KEVA B
Indoor voltage sensor

Parameters for Application
<table>
<thead>
<tr>
<th>Parameter</th>
<th>Unit</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated primary voltage of application</td>
<td>kV</td>
<td>up to 24</td>
</tr>
</tbody>
</table>

Sensor Parameters
<table>
<thead>
<tr>
<th>Parameter</th>
<th>Unit</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated primary voltage, $U_{lm}$</td>
<td>kV</td>
<td>15/√3, 22/√3</td>
</tr>
<tr>
<td>Highest voltage for equipment, $U_{m}$</td>
<td>kV</td>
<td>17.5, 24</td>
</tr>
<tr>
<td>Rated power frequency withstand voltage</td>
<td>kV</td>
<td>38, 50</td>
</tr>
<tr>
<td>Rated lightning impulse withstand voltage</td>
<td>kV</td>
<td>95, 125</td>
</tr>
<tr>
<td>Rated transformation ratio, $K_n$ for voltage measurement</td>
<td>-</td>
<td>10 000:1</td>
</tr>
<tr>
<td>Voltage accuracy class</td>
<td>-</td>
<td>0.5/3P</td>
</tr>
<tr>
<td>Length of cable</td>
<td>m</td>
<td>5.5</td>
</tr>
</tbody>
</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 B 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 applications
The voltage sensor type KEVA B is intended for use in voltage measurement in air insulated medium voltage switchgear. The voltage sensor KEVA B has been designed to be used as a post insulator but can be used as a stand-alone unit as well.

Application of voltage sensor as a post insulator in air insulated medium voltage switchgear UniGear ZS1.

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.

![Voltage sensor](image_url)

![Sensor applications](image_url)

![Differences between Sensors and Instrument Transformers](image_url)

![Example of voltage measurement range](image_url)
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.

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 (aU) and phase error correction factor (pU) of a voltage sensor.

Example of a sensor label

Connector RJ-45
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
Voltage sensors:
IEC 60044-7 (1999-12)
Instrument transformers –
Part 7: Electronic voltage transformers

Highest voltage for equipment and test voltages

<table>
<thead>
<tr>
<th>Type</th>
<th>Highest voltage for equipment $U_{m}$ (kV)</th>
<th>Rated power frequency test voltage (kV)</th>
<th>Rated lightning impulse test voltage (kV)</th>
</tr>
</thead>
<tbody>
<tr>
<td>KEVA 17.5 B</td>
<td>17.5</td>
<td>38 (42)</td>
<td>95</td>
</tr>
<tr>
<td>KEVA 24 B</td>
<td>24</td>
<td>50</td>
<td>125</td>
</tr>
</tbody>
</table>

Note: For KEVA 17.5 B, the extended rated power frequency test voltage 42kV could be selected.

Voltage sensor, rated values

<table>
<thead>
<tr>
<th>Type</th>
<th>Rated primary voltage $U_{pn}$ (kV)</th>
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<tbody>
<tr>
<td>KEVA 17.5 B</td>
<td>15/√3</td>
</tr>
<tr>
<td>KEVA 24 B</td>
<td>22/√3</td>
</tr>
</tbody>
</table>

• 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: -5°C / + 40°C
• Transport and storage: -40°C / + 80°C

Cable
• Length: 5.5 m
• Connector: RJ-45 (CAT-6)

Ordering data
• KEVA 17.5 B20 1VL5400060V0101
• KEVA 17.5 B21 1VL5400060V0102
• KEVA 24 B20 1VL5400071V0101
• KEVA 24 B21 1VL5400071V0102
Dimensions and weight

KEVA 17.5 B20

- Outline drawing number: 2RKA015214A0001
- Weight: 1.96 kg

[Diagram of KEVA 17.5 B20]

SIZE OF SOCKET FOR RATING PLATE: 70mm x 23mm

CABLE LENGTH 5.5m

CONNECTOR RJ 45 CAT6
KEVA 17.5 B21

- Outline drawing number: 2RKA015214A0002
- Weight: 1.96 kg
KEVA 24 B20

- Outline drawing number: 2RKA017572A0001
- Weight: 2.52 kg
KEVA 24 B21

- Outline drawing number: 2PKA017556A0001
- Weight: 2.52 kg