MEDIUM VOLTAGE PRODUCTS

KEVA C
Indoor voltage sensors for Cellpack separable connectors
KEVA C INDOOR VOLTAGE SENSORS FOR CELLPACK SEPARABLE CONNECTORS

Parameters for Application
<table>
<thead>
<tr>
<th>Value</th>
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<tbody>
<tr>
<td>Rated primary voltage of application</td>
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</tbody>
</table>

Sensor Parameters
<table>
<thead>
<tr>
<th>Value</th>
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</thead>
<tbody>
<tr>
<td>Rated primary voltage, $U_{pn}$</td>
</tr>
<tr>
<td>Highest voltage for equipment, $U_m$</td>
</tr>
<tr>
<td>Rated power frequency withstand voltage</td>
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<tr>
<td>Rated lightning impulse withstand voltage</td>
</tr>
<tr>
<td>Rated transformation ratio, $K_n$ for voltage measurement</td>
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<tr>
<td>Voltage accuracy class</td>
</tr>
<tr>
<td>Length of cable</td>
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</table>

Sensor principles
Electronic Instrument Transformers (Sensors) offer an alternative way of making the voltage measurement 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 voltage 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 device.

Voltage sensor
Voltage measurement in KEVA C sensors is based on the resistive divider principle. The output voltage is directly proportional to the input voltage:

$$U_s = \frac{R_2}{R_1 + R_2} U_p$$

In all cases, the transmitted output signal reproduces the actual waveform of the primary voltage 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. Modern IEDs (such as ABB’s 615 series relays) are designed for such sensor use.

Modern digital apparatuses (microprocessor based relays) allow protection and measurement functions to be combined. They fully support voltage sensing realized by the single sensor with double the accuracy class designation (e.g.: voltage sensing with combined accuracy class 0.5/3P).
### Sensor variants

<table>
<thead>
<tr>
<th>Sensor type designation</th>
<th>Metal coated (conductive surface)</th>
<th>Picture</th>
</tr>
</thead>
<tbody>
<tr>
<td>KEVA 24 C10</td>
<td></td>
<td><img src="image1" alt="KEVA 24 C10" /></td>
</tr>
<tr>
<td>KEVA 24 C25</td>
<td></td>
<td><img src="image2" alt="KEVA 24 C25" /></td>
</tr>
<tr>
<td>KEVA 24 C10c</td>
<td>X</td>
<td><img src="image3" alt="KEVA 24 C10c" /></td>
</tr>
<tr>
<td>KEVA 24 C25c</td>
<td>✓</td>
<td><img src="image4" alt="KEVA 24 C25c" /></td>
</tr>
</tbody>
</table>

Tab. 1. Sensor design variants (with and without conductive surface)

### 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 voltage range.

Example of voltage measurement range for metering accuracy class 0.5 and protection accuracy class 3P:

The accuracy limits are described on the graph below.

#### Rated parameters

Because the sensors are highly linear within a very wide range of voltages, the same single sensor can be used for the various rated voltages associated with each specific application up to the specified maximum voltage for equipment. There is no need to specify other parameters such as burden etc. since they are standard over the defined range. To achieve the correct function of the protection and control IED, the selected rated voltage as well as the rated transformation ratio, must be properly set into the IED.

#### Correction factors

The amplitude and phase error of a voltage sensor is, in practice, constant and independent of the primary voltage. 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.

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Values of the correction factors for the amplitude and phase error of a voltage 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 both correction factors (Cfs): amplitude correction factor ($a_U$) and phase error correction factor ($p_U$) of a voltage sensor.

**Secondary cables**

The sensor is equipped with a cable for connection with the IED. The cable connector is type RJ-45. 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 connector.

**Connector adapters**

To provide connectivity between a sensor with a RJ-45 cable connector and IEDs with Twin-BNC connectors a group of adapters were designed. To provide connectivity between current and voltage sensors with RJ-45 cable connectors and IEDs with RJ-45 connector 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. 1VLC000710 - Sensor accessories.

**Standards**

- IEC 60044-7 (1999-12) Instrument transformers - Part 7: Electronic voltage transformers
- HD 629.1 S2 (02/2006) + A1 (09/2008) Table 10, test requirements

**Highest voltage for equipment and test voltages**

- Highest voltage for equipment, $U_m$: 24 kV
- Rated power frequency test voltage: 50 kV
- Rated lightning impulse test voltage: 125 kV

**Voltage sensor, rated values**

- Rated primary voltage, $U_{pn}$: 22/√3 kV
- Rated frequency, $f_r$: 50/60 Hz
- Accuracy class: 0.5/3P
- Rated burden, $R_{br}$: 10 MΩ
- Rated transformation ratio, $K_n$: 10 000:1
- Rated voltage factor, $k_u$: 1.9/8h

**Temperature category**

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

**Cable**

- Length: 2.2; 5 m
- Connector: RJ-45 (CAT-6)
- Grounding wire length: 0.5 m
<table>
<thead>
<tr>
<th>Sensor type</th>
<th>Manufacturer</th>
<th>Supported type of cable connector</th>
<th>Sensor ordering data</th>
</tr>
</thead>
<tbody>
<tr>
<td>KEVA 24 C10</td>
<td></td>
<td>Cellpack</td>
<td>1VL5400061V0101 (2.2 m)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>CTS-S 630A 24kV</td>
<td>1VL5400061V0103 (5 m)</td>
</tr>
<tr>
<td>KEVA 24 C10c</td>
<td></td>
<td></td>
<td>1VL5400061V0201 (2.2 m)</td>
</tr>
<tr>
<td>KEVA 24 C25</td>
<td></td>
<td>Cellpack</td>
<td>1VL5400079V0101 (2.2 m)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>CTS 630A 24kV</td>
<td>1VL5400079V0103 (5 m)</td>
</tr>
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<td>KEVA 24 C25c</td>
<td></td>
<td></td>
<td>1VL5400079V0201 (2.2 m)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>1VL5400079V0203 (5 m)</td>
</tr>
</tbody>
</table>

Tab. 3. Sensor overview.

**Note:** For use in alternative cable connectors please contact ABB.
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Dimensional Drawings

KEVA 24 C10 and KEVA 24 C10c

Outline drawing number: 2RKA015654
Weight: 0.85 kg
KEVA 24 C25 and KEVA 24 C25c

Outline drawing number: 2RKA019522
Weight: 0.85 kg

Connection interface is by cellpack

Connector end

Rating plate tightening hexagon 24

Grounding wire length 0.5m, eye M8

Secondary cable several lengths with or without conductive layer

Connector RJ45 CAT6