AIRPORT LIGHTING
SEQUENTIAL FLASH LIGHT SYSTEM
IN LED TECHNOLOGY
SFL 792

PRESENTATION

The use of high power LED technology instead of traditional discharge tubes is a major step to lower operational cost, higher personnel safety and very low installation cost. The LED based SFL system from Hella Induperm is designed to meet the requirements of ICAO in Annex 14 for flash lights used in a center line approach system (AFL), as runway threshold identification light (TiL), or in a combination of both light systems.

APPLICATION

The system offers control and monitoring of a system with up to 30 nos. approach flash lights (AFL) and 2 nos. threshold identification lights (TiL), without the use of separate control cables. The very low power consumption in the LED flash light fixture makes it possible to use installation cable of maximum 4 mm², and the total installation only requires a 4 wire cable, as can be seen on the installation diagram.

THE SYSTEM

A complete SFL system includes a SFL Flash controller system in the substation, and a system dependant number of LED SFL light fixtures with belonging Terminal boxes.

COMPLIANCES

The SFL 961 is designed to meet the requirements of ICAO in Annex 14 for flashlights used in an approach centre line system (AFL) with belonging runway threshold identification light (TiL).

- ICAO Annex 14
- International Standard IEC 61822
- European Aviation Safety Agency CS-ADR-DSN
- Nachrichten für Luftfahrer Teil I (NFL I 95/03)
- ENV 50234: 1997*

* Fulfillment of general required points. No compliance with requirements, which are specific for the application in Xenon system.
DESCRIPTION

CONTROLLER UNIT
Hella Induperm sequential flash light (SFL) controller system is based on a
digital controller and monitoring system, in the same mechanical layout,
and with the same easy to use menu as the Hella Induperm constant
current regulator type CCR 961.

The controller supplies power for flashing, heating and communication via
a 4 x 4 mm² standard installation cable connected in one loop to all fixtures.
The power line communication includes the following information
to each light fixture:
• Requested light intensity (3 steps)
• Time for one sequence (one or two per second)
• Start signal for each new sequence

The controller unit can be supplied as a module in the same layout as the
HELLA Induperm CCR type 961, and can be installed in a module cubicle for
CCRs, or the controller can be supplied as a wall mounted unit.

<table>
<thead>
<tr>
<th>SFL controller parts</th>
<th>Type No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Module for RS 485</td>
<td>SFL 961 – RS 485</td>
</tr>
<tr>
<td>Module for profibus</td>
<td>SFL 961 – Profi</td>
</tr>
<tr>
<td>Stand-alone cubicle for max. two nos. SFL modules</td>
<td>SFL 961 – Cubicle</td>
</tr>
<tr>
<td>Wall mount cabinet for RS 485</td>
<td>SFL 961-WM-RS 485</td>
</tr>
<tr>
<td>Wall mount cabinet for profibus</td>
<td>SFL 961-WM- Profi</td>
</tr>
<tr>
<td>Circuit selector kit to be built into wall mount cabinet</td>
<td>SFL 961-B1/B2</td>
</tr>
<tr>
<td>Parallel interface for Module or wall cabinet, RS 485</td>
<td>–</td>
</tr>
</tbody>
</table>

TERMINAL BOX

APPLICATION
A Terminal box is placed within a distance of 1 to 25 m from each flash light
fixture. The terminal box is for the connection of the cable from the controller
unit to each flash light fixture. An incoming and an outgoing cable each
typical 4 x 4 mm², is used to supply power and communication signals to the
Flash Light fixture via two nos. isolating transformers each 230 VAC / 24VDC,
both placed in the terminal box.

DESCRIPTION
The terminal box is stainless steel, and can be mounted in many ways, on
poles, on a wall etc.
• Size: H x W x D: 360 x 200 x 120 mm
• Weight approx. 6.6 kg
• IP 68
• Standard type (in stainless steel): SFL TB1
• Lightning arrestor block type nr: 40-6308
• Mounting kit for 60 mm pole type: MT 60 mm

Cable connections from terminal box to flash light fixture:

<table>
<thead>
<tr>
<th>Distance from box to fixture (m)</th>
<th>Cable dimension</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 – 8</td>
<td>3 x 1.5 mm² + ground</td>
</tr>
<tr>
<td>8 – 25</td>
<td>3 x 2.5 mm² + ground</td>
</tr>
<tr>
<td>&gt; 25</td>
<td>3 x 4 mm² + ground</td>
</tr>
</tbody>
</table>
HIGH-INTENSITY LED SFL LIGHT FIXTURE

APPLICATION
The high-intensity LED fixture is intended to be used instead of discharge-type flash light in barrette centre line approach system and / or as runway threshold identification lights. The required intensities are reached with LEDs as used in our standard LED approach light fixture. All communication and control via the power cables.

DESCRIPTION
The fitting type is a high-intensity, unidirectional, lightweight, elevated light constructed to meet the demands for easy mounting, leveling and service, capability to resist jet blast from today’s aircrafts and last but not least to give sufficient light intensity, in the right angles with the use of a LED light source with low power consumption and a long life-time.

OPERATION
Brilliancy control by means of PWM regulation in light fixture, based on step command received via power cable. The flashing frequency can be one or two flashes / sec.

The first unit is located at the beginning of the approach, and the last unit is closest to the threshold. The units are flashing in sequences so that the pilot sees the light moving towards the runway. The threshold identification lights (TIL/RIL) are flashing simultaneously. The TIL are connected to same supply cable as the approach sequential flash light system. Input line voltage is 230 V, and the supply cable is connected to the fixture via transformers in a terminal box. The supply includes flashing power, synchronization of the flashing sequence as well as power for heating element in the fixture. The address of each fixture is set by means of a built-in dipswitch. The flash light systems is controlled by Hella Induperm flash light controller system SFL 961-LED.

FEATURES
• The design conforms to the photometric requirement of ICAO in Annex 14, Fig. 2.1 with 40 W LED module
• LED solution with many advantages compared to discharge tubes, e. g.: spare part price, lifetime, power consumption and no high voltages present in the light fixture, max. 24 VDC
• Front glass according to FAA spec. CAA-1199a
• Extremely easy adjustment due to patented ball joint
• The shape, the small size and weight (3 kg. – 6ib.) are favourable features in respect to wind load and mast construction
• The outside surface of the glass is smooth and needs no cleaning
• No adjustment after re-lamping
• Mounting on tube, pole or base plates
• Only fully corrosion proof components
• Finished in stove enamel aviation yellow
• Lamp power, heating supply and synchronisation signals via only low voltage power supply

LIGHT DISTRIBUTION

Photometric data

<table>
<thead>
<tr>
<th>SFL 792 LED light – ICAO white</th>
<th>HELLA min. average</th>
</tr>
</thead>
<tbody>
<tr>
<td>ICAO min. average</td>
<td>23092 cd</td>
</tr>
<tr>
<td>20000 cd</td>
<td></td>
</tr>
<tr>
<td>ICAO min.</td>
<td>12033 cd</td>
</tr>
<tr>
<td>10000 cd</td>
<td></td>
</tr>
<tr>
<td>2000 cd</td>
<td>3167 cd</td>
</tr>
<tr>
<td>1000 cd</td>
<td>2344 cd</td>
</tr>
<tr>
<td>ICAO ratio max.</td>
<td>2.88</td>
</tr>
<tr>
<td>3.00</td>
<td></td>
</tr>
</tbody>
</table>
### OPERATION

The AFL light fixtures will start flashing at the beginning of the approach line towards the threshold. If the TIL lights are installed, they will flash simultaneously as the last units in one sequence. The flash frequency can be selected as 1 or 2 flashes/sec.

The system can be supplied for 1 or 3 intensity steps. The controller output is two phases, where one is only for the power supply, while the other phase is for both the power supply and communication. The controller makes a break in the communication phase, which are registered by the light fixtures as a start signal for a new sequence, and the light fixtures starts counting the half-waves, and compares the number with the address of the fixtures. When the number of half-waves matches the address, the fixture will flash.

The communication also includes information on the required light intensity. As the intensity regulation is performed in each light fixture instead of in the controller, there will be no losses and heating in the controller unit, and not least very little sensitivity to cable resistance from controller to each light fixture.

As the supply to the light fixtures is low voltage via transformers in the terminal box, lighting arrestors are only needed in each end of the supply cable that is in the power station and in the first terminal box in the approach.

The controller unit can measure the flash current when a flash light fixture is activated, and as the controller unit knows when each fixture is supposed to flash, the controller can detect and indicate locally and remotely a faulty light fixture.

The light fixtures are supplied with a small heater and a thermostat to keep the fixture inside is from dew. The heating can be on, and powered from the same cable as the flashing, even without the flashing being activated, simply by not sending a break in the supply. The flashing sequence can only be started by a break (missing pulses) in the supply.

### MOUNTING DEVICES

HELLA Induperm elevated light fixtures can be delivered with various types of breakable couplings:

- **Type A:** With 2” thread (European standard thread or 11.5 NPT or NPS)
- **Type C:** For 2” pole mounting
- **Customer designed couplings**

HELLA Induperm breakable coupling is calculated and tested to break at:

\[ 64 \text{ Kgm} \pm 4 \text{ Kgm}\] which is in according FAA AC 150/5345-46B, sect 3.4.2.1.

As no voltage above 24 VDC is present in the light fixtures, the safety is increased drastically compared to service on traditional discharge flash types. There is no safety problem in working with the flash light fixtures when these are in operation, but to avoid the high intensity flashes when working with a fixture, a small switch in each fixture can turn-off the power LEDs, while synchronization and functionality can still be controlled via small control LEDs in the fixture.
Controller types

Module
- SFL 961 module for RS 485 or profibus in cubicle.

Wall cabinet
- SFL 961 WM for RS 485 or profibus. Can be extended with circuit selector.

Terminal box
- SFL 792 (breakable coupling A)
- SFL 792 (breakable coupling C)

Last box with lighting arr.
- Polycarbonate SFL TB2
- Stainless SFL TB1
- Lighting arrester kit 40-6308