PAPI – Precision Approach Path Indicator
(PU3L)

User Manual

UM-0054, Rev. 1.8, 2022/05/09

ADB SAFEGATE

A.0 Disclaimer / Standard Warranty

CE certification

The equipment listed as CE certified means that the product complies with the essential requirements concerning safety and hygiene. The European directives that have been taken into consideration in the design are available on written request to ADB SAFEGATE.

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Products manufactured by ADB SAFEGATE are guaranteed against mechanical, electrical, and physical defects (excluding lamps) which may occur during proper and normal use for a period of two years from the date of ex-works delivery, and are guaranteed to be merchantable and fit for the ordinary purposes for which such products are made.

Note

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Replaced or repaired equipment under warranty falls into the warranty of the original delivery. No new warranty period is started for these replaced or repaired products.

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ADB SAFEGATE LED products (with the exception of obstruction lighting) are warranted against electrical defects in design or manufacture of the LED or LED specific circuitry for a period of 4 years from date of installation, per FAA EB67 (applicable edition). These FAA certified constant current (series) powered LED products must be installed, interfaced and powered with and through products certified under the FAA Airfield Lighting Equipment Program (ALECP) to be included in this 4 (four) year warranty. This includes, but is not limited to, interface with products such as Base Cans, Isolation Transformers, Connectors, Wiring, and Constant Current Regulators.

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Note

See your sales order contract for a complete warranty description.

Replaced or repaired equipment under warranty falls into the warranty of the original delivery. No new warranty period is started for these replaced or repaired products.

Liability

WARNING

Use of the equipment in ways other than described in the catalog leaflet and the manual may result in personal injury, death, or property and equipment damage. Use this equipment only as described in the manual.

ADB SAFEGATE cannot be held responsible for injuries or damages resulting from non-standard, unintended uses of its equipment. The equipment is designed and intended only for the purpose described in the manual. Uses not described in the manual are considered unintended uses and may result in serious personal injury, death or property damage.

Unintended uses, includes the following actions:

- Making changes to equipment that have not been recommended or described in this manual or using parts that are not genuine ADB SAFEGATE replacement parts or accessories.
- Failing to make sure that auxiliary equipment complies with approval agency requirements, local codes, and all applicable safety standards if not in contradiction with the general rules.
- Using materials or auxiliary equipment that are inappropriate or incompatible with your ADB SAFEGATE equipment.
- Allowing unskilled personnel to perform any task on or with the equipment.

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1.0 Safety

Introduction to Safety

This section contains general safety instructions for installing and using ADB SAFEGATE equipment. Some safety instructions may not apply to the equipment in this manual. Task- and equipment-specific warnings are included in other sections of this manual where appropriate.

1.1 Safety Messages

HAZARD Icons used in the manual

For all HAZARD symbols in use, see the Safety section. All symbols must comply with ISO and ANSI standards.

Carefully read and observe all safety instructions in this manual, which alert you to safety hazards and conditions that may result in personal injury, death or property and equipment damage and are accompanied by the symbol shown below.

	WARNING Failure to observe a warning may result in personal injury, death or equipment damage.
	DANGER - Risk of electrical shock or ARC FLASH Disconnect equipment from line voltage. Failure to observe this warning may result in personal injury, death, or equipment damage. ARC Flash may cause blindness, severe burns or death.
	WARNING - Wear personal protective equipment Failure to observe may result in serious injury.
	WARNING - Do not touch Failure to observe this warning may result in personal injury, death, or equipment damage.
	CAUTION Failure to observe a caution may result in equipment damage.

Qualified Personnel

	Important Information The term **qualified personnel** is defined here as individuals who thoroughly understand the equipment and its safe operation, maintenance and repair. Qualified personnel are physically capable of performing the required tasks, familiar with all relevant safety rules and regulations and have been trained to safely install, operate, maintain and repair the equipment. It is the responsibility of the company operating this equipment to ensure that its personnel meet these requirements. Always use required personal protective equipment (PPE) and follow safe electrical work practice.

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1.1.1 Introduction to Safety

CAUTION

Unsafe Equipment Use
This equipment may contain electrostatic devices, hazardous voltages and sharp edges on components

- Read installation instructions in their entirety before starting installation.
- Become familiar with the general safety instructions in this section of the manual before installing, operating, maintaining or repairing this equipment.
- Read and carefully follow the instructions throughout this manual for performing specific tasks and working with specific equipment.
- Make this manual available to personnel installing, operating, maintaining or repairing this equipment.
- Follow all applicable safety procedures required by your company, industry standards and government or other regulatory agencies.
- Install all electrical connections to local code.
- Use only electrical wire of sufficient gauge and insulation to handle the rated current demand. All wiring must meet local codes.
- Route electrical wiring along a protected path. Make sure they will not be damaged by moving equipment.
- Protect components from damage, wear, and harsh environment conditions.
- Allow ample room for maintenance, panel accessibility, and cover removal.
- Protect equipment with safety devices as specified by applicable safety regulations
- If safety devices must be removed for installation, install them immediately after the work is completed and check them for proper functioning prior to returning power to the circuit.

Failure to follow this instruction can result in serious injury or equipment damage

Additional Reference Materials

Important Information

- IEC - International Standards and Conformity Assessment for all electrical, electronic and related technologies.
- IEC 60364 - Electrical Installations in Buildings.
- FAA Advisory: AC 150/5340-26 (current edition), Maintenance of Airport Visual Aid Facilities.
- Maintenance personnel must refer to the maintenance procedure described in the ICAO Airport Services Manual, Part 9.
- ANSI/NFPA 79, Electrical Standards for Metalworking Machine Tools.
- National and local electrical codes and standards.

1.1.2 Intended Use

CAUTION

Use this equipment as intended by the manufacturer
This equipment is designed to perform a specific function, do not use this equipment for other purposes

- Using this equipment in ways other than described in this manual may result in personal injury, death or property and equipment damage. Use this equipment only as described in this manual.

Failure to follow this instruction can result in serious injury or equipment damage

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1.1.3 Material Handling Precautions: Storage

CAUTION

Improper Storage
Store this equipment properly

- If equipment is to be stored prior to installation, it must be protected from the weather and kept free of condensation and dust.

Failure to follow this instruction can result in equipment damage

1.1.4 Operation Safety

CAUTION

Improper Operation
Do Not Operate this equipment other than as specified by the manufacturer

- Only qualified personnel, physically capable of operating the equipment and with no impairments in their judgment or reaction times, should operate this equipment.
- Read all system component manuals before operating this equipment. A thorough understanding of system components and their operation will help you operate the system safely and efficiently.
- Before starting this equipment, check all safety interlocks, fire-detection systems, and protective devices such as panels and covers. Make sure all devices are fully functional. Do not operate the system if these devices are not working properly. Do not deactivate or bypass automatic safety interlocks or locked-out electrical disconnects or pneumatic valves.
- Protect equipment with safety devices as specified by applicable safety regulations.
- If safety devices must be removed for installation, install them immediately after the work is completed and check them for proper functioning.
- Route electrical wiring along a protected path. Make sure they will not be damaged by moving equipment.
- Never operate equipment with a known malfunction.
- Do not attempt to operate or service electrical equipment if standing water is present.
- Use this equipment only in the environments for which it is rated. Do not operate this equipment in humid, flammable, or explosive environments unless it has been rated for safe operation in these environments.
- Never touch exposed electrical connections on equipment while the power is ON.

Failure to follow these instructions can result in equipment damage

1.1.5 Maintenance Safety

DANGER

Electric Shock Hazard
This equipment may contain electrostatic devices

- Do not operate a system that contains malfunctioning components. If a component malfunctions, turn the system OFF immediately.
- Disconnect and lock out electrical power.
- Allow only qualified personnel to make repairs. Repair or replace the malfunctioning component according to instructions provided in its manual.

Failure to follow these instructions can result in death or equipment damage

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1.1.6 Material Handling Precautions, ESD

CAUTION

Electrostatic Sensitive Devices
This equipment may contain electrostatic devices

- Protect from electrostatic discharge.
- Electronic modules and components should be touched only when this is unavoidable e.g. soldering, replacement.
- Before touching any component of the cabinet you shall bring your body to the same potential as the cabinet by touching a conductive earthed part of the cabinet.
- Electronic modules or components must not be brought in contact with highly insulating materials such as plastic sheets, synthetic fiber clothing. They must be laid down on conductive surfaces.
- The tip of the soldering iron must be grounded.
- Electronic modules and components must be stored and transported in conductive packing.

Failure to follow this instruction can result in equipment damage

1.2 Safety Instructions

Make sure you read this section and are familiar with safety precautions before any work is started.

1.2.1 Product Safety

Airfield lighting fixtures in a constant current circuits are connected in a circuit via isolating transformers with currents between 2.0 – 6.6A in the primary circuits. The primary voltages, depending on the circuitry, are usually several kilovolts and therefore lethal. Although the open circuit voltages of the isolating transformers are much lower, the peak voltage while opening the secondary circuit under current is also hazardous. So it is vitally important to follow all the safety regulations with adequate circumspection.

In the design of this equipment all the practical safety aspects have been taken into account. It is also important to strictly follow existing international or national regulations, the instructions established by civil aviation authority or airport operator and the following instructions.

1.2.2 Electrical Maintenance

Valid safety regulations must always be followed. Never carry out any maintenance or maintenance measures before the current is confirmed as safely disconnected. Use extreme caution when disconnecting or connecting high voltage primary connectors.

WARNING

PRIOR TO THE COMMENCEMENT OF WORK ALL ELECTRICAL SERVICES MUST BE ISOLATED FROM THE SUPPLY AND CONNECTED TO EARTH. FULL DETAILS OF THE WORK INVOLVED MUST BE GIVEN TO THE AUTHORISED PERSON RESPONSIBLE FOR THE ELECTRICAL ENGINEERING SERVICES AT THE AIRPORT WITH REGARD TO THE DURATION OF THE WORK AND SO ON. IT IS RECOMMENDED THAT PRIOR TO STARTING ANY CUTTING WORK, THE NATURE AND LOCATION OF SERVICES SUCH AS CABLE DUCTS AND THE LIKE SHOULD BE IDENTIFIED. ANY INSTALLATION OR MAINTENANCE WORK SHOULD ONLY BE CARRIED OUT BY TRAINED AND EXPERIENCED PERSONNEL. ALSO, WHEN WORKING ON CIRCUITS USING AIRFIELD SMART POWER SYSTEM (ASP) THE SCM MUST BE TUNED OFF.

1.2.3 Mechanical Maintenance

When maintaining mechanical components, it is important to follow the instructions for electrical maintenance.

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2.0 Introduction

In this section, you find a general description related to the installation and usage of the unit.

The PU3L is an equipment to be used as a unit in PAPI (four units) and APAPI (two units) systems.

The PAPI system provides the pilot with the necessary visual information to place the aircraft on the ideal approach slope and can be used by day or night. The system can be used by all aircraft as soon as it is set up since it does not require any airborne instrumentation.

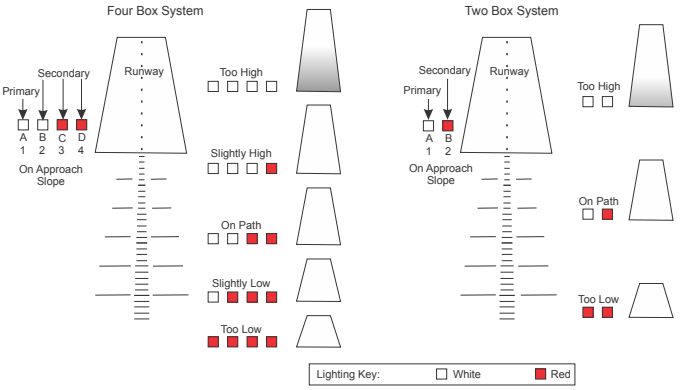
One system normally comprises four identical indicators, each one producing a white beam above a certain angle and a red one underneath.

Red to white transition is accurate since it does not exceed 3 minutes.

Four indicators, once installed, form one single wing bar on the left side of the runway. They are adjusted according to the different site angles, this angle increasing from the farthest indicator to the nearest one, from the runway. The difference of site angle between two consecutive units is generally 20 minutes.

Two symmetrical wing bars (that means 8 indicators) are recommended when no horizontal indication can be given to pilots.

APAPI is a 2-box system. PAPI and APAPI systems provide a precision approach path indication but APAPI is used when there is no jet aircraft landing.



2.1 Delivery of the unit

Each unit is individually packed in a durable cardboard box, labelled with its reference name and code.

On request, one set of unit documents (commercial brochure, installation manual, maintenance manual and spare parts list) is delivered with the units.

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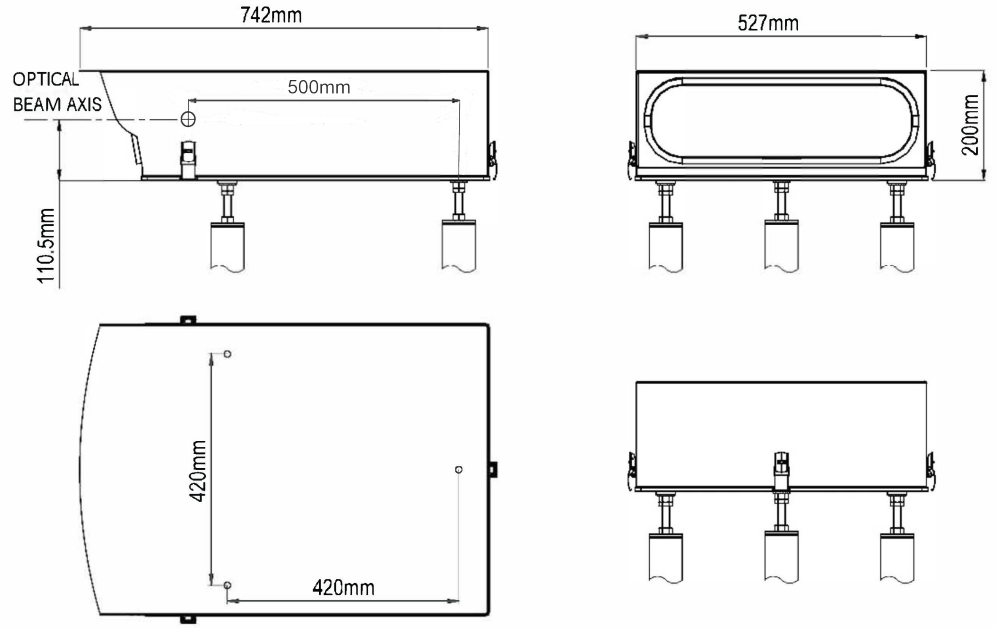
2.2 Dimensions

Figure 1: PU3L light unit housing dimensions



Note

The optical beam reference point is 500 mm from the middle of the back pole.

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3.0 Installation

In this section you find a description of the different steps to be taken for successful installation of the unit. Before you start, make sure you have read and understood Safety Instructions.

The following tools and accessories are required for installation and removal of the unit:

Standard tools and accessories:

- Two open-end wrenches of 22 mm
- One 22 mm box spanner/ socket
- Two open-end wrenches of 17 mm
- One 8 mm box spanner/ socket
- One small flat screwdriver
- One brush or cloth
- One spirit level

Special tools and accessories:

- One set of adjustment tools (supplied in a small case)

Note

Standard surveyor equipment will also be required to determine the location of the foundation blocks etc.

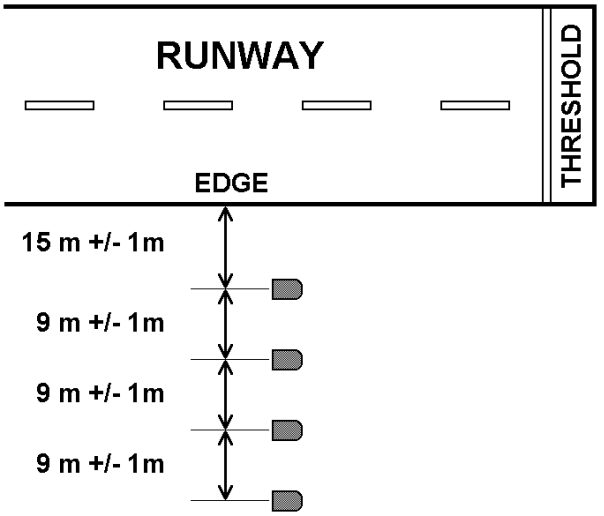
- One multimeter (for tilt switch installation)

The first step of PAPI system installation is the calculation required to determine the accurate positioning of the units relative to the runway threshold and the runway edge. The distance from the threshold will be determined by the largest aircraft to use the runway, the height of the aircraft wheels over the threshold, possible obstacles in the approach zone, in accordance with ILS system.

For more details concerning this calculation please see the Chapter 8.4 of the Part 4 of ICAO Aerodrome Design Manual.

Once the above distance has been calculated the PAPI positions are given as follows:

Figure 2: Location of PAPI relative to runway edge



The PU3L is mounted on three legs, each consisting of a tripod stand, a frangible coupling and an aluminum tube. The length of the tube has to be determined at the time of installation depending on the individual heights of the PAPI units, the local ground conditions etc.

On the center of each PAPI body there is a datum point which can be used to ensure that all of the units are at the same level.

The tube supplied is 60 mm in diameter and 400 mm long.

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The installation steps refer to:

1. Civil works
2. Installing the legs on the concrete plinth
3. Installing the PU3L unit on three legs
4. Installing of the PU3L unit on four legs
5. Adjusting the elevation angle
6. Installing the optional devices

3.1 Civil works

3.1.1 PU3L unit possible heights

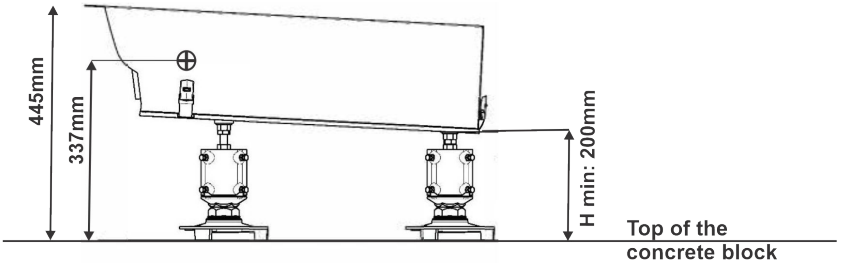
The PAPI units should be mounted as low as possible. The tube supplied for the PAPI legs is 60 mm in diameter and 400 mm long. The insertion depth of the tube into the frangible coupling is 62 mm. Make sure you add 62 mm to the measured tube length when calculating the required length.

The information below helps you to fix the topographic heights of the top of the concrete plinth dedicated to support the four PU3L units of the PAPI. Please take into account the following data and see Figure 3: where H = Overall Leg height when assembled.

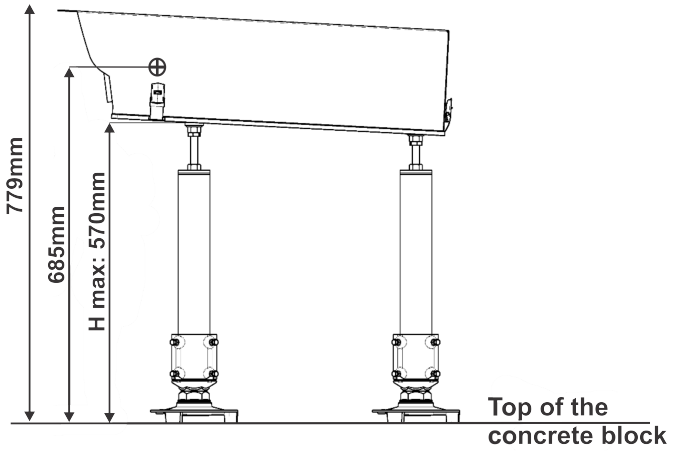
- The threaded rods of the three legs permit a maximum vertical adjustment of 60 mm.
- The maximum possible length of the PU3L leg assembly is 570 mm.
- The minimum possible length of the PU3L leg assembly is 200 mm.

The same values are also applicable for PU3L 4 legs version.

Figure 3: Maximum and minimum heights of PU3L



The minimum beam axis height is approximately 337 mm and is achieved by setting the back leg to its minimum height (200 mm) and setting the unit to an angle of 3° glide slope or less. This value can be lower dependent on the setting angle of the light unit.



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The maximum beam axis height is approximately 685 mm and is achieved by setting the front legs to their maximum height (570 mm) and setting the unit to an angle of 3° glide slope. This value can be higher dependent on the setting angle of the light unit.

Note

The optical beam reference point is 500 mm from the center of the back pole.

3.1.2 Concrete plinth standard dimensions

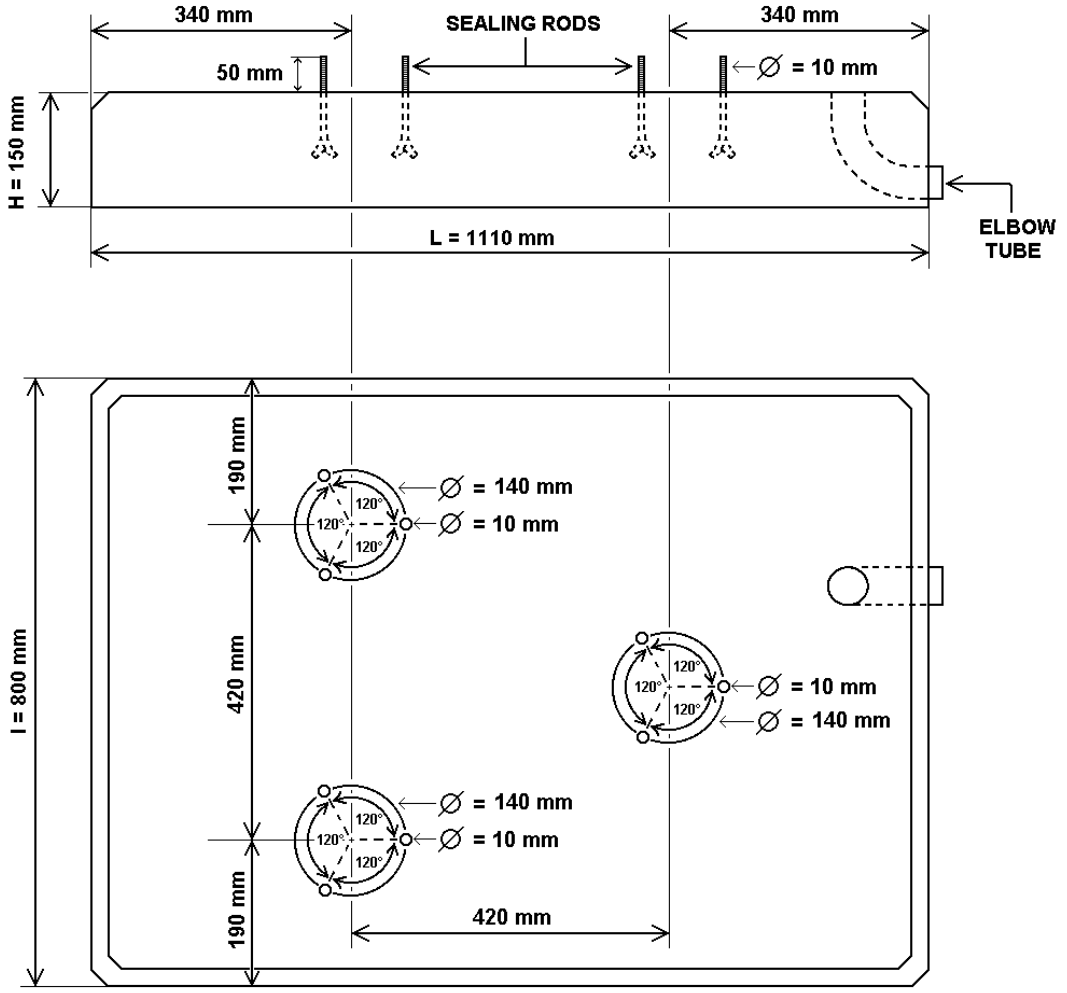
Once the location of the foundations for the PAPI units has been determined, each of the units will need to have a concrete plinth constructed as per the dimensions given in Figure 4.

Note

These dimensions are minimum requirements suitable for compacted and stabilized ground and may need to be increased due to local conditions. Ideally, the concrete plinths should be level with the ground; however, the requirements for chamfered edges should be kept in mind.

Three sets of three sealing rods with M10 threads (one per tripod base) may be fixed into the concrete while it is still wet; alternatively, the use of rawl bolts is recommended. We would also recommend placing a conduit elbow in the concrete plinth for the secondary AGL cables.

Figure 4: Standard sizes of the concrete plinth



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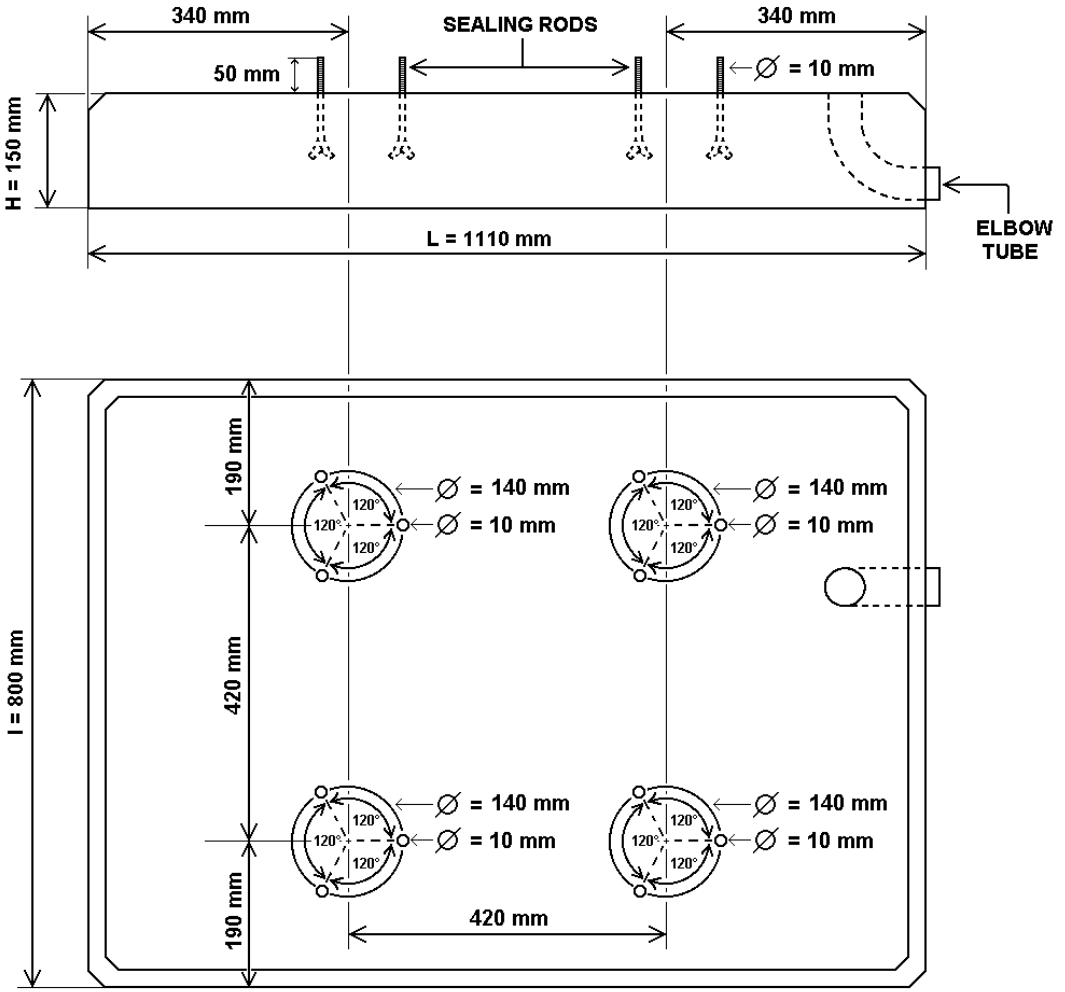
Note

For PU3L 4-legs version, four sets of three sealing rods with M10 threads are to be used. All the other recommendations are applicable here too.

Figure 5: Standard sizes of the concrete plinth, 4-legs version



3.1.3 Electrical circuits

Manholes and conduits dedicated to receiving respectively isolating cables (primary and secondary) for transformers and power supply must also be supplied and installed in the ground in order to shelter the equipment used to supply power to the PAPI system.

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Manholes and conduits characteristics depend on local needs, e.g. type of soil, type of climate, etc. Still, we recommend to (see also Figure 6 and Figure 7):

- Use one manhole (A) for 2 PU3L units (that is 2 manholes for one PAPI system)
- Minimize the length of the conduit (B) for the secondary cables (minimize the distance between the manhole (A) and the concrete block (C) that supports the PU3L unit)
- Use one conduits network (D) for each independent primary circuit used for power supply of the PAPI system (the use of only one or two independent circuits is possible)

Figure 6: Manhole and conduits (I)

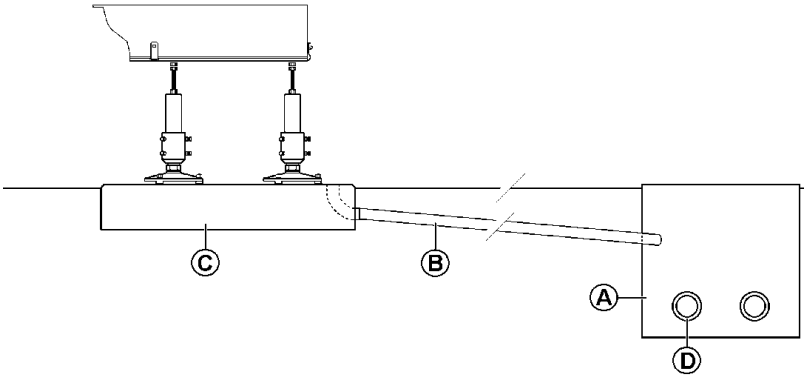
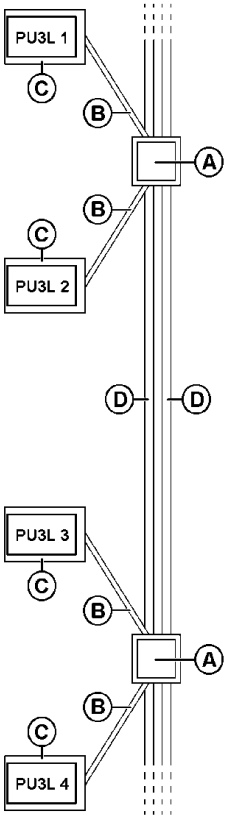


Figure 7: Manhole and conduits (II)



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3.2 Installing the legs on the concrete plinth

For each leg:

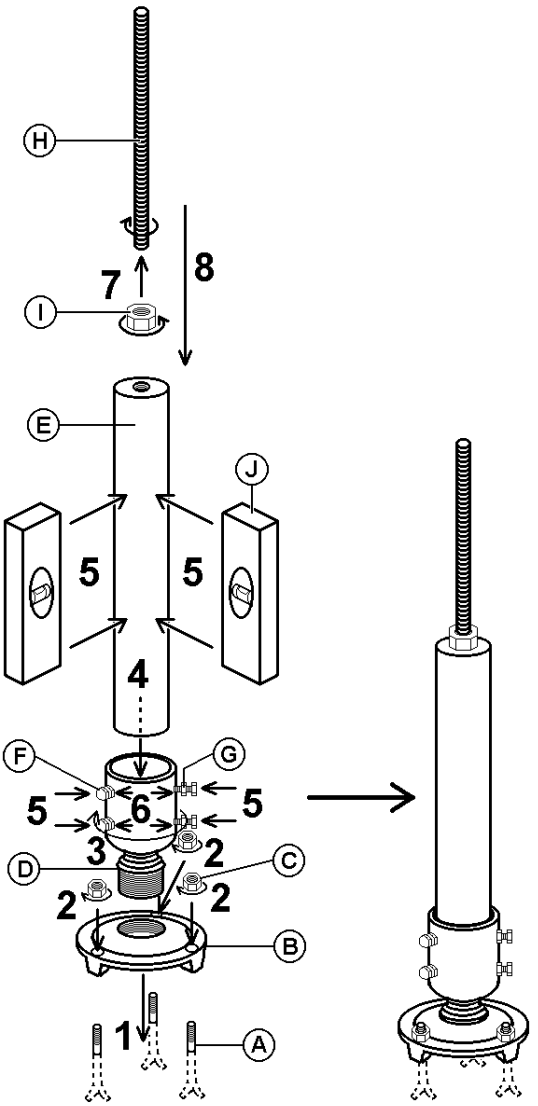
1. Mount the tripod stand (B) on the sealing rods (A).
2. Fix the tripod stand (B). Using an open-end spanner n° 10, screw and lock three M10 nuts (C) on the three sealing rods (A).
3. Use a 55 mm open ended spanner to fix the frangible coupling (D) to the tripod stand (B).
4. Mount the tube of the leg (E) in the frangible coupling (D). The tube must have been cut to the required length.

> **Note**
> Maximum amount of adjustment with the threaded rods (H) is 60 mm. Minimum distance between the plinth and the base of the PU3L is 200 mm (on the rear leg). Maximum distance between the plinth and the base of the PU3L box is 570 mm (on the front legs).

5. Use a spirit level (J) and an open-end 10-mm spanner to insert the tube (E) vertically into the frangible coupling (D), adjusting the six fixing screws (F) until they fit.
6. Tighten the six lock nuts (G).
7. Place the lower lock nut (I) on the threaded rod (H).
8. Insert the threaded rod (H) by screwing it into position in the tube (E).

> **Note**
> A minimum of 25 mm is required to be inserted.

9. When the rod is correctly positioned, tighten the lower lock nut (I).



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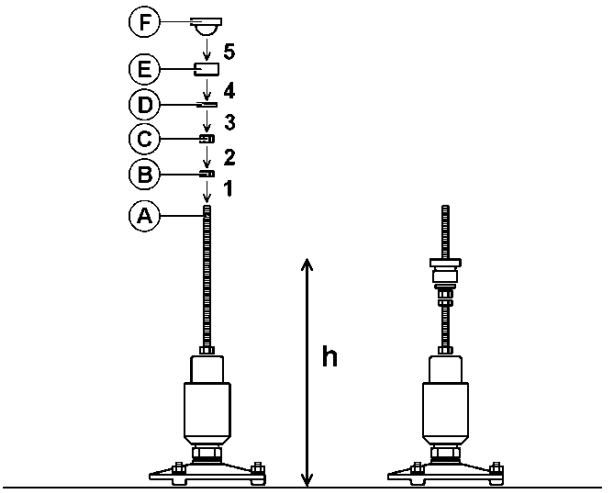
3.3 Installing the PU3L unit on three legs

3.3.1 Preparing the top of the legs

For each leg:

1. Screw the upper lock nut (B) on the threaded rod of the leg (A) about 20 mm below its final position.
2. Screw the fixing nut (C) on the threaded rod (A) at about its final fixing position (height h) above the concrete plinth.
3. Place the lower fixing washer (D) on the threaded rod (A).
4. Place the first part of the lower knee joint (E) on the threaded rod (A).
5. Place the second part of the lower knee joint (F) on the threaded rod (A).

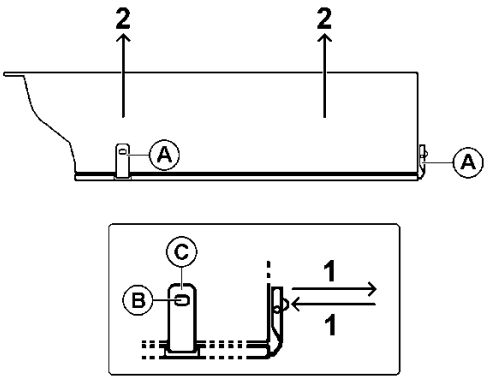


3.3.2 Removing the PU3L cover

1. Open the three catches (A). The catches are of the locking type and a button (B) needs to be pressed before the catch will open.

> **Note**
> The locking part of the catches is aimed at securing the closing. If you do not press on the buttonyou will not be able to open the catches. Don't force the catches since they can get damaged.

2. Lock the three catches in the upright position.
3. Remove the PU3L cover.



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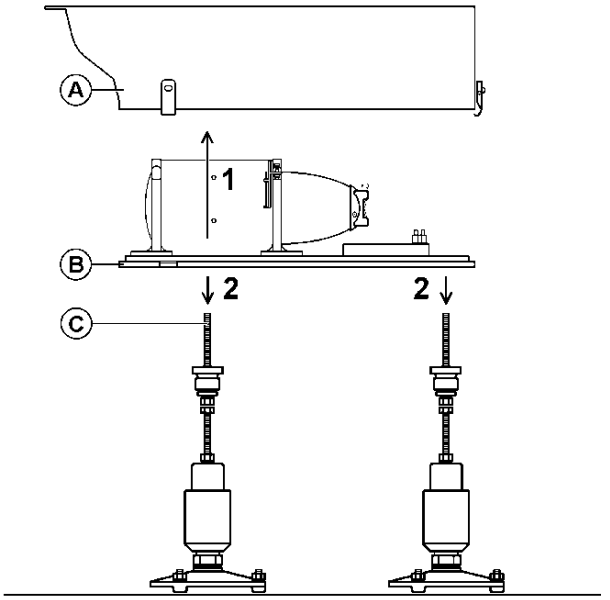
3.3.3 Mounting the unit on the three legs

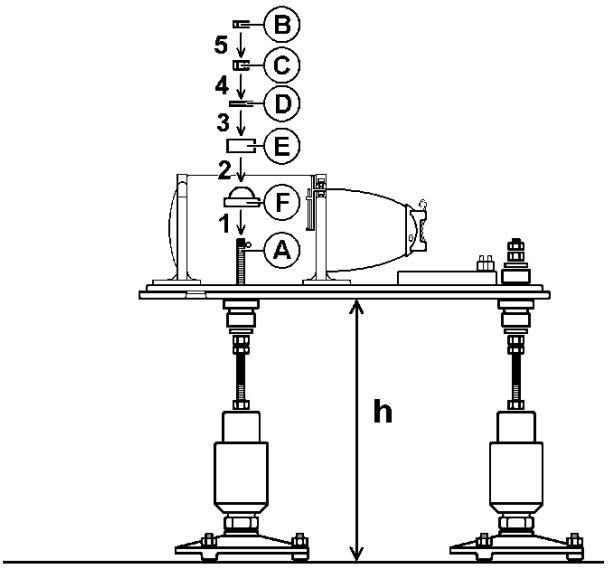
1. Remove the cover (A) of the PU3L.
2. Place the base plate (B) on the three legs (C).



3.3.4 Securing the unit

For each leg:

1. Place the upper knee joint (F) on the threaded rod (A).
2. Mount the top part of the knee joint (E) on the threaded rod (A).
3. Mount the upper fixing washer (D) on the threaded rod (A).
4. Screw the PU3L fixing nut (C) on the threaded rod of the leg (A). Do not tighten it at this stage!
5. Screw the PU3L lock nut (B) on the threaded rod (A) about 10 mm above the fixing nut (C).



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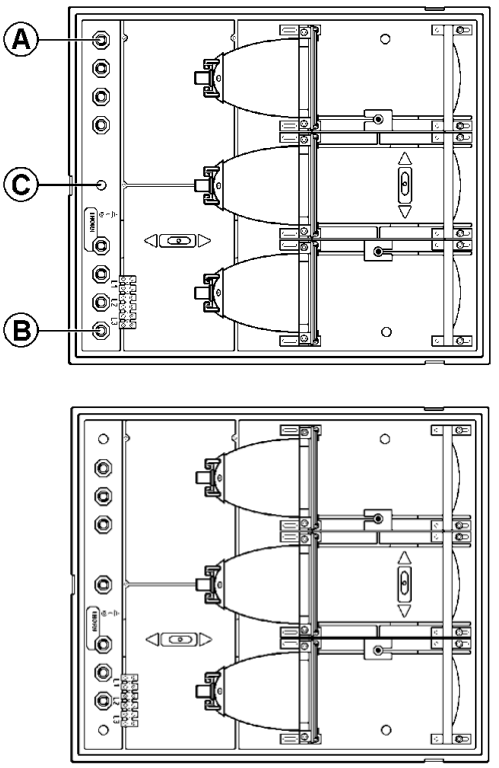
3.4 Installing the PU3L unit on four legs

3.4.1 Modifying the PU3L box for mounting onto four legs

To be able to be mounted onto four legs, a standard PU3L box (three legs version) must be modified before its installation. The modification consists of changing the place of one cable gland on the plate and removing the other one. This process is described below:

1. Remove the two cable glands (A) and (B).
2. Install one of these cable glands in the hole (C).
3. Place the lower fixing washer (D) on the threaded rod (A).



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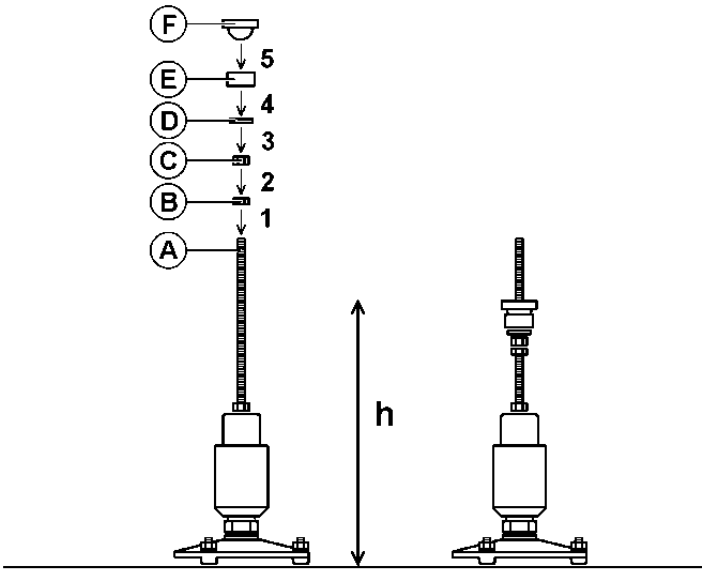
3.4.2 Preparing the top of the legs

For each leg:

1. Screw the upper lock nut (B) on the threaded rod of the leg (A) about 20 mm below its final position.
2. Screw the fixing nut (C) on the threaded rod (A) at about its final fixing position (height *h*) above the concrete plinth.
3. Place the lower fixing washer (D) on the threaded rod (A).
4. Place the first part of the lower knee joint (E) on the threaded rod (A).
5. Place the second part of the lower knee joint (F) on the threaded rod (A).

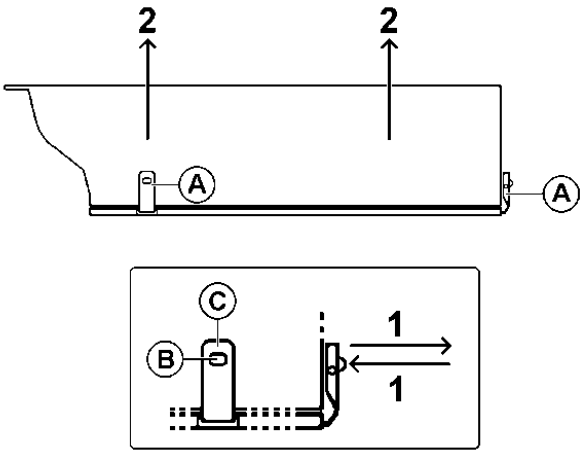


3.4.3 Removing the PU3L cover

1. Open the three catches (A). The catches are of the locking type and a stab (B) needs to be pressed before the catch will open.

> **Note**
> The locking part of the catches is aimed at securing the closing. If you do not press on the stab you will not be able to open the catches. Don't force the catches since they can get damaged.

2. Lock the three catches in the upright position.
3. Remove the PU3L cover.



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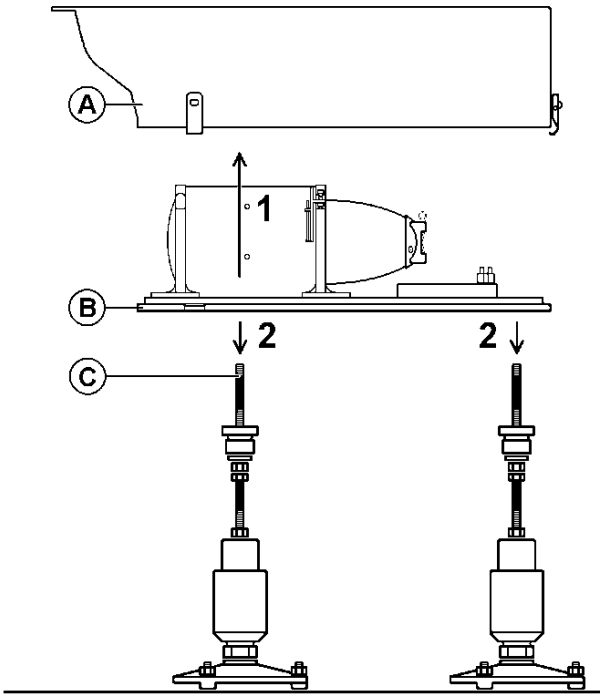
3.4.4 Mounting the unit on four legs

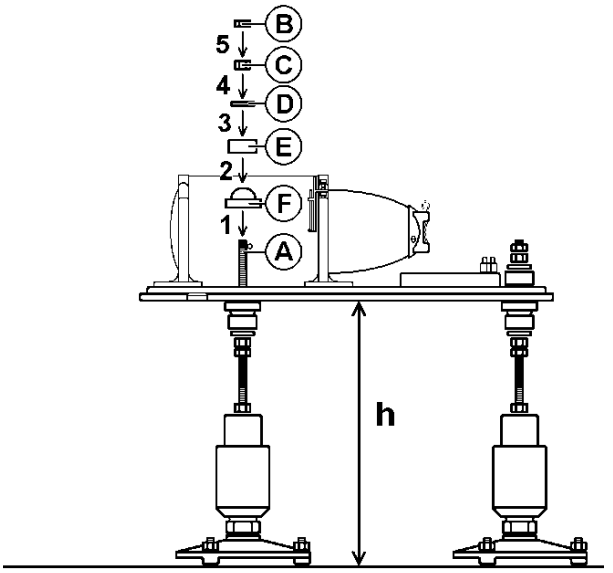
1. Remove the cover (A) of the PU3L.
2. Place the base plate (B) on the four legs (C).



3.4.5 Securing the unit

For each leg:

1. Place the upper knee joint (F) on the threaded rod (A).
2. Mount the top part of the knee joint (E) on the threaded rod (A).
3. Mount the upper fixing washer (D) on the threaded rod (A).
4. Screw the PU3L fixing nut (C) on the threaded rod of the leg (A). Do not tighten it at this stage!
5. Screw the PU3L lock nut (B) on the threaded rod (A) about 10 mm above the fixing nut (C).



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3.5 Electrical connections

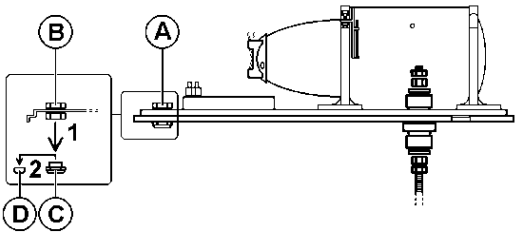
3.5.1 Connecting the secondary cables to the unit

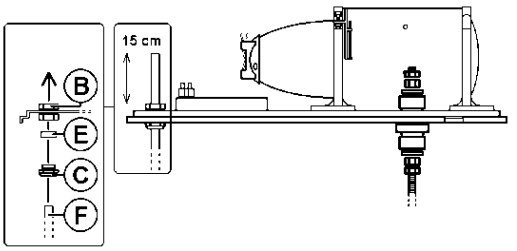
For each unit:

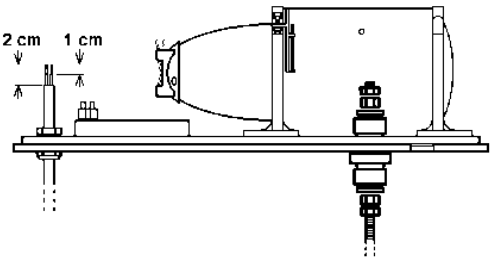
1. Unscrew and remove the lower nut (C) of the cable gland (A).
2. Remove the plug (D) from the lower nut (C) of the cable gland (A).

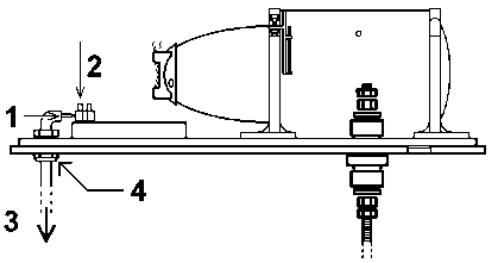
Note
All unused cable entries must have the blanking plug left in situ in order to maintain the IP rating of the unit.

3. Pass the secondary cable (F);
   a. through the cable gland lower nut (C),
   b. then through the cable gland gasket (E),
   c. and through the cable gland body (B).
4. Pull the secondary cable about 15 cm into the box.
5. Strip back the outer cover of the cable by approx. 20 mm.
6. Bare the cables cores for a length of about 10 mm.
7. Connect the two cable cores to the PU3L dedicated terminal (two connections per secondary cable).
8. Pull on the cable from the outside so that only the minimum length remains inside the unit.
9. Reassemble the cable gland body (B) and tighten to fit.









Note
On PU3L 4-legs version, the connection of secondary cables must be done using the cable glands marked ①, ② and ③ in the figure below (the cable gland ④ is not used). For PU3L equipped with two lamps, only the cable glands marked ② and ③ are used.

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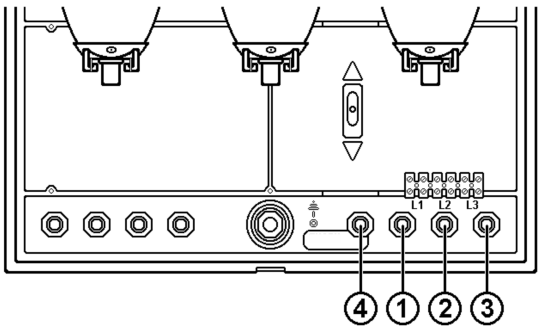


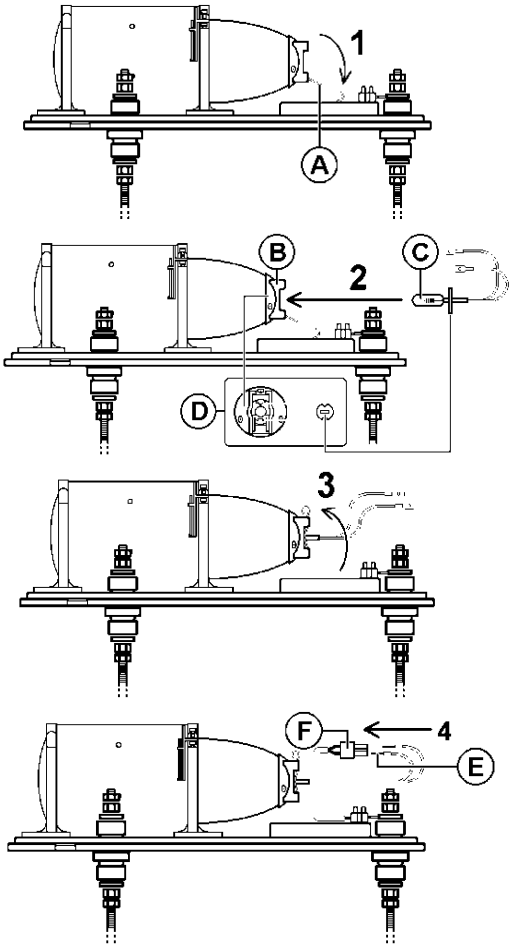
3.5.2 Fixing and connecting the lamps

For each lamp:

1. Open the lamp retaining spring (A).
2. Install the lamp (C) in the lamp holder (B).

> **Note**
> Ensure that the indentations in the lamp holder line up with those in the Pk30d lamp.

3. Close the lamp retaining spring (A).
4. Connect the two lamp leads to the appropriate terminals (F) inside the PU3L.



3.6 Adjusting the elevation angle

At this stage the PU3L PAPI units have been:

- Installed on their concrete plinths
- Equipped with secondary cables (two or three)
- Equipped with lamps (two or three)

The final step of the installation process is to set the elevation angles of the units.

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Note

The angle of approach on the typical airfield is usually 3 degrees; however, this has to be verified with the client and the local Aviation Authority. The standard angular displacement between each unit is 20 minutes of arc.

For a 3 degree approach this would give the unit closest to the runway a setting of 3°30', the next 3°10', the next 2°50' and the last one 2°30'.

3.6.1 Content of the Clinometer box

1. Clinometer
2. 6° rising block
3. Spirit level used for:
   a. Adjusting the front of the PU3L (see 2.6.3.1 a)
   b. Adjusting the tilt switch device (see 2.7.1.1)
4. Screws and hexagonal key to fix the clinometer on the rising block

Figure 8: Clinometer box

3.6.2 Using the Clinometer

3.6.2.1 The Clinometer parts

The clinometer comprises following parts:

1. A support on which is fixed a scale in degrees and three intermediate graduations, each representing 15 minutes of angle
2. A precision spirit level, sliding on the support, which is fixed on a scale divided into 15 minutes
3. 15 intervals, each representing 1 minute of angle
4. A locking flange for locking the level position during adjustment

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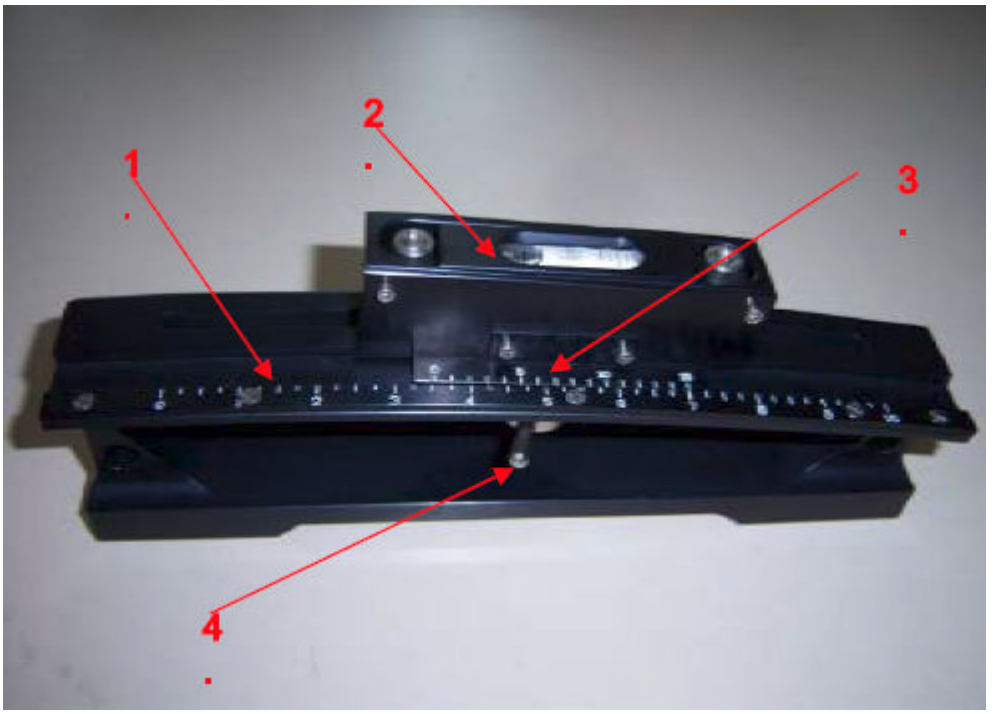

3.6.2.2 Adjustment examples

Setting the clinometer to 2° 30 '

1. Adjust the clinometer until the 0 minutes graduation is aligned with the 2nd graduation after the 2° graduation (see image).
2. The inclinometer is now set at 2° + (2 x 15') = 2° 30' .

NOTICE
Each graduation is equivalent to 15'.

The inclinometer is now set at 2° + (2 x 15') = 2° 30' .

NOTICE
Each graduation is equivalent to 15'.

3. Secure the clinometer position with the clamp.

Setting the clinometer to 2° 50 '

1. Adjust the clinometer until the 0 minutes graduation is aligned with the 3rd graduation after the 2° graduation.
2. The inclinometer is now set at 2° + (3 x 15') = 2° 45'.

NOTICE
Each graduation is equivalent to 15').

3. Add 5' by adjusting the clinometer until the 10 minutes graduation is aligned with the next graduation (see image).
4. The clinometer is now set at 2° + 45' + 5' = 2° 50'.
5. Secure the clinometer position with the clamp.

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Setting the clinometer to 3° 10 '

1. Adjust the clinometer until the 0 minutes graduation is aligned with the 3° graduation.
2. The inclinometer is now set at 3°.
3. Add 10' by adjusting the clinometer until the 10 minutes graduation is aligned with the next graduation (see image).
4. The clinometer is now set at 3° + 10' = 3° 10'.
5. Secure the clinometer position with the clamp.

Setting the clinometer to 3° 30 '

1. Adjust the clinometer until the 0 minutes graduation is aligned with the 2nd graduation after the 3° graduation (see image).
2. The inclinometer is now set at 3° + (2 x 15') = 3° 30'

> **Note**
> Each graduation is equivalent to 15')

3. Secure the clinometer position with the clamp.Secure the level position with the clamp.
   Secure the level position with the clamp.

3.6.2.3 The use of the 6° rising block

The setting angle of the clinometer is limited to 6.5 degrees (approach slope ≈6°). Normally, this angle limit is sufficient for airports. But, for some application, like heliports, this limit is not sufficient.

In this case, the clinometer can be fixed on the 6° rising block to increase the elevation angle. In this configuration, the elevation angle is equal to the angle sitting on the clinometer plus 6°.

For example, to have an elevation angle of 7°15′:

- Fix the clinometer on the 6° rising block
- Set an angle of 1°15′ on the clinometer

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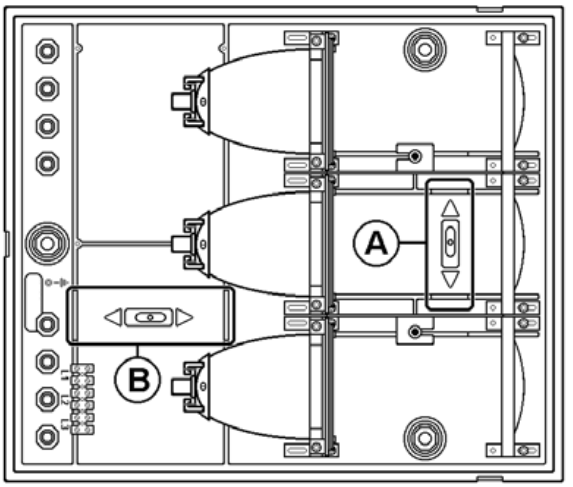
3.6.3 Calibration procedure

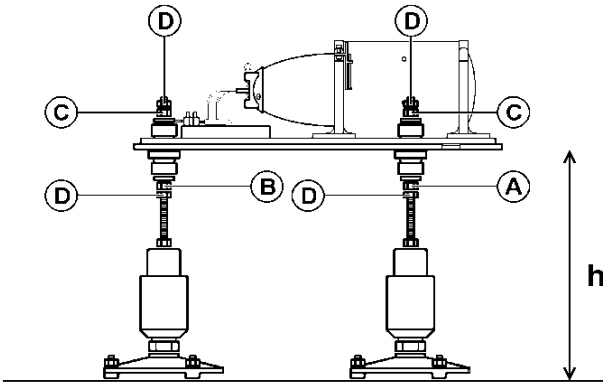
3.6.3.1 Setting up of the two special alignment tools

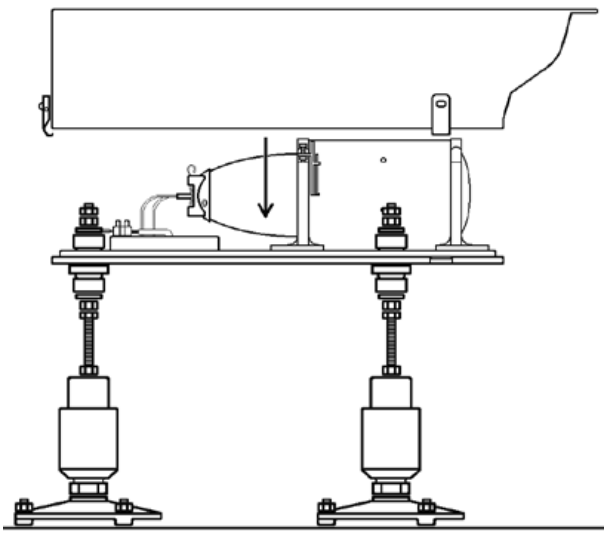
1. Place the level at reference point A.
2. Set and lock the required elevation angle on the clinometer by moving the spirit level on the body of the tool. Adjust the 0 on the spirit level scalewith the division you need on the scale of the body.
3. Connect the two lamp leads to the appropriate terminals (F) inside the PU3L.



3.6.3.2 Adjusting the unit

1. If necessary, using the lower fixing nuts (A), adjust the height 'h' of the PU3L base plate. Do not tighten it at this stage!
2. Adjust the front legs fixing nuts (A), whilst observing the spirit level, to set the front of the unit horizontal and level. Do not tighten it at this stage!
3. Adjust the rear leg fixing nuts (B), whilst observing clinometer, to set the required angle of the unit. Do not tighten it at this stage!
4. Tighten the upper fixing nuts (C) of the three legs after ensuring that the angle setting has not changed. Correct the adjustment if necessary.
5. Tighten the lock nuts (D) (upper and lower) of the three legs to fix the unit in place.
6. Remove the spirit level and the clinometer.
7. Replace the PU3L cover and close the three catches.





The PAPI unit PU3L is now operational. When the four units of a PAPI system are all operational the system itself is operational and can be put in service and use.

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3.7 Installing optional devices

As all the PU3L units are delivered without lamps and any optional devices (tilt switch and heating resistors), you have to install the corresponding devices in the PU3L unit in order to implement the corresponding optional function.

3.7.1 Installing the tilt switch

The tilt switch system is composed of four tilt switch devices: One Master tilt switch unit and three Slave tilt switch units mounted in the corresponding PU3L. In other words, one tilt switch becomes the master and the three others become slaves and they are linked together by cables. The installation of a tilt switch system requires three main operations:

- Electrical cabling of the system
- Mechanical mounting and adjustment of the devices in the PU3L units
- Calibration of the tilt switch devices
- Commissioning of the whole system

3.7.1.1 Adjusting the tilt switch devices in the PU3L units

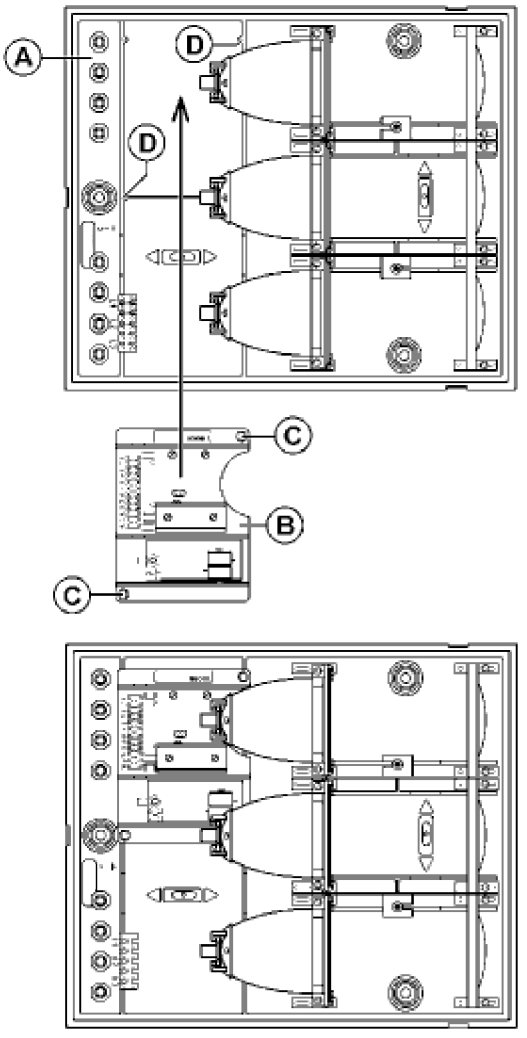
Mounting the tilt switch

For each PU3L unit:

1. Remove the cover of the PU3L (see Removing the PU3L cover).
2. Using the two fixing holes (D) located on the PU3L base plate (A) and the two fixing screws (C) located on the tilt switch device (B), fix and lock the tilt switch device on the PU3L base plate.

Note

One of the four PU3L units must be equipped with a Master tilt switch device and the three others with Slave tilt switch devices.
You can recognize the Master tilt switch device as it is the only one equipped with power supply and control module, a big module located under the tilt switch device.
Depending on the design of the AFL circuits and on the arrangement is more convenient for you (see Installing the tilt switch section Electrical connections on Tilt switch device main terminal), you can install the Master tilt switch device in the first or in the last (starting from the runway edge) PU3L unit of the PAPI system.



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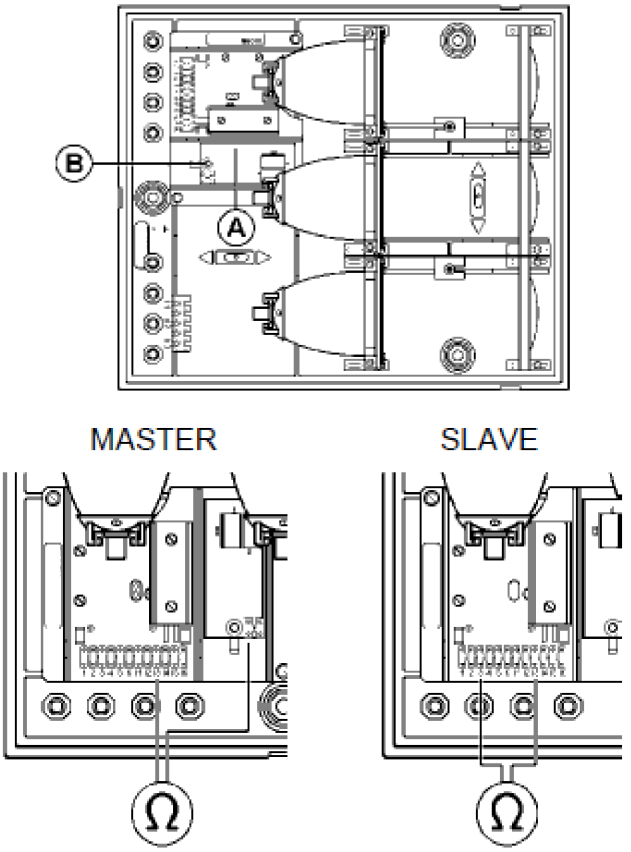
Adjusting the devices in the PU3L unit

For each PU3L:

1. Put the Spirit Level on the plate of the tilt switch device which supports the two mercury contacts in (A).
2. Using the adjustment screw (B) and looking at the spirit level, set the plate of the tilt switch device which supports the two mercury contacts in a horizontal position.
3. Verify that the mercury contacts are closed:
   - For the Master PU3L unit, use an Ohmmeter to verify that connection 13 of the tilt switch device main terminal and connection 1 of the mercury contact terminal are short-circuited.
   - For the Slave PU3L units, use an Ohmmeter to verify that connections 3 and 13 of the tilt switch device main terminal are short-circuited.
4. If required, put back in place the PU3L cover.



3.7.1.2 Electrical cabling of the system

After mounting and adjustment of the four tilt switch devices in the four PU3L units, the next operation is to make the electrical cabling for the system works. These cabling operations are divided in two separate steps: Cabling internal to PU3L units and cabling external to PU3L units.

Internal cabling

This operation involves the connection of the contacts of the relay dedicated to short-circuiting the lamps (when at least one of the PU3L units is miss-adjusted) to the two poles of each lamp.

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All the tilt switch devices are delivered with one set of three two-pole cables, each one intended to be connected to one lamp.

For each PU3L unit:

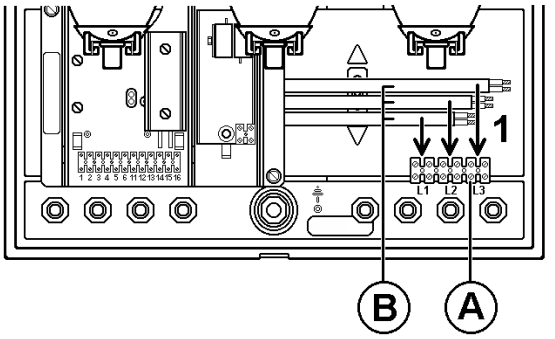
1. If required, remove the cover of the PU3L (see Removing the PU3L cover).
2. Depending on the number of lamps of the PU3L unit, connect the 2 or 3 cables (B) of the tilt switch device to the dedicated connections of the PU3L main terminal (A).

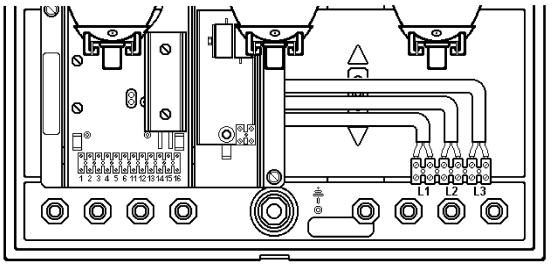
Note

The connections corresponding to the lamps are marked on the PU3L base plate casting:

- L1 for Lamp 1
- L2 for Lamp 2
- L3 for Lamp 3

3. If required, put back in place the PU3L cover.





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External cabling

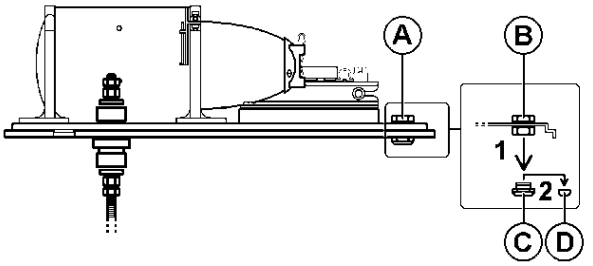
For the connection of the cables coming out from the PU3L units, the first step is to pass the corresponding cables through the cable glands.

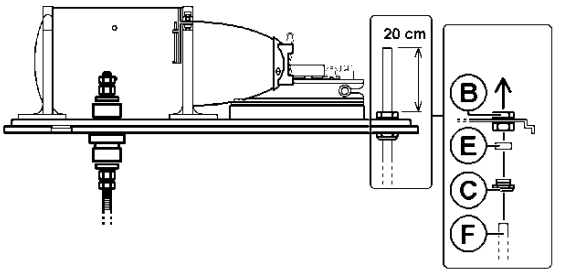
For each cable to connect:

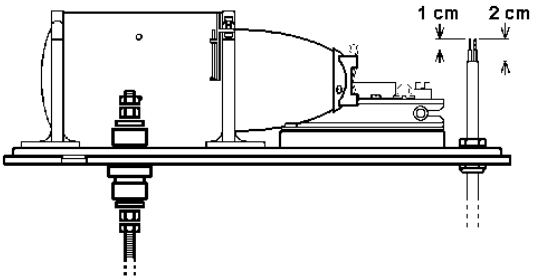
1. Unscrew and remove the lower nut (C) of the cable gland (A).
2. Remove the plug (D) from the lower nut (C) of the cable gland (A).

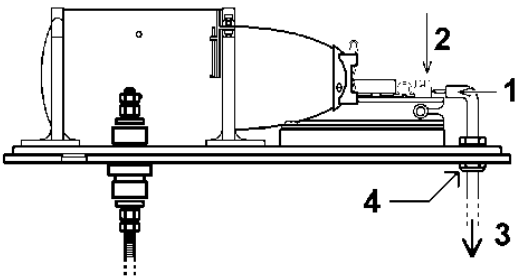
> **Note**
> All the unused cable entries must have the blanking plug left in situ in order to maintain the IP rating of the unit.

3. Pass the corresponding cable (F):
   - through the cable gland lower nuts (C),
   - then through the cable gland gasket (E),
   - and through the cable gland body (B).
4. Pull the corresponding cable about 20 cm into the box.
5. Strip back the outer cover of the cable by approximately 20 mm.
6. Bare the cable cores for a length of about 10 mm.
7. Connect the cable cores to the dedicated terminal of the tilt switch device, see Installing the tilt switch section Main terminal connections correspondence.
8. Pull back the cable to keep the minimum length inside the unit.
9. Reassemble cable gland (A) and tighten to fit.









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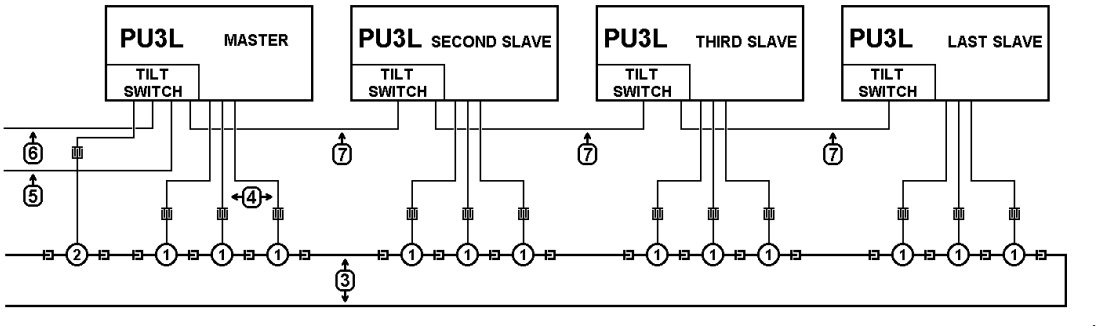
Electrical connections on tilt switch device main terminal

The wiring overview drawing below shows the different electrical connections necessary on a PAPI system with tilt switch option equipped of PU3L units.

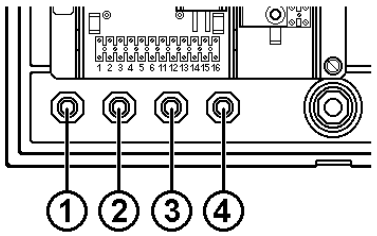
Figure 9: Wiring overview



1. Isolating transformers for the lamp
2. Isolating transformer for the supply of the Master tilt switch device
3. Primary cable
4. Secondary cable
5. Heating resistors supply 230 Vac (optional)
6. Alarm feedback cable (option) primary cable
7. Cable for tilt switch circuit
    a. relays supply (+12 Vdc)
    b. heating resistors supply (optional)

Cable glands correspondence

In the figure below you can find the correspondence between functions (Master tilt switch device supply 6.6 A, alarm feedback signal, heating resistor supply, tilt switch circuit, relays supply) and cable glands.



Master PU3L unit

1. Master tilt switch supply cable (2.8 to 6.6A)
2. Alarm feedback signal (dry contact)
3. Heating resistor supply cable (optional) = 230 Vac
4. Control Out = tilt switch circuit
    - relays supply (+12 Vdc)
    - heating resistors supply 230 Vac (optional)

Slave PU3L unit

1. Not used
2. Not used

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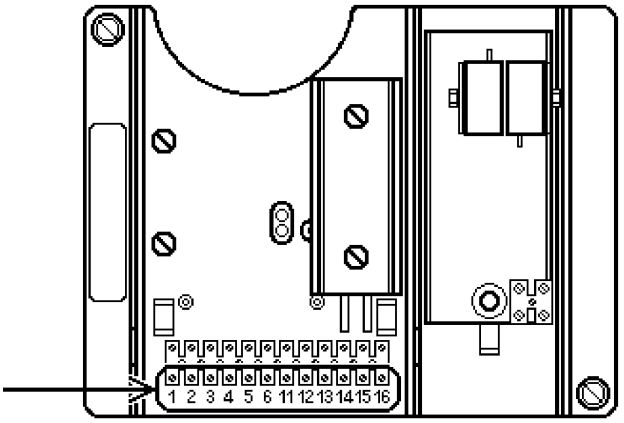
3. Control In = tilt switch circuit
    - relays supply (+12 Vdc)
    - heating resistors supply 230 Vac (optional)
4. Control Out = tilt switch circuit
    - relays supply (+12 Vdc)
    - heating resistors supply 230 Vac (optional)

Main terminal connections correspondence

In the figure below you can find the correspondence between functions (Master tilt switch device supply 6.6 A, alarm feedback signal, heating resistor supply, tilt switch circuit) and the connection on the tilt switch device main terminal.



Master PU3L unit

1 and 2 master tilt switch device supply (2.8 to 6.6 A), Input
3 and 4 alarm feedback signal, internal dry contact (optional)
5 and 6 heating resistors supply In (optional) 230 V, Input
11 and 12 relays supply (+12 Vdc), Output
13 and 14 tilt switch circuit, Output
15 and 16 heating resistors supply Out (optional) 230 V, output

Slave PU3L unit

1 and 2 relays supply (+12 Vdc), Input
3 and 4 tilt switch circuit, Input
5 and 6 heating resistors supply In (optional) 230 V, Input
11 and 12 relays supply (+12 Vdc), Output
13 and 14 tilt switch circuit, Output
15 and 16 heating resistors supply Out (optional) 230 V, Output

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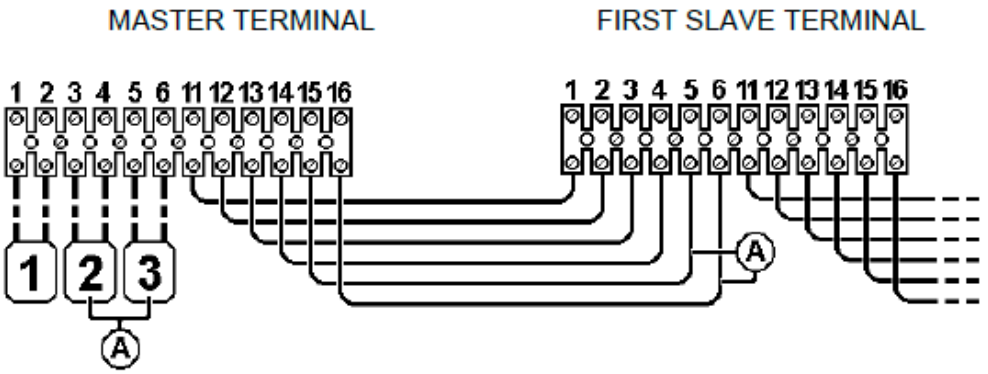
Electrical connections between PU3L units

In the figure below you can find the wiring you have to make on and between the main terminals of the tilt switch devices of PU3L units for the commissioning of the tilt switch function on the PAPI system.

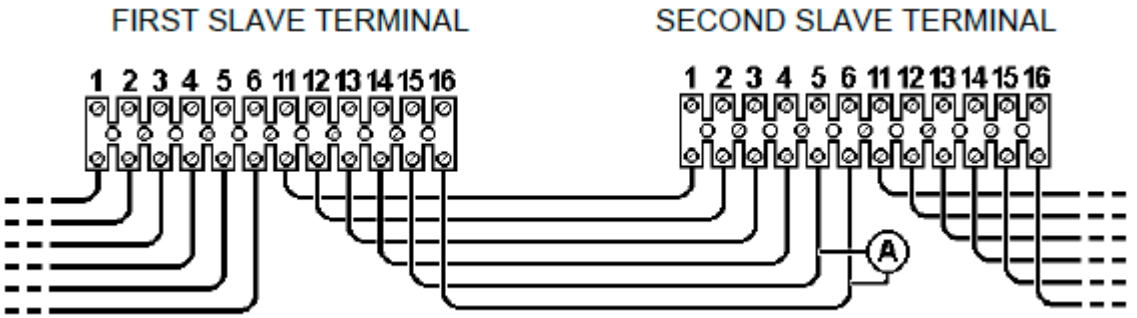
Figure 10: Connection between the Master PU3L unit and the first Slave PU3L unit



1. Master tilt switch device supply
2. Alarm feedback signal (optional)
3. Heating resistors supply (optional)

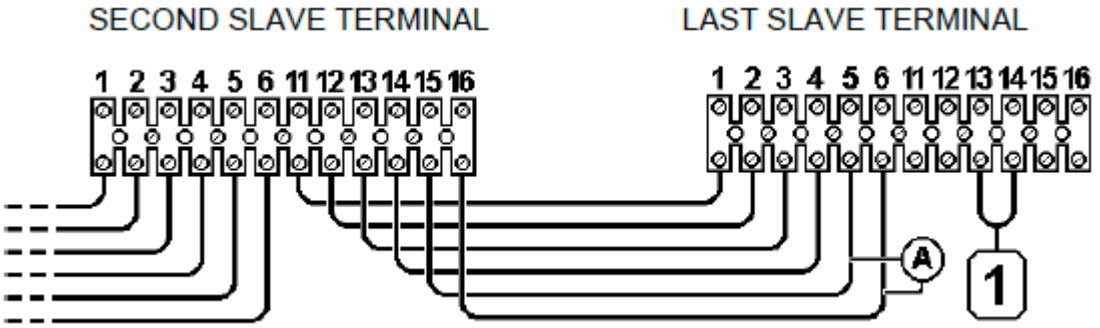
A. Optional wires

Figure 11: Connection between the first Slave PU3L unit and the second Slave PU3L unit



A. Optional wires only for heating resistors supply

Figure 12: Connection between the second Slave PU3L unit and the last Slave PU3L unit



1. Jumper, absolutely necessary for closing the tilt switch circuit

A. Optional wires only for heating resistors supply

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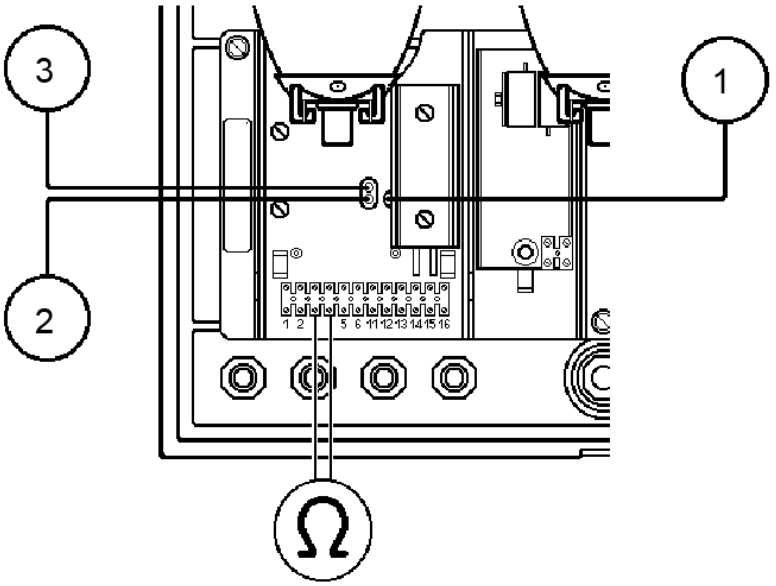
3.7.1.3 Commissioning the tilt switch system

After mounting and adjustment of all tilt switch devices in the PU3L units and after wiring of the whole system, you have to commission the tilt switch system. During this commissioning you have to test it either in the Normal status or the Fault status.

Test in Normal status

1. Power On the PAPI system (supply the corresponding AFL loop(s) with current with TRMS value from 2.8 to 6.6 Amps).
2. Check that all the PU3L units of the PAPI system are light ON and operational.
3. Remove the cover of the PU3L master unit, and check the status of the three LEDs of the tilt switch device:
   a. The Red LED ① shows that the power supply module is supplied with 12 Vdc, LED is ON.
   b. The Green LED ② shows that the tilt switch circuit is closed, LED is ON. .
   c. The Red LED ③ shows that the tilt switch circuitis open, LED is OFF.



4. With an Ohmmeter, verify that the dry contact of the Alarm feedback signal is open, indicating that the PAPI system is serviceable. Make the measurement between the connections ③ and ④ of the Master tilt switch device main terminal.

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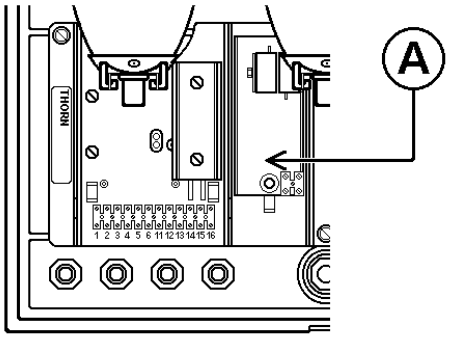
Test in Fault status

1. Push down the plate supporting the mercury contacts in (A).



2. Wait about 5 seconds.
3. Verify that all the PU3L units are Light OFF.
4. Control the status of the three LEDs of the tilt switch device:
   - The Red LED ① shows that the power supply module is supplied with 12 Vdc, LED is ON.
   - The Green LED ② shows that the tilt switch circuit is closed, LED is ON.
   - The Red LED ③ shows that the tilt switch open, LED is ON.
5. With an Ohmmeter, verify that the dry contact of the Alarm feedback signal is closed , indicating that the PAPI system is Out Of Service due to miss-alignment. Make the measurement between the connections 3 and 4 of the Master tilt switch device main terminal.
6. Reconnect the disconnected wire.
7. Restart the 2.8-6.6A AFL loops.
8. Control that now all the PU3L units of the PAPI system are Light ON and operational.

When the Fault status has been successfully tested on the four PU3L units, your tilt switch system is considered operational.

3.7.2 Installing the heating resistor

For use in cold or wet areas, the PU3L unit can be equipped (optional) with aspecial heating resistor. This must be supplied in 230 Vac and this option needs a dedicated supply wiring. The installation of heating resistors on a PAPI system requires two main operations: mechanical mounting in the PU3L units and electrical cabling.

3.7.2.1 Mounting of heating resistors and terminal plates

The first operation is to mount one heating resistor and one terminal plate in each of the four PU3L of the PAPI system.

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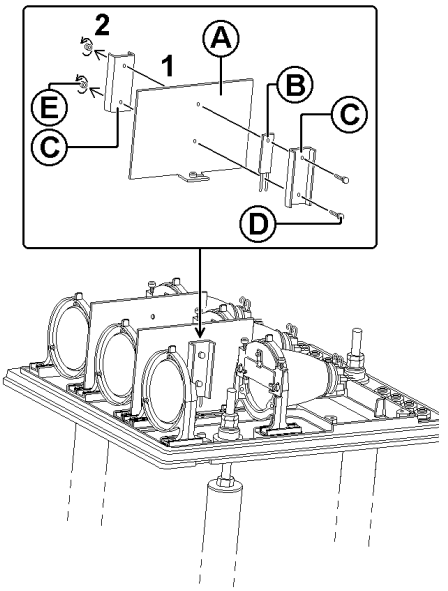
Mounting of heating resistors

For each PU3L unit:

1. Remove the cover of the PU3L (see Removing the PU3L cover).
2. Using the two sets of fixing screws (D) and nuts (E), fix the heating resistor (B) and its two radiators (C) on the separating screen (A) of the PU3L.
3. If required, put back in place the PU3L cover.



Mounting of terminal plates

The connections of the heating resistors with external wiring are done using terminals mounted on plates that you also have to mount in the PU3L units.

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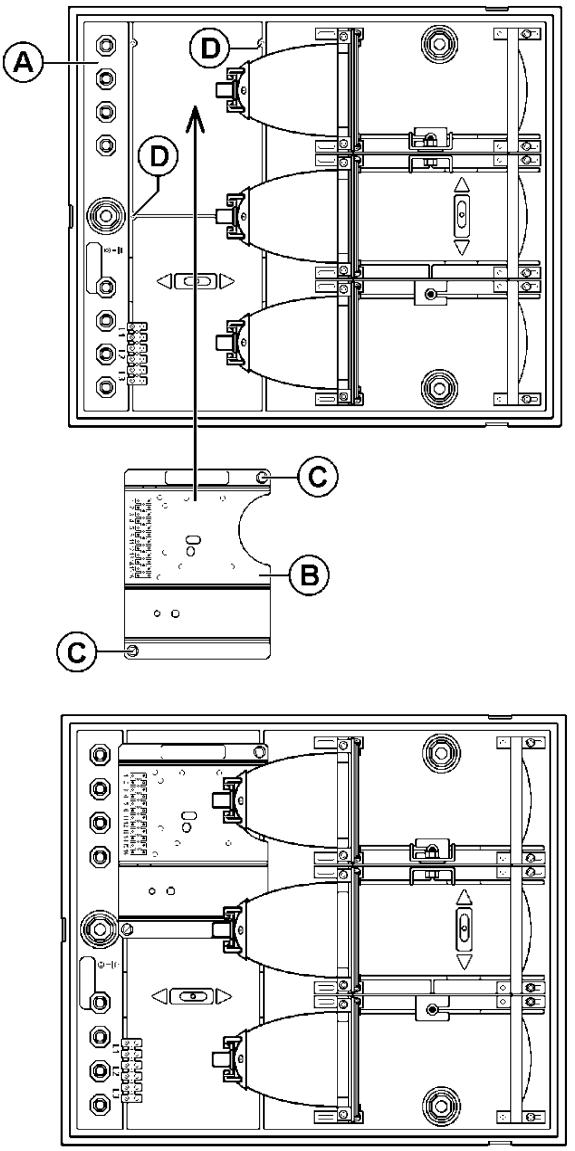
Note

If your PU3L is equipped with the optional tilt switch system, the connection of the heating resistors should be done on the main terminal of the tilt switch devices. In this case, see chapter Installing the tilt switch for the mechanical installation of the tilt switch devices.

If your PU3L is not equipped with the optional tilt switch system, you have to install special terminal plates in all the PU3L units.

For each PU3L unit:

1. If required, remove the cover of the PU3L (see Removing the PU3L cover).
2. Using the two fixing holes (D) located on the PU3L base plate (A) and the two fixing screws (C) located on the terminal plate (B), fix and lock the terminal plate on the PU3L base plate.



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4.0 Maintenance

4.1 General statement

The last operation of the production of a PU3L box in our factory is its complete optical adjustment (positioning in the PU3L of filter supports, reflector holders and lens supports). As all these adjustment operations can only be made in a laboratory. The corresponding fixing/ adjusting screws and nuts are marked and locked during this operation using special red marking glue.

This means that:

- All fixing and holding components locked and marked by red marking glue should not be removed, in order to preserve the quality of the optical adjustments made in laboratory.
- The following operations cannot be made without a new laboratory optical adjustment:

  a) Replacement of a lens
  b) Replacement of a lens holder
  c) Replacement of a reflector support
  d) Replacement of a filter holder

If you need to make one or more of these operations on a PU3L unit, please send the corresponding PU3L unit to ADB SAFEGATE for repairing.

Note

All the maintenance operations described in this document are available for standard three legs version and for optional four legs version of the PU3L.

The following tools and accessories are required for maintenance actions:

- Two open end wrenches of 22 mm
- Two open end wrenches of 17 mm
- One 22 mm box spanner / socket
- One 8 mm box spanner / socket
- One small flat screwdriver
- One brush or cloth

4.2 Basic maintenance program

Based on the previous experience in airfield lighting, the following list is a recommendation for the various maintenance tasks to be carried out in order to keep the equipment in correct operating conditions.

When	What
Daily	General visual check of the PAPI unit
Weekly	Visual inspection of the PAPI unit Removal of dust from outside of the PAPI unit
Monthly	Checking the optical part of the unit (=> mechanical damages) Checking the proper fixing of the unit on its base
Yearly	Detailed inspection of the PAPI units Verification of angles adjustment Cleaning of the optical part

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Note

This basic maintenance program is proposed (as an example) for the PU3L PAPI unit installed on a standard airport in normal operating conditions.

A daily function check is referred to in the document:

> ICAO, Airport Services Manual Part 9, Airport Maintenance Practice and FAA AC 150/5340-26A, Maintenance of airport visual aids facilities

The unit is designed for outdoor operation, however storing the unit outside without using it is a risk for damage to light components. For a longer storage time, more than a week, it is recommended to store the unit indoors in a dry and dust free environment and at room temperature. Proper storage ensures trouble free replacement procedures. It is strongly recommended not to store any electrical equipment outside.

4.3 Workshop maintenance

Before you start, make sure you have read and understand Safety Instructions.

The workshop maintenance refers to following:

1. Disassembling/ assembling the unit
2. Replacing a lamp
3. Replacing a filter
4. Replacing the protection front glass and its gasket
5. Replacing a reflector

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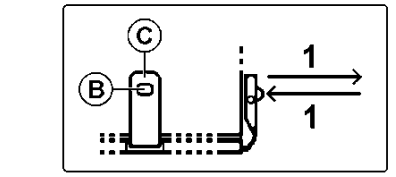
4.3.1 Disassembling/Assembling the unit

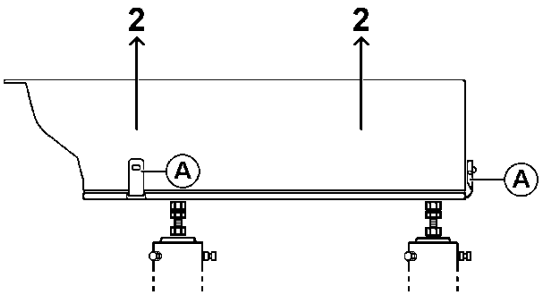
Disassemble

1. Open the three catches (A).
2. The catches are of the locking type and a stab (B) needs to be pressed before the catch will open.

> **Note**
> The locking part of the catches is aimed at securing the closing. If you do not press on the stab you will not be able to open the catches. Don't force the catches since they can get damaged.

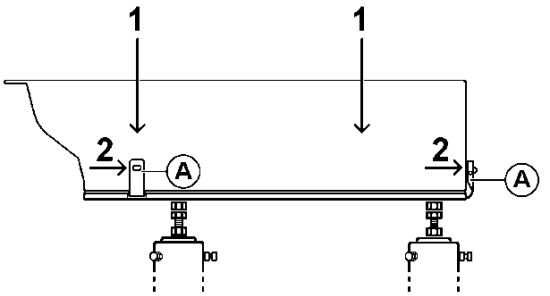
3. Lock the three catches in the upright position.
4. Remove the PU3L cover (see Removing the PU3L cover).





Assemble

1. Put the PU3L cover back in place.
2. Open the three catches (A).
3. Close and lock the three catches in upright position.



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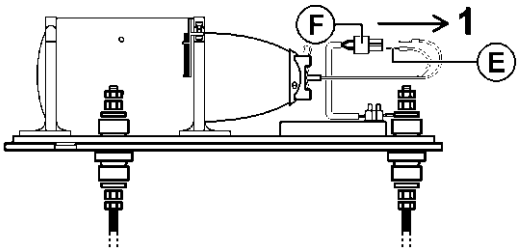
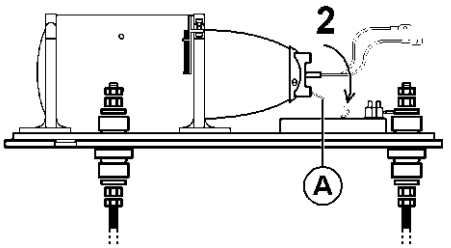
4.3.2 Replacing a lamp

Remove

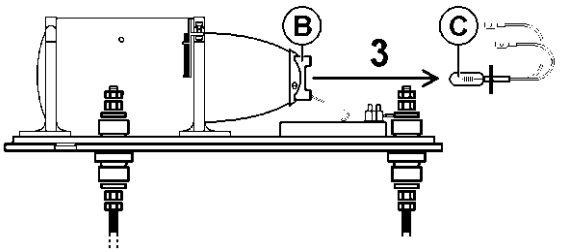
1. Remove the PU3L cover (see Removing the PU3L cover).
2. Disconnect the two lamp leads from their terminals (F).



3. Open the lamp retaining spring (A).



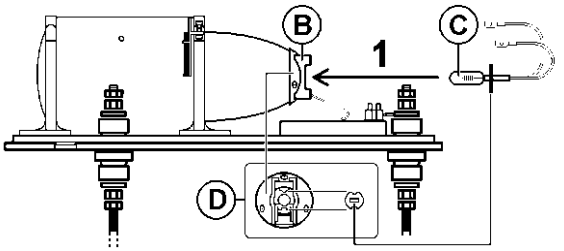
4. Remove the lamp (C) from its lamp holder (B).



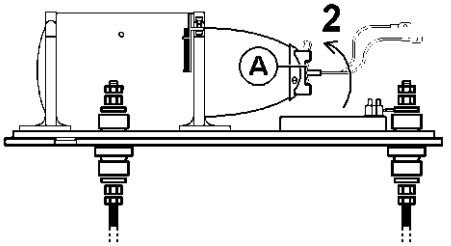
Replace

1. Install the lamp (C) on its lamp holder (B).

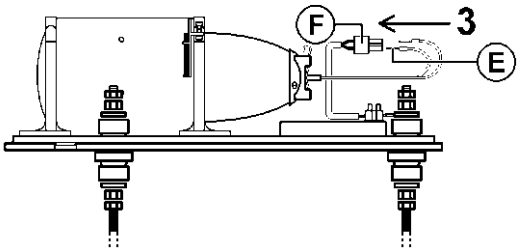
> **Note**
> Ensure that the indentations in the lamp holder line up with those in the Pk30d lamp.



2. Close the lamp retaining spring (A) on the lamp (C).



3. Connect the two lamp leads (E) to the appropriate terminals (F).
4. Put the PU3L cover back in place (see Removing the PU3L cover).



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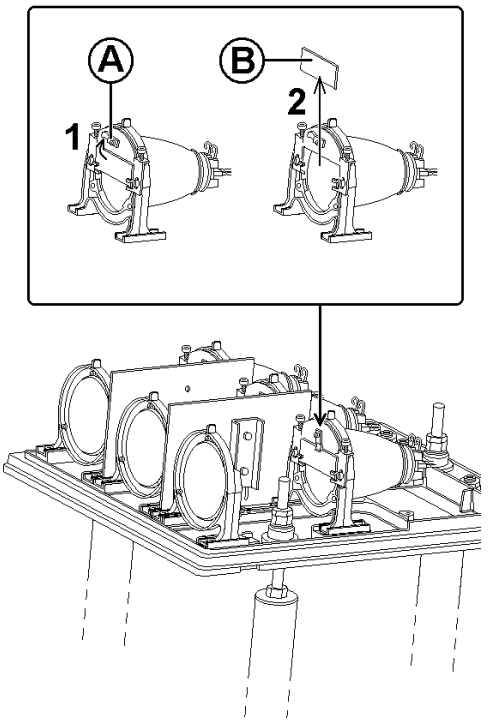
4.3.3 Replacing a filter

Remove

1. Remove the PU3L cover (see Removing the PU3L cover).
2. Turn the filter spring (A) sideways.
3. Slide up and remove from its holder the defective filter (B).

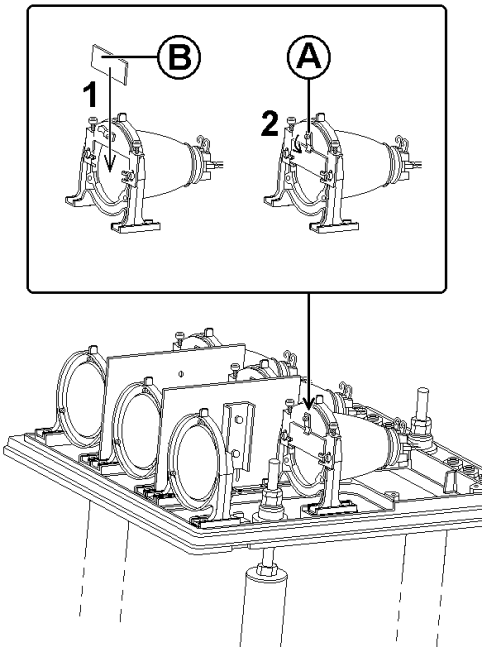


Replace

1. Slide down and place the new filter (B) on its holder.
2. Verify the position of the filter on its holder so that both supporting parts are in contact with the bottom of the filter.
3. Turn down the filter fixing spring (A).

> **Note**
> If the filter has been mounted correctly, it is automatically adjusted. In this case you don't need to make any optical adjustments. Don't change the filter holder adjustment.

4. Put the PU3L cover back in place (see Removing the PU3L cover).



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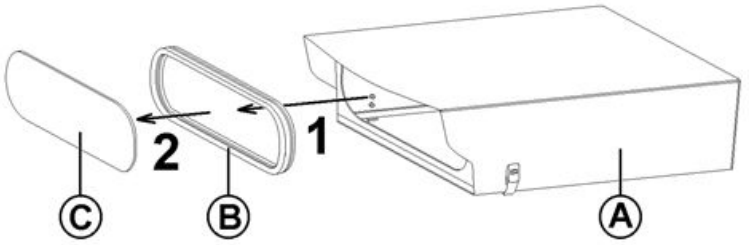
4.3.4 Replacing the protection front glass and its gasket

Remove

1. Remove the PU3L cover (see Removing the PU3L cover).
2. Remove the front glass (C) and its gasket (B) from the PU3L cover (A).



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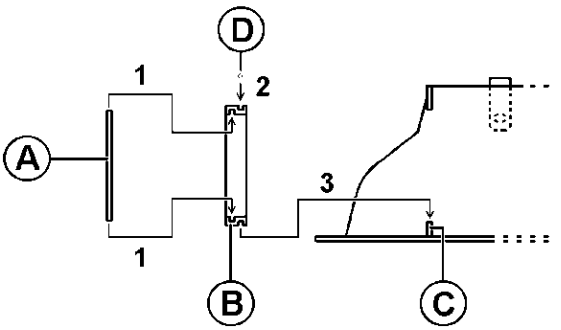
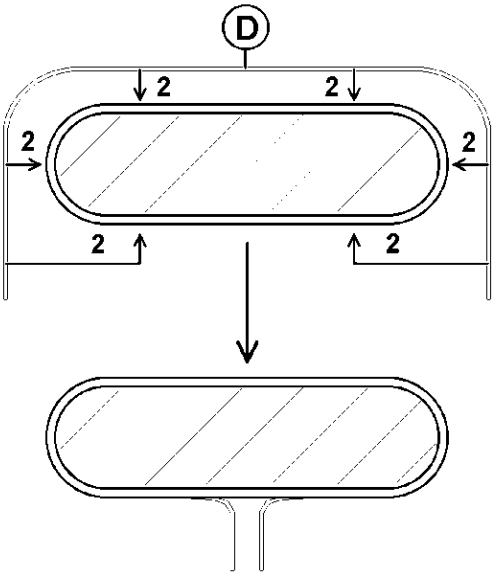
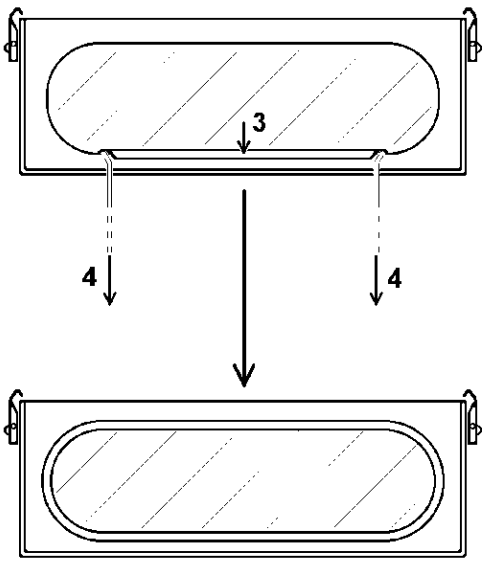
Replace

1. Mount the new gasket (B) on the new front glass (A). Insert the front glass in the internal groove of the gasket.
2. Pour paraffin on the small cord (D) used to mount the front glass and its gasket in the window of the PU3L cover.
3. Insert the small cord (D) in the external groove of the gasket.





4. Mount the new front glass and its new gasket in the window of the cover.
5. Mount only the lip of the upper part of the gasket inside the PU3L cover on the upper part of its widow (C).
6. The ends of the small cord must be inside the PU3L cover.
7. Push the front glass and its gasket on the front of the PU3L cover.
8. Pull on the small cord ends inside the PU3L to pass the lip of the gasket inside the PU3L cover all round the window.
9. Put the PU3L cover back in place (see Removing the PU3L cover).



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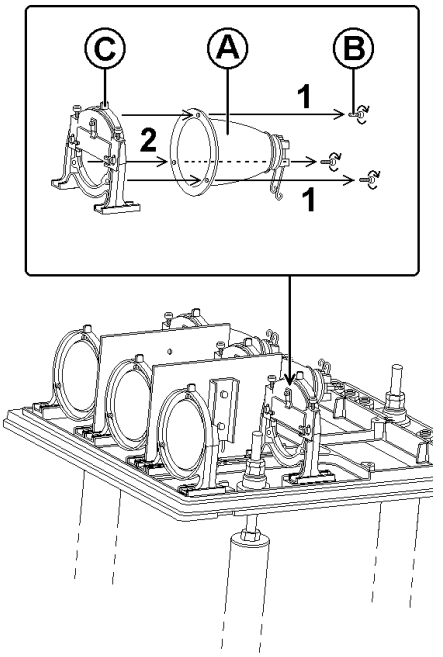
4.3.5 Replacing a reflector

Remove

1. Remove the PU3L cover (see Removing the PU3L cover).
2. Remove the lamp from the reflector.
3. Untighten the three fixing screws (B) of the reflector (A).
4. Remove the reflector from its holder (C).



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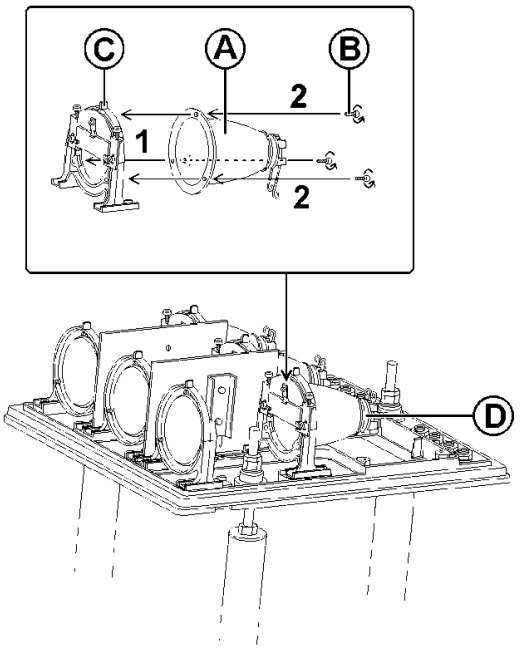
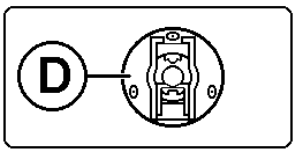
Replace

1. Put the new reflector (A) in place on its holder (C).
   Take care of the position of the lamp holder (D) on the reflector.
2. Mount, screw and lock the three reflector fixing screws (B).
3. Put the lamp back in place on the reflector.
4. Put the PU3L cover back in place (see Removing the PU3L cover).



TOP



BOTTOM

4.4 Electrical cabling of the heating resistors

The second operation to execute is to make the electrical cabling over the PAPI system. These cabling operations are divided in two separate steps: cabling internal to PU3L units and cabling external to PU3L units.

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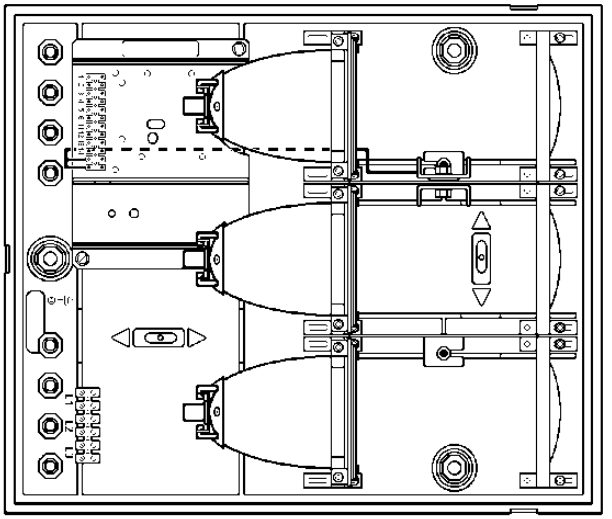
Internal cabling

This operation involves connecting the the two poles of the heating resistor to the main terminal of the terminal plate or of the tilt switch device.

For each PU3L unit:

1. If required, remove the cover of the PU3L (see Removing the PU3L cover).
2. Pass the resistor's two wires under the reflector holder (A), under the terminal plate (or tilt switch device) (B) and then connect them to the connections **15** and **16** of the main terminal.
3. If required, put back in place the PU3L cover.



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External cabling

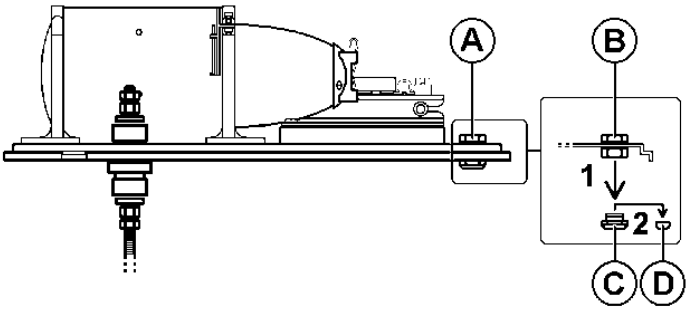
Concerning connection of cables coming from outside the PU3L units, the first step is always to pass the corresponding cables through the cable glands.

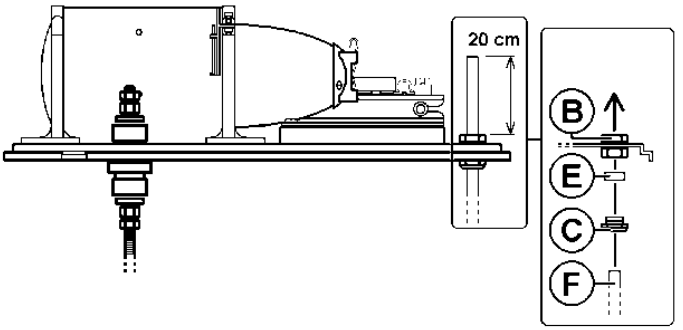
For each cable to connect:

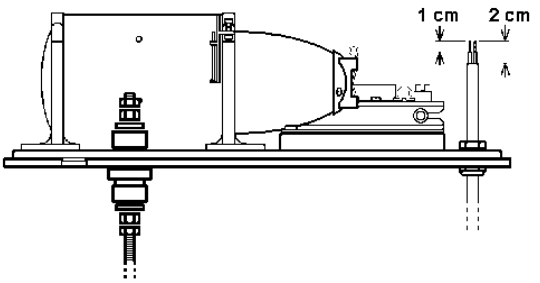
1. Untighten and remove the lower nut (C) of the cable gland (A).
2. Remove the plug (D) from the lower nut (C) of the cable gland (A).

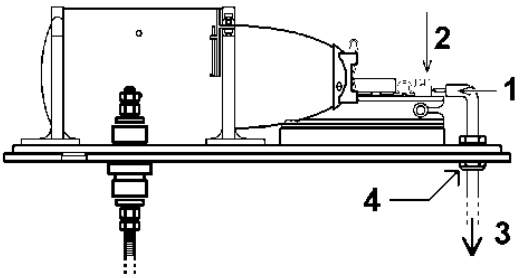
> **Note**
> All the unused cable entries must have the left blanking plug in situ in order to maintain IP rating of the unit.

3. Pass the corresponding cable (F) through the cable gland lower nuts nut
4. Pull the corresponding cable about 20 cm into the box.
5. Strip back the outer cover of the cable by approx. 20 mm.
6. Bare the cables cores for a length of about 10 mm.
7. Connect the cable cores to the tilt switch device dedicated terminal (see next section).
8. Pull back the cable to keep the minimum length inside the unit.
9. Reassemble the cable gland body (B) and tighten to fit.









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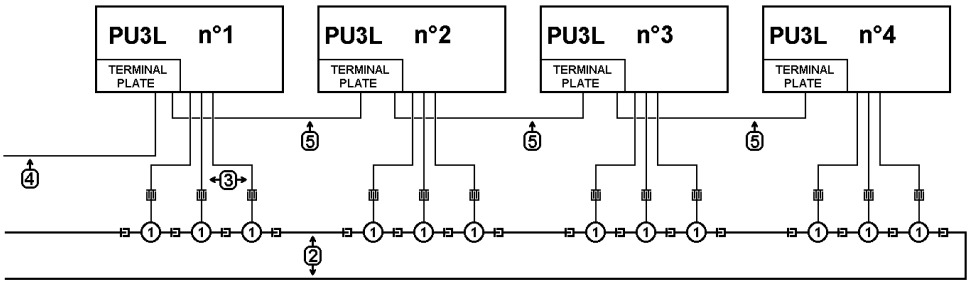
Electrical connections on Main terminal

The wiring overview below shows the different electrical connections necessary on the PAPI system without tilt switch using PU3L units equipped with heating resistors (= distribution of 230 Vac power supply). For system equipped with tilt switch see Installing the tilt switch.

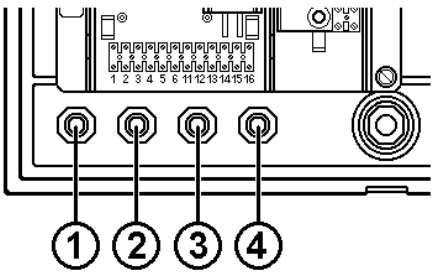
Figure 13: Wiring overview



1. Isolating transformer for the lamps
2. Primary cable
3. Secondary cable
4. Heating resistors supply 230 Vac
5. Cable for heating resistors supply

Cable glands correspondence

In the figure below, you find the correspondence between functions (heating resistors supply Input and heating resistors supply Output) and cable glands.



1. Not used
2. Not used
3. Heating resistors supply “In” = 230 Vac
4. Heating resistors supply “Out” = 230 Vac

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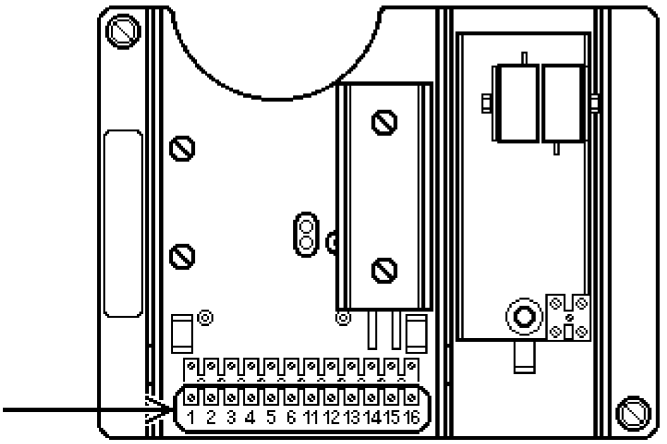
Main terminal connections correspondence

In the figure below, you find the correspondence between functions (heating resistors supply Input and heating resistors supply Output) and connection on terminal of the terminal plate.



- 1 and 2 not used
- 3 and 4 not used
- 5 and 6 heating resistors supply **In** 230 V, Input
- 11 and 12 not used
- 13 and 14 not used
- 15 and 16 heating resistors supply **Out** 230 V, Output

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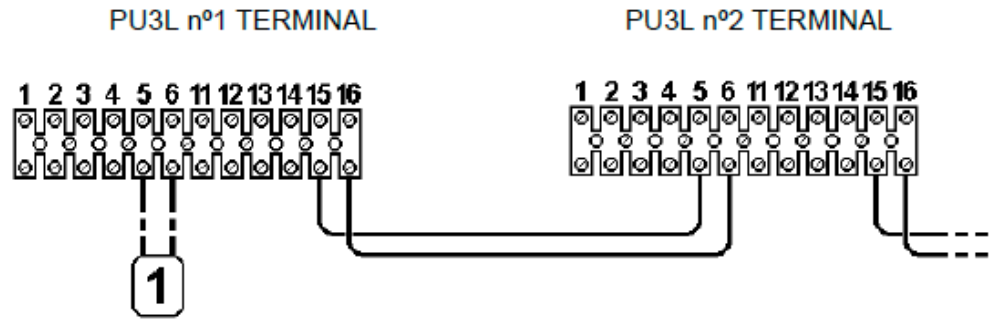
Electrical connections between the PU3L units

In the figure below, you find the wiring you have to make on and between the main terminals of the main terminal plates for installation of the heating resistors on the PAPI system.

Figure 14: Connection between PU3L unit N° 1 and the PU3L unit N° 2



1. Heating resistors supply

Figure 15: Connection between PU3L unit N° 2 and the PU3L unit N° 3

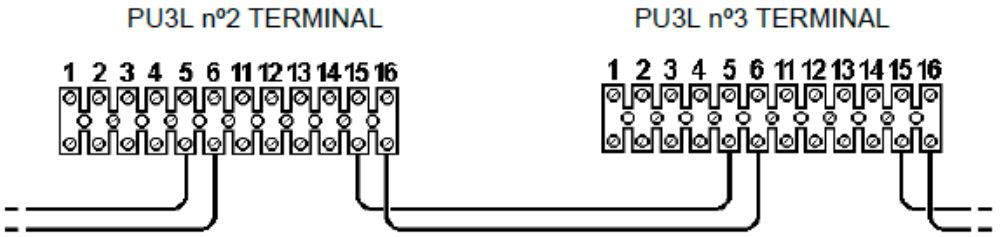
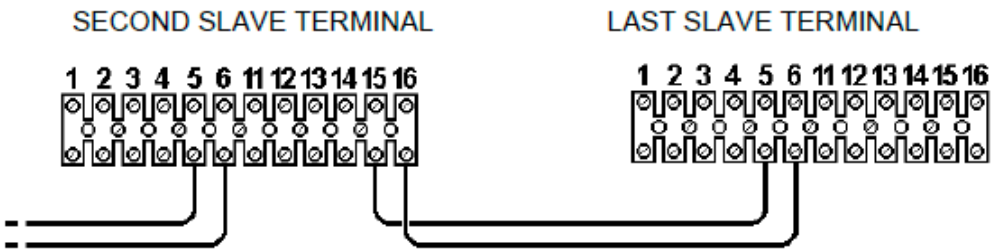


Figure 16: Connection between PU3L unit N° 3 and the PU3L unit N° 4



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5.0 Troubleshooting

For a PAPI system equipped with the optional tilt switch function already successfully commissioned, one of the following problems may occur:

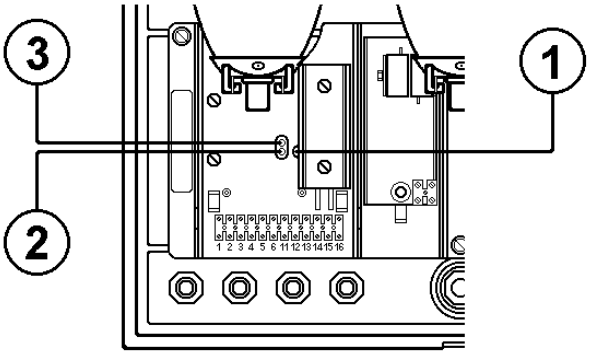
- The PAPI system remains Light Off when it is Power On
- Some PU3L units remain Light Off when the PAPI system is Power On

Below you will find instructions on how to solve these problems. Note that after some operations you have to restart the commissioning operations, to do this please refer to Installation.

The PAPI System is Light Off

1. Verify that the PAPI AFL loop(s) is/are Power On with a TRMS value of at least 2.8 Amps.
2. Remove the covers of all the PU3L units (see Removing the PU3L cover).

   Figure 17: Location of the Master Tilt switch of the device LEDs

3. Control the status of the three LEDs of the Master tilt switch device:
   - The Red LED (1) showing that the power supply module supply 12 Vdc must be Light On. LED Light Off means that the control and supply module does not supply 12 Vdc to all the relays and by default all the lamps are short-circuited. Verify that the master tilt switch module is supplied (2.8 to 6.6 Amps). If it is the case change the master tilt switch module and restart the commissioning.
   - The Green LED (2) showing that the mercury contacts loop is closed must be Light On. LED Light Off means that the mercury contacts loop is open somewhere. Find where the loop is open, correct the problem and restart the commissioning.

     To find where the loop is open, follow the steps below:

     a. Power Off the PAPI system.

     b. Open the loop on the PU3L master unit. Disconnect the wire connected to the connections 13 and 14 of the master tilt switch device main terminal.

     c. With an Ohm meter, test the mercury contacts loop. Verify that the loop is closed (make the measurement on the wires disconnected). If the loop is closed the problem is due to the Master tilt switch device. Test that the Master mercury contacts are closed. If it is not the case, adjust it again and restart the commissioning. Otherwise change the Master tilt switch device.

     d. If the loop is open, find where the loop is open. To do this follow the steps below:

        1. Go to the first Slave PU3L and measure the mercury contacts loop on the tilt switch device main terminal. Make the measurement between the connections 2 and 3 of the main terminal.
           - If the loop is closed, the problem is located on the wiring between PU3L and the previous one (here between the Master and the first Slave). Find and correct it, then restart the commissioning [1].
           - If the loop is open, test the mercury contacts of the PU3L (here the first Slave PU3L). Make the measurement between the connections 3 and 13 of the main terminal. If the mercury contacts are open the

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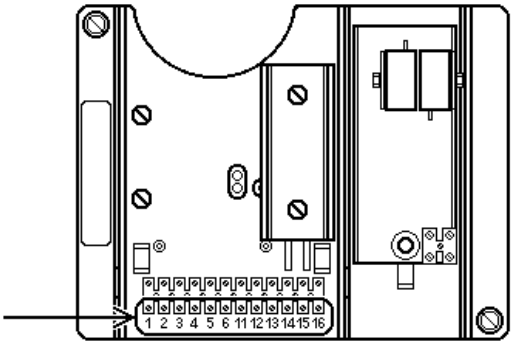
problem is located on mercury contacts plate. Find and correct it (make the adjustment again), then restart the commissioning [1] .

2. If the problem is not located on the first Slave do the same operations as in i. on the second Slave PU3L.
3. If the problem is not located on the second Slave do the same operations as in i. on the last Slave PU3L.

Figure 18: Tilt switch device main terminal connections



Note

Some PU3L of the PAPI system remain Light Off

1. Remove the covers of all the PU3L (see Removing the PU3L cover).
2. With a Voltmeter verify the distribution on the system of the 12 Vdc dedicated to open the short-circuit relay.
   a. On the first Light Off slaves PU3L (starting from the master).
   b. Verify the Input 12 Vdc. Make measurements between the connections 1 and 2 of the tilt switch device main terminal. If the 12 Vdc is not present, the problem is located on the wiring between PU3L and the previous one. Find and correct it, then restart the commissioning.
   c. Otherwise verify the output 12 Vdc. Make measurements between the connections 11 and 12 of the tilt switch device main terminal. If the 12 Vdc is not present, the problem is located inside the PU3L. Find and correct it, then restart the commissioning.
3. Put the covers back in place on all the PU3L (see Removing the PU3L cover).

[1] Before restarting the commissioning don't forget to reconnect the corresponding wires on the connections 2 and 3 of the main terminal of the master tilt switch device and put back in place the covers of the four PU3L (see Removing the PU3L cover).

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6.0 Spare Parts

6.1 Precision Approach Path Indicator PU3L

The following is a list of spare parts and an overview for PU3L fittings.

Item	Description	Quantity		New code	Old code
		Fitting	Code		
1 [1]	Set of 3 PU3L complete legs: 60 mm tube (L = 400 mm), threaded rod, fixation accessories.	1	1	SGEPU3L.12887	96216851
	Frangible coupling 2" BSP (not included in exploded view)			SGEFR047284	-
2	PU3L base plate (alone)	1	1	Not for sale	Not for sale
	NPS frangible coupling BSP frangible coupling NPS tripod stand (mounting flange) BSP tripod stand (mounting flange)	2 or 3	1	SGE.SP10148 SGE.SP12533 SGE.SP12532 SGE.SP12534	- - - -
3/4 [2]	Lens mounted on support + fixing screws	2 or 3	1	SGE.SP14794	96217028
5	Red filter	2 or 3	1	SGE.SP12942	96216909
7 [2]	Reflector with lamp support - PU3L ICAO/ FAA - PU3L BS	2 or 3	1	SGE.SP12966 On request	96216937 On request
4/6/7 [2]	Aluminum reflector mounted on support + filter support + fixing screws - PU3L ICAO/ FAA - PU3L BS	2 or 3	1	 On request On request	 On request On request
8	PK30d lamp 200W 6.6 A PK30d lamp 150W 6.6 A PK30d lamp 100W 6.6 A	2 or 3	1	IDM11990 IDM11989 IDM11988	96200913 96200949 96200912
9	Separating screen	1	1	Not for sale	Not for sale
10	Terminal for secondary circuits connection + Cables	1	1	SGE.SP12967	96216938
	Lamp connector alone	1	1	SGE.SP12667	96216594
11	Compression packer for cables entry	2 or 3	1	SGE.SP12968	96216939
12/13/14	Complete PU3L cover	1	1	SGE.SP12965	96216936
13/14	Protection front glass + gasket	1	1	SGE.SP12941	96216908
15/18	Heating resistor and fixing accessories (option)	0 or 1	1	SGE.SP12945	96216913
16	PU3L tilt switch / master v 2	0 or 1	1	SGE.SP24841	-
17	PU3L tilt switch / slave v 2	0 or 1	1	SGE.SP24842	-
18	Heating resistor terminal plate + 15	0 or 1	1	SGE.SP12945	96216913
	Setting Tool for PU3L		1	SG12490	96213587

Notes

[1] Please contact ADB SAFEGATE for assistance when ordering this spare part at www.adbsafegate.

[2] Requires factory calibration, please contact www.adbsafegate when ordering this spare part.

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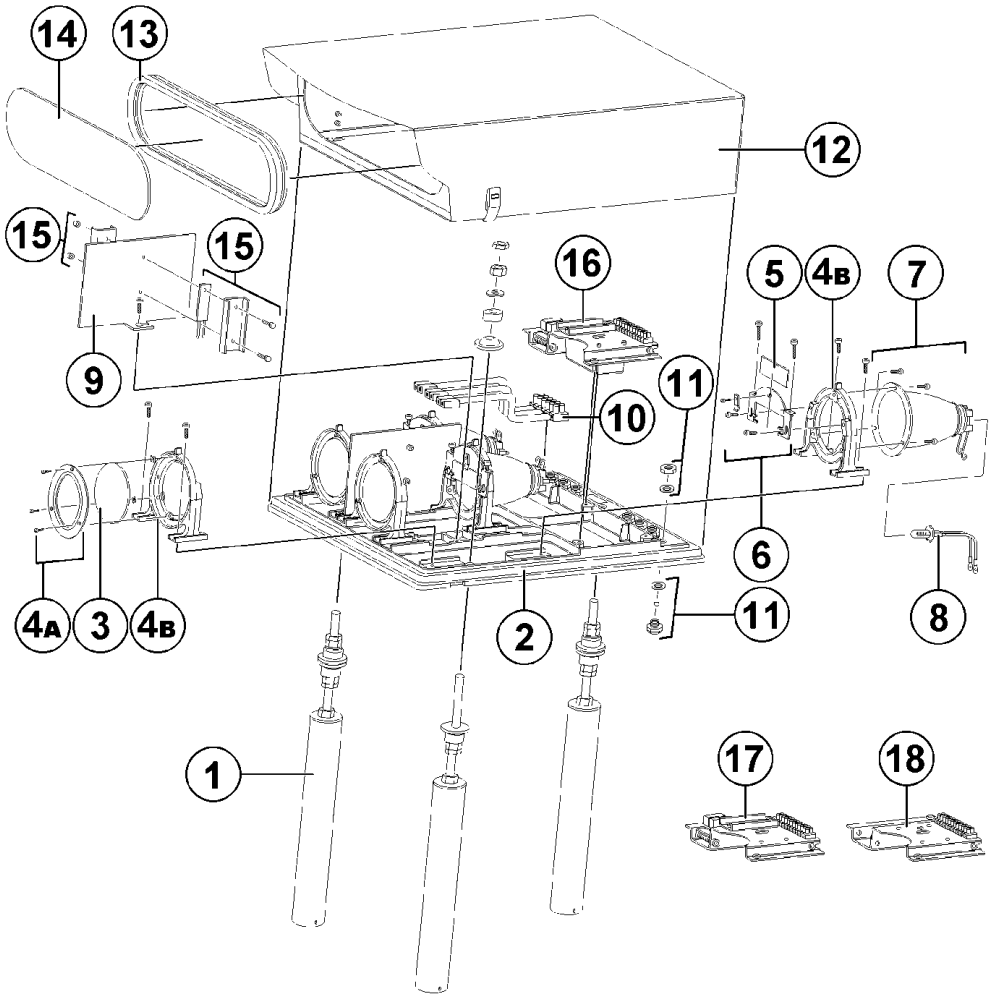
6.2 PU3L Overview



Note

Component availability or component design may be subject to change. Changes in this document due to error or content updates may be done at any time without prior notice. For more information contact ADB SAFEGATE, see www.adbsafegate.com.

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7.0 SUPPORT

Our experienced engineers are available for support and service at all times, 24 hour/7 days a week. They are part of a dynamic organization making sure the entire ADB SAFEGATE is committed to minimal disturbance for airport operations.

ADB SAFEGATE Support

Live Technical Support - Americas
If at any time you have a question or concern about your product, just contact ADB SAFEGATE's technical service department. Trained in all areas of system issues, troubleshooting, quality control and technical assistance, our highly experienced Technical support specialists are available 24 hours a day, seven days a week to provide assistance over the phone.
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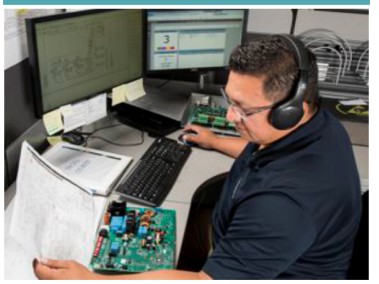
ADB SAFEGATE Americas Technical Service & Support (International): +1-614-861-1304
During regular business hours, you can also Chat with a Service Technician. We look forward to working with you!



Before You Call
When you have an airfield lighting or system control system problem it is our goal to support airfield maintenance staff as quickly as possible. To support this effort we ask that you have the following information ready before calling.

- The *airport code*
- If not with an airport, then company name (prefer customer id number)
- Contact phone number and email address
- Product with part number preferable or product number
- Have you reviewed the product's manual and troubleshooting guide
- Do you have a *True RMS* meter available (and any other necessary tools)
- Be located with the product ready to troubleshoot

Note
For more information, see www.adbsafegate.com, or contact ADB SAFEGATE Support via email at support@adbsafegate.com or
Brussels: +32 2 722 17 11
Rest of Europe: +46 (0) 40 699 17 40
Americas: +1 614 861 1304. Press 3 for technical service or press 4 for sales support.
China: +86 (10) 8476 0106

7.1 ADB SAFEGATE Website

The ADB SAFEGATE website, www.adbsafegate.com, offers information regarding our airport solutions, products, company, news, links, downloads, references, contacts and more.

7.2 Recycling

7.2.1 Local Authority Recycling

The disposal of ADB SAFEGATE products is to be made at an applicable collection point for the recycling of electrical and electronic equipment. The correct disposal of equipment prevents any potential negative consequences for the environment and human health, which could otherwise be caused by inappropriate waste handling. The recycling of materials helps to conserve natural resources. For more detailed information about recycling of products, contact your local authority city office.

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7.2.2 ADB SAFEGATE Recycling

ADB SAFEGATE is fully committed to environmentally-conscious manufacturing with strict monitoring of our own processes as well as supplier components and sub-contractor operations. ADB SAFEGATE offers a recycling program for our products to all customers worldwide, whether or not the products were sold within the EU.

ADB SAFEGATE products and/or specific electrical and electronic component parts which are fully removed/separated from any customer equipment and returned will be accepted for our recycling program.

All items returned must be clearly labeled as follows:

- For *ROHS/WEEE* Recycling
- Sender contact information (Name, Business Address, Phone number).
- Main Unit Serial Number.

ADB SAFEGATE will continue to monitor and update according for any future requirements for *EU directives* as and when *EU member states* implement new *regulations* and or *amendments*. It is our aim to maintain our *compliance plan* and assist our customers.

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