



## LED INSET RUNWAY CENTRELINE, R.E.T.I.L. AND RAPID EXIT TAXIWAY CENTRELINE LIGHT



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| 09/09/2015 | 0.4   | Updated identification of P/N<br>Tightening torque of the screws on the base L-868 changed<br>Added to refer to standard EASA                 |           |             |
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Supersedes edition 08/27/2020

LED INSET RUNWAY CENTRELINE, R.E.T.I.L. AND RAPID EXIT TAXIWAY CENTRELINE LIGHT LIRC  
INSTRUCTION MANUAL FOR USE, INSTALLATION AND MAINTENANCE

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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**



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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## 1 GENERAL

---

**LIRC** inset LED runway centreline light is high intensity, bidirectional or unidirectional, 8" steady burning type.

These fixtures are intended for use as runway centerline, R.E.T.I.L. and rapid exit taxiway centreline in order to provide a visual aid to the moving aircraft.

LIRC lights are in compliance with ICAO Annex 14 Vol.1, EASA CS-ADR-DSN, FAA AC 150/5345-46 (Style 3), IEC TS 61827 (Style 4), CASA Manual of Standard Part 139 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, EASA CS-ADR-DSN, STANAG 3316 and FAA 150/5340-30.

## 2 MAIN FEATURES

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Each light assembly consists of a removable fixture and a shallow base receptacle. The fixture is waterproof and designed to withstand aircraft impact and roll-over loads without damage.

On request a suitable adaptor ring (base mounted, option R) is available to allow the installation on shallow base, 12" diameter, or on deep base, type L-868, size B, as per FAA AC 150/5345-42, thereby permitting replacement of any inset fixture without removing the deep base from the pavement.

The fixture can be bidirectional type (bidirectional dome equipped with two LED modules, operating at the same time or independently) or unidirectional type (unidirectional dome equipped with only one LED module).

Power consumption for bidirectional fixture is 29 VA (1 plug) and 32 VA (2 plugs), unidirectional fixture is 16 VA (1 plug).

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## 2.1 REMOVABLE LIGHT UNIT

The removable fixture mainly consists of a dome, an optical assembly, a power supply/control board, and a lower cover.

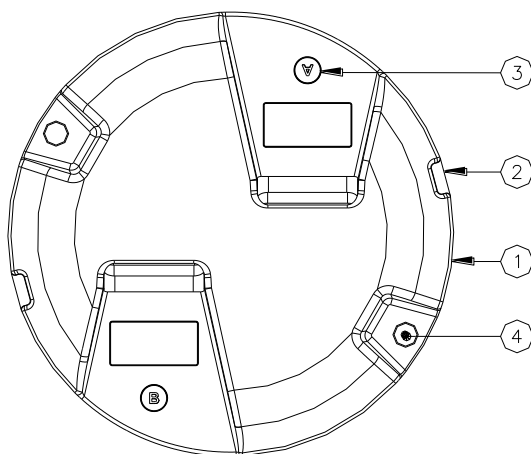
### 2.1.1 Dome

The dome is made of treated drop-forged aluminium and includes one or two windows to seat the prisms, complete with gaskets, kept in the proper position by means of a mounting plate fixed with HSCS M5x12 screws. In correspondence of the windows, the dome is outside provided with identification letters "A" and "B".

The dome is provided with two through holes for fastening the light unit to the base and two dead holes for matching two studs mounted on the base, so to prevent the rotation of the light unit due to aircraft wheel impact/roll over.

It is also provided with two suitable slots, in opposite position, to make easy the fixture removal by using two suitable lifting tools (available on request, P/N 332.4140 or 332.4230). As alternative, two screwdrivers can be used.

A silicone O-Ring (separately supplied) has to be mounted outside around the dome, to avoid dirt deposits between dome and shallow base.



1. Dome
2. Slot for dome removal
3. Letter "A" to identify the beam
4. Through hole for light unit fastening

Figure 1 – 8" Dome outside view

### 2.1.2 Optical Assembly

The **optical assembly** consists of two prisms (Figure 5 - n°9) with relevant gaskets (Figure 5 - n°8) kept into the proper position by mounting plate (Figure 5 - n°11) and two LED module (Figure 5 - n°13) with reflector (Figure 5 - n°12). Unidirectional fixtures mount only one prism and one LED module.

Each LED module consists of four LEDs mounted on a metal core PCB, coupled with the support through thermo conductive material; the reflector is fixed to the support assembly.

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All the optical assembly parts are factory assembled; they may be field-replaced if necessary.

### 2.1.3 Power Supply/Control Board

The power supply/control board is encapsulated into waterproof and heat conductive silicon resin.

The PCB powers and controls the LEDs so that the light output provided at every current step from 2.8 A to 6.6 A is comparable to a traditional halogen lamp, according to the requirements of FAA "Engineering Brief N°67" document.

### 2.1.4 Lower Cover

The **lower cover** consists of a treated aluminium casting; it is fastened to the dome by means of three screws TORX M5x10. An O-Ring is provided between dome and lower cover.

The cover is provided with one or two threaded holes for cable entry and external grounding screw with XHHW, 600V, AWG12 cable, 0.250 m or 0.50 m long (with male faston terminal) or ground clamp for AWG6, XHHW, 600V cable. A suitable valve is outside mounted for the leakage test.

Watertightness between fixture and shallow base is ensured by means of a gasket (separately supplied) to be placed on the relevant groove around the lower cover.

The fixture is supplied with one or two **cable lead with L-823 plug**; they consist of two single-pole leads, size 1.3 mm<sup>2</sup> (#16 AWG), external length 0.250m or 0,460 m long. The plug is in compliance with FAA AC 150/5345-26 for very quick coupling with the receptacle mounted on the shallow base.

If the light unit is equipped with one cable lead with plug, both the power supply/control board sections will work simultaneously; if it is necessary to operate independently the two power supply/control board sections, then two cable leads with plug are necessary.

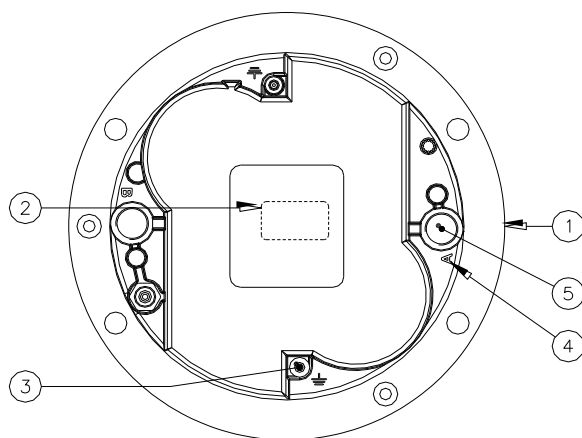
The fixture is 203 mm in diameter and 85 mm (+ 18,5 mm for plugs) high; the protrusion above the ground is less than 6.35 mm.

An identification data label is externally applied over the lower cover (Figure 2 – n°2). Moreover, to identify quickly the beam colour, the letters "A" and "B" of the dome in front of the windows are painted in the same colour of the light beam.

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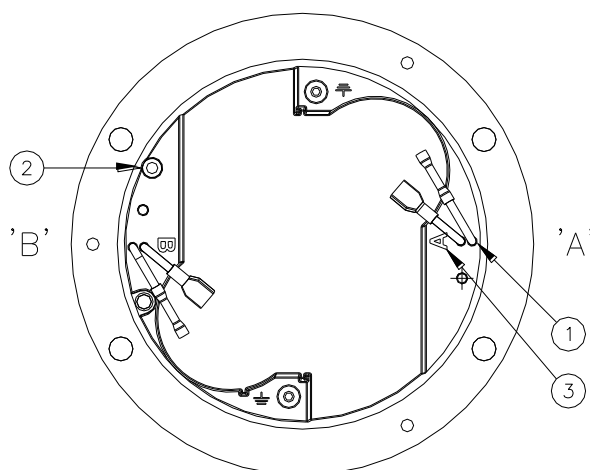
1. Lower cover
2. Identification label
3. Grounding cable hole
4. Letter "A" and "B" for cable lead identification
5. Cable lead entry

*Figure 2 – Lower Cover Outside View*

The same colour painting is provided outside on the lower cover.

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

All hardware is made of stainless steel.



1. Cable lead with plug
2. Leak test valve
3. Letter "A" and "B" for cable lead identification

*Figure 3 – Lower Cover Inside View*

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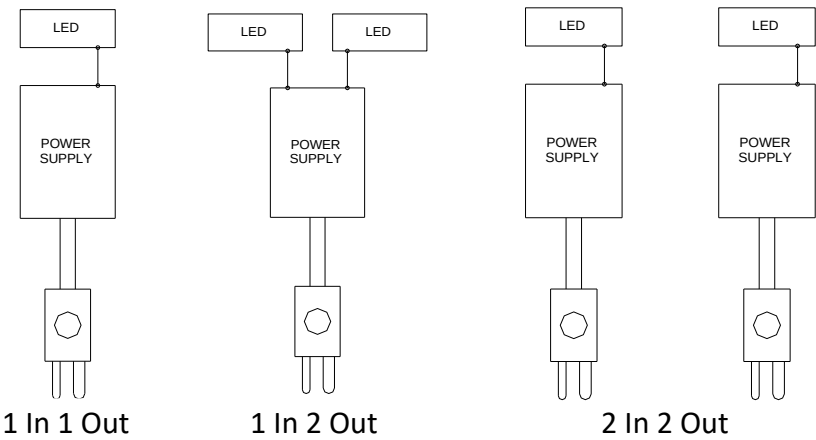


Figure 4 – Wiring Diagram

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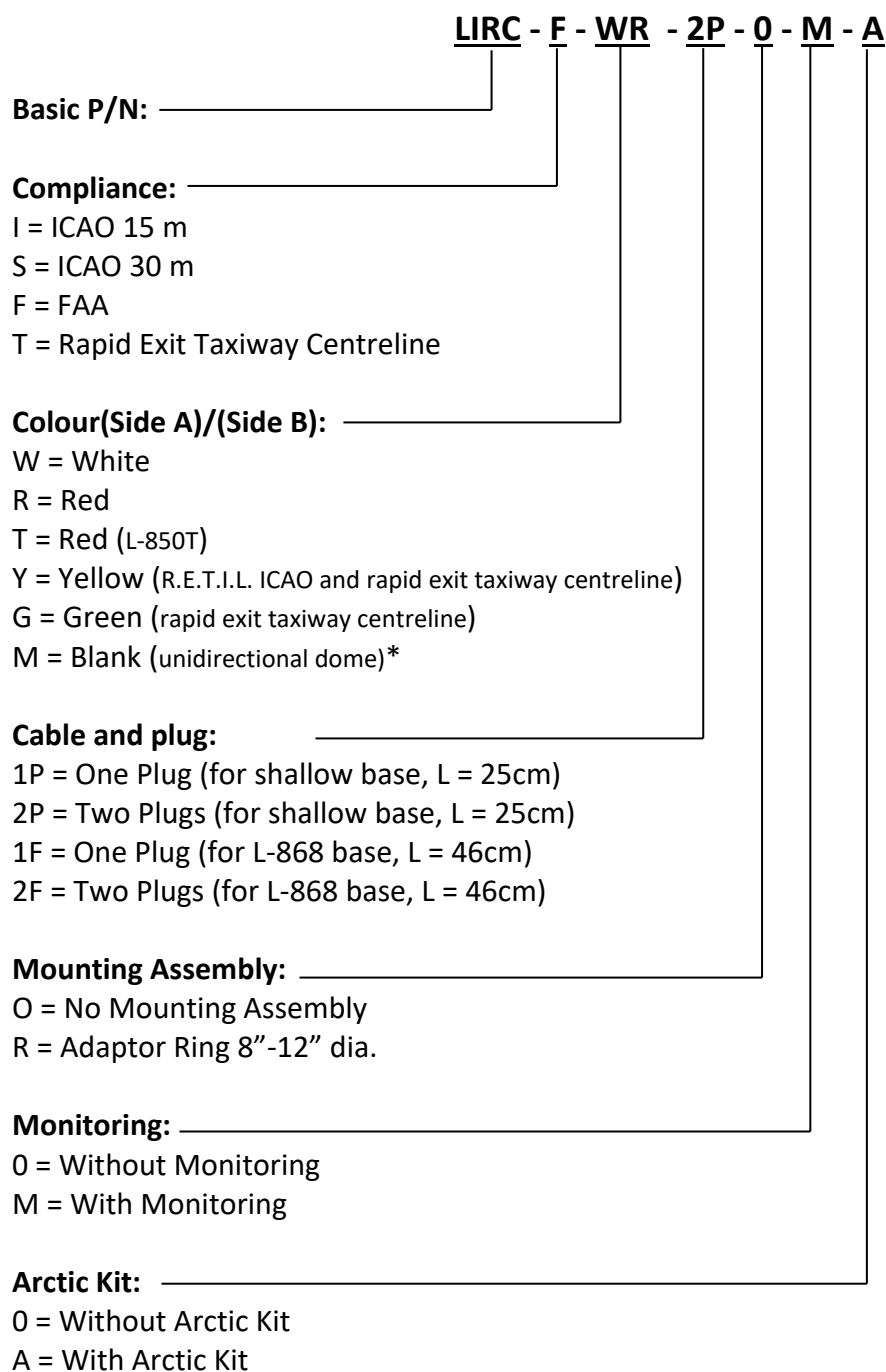


Figure 5 – Exploded View

| No. | Description                         | Qty |
|-----|-------------------------------------|-----|
| 1   | Dome .....                          | 1   |
| 2   | O-Ring for dome .....               | 1   |
| 3   | O-Ring for lower cover.....         | 1   |
| 4   | Arctic kit heater .....             | 1-2 |
| 5   | Arctic kit thermostat.....          | 1-2 |
| 6   | Lower cover .....                   | 1   |
| 7   | Valve for watertightness test ..... | 1   |
| 8   | Prism gasket .....                  | 1-2 |
| 9   | Prism .....                         | 1-2 |
| 10  | Prism holder gasket .....           | 1-2 |
| 11  | Mounting plate.....                 | 1   |
| 12  | Reflector with hardware.....        | 1-2 |
| 13  | LED module with accessories.....    | 1-2 |
| 14  | Lower cover gasket.....             | 1   |
| 15  | FAA L-823 plug.....                 | 1-2 |

Figure 6 – Part List

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\* The not-finished "M" side, on straight sections, is always side "B"

*Figure 7 - Complete P/N identification*

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## 2.2 SHALLOW BASE

The **shallow base** (Figure 9) consists of a treated aluminium casting containing an electrical feed-thru system to connect the power cables, consisting of one or two cable leads with receptacle incoming inside the base through one or two cable glands. The cable lead with receptacle consists of two single-pole leads, size 2.5 mm<sup>2</sup>, 1.00 m long, with FAA L-823 receptacle.

The letters "A" and "B" are printed inside the base for cable leads identification.

The base is equipped with an internal grounding screw with XHHW, 600V, AWG12 cable lead, 0.250 m long, with female faston terminal for quick connection to the corresponding of the fixture. An additional external grounding screw is provided close to the cable entry.

The shallow base is designed for cementing in place by means of epoxy-resin in a hole drilled in the pavement.

The fixture has to be fastened to the base by means of two or six M10x30 stainless steel hex cap screws (8" or 12" shallow base resp.). If the base has American threaded holes, UNC 3/8-16 screws can be used. Each locking screw is complete with special sealed external silicon-coated lock-washer.

A gasket (separately supplied) must be placed between base and fixture for watertightness: for 8" fixtures (Figure 8 - n°1) around the lower cover, for 12" fixtures (Figure 9 - n°9) placed in the relevant shallow base groove.

The 12" shallow base is 320 mm in diameter and 150 mm high, while the 8" one is 214 mm in diameter and 125 mm high.

On request, special bases without cable leads can be supplied, provided with holes suitable for conduit connections.

Inside the base two suitable holders (Figure 9 - n°7) are provided to properly sustain the secondary power cable, in case of this cable is inside incoming through a conduit.

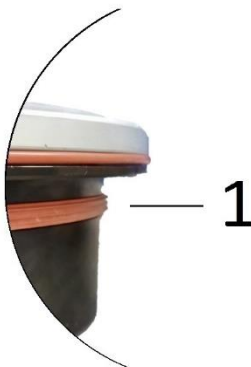


Figure 8 – Gasket of 8" fixture for 8" shallow base

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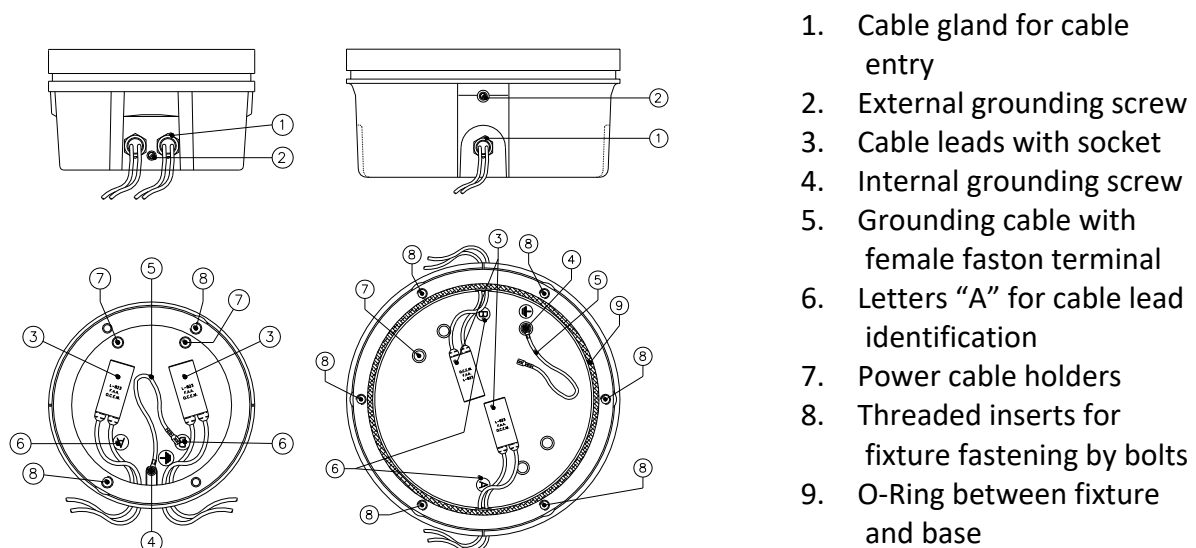


Figure 9 – Standard 8"-12" shallow base

## 2.3 ELECTRONIC SECTION

The electronic section consists of the following circuits:

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

### 2.3.1 Current / current conversion circuit

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

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

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### 2.3.2 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.

### 2.3.3 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 analysed 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

## 2.4 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 (two in case of fixture with double cable lead) and one or two heaters. It starts when the dome temperature is less than about -1°C and turns-off when the dome temperature reaches about 10°C.

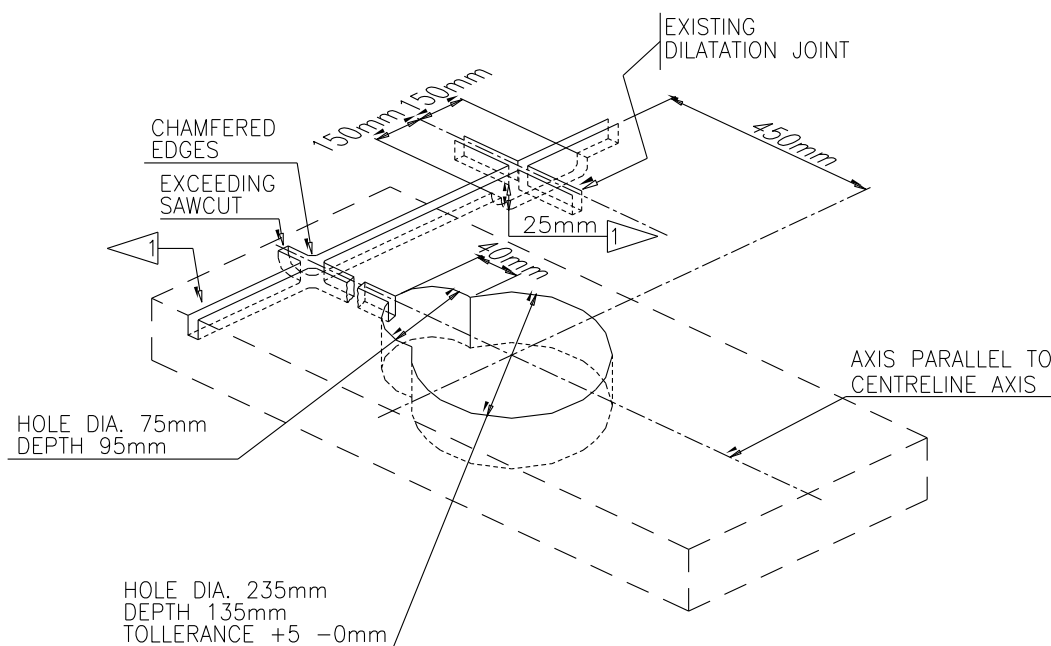
Arctic kit consumption is less than 20 VA per plug.

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### 3 INSTALLATION

#### 3.1 Pavement Boring and Sawcutting

Drill each recess in pavement following the instruction in Figure 10.



NOTE:

- 1 12" SHALLOW BASE :  
 BASE HOLE : DIA: 340mm – 160 mm DEEP ( +5 ; -0 )  
 CABLE GLAND HOLE : DIA: 75mm – 120 mm DEEP

Figure 10 – Pavement Boring, Sawcutting and Joint Intersection Details

Make sure the recess size and depth are maintained within the specified limits. All surfaces of the recess must be clean and dry. If any of these surfaces is damp, it is desirable that it be dried and blown clean with a compressed air blast. The recess side walls must be perpendicular to the pavement surface. The bottom surface must be flat or slightly concave to assure that the shallow base rest securely and in true position. The recess can best be drilled using a diamond-faced core drill in a sturdy, stable drill rig.

Mark on the pavement surface the aiming direction of the light by chalk, nails or other devices.

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### 3.1.1 Scheme of Light Configurations

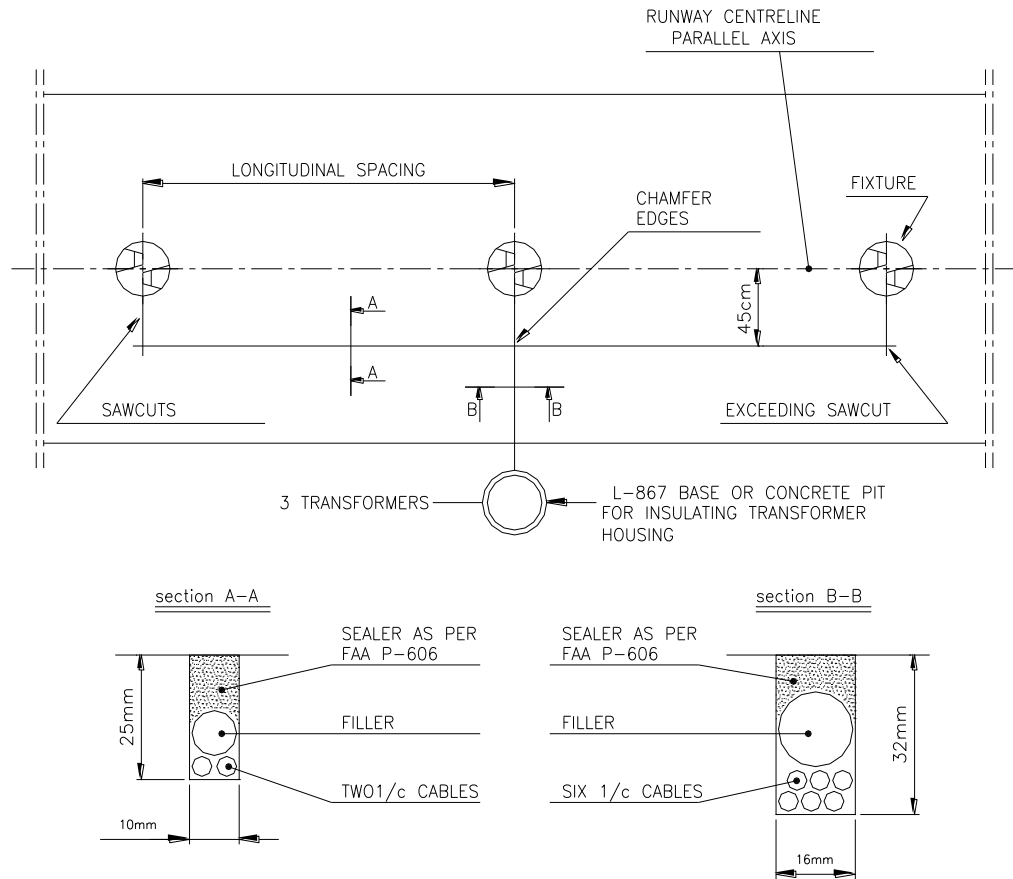


Figure 11 – Example of Light Unit Configuration (One Transformer per each Light)

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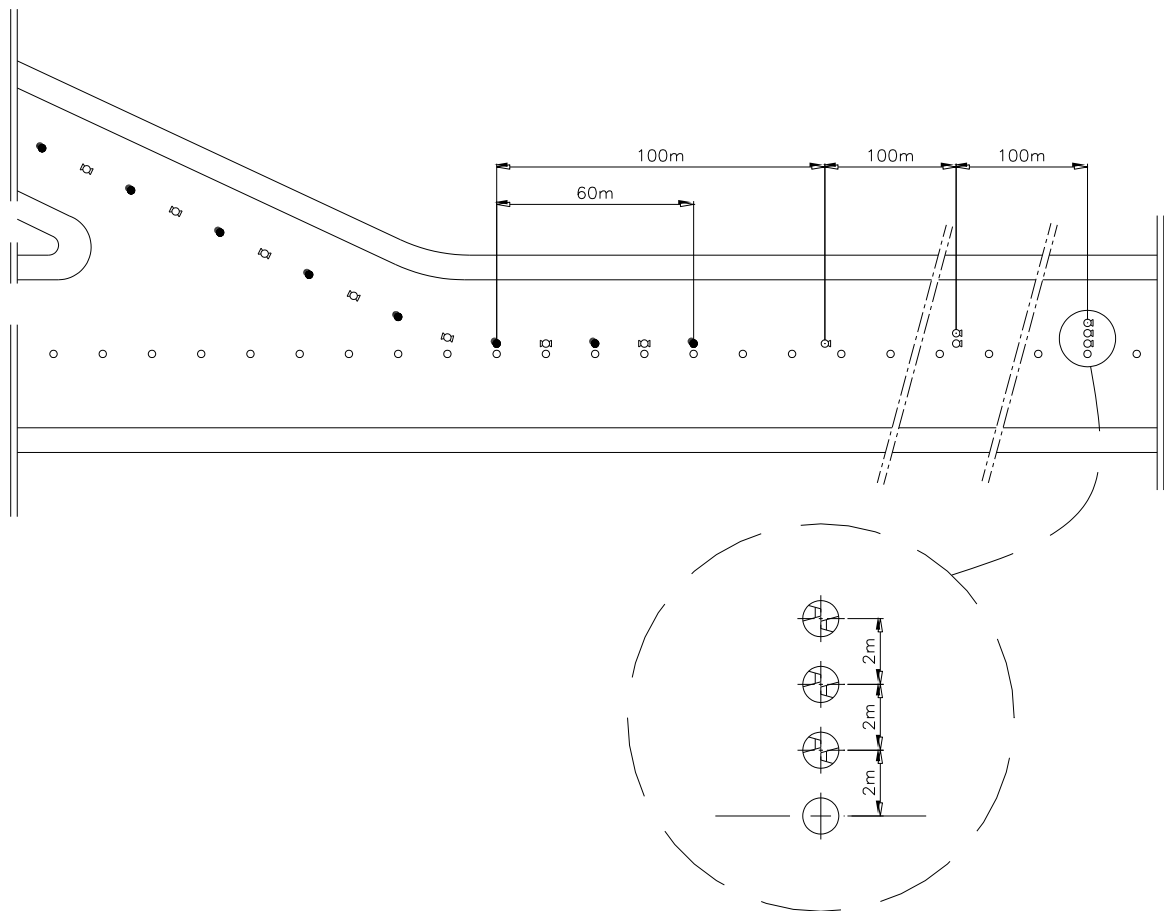


Figure 12 – R.E.T.I.L. Configuration

3.2 INSTALLING THE SHALLOW BASE

Two different installations are possible:

- Method “A” – cable leads to be laid in wireways
- ▣ Method “B” – cable leads to be laid in cable ducts (Figure 16)

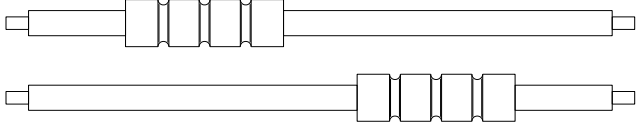
Proceed as follow to realize a proper installation.

| STEP | A | B | ACTIVITY DESCRIPTION                                                                                                                                                                             |
|------|---|---|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1    | • | ▣ | Take the base from the shipping box.                                                                                                                                                             |
| 2    | • | ▣ | To assure an adequate bond between base and hole all external surfaces of the base should be sandblasted and must be cleaned with solvent. <b>TAKE CARE NOT TO DAMAGE THE ELECTRICAL SYSTEM.</b> |

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| STEP | A | B | ACTIVITY DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|------|---|---|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 3    | • | / | Connect an insulated G/Y grounding wire of suitable length to the grounding screw externally provided on the wall of the base.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| 4    | • | / | <p>Splice the light base leads to the power cables using solderless squeeze connectors, as shown in the figure, crimped with the proper tool. Connect also the grounding wire to the main grounding network by using a suitable clamping lug.</p>  <p><b>ATTENTION: Insulate each splice carefully using either heat shrinkable insulating tubing properly applied or at least three layers of plastic electrical insulating tape applied with half overlap.</b></p>                                                                      |
| 5    | • | ▣ | <u>Mount the positioning jig (P/N 332.4301) on the base as shown in Figure 17.</u><br><u>An optical device for proper fixture orientation is available (P/N 332.4351 Figure 18).</u>                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| 6    | • | / | Properly arrange the leads in the wireways using small pieces of insulating tape if necessary.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| 7    | • | ▣ | <p>Completely cover the bottom of the base with sealer material, apply a thin coat of sealer to the bottom of the drilled hole to assure a bond between the bottom of the light base and the drilled hole. It may be necessary to place temporary plugs so as to block the wireways entrances into the drilled hole (METHOD "A") or the cable ducts entrance (METHOD "B"). The plugs will retain the sealer while it begins to dry up.</p> <p><b>ATTENTION: avoid starting the installation when the ambient temperature is below 10°C (86°F), unless the sealer used is designed to dry up at a lower temperature.</b></p> |
| 8    | • | ▣ | Push the base into the recess until its upper side is at the level of the pavement surface; take care no sealer flowing inside the base. Align the notch of the base with the markings on the pavement surface.                                                                                                                                                                                                                                                                                                                                                                                                             |

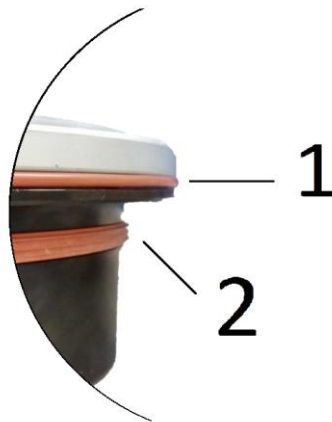
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| STEP | A | B | ACTIVITY DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|------|---|---|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 9    | ● | / | <p>Observing the circular level fixed on the jig, level the jig by operating the three leveling lobe knobs (Figure 17). If necessary, a weight may be placed on the jig to hold the light base in position.</p> <p>The remainder of the space between the sides of the shallow base and the drilled hole should be filled with sealer up to approx 25 mm from the pavement, according to the local needs.</p> <p>Fill the remaining 25 mm with a suitable joint sealing filler.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| 10   | / | ▣ | <p>Observing the circular level fixed on the jig, level the jig by operating the three leveling lobe knobs (Figure 17). If necessary, a weight may be placed on the jig to hold the light base in position.</p> <p>When the shallow base is in its final position, the conduit(s) must be properly jointed to the hole(s) provided on the shallow base. This(these) hole(s) can be provided either on the wall either on the bottom, the number and the dimensions according to customer requirements ( and Figure 16).</p> <p>The remainder of the space between the sides of the shallow base and the drilled hole should be filled with sealer up to approx 25 mm from the pavement, according to the local needs.</p> <p>Fill the remaining 25 mm with a suitable joint sealing filler.</p>                                                                                                                                                                                                                          |
| 11   | / | ▣ | Lay the secondary power cable, equipped with a suitable two-pole receptacle kit, and the grounding wire inside the cable duct.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| 12   | ● | ▣ | <p>To install a 8" fixture place the O-Ring around the dome (Figure 13- n°1) and between fixture and base (Figure 13- n°2), for 8" fixtures with adaptor ring place the O-Ring between fixture and base (Figure 14- n°2).</p> <p>To install a 12" fixture place the O-Ring around the dome (Figure 14- n°1) and between fixture and base (Figure 14- n°2).</p> <p>Connect the plug and the grounding wire of the fixture with the receptacle and the grounding wire of the base; press the fixture by hand onto the base and secure it using the six (12" base) locking screws complete with washer, one drop of screw paste (e.g. Dow Corning Molycote 1000) should be applied to the screws before installation; two screws are used for 8" base, one drop of anaerobic adhesive, medium type (e.g. Loctite 243) should be applied.</p> <p>Tightening torque is 35 Nm.</p> <p><b>ATTENTION: The fixture is subject to mechanical damage and/or optical misalignment if not properly seated on the base flange.</b></p> |

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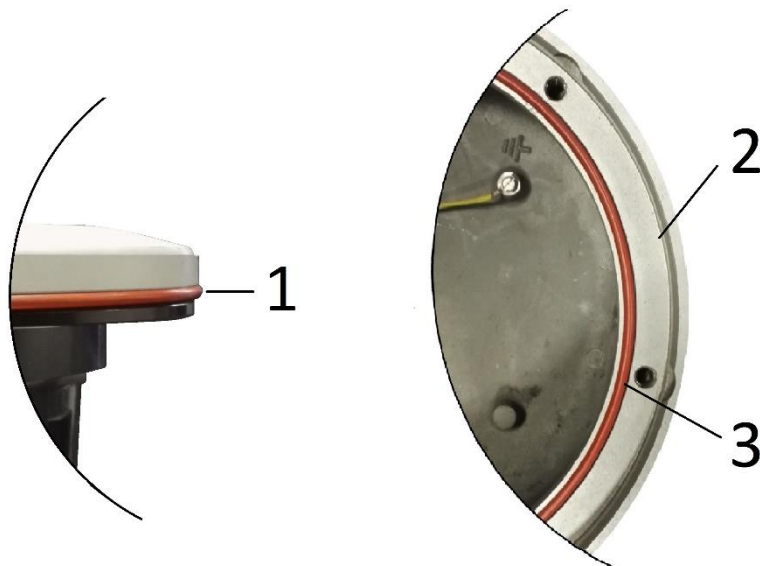
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1. O-Ring around the dome
2. O-Ring between fixture and base

*Figure 13 – Gaskets for 8" shallow base*



1. O-Ring around the dome
2. 12" shallow base
3. O-Ring between fixture and base

*Figure 14 – Gaskets for 12" shallow base*

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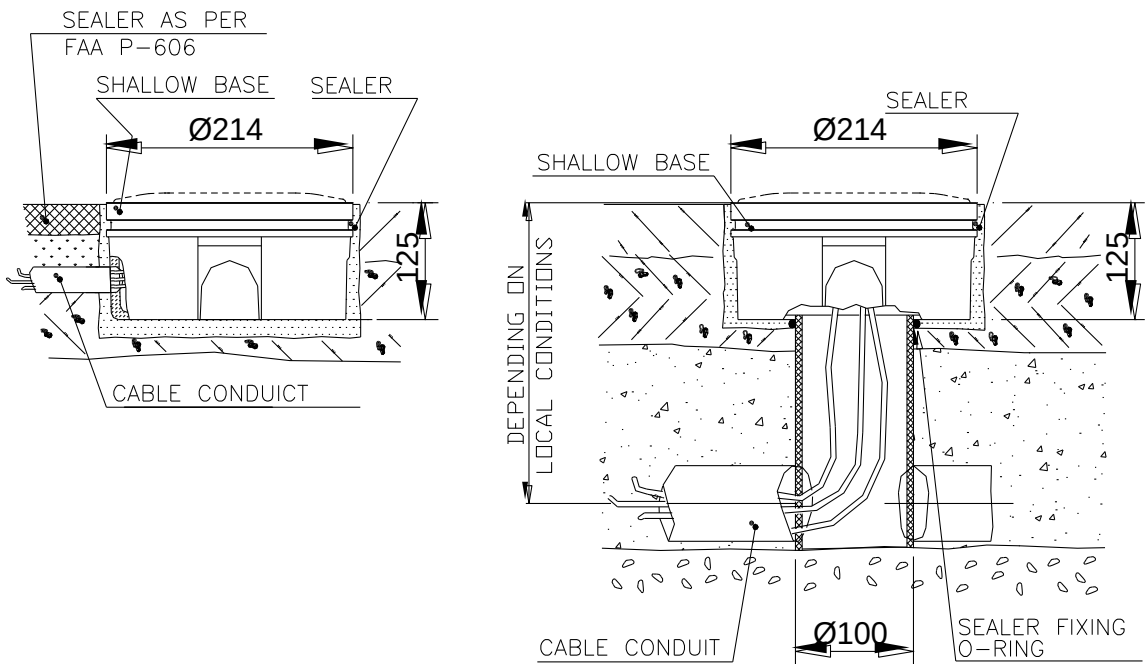


Figure 15 – 8” shallow base for side or bottom ducts (method “B”)

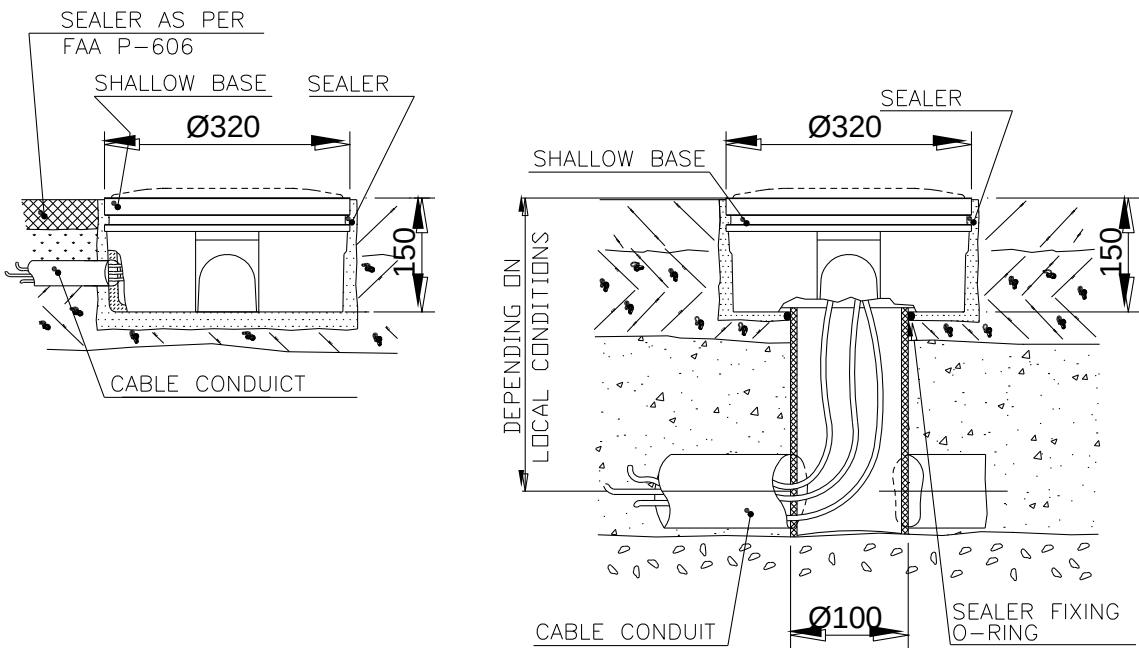


Figure 16 – 12” shallow base for side or bottom ducts (method “B”)

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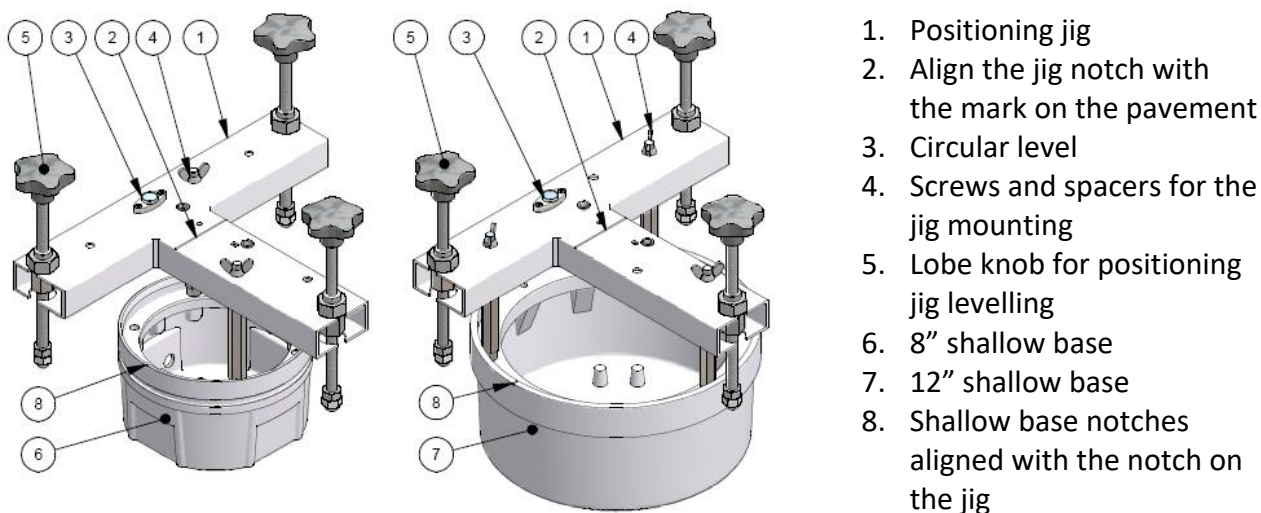
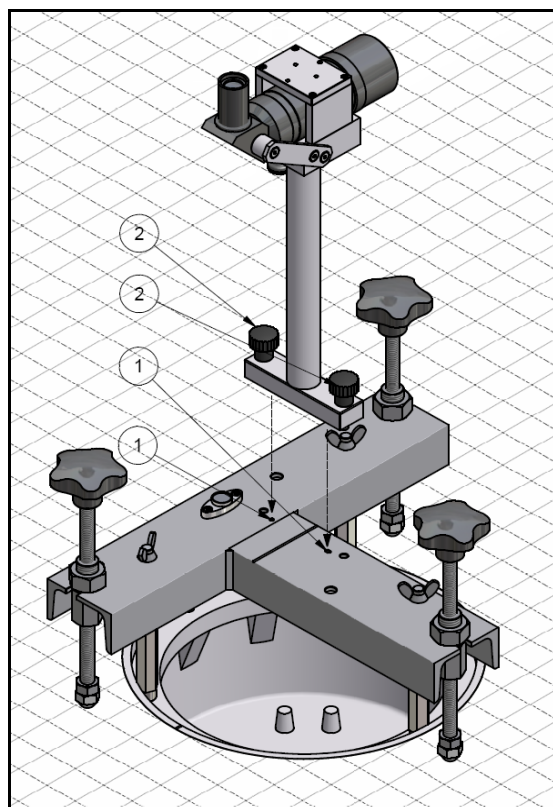


Figure 17 – Shallow base installation details



1. Positioning jig holes for optical device reference pins
2. Fixing knobs

Figure 18 – Optical device (refer to the manual UT-MT-0485 for further information)

### 3.3 INSTALLING THE LIGHT UNIT ON L-868 BASE, SIZE B

Install L-868 light base in compliance with FAA AC 150/5340-30.

The fixture is shipped complete (including the lamps) and is ready for installation as received, in case of 8" fixture it shall be complete of adaptor ring.

Be sure the flange on the transformer housing is clean and the O-Ring (Figure 19 – n°2), if used, is in place in the O-Ring groove.

Connect the plug of the fixture to the receptacle of the isolating transformer inside the deep base. Connect the grounding wire of the fixture to the grounding wire of the deep base (faston connection). Then press the fixture firmly and evenly by hand onto the base flange. Secure the fixture to the base by using the six locking screws complete with washers, supplied with the base. One drop of anaerobic adhesive, medium type (e.g. Loctite 243) should be applied to the screws before installation; tightening torque is 35 Nm.

The fixture is subject to optical misalignment and/or mechanical damage if not properly seated.



1. L-868 base
2. O-Ring between fixture and base

*Figure 19 – Gaskets for L-868 base*

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### 3.4 SECONDARY WIRING

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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 an inset fixture, installed in the taxiway/runway pavement on its shallow base 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 base (when installed), the base 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 power supply a two-plug fixture by a single isolation transformer or connect in series more fixtures (with one or two plugs indifferently) on the secondary side of a single isolation transformer: please contact ENERGY TECHNOLOGY technical department for additional information about this electrical solution.

## 4 MAINTENANCE

---

**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

---

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.

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#### 4.1.1 Periodical Checks

|                    |                                                                                 |
|--------------------|---------------------------------------------------------------------------------|
| <b>Weekly</b>      | <b>Cleaning of the prisms and the light output channel of runway fixtures</b>   |
| <b>Bi-monthly</b>  | <b>Cleaning of the prisms and the light output channel of taxiway fixtures</b>  |
| <b>Annually</b>    | <b>Check for burned-out led</b>                                                 |
|                    | <b>Check for moisture inside the fixture</b>                                    |
|                    | STABILITY OF THE CIVIL WORKS OF RUNWAY FIXTURES                                 |
| <b>Unscheduled</b> | <b>Check for water in base</b>                                                  |
|                    | <b>ELECTRICAL CONNECTIONS AND INSULATION DEGREE</b>                             |
|                    | <b>LEAKAGE TEST</b>                                                             |
|                    | <b>Condition of all gaskets</b>                                                 |
|                    | <b>Check torque of mounting bolts after a month of their first installation</b> |
|                    | <b>Remove snow from around fixtures</b>                                         |
|                    | <b>Check wires in saw kerfs</b>                                                 |

#### 4.1.2 Snowplow Operations

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.

Passes over the light rows should be made with a power broom only if practical. Whenever snowplows must traverse in-pavement light fixtures, they should be either travelling at less than 10 km/h or have the blades lifted clear of the fixtures. 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 FROM THE BASE

---

#### 4.2.1 Removing the fixture

- Remove the fixture from the base, after switching off, by unscrewing the two locking screws complete with washers.
- Raise the fixture by using the two lifting tools (P/N 332.4140 or 332.4230) inserted in the suitable slots provided on the dome. As an alternative, two screwdrivers can be used.

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- Disconnect the fixture plug/s and grounding cable from those inside the shallow base.

#### 4.2.2 Opening the fixture

Unscrew the leak valve cap and push the valve central pin, in this way the light internal pressure is the same of the atmospheric pressure.

Open the fixture by unscrewing the three locking screws TORX M5x10 (Figure 20 - n°1). Every time the fixture is opened, inspect the following parts and replace them if necessary:

- prism, if it is dirty or damaged
- prism gasket, check the integrity
- cable lead with plug

#### 4.2.3 Closing the fixture

Every time the fixture is opened **replace** the following items with a new ones:

- three locking screws TORX M5x10 (Figure 20 - n°1);
- O-Rings between dome and lower cover (Figure 22 – n°2);

Verify the correct position of O-Ring between dome and lower cover (Figure 22 – n°2); mount the lower cover on the dome and fasten it by means the three screws TORX M5x10 (Figure 20 - n°1). One drop of anaerobic adhesive lower type (e.g. LOXEAL 24-18) should be applied to the screws before installation; tightening torque is 2.5 Nm.

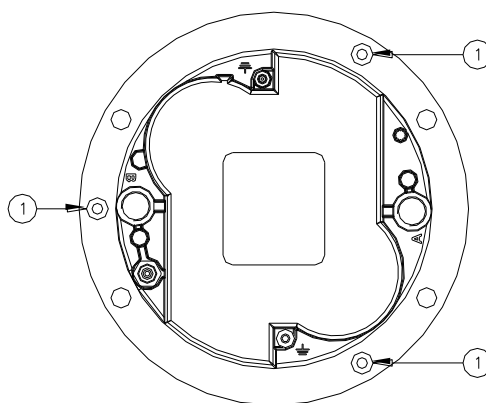


Figure 20 - Lower Cover Fixing Screws

#### 4.2.4 Leakage test

The assembly should be given a 1.38 kPa air pressure test. This can be done by connecting an external air pressure line to the valve (Figure 21– n°2) provided on the lower cover. Immerge the assembly under water, so air loss will be easily viewed if some part is damaged or assembling is wrong.

If there is no air loss then test is passed successfully.

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Light unit is ready to be field installed.

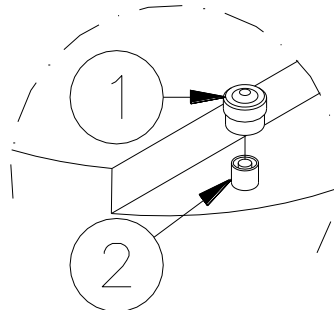
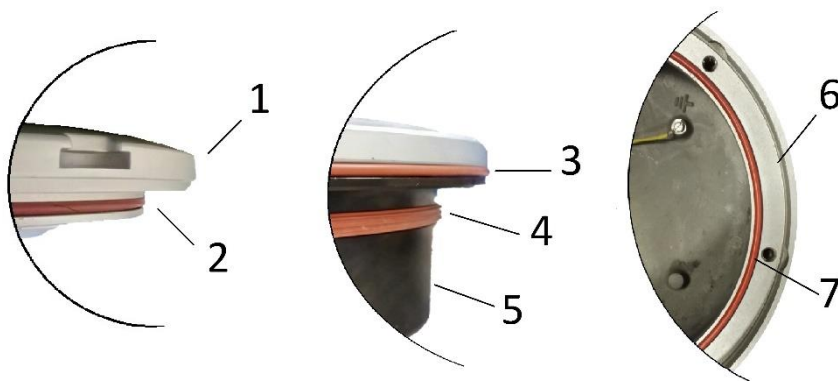


Figure 21 - Lower Cover with Pressure Valve

#### 4.2.5 Reinstalling the fixture

Every time the fixture is removed from the base replace the following items with a new ones making sure that are right placed in the relevant groove:

- the two special seal lock washers;
- O-Ring around the dome (Figure 22 – n°3);
- Gasket between fixture and 8" shallow base (Figure 22 – n°4);
- O-Ring between fixture and 12" shallow base (Figure 22 – n°7);
- The fixture is ready to be field installed.



1. Dome
2. O-Ring between dome and lower cover
3. O-Ring around the dome
4. Gasket between fixture and shallow base
5. Lower Cover
6. 12" Shallow base
7. O-Ring between fixture and 12" Shallow base

Figure 22 – Fixture Gaskets

### 4.3 PRIMS CLEANING

#### 4.3.1 Prism outside cleaning

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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 prisms surface with non abrasive glass product.

#### 4.3.2 Prism inside cleaning

Normally the cleaning of the prism inside surfaces is not necessary because fixture is watertight. Whenever it is necessary, remember the following rules.

Remove the fixture from the base and open it following instructions of *“Removing and Opening the Light Unit From the Base”* and proceed as follows:

clean the prisms surfaces (Figure 23) with non abrasive glass product  
dry them carefully

reassembly the light unit following instructions of paragraph *“Closing the Fixture”*, *“Leakage Test”* and *“Reinstalling the fixture”*.

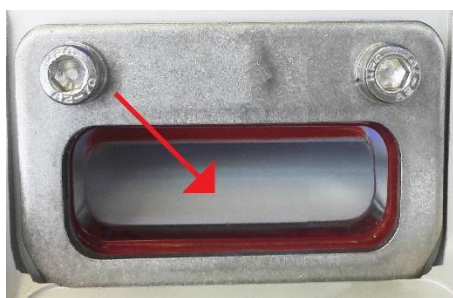


Figure 23 - Prism Cleaning

## 4.4 PRISM REPLACEMENT

---

If the prism is damaged it must be replaced as described below.

It is highly recommended to do a complete overhaul of the fixture. Contact OCEM - ENERGY TECHNOLOGY for any suggestion.

#### 4.4.1 Removing the Prism

Remove the fixture from the base and open it following instructions of *“Removing and Opening the Light Unit From the Base”*.

Clean out possible pieces of the old prism and all accumulated debris from the inside. Unscrew the two screws HSCS M5x12 (Figure 24- n°6) and remove the mounting plate (Figure 24 - n°5). Then remove the old prism and the gasket, carefully clean the prism seat by scraping and taking care not to damage the relevant walls.

#### 4.4.2 Installing the New Prism

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Place a new gasket (Figure 24 - n°2) in the prism cavity on the dome, then position and press by hand the prism (Figure 24 - n°3) in the relevant seat and place a new gasket in the back side of the prism (Figure 24 - n°4).

Then fasten the mounting plate (Figure 24 - n°5) with the two relevant screws HSCS M5x12 (Figure 24 - n°6); tightening torque is 2.5 Nm. Inspect all components inside the fixture for damages or signs of corrosion. Replace all necessary components.

Close the light fixture following instructions of paragraph *“Closing the Fixture”*, *“Leakage Test”* and *“Reinstalling the fixture”*.

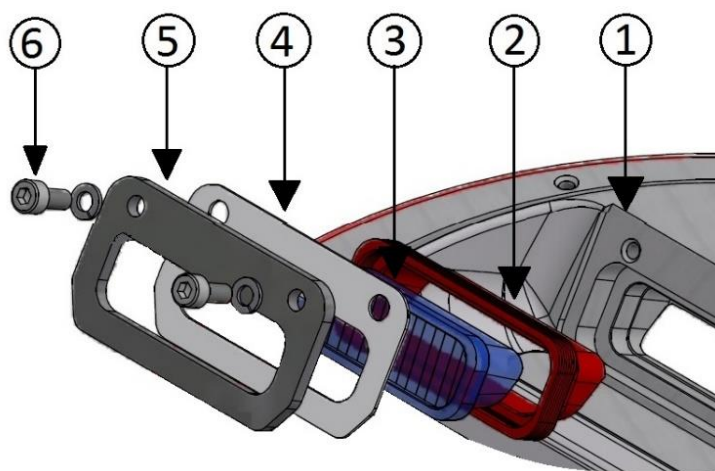


Figure 24 - Prism Replacement

#### 4.5 LED MODULE REPLACEMENT

Remove the fixture from the base and open it following instructions of *“Removing and Opening the Light Unit From the Base”* and proceed as follow:

- disconnect the power supply connector from the LED module (Figure 25 – n°4)
- remove the LED module (Figure 25 – n°3) and the relevant reflector (Figure 25 – n°1) from the mounting plate unscrewing the two screw HSCS M3x12
- replace the LED module it with a new one
- check that the thermal interface (Figure 25 – n°5) is placed under the LED module and right-positioned
- check that the Kapton insulating sheet (Figure 25 – n°2) is placed over the LED board is lying down and right-positioned
- fasten the LED module and the relevant reflector with a tightening torque of 0.6 Nm
- reconnect the power supply connector (Figure 25 – n°4) to the LED module

Reassembly the fixture following instructions of paragraph *“Closing the Fixture”*, *“Leakage Test”* and *“Reinstalling the fixture”*.

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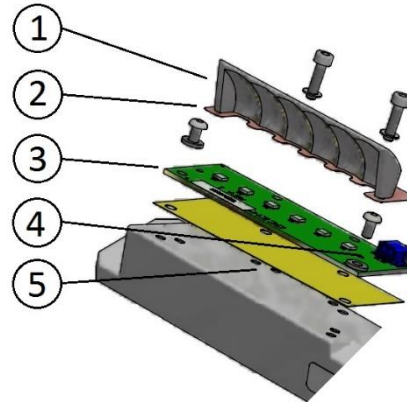


Figure 25 – LED Module Replacement

#### 4.6 ELECTRONICS REPLACEMENT

---

Remove the fixture from the base and open it following instructions of *“Removing and Opening the Light Unit From the Base”* and proceed as follow:

- disconnect the power supply connector(s) from the LED module(s)
- replace the entire lower cover with a new one complete with electronic section
- reconnect the power supply connector(s) to the LED module(s)

Reassembly the fixture following instructions of paragraph *“Closing the Fixture”*, *“Leakage Test”* and *“Reinstalling the fixture”*.

#### 4.7 ARCTIC KIT REPLACEMENT

---

##### 4.7.1 Thermostat

Remove the fixture from the base and open it following instructions of *“Removing and Opening the Light Unit From the Base”* and proceed as follow:

- disconnect the thermostat from the cable lead with plug and from the PCB
- unscrew the two screws HSCS M3x8
- unsolder the heater cable from the thermostat
- take a new thermostat and solder the heater cable 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

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#### 4.7.2 Heater

- unsolder the heater cable from the thermostat
- unscrew the three screws HSCS M3x8 which fasten the heater
- solder the new heater cable on the thermostat terminals
- protect the soldered joint from moisture with a piece of suitable heat shrink tubing
- clean the heater dome area
- apply silicon thermal paste (like Wacker P12) under the new heater
- position the heater on the dome and tighten the three screws with plastic washer; tightening torque 0.6 Nm

Reassembly the fixture following instructions of paragraph *“Closing the Fixture”*, *“Leakage Test”* and *“Reinstalling the fixture”*.

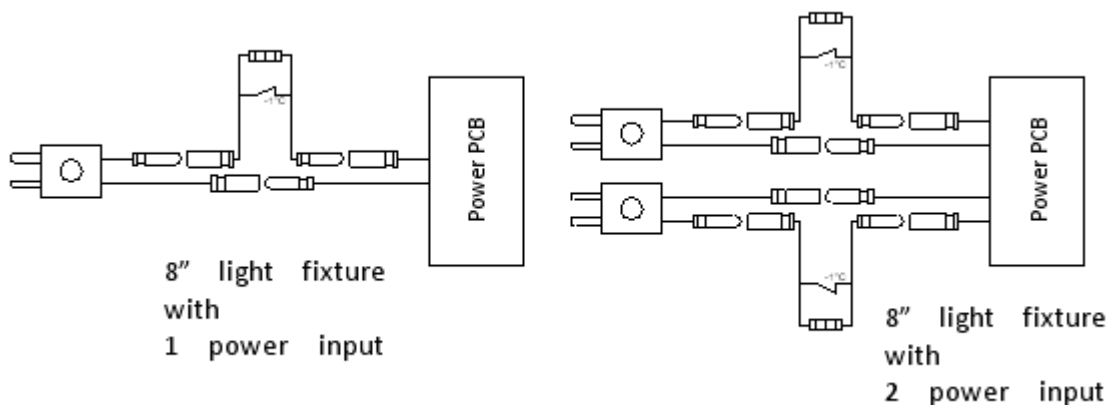


Figure 26 – Wiring diagrams for the heaters

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## 4.8 GASKETS

### 4.8.1 Gasket examination

Every time a fixture is opened each O-Ring must be examined as described below and **replaced** if necessary.

Any O-Ring that is stretched, torn, has a permanent set or some other defect, which would prevent it from obtaining a water-tight seal **must be replaced with a new O-Ring**.

Remove the fixture from the base and open it following instructions of *“Removing and Opening the Light Unit From the Base”*.

Light assembly is equipped with the following gaskets:

- O-Ring between dome and lower cover (Figure 27 - n°2);
- O-Ring around the dome (Figure 27 - n°3);
- Gasket between fixture and 8" shallow base (Figure 27 - n°4);
- O-Ring between fixture and 12" shallow base (Figure 27 - n°7);
- prism gasket mounted between prism and dome (Figure 28- n°2).

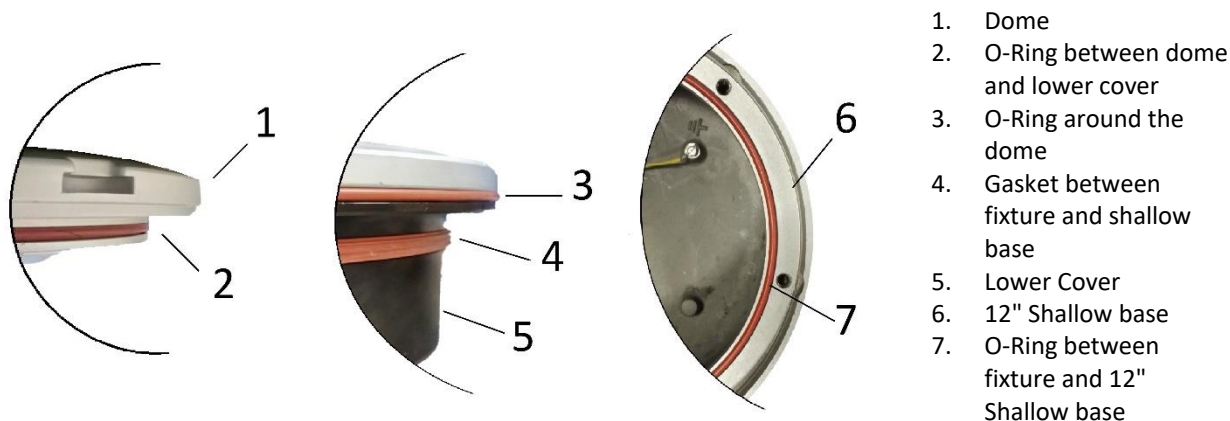
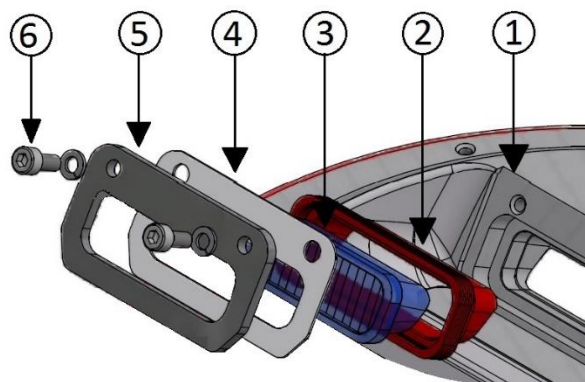


Figure 27– Fixture Gaskets



*Figure 28 – Prism Gasket***4.8.2 O-Ring replacement**

Remove the old O-Ring from the groove and clean the flange mating surfaces and the groove, scraping carefully. Take care not to damage the mating surface and the bottom and sides of the groove. Position it in the centre of its groove and push it inside.

**NOTE 1:** Make sure that the proper O-Ring is re-inserted into the groove.

**NOTE 2:** The seat of an O-Ring gasket is dimensioned to allow the proper positioning when compressed between the mating surfaces. Screws properly tightened are important in obtaining a complete seal.

| TIGHTENING TORQUE      |                                |
|------------------------|--------------------------------|
| lower cover TORX M5x16 | 2.5 Nm                         |
| fixture locking screw  | 35 Nm (for shallow base)       |
|                        | 35 Nm (for L-868 base, size B) |

**4.9 CABLE LEAD WITH PLUG****4.9.1 Removing the cable lead with plug**

Remove the fixture from the base and open it following instructions of *“Removing and Opening the Light Unit From the Base”*.

Inside the lower cover, disconnect the pair of wires from the electronics by cutting the cables, unscrew the gland and pull out the cable lead with gland gasket.

**4.9.2 Installing the new unipolar cable lead with plug**

Insert the gland nut on the new unipolar cable lead so that the length of the cable outside the fixture is 22cm (Figure 29 - n°2).

Splice the ends of the cables for a length of approx. 7mm (Figure 29 - n°3).

Tighten the gland nut at 6Nm.

Restore the electrical connections by faston terminals or joints.

Close the light fixture following instructions of paragraph *“Closing the Fixture”*, *“Leakage Test”* and *“Reinstalling the fixture”*.

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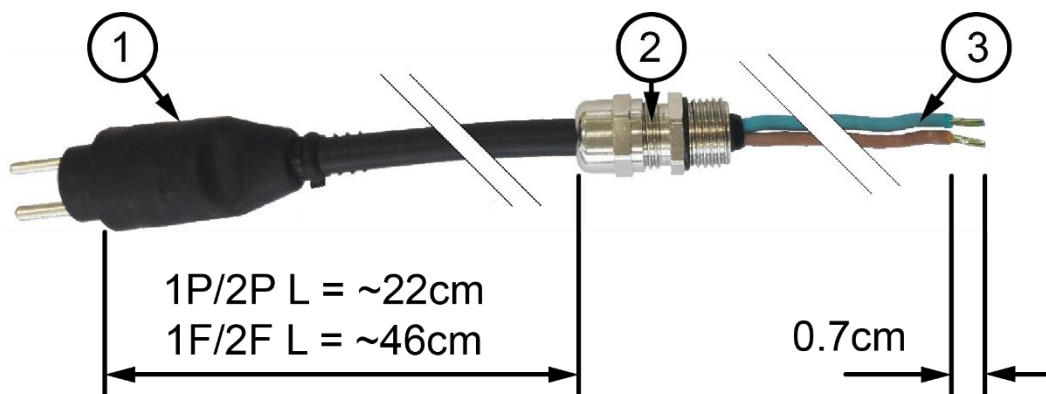


Figure 29 - Unipolar cable lead with plug.

#### 4.10 PRESSURE VALVE

If a leakage is found through the pressure valve during an air pressure test, check carefully where the leakage happens. If the leakage is between the valve (Figure 30 - n°2) and the lower cover (Figure 30 - n°1), check the tightening of the valve body to the lower cover from the outside of the fixture.

In case the pressure valve needs replacing operate as follows, considering the fixture already opened following instructions of *“Removing and Opening the Light Unit From the Base”*. Unscrew the valve body with gasket from the outside of the lower cover (Figure 30 - n°1) by clamping the hexagonal end section of the valve body. Screw the new valve on the lower cover; tightening torque is 0.35 Nm. Check the valve core (Figure 30 - °4) is tightened to the valve body (Figure 30 - n°2) and then screw its cap (Figure 30 - n°3).

Reassembly the light unit following instructions of paragraph *“Closing the Fixture”*, *“Leakage Test”* and *“Reinstalling the fixture”*.

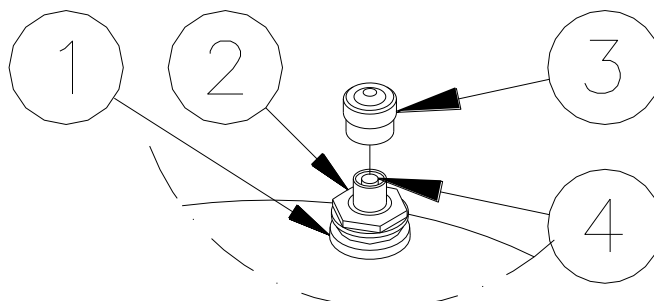
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Figure 30 - Lower Cover with Pressure Valve

#### 4.11 CLEANING

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Service life depends upon the entire assembly being waterproof. All surfaces must be clean, dry and free of all foreign matter if the light fixture is to operate for an extended period without requiring maintenance.

#### 4.12 MONITORING

---

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.

The system requires a Automatic Switchover (MCC) located inside the concrete pit or the deep base, placed between the isolation transformer and the light fixture itself.

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:

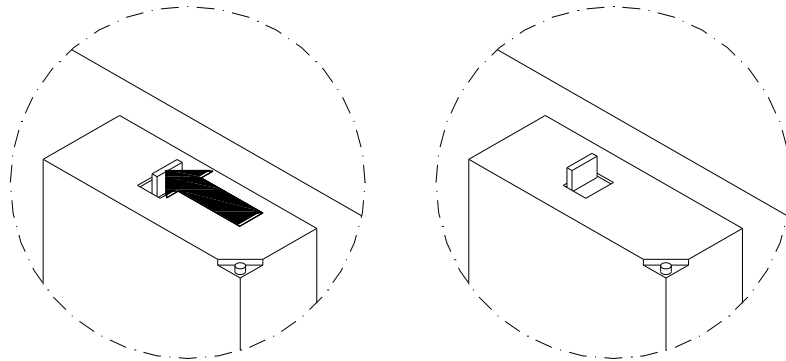
- remove the fixture from the base and open it following instructions of *“Removing and Opening the Light Unit From the Base”*
- replace the LED module following instructions of *“LED Module Replacement”*
- restore the condition of proper functioning of the monitoring device as shown in Figure 31

Reassembly the fixture following instructions of paragraph *“Closing the Fixture”*, *“Leakage Test”* and *“Reinstalling the fixture”*.

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*Figure 31 - Restoring the Monitoring Device*

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## 5 TROUBLESHOOTING

| Problem                              | Possible cause                                                                               | Solution                                                                                          |
|--------------------------------------|----------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------|
| Distorted light beam output          | Broken or damaged prism                                                                      | Replace prism                                                                                     |
|                                      | Wrong prism installed                                                                        | CHECK PARTS LIST AND INSTALL THE CORRECT PRISM                                                    |
| Weak light output                    | Primary loop with partial short circuit                                                      | Check cable assembly                                                                              |
|                                      | Defect in the isolation transformer                                                          | Replace transformer                                                                               |
|                                      | Dirty prism or dome                                                                          | 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 | Prism gasket, O-rings between dome and lower cover                                           | Replace all gasket and execute leakage test                                                       |
|                                      | Pinched fixture power cables                                                                 | Replace fixture leads                                                                             |

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## 6 SPARE PARTS

| CODE      | DESCRIPTION                                                               |
|-----------|---------------------------------------------------------------------------|
| RISL10001 | Unidirectional dome                                                       |
| RISL10002 | Unidirectional dome with artic kit                                        |
| RISL10003 | Gasket kit                                                                |
| RISL10004 | Artic kit                                                                 |
| RISL10005 | Bottom cover 8" 1I/1O with monitoring (ICAO)                              |
| RISL10006 | Bottom cover 8" 1I/1O without monitoring (ICAO)                           |
| RISL10007 | Bottom cover 8" 1I/1O with monitoring (FAA)                               |
| RISL10008 | Bottom cover 8" 1I/1O without monitoring (FAA)                            |
| RISL10009 | Kit prisms with gasket                                                    |
| RISL10010 | Kit reflector with screw                                                  |
| RISL10011 | LED module F219, WHITE                                                    |
| RISL10012 | LED module F219, GREEN                                                    |
| RISL10013 | LED module F219, RED for RM, TM and WR-2P configurations                  |
| RISL10014 | LED module F219, YELLOW                                                   |
| RISL10015 | LED module F219, RED for WR-1P configuration                              |
| RISL10016 | Kit prisms with gasket for rapid exit configuration                       |
| RISL10017 | Bottom cover 8" 2I/2O with monitoring (ICAO)                              |
| RISL10018 | Bottom cover 8" 2I/2O without monitoring (ICAO)                           |
| RISL10019 | Bottom cover 8" 2I/2O with monitoring (ICAO) only for WR configuration    |
| RISL10020 | Bottom cover 8" 2I/2O without monitoring (ICAO) only for WR configuration |
| RISL10021 | Bottom cover 8" 1I/2O with monitoring (ICAO)                              |
| RISL10022 | Bottom cover 8" 1I/2O without monitoring (ICAO)                           |
| RISL10023 | Bottom cover 8" 1I/1O with monitoring (ICAO) for configuration RM         |
| RISL10024 | Bottom cover 8" 1I/1O without monitoring (ICAO) for configuration RM      |
| RISL10025 | Bottom cover 8" 2I/2O with monitoring (FAA)                               |
| RISL10026 | Bottom cover 8" 2I/2O without monitoring (FAA)                            |
| RISL10027 | Bottom cover 8" 2I/2O without monitoring (FAA) only for WR configuration  |
| RISL10028 | Bottom cover 8" 2I/2O with monitoring (FAA) only for WR configuration     |
| RISL10029 | Bottom cover 8" 1I/2O without monitoring (FAA)                            |
| RISL10030 | Bottom cover 8" 1I/2O with monitoring (FAA)                               |
| RISL10031 | Bottom cover 8" 1I/1O with monitoring (FAA) for configuration RM          |
| RISL10032 | Bottom cover 8" 1I/1O without monitoring (FAA) for configuration RM       |
| RISL10033 | Bidirectional dome                                                        |
| RISLX0002 | Pressure valve                                                            |
| RISLX0003 | Grease for O-Ring gaskets (400 gr)                                        |
| RISLX0004 | Screws and O-Ring gasket for fixture fixing on base                       |
| RISLX0005 | Bipolar cable lead with plug L=0.6 m (FAA)                                |
| RISLX0006 | Unipolar cable lead with plug L=0.6 m (ICAO)                              |
| RISLX0007 | Anaerobic adhesive for fillets                                            |
| RISLX0008 | L-823 cable with gland nut for shallow bases                              |

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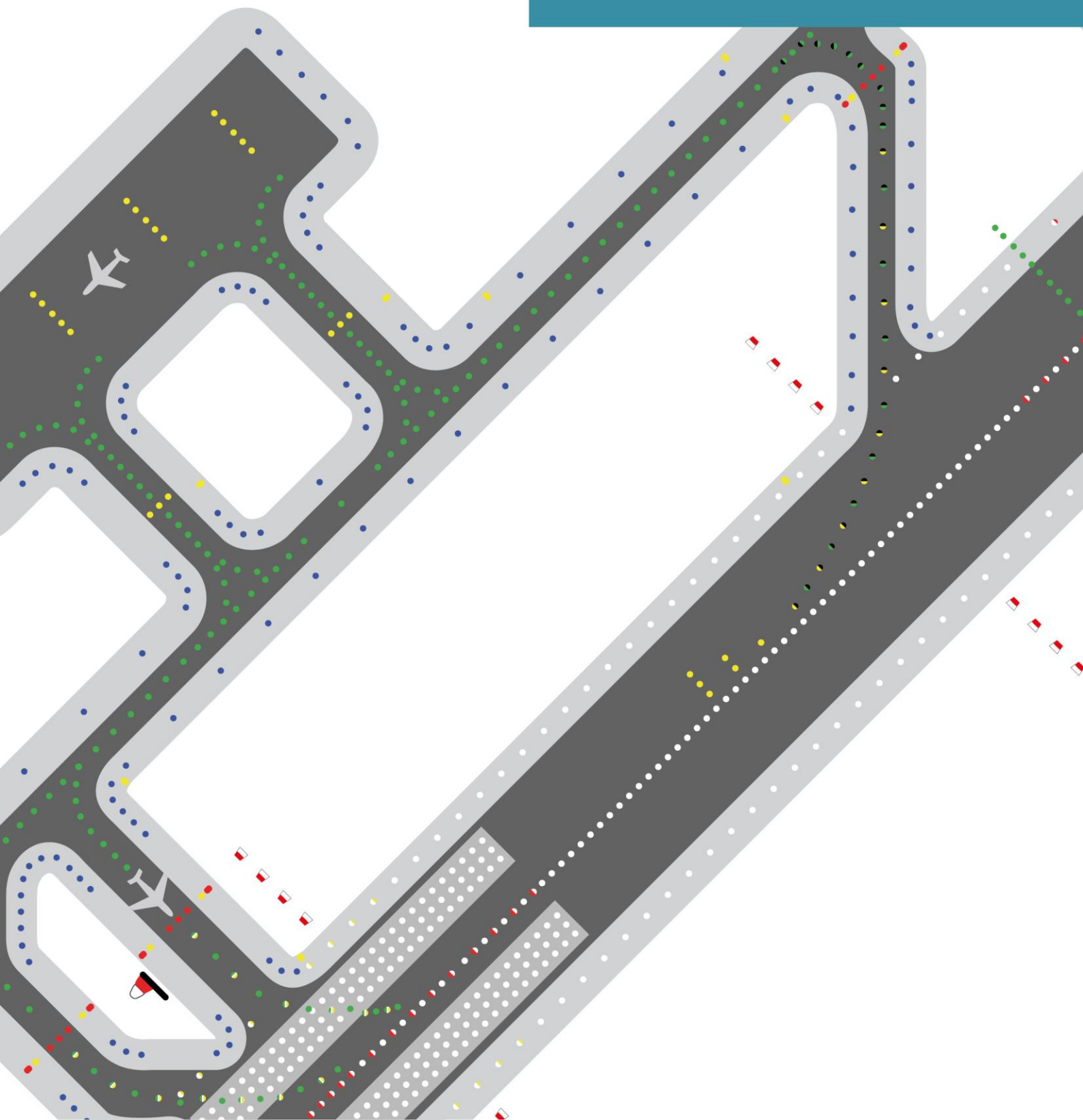
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