



Catalog

CCS

**Capacitive
Silicone Sensor**

AC Voltage Detectors

AC Voltage Detectors

up to 27,500 V_{AC}

Description

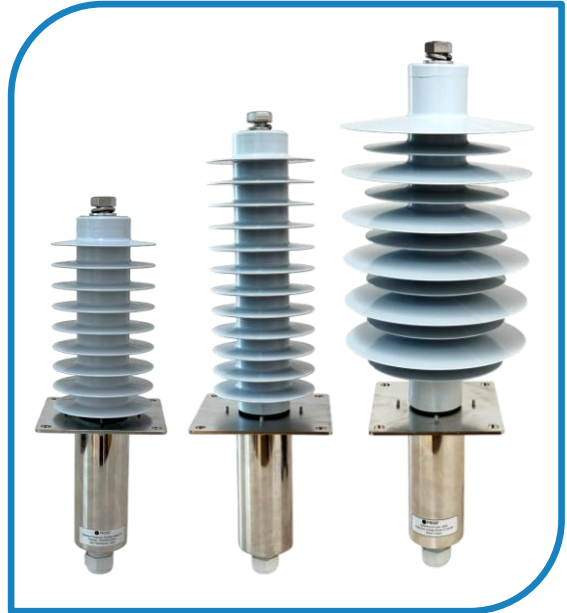
✓ **AC Voltage Detectors** are AC voltage monitoring and measurement devices designed to continuously supervise the status of an electrical installation.

✓ They measure the **AC voltage level**, detect **voltage presence, absence, overvoltage or undervoltage conditions**, and generate the signals and alarms required to facilitate installation monitoring and diagnosis.

✓ They are particularly suitable for **railway and industrial applications, as well as AC power supply systems**.

✓ **AC Voltage Detectors** consist of a **CCS – Silicone Capacitive Sensor** and one of the following outputs:

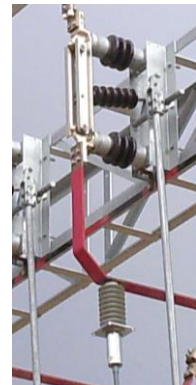
- **CBI21** – 4–20 mA Output
- **FO** – Fiber Optic Output
- **RS485** Modbus
- **SMFR** – Signal Light



Applications

Detection and Measurement of **AC voltage** in Railway and Electrical Installations:

- High-Speed Trains
- Conventional AC Trains
- AC Underground / Metro Systems
- Medium-Voltage Power Lines
- Industrial Installations

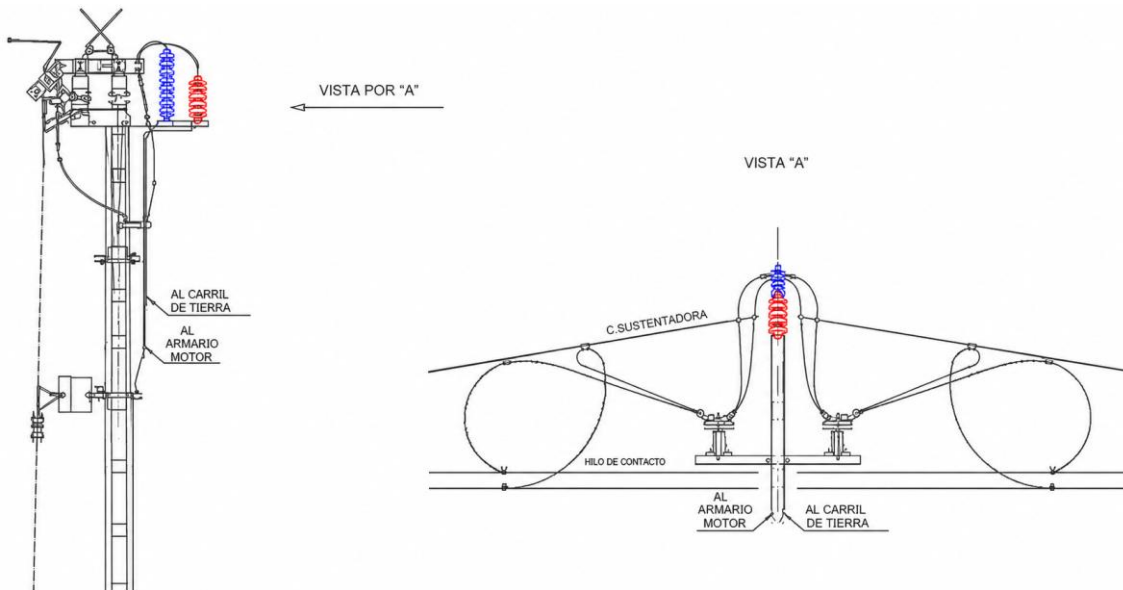


1 Catenary Voltage Detectors

Continuous Monitoring



Assembly Diagram



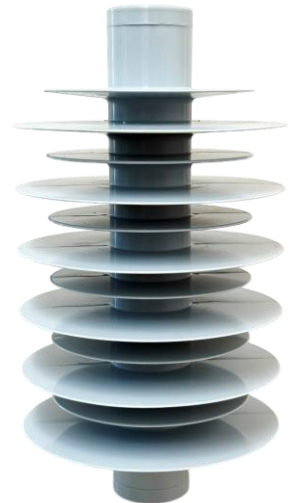


Capacitive Silicone Sensor

- ✓ **AC** Voltage Detection and Measurement up to **27,500 V_{AC}**
- ✓ **Aluminum** terminals and exterior **silicone** coating
- ✓ Creepage distance of **972 mm** or **1605 mm** for **medium** or **very heavy contamination (MF)** according to IEC 60815-3 application area.
- ✓ Sensor weight CCS25: **1.8 kg** or CCS25-MF: **2.8 kg**
- ✓ Full equipment weight CCS25: **2.8 kg** or CCS25-MF: **3.8 kg**
- ✓ **High resistance** against tampering and vandalism
- ✓ Lower weight, improved strength and better impact durability than epoxy sensors
- ✓ **Stainless steel** brackets, **waterproof** case and screws with anti-vibration washers **Nord-Lock®**
- ✓ **Cable gland** for **cable** or **conduit**, depending on the model
- ✓ **Vertical mounting** with M16 **hexagonal screw** adaptable to any installation
- ✓ Optional **bracket** for **beam** or **catenary** mounting for vertical installation. Adaptable to any installation



CCS25

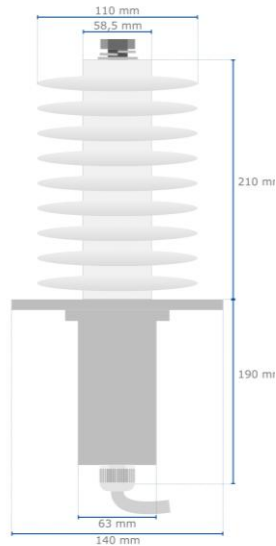
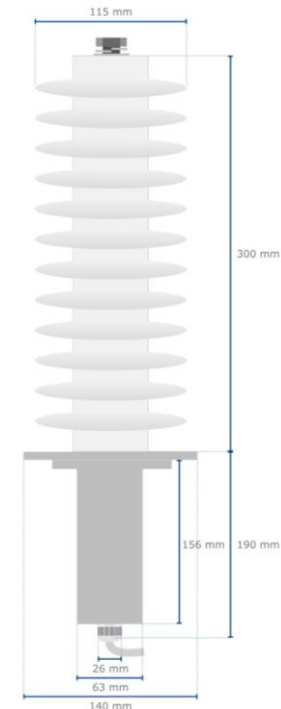
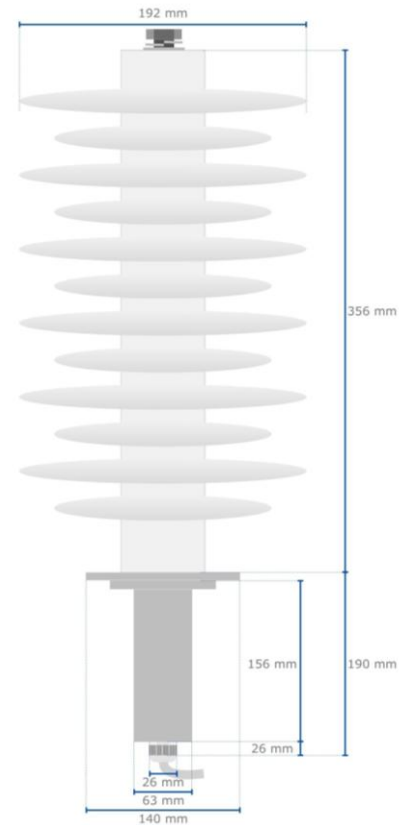
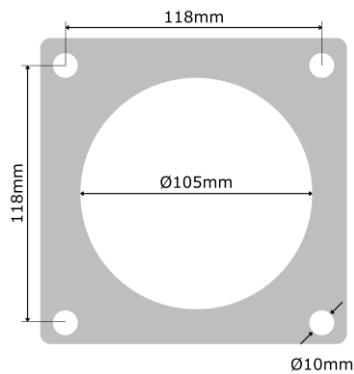
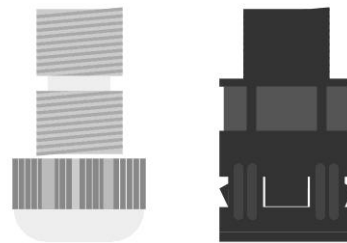


CCS25-MF

Models

Model	Service Voltage	Test 1 min 50 Hz	Creepage Distance	Pollution Zone	Sensor Height	Sensor Weight
CCS10	10 kV _{AC}	50 kV _{AC}	618 mm	Medium	210 mm	1.2 kg
CCS10-MF	10 kV _{AC}	50 kV _{AC}	972 mm	Very Heavy	300 mm	1.8 kg
CCS15	15 kV _{AC}	50 kV _{AC}	618 mm	Medium	210 mm	1.2 kg
CCS15-MF	15 kV _{AC}	50 kV _{AC}	972 mm	Very Heavy	300 mm	1.8 kg
CCS25	27.5 kV _{AC}	95 kV _{AC}	972 mm	Medium	300 mm	1.8 kg
CCS25-MF	27.5 kV _{AC}	95 kV _{AC}	1605 mm	Very Heavy	356 mm	2.8 kg

Dimensions


CCS10
CCS15

CCS10-MF
CCS15-MF
CCS25

CCS25-MF

Detector Base

Cable or Conduit Gland

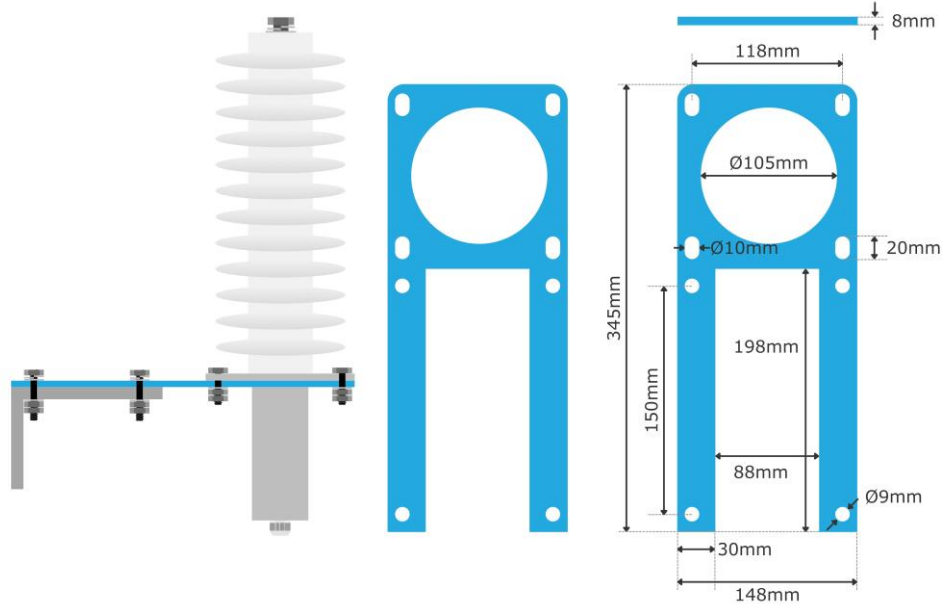
Technical data

CCS

Specifications	
Silicone	ISO 37
Elongation at Break	630 %
Tensile Strength	8.5 N/mm ²
Rated Frequency	16-60 Hz
Standard	EN 50124

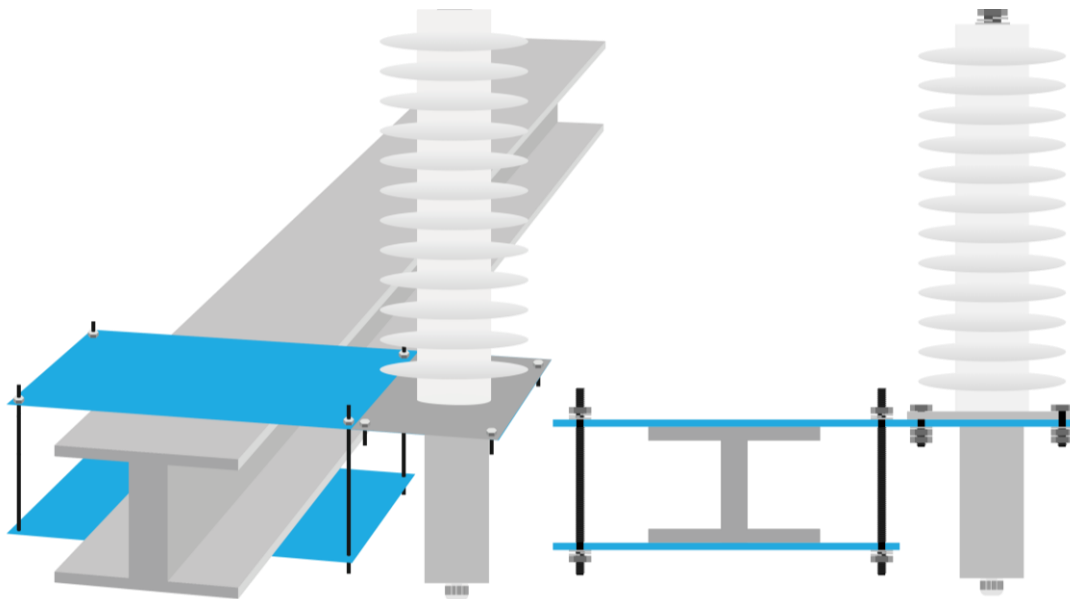
⚙ Mounting Bracket – SOP-006

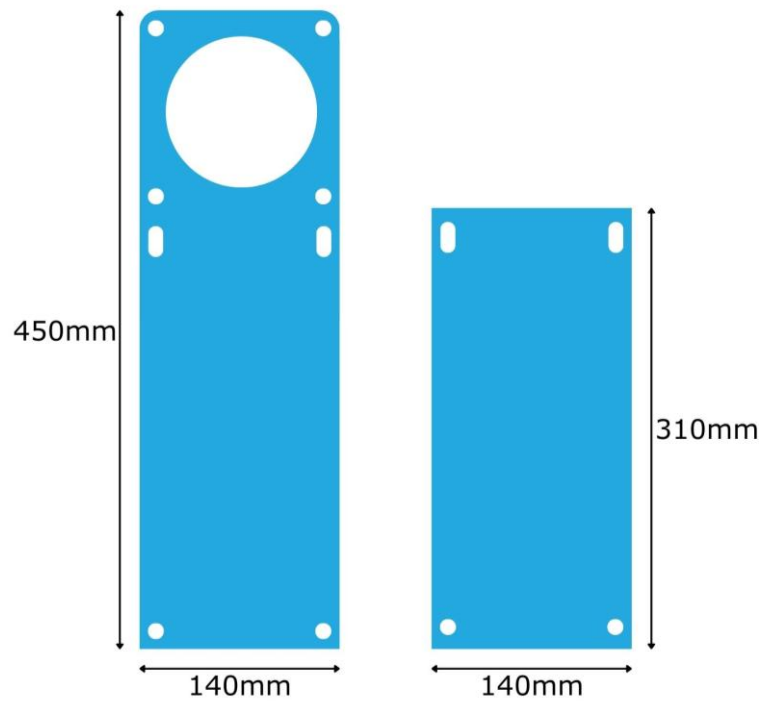
- Zinc-plated mounting bracket kit for **catenary attachment**
- Adaptable to any installation



⚙ Mounting Bracket – SOP-008

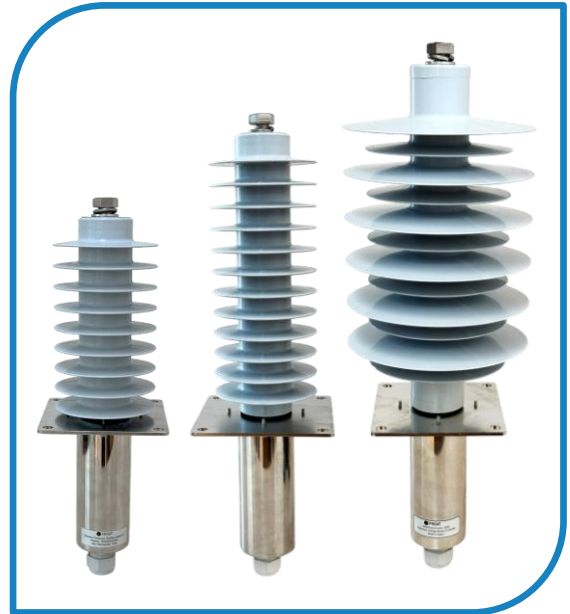
- Galvanized mounting bracket kit and stainless-steel screws for **beam anchoring**
- Adaptable to any installation
- Approved by ADIF
- Hot-dip galvanized in accordance with **UNE-EN ISO 1461**





CCS + CBI21 **Capacitive Silicone Sensor** **+** **Output 4-20 mA**

- ✓ Capacitive Silicone Sensor **CCS**
- ✓ **CBI21 current loop converter** with isolated output **4-20 mA** proportional to catenary voltage
- ✓ **16-60 Hz frequency range**, depending on the model
- ✓ Auxiliary supply voltage **85-264 V_{AC} | 85-370 V_{DC}, 48 V_{DC} or 24 V_{DC}** depending on the model
- ✓ CCS + CBI21 withstands **170 kV** lightning impulses
- ✓ CCS-MF + CBI21 withstands **250 kV** lightning impulses
- ✓ **Epoxy-coated circuit** installed in waterproof enclosure

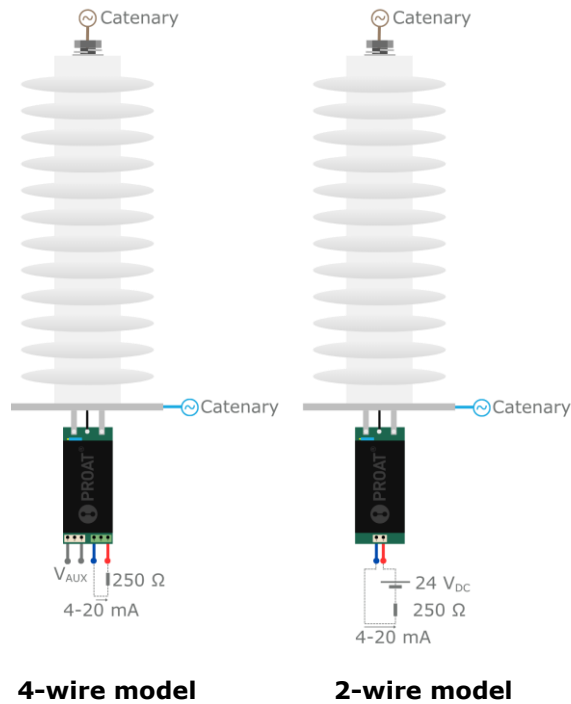


Models

Model	Nominal Frequency	Output	Output 4 – 20 mA	Auxiliary voltage
CBI21	50-60 Hz	4 wires	Yes	85-264 V _{AC} 85-370 V _{DC}
CBI21-48	50-60 Hz	4 wires	Yes	48 V _{DC}
CBI21-24	50-60 Hz	4 wires	Yes	24 V _{DC}
CBI21-2H-24	50-60 Hz	2 wires	Yes	24 V _{DC}
CBI21-HZ	16-60 Hz	4 wires	Yes	85-264 V _{AC} 85-370 V _{DC}
CBI21-HZ-24	16-60 Hz	4 wires	Yes	24 V _{DC}

Order example: CCS25 + CBI21-24

+ Connection



+ Technical data

CBI21

Specifications	
Output (RL = 500 Ω)	4-20 mA
Maximum output	≤ 23 mA
Recommended load resistance	250 Ω
Maximum load resistance	≤ 750 Ω
Linearity	1 %
Accuracy	±1 %
Response time	200 ms
Consumption	3 W
Recommended distance	≤ 500 m
Maximum distance with 1 mm ² conductor	≤ 1000 m
Input-Output isolation	3 kV
Operating temperature	-40° to +75°
Tests	
UNE 61243-1 Standard	Applied voltage from 0 to 50 kV _{DC}
	Operating time test , according to 6.2.10: Applied voltages: 30 kV _{AC} and then 50 kV _{AC} for 5 minutes
	Dielectric test at industrial frequency 95 kV _{AC} 50 Hz, for 1 minute
	Dielectric test , section 6.3: 15 positive pulses and 15 negative pulses, lightning type 170 kV 1.2 μs/50μs
	Climatic test : from +20°C to -40°C, from -40°C to +20°C, from +20°C to +75°C and from +75°C to +20°C with a 10-hour stay at -40°C and +75°C Limit test: Tests have been carried out to determine the extreme voltage that the equipment withstands, reaching 133 kV. At that point, flashover occurred across the insulator surface without causing internal damage. The equipment was still working properly after the test
UNE-EN ISO 9227 Standard	Corrosion test

CCS + FO **Capacitive Silicone Sensor** + **Fiber Optic Output**

- ✓ Capacitive Silicone Sensor **CCS**
- ✓ Fiber Optic Transmitter-Receiver **EFO25** and **RFO25**
- ✓ CCS + FO withstands **170 kV** lightning-like impulses
- ✓ The set is approved by **ADIF**

EFO25 – Fiber Optic Emitter

- ✓ Light **pulse output** proportional to the voltage in self-powered models
- ✓ 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 **±12 V_{DC} auxiliary voltage** depending on the model

Optional power supply **FA1212-36** of ± 12 V_{DC} for input voltages **85-264 V_{AC} | 85-370 V_{DC}** with galvanic isolation input/output rated at **36 kV**

- ✓ **Epoxy-coated circuit** installed in waterproof enclosure

RFO25 – Fiber Optic Receiver

- ✓ **Real-time display** of catenary voltage
- ✓ **2 potential-free output contacts:**
 - Voltage Presence – Programmable levels
 - Anomalies – Fiber Optic communication failure
- ✓ **Programmable thresholds** of the presence and absence of voltage contact
- ✓ **4-20 mA** output proportional to the catenary voltage
- ✓ **DIN rail** installation
- ✓ Auxiliary voltage **85-264 V_{AC} | 85-370 V_{DC}**



Models – Fiber Optic Emitters

Model	Fiber Optic	Auxiliary voltage
EFO25	SL Connector	Self-powered from the catenary
EFOA25	SL Connector	±12 V _{DC}
EFO25-LD	ST Connector	Self-powered from the catenary
EFOA25-LD	ST Connector	±12 V _{DC}

Order example: CCS25 + EFOA25 with power supply FA1212-36 and compatible receiver RFOA25-D

Models – Power Supply

Model	Input	Output	Isolation Input-Output
FA1212-36	85-264 V _{AC} 85-370 V _{DC}	±12 V _{DC}	36 kV _{AC}

Models – Fiber Optic Receivers

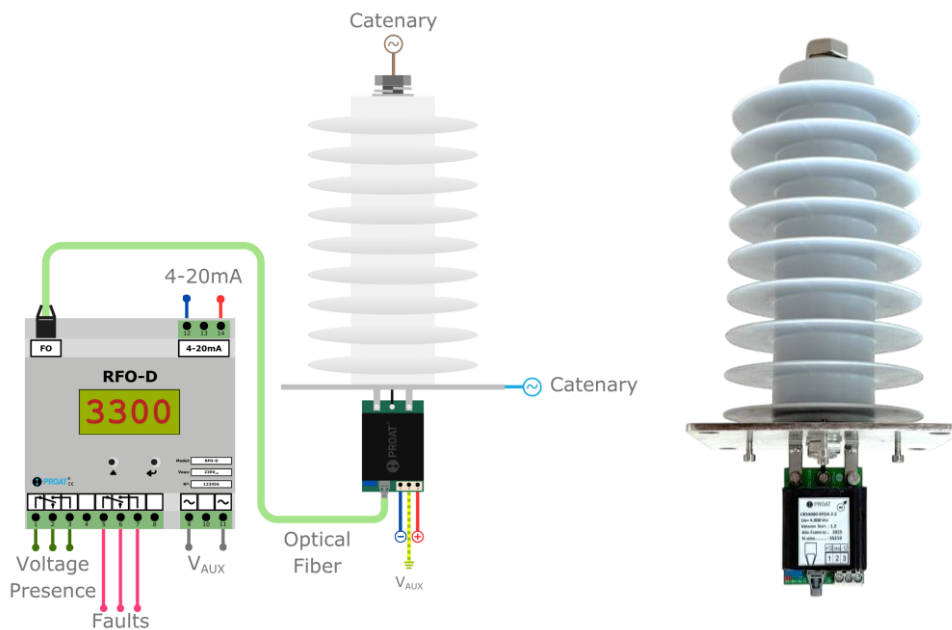
Model	Fiber Optic	Compatible Emitter	Installation	Real-Time Visualization	Output 4-20 mA	Output Contacts	Auxiliary voltage
RFO25-D	SL Connector	EFO25	DIN Rail	Yes	Yes	Yes	85-264 V _{AC} 85-370 V _{DC}
RFO25-D-24	SL Connector	EFO25	DIN Rail	Yes	Yes	Yes	24 V _{DC}
RFOA25-D	SL Connector	EFOA25	DIN Rail	Yes	Yes	Yes	85-264 V _{AC} 85-370 V _{DC}
RFOA25-D-24	SL Connector	EFOA25	DIN Rail	Yes	Yes	Yes	24 V _{DC}
RFO25-D-LD	ST Connector	EFO25-LD	DIN Rail	Yes	Yes	Yes	85-264 V _{AC} 85-370 V _{DC}
RFO25-D-LD-24	ST Connector	EFO25-LD	DIN Rail	Yes	Yes	Yes	24 V _{DC}
RFOA25-D-LD	ST Connector	EFOA25-LD	DIN Rail	Yes	Yes	Yes	85-264 V _{AC} 85-370 V _{DC}
RFOA25-D-LD-24	ST Connector	EFOA25-LD	DIN Rail	Yes	Yes	Yes	24 V _{DC}

*Other models can be manufactured upon request

Models – Fiber Optic Patch Cords

Model	Connector	Distance
LG-xxx	SL Connector	Models from 5 to 100 meters
LG-xxx-LD	ST Connector	Models from 5 to 5,000 meters

Connection

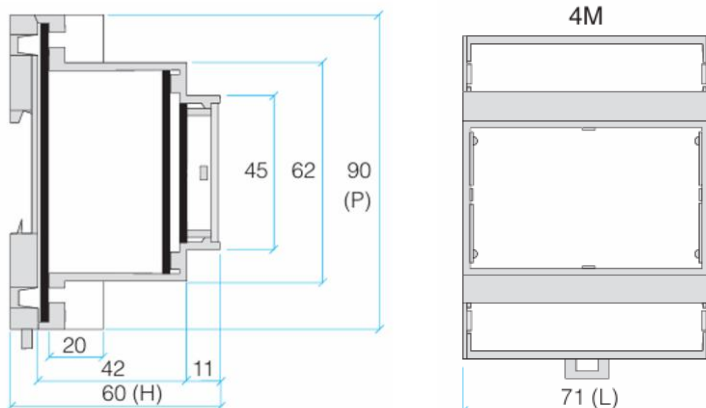


Technical Data – RFO25-D

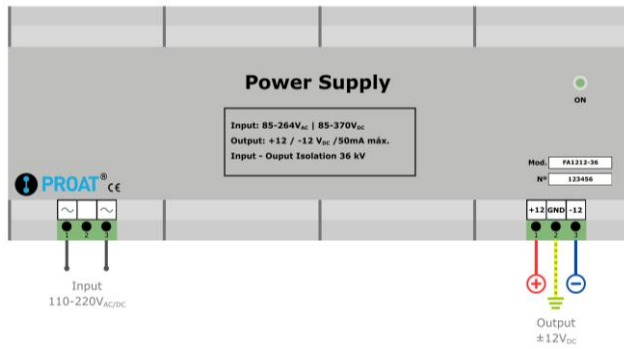
RFO25-D	
Specifications	
Contact Type	SPDT
Switching Capacity:	1000 VA
Switching Voltage:	$\leq 230 V_{AC}$
Response Time	$< 1 s$
Reading Range	$0 - U_N + 10\%$
Auxiliary voltage	$85-264 V_{AC} \mid 85-370 V_{DC}$
Standby Power Consumption	$< 5 W$
Operating Temperature:	$-10^{\circ} a +60^{\circ}$
Regulations	CE

Constructive Characteristics – RFO-D

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

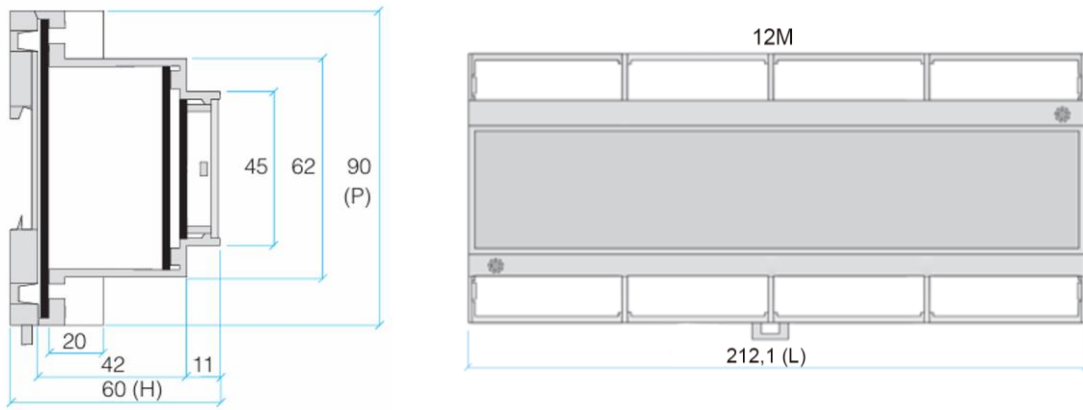


FA1212-36 Power Supply



Constructive Characteristics – FA1212-36

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



Tests

FA1212-36

Tests	
UNE 21138 Standard	Mechanical bending resistance tests: 20 N
	Dry lightning impulse withstand voltage tests
UNE 60068 Standard	Corrosion test
Other tests	Operating temperature test

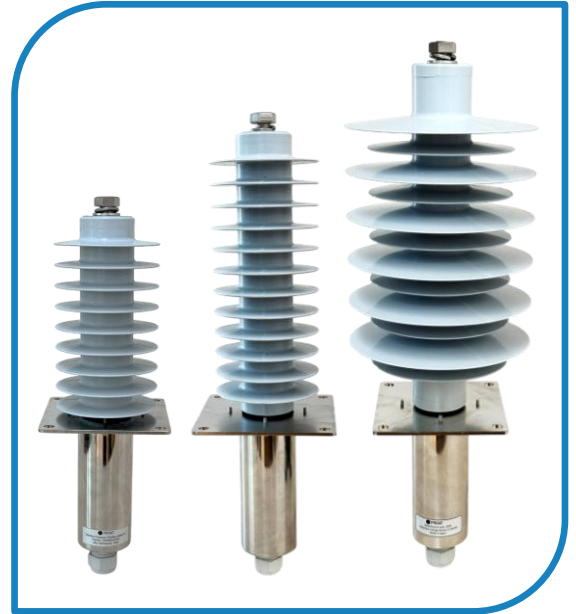
CCS + RS485 Modbus

Capacitive Silicone Sensor

+

Output RS485 Modbus

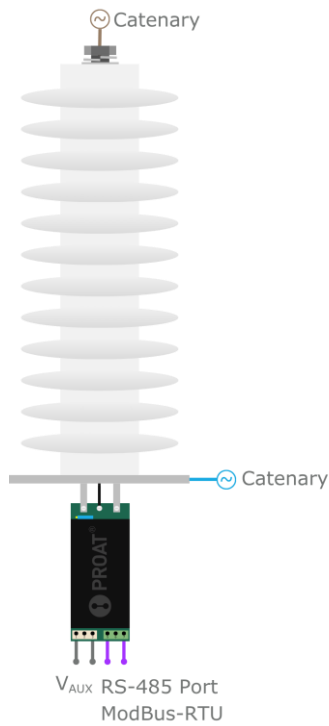
- ✓ Capacitive Silicone Sensor **CCS**
- ✓ Voltage measurement and **RS-485 Modbus** communications circuit
- ✓ Auxiliary voltage **85-264 V_{AC} | 85-370 V_{DC}**
- ✓ CCS + RS485 Modbus withstands **170 kV** lightning-like impulses
- ✓ **Epoxy-coated circuit** installed in waterproof enclosure



Models

Model	Auxiliary voltage
RS485-Modbus	85-264 V _{AC} 85-370 V _{DC}

Connection



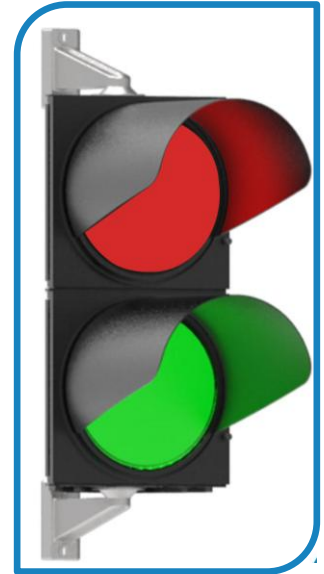
Technical Data

RS485-Modbus

Specifications	
Interface	RS-485
Protocol	Modbus-RTU
Parameters	9600, 8, N, 1
Modbus ID	Selectable
Available Functions	3, 4 and 6
Operation	Slave
Cable length (m)	< 1200
Response Time	0.2 s
Linearity	2 %
Precision	±1 %
Consumption	2 W
Input-output isolation	3 kV
Operating Temperature:	-30° to +75°
Tests	
UNE 61243-1 Standard	Applied voltage from 0 to 50 kV _{DC}
	Operating time test , according to 6.2.10: Applied voltages: 30 kV _{AC} and then 50 kV _{AC} for 5 minutes
	Dielectric test at industrial frequency 95 kV _{AC} 50 Hz, for 1 minute
	Dielectric test , section 6.3: 15 positive pulses and 15 negative pulses, lightning type 170 kV 1.2 µs/50µs
	Climatic test : from +20°C to -40°C, from -40°C to +20°C, from +20°C to +75°C and from +75°C to +20°C with a 10-hour stay at -40°C and +75°C
	Limit test: Tests have been carried out to determine the extreme voltage that the equipment withstands, reaching 133 kV. At that point, flashover occurred across the insulator surface without causing internal damage. The equipment was still working properly after the test
UNE-EN ISO 9227 Standard	Corrosion test

CCS + SMFR **Capacitive Silicone Sensor** **+** **Green/Red Signal Light**

- ✓ Capacitive Silicone Sensor **CCS** + **CBI21** for AC voltage measurement with output 4-20 mA
- ✓ Green/Red signal light for catenary voltage signaling:
 - High-intensity **Ø 200 mm** LED modules
 - Enclosure color: **dark gray**
- ✓ Voltage **Presence Controller PTC-E1**:
 - **4-20 mA** measurement reading
 - Power-on LED
 - Measurement LED
 - Anomaly LED
 - Two voltage-free changeover contacts:
 - Voltage
 - Anomaly
 - Auxiliary voltage 85-264 V_{AC} | 85-370 V_{DC} or 24 V_{DC}

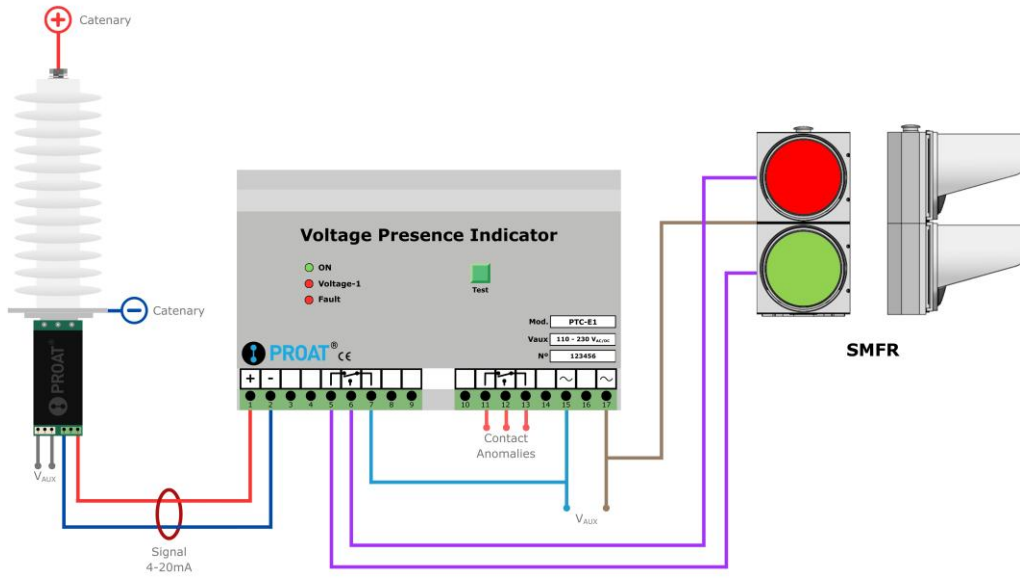


Models

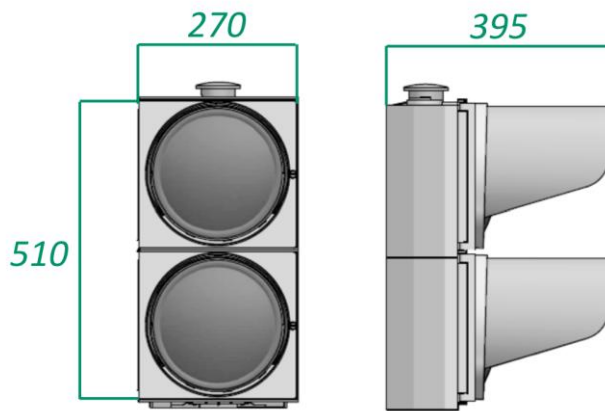
Configuration Options:

- **CCS** - Any Model
- **CBI21** - Any 4 Wire Model
- **PTC-E1** - Voltage Presence Controller
- **SMFR** – Green/Red Signal Light
- **Signal Light Attachment** - Any Model

Connection

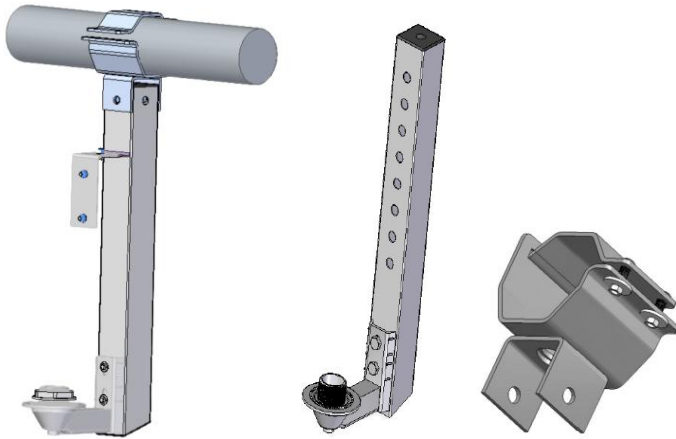


Constructive Characteristics



❶ Mounting Bracket SOP-SMFR-001

- Mounting Bracket for attachment to a **76 mm diameter bracket**
- Made of galvanized steel

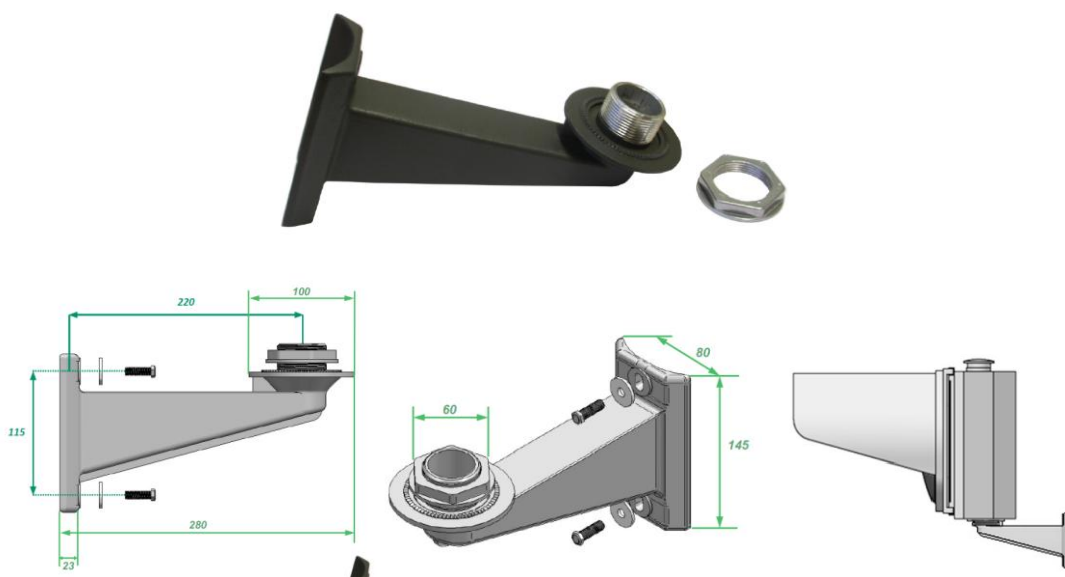


❷ Mounting Bracket SOP-SMFR-002

- Mounting Bracket for attachment to wall or **column Ø 100 mm**
- Made of cast **aluminum**
- **Coated** with **polyester** powder polymerized at 230 °C
- Fixed with 2 M8 screws
- Internal positioning and anti-rotation serration of the coupled Signal Light head.
- Signal Light fixing by sleeve-nut assembly 1½" made of aluminum

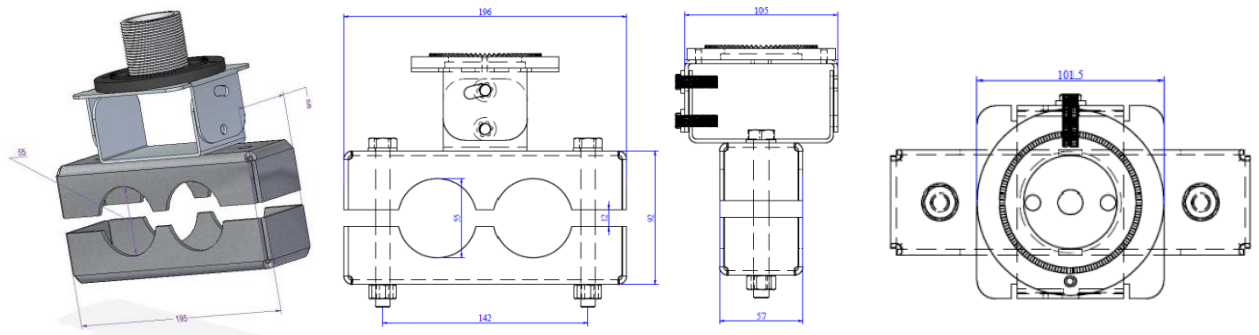
Advantages

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



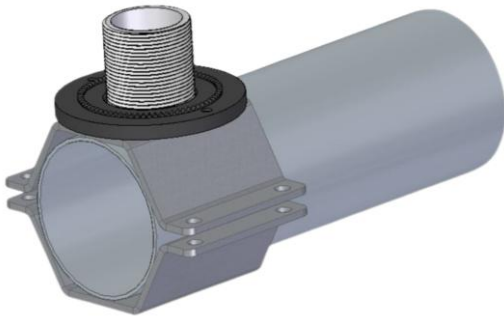
❶ Mounting Bracket SOP-SMFR-003

- Mounting Bracket for attachment to a double 76 mm diameter bracket
- Made of galvanized steel



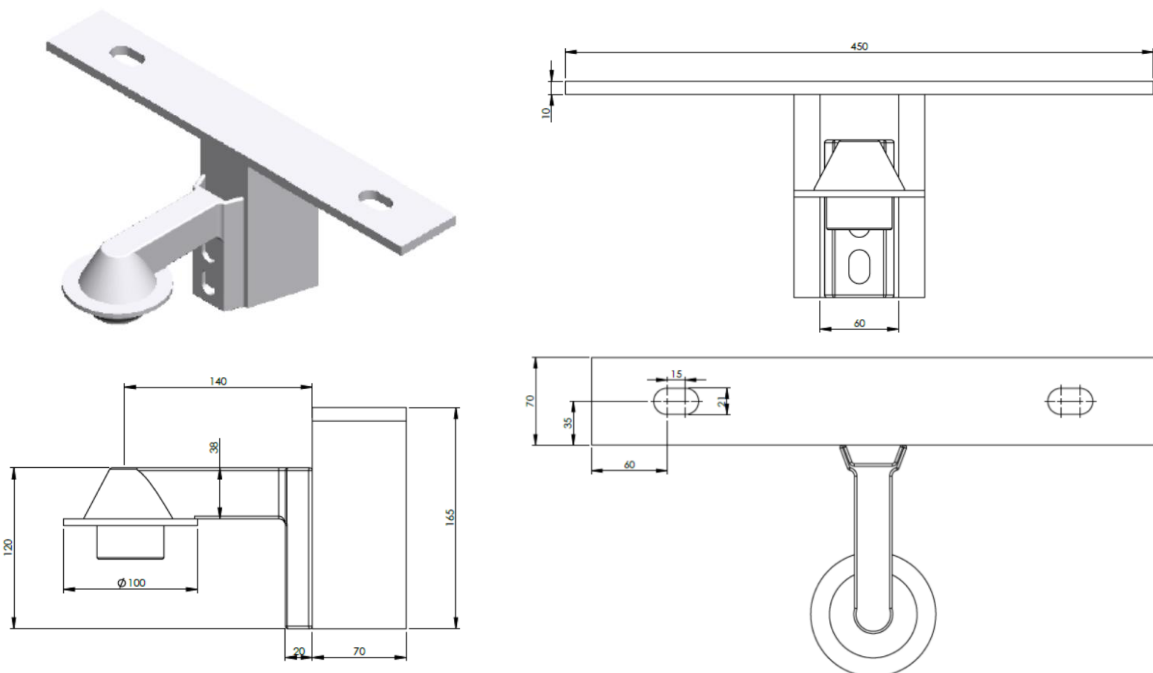
❷ Mounting Bracket SOP-SMFR-004

- Mounting Bracket for attachment to a **76 mm diameter bracket**
- Made of galvanized steel



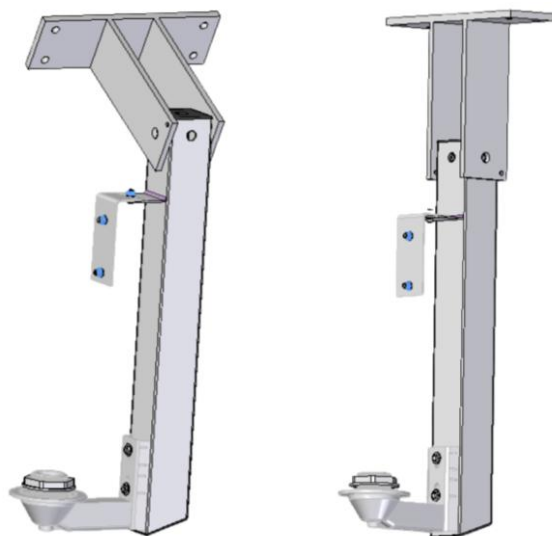
❸ Mounting Bracket SOP-SMFR-005

- Mounting Bracket for inverted ceiling mounting
- Made of **galvanized steel**



❶ Mounting Bracket SOP-SMFR-006

- Mounting Bracket for mounting on a **ceiling or vault**
- Made of galvanized steel



❷ Technical data

SMFR

Case Specifications	
Enclosure material	Colored UV-stabilized polycarbonate
IP rating	IP55 (according to EN 60529)
Degree of impact resistance	IR3 (according to EN 60598)
Electromagnetic Compatibility	According to EN 50293
Operating temperature	-40° C to +60° C
Certificate and marking	According to EN 12368
LED Optics (PIL)	200 x 200 mm
External dimensions	270 x 510 mm
Enclosure color	gray, black, yellow or green
LED colors	Green and Red

LED Optics

Specifications	
Nominal voltage	125 V _{DC} or 230 V _{AC}
Power consumption	< 8 W
Number of LEDs (Red or Green)	120
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)	Complies with the requirements of EN 50278
Luminance distribution (EN 12368 – 6.4)	W A3/1
Luminance uniformity (EN 12368 – 6.5)	> 1:10
Ghost effect (EN 12368 – 6.6) *	Class 4 (Red) Class 5 (Green)
Colors of light signals (EN 12368 – 6.7)	620-630 nm (Red) 502-508 nm (Green)
Environmental protection grade (EN 60598)	IP65
Degree of impact resistance (EN 60598-1)	IR3
Front lens material	UV-stabilized transparent polycarbonate
Enclosure material	Black ABS

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