

AviaSafe



EL-AP LED ELEVATED APPROACH

Instruction Manual for Operation and Maintenance

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I . ABOUT THIS MANUAL

Rev.	Edited by	Approved by	Date	Description	Pages
1.00	Y.M	A.M	11/06/2024	First Edition	-
2.00					
3.00					
4.00					

The manual shows the information necessary to:

- *Installation*
- *Maintenance*
- *Troubleshooting*

How to work with this manual:

make sure to read the safety section before doing anything.

It is recommended to read section 1-1, which pertains to the buyer's obligation and warranty terms and condition of the company.

If you are starting up the device for the first time, read the Safety section, Technical specifications, Installation.

Otherwise, based on your issue, find and read the relevant chapter.

II . SUMMARY

Abbreviation	Definition
EL-AP	Elevated Approach
DC	Direct Current
VOR	The Very High Frequency Omni-Directional Range
RVR	Runway Visual Range
FAA	Federal Aviation Administration
ICAO	International Civil Aviation Organization
LV	Low Voltage
V	Volt
A	Ampere
AC	Alternating Current
VA	Volt-Ampere
CCR	Constant Current Regulator
VAC	Volts Alternating Current
AWG	American wire gauge
STANAG	Standardization Agreement
IEC	International Electrotechnical Commission

1. SAFETY



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.

AVIASAFE 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.

AVIASAFE'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 labor 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.



Before proceeding to the installation, maintenance or troubleshooting, carefully read the entire document.

1-1. Safety information

It is important to exercise caution when working with this equipment; it is typically used or connected to two 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.

Removing the protections and safety devices for no reason is unacceptable. Avoid contact with voltage or current sources. For no reason the protections and the safety devices must be removed.

1-2. Operation

Only authorized and qualified personnel should operate this equipment. Improper use or tampering with the internal parts can be extremely dangerous and may result in severe injury or death.

Prior to any operation, ensure that you have thoroughly reviewed and understood the safety instructions provided in this manual. Adhere strictly to all safety guidelines and protocols when working with or near the equipment.

Failure to follow proper safety procedures can expose you to hazardous voltages, currents, and other risks associated with high-powered electrical systems. Exercise the utmost caution at all times.

1-3. Unsafe energized circuit

Do not carry out any operation on the converter or an apparatus connected to it when the circuits are energized. Ensure that all power sources have been disconnected and that the equipment has been properly de-energized before attempting any maintenance or repair work. Failure to do so could result in severe injury or death from electric shock.

1-4. Caution high voltage

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 the discharge time (at least 5 minutes), ground the system carefully, and check for voltage presence before accessing. Failure to properly de-energize the equipment and observe the necessary safety precautions could result in severe injury or death from electric shock.

1-5. Reanimation

The maintenance staff must be aware of the risks related to electricity, criteria to prevent the risk of electric shock and resuscitation techniques. Adequate training and safety awareness is critical when working with this equipment.



1-6. Out of Service

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

1-7. CE Marking

CE This device aligns with the standards set forth by European regulations to bear the CE mark. Users are advised to thoroughly review this documentation and adhere to all specified standards. The device satisfies criteria concerning the well-being and security outlined in key EC mandates, notably the EMC Directive regarding electromagnetic compatibility (2014/30/EU) and the LV Directive concerning electrical devices intended for use within specific voltage thresholds (2014/35/EU).

1-8. Disposal

 Upon completion of usage, individuals are obligated to deposit all waste at designated waste separation facilities. Users bear the responsibility for appropriately discarding the equipment  in compliance with the WEEE Directive and the pertinent prevailing national regulations at the disposal juncture. Never should these devices be discarded with household refuse.

1-9. Labeling

Each device is affixed with an identification plaque that displays the product code. This plate also includes supplementary information such as the model's name, intended applications or uses, power supply specifications, any trademarks, and/or symbols indicating compliance with particular regulations or laws.

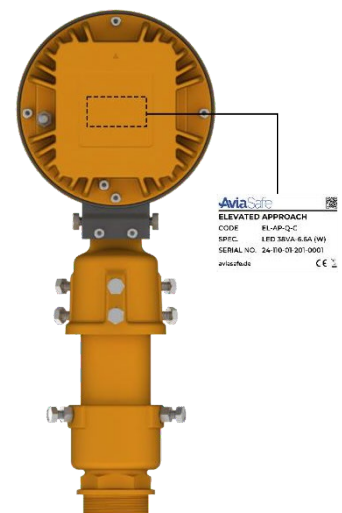


Figure 1 - Labeling

2. PRODUCT INTRODUCTION

2-1. Compliance with Standards

- A. ICAO Annex 14 - Volume I
- B. FAA AC150/5345-46E & EB No.67D
- C. EASA CS-ADR-DSN
- D. IEC TS 61827
- E. NATO STANAG 3316
- F. CAA CAP 168

2-2. Feature & Benefits

- A. LED Unidirectional Elevated Light.
- B. Average LED life of 60,000 hours at full intensity but over 100,000 hours in typical operating conditions.
- C. Very low energy consumption compared to halogen lights, resulting in a lower range of CCRs and transformers.
- D. Low life cycle costs due to the long LED lifespan.
- E. Operates on 3-step or 5-step ferroresonant or thyristor CCRs.
- F. In compliance with FAA & EASA standards.
- G. Fully compatible with existing Airfield Lighting infrastructure. Installation on the same mounting device as most conventional lights for a straightforward replacement.
- H. IP68: Dust-tight and protected against submersion in water.
- I. Designed with few mechanical parts, resulting in a more affordable price and allowing for longer maintenance intervals.
- J. Fully dimmable lights. The light output is variable, similar to a traditional halogen light, operating within the 2.8 A to 6.6 A range.
- K. The electronics are fully encapsulated.
- L. Optimized LED performance ensures there are no visual flickers.
- M. Anti-vibration Electronics

2-3. Applications

- A. Approach Centerline & Cross Bars & Side Rows
- B. Threshold & Wing Bars
- C. Runway End
- D. Stop Bars

2-4. Environmental conditions

- A. Temperature: -55 °C to +55 °C
-67 °F to +131 °F
- B. Humidity: Up to 100%

2-5. Volume & weight

- A. Weight: 3.9 Kg
- B. Volume(m³): 0.009

2-6. Main option

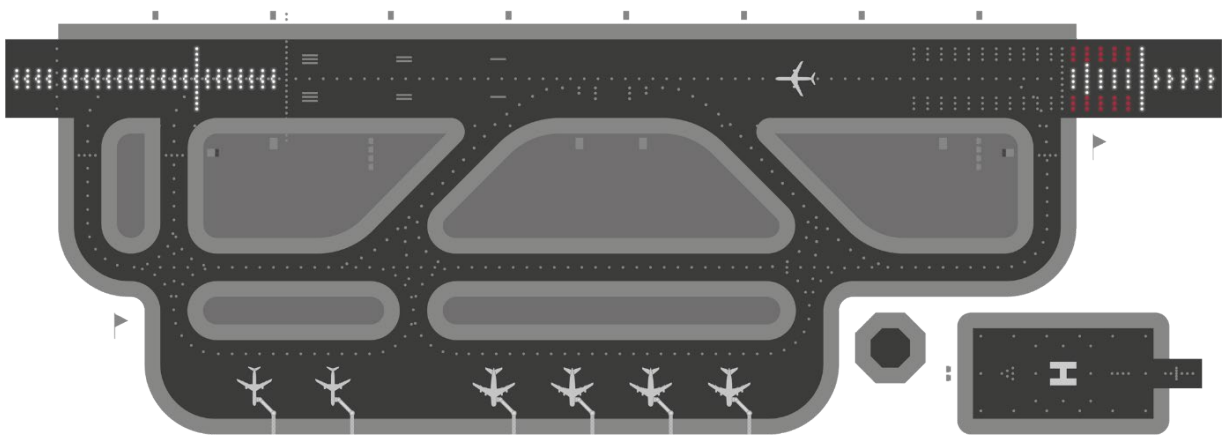


Figure 2 – Approach

- A. Heater: electric device, thermostatically controlled, that heats the area near the prisms (inset fixtures) or the external glass lens (elevated fixtures) favoring the melting of the ice and/or snow; thus avoids the light beam obstruction with a behavior similar to a traditional halogen lamp. 20 VA per plug
- B. Monitoring: an electronic device that returns information of open circuit at the secondary of the isolation transformer in case of failure of a luminous LED source or control board

2-7. Article Number

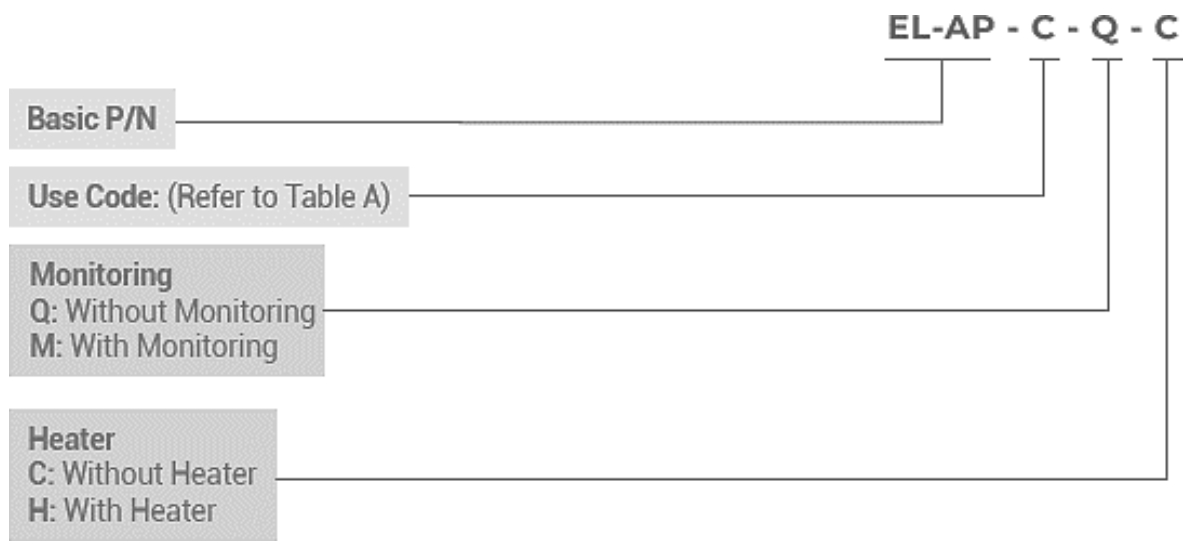


Figure 3 – Article Number

2-8. Electrical Table

Table 1 – Electrical Table

ELECTRICAL TABLE			
TYPE	Consumption at 6.6A	Power Factor	
		2.8A	6.6A
Light White (w/o Heater)	38VA	0.96	0.98
Light White (with Heater)	53VA	0.96	0.98

3. MECHANICAL DISCRIPTION

3-1. Exploded Diagram

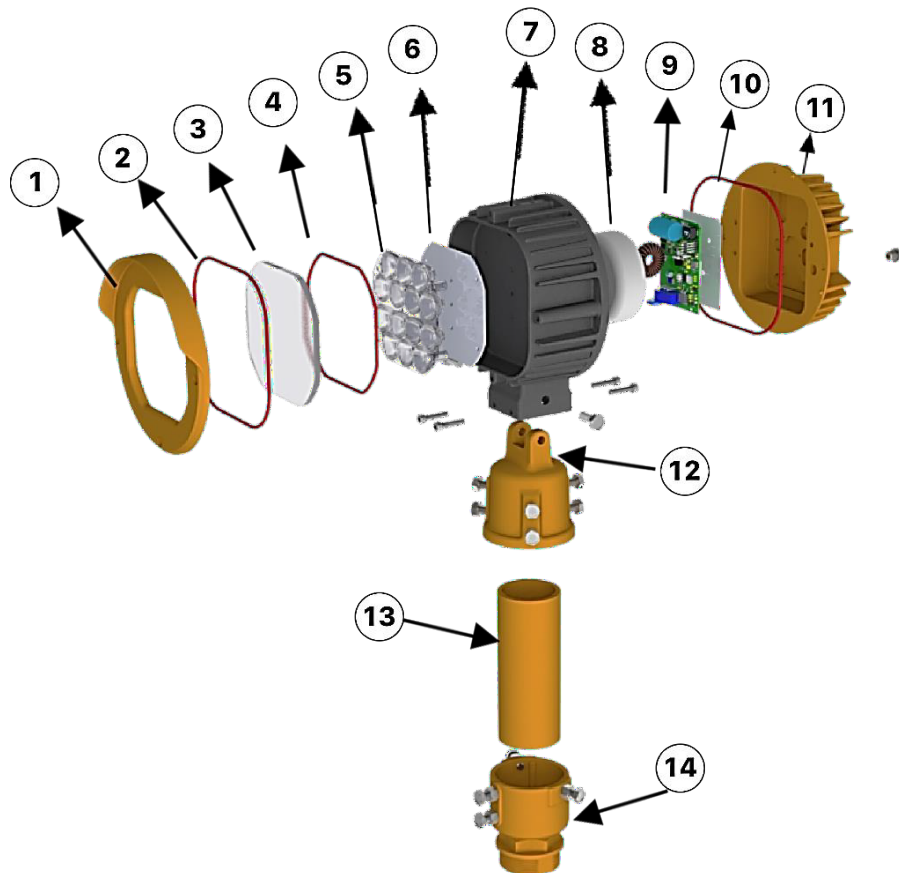


Figure 4 – Exploded Diagram

1. Front Body
2. O-Ring
3. Front Glass
4. O-Ring
5. TIR
6. LED PCB
7. LED Module
8. Transformer
9. PCB
10. O-Ring
11. Back Body
12. Aiming Support
13. Pipe
14. Breakable Coupling

3-2. Dimension

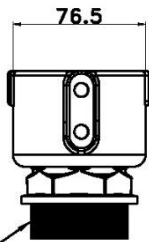
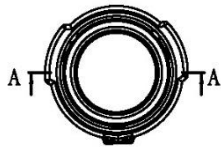


Figure 5 - Dimension

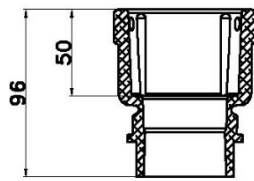
3-3. Accessories

3-3-1. Breakable Coupling

Top



Thread Pitch Size 11G



SECTION A-A



Figure 6 – Breakable Coupling Drawing Model

Figure 7 – Breakable Coupling

3-3-2. Base Plate

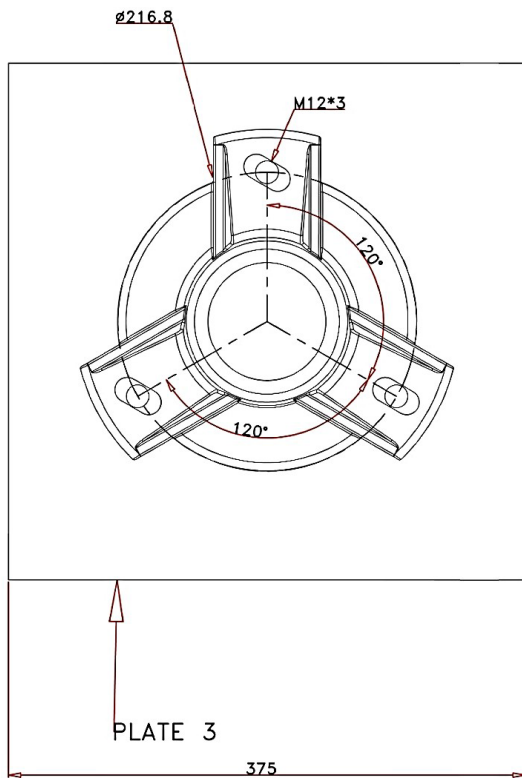


Figure 9 – Base Plate

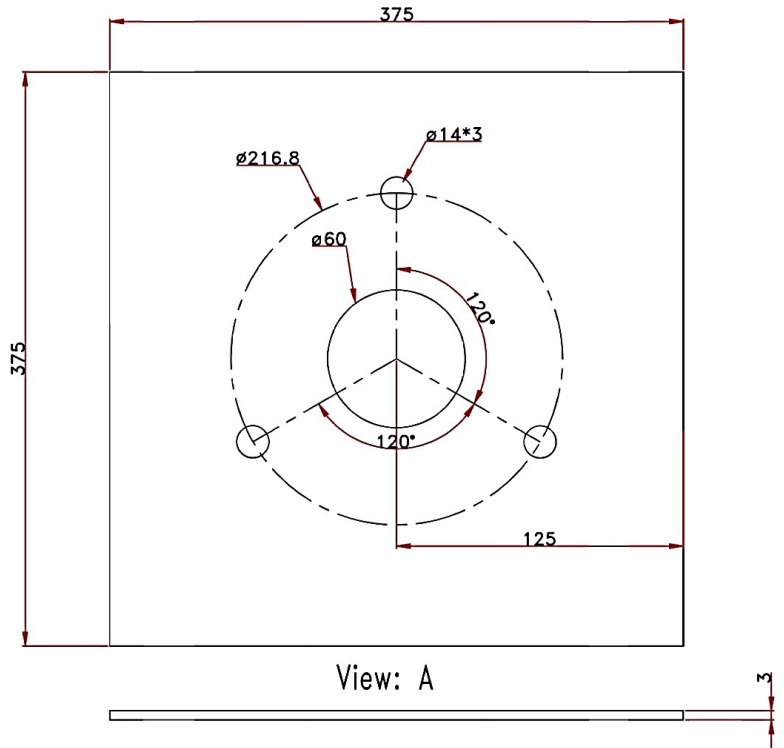


PLATE 25*25*3

Figure 8 – Base Plate

4. INSTALLATION

4-1. Electronic Description

The electronic section consists of the following circuits:

- A. Current / current conversion circuit
- B. LED command circuit
- C. Control circuit

4-1-1. Current conversion circuit

This electronic section provides 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:

- A. minimize the power losses
- B. significant increase of efficiency
- C. high input power factor
- D. independent form the CCR topology: the CCR may have any output current waveform
- E. no percentage of load dependent: the CCR can feed without any problem also few lights in the series circuit
- F. 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.

4-1-2. 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 words, the LED luminous output depends on the time of application (duty-cycle) of constant current impulses.

4-1-3. 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 feature, 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 an RMS conversion of the input current. The RMS conversion give a good accuracy with any input current waveform.

4-1-4. Other Function

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.

4-2. Deep Base / Pipe Elbow

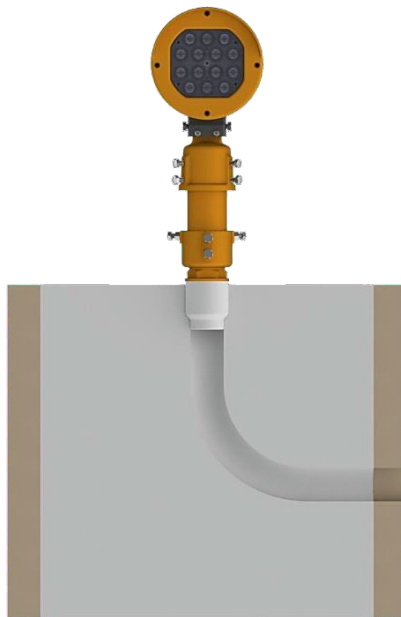


Figure 11 - Pipe Elbow Installation

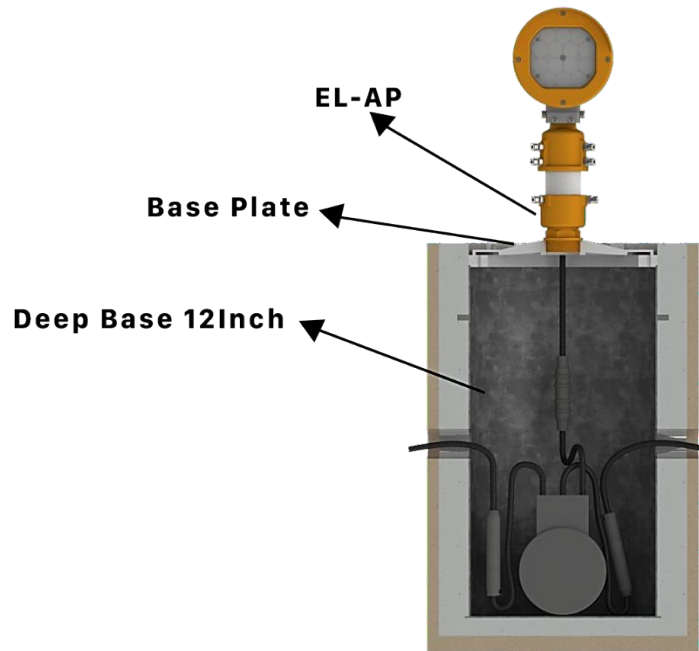


Figure 10 – Deep Base

4-2. Preliminary operation

Utilize the fixture solely with matching supports. Normally, install the fixture on a concrete block.

Verify the vertical alignment of the upper segment of the support.

For an elbow pipe, ensure the vertical alignment of the upper section of the pipe.

4-3. Required Tools

- A. 10mm Wrench
- B. 13mm Wrench
- C. Allen 5 Wrench
- D. 19mm Wrench

4-4. Installation of the Light Fixture



Retain the device in its original packaging until the installation phase.

Proceed with assembling the fixture and verify the power supply specifications

Before installation. Pay close attention to correctly positioning the fixture on the base.



Before conducting any maintenance on the device, disconnect all external power sources and affix suitable work-in-progress alerts on the systems.

Wait for the discharge period (minimum of 5 minutes) and employ appropriate tools to ensure there are no remaining energies before interacting with the electrical equipment .

1. Begin by attaching the base plate to the designated location with a 19mm Wrench.
2. Inside the base plate, extract a secondary cable from the transformer and an earth wire embedded within.
3. Secure the breakable coupling onto the base plate and tighten it firmly using a specialized wrench.
4. Insert a pipe (size 60) into the breakable coupling and thread the cables through it.
5. Connect the female end of the light fixture cable to the male end of the secondary cable and attach the earth wire.
6. Tighten 4 screws on the breakable coupling using a 13mm wrench to secure the pipe inside (visually ensure the pipe is level).
7. Place the light fixture on the pipe and vertically (from above) ensure its correct orientation with respect to the runway.
8. Position the aiming device on the fixture to fit properly into the 2 holes on the fixture and secure it.
9. Visually or with a string, confirm the alignment of the light fixture with the runway.
10. After verifying the previous step, slightly tighten the fixture screws (6 in total) and ensure the locking nut is loose.
11. Place the digital leveling tool on the aiming device and carefully loosen 4 of the fixture aiming screws using a 4 Allen key (M5 screws) then you can set the fixture by tightening screws from behind of the fixture. After you made sure of aiming the right way you can tighten screws from front of the fixture.
12. Finally, securely fasten all of screws and locking nuts using a 4 Allen key and a 13mm wrench for the fixture and breakable coupling.



Figure 12 – EL-AP

4-6. Fixture Pointing

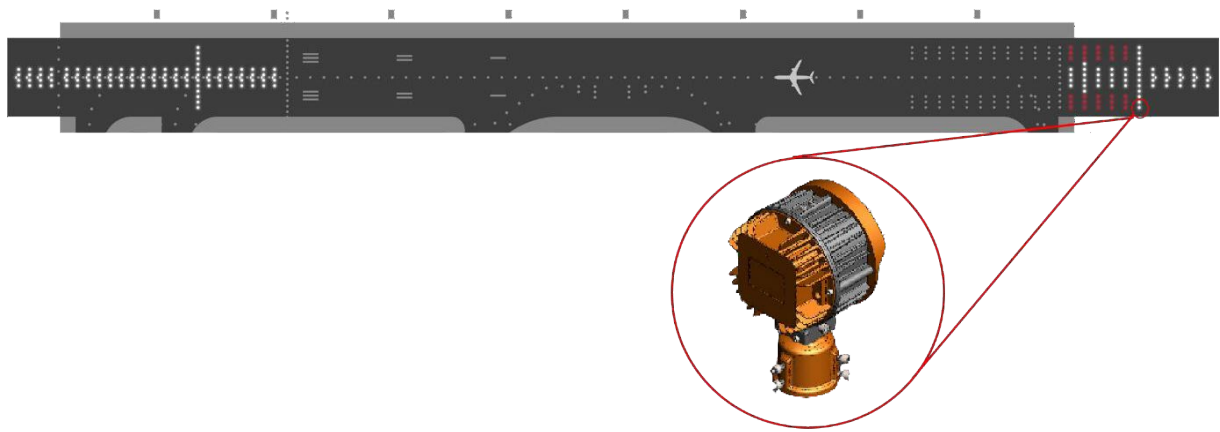


Figure 13 – Fixture Pointing

5. MAINTENANCE

5-1. Scheduled Maintenance

As per the guidelines outlined in FAA AC 150/5340 26C and ICAO Airport Service Manual Part 9: Airport Maintenance Practices, EL-AP fixtures require routine maintenance. It is important to note that the inspection frequency can vary based on facility and runway traffic levels as well as the fixture's age.

To ensure the fixture operates correctly and has an extended lifespan, regular checks and scheduled inspections must be performed. If needed, appropriate corrective measures should be taken to reinstate and maintain operational safety levels as mandated by the standards.

1. Daily
 - A. Check correct operation of the fixture.
 - B. Visual check broken components and cleanliness of lenses the installed fixture.
Repair/ Replace as necessary.
2. Weekly
 - A. Replacement of fixture presenting breakdowns or malfunctions
3. Monthly
 - A. External cleaning of the protective glass/lens.
 - B. Installation check of the fixture.
4. Annually
 - A. Check the stability of the civil works.
5. Unscheduled
 - A. After exceptional weather events, check the condition of the fixture and remove any objects interfering with the light beam.
 - B. Check for the presence of water inside the installation bases.
 - C. Check of the electrical connections and of the isolation degree of the system.
 - D. Check of the mounting seals.
 - E. Check of the integrity of the electric cables.
 - F. Removal of snow. Techniques for snow removal are described in the manual: Airport Service Manual ICAO-Part 9-Airport Maintenance Practices on in the FAA AC-150/5200-30 specifications.



Whenever the fixture body is opened, it is imperative to replace all seals: exclusively employ original ones. spare parts by AVIASAFE Airfield Technology.

5-2. Opening

When opening the EL-AP fixture, it is crucial to verify the following:

- A. The optical unit is intact and clean.
- B. The O-Ring of the front glass is free from damage.
- C. The supply cables and connectors are undamaged, without any signs of wear or abrasions.

5-3. Closing

After completing any maintenance task, it is essential to energize the light fixture in order to ensure that the light turns on.

The alignment of the fixture should only be tested once it has been positioned on the Approach.

5-4. Cleaning of the Front Glass

To clean the outer surface of the front glass, utilize neutral and non-abrasive products along with a clean cloth. This cleaning procedure can be carried out directly on the runway without needing to remove or open the fixture. Under regular operating conditions, internal cleaning of the front glass is typically unnecessary.

If needed, clean the inner surface of the front glass the same way.

5-5. Replacement of the LED module

- A. Remove the fixture from the base as detailed in the "INSTALLATION" section and transport it to the workshop for maintenance.
- B. Open the Front Body to access the LED module.
- C. Disconnect the connector and extract the old LED module for replacement. Ensure the Front glass and TIR is intact.
- D. Clean the mounting area of the LED module and apply thermal conductive grease.
- E. Thread the cable through the hole in the LED module, solder it to the new LED, and position it correctly.
- F. Secure the 5 M4 screws on the LED and TIR.
- G. Power the fixture with a CCR and verify proper LED functionality. Cease the test power and disconnect the fixture.
- H. If the light fails to illuminate, repeat steps E onwards. If the issue persists, contact the company's after-sales service for repair.
- I. Reassemble the unit. The device is now prepared for installation on the approach.

6. TROUBLESHOOTING

Table 2 - Troubleshooting

Problem	Possible cause	Solution
Distorted light beam output	Broken or damaged TIR or glass	Replace TIR or Glass
	Wrong TIR installed	Check parts list and install the correct TIR
Weak light output	Primary loop with partial short circuit	Check cable assembly
	Defect in the isolation transformer	Replace transformer
	Dirty TIR or Glass	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	LED Detective	Replace the LEDs board
	Power PCB Detective	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	O-rings between Front glass and Body / Body and LED module / LED module and back body	Replace all O-rings and execute leakage test
	Pinched fixture power cables	Replace fixture leads