

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
- Voltage sensors
- Combined devices
- Filters for Cenelec-A band (PRIME, G3, Meters & More)

Communications / Sensors, Couplers & Filters

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.



Making the Smart Grid Real

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 voltage and phase angle values to automation and monitoring equipment.

Description

Sensors

ZIV offers different types of sensors specially designed for distribution system 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.
ACA-1/RC	Combined sensor & PLC coupler, suitable for GIS.
CAMS-10/RC	Combined sensor & PLC coupler, for outdoor and indoor use.





ACA-1/RC

Making the Smart Grid Real

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 CAMT-6	Wideband PLC couplers, capacitive, for outdoor and indoor use.
ACA-500 ACA-36	Wideband PLC couplers, capacitive, suitable for gas 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.
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.



Voltage sensors





ACA-1R

The ACA/R is a resitive 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.



Phase-to-ground

From -25 to +50 °C

24 kV_{rms}

±0.5%

DRMO-1/10K/05

The DRMO-1/10K/05 is a resistive sensor for outdoor use intended for phase-to-ground voltage measurement in distribution power lines.

The DRMT-1/10K is for indoor use.

Electrical characteristics

Connection type

System voltage

(between phases) Accuracy

Temperature

range

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	

From -10 to +60 °C

Mechanical characteristics

range

Dimensions	Height: Max. Ø:	148 mm 74 mm
Equipment connection	BNC conne	ector
Ground connection	M6 rod and	d nut
Weight	965 g	

Mechanical characteristics

Dimensions	Height: 249 mm Max. Ø: 110 ±3.6% mm
Line connection	M10 rod or M10 groove
Equipment connection	TNC connector
Ground/Mounting	M12 groove and M8 earth connection
Weight	1600 g



For distribution grid monitoring.

Combined sensors



CAMS-10/RC

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

Indoor and outdoor use.





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)

Frequency

range

24 kV_{rms} 100 kHz ÷ 10 MHz System voltage (between phases) $24 \text{ kV}_{\text{rms}}$ Frequency range $2 \div 30 \text{ MHz}$ Accuracy $\pm 1\%$



Measuring and coupling functions in a stand-alone device.



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

Medium-Voltage feeders.

Electrical characteristics

Indoor and outdoor use.

Capacitive PLC couplers intended for

wideband transmission, for injecting

and transmitting the PLC signal over the

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

Mechanical characteristics

Dimensions CAMT-5LSR: CAMT-6:	<u>Height Max.Ø</u> 249 mm 110±3.6%mm 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

Mechanical characteristics

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



Coupler elements



PLC couplers



AIMT-4

Type

Coupling

Temperature range

Inductive PLC coupler intended for wideband transmission.

For use in masonry switchgear, AIS and GIS.

Electrical characteristics

Frequency range 2 ÷ 30 MHz

MVSD-1

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

the

Electrical characteristics

Inductive (split-core type)	Coupling	Inductive (installed in series in the earth connector of the
Phase-to-ground (over insulated cable)	Maximum	MV cable shield)
2 ÷ 30 MHz	system voltage (between phases)	36 kV _{rms}
From –25 to +55 °C	Frequency range	500 kHz ÷ 30 MHz
	Temperature range	From –10 to +60 °C

Mechanical characteristics

Dimensions	Height: Width: Depth:	31 mm 134 mm 111 mm
$\text{Max. MV cable } \varnothing$	50 mm	
Equipment connection	0.5 m RG extension BNC con	i-58 cable, nector
Locking system	Two M5 x 912) Aller	k 30 (DIN n screws
Weight	600 g	

Mechanical characteristics

Dimensions	Height: Width: Depth:	163.5 mm 212 mm 129 mm
Mounting	Two Ø6.	5 clamping screws
Shield connection	Two M8 16 mm ²	terminals for 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 coupler & **PLC sensor for CENELEC-A** band



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

Indoor and outdoor use.



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 on an intelligent algorithm in the concentrator, to detect the line to which the meters are connected.

Electrical characteristics

Туре	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

Electrical characteristics

Coupling Phase-to-earth by means of capacitor of 10 nF System voltage (between phases) 2 Frequency range

Temperature range

24 kV _{rms}
100 kHz ÷ 10 MHz
From -10 to +60 °C

Mechanical characteristics

Dimensions	Height: Max. Ø:	315 mm 172 mm	Dim
Line connection	M16 hex (tubular b	head screw blade terminal)	Equi
Equipment	-		conr
connection	BNC con	nector	Lock
Ground/Mounting	Three M8	3 rods	Wei
Weight	7.75 kg		

Mechanical characteristics

Dimensions	Height: Width: Depth:	29 mm 72 mm 108 mm
Equipment connection	BNC	
Locking system	By side lev	vers
Weight	300 g	



Couplers are for indoor and outdoor use.

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.



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

Туре	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

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: Width: Depth:	29 mm 72 mm 108 mm	[
Connector type	BNC		L
Locking system	By side lev	ers	
Weight	300 g		E

Mechanical characteristics

Dimensions	Height: Width: Depth:	29 mm 50mm 86 mm
ine connection	Two flexible conductors o lenght of 4 m	f 2 m m ²
Equipment connection	BNC connect	tor
Neight	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)

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

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-A band (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

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.

screws or DIN rail

FBBP Family of filters

FBBP-4

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





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