Airfield Lighting

Manual

SafeLED and SafeLED IQ Elevated Light (SL-RE-E, SL-RT-E, SL-RN-E, SL-RTN-E, SL-SB-E)

- Runway Edge L-862(L)
- Runway Threshold
- Runway Threshold L-862E(L)
- Runway End
- Runway End L-862E(L)
- Runway Threshold/End
- Runway Threshold/End L-862E(L)
- Stop Bar
- Stop Bar L-862S(L)

SAFEGATE GROUP

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MANUAL

SAFELED AND SAFELED IQ ELEVATED LIGHT

(SL-RE-E, SL-RT-E, SL-RN-E, SL-RTN-E, SL-SB-E)

Section Description Page No.

Documentation

This document includes Airfield Lighting information with a focus on safety, installation and maintenance procedures.
For more information, see www.safegate.com.

***Note**: It is very important to read this document before any work is started.*

Copyright

History

Version	Date	Description
1.0	January 2015	First version
1.1	June 2015	Second version
1.2	August 2015	Third version
1.3	March 2016	Fourth version
1.4	September 2016	Fifth version

***Note**: This page is to be updated with every authorized change to the document.*

Abbreviations and Terms

This document may include abbreviations and terms.

Abbreviation	Term
ASP-SC	Airfield Smart Power SafeControl
A-SMGCS	Advanced Surface Movement Guidance and Control System
CAA	Civil Aviation Authority
CCR	Constant Current Regulator
CU	Concentrator Unit
FAA	Federal Aviation Administration
ICAO	International Civil Aviation Organization
IEC	International Electrotechnical Committee
ILCMS	Individual Light Control and Monitor System
LED	Light Emitting Diode
LMS	Light Monitor and Switch unit
NATO	North Atlantic Treaty Organization
NCU	Network Concentrator Unit
SCF	Series Circuit Filter
SCM	Series Circuit Modem
SMGCS	Surface Movement Guidance and Control System
SSU	System Switch Unit
STAC	Service Technique de l'Aviation Civile (France)
STANAG	Standardization Agreement (NATO)

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1. INTRODUCTION

In this section you can find a general description and safety instructions related to the installation and usage of the light fixture.

SafeLED Elevated is a high-intensity, LED-based light fixture.

The light fixtures can be positioned on the runway and are available for connection in a series circuit.

- The SafeLED IQ light fixtures have integrated IQ technology for monitoring and control. It comes in three different versions:
- **SafeLED** – a LED-based light fixture with integrated fail open technology and backwards compatible with CCR operated halogen/incandescent elevated light fixtures.
- **SafeLED IQ (IQ1)** – Including additional and integrated intelligence (IQ) in a built in converter for individual monitoring and control, based on Safegate ASP - SafeControl technology Individual Light Control and Monitor System (ILCMS).
- **SafeLED IQ Ready (IQ0)** – SafeLED IQ where the IQ functionality is temporarily disabled. Remote activation of IQ functionality is supported.

Note: *SafeLED IQ and SafeLED IQ Ready elevated light fixtures do not include fail open functionality, as they are installed in an ILCMS system which provides the same functionality.*

1.1 SAFETY INSTRUCTIONS

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 SO ON. SHOULD BE IDENTIFIED ANY INSTALLATION OR MAINTENANCE WORK SHOULD ONLY BE CARRIED OUT BY TRAINED AND EXPERIENCED PERSONNEL.*

HIGH LIGHT INTENSITY! DO NOT STARE DIRECTLY INTO THE LIGHT BEAM AT A CLOSE DISTANCE.

1.2 DESCRIPTION OF THE LIGHT FIXTURE

The SafeLED Elevated light fixtures are high-intensity provided in different colour combinations for different applications, white-white, white-yellow, white-red, yellow-red, green-red, red-red, green and red. It comes in three different versions, uni-directional and bi-directional versions or bi-directional version with added omni-module for circular guidance.

1.2.1 Dimensions of the Fixture

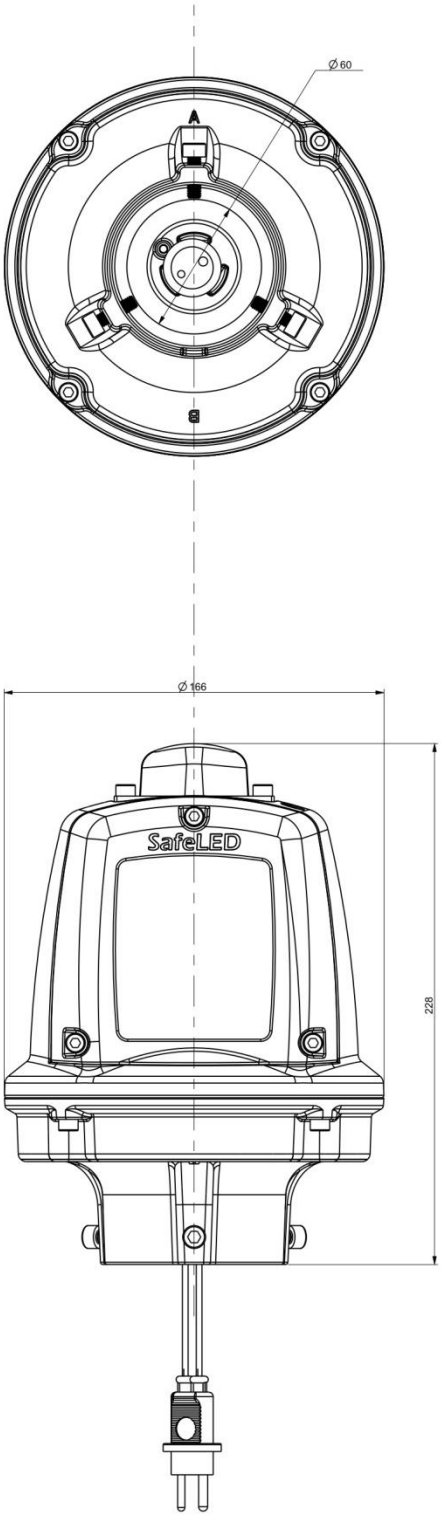


FIGURE 1 - LIGHT FIXTURE DIMENSIONS FOR CIRCULAR GUIDANCE

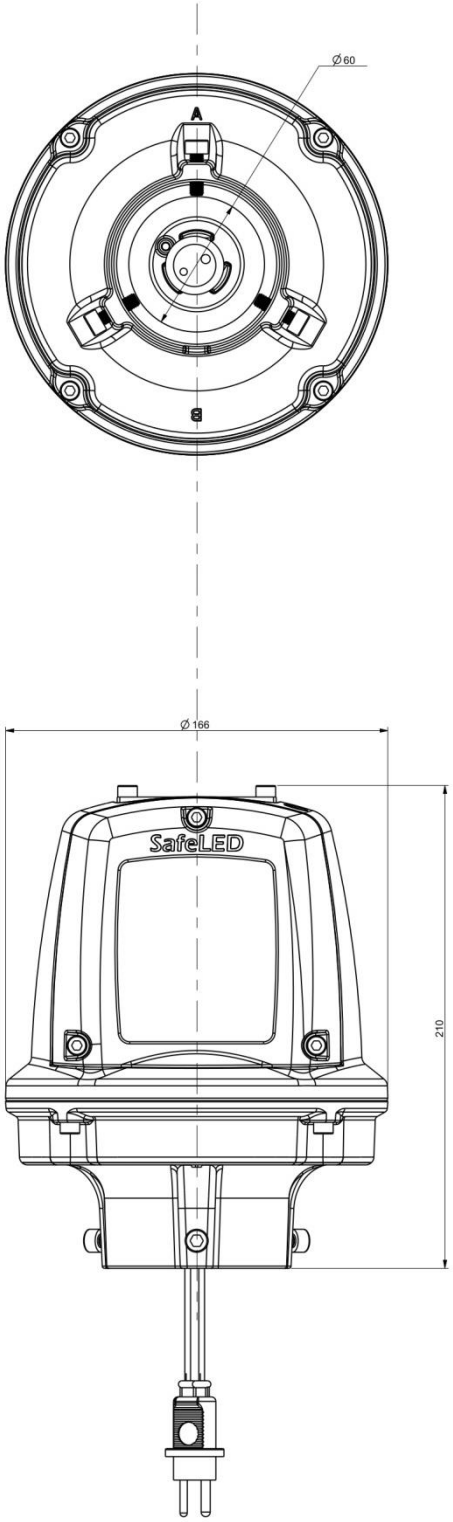


FIGURE 2 - LIGHT FIXTURE DIMENSIONS

1.2.1.1 Interface

The light fixture is designed to fit on any pole with an outer diameter of 60 mm and a wall thickness of 4±2 mm.

1.2.2 Selection of Isolation Transformer

1.2.2.1 2.8-6.6A System

An isolation transformer in a series system has a specified current ratio (normally 6.6/6.6A) that is considered to be fixed as long as the load does not exceed the nominal wattage of the transformer.

Most manufactures specify a certain spare capacity (20-30%).

When the load exceeds the nominal wattage, the transformer begins to saturate, the current ratio drops as a function of the overload. To avoid this current drop (intensity drop) the nominal wattage should not be exceeded. It is even more important in a system with SafeLED IQ where the IQ function adds a secondary load for its power consumption.

Note: *The SafeLED (without IQ) is not to be connected to transformers larger than 100W.*

The secondary load of an isolation transformer in a SafeLED IQ system includes:

- Light fixture load
- Cable losses

1.2.2.2 Light Fixture Load

The light fixture load is the total wattage of the light fixture.

Description	Total wattage
Runway Edge Elevated White-White for Precision Approach L-862(L)	27 W
Runway Edge Elevated Yellow-White for Precision Approach L-862(L)	26 W
Runway Edge Elevated Red-White for Precision Approach L-862(L)	23 W
Runway Edge Elevated Red-Yellow for Precision Approach L-862(L)	21 W
Runway Edge Elevated White-White for Circular Guidance L-862(L)	36 W
Runway Edge Elevated Yellow-White for Circular Guidance L-862(L)	34 W
Runway Edge Elevated Red-White for Circular Guidance L-862(L)	30 W
Runway Edge Elevated Red-Yellow for Circular Guidance L-862(L)	28 W
Runway Threshold Elevated	20 W
Runway Threshold Elevated L-862E(L)	10 W
Runway End Elevated	15 W
Runway End Elevated unidirectional L-862E(L)	15 W
Runway End Elevated bidirectional L-862E(L)	23 W
Runway Threshold/End Elevated	28 W
Runway Threshold/End Elevated L-862E(L)	18 W
Stop Bar Elevated	10 W
Stop Bar Elevated L-862S(L)	15 W

1.2.2.3 Secondary Cable Losses

The cable, including any extensions, between the isolation transformer and the light fixture adds power losses (here expressed in Watts per meter).

Example of cable losses at different current and different cable areas

	6.6 A Operation	**2A Operation**
2.5 mm² Cu-wire:	0.6 W/m	0.06 W/m
4.0 mm² Cu-wire:	0.4 W/m	0.04 W/m
***Note**: Secondary cable lengths should not exceed 100 m.*		

1.2.2.4 2A System

When dimensioning the isolation transformer size for a 2A-system (a series circuit with SafeLED IQ 2A which is only supposed to run in 2A), it is important to know that the regular method by adding up the total wattage on the isolation transformer secondary side, cannot be used. This is because a standard isolation transformer 6.6/6.6A is marked with a maximum wattage running at 6.6A. According to Lenz Law of Induction, the dimensioning property of a transformer is the total voltage, and not the wattage, of the secondary side of the transformer in a 50/60Hz series circuit system.

The consequence in a 2A-system is the wattage marked on a 6.6/6.6A isolation transformer must generally be multiplied by the factor 0.3 to find the total wattage which can be supplied from the transformer without saturating.

***Note:** The same dimensioning method must be used for a CCR, as the transformer kVA-size marked on a CCR is normally calculated at 6.6A, not at 2A. There are also more constrains to consider such as spare capacity. For more information, contact Safegate for a complete CCR dimensioning procedure.*

1.2.3 Transformer Selection Guidelines

Calculation Example for transformer selection:

1.2.3.1 6.6 A mode

Light fixture Runway Edge Elevated White-White for Precision Approach: 27 W

Secondary cable length 20 meters, 2.5 mm2, -> 0.6 W/m = 12 W cable power loss

Total load 27 W + 12 W = **39 W**

Max total load for a 45 W transformer is 45 W at 6.6 A

Result: Transformer rating should be at least **45 W**

***Note:** If the light fixture is used in ASP systems a 10 W margin should be added to the transformer. This wattage is not being used but needs to be available for the power line communication.*

Total load for ASP systems 27 W + 12 W + 10 W = **49 W**

Result: Transformer rating should be at least **65 W**

***Note:** It is not recommended to use transformers with lower rating than 65 W for ASP installations.*

1.2.3.2 2 A mode

Light fixture Runway Edge Elevated White-White for Precision Approach: 27 W

Secondary cable length 50 meters, 4.0 mm2 -> 0.04 W/m = 2 W cable power loss

ASP system communication margin = 10 W

Note: *This wattage is not being used but needs to be available for the power line communication.*

Total load 27 W + 2 W + 10 W = **39 W**

Max total load for a 150 W transformer is 45 W at 2 A.

Result: Transformer rating should be at least **150 W**

Note: *Using too high power rate transformers leads to very inductive load that lowers usable power of CCR.*

1.2.3.3 Transformer selection suggestions

	Cable area 2.5 mm²	Cable area 4 mm²	Total load (W)	Transformer (W)
SafeLED Unidirectional RT-E, RN-E, SB-E	<50m		40-50	65
	50-100m		70-80	100
		<50m	30-40	45
		50-100m	50-60	65
SafeLED Bidirectional RE-E-B, RTN-E, RN-E	<50m		51-58	65
	50-100m		81-88	100
		<50m	41-48	65
		50-100m	61-68	100
SafeLED Bidirectional Circular Guidance RE-E-O	<50m		58-67	100
	50-100m		88-97	100
		<50m	48-57	65
		50-100m	68-77	100
SafeLED IQ Unidirectional RT-E, RN-E, SB-E	<50m		50-60	65
	50-100m		80-90	100
		<50m	40-50	65
		50-100m	60-70	100
SafeLED IQ Bidirectional RE-E-B, RTN-E, RN-E	<50m		61-68	100
	50-100m		91-98	100
		<50m	51-58	65
		50-100m	71-78	100
SafeLED IQ Bidirectional Circular Guidance RE-E-O	<50m		68-77	100
	50-100m		98-107	150
		<50m	58-67	100
		50-100m	78-87	100
SafeLED IQ (2A) Unidirectional RT-E, RN-E, SB-E	<50m			150
	50-100m			150
		<50m		150
		50-100m		150
SafeLED IQ (2A) Bidirectional RE-E-B, RTN-E, RN-E	<50m			150
	50-100m			150
		<50m		150
		50-100m		150
SafeLED IQ (2A) Bidirectional Circular Guidance RE-E-O	<50m			200
	50-100m			200
		<50m		200
		50-100m		200

Note: *Please contact Safegate Group for more information how to select correct transformer to different installations.*

1.3 DELIVERY OF THE LIGHT FIXTURE

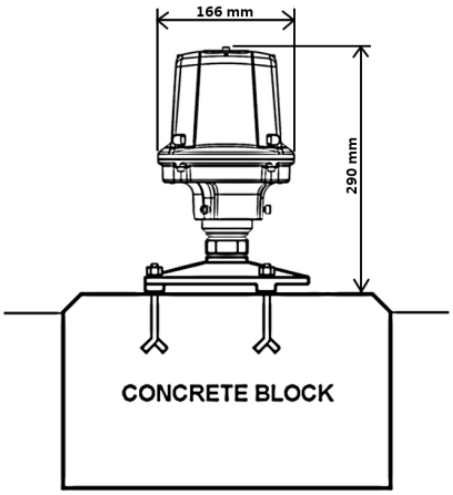
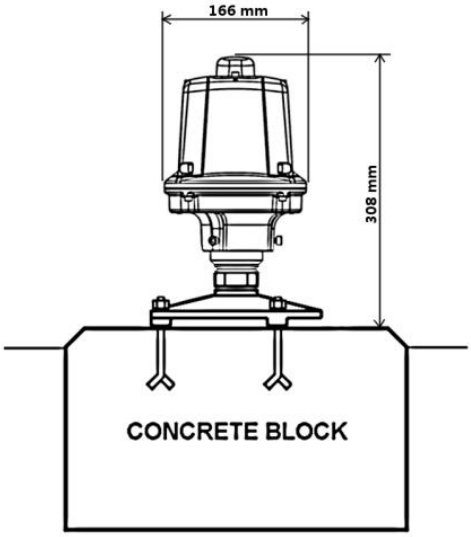
Each unit is supplied completely assembled, tested, sealed and ready for installation on a tube or frangible coupling.

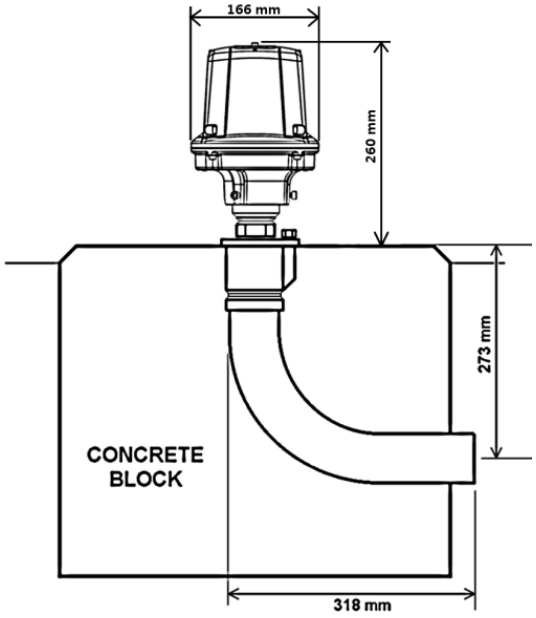
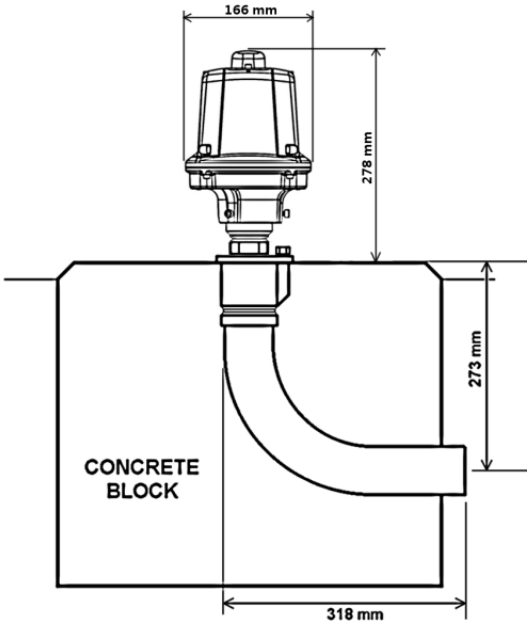
The light fixture is installed with a secondary cable to a transformer equipped with an FAA L-823 plug (style 6). Each unit is individually packed in a durable, cushioned and corrugated cardboard box, labeled with its reference name and code.

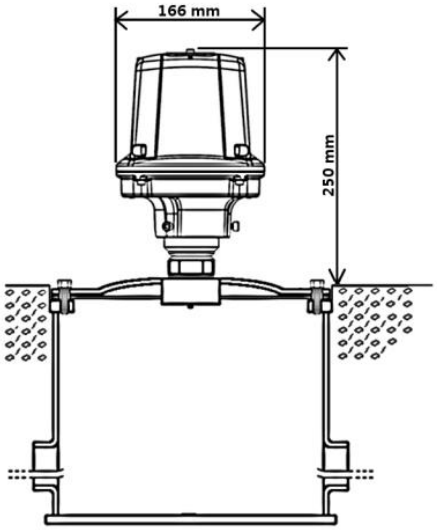
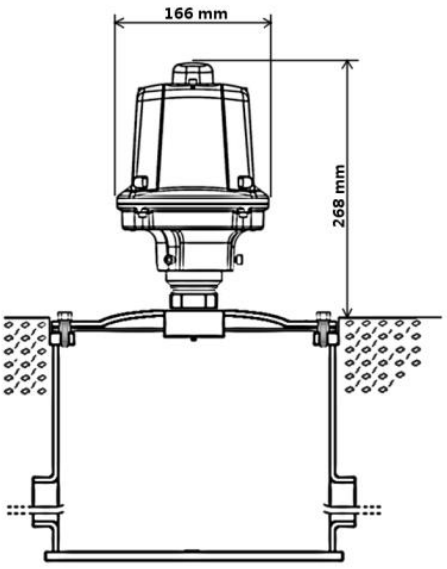
2. INSTALLATION

2.1 TYPICAL INSTALLATION

The light fixture can be installed on different supports as follows:

Description	Image example
• Ground level mounting with a frangible collar on a tripod stand.	 FIGURE 3 – LIGHT FIXTURE ON TRIPOD STAND AND FRANGIBLE COLLAR  FIGURE 4 - CIRCULAR GUIDANCE LIGHT FIXTURE ON TRIPOD STAND AND FRANGIBLE COLLAR

Description	Image example
• Ground level mounting with a frangible collar on conduit elbow.	 FIGURE 5 – LIGHT FIXTURE ON CONDUIT ELBOW AND FRANGIBLE COLLAR  FIGURE 6 - CIRCULAR GUIDANCE LIGHT FIXTURE ON CINDUIT ELBOW AND FRANGIBLE COLLAR

Description	Image example
• Ground level mounting with frangible collar on FAA deep can and base plate.	 FIGURE 7 – LIGHT FIXTURE ON FAA BASE PLATE AND FRANGIBLE COLLAR  FIGURE 8 - CIRCULAR GUIDANCE LIGHT FIXTURE ON FAA BASE PLATE AND FRANGIBLE COLLAR

2.2 ANGLE ADJUSTMENT

SafeLED Elevated Bidirectional light fixtures comes with different built in azimuth and altitude angles depending on which application it is used for. SafeLED Elevated Unidirectional light fixtures have built in altitude angle dependent of the application but should be positioned to the correct azimuth angle upon installation and are therefore only available as a straight toe in option (0° azimuth angle).

The recommended standard angles for SafeLED Elevated light fixtures can be found in the sections *2.2.1 Azimuth angle* and *2.2.2 Altitude angle.*

2.2.1 Azimuth angle

Runway Edge Lighting (RE-E) - L-862(L) = 4° Toe in *(Built in)*

Compliant with:

- Runway width of 45 m, Toe in of 3,5°
- Runway width of 60 m, Toe in of 4,5°

Runway End Lighting (RN-E) - L862E(L) = 0° *(Built in)*

Unidirectional Runway Threshold Lighting (RT-E) - L-862E(L) = 0° or Toe in of 3,5° *(Set upon installation)*

Bidirectional* Runway Threshold Lighting - L-862E(L) = 0° or Toe in of 3,5° *(Built in)*

* The green side of a Runway Threshold/End (RTN-E) light fixture.

Stop Bar Lighting - L-862S(L) = 0° *(Built in)*

2.2.2 Altitude angle

Runway Edge Lighting = +3,5° *(Built in)*

Runway End Lighting = +2,5° *(Built in)*

Runway Threshold Lighting = +5,5° *(Built in)*

Stop Bar Lighting = +5,5° *(Built in)*, adjustment possibilities ± 4,5°

2.3 LIGHT EMISSION DIRECTIONS

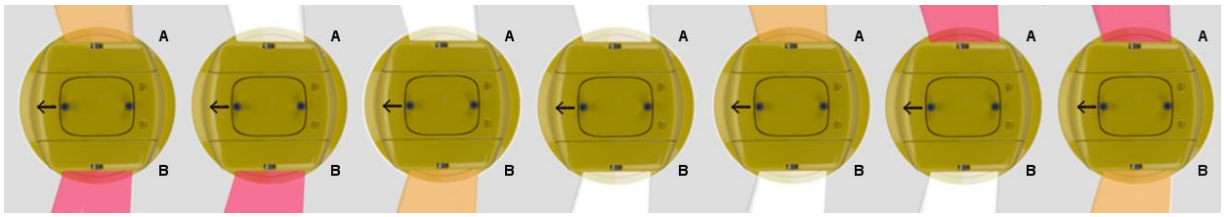
2.3.1 Definition of Light Emission Directions

The SafeLED Elevated light fixtures are marked with A and B direction on the outside of both the bottom cover and the top cover.

There is an arrow on the top side of the light fixture. This arrow indicates a bidirectional light fixtures orientation with respect to the runway centre line. Bidirectional light fixtures must always be installed with the arrow pointing to the centreline. This is important because the bidirectional light fixtures have built in azimuth angles but also to ensure, when using a monitoring and control-system, that the correct side (A or B) is addressed.

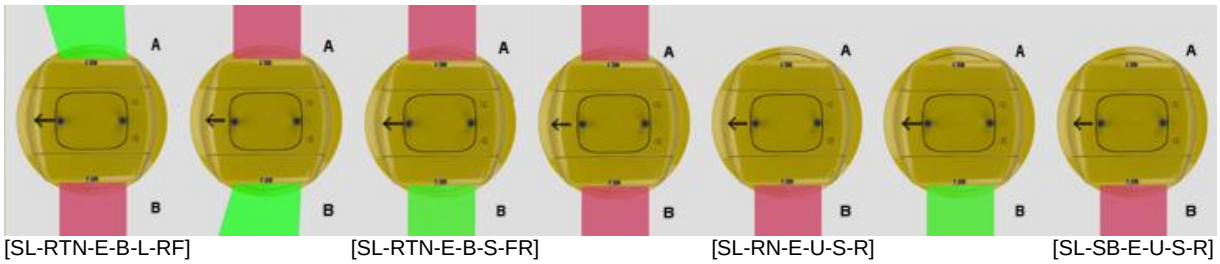
If a bidirectional light fixture is to be placed on the centre line, align the light fixture A- and B-side according to *Figure 11 or Figure 12*.

The arrow is only to be used for bidirectional light fixtures. Unidirectional light fixtures does not have integrated toe-in and needs to be set in correct position when installed, using the sight device. For more information how to install the light fixture, see 3.1 SET THE LIGHT FIXTURE.



[SL-RE-E-B-RY] [SL-RE-E-B-RW] [SL-RE-E-B-YW] [SL-RE-E-B-WW] [SL-RE-E-B-WY] [SL-RE-E-B-WR] [SL-RE-E-B-YR]

FIGURE 9 – LIGHT EMISSION DIRECTIONS FOR RUNWAY EDGE



[SL-RTN-E-B-L-RF] [SL-RTN-E-B-S-FR] [SL-RN-E-U-S-R] [SL-SB-E-U-S-R]
[SL-RTN-E-B-R-FR] [SL-RN-E-B-S-RR] [SL-RT-E-U-S-F]

FIGURE 10 – LIGHT EMISSION DIRECTIONS FOR RUNWAY THRESHOLD/END, THRESHOLD AND STOP BAR

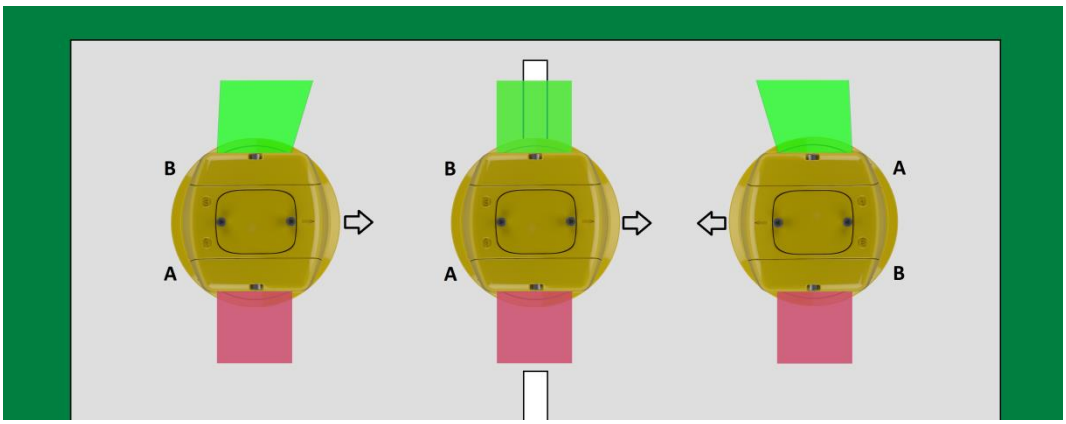


FIGURE 11 – ALIGNMENT OF THE ARROW AND A/B-MARKINGS ON A COMBINED THRESHOLD/END LIGHT FIXTURE PLACED ON THE CENTRE LINE

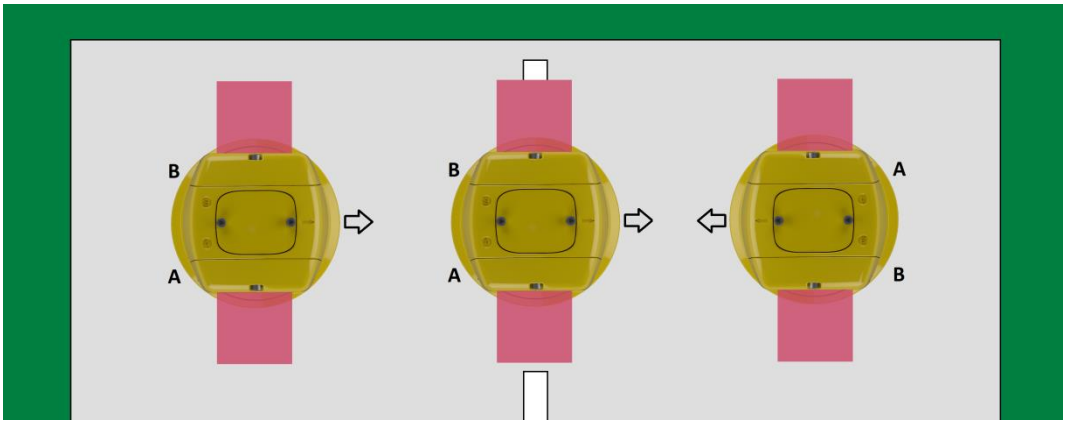


FIGURE 12 – ALIGNMENT OF THE ARROW AND A/B-MARKINGS ON A BIDIRECTIONAL END LIGHT FIXTURE PLACED ON THE CENTRE LINE

2.3.2 SafeLED IQ0 and SafeLED IQ1 Schematic Installation Example

It is important to keep track of the positioning of the SafeLED IQ0 and SafeLED IQ1 light fixtures in the bases in order to program the ASP parameters correctly (See section 3.1.1).

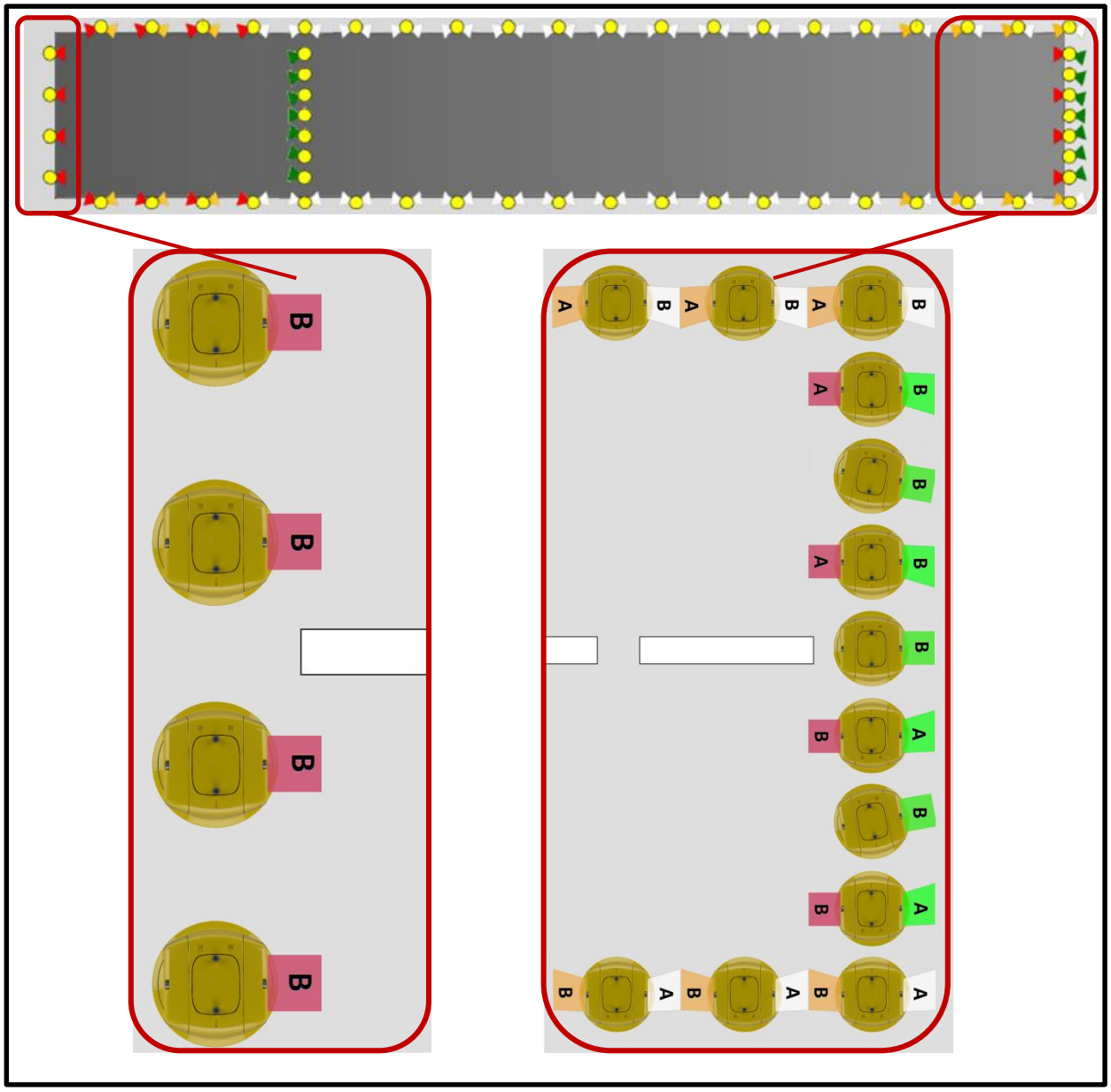


FIGURE 13 – IT IS IMPORTANT TO KEEP TRACK OF AND TO CORRECTLY ORIENT THE A AND B MARKINGS ON THE LIGHT FIXTURES WHEN INSTALLING LIGHT FIXTURES ON A RUNWAY. THE FIGURE SHOWS AN EXAMPLE OF A RUNWAY. NOTE HOW THE A AND B MARKINGS VARY ALONG THE THRESHOLD, EDGE, AND END

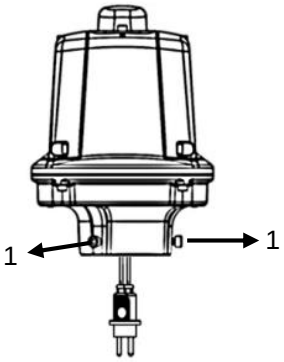
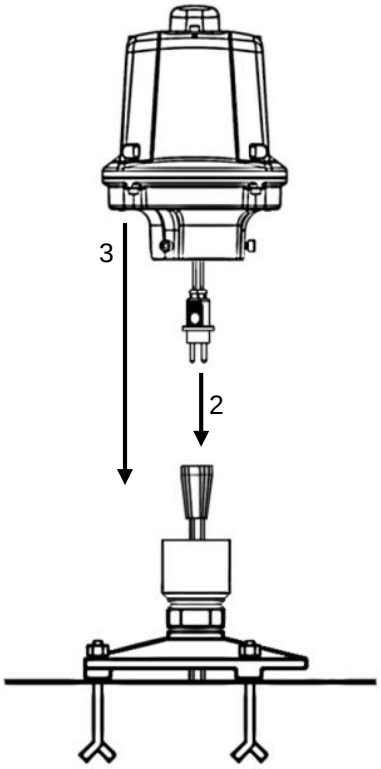
2.4 TOOLS REQUIRED

The following tools are recommended for installation:

- Allen keys
- A wrench
- One brush or cloth
- Sight Device

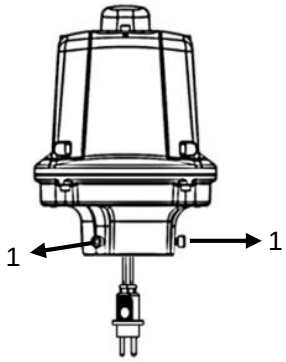
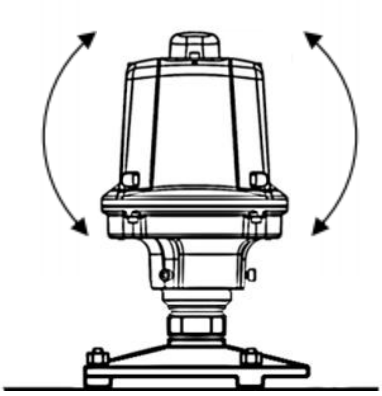
NOTE: *Provided that the base intended to receive the light fixture has been properly installed, no other specific tool is required.*

2.5 INSTALL/REMOVE ON/FROM A SUPPORT

Install the light fixture on a support	Image example
Before you start • Open the box and verify that the characteristics of the light fixture correspond to you design requirements, such as: type, actual installation position, colour, direction and electrical supply.	
1. Loosen (but do not remove) the three setting screws (M6x20 mm) on the fixture with an allen key.	FIGURE 14 - PREPARATION
2. Connect the light fixture cable (male) to the power supply cable plug (female). 3. Set the light fixture in correct position, *see section 3.1 Set the Light Fixture,* and fasten the three setting screws using an allen key, make sure to hold the light fixture in its position when tighten the screws so that it does not turn. • After installation, check that the light fixture functions properly.	 FIGURE 15 - PLACEMENT

Remove the light fixture from the support
1. Loosen (but do not remove) the three setting screws on the fixture with an allen key. 2. Remove the light fixtures from its support. 3. Disconnect the light fixture cable from the power supply cable plug.

2.6 SET THE LIGHT FIXTURE

Set the light fixture	Image example
Adjustment of the light fixture is possible by 4 degrees in all directions to allow levelling of the fixture after installation. 1. Loosen (but do not remove) the three setting screws (M6x20 mm) on the fixture with an allen key.	 FIGURE 16 - LOOSEN THE SETTING SCREWS
2. Adjust the light fixture to desirable orientation. A sight device should be used for this step. Read more about the sight device in *2.6. Sight device for bi-directional light fixture.* 3. Fasten the three setting screws using an allen key, make sure to hold the light fixture in its position when tighten the screws so that it does not turn.	 FIGURE 17 - ADJUSTMENT IN ALL DIRECTIONS

2.7 SIGHT DEVICE FOR THE LIGHT FIXTURE

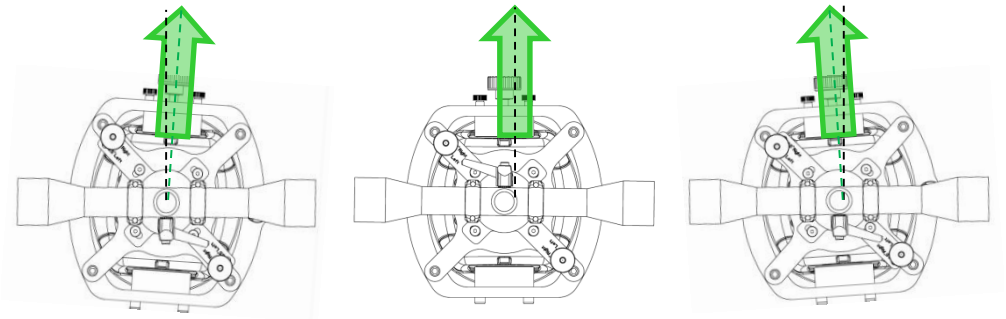
This SafeLED Elevated light fixtures are used on airfields to guide moving aircraft. It is therefore very important to align the light fixtures both vertically and horizontally according to the regulations. This can be done with the help of a Sight Device placed on the light fixture during installation.

The Sight Device is equipped with an aiming telescope which can be adjusted to three different pre-set toe-in angle options, 0°, 3.5° Right and 3.5° Left. The scope can be rotated ±360° in steps of 90°. The aiming telescope is used to facilitate the azimuth adjustment of a light fixture. The sight device does also have a circular spirit level to help adjust the light fixture vertically.

FIGURE 18 – THE SIGHT DEVICE

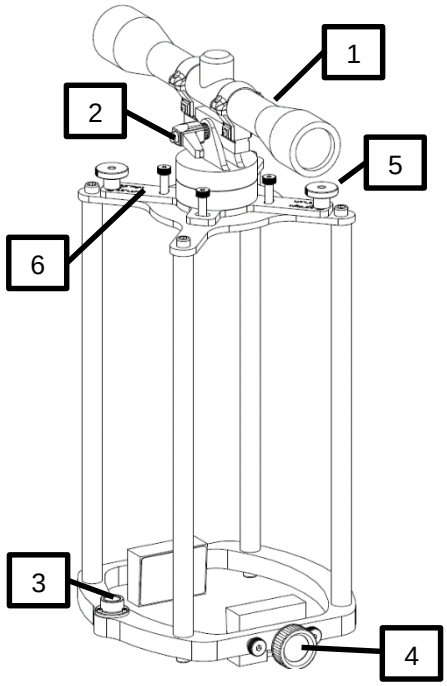
The Sight Device has three pre-set azimuth-angle settings, 0°, 3.5° Left and 3.5° Right, were *Left* and *Right* represents the desired direction of the emitted light beam for the light fixture. All bidirectional light fixtures should use the 0° setting. For unidirectional light fixtures, choose the setting that corresponds to the angle in section *2.2.1 Azimuth angle.*

Note: Manual toe in adjustment should always be towards the runway centerline.

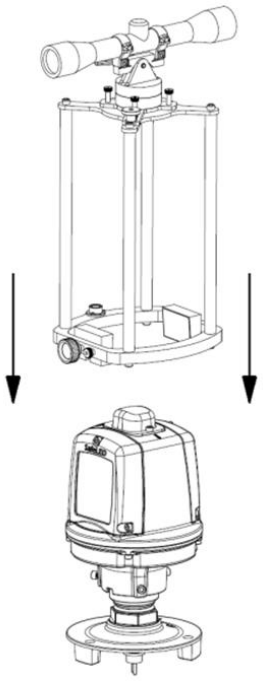


3.5° Right 0° 3.5° Left

FIGURE 19 – THE DIRECTION OF THE EMITTED LIGHT FOR THE THREE DIFFERENT PRE-SET AZIMUTH-ANGLE OPTIONS

Design	Image example
1. Aiming telescope 2. Mounting screw 3. Circular level 4. Set screw 5. Toe-in nut 6. Toe-in plate	 FIGURE 20 – SIGHT DEVICE

2.7.1 Mounting the Sight Device

Mounting the Sight Device	Image example
1. Make sure the set block is in its outer position by rotating the set screw counter clockwise. 2. Slide the Sight Device over the light fixture with the blocks positioned over the windows of the light fixture. 3. Make sure the bottom of the blocks is resting on the lower edges of the window frames.	 FIGURE 21 – MOUNTING

4. Turn the set screw clockwise until the Sight Device is fastened hard enough not to slide sideways.
5. The Sight Device is now ready for operation.

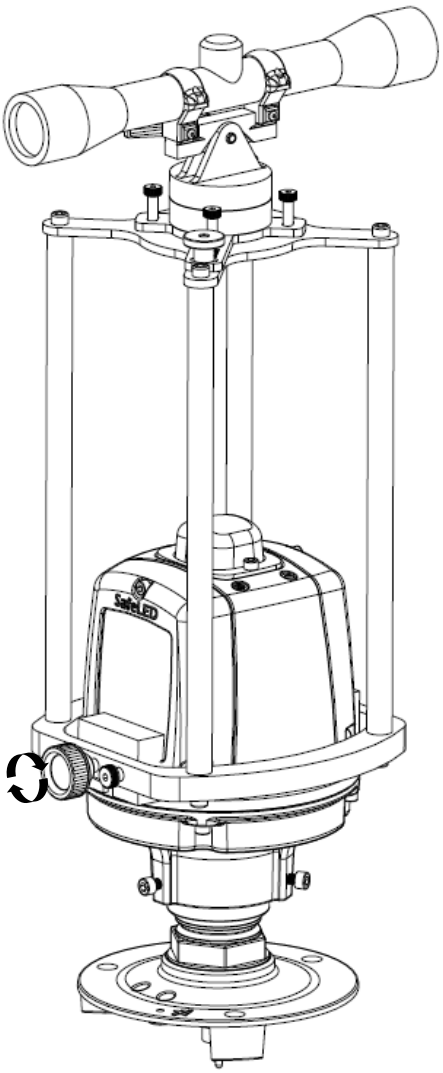
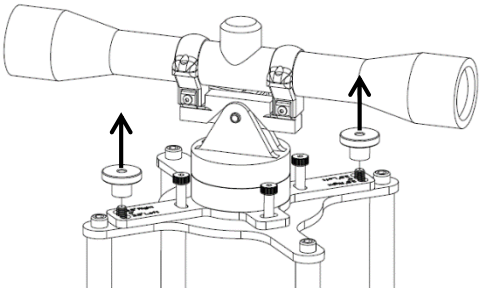
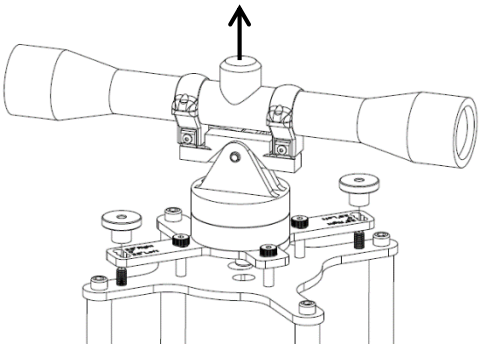
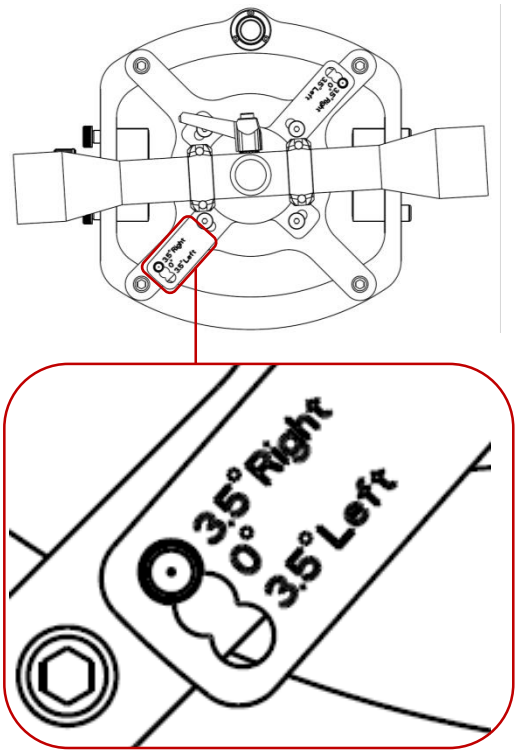
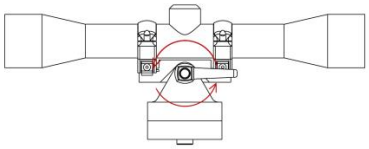
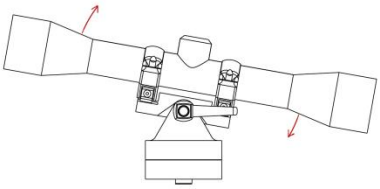
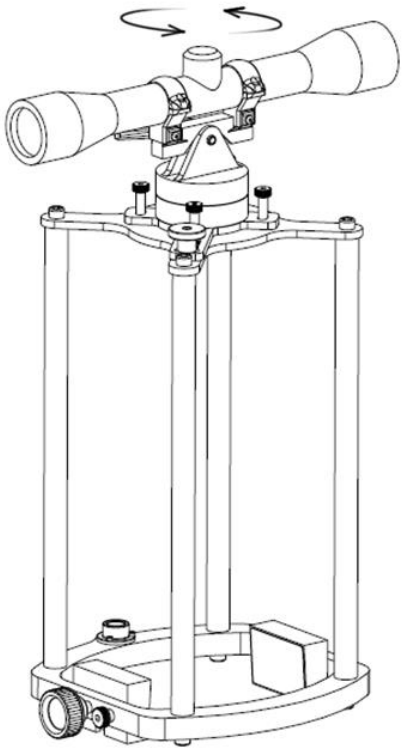


FIGURE 22 – FASTEN THE SET SCREW

2.7.2 Toe-in Adjustment Operation

Toe-in Adjustment Operation	Image example
1. By loosening the two toe-in nuts it is possible to adjust at what toe-in angle the light fixture should be installed at.	 FIGURE 23 – LOOSEN THE TOE IN NUTS
2. When the toe-in nuts are removed three holes are revealed underneath each one, one for each pre-set toe in option. 3. Adjusting the toe-in setting is made by lifting the toe-in plate up, turning it and lowering it again so that the two screws align with the two holes corresponding to the desired toe in angle. ***Note: Make sure that both screws align with the holes for the desired toe-in option.*** 4. To finish the operation, reattach the two toe-in nuts. ***Note: When installing bidirectional light fixtures always use toe-in option '0°'. For unidirectional light fixtures, use the toe in option that corresponds to the angle in section 2.2.1 Azimuth angle.***	 FIGURE 24 – LIFT THE TOE IN PLATE TO ADJUST THE TOE-IN SETTING  FIGURE 25 – THE THREE HOLES FOR THE PRE-SET TOE-IN OPTIONS

2.7.3 Manual Adjustment Operation

Manual Adjustment Operation	Image example
5. By loosening the mounting screw it is easy to adjust the elevation angle of the aiming telescope, ±15°. This facilitates the adjustment operation if aiming points don't have the same eminence as the telescope.	 FIGURE 26 – LOOSEN THE MOUNTING SCREW
6. After adjusting the aiming telescope elevation angle, make sure to fasten the mounting screw again.	 FIGURE 27 – ADJUSTING ELEVATION ANGLE
7. As mentioned before, the aiming telescope can also be rotated horizontally ±360° and has four pre-set steps with an increment of 90° per step.	 FIGURE 28 – ROTATION OF AIMING TELESCOPE

2.7.4 Using the Sight Device

The Sight Device is used to ensure that a light fixture is installed correctly, with respect to both levelling and azimuth angle.

2.7.4.1 Levelling the Light Fixture

The spirit level near the bottom of the Sight Device shows whether the light fixture is levelled or not.

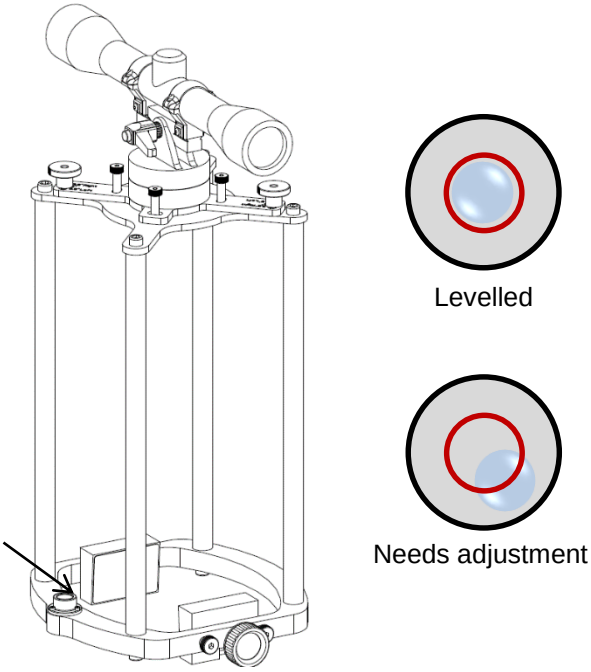


FIGURE 29 – THE SPIRIT LEVEL ON THE SIGHT DEVICE

2.7.4.2 Installing At the Correct Azimuth Angle

Before installation make sure that the toe-in setting on the Sight Device is correct, see section *2.7 SIGHT DEVICE FOR BI-DIRECTIONAL LIGHT FIXTURE* and *2.7.2 Toe-in Adjustment Operation.*

To install a light fixture at the correct azimuth angle, use the aiming telescope in one of its four possible pre-set positions, and aim at a light fixture or other object in the same row as the light fixture being installed, (e.g. the threshold, end or edge row). The row can be either in line with or perpendicular to the light fixtures light beam orientation.

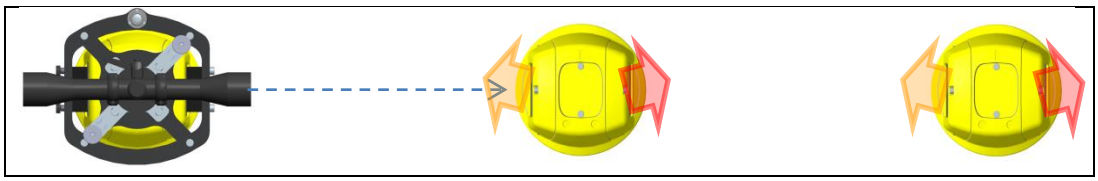


FIGURE 30 – USAGE OF THE AIMING TELESCOPE ON A ROW OF RUNWAY EDGE LIGHT FIXTURES. THE AIMING TELESCOPE IS PLACED AT PARALLELL ANGLES WITH THE LIGHT BEAM. THE TOE IN OPTION ON THE SIGHT DEVICE SHOULD, SINCE A BIDIRECTIONAL LIGHT FIXTURE IS BEING INSTALLED, BE SET TO 0°.

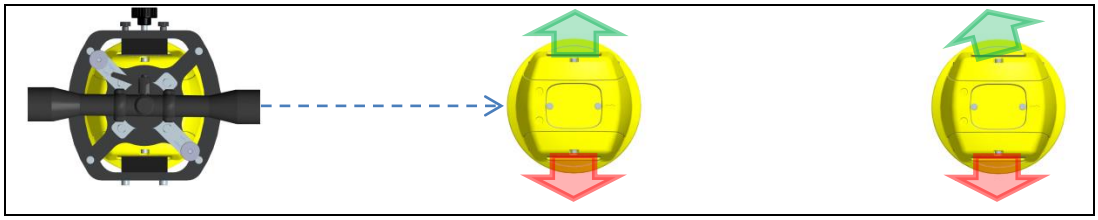


FIGURE 31 – USAGE OF THE AIMING TELESCOPE ON A ROW OF BIDIRECTIONAL LIGHT FIXTURES IN RIGHT ANGLES WITH THE RUNWAY (E.G. A RUNWAY THRESHOLD/END OR A BIDIRECTIONAL END ROW). THE AIMING TELESCOPE IS PLACED AT RIGHT ANGLES COMPARED TO THE LIGHT BEAM. THE TOE IN OPTION ON THE SIGHT DEVICE SHOULD, SINCE A BIDIRECTIONAL LIGHT FIXTURE IS BEING INSTALLED, BE SET TO 0°.

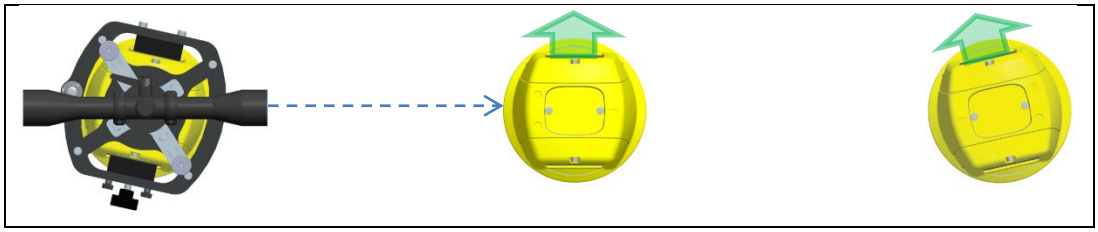


FIGURE 32 – USAGE OF THE AIMING TELESCOPE ON A ROW OF UNIDIRECTIONAL RUNWAY THRESHOLD LIGHT FIXTURES. THE AIMING TELESCOPE IS PLACED AT RIGHT ANGLES COMPARED TO THE LIGHT BEAM. THE TOE IN OPTION ON THE SIGHT DEVICE SHOULD, SINCE THE LIGHT FIXTURE SHOULD BE INSTALLED AT A TOE IN OF 3.5° POINTING TOWARDS THE RIGHT, IN THIS EXAMPLE BE SET TO 3.5° RIGHT.

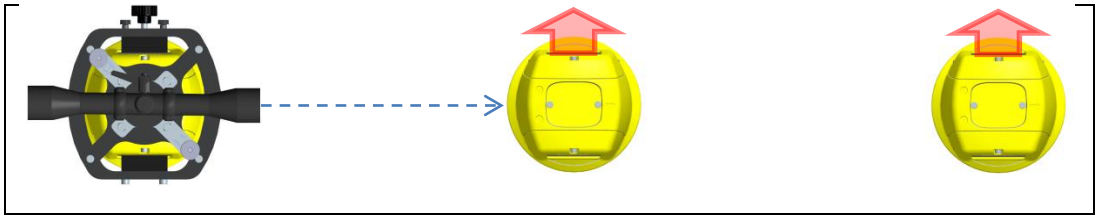


FIGURE 33 – USAGE OF THE AIMING TELESCOPE ON A ROW OF UNIDIRECTIONAL LIGHT FIXTURES IN RIGHT ANGLES WITH THE RUNWAY (E.G. A RUNWAY END OCH STOP BAR ROW). THE AIMING TELESCOPE IS PLACED AT RIGHT ANGLES COMPARED TO THE LIGHT BEAM. THE TOE IN OPTION ON THE SIGHT DEVICE SHOULD, SINCE THE LIGHT FIXTURE SHOULD BE INSTALLED AT A TOE IN OF 0°, IN THIS EXAMPLE BE SET TO 0°.

3. OPERATION

In this section you can find a description of the different technologies that enable the operation of the light fixture and instructions regarding programming and connection of the light fixture. Before you start, make sure you have read and understand §1.1 Safety Instructions.

3.1 TECHNOLOGY DESCRIPTION

3.1.1 ASP Safecontrol System Technology

A Safegate ASP-SC system is designed to provide individual monitoring of airfield lighting using the series circuit as a means of communicating status information from airfield lights and sensors. The same concept is used for lighting control providing the foundation for SMGCS or A-SMGCS, which includes for example automation of stop bars with or without sensors, taxiway guidance (routing) in combination with status monitoring. For more information, see ASP-SafeControl documentation.

3.1.2 SafeLED IQ and the 2A concept

The ASP-SC System, using the IQ concept, is designed to provide selective switching and/or monitoring of airfield lighting by use of an addressable switching unit inside each individually controlled light fixture. A SafeLED IQ light fixture is connected to the secondary side of a standard series circuit isolation transformer. Communications to/from a SafeLED IQ light fixture uses a unique power line communication technique developed by Safegate Group where the communication signals are superimposed on the series circuit current.

In a 2A system the CCR is set at a low constant current and the ASP-SafeControl manages the intensity level of every single SafeLED IQ light fixture. Furthermore the SafeLED IQ light fixture could have different light intensity levels in the same circuit.

3.1.3 Sensor Interface Unit (SIU)

Sensors for presence- and direction detection of aircraft and vehicles on the airfield can easily be interfaced to the ASP-SC system using a SIU. The SIU communicates the detect/no-detect status signals as well as its own status to the series circuit in the same manner as the SafeLED IQ. The SIU is also connected to the secondary side of a standard isolation transformer using a standard 2-pin FAA-style connector. Connection to the sensor is established using an IP68 rated 7-pin connector. The SIU can also supply the sensor with DC-voltage from a built-in current to voltage converter.

3.1.4 Network Concentrator Unit (NCU)

The NCU concentrates all incoming status information from the field, both lamp and sensor statuses. The NCU includes redundant capability.

3.1.5 Series Circuit Modem (SCM)

The SCM is an interface to the series circuit which receives command from an NCU. The SCM connects to the series circuit via a standard isolation transformer and to an NCU via standard RS485 or RS232 serial communication.

3.1.6 Series Circuit Filter (SCF)

The SCF is connected across the Constant Current Regulator (CCR) series circuit output and is used to contain the communication signalling within the airfield circuit and minimize feedback into the regulator.

3.1.7 Control System Interface

The NCU operates as the ASP-SC system main interface interpreting commands sent from the Host/Supervisor System (including the Safegate ASP-SC system) and in turn controlling the appropriate SafeLED IQ as directed. It maintains all lighting and error status, sensor detections as reported from the airfield components and is the central point of the ASP-SC system as operated from each vault. Individual light fixtures can be grouped in lighting segments spanning one or more series circuits, for example an interleaved stop bar. In turn, the NCU provides alarm status for percentage and adjacent lamp failure within those defined lighting segments per requirements for low visibility operations. Airfield lighting and ASP-SC system component status are constantly monitored and updated to the Host/Supervisor system upon occurrence.

3.2 PROGRAMMING SAFELED IQ

SafeLED IQ can be delivered as a pre-programmed unit with field position information and monitor/control parameter settings.

The SafeLED IQ can also be programmed during maintenance or updated remotely from the sub-station if installed in a circuit using the Wake on Circuit function.

3.2.1 Setting up the Hardware Equipment

The following hardware is required for SafeLED IQ programming:

- SCM – Series Circuit Modem.
- LPC – SafeLED IQ/Sensor Interface Unit (SIU) Programming Control unit.
- Cable(s) – power and communication.
- PC – including ASP-SC Maintenance Tool (AMT) software for programming.

The following are instructions how to set up the hardware equipment required for SafeLED IQ programming.

Connect the LPC unit to SCM unit

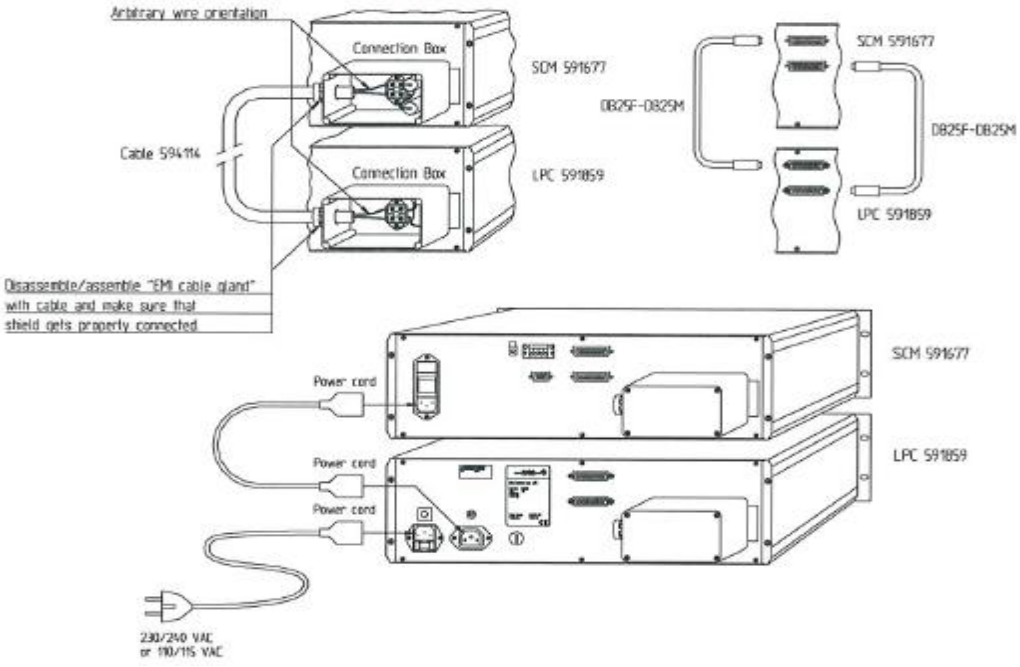


FIGURE 34 – HW SETUP FOR PROGRAMMING

1. Check the voltage selector is in the appropriate position: 120 or 240 V.
2. Connect the LPC unit to the SCM unit using the cables supplied.
   Connections are made at the rear of each unit.

Connect a PC to the SCM unit

- Using the cable supplied (RS-232), connect the shorter cable end with LOAD/RESET (591836) to the PC and the longer cable end to the LPC.

***Note**: For more information, see the marking on the LOAD/RESET box.*

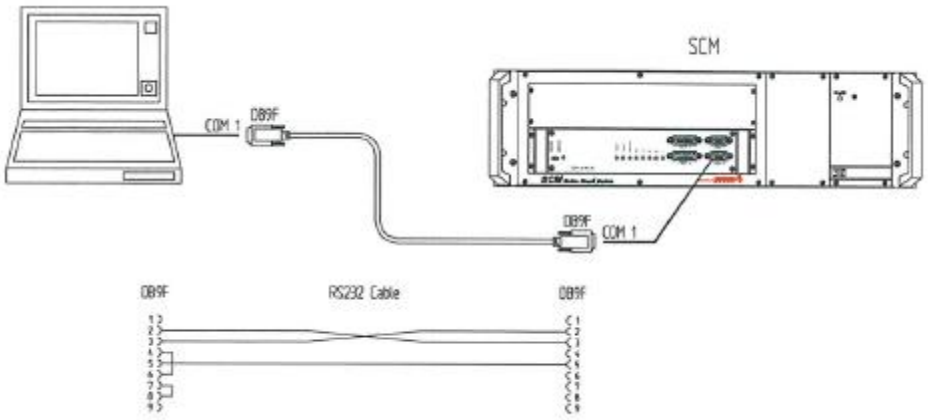


FIGURE 35 – CONNECT PC TO SCM

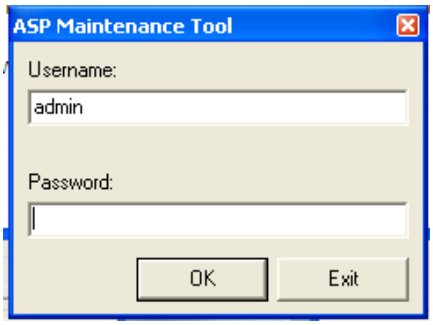
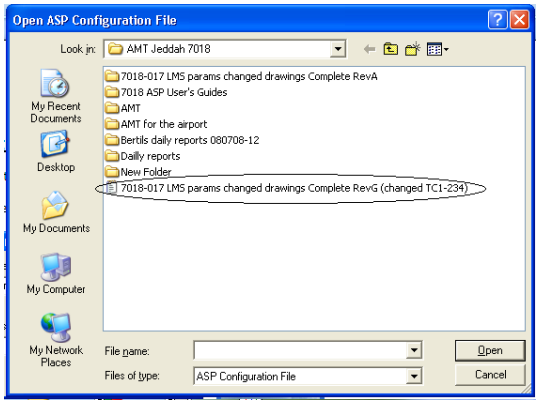
Connect the LPC to a SafeLED IQ product

FIGURE 36 – CONNECT LPC TO LIGHT

1. Using the cable supplied (594115), connect to **Output 1** or **Output 2** to a SafeLED IQ product. ***Note**: The Short Circuit Plug should be connected to the output NOT in use, either **Output 1** or **Output 2**. The two outputs are connected in series to give equal functionality.*
2. Make sure the **Remote** button on the LPC is NOT pressed before you start programming.
3. Turn on the **Power** button.

3.2.2 Programming the Software

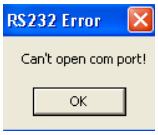
ASP-SC Maintenance Tool (AMT) software is required for SafeLED IQ product configuration. The following are instructions how to use AMT software (version 3.3 or later) for SafeLED IQ product configuration.

Program a SafeLED IQ product	
1. Make sure the Remote button on the LPC is NOT pressed in (off) before you start programming. 2. Start the AMT program on the PC and if **Can't open COM port** appears, click **OK**.	 FIGURE 37 – AMT START
3. Enter the following information: Enter Username: for example, **guest** Enter Password: ******** for example, **safegate** ***Note:*** *User name and password may differ.* 4. Click **OK**.	 FIGURE 38 – AMT LOGIN
5. Chose the text file with the required airport and light fixture to use. 6. Select the file and click **Open**.	 FIGURE 39 – AMT TEXT FILE

Program a SafeLED IQ product

7. Select to use the correct COM-port, if required.
   ***Note**: To check which COM-port is in use on your PC, go to windows **Start**, right click on **My computer** and select **Properties**. Select the **Hardware** tab and click **Device Manager**. Select **Ports (COM & LPT)** to view the COM-port in use, for example **USB to Serial bridge (COM 2)**.*
8. Set the connection to **LPU**.

***Note**: If an **RS232 Error** window appears, click **OK**.*



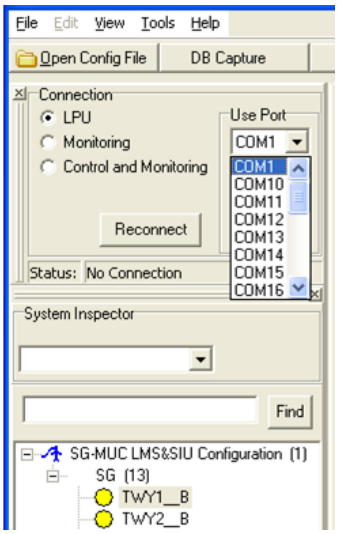


FIGURE 40 – AMT COM PORT

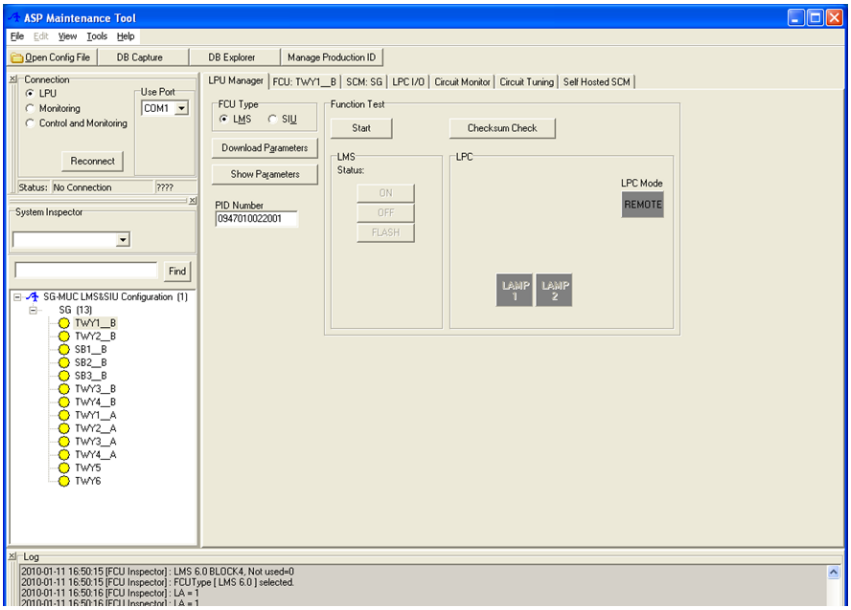


FIGURE 41 – AMT TOOL

9. Check the **LPU** tab (default) appears in the upper area of the window.
10. From the configuration list (to the left), select the circuit name, for example SG (11) and then the light fixture parameter name to configure, for example, SB1_B.
    ***Note**: Product may require configuration of both sides or only one side. Parameter name __A is for A-side and __B is for B-side of SafeLED IQ.*

11. Check the SafeLED IQ for the Production ID (**PID**) number.

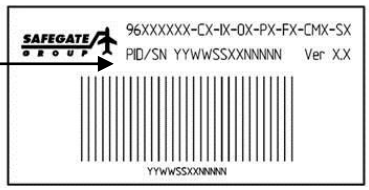


FIGURE 42 – CHECK PID

Program a SafeLED IQ product

12. From the LPU Manager tab, enter the **PID Number** in the text field, manually or using a bar code reader.
***Note**: The number corresponds to the product information number found on the bottom of the SafeLED IQ, as in the previous step.*

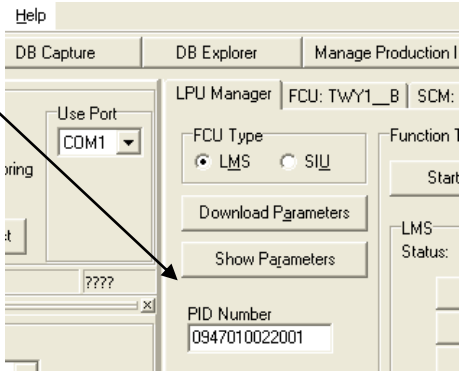


FIGURE 43 – AMT ENTER PID

13. Click **Download Parameters**, to start an automatic parameter download.

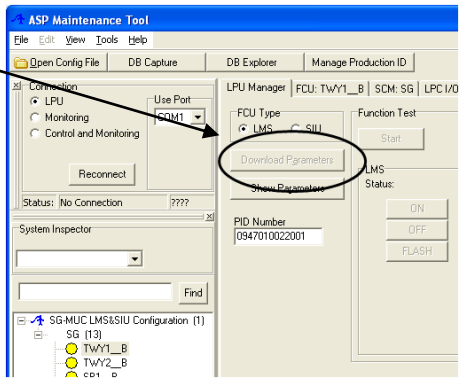


FIGURE 44 – AMT DOWNLOAD PARAMS

14. Click **Continue** to confirm parameter download.
15. The SCM unit should now sound and configuration progress information appears in the log at the bottom of the window.
***Note**: If there is no sound from the SCM during configuration, check settings for example COM port or cables.*

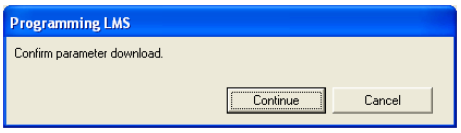


FIGURE 45 – AMT CONFIRM PARAMS

16. When downloading the parameters is complete, a checksum check starts to ensure the SafeLED IQ has received the new parameters without fault.
If the unit without fault,
click **OK** and the unit is now ready to use.

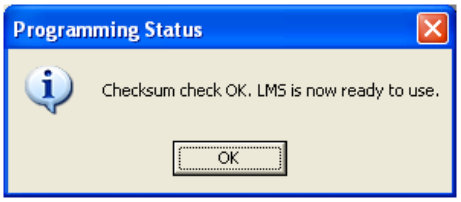


FIGURE 46 – AMT CHECKSUM

17. Disconnect the SafeLED IQ product cable.

18. Turn off the SCM, LPC for at least 30 seconds to fully power down the SafeLED IQ or when no more SafeLED IQ products are to be configured.

19. Turn on the LPC to power up the SafeLED IQ, for example an RGL, set to flash as default, should flash.

3.3 CONNECTING THE LIGHT FIXTURES IN A SERIES CIRCUIT

3.3.1 Operational Characteristics

The extent of use of all SafeLED IQ functionality is determined by the application. All functionality described in this document is not necessarily used at a specific installation. This section is a summary of common functionality available in SafeLED IQ.

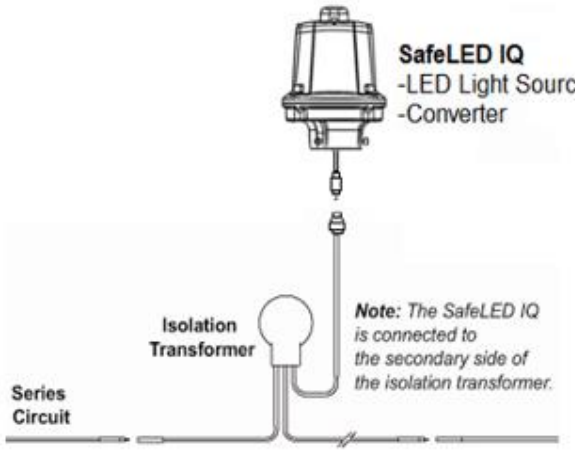


FIGURE 47 – SERIES CIRCUIT CONNECTION

3.3.2 Power On or Default State

IQ is configured to set the lamp to a predefined state when the series circuit is energized. This feature is called *default state* and the options are LAMP ON, LAMP OFF or LAMP FLASHING. The option to select depends on the light function for a SafeLED IQ light fixture and the operative requirements.

3.3.3 Safe State

If communication between the SafeLED IQ and the SCM is interrupted or lost, IQ functionality (after a programmable timeout) sets the lamp to a predefined state known as **safe state**. Safe state can be set to **LAMP ON**, **LAMP OFF**, **LAMP FLASHING** or **no change**.

3.3.4 Command Memory

When current in the series circuit is lost, for example if a CCR is turned off or for any other reason, SafeLED IQ remembers the current lamp status for a limited amount of time. The IQ can be configured, once current is restored in the circuit, to set the lamp to the previous state, typically the last commanded state before a power loss. This feature, when enabled, overrides the default state.

It is possible to apply a condition based on the amount of time current was lost. The SafeLED IQ sets the lamp to the default state if current was restored beyond this time limit. The time limit is programmable from 1 to 20 seconds approximately.

3.3.5 SoftON/SoftOFF

The SafeLED IQ can be programmed to delay the physical turning on or off of the lamp upon reception of a command from the SCM. The purpose of **SoftON/SoftOFF** is to mitigate the sudden load change to which the CCR is subjected when a large portion of the load is commanded on or off with a single command. The command acknowledge from the SafeLED IQ is unaffected, and thereby neither is the response time. Without this feature it may not be possible to turn on/ off all or most of the light fixture on a circuit with a single command, without the CCR tripping because of over- or under-current.

The physical delay is programmable on an individual level in 10ms increments. There is no response time impact when **SoftON/SoftOFF** is enabled.

4. MAINTENANCE

In this section you can find a description of the different steps for the maintenance of the light fixture.

Before you start, make sure you have read and understand §1.1 Safety Instructions.

Find out the location of the light fixture that needs maintenance. If the purpose is to replace an existing light fixture with new one, make sure that corresponding unit is available.

WARNING! *WHEN A LIGHT FIXTURE HAS BEEN REMOVED FROM ITS BASE, THE BASE MUST BE EITHER FITTED WITH A COVER OR A RESERVE LIGHT PUT IN ITS PLACE.*

IT IS RECOMMENDED THAT ONLY AUTORIZED PERSONNEL DISASSEMBLE LIGHT FIXTURES WITH PRIOR AGREEMENT FROM SAFEGATE.

4.1 BASIC MAINTENANCE PROGRAMME

There are recommended maintenance tasks to ensure that the equipment is in correct operating condition.

Maintenance tasks	
Weekly	• Visual inspection of the light fixture. • Removal of dust from external surfaces of the light fixture.
Monthly	• Check of the optical window, check for mechanical damage. • Check for proper fixing of the light fixture on its support.
Yearly	• Detailed inspection of the light fixture. • Check of the body resistance, check for mechanical damage (for example cracks around prism windows). • Clean of the optical windows.

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 light fixture is designed for outdoor operation. However, storing the light fixture outside without using it is a risk for damage to light fixture components. For a longer storage time (more than a week), it is recommended to store the light fixture 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.

4.2 TOOL REQUIRED

Before you start, make sure you have read and understand§1.1 Safety Instructions.

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

Standard tools and accessories:

- Allen keys
- Torque Wrench
- One brush or cloth (general cleaning)

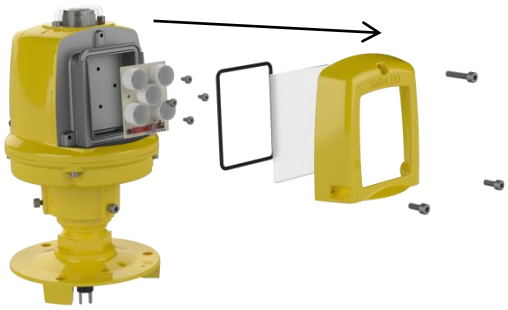
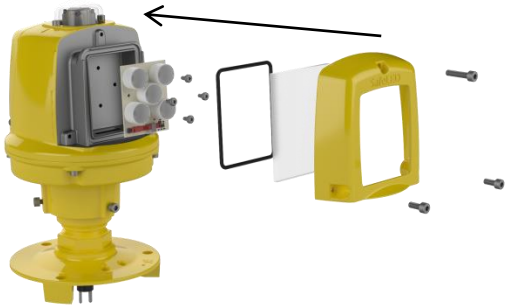
4.3 REPLACING THE FRONT GLASS

Replace the front glass	
Disassemble 1. Unscrew the 3 screws on the side where you need to replace the front glass. 2. Remove the window frame. 3. Remove the front glass. 4. Remove the o-ring gasket.	 FIGURE 48 – DISASSEMBLE
Assemble 1. Place a new o-ring gasket in its position. 2. Place the new front glass in position. 3. Place the window frame in position. 4. Fasten the screws on the window frame with a torque of 3,5 Nm.	 FIGURE 49 – REASSEMBLE

4.4 REPLACE THE MOULDED GLASS

Replace the glass dome	
Disassemble 1. Unscrew the 2 screws on the top of the light fixture to replace the glass dome. 2. Remove the glass holder. 3. Remove the glass dome. 4. Remove the gasket.	 FIGURE 50 – DISASSEMBLE
Assemble 1. Place a new gasket in its position. 2. Place the new glass dome in position. 3. Place the PFTE disc on top of the glass. 4. Place the glass holder in position. 5. Fasten the 2 screws and 2 washers on the top of the light fixture with a torque of 3 Nm.	 FIGURE 51 – REASSEMBLE

4.5 REPLACE THE DIRECTIONAL LED BOARDS

Replace the directional led boards	
Disassemble 1. Unscrew the 3 screws on the side where you need to replace the led board. 2. Remove the window frame. 3. Remove the front glass. 4. Remove the o-ring gasket. 5. Unscrew the 4 screws holding the led board in place. 6. Disconnect the led cable and remove the led board and the wedge if present.	 FIGURE 52 – DISASSEMBLE
Assemble 1. Connect the led cable and place the new led board in its position, if a LED-board which should be installed on top of a wedge is being replaced, make sure to use the correct wedge and to orient the wedge correctly according to section 6.1. 2. Fasten the 4 screws holding the led board with a torque of 2 Nm. 3. Place a new o-ring gasket in its position. 4. Place the front glass in position. 5. Place the window frame in position. 6. Fasten the 3 screws on the window frame with a torque of 3,5 Nm.	 FIGURE 53 – REASSEMBLE

4.6 REPLACE THE OMNI MODULE

Replace the omni module

Disassemble

1. Unscrew the 4 screws attaching the top cover to the bottom cover.
2. Unscrew the 2 screws on the top of the light fixture.
3. Remove the glass holder.
4. Place the PFTE disc on top of the glass.
5. Remove the glass dome.
6. Remove the gasket.
7. Unscrew the 2 screws attaching the omni module to the top cover.
8. Disconnect the 4 led cables and remove the omni module.

FIGURE 54 – DISASSEMBLE

Assemble

1. If the led cables connected to the converter have been removed to ease the disassembling of omni module, make sure to connect the cables as shown in *4.7 LED Cable connections to the converter*.
2. Connect the 4 led cables and place the new omni module in its position.
3. Fasten the 2 screws holding the omni module with a torque of 1 Nm.
4. Place a new gasket in its position.
5. Place the glass dome in position.
6. Place the PFTE disc on top of the glass.
7. Place the glass holder in position.
8. Fasten the 2 screws on the top of the light fixture with a torque of 3 Nm.
9. Fasten the 4 screws attaching the top cover to the bottom cover with a torque of 4,5 Nm.

FIGURE 55 –REASSEMBLE

4.7 LED CABLE CONNECTIONS TO THE CONVERTER

LED cable connections to the converter

Assemble

1. It is very important that the led cables are connected to the converter shown in figure 56.
2. Incorrect connection may damage the converter!

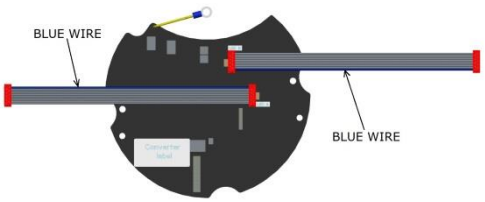


FIGURE 56 – LED CABLE CONNECTION

5. 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 Safegate Group is committed to minimal disturbance for airport operations.

Safegate Group Support	
Safegate Group knows that our equipment is used in one of the busiest industries in the world, where down-time costs money and creates delays for airlines and their passengers. As one of the world's leading suppliers of airport systems, Safegate Group is committed to ensuring that our customers are able to get the most out of your equipment, regardless of the location or the time of day. For this reason, Safegate Group has established the Safegate Group Support service. Safegate Group Support is a unique service provided by Safegate Group to our customers, free of charge during the warranty period or as a service contract. Any time of day, any day of the year, a Safegate Group engineer is on standby to answer questions and assist with any problems that may arise. Qualified technical assistance is just a phone call or an e-mail away, 24-7 worldwide. ✉ support@safegate.com ☎ +46 40 699 1740	 

5.1 SAFEGATE GROUP WEBSITE

The Safegate Group Website, www.safegate.com, offers information regarding our airport solutions, products, company, news, links, downloads, references, contacts and more.

***Note**: There is also a **Client/Partner login** area for the latest information and updates, if available.*

5.2 RE-CYCLING

5.2.1 Local Authority Re-cycling

The disposal of Safegate Group 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.

5.2.2 Safegate Group Re-cycling

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

Safegate Group 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 labelled as follows:

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

Safegate Group 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.
***Note**: For more information, see www.safegate.com, or contact Safegate Group Support via email at support@safegate.com or phone +46 40 699 1740.*

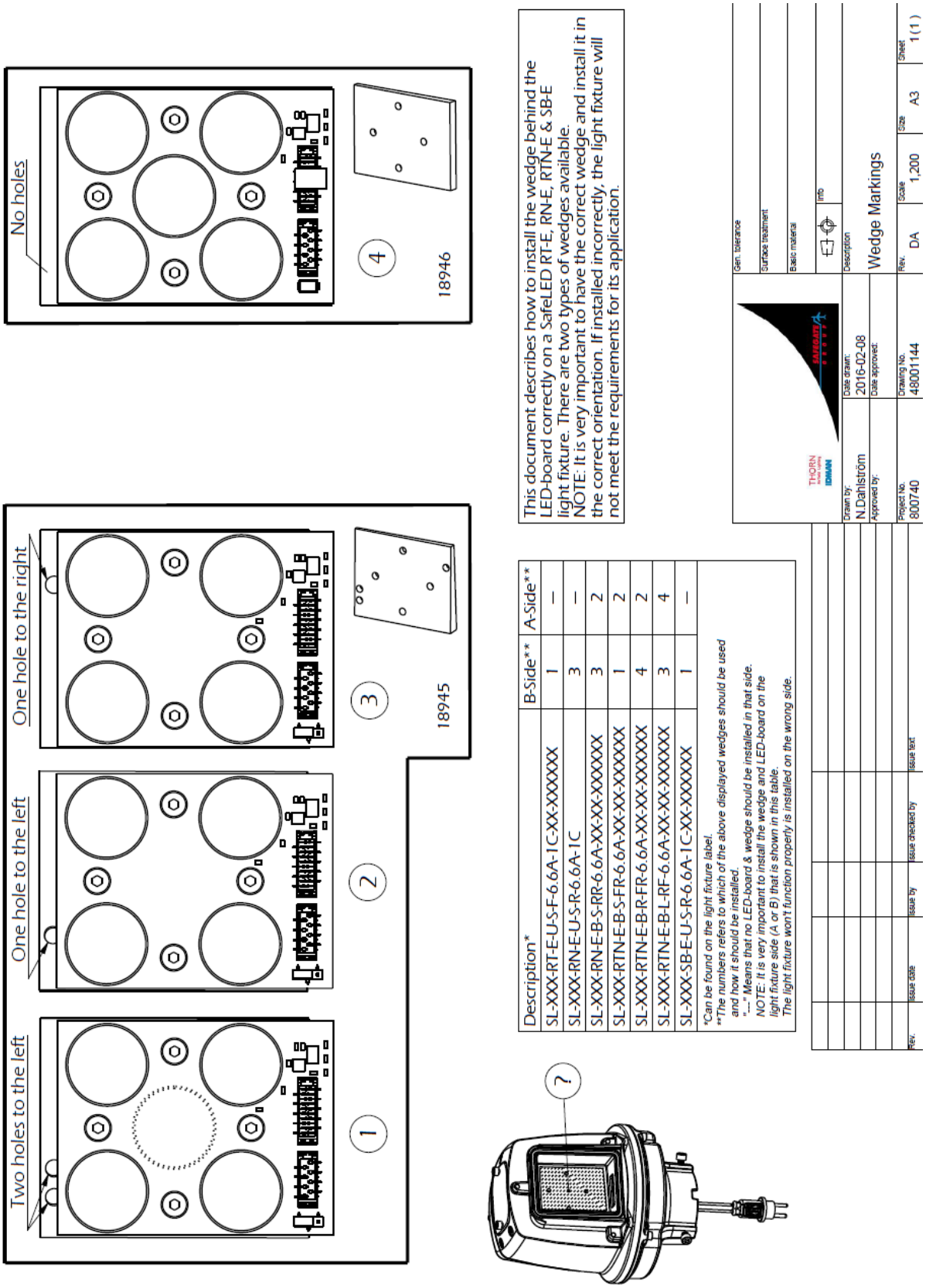
5.3 SPARE PARTS

Spare parts are available for Airfield Lighting light fixtures. For more information see the Spare Parts List document.

***Note**: Contact Safegate Group for assistance with ordering spare parts.*

6. DRAWINGS

6.1 WEDGE ORIENTATIONS



Check in to the future

How many aircraft can your airport handle today?
Can this number be increased without adverse effects on the airport's safety level?
It is a known fact that traffic volume will rise in the foreseeable future. More movements will demand monitoring of the entire airport. Requirements will be sharpened and the development of an integrated system controlling not only ground movements but also air traffic close to the airport is of the highest interest.
The International Civil Aviation Organization (ICAO) already describes A-SMGCS, Advanced Surface Movement Guidance and Control System, as the answer to the future modern airport need to control the entire airport space in one superior system.

To a larger extent than today's systems, A-SMGCS will rely on automated processes to give both pilots and traffic controllers exact information about positions and directions. Safegate Group delivers complete A-SMGCS solutions already, as well as all vital parts relating to it.
Safegate Group can check your airport into the future – today!

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SAFEGATE GROUP

Safegate Group offers solutions for increased safety, efficiency and environmental benefits to airports worldwide. The company was founded in 1973 and has its headquarters in Malmö, Sweden. Safegate Group has more than 70 partners around the globe in order to be close to its customers.
Earlier members of Safegate Group include Thorn AFL and Idman, who both have over 40 years of experience in airfield lighting solutions for airports and heliports. The latest member of Safegate Group is Avibit, a leading provider of next generation software applications and integration of efficient air traffic control systems. Safegate Group's complete range of products and services, a "one-stop shop", provides solutions to customers and airborne travellers around the globe.

www.safegate.com