



LED SIGNAL LIGHTS

MAFELEC and TSL-ESCHA GmbH

MAFELEC develops control and signaling solutions for harsh environments. From push buttons to switches, from complete control panels to door control solutions, the company offers products that are best suited to the needs of our partners.

TSL stands for Touch, Signal and Light. Door opening push buttons, signal lights, sounders, indicator and display devices as well as LED lighting are part of the product portfolio. TSL-ESCHA develops, manufactures, and distributes individual customer solutions for public transportation.

Members of the MAFELEC TEAM

TSL-ESCHA based in Halver (Germany) and MAFELEC in Chimilin (France) are part of the MAFELEC TEAM. The owner-managed group of companies offers solutions for HMI, lighting and sensors and is active in the markets of bus and railway, industrial vehicle, industry, energy, defense, aerospace, and elevators.

DOOR LIGHT STRIPES LS.....	4-7
SIGNAL LIGHTS SL AND TL	8-19
SIGNAL LIGHTS M-DOOR	20-21
SIGNAL LIGHTS SLV40 AND SLT92.....	22-23
DOOR INDICATOR LIGHT PL13	24-25
HAND RAIL LIGHT HL18 AND HL22.....	26-29
VL55 LED LIGHT IN DOOR COVE.....	30-33
MULTI-PURPOSE LIGHT SLR120	34-35

CONTENTS

LED SIGNAL LIGHTS

LED SIGNAL LIGHTS FOR DIFFERENT APPLICATION AREAS

Buses and trains operate every day in a wide variety of climate zones – often under very harsh operating conditions. TSL-ESCHA and MAFELEC LED signal lights are optimized for the various application areas. They are designed to withstand extreme heat and dust as well as high humidity or frost.

In addition to functional reliability, priority is put on passenger needs: optimal brightness and recognition of signal lights allow passengers to use public transport comfortably and, above all, safely.

- Optimized efficiency in mechanics, electronics and lighting
- Needs-based luminosity
- Standards-compliant designs
- High durability
- Wide variety of designs, sizes, display colors and beam angles
- High vandalism resistance



A large range of different signal lights for every application.

LS LED STRIPS FOR DOOR ILLUMINATION CUSTOMIZED AND SAFE

The LS series LED light strips developed in 2016 are a huge success. TSL pioneered the light strips in the movable door element, which noticeably mark the opening and closing process. Today, there are different variants of the LS series, all oriented to different installation situations. Throughout the world, the light strips ensure greater safety in the door area of trains and buses.

- Clearly signaling at the door during the opening and closing process
- Adaptation to customer-specific vehicle and door leaf contours possible
- Customizable signaling colors

Made in Germany - All light strips are
manufactured at TSL-ESCHA in Halver.

LS

MORE LIGHT AND MORE SAFETY

The adaptability of the LED light strips is what makes them particularly impressive. Every LS system is a customized solution, as this series is based on the individual installation requirements of different door systems. During the design phase, there is an intensive exchange with manufacturers and operators in order to meet all of their requirements.

The smallest light has a cross-section of only 5 x 15 millimeters. The length and width of the light strips can be easily adapted, depending on the type of mounting and available installation space. In addition, TSL's LS series light strips offer passengers greater safety. The movable door elements clearly stand out during the opening and closing process.

LS light strips are particularly noticeable when they are mounted close to the closing edge.

There are two variants, Pro-Line and Basic Line for the control and adjustment of the light color of the light strips:


- The Pro-Line requires a control and power unit (PCU) for a voltage range of 24 VDC \pm 30 %. There are 15 different configurations possible. Different light colors can be mixed from red, green, blue and white and displayed in different brightnesses.
- With the Basic-Line, the light strips can be controlled directly by the door control unit. The electronics are designed for the light colors red and green, but cannot be mixed or dimmed.

- Homogeneous light emission even at low mounting depths
- Adaptation to different contours
- Easy assembly/disassembly
- Optimal use of the available installation space
- Proven chemical resistance to many surface cleaners
- Durability of the product due to high quality material
- High reliability due to optimal design and material selection
- Complies with the current standards for rail vehicles (EN 50155, EN 45545-2 and EN 61373)



Nominal voltage	24 VDC
Nominal power - Basic-Line	5 W @ 24 VDC per 1 m
Nominal power - Pro-Line	7 W @ 24 VDC per 1 m
Operating temperature	-40 ... +85 °C
Degree of protection	IP67
Visible external dimensions (L x W x H)	Individual





The rounded housing design allows the light signals to be seen from all sides.

SIGNAL LIGHTS SERIES SL AND TL MAXIMUM EFFICIENCY AND LUMINOSITY

The SL series and TL series signal lights are often used to indicate the door status in buses or trains. Passengers thus know when the door will open or close. TSL-ESCHA's signal lights are suitable for the door area on both the interior and exterior of public transport vehicles.

- Low installation height
- Optimal brightness and recognition according to intended usage
- Signaling to passengers or to operating personnel
- Robust housing technology, high degree of protection and wide operating temperature range
- Proven chemical resistance to many surface cleaners
- Complies with the current standards for rail vehicles (EN 50155, EN 45545-2 and EN 61373)

SLE161, SLE162, SLE163

NEW GENERATION OF SIGNAL LIGHTS

The SLE161 and SLE162 signal lights are versatile due to their extremely flat, compact dimensions (only 15 millimeter high) and convince with a modern design.

TSL-ESCHA has launched the next generation of signal lights with the SLE161, SLE162 and SLE163. The SLE161 is a variant with 10 LEDs and the SLE162 with 20 LEDs. As with the SLE161, a lateral reflector can be selected for even better lateral detectability. In appearance, the SLE161 differs insignificantly from the previous model. The SLE162 provides an even more uniform and homogeneous illumination due to 20 LEDs. It is also possible to use 2 x 20 LEDs in two colors

(red/green or red/white) to display different statuses on the entire illuminated surface. A color-neutral cover is then used for this.

The new SLE163 has two separately controllable LED chambers and can also be used as a door status indicator.

Two mounting options (front or rear) are provided. An optional mounting adapter is available to replace older or obsolete types of signal lights that were previously installed. There is an optional mounting adapter that allows the SLE16n series to be used as a replacement for various old devices.



SLE161



- 10 LEDs, successor of the SLE160
- Light colors: red, yellow, green, blue and white (unicolor)
- Variant for use as side indicator light for trams with E1 approval from the German Federal Motor Transport Authority

SLE162



- 20 LEDs for an even more uniform and homogeneous illumination
- Light colors: red, yellow, green, blue and white (unicolor)
- Bicolor light colors: red/green and red/white (with white cover)

SLE163



- 9 + 9 LEDs can be controlled in segments
- Light colors red, green, yellow, blue and white in any possible combination
- Can be used as a door status indicator

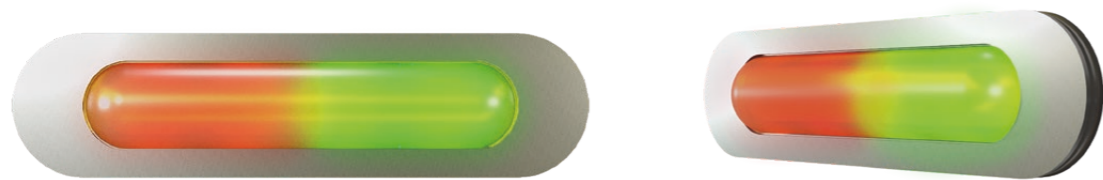


Nominal voltage	24, 72 or 110 VDC
Nominal power	2.5 ... 5 W
Operating temperature	-40 ... +60°C
Degree of protection	IP44 (interior) or IP67
Visible external dimensions (L x W x H)	160 x 56 x 15 mm

SLE150

STAINLESS STEEL FRONT COVER

- Front mounting on the outside and inside of rail vehicles or turnstiles
- Flat construction type with robust glass cover
- Separately controllable bicolor field as an option
- Luminous colors: red, yellow, green; bicolor version red-green, red-white
- Good recognition from all directions
- Special feature: Stainless steel front cover, Glass diffusing lens
- Diffusing lens also in flat design

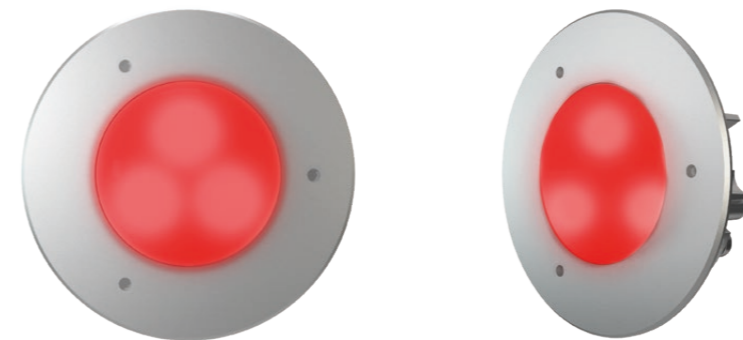


Nominal voltage	24 ... 110 VDC
Nominal power	2,5 W @ 24 VDC depending on the LED color
Operating temperature	-40 ... +70 °C
Degree of protection	IP67
Visible external dimensions (L x W x H)	200 x 50 x 15 mm

SLK50

GLASS DOME WITH 50 MM DIAMETER

- For signaling or illumination in a spherical glass dome
- Flat construction type with robust, highly-curved glass cover (glass height of 14 mm)
- Luminous colors: red and white
- Beam angle of 120° through spherical body ensures ideal recognizability



Nominal voltage	24 ... 36 VDC
Nominal power	2 W @ 24 VDC
Operating temperature	-40 ... +50 °C
Degree of protection	IP67
Visible external dimensions (D x H)	Ø90 x 14 mm

SL63 FLAT DIFFUSING LENSES

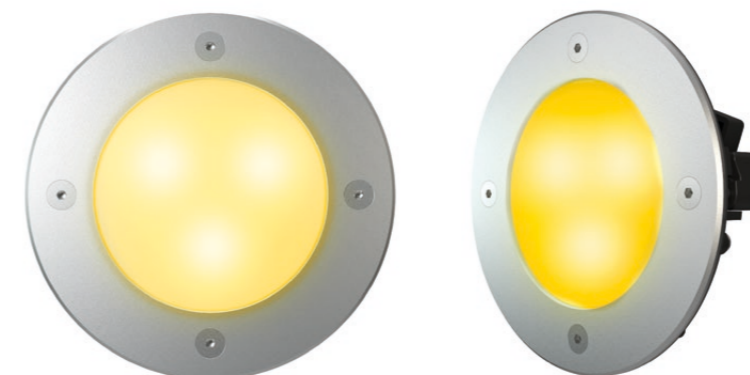
- For signaling with transparently colored or clear diffusing lens with circular visual effect
- Flat construction type with robust, curved diffusing lens (glass height of 3 mm)
- Stainless steel front panel
- Luminous colors: red, yellow, green, blue, white and red-green
- Separately controllable LED colors as an option
- Special feature: ideal for low passage heights



Nominal voltage	24 or 110 VDC
Nominal power	3 W @ 24 VDC or 4 W @ 110 VDC depending on the LED color
Operating temperature	-40 ... +80 °C
Degree of protection	IP67
Visible external dimensions (D x H)	Ø100 x 5 mm

SLE63 RAISED DIFFUSING LENSES

- For signaling with transparently colored or clear glass lenses with circular visual effect
- Flat construction type with robust, raised glass cover (glass height of 11 mm)
- Stainless steel front panel
- Luminous colors: red, yellow, green, blue, white and red-green
- Special feature: Very good lateral visibility with low installation height



Nominal voltage	24 or 110 VDC
Nominal power	3 W @ 24 VDC or 4 W @ 110 VDC depending on the LED color
Operating temperature	-40 ... +80 °C
Degree of protection	IP67
Visible external dimensions (D x H)	Ø100 x 14 mm

SLK63

BEST VISIBILITY DUE TO DOMED SHAPE

- For signaling with transparently colored or clear hemisphere glass lenses with circular visual effect
- Flat construction type with robust, hemispherical glass cover (glass height of 22 mm)
- Stainless steel front panel
- Luminous colors: red, yellow, green, blue, white and red-green
- Separately controllable LED colors as an option
- Special feature: frequently used entrance light in the train, optimal lateral visibility thanks to the hemispherical glass



Nominal voltage	24 or 110 VDC
Nominal power	3 W @ 24 VDC or 4 W @ 110 VDC depending on the LED color
Operating temperature	-40 ... +80 °C
Degree of protection	IP67
Visible external dimensions (D x H)	Ø100 x 25 mm

The SLK63 has a glass height of 22 millimeters.



TL80

USE AS STEP LIGHT IN DOOR AREA

- Housing stepped to ensure flush back-side mounting in claddings
- Robust glass cover
- Various glass covers available
- Luminous colors: red, blue, white
- Beam angle of 120°, 80° or diffuse
- Special feature: plastic housing, fully encapsulated
- Perfectly suited as step lighting in the door area
- Various cable outlets



Nominal voltage	24 or 110 VDC
Nominal power	3 W @ 24 VDC
Operating temperature	-40 ... +50 °C
Degree of protection	IP67
Visible external dimensions (L x W)	80 x 20 mm

TL83

VERSATILE DUE TO FLAT DESIGN

- Housing stepped to ensure flush back-side mounting in claddings
- Various glass covers available
- Flat housing with robust glass cover
- Flat design also enables use as a surface-mounted variant
- Luminous colors: red, blue, white
- Beam angle of 120°, 80° or diffuse
- Special feature: die-cast aluminum housing
- Can be used in construction site and fire fighting vehicles
- Various cable outlets



Nominal voltage	24 VDC
Nominal power	4 W @ 24 VDC depending on the LED color
Operating temperature	-40 ... +50 °C
Degree of protection	IP67
Visible external dimensions (L x W)	80 x 20 mm

M-DOOR SL40SD SEMI DOMED

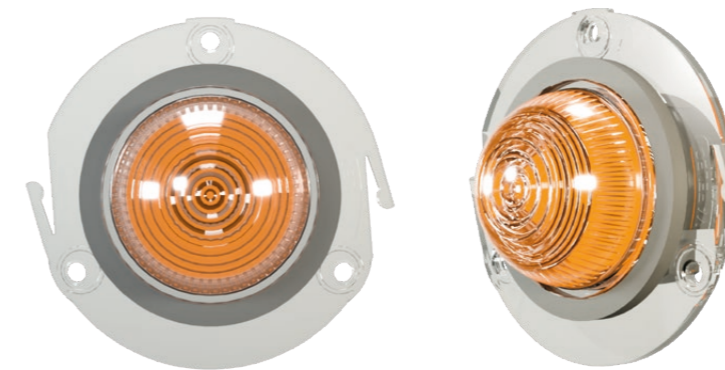
- LED signal light for door areas based on the M-Door range of push buttons and indicators
- Hemispherical lens with a diameter of 40 millimeters
- Single color or bicolor
- Steady or blinking illumination
- Visible in all directions
- Front or rear mounting
- Large variety of bezels: form, color and material according to the M-Door range
- Cable output



Nominal voltage	24, 72 or 110 VDC
Nominal power	1 W @ 110 VDC
Operating temperature	-40 ... +85 °C
Degree of protection	IP67 front, IP65 rear
Visible external dimensions (D x H)	Ø45 x 16.5 mm (without bezel)

M-DOOR SL40D DOMED

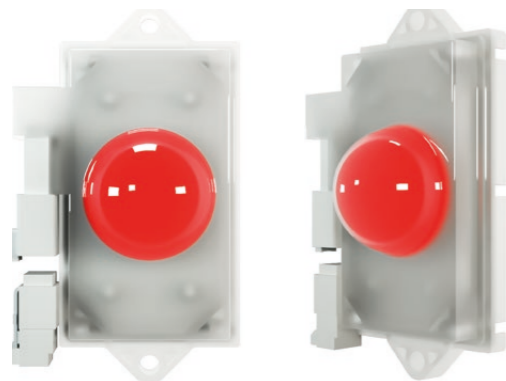
- LED signal light for door areas based on the M-Door range of push buttons and indicators
- Hemispherical lens with a diameter of 40 millimeters
- Single color or bicolor
- Steady or blinking illumination
- Visible in all directions
- Front or rear mounting
- Large variety of bezels: form, color and material according to the M-Door range
- Cable output



Nominal voltage	24, 72 or 110 VDC
Nominal power	1 W @ 110 VDC
Operating temperature	-40 ... +85 °C
Degree of protection	IP67 front, IP65 rear
Visible external dimensions (D x H)	Ø45 x 24.5 mm (without bezel)

SLV40 FOR DOOR STATUS INFORMATION

- LED signal light for interior installation next to the door
- Ø40 mm domed lens
- Single color: red or yellow, other colors and bicolor versions on demand
- Visible in all directions
- 19 LEDs for improved visibility
- Steady or blinking illumination
- Rear mounting
- Integrated Deutsch DT04-2P connector



Nominal voltage	24, 36, 72 or 110 VDC
Nominal power	3 W @ 110 VDC
Operating temperature	-40 ... +85 °C
Degree of protection	IP65 front, IP54 rear
Visible external dimensions (D x H)	Ø40 x 24.5 mm

SLT92 HIGH VISIBILITY

- LED signal light for outside integration, above train doors
- Trapezoidal lens on 92 x 92 mm base
- Single color: red, yellow, green, blue, white
- Bicolor version on demand
- 24 LEDs placed in three different orientations for high visibility in all directions
- Steady or blinking illumination
- Front mounting
- Tab connection or cable output



Nominal voltage	24, 36, 72 or 110 VDC
Nominal power	3 W @ 110 VDC
Operating temperature	-40 ... +85 °C
Degree of protection	IP65 front
Visible external dimensions (L x W x H)	92 x 92 x 40 mm

DOOR INDICATOR LIGHT PL13

MULTICOLORED AND RECOGNIZABLE

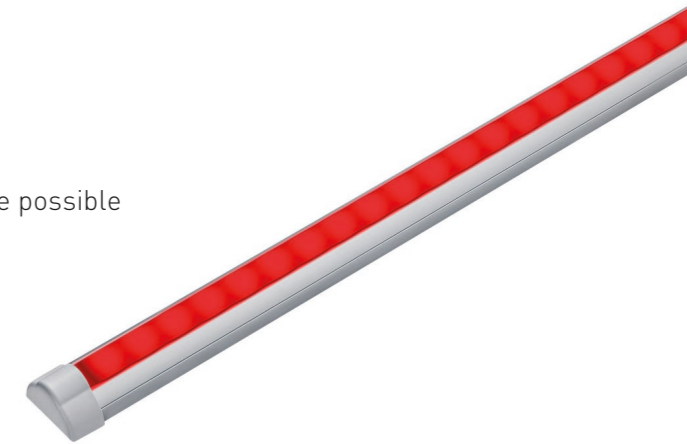
TSL-ESCHA's door indicator light PL13 is used in the interior of rail vehicles on the door cove. It is an information and signal light. The optimal visibility of the PL13 provides passengers more safety and comfort when boarding and alighting.

The door indicator light PL13 features four luminous colors. The door that will open can even be indicated before the stop on bidirectional vehicles, thereby speeding up boarding and exiting.

Thanks to its rounded housing design, TSL's door indicator light PL13 is easily recognizable, even from different viewing directions. The integrated light diffuser reduces extreme contrasts between light and shadow and emits a soft light.

The PL13's power supply is housed inside the cove. The light is first mounted on the outside of the cove. This TSL series is particularly robust and resistant to shock and vibration.

- Good visibility of the light signals
- Usually mounted above the door area on the door cove
- Light diffuser emits soft light
- Four display colors possible*
- Light colors from the color spectrum red, green, blue and white possible
- Controlled like LS Basic-Line or LS Pro-Line
- Resistant to shock and vibration
- Complies with the current standards for rail vehicles (EN 50155, EN 45545-2 and EN 61373)



Nominal voltage	24 VDC
Nominal power - Basic-Line	5 W @ 24 VDC per 1 m
Nominal power - Pro-Line	7 W @ 24 VDC per 1 m
Operating temperature	-25 ... +55 °C
Degree of protection	IP20
Visible external dimensions (L x W x H)	509 or 1009 x 30 x 22 mm



***e.g.:**
red - door closing
yellow - exit on this side
green - door opening
blue - service



HANDRAIL LIGHTING

PERFECT COMBINATION OF AESTHETICS AND FUNCTIONALITY

Leveraging their expertise in LED technology, TSL-ESCHA has introduced two versions of handrail lighting specifically designed for rail vehicles: the HL22 and HL18. The HL22 is another joint project between TSL-ESCHA and MAFELEC.

These lighting solutions blend seamlessly into the vehicle's design, providing a modern appearance and enhancing the interior ambiance. Positioned strategically in the door areas, the handrail lights function as orientation aids for passengers, improving transfer efficiency and ensuring safe and comfortable boarding and alighting. This reduces wait and dwell times at stops. It is also possible to use colored light (red and green) to clearly signal the opening and closing of doors to increase safety when entering and exiting the vehicle.

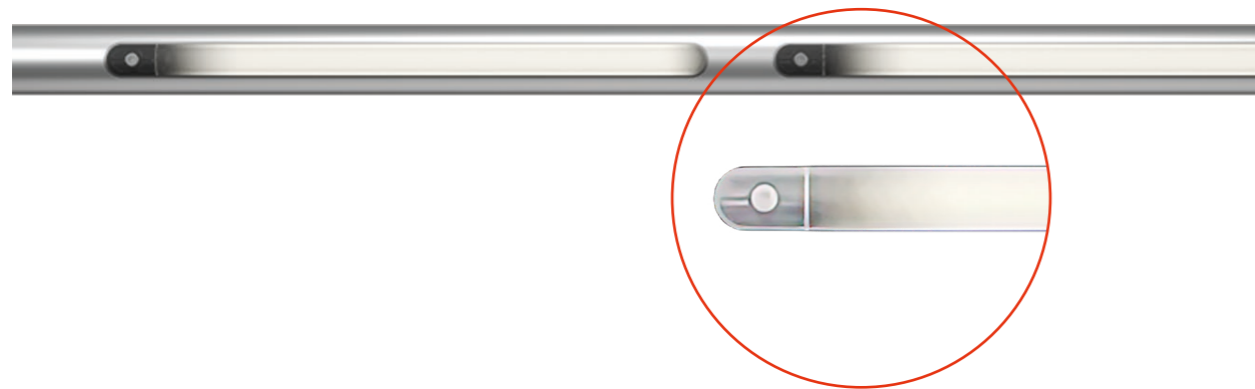
TSL-ESCHA and MAFELEC set new standards in the industry with their commitment to innovative, customized solutions. Their goal is to continually push the boundaries of technology and provide customers around the world with durable and reliable products. Innovative ideas and solutions can make public transportation even safer and more comfortable, and elevate the travel experience for passengers.



>> The new handrail lights offer a perfect combination of functionality and aesthetics <<

HANDRAIL LIGHT HL18 RETROFIT OPTION

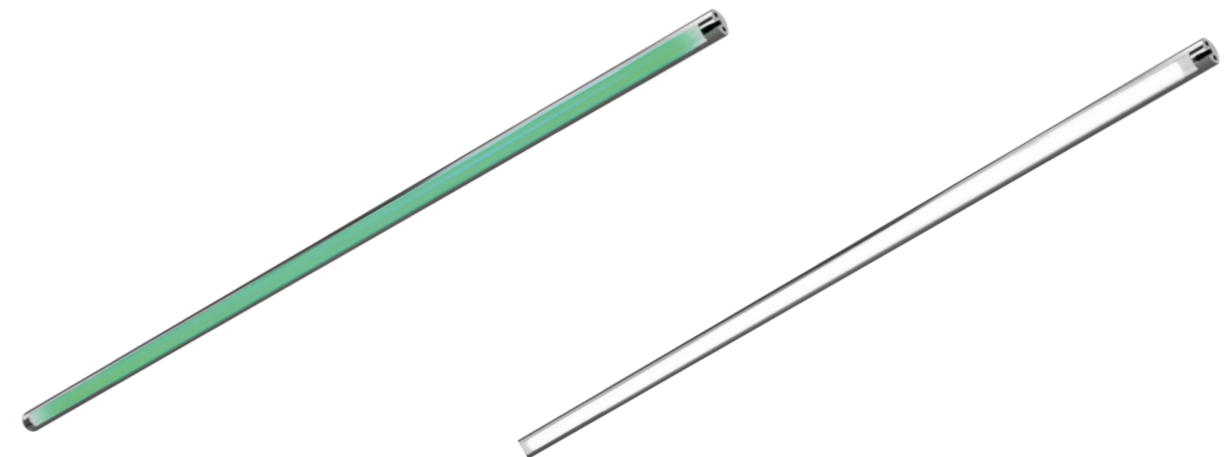
- For installation or retrofitting in handrails
- Optimum indirect lighting of the door side panel possible
- Only longitudinal milling required as mounting cutout for mechanical integration
- Flush and sealed mounting in handrails with IP54 degree of protection
- Can also be used as signal light in red and green



Nominal voltage	24 VDC
Nominal power	0,7 W @ 24 VDC, 5.000 K, CRI >80, 650 cd/m ²
Operating temperature	-40 ... +70 °C
Degree of protection	IP54
Luminous colors	red, green, white

HANDRAIL LIGHT HL22 ALL-IN-ONE SOLUTION

- The light strip is installed directly in the retaining bar and supplied as a complete assembly
- Special stainless steel profile shaped for light strips with maximum stability
- Homogeneous light emission thanks to fixed diffuser profile
- The strength of the retaining bar is ensured by an individual profile contour
- Aesthetic and functional, perfect integration into the interior of the rail vehicle



Nominal voltage	24 VDC ±10%
Nominal power	7 W @24 VDC for HL22x11 with LSE12x08, 11 W @24 VDC for HL22x13 with LSE12x12, 12 W @24 VDC for HL22x14 with LSE12x13
Operating temperature	-40 ... +70 °C
Degree of protection	IP67 for LSE12
Luminous colors	red, green, yellow, white (upon customer request)

LED LIGHT VL55 IN DOOR COVE SIGNALS AND ILLUMINATES

The VL55 LED light by TSL-ESCHA is intended for installation in the overhead area of the door entrance in the interior. It is the ideal combination of signal light and door illumination. This LED lighting was custom-developed for a railway vehicle's door cove.

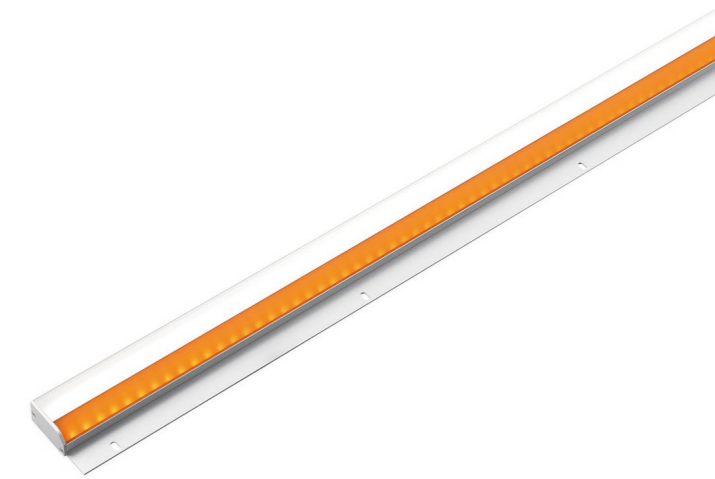
The vehicle's entrance area is illuminated according to EN 13272-2, with at least 75 lux, in the same luminous color of the interior lighting and without dark fields. The VL55 even reaches an illuminance of 200 lux at a distance of two meters. The LED signal light

points into the interior of the vehicle. The idea is to ensure greater safety and comfort.

The color of the VL55 LED can be tailored to suit customer-specific requirements. Various colors, such as red or orange, can be used to provide passengers with targeted warning information. The light and signal colors can be parameterized.

This type of LED light is designed for typical railway requirements, both electronically and mechanically.

- Single light - double benefit: Illumination and signaling
- Optimum illumination of the entrance area from above
- Safe and clearly visible signaling of door movement in the direction of passengers
- Light/signal colors can be parameterized and changed on request, even after installation
- Up to 1.80 meter long, with unobtrusive design
- Non-visible fastening in cove flap
- Light fastened and connected to the PCU in the door cove
- Complies with the current standards for rail vehicles (EN 50155, EN 45545-2 and EN 61373)



Nominal voltage	24 VDC
Nominal power	38 W @ 24 VDC in 1.2 m
Operating temperature	-25 ... +55 °C
Degree of protection	IP20
Visible external dimensions (L x W x H)	~ 600 ... ~ 1800 x 55 x 25 mm

VL30 EFFICIENT AND BICOLOR

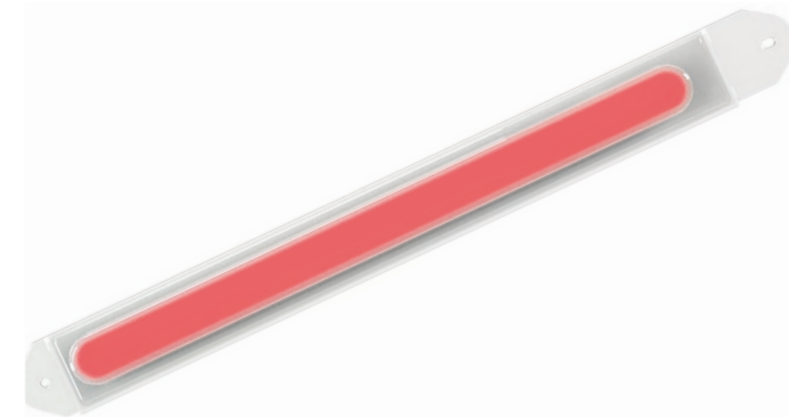
The VL30 light is a LED signaling solution specifically designed for integration into the overhead panels of railway doors. It is used to give an indication of the status of the door.

With single or dual color lighting, fixed or flashing, this product can be adapted to the various requirements of operators. The design ensures uniform, spotless illumination along the entire length of the product, as well as a high luminance of around 400 cd/m². All this while maintaining low power consumption.

Its slim design allows it to integrate perfectly into its environment while remaining highly visible and thus promoting passenger safety.

Available in 72 or 110 VDC +25 %/-30 %, designed according to railway normative requirements, it is particularly adapted to Metros and EMUs as it does not require the addition of a power converter.

- Standard visible length: 365 mm
- Improved visibility of door status
- Homogeneous lighting
- High luminance level (>400 cd/m²)



Nominal voltage	72 or 110 VDC
Nominal power	6 W @ 110 VDC
Operating temperature	-25 ... +70 °C
Degree of protection	IP54
Visible external dimensions (L x W)	30 x 365 mm

MULTI-PURPOSE LIGHT SLR120

OPTICAL AND ACOUSTIC

As the name of the multi-purpose light SLR120 suggests, this TSL product can be combined in many ways. A signal light ring with an outer diameter of 120 millimeters serves as the basis. An optional sounder, such as WM87 and PKW21, or stainless steel panel can be integrated in the inner diameter. A push button with the same hole dimensions, such as the Presskey, can also be combined with the SLR120.

TSL-ESCHA's multi-purpose light SLR120 is used in public transport vehicles. This product can be installed in the door cove inside and on

the wall panel outside. The big advantage for rail operators: The combination of a signal light ring and acoustic warning sounder informs passengers both visually and acoustically about the opening and closing processes of the door, thus promoting passenger safety.

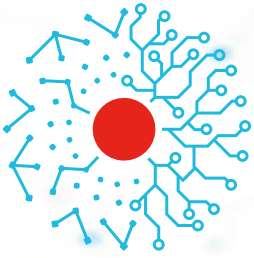
The SLR120 also saves space, as it compactly combines the signal light ring and acoustic warning sounder products. This in turn reduces the installation effort and costs. The fully encapsulated electronics with 40 LEDs provides for surprisingly bright illumination.

- Suitable for a combination of signal light and sounder
- Three color display options available: red, green, red-green alternating
- Application area in the door cove or outside on the wall panel
- Proven chemical resistance to many surface cleaners
- Can be mounted from the front or back side and comes equipped with a cable outlet for optional plugs
- Complies with the current standards for rail vehicles (EN 50155, EN 45545-2 and EN 61373)



Nominal voltage	24 or 110 VDC
Nominal power	ca. 1.2 W @ 24 VDC or 2.2 W @ 110 VDC
Operating temperature	-40 ... +80 °C
Degree of protection	IP67
Visible external dimensions (D x H)	Ø121 x 15 mm





MAFELEC TEAM

CREATING **TOGETHER** SMART AND SUSTAINABLE INTERFACES

HMI INTERIOR AND EXTERIOR

- DOOR EQUIPMENT
- PASSENGER COMFORT
- SANITARIES
- DRIVER DESK
- SAFETY SOLUTIONS

DETECTION & PROTECTION

- VOLTAGE & CURRENT SENSORS
- CIRCUIT BREAKERS
- INSULATORS AND BUSHINGS
- POWER SWITCHES

LIGHTING INTERIOR AND EXTERIOR

- FRONT LIGHTING
- INTERIOR LIGHTING
- EXTERIOR LIGHT SIGNATURE



MAFELEC
471, Route de la Cuisinière | 38490 Chimilin | France
T +33 4 763 207 33 | contact@mafelec.com
www.mafelec.com



TSL-ESCHA GmbH
Post office box 1134 | 58541 Halver | Germany
T +49 2353 66796-0 | info@tsl-escha.com
www.tsl-escha.com

MEMBERS OF THE MAFELEC TEAM

