



*Catalog*  
**CRS**  
**Resistive**  
**Silicone Sensor**

Voltage Detectors  
for DC Catenary


**CRS**

## Resistive Silicone Sensor

- ✓ Voltage presence detector for catenary **V<sub>DC</sub>**
- ✓ Models from **750 V<sub>DC</sub>** to **4.000 V<sub>DC</sub>**
- ✓ **Aluminum** terminals and **Silicone** outer coating
- ✓ Leakage Line: **618mm**
- ✓ Output Options:
  - **Reed Relay**
  - **CBI21** – Output 4-20 mA
  - **FO** – Fiber Optic Output
  - **PTC-M1** – Current Voltage Presence Detector
  - **Led** – Light Indicator
  - **SMFR** – Semaphore
- ✓ Sensor weight: **1,2 Kg**
- ✓ Complete equipment weight: **2,25 Kg**
- ✓ **High resistance** to manipulation and vandalism
- ✓ Better weight, endurance, and shock resistance compared to epoxy-coated sensors
- ✓ Mounting accessories, waterproof case and **Stainless-Steel** screws with anti-vibration **Nord-Lock®** washers
- ✓ **Vertical assembly** with **M16** hexagonal screw adaptable to any installation, optional side support
- ✓ Optional SOP-008 for **beam anchoring for vertical mounting**. Adaptable to any installation. Approved by ADIF.



### Applications

Detection of DC Voltage presence in Railway Installations:

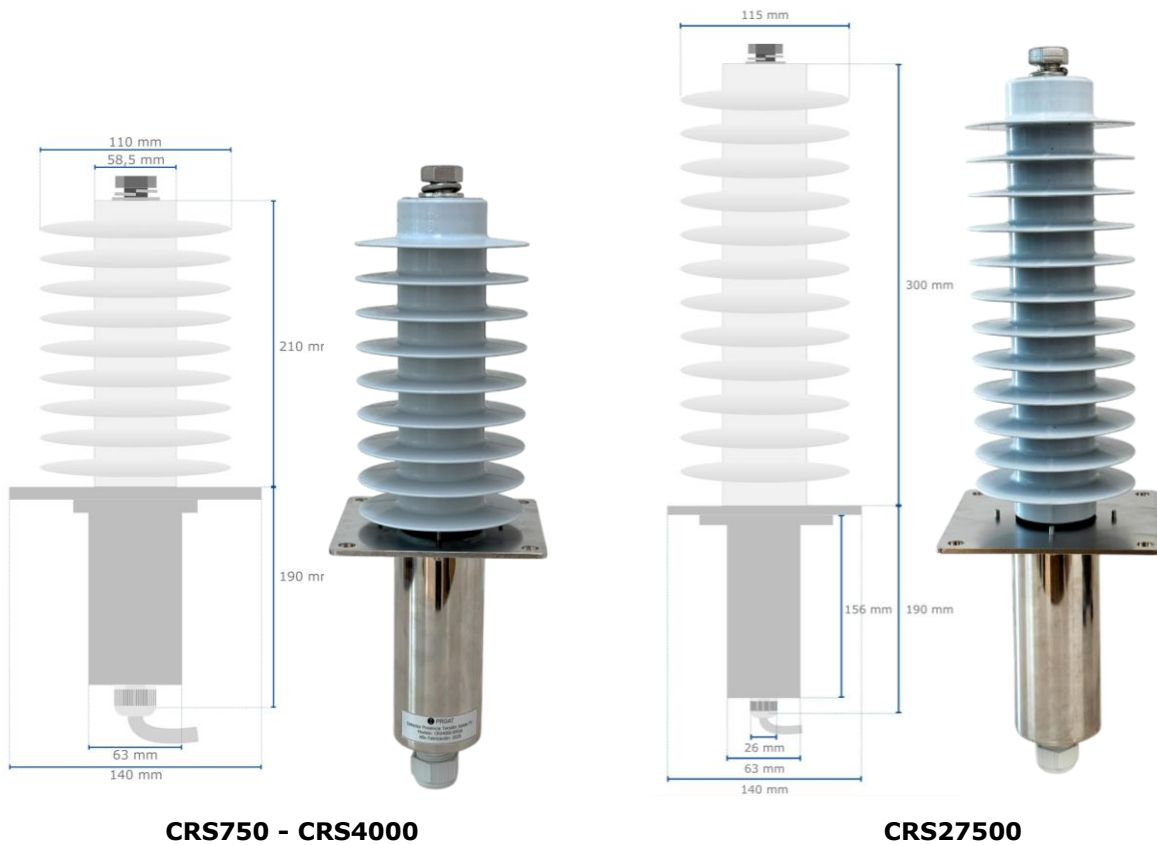
- Conventional Trains
- Metros
- Trams



## Models

Model	Voltage Service	Supports 27,5 kV <sub>AC</sub>	Test 1 min 50 Hz	Leakage Line	Pollution Zone	Sensor's Height	Sensor Weight
<b>CRS750</b>	0-750 V <sub>DC</sub>	No	4 kV <sub>DC</sub>	618mm	Average	210mm	1,2 kg
<b>CRS1500</b>	0-1500 V <sub>DC</sub>	No	5 kV <sub>DC</sub>	618mm	Average	210mm	1,2 kg
<b>CRS3000</b>	0-3000 V <sub>DC</sub>	No	10 kV <sub>DC</sub>	618mm	Average	210mm	1,2 kg
<b>CRS4000</b>	0-4000 V <sub>DC</sub>	No	10 kV <sub>DC</sub>	618mm	Average	210mm	1,2 kg
<b>CRS27500</b>	0-4000 V <sub>DC</sub>	Yes	10 kV <sub>DC</sub> y 50 kV <sub>AC</sub>	972mm	Average	300mm	1,8 kg

## Measurements

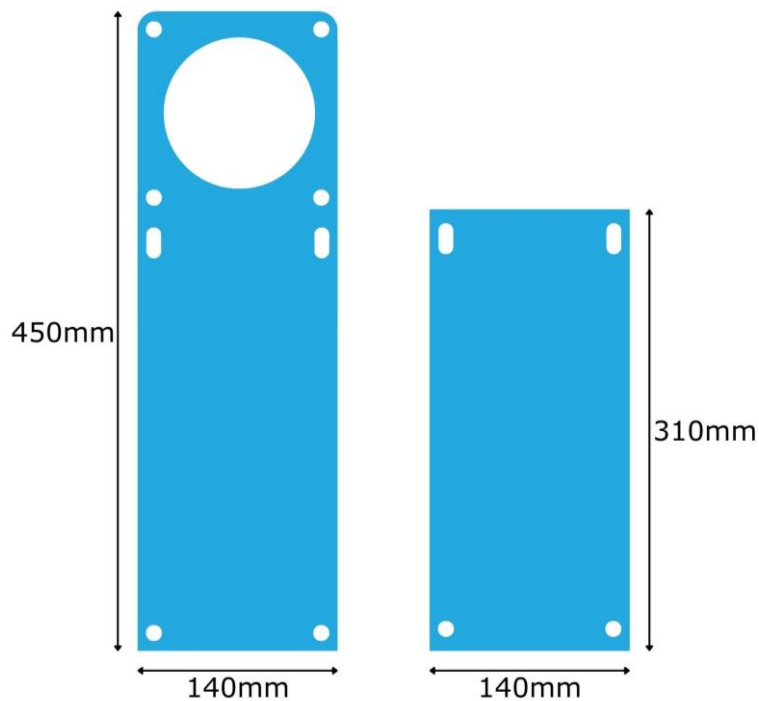
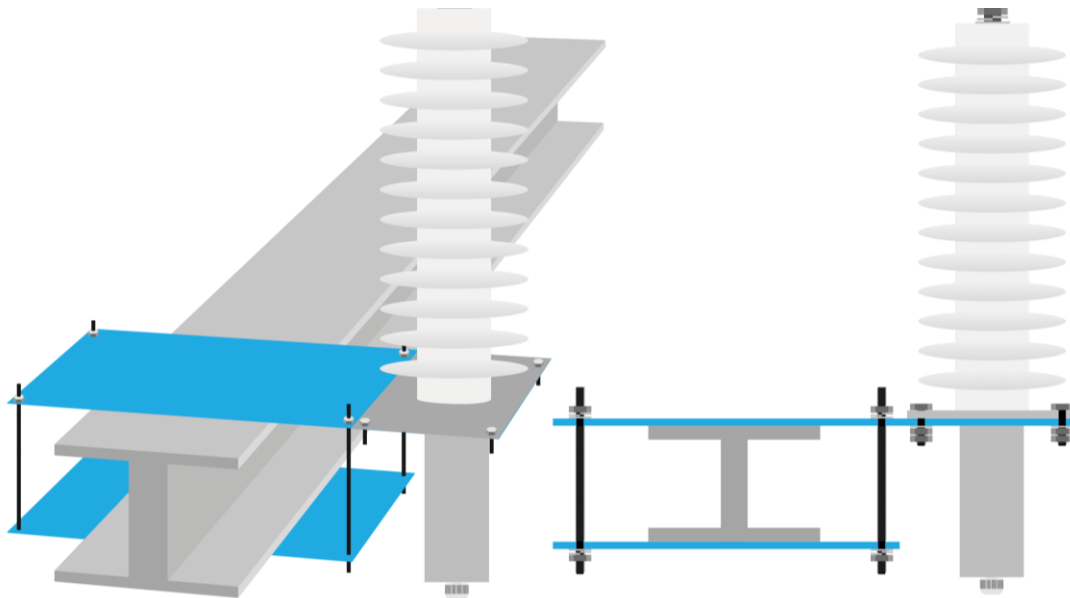


## Technical Data

<b>CRS</b>	
<b>Silicone</b>	<b>ISO 37</b>
Elongation upon impact	630 %
Resistance to traction	8,5 N/mm <sup>2</sup>

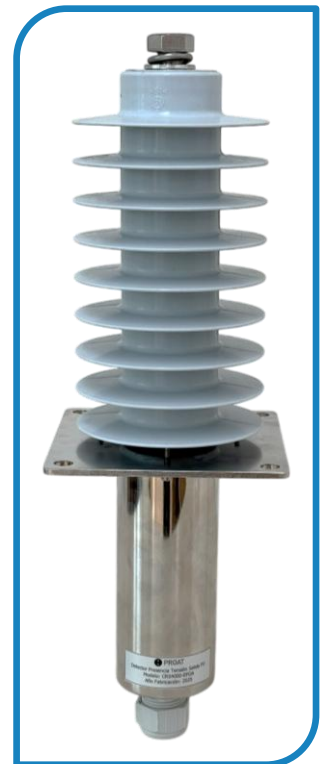
### Support – SOP-008

- Bracket for **mounting beam anchor**
- Adaptable to any installation
- **Approved by ADIF**
- Made of hot-dip galvanized steel **UNE EN ISO 1461**



# **CRS + RL** Resistive Silicone Sensor + Reed Relay Output

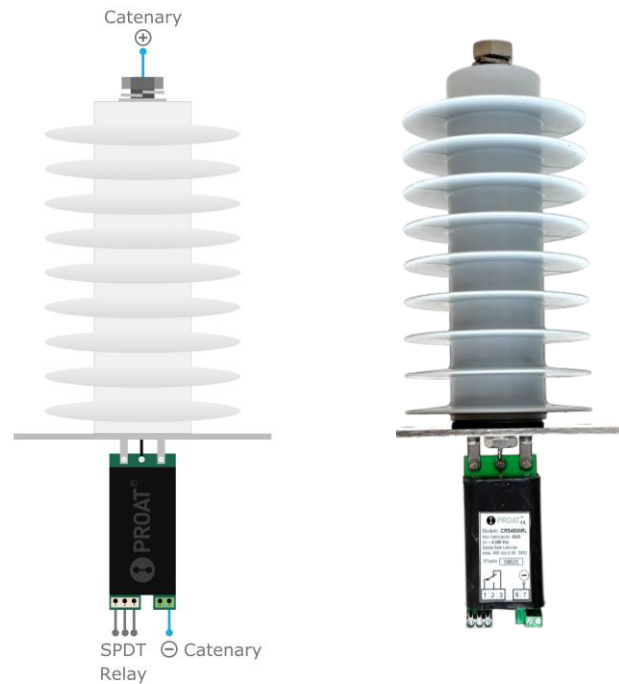
- ✓ Resistive Silicone Sensor **CRS**
- ✓ Reed Relay with **potential-free switched contact** output:
  - Activation at **>40%** of the nominal voltage
  - Deactivation at **<30%** of the nominal voltage
- ✓ **Self-powered** of the catenary voltage itself
- ✓ Very low power solution: **3mA**
- ✓ Response Time: **15ms**
- ✓ **Epoxy** coated circuit installed in waterproof case
- ✓ Approved by ADIF with Registration Number **64999051E** on 1-Sept-2016



## **Models**

Model	Nominal Voltage	Leakage Line	Output	Auxiliary Voltage
<b>CRS750 + RL</b>	750 V <sub>DC</sub>	618 mm	Reed Relay	Self-powered
<b>CRS1500 + RL</b>	1500 V <sub>DC</sub>	618 mm	Reed Relay	Self-powered
<b>CRS3000 + RL</b>	3000 V <sub>DC</sub>	618 mm	Reed Relay	Self-powered
<b>CRS4000 + RL</b>	4000 V <sub>DC</sub>	618 mm	Reed Relay	Self-powered

## Connection



## Technical Data

### Reed Relay

Specifications	
Contact Type	SPDT
Switching Capacity	<60 VA
Switching Voltage	<400 V <sub>AC</sub> / V <sub>DC</sub>
Switching Current	<1.0 A
Transport/Carrying Current	<2.0 A
Insulation Resistance	>10 <sup>9</sup> Ω
Operating Temperature	-40° a +125°

## Tests

Tests **Norm UNE 21138**:

- Mechanical flexural strength tests: 20N
  - Dry lightning impulse withstands voltage tests

Tests **Norm UNE 600068**:

- Corrosion test

Otros tests:

- Operating Temperature

# CRS + CBI21

## Resistive Silicone Sensor

+

## Output 4-20mA

- ✓ Resistive Silicone Sensor **CRS**
- ✓ Current loop converter **CBI21** with isolated **4-20mA** output proportional to catenary voltage
- ✓ Auxiliary voltage **85-264 V<sub>AC</sub> | 85-370 V<sub>DC</sub> , 48 V<sub>DC</sub> , 24 V<sub>DC</sub>** depending on model
- ✓ CRS+CBI21 withstands lightning impulses up to **95kV**
- ✓ Epoxy coated circuit installed in waterproof case

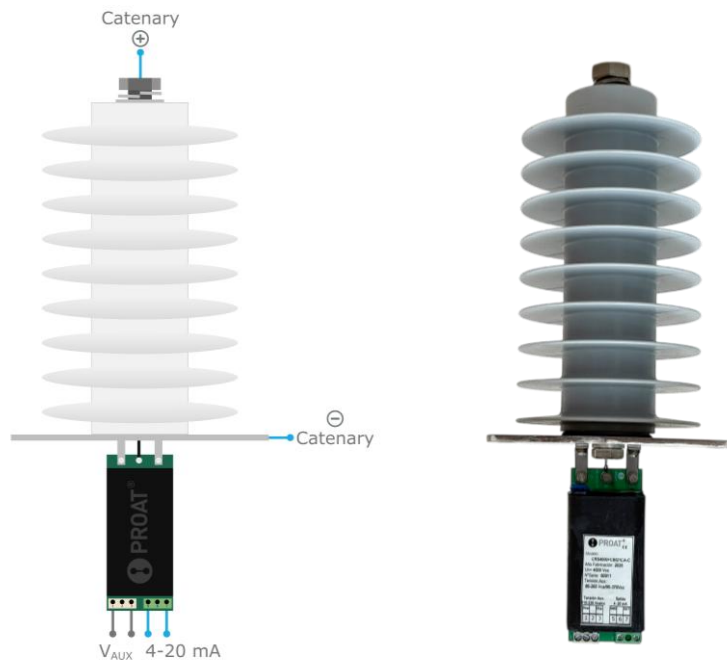


### Models

Model	Compatible Sensor	Output	Auxiliary Voltage
<b>CBI21-CA</b>	CRS750 to CRS4000	4-20mA	85-264 V <sub>AC</sub>   85-370 V <sub>DC</sub>
<b>CBI21-CA-24</b>	CRS750 to CRS4000	4-20mA	24 V <sub>DC</sub>
<b>CBI21-CA-48</b>	CRS750 to CRS4000	4-20mA	48 V <sub>DC</sub>
<b>CBI21-FA</b>	CRS27500	4-20mA	85-264 V <sub>AC</sub>   85-370 V <sub>DC</sub>
<b>CBI21-FA-24</b>	CRS27500	4-20mA	24 V <sub>DC</sub>
<b>CBI21-FA-48</b>	CRS27500	4-20mA	48 V <sub>DC</sub>

Example order: CRS4000 + CBI21-CA-24

## Connection



## Technical Data

### CBI21

Specifications	
Output (RL = 500 Ω)	4-20 mA
Maximum load resistance	750Ω
Linearity	1%
Accuracy	±1%
Consumption	3W
Input-Output isolation	3kV
Operating temperature	-30° to +75°

## Tests

### Tests **Norm UNE 21308-1:**

- Mechanical Testing
- Dry lightning impulse voltage tests
- Voltage tests supported at dry industrial frequency
- Voltage tests supported at industrial frequency in rain

### Tests **Norm UNE 600068:**

- Corrosion test

### Other Tests:

- Operating temperature
- Accuracy of voltage response

# **CRS + FO** Resistive Silicone Sensor + Fiber Optic Output

- ✓ Resistive Silicone Sensor **CRS**
- ✓ Fiber Optic Transmitter-Receiver **EFO** and **RFO**
- ✓ CRS+FO supports lightning impulses up to **95kV**
- ✓ The CRS + FO set is **ADIF** approved (DPA-FO) with reference number **2014/00067** on 29 January 2014
- ❶ **EFO – Fiber Optic Transmitter**
  - ✓ **Light pulse** output proportional to catenary voltage
  - ✓ Models for:
    - Fiber Optic with **SL connector** up to **100** meters
      - Fiber Optic with **ST connector** up to **5.000** meters
  - ✓ Linearity: **±5%**
  - ✓ **Self-powered or Auxiliary Voltage ±12V<sub>DC</sub>** depending on model
  - ✓ Optional **FA1212** ±12V<sub>DC</sub> power supply for voltages **85-264 V<sub>AC</sub> | 85-370V<sub>DC</sub>** with galvanic isolation input-output **18,5kV**
  - ✓ **Epoxy coated** circuit installed in waterproof cover
- ❷ **RFO – Fiber Optic Receiver**
  - ✓ With **Real-time display** of catenary voltage for Din Rail models
  - ✓ **2 potential-free** output contacts:
    - Presence of voltage – Programmable levels
    - Anomalies – Fiber Optic communication error
  - ✓ **Programmable levels** of the presence and absence of voltage contact for Din Rail models
  - ✓ **4-20mA** output proportional to the catenary voltage
  - ✓ Installation on **Din Rail** o **Rack Submodule 19'** depending on model
  - ✓ Auxiliary voltage **85-264 V<sub>AC</sub> | 85-370V<sub>DC</sub>** or **24 V<sub>DC</sub>**



### Models – Fiber Optic Emitters

Model	Fiber Optic	Auxiliary Voltage
<b>EFO</b>	SL Connector	Catenary Self-powered
<b>EFOA</b>	SL Connector	±12V <sub>DC</sub>
<b>EFO-LD</b>	ST Connector	Catenary Self-powered
<b>EFOA-LD</b>	ST Connector	±12V <sub>DC</sub>

Example order: CRS4000 + EFOA with Power supply FA1212-18 and compatible receiver RFOA-D

### Models – Fiber Optic Receivers

Model	Fiber Optic	Compatible Emitter	Installation	Real Time Visualization	4-20 mA Output	Output Contacts	Auxiliary Voltage
<b>RFO</b>	SL Connector	EFO	19' Rack Submodule	No	No	Yes	85-264 V <sub>AC</sub>   85-370 V <sub>DC</sub>
<b>RFO-D</b>	SL Connector	EFO	Din Rail	Yes	Yes	Yes	85-264 V <sub>AC</sub>   85-370 V <sub>DC</sub>
<b>RFO-D-24</b>	SL Connector	EFO	Din Rail	Yes	Yes	Yes	24 V <sub>DC</sub>
<b>RFOA</b>	SL Connector	EFOA	19' Rack Submodule	No	No	Yes	85-264 V <sub>AC</sub>   85-370 V <sub>DC</sub>
<b>RFOA-D</b>	SL Connector	EFOA	Din Rail	Yes	Yes	Yes	85-264 V <sub>AC</sub>   85-370 V <sub>DC</sub>
<b>RFOA-D-24</b>	SL Connector	EFOA	Din Rail	Yes	Yes	Yes	24 V <sub>DC</sub>
<b>RFO-LD</b>	ST Connector	EFO-LD	19' Rack Submodule	No	No	Yes	85-264 V <sub>AC</sub>   85-370 V <sub>DC</sub>
<b>RFO-D-LD</b>	ST Connector	EFO-LD	Din Rail	Yes	Yes	Yes	85-264 V <sub>AC</sub>   85-370 V <sub>DC</sub>
<b>RFO-D-LD-24</b>	ST Connector	EFO-LD	Din Rail	Yes	Yes	Yes	24 V <sub>DC</sub>
<b>RFOA-LD</b>	ST Connector	EFOA-LD	19' Rack Submodule	No	No	Yes	85-264 V <sub>AC</sub>   85-370 V <sub>DC</sub>
<b>RFOA-D-LD</b>	ST Connector	EFOA-LD	Din Rail	Yes	Yes	Yes	85-264 V <sub>AC</sub>   85-370 V <sub>DC</sub>
<b>RFOA-D-LD-24</b>	ST Connector	EFOA-LD	Din Rail	Yes	Yes	Yes	24 V <sub>DC</sub>

\* Other models can be manufactured upon request

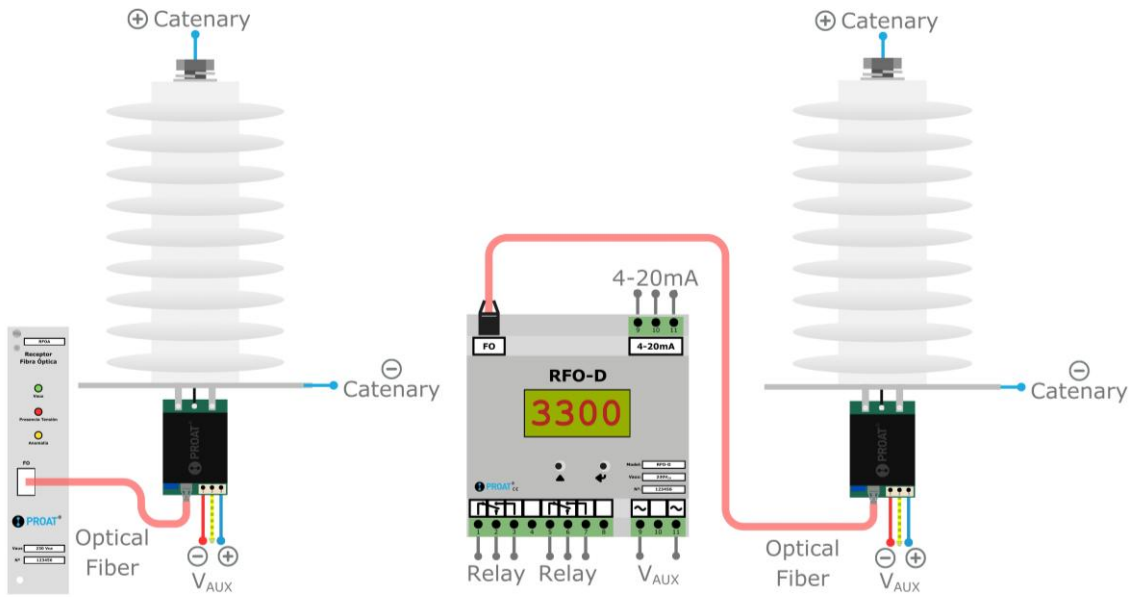
### Models – Fiber Optic Patch cords

Model	Connector	Distance
<b>LG-xxx</b>	SL Connector	5 to 100 meters models
<b>LG-xxx-LD</b>	ST Connector	5 to 5,000 meters models
<b>LG-xxx-LD-R</b>	ST Connector	5 to 5,000 meters models - Reinforced

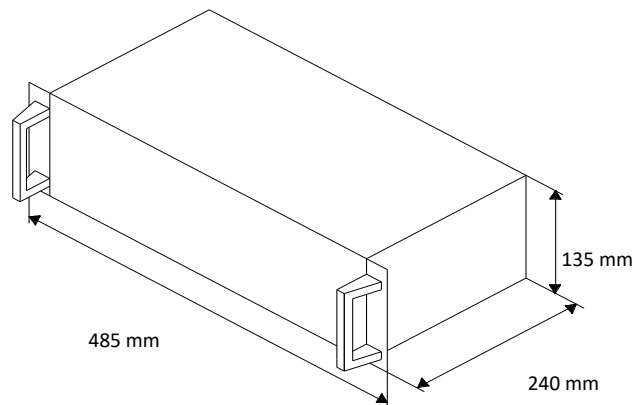
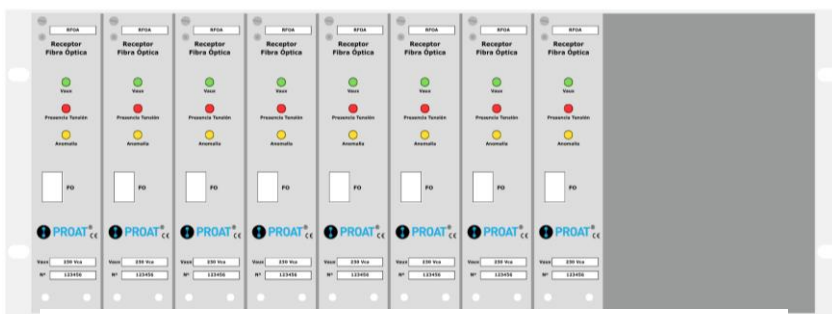
## Models – Power Supply

Model	Input	Output	Isolation Input-Output
FA1212-18	85-264 V <sub>AC</sub>   85-370V <sub>DC</sub>	±12V <sub>DC</sub>	18,5 kV <sub>AC</sub>

## Connection



## 19' Rack mounting case for 12 Modules

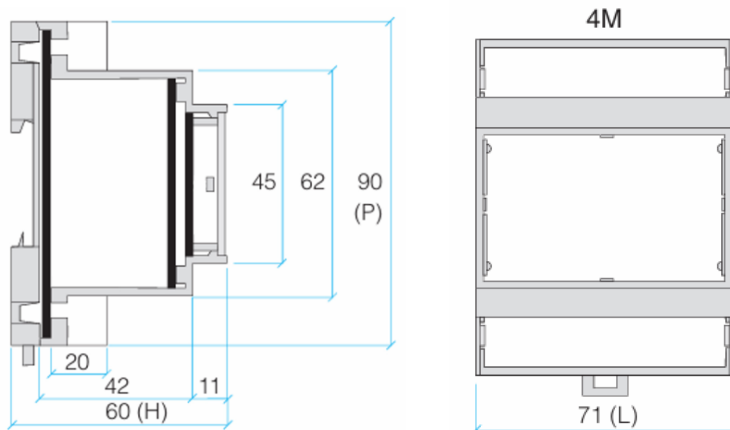


## Technical Data – RFO-D

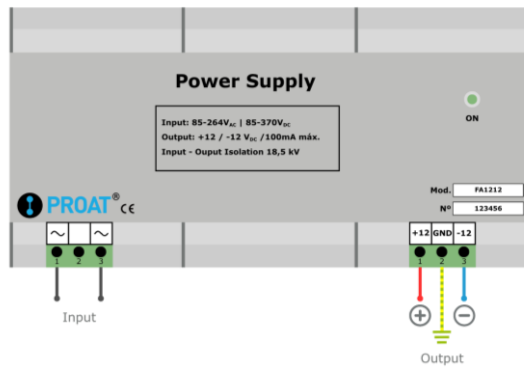
RFO-D	
Specifications	
Contact Type	SPDT
Switching Capacity	1000 VA
Switching Voltage	$\leq 230 V_{AC}$
Response Time	<1s
Reading Range	0 - $U_N + 10\%$
Auxiliary Voltage	85-264 $V_{AC}$   85-370 $V_{DC}$ 24 $V_{DC}$
Standby Power Consumption	<5W
Operating Temperature	-10° a +60°
Regulations	CE

## Constructive Characteristics – RFO-D

- DIN Rail installation
- Front Plate terminals
- Self-extinguishing plastic case class V0

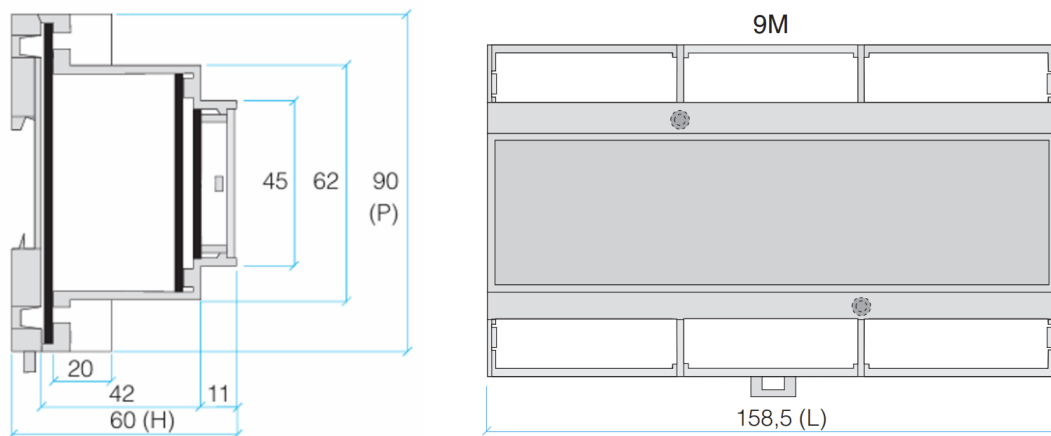


## Power Supply – FA1212-18



## Constructive Characteristics – FA1212-18

- DIN Rail installation
- Front Plate Terminals
- Self-extinguishing plastic case class V0



## Tests

### Tests **Norm UNE 21138:**

- Mechanical flexion strength tests: 20N
- Dry lightning impulse withstands voltage tests

### Tests **Norm UNE 60068:**

- Corrosion test

### Other Tests:

- Operating Temperature

# **CRS + PTC-M1**

## Resistive Silicone Sensor

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## Current Voltage Presence Detector

- ✓ Silicone Resistive Sensor **CRS**
- ✓ Remote signaling in electrical panel, for disconnectors or circuit breakers.
- ✓ **PTC-M1** amplifies the signal coming from a Resistive Sensor. Input **150 V<sub>DC</sub>**, activation with **>30%**
- ✓ Potential-Free Switched Contact **Output**
- ✓ Voltage indication by Red Led diode
- ✓ Auxiliary voltage **120-230 V<sub>DC</sub> | 120-230 V<sub>AC</sub> OR 48 V<sub>DC</sub>**  
Depending on the model
- ✓ Socket contacts **11 Pins, DIN rail mounting**



### Applications

Detection of the presence of **DC voltage** in Railway Installations:

- Conventional Trains
- Metros
- Trams

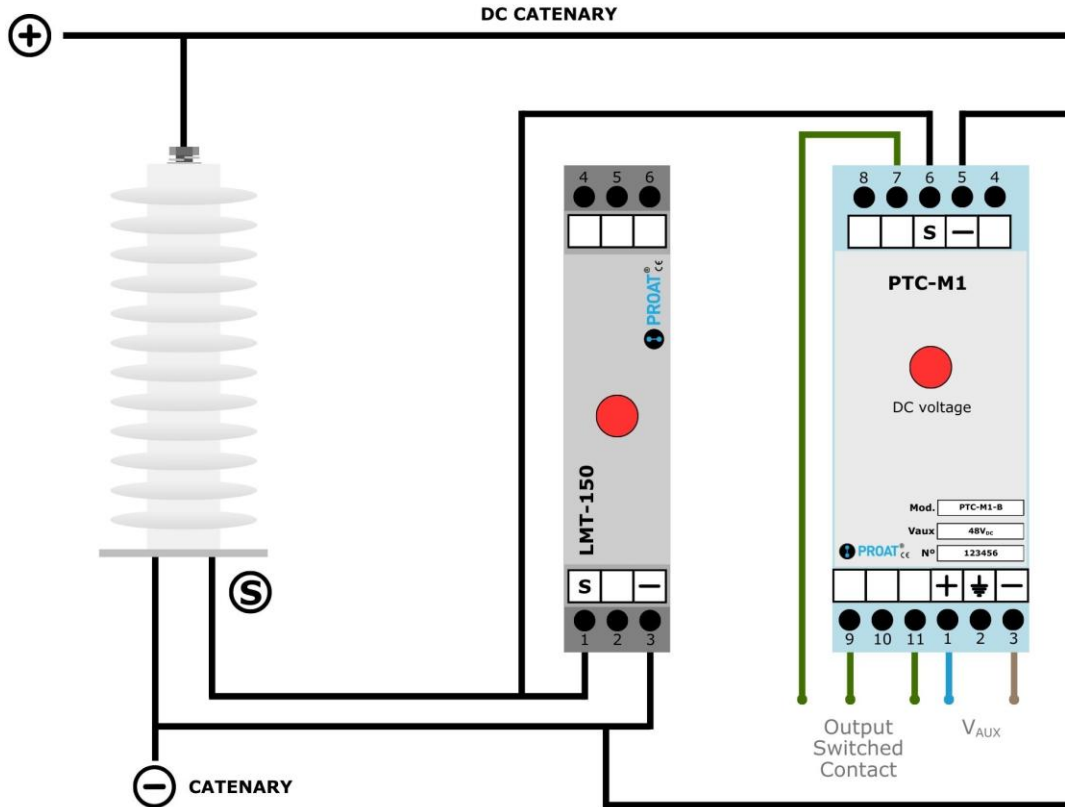


### Models

Model	Auxiliary Voltage
<b>PTC-M1</b>	120-230 V <sub>DC</sub>   120-230 V <sub>AC</sub>
<b>PTC-M1-48</b>	48 V <sub>DC</sub>

Example of order: CRS1500 + PTC-M1

## Connection



## LMT-150 Limiter

The function of the LMT-150 limiter is to prevent the output voltage from remaining at non-hazardous levels (<150 V) when the PTC-M1 is disconnected from the base.

A red LED indicates the presence of voltage in the catenary.

Model	LED
LMT-150	No
LMT-150-L	Yes



## • Constructive Characteristics– PTC-M1

- DIN rail installation
- UNDECAL base terminals
- Self-extinguishing plastic enclosure, class V0



## • Technical data – PTC-M1

MODEL	PTC-M1
<b>Technical data</b>	
Input Voltage	0-150 V <sub>DC</sub>
Presence detection level	30%
Quiescent consumption	1 W
Fault consumption	<2 W
<b>Standards complied with</b>	
Insulation Test Voltage	
High-frequency disturbances	
Fast Transients	
Voltage Impulse	
<b>Relay Contact Characteristics</b>	
Continuous Current	5 A
Switching Voltage	<230 V <sub>AC</sub>
Switching Power	<2000 VA

# **CRS + LED** Resistive Silicone Sensor + LED Light Indicator

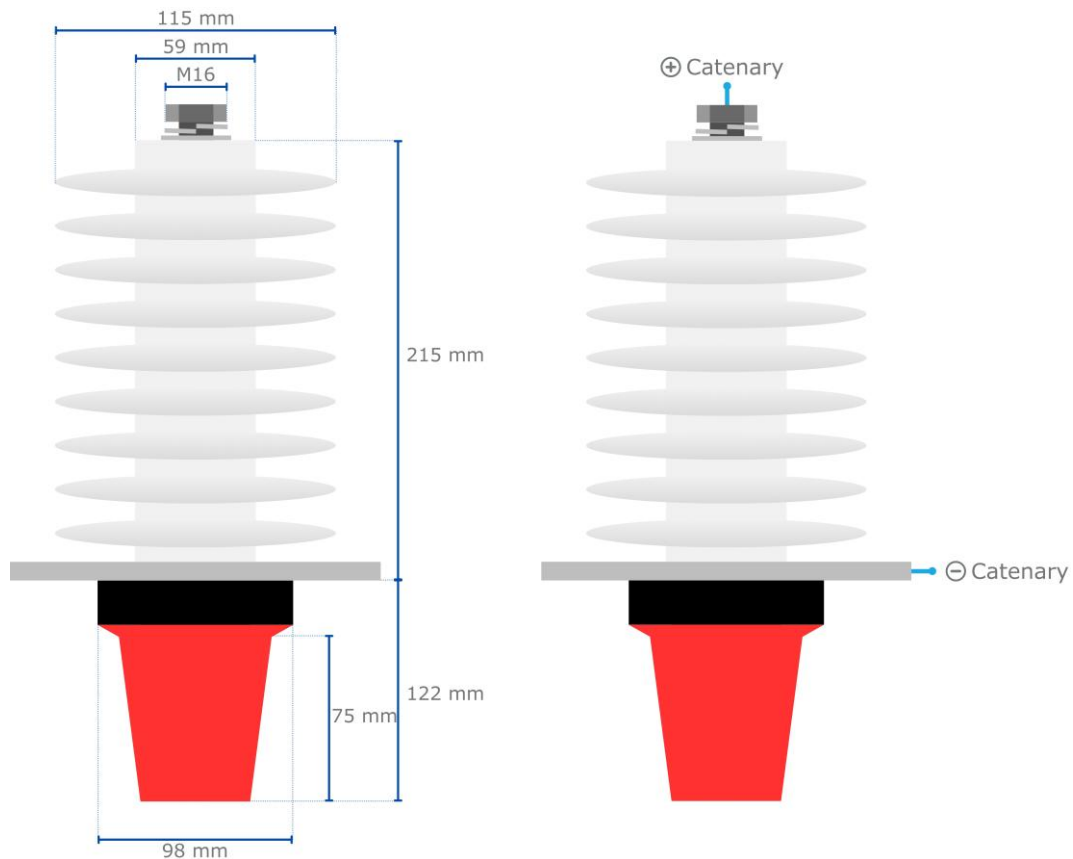
- ✓ Resistive Silicone Sensor **CRS**
- ✓ Control circuit and a **LED** flashing light lamp
- ✓ Black ABS base and Red translucent polycarbonate lampshade
- ✓ **Self-powered** from the catenary
- ✓ **Voltage signaling** in tunnels, workshops, etc. For maintenance or emergency tasks.
- ✓ Light indicator activation > **30%** of nominal voltage
- ✓ Life of light cards >**50000 hours**
- ✓ **Epoxy** coated circuit installed in waterproof case



## **Models**

Model	Voltage Service	Auxiliary Voltage
<b>CRS750 + LED</b>	0-750 V <sub>DC</sub>	Self-powered
<b>CRS1500 + LED</b>	0-1500 V <sub>DC</sub>	Self-powered
<b>CRS3000 + LED</b>	0-3000 V <sub>DC</sub>	Self-powered
<b>CRS4000 + LED</b>	0-4000 V <sub>DC</sub>	Self-powered
<b>CRS27500 + LED</b>	0-25k V <sub>AC</sub>	Self-powered

## Measurements and Connection



## Tests

Tests **Norm UNE 21138:**

- Mechanical flexion strength tests: 20N
- Dry lightning impulse withstands voltage tests

Tests **Norm UNE 60068:**

- Corrosion test

Other Tests:

- Operating Temperature

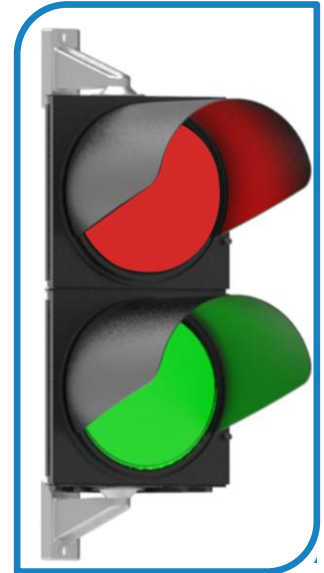
# **CRS + SMFR**

## Resistive Silicone Sensor

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## Green/Red Semaphore

- ✓ Capacitive Silicone Sensor **CRS** + **CBI21** for AC voltage measurement with output 4-20mA
- ✓ Semaphore Green/Red for catenary voltage signaling:
  - Optical LED high **luminosity** in  $\Phi$  200 mm
  - Enclosure color: **Dark Gray**
- ✓ Voltage **Presence Controller PTC-E1**:
  - Reading of the measures **4-20mA**
  - Signage **LED** of the measure
  - Signage **LED Independent** from Ignition and Anomalies
  - Output with **2 Potential-Free Switched Contacts**:
    - Voltage
    - Anomaly
  - Auxiliary voltage **85-264 V<sub>AC</sub> | 85-370 V<sub>DC</sub> or 24 V<sub>DC</sub>**

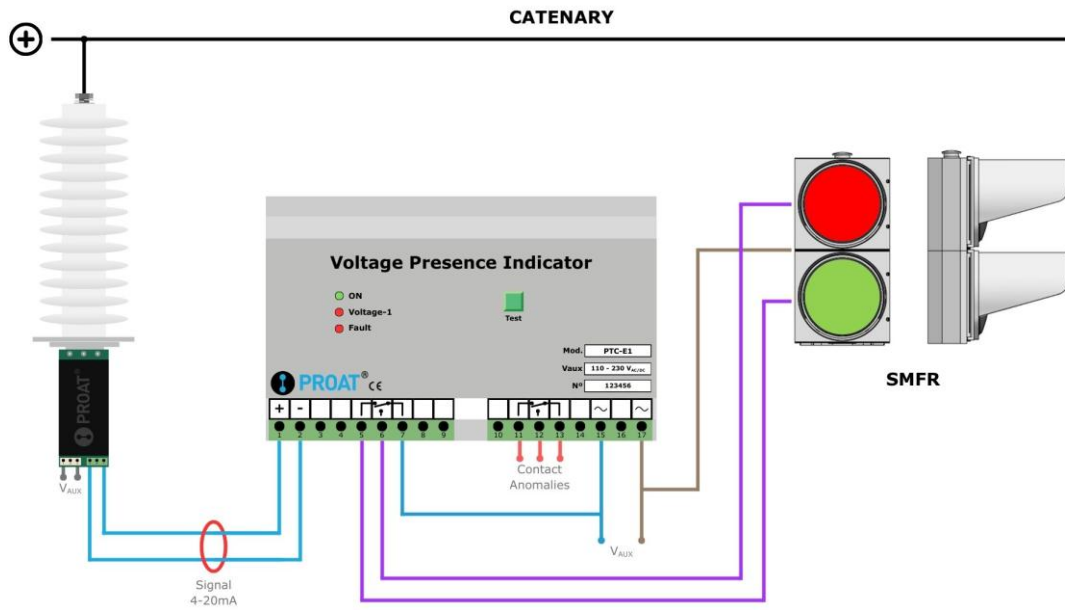


### **Models**

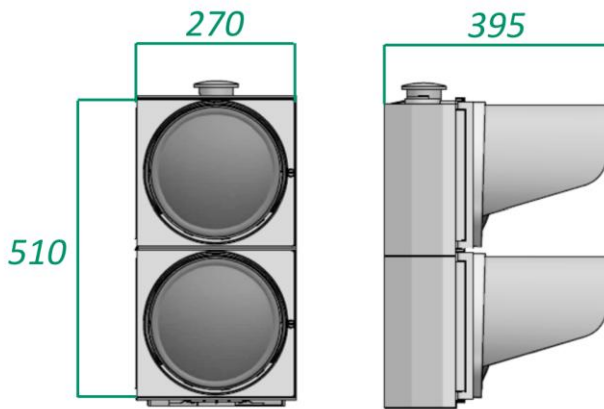
Configuration Options:

- **CRS** - Any Model
- **CBI21** - Any 4 Wire Model
- **PTC-E1** - Voltage Presence Controller PTC-E1
- **SMFR** - Green – Red semaphore
- **Semaphore Support** - Any Model

**Connection**

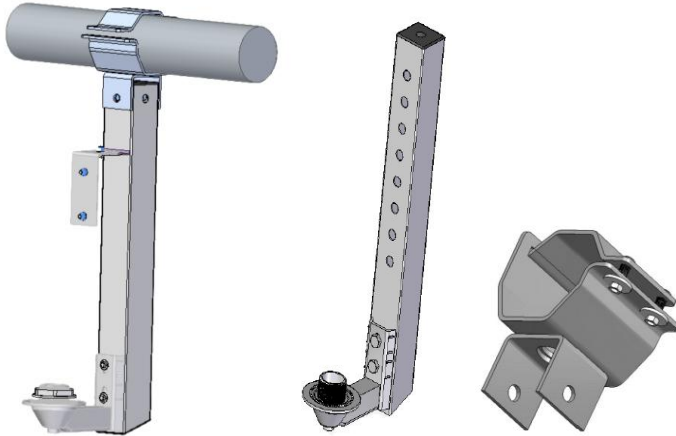


**Constructive Characteristics**



### Support SOP-SMFR-001

- Support for anchoring on **Bracket of diameter 76mm**
- Made of **galvanized steel**

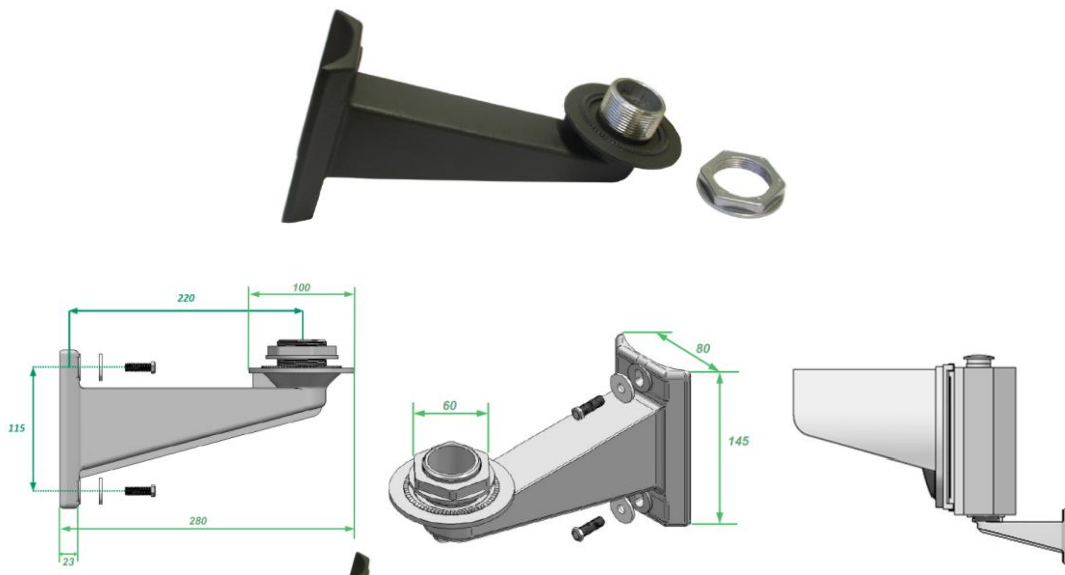


### Support SOP-SMFR-002

- Support for anchoring on wall or **column Ø 100 mm**
- Made of cast **aluminum**
- **Coated in powder polyester** polymerized at 230°C
- Fixing by 2 M-8 screws.
- Internal positioning and anti-rotation serration of the coupled semaphore head.
- Traffic light fixing by sleeve-nut assembly 1½" made of aluminum

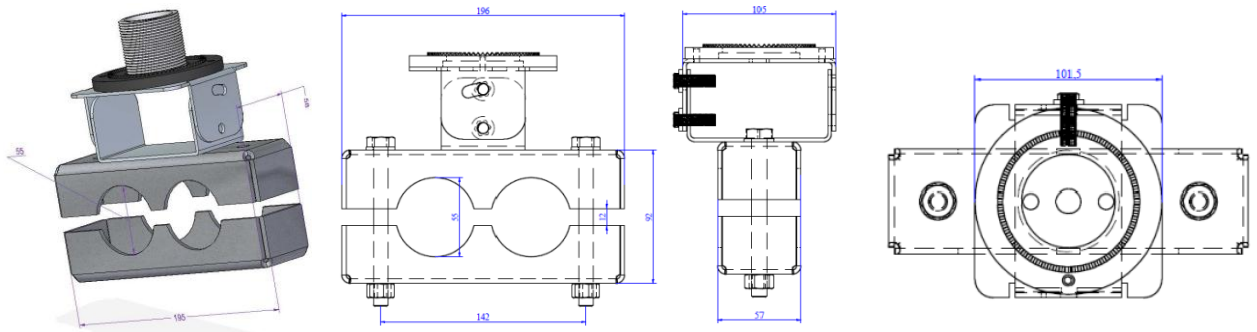
#### Advantages

- High mechanical strength
- High resistance to environmental conditions
- Its hollow structure allows the traffic light to be wired through it



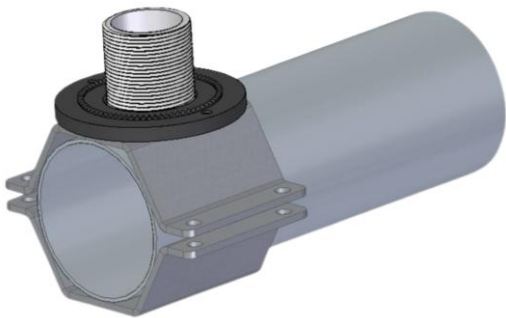
### Support SOP-SMFR-003

- Support for anchoring on **Bracket of diameter 76mm**
- Made of **galvanized steel**



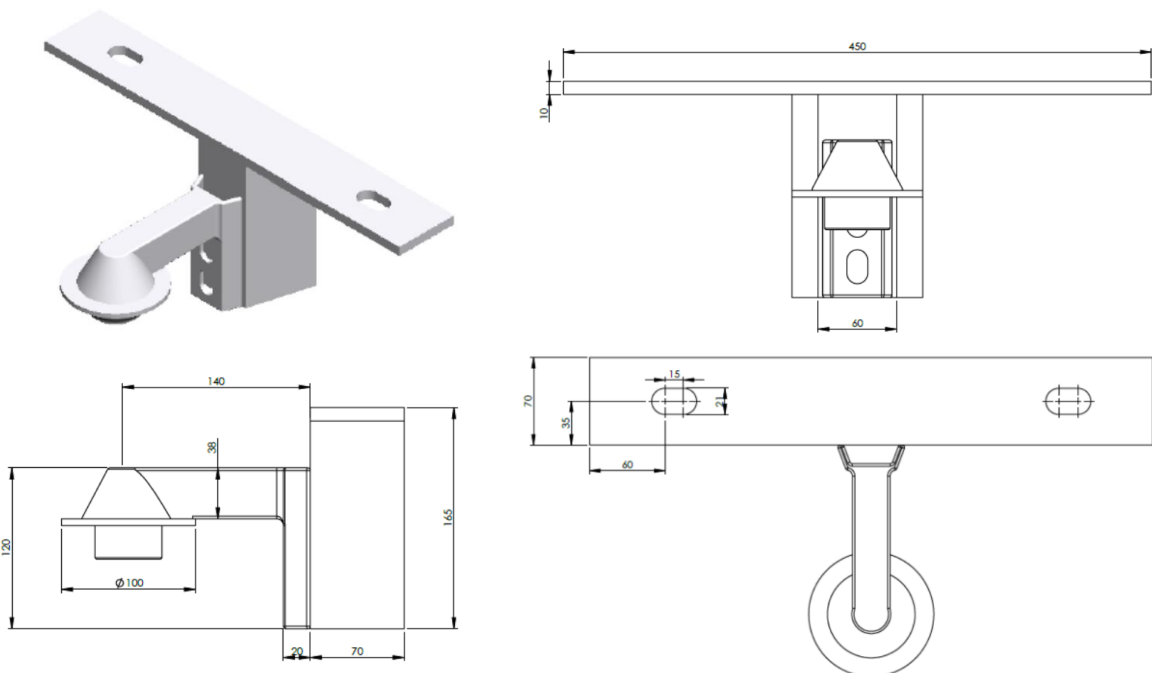
### Support SOP-SMFR-004

- Support for anchoring on **Bracket of diameter 76mm**
- Made of **galvanized steel**



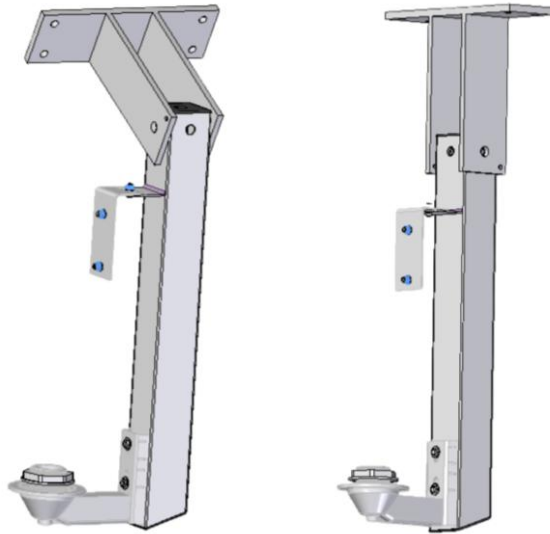
### Support SOP-SMFR-005

- Support for **inverted ceiling anchoring**
- Made of **galvanized steel**



## Support SOP-SMFR-006

- Support for anchoring in **ceiling or vault**
- Made of **galvanized steel**



## Technical Data

### SFMR

Case Specifications	
Manufacturing material	U.V. Colored stabilized polycarbonate
Environmental Protection Grade	IP55 (according to EN 60529)
Degree of impact resistance	IR3 (according to EN 60598)
Electromagnetic Compatibility	According to EN 50293
Operating Temperature	-40°C a +60°C
Certificate and marking	According to EN12368
Square Optics (PIL)	200 x 200 mm
Outside Size	270 x 255 mm
LED Colors	Green, Red

### PIL-200x200 PPC

Specifications			
Nominal Voltage	125 V <sub>DC</sub> or 230 V <sub>AC</sub>		
Consumption	< 8W		
Number of LEDs (Red, Amber or Green)	56		
On/off reaction time	< 50 ms		
Environmental requirements (EN 12368 – 5.1)	Class A, B, C (operating temperature of -30°C to + 70°C)		
Electromagnetic Compatibility (EMC)	Meets standard requirements EN50278		
Luminance Distribution (EN 12368 – 6.4)	WA3/1		
Luminance Uniformity (EN 12368 – 6.5)	> 1:10		
Ghost effect (EN 12368 – 6.6) *	Class 4 (Red)	Class 4 (Amber)	Class 5 (Green)
Colors of light signals (EN 12368 – 6.7)	620-630 nm (Red)	587-592 nm (Amber)	502-508 nm (Green)
Environmental Protection Grade (EN 60598)	IP65		
Degree of impact resistance (EN 60598-1)	IR3		
Front Lens Material	Stabilized transparent polycarbonate UV		
Enclosure material	ABS black		

(\*) The ghosting effect occurs in halogen or incandescent traffic lights with the parabolic reflector, due to the reflection of the sun. Drivers could get confused and have the impression that the traffic light is on when it is not.

# OTHER ASSEMBLIES

## Models Adapted for Metropolitan Facilities

