Airfield Lighting
Manual

8" Inset Lights - IDM 4671, IDM 4581, IDM 4582

- Touchdown Zone
- Runway Centre Line
- Rapid exit taxiway indicator lights (RETIL)
- Enhanced Rapid Exit Taxiway Centre Line

***Note**: This page is blank for convenient double-sided printing.*

8” INSET LIGHTS

IDM 4671, IDM 4581, IDM 4582

CONTENTS

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	August 2010	First Release

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

Abbreviations and Terms

This document may include abbreviations and terms.

Abbreviation	Term
CAA	Civil Aviation Authority
CCR	Constant Current Regulator
CU	Concentrator Unit
FAA	Federal Aviation Administration
ICAO	International Civil Aviation Organization
IEC	International Electrotechnical Committee
LED	Light Emitting Diode
LMS	Light Monitor and Switch unit
NATO	North Atlantic Treaty Organization
STAC	Service Technique de l'Aviation Civile (France)
STANAG	Standardization Agreement (NATO)

1. INTRODUCTION

Airfield Inset lights IDM 4671, IDM 4581 and IDM 4582 are 8” light fittings with numerous lighting options for runway site requirements at airports. The protrusion height is 10 mm.

FIGURE 1 - 8” INSET LIGHT

The inset lights IDM 4671, IDM 4581 and IDM 4582 are used in configurations for:

- **Touchdown zone (TDZ)** light barrettes must locate symmetrically about the runway centre line. The lateral spacing of the innermost lights in the barrettes must equal the spacing of the touchdown zone marking. The longitudinal spacing can be either 30m or 60m, but 30m is preferred to allow operations in lower visibility minima.
- **Runway centre line (RCL)** lights are located on the runway centre line marking or, when it is not practicable, the offset cannot be greater than 0.6 m on the same side of the runway centre line. The longitudinal spacing (15m or 30m) depends on the category of the runway.
- **Rapid exit taxiway indicator lights** (RETIL) form an entity of six electrically inter-connected lights which all work simultaneously together when on, and if any individual light fails - all six lights are off.

  The lights form a three row triangle (or direction arrow) which points to a starting point of a rapid exit taxiway. The last single light is positioned in a place on a curve leading to where a taxiway starts. The triangle is positioned on the side of a runway where a rapid exit from a taxiway exists. The lights are distanced 2 m from each other, perpendicular to the runway and the light nearest to the runway centre line is distanced 2m away from it. The light distance in the runway direction is to be 100 m.
- **Enhanced rapid exit taxiway centre line lights** are for rapid exits in places where low visibility conditions occur. They are used in a similar way to normal taxiway centre line lights (TCL) lights, where the only exception is they must have similar intensity control as with runway lights. For more information, see on ICAO Annex 14 4th edition paragraph 5.3.16.9.

1.1 SAFETY INSTRUCTIONS

1.1.1 General safety

Make sure you read this section and are familiar with safety precautions before any work is started. Keep away from live circuits. It is vital to switch off the current securely before any installation or maintenance procedures are carried out. It is also strongly recommended to disconnect the primary circuit from CCR before these activities.

1.1.2 Product safety

Airfield lighting is connected to a constant current circuit with nominal current of 6.6 amperes via an isolating transformer. 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.

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

1.1.4 Mechanical maintenance

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

WARNING! *IT IS STRONGLY RECOMMENDED TO DEPRESSURIZE THE LIGHT BEFORE OPENING FOR MAINTENANCE. IT IS IMPORTANT TO UNDERSTAND THAT OPENING A PRESSURIZED LIGHT CAUSES THE LIGHT HALVES TO SEPARATE AT HIGH SPEED, AND MAY CAUSE PERSONAL INJURY AND DAMAGE THE LIGHT.*

THE LIGHTS ARE DESIGNED TO WITHSTAND INTERNAL PRESSURE OF 1.5 BAR. IT IS NOT ALLOWED TO EXCEED 1.5 BAR OF PRESSURE IN ANY CIRCUMSTANCES. FOR THIS REASON, IT IS NOT ALLOWED TO OPEN THE INNER COVER USING COMPRESSED AIR, AS THIS MAY CAUSE PERSONAL INJURY AND DAMAGE THE LIGHT.

1.2 DELIVERY AND OVERVIEW OF LIGHTS

Each unit is supplied completely assembled, tested and sealed, ready for installation. The electrical connection is made via one cable assembly; the cable is equipped with an FAA L-823 2-pole plug.

For some applications, optional cut-out devices (relays or film disks) are available. Each device forms an electrical bypass over the lamp, after the lamp failure.

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

The information below is an overview for uni- or bi-directional, high intensity, inset light fittings with lamp colour, dichroic filter and connector options. The lights are designed according to airfield placement and functionality.

Overview of lights

Light	Optics	Colours	Power	Toe-in	Description
IDM 4671	Narrow (N)	Clear (C)	1x48W	0	Unidirectional touchdown zone
				L	Unidirectional touchdown zone with toe-in
				R	
IDM 4581	N	C	1x48W	0	Unidirectional touchdown zone or runway centre line light
				L	Unidirectional touchdown zone light with toe-in
				R	
		Yellow (Y)	1x48W	0	Rapid exit taxiway indicator light (RETIL)
		Red (R)	1x48W	0	Unidirectional runway centre line light
	Wide (W)	Y	1x48W	0	Unidirectional enhanced rapid exit taxiway centre line light
		Green (G)	1x48W	0	
IDM 4582	N	C	2x48W	0	Bi-directional runway centre line light
		C/R	2x48W	0	

For more information, see www.safegate.com.

2. INSTALLATION

Inset lights are installed in base receptacles that are stationary installed on the field.

There are many different installation practices which can be adopted for bases and detailed instructions how to carry out the installation can be found on base manuals.

For correct light location, it is recommended to read and comply with the following:

- ICAO: Annex 14 Volume I 5th edition 2009 paragraph 5.3 Lights, which refers to lighting system installation in general.
- All drawings and design plans, for the particular project, to guarantee correct location for each light.

Native base receptacle for IDM 4581, IDM 4582 and IDM 4671 is IDM 6494. It is also possible to install these luminaires on other 8” base receptacles or adapter rings but in these cases compatibility has to be ensured forehand.

2.1 BEFORE YOU START

Make sure you have read and understand 1.1 Safety Instructions on page 4.

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

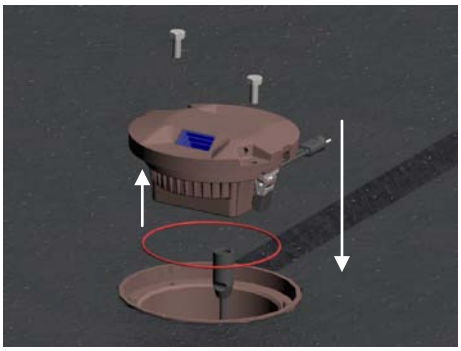
2.1.1 Tools and materials required

- Lifting hooks.
- Torque wrench, socket 17mm.

2.1.2 Base option

Base option for 8” fittings	Image example
A base receptacle, IDM 6494, is used for the 8” inset lights. The base dimensions are: outer diameter is 218 mm and height is 120 mm. ***Note**: IDM 6494 is also available with options for the number and/or placement of cable inlets. For more information, see www.safegate.com.*	 FIGURE 2 - BASE FOR 8” INSET LIGHTS

2.2 INSTALL A LIGHT IN A BASE (IDM 6494)

Install a light	Image example
(a) Make sure the inner surfaces of the base are clean and dry. (b) Place the o-ring gasket in the groove on the light, to seal the gap between the light and the base. (c) Connect the secondary plug and its receptacle inside the base. (d) Use lifting hooks to lower the light in the base. (e) Make sure the cable rests properly inside the base. (f) Align the light to the base groove, previously set to the desired direction. (g) Loosely fasten the light with two M10x25 bolts by hand. ***Note**: Thread elements in bases are locking type and therefore bolts cannot be fully turned down by hand.* (h) Fasten the bolts using a torque wrench, gradually in sequence, to a torque of 40 Nm. (i) Connect the secondary cable to the isolating transformer in the transformer pit. (j) After installing all the lights in the circuit, test that lights are operational.	 FIGURE 3 - LIGHT INSTALLATION

3. MAINTENANCE

3.1 BEFORE YOU START

WARNING! *MAKE SURE YOU HAVE READ AND UNDERSTOOD 1.1 SAFETY INSTRUCTIONS ON PAGE 4.*

3.1.1 Light pressure

Depressurize the light using the valve in the inner cover immediately before maintenance due to:

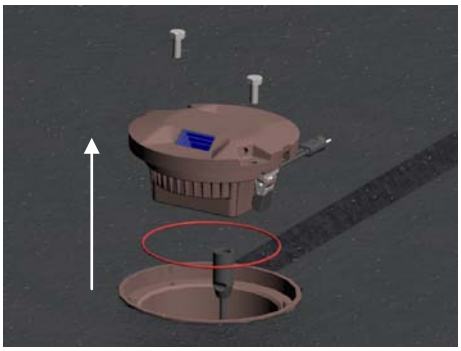
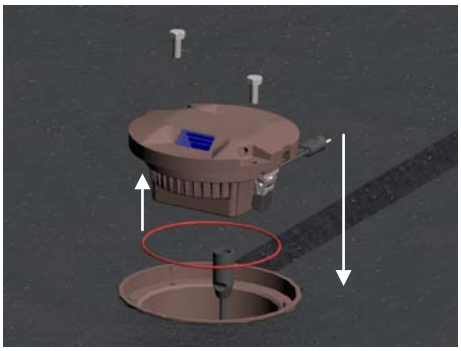
- The light may contain pressure due to high internal temperature as it has been on for a long period of time immediately before maintenance.
- If the light cover is hot, there is probably pressure inside and the light.
- If the latch mechanism feels abnormally tight this means there is a risk for pressure inside the light.

3.1.2 Handle with care and clean

It is important to handle with care and clean to maximize the light and component lifetime and minimize maintenance.

- Do not touch the glass bulb or the reflecting surface of the lamp with bare hands as this can shorten the expected lifetime of the lamp.
- Use a soft, clean and dry rag when cleaning, handling or maintaining the optical parts of the light.
- When any maintenance procedures are carried out, remove all possible dust and moisture from the inside of the base, inner cover and top cover.
- All sealing mating surfaces must be thoroughly cleaned before reassembling.

3.2 REPLACE A LIGHT IN A BASE

Replace a light	Image examples
***Note**: Make sure you have read and understood 1.1 Safety* Instructions *on page 4*.	
Remove a light from a base	
(a) Clean the outer surface of the top cover. (b) Unfasten the two bolts securing the light. (c) Use the lifting hooks to lift the light from the base. Alternatively, if lifting hooks are not available or the light is stuck in the base, use the openings on the side of the top cover to lever the light up from the base. (d) Disconnect the secondary cable. (e) If the base is to remain empty during maintenance, insert a cover on the base or install a temporary light to seal the base once again. (f) In a maintenance workshop, thoroughly clean the outer surfaces of the light before carrying out any maintenance procedures.	 FIGURE 4 - LIGHT REMOVAL
Install a light in a base	
(g) Make sure the inner surfaces of the base are clean and dry. (h) Place the o-ring gasket in the groove on the light, to seal the gap between the light and the base. (i) Connect the secondary plug and its receptacle inside the base. (j) Use lifting hooks to lower the light in the base. (k) Make sure the cable rests properly inside the base. (l) Align the light to the base groove, previously set to the desired direction. (m) Loosely fasten the light with two M10x25 bolts by hand. ***Note**: Thread elements in bases are locking type and therefore bolts cannot be fully turned down by hand.* (n) Fasten the bolts using a torque wrench, gradually in sequence, to a torque of 40 Nm. (a) Connect the secondary cable to the isolating transformer in the transformer pit. (b) Connect and test the light is operational.	 FIGURE 5 - LIGHT INSTALLATION

3.3 WORKSHOP MAINTENANCE

It is important to always make sure that the light is depressurized before disassembly for maintenance work.

***Note**: Make sure you have read and understood 1.1 Safety* Instructions *on page 4*.

***Note**: Only the most common maintenance procedures are instructed in following paragraphs. Construction of the luminaire allows that it can be fully disassembled and all the parts can be replaced if needed*.

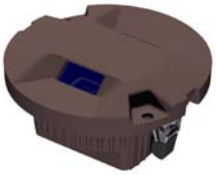
3.3.1 Pressure release

The light includes a valve component according to standard automotive tubeless valve design for common pressure gauges. The valve is loosened to release pressure during maintenance and tightened after assembly for testing, before use in the field.

3.3.2 Disassemble a light cover

Disassemble a light cover	**Image examples**
***Note**: Make sure you have read and understood 1.1 Safety* Instructions *on page 4*.	
(a) Release pressure by loosening the valve on the light cover before opening. (b) Open the inner cover by pulling the latches simultaneously outwards.	 FIGURE 6 - OPENING THE LATCHES
(c) Place the hook of the latch towards the rod in the inner cover and press the latches downwards to push out the inner cover.	 FIGURE 7 - PUSHING OUT THE INNER COVER

3.3.3 Assemble the light cover

Assemble the light cover	Image examples
(a) Always replace the O-ring gasket of the inner cover when a light is opened for maintenance. (b) Use proper lubricant for the new O-ring, for example high temperature resistant (minimum 200°C) grease. ***Note**: Do not use copper based grease as it strongly stimulates corrosion.* (c) Before replacing the inner cover, apply lubricant to the O-ring and/or top cover sealing mating surface. This eases replacement considerably and extends the lifetime of the O-ring. (d) Place the O-ring in the contours of the inner cover. Check the O-ring is flush and not twisted. (e) Place the inner cover on the top cover. For IDM 4582 C/R version, place the inner cover with the secondary cable on the same side as the colour filter. (f) Make sure the O-ring is correctly positioned inside the gasket groove. (g) Place the latches in position. *(h)* Close the latches simultaneously. ***Note**: If the latches are not closed simultaneously the O-ring may break and the integrity of the light is at risk. If it is difficult to close the latches, the valve can be loosened to ease closure of the latches. If the valve is loosened it must be tightened again before integrity testing*. (i) Perform a seal integrity test. For more information, see 3.3.4 Seal integrity test on page 12.	 FIGURE 8 - PLACE O-RING ON THE COVER  FIGURE 9 - PLACE THE INNER COVER  FIGURE 10 - CLOSING THE LATCHES  FIGURE 11 - CLOSE THE COVER

3.3.4 Seal integrity test

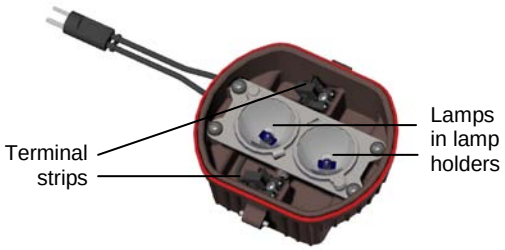
The light can be easily tested for seal integrity, when assembled, by using the valve on the cover. Before applying a pressure gauge to the light, make sure the cover latches are properly closed and the valve is tightened.

WARNING! *NEVER EXCEED TESTING PRESSURE OF 1.5 BAR. THE LIGHT IS NOT DESIGNED TO WITHSTAND PRESSURES HIGHER THAN 1.5 BAR.*

Fit a pressure gauge to the valve and put the light into a water container with the assembled light completely covered with water. Gradually increase to the maximum testing pressure of 1.5 bar (150 kPa). Keep the light in water for a few minutes and inspect for air bubbles/leaks. If there are leaks, it may be necessary to tighten the cable gland, change the prism gasket or change the O-ring gasket, depending on where the leak appears from.

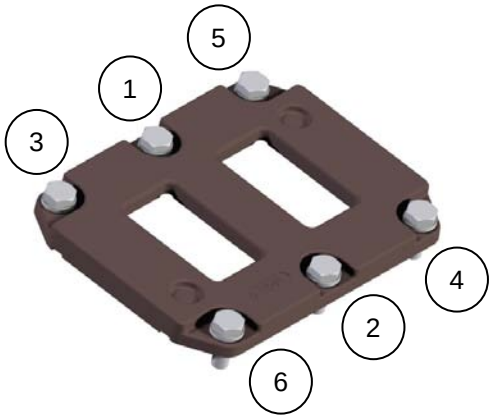
3.3.5 Replace a lamp in a light

Lamps are located inside the inner cover of the light. There is no cable connection between the top cover and the inner cover. The lamps are placed in lamp holder s with connectors. The lamp holders connect to terminal strips in the inner cover.

Replace a lamp in a light	Image example
(a) Disassemble the light, see 3.3.2 Disassemble a light cover on page 10. (b) Disconnect lamp wiring from terminal strips	 FIGURE 12 - IDM 4582 INNER COVER COMPONENTS
(c) Release the lamp holder by lifting the fixing bolt and then moving the lamp holder ring to the left.	 FIGURE 13 - LAMP REMOVAL - FIXING BOLT
(d) Lift the holder ring (for example with a forefinger) and press gently on the hinge (for example with a thumb), to prevent it from sticking. (e) Pull the lamp away from the lamp holder, whilst making sure not to bend the connectors. (f) Carefully push the new lamp in position, in the lamp holder. Make sure it is not tilted. (g) Carefully close the fastening ring in position, using forefinger and a thumb on the hinge. (h) Lift up the fixing bolt and turn the lamp holder ring to the right, to release/close the fixing bolt. (i) Connect lamp wiring to the round male connectors on the terminal strip.	 FIGURE 14 - LAMP REMOVAL - LAMP HOLDER

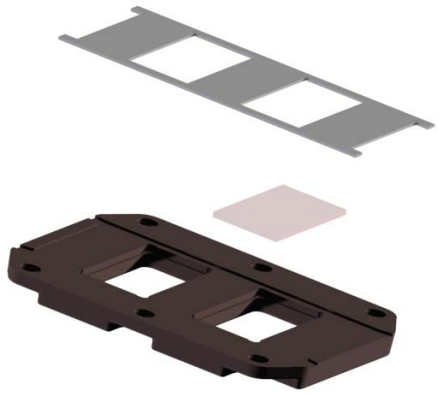
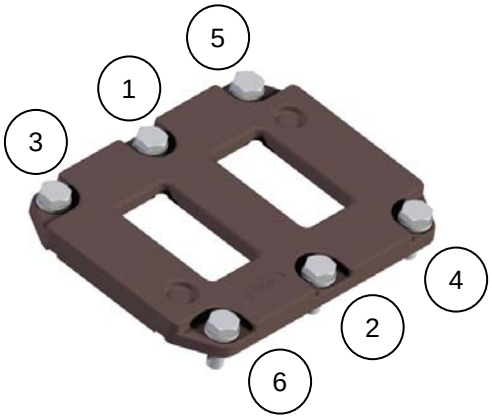
3.3.6 Remove/insert prisms and a prism gasket

Prisms and the prism gasket are located in the top cover of the light.

Remove prisms and a prism gasket	Image examples
(a) Disassemble the light, see 3.3.2 Disassemble a light cover on page 10. (b) Unfasten the screws and washers (6 pcs.) securing the fastening plate to the top cover. *(c)* Remove the fastening plate. ***Note**: The pad keeps the colour filters in place when the fastening plate is removed. Make sure the colour filters do not fall out of position when removing the fastening plate.* (d) Remove a prism by pushing it out from the top cover outer surface. (e) Remove the gasket from the top cover. ***Note**: Always replace prism gaskets when re-assembling prisms.*	 FIGURE 15 - PRISMS AND GASKET REPLACEMENT
Insert prisms and a gasket (a) Clean the gasket mating surfaces in the top cover and the new gasket. (b) Apply some silicone grease to the gasket surfaces. (c) Place the gasket and the prism(s) correctly in position. (d) Place the fastening plate, with colour filters and pad still attached, in position. (e) Before tightening the screws, check the colour filter is correctly in position. (f) Loosely tighten the screws by hand and check the components are properly aligned. (g) Tighten the screws (to a torque of 6 Nm) in sequence, as shown in the figure - centre screws followed by diagonal corner screws. (h) Tighten the screws (to a torque of 11 Nm) in sequence, as shown in the figure - centre screws followed by diagonal corner screws.	 FIGURE 16 - FASTENING PLATE TIGHTENING SEQUENCE

3.3.7 Replace a colour filter

The colour filter is located in a prism fastening plate, in the top cover.

Replace a colour filter	Image example
(a) Disassemble the light, see 3.3.2 Disassemble a light cover on page 10. (b) Remove the prism fastening plate, see 3.3.6 Remove/insert prisms and a prism gasket on page 13 if needed. ***Note**: If there is no aim to replace prism do not detach it from a top cover. Detaching the prism may cause defects to the prism and prism sealing needs to be replaced.* (c) Remove the pad holding the colour filters to the fastening plate. (d) Remove the colour filter. (e) Place the new colour filter in position. (f) Place the pad strips in the grooves on the fastening plate, until the pad clicks into position. (g) Place the fastening plate, with colour filter and pad attached, in position. Makes sure the colour filters are correctly in position. (h) Loosely tighten the screws by hand and check the components are properly aligned. (i) Tighten the screws (to a torque of 6 Nm) in sequence, as shown in the figure - centre screws followed by diagonal corner screws. (j) Tighten the screws (to a torque of 11 Nm) in sequence, as shown in the figure - centre screws followed by diagonal corner screws.	 FIGURE 17 - COLOUR FILTER REPLACEMENT  FIGURE 18 - FASTENING PLATE TIGHTENING SEQUENCE

3.4 TECHNICAL INFORMATION

3.4.1 Storage

The light is designed for outdoor operation, however storing the light 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 light indoors in a dry and dust free environment and at room temperature (warm or cool). Proper storage ensures trouble free replacement procedures. It is strongly recommended not to store any electrical equipment outside.

3.4.2 Daily function check for installed equipment

If the equipment is installed, but not in operation or intended to be used for a longer period of time (more than one week), it is recommended to perform a daily function check to ensure system availability in case of urgent need.

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.

3.4.3 Specification

- ICAO Annex 14 Volume I 5th edition 2009;
- Runway centre line versions: paragraph 5.3.12
- Touchdown zone versions 5.3.13
- Rapid exit taxiway indicator light version 5.3.14
- Enhanced rapid exit taxiway centre line versions 5.3.16.9

3.4.4 Application

Bi- and uni-directional inset lights for:

- Runway centre line.
- Touchdown zone.
- Rapid exit taxiway indicator lightning.
- Enhanced rapid exit taxiway centre line systems Cat. I, II and III.

3.4.5 Technical characteristics

Characteristic	Description
Light dimensions	Projection 10,0 mm Diameter 203 mm Height 95 mm
Base (IDM 6494) dimension	Diameter 218 mm Height 120 mm
Weight	3.0 kg (IDM 4582) light 2.3 kg (IDM 6494) base
Ingression Protection	IP67
Materials	Body AlSi10Mg Primary Silicone rubber gaskets Stainless steel hardware
Surface treatment	Anodising on cast alloy parts
Cables and connectors	Plugs: FAA L-823 Style 6 Receptacles: FAA L-823 Style 12 Secondary cable: FAA 150/5345-70
Light sources	48W, 6,6A, Ø50 mm dichroic halogen lamp with 130 mm wires and Ø4 mm round female connectors. Average lifetime 1500 hours at rated current.
Packing	Dimensions: 220x220x140 mm Weight: 3.1 kg
Accessories	Base Receptacle (IDM 6494) Alignment device (IDM 6092) Lifting hooks

For more information, contact Safegate Group or see www.safegate.com.

3.5 SUPPORT

3.5.1 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.*

3.6 RE-CYCLING

3.6.1 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.

3.6.2 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, contact Safegate Group Support via email at support@safegate.com or phone +46 40 699 1740.*

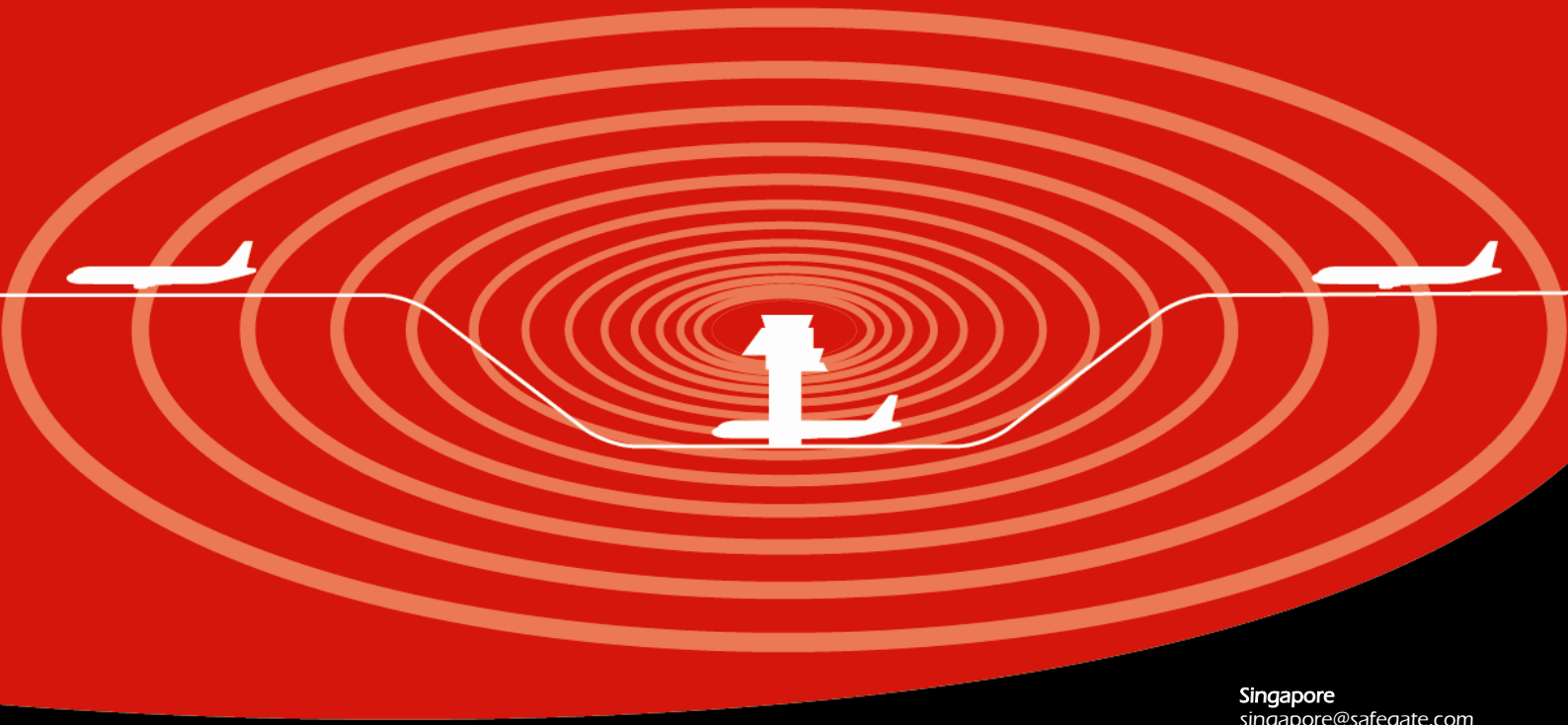
3.7 SPARE PARTS

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

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

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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THORN Airfield Lighting IDMAN SAFEGATE GROUP

Safegate Group offers solutions for increased safety, efficiency and environmental benefits to airports around the world. The company was founded in 1973 and has its headquarters in Malmö, Sweden. Safegate Group has over 70 partners around the globe in order to be close to its customers. The latest members of Safegate Group, Thorn AFL and Idman, have both over 40 years of experience in airfield lighting solutions for airports and heliports worldwide. Safegate Group´s complete range of products and services, a "one-stop shop", provides solutions to customers and airborne travellers around the globe.

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