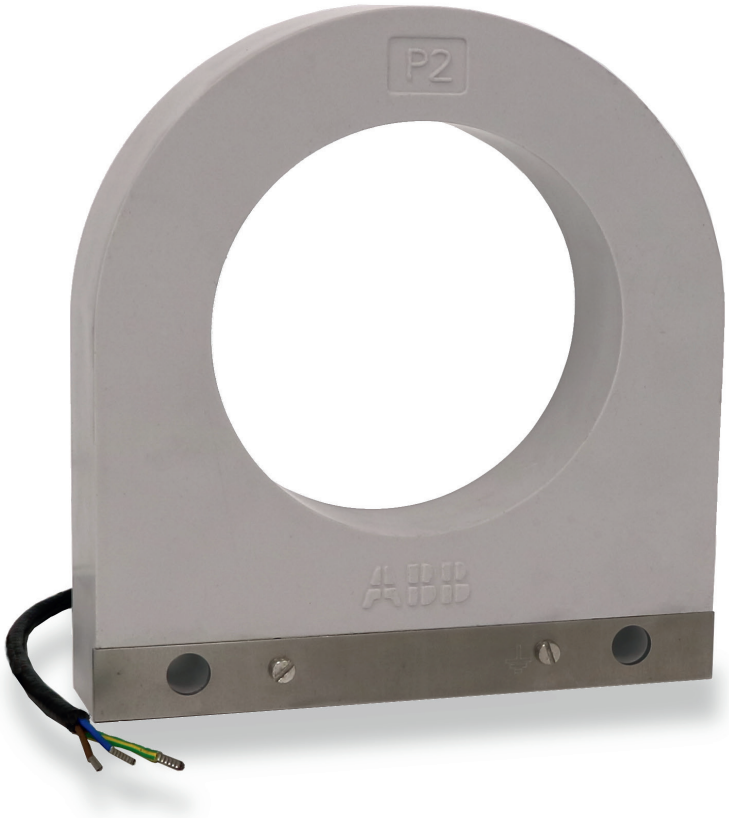
MEDIUM VOLTAGE PRODUCT

# KECA 80 O135

## Outdoor current sensors



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01 Sensor characteristics

| Parameters for Application | Value |
|---|---|
| Rated primary current of application | up to 4 000 |

| Sensor Parameters | Value |
|---|---|
| Highest voltage for equipment, $U_m$ | 0.72 kV |
| Rated primary current, $I_{pr}$ | 80 A |
| Rated continuous thermal current, $I_{cth}$ | 4 000 A |
| Rated transformation ratio, $K_{ra}/K_r$ | 80 A/<br>150 mV at 50 Hz<br>180 mV at 60 Hz |
| Accuracy class:<br>- IEC 61869-10 | <br>0.5/5P630-A2 |
| Length of cable | 0.4 m |
| Degree of protection provided by enclosures: | IP 66 / IP 68 |
| Degree of protection against external mechanical impacts: | IK07 |

## Sensor principles

The current sensors (low-power passive current transformers according to IEC 61869-10 standards) type KECA 80 O135 offers an alternative way of making the current 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 significantly reduce size, increase safety, and to provide greater rating standardization and a wider functionality range. These well known principles can only be fully utilized in combination with versatile electronic relays.

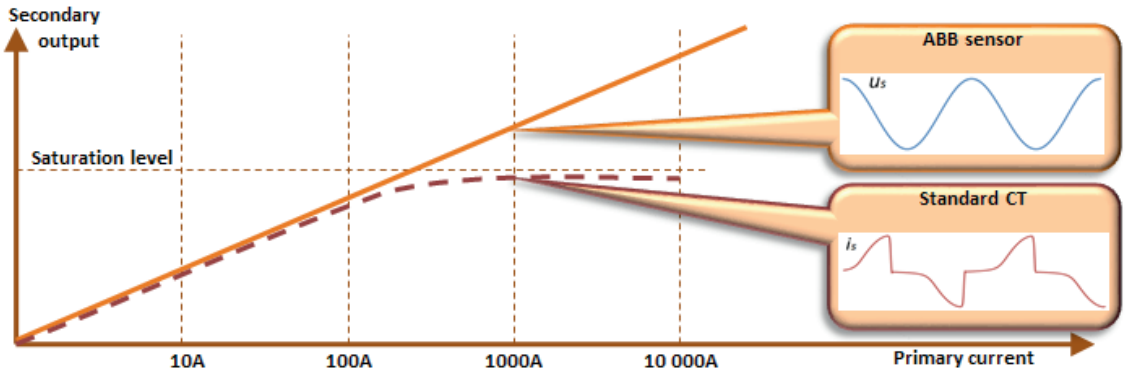
## Sensor characteristics

Construction of ABB's current sensors is done without the use of a ferromagnetic core. This fact results in several important benefits for the user and the application. The main benefit is that the behavior of the sensor is not influenced by non-linearity and width of hysteresis curve, which results in a highly accurate and linear response over a wide dynamic range of measured quantities.

A linear and highly accurate sensor characteristic in the full operating range enables the combination of metering and protection classes in one winding. With KECA 80 O135 sensor measuring **class 0.5** is reached for continuous current measurement in the extended accuracy range from 5% of the rated primary current $I_{pr}$ **not only up to 120% of $I_{pr}$** (as being common for conventional current transformers), **but even up to the rated continuous thermal current $I_{cth}$**. For dynamic current measurement (protection purposes) the ABB sensor KECA 80 O135 fulfils requirements of protection class **5P up to an impressive value reaching 50 kA**. That provides the possibility to designate the corresponding accuracy class as **0.5/5P630-A2 (IEC 61869-10)** , proving excellent linearity and accuracy measurements.

## Current sensor

Current measurement in KECA 80 O135 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 (see fig. 02).

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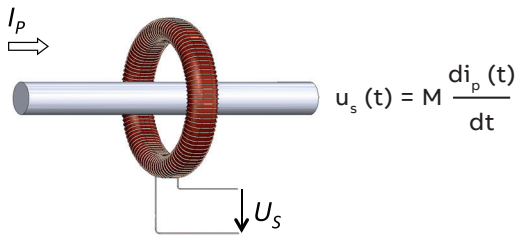
02 Rogowski coil principle

03 IED and sensor




02

In all cases, a signal that represents the actual primary current waveform is easily obtained by integrating the transmitted output signal.

**Protection and control IEDs (Intelligent Electronic Devices)**
Protection and control IEDs incorporate the functions of a traditional relay, as well as allow new additional functions. The information transmitted from the sensors to the IED is very accurate, providing the possibility of 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 (such as ABB's 615 series relays) are designed for such sensor use, and they are also equipped with built-in integrators for Rogowski coil sensor inputs. Modern digital apparatuses (microprocessor based relays) allow protection and measurement functions to be combined. They fully support current sensing realized by the single sensor with double the accuracy class designation, e.g.: current sensing with combined accuracy class 0.5/5P630-A2 (IEC 61869-10).

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**Sensor applications**
The current sensor type KECA 80 O135 is intended for use on the SF6-insulated pole mounted switch disconnector type SECTOS. For use in other application please contact ABB.

**Differences between Sensors and Instrument Transformers**
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. Thus, current sensing for both measurement and protection purposes could be realized with single secondary winding with a double rating. In addition, one standard sensor can be used for a broad range of rated currents and is also capable of precisely transferring signals containing frequencies different from rated ones.

For this type of sensor, the variation of amplitude and phase error or composite error in a current range from 5 % of rated primary current $I_{pr}$ up to 50 kA is within the limits specified by IEC 61869-10.

**Example of current measurement range with rated current 80 A and accuracy class 0.5/5P630-A2 (IEC 61869-10):**
Metering accuracy class 0.5 is, according to the IEC 61869-10 standards, guaranteed from 5% of $I_{pr}$ up to $K_{pcr} \times I_{pr}$ where $K_{pcr}$ is rated extended primary current factor and $I_{pr}$ is rated primary current. Factor $K_{pcr}$ is in the case of conventional CTs usually just 1.2, but in the case of the KECA 80 O135 sensors the $K_{pcr}$ factor is several times higher and equals 50 for KECA 80 O135.

Protection accuracy class 5P630-A2 is guaranteed, for the advanced KECA 80 O135 sensor, from the current equal to $K_{pcr} \times I_{pr}$ up to the current corresponding to $K_{alf} \times I_{pr}$ value, where $K_{alf}$ is, according to IEC 61869-10, the accuracy limit factor.

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04 Combined accuracy class

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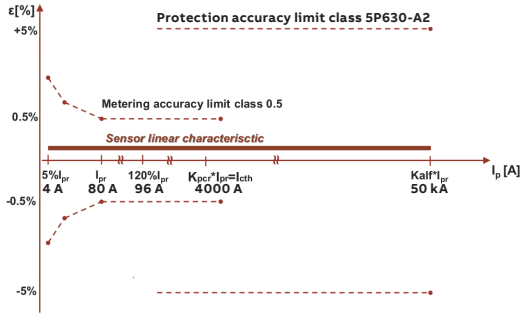
05 Example of sensor label (IEC 61869-10)

For this type of sensors the value of $K_{pcr}$ x $I_{pr}$ is equal to the rated continuous thermal current $I_{cth}$ (4 000 A) and the value of $K_{alf}$ x $I_{pr}$ is equal to 50 kA.

The accuracy limits are described on the graph below.

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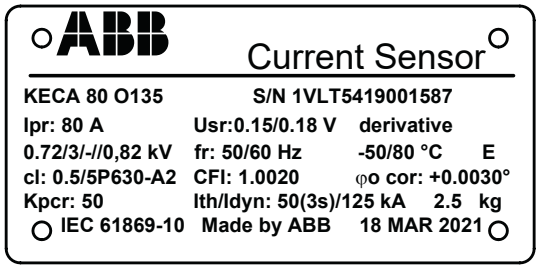
**Compactness**
Since the sensing elements are particularly small, the same elements are used for both measurement and protection, and the secondary cables are offered with different lengths, the current sensors can be easily integrated on other equipment at different heights and in different environments. These facts enable the design of sensors in a very universal way which contributes for placing sensors outside the switchgear or apparatus on the less accessible places on the mast or in the cable duct.

**Rated parameters**
Because the sensors are highly linear within a very wide range of currents, the same single sensor can be used for the various rated currents associated with each specific application up to the specified maximum voltage for equipment. 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 properly set into the IED.

**Energy savings concept**
As there is no iron core, no necessity for high burden values and thus a possibility for low current losses and only one secondary winding needed, KECA 80 O135 sensor exhibits extremely low energy consumption that is just a fraction of that transferred to heat in conventional CTs. This fact contributes to huge energy savings during its entire operating life, supporting the world-wide effort to reduce energy consumption.

**Correction factors**
The amplitude and phase error of a current sensor is, in practice, constant and independent of the primary current. Due to this fact it is an inherent and constant property of each sensor and it is not considered as unpredictable and influenced error. Hence, it can be easily corrected in the IED by using appropriate correction factors, stated separately for every sensor. Values of the correction factors for the amplitude and phase error of a current sensor are mentioned on the sensor label (for more information please refer to Instructions for installation, use and maintenance) and should be uploaded without any modification into the IED before the sensors are put into operation (please check available correction in the IED manual). To achieve required accuracy classes it is recommended to use all correction factors: amplitude correction factor (al/CFl) and phase error correction factor (pl/$\varphi_{0\,cor}$) of a current sensor.

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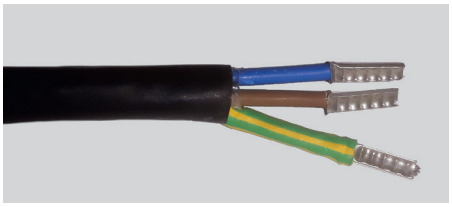
**Secondary cables**
The secondary cable is a single shielded cable designed to give maximum EMI shielding. The secondary cable is inseparable part of each sensor and cannot be additionally extended, shortened, branched, modified, withdrawn or changed due to the guarantee of accuracy and performance of the sensor.

Terminals are as cable wires with ferrules. Connection is in the junction box. The junction boxes are provided with PG16 cable glands. The degree of protection provided by enclosures of the junction box is IP 66.

06 Ferrules termination



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Sensor accuracy classes are verified up to the connection to the IED, i.e. also considering its secondary cable together with an additional connecting cable.

The additional connecting cable, the junction box and the RJ45-type connectors are not parts of the sensor delivery but are parts of the load break switch delivery.

These cables are intended for indirect connection to the IED by connection via the junction box and without the need for subsequent load calculation. Each sensor is therefore tested for accuracy with its own cable and with PAAR-TRONIC-CY-CY black UV 7x2x0.25 18048020 connecting cable. Another connection cable can be used in agreement with the sensor manufacturer.

**Standards**

- IEC 61869-10 (2017-12) Instrument transformers Part 10: Additional requirements for low-power passive current transformers

**Highest voltage for equipment and test voltages**

- Highest voltage for equipment, $U_m$: 0.72 kV
- Power frequency voltage withstand test on primary terminals: 3 kV

**Insulation requirements for secondary terminals according to IEC 61869-10**

- Power frequency voltage withstand capability: 0.82 kV
- Impulse voltage withstand capability: 1.5 kV 1.2/50 µs

**Current sensor, rated values**

- Rated primary current, $I_{pr}$: 80 A
- Rated transformation ratio, $K_{ra}/K_r$: 80 A/0.150 V at 50 Hz, 80 A/0.180 V at 60 Hz
- Rated secondary output, $U_{sr}$: 3 mV/Hz, i.e. 150 mV at 50 Hz or 180 mV at 60 Hz
- Rated continuous thermal current, $I_{cth}$: 4 000 A
- Rated short-time thermal current, $I_{th}$: 50 kA/3s
- Rated dynamic current, $I_{dyn}$: 125 kA
- Rated frequency, $f_r$: 50/60 Hz
- Rated extended primary current factor, $K_{pcr}$: 50
- Accuracy limit factor, $K_{alf}$: 630
- Accuracy class:
  - IEC 61869-10: 0.5/5P630-A2
- Rated burden, $R_{br}$:
  - IEC 61869-10: 2 MΩ; 50 pF

**Temperature category**

- Operation: -50°C/+80°C
- Transport and storage: -50°C/+80°C

**Cable**

- Length: 0.4 m
- Connector: ferrules

**Degree of protection**

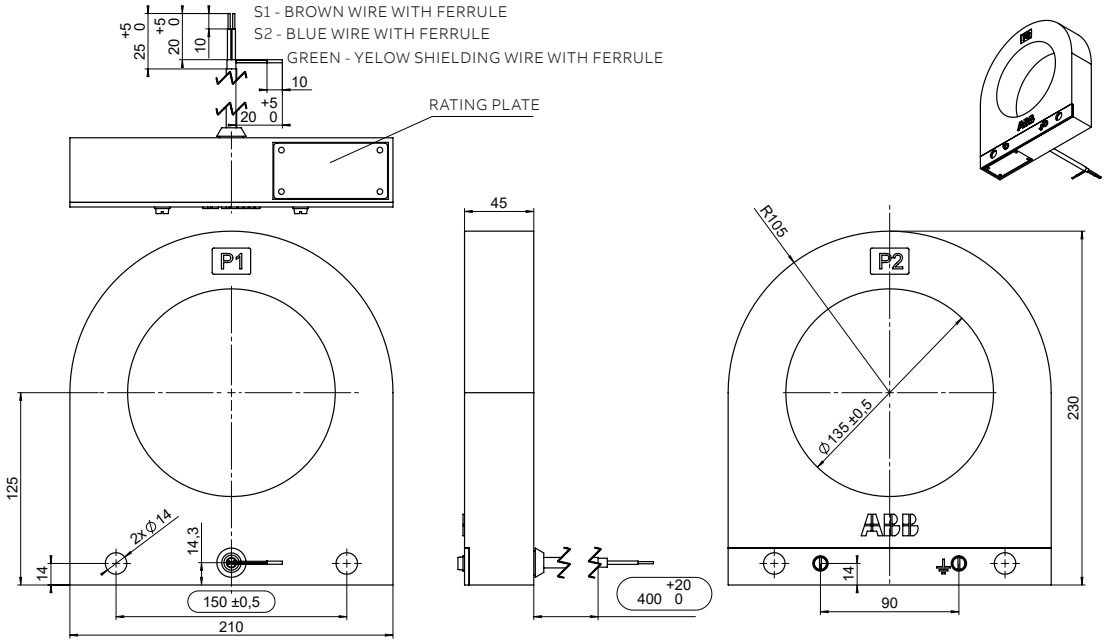
- Provided by enclosures according to IEC 60529: IP 66 / IP 68
- Against external mechanical impacts according to IEC 62262: IK07

| Type | Sensor ordering data |
|---|---|
| | IEC 61869-10 |
| KECA 80 O135 | 1VL5400089V1101 |

# Dimensional Drawing

## KECA 80 O135

Outline drawing numbers:
2RKA026158A0001
Weight: 2.5 kg



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