EC DECLARATION OF CONFORMITY

Document number:	MDC010-03
Product type:	DALI Emergency Lighting Test and Monitoring System
Product range:	N-Light Connect
Model type(s):	Refer to Annex A

Manufactured and supplied by: **Mackwell, WS9 8UG, UK**

Mackwell Electronics Limited declares under our sole responsibility that the above product(s) conform to the essential requirements of the EC directives and relevant harmonised standards listed below:

2014/35/EU	Low Voltage Directive
2014/30/EU	Electromagnetic Compatibility Directive
2011/65/EU	RoHS Directive

EN 61347-1:2008+A2:2013	Lamp Controlgear - Part1: General and safety requirements
EN 61347-2-11:2002	Lamp Controlgear - Part 2-11: Particular requirements for miscellaneous electronic circuits used with luminaires
EN 61547:2009	Equipment for general lighting purposes - EMC immunity requirements
EN 55015:2013+A1:2015	Limits And Methods Of Measurement Of Radio Disturbance Characteristics Of Electrical Lighting And Similar Equipment
EN 61000-3-2:2014	Electromagnetic Compatibility (EMC) - Part 3-2: Limits - Limits for harmonic current emissions (equipment input current ≤16A per phase)

Authorised on behalf of Mackwell

Mackwell
Vigo Place
Aldridge
West Midlands
England
WS9 8UG

Date: 29 April 2016

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EC DECLARATION OF CONFORMITY

Annex A - List of declared products

Document number: MDC010-03

Article No.	*Item Code / Description*		*Article No.*	*Item Code / Description*
9005033	N-Light Connect	(14)		
9005137	N-Light EC	(15)		
9005289	N-Light EC EU	(15)		

Test Report

Report No	TR/14/623
Client	Mackwell Electronics Ltd Vigo Place, Walsall, WS9 8UG United Kingdom
Authority & date	Project No.: 400003489, SMO: 8183081 Date: 23/06/2014
Items tested	Mackwell N-light Connect touch panel
Specification	IEC 61547: 2009 (Second Edition) BS EN 61547:2009
Results	A type sample of the above appliance has been tested and examined to the relevant requirements of the above specification and has been found to comply with these requirements, subject to the implementation of any corrective actions detailed in this test report.
Prepared by	Jordan Bucko
Authorised by	Chris Colgan
Issue Date	26/11/2014
Conditions of issue	This Test Report is issued subject to the conditions stated in current issue of CP0322 'Conditions of Contract for Testing'. The results contained herein apply only to the particular sample/s tested and to the specific tests carried out, as detailed in this Test Report. The issuing of this Test Report does not indicate any measure of Approval, Certification, Supervision, Control or Surveillance by BSI of any product. No extract, abridgement or abstraction from a Test Report may be published or used to advertise a product without the written consent of BSI, who reserve the absolute right to agree or reject all or any of the details of any items or publicity for which consent may be sought.

BSI, Holywell Park, Loughborough, Leicestershire, LE11 3AQ Tel: 01509 331133, e-mail: appliances@bsigroup.com

Test Report issued under the responsibility of:

BSI Appliances

TEST REPORT
IEC 61547
Equipment for General Lighting Purposes – EMC Immunity Requirements

Report Reference No. ..... :	TR/14/623
Compiled by (+ signature).....	Jordan Bucko
Approved by (+ signature)	Chris Colgan
Date of issue ..... :	26/11/2014
Total number of pages	38

CB Testing Laboratory ..... :	BSI Appliances
Address ..... :	Ashby Road Loughborough Leicestershire LE11 3AQ, UK

Applicant's name ..... :	Mackwell Electronics Ltd
Address ..... :	Vigo Place, Walsall, WS9 8UG, UK

Test specification:

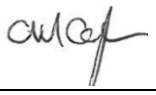
Standard ..... :	IEC 61547: 2009 (Second Edition)
Test procedure ..... :	CB Scheme
Non-standard test method……..:	N/A

Test Report Form No. ..... :	IEC61547A
Test Report Form(s) Originator..... :	TÜV SÜD PSB Pte Ltd
Master TRF ..... :	Dated 2009-08

Test item description..... :	Touch panel for monitoring and test of lighting systems
Trade Mark..... :	N-light
Manufacturer ..... :	Mackwell
Model/Type reference ..... :	N-light Connect 9005033
Ratings ..... :	230V ~ 50/60Hz 50mA

Report Index:

1.0 Program details

Testing procedure and testing location:		
☒ **Testing Laboratory**:	BSI Appliances	
Testing location/ address.....:	Ashby Road Loughborough Leicestershire LE11 3AQ, UK	
☐ ~~**Associated CB Test Laboratory:**~~		
~~Testing location/ address.....:~~		
Tested by (name + signature).....:	Jordan Bucko	
Approved by (+ signature).....:	Chris Colgan	
☐ ~~Testing procedure: TMP~~		
~~Tested by (name + signature).....:~~		
~~Approved by (+ signature).....:~~		
~~Testing location/ address.....:~~		
☐ ~~Testing procedure: WMT~~		
~~Tested by (name + signature).....:~~		
~~Witnessed by (+ signature).....:~~		
~~Approved by (+ signature).....:~~		
~~Testing location/ address.....:~~		
☐ ~~Testing procedure: SMT~~		
~~Tested by (name + signature).....:~~		
~~Approved by (+ signature).....:~~		
~~Supervised by (+ signature).....:~~		
~~Testing location/ address.....:~~		
☐ ~~Testing procedure: RMT~~		
~~Tested by (name + signature).....:~~		
~~Approved by (+ signature).....:~~		
~~Supervised by (+ signature).....:~~		
~~Testing location/ address.....:~~		

Summary of testing:

Tests performed (name of test and test clause):	**Testing location:**
Product tested to the full requirements of IEC 61547: 2009 (Second Edition) BS EN 61547:2009	BSI Appliances Ashby Road Loughborough Leicestershire LE11 3AQ UK

Summary of compliance with National Differences:

No applicable National Differences

Copy of marking plate

Test item description.....:	Touch panel for monitoring and test of lighting systems
Trade Mark.....:	N-light
Manufacturer.....:	Mackwell
Model/Type reference.....:	N-light Connect 9005033
Ratings.....:	230V ~ 50/60Hz 50mA

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.....:	20/02/2014
Date (s) of performance of tests.....:	14/11/2014 – 16/11/2014

General remarks:

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

The results contained in this report reflect the results for this particular model and serial number. It is the responsibility of the manufacturer to ensure that all production models meet the intent of the requirements detailed within this report.

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

"(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.

General product information:

The Mackwell ‘N-light connect’ is a touch screen device used for testing and monitoring of DALI controlled emergency luminaires.

Panel is configured using the N-light software via the USB or Ethernet port.

The device is AC powered from the mains supply, 230V 50mA.

128 DALI addresses are monitored via two DALI subnets “A” and “B” which are connected into the device via screw terminals.

Remote access to the system is possible through the Ethernet connection on the panel.

1.1 TEST SUMMARY

CL	Requirement – Test	Result/Comments	Verdict
5.2	IEC 61000-4-2	Electrostatic Discharge Immunity	P
5.3	IEC 61000-4-3	RF Radiated Immunity (RF Electromagnetic fields)	P
5.5	IEC 61000-4-4	Electrical Fast Transients Immunity	P
5.7	IEC 61000-4-5	Voltage Surge Immunity	P
5.6	IEC 61000-4-6	Conducted Disturbance Immunity Injected Currents (RF common mode);	P
5.4	IEC 61000-4-8	Power Frequency Magnetic Field Immunity	P
5.8,5.9	IEC 61000-4-11	Voltage Dips & Interruptions Immunity; Voltage Fluctuations	P

1.2 PRODUCT DESCRIPTION

Description	:	Touch panel for monitoring and test of lighting systems
Manufacturer	:	Mackwell
Model Number	:	N-light Connect 9005033
Brand	:	N-light
Serial Number	:	9005033
Microprocessor	:	Amulet
Operating Frequency	:	50/60Hz
Clock / Oscillator Frequency	:	25MHz
Rated Input Power	:	12W

1.3 SUPPORTING EQUIPMENT DESCRIPTION

1) Mackwell XYLUX LD4/D1luminaire – Fully DALI compliant self-contained maintained luminaire

2) Mackwell DALI simulator – x8 DALI daughter boards for simulation of running conditions

1.4 EUT OPERATING CONDITIONS

EN 61547
Electrostatic Discharge Immunity RF Radiated Immunity (RF Electromagnetic fields) Electrical Fast Transients Immunity Voltage Surge Immunity Conducted Disturbance Immunity (Injected Current-RF common mode) Power Frequency Magnetic Field Immunity Voltage Dips and Interruptions Immunity & Voltage Fluctuations
Operating Modes: Running

1.5 ELECTROSTATIC DISCHARGE IMMUNITY TEST

IEC 61000-4-2 Electrostatic Discharge Immunity Test Pass / Fail Criteria

Test: Electrostatic Discharge Immunity
Performance Criteria:
Performance Criteria Pass= During the test electromagnetic phenomena shall not inhibit operation of the ATS or initiate an unwanted test Additional requirement for lighting equipment incorporating a starting device: After the test, the lighting equipment is switched off. After half an hour, it is switched on again. The lighting equipment shall start and operate as intended.
Monitoring Method(s): Visual

IEC 61000-4-2 Electrostatic Discharge Immunity Test Instrumentation

Instrument	Model	S/No	Cal Due Date
Schaffner ESD device	NSG 435	548.0022	05/09/15

1.5 ELECTROSTATIC DISCHARGE IMMUNITY TEST

IEC 61000-4-2 Electrostatic Discharge Immunity Test Setup Procedure

IEC 61000-4-2 Electrostatic Discharge Immunity Test Method

1. Direct Air & Contact Discharges

Application of direct air and contact discharges to the discharge points specified by the customer were carried out in the following manner:

a. The EUT was switched on and allowed to warm up to its normal operating condition.

b. The test discharge points are shown in the report.

c. For air discharges, the charged rounded electrode was positioned at a distance away from the test point and moved towards the EUT at a steady rate until a discharge was made or until the electrode touched the EUT, whichever occurs first.

d. For contact discharges, the pointed electrode was applied directly to the test point, in contact with the conductive surface of the EUT. The discharges were then made with the electrode in contact with the EUT.

e. The required number of positive and negative discharges were applied at each test point; with a one second interval between discharges.

f. The EUT was monitored during the test in accordance with the Pass / Fail criteria declared by the customer.

2. Indirect Coupling Plane Discharges

Indirect application of discharges using the HCP & VCP were performed on the sides of the EUT in the following manner:

a. The EUT was switched on and allowed to warm up to its normal operating condition.

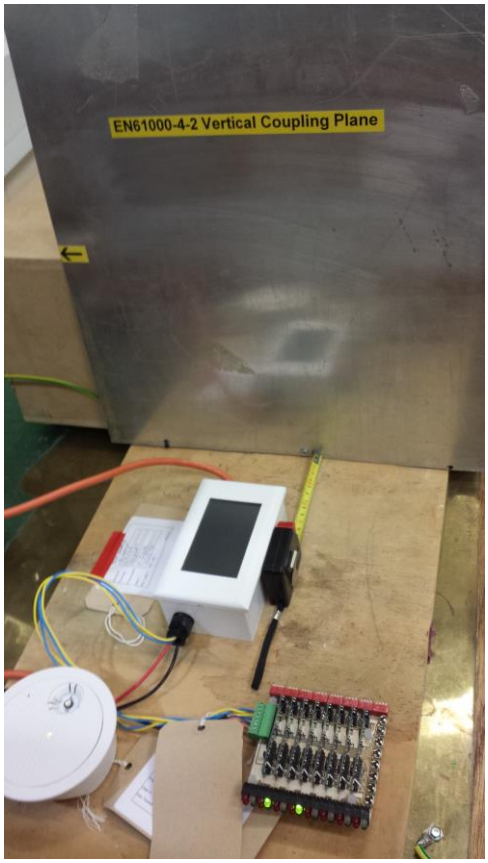
b. The discharges to the HCP / VCP were made 0.1m away from one side of the EUT.

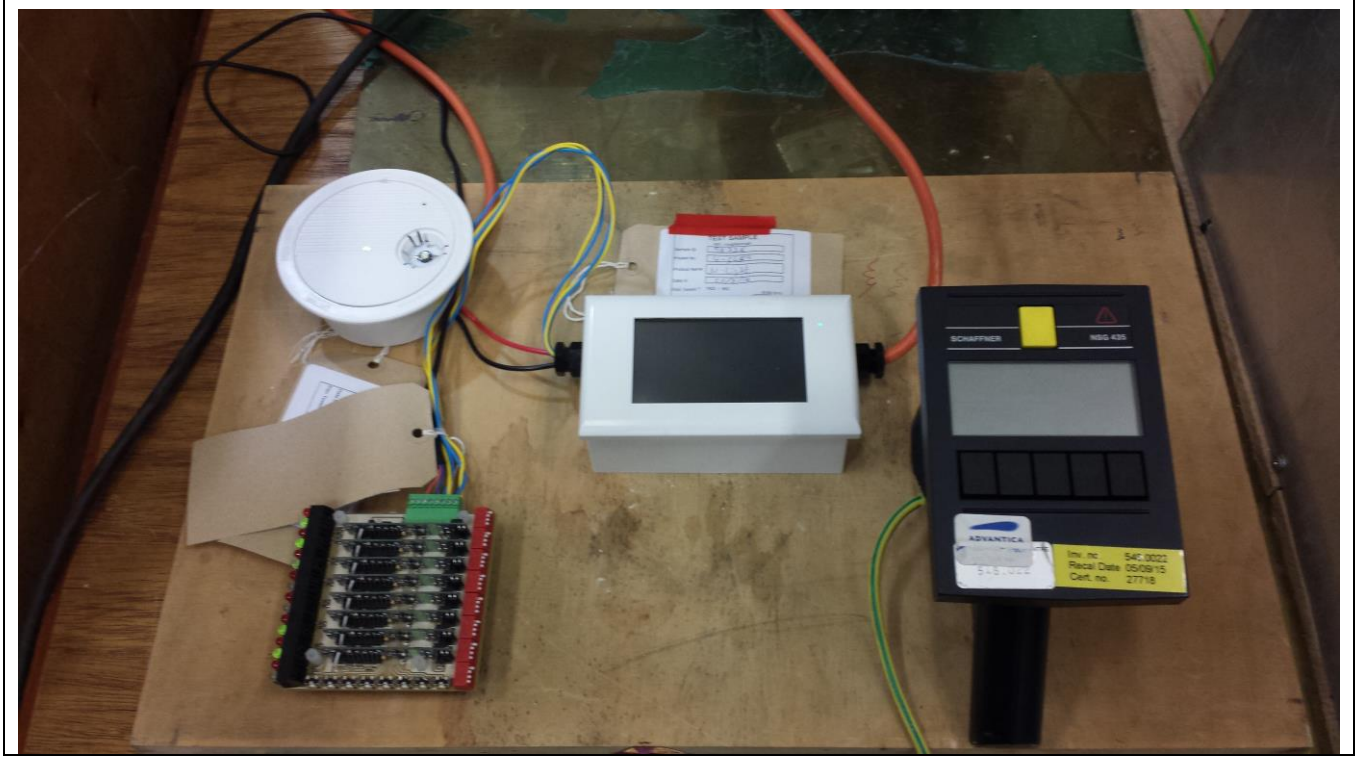
c. The required number of positive and negative discharges was applied at each test point; with one second interval between discharges.

d. The EUT was monitored during the test in accordance with the Pass / Fail criteria declared by the customer.

e. The test was then repeated on the remaining necessary sides of the EUT.

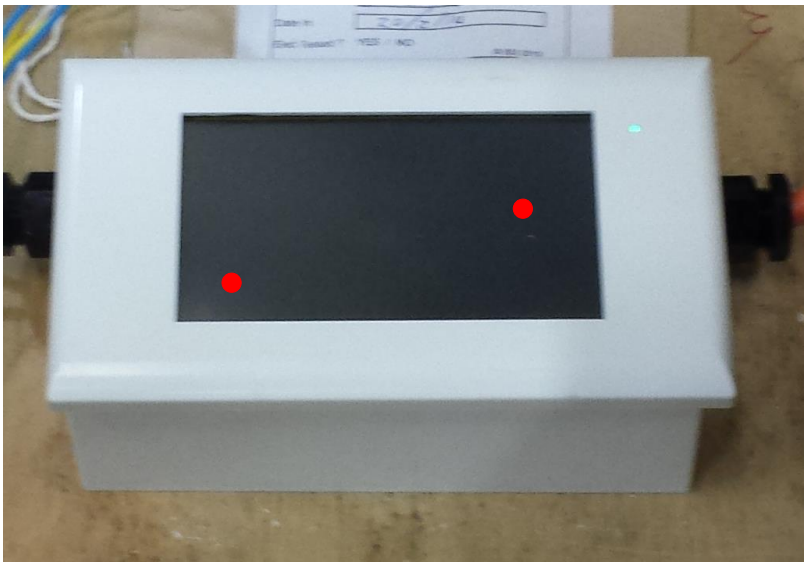
1.5 ELECTROSTATIC DISCHARGE IMMUNITY TEST

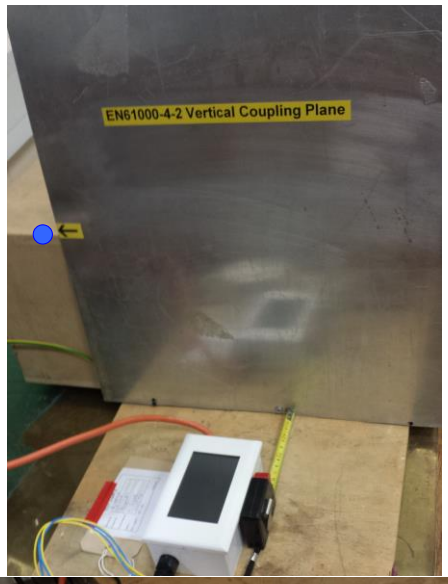


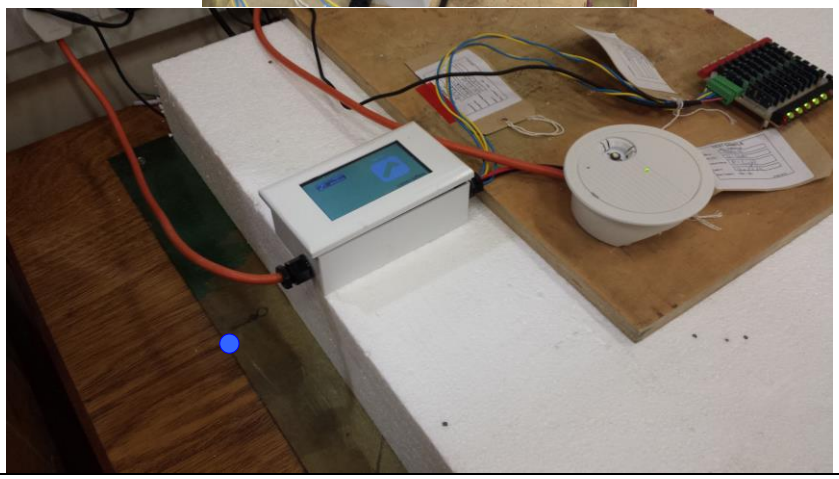


Electrostatic Discharge Immunity Test Setup

1.5 ELECTROSTATIC DISCHARGE IMMUNITY TEST







ESD TEST POINTS

- **Air Discharge**
- **Contact Discharge**

1.5 ELECTROSTATIC DISCHARGE IMMUNITY TEST

IEC 61000-4-2 Electrostatic Discharge Immunity Results

Operating Mode	Running	Temperature	20.4oC
Test Input Power	240V 50Hz	Relative Humidity	44%
		Atmospheric Pressure	986mbar
		Tested By	Jordan Bucko

Discharge Type	Test Severity Level	Results
Air Discharges	± 8kV	Pass
Direct Contact Discharges	± 4kV	N/A
Indirect Contact Discharges	± 4kV	Pass

Notes

1. Please refer to the Pass /Fail criteria to interpret the results.
2. Human Body Model — Storage Capacitor 150pF; Discharge Resistor 330Ω
3. Discharge Details — No. of Discharges / Point, Level & Polarity: 10 air discharges, 10 contact discharges; Discharge Interval: 1 second

1.6 RF RADIATED IMMUNITY TEST (RF Electromagnetic fields)

IEC 61000-4-3 RF Radiated Immunity Test Pass / Fail Criteria

Test: RF Radiated Immunity (RF Electromagnetic fields)
Performance Criteria:
Performance Criteria **Pass=** During the test electromagnetic phenomena shall not inhibit operation of the ATS or initiate an unwanted test Additional requirement for lighting equipment incorporating a starting device: After the test, the lighting equipment is switched off. After half an hour, it is switched on again. The lighting equipment shall start and operate as intended.
Monitoring Method(s): Visual

IEC 61000-4-3 RF Radiated Immunity Test Instrumentation

Instrument	Model	S/No	Cal Due Date
Teseq radiated immunity test system	ITS 6006	548.0059	24/04/15
Teseq power amplifier	CBA 1G-018	548.0061	N/A

1.6 RF RADIATED IMMUNITY TEST
(RF Electromagnetic fields)

IEC 61000-4-3 RF Radiated Immunity Test Setup Procedure

IEC 61000-4-3 RF Radiated Immunity Test Method

1. The EUT was switched on and allowed to warm up to its normal operating condition.
2. The EUT was exercised and monitored in the manner specified by the customer.
3. All test instruments were PC controlled, via their IEEE 488.2 bus interfaces, and the test conducted in the following manner:
   a. The testing frequencies were swept over the required frequency range, with a step frequency equal to 1% of fundamental. The sweep rate was $\leq 1.5 \times 10^{-3}$ decades/s.
   b. For each frequency tested, the incident power to the antenna was adjusted to the required unmodulated test level, as established during the chamber calibration. With the incident power at the correct level, the 80% AM 1kHz AF was switched on for the specified dwell time.
4. The EUT was continuously monitored during the test in accordance with the Pass / Fail criteria declared by the customer.
5. The test was done in both horizontal and vertical antenna polarizations, and for all necessary sides of the EUT.

1.6 RF RADIATED IMMUNITY TEST
(RF Electromagnetic fields)

RF Radiated Immunity Test Setup

1.6 RF RADIATED IMMUNITY TEST

(RF Electromagnetic fields)
IEC 61000-4-3 RF Radiated Immunity Results

Operating Mode	Running	Temperature	20.7°C
Test Input Power	240V 50Hz	Relative Humidity	44%
		Atmospheric Pressure	948mbar
		Tested By	Jordan Bucko

Sides Tested	Frequency	Test Severity Level	Results
Front, Back, Left, Right	80MHz - 1000MHz	3V/m, 80% AM 1kHz	Pass

Notes

1. Please refer to the Pass/Fail criteria to interpret the results.

1.7 ELECTRICAL FAST TRANSIENTS IMMUNITY TEST

IEC 61000-4-4 Electrical Fast Transients Immunity Test Pass / Fail Criteria

Test: Electrical Fast Transients Immunity
Performance Criteria:
Performance Criteria **Pass=** During the test electromagnetic phenomena shall not inhibit operation of the ATS or initiate an unwanted test Additional requirement for lighting equipment incorporating a starting device: After the test, the lighting equipment is switched off. After half an hour, it is switched on again. The lighting equipment shall start and operate as intended.
Monitoring Method(s): Visual

IEC 61000-4-4 Electrical Fast Transients Immunity Test Instrumentation

Instrument	Model	S/No	Cal Due Date
Teseq EMC test system	NSG 3060	1373(548.0050)	07/11/14

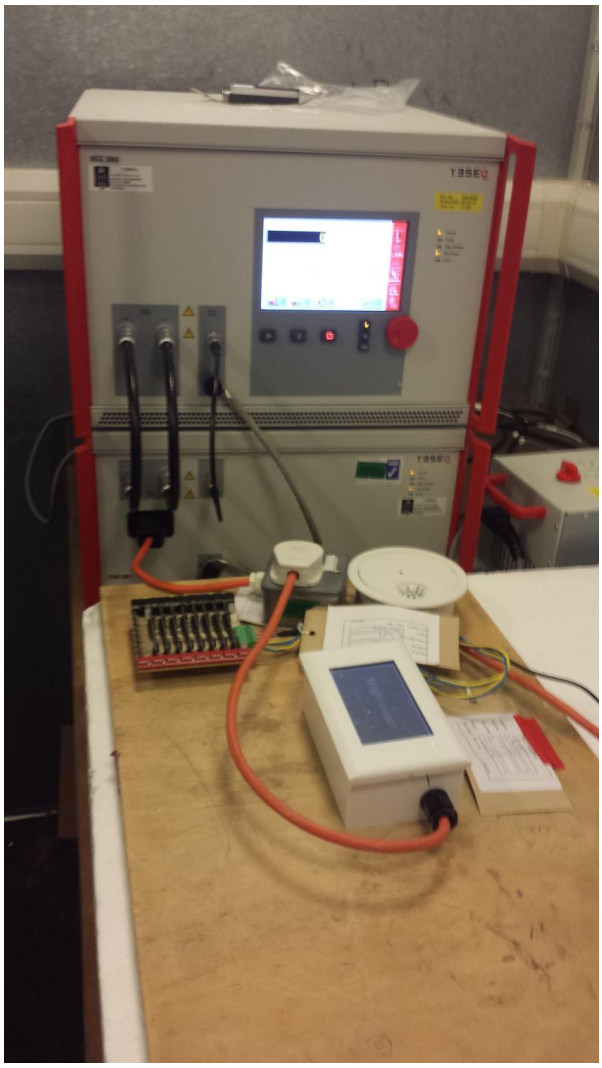
1.7 ELECTRICAL FAST TRANSIENTS IMMUNITY TEST

IEC 61000-4-4 Electrical Fast Transients Immunity Test Setup Procedure

IEC 61000-4-4 Electrical Fast Transients Immunity Test Method

1. The EUT was switched on and allowed to warm up to its normal operating condition.
2. D.C./A.C. Power Line Test
   a. The EFT test system has a built-in coupling/decoupling network, which couples the generated EFT bursts into the EUT power supply lines connected to it.
   b. The EFT bursts were coupled to the selected lines of the EUT individually and simultaneously for the necessary test duration.
3. I/O Signal & Control Line Test
   a. The interference impulses were capacitively coupled to the EUT's signal cables for the necessary test duration.
   b. The EUT was monitored during the test in accordance with the Pass / Fail criteria declared by the customer.
   c. The test was performed with EFT bursts in the positive and negative polarities and repeated on all necessary lines.

1.7 ELECTRICAL FAST TRANSIENTS IMMUNITY TEST



Electrical Fast Transients Immunity Test Setup

1.7 ELECTRICAL FAST TRANSIENTS IMMUNITY TEST

IEC 61000-4-4 Electrical Fast Transients Immunity Results

Operating Mode	Running	Temperature	20.7°C
Test Input Power	240V 50Hz	Relative Humidity	44%
		Atmospheric Pressure	948mbar
		Tested By	Jordan Bucko

Cable	Test Severity Level	Results
MAINS LINE		
Live Line	± 1.0kV	Pass
Neutral Line	± 1.0kV	Pass
Earth Line	± 1.0kV	Pass
Live + Neutral + Earth Lines	± 1.0kV	Pass
DC LINE		
Input DC Line	± 0.5kV	N/A
Output DC Line	± 0.5kV	N/A
CONTROL & SIGNAL LINES		
Control Lines	± 0.5kV	N/A
Signal Lines	± 0.5kV	N/A

Notes

1. Please refer to the Pass/Fail criteria to interpret the results.
2. EFT Test Details
   - Waveshape: 5/50 Tr/Th ns
   - Repetition Frequency: 5kHz
   - Test Duration / Level & Polarity: 2 minutes

1.8 VOLTAGE SURGE IMMUNITY

IEC 61000-4-5 Voltage Surge Immunity Test Pass / Fail Criteria

Test: Voltage Surge Immunity
Performance Criteria:
Performance Criteria **Pass =** During the test electromagnetic phenomena shall not inhibit operation of the ATS or initiate an unwanted test Additional requirement for lighting equipment incorporating a starting device: After the test, the lighting equipment is switched off. After half an hour, it is switched on again. The lighting equipment shall start and operate as intended.
Monitoring Method(s): Visual

IEC 61000-4-5 Voltage Surge Immunity Test Instrumentation

Instrument	Model	S/No	Cal Due Date
Teseq EMC test system	NSG 3060	1373(548.0050)	07/11/14

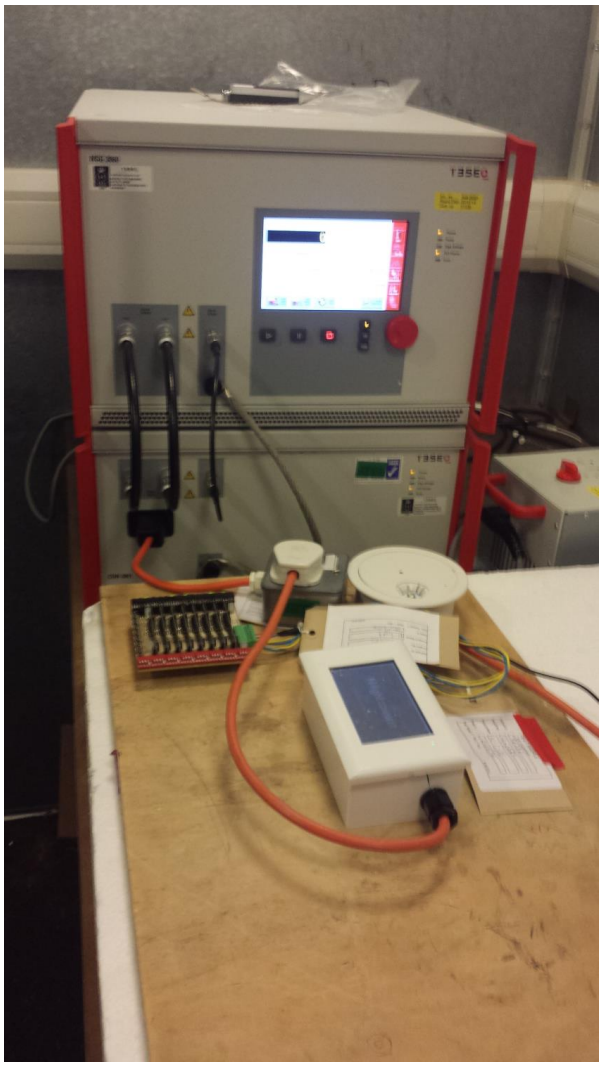
1.8 VOLTAGE SURGE IMMUNITY

IEC 61000-4-5 Voltage Surge Immunity Test Setup Procedure

IEC 61000-4-5 Voltage Surge Immunity Test Method

1. The power supply to EUT was switched on and allowed to warm up to its normal operating condition.
2. For a.c. mains lines, the surge was applied at the peak of the mains voltage at 90° phase angle of 5 positive polarity pulses and 270° phase angles of 5 negative polarity pulses.
3. The correct open-circuit test level was set with the surge generator disconnected from the coupling network.
4. The output of the generator was then reconnected back to the coupling network.
5. Five discharges, generated by the voltage surge generator, and were made on each relevant line, for each polarity, at each test level, with the relevant discharge interval.
6. The EUT was observed during, and checked after the test to determine the result.

1.8 VOLTAGE SURGE IMMUNITY



Voltage Surge Immunity Test Setup

1.8 VOLTAGE SURGE IMMUNITY

IEC 61000-4-5 Voltage Surge Immunity Results

Operating Mode	Running	Temperature	20.7°C
Test Input Power	240V 50Hz	Relative Humidity	44%
		Atmospheric Pressure	948mbar
		Tested By	Jordan Bucko

Cable	Test Severity Level	Results
MAINS LINE		
Neutral - Earth	± 1.0kV	Pass
Live – Earth	± 1.0kV	Pass
Live - Neutral	± 0.5kV	Pass

Notes

1. Please refer to the Pass/Fail criteria to interpret the results.
2. Surge Details

Waveshape	1.2/50 (8/20) Tr/Th µs
No. of Surges / Line, Level & Polarity	5 surges Positive and negative
Phase angle	at 90° and 270° phase angles
Surge Interval	30 seconds

1.9 CONDUCTED DISTURBANCE IMMUNITY

(Injected Currents (RF common mode)

IEC 61000-4-6 Conducted Disturbance Immunity Test Pass / Fail Criteria

Test: Conducted Disturbance Immunity- Injected Currents (RF common mode);
Performance Criteria:
Performance Criteria **Pass=** During the test electromagnetic phenomena shall not inhibit operation of the ATS or initiate an unwanted test Additional requirement for lighting equipment incorporating a starting device: After the test, the lighting equipment is switched off. After half an hour, it is switched on again. The lighting equipment shall start and operate as intended.
Monitoring Method(s): Visual

IEC 61000-4-6 Conducted Disturbance Immunity Test Instrumentation

Instrument	Model	S/No	Cal Due Date
Teseq signal generator/amplifier	NSG 4070	548.0054	02/10/15

1.9 CONDUCTED DISTURBANCE IMMUNITY

Injected Currents (RF common mode)

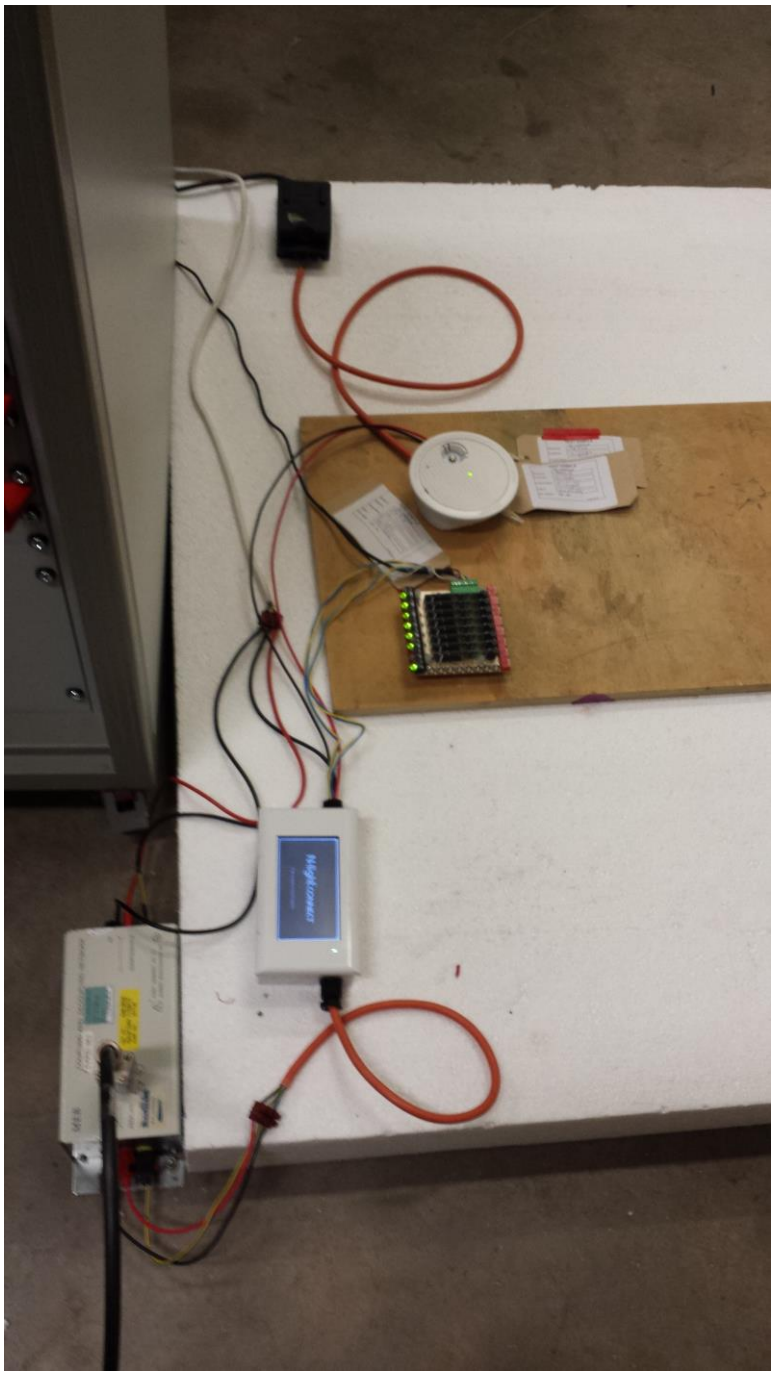
IEC 61000-4-6 Conducted Disturbance Immunity Test Setup Procedure

1. CDN Injection Method
2. EM Clamp Injection Method

IEC 61000-4-6 Conducted Disturbance Immunity Test Method

1. The EUT was switched on and allowed to warm up to its normal operating condition.
2. The interfering signal was swept from 150kHz to 80MHz, with a step frequency equal to 1% of fundamental. The sweep rate was $\leq 1.5 \times 10^{-3}$ decades/s.
3. CDN Injection Method
4. EM Clamp Injection Method
5. The EUT was continuously monitored during the test in accordance with the Pass / Fail criteria declared by the customer.

1.9 CONDUCTED DISTURBANCE IMMUNITY
Injected Currents (RF common mode)



Conducted Disturbance Immunity Test Setup

1.9 CONDUCTED DISTURBANCE IMMUNITY

Injected Currents (RF common mode)
IEC 61000-4-6 Conducted Disturbance Immunity Results

Operating Mode	Running	Temperature	20.7°C
Test Input Power	240V 50Hz	Relative Humidity	44%
		Atmospheric Pressure	948mbar
		Tested By	Jordan Bucko

Cable	Frequency	Test Severity Level	Results
MAINS LINE			
AC mains	0.15MHz-80MHz	3V,80% AM 1KHz	Pass
DC LINE			
DC lines	0.15MHz-80MHz	3V,80% AM 1KHz	N/A
CONTROL & SIGNAL LINES			
Signal lines	0.15MHz-80MHz	3V,80% AM 1KHz	N/A

Notes

1. Please refer to the Pass/Fail criteria to interpret the results.
2. Conducted Immunity Details — Frequency Step: 1% of fundamental; Sweep Rate: $\leq 1.5 \times 10^{-3}$ decades/s

2.0 POWER FREQUENCY MAGNETIC FIELD IMMUNITY

IEC 61000-4-8 Power Frequency Magnetic Field Immunity Test Pass / Fail Criteria

Test: Power Frequency Magnetic Field Immunity
Performance Criteria:
Performance Criteria **Pass=** During the test electromagnetic phenomena shall not inhibit operation of the ATS or initiate an unwanted test Additional requirement for lighting equipment incorporating a starting device: After the test, the lighting equipment is switched off. After half an hour, it is switched on again. The lighting equipment shall start and operate as intended.
Monitoring Method(s): Visual

IEC 61000-4-8 Power Frequency Magnetic Field Immunity Test Instrumentation

Instrument	Model	S/No	Cal Due Date
BSI power frequency magnetic field immunity rig	BSI rig	N/A	Calibrated before use

2.0 POWER FREQUENCY MAGNETIC FIELD IMMUNITY

IEC 61000-4-8 Power Frequency Magnetic Field Immunity Test Setup Procedure

IEC 61000-4-8 Power Frequency Magnetic Field Immunity Test Method

1. The EUT was switched on and allowed to warm up to its normal operating condition.
2. The test generator was then switched on at the correct test level to generate the required magnetic field for the test.
3. The EUT was exposed to the magnetic field for the required duration.
4. The test is repeated for the X, Y and Z axes of the EUT.
5. The EUT was continuously monitored during the test in accordance with the Pass / Fail criteria declared by the customer.

2.0 POWER FREQUENCY MAGNETIC FIELD IMMUNITY

IEC 61000-4-8 Power Frequency Magnetic Field Immunity Results

Operating Mode	Running	Temperature	20.7°C
Test Input Power	240V 50Hz	Relative Humidity	44%
		Atmospheric Pressure	948mbar
		Tested By	Jordan Bucko

Side / Axis	Test Severity Level	Results
X Y Z	3A/m (50Hz)	Pass
X Y Z	3A/m (60Hz)	Pass

Notes

1. Please refer to the Pass/Fail criteria to interpret the results.

2.1 VOLTAGE DIPS AND INTERRUPTIONS IMMUNITY

Voltage Fluctuations

IEC 61000-4-11 Voltage Dips and Interruptions Immunity Test Pass / Fail Criteria

Test: Voltage Dips and Interruptions Immunity (70% dip, 10 period); Test: Voltage Dips and Interruptions Immunity (0% dip, 0.5 period) Test: Voltage Fluctuations
Performance Criteria:
Performance Criteria **Pass=** During the test electromagnetic phenomena shall not inhibit operation of the ATS or initiate an unwanted test Additional requirement for lighting equipment incorporating a starting device: After the test, the lighting equipment is switched off. After half an hour, it is switched on again. The lighting equipment shall start and operate as intended.
Monitoring Method(s): Visual

IEC 61000-4-11 Voltage Dips and Interruptions Immunity Test Instrumentation

Instrument	Model	S/No	Cal Due Date
Teseq EMC test system	NSG 3060	1373(548.0050)	07/11/14

2.1 VOLTAGE DIPS AND INTERRUPTIONS IMMUNITY

Voltage Fluctuations

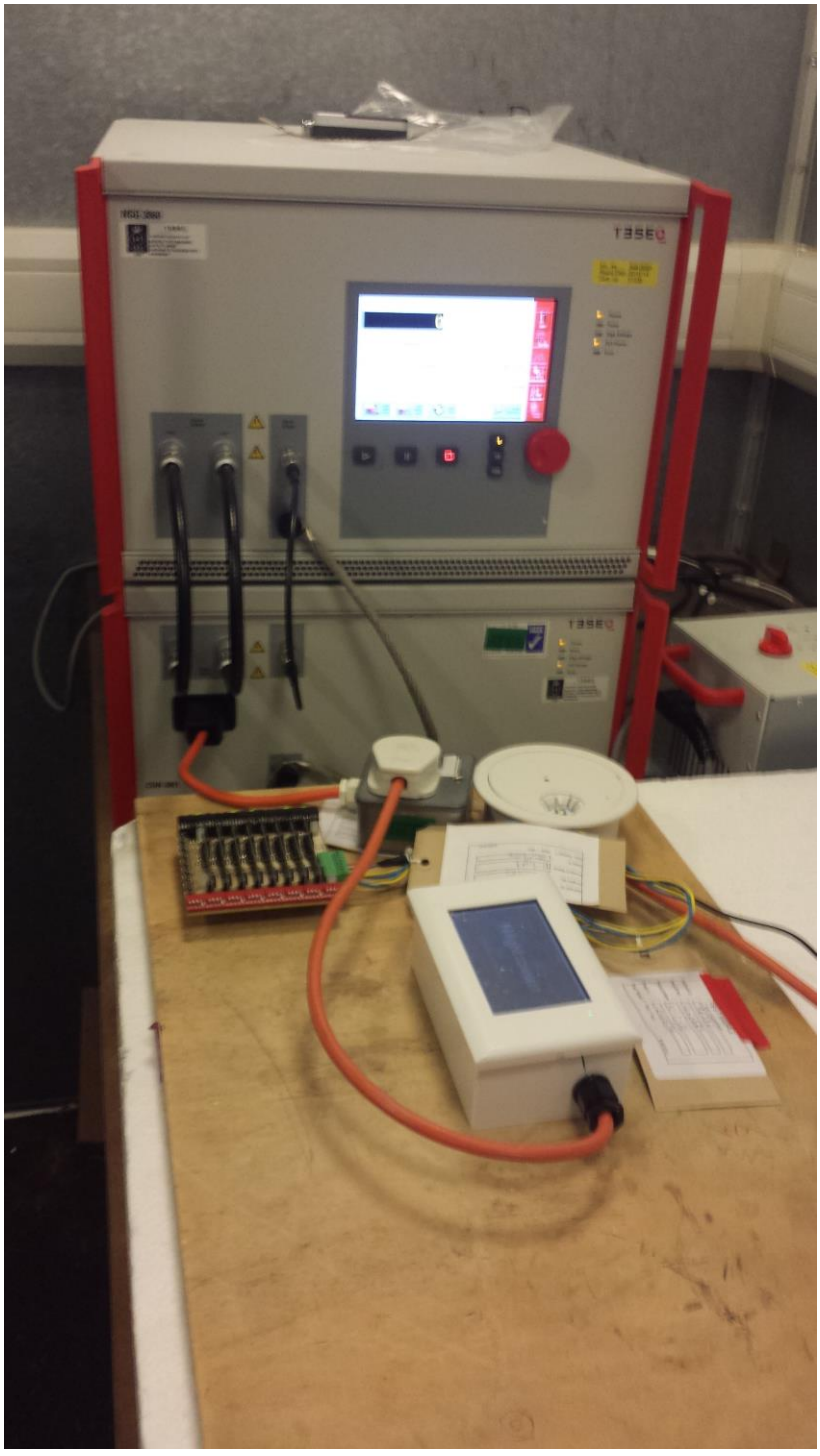
IEC 61000-4-11 Voltage Dips and Interruptions Immunity Test Setup Procedure

IEC 61000-4-11 Voltage Dips and Interruptions Immunity Test Method

1. The EUT was switched on and allowed to warm up to its normal operating condition.
2. The test system was controlled by the test software to apply the required voltage dips and interrupts to EUT mains cable.
3. The EUT was monitored during the test in accordance with the Pass / Fail criteria declared by the customer.

2.1 VOLTAGE DIPS AND INTERRUPTIONS IMMUNITY

Voltage Fluctuations



Voltage Dips and Interruptions Immunity Test Setup

2.1 VOLTAGE DIPS AND INTERRUPTIONS IMMUNITY

Voltage Fluctuations

IEC 61000-4-11 Voltage Dips and Interruptions Immunity Results

Operating Mode	Running	Temperature	20.7°C
Test Input Power	240V 50Hz	Relative Humidity	44%
		Atmospheric Pressure	948mbar
		Tested By	Jordan Bucko

Cable	Test Severity Level	Results
MAINS LINE		
AC Mains	70% dip, 10 Period	Pass
AC Mains	0% dip, 0.5 Period	Pass

Notes

1. Please refer to the Pass/Fail criteria to interpret the results.

Test Report

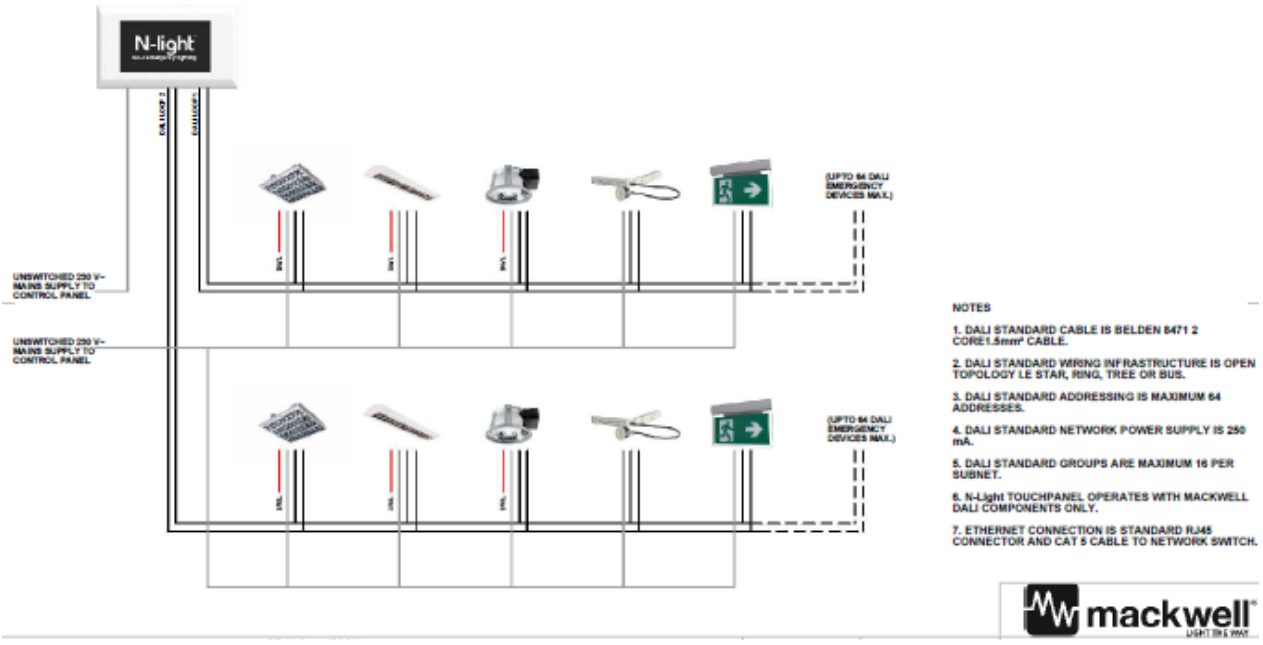
Report No	TR/14/533
Client	Mackwell Electronics Ltd Vigo Place, Walsall, WS9 8UG United Kingdom
Authority & date	Project No.: 400003489, SMO: 8183081/8183083 Date: 23/06/2014
Items tested	N-light connect complete system test
Specification	BS EN 62034:2012
Results	Samples of the above appliance have been tested and examined to the relevant requirements of the above specification and have been found to comply with these requirements, subject to the implementation of any corrective actions detailed in this test report.
Prepared by	 Jordan Bucko
Authorised by	 Chris Colgan
Issue Date	26/11/2014
Conditions of issue	This Test Report is issued subject to the conditions stated in current issue of CP0322 'Conditions of Contract for Testing'. The results contained herein apply only to the particular sample/s tested and to the specific tests carried out, as detailed in this Test Report. The issuing of this Test Report does not indicate any measure of Approval, Certification, Supervision, Control or Surveillance by BSI of any product. No extract, abridgement or abstraction from a Test Report may be published or used to advertise a product without the written consent of the Managing Director, Testing Services, who reserves the absolute right to agree or reject all or any of the details of any items or publicity for which consent may be sought.

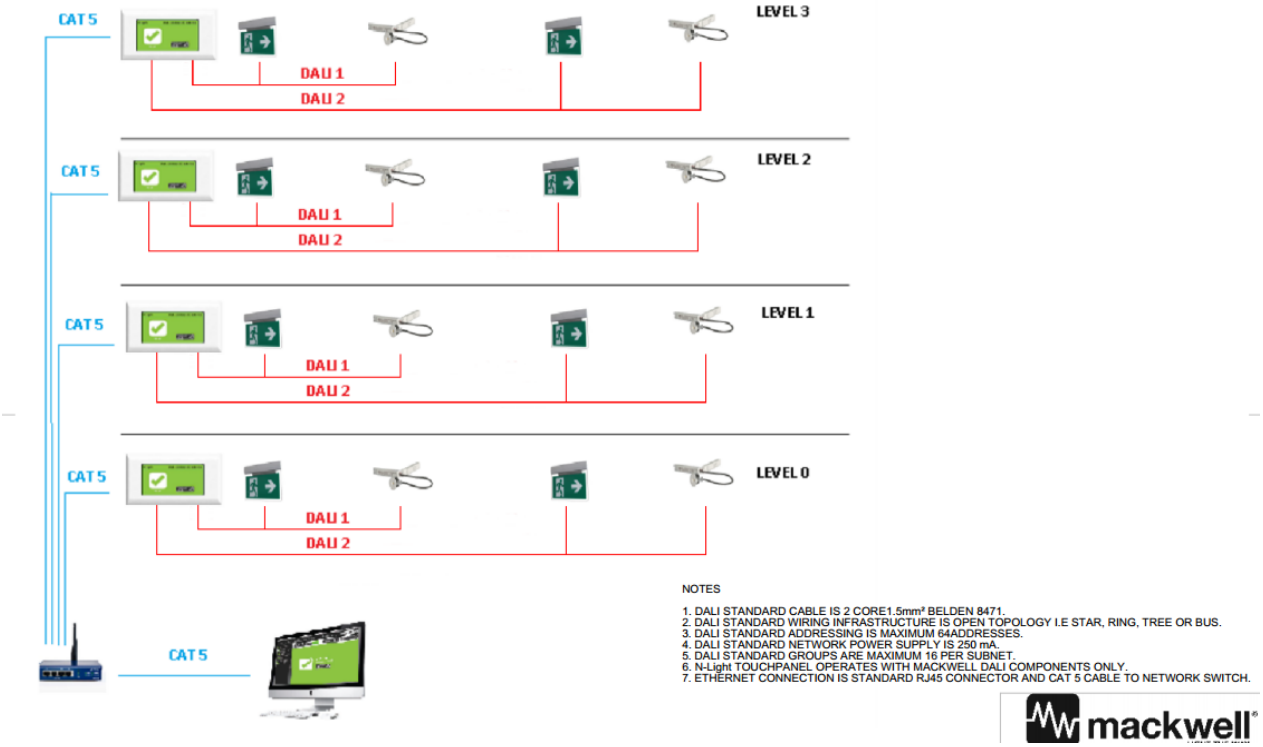
BSI, Holywell Park, Loughborough, Leicestershire, LE11 3AQ Tel: 01509 331133, e-mail: appliances@bsigroup.com

TEST REPORT
BS EN 62034
Luminaires
Part 2: Particular requirements:
Section Eleven – Miscellaneous electronic circuits used with luminaires

Report Reference No.....:	TR/14/533
Date of issue.....:	26/11/2014
Total number of pages	26
Testing Laboratory.....:	BSI Appliances
Address .....:	Holywell Park, Ashby Road, Loughborough, LE11 3AQ.
Applicant's name.....:	Mackwell
Address .....:	Vigo Place, Walsall, WS9 8UG United Kingdom
Test specification:	
Standard.....:	BS EN 62034:2012
Test item description .....:	Touch panel for monitoring and test of lighting systems
Trade Mark .....:	N-light
Manufacturer .....:	Mackwell
Model/Type references.....:	N-light Connect 9005033
Ratings .....:	230V ~ 50/60Hz 50mA

System test layout diagram





Copy of marking

Test item particulars ..... :	Complete wired system test, cabling & software
Classification of installation and use ..... :	Class type PER
Supply Connection ..... :	Permanent connection to fixed wiring
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 ..... :	20/02/2014
Date (s) of performance of tests..... :	07/08/2014 – 14/11/2014

General remarks:

The test results presented in this report relate only to the objects tested.
This report shall not be reproduced, except in full, without the written approval of the Issuing testing laboratory.

General product information:

Complete system test with ancillary power supply modules utilised to simulate a basic wired system.

Simulated system with:

(a) 1x “XYLUX LD4/D1” luminaire (DALI A line) and 1x ‘’Mackwell DALI simulator’’, x8 DALI daughter boards (Dali B line).
(b) N-light Connect 9005033 touch screen panel

The above was used in assessing the complete system, wiring and software evaluation to the clauses of BS EN 62034:2012.

Note 1) The abbreviation “ATS” is used in this report and the standard referring to “Automated Test System” which includes the touch panel control unit, connected emergency luminaires, supplies and an externally connected and configured computer to monitor, test and report the system statuses.

Note 2) Done as part of a complete system test, see BSI report TR/14/486 (Touch panel).

4	**REQUIREMENTS**		**---**
4.1	Safety, Construction and installation instructions		**---**
	- Compliance of ATS with BS EN 60598-1 and BS EN 60598-2-22 where appropriate.		P
	- Design of ATS allows only authorised personnel can change test duration and frequency of tests.	Password lockable touch screen	P
	- Manufacturer supplies instructions for ATS, to include any size and compatibility limits	Maximum number of DALI controlled units =128 (64 on each DALI line, 1 & 2)	P
	- Instructions supplied by manufacturers advise on types of luminaires for which ATS designed	Suitable for use in conjunction with all Mackwell DALI emergency components, including XYLUX self-contained LED emergency luminaires and XY-VEX exit signs	P
	- ATS classified and marked as per Annex B	PER class	P
4.2	Monitoring of the timing circuit		---
	- Any failure during progress of test sequence indicated locally on luminaire and/or on remote panel	Fault identified with red ‘‘X’’ on panel	P
4.3	Functional requirements		---
4.3.1	- ATS checks functional operation of luminaires at intervals and durations as specified in clause 5	Manually or at settable periodicity.	P
	- Any fault to be indicated or reported within 24h of their detection	Faults logged when a functional test is run, which is either manually or at the shortest duration automatically - detection being when the functional test is run.	P
4.3.2	Emergency battery supply		---
	- The test system shall check and indicate if the emergency battery supply has failed	Battery fault logged	P
4.3.3	Lamps tested in the emergency mode		---
	- The test system shall check that any changeover device has powered lamp from the emergency power supply		P
4.3.4	Maintained luminaires tested in emergency mode and in normal mains condition		P
	- Maintained device with no changeover: Test system checks lamp operates correctly in normal mains supply and failed supply conditions		N/A
	- Maintained device with changeover: Test carried out according to 4.3.3 with the monitoring of battery current or output voltage to check changeover		P

4.4	System integrity		---
4.4.1	Protection against system part failures and faults		---
	- Any single fault or part-failure that occurs within ATS or within one of the system parts, shall not affect emergency operation of the ATS, in accordance with 4.4.2 to 4.4.7		P
4.4.2	Intercommunications failure		---
	- Any failure of intercommunication between parts of ATS as defined in 3.3 and 3.4, shall not inhibit emergency operation of the luminaires connected to the ATS		P
	- Any failure of intercommunication between parts of ATS as defined in 3.3 and 3.4, shall not initiate an unwanted test		P
	- Any failure of intercommunication in P, ER, PER and PERC ATS types shall be indicated as a fault on the remote panel within 24 h of failure occurring.		P
4.4.3	System interconnection		---
	- Operation of luminaires in the emergency mode shall not be affected by faults in the interconnections of the ATS		P
	- Unaffected by earth faults on DALI line		P
	- Unaffected by short circuits across DALI line		P
	- Unaffected by open circuit of DALI line		P
	- No unwanted tests initiated during simulated faults above		P
	Note :Short circuit between supply and communication wiring not included in test if double insulated wiring method used		N/A
4.4.4	Component failures		---
	- Failure of any single part within ATS shall not inhibit emergency operation of more than one luminaire connected to ATS		P
	- No unwanted test initiated		P
	- For component failures that mimic a control signal or inhibit an emergency operation, the requirements of IEC 61347-1 apply		N/A
4.4.5	System parts compatibility		---
	- The individual parts, control gear and other electronic devices selected to form an ATS shall be proven to be compatible with each other	DALI standard proven and well documented. . All components are certified DALI compliant	P
	- Responsibility of system designer to ensure ATS component and procedure compatibility. The manufacturer of ATS components/system shall provide details of compatible system components	DALI standard proven and well documented. All components are certified DALI compliant	P

	- Manufacturer declares the limits of installation in the instruction sheet, length of cabling, quantity of luminaires	DALI standard documents all limits of installations, including cabling length (300m for 1.5 mm^2) and quantities of luminaires (64 per DALI line)	P
	- In the technical folder, the justification of compatibility between any part within the ATS	When installed using components complying with approved DALI specification and standard.	P
4.4.6	Electromagnetic immunity of the ATS		---
	- Electromagnetic phenomena shall not inhibit operation of the ATS or initiate an unwanted test	See BSI report TR/14/623	P
	- Compliance checked by the tests of IEC 61547, IEC 61547 test report provided by the manufacturer or a third party test house.	See BSI report TR/14/623	P
4.4.7	Software failure		---
	- The correct operation of ATS software shall be proven	Proven as part of this assessment	P
	- Responsibility of system designer to conduct sufficient investigations and operational trials to ensure correct operation of software and failure operation	Reference documents used: (a) N-light and DALI Interface Emergency Lighting Control Gear - Description and Operating Notes (V1.0) (b) N-light bootloader flowchart (P104 Bootloader) (c) N-light firmware flow chart (P104 DALI control box screen flow chart) (d) N-light touch screen navigation (P104 DALI control box screen navigation) (e) Configurator navigation (P105 N-light USB navigation)	P
	- Detailed software design documentation – functional descriptions, flowcharts, fault mode analysis, software and hardware interaction provided by the designer/manufacturer in order that the test laboratory can ensure the reliability of the software	Reference documents used: (a) N-light and DALI Interface Emergency Lighting Control Gear - Description and Operating Notes (V1.0) (b) N-light bootloader flowchart (P104 Bootloader) (c) N-light firmware flow chart (P104 DALI control box screen flow chart) (d) N-light touch screen navigation (P104 DALI control box screen navigation) (e) Configurator navigation (P105 N-light USB navigation	P

	- Any software failure shall not inhibit the emergency operation of more than one of the luminaires connected to the system, and shall not initiate an unwanted test	Reference documents used: (a) N-light and DALI Interface Emergency Lighting Control Gear - Description and Operating Notes (V1.0) (b) N-light bootloader flowchart (P104 Bootloader) (c) N-light firmware flow chart (P104 DALI control box screen flow chart) (d) N-light touch screen navigation (P104 DALI control box screen navigation) (e) Configurator navigation (P105 N-light USB navigation	P
4.5	Test of emergency lamp(s)		---
	- The ATS shall check and indicate if the emergency lamp(s) do not operate in emergency mode	Fault is logged on luminaire and touch panel	P
	- In the case of P, ER, PER and PERC ATS types (see Annex B), the indication shall be on the remote panel and possibly on the luminaires	Fault is logged on luminaire and touch panel	P
	- Compliance checked by removal of incandescent lamp during test	No incandescent lamp	N/A
	- Fault abnormal conditions of IEC 60598-1 for fluorescent, discharge lamps or any other emergency lamp technology, e.g. L.E.D.	S/C of LED lamp	P
	- Fault indication given locally on the luminaire and/or on the remote panel as applicable	Fault is logged on luminaire and touch panel	P

5	**TEST DURATION AND INTERVAL**		---
5.1	Functional test		---
	- Functional test able to be performed at least once a month	Manual and monthly	P
	- Test duration sufficient to check the illumination of the lamp		P
	- Rated duration is defined in IEC 60598-2-22		P
	- If a mains supply failure occurs before a functional test and within such a time that the battery could not be re-charged sufficiently to run a successful function test, then the test should be postponed until the battery is sufficiently charged. The compatibility of the final ATS parts shall ensure their reliable operation.		P
	- In the case of P, ER, PER and PERC types in the event a functional test is postponed, indication of the pending test shall be given on the remote panel.		P

	- Where applicable, test function and test postponement functions are demonstrated	Verified test function and test postponement (spinning icon on touch panel; fault logged)	P
	- If a mains supply failure occurs while a functional test is in progress, the test is postponed and the luminaires enter emergency mode	Verified test function and test postponement (spinning icon on touch panel; fault logged)	P
	- After restoration of mains supply, postponed functional test shall re-commence automatically as soon as conditions permit		P
	- If the duration of the functional test is less than 1% of rated duration, then the postponed function is not required		P
	- Conformity of timing requirements is checked by inspection of the manufacturer's declaration and technical file provided by the manufacturer.		P
5.2	Duration test		---
	- For full rated duration, a test shall be performed according to manufacturer's instructions at the commissioning of the ATS, and repeated automatically at least annually		P
	- Random automatically-initiated rated duration tests shall be carried out within 52 weeks after commissioning		P
	- The test duration shall not be able to be changed by unauthorised persons	Touch screen can be password locked to prevent unauthorised access to settings	P
	- Duration test shall only be started when the battery supply is fully charged	Verified duration test could not be started/completed on a discharged test sample	P
	- If a mains supply failure occurs while a duration test is in progress, the test is postponed and the luminaires enter emergency mode		P
	- After restoration of mains supply, postponed duration test shall re-commence automatically as soon as conditions permit	Test postpones correctly, retries every hour, for 24h, before flagging fault if failed to complete	P
	- The design of the system should ensure this, for example by allowing a fixed delay time for the battery supply to re-charge or by monitoring the real-time charge state of the battery		P
	- In the case of P, ER, PER and PERC types in the event a duration test is postponed, indication of the pending test shall be given on the remote panel.	PER Class – Indication of pending tests shown on touch screen	P
	- Compliance is checked, where applicable, by confirming that the test function and test postponement functions have functioned correctly.		P
	- Conformity of timing requirements is checked by inspection of the manufacturer's declaration and technical file provided by the manufacturer.	Accuracy of crystal (25Mhz) = ± 10ppm @ 25°C	P

6	**PROTECTION OF A BUILDING DURING THE PERIODS OF TEST AND SUBSEQUENT RECHARGE OF THE EMERGENCY LIGHTING SYSTEM**		**---**
6.1	General		---
	- This clause applies to all ATS types where appropriate time and dates are used to programme the testing sequences. Manufacturer's declaration and appropriate document evidence shall be provided	Reference documents used: (a) N-light and DALI Interface Emergency Lighting Control Gear - Description and Operating Notes (V1.0)	P
	- ATS shall be designed to minimize the effects of a mains supply failure on the availability of emergency lighting when batteries are only partially charged as a result of a duration test and subsequent battery recharge		P
	- If there is a possibility that a building could be occupied during the duration test, only the procedures in 6.3 shall be used		P
6.2	Accuracy and protection of timing periods		---
6.2.1	General		---
	- The accuracy and the function of an ATS timer shall conform to the requirements of 6.2.2 and 6.2.3	Accuracy of crystal (25Mhz) = ± 10ppm @ 25°C	P
6.2.2	Timing accuracy		---
	- ATS timer consists of two timing requirements – timing of test interval and timing of test function.		P
	- Accuracy of timing of test interval shall be tested to ensure that it has an accuracy of ±75 s per week	Accuracy of crystal (25Mhz) = ± 10ppm @ 25°C	P
	- Accuracy of timing of test function shall be tested to ensure it has the same accuracy as the timing of the test interval		P
	- Compliance checked by the periodicity of two successive functional tests. This periodicity shall be stated in the instruction sheet of the manufacturer.	Over a period of 2 weeks (2 tests)	P
6.2.3	Protection of timing function		---
	- The timing function shall be retained through periods of mains supply failure or interruption for up to 7 days, unless:		P
	a) the ATS automatically restores separated timings of alternate luminaires;		N/A
	b) the ATS is designed to provide automatic restoring for testing alternative luminaires or automatic initiation of test function		P
	- Operating instructions state that the ATS be re-commissioned following extended periods of mains supply failure		P

	- The extended period of mains supply failure shall be specified by the manufacturer in the operating instructions, and shall be greater than 7 days.		P
	- Compliance checked by: - The simulation of a mains failure, and		P
	- Verification of the correct functioning of the timing		P
	- This last compliance is checked by measuring the periodicity of the functional test		P
	- After a charging cycle of 24 h at 0.9 times the rated supply voltage, the time and the date of the first test which occurred is noted		P
	- switch of the mains of the ATS during seven days		P
	- switch on the mains of the ATS		P
	- The time and date of the first functional test which occurred is noted after the restoration of the mains supply. The periodicity of the test declared by the manufacturer is checked		P
	- In the case of a periodicity of less than 1 week + 24h, the periodicity between the first test happening after the restoration of the normal supply and the following test is checked. The test shall be performed at the time and date initially scheduled before the mains interruption		P
6.3	Requirements for premises that may be occupied during the test and recharge periods		---
6.3.1	General		---
	(a) Conforms to the measure of 6.3.2 for systems of self-contained luminaires; or		P
	(b) 6.3.3 for centrally supplied luminaires		N/A
6.3.2	Testing of self-contained luminaires		---
	– tested by procedures 6.3.2.2, 6.3.2.3 or 6.4.2.4		P
6.3.2.2	Testing alternate luminaires		---
	– Confirmation that the sequence of testing does not affect alternate luminaires during the same test period. This is checked by inspection of the documentation of the manufacturer	Randomised delay times minimise the possibility of adjacent luminaires entering test or recharge periods at the same time	P
6.3.2.3	Manual initiation of the test function		---
	– In case of a non-automatic initiation of the test, manual initiation of the test shall be acceptable providing there is a visible fault indication (as described in 7.2), or records of previous tests which indicate that the discharge test has not been carried out within the previous 12-month period. Compliance is checked by inspection.		P

6.3.2.4	Automatic initiation of test function – Automatically initiated tests shall perform the tests in accordance with clause 5. However the duration test shall be carried out within 52 weeks after commissioning. This requirement is applicable only in combination with 6.3.2.2 for premises which may be occupied during the test and the subsequent recharging period. Randomly automatically-initiated duration tests shall be carried out within 52 weeks after commissioning. Compliance is checked by inspection.	Randomised delay times minimise the possibility of adjacent luminaires entering test or recharge periods at the same time	P
6.3.3	Test of centrally powered systems		---
6.3.3.1	General		---
	- Provide facilities to be tested by one of the procedures in 6.3.3.2 or 6.3.3.4		N/A
	- and optionally 6.3.3.3 in case of a manual initiation of the test		N/A
6.3.3.2	Dual batteries		---
	- ATS equipped with dual parallel batteries shall be arranged to enable the ATS to be tested in two sections, where each section shall be capable of providing illumination while the other is discharged. Compliance is checked by the alternate operation of the dual batteries, allowing the batteries to recharge for 24 h between the two tests.		N/A
6.3.3.3	Manual initiation of the test function		---
	- Manual initiation of the test shall be acceptable providing there is a visible fault indication (as described in 7.2), or records of previous tests which indicate that the discharge test has not been carried out within the previous 12-month period. Compliance is checked by inspection.		N/A
6.3.3.4	Limited duration test		---
	- The limited duration test shall be performed for two-thirds of the rated duration.		N/A
	- The central emergency power supply system shall be automatically checked to ensure that the battery has not discharged to a lower voltage than is required for a discharge of two-thirds of the rated duration		N/A
	- Manufacturer shall provide a battery declaration and details of the test requirements which includes the minimum battery voltage for the limited duration test for a discharge of two-thirds of the rated duration		N/A

6.3.4	Automatic test recording facilities		---
	- Where an ATS with a recording facility is used to monitor the status of the installation of the emergency lighting, the ATS shall indicate the results of testing in accordance with clause 4, with an indication of an indication of the location of any fault.	Touch panel allows identification of any device connected and logs any faults locally and on system	P

7	**INDICATION AND RECORDING OF RESULTS OF TESTS THAT THE EQUIPMENT HAS TO PERFORM**		**---**
7.1	General		---
	- The ATS shall give an indication of all test results		P
	- The ATS test result indication of a failure of a duration test shall not be cancelled out by a subsequent successful function test	Previous logged faults stay recorded in non-volatile memory	P
	- During a mains failure condition, the results of a test failure shall be retained for at least one week after the mains failure and be indicated when the mains is resumed, or the ATS shall automatically repeat the failed test after recharging for a period of 24h	Touch panel stores logged faults indefinitely in non-volatile memory.	P
	- For P and S types, the records are displayed by local indicators	Luminaires have Bi-colour fault status LED's	P
	- Compliance is checked by inspection of records/log.		P
7.2	Indication		---
	- Each ATS shall indicate whether the mains supply is functioning normally or has failed. The results of all tests shall be indicated		P
	- If the indicator lamps are used, they shall comply with IEC 60073.		P
	- Compliance is checked by inspection.		P
7.3	Recording		---
	- Self-contained luminaires with built-in automatic testing facilities (see 3.2) shall comprise a visual indication of the results of the test, which may be simplified to illuminated indicators		P
	- Fault indicators shall only be reset to their non-fault status by correction of the fault		P
	- For centrally monitored automatic test systems (see 3.3 and 3.4), the results of the tests shall be stored electronically with either a visual warning or a visual and audible warning of a failure.		P
	- Test histories shall be available as both a visual and printable record		P
	- Compliance is checked by inspection		P

Annex B	**CLASSIFICATION OF ATS TYPES**		**---**
B.1	General		---
	- Meets the minimum requirements as per table B.1 for classification of ATS of the following:		P
	- Type S		N/A
	- Type P		N/A
	- Type ER		N/A
	- Type PER		P
	- Type PERC		N/A

Appendix A: System test results

Clause	Description of Test or fault condition	Duration	Observations	Result
4.2	Luminaire on DALI A line in emergency mode, Functional test run	1h	Function test request pending shown, function test resumes	P
4.2	Luminaire on DALI B line in emergency mode, Functional test run	1h	Function test request pending shown, function test resumes	P
4.2 & 4.4.2	DALI A line short circuit, Functional test run	<1m	Device lost displayed on control panel, fault logged	P
4.2 & 4.4.2	DALI B line short circuit, Functional test run	<1m	Device lost displayed on control panel, fault logged	P
4.2 & 4.3.2	Test of battery disconnected, functional test run	<1m	Red 'X' displayed on touch control panel next to battery, Error indication on LED on luminaire, fault logged	P
4.3.1	Test of faults reported within 24h of detection	<1m	Faults logged at the completion of functional tests or retry timeout period (24h)	P
4.3.3	Test of lamps in emergency mode – functional test run	<1m	Green 'tick' shown next to emergency lamp	P
4.3.3	Test of lamps in emergency mode – Luminaire lamp disconnected, functional test run	<1m	Red 'X' shown next to emergency lamp	P
4.3.4	Functional test checks normal and emergency modes	<1m	Both modes tested	P
4.4.3	Earth Fault applied to DALI A line	1h	No effect on emergency operation of luminaires on either DALI A or B lines, No unwanted test generated	P
4.4.1 & 4.4.2	Check of Intercommunications fault reporting within 24h of fault occurring for P, ER, PER and PERC system types. Tested by shorting and open circuiting DALI A and B lines separately and setting Communication tests to a convenient time to detect any faults.	<24h	Detection of open circuit and short circuit DALI data lines within any 24 hour period, fault logged, followed by date stamp for each affected luminaire	P
4.4.3	Earth Fault applied to DALI B line	1h	No effect on emergency operation of luminaires on either DALI A or B lines, No unwanted test generated	P
4.4.3	Short Circuit applied across DALI A line	1h	No effect on emergency operation of luminaires on either DALI A or B lines, No unwanted test generated	P

4.4.3	Short Circuit applied across DALI B line	1h	No effect on emergency operation of luminaires on either DALI A or B lines, No unwanted test generated	P
4.4.3	Open Circuit of DALI A line	1h	No effect on emergency operation of luminaires on either DALI A or B lines, No unwanted test generated	P
4.4.3	Open Circuit of DALI B line	1h	No effect on emergency operation of luminaires on either DALI A or B lines, No unwanted test generated	P
4.4.4	Component failures		Reference documents used: (a) N-light and DALI Interface Emergency Lighting Control Gear - Description and Operating Notes (V1.0) (b) N-light bootloader flowchart (P104 Bootloader) (c) N-light firmware flow chart (P104 DALI control box screen flow chart) (d) N-light touch screen navigation (P104 DALI control box screen navigation) (e) Configurator navigation (P105 N-light USB navigation)	P
4.4.5	System parts compatibility		DALI standard proven and well documented. . All components are certified DALI compliant	P
4.4.6	Electromagnetic immunity		See BSI Report TR/14/623	P
4.4.7	Software failure		Reference documents used: (a) N-light and DALI Interface Emergency Lighting Control Gear - Description and Operating Notes (V1.0) (b) N-light bootloader flowchart (P104 Bootloader) (c) N-light firmware flow chart (P104 DALI control box screen flow chart) (d) N-light touch screen navigation (P104 DALI control box screen navigation) (e) Configurator navigation (P105 N-light USB navigation)	P

4.5	Test of Emergency lamps – LED light source removed from luminaire	<1 m	Fault indicated on touch panel and luminaire	P
4.5	Test of Emergency lamps – short circuit applied to LED output	<1 m	Fault indicated on touch panel and luminaire	P
5.1	Functional test – Sufficient to check illumination of lamp but shall not exceeed 10% of the rated luminaire duration (180 m rating, < 18 m duration test)	30s	Test system of 1 luminaire per DALI line gave a functional test time of 30s	P
5.1	Mains supply failure before functional test with luminaire capacity insufficient to run functional test, test postponement until luminaire has sufficient capacity	Until charged fully	Discharged unit on system test postponed duration testing	P
5.1	Indication of postponed testing on P, ER, PER, PERC ATS types on remote panel	Until charged fully	Spinning icon showing postponed test on test sample system	P
5.1	Following restoration of main supply, postponed functional test shall recommence as soon as conditions permit.		Postponed test on test sample system	P
5.1	If duration of functional testing is less than 1% of the rated duration, then the postponed function is not required.		Postponed tests shown	P
5.2	Duration test performed according to the manufacturer's instructions			P
5.2	Mains supply failure during duration test, test postponed and luminaires enter emergency mode	<1 s	Luminaire entered emergency mode whilst a duration test was in progress and/or pending	P
5.2	Luminaires with capacity insufficient to run duration test, test postponement until luminaire has sufficient capacity	Until charged fully	Discharged luminaire prevented duration test running, shown on touch panel	P
5.2	Indication of postponed testing on P, ER, PER, PERC ATS types on remote panel		Postponed test shown on remote panel	P
6.2.2	Compliance checked by the periodicity of two successive functional tests. It shall have an accuracy of ±75 s.	2 week	There was less than 1 second difference (not measurably noticeable) between the first test and second tests occurring during examination of sample.	P

6.2.3	Timing function shall be retained through periods of mains supply failure or interruption for up to 7 days	1 week	The ATS is designed to provide automatic restoring for testing alternative luminaires or automatic initiation of test function	P
7.1	ATS gives indication of all test results		All appropriate test faults are logged and recorded by the ATS.	P
7.1	Functional test run after failed duration test not influencing duration test result			P
7.1	Unit retains failure after being switched off for 1 week	1 week	All faults remain logged in non-voltatile Flash memory.	P
7.1	If failure is not retained, ensure a duration test is initiated automatically			N/A
7.2	Each ATS shall indicate whether the mains supply is functioning, the results of all tests shall be indicated. Indicator lamps where used comply with IEC 60073			P
7.3	Self contained luminaires have visual indication of the results of test, which only reset to their non–fault status by correction the fault.		Fault indicator LEDs of test status/result, faults clear only when fault rectified	P

Appendix B: Manufacturer Data Sheets

N-light®

DALI emergency lighting test and monitoring system

N-light® CONNECT

The N-light® CONNECT touch panel is a DALI emergency lighting test and monitoring system from Mackwell. Designed to be simple to use and intuitive in system status diagnostics. Multiple N-light® CONNECT touch panels can be networked together to monitor larger DALI systems.

The control panel operates without the need for permanent connection to a PC.

Reports may be viewed and printed using the N-light® Windows® based commissioning software.

Remote access to the system is possible through Ethernet connection via a variety of networking options.

Suitable for use in conjunction with all Mackwell® DALI emergency components, including XYLUX® self-contained LED emergency luminaires and XY-VEX exit signs.

Mackwell® was an early adopter of DALI emergency lighting products and has been a member of the DALI working group since 2007.

System Features

- Touch-screen user interface
- Intuitive colour-coded display of system status
- 128 DALI addresses via two DALI subnets
- Integrated network and power connections
- Recessed and surface-mount housings supplied
- Ethernet port for commissioning and networking
- Configured using N-Light® commissioning software
- Password-protected engineering mode
- View and print reports using N-Light® commissioning software
- Compatible with all Mackwell® DALI emergency products
- Auto power save mode

DALI

email. sales@mackwell.com
www.mackwell.com
tel. +44 (0) 1922 458 255
Vigo Place, Aldridge, West Midlands, WS9 8UX, England

DALI emergency lighting control system

N-light® CONNECT

TECHNICAL DATA

POWER SUPPLY	
Rated voltage	230V
Supply frequency	50/60Hz
Power	2.4W
USER INTERFACE	
Screen	4.3" resistive touch-panel, 24-bit, 16 million colour LCD
Resolution	480 x 272 pixels
Backlight	LED
DATA TRANSFER	Ethernet TCP/IP
MEMORY	4-Year test log
INTERNAL BATTERY	CR1220 3V lithium coin cell (Replaceable)
TEMPERATURE RANGE	0 to +50°C
OUTPUTS	
2 x DALI loops	Maximum 64 devices per loop
Current limit	250mA
INPUTS	
Power supply	
USB & GUI programming port	
MECHANICAL DATA	
Weight (incl. pattress)	330g
Dimensions L x W x H	130 x 47 x 69mm
Fixing centres	120mm
Protection rating	IP20 - Suitable for indoor use only.

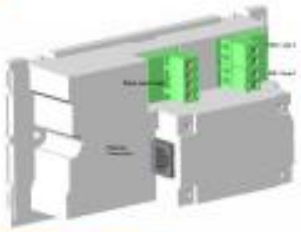
RELEVANT STANDARDS

EN 61347-2-11	Automatic electrical controls for household and similar use
EN 62034	Automatic test systems for emergency escape lighting equipment
EN 61547	Equipment for general lighting purposes - EMC immunity requirements
EN 55015	Limits and methods of measurement of radio disturbance characteristics of electrical lighting and similar equipment

N-light® CONNECT KIT

1. Pattress box (surface and recessed)
2. Control panel
3. Clip-on fascia
4. USB to mini USB cable
5. 2 x 25mm M3.5 electrical screws
6. 2 x 2-way DALI connector blocks
7. 1 x 4-way power connector block
8. Battery kit

N-light® CONNECTIONS IMAGE



SUPPORT SERVICE

Mackwell® offer service support with the N-light® CONNECT system. This includes system commissioning and maintenance contracts. Please contact Mackwell® Support Services for further information at nlightsupport@Mackwell.com.

DALI COMPATIBILITY NOTE

All Mackwell® DALI modules are designed to comply with the DALI Standard EN 62386, for emergency lighting components. Customers who purchase product that incorporates the DALI protocol must accept full system responsibility for the integration of the Mackwell® modules into the DALI system and have the experience and resource to accept this responsibility. Please note that product warranty does not extend to cover the system integration process.

We reserve the right to alter specifications without prior notice.

N-light®

email: sales@mackwell.com
www.mackwell.com
tel. +44 (0) 1922 458 255
Vigo Place, Aldridge, West Midlands, WS9 8UG, England

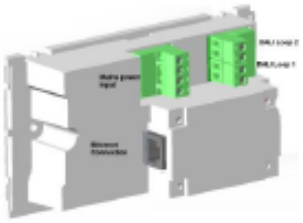
N-light

INSTALLATION INSTRUCTIONS

N-light® CONNECT

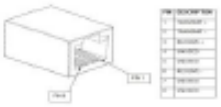
INSTALLATION DATA

Rated voltage	230V
Frequency	50/60Hz
Power	2.4W
Temperature range	0 to +50°C
Weight (including pattress)	310g
Dimensions L x H x D (including Surface mount housing)	156x92x58mm
Protection rating	IP20 - Suitable for indoor use only



INSTALLATION KIT

1. Pattress box (surface and recessed)
2. Control panel
3. Clip-on fascia
4. USB to mini USB cable
5. 2 x 25mm M3.5 electrical screw
6. 2 x 2-way DALI connector block
7. 1 x 4-way power connector block
8. Battery kit



CONNECTION DATA

DALI 1 & 2	2-core mains rated 0.5 to 1.5mm^2
Power	3-core T&E 2.5mm^2
Network	Cat5e Ethernet cable RJ45 to RJ45
USB	Front facing mini-USB

CONTROL CONNECTIONS

DALI	2 x subnet to DALI slave devices

POWER CONNECTION

Mains supply	Mains power supply protected at external supply

NETWORK CONNECTION

Ethernet backbone	RJ45 port to PC or network switch

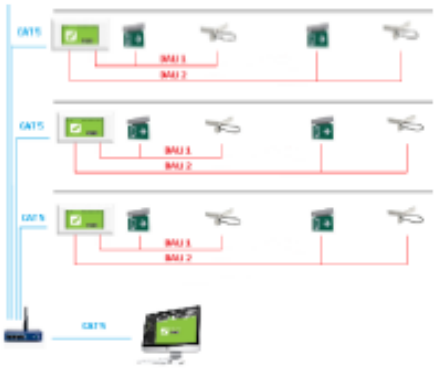
email: sales@mackwell.com
www.mackwell.com
tel. +44 (0) 1922 458 255
Vigo Place, Aldridge, West Midlands, WS9 8UG, England

INSTALLATION INSTRUCTIONS

N-light® CONNECT

INSTALLATION REQUIREMENTS

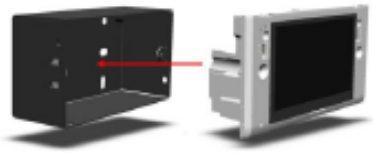
1. The panel can be recessed or surface-mounted
2. Dimensions for cavity wall cut out approx.133mm x 75mm
   A depth of at least 47mm is required for a neat fit
3. Typical DALI cable is Belden 8471 2-core 1.5mm^2 mains rated
4. DALI wiring topology is line, star or tree (or a combination of these)
5. Max. distance between panel and furthest slave device is 300m
6. DALI subnet maximum 64 slave devices
7. Ethernet connection for networking panels
8. Max. distance between Ethernet devices is 100m
9. Typical Ethernet cable is Cat5e
10. Commissioned using N-light® CONFIGURATOR software
11. Compatible with mackwell® DALI emergency components only



INSTALLATION PROCESS

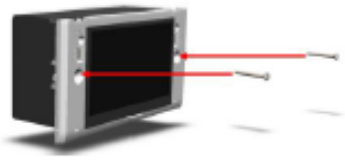
STAGE 1

Prepare recess or conduit for fitment of pattress. Pass the power, network and DALI cables through the pattress and terminate in the appropriate connector blocks 6 and 7.



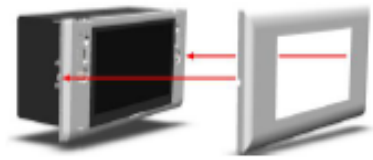
STAGE 2

Plug connector blocks into the sockets on the rear of the panel. Plug the network cable into the RJ45 socket. Carefully align the panel with the fixing holes and push into place in the pattress box so that it fits firmly in place.



STAGE 3

Use the M3.5 screws provided to secure the panel to the pattress box.



STAGE 4

Clip on the decorative fascia, ensuring that the hole in the fascia is in the top right hand corner.
System installation is complete and ready for commissioning. Please contact mackwell® Support Services.

To prevent unnecessary discharging of emergency batteries, it is recommended that mains power is disconnected after installation and not re-applied until the system is to be commissioned.

DALI COMPATIBILITY NOTE

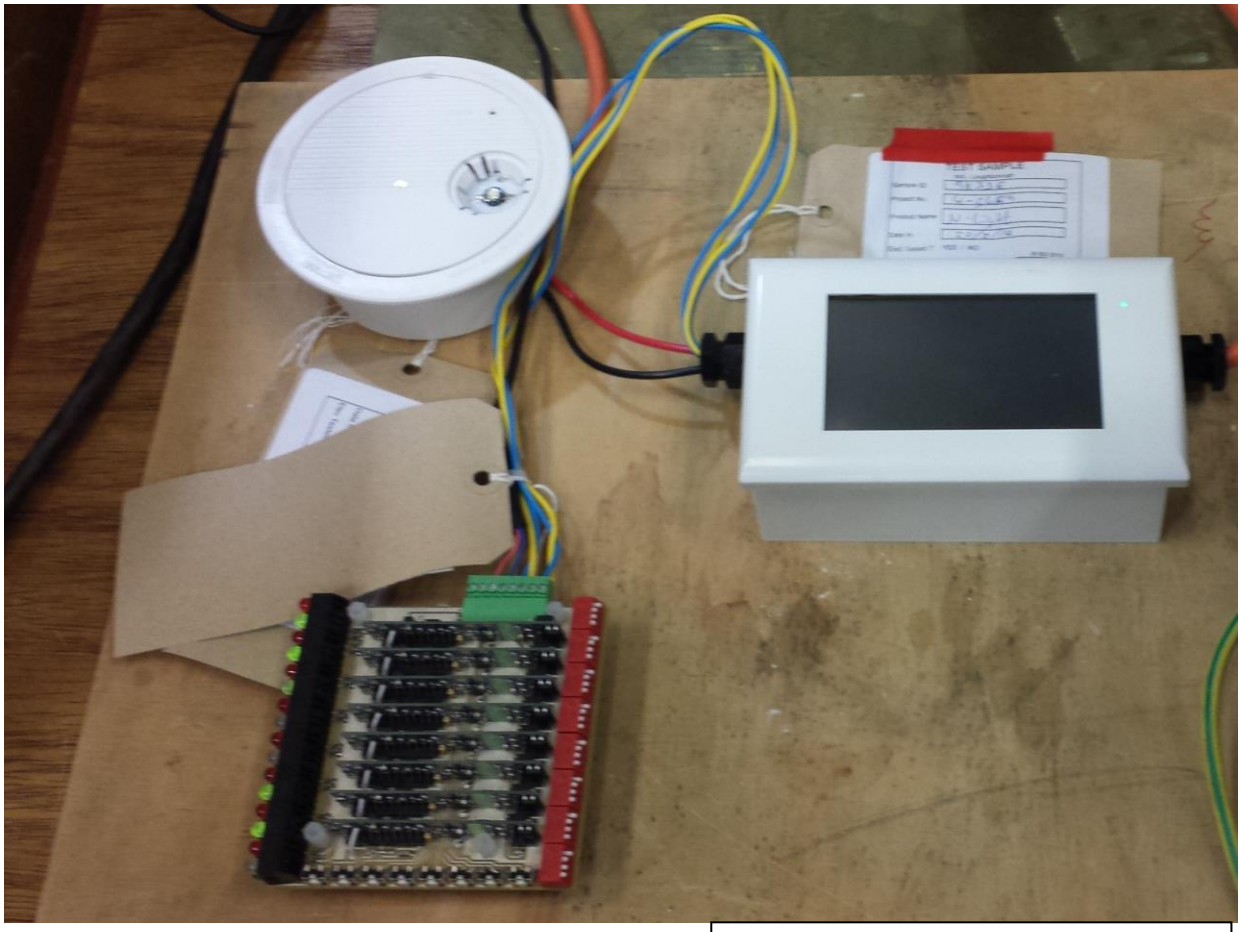
All mackwell® DALI modules are designed to comply with the DALI Standard EN 62386, for emergency lighting components. Customers who purchase product that incorporates the DALI protocol must accept full system responsibility for the integration of the mackwell® modules into the DALI system and have the experience and resource to accept this responsibility. Please note that product warranty does not extend to cover the system integration process. Please contact mackwell® Support Services on nlight-support@mackwell.com for further information.

We reserve the right to alter specifications without prior notice.

N-light®

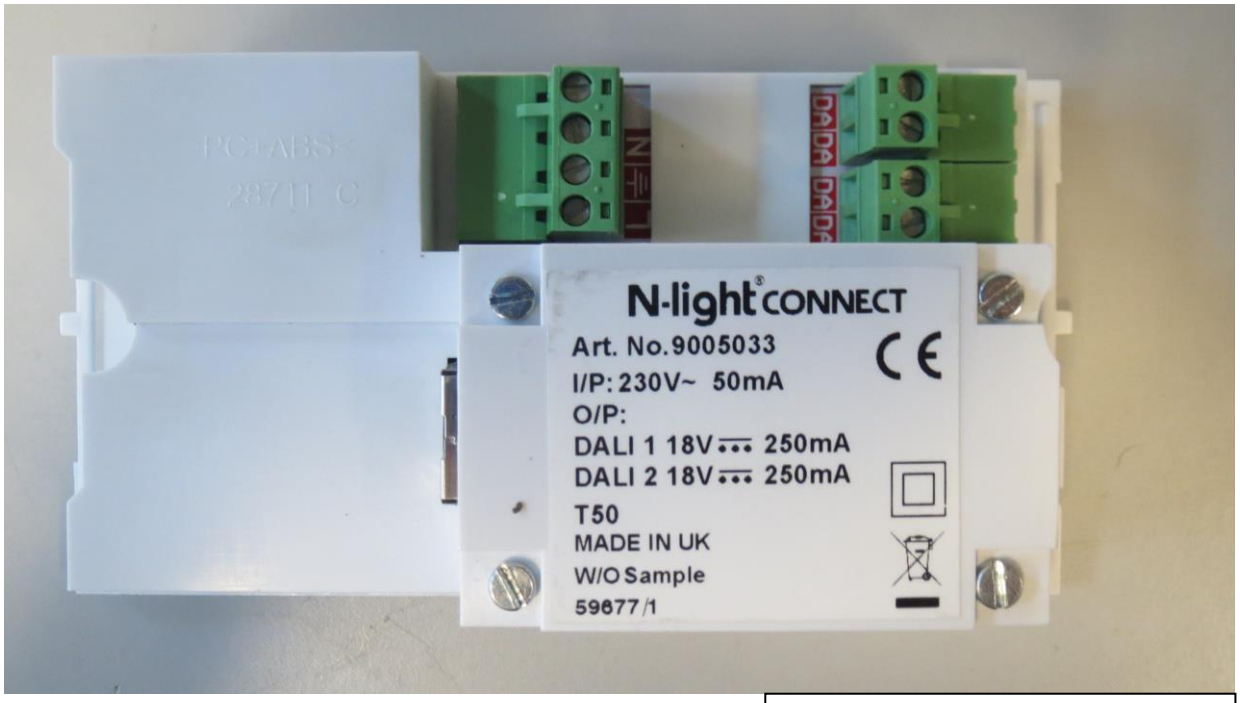
email. sales@mackwell.com
www.mackwell.com
tel. +44 (0) 1922 458 255
Vigo Place, Aldridge, West Midlands, WS9 8UD, England

Photographs of products and system

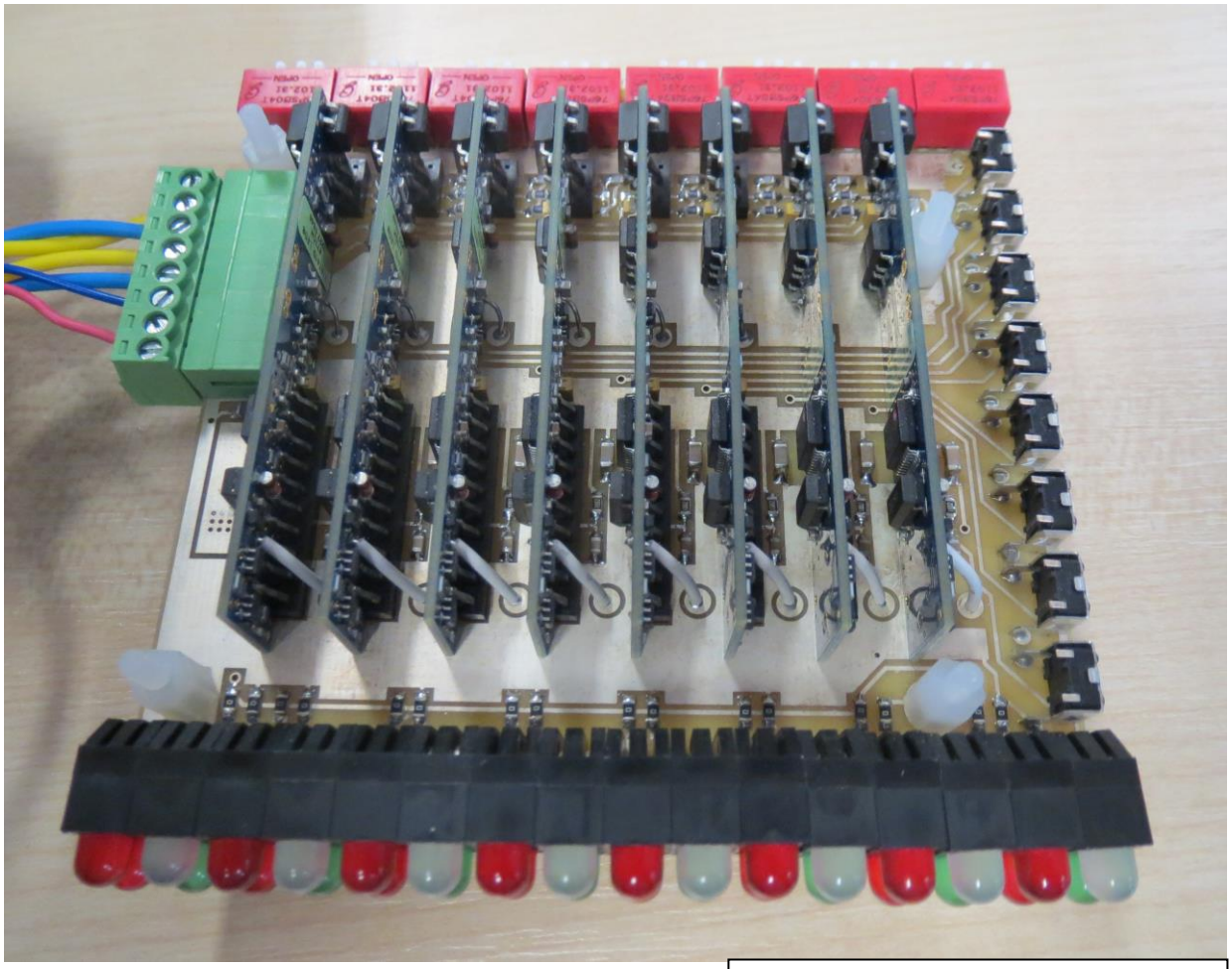


Full view of Mackwell N-light ATS set-up

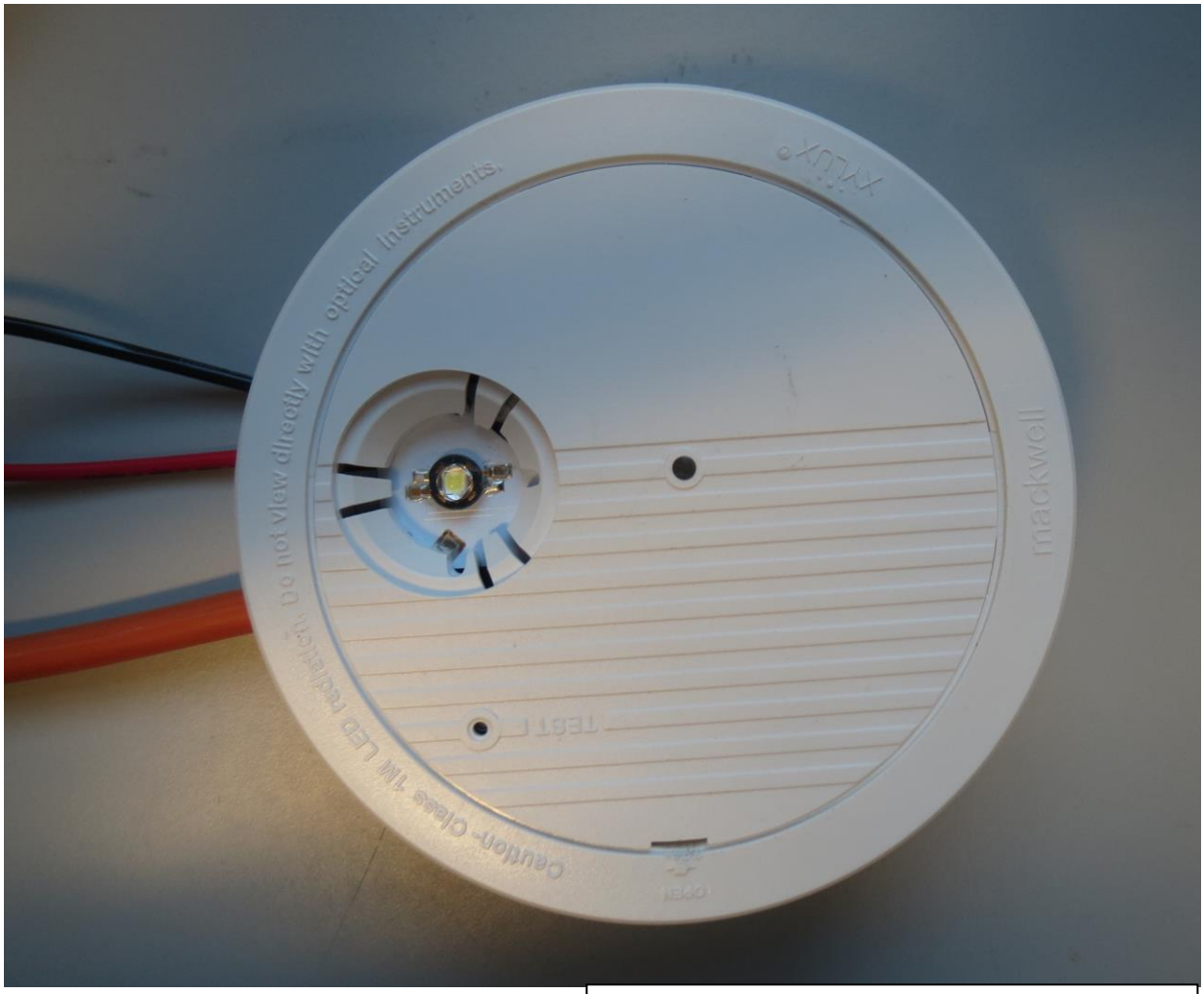
Front view of Mackwell N-light panel



Rear view of Mackwell N-light panel



Front view of Mackwell DALI simulator



Front view of Mackwell XYLUX LD4/D1 luminaire

****End of report****

Test Report

Report No	TR/14/486
Client	Mackwell Electronics Ltd Vigo Place, Walsall, WS9 8UG United Kingdom
Authority & date	Project No.: 400003489, SMO: 8183090 Date: 23/06/2014
Items tested	Mackwell N-light Connect touch panel
Specification	IEC 61347-2-11 (First Edition):2001 used in conjunction with IEC 61347-1 (Second Edition):2007+A1:2010+A2:2012 BS EN 61347-11:2002 used in conjunction with BS EN 61347-1:2008+A2:2013
Results	A type sample of the above appliance has been tested and examined to the relevant requirements of the above specification and has been found to comply with these requirements, subject to the implementation of any corrective actions detailed in this test report.
Prepared by	Jordan Bucko
Authorised by	Greg Childs
Issue Date	10/10/2014
Conditions of issue	This Test Report is issued subject to the conditions stated in current issue of CP0322 'Conditions of Contract for Testing'. The results contained herein apply only to the particular sample/s tested and to the specific tests carried out, as detailed in this Test Report. The issuing of this Test Report does not indicate any measure of Approval, Certification, Supervision, Control or Surveillance by BSI of any product. No extract, abridgement or abstraction from a Test Report may be published or used to advertise a product without the written consent of BSI, who reserve the absolute right to agree or reject all or any of the details of any items or publicity for which consent may be sought.

BSI, Holywell Park, Loughborough, Leicestershire, LE11 3AQ Tel: 01509 331133, e-mail: appliances@bsigroup.com

Test Report issued under the responsibility of:

BSI

TEST REPORT
IEC 61347-2-11

Part 2: Particular requirements:
Section Eleven – Miscellaneous electronic circuits used with luminaires

Report Number. .....:	TR/14/486
Date of issue .....:	10/10/2014
Total number of pages.....:	32

Applicant's name.....:	Mackwell Electronics Ltd
Address .....:	Vigo Place, Walsall, WS9 8UG United Kingdom

Test specification:	
Standard .....:	IEC 61347-2-11 (First Edition):2001 used in conjunction with IEC 61347-1 (Second Edition):2007+A1:2010+A2:2012
Test procedure .....:	CB Scheme
Non-standard test method……..:	N/A

Test Report Form No.....:	IEC61347_2_11D
Test Report Form(s) Originator.....:	Intertek Semko AB
Master TRF.....:	2013-11

If this Test Report Form is used by non-IECEE members, the IECEE/IEC logo and the reference to the CB Scheme procedure shall be removed.

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.

Test item description .....:	Touch panel for monitoring and test of lighting systems
Trade Mark .....:	N-light
Manufacturer.....:	Mackwell
Model/Type reference .....:	N-light Connect 9005033
Ratings .....:	230V ~ 50/60Hz 50mA

Testing procedure and testing location:	
☒ **CB Testing Laboratory:**	BSI Appliances
Testing location/ address .....:	Ashby Road Loughborough Leicestershire LE11 3AQ UK
☐ ~~**Associated Laboratory:**~~	
~~Testing location/ address .....:~~	
Tested by (name + signature) .....:	Jordan Bucko
Approved by (+ signature).....:	Greg Childs
☐ ~~Testing procedure: TMP~~	
~~Testing location/ address .....:~~	
~~Tested by (name + signature) .....:~~	
~~Approved by (+ signature).....:~~	
☐ ~~Testing procedure: WMT~~	
~~Testing location/ address .....:~~	
~~Tested by (name + signature) .....:~~	
~~Witnessed by (+ signature) .....:~~	
~~Approved by (+ signature).....:~~	
☐ ~~Testing procedure: SMT~~	
~~Testing location/ address .....:~~	
~~Tested by (name + signature) .....:~~	
~~Approved by (+ signature).....:~~	
~~Supervised by (+ signature) .....:~~	

Summary of testing:

Tests performed (name of test and test clause):	**Testing location:**
Sample tested to the full requirements of : BS EN 61347-11:2002 used in conjunction with BS EN 61347-1:2008+A2:2013 IEC 61347-2-11 (First Edition):2001 used in conjunction with IEC 61347-1 (Second Edition):2007+A1:2010+A2:2012	BSI Appliances Ashby Road Loughborough Leicestershire LE11 3AQ UK

Summary of compliance with National Differences:

List of countries addressed:

Cenelec countries addressed

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.

Test item particulars ..... :	Touch panel for monitoring and test of lighting systems
Classification of installation and use ..... :	Normal
Supply Connection ..... :	Permanent connection to fixed wiring
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 ..... :	20/02/2014
Date (s) of performance of tests..... :	07/08/2014 – 24/09/2014

General remarks:

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 testing laboratory.
"(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 61347-1

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) ..... :

Mackwell Electronics Ltd
Vigo Place,
Walsall,
WS9 8UG
United Kingdom

General product information:

The Mackwell 'N-light connect' is a touch screen device used for testing and monitoring of DALI controlled emergency luminaires.

Panel is configured using the N-light software via the USB or Ethernet port.

The device is AC powered from the mains supply, 230V 50mA.

128 DALI addresses are monitored via two DALI subnets "A" and "B" which are connected into the device via screw terminals.

Remote access to the system is possible through the Ethernet connection on the panel.

IEC 61347-2-11			
Clause	Requirement + Test	Result - Remark	Verdict
4 (4)	**GENERAL REQUIREMENTS**		**---**
- (4)	Insulation materials for double or reinforced insulation according requirements in Annex N of IEC 61347-1	(see Annex N)	N/A
- (4)	Compliance of independent controlgear enclosure with IEC 60 598-1		N/A
- (4)	Built-in magnetic ballast with double or reinforced insulation comply with Annex I of IEC 61347-1		N/A
- (4)	Built-in electronic controlgear with double or reinforced insulation comply with Annex O of IEC 61347-1	(see Annex O)	N/A
- (4)	SELV controlgear comply with Annex L of IEC 61347-1	(see Annex L)	N/A

6 (6)	**CLASSIFICATION**		**---**
	Built-in controlgear ..... :	Yes ☐ No ☒	—
	Independent controlgear ..... :	Yes ☐ No ☒	—
	Integral controlgear ..... :	Yes ☐ No ☒	—

7 (7)	**MARKING**		---
7.1 (7.1)	Mandatory markings (other than integral miscellaneous electronic circuits)		---
	a) mark of origin	N-light	P
	b) model number or type reference	Connect	P
	d) correlation between interchangeable parts and controlgear marked		N/A
	e) rated supply voltage (V)	230V	P
	supply frequency (Hz)	50/60Hz	P
	supply current (A)	50mA	P
	f) earthing symbol		P
	k) wiring diagram		P
	l) value of t_c alternative t_a	T50	P
7.1 (-)	- control terminals identified, if applicable	DA	P
- (7.2)	Marking durable and legible		P
	Rubbing 15 s water, 15 s petroleum; marking legible		P
7.2 (7.1)	Information to be provided, if applicable:		---

IEC 61347-2-11			
Clause	Requirement + Test	Result - Remark	Verdict
	h) declaration on protection against accidental contact		P
	i) cross-section of conductors (mm²)		P
	j) number, type and wattage of lamp(s)		N/A
- (7.2)	Marking durable and legible		P
	Rubbing 15 s water, 15 s petroleum; marking legible		P
8 (10)	**PROTECTION AGAINST ACCIDENTAL CONTACT WITH LIVE PARTS**		**---**
- (10.1)	Controlgear protected against accidental contact with live parts		P
- (A2)	Voltage measured with 50 kΩ	(see Annex A)	P
- (A3)	Voltage > 35 V peak 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 .....:		P
- (10.3)	Controlgear providing SELV		---
	Accessible conductive parts are insulated from live parts by double or reinforced insulation in SELV controlgear	No SELV	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		---
	Output voltage under load ≤ 25 V r.m.s. or ≤ 60 V d.c.	No SELV	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

IEC 61347-2-11			
Clause	Requirement + Test	Result - Remark	Verdict
	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
9 (8)	**TERMINALS**		**---**
- (8)	Screw terminals according section 14 of IEC 60598-1:		**---**
	Separately approved; component list	(see Annex 1)	P
	Part of the controlgear	(see Annex 2)	P
	Screwless terminals according section 15 of IEC 60598-1:		**---**
	Separately approved; component list	No screwless terminals	N/A
	Part of the controlgear		N/A
10 (9)	**PROVISION FOR PROTECTIVE EARTHING**		**---**
- (9.1)	Provisions for protective earthing		---
	Terminal complying with clause 9	No protective earthing	N/A
	Locked against loosening and not possible to loosen by hand		N/A
	Not possible to loosen clamping means unintentionally on screwless terminals		N/A
	Earthing via means of fixing		N/A
	Earthing terminal only used for the earthing of the control gear		N/A
	All parts of material minimizing the danger of electrolytic corrosion		N/A
	Made of brass or equivalent material		N/A
	Contact surface bare metal		N/A
- (9.2)	Provision for functional earthing		---
	Comply with clause 8 and 9.1		P
- (9.3)	Earth contact via the track on the printed board		---

IEC 61347-2-11			
Clause	Requirement + Test	Result - Remark	Verdict
	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 ..... :	No protective earthing	N/A
- (9.4)	Earthing of built-in lamp controlgear		---
	Earth by means of fixing to earthed metal of luminaire in compliance of 7.2 of IEC 60598-1	Not built-in controlgear	N/A
	Earthing terminal only for earthing the built-in controlgear		N/A
- (9.5)	Earthing via independent controlgear		---
- (9.5.1)	Earth connection to other equipment		---
	Looping or through connection, conductor min. 1,5 mm² and of copper or equivalent	Not independant controlgear	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		---
	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 ..... :	Not independant controlgear	N/A
	Output earthing terminal marked as in 7.1 t) of IEC 61347-1		N/A
11 (11)	**MOISTURE RESISTANCE AND INSULATION**		**---**
	After storage 48 h at 91-95% relative humidity and 20-30 °C measuring of insulation resistance with d.c. 500 V (MΩ):		---
	For basic insulation ≥ 2 MΩ ..... :		N/A
	For double or reinforced insulation ≥ 4 MΩ ..... :	127MΩ	P
	Between primary and secondary circuits in controlgear providing SELV, values in Annex L in IEC 61347-1		N/A
12 (12)	**ELECTRIC STRENGTH**		**---**
- (12)	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):		---

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Clause	Requirement + Test	Result - Remark	Verdict
	Basic insulation, 2U + 1000 V		N/A
	Supplementary insulation, 2U + 1000 V		N/A
	Double or reinforced insulation, 4U + 2000 V		P
	No flashover or breakdown		P
	Solid or thin sheet insulation for double or reinforced insulation fulfil the requirements in Annex N in IEC 61347-1		N/A
14 (14)	**FAULT CONDITIONS**		**---**
- (14)	When operated under fault conditions the controlgear:		---
	- 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		P
- (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:		---
	The insulation resistance ≥ 1 MΩ ..... :	401MΩ	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		—

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Clause	Requirement + Test	Result - Remark	Verdict
15 (15)	**CONSTRUCTION**		**---**
- (15.1)	Wood, cotton, silk, paper and similar fibrous material		---
	Wood, cotton, silk, paper and similar fibrous material not used as insulation		P
- (15.2)	Printed circuits		---
	Printed circuits used as internal connections complies with clause 14		P
- (15.3)	Plugs and socket-outlets used in SELV or ELV circuits		---
	No dangerous compatibility between output socket-outlet and a plug for socket-outlets for input circuit in relation to installation rules, voltages and frequencies	No plug and socket outlets	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
16 (16)	**CREEPAGE DISTANCES AND CLEARANCES**		**---**
- (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	No SELV	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

IEC 61347-2-11			
Clause	Requirement + Test	Result - Remark	Verdict
17 (17)	**SCREWS, CURRENT-CARRYING PARTS AND CONNECTIONS**		**---**
	Screws, current-carrying parts and connections in compliance with IEC 60598-1 (clause numbers between parentheses refer to IEC 60598-1)		---
(4.11)	Electrical connections		---
(4.11.1)	Contact pressure		P
(4.11.2)	Screws:		---
	- self-tapping screws		N/A
	- thread-cutting screws		N/A
(4.11.3)	Screw locking:		---
	- spring washer		N/A
	- rivets		N/A
(4.11.4)	Material of current-carrying parts		P
(4.11.5)	No contact to wood or mounting surface		P
(4.11.6)	Electro-mechanical contact systems	No electro-mechanical system	N/A
(4.12)	Mechanical connections and glands		---
(4.12.1)	Screws not made of soft metal		P
	Screws of insulating material	No screws of insulating material	N/A
	Torque test: torque (Nm); part ..... :	0.4Nm, Pillar terminal	P
	Torque test: torque (Nm); part ..... :	0.4Nm, Housing fixing	P
	Torque test: torque (Nm); part ..... :	0.5Nm, PCB fixing	P
(4.12.2)	Screws with diameter < 3 mm screwed into metal		N/A
(4.12.4)	Locked connections:		---
	- fixed arms; torque (Nm)..... :	No locked connections	N/A
	- lampholder; torque (Nm)..... :		N/A
	- push-button switches; torque 0,8 Nm..... :		N/A
(4.12.5)	Screwed glands; force (Nm) ..... :	No Screwed glands	N/A

18 (18)	**RESISTANCE TO HEAT, FIRE AND TRACKING**		**---**
- (18.1)	Ball-pressure test:		---
	- part tested; temperature (°C)..... :	Housing, 75°C	P
	- part tested; temperature (°C)..... :	Terminal, approved component (see annex 1)	P
- (18.2)	Test of printed boards:		---

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Clause	Requirement + Test	Result - Remark	Verdict
	- part tested.....:	PCB, approved component (see annex 1)	P
	- part tested.....:		N/A
- (18.3)	Glow-wire test (650°C):		---
	- part tested.....:	Housing	P
	- part tested.....:		N/A
- (18.4)	Needle flame test (10 s):		---
	- part tested.....:	Terminal, approved component (see annex 1)	P
	- part tested.....:		N/A
- (18.5)	Tracking test:		---
	- part tested.....:		N/A
	- part tested.....:		N/A

19 (19)	**RESISTANCE TO CORROSION**		**---**
	- test according 4.18.1 of IEC 60598-1		N/A
	- adequate varnish on the outer surface		N/A

20 (-)	**ANNEXES**		**---**
	Comply with appropriate annexes of IEC 61347-1	(see Annexes)	P

14	**TABLE: tests of fault conditions**	**---**
Part	Simulated fault	Hazard
Capacitor C6	Short circuit	NO
Capacitor C2	Short circuit	NO
Resistor R3	Short circuit	NO
Bridge rectifier BR1	Short circuit	NO

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Clause	Requirement + Test	Result - Remark	Verdict

16 (16)	**TABLES: Creepage distances and clearances**						---
Table 3	**Minimum distances (mm) for a.c. (50/60 Hz) sinusoidal voltages**						**---**
RMS working voltage (V) not exceeding		50	150	250	500	750	1000
Creepage distances							
Required basic insulation, PTI ≥ 600		0,6	0,8	1,5	3	4	5,5
Measured		---	---	3.5	---	---	---
Required basic insulation, PTI < 600		1,2	1,6	2,5	5	8	10
Measured		---	---	3.5	---	---	---
Required supplementary insulation PTI ≥ 600		-	0,8	1,5	3	4	5,5
Measured		---	---	---	---	---	---
Required supplementary insulation PTI < 600		-	1,6	2,5	5	8	10
Measured		---	---	---	---	---	---
Required reinforced insulation		-	3,2	5	6	8	11
Measured		---	---	8.4	---	---	---
Clearances							
Required basic insulation		0,2	0,8	1,5	3	4	5,5
Measured		---	---	3.5	---	---	---
Required supplementary insulation		-	0,8	1,5	3	4	5,5
Measured		---	---	---	---	---	---
Required reinforced insulation		-	1,6	3	6	8	11
Measured		---	---	8.1	---	---	---
Table 4	**Minimum distances (mm) for non-sinusoidal pulse voltages**						
Rated pulse voltage (peak kV)	2,0	2,5	3,0	4,0	5,0	6,0	8,0
Required clearances	1,0	1,5	2	3	4	5,5	8
Measured	---	3.5	---	---	---	---	---
Rated pulse voltage (peak kV)	10	12	15	20	25	30	40
Required clearances	11	14	18	25	33	40	60
Measured	---	---	---	---	---	---	---
Rated pulse voltage (peak kV)	50	60	80	100	-	-	-
Required clearances	75	90	130	170	-	-	-
Measured	---	---	---	---	---	---	---

IEC 61347-2-11			
Clause	Requirement + Test	Result - Remark	Verdict
	ANNEXES FROM IEC 61347-1		---
A	**ANNEX A - TEST TO ESTABLISH WHETHER A CONDUCTIVE PART IS A LIVE PART WHICH MAY CAUSE AN ELECTRIC SHOCK**		---
A.1	Comply with A.2 or A.3		P
A.2	Voltage ≤ 35 V peak or ≤ 60 V d.c ..... :	90.4V	P
A.3	If voltage > 35 V peak or > 60 V d.c. or protective impendance device; touch current does not exceed 0,7 mA (peak) or 2 mA d.c. ..... :	0.07mA	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**		---
C3	**GENERAL REQUIREMENTS**		**---**
C3.1	Thermal protection means integral with the controlgear, protected against mechanical damage	No protection against overheating	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**		**---**
	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**		**---**
C6.1	Symbol for temperature declared thermally protected controlgear		N/A
C6.2	Declaration of the type of protection provided		N/A
C7	**LIMITATION OF HEATING**		**---**
C7.1	Preselection test:		---

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Clause	Requirement + Test	Result - Remark	Verdict
	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
C7.2	Functioning of protection means:		---
	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 controlgear 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
	Controlgear according to C5 a) or C5 e) operated until stable conditions are achieved		N/A
	Automatic-resetting thermal protectors working 3 times		N/A
	Controlgear according to C5 b) working 6 times		N/A
	Controlgear 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**		---
	Tests in C7 performed in accordance with Annex D, if applicable	No thermal protection	N/A
E	**ANNEX E – USE OF CONSTANT S OTHER THAN 4500 IN t_w TESTS**		---
	Comply with tests according Annex E, if applicable		N/A

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Clause	Requirement + Test	Result - Remark	Verdict

F	**ANNEX F - DRAUGHT-PROOF ENCLOSURE**		---
	Draught-proof enclosure in accordance with the description		P
	Dimensions of the enclosure		P
	Other design; description		N/A

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

I	**ANNEX I - ADDITIONAL REQUIREMENTS FOR BUILT-IN MAGNETIC BALLASTS WITH DOUBLE OR REINFORCED INSULATION**		---
	Comply with tests according Annex I, if applicable		N/A

L	**ANNEX L: PARTICULAR ADDITIONAL REQUIREMENTS FOR CONTROLGEAR PROVIDING SELV**		---
L.3	**Classification**		**---**
	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**		**---**
	Adequate symbols are used	No SELV	N/A
L.5	**Protection against electric shock**		**---**
	Comply with 9.2 of IEC 61558-1		N/A
L.6	**Heating**		**---**
	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**		**---**

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Clause	Requirement + Test	Result - Remark	Verdict
	Comply with tests of clause 15 of IEC 61558-1 with adjustments		N/A
L.8	**Insulation resistance and electric strength**		**---**
L.8.1	Conditioned 48 h between 91 % and 95 %		N/A
L.8.2	Insulation resistance		---
	Between input- and output circuits not less than 5 MΩ .....:		N/A
	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		---
	1) Between live parts of input circuits and live parts of output circuits .....:		N/A
	2) Over basic or supplementary insulation between:		---
	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**		**---**
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**		**---**
	Protective devices comply with 20.6 – 20.11 of IEC 61558-1		N/A
L.11	**Creepage distances and clearances**		**---**
	1. Insulation between input and output circuits, basic insulation:		---
	a) measured values $\geq$ specified values (mm) .....:		N/A
	b) measured values $\geq$ specified values (mm) .....:		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	c) measured values ≥ specified values (mm) ..... :		N/A
	2. Insulation between input and output circuits, double or reinforced insulation:		---
	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		---
	- measured values ≥ specified values (mm) ..... :		N/A
	3. Insulation between adjacent output circuits		---
	- measured values ≥ specified values (mm) ..... :		N/A
	4. Insulation between terminals for external connection:		---
	- measured values ≥ specified values (mm) ..... :		N/A
	5. Basic or supplementary insulation:		---
	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:		---
	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:		---
	a) measured values ≥ specified values (mm) ..... :		N/A
	b) measured values ≥ specified values (mm) ..... :		N/A
	c) measured values ≥ specified values (mm) ..... :		N/A

M	**ANNEX M: DIELECTRIC STRENGTH TEST VOLTAGES FOR CONTROLGEAR INTENDED FOR USE IN IMPULSE WITHSTAND CATEGORY III**		---
	Comply with tests according Annex M, if applicable		N/A

IEC 61347-2-11			
Clause	Requirement + Test	Result - Remark	Verdict
N	**ANNEX N: REQUIREMENTS FOR INSULATION MATERIALS USED FOR DOUBLE OR REINFORCED INSULATION**		---
N.4	**General requirements**		**---**
N.4.1	Material comply with IEC 60085 and IEC 60216 series		N/A
N.4.2	Solid insulation		---
	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		---
	- 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)		---
	Electric strength test after mandrel test:		---
	- 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**		---
O.6	**Marking**		**---**
	Marking according clause 7 (7)	Not built-in	N/A
	Special symbol		N/A
	Meaning of the special symbol explained in catalogue		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
O.7	**Protection against accidental contact with live parts**		**---**
	Requirements of clause 8 (10)		N/A
	Test finger not possible to make contact with basic insulated metal parts		N/A
O.8	**Terminals**		**---**
	Clause 9 (8)		N/A
O.9	**Provision for earthing**		**---**
	Functional earthing terminals comply with clause 9 of part 1		N/A
	No protective earthing terminal		N/A
O.10	**Moisture resistance and insulation**		**---**
	Clause 11 (11)		N/A
O.11	**Electric strength**		**---**
	Clause 12 (12)		N/A
O.13	**Fault conditions**		**---**
	Clause 14 (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**		**---**
	Clause 16 (15)		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**		**---**
	Clause 17 (16)		N/A
	Comply with corresponding values for luminaries in IEC 60598-1		N/A
O.16	**Screws, current-carrying parts and connections**		**---**
	Clause 18 (17)		N/A

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Clause	Requirement + Test	Result - Remark	Verdict

O.17	**Resistance to heat and fire**		**---**
	Clause 19 (18)		N/A
O.18	**Resistance to corrosion**		**---**
	Clause 20 (19)		N/A

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Clause	Requirement + Test	Result - Remark	Verdict

	ANNEX 1: components	---

object/part No.	code	manufacturer/ trademark	type/model	technical data	standard	mark(s) of conformity
Screw terminals	C	Camden Boss	CTB9350/4A0, CTB9350/2A0, CTB9208/2, CTB9208/4	12A, 320V, T110	EN 60998 UL 1059	IMQ, UL
Transformer T1	C	Ole Wolff International	OWTR – 16484	1.45mH	EN 61347-2-11	Tested in product
Transformer T2	C	Ole Wolff International	OWTR - 16448	1.25mH	EN 61347-2-11	Tested in product
Fuse FS1	C	Cooper Bussmann	ETF-800mA	250V, 800mA	EN 60127	VDE
Fuse FS2, FS3	C	Schurter	UMT 250	250VAC, 800mA	EN 60127	VDE
Capacitor C1	C	WIMA	MKP-X2	250V, 100nF	EN 132400 IEC 60384 UL 1414	ENEC 10, CQC, UL
Capacitor C2	C	EPCOS	B43858	400V, 4.7µF	IEC 60384	Tested in product
Capacitor C3	C	WIMA	MKP-X2	250V, 330nF	IEC 60384 UL 1414	ENEC 03, CQC, UL
Capacitor C4, C6, C7, C8	C	Murata	JY222M	250V, 2.2nF	EN 60065, IEC 60384, I UL 1414, E384	BSI, VDE, UL, CSA
PCB	C	Isola	Duraver E-Cu 104	UL94-V0	EN 60249-2-5 UL94	VDE, UL

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

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Clause	Requirement + Test	Result - Remark	Verdict

	ANNEX 2: screw terminals (part of the controlgear)	---

(14)	**SCREW TERMINALS** (IEC 60598-1)		---
(14.2)	Type of terminal	Pillar plug terminal	—
	Rated current (A)	8A	—
(14.3.2.1)	One or more conductors		N/A
(14.3.2.2)	Special preparation		P
(14.3.2.3)	Terminal size	2	P
	Cross-sectional area (mm²)	2.5mm^2	P
(14.3.3)	Conductor space (mm)	2.13mm	P
(14.4)	Mechanical tests		---
(14.4.1)	Minimum distance		P
(14.4.2)	Cannot slip out		P
(14.4.3)	Special preparation		P
(14.4.4)	Nominal diameter of thread (metric ISO thread) .	M3	P
	External wiring		P
	No soft metal		P
(14.4.5)	Corrosion		P
(14.4.6)	Nominal diameter of thread (mm).....	2.5mm	P
	Torque (Nm)	0.2Nm	P
(14.4.7)	Between metal surfaces		P
	Lug terminal		N/A
	Mantle terminal		N/A
	Pull test; pull (N)	50N	P
(14.4.8)	Without undue damage		P

IEC 61347-2-11			
Clause	Requirement + Test	Result - Remark	Verdict
	ANNEX 3: screwless terminals (part of the controlgear)		---
(15)	**SCREWLESS TERMINALS** (IEC 60598-1)		---
(15.2)	Type of terminal ..... :	No screwless terminals	—
	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
(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)	Terminals and connections for internal wiring		---
(15.5.1)	Mechanical tests		---
(15.5.1.1.1)	Pull test spring-type terminals (4 N, 4 samples)….:		N/A
(15.5.1.1.2)	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
(15.6)	Electrical tests		---
	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

IEC 61347-2-11			
Clause	Requirement + Test	Result - Remark	Verdict

(15.7)	Terminals external wiring										N/A
	Terminal size and rating										N/A
(15.8.1)	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
(15.9)	Contact resistance test										---
	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										
	Voltage drop after 10th alt. 25th cycle										
	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										
	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										
	Max. allowed voltage drop (mV) ..... :										—
terminal	1	2	3	4	5	6	7	8	9	10	
voltage drop (mV)											
	Continued ageing: voltage drop after 50th alt. 100th cycle										
	Max. allowed voltage drop (mV) ..... :										—
terminal	1	2	3	4	5	6	7	8	9	10	
voltage drop (mV)											

IEC61347_2_11B - ATTACHMENT			
Clause	Requirement + Test	Result - Remark	Verdict

ATTACHMENT TO TEST REPORT IEC 61347-2-11
EUROPEAN GROUP DIFFERENCES AND NATIONAL DIFFERENCES

Part 2: Particular requirements

Section Eleven – Miscellaneous electronic circuits used with luminaires

Differences according to.....:	EN 61347-2-11:2005 used in conjunction with EN 61347-1:2008
Attachment Form No.....:	EU_GD_IEC61347_2_11B
Attachment Originator .....:	IMQ SpA
Master Attachment.....:	Date 2009-10

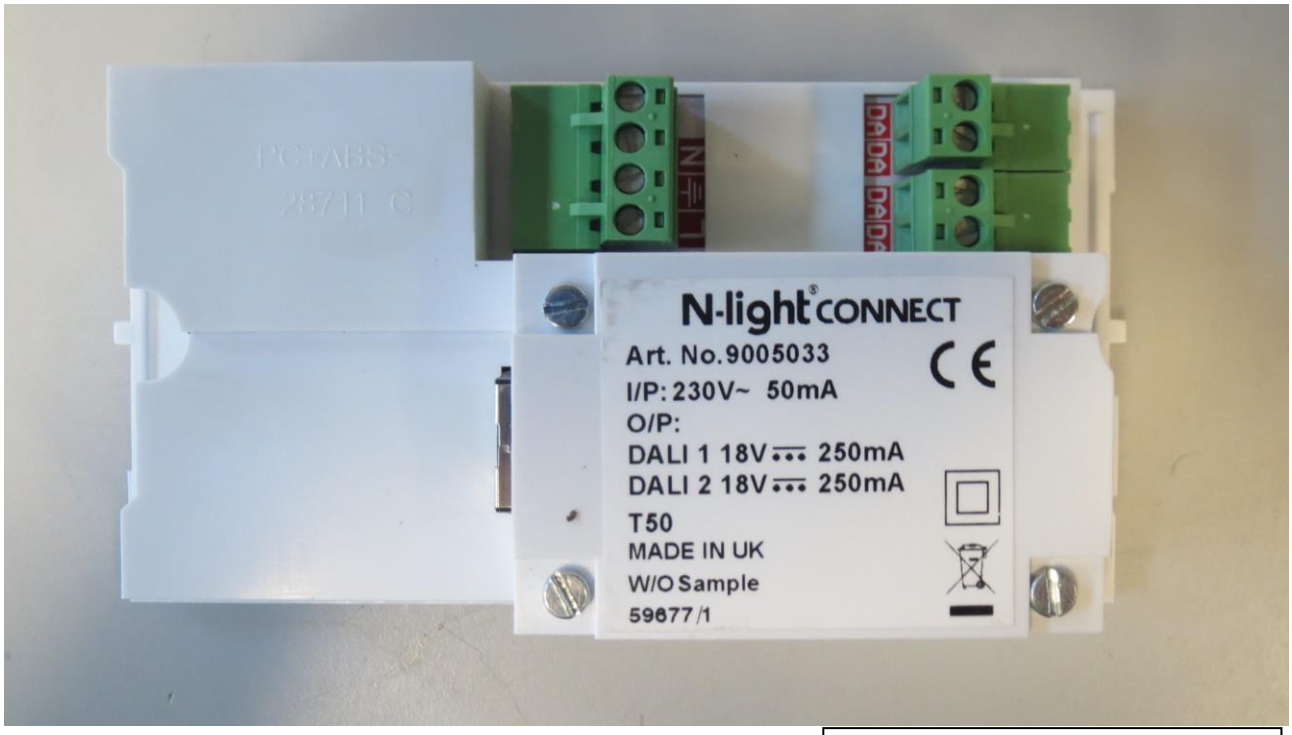
(16)	**CREEPAGE DISTANCES AND CLEARANCES**					**---**
	Minimum distances for a.c. (50/60 Hz) sinusoidal voltages					**---**
RMS working voltage (V) not exceeding	50	150	250	500	750	1000
1 minimum distances between live parts of different polarity. Specify the value measured.	N/A	N/A	8.8	N/A	N/A	N/A
2 minimum distances between live parts and accessible parts which are permanently fixed to the lamp control gear, including screws or devices for fixing covers or fixing the lamp control gear to its support. Specify the value measured.	N/A	N/A	3.5	N/A	N/A	N/A
3 minimum distances for ballasts declared protected against accidental contact between live parts and the outer accessible surface of insulating parts	N/A	N/A	N/A	N/A	N/A	N/A
- required creepage distances (mm), Basic insulation PTI ≥ 600	0,6	0,8	1,5	3	4	5,5
- required creepage distances (mm), Basic insulation PTI < 600	1,2	1,6	2,5	5	8	10
- required creepage distances (mm), Supplementary insulation PTI ≥ 600	-	0,8	1,5	3	4	5,5
- required creepage distances (mm), Supplementary insulation PTI < 600	-	1,6	2,5	5	8	10
- required creepage distances (mm), Reinforced insulation	-	3,2	5	6	8	11
1 minimum distances between live parts of different polarity. Specify the value measured.	N/A	N/A	8.8	N/A	N/A	N/A

IEC61347_2_11B - ATTACHMENT			
Clause	Requirement + Test	Result - Remark	Verdict

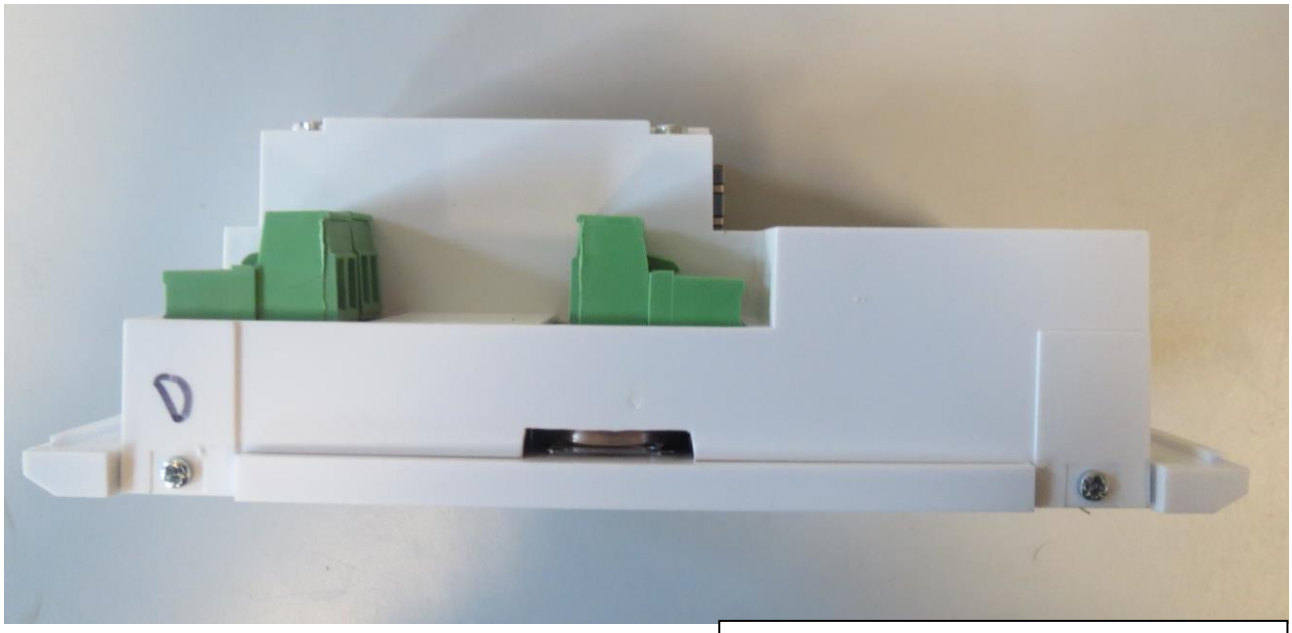
2	minimum distances between live parts and accessible parts which are permanently fixed to the lamp control gear, including screws or devices for fixing covers or fixing the lamp control gear to its support. Specify the value measured.	N/A	N/A	3.1	N/A	N/A	N/A
3	minimum distances for ballasts declared protected against accidental contact between live parts and the outer accessible surface of insulating parts	N/A	N/A	N/A	N/A	N/A	N/A
	- required clearance distances (mm), Basic insulation	0,2	0,8	1,5	3	4	5,5
	- required clearance distances (mm), Supplementary insulation	-	0,8	1,5	3	4	5,5
	- required clearance distances (mm), Reinforced insulation	-	1,6	3	6	8	11

Photographs of product:

Front view of 9005033 N-light panel

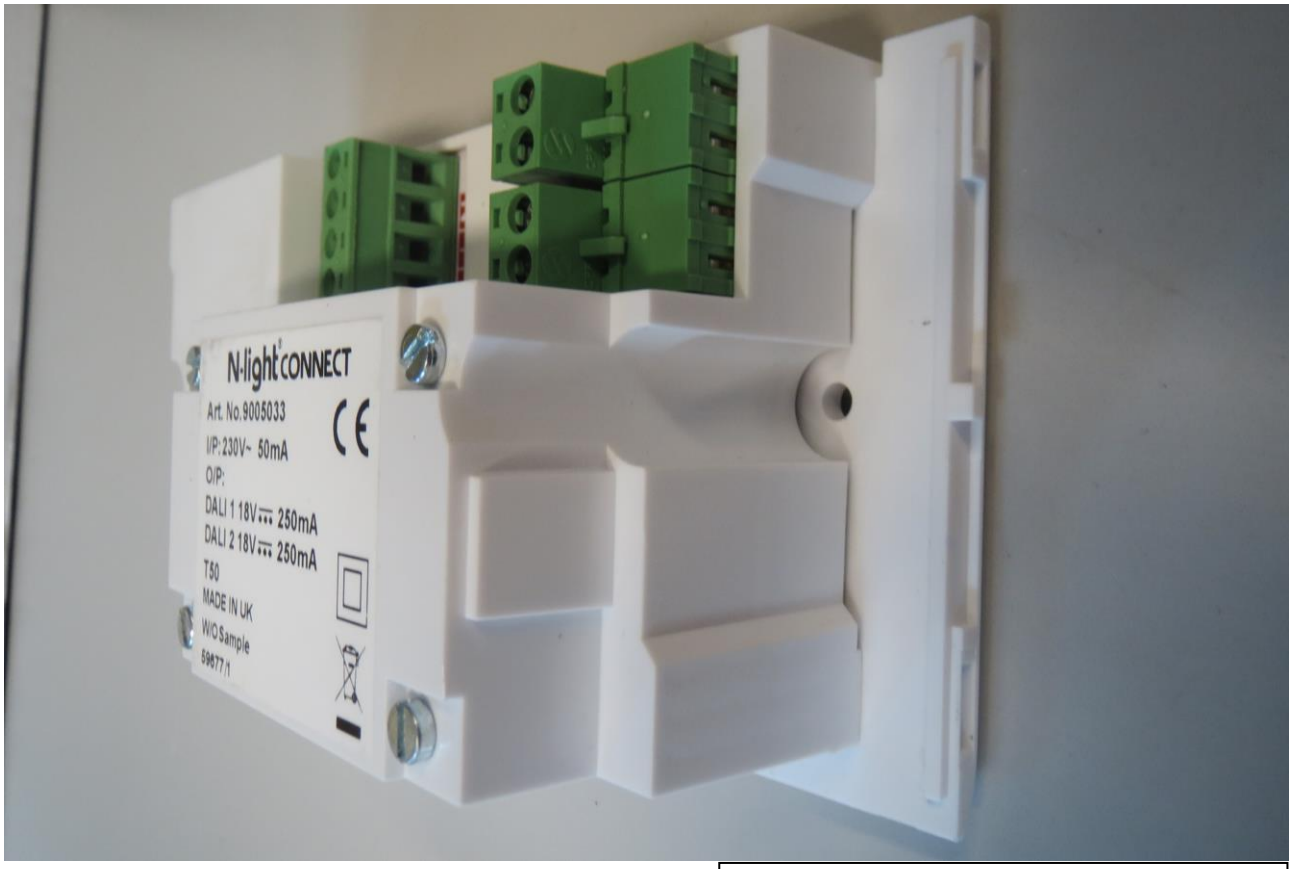


Rear view of 9005033 N-light panel

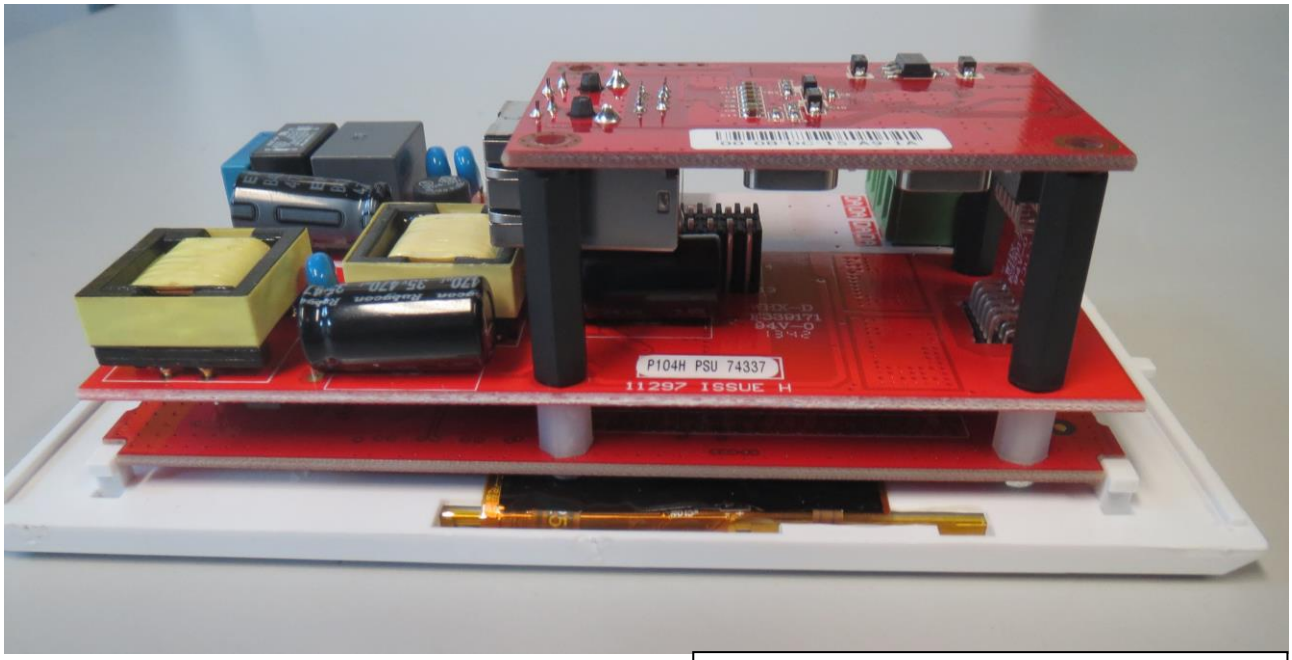


Terminal side view of 9005033 N-light panel

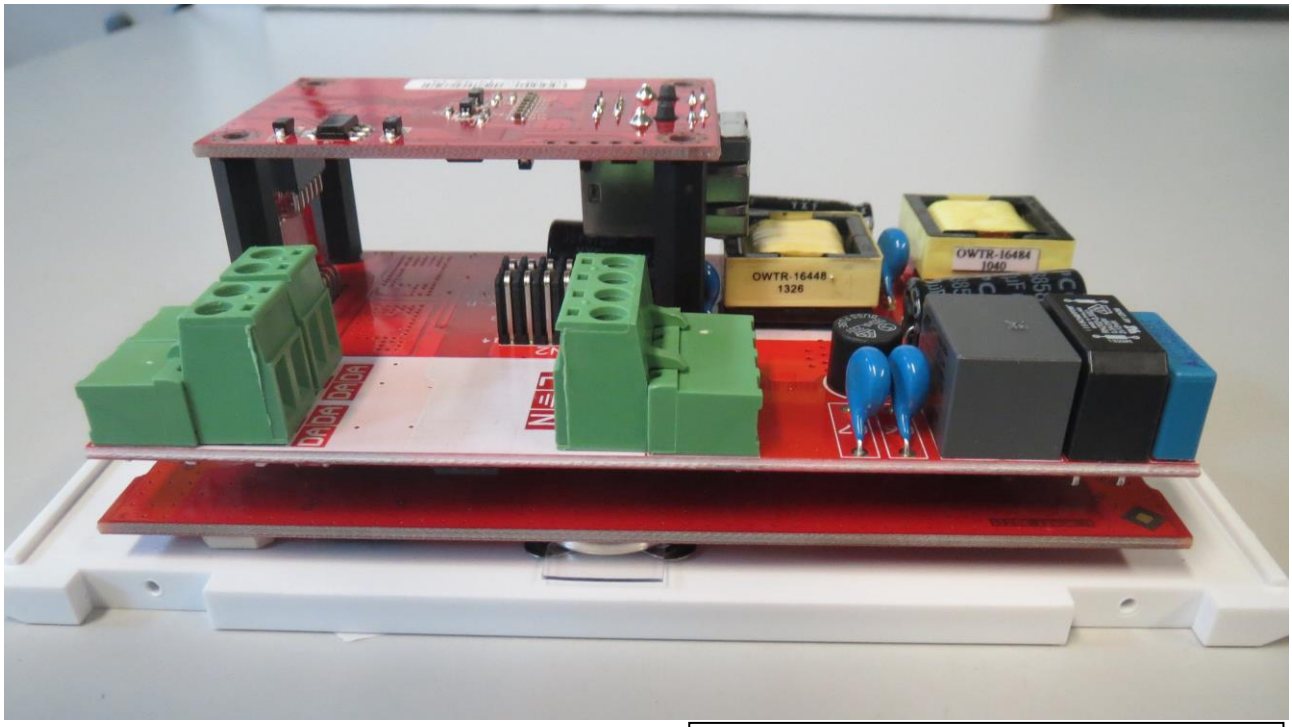
Bottom side view of 9005033 N-light panel



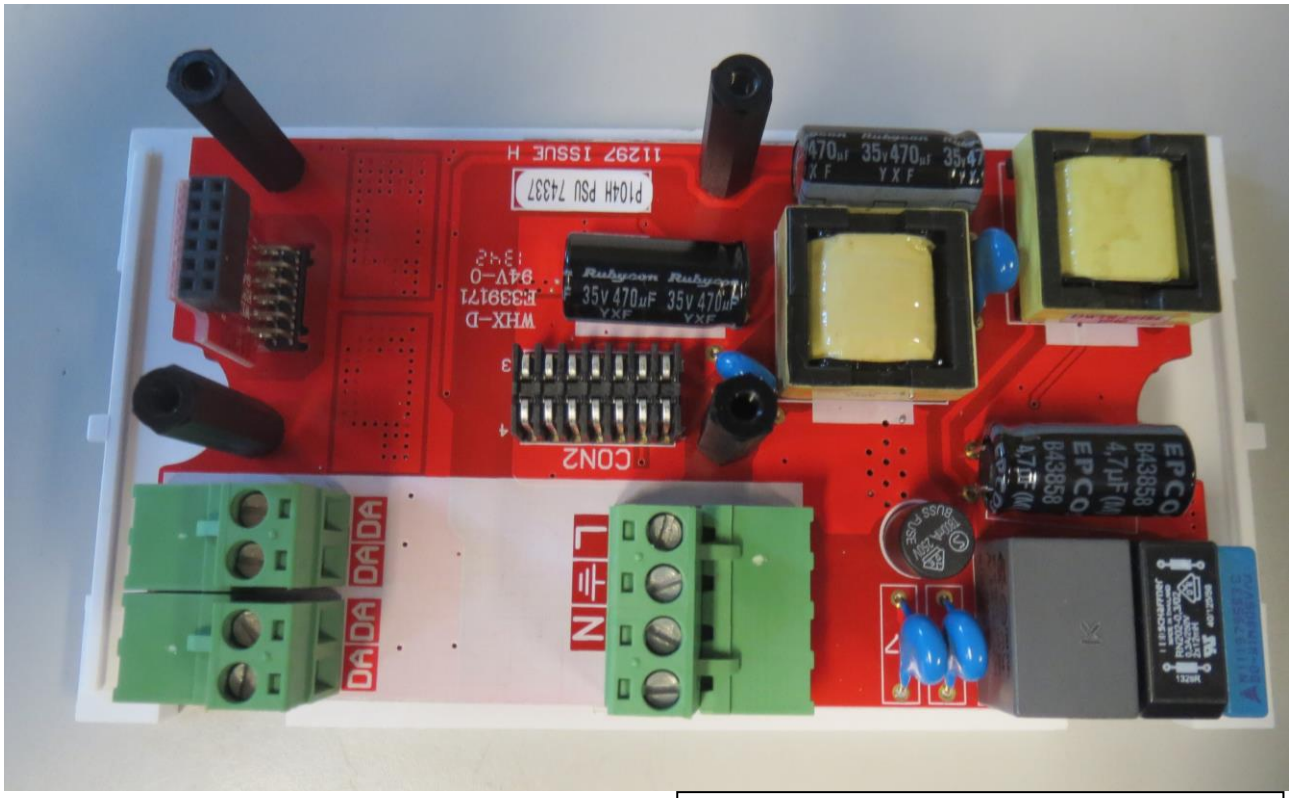
Terminal end view of 9005033 N-light panel



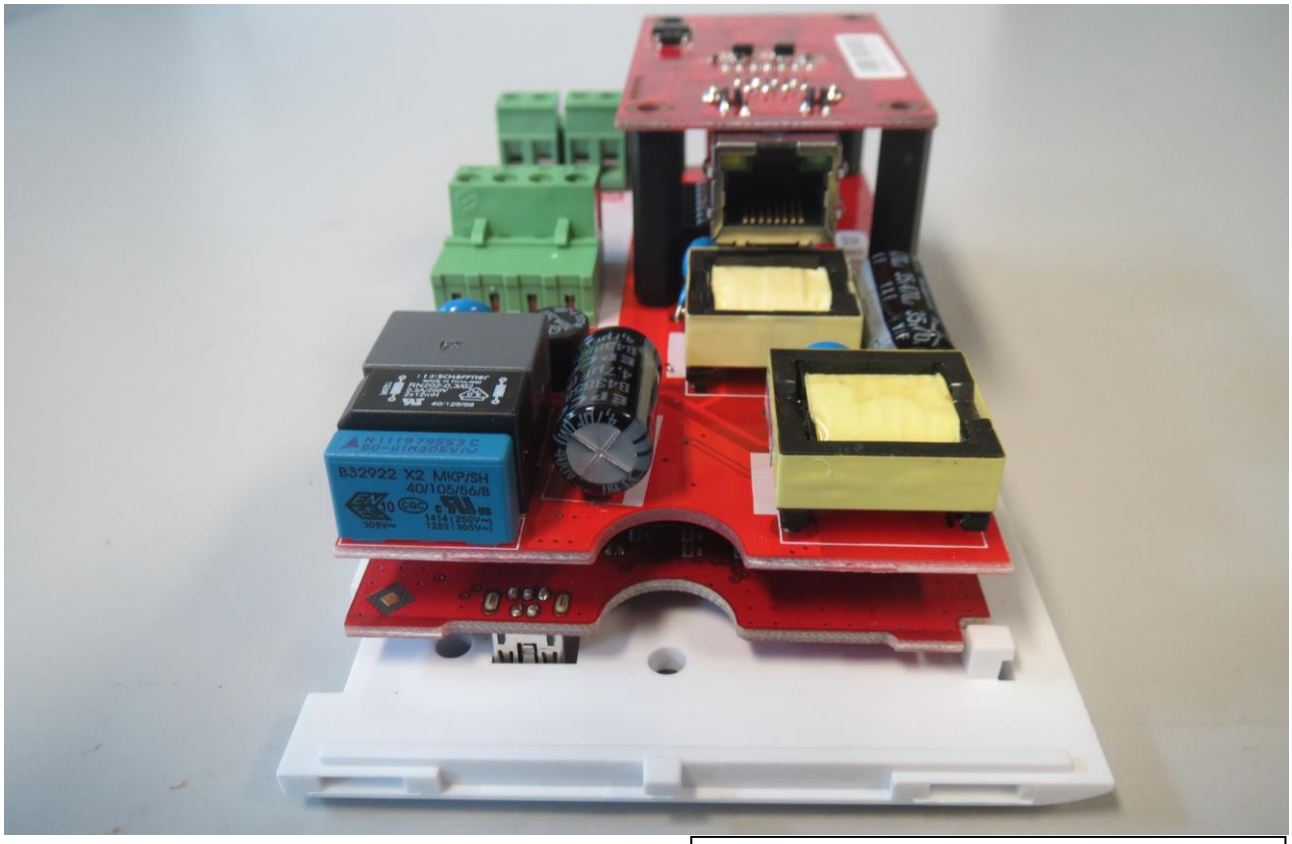
PCB stack side view of 9005033 N-light panel



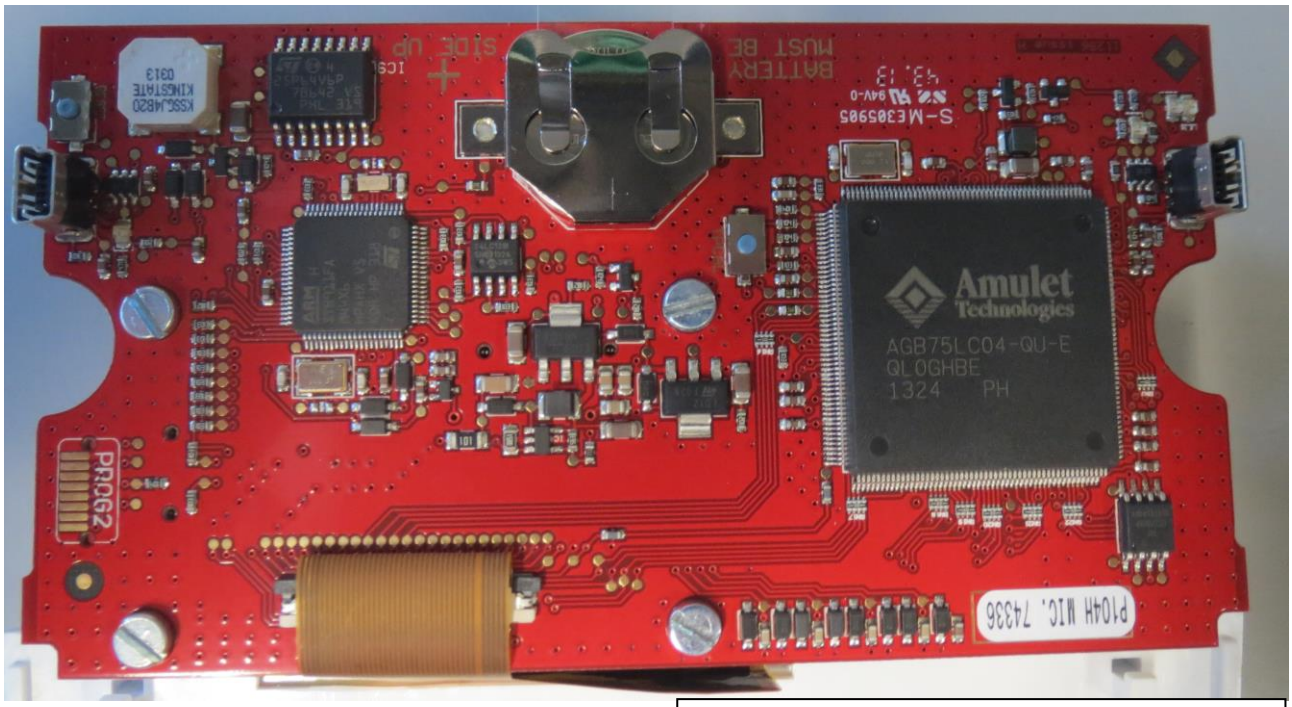
PCB stack side view of 9005033 N-light panel



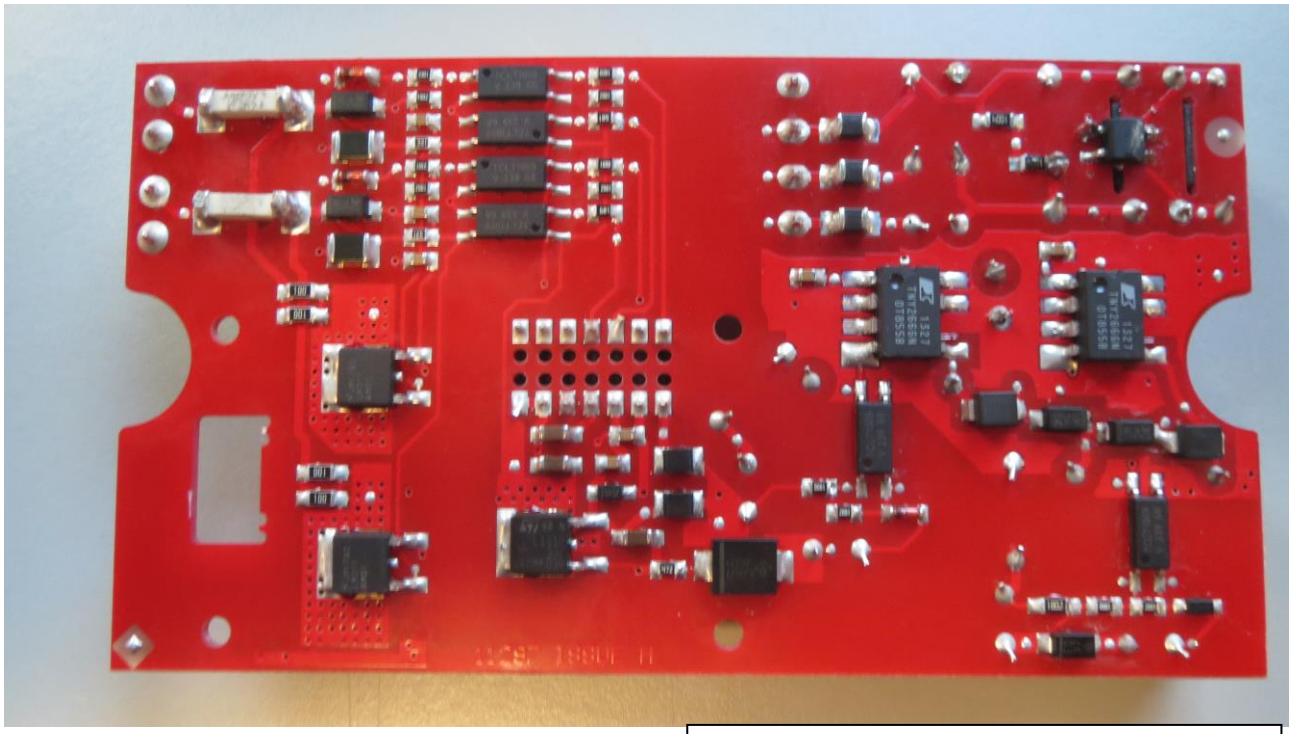
Mains PCB top view of 9005033 N-light panel



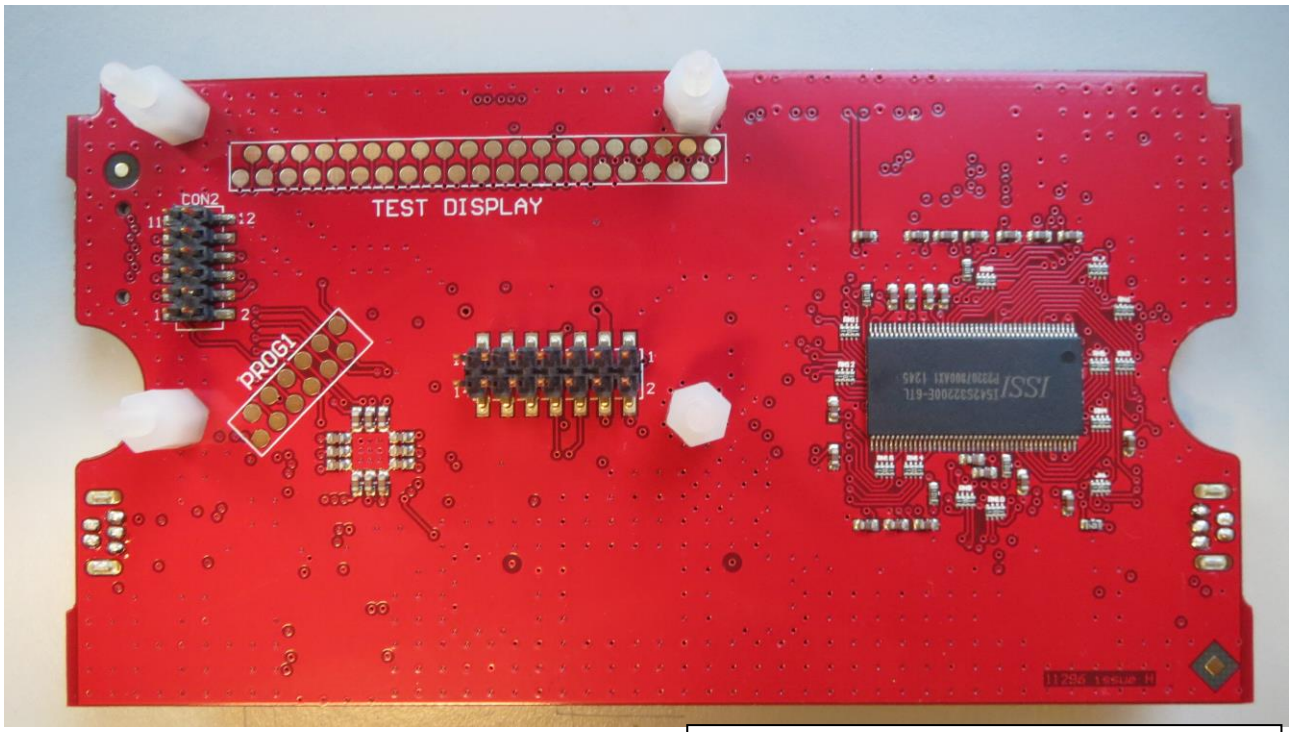
PCB stack end view of 9005033 N-light panel



Bottom PCB rear view of 9005033 N-light panel

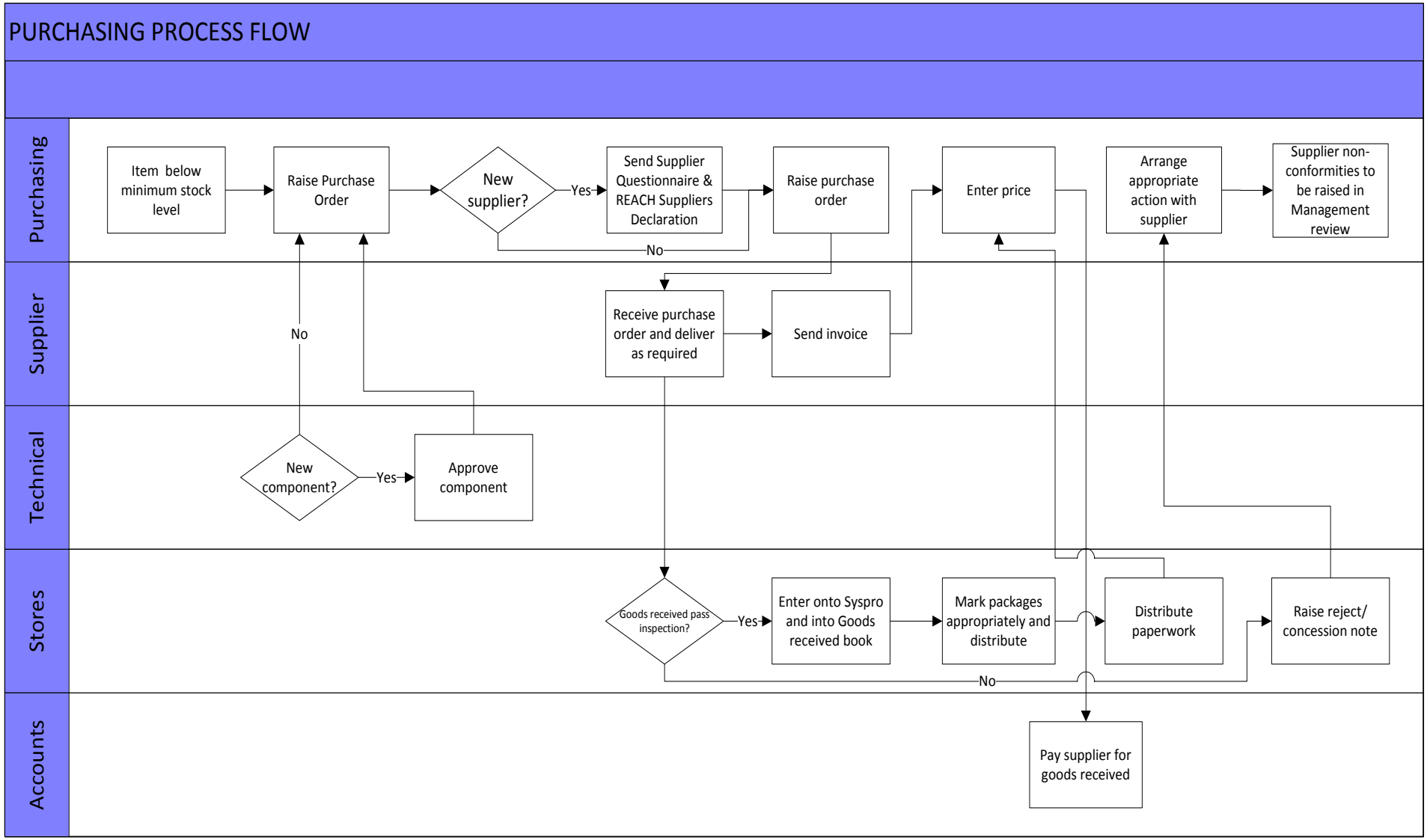


Mains PCB rear view of 9005033 N-light panel



Bottom PCB top view of 9005033 N-light panel

	Title: Purchasing Process Flow	Process Number:	PUR003
		Revision:	6
	Area: Purchasing	Owner:	J. Carter
		Date of Issue:	30/03/2018



SUPPLIER ASSESSMENT FORM

Please return for the attention of Ms. J. Carter (Purchasing Assistant)
Mackwell Electronics Ltd
Vigo Place, Aldridge, Walsall, West Midlands, WS9 8UG, United Kingdom.

Company:	
Address:	
Post Code:	
Telephone Number:	
Fax Number:	
Person responsible for Quality:	
Position:	
Email Address:	

Does your company hold registration to BS EN ISO9001?	**Yes**		**No**	
If **YES** please provide Certificate Registration Number and accreditation body, e.g. BSI, Lloyds etc. If **NO** please identify if you intend to 'register' your Quality Management System in the near future.				
Does your company hold registration to BS EN ISO14001?	**Yes**		**No**	
If **YES** please provide Certificate Registration Number and accreditation body, e.g. BSI, Lloyds etc. If **NO** please identify if you intend to 'register' your Environmental Management System in the near future.				
Do any of your products have a limited shelf life?	**Yes**		**No**	
If yes, please give details, including any specific conditions that may apply such as temperature or maintenance etc.				
Does your company issue Certificates of Conformity upon request?	**Yes**		**No**	
Does your company agree to abide by the guidelines and principles as highlighted in the Mackwell Supplier Code of Conduct (shown below)?	**Yes**		**No**	
If **NO** please state which area of our Supplier Code of Conduct your company abstains from.				

MACKWELL ELECTRONICS LTD SUPPLIER CODE OF CONDUCT

INTRODUCTION

Our objective is to operate as a profitable and responsible manufacturer, whilst seeking to uphold social, ethical and environmental principles to our shareholders, customers, employees, suppliers and society as a whole.

Therefore, we wish to only work with reputable suppliers and that can produce goods for us in an ethically responsible way. This means lawfully, through fair and honest dealing, without exploitation of the people who made them, with decent working conditions and with regard to the environment. We will monitor these parameters, as part of our routine Supplier Approval process.

LEGAL COMPLIANCE

We expect all of our suppliers to comply with their national laws and regulations and to respect the fundamental International Labour Organisation (ILO) conventions and the Universal Declaration of Human Rights. Where the Code or national law addresses the same issue, the supplier is expected, as a minimum, to be in compliance with the applicable legal requirements of the country in which it operates.

HEALTH & SAFETY

We expect our suppliers to provide a safe and healthy environment for their employees in accordance with applicable local laws and regulations. Appropriate procedures should be in place to prevent accidents and injury to health occurring in the course of work or as a result of the operation of employer facilities. Suppliers should have a nominated senior management health & safety representative who monitors the facility's compliance with procedures.

REMUNERATION

Mackwell Electronics expects wages and benefits paid for a standard working week to meet, or exceed the national legal standards or industry benchmark standards, whichever is the higher.

WORKING HOURS

Suppliers are expected to comply with applicable local laws and industry standards on working hours. Suppliers should not, except in special circumstances or as permitted by local law, expect employees to work more than 48 hours per week and shall be provided with, on average, at least one day off every 7-day period.

FORCED LABOUR

We expect that our suppliers will not permit the use of any forced labour, whether in the form of prison labour, indentured labour, bonded labour or otherwise. Forced labour should be considered to include any work or service, which is extracted from any person under the threat of penalty for its non-performance and for which the worker does not offer himself or herself voluntarily.

CHILD LABOUR

We object to the employment of persons;

- Younger than 15 years of age, or 14 where the law of the country permits.
- Younger than the age for completing compulsory education where this is greater than 15 in the relevant Country.

In addition, employers must comply with all their local legal requirements for young workers, particularly those pertaining to hours of work, wages, health and safety and general working conditions. A young worker is defined as any worker over the age of a child as defined above and under the age of 18 years old. Child labour is not acceptable.

FREEDOM OF ASSOCIATION

We expect that our suppliers will not prevent employees and other workers from associating freely with any lawful workers' association or collective bargaining association. Where laws prohibit these freedoms, the supplier is encouraged to facilitate parallel means of association and bargaining.

HARASSMENT AND ABUSE

We expect that our suppliers will provide a safe workplace free from harassment, and they will not permit the use of monetary fines, corporal punishment or other forms of mental or physical abuse, coercion or intimidation. All disciplinary measures should be recorded.

ETHICS AND INTEGRITY

We expect that our suppliers will conduct business with integrity and communicate honestly regarding the nature of the products they supply.

DISCRIMINATION

We expect that our suppliers will not discriminate on race, caste, origin, religion, disability, gender, sexual orientation, union or political affiliation or age.

ENVIRONMENTAL

We encourage suppliers to have an Environmental Policy that is communicated to all employees and states the overall environmental objectives, a commitment to comply with local laws and a commitment to continuous improvement. Where practical, materials from sustainable and well-managed sources should be used. Suppliers should encourage recycling and take steps to minimise, and carefully dispose of, waste. We encourage the reduction of energy within our suppliers' processes.

COMMUNICATION

Suppliers are encouraged to take appropriate steps to ensure the provisions of this Code are communicated to their employees and their own supply chain. Suppliers are also encouraged to ensure that the principles referred to above are adopted and applied by their employees, suppliers, agents and contractors so far as reasonably possible.

I, …….. have read the above and confirm that this Company practices its business in compliance with the above code of conduct.

Name: …….. **Signature: ……**

Date: ……

INTERNAL VERIFICATION

Quality and Environmental Manager's acknowledgment

Accepted	Yes / No	**Date**	
Comments			

Materials Director's acknowledgment

Accepted	Yes / No	**Date**	
Comments			

NPI / Project Reference: P104 **Engineer(s): K. Bridgewater**

Report Details: **Date: 12/02/2014 (Harmonics 09/05/18)**

1 Preamble

This report details the performance of the Equipment Under Test listed in section 2, regarding;

A. Radio disturbance characteristics (emissions) of electrical lighting equipment to *EN 55015:2013+A1:2015* and

B. Harmonic current emissions and flicker requirements to *EN 61000-3-2:2014* & *EN 61000-3-3:2013*

These tests are performed for in-house pre-compliance verification to the following EC Directive(s):

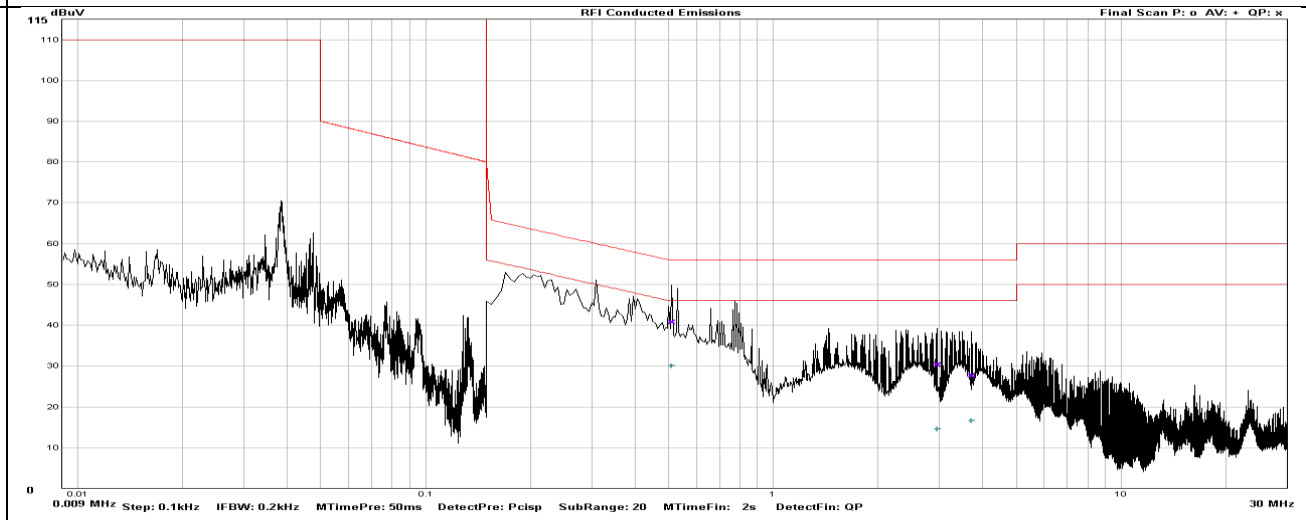
2014/30/EU Electromagnetic Compatibility Directive

2 Equipment Under Test / Build Specification

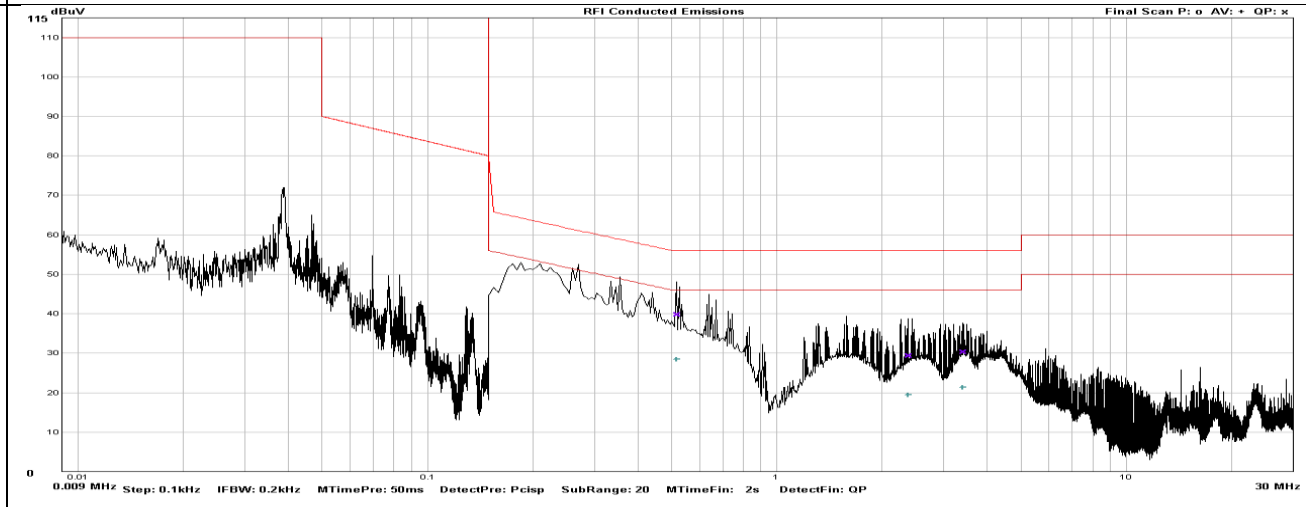
N Light Control Panel

3 Test Data

1 Conducted EMC Emissions

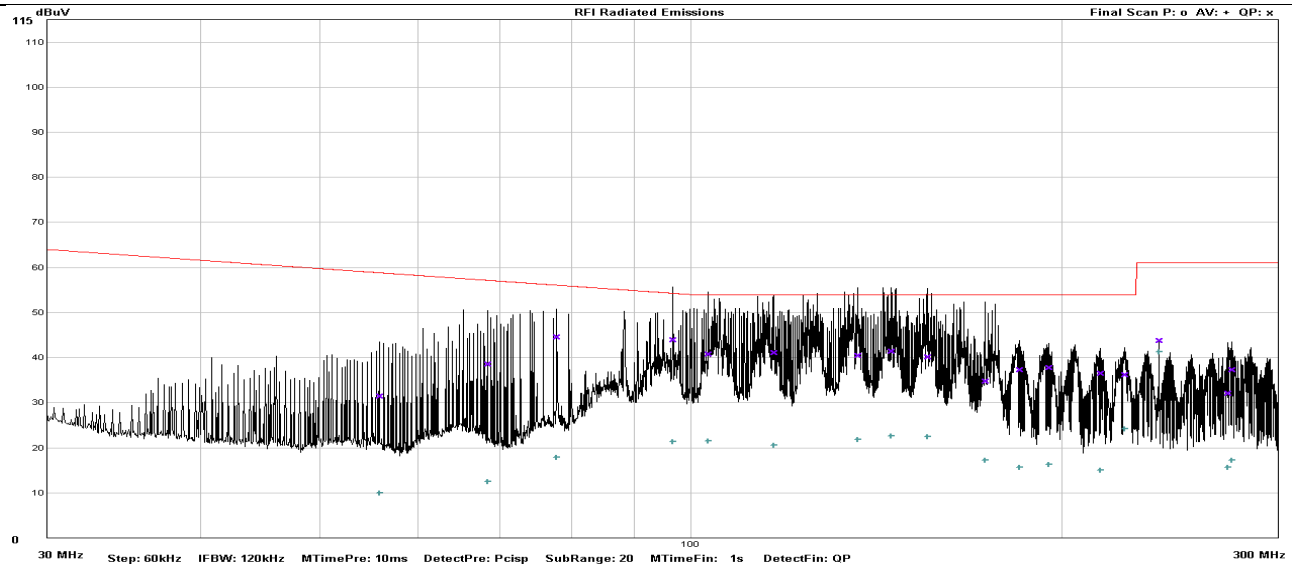


Live Pole Mains

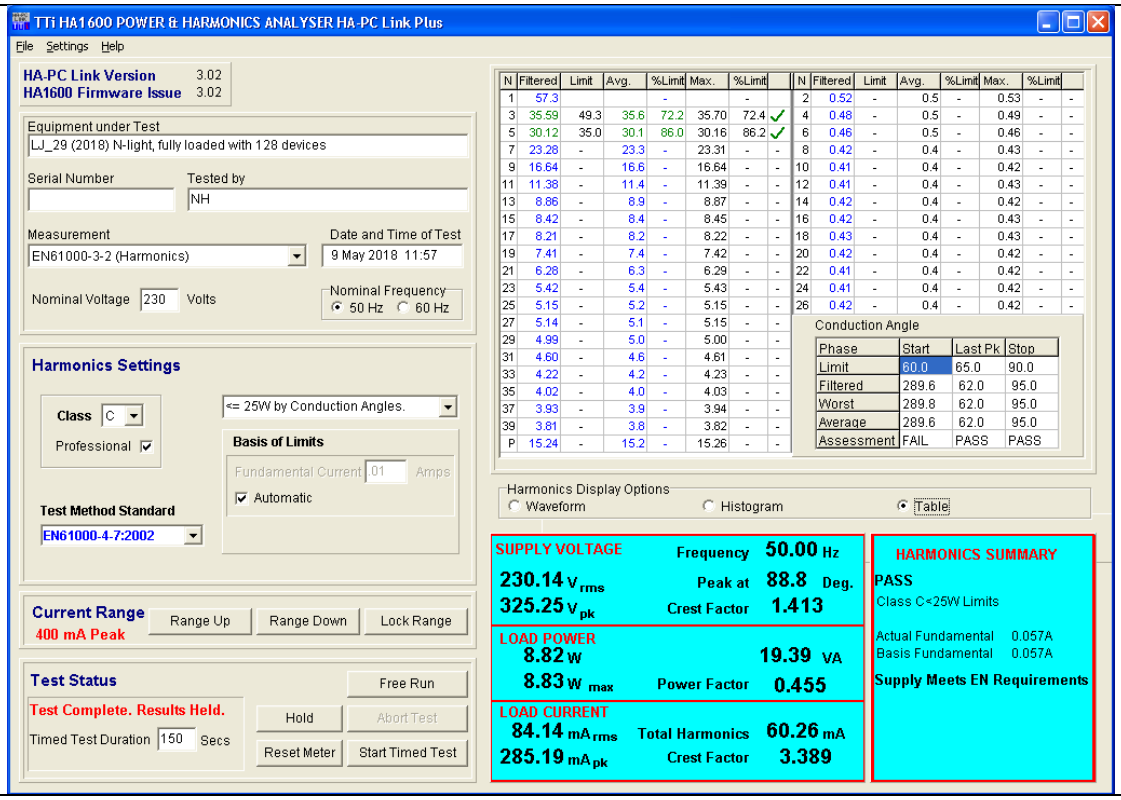


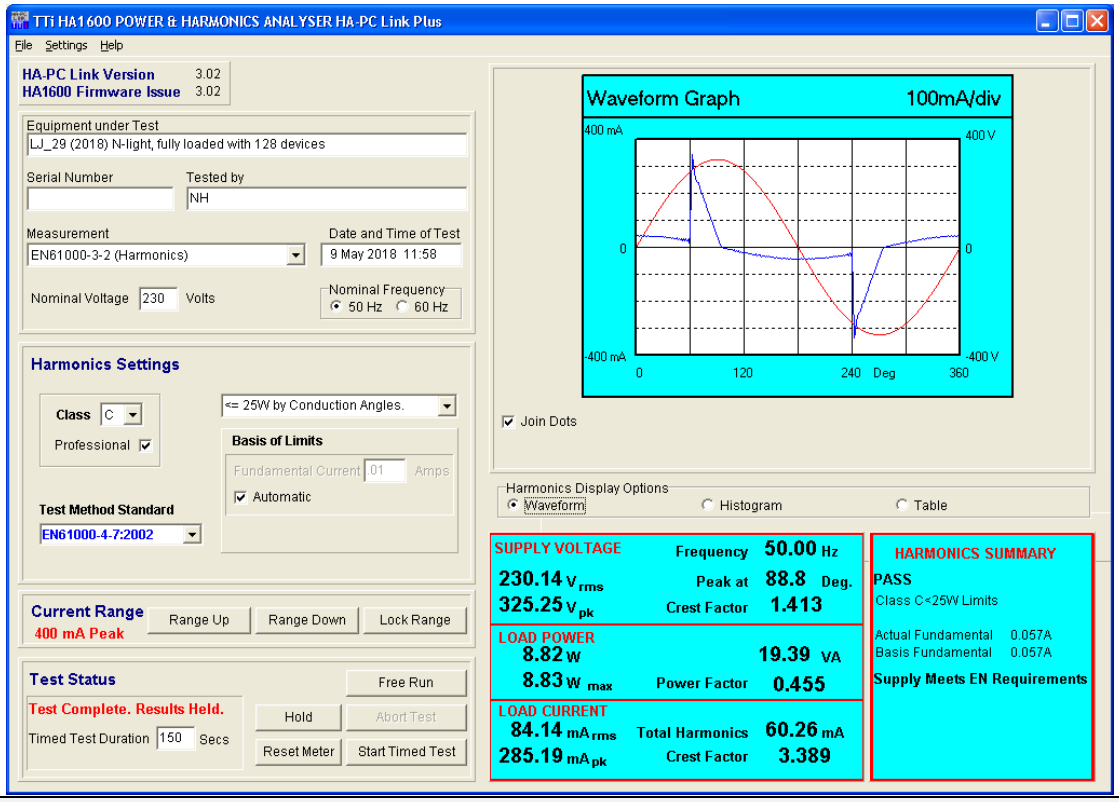
Neutral Pole Mains

2 Radiated EMC Emissions



3 Harmonics





4 Summary

Conducted & Radiated EMC Emissions: (PASS)
The equipment under test meets the requirements for RFI conducted emissions.
Any high quasi-peak levels are below the limits defined in the applicable standards.

Harmonic Current Emissions & Flicker: (PASS)
Low harmonic emissions of the fundamental mains frequency generated by the equipment under test is below the allowed values. Measurements show that the equipment under test meets the required specification in the applicable standards.

MACKWELL ELECTRONICS STATEMENT ON THE REACH REGULATION (1907/2006 EC)

The REACH regulations (EC) 1907/2006, article 59 (1, 10) and the updated candidate list published on 20/06/2013.

Our investigations and that of our suppliers declarations confirm that our products and packaging do not contain any of the substances from the updated candidate list, (20/06/2013), in concentrations above the 0.1% weight.

Excluded from this for the purposes of emergency use are nickel-cadmium batteries, (NiCd), which contain cadmium in a concentration of above 0.1% by mass.

Substance Name	EG – Nr.	CAS – Nr.
Cadmium	231 – 152 - 8	7440 – 43 - 9

The requirements in REACH regulations that apply to mackwell have been identified. We are considered as a downstream user, and regarding some articles as an importer according to the definitions of REACH. The registration of substances as such or in articles does not apply to us since substances in articles are not intended to release from articles. The substances we are using will be registered by our suppliers.

We set a high value on the safe use of chemical substances, and the instructions included in the safety data sheets of chemicals are strictly followed. The chemicals we use are commonly used in many industrial sectors.

We have required our raw material and component suppliers to provide us information on relevant chemicals in their supplied products. This enables us to provide information about restricted dangerous substances (Reach Annex XVII) or substances of very high concern (SVHC) for our customers.

Based on information provided by our suppliers all mackwell products comply with substance restriction requirements described in REACH Annex XVII.

Based on our current knowledge and current supplier information, no substances of very high concern **(SVHCs**), excluding cadmium, (exempt), are exceeding the defined threshold limit for reporting. Current list of SVHCs is available on the website of the European Chemicals Agency (http://echa.europa.eu/).

John Allsopp
QCI Manager
Mackwell

January 2018