IECEx Certificate of Conformity

INTERNATIONAL ELECTROTECHNICAL COMMISSION
IEC Certification System for Explosive Atmospheres

for rules and details of the IECEx Scheme visit www.iecex.com

Certificate No.: **IECEx CML 21.0037**

Page 1 of 4

Certificate history:
Issue 1 (2022-02-25)
Issue 0 (2021-10-20)

Status: **Current**

Issue No: 2

Date of Issue: 2024-04-30

Applicant: **Raytec Ltd**
Unit 15 Wansbeck Business Park
Rotary Parkway
Ashington
Northumberland
NE63 8QW
United Kingdom

Equipment: **SPARTAN Mid Power Floodlight/Highbay**

Optional accessory:

Type of Protection: **Increased Safety "eb", Encapsulation "mb", Dust Ignition "tb"**

Marking:

Standard:	**Emergency:**
Ex eb mb IIC T4 Gb Ex tb IIIC T90°C Db Ta= -40°C to +60°C	Ex eb mb IIC T4 Gb Ex tb IIIC T90°C Db Ta= -20°C to +50°C

Approved for issue on behalf of the IECEx Certification Body: **H M Amos**

Position: **Technical Specialist**

Signature:
(for printed version)

Date:
(for printed version) April, 30, 2024

1. This certificate and schedule may only be reproduced in full.
2. This certificate is not transferable and remains the property of the issuing body.
3. The Status and authenticity of this certificate may be verified by visiting www.iecex.com or use of this QR Code.

Certificate issued by:

Eurofins E&E CML Limited
Unit 1, Newport Business Park
New Port Road
Ellesmere Port, CH65 4LZ
United Kingdom

IECEx Certificate of Conformity

Manufacturer: **Raytec Ltd**
Unit 15 Wansbeck Business Park
Rotary Parkway
Ashington
Northumberland
NE63 8QW
United Kingdom

Manufacturing locations:

This certificate is issued as verification that a sample(s), representative of production, was assessed and tested and found to comply with the IEC Standard list below and that the manufacturer's quality system, relating to the Ex products covered by this certificate, was assessed and found to comply with the IECEx Quality system requirements.This certificate is granted subject to the conditions as set out in IECEx Scheme Rules, IECEx 02 and Operational Documents as amended

STANDARDS :
The equipment and any acceptable variations to it specified in the schedule of this certificate and the identified documents, was found to comply with the following standards

IEC 60079-0:2017 Explosive atmospheres - Part 0: Equipment - General requirements
Edition:7.0

IEC 60079-18:2017 Explosive atmospheres - Part 18: Protection by encapsulation "m"
Edition:4.1

IEC 60079-31:2013 Explosive atmospheres - Part 31: Equipment dust ignition protection by enclosure "t"
Edition:2

IEC 60079-7:2017 Explosive atmospheres - Part 7: Equipment protection by increased safety "e"
Edition:5.1

This Certificate **does not** indicate compliance with safety and performance requirements other than those expressly included in the Standards listed above.

TEST & ASSESSMENT REPORTS:
A sample(s) of the equipment listed has successfully met the examination and test requirements as recorded in:

Test Reports:

GB/CML/ExTR22.0038/00 GB/CML/ExTR24.0064/00

Quality Assessment Report:

GB/SIR/QAR13.0018/12

IECEx Certificate of Conformity

EQUIPMENT:
Equipment and systems covered by this Certificate are as follows:

The Spartan Mid Power Floodlight/Highbay are suitable for installation in Zone 1 environments with different mounting arrangements and orientations

Refer to Annex for full description and conditions of manufacture.

SPECIFIC CONDITIONS OF USE: NO

IECEx Certificate of Conformity

DETAILS OF CERTIFICATE CHANGES (for issues 1 and above)
This report assesses the following modifications to the Spartan Mid Power LED Floodlight / Highbay:

1. Addition of intelligent emergency model.
2. Marking and ambient is updated to include emergency model.
3. Description updated to include emergency model.

Annex:

IECEx CML 21.0037 Iss. 2 Certificate Annex_1.pdf

CML B.V.
Koopvaardijweg 32
4906CV Oosterhout
The Netherlands

Newport Business Park
New Port Road
Ellesmere Port
CH65 4LZ
UK

Evaluation Report (Variation)

Certificate	CML 21ATEX3317 Issue 2	IECEx CML 21.0037 Issue 2	CML 21UKEX3319 Issue 2
	CML 21ATEX3320 Issue 2	IECEx CML 21.0038 Issue 2	CML 21UKEX3321 Issue 2
Title	Spartan Mid Power LED Floodlight / Highbay		
Applicant	Raytec Ltd.		
Report	R16593A/00	GB/CML/ExTR24.0064/00	
Date	April 2024		

8175

1 Introduction

1.1 Scope of this report and modifications assessed

This report assesses the following modifications to the Spartan Mid Power LED Floodlight / Highbay:

i. Addition of intelligent emergency model.
ii. Marking and ambient is updated to include emergency model.
iii. Description updated to include emergency model.

1.2 Product Description

The product description is amended as follows.

The Spartan Mid Power Floodlight/Highbay are suitable for installation in Zone 1 or Zone 2, and Zone 21 or 22 environments with different mounting arrangements and orientations.

Zone 1 and Zone 21 models have an encapsulated LED assembly containing up to 48 LEDs protected by encapsulation, located behind a glass window.

Zone 2 and Zone 22 models have the same LED assembly except it is not encapsulated.

The main assembly consists of a single aluminium enclosure containing an encapsulated electronic power supply and suitably certified Ex Component terminals for connection of internal and field wiring using suitably certified cable glands. The window assembly consists of an aluminium casting and glass front.

The equipment will operate up to a maximum125W over a 110 to 277V range. Various beam patterns are available, external mounting brackets will determine if it is a floodlight or Highbay luminaire.

An intelligent emergency variant of the equipment is available. It is supplied with a rechargeable battery pack housed in a metallic enclosure mounted at the bottom of the luminaire enclosure. The battery compartment has an indication LED fitted through the enclosure wall.

Additional separately certified components:

Terminal Type	ATEX Approval	IEC Ex Approval	Temperature Range
Weidmuller MK6/MK3/BK	TUV 18 ATEX 8209U	IECEx TUR 18.0019U	-60°C to +130°C

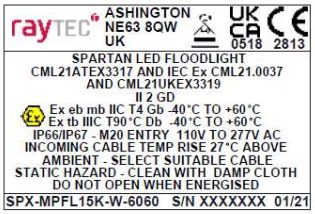
1.3 Marking

The marking has changed as a result of this variation. The complete marking details are shown below:

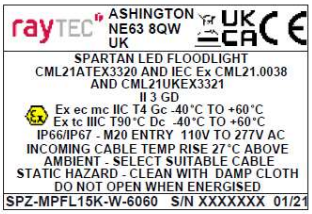
Item	Detail		ATEX	UKEx	IECEx
Manufacturer name or registered trade mark	Raytec Ltd.		✓	✓	✓
Address	Unit 15 Wansbeck Business Park, Rotary Parkway, Ashington Northumberland NE63 8QW, United Kingdom		✓	✓	✓
Type identification	Spartan Mid Power LED Floodlight / Highbay		✓	✓	✓
Serial No and year of manufacture	Xxxxx/yy		✓	✓	✓
ATEX certificate number	Zone 1: CML21ATEX3317 Zone 2: CML21ATEX3320		✓		
UKEx Certificate number	Zone 1: CML21UKEX3319 Zone 2: CML21UKEX3321			✓	
IECEx Certificate number	Zone 1: IECEx CML 21.0037 Zone 2: IECEx CML 21.0038				✓
CE mark (not components) Notify Body No. (if applicable)	CE nnnn		✓		
UKCA marking (not components) Approved Body No. (if applicable)	UKCA nnnn			✓	
ATEX/UKEX marking	Ex II 2 GD II 3 GD		✓	✓	
Code	**<u>Standard</u>** (unchanged) <u>Zone 1</u> Ex eb mb IIC T4 Gb Ex tb IIIC T90°C Db <u>Zone 2</u> Ex ec mc IIC T4 Gc Ex tc IIIC T90°C Dc	**<u>Emergency</u>** <u>Zone 1</u> Ex eb mb IIC T4 Gb Ex tb IIIC T90°C Db <u>Zone 2</u> Ex ec mc IIC T4 Gc Ex tc IIIC T90°C Dc	✓	✓	✓
Ambient	-40°C to +60°C	-20°C to +50°C	✓	✓	✓
Rating	110V to 277V AC		✓	✓	✓
Warnings/Informative markings	INCOMING CABLE TEMP RISE 27°C ABOVE AMBIENT- SELECT SUITABLE CABLE STATIC HAZARD- CLEAN WITH DAMP CLOTH DO NOT OPEN WHEN ENERGIZED		✓	✓	✓

A copy of the nameplate/label is shown below:

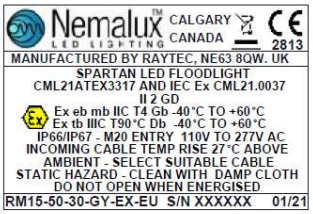
Standard - unchanged



TYPICAL ZONE 1 STD NAMEPLATES



TYPICAL ZONE 2 STD NAMEPLATES



TYPICAL ZONE 1 STD NAMEPLATES NEMALUX VARIANT

Emergency - New

NAMEPLATES

TYPICAL ZONE 1 EMERGENCY NAMEPLATES

TYPICAL ZONE 2 EMERGENCY NAMEPLATES

TYPICAL ZONE 1 EMERGENCY NAMEPLATES NEMALUX VARIANT

1.4 Applicant's Name & Address

The applicant's name and address are unchanged but has been reproduced below for reference.

Raytec Ltd.
Unit 15 Wansbeck Business Park,
Rotary Parkway,
Ashington Northumberland,
NE63 8QW,
United Kingdom

1.5 Manufacturer's Name & Address

The applicant's name and address are unchanged but has been reproduced below for reference.

Raytec Ltd.
Unit 15 Wansbeck Business Park,
Rotary Parkway,
Ashington Northumberland,
NE63 8QW,
United Kingdom

1.6 Trademark

The trademark is unchanged but has been reproduced below for reference.

1.7 Equipment name/model number

Spartan Mid Power LED Floodlight / Highbay

1.8 Rating

The product rating is unchanged.

1.9 Assessment Standards

The standards are unchanged but are reproduced below for reference.

ATEX	UKEX	IECEx
EN IEC 60079-0:2018 EN IEC 60079-7:2015+A1:2018 EN 60079-18:2015+A1:2017 EN 60079-31:2014	EN IEC 60079-0:2018 EN IEC 60079-7:2015+A1:2018 EN 60079-18:2015+A1:2017 EN 60079-31:2014	IEC 60079-0:2017 Ed. 7 IEC 60079-7:2017 Ed. 5.1 IEC 60079-18:2017 Ed. 4.1 IEC 60079-31:2013 Ed. 2

With the exception that 'EN' standards contain additional non-technical requirements to comply with the ATEX/UKEX requirements, it is considered that the IECEx, ATEX and UKEX standards are technically identical.

The above list of documents may detail standards that do not appear on the UKAS Scope of Accreditation but have been applied under CML's flexible scope of accreditation, which is available on request. Where applicable, any such standards have been verified to fall within the bounds of CML's flexible scope of accreditation and are marked with an asterisk.

RvA accreditation for CML BV ATEX certificates does not use a flexible scope.

1.10 Documentation

1.10.1 Technical Documents

The modifications assessed in this report are detailed in the following drawings. It was verified that these documents give a full and accurate description of those aspects of the equipment relating to compliance with the listed relevant certification standards.

#	Drawing No.	Sheets	Rev	Approved /issued date	Title
01	1250-SD-0001	1 to 3	D	30 Apr 2024	Spartan Mid Power LED Floodlight/High Bay

#	Drawing No.	Sheets	Rev	Approved /issued date	Title
02	1250-SD-0008	1 to 3	A	30 Apr 2024	PCB Schematic – Spartan EMX MPFL Power supply
03	1250-SD-0009	1 to 6	B	30 Apr 2024	Emergency PCB PSU FMEA Analysis
04	1250-SD-0010	1 of 1	B	30 Apr 2024	Parts list Spartan EMX MPFL power supply
05	1250-SD-0011	1 of 1	A	30 Apr 2024	Thermal fuse location – Spartan EMX MPFL power supply

Unless otherwise stated all the above drawings refer to IECEx, ATEX and UKEX.

1.10.2 Supporting information

#	Document No.	Title
01	1250-D-0005 Rev 3	Installation, operation, maintenance instructions
02	CMP 16 ETS2	Nylon washer data sheet
03	Expansil GP400	Gasket data sheet
04	psr	Battery pack data sheet
05	Ni-MH VHT D U	Battery cell data sheet
06	7096N	Clear encapsulant
07	473 series	Battery fuse data sheet
08	N-F Series	Thermal fuse data sheet
09	L-57EGW	Indicator LED data sheet
10	GW CSSRM3.PM	Main LED
11	IECEx TUR 18.0019U	Weidmuller MK6/MK3/BK Terminal Cert
12	TUV 18 ATEX 8209U	Weidmuller MK6/MK3/BK Terminal Cert
13	R325A	ExTR potted fuse
14	VNT DU Hc	Battery cell data sheet (alternate)
15	Discharge protection letter	Battery pack deep discharge protection
16	Battery manufacturer email	Discharge cut off

1.11 Instructions

The modifications required the instructions to be revised. Updated instructions complying with EN IEC 60079-0:2018 / IEC 60079-0:2017 Ed. 7, clause 30, for the modified product, were provided.

1.12 Attachments

None

1.13 Conditions of manufacture

There are no additional conditions of manufacture. Any existing conditions of manufacture are unchanged.

1.14 Specific Conditions of Use

There are no additional conditions/limitations.

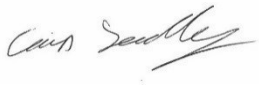
1.15 Compliance with Essential Requirements of Directive 2014/34/EU and Directive UKSI 2016:1107 (as amended)

There have been no changes affecting the original assessment to the Essential Health & Safety Requirements of Directive 2014/34/EU for ATEX certification and Directive UKSI 2016:1107 (as amended) for UKEX certification.

1.16 Conclusion

The modifications assessed in this report allow the equipment to maintain compliance with the listed standards, the certification code being unchanged. In addition, the equipment continues to meet the requirements of European Directive 2014/34/EU for ATEX certification and Directive UKSI 2016:1107 (as amended) for UKEX certification, for the Category indicated in section 1.3.

1.17 Signatories

Compiled by + signature (ExTL):	**H. Cleave** Senior Certification Engineer	
Reviewed by + signature (ExTL):	**Iain Leadley** Technical Manager & Principal Certification Engineer Date:25-03-2024	
Reviewed by + signature (ExTL):	**Andrew Holmes B.Eng. (Hons) FSEng. MIET** Technical Director Date: 30-04-2024	
Approved by + signature (ExCB):	H M Amos Technical Specialist Date: 30-04-2024	

IECEx TEST REPORT COVER

ExTR Reference Number..... :	Refer to Front Page
ExTR Free Reference Number ..... :	Refer to Front Page
Compiled by + signature (ExTL) .... :	Refer to Section 1.17
Reviewed by + signature (ExTL).... :	Refer to Section 1.17
Endorsed by + signature (ExCB) ... :	Refer to Section 1.17
Date of issue ..... :	Refer to Front Page
Ex Testing Laboratory (ExTL)..... :	Eurofins E&E CML Limited
Address..... :	Newport Business Park, New Port Road, Ellesmere Port, CH65 4LZ, United Kingdom
Ex Certification Body (ExCB)..... :	Eurofins E&E CML Limited
Address..... :	Newport Business Park, New Port Road, Ellesmere Port, CH65 4LZ, United Kingdom
Applicant's name..... :	Refer to section 1.4
Address..... :	Refer to section 1.4
Standards associated with this ExTR package ..... :	Refer to Section 1.9
Clauses considered ..... :	All clauses considered
Test Report Form Number..... :	ExTR Cover_10 (released 2022-10)
Related Amendments, Corrigenda or ISHs ..... :	All related decision sheets as identified in the checklist.
Test item description..... :	Refer to Section 1.2
Model/type reference ..... :	Refer to Section 1.7
Code (e.g. Ex __ II__ T__)..... :	Refer to Section 1.2 and/or 1.3
Rating..... :	Refer to Section 1.8

ExTR Package Contents
Assembled ExTR documents and Additional reference material:
IECEx Test Report Cover
Checklist per each standard referenced in Section 1.9

Manufacturer's name.....:	Refer to Section 1.5
Address .....:	Refer to Section 1.5
Trademark .....:	Refer to Section 1.6
Certificate No. (optional) .....:	Refer to Section 1.3
QAR Reference No. (optional) .....:	**GB/SIR/QAR13.0018/11**

Particulars: Test item vs. Test requirements

Classification of installation and use ..... :	Fixed
Ingress protection ..... :	IP6 7
Rated ambient temperature range (°C)..... :	Refer to section 1.3
Rated service temperature range (°C) for Ex Components .... :	If relevant, refer to Section 1.14

General remarks:

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

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

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

Use of uncertainty of measurement for decisions on conformity (Decision rule):

No decision rule is specified by the standards associated with this ExTR package, when comparing the measurement result with the applicable limit according to the specification in these standards. The decisions on conformity are made without applying the measurement uncertainty as described in IECEx OD 012 (i.e. "simple acceptance" decision rule, previously known as "accuracy method").

General product information:

Refer to Section 1.2

Details of change (applicable only when revising an existing ExTR package):

Refer to Section 1.1

Copy of Marking Plate:

Refer to the original certificate/report and Section 1.3

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

If relevant, refer to Section 1.1

Testing not fully performed by ExTL staff at the above ExTL address:

Refer to Section 4, if relevant

National differences considered as part of this evaluation:

None

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

Refer to Section 1.14

Routine tests:
Refer to Section 1.13
Date(s) of performance for all testing:
Refer to Section 4
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Technical Documents
Refer to Section 1.10

Note: All above documents are either new or revised. Refer to the previous ExTR issued for details of other documents.

2 Certification Overview

This variation sees the addition of an emergency model which includes batteries. The emergency model consists of the existing luminaire with the following modifications:

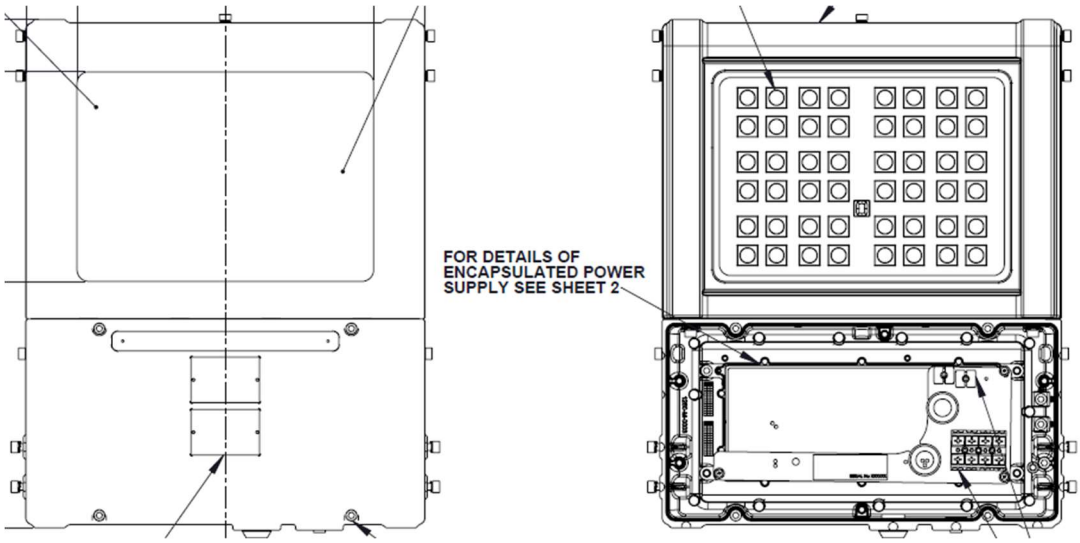
- Emergency PSU replaces standard PSU in existing housing and remains encapsulated.
- Addition of battery pack, housed in new battery housing.
- Encapsulated fuse in the battery compartment.
- LED indicator in battery compartment.
- Union connects battery enclosure to existing luminaire enclosure.

3 Modifications

Refer to section 5 for modified clauses checklist.

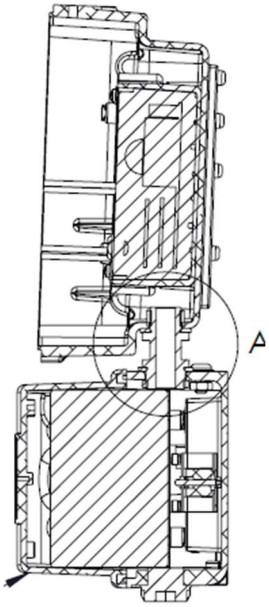
3.1 Addition of intelligent emergency variant.

This variation sees the addition of an emergency model which includes batteries. The luminaire itself is unchanged:



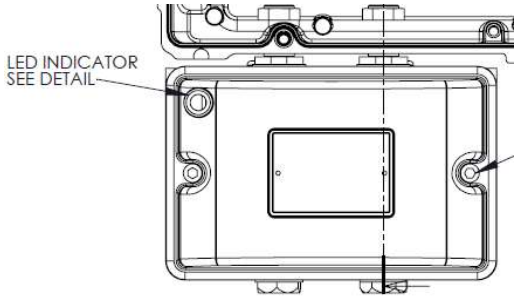
The additional elements that create the emergency variant are:

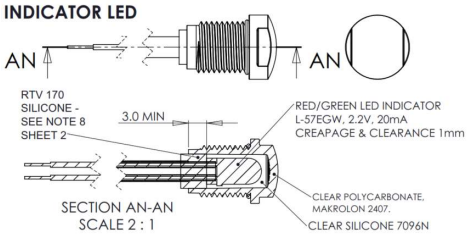
- New emergency PSU (inside existing enclosure) assessed under IEC 60079-18.
- New batteries, battery enclosure assessed under IEC 60079-7
- Encapsulated fuse housed in the battery compartment assessed under IEC 60079-18
- Union to connect the battery pack to the existing enclosure (PSU).
- Indicator LED assessed under IEC 60079-7



The graphic above shows the new PSU inside the existing enclosure at the top, the union circled and the new battery pack and enclosure at the bottom.

The new battery compartment is also fitted with an LED indicator.



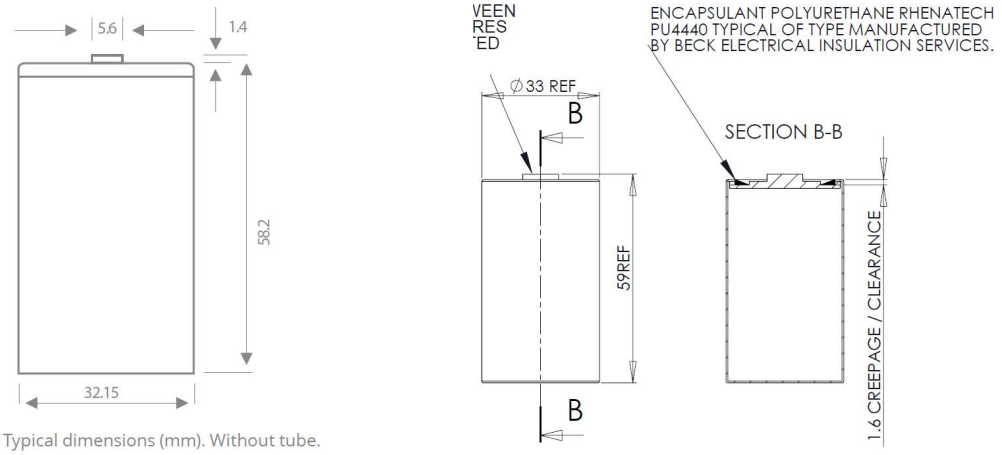


3.1.1 Battery Pack

The battery pack briefly comprises 10 NiMH battery cells, separately certified terminals and an LED indicator fitted within a metallic enclosure with silicone sponge gasket. The manufacture lists an alternate battery cell that may be optionally utilised in the place of the Ni-MH cells. The alternate cells are utilised into a battery pack with identical voltage, creepage and clearance as the standard battery cell. The only difference being a lower capacity resulting in a lower charge current and therefor lower temperature rise.

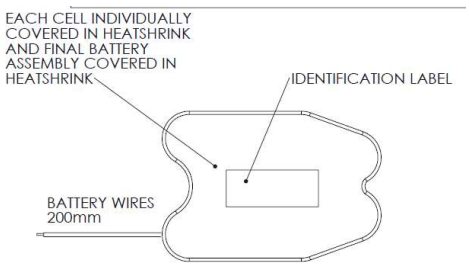
Battery Cell		**Alternate Battery cell**	
Manufacture	ARTS Energy	Manufacture	ARTS Energy
Model Ref	VHT D U (N101130-2)	Model Ref	VNT D U
Cell Type	Ni-MH sealed, gas tight	Cell Type	Ni-Cd sealed, gas tight
Voltage	1.2 V	Voltage	1.2 V

Battery Cell		Alternate Battery cell	
Capacity	6.4 Ah	Capacity	4.5 Ah
Discharge Temp	-20°C to +50°C	Discharge Temp	-20°C to +70°C
Charge Current	0.6 Ah	Charge Current	0.42 Ah
Size	32.15 mm Ø 58.2 mm hight	Size	32.15 mm Ø 59.9 mm hight

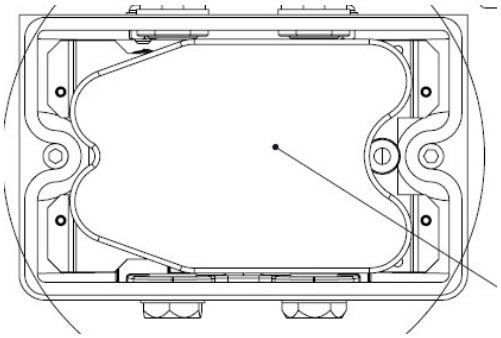


Typical dimensions (mm). Without tube.

IEC 60079-7 clause 6.6.2.6 and table 2 require a minimum creepage distance of 1.6mm. The battery cells have a minimum creepage of 1.4mm. Therefore Raytec utilises polyurethane encapsulant to increase the creepage as permitted under IEC 60079-7 clause 5.6.2.1.



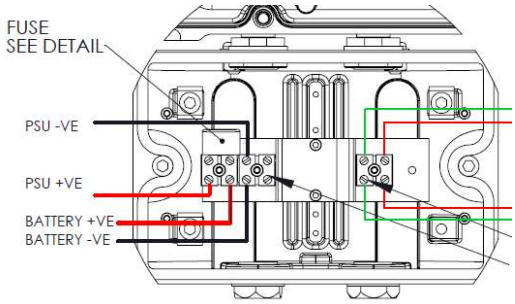
The battery pack is connects the 10 cells in series. The cells are spot weld together, connecting +VE and -VE wires with crimp fitting and spot weld. Each cell is individually wrapped in heat sink and the final battery assembly again wrapped in heat sink.



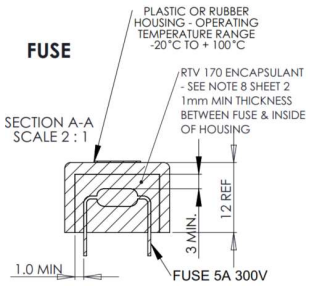
The battery pack is securely held within the battery pack enclosure using a metal bracket screwed to the inside of the enclosure cover.

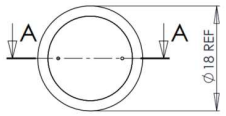
3.1.2 Encapsulated Fuse (Battery Pack)

Housed within the battery compartment is an encapsulated fuse fitted alongside the separately certified terminals. The fuse is identical to that previously assessed and tested under alternative products, all are currently certified for use with CML 14ATEX3119 / IECEx CML 15.0001 / CML 21UKEX3105.



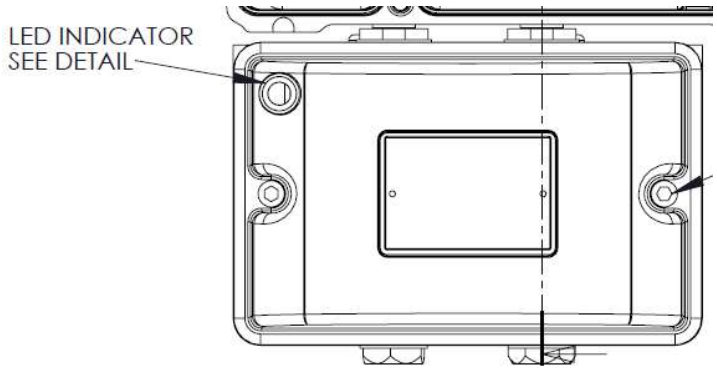
The non resettable fuse is rated at a at a maximum of 5A and 300V and is encapsulated inside a plastic or rubber housing with silicone encapsulant RTV170. Refer to ExTR R325A in supporting information for further information.



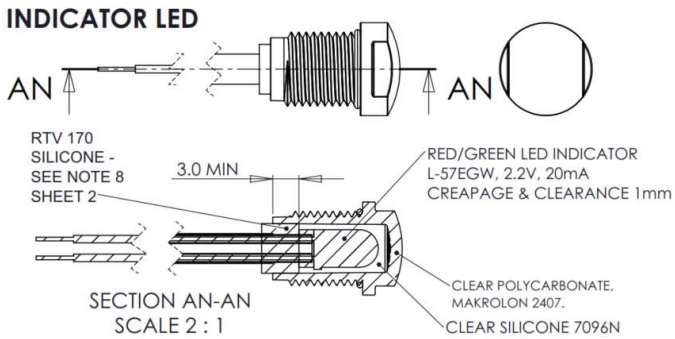


3.1.3 Indicator LED (Battery Pack)

Mounted through the external cover of the battery pack is an indicator LED.



The single LED is mounted in a polycarbonate lens/housing made from Lexan or Makrolon. The LED is installed with clear silicone fixing it into the polycarbonate housing. The LED indicator is assessed as encapsulated.

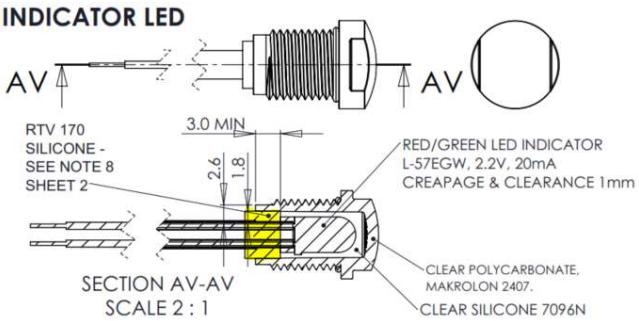


A flying lead is permanently soldered to the LED leg, this is housed inside a polycarbonate clear enclosure and potted with clear silicone potting and black encapsulant end. The clear silicone 7096N is not assessed as encapsulant, it is a space filler to aid with assembly and is suitable for the required temperature. The black encapsulant is the same as used in the power supply.

The LED itself is supplied with 2.2 V 20mA with a minimum creepage and clearance of 1mm. The polycarbonate housing, silicone encapsulant and indicator LED are suitable for their required service temperature, refer to section 3.1.6.2.

There is a minimum distance through the black encapsulant of

- LED and atmosphere including enclosure wall = 1.8 mm
- LED and free surface = 3 mm



3.1.4 Terminals

The emergency luminaire utilised the same type, number and location of separately certified terminals as the currently approved standard model in the main enclosure. The additional battery pack includes extra separately certified terminals of the same type used in the main enclosure.

Terminal Type	ATEX Approval	IEC Ex Approval	Temperature Range
Weidmuller MK6/MK3/BK	TUV 18 ATEX 8209U	IECEx TUR 18.0019U	-60°C to +130°C

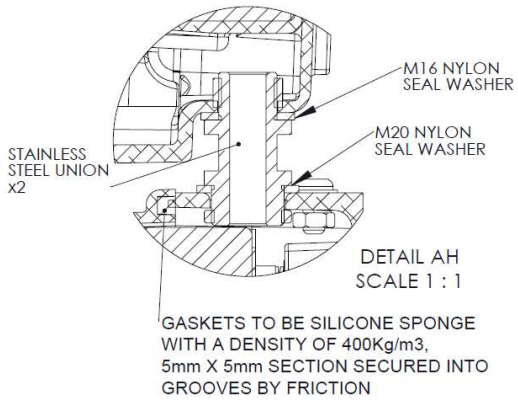
It is noted that the terminal manufacturer has updated their IECEx certification and replaced their ATEX certificate. The component certificates contain the following requirements and schedule of limitations (for models used within this equipment) which are considered as follows:

Weidmuller - MK/BK Series	
Requirements	**Consideration**
Operating temperature range -60°C to +90°C for T4 application.	The standard luminaire ambient is -40°C to +60°C. The emergency luminaire ambient is -20°C to +50°C. The rise on the terminals is 23.8K.
The MK BK-series products are suitable for use in enclosures in atmospheres with flammable gases or combustible dust. For flammable gases these enclosures must satisfy the requirements according to IEC 60079-0 and IEC 60079-7. For combustible dust the enclosure must satisfy the requirements according to IEC 60079-0 and IEC 60079-31.	Equipment certified to: EN IEC 60079-0:2018 EN IEC 60079-7:2015+A1:2018 EN IEC 60079-18:2015+A1:2017 EN 60079-31:2014
The enclosure shall be constructed to block all sun and UV light from affecting the terminal blocks. The terminal blocks shall be placed inside a suitable certified IP54 enclosure in type of protection “eb” for gas atmosphere. For dust atmosphere the terminal blocks shall be mounted inside a suitable certified enclosure (IEC 60079-31) in type of protection “t”.	Equipment certified to IP66/67 for ‘eb’ and protection ‘t’.

Weidmuller - MK/BK Series	
Requirements	**Consideration**
Under normal operating conditions the temperature rise of the terminal blocks is maximum 40 K, measured at the maximum permitted rated current. Due to the above mentioned, the terminal blocks may be used in apparatus of temperature classes T6..T1 as long as the terminal block ambient temperature range is not exceeded. No part of terminal block must exceed 130°C under any condition. • T6 (- 60°C ... +40 °C) • T5 (- 60°C ... +55 °C) • T4 (- 60°C ... +90 °C)	Temperature class assessed as part of equipment. See Section 3.1.6
When using the MK BK -series products especially with other terminal blocks series or sizes or accessories the requirements for clearance and creepage distances according to table 1 of IEC 60079-7 must be observed. Regarding the use of covers, cross-connectors and end brackets the instructions of the manufacturer must be followed.	Connection facilities in Ex e (IEC 60079-7) enclosure using suitably certified terminals and cable entries.
For cross connection accessories, current rating, resistance across the terminal please refer to the “Notice to Installers”.	Mains and interconnection terminal blocks-orientation and quantity to suit application.
No other wire sizes or types than the ones specified in instructions must be used. The terminal blocks must either be mounted next to another block of the same type and size or with an end plate.	Mains and interconnection terminal blocks-orientation and quantity to suit application.
If smaller conductor cross sections than the rated conductor cross sections are used, then the corresponding lower current shall be stated in the Certificate of the complete apparatus.	Appropriate conductors are utilised.
Unused terminals shall be tightened.	All unused terminals are tightened

3.1.5 Unions

The emergency model of the luminaire utilises 2 unions to connect the battery enclosure to the main enclosure and allows cables to pass between. The union is a ST/ST tube and is installed with nylon washers to maintain IP.



3.1.6 Thermal considerations.

3.1.6.1 Thermal rise

A sample of Spartan Mid Power Emergency luminaire was subject to thermal rise testing. The highest thermal rise at rated voltage, +/- 10% of rated voltage and when running in emergency mode (battery).

Spartan Mid Power Emergency			
Location	**Rated**	**90/110%**	**Emergency**
LED Side	41.3	41.2	39.0
Potting (LED Enclosure)	32.1	32.0	31.4
Gasket (LED Enclosure)	22.0	22.0	21.4
Lens (Internal)	55.2	55.0	39.4
Component A (PSU)	100.2	100.5	79.8
Component B (PSU)	85.6	93.8	36.4
Component C (PSU)	42.2	42.2	69.1
T/B (Main Enclosure)	20.1	21.1	16.7
Live Conductor	16.7	17.3	14.1
Branching point	13.9	14.5	11.7
Gasket (Main Enclosure)	18.0	18.2	16.9
Cable Gland	6.5	6.7	5.6
Battery	4.0	6.4	13.9
T/B (Battery Enclosure)	3.7	4.0	9.4
Gasket (Battery Enclosure)	3.8	3.6	5.2

Spartan Mid Power Emergency			
Location	**Rated**	**90/110%**	**Emergency**
Lens (External)	38.8	38.5	30.0
Enclosure Back (LED Enclosure)	31.8	31.6	30.8
Enclosure Back (Main Enclosure)	1.2	1.8	0.8
Enclosure Front (Main Enclosure)	14.3	14.5	12.9
Enclosure Front (Battery Enclosure)	2.7	3.0	5.8
Gasket (Lens)	18.8	18.8	18.2
Component D (PSU)	60.4	62.6	42.3

When comparing thermal rise results of the emergency to original models we have seen a maximum increase of 10K. The emergency model has reduced its upper ambient by 10°C to compensate for the increased temperature.

3.1.6.2 Non-metallic materials

The following additional non-metallic materials are relied on for safety; their suitability is considered below. The new Emergency model only is considered here with a maximum ambient of +50°C.

Component	Material	Operating Temp	Max Required Service Temp
Indicator LED housing	Polycarbonate Lexan 143R or Makrolon 2407	+125°C	-20°C to 64°C*
Gasket	Silicone rubber sponge GP400	-60°C to +230°C	-20°C to +72°C
Union washer	Nylon CMP 16 ETS2	-60°C to +130°C	-20°C to +69°C
Encapsulant	Silicone Elastomer Sylgard RTV170	-45°C to +200°C	-20°C to +151°C
Thermal fuse	N-F Series N4F	-10°C to 127°C	-20°C to +101°C
LED	LED GW CSSRM3.PM	-40°C to +125°C	-20°C to +92°C
Battery cell	Ni/MH	-20°C to +85°C	-20°C to +64°C
Alternate battery cell	Ni/Cd	-20°C to +70°C	-20°C to +64°C
Cell encapsulant	Polyurethane Elan-Tron PU4449	+124°C	-20°C to +64°C
Battery fuse	Little fuse 473 Series	-60°C to 125°C	-20°C to +60°C
Battery fuse housing	Plastic or rubber	-20°C to +100°C	-20°C to +60°C
Terminals	Refer to section 3.1.4	-60°C to 130°C*	-20°C to +72°C
Conductors	RS Pro YGZ	-60°C to +200°C	-20°C to +68°C
Indicator LED	LED L-57EGW	-40°C to +85°C	-20°C to 64°C*
Indicator LED	Clear Silicone 7096N	-50°C to +150°C	-20°C to 64°C*

Component	Material	Operating Temp	Max Required Service Temp
Union seal	Nylon washer TDS581	-60°C to +130°C	-20°C to +72°C

* Indicator LED was not measured. It is supplied with 2.2V and expected to generate negligible heat. The battery temp rise of 14K was used as worst case scenario.

3.1.6.3 T Class/T Ratings

The intelligent emergency model of the Spartan luminaire is assigned the following T Class and T Rating.

	Location	Max thermal rise	Max Temp (+50°C ambient)	Marking
Gas	Lens (internal)	55.2 K	105.2°C	T4
Dust	Lens (External)	38.8	88.8°C	T90°C

The equipment remains suitable for T4 and T90°C application.

3.2 Marking and ambient is updated to include emergency model.

The intelligent emergency model of the Spartan luminaire marking is unchanged from current models with the exception of the ambient reduction. Refer to section 1.3. The lower ambient is increased and the upper ambient reduced as follows.

	Current Std Models	**New Emergency Model**
Ambient	-40°C to +60°C	-20°C to +50°C

4 Samples received and tests conducted

4.1 Samples received

CML Sample Reference	Description	Date of arrival
S16593-1	Spartan Mid Power Emergency – empty enclosure	09/08/2023
S16593-2	Spartan Mid Power Emergency - empty enclosure	09/08/2023
S16593-3	Spartan Mid Power Emergency - working	09/08/2023

4.2 Tests carried out at ExTL

The following tests were conducted at Eurofins E&E CML Limited, by CML laboratory engineers.

Test	Standard and clause	Parameters/Result	Reference
Thermal Rise	IEC 60079-0 Cl. 26.5	S16593-3 Thermal rise testing was conducted on the intelligent emergency model. The results were compared to existing models results. A maximum increase of 10°C above existing model was found. Refer to section 3.1.6.1. Samples tested utilised standard battery cells which is considered worst case for thermal rise due to higher charge current.	20230901.20
Impact	IEC 60079-0 Cl. 26.4.2	S16593-1, 2 7J impact on union and additional PSU enclosure. Pass	20230901.22
IP 6X	IEC 60079-0 Cl. 26.4.5	S16593-1, 2 Fixings tightened to 4Nm Pass	20230901.21
IP X6	IEC 60079-0 Cl. 26.4.5	S16593-1, 2 Fixings tightened to 4Nm Pass	20240103.10

4.3 Witnessed and offsite tests

None

4.4 Outsourced tests

None

4.5 Tests conducted by other organisations

None

4.6 Waived tests

Test	Standard and clause	Justification
Thermal endurance to heat	IEC 60079-0 Cl 26.8	Thermal rise testing of the new emergency model showed a max thermal rise of 10°C above existing models tested. The maximum upper ambient of the emergency model has been reduced by 10°C to allow for this rise. Therefore, the required temperatures of the non-metallics relied on for safety remain the same or less than previously tested. The only additional non-metallic is a Nylon washer fitted with the union to attach the battery pack to the enclosure. the Spartan FL** Luminaire where it was used to seal the union between the light engine and PSU. It was conditioned at +107°C as part of this assessment. This is above the required +92°C required in this application (max service +72°C). Retesting was not considered necessary. For further information on limiting temperature refer to section 3.1.6.2.
Thermal endurance to cold	IEC 60079-0 Cl 26.9	The new emergency model has a reduced lower ambient of -20°C (which is 20°C warmer than current models. Testing on current models is considered more onerous that requirements of the emergency and therefore retesting was not considered necessary. The additional Nylon washer has a COT with a lower limit of -60°C far below the required limit of -20°C. The washer has been previously conditioned under the Spartan FL** Luminaire where it was used to seal the union between the light engine and PSU. It was conditioned at -55°C as part of this assessment. This is below the required +25°C required in this application (-20°C lower ambient). Retesting was not considered necessary.
Dielectric strength	IEC 60079-7 Cl 6.1	A dielectric strength test is considered as part of the conditions of manufacture; therefore, this test was not deemed to be required.
Water absorption (potting sample)	IEC 60079-18 Cl 8.1.1	The encapsulant has been used on previous SPARTAN Models (CML 13ATEX3007 & IECEx CML 14.0001) The test data has been carried forward and is available in supporting information folder.

Test	Standard and clause	Justification
Dielectric strength (potting sample)	IEC 60079-18 Cl 8.1.2	The encapsulant has been used on previous SPARTAN Models (CML 13ATEX3007 & IECEx CML 14.0001) The test data has been carried forward and is available in supporting information folder, testing was performed at the same required voltage.
Pressure test	IEC 60079-31 CL 6.1.1.3	Gasket is held securely in place inside groove in enclosure lid.

4.7 Decision rule

Tests detailed in the preceding sections are accepted as pass or fail based on the simple acceptance decision rule where a measurement that falls within the tolerance band of the measurand is, where one is specified in the standard, considered to comply. Ref IEC Guide 98-4.

5 Checklists

Clauses affected by the modifications:

IEC 60079-0			
Clause	**Requirement – Test**	**Result – Remark**	**Verdict**
5 DS 2016/002 DS 2015/011A	Temperatures		
5.1	Environmental influences		
5.1.1	Ambient temperature	The emergency model ambient is restricted due to limiting operation temperature of the battery. -20 to +50°C	Pass
5.2 DS 2020/006	Service temperature	Ts takes maximum Ta into account.	Pass
5.3	Maximum surface temperature		
5.3.1	Determination of maximum surface temperature	Thermal rise testing was conducted. Refer to section 3.1.6	Pass
5.3.2	Limitation of maximum surface temperature		
5.3.2.2	Group II electrical equipment	Maximum surface temperature determined, and appropriate T class assigned. Refer to section 3.1.6	Pass
5.3.2.3	Group III electrical equipment		
5.3.2.3.2	Maximum surface temperature for EPL Db	The maximum surface temperature was determined without a dust layer and does not exceed the assigned maximum surface temperature. Refer to section 3.1.6	Pass
6	Requirements for all electrical equipment		
6.2	Mechanical strength of equipment	The emergency model was subject to impact testing. Refer to section 4. The emergency model is the same as the standard model with an additional battery pack mounted at the bottom via union. Therefore, impact testing was focused on the battery pack, unions and lower end of the enclosure. It was not deemed necessary to repeat lens impacts.	Pass

IEC 60079-0			
Clause	**Requirement – Test**	**Result – Remark**	**Verdict**
6.5	Gasket retention	The main enclosure is unchanged on the emergency model. The additional battery enclosure utilises a silicone sponge gasket which is held in place via friction. The unions utilise a nylon washer, the unions are not intended to be opened during installation or normal use.	Pass
7	Non-metallic enclosures and non-metallic parts of enclosures		
7.1	General		
7.1.1	Applicability	The main enclosure is unchanged on the emergency model. Th additional battery pack and unions are metallic but utilise non metallic gaskets.	Pass
7.1.2	Specification of materials		
7.1.2.1	General	Manufacturers documentation specifies the materials.	Pass
7.1.2.3	Elastomers	Main enclosure – unchanged Battery compartment – Silicone gasket (same as main enclosure Union – Nylon washer	Pass
7.2	Thermal endurance		
7.2.1	Tests for thermal endurance	Thermal endurance testing conducted. Refer to section 4	Pass
7.2.2	Material selection	The gaskets have an RTI of 20K above the maximum service temperature. Refer to section 3.1.6.2	Pass
8	Metallic enclosures and metallic parts of enclosures		
8.1	Material composition	Manufacturers documentation specifies the materials.	Pass
8.3	Group II	Main luminaire enclosure unchanged. Additional battery enclosure manufactured from aluminium with less than 7.5% magnesium, titanium and zirconium. The union is manufactured from Stainless Steel.	Pass
8.4	Group III	Refer to clause 8.3	Pass
9	Fasteners		

IEC 60079-0			
Clause	**Requirement – Test**	**Result – Remark**	**Verdict**
9.1	General	No special fasteners. Main enclosure unchanged. Battery compartment fastened with 2 x M6 bolts.	Pass
14	Connection facilities		
14.1	General	Connection to the PSU remains unchanged from standard variant. The connection to the new battery pack is via separately certified terminal blocks.	Pass
14.2	Type of protection	Separately certified increased safety terminal blocks utilised.	Pass
14.3	Creepage and clearance	Covered by separately certified terminal blocks.	Pass
15.1	Equipment requiring earthing or bonding		
15.1.1	Internal earthing	Main enclosure earthing unchanged. Battery compartment supplied with internal earthing stud.	Pass
15.1.2	External bonding	Main enclosure earthing unchanged. Battery compartment earthing stud provided near the cable entry glands.	Pass
16 DS 2017/001	Entries into enclosures		
16.1	General	The main enclosure has 2 additional entries in the bottom, these are plugged by 2 unions. The unions are tested and assessed in this variation. The emergency enclosure is connected to the main enclosure via the 2 unions. In addition, it has 2 entries in the bottom of the battery compartment. These are plugged with separately certified stoppers only.	Pass

IEC 60079-0			
Clause	**Requirement – Test**	**Result – Remark**	**Verdict**
16.6 DS 2018/002	Temperature at branching point and entry point	Cable entry is +68°C and branching is +65°C. No warnings required. The temperatures at the entry and branch points are less than 70 ºC and 80 ºC respectively. The manufacturer has included a warning on the label which states 'Incoming cable temperature rise 27°C above ambient- select suitable cable.' This statement is not necessary for compliance and the actual rise is less than that stated.	Pass
23	Equipment incorporating cells and batteries		
23.1	General	All clauses considered.	Pass
23.2	Interconnection of cells to form batteries	Cells are connected in series.	Pass
23.3 DS 2019/002	Cell types	Secondary nickel metal hydride cells. Alternate Nickel cadium battery permitted as an alternate.	Pass
23.4	Cells in a battery	All 10 cells identical.	Pass
23.5	Ratings of batteries	Battery's are operated within their ratings.	Pass
23.6	Interchangeability	Only secondary cells are utilised.	N/A
23.7	Charging of primary batteries	No primary cells.	N/A
23.8	Leakage	Cells are sealed.	Pass
23.9	Connections	Cells suitably connected.	Pass
23.10	Orientation	Battery orientation is not important for safe operation.	N/A
23.11	Replacement of cells or batteries	Cells are not intended to be replaced.	N/A
23.12	Replaceable battery pack	Batteries are not intended to be replaced; information is given in the user instructions to detail appropriate replacement where necessary.	Pass
24	Documentation	Compliance documentation provided, refer to section 1.10	Pass
26 DS 2017/005	Type tests		
26.4.2 DS 2020/001	Resistance to impact	Impact testing conducted. Refer to section 4	Pass
26.4.5 DS 2012/003	Degree of protection (IP) by enclosures		

IEC 60079-0			
Clause	**Requirement – Test**	**Result – Remark**	**Verdict**
26.4.5.1	Test procedure	IP testing conducted. Refer to section 4	Pass
26.4.5.2	Acceptance criteria	Refer to section 4	Pass
26.5	Thermal tests		
26.5.1	Temperature measurement		
26.5.1.1	General	Thermal rise testing was conducted. Refer to section 4.	Pass
26.5.1.2	Service temperature	Refer to section 3.1.6	Pass
26.5.1.3	Maximum surface temperature	Refer to section 3.1.6	Pass
26.8 DS 2020/003	Thermal endurance to heat	Testing waived. Refer to section 4	Pass
26.9	Thermal endurance to cold	Testing waived. Refer to section 4	Pass
29 DS 2012/005A DS 2017/007 DS 2021/005 DS 2021/006	Marking	Refer to section 1.3	Pass
30 DS 2021/006	Instructions	Supplied, refer to section 1.11	Pass
30.2	Cells and batteries	The battery type reference is shown on the battery pack itself. As the battery pack is not replaceable it is not included in the instructions.	N/A

IEC 60079-7			
Clause	**Requirement – Test**	**Result – Remark**	**Verdict**
4.2	Electrical connections		

IEC 60079-7			
Clause	**Requirement – Test**	**Result – Remark**	**Verdict**
4.2.1	General	Connection on the emergency model are the same as the standard model with the addition of new connections in the battery compartment. The battery compartment utilises separately component certified Ex e terminal blocks and are accepted as complying with the requirements of this clause. The battery pack has spot welded flying leads connected to the battery pack, these are provided with additional support from a heat shrink covering.	Pass
4.2.3	Factory connections		
4.2.3.1	General	Exposed live parts are fixed in position such that the minimum clearance and creepage distance is maintained.	Pass
4.3 See also DS 2016/001	Clearances	The equipment requires a minimum clearance of 5 mm. Manufacturers documentation confirms a minimum clearance of 8mm.	Pass
4.4	Creepage distances		
4.4.1 See also DS 2016/001	General	Equipment utilises separately certified terminals, PCBs and LEDs protected by encapsulation. Minimum creepage of Ex e parts of the equipment is a minimum of 8mm; suitable for all material groups.	Pas
4.10	Degrees of protection provided by enclosures		
4.10.1	Enclosure requirements	Equipment requires IP54 and has passed IP 66 testing	Pass
5.6	Supplementary requirements for equipment incorporating cells and batteries		
5.6.1	Type of cells and batteries		
5.6.1.1	General	Nickel-metal hydride battery cells.	Pass

IEC 60079-7			
Clause	**Requirement – Test**	**Result – Remark**	**Verdict**
5.6.1.2	Sealed cells	10 Secondary battery cells are sealed, gas tight and assembled into a battery pack. The cells used have a typical capacity of 6.4 Ah and do not exceed 25 Ah. Alternate battery cell have a typical capacity of 4.5 Ah and do not exceed 25 Ah. Emergency model has a restricted ambient ensuring the battery cells are not operates outside of their limits (-20°C to +85°C/70°C).	Pass
5.6.1.3	Valve-regulated cells and batteries	The cells are not valve regulated.	N/A
5.6.1.4	Vented cells and batteries	The cells are not vented.	N/A
5.6.2	Requirements for cells and batteries ≤25 Ah		
5.6.2.1	Encapsulation of cells or batteries	Cells utilise encapsulant to increase creepage. Cells are sealed and venting is not a concern.	Pass
5.6.2.2	Use of secondary cells or batteries	Equipment is designed for use with secondary cells.	Pass
5.6.2.3	Cell connection	Battery pack is made up of 10 cells connected in series.	Pass
5.6.2.4	Discharge mode		
5.6.2.4.1	General		
5.6.2.4.1.1	Connecting cells in series	10 cells are connected in series, precaution to prevent reverse charging is taken.	Pass
5.6.2.4.1.2	Deep discharge protection	The inverter circuit provides protection against deep discharge and reverse charging of cells by implementing a discharge cut off voltage above the manufacturer's recommended minimum voltage per cell. After switching off the load the current draw from the battery is below 0.1% of the rated capacity of the battery pack therefore preventing any individual cells entering a discharge state sufficient for reverse charging to occur, therefore 10 cells in the battery pack deemed acceptable. Refer to letter within supporting information section 1.10.2	Pass

IEC 60079-7			
Clause	**Requirement – Test**	**Result – Remark**	**Verdict**
5.6.2.4.2	Discharge conditions for Level of Protection “eb”	The battery pack has flying leads which are terminated on a component approved terminal block and an encapsulated fuse is fitted alongside the separately certified terminal as a safety device. The fuse is rated such that it prevents the battery from discharging at currents which can cause such damage to the battery to invalidate the type of protection increased safety.	Pass
5.6.2.4.3	Discharge conditions for Level of Protection “ec”	Protection level eb	N/A
5.6.2.5	Service temperature	Emergency model has a restricted ambient ensuring the battery cells are not operates outside of their limits (- 20°C to +85°C/70°C). Refer to section 3.1.6.2	Pass
5.6.2.6	Creepage and clearance		
5.6.2.6.1	Level of Protection “eb”	Battery cells have a voltage of 1.2V. The manufacturer confirms a 1.6 mm creepage and clearance which complies with table 2 of IEC 60079-7.	Pass
5.6.2.6.2	Level of Protection “ec”	Protection level eb	N/A
5.6.2.7	Connections	The battery pack has flying leads which are terminated on a component approved terminal block.	Pass
5.6.2.8	Replaceable battery packs	The battery pack is not intended for user replacement.	N/A
5.6.2.9	Replaceable battery pack connections	The battery pack is not intended for user replacement.	N/A
5.6.2.10	Release of electrolyte		
5.6.2.10.1	Level of Protection “eb”	The cells are sealed gas tight type.	Pass
5.6.2.10.2	Level of Protection “ec”	Protection level eb	N/A
5.6.2.11	Disconnection and transportation	The battery is not disconnected in the hazardous area.	N/A
5.6.3	Requirements for valve-regulated or vented cells or batteries >25 Ah	Battery cells are not valve regulated or vented.	N/A
5.6.4	Charging of cells and batteries		
5.6.4.1	Charger specifications		

IEC 60079-7			
Clause	**Requirement – Test**	**Result – Remark**	**Verdict**
5.6.4.1.1	Level of Protection “eb”	The emergence PSU and inverter supply a continual charge current of <300mA to the batteries. The battery pack has flying leads which are terminated on a component approved terminal block which protects the battery supply from other voltages in the enclosure. The inverter circuits provide protection against deep discharge and cell polarity reversal (parallel diode across the battery input). Current into batteries is provided with very low terminal voltages making it suitable to recharge deeply discharged cells. Due to the current limitations, there will be no significant heating if the battery is damaged and cannot accept the charge. An encapsulated fuse is fitted alongside the separately certified terminal.	Pass
5.6.4.1.2	Level of Protection “ec”	Protection level eb	N/A
5.6.4.2	Outgassing during charging of valve-regulated or vented cells or batteries		
5.6.4.2.1	Level of Protection “eb”	Battery cells are not valve regulated or vented.	N/A
5.6.4.2.2	Level of Protection “ec”	Battery cells are not valve regulated or vented.	N/A
5.9	Supplementary requirements for fuses		
5.9.1	General	Thermal fuses utilised protected by encapsulation.	Pass
5.9.2	Temperature class of equipment	Suitable thermal fuses for the required surface temperature are selected.	Pass
6.1	Dielectric strength	Testing waived, refer to section 4	Pass
6.3	Luminaires		
6.3.1	Battery operated luminaires	Battery charged prior to testing.	Pass
6.6	Verification and tests for cells and batteries of Level of Protection “eb”	Tests not applicable to batteries less than 25 A.h capacity	N/A
7	Routine verifications and routine tests		
7.1	Dielectric tests	Routine test applied, existing condition does not require modifying.	Pass

IEC 60079-7			
Clause	**Requirement – Test**	**Result – Remark**	**Verdict**
7.2	Dielectric tests for batteries	Not applicable, battery is less than 25 A.h capacity.	N/A
9	Marking and instructions		
9.1	General marking	Refer to section 1.3	Pass
9.3	Instructions for use		
9.3.1	Battery operated equipment	Only relevant clauses applied, as the battery pack is specific to the equipment and can only be replaced with a unit from the original manufacturer. The type identification is marked on the battery pack to facilitate replacement, should that be necessary.	Pass

IEC 60079-18 applies to the new PSU and fuse only. The LED module is unchanged.

IEC 60079-18			
Clause	**Requirement – Test**	**Result – Remark**	**Verdict**
6	Temperatures		
6.1	General	The service and surface temperature have been determined and the limiting temperatures of the compound have been considered. Refer to section 4	Pass
6.2	Determination of the limiting temperatures		
6.2.1	Maximum surface temperature	Maximum service temperature of the new PSU determined through testing. Temperature of unchanged LED module confirmed. Indicator LED temperature considered. Refer to section 3.1.6	Pass
6.2.2	Temperature of the compound	The hottest component in the compound has been previously determined. Refer to section 3.1.6	Pass
6.3	Temperature limitation	Testing was carried out as appropriate, circuit is protected by thermal fuses	Pass
7	Constructional requirements		
7.1	General	The surface of the compound is surrounded by an enclosure on three sides. The free surface is contained fully within the enclosure. The enclosure has undergone testing in accordance with IEC 60079-0. All clauses considered.	Pass
7.2	Determination of faults		
7.2.1	Fault examination	Equipment is ‘mb’ and considers one internal countable fault and the most onerous condition is considered in the fault analysis.	Pass
7.2.2	Components considered as not subject to fail	Components have been assessed and are not considered to fail where applicable.	Pass

IEC 60079-18			
Clause	**Requirement – Test**	**Result – Remark**	**Verdict**
7.2.3	Isolating components	Battery charger transformer does not meet IEC 61558-2-6 and is therefore considered under fault analysis – thermal fuses fitted.	Pass
7.2.4	Infallible separation distances		
7.2.4.1	General	Infallible distances detailed in manufacturer documentation 1250-SD-00009	Pass
7.2.4.2	Distances through the compound	Distances through compound are greater than 1mm.	Pass
7.2.4.3	Distances through solid insulation	Distance through solid insulation is greater than 0.1mm. retesting encapsulant as per clause 8.2.4 was not considered necessary.	Pass
7.3	Free space in the encapsulation		
7.3.1	Group III “m” equipment	Compound thickness is a minimum of 3mm (mb) & no single void exceeds 10 cm^3.	Pass
7.3.2	Group I and Group II “m” equipment	Compound thickness is a minimum of 3mm (mb) & sum of voids does not exceed 100 cm^3. No pressure test required.	Pass
7.4	Thickness of the compound		
7.4.1	“m” equipment	Distance from circuit to free surface, metallic enclosure and non-current carrying is a minimum of 3mm and complies with this standard.	Pass
7.6	External connections		
7.6.1	General	Permanent connections within the encapsulant are soldered into place on the PCB’s or connected through appropriate connections. The cables are prevented against damage from flexing and pulling by these connections, the potting and where necessary additionally looped through metal framework. The potting surface does not serve as an external surface and so pull test not necessary.	Pass
7.7	Protection of bare live parts	Bare live parts do not exit the encapsulant surface. Insulted conductors are considered under EN 60079-7 once they have exited the encapsulant.	Pass

IEC 60079-18			
Clause	**Requirement – Test**	**Result – Remark**	**Verdict**
7.8	Cells and batteries	Batteries not considered under IEC 60079-18 (They are protected by Ex e).	N/A
7.9	Protective devices		
7.9.1	General	Equipment utilises thermal fuses and are rated suitability.	Pass
7.9.2	Electrical protective devices		
7.9.2.1	General	Thermal fuses used are suitably rated.	Pass
7.9.2.2	Protective devices that are connected to the “m” equipment	Not applicable, thermal fuses are contained within the encapsulant.	N/A
7.9.3	Thermal protective devices	Non resettable thermal fuses are utilised and suitably rated.	Pass
7.9.4	Built-in protective devices	Protective devices are suitable for encapsulation and data sheets have been provided.	Pass
8	Type tests		
8.1.1	Water absorption test	Testing waived, refer to section 4	Pass
8.1.2	Dielectric strength test	Testing waived, refer to section 4	Pass
9	Routine verifications and tests		
9.1	Visual inspections	Equipment will be visually inspected. Existing condition of manufacture does not require modifying.	Pass
9.2 **IEC 60079-18:2014/AMD1**	Dielectric strength test	Each piece of equipment will undergo a dielectric strength test. Existing condition of manufacture does not require modifying. It was not considered necessary for the test to include foil on the surface of the encapsulant during the test due to the high electric strength of the encapsulant (14kV/mm) and the depth of the encapsulant (min 3 mm) because failure would not occur unless the unit also failed the visual inspection, which is included as a routine test.	Pass
10	Marking	Refer to section 1.3	Pass

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Clause	**Requirement – Test**	**Result – Remark**	**Verdict**
4.4	Requirements for Ex Equipment with Level of Protection “tb” and “tc”		
4.4.1	Fault current	Not intended to interrupt current above 10kA.	N/A
4.4.2	Maximum surface temperature	Maximum marked surface temperature testing completed in accordance with clause 6.1.2 (with no dust layer).	Pass
4.4.3	Dust exclusion	Dust exclusions from clause 6.1.1 considered	Pass
4.4.4	Thermal protection	The equipment cannot exceed marked surface temperature. Encapsulated parts utilise thermal protective devices and are considered under IEC 60079-18.	Pass
4.4.5	Cells and batteries	Sealed cells are used and protective device is provided, refer to IEC 60079-7.	Pass
5	Construction		
5.1	Joints		
5.1.1	General	All clauses considered.	Pass
5.1.2	Threaded joints	Threaded entries have the minimum number of threads, quality of fit specified in manufacturers documentation.	Pass
5.1.3	Gaskets and seals	Main enclosure and battery enclosure seal is one piece construction and secured by friction into a groove. Nylon washer utilised with union is aligned around screw by design.	Pass
5.2	Cable glands, cable transit devices and conduit sealing devices	Cable glands are to be separately certified. Unions have been assessed and tested in lie with IEC 60079-0.	Pass
5.3	Entries		
5.3.1	Plain entries	No Plain entries	N/A
5.3.2	Threaded entries	Each entry is a maximum of 25mm Ø. Threaded holes are manufactured to be parallel threads that comply with 6H tolerance of ISO 965-1 and ISO 965-3. A minimum of 5 threads are found in each threaded entry.	Pass

IEC 60079-31			
Clause	**Requirement – Test**	**Result – Remark**	**Verdict**
6 See also DS 2020/004	Verification and tests		
6.1	Type tests		
6.1.1	Type tests for dust exclusion by enclosures		
6.1.1.1	General	All testing considered refer to section 4	Pass
6.1.1.2	Impact test on supplementary internal enclosures	Not applicable, enclosure not considered supplementary enclosure. More onerous impact tests from EN 60079-0 have been considered.	N/A
6.1.1.3	Pressure test	Test waived, refer to section 4.	Pass
6.1.1.4	IP test	Testing conducted, refer to section 4.	Pass
6.1.2	Tests to determine maximum surface temperature	Testing conducted, no overload malfunction condition required as per table 2.	N/A
7 See also DS 2015/004 DS 2015/010 DS 2020/004	Marking	Refer to section 1.3	Pass