

Edition 04/22/2008



# MEDIUM INTENSITY LED OMNIDIRECTIONAL ELEVATED TAXIWAY EDGE LIGHT

## LVC02

# INSTRUCTION MANUAL FOR USE AND MAINTENANCE

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<b>REVISIONS</b>				
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### **LIMITED PRODUCT WARRANTY**

*THE FOLLOWING WARRANTY IS EXCLUSIVE AND IN LIEU OF ALL OTHER WARRANTIES, WHETHER EXPRESS, IMPLIED OR STATUTORY, INCLUDING, BUT NOT BY WAY OF LIMITATION, ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR ANY PARTICULAR PURPOSE.*

*OCEM warrants to each original Buyer of Products manufactured by the Company that such Products are, at the time of delivery to the Buyer, free of material and workmanship defects, provided that no warranty is made with respect to:*

- (a) any Product which has been repaired or altered in such a way, in Company's judgement, as to affect the Product adversely;*
- (b) any Product which has, in Company's judgement, been subject to negligence, accident or improper storage;*
- (c) any Product which has not been operated and maintained in accordance with normal practice and in conformity with recommendations and published specification of Company; and,*
- (d) any Product, component parts or accessories manufactured by others but supplied by Company (any claims should be submitted directly to the manufacturer thereof).*

*OCEM's obligation under this warranty is limited to use reasonable efforts to repair or, at its option, replace, during normal business hours at the facility of the Company, any Product which in its judgement proved not to be as warranted within the applicable warranty period. All costs of transportation of Products claimed not to be warranted and of repaired or replacement Products to or from the facility of the Company shall be borne by Purchaser. Company may require the return of any Product claimed not to be as warranted to its facility, transportation prepaid by Purchaser, to establish a claim under this warranty. The cost of labour for installing a repaired or replacement Product shall be borne by Purchaser. Replacement parts provided under the terms of this warranty are warranted for the remainder of the warranty period of the Products upon which they are installed to the same extent as if such parts were original components thereof. Warranty services provided under the Agreement do not assure uninterrupted operations of Products; Company does not assume any liability for damages caused by any delays involving warranty service. The warranty period for the Products is 24 months from date of shipment or 12 months from date of first use whichever occurs first.*

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## **SAFETY NOTICES**

*This equipment is normally used or connected to circuits that may employ voltages which are dangerous and may fatal if accidentally contacted by operating or maintenance personnel. Extreme caution should be exercised when working with this equipment. While practical safety precautions have been incorporated in this equipment, the following rules must be strictly observed:*

### **KEEP AWAY FROM LIVE CIRCUITS**

*Operating and maintenance personnel must at all times observe all safety regulations. Do not perform maintenance on internal components or re-lamp with power ON.*

### **RESUSCITATION**

*Maintenance personnel should familiarize themselves with the technique for resuscitation found in widely published manuals of first aid instructions.*

### **PLACING OUT OF SERVICE**

*In case of dismantling, placing out of service, scrapping, the user shall follow all the required precautions for component and material elimination, according to **local rules**.*

### **CE CERTIFICATE**

**CE** *This equipment complies with the requirements of the EEC directives 2004/108/EEC and 2006/95/EEC with regard to "Electromagnetic Compatibility" and "Low Voltage Electrical Apparatus" respectively.*

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## 1. GENERAL

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<b>LVC02</b>	Elevated taxiway edge LED lights are medium intensity, omnidirectional, steady burning type. These fittings are used for taxiway edge lighting in order to provide a visual aid to the moving aircraft. LVC02 lights are in compliance with ICAO - Annex 14 Vol.1, IEC TS 61827, FAA AC 150/5345-46 and NATO-STANAG 3316.
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The fixtures described in this manual are designed to be connected at the existing series circuit, replacing those equipped with incandescent lamps, fed through standard isolation transformers connected at any type of CCR with variable current from 2.8 A to 6.6 A  
Light output in compliance with FAA "Engineering Brief N°67" document requirements.  
Location of these fittings shall be in compliance with ICAO – Annex 14, STANAG 3316 and FAA.

## 2. MAIN FEATURES

### 2.1. FIXTURE

The LVC light consists of (Figure 1):

- heat resistant blue glass symmetric **lens**; it is fixed to the body by means of a **clamp band with a gasket**;
- aluminium **body** balanced on an aluminium **slipfitter** and fixed to it by means of four levelling screws; the body mounts the **power supply/control PCB** and the LED assembly through two small columns;
- steel **1-inch-tube**, 6" long, but available in different length, provided between slipfitter and breakable coupling; to lock the tube, the slip fitter is equipped with two setscrews and the breakable coupling with one;
- aluminium **breakable coupling** provided with a breakable groove, meeting FAA Specs, and with a lower 1"1/2 - 12 UNF male thread. On request the male threading may be 2"-11 1/2 NPS or 2" GAS;
- two, single-pole Teflon **cable leads**, 14 AWG, 0.400 m long, **with plug** meeting FAA Specs L-823; one cable is equipped with female faston terminal and the other with a male one; a yellow-green wire, size 2.5 mm<sup>2</sup>, 0.500 m long, is provided for grounding purpose;
- a **LED assembly**, consisting of one blue LED, mounted on a PCB complete with a dedicated optic to collect the LED luminous flux so to maximize the light output.

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The finishing of the light is realized by phosphating and baked polyester electrostatic powder yellow coating.

All hardware is made of stainless steel.

For the complete identification of the LVC P/N, including possible options, take as reference Figure 3.

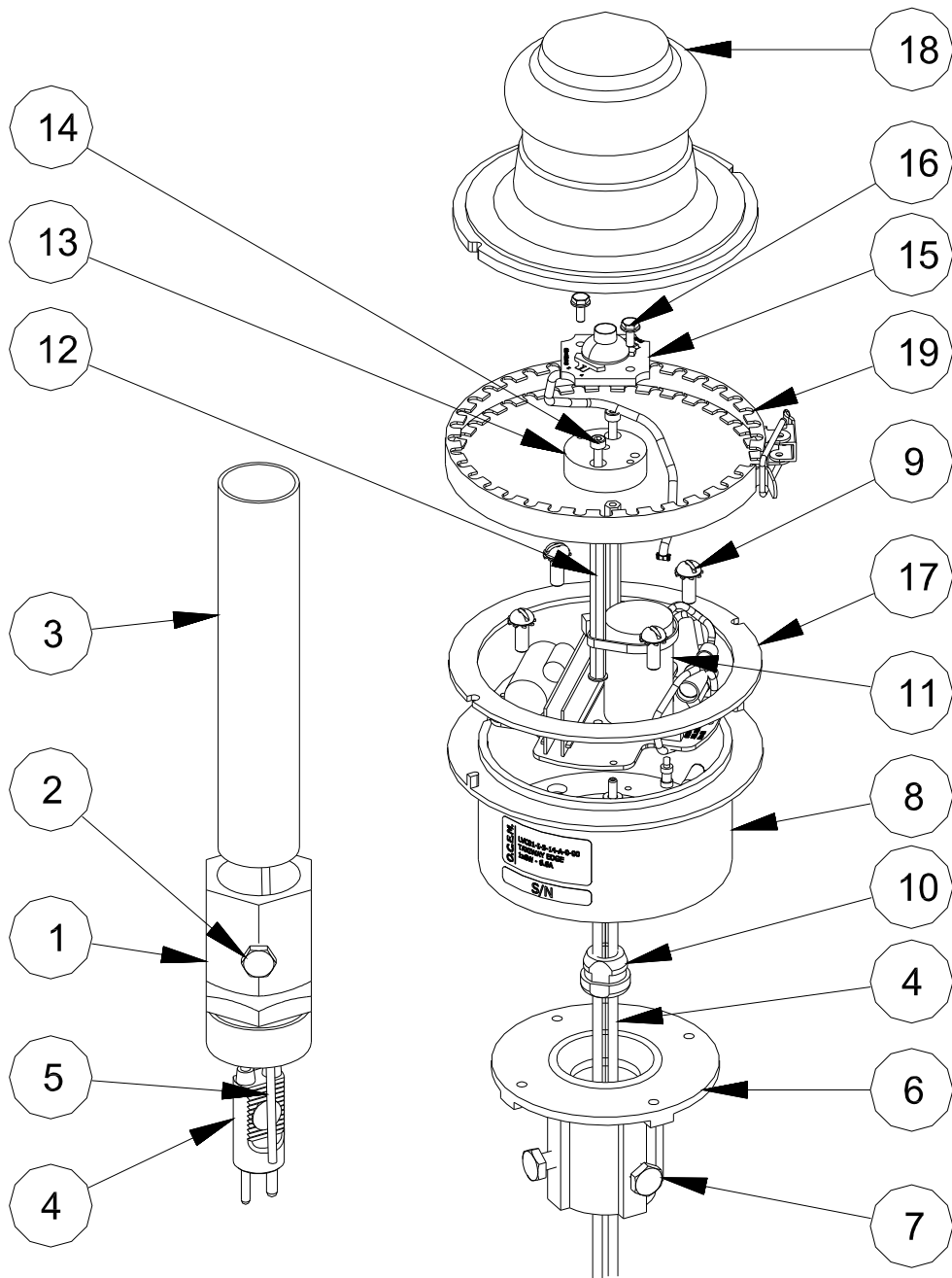


Figure 1 – Exploded view (see Figure 2)

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N°	Description	Qt.
1	Frangible coupling	1
2	Hex head cap 1/4"-20 x 1/2" stainless steel screw	1
3	1" thinwall tube	1
4	Cable lead with L-823 plug	1
5	Grounding cable lead	1
6	Slipfitter	1
7	Hex head cap 1/4"-20 x 1/2" stainless steel screw	2
8	Body	1
9	Round head 10-24 x 1/2" stainless steel screw with Lockwasher	4
10	Strain relief bush	1
11	PCB	1
12	Supporting columns for LED assembly	2
13	LED assembly support	1
14	HSCH M3x12 stainless steel screw	2
15	LED assembly	1
16	Hex head cap M3 x 8 stainless steel screw with washer	2
17	Lens gasket	1
18	Lens	1
19	Lens clamp band	1

Figure 2 – Parts list

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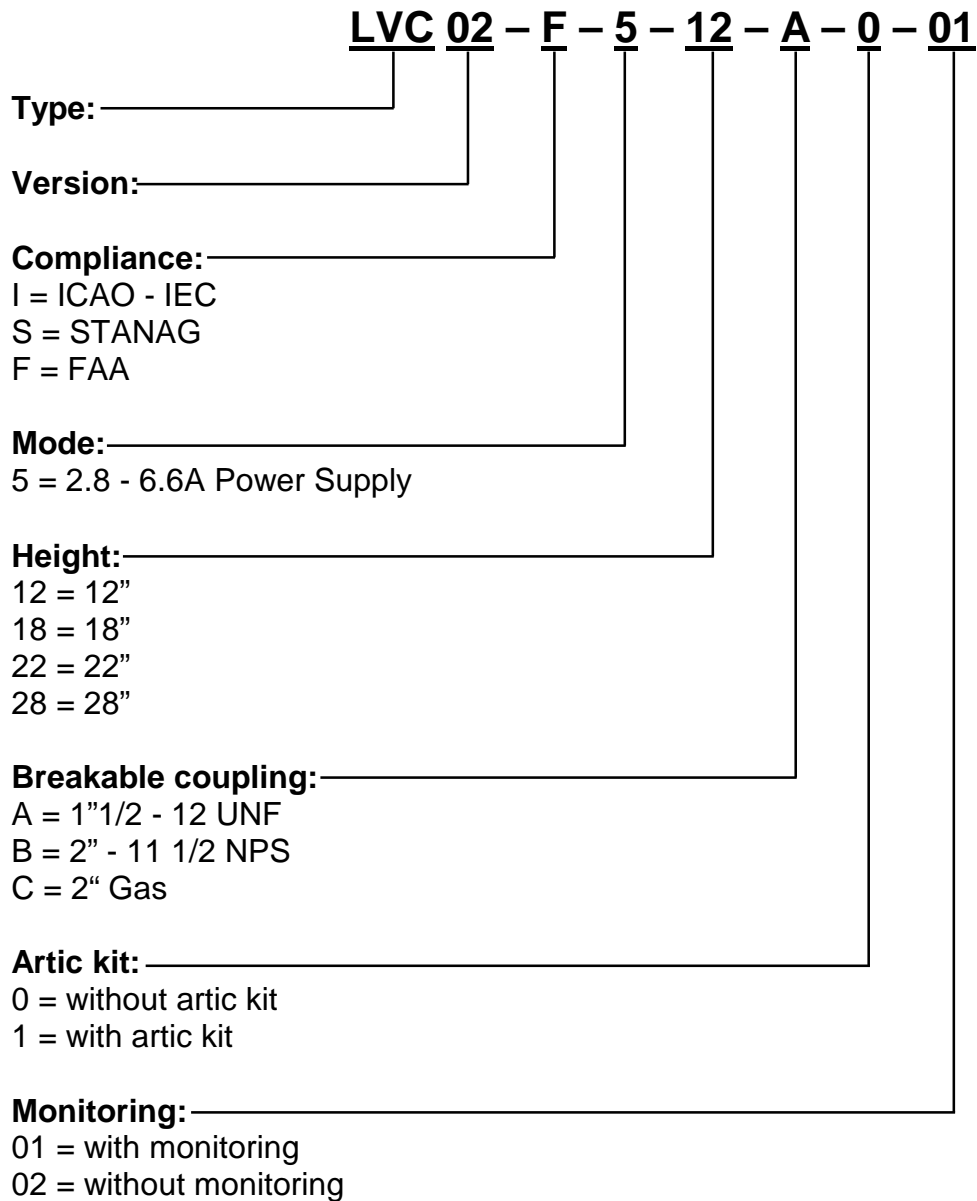


Figure 3 – Complete P/N identification

## 2.2. ELECTRONIC SECTION

The electronic section consists of the following circuits:

Current / current conversion circuit

- LED command circuit
- Control circuit

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### 2.2.1. *Current / current conversion circuit (patented)*

This electronic section provide a conversion from the input current value (within range from 2.8 A to 6.6 A) to the specified LED current value.

This conversion, performed in one transformation only, allows to achieve several benefits:

- minimize the power losses;
- significant increase of efficiency;
- high input power factor;
- independent form the CCR topology: the CCR may have any output current waveform;
- no percentage of load dependent: the CCR can feed without any problem also few lights in the series circuit;
- isolation transformers of smaller size can be used, respect to those used with the equivalent fixtures equipped with halogen lamps.

To meet the previous features, the conversion circuit is based on the MOSFET technology. This circuit has been designed to withstand the several field stresses (like withstand at elevated current peak) determinate by:

- defective connections along the series circuit;
- sudden variations of the CCR power supply voltage; in many cases the CCRs don't provide suitable response time in order to compensate these variations;
- use of circuit selectors.

The input circuit is protected against over-voltage, tested in accordance with the requirements in FAA "Engineering Brief N°67" document.

### 2.2.2. *LED command circuit*

A PWM technique is used to command the LEDs. As known LEDs need to be supplied with a constant current; therefore in order to vary the luminous emission with a proper linearity is necessary the supply current will be applied at impulses. In other words, the LED luminous output depends on the time of application (duty-cycle) of constant current impulses.

### 2.2.3. *Control circuit*

The main task of the control circuit is to assure the correct LED light emission according to the series circuit current.

To perform this features, the circuit is provided with a current sensor that generate a signal proportional to the series circuit current.

This signal is analyzed by a DSP which perform a RMS conversion of the input current.

The RMS conversion give a good accuracy with any input current waveform.

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Other functions:

- diagnostic, auxiliary voltage control and LED status control. In case of any LED failure or relative power supply circuit failure, the electronic control circuit commands the intervention of the monitoring device so that the secondary side of the isolation transformer becomes open, like in the case of an incandescent lamp failure. This feature is essential when the monitoring option is required;
- events recording (not-volatile memory) for diagnostic purposes;

PC operator interface through serial connection: this feature allows to calibrate the brightness depending on the current, to modify the emission curve, to read the events occurred during the operating time.

### **2.3. ARCTIC KIT**

The optional arctic kit is in compliance with FAA "Engineering Brief N°67" document and it prevents from the ice over the prisms area.

The arctic kit is connected in series to the PCB and it consists of a thermostat and a heater. It starts when the dome temperature is less than about -1°C and turns-off when the dome temperature reaches about 10°C.

Arctic kit consumption is less than 10 VA.

## **3. INSTALLATION**

The light is shipped completely assembled including the LED assembly, except the 1-inch tube and the breakable coupling which are delivered separately inside the same carton.

**Note:** if the fixture has been ordered with an extra height option, the tubing may be packaged separately.

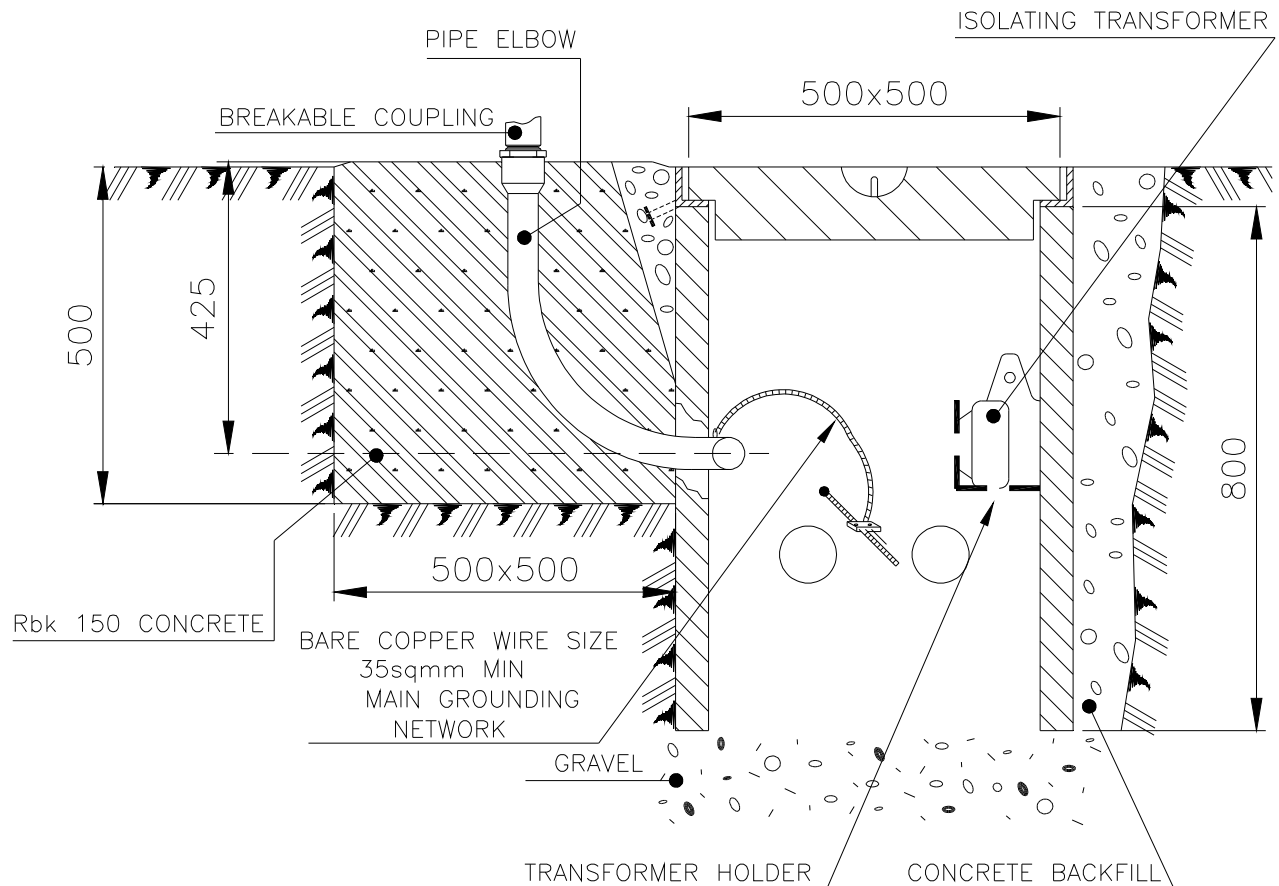
Each light is usually installed on a suitable concrete block, into which a pipe elbow is cemented. The isolating transformer is housed into a separate concrete pit which is normally placed close to the above concrete block (Figure 4).

The pit can be placed far from the concrete block too, but in this case a suitable cable duct has to be provided between the pit and the pipe elbow for passing the secondary cable.

As alternative the assembly pit-pipe elbow can be replaced by a steel sheet base, which can be used to house the isolating transformer, complete with an upper steel plate with a threaded sleeve.

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IMPORTANT: MAKE SURE THE UPPER END OF THE PIPE ELBOW IS VERTICAL

Figure 4 – Installation of elevated light: civil works (demonstrative)

### **WARNING**

The LVC light has been designed to be powered through series circuit fed by constant current regulator.

Don't power the light through a different power source.

Don't connect or disconnect the light from the isolating transformer when the series circuit is live.

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For the installation of the light the following steps are suggested:

1. Pass together the secondary cable lead with receptacle and a suitable length of grounding wire (grounded inside the pit) through the pipe elbow.
2. Place the receptacle into the upper threaded section of the pipe elbow, by holding it between the two plastic rings, and pass the grounding wire through the rings (in correspondence of break point provided on the rings).
3. Slide one end of the 1-inch tube over the fixture cable assembly (cable leads with plug plus yellow-green wire) and into the fixture slipfitter until the slipfitter bottoms against the tube.
4. Slide the frangible coupling over the cable assembly (cable leads with plug plus yellow-green wire) and onto the other end of the 1-inch tube until it bottoms against the tube.
5. Connect the fixture grounding wire to the grounding wire coming from the pit (or from the base): splice both the wires and connect them together by using a crimping connector.
6. Connect the light plug to the secondary receptacle inside the pipe elbow.
7. Slide the frangible coupling down over the plug and tighten it into pipe elbow (or the base plate) until coupling bottoms out. Push any extra cable length into the 1-inch tube. Tighten the tube to the coupling with the setscrew on the coupling.
8. Tighten the body to the 1-inch tube with the two setscrews on the side of the slipfitter.
9. Release the lens clamp band and remove the blue lens with the relevant gasket from the fixture body.
10. Place on the light body the levelling device (P/N 332.3490 available on request) (Figure 5) in fixed position and level the light body on the slipfitter by operating the four levelling screws until the bubble is centered.
11. Remove the levelling device and place the gasket on the body.
12. Set the lens on the body so that the two locating pins align with two recessed of the lens bottom flange.
13. Fit the lens clamp band over the lens and body flange. Fit the lamp spring over the lamp catch and push down the lever to tighten band together.

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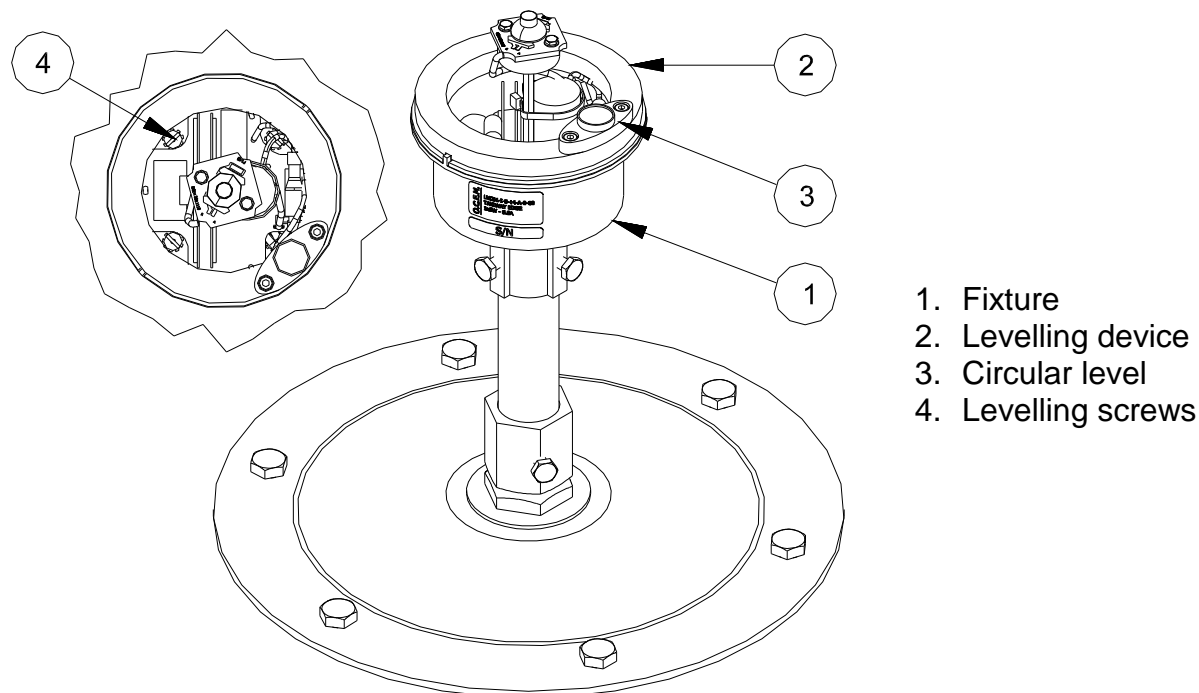


Figure 5 – Levelling device

### 3.1. SECONDARY WIRING

The IEC 61823 International Standard (AGL series transformers) states at par. 4.6 that “if an earthing connection is provided, it shall be connected to the larger socket of the transformer secondary connector.”

This means that, when a fixture is directly connected to the relevant isolation transformer (provided with earthing connection), the fixture secondary side is wired to the grounding network through the larger pin of fixture plug.

In case of a fixture, installed far from the relevant isolation transformer, it is necessary to provide a secondary extension between fixture and transformer. Assure the earthing wiring, above described, between the larger socket of the transformer secondary connector and the larger pin of the fixture plug.

It is possible to connect in series more fixtures on the secondary side of a single isolation transformer: please contact OCEM technical department for additional information about this electrical solution.

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#### **4. MAINTENANCE**

The basic purpose of a visual system is to aid in the safe operation of aircraft. Therefore the highest standard of maintenance are required.

Once a system has been installed, its usefulness is dependent on its serviceability which in turn depends upon the effectiveness of the maintenance work carried out.

The preferred method of maintaining these lights is replacing each fixture periodically and systematically and return it to the maintenance shop for renovation.

Field servicing shall be limited to cleaning the lens.

***WARNING***  
**BEFORE ANY MAINTENANCE INTERVENTION, MAKE SURE THE POWER SUPPLY BE SWITCHED OFF.**  
**DO NOT OPERATE ON LIVE PARTS!!!**

##### **4.1. REMOVING THE FIXTURE**

Remove the fixture from base plate or pipe elbow following steps are suggested:

1. unscrew the frangible coupling screw;
2. hold the fixture and unscrew the frangible coupling;
3. lay the fixture and disconnect plug to the secondary receptacle inside the pipe elbow;
4. disconnect the fixture grounding wire to the grounding wire coming from the pit (or from the base).

##### **4.2. LENS CLEANING**

Clean the external surface of the lens with not-abrasive glass product.

##### **4.3. LENS REPLACEMENT**

Release the lens clamp band and remove the broken blue lens with the relevant gasket from the fixture body.

Place a **new gasket** on the body.

Set the **new lens** on the body so that the two locating pins align with two recessed of the lens bottom flange.

Fit the lens clamp band over the lens and body flange. Fit the lamp spring over the lamp catch and push down the lever to tighten band together.

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#### 4.4. LED ASSEMBLY REPLACEMENT

Remove the lens with gasket as above described.

Remove the faulted LED assembly by releasing the two locking screws with washer, which lock the assembly to the small supporting columns, and disconnecting the assembly cable from the power supply/control PCB (Figure 6).

Provide a **new LED assembly** and reassembly the unit with reverse procedure. Apply silicon thermal paste (like Wacker P12) under the LED board and fasten it with a tightening torque of 1.1 Nm.

**IMPORTANT: IT IS SUGGESTED TO REPLACE THE LENS GASKET TO NOT AFFECT WATERTIGHTNESS.**

#### 4.5. ELECTRONIC SECTION REPLACEMENT

Remove the lens and the LED assembly as above described.

Remove the LED assembly support by unscrewing the two locking screws, which lock the support to the small supporting columns (Figure 6).

Unscrew the two columns with washer making free the power supply/control PCB.

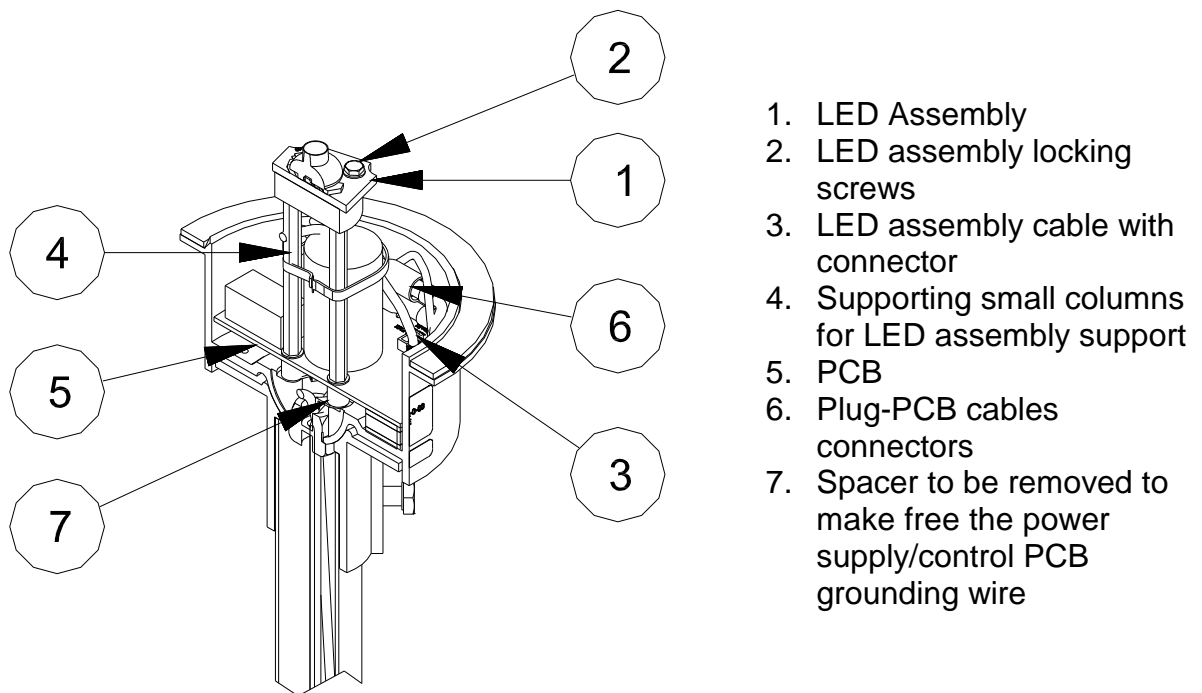


Figure 6 – LED Assembly and PCB replacement

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Disconnect the PCB from the cable leads with plug (fast-on connection).

Then unscrew one of the two the spacers placed under the PCB to make free the PCB grounding cable.

Provide a **new power supply/control PCB** and reassembly the unit with reverse procedure.

**IMPORTANT: IT IS SUGGESTED TO REPLACE THE LENS GASKET TO NOT AFFECT WATERTIGHTNESS.**

#### **4.6. BREAKABLE COUPLING REPLACEMENT**

Unscrew the lower threaded section of broken breakable coupling from the pipe elbow (or base plate), cut the grounding wire, disconnect the light plug from the secondary receptacle and remove the threaded section.

Remove the upper section of the broken breakable coupling from the 1-inch pipe by releasing the setscrew.

If damaged, replace the 1-inch tube too. To make free the tube, release the two setscrew on the slip fitter.

Provide a new breakable coupling and, if required, a new 1-inch tube.

Reassembly the unit by following the installation steps from item 4 through item 13 par.3

#### **4.7. CABLE LEAD REPLACEMENT**

The replacement of the cable lead requires the fixture be completely disassembled, so follow the procedures above described to replace the power supply/control PCB, and to replace the breakable coupling and the 1-inch tube.

After the above, it is available the light body fastened to the slipfitter complete with cable leads with plug and grounding wire.

Unscrew the spacer (provided for PCB) to make free the fixture grounding cable.

Remove the body from the slipfitter by releasing the four levelling screws with washer.

Remove the cable gland from the outside by lightly squeezing it by means of pliers; open the cable gland to make free the damaged cable leads with plug and the grounding wire.

Insert a **new cable gland** on a **new light cable leads with plug** and a **new grounding wire** (if necessary) and place the cable gland at approx 9 cm from the free extremity of the wires with plug. Take care that the grounding wire end with eyelet terminal be at 1-2 cm from the cable gland.

By using pliers, squeeze the cable gland on the wires and insert the assembly gland-cable leads-grounding wire through the suitable seat provided in the bottom of the slipfitter.

Make sure the cable gland be properly placed.

Reassembly with reverse procedure.

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## 4.8. ARCTIC KIT REPLACEMENT

### 4.8.1. THERMOSTAT

Remove the lens with gasket as above described.

Disconnect the thermostat from the cable lead with plug and from the PCB, unscrew the two screws HSCH M3x6 and unsolder the heater cable from the thermostat.

Take a new thermostat and solder the heater cable and the two wires with cylindrical connector on the new thermostat terminals. Protect the soldered joint from moisture with a piece of suitable heat shrink tubing.

Tighten the two screws with tightening torque 0.6 Nm.

### 4.8.2. HEATER

Remove the lens with gasket as above described.

Unsolder the heater cable from the thermostat and remove the broken sticker heater from the inner side of the lens.

Clean the internal surface of the lens with non abrasive glass product.

Attach the new sticker heater to the lens, take care that the heater is perfectly adherent to the lens and put immediately under to the rounded zone of the lens.

Solder the new heater cable on the thermostat terminals and protect the soldered joint from moisture with a piece of suitable heat shrink tubing.

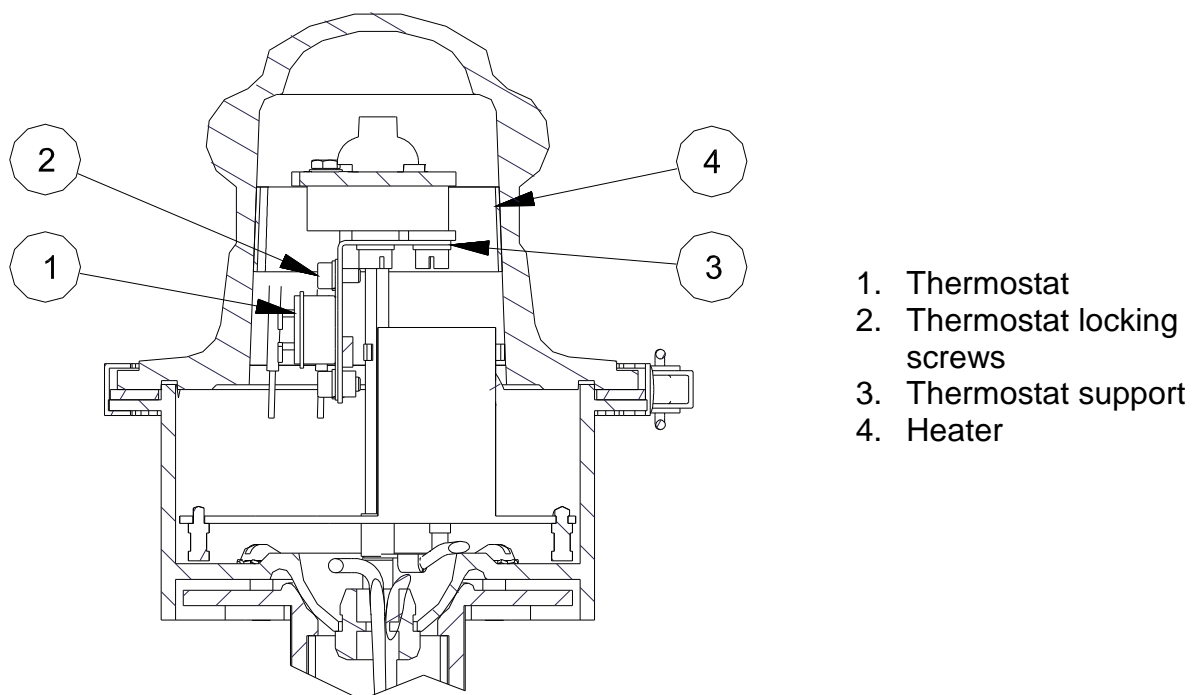


Figure 7 – Arctic kit

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#### **4.9. ADD THE ARCTIC KIT**

It is possible to add the arctic kit to a fixture not equipped with this option.

Remove the lens with gasket and the LED assembly support as above described.

Fasten the thermostat support (Figure 7) under the LED assembly support using the plastic washers and the plastic screws.

Attach the sticker heater to the lens and solder his cable to the thermostat as above described.

Connect the thermostat cylindrical connector to the connector of the cable lead with plug and to the connector of the PCB.

Reassembly the fixture.

#### **4.10. MAINTENANCE PROGRAM**

The frequency at which routine inspection, cleaning and servicing are required to be performed will vary according to the type of equipment, its location and usage.

A maintenance program must be drawn up for each individual airport based on past experience and its aim should be to achieve the required service standard.

The following are presented as guidance material in establishing a preventive maintenance program.

##### **4.10.1. DAILY CHECKS**

- a) Burnt-out luminous source.
- b) Broken parts of lights.

##### **4.10.2. MONTHLY CHECKS**

- a) Cleaning of the lenses.
- b) Correct setting of the lights.

##### **4.10.3. SEMI-ANNUAL CHECKS**

- a) Painting or replacement of rusted parts.

##### **4.10.4. ANNUAL CHECKS**

- a) Stability of the civil works.
- b) Stability and assembly of lights.
- c) Electrical connections and insulation degree.
- d) Luminous efficiency of lamps.

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e) Condition of all the gaskets.

#### *4.10.5. UNSCHEDULED CHECKS*

a) After unusual atmospheric precipitation, check the light condition and remove any luminous beam obstructions.

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LVC02 - MEDIUM INTENSITY LED OMNIDIRECTIONAL ELEVATED TAXIWAY EDGE LVC LED LIGHT

**5. LIST OF THE RECOMMENDED SPARE PARTS**

<b>CODE</b>	<b>DESCRIPTION</b>	<b>FIG.</b>	<b>ITEM</b>
156.5390	Body with slip fitter	1	6, 8, 9
001.2167	Blue lens	1	18
001.2072	Gasket for lens	4	17
001.2174	Lens clamp band	1	19
150.3215	LED assembly	4	15
156.5410	Power supply/control PCB (no monitoring)	1	11
156.5450	Power supply/control PCB (monitoring)	1	11
156.5380	Cable leads with plug, complete faston terminals	1	4
156.5400	Fixture grounding wire	1	5
001.2172	Cable gland	1	10
001.2062	Breakable coupling, 1 1/2 - 12 UNF male thread	1	1
156.5420	Breakable coupling, 2" - 11 1/2 NPS male thread	1	1
156.5430	Breakable coupling, 2" - 11 GAS male thread	1	1
001.2125	Standard 1-inch tube, 6" long	1	3
202.1000	Arctic kit heater	7	4
156.5460	Arctic kit thermostat with support	7	1, 2, 3
485.0174	Arctic kit thermostat	7	1