



Catálogo

**RAILWAY
SECTOR**



🔌 WHAT DO WE DO?

At **PROAT**, we design, manufacture and distribute electrical and electronic equipment for the **measurement**, **protection** and **control** of electrical installations.

We also have a **high-voltage laboratory**, where we carry out tests and verifications to ensure the quality, reliability and safety of our products.



INDEX

Summary of models

DC Voltage Detectors for Catenary

- **CRS – Silicone Resistive Voltage Sensor**
 - CRS + RL – Reed Relay
 - CRS + CBI21 – 4-20 mA Output
 - CRS + FO – Fiber Optic
 - CRS + PTC-M1 – DC indicator
 - CRS + LED – Flashing Led Indicator
 - CRS + SMFR – Signal Light
- **CRE – Epoxy Resistive Voltage Sensor**
 - CRE + RL (Reed Relay)
 - CRE + PTC-M1 (DC Voltage Presence Detector)
- **SMFR – DC Catenary Voltage Detector Signal Light**

AC Voltage Detectors for Catenary

- **CCS – Silicone Capacitive Voltage Sensor**
 - CCS + CBI21 – 4-20 mA Output
 - CCS + FO – Fiber Optic
 - CCS + RS485 – ModBus
 - CCS + SMFR – Signal Light
- **VFR+MIC – AC Catenary Voltage Detectors**
- **GDB – Dual Voltage Discriminator Unit 27,5 kV_{AC} - 3,3 kV_{DC}**

Other Equipment

- **FACV – AC Insulation Monitor**
- **IPT3 – AC Voltage Presence Indicator**
- **PTA3 – AC Voltage Detector**
- **DCT – Ground Continuity Detector**
- **Diode + Dissipator Assemblies**

DC and AC Voltage Detectors for Catenary

Models Summary

				
	CRS	CRS-27500	CCS	CCS-MF
Voltage	DC	DC + AC	AC	AC
Range	0-4000 V _{DC}	0-4000 V _{DC} 0-27500 V _{AC}	0-27500 V _{AC}	0-27500 V _{AC}
Pollution Degree	Medium	Medium	Medium	Very High

SALIDAS

Reed Relay				
CBI-21 4-20mA				
RS485 ModBus				
Fiber Optic				
PTC-M1				
LED 				
SMFR 				

DC Voltage Detectors

up to 4000 V_{DC}

Description

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

✓ They measure the **DC 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 DC power supply systems**.

✓ **DC Voltage Detectors** consist of a **CRS –Resistive Silicone Sensor** and one of the following outputs:

- **Reed Relay** – Changeover Contact
- **CBI21** – 4–20 mA Output
- **FO** – Fiber Optic Output
- **PTC-M1** – DC Voltage Presence Detector
- **LED** – Light Indicator
- **SMFR** – Signal Light



Applications

Detection and Measurement of **DC Voltage** in Railway Installations and Electrical Installations:

- Conventional Trains
- Metros
- Trams
- Power Lines
- Industrial Installations

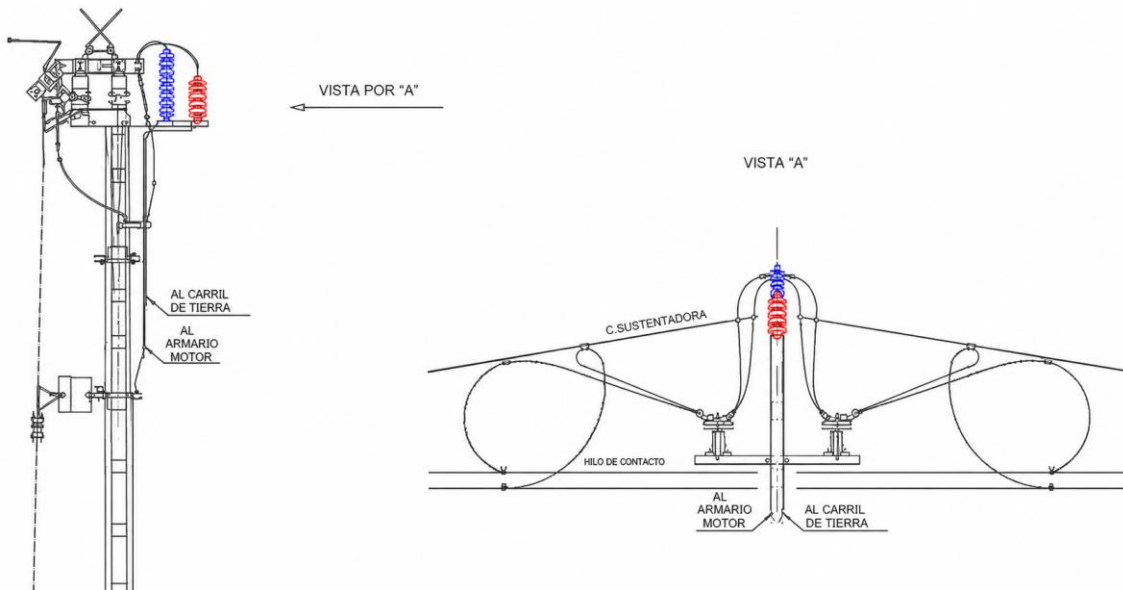


❶ Voltage Detectors for Catenary

Continuous Monitoring



Assembly Diagram





Resistive Silicone Sensor

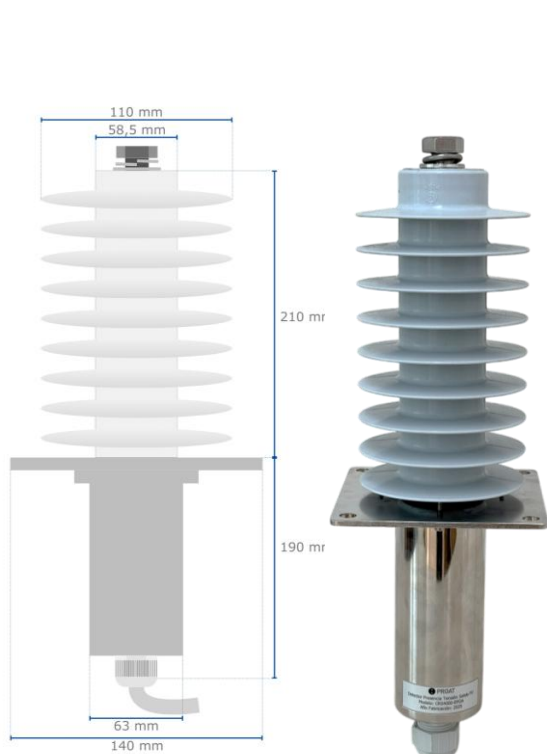
- ✓ **DC** Detection and Measurement up to **4,000 V_{DC}**
- ✓ **Aluminum** terminals and **Silicone** outer coating
- ✓ Creepage Distance: **618 mm**
- ✓ CRS4000 sensor only weight: **1.2 kg**
- ✓ Complete CRS4000 equipment weight: **2.25 kg**
- ✓ **High resistance** to manipulation and vandalism
- ✓ Lower weight, improved resistance and better impact durability than epoxy sensors
- ✓ Mounting accessories, waterproof enclosure, screws, and hardware in **stainless-steel**, with **Nord-Lock®** anti-vibration washers
- ✓ Cable gland or conduit gland, depending on the model.
- ✓ **Vertical mounting** with **M16** hexagonal screw adaptable to any installation
- ✓ Optional **mounting bracket** for **beam** or **catenary** attachment for vertical installation, adaptable to any installation



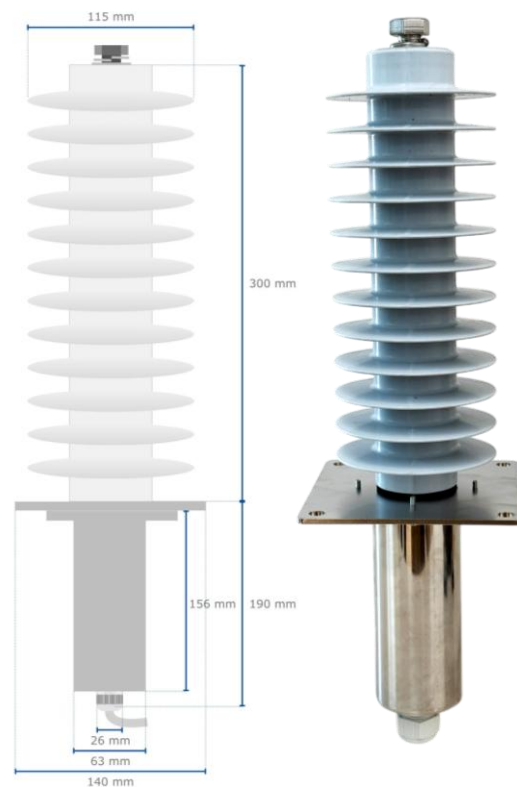
Models

Model	Voltage Service	Supports 27.5 kV _{AC}	Test 1 min 50 Hz	Creepage Distance	Pollution Zone	Sensor's Height	Sensor Weight
CRS750	0-750 V _{DC}	No	4 kV _{DC}	618 mm	Medium	210 mm	1.2 kg
CRS1500	0-1500 V _{DC}	No	5 kV _{DC}	618 mm	Medium	210 mm	1.2 kg
CRS3000	0-3000 V _{DC}	No	10 kV _{DC}	618 mm	Medium	210 mm	1.2 kg
CRS4000	0-4000 V _{DC}	No	10 kV _{DC}	618 mm	Medium	210 mm	1.2 kg
CRS27500	0-4000 V _{DC}	Yes	10 kV _{DC} and 50 kV _{AC}	972 mm	Medium	300 mm	1.8 kg

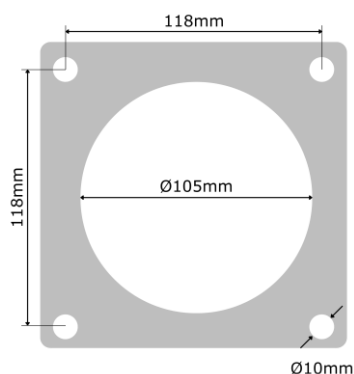
Dimensions



CRS750 - CRS4000



CRS27500



Detector Base



Cable or Conduit Gland

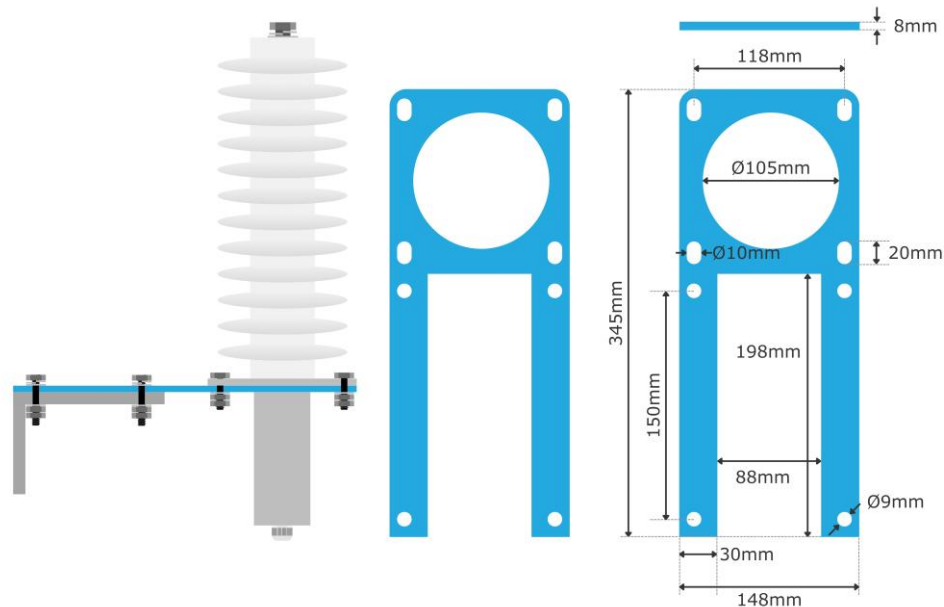
Technical data

CRS

Specifications	
Silicone	ISO 37
Elongation at break	630 %
Tensile strength	8.5 N/mm ²

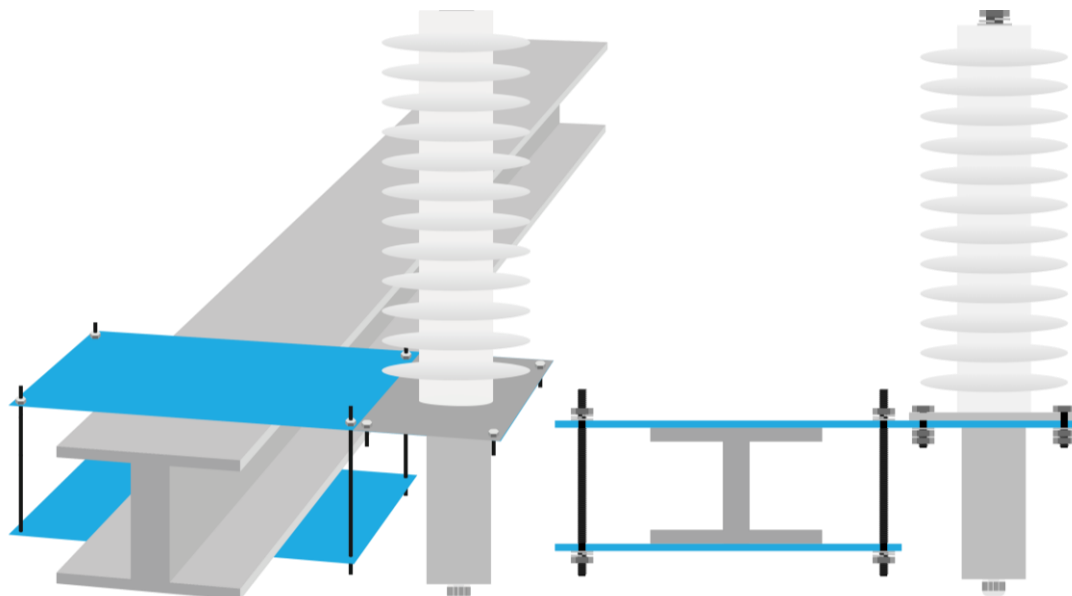
⚙ Mounting Bracket – SOP-006

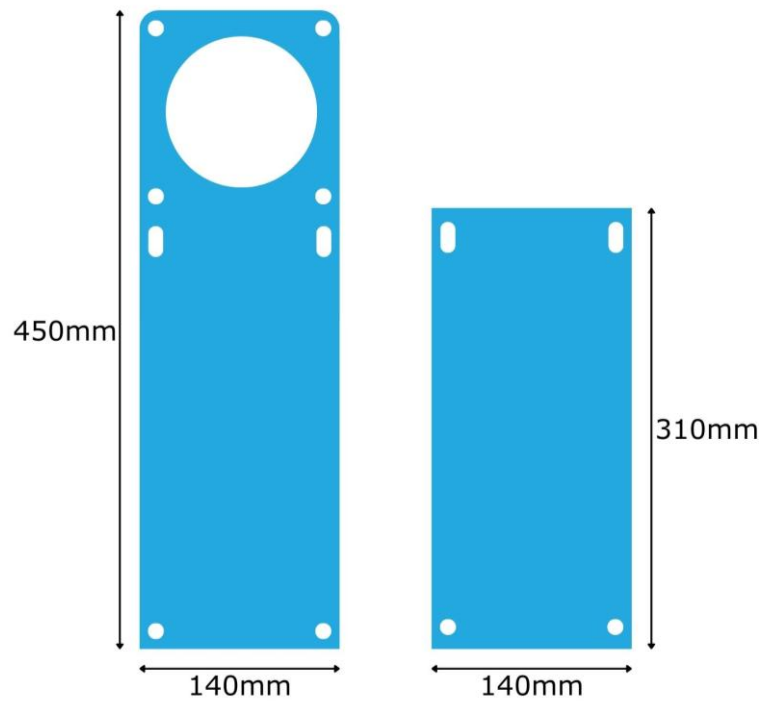
- Zinc-plated mounting Bracket kit for **catenary attachment**
- Adaptable to any installation



⚙ Mounting Bracket – SOP-008

- Galvanized mounting bracket kit and stainless-steel screws for **beam mounting**
- 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 changeover contact** output:
 - Activation at **> 40%** of the nominal voltage
 - Deactivation at **< 30%** of the nominal voltage
- ✓ **Self-powered** by the catenary voltage
- ✓ Very low power solution: **3 mA**
- ✓ Response time: **15 ms**
- ✓ **Epoxy** coated circuit installed in waterproof enclosure
- ✓ Approved by ADIF under Registration Number **64999051E** on 1-Sept-2016

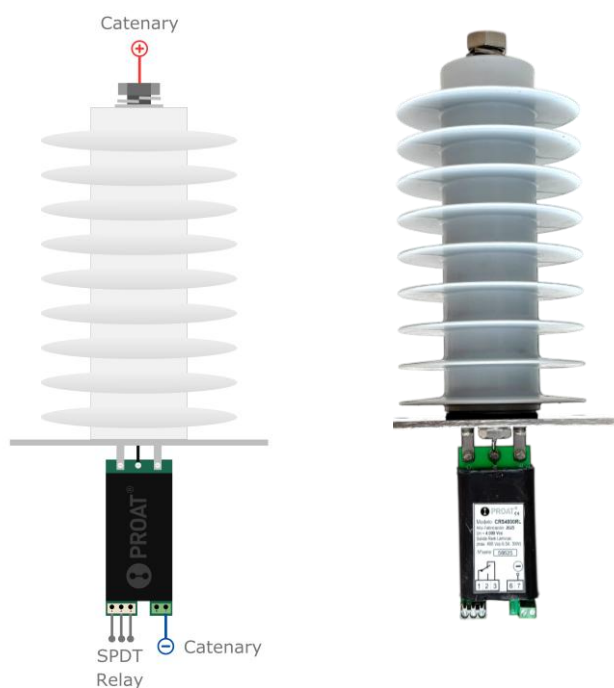


Models

Model	Nominal Voltage	Leakage Line	Output	Auxiliary Voltage
CRS750 + RL	750 V _{DC}	618 mm	Reed Relay	Self-powered
CRS1500 + RL	1500 V _{DC}	618 mm	Reed Relay	Self-powered
CRS3000 + RL	3000 V _{DC}	618 mm	Reed Relay	Self-powered
CRS4000 + RL	4000 V _{DC}	618 mm	Reed Relay	Self-powered

*Custom electrical panels with CRS+RL equipment can be manufactured upon request

⚙️ Wiring

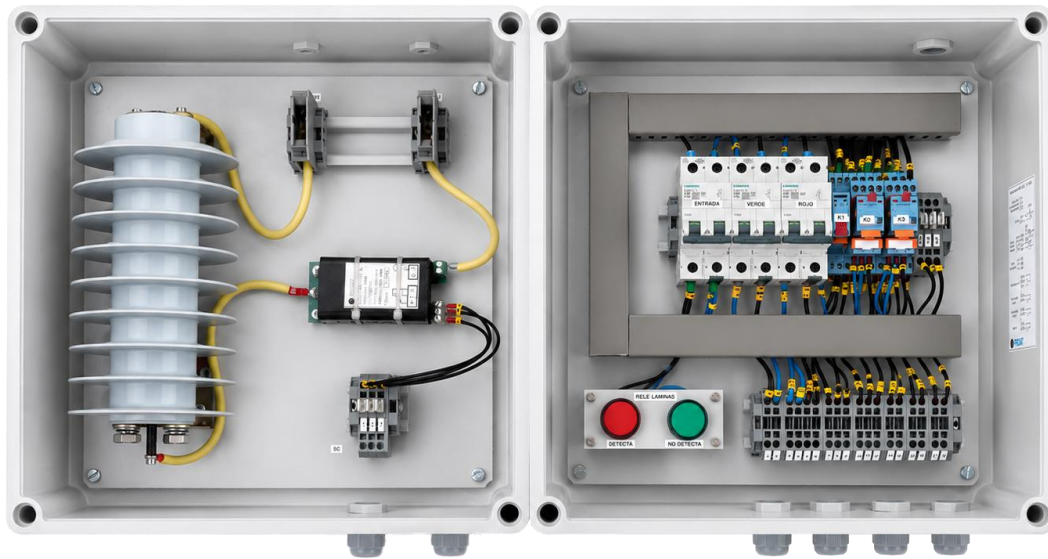


⚙️ Technical data

CRS + Reed Relay

Specifications	
Contact type	SPDT
Switching capacity	< 60 VA
Switching voltage	< 400 V _{AC} / V _{DC}
Switching current	< 1.0 A
Max switching power	< 40 W
Carry current	< 2.0 A
Insulation resistance	>10 ⁹ Ω
Operating temperature	-40° C to +125° C
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

• **CRS + RL Electrical Panels**



CRS + CBI21

Resistive Silicone Sensor

+

4-20 mA Output

- ✓ Resistive Silicone Sensor **CRS**
- ✓ **CBI21** current loop converter with isolated **4-20 mA** output proportional to catenary voltage
- ✓ Auxiliary voltage **85-264 V_{AC} | 85-370 V_{DC}, 48 V_{DC}, 24 V_{DC}** depending on model
- ✓ CRS+CBI21 withstands lightning impulses up to **95 kV**
- ✓ **Epoxy coated** circuit installed in waterproof enclosure

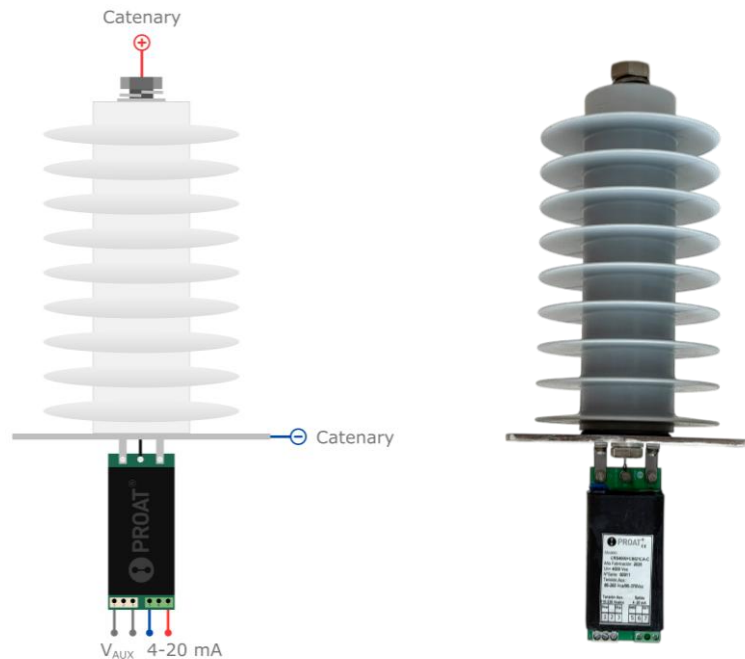


Models

Model	Compatible Sensor	Output	Auxiliary Voltage
CBI21-CA	CRS750 to CRS4000	4-20 mA	85-264 V _{AC} 85-370 V _{DC}
CBI21-CA-24	CRS750 to CRS4000	4-20 mA	24 V _{DC}
CBI21-CA-48	CRS750 to CRS4000	4-20 mA	48 V _{DC}
CBI21-FA	CRS27500	4-20 mA	85-264 V _{AC} 85-370 V _{DC}
CBI21-FA-24	CRS27500	4-20 mA	24 V _{DC}
CBI21-FA-48	CRS27500	4-20 mA	48 V _{DC}

Order Example: CRS4000 + CBI21-CA-24

Wiring



Technical data

CRS + CBI21

Specifications	
Output (RL = 500 Ω)	4-20 mA
Maximum load resistance	750 Ω
Linearity	1%
Accuracy	$\pm 1\%$
Power consumption	3 W
Input-Output isolation	3 kV
Operating temperature	-30° C to +75 ° C
Tests	
UNE 21138 Standard	Mechanical bending resistance tests: 20 N
	Dry lightning impulse withstand voltage tests
	Dry power-frequency withstand voltage tests
	Wet power-frequency withstand voltage tests
UNE 60068 Standard	Corrosion test
Other tests	Operating temperature test
	Voltage measurement accuracy

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

- ✓ Resistive Silicone Sensor **CRS**
- ✓ Fiber Optic Transmitter-Receiver **EFO** and **RFO**
- ✓ CRS + FO withstands lightning impulses up to **95 kV**
- ✓ The CRS + FO set is **ADIF** approved (DPA-FO) with reference number **2014/00067** on 29 January 2014

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 **5000** meters
- ✓ Linearity: **±2%**
- ✓ **Self-powered or Auxiliary Voltage ±12 V_{DC}** depending on model
- ✓ Optional **FA1212-18** ±12 V_{DC} power supply for voltages **85-264 V_{AC}** | **85-370 V_{DC}** with galvanic isolation input-output **18.5 kV_{AC}**
- ✓ **Epoxy coated** circuit installed in waterproof enclosure

RFO – Fiber Optic Receiver

- ✓ **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
- ✓ **4-20 mA** output proportional to the catenary voltage
- ✓ Installation on **DIN Rail** or in a **19" Rack Submodule** depending on model
- ✓ Auxiliary voltage **85-264 V_{AC}** | **85-370 V_{DC}** or **24 V_{DC}**



Models – Fiber Optic Transmitters

Model	Fiber Optic	Auxiliary Voltage
EFO	SL Connector	Self-powered from the catenary
EFOA	SL Connector	$\pm 12 V_{DC}$
EFO-LD	ST Connector	Self-powered from the catenary
EFOA-LD	ST Connector	$\pm 12 V_{DC}$

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

*Custom electrical panels with CRS+FO equipment can be manufactured upon request

Models – Fiber Optic Receivers

Model	Fiber Optic	Compatible Transmitter	Installation	Real-Time Display	4-20 mA Output	Output Contacts	Auxiliary Voltage
RFO	SL Connector	EFO	19" Rack Submodule	No	No	Yes	85-264 V _{AC} 85-370 V _{DC}
RFO-D	SL Connector	EFO	DIN Rail	Yes	Yes	Yes	85-264 V _{AC} 85-370 V _{DC}
RFO-D-24	SL Connector	EFO	DIN Rail	Yes	Yes	Yes	24 V _{DC}
RFOA	SL Connector	EFOA	19" Rack Submodule	No	No	Yes	85-264 V _{AC} 85-370 V _{DC}
RFOA-D	SL Connector	EFOA	DIN Rail	Yes	Yes	Yes	85-264 V _{AC} 85-370 V _{DC}
RFOA-D-24	SL Connector	EFOA	DIN Rail	Yes	Yes	Yes	24 V _{DC}
RFO-LD	ST Connector	EFO-LD	19" Rack Submodule	No	No	Yes	85-264 V _{AC} 85-370 V _{DC}
RFO-D-LD	ST Connector	EFO-LD	DIN Rail	Yes	Yes	Yes	85-264 V _{AC} 85-370 V _{DC}
RFO-D-LD-24	ST Connector	EFO-LD	DIN Rail	Yes	Yes	Yes	24 V _{DC}
RFOA-LD	ST Connector	EFOA-LD	19" Rack Submodule	No	No	Yes	85-264 V _{AC} 85-370 V _{DC}
RFOA-D-LD	ST Connector	EFOA-LD	DIN Rail	Yes	Yes	Yes	85-264 V _{AC} 85-370 V _{DC}
RFOA-D-LD-24	ST Connector	EFOA-LD	DIN Rail	Yes	Yes	Yes	24 V _{DC}

* Other models can be manufactured upon request

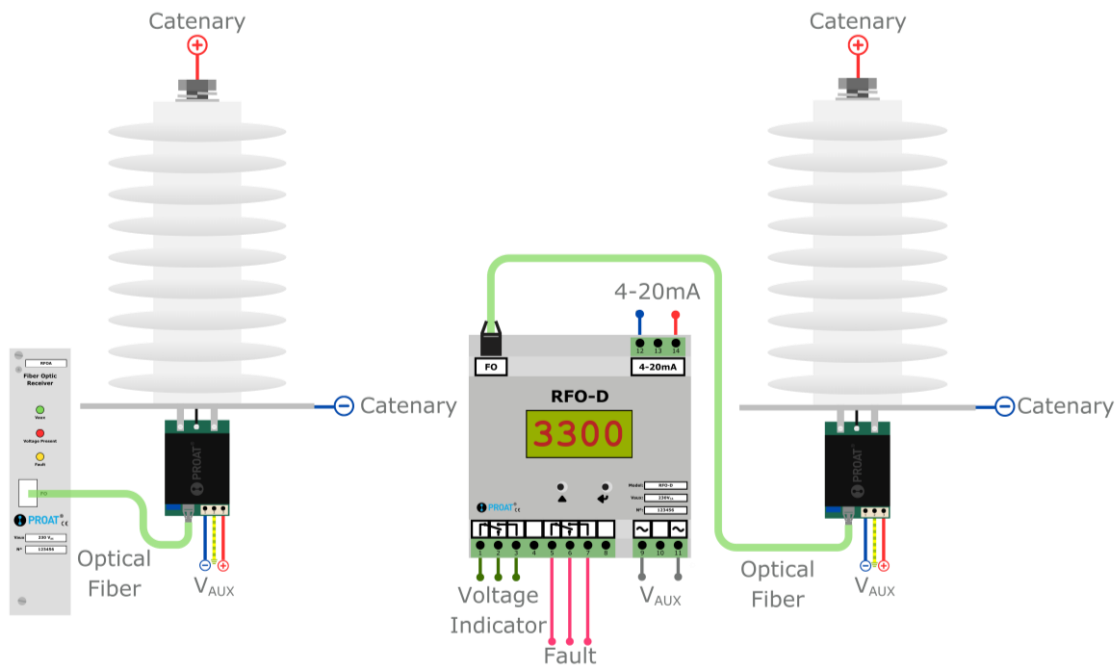
Models – Fiber Optic Patch cords

Model	Connector	Distance
LG-xxx	SL Connector	5 to 100 meters
LG-xxx-LD	ST Connector	5 to 5000 meters
LG-xxx-LD-R	ST Connector	5 to 5000 meters – Reinforced

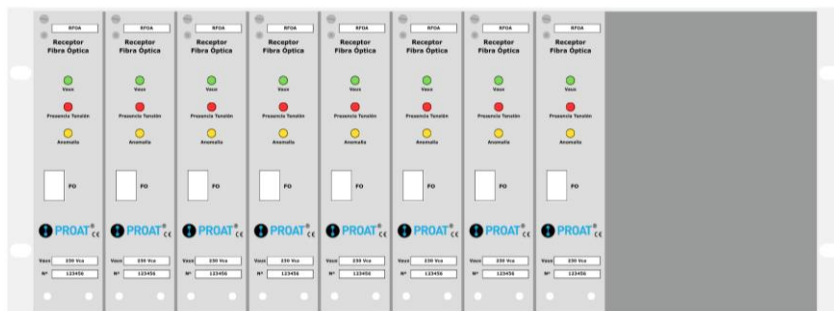
Models – Power Supply

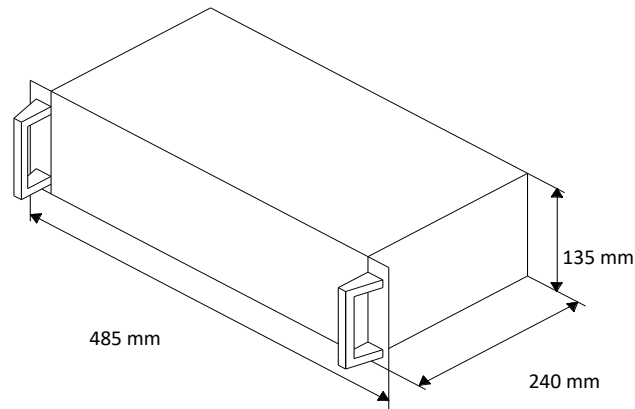
Model	Input	Output	Isolation Input-Output
FA1212-18	85-264 V _{AC} 85-370 V _{DC}	±12 V _{DC}	18.5 kV _{AC}

Wiring



19" Rack mounting case for 12 Modules





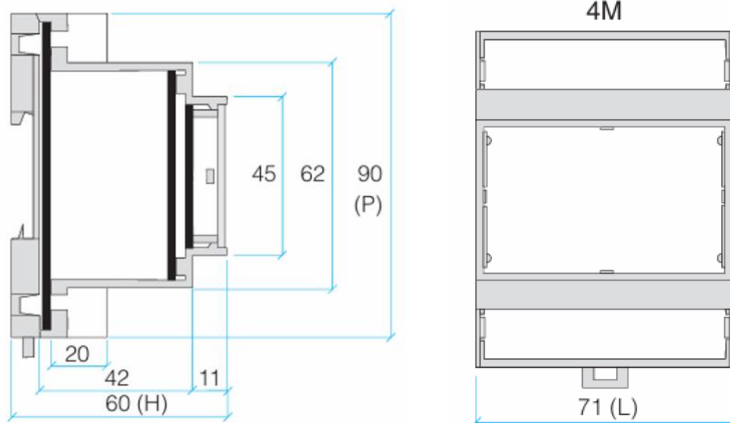
Technical data – RFO-D

RFO-D

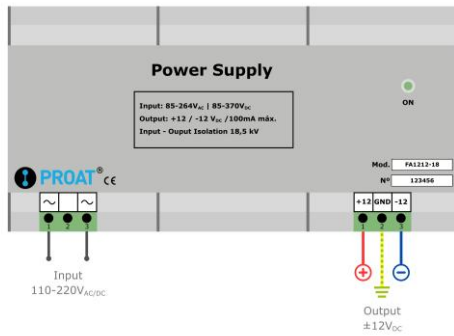
Specifications	
Contact type	SPDT
Switching capacity	1000 VA
Switching voltage	$\leq 230 V_{AC}$
Response time	$< 1 s$
Reading range	$0 - U_N + 10\%$
Auxiliary voltage	$85-264 V_{AC} \mid 85-370 V_{DC}$ $24 V_{DC}$
Standby power consumption	$< 5 W$
Operating temperature	$-10^{\circ} C$ to $+60^{\circ} C$
Regulations	CE

Constructive Characteristics – RFO-D

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

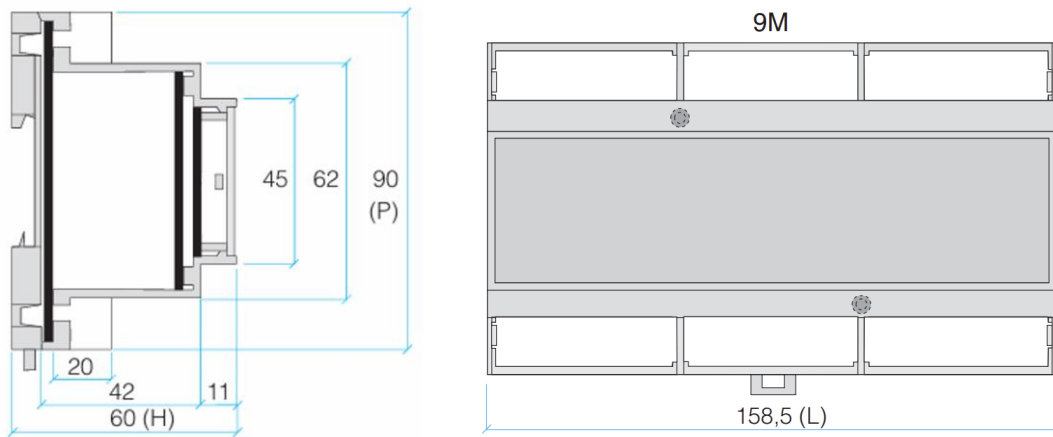


Power Supply – FA1212-18



Constructive Characteristics – FA1212-18

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

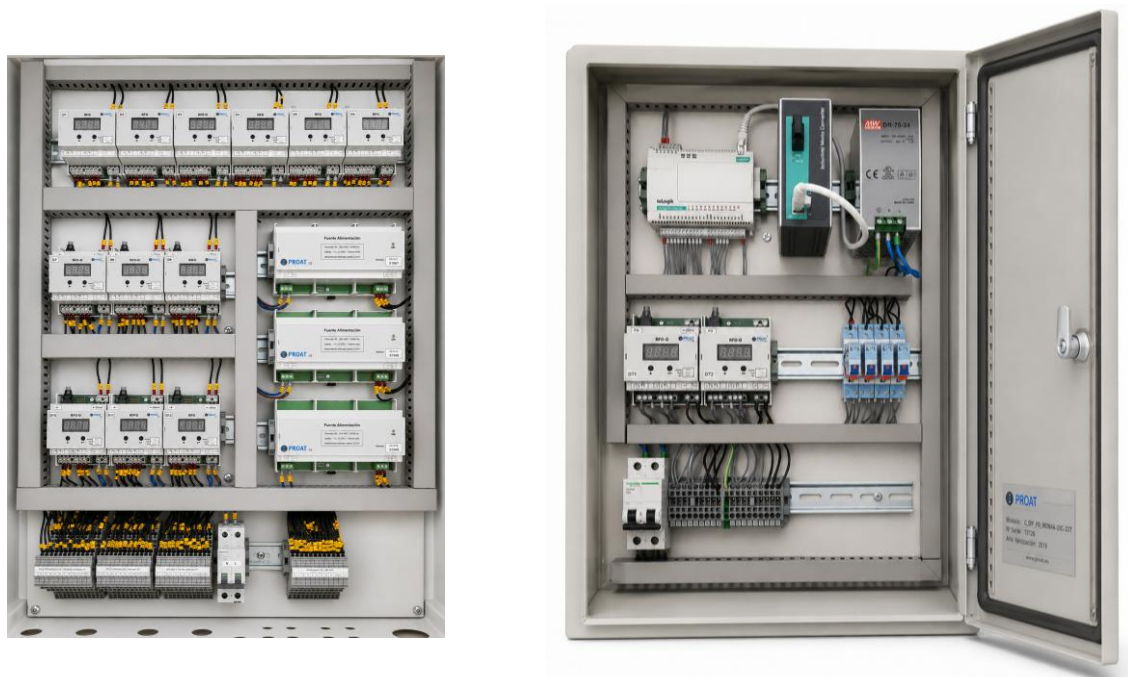


Technical data – FA1212-18

FA1212-18

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

CRS + FO Electrical Panels



Panel with RFO and FA1212-12

Remot-Control Panel

CRS + PTC-M1

Resistive Silicone Sensor

+

DC Voltage Presence Detector

- ✓ Resistive Silicone Sensor **CRS**
- ✓ Remote DC voltage indication in electrical panels for disconnectors and circuit breakers.
- ✓ **PTC-M1** amplifies the signal from a Resistive Silicone Sensor
- ✓ Input **150 V_{DC}**, activation with **>30%**
- ✓ Potential-Free Switched Contact **Output**
- ✓ Voltage indication by Red LED indicator
- ✓ Auxiliary voltage **120-230 V_{DC} | 120-230 V_{AC} or 48 V_{DC}** depending on the model
- ✓ Contacts on an **11-pin socket, DIN rail** mounting

Applications

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

- Conventional Trains
- Metros
- Trams



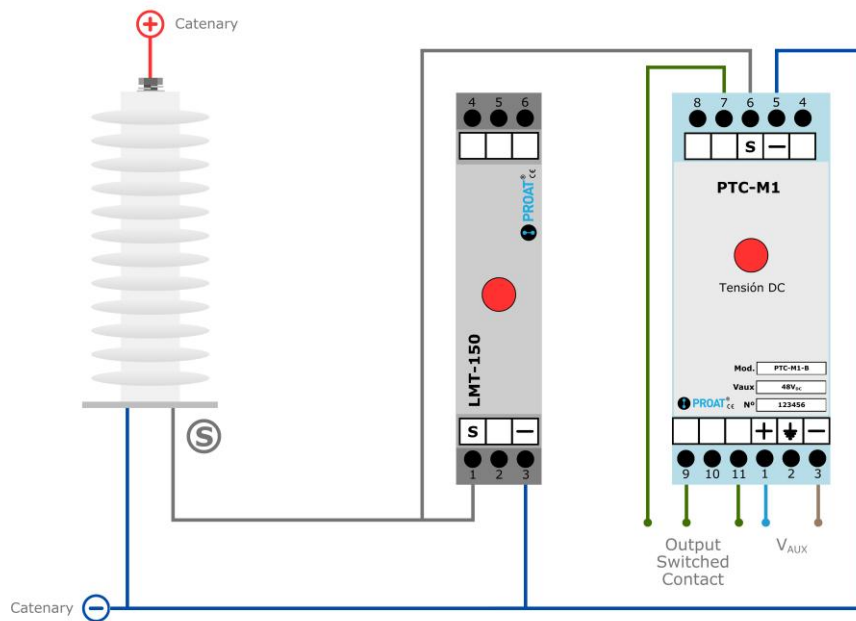
Models

Model	Auxiliary Voltage
PTC-M1	120-230 V _{DC} 120-230 V _{AC}
PTC-M1-48	48 V _{DC}

Order Example: CRS1500 + PTC-M1



Wiring



LMT-150 Limiter

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

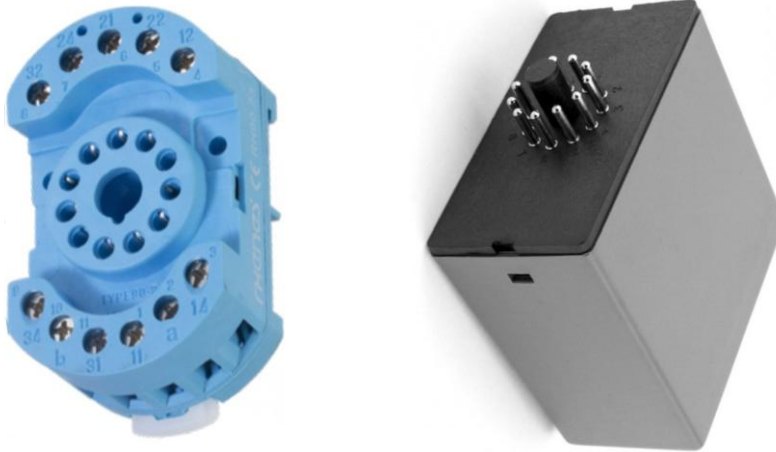
A red LED indicates the presence of voltage in the catenary.

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



❶ Constructive Characteristics– PTC-M1

- DIN rail installation
- Terminals on UNDECAL base
- Contacts on an 11-pin socket
- Enclosure dimensions: 80 mm × 77 mm × 42 mm
- UNDECAL base dimensions: 64 mm × 38 mm × 23 mm
- Self-extinguishing plastic enclosure, class V0

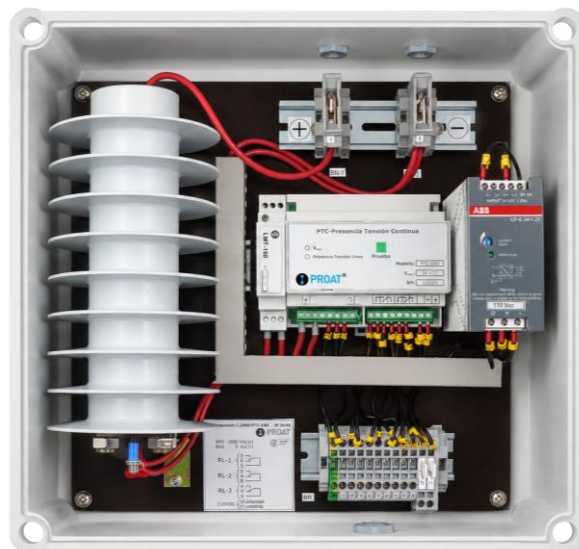


❷ Technical data – PTC-M1

PTC-M1	
Specifications	
Input voltage	0-150 V _{DC}
Presence detection level	100 V ±20%
Response time	30 ms
Standby power consumption	1 W
Fault power consumption	< 2 W
Standards complied with	
Insulation test voltage	
High-frequency disturbances	
Fast transients	
Voltage impulse	
Relay contact characteristics	
Continuous current	5 A
Switching voltage	< 230 V _{AC}
Switching power	< 2000 VA



❶ CRS + PTC Electrical Panels



Onboard DC Voltage Detector for Locomotives

CRS + LED

Resistive Silicone Sensor + Flashing LED Indicator

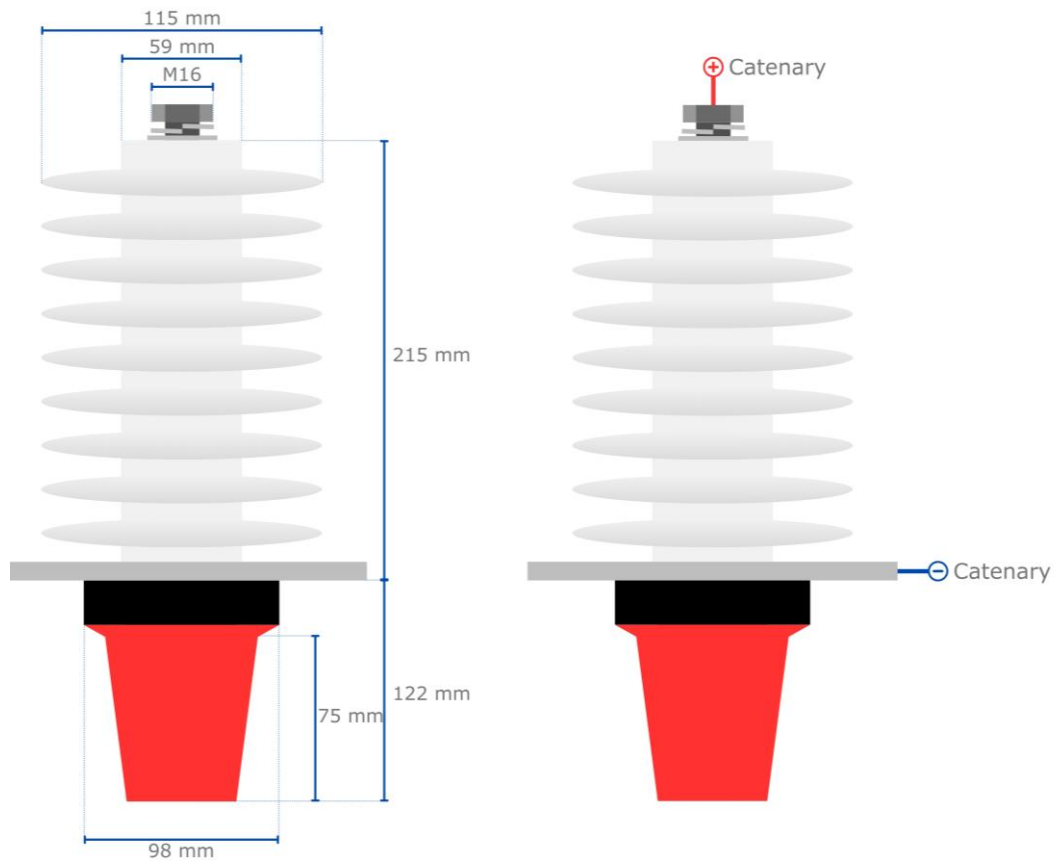
- ✓ Resistive Silicone Sensor **CRS**
- ✓ Control circuit and a **Flashing LED Indicator**
- ✓ Black ABS base and Red translucent polycarbonate lampshade
- ✓ **Self-powered** from the catenary
- ✓ **Voltage signaling** in tunnels, workshops, etc. For maintenance or emergency tasks.
- ✓ Light indicator activation > **30%** of nominal voltage
- ✓ LED board service life: > **50,000 hours**
- ✓ **Epoxy** coated circuit installed in waterproof enclosure



Models

Model	Voltage Service	Auxiliary Voltage
CRS750 + LED	0-750 V _{DC}	Self-powered
CRS1500 + LED	0-1500 V _{DC}	Self-powered
CRS3000 + LED	0-3000 V _{DC}	Self-powered
CRS4000 + LED	0-4000 V _{DC}	Self-powered
CRS27500 + LED	0-4000 V _{DC}	Self-powered

⚙️ Wiring and Dimensions



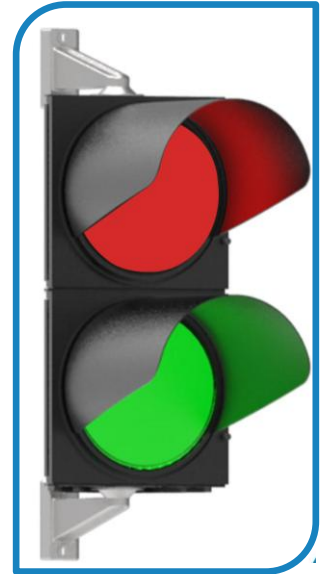
⚙️ Technical data

CRS + LED

Specifications	
Maximum current	< 3 mA
Flashing frequency at U_N	1 Hz
LED activation	> 30% U_N
LED service life	> 50 000 hours
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

CRS + SMFR **Resistive Silicone Sensor** **+** **Green/Red Signal Light**

- ✓ Resistive Silicone Sensor **CRS + CBI21** for DC voltage measurement with **4-20 mA output**
- ✓ 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}

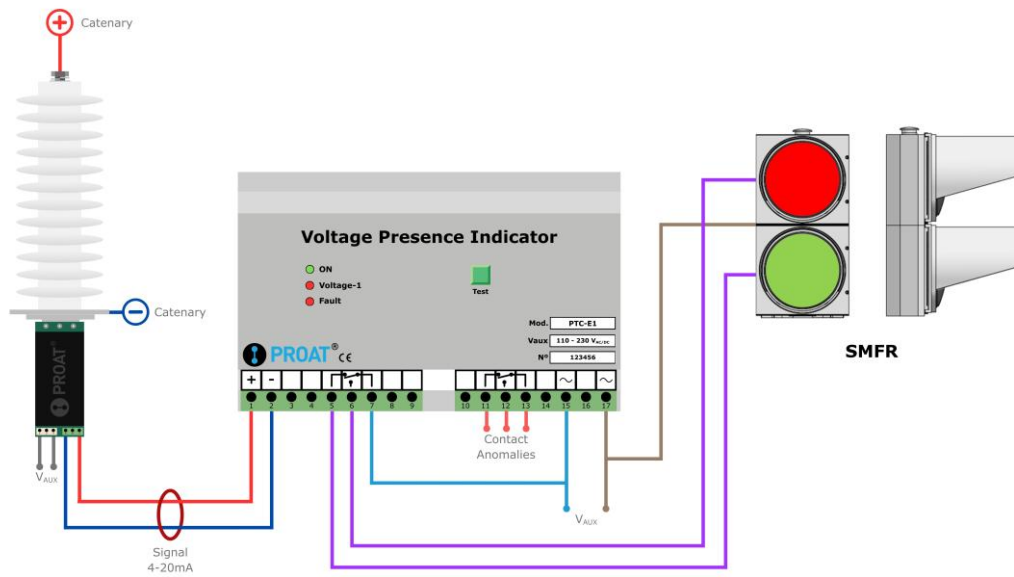


Models

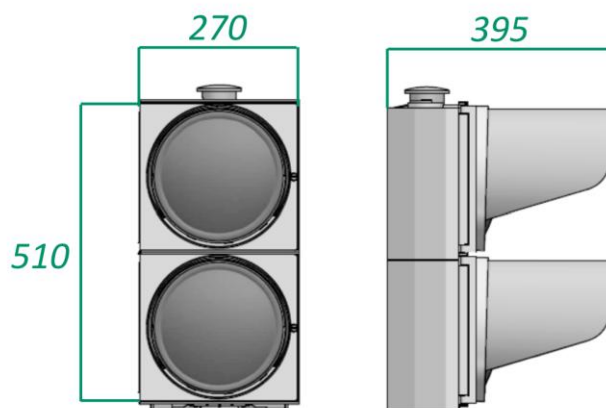
Configuration Options:

- **CRS** - Any Model
- **CBI21** - Any Model
- **PTC-E1** - Voltage Presence Controller
- **SMFR** - Green – Red Signal Light
- **Signal Light Attachment** - Any Model

⚙️ Wiring

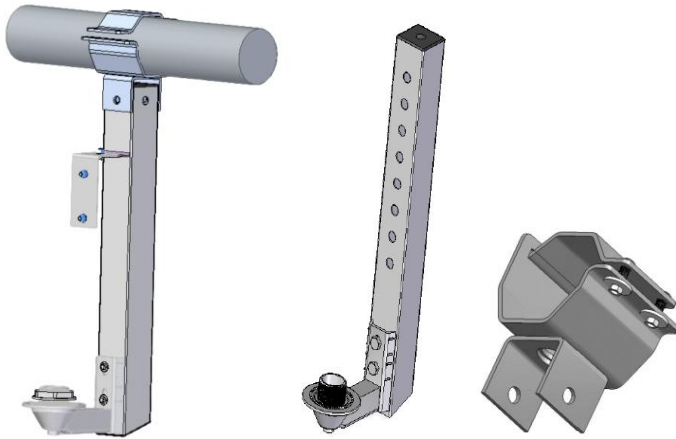


⚙️ Constructive Characteristics



❶ Mounting Bracket SOP-SMFR-001

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

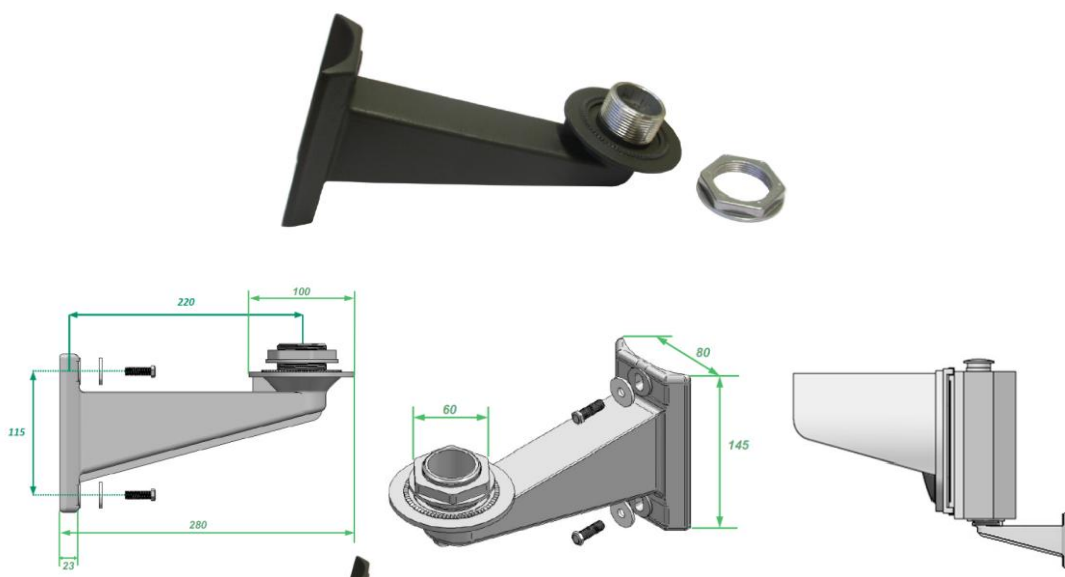


❷ Mounting Bracket SOP-SMFR-002

- 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

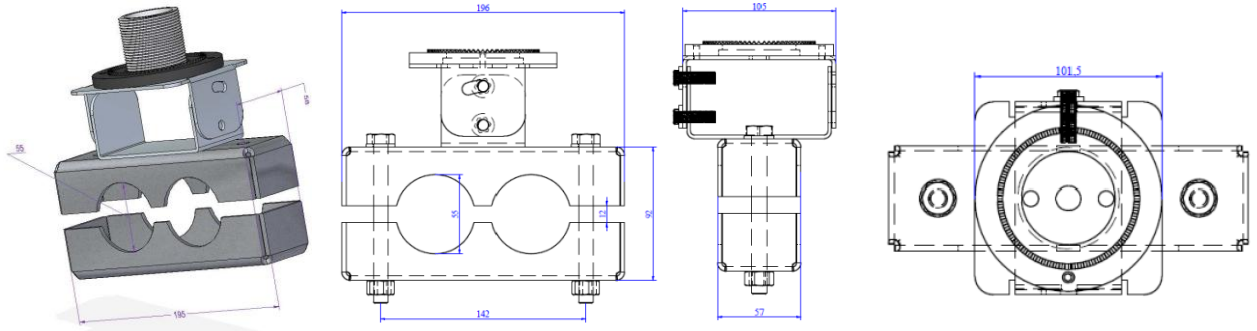
Advantages

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



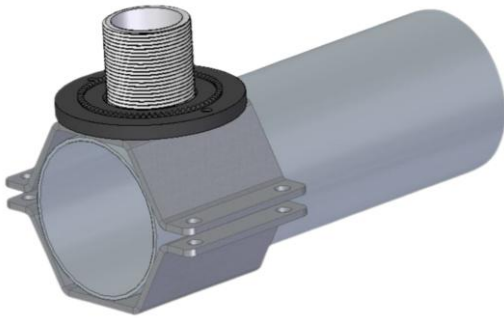
❗ Mounting Bracket SOP-SMFR-003

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



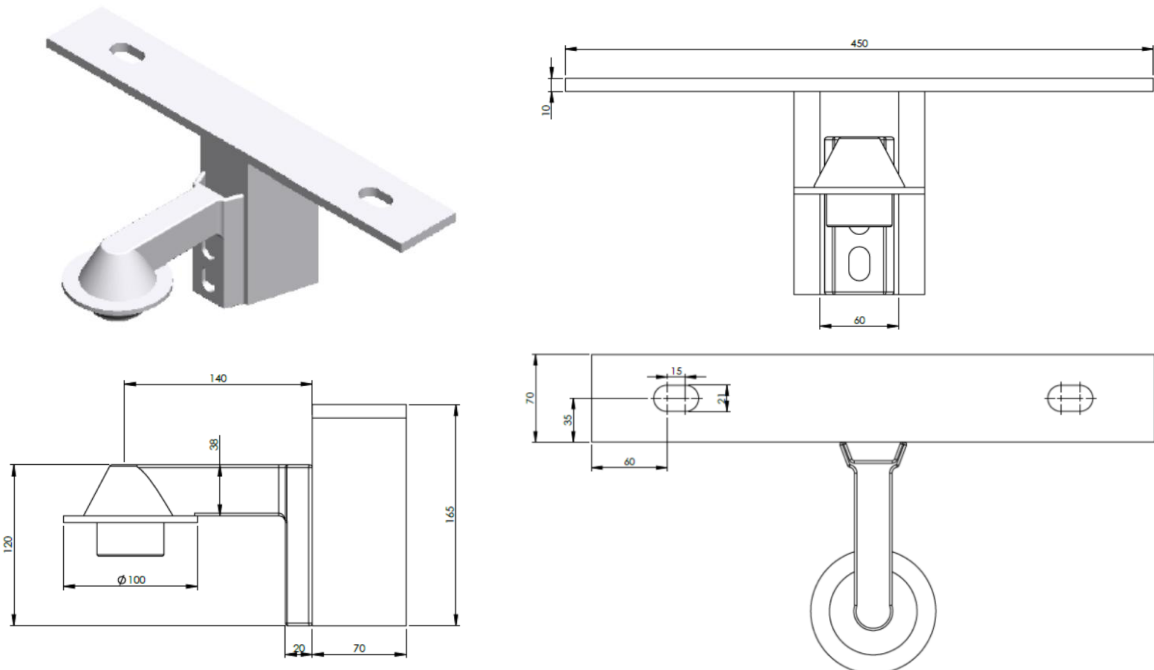
ⓘ Mounting Bracket SOP-SMFR-004

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



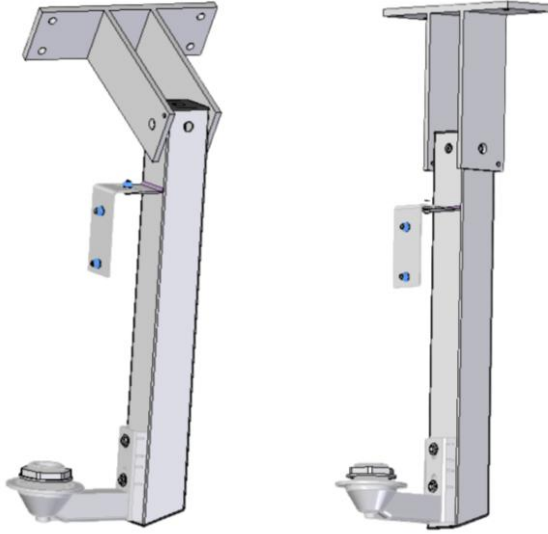
! Mounting Bracket SOP-SMFR-005

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



❶ Mounting Bracket SOP-SMFR-006

- Mounting Bracket for mounting in **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.

CRE + RL

Epoxy Resistive Sensor + Reed Relay Output

- ✓ **DC** Catenary Voltage Detector
- ✓ Models from **750 V_{DC}** to **4000 V_{DC}**
- ✓ **Brass** terminals and **Epoxy** construction
- ✓ Outdoor models made of **Cycloaliphatic Epoxy** resin
- ✓ Creepage distance: **305 mm**
- ✓ **Self-powered** from the catenary voltage
- ✓ **Vertical mounting** adaptable to any installation

Reed Relay

✓ **Reed relay** housed in a cylindrical aluminium enclosure and encapsulated in epoxy resin with potential-free changeover contact output:

- Activation at **> 40%** of nominal voltage
- Deactivation at **< 30%** of the nominal voltage
- Response time: **15 ms**
- Consumption: **3 mA** a 4000 V_{DC}

Applications

Detection of **DC voltage** presence in railway installations:

- Conventional trains
- Metro systems
- Trams



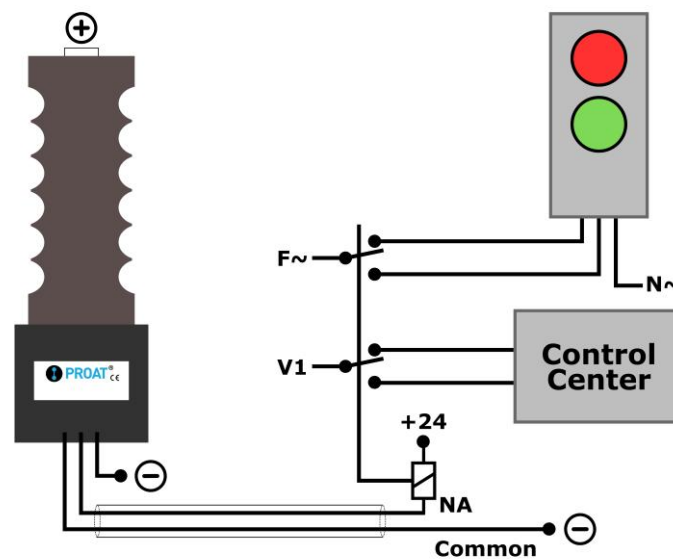
Models

Model	Material	Nominal Voltage V_N	Mechanical Load	Creepage distance	Test Voltage 10 s	Weight
CRE-750 + RL	Epoxy	750 V _{DC}	4000 N	305 mm	2 * V _N	1.5 kg
CRE-750-EXT + RL	Cycloaliphatic Epoxy	750 V _{DC}	4000 N	305 mm	2 * V _N	1.5 kg
CRE-1500 + RL	Epoxy	1500 V _{DC}	4000 N	305 mm	2 * V _N	1.5 kg
CRE-1500-EXT + RL	Cycloaliphatic Epoxy	1500 V _{DC}	4000 N	305 mm	2 * V _N	1.5 kg
CRE-4000 + RL	Epoxy	4000 V _{DC}	4000 N	305 mm	2 * V _N	1.5 kg
CRE-4000-EXT + RL	Cycloaliphatic Epoxy	4000 V _{DC}	4000 N	305 mm	2 * V _N	1.5 kg

Connection

Four terminals for external connection:

- Catenary negative
- Three terminals for the reed relay changeover contact



Example of connection to a signal light

Technical data - RL

Reed Relay

Specifications	
Contact Type	SPDT
Switching Capacity	< 60 VA
Switching Voltage	< 400 V _{AC} / V _{DC}
Switching Current	< 1 A
Carrying Current	< 2 A
Insulation Resistance	> 10 ⁹ Ω
Operating Temperature	-40°C a +125°C

CRE + PTC-M1

Epoxy Resistive Sensor

+

DC Voltage Detector

- ✓ **DC Catenary** Voltage Presence Detector
- ✓ Models from **750 V_{DC}** to **4000 V_{DC}**
- ✓ **Brass** terminals and **Epoxy** construction
- ✓ Outdoor models made of cycloaliphatic Epoxy resin
- ✓ Creepage distance: **305 mm**
- ✓ **Vertical mounting** adaptable to any installation



PTC-M1 – DC Voltage Presence Detector

- ✓ **PTC-M1** amplifies the signal from a Resistive Sensor. Input **150 V_{DC}**, activation at **> 30%**
- ✓ Output: **potential-free switching contact**
- ✓ Voltage indication with **Red LED** diode
- ✓ Auxiliary voltage **120-230 V_{DC} | 120-230 V_{AC}** or **48 V_{DC}** depending on model
- ✓ Contacts on **11-pin** socket, **DIN rail** mounting

Applications

Detection of **DC voltage presence** in railway installations:

- Conventional trains
- Metro systems
- Trams

Allows remote signaling in an electrical panel, for disconnectors or circuit breakers.



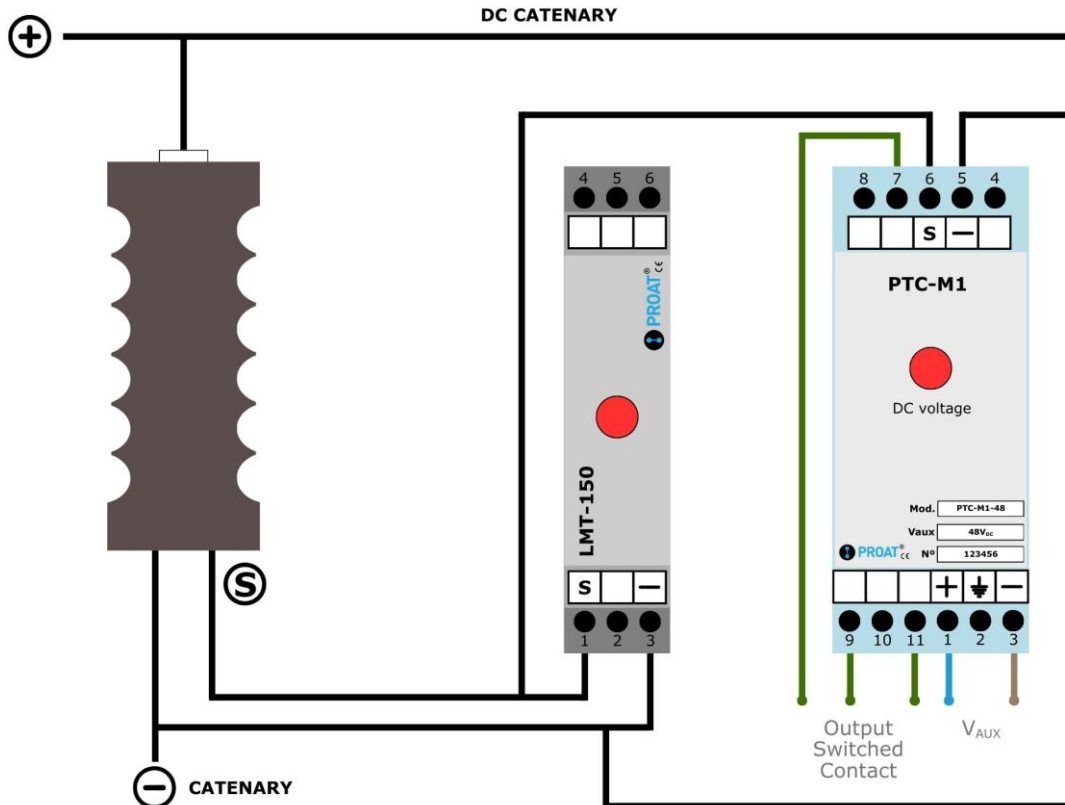
Models

Model	Material	Nominal Voltage V_N	Mechanical Load	Creepage distance	Test Voltage 10s	Weight
CRE-750	Epoxy	750 V _{DC}	4000 N	305 mm	2 * V _N	1.5 kg
CRE-750-EXT	Cycloaliphatic Epoxy	750 V _{DC}	4000 N	305 mm	2 * V _N	1.5 kg
CRE-1500	Epoxy	1500 V _{DC}	4000 N	305 mm	2 * V _N	1.5 kg
CRE-1500-EXT	Cycloaliphatic Epoxy	1500 V _{DC}	4000 N	305 mm	2 * V _N	1.5 kg
CRE-4000	Epoxy	4000 V _{DC}	4000 N	305 mm	2 * V _N	1.5 kg
CRE-4000-EXT	Cycloaliphatic Epoxy	4000 V _{DC}	4000 N	305 mm	2 * V _N	1.5 kg

Model	Auxiliary Voltage
PTC-M1	120-230 V _{DC} 120-230 V _{AC}
PTC-M1-48	48 V _{DC}

Example of order: CRE-750 + PTC-M1

Connection



❶ LMT-150 Voltage Limiter

The function of the LMT-150 voltage limiter is to prevent the output voltage from reaching hazardous levels ($>150\text{ V}$) 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



❷ Constructive Features – PTC-M1

- DIN rail installation
- Terminals on UNDECAL base
- Contacts on an 11-pin socket
- Enclosure dimensions: $80\text{ mm} \times 77\text{ mm} \times 42\text{ mm}$
- UNDECAL base dimensions: $64\text{ mm} \times 38\text{ mm} \times 23\text{ mm}$
- Self-extinguishing plastic enclosure, class V0



❸ Technical data – PTC-M1

PTC-M1	
Specifications	
Input voltage	$0-150\text{ V}_{\text{DC}}$
Presence detection level	$100\text{ V} \pm 20\%$
Response time	30 ms
Standby power consumption	1 W
Fault power consumption	$< 2\text{ W}$
Standards compliance	
Insulation test voltage	
High-frequency disturbances	
Electrical fast transients	
Voltage impulse	
Relay contact characteristics	
Continuous current	5 A
Switching voltage	$< 230\text{ V}_{\text{AC}}$
Switching capacity	$< 2000\text{ VA}$



SMFR

DC Catenary Voltage Detector Traffic Light

- ✓ **DC Catenary Voltage Detector**
- ✓ Models of **750 V_{DC}** or **1500 V_{DC}**
- ✓ **Self-powered or Auxiliary Voltage** depending on the model
- ✓ High-brightness **LED optics** in Ø 200 mm
- ✓ Pictogram '**750**', '**1500**' or **Light**
- ✓ **Available LED colors:** amber, blue, red, green and white
- ✓ Enclosure color: **Dark Gray**



Applications

DC Catenary voltage signaling for drivers:

- Trams
- Metropolitan Networks



Functional Features

Self-Powered Model

- Powered by catenary voltage, connected to positive and negative

	SFMR-750	SFMR-1500
Operating ranges		
On	$\geq 440 \text{ V}_{\text{DC}}$	$\geq 880 \text{ V}_{\text{DC}}$
Off	$< 440 \text{ V}_{\text{DC}}$	$< 880 \text{ V}_{\text{DC}}$
Nominal Voltage	$750 \text{ V}_{\text{DC}}$	$1500 \text{ V}_{\text{DC}}$
Max. permanent voltage	$800 \text{ V}_{\text{DC}}$	$1600 \text{ V}_{\text{DC}}$
Max. peak voltage	$1200 \text{ V}_{\text{DC}} (5\text{ms})$	$2000 \text{ V}_{\text{DC}} (5\text{ms})$

Models with Auxiliary Voltage

	SFMR-750	SFMR-1500
Operating ranges		
On	$> 500 \text{ V}_{\text{DC}}$	$\geq 880 \text{ V}_{\text{DC}}$
Intermittent	$\leq 500 \text{ V}_{\text{DC}}$	$\geq 880 \text{ V}_{\text{DC}}$
Off	No auxiliary voltage	No auxiliary voltage
Nominal Voltage	$750 \text{ V}_{\text{DC}}$	$1500 \text{ V}_{\text{DC}}$
Max. permanent voltage	$800 \text{ V}_{\text{DC}}$	$1600 \text{ V}_{\text{DC}}$
Max. peak voltage	$1200 \text{ V}_{\text{DC}} (5\text{ms})$	$2000 \text{ V}_{\text{DC}} (5\text{ms})$

Optics



750 Optics Pictogram



1500 Optics Pictogram



**Round LED Optics
PIL-200x200 PPC**

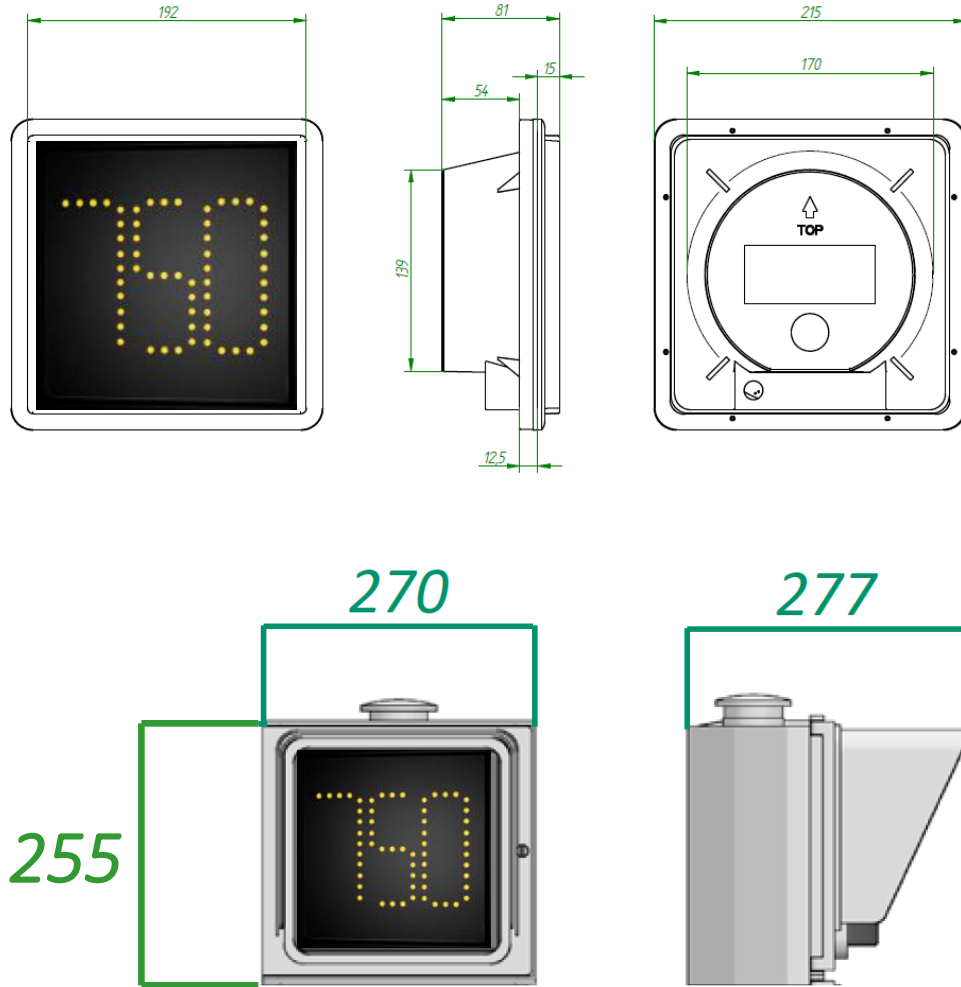
Models of 750 V_{DC}

Model	Nominal Voltage	Pictogram	LED Color	Auxiliary Voltage
SMFR-750-PA	750 V _{DC}	'750'	Amber	Self-Powered
SMFR-750-PZ	750 V _{DC}	'750'	Blue	Self-Powered
SMFR-750-PR	750 V _{DC}	'750'	Red	Self-Powered
SMFR-750-PV	750 V _{DC}	'750'	Green	Self-Powered
SMFR-750-PB	750 V _{DC}	'750'	White	Self-Powered
SMFR-750-PA-230	750 V _{DC}	'750'	Amber	230 V _{AC}
SMFR-750-PZ-230	750 V _{DC}	'750'	Blue	230 V _{AC}
SMFR-750-PR-230	750 V _{DC}	'750'	Red	230 V _{AC}
SMFR-750-PV-230	750 V _{DC}	'750'	Green	230 V _{AC}
SMFR-750-PB-230	750 V _{DC}	'750'	White	230 V _{AC}
SMFR-750-PA-125	750 V _{DC}	'750'	Amber	125 V _{DC}
SMFR-750-PZ-125	750 V _{DC}	'750'	Blue	125 V _{DC}
SMFR-750-PR-125	750 V _{DC}	'750'	Red	125 V _{DC}
SMFR-750-PV-125	750 V _{DC}	'750'	Green	125 V _{DC}
SMFR-750-PB-125	750 V _{DC}	'750'	White	125 V _{DC}
SMFR-750-A-230	750 V _{DC}	LED Optics	Amber	230 V _{AC}
SMFR-750-Z-230	750 V _{DC}	LED Optics	Blue	230 V _{AC}
SMFR-750-R-230	750 V _{DC}	LED Optics	Red	230 V _{AC}
SMFR-750-V-230	750 V _{DC}	LED Optics	Green	230 V _{AC}
SMFR-750-B-230	750 V _{DC}	LED Optics	White	230 V _{AC}
SMFR-750-A-125	750 V _{DC}	LED Optics	Amber	125 V _{DC}
SMFR-750-Z-125	750 V _{DC}	LED Optics	Blue	125 V _{DC}
SMFR-750-R-125	750 V _{DC}	LED Optics	Red	125 V _{DC}
SMFR-750-V-125	750 V _{DC}	LED Optics	Green	125 V _{DC}
SMFR-750-B-125	750 V _{DC}	LED Optics	White	125 V _{DC}

Models of 1500 V_{DC}

Model	Nominal Voltage	Pictogram	LED Color	Auxiliary Voltage
SMFR-1500-PA	1500 V _{DC}	‘1500’	Amber	Self-Powered
SMFR-1500-PZ	1500 V _{DC}	‘1500’	Blue	Self-Powered
SMFR-1500-PR	1500 V _{DC}	‘1500’	Red	Self-Powered
SMFR-1500-PV	1500 V _{DC}	‘1500’	Green	Self-Powered
SMFR-1500-PB	1500 V _{DC}	‘1500’	White	Self-Powered
SMFR-1500-PA-230	1500 V _{DC}	‘1500’	Amber	230 V _{AC}
SMFR-1500-PZ-230	1500 V _{DC}	‘1500’	Blue	230 V _{AC}
SMFR-1500-PR-230	1500 V _{DC}	‘1500’	Red	230 V _{AC}
SMFR-1500-PV-230	1500 V _{DC}	‘1500’	Green	230 V _{AC}
SMFR-1500-PB-230	1500 V _{DC}	‘1500’	White	230 V _{AC}
SMFR-1500-PA-125	1500 V _{DC}	‘1500’	Amber	125 V _{DC}
SMFR-1500-PZ-125	1500 V _{DC}	‘1500’	Blue	125 V _{DC}
SMFR-1500-PR-125	1500 V _{DC}	‘1500’	Red	125 V _{DC}
SMFR-1500-PV-125	1500 V _{DC}	‘1500’	Green	125 V _{DC}
SMFR-1500-PB-125	1500 V _{DC}	‘1500’	White	125 V _{DC}
SMFR-1500-A-230	1500 V _{DC}	LED Optics	Amber	230 V _{AC}
SMFR-1500-Z-230	1500 V _{DC}	LED Optics	Blue	230 V _{AC}
SMFR-1500-R-230	1500 V _{DC}	LED Optics	Red	230 V _{AC}
SMFR-1500-V-230	1500 V _{DC}	LED Optics	Green	230 V _{AC}
SMFR-1500-B-230	1500 V _{DC}	LED Optics	White	230 V _{AC}
SMFR-1500-A-125	1500 V _{DC}	LED Optics	Amber	125 V _{DC}
SMFR-1500-Z-125	1500 V _{DC}	LED Optics	Blue	125 V _{DC}
SMFR-1500-R-125	1500 V _{DC}	LED Optics	Red	125 V _{DC}
SMFR-1500-V-125	1500 V _{DC}	LED Optics	Green	125 V _{DC}
SMFR-1500-B-125	1500 V _{DC}	LED Optics	White	125 V _{DC}

Constructive Features

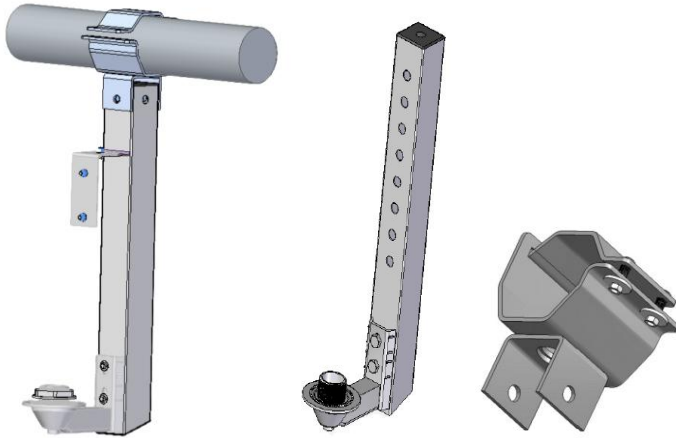


Power Cable

- **SMFR-750:** It is recommended to use cable of the type SEGURFOC-331 SZ1-K (AS+) 1x1.5 1000V with silicone insulation or similar
- **SMFR-1500:** It is recommended to use cable of the type Exzhellent® Solar ZZ-F (AS) 1.8 kV DC – 0.6-1 kV AC TÜV 2 Pfg 116

❶ Mounting Bracket SOP-SMFR-001

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

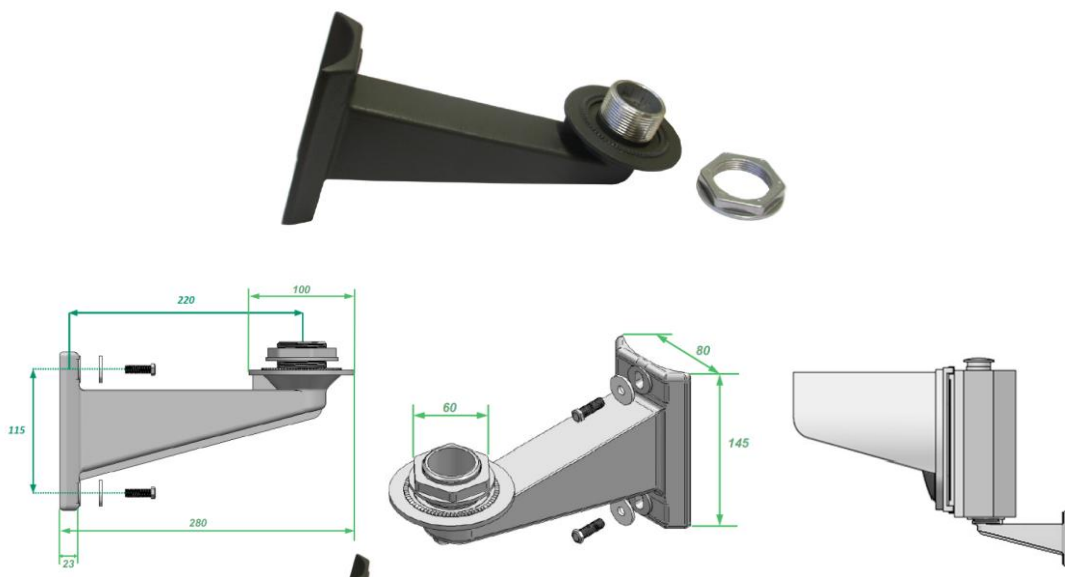


❷ Mounting Bracket SOP-SMFR-002

- 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

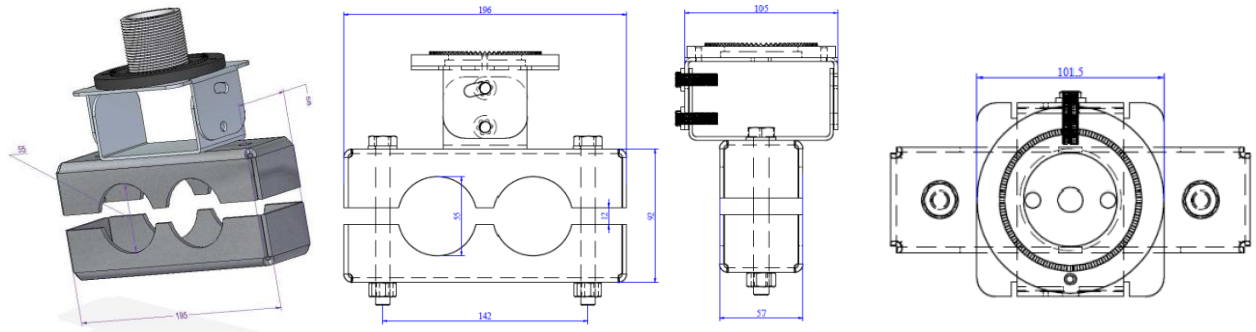
Advantages

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



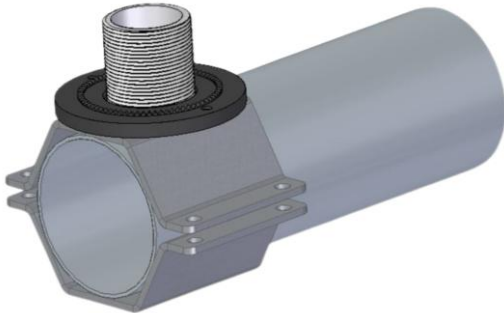
❶ Mounting Bracket SOP-SMFR-003

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



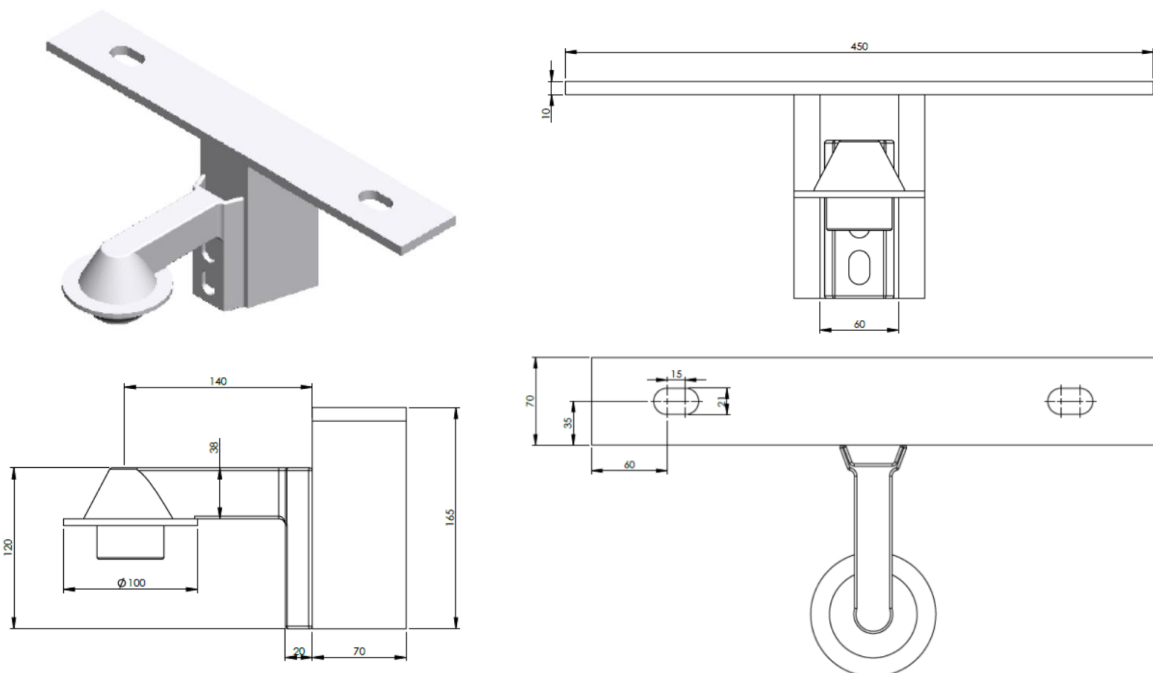
❷ Mounting Bracket SOP-SMFR-004

- 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
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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.



AC Voltage Detectors

up to 27,500 V_{AC}

Description

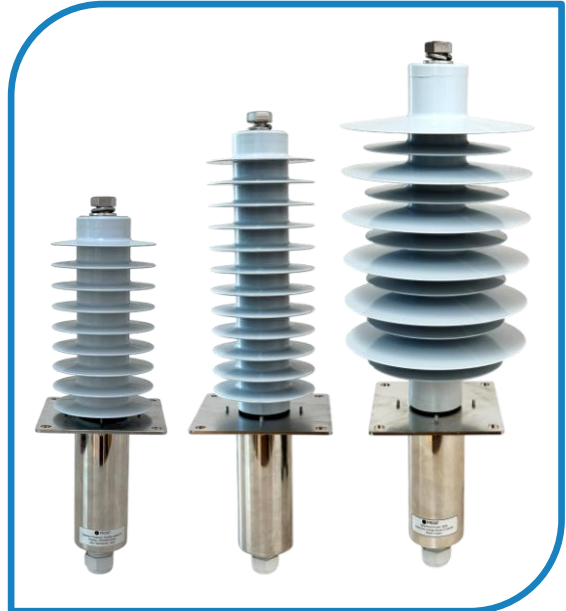
✓ **AC Voltage Detectors** are AC voltage monitoring and measurement devices designed to continuously supervise the status of an electrical installation.

✓ 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:

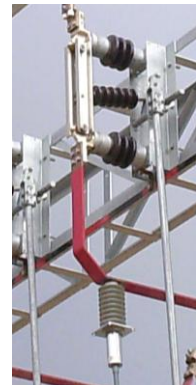
- **CBI21** – 4–20 mA Output
- **FO** – Fiber Optic Output
- **RS485** Modbus
- **SMFR** – Signal Light



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

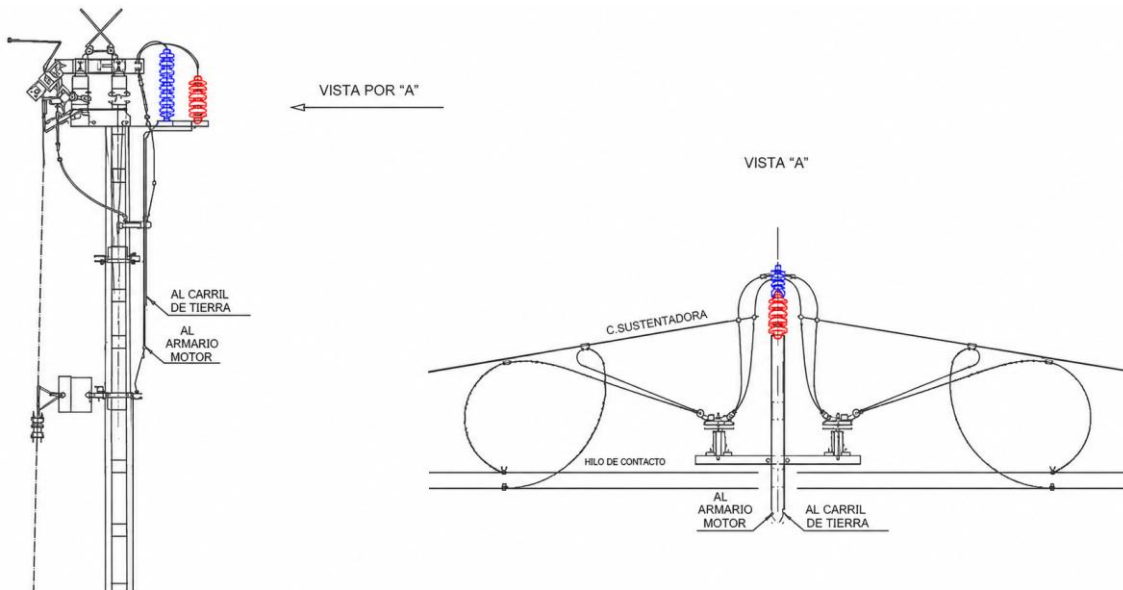


1 Catenary Voltage Detectors

Continuous Monitoring



Assembly Diagram



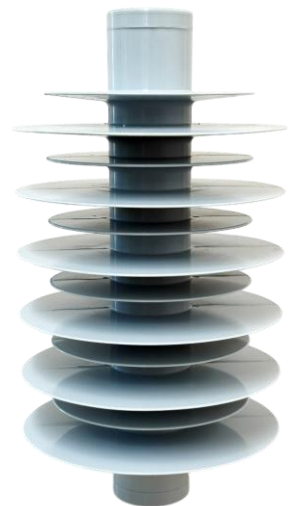


Capacitive Silicone Sensor

- ✓ **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

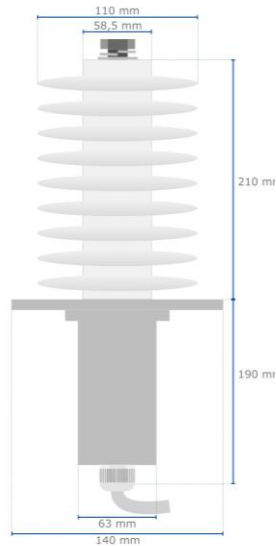
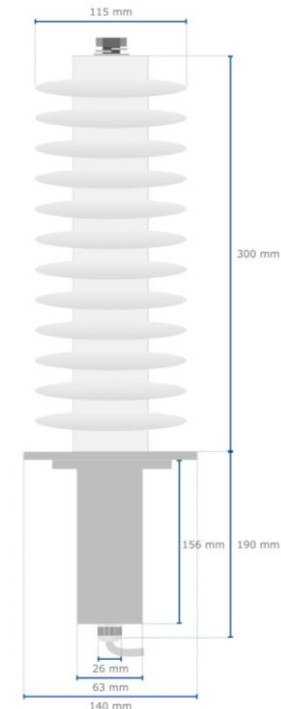
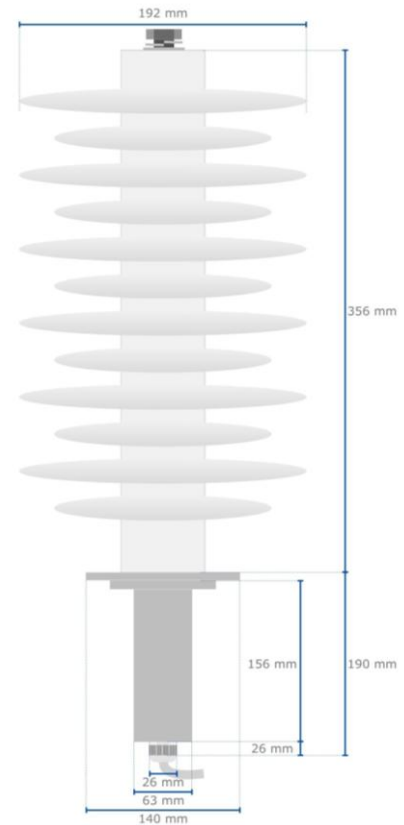
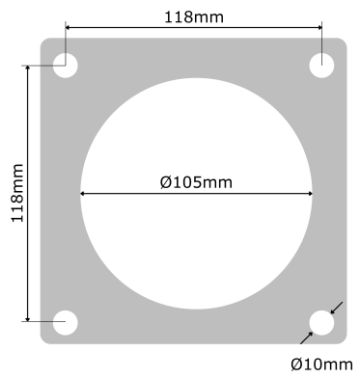
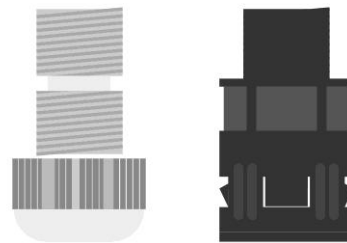


CCS25-MF

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

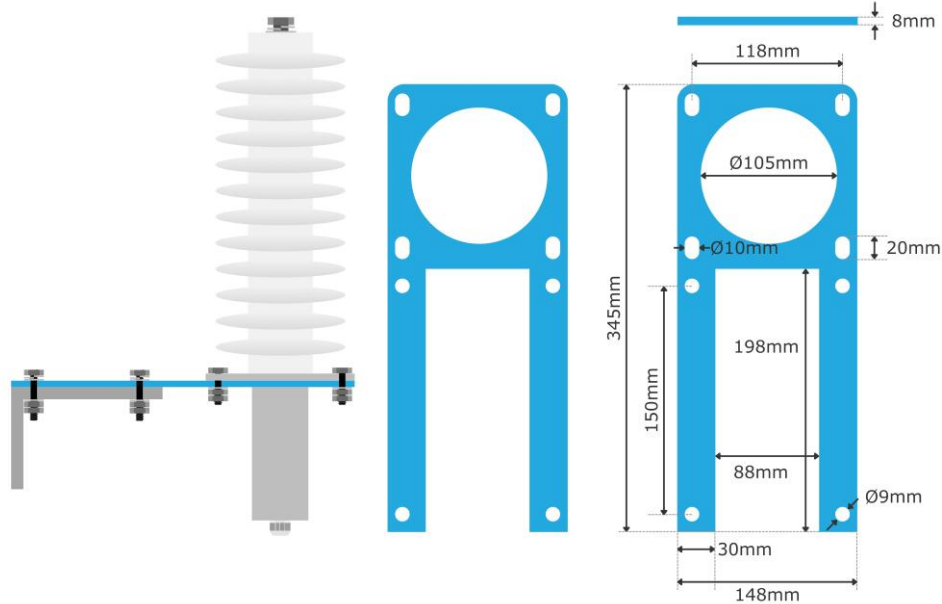
Technical data

CCS

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

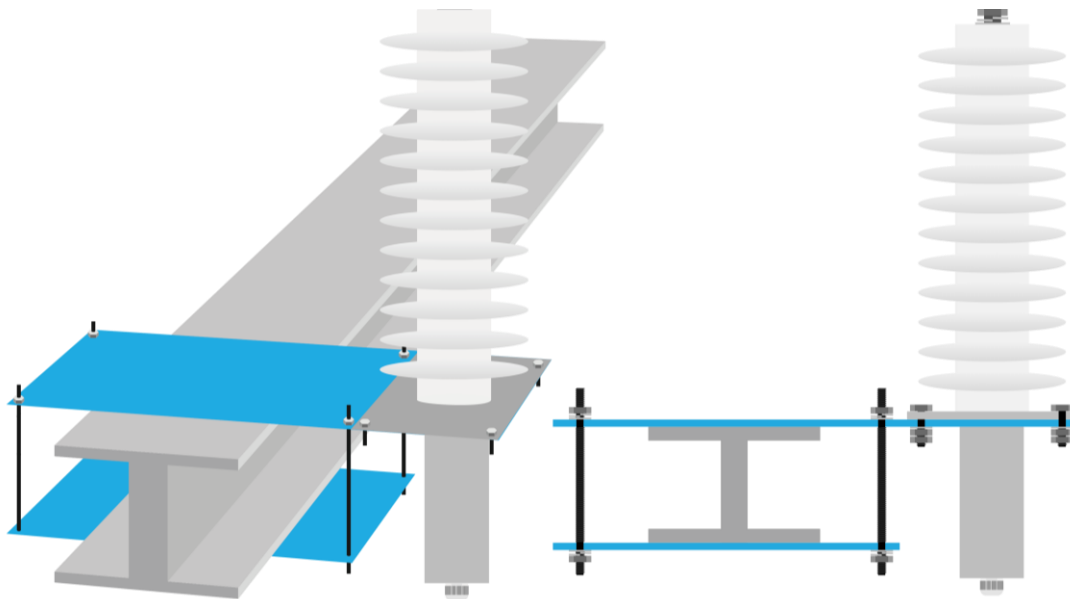
⚙ Mounting Bracket – SOP-006

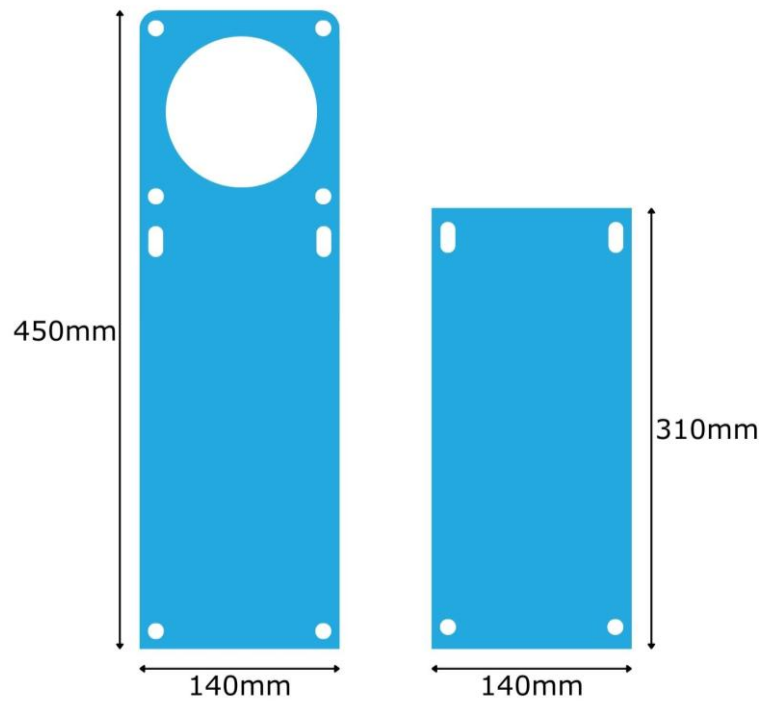
- Zinc-plated mounting bracket kit for **catenary attachment**
- Adaptable to any installation



⚙ Mounting Bracket – SOP-008

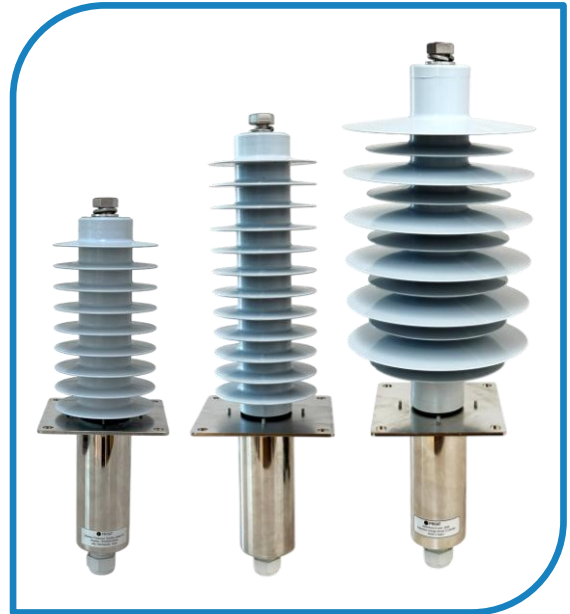
- Galvanized mounting bracket kit and stainless-steel screws for **beam anchoring**
- Adaptable to any installation
- Approved by ADIF
- Hot-dip galvanized in accordance with **UNE-EN ISO 1461**





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

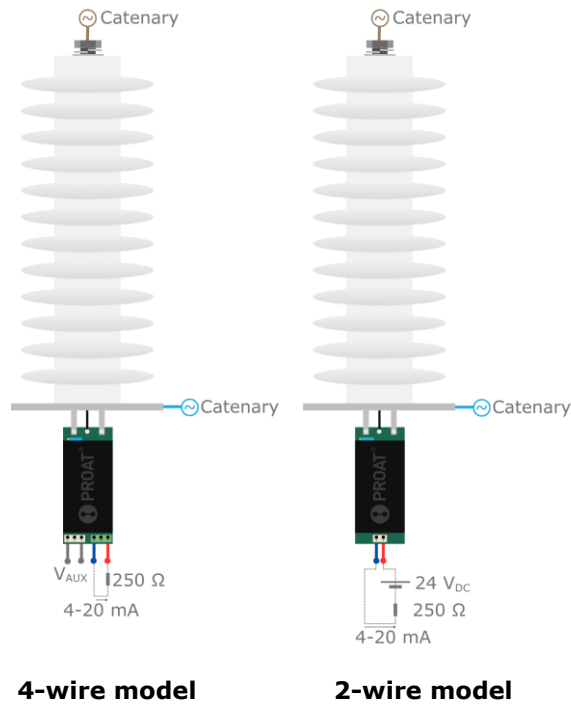


Models

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

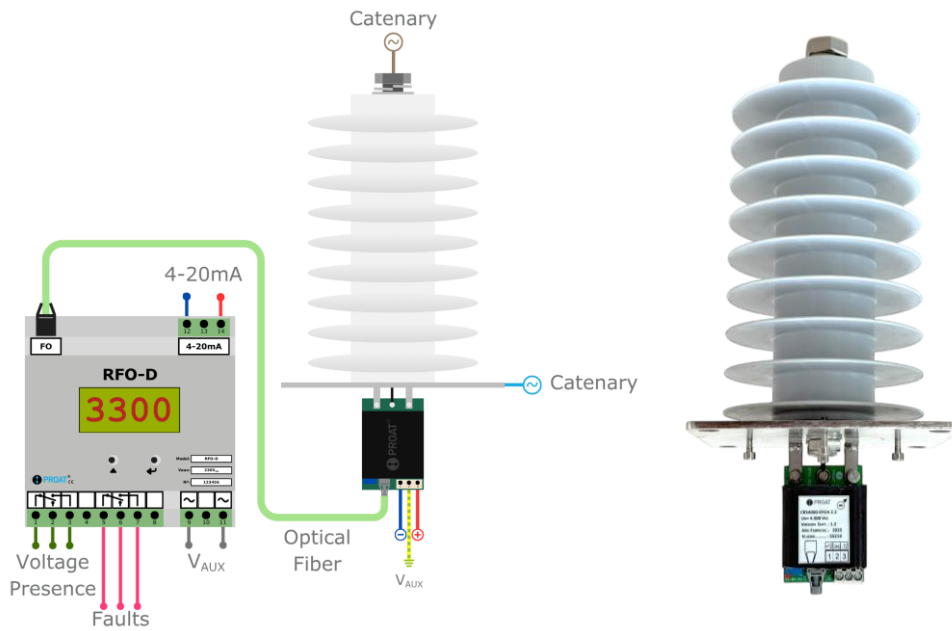
Model	Fiber Optic	Compatible Emitter	Installation	Real-Time Visualization	Output 4-20 mA	Output Contacts	Auxiliary voltage
RFO25-D	SL Connector	EFO25	DIN Rail	Yes	Yes	Yes	85-264 V _{AC} 85-370 V _{DC}
RFO25-D-24	SL Connector	EFO25	DIN Rail	Yes	Yes	Yes	24 V _{DC}
RFOA25-D	SL Connector	EFOA25	DIN Rail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

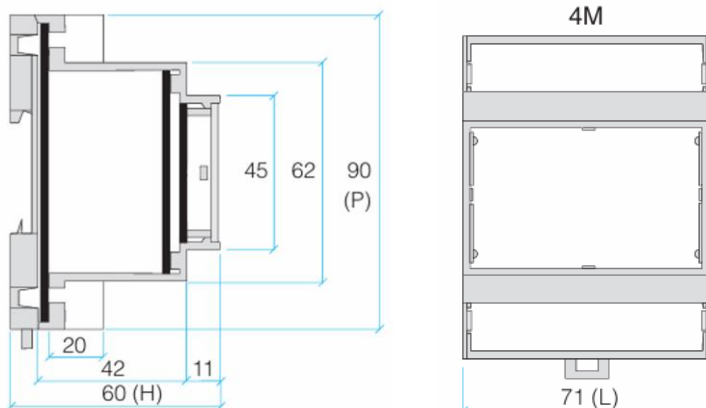


Technical Data – RFO25-D

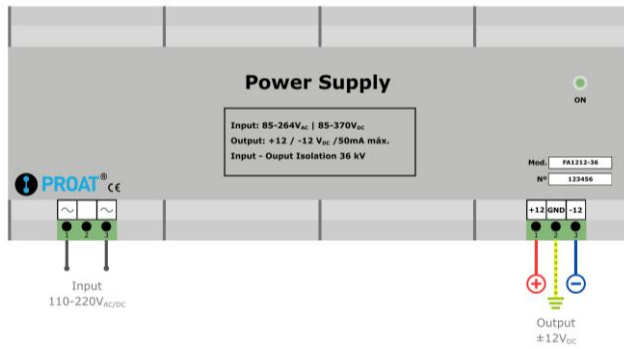
Specifications	
Contact Type	SPDT
Switching Capacity:	1000 VA
Switching Voltage:	$\leq 230 V_{AC}$
Response Time	$< 1 s$
Reading Range	$0 - U_N + 10\%$
Auxiliary voltage	$85-264 V_{AC} \mid 85-370 V_{DC}$
Standby Power Consumption	$< 5 W$
Operating Temperature:	$-10^{\circ} a +60^{\circ}$
Regulations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

Constructive Characteristics – RFO-D

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

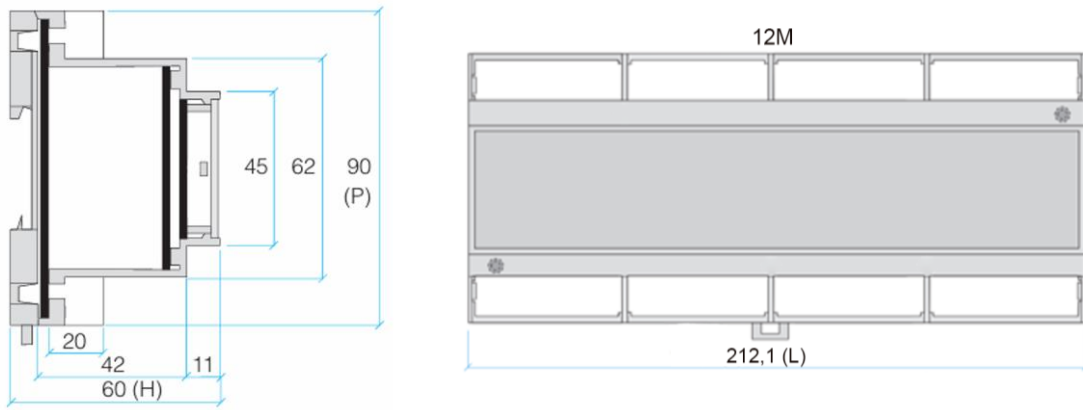


FA1212-36 Power Supply



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

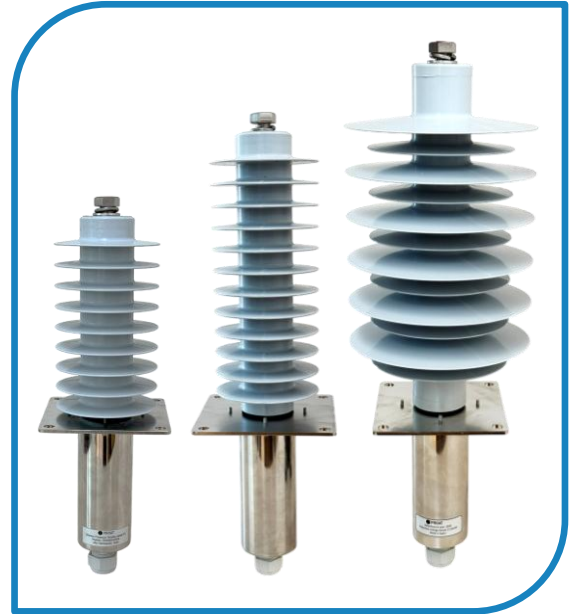
CCS + RS485 Modbus

Capacitive Silicone Sensor

+

Output RS485 Modbus

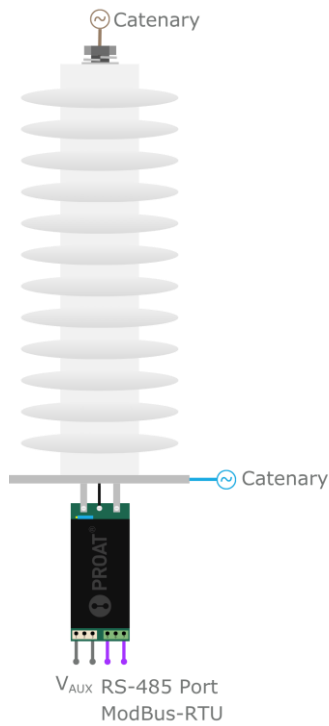
- ✓ Capacitive Silicone Sensor **CCS**
- ✓ Voltage measurement and **RS-485 Modbus** communications circuit
- ✓ Auxiliary voltage **85-264 V_{AC} | 85-370 V_{DC}**
- ✓ CCS + RS485 Modbus withstands **170 kV** lightning-like impulses
- ✓ **Epoxy-coated circuit** installed in waterproof enclosure



Models

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

Connection



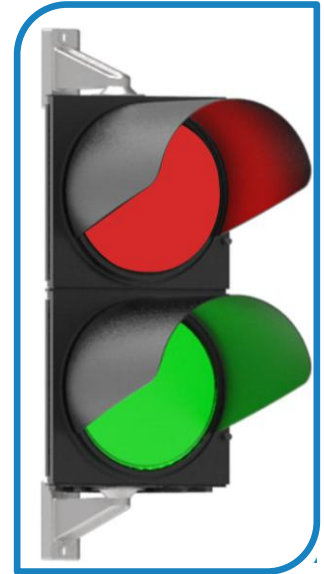
Technical Data

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}

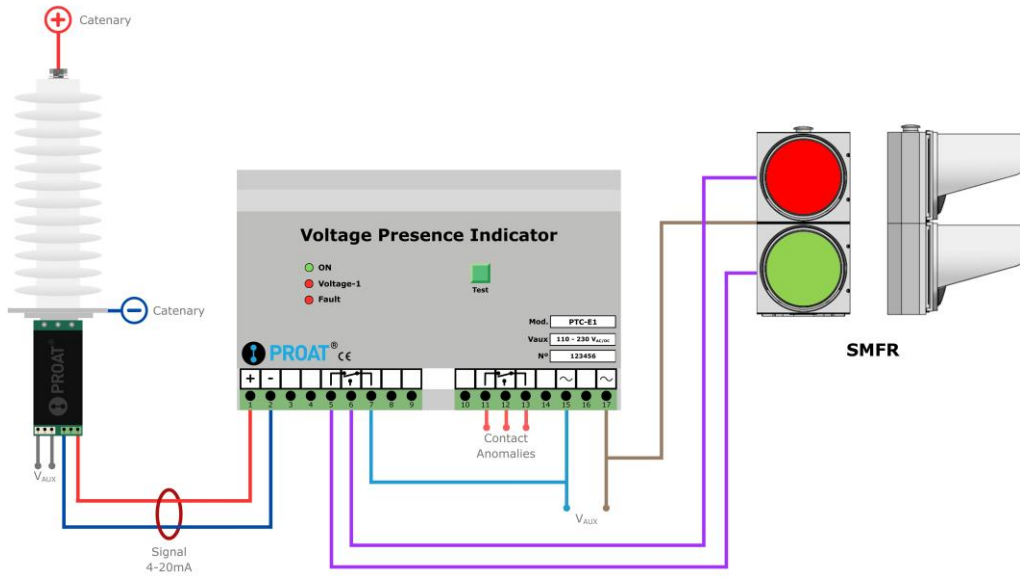


Models

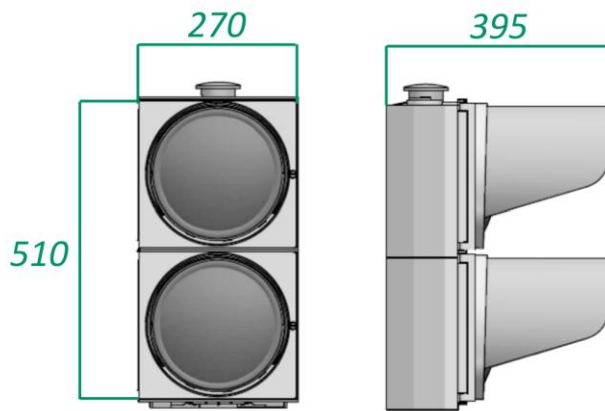
Configuration Options:

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

Connection

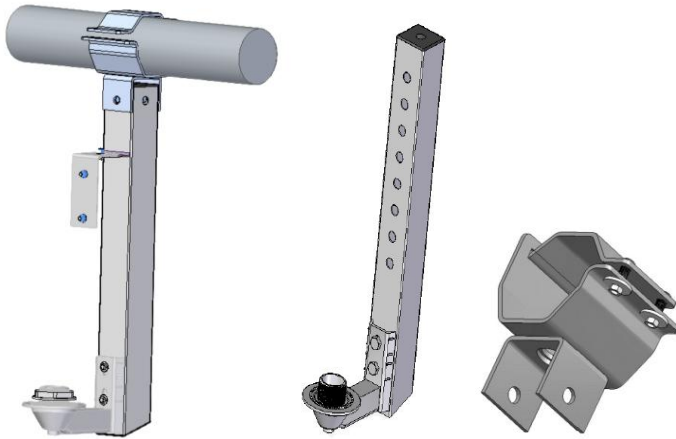


Constructive Characteristics



❶ Mounting Bracket SOP-SMFR-001

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

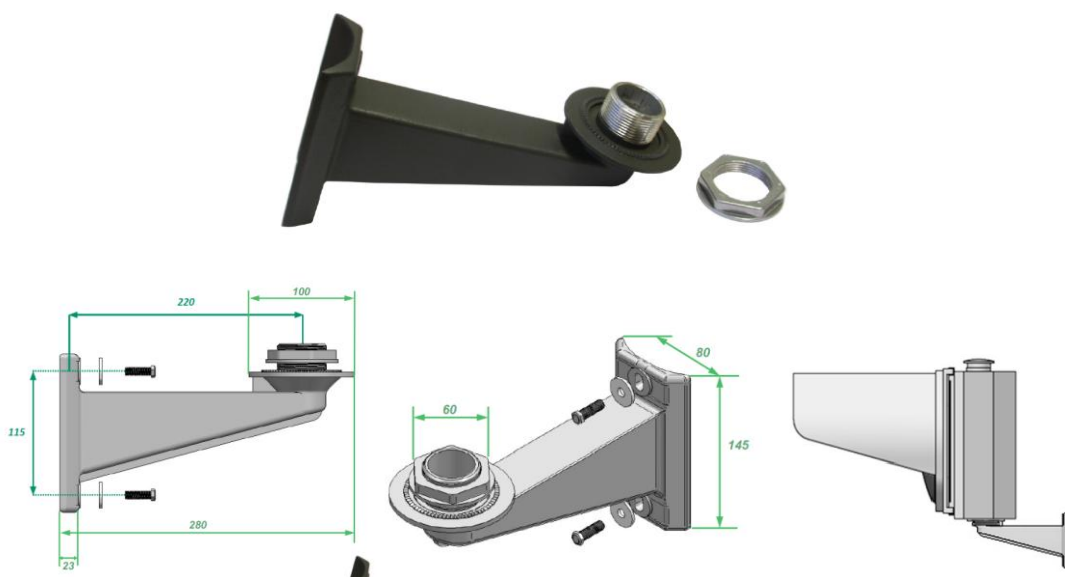


❷ Mounting Bracket SOP-SMFR-002

- 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

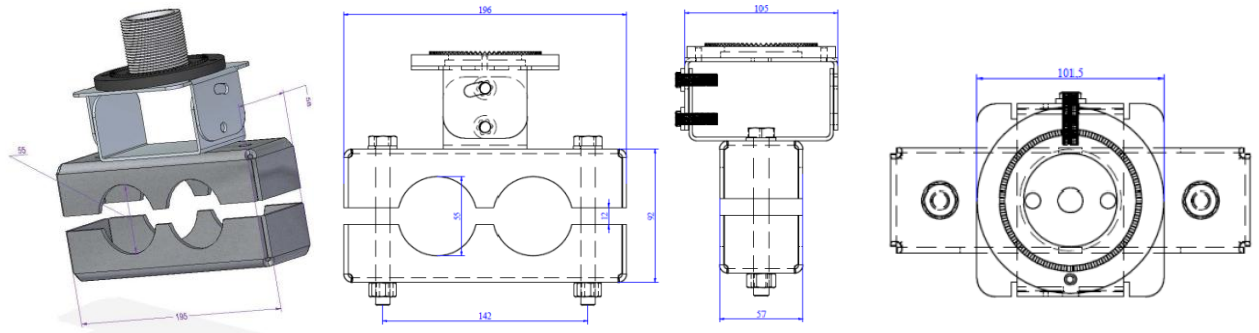
Advantages

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



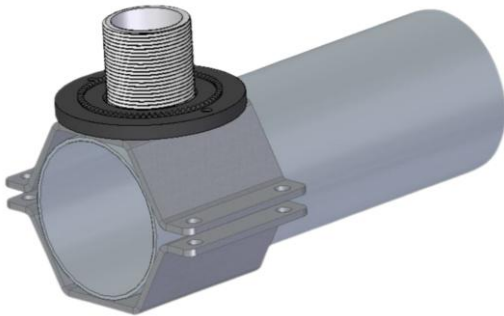
❶ Mounting Bracket SOP-SMFR-003

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



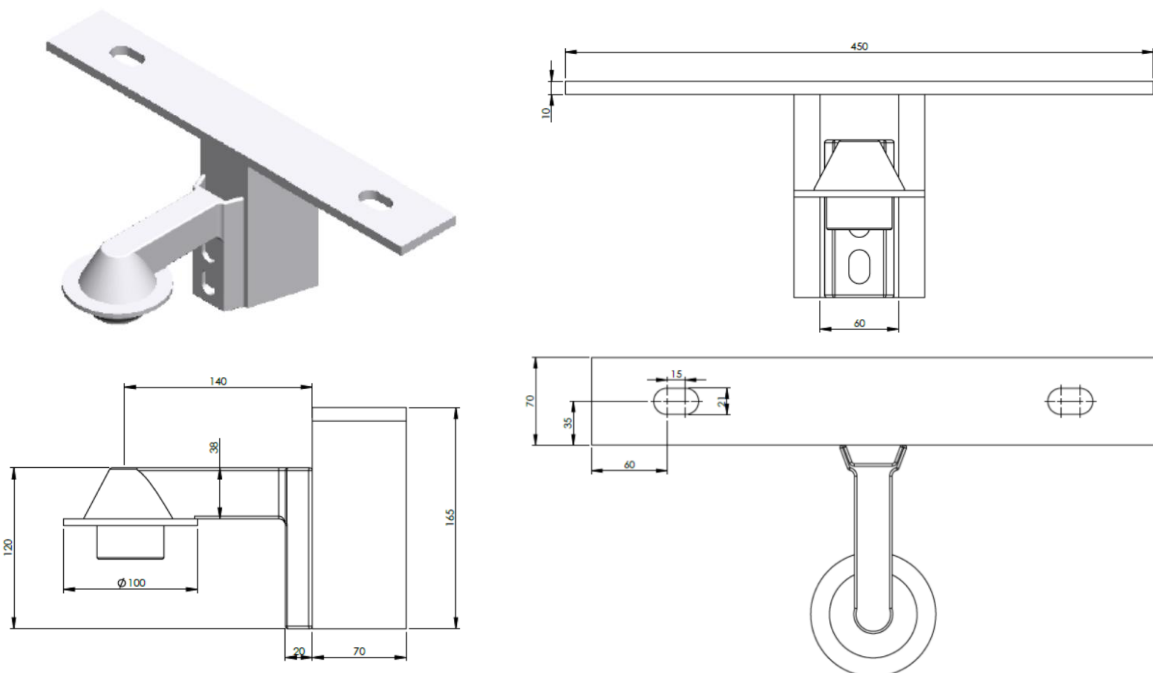
❷ Mounting Bracket SOP-SMFR-004

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



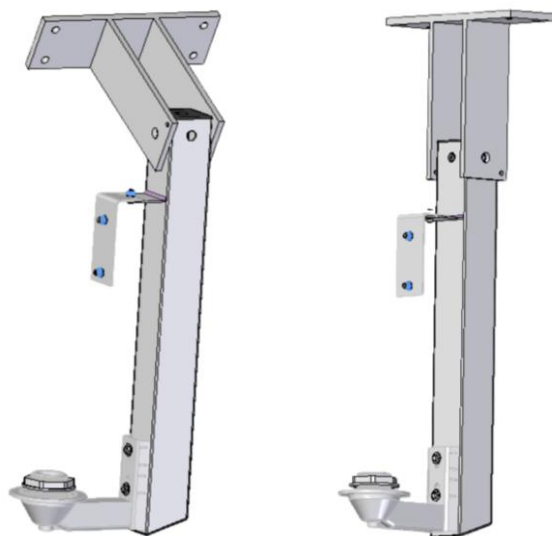
❸ Mounting Bracket SOP-SMFR-005

- 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.

VFR + MIC

Silicone-Epoxy Transformer for AC Catenary

- ✓ Silicone-Epoxy Transformer **25kV_{AC} – 100 V_{AC}**
- ✓ **0–100 V_{AC} output** proportional to the catenary voltage
- ✓ **0.12 mm** copper primary winding
- ✓ **1.3 mm** copper secondary winding
- ✓ Primary winding made with **epoxy resin** insulation class E (CEI 60085 Standard)
- ✓ **Enclosed in galvanized steel** to prevent the projection of fragments
- ✓ **Non-polluting:** free of oils and fluorinated gases as insulating materials
- ✓ Weight: **40 kg**
- ✓ Creepage distance: **1,950 mm**
- ✓ Service life: **> 30 years**; maintenance-free
- ✓ Exclusively **vertical** mounting

MIC-25 – AC Catenary Voltage Detector

- ✓ **The MIC-25 displays the catenary voltage**
- ✓ Installed in **DIN rail**
- ✓ Auxiliary power supply **24 V_{DC}** or **230 V_{AC} 50Hz** depending on model

Applications

AC voltage presence detection in railway installations:

- High-speed trains
- Conventional AC trains
- AC metro systems



Transformer Model

Model	Primary Voltage	Secondary Voltage
VFR-25Kv-100	25 kV _{AC}	100 V _{AC}

Display Model

Model	Display range	Auxiliary Voltage
MIC-25kv	0-30 kV _{AC}	230 V _{AC}
MIC-25kv-24	0-30 kV _{AC}	24 V _{DC}

Technical data

MODEL VFR-25Kv-100

Electrical Characteristics

Rated Primary Voltage - U _{pn}	27.5 kV
Rated Secondary Voltage - U _{sn}	100 V
Maximum Service Voltage - U _m	36 kV
Rated power-frequency withstand voltage:	
Between primary and secondary to ground	70 kV
Between secondary and ground	3 kV
Maximum lightning impulse withstand voltage (peak value)	170 kV
Rated burden	100 VA
Accuracy class	1
Rated frequency (f)	50/60 Hz
Permissible continuous overvoltage (U _n) (kV)	1,2 U _{pn}

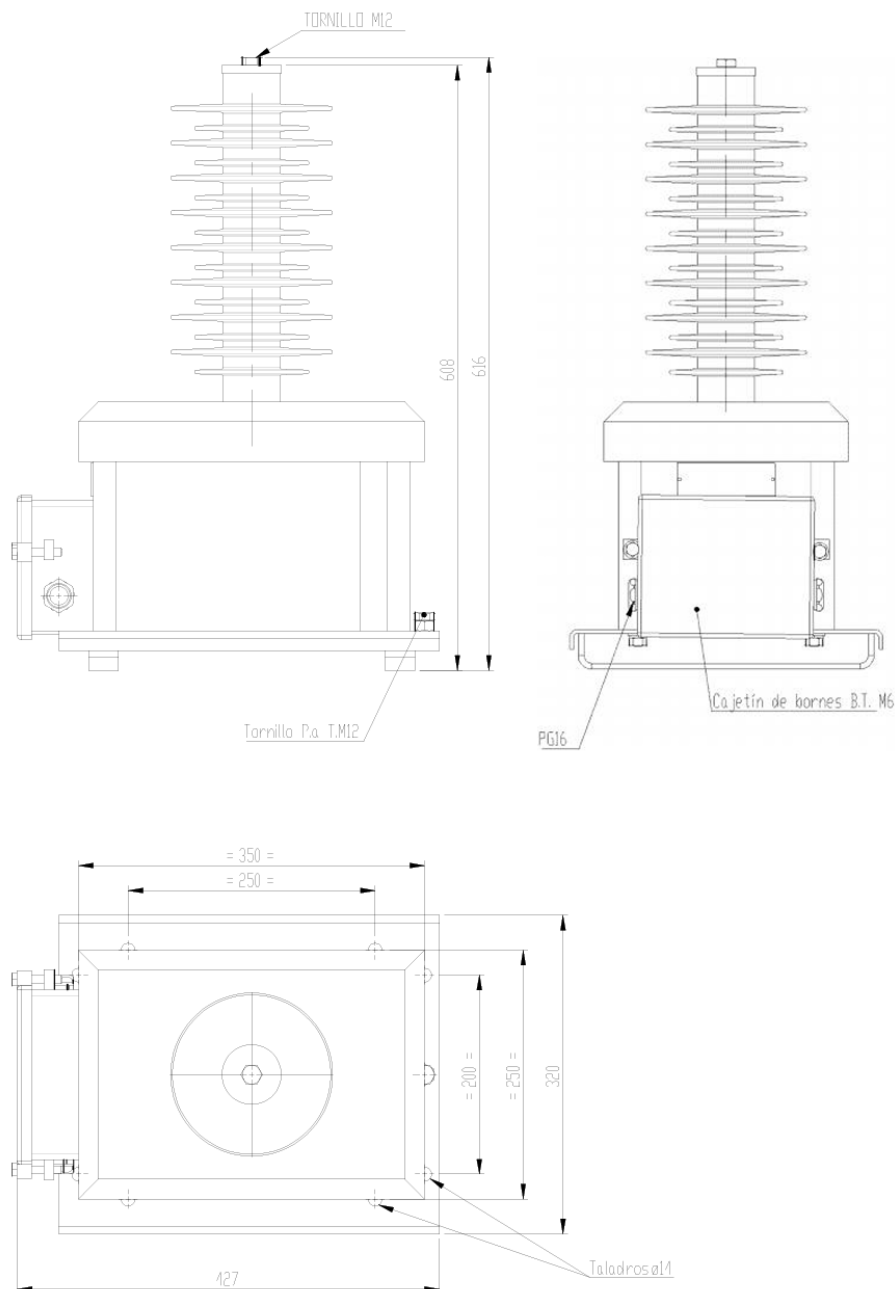
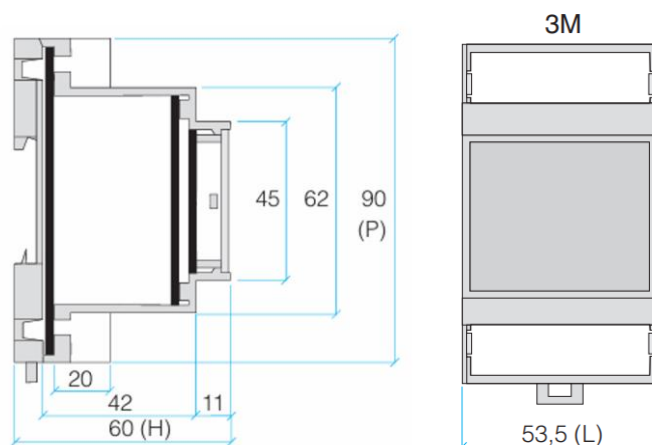
Mechanical Characteristics

Tightening torque for M6 screws	4 Nm
Tightening torque for M12 screws	35 Nm
Primary terminal material	Aluminum
Ground terminal material	Stainless-steel
Sealed secondary terminal cover, sealable with cable gland connection	
Galvanized Steel tank to prevent corrosion	
Weight	40 kg
Creepage distance	1950 mm

Other Characteristics

Service life	>30 years
Enclosure material	Silicone
Internal material	Epoxy
Maintenance-free	



④ Dimensions - VFR

④ Dimensions - MIC


GDB

Dual-Voltage Discrimination Group for DC/AC Catenary

✓ **GDB** detects the presence of **DC** and **AC** voltage in railway systems

✓ For **workshops** or railway installations with **two different voltages**, the Dual-Voltage Discrimination Group (GDB) is installed to signal the voltage present in the catenary

✓ **CCS25 + CBI21** Capacitive Detector for AC voltage measurement:

- Nominal Voltage: **27.5 kV_{AC}**
- **4-20 mA Output**
- Sensor **with DC voltage filter**. 4 mA output up to voltages of 50 kV_{DC}
- Auxiliary voltage **85-264 V_{AC} | 85-370 V_{DC} or 24 V_{DC}**

✓ **CRS27500 + CBI21FA** Resistive Detector for DC voltage measurement:

- Nominal Voltage: **3.3 kV_{DC}**
- **Output 4-20 mA**
- Sensor with **AC voltage filter**. 4 mA output up to voltages of 36 kV_{AC}
- Auxiliary voltage **85-264 V_{AC} | 85-370 V_{DC} or 24 V_{DC}**

✓ Voltage **Presence Controller PTC-E2**:

- Reading of **two 4-20 mA signals**
- Independent **LED** indication for AC and DC
- Independent LEDs for power-on and fault indication
- 3 potential-free changeover contacts:
 - **DC** voltage
 - **AC** voltage
 - **Fault**
- Auxiliary Voltage **85-264 V_{AC} | 85-370 V_{DC} or 24 V_{DC}**



Applications

Detection of AC and DC voltage presence in railway installations.



Functional Features

- **3 output relays with potential-free changeover contacts** to indicate DC voltage presence, AC voltage presence and faults
- **TEST button** to simulate system activation and deactivation
- **Green LED** for power-on indication
- **Red LED** for Voltage 1 indication
- **Red LED** for Voltage 2 indication
- **Red LED** for fault indication

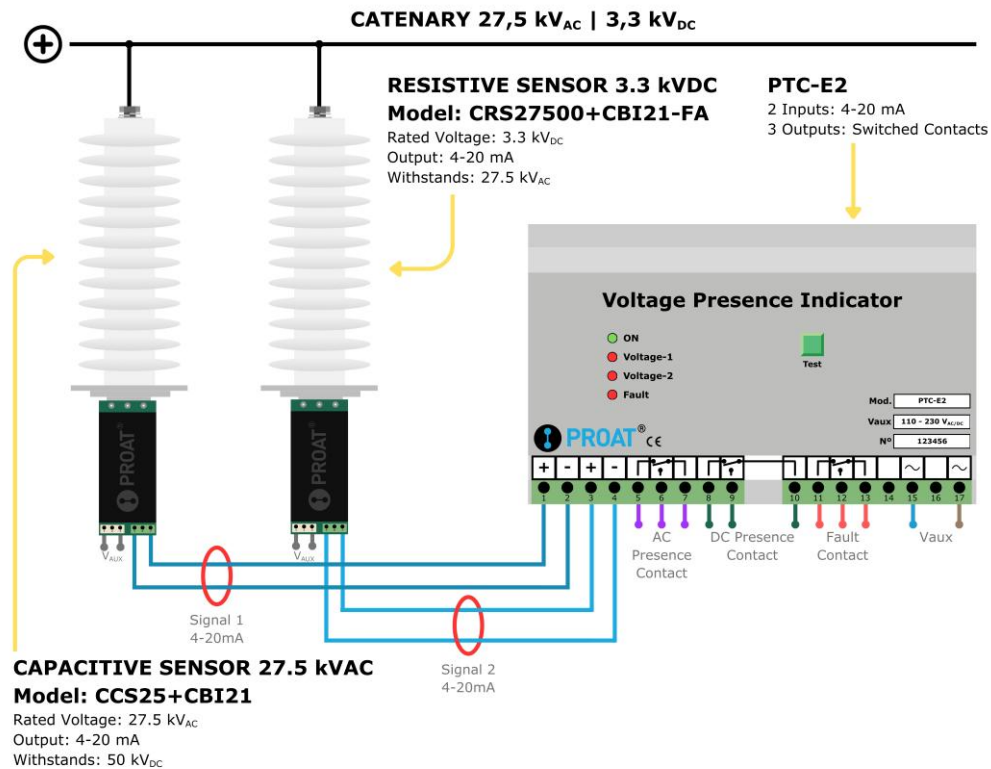
Models

Model	DC Nominal Voltage	AC Nominal Voltage	Nominal Frequency	Auxiliary Voltage
GDB	3.3 kV _{DC}	27.5 kV _{AC}	50-60 Hz	85-264 V _{AC} 85-370 V _{DC}
GDB-24	3.3 kV _{DC}	27.5 kV _{AC}	50-60 Hz	24 V _{DC}
GDB-HZ	3.3 kV _{DC}	27.5 kV _{AC}	16-60 Hz	85-264 V _{AC} 85-370 V _{DC}
GDB-HZ-24	3.3 kV _{DC}	27.5 kV _{AC}	16-60 Hz	24 V _{DC}

*Other models can be manufactured upon request

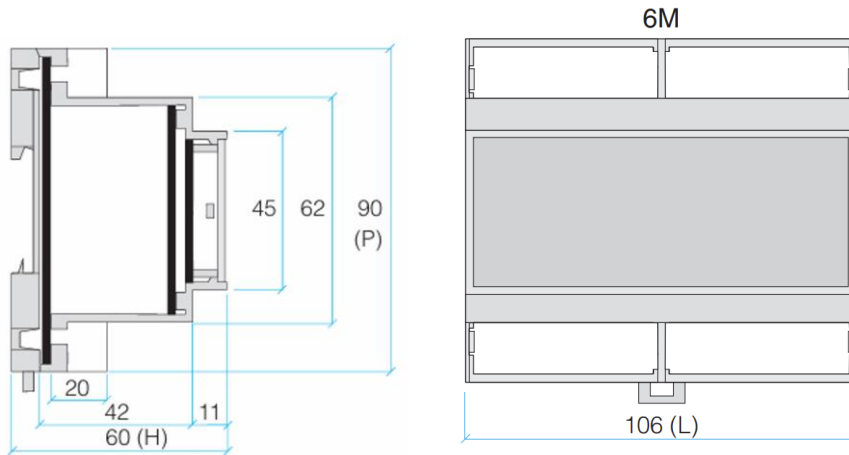
*Custom electrical panels with GDB equipment can be manufactured upon request

Wiring - GDB



Constructional Features – PTC-E2

- DIN rail installation
- Front-accessible connection terminals
- Self-extinguishing plastic enclosure, class V0



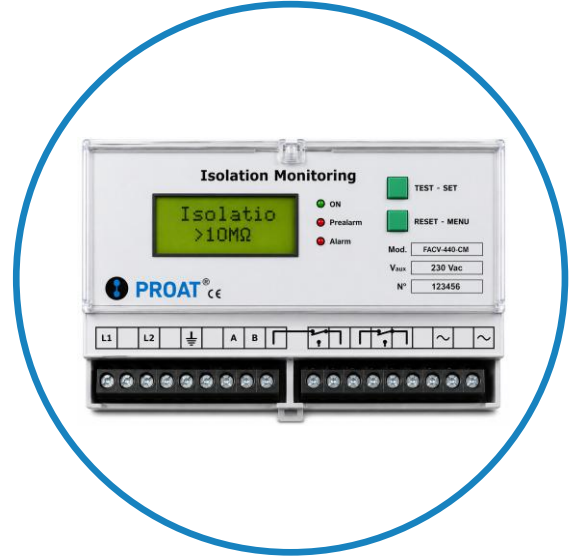
GDB Electrical Panels



 FACV

AC Insolation Monitor with Automatic Reset and Real-Time Display

- ✓ Detects **symmetrical and asymmetrical** insulation faults in single-phase and three-phase AC systems in any of the phases, or between the neutral point and ground.
- ✓ **Continuous monitoring of the insulation level** for IT systems from **115 V_{AC}** to **7200 V_{AC}**, depending on the model and coupler.
- ✓ **2 independent potential-free output** changeover contacts, with programmable actuation levels and time delays: pre-alarm and alarm.
- ✓ **Pre-alarm:** actuation level of 50 - 150 kΩ and actuation delay of 10-30 seconds.
- ✓ **Alarm:** actuation level of 1 - 45 kΩ and actuation delay of 1-10 seconds
- ✓ Alarm with **automatic reset** configurable between 1-60 minutes
- ✓ **Real-time display** of the installation's isolation level. Measurement range: 1 kΩ - 1000 kΩ
- ✓ For IT systems from **115 V_{AC}** – **7200 V_{AC}** depending on model and coupler
- ✓ **Modbus** Communications



Applications

Monitoring of possible isolation failures in AC systems isolated from IT ground:

- Railway Infrastructure
- Photovoltaic Power Systems
- Industrial Electrical Equipment
- Marine Electrical Systems
- Electric Vehicle Charging Infrastructure
- Lighting Systems
- Elevators Systems



❶ Functional Features

- 2 output relays with independent potential-free changeover contacts, with programmable actuation levels and timings: Pre-alarm and Alarm.
- Programming adjustment values using the **SET-MENU** buttons on the front of the device:
 - Pre-alarm action level
 - Alarm action level
 - Pre-alarm time delay
 - Alarm time delay
 - Automatic reset time
 - Alarm memory – Yes/No
 - Modbus ID
 - Language: Spanish/English
- 2x8-character front display with Real-time insulation resistance
- **TEST** button to simulate ground faults (+) and (-)
- **RESET** button to reset the device and clear the fault
- LEDs to signal pre-alarm and alarm faults
- Electrically isolated RS-485 interface with Modbus-RTU protocol:
 - Instantaneous isolation measurement, Relay status, View ModBus map

❷ Models

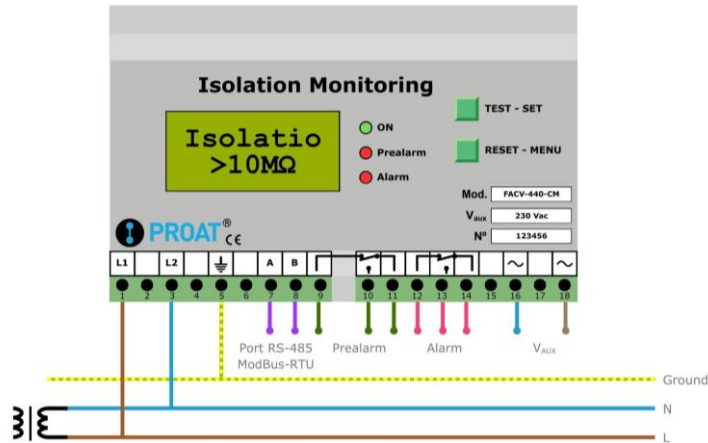
Model	Nominal Voltage U_N	Operating Range	Alarm Levels	Supply Voltage	DIN Size	Communications
FACV-115-M	115 V _{AC}	0-115 V _{AC}	50-150 kΩ and 1-45 kΩ	60-264V _{AC} 80-300V _{DC}	9M – 160 mm	Modbus-RTU
FACV-115-M-24	115 V _{AC}	0-115 V _{AC}	50-150 kΩ and 1-45 kΩ	24 V _{DC}	9M – 160 mm	Modbus-RTU
FACV-230-M	230 V _{AC}	0-230 V _{AC}	50-150 kΩ and 1-45 kΩ	60-264V _{AC} 80-300V _{DC}	9M – 160 mm	Modbus-RTU
FACV-230-M-24	230 V _{AC}	0-230 V _{AC}	50-150 kΩ and 1-45 kΩ	24 V _{DC}	9M – 160 mm	Modbus-RTU
FACV-440-M	440 V _{AC}	0-440 V _{AC}	50-150 kΩ and 1-45 kΩ	60-264V _{AC} 80-300V _{DC}	9M – 160 mm	Modbus-RTU
FACV-440-M-24	440 V _{AC}	0-440 V _{AC}	50-150 kΩ and 1-45 kΩ	24 V _{DC}	9M – 160 mm	Modbus-RTU
FACV-500-M	500 V _{AC}	0-500 V _{AC}	50-150 kΩ and 1-45 kΩ	60-264V _{AC} 80-300V _{DC}	9M – 160 mm	Modbus-RTU
FACV-500-M-24	500 V _{AC}	0-500 V _{AC}	50-150 kΩ and 1-45 kΩ	24 V _{DC}	9M – 160 mm	Modbus-RTU
FACV-750-M	750 V _{AC}	0-750 V _{AC}	50-150 kΩ and 1-45 kΩ	60-264V _{AC} 80-300V _{DC}	9M – 160 mm	Modbus-RTU
FACV-750-M-24	750 V _{AC}	0-750 V _{AC}	50-150 kΩ and 1-45 kΩ	24 V _{DC}	9M – 160 mm	Modbus-RTU
FACV-440E-M + AC-1000	1000 V _{AC}	0-1000 V _{AC}	50-150 kΩ and 1-45 kΩ	60-264V _{AC} 80-300V _{DC}	9M – 160 mm + Coupler	Modbus-RTU
FACV-440E-M-24 + AC-1000	1000 V _{AC}	0-1000 V _{AC}	50-150 kΩ and 1-45 kΩ	24 V _{DC}	9M – 160 mm + Coupler	Modbus-RTU
FACV-440S-M + ADP-4200	4200 V _{AC}	0-4200 V _{AC}	50-150 kΩ and 1-45 kΩ	60-264V _{AC} 80-300V _{DC}	9M – 160 mm + Coupler	Modbus-RTU
FACV-440S-M-24 + ADP-4200	4200 V _{AC}	0-4200 V _{AC}	50-150 kΩ and 1-45 kΩ	24 V _{DC}	9M – 160 mm + Coupler	Modbus-RTU
FACV-440S-M + ADP-7200	7200 V _{AC}	0-7200 V _{AC}	50-150 kΩ and 1-45 kΩ	60-264V _{AC} 80-300V _{DC}	9M – 160 mm + Coupler	Modbus-RTU
FACV-440S-M-24 + ADP-7200	7200 V _{AC}	0-7200 V _{AC}	50-150 kΩ and 1-45 kΩ	24 V _{DC}	9M – 160 mm + Coupler	Modbus-RTU

Optional **tropicalization** by adding the suffix **-T**

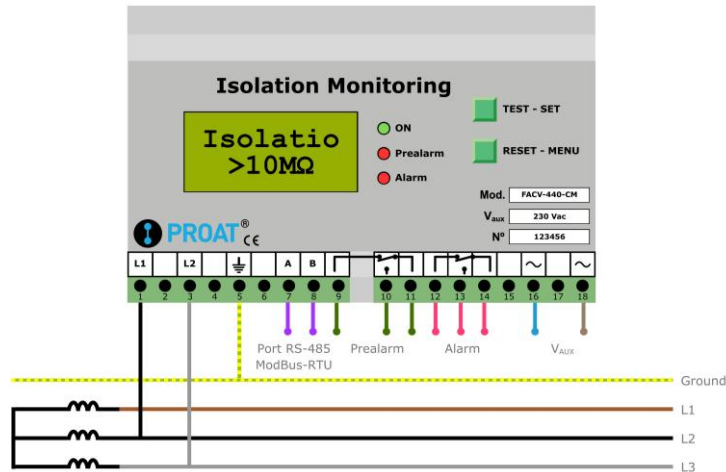
*Other models can be manufactured upon request

Wiring FACV

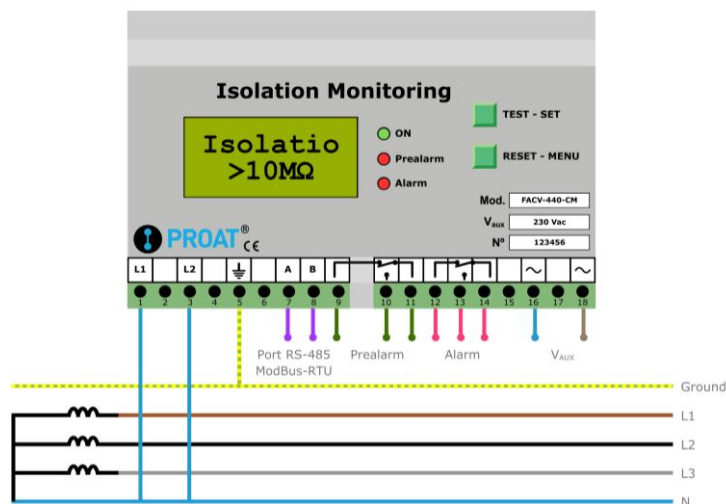
- Single-phase



- Three-phase without neutral

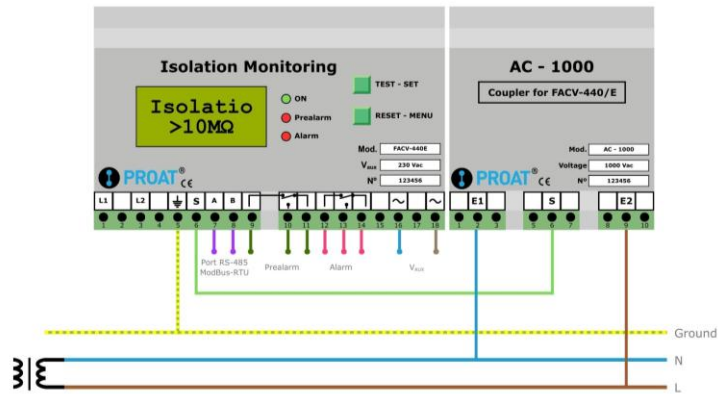


- Three-phase with neutral

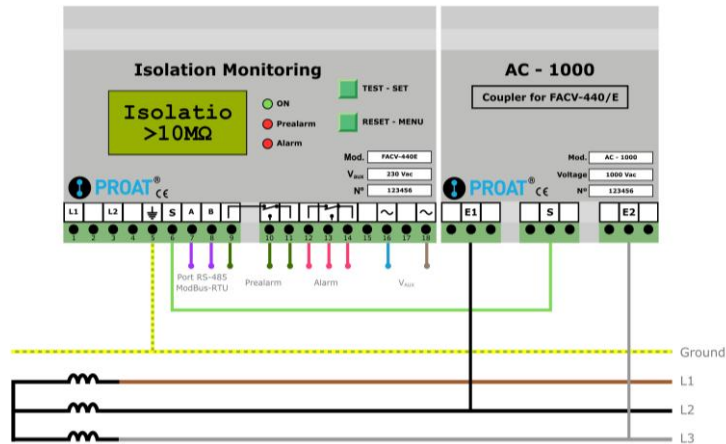


Wiring FACV + AC-1000

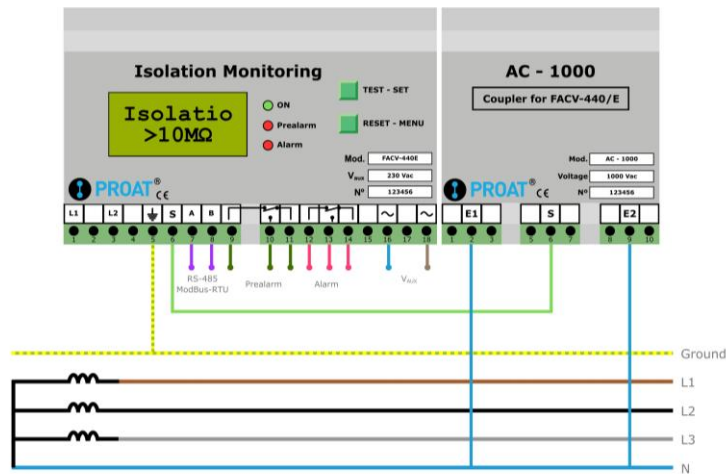
- Single-phase



- Three-phase without neutral



- Three-phase with neutral



Technical Data

MODEL	FACV
Voltage Range	
Monitoring Voltage U_N	0 - $U_N V_{AC}$
Nominal frequency F_N	40-300 Hz
	60 – 264 V_{AC}
Auxiliary voltage V_{AUX}	80 – 300 V_{DC}
	24 V_{DC}
Standby consumption	≤ 6 W
Maximum consumption	≤ 12 W
Response Values	
Pre-alarm level	50 k Ω - 150 k Ω
Alarm level	1 k Ω - 45 k Ω
Measurement range	1 k Ω - 1000 k Ω
Measurement error 1-10 k Ω /10-200 k Ω	±1 k Ω / ±10%
Hysteresis	25 %
Response time with $R_F=0.5 \cdot R_{AL}$	≤ 5 s
Pre-alarm time delay	10-30 s
Alarm time delay	1-10 s
Reset time	1-60 min
Factory settings	
Pre-alarm level	100 k Ω
Alarm level	10 k Ω
Pre-alarm time delay	10 s
Alarm time delay	5 s
Reset time	1 min
Modbus ID	1
Alarm memory	No
Language	ESP
Measuring Circuit	
Measurement voltage	+12 V_{DC}
Internal resistance	> 132 k Ω
Impedance at 50Hz	> 132 k Ω
Measurement current with $R_F=0$	≤ 300 μA
Parasitic capacitance	< 5 μF
Type of faults detected	Symmetrical and Asymmetrical
Front Panel	
ON	Green LED
Pre-alarm	Red LED
Alarm	Red LED
Test button	Yes
Reset button	Yes
Screen	LCD 2x8 charac.
Dielectric Test	
V_{DC} Input – V_{AUX}	3 kV $_{RMS}$ – 1 min
V_{DC} Input - Output Contacts	3 kV $_{RMS}$ – 1 min
V_{AUX} – Output Contacts	3 kV $_{RMS}$ – 1 min

Switching Elements	
Number of switching elements	2
Type of outputs	Switched relay
Outputs	Potential-free contacts
Max AC load	250 V_{AC} 2A
Max DC load	300 V_{DC} 0.1A
Switching time R_L	< 10 ms
Number of cycles	20,000,000

General	
Operation mode	Continuous
Mounting	DIN rail
Connection	Screw M2.5
Screw torque	≤ 0.4 Nm
Protection grade	IP20
Flammability class	UL94V-0
Weight	350 g
Operating temperature	-5°C to +60°C
Storage temperature	-20°C to +80°C
Relative humidity (non-condensing)	< 95 %
Setting values method	Front opening

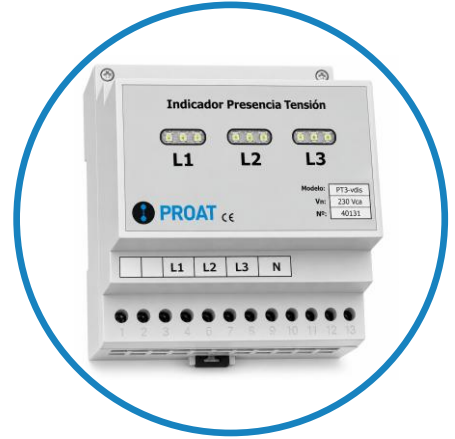
Standards	
Electrical safety requirements	UNE-EN 61010-1
Electrical safety requirements	UNE-EN 61010-2-081
Electromagnetic compatibility (EMC)	UNE-EN 61000-6-1
Electromagnetic compatibility (EMC)	UNE-EN 61000-6-3/A1
European directive	2006/95/CE
European directive	2004/108/CE
Standard	IEC-61557-8

Communications	
Interface	RS-485
Protocol	Modbus-RTU
Port parameters	9600, 8, 0, 1
ID ModBus	1-248
Available features	3, 4
Operation	Slave
Cable length (m)	< 1200
Connection	Terminals A/B

IPT3

AC Voltage Presence Indicator

- ✓ **IPT3** indicates the **presence of alternating voltage in three-phase systems**
- ✓ For three-phase voltages up to **440 V_{AC}**
- ✓ For voltages **up to 36 kV_{AC}** using **APRC epoxy capacitive sensors**, depending on the model
- ✓ **Flashing red LED signalling**, independent in each phase
- ✓ **Self-powered** from the monitored installation
- ✓ **Indicates voltage presence** when the measured voltage **exceeds 40% of the nominal voltage**, according to UNE-EN 62271



Applications

Monitoring of voltage presence or absence in three-phase AC systems:

- Railway installations
- Photovoltaic installations
- Industrial equipment
- Marine electrical systems
- Electric car charging systems



Functional Features

- **Three red LED indicators**, one per phase, providing independent voltage presence indication.
- **TEST button** to verify correct operation of the unit.

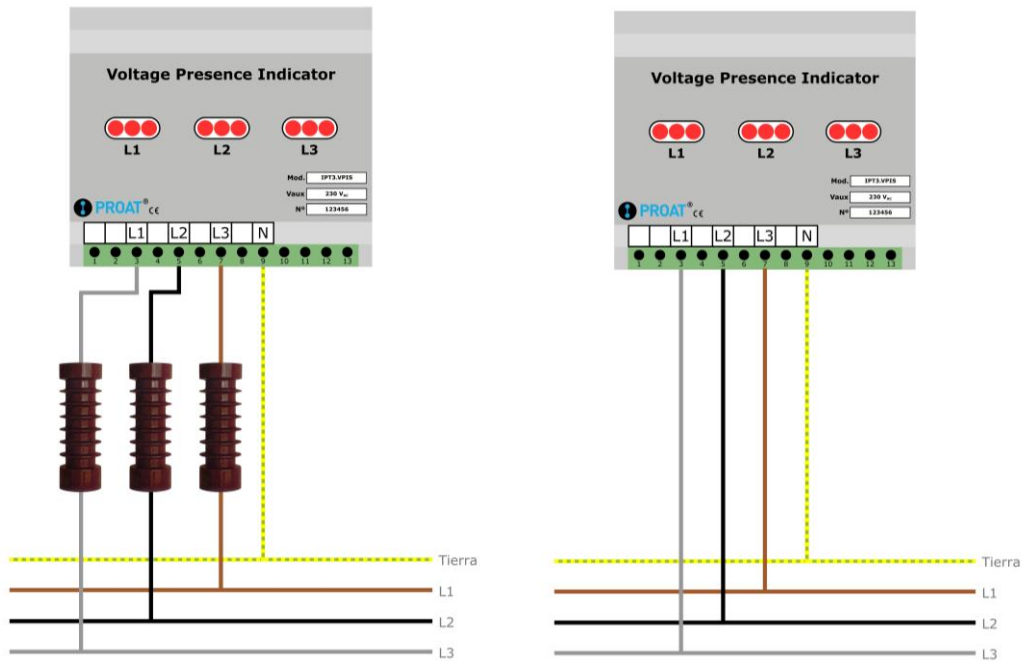
Models IPT3

Models IPT3	Auxiliary Voltage	Nominal Voltage
IPT3	Self-powered	$\leq 440 V_{AC}$

Sensor Models

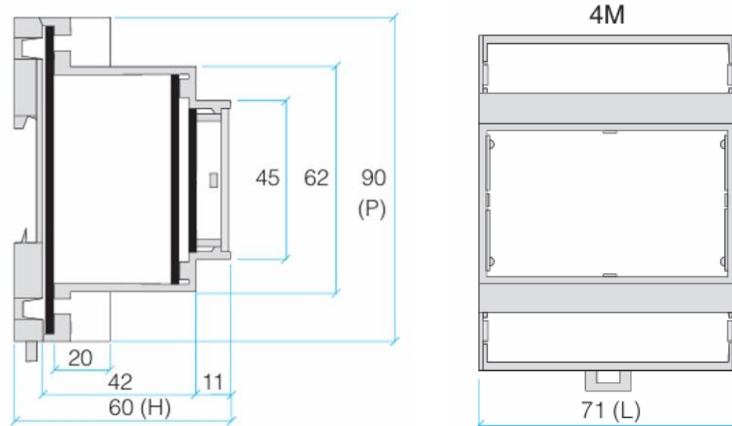
Model	Nominal Voltage	Creepage Distance	Capacitance	Impulse Withstand Voltage	Maximum Load	Weight
APRC-36	36 kV _{AC}	457 mm	75 pF	≤ 170 kV	4000 N	2.3 kg
APRC-24	24 kV _{AC}	305 mm	150 pF	≤ 125 kV	4000 N	1.3 kg
APRC-17,5	17,5 kV _{AC}	256 mm	150 pF	≤ 95 kV	4000 N	0.9 kg
APRC-12	12 kV _{AC}	171 mm	220 pF	≤ 75 kV	4000 N	0.54 kg

⚙️ Wiring Diagram



⚙️ Constructive Characteristics – IPT3

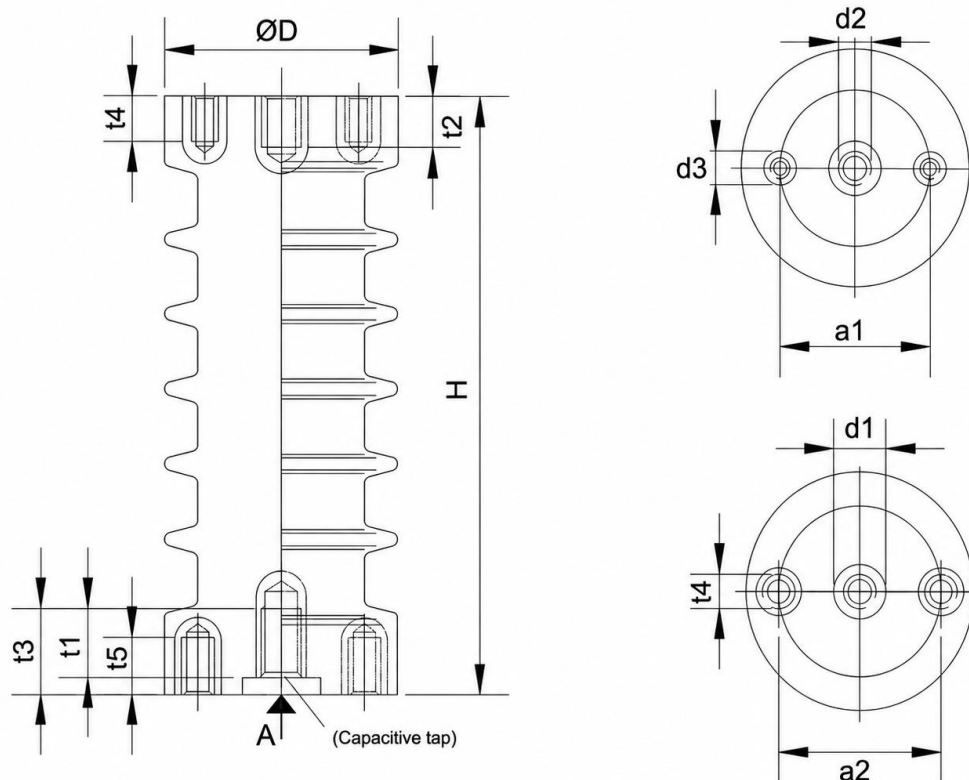
- DIN rail mounting
- Front-access connection terminals
- V0 class self-extinguishing plastic enclosure



⚙️ Technical Data

- Operating temperature: **-25°C to +55°C**
- Protection class: **IP40**
- Power consumption: **< 0,5 W** (at 230 V_{AC})
- Minimum current required **120 µA** according to UNE-EN 62271

❶ Constructive Characteristics – Sensors



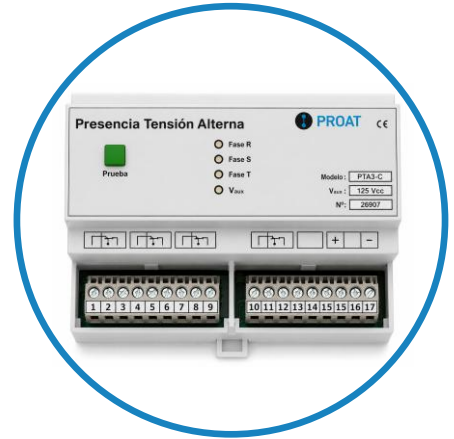
Model	H	ØD	d1	d2	d3	d4	a1	a2	t1	t2	t3	t4	t5
APRC-36	310	80	M12	M12	M8	M10	46	50	20	15	25	12	15
APRC-24	225	70	M12	M12	M8	M10	46	50	20	15	25	12	15
APRC-17,5	175	70	M12	M12	M8	M10	46	50	20	15	25	15	15
APRC-12	120	56	M16	M12	M6	-	36	40	35	15	40	9	10

All dimensions are in millimetres.

PTA3

AC Voltage Detector

- ✓ **PTA3** Detects the **presence of alternating voltage in three-phase systems**
- ✓ For voltages up to **440 V_{AC}**
- ✓ For voltages up to **36 kV_{AC}** with APRC Epoxy Capacitive Sensors
- ✓ **Independent front-panel LED** indication for each phase
- ✓ Output with **4 potential-free changeover contacts**:
 - Phase R
 - Phase S
 - Phase T
 - 3 Phases
- ✓ Auxiliary voltage **85-264 V_{AC} | 85-370 V_{DC} or 24 V_{DC}** depending on the model



Applications

Monitoring the presence or absence of voltage in three-phase AC systems:

- Railway Facilities
- Photovoltaic Installations
- Industrial Equipment
- Naval Electrical Systems
- Electric Car Charging Systems



Functional Features

- **Four voltage-free changeover output contacts**, one for each phase, which switch in the absence of voltage on the corresponding phase (R, S or T), and a fourth contact that switches if all three phases fail
- **Red LEDs** indicating the presence of voltage on each phase
- **Green LED** indicating the presence of the auxiliary supply voltage
- **TEST button** to verify the correct operation of the device

Models PTA3

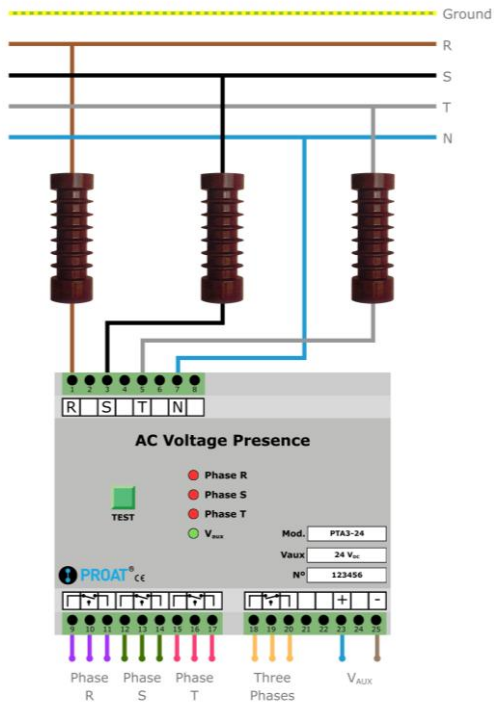
Model	Nominal Three-phase Voltage U_N	Auxiliary Voltage
PTA3	Depending on the sensor	85-264 V _{AC} 85-370 V _{DC}
PTA3-24	Depending on the sensor	24 V _{DC}
PTA3-S440	440 V _{AC}	85-264 V _{AC} 85-370 V _{DC}
PTA3-S440-24	440 V _{AC}	24 V _{DC}

*Other models can be manufactured on request

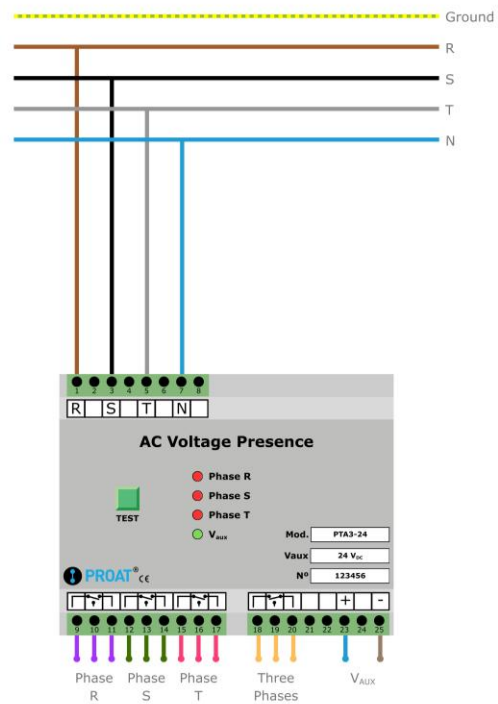
Sensor Models

Model	Nominal Voltage	Creepage Distance	Capacitance	Impulse Withstand Voltage	Maximum Load	Weight
APRC-36	36 kV _{AC}	457 mm	75 pF	≤ 170 kV	4000 N	2.3 kg
APRC-24	24 kV _{AC}	305 mm	150 pF	≤ 125 kV	4000 N	1.3 kg
APRC-17,5	17,5 kV _{AC}	256 mm	150 pF	≤ 95 kV	4000 N	0.9 kg
APRC-12	12 kV _{AC}	171 mm	220 pF	≤ 75 kV	4000 N	0.54 kg

Connection



PTA3

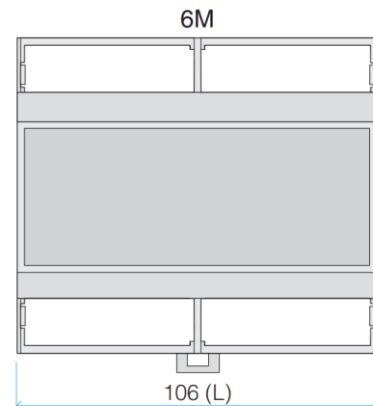
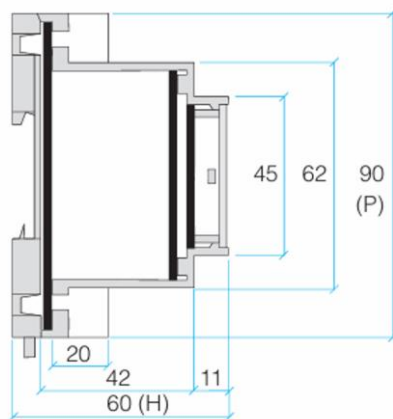


PTA3-S440

PTA3 associated with three Capacitive Sensors to detect absence of line voltage.

Construction Features – PTA3

- DIN rail mounting
- Front-access connection terminals
- V0 class self-extinguishing plastic enclosure



Technical Data

PTA3

Specifications	
Auxiliary Supply Voltage	85-264 V _{AC} 85-370 V _{DC} 24 V _{DC}
Power Consumption (Standby)	1.5 W
Power Consumption (Signaling)	< 2 W
Operating Temperature	-5° C to +55° C
APRC Capacitive Sensors	de 3,6 to 36 kV
Relay Contact Properties	
Continuous current	6A
Max. switching voltage	230 V _{AC}
Max. switching power	2000 VA
Standards	
Dielectric Strength	
Electrical Fast Transients	EN61000-4-4
Impulse Voltage	EN61000-4-5

 DCT

Ground Continuity Detector

- ✓ **Detects faults** in the installation's **ground connection**
- ✓ Triggers an **alarm signal** when the ground connection is interrupted or when its resistance exceeds the programmed threshold
- ✓ **Potential-free changeover contact output**, with a programmable trip level between 1 and 99 Ω .
- ✓ **Real-time display** of the ground circuit resistance
- ✓ **Modbus-RTU** communications
- ✓ **Tropicalized** device for protection in harsh environments.



Applications

Monitoring of potential ground connection faults:

- Railway installations
- Photovoltaic installations
- Electrical installations
- Industrial equipment
- Mining installations
- Electric vehicle charging systems



Functional Features

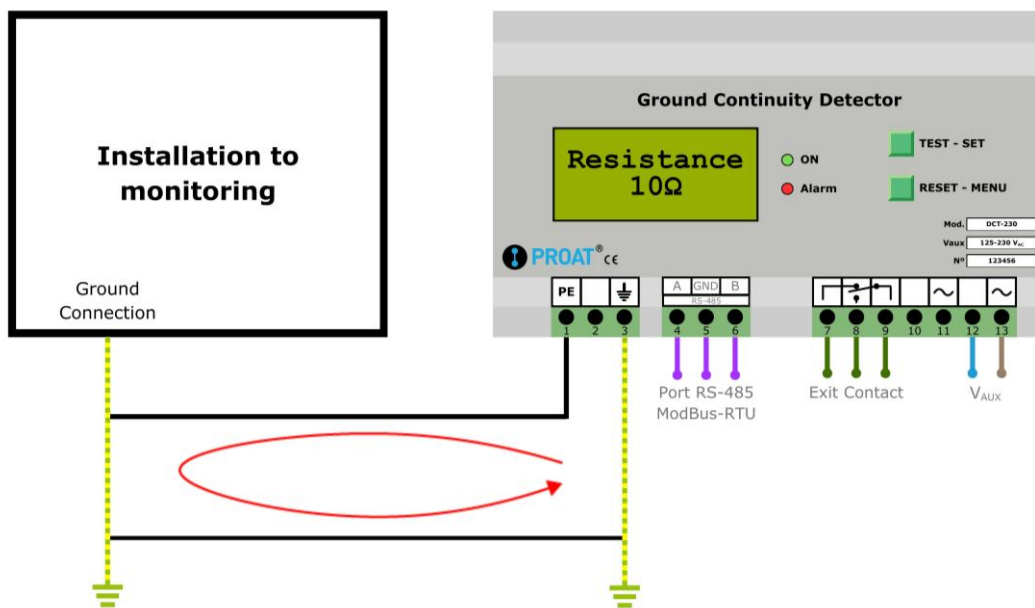
- **Real-time display** of the ground circuit resistance
- **Green LED** indicating that the unit is powered on
- **Red alarm LED**
- Alarm via **potential-free changeover contact**
- RS-485 port with **Modbus-RTU**

Models

Model	Auxiliary voltage	Communications
DCT-230	120-230 V _{AC/DC}	-
DCT-24	20-30 V _{DC}	-
DCT-230-M	120-230 V _{AC/DC}	Modbus-RTU
DCT-24-M	20-30 V _{DC}	Modbus-RTU

*Other models can be manufactured on request

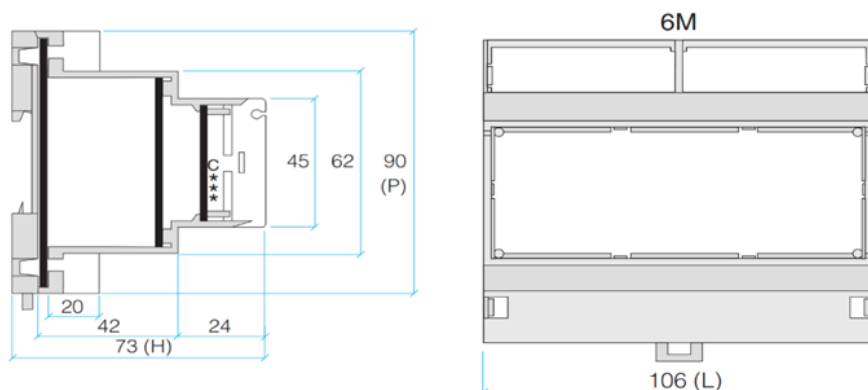
Wiring Diagram



The DCT continuously monitors the resistance of the red loop.

Construction Features

- DIN-rail mounting
- Front-accessible connection terminals
- Self-extinguishing plastic enclosure, class V-0



Technical Data

Voltage ranges	
Auxiliary voltage V_{AUX} (DCT-230)	120-230 $V_{AC/DC}$
Auxiliary voltage V_{AUX} (DCT-24)	24 V_{DC}
Power consumption	≤ 12 VA
Programmable values and response	
Adjustment level	1-99 Ω
Measurement error 0-10 Ω	± 1 Ω
Measurement error 10-50 Ω	± 10 %
Measurement error 50-1000 Ω	± 5 %
Response time	< 1 s
Delay before alarm activation	5 s
RL switching time (type C)	< 100 ms
Hysteresis	± 1 Ω
Factory settings	
Adjustment level	20 Ω
Delay before alarm activation	5 s
Language	Spanish
Modbus ID	1
Measuring circuit	
Internal resistance R+	122 Ω
Internal resistance R-	122 Ω
Applied measurement voltage	+18 V_{DC}
Front panel	
ON	Green LED
Alarm	Red LED
Identification labels	Yes
Test button	Yes
Reset button	Yes
Display	LCD 2 x 8 chars.
Information displayed	Resistance value
Dielectric test	
PE-ground input vs. auxiliary voltage	2 kV_{DC}
PE-ground input vs. switching elements	2 kV_{DC}
Auxiliary voltage vs. switching elements	2 kV_{DC}

Switching elements	
Number of switching elements	1
Output type	Changeover contact
Outputs	Potential-free
Maximum AC load	250 VAC / 2 A
Maximum DC load	300 VDC / 0.1 A
RL switching time	< 10 ms
Service life, number of cycles	20,000,000
General data	
Operating mode	Continuous
Mounting	DIN rail
Connection	M2.5 screw terminal
Maximum tightening torque	0.4 Nm
Degree of protection	IP20
Flammability	UL 94 V-0
Weight	310 g
Operating temperature	-15 °C to +70 °C
Storage temperature	-20 °C to +80 °C
Relative humidity (non-condensing)	< 95 %
Value adjustment method	Front-panel selection
Standards	
EMC emissions	EN 50081
EMC immunity	EN 50082-1
Electromagnetic compatibility	UNE EN 50121-5
Communications	
Interface	RS-485
Protocol	Modbus-RTU
Parameters	9600, 8, N, 1
Modbus ID	1-240
Available functions	3, 4 and 6
Operation	Slave
Cable length (m)	< 1200
Connection	Terminals A/B

DIODE-HEATSINK ASSEMBLIES

(Approved by the Ministry of Defense)



Polycarbonate Enclosure

Bakelite Mounting Plate

Transparent Cover

