



Catalog
CCS
Capacitive
Silicone Sensor

Voltage Detectors
for AC Catenary



Capacitive Silicone Sensor

- ✓ Catenary Voltage Detector **V_{AC}**
- ✓ Models until **27,500 V_{AC}**
- ✓ **Aluminum** terminals and exterior **silicone** coating
- ✓ Leakage line of **972mm** or **1605mm** for **medium** or **very heavy contamination (MF)** according to IEC 60815-3 application area
- ✓ Available Outputs:
 - **CBI21** – Output 4-20 mA
 - **FO** – Fiber Optic Output
 - **RS485** Modbus
- ✓ Sensor's weight CCS25: **1,8** or CCS25-MF: **2,8** Kg
- ✓ Full equipment weight CCS25: **2,8** or CCS25-MF: **3,8** Kg
- ✓ **High resistance** against tampering and vandalism
- ✓ Better weight, resistance and shock life compared to epoxy collectors
- ✓ **Stainless Steel** brackets, **waterproof** case and screws with anti-vibration washers **Nord-Lock®**
- ✓ **Vertical mounting** with M16 **hexagonal screw** adaptable to any installation, optional side bracket



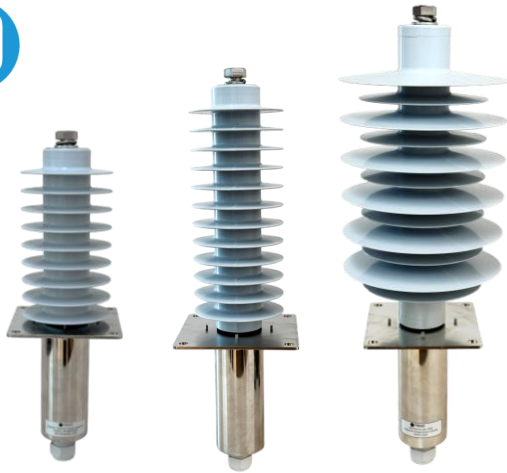
Models

Model	Voltage Service	Test 1 min 50 Hz	Leakage Line	Pollution Zone	Sensor Height	Sensor Weight
CCS10	10 kV _{AC}	50 kV _{AC}	618mm	Average	210mm	1,2 kg
CCS10-MF	10 kV _{AC}	50 kV _{AC}	972mm	Very strong	300mm	1,8 kg
CCS25	27,5 kV _{AC}	95 kV _{AC}	972mm	Average	300mm	1,8 kg
CCS25-MF	27,5 kV _{AC}	95 kV _{AC}	1605mm	Very strong	360mm	2,8Kg

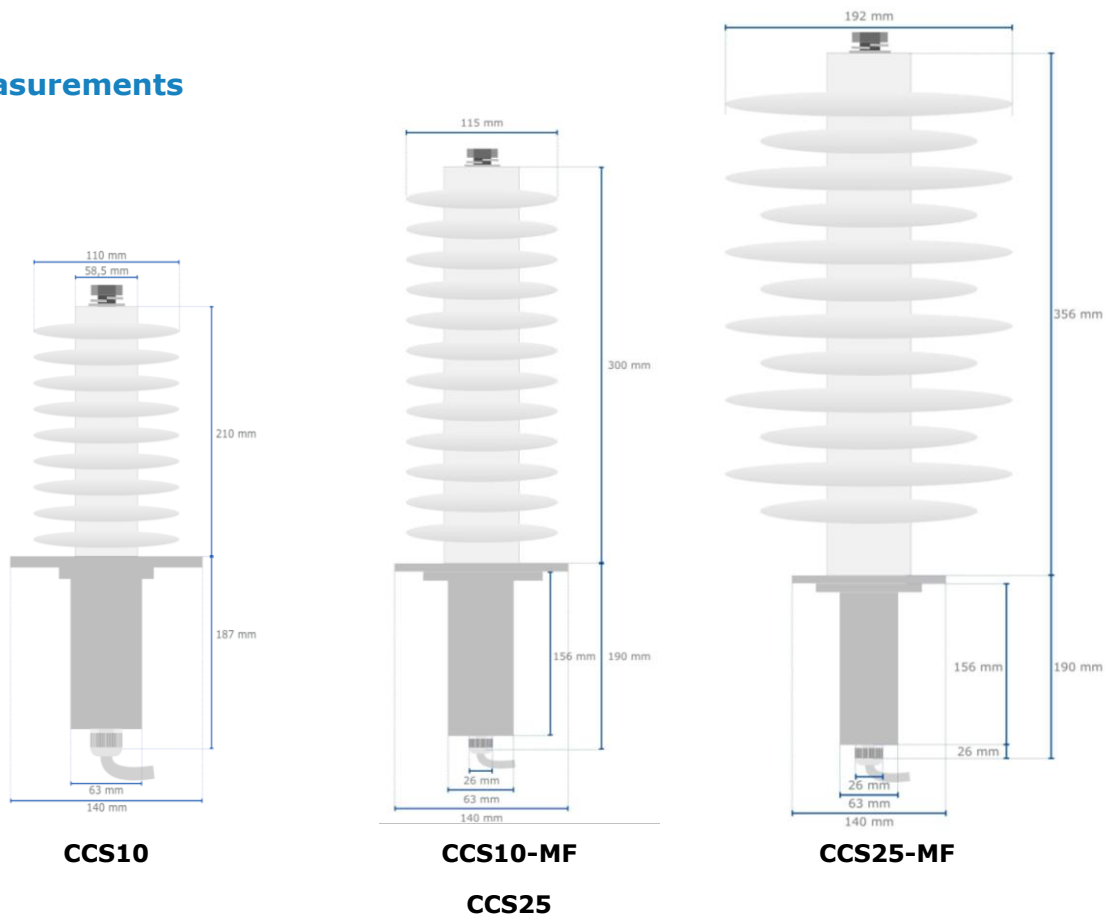
Applications

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

- High Speed Trains
- Conventional trains in AC
- Underground / Subway in AC



Measurements



Technical data

CCS	
Silicone	ISO 37
Elongation Upon Impact	630 %
Resistance to traction	8,5 N/mm ²

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

- ✓ Capacitive Silicone Sensor **CCS**
- ✓ CBI21 **current loop converter** with isolated output **4-20mA** proportional to catenary voltage
- ✓ Measurement 16-60 Hz depending on model
- ✓ Auxiliary voltage **85-264 V_{AC} | 85-370 V_{DC} , 48 V_{DC} , 24 V_{DC}** Depending on the model
- ✓ CCS25 + CBI21 Supports lightning-like impulses **170kV**
- ✓ CCS25-MF + CBI21 Supports lightning-like impulses **250kV**
- ✓ **Epoxy Coated Circuit** installed in waterproof case

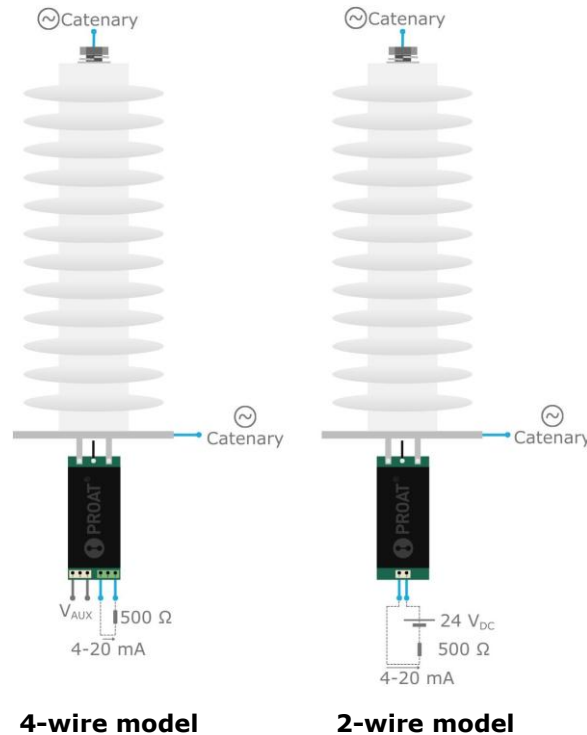


Models

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}

Example order: CCS25 + CBI21-24

Connection



Technical data

CBI21

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

Tests

Tests Norm UNE 61243-1:

- Applied voltage from 0 to 50 kVDC
- Operating time **tests**, according to 6.2.10: Applied voltages: 30 kVAC and then 50 kVAC for 5 minutes.
- Dielectric test** at industrial frequency 95 kVAC 50 Hz, for 1 minute.
- Dielectric test**, section 6.3: 15 positive pulses and 15 negative pulses, lightning type 170 KV 1.2us/50us.
- 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 133kV. At that point, the insulator was contoured without causing internal damage. (The equipment was still working properly after the test.)

Tests Norm UNE-EN ISO 9227:

- Corrosion test

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

- ✓ Capacitive Silicone Sensor **CCS**
- ✓ Fiber Optic Transmitter-Receiver **EFO** and **RFO**
- ✓ CCS+FO Supports lightning impulse voltages up to **95kV**
- ✓ The set is approved by **ADIF**

EFO – Fiber Optic Emitter

- ✓ **Outputs light pulses** proportional to catenary voltage
- ✓ Models for:
 - Fiber Optic with **SC connector** up to **100** meters
 - Fiber Optic with **ST connector** up to **5,000** meters
- ✓ Linearity: **±5%**
- ✓ **Self-powered** or **Auxiliary voltage ±12VDC** depending on model
- ✓ Optional power supply **FA1212-36** of $\pm 12V_{DC}$ for input voltages **85-264 V_{AC}** | **85-370V_{DC}** with galvanic isolation input/output rated at **36kV**
- ✓ **Epoxy Coated Circuit** installed in waterproof case

RFO – Fiber Optic Receiver

- ✓ With **Real-time display** of catenary voltage for Din Rail models
- ✓ **2 potential-free** output contacts:
 - Voltage presence – programmable threshold levels
 - Anomalies – Fiber Optic communication error
- ✓ **Programmable thresholds** of the presence and absence of voltage contact for Din Rail models
- ✓ **4-20mA** output proportional to the catenary voltage
- ✓ Installation on **Din Rail**
- ✓ Auxiliary voltage **85-264 V_{AC}** | **85-370V_{DC}**



Models – Fiber Optic Emitters

Model	Fiber Optic	Auxiliary voltage
EFO25	SC Connector	Catenary Self-powered
EFOA25	SC Connector	±12V _{DC}
EFO25-LD	ST Connector	Catenary Self-powered
EFOA25-LD	ST Connector	±12V _{DC}

Example order: 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} 85-370V _{DC}	±12V _{DC}	36 kV _{AC}

Models – Fiber Optic Receivers

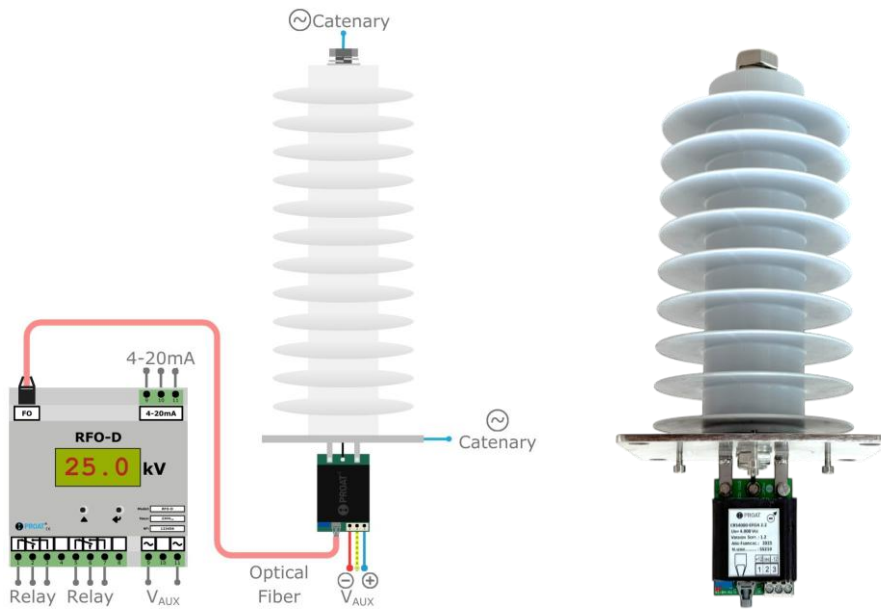
Model	Fiber Optic	Compatible Emitter	Installation	Real-Time Visualization	Output 4-20 mA	Output Contacts	Auxiliary voltage
RFO25-D	SL Connector	EFO25	Din Rail	Yes	Yes	Yes	85-264 V _{AC} 85-370 V _{DC}
RFO25-D-24	SL Connector	EFO25	Din Rail	Yes	Yes	Yes	24 V _{DC}
RFOA25-D	SL Connector	EFOA25	Din Rail	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	SC Connector	Models from 5 to 100 meters
LG-xxx-LD	ST Connector	Models from 5 to 5,000 meters

Connection

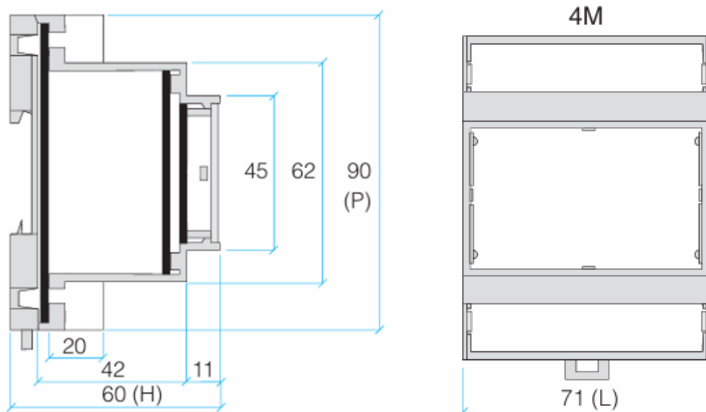


Technical Data – RFO-D

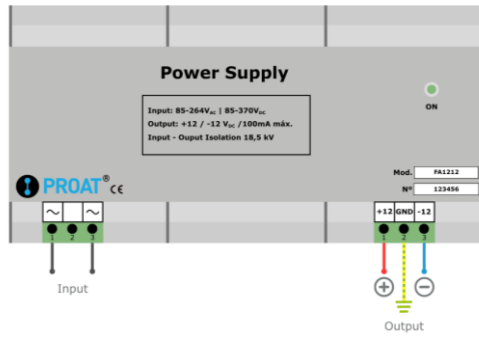
RFO-D	
Specifications	
Contact Type	SPDT
Switching Capacity	1000 VA
Switching Voltage	$\leq 230 V_{AC}$
Response Time	$< 1s$
Reading Range	$0 - U_N + 10\%$
Auxiliary Voltage	$85-264 V_{AC} 85-370V_{DC}$ $24V_{DC}$
Standby Power Consumption	$< 5W$
Operating Temperature	-10° to $+60^{\circ}$
Regulations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

Constructive Characteristics – RFO-D

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

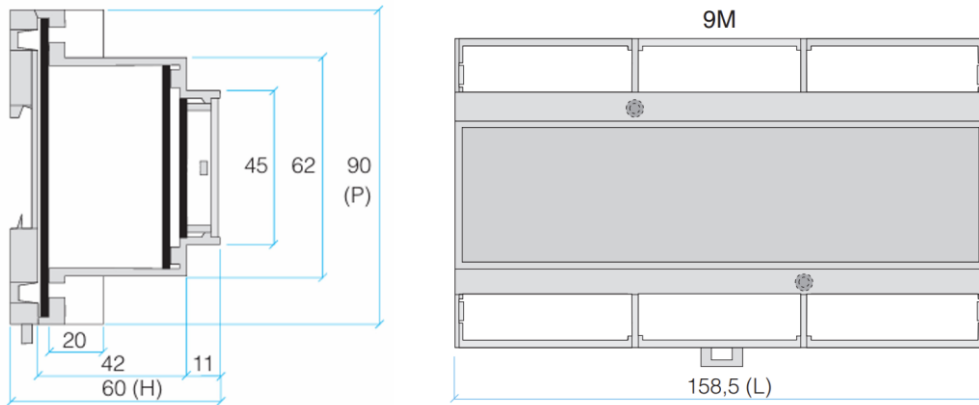


❶ Power Supply FA1212



❷ Constructive Characteristics

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



❸ Tests

Tests **Norm UNE 21138**:

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

Tests **Norm UNE 600068**:

- Corrosion test

Other Tests:

- Operating temperature

CCS + RS485 ModBus

Capacitive Silicone Sensor

+

Output RS485 ModBus

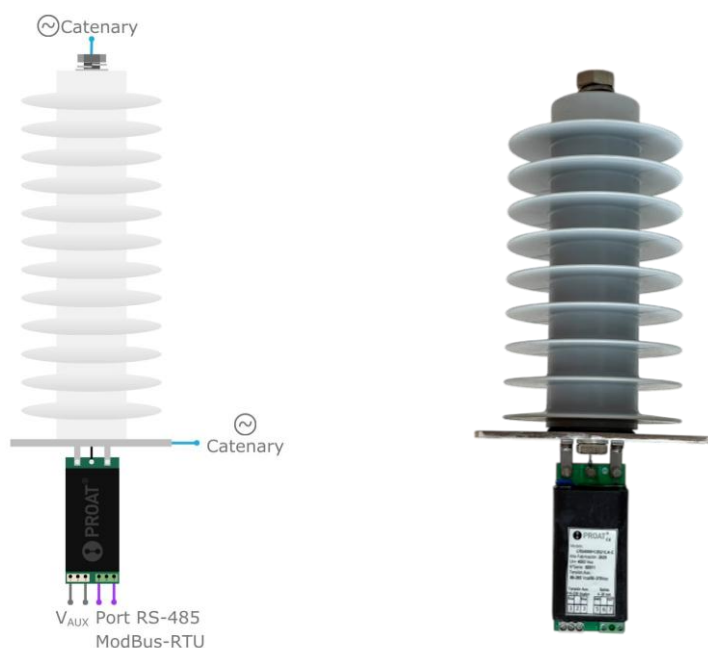
- ✓ Capacitive Silicone Sensor **CCS**
- ✓ Voltage and **RS485 ModBus** communications measurement circuit
- ✓ Auxiliary voltage **85-264 V_{AC} | 85-370 V_{DC}**
- ✓ CCS + RS485 ModBus Supports lightning impulse voltages up to **170kV**
- ✓ **Epoxy Coated Circuit** installed in waterproof case



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
ID ModBus	Selectable
Available Features	3,4, 6
Operation	Slave
Cable length (m)	<1200
Response Time	0,2 seg.
Linearity	2%
Precision	±1%
Consumption	2W
Input-output isolation	3kV
Operating Temperature	-30° to +75°

Tests

Tests Norm UNE 61243-1:

- **Applied voltage:** 0 to 50 kV_{DC}
- **Uptime Testing**, according to 6.2.10: Applied Voltages of 30 kV_{AC} and then 50 kV_{AC} for 5 minutes.
- **Industrial Frequency Dielectric Testing** 95 kV_{AC} 50 Hz, for 1 minute.
- **Dielectric test**, section 6.3: 15 positive and 15 negative lightning impulses, 170 KV 1,2us/50us.
- **Climate 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 10-hour dwell times at -40°C and +75°C.
- **Limit test:** Tests have been carried out to determine the extreme voltage that the equipment withstands, reaching 133kV. At that point, the insulator surface showed contouring, with no internal damage. (The equipment was still working properly after the test.)

Tests Norm UNE-EN ISO 9227:

- Corrosion test