MEDIUM VOLTAGE PRODUCT

KECA 80 C184; KECA 80 C216
Indoor current sensor
### Parameters for Application

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated primary current of application</td>
<td>up to 4 000/3 150 A</td>
</tr>
</tbody>
</table>

### Sensor Parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Highest voltage for equipment, ( U_m )</td>
<td>0.72 kV</td>
</tr>
<tr>
<td>Rated primary current, ( I_{pr} )</td>
<td>80 A</td>
</tr>
<tr>
<td>Rated continuous thermal current, ( I_{cth} )</td>
<td>4 000 A for KECA 80 C184, 3 150 A for KECA 80 C216</td>
</tr>
<tr>
<td>Rated transformation ratio, ( K_r )</td>
<td>80 A/150 mV at 50 Hz, 180 mV at 60 Hz</td>
</tr>
</tbody>
</table>

### Accuracy class:

- IEC 60044-8: 0.5/5P400
- IEC 61869-10: 0.5/5P400-A2

| Length of cable | 5 m |

### Sensor characteristics

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 Cxxx sensors 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 sensors KECA 80 Cxxx fulfill requirements of protection class **5P up to an impressive value reaching 31.5 kA**. That provides the possibility to designate the corresponding accuracy class as 0.5/5P400 (IEC 60044-8) or 0.5/5P400-A2 (IEC 61869-10), proving excellent linearity and accuracy measurements.

### Current sensor

Current measurement in KECA 80 Cxxx 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).
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 0.5/5P400 (IEC 60044-8) or 0.5/5P400-A2 (IEC 61869-10).

**Example of current measurement range with rated current 80 A and accuracy class 0.5/5P400 (IEC 60044-8) or 0.5/5P400-A2 (IEC 61869-10):**

Metering accuracy class 0.5 is, according to the IEC 60044-8 and 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 \( K_{pcr} \) in the case of conventional CTs usually just 1.2, but in the case of the KECA 80 Cxxx sensors the \( K_{pcr} \) factor is several times higher and equals 50 for KECA 80 C184 and 39.375 for KECA 80 C216.

Protection accuracy class 5P400 or 5P400-A2 is guaranteed, for the advanced KECA 80 Cxxx sensors, from the current equal to \( K_{pr} \times I_{pr} \) up to the current corresponding to \( K_{all} \times I_{pr} \) value, where \( K_{all} \) is, according to IEC 60044-8 and IEC 61869-10, the accuracy limit factor.

**Sensor applications**

The current sensors type KECA 80 Cxxx are intended for use in current measurement in medium voltage air insulated switchgear type UniGear ZS1 24 kV.
For this type of sensors the value of $K_{pcr} \times I_{pr}$ is equal to the rated continuous thermal current $I_{cth}$ (4 000 or 3 150 A) and the value of $K_{alf} \times I_{pr}$ is equal to 31.5 kA.

The accuracy limits are described on the graph below.

Compactness
Since the sensing elements are particularly small, and the same elements are used for both measurement and protection, the current sensors can be easily integrated into the switchgear. These facts enable the design of sensors in a very optimal way which contributes to high level of switchgear simplification.

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 Cxxx sensors exhibit 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 ($aI/CFl$) and phase error correction factor ($\phi I/\phi_{cor}$) of a current sensor.

Secondary cables
The sensor is equipped with a cable for connection with the IED. The cable connector is type R345. The sensor accuracy classes are verified up to the R345 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 connector.

Connector adapters
To provide connectivity between a sensor with a RJ45 cable connector and IEDs with Twin-BNC connectors a group of adapters were designed. To provide connectivity between current and voltage sensors with RJ45 cable connectors and IEDs the coupling adapter was designed. The use of connector or coupling adapters has no influence on the current and/or voltage signal and accuracy of the sensor with the cable.

For more information about connector adapters and coupling adapter refer to Doc. No. 1VL0000710 - Sensor accessories.

Standards
- IEC 60044-8 (2002-07) Instrument transformers Part 8: Electronic current transformers
- IEC 61869-10 (2017-12) Instrument transformers Part 10: Additional requirements for low-power passive current transformers

Certifications
KECA 80 C184 - UL certified
(UL file number E501098)

Highest voltage for equipment and test voltages
- Highest voltage for equipment, \( U_{n} \): 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, \( I_{p} \): 80 A
- Rated transformation ratio, \( K_{r} \): 80 A/0.150 V at 50 Hz
  80 A/0.180 V at 60 Hz
- Rated secondary output, \( U_{s} \): 3 mV/Hz
  i.e. 150 mV at 50 Hz
  or 180 mV at 60 Hz
- Rated continuous thermal current, \( I_{ct} \): 4 000 A for KECA 80 C184
  3 150 A for KECA 80 C216
- Rated short-time thermal current, \( I_{th} \): 85 kA/3s for KECA 80 C184
  31.5 kA/4s for KECA 80 C216
- Rated dynamic current, \( I_{dyn} \): 230 kA for KECA 80 C184
  100 kA for KECA 80 C216
- Rated frequency, \( f \): 50/60 Hz
- Rated extended primary current factor, \( K_{pcr} \): 50 for KECA 80 C184
  39.375 for KECA 80 C216
- Accuracy limit factor, \( K_{al} \): 400
- Accuracy class:
  - IEC 60044-8: 0.5/5P400
  - IEC 61869-10: 0.5/5P400-A2
- Rated burden, \( R_{br} \):
  - IEC 60044-8: 10 MΩ
  - IEC 61869-10: 2 MΩ; 50 pF

Temperature category
- Operation: -25°C/+80°C
- Transport and storage: -40°C/+80°C

Cable
- Length: 5 m
- Connector: RJ45 (CAT-6)

Optional accessory KECA 80 C184
- Clamping system: 2RKA024750A0001

<table>
<thead>
<tr>
<th>Type</th>
<th>Sensor ordering data</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>IEC 60044-8</td>
</tr>
<tr>
<td>KECA 80 C184</td>
<td>1VL5400072V0101</td>
</tr>
<tr>
<td>KECA 80 C216</td>
<td>1VL5400073V0101</td>
</tr>
</tbody>
</table>
Dimensional Drawings

KECA 80 C184

Outline drawing number: 2RKA017253A0001
Weight: 0.65 kg

3D VIEW

CONNECTOR RJ45 CAT6
IEC 60044-8

PIN 1
PIN 8

PIN 4 - COIL START (S1)
PIN 5 - COIL END (S2)

CONNECTOR RJ45 CAT6
IEC 61869-10

PIN 1
PIN 8

PIN 1 - COIL START (S1)
PIN 2 - COIL END (S2)
KECA 80 C216

Outline drawing number: 2RKA017322A0001
Weight: 0.95 kg

CABLE LENGTH 5m

4x Ø 6,3 (TOP)

CONNECTOR RJ45 CAT6
IEC 60044-8

A 2 : 1

PIN 1
PIN 8

PIN 4 - COIL START (S1)
PIN 5 - COIL END (S2)

CONNECTOR RJ45 CAT6
IEC 61869-10

A 2 : 1

PIN 1
PIN 8

PIN 1 - COIL START (S1)
PIN 2 - COIL END (S2)
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