
T29B-1-60	60	IK 08
T29B-1-70	70	IK 08
T29B-1-75	75	IK 08

T29A series have same mechanical and electrical construction. So IK 09 test is performed on T29A-1-40.
T29B series have same mechanical and electrical construction. So IK 08 test is performed on T29B-1-75.

5 Mechanical Impact Test (IK08&IK09):

Lab Environmental Conditions:

Ambient Temperature: 25.6°C

Relative Humidity: 54%RH.

Test Methods/Specification:

Test methods: According to IEC 62262:2002 and IEC 60068-2-75:1997.

Test condition: According to the client's requirement, IK 09 tests for enclosure

Impact energy of IK 08 and IK 09 are shown as below:

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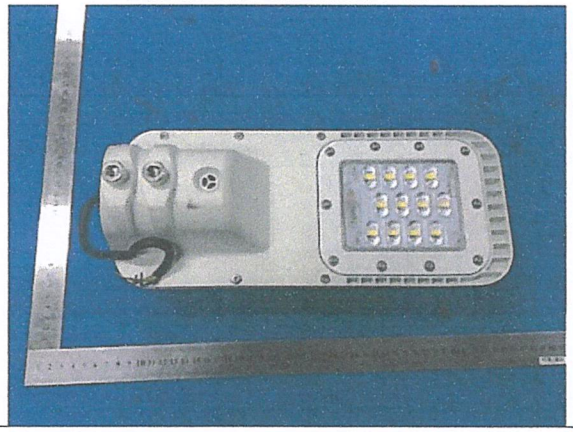
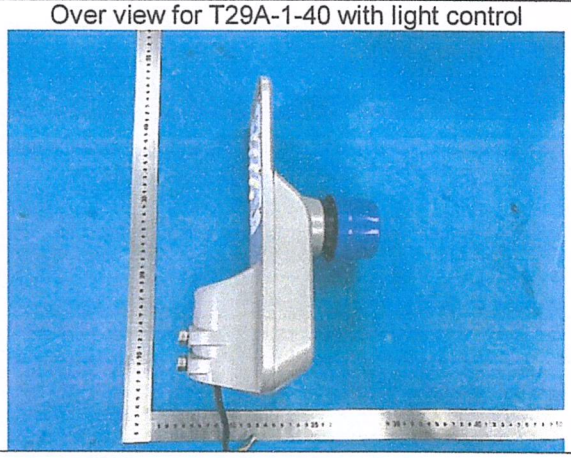
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IK code	IK00	IK01	IK02	IK03	IK04	IK05	IK06	IK07	IK08	IK09	IK10
Impact energy, J	*	0,14	0,2	0,35	0,5	0,7	1	2	5	10	20
* Not protected according to this standard.											
NOTE 1 When higher impact energy is required, the value of 50 J is recommended.											
NOTE 2 A characteristic group numeral of two figures has been chosen to avoid confusion with some national standards which used a single numeral for a specific impact energy.											

Test equipment: Vertical hammer type impact tester (IEC 60068-2-75: 1997)
Impact energy: 5J for IK 08; 10J for IK 09
Operating mode: Power off
Criteria after impact test
Visual inspection: Check if breakage, crack, and separation occur.

6 Documentation

Photo documentation:

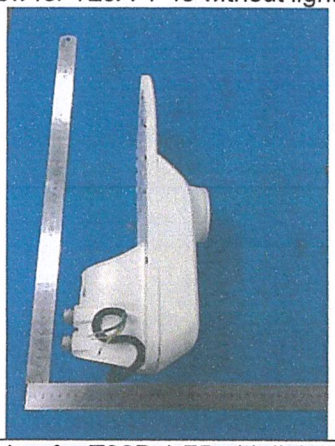
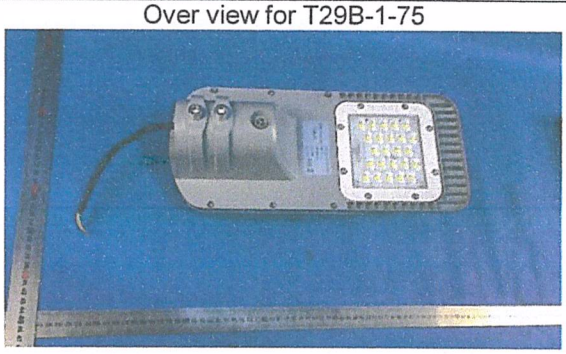
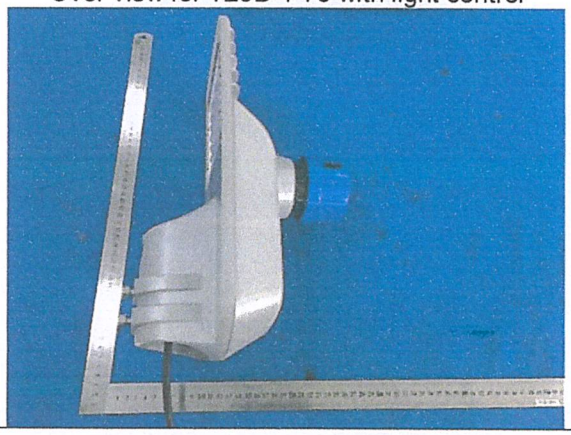
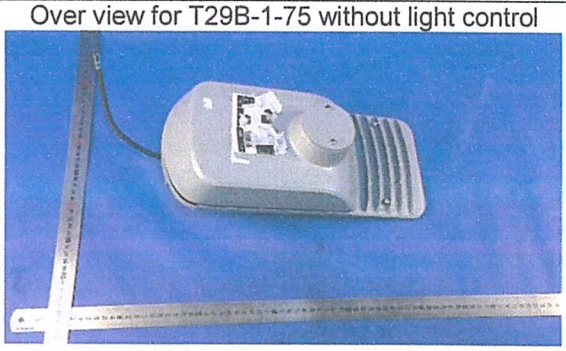
Over view for T29A-1-40	Over view for T29A-1-40 with light control
	

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Over view for T29A-1-40 without light control	Over view for T29B-1-75
	
Over view for T29B-1-75 with light control	**Over view for T29B-1-75 without light control**
	

7 Test equipment

IK 08 test equipment	IK 09 test equipment
	

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Engineer: _____ **Technical Report checked:** _____

Hui GONG **Huidong ZHANG**

Project Handler **Designated Reviewer**

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0202

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Technical Report No. 704021809901-00

Rev. 00

Dated 2018-01-15

Client:	Hangzhou Hpwinner Opto. Corporation No.18 Kangzhong Road, Gongshu District, 310015 Hangzhou City, Zhejiang Province, PEOPLE'S REPUBLIC OF CHINA
Manufacturing place:	Same as applicant
Test subject:	Product: LED street light Type: T29A-1-20, T29A-1-30, T29A-1-40, T29B-1-40, T29B-1-50, T29B-1-60, T29B-1-70, T29B-1-75
Test specification:	IEC 60598-1:2014 IEC 60598-2-3:2002+A1:2011
Purpose of examination:	According to client's requirement for above mentioned models - Endurance test - IP 65 & IP 66 test
Test result:	**Pass**

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No.151 Heng Tong Road, Shanghai
200070, P.R.China

1 Description of the test subject

1.1 Technical Data

Model	T29A-1-20, T29A-1-30, T29A-1-40, T29B-1-40, T29B-1-50, T29B-1-60, T29B-1-70, T29B-1-75
Rated Voltage	100-240V~
Protection Class	Class I
Protection Against Moisture	IP 65 & IP 66
Supply connection	Supply cords

2 Order

2.1 Receipt of Test Sample, Location

2017-12-07, TUV SUD Shanghai Branch

2.2 Date of Testing

2017-12-08 to 2017-12-18

TÜV SÜD Certification and Testing (China) Co., Ltd. Shanghai Branch

2.3 Points of Non-compliance or Exceptions of the Test Procedure

None

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3 Test Results

3.1 Positive Test Results

Selected sub-clauses from	Check points	Brief Description / Remarks	Pass / Fail
Clause 9.2.2	IP 6X test	For IP6X: no deposit of talcum powder inside enclosures for dust-tight luminaires	Pass
Clause 9.2.6	IP X5 test	For IPX5: no water in Jet-proof luminaire	Pass
Clause 9.2.7	IP X6 test	For IPX6: no water in Powerful water jet-proof luminaire	Pass

4 Remark

Models list:

Model	Wattage (W)
T29A-1-20	20
T29A-1-30	30
T29A-1-40	40
T29B-1-40	40
T29B-1-50	50
T29B-1-60	60
T29B-1-70	70
T29B-1-75	75

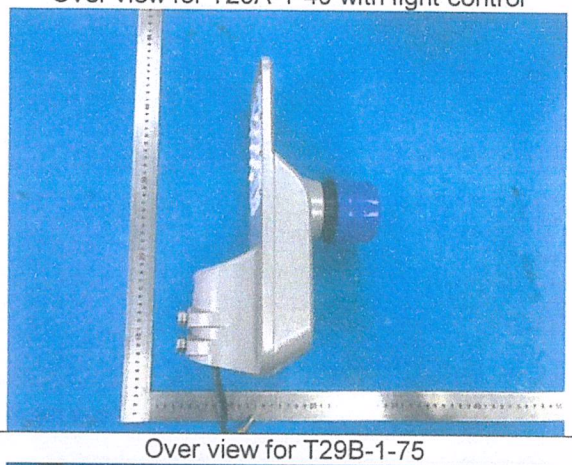
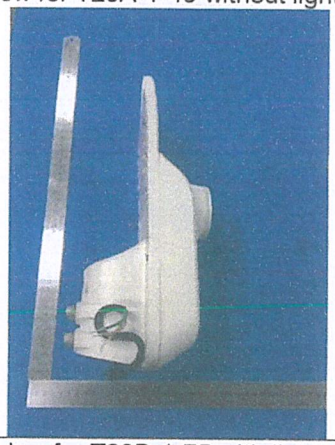
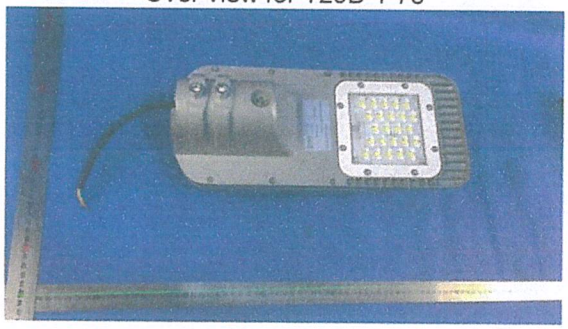
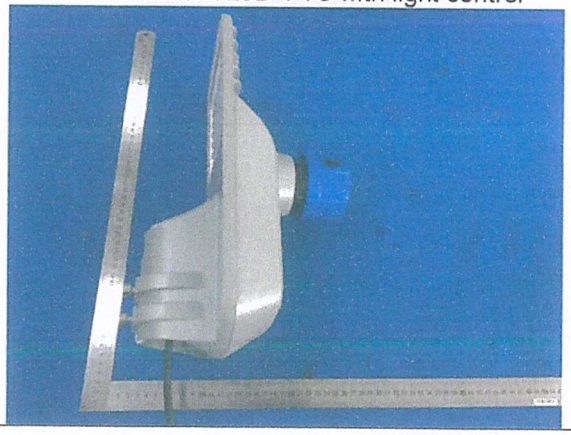
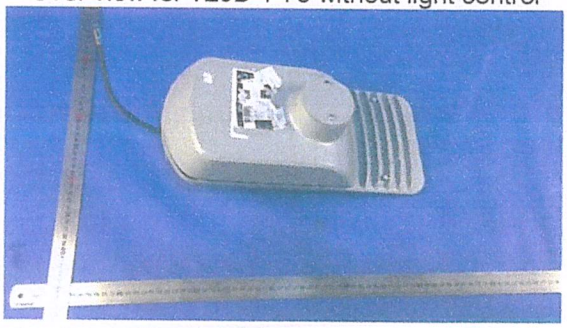
All models with with light control have same mechanical and electrical construction. So IP65 test was performed on T29B-1-75 with light control and passed.
All models without with light control have same mechanical and electrical construction. So IP66 test was performed on T29B-1-75 without light control and passed.

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5 Documentation

Photo documentation

Over view for T29A-1-40 	Over view for T29A-1-40 with light control 
Over view for T29A-1-40 without light control 	Over view for T29B-1-75 
Over view for T29B-1-75 with light control 	Over view for T29B-1-75 without light control 

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«laboratory legal entity name»
TÜV SÜD Group

Engineer: _____ Technical Report checked: _____

Hui GONG — Project Handler

Huidong ZHANG — Designated Reviewer

CSCH_F_09.20E – Rev. 1 2012-10-29

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TÜV SÜD Certification and Testing (China) Co., Ltd. Shanghai Branch
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Test Report No.: 748212400801
Dated 02-May-2017

China

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SUBJECT	**Vibration test**
TEST LOCATION	**TÜV SÜD Certification and Testing (China) Co., Ltd Shanghai Branch Testing Center** **Environmental and Reliability Laboratory** No.1951, Building 16, Duhui Road, Minhang District Shanghai 201108, P. R. China
TESTED FOR	**HANGZHOU HPWINNER OPTO CORRORATION.** No.18 Kangzhong Road, Gongshu District, Hangzhou City, Zhejiang Province, P.R.China
TEST PERIOD	28-Apr-2017

Prepared By

02-May-2017
Lv Songmao
Test Engineer

Authorized By

02-May-2017
Jiang Jiong
Supervisor

Laboratory:
TÜV SÜD Certification and Testing (China) Co., Ltd Shanghai Branch
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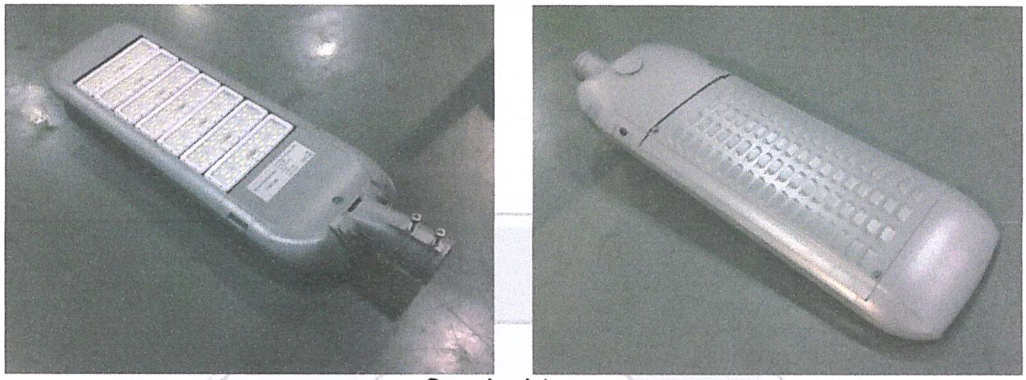
China

1 Description of Sample

Sample Name: LED Street Light

Sample Model: T19E-7-420

Sample Quantity: 1 piece.



Sample picture

China

2 Vibration Test

Equipment of Test:

Equipment	Manufacturer	Equipment No.	Cal. Date	Cal. Due Date
Vibration shaker	STI	TC_SH_ENV_EQ_032	14-Apr-2017	13-Apr-2018
Accelerometer	PCB	TC_SH_ENV_EQ_045	07-May-2016	06-May-2017

Lab Environmental Conditions:

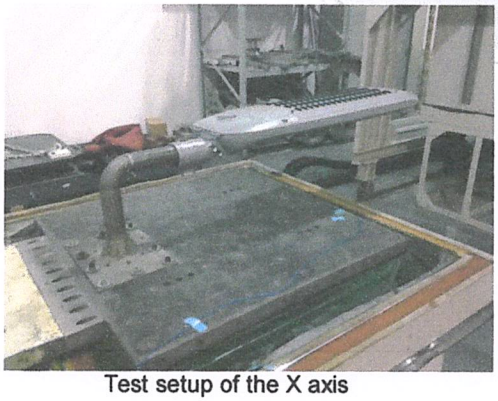
Ambient Temperature: 21.2 ℃.
Relative Humidity: 45.1 %RH.

Test Methods/Specification:

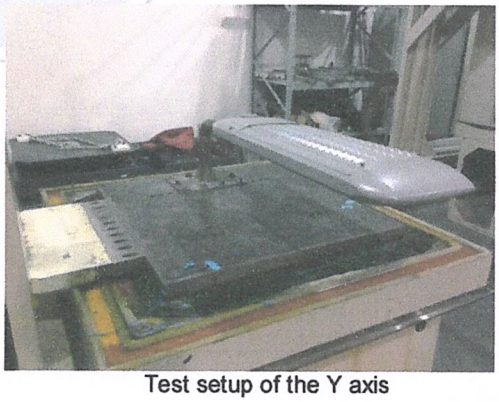
Test methods: According to IEC 60068-2-6: 2007
Test conditions:

Frequency(Hz)	Acceleration(m/s^2)
3	2.5
- Test direction: X, Y, Z axes - Sweep No.: 10,000 cycles per axis.	

Test Setup:



Test setup of the X axis



Test setup of the Y axis



Test setup of the Z axis

Test Result:

Test orientation	Test Result
X axis	- No visible damage was observed on the sample after test.
Y axis	- No visible damage was observed on the sample after test.
Z axis	- No visible damage was observed on the sample after test.

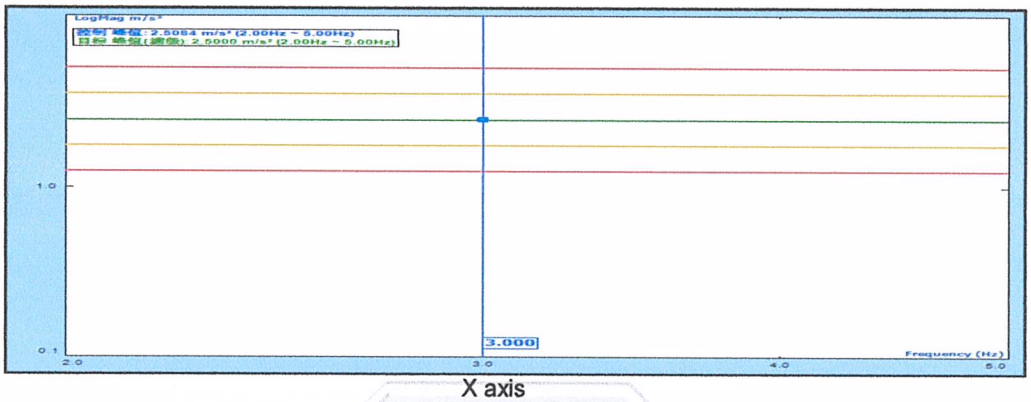
Appendix 1: Sample pictures after test.



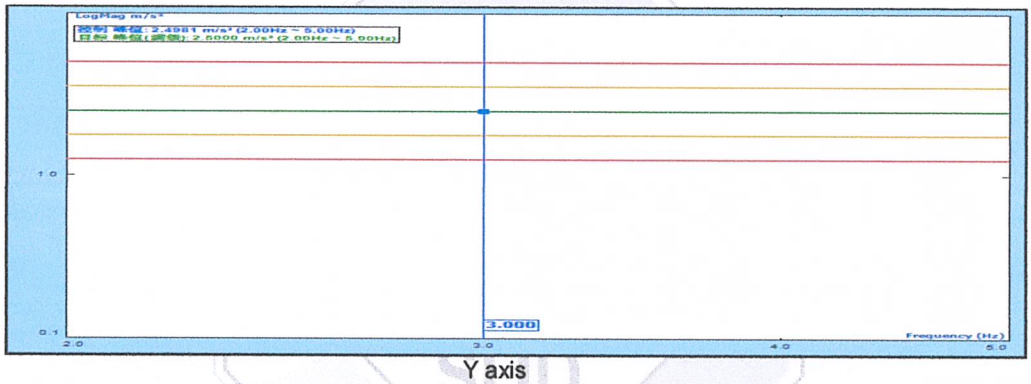


China

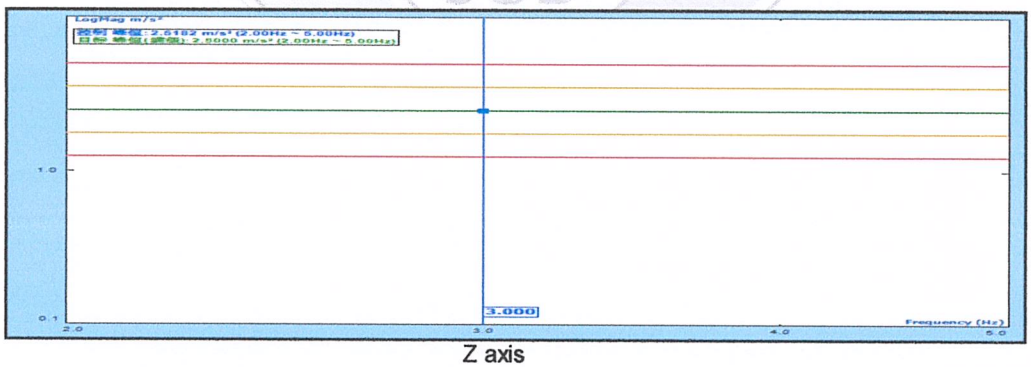
Appendix 2: Actual test profile



X axis



Y axis



Z axis

----------This is the end page of the report----------

Report No: NTR201801004

TESTING
NVLAP LAB CODE 600175-0

HPWINNER

IESNA LM-79-08 Test Report

Report Prepared for:

Hangzhou Hpwinner Opto. Corporation

No.1 Building, 18th Kangzhong Road,

Gongshu District, Hangzhou

LED Street Light

Model: T19B-3-180 180 W

Test Specifications:	
Date of Receipt:	Jan.22, 2018
Date of Test:	Jan.23, 2018
Test Item:	Electrical, Photometric and Chromaticity
Reference Standard:	IESNA LM-79-08 Approved Method: Electrical and Photometric Measurements of Solid-State Lighting Products

Tested & Reported By:	**Approved By:**
LIU Minggang / Jan.24, 2018	LIU Mingzhao / Jan.24, 2018
Tester Personnel & Signatory	**Approved Name & Signatory**

Testing Center of Hangzhou Hpwinner Opto Corporation SEAL

Laboratory: Testing Center of Hangzhou Hpwinner Opto Corporation
NVLAP LAB CODE 600175-0

Note: This report does not imply product certification, approval, or endorsement by NVLAP, NIST, or any agency of the Federal Government.

No.18, Kangzhong Road, Gongshu District, Hangzhou, Zhejiang Province, P.R. China
Tel: +86-571-8831-3902 Fax: +86-571-8997-1205 Email: xy@hpwin.com

Test Summary

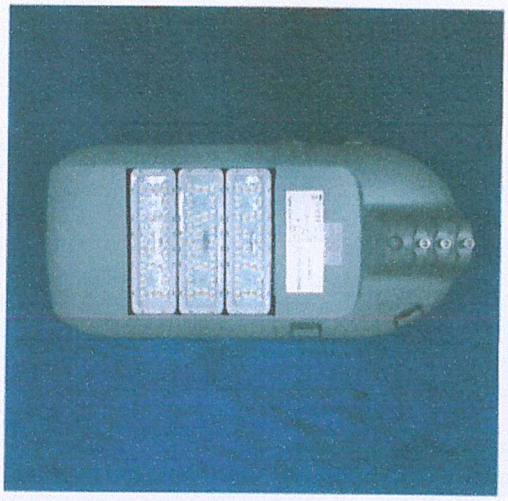
Sample Tested: T19B-3-180 180 W

Luminous Efficacy (Lumens / Watt)	Total Luminous Flux (Lumens)	Input Power (Watts)	Power Factor	THD (Current %)
153.08	27 095.7	177.01	0.988	/

CCT (K)	Color Rendering Index	Stabilization Time (Light & Power) (min)
5 191	75.4	42

IES Classification	Longitudinal Classification	Cut-off Classfication
Type I	Short	Cut-off

Sample Photos





Equipment Under Test (EUT)

Name of Sample	LED Street Light
Model	T19B-3-180 180 W
Electrical Ratings	230 Vac, 50 Hz
Dimensions (Length x Width)	0.25 m x 0.24 m (light-emitting surface)
Product Description	5 000 K
Model of LED Control Device	/
Model of Light Source	/

Test Results

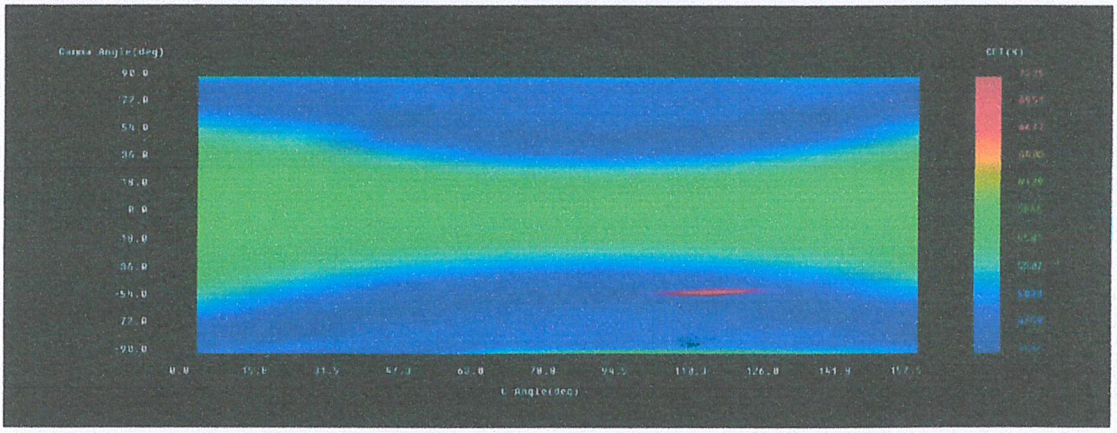
The following results were obtained after stabilization of the sample in accordance with the requirements set forth in section 5.0 of IES LM79-2008. Stability is achieved when the variation of 3 readings of light output and electrical power over a period of 30 minutes, taken 15 minutes apart, is less than 0.5%.

Ambient (℃)	25.0	**Test Orientation**	Light Down
Stabilization Time (min)	42	**Total Operating Time(min)**	162

Parameter	Result		
Test Voltage (V)	229.84	/	/
Voltage Frequency (Hz)	50	/	/
Test Current (A)	0.80	/	/
Power Factor	0.988	/	/
Input Power (W)	177.01	/	/
THD (Current %)	/	/	/
Luminous Efficacy (lm/W)	153.08		
Total Luminous Flux (lm)	27 095.7		
Color Rendering Index (CRI)	75.4		
R9	-13		
Correlated Color Temperature (K)	5 191		
Chromaticity (Chroma x, Chroma y)	(0.3399,0.3459)		
Chromaticity (Chroma u', Chroma v')	(0.2101,0.4811)		
Duv	/		
Beam Angle (0°-180°)	156.2°		
Beam Angle (90°-270°)	81.1°		
Center Beam Candle Power (cd)	8 730		
Zonal Lumens in the 0°-60° Zone	79.10%		
Zonal Lumens in the 60°-90° Zone	20.70%		
Zonal Lumens in the 90°-120° Zone	0.10%		
Zonal Lumens in the 120°-180° Zone	0.20%		

Special Color Rendering Indices	
R1	74
R2	79
R3	82
R4	77
R5	76
R6	72
R7	81
R8	62
R9	-13
R10	50
R11	77
R12	53
R13	74
R14	90
R15	69

Spectrum Test Report



Color Parameters:

Average: x=0.3399,y=0.3459 u'=0.2101,v'=0.4811 CCT=5191K Ra=75.4 Rf=73 Rg=96

Center : x=0.3251,y=0.3205 u'=0.2099,v'=0.4655 CCT=5877K Ra=77.7 Rf=71 Rg=98

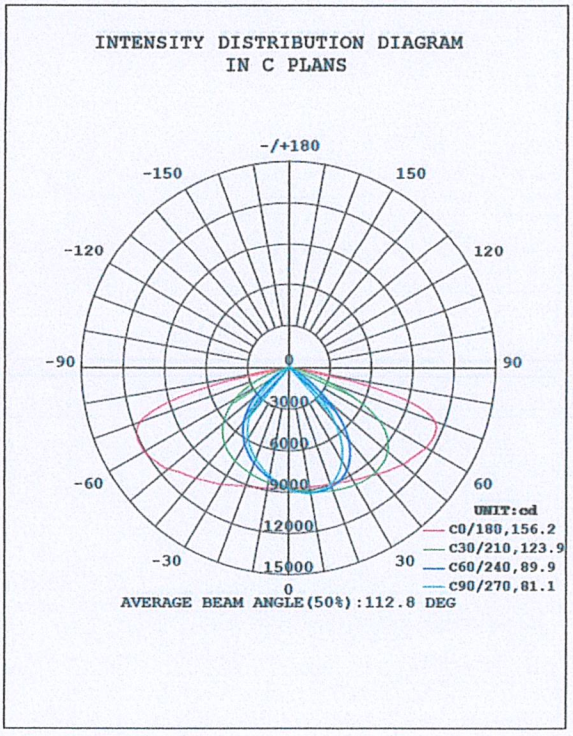
IESNA LM-79-2008 Max. du'v': 0.0402 / max.du'v': 0.0000[Set Range]

LB/T 001-2009: avg. color nonuniformity du'v':0.0155

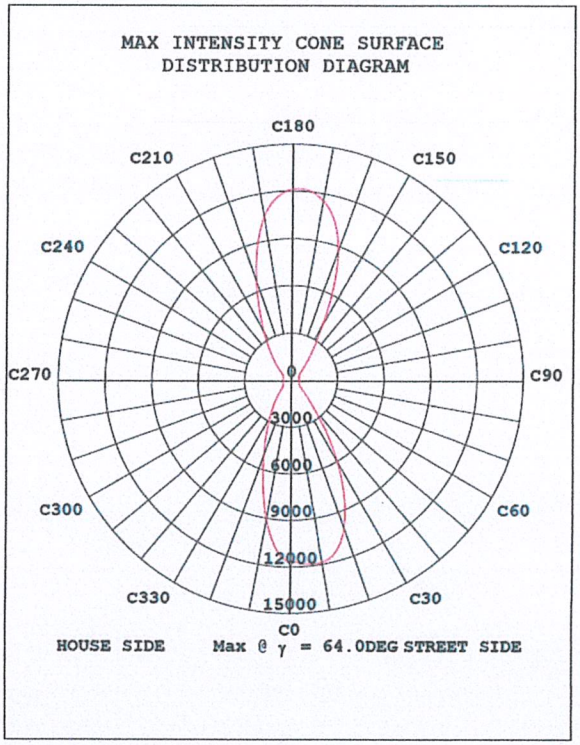
LB/T 001-2009: max. color nonuniformity du'v':0.0341

Average: R1=74 R2=79 R3=82 R4=77 R5=76 R6=72 R7=81 R8=62 R9=-13 R10=50
R11=77 R12=53 R13=74 R14=90 R15=69

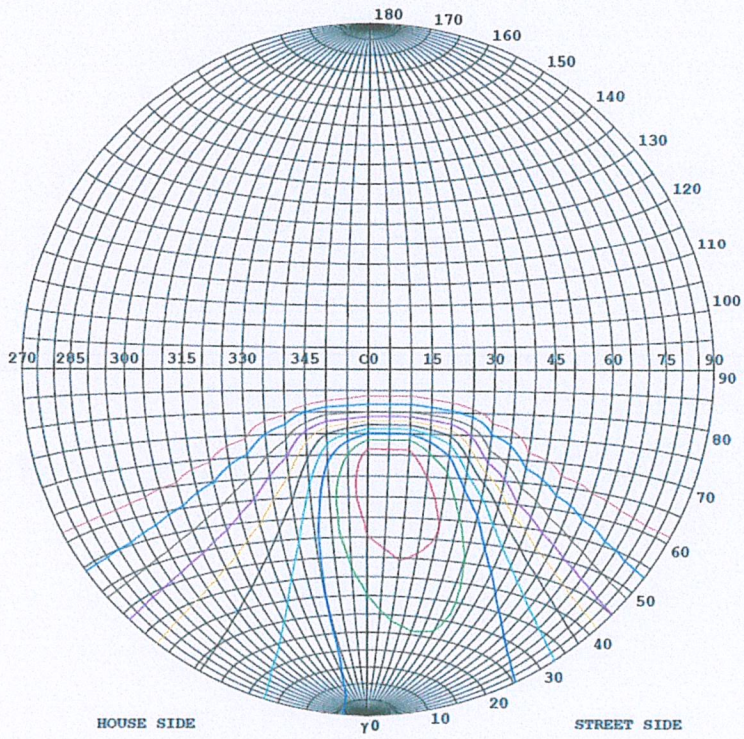
Intensity Distribution Diagram IN C Plans



Max Intensity Cone Surface Distribution Diagram



Isocandela Diagram



Classification:

IES:Type I - Short
CIE:Narrow - Intermediate
IES:Cut-off
CIE:Semi-cut-off
Max.At80:91.55cd/klm
Max.At90:0.3600cd/klm
Max.80-90:91.55cd/klm

ISOCANDELA DIAGRAM	
UNIT	cd
Imax=100%	12101
90%	10891
80%	9681
70%	8471
60%	7261
50%	6051
40%	4841
30%	3630
20%	2420
10%	1210
5%	605

IESNA Luminaire Flux Distribution Table

Zone	Lumens	Luminaire %
FL - Front-Low(0-30)	3854.9	14.2
FM - Front-Medium(30-60)	7981.3	29.5
FH - Front-High(60-80)	3032.6	11.2
FVH - Front-Very High(80-90)	91.284	0.3
Total Forward Light	14991	55.3

BL - Back-Low(0-30)	3274.8	12.1
BM - Back-Medium(30-60)	6319.4	23.3
BH - Back-High(60-80)	2406.6	8.9
BVH - Back-Very High(80-90)	72.158	0.3
Total Back Light	12105	44.7

UL - Uplight-Low(90-100)	3.8465	0.0
UH - Uplight-High(100-180)	58.869	0.2
Total Up Light	62.715	0.2

BUG(Back,Up,Glare) Rating	B4-U3-G3

Zone	Downward Lumens	Upward Lumens	Total Lumens
House Side	12073	32.177	12105
Street Side	14960	30.538	14991

Equipment List

Test Equipment	Model	Equipment No.	Calibration Date	Calibration Due Date
Goniophotometer System	GO-R5000_2M2D	HPTC-SB0001	2017-07-20	2018-07-19
Standard Lamp	D908S	HPTC-SB0031	2017-02-06	2018-02-06
AC Power Supply	DPS1060	HPTC-SB0002	2017-04-18	2018-04-18
DC Power Supply	WY12010	HPTC-SB0003	2017-04-18	2018-04-18
Power Meter	PF2010	HPTC-SB0004	2017-09-22	2018-09-21
Humidity Temperature Meter	608-H1	HPTC-SB0041	2017-02-15	2018-02-15

Test Methods

Seasoning of SSL Product

For the purpose of rating new SSL products, SSL products shall be tested with no seasoning. Therefore, no seasoning was performed.

Sphere-Spectroradiometer Method- Photometric and Electrical Measurements

HAAS-2000 Spectroradiometer and Two Meter Sphere was used to measure correlated color temperature, chromaticity coordinates, and the color rendering index for each SSL unit. The coating reflectance of each sphere is 98%. The measure geometry is 4π. The diameter of sphere is 2m. Self-absorption correction is conducted in testing.

Bandwidth of spectroradiometer is 380nm-780nm, and spectral resolution is 2nm.

Ambient temperature was measured at a position inside the sphere. Each SSL unit was operated on the client provided driver at the rated input voltage in its designated orientation.

The Electrical quantities are measured by means of a calibrated PF2010 digital power meter.
The standard reference of the integrated sphere system is 100w halogen incandescent lamp, the intensity distribution type is omni-directional, and is traceable to the National Institute of Metrology P.R. China.

Goniophotometer Method

Photometric and Electrical Measurements

The Total Luminous Flux was measured by calibrated EVERFINE GO-R5000 Type C Goniophotometer with the distance 1.9m between the Class L detector and the sample's reference centre.
The Light distribution was measured by calibrated EVERFINE GO-R5000 Type C Goniophotometer with the distance 26m between the Class L detector and the sample's reference centre.
Bandwidth of Spectroradiometer is 380nm-780nm, and spectral resolution is 2nm.
Ambient temperature was measured at the same height of the sample mounted on the Goniophotometer equipment. Each SSL unit was operated on the client provided driver at the rated input voltage in its designated orientation.
The Electrical quantities are measured by means of a calibrated PF2010 digital power meter.
The standard reference of the integrated sphere system is 500w halogen incandescent lamp, the intensity distribution type is omni-directional, and is traceable to the National Institute of Metrology P.R. China.

Color Characteristics Measurements

The color characteristics of SSL products include chromaticity coordinates, correlated color temperature, and color rendering index. These characteristics of SSL products may be spatially non-uniform, and thus, in order that they can be specified accurately, the color quantities shall be measured as values that are spatially average, weighted to intensity, over the angular range where light is intentionally emitted from the SSL product. The color characteristics measurements are using Gonio-spectroradiometer.

0220

A CGCRE é signatária do
Acordo de Reconhecimento Mútuo
da ILAC International Laboratory Accreditation

Ensaios
CRL 0181

LET-EMC-RE 2395-4220-01-C – 01.00(Pt)
de 30-Mai-2018

RELATÓRIO TÉCNICO
Ensaios de Compatibilidade Eletromagnética
Segundo a ABNT NBR IEC/CISPR 15
Modelo: T29B-1-75

Signatário Autorizado:

Gustavo Iervolino de Morais

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Sugestões / Reclamações / Comentários
Por favor, enviar e-mail para qualidade@eldorado.org.br

Sumário

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2. LISTA DE ENSAIOS 3

3. REQUISITOS DE EMISSÃO DE PERTURBAÇÕES ELETROMAGNÉTICAS 4

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3.2. Perturbações Eletromagnéticas Radiadas (Câmara Semi-Anecóica) 8

3.3. Método Independente de Medições de Perturbações Radiada 15

4. LISTA GERAL DE INSTRUMENTOS 18

5. HISTÓRICO DE REVISÕES 19

1. OBJETIVO

O objetivo do relatório é descrever e apresentar os resultados obtidos nos ensaios de EMC realizados no Laboratório no produto modelo T29B-1-75, conforme os documentos normativos citados abaixo:

Documentos de Referência	
ABNT NBR IEC/CISPR 15 – Limites e Métodos de Medição das Radioperturbações Características dos Equipamentos Elétricos de Iluminação e Similires.	21-Set-2014
CISPR 15 - Limits and methods of measurement of radio disturbance characteristics of electrical lighting and similar equipment	27-Mar-2015
CISPR 16-1-4 – Specification for radio disturbance and immunity measuring apparatus and methods – Part 1-4: Radio disturbance and immunity measuring apparatus – Antennas and test sites for radiated disturbance measurements.	Edition 3.0 2010-04
CISPR 32– Electromagnetic compatibility of multimedia equipment – Emission requirements	Edition 1.0 2012-01

Para análise deste relatório, é necessário que o relatório de identificação do processo seja utilizado. Tal relatório possui a seguinte codificação **LET-ID 2395-4220-01**, em sua última versão.

2. LISTA DE ENSAIOS

A tabela seguinte apresenta os ensaios e itens da resolução os quais descrevem os métodos e limites.

ABNT NBR IEC/CISPR 15		
Item Norma	Ensaio	Item Rel.
4.3	Emissão de Tensões de Perturbações	3.1
4.4	Perturbações Eletromagnéticas Radiadas (Câmara Semi-Anecóica)	3.2
Anexo B	Método Independente de Medições de Perturbações Radiada	3.3

Tabela 1 - Lista dos ensaios realizados

3. REQUISITOS DE EMISSÃO DE PERTURBAÇÕES ELETROMAGNÉTICAS

3.1. Tensões de Perturbação

3.1.1. Terminais de Alimentação

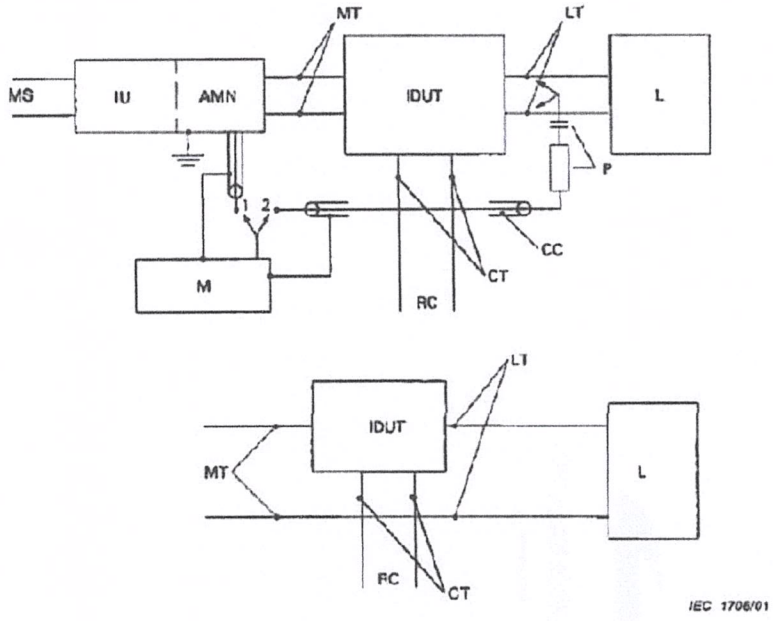
3.1.1.1. Requisito normativo

Conforme o item 4.3.1 da ABNT NBR IEC/CISPR 15, as emissões a partir das portas de energia elétrica do equipamento sob ensaio devem atender aos limites apresentados na tabela abaixo.

Limites das tensões de perturbações nos terminais de alimentação		
Faixa de Frequência	**Detector Quase Pico**	**Detector Médio**
9 a 50 KHz	110 dBμV	—
50 a 150 KHz	90 a 80 dBμV	—
150 a 500 KHz	66 a 56 dBμV	56 a 46 dBμV
0,5 a 5 MHz	56 dBμV	46 dBμV
5 a 30 MHz	60 dBμV	50 dBμV

Tabela 2 – Limites para o ensaio de tensões de perturbação eletromagnética

A montagem do ensaio foi realizada conforme referido o Item 8.1.1 da Norma ABNT NBR IEC/CISPR 15. Em conformidade as informações supracitadas, segue abaixo ilustração de montagem apresentado pela norma nas figuras 5 e 6.



(Fonte: ABNT NBR IEC/CISPR 15– Figura 5 – Configuração de medição para um dispositivo independente de regulação de luz, transformador ou conversor)

MS Ligação à rede elétrica

UI Unidade de isolamento

AMN 50 Ω/ 50 μH + 5 Ω (ou 50 Ω/ 50 μH) da rede fictícia em V (Artificial Mains V Network)

MT Terminais da rede

IDUT Dispositivo independente em ensaio

LT Terminais da carga

L Carga

P Sonda ($R \geq 1\,500\ \Omega$ e $C \geq 0{,}005\ \mu F$)

CC Cabo coaxial

CT Terminais do controle

M Receptor de medição CISPR

RC Controle remoto (se houver)

Posições da chave e conexões da sonda:

1 Para medidas de corrente

2 Para medidas de carga

Quando um dispositivo de dois terminais é inserido em apenas um único condutor da fonte de energia, as medições devem ser feitas conectando o segundo condutor da fonte de energia, conforme indicado na proxima figura.

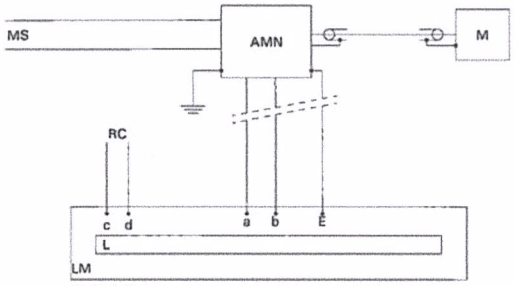


Figura 6A

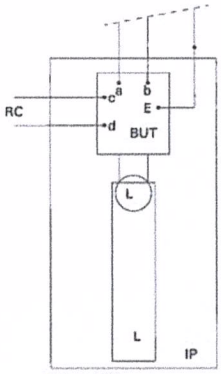


Figura 6B

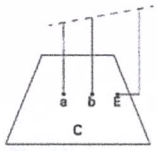


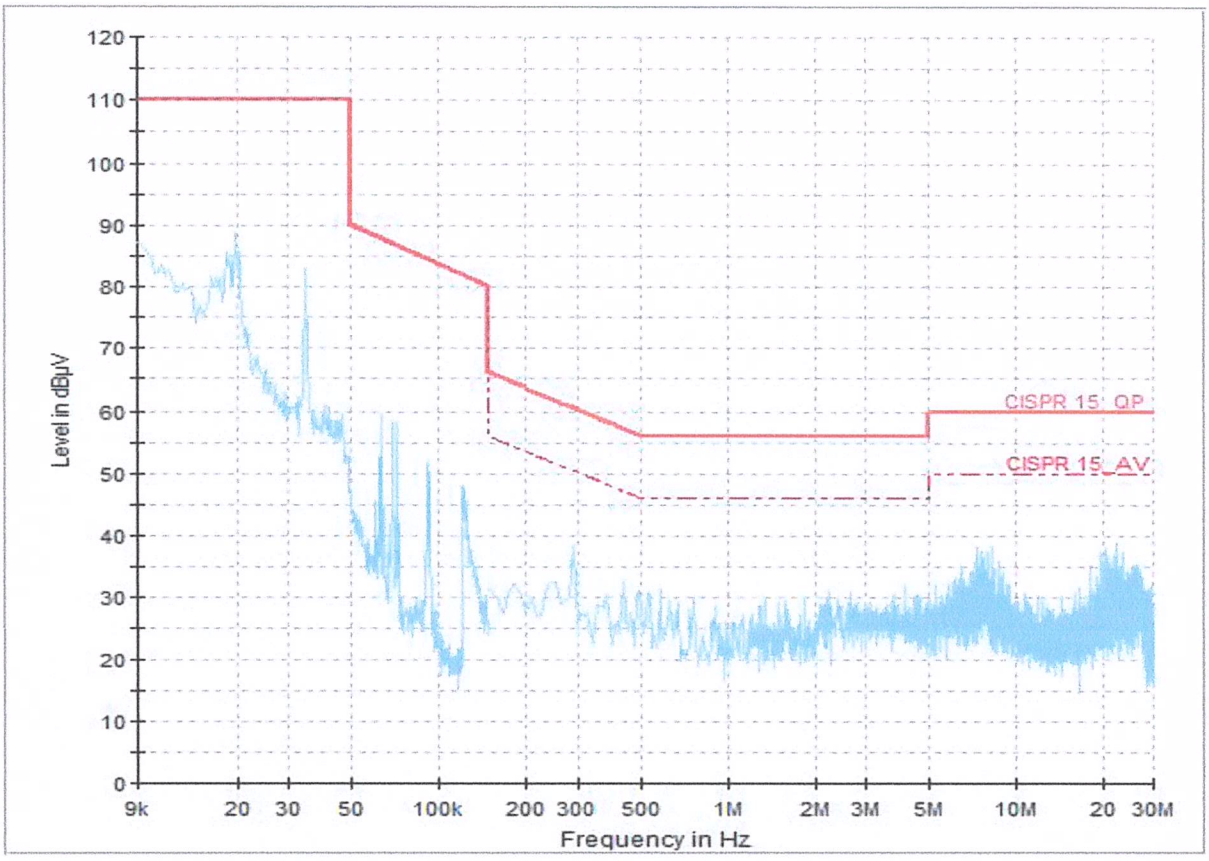
Figura 6C

AMN	50 Ω/ 50 µH + 5 Ω (ou 50 Ω/ 50 µH) da rede fictícia em V (Artificial Mains V Network)
MS	Ligação à rede elétrica
LM	Luminária
L	Carga
M	Receptor de medição CISPR
C	Caixa metálica cônica
RC	Controle remoto da luz
IP	Pedaço de material isolante
a - b	Terminais de alimentação
c - d	Terminais de controle
E	Terminal terra
BUT	Reator em ensaio

Fonte: ABNT NBR IEC/CISPR 15– Figura 6 - Configuração da medição de uma luminária (Figura 6A), um reator independente (Figura 6B) e uma lâmpada com reator integrado (Figura 6C)

3.1.1.2. Resultado do ensaio

Data de Execução	30/Mai/2018	Temperatura	23,4 °C ± 1,1	Umidade	42,2 % ± 3,5
Equipamento Sob Ensaio	01		Tensão de Alimentação		127 V_{AC}
Modo de exercício	O equipamento sob ensaio é exercitado sendo alimentado com a tensão nominal, não excedendo uma tolerância de 2 %.				



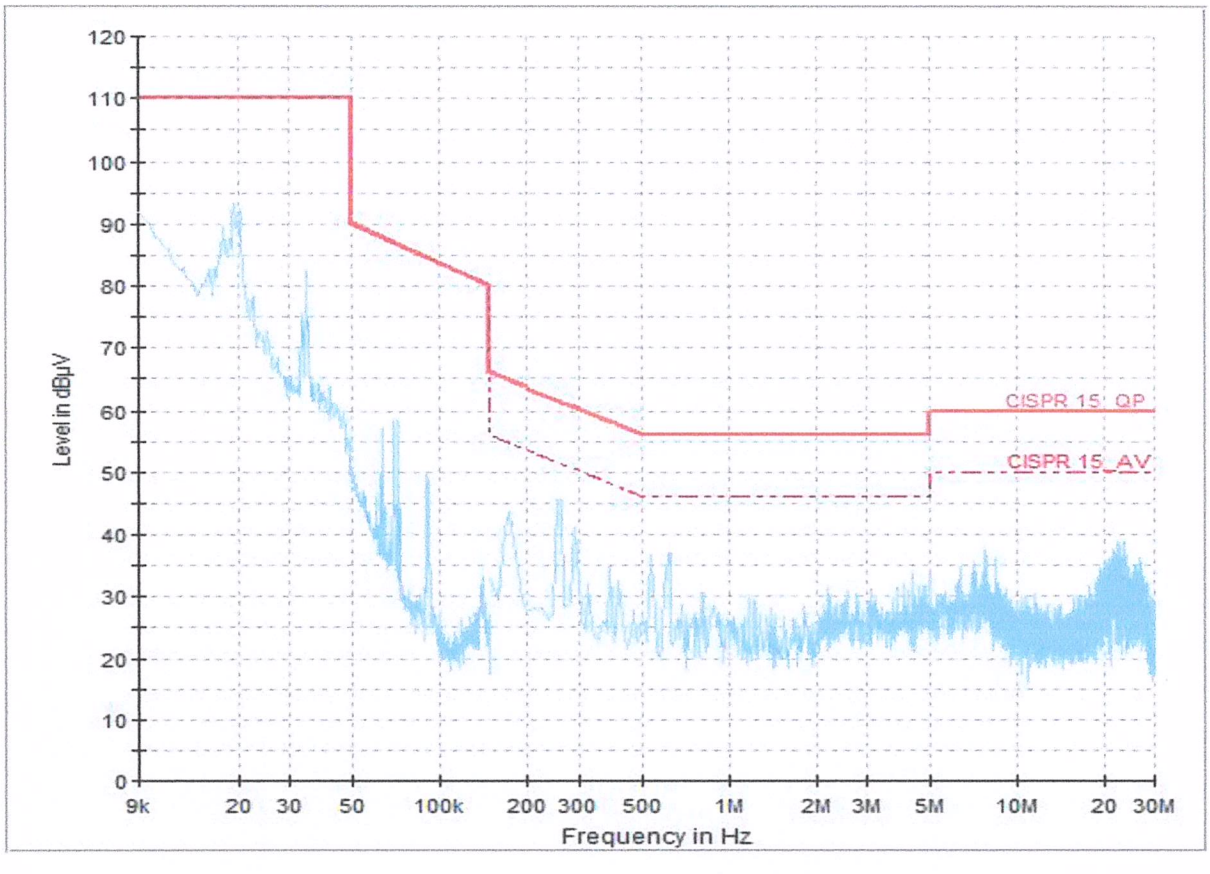
Medição de Pico (Preview Test) — Medição de Médio (Final Test) — Medição de Quase Pico (Final Test) — Limite Quase Pico e Médio (Preview Test)

Frequência (MHz)	QuasiPeak (dBµV)	Limite (dBµV)	Margem (dB)	Linha	Incerteza [dBµV]	Fator k
—	—	—	—	—	—	—
Frequência (MHz)	**Average (dBµV)**	**Limite (dBµV)**	**Margem (dB)**	**Linha**	**Incerteza [dBµV]**	**Fator k**
—	—	—	—	—	—	—

Não houve ruídos significativos para medições finais.

Tabela 3 - Resultados do ensaio de tensões de perturbações nos terminais de alimentação

Data de Execução	30/Mai/2018	Temperatura	23,4 °C ± 1,1	Umidade	42,2 % ± 3,5
Equipamento Sob Ensaio	01		Tensão de Alimentação		220 V_{AC}
Modo de exercício	O equipamento sob ensaio é exercitado sendo alimentado com a tensão nominal, não excedendo uma tolerância de 2 %.				



Medição de Pico (Preview Test) — Medição de Médio (Final Test) — Medição de Quase Pico (Final Test) — Limite Quase Pico e Médio (Preview Test)

Frequência (MHz)	QuasiPeak (dBµV)	Limite (dBµV)	Margem (dB)	Linha	Incerteza [dBµV]	Fator k
—	—	—	—	—	—	—
Frequência (MHz)	**Average (dBµV)**	**Limite (dBµV)**	**Margem (dB)**	**Linha**	**Incerteza [dBµV]**	**Fator k**
—	—	—	—	—	—	—

Não houve ruídos significativos para medições finais.

Tabela 4 - Resultados do ensaio de tensões de perturbações nos terminais de alimentação

3.2. Perturbações Eletromagnéticas Radiadas (Câmara Semi-Anecóica)

3.2.1. Faixa de 9 KHz a 30 MHz

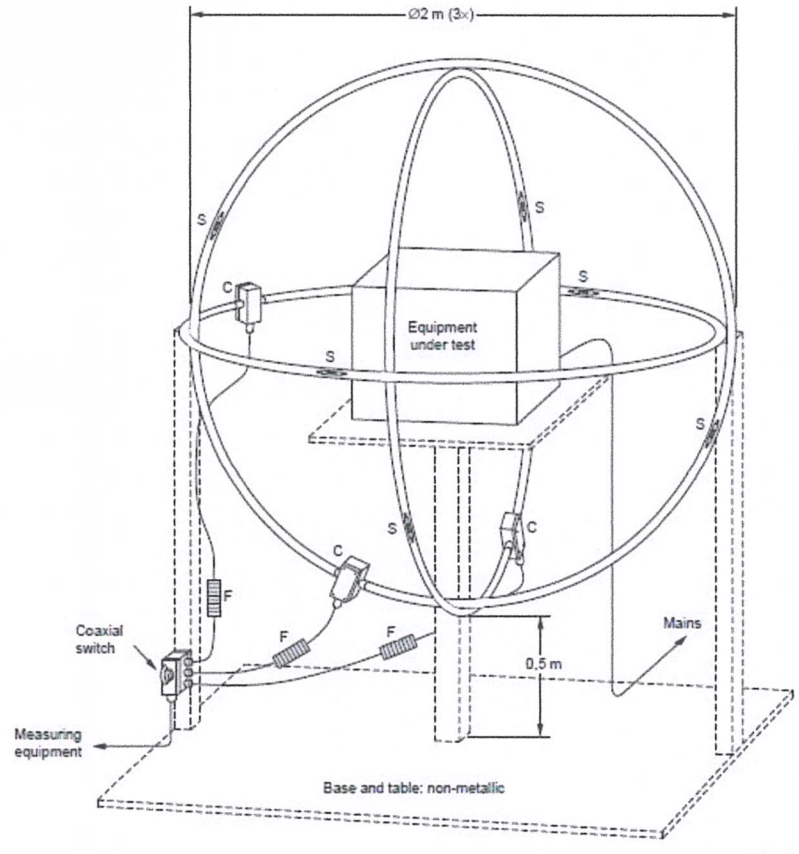
3.2.1.1. Requisito normativo

Conforme o item 4.4.1 da ABNT NBR IEC/CISPR 15, as emissões a partir das portas de energia elétrica do equipamento sob ensaio devem atender aos limites apresentados na tabela abaixo.

Limites para o ensaio de emissão de perturbação campos magnéticos radiado	
Faixa de Frequência	**Detector Quase Pico**
9 a 70 KHz	88 dB(μA)
70 a 150 KHz	88 a 58 dB(μA)
0,15 a 3,0 MHz	58 a 22 dB(μA)
3,0 a 30 MHz	22 dB(μA)

Tabela 5 – Limites para o ensaio de emissão de perturbação campos magnéticos radiado

A montagem do ensaio foi realizada conforme referido o Item 4.7 da Norma Internacional CISPR 16-1-4. Em conformidade as informações supracitadas, segue abaixo ilustração de montagem apresentado pela norma.



S Antena Loop

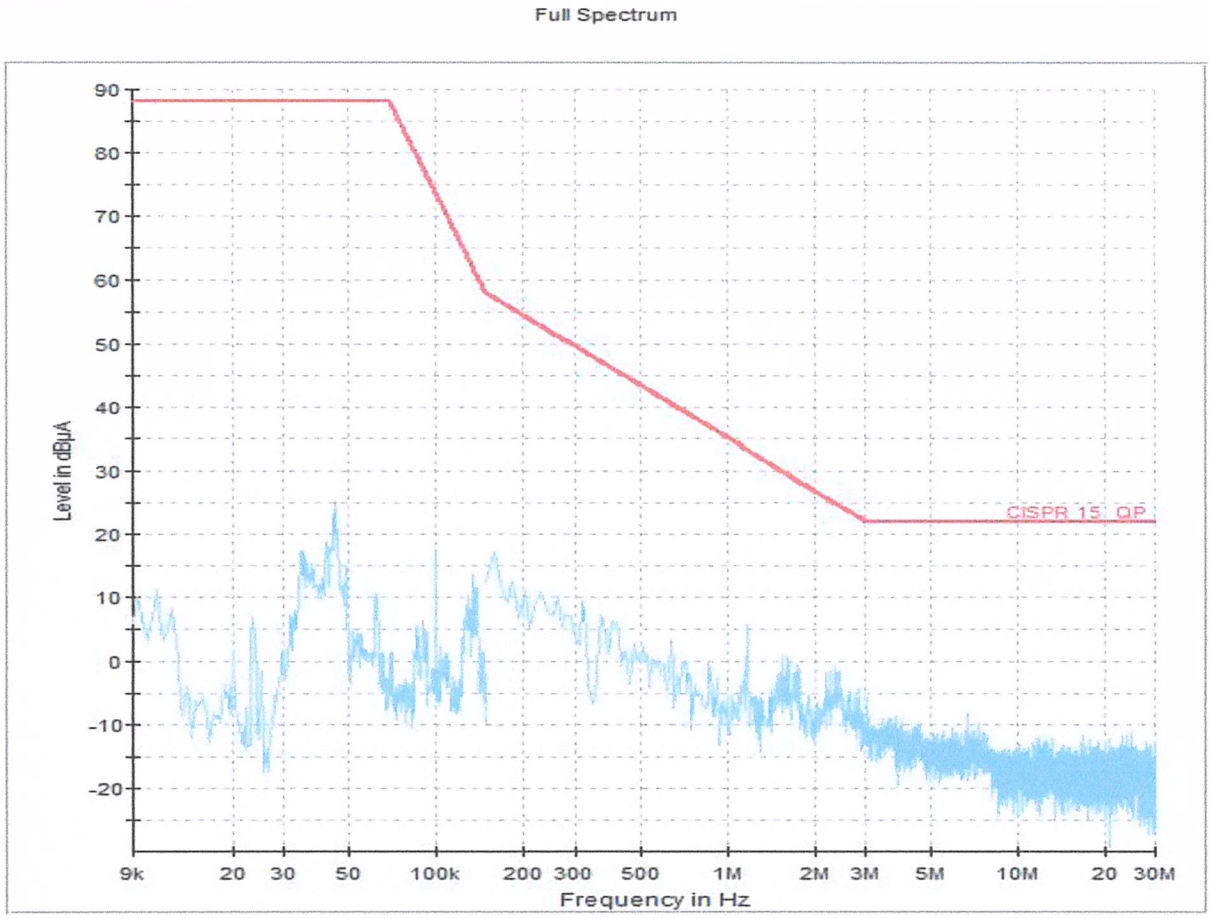
C Sonda de Corrente

F Ferrite

Figure C.1 (CISPR 16-1-4)

3.2.1.2. Resultado do ensaio

Data de Execução	30/Mai/2018	Temperatura	23,3 °C ± 1,2	Umidade	45,0 % ± 8,9
Equipamento Sob Ensaio	01	Tensão de Alimentação	127 V_{AC}	Eixo de Medição	X
Modo de exercício	O equipamento sob ensaio é exercitado sendo alimentado com a tensão nominal, não excedendo uma tolerância de 2 %.				



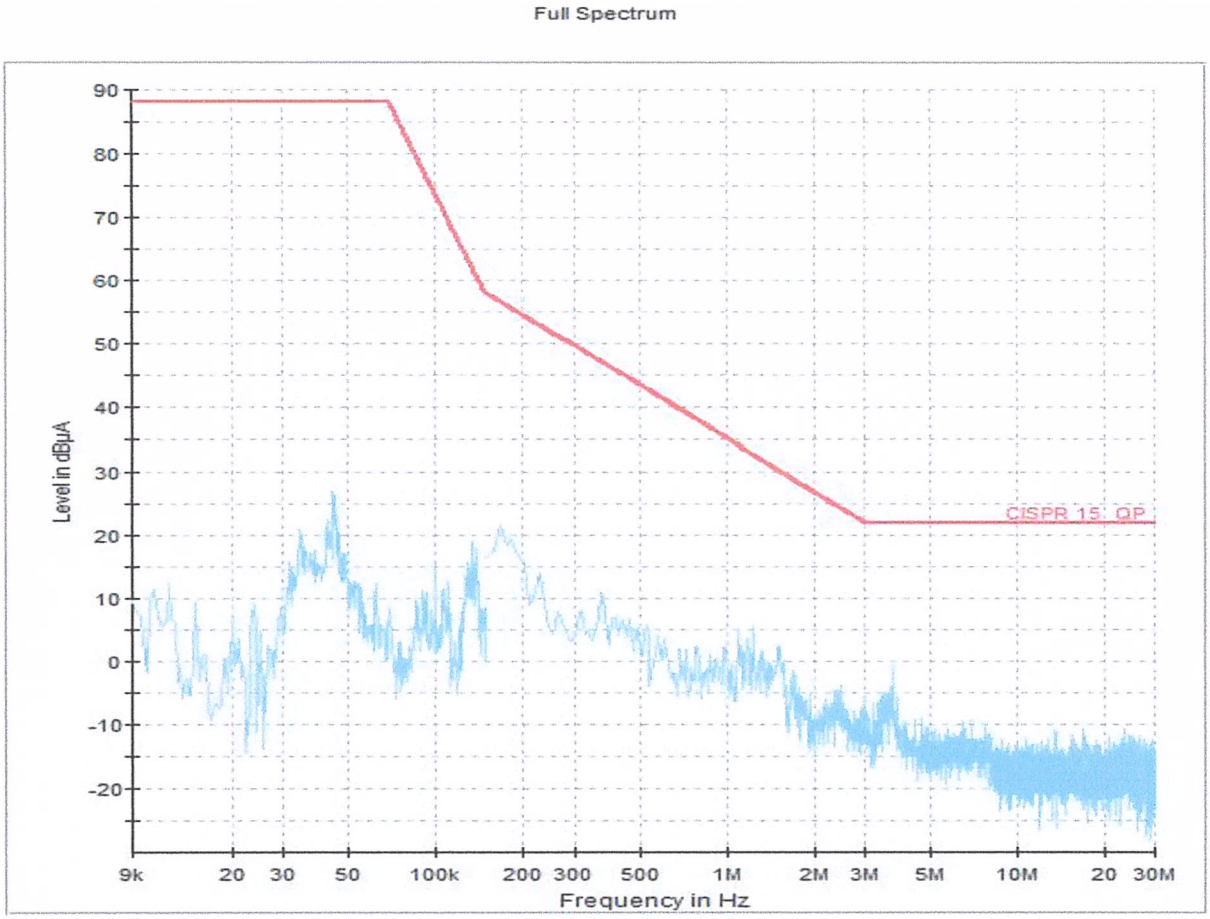
Medição de Pico (Preview Test) ◆ Medição de Quase-Pico (Final Test) Limite Quase-Pico (Preview Test)

Frequência (MHz)	QuasiPeak (dBµV)	Limite (dBµV)	Margem (dB)	Incerteza [dBµV]	Fator k
—	—	—	—	—	—

Não houve ruídos significativos para medições finais.

Tabela 6 - Resultados do ensaio de emissão de perturbação eletromagnética radiadas

Data de Execução	30/Mai/2018	Temperatura	23,3 °C ± 1,2	Umidade	45,0 % ± 8,9
Equipamento Sob Ensaio	01	Tensão de Alimentação	127 V_{AC}	Eixo de Medição	Y
Modo de exercício	O equipamento sob ensaio é exercitado sendo alimentado com a tensão nominal, não excedendo uma tolerância de 2 %.				



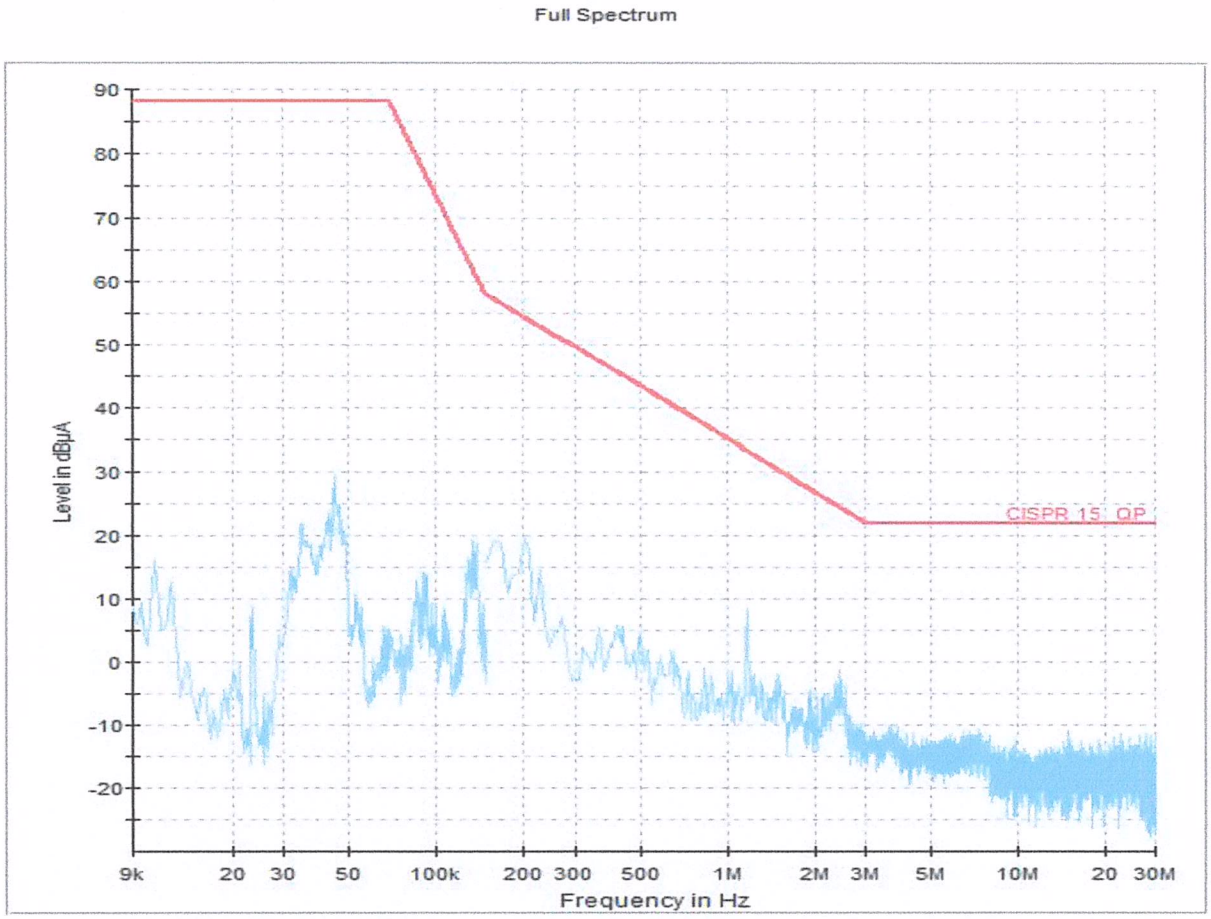
Medição de Pico (Preview Test) ◆ Medição de Quase-Pico (Final Test) Limite Quase-Pico (Preview Test)

Frequência (MHz)	QuasiPeak (dBµV)	Limite (dBµV)	Margem (dB)	Incerteza [dBµV]	Fator k
—	—	—	—	—	—

Não houve ruídos significativos para medições finais.

Tabela 7 - Resultados do ensaio de emissão de perturbação eletromagnética radiadas

Data de Execução	30/Mai/2018	Temperatura	23,3 °C ± 1,2	Umidade	45,0 % ± 8,9
Equipamento Sob Ensaio	01	Tensão de Alimentação	127 V_{AC}	Eixo de Medição	Z
Modo de exercício	O equipamento sob ensaio é exercitado sendo alimentado com a tensão nominal, não excedendo uma tolerância de 2 %.				



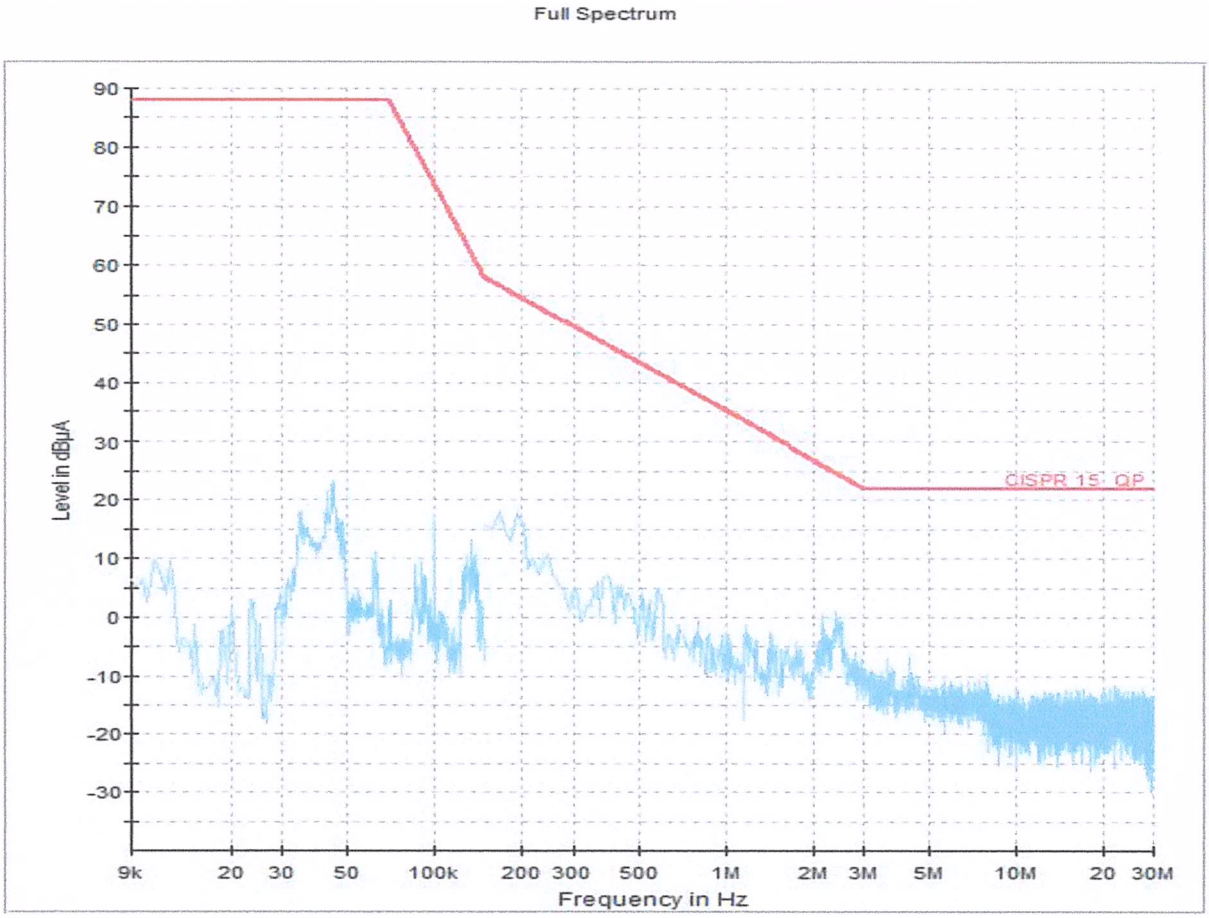
Medição de Pico (Preview Test) ◆ Medição de Quase-Pico (Final Test) Limite Quase-Pico (Preview Test)

Frequência (MHz)	QuasiPeak (dBµV)	Limite (dBµV)	Margem (dB)	Incerteza [dBµV]	Fator k
—	—	—	—	—	—

Não houve ruídos significativos para medições finais.

Tabela 8 - Resultados do ensaio de emissão de perturbação eletromagnética radiadas

Data de Execução	30/Mai/2018	Temperatura	23,3 °C ± 1,2	Umidade	45,0 % ± 8,9
Equipamento Sob Ensaio	01	Tensão de Alimentação	220 V_{AC}	Eixo de Medição	X
Modo de exercício	O equipamento sob ensaio é exercitado sendo alimentado com a tensão nominal, não excedendo uma tolerância de 2 %.				



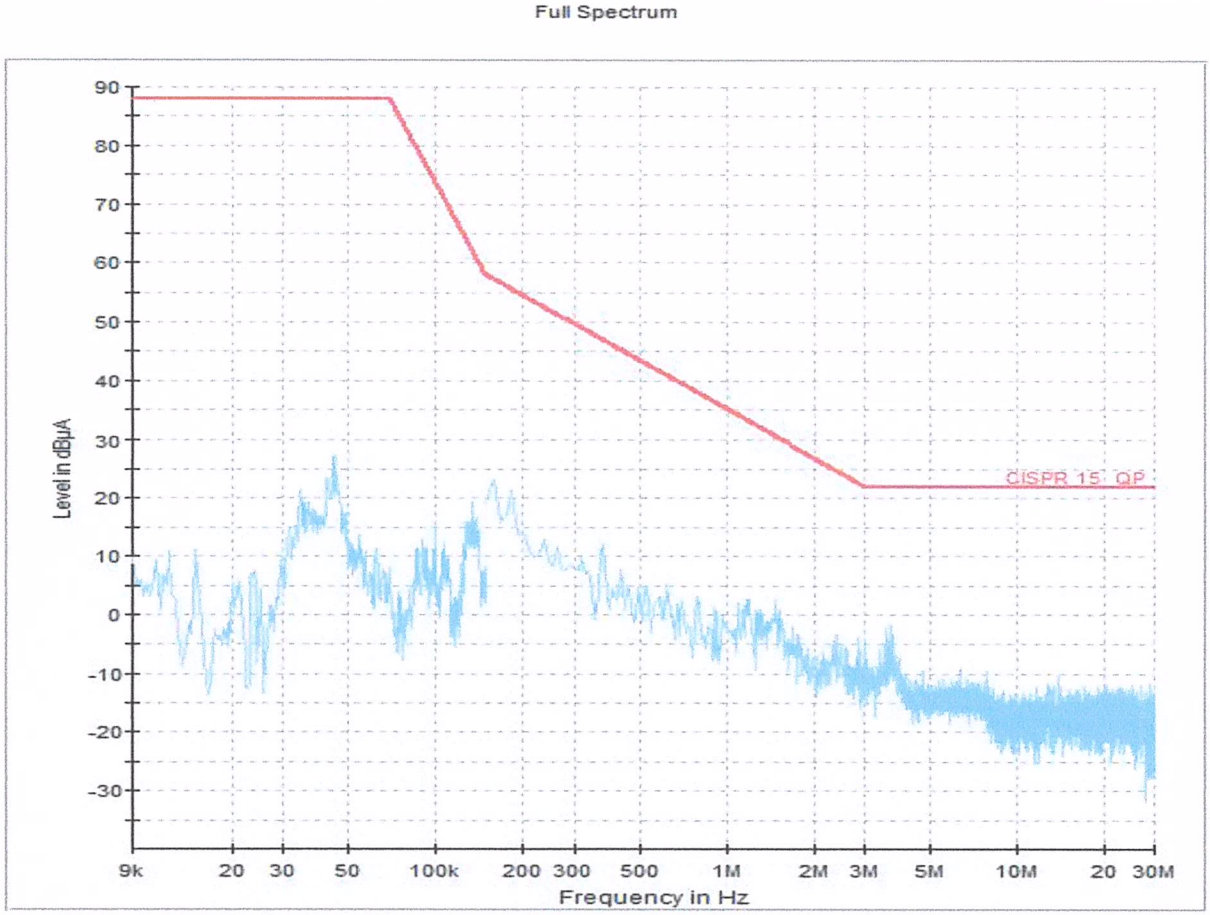
Medição de Pico (Preview Test) ◆ Medição de Quase-Pico (Final Test) Limite Quase-Pico (Preview Test)

Frequência (MHz)	QuasiPeak (dBµV)	Limite (dBµV)	Margem (dB)	Incerteza [dBµV]	Fator k
—	—	—	—	—	—

Não houve ruídos significativos para medições finais.

Tabela 9 - Resultados do ensaio de emissão de perturbação eletromagnética radiadas

Data de Execução	30/Mai/2018	Temperatura	23,3 °C ± 1,2	Umidade	45,0 % ± 8,9
Equipamento Sob Ensaio	01	Tensão de Alimentação	220 V_{AC}	Eixo de Medição	Y
Modo de exercício	O equipamento sob ensaio é exercitado sendo alimentado com a tensão nominal, não excedendo uma tolerância de 2 %.				



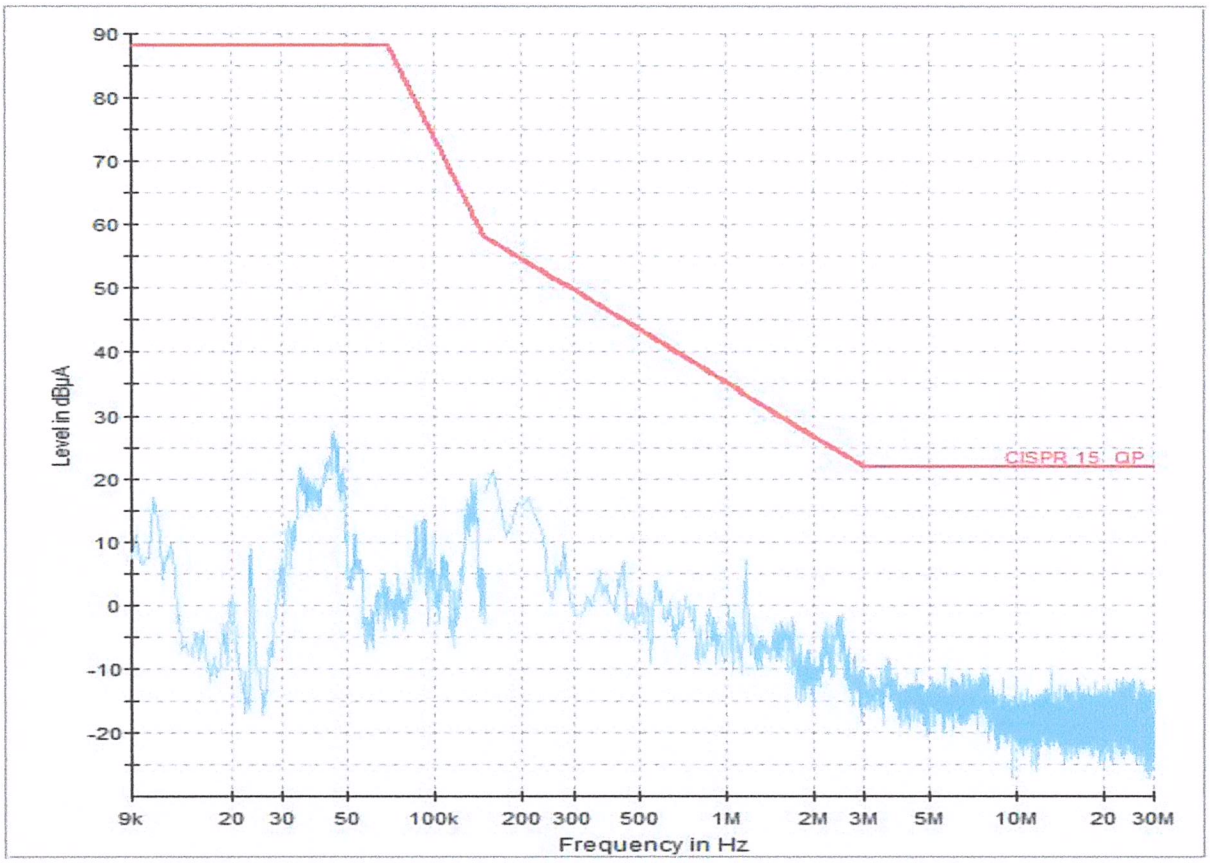
Medição de Pico (Preview Test) ◆ Medição de Quase-Pico (Final Test) Limite Quase-Pico (Preview Test)

Frequência (MHz)	QuasiPeak (dBµV)	Limite (dBµV)	Margem (dB)	Incerteza [dBµV]	Fator k
—	—	—	—	—	—

Não houve ruídos significativos para medições finais.

Tabela 10 - Resultados do ensaio de emissão de perturbação eletromagnética radiadas

Data de Execução	30/Mai/2018	Temperatura	23,3 °C ± 1,2	Umidade	45,0 % ± 8,9
Equipamento Sob Ensaio	01	Tensão de Alimentação	220 V_{AC}	Eixo de Medição	Z
Modo de exercício	O equipamento sob ensaio é exercitado sendo alimentado com a tensão nominal, não excedendo uma tolerância de 2 %.				



Medição de Pico (Preview Test) ◆ Medição de Quase-Pico (Final Test) Limite Quase-Pico (Preview Test)

Frequência (MHz)	QuasiPeak (dBµV)	Limite (dBµV)	Margem (dB)	Incerteza [dBµV]	Fator k
—	—	—	—	—	—

Não houve ruídos significativos para medições finais.

Tabela 11 - Resultados do ensaio de emissão de perturbação eletromagnética radiadas

3.3. Método Independente de Medições de Perturbações Radiada

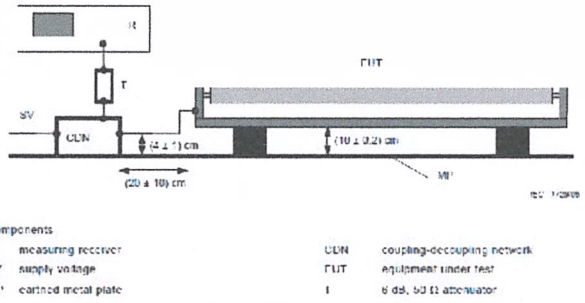
3.3.1. Requisito normativo

Conforme o anexo B da ABNT NBR IEC/CISPR 15, as emissões de perturbações do equipamento sob ensaio devem atender aos limites apresentados na tabela abaixo.

Limites de tensão nos terminais em modo comum, método CDN	
Faixa de Frequência	**Detector Quase Pico**
30 a 100 MHz	64 a 54 dBµV
100 a 230 MHz	54 dBµV
230 a 300 MHz	61 dBµV

Tabela 12 – Limites para o ensaio de emissão de perturbação utilizando o método independente

A montagem do ensaio foi realizado conforme referido o Item B.6 da Norma ABNT NBR IEC/CISPR 15. Em conformidade as informações supracitadas, segue abaixo ilustração de montagem apresentado pela norma.



Components

R	measuring receiver	CDN	coupling-decoupling network
SV	supply voltage	EUT	equipment under test
MP	earthed metal plate	T	6 dB, 50 Ω attenuator

Figure B.1 – Test set-up for CDN method

O adaptador de lâmpada utilizado no ensaio é referido no Anexo E da Norma CISPR 15+AMD1:2015. Em conformidade as informações supracitadas, segue abaixo ilustração de montagem apresentado pela norma.

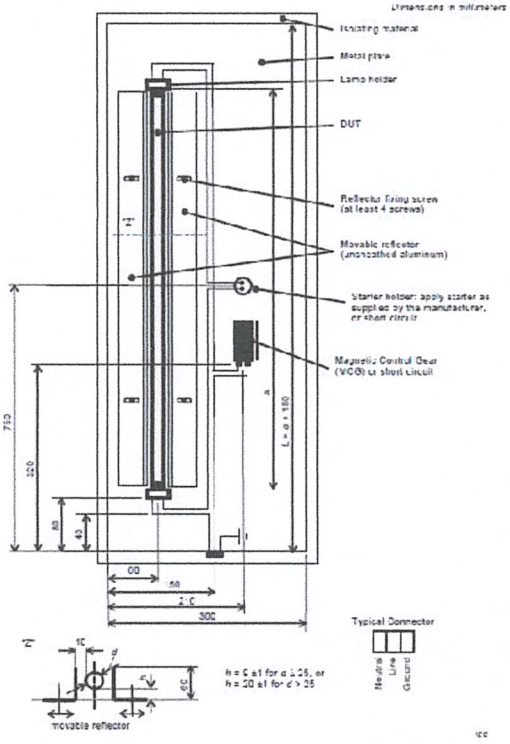
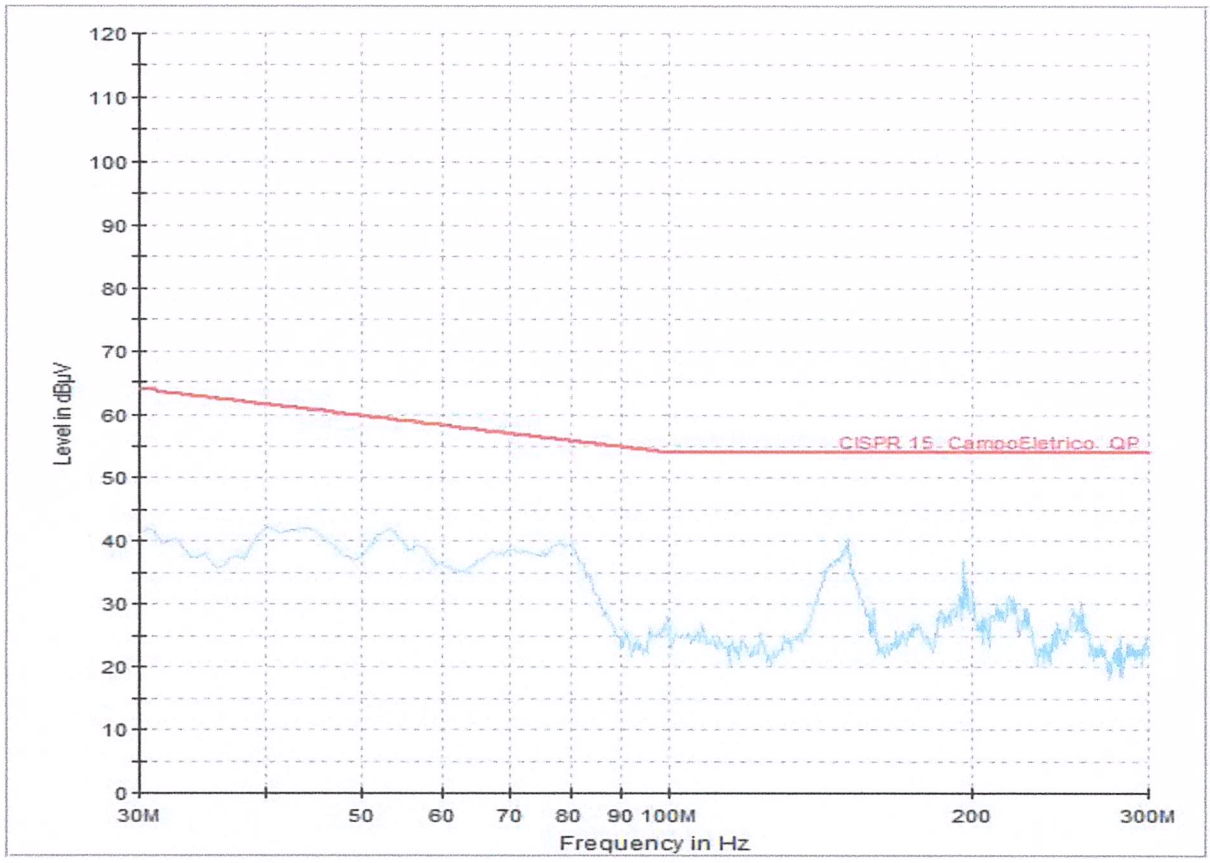


Figure E.1 – Measurement set-up for double-capped lamp adapter, double-capped self-ballasted lamp, double capped semi luminaire and double capped retrofit lamp

3.3.2. Resultado do ensaio

Data de Execução	30/Mai/2018	Temperatura	22,4 °C ± 0,3	Umidade	44,3 % ± 1,0
Equipamento Sob Ensaio	01		Tensão de Alimentação		127 V_{AC}
Modo de exercício	O equipamento sob ensaio é exercitado sendo alimentado com a tensão nominal, não excedendo uma tolerância de 2 %.				



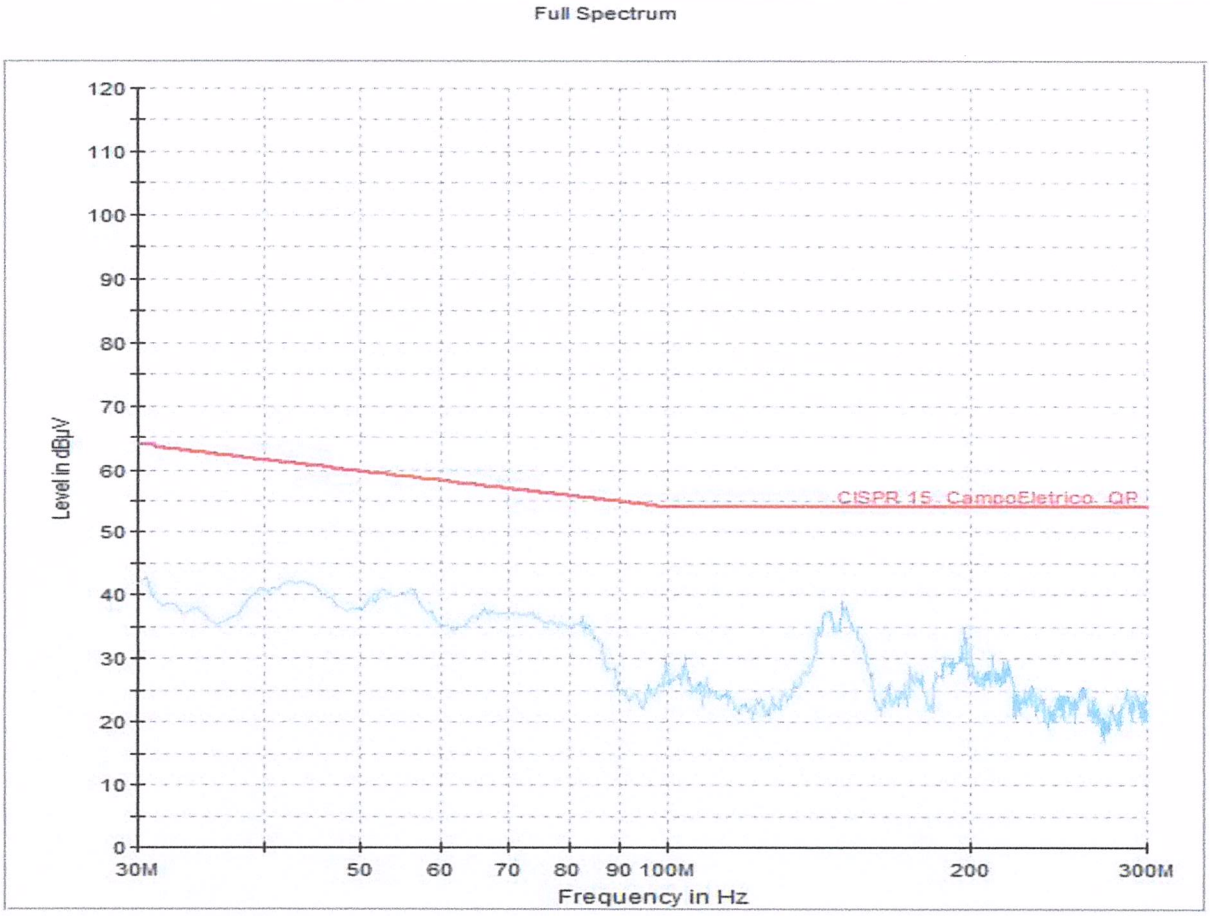
Medição de Pico (Preview Test) ◆ Medição de Quase-Pico (Final Test) Limite Quase-Pico (Preview Test)

Frequência (MHz)	QuasiPeak (dBµV)	Limite (dBµV)	Margem (dB)	Incerteza [dBµV]	Fator k
—	—	—	—	—	—

Não houve ruídos significativos para medições finais.

Tabela 13 - Resultados do ensaio de emissão de perturbação eletromagnética conduzidas nas portas de energia elétrica

Data de Execução	30/Mai/2018	Temperatura	22,4 °C ± 0,3	Umidade	44,3 % ± 1,0
Equipamento Sob Ensaio	01		Tensão de Alimentação		220 V_{AC}
Modo de exercício	O equipamento sob ensaio é exercitado sendo alimentado com a tensão nominal, não excedendo uma tolerância de 2 %.				



Medição de Pico (Preview Test) ◆ Medição de Quase-Pico (Final Test) Limite Quase-Pico (Preview Test)

Frequência (MHz)	QuasiPeak (dBµV)	Limite (dBµV)	Margem (dB)	Incerteza [dBµV]	Fator k
—	—	—	—	—	—

Não houve ruídos significativos para medições finais.

Tabela 14 - Resultados do ensaio de emissão de perturbação eletromagnética conduzidas nas portas de energia elétrica

4. LISTA GERAL DE INSTRUMENTOS

Segue listado na tabela abaixo as referências dos equipamentos utilizados na execução dos ensaios pertencentes ao Laboratório de Ensaios e Testes:

Equipamentos / acessórios utilizados	Identificação
Tensões de Perturbações - Terminais de Alimentação	
Multímetro Digital	012178
Mesa Para Ensaios	001124
Plano Terra De Referência	AC 1335
Cabo De Rf	AC 2447
Termo-higrômetro Digital	015231
Transient Limiter	010362
Lisn - Two Line V - Network	001091
Emi Test Receiver	001088
Perturbações Eletromaginéticas Radiadas (Campo Magnético) - Faixa de 9 KHz a 30 MHz	
Termo-higrômetro Digital	015226
Multímetro Digital	AC 1576
Cabo De Rf	012934
Mesa Para Ensaios	010029
Mesa Para Ensaios	010028
Antena Triple-loop	010024
Emi Test Receiver	001088
Metodo Independente de Medições de Perturbações Radiada	
Multímetro Digital	012178
Cdn	015570
Plano Terra De Referência	AC 1335
Suporte Isolante	AC 1667
Cabo De Rf	AC 2447
Emi Test Receiver	001088
Termo-higrômetro Digital	015231

Tabela 15 – Relação dos equipamentos / acessórios utilizados na execução dos ensaios

5. HISTÓRICO DE REVISÕES

Histórico	Data	Versão
Emissão inicial do documento	30-Mai-2018	01.00

---x---x---x---x---

0239

PULSE LED

Linha de Luminárias Lutece Família TX9 - Iluminação Pública

Aplicações

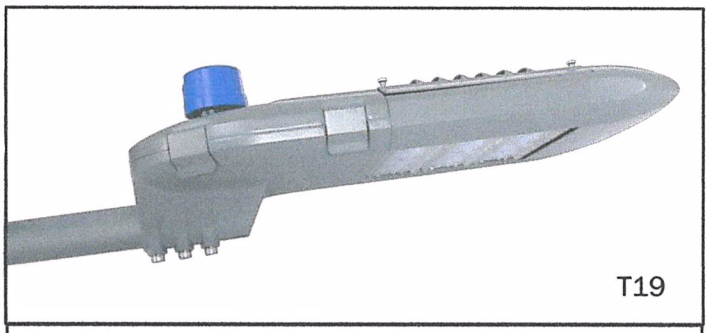
- Iluminação Pública
  (Rodovias, ruas principais e secundárias)
- Áreas e espaços públicos
  (Estacionamentos, praças e shopping centers)

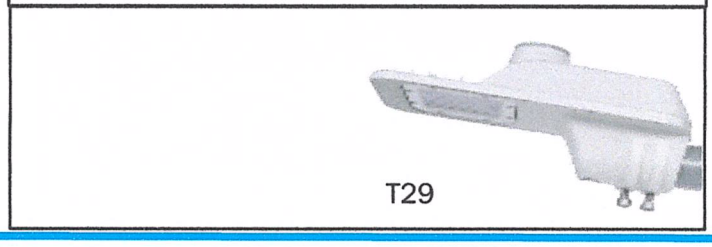
Cores Padrão

Preto

Branco

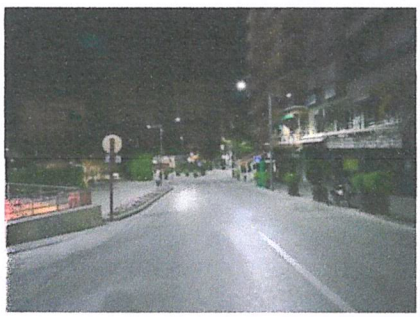
Cinza


T19


T29

Características

- Patente proprietária dos módulos LED IP68 (máximo nível de proteção) nos compartimentos do LED;
- Várias opções de distribuição de luz disponíveis para diferentes perfis de uso;
- Estrutura em alumínio Injetado para melhor condução térmica, radiação e convecção;
- Várias opções de potência a escolher;
- Assistência técnica no Brasil reduzindo os custos de manutenção;
- Desempenho imbatível com a qualidade Pulse LED;
- Fácil acesso aos componentes para troca ou manutenção;
- Dimerizável;
- Opcionais, tomada para fotocélulas de 7 pinos padrão NEMA.

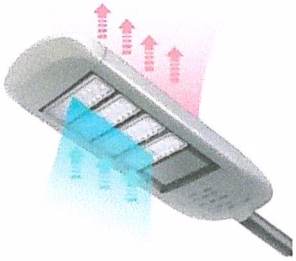
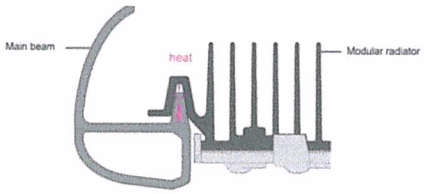
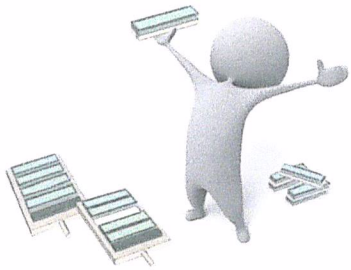
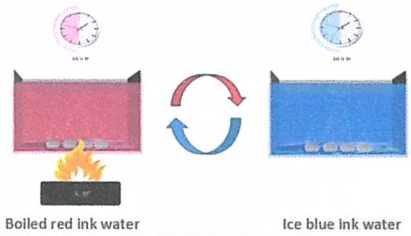
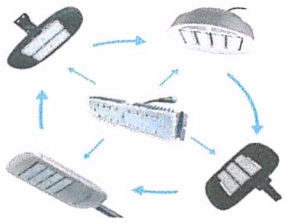






PULSE LED

Vantagens técnicas Pulse LED

		
Efeito de convecção do ar	Estrutura de dissipação de calor injetada	Fácil manutenção
	 The high lumen, high efficacy, multi-die single emitter committed to lowering lighting system cost	
Proteção ip66 do conjunto	Alta eficiência energética > 140lm/w	Diversas combinações de potência

PULSE LED

Especificações Técnicas

Modelo	Voltagem de Entrada(V) Frequência (Hz)	Corrente na fonte (mA)	Potência (W)	M16		Fator de Potência	Marca do LED	Temperatura de Cor (K) - Opções	CRI
				Eficiência (lm/W)	Lumens (lm)				
T19E-4180	AC100-27750/60	1000(14P2S)	180	135	24.300,00	0,98	CreeXP-G3	3000 a 6000K	≥70
T19E-4150		1200(9P2S)	150	125	18.750,00				
T19E-4100		1200(14P2S)	100	125	12.500,00				
T29B-1-75-70		1200(14P2S)	70	140	9.800,00				
T29B-1-75-60		1000(14P2S)	60	140	8.400,00				

PULSE LED

Especificações Técnicas

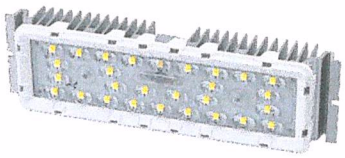
Ambiente de operação e Embalagem

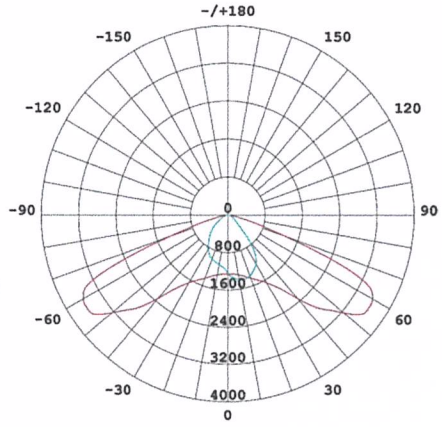
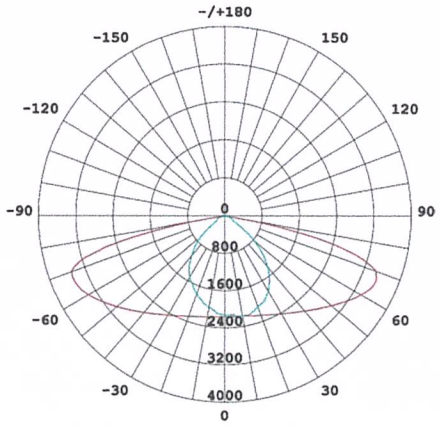
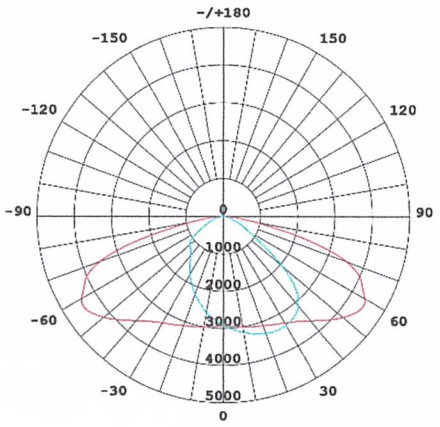
Modelo	Temp. de operação	IP Classificação	Proteção de Surtos	Vida útil do LED	Material do Corpo	Diam. de Instalação (mm)	Dimensões (mm)	Caixa (mm)	Peso Líq.. (kg)	Peso Bruto (kg)
T19E-4180	-40°C~+50°C, 10%~90%RH.	IP66	≥10 KV	>50,000	Alumínio Injetado AP	Φ43±5 a Φ65±5	820x330x160	910x410x230	9,6	11,2
T19E-4150							820x330x160	910x410x230	9,6	11,2
T19E-4100							740x330x160	830x410x230	8,4	9,8
T29B-1-75-70							380*165*200	470x250x270	3,3	4,1
T29B-1-75-60							380*165*200	470x250x270	3,3	4,1

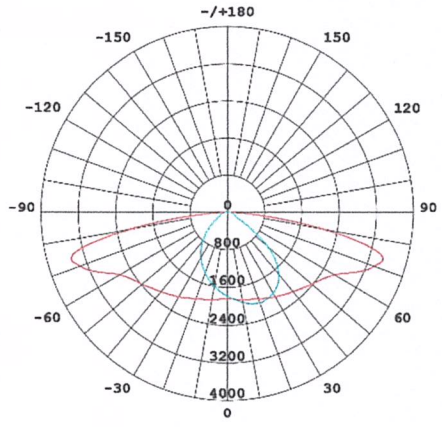
Garantia

5-Anos contra defeito de fabricação. Para Maiores informações consulte o termo de garantia de produtos Pulse LED.

Distribuições Luminosas



Lente C1	Lente C2	Lente C3
IESNA Tipo I Curto	IESNA Tipo II Curto	IESNA Tipo II Médio
		

Lente C4
IESNA Tipo II Médio


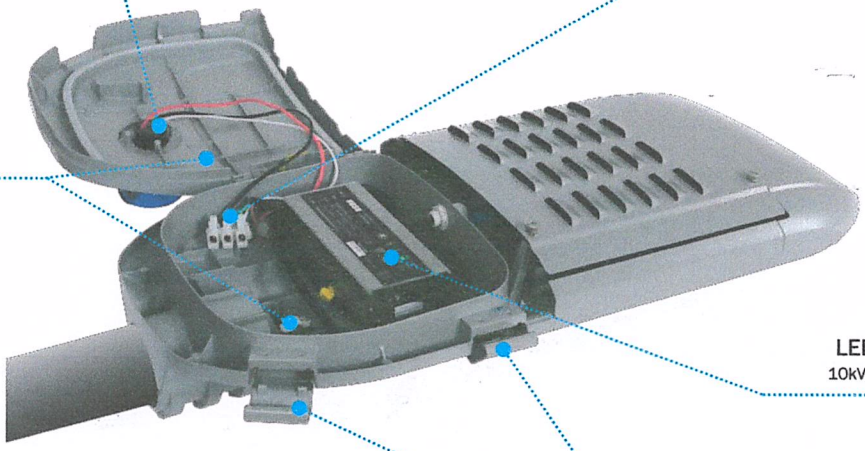
Construção



NEMA receptáculo & fotocélula



Barramentos
Facilitam as conexões



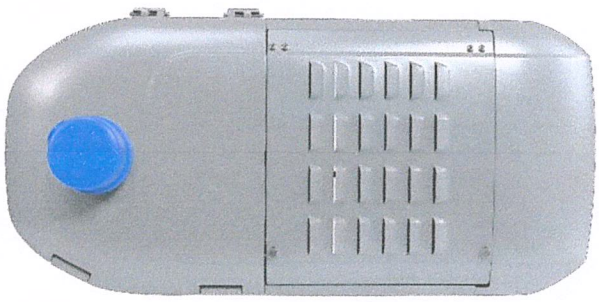
Compartimento
IP66

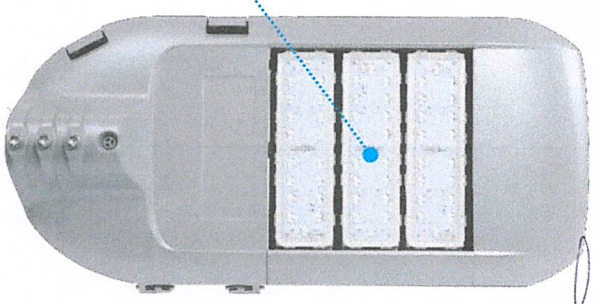
LED Driver
10kV Standard

2 x Travas em Aço Inox
Fácil acesso ao compartimento Elétrico



Conjunto ótico IP68 patenteado





Choose certainty.
Add value.

Technical Report No. 704021705524-00
Rev. 00
Dated 2017-05-23

Client:	Hangzhou Hpwinner Opto. Corporation No.18 Kangzhong Road, Gongshu District, 310015 Hangzhou City, Zhejiang Province, PEOPLE'S REPUBLIC OF CHINA
Manufacturing place:	Same as applicant
Test subject:	Product: LED street lighting Type: T19E-7-420
Test specification:	EN 60598-1:2015 EN 60598-2-3: 2003+A1:2011
Purpose of examination:	According to client's requirement for above mentioned models - Static load test
Test result:	**Pass**

This technical report may only be quoted in full. Any use for advertising purposes must be granted in writing. This report is the result of a single examination of the object in question and is not generally applicable evaluation of the quality of other products in regular production.

Telephone : +86 021 61410123
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http://www.tuv-sud.cn

TÜV SÜD Certification and Testing (China) Co., Ltd. Shanghai Branch
No.151 Heng Tong Road, Shanghai
200070, P.R.China.

1 Description of the test subject

1.1 Technical Data

Model	**T19E-7-420**
Drag coefficient	1.2
Area of the surface to be loaded	0.3762m^2
Wind speed	57m/s
Load	898.4N

2 Order

2.1 Receipt of Test Sample, Location

2017-05-17

2.2 Date of Testing

2017-05-17 to 2017-05-23

TÜV SÜD Certification and Testing (China) Co., Ltd. Shanghai Branch

2.3 Points of Non-compliance or Exceptions of the Test Procedure

None

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No.151 Heng Tong Road, Shanghai
200070, P.R.China.

3 Test Results

3.1 Positive Test Results

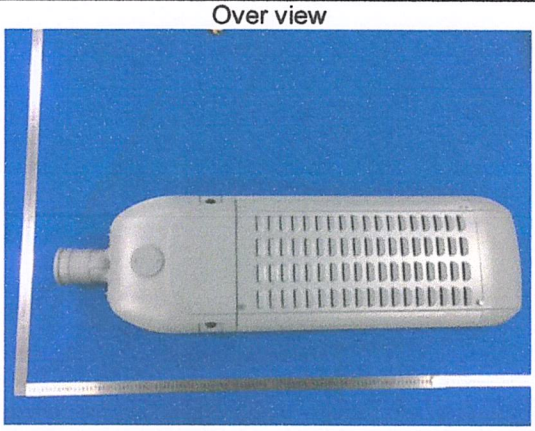
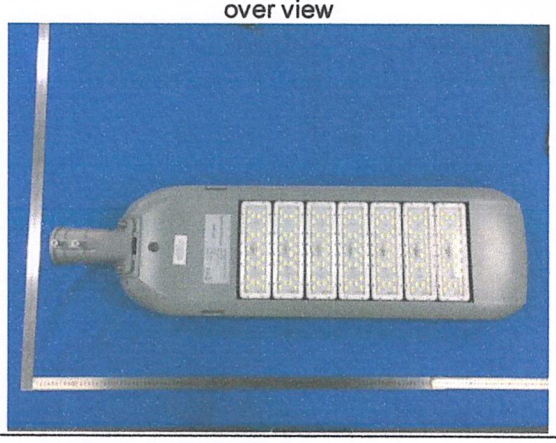
Selected sub-clauses from	Check points	Brief Description / Remarks	Pass / Fail
Clause 3.6.3.1	Static load test	After the test, there shall be no visible failure impairing the safety, no permanent deformation from the attachment which exceeds a slope of more than 2 cm/m, and no rotation around the point of attachment.	PASS

4 Remark

N/A

5 Documentation

Photo documentation

Over view	over view
	

«laboratory legal entity name»
TÜV SÜD Group

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Telefax : +86 021 61408600

http://www.tuv-sud.cn

TÜV SÜD Certification and Testing (China) Co., Ltd. Shanghai Branch
No.151 Heng Tong Road, Shanghai
200070, P.R.China.

Engineer: _____
Xiaohui YANG
Project Handler

Technical Report checked: _____
Na ZHANG
Designated Reviewer

IPS_GCN_F_09 20E – Rev. 1 2012-10-29

Telephone : +86 021 61410123
Telefax : +86 021 61408600

http://www.tuv-sud.cn

TÜV SÜD Certification and Testing (China) Co., Ltd. Shanghai Branch
No.151 Heng Tong Road, Shanghai
200070, P.R.China.

CREE

IESLM-80-2008
RELATÓRIODE ENSAIO

Cree® XLamp® XP-G3 White LEDs

NVLAP TESTING
NVLAP Lab Code 500041-0

INFORMAÇÃO REQUERIDA PARA A Lm-80-08

Cree classifica estes LEDs como "LED encapsulado" conforme as normas ENERGY STAR DE 09 Set de 2011[1].

. Número de fontes luminosas LED testadas	Veja resultados específicos nas páginas seguintes.
. Descrição das fontes LED testadas	Xlamp XP-G3 leds White (Série: XPGDWT) Este relatório LM-80 se aplica aos seguintes codigos: XPGDWT-xx-xxxx-xxxxx Todas as medidas deste teste são de LED encapsulado.
. Descrição do equipamento auxiliar utilizado	Esfera Integradora: Instrument Systems ISP-500 Espectômetro: Instrument Systems CAS-140 Medidor da Fonte de enrgia: Keithley 2420
. Ciclo operacional	Led encapsulados mantidos em corrente constante.
. Condições do Ambiente	LED encapsulados foram operado em câmaras de ambiente. A temperatura do ar for controlada através de fluxo de ar na câmara. Temp: Veja resultados específicos nas páginas seguintes RH: < 45% Fluxo de ar: 800 CFM
. Temperatura do ensaio	Veja resultados específicos nas páginas seguintes.
. Corrente fornecida pela fonte ao LED durante o ensaio.	Veja resultados específicos nas páginas seguintes.
8. Fluxo luminoso inicial e tensão direta na medição fotométrica	Veja resultados específicos nas páginas seguintes.
9. Dados da manutenção do Fluxo Luminoso para cada fonte individual LED	Veja resultados específicos nas páginas seguintes. Temperatura ajustada para medida do fluxo luminoso: 25°C ±2°C.
10. Observação da falha da fonte luminosa LED	Nenhuma falha durante o teste.
11. Intervalo de Monitoramento da fonte LED	Veja resultados específicos nas páginas seguintes.
12. Limite de medida da medida fotométrica	Cree considera uma tolerância de of ±2.0% on nas medidas do fluxo para o teste LM-80.
13. Mudança da cromaticidade ao longo do tempo	Veja resultados específicos nas páginas seguintes. Temperatura ajustada para medida do fluxo luminoso: 25°c ±2°c.
Autorização do Relatório do Teste	Arthur Pun, Teste de Componentes, Gerente do Laboratório

1 http://www.energystar.gov/ia/partners/prod_development/new_specs/downloads/luminaires/ENERGY_STAR_Final_Lumen_Maintenance_Guidance.pdf

www.cree.com/Xlamp

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Cree, Inc.
4600 Silicon Drive
Durham, NC 27703
USA Tel: +1.919.407.5300

HISTORICO DE VERSÕES

Ver	data	Mudança
0	7 Jan, 2016	Emissão
1	8 Abr, 2016	Adicionada a duração do teste conjunto 1, removido o status anterior, adicionado conjunto 2.
2	17 Ago, 2016	Estendido conjuntos #1 e 2 com duração adicional.
3	9 Set, 2016	Adicionado o conjunto #3 - 12
4	13 Set, 2016	Ajustados os erros no conjunto de dados 10
5	02 Dez, 2016	Estendido conjunto #2 com duração adicional. Adicionado o conjunto #13.
6	28 Fev, 2017	Removidos conjuntos#1 e 2. adicionado conjunto #14. Estendidos os conjuntos #3, 4, 6, 7, 9 & 11 com duração adicional.
7	15 Mai, 2017	Estendidos os conjuntos #3, 4, 6, 7, 9, 11 & 14 com duração do teste adicional.
8	15 Nov, 2017	Adicionado o conjunto #15. Estendidos os conjuntos #3, 4, 5, 6, 7, 8, 9 & 11 com duração do teste adicional. Revisado o Grafico TM-21 para todos os conjuntos. Adicionou gráfico de deslocamento de cores e tabela de sumário para todos os testes.

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SUMÁRIO DE RESULTADOS DO TESTE

Conjunto	temp.Enc. [ts]	temp. ambiente [ta]	Corrente [If]	Objetivo CCt Alvo	Contagem Amostra	Duração do Teste	Vida útil tm-21 Estimada
3	85°C	85°C	350 mA	3000K	25	14,112 h	L90(14k) > 84,700 h L80(14k) > 84,700 h L70(14k) > 84,700 h
4	105°C	105°C	350 mA	3000K	25	13,608 h	L90(14k) > 81,600 h L80(14k) > 81,600 h L70(14k) > 81,600 h
5	120°C	120°C	350 mA	3000K	25	8,568 h	L90(9k) > 51,400 h L80(9k) > 51,400 h L70(9k) > 51,400 h
6	85°C	85°C	700 mA	3000K	25	14,112 h	L90(14k) > 84,700 h L80(14k) > 84,700 h L70(14k) > 84,700 h
7	105°C	105°C	700 mA	3000K	25	12,600 h	L90(13k) > 75,600 h L80(13k) > 75,600 h L70(13k) > 75,600 h
8	120°C	120°C	700 mA	3000K	25	8,568 h	L90(9k) = 39,600 h L80(9k) > 51,400 h L70(9k) > 51,400 h
9	85°C	85°C	1050 mA	3000K	25	14,112 h	L90(14k) > 84,700 h L80(14k) > 84,700 h L70(14k) > 84,700 h
15	105°C	105°C	1050 mA	3000K	25	8,064 h	L90(8k) > 48,400 h L80(8k) > 48,400 h L70(8k) > 48,400 h
10	105°C	105°C	1050 mA	4000K	20	11,592 h	L90(12k) = 36,700 h L80(12k) > 69,600 h L70(12k) > 69,600 h
11	85°C	85°C	1500 mA	3000K	25	13,608 h	L90(14k) = 74,300 h L80(14k) > 81,600 h L70(14k) > 81,600 h
14	105°C	105°C	1500 mA	3000K	25	10,080 h	L90(10k) = 27,900 h L80(10k) > 60,500 h L70(10k) > 60,500 h
12	120°C	120°C	1500 mA	3000K	20	6,048 h	L90(6k) = 7,830 h L80(6k) = 20,800 h L70(6k) = 35,500 h
13	85°C	85°C	2000 mA	3000K	25	6,048 h	L90(6k) = 17,500 h L80(6k) > 36,300 h L70(6k) > 36,300 h

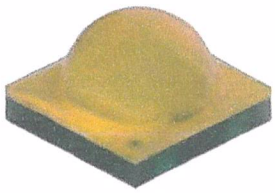
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CREE

FICHA TÉCNICA FAMÍLIA DE PRODUTOS

CLD-DS139 Rev 1B

LEDs Cree® XLamp® XP-G3



XP-G3 White



XP-G3 Royal Blue

Descrição do produto

O led XLamp®XP-G3 Possui a maior eficiência e confiabilidade na plataforma XP-G. Incorporando elementos da tecnologia Plataforma CREE SC5™, o IED XP-G3 LED entrega alta confiabilidade em altas temperaturas aliado a uma alta eficiência atendendo uma alta eficácia para a classificação DLC.

Otimizado para aplicações direcionais, para uso indoor e outdoor, o LED XP-G3 possui todos os benefícios da plataforma XP-G – compacto possui dimensões 3,45 mm x 3,45mm de encapsulamento – propicia menos tempo de projeto e diminui o tempo de lançamento no Mercado para suas aplicações.

FEAtuREs

- Disponível em outdoor white e 70-, 80- e 90-CRI white e royal blue
- Compatível com tabelas cromaticidade ANSI
- Opção para 3 e 5 terminais
- Corrente máxima do driver: 2000 mA
- Baixa Resistência térmica: white: 3 °C/W, royal blue: 2 °C/W
- Ângulo de visão ampliado: 125° - 130°
- Vida ilimitada para operação ≤ 30 °C/85% RH
- Solda - JEDEC J-STD-020C
- Caminho elétricamente e termicamente neutro
- Compliance com RoHS e REACh
- Componente reconhecido UL® (E349212)

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Cree, Inc.
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Durham, NC 27703
USA Tel: +1.919.313.5300

CARACTERÍSTICAS

Características	Unidade	Mínimo	Típico	Máximo
Resistência térmica na junção - white	°C/W		3	
Resistência térmica na junção - royal blue	°C/W		2	
Ângulo de Visão (FWHM) - white	Graus		125	
Ângulo de Visão (FWHM) - royal blue	Graus		130	
Coeficiente de temperature da Tensão	mV/°C		-1.3	
ESD Classificação Dielétrica (HBM por Mil-Std-883D)	v		Class 3A	
DC Corrente direta	mA			2000
Tensão Reversa	v			5
Tensão Direta (@ 350 mA, 85 °C) - white	v		2.73	3
Tensão Direta(@ 350 mA, 25 °C) - royal blue	v		2.82	3.1
Tensão Direta(@ 700 mA, 85 °C) - white	v		2.83	
Tensão Direta(@ 700 mA, 25 °C) - royal blue	v		2.93	
Tensão Direta(@ 1000 mA, 85 °C) - white	v		2.89	
Tensão Direta(@ 1000 mA, 25 °C) - royal blue	v		3.01	
Tensão Direta(@ 1500 mA, 85 °C) - white	v		2.99	
Tensão Direta(@ 1500 mA, 25 °C) - royal blue	v		3.11	
Tensão Direta(@ 2000 mA, 85 °C) - white	v		3.06	
Tensão Direta(@ 2000 mA, 25 °C) - royal blue	v		3.20	
LED Temperatura da Junçãop	°C			150

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FLUXO LUMINOSO – CARACTERÍSTICAS - WHITE (t_j = 85 °C)

A tabela a seguir define os códigos para pedido do LED XLamp XP-G3. Veja definições de cromaticidade nas tabelas subsequentes..

Cromaticidade		Fluxo Luminoso Mínimo (lm) @ 350 mA			Código para pedido			
Kit	CCt	Código	Fluxo (lm) @ 85 °C	Fluxo (lm) @25 °C*	70 CRi Típico	70 IRC Mínimo	80 IRC Mínimo	90 IRC Mínimo
3e	5000 K	S4	164	179		XPGDWT-B1-0000-00L3E		
		S3	156	170		XPGDWT-B1-0000-00K3E	XPGDWT-H1-0000-00K3E	
		S2	148	161		XPGDWT-B1-0000-00J3E	XPGDWT-H1-0000-00J3E	
		R5	139	152			XPGDWT-H1-0000-00H3E	
		R4	130	142				
		R3	122	133				XPGDWT-U1-0000-00F3E
		R2	114	124				XPGDWT-U1-0000-00E3E
e3	5000 K	S5	172	187	XPGDWT-01-0000-00ME3			
		S4	164	179	XPGDWT-01-0000-00LE3	XPGDWT-B1-0000-00LE3		
		S3	156	170	XPGDWT-01-0000-00KE3	XPGDWT-B1-0000-00KE3	XPGDWT-H1-0000-00KE3	
		S2	148	161	XPGDWT-01-0000-00JE3	XPGDWT-B1-0000-00JE3	XPGDWT-H1-0000-00JE3	
		R5	139	152			XPGDWT-H1-0000-00HE3	
		R4	130	142				
		R3	122	133				XPGDWT-U1-0000-00FE3
		R2	114	124				XPGDWT-U1-0000-00EE3
F4	4750K	S4	164	179	XPGDWT-01-0000-00LF4	XPGDWT-B1-0000-00LF4		
		S3	156	170	XPGDWT-01-0000-00KF4	XPGDWT-B1-0000-00KF4	XPGDWT-H1-0000-00KF4	
		S2	148	161	XPGDWT-01-0000-00JF4	XPGDWT-B1-0000-00JF4	XPGDWT-H1-0000-00JF4	
		R5	139	152		XPGDWT-B1-0000-00HF4	XPGDWT-H1-0000-00HF4	
		R4	130	142			XPGDWT-H1-0000-00GF4	
		R3	122	133				XPGDWT-U1-0000-00FF4
		R2	114	124				XPGDWT-U1-0000-00EF4

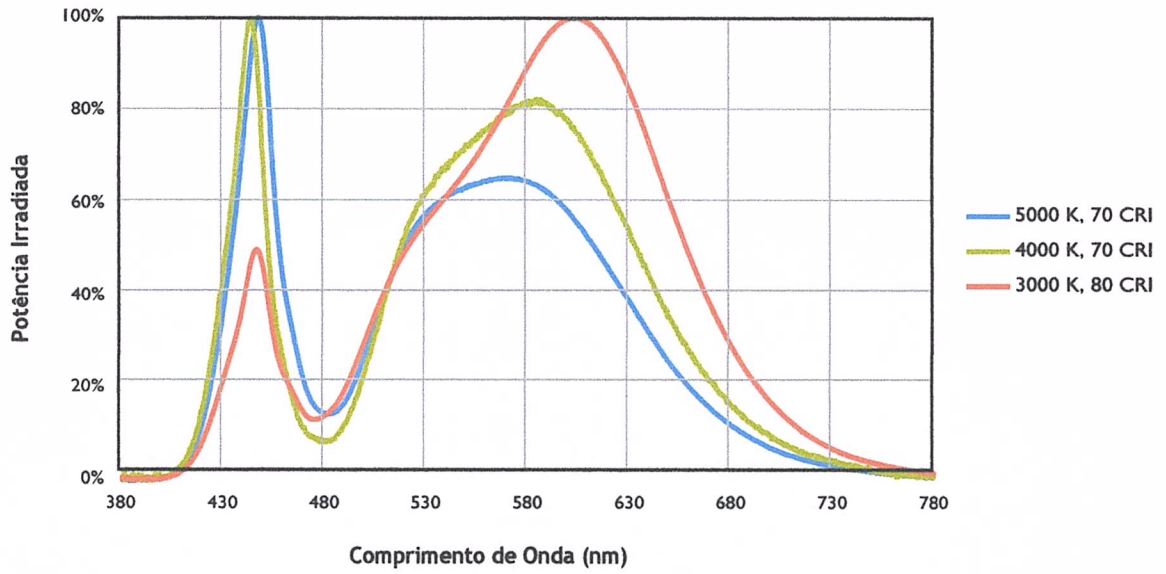
Notes

- A Cree considera uma tolerância de ±7% nas medidas de fluxo e potência, ±0.005 nas medidade de chromaticidade (CCx, CCy) e a tolerancia de ±2 em medidas de IRC.
- Os LEDs CREE XLamp XP-G3 LED são especificados apenas pelo fluxo minimo e não máximo.

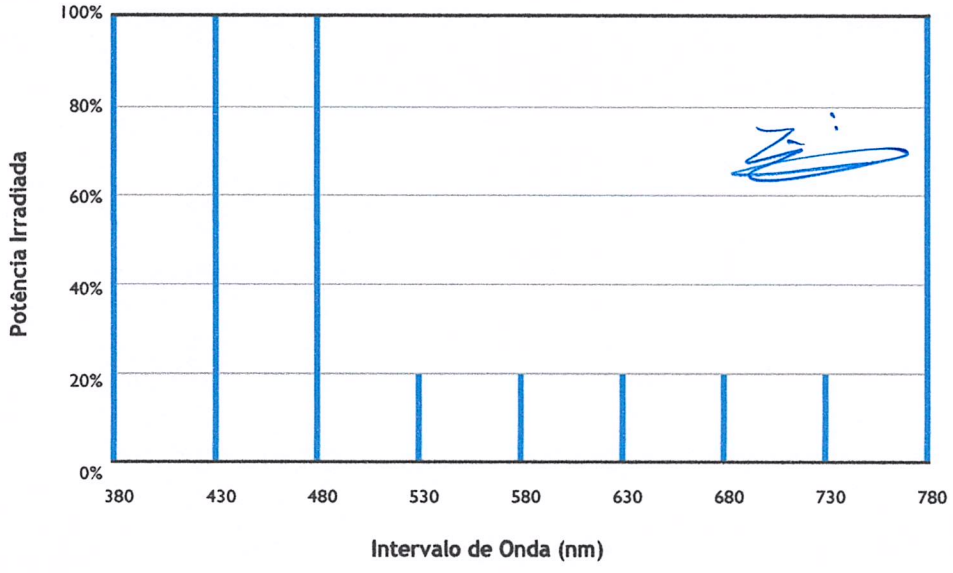
* Valores de Fluxo a 25 °C calculados apenas como referência.

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POTÊNCIA DE ESPECTRO RELATIVA - WhitE

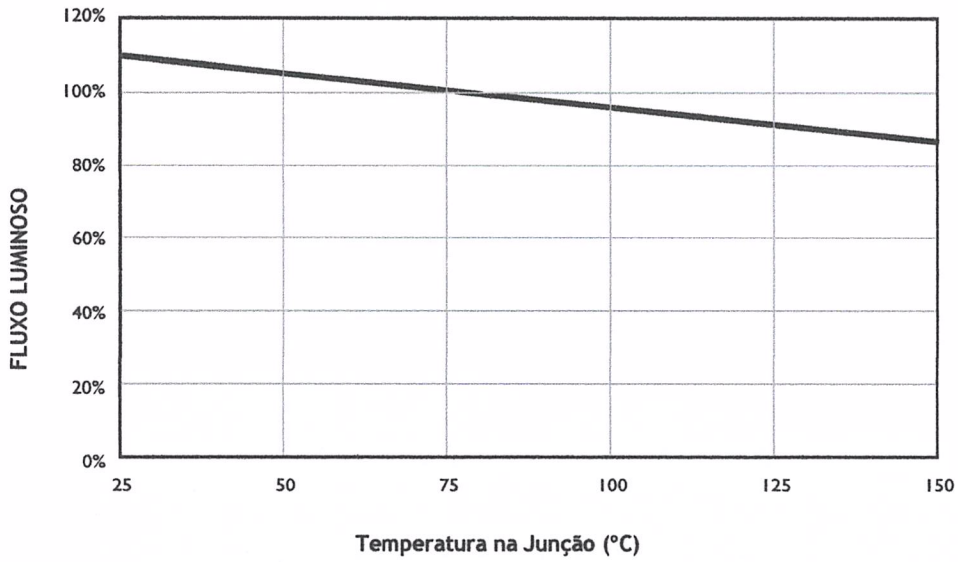


DISTRIBUIÇÃO DE POTÊNCIA DE ESPECTRO RELATIVA - RoyAL BLuE

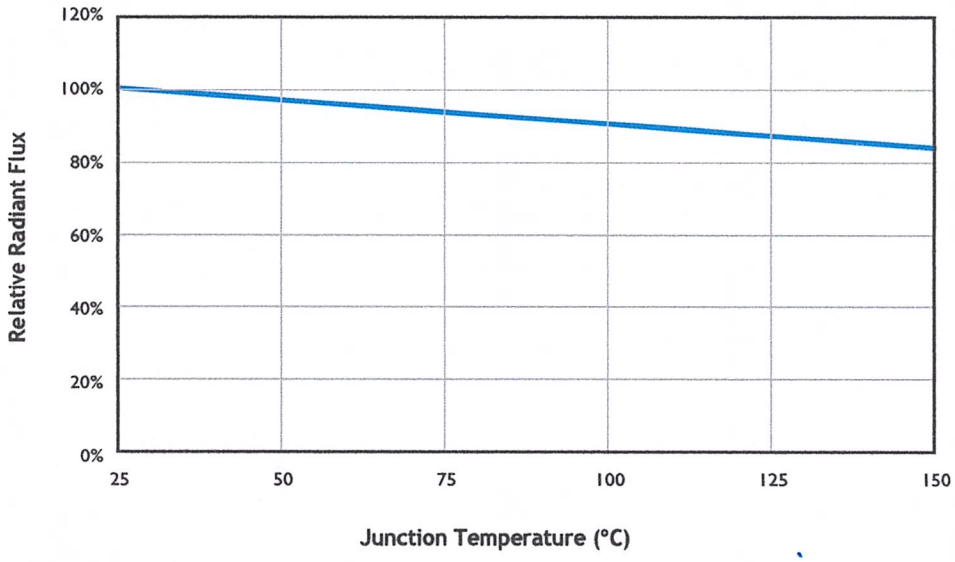


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TEMPERATURA RELATIVA FLUXO VS. JUNÇÃO - White (i_F = 350 mA)

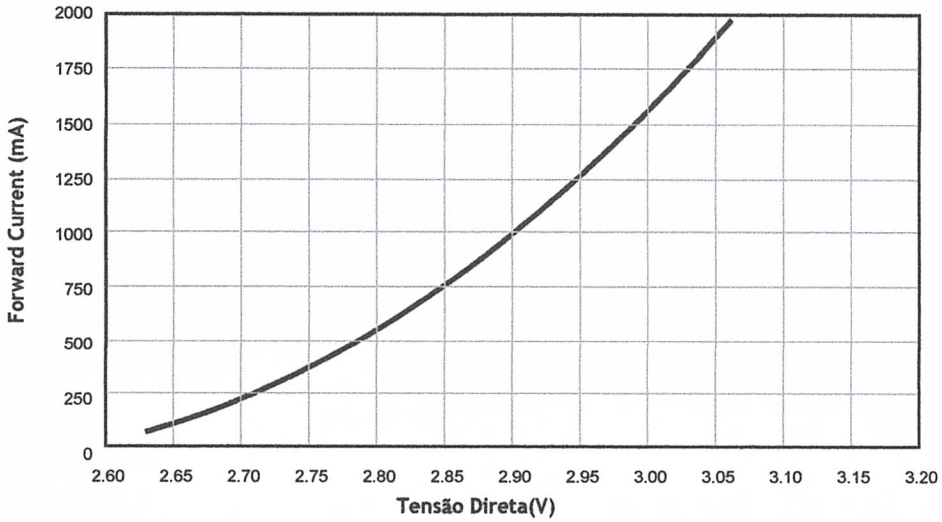


TEMPERATURA RELATIVA FLUXO VS. JUNÇÃO - Royal Blue (i_F = 350 mA)

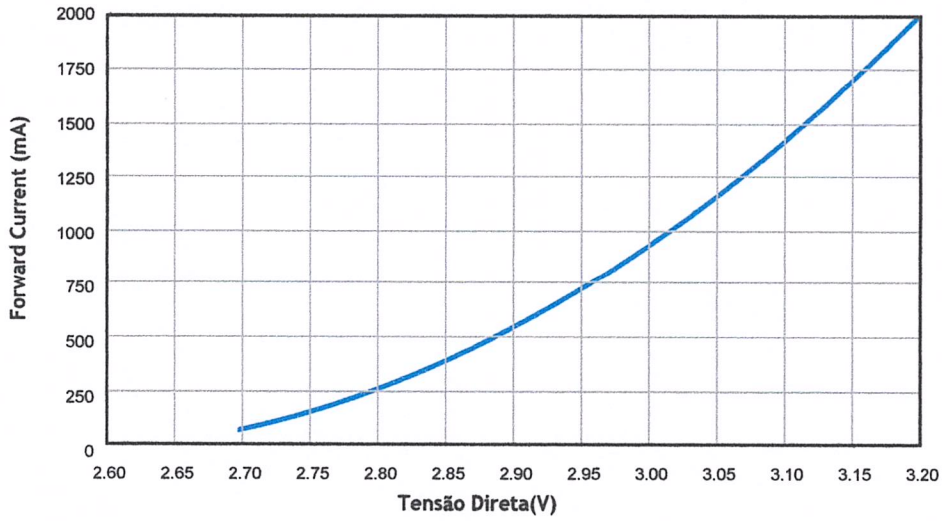


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CARACTERÍSTICAS ELÉTRICAS - White (t_j = 85 °C)



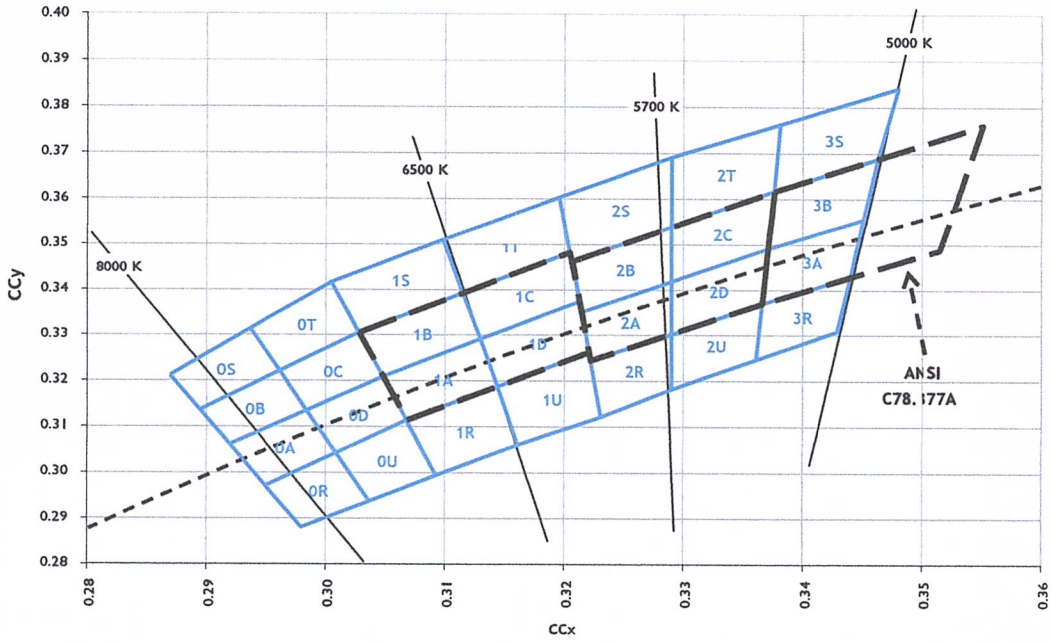
CARACTERÍSTICAS ELÉTRICAS - RoyAL BLuE (t_j = 25 °C)



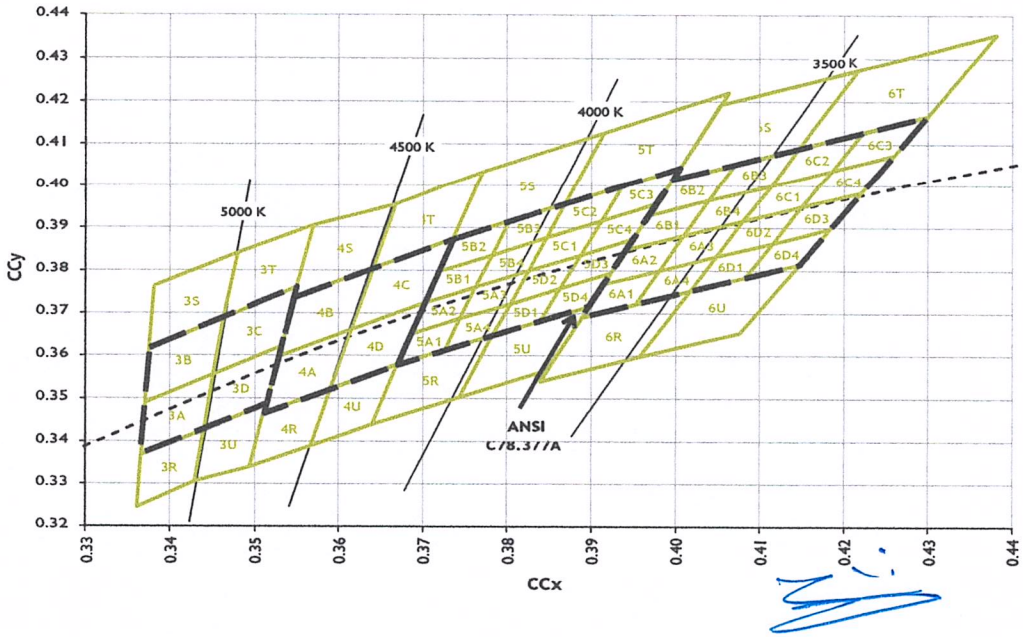
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PADRÃO DA CURVA CREE'S – PLOTADAS NA CURVA DO CIE 1931 CIE

ANSI Cool White



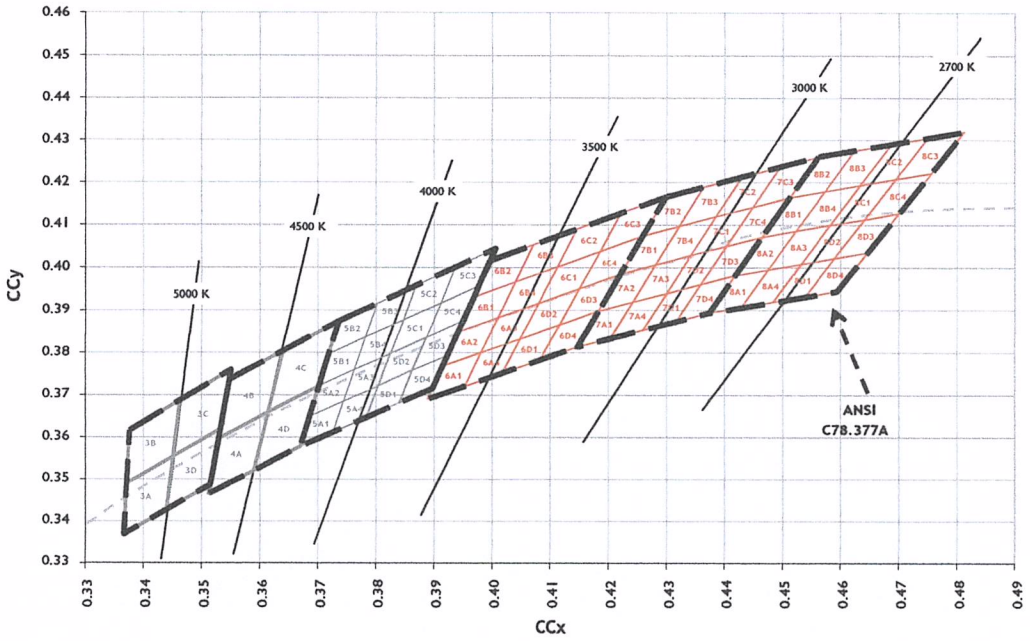
Neutral White



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PADRÃO DA CURVA CREE'S – PLOTADAS NA CURVA DO CIE 1931 CIE - CONTINUAÇÃO

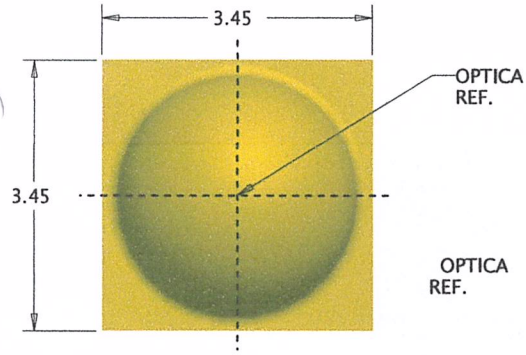
ANSI Branco Neutro White and ANSI Branco Quente



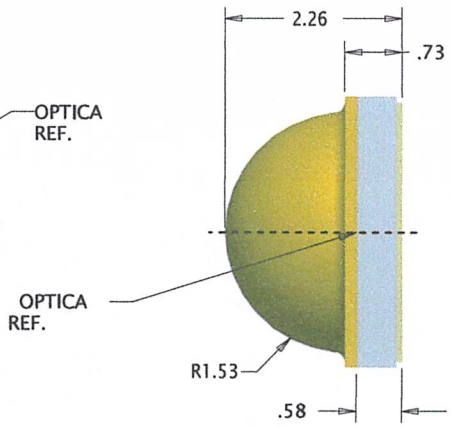
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DIMENSÕES MECÂNICAS (t_A = 25 °C)

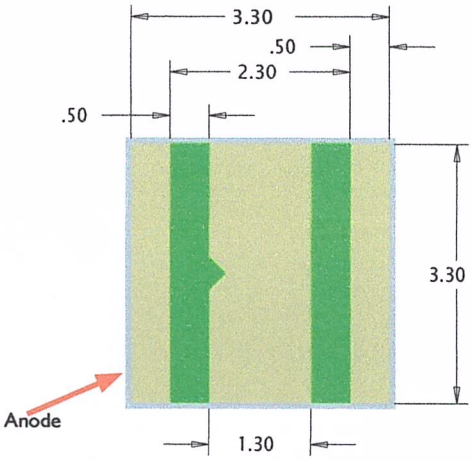
Todas as medidas variam ±.13 mm a menos que indicado.



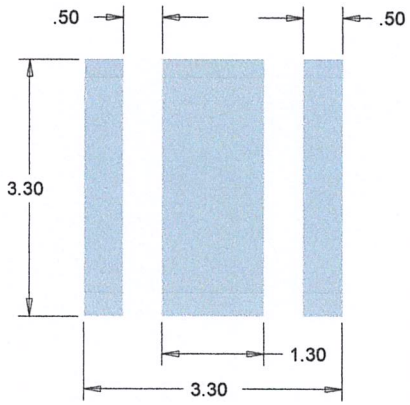
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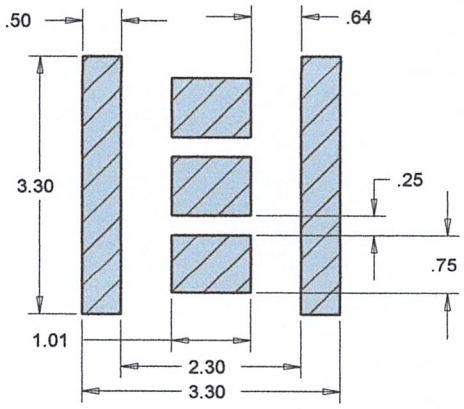
Lateral



Fundo



Recommendado Pad solda PCD



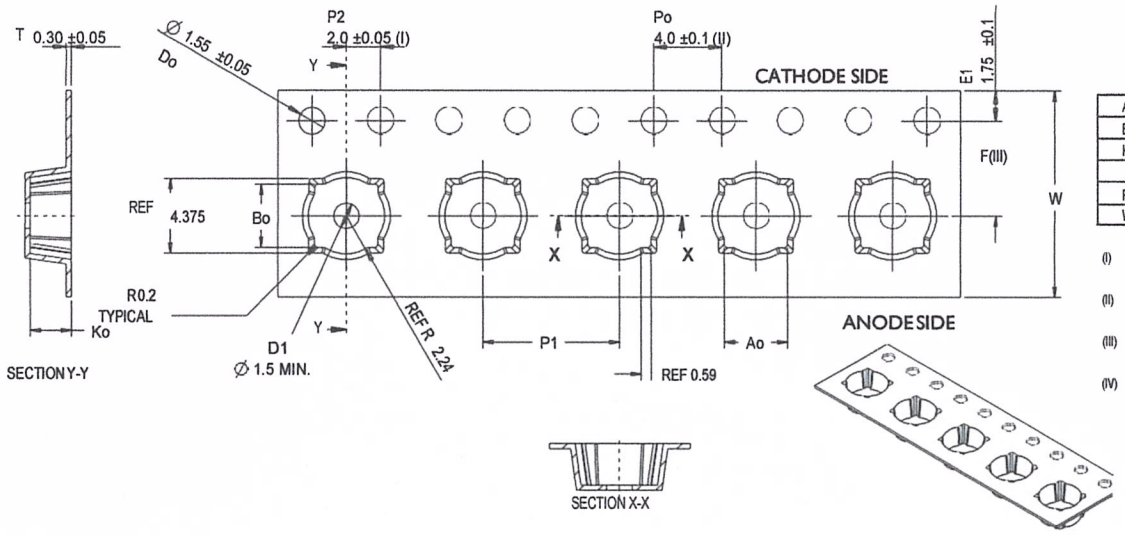
Stencil

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ROLO E CONTAIN ER

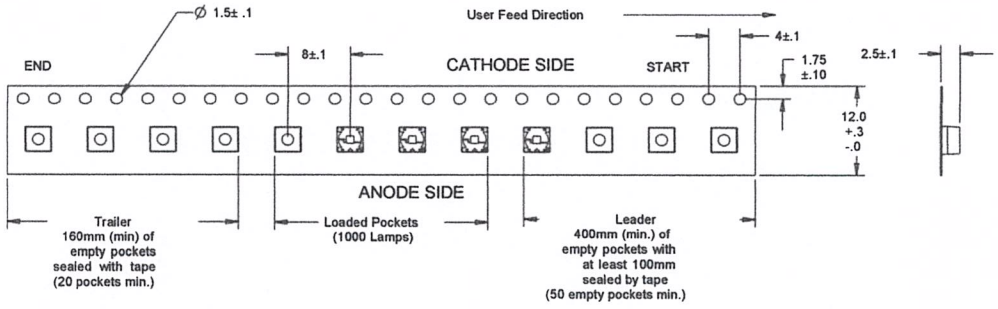
Padrão de embalagem.

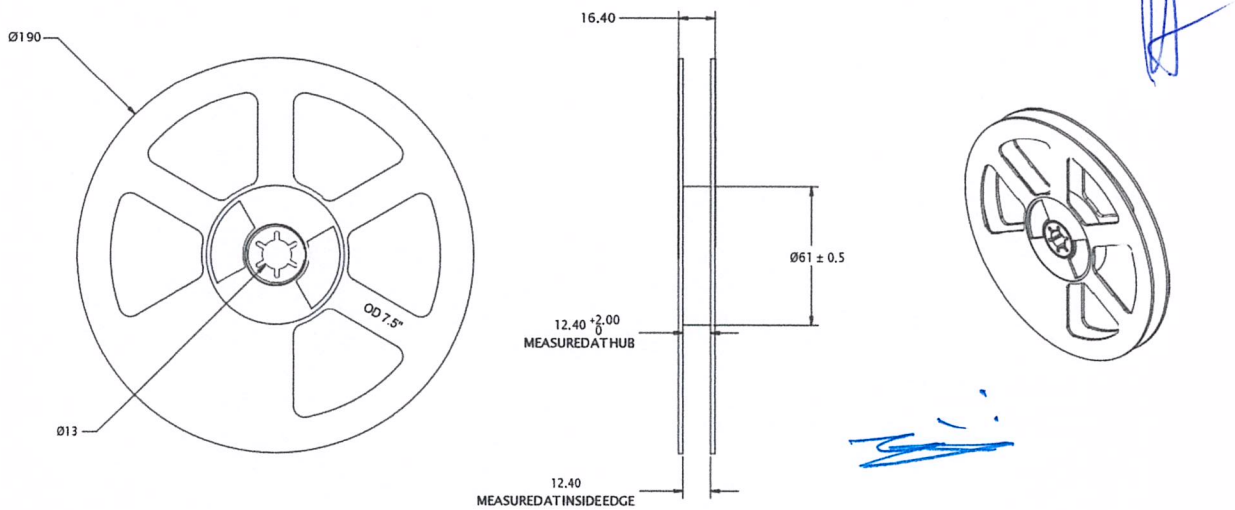
Dimensões em mm.



Ao	3.70	+/-0.1
Bo	3.70	+/-0.1
Ko	2.40	+0.0/-0.1
F	5.50	+/-0.05
P 1	8.00	+/-0.1
W	12.00	+0.3/-0.1

(I) Measured from centerline of sprocket hole to centerline of pocket.
(II) Cumulative tolerance of 10 sprocket holes is ± 0.20.
(III) Measured from centerline of sprocket hole to centerline of pocket.
(IV) Other material available.

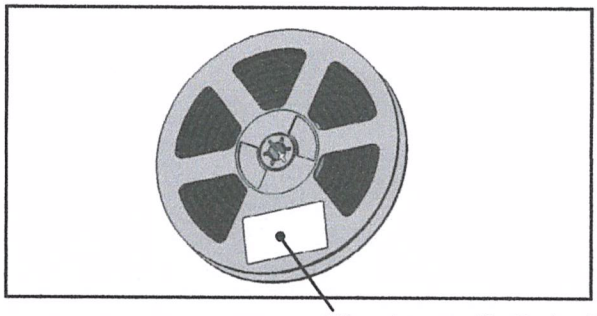




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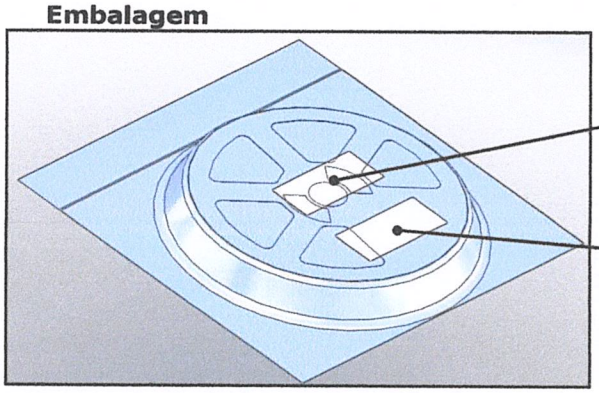
PACKAGinG

Rolo



Etiqueta com Bin Code Cree, Quantidade, #série

Embalagem



Etiqueta com Cree Order Code, Quantidade, Rolo ID, PO #

Etiqueta com Cree Bin Cod, Quantidade, Reel ID

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0263

Ensaios
NBR ISO/IEC
17025

CRL 0598

RELATÓRIO DE ENSAIOS DE LUMINÁRIA COM TECNOLOGIA LED PARA ILUMINAÇÃO PÚBLICA

TOP LAB 01 – 146/2018

Objetivo:

Realizar ensaios de avaliação em luminária com tecnologia LED para iluminação pública.

Proposta: 146_2018 (Rev. 00)

Data de emissão: 24/05/2018

Revisão: 01

Empresa: Pulse Sistemas Eletrônicos Ltda.

Produto: Luminária LED IP T29B-1-75

N.º de páginas: 29

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6.3. Potência, Fator de potência, Corrente de alimentação, Fluxo luminoso, Eficiência energética, Classe de eficiência energética, Índice de reprodução de cor e Temperatura de cor correlata;

6.4. Controle de distribuição luminosa;

6.5. Diagramas de distribuição da intensidade luminosa e cone de intensidade máxima;

6.6. Diagrama de isocandela;

6.7. Diagrama de isocandela streetlight;

6.8. Índice de reprodução de cores – IRC;

6.9. Temperatura de cor correlata – TCC.

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1. INTRODUÇÃO

Este relatório documenta os resultados dos ensaios realizados em uma amostra de uma (1) Luminária LED IP T29B-1-75 do tipo descrito no item 2.

1.1. DADOS DA EMPRESA

- Empresa: Pulse Sistemas Eletrônicos Ltda.
- Endereço: Av. Juscelino Kubitschek de Oliveira, 1964 - Cidade Industrial, Curitiba/ PR
- CEP: 81290-000
- CNPJ: 16 370.273/ 0001-68
- Responsável: Srs. Mário Cesar Sens/ Miguel A.Vallecilla
- Tel./Cel.: +55 41 3097 4452/ 4463 / 4471
- E-mail: mac@pulse-se.com.br / miguel.v@pulse-se.com.br

2. DESCRIÇÃO DA AMOSTRA ENSAIADA

2.1. INFORMAÇÕES DA AMOSTRA

TABELA 2.1.1

CARACTERÍSTICA	DESCRIÇÃO
Marca Comercial	PULSE
Descrição	Luminária LED IP T29B-1-75
Modelo	T29B-1-75-60
Potência Nominal	60 W
Tensão Nominal	110 ~ 277 V
Corrente Nominal	0,5 A
Frequência de Operação	50/ 60 Hz
Fator de Potência	0,98
Índice de Reprodução de Cor	>70
Temperatura de Cor Correlata	4000 K
IP Luminária	67
Reator/ Driver	Integrado à luminária
Quantidade de amostras	Uma (1) unidade

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2.2. FOTOS DA AMOSTRA



FOTO 01

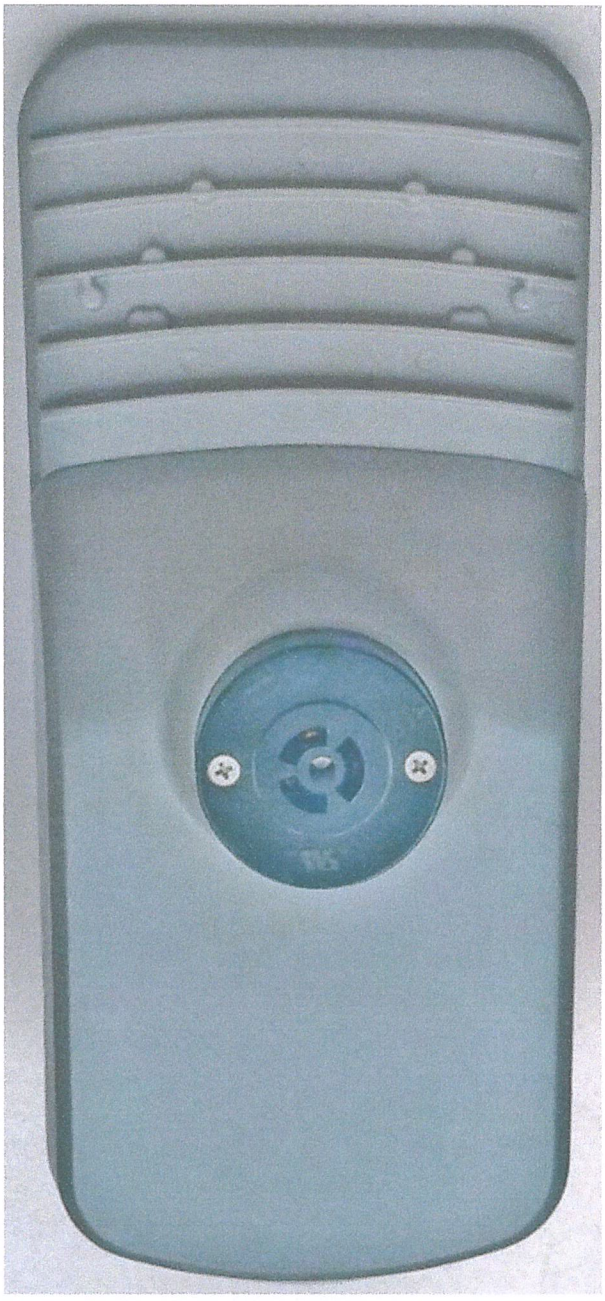


FOTO 02

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2.2. FOTOS DA AMOSTRA

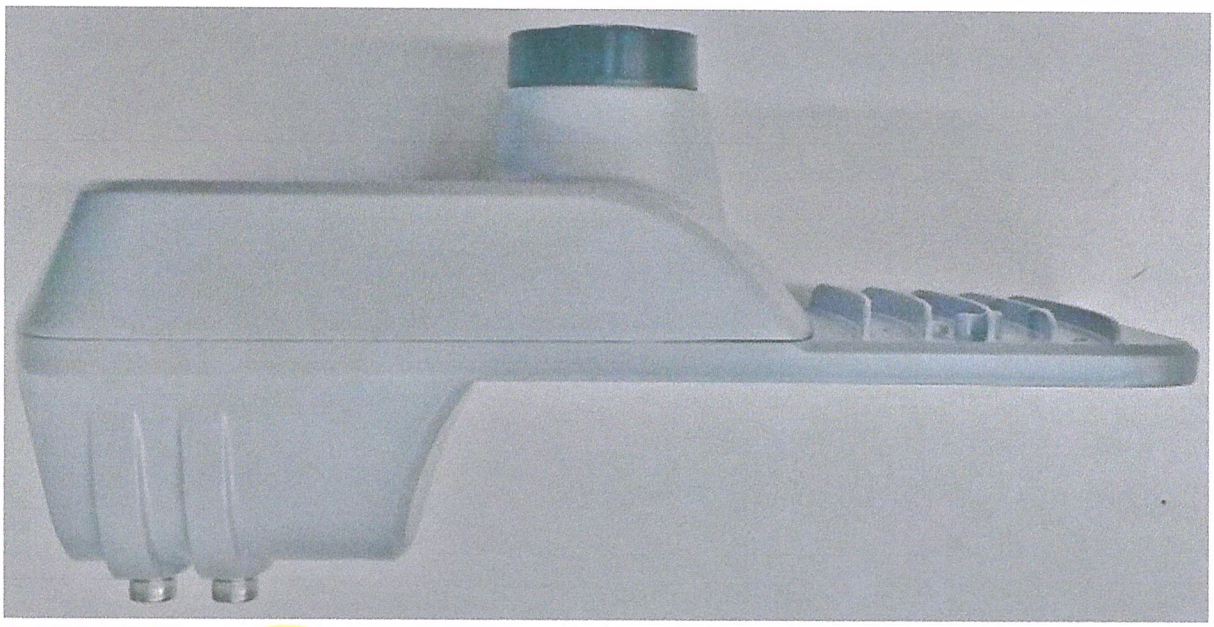


FOTO 03

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FOTO 04

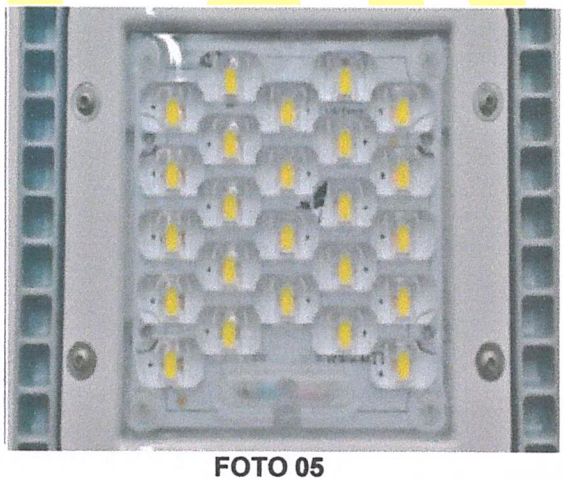


FOTO 05

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3. PROCEDIMENTOS DE ENSAIO

3.1 NORMAS E/ OU DOCUMENTOS DE REFERÊNCIA.

As seguintes normas são parcialmente ou totalmente usadas ou referenciadas para os testes:

- Portaria Inmetro n.º 20, de 15 de fevereiro de 2017 - Regulamento Técnico da Qualidade para Luminárias para Iluminação Pública Viária.
- Portaria Inmetro n.º 335, de 29 de agosto de 2011 - Aprovar as informações obrigatórias para os dispositivos elétricos de baixa tensão.
- Portaria Inmetro n.º 118, de 06 de março de 2015 - Requisitos Gerais de Certificação de Produtos - RGCP.
- Portaria Inmetro n.º 248, de 25 de maio de 2015 e substitutivas. - Aprova o Vocabulário Inmetro de Avaliação da Conformidade.
- ABNT IEC/TS 62504:2013 - Termos e definições para LED e os módulos de LED de iluminação geral.
- ABNT NBR 15129:2012 - Luminárias para Iluminação Pública – Requisitos particulares.
- ABNT NBR 5101:2012 - Iluminação pública.
- ABNT NBR 5461:1991 - Iluminação – Terminologia.
- ABNT NBR IEC 60598-1:2010 - Luminárias – Parte 1: Requisitos gerais e ensaios.
- ABNT NBR IEC 62031:2013 - Módulos de LED para iluminação em geral — Especificações de segurança.
- ANSI/NEMA/ANSLG C78.377/2015 - Specifications for the Chromaticity of Solid State Lighting Products.
- CIE 84:1989 - Measurement of Luminous Flux.
- IEC 60050-845:1987 - International Electro-tech nical Vocabulary, Lighting.
- IEC 62722-2-1:2014, Ed. 1.0 - Luminaire performance – Part 2-1: Particular requirements for LED luminaires.
- IESNA LM-79-08 - Electrical and Photometric Measurement of Solid State Lighting Products.

3.2 RELAÇÃO DOS ENSAIOS REALIZADOS.

- Características fotométricas (RTQ B.1);
- Classificação das distribuições de intensidade luminosas (RTQ B.2);
- Eficiência energética para luminárias com tecnologia LED (RTQ B.3);
- Índice de reprodução de cor – IRC (RTQ B.4);
- Temperatura de cor correlata – TCC (RTQ B.5);
- Controle da distribuição luminosa (RTQ B.6.1);
- Potência total do circuito (RTQ A.5.3);
- Fator de potência (RTQ A.5.4);
- Corrente de alimentação (RTQ A.5.5);
- Medição das curvas de distribuição da intensidade luminosa;
- Medição das coordenadas de intensidade máxima;
- Medição do fluxo luminoso;
- Medição das curvas de isocandela streetlight.

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3.3 EQUIPAMENTOS UTILIZADOS

- Goniofotômetro Everfine – modelo GO2000A - Próxima calibração Dezembro 2018.
- Fonte de tensão Everfine – modelo VPS 1030 - Próxima calibração Outubro 2018.
- Analisador de potência Everfine - modelo PF 2010A – Próxima calibração Setembro 2018.
- Espectro radiômetro Everfine - modelo HAAS – 2000 – Próxima calibração Dezembro 2018.
- Termo higrômetro – Barigo & Salcas – Próxima calibração Novembro 2018.

3.4 INCERTEZAS DAS MEDIÇÕES

- Características fotométricas (goniofotômetro): ± 3,2 %
- Características elétricas: ± 0,8 %
- Características de cor: ± 5,1 %.
- Características de temperatura: ± 1,5 %.

3.5. MÉTODOS DE ENSAIO

3.5.1 Condições ambientais.

Todos os ensaios fotométricos foram realizados a uma temperatura ambiente de (25 ± 1) °C e a uma umidade relativa de 65 % no máximo. Na realização dos ensaios fotométricos foi evitado o fluxo de ar, além daquele gerado pela própria luminária que ficou limitado à velocidade relativa a 0,2 m/ s. O fluxo de ar ao redor da amostra testada não afetou o seu desempenho.

3.5.2. Tensão de ensaio

A tensão de ensaio foi a tensão nominal de 220 V. A fonte de alimentação AC tem uma tensão com forma de onda senoidal, na frequê ncia prescrita de 60 Hz, de tal modo que a soma RMS das componentes harmónicas não excedeu a 3 % da fundamental durante a operação de teste. A tensão de ensaio ficou estável dentro de ± 0,5 % durante os períodos de estabilização da luminária e de ± 0,2 % no momento da medição.

3.5.3. Sazonagem e estabilização

As medições só foram iniciadas depois de transcorrido o tempo de estabilização. Conforme a IESNA LM-79-08, para o objetivo de avaliar novos produtos de LED, estes produtos devem ser ensaiados sem sazonagem. Antes da medição, a amostra foi estabilizada até que as variações da saída de luz e potência foram menores que 0,5% em intervalos de 30 minutos (3 leituras tomadas com 15 minutos de intervalo). (1)

3.5.4. Instrumentação elétrica

As incertezas de calibração dos instrumentos para tensão e corrente AC foram inferiores a 0,2 %. A incerteza de calibração do medidor de potência AC foi inferior a 0,5 % (95% de intervalo de confiança, k = 2).

3.5.5. Método de medição do fluxo luminoso total

O fluxo luminoso total foi medido por um goniofotômetro e o valor do fluxo luminoso total foi calculado automaticamente por software. (2)

3.5.6. Método de medição da distribuição da intensidade luminosa

A distribuição de intensidade luminosa foi medida por um goniofotômetro e os gráficos foram gerados automaticamente por software. (2)

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3.5.7. Método de medição da cor

A intensidade da radiação espectral foi medida por um gônio-espectro radiômetro e as características de cor (índice de reprodução de cores, temperatura de cor correlata, coordenadas cromáticas) foram calculadas automaticamente por software. (2) (3) (4)

Notas: (1) O tempo total de funcionamento antes da medição, incluindo o tempo de estabilização, foi de aproximadamente meia hora. O tempo de acendimento durante os ensaios foi cerca de 2 horas.

(2) O plano de referência da luminária foi localizado no centro do suporte da luminária do goniofotômetro, a uma distância de teste de 6,35 m dos detectores.

(3) O espectro radiômetro possui faixa espectral de 380 nm a 780 nm, resolução espectral de 2 nm e acurácia de ± 0,3 nm.

(4) Os métodos de teste para determinação das características de cor são realizados de acordo com a seção 12.0 - Test Methods for Color Characteristics of SSL Products da IESNA LM-79-08.

4. RESUMO DOS RESULTADOS DOS ENSAIOS.

4.1. ENSAIOS REFERENTES À EFICIÊNCIA ENERGÉTICA

TABELA 4.1.1

Item do RTQ	Descrição	Tensão	Parecer
A.5.3	Potência total do circuito	220 V	**Conforme**
A.5.4	Fator de Potência	220 V	**Conforme**
A.5.5	Corrente de alimentação	220 V	**Conforme**
B.2	Classificação das distribuições de intensidade	220 V	**Conforme**
B.3	Eficiência Energética	220 V	**Não Aplicável**
B.4	Índice de Reprodução de Cor – IRC	220 V	**Conforme**
B.5	Temperatura de Cor Correlata – TCC	220 V	**Conforme**
B.6.1	Controle da Distribuição Luminosa	220 V	**Conforme**
Anexo IV	Classes de Eficiência Energética Calculada	220 V	**A**

4.2. CARACTERÍSTICAS ELÉTRICAS

TABELA 4.2.1

GRANDEZA	RESULTADO
Tensão de Ensaio	220,1 V
Corrente	0,2966 A
Potência	62,33 W
Frequência	60,0 Hz
Fator de Potência	0,9759
Distorção Harmônica Total da Corrente	15,08 %
Distorção Harmônica Total da Tensão	0,21 %

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4.3. CARACTERÍSTICAS FOTOMÉTRICAS E COLORIMÉTRICAS

TABELA 4.3.1

GRANDEZA	RESULTADO
Fluxo Luminoso	8588 lm
Eficiência Luminosa	137,78 lm/ W
Intensidade Luminosa Máxima	5043 cd
Coordenadas Cromáticas (x, y) - Média	x=0,3663; y=0,3549
Coordenadas Cromáticas (u', v') - Média	u'=0,2245; v'=0,4895
Temperatura de Cor Correlata - Média	4260 K
Índice de Reprodução de Cor (Ra) - Médio	78,2
Coordenadas Cromáticas (x, y) – Centro Facho	x=0,3568; y=0,3402
Coordenadas Cromáticas (u', v') – Centro Facho	u'=0,2241; v'=0,4807
Temperatura de Cor Correlata – Centro Facho	4492 K
Índice de Reprodução de Cor (Ra) – Centro Facho	79,8
R9 (Centro do Facho)	7
Abertura de Facho Média (50% Imax)	119,9 °

5. REQUISITOS TÉCNICOS REFERENTES À EFICIÊNCIA ENERGÉTICA

5.1. CARACTERÍSTICAS FOTOMÉTRICAS (RTQ B.1)

A finalidade principal desse ensaio é a determinação da distribuição luminosa, que é obtida pela medição da intensidade luminosa em direções definidas por dois ângulos, normalmente chamados de horizontal e vertical (ou C e Gama, respectivamente). A partir da distribuição luminosa será avaliado o desempenho fotométrico da luminária em determinada instalação.

O ensaio para determinação da distribuição luminosa e do fluxo luminoso das luminárias deve ser feito obedecendo-se no mínimo os ângulos horizontais e verticais discriminados a seguir:

Ângulos horizontais: 0° - 5° - 10° - 15° - 20° - 25° - 30° - 35° - 40° - 45° - 50° - 55° - 60° - 65° - 70° - 75° - 80° - 85° - 90° - 95° - 100° - 105° - 110° - 115° - 120° - 125° - 130° - 135° - 140° - 145° - 150° - 155° - 160° - 165° - 170° - 175° - 180° - 185° - 190° - 195° - 200° - 205° - 210° - 215° - 220° - 225° - 230° - 235° - 240° - 245° - 250° - 255° - 260° - 265° - 270° - 275° - 280° - 285° - 290° - 295° - 300° - 305° - 310° - 315° - 320° - 325° - 330° - 335° - 340° - 345° - 350° - 355 °.

Ângulos verticais: 0° - 2,5° - 5° - 7,5° - 10° - 12,5° - 15° - 17,5° - 20° - 22,5° - 25° - 27,5° - 30° - 32,5° - 35° - 37,5° - 40° - 41° - 42° - 43° - 44° - 45° - 46° - 47° - 48° - 49° - 50° - 51° - 52° - 53° - 54° - 55° - 56° - 57° - 58° - 59° - 60° - 61° - 62° - 63° - 64° - 65° - 66° - 67° - 68° - 69° - 70° - 71° - 72° - 73° - 74° - 75° - 76° - 77° - 78° - 79° - 80° - 82,5° - 85° - 87,5° - 90° - 92,5° - 95° - 97,5° - 100° - 102,5° - 105° - 110° - 112,5° - 115° - 117,5° - 120°.

A montagem da luminária para a fotometria deve corresponder à montagem em suporte horizontal ou vertical, de acordo com o tipo da luminária. Adicionalmente, no caso de luminárias com regulagem de elevação, a fotometria deve ser feita na regulagem de ângulo indicada pelo fabricante, que constará obrigatoriamente no relatório de ensaio.

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5.2. CLASSIFICAÇÃO DAS DISTRIBUIÇÕES DE INTENSIDADE LUMINOSA (RTQ B.2)

As luminárias são classificáveis, com base na ABNT NBR 5101, quanto à distribuição transversal, à distribuição longitudinal e ao controle de distribuição, conforme a **Tabela 5.2.1.**

TABELA 5.2.1

Classificação das distribuições de intensidade luminosa conforme ABNT NBR 5101	
Distribuição transversal	Tipo I / II / III
Distribuição longitudinal	Curta /Média / Longa
Controle de distribuição de intensidade luminosa	Totalmente limitada/ Limitada

5.3. EFICIÊNCIA ENERGÉTICA PARA LUMINÁRIAS COM TECNOLOGIA LED (RTQ B.3)

A eficiência energética é a razão entre as grandezas medidas do fluxo luminoso da luminária (lm) e a potência total consumida (W). A medição deve ser realizada após o período de estabilização da luminária na tensão de ensaio.

As luminárias devem apresentar o valor mínimo aceitável medido (lm/ W) em relação ao nível de eficiência energética (lm/ W) da **Tabela 5.3.1** e a Eficiência Energética medida não pode ser inferior a 90% do valor de Eficiência Energética declarado.

Obs.: O método e condição de medição deverão seguir as recomendações da IES LM-79.

TABELA 5.3.1

Classificação das distribuições de intensidade luminosa conforme ABNT NBR 5101

Classes	Nível de Eficiência Energética (lm/W)	Valor mínimo aceitável medido (lm/W)
A	EE ≥ 100	98
B	90 ≤ EE < 100	88
C	80 ≤ EE < 90	78
D	70 ≤ EE < 80	68

5.4. ÍNDICE DE REPRODUÇÃO DE COR – IRC (RTQ B.4)

O Índice de reprodução de cor de uma fonte de luz é um conjunto de cálculos que fornece a medida do quanto as cores percebidas do objeto iluminado por esta fonte se aproximam daquelas do mesmo objeto iluminado por uma fonte padrão (iluminante de referência). A quantificação é dada pelo índice de reprodução de cor geral (Ra), que varia de 0 a 100. Somente para o caso das fontes de luz tipo luz do dia, o significado do Ra é uma medida do quanto a reprodução das cores por esta fonte se aproxima daquela pela luz natural. Quanto maior o valor de Ra, melhor a reprodução da cor.

As luminárias públicas com tecnologia LED deverão apresentar Ra ≥ 70.

5.5. TEMPERATURA DE COR CORRELATA – TCC (RTQ B.5)

A temperatura de cor correlata (TCC) é uma metodologia que descreve a aparência de cor de uma fonte de luz branca em comparação a um radiador planckiano.

O valor da temperatura de cor correlata deverá estar entre 2700 K e 6500 K, seguindo as variações estabelecidas na **Tabela 5.5.1** a seguir:

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TABELA 5.5.1

Temperatura de Cor Correlata		
Valor Mínimo (K)	**Valor Declarado (K)**	**Valor Máximo (K)**
2580	2700	2870
2870	3000	3220
3220	3500	3710
3710	4000	4260
4260	4500	4746
4746	5000	5312
5312	5700	6022
6022	6500	7042
TCC Flexível (2800 –5600K)	$TF^1 \pm \Delta T^2$	
1) TF deve ser escolhido em passos de 100 K (2800, 2900, ..., 6400 K), excluindo os valores nominais da TCC listados acima.		
2) ΔT deve ser calculado por $\Delta T = 1{,}1900 \times 10^{-8} \times T^3 - 1{,}5434 \times 10^{-4} \times T^2 + 0{,}7168 \times T - 902{,}55$		

5.6. CONTROLE DE DISTRIBUIÇÃO LUMINOSA (RTQ B.6.1)

O control e de distribuição luminosa é definido pela norma ABNT NBR 5101 e seus valores apresentados na **Tabela 5.6.1.**

TABELA 5.6.1

Controle de distribuição luminosa - CDL		
Tipo de luminária		**CDL(%) = (Cd x 100) / fluxo luminária**
Totalmente limitada	acima de 90°	0
	acima de 80°e até 90°	≤ 10
Limitada	acima de 90°	≤ 2,5
	acima de 80° e até 90°	≤ 10

5.7. POTÊNCIA TOTAL DO CIRCUITO (RTQ A.5.3)

Na tensão nominal, a potência total do circuito não deve ser superior a 110 % do valor declarado pelo fabricante.

5.8. FATOR DE POTÊNCIA (RTQ A.5.4)

O fator de potência medido não deverá ser inferior a 0,92. O fator de potência medido do circuito não deve ser inferior ao valor marcado por mais de 0,05, quando a luminária é alimentada com tensão e frequência nominais.

O fator de potência deverá ser medido sem a inclusão do filtro de linha do instrumento de medição. Filtros para eliminar ruídos de frequências elevadas deverão estar dentro do driver da luminária, para que ao alimentar a luminária a rede elétrica não sejam conduzidos ruídos de alta frequência para a rede.

5.9. CORRENTE DE ALIMENTAÇÃO (RTQ A.5.5)

Na tensão nominal, a corrente de alimentação não deve diferir em mais de 10 % do valor marcado no dispositivo de controle ou declarado na literatura do fabricante.

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6. RESULTADOS DOS ENSAIOS

6.1. CARACTERÍSTICAS FOTOMÉTRICAS (RTQ B.1)

TABELA 6.1.1

γ	C (graus)											
(graus)	0	5	10	15	20	25	30	35	40	45	50	55
0	1899,0	1899,0	1899,0	1899,0	1899,0	1899,0	1899,0	1899,0	1899,0	1899,0	1899,0	1899,0
2,5	1896,6	1898,5	1899,8	1901,7	1903,9	1906,1	1906,0	1910,6	1911,4	1912,5	1914,4	1915,5
5	1897,6	1900,9	1904,4	1908,2	1912,2	1916,6	1919,5	1923,9	1929,2	1932,7	1937,4	1940,1
7,5	1901,7	1907,1	1913,1	1919,4	1926,2	1932,7	1937,9	1947,6	1953,2	1958,9	1966,0	1971,4
10	1910,6	1918,0	1926,9	1935,6	1945,4	1954,3	1965,1	1974,1	1984,9	1993,7	2004,1	2011,3
12,5	1924,4	1934,5	1946,6	1958,1	1971,1	1984,1	1996,5	2011,4	2023,7	2035,7	2048,9	2058,3
15	1943,6	1957,2	1972,5	1987,8	2004,5	2021,3	2036,7	2055,4	2071,6	2084,7	2100,9	2112,7
17,5	1967,5	1984,8	2004,2	2023,7	2045,4	2065,4	2086,5	2109,3	2127,8	2144,6	2163,6	2178,2
20	1996,4	2017,9	2042,5	2066,3	2093,7	2121,8	2141,6	2169,9	2193,9	2214,9	2239,7	2260,7
22,5	2030,6	2056,9	2086,9	2116,9	2151,0	2180,9	2211,7	2242,8	2274,8	2301,4	2334,1	2359,3
25	2069,3	2100,9	2138,0	2175,8	2216,2	2253,7	2291,2	2330,3	2369,4	2405,2	2446,9	2473,8
27,5	2111,2	2150,5	2195,8	2241,8	2289,5	2336,4	2382,1	2429,8	2483,5	2522,9	2556,9	2574,1
30	2157,7	2205,6	2261,7	2316,7	2372,5	2426,4	2489,9	2552,0	2604,7	2633,4	2648,2	2642,1
32,5	2206,8	2267,2	2336,8	2400,4	2467,0	2534,1	2610,8	2672,3	2713,7	2720,4	2704,0	2666,5
35	2263,8	2339,2	2424,0	2498,9	2578,0	2661,9	2738,7	2789,8	2800,2	2770,9	2712,3	2645,1
37,5	2330,8	2425,5	2526,6	2614,1	2712,6	2802,1	2869,6	2883,2	2846,6	2769,7	2675,9	2590,5
40	2420,7	2538,3	2658,5	2759,2	2869,2	2953,3	2982,2	2941,1	2844,1	2729,7	2623,7	2532,3
41	2468,2	2596,2	2724,7	2831,3	2941,4	3013,8	3016,7	2947,8	2829,7	2711,3	2605,1	2498,3
42	2522,2	2662,0	2799,1	2912,2	3018,5	3072,6	3046,7	2947,8	2814,6	2695,6	2581,9	2451,2
43	2583,4	2734,3	2881,8	2999,9	3101,0	3134,2	3079,2	2947,3	2802,7	2681,5	2547,4	2387,9
44	2647,9	2810,3	2971,3	3092,2	3186,0	3189,6	3095,3	2938,8	2793,2	2663,2	2499,2	2309,7
45	2715,2	2891,7	3066,2	3186,9	3269,2	3242,9	3110,4	2937,5	2785,1	2635,2	2435,3	2214,9
46	2787,8	2979,6	3167,8	3285,1	3351,2	3288,1	3123,1	2939,1	2771,0	2591,6	2352,2	2103,1
47	2866,2	3077,4	3277,2	3387,9	3431,0	3329,3	3134,4	2936,9	2751,8	2531,6	2252,8	1983,7
48	2951,7	3184,3	3392,9	3493,5	3505,7	3366,1	3150,0	2939,4	2721,0	2455,8	2141,2	1862,2
49	3044,1	3300,4	3513,7	3602,3	3578,4	3402,1	3168,5	2942,3	2678,6	2366,3	2022,4	1740,2
50	3142,2	3425,2	3639,6	3710,7	3647,9	3443,1	3196,7	2936,1	2623,3	2264,6	1900,8	1625,4
51	3249,0	3560,5	3772,1	3820,4	3717,3	3483,5	3224,0	2922,1	2551,9	2153,4	1784,6	1518,4
52	3366,5	3704,5	3912,6	3930,0	3783,9	3532,0	3242,3	2898,1	2467,6	2037,6	1674,9	1404,5
53	3489,9	3854,5	4056,1	4036,4	3852,9	3586,1	3253,6	2851,4	2371,4	1924,9	1564,7	1272,9
54	3618,4	4009,8	4198,8	4135,8	3921,5	3638,2	3256,4	2788,6	2265,7	1813,9	1441,2	1124,0
55	3748,3	4161,9	4332,1	4224,2	3988,4	3684,7	3238,1	2714,6	2157,7	1701,0	1295,4	965,12
56	3882,0	4311,1	4456,2	4304,7	4058,5	3718,3	3198,7	2629,3	2050,5	1572,4	1128,4	817,65
57	4004,7	4447,9	4559,1	4376,6	4128,9	3726,9	3145,6	2536,7	1938,6	1422,0	958,05	691,95
58	4119,0	4566,9	4640,7	4440,7	4196,5	3715,5	3066,3	2438,7	1812,8	1246,3	802,34	585,58
59	4232,7	4685,3	4709,2	4503,7	4248,3	3673,3	2981,5	2333,0	1660,2	1060,1	670,82	490,87

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TABELA 6.1.2

γ	C (graus)											
(graus)	60	65	70	75	80	85	90	95	100	105	110	115
0	1899,0	1899,0	1899,0	1899,0	1899,0	1899,0	1899,0	1899,0	1899,0	1899,0	1899,0	1899,0
2,5	1917,4	1918,8	1919,5	1920,5	1921,7	1922,0	1922,5	1922,5	1922,8	1921,7	1922,3	1921,1
5	1944,0	1946,5	1949,4	1951,3	1953,6	1954,3	1955,2	1955,3	1955,5	1954,4	1954,2	1951,6
7,5	1977,4	1982,0	1987,5	1990,3	1994,3	1995,6	1997,3	1997,0	1997,3	1995,1	1994,4	1991,0
10	2020,2	2027,0	2033,8	2038,4	2044,0	2045,9	2047,6	2048,0	2048,1	2045,5	2044,2	2039,6
12,5	2069,1	2077,4	2085,9	2091,6	2098,0	2100,9	2104,2	2103,7	2104,2	2100,6	2099,7	2093,5
15	2126,2	2136,3	2148,1	2154,8	2164,3	2167,5	2172,0	2171,3	2171,6	2167,3	2165,4	2157,8
17,5	2196,4	2208,9	2224,0	2233,9	2246,4	2251,2	2256,9	2256,1	2255,8	2249,3	2246,0	2235,8
20	2283,0	2300,8	2320,9	2334,0	2349,5	2356,1	2363,5	2362,2	2361,9	2353,1	2347,9	2333,8
22,5	2389,8	2410,3	2430,8	2442,8	2457,6	2464,0	2470,3	2470,8	2471,5	2466,0	2462,8	2449,6
25	2498,2	2513,1	2524,9	2530,7	2537,9	2542,1	2545,9	2548,4	2552,7	2555,1	2559,1	2555,9
27,5	2583,0	2582,1	2577,9	2571,8	2567,8	2568,4	2568,9	2573,4	2580,8	2594,5	2610,8	2625,1
30	2625,9	2603,8	2579,1	2559,9	2543,7	2538,5	2534,8	2543,0	2554,8	2579,2	2608,3	2642,5
32,5	2621,4	2578,1	2538,2	2509,7	2487,5	2480,7	2476,3	2483,7	2496,2	2526,8	2563,6	2613,0
35	2576,7	2522,1	2474,6	2442,1	2416,4	2407,1	2400,1	2409,3	2424,1	2459,4	2499,6	2554,0
37,5	2515,5	2453,9	2388,7	2337,7	2291,1	2271,1	2255,9	2271,6	2294,6	2348,8	2409,4	2484,1
40	2428,9	2328,0	2222,4	2141,7	2067,7	2036,9	2013,0	2032,7	2064,1	2139,9	2225,3	2343,1
41	2370,7	2250,0	2124,8	2034,9	1952,4	1919,9	1893,4	1915,1	1946,2	2028,9	2121,7	2256,4
42	2297,4	2154,6	2013,6	1916,8	1831,4	1793,9	1771,4	1790,7	1823,1	1907,6	2004,8	2152,3
43	2206,3	2045,4	1893,3	1791,8	1708,1	1669,8	1647,7	1664,6	1698,6	1779,0	1880,1	2035,0
44	2099,8	1926,8	1771,1	1667,0	1586,4	1551,0	1530,0	1546,4	1578,2	1653,9	1754,7	1910,8
45	1983,8	1804,1	1650,2	1550,7	1476,6	1443,4	1424,0	1439,0	1468,3	1537,3	1633,3	1782,6
46	1860,6	1678,1	1533,8	1441,4	1372,1	1340,6	1321,9	1335,9	1362,7	1428,2	1517,1	1657,4
47	1737,8	1563,7	1427,2	1338,3	1269,2	1238,3	1217,0	1231,8	1256,9	1322,1	1409,4	1542,9
48	1623,4	1459,9	1324,3	1233,2	1161,0	1129,1	1105,6	1119,9	1144,6	1210,6	1299,5	1434,5
49	1516,3	1355,0	1211,6	1116,9	1044,9	1013,3	990,05	1003,2	1025,1	1088,5	1177,4	1318,6
50	1410,2	1238,7	1088,2	994,14	928,08	901,01	879,46	890,82	906,14	959,93	1045,3	1189,7
51	1291,8	1108,8	957,91	874,92	821,98	801,28	784,20	789,13	799,10	839,14	910,14	1048,6
52	1157,4	970,19	834,44	772,08	730,83	712,98	695,70	701,69	708,99	738,60	789,85	906,71
53	1009,7	838,23	736,69	683,05	645,33	634,35	618,74	622,81	625,05	653,69	691,55	778,85
54	866,23	726,35	646,67	602,53	567,26	557,97	543,17	545,43	545,84	574,20	609,21	673,68
55	747,74	633,35	563,79	518,92	485,85	477,25	462,79	463,70	463,42	490,33	527,88	585,34
56	638,69	545,50	479,31	433,14	405,23	396,06	382,54	383,76	384,11	407,03	445,94	500,55
57	546,83	462,20	398,49	361,39	343,29	336,50	326,96	328,53	328,97	341,33	372,22	422,18
58	460,18	387,58	337,80	316,08	303,27	297,71	287,49	292,24	291,53	302,35	321,67	358,98
59	387,41	337,26	300,09	283,58	271,69	267,26	261,82	264,73	265,74	275,69	287,71	315,30

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TABELA 6.1.3

γ	C (graus)											
(graus)	120	125	130	135	140	145	150	155	160	165	170	175
0	1899,0	1899,0	1899,0	1899,0	1899,0	1899,0	1899,0	1899,0	1899,0	1899,0	1899,0	1899,0
2,5	1920,7	1919,3	1918,7	1917,4	1916,3	1914,4	1913,1	1911,5	1909,9	1908,0	1906,6	1904,4
5	1950,3	1947,5	1945,5	1942,1	1938,9	1934,8	1931,8	1928,0	1924,7	1920,1	1917,1	1913,4
7,5	1988,4	1983,8	1980,1	1974,4	1969,4	1962,9	1957,9	1951,3	1945,2	1938,0	1933,1	1926,7
10	2035,5	2028,9	2023,1	2015,1	2008,1	1998,5	1991,0	1981,1	1972,8	1962,7	1954,7	1945,9
12,5	2089,0	2081,3	2075,0	2065,5	2056,2	2043,0	2032,1	2018,8	2006,9	1993,7	1982,4	1970,1
15	2152,4	2142,4	2134,8	2122,4	2110,9	2095,0	2081,6	2064,1	2048,6	2030,5	2016,3	1999,7
17,5	2227,4	2214,7	2205,0	2188,8	2174,8	2155,9	2139,4	2117,5	2097,9	2075,1	2056,4	2035,5
20	2321,7	2303,6	2288,0	2267,3	2249,4	2226,5	2206,6	2181,2	2156,3	2127,9	2103,1	2076,7
22,5	2437,0	2412,2	2390,1	2361,7	2338,4	2309,6	2284,3	2252,3	2222,6	2187,4	2155,4	2123,8
25	2550,3	2533,1	2513,0	2478,8	2445,0	2405,9	2372,3	2333,0	2297,1	2254,7	2215,4	2176,2
27,5	2636,5	2637,5	2630,4	2605,8	2572,1	2519,0	2473,6	2423,9	2380,3	2331,3	2284,5	2233,5
30	2676,0	2705,8	2724,9	2721,9	2699,0	2650,9	2593,9	2529,3	2477,4	2419,5	2362,8	2300,0
32,5	2665,1	2723,7	2775,9	2808,5	2813,6	2781,8	2730,3	2655,0	2590,1	2522,3	2455,4	2377,8
35	2616,1	2694,1	2773,4	2847,2	2897,3	2903,3	2873,9	2801,6	2720,8	2637,1	2560,3	2467,0
37,5	2556,2	2637,6	2728,6	2835,7	2932,5	2998,7	3010,8	2959,6	2883,4	2784,3	2697,6	2586,2
40	2456,9	2576,8	2681,3	2792,1	2919,3	3045,2	3131,5	3136,0	3082,8	2984,7	2880,6	2747,4
41	2389,5	2535,9	2660,5	2778,0	2907,0	3053,0	3170,2	3206,7	3171,6	3076,1	2965,0	2822,6
42	2306,2	2480,3	2631,0	2766,5	2897,7	3056,5	3203,2	3277,7	3262,6	3172,0	3056,8	2903,4
43	2204,9	2406,6	2589,7	2752,1	2892,3	3057,3	3232,1	3342,0	3353,4	3271,7	3157,4	2990,8
44	2088,6	2316,6	2530,2	2727,0	2888,0	3059,5	3255,9	3401,6	3446,7	3375,9	3263,8	3084,5
45	1964,8	2206,8	2452,3	2688,0	2879,9	3063,6	3273,7	3453,2	3534,4	3482,5	3374,5	3183,7
46	1835,2	2084,5	2352,8	2631,6	2861,9	3069,5	3288,1	3498,8	3618,9	3592,5	3493,2	3293,0
47	1711,0	1956,3	2239,9	2559,9	2835,2	3076,3	3306,3	3539,7	3698,2	3704,2	3615,4	3411,8
48	1595,6	1829,8	2118,3	2473,3	2798,0	3081,1	3331,1	3577,9	3772,2	3815,9	3744,2	3537,9
49	1484,8	1704,1	1991,7	2370,8	2744,9	3078,0	3358,5	3619,6	3847,4	3931,0	3879,5	3674,3
50	1365,8	1590,6	1868,8	2258,9	2674,6	3062,4	3384,9	3664,9	3919,4	4045,2	4018,2	3817,7
51	1231,1	1472,4	1752,8	2138,5	2588,4	3032,3	3405,0	3716,6	3989,3	4154,9	4160,3	3966,4
52	1080,5	1340,1	1636,9	2019,1	2489,3	2983,9	3414,1	3768,9	4052,8	4253,6	4300,2	4118,4
53	927,39	1188,4	1507,1	1902,7	2379,1	2917,9	3407,0	3814,1	4113,8	4340,0	4433,3	4266,7
54	785,73	1021,2	1355,2	1776,1	2263,7	2840,7	3382,9	3846,4	4173,2	4417,4	4550,5	4403,7
55	675,55	864,23	1184,8	1642,8	2148,3	2752,4	3336,5	3862,7	4234,0	4482,9	4645,6	4529,9
56	578,46	727,53	1006,1	1483,3	2026,8	2651,4	3267,3	3856,3	4293,8	4539,8	4724,4	4646,1
57	492,00	612,24	840,98	1301,3	1889,6	2540,7	3177,9	3819,9	4340,0	4593,4	4787,6	4753,2
58	415,62	514,62	701,38	1108,3	1723,0	2417,9	3068,3	3753,5	4367,8	4644,9	4841,4	4860,4
59	360,46	433,53	570,60	925,13	1524,8	2276,7	2947,3	3661,3	4363,8	4697,8	4874,6	4956,7

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TABELA 6.1.4

γ	C (graus)											
(graus)	180	185	190	195	200	205	210	215	220	225	230	235
0	1899,0	1899,0	1899,0	1899,0	1899,0	1899,0	1899,0	1899,0	1899,0	1899,0	1899,0	1899,0
2,5	1903,3	1901,5	1899,6	1898,2	1896,6	1896,3	1892,0	1894,1	1890,9	1889,6	1889,0	1887,9
5	1910,1	1906,9	1903,1	1900,3	1896,9	1893,4	1890,4	1889,0	1886,9	1884,6	1882,8	1880,9
7,5	1921,2	1916,0	1910,7	1906,3	1901,5	1898,2	1891,2	1889,7	1885,8	1882,5	1879,8	1876,8
10	1938,2	1930,9	1923,2	1917,0	1910,7	1904,6	1894,7	1893,6	1887,4	1881,9	1877,1	1873,3
12,5	1959,0	1949,6	1940,0	1931,9	1923,2	1915,2	1905,8	1897,8	1891,5	1884,4	1876,6	1870,0
15	1985,6	1973,2	1960,5	1950,5	1939,1	1929,8	1916,1	1906,5	1896,4	1886,5	1875,2	1866,0
17,5	2017,6	2001,6	1985,7	1972,7	1958,6	1946,7	1928,1	1919,2	1903,1	1889,0	1875,0	1861,6
20	2054,6	2034,6	2015,3	1999,8	1982,4	1966,0	1945,6	1929,7	1909,6	1891,7	1873,1	1855,7
22,5	2096,1	2070,7	2048,2	2030,2	2009,2	1989,5	1963,2	1944,4	1918,8	1894,4	1870,4	1846,5
25	2142,3	2110,6	2084,1	2064,2	2038,9	2014,5	1986,2	1959,6	1928,0	1896,0	1865,2	1835,6
27,5	2192,0	2153,1	2122,5	2098,8	2069,4	2041,3	2006,5	1974,1	1935,0	1896,8	1859,0	1823,6
30	2246,8	2198,9	2163,5	2135,7	2102,9	2070,5	2028,4	1987,2	1941,3	1895,5	1851,9	1810,3
32,5	2310,3	2252,3	2209,1	2176,2	2139,1	2102,2	2050,1	2001,8	1947,2	1892,8	1843,0	1799,2
35	2381,1	2313,0	2261,2	2223,6	2181,6	2132,4	2071,9	2014,2	1949,7	1890,3	1834,6	1784,9
37,5	2476,6	2389,4	2322,7	2276,4	2225,5	2165,6	2094,1	2023,9	1949,4	1882,3	1817,1	1757,4
40	2611,3	2497,9	2409,5	2344,9	2274,8	2198,5	2112,9	2029,6	1943,6	1861,3	1783,4	1712,8
41	2675,8	2552,1	2452,3	2379,2	2298,1	2212,9	2117,5	2031,8	1937,7	1848,0	1763,9	1688,9
42	2745,6	2609,6	2501,0	2417,5	2324,7	2226,5	2124,2	2031,3	1929,2	1832,3	1741,0	1660,2
43	2818,5	2670,7	2553,0	2458,8	2353,3	2246,8	2129,0	2025,6	1918,1	1812,8	1713,6	1628,8
44	2897,1	2735,2	2606,5	2502,8	2384,5	2256,6	2131,0	2018,1	1901,9	1787,6	1681,3	1592,8
45	2979,4	2801,6	2661,3	2548,2	2416,1	2273,4	2132,3	2003,0	1880,6	1755,4	1645,3	1553,3
46	3066,5	2872,5	2717,1	2593,9	2447,5	2289,5	2130,7	1987,9	1851,5	1718,8	1605,6	1513,1
47	3163,4	2948,7	2778,4	2641,4	2479,3	2305,6	2128,7	1966,5	1818,3	1676,6	1563,4	1470,9
48	3266,8	3031,4	2843,4	2690,6	2510,1	2315,9	2121,8	1939,3	1777,3	1631,5	1519,3	1427,4
49	3379,0	3119,0	2911,3	2740,0	2537,4	2322,9	2107,6	1909,3	1731,9	1585,8	1473,0	1382,6
50	3497,5	3210,5	2982,1	2788,0	2561,8	2324,0	2090,5	1873,2	1686,0	1537,0	1424,2	1332,5
51	3620,9	3302,8	3050,7	2833,6	2581,5	2319,5	2064,6	1830,7	1636,5	1484,5	1370,1	1274,0
52	3748,4	3393,7	3115,9	2874,1	2596,0	2308,2	2033,2	1785,0	1582,9	1427,1	1308,3	1208,8
53	3879,5	3481,7	3174,6	2905,9	2601,6	2290,4	1996,2	1730,8	1524,4	1362,6	1237,5	1135,9
54	4007,8	3568,2	3228,0	2930,1	2598,1	2262,7	1948,5	1669,9	1458,1	1287,8	1158,5	1051,7
55	4129,6	3649,3	3276,4	2946,0	2585,2	2224,1	1890,9	1605,1	1384,8	1204,3	1074,4	954,62
56	4239,9	3722,1	3319,2	2955,0	2562,4	2177,7	1824,9	1533,4	1304,1	1115,6	984,58	851,29
57	4347,2	3788,2	3356,2	2956,2	2528,7	2116,3	1746,9	1454,0	1214,3	1023,4	887,85	749,86
58	4457,0	3854,4	3384,4	2950,0	2487,5	2046,2	1668,9	1366,9	1121,0	931,93	790,99	649,35
59	4561,9	3919,3	3403,8	2928,8	2432,5	1963,3	1586,0	1273,6	1024,1	840,22	696,99	557,14

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TABELA 6.1.5

γ	C (graus)											
(graus)	240	245	250	255	260	265	270	275	280	285	290	295
0	1899,0	1899,0	1899,0	1899,0	1899,0	1899,0	1899,0	1899,0	1899,0	1899,0	1899,0	1899,0
2,5	1886,9	1886,6	1885,5	1885,2	1885,2	1884,8	1883,8	1884,0	1883,5	1883,6	1883,8	1883,9
5	1879,3	1877,9	1876,6	1875,5	1874,9	1874,2	1873,5	1873,4	1872,7	1872,5	1873,0	1873,0
7,5	1873,7	1871,9	1869,6	1867,9	1866,8	1865,9	1864,4	1864,3	1863,8	1863,5	1864,3	1864,3
10	1869,1	1866,0	1862,8	1860,1	1858,4	1856,9	1854,9	1854,8	1854,3	1854,3	1855,7	1856,5
12,5	1863,4	1858,4	1853,9	1850,0	1847,6	1845,6	1843,8	1843,2	1842,9	1843,8	1845,7	1847,5
15	1856,6	1849,2	1842,2	1836,9	1833,4	1830,8	1828,8	1828,3	1828,7	1830,0	1833,5	1836,7
17,5	1849,0	1837,6	1828,1	1820,0	1815,1	1810,9	1809,1	1808,3	1809,9	1811,6	1817,0	1822,6
20	1838,2	1823,0	1810,0	1798,7	1792,4	1786,9	1786,1	1783,9	1787,5	1789,6	1797,7	1805,8
22,5	1824,9	1804,6	1789,7	1775,1	1763,0	1759,5	1753,5	1755,9	1756,1	1764,2	1773,4	1787,5
25	1808,7	1785,2	1762,6	1748,6	1734,8	1729,8	1723,5	1726,2	1727,6	1737,6	1748,4	1767,5
27,5	1791,1	1762,5	1737,1	1721,3	1706,5	1700,8	1695,0	1698,0	1699,8	1711,3	1724,3	1746,6
30	1773,1	1744,0	1716,6	1700,1	1684,6	1678,6	1672,8	1675,8	1679,0	1691,7	1705,5	1728,7
32,5	1757,6	1727,0	1696,7	1677,4	1660,3	1653,1	1647,5	1651,4	1656,4	1671,4	1688,4	1714,6
35	1737,3	1700,7	1666,0	1642,2	1622,8	1613,5	1608,2	1612,7	1620,6	1639,4	1661,6	1692,4
37,5	1702,7	1659,2	1620,1	1592,3	1571,5	1561,1	1556,7	1561,3	1571,9	1592,5	1619,0	1655,2
40	1650,1	1598,9	1557,2	1527,2	1506,5	1495,2	1492,5	1497,3	1508,9	1531,1	1560,9	1601,0
41	1622,2	1569,2	1527,7	1498,1	1477,9	1467,4	1464,8	1469,4	1480,8	1503,3	1533,0	1573,8
42	1590,6	1536,5	1496,2	1466,9	1448,5	1438,8	1436,4	1441,2	1452,1	1472,9	1502,9	1543,2
43	1556,7	1502,8	1463,3	1434,9	1418,3	1409,1	1407,7	1412,2	1422,9	1442,1	1470,8	1510,7
44	1520,2	1467,0	1429,1	1402,3	1386,2	1377,8	1376,9	1381,1	1391,5	1409,7	1436,9	1475,8
45	1482,0	1429,9	1393,8	1367,6	1351,7	1342,7	1342,1	1346,6	1357,0	1374,9	1402,4	1440,0
46	1443,5	1393,3	1357,0	1329,6	1313,9	1304,1	1303,6	1307,8	1319,9	1338,5	1367,3	1404,5
47	1403,7	1353,0	1316,1	1287,8	1271,1	1260,4	1260,6	1264,6	1278,2	1297,5	1328,2	1366,6
48	1361,4	1308,7	1271,1	1241,5	1223,9	1210,6	1210,6	1215,6	1232,4	1252,4	1284,7	1325,3
49	1315,2	1260,5	1221,7	1184,3	1161,5	1142,1	1143,1	1148,3	1171,5	1198,2	1237,1	1279,3
50	1263,1	1206,2	1157,5	1107,2	1081,1	1059,2	1060,0	1065,1	1092,5	1123,2	1176,4	1227,6
51	1204,3	1136,1	1074,3	1019,3	991,32	967,24	969,82	973,62	1003,3	1036,3	1094,5	1159,8
52	1134,0	1047,0	981,40	921,17	890,18	863,65	866,82	871,27	902,71	939,68	1002,5	1072,4
53	1046,3	951,02	878,72	815,87	786,34	764,44	764,14	770,48	797,33	833,36	901,74	976,34
54	947,73	844,53	774,34	720,87	690,38	668,62	670,66	674,58	700,42	734,31	794,55	871,10
55	842,40	737,03	685,55	631,06	602,96	581,86	583,97	586,92	610,97	640,34	697,99	766,38
56	735,01	639,53	602,42	550,36	523,92	506,54	508,37	511,33	532,34	560,19	614,54	668,22
57	633,85	552,91	525,92	484,79	460,00	444,20	445,34	448,47	465,64	490,56	539,77	583,65
58	542,11	485,94	471,91	424,93	401,15	387,30	389,68	393,45	407,41	429,77	473,39	509,47
59	462,30	440,48	404,18	344,56	328,69	331,81	334,28	338,13	347,09	361,77	418,88	448,97

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TABELA 6.1.6

γ	C (graus)											
(graus)	300	305	310	315	320	325	330	335	340	345	350	355
0	1899,0	1899,0	1899,0	1899,0	1899,0	1899,0	1899,0	1899,0	1899,0	1899,0	1899,0	1899,0
2,5	1884,0	1884,3	1885,2	1885,9	1886,3	1887,3	1888,2	1889,5	1890,9	1891,7	1893,3	1894,9
5	1873,4	1874,3	1875,2	1876,7	1877,7	1879,2	1881,4	1883,6	1885,7	1887,9	1890,6	1893,9
7,5	1865,2	1866,4	1867,9	1870,2	1872,0	1874,6	1877,1	1880,3	1883,6	1887,3	1891,5	1896,0
10	1857,7	1860,2	1862,5	1865,9	1868,5	1872,7	1876,3	1881,1	1885,2	1890,8	1896,1	1902,7
12,5	1850,1	1854,0	1857,9	1863,2	1867,7	1873,2	1879,0	1885,4	1891,8	1898,7	1905,8	1914,1
15	1841,7	1847,2	1853,9	1861,6	1868,5	1876,5	1884,7	1893,5	1901,8	1911,1	1920,2	1931,2
17,5	1830,6	1839,6	1849,5	1860,7	1870,9	1881,6	1892,5	1904,1	1914,8	1926,5	1937,8	1951,4
20	1817,8	1830,9	1844,9	1859,9	1874,2	1889,4	1903,2	1917,9	1931,1	1945,2	1959,7	1976,4
22,5	1803,3	1820,7	1839,5	1859,7	1878,8	1898,1	1916,2	1934,6	1951,6	1969,2	1986,1	2006,1
25	1788,1	1809,1	1833,3	1858,8	1883,4	1908,9	1931,9	1955,0	1975,6	1997,2	2016,1	2039,6
27,5	1767,6	1797,1	1826,5	1857,8	1889,6	1921,9	1950,6	1978,8	2002,9	2028,4	2050,2	2075,6
30	1751,8	1785,0	1819,4	1857,0	1895,3	1934,9	1971,4	2005,1	2032,9	2061,2	2085,0	2114,6
32,5	1740,4	1775,4	1812,7	1855,3	1901,3	1948,2	1992,2	2033,0	2065,4	2095,5	2122,6	2155,7
35	1724,5	1766,0	1808,6	1855,9	1907,0	1961,5	2012,8	2061,8	2100,5	2134,7	2165,3	2205,0
37,5	1695,2	1744,6	1797,0	1852,9	1911,6	1973,1	2033,1	2090,5	2140,1	2181,6	2215,3	2261,8
40	1648,6	1706,6	1769,2	1838,6	1910,7	1982,3	2053,2	2122,5	2182,7	2231,9	2274,3	2334,2
41	1624,2	1685,7	1752,2	1828,8	1907,1	1984,8	2061,3	2135,4	2200,2	2256,0	2303,9	2371,6
42	1595,9	1660,3	1733,1	1814,8	1900,7	1986,1	2068,8	2148,9	2218,7	2282,3	2338,6	2415,7
43	1563,7	1632,2	1709,5	1797,9	1892,2	1985,8	2074,8	2161,8	2240,1	2313,0	2378,1	2465,6
44	1528,4	1598,1	1681,3	1776,9	1879,9	1981,8	2079,1	2174,0	2263,0	2346,7	2423,0	2519,2
45	1491,5	1561,0	1648,0	1750,1	1863,0	1973,5	2080,7	2185,6	2287,9	2384,3	2470,8	2575,6
46	1454,8	1522,4	1612,0	1718,7	1840,5	1960,1	2078,2	2195,7	2313,2	2423,0	2518,9	2633,2
47	1416,9	1483,0	1572,6	1682,2	1812,2	1940,9	2072,0	2204,9	2339,7	2465,3	2570,6	2696,9
48	1377,5	1442,4	1531,6	1642,8	1774,4	1917,2	2063,8	2213,3	2367,4	2508,8	2625,1	2766,1
49	1334,5	1400,0	1488,5	1599,9	1735,9	1888,8	2051,5	2220,6	2394,2	2553,5	2683,2	2840,3
50	1285,5	1353,8	1442,5	1554,3	1693,6	1855,9	2035,4	2225,3	2417,7	2597,2	2744,8	2918,2
51	1230,4	1300,2	1392,9	1505,3	1647,5	1819,1	2014,6	2224,7	2438,2	2639,5	2808,1	3001,7
52	1162,8	1238,8	1335,9	1450,7	1596,6	1777,4	1988,5	2218,6	2454,5	2682,6	2876,0	3094,0
53	1076,9	1169,7	1271,1	1390,1	1541,3	1729,3	1957,6	2206,8	2466,7	2723,0	2943,2	3185,7
54	979,35	1087,9	1196,7	1320,8	1479,1	1673,8	1917,8	2186,8	2472,8	2758,9	3005,9	3277,0
55	875,10	991,43	1115,6	1242,8	1409,5	1612,2	1868,9	2157,8	2470,8	2785,7	3062,7	3363,3
56	764,40	888,02	1027,3	1157,8	1333,3	1544,9	1810,2	2120,5	2458,3	2803,2	3114,3	3449,6
57	660,67	781,72	929,79	1066,8	1248,9	1470,5	1746,0	2072,7	2436,5	2811,2	3160,4	3531,6
58	568,38	677,38	830,42	974,80	1158,3	1390,5	1674,5	2015,7	2405,2	2810,2	3199,7	3603,9
59	488,50	583,50	730,59	882,69	1064,0	1304,1	1598,0	1949,5	2364,2	2800,2	3232,4	3669,9

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TABELA 6.1.7

γ	C (graus)											
(graus)	0	5	10	15	20	25	30	35	40	45	50	55
60	4349,6	4803,0	4766,6	4565,5	4275,6	3602,9	2873,7	2214,2	1477,4	885,93	547,92	410,64
61	4466,3	4909,5	4802,5	4622,2	4267,9	3504,8	2769,5	2070,9	1274,3	726,14	448,83	358,44
62	4572,3	4983,7	4808,6	4667,8	4223,8	3392,4	2673,4	1881,5	1075,1	581,46	377,77	317,91
63	4661,3	5012,7	4785,5	4691,7	4142,3	3278,6	2576,4	1671,8	883,43	458,46	335,94	282,45
64	4720,9	4997,0	4747,6	4686,8	4025,9	3178,0	2449,0	1441,3	705,42	371,36	302,15	258,75
65	4742,6	4939,0	4703,7	4643,4	3879,2	3099,7	2265,2	1208,3	529,15	320,21	274,15	242,43
66	4722,4	4839,9	4655,9	4552,9	3698,6	3027,5	2010,1	988,80	393,89	287,31	252,29	227,67
67	4661,0	4708,2	4609,1	4416,5	3507,4	2923,1	1721,2	783,84	308,94	260,77	233,71	214,87
68	4559,6	4543,0	4555,1	4236,4	3321,0	2744,0	1437,8	581,36	261,55	238,16	218,13	207,54
69	4429,7	4358,3	4487,3	4021,6	3155,4	2480,7	1194,8	410,20	232,29	217,91	205,67	203,80
70	4275,9	4169,9	4387,0	3772,5	3007,4	2142,5	974,40	300,95	208,21	201,00	195,52	199,07
71	4092,2	3982,9	4235,7	3501,7	2840,6	1807,8	764,25	234,94	190,92	188,15	188,10	191,10
72	3854,7	3778,2	4024,3	3231,8	2621,7	1492,4	559,64	201,54	178,97	182,18	180,48	181,18
73	3545,5	3558,7	3770,5	2975,1	2342,2	1219,6	406,85	180,85	170,08	174,81	173,50	172,95
74	3178,0	3339,3	3518,9	2705,3	1992,3	964,43	292,99	166,51	161,83	162,48	164,23	163,77
75	2779,2	3144,1	3264,1	2395,0	1610,4	723,53	222,14	153,53	153,41	152,02	152,99	153,91
76	2404,9	2954,7	2965,1	2041,5	1262,5	519,40	180,39	141,36	143,72	145,12	144,13	146,10
77	2069,9	2699,6	2559,3	1682,6	960,16	374,53	153,02	131,00	134,66	137,67	136,03	152,54
78	1765,0	2347,7	2076,9	1341,8	726,62	279,75	131,90	121,44	127,82	128,62	128,37	147,15
79	1426,0	1903,9	1582,7	1050,2	525,46	221,39	115,69	114,41	121,33	118,60	118,35	129,78
80	1094,9	1451,6	1166,8	810,97	403,09	182,71	105,56	108,49	112,91	108,54	106,35	120,28
82,5	457,35	721,47	552,05	418,76	238,10	116,85	92,882	93,050	90,208	86,406	79,297	87,012
85	161,19	320,16	285,39	203,21	143,61	78,364	66,361	70,667	61,665	58,430	51,830	57,272
87,5	44,645	111,15	121,26	83,764	68,881	39,475	33,918	37,949	32,211	31,224	25,161	29,871
90	9,8349	13,883	17,373	15,241	9,5246	5,7005	4,3739	4,0566	2,9955	2,8802	2,2614	2,0489
92,5	7,9585	7,5802	7,1271	6,4106	5,6407	4,7524	3,9736	3,3189	2,8690	2,5385	2,3074	2,1719
95	9,0134	8,5858	8,0839	7,3111	6,4959	5,5445	4,6891	3,9178	3,3647	2,9326	2,6211	2,4107
97,5	10,114	9,6349	9,0942	8,2823	7,4194	6,3941	5,4488	4,5754	3,9111	3,3882	2,9879	2,6970
100	11,237	10,714	10,144	9,2787	8,3642	7,2617	6,2239	5,2624	4,5036	3,8814	3,4022	3,0312
102,5	12,320	11,814	11,196	10,287	9,3098	8,1316	7,0088	5,9668	5,1189	4,4206	3,8663	3,4157
105	13,330	12,867	12,225	11,269	10,232	8,9829	7,7822	6,6696	5,7525	4,9869	4,3704	3,8441
107,5	14,213	13,796	13,143	12,167	11,073	9,7705	8,5326	7,3605	6,3911	5,5675	4,9071	4,3178
110	14,902	14,559	13,911	12,953	11,837	10,531	9,2442	8,0415	7,0348	6,1676	5,4576	4,8291
112,5	15,452	15,174	14,539	13,631	12,543	11,248	9,9313	8,7300	7,6813	6,7790	6,0294	5,3691
115	15,915	15,703	15,099	14,274	13,209	11,932	10,598	9,4081	8,3298	7,4067	6,6198	5,9531
117,5	16,338	16,183	15,632	14,883	13,833	12,592	11,251	10,074	8,9762	8,0451	7,2346	6,5682
120	16,694	16,616	16,137	15,439	14,422	13,221	11,884	10,737	9,6141	8,6955	7,8663	7,2368

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TABELA 6.1.8

γ	C (graus)											
(graus)	60	65	70	75	80	85	90	95	100	105	110	115
60	339,44	300,43	280,45	264,79	256,77	254,56	250,37	252,71	252,19	260,99	271,95	282,15
61	297,90	280,71	268,96	252,14	242,60	240,03	235,24	238,65	238,24	248,99	261,65	267,45
62	271,28	270,28	255,98	239,83	229,73	225,65	217,70	223,11	224,94	237,18	248,80	255,80
63	258,03	260,09	242,03	230,02	218,84	211,82	202,32	208,63	214,21	227,93	237,41	244,40
64	245,21	247,06	231,93	225,48	208,39	197,80	190,11	194,49	202,55	225,19	229,84	236,02
65	231,90	236,32	229,34	223,00	192,92	181,13	174,66	177,85	187,53	220,81	224,16	231,33
66	224,28	228,32	229,18	208,00	179,00	167,41	160,84	164,88	173,24	203,88	218,52	223,48
67	217,63	220,65	219,87	193,84	168,00	154,86	148,17	153,35	161,79	183,07	207,51	213,32
68	210,82	213,38	205,53	179,72	158,68	144,62	137,25	143,77	150,75	168,54	193,30	201,40
69	201,39	203,50	194,52	170,76	149,21	135,98	129,50	134,52	142,63	162,50	183,04	188,68
70	193,31	191,12	194,13	173,29	141,32	127,75	124,12	126,10	136,30	166,69	184,82	176,31
71	184,59	181,09	187,82	166,01	135,24	121,52	119,26	119,60	131,67	155,74	178,07	166,97
72	172,39	170,61	175,03	153,07	134,29	117,66	113,98	116,72	131,48	145,69	165,59	155,34
73	160,51	160,97	164,37	151,10	127,15	112,44	109,52	111,55	126,09	145,24	159,15	151,46
74	152,04	164,41	168,55	142,20	120,36	111,57	110,80	112,06	121,33	140,28	161,94	160,84
75	151,80	171,44	160,51	135,27	117,64	108,30	106,62	107,52	113,47	132,11	153,49	164,89
76	158,26	165,10	145,73	122,86	104,94	98,193	96,184	97,057	100,35	113,67	136,85	155,02
77	148,39	152,76	128,22	106,33	93,819	89,414	86,772	89,553	90,002	101,18	118,92	141,01
78	133,72	134,30	113,92	95,999	84,238	81,121	77,169	82,316	81,318	94,151	104,75	121,14
79	121,75	117,17	99,955	89,160	75,330	72,953	66,980	74,012	73,298	87,131	90,692	106,61
80	110,37	103,38	86,609	83,007	69,204	64,523	55,481	64,280	65,869	78,590	80,845	94,422
82,5	79,045	74,711	62,253	57,854	47,623	44,471	38,170	45,143	44,018	52,844	57,177	68,219
85	52,993	48,673	39,454	33,432	27,923	26,964	15,605	26,684	25,984	29,660	34,942	40,884
87,5	25,471	20,476	16,176	13,854	11,467	11,019	6,0188	10,337	10,013	11,175	12,189	15,188
90	1,9620	1,9073	1,9055	1,8945	1,9026	1,9005	1,1558	1,9223	1,9347	1,9490	1,9568	1,9842
92,5	2,0671	2,0154	1,9444	1,9425	1,9075	1,9243	1,2120	1,9407	1,9480	1,9863	2,0079	2,0976
95	2,2421	2,1363	2,0092	1,9667	1,9101	1,9243	1,2984	1,9407	1,9481	2,0079	2,0749	2,2193
97,5	2,4606	2,2795	2,0922	1,9992	1,9182	1,9352	1,4382	1,9543	1,9561	2,0484	2,1612	2,3679
100	2,7221	2,4682	2,2166	2,0670	1,9611	1,9674	1,6395	1,9977	2,0016	2,1160	2,2878	2,5638
102,5	3,0384	2,7153	2,3961	2,1772	2,0663	2,0679	1,9203	2,0948	2,1121	2,2344	2,4676	2,8181
105	3,4137	3,0306	2,6710	2,4309	2,3575	2,3298	2,3320	2,3755	2,4408	2,5392	2,7663	3,1495
107,5	3,8350	3,4157	3,0765	2,9064	2,8304	2,7888	2,8035	2,8394	2,9164	3,0137	3,2122	3,5417
110	4,3112	3,8709	3,5952	3,4261	3,3424	3,2946	3,3110	3,3484	3,4291	3,5334	3,7217	4,0059
112,5	4,8318	4,4097	4,1496	3,9773	3,8813	3,8338	3,8429	3,8842	3,9648	4,0758	4,2644	4,5524
115	5,4000	5,0180	4,7509	4,5689	4,4567	4,4095	4,4175	4,4572	4,5348	4,6590	4,8432	5,1368
117,5	6,0362	5,6573	5,3665	5,1894	5,0615	5,0194	5,0151	5,0579	5,1236	5,2629	5,4403	5,7421
120	6,6887	6,3275	6,0145	5,8408	5,6955	5,6597	5,6443	5,6605	5,7394	5,8755	6,0536	6,3535

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TABELA 6.1.9

γ	C (graus)											
(graus)	120	125	130	135	140	145	150	155	160	165	170	175
60	317,80	374,44	465,90	753,57	1309,2	2109,8	2829,5	3548,7	4325,8	4742,6	4876,5	5021,2
61	281,14	336,37	393,28	599,45	1097,3	1912,2	2720,2	3419,1	4248,6	4759,5	4844,1	5042,7
62	259,04	298,87	346,96	468,84	894,98	1678,4	2597,7	3289,9	4123,3	4739,2	4792,3	5018,6
63	245,55	267,89	314,48	379,15	704,11	1432,7	2433,9	3178,5	3958,7	4680,6	4739,2	4961,8
64	229,26	246,49	285,24	325,56	522,47	1190,7	2214,5	3087,2	3771,3	4576,0	4688,2	4872,1
65	218,01	229,92	259,01	291,79	390,22	962,12	1934,3	2983,9	3555,6	4423,8	4636,7	4747,5
66	212,49	215,36	237,73	264,87	311,33	748,19	1638,4	2826,8	3346,8	4230,7	4570,3	4585,8
67	208,47	206,52	219,38	240,43	266,47	545,45	1371,2	2599,1	3167,6	4000,3	4477,5	4392,3
68	201,03	202,34	206,19	219,67	234,84	393,11	1135,2	2292,9	2995,5	3749,7	4347,5	4186,2
69	193,94	196,95	196,17	202,88	208,97	297,02	910,95	1956,3	2815,9	3485,3	4181,1	3981,1
70	185,47	190,87	188,51	191,21	193,72	237,83	702,05	1622,9	2594,6	3212,4	3982,6	3770,9
71	174,23	182,39	181,11	186,16	179,50	203,54	504,91	1335,4	2318,7	2935,6	3753,7	3554,1
72	162,37	173,66	174,39	173,19	169,01	181,70	361,90	1072,0	1994,8	2637,5	3490,3	3337,2
73	154,43	164,54	164,90	162,52	160,54	166,04	261,79	817,00	1642,3	2313,3	3192,7	3136,2
74	149,72	154,78	154,22	153,22	152,81	151,70	197,78	585,54	1297,4	1963,5	2845,4	2926,0
75	150,50	151,36	145,00	145,65	143,59	139,99	162,34	407,42	983,10	1608,7	2424,8	2640,7
76	148,64	149,27	135,95	137,46	135,34	129,92	139,54	289,14	729,86	1288,6	1954,3	2256,0
77	134,35	146,12	127,01	127,62	128,36	121,04	122,38	215,63	507,59	1001,1	1483,9	1793,0
78	122,27	131,25	115,91	117,40	120,73	113,87	109,19	174,86	374,28	753,93	1075,0	1346,3
79	111,20	119,96	104,94	107,33	112,40	107,73	100,70	141,25	293,02	562,94	772,88	990,98
80	99,569	108,01	93,194	100,28	106,23	108,95	96,328	118,99	236,82	429,05	561,83	735,31
82,5	70,684	75,513	67,937	72,892	76,894	82,053	79,531	84,399	145,63	212,68	272,56	329,68
85	44,645	48,361	41,766	47,777	49,588	55,441	51,432	52,686	81,189	98,125	132,29	124,32
87,5	18,249	20,114	15,892	19,589	19,013	20,359	17,865	17,911	25,903	32,372	36,767	29,573
90	2,0104	2,0890	2,1907	2,3803	2,6912	3,1352	3,8032	4,5853	5,4879	6,2650	6,9827	7,4365
92,5	2,1659	2,3001	2,4702	2,7501	3,1584	3,7071	4,4954	5,3647	6,3362	7,1494	7,9121	8,4096
95	2,3543	2,5544	2,8069	3,1696	3,6763	4,3447	5,2390	6,1980	7,2367	8,0991	8,9079	9,4302
97,5	2,5810	2,8513	3,1904	3,6389	4,2400	5,0133	6,0052	7,0438	8,1672	9,0930	9,9586	10,541
100	2,8585	3,2000	3,6163	4,1438	4,8357	5,6973	6,7711	7,9038	9,1156	10,112	11,053	11,694
102,5	3,1785	3,5972	4,0837	4,6788	5,4481	6,3904	7,5501	8,7611	10,069	11,156	12,170	12,840
105	3,5583	4,0182	4,5798	5,2417	6,0767	7,0797	8,3087	9,5888	10,979	12,162	13,226	13,896
107,5	3,9802	4,4927	5,1045	5,8161	6,7140	7,7578	9,0460	10,393	11,811	13,040	14,115	14,754
110	4,4453	4,9922	5,6497	6,4066	7,3584	8,4614	9,7563	11,142	12,554	13,773	14,811	15,459
112,5	4,9666	5,5229	6,2211	7,0242	8,0026	9,1518	10,470	11,842	13,197	14,381	15,353	15,983
115	5,5461	6,0982	6,8073	7,6557	8,6554	9,8115	11,088	12,510	13,747	14,873	15,768	16,365
117,5	6,1668	6,7204	7,4071	8,2758	9,2768	10,448	11,629	12,953	14,213	15,179	16,012	16,597
120	6,7673	7,3614	8,0365	8,8494	9,8515	10,981	12,099	13,254	14,368	15,343	16,063	16,648

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TABELA 6.1.10

γ	C (graus)											
(graus)	180	185	190	195	200	205	210	215	220	225	230	235
60	4654,4	3978,8	3406,8	2883,0	2356,2	1867,3	1489,4	1174,9	928,27	748,23	605,84	467,01
61	4729,3	4022,0	3389,3	2818,2	2263,3	1759,5	1380,7	1067,5	833,95	660,09	517,56	387,32
62	4780,3	4036,2	3342,4	2740,8	2165,9	1650,9	1264,0	957,93	744,70	573,88	431,84	324,97
63	4801,4	4016,8	3265,8	2653,3	2065,2	1538,0	1141,3	848,30	657,24	490,67	355,13	276,67
64	4779,0	3957,2	3155,5	2549,2	1958,1	1418,3	1018,7	745,37	570,87	409,57	292,42	239,33
65	4717,9	3866,6	3020,9	2421,3	1829,1	1280,6	894,53	650,15	486,44	336,86	244,96	212,10
66	4612,5	3750,4	2864,3	2274,7	1690,3	1127,5	767,26	555,32	403,74	276,00	209,76	192,69
67	4461,6	3615,2	2691,9	2115,9	1529,6	967,81	642,66	460,30	329,97	228,22	186,99	180,11
68	4277,3	3463,6	2516,9	1945,0	1348,4	813,85	529,34	368,28	269,31	195,48	173,74	171,67
69	4066,1	3293,2	2340,4	1767,7	1166,9	681,15	432,64	292,25	219,48	174,96	165,59	165,47
70	3817,6	3093,6	2160,3	1577,7	986,80	556,46	350,98	234,48	181,00	160,47	158,74	162,91
71	3523,5	2855,5	1966,6	1380,3	816,21	454,22	285,72	193,77	160,86	151,08	152,62	161,93
72	3192,5	2557,8	1745,8	1173,7	665,98	379,37	238,65	165,23	146,04	143,45	147,96	162,62
73	2834,6	2195,2	1512,8	957,20	529,06	322,36	203,85	145,91	141,01	138,80	144,73	159,68
74	2495,5	1807,6	1250,8	767,59	418,73	273,18	176,69	133,24	140,18	137,22	141,99	151,45
75	2195,8	1439,0	982,69	592,44	339,70	223,56	152,39	123,67	136,38	138,31	140,53	136,34
76	1879,5	1112,9	739,86	450,02	271,68	175,44	128,33	115,13	128,78	139,05	137,00	123,23
77	1550,5	838,42	540,22	349,49	225,37	147,11	109,82	105,40	118,33	136,06	134,57	109,77
78	1196,8	624,92	375,87	267,33	182,72	116,00	99,946	96,105	106,95	125,68	128,41	100,86
79	876,65	430,34	256,59	188,28	136,03	93,366	91,651	85,802	91,767	112,20	110,07	93,643
80	614,10	287,95	184,59	131,93	103,08	81,545	83,733	75,649	77,339	97,868	92,272	86,338
82,5	222,42	105,41	83,333	65,075	62,679	60,161	62,848	55,730	57,311	60,069	64,554	64,331
85	65,124	47,172	52,845	41,920	42,918	40,141	50,542	38,419	38,718	37,081	38,637	39,424
87,5	19,961	19,433	20,376	19,128	18,981	18,274	21,522	17,229	17,269	16,222	16,829	15,776
90	7,8389	8,0785	7,9551	7,7157	7,2927	6,3836	5,3733	4,4250	3,3364	2,4456	1,7325	1,2715
92,5	8,9228	9,2077	9,1221	8,8856	8,4654	7,5186	6,4399	5,3936	4,2062	3,1606	2,2849	1,6602
95	10,065	10,390	10,302	10,055	9,6419	8,6611	7,5593	6,4269	5,1529	3,9837	2,9458	2,1877
97,5	11,238	11,595	11,487	11,181	10,740	9,7484	8,6734	7,5029	6,1507	4,8806	3,6951	2,8179
100	12,379	12,721	12,587	12,234	11,748	10,758	9,7199	8,5723	7,1652	5,8442	4,5446	3,5520
102,5	13,437	13,689	13,503	13,161	12,603	11,740	10,692	9,6020	8,1846	6,8280	5,4602	4,3593
105	14,347	14,543	14,319	13,975	13,326	12,618	11,627	10,566	9,1886	7,8327	6,4126	5,2418
107,5	15,088	15,229	15,017	14,685	14,088	13,411	12,512	11,444	10,146	8,8181	7,3975	6,1805
110	15,693	15,768	15,596	15,290	14,777	14,143	13,328	12,242	11,025	9,7577	8,3698	7,1291
112,5	16,180	16,207	16,070	15,808	15,388	14,789	14,049	12,985	11,864	10,637	9,3151	8,0645
115	16,585	16,572	16,448	16,217	15,868	15,345	14,634	13,675	12,645	11,471	10,194	8,9541
117,5	16,937	16,864	16,697	16,481	16,170	15,671	15,130	14,256	13,337	12,223	11,017	9,8242
120	17,189	17,071	16,829	16,602	16,282	15,877	15,431	14,691	13,945	12,886	11,761	10,668

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TABELA 6.1.11

γ	C (graus)											
(graus)	240	245	250	255	260	265	270	275	280	285	290	295
60	397,86	376,07	328,47	285,83	268,06	271,00	281,26	277,68	273,93	294,51	348,84	401,29
61	338,79	311,98	268,94	241,18	221,39	214,29	225,64	226,29	226,76	246,60	279,05	341,98
62	290,71	261,35	229,95	200,54	185,77	176,79	184,75	178,04	189,37	203,61	236,42	282,39
63	251,71	218,40	196,94	176,59	164,32	153,17	161,50	154,11	165,23	175,11	202,04	231,19
64	221,24	192,97	178,76	163,35	144,47	134,69	139,65	135,40	144,81	157,90	178,49	199,25
65	199,82	180,67	171,14	152,27	127,26	115,80	118,62	117,72	127,69	148,86	168,92	181,99
66	185,48	175,42	164,73	140,20	111,88	98,528	100,07	100,66	111,81	137,37	162,50	176,57
67	177,37	176,87	157,95	129,58	95,707	83,510	81,757	85,348	97,379	128,39	156,08	177,80
68	174,12	180,57	148,13	116,75	84,501	70,173	67,040	71,721	85,808	116,79	146,28	181,56
69	174,59	175,02	138,11	108,47	75,240	58,445	54,692	59,862	75,723	108,52	138,21	172,33
70	175,48	161,00	134,78	106,66	65,702	47,946	44,588	50,219	67,694	106,08	137,39	162,80
71	170,55	147,88	130,38	95,837	58,301	39,514	36,506	41,123	60,053	98,867	135,89	151,50
72	159,10	134,47	120,32	82,346	51,991	32,938	30,024	34,023	53,589	83,690	125,36	144,33
73	145,89	124,31	100,08	70,068	46,531	28,505	25,261	28,691	47,787	71,015	104,52	134,78
74	131,56	112,95	90,362	65,223	42,371	25,411	21,953	25,385	44,057	66,410	93,584	120,66
75	118,72	105,10	87,698	66,154	39,994	23,342	19,179	22,897	41,234	69,055	95,366	111,01
76	108,74	98,917	90,048	71,874	38,760	21,352	16,568	20,911	38,939	73,359	98,459	105,46
77	100,59	92,474	84,359	62,883	35,208	19,223	13,968	18,560	34,669	60,458	90,061	98,578
78	93,671	86,004	75,502	49,549	33,552	17,043	11,811	16,338	32,242	51,467	77,315	89,612
79	87,707	80,070	69,790	43,852	29,408	14,785	10,135	13,996	29,159	46,970	70,232	83,674
80	81,882	79,720	63,399	39,152	24,492	13,115	8,7112	12,399	25,517	42,083	66,102	81,525
82,5	68,204	54,652	41,383	24,228	15,746	9,4709	5,8629	9,1978	18,260	26,370	47,678	64,347
85	44,538	33,805	24,231	13,335	10,163	5,4744	1,8737	5,4831	10,857	16,353	26,703	38,023
87,5	17,649	14,539	9,9403	5,9519	4,4723	2,3565	0,8165	2,5296	4,8486	7,2656	11,953	18,449
90	1,0130	0,9360	0,8731	0,8670	0,8324	0,8110	0,7869	0,8019	0,9931	1,1668	1,7861	2,0487
92,5	1,2732	1,0820	1,0109	0,9510	0,9299	0,8947	0,9005	0,8754	0,9034	0,8996	0,9519	0,9913
95	1,6538	1,3616	1,2207	1,1327	1,1057	1,0643	1,0671	1,0447	1,0711	1,0772	1,1438	1,2310
97,5	2,1469	1,7496	1,5196	1,3940	1,3379	1,2976	1,2871	1,2686	1,2928	1,3228	1,4165	1,5793
100	2,7477	2,2409	1,9151	1,7474	1,6556	1,5996	1,5789	1,5652	1,5972	1,6519	1,7860	2,0380
102,5	3,4453	2,8410	2,4108	2,1955	2,0560	1,9892	1,9545	1,9495	1,9845	2,0854	2,2618	2,6038
105	4,2340	3,5398	3,0165	2,7440	2,5559	2,4733	2,4169	2,4225	2,4711	2,6171	2,8484	3,2889
107,5	5,0916	4,3262	3,7241	3,4047	3,1619	3,0604	2,9880	3,0062	3,0641	3,2602	3,5488	4,0713
110	5,9913	5,1748	4,5210	4,1486	3,8601	3,7415	3,6534	3,6873	3,7600	4,0028	4,3407	4,9270
112,5	6,9197	6,0648	5,3805	4,9639	4,6525	4,5131	4,4199	4,4572	4,5553	4,8258	5,2072	5,8282
115	7,8571	6,9745	6,2769	5,8300	5,5070	5,3415	5,2520	5,2900	5,4116	5,6990	6,1196	6,7584
117,5	8,8101	7,8987	7,2034	6,7297	6,4072	6,2265	6,1492	6,1771	6,3272	6,6120	7,0623	7,7010
120	9,7399	8,8087	8,1507	7,6624	7,3474	7,1477	7,0833	7,1002	7,2541	7,5496	8,0027	8,6397

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TABELA 6.1.12

γ	C (graus)											
(graus)	300	305	310	315	320	325	330	335	340	345	350	355
60	427,19	494,65	637,28	792,72	969,25	1212,4	1517,5	1878,5	2317,2	2786,7	3257,3	3733,6
61	373,64	415,74	548,21	698,36	876,42	1113,1	1431,2	1799,3	2259,0	2761,3	3273,4	3799,0
62	320,28	351,78	461,85	609,18	788,72	1014,3	1335,4	1708,8	2186,2	2717,0	3274,2	3865,2
63	271,33	300,31	380,94	524,53	701,55	914,65	1225,7	1606,8	2100,8	2661,7	3256,9	3920,1
64	236,14	260,74	314,49	441,97	615,24	815,00	1108,8	1492,9	2005,6	2591,4	3216,9	3947,3
65	209,33	233,18	264,18	365,42	531,52	720,00	992,50	1375,3	1905,6	2508,3	3145,1	3937,7
66	190,86	210,39	225,72	299,59	448,22	626,63	877,33	1251,3	1789,5	2406,4	3036,8	3880,2
67	179,89	190,09	198,09	246,95	371,47	536,24	762,81	1112,2	1661,5	2288,2	2904,7	3787,1
68	175,73	175,65	180,93	208,90	304,18	445,94	647,71	964,39	1516,6	2151,0	2757,7	3674,2
69	180,73	168,04	170,16	183,68	250,04	359,16	535,22	817,44	1353,3	1996,7	2598,5	3549,0
70	185,06	164,51	162,74	168,54	206,84	283,60	433,85	686,37	1180,5	1829,8	2434,7	3414,5
71	175,15	164,95	155,97	158,27	178,94	225,72	347,46	563,64	1011,8	1647,8	2269,4	3263,1
72	160,24	164,64	150,41	148,35	158,79	185,94	280,95	460,96	849,76	1457,2	2108,4	3082,6
73	148,31	162,55	145,57	140,46	144,09	159,03	228,83	377,29	697,34	1259,6	1937,1	2856,4
74	138,23	157,21	142,78	135,00	137,90	141,95	192,88	312,86	556,57	1050,1	1733,4	2560,1
75	126,42	148,01	140,36	130,64	136,34	130,30	167,93	264,10	438,84	849,54	1514,4	2191,4
76	115,18	132,73	138,69	131,14	133,05	120,97	145,63	220,29	354,73	675,77	1248,8	1778,6
77	107,70	118,20	135,13	132,96	126,79	112,41	125,47	174,81	283,93	511,46	973,13	1385,5
78	99,175	105,23	133,81	134,45	121,70	104,00	108,81	140,60	225,35	389,61	726,93	1053,9
79	91,472	98,290	126,28	125,27	115,34	94,326	99,759	118,16	192,21	306,50	519,00	788,71
80	85,465	92,518	103,56	111,69	104,28	84,624	93,229	93,850	146,14	219,60	349,82	580,70
82,5	70,575	73,899	77,916	81,452	66,764	64,205	74,334	68,742	76,309	98,905	134,30	217,00
85	48,220	49,548	50,757	47,297	47,145	45,492	58,070	48,930	52,754	53,730	68,802	83,092
87,5	23,277	23,354	24,789	24,448	26,134	26,286	32,014	28,921	31,040	31,844	35,011	33,293
90	2,9221	3,2017	4,1381	4,4274	5,7302	6,2959	7,8095	7,7821	8,9056	9,6865	10,954	10,686
92,5	1,1160	1,3850	1,8632	2,5653	3,4176	4,4856	5,4414	6,4510	7,1838	7,8445	8,1810	8,3904
95	1,4459	1,8561	2,4640	3,3228	4,3228	5,4925	6,5372	7,6022	8,3500	9,0159	9,3434	9,5591
97,5	1,8905	2,4356	3,1747	4,1789	5,3013	6,5417	7,6575	8,7401	9,4983	10,183	10,540	10,775
100	2,4482	3,1293	3,9796	5,1189	6,3206	7,6192	8,7604	9,8169	10,583	11,313	11,738	12,030
102,5	3,1167	3,9198	4,8754	6,1061	7,3402	8,6698	9,7865	10,807	11,605	12,382	12,881	13,225
105	3,8872	4,7906	5,8251	7,1032	8,3531	9,6733	10,751	11,750	12,551	13,366	13,887	14,276
107,5	4,7441	5,7197	6,7961	8,1014	9,3399	10,627	11,657	12,626	13,430	14,251	14,768	15,207
110	5,6545	6,6724	7,7815	9,0742	10,299	11,521	12,512	13,437	14,245	15,020	15,540	15,961
112,5	6,6066	7,6393	8,7562	10,017	11,210	12,374	13,354	14,229	15,008	15,699	16,177	16,525
115	7,5660	8,5900	9,6997	10,916	12,086	13,210	14,170	15,000	15,743	16,318	16,719	16,976
117,5	8,5283	9,5176	10,617	11,784	12,944	14,034	14,989	15,777	16,443	16,906	17,200	17,340
120	9,4546	10,418	11,491	12,620	13,767	14,837	15,789	16,532	17,088	17,430	17,570	17,599

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6.2. CLASSIFICAÇÃO DAS DISTRIBUIÇÕES DE INTENSIDADE LUMINOSA (RTQ B.2)

TABELA 6.2.1

TENSÃO NOMINAL DE ENSAIO - 220V	
RTQ - B.2 Classificação das distribuições de intensidade luminosa	
Distribuição transversal	Tipo II
Distribuição longitudinal	Curta
Controle de distribuição de intensidade luminosa	Limitada
PARECER ENCE FINAL	**Conforme**

6.3. POTÊNCIA, FATOR DE POTÊNCIA, CORRENTE, FLUXO LUMINOSO, EFICIÊNCIA ENERGÉTICA, CLASSE, I.R.C. E T.C.C.

TABELA 6.3.1

TENSÃO NOMINAL DE ENSAIO - 220V								
RTQ	A.5.3	A.5.4	A.5.5		B.3		B.4	B.5
Luminária	Potência	F.P.	Corrente	Fluxo	E.E.	Classe	I.R.C.	T.C.C.
N.º	(W)		(A)	(lm)	(lm/W)		Ra	(K)
01	62,33	0,954	0,2966	8.588	137,78	A	78,2	4260
Declarado	60	0,96	0,5	N.D.	N.D.	N.D.	>70	4000
Mínimo (1)		0,92			N.A.		70	3710
Máximo (1)	66,0		0,55					4260
PARECER	C.R.	C.R.	C.R.		N.A.	N.A.	C.R.	C.R.

Legenda:
Potência = Potência total do circuito (RTQA.5.3)
F.P. = Fator de potência (RTQ A.5.4)
Corrente = Corrente de alimentação (RTQ A.5.5)
Fluxo = Fluxo luminoso
E.E. = Eficiência energética (RTQ B.3)
Classe = Classe de eficiência energética (RTQ B.3)
I.R.C. = Índice de Reprodução de Cor - Médio – IRC (RTQ B.4)
T.C.C. = Temperatura de Cor Correlata - Média – TCC (RTQ B.5)
C.R. = Conforme com os Requisitos.
N.C.R. = Não Conforme com os Requisitos.
N.D. = Não Declarado
N.A. = Não Aplicável

Nota: (1) Limites especificados na Portaria n.º 20, de 15 de fevereiro de 2017

6.4. CONTROLE DE DISTRIBUIÇÃO LUMINOSA (RTQ B.6.1)

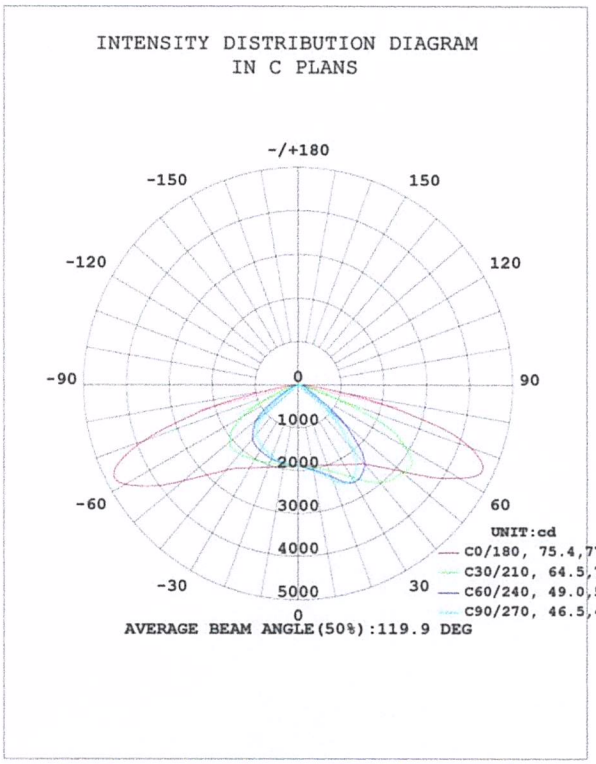
TABELA 6.4.1

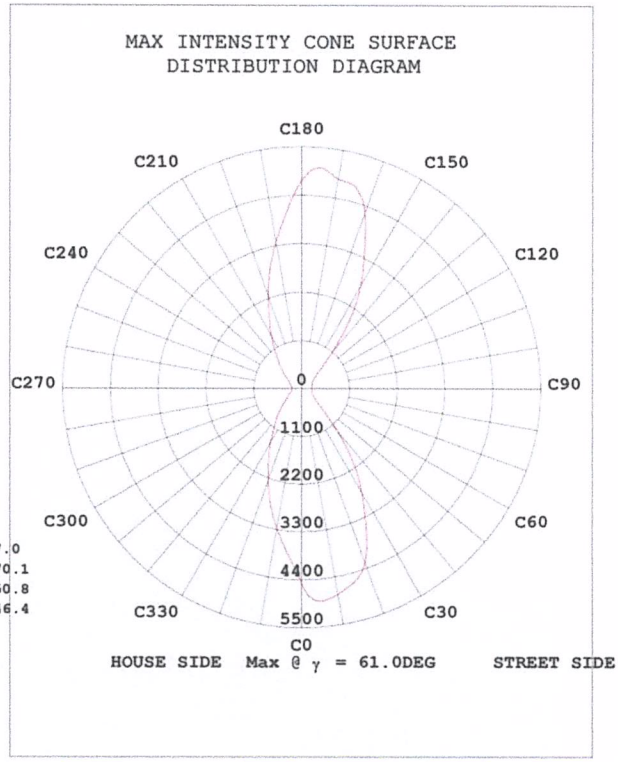
CONTROLE DE DISTRIBUIÇÃO LUMINOSA - CDL		
Tipo de luminária		CDL(%) = (Cd x 100) / fluxo luminária
Limitada	acima de 90°	0,20 % = (17,6 cd x 100)/ 8588 lm
	acima de 80° e até 90°	8,40 % = (721,5 cd x 100)/ 8588 lm

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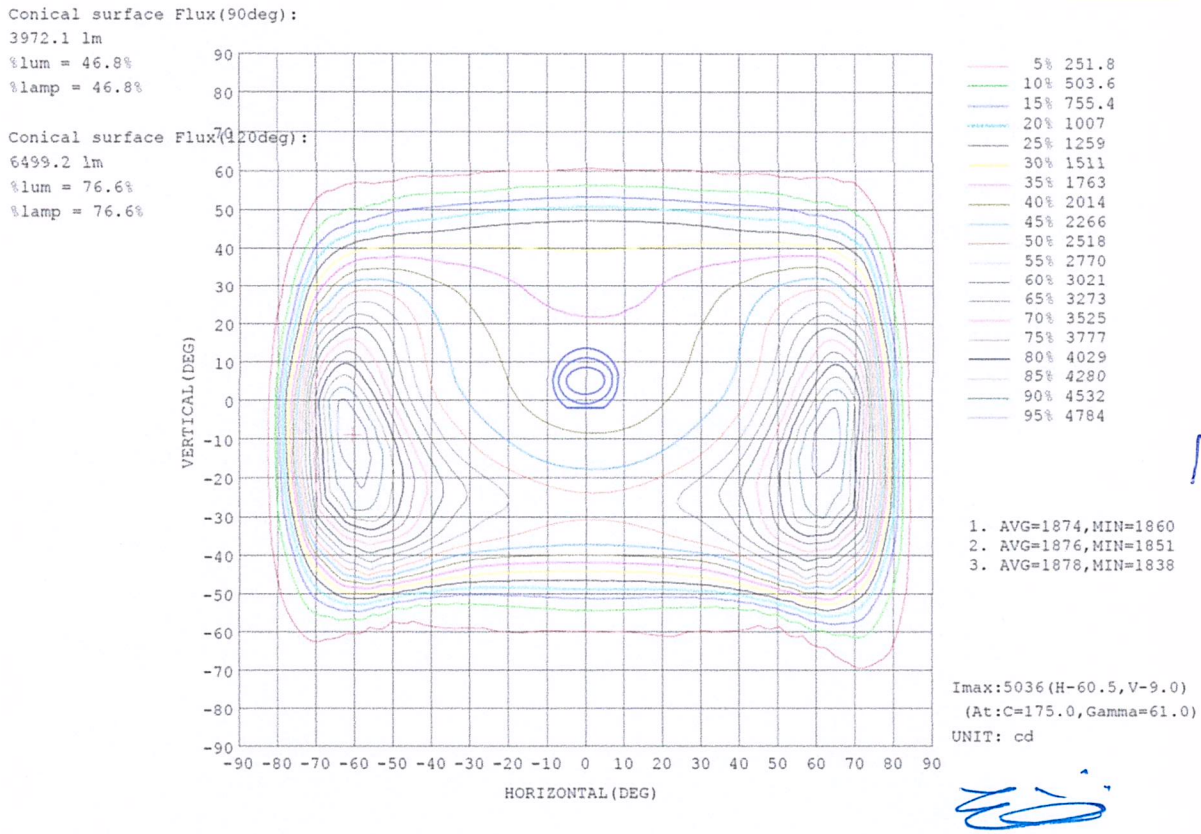
0288

6.5. DIAGRAMAS DE DISTRIBUIÇÃO DA INTENSIDADE LUMINOSA E CONE DE INTENSIDADE MÁXIMA





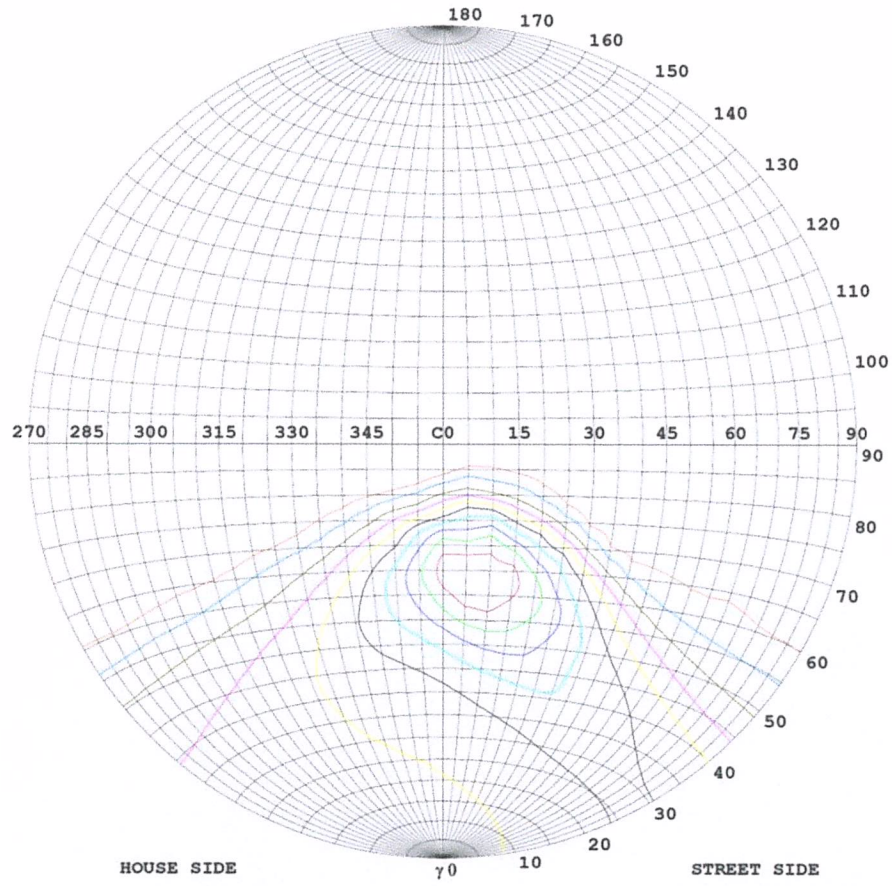
6.6. DIAGRAMA DE ISOCANDELA



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6.7. DIAGRAMA DE ISOCANDELA STREETLIGHT

FIGURA 6.7.1



ISOCANDELA DIAGRAM	
UNIT	cd
Imax=100%	5043
90%	4538
80%	4034
70%	3530
60%	3026
50%	2521
40%	2017
30%	1513
20%	1009
10%	504
5%	252

6.8. ÍNDICE DE REPRODUÇÃO DA COR

O Índice de Reprodução da Cor (IRC) é um sistema internacional utilizado para avaliar a capacidade da própria lâmpada para representar as cores dos objetos. Quanto mais alto o IRC (baseado em uma escala de 0 a 100), melhor aparecem as cores. As classificações IRC de lâmpadas diversas podem ser comparadas. Contudo, uma comparação numérica somente é válida se as lâmpadas são também avaliadas quanto à mesma cromaticidade. As diferenças de IRC entre lâmpadas de maneira geral não são significantes, ou seja, visíveis a olho nu, a menos que a diferença seja maior que três a cinco pontos.

As primeiras oito amostras (**R1 a R8**), utilizadas para calcular o índice geral de reprodução de cor **Ra**, são cores com saturação relativamente baixas e são distribuídas uniformemente sobre toda a gama de tons. As outras amostras de cores propiciam informações suplementares sobre as propriedades de reprodução da cor da fonte de luz. As primeiras quatro (**R9 a R12**) possuem alta saturação e as últimas (**R13 a R15**) representam objetos conhecidos, tais como a cor de folhas verdes. Os espectros de refletância destas amostras podem ser encontrados na CIE.

A **Tabela 6.8.1** mostra o IRC para o centro do facho e os principais parâmetros de cor onde destacamos o comprimento de onda dominante (matiz), que corresponde à intensidade espectral da cor, e a pureza (saturação), que especifica o grau de mistura do matiz com a cor branca. Quanto mais próxima de zero, maior é a quantidade da cor branca misturada no matiz.

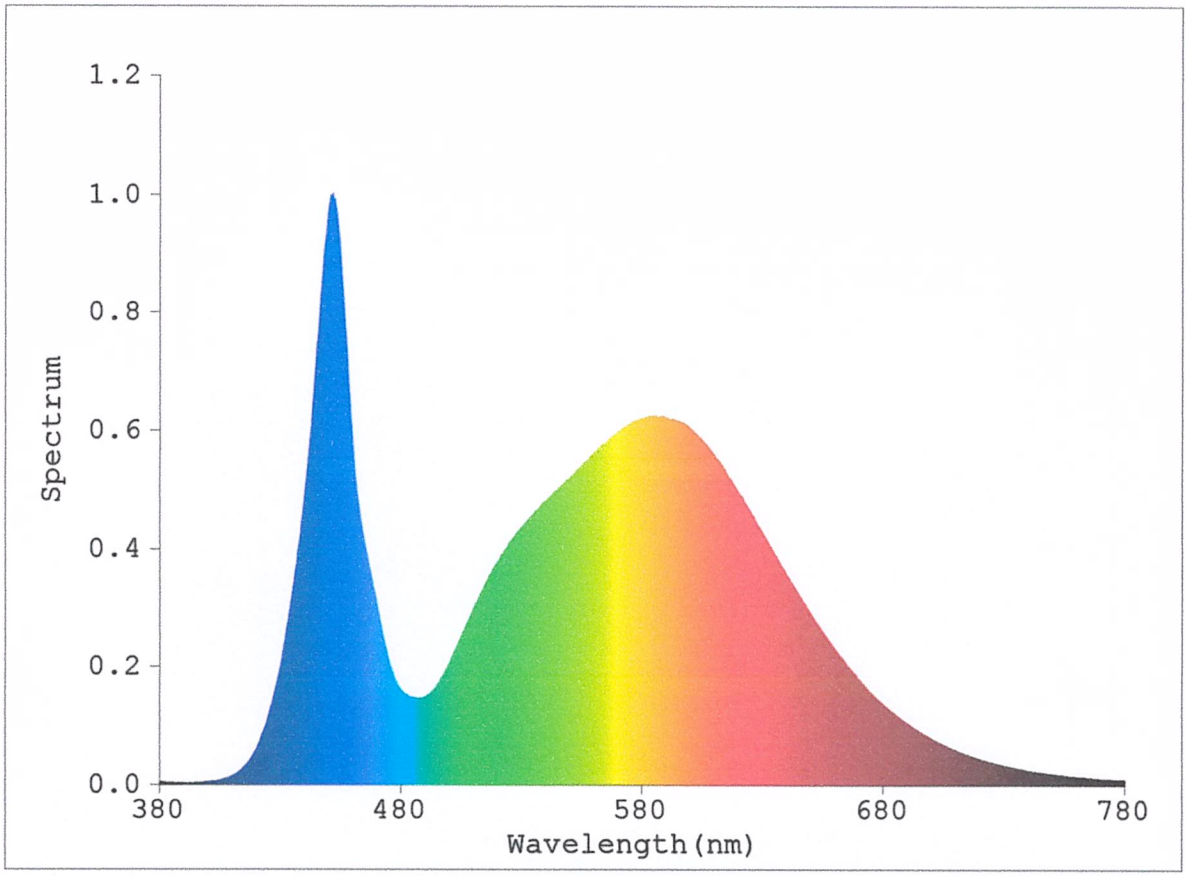
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TABELA 6.8.1

Valores para o centro do facho																	
Comprimento de onda		Pureza	IRC														
dominante	de pico																
nm	nm	%	Ra	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	R13	R14	R15
592,8	451,9	9,1	79,8	80	87	88	78	79	78	84	65	7	65	74	54	81	93	78

A **Figura 6.8.2** mostra a curva espectral para o centro do facho.

FIGURA 6.8.2



6.9. TEMPERATURA DE COR CORRELATA

A temperatura de cor está diretamente relacionada com a temperatura física do filamento nas lâmpadas incandescentes, de forma que a escala de temperatura Kelvin (K) é utilizada para descrever a temperatura de cor. Para lâmpadas LED, onde nenhum filamento está envolvido, o termo -temperatura de cor correlatall (TCC) é utilizado para indicar que a luz parece llcomo sell estivesse operando em uma dada temperatura de cor.

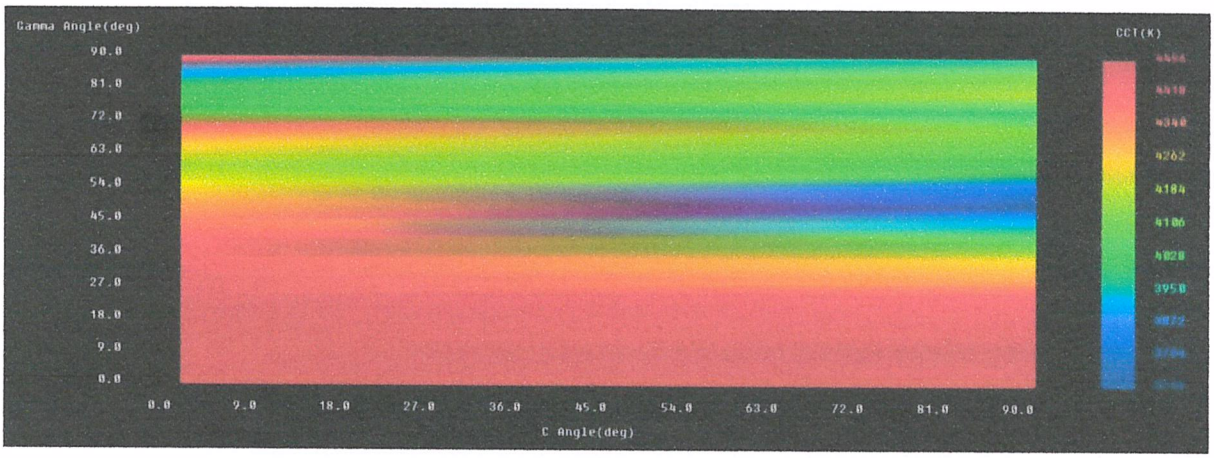
As temperaturas de cor correlata são expressas em Kelvins (K) ou como coordenadas x e y no Diagrama de Cromaticidade da CIE. Embora isto não possa ser considerado fisicamente, uma temperatura de cor mais alta (K) descreve uma fonte de luz azulada, visualmente "fria".

A **Figura 6.9.1** mostra as TCC de acordo com o ângulo do facho luminoso.

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FIGURA 6.9.1



A **Tabela 6.9.2** indica os principais valores médios e para o centro do facho para: as coordenadas x e y, u' e v', a temperatura de cor correlata **TCC** e o índice geral de reprodução de cor **Ra**.

TABELA 6.9.2

	Média	Centro do Facho
Coordenadas Cromáticas (x,y)	x=0,3663; y=0,3549	x=0,3568; y=0,3402
Coordenadas Cromáticas (u',v')	u'=0,2245; v'=0,4895	u'=0,2241; v'=0,4807
Temperatura de Cor Correlata	4260 K	4492 K
Índice de Reprodução de Cor	78,2	79,8

24/05/2018

Supervisor / Responsável Técnico
João Marcos Intronno
CREA nº 1991104398

24/05/2018

Gerente da Qualidade
José Luiz Macedo Barros
CREA nº 1984105652

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CNA S L5776

Test Report issued under the responsibility of:

DEKRA

TEST REPORT
IEC 60598-2-3
Luminaires
Part 2: Particular requirements
Section 3: Luminaires for road and street lighting

Report Number. ..... :	**6000302.50 REV1.2**
Date of issue..... :	**2018-05-23**
Total number of pages ..... :	**75 (including this page 1)**
Name of Testing Laboratory preparing the Report ..... :	DEKRA Testing and Certification (Shanghai) Ltd.
Applicant's name..... :	Hangzhou Hpwinner Opto. Corporation
Address..... :	No.18 Kangzhong Road, Gongshu District, 310015Hangzhou City, Zhejiang Province, PEOPLE'S REPUBLIC OF CHINA
Test specification:	
Standard ..... :	IEC 60598-2-3:2002/AMD1:2011 used in conjunction with IEC 60598-1:2014
Test procedure ..... :	CB Scheme
Non-standard test method ..... :	N/A
Test Report Form No. ..... :	IEC60598_2_3K
Test Report Form(s) Originator.... :	Intertek Semko AB
Master TRF..... :	2016-09

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This report is not valid as a CB Test Report unless signed by an approved CB Testing Laboratory and appended to a CB Test Certificate issued by an NCB in accordance with IECEE 02.

General disclaimer:

The test results presented in this report relate only to the object tested.
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Test item description..... :	LED street light
Trade Mark ..... :	PULSE LED
Manufacturer..... :	Hangzhou Hpwinner Opto. Corporation
Model/Type reference..... :	T19E-4
Ratings..... :	100 – 277 V~; 50/60 Hz; 60 / 120 W

Responsible Testing Laboratory (as applicable), testing procedure and testing location(s):			
☒	**CB Testing Laboratory:**		
Testing location/ address.....:		DEKRA Testing and Certification (Shanghai) Ltd. 3/F, #250, Jiangchangsan Road building 16 Headquater Economy Park Shibei Hi-Tech Park, Zhabei District, Shanghai, P.R.C 200436	
☐	**Associated CB Testing Laboratory:**		
Testing location/ address.....:			
Tested by (name, function, signature).....:		Li Peng	Peng Li
Approved by (name, function, signature)...:		Wesley Xu	Wesley
☐	**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): **N/A**	
Summary of testing:	
Tests performed (name of test and test clause): All test items have been done in CBTL.	**Testing location:** DEKRA Testing and Certification (Shanghai) Ltd. 3/F, #250, Jiangchangsan Road building 16 Headquater Economy Park Shibei Hi-Tech Park, Zhabei District, Shanghai, P.R.C 200436
Summary of compliance with National Differences: **Europe**	

Copy of marking plate:

The artwork below may be only a draft. The use of certification marks on a product must be authorized by the respective NCBs that own these marks.

PULSE LED

Modelo: T19E-4180 Lutece Tipo de luminária: LED
Equipamento Classe I
Potência: 180W
Tensão: 100 – 277 V ~
Frequencia: 50/60Hz **IP: 66**
Data de fabricação: MM/AA Ta=45°C
Número de Série:

PULSE LED

Modelo: T19E-4090 Lutece Tipo de luminária: LED
Equipamento Classe I
Potência: 90W
Tensão: 100 – 277 V ~
Frequencia: 50/60Hz **IP: 66**
Data de fabricação: MM/AA Ta=45°C
Número de Série:

PULSE LED

Modelo: T19E-4150 Lutece Tipo de luminária: LED
Equipamento Classe I
Potência: 150W
Tensão: 100 – 277 V ~
Frequencia: 50/60Hz **IP: 66**
Data de fabricação: MM/AA Ta=45°C
Número de Série:

Test item particulars .....:	--
Classification of installation and use.....:	IP66; Class I
Supply Connection .....:	Connecting leads
.....:	--
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..... :	2016-12
Date (s) of performance of tests ..... :	2016-12 ~ 2017-02

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.

Clause numbers between brackets refer to clauses in IEC 60598-1

Following standards were considered:

- IEC 60598-1:2014
- EN 60598-1:2015
- IEC 60598-2-3:2002 + A1:2011
- EN 60598-2-3:2003 + A1:2011
- IEC 62471: 2006
- EN 62471:2008
- IEC/TR 62778:2014
- EN 62493:2010

Manufacturer's Declaration per sub-clause 4.2.5 of IECEE 02:

The application for obtaining a CB Test Certificate includes more than one factory location and a declaration from the Manufacturer stating that the sample(s) submitted for evaluation is (are) representative of the products from each factory has been provided.....:	☐ **Yes** ☒ **Not applicable**

When differences exist; they shall be identified in the General product information section.

Name and address of factory (ies)..... :	HANGZHOU HPWINNER OPTO CORPORATION No.18 Kangzhong Road, Gongshu District, Hangzhou City, Zhejiang Province, P.R.China

General product information:

The products are Class I LED street luminaire.

They possess different LED drivers and LED modules. Full tests were performed on all model.

LED driver of all model were tested in appliance according to IEC 61347-1:2007 + A1: 2010 + A2:2012, EN 61347-1:2008 + A1:2011 + A2:2013; IEC 61347-2-13:2014 and EN 61347-2-13:2014.

The products were tested according to IEC 62471:2006; EN 62471:2008; IEC/TR 62778:2014 and classified as Risk group II. Refer to DEKRA test report 6000303.50P.

The products were tested according to EN 62493:2010, the test result refer to DEKRA test report 6000304.10.

IEC 60598-2-3			
Clause	Requirement + Test	Result - Remark	Verdict
3.2 (0)	**GENERAL TEST REQUIREMENTS**		P
3.2 (0.1)	Information for luminaire design considered .....:	Yes ☐ No ☒ Lamp standard:	—
3.2 (0.3)	More sections applicable ..... :	Yes ☐ No ☒ Section/s:	—
			N/A

3.4 (2)	**CLASSIFICATION OF LUMINAIRES**		P
3.4 (2.2)	Type of protection ..... :	Class I	P
3.4 (2.3)	Degree of protection ..... :	IP66	P
3.4 (2.4)	Luminaire suitable for direct mounting on normally flammable surfaces ..... :	Yes No ☐	—
3.4 (2.5)	Luminaire for normal use ..... :	Yes No ☐	—
	Luminaire for rough service ..... :	Yes ☐ No ☒	—
3.4 (-)	Modes of installation of road or street lighting		—
	a) on a pipe	Yes ☐ No ☒	—
	b) on a mast arm	Yes No ☐	—
	c) on a post top	Yes ☐ No ☒	—
	d) on span or suspension wires	Yes ☐ No ☒	—
	e) on a wall	Yes ☐ No ☒	—

3.5 (3)	**MARKING**		P
3.5 (3.2)	Mandatory markings		P
	Position of the marking		P
	Format of symbols/text		P
3.5 (3.3)	Additional information		P
	Language of instructions		P
3.5 (3.3.1)	Combination luminaires		N/A
3.5 (3.3.2)	Nominal frequency in Hz		P
3.5 (3.3.3)	Operating temperature		P
3.5 (3.3.4)	Symbol or warning notice		P
3.5 (3.3.5)	Wiring diagram		N/A
3.5 (3.3.6)	Special conditions		N/A
3.5 (3.3.7)	Metal halide lamp luminaire – warning		N/A
3.5 (3.3.8)	Limitation for semi-luminaires		N/A

IEC 60598-2-3			
Clause	Requirement + Test	Result - Remark	Verdict
3.5 (3.3.9)	Power factor and supply current		P
3.5 (3.3.10)	Suitability for use indoors		N/A
3.5 (3.3.11)	Luminaires with remote control		N/A
3.5 (3.3.12)	Clip-mounted luminaire – warning		N/A
3.5 (3.3.13)	Specifications of protective shields		N/A
3.5 (3.3.14)	Symbol for nature of supply		P
3.5 (3.3.15)	Rated current of socket outlet		N/A
3.5 (3.3.16)	Rough service luminaire		N/A
3.5 (3.3.17)	Mounting instruction for type Y, type Z and some type X attachments		P
3.5 (3.3.18)	Non-ordinary luminaires with PVC cable		N/A
3.5 (3.3.19)	Protective conductor current in instruction if applicable		N/A
3.5 (3.3.20)	Provided with information if not intended to be mounted within arm's reach		N/A
3.5 (3.3.21)	Non replaceable and non-user replaceable light sources information provided		P
	Cautionary symbol		P
3.5 (3.3.22)	Controllable luminaires, classification of insulation provided		N/A
3.5 (3.4)	Test with water		P
	Test with hexane		P
	Legible after test		P
	Label attached		P
3.5 (-)	Additional information in instruction leaflet		P
	a) Design attitude		P
	b) Weight		P
	c) Overall dimensions		P
	d) Maximum projected area if applicable		P
	e) Cross-sectional area of wires if applicable		P
	f) Suitability for indoors use		N/A
	g) Dimensions of the compartment		P
	h) Torque setting to be applied to bolts or screws		P
	i) Maximum mounting height		P

IEC 60598-2-3			
Clause	Requirement + Test	Result - Remark	Verdict
3.6 (4)	**CONSTRUCTION**		P
3.6 (4.2)	Components replaceable without difficulty		P
3.6 (4.3)	Wireways smooth and free from sharp edges		P
3.6 (4.4)	**Lampholders**		N/A
3.6 (4.4.1)	Integral lampholder		N/A
3.6 (4.4.2)	Wiring connection		N/A
3.6 (4.4.3)	Lampholder for end-to-end mounting		N/A
3.6 (4.4.4)	Positioning		N/A
	- pressure test (N) .....:		—
	After test the lampholder comply with relevant standard sheets and show no damage		N/A
	After test on single-capped lampholder the lampholder have not moved from its position and show no permanent deformation		N/A
	- bending test (N) .....:		—
	After test the lampholder have not moved from its position and show no permanent deformation		N/A
3.6 (4.4.5)	Peak pulse voltage		N/A
3.6 (4.4.6)	Centre contact		N/A
3.6 (4.4.7)	Parts in rough service luminaires resistant to tracking		N/A
3.6 (4.4.8)	Lamp connectors		N/A
3.6 (4.4.9)	Caps and bases correctly used		N/A
3.6 (4.4.10)	Light source for lampholder or connection according IEC 60061 not connected another way		N/A
3.6 (4.5)	**Starter holders**		N/A
	Starter holder in luminaires other than class II		N/A
	Starter holder class II construction		N/A
3.6 (4.6)	**Terminal blocks**		N/A
	Tails		N/A
	Unsecured blocks		N/A
3.6 (4.7)	**Terminals and supply connections**		**P**
3.6 (4.7.1)	Contact to metal parts		N/A
3.6 (4.7.2)	Test 8 mm live conductor		N/A
	Test 8 mm earth conductor		N/A
3.6 (4.7.3)	Terminals for supply conductors		P
3.6 (4.7.3.1)	Welded method and material		N/A

IEC 60598-2-3			
Clause	Requirement + Test	Result - Remark	Verdict
	- stranded or solid conductor		N/A
	- spot welding		N/A
	- welding between wires		N/A
	- Type Z attachment		N/A
	- mechanical test according to 15.6.2		N/A
	- electrical test according to 15.6.3		N/A
	- heat test according to 15.6.3.2.3 and 15.6.3.2.4		N/A
3.6 (4.7.4)	Terminals other than supply connection		P
3.6 (4.7.5)	Heat-resistant wiring/sleeves		N/A
3.6 (4.7.6)	Multi-pole plug		N/A
	- test at 30 N		N/A
3.6 (4.8)	**Switches**		N/A
	- adequate rating		N/A
	- adequate fixing		N/A
	- polarized supply		N/A
	- compliance with IEC 61058-1 for electronic switches		N/A
3.6 (4.9)	**Insulating lining and sleeves**		P
3.6 (4.9.1)	Retainment		P
	Method of fixing .....:	Heat shrinkable tube; wrapping PCB of LED driver	P
3.6 (4.9.2)	Insulated linings and sleeves:		P
	Resistant to a temperature > 20 °C to the wire temperature or		N/A
	a) & c) Insulation resistance and electric strength		P
	b) Ageing test. Temperature (°C) .....:		N/A
3.6 (4.10)	**Double or reinforced insulation**		N/A
3.6 (4.10.1)	No contact, mounting surface – accessible metal parts – wiring of basic insulation		N/A
	Safe installation fixed luminaires		N/A
	Capacitors and switches		N/A
	Interference suppression capacitors according to IEC 60384-14		N/A
3.6 (4.10.2)	Assembly gaps:		N/A
	- not coincidental		N/A
	- no straight access with test probe		N/A

IEC 60598-2-3			
Clause	Requirement + Test	Result - Remark	Verdict
3.6 (4.10.3)	Retainment of insulation:		N/A
	- fixed		N/A
	- unable to be replaced; luminaire inoperative		N/A
	- sleeves retained in position		N/A
	- lining in lampholder		N/A
1.6 (4.10.4)	Protective impedance device		N/A
	Double or reinforced insulation bridged by appropriate and at least two resistors or two Y2 capacitors or one Y1 capacitor		N/A
	Y1 or Y2 capacitors comply with IEC 60384-14		N/A
	Resistors comply with test (a) in 14.1 of IEC 60065		N/A
3.6 (4.11)	**Electrical connections and current-carrying parts**		**P**
3.6 (4.11.1)	Contact pressure		P
3.6 (4.11.2)	Screws:		N/A
	- self-tapping screws		N/A
	- thread-cutting screws		N/A
3.6 (4.11.3)	Screw locking:		P
	- spring washer		P
	- rivets		N/A
3.6 (4.11.4)	Material of current-carrying parts		P
3.6 (4.11.5)	No contact to wood or mounting surface		P
3.6 (4.11.6)	Electro-mechanical contact systems		N/A
3.6 (4.12)	**Screws and connections (mechanical) and glands**		**P**
3.6 (4.12.1)	Screws not made of soft metal		P
	Screws of insulating material		N/A
	Torque test: torque (Nm); part.....:	0,6 Nm; on cord anchorage; earthing screw	P
	Torque test: torque (Nm); part.....:		N/A
	Torque test: torque (Nm); part.....:		N/A
3.6 (4.12.2)	Screws with diameter < 3 mm screwed into metal		N/A
3.6 (4.12.4)	Locked connections:		N/A
	- fixed arms; torque (Nm) .....:		N/A
	- lampholder; torque (Nm).....:		N/A
	- push-button switches; torque 0,8 Nm .....:		N/A
3.6 (4.12.5)	Screwed glands; force (Nm).....:	6,25 Nm	P

IEC 60598-2-3			
Clause	Requirement + Test	Result - Remark	Verdict
3.6 (4.13)	**Mechanical strength**		**P**
3.6 (4.13.1)	Impact tests:		P
	- fragile parts; energy (Nm) .....:		N/A
	- other parts; energy (Nm).....:	5 Nm on all accessible parts (IK08)	P
	a) live parts		P
	b) linings		P
	c) protection		N/A
	d) covers		P
3.6 (4.13.3)	Straight test finger		P
3.6 (4.13.4)	Rough service luminaires		N/A
	- IP54 or higher		N/A
	a) fixed		N/A
	b) hand-held		N/A
	c) delivered with a stand		N/A
	d) for temporary installations and suitable for mounting on a stand		N/A
3.6 (4.13.6)	Tumbling barrel		N/A
3.6 (4.14)	**Suspensions, fixings and means of adjusting**		P
3.6 (4.14.1)	Mechanical load:		P
	A) four times the weight		P
	B) torque 2,5 Nm		N/A
	C) bracket arm; bending moment (Nm) .....:		N/A
	D) load track-mounted luminaires		N/A
	E) clip-mounted luminaires, glass-shelve. Thickness (mm) .....:		N/A
	Metal rod. diameter (mm) .....:		N/A
	Fixed luminaire or independent control gear without fixing devices		N/A
3.6 (4.14.2)	Load to flexible cables		N/A
	Mass (kg) .....:		—
	Stress in conductors (N/mm²) .....:		N/A
	Mass (kg) of semi-luminaire .....:		N/A
	Bending moment (Nm) of semi-luminaire .....:		N/A
3.6 (4.14.3)	Adjusting devices:		N/A
	- flexing test; number of cycles.....:		N/A

IEC 60598-2-3			
Clause	Requirement + Test	Result - Remark	Verdict
	- strands broken .....:		N/A
	- electric strength test afterwards		N/A
3.6 (4.14.4)	Telescopic tubes: cords not fixed to tube; no strain on conductors		N/A
3.6 (4.14.5)	Guide pulleys		N/A
3.6 (4.14.6)	Strain on socket-outlets		N/A
3.6 (4.15)	**Flammable materials**		**P**
	- glow-wire test 650°C.....:	See Test Table 3.15 (13.3.2)	P
	- spacing ≥30 mm		N/A
	- screen withstanding test of 13.3.1		N/A
	- screen dimensions		N/A
	- no fiercely burning material		P
	- thermal protection		N/A
	- electronic circuits exempted		N/A
3.6 (4.15.2)	Luminaires made of thermoplastic material with lamp control gear		N/A
	a) construction		N/A
	b) temperature sensing control		N/A
	c) surface temperature		N/A
3.6 (4.16)	**Luminaires for mounting on normally flammable surfaces**		**P**
	No lamp control gear .....:	(compliance with Section 12)	N/A
3.6 (4.16.1)	Lamp control gear spacing:		N/A
	- spacing 35 mm		N/A
	- spacing 10 mm		N/A
3.6 (4.16.2)	Thermal protection:		N/A
	- in lamp control gear		N/A
	- external		N/A
	- fixed position		N/A
	- temperature marked lamp control gear		N/A
3.6 (4.16.3)	Design to satisfy the test of 12.6	(see clause 12.6)	N/A
3.6 (4.17)	**Drain holes**		N/A
	Clearance at least 5 mm		N/A
3.6 (4.18)	**Resistance to corrosion**		**P**
3.6 (4.18.1)	- rust-resistance		N/A
3.6 (4.18.2)	- season cracking in copper		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
3.6 (4.18.3)	- corrosion of aluminium		P
3.6 (4.19)	Ignitors compatible with ballast		N/A
3.6 (4.20)	Rough service vibration		N/A
3.6 (4.21)	**Protective shield**		N/A
3.6 (4.21.1)	Shield fitted if tungsten halogen lamps or metal halide lamps		N/A
	Shield of glass if tungsten halogen lamps		N/A
3.6 (4.21.2)	Particles from a shattering lamp not impair safety		N/A
3.6 (4.21.3)	No direct path		N/A
3.6 (4.21.4)	Impact test on shield		N/A
	Glow-wire test on lamp compartment .....:	See Test Table 3.15 (13.3.2)	N/A
3.6 (4.22)	Attachments to lamps not cause overheating or damage		N/A
3.6 (4.23)	Semi-luminaires comply Class II		N/A
3.6 (4.24)	**Photobiological hazards**		**P**
3.6 (4.24.1)	No excessive UV radiation if tungsten halogen lamps and metal halide lamps (Annex P)		N/A
3.6 (4.24.2)	Retinal blue light hazard		P
	Class of risk group assessed according to IEC/TR 62778 ..... :	RG2	—
	Luminaires with E_{thr} :		P
	a) Fixed luminaires		P
	- distance x m, borderline between RG1 and RG2...:	0,317 m	P
	- marking and instruction according 3.2.23		P
	b) Portable and handheld luminaires		N/A
	- marking according 3.2.23 if RG1 exceeded at 200 mm according to IEC/TR 62778		N/A
	Portable luminaires for children IEC 60598-2-10 and Mains socket outlet nightlights IEC 60598-2-12 not exceed RG1 at 200 mm according to IEC/62778		N/A
3.6 (4.25)	**Mechanical hazard**		**P**
	No sharp point or edges		P
3.6 (4.26)	**Short-circuit protection**		N/A
3.6 (4.26.1)	Adequate means of uninsulated accessible SELV parts		N/A
3.6 (4.26.2)	Short-circuit test with test chain according 4.26.3		N/A
	Test chain not melt through		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	Test sample not exceed values of Table 12.1 and 12.2		N/A
3.6 (4.27)	**Terminal blocks with integrated screwless earthing contacts**		N/A
	Test according Annex V		N/A
	Pull test of terminal fixing (20 N)		N/A
	After test, resistance < 0,05 Ω		N/A
	Pull test of mechanical connection (50 N)		N/A
	After test, resistance < 0,05 Ω		N/A
	Voltage drop test, resistance < 0,05 Ω		N/A
3.6 (4.28)	**Fixing of thermal sensing control**		N/A
	Not plug-in or easily replaceable type		N/A
	Reliably kept in position		N/A
	No adhesive fixing if UV radiations from a lamp can degrade the fixing		N/A
	Not outside the luminaire enclosure		N/A
	Test of adhesive fixing:		N/A
	Max. temperature on adhesive material (°C) .....:		—
	100 cycles between t min and t max		N/A
	Temperature sensing control still in position		N/A
3.6 (4.29)	**Luminaires with non-replaceable light source**		**P**
	Not possible to replace light source		P
	Live part not accessible after parts have been opened by hand or tools		N/A
3.6 (4.30)	**Luminaires with non-user replaceable light source**		N/A
	If protective cover provide protection against electric shock and marked with -caution, electric shock riskII symbol:		N/A
	Minimum two fixing means		N/A
3.6 (4.31)	**Insulation between circuits**		**P**
	Circuits insulated from LV supply fulfil requirements according 4.31.1 – 4.31.3		P
	Controllable luminaires requiring same level of insulation for all components, the insulation between control terminals and LV supply fulfil requirements according 4.31.1 – 4.31.3		N/A
3.6 (4.31.1)	SELV circuits		N/A
	Used SELV source		N/A
	Voltage ≤ ELV		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	Insulating of SELV circuits from LV supply		N/A
	Insulating of SELV circuits from other non SELV circuits		N/A
	Insulating of SELV circuits from FELV		N/A
	Insulating of SELV circuits from other SELV circuits		N/A
	SELV circuits insulated from accessible parts according Table X.1		N/A
	Plugs not able to enter socket-outlets of other voltage systems		N/A
	Socket outlets does not admit plugs of other voltage systems		N/A
	Plugs and socket-outlets does not have protective conductor contact		N/A
3.6 (4.31.2)	FELV circuits		N/A
	Used FELV source		N/A
	Voltage ≤ ELV		N/A
	Insulating of FELV circuits from LV supply		N/A
	FELV circuits insulated from accessible parts according Table X.1		N/A
	Plugs not able to enter socket-outlets of other voltage systems		N/A
	Socket outlets does not admit plugs of other voltage systems		N/A
	Socket-outlets does not have protective conductor contact		N/A
3.6 (4.31.3)	Other circuits		N/A
	Other circuits insulated from accessible parts according Table X.1		N/A
	Class II construction with equipotential bonding for protection against indirect contacts with live parts:		N/A
	- conductive parts are connected together		N/A
	- test according 7.2.3		N/A
	- conductive part not cause an electric shock in case of an insulation fault		N/A
	- equipotential bonding in master/slave applications		N/A
	- master luminaire provided with terminal for accessible conductive parts of slave luminaires		N/A
	- slave luminaire constructed as class I		N/A
3.6 (4.32)	**Overvoltage protective devices**		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	Comply with IEC 61643-11		N/A
	External to controlgear and connected to earth:		N/A
	- only in fixed luminaires		N/A
	- only connected to protective earth		N/A
3.6.1 (-)	At least IP X3 or X5 respectively. IP ..... :	IP66	P
	Column-integrated luminaires:		N/A
	- parts below 2,5 m. IP ..... :		N/A
	- parts above 2,5 m. IP ..... :		N/A
3.6.2 (-)	Suspension on span wires		N/A
3.6.3 (-)	Means for attaching the luminaire or external parts to its support appropriate to the weight		N/A
3.6.3.1 (-)	Static load test		P
	- drag coefficient..... :	1,2	P
	- loaded area (m^2)..... :	0,27	P
	- used load (N)..... :	536	P
	- measured deformation (cm/m) ..... :	0	P
	- no rotation		P
3.6.4 (-)	Adjustable lampholders		N/A
3.6.5 (-)	Luminaires installed above 5 m, glass covers shall be:		N/A
	a) glass that fractures into small pieces (test according to 3.6.5.1), or		N/A
	b) glass having a high impact shock resistance (test according to 3.6.5.2), or		N/A
	c) protected by any means to retain glass fragments		N/A
	For tunnel luminaires 3.6.5.1 apply		N/A
	Method of protection declared by the manufacturer		N/A
3.6.5.1 (-)	Protection by the use of glass that fractures into small pieces		N/A
	- number of particles is more than 40 ..... :		N/A
3.6.5.2 (-)	Protection by the use of high impact resistant glass		N/A
3.6.5.2.1 (-)	Glass covers have high mechanical strength		N/A
	Test according IEC 62262 with test apparatus according IEC 60068-2-75 with impact energy of 5J on preconditioned sample		N/A
3.6.5.2.2 (-)	Glass covers not break into large pieces		N/A
	- test according 3.6.5.1, number of particles is more than 20 ..... :		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
3.6.6 (-)	Connection compartment of column-integrated luminaire		N/A
	- provides adequate space		N/A
	- means for attachment		N/A
	- means for attachment of metal corrosion-resistant		N/A
3.6.7 (-)	Compliance with ISO standard or other..... :		N/A
3.6.8 (-)	Doors of column-integrated luminaires:		N/A
	- corrosion-resistant		N/A
	- opening only possible for an authorized person		N/A
	- impact test 5 Nm		N/A
	- sample show no damage		N/A
3.6.9 (-)	Column-integrated luminaire:		N/A
	- dimension of the cable entry slot (mm)..... :		N/A
	- cable path from the slot to the connection compartment (mm) ..... :		N/A
	- cable path free from obstruction that might cause abrasion of the cable		N/A
3.7 (11)	**CREEPAGE DISTANCES AND CLEARANCES**		P
3.7 (11.2)	Creepage distances and clearances .....:	See Table 3.7 (11.2)	P
	Impulse withstand category (Normal category II) (Category III Annex U, Table U.1)	Category II ☒ Category III ☐	—
3.8 (7)	**PROVISION FOR EARTHING**		P
3.8 (7.2.1 + 7.2.3)	Accessible metal parts		P
	Metal parts in contact with supporting surface		P
	Resistance < 0,5 Ω .....:	0,01	P
	Self-tapping screws used		N/A
	Thread-forming screws		N/A
	Thread-forming screw used in a grove		N/A
	Earth makes contact first		P
	Terminal blocks with integrated screwless earthing contacts tested according Annex V		N/A
	Protective earthing of the luminaire not via built-in control gear		P
3.8 (7.2.2 + 7.2.3)	Earth continuity in joints, etc.		P

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Clause	Requirement + Test	Result - Remark	Verdict
3.8 (7.2.4)	Locking of clamping means		N/A
	Compliance with 4.7.3		N/A
	Terminal blocks with integrated screwless earthing contacts tested according Annex V		N/A
3.8 (7.2.5)	Earth terminal integral part of connector socket		N/A
3.8 (7.2.6)	Earth terminal adjacent to mains terminals		P
3.8 (7.2.7)	Electrolytic corrosion of the earth terminal		P
3.8 (7.2.8)	Material of earth terminal		P
	Contact surface bare metal		P
3.8 (7.2.10)	Class II luminaire for looping-in		N/A
	Double or reinforced insulation to functional earth		N/A
3.8 (7.2.11)	Earthing core coloured green-yellow		P
	Length of earth conductor		P
3.8.1 (-)	Attachment prevented from rotation		P
3.9 (14)	**SCREW TERMINALS**		P
	Separately approved; component list	(see Annex 1)	P
	Part of the luminaire	(see Annex 3)	N/A
3.9 (15)	**SCREWLESS TERMINALS AND ELECTRICAL CONNECTIONS**		N/A
	Separately approved; component list .....:	(see Annex 1)	N/A
	Part of the luminaire .....:	(see Annex 4)	N/A
3.10 (5)	**EXTERNAL AND INTERNAL WIRING**		P
3.10 (5.2)	**Supply connection and external wiring**		**P**
3.10 (5.2.1)	Means of connection.....:	Connecting leads	P
	Outdoor luminaire has not PVC insulated external wiring if not class III or SELV ≤ 25 V a.c./60 V d.c. or protected from outdoor environment		N/A
3.10 (5.2.2)	Type of cable.....:		P
	Nominal cross-sectional area (mm²).....:		P
	Cables equal to IEC 60227 or IEC 60245		P
3.10 (5.2.3)	Type of attachment, X, Y or Z		P
3.10 (5.2.5)	Type Z not connected to screws		N/A
3.10 (5.2.6)	Cable entries:		P

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Clause	Requirement + Test	Result - Remark	Verdict
	- suitable for introduction		P
	- adequate degree of protection		P
3.10 (5.2.7)	Cable entries through rigid material have rounded edges		N/A
3.10 (5.2.8)	Insulating bushings:		N/A
	- suitably fixed		N/A
	- material in bushings		N/A
	- material not likely to deteriorate		N/A
	- tubes or guards made of insulating material		N/A
3.10 (5.2.9)	Locking of screwed bushings		N/A
3.10 (5.2.10)	Cord anchorage:		P
	- covering protected from abrasion		P
	- clear how to be effective		P
	- no mechanical or thermal stress		P
	- no tying of cables into knots etc.		N/A
	- insulating material or lining		P
3.10 (5.2.10.1)	Cord anchorage for type X attachment:		N/A
	a) at least one part fixed		N/A
	b) types of cable		N/A
	c) no damaging of the cable		N/A
	d) whole cable can be mounted		N/A
	e) no touching of clamping screws		N/A
	f) metal screw not directly on cable		N/A
	g) replacement without special tool		N/A
	Glands not used as anchorage		N/A
	Labyrinth type anchorages		N/A
3.10 (5.2.10.2)	Adequate cord anchorage for type Y and type Z attachment		P
3.10 (5.2.10.3)	Tests:		P
	- impossible to push cable; unsafe		P
	- pull test: 25 times; pull (N) .....:	60 N	P
	- torque test: torque (Nm).....:		P
	- displacement ≤ 2 mm		P

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Clause	Requirement + Test	Result - Remark	Verdict
	- no movement of conductors		P
	- no damage of cable or cord		P
	- function independent of electrical connection		P
3.10 (5.2.11)	External wiring passing into luminaire		N/A
3.10 (5.2.12)	Looping-in terminals		N/A
3.10 (5.2.13)	Wire ends not tinned		N/A
	Wire ends tinned: no cold flow		N/A
3.10 (5.2.14)	Mains plug same protection		N/A
	Class III luminaire plug		N/A
	No unsafe compatibility		N/A
3.10 (5.2.16)	Appliance inlets (IEC 60320)		N/A
	Installation couplers (IEC 61535)		N/A
	Other appliance inlet or connector according relevant IEC standard		N/A
3.10 (5.2.17)	No standardized interconnecting cables properly assembled		N/A
3.10 (5.2.18)	Used plug in accordance with		N/A
	- IEC 60083		N/A
	- other standard		N/A
3.10 (5.3)	**Internal wiring**		**P**
3.10 (5.3.1)	Internal wiring of suitable size and type		P
	Through wiring		N/A
	- not delivered/ mounting instruction		N/A
	- factory assembled		N/A
	- socket outlet loaded (A) .....:		N/A
	- temperatures .....:	(see Annex 2)	N/A
	Green-yellow for earth only		P
3.10 (5.3.1.1)	Internal wiring connected directly to fixed wiring		P
	Cross-sectional area (mm²) .....:	1,0	P
	Insulation thickness		P

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Clause	Requirement + Test	Result - Remark	Verdict
	Extra insulation added where necessary		N/A
3.10 (5.3.1.2)	Internal wiring connected to fixed wiring via internal current-limiting device		P
	Adequate cross-sectional area and insulation thickness		P
3.10 (5.3.1.3)	Double or reinforced insulation for class II		N/A
3.10 (5.3.1.4)	Conductors without insulation		N/A
3.10 (5.3.1.5)	SELV current-carrying parts		N/A
3.10 (5.3.1.6)	Insulation thickness other than PVC or rubber		N/A
3.10 (5.3.2)	Sharp edges etc.		P
	No moving parts of switches etc.		N/A
	Joints, raising/lowering devices		N/A
	Telescopic tubes etc.		N/A
	No twisting over 360°		P
3.10 (5.3.3)	Insulating bushings:		N/A
	- suitable fixed		N/A
	- material in bushings		N/A
	- material not likely to deteriorate		N/A
	- cables with protective sheath		N/A
3.10 (5.3.4)	Joints and junctions effectively insulated		P
3.10 (5.3.5)	Strain on internal wiring		N/A
3.10 (5.3.6)	Wire carriers		N/A
3.10 (5.3.7)	Wire ends not tinned		N/A
	Wire ends tinned: no cold flow		N/A
3.10.1 (-)	Cord anchorage if applicable		P
	- pull test: 25 times; pull (N) ..... :	60 N	P
	- torque test: torque (Nm)..... :	0,25 Nm	P

3.11 (8)	**PROTECTION AGAINST ELECTRIC SHOCK**		P
3.11 (8.2.1)	Live parts not accessible		P
	Basic insulated parts not used on the outer surface without appropriate protection		P

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Clause	Requirement + Test	Result - Remark	Verdict
	Basic insulated parts not accessible with standard test finger on portable, settable and adjustable luminaires		N/A
	Basic insulated parts not accessible with Ø 50 mm probe from outside, other types of luminaires		P
	Lamp and starterholders in portable and adjustable luminaires comply with double or reinforced insulation requirements		N/A
	Basic insulation only accessible under lamp or starter replacement		N/A
	Protection in any position		P
	Double-ended tungsten filament lamp		N/A
	Insulation lacquer not reliable		P
	Double-ended high pressure discharge lamp		N/A
	Relevant warning according to 3.2.18 fitted to the luminaire		N/A
3.11 (8.2.2)	Portable luminaire adjusted in most unfavourable position		N/A
3.11 (8.2.3.a)	Class II luminaire:		N/A
	- basic insulated metal parts not accessible during starter or lamp replacement		N/A
	- basic insulation not accessible other than during starter or lamp replacement		N/A
	- glass protective shields not used as supplementary insulation		N/A
3.11 (8.2.3.b)	BC lampholder of metal in class I luminaires shall be earthed		N/A
3.11 (8.2.3.c)	SELV circuits with exposed current carrying parts:		N/A
	Ordinary luminaire:		N/A
	- voltage under load (V) .....:		N/A
	- no-load voltage (V) .....:		N/A
	- touch current if applicable (mA) .....:		N/A
	One conductive part insulated if required		N/A
	Other than ordinary luminaire:		N/A
	- nominal voltage (V) .....:		N/A
	Class III luminaire only for connection to SELV		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	Class III luminaire not provided with means for protective earthing		N/A
1.11 (8.2.4)	Portable luminaire have protection independent of supporting surface		N/A
3.11 (8.2.5)	Compliance with the standard test finger or relevant probe		P
3.11 (8.2.6)	Covers reliably secured		P
3.11 (8.2.7)	Luminaire other than below with capacitor > 0,5 µF not exceed 50 V 1 min after disconnection		P
	Portable luminaire with capacitor > 0,1 µF (0.25) not exceed 34 V 1 s after disconnection		N/A
	Other luminaires with capacitor > 0,1 µF (0.25) with plug and track adaptors not exceed 60 V 5 s after disconnection		N/A
3.12 (12)	**ENDURANCE TEST AND THERMAL TEST**		P
3.12.2 (-)	If IP > IP 20 relevant test of (12.4), (12.5) and (12.6) after (9.2) before (9.3) specified in 3.13		—
3.12 (12.3)	Endurance test:		P
	- mounting-position .....:	mast arms	—
	- test temperature (°C) .....:	60	—
	- total duration (h) .....:	240	—
	- supply voltage: Un factor; calculated voltage (V)...:	305 V~	—
	- lamp used .....:	LED as delivered	—
3.12 (12.3.2)	After endurance test:		P
	- no part unserviceable		P
	- luminaire not unsafe		P
	- no damage to track system		N/A
	- marking legible		P
	- no cracks, deformation etc.		P
3.12 (12.4)	Thermal test (normal operation)	(see Annex 2)	P
3.12 (12.5)	Thermal test (abnormal operation)	(see Annex 2)	N/A
3.12 (12.6)	Thermal test (failed lamp control gear condition):		N/A
3.12 (12.6.1)	Through wiring or looping-in wiring loaded by a current of (A) .....:		—
	- case of abnormal conditions .....:		—

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Clause	Requirement + Test	Result - Remark	Verdict
	- electronic lamp control gear		N/A
	- measured winding temperature (°C): at 1,1 Un ....:		—
	- measured mounting surface temperature (°C) at 1,1 Un .....:		N/A
	- calculated mounting surface temperature (°C) .....:		N/A
	- track-mounted luminaires		N/A
3.12 (12.6.2)	Temperature sensing control		N/A
	- case of abnormal conditions .....:		—
	- thermal link		N/A
	- manual reset cut-out		N/A
	- auto reset cut-out		N/A
	- measured mounting surface temperature (°C).....:		N/A
	- track-mounted luminaires		N/A
3.12 (12.7)	Thermal test (failed lamp control gear in plastic luminaires):		N/A
3.12 (12.7.1)	Luminaire without temperature sensing control		N/A
3.12 (12.7.1.1)	Luminaire with fluorescent lamp ≤ 70W		N/A
	Test method 12.7.1.1 or Annex W .....:		—
	Test according to 12.7.1.1:		N/A
	- case of abnormal conditions .....:		—
	- Ballast failure at supply voltage (V) .....:		—
	- Components retained in place after the test		N/A
	- Test with standard test finger after the test		N/A
	Test according to Annex W:		N/A
	- case of abnormal conditions .....:		—
	- measured winding temperature (°C): at 1,1 Un .....:		—
	- measured temperature of fixing point/exposed part (°C): at 1,1 Un .....:		—
	- calculated temperature of fixing point/exposed part (°C) .....:		—
	Ball-pressure test..... :	See Table 3.15 (13.2.1)	N/A
3.12 (12.7.1.2)	Luminaire with discharge lamp, fluorescent lamp > 70W, transformer > 10 VA		N/A
	- case of abnormal conditions .....:		—

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Clause	Requirement + Test	Result - Remark	Verdict
	- measured winding temperature (°C): at 1,1 Un .....:		—
	- measured temperature of fixing point/exposed part (°C): at 1,1 Un .....:		—
	- calculated temperature of fixing point/exposed part (°C) .....:		—
	Ball-pressure test.....:	See Table 3.15 (13.2.1)	N/A
3.12 (12.7.1.3)	Luminaire with short circuit proof transformers ≤ 10 VA		N/A
	- case of abnormal conditions .....:		—
	- Components retained in place after the test		N/A
	- Test with standard test finger after the test		N/A
3.12 (12.7.2)	Luminaire with temperature sensing control		N/A
	- thermal link.....:	Yes ☐ No ☐	—
	- manual reset cut-out.....:	Yes ☐ No ☐	—
	- auto reset cut-out .....:	Yes ☐ No ☐	—
	- case of abnormal conditions .....:		—
	- highest measured temperature of fixing point/ exposed part (°C): .....:		—
	Ball-pressure test:.....:	See Table 3.15 (13.2.1)	N/A
3.12.1 (-)	Temperature reduction if for outdoor use only		P
3.12.2 (-)	(See above)		—
3.12.3 (-)	Glass covers used within the thermal limits declared by the glass manufacturer		N/A

3.13 (9)	**RESISTANCE TO DUST AND MOISTURE**		P
3.13.1 (-)	If IP > IP 20 the order of tests as specified in clause 3.12		P
3.13 (9.2)	Tests for ingress of dust, solid objects and moisture:		P
	- classification according to IP.....:	IP66	—
	- mounting position during test .....:	mast arm	—
	- fixing screws tightened; torque (Nm).....:	4,2 Nm on gland	—
	- tests according to clauses .....:	9.2.2 and 9.2.7	—
	- electric strength test afterwards		P
	a) no deposit in dust-proof luminaire		N/A
	b) no talcum in dust-tight luminaire		P

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Clause	Requirement + Test	Result - Remark	Verdict
	c) no trace of water on current-carrying parts or on insulation where it could become a hazard		P
	c.1) For luminaires without drain holes – no water entry		P
	c.2) For luminaires with drain holes – no hazardous water entry		N/A
	d) no water in watertight or pressure watertight luminaire		N/A
	e) no contact with live parts (IP 2X)		N/A
	e) no entry into enclosure (IP 3X and IP 4X)		N/A
	e) no contact with live parts through drain holes and ventilation slots (IP3X and IP4X)		N/A
	f) no trace of water on part of lamp requiring protection from splashing water		N/A
	g) no damage of protective shield or glass envelope		N/A
3.13 (9.3)	Humidity test 48 h		P
3.14 (10)	**INSULATION RESISTANCE AND ELECTRIC STRENGTH**		P
3.14 (10.2.1)	Insulation resistance test		P
	Cable or cord covered by metal foil or replaced by a metal rod of mm Ø .....:		—
	Insulation resistance (MΩ) .....:		—
	SELV		N/A
	- between current-carrying parts of different polarity :		N/A
	- between current-carrying parts and mounting surface .....:		N/A
	- between current-carrying parts and metal parts of the luminaire.....:		N/A
	- between the outer surface of a flexible cord or cable where it is clamped in a cord anchorage and accessible metal parts .....:		N/A
	- Insulation bushings as described in Section 5 .....:		N/A
	Other than SELV		P
	- between live parts of different polarity.....:		N/A
	- between live parts and mounting surface .....:	5000 M	P
	- between live parts and metal parts.....:	5000 M	P
	- between live parts of different polarity through action of a switch .....:		N/A

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	- between the outer surface of a flexible cord or cable where it is clamped in a cord anchorage and accessible metal parts .....:		N/A
	- Insulation bushings as described in Section 5 .....:		N/A
3.14 (10.2.2)	Electric strength test		P
	Dummy lamp		N/A
	Luminaires with ignitors after 24 h test		N/A
	Luminaires with manual ignitors		N/A
	Test voltage (V) .....:	1600 V	P
	SELV		N/A
	- between current-carrying parts of different polarity :		N/A
	- between current-carrying parts and mounting surface .....:		N/A
	- between current-carrying parts and metal parts of the luminaire.....:		N/A
	- between the outer surface of a flexible cord or cable where it is clamped in a cord anchorage and accessible metal parts .....:		N/A
	- Insulation bushings as described in Section 5 .....:		N/A
	Other than SELV		P
	- between live parts of different polarity.....:		N/A
	- between live parts and mounting surface .....:	1600 V	P
	- between live parts and metal parts.....:	1600 V	P
	- between live parts of different polarity through action of a switch .....:		N/A
	- between the outer surface of a flexible cord or cable where it is clamped in a cord anchorage and accessible metal parts .....:		N/A
	- Insulation bushings as described in Section 5 .....:		N/A
3.14 (10.3)	Touch current or protective conductor current (mA).:	0,001 mA	P

3.15 (13)	**RESISTANCE TO HEAT, FIRE AND TRACKING**		P
3.15 (13.2.1)	Ball-pressure test.....:	See Test Table 3.15 (13.2.1)	P
3.15 (13.3.1)	Needle-flame test (10 s) .....:	See Test Table 3.15 (13.3.1)	P
3.15 (13.3.2)	Glow-wire test (650°C).....:	See Test Table 3.15 (13.3.2)	P

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Clause	Requirement + Test	Result - Remark	Verdict
3.15 (13.4)	Proof tracking test (IEC 60112).....:	See Test Table 3.15 (13.4)	P

3.7 (11.2)	TABLE: Creepage distances and clearances							P
	Minimum distances (mm) for a.c. (50/60 Hz) sinusoidal voltages							P
	Applicable part of IEC 60598-1 Table 11.1* and 11.2*							P
	Insulation type **	Measured clearance	Required		Measured creepage	Required		
			clearance	*Table		creepage	*Table	
Distance 1:	BI	2,85	1,8	11.1	2,85	2,8	11.1	
Working voltage (V) ..... :					277 V~			—
PTI ..... :					< 600 ☒ ≥ 600 ☐			—
Pulse voltage if applicable (kV) ..... :					--			—
Supplementary information: L-N for 60 W model								
Distance 2:	BI	3,68	1,8	11.1	3,68	2,8	11.1	
Working voltage (V) ..... :					277 V~			—
PTI ..... :					< 600 ☒ ≥ 600 ☐			—
Pulse voltage if applicable (kV) ..... :					--			—
Supplementary information: live – accessible part for 60 W model								
Distance 3:	BI	2,4	1,8	11.1	3,1	2,8	11.1	
Working voltage (V) ..... :					277 V~			—
PTI ..... :					< 600 ☒ ≥ 600 ☐			—
Pulse voltage if applicable (kV) ..... :					--			—
Supplementary information: L-N for 180 W model								
Distance 4:	BI	3,2	1,8	11.1	3,2	2,8	11.1	
Working voltage (V) ..... :					277 V~			—
PTI ..... :					< 600 ☒ ≥ 600 ☐			—
Pulse voltage if applicable (kV) ..... :					--			—
Supplementary information: live – accessible part for 180 W model								

** Insulation type: B – Basic; S – Supplementary; R – Reinforced. See also IEC 60598-1 Annex M.

3.15 (13.2.1)	TABLE: Ball Pressure Test of Thermoplastics	P
Allowed impression diameter (mm) .....:	2 mm	—

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Clause	Requirement + Test	Result - Remark	Verdict

Object/ Part No./ Material	Manufacturer/ trademark	Test temperature (°C)	Impression diameter (mm)
Lens	see component list	125	0,5
PCB of LED driver	see component list	125	0,5
Supplementary information:--			

3.15 (13.3.1)	TABLE: Needle-flame test (IEC 60695-11-5)				P
Object/ Part No./ Material	Manufacturer/ trademark	Duration of application of test flame (ta); (s)	Ignition of specified layer Yes/No	Duration of burning (tb) (s)	Verdict
PCB for component list	see component list	10	No	0	P
Supplementary information:--					

3.15 (13.3.2)	TABLE: Glow-wire test (IEC 60695-2-11)			P
Glow wire temperature .....:	650°C			—
Object/ Part No./ Material	Manufacturer/ trademark	Ignition of specified layer Yes/No	Duration of burning (tb) (s)	Verdict
Lens	see component list	no	0	P
potting compound of LED driver	see component list	no	0	P
cord anchorage	see component list	no	0	P
rubber ring	see component list	no	0	P
Any flame or glowing of the sample extinguished within 30 s of withdrawing the glow-wire, and any burning or molten drop did not ignite the underlying parts (Yes/No) ..... :				Yes
Supplementary information: --				

3.15 (13.4)	TABLE: Proof tracking test (IEC 60112)	P

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Clause	Requirement + Test	Result - Remark	Verdict

Test voltage PTI .....:		175 V			—
Object/ Part No./ Material	Manufacturer/ trademark	Withstand 50 drops without failure on three places or on three specimens			Verdict
Lens	**see component list**	P	P	P	P
Supplementary information: --					

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Clause	Requirement + Test	Result - Remark	Verdict

ANNEX 1	TABLE: Critical components information					P
Object / part No.	**Code**	**Manufacturer/ trademark**	**Type / model**	**Technical data**	**Standard**	**Mark(s) of conformity[1)]**
Supply cord	B	Ningbo Dabu Electric Appliance Co., Ltd.	H05RN-F	3 X 1,0 mm^2	VDE 0282-4	VDE 40030691
Supply cord (Alternative)	B	Guangdong KaiHua Electric Appliance Co., Ltd.	H05RN-F	3 X 1,0 mm^2	VDE 0282-4	VDE 40015132
Supply cord (Alternative)	B	Huizhou Mainland Electric Wire & Cable Co., Ltd.	H05RN-F	3 X 1,0 mm^2	VDE 0282-4	VDE 40026038
Supply cord (Alternative)	B	Guangdong Rifeng Electrical Cable Co., Ltd.	H05RN-F	3 X 1,0 mm^2	VDE 0282-4	VDE 40015999
internal wiring	B	Ningbo Dabu Electric Appliance Co., Ltd.	H05RN-F	2 X 1,0 mm^2	VDE 0282-4	VDE 40030691
internal wiring (Alternative)	B	Guangdong KaiHua Electric Appliance Co., Ltd.	H05RN-F	2 X 1,0 mm^2	VDE 0282-4	VDE 40015132
internal wiring (Alternative)	B	Huizhou Mainland Electric Wire & Cable Co., Ltd.	H05RN-F	2 X 1,0 mm^2	VDE 0282-4	VDE 40026038
internal wiring (Alternative)	B	Guangdong Rifeng Electrical Cable Co., Ltd.	H05RN-F	2 X 1,0 mm^2	VDE 0282-4	VDE 40015999
internal wiring (Alternative)	B	Dongguan Recheer Electric Wire & Cable Co., Ltd.	H05RN-F	2 X 1,0 mm^2	VDE 0282-4	VDE 40015173
internal wiring (Alternative)	B	Lucky United electric Wire & Cable Co., Ltd.	H05RN-F	2 X 1,0 mm^2	VDE 0282-4	VDE 40039185
Earthing wire	B	Shangyu Mingsheng Cable Co., Ltd.	H05S-L	1 X 0,5 mm^2	VDE 0282-4	VDE 40023108
Connector	B	Hangzhou HPWINNER Opto. Corporation	C1A-1F	500 V; 10 A; IP68	IEC 61984	TUV SUD SG-IT-00113

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Clause	Requirement + Test	Result - Remark	Verdict

Connector (Alternative)	B	Hangzhou HPWINNER Opto. Corporation	C1A-1M	500 V; 10 A; IP68	IEC 61984	TUV SUD SG-IT-00113
Connector (Alternative)	B	Hangzhou HPWINNER Opto. Corporation	C1A-S2M	500 V; 10 A; IP68	IEC 61984	TUV SUD SG-IT-00113
Connector (Alternative)	B	Hangzhou HPWINNER Opto. Corporation	C1A-S3M	500 V; 10 A; IP68	IEC 61984	TUV SUD SG-IT-00113
Connector (Alternative)	B	Hangzhou HPWINNER Opto. Corporation	C1A-S4M	500 V; 10 A; IP68	IEC 61984	TUV SUD SG-IT-00113
LED driver	C	INVENTRONICS	EUG-150S105D	input: 120 – 277 V~; 50/60 Hz Output: 1350 mA; 30 – 45 Vdc; 1400 mA; 28 – 42 Vdc; IP67; 1 – 10 V dimming; tc = 80 ℃	IEC/EN 61347-2-13; IEC/EN 61347-1	Tested in appliance
LED driver	C	INVENTRONICS	EUG-240S105DV	input: 120 – 277 V~; 50/60 Hz Output: 1500 mA; 80 – 120 Vdc; 1600 mA; 75 – 113 Vdc; IP67; 1 – 10 V dimming; tc = 80 ℃	IEC/EN 61347-2-13; IEC/EN 61347-1	Tested in appliance
terminal block	B	Heavy Power Co., Ltd.	PA9	450 V; 24 A; max 2,5 mm^2	EN 60998-1; EN 60998-2-1	VDE 40016425
terminal block	B	Jiangxi Kimbetter Electrical Co., Ltd.	PA12	500 V; 2,5 - 6 mm^2	EN 60998-1; EN 60998-2-1	VDE 40025351
terminal block	B	Jiangxi Kimbetter Electrical Co., Ltd.	PA14	500 V; 0,5 - 10 mm^2	EN 60998-1; EN 60998-2-1	VDE 40036869
connector (inside the driver chamber)	B	Wago Kontakttechnik Gmbh & Co., KG.	222-412	400 V; 2,5 - 4 mm^2	EN 60998-1; EN 60998-2-1	ENEC 01360

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Clause	Requirement + Test	Result - Remark	Verdict

connector (inside the driver chamber) (Alternative)	B	Wago Kontakttechnik Gmbh & Co., KG.	222-413	400 V; 2,5 - 4 mm^2	EN 60998-1; EN 60998-2-1	ENEC 01360
connector (inside the driver chamber) (Alternative)	C	Degson Electronics Co., Ltd.	DG223-4.61-02P	400 V; 2,5 - 4 mm^2	IEC/EN 60598-2-3	Tested in appliance
connector (inside the driver chamber) (Alternative)	C	Degson Electronics Co., Ltd.	DG223-4.61-03P	400 V; 2,5 - 4 mm^2	IEC/EN 60598-2-3	Tested in appliance
connector (inside the driver chamber) (Alternative)	C	Shanghai Long-Join Intelligent Technology Inc.	JL207	105- 305 V~; 50/60 Hz; 1000 W max	IEC/EN 60598-2-3	Tested in appliance
PCB for LED module	C	Hangzhou Dejia Electronics Co., Ltd.	DJ-A06	MCPCB; V-0	IEC/EN 60598-2-3	Tested in appliance
PCB for LED module	C	Hangzhou Dongda Electronic Co., Ltd.	HD	MCPCB; V-0	IEC/EN 60598-2-3	Tested in appliance
PCB for LED module	C	Hangzhou Dongda Electronic Co., Ltd.	HD-1	MCPCB; V-0	IEC/EN 60598-2-3	Tested in appliance
LED module	C	Hangzhou HPWINNER Opto Corporation	M2A-26	Constant current input: 1,4 A max; 60 W max;	IEC/EN 62031	Tested in appliance
LED chip	C	Cree	XPG3	3 V; 0,35 A	IEC/EN 60598-2-3	Tested in appliance
Lens	C	HPWINNER	--	PC	IEC/EN 60598-2-3	Tested in appliance
Cord anchorage	C	HPWINNER	--	PC	IEC/EN 60598-2-3	Tested in appliance
For LED driver						
Input wiring	B	Guangdong KaiHua Electric Appliance Co.,Ltd	H05RN-F	3×1.0mm²	EN 60245-3	VDE 40015132
Input wiring (Alternative)	B	Ningbo Dabu Electric Appliance Co.,Ltd.	H05RN-F	3×1.0mm²	EN 60245-3	VDE 40030691
Input wiring (Alternative)	B	Huizhou Mainland Electric Wire & Cable Co., Ltd.	H05RN-F	3×1.0mm²	EN 60245-3	VDE 40026038

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Clause	Requirement + Test	Result - Remark	Verdict

Input wiring (Alternative)	B	Guangdong Rifeng Electrical Cable Co., Ltd.	H05RN-F	3×1.0mm²	EN 60245-3	VDE 40015999
output wiring	B	Guangdong KaiHua Electric Appliance Co.,Ltd	H05RN-F	2×1.0mm²	EN 60245-3	VDE 40015132
output wiring (Alternative)	B	Ningbo Dabu Electric Appliance Co.,Ltd.	H05RN-F	2×1.0mm²	EN 60245-3	VDE 40030691
output wiring (Alternative)	B	Huizhou Mainland Electric Wire & Cable Co., Ltd.	H05RN-F	2×1.0mm²	EN 60245-3	VDE 40026038
output wiring (Alternative)	B	Guangdong Rifeng Electrical Cable Co., Ltd.	H05RN-F	2×1.0mm²	EN 60245-3	VDE 40015999
earthing wiring	B	Jiangyin Haocheng Electrical Appliances Wire & Cable Co.,Ltd	H05SJ-K	0.75mm2 , 180 ℃,	EN 50525-2-41	VDE 40017754
earthing wiring (Alternative)	B	Zhuhai Hengwang Electronics Co., Ltd.	H05SJ-K	0.75mm2 , 180 ℃,	EN 50525-2-41	VDE 40025629
fuse	B	Dongguan Better Electronics Technology Co., Ltd.	932	10A 300VAC	IEC 60127-1 IEC 60127-3	TUV 50279350
Y2 Capacitors(C61)	B	Jyh Chung Electronic Co., Ltd.	JY	10nF 300VAC, 25/085/21/C	EN 60384-14	VDE 123326
Y2 Capacitors(C61) (Alternative)	B	Haohua Electronic Co.	CT 7	10nF 300VAC, 30/125/56/C	EN 60384-14	VDE 40013601
Varistor(MOV1, MOV2,MOV3,MOV4,MOV5,MOV6,MOV8)	B	Haohua Electronic Co.	HVR 14 K511	510V,T85	IEC 61051-1 IEC 61051-2 IEC 61051-2-2	VDE 40031718
Varistor(MOV1, MOV2,MOV3,MOV4,MOV5,MOV6,MOV8) (Alternative)	B	Guangdong Foshan Kestar Electronic Co., Ltd.	MYG14-511	510V,T85	IEC 61051-1 IEC 61051-2 IEC 61051-2-2	VDE 40005616
Varistor(MOV1, MOV2,MOV3,MOV4,MOV5,MOV6,MOV8) (Alternative)	B	Brightking (Shenzhen) Co., Ltd.	14D511K	510V,T85	IEC 61051-1 IEC 61051-2 IEC 61051-2-2	VDE 40027827

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Clause	Requirement + Test	Result - Remark	Verdict

Varistor(MOV1, MOV2,MOV3,MOV4,MOV5,MOV6,MOV8) (Alternative)	B	Centra Science Corp.	CNR-14D511K	510V,T85	IEC 61051-1 IEC 61051-2 IEC 61051-2-2	VDE 40008220
Varistor(MOV1, MOV2,MOV3,MOV4,MOV5,MOV6,MOV8) (Alternative)	B	Thinking Electronic Industrial Co., Ltd.	TVR14511-D	510V,T85	IEC 61051-1 IEC 61051-2 IEC 61051-2-2	VDE 40021243
Varistor(MOV9)	B	Haohua Electronic Co.	HVR 14 K561	560V,T85	IEC 61051-1 IEC 61051-2 IEC 61051-2-2	VDE 40031718
Varistor(MOV9) (Alternative)	B	Guangdong Foshan Kestar Electronic Co., Ltd.	MYG14-561	560V,T85	IEC 61051-1 IEC 61051-2 IEC 61051-2-2	VDE 40005616
Varistor(MOV9) (Alternative)	B	Brightking (Shenzhen) Co., Ltd.	14D561K	560V,T85	IEC 61051-1 IEC 61051-2 IEC 61051-2-2	VDE 40027827
Varistor(MOV9) (Alternative)	B	Centra Science Corp.	CNR-14D561K	5670V,T85	IEC 61051-1 IEC 61051-2 IEC 61051-2-2	VDE 40008220
Varistor(MOV9) (Alternative)	B	Thinking Electronic Industrial Co., Ltd.	TVR14561-D	560V,T85	IEC 61051-1 IEC 61051-2 IEC 61051-2-2	VDE 40021243
Varistor(MOV7)	B	Haohua Electronic Co.	HVR 20 K561	560V,T85	IEC 61051-1 IEC 61051-2 IEC 61051-2-2	VDE 40031718
Varistor(MOV7) (Alternative)	B	Guangdong Foshan Kestar Electronic Co., Ltd.	MYG20-561	560V,T85	IEC 61051-1 IEC 61051-2 IEC 61051-2-2	VDE 40005616
Varistor(MOV7) (Alternative)	B	Brightking (Shenzhen) Co., Ltd.	20D561K	560V,T85	IEC 61051-1 IEC 61051-2 IEC 61051-2-2	VDE 40027827
Varistor(MOV7) (Alternative)	B	Centra Science Corp.	CNR-20D561K	560V,T85	IEC 61051-1 IEC 61051-2 IEC 61051-2-2	VDE 40008220
Varistor(MOV7) (Alternative)	B	Thinking Electronic Industrial Co., Ltd.	TVR20561-D	560V,T85	IEC 61051-1 IEC 61051-2 IEC 61051-2-2	VDE 40021243

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Clause	Requirement + Test	Result - Remark	Verdict

X2 Capacitors(CX2)	B	Nanjing Tengen Rongguangda Electronics (Group) Co., Ltd.	MKP	0.22uF AC 275 V 40/100/56 X2 type	IEC 60384-14	VDE 40028680
X2 Capacitors(CX2) (Alternative)	B	Foshan City Nanhai District Xinyuan Electronic Co., Ltd.	MKP-X2	0.22uF AC 275 V 40/105/21 X2 type	IEC 60384-14	VDE 40027433
X2 Capacitors(CX2) (Alternative)	B	Carli Electronics Co., Ltd.	MPX	0.22uF AC 275 V 40/100/21 X2 type	IEC 60384-14	VDE 40008520
X2 Capacitors(CX2) (Alternative)	B	Xiamen Faratronic Co. Ltd.	MKP62	0.22uF AC 275 V 40/100/56 X2 type	IEC 60384-14	VDE 40000358
X2 Capacitors(CX2) (Alternative)	B	Shenzhen Jing Yu Electronics Co., Ltd.	CBBX2	0.22uF AC 275 V 40/100/21 X2 type	IEC 60384-14	VDE 40025597
X2 Capacitors(CX2) (Alternative)	B	STRONG Components Co. LTD	MPX	0.22uF AC 275 V 40/110/56 X2 type	IEC 60384-14	VDE 40005451
X2 Capacitors(CX2) (Alternative)	B	DongGuan Wei Qing Electronic Co. ,Ltd	MPX	0.22uF AC275V,AC300V, AC310V 40/110/ 56 X2 type	IEC 60384-14	VDE 40040406
X2 Capacitors(CX1)	B	Nanjing Tengen Rongguangda Electronics (Group) Co., Ltd.	MKP	0.15uF AC 275 V 40/100/56 X2 type	IEC 60384-14	VDE 40028680
X2 Capacitors(CX1) (Alternative)	B	Foshan City Nanhai District Xinyuan Electronic Co., Ltd.	MKP-X2	0.15uF AC 275 V 40/105/21 X2 type	IEC 60384-14	VDE 40027433
X2 Capacitors(CX1) (Alternative)	B	Carli Electronics Co., Ltd.	MPX	0.15uF AC 275 V 40/100/21 X2 type	IEC 60384-14	VDE 40008520
X2 Capacitors(CX1) (Alternative)	B	Xiamen Faratronic Co. Ltd.	MKP62	0.15uF AC 275 V 40/100/56 X2 type	IEC 60384-14	VDE 40000358
X2 Capacitors(CX1) (Alternative)	B	Shenzhen Jing Yu Electronics Co., Ltd.	CBBX2	0.15uF AC 275 V 40/100/21 X2 type	IEC 60384-14	VDE 40025597
X2 Capacitors(CX1) (Alternative)	B	STRONG Components Co. LTD	MPX	0.15uF AC 275 V 40/110/56 X2 type	IEC 60384-14	VDE 40005451

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Clause	Requirement + Test	Result - Remark	Verdict

X2 Capacitors(CX1) (Alternative)	B	DongGuan Wei Qing Electronic Co. ,Ltd	MPX	0.15uF AC275V,AC300V, AC310V 40/110/ 56 X2 type	IEC 60384-14	VDE 40040406
Y1 Capacitors(CY1, CY2,CY3,CY3A, CY4,CY5)	B	Haohua Electronic Co.	CT 7	Y1 2.2nF/400V	IEC 60384-14	VDE 40003902
Y1 Capacitors(CY1, CY2,CY3,CY3A, CY4,CY5) (Alternative)	B	Jyh Chung Electronic Co., Ltd.	JD	Y1 2.2nF/400V	IEC 60384-14	VDE 137027
Y1 Capacitors(CY1, CY2,CY3,CY3A, CY4,CY5) (Alternative)	B	JYH HSU (JEC) ELECTRONICS LTD	JD	Y1 2.2nF/400V	IEC 60384-14	VDE 40038642
Y1 Capacitors(CY1, CY2,CY3,CY3A, CY4,CY5) (Alternative)	B	Walsin Technology Corp.	AH	Y1 2.2nF/400V	IEC 60384-14	VDE 40001804
PCB	B	LIANXIANG ELECTRONICS CO LTD	LX-D,LX-DS	V-0, 130°C	IEC/EN 61347-1, IEC/EN 61347-2-13	Tested with appliances UL E328148
PCB (Alternative)	B	HE SHAN RUN CHANG ELECTRON & ELECTRIC CO LTD	HE-02	V-0, 130°C	IEC/EN 61347-1, IEC/EN 61347-2-13	Tested with appliances UL E242464
PCB (Alternative)	B	SHENZHEN COREPCB TECHNOLOGY CO LTD	GH-4	V-0, 130°C	IEC/EN 61347-1, IEC/EN 61347-2-13	Tested with appliances UL E349020
PCB (Alternative)	B	HUIZHOU TAISHENG ELECTRONICS CO LTD	TS-M8	V-0, 130°C	IEC/EN 61347-1, IEC/EN 61347-2-13	Tested with appliances UL E361828
PCB (Alternative)	B	FO SHAN LIAN XING CIRCUIT BOARD CO LTD	LX-A-B	V-0, 105°C	IEC/EN 61347-1, IEC/EN 61347-2-13	Tested with appliances UL E248320
Transformer (Alternative)	B	FOSHAN HUAQUAN ELECTRICAL LIGHTING CO.,LTD	PQ3220	Class B 130°C 320uH	IEC/EN 61347-1, IEC/EN 61347-2-13	Tested with appliance
Transformer (Alternative)	B	LI-YU ELECTRONIC CO LTD	PQ3220	Class B 130°C 320uH	IEC/EN 61347-1, IEC/EN 61347-2-13	Tested with appliance

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Clause	Requirement + Test	Result - Remark	Verdict

Transformer (Alternative)	B	FoshanCity Shunde District Beijiao sheng yi Electrical Appliance Factory	PQ3220	Class B 130°C 320uH	IEC/EN 61347-1, IEC/EN 61347-2-13	Tested with appliance
Transformer (Alternative)	B	BOLUOXIAN JIASHENGYUAN ELECTRONICS CO., LTD.	PQ3220	Class B 130°C 320uH	IEC/EN 61347-1, IEC/EN 61347-2-13	Tested with appliance
Transformer (Alternative)	B	Zhongshan Cabernet Electronic Technology Co., Ltd.	PQ3220	Class B 130°C 320uH	IEC/EN 61347-1, IEC/EN 61347-2-13	Tested with appliance
Transformer (Alternative)	B	Shenzhen Baoxin flag Technology Co. Ltd.	PQ3220	Class B 130°C 320uH	IEC/EN 61347-1, IEC/EN 61347-2-13	Tested with appliance
Opto coupler	B	Everlight	EL817	Dti≥0,4mm;Reinforced insulation;T100	IEC 60747-5-2 IEC 60747-5-5	VDE 132249
Opto coupler	B	Bright Led	BPC 817B	Dti≥0,4mm;reinforced insulation;T100	IEC 60747-5-2 IEC 60747-5-5	VDE 40007240
potting compound	C	Dongguan Zhaoshun Sililcone New Material Technology Co., Ltd.	ZS-GF, 118A/B	V-0	IEC/EN 61347-1, IEC/EN 61347-2-13	Tested with appliance
potting compound (Alternative)	C	Fuming Chemical Industry Co., Ltd.	FM-700(XX)	V-0	IEC/EN 61347-1, IEC/EN 61347-2-13	Tested with appliance
potting compound (Alternative)	C	Guangzhou Better New Materials Co., Ltd.	116P; 117P	V-0	IEC/EN 61347-1, IEC/EN 61347-2-13	Tested with appliance
RA (RA1, RA3)	C	Shenzhen Junyao Electronics Co., Ltd.	2RH3000L-8	3000 V	IEC/EN 61347-1, IEC/EN 61347-2-13	Tested with appliance
RA (RA1, RA3)	C	Shenzhen Longyuan Rui Electronics Co., Ltd.	2RH3000T-8	3000 V	IEC/EN 61347-1, IEC/EN 61347-2-13	Tested with appliance
RA (RA2, RA4, RA5)	C	Shenzhen Junyao Electronics Co., Ltd.	2RL470L-5	470 V	IEC/EN 61347-1, IEC/EN 61347-2-13	Tested with appliance
RA (RA2, RA4, RA5)	C	Shenzhen Longyuan Rui Electronics Co., Ltd.	2RL470L-5	470 V	IEC/EN 61347-1, IEC/EN 61347-2-13	Tested with appliance

IEC 60598-2-3			
Clause	Requirement + Test	Result - Remark	Verdict

Supplementary information:

[1)] Provided evidence ensures the agreed level of compliance. See OD-CB2039.

The codes above have the following meaning:

A - The component is replaceable with another one, also certified, with equivalent characteristics

B - The component is replaceable if authorised by the test house

C - Integrated component tested together with the appliance

D - Alternative component

IEC 60598-2-3			
Clause	Requirement + Test	Result - Remark	Verdict

ANNEX 2	TABLE: Temperature measurements, thermal tests of Section 12		P
	Type reference ..... :	LT2120-C4	—
	Lamp used..... :	LED as delivered	—
	Lamp control gear used ..... :	LED driver as delivered	—
	Mounting position of luminaire..... :	on mast arm	—
	Supply wattage (W) ..... :	119,9	—
	Supply current (A)..... :	0,7	—
	Calculated power factor ..... :	0,955	—
	Table: measured temperatures corrected for ta = 50 °C:		P
	- abnormal operating mode ..... :	LED driver shut off when output was short-circuited	—
	- test 1: rated voltage ..... :	277 V	—
	- test 2: 1,06 times rated voltage or 1,05 times rated wattage..... :	293,6 V	—
	- test 3: Load on wiring to socket-outlet, 1,06 times voltage or 1,05 times wattage ..... :	--	—
	- test 4: 1,1 times rated voltage or 1,05 times rated wattage..... :	--	—
	Through wiring or looping-in wiring loaded by a current of A during the test ..... :	--	—

Temperature measurements, (°C)

Part	Ambient	Clause 12.4 – normal				Clause 12.5 – abnormal	
		test 1	test 2	test 3	limit	test 4	limit
supply cord	50	--	55,6	--	90	--	--
terminal block	50	--	56,5	--	130	--	--
tc	50	63,5	--	--	80	--	--
internal wiring	50	--	56,5	--	90	--	--
connector	50	--	59,8	--	90	--	--
internal wiring to LED	50	--	75,0	--	90	--	--
mounting surface	50	--	53,0	--	90	--	--
Lens	50	--	56,5	--	90	--	--
C5	50	--	65,7	--	105	--	--
C6	50	--	67,4	--	105	--	--

IEC 60598-2-3							
Clause	Requirement + Test				Result - Remark		Verdict
CY3A	50	--	67,4	--	120	--	--
C4	50	--	74,5	--	105	--	--
C3A	50	--	66,5	--	105	--	--
C3	50	--	65,5	--	105	--	--
C2	50	--	65,8	--	105	--	--
C1	50	--	63,5	--	105	--	--
CX1	50	--	62,8	--	120	--	--
CX2	50	--	61,6	--	120	--	--
T1	50	--	70,6	--	130	--	--
PCB	50	--	68,4	--	130	--	--
Supplementary information: --							

ANNEX 2	TABLE: Temperature measurements, thermal tests of Section 12		P
	Type reference .....:	LT2200-C4	—
	Lamp used.....:	LED as delivered	—
	Lamp control gear used .....:	LED driver as delivered	—
	Mounting position of luminaire.....:	on mast arm	—
	Supply wattage (W) .....:	196,9	—
	Supply current (A).....:	0,781	—
	Calculated power factor .....:	0,968	—
	Table: measured temperatures corrected for ta = 50 °C:		P
	- abnormal operating mode .....:	LED driver shut off when output was short-circuited	—
	- test 1: rated voltage .....:	277 V	—
	- test 2: 1,06 times rated voltage or 1,05 times rated wattage.....:	293,6 V	—
	- test 3: Load on wiring to socket-outlet, 1,06 times voltage or 1,05 times wattage .....:	--	—
	- test 4: 1,1 times rated voltage or 1,05 times rated wattage.....:	--	—
	Through wiring or looping-in wiring loaded by a current of A during the test .....:	--	—

Temperature measurements, (°C)			
Part	Ambient	Clause 12.4 – normal	Clause 12.5 – abnormal

IEC 60598-2-3			
Clause	Requirement + Test	Result - Remark	Verdict

		test 1	test 2	test 3	limit	test 4	limit
supply cord	50	--	55,6	--	90	--	--
terminal block	50	--	62,5	--	130	--	--
tc	50	77,1*	--	--	80	--	--
internal wiring	50	--	80,8*	--	90	--	--
connector	50	--	62,4	--	90	--	--
internal wiring to LED	50	--	77,0	--	90	--	--
mounting surface	50	--	53,2	--	90	--	--
Lens	50	--	108,7	--	130	--	--
rubber ring	50	--	57,9	--	230	--	--
cord anchorage	50	--	59,3	--	130	--	--
C35	50	--	79,2	--	105	--	--
C33	50	--	79,1	--	105	--	--
C34	50	--	76,3	--	105	--	--
C43A	50	--	75,5	--	105	--	--
C43	50	--	75,5	--	105	--	--
C36	50	--	79,7	--	105	--	--
C37	50	--	77,6	--	105	--	--
C38	50	--	79,1	--	105	--	--
C7	50	--	77,0	--	105	--	--
C5	50	--	75,7	--	105	--	--
CY3	50	--	77,0	--	120	--	--
CX1	50	--	77,0	--	120	--	--
CX2	50	--	105,4	--	120	--	--
T1	50	--	83,2	--	130	--	--
PCB	50	--	78,8	--	130	--	--

Supplementary information:
* 10 degree has been reduced at the result for outdoor luminaire

IEC 60598-2-3			
Clause	Requirement + Test	Result - Remark	Verdict

ANNEX 3	**Screw terminals (part of the luminaire)**	N/A

ANNEX 4	**Screwless terminals (part of the luminaire)**	N/A

Annex - IEC 61347-2-13			
Clause	Requirement + Test	Result - Remark	Verdict

4 (4)	GENERAL REQUIREMENTS		P
	Insulation materials according requirements in Annex N of IEC 61347-1	(see Annex N)	N/A
	Compliance of independent controlgear enclosure with IEC 60 598-1		N/A
	Built-in magnetic ballast with double or reinforced insulation comply with Annex I of IEC 61347-1		N/A
	Built-in electronic controlgear with double or reinforced insulation comply with Annex O of IEC 61347-1	(see Annex O)	N/A
	SELV controlgear comply with Annex L of IEC 61347-1	(see Annex L)	N/A
	Independent SELV controlgear comply with Annex I of this part 2	(see Annex I)	N/A

6 (6)	CLASSIFICATION		P
	Independent convertor .....:	Yes ☐ No ☒	—
	Built-in convertor .....:	Yes ☒ No ☐	—
	Integral convertor .....:	Yes ☐ No ☒	—
	SELV-equivalent or isolating convertor .....:	Yes ☐ No ☒	—
	Auto-wound convertor .....:	Yes ☐ No ☒	—
	Independent SELV controlgear.....:	Yes ☐ No ☒	—

8 (10)	PROTECTION AGAINST ACCIDENTAL CONTACT WITH LIVE PARTS		P
- (10.1)	Controlgear protected against accidental contact with live parts		P
- (A2)	Voltage measured with 50 kΩ	(see Annex A)	N/A
- (A3)	Voltage > 35 V r.m.s. or > 60 V d.c. or protective impendance device	(see Annex A)	P
- (10.1)	Lacquer or enamel not used for protection or insulation		P
	Adequate mechanical strength on parts providing protection		P
- (10.2)	Capacitors > 0,5 µF: voltage after 1 min (V): < 50 V ..... :	0	P
- (10.3)	Controlgear providing SELV		N/A

Annex - IEC 61347-2-13			
Clause	Requirement + Test	Result - Remark	Verdict
	Accessible conductive parts are insulated from live parts by double or reinforced insulation in SELV controlgear		N/A
	No connection between output circuit and the body or protective earthing curcuit		N/A
	No possibility of connection between output circuit and the body or protective earthing circuit through other conductive parts		N/A
	SELV outputs separated by at least basic insulation		N/A
	ELV conductive parts insulated as live parts		N/A
	Tests according Annex L of IEC 61347-1		N/A
- (10.4)	Accessible conductive parts in SELV circuits		N/A
	Output voltage under load ≤ 25 V r.m.s. or ≤ 60 V d.c.		N/A
	If output voltage > 25 V r.m.s. or > 60 V d.c.; No load output ≤ 35 V peak or ≤ 60 V d.c and touch current does not exceed 0,7 mA (peak) or 2 mA d.c. ..... :		N/A
	One conductive part is insulated if output voltage or current exceeding the values above and withstand test voltage 500 V		N/A
	Double or reinforced insulation bridged by appropriate and at least two resistors or two Y2 capacitors or one Y1 capacitor		N/A
	Y1 or Y2 capacitors comply with IEC 60384-14		N/A
	Resistors comply with test (a) in 14.1 of IEC 60065		N/A
8.1	SELV-equivalent controlgear accessible parts are insulated from live parts by double or reinforced insulation according 8.6 and 13.1 in IEC 60065		N/A
8.2	Exposed terminals of SELV or SELV-equivalent controlgear if: - the rated or maximum rated output voltages ≤ 25 V r.m.s. - the no-load output voltage ≤ 30 V r.m.s. or 33 √2 V peak		N/A
	Insulated terminals if convertor with rated output voltage > 25 V		N/A
	One capacitor Y1 or two capacitors Y2 complying with IEC 60384-14 of the same values used in series between SELV or SELV-equivalent output and primary circuits		N/A

Annex - IEC 61347-2-13			
Clause	Requirement + Test	Result - Remark	Verdict

	Other components bridging the separating transformer complying with IEC 60065, clause 14		N/A

9 (8)	**TERMINALS**		N/A
	Screw terminals according section 14 of IEC 60598-1:		N/A
	Separately approved; component list	(see Annex 1)	N/A
	Part of the controlgear	(see Annex 2)	N/A
	Screwless terminals according section 15 of IEC 60598-1:		N/A
	Separately approved; component list	(see Annex 1)	N/A
	Part of the controlgear	(see Annex 3)	N/A

10 (9)	**PROVISION FOR PROTECTIVE EARTHING**		P
- (9.1)	Provisions for protective earthing		P
	Terminal complying with clause 8		P
	Locked against loosening and not possible to loosen by hand		P
	Not possible to loosen clamping means unintentionally on screwless terminals		N/A
	Earthing via means of fixing		P
	Earthing terminal only used for the earthing of the control gear		P
	All parts of material minimizing the danger of electrolytic corrosion		P
	Made of brass or equivalent material		P
	Contact surface bare metal		P
- (9.2)	Provision for functional earthing		N/A
	Comply with clause 8 and 9.1		N/A
- (9.3)	Earth contact via the track on the printed board		P
	Test with a current of 25 A between earthing terminal and each of the accessible metal parts; measured resistance (Ω) at ≥ 10 A according 7.2.3 of IEC 60598-1: < 0,5 Ω .....:	0,047	P
- (9.4)	Earthing of built-in lamp controlgear		N/A
	Earth by means of fixing to earthed metal of luminaire in compliance of 7.2 of IEC 60598-1		N/A
	Earthing terminal only for earthing the built-in controlgear		N/A

Annex - IEC 61347-2-13			
Clause	Requirement + Test	Result - Remark	Verdict

- (9.5)	Earthing via independent controlgear		N/A
- (9.5.1)	Earth connection to other equipment		N/A
	Looping or through connection, conductor min. 1,5 mm² and of copper or equivalent		N/A
	Protective earthing wires in line with 5.3.1.1 and clause 7		N/A
- (9.5.2)	Earthing of the lamp compartments powered via the independent lamp controlgear		N/A
	Test with a current of 25 A between input and output earth terminals; measured resistance (Ω) between earthing terminal and each of the accessible metal parts at ≥ 10 A according 7.2.3 of IEC 60598-1: < 0,5 Ω .....:		N/A
	Output earthing terminal marked as in 7.1 t) of IEC 61347-1		N/A

11 (11)	**MOISTURE RESISTANCE AND INSULATION**		**P**
	After storage 48 h at 91-95% relative humidity and 20-30 °C measuring of insulation resistance with d.c. 500 V (MΩ):		P
	For basic insulation ≥ 2 MΩ .....:	5000 MΩ	P
	For double or reinforced insulation ≥ 4 MΩ .....:		N/A
	Between primary and secondary circuits in controlgear providing SELV, values in Annex L in IEC 61347-1		N/A
11 (-)	Adequate insulation between input and output terminals not bounded together in SELV-equivalent controlgear		N/A

12 (12)	**ELECTRIC STRENGTH**		**P**
	Immediately after clause 11 electric strength test for 1 min		P
	Basic insulation for SELV, test voltage 500 V		N/A
	Working voltage ≤ 50 V, test voltage 500 V		N/A
	Working voltage > 50 V ≤ 1000 V, test voltage (V):		P
	Basic insulation, 2U + 1000 V	1554 V	P
	Supplementary insulation, 2U + 1000 V		N/A
	Double or reinforced insulation, 4U + 2000 V		N/A
	No flashover or breakdown		P

Annex - IEC 61347-2-13			
Clause	Requirement + Test	Result - Remark	Verdict
	Solid or thin sheet insulation for double or reinforced insulation fulfil the requirements in Annex N in IEC 61347-1		N/A
12 (-)	Windings in separating transformers in SELV-equivalent convertors according to 14.3.2 of IEC 60065		N/A

14 (14)	**FAULT CONDITIONS**		**P**
- (14)	When operated under fault conditions the controlgear:		P
	- does not emit flames or molten material		P
	- does not produce flammable gases		P
	- protection against accidental contact not impaired		P
	Thermally protected controlgear does not exceed the marked temperature value		N/A
	Fault conditions: capacitors, resistors or inductors without proof of compliance with relevant specifications have been short-circuited or disconnected	(see appended table)	P
- (14.1)	Short-circuit of creepage distances and clearances if less than specified in clause 16 in Part 1 (except between live parts and accessible metal parts)	(see appended table)	P
	Creepage distances on printed boards less than specified in clause 16 in Part 1 provided with coating according to IEC 60664-3		N/A
- (14.2)	Short-circuit or interruption of semiconductor devices	(see appended table)	P
- (14.3)	Short-circuit across insulation consisting of lacquer, enamel or textile	(see appended table)	N/A
- (14.4)	Short-circuit across electrolytic capacitors	(see appended table)	P
- (14.5)	After the tests has been carried out on three samples:		P
	The insulation resistance ≥ 1 MΩ .....:	5000 MΩ	P
	No flammable gases		P
	No accessible parts have become live		P
	During the tests, a five-layer tissue paper, where the test specimen is wrapped, does not ignite		P
- (14.6)	Relevant fault condition tests with high-power supply		—
14 (-)	Temperature declared thermally protected lamp controlgear fulfil requirements in Annex C		N/A

Annex - IEC 61347-2-13			
Clause	Requirement + Test	Result - Remark	Verdict

15 (-)	**TRANSFORMER HEATING**		P
	Windings of separating transformer in a SELV-equivalent controlgear fulfil the requirements according to 7.1 and 11.2 of IEC 60065		P
15.1 (-)	Normal operation		P
	Temperatures do not exceed the changed values of the values in column 2 of Table 3 of IEC 60065, in respect to relevant ambient temperature at t_c, under normal operation		P
15.2 (-)	Abnormal operation		N/A
	Temperatures do not exceed the changed values of the values in column 3 of Table 3 of IEC 60065, in respect to relevant ambient temperature at t_c, under abnormal conditions of Cl. 16 and fault conditions of Cl. 14		N/A
	Ambient temperature at t_c .....:		—

16	**ABNORMAL CONDITIONS**		**P**
16.1	Control gear which are of the constant voltage output type:		N/A
	a) No LED module inserted		N/A
	b) Double LED modules or equivalent load connected to the output terminals		N/A
	c) Output terminal short-circuited (20 cm and 200 cm or declared length)		N/A
	During and at the end of the tests no defect impairing safety, nor any smoke or flammable gases produced		N/A
16.2	Control gear which are of the constant current output type:		P
	a) No LED module connected		P
	b) Double the LED modules or equivalent load connected in series to the output terminals		N/A
	c) Output terminal short-circuited (20 cm and 200 cm or declared length)		P
	Maximum output voltage not exceeded		P
	During and at the end of the tests no defect impairing safety, nor any smoke or flammable gases produced		P

Annex - IEC 61347-2-13			
Clause	Requirement + Test	Result - Remark	Verdict

17 (15)	**CONSTRUCTION**		**P**
- (15.1)	Wood, cotton, silk, paper and similar fibrous material		P
	Wood, cotton, silk, paper and similar fibrous material not used as insulation		P
- (15.2)	Printed circuits		P
	Printed circuits used as internal connections complies with clause 14		P
- (15.3)	Plugs and socket-outlets used in SELV or ELV circuits		N/A
	No dangerous compatibility between output socket-outlet and a plug for socket-outlets for input circuit in relation to installation rules, voltages and frequencies		N/A
	Plugs and socket-outlets for SELV comply with IEC 60906-3 and IEC 60884-2-4		N/A
	Plugs and socket-outlets for SELV ≤ 3 A, ≤ 25 V r.m.s. or ≤ 60 V d.c. and ≤ 72 W comply with IEC 60906-3 and IEC 60884-2-4 or:		N/A
	- plugs not able to enter socket-outlets of other standardised system		N/A
	- socket-outlets not admit plugs of other standardised system		N/A
	- socket-outlets without protective earth		N/A
17 (-)	Socket-outlet in the output circuit does not accept plugs complying with IEC 60083 and IEC 60906		N/A
	Not possible to engage plugs accepted by socket-outlet in the output circuit with socket-outlets complying with IEC 60083 and IEC 60906		N/A

18 (16)	**CREEPAGE DISTANCES AND CLEARANCES**		**P**
- (16)	Creepage distances and clearances according to Table 3 and 4, as appropriate	(see appended table)	P
	Controlgears providing SELV comply with L.1 in Annex L		N/A
	Insulating lining of metallic enclosures		N/A
	Basic insulation on printed boards tested according to clause 14		P
	Distances subjected to both sinusoidal voltage as non-sinusoidal pulses not less than value in either Table 3 or 4		P
	Creepage distances not less than minimum clearance		P

Annex - IEC 61347-2-13			
Clause	Requirement + Test	Result - Remark	Verdict

19 (17)	**SCREWS, CURRENT-CARRYING PARTS AND CONNECTIONS**		**P**
	Screws, current-carrying parts and connections in compliance with IEC 60598-1 (clause numbers between parentheses refer to IEC 60598-1)		P
(4.11)	Electrical connections		P
(4.11.1)	Contact pressure		P
(4.11.2)	Screws:		N/A
	- self-tapping screws		N/A
	- thread-cutting screws		N/A
(4.11.3)	Screw locking:		N/A
	- spring washer		N/A
	- rivets		N/A
(4.11.4)	Material of current-carrying parts		P
(4.11.5)	No contact to wood		P
(4.11.6)	Electro-mechanical contact systems		N/A
(4.12)	Mechanical connections and glands		N/A
(4.12.1)	Screws not made of soft metal		N/A
	Screws of insulating material		N/A
	Torque test: part; torque (Nm) .....:		N/A
	Torque test: part; torque (Nm) .....:		N/A
	Torque test: part; torque (Nm) .....:		N/A
(4.12.2)	Screw diameter < 3 mm screwed into metal		N/A
(4.12.4)	Locked connections		N/A
	- fixed arms; torque (Nm).....:		N/A
	- lampholder; torque (Nm).....:		N/A
	- push-button switches; torque 0,8 Nm.....:		N/A
(4.12.5)	Screwed glands: force (N) .....:		N/A

14	**TABLE: tests of fault conditions**	**P**
Part	Simulated fault	Hazard
For 60 W LED driver		
C5	Short-circuited; shut off, recoverable	NO
C6	Short-circuited; shut off, recoverable	NO

Annex - IEC 61347-2-13			
Clause	Requirement + Test	Result - Remark	Verdict

C4A	Short-circuited; lamp flash, power decrease, recoverable	NO
C4	Short-circuited; shut off, recoverable	NO
C3A	Short-circuited; shut off, recoverable	NO
C3	Short-circuited; shut off, recoverable	NO
Q1	Short-circuited; C2, D2, RS1, RS2, RS3 broken	NO
C2	Short-circuited; L2 broken	NO
D4	Short-circuited; shut off, recoverable	NO
D8	Short-circuited; shut off, recoverable	NO
C13	Short-circuited; shut off, recoverable	NO
D3A	Short-circuited; shut off, recoverable	NO
D3	Short-circuited; shut off, recoverable	NO
Q2	Short-circuited; fuse broken	NO
C12	Short-circuited; shut off, recoverable	NO
For 180 W LED driver		
C35	Short-circuited; shut off, recoverable	NO
C33	Short-circuited; shut off, recoverable	NO
C34	Short-circuited; shut off, recoverable	NO
C43	Short-circuited; shut off, recoverable	NO
C36	Short-circuited; shut off, recoverable	NO
C38	Short-circuited; shut off, recoverable	NO
C6	Short-circuited; fuse broken	NO
C5	Short-circuited; lamp flash, power decrease, recoverable	NO
C7	Short-circuited; fuse broken	NO
Q17	Short-circuited; fuse broken	NO
D17	Short-circuited; R2 broken	NO
D15	Short-circuited; shut off, non-recoverable	NO
D18	Short-circuited; shut off, recoverable	NO
D7	Short-circuited; shut off, recoverable	NO
D6	Short-circuited; normal operation	NO
C13	Short-circuited; shut off, non-recoverable	NO

Annex - IEC 61347-2-13			
Clause	Requirement + Test	Result - Remark	Verdict

A	**ANNEX A - TEST TO ESTABLISH WHETHER A CONDUCTIVE PART IS A LIVE PART WHICH MAY CAUSE AN ELECTRIC SHOCK**		**P**
A.1	Comply with A.2 or A.3		P
A.2	Voltage ≤ 35 V peak or ≤ 60 V d.c .....:		N/A
A.3	If voltage > 35 V r.m.s. or > 60 V d.c. or protective impendance device; touch current does not exceed 0,7 mA (peak) or 2 mA d.c. .....:	0,01 mA	P
	Comply with Annex G of IEC 60598-1		N/A

C	**ANNEX C – PARTICULAR REQUIREMENTS FOR ELECTRONIC LAMP CONTROLGEAR WITH MEANS OF PROTECTION AGAINST OVERHEATING**		N/A
C3	**GENERAL REQUIREMENTS**		N/A
C3.1	Thermal protection means integral with the convertor, protected against mechanical damage		N/A
	Renewable only by means of a tool		N/A
	If function depending on polarity, for cord-connected equipment protection means in both leads		N/A
	Thermal links comply with IEC 60691		N/A
	Electrical controls comply with IEC 60730-2-3		N/A
C3.2	No risk of fire by breaking (clause C7)		N/A
C5	**CLASSIFICATION**		N/A
	a) automatic resetting type		—
	b) manual resetting type		—
	c) non-renewable, non-resetting type		—
	d) renewable, non-resetting type		—
	e) other type of thermal protection; description ...:		N/A
C6	**MARKING**		N/A
C6.1	Symbol for temperature declared thermally protected ballasts		N/A
C6.2	Declaration of the type of protection provided		N/A
C7	**LIMITATION OF HEATING**		N/A
C7.1	Preselection test:		N/A
	Test sample placed for at least 12 h in an oven having temperature (t_c - 5) K		N/A
	No operation of the protection device		N/A

Annex - IEC 61347-2-13			
Clause	Requirement + Test	Result - Remark	Verdict

C7.2	Functioning of protection means:		N/A
	Normal operation of the sample in a test enclosure according to Annex D at an ambient temperature such that (t_c +0; -5) °C is obtained		N/A
	No operation of the protection device		N/A
	Introducing of the most onerous test condition determined during test of clause 14		N/A
	Output of windings connected to the mains supply short-circuited, and other part of the convertor operated under normal conditions		N/A
	Increasing of the current through the windings continuously until operation of the protection means		N/A
	Continuous measuring of the highest surface temperature		N/A
	Ballasts according to C5 a) or C5 e) operated until stable conditions are achieved		N/A
	Automatic-resetting thermal protectors working 3 times		N/A
	Ballasts according to C5 b) working 6 times		N/A
	Ballasts according to C5 c) and C5) d) working once		N/A
	Highest temperature does not exceed the marked value		N/A
	Any overshoot of 10% over the marked value within 15 min		N/A

D	**ANNEX D – REQUIREMENTS FOR CARRY OUT THE HEATING TESTS OF THERMALLY PROTECTED LAMP CONTROLGEAR**		N/A
	Tests in C7 performed in accordance with Annex D, if applicable		N/A

E	**ANNEX E – USE OF CONSTANT S OTHER THAN 4500 IN t_w TESTS**		N/A
	Comply with tests according Annex E		N/A

F	**ANNEX F - DRAUGHT-PROOF ENCLOSURE**		P
	Draught-proof enclosure in accordance with the description		P
	Dimensions of the enclosure		P

Annex - IEC 61347-2-13			
Clause	Requirement + Test	Result - Remark	Verdict

	Other design; description		N/A

H	**ANNEX H - TESTS**		P
	All tests performed in accordance with the advice given in Annex H, if applicable		P

L	**ANNEX L: PARTICULAR ADDITIONAL REQUIREMENTS FOR CONTROLGEARS PROVIDING SELV** (IEC 61347-1)		N/A
L.3	**Classification**		N/A
	Class I	Yes ☐ No ☐	—
	Class II	Yes ☐ No ☐	—
	Class III	Yes ☐ No ☐	—
	non-inherently short circuit proof controlgear	Yes ☐ No ☐	—
	inherently short circuit proof controlgear	Yes ☐ No ☐	—
	fail safe controlgear	Yes ☐ No ☐	—
	non-short-circuit proof controlgear	Yes ☐ No ☐	—
L.4	**Marking**		N/A
	Adequate symbols are used		N/A
L.5	**Protection against electric shock**		N/A
	Comply with 9.2 of IEC 61558-1		N/A
L.6	**Heating**		N/A
	No excessive temperatures in normal use		N/A
	Value if capacitor t_c marked .....:		—
	Winding insulation classified as Class .....:		—
	Comply with tests of clause 14 of IEC 61558-1 with adjustments		N/A
L.7	**Short-circuit and overload protection**		N/A
	Comply with tests of clause 15 of IEC 61558-1 with adjustments		N/A
L.8	**Insulation resistance and electric strength**		N/A
L.8.1	Conditioned 48 h between 91 % and 95 %		N/A
L.8.2	Insulation resistance		N/A
	Between input- and output circuits not less than 5 MΩ .....:		N/A

Annex - IEC 61347-2-13			
Clause	Requirement + Test	Result - Remark	Verdict
	Between metal parts of class II convertors which are separated from live parts by basic insulation only and the body not less than 5 MΩ .....:		N/A
	Between metal foil in contact with the inner and outer surfaces of enclosures of insulating material not less than 2 MΩ .....:		N/A
L.8.3	Electric strength		N/A
	1) Between live parts of input circuits and live parts of output circuits .....:		N/A
	2) Over basic or supplementary insulation between:		N/A
	a) live parts having different polarity .....:		N/A
	b) live parts and body if intended to be connected to protective earth .....:		N/A
	c) accessible metal parts and a metal rod of the same diameter as the flexible cable or cord .....:		N/A
	d) live parts and an intermediate metal part .....:		N/A
	e) intermediate metal parts and the body .....:		N/A
	f) each input circuit and all other input circuits ....:		N/A
	3) Over reinforced insulation between the body and live parts .....:		N/A
L.9	**Construction**		N/A
L.9.1	Transformer comply with 19.12 of IEC 61558-1 and 19 of IEC 61558-2-6		N/A
	HF transformer comply with 19 of IEC 61558-2-16		N/A
L.10	**Components**		N/A
	Protective devices comply with 20.6 – 20.11 of IEC 61558-1		N/A
L.11	**Creepage distances and clearances**		N/A
	1. Insulation between input and output circuits, basic insulation:		N/A
	a) measured values ≥ specified values (mm) .....:		N/A
	b) measured values ≥ specified values (mm) .....:		N/A
	c) measured values ≥ specified values (mm) .....:		N/A
	2. Insulation between input and output circuits, double or reinforced insulation:		N/A
	a) measured values ≥ specified values (mm) .....:		N/A
	b) measured values ≥ specified values (mm) .....:		N/A
	c) measured values ≥ specified values (mm) .....:		N/A
	3. Insulation between adjacent input circuits		N/A

Annex - IEC 61347-2-13			
Clause	Requirement + Test	Result - Remark	Verdict

	- measured values ≥ specified values (mm) .....:		N/A
	3. Insulation between adjacent output circuits		N/A
	- measured values ≥ specified values (mm) .....:		N/A
	4. Insulation between terminals for external connection:		N/A
	- measured values ≥ specified values (mm) .....:		N/A
	5. Basic or supplementary insulation:		N/A
	a) measured values ≥ specified values (mm) .....:		N/A
	b) measured values ≥ specified values (mm) .....:		N/A
	c) measured values ≥ specified values (mm) .....:		N/A
	d) measured values ≥ specified values (mm) .....:		N/A
	e) measured values ≥ specified values (mm) .....:		N/A
	6. Reinforced insulation or insulation:		N/A
	Between body and output circuit: measured values ≥ specified values (mm) .....:		N/A
	Between body and output circuit if provision against transient voltages: measured values ≥ specified values (mm) .....:		N/A
	7. Distance through insulation:		N/A
	a) measured values ≥ specified values (mm) .....:		N/A
	b) measured values ≥ specified values (mm) .....:		N/A
	c) measured values ≥ specified values (mm) .....:		N/A

N	**ANNEX N: REQUIREMENTS FOR INSULATION MATERIALS USED FOR DOUBLE OR REINFORCED INSULATION** (IEC 61347-1)		N/A
N.4	**General requirements**		N/A
N.4.1	Material comply with IEC 60085 and IEC 60216 series		N/A
N.4.2	Solid insulation		N/A
	Electric strength test at least 5 kV or 1,35 x test voltage in Table N.1		N/A
	If not classified according IEC 60085 and IEC 60216 series: Electric strength test increased 10 % of 5,5 kV or 1,5 x test voltage in Table N.1		N/A
N.4.3	Thin sheet insulation		N/A
N.4.3.1	Thickness and composition of thin sheet insulation		N/A

Annex - IEC 61347-2-13			
Clause	Requirement + Test	Result - Remark	Verdict
	- Inside the ballast and not subjected to handling or abrasion during the production and during maintenance		N/A
	- Non-separated layers: Min. 3 layers and fulfil mandrel test of 150N		N/A
	- Separated layers: Min. 2 layers and each layer fulfil mandrel test of 50N		N/A
	- Separated layers (alternative): Min. 3 layers and 2/3 of the layers fulfil mandrel test of 100N		N/A
N.4.3.2	Mandrel test (electric strength test during mechanical stress)		N/A
	Electric strength test after mandrel test:		N/A
	- Non-separated layers: min. 5 kV or 1,35 x test voltage in Table N.1		N/A
	- 2/3 of min. 3 separated layers: min. 5 kV or 1,25 x test voltage in Table N.1		N/A
	- one of 2 separated layers: min. 5 kV or 1,25 x test voltage in Table N.1		N/A
	No flashover or breakdown occurred		N/A
O	**ANNEX O: ADDITIONAL REQUIREMENTS FOR BUILT-IN ELECTRONIC CONTROLGEAR WITH DOUBLE OR REINFORCED INSULATION** (IEC 61347-1)		N/A
O.6	**Marking**		N/A
	Marking according clause 7 (7)	See clause 7	N/A
	Special symbol		N/A
	Meaning of the special symbol explained in catalogue		N/A
O.7	**Protection against accidental contact with live parts**		N/A
	Requirements of clause 8 (10)	See clause 8	N/A
	Test finger not possible to make contact with basic insulated metal parts		N/A
O.8	**Terminals**		N/A
	Clause 9 (8)	See clause 9	N/A
O.9	**Provision for earthing**		N/A
	Functional earthing terminals comply with clause 9 of part 1		N/A
	No protective earthing terminal		N/A
O.10	**Moisture resistance and insulation**		N/A
	Clause 11 (11)	See clause 11	N/A

Annex - IEC 61347-2-13			
Clause	Requirement + Test	Result - Remark	Verdict

O.11	**Electric strength**		N/A
	Clause 12 (12)	See clause 12	N/A
O.13	**Fault conditions**		N/A
	Clause 14 (14)	See clause 14	N/A
	End of test, between live part and accessible metal parts or external parts of insulating material in contact with the supporting surface comply with dielectric strength test reduced to 35 % of values according Table 1 in part 1		N/A
	Insulation resistance according to O.10 between live part and accessible metal parts or external parts of insulating material in contact with the supporting surface not less than 4 MΩ		N/A
O.14	**Construction**		N/A
	Clause 17 (15)	See clause 17	N/A
	Accessible metal parts insulated from live parts by double or reinforced insulation		N/A
	Live part insulated from supporting surface in contact with external faces by double or reinforced insulation		N/A
O.15	**Creepage distances and clearances**		N/A
	Clause 18 (16)	See clause 18	N/A
	Comply with corresponding values for luminaries in IEC 60598-1		N/A
O.16	**Screws, current-carrying parts and connections**		N/A
	Clause 19 (17)	See clause 19	N/A
O.17	**Resistance to heat and fire**		N/A
	Clause 20 (18)	See clause 20	N/A
O.18	**Resistance to corrosion**		N/A
	Clause 21 (19)	See clause 21	N/A

Annex - IEC 62031			
Clause	Requirement + Test	Result - Remark	Verdict

6	**CLASSIFICATION**		**P**
	Built-in module .....:	Yes ☐ No ☒	—
	Independent module .....:	Yes ☐ No ☒	—
	Integral module .....:	Yes ☒ No ☐	—
	For Integral module; Note to 1.2.1 in IEC 60598-1 applies.		

7	**MARKING**		N/A
7.1	Mandatory markings:		N/A
	- mark of origin		N/A
	- model number, type reference .....:		N/A
	- rated supply voltage (V) .....:		N/A
	- rated supply current (A) .....:		N/A
	- rated input power (V) .....:		N/A
	- nominal power		N/A
	- indication of connections, wiring diagram		N/A
	- value of t_c		N/A
	- eye protection		N/A
	- marking of built-in modules only		N/A
7.2	- location of marking		N/A
7.3	Marking durable and legible		N/A
	Rubbing 15 s water, marking legible		N/A

8	**SCREW TERMINALS**		N/A
	Compliance with section 14 of IEC 60598-1		N/A
	SCREWLESS TERMINALS		N/A
	Compliance with section 15 of IEC 60598-1		N/A
	CONNECTORS		N/A
	Compliance with IEC 60838-2-2		N/A

Annex - IEC 62031			
Clause	Requirement + Test	Result - Remark	Verdict

8 (10)	**PROTECTION AGAINST ACCIDENTAL CONTACT WITH LIVE PARTS**		**P**
	Protection against accidental contact with live parts in compliance with IEC 61347-1 (clause numbers between parentheses refer to IEC 61347-1)		P
- (10.1)	Controlgear protected against accidental contact with live parts		P
- (A1)	Current measured according to IEC 60990, figure 4 and clause 7.1: max. 0,7 mA (peak) or 2,0 mA d.c., for f ≥ 1000 Hz max. 70 mA .....:		N/A
- (A2)	Voltage at 50 kΩ (V): max. 34 V (peak) .....:		N/A
	Lacquer or enamel not used for protection or insulation		N/A
	Adequate mechanical strength on parts providing protection		N/A
- (10.2)	Capacitors > 0,5 µF: voltage after 1 min (V): < 50 V .....:		N/A
8.1 (-)	SELV-equivalent controlgear accessible parts are insulated from live parts by double or reinforced insulation according 8.6 and 13.1 in IEC 60065		N/A
8.2 (-)	Exposed terminals of SELV or SELV-equivalent controlgear are allowed if: - the rated or maximum output voltage does not exceeding 25 V r.m.s. - the no-load output voltage does not exceed 30 V r.m.s. or 33 √2 V peak		N/A
	Insulated terminals if rated output voltage >25 V		N/A
	One capacitor Y1 or two capacitors Y2 of the same values used in series between SELV or SELV-equivalent output and primary circuits - Capacitor complying with IEC 60384-14 - Other components bridging the separating transformer complying with EN 60065, clause 14		N/A

11	**MOISTURE RESISTANCE AND INSULATION**		**P**
	Protection against moisture and insulation in compliance with Clause 11, IEC 61347-1		P
	After storage 48 h at 91-95% relative humidity and 20-30 °C measuring of insulation resistance with d.c. 500 V (MΩ): ≥ 2 MΩ .....:	>1000 MΩ	P
	Adequate insulation between input and output terminals not bounded together in SELV-equivalent controlgear		N/A
	For double or reinforced insulation the resistance exceeds 4 MΩ		N/A

Annex - IEC 62031			
Clause	Requirement + Test	Result - Remark	Verdict

12	**ELECTRIC STRENGTH**		**P**
	Electric strength in compliance with Clause 12 of IEC 61347-1		P
	Immediately after clause 11 electric strength test for 1 min		P
	Working voltage ≤ 42 V, test voltage 500 V		N/A
	Working voltage > 42 V, test voltage (V): 2U + 1000 V .....:	1554 V	P
	Reinforced insulation, test voltage (V): .....:		N/A
	No flashover or breakdown		P
	Windings in separating transformers in SELV-equivalent control gear according to 14.3.2 of EN 60065		N/A

13	**FAULT CONDITIONS**		**P**
13.1	*In compliance with IEC 61347-1 (clause numbers between parentheses refer to IEC 61347-1)*		P
	When operated under fault conditions the LED-module:		P
	- does not emit flames or molten material		P
	- does not produce flammable gases		P
	- protection against accidental contact not impaired		P
	Thermally protected controlgear does not exceed the marked temperature value		N/A
	Fault conditions: capacitors, resistors or inductors without proof of compliance with relevant specifications have been short-circuited or disconnected	(see appended table)	N/A
- (14.1)	Short-circuit of creepage distances and clearances if less than specified in clause 16 in Part 1 (except between live parts and accessible metal parts)	(see appended table)	N/A
	Distances on printed boards provided with coating according to IEC 60664-3		N/A
- (14.2)	Short-circuit or interruption of semiconductor devices	(see appended table)	P
- (14.3)	Short-circuit across insulation consisting of lacquer, enamel or textile	(see appended table)	N/A
- (14.4)	Short-circuit across electrolytic capacitors	(see appended table)	N/A
- (14.5)	During the tests, a five-layer tissue paper, where the test specimen is wrapped, does not ignite		P

Annex - IEC 62031			
Clause	Requirement + Test	Result - Remark	Verdict
	After the tests the insulation resistance with d.c. 500 V (MΩ) are ≥ 1 MΩ .....:	> 500 MΩ	P
	Temperature declared thermally protected LED-modules fulfil the requirements in Annex C of IEC 61437-1		N/A
13.2	Module withstands overpower condition >15 min.		P
	Module with automatic protective device or power limiter, test performed 15 min. at limit.		P
	During the tests, tissue paper, spread below module, does not ignite		P

15	**CONSTRUCTION**		**P**
	Wood, cotton, silk, paper and similar fibrous material not used as insulation		P

16	**CREEPAGE DISTANCES AND CLEARANCES**		**P**
	Creepage and distances and clearances in compliance with IEC 60598-1		P
	Class of protection ..... :	Class I	—
	Working voltage (V) ..... :	277 V~	—
	Voltage form ..... :	Sinusoidal	—
	PTI ..... :	≤ 175	—
	Rated pulse voltage (kV) ..... :	--	—
	(1) Live parts of different polarity: cr (mm); cl (mm) ..... :		N/A
	(2) Live parts and accessible parts: cr (mm); cl (mm) ..... :	Cr = cl > 3,0 > 2,5 (module - enclosure)	P
	(3) Parts becoming live: cr (mm); cl (mm) .. :		N/A
	(4) Outer surface of cable: cr (mm); cl (mm) :		N/A
	(5) Live parts of switches: cr (mm); cl (mm) :		N/A
	(6) Live parts and supporting surface: cr (mm); cl (mm) ..... :		N/A

17 (17)	**SCREWS, CURRENT-CARRYING PARTS AND CONNECTIONS**		**P**
	Screws, current-carrying parts and connections in compliance with IEC 60598-1 (clause numbers between parentheses refer to IEC 60598-1)		P
(4.11)	Electrical connections:		P
(4.11.1)	Contact pressure		P

Annex - IEC 62031			
Clause	Requirement + Test	Result - Remark	Verdict

(4.11.2)	Screws:		N/A
	- self-tapping screws		N/A
	- thread-cutting screws		N/A
	- at least two self-tapping screws		N/A
(4.11.3)	Screw locking:		N/A
	- spring washer		N/A
	- rivets		N/A
(4.11.4)	Material of current-carrying parts		P
(4.11.5)	No contact to wood		P
(4.12)	Mechanical connections and glands:		N/A
(4.12.1)	Mechanical stress		N/A
	Screws not made of soft metal		N/A
	Screws of insulating material		N/A
	Torque test: part; torque (Nm) .....:		N/A
	Torque test: part; torque (Nm) .....:		N/A
	Torque test: part; torque (Nm) .....:		N/A
(4.12.2)	Screw diameter < 3 mm screwed into metal		N/A
(4.12.3)	Void		—
(4.12.4)	Locked connections		N/A
(4.12.5)	Screwed glands: force (N) .....:		N/A

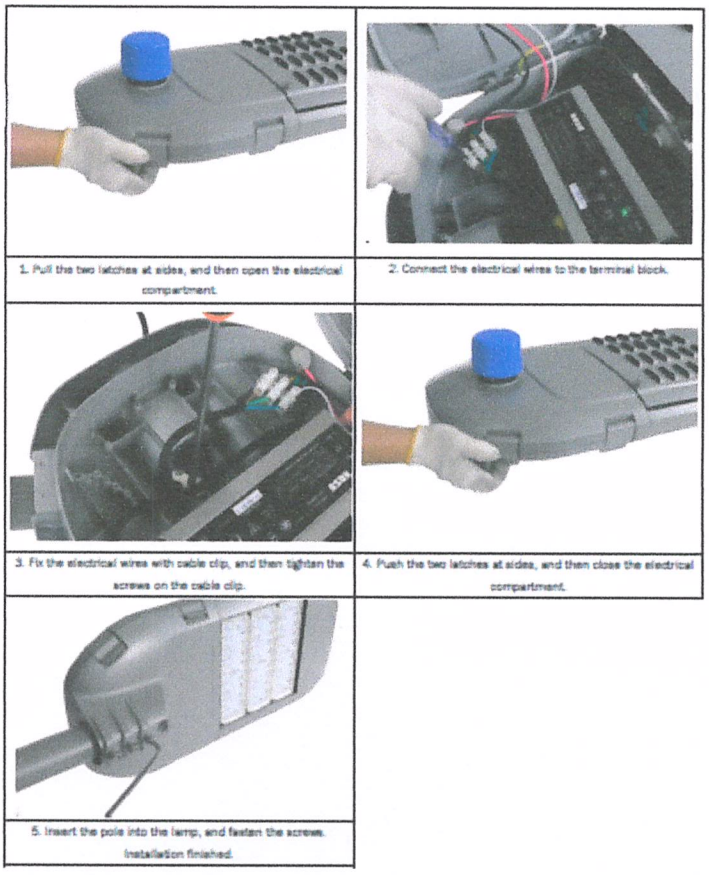
18 (18)	**RESISTANCE TO HEAT, FIRE AND TRACKING**		**P**
	Resistance to Heat, Fire and Tracking in compliance with IEC 61347-1 (clause numbers between parentheses refer to IEC 61347-1)		P
(18.1)	Parts of insulating material retaining live parts in position, ball-pressure test:		N/A
	- part; test temperature (°C) .....:		N/A
	- part; test temperature (°C) .....:		N/A
(18.2)	Printed boards in accordance with IEC 60249-1, 4.3		P
(18.3)	External parts of insulating material preventing electric shock glow-wire test 650 °C		P
(18.4)	Parts of insulating material retaining live parts in position, needle-flame test 10 s:		P
	- flame extinguished within 30 s		P
	- no flaming drops igniting tissue paper		P
(18.5)	Tracking test		P

Annex - IEC 62031			
Clause	Requirement + Test	Result - Remark	Verdict

19	**RESISTANCE TO CORROSION**		**N/A**
	Resistance to corrosion in compliance with IEC 61347-1		N/A
	Rust protection:		N/A
	- test according 4.18.1 of IEC 60598-1		N/A
	- adequate varnish on the outer surface		N/A

Annex Manual: For 90 W model

Installation



1. Pull the two latches at sides, and then open the electrical compartment.

2. Connect the electrical wires to the terminal block.

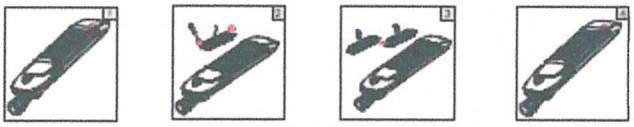
3. Fix the electrical wires with cable clip, and then tighten the screws on the cable clip.

4. Push the two latches at sides, and then close the electrical compartment.

5. Insert the pole into the lamp, and fasten the screws. Installation finished.

Installation Instructions

Maintenance



1. Undo the two hand screws to open the cover for light source compartment
2. Undo the screws on both end of the module, and disconnect the module at cable.
3. Take out the failed module and install a new one. Tighten up the screws and the cable connector
4. Close the cover and tighten up the hand screws.

Cable Connection



1. Connect the male and female connectors by aligning the indicative arrow on them.



2. Hold the nut on one terminal still, meanwhile, rotating clockwise till the one on the other terminals is tightened up. Otherwise thewaterproof performance might be affected

Wiring

Power Supply End	Earth wire	Neutral wire	Live wire
Picture End	Yellow-green lead	Blue lead	Brown lead
	Green lead	White lead	Black lead

Caution

a. Disconnect or turn off power before installation, maintenance and wiring.

b. Cable connection must be insulated and waterproof.

c. For luminaires with glass cover: the cover is made of tempered glass which shatters into small pieces without sharp edges when it breaks. Application condition: -30°C~100°C; maximum temperature rise ≤50°C.

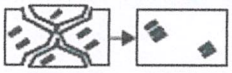
d. The light source should be replaced by the manufacturer, its server agent, or someone similarly qualified.

Warning: Danger! Electric shock risk!
(via IEC 60417-6042 (2011-11))

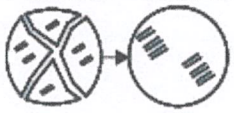


For luminaires with glass cover: The broken cover should be replaced.

Rectangle



Round



The luminaire should be positioned so that prolonged staring into the luminaire at a distance closer than 0.317 m is not expected.

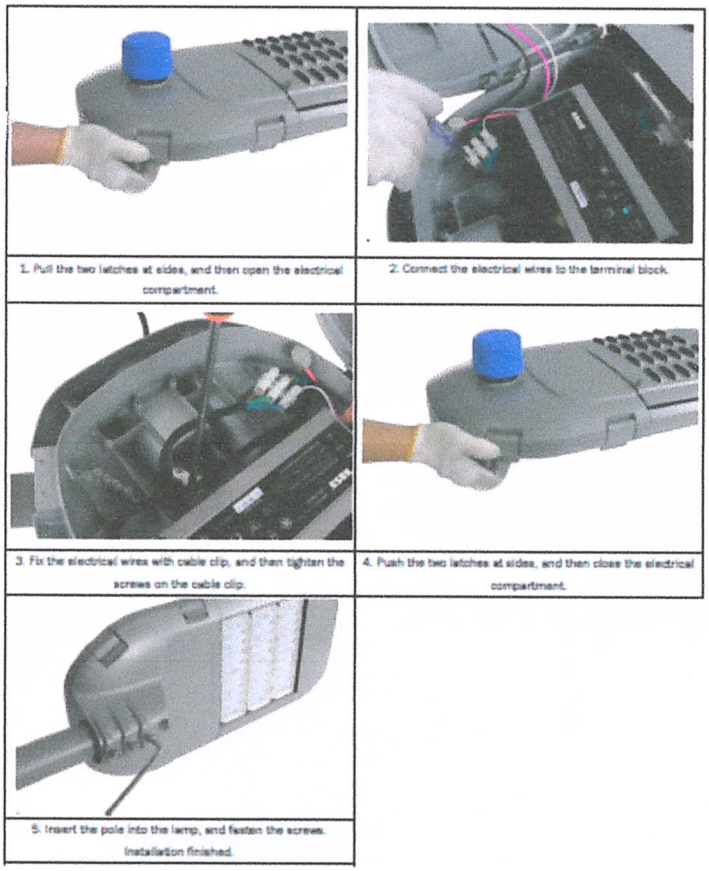


Remarks

1. This luminaire uses permanent connection on power supply with flexible cable and wires (60245 IEC57). Sufficient length of cable is reserved for connection to AC power. Protection over the connection joint andelimination of tensile force there should be ensured.ufficient.
2. This luminaire uses type Z attachment: If the external flexible cable or flexible wire is damaged, it should be replaced by the manufacturer or its server agent to avoid danger.
3. Wiring: the connection to AC power should be operated on terminal blocks in a wiring box with a degree of protection at least equivalent to the luminaire, and there should be devices to fixate wires.
4. The luminaire can be mounted onto ordinary combustible surfaces.

For 150/180 W model:

Installation



Annex picture

Caution

a. Disconnect or turn off power before installation, maintenance and wiring.

b. Cable connection must be insulated and waterproof.

c. For luminaires with glass cover: the cover is made of tempered glass which shatters into small pieces without sharp edges when it breaks. Application condition: -30°C~100°C; maximum temperature rise ΔT60°C.

d. The light source should be replaced by the manufacturer, its server agent, or someone similarly qualified.

Warning: Danger! Electric shock risk!

(via IEC 60417-6042 (2011-11))

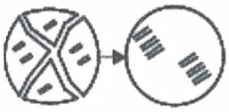


For luminaires with glass cover: The broken cover should be replaced.

Rectangle



Round



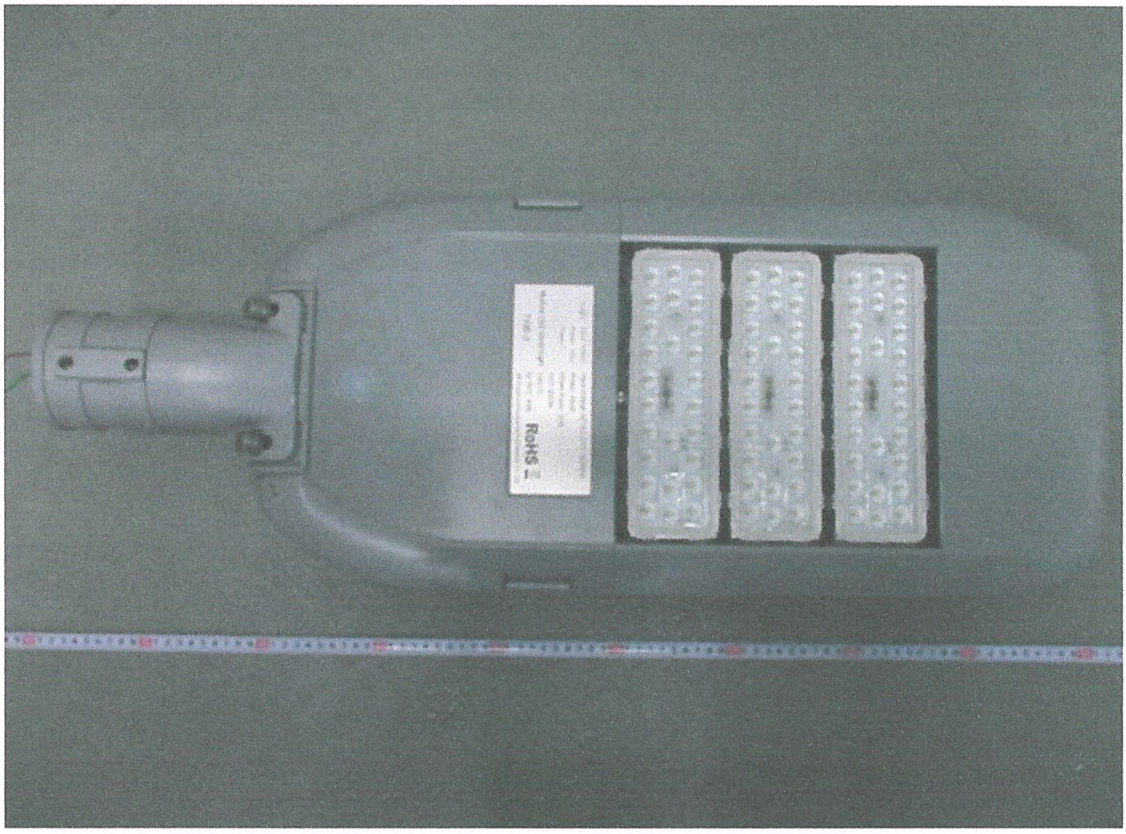
The luminaire should be positioned so that prolonged staring into the luminaire at a distance closer than 0.317 m is not expected.



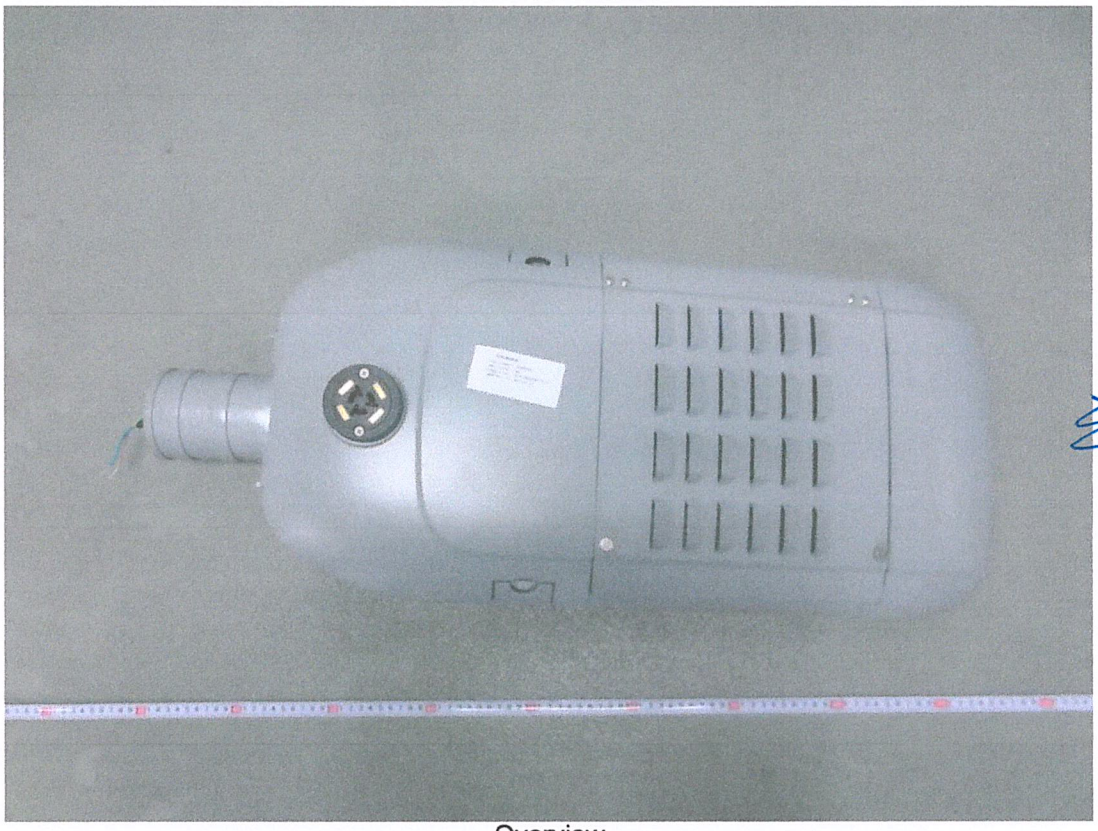
Remarks

1. This luminaire uses permanent connection on power supply with flexible cable and wires (60045 IEC57). Sufficient length of cable is reserved for connection to AC power. Protection over the connection joint and elimination of tensile force there should be ensured sufficient.
2. This luminaire uses type Z attachment: if the external flexible cable or flexible wire is damaged, it should be replaced by the manufacturer or its server agent to avoid danger.
3. Wiring: the connection to AC power should be operated on terminal blocks in a wiring box with a degree of protection at least equivalent to the luminaire, and there should be devices to fixate wires.
4. The luminaire can be mounted onto ordinary combustible surfaces.

Annex picture

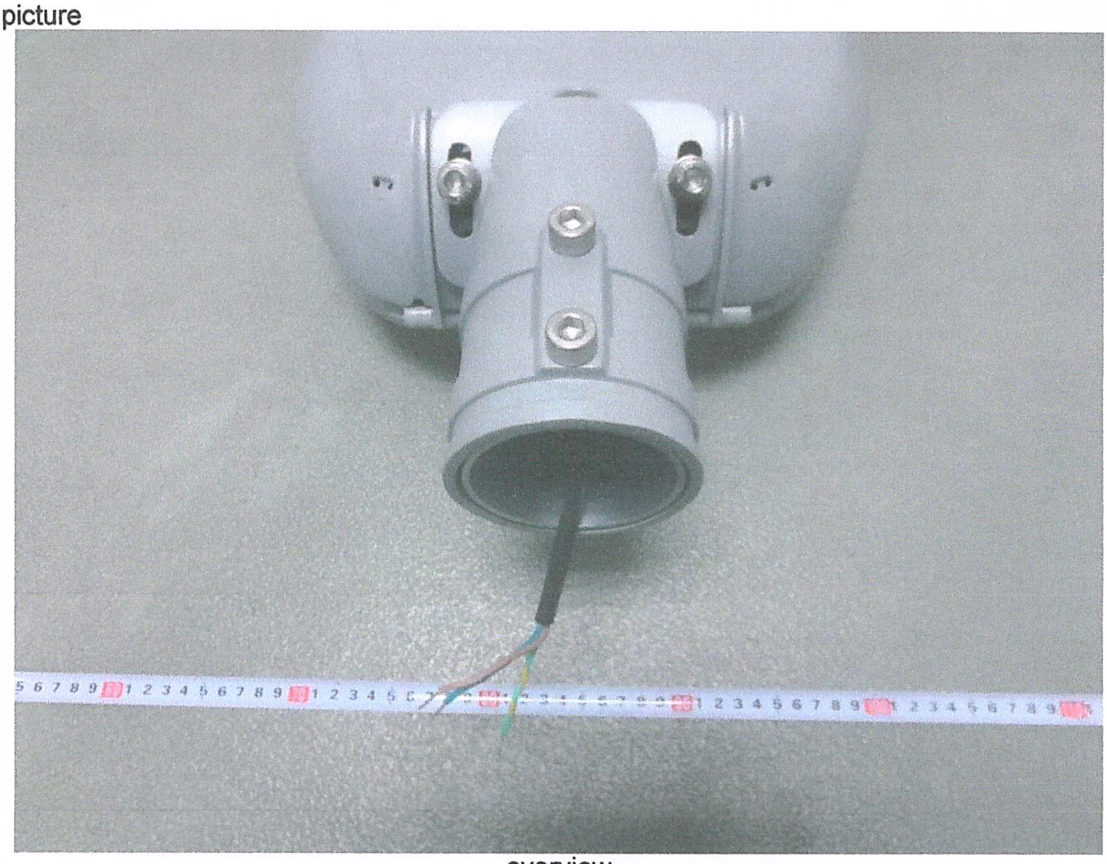


General 150 W model

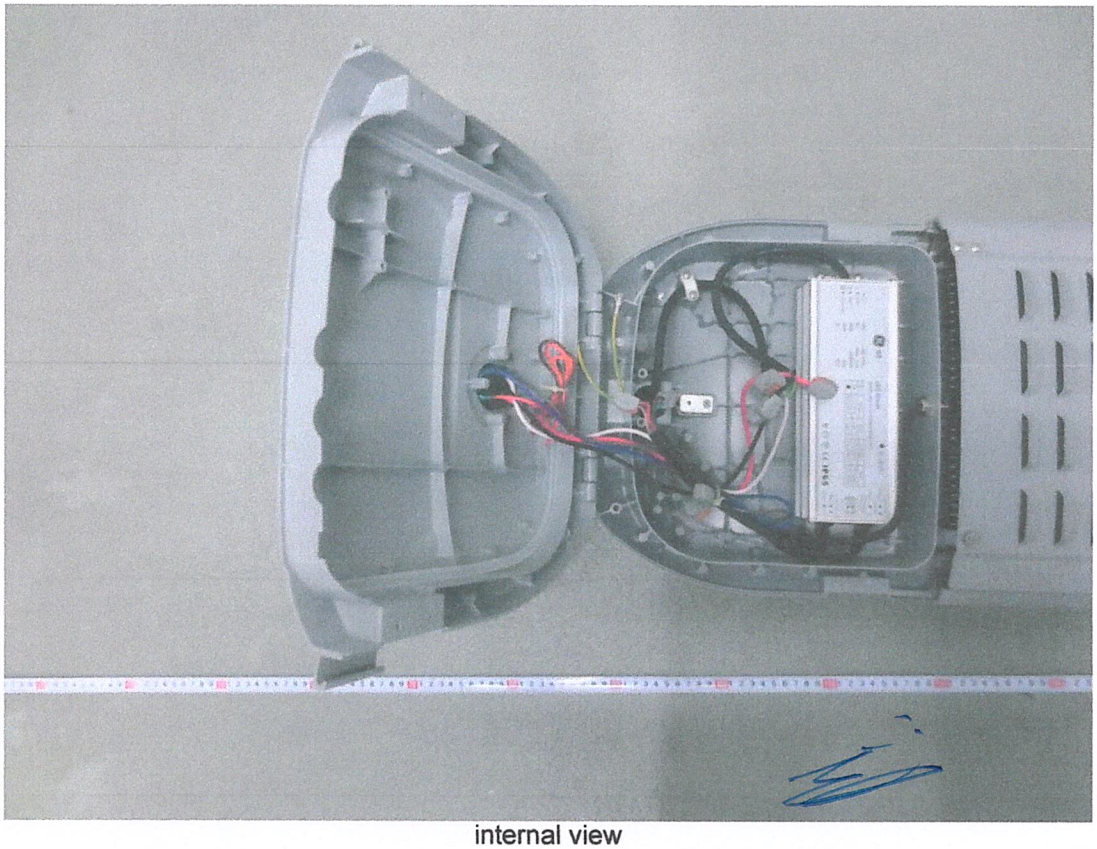


Overview

Annex picture

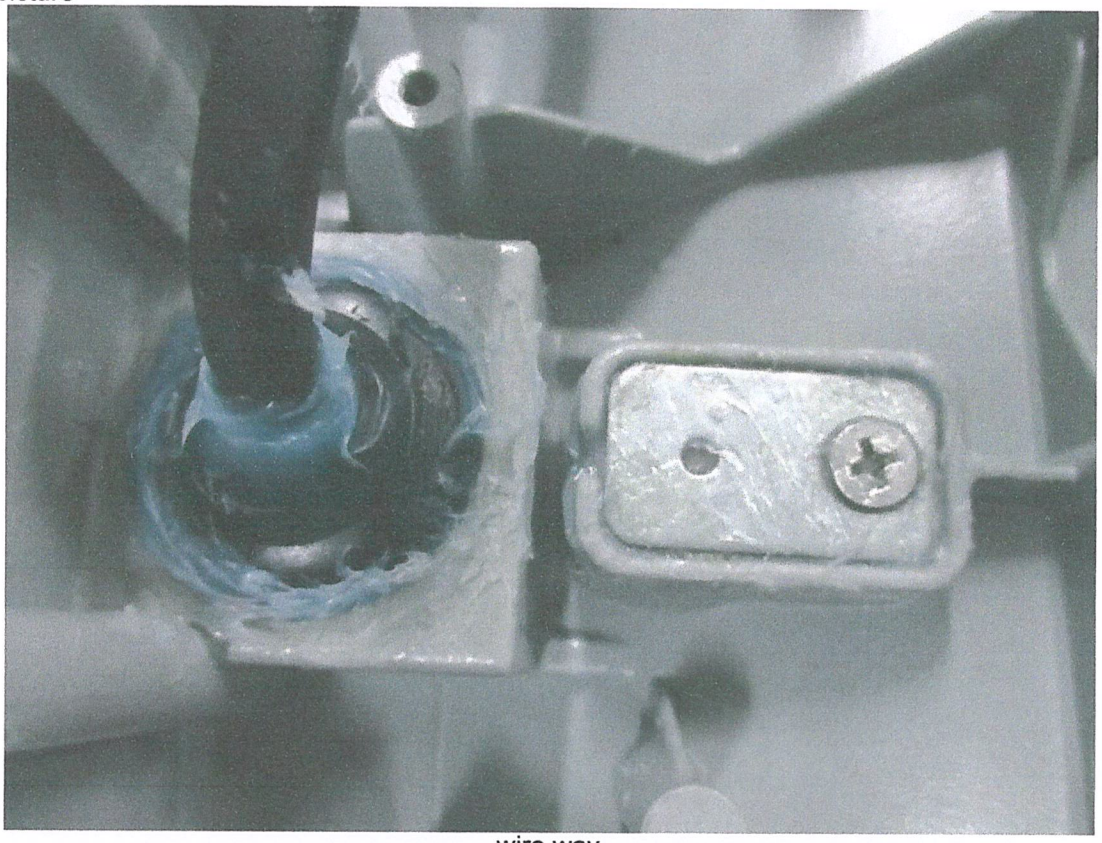


overview



internal view

Annex picture

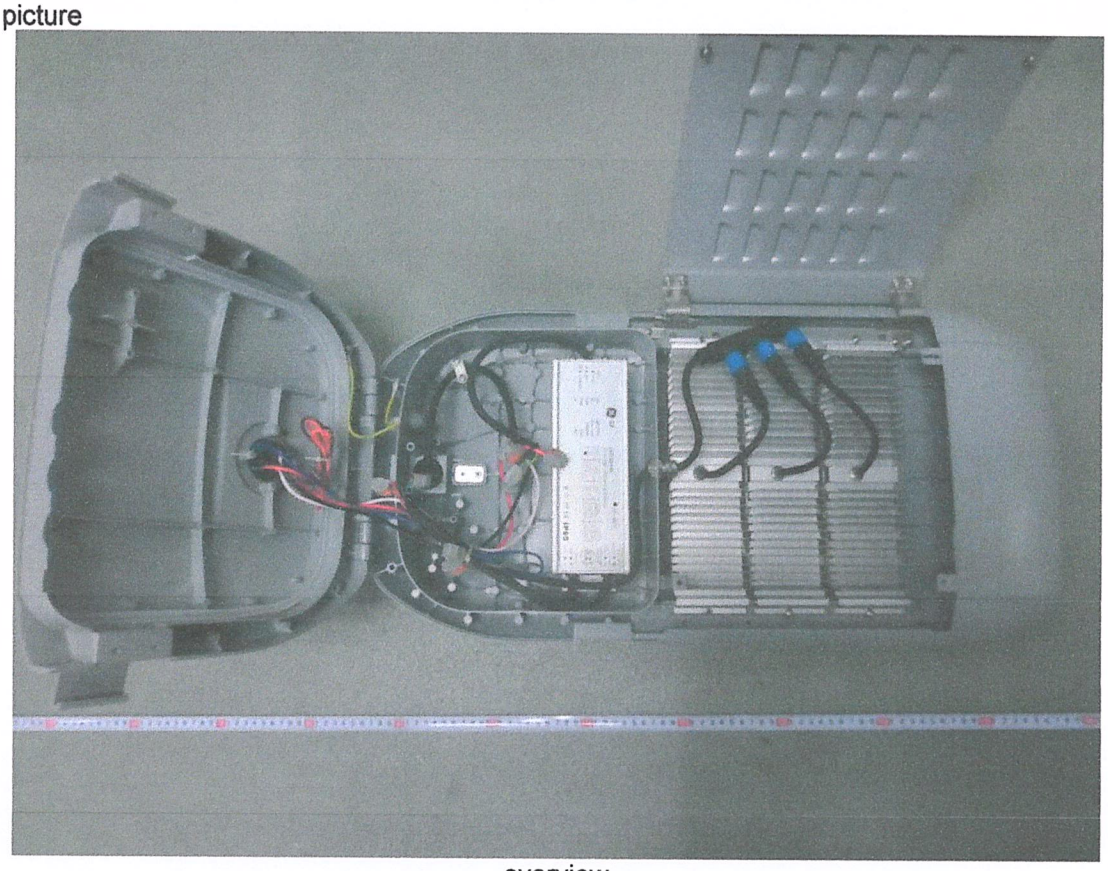


wire way

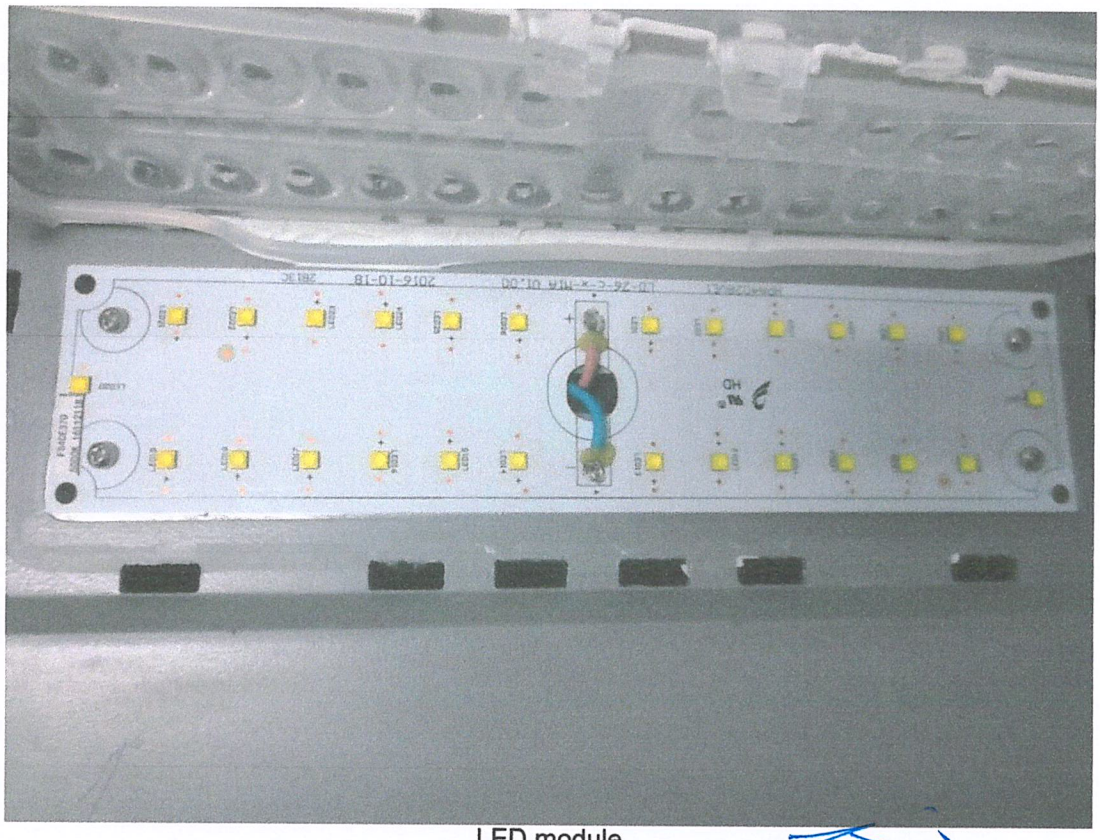


cord anchorage

Annex picture



overview



LED module

----------the end----------

IEC IECEE	**Test Report issued under the responsibility of:** **NCB TÜV SÜD PSB Pte Ltd** **1 Science Park Drive, 118221 Singapore** **Singapore**	TÜV SÜD

TEST REPORT
IEC 60598-2-3
Luminaires
Part 2: Particular requirements
Section 3: Luminaires for road and street lighting

Report Number. ..... :	083-1705534-000
Date of issue..... :	2018-01-22
Total number of pages	55
Name of Testing Laboratory preparing the Report ..... :	TÜV SÜD Certification and Testing (China) Co., Ltd. Shanghai Branch
Applicant's name..... :	Hangzhou Hpwinner Opto. Corporation
Address..... :	No.18 Kangzhong Road, Gongshu District, 310015 Hangzhou City, Zhejiang Province, PEOPLE'S REPUBLIC OF CHINA
Test specification:	
Standard ..... :	IEC 60598-2-3:2002/AMD1:2011 used in conjunction with IEC 60598-1:2014
Test procedure ..... :	CB Scheme
Non-standard test method ..... :	N/A
Test Report Form No. ..... :	IEC60598_2_3K
Test Report Form(s) Originator.... :	Intertek Semko AB
Master TRF..... :	2016-09

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This report is not valid as a CB Test Report unless signed by an approved CB Testing Laboratory and appended to a CB Test Certificate issued by an NCB in accordance with IECEE 02.

General disclaimer:

The test results presented in this report relate only to the object tested.
This report shall not be reproduced, except in full, without the written approval of the Issuing CB Testing Laboratory. The authenticity of this Test Report and its contents can be verified by contacting the NCB, responsible for this Test Report.

Test item description..... :	Luminaires for road and street lighting (LED street light)
Trade Mark..... :	N/A
Manufacturer..... :	Hangzhou Hpwinner Opto. Corporation
Model/Type reference..... :	See 'General product information'
Ratings..... :	120-240V=, 50/60Hz, Class I, IP67, ta:50°C Details see 'General product information'

Responsible Testing Laboratory (as applicable), testing procedure and testing location(s):			
X	CB Testing Laboratory:	TUV SUD Certification and Testing (China) Co., Ltd. Shanghai Branch No.151 Heng Tong Road. Shanghai 200070 P.R. China	
Testing location/ address.....:		No. 1999, Duhui Road, Shanghai, 201108, P. R. China	
—	Associated CB Testing Laboratory:	N/A	
Testing location/ address.....:		N/A	
Tested by (name, function, signature).....:		Jiani WANG	
Approved by (name, function, signature)...:		Huidong ZHANG	
—	Testing procedure: CTF Stage 1:	N/A	
Testing location/ address.....:		N/A	
Tested by (name, function, signature).....:		N/A	
Approved by (name, function, signature)...:		N/A	
—	Testing procedure: CTF Stage 2:	N/A	
Testing location/ address.....:		N/A	
Tested by (name + signature) ....:		N/A	
Witnessed by (name, function, signature)..:		N/A	
Approved by (name, function, signature)...:		N/A	
—	Testing procedure: CTF Stage 3:	N/A	
—	Testing procedure: CTF Stage 4:	N/A	
Testing location/ address.....:		N/A	
Tested by (name, function, signature).....:		N/A	
Witnessed by (name, function, signature)..:		N/A	
Approved by (name, function, signature)...:		N/A	
Supervised by (name, function, signature) :		N/A	

List of Attachments (including a total number of pages in each attachment): Lighting equipment is deemed to comply with the requirements of IEC 62493:2015 without testing.	
Summary of testing: Determination of the test result includes consideration of measurement uncertainty from the test equipment and methods. All test performed with positive result.	
Tests performed (name of test and test clause): Unless otherwise specified, Complete tests were performed on LT2040 which has the highest rated wattage and contain all components LT2040 (LUXEON 5050) and T29B-1-60 (LUXEON 3030) were chosen for 62471 & 62778 test because of the highest wattage and current and classified into risk 1. Visual check was performed on other models. The test results comply with the requirements.	**Testing location:** TÜV SÜD Certification and Testing (China) Co., Ltd. Shanghai Branch No. 1999, Duhui Road, Shanghai, 201108, P. R. China
Summary of compliance with National Differences: N/A	
Copy of marking plate: LED Street Light Modelo: T29B-1-75-60 Tensão: AC 100-277V, 50/60Hz Rated Potência: 60W Corrente: 1.2A Fator de Potência: 0.98 Ta:45°C, Luminária LED PULSE SISTEMAS ELETRONICOS Av. J. Kubitscheck de Oliveira., 1964 Curitiba, PR- Brasil Note 1: Height of letter and numeral not less than 2mm, graphical symbol not less than 5mm, WEEE not less than 7mm Note 2: The labels of other types are similar with the above, just the different model name and specification.	

Test item particulars .....:	Luminaires for road and street lighting (LED street light)
Classification of installation and use.....:	Class I
Supply Connection .....:	Supply cords
.....:	
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..... :	2017-12-08
Date (s) of performance of tests ..... :	2017 12-11 to 2017-12-21

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.

Remark 1:
The following contents are included and as appendix of this test report:

1) Test report IEC 60598-2-3:2002 (Third Edition) + A1:2011 used in conjunction with IEC 60598-1:2014 (Eighth Edition)
2) Appendix 1: Additional requirements of IEC 62031:2008 + A1:2012 +A2:2014
3) Appendix 2: Additional requirements of IEC 62493:2015
4) Appendix 3: Additional requirements of IEC 62471:2006
5) Appendix 4: Additional requirements of IEC/TR 62778:2014
6) Appendix 5: Photograph

Manufacturer's Declaration per sub-clause 4.2.5 of IECEE 02:

The application for obtaining a CB Test Certificate includes more than one factory location and a declaration from the Manufacturer stating that the sample(s) submitted for evaluation is (are) representative of the products from each factory has been provided.....:	☐ **Yes** ☒ **Not applicable**

When differences exist; they shall be identified in the General product information section.

Name and address of factory (ies)..... :	Hangzhou Hpwinner Opto. Corporation No.18 Kangzhong Road, Gongshu District, 310015 Hangzhou City, Zhejiang Province, PEOPLE'S REPUBLIC OF CHINA

General product information:

All products covered in this report are street luminaires with LED modules (LED modules: Lumileds Luxeon 5050, Lumileds Luxeon 3030), and each model have same mechanical and electrical construction, just have different wattage and LED driver, details information as below table:

Model	Wattage (W)	LED Driver	LED Driver	Chip Max QTY (Luxeon 5050)	Chip Max QTY (Luxeon 3030)
T29B-1-75-60	60	EUG-075S175DV/ EUK-075S175DV/ EUK-075S175TV	LDP-075M062H/ LDP-075R062H	24	63
T29B-1-75-70	70	EUG-075S175DV/ EUK-075S175DV/ EUK-075S175TV	LDP-075M062H/ LDP-075R062H	24	--
T29B-1-75-75	75	EUG-075S175DV/ EUK-075S175DV/ EUK-075S175TV	LDP-075M062H/ LDP-075R062H	24	--

IEC 60598-2-3			
Clause	Requirement + Test	Result - Remark	Verdict

3.2 (0)	GENERAL TEST REQUIREMENTS		P
3.2 (0.1)	Information for luminaire design considered .....:	Standard IEC 62031 Yes ☒ No ☐	—
3.2 (0.3)	More sections applicable ..... :	Yes ☐ No ☒	—

3.4 (2)	CLASSIFICATION		P
3.4 (2.2)	Type of protection .....:	Class I	—
3.4 (2.3)	Degree of protection .....:	IP67	—
3.4 (2.4)	Luminaire suitable for direct mounting on normally flammable surfaces .....:	Yes No ☐	—
3.4 (2.5)	Luminaire for normal use .....:	Yes No ☐	—
	Luminaire for rough service .....:	Yes ☐ No ☒	—
3.4 (-)	Modes of installation of road or street lighting		—
	a) on a pipe	Yes ☐ No ☒	—
	b) on a mast arm	Yes ☐ No ☒	—
	c) on a post top	Yes No ☐	—
	d) on span or suspension wires	Yes ☐ No ☒	—
	e) on a wall	Yes ☐ No ☒	—

3.5 (3)	MARKING		P
3.5 (3.2)	Mandatory markings		P
	Position of the marking		P
	Format of symbols/text		P
3.5 (3.3)	Additional information		P
	Language of instructions	English	P
3.5 (3.3.1)	Combination luminaires		N/A
3.5 (3.3.2)	Nominal frequency in Hz	50/60Hz	P
3.5 (3.3.3)	Operating temperature	50°C	P
3.5 (3.3.4)	Symbol or warning notice		N/A
3.5 (3.3.5)	Wiring diagram		N/A
3.5 (3.3.6)	Special conditions		N/A
3.5 (3.3.7)	Metal halide lamp luminaire – warning		N/A
3.5 (3.3.8)	Limitation for semi-luminaires		N/A
3.5 (3.3.9)	Power factor and supply current		P

IEC 60598-2-3			
Clause	Requirement + Test	Result - Remark	Verdict
3.5 (3.3.10)	Suitability for use indoors		N/A
3.5 (3.3.11)	Luminaires with remote control		N/A
3.5 (3.3.12)	Clip-mounted luminaire – warning		N/A
3.5 (3.3.13)	Specifications of protective shields		N/A
3.5 (3.3.14)	Symbol for nature of supply	~	P
3.5 (3.3.15)	Rated current of socket outlet		N/A
3.5 (3.3.16)	Rough service luminaire		N/A
3.5 (3.3.17)	Mounting instruction for type Y, type Z and some type X attachments	Type Y	P
3.5 (3.3.18)	Non-ordinary luminaires with PVC cable		N/A
3.5 (3.3.19)	Protective conductor current in instruction if applicable		N/A
3.5 (3.3.20)	Provided with information if not intended to be mounted within arm's reach		N/A
3.5 (3.3.21)	Non-replaceable and non-user replaceable light sources information provided	Non-replaceable light sources	P
	Cautionary symbol		P
3.5 (3.3.22)	Controllable luminaires, classification of insulation provided		N/A
3.5 (3.4)	Test with water		P
	Test with hexane		P
	Legible after test		P
	Label attached		P
3.5 (-)	Additional information in instruction leaflet		P
	a) Design attitude		P
	b) Weight		P
	c) Overall dimensions		P
	d) Maximum projected area if applicable		P
	e) Cross-sectional area of wires if applicable		N/A
	f) Suitability for indoors use		N/A
	g) Dimensions of the compartment		N/A
	h) Torque setting to be applied to bolts or screws		P
	i) Maximum mounting height		P

3.6 (4)	**CONSTRUCTION**		P
3.6 (4.2)	Components replaceable without difficulty		P

IEC 60598-2-3			
Clause	Requirement + Test	Result - Remark	Verdict
3.6 (4.3)	Wireways smooth and free from sharp edges		P
3.6 (4.4)	**Lampholders**		N/A
3.6 (4.4.1)	Integral lampholder		N/A
3.6 (4.4.2)	Wiring connection		N/A
3.6 (4.4.3)	Lampholder for end-to-end mounting		N/A
3.6 (4.4.4)	Positioning		N/A
	- pressure test (N) .....:		—
	After test the lampholder comply with relevant standard sheets and show no damage		N/A
	After test on single-capped lampholder the lampholder have not moved from its position and show no permanent deformation		N/A
	- bending test (N) .....:		—
	After test the lampholder have not moved from its position and show no permanent deformation		N/A
3.6 (4.4.5)	Peak pulse voltage		N/A
3.6 (4.4.6)	Centre contact		N/A
3.6 (4.4.7)	Parts in rough service luminaires resistant to tracking		N/A
3.6 (4.4.8)	Lamp connectors		N/A
3.6 (4.4.9)	Caps and bases correctly used		N/A
3.6 (4.4.10)	Light source for lampholder or connection according IEC 60061 not connected another way		N/A
3.6 (4.5)	**Starter holders**		N/A
	Starter holder in luminaires other than class II		N/A
	Starter holder class II construction		N/A
3.6 (4.6)	**Terminal blocks**		N/A
	Tails		N/A
	Unsecured blocks		N/A
3.6 (4.7)	**Terminals and supply connections**		P
3.6 (4.7.1)	Contact to metal parts		P
3.6 (4.7.2)	Test 8 mm live conductor		P
	Test 8 mm earth conductor		P
3.6 (4.7.3)	Terminals for supply conductors		P
3.6 (4.7.3.1)	Welded method and material		N/A
	- stranded or solid conductor		N/A
	- spot welding		N/A

IEC 60598-2-3			
Clause	Requirement + Test	Result - Remark	Verdict
	- welding between wires		N/A
	- Type Z attachment		N/A
	- mechanical test according to 15.8.2		N/A
	- electrical test according to 15.9		N/A
	- heat test according to 15.9.2.3 and 15.9.2.4		N/A
3.6 (4.7.4)	Terminals other than supply connection		P
3.6 (4.7.5)	Heat-resistant wiring/sleeves		N/A
3.6 (4.7.6)	Multi-pole plug		N/A
	- test at 30 N		N/A
3.6 (4.8)	**Switches**		N/A
	- adequate rating		N/A
	- adequate fixing		N/A
	- polarized supply		N/A
	- compliance with IEC 61058-1 for electronic switches		N/A
3.6 (4.9)	**Insulating lining and sleeves**		N/A
3.6 (4.9.1)	Retainment		N/A
	Method of fixing .....:		—
3.6 (4.9.2)	Insulated linings and sleeves:		N/A
	Resistant to a temperature > 20 °C to the wire temperature or		N/A
	a) & c) Insulation resistance and electric strength		N/A
	b) Ageing test. Temperature (°C) .....:		N/A
3.6 (4.10)	**Double or reinforced insulation**		N/A
3.6 (4.10.1)	No contact, mounting surface – accessible metal parts – wiring of basic insulation		N/A
	Safe installation fixed luminaires		N/A
	Capacitors and switches		N/A
	Interference suppression capacitors according to IEC 60384-14		N/A
3.6 (4.10.2)	Assembly gaps:		N/A
	- not coincidental		N/A
	- no straight access with test probe		N/A
3.6 (4.10.3)	Retainment of insulation:		N/A
	- fixed		N/A

IEC 60598-2-3			
Clause	Requirement + Test	Result - Remark	Verdict
	- unable to be replaced; luminaire inoperative		N/A
	- sleeves retained in position		N/A
	- lining in lampholder		N/A
3.6 (4.11)	**Electrical connections and current-carrying parts**		**P**
3.6 (4.11.1)	Contact pressure		P
3.6 (4.11.2)	Screws:		N/A
	- self-tapping screws		N/A
	- thread-cutting screws		N/A
3.6 (4.11.3)	Screw locking:		N/A
	- spring washer		N/A
	- rivets		N/A
3.6 (4.11.4)	Material of current-carrying parts		P
3.6 (4.11.5)	No contact to wood or mounting surface		P
3.6 (4.11.6)	Electro-mechanical contact systems		P
3.6 (4.12)	**Screws and connections (mechanical) and glands**		**N/A**
3.6 (4.12.1)	Screws not made of soft metal		N/A
	Screws of insulating material		N/A
	Torque test: torque (Nm); part.....:		N/A
	Torque test: torque (Nm); part.....:		N/A
	Torque test: torque (Nm); part.....:		N/A
3.6 (4.12.2)	Screws with diameter < 3 mm screwed into metal		N/A
3.6 (4.12.4)	Locked connections:		N/A
	- fixed arms; torque (Nm).....:		N/A
	- lampholder; torque (Nm).....:		N/A
	- push-button switches; torque 0,8 Nm.....:		N/A
3.6 (4.12.5)	Screwed glands; force (Nm).....:		N/A
3.6 (4.13)	**Mechanical strength**		**P**
3.6 (4.13.1)	Impact tests:		P
	- fragile parts; energy (Nm) .....:		N/A
	- other parts; energy (Nm).....:	Translucent cover: 0,7Nm Metal enclosure: 0,7Nm	P
	1) live parts		P
	2) linings		N/A
	3) protection		P
	4) covers		P

IEC 60598-2-3			
Clause	Requirement + Test	Result - Remark	Verdict
3.6 (4.13.3)	Straight test finger		P
3.6 (4.13.4)	Rough service luminaires		N/A
	- IP54 or higher		N/A
	a) fixed		N/A
	b) hand-held		N/A
	c) delivered with a stand		N/A
	d) for temporary installations and suitable for mounting on a stand		N/A
3.6 (4.13.6)	Tumbling barrel		N/A
3.6 (4.14)	**Suspensions, fixings and means of adjusting**		P
3.6 (4.14.1)	Mechanical load:		P
	A) four times the weight		P
	B) torque 2,5 Nm		N/A
	C) bracket arm; bending moment (Nm) .....:		N/A
	D) load track-mounted luminaires		N/A
	E) clip-mounted luminaires, glass-shelve. Thickness (mm) .....:		N/A
	Metal rod. diameter (mm) .....:		N/A
	Fixed luminaire or independent control gear without fixing devices		N/A
3.6 (4.14.2)	Load to flexible cables		N/A
	Mass (kg) .....:		—
	Stress in conductors (N/mm²) .....:		N/A
	Mass (kg) of semi-luminaire .....:		—
	Bending moment (Nm) of semi-luminaire .....:		N/A
3.6 (4.14.3)	Adjusting devices:		N/A
	- flexing test; number of cycles.....:		N/A
	- strands broken .....:		N/A
	- electric strength test afterwards		N/A
3.6 (4.14.4)	Telescopic tubes: cords not fixed to tube; no strain on conductors		N/A
3.6 (4.14.5)	Guide pulleys		N/A
3.6 (4.14.6)	Strain on socket-outlets		N/A
3.6 (4.15)	**Flammable materials**		P
	- glow-wire test 650°C.....:	See Test Table 3.15 (13.3.2)	P

IEC 60598-2-3			
Clause	Requirement + Test	Result - Remark	Verdict
	- spacing □30 mm		N/A
	- screen withstanding test of 13.3.1		N/A
	- screen dimensions		N/A
	- no fiercely burning material		P
	- thermal protection		N/A
	- electronic circuits exempted		N/A
3.6 (4.15.2)	Luminaires made of thermoplastic material with lamp control gear		N/A
	a) construction		N/A
	b) temperature sensing control		N/A
	c) surface temperature		N/A
3.6 (4.16)	**Luminaires for mounting on normally flammable surfaces**		**P**
	No lamp control gear .....:	(compliance with Section 12)	N/A
3.6 (4.16.1)	Lamp control gear spacing:		N/A
	- spacing 35 mm		N/A
	- spacing 10 mm		N/A
3.6 (4.16.2)	Thermal protection:		N/A
	- in lamp control gear		N/A
	- external		N/A
	- fixed position		N/A
	- temperature marked lamp control gear		N/A
3.6 (4.16.3)	Design to satisfy the test of 12.6	(see clause 12.6)	N/A
3.6 (4.17)	**Drain holes**		N/A
	Clearance at least 5 mm		N/A
3.6 (4.18)	**Resistance to corrosion**		**P**
3.6 (4.18.1)	- rust-resistance		P
3.6 (4.18.2)	- season cracking in copper		P
3.6 (4.18.3)	- corrosion of aluminium		P
3.6 (4.19)	Igniters compatible with ballast		N/A
3.6 (4.20)	Rough service vibration		N/A
3.6 (4.21)	**Protective shield**		N/A
3.6 (4.21.1)	Shield fitted if tungsten halogen lamps or metal halide lamps		N/A
	Shield of glass if tungsten halogen lamps		N/A
3.6 (4.21.2)	Particles from a shattering lamp not impair safety		N/A

IEC 60598-2-3			
Clause	Requirement + Test	Result - Remark	Verdict
3.6 (4.21.3)	No direct path		N/A
3.6 (4.21.4)	Impact test on shield		N/A
	Glow-wire test on lamp compartment .....:	See Test Table 3.15 (13.3.2)	N/A
3.6 (4.22)	Attachments to lamps not cause overheating or damage		N/A
3.6 (4.23)	Semi-luminaires comply Class II		N/A
3.6 (4.24)	**Photobiological hazards**		**P**
3.6 (4.24.1)	No excessive UV radiation if tungsten halogen lamps and metal halide lamps (Annex P)		N/A
3.6 (4.24.2)	Retinal blue light hazard		P
	Luminaires with E_{thr}:		P
	a) Fixed luminaires		P
	- distance x m, borderline between RG1 and RG2...:	RG1	P
	- marking and instruction according 3.2.23		N/A
	b) Portable and handheld luminaires		N/A
	- marking according 3.2.23 if RG1 exceeded at 200 mm according to IEC/TR 62778		N/A
	Portable luminaires for children IEC 60598-2-10 and Mains socket outlet nightlights IEC 60598-2-12 not exceed RG1 at 200 mm according to IEC/62778		N/A
3.6 (4.25)	**Mechanical hazard**		**P**
	No sharp point or edges		P
3.6 (4.26)	**Short-circuit protection**		N/A
3.6 (4.26.1)	Adequate means of uninsulated accessible SELV parts		N/A
3.6 (4.26.2)	Short-circuit test with test chain according 4.26.3		N/A
	Test chain not melt through		N/A
	Test sample not exceed values of Table 12.1 and 12.2		N/A
3.6 (4.27)	**Terminal blocks with integrated screwless earthing contacts**		N/A
	Test according Annex V		N/A
	Pull test of terminal fixing (20 N)		N/A
	After test, resistance < 0,05 ϕ_1		N/A
	Pull test of mechanical connection (50 N)		N/A
	After test, resistance < 0,05 ϕ_1		N/A
	Voltage drop test, resistance < 0,05 ϕ_1		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
3.6 (4.28)	**Fixing of thermal sensing control**		N/A
	Not plug-in or easily replaceable type		N/A
	Reliably kept in position		N/A
	No adhesive fixing if UV radiations from a lamp can degrade the fixing		N/A
	Not outside the luminaire enclosure		N/A
	Test of adhesive fixing:		N/A
	Max. temperature on adhesive material (°C) .....:		—
	100 cycles between t min and t max		N/A
	Temperature sensing control still in position		N/A
3.6 (4.29)	**Luminaires with non-replaceable light source**		P
	Not possible to replace light source		P
	Live part not accessible after parts have been opened by hand or tools		P
3.6 (4.30)	**Luminaires with non-user replaceable light source**		N/A
	If protective cover provide protection against electric shock and marked with "caution, electric shock risk" symbol:		N/A
	Minimum two fixing means		N/A
3.6 (4.31)	**Insulation between circuits**		P
	Circuits insulated from LV supply fulfil requirements according 4.31.1 – 4.31.3		N/A
	Controllable luminaires requiring same level of insulation for all components, the insulation between control terminals and LV supply fulfil requirements according 4.31.1 – 4.31.3		N/A
3.6 (4.31.1)	SELV circuits		P
	Used SELV source		P
	Voltage Š ELV		N/A
	Insulating of SELV circuits from LV supply		N/A
	Insulating of SELV circuits from other non SELV circuits		N/A
	Insulating of SELV circuits from FELV		N/A
	Insulating of SELV circuits from other SELV circuits		N/A
	SELV circuits insulated from accessible parts according Table X.1		N/A
	Plugs not able to enter socket-outlets of other voltage systems		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	Socket outlets does not admit plugs of other voltage systems		N/A
	Plugs and socket-outlets does not have protective conductor contact		N/A
3.6 (4.31.2)	FELV circuits		N/A
	Used FELV source		N/A
	Voltage Š ELV		N/A
	Insulating of FELV circuits from LV supply		N/A
	FELV circuits insulated from accessible parts according Table X.1		N/A
	Plugs not able to enter socket-outlets of other voltage systems		N/A
	Socket outlets does not admit plugs of other voltage systems		N/A
	Socket-outlets does not have protective conductor contact		N/A
3.6 (4.31.3)	Other circuits		P
	Other circuits insulated from accessible parts according Table X.1		P
	Class II construction with equipotential bonding for protection against indirect contacts with live parts:		N/A
	- conductive parts are connected together		N/A
	- test according 7.2.3 of above		N/A
	- conductive part not cause an electric shock in case of an insulation fault		N/A
	- equipotential bonding in master/slave applications		N/A
	- master luminaire provided with terminal for accessible conductive parts of slave luminaires		N/A
	- slave luminaire constructed as class I		N/A
3.6 (4.32)	**Overvoltage protective devices**		N/A
	Comply with IEC 61643-11		N/A
	External to controlgear and connected to earth:		N/A
	- only in fixed luminaires		N/A
	- only connected to protective earth		N/A
3.6.1 (-)	At least IP X3 or X5 respectively. IP ..... :	IP67	P
	Column-integrated luminaires:		N/A
	- parts below 2,5 m. IP ..... :		N/A
	- parts above 2,5 m. IP ..... :		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
3.6.2 (-)	Suspension on span wires		N/A
3.6.3 (-)	Means for attaching the luminaire or external parts to its support appropriate to the weight		P
3.6.3.1 (-)	Static load test		P
	- drag coefficient..... :	1,2	P
	- loaded area (m²)..... :	0,36	P
	- used load (N)..... :	878	P
	- measured deformation (cm/m) ..... :		P
	- no rotation		P
3.6.4 (-)	Adjustable lampholders		N/A
3.6.5 (-)	Luminaires installed above 5 m, glass covers shall be:		P
	a) glass that fractures into small pieces (test according to 3.6.5.1), or		N/A
	b) glass having a high impact shock resistance (test according to 3.6.5.2), or		P
	c) protected by any means to retain glass fragments		N/A
	For tunnel luminaires 3.6.5.1 apply		N/A
	Method of protection declared by the manufacturer		P
3.6.5.1 (-)	Protection by the use of glass that fractures into small pieces		N/A
	- number of particles is more than 40 ..... :		N/A
3.6.5.2 (-)	Protection by the use of high impact resistant glass		P
3.6.5.2.1 (-)	Glass covers have high mechanical strength		P
	Test according IEC 62262 with test apparatus according IEC 60068-2-75 with impact energy of 5J on preconditioned sample	IK08	P
3.6.5.2.2 (-)	Glass covers not break into large pieces		N/A
	- test according 3.6.5.1, number of particles is more than 20 ..... :		N/A
3.6.6 (-)	Connection compartment of column-integrated luminaire		N/A
	- provides adequate space		N/A
	- means for attachment		N/A
	- means for attachment of metal corrosion-resistant		N/A
3.6.7 (-)	Compliance with ISO standard or other..... :		N/A
3.6.8 (-)	Doors of column-integrated luminaires:		N/A
	- corrosion-resistant		N/A
	- opening only possible for an authorized person		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	- impact test 5 Nm		N/A
	- sample show no damage		N/A
3.6.9 (-)	Column-integrated luminaire:		N/A
	- dimension of the cable entry slot (mm)..... :		N/A
	- cable path from the slot to the connection compartment (mm) ..... :		N/A
	- cable path free from obstruction that might cause abrasion of the cable		N/A
3.7 (11)	**CREEPAGE DISTANCES AND CLEARANCES**		P
3.7 (11.2)	Creepage distances and clearances .....:	See Table 3.7 (11.2)	P
	Working voltage (V) .....:	120-240V~	—
	Rated pulse voltage (kV).....:	N/A	—
	Voltage form.....:	Sinusoidal ☐ Non-sinusoidal ☒	—
	PTI .....:	< 600 ☒ ≥ 600 ☐	—
	Impulse withstand category (Normal category II) (Category III Annex U)	Category II ☒ Category III ☐	—
3.8 (7)	**PROVISION FOR EARTHING**		
3.8 (7.2.1 + 7.2.3)	Accessible metal parts		P
	Metal parts in contact with supporting surface		P
	Resistance < 0,5 ϕι.....:	0,065	P
	Self-tapping screws used		N/A
	Thread-forming screws		N/A
	Thread-forming screw used in a grove		N/A
	Earth makes contact first		P
	Terminal blocks with integrated screwless earthing contacts tested according Annex V		N/A
	Protective earthing of the luminaire not via built-in control gear		P
3.8 (7.2.2 + 7.2.3)	Earth continuity in joints, etc.		P
3.8 (7.2.4)	Locking of clamping means		N/A
	Compliance with 4.7.3		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	Terminal blocks with integrated screwless earthing contacts tested according Annex V		N/A
3.8 (7.2.5)	Earth terminal integral part of connector socket		N/A
3.8 (7.2.6)	Earth terminal adjacent to mains terminals		N/A
3.8 (7.2.7)	Electrolytic corrosion of the earth terminal		N/A
3.8 (7.2.8)	Material of earth terminal		P
	Contact surface bare metal		P
3.8 (7.2.10)	Class II luminaire for looping-in		N/A
	Double or reinforced insulation to functional earth		N/A
3.8 (7.2.11)	Earthing core coloured green-yellow		P
	Length of earth conductor		P
3.8.1 (-)	Attachment prevented from rotation		N/A
3.9 (14)	**SCREW TERMINALS**		P
	Separately approved; component list .....:	(see Annex 1)	P
	Part of the luminaire .....:	(see Annex 3)	N/A
3.9 (15)	**SCREWLESS TERMINALS AND ELECTRICAL CONNECTIONS**		N/A
	Separately approved; component list .....:	(see Annex 1)	N/A
	Part of the luminaire .....:	(see Annex 4)	N/A
3.10 (5)	**EXTERNAL AND INTERNAL WIRING**		P
3.10 (5.2)	Supply connection and external wiring		P
3.10 (5.2.1)	Means of connection.....:	Supply cords	P
	Outdoor luminaire has not PVC insulated external wiring if not class III or SELV Š 25 V a.c./60 V d.c. or protected from outdoor environment		N/A
3.10 (5.2.2)	Type of cable.....:	H05RN-F	P
	Nominal cross-sectional area (mm²).....:	3G1,0	P
	Cables equal to IEC 60227 or IEC 60245		P
3.10 (5.2.3)	Type of attachment, X, Y or Z	Type Y	P
3.10 (5.2.5)	Type Z not connected to screws		N/A
3.10 (5.2.6)	Cable entries:		P
	- suitable for introduction		P
	- adequate degree of protection		P

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Clause	Requirement + Test	Result - Remark	Verdict
3.10 (5.2.7)	Cable entries through rigid material have rounded edges		N/A
3.10 (5.2.8)	Insulating bushings:		N/A
	- suitably fixed		N/A
	- material in bushings		N/A
	- material not likely to deteriorate		N/A
	- tubes or guards made of insulating material		N/A
3.10 (5.2.9)	Locking of screwed bushings		N/A
3.10 (5.2.10)	Cord anchorage:		P
	- covering protected from abrasion		P
	- clear how to be effective		P
	- no mechanical or thermal stress		P
	- no tying of cables into knots etc.		P
	- insulating material or lining		P
3.10 (5.2.10.1)	Cord anchorage for type X attachment:		N/A
	a) at least one part fixed		N/A
	b) types of cable		N/A
	c) no damaging of the cable		N/A
	d) whole cable can be mounted		N/A
	e) no touching of clamping screws		N/A
	f) metal screw not directly on cable		N/A
	g) replacement without special tool		N/A
	Glands not used as anchorage		N/A
	Labyrinth type anchorages		N/A
3.10 (5.2.10.2)	Adequate cord anchorage for type Y and type Z attachment		P
3.10 (5.2.10.3)	Tests:		P
	- impossible to push cable; unsafe		P
	- pull test: 25 times; pull (N) .....:	60	P
	- torque test: torque (Nm).....:	0,25	P
	- displacement □ 2 mm		P
	- no movement of conductors		P
	- no damage of cable or cord		P

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Clause	Requirement + Test	Result - Remark	Verdict
	- function independent of electrical connection		N/A
3.10 (5.2.11)	External wiring passing into luminaire		N/A
3.10 (5.2.12)	Looping-in terminals		N/A
3.10 (5.2.13)	Wire ends not tinned		P
	Wire ends tinned: no cold flow		N/A
3.10 (5.2.14)	Mains plug same protection		N/A
	Class III luminaire plug		N/A
	No unsafe compatibility		N/A
3.10 (5.2.16)	Appliance inlets (IEC 60320)		N/A
	Installation couplers (IEC 61535)		N/A
	Other appliance inlet or connector according relevant IEC standard		N/A
3.10 (5.2.17)	No standardized interconnecting cables properly assembled		N/A
3.10 (5.2.18)	Used plug in accordance with		N/A
	- IEC 60083		N/A
	- other standard		N/A
3.10 (5.3)	**Internal wiring**		**P**
3.10 (5.3.1)	Internal wiring of suitable size and type		P
	Through wiring		N/A
	- not delivered/ mounting instruction		N/A
	- factory assembled		N/A
	- socket outlet loaded (A).....:		N/A
	- temperatures.....:	(see Annex 2)	N/A
	Green-yellow for earth only		N/A
3.10 (5.3.1.1)	Internal wiring connected directly to fixed wiring		P
	Cross-sectional area (mm²) .....:	2x1,0	P
	Insulation thickness		P
	Extra insulation added where necessary		N/A
3.10 (5.3.1.2)	Internal wiring connected to fixed wiring via internal current-limiting device		P

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Clause	Requirement + Test	Result - Remark	Verdict
	Adequate cross-sectional area and insulation thickness		P
3.10 (5.3.1.3)	Double or reinforced insulation for class II		N/A
3.10 (5.3.1.4)	Conductors without insulation		N/A
3.10 (5.3.1.5)	SELV current-carrying parts		N/A
3.10 (5.3.1.6)	Insulation thickness other than PVC or rubber		N/A
3.10 (5.3.2)	Sharp edges etc.		P
	No moving parts of switches etc.		N/A
	Joints, raising/lowering devices		N/A
	Telescopic tubes etc.		N/A
	No twisting over 360°		P
3.10 (5.3.3)	Insulating bushings:		N/A
	- suitable fixed		N/A
	- material in bushings		N/A
	- material not likely to deteriorate		N/A
	- cables with protective sheath		N/A
3.10 (5.3.4)	Joints and junctions effectively insulated		N/A
3.10 (5.3.5)	Strain on internal wiring		N/A
3.10 (5.3.6)	Wire carriers		N/A
3.10 (5.3.7)	Wire ends not tinned		P
	Wire ends tinned: no cold flow		N/A
3.10.1 (-)	Cord anchorage if applicable		P
	- pull test: 25 times; pull (N) ..... :	60	P
	- torque test: torque (Nm)..... :	0,25	P

3.11 (8)	**PROTECTION AGAINST ELECTRIC SHOCK**		P
3.11 (8.2.1)	Live parts not accessible		P
	Basic insulated parts not used on the outer surface without appropriate protection		P
	Basic insulated parts not accessible with standard test finger on portable, settable and adjustable luminaires		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	Basic insulated parts not accessible with Ø 50 mm probe from outside, other types of luminaires		P
	Lamp and starterholders in portable and adjustable luminaires comply with double or reinforced insulation requirements		N/A
	Basic insulation only accessible under lamp or starter replacement		P
	Protection in any position		P
	Double-ended tungsten filament lamp		N/A
	Insulation lacquer not reliable		N/A
	Double-ended high pressure discharge lamp		N/A
	Relevant warning according to 3.2.18 fitted to the luminaire		N/A
3.11 (8.2.2)	Portable luminaire adjusted in most unfavourable position		N/A
3.11 (8.2.3.a)	Class II luminaire:		N/A
	- basic insulated metal parts not accessible during starter or lamp replacement		N/A
	- basic insulation not accessible other than during starter or lamp replacement		N/A
	- glass protective shields not used as supplementary insulation		N/A
3.11 (8.2.3.b)	BC lampholder of metal in class I luminaires shall be earthed		N/A
3.11 (8.2.3.c)	SELV circuits with exposed current carrying parts:		N/A
	Ordinary luminaire:		N/A
	- touch current .....:		N/A
	- no-load voltage.....:		N/A
	Other than ordinary luminaire:		N/A
	- nominal voltage .....:		N/A
3.11 (8.2.4)	Portable luminaire have protection independent of supporting surface		N/A
3.11 (8.2.5)	Compliance with the standard test finger or relevant probe		P
3.11 (8.2.6)	Covers reliably secured		P
3.11 (8.2.7)	Discharging of capacitors □ 0,5 µF		P
	Portable plug connected luminaire with capacitor		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	Other plug connected luminaire with capacitor		N/A
	Discharge device on or within capacitor		N/A
	Discharge device mounted separately		N/A
3.12 (12)	**ENDURANCE TEST AND THERMAL TEST**		P
3.12.2 (-)	If IP > IP 20 relevant test of (12.4), (12.5) and (12.6) after (9.2) before (9.3) specified in 3.13		—
3.12 (12.3)	Endurance test:		P
	- mounting-position.....:	Normal position	—
	- test temperature (°C).....:	50°C	—
	- total duration (h) .....:	240h	—
	- supply voltage: Un factor; calculated voltage (V)...:	1,1 x 240V=264V	—
	- lamp used .....:	LED module	—
3.12 (12.3.2)	After endurance test:		P
	- no part unserviceable		P
	- luminaire not unsafe		P
	- no damage to track system		P
	- marking legible		P
	- no cracks, deformation etc.		P
3.12 (12.4)	Thermal test (normal operation)	(see Annex 2)	P
3.12 (12.5)	Thermal test (abnormal operation)	(see Annex 2)	P
3.12 (12.6)	Thermal test (failed lamp control gear condition):		N/A
3.12 (12.6.1)	Through wiring or looping-in wiring loaded by a current of (A) .....:		—
	- case of abnormal conditions .....:		—
	- electronic lamp control gear		N/A
	- measured winding temperature (°C): at 1,1 Un ....:		—
	- measured mounting surface temperature (°C) at 1,1 Un .....:		N/A
	- calculated mounting surface temperature (°C) .....:		N/A
	- track-mounted luminaires		N/A
3.12 (12.6.2)	Temperature sensing control		N/A
	- case of abnormal conditions .....:		—

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Clause	Requirement + Test	Result - Remark	Verdict
	- thermal link		N/A
	- manual reset cut-out		N/A
	- auto reset cut-out		N/A
	- measured mounting surface temperature (°C).....:		N/A
	- track-mounted luminaires		N/A
3.12 (12.7)	Thermal test (failed lamp control gear in plastic luminaires):		N/A
3.12 (12.7.1)	Luminaire without temperature sensing control		N/A
3.12 (12.7.1.1)	Luminaire with fluorescent lamp Š 70W		N/A
	Test method 12.7.1.1 or Annex W .....:		—
	Test according to 12.7.1.1:		N/A
	- case of abnormal conditions .....:		—
	- Ballast failure at supply voltage (V) .....:		—
	- Components retained in place after the test		N/A
	- Test with standard test finger after the test		N/A
	Test according to Annex W:		N/A
	- case of abnormal conditions .....:		—
	- measured winding temperature (°C): at 1,1 Un .....:		—
	- measured temperature of fixing point/exposed part (°C): at 1,1 Un .....:		—
	- calculated temperature of fixing point/exposed part (°C) .....:		—
	Ball-pressure test..... :	See Table 3.15 (13.2.1)	N/A
3.12 (12.7.1.2)	Luminaire with discharge lamp, fluorescent lamp > 70W, transformer > 10 VA		N/A
	- case of abnormal conditions .....:		—
	- measured winding temperature (°C): at 1,1 Un .....:		—
	- measured temperature of fixing point/exposed part (°C): at 1,1 Un .....:		—
	- calculated temperature of fixing point/exposed part (°C) .....:		—
	Ball-pressure test.....:	See Table 3.15 (13.2.1)	N/A
3.12 (12.7.1.3)	Luminaire with short circuit proof transformers Š 10 VA		N/A
	- case of abnormal conditions .....:		—

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Clause	Requirement + Test	Result - Remark	Verdict
	- Components retained in place after the test		N/A
	- Test with standard test finger after the test		N/A
3.12 (12.7.2)	Luminaire with temperature sensing control		N/A
	- thermal link.....:	Yes ☐ No ☐	—
	- manual reset cut-out.....:	Yes ☐ No ☐	—
	- auto reset cut-out .....:	Yes ☐ No ☐	—
	- case of abnormal conditions .....:		—
	- highest measured temperature of fixing point/ exposed part (°C): .....:		—
	Ball-pressure test:.....:	See Table 3.15 (13.2.1)	N/A
3.12.1 (-)	Temperature reduction if for outdoor use only		P
3.12.2 (-)	(See above)		—
3.12.3 (-)	Glass covers used within the thermal limits declared by the glass manufacturer		P

3.13 (9)	**RESISTANCE TO DUST, SOLID OBJECTS AND MOISTURE**		P
3.13.1 (-)	If IP > IP 20 the order of tests as specified in clause 3.12		P
3.13 (9.2)	Tests for ingress of dust, solid objects and moisture:		—
	- classification according to IP.....:	IP 67	—
	- mounting position during test .....:	Normal position	—
	- fixing screws tightened; torque (Nm).....:	2/3 torque	—
	- tests according to clauses .....:	(cl 9.2.2 & cl 9.2.6)	—
	- electric strength test afterwards	(see cl 10.2.2)	P
	a) no deposit in dust-proof luminaire		N/A
	b) no talcum in dust-tight luminaire		P
	c) no trace of water on current-carrying parts or on insulation where it could become a hazard		P
	d) i) For luminaires without drain holes – no water entry		P
	d) ii) For luminaires with drain holes – no hazardous water entry		N/A
	e) no water in watertight luminaire		N/A
	f) no contact with live parts (IP 2X)		N/A
	f) no entry into enclosure (IP 3X and IP 4X)		N/A
	f) no contact with live parts (IP3X and IP4X)		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	g) no trace of water on part of lamp requiring protection from splashing water		N/A
	h) no damage of protective shield or glass envelope		P
3.13 (9.3)	Humidity test 48 h		P
3.14 (10)	**INSULATION RESISTANCE AND ELECTRIC STRENGTH**		P
3.14 (10.2.1)	Insulation resistance test		P
	Cable or cord covered by metal foil or replaced by a metal rod of mm Ø .....:		—
	Insulation resistance (Mϕι).....:		—
	SELV		N/A
	- between current-carrying parts of different polarity :		N/A
	- between current-carrying parts and mounting surface .....:		N/A
	- between current-carrying parts and metal parts of the luminaire.....:		N/A
	- between the outer surface of a flexible cord or cable where it is clamped in a cord anchorage and accessible metal parts .....:		N/A
	- Insulation bushings as described in Section 5 .....:		N/A
	Other than SELV		P
	- between live parts of different polarity.....:	>100M	P
	- between live parts and mounting surface .....:	>100M	P
	- between live parts and metal parts.....:	>100M	P
	- between live parts of different polarity through action of a switch.....:		N/A
	- between the outer surface of a flexible cord or cable where it is clamped in a cord anchorage and accessible metal parts .....:		N/A
	- Insulation bushings as described in Section 5 .....:		N/A
3.14 (10.2.2)	Electric strength test		P
	Dummy lamp		P
	Luminaires with ignitors after 24 h test		P
	Luminaires with manual ignitors		P
	Test voltage (V).....:		N/A
	SELV		N/A

IEC 60598-2-3			
Clause	Requirement + Test	Result - Remark	Verdict
	- between current-carrying parts of different polarity :		N/A
	- between current-carrying parts and mounting surface .....:		N/A
	- between current-carrying parts and metal parts of the luminaire.....:		N/A
	- between the outer surface of a flexible cord or cable where it is clamped in a cord anchorage and accessible metal parts .....:		N/A
	- Insulation bushings as described in Section 5 .....:		N/A
	Other than SELV		P
	- between live parts of different polarity.....:	1480V	P
	- between live parts and mounting surface .....:	1480V	P
	- between live parts and metal parts.....:	1480V	P
	- between live parts of different polarity through action of a switch.....:		N/A
	- between the outer surface of a flexible cord or cable where it is clamped in a cord anchorage and accessible metal parts .....:		N/A
	- Insulation bushings as described in Section 5 .....:		N/A
3.14 (10.3)	Touch current or protective conductor current (mA).:	0,327	P

3.15 (13)	RESISTANCE TO HEAT, FIRE AND TRACKING		P
3.15 (13.2.1)	Ball-pressure test.....:	See Test Table 3.15 (13.2.1)	P
3.15 (13.3.1)	Needle-flame test (10 s) .....:	See Test Table 3.15 (13.3.1)	N/A
3.15 (13.3.2)	Glow-wire test (650°C).....:	See Test Table 3.15 (13.3.2)	P
3.15 (13.4)	Proof tracking test (IEC 60112).....:	See Test Table 3.15 (13.4)	N/A

IEC 60598-2-3			
Clause	Requirement + Test	Result - Remark	Verdict

3.7 (11.2)	TABLE: Creepage distances and clearances							P
	Minimum distances (mm) for a.c. (50/60 Hz) sinusoidal voltages							P
	Applicable part of IEC 60598-1 Table 11.1* and 11.2*							P
	Insulation type **	Measured clearance	Required clearance	Required *Table	Measured creepage	Required creepage	Required *Table	
Distance 1 (From different polarity):	B	>5	1,5	11,1	>5	2,5	11,1	
Working voltage (V) ..... :					240V			—
PTI ..... :					< 600 ☒ ≥ 600 ☐			—
Pulse voltage if applicable (kV) ..... :								—
Supplementary information:								
Distance 2 (From live part to enclosure):	B	>5	1,5	11,1	>5	2,5	11,1	
Working voltage (V) ..... :					240V			—
PTI ..... :					< 600 ☒ ≥ 600 ☐			—
Pulse voltage if applicable (kV) ..... :								—
Supplementary information:								
Distance 3 (From LED module to enclosure):	B	3,8	1,5	11,1	3,5	2,5	11,1	
Working voltage (V) ..... :					260VDC			—
PTI ..... :					< 600 ☒ ≥ 600 ☐			—
Pulse voltage if applicable (kV) ..... :								—
Supplementary information:								

IEC 60598-2-3			
Clause	Requirement + Test	Result - Remark	Verdict

3.15 (13.2.1)	TABLE: Ball Pressure Test of Thermoplastics			P
Allowed impression diameter (mm) .....:		2		—
Object/ Part No./ Material	Manufacturer/ trademark	Test temperature (°C)	Impression diameter (mm)	
Translucent cover	-	120	1,1	
Supplementary information:				

3.15 (13.3.1)	TABLE: Needle-flame test (IEC 60695-11-5)				N/A
Object/ Part No./ Material	Manufacturer/ trademark	Duration of application of test flame (ta); (s)	Ignition of specified layer Yes/No	Duration of burning (tb) (s)	Verdict
Supplementary information:					

3.15 (13.3.2)	TABLE: Glow-wire test (IEC 60695-2-11)				P
Glow wire temperature .....:		650°C			—
Object/ Part No./ Material	Manufacturer/ trademark	Duration of application of test flame (ta); (s)	Ignition of specified layer Yes/No	Duration of burning (tb) (s)	Verdict
Translucent cover	-	30s	No	2s	P
Any flame or glowing of the sample extinguished within 30 s of withdrawing the glow-wire, and any burning or molten drop did not ignite the underlying parts (Yes/No)..... :					
Supplementary information:					

3.15 (13.4)	TABLE: Proof tracking test (IEC 60112)				N/A
Test voltage PTI .....:		175 V			—
Object/ Part No./ Material	Manufacturer/ trademark	Withstand 50 drops without failure on three places or on three specimens			Verdict
Supplementary information:					

IEC 60598-2-3			
Clause	Requirement + Test	Result - Remark	Verdict

ANNEX 1	TABLE: Critical components information					
Object / part No.	**Code**	**Manufacturer/ trademark**	**Type / model**	**Technical data**	**Standard**	**Mark(s) of conformity[1)]**
Supply cord & output	B	Dong Guan Recheer Electric Wire & Cable Co., Ltd.	H05RN-F	2 x 1,0 mm², 3 x 1,0 mm²	EN 50525-2-21	VDE 40015173
Alternative	B	Dong Guan Ever United Electric Wire & Cable Co., Ltd.	H05RN-F	2 x 1,0 mm², 3 x 1,0 mm²	EN 50525-2-21	VDE 40016378
Alternative	B	Guangdong Rifeng Electrical Cable Co., Ltd.	H05RN-F	2 x 1,0 mm², 3 x 1,0 mm²	EN 50525-2-21	VDE 40015999
Alternative	B	I-SHENG Electronics (Kunshan) Co., Ltd.	H05RN-F	2 x 1,0 mm², 3 x 1,0 mm²	EN 50525-2-21	VDE 40014085
Alternative	B	Huizhou Mainland Electric Wire & Cable Co., Ltd.	H05RN-F	2 x 1,0 mm², 3 x 1,0 mm²	EN 50525-2-21	VDE 40026038
Alternative	B	Guangdong Huasheng Electrical Appliances Co., Ltd.	H05RN-F	2 x 1,0 mm², 3 x 1,0 mm²	EN 50525-2-21	VDE 40016788
Alternative	B	Wuxi Zhonghui Wire & Cable Co., Ltd.	H05RN-F	2 x 1,0 mm², 3 x 1,0 mm²	EN 50525-2-21	VDE 40020334
Alternative	B	Wuxi Wire Factory	H05RN-F	2 x 1,0 mm², 3 x 1,0 mm²	EN 50525-2-21	VDE 40025638
Alternative	B	Zhenjiang Zhongjia Electric Co., Ltd.	H05RN-F	2 x 1,0 mm², 3 x 1,0 mm²	EN 50525-2-21	VDE 40030173
Terminal Block	B	WAGO KONTAKTTECHNIK GMBH & CO KG	222-412	2.5 to 4 mm² / 400 V, 2.5 mm² r/f 24A and 4 mm² f 32A	EN 60998-1 EN 60998-2-1	UL ENEC-01360
Alternative	B	WAGO KONTAKTTECHNIK GMBH & CO KG	222-413	2.5 to 4 mm² / 400 V, 2.5 mm² r/f 24A and 4 mm² f 32A	EN 60998-1 EN 60998-2-1	UL ENEC-01360

IEC 60598-2-3			
Clause	Requirement + Test	Result - Remark	Verdict

Alternative	B	JiangXi Kimbetter Electrical Co.,Ltd.	PA14	500VAC,100A,0.5-10mm²	EN 60998-1 EN 60998-2-1	VDE 40036869
LED	B	LUMILEDS LLC	LUXEON 5050	240mA Max,26.5V Max	IEC 62471	Tested with appliance
Alternative	B	LUMILEDS LLC	LUXEON 3030	Max. 1 W, 5,8-6,4V, Max. 240 mA	IEC 62471	Tested with appliance
Metal core PCB	B	HANGZHOU DONGDA ELECTRONIC CO LTD	HD	Aluminum Base PCB, V-0	IEC 60598-1 IEC 60598-2-3	Tested with appliance UL E346669
Alternative	B	HANGZHOU DONGDA ELECTRONIC CO LTD	HD-1	Aluminum Base PCB, V-0	IEC 60598-1 IEC 60598-2-3	Tested with appliance UL E346669
LED Driver	B	INVENTRONICS (HANGZHOU), INC.	EUC-026S050SVM0002	Input:120-240 V~, 50/60 Hz; Output: Max. 26 W 32-65 V SELV Class I, IP67, ta = 70ª tc = 85ª	IEC 61347-1 IEC 61347-2-13	TUV SUD B 15 09 79136 087
Alternative	B	INVENTRONICS (HANGZHOU), INC.	EUC-040S070DVM	Input:120-240 V~, 50/60 Hz; Output: Max. 40 W 32-80 V SELV Class I, IP67, tc = 90ª	IEC 61347-1 IEC 61347-2-13	TUV SUD SG PSB-LE-00295
Alternative	B	INVENTRONICS (HANGZHOU), INC.	EUC-040S105DVM	Input:120-240 V~, 50/60 Hz; Output: Max. 40 W 21-54 V SELV Class I, IP67, tc = 90ª	IEC 61347-1 IEC 61347-2-13	TUV SUD SG PSB-LE-00295
Alternative	B	INVENTRONICS (HANGZHOU), INC.	EUG-075S105DV	Input:100-240 V~, 50/60 Hz; Output: Max. 75 W 36-107 V SELV Class I, IP67, ta = 60ª tc = 90ª	IEC 61347-1 IEC 61347-2-13	TUV Rheinland DE 2-019596
Alternative	B	INVENTRONICS (HANGZHOU), INC.	EUG-075S175DV	Input:100-240 V~, 50/60 Hz; Output: Max. 75 W 22-63 V SELV Class I, IP67, ta = 60ª tc = 90ª	IEC 61347-1 IEC 61347-2-13	TUV Rheinland DE 2-019596

IEC 60598-2-3			
Clause	Requirement + Test	Result - Remark	Verdict

Alternative	B	INVENTRONICS (HANGZHOU), INC.	EUK-075S105DV	Input:100-240 V~, 50/60 Hz; Output: Max. 75 W 36-107 V SELV Class I, IP67, ta= 55ª tc = 90ª	IEC 61347-1 IEC 61347-2-13	TUV Rheinland DE 2-022064-A1
Alternative	B	INVENTRONICS (HANGZHOU), INC.	EUK-075S105TV	Input:100-240 V~, 50/60 Hz; Output: Max. 75 W 36-107 V SELV Class I, IP67, ta= 55ª tc = 90ª	IEC 61347-1 IEC 61347-2-13	TUV Rheinland DE 2-022064-A1
Alternative	B	INVENTRONICS (HANGZHOU), INC.	EUK-075S175DV	Input:100-240 V~, 50/60 Hz; Output: Max. 75 W 22-63 V SELV Class I, IP67, ta= 55ª tc = 90ª	IEC 61347-1 IEC 61347-2-13	TUV Rheinland DE 2-022064-A1
Alternative	B	INVENTRONICS (HANGZHOU), INC.	EUK-075S175TV	Input:100-240 V~, 50/60 Hz; Output: Max. 75 W 22-63 V SELV Class I, IP67, ta= 55ª tc = 90ª	IEC 61347-1 IEC 61347-2-13	TUV Rheinland DE 2-022064-A1
Alternative	B	Moso Power Supply Technology Co., Ltd.	LDC-042S053	Input:100-277 V~, 50/60 Hz; Output: 0.8 A, 28-53 VDC Class I, IP67, ta= 60ª tc = 85ª	IEC 61347-1 IEC 61347-2-13	TUV SUD N8A 15 08 67179 308
Alternative	B	Moso Power Supply Technology Co., Ltd.	LDC-042B053	Input:100-277 V~, 50/60 Hz; Output: 0.8 A, 28-53 VDC Class I, IP67, ta= 60ª tc = 85ª	IEC 61347-1 IEC 61347-2-13	TUV SUD N8A 15 08 67179 308
Alternative	B	Moso Power Supply Technology Co., Ltd.	LDP-042M080	Input:100-277 V~, 50/60 Hz; Output: 0.6 A, 45-80 VDC Class I, IP67, ta= 60ª tc = 85ª	IEC 61347-1 IEC 61347-2-13	TUV SUD B 16 10 77716 055

IEC 60598-2-3			
Clause	Requirement + Test	Result - Remark	Verdict

Alternative	B	Moso Power Supply Technology Co., Ltd.	LDP-042R080	Input:100-277 V~, 50/60 Hz; Output: 0.6 A, 45-80 VDC Class I, IP67, ta= 60ª tc = 85ª	IEC 61347-1 IEC 61347-2-13	TUV SUD B 16 10 77716 055
Alternative	B	Moso Power Supply Technology Co., Ltd.	LDP-060M086	Input:100-277 V~, 50/60 Hz; Output: 0.9 A, 40-86 VDC Class I, IP67, ta= 60ª tc = 85ª	IEC 61347-1 IEC 61347-2-13	TUV SUD B 16 10 77716 055
Alternative	B	Moso Power Supply Technology Co., Ltd.	LDP-060R086	Input:100-277 V~, 50/60 Hz; Output: 0.9 A, 40-86 VDC Class I, IP67, ta= 60ª tc = 85ª	IEC 61347-1 IEC 61347-2-13	TUV SUD B 16 10 77716 055
Alternative	B	Moso Power Supply Technology Co., Ltd.	LDP-075R062H	Input:100-277 V~, 50/60 Hz; Output: 0.17-1.67 A, 35-62 VDC Class I, IP67, ta= 60ª tc = 85ª	IEC 61347-1 IEC 61347-2-13	TUV SUD N8A 15 07 67179 373
Alternative	B	Moso Power Supply Technology Co., Ltd.	LDP-075M062H	Input:100-277 V~, 50/60 Hz; Output: 0.17-1.67 A, 35-62 VDC Class I, IP67, ta= 60ª tc = 85ª	IEC 61347-1 IEC 61347-2-13	TUV SUD N8A 15 07 67179 373
Surge Protective Device	B	INVENTRONICS (HANGZHOU)	PU-20KS10KTVA	240V,Uc=320Vac,47-63Hz	IEC 61643-11	Demark D-03737

Supplementary information:

[1)] Provided evidence ensures the agreed level of compliance. See OD-CB2039.

The codes above have the following meaning:

A - The component is replaceable with another one, also certified, with equivalent characteristics

B - The component is replaceable if authorised by the test house

C - Integrated component tested together with the appliance

D - Alternative component

IEC 60598-2-3			
Clause	Requirement + Test	Result - Remark	Verdict

ANNEX 2	TABLE: Temperature measurements, thermal tests of Section 12		P
	Type reference ..... :	T29B-1-75-75	—
	Lamp used..... :	LED module	—
	Lamp control gear used ..... :	LDP-075M062H	—
	Mounting position of luminaire..... :	Fixed mounting	—
	Supply wattage (W) ..... :	74,81	—
	Supply current (A)..... :	0,313	—
	Calculated power factor ..... :	N/A	—
	Table: measured temperatures corrected for ta = 50 °C:		P
	- abnormal operating mode..... :	LED driver output short-circuit	—
	- test 1: rated voltage ..... :	240 V~	—
	- test 2: 1,06 times rated voltage or 1,05 times rated wattage..... :	1,06 x 240 V= 254,4 V~	—
	- test 3: Load on wiring to socket-outlet, 1,06 times voltage or 1,05 times wattage ..... :	N/A	—
	- test 4: 1,1 times rated voltage or 1,05 times rated wattage..... :	1,1 x 240 V=264 V~	—
	Through wiring or looping-in wiring loaded by a current of A during the test ..... :	N/A	—

Temperature measurements, (°C)

Part	Ambient	Clause 12.4 – normal				Clause 12.5 – abnormal	
		test 1	test 2	test 3	limit	test 4	limit
Supply cords	50	--	52,2	--	90	--	--
Cord anchorage	50	--	64,6	--	75	--	--
Input Internal wire	50	--	68,2	--	90	--	--
Output Internal wire	50	--	70,4	--	90	--	--
Connector	50	--	62,2	--	130	--	--
Tc on LED controlgear (LDP-075M062H)	50	61,3	--	--	85	50,6	95
Tc on LED controlgear (EUG-075S175DV)	50	61,5	--	--	85	47,3	95
Tc on LED controlgear (EUK-075S175DV)	50	58,4	--	--	85	46,8	95

IEC 60598-2-3							
Clause	Requirement + Test				Result - Remark		Verdict
Translucent cover of LED module	50	--	83	--	Ball-pressure	--	--
Mounting surface	50	--	56,9	--	90	50,4	130
Supplementary information:							

IEC 60598-2-3			
Clause	Requirement + Test	Result - Remark	Verdict

ANNEX 3	**Screw terminals (part of the luminaire)**		N/A
(14)	**SCREW TERMINALS**		N/A
(14.2)	Type of terminal.....:		—
	Rated current (A).....:		—
(14.3.2.1)	One or more conductors		N/A
(14.3.2.2)	Special preparation		N/A
(14.3.2.3)	Terminal size		N/A
	Cross-sectional area (mm²) .....:		—
(14.3.3)	Conductor space (mm) .....:		N/A
(14.4)	Mechanical tests		N/A
(14.4.1)	Minimum distance		N/A
(14.4.2)	Cannot slip out		N/A
(14.4.3)	Special preparation		N/A
(14.4.4)	Nominal diameter of thread (metric ISO thread) .....:	M	N/A
	External wiring		N/A
	No soft metal		N/A
(14.4.5)	Corrosion		N/A
(14.4.6)	Nominal diameter of thread (mm).....:		N/A
	Torque (Nm).....:		N/A
(14.4.7)	Between metal surfaces		N/A
	Lug terminal		N/A
	Mantle terminal		N/A
	Pull test; pull (N) .....:		N/A
(14.4.8)	Without undue damage		N/A

ANNEX 4	**Screwless terminals (part of the luminaire)**		N/A
(15)	**SCREWLESS TERMINALS**		N/A
(15.2)	Type of terminal.....:		—
	Rated current (A).....:		—
(15.3.1)	Material		N/A
(15.3.2)	Clamping		N/A
(15.3.3)	Stop		N/A
(15.3.4)	Unprepared conductors		N/A

IEC 60598-2-3			
Clause	Requirement + Test	Result - Remark	Verdict
(15.3.5)	Pressure on insulating material		N/A
(15.3.6)	Clear connection method		N/A
(15.3.7)	Clamping independently		N/A
(15.3.8)	Fixed in position		N/A
(15.3.10)	Conductor size		N/A
	Type of conductor		N/A
(15.5.1)	Terminals internal wiring		N/A
(15.5.1.1)	Pull test spring-type terminals (4 N, 4 samples).....:		N/A
(15.5.1.2)	Pull test pin or tab terminals (4 N, 4 samples) .....:		N/A
	Insertion force not exceeding 50 N		N/A
(15.5.1.2)	Permanent connections: pull-off test (20 N)		N/A
(15.5.2)	Electrical tests		N/A
	Voltage drop (mV) after 1 h (4 samples).....:		N/A
	Voltage drop of two inseparable joints		N/A
	Number of cycles:		—
	Voltage drop (mV) after 10th alt. 25th cycle (4 samples) .....:		N/A
	Voltage drop (mV) after 50th alt. 100th cycle (4 samples) .....:		N/A
	After ageing, voltage drop (mV) after 10th alt. 25th cycle (4 samples).....:		N/A
	After ageing, voltage drop (mV) after 50th alt. 100th cycle (4 samples).....:		N/A
(15.6)	Terminals external wiring		N/A
	Terminal size and rating		N/A
(15.6.2.1)	Pull test spring-type terminals or welded connections (4 samples); pull (N) .....:		N/A
	Pull test pin or tab terminals (4 samples); pull (N) .....:		N/A

IEC 60598-2-3			
Clause	Requirement + Test	Result - Remark	Verdict

(15.6.3.1)	**TABLE: Contact resistance test**										N/A
	Voltage drop (mV) after 1 h										—
terminal	1	2	3	4	5	6	7	8	9	10	
voltage drop (mV)											
	Voltage drop of two inseparable joints										N/A
	Voltage drop after 10th alt. 25th cycle										N/A
	Max. allowed voltage drop (mV)..... :										—
terminal	1	2	3	4	5	6	7	8	9	10	
voltage drop (mV)											
	Voltage drop after 50th alt. 100th cycle										N/A
	Max. allowed voltage drop (mV)..... :										—
terminal	1	2	3	4	5	6	7	8	9	10	
voltage drop (mV)											
	Continued ageing: voltage drop after 10th alt. 25th cycle										N/A
	Max. allowed voltage drop (mV)..... :										—
terminal	1	2	3	4	5	6	7	8	9	10	
voltage drop (mV)	1,1	1,3	1,3	1,4	1,3	1,4	1,4	1,4	1,2	1,3	
	Continued ageing: voltage drop after 50th alt. 100th cycle										N/A
	Max. allowed voltage drop (mV)..... :										—
terminal	1	2	3	4	5	6	7	8	9	10	
voltage drop (mV)											
Supplementary information:											

Appendix 1: Additional requirements of IEC 62031:2008+A1:2012 + A2:2014			
Clause	Requirement + Test	Result - Remark	Verdict

6	**CLASSIFICATION**		**P**
	Built-in module .....:	Yes ☐ No ☒	—
	Independent module .....:	Yes ☐ No ☒	—
	Integral module .....:	Yes ☒ No ☐	—
	For Integral module; Note to 1.2.1 in IEC 60598-1 applies.		P

13.2	Module withstands overpower condition >15 min.	150% rated voltage, thermally stabilised	P
	Module with automatic protective device or power limiter, test performed 15 min. at limit.		N/A
	During the tests, tissue paper, spread below module, does not ignite		P

14	**TABLE: tests of fault conditions**	**P**
Part	Simulated fault	Hazard
LED bulb	Short circuit: Lighting not work	No

Appendix 2: Additional requirements of IEC 62493:2015			
Clause	Requirement + Test	Result - Remark	Verdict

4	**LIMITS**		N/A
4.1	**General**		N/A
	Comply with Van der Hoofden test limit in 4.2.3 or inherently compliant in 4.2.2 and pass assessment procedure for intentional radiators in 4.3		N/A
4.2	**Unintentional radiating part of lighting equipment**		P
4.2.2	Lighting equipment deemed to comply with the Van der Hoofden test without testing		P
	1) electronic controlgear	Yes ☐ No ☒	—
	2) incandescent-lamp technology	Yes ☐ No ☒	—
	3) LED-light-source technology	Yes ☒ No ☐	—
	4) OLED-light-source technology	Yes ☐ No ☒	—
	5) high-pressure discharge lamp LED-light-source technologies	Yes ☐ No ☒	—
	6) low-pressure discharge lamp technologies with exposure distance Š 50 cm	Yes ☐ No ☒	—
	7) independent auxiliary	Yes ☐ No ☒	—
	Not fulfil any of 1-7 above subject to 4.2.3		—
4.2.3	Applications of limits		N/A
	Not fulfil any of 1-7 in 4.2.2 but the compliance factor *F* is Š 1		N/A
4.3	**Intentional radiating part of lighting equipment**		N/A
	Comply with one of methods in Clause 7 if intentional radiator		N/A

Appendix 3: Additional requirements of IEC 62471: 2006

Table 6.1	Emission limits for risk groups of continuous wave lamps			Model: T29B (LUXEON 5050)					P
Risk	Action spectrum	Symbol	Units	Emission Measurement					
				Exempt		Low risk		Mod risk	
				Limit	Result	Limit	Result	Limit	Result
Actinic UV	$S_{UV}(L)$	E_s	$W \cdot m^{-2}$	0,001	--	0,003	$3{,}54 \times 10^{-5}$	0,03	--
Near UV		E_{UVA}	$W \cdot m^{-2}$	10	--	33	$2{,}47 \times 10^{-4}$	100	--
Blue light	B(L)	L_B	$W \cdot m^{-2} \cdot sr^{-1}$	100	$1{,}89 \times 10^{2}$	10000	$1{,}12 \times 10^{3}$	4000000	$7{,}88 \times 10^{3}$
Blue light, small source	B(L)	E_B	$W \cdot m^{-2}$	1,0*	-	1,0	-	400	-
Retinal thermal	R(L)	L_R	$W \cdot m^{-2} \cdot sr^{-1}$	28000/a	$1{,}33 \times 10^{4}$	28000/a	$1{,}33 \times 10^{4}$	71000/a	$9{,}4 \times 10^{5}$
Retinal thermal, weak visual stimulus**	R(L)	L_{IR}	$W \cdot m^{-2} \cdot sr^{-1}$	6000/a	--	6000/a	a=0,0338rad 2,2	6000/a	--
IR radiation, eye		E_{IR}	$W \cdot m^{-2}$	100	--	570	0	3200	--

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

Appendix 3: Additional requirements of IEC 62471: 2006

Table 6.1	Emission limits for risk groups of continuous wave lamps			Model: T29B-1-60 (LUXEON 3030)					P
Risk	Action spectrum	Symbol	Units	Emission Measurement					
				Exempt		Low risk		Mod risk	
				Limit	Result	Limit	Result	Limit	Result
Actinic UV	$S_{UV}(L)$	E_s	$W \cdot m^{-2}$	0,001	--	0,003	$2,47 \times 10^{-5}$	0,03	--
Near UV		E_{UVA}	$W \cdot m^{-2}$	10	--	33	$8,67 \times 10^{-4}$	100	--
Blue light	B(L)	L_B	$W \cdot m^{-2} \cdot sr^{-1}$	100	$1,33 \times 10^{2}$	10000	$7,31 \times 10^{2}$	4000000	$1,00 \times 10^{3}$
Blue light, small source	B(L)	E_B	$W \cdot m^{-2}$	1,0*	-	1,0	-	400	-
Retinal thermal	R(L)	L_R	$W \cdot m^{-2} \cdot sr^{-1}$	28000/a	$8,71 \times 10^{3}$	28000/a	$8,71 \times 10^{3}$	71000/a	$1,19 \times 10^{4}$
Retinal thermal, weak visual stimulus**	R(L)	L_{IR}	$W \cdot m^{-2} \cdot sr^{-1}$	6000/a	--	6000/a	a=0,0429rad 5,69	6000/a	--
IR radiation, eye		E_{IR}	$W \cdot m^{-2}$	100	--	570	0	3200	--

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

Appendix 4: Additional requirements of IEC/TR 62778: 2014			
Clause	Requirement + Test	Result - Remark	Verdict
7	**MEASUREMENT INFORMATION FLOW**		**P**
7.1	**Basic flow**		**P**
	'Law of conservation of luminance' applied		P
	Use of only true luminance/radiance values		P
	In case of luminaire: The light source is operated in the luminaire under similar conditions as when tested as a component		P
	In case E_{thr} value for RG2 was established the peak value was derived from angular light distribution		N/A
7.2	**Conditions for the radiance measurement**		**P**
	Standard condition applied (200mm distance, 0,011rad field of view)		P
	Non-standard condition applied		P
7.3	**Special cases (I): Replacement by a lamp or LED module of another type**		**N/A**
	Light source is a white light source		N/A
	Evaluation done based on highest luminance		N/A
	Evaluation done based on CCT value		N/A
7.4	**Special cases (II): Arrays and clusters of primary light sources**		N/A
	LED package is evaluated as	☐ RG0 unlimited ☐ RG1 unlimited	N/A
	E_{thr} of LED package applies to array		N/A
8	**RISK GROUP CLASSIFICATION**		**P**
	Risk group achieved:		P
	- ..Risk Group 0 unlimited		N/A
	- ..Risk Group 1 unlimited		P
	- E_{thr} ..... (lx) : Distance to reach RG1..... (m) :		N/A

Appendix 4: Additional requirements of IEC/TR 62778: 2014			
Clause	Requirement + Test	Result - Remark	Verdict

	TABLE: Spectroradiometric measurement		P
	Measurement performed on:	☐ **LED package** ☐ **LED module** ☐ **Lamp** ☒ **Luminaire**	
	Model number..... :	T29B-1-75-75	
	Test voltage (V)..... :	240	—
	Test current (mA)..... :	0,3	—
	Test frequency (Hz)..... :	50	—
	Ambient, t (°C)..... :	25	—
	Measurement distance..... :	☒ 20 cm ☐ ... cm	—
	Source size ..... :	☒ Non-small ☐ Small : ..... mm	—
	Field of view ..... :	☐ 100 mrad ☒ 11 mrad ☐ 1,7 mrad (for small sources)	—

Item	Symbol	Units	Result	Remark
Correlated colour temperature	CCT	K	4442	
x/y colour coordinates			/	
Blue light hazard radiance	L_B	$W/(m^2 \cdot sr^1)$	$1,156x10^3$	RG1
Blue light hazard irradiance	E_B	W/m^2	$2,177x10^1$	
Luminance	L	cd/m^2	$1,154x10^6$	
Illuminance	E	lx	21728	

Supplementary information:

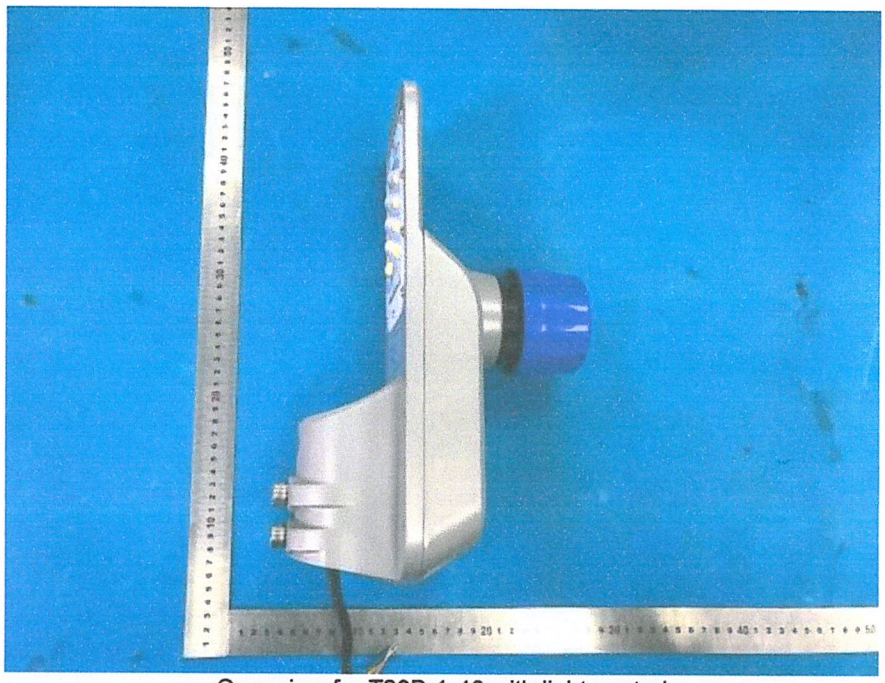
Appendix 4: Additional requirements of IEC/TR 62778: 2014			
Clause	Requirement + Test	Result - Remark	Verdict

	TABLE: Spectroradiometric measurement		P
	Measurement performed on:	☐ **LED package** ☐ **LED module** ☐ **Lamp** ☒ **Luminaire**	
	Model number..... :	T29B-1-75-50	
	Test voltage (V)..... :	240	—
	Test current (mA)..... :	0,2	—
	Test frequency (Hz)..... :	50	—
	Ambient, t (°C)..... :	25	—
	Measurement distance..... :	☒ 20 cm ☐ ... cm	—
	Source size ..... :	☒ Non-small ☐ Small : ..... mm	—
	Field of view ..... :	☐ 100 mrad ☒ 11 mrad ☐ 1,7 mrad (for small sources)	—

Item	Symbol	Units	Result	Remark
Correlated colour temperature	CCT	K	4374	
x/y colour coordinates			/	
Blue light hazard radiance	L_B	$W/(m^2 \cdot sr^1)$	$3{,}633 \times 10^3$	RG1
Blue light hazard irradiance	E_B	W/m^2	$1{,}534 \times 10^1$	
Luminance	L	cd/m^2	$3{,}547 \times 10^6$	
Illuminance	E	lx	14977	

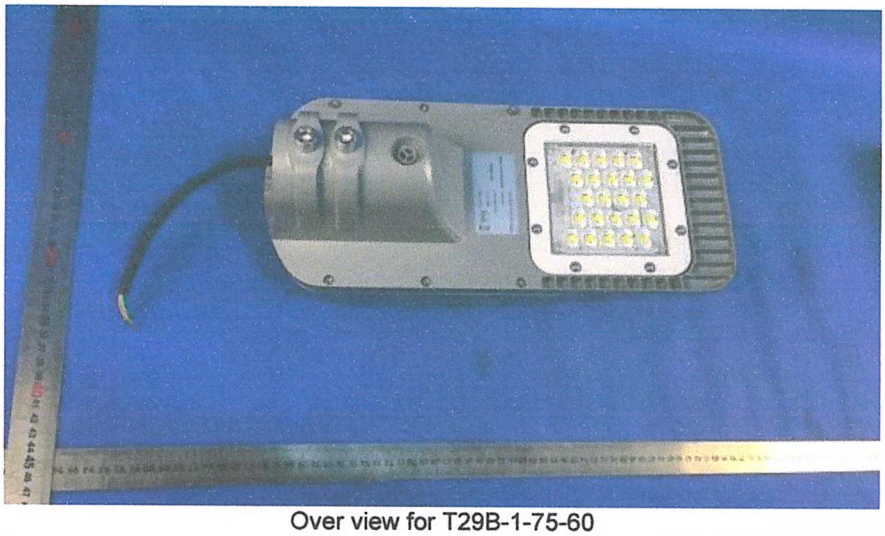
Supplementary information:

Appendix 5: Photograph



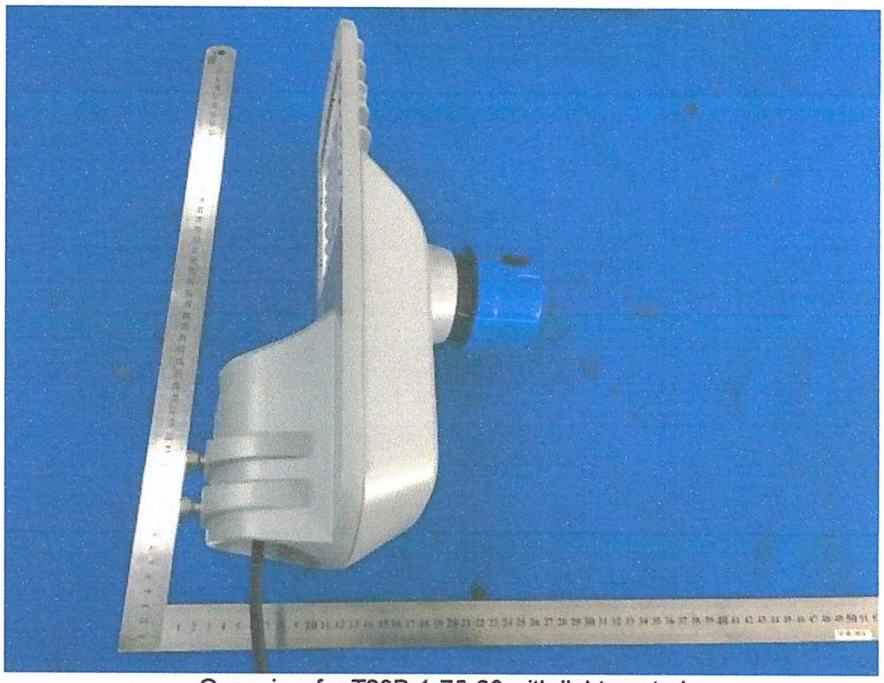
Over view for T29B-1-40 with light control

Appendix 5: Photograph



Over view for T29B-1-75-60

Appendix 5: Photograph

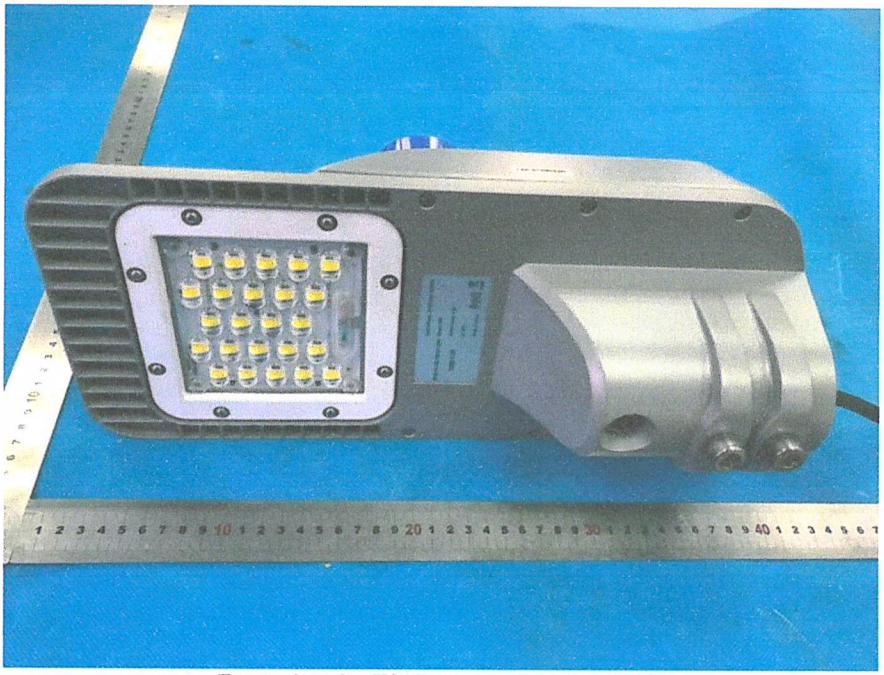


Over view for T29B-1-75-60 with light control



Over view for T29B-1-75-60 without light control

Appendix 5: Photograph

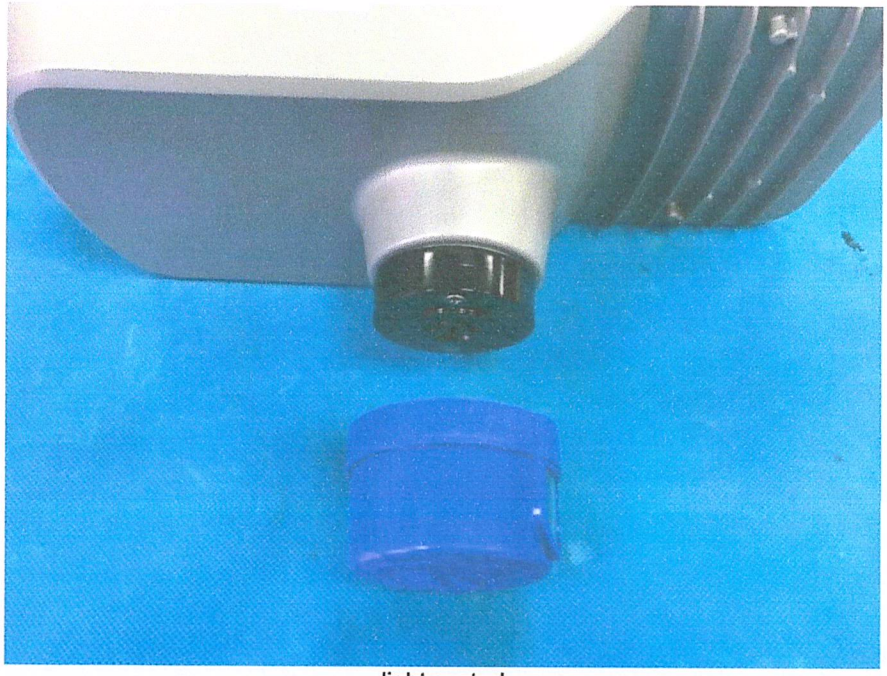


Front view for T29B-1-75-60 with light control

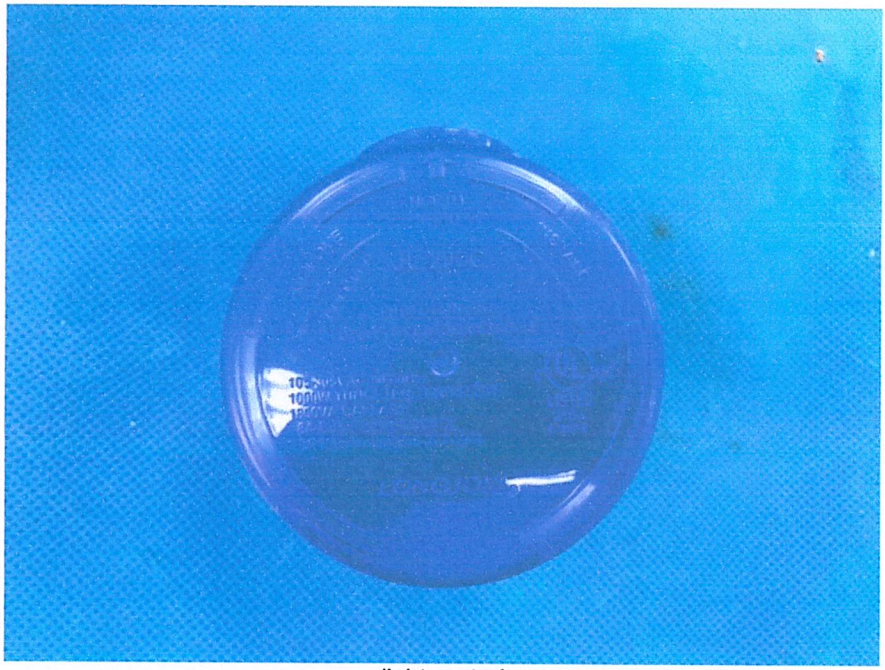


Back view for T629B-1-75-60 with light control

Appendix 5: Photograph

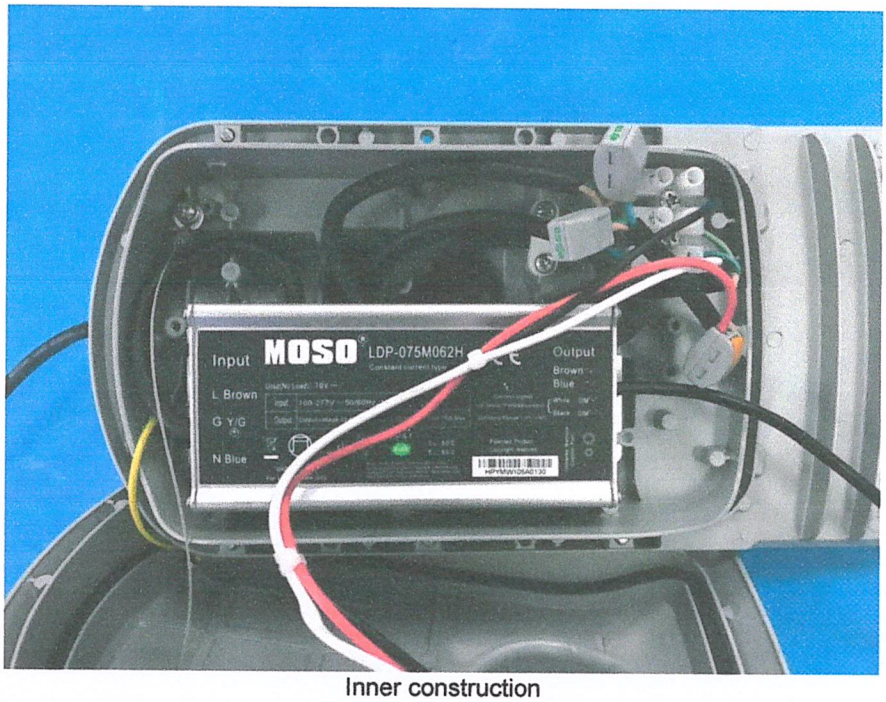


light control

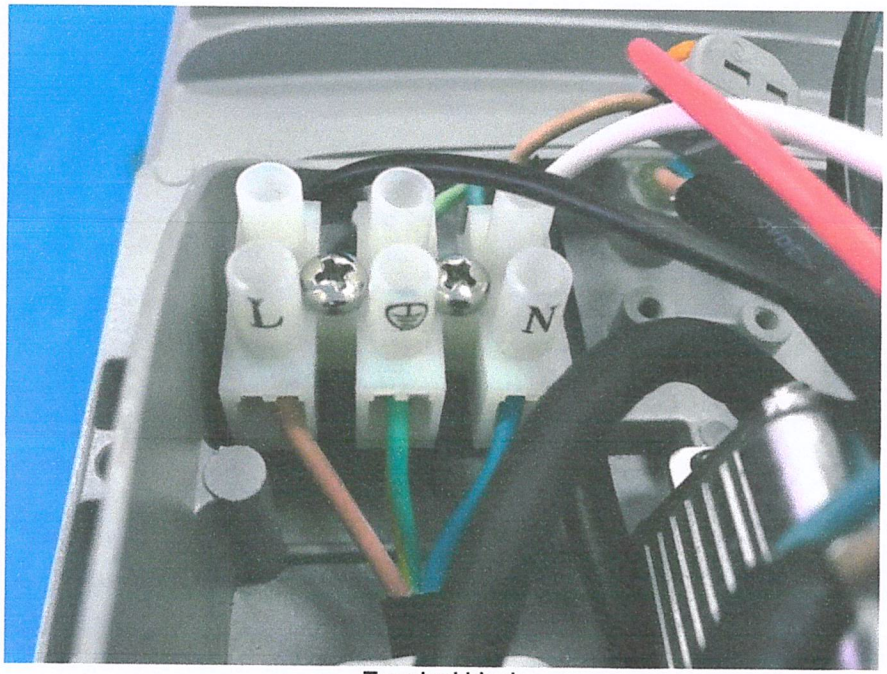


light control

Appendix 5: Photograph

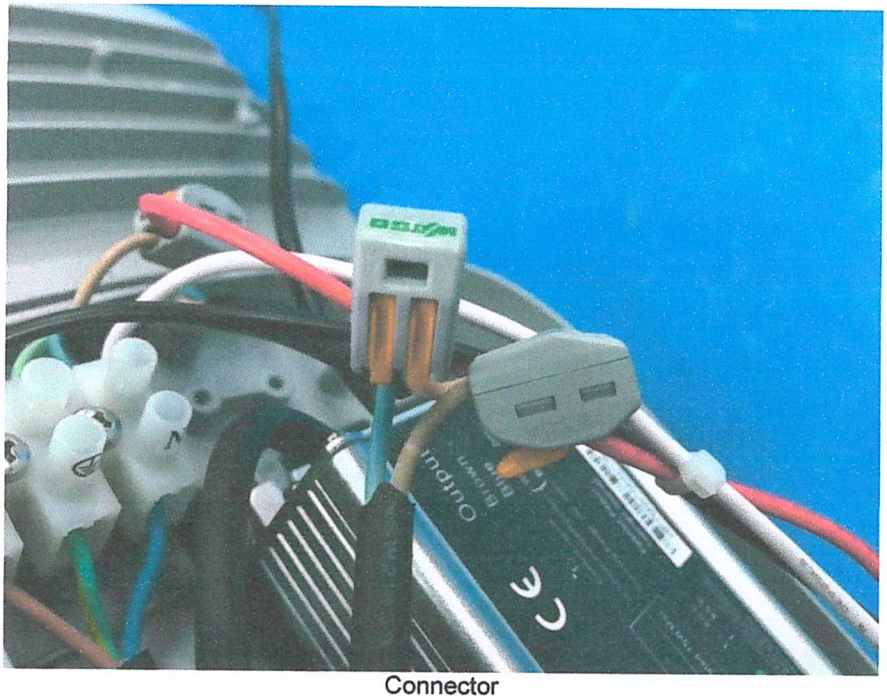


Inner construction

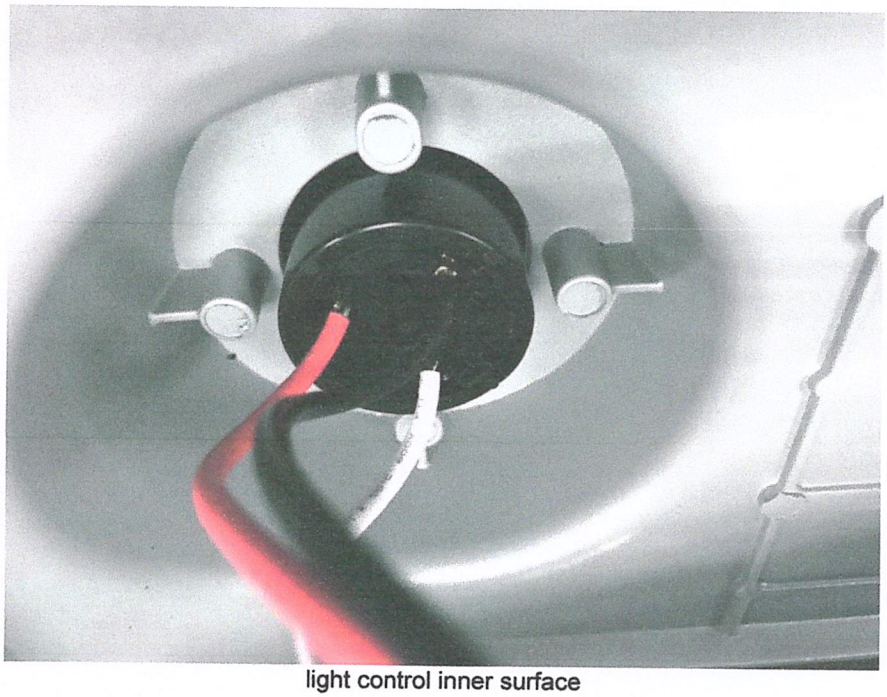


Terminal block

Appendix 5: Photograph



Connector

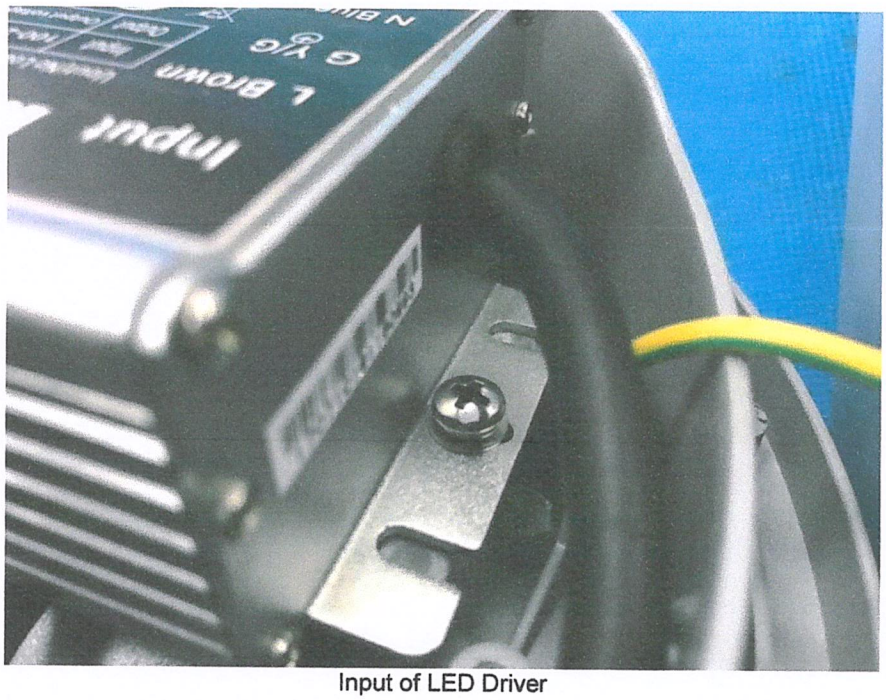


light control inner surface

Appendix 5: Photograph

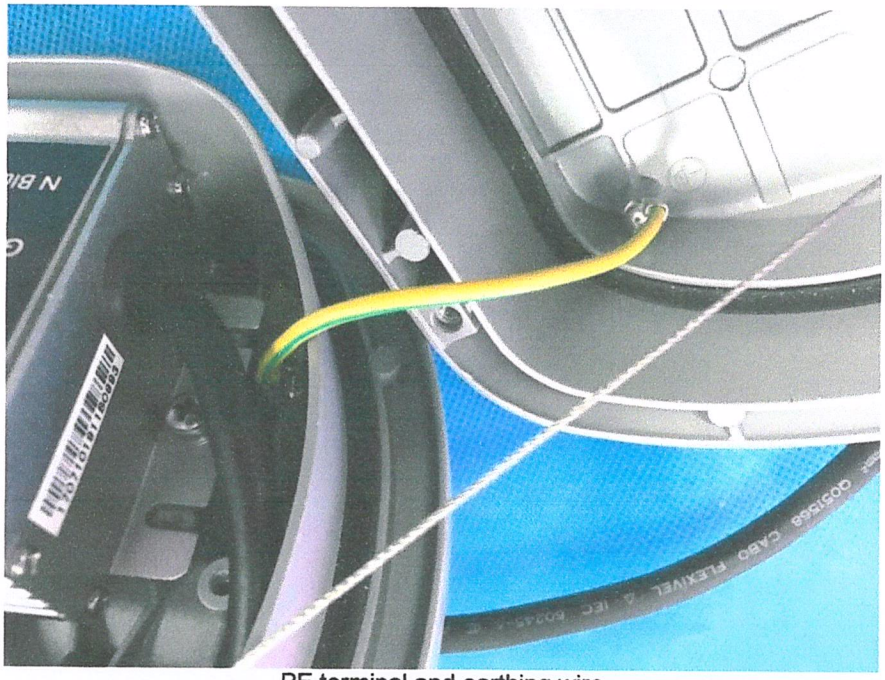


LED Driver

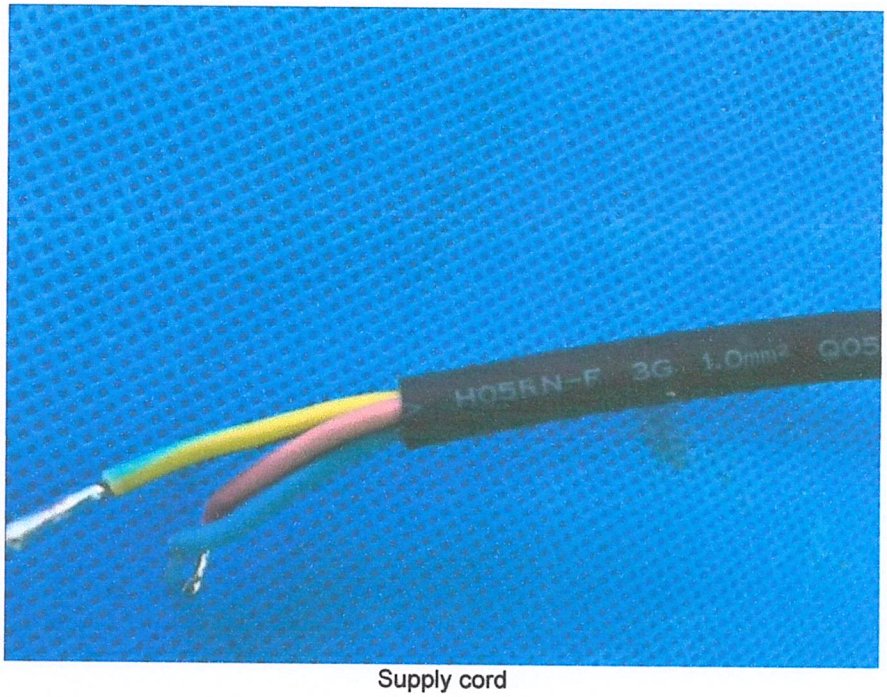


Input of LED Driver

Appendix 5: Photograph



PE terminal and earthing wire



Supply cord

Appendix 5: Photograph



LED Module