MEDIUM VOLTAGE PRODUCT

KEVCR 24 BA2

Indoor Combined Sensor

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01 Rogowski coil principle
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02 Capacitive divider principle

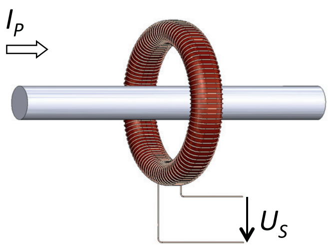
Sensor Parameters	Value
Rated primary current, I_{pr}	500 A
Rated primary voltage, U_{pn}	22/√3 kV
Highest voltage for equipment (U_m)	24 kV
Rated power frequency withstand voltage	50 kV
Rated lightning impulse withstand voltage	125 kV
Rated continuous thermal current, I_{cth}	2 000 A
Rated transformation ratio, K_{ra} for current measurement	500 A/0.150 V at 50 Hz 500 A/0.180 V at 60 Hz
Rated transformation ratio, K_n for voltage measurement	10 000 : 1
Current accuracy class	1/5P15
Voltage accuracy class	1/3P
Length of cable	3.2 m

Sensor Principles

Sensors offer an alternative way of making the current and voltage measurements needed for the protection and monitoring of medium voltage power systems. Sensors based on alternative principles have been introduced as successors to conventional instrument transformers in order to reduce size, increase safety, provide greater standardization and a wider functionality range. These well known principles can only be fully utilized in combination with versatile electronic relays.

Current Sensor

Current measurement in KEVCR sensors is based on the Rogowski coil principle. A Rogowski coil is a toroidal coil, without an iron core, placed around the primary conductor in the same way as the secondary winding in a current transformer. However, the output signal from a Rogowski coil is not a current, but a voltage:



$$u_s(t) = M \frac{di_p}{dt}$$

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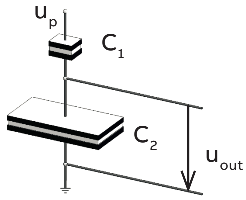
In all cases, a signal reproducing the actual primary current waveform is obtained by integration of the transmitted signal.

Voltage sensor

Voltage measurement in KEVCR sensors is based on the capacitive divider principle. The output voltage is directly proportional to the input voltage:

$$u_{out} = \frac{C_1}{C_1 + C_2} u_p$$



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In all cases, the transmitted signal reproduces the actual waveform of the primary.

Protection and Control IEDs (Intelligent Electronic Devices)

A protection and control IED incorporates the functions of a traditional relay, as well as new additional functions. The information transmitted from the sensors to the IED is, during fault conditions, more accurate than the corresponding secondary information from an instrument transformer, providing the possibility for a versatile relay functionality. However, the IED must be able to operate with sufficient accuracy at a sensor's low input signal level, and the signal from the Rogowski coil must be integrated. Modern IEDs are designed for sensor use, and they are also equipped with built-in integrators for Rogowski coil sensor inputs.

Modern digital apparatus (microprocessor based relays) enables protection and measurement functions to be realized within the same sensor with double the accuracy (e.g.: current sensing with combined accuracy class 1/5P as well as voltage sensing with combined accuracy class 1/3P).

Sensor Design

Combined sensor KEVCR based on Rogowski coil principle for current measurement and capacitive divider for voltage measurement with combination of ABB Relion technology for protection and controlling is well suitable for Air-insulated Switchgear.

Sensor Application

The sensor was designed primarily for use as an integrated solution with ABB circuit breakers. Please contact ABB to discuss alternative applications.

03 KEVCR 24 BA2 sensor on eVD4 circuit breaker with integrated RBX615 IED

04 Combined accuracy class

05 Example of a sensor label

03

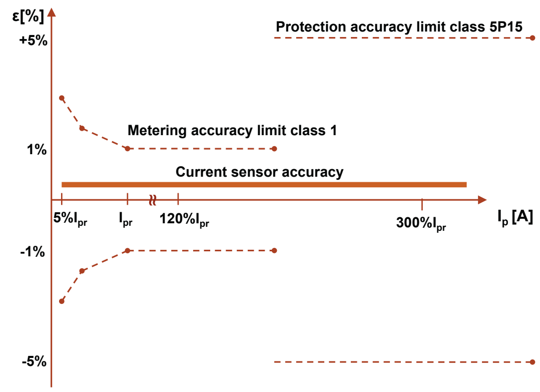
Differences between Sensor and Instrument Transformer

There are some noticeable differences between Sensors and conventional Instrument Transformers:

Linearity

Due to the absence of a ferromagnetic core the sensor has a linear response over a very wide primary current range, far exceeding the typical CT range. Measurement and protection is realized with one single secondary winding with double ratings. In addition, one single standard sensor can be used for a range of rated currents.
For this type of sensor, the variation of amplitude error at constant ambient temperature and the same application within a current range from 5% Ipr (25 A) up to 15 x Ipr (7500 A) is within the specified IEC limits.

Example: Rated current of 500 A, metering accuracy class 1 + protection accuracy 5P15. The accuracy limits are according to the graph bellow.



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Compactness

Since the sensing elements are particularly small, and the same elements are used for both measurement and protection, the current and voltage sensors can easily be combined in one device - the Combined Sensor, which is still smaller than the conventional Instrument Transformer, or they can be integrated into other equipment.

Rated Parameters

Because the sensors are highly linear within a very wide range of currents and voltages, the same single sensor can be used for the various rated currents and voltages associated with each specific application.

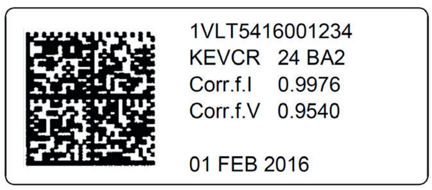
There is no need to specify other parameters such as burden, safety factor etc. since they are standard over the defined range. To achieve the correct function of the protection and control IED, the selected rated current, as well as the rated transformation ratio, must be programmed into it.

Correction Factors

The amplitude and phase error of a current and a voltage sensor is, in practice, constant and independent of the primary current and primary voltage. Hence, it can be corrected in the IED by using appropriate correction factors, stated separately for every sensor.

This sensor includes a built-in temperature sensor, providing additional temperature correction for voltage sensing that eliminates any drift in accuracy of the capacitive divider.

Values of the possible corrections are stored in the 2D barcode (for more information please refer to Instructions for installation, use and maintenance) and should be uploaded into the IED before the sensors are put into operation (please check available correction in IED manual).



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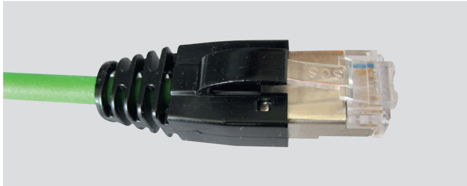
Secondary Cables

The sensor is equipped with a cable for connection with the IED. The cable termination can be realized by the cable connector RJ45. The sensor accuracy classes are verified up to the connector i.e. considering also its secondary cable. These cables are intended to be connected directly to the IED, and subsequently neither burden calculation nor secondary wiring is needed. Every sensor is therefore accuracy tested when equipped with its own cable and termination.

— 06 Connector RJ45



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Standards
Voltage sensors: IEC 60044-7 (1999-12)
Instrument transformers – Part 7: Electronic voltage transformers

Current sensors: IEC 60044-8 (2002-07)
Instrument transformers – Part 8: Electronic current transformers

Sensor name code
KEVCR 24 B A 2

Design number (2)

Sensor function: (A)
A = voltage and current sensors
C = current sensor

Use of sensors and current range: (B)
A: I_{cth} = 1 250 A
B: I_{cth} = 2 000 A

Highest voltage for equipment: (24)
Voltage rating: 24 kV

Cast resin insulated combisensor: (KEVCR)
KE = sensors
V = voltage
C = current
R = for use in circuit breakers

	KEVCR 24 BA2
Highest voltage for equipment and test voltages	
Highest voltage for equipment, U_m	24 kV
Rated power frequency withstand voltage	50 kV
Rated lighting impulse withstand voltage	125 kV
Power frequency voltage withstand test on secondary terminals	0.5 kV
Impulse voltage withstand test on secondary terminals	1 kV
Voltage sensor, rated values	
Rated primary voltage, U_{pn}	22/√3 kV
Maximum rated primary voltage, U_{pn} max	22/√3 kV
Rated frequency, f_n	50/60 Hz
Accuracy class	1/3P
Rated burden, R_{br}	≥ 4 MΩ
Rated transformation ratio, K_n	10 000:1
Rated voltage factor, k_u	1.9/8h
Current sensor, rated values	
Rated primary current, I_{pr}	500 A
Rated secondary output, U_{sr}	150 mV at 50 Hz 180 mV at 60 Hz
Rated continuous thermal current, I_{cth}	2 000 A
Rated short-time thermal current, I_{th}	40 kA/3s
Rated dynamic current, I_{dyn}	100 kA
Rated frequency, f_r	50/60 Hz
Accuracy class	1/5P15
Rated burden, R_{br}	≥ 4 MΩ
Rated transformation ratio, K_{ra}	500 A/0.150 V at 50 Hz 500 A/0.180 V at 60 Hz

Tab. 1: Sensor parameters

Temperature category:
- Operation: -5°C/+40°C
- Transport and storage: -40°C/+70°C

Cable:
- Length: 3.2 m
- Connector: RJ45

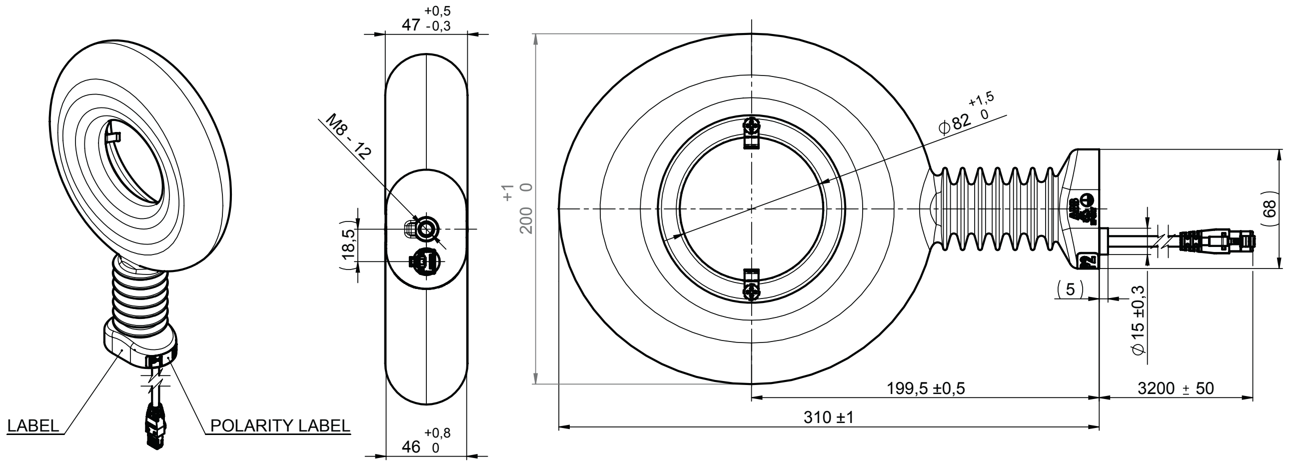
Dimensions and weight
- outline drawing number KEVCR 24 BA2: 1VL53000710R0101
- Weight: 2.4 kg

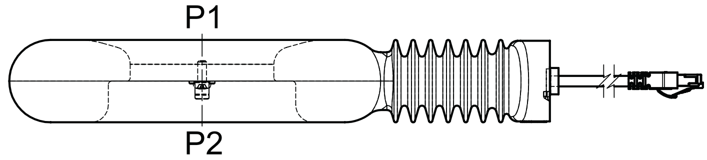
Ordering data
- KEVCR 24 BA2: 1VL5400055V0102

Dimensional Drawing

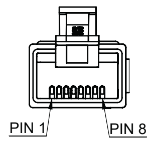
KEVCR 24 BA2

Outline drawing number: 1VL53000710R0101
Weight: 2.4 kg
Cable length: 3.2 m





CONNECTOR RJ45 PIN ASSIGNMENT TO USED WIRES:



ROGOWSKI SENSOR:
PIN 4 - COIL START - S1
PIN 5 - COIL END - S2

VOLTAGE SENSOR:
PIN 7 - CAP. ELECTRODE - a
PIN 8 - GROUND - n

RJ45 CONNECTOR - FRONT VIEW

CONTACT US

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1VLC000741 Rev.-, en 2024.03.25