

Sensors, Couplers & Filters



Sensors, Couplers and Filters for the deployment of smart devices in MV and LV networks

- Narrowband PLC couplers
- Wideband PLC couplers
- PLC couplers for Cenelec-A band
- Current & Voltage sensors
- Combined devices
- Filters for Cenelec-A band (PRIME, G3, Meters & More)



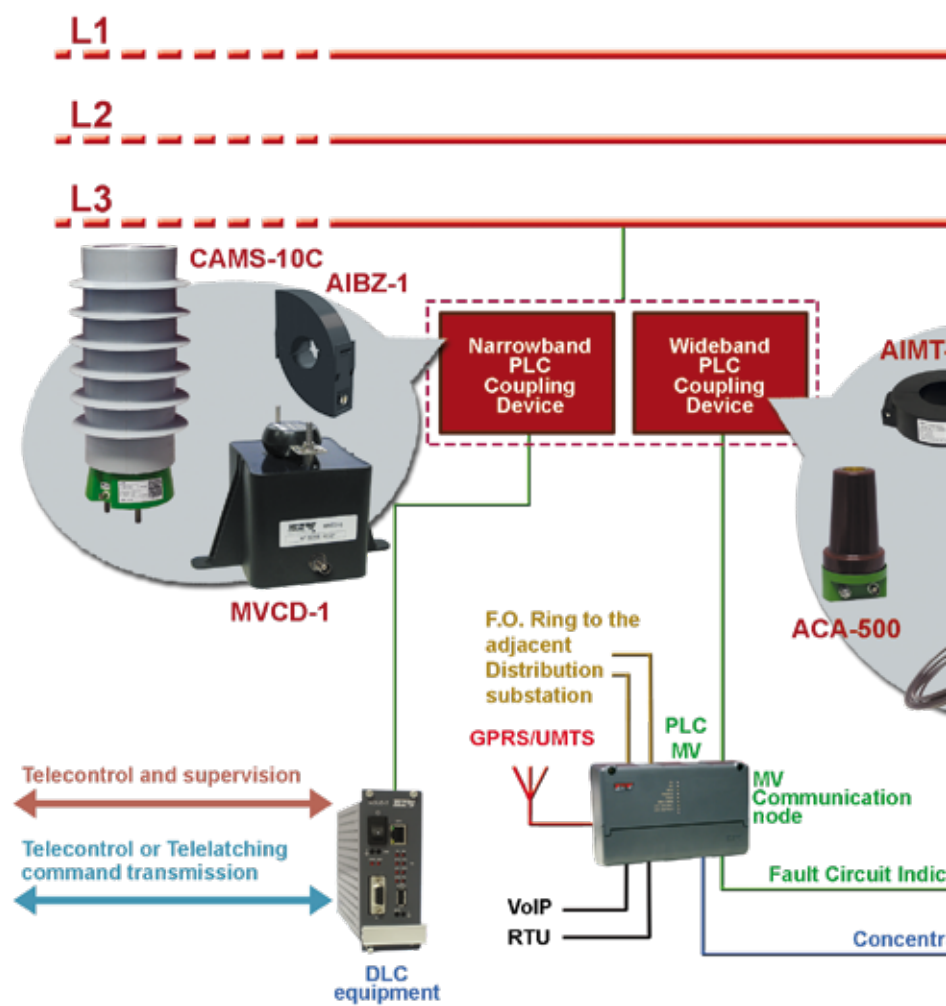
Sensors and PLC Couplers for MV and LV Smart Grids



Description

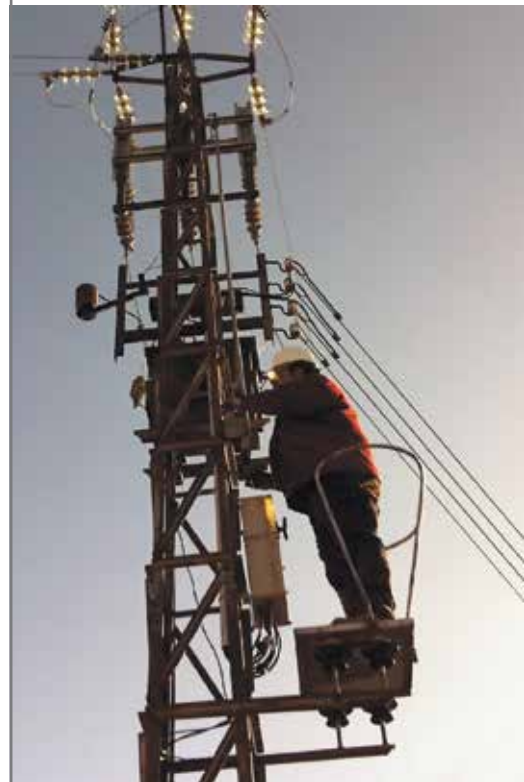
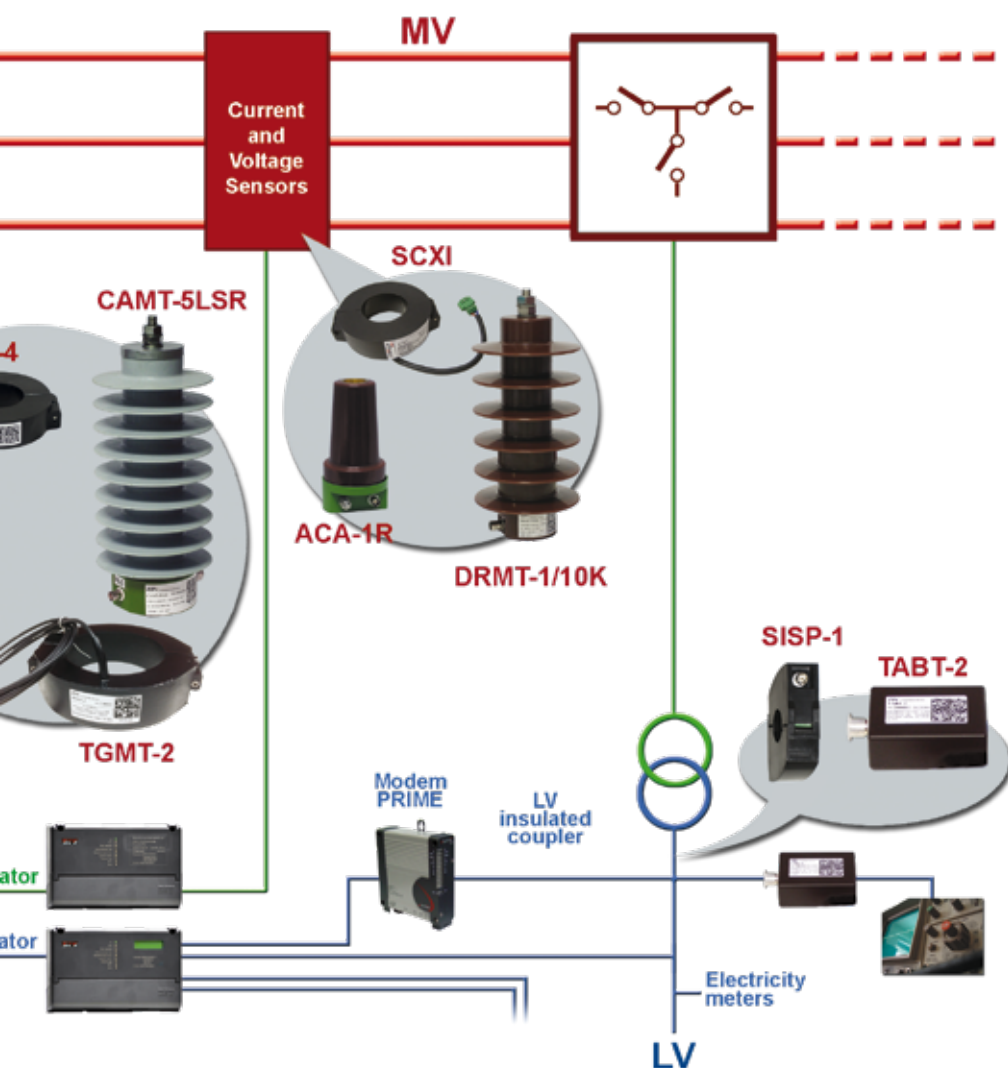
Introduction

Electrical utilities rely on distribution grid automation to improve service, reduce operation costs, and manage the grid in real time. This technology requires the deployment of electronic equipment in the distribution system.



Such electronic equipment requires **sensors** to measure important electrical parameters such as voltage, current and phase angles.

Also, **couplers** are required to communicate these electronic devices using Powerline Communications (PLC) technology. Couplers should be adapted to the different frequencies and available space either in Medium Voltage or Low Voltage points.



Full range of PLC Sensors and Couplers to implement advanced automation and monitoring functions in existing distribution facilities.

Sensors and PLC Couplers for MV and LV Smart Grids



ZIV sensors provide reliable current, voltage, and phase angle values to automation and monitoring equipment and fault circuit indicators.

Description

Sensors

ZIV offers different types of sensors specially designed for distribution system current and voltage acquisition.

ZIV resistive voltage sensors are in direct contact with the medium-voltage conductors and, therefore, they are subject to all applicable industry safety standards depending on voltage level and installation.

Sensors provide reliable voltage and phase angle values to automation and monitoring equipment.

DRMT-1/10K Resistive voltage sensors, suitable for masonry switchgear and air insulated switchgear (AIS).

DRMO-1/10K/05 Resistive voltage sensor, for outdoor use.

ACA-1R Resistive voltage sensors, suitable for gas insulated switchgear (GIS).

SISP-1 Inductive voltage sensor, completely insulated, for sensing the signal in the PRIME frequency band, and installation in the Low-Voltage feeders.

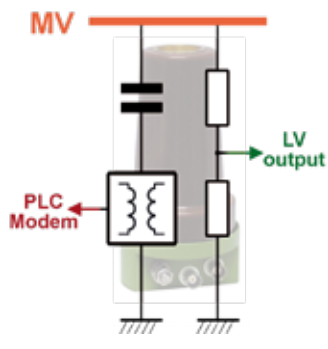
SCXI Inductive current sensors, suitable for masonry switchgear, AIS and GIS.

ACA-1/RC Combined sensor & PLC coupler, suitable for GIS.

CAMS-10/RC Combined sensor & PLC coupler, for outdoor and indoor use.



ACA-1R



ACA-1/RC

PLC couplers

ZIV has a full range of capacitive and inductive couplers. These inject the high-frequency signals, generated by the PLC communications equipment.

Transmission is performed between phase and ground or through the earth connection of the underground cable shields.

All PLC couplers are designed to meet the corresponding industry standards, for safe communication access to the medium voltage and low voltage grid equipment.

CAMT-5LSR Wideband PLC couplers, capacitive, for outdoor and indoor use.
CAMT-6

ACA-500 Wideband PLC couplers, capacitive, suitable for gas
ACA-36 insulated switchgear (GIS).

AIMT-4 Wideband PLC couplers, inductive, suitable for masonry switchgear, AIS and GIS.

MVSD-1 Wideband PLC coupler, inductive, suitable for GIS and AIS with access to the cable screen.

TGMT-2 Wideband PLC coupler, inductive, allows clamping a three-phase medium-voltage insulated cable.

MVCD-1 Narrowband PLC coupler, inductive, suitable for GIS and AIS with access to the cable screen

CAMS-10C PLC coupler, capacitive, for outdoor and indoor use.

AIBZ-1 PLC coupler, inductive, for CENELEC A band, suitable for masonry switchgear and GIS with access to the cable screen.

TABT-2 Insulated PLC coupler, capacitive, low voltage, for CENELEC A band intended for measuring the PLC signal present in Low-Voltage feeders.



In order to achieve good PLC performance, impedance matching is one of the key factors. The couplers match the impedance between the PLC modem and the MV cable and, at the same time, protect the electronic equipment from transients and provide electrical insulation against MV power frequency.

Current and Voltage sensors



ACA-1R

The ACA/R is a resistive voltage sensor intended for installation into a symmetrical tee connector in gas insulated switchgear (GIS).

The dimensions of the sensor comply with UNE EN-50181 standard.

Electrical characteristics

| | |
|---------------------------------|---|
| Connection type | Phase-to-ground |
| System voltage (between phases) | 24 kV _{rms} |
| Accuracy | ±1% and ±0.5% (ACA-1R/10K and ACA-1R/10K/05 respectively) |
| Temperature range | From -10 to +60 °C |

Mechanical characteristics

| | | |
|----------------------|----------------|--------|
| Dimensions | Height: | 148 mm |
| | Max. Ø: | 74 mm |
| Equipment connection | BNC connector | |
| Ground connection | M6 rod and nut | |
| Weight | 965 g | |



DRMT-1/10K

The DRMT is a resistive voltage sensor intended for installation in masonry switchgear and air insulated switchgear (AIS).

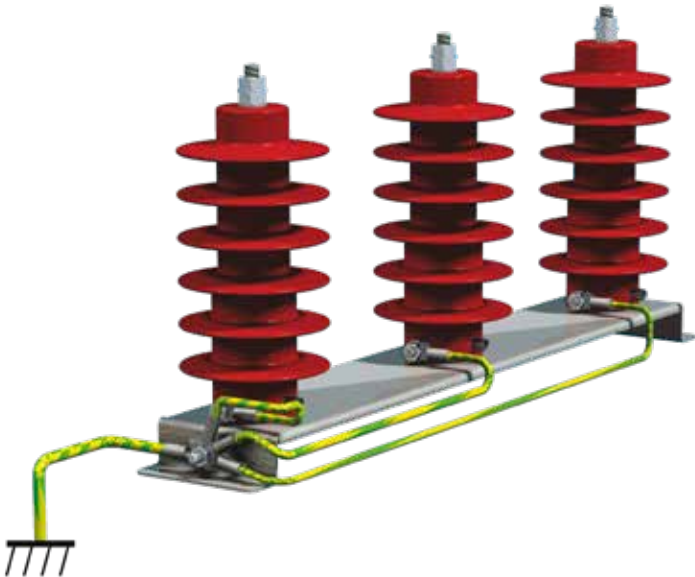
The DRMO-1/10K/05 is for outdoor use.

Electrical characteristics

| | |
|---------------------------------|---|
| Connection type | Phase-to-ground |
| System voltage (between phases) | 24 kV _{rms} |
| Accuracy | ±1% and ±0.5% (DRMT-1/10K and DRMO-1/10K/05 respectively) |
| Temperature range | From -10 to +60 °C |

Mechanical characteristics

| | | |
|----------------------|------------------------------------|--------|
| Dimensions | Height: | 215 |
| | Max. Ø: | 105 mm |
| Line connection | M10 rod or M10 groove | |
| Equipment connection | BNC connector | |
| Ground/Mounting | M12 groove and M8 earth connection | |
| Weight | 1350 g | |



For fault detection applications, protective relaying, and distribution grid monitoring.



SCXI

The SCXI is an inductive current sensor that is made up of a toroidal transformer of two semi-cores.

Intended for easy installation in masonry switchgear, AIS and GIS.

Electrical characteristics

| | |
|----------------------|--------------------------------|
| Type | Inductive (split-core type) |
| Connection | Over insulated cable |
| Transformation ratio | 500:1 |
| Accuracy | ±2% |
| Temperature range | From -25 to +55 °C |

Mechanical characteristics

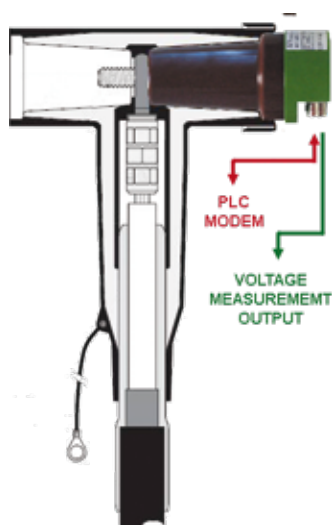
| | |
|-----------------|--|
| Dimensions | External Ø: 111 mm Internal Ø: 55 mm Width: 134 mm Thickness: 31 mm |
| Connection | Screw terminal for 1.5 mm ² cable |
| Max. MV cable Ø | 50 mm |
| Locking system | Two Allen M5 screws |
| Weight | 600 g |



ACA-1/RC

A wideband capacitive PLC coupler (500 pF) and a voltage divider are integrated in the same device.

Intended for installation into a symmetrical tee connector in gas insulated switchgear (GIS).



System voltage
(between phases) 24 kV_{rms}

Frequency range 2 ÷ 30 MHz

Accuracy ±1%



CAMS-10/RC

A capacitive PLC coupler (10 nF) and a voltage divider are integrated in the same device.

Indoor and outdoor use.

System voltage
(between phases) 24 kV_{rms}

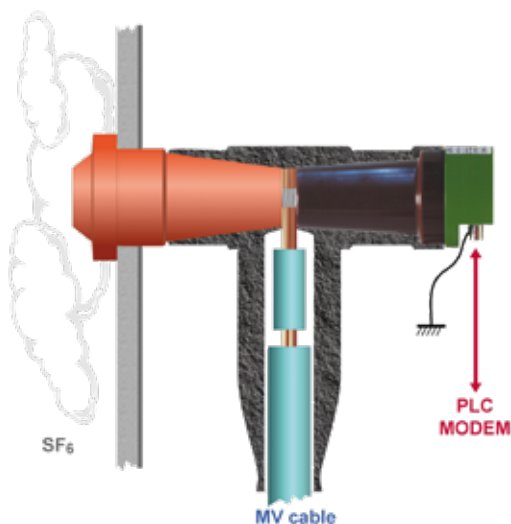
Frequency range 100 kHz ÷ 10 MHz

Combined sensors



By installing an SCXI sensor in each of the three phases of the distribution MV cables, the vector sum of the three measured current values can be calculated.

PLC couplers



PLC couplers are designed to meet the corresponding industry standards, for safe communication access to the distribution grid equipment.

CAMT-5LSR CAMT-6



Capacitive PLC couplers intended for wideband transmission, for injecting and transmitting the PLC signal over the Medium-Voltage feeders.
Indoor and outdoor use.

Electrical characteristics

| | |
|-------------------|---|
| Coupling | Phase-to-earth by means of capacitor of 500 pF |
| System voltage | 24 kV _{rms} (CAMT-5LSR) 36 kV _{rms} (CAMT-6) |
| Frequency range | 2 ÷ 30 MHz |
| Temperature range | From -10 to +60 °C |

Mechanical characteristics

| | | |
|----------------------|---------------------------------------|------------|
| Dimensions | Height | Max. Ø |
| CAMT-5LSR: | 249 mm | 110±3.6%mm |
| CAMT-6: | 334 mm | 114 mm |
| Line connection | M10 rod or M10 screw base | |
| Equipment connection | BNC connector | |
| Ground/Mounting | M12 groove and M8 earth connection | |
| Weight | | |
| CAMT-5LSR: | 1.6 kg | |
| CAMT-6: | 2.3 kg | |

ACA-500 ACA-36



Capacitive PLC couplers intended for wideband transmission, for installation into a symmetrical tee connector in gas insulated switchgear (GIS).

The dimensions of the couplers comply with UNE EN-50181 standard.

Electrical characteristics

| | |
|---------------------------------|---|
| Coupling | Phase-to-earth by means of capacitor of 500 pF |
| System voltage (between phases) | 24 kV _{rms} (ACA-500) 36 kV _{rms} (ACA-36) |
| Frequency range | 2 ÷ 30 MHz |
| Temperature range | From -10 to +60 °C |

Mechanical characteristics

| | |
|----------------------|---------------------------------|
| Dimensions | Height: 148 mm Max. Ø: 74 mm |
| Equipment connection | BNC connector (balanced) |
| Earth connection | M6 rod |
| Weight | |
| ACA-500: | 965 g |
| ACA-36: | 1 kg |



Coupler elements



AIMT-4

Inductive PLC coupler intended for wideband transmission.
For use in masonry switchgear, AIS and GIS.

Electrical characteristics

| | |
|-------------------|--|
| Type | Inductive (split-core type) |
| Coupling | Phase-to-ground (over insulated cable) |
| Frequency range | 2 ÷ 30 MHz |
| Temperature range | From -25 to +55 °C |

Mechanical characteristics

| | |
|----------------------|---|
| Dimensions | Height: 31 mm Width: 134 mm Depth: 111 mm |
| Max. MV cable Ø | 50 mm |
| Equipment connection | 0.5 m RG-58 extension cable, BNC connector |
| Locking system | Two M5 x 30 (DIN 912) Allen screws |
| Weight | 600 g |



MVSD-1 MVCD-1

Inductive PLC couplers intended for injecting and transmitting the PLC signal through the ground connection.
For use in AIS and GIS.

Electrical characteristics

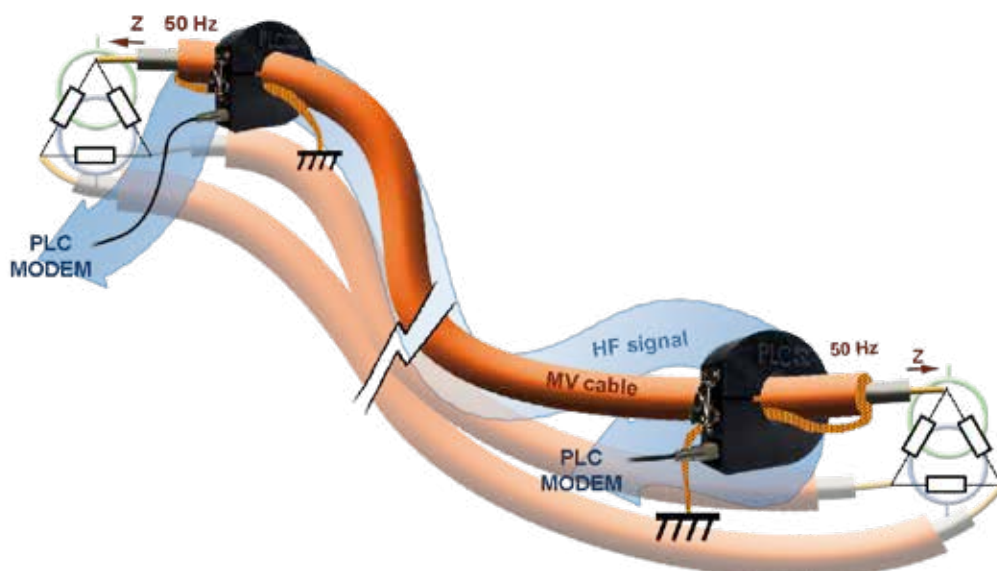
| | |
|---|---|
| Coupling | Inductive (installed in series in the earth connector of the MV cable shield) |
| Maximum system voltage (between phases) | 36 kV _{rms} |
| Frequency range | 500 kHz ÷ 30 MHz (MVSD-1) 10 kHz ÷ 1 MHz (MVCD-1) |
| Temperature range | From -10 to +60 °C |

Mechanical characteristics

| | |
|----------------------|--|
| Dimensions | Height: 163.5 mm Width: 212 mm Depth: 129 mm |
| Mounting | Two Ø6.5 clamping screws |
| Shield connection | Two M8 terminals for 16 mm ² cable |
| Equipment connection | BNC |
| Weight | 3.25 kg |



The idea behind the mechanical design of the inductive couplers is to make installation easy and convenient.



PLC couplers



Couplers are for indoor and outdoor use.



CAMS-10C

Capacitive PLC coupler for injecting and transmitting the PLC signal over Medium-Voltage feeders. Indoor and outdoor use.

Electrical characteristics

| | |
|---------------------------------|---|
| Coupling | Phase-to-earth by means of capacitor of 10 nF |
| System voltage (between phases) | 24 kV _{rms} |
| Frequency range | 100 kHz ÷ 10 MHz |
| Temperature range | From -10 to +60 °C |

Mechanical characteristics

| | |
|----------------------|---|
| Dimensions | Height: 315 mm Max. Ø: 172 mm |
| Line connection | M16 hex head screw (tubular blade terminal) |
| Equipment connection | BNC connector |
| Ground/Mounting | Three M8 rods |
| Weight | 7.75 kg |



TGMT-2

The TGMT-2 is an inductive PLC coupler intended for wideband transmission, for three-phase MV cables.

It can be used indoors and outdoors thanks to its resin encapsulation.

Electrical characteristics

| | |
|---|--|
| Type | Inductive (split-core type) |
| Coupling | Between the 3 phases and ground over insulated cable |
| Maximum system voltage (between phases) | 24 kV _{rms} |
| Frequency range | 2 ÷ 30 MHz |
| Temperature range | From -10 to +60 °C |

Mechanical characteristics

| | |
|----------------------|---|
| Dimensions | External Ø: 174 mm Internal Ø: 115 mm Width: 195 mm Thickness: 47 mm |
| Max. MV cable Ø | 110 mm |
| Equipment connection | BNC connector (2 m cable) |
| Locking system | Two Allen M5 screws |
| Accessories | BNC cable extension |
| Weight | 2 kg |



PLC couplers for CENELEC A band



AIBZ-1

The AIBZ-1 is an inductive PLC coupler intended for CENELEC A-band transmission via the distribution MV cable shield.

Ideal for Narrowband applications.

For use in masonry switchgear and GIS with access to the cable shield.

Electrical characteristics

| | |
|----------------------|--|
| Type | Inductive (split-core type) |
| Coupling | Over the earth connection of the MV cable shield |
| Frequency range | 100 kHz ÷ 5 MHz |
| Temperature range | From -10 to +60 °C |

Mechanical characteristics

| | | |
|----------------|----------------|--------|
| Dimensions | Height: | 29 mm |
| | Width: | 72 mm |
| | Depth: | 108 mm |
| Connector type | BNC | |
| Locking system | By side levers | |
| Weight | 300 g | |



SISP-1

The SISP-1 is a PLC inductive sensor especially designed to operate in LV in the PRIME (CENELEC-A) frequency band.

The PLC signal from the PRIME meters is sensed by the SISP-1 and received by the line detection nodes. A sensor connected to each line of a secondary substation will make it possible, by means of an intelligent algorithm in the concentrator, to detect the line to which the meters are connected.

Electrical characteristics

| | |
|------------------------------------|---|
| Type | Inductive (split-core type) |
| Connection | Clamping the neutral or the phase (insulated cable) |
| System voltage (between phases) | 400 V _{AC} |
| Temperature range | From -10 to +60 °C |

Mechanical characteristics

| | | |
|-------------------------|----------------|--------|
| Dimensions | Height: | 29 mm |
| | Width: | 72 mm |
| | Depth: | 108 mm |
| Equipment connection | BNC | |
| Locking system | By side levers | |
| Weight | 300 g | |



TABT-2

The TABT-2 is a capacitive PLC coupler designed for measuring the PLC signal present over Low Voltage grids.

It provides galvanic insulation and impedance matching as follows: 50 Ω equipment side to 12.5 Ω or 50 Ω line side.

For installation in Low-Voltage feeders.

Electrical characteristics

| | |
|-----------------------------|---------------|
| Coupling | Phase-neutral |
| Frequency range | 10 ÷ 600 kHz |
| Equipment side impedance | 50 Ω |
| Line side impedance | 12.5 or 50 Ω |
| Nominal power | 5 W |

Mechanical characteristics

| | | |
|-------------------------|---|-------|
| Dimensions | Height: | 29 mm |
| | Width: | 50 mm |
| | Depth: | 86 mm |
| Line connection | Two flexible conductors of 2 m length of 4 mm ² | |
| Equipment connection | BNC connector | |
| Weight | 120 g | |



*The TABT-2 coupler
allows the measurement
of HF signals over
Low Voltage grids.*

Filters to mitigate conducted disturbances in LV PLC networks



FBBP-1 (50 A)
Single phase
(Phase-Neutral connection)

FBBP-2 (50 A x 3)
Three phase
(Phase 1,2,3 connection)

FBBP-4 (20 A, 40A and 65 A)
Single phase
(without Neutral connection)

FBBP-5 (65 A x 3)
Three phase
(Phase 1,2,3 connection)

Description

The CENELEC-A EN 50065 frequency band is used by PLC technologies such as PRIME, G3 or Meters & More for communications to support remote meter reading.

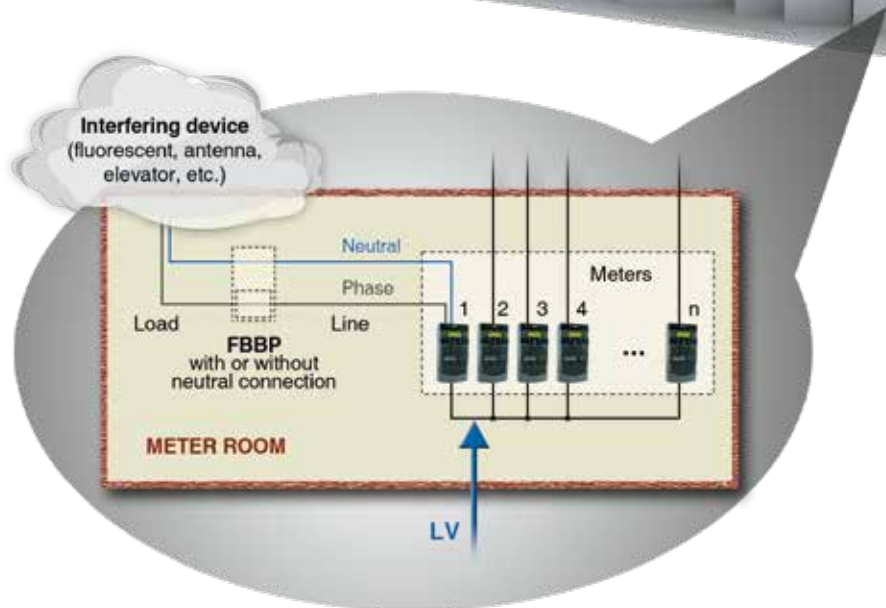
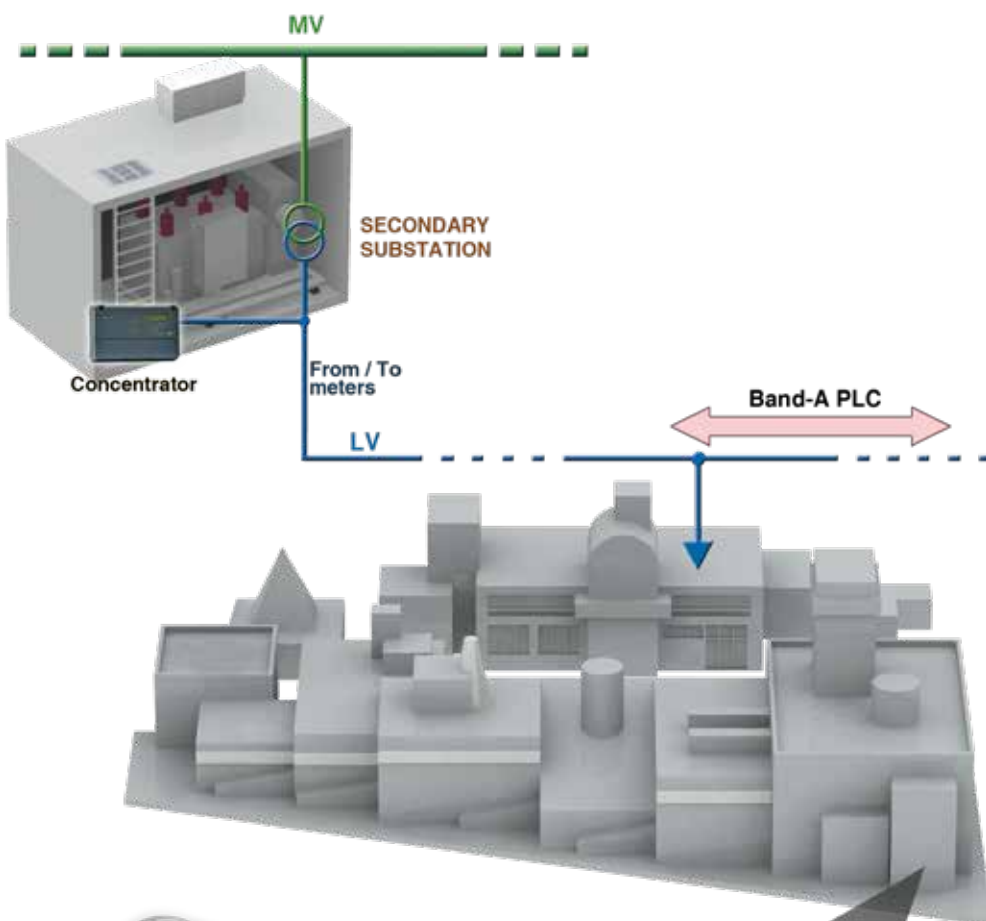
This band, however, may be affected by conducted noise generated by domestic or industrial appliances.

The FBBP family of filters is used to mitigate such noise so that it does not interfere with the PLC signal, so enhancing the performance of the smart meter reading and enabling the construction of the intelligent grids of the future.



Other FBBP filters with different characteristics, for other applications or frequency bands, can be developed upon request.





*Filters for
CENELEC Band A
(PRIME, G3,
Meters & More)*

FBBP

Family of filters



FBBP-1 (50 A)
Single phase
(Phase-Neutral connection)



FBBP-2 (50 A x 3)
Three phase
(Phase 1,2,3 connection)

Technical specifications

FBBP-1

| | |
|--|---|
| Filter type | Low pass |
| Connection type | Single phase (Phase-Neutral) |
| Maximum current | Up to 50 A (10 kW) |
| Attenuation in CENELEC Band A (PRIME, G3, Meters & More) | > 48 dB |
| Finish | Cast aluminium |
| Dimensions | H: 120 mm, W: 260 mm, D: 56 mm |
| Weight | 2.5 kg |
| Connection | Phoenix UW16-UT (for 16 mm ² cables) |
| Ground connection | M6 threaded rod |
| Anchoring | Four Ø5 lateral clamping screws or DIN rail |

FBBP-2

| | |
|--|---|
| Filter type | Low pass |
| Connection type | Three phase (with no neutral phase connection) |
| Maximum current | Up to 50 A (3 x 11.5 kW) |
| Attenuation in CENELEC Band A (PRIME, G3, Meters & More) | > 40 dB |
| Finish | Cast aluminium |
| Dimensions | H: 214 mm, W: 315 mm, D: 93 mm |
| Weight | 8.2 kg |
| Connection | Phoenix UW16-UT (for 16 mm ² cables) |
| Ground connection | M6 threaded rod |
| Anchoring | Four Ø8.5 lateral screws |

FBBP-4

| | |
|--|---|
| Filter type | Notch band filter (second order) |
| Connection type | Single phase (with no neutral phase connection) |
| Maximum current | FBBP-4/20: Up to 20 A (4.4 kW) FBBP-4/40: Up to 40 A (9.2 kW) FBBP-4/65: Up to 65 A (15 kW) |
| Attenuation in CENELEC Band A (PRIME, G3, Meters & More) | > 20 dB |
| Finish | ABS fireproof plastic (UL 94 V0) |
| Dimensions | FBBP-4/20: H: 60 mm , W: 60 mm , D: 50 mm (68.5 mm for DIN rail) FBBP-4/40/65: H: 83 mm , W: 147 mm, D: 59 mm (77.5 mm for DIN rail) |
| Weight | FBBP-4/20: 290 g FBBP-4/40: 1 kg FBBP-4/65: 1.15 kg |
| Connection | MPT1612 EUROCLAMP (for 16 mm ² cables) or double screw terminals. Different connection terminals upon request |
| Anchoring | FBBP-4/20: On a level base or DIN rail (option C) FBBP-4/40/65: Four Ø5 holes or DIN rail (option C) |

FBBP-5

| | |
|--|---|
| Filter type | Notch band filter (second order) |
| Connection type | Three phase (with no neutral phase connection) |
| Maximum current | Up to 65 A (3 x 15 kW) |
| Attenuation in CENELEC Band A (PRIME, G3, Meters & More) | > 20 dB |
| Finish | ABS fireproof plastic (UL 94 V0) |
| Dimensions | H: 250 mm , W: 147 mm , D: 59 mm (77.5 mm for DIN rail) |
| Weight | 3.8 kg |
| Connection | MPT1612 EUROCLAMP (for 16 mm ² cables) |
| Anchoring | Through a plate with four lateral slots (H: 330 mm, W: 176 mm, D: 8 mm) or DIN rail of 340 mm in length |



FBBP-4 (20 A, 40A and 65 A)
Single phase
(without Neutral connection)



FBBP-5 (65 A x 3)
Three phase
(Phase 1,2,3 connection)



www.zivautomation.com

Headquarters

Parque Tecnológico, 210
48170 Zamudio, Bizkaia, Spain

T: +34 94 452 20 03

F: +34 94 452 21 40

ziv@zivautomation.com



6 Manufacturing facilities & 14 Customer support centers

Chicago (USA)
Mexico (MEX)
Niteroi (BRA)

Dublin (IRL)
Newcastle (GBR)

Paris (FRA)

Zamudio (ESP)
Madrid (ESP)
Barcelona (ESP)

Dubai (ARE)
Ryhad (SAU)
Bangalore (IND)
Singapore (SGP)
Yakarta (IDN)

Making the Smart Grid Real ...with you

Please visit our website for local information in your area

Rev.9.2 - November 2019

ZIV continually strives to improve products and services. The technical information included in this document is subject to change without notice.

