MAFELEC

TSL-ESCHA

# 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.

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LED SIGNAL LIGHTS

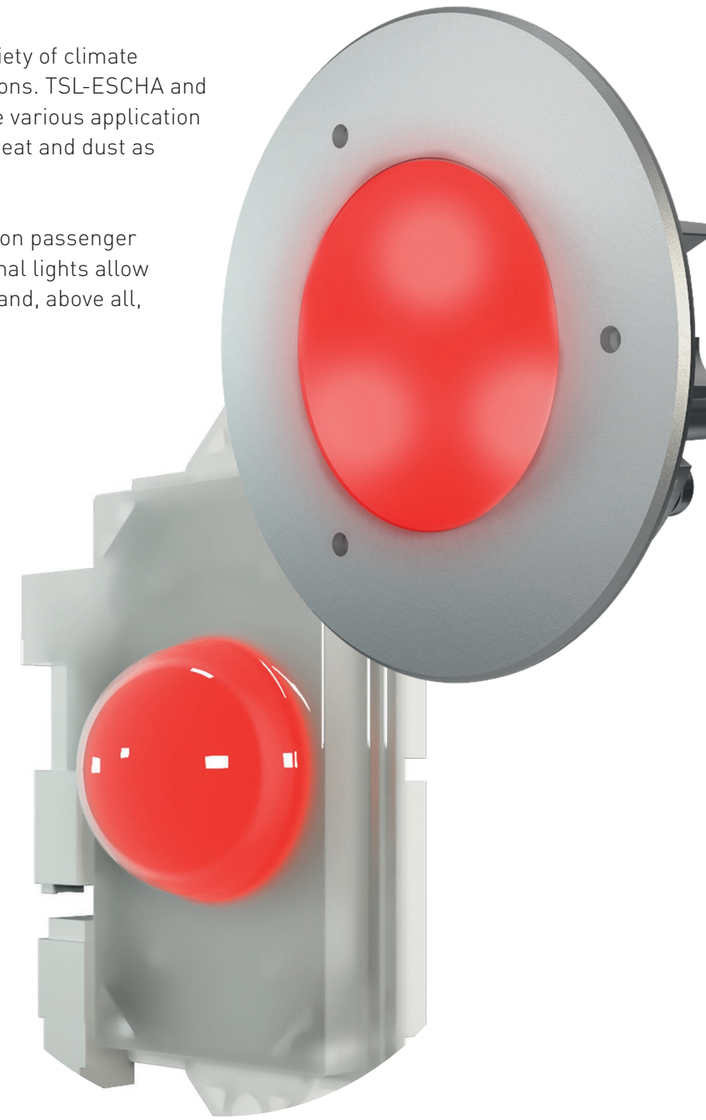


# LED SIGNAL LIGHTS
## FOR DIFFERENT APPLICATION AREAS

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 development
- Durability



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 indicates the signaling at the door during the opening and closing process
- Adaptation to customer-specific vehicles 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

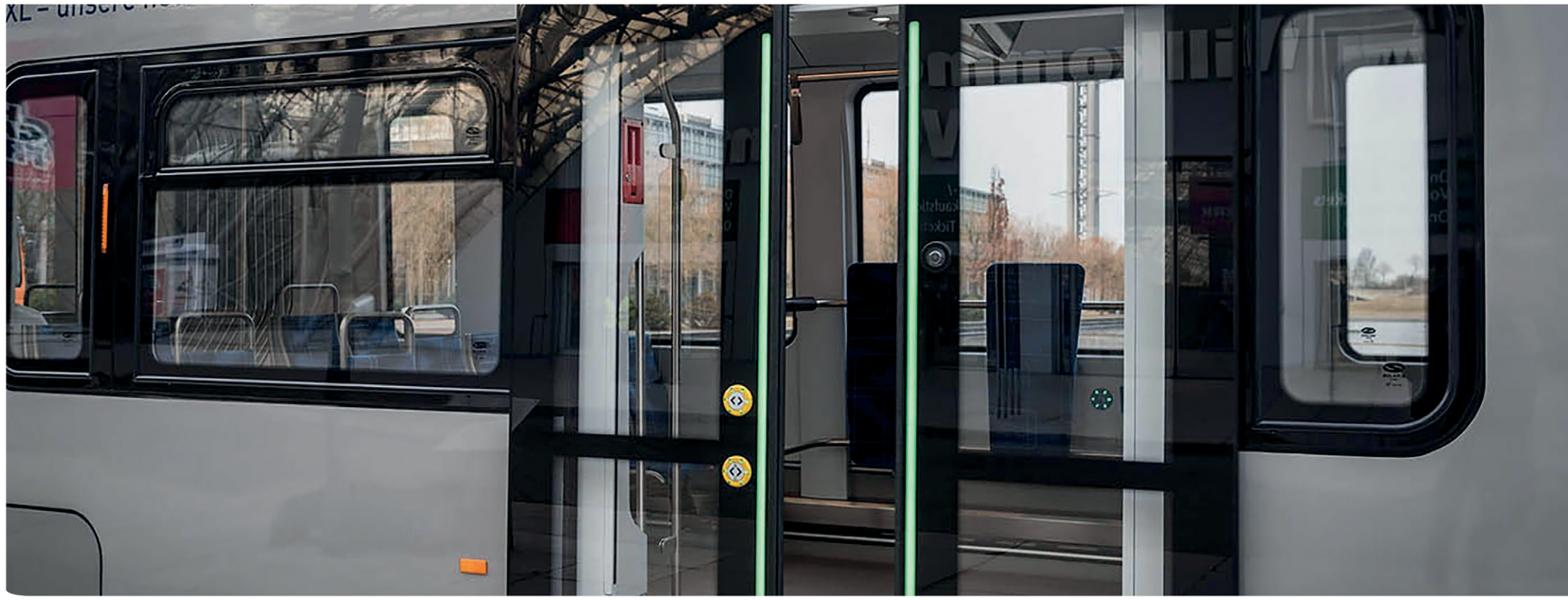
The adaptability of the LED light strips is what makes them particularly impressive. Every LS system is a customized solution, as this series is based on the individual installation requirements of different door systems. During the design phase, there is an intensive exchange with manufacturers and 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 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 ±30 %. There are 15 different configurations possible. Different light colors can be mixed from red, green and blue and are also dimmable.
- 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 and cannot be 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 | 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 (here for the SLE161) ensures optimal recognition, because the warning signal can be seen from different angles.

# 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.

- 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)

# **SLE160, SLE161, SLE162**
# 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 and SLE162.

The SLE161 and SLE162 replace the previous SLE160, which is now only available with red light color. 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 with two colors (red/green or red/white) to indicate different states. A white cover is then used for this. Thanks to new, efficient LEDs, the signal light is even better to see and illuminates more homogeneously.

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. The black colored adapter increases the contrast and also allows the signal light to protrude by 26 Millimeter, which further increases lateral visibility.

SLE160

- 10 LEDs
- Light color: only available with red light color

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

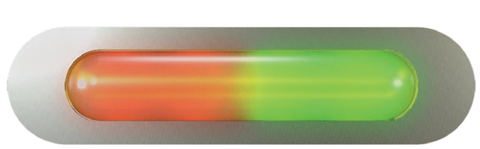
SLE162

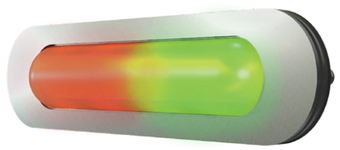
- 20 LEDs for an even more uniform and homogeneous illumination
- Light colors: red, yellow, green, blue and white (unicolor)
- Bicolor light colors: red/green and red/white (with white cover)

| | |
|---|---|
| Nominal voltage | 24 or 110 VDC |
| Nominal power | Red:3 W @ 24 VDC or 5 W @ 110 VDC; yellow: 3 W @ 24 VDC, 2,5 W @ 110 VDC; white: 5 W @ 110 VDC; red/green: 5 W @ 110 VDC |
| 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

- Surface mounting on the inside or outside 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

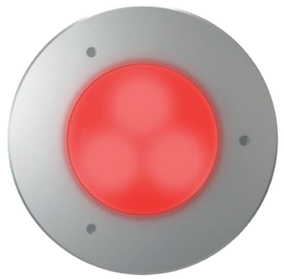




| | |
|---|---|
| Nominal voltage | 24 ... 110 VDC |
| Nominal power | 2,5 W @ 24 VDC depending on the LED color |
| Operating temperature | -40 ... +70 °C |
| Degree of protection | IP67 |
| Visible external dimensions (L x W x H) | 200 x 50 x 15 mm |

## SLK50
# GLASS DOME WITH 50 MM DIAMETER

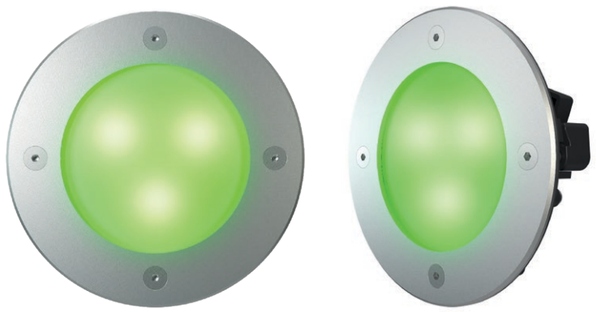
- For signaling or illumination in a spherical glass dome
- Flat construction type with robust, highly-curved glass cover (glass height of 14 mm)
- Luminous colors: red and white
- Beam angle of 120° through spherical body ensures ideal recognizability
- Compact in design with smaller dimensions than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



| | |
|---|---|
| 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
# IDEAL FOR LOW DOOR FRAMES

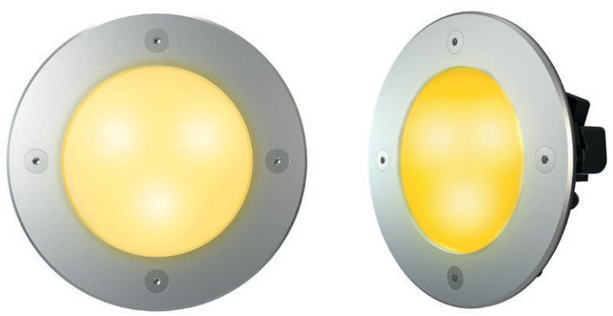
- For signaling with transparently colored or clear glass lenses with circular visual effect
- Flat construction type with robust, curved glass cover (glass height of 3 mm)
- Separately controllable LED colors as an option
- Luminous colors: red, yellow, green, blue, white and red-green
- Special feature: ideal for low door frames



| | |
|---|---|
| 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 GLASS COVER INCREASES VISIBILITY

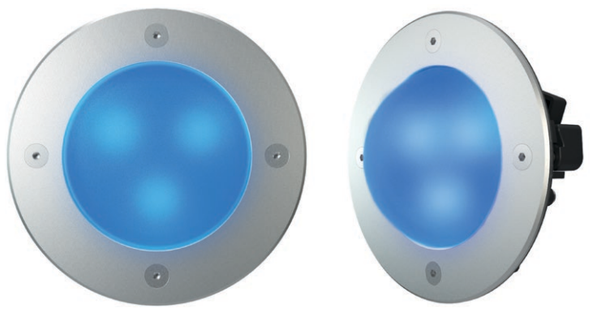
- For signaling with transparently colored or clear glass lenses with circular visual effect
- Flat construction type with robust, raised glass cover (glass height of 11 mm)
- Luminous colors: red, yellow, green, blue, white and red-green
- The more pronounced the glass curvature, the better the lateral recognition
- Special feature: Installation on the interior and exterior door area, for example in the door cove, door leaf or as a ramp light



| | |
|---|---|
| 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 glass lenses with circular visual effect
- Flat construction type with robust, domed glass cover (glass height of 22 mm)
- Separately controllable LED colors as an option
- Luminous colors: red, yellow, green, blue, white and red-green
- The more pronounced the glass curvature, the better the lateral recognition
- Special feature: popular as an entrance light in the train, optimal lateral visibility thanks to the hemispherical glas



| | |
|---|---|
| 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
- Flat construction type with robust glass cover
- Ideal for signaling
- Luminous colors: red, blue, white
- Beam angle of 120°, 80° or diffuse
- Special feature: plastic housing
- Perfectly suited as step light in the door area

| | |
|---|---|
| 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
- 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

| | |
|---|---|
| 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

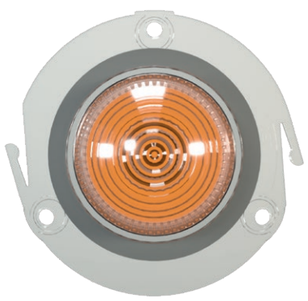
- LED signal light for door areas based on the M-Door range of push buttons and indicators
- Ø40 mm semi-domed lens
- Single color or bicolor
- Steady or blinking illumination
- Visible in all directions
- Front or rear mounting
- Large variety of bezels: form, color and material according to the M-Door 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

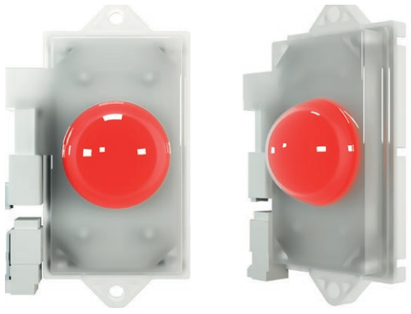
- LED signal light for door areas based on the M-Door range of push buttons and indicators
- Ø40 mm domed lens
- Single color or bicolor
- Steady or blinking illumination
- Visible in all directions
- Front or rear mounting
- Large variety of bezels: form, color and material according to the M-Door range
- 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 exterior 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
## ROBUST AND RECOGNIZABLE

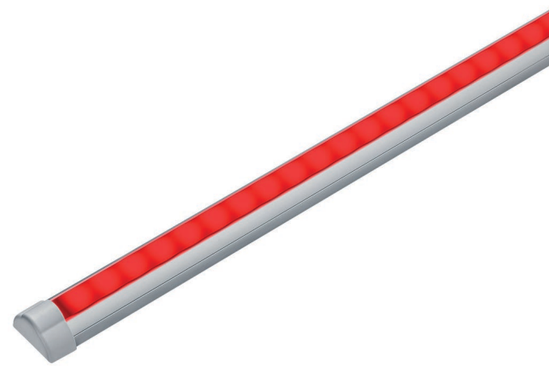
TSL-ESCHA's door indicator light PL13 is used in the interior of rail vehicles on the door cove. It is an information and signal light. The optimal visibility of the PL13 provides passengers more safety and comfort when boarding and alighting.

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. Then both components are screwed together. 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*
- Can be mounted from the inside and connected to a PCU as well as a cable outlet for optional plugs
- 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 | 6 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**

# LED LIGHT VL55 IN DOOR COVE
## SIGNALS AND ILLUMINATES

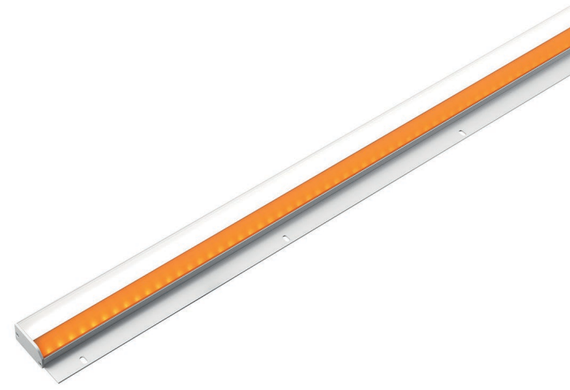
The VL55 LED light by TSL-ESCHA is intended for installation in the overhead area of the door entrance in the interior. It is the ideal combination of signal light and door illumination. This LED lighting was custom-developed for a vehicle's door cove.

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 around 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
- 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 ... ~ 1.800 x 55 x 25 mm |

# VL30
## EFFICIENT AND BICOLOR

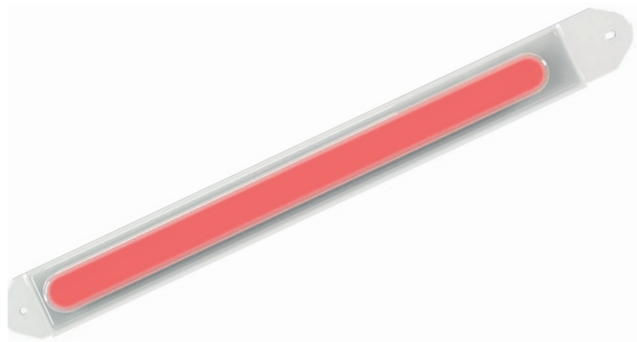
The VL30 light is a LED signaling solution specifically designed for integration into the overhead panels of railway doors. It is used to give an indication of the status of the door.

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/m$^2$. 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)
- Complies with railway standards



| | |
|---|---|
| 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 SMART AND
SUSTAINABLE INTERFACES

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

**DETECTION & PROTECTION**

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- CIRCUIT BREAKERS
- INSULATORS AND BUSHINGS
- POWER SWITCHES

**LIGHTING**
**INTERIOR AND EXTERIOR**

- FRONT LIGHTING
- INTERIOR LIGHTING
- EXTERIOR LIGHT SIGNATURE

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