AWL
AIRCRAFT WARNING LIGHT

LIOL-B TYPE

OPERATION AND MAINTENANCE MANUAL

COMBUSTION AND ENERGY SRL
Via per Dolzago 21, 23848 – Oggiono (LC) – Italy – Ph. +39 0341.260926 – E-mail: info@luxsolar.com / info@ce2k.com - Web: www.luxsolar.com / www.ce2k.com

INDEX:

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LUXSOLAR - AERONAUTICAL LIGHTING

1) LIOL-B DATASHEET, ORDERING CODE, WEIGHT AND DIMENSIONS

AIRCRAFT WARNING LIGHTS

LOW INTENSITY OBSTRUCTION LIGHT
LIOL - A / LIOL - B

AWL - LIOL

LXS® LUXSOLAR®

rev_01

COMBUSTION AND ENERGY - info@luxsolar.com - www.luxsolar.com - Ph. +39.0341.260926

AIRCRAFT WARNING LIGHTS

LIOL - A / LIOL - B

KEY FEATURES

- Based on LED technology
- RED steady burning light
- >10 cd LIOL - A
- >32 cd LIOL - B
- Long life time >10+ years life expectancy
- Low consumption
- Stabilised light output
- Lightweight and compact
- Low wind load factor
- Easy to install
- No RF-radiations
- Patented beacon (Germany 20 2011 107 787.3; France 1160162)

OPTICAL FEATURES

- Cd emission +6° and +10°
- Horizontal beam radiation 360°
- Vertical beam spread >10°
- Optical reflector

OPTIONS

- Twin version: two galvanically separate circuits in the same fixture
- Fault alarm
- Infrared available
- Beacon support bracket
- Automatic changeover from normal to backup light

ELECTRICAL FEATURES

- Power Supply AC or DC
- Power consumption LIOL-B: 4W
- LED feeded at costant current

MECHANICAL FEATURES

- Anodised aluminium body with heat-sink pins on the bottom
- Policarbonate UV Resistant Dome
- Silicon gasket
- Degree of protection: IP65
- Operating temperature: -25°C to +55°C
- Storage temperature: -25°C to +55°C
- Lamp unit weight: 0,6 Kg

APPLY TO

- Airport - Stack - High Building - Chimney - Tower crane
- Pipe line - Bridge - Radio and television tower
- Transmission line - Wind turbine - Wind mast measurement
- Radar - Antenna

INTERNATIONAL REGULATION

- ICAO Aerodromes -Annex 14 Volume 1, 6th Edition, July 2013 Chapter 6: Low intensity, Type A-B steady burning obstacle light
- FAA AC150/5345-43F E.B. #67 Lamp type L-810
- DGAC/STAC approval nr. 2013A048
- CE marking

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AIRCRAFT WARNING LIGHTS

LIOL - A / LIOL - B

Order code

L810-LXS-AR — [1] [2] [3] [4] – [5] [6] [7] – [8]

[1]
- ≥10cd = A
- ≥32cd = B
- Customer's request = U

[2]
- Base = B
- Junction Box = J
- Wall mounting & JB = W
- Side = S

[3]
- Standard = S
- Customized = L

[4]
- 24VDC = 0
- 12VDC = 1
- 12/24VDC = 2
- 24/48VDC = 3
- 115VAC = 4
- 230VAC = 5
- 115/230VAC = 6

[5]
- R = Red
- Y = Yellow
- G = Green
- W = White
- B = Blue

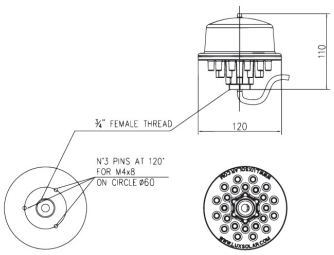
[6]
- 0 = Without twilight sensor and without alarm
- 1 = With twilight sensor and alarm
- 2 = With alarm and without twilight sensor
- 3 = With twilight sensor and without alarm

[7]
- S = Single light
- T = Twin light
- I = Visible light + infrared LEDs

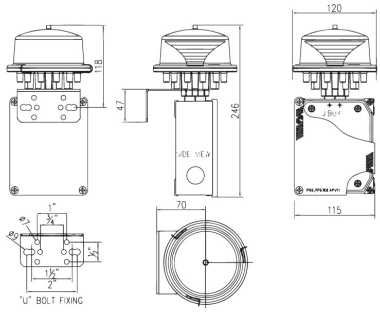
[8]
- Manufacturer code

Order Code 2

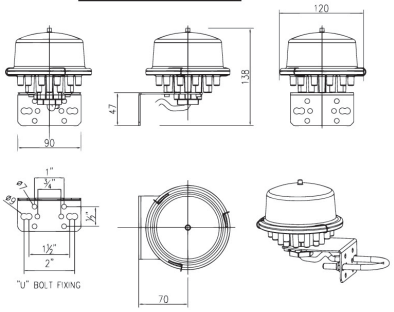
B = Base



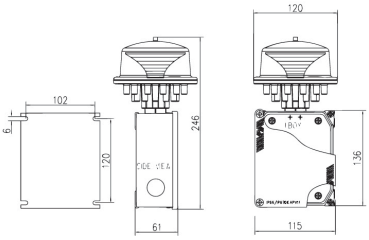
W = Wall Mounting and JB



S = Side Mounting



J = Junction Box



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2) OVERVIEW

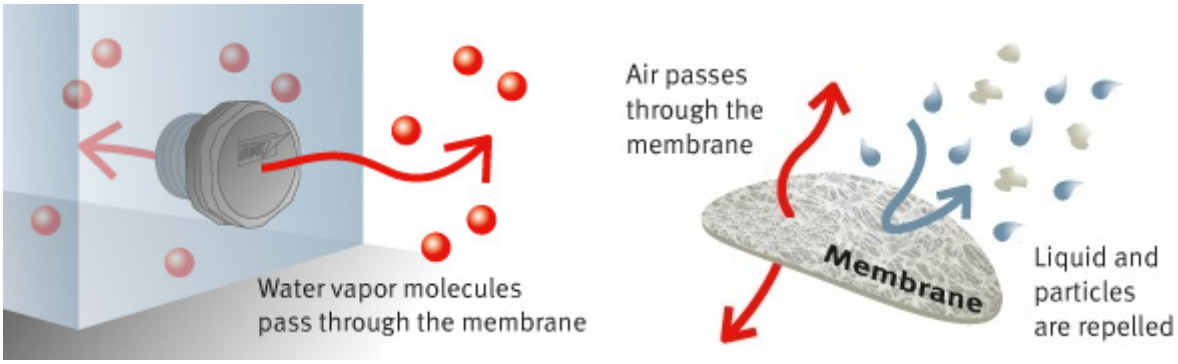
The beacons are pre-assembled in factory and can operate with their own power supply circuits.

The necessary power feed the beacon is 1/10 of the power needed for the same beacon incandescent type.

This manual has to be read and understood before doing maintenance on the system or doing the start-up.

For the system functioning and first start-up, please refer to document F.A.T. included in the data book.

Each lamp has a special breathing valve to prevent moisture presence. This device:
- Equalizes pressures to protect housing enclosures and seals;
- Prevent contamination to protect electronics;
- Reduce condensation to protect against corrosion.



3) ICAO RULES GENERAL CONCEPTS, TYPE OF LAMPS

Rules References:
- ICAO (International Standards and Recommended Practices), Annex 14, Aerodromes, Volume I, Aerodrome Design and Operations, 6th July 2013;
- ICAO Aerodrome Design Manual, Part 4, Visual AIDS, 4th edition 2004;
- ICAO Airport Service Manual, Part 9, Airport Maintenance Practices 1984, par. 2.6 Light Maintenance Procedure.

Aircraft Warning Light (AWL) beacons are designed in accordance with ICAO rules.
These rules define: optical characteristics, number to be installed and allowed configurations of the lights.

Please refer to the table below:

1	2	3	4	5	6	7
Light Type	**Colour**	**Signal Type/ (flash rate)**	**Peak intensity (cd) at given Background Luminance (b)**			**Light Distribution Table**
			Day (Above 500cd/m²)	**Twilight (50-500cd/m²)**	**Night (Below 50cd/m²)**	
Low-intensity, Type A (fixed obstacle)	Red	Fixed	N/A	N/A	10	Table 6-2
Low-intensity, Type B (fixed obstacle)	Red	Fixed	N/A	N/A	32	Table 6-2
Low-intensity, Type C (mobile obstacle)	Yellow/Blue (a)	Flashing (60-90 fpm)	N/A	40	40	Table 6-2
Low-intensity, Type D (follow-me vehicle)	Yellow	Flashing (60-90 fpm)	N/A	200	200	Table 6-2
Medium-intensity, Type A	White	Flashing (20-60 fpm)	20.000	20.000	2.000	Table 6-3
Medium-intensity, Type B	Red	Flashing (20-60 fpm)	N/A	N/A	2.000	Table 6-3
Medium-intensity, Type C	Red	Fixed	N/A	N/A	2.000	Table 6-3
High-intensity, Type A	White	Flashing (40-60 fpm)	200.000	20.000	2.000	Table 6-3
High-intensity, Type B	White	Flashing (40-60 fpm)	100.000	20.000	2.000	Table 6-3

* Document extract from ICAO Annex 14, Aerodromes, Volume I, Table 6-1. "Characteristics of obstacle lights" *

LUXSOLAR - AERONAUTICAL LIGHTING

ICAO defines three categories of lights:

- Low Intensity;
- Medium Intensity;
- High Intensity.

Differences between these categories are related to: luminous intensity, colours, steady burning or flashing mode and functioning during day and/or night.

Combinations of lights are possible, for example Medium Intensity Light Type AB: white flashing during daytime and red flashing during night-time.

When flashing lights are installed on a structure, they have to be synchronized.

4) LIOL-B BEACONS EMISSION TESTS

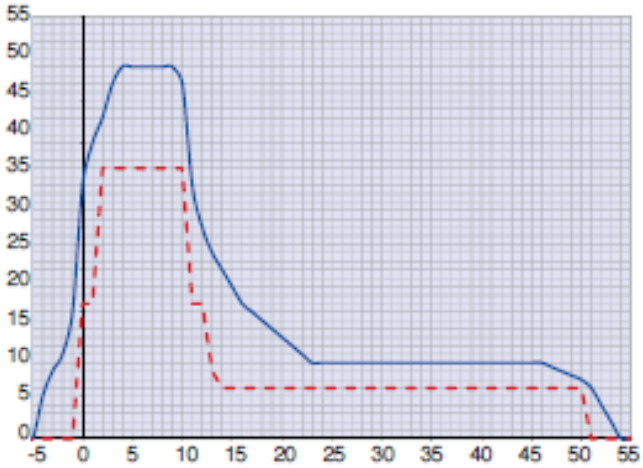
Low Intensity Obstruction Lights (LIOL) type B (with 360° radial emission), have the following intensity:

- Switch off during day time;
- 32cd red steady burning during night-time.

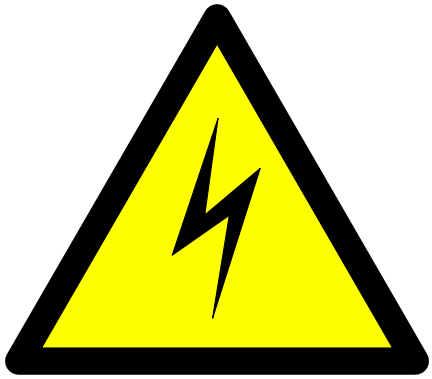
Reference code number: **L810-LXS-AR** (see datasheet page. 5)

Night mode (red steady burning):

	Minimum	*Maximum*
Measured Intensity (cd)	48	90



5) SAFETY NOTICE



DANGER - ELECTRICAL VOLTAGE

The AWL system associated with the supplied equipment uses 230VAC (as option 24VDC) and 170VDC voltage to supply the beacons. This voltage is present in the AWL panels and also inside the beacon.
In addition some components installed inside the AWL panel contain capacitors that will retain their charge for several minutes after the main power has been switched off.

To avoid risk of injury we recommend the following precautions:

- Maintenance should only be undertaken by qualified, experienced personnel, familiar with the equipment involved;
- After isolating the power supply wait at least 5 minutes before opening the panel. This allows the capacitors to drain their charge;
- Ensure the system is electrically isolated before attempting maintenance on cables.

DANGER – HIGH BRIGHTNESS

Do not look directly the light source (LED) during system functioning. Considering the high brightness of this source there is an high risk to be dazzled and/or to have temporary or permanent sight injury.
If during maintenance it will be necessary to leave the light on, it will be mandatory to use adequate protection glasses, for the whole time.

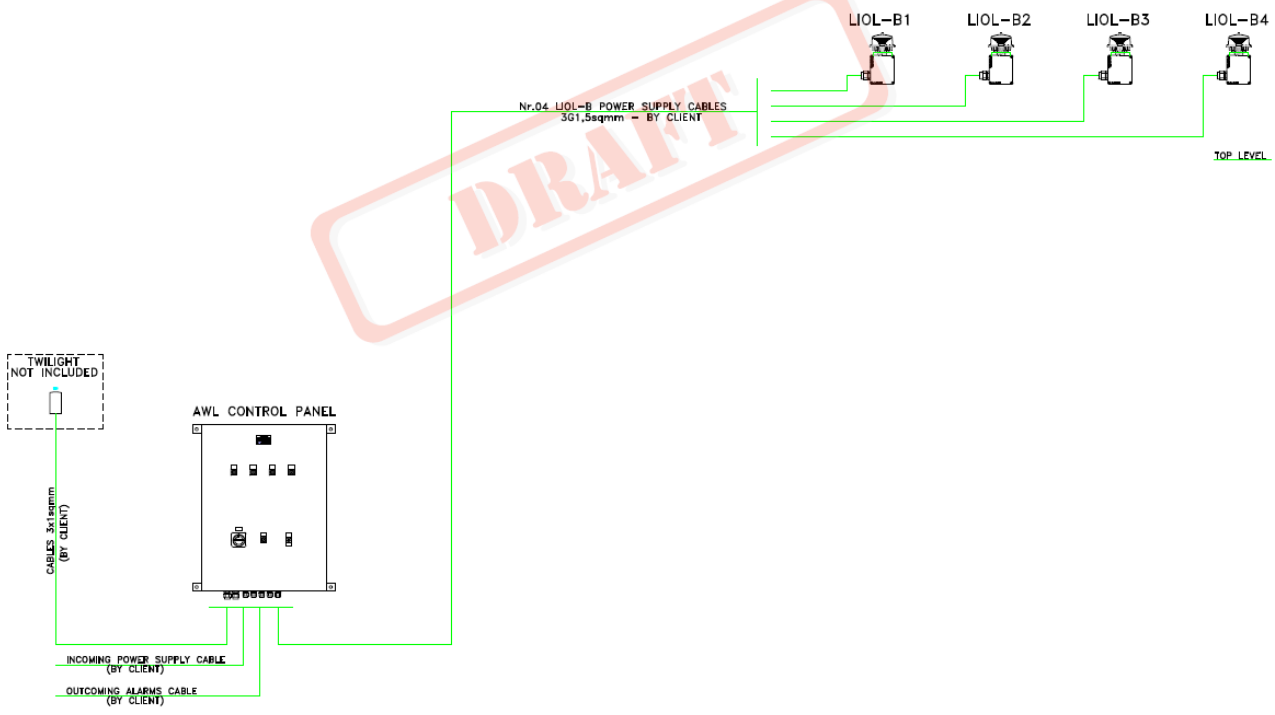
6) TYPICAL GENERAL LAYOUT AND SYSTEM DESCRIPTION

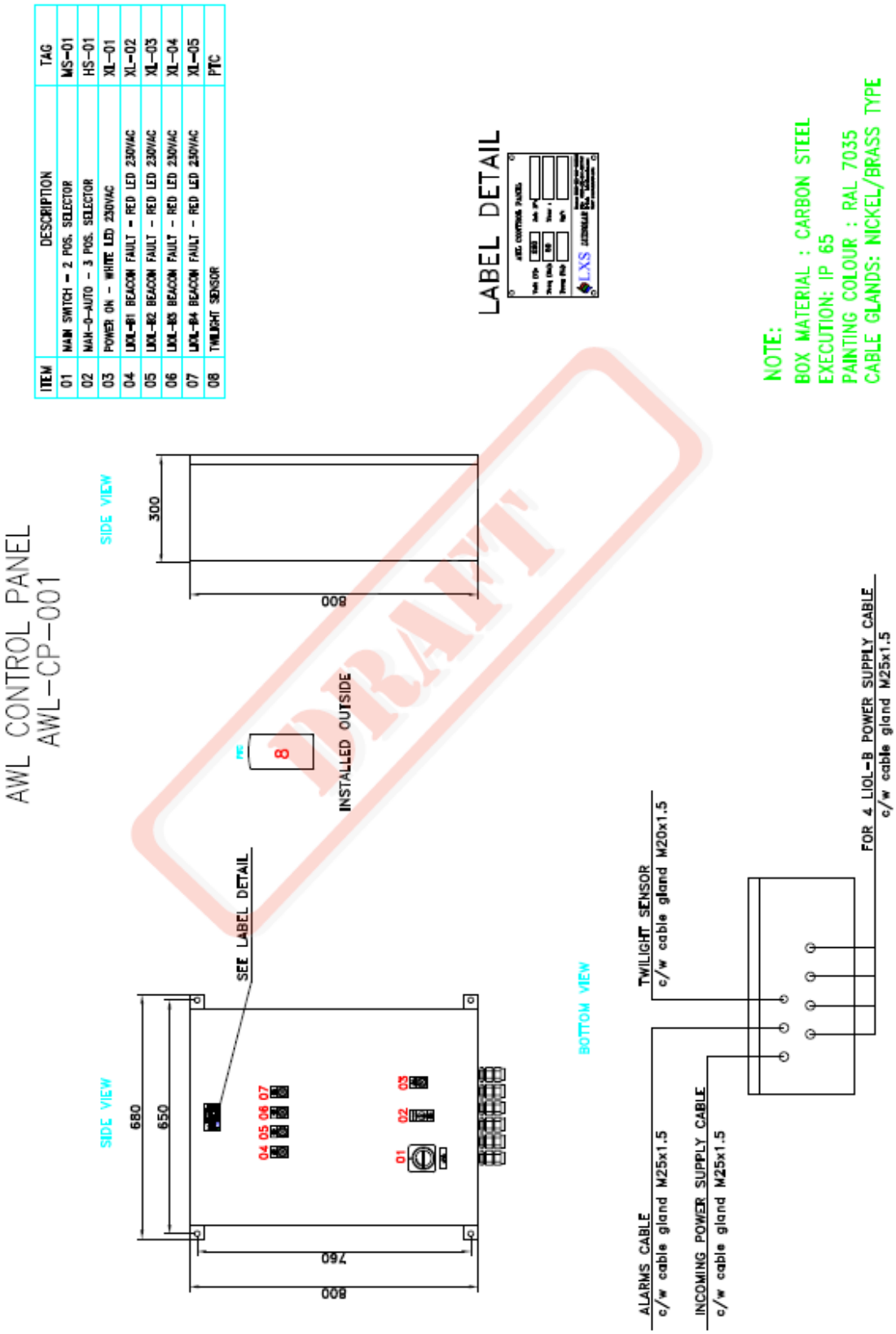
LIOL-B AWL system is used when the structure is higher or equal than 45m.
Lights are installed on the top of the MARKED structure and composed by the following material:

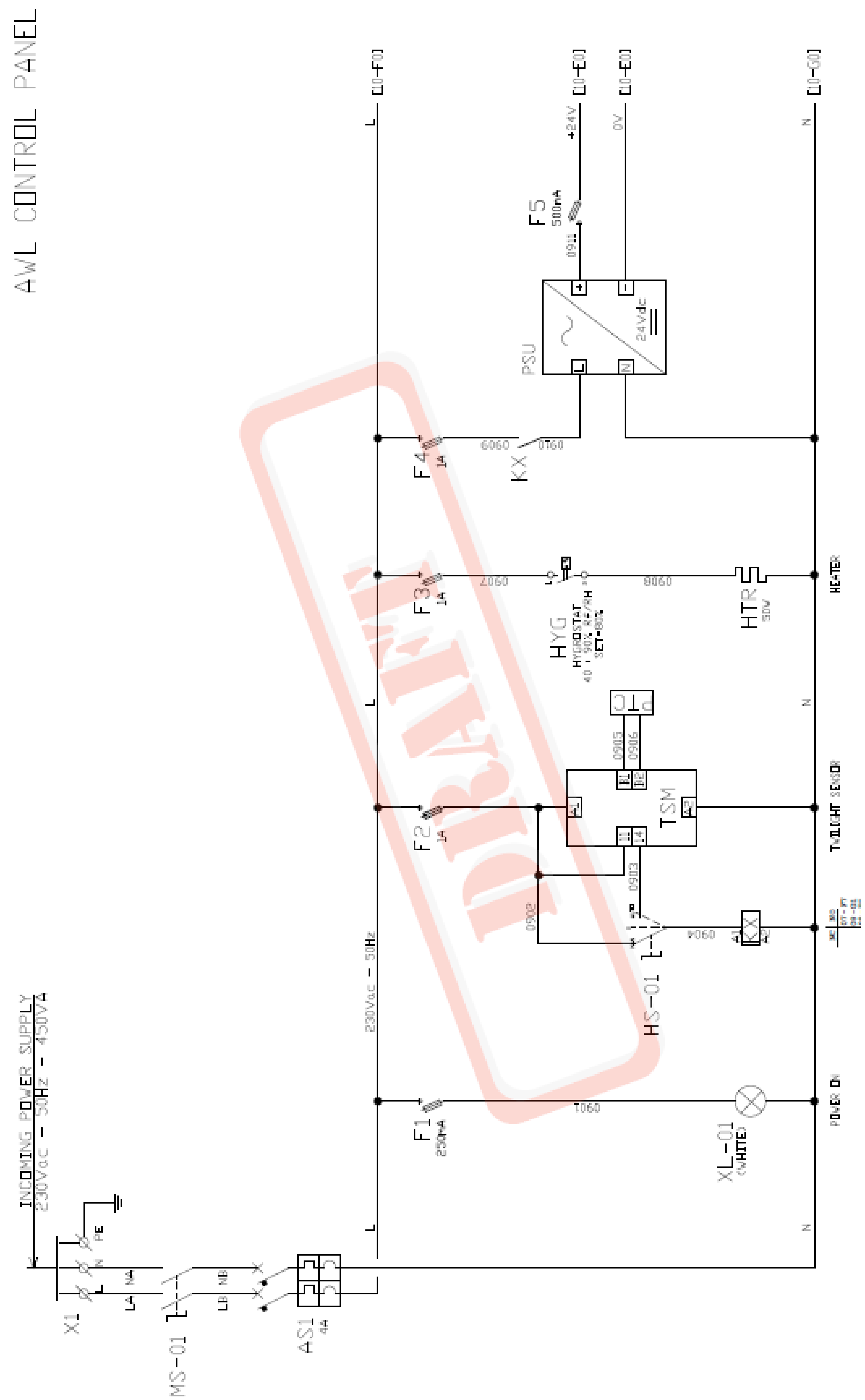
At base structure:
- Nr.01 Base AWL Panel;
- Nr.01 Twilight Sensor.

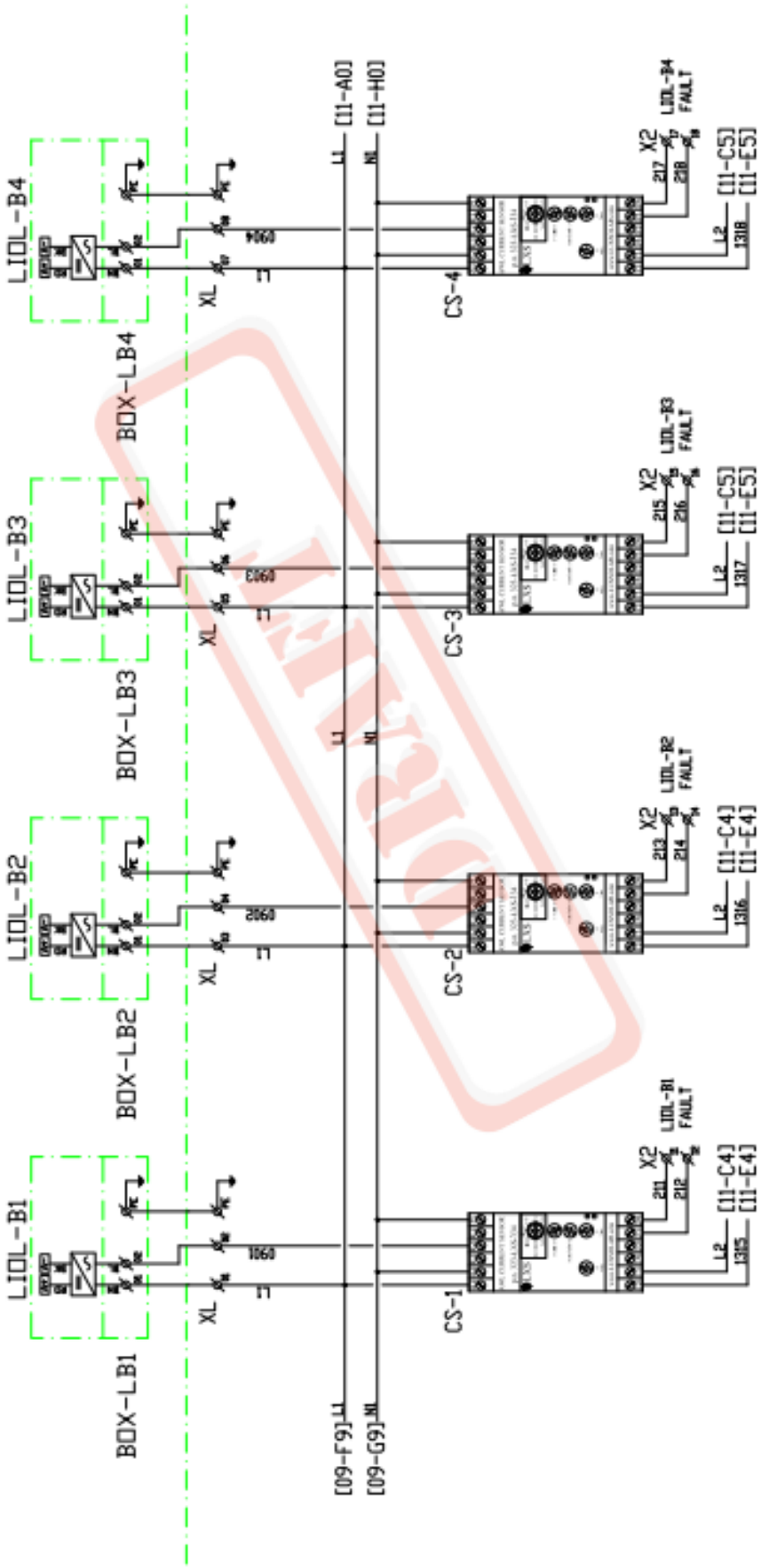
At top level:
- Nr.01 or 03 or 04 LIOL-B beacons (quantity depends on the shape and diameter of the structure).

In the next pages it is shown the typical interconnection diagram of the system. For further details please refer to the dedicated electrical drawing.




ITEM
DESCRIPTION
TAG
01 MAIN SWITCH – 2 POS. SELECTOR MS–01
02 MAN–0–AUTO – 3 POS. SELECTOR HS–01
03 POWER ON – WHITE LED 230VAC XL–01
04 LXOL–B1 BEACON FAULT – RED LED 230VAC XL–02
05 LXOL–B2 BEACON FAULT – RED LED 230VAC XL–03
06 LXOL–B3 BEACON FAULT – RED LED 230VAC XL–04
07 LXOL–B4 BEACON FAULT – RED LED 230VAC XL–05
08 TWILIGHT SENSOR PTC
LABEL DETAIL
NOTE:
BOX MATERIAL : CARBON STEEL
EXECUTION: IP 65
PAINTING COLOUR : RAL 7035
CABLE GLANDS: NICKEL/BRASS TYPE
AWL CONTROL PANEL
AWL–CP–001
SIDE VIEW
300
800
INSTALLED OUTSIDE
SEE LABEL DETAIL
SIDE VIEW
680
650
760
800
BOTTOM VIEW
TWILIGHT SENSOR
c/w cable gland M20x1.5
FOR 4 LIOL–B POWER SUPPLY CABLE
c/w cable gland M25x1.5
ALARMS CABLE
c/w cable gland M25x1.5
INCOMING POWER SUPPLY CABLE
c/w cable gland M25x1.5
DRAFT

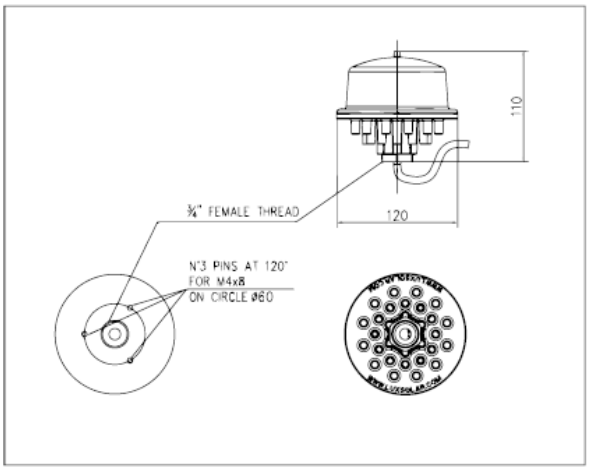

AWL CONTROL PANEL
INCOMING POWER SUPPLY
230Vac - 50Hz - 450VA
X1
MS-01
AS1
4A
230Vac - 50Hz
L
N
PE
F1
250mA
F2
1A
F3
1A
F4
1A
F5
500mA
XL-01
(WHITE)
POWER ON
HS-01
KX
TSM
TWILIGHT SENSOR
HYG
HYGROSTAT
HTR
50W
HEATER
PSU
24Vdc
+24V
0V
KX


LIDL-B4
LIDL-B3
LIDL-B2
LIDL-B1
BOX-LB4
BOX-LB3
BOX-LB2
BOX-LB1
XL
CS-4
CS-3
CS-2
CS-1
[11-A0]
[11-H0]
[09-F9]
[09-G9]
L1
NL
X2
[11-C5]
[11-E5]
[11-C4]
[11-E4]
AWL CONTROL PANEL

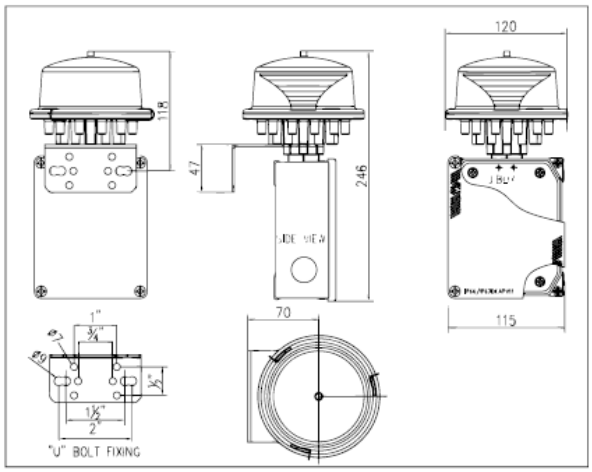
7) FIXING DETAILS

Each beacon can be fixed to the structure in different ways, see details below:

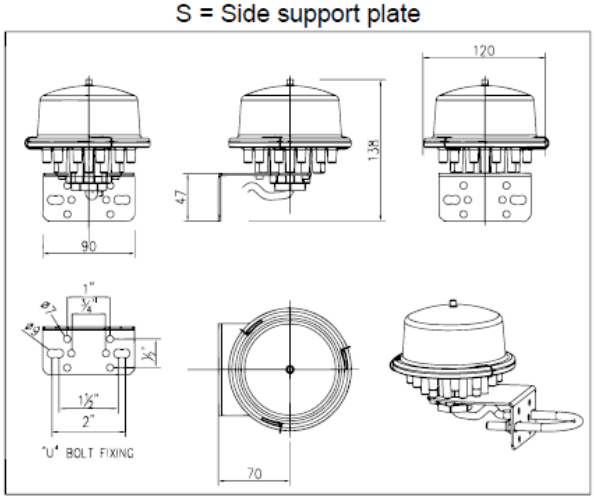
B = Base



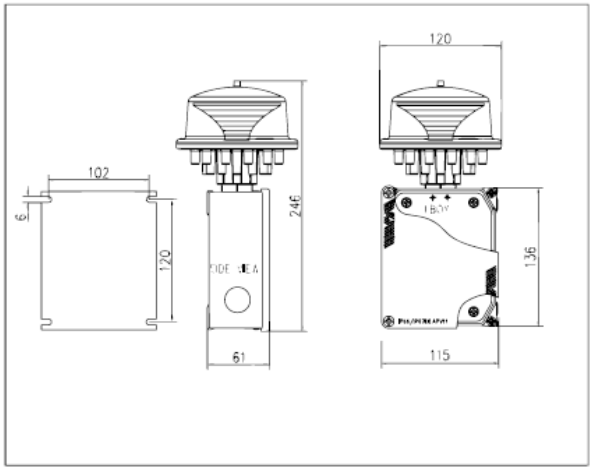
W = JB+S



S = Side support plate



J = With JB



8) AWL SYSTEM OPERATIONS

The AWL system is designed to work only during night-time. During normal operation LIOL-B beacons are steady burning, according to the light condition. It feeded with 230VAC 50/60Hz voltage, 1 phase + neutral (or 24Vdc as option). The voltage has to be sinusoidal (in VAC version only) so no square UPS input voltage nor diesel generator type is allowed.

There are Nr.02 functional modes of the system.

- Day mode: LIOL-B beacons are switched OFF;
- Night mode: LIOL-B beacons are light on steady burning mode.

Switch between day and night mode automatically is made by the system, through the twilight sensor. This devices, that detects the light difference between day and night has to be installed in a safe area, where artificial light is not present (to avoid false reading). During tests phase or commissioning it is possible to "force" the mode condition by covering or light up the sensor; It has an hysteresis of about 1 minute on the reading, so the change over is not immediate.

For the start-up please refer to the step-by-step instruction included in the FAT document

Each LIOL-B beacon is feeded through Nr.01 current sensor, code 323-LXS-134 (CS components in the drawings), used check the lamp status. For further details please refer to Section 9.

Once the system has been switched on and tested, it works automatically through the twilight sensor, so manually change the status mode is not necessary.

A system with multiple lights can be controlled in this way on the AWL Control Panel are installed fault status lamps (one for each beacon of fault beacon level), while inside the panel are installed fault signal contacts (one for each beacon).

9) FAULT DETECTION, ELECTRONIC BOARDS DETAILS AND SETTING

Each LIOL-B beacon is power supplied with Nr.01 current sensor, code 323-LXS-134 (CS components in the drawings). These sensors check the lamp status by reading its current value.

LIOL beacon has Nr.05 trimmer and the correct configuration is the following:

- For all CS-1/2:
- Undercurrent No Memory
- I value: 20%
- Hysteresis: 7,5%
- Ti: 4s
- Tt: 3s

The current sensor checks continuously the beacon status and in case of fault it automatically switches on the fault signalling lamps and the fault contact.
Once the system detects fault condition it is possible to understand visually which is the electronic board in this condition. On the bottom right side of the boards are installed Nr.02 status LEDs. Un refer to the power supply circuit so during the night it has to be on and fixed. Instead R refers to the output so in this case we have two conditions:

- Normal operation: it is on and fixed;
- Faulty operation: it is off while Un is on.

Once the fault condition is detected please contact our technical office by phone or email for further assistance.

Electronic board PSU regulatory compliance

The LED DRIVER PSU, is designed to allow the Warning Beacons to comply with ICAO rules, and FAA, EASA specifications.

Combustion and Energy Srl, as manufacturer of AWL beacons, and relevant Driver Circuits declares to operate in accordance with EN-ISO-9001: 2000 (cert nr. IQ-1200-15), and 89/392/CEE, 91/368/CEE, 93/44/CEE, 93/68/CEE directives.

Combustion and Energy Srl, as manufacturer of AWL beacons, and relevant Driver Circuits inform that the above part of devices can not be in service before that the full device, on which it will be incorporated, as to be declared in conformity to the rules 89/392/CEE.

10) MAINTENANCE

AWL beacons maintenance has to be done in accordance with ICAO rules:

Airport Service Manual
Part 9
Airport Maintenance Practices
1984
par.2.6 Light Maintenance Procedure

Maintenance procedure can be resumed as follow:

1) AWL beacons cleaning intervention:
   Dust and sand brought by wind to the beacons, often reduce the intensity of the light so they have to be removed. The same thing has to be done for water left on the glass by bugs. For this reason every two months it is necessary to clean the Beacons protection, with water and suitable fluids.
   Pay attention!!!
   Do not use corrosive or oily products.
   If there will be meteorological phenomenon with dust, the beacons cleaning is required.

2) Damaged beacon replacement
   As soon as the broken beacon is detected, replace it immediately with a new one. Do not try to repair it on quote; test and repair the beacons only in laboratory.

3) Periodic check
   Climatic conditions, lens degrade and the reduction of the intensity emitted from light source are the causes of possible reduction of the intensity of AWL beacons. ICAO rules provide that if the light intensity is reduced under the 50% of the specified value, it is necessary the replacement of the beacon.
   By the way it is strongly prompted to replace the beacon if the light intensity is less than 70%.
   A simple light sensor, used overnight, can indicate the light intensity value, that has to be compared with the ICAO one.

The optimum working period of AWL beacons (LED type) can be define in 5 years before beacons replacement.

MAINTENANCE MODULE

Please send us this report every six months, starting from bill of materials date, at Luxsolar by fax nr. +39 0341 577747.
Others way of sending will not be considered. The compilation of this module is necessary for the warranty.

Date of document: …./…./……..

Person in charge: ……

Company: ……..……

Report number: ……..……

Device	State of functioning and preservation			Notes
	Very good	Good	Damaged	
LIOL-B LED beacons				
Control panels				
Internal wiring				
Twilight sensor				
Interconnection cables				

11) TROUBLESHOOTING

Very important! Some of the tests below have to be done with live system. For this reason they should only be undertaken by qualified, experienced personnel, familiar with the equipment involved.

Preliminary tests to be done without power supply:

- Verify the interconnection cables installation (correct pins, bolts tighten etc.);
- Verify that all green connectors on all electrical devices inside the panel are fixed correctly to the related electronic boards;
- Verify that all the fuses integrity;
- Verify that all the automatic switches are in ON position;
- Verify that the system receive 230Vac power supply (or 24Vdc as option);
- Verify if black burnt mark are present on electrical components.

Please find here below some fault conditions, with dedicated solution. All the operations that require replacement of components have to be done without power supply.

- *Fault* = all LIOL-B beacons are off
  Probable causes = there is no electrical power supply to the system, automatic switches into off position, main switch into 0 position, fused terminals open
  Solutions = give power supply to the system, turn automatic switches into on position, turn main switch into 1 position, close fused terminals

- *Fault* = one LIOL-B beacon is in fault condition
  Probable causes = there is no electrical power supply to the lamp, one or more electronic board are in fault, damaged LEDs inside the beacon, wrong interconnection
  Solutions = give power supply to the lamp, replace the electronic board, replace the beacon, change the interconnection

12) LIOL-B TESTS: ICAO CERTIFICATION, IP65 TEST, CLIMATIC TEST REPORT

ICAO CERTIFICATION

Liberté • Égalité • Fraternité
RÉPUBLIQUE FRANÇAISE

MINISTÈRE DE L'ÉCOLOGIE, DU DÉVELOPPEMENT DURABLE,
DES TRANSPORTS ET DU LOGEMENT

Direction générale de l'aviation civile

Service technique de l'aviation civile

Département Sûreté Equipements

Division Equipements

CERTIFICATE OF COMPLIANCE
aeronautical ground lighting

STAC approval n° 2011A102

Issued to :
PROMIC
46, rue de la Pierre Plantée
42650 ST-JEAN-BONNEFONDS
France

Date : 09/12/2011

Material :

Brand or manufacturer	Designation	Material	Colour	Characteristics
Luxsolar	L810-LXS-100 AR	Elevated	Red	8 red LEDs LUXEON-REBEL LXML-PH01-0050

The above referred fitting is compliant with obstacle light, low intensity, type B requirements. The operating range is limited from -25°C to +50°C by manufacturer requirements.
The material approval is five years valid, the expiration date is : 08/12/2016

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www.developpement-durable.gouv.fr

Standards :
STAC : Feux de balisage d'obstacles – Spécifications techniques, PRO/STAC/SE/VIS/6003, V3 dated 22/07/2011
ICAO Annex 14 volume 1, 5th edition
Industrial's technical documentation
STAC Tests :
Report : RESAN/STAC/SE/PROMIC/11-5403 dated 09/12/2011
Measurements : 253, 254, 255, 256, 257, 258, 292 PP, 248, 249, 250, 259, 260, 261PC

Any optical or mechanical modification must be submitted to the STAC and apply to an approval extension.

BP 53735, 9 avenue du docteur Maurice Grynfogel
31037 Toulouse Cedex
Tél : 01 49 56 83 00 – Fax: 01 49 56 83 02
www.stac.aviation-civile.gouv.fr

dgac STAC

IP65 TEST REPORT

Nemko

ilac-MRA

ACCREDIA
L'ENTE ITALIANO DI ACCREDITAMENTO
LAB N° 1244

TEST REPORT
ENVIRONMENTAL
EN 60529:1991+A1:2000

Report Reference No. ..... :	234664TRFENV
Tested by (project handler):	Cristian Simone .(project handler)
Verified by (verificator):	Paolo Barbieri (verificator)
Date of issue ..... :	2013-04-04
Testing Laboratory ..... :	**Nemko Spa**
Address ..... :	Via del Carroccio 4
	I-20853 Biassono (MB)
Testing location/ procedure..... :	Full application of Harmonised standards ☒ Partial application of Harmonised standards ☐ Other standard testing methods ☐ Non-standard testing methods ☐
Testing location/ address ..... :	Nemko Spa - Via del Carroccio 4, I-20853 Biassono (MB)
Applicant's name..... :	**Combustion and Energy Srl / Luxsolar**
Address ..... :	Via per Dolzago 21 23848 Oggiono LC Italy
Test specification	
Standard ..... :	EN 60529:1991+A1:2000
	EN 60598-1:2008 + A11: 2009 (partial application, only §9)
Non-standard test method..... :	N/A
Test Report Form No. ..... :	TRF EN60529
TRF Originator ..... :	Nemko Spa
Master TRF ..... :	2009-06

Test item description::	Indicator LED low intensity obstruction lights
Trade Mark:	Combustion and Energy Srl / Luxsolar
Manufacturer:	Combustion and Energy Srl / Luxsolar
Model:	L-810-LXS-AR
Ratings:	24Vdc, 5W, IP65

LAB N° 1244

ENV -- TEST REPORT

Type / Model:	L-810-LXS-AR
Equipment:	Indicator LED low intensity obstruction lights
Applicant:	**Combustion and Energy Srl / Luxsolar**
Address:	Via per Dolzago 21 23848 Oggiono LC Italy
Manufacturer:	**Combustion and Energy Srl / Luxsolar**
Address:	Via per Dolzago 21 23848 Oggiono LC Italy
Date of receipt of test sample	2013-03-27
Testing commenced on	2013-04-02
Testing concluded on	2013-04-03

Test Result (according to the standards on page 4)	**POSITIVE**

The test report merely corresponds to the test sample.

Nemko ilac-MRA ACCREDIA L'ENTE ITALIANO DI ACCREDITAMENTO LAB N° 1244

6. TEST CONDITIONS AND RESULTS

6.1 IP 6X

Test performed in a dust chamber containing talcum powder able to pass through a square-meshed sieve whose nominal wire diameter is 50 µm and whose nominal free distance between wires is 75 µm.
Test proceeds as follows:

a) The luminaire was suspended outside the dust chamber and operated at rated supply voltage until operating temperature was reached,
b) The luminaire, whilst still operating, was placed with the minimum disturbance in the dust chamber,
c) The door of the dust chamber was closed,
d) The fan/blower causing the talcum powder to be in suspsension was switched on,
e) After 1 min, the luminaire was switched off and allowed to cool for 3 hours whilst the talcum powder remained in suspension.

6.1.1 Photo documentation of the test set-up

Pic.1

6.1.2 Test results

Mod.	IP6X dust test	Result The requirements are
L-810-LXS-AR	Dust was not present inside the enclosure and on live parts	**Fulfilled**
Note: --		

LAB N° 1244

6.2 IP X5

Test duration ..... : 15 min.
Flow rate ..... : 12.5 l/min.
Internal diameter of the nozzle:..... : 6,3 mm
Distance from nozzle to enclosure surface..... : 3 m.

6.2.1 Photo documentation of the test set-up.

Pic.2

6.2.2 Test results

MOD.	IPX5 Water test	Result The requirements are
L-810-LXS-AR	Water was not present inside the enclosure and on live parts	**Fulfilled**
Note: –		

7. TEST EQUIPMENT

Equipment used for testing are recorded and saved into the company archive as file 234664-INS.doc

It will be made available if requested.

CLIMATIC TEST REPORT

PRIMA RICERCA & SVILUPPO

CLIMATIC TEST REPORT CLITR_140989-1

Prima Ricerca & Sviluppo S.r.l. – Capitale Sociale € 50.000 i.v.
Codice Fiscale e Partita IVA 02635860139 – Uff. registro di COMO - n.REA CO270979
Via Campagna, 92 – I – 22020 Faloppio (Co) – Tel +39 031.3500011 Fax +39 031.991309
www.primaricerca.it; info@primaricerca.it

EQUIPMENT UNDER TEST : **Lampeggiante Bassa Intensità (L810-LXS)**

CUSTOMER:

- **Dept. / Firm :** Combustion and energy SRL
- **Mrs.:** Sansoni
- **Address:** Via per Dolzago 21 – 23848 OGGIONO – LC
- **Tel:** +39 0341 260926 • **Fax:** +39 - • **E-mail:** a.digiovine@ce2k.com; led@luxsolar.com

REFERENCE STANDARDS :

EN 60068-2-1 (2007-04) - Prova Ae: Freddo, per campioni che dissipano calore con cambiamento graduale della temperatura cui viene richiesto di essere alimentati durante la prova

EN 60068-2-2 (2007-09) - Prova Be: prova di caldo secco per campioni dissipanti calore con variazione graduale di temperatura e alimentati per tutta la durata della prova

Test Laboratory: Prima Ricerca & Sviluppo S.r.l.
Via Campagna, 92 - 22020 Faloppio fraz. Gaggino (CO) - Italy

Site of test execution: Prima Ricerca & Sviluppo S.r.l.
Via Boscone - Olgiate Comasco (CO) - Italy

Date of test samples receipt: 2014, July **Date of test start:** 2014-07-31 **Date of test end:** 2014-08-02

Witness to the test:	Compiled by:	Approved by:
Nobody	Gianluigi Verga	Giovanni Molteni

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5. SUMMARY OF TEST RESULTS

	Test	Page	Test results	
1	COLD TEST (OPERATING) Test Ae • Temperatura: -20 °C • Durata: 24 h	7	☒ PASS	☐ FAIL
2	DRY HEAT TEST (OPERATING) : Test Be • Temperatura: +50 °C • Durata: 24 h	8	☒ PASS	☐ FAIL

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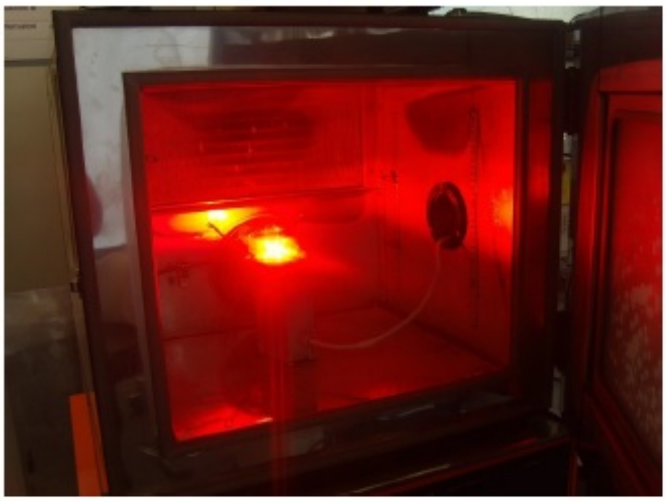
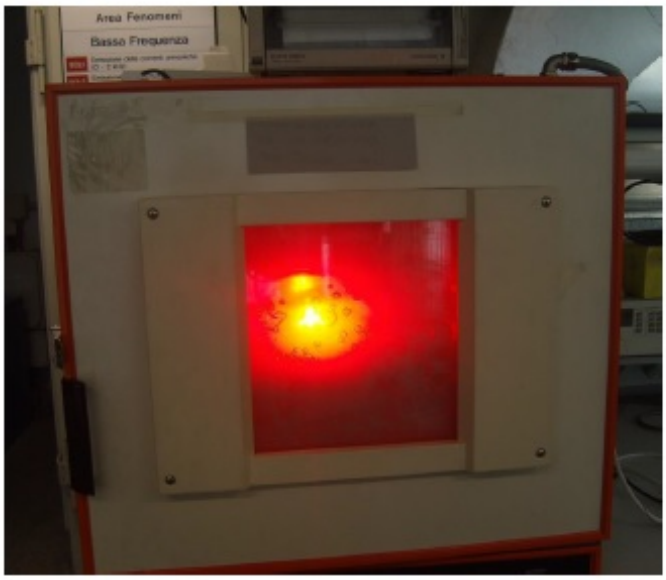
The cold test





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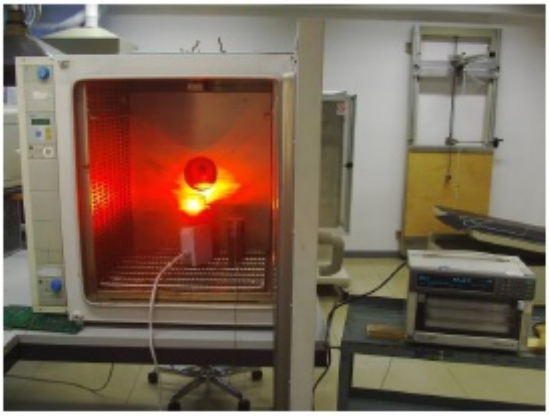
The dry heat test



End of the dry heat test

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13) WARRANTY

LUXSOLAR Warranty, Obstruction Lighting

Combustion and Energy SRL – "Luxsolar" warrants the purchaser and the final user of AWL LED beacons "Luxsolar" that at the moment of their purchase the products were exempt of shortages and conform with ICAO Annex 14 requirements.

3 years warranty for materials and labor
For a period of five years from the purchase date, "Luxsolar", at its unchallengeable opinion, provides to repair or replace lacking product, directly or through other companies and people. Warranty is applicable only in case of factory default or assembly default.

3 years warranty for light degradation
For a period of five years from installation date, "Luxsolar" at its unchallengeable opinion, provides to repair or replace (directly or through other companies and people) the product having a light intensity 7% lower than the intensity required according to ICAO Annex 14 June 2004 rules .

Warranty does not cover: (1) Advice or information complementary given by "Luxsolar", (2) assembly and disassembly of products, (3) Fault or lacks caused by accidents, modifications, wrong use, environment temperature >55°C, voltage value higher than the indicated one, wrong maintenance, abuse, wrong installation and wrong storage.

Warranty conditions: (1) The user has to communicate and detail the shortage or the reduction of light intensity before the end of the warranty period; (2) Ship the product with a copy of the purchase order and the name of the original purchaser; (3) The user has to pre-pay all shipping costs (including insurance), from plant to Luxsolar and from Luxsolar to plant for repaired and/or replaced parts; (4) Luxsolar is authorized to detain repaired/replaced parts; (5) every six months, starting bill of material 's date, User has to send the maintenance module -entirely compiled- to Luxsolar service center, exclusively by FAX (no. +39-0341-577747). If this module will not be sent, warranty will not be applied to repair/replacement.

Warranty limitations: this warranty will not cover other suppliers' products. All the replaced/repaired products will be covered by warranty only for the remaining warranty period. The replaced products will not be necessarily identical to original ones, though having the same functionality. Repairs, replacements or compensations are the only remedies agreed by this warranty.
"Luxsolar" declines any other kind of warranty, included, without limitations, the implicit warranty of commercial use and suitability for other uses.

Damage limitations: Under no circumstances "LUXSOLAR" will be liable for incidental or accidental damages and loss of profits or savings - suffered by purchaser or third part - that may be caused by its products or by failure of its products. This limitation will be effective even if damage and loss have been caused by "Luxsolar" or its representative's negligence and even if "Luxsolar" is informed about the possibility of such damages and losses. This limitation of liability may not apply to damages relating to personal injury or death in jurisdictions where such damages may not be disclaimed as a matter of law.
To obtain warranty service, user has to ask (by fax +39-0341-577747) and obtain the authorization return number of material (ARM) from Luxsolar Service Centre.