



VOLTAGE & CURRENT SENSORS
FOR MEDIUM VOLTAGE
SWITCHGEARS



CURRENT AND VOLTAGE SENSORS

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CURRENT AND VOLTAGE SENSORS FOR MEDIUM VOLTAGE APPLICATIONS

By growing microprocessor technology, the modern switchgear technology has modified the requirements for instrument transformers used for measurement and protection because of self-powered and microprocessor-based relays. The modern secondary equipment does not need the high-power output of the instrument transformers as this was necessary for electromechanical relays. For this reason, ALCE developed the low power sensors series, a range of voltage and current transformers which are compatible with the modern microprocessor-controlled relays and other secondary equipment with high input impedance.

ALCE Low Power Sensors fit into existing as well as future designs of switchgear and fulfill the requirements of IEC standards 61869-10 and 61869-11. The output signal for the ALCE Voltage Sensor is volts rather than conventional hundreds of volts; the output of the ALCE Current Sensor is millivolts rather than conventional amperes. Low power sensors have a very good linearity and an extended measuring range. Both, current and voltage sensors provide a low voltage signal output (mV to some Volts). Thereby the safety for the connected equipment and for the field service staff increases and the risk of damages caused by human errors is reduced.

ADVANTAGES

- Designed for low power digital protection and measuring in accordance with:
IEC 61869-10, Electronic Current Transformers
IEC 61869-11, Electronic Voltage Transformers
 - Cost effective
- Both measuring protection requirements can be met with one ALCE single low power sensor for measurement and protection purposes.
- Reduced size and weight: easy to handle, less space required
 - Opportunity to optimize medium voltage switchgear for size, manufacture, logistics and operation.
 - EMC immunity.
 - Operator safety with earthed metal encapsulated housing.
 - No secondary circuit problem: ALCE low power voltage and current transformers can have their secondary open or short circuited.
 - Important safety feature.
 - High reliability and availability.
 - Environmentally friendly, less raw material required

FEATURES

- Medium voltage applications up to 36 kV
- Rated short circuit current withstand up to 25 kA / 3 s
- Type tested to IEC standards
- Meets IEC 61869-10 and 61869-11 requirements
- Few models to cover the whole range of application
- Compact, light and easy to connect
- Quality Assurance in accordance with ISO 9001

VOLTAGE SENSOR

Voltage Sensors are passive devices based on a compensated resistive divider which consists of two resistive elements that divide the input signal in order to receive a proper output value. They are designed for medium voltage protection and measuring system in accordance with IEC 61869-11. For voltage levels between 1kV and 36kV the resistors are embedded into a casted resin.

PHASE CURRENT SENSOR

Phase Current Sensors are passive devices, based on principle of a ring core transformer with an integrated precision shunt, designed for medium voltage protection and measuring systems in accordance with IEC 61869-10. The current sensors provides a voltage output proportional to the primary current.

SENSOR FOR EARTH FAULT DETECTION

In case of earth fault in three-phase network, a current occurs due to the displacement of the neutral point. This current is implemented with a specific ratio in the output of the sensor. Therefore the system enables to detect fault and short-circuit currents. In this sensor inductive transformer principles are combined with sensor technology.

GENERAL INFORMATION

Accuracy limits of voltage sensors for measurement purposes

Class		Voltage error (%)	Phase displacement (min)
Accuracy Class IEC 61869-11	0.5	0.5	20
	1	1	40
	3	3	limit values are not specified

Accuracy limits of voltage sensors for protection purposes

Class		Voltage error (%)	Phase displacement (min)
Accuracy Class IEC 61869-11	3P	3	120
	6P	6	240

Accuracy limits of phase current sensors for measurement purposes

Class		Current error (%)					Phase displacement (min)			
		5% I _p	20% I _p	50% I _p	100% I _p	120% I _p	5% I _p	20% I _p	100% I _p	120% I _p
Accuracy Class IEC 61869-10	0.5	1.5	0.75	-	0.5	0.5	90	45	30	30
	1	3	1.5	-	1	1	180	90	60	60
	3	-	-	3	-	3	limit values are not specified			

Accuracy limits of current sensors for protection purposes

Class		Current error (100% I _p)	Phase displacement (min)	Composite error at rated accuracy - limits
Accuracy Class IEC 61869-10	5P	1	60	5
	10P	3	-	10

VOLTAGE SENSOR

TYPE	VSP-36C	Voltage sensor for symmetric plug	
U (kV)	12/28/75		
	24/50/125		
	36/70/170		
Application	Original equipment / Retrofitting		
Manufacturer	Nexans - Euromold	T-Connector	(K)(M)400TB/G // (K)(M) 440TB/G // (K)(M) 440PB/G // (K)(M) 400PB-XSA // KAA4
	Cellpack		CTS-S 630A
	Suedkabel		MUT 33 // SEHDT 13 // SEHDT 13 // SEHDT 23 // SEHDT 33 // SEHDT 23 // EHDT 33 // UT 33

VOLTAGE SENSOR

TYPE	VSP-36N	Voltage sensor for asymmetric plug	
U (kV)	12/28/75		
	24/50/125		
	36/70/170		
Application	Original equipment / Retrofitting		
Manufacturer	NKT	T-Connector	CB 12-630/ CC 12-630 , CB 24-630 , CC24-630 , CB 36-630
	TE Connect Raychemi		RSTI 58XX /RSTI-CC 58XX

CURRENT SENSOR

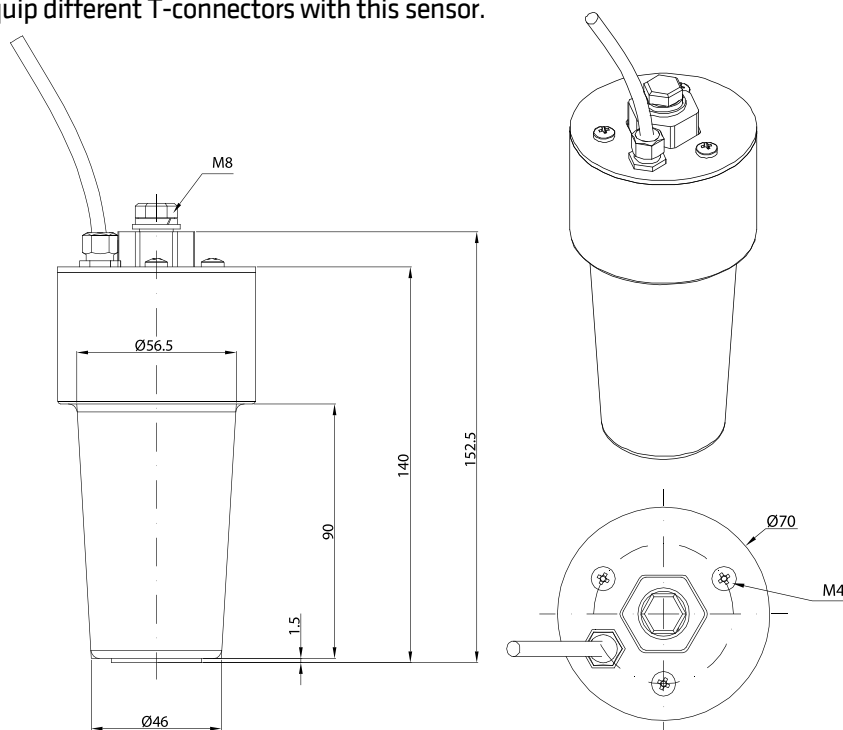
TYPE	LPTC-A55	LPCT-82	LPCT-A120	LPCT-3X84
Current Sensor	Split core phase current sensor	Closed core current sensor	Split core sensor for earth fault detection	Closed core sensor for earth fault detection with phase current sensors
U (kV)	0,72/3			
Application	Original equipment / Retrofitting			
Inside Diameter	Ø 55 mm	Ø 82 mm	Ø 120 mm	3 x Ø 84 mm

VSP-36C

The voltage sensor is mounted on the cable outlet at the back of the T-connector. Therefore, the insulating plug is replaced by the voltage sensor. The accuracy of the sensor, i.e. the absolute value error and phase error, is constant over the lifetime and have not to be recalibrated or readjusted. The calibration to the desired nominal and secondary voltage is performed at ALCE.

Cable length in delivery condition may not be changed. The voltage sensor is suitable for both, original equipment and retrofitting, without any reconstructions of network stations necessary.

The cone of the voltage sensor is designed in accordance with EN50181, type C. Due to the standardized design it is possible to equip different T-connectors with this sensor.

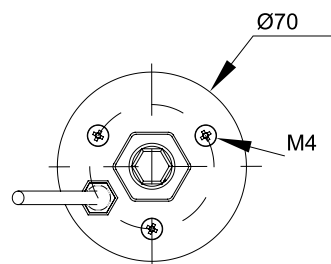
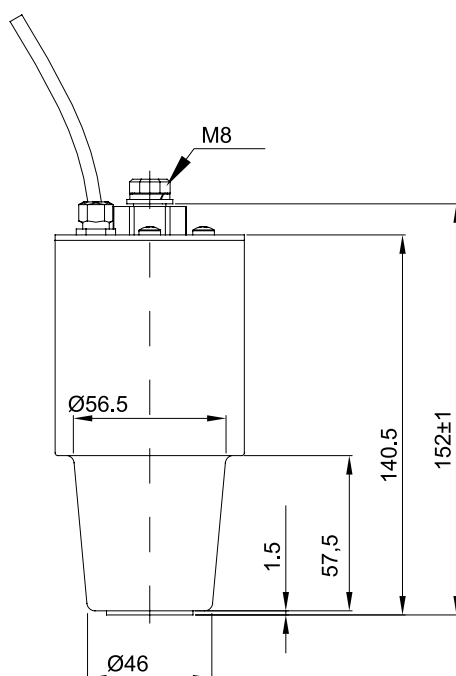


TECHNICAL DATA

TYPE	VSP-36C
Insulation Level	max. 36 / 70 / 170 kV
Rated Voltages	max. 30/√3 kV
Rated Secondary Voltage	3,25/√3 V (or on request)
Rated Frequency	50 Hz / 60 Hz
Voltage Factor	1,2 Un and 1,9 Un 8h
Accuracy Class / Protection Class	0,2 / 0,5 / 1 / 3 // 3P / 6P
External Conditions	Operation: -25°C to +40°C or -40°C to +40°C * Storage: -40°C to +80°C (or on request)
Rated Burden (Standard)	200kΩ ±1% Accuracy, 350 pF ±10% *
Overvoltage Protection	Internal surge arrester
Standard	IEC 61869-11

VSP-36N

The shortened cone voltage sensor is suitable for asymmetrical t-plug-type manufacturers.



TECHNICAL DATA

TYPE	VSP-36N
Insulation Level	max. 36 / 70 / 170 kV
Rated Voltages	max. $30/\sqrt{3}$ kV
Rated Secondary Voltage	$3,25/\sqrt{3}$ V (or on request)
Rated Frequency	50 Hz / 60 Hz
Voltage Factor	1,2 U_n and 1,9 U_n 8h
Accuracy Class / Protection Class	0,2 / 0,5 / 1 / 3 // 3P / 6P
External Conditions	Operation: -25°C to +40°C or -40°C to +40°C * Storage: -40°C to +80°C (or on request)
Rated Burden (Standard)	200k Ω $\pm 1\%$ Accuracy, 350 pF $\pm 10\%$ *
Overvoltage Protection	Internal surge arrester
Standard	IEC 61869-11

* Alternatives on request

S10N 1000, S20N 1000, S30N 1000

This air-insulated voltage sensor is suitable as original equipment and for retrofitting of air-insulated switchgears. The sensors do not have to be calibrated because the output signal (acc. to IEC60044-7) is guaranteed over the lifetime. Innovative design eliminates ambient influences from electrical and magnetical fields. On the customer's request, this sensor can be used with supporting function (post insulator function). Technical details are provided in the specific data sheet on request.

The voltage sensors are originally equipped with shielded 2-pole connection cable with a M8-industrial socket. The connection to the electronic device will be realized with an additional extension cable with open ends or on customer request.



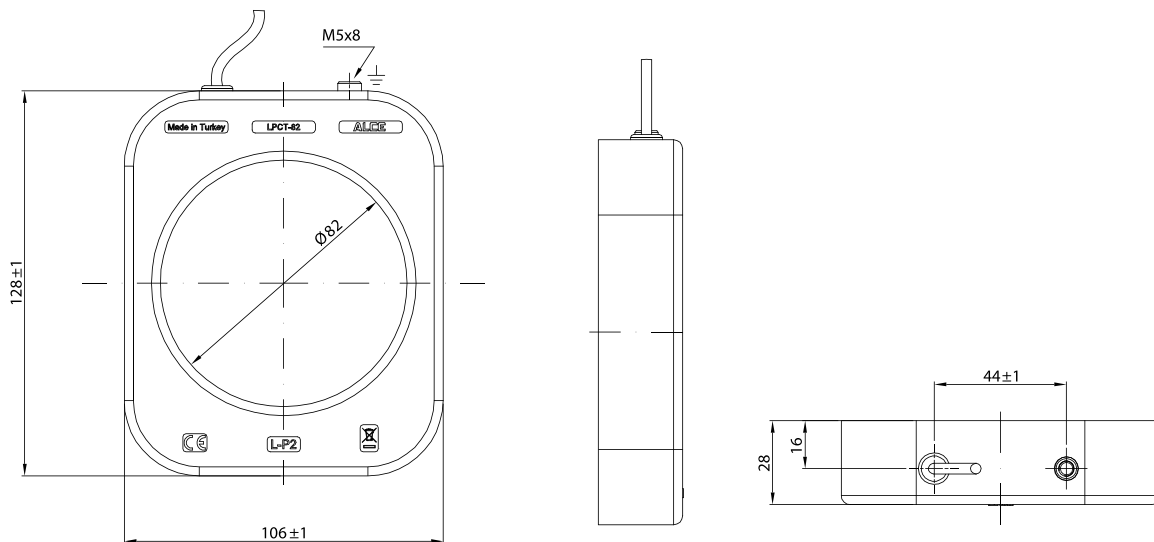
TECHNICAL DATA	
TYPE	S10N-1000, S30N-1000, S30N-1000
Insulation Level	12 / 28 / 75, 24 / 50 / 125, 36 / 70 / 170 kV
Rated Voltages	max. $30/\sqrt{3}$ kV
Rated Secondary Voltage	$3,25/\sqrt{3}$ V (or on request)
Rated Frequency	50 Hz / 60 Hz
Voltage Factor	1,2 Un and 1,9 Un 8h
Accuracy Class / Protection Class	0,2 / 0,5 / 1 / 3 // 3P / 6P
External Conditions	Operation: -25°C to +40°C or -40°C to +40°C *
	Storage: -40°C to +80°C (or on request)
Rated Burden (Standard)	200kΩ ±1% Accuracy, 350 pF ±10% *
Overvoltage Protection	Internal surge arrester
Height	12/28/75kV... 130mm
	24/50/125kV... 210mm
	36/70/170kV... 300mm
Standard	IEC 60044-7 // IEC 61869-11

The phase current sensors are available in different versions. The first version has a split ring core for retrofit purposes whereas the second one is available with closed ring cores for original equipment.

Closed Core (LPCT-82)

This type is designed for simple original equipment in switchgears. It is slide on the not mounted output T-connector in the substation. When the connector is screwed on the feed through, its sheathing expands. Thus, the sheathing presses against the inner surface of the current sensor and fixes it. Consequently, additional fixations of the sensor in the substation are not necessary. Due to a stable production process, it is possible to provide sensors in a set of three with a standard deviation in absolute value and phase error of 0,05% and 0,05°, respectively. Consequently, a set of three sensors enables earth fault current detection in addition to the current measurement, without using earth fault detection transformers.

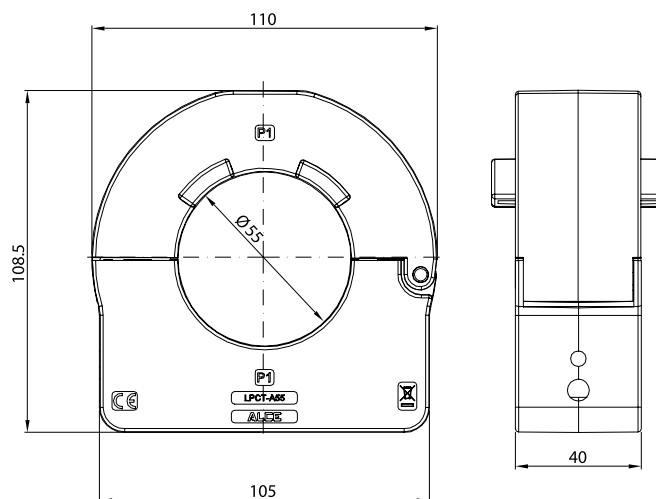
Due to their small size, up to three sensors can be mounted in a cable compartment with a width of 300mm and a phase distance of 95mm.



Split Core (LPCT-A55)

The retrofit application in existing installations is the primary field of application for this type. The click system enables a tool-free mounting of the sensor on site. Dismounting of the T-connector is not necessary, since the sensor is enclosing the cable. The sensor is delivered with two cable straps to fix it directly on the output cable. The cut surface of the iron core and a sophisticated spring system in the sensor housing ensure that the measurement precision of the sensor is guaranteed after assembly on the output cable.

The accuracy of this sensor, more precisely the absolute value error and the phase error is in class 1 according to IEC 61869-10.



TECHNICAL DATA

CURRENT SENSORS (LPCT-82 & LPCT-A55)

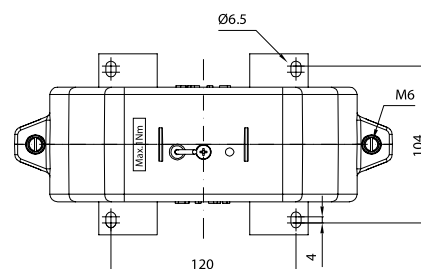
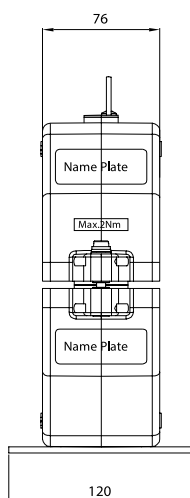
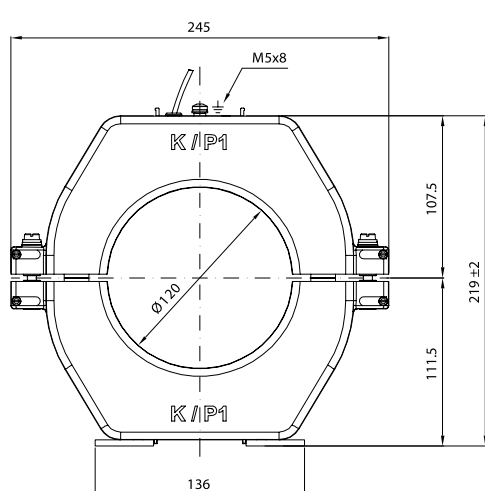
Insulation Level	0,72 kV
Primary Current	300 A; Ext. 200% (Alternatives on request)
Output Signal	225 mV according to IEC 60044-8
Rated Short Time Thermal Current	25 kA / 1 s
Rated Frequency	50 Hz / 60 Hz
Accuracy Class	LPCT-A55 : 0,5 / 1 & 5P10 LPCT-82 : 0,2s / 0,2 / 0,5 & 5P10
External Conditions	Operation: -25°C to +40°C or -40°C to +40°C * Storage: -40°C to +80°C (or on request)
Rated Burden (Standard)	≥ 20 kΩ
Standard	IEC 61869-10

* Alternatives on request

Sensors For Earth Fault Detection (LPCT-A120)

In case of earth fault in a three-phase network, a current occurs due to the displacement of the neutral point. This current is implemented with a specific ratio in the output of the sensor. Therefore the system enables to detect fault and short-circuit currents. In this sensor inductive transformer principles are combined with sophisticated sensor technology.

The high finished cut surfaces of the iron core ensure a constant and high accuracy of the measurement after assembling.



TECHNICAL DATA

CURRENT SENSORS (LPCT-A120)

Insulation Level	0,72 kV
Ratio Earth Fault Detection	60A (Alternatives on request)
Ratio Phase Current Sensor	300A (Alternatives on request)
Output Signal	225 mV according to IEC 61869-10/2018
Rated Short Time Thermal Current	25 kA / 3s
Rated Frequency	50 Hz / 60 Hz
Accuracy Class	Primary current: from 1 to 60 A / Phase displacement: ±120 min. 0,2 / 0,5 / 1 / 3 & 5P10
External Conditions	Operation: -25°C to +40°C or -40°C to +40°C * Storage: -40°C to +80°C (or on request)
Rated Burden (Standard)	≥ 20 kΩ
Standard	IEC 61869-10

* Alternatives on request

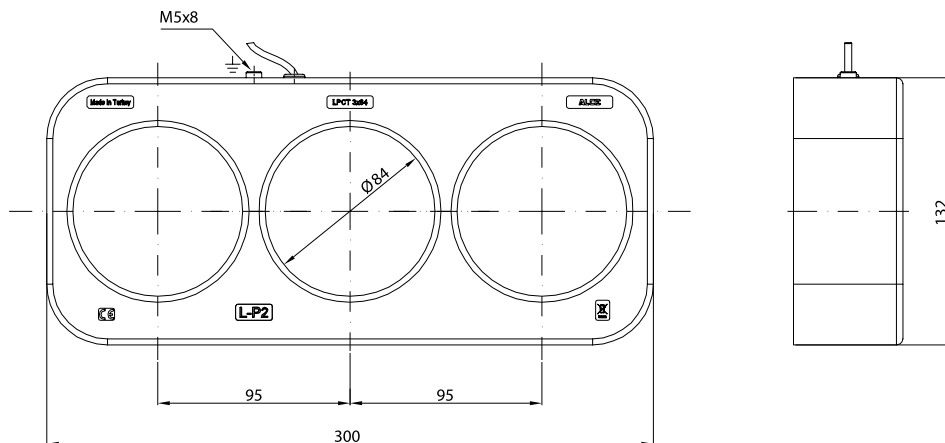
Multifunctional Current Sensors (LPCT-3X84)

(Phase Current- and Earth Fault Detection)

The current sensor in 3-phase design combines maximum flexibility with maximum functionality. It is possible to add the earth fault detection to the three single phase converter in the sensor.

In addition to the extended version, consisting in three current sensors and a sensor for the earth fault detection, different simpler layouts can be provided in accordance with customer's requirements. This sensor is designed for original equipment in switchgears. An advantage of this system is a simple and easy assembling of a single sensor, which takes over the tasks of up to four different sensors. The size of the device is always the same, regardless of the configuration chosen by the customer. Due to the closed design of the sensor core, significantly higher accuracies, than with cut iron cores, are achieved.

The design of the sensor can be adapted to the customer's request regarding the distance between the poles and the external dimensions.



TECHNICAL DATA

CURRENT SENSORS (LPCT-3x84)

Insulation Level	0,72 kV
Ratio Earth Fault Detection	60A (Alternatives on request)
Ratio Phase Current Sensor	300A (Alternatives on request)
Output Signal	225 mV according to IEC 61869-10/2018
Rated Short Time Thermal Current	25 kA / 1s
Rated Frequency	50 Hz / 60 Hz
Accuracy Class Phase Current	0,2 / 0,5 / 1 / 3 & 5P10
Accuracy Class Earth Fault Detection	Primary current: from 1 to 60 A / Phase displacement: ± 120 min.
	0,5 / 1
Integrable Sensor Options	3x phase & 2x phase + 1 earth fault & 2x phase + 1 earth fault
External Conditions	Operation: -25°C to +40°C or -40°C to +40°C *
	Storage: -40°C to +80°C (or on request)
Rated Burden (Standard)	≥ 20 k Ω
Standard	IEC 61869-10

* Alternatives on request



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