GREENWOOD POWER

PRODUCT GUIDE

MADE IN EUROPE

VOLTAGE
0.72 – 36 kV

ACCURACY
UP TO 0.2S

STANDARDS
IEC · IEEE

SENSORS FOR SMART GRID
LOW-POWER VOLTAGE & CURRENT SENSORS
MV · LV · OUTDOOR · SYSTEM SOLUTIONS



IEC 61869-1 · -10 · -11 · IEEE 386 · ANSI

www.3b-energy.com

PRODUCTS BY GWP greenwood power



About us

Greenwood-Power (GWP) is an innovative partner for every design of **non-conventional instrument transformers** for low and medium voltage networks. Its compact, passive sensors turn high voltages and high currents into small standardised signals that electronic protection, control and metering devices can process directly.

The products enable the progressive transformation of existing distribution grids into **smart grids** with superior resilience, outstanding sustainability and excellent safety. Designs are developed and built in Europe and can be **tailored to customer requirements** – ratios, outputs, connectors and cable lengths.

1/3–2/3
Price of a conventional instrument transformer

0.2S
Highest accuracy class acc. IEC 61869

99 %
Better energy efficiency than conventional transformers

150 kHz
Bandwidth from 50 Hz – power-quality ready

-40/+80 °C
Wide temperature range

Passive
Technology – no auxiliary supply for the sensors

WE STAND FOR

- Tailored solutions for the unique needs of each customer
- High quality products and best price-performance ratio
- Short decision-making processes and extremely fast implementation
- Unique expertise in non-conventional transformers

APPLICATION · SECONDARY SUBSTATIONS



3B Energy is active in the whole world of power transmission and distribution and supports the customer through engineering, purchasing, supply and after-sales service. Together with Greenwood-Power, 3B Energy offers a complete range of sensors and accessories as a single partner for the whole plant.





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BACKGROUND · CHALLENGE · SOLUTION

01 Sensors for the smart grid

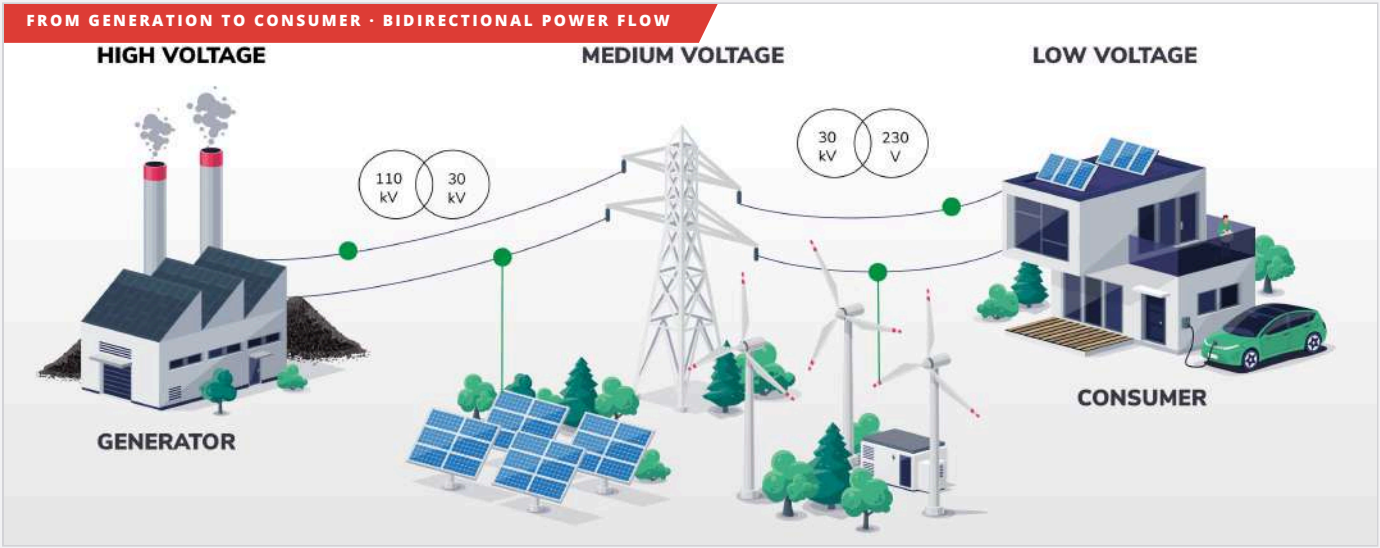
The challenge. The power grid has grown larger and more versatile. Besides the original equipment it now includes cables, batteries and renewable sources such as wind turbines and solar panels, placed anywhere on the network. Customers feed their own energy into the grid, so power flows **in two directions** and the output can change at any point – measuring only on the generation side is no longer enough.

The solution. Measuring devices must be installed at medium and low-voltage level. Sensors transform high voltages and currents into small signals that electronic smart devices can handle, for **more effective and reliable smart grids**.

Sensors vs. conventional transformers

- **Smaller, lighter** and more flexible
- Usually cost only **1/3 to 2/3** of a conventional transformer
- **Save important resources** thanks to the different design
- **99 % better energy efficiency** than conventional transformers

FROM GENERATION TO CONSUMER · BIDIRECTIONAL POWER FLOW



APPLICATION

Grid stations in urban, rural and industrial areas

The sensors are used for **measuring, monitoring, protecting** and detecting short circuits or earth faults – including the direction of current flow during faults. Compact dimensions allow quick and easy **retrofitting without significant changes** to the switchgear.

Analysis · Indication · Automation · Control · Protection · Billing



MV and LV compartments of a secondary substation

IEC 61869-1 · IEC 61869-11 · ORIGINAL EQUIPMENT / RETROFIT

02 Voltage sensors at a glance

GWP voltage sensors are **passive low-power instrument transformers** that deliver a standard low-power output of **3.25/√3 V**. Cone types replace the blind plug of a T-connector in gas-insulated switchgear; support-insulator types carry the bus bar in air-insulated switchgear. All sensors are suitable for **original equipment and retrofit**.

3.25/√3 V	0.2	<130 mm
Secondary output	Accuracy class · 3P/6P	Length of cone types



VxxxC



V360C



VxxxK



VxxxAE



VxxxL

SELECTION OVERVIEW

Sensor type	Insulation level [kV]	Compatible connectors / versions	Page
CONE TYPE SENSORS FOR T-CONNECTORS IN GAS-INSULATED SWITCHGEAR			
VxxxC-xx Type C cone acc. EN 50181	12/28/75 · 24/50/125	Südkabel SEHDT 13.1 / 23 · Nexans (K)400TB/G, (K)440TB/G · Prysmian FMCT-400 · 3M 93-EE-705	12
V360C-xx Type C cone, 36 kV	36/70/170	Südkabel SEHDT 36 · Nexans M400TB/G, M440TB/G · Prysmian FMCT-400 · 3M 94-EE-705	12
VxxxK-xx Shortened cone	12/28/75 · 24/50/125	Südkabel SET/SAT 12, SET/SAT 24 · Nexans (K)430TB · nkt CB24 · TE RSTI-58xx · 3M 93-EE	12
VxxxB-xx Nexans 480TB/G	12/28/75 · 24/50/125	Nexans 480TB/G, K480TB/G (with BIPA plug)	12
VxxxJC-xx Cellpack CTS-S 630, long cone	12/28/75 · 24/50/125	Cellpack CTS-S xxxA 24 kV	12
VxxxJK-xx Cellpack CTS 630, short cone	12/28/75 · 24/50/125	Cellpack CTS xxxA 24 kV	12
VxxxAE-xx IEEE 386, size 11 cone	15/25/28 · 28/45/125	Richards 62LCN/62LCT, 92LCN/92LCT · ABB Elastimold K655LR-W0X · Eaton Cooper BT625AB1 · Prysmian DBTX25X-X	12
SENSORS FOR AIR-INSULATED SWITCHGEAR			
VxxxL-xx Support insulator type	12/28/75 · 24/50/125 · 36/70/170	V120L · V240L · V360L – base mounted with supporting function	14
VxxxLC-xx Insulator type	12/28/75	V120LC – base mounted without supporting function	14

GAS-INSULATED SWITCHGEAR · EN 50181 · IEEE 386

03 Cone type voltage sensors for T-connectors

T-connectors use a blind plug to secure the connector in place after installation. GWP cone type sensors are used **instead of the blind plug**: they secure the T-connector and measure the voltage at the same time. The sensor has a point for common earth connection and an output cable for connection to an **intelligent electronic device (IED)**.

- **Passive components** – no need for power supplies
- **Compact form factor** – the length of a standard blind plug
- **Robust design** – tightening cap made of solid aluminium
- **Compatible** with T-connectors acc. EN 50181 type C (symmetric and asymmetric) and IEEE 386
- **Wide temperature range**



Cone sensors installed in place of the blind plugs



VxxxC



V360C



VxxxK



VxxxB



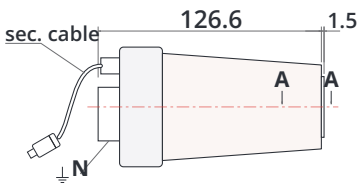
VxxxJC



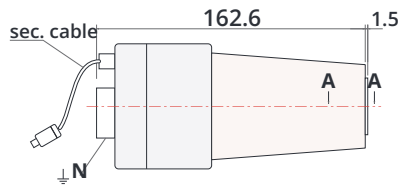
VxxxJK



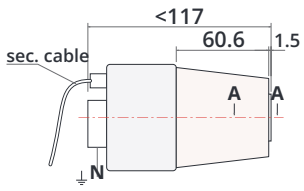
VxxxAE



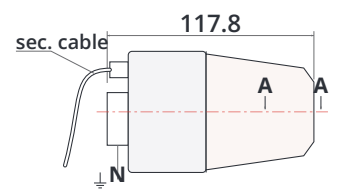
VxxxC



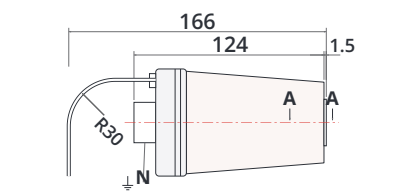
V360C



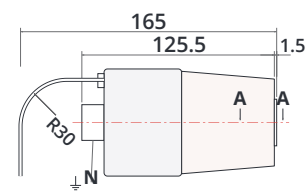
VxxxK



VxxxB



VxxxJC · sec. cable 2 m, open end



VxxxJK · sec. cable 2 m, open end

Technical schemata, dimensions in mm. Examples of connection devices: Satec, Siemens, SEL, Fanox ... see page 19. Matching switchgears: see page 20.

IEC 61869-1 · IEC 61869-11

Technical data – cone type voltage sensors

Technical data	VxxxC	V360C	VxxxK	VxxxB	VxxxJC	VxxxJK	VxxxAE
Standard / interface	EN 50181 type C	EN 50181 type C	Shortened cone	Nexans BIPA	Cellpack long cone	Cellpack short cone	IEEE 386-201 size 11
Insulation level	max. 24/50/125 kV	max. 36/70/170 kV	max. 24/50/125 kV	max. 24/50/125 kV	max. 24/50/125 kV	max. 24/50/125 kV	max. 28/45/125 kV
Primary / nominal voltage	max. 20 kV/√3*	max. 30 kV/√3*	max. 20 kV/√3*	max. 20 kV/√3*	max. 20 kV/√3*	max. 20 kV/√3*	max. 25 kV/√3*
Secondary output	3.25/√3 V*						ALL TYPES
Accuracy class	max. 0.2 & 3P/6P						ALL TYPES
Burden	≥100 kΩ – 10 MΩ, < 500 pF*						ALL TYPES
Storage temperature range	-40 °C to +80 °C						ALL TYPES
Secondary connection	open ends*						ALL TYPES
Length	< 130 mm						ALL TYPES

* *... or customer defined.*

TYPES OF CABLE CONNECTION

Compatible T-connectors (IEC)

Manufacturer	12 kV	24 kV	36 kV
SYMMETRIC T-CONNECTOR / DEADBREAK — VxxxC (12/24 kV) · V360C (36 kV)			
Südkabel	SEHDT 13.1	SEHDT 23	SEHDT 36
Nexans	400TB/G · 440TB/G	K400TB/G · K440TB/G	M400TB/G · M440TB/G
Prysmian	FMCT-400	FMCT-400	FMCT-400
3M	93-EE-705	93-EE-705	94-EE-705
ASYMMETRIC T-CONNECTOR / DEADBREAK — VxxxK			
Südkabel	SET 12 · SAT 12	SET 24 · SAT 24	—
Nexans	430TB	K430TB	—
nkt	CB24	CB24	—
TE Connectivity / Raychem	RSTI-58xx	RSTI-58xx	—
3M	93-EE	93-EE	—
NEXANS WITH BIPA PLUG — VxxxB · CELLPACK — VxxxJC / VxxxJK			
Nexans	480TB/G	K480TB/G	—
Cellpack (VxxxJC)	CTS-S xxxA 24 kV	CTS-S xxxA 24 kV	—
Cellpack (VxxxJK)	CTS xxxA 24 kV	CTS xxxA 24 kV	—

IEEE 386 SIZE 11 DEADBREAKS

VxxxAE · 15 / 28 kV

Manufacturer	Type
Richards	62LCN/62LCT · 92LCN/92LCT
ABB Elastimold	K655LR-W0X
Eaton Cooper	BT625AB1
Prysmian	DBTX25X-X

One sensor, many connectors

Ratio, secondary output and connection are available **customer defined**. Tell us the T-connector already installed in the field and we will select the matching sensor.

AIR-INSULATED SWITCHGEAR · INDOOR

04 Support insulator voltage sensors

Type **VxxxL-xx** sensors are designed for indoor air-insulated switchgear. The sensor resists horizontal forces and is used as an **insulated support for bus bars**, from which the voltage is measured. It is secured at the opposite end by a single nut, which is also the connection to common earth; the output cable on the same end connects to the IED. Type **VxxxLC-xx** is the compact insulator version without supporting function.

- **Bending strength** can be specified by the customer
- **Passive components** – no need for power supplies
- **Easy installation** – a single bolt on the bottom side
- **Wide temperature range**
- **No influence** of neighbouring electric fields



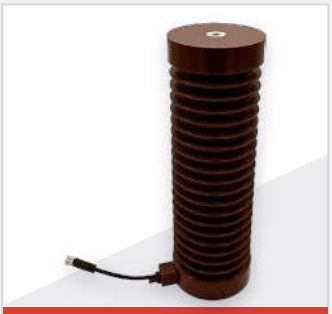
VxxxL sensors supporting the bus bars in an AIS panel



VxxxL · H 130 mm



VxxxL · H 210 mm



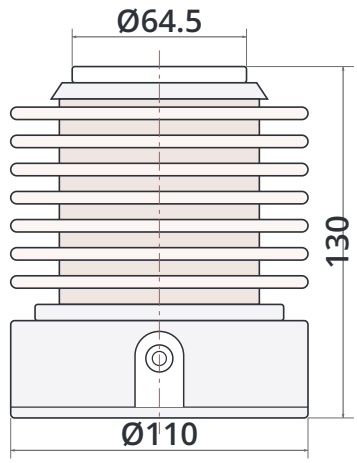
VxxxL · H 300 mm



V120LC

Technical data	VxxxL-xx	VxxxLC-xx
Function	Base mounted, **with** supporting function	Base mounted, **without** supporting function
Versions	V120L · V240L · V360L	V120LC
Insulation level	max. 36/70/170 kV	max. 12/28/75 kV
Primary / nominal voltage	max. 30 kV/√3*	max. 10 kV/√3*
Secondary output	3.25/√3 V*	3.25/√3 V*
Accuracy class	max. 0.2 & 3P/6P	max. 0.2 & 3P/6P
Burden	≥100 kΩ – 10 MΩ, < 500 pF*	≥100 kΩ – 10 MΩ, < 500 pF*
Storage temperature range	-40 °C to +80 °C	-40 °C to +80 °C
Secondary connection	open ends*	open ends*
Height	130 mm · 210 mm · 300 mm	130 mm

* *... or customer defined.*



VxxxLC · technical schema

IEC 61869-1 · IEC 61869-10 · RETROFIT / FIRST INSTALLATION

05 Current sensors at a glance

GWP current sensors are **passive low-power current sensors** with standard voltage output. Ring types are installed on the bushings of GIS/RMU, split types close around existing screened cables – **without disconnecting them**. Typical uses: analysis, indication, automation, control, protection and billing.

225 mV
Standard secondary output

2500 A
Max. primary range

0.2S
Max. accuracy class


ExxxR


ExxxRx


ExxxDA


ExxxT


ExxxSx


LxxxT

Sensor type	Design	Application	Inner Ø [mm]	Mounting / RMU / switchgear	Page
MEDIUM VOLTAGE · RING TYPE					
ExxxR-xx	Ring, "one for all", on bushings	Indoor	83	Siemens, Schneider Electric, Lucy Electric, Ormazabal ...	10
ExxxRx-xx	Ring, on bushings	Outdoor	90 · 130 · 180	G&W, Hubbell, Eaton ...	10
ExxxRG-xx	Ring, on bushings	Outdoor	84	G&W, Hubbell, Eaton ...	10
ExxxDA-xx	Ring, 3-phase block	Outdoor	85 · pole dist. 95	Siemens 8DJH-Compact or equivalent	10
MEDIUM VOLTAGE · FLEXIBLE SPLIT TYPE (AROUND SCREENED CABLES)					
ExxxT-xx	Split, 1-phase	Retrofit · indoor	65	Siemens, Schneider Electric, Lucy Electric, Ormazabal ...	12
ExxxSx-xx	Split, 1-phase, IP67	Retrofit · outdoor	90 · 130 · 180	Siemens, Schneider Electric, Lucy Electric, Ormazabal ...	12
ExxxE-xx	Residual split, around 3-phase	Retrofit · indoor	160	Siemens, Schneider Electric, Lucy Electric, Ormazabal ...	12
ExxxE-9L	Residual split, 3-phase	Retrofit · indoor	65	Siemens, Schneider Electric, Lucy Electric, Ormazabal ...	12
LOW VOLTAGE					
LxxxRA-xx	Ring, NH-fuse switch	Retrofit · indoor	46 × 66 × 29	Low voltage net automation	14
LxxxRJ-xx	Ring, NH-fuse switch	Retrofit · indoor	22	Hager / Jean Müller	14
LxxxT-xx	Highly-flexible split	Retrofit · indoor	40	LV feeder	14
LxxxTD-xx	Split	Retrofit · indoor	32.5	LV feeder	14

MEDIUM VOLTAGE · ON BUSHINGS · AIS / GIS

06 Ring type current sensors

Ring type sensors are installed on the **bushings of GIS, RMU and pad-mounted equipment**, at the switchgear manufacturer or on site. The **ExxxR "one for all"** fits the bushings of the most common European RMUs; the outdoor versions ExxxRx, ExxxRG and the 3-phase block ExxxDA cover North American style equipment and compact switchgear.

- **Passive components** – no need for power supplies
- **Primary range** from 10 A up to 2500 A
- **Secondary outputs** 22.5 / 150 / 225 / 333 mV or customer defined
- **Easy installation** on bushings and cables



ExxxR



ExxxRx

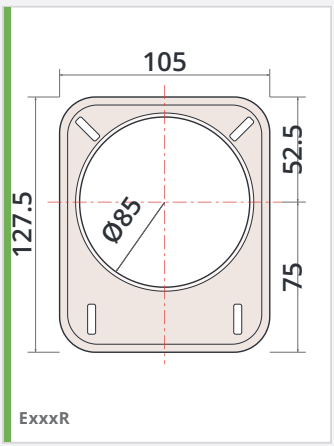


ExxxRG

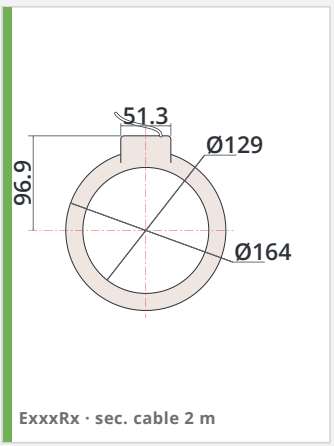


ExxxDA

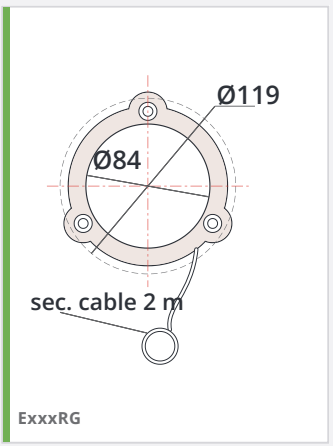
Technical data	ExxxR-xx	ExxxRx-xx	ExxxRG-xx	ExxxDA-xx
Design	Ring · indoor · "one for all"	Ring · outdoor	Ring · outdoor	Ring · outdoor · 3-phase
Insulation level	0.72/3/- kV	0.72/3/- kV	0.72/3/- kV	0.72/3/- kV
Primary current range	10 – 2500 A	10 – 2500 A	100 A*	100 A*
Secondary output	225 mVAC*	22.5 / 150 / 225 / 333 mV	22.5 / 150 / 225 / 333 mV	22.5 / 150 / 225 / 333 mV
Accuracy class	max. 0.2S	max. 0.2S	max. 0.2S	max. 0.2
Over current factor	max. P10	xxPxx (e.g. 5P10)	max. P10	max. P10
Burden	≥10 kΩ – 10 MΩ, < 1 nF	≥10 kΩ	≥10 kΩ	≥10 kΩ
Primary connection	on bushing	on bushing	on bushing	on bushing
Secondary connection	clamps, RJ45, open ends	open ends	open ends*	open ends*
Inner diameter	83 mm · height 30.5 mm	129 mm (90 · 130 · 180)	84 mm	84 mm · pole dist. 95 mm



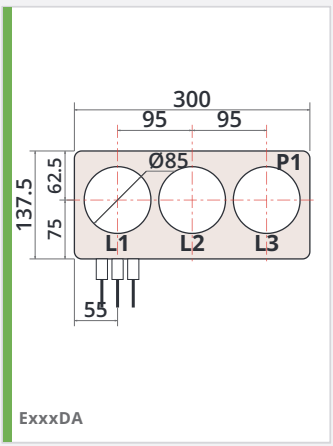
ExxxR



ExxxRx · sec. cable 2 m



ExxxRG



ExxxDA

* ... or customer defined. Dimensions in mm. Matching switchgears: see page 20.

RING TYPE EXXXR-XX · 225 MV SERIES

Measuring ranges and classes

Type	Range acc. IEC 61869	Range with given acc.	I prim. [A]	U sec. [mV]	Max. ext. [%]	Max. class	FS	P class
E004R-XXX-O4A	2 – 160 A	20 – 160 A	40	225	400	0.5	FS40	5P30
E005R-XXX-O4A	2.5 – 200 A	25 – 200 A	50	225	400	0.5	FS30	5P20
E006R-XXX-O4A	3 – 240 A	30 – 240 A	60	225	400	0.5	FS30	5P20
E008R-XXX-O4A	4 – 320 A	40 – 320 A	80	225	400	0.5	FS30	5P20
E010R-XXX-O4A	5 – 400 A	50 – 400 A	100	225	400	0.5	FS20	5P15
E012R-XXX-O4A	6 – 480 A	60 – 480 A	120	225	400	0.5	FS25	5P15
E015R-XXX-O4A	7.5 – 600 A	75 – 600 A	150	225	400	0.5	FS20	5P15
E020R-XXX-O4A	2 – 600 A	100 – 600 A	200	225	300	0.5S	FS15	5P10
E024R-XXX-O4A	2.4 – 720 A	120 – 720 A	240	225	300	0.5S	FS15	5P10
E030R-XXX-O4A	3 – 600 A	150 – 600 A	300	225	200	0.5S/0.2	FS10	5P8
E035R-XXX-O4A	3.5 – 700 A	175 – 700 A	350	225	200	0.5S/0.2	FS15	5P10
E040R-XXX-O4A	4 – 800 A	200 – 800 A	400	225	200	0.5S/0.2	FS10	5P5
E048R-XXX-O4A	4.8 – 960 A	240 – 960 A	480	225	200	0.5S/0.2	FS10	5P5
E060R-XXX-O4A	6 – 1200 A	300 – 1200 A	600	225	200	0.5S/0.2	FS7	5P5
E070R-XXX-O4A	7 – 1400 A	350 – 1400 A	700	225	200	0.5S/0.2	FS7	5P5
E080R-XXX-O4A	8 – 1600 A	400 – 1600 A	800	225	200	0.2S	FS7	5P5
E100R-XXX-O4A	10 – 1200 A	500 – 1200 A	1000	225	120	0.2S	FS5	—
E120R-XXX-O4A	12 – 1440 A	600 – 1440 A	1200	225	120	0.2S	FS5	—
E140R-XXX-O4A	14 – 1680 A	700 – 1680 A	1400	225	120	0.2S	FS5	—

225 mV Standard output for IEDs with low-power inputs acc. IEC 61869-6/-10. Other outputs (22.5 / 150 / 333 mV) on request.

RING TYPE IXXXR-XX · 1 A SERIES

For protection relays with conventional 1 A inputs

Type	Range acc. IEC 61869 (1 %, 5 %, 20 %)	Range with given acc.	I nom.	Acc.	FS / FSi	Protection class
I020R-xx	10 – 240 A	100 – 240 A	200 A	0.5	FS3	—
I025R-xx	2.5 – 375 A	125 – 375 A	250 A	0.5S	FS5	—
I030R-xx	3 – 600 A	150 – 600 A	300 A	0.5S	FS5	—
I035R-xx	3.5 – 700 A	175 – 700 A	350 A	0.5S	FS5	—
I040R-xx	4 – 800 A	200 – 800 A	400 A	0.5S	FS5	—
I045R-xx	4.5 – 900 A	225 – 900 A	450 A	0.5S	FS5	—
I050R-xx	5 – 1000 A	250 – 1000 A	500 A	0.5S	FS5	—
I055R-xx	5.5 – 1100 A	275 – 1100 A	550 A	0.5S	FS5	—
I060R-xx	6/30 – 1200 A	300 – 1200 A	600 A	0.5S/0.2	FS5	—
I063R-xx	3.15/31.5 – 1260 A	315 – 1260 A	630 A	0.5S/0.2	FS6	5P5/10P5

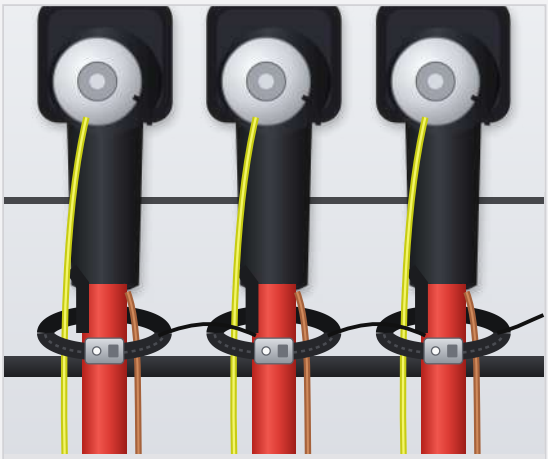
1 A Burden (power) 1 VA or less · output 1 A for all types.

MEDIUM VOLTAGE · RETROFIT · SCREENED CABLES

07 Flexible split type current sensors

Split-core sensors are designed for installation on cables on the primary or secondary side of AIS and GIS. They **open and close around existing cables**, making retrofit fast and safe in every switchgear of the secondary distribution level. Residual versions measure the **earth-fault current** of all three phases.

- **Passive components** – no need for power supplies
- **Split core** – retrofit without disconnecting cables
- **Cost-effective construction** for an optimal price-benefit ratio
- **Outdoor IP67** version available



Split type sensors on the cable terminations of a GIS panel



ExxxT



ExxxSx



ExxxE



ExxxE-9L

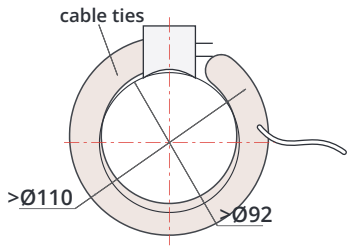
Technical data	ExxxT-xx	ExxxSx-xx	ExxxE-xx	ExxxE-9L
Design	Split · indoor · 1-phase	Split · outdoor IP67 · 1-phase	Residual · indoor · around 3-phase	Residual · indoor · 3-phase
Insulation level	0.72/3/- kV	0.72/3/- kV	0.72/3/- kV	0.72/3/- kV
Primary current range	3.75 – 1800 A	5 – 1000 A	60 A*	60 A*
Secondary output	22.5 / 150 / 225 / 333 mV	22.5 / 150 / 225 / 333 mV	225 mVAC*	225 mVAC*
Accuracy class	max. 0.5	max. 0.5S	3	1/3
Over current factor	xxPxx (e.g. 5P10)	xxPxx (e.g. 5P10)	max. P50	max. P50
Burden	≥10 kΩ	≥10 kΩ	≥10 kΩ – 10 MΩ, < 1 nF	≥10 kΩ – 10 MΩ, < 1 nF
Primary connection	on cables	on cables	on cables	on cables
Secondary connection	clamps, RJ45, open ends	clamps, RJ45, open ends	clamps, RJ45, open ends	clamps, RJ45, open ends
Inner diameter	65 mm	90 · 130 · 180 mm	160 mm	65 mm

* *... or customer defined. Matching switchgears: see page 20.*

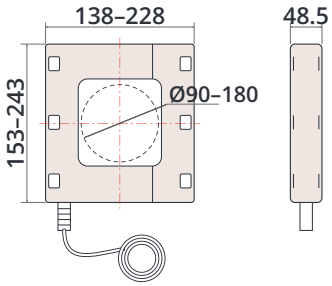
SPLIT TYPE EXXXT-XX · 225 MV SERIES

Measuring ranges and classes

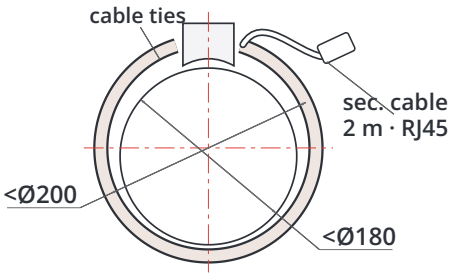
Type	Range acc. IEC 61869	Range with given acc.	I prim. [A]	U sec. [mV]	Max. ext. [%]	Max. class	FS	P class
E007T-XXX	3.75 – 300 A	37.5 – 300 A	75	225	400	0.5	FS50	5P30
E010T-XXX	5 – 400 A	50 – 400 A	100	225	400	0.5	FS30	5P20
E015T-XXX	7.5 – 600 A	75 – 600 A	150	225	400	0.5	FS15	5P10
E020T-XXX	10 – 400 A	100 – 400 A	200	225	200	0.5	FS30	5P15
E030T-XXX	15 – 600 A	150 – 600 A	300	225	200	0.5	FS10	5P5
E040T-XXX	20 – 800 A	200 – 800 A	400	225	200	0.5	FS15	5P10
E050T-XXX	25 – 1000 A	250 – 1000 A	500	225	200	0.5	FS10	5P5
E060T-XXX	30 – 1200 A	300 – 1200 A	600	225	200	0.5	FS7	5P5
E075T-XXX	37.5 – 1500 A	375 – 1500 A	750	225	200	0.5	FS7	5P5
E080T-XXX	40 – 1600 A	400 – 1600 A	800	225	200	0.5	FS10	5P5
E080T-XXX	45 – 1800 A	450 – 1800 A	900	225	200	0.5	FS5	—
E100T-XXX	50 – 1500 A	500 – 1500 A	1000	225	150	0.5	FS7	5P5
E120T-XXX	60 – 1800 A	600 – 1800 A	1200	225	150	0.5	FS5	—
E150T-XXX	75 – 1800 A	750 – 1800 A	1500	225	150	0.5	FS5	—



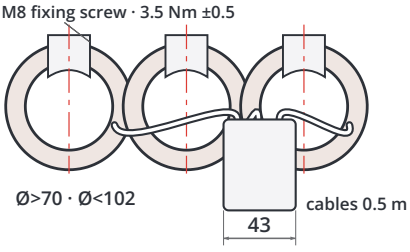
ExxxT · technical schema



ExxxSx · technical schema



ExxxE · technical schema



ExxxE-9L · technical schema

How to read the table

Range acc. IEC 61869: full measuring range of the sensor. **Range with given acc.**: range in which the stated class is guaranteed. **FS**: instrument security factor. **P class**: protection class (e.g. 5P10 = 5 % composite error up to 10 × rated primary current).

LOW VOLTAGE · SECONDARY SUBSTATIONS · LV FEEDERS

08 Low voltage current sensors

The L-series was developed specifically for **low voltage applications** in secondary substations and LV distribution. The split-core design and small size give these sensors the **flexibility of a Rogowski coil** with the benefit of solid core accuracy, easy installation on LV cables and NH-fuse switches, and cost efficiency for any LV project.

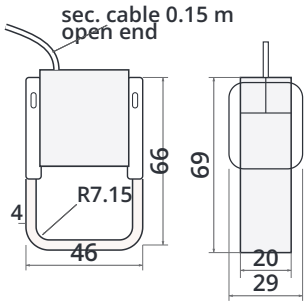
- **Passive components** – no need for power supplies
- **Split core** – allows retrofit installation
- **Fits NH-fuse switches** and LV feeders
- **Wide temperature range**



LV feeders equipped with split type sensors

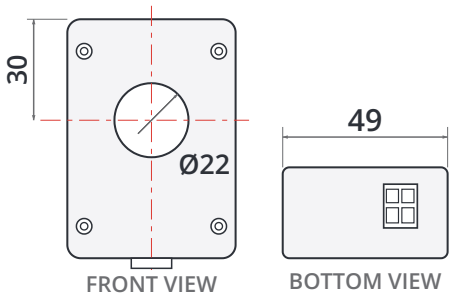


LxxxRA



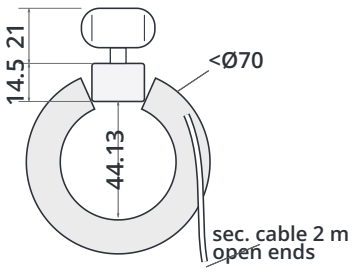


LxxxRJ



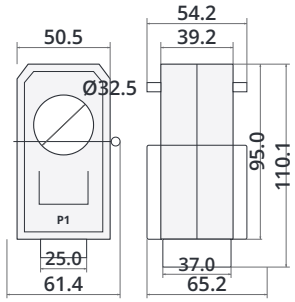


LxxxT





LxxxTD



Technical data	LxxxRA-xx	LxxxRJ-xx	LxxxT-xx	LxxxTD-xx
Design	Ring · NH-fuse switch	Ring · NH-fuse switch	Highly-flexible split	Split
Application	LV net automation	Hager / Jean Müller	LV feeders, retrofit	LV feeders, retrofit
Insulation level	0.72/3/- kV	0.72/3/- kV	0.72/3/- kV	—
Primary current	rated 500 A · ext. 150 %	400 A*	100 – 1000 A	ratio 400/1 A
Secondary output	84.5 mV	225 mVAC*	225 mVAC*	1 A · 0.2 VA
Accuracy class	max. 0.5S	max. 0.5 & 5P5	0.5 / 1 / 3	Class 1 acc. IEC 61869-2
Over current factor	—	—	max. P5 (FS5)	—
Burden	≥10 kΩ	≥10 kΩ, < 1 nF	≥10 kΩ, < 1 nF	—
Frequency / temperature	50 Hz · -20/+70 °C	—	—	—
Secondary connection	cable 0.15 m, open end	—	open ends*	—
Inner dimension	46 × 66 × 29 mm	Ø 22 mm	Ø 40 mm	Ø 32.5 mm

* *... or customer defined. Dimensions in mm.*

POLES AND OVERHEAD LINES · UP TO 36 KV

09 Modular outdoor sensors

All outdoor sensors are built in a **modular fashion**: they can be installed as a hanging device on the line or base mounted on a rail, as pure voltage, pure current or **combined voltage and current sensor** up to 36 kV line voltage. The housing is made of **cycloaliphatic epoxy resin**, well known and proven in outdoor applications.

- **Modular system** for the best price-performance ratio
- **Long lifetime** – outdoor epoxy resin
- **Hanging or base mounted** versions
- **Highest stability** against harsh environments thanks to passive components
- **Flexibility** – pure voltage, pure current or combined

Measurement	Type	Installation
Voltage	**VxxxFE-xx**	Rail / base mounted · clamp installation
Voltage	**VxxxFD-xx**	Hanging · hot plug installation
Current	**ExxxFG-xx**	Rail / base mounted
Current	**ExxxFF-xx**	Hanging
Combined	**PxxxFC-xx**	Rail / base mounted
Combined	**PxxxFB-xx**	Hanging · retrofit

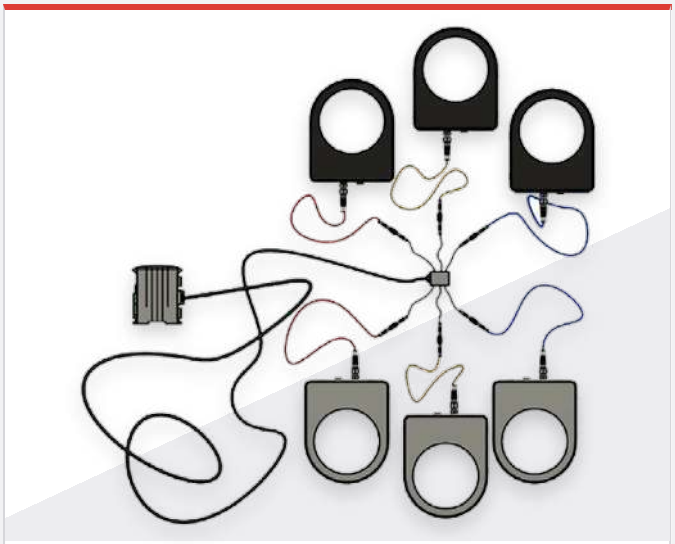


Technical data	Voltage	Current	Combined
Types	VxxxFE-xx · VxxxFD-xx	ExxxFG-xx · ExxxFF-xx	PxxxFC-xx · PxxxFB-xx
Insulation levels	24/50/125 kV · 28/45/125 kV 35/50/150 kV · 36/70/170 kV	as voltage	as voltage
Nominal voltage	max. 20 kV/√3 · max. 28 kV ULL (16.2 kV ULG) max. 30 kV/√3 · max. 36.6 kV ULL (21.1 kV ULG)	—	as voltage
Nominal current	—	600 A*	600 A*
Secondary output	3.25 V/√3* 3.25 V ULL (1.876 V ULG)*	225 mV*	as voltage & 225 mV*
Accuracy	max. 0.5 & 3P/6P	max. 0.2 & 5P10/5P20	V: max. 0.5 & 3P/6P I: max. 0.2 & 5P10/5P20
Burden	≥100 kΩ – 10 MΩ, < 500 pF*	>10 kΩ	V: ≥100 kΩ – 10 MΩ · I: >10 kΩ
Primary connection	hanging or base mounted, directly connected to the overhead line		
Secondary connection	open ends*		

* *... or customer defined. ULL = line-to-line voltage, ULG = line-to-ground voltage.*

COMBINED VOLTAGE AND CURRENT MEASUREMENT

10 System solutions for LBS and GIS

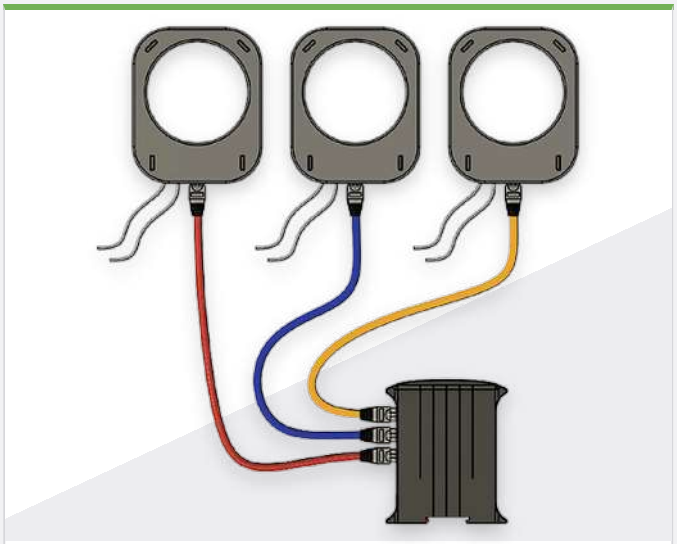


LOAD BREAK SWITCHES · OUTDOOR

CxxxFA-xx

Active system of **up to six combined voltage and current sensors** – or a mix of combined, voltage-only and current-only sensors – mounted on the in- and output bushings of a load break switch or sectionalizer to monitor both sides. The capacitive voltage side allows a complete **"no contact with carrier"** installation.

- Up to 6 × voltage and 6 × current measurement
- Self-calibrating capacitive divider
- Complete galvanic separation from the LBS
- Design for easy and fast installation · IP54



GIS SWITCHGEAR · BUSHINGS · INDOOR

CxxxR-xx

Uses the additional **capacitive tap of the bushing** to measure voltage and adapts to any C-tap value. It sets itself automatically at the GIS manufacturer's factory to a preconfigured ratio with standard output 3.25/√3 V acc. IEC 61869-11. Active compensation of temperature and neighbour fields reaches **class 0.5**; combined with 3 current sensors for a highly cost-efficient design.

- Installed and connected to the IEDs at the switchgear factory – no site work
- Self-calibrating · output not burden dependent
- Galvanic separation · hardware compensation, no correction factors
- Active temperature compensation of the C-tap

Technical data	CxxxFA-xx · LBS	CxxxR-xx · GIS bushing
Isolation level	max. 36/70/170 kV*	max. 36/70/170 kV*
Nominal voltage & current	V: 30 kV/√3* · I: 300 A* · ext. 200 %	V: 30 kV/√3* · I: min. 40 A* · ext. 200 %
Merging box output	V: 3.25 V/√3* · I: 225 mV*	V: 3.25 V/√3* · I: 225 mV*
Accuracy	V: ± 3 % · I: 0.5, max. 5P10	V: 0.5 · I: 0.5, max. 5P10
Burden	V: ≥10 MΩ, < 75 pF · I: ≥10 kΩ	V: ≥10 MΩ, < 75 pF · I: ≥10 kΩ
Installation	outdoor · IP54 · inner Ø 130 mm	indoor · inner Ø 83 mm
Secondary connection	open ends*	clamp terminals
Power supply	± 24 VDC	± 24 VDC

* *... or customer defined. Product insulation level 0.72/3/- kV; system insulation level max. 36/70/170 kV. Matching RMU (CxxxR): Siemens, Schneider Electric, Lucy Electric, Ormazabal, Alfanar ...*

SPECIAL APPLICATIONS · ADD-ONS

11 Amplifiers and devices

Voltage amplifiers **combine sensor technology with IEDs that have conventional 100 – 120 V inputs**: the low-power sensor signal is amplified while keeping a combined accuracy class of sensor and amplifier up to 0.2 acc. IEC 61869, with very low power consumption.



V-Mate · Orion



Capdis-4o · Kries



sensART VMAC · Arteche

Technical data	V-Mate	Capdis-4o / 4o HF	sensART VMAC
Manufacturer	Orion	Kries	Arteche
Aux. voltage	24 – 230 V AC/DC	24 – 230 V AC/DC	48 – 125 VDC
Input voltage	3.25 V/√3	3.25 V/√3	3.25 V/√3
Output voltage	100 / 110 / 120 V/√3	100 V/√3	100 / 110 / 120 V/√3
Accuracy	0.2 (0.2 with matched sensors)	0.5	0.5 – 1P
Load	0.5 VA per channel	0.5 VA per channel	0.4 VA per channel



GWP · MODBUS-RTU

H667AG-xx

Temperature & humidity monitoring system

Characteristic	Value
Temperature sensors	7 (6 satellites + 1 base)
Humidity sensors	1
Accuracy T / RH	± 0.2 % / ± 2 % rel
Connection	Modbus-RTU, 4800 – 115200 Bd
Power	24 VDC · 50 mA
Insulation level	0.72/3/- kV



ELSETA · AUTOMATIC BURDEN ADJUSTMENT

Burden Converter

Adapts the sensor output to the IED burden

Characteristic	Value
Input / output	3 × 3.25 V/√3
Device burden	up to 15 mA output
Accuracy	1 MΩ ‖ < 170 pF
Consumption	< 200 mA @ 12 VDC
Power supply	9 – 33 VDC (full range)
Connection	open end cables

H667AG features: data packet format configurable from the master, byte register swap, big or little endian, customer-defined factory settings. Burden converter: very simple installation, does not affect amplitude and phase correction, isolated power circuit.

ADAPTERS · IEC 61869-6

Merging box and adapters



Merging Box GWP

Consolidates current and voltage measurements of each phase of a 3-phase system into one **RJ45 connector acc. IEC 61869-6**, for easy data transmission or monitoring.

RJ45 pinning · Voltage a=7, n=8 · Current S1=1, S2=2



Y-Adapter cable GWP

Combines two separate low-power signals or data connections into a single input.

RJ45 pinning · Voltage a=7, n=8 · Current S1=1, S2=2



Y-Adapter (LAN splitter 2 to 1) GWP

Combines two Ethernet connections into a single output, allowing data from **two sensors to share one RJ45 cable**.



KAA4 Adapter Nexans

Enables easy installation of a voltage sensor **directly at the distribution transformer bushing**, between bushing and elbow connector. Used together with the GWP VxxxC sensor.

CONFIGURATIONS AND CONNECTIONS

Plugs and cable lengths for every sensor

Sensor / adapter	Plug	Cable length
Voltage sensors	Open end · RJ45 · M8 · BNC · miscellaneous	1 · 1.5 · 2 · 3 · 3.7 · 5 · 10 m
Current sensors	Open end · RJ45 · M8 · BNC · miscellaneous	1 · 1.5 · 2 · 3 · 3.7 · 5 · 10 m
Merging box	RJ45	on request
Y-adapters	RJ45	on request
KAA4 adapter (A to C)	—	—

Open end
wire ends for terminal blocks

RJ45
IEC 61869-6 low-power pinning

M8
screw-locked industrial plug

BNC
coaxial, for test & PQ devices

Plug & play from sensor to IED

Each sensor can be delivered with the plug and cable length required by the protection relay or meter. Combine sensors, merging box and Y-adapters to reduce wiring in the low voltage compartment.

DEVICES FOR VOLTAGE AND CURRENT SENSORS

12 Compatible measuring and protection devices

GWP sensors work with the low-power inputs of the leading IEDs, protection relays and power-quality meters. The table shows proven combinations and their **areas of application**.

Manufacturer	Series	Type	Analysis	Indication	Automation, control & protection
ABB	—	Rio600			✔
A.Eberle	EOR	3DS	✔	✔	✔
A.Eberle	PQI	DE	✔	✔	
ComAp	—	InteliPro			✔
FANOX	—	SIR-C			✔
FANOX	—	SIL-S			✔
Horstmann	Compass	B 2.0 · Bs 2.0 · D	✔	✔	✔
Janitza	—	UMG 801 · 800-CT8-LP	✔		
Janitza	—	UMG96 PQ-L-LP	✔	✔	
Kries	IKI	50		✔	
Powerside	PQube	50	✔	✔	✔
PQ Plus	UMD	98	✔		
Satec	PM · EM	335/Pro · 235/Pro	✔	✔	
Schneider Electric	PowerLogic	P3U30 · P3F/L/M/G30			✔
SEG / Woodward	—	XU2-AC · MRA4			✔
SEL	SEL-	451 · 487E · 651R · 700G · 710-5 · 751 · 787L · 787-2.3.4			✔
Siemens	SIPROTEC 5	7SJ81/80 · 7SY82			✔
Siemens	SIPROTEC Compact	7SC80			✔
Siemens	SICAM	FCM	✔	✔	
Sprecher Automation	SPRECON	EDIR	✔	✔	
Sprecher Automation	SPRECON	E-C			✔
Wago	—	750-495			✔
ZIV	—	TCA	✔	✔	✔

List not exhaustive – further devices on request.

MATCHING SWITCHGEAR · ORIGINAL EQUIPMENT / RETROFIT

13 Switchgear overview

GWP sensors are installed in the ring main units and secondary switchgear of the main European manufacturers – as original equipment at the switchgear factory or as retrofit in the field.

SIEMENS



8DJH



8DJH-COMPACT



8DJH36

SCHNEIDER ELECTRIC



RM6



FBX



RINGMASTER

DRIESCHER



MINEX



MINEX C



G.I.S.E.L.A

LUCY ELECTRIC



AEGIS PLUS



AEGIS 36 KV

ALFANAR



ALFA-R SF6 RMU 17.5 KV



ALFA-R SF6 RMU 36 KV

ABB



SAFERING



SAFEPLUS

EATON



XIRIA

ORMAZABAL



GA / GAE + GE

Your switchgear is not listed?

GWP sensors are designed to fit most RMU and secondary switchgear on the market. Send us the switchgear type, bushing or cable data and we will propose the matching sensor – also **customer defined**.

GWP RANGE

14 Range at a glance

Product family	Standard	Voltage / current	Secondary output	Max. class	Page
Cone type voltage sensors	IEC 61869-11 · EN 50181 · IEEE 386	12 – 36 kV	3.25/√3 V	0.2 · 3P/6P	6
AIS voltage sensors	IEC 61869-11	12 – 36 kV	3.25/√3 V	0.2 · 3P/6P	8
MV ring type current sensors	IEC 61869-10	0.72 kV · 10 – 2500 A	22.5 – 333 mV / 1 A	0.2S · P10	10
MV split type current sensors	IEC 61869-10	0.72 kV · 3.75 – 1800 A	22.5 – 333 mV	0.5S · P50	12
LV current sensors	IEC 61869-10 / -2	0.72 kV · up to 1000 A	84.5 / 225 mV · 1 A	0.5S · 5P5	14
Outdoor sensors	IEC · ANSI / IEEE	up to 36 kV · 600 A	3.25/√3 V · 225 mV	0.2 · 5P20	15
Combined systems	IEC 61869-10 / -11	up to 36 kV	3.25/√3 V · 225 mV	0.5 · 5P10	16
Amplifiers, devices & adapters	IEC 61869-6	—	100 – 120 V · RJ45	up to 0.2	17

Values are maximum ratings of the family; see the individual pages for each type. Ratios, outputs and connections are available customer defined.

COMMON FEATURES

- **Passive technology** – no auxiliary supply for sensors
- Bandwidth from **50 Hz up to 150 kHz** for power quality
- Standard low-power outputs acc. **IEC 61869-10/-11**
- **Compact** – ideal for retrofit without changes to the switchgear
- **Made in Europe**

HOW TO ORDER

1. **Product:** family and full type designation.
2. **Ratings:** insulation level, primary voltage / current, accuracy and protection class.
3. **Interface:** T-connector type or bushing / cable diameter.
4. **Secondary:** output signal, plug and cable length.
5. **Quantity** and requested accessories (amplifiers, merging box, adapters).
6. **Special requirements:** customer-defined ratios, outputs, IED to be connected.

For product selection, datasheets and quotations please contact **3B Energy** · info@3b-energy.com · +39 0371 1856259

Notes

Notes

Notes

GREENWOOD POWER PRODUCTS

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