

MEDIUM VOLTAGE PRODUCT

# KEVA B

Indoor voltage sensor



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01 Resistive divider  
principle

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02 IED and sensor

Parameters for Application	Value
Rated primary voltage of application	up to 48 kV
Sensor Parameters	Value
Rated primary voltage, $U_{pn}/U_{pr}$	15/√3 kV 22/√3 kV 33/√3 kV 34.5/√3 kV 45/√3 kV
Highest voltage for equipment, $U_m$	17.5 kV 24 kV 36 kV 38 kV 48 kV
Rated power frequency withstand voltage	38 (42) kV 50 kV 70 kV 80 kV 95 kV
Rated lightning impulse withstand voltage	95 kV 125 kV 170 kV 180 kV 200 kV
Rated transformation ratio, $K_n/K_r$ for voltage measurement	10 000:1
Voltage accuracy class	0.5/3P
Length of cable	5.5 m

### Sensor principles

Voltage sensors (Electronic voltage transformers according to IEC 60044-7 and low-power passive voltage transformers according to IEC 61869-11 standards) type KEVA B 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.

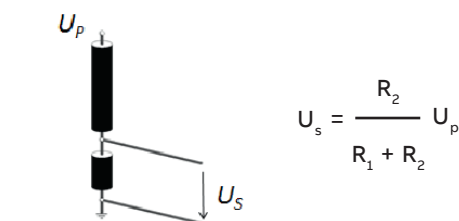
The main benefit is that the behavior of the sensor is not influenced by non-linearity and width of hysteresis curve, which results in a highly accurate and linear response over a wide dynamic range of measured quantities. A linear and highly accurate sensor characteristic in the full operat-

ing 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:



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### 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).



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Voltage sensors KEVA 36 B2x and KEVA 48 B2x are produced according to IEC 61869-11 standard and shall be used with IED complying with the same standard, i.e. input impedance of IED corresponds to the rated burden 2 MOhm / 50 pF. In case voltage sensors would be used with IED with different input impedance than defined by IEC 61869-11 standard (2 MOhm / 50 pF), impedance matching factor shall be used. For more information see the Manual 1VLM000812.

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

04 Combined accuracy class

05 Example of a sensor label (IEC 60044-7)

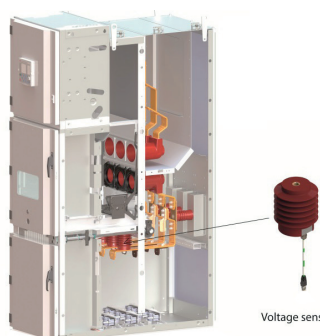
06 Example of a sensor label (IEC 60044-7 with UL certification)  
- Upper label - part of accessories, to be glued to Switchgear  
- Bottom label with UL logo - placed on sensor

07 Example of a sensor label (IEC 61869-11)

08 Example of a sensor label (IEC 61869-11)

### 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.



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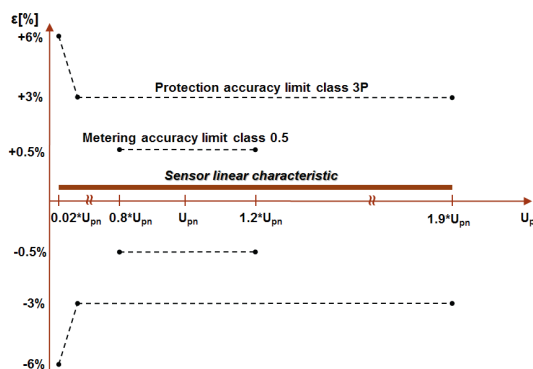
### Differences between Sensors and Instrument Transformers

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.



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#### 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.

#### ABB

#### Voltage Sensor

KEVA 24 B20 S/N 1VLT5413920000  
Upn: 22/√3 kV Kn: 10000/1 cl: 0.5/3P  
ku: 1.9/8h fr: 50/60 Hz  
Cfs.: aU: 0.9984 pU: -0.0400°  
IEC 60044-7 24/50/125 kV 2.52 kg  
Made by ABB E 16 MAY 2014



05

#### ABB

#### Voltage Sensor

KEVA 17.5 B21 Electronic voltage transformer  
Un: 15/√3 kV K: 10000/1 cl: 0.5/3P E  
Cfs: aU 0.6666 pU: 0.8888 2 kg  
fr: 50/60 Hz 17.5/38/95 kV 24 MAY 2019  
IEC 60044-7 Made by ABB S/N 1VLT5419001587



06

#### ABB

#### Voltage Sensor

KEVA 17.5 B21 Electronic voltage transformer  
Un: 15/√3 kV K: 10000/1 cl: 0.5/3P E  
Cfs: aU 0.6666 pU: 0.8888 2 kg  
fr: 50/60 Hz 17.5/38/95 kV 24 MAY 2019  
IEC 60044-7 Made by ABB S/N 1VLT5419001587



07

#### ABB

#### Voltage Sensor

KEVA 17.5 B20 S/N 1VLT5419001545  
Up: 15/√3 kV Kr: 10000/1 cl: 0.5/3P φor: 0°  
Fv: 1.9/8h fr: 50/60 Hz -5/40 °C E  
CFU: 0.9957 φo cor: +1.1717° 17.5/38/95/0.82 kV  
IEC 61869-11 Made by ABB 24 OCT 2018 2 kg



08

#### ABB

#### Voltage Sensor

KEVA 36 B20 S/N 1VLT5411001545  
Up: 33/√3 kV Kr: 10000/1 cl: 0.5/3P φor: 0°  
Fv: 1.9/8h fr: 50/60 Hz -5/55 °C E  
CFU: 0.6666 φo cor: 0.8888° 36/70/170/0.82 kV  
IEC 61869-11 7.1 kg  
Made by ABB 20 Jun 2018

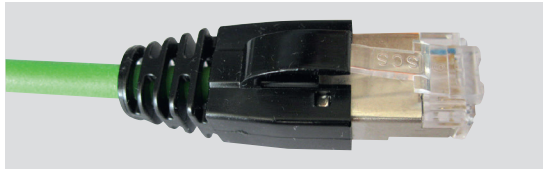


#### 09 Connector RJ45

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: amplitude correction factor ( $aU/CF_u$ ) and phase error correction factor ( $pU/\varphi_{0\text{cor}}$ ) of a voltage sensor.

#### Secondary cables

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



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#### 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 with RJ45 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
- IEC 61869-11 (2017-12) Instrument transformers Part 11: Additional requirements for low-power passive voltage transformers

#### Certifications

- KEVA 17.5 B21 - UL certified (UL file number E501098)



- KEVA 17.5 B2x and KEVA 24 B2x certified Level 2 aging test according to IEC 62271-304:2008

Type	Highest voltage for equipment $U_m$ (kV)	Rated power frequency test voltage (kV)	Rated lightning impulse test voltage (kV)
KEVA 17.5 B	17.5	38 (42)	95
KEVA 24 B	24	50	125
KEVA 36 B	36	70	170
KEVA 38 B	38	95	200
KEVA 48 B	48	80	180

Tab. 1. Highest voltage for equipment and test voltages

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

**Insulation requirements for secondary terminals according to IEC 61869-11**

- Power frequency voltage withstand capability: 0.82 kV
- Impulse voltage withstand capability: 1.5 kV 1.2/50  $\mu$ s

- Rated frequency,  $f_r$ : 50/60 Hz
- Accuracy class: 0.5/3P
- Rated burden,  $R_{br}$ :  
IEC 60044-7 10 M $\Omega$   
IEC 61869-11 2 M $\Omega$ ; 50 pF
- Rated transformation ratio,  $K_n/K_r$ : 10 000:1
- Rated voltage factor,  $k_u/F_v$ : 1.9/8h

**Voltage sensor, rated values**

Type	Rated primary voltage $U_{pn}/U_{pr}$ (kV)
KEVA 17.5 B	15/ $\sqrt{3}$
KEVA 24 B	22/ $\sqrt{3}$
KEVA 36 B	33/ $\sqrt{3}$
KEVA 38 B	34.5/ $\sqrt{3}$
KEVA 48 B	45/ $\sqrt{3}$

Tab. 2. Rated primary voltage

**Temperature category**

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

**Cable**

- Length: 5.5 m; 7 m; 9,9 m
- Connector: RJ45 (CAT-6)

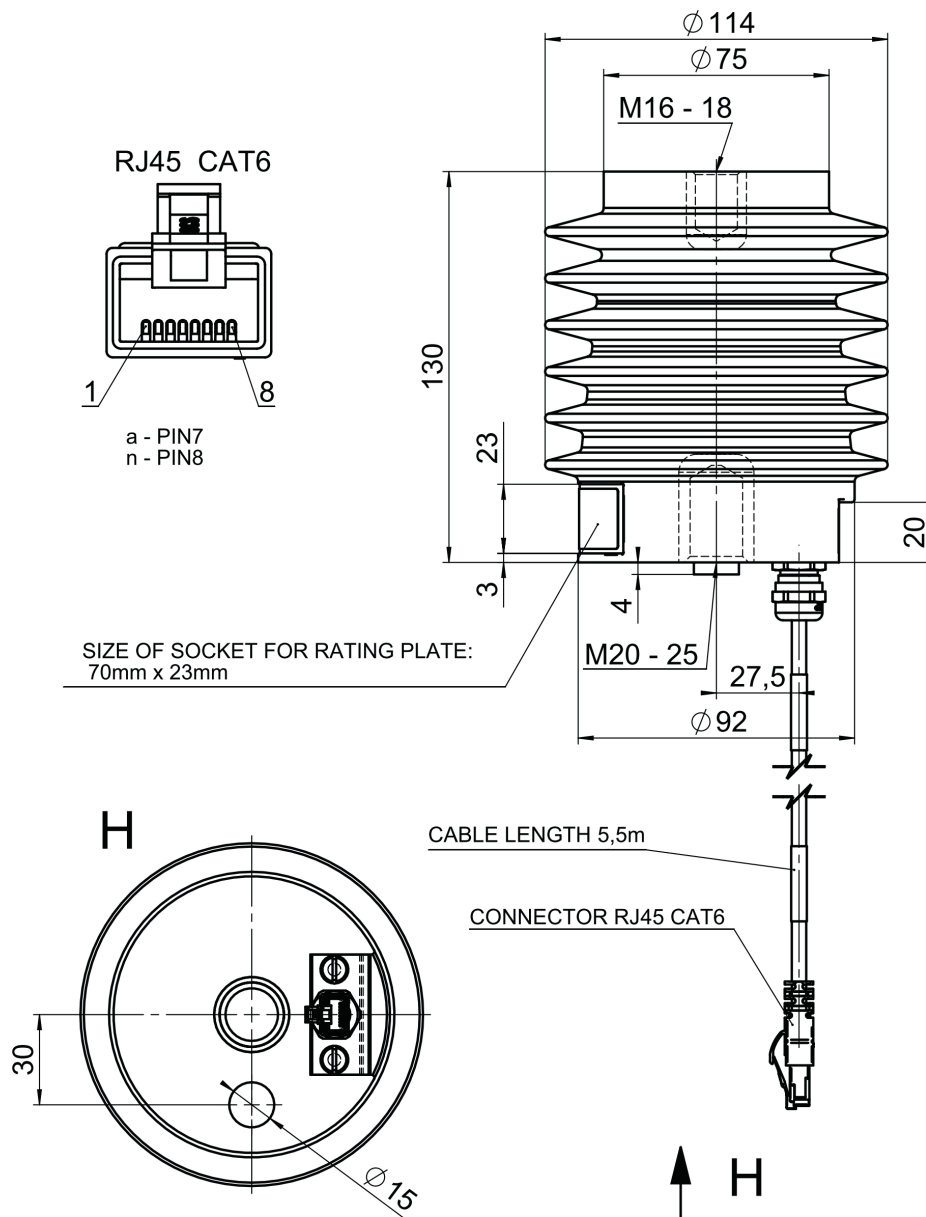
Type	Cable length	IEC 60044-7	IEC 60044-7 + UL certification	IEC 61869-11
KEVA 17.5 B20	5.5 m	1VL5400060V0101	-	1VL5400060V1101
KEVA 17.5 B21	5.5 m	1VL5400060V0102	1VL5400060V0302	1VL5400060V1102
KEVA 24 B20	5.5 m	1VL5400071V0101	-	1VL5400071V1101
KEVA 24 B21	5.5 m	1VL5400071V0102	-	1VL5400071V1102
KEVA 36 B20	7 m	-	-	1VL5400086V1101
	9.9 m	-	-	1VL5400086V1103
KEVA 36 B21	7 m	-	-	1VL5400086V1102
	9.9 m	-	-	1VL5400086V1104
KEVA 38 B20	7 m	-	-	1VL5400135V1101
	9.9 m	-	-	1VL5400135V1103
KEVA 38 B21	7 m	-	-	1VL5400135V1102
	9.9 m	-	-	1VL5400135V1104
KEVA 48 B20	7 m	-	-	1VL5400132V1101
	9.9 m	-	-	1VL5400132V1103
KEVA 48 B21	7 m	-	-	1VL5400132V1102
	9.9 m	-	-	1VL5400132V1104

## Dimensional Drawings

### KEVA 17.5 B20

Outline drawing number: 2RKA015214A0001

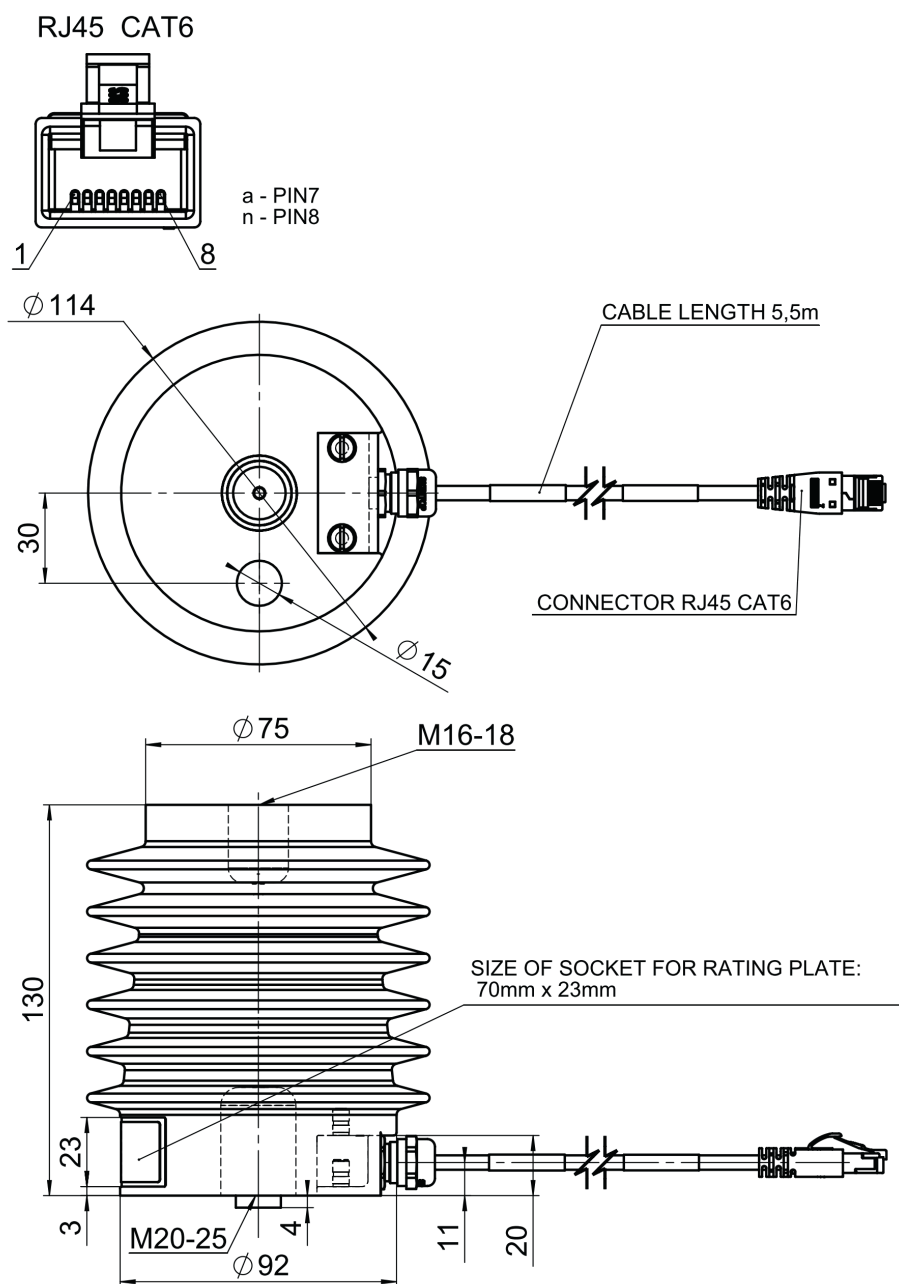
Weight: 1.96 kg



# KEVA 17.5 B21

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Weight: 1.96 kg

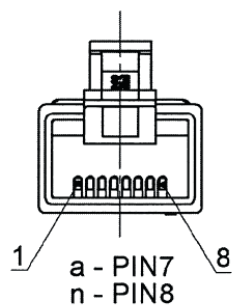


**KEVA 24 B20**

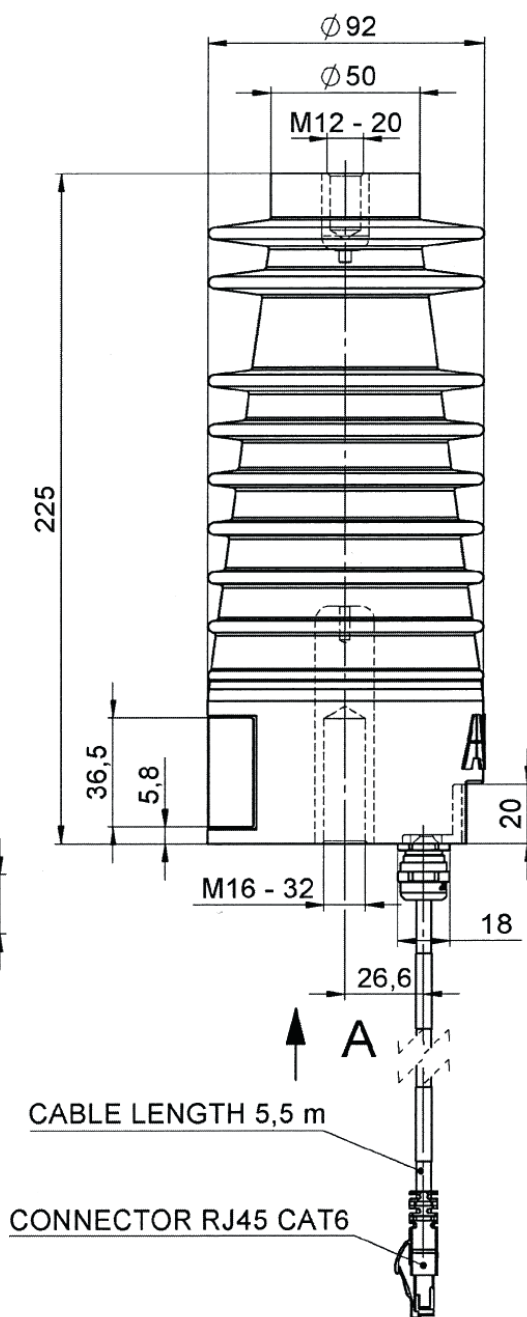
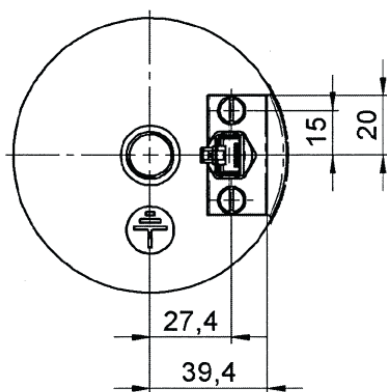
Outline drawing number: 2RKA017572A0001

Weight: 2.52 kg

RJ45 CAT6 DETAIL:



A 1:2

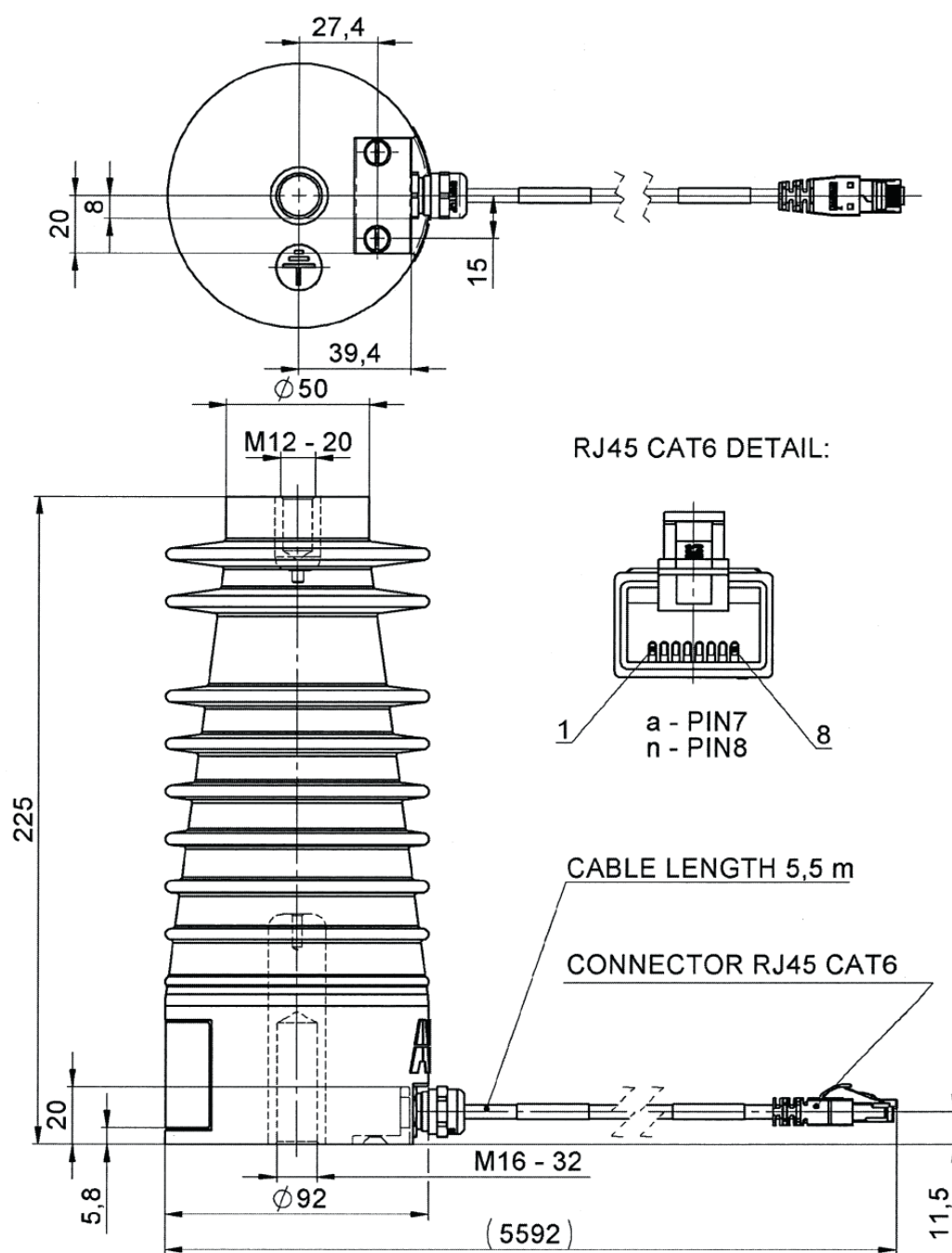




# KEVA 24 B21

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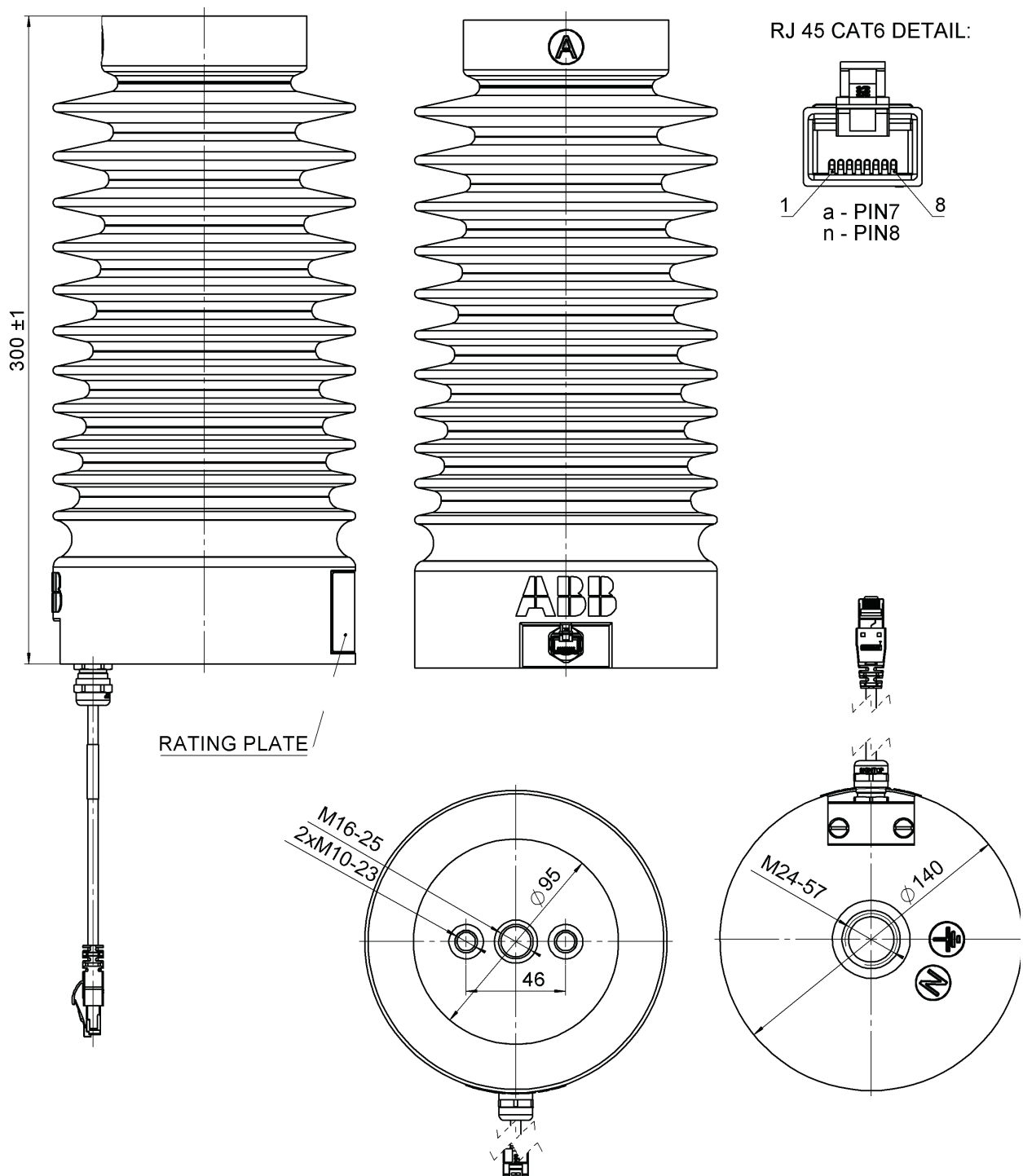
Weight: 2.52 kg



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**KEVA 36 B20**  
**KEVA 38 B20**  
**KEVA 48 B20**

Outline drawing number: 2RKA024763A0001

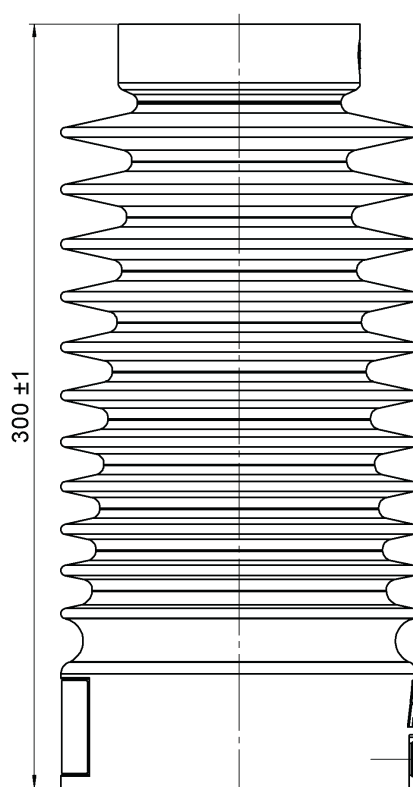
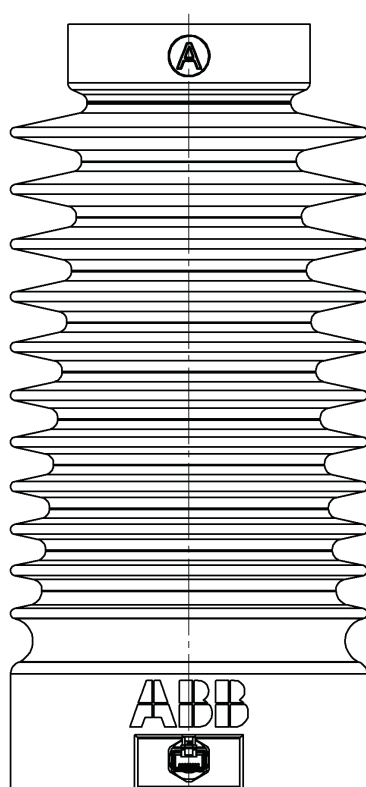
Weight: 7,1 kg



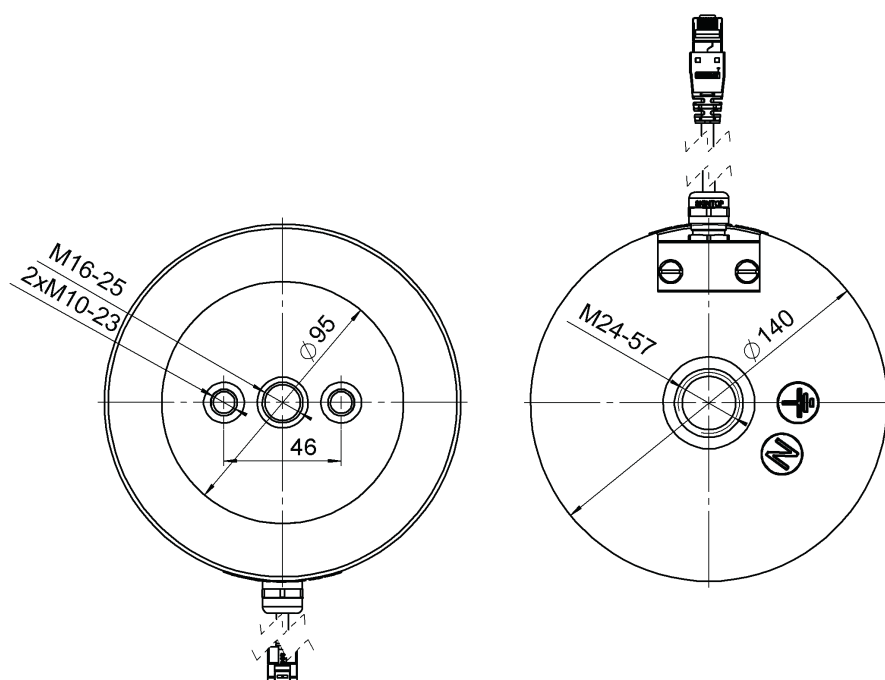
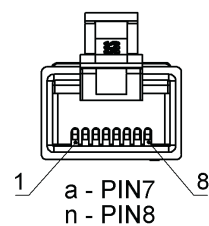
—  
**KEVA 36 B21**  
**KEVA 38 B21**  
**KEVA 48 B21**

Outline drawing number: 2RKA024763A0002

Weight: 7,1 kg



RJ 45 CAT6 DETAIL:



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