

Supersedes edition 19/05/2017



## LED ELEVATED TAXIWAY EDGE LIGHT

LTE

# INSTRUCTION MANUAL FOR USE, INSTALLATION AND MAINTENANCE

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Approved by: Matteo Mazzotti

N° Attachments: 1

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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 - ENERGY TECHNOLOGY 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;
- (d) the breaking of the warranty seals, if present, determines the immediate termination of the warranty; and,

OCEM - ENERGY TECHNOLOGY's obligation under this warranty is limited to use reasonable efforts to repair or, at its option, replace, during normal working 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 those repaired or replaced, 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 the installation of a repaired or replaced 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.

### **IMPORTANT: READ THIS DOCUMENT**

Before proceeding to the operations of installation, commissioning, operation, maintenance or disposal, carefully read the entire document.

### **SAFETY INFORMATION**

Extreme caution should be exercised when working with this equipment; it is normally used or connected to circuits that operate at dangerous voltages and can be fatal.

The following section contains important safety information that you must follow when installing and using the apparatus.

Misuse of the equipment or lack of care in applying safety procedures and prescriptions specified in this document, may result in a hazard.

Avoid contact with voltage or current sources.

For no reason the protections and the safety devices must be removed.

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### OPERATION ON THE EQUIPMENT - SKILLS

Operation on the equipment and access to its internal parts shall be done by experienced personnel, adequately trained and aware of the risks related to electricity and high voltages.

Safety rules shall be adopted when operating on the equipment, or on cables and other apparatus connected to the it

### DO NOT OPERATE ON ENERGIZED CIRCUITS

Do not carry out any operation on the converter or on apparatus connected to it when the circuits are energized.

### WHEN HANDLING AND SERVICING THIS EQUIPMENT, OBSERVE PRECAUTIONS FOR HIGH VOLTAGE EQUIPMENT.

Before any access, inspection or intervention, be sure to have switched-off the unit, opened the main circuit breaker and removed the supply to the unit (by opening the circuit breaker/switch on the distribution board at the beginning of the supply line).

Then wait discharge time (at least 5 minutes), ground carefully the system, and check for voltage presence before accessing..

### REANIMATION

The maintenance staff must be aware of the risks related to electricity, criteria to prevent the risk of electric shock and resuscitation techniques

### CE MARK

**CE** This equipment complies with the requirements of European regulations for the CE mark. The user has to respect all prescriptions reported in this document.

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.

### OUT OF SERVICE

In case of dismantling, decommissioning, destruction, disposal, the user shall follow all the required precautions for component and material elimination, according to local rules and applicable law.

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### EDITIONS

**Date**

07/24/2013	First issue
09/24/2013	Added the light fixture heights up to 760 mm
11/14/2013	Updated chapter "Cable lead with plug" and "List of the recommended spare parts"
11/03/2014	New address of the Company Deleted § "List of the recommended spare parts" and added relevant attachment
19/05/2017	Added reference to FAA 150/5345-30 for installation and specified the ground wire used in the main features.
19/03/2018	Replaced gasket, ring nut and added o-ring

### REVISIONS

<b>Index</b>	<b>Date</b>	<b>Description</b>	<b>Edited by</b>	<b>Approved by</b>
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### LIST OF EFFECTIVE PAGES

From page 1 to page 23

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**LIST OF ATTACHMENTS**

UC-PU-0278 - LIST OF THE RECOMMENDED SPARE PARTS

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## 1 GENERAL

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LTE elevated LED taxiway edge light is low intensity, omnidirectional steady burning type.

These fixtures are intended for use as taxiway edge light, in order to provide a visual aid to the moving aircraft.

LTE lights are in compliance with ICAO Annex 14 Vol.1, FAA AC 150/5345-46, IEC TS 61827 and NATO-STANAG 3316.

The fixtures described in this manual are designed to be connected to series circuit, replacing those equipped with incandescent lamps, fed through standard isolation transformers connected to CCR with variable current from 2.8 A to 6.6 A.

Location of these fittings shall be in compliance with ICAO - Annex 14, STANAG 3316 and FAA 150/5340-30.

## 2 MAIN FEATURES

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The fixture consists of:

- heat resistant transparent glass lens; it is mechanically secured to the body by metal threaded ring with flat gasket
- aluminium body mounted on the pole using three screws. These screws also allow the levelling of equipment
- the power supply/control PCB and the LED circuit are mounted on the aluminium inner body
- steel 1-inch-tube, available in different length, connecting the main body and fragile joint; to lock the tube, the breakable coupling is equipped with one screw
- 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 neoprene cable leads, size 2.5 mm<sup>2</sup>, 0.3 m long, with plug meeting FAA Specs L-823; a wire, XHHW, 600V, AWG12 type is provided for grounding purpose
- a LED module, 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

Power consumption: 6 VA. All hardware is made of stainless steel.

See *"Complete P/N identification"* figure for P/N information.

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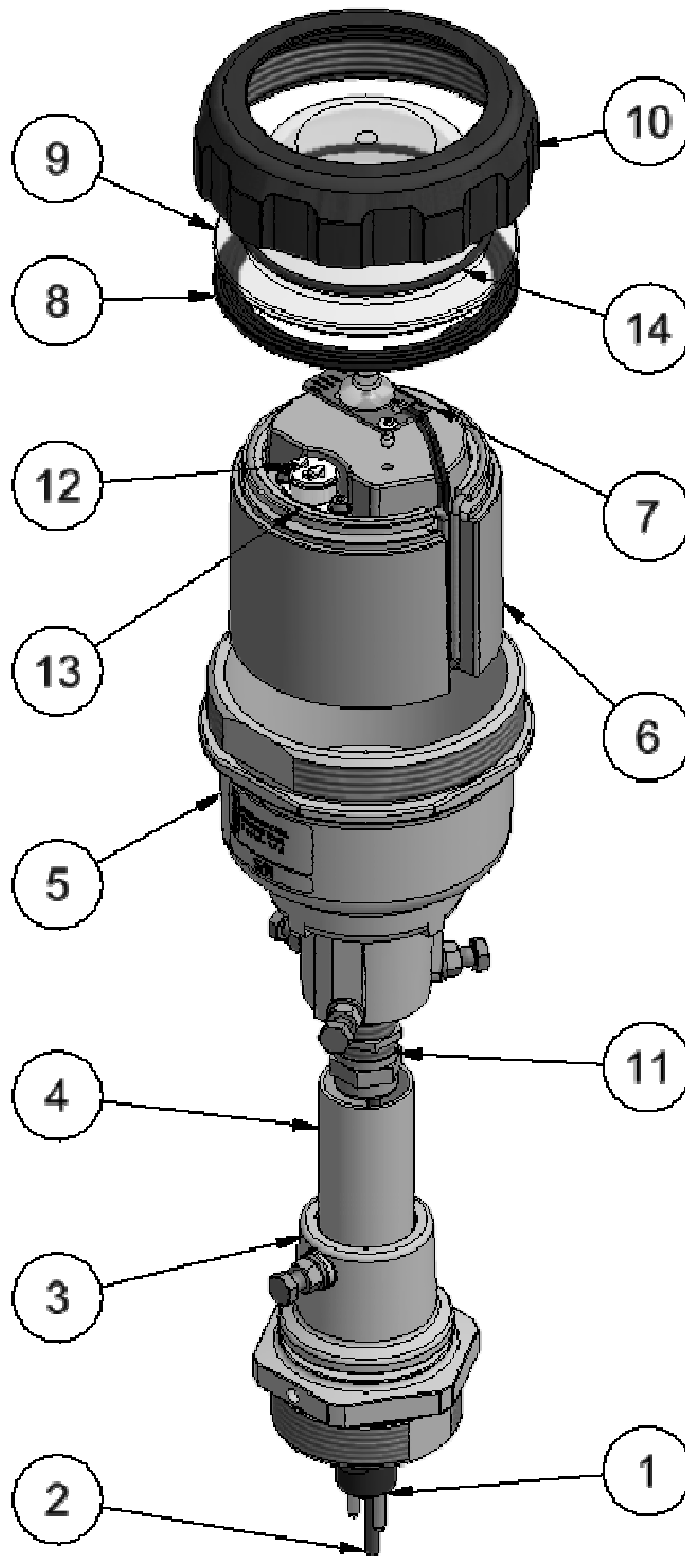


Figure 1 – Exploded View



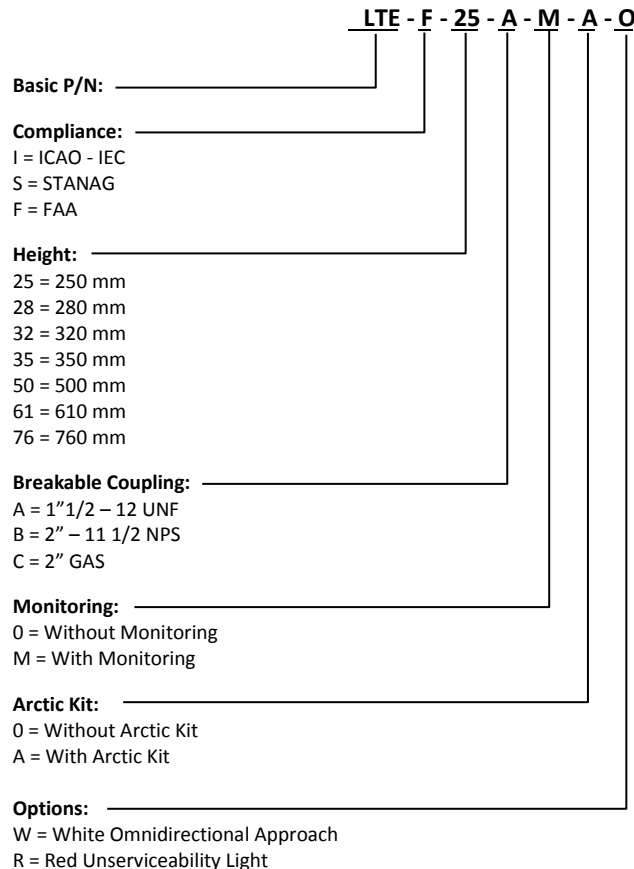
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No.	Description	Qty
1	FAA L-823 plug .....	1
2	Fixture grounding wire.....	1
3	Breakable coupling .....	1
4	Standard 1-inch tube .....	1
5	Body with slipfitter.....	1
6	Electronic .....	1
7	LED module with accessories.....	1
8	Gasket for lens .....	1
9	Lens .....	1
10	Lens locking ring.....	1
11	Cable gland.....	1
12	Arctic kit thermostat.....	1
13	Arctic kit heater .....	1
14	O-Ring .....	1

Figure 2 – Part List



*Figure 3 - Complete P/N identification*

## 2.1 ELECTRONIC SECTION

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The electronic section consists of the following circuits:

- Current / current conversion circuit
- LED command circuit
- Control circuit

### 2.1.1 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.

### 2.1.2 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

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words, the LED luminous output depends on the time of application (duty-cycle) of constant current impulses.

### 2.1.3 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.

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 features is essential when the monitoring option is required
- events recording (not-volatile memory) for diagnostic purposes
- PC operator interface through serial connection: this features allows to calibrate the brightness depending on the current, to modify the emission curve, to read the events occurred during the operating time

## 2.2 ARCTIC KIT

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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 is consists of a thermostat and one 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 12 VA.

## 3 INSTALLATION

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### 3.1 CIVIL WORKS

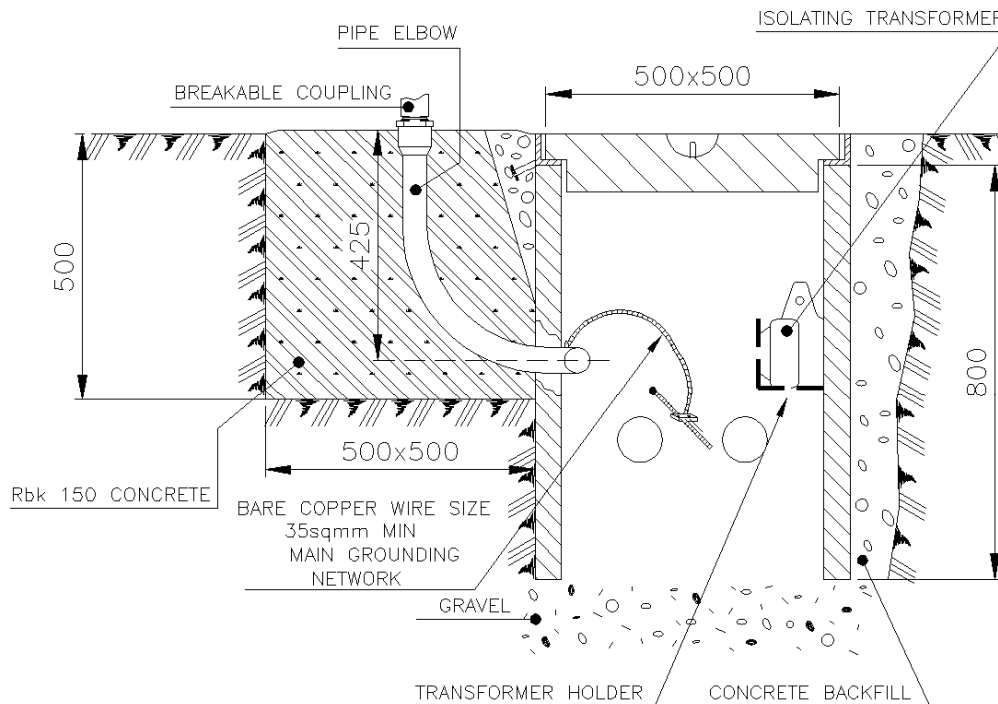
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Each light is usually installed on a suitable concrete block, into which a pipe elbows is cemented. The isolating transformer is housed into a separate concrete pit which is normally placed close the above concrete block (Figure 4).

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.

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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.



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

Figure 4 – Civil Works

### 3.2 INSTALLING THE LIGH UNIT

The light is shipped completely assembled including the LED module, 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.

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

- pass together the secondary cable lead with receptacle and a suitable length of grounding wire (grounded inside the pit) through the pipe elbow

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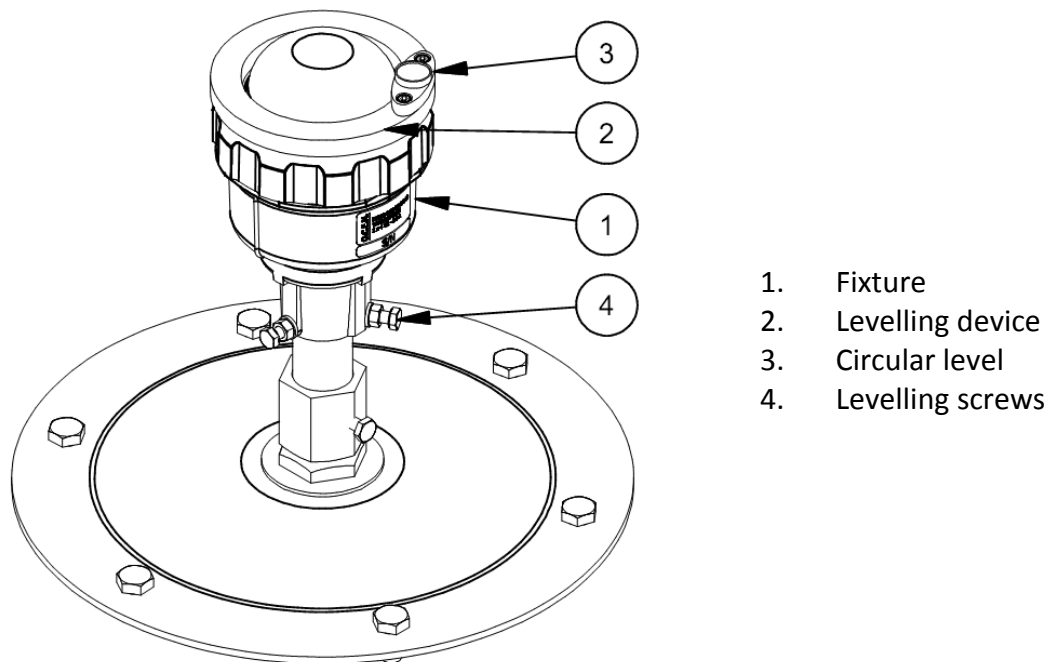
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- place the receptacle into the upper threaded section of the pipe elbow, by holding it between the two plastic rings, and pass the grounding wire through the rings (in correspondence of break point provided on the rings)
- slide one end of the 1-inch tube over the fixture cable assembly (cable leads with plug plus yellow-green wire) and into the fixture body until the body bottoms against the tube
- approach, without tighten, the set screws on the side of the body to the 1-inch tube
- 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
- 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
- connect the light plug to the secondary receptacle inside the pipe elbow
- 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
- Place on the lens locking ring the levelling device (P/N 332.3500 available on request) as shown in Figure 5. Levelling the light body by operating the three levelling screws until the bubble is centered
- remove the levelling device

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### 3.3 SECONDARY WIRING

The IEC 61823 International Standard (AGL series transformers) states at para. 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 in the taxiway/runway pavement on its concrete pit far from the relevant isolation transformer, it is necessary to provide a secondary extension between fixture and transformer. To help the installer to identify the larger socket of the female connector inside the concrete pit, the concrete pit secondary cable leads are identified by a colour code: the grey wire is wired to the larger socket, the black wire to the other one. In this way it will be easy to 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 ENERGY TECHNOLOGY technical department for additional information about this electrical solution.

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## 4 MAINTENANCE

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

LED lighting fixtures do not require frequent maintenance. With well-run installations and handling fixture carefully, avoiding excessive falls or collisions, the only maintenance work to be carried out on the field is to clean the prisms.

### 4.1 MAINTENANCE PROGRAM

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In order to ensure maximum light fixture life, the installed units should be subject to a maintenance program in accordance with the following instructions and taking as reference the Airport Service Manual ICAO - Part 9 - Airport Maintenance Practices or FAA AC 150 5340-30.

#### 4.1.1 Periodical Checks

<b>Daily</b>	Burnt-out luminous source
	Broken parts of lights
<b>Monthly</b>	Cleaning of the lenses
	Correct setting of the lights
<b>Semi-Annual</b>	Painting or replacement of rusted parts
<b>Annual</b>	Stability of the civil works
	Stability and assembly of lights
	Electrical connections and insulation degree
	Luminous efficiency of luminous sources
<b>Unscheduled</b>	Condition of all the gaskets
	After unusual atmospheric precipitation, check the light condition and remove any luminous beam obstructions

#### 4.1.2 Snowplow Operations

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Snowplow operators should exercise extra care not to strike the light fixtures with snowplow blades. After snow removal operations, inspect all light fixtures to locate and replace, if necessary, any damaged light assemblies.

Recommended snow removal techniques are described in Airport Service Manual ICAO - Part 9 - Airport Maintenance Practices or FAA AC 150/5200-30.

## 4.2 REMOVING AND OPENING THE LIGHT UNIT

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### 4.2.1 Removing the fixture

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

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

## 4.3 LENS CLEANING

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### 4.3.1 Prism outside cleaning

- Removing the fixture is not necessary to clean the outer surface of the prisms, and if already removed is not necessary to open it. Clean the lens surface with non abrasive glass product.

## 4.4 LENS REPLACEMENT

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Unscrew the lens locking ring and remove the broken lens with the relevant gasket from the fixture body.

In order to removal the lens, press down the lens with the palm of one hand and, with the other hand, unscrew the locking ring (Figure 6).

Place a new gasket on the body.

Set the new lens on the body.

Hand tighten the locking ring.



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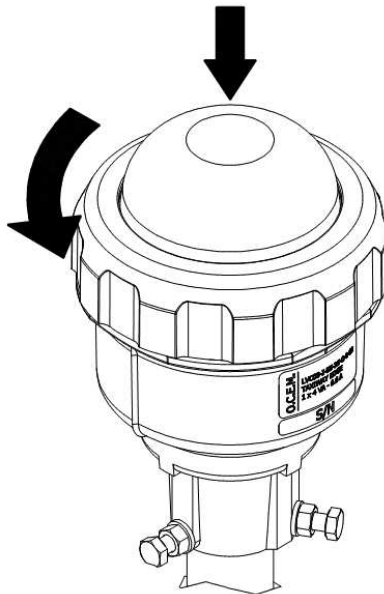


Figure 6 – Removing the Lens

#### 4.5 LED MODULE REPLACEMENT

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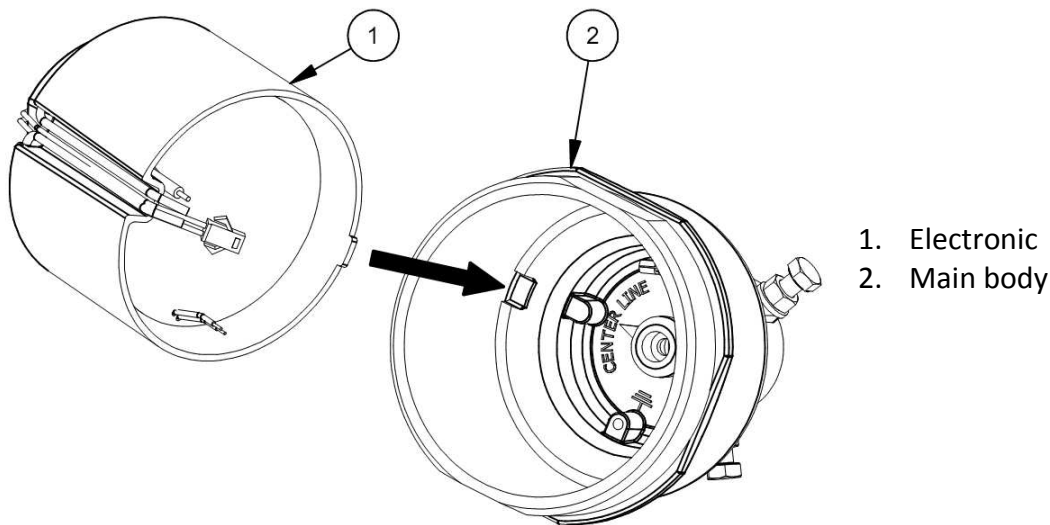
Remove the lens with gasket as above described and proceed as follow:

- remove the LED module by removing the two fasteners by means of a drill with a twist drill  $\varnothing 3$
- take out the electronic from the body and disconnect the LED module from the PCB
- provide a new LED module and reassembly the unit with reverse procedure
- apply silicon thermal paste (like Wacker P12) under the LED module and fasten it with a riveting tool
- **IMPORTANT: IT IS SUGGESTED TO REPLACE THE LENS GASKET TO NOT AFFECT WATERTIGHTNESS.**

Make sure the tooth of the Electronic goes to inserted into its seat on the body (Figure 7).

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#### 4.6 ELECTRONIC REPLACEMENT

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Remove the lens with gasket as above described and proceed as follow:

- take out the electronic from the body and disconnect the PCB from cable lead with plug and from the LED module
- remove the LED module by removing the two fasteners by means of a drill with a twist drill  $\varnothing 3$
- provide a new electronic and reassembly the unit with reverse procedure
- apply silicon thermal paste (like Wacker P12) under the LED module and fasten it with a riveting tool

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

#### 4.7 BREAKABLE COUPLING REPLACEMENT

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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 setscrew on the main body.

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

Reassembly the unit by following the installation steps.

## 4.8 CABLE LEAD WITH PLUG

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### 4.8.1 Removing the cable lead with plug

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

Unscrew the grounding screw inside the body to make free the grounding cable.

Remove the cable gland from the outside of the fixture body using a double ended deep offset ring wrench CH 20; pull out the damaged cable lead and/or the grounding wire from the sealing insert.

### 4.8.2 Installing the new cable lead with plug

Replace the cable gland if damaged.

Insert a new cable lead and a new grounding wire (if necessary) into the sealing insert at approx 8 cm from the free extremity of the cable lead. Take care that the grounding wire end with eyelet terminal be at 3-4 cm from the cable gland.

Place the sealing insert into the relevant cable gland seat and tighten it using a double ended deep offset ring wrench CH 20.

Reassembly with reverse procedure.

## 4.9 ARCTIC KIT REPLACEMENT

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### 4.9.1 Thermostat

Remove the lens with gasket as above described.

Disconnect the thermostat from the cable lead with plug, from the PCB and from the heater (Figure 8), unscrew the two screws HSCH M3x6.

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Take a new thermostat with soldered cable, tighten the two screws with tightening torque 0.6 Nm, and join the wires through the cylindrical butt connectors as shown in the diagram of Figure 8.

Carefully insert the wires of the heater, those of the thermostat and those of the LED board into the seat on the side of the electronic to avoid damage to the cables when you insert the electronic into the main body.

#### 4.9.2 Heater

Proceed as described in the preceding paragraph.

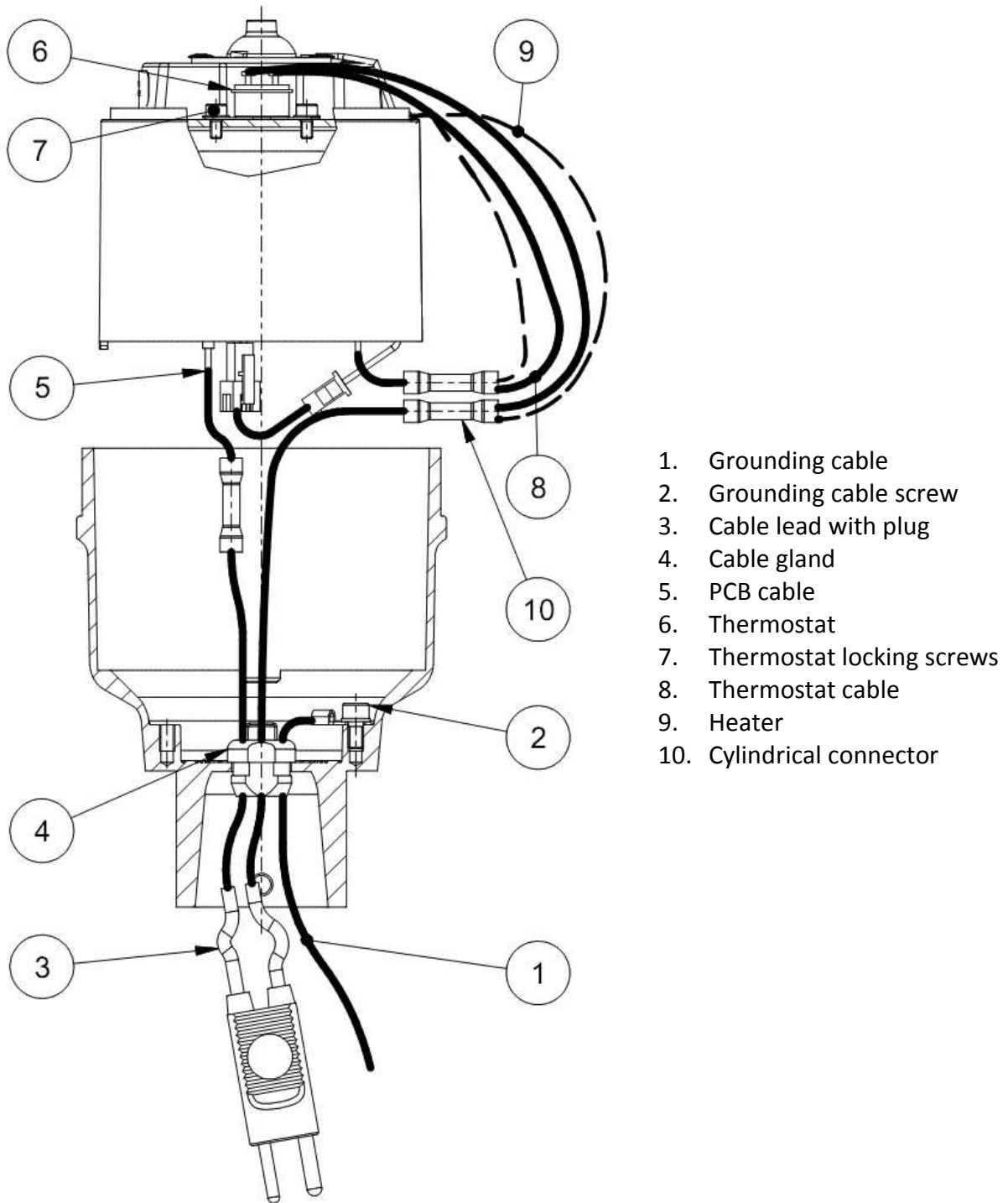
Positional the new heater in the groove of the plastic ring. Position the ring on the electronic so that the heater comes into contact with the lens and the cables can move through the seat on the side of the electronic.

Reassemble the fixture as described above.

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1. Grounding cable
2. Grounding cable screw
3. Cable lead with plug
4. Cable gland
5. PCB cable
6. Thermostat
7. Thermostat locking screws
8. Thermostat cable
9. Heater
10. Cylindrical connector

Figure 8 – Cable lead with plug, Grounding cable and Arctic kit

#### 4.10 MONITORING

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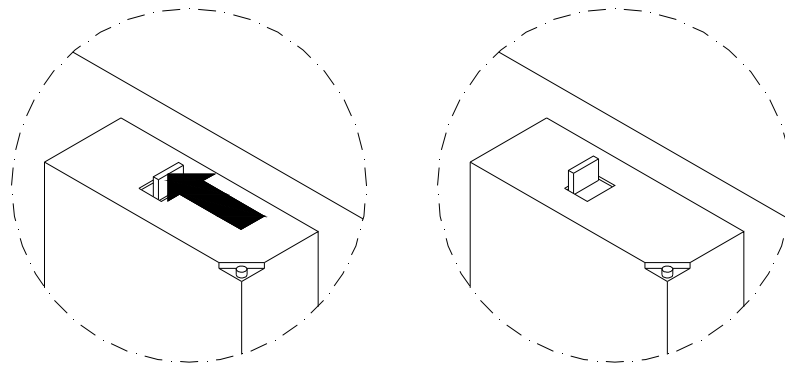
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The fixtures can be provided with the option of monitoring. This device allows to show at the constant current regulator as if the fixture circuit was open when a LED burns out. The fixture thus acts as a traditional lamp fixture.

When the fixture has a bad operation, the internal monitoring device disconnects definitively the fixture from the series circuit; after this operation to restore the normal operation of the fixture it's necessary to replace the LED board and unlock the monitoring device. For this operation it is necessary to follow these steps:

- remove the fixture from the base and open it following instructions of *“Removing and Opening the Light Unit”*
- replace the LED module following instructions of *“LED Module Replacement”*
- restore the condition of proper functioning of the monitoring device as shown in Figure 9



*Figure 9 - Restoring the Monitoring Device*

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 LED ELEVATED TAXIWAY EDGE LIGHT LTE  
 INSTRUCTION MANUAL FOR USE, INSTALLATION AND MAINTENANCE

## 5 TROUBLESHOOTING

Problem	Possible cause	Solution
Distorted light beam output	Broken or damaged lens	Replace lens
Weak light output	Primary loop with partial short circuit	Check cable assembly
	Defect in the isolation transformer	Replace transformer
	Dirty lens	Clean the light fixture
	One LED of the luminous source damaged in short circuit (only without the monitoring option)	Replace the LEDs board
	Wrong power PCB installed	Check parts list and install the correct PCB
Luminous source not working	LEDS DEFECTIVE	Replace the LEDs board
	POWER PCB DEFECTIVE	Replace the Power PCB
	Moisture inside the fixture	Execute leakage test and replace damaged components. Clean and dry the inside area of the fixture
	No connection of primary circuit	Check transformer output current with A-meter
	Defective isolation transformer or secondary wiring	Check power line between the light fixture and the transformer, including connectors
	Monitoring device locked (only if this option)	Unlocked monitoring device
Water or moisture inside the fixture	Lens gasket	Replace the gasket
	Pinched fixture power cables	Replace fixture leads