MEDIUM VOLTAGE PRODUCT

KEVA B with 3.25V output

Indoor voltage sensor

Parameters for Application	Value
Rated primary voltage of application	up to 24 kV

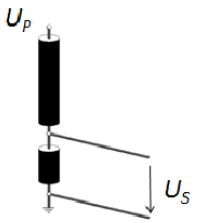
Sensor Parameters	Value
Rated primary voltage, U_{pn}/U_{pr}	10/√3 kV 15/√3 kV 20/√3 kV
Highest voltage for equipment, U_m	17.5 kV 24 kV
Rated power frequency withstand voltage	38 (42) kV 50 kV
Rated lightning impulse withstand voltage	95 kV 125 kV
Rated secondary voltage, U_{sr}	3.25/ √3 V
Voltage accuracy class	0.5/3P
Length of cable	5.5, 7, 8, 9.9 m

Sensor principles
Voltage sensors (low-power passive voltage transformers according to IEC 61869-11 standard) 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:



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

01 Resistive divider principle

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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 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).

Attention: In order to provide compatibility between voltage sensors and IED, the rated burden of voltage sensor and input impedance of IED shall match. The standard IEC 61869-11 defines rated burden of voltage sensor 2MΩ/50pF. Consequently, the same impedance is expected for input impedance of connected IED.
The other option is to use voltage sensors with rated burden 200 kΩ/350pF what corresponds to the input impedance of various IEDs available on the market.
In case IED with different input impedance would be used, please contact ABB.

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

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04 Combined accuracy class

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05 Example of a sensor label for KEVA 17,5 B (IEC 61869-11)

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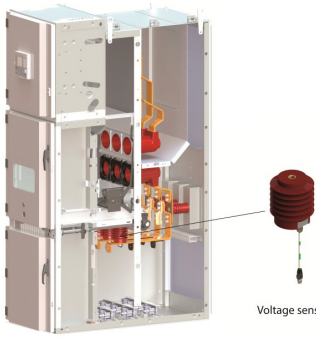
06 Example of a sensor label for KEVA 24 B (IEC 61869-11)

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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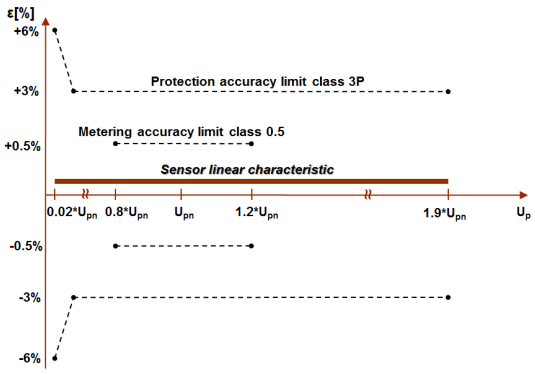
Differences between Sensors and Instrument Transformers

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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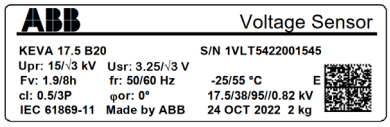
Rated parameters

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.



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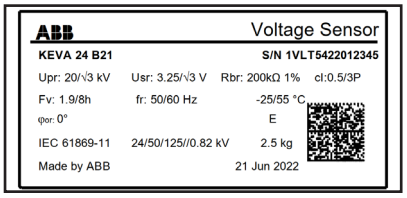

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07 Connector RJ45

Secondary cables

The sensor is equipped with a cable for connection with the IED. The cable termination can be realized by the cable connector RJ45 (standard solution) or with ferrules. The sensor accuracy classes are verified up to the connector or ferrules, 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 termination.

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Standards

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

Certifications

- 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

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 µs

Voltage sensor, rated values

Type	Rated primary voltage U_{pn}/U_{pr} (kV)
KEVA 17.5 B	10/√3 15/√3
KEVA 24 B	20/√3

Tab. 2. Rated primary voltage

- Rated frequency, f_r: 50/60 Hz
- Accuracy class: 0.5/3P
- Rated burden, R_{br}: IEC 61869-11 2 MΩ; 50 pF or 200 kΩ/ 350 pF
- Rated secondary voltage, U_{sr}: 3.25/ √3 V
- Rated voltage factor, k_u/Fv: 1.9/8h

Temperature category

- Operation: -25°C/+55°C
- Transport and storage: -40°C/+80°C

Cable

- Length: 5.5, 7, 8, 9.9 m
- Connector: RJ45 (CAT-6) ferrules

Secondary cables with RJ 45 connection

Sensor type designation	Ratio	Burden	Secondary cable length			
			5,5 m	7 m	8 m	9.9 m
KEVA 17,5 B20	10/√3 kV	2 MΩ/50 pF	1VL5400147V1101	1VL5400147V1103	1VL5400147V1107	1VL5400147V1105
		200 kΩ/350 pF	1VL5400148V1101	1VL5400148V1103	1VL5400148V1107	1VL5400148V1105
	15/√3 kV	2 MΩ/50 pF	1VL5400149V1101	1VL5400149V1103	1VL5400149V1107	1VL5400149V1105
		200 kΩ/350 pF	1VL5400150V1101	1VL5400150V1103	1VL5400150V1107	1VL5400150V1105
KEVA 17,5 B21	10/√3 kV	2 MΩ/50 pF	1VL5400147V1102	1VL5400147V1104	1VL5400147V1108	1VL5400147V1106
		200 kΩ/350 pF	1VL5400148V1102	1VL5400148V1104	1VL5400148V1108	1VL5400148V1106
	15/√3 kV	2 MΩ/50 pF	1VL5400149V1102	1VL5400149V1104	1VL5400149V1108	1VL5400149V1106
		200 kΩ/350 pF	1VL5400150V1102	1VL5400150V1104	1VL5400150V1108	1VL5400150V1106
KEVA 24 B20	20/√3 kV	2 MΩ/50 pF	1VL5400151V1101	1VL5400151V1103	1VL5400151V1107	1VL5400151V1105
		200 kΩ/350 pF	1VL5400152V1101	1VL5400152V1103	1VL5400152V1107	1VL5400152V1105
KEVA 24 B21	20/√3 kV	2 MΩ/50 pF	1VL5400151V1102	1VL5400151V1104	1VL5400151V1108	1VL5400151V1106
		200 kΩ/350 pF	1VL5400152V1102	1VL5400152V1104	1VL5400152V1108	1VL5400152V1106

Tab. 3. Secondary cables with RJ 45 connection - Ordering numbers by sensor type, standard and cable length

Secondary cables with ferrules connection

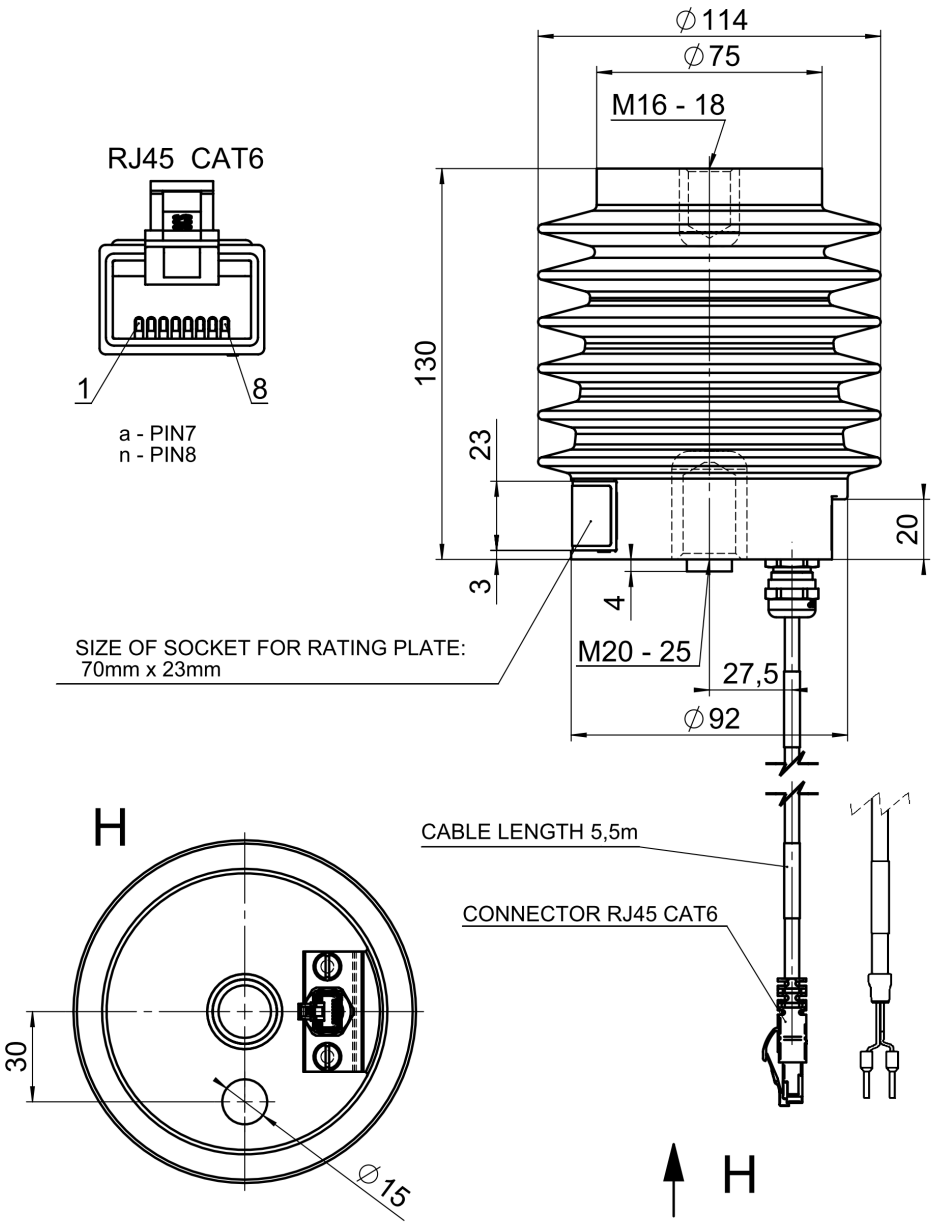
Sensor type designation	Ratio	Burden	Secondary cable length			
			5,5 m	7 m	8 m	9.9 m
KEVA 17,5 B20	10/√3 kV	2 MΩ/50 pF	1VL5400147V1111	1VL5400147V1113	1VL5400147V1117	1VL5400147V1115
		200 kΩ/350 pF	1VL5400148V1111	1VL5400148V1113	1VL5400148V1117	1VL5400148V1115
	15/√3 kV	2 MΩ/50 pF	1VL5400149V1111	1VL5400149V1113	1VL5400149V1117	1VL5400149V1115
		200 kΩ/350 pF	1VL5400150V1111	1VL5400150V1113	1VL5400150V1117	1VL5400150V1115
KEVA 17,5 B21	10/√3 kV	2 MΩ/50 pF	1VL5400147V1112	1VL5400147V1114	1VL5400147V1118	1VL5400147V1116
		200 kΩ/350 pF	1VL5400148V1112	1VL5400148V1114	1VL5400148V1118	1VL5400148V1116
	15/√3 kV	2 MΩ/50 pF	1VL5400149V1112	1VL5400149V1114	1VL5400149V1118	1VL5400149V1116
		200 kΩ/350 pF	1VL5400150V1112	1VL5400150V1114	1VL5400150V1118	1VL5400150V1116
KEVA 24 B20	20/√3 kV	2 MΩ/50 pF	1VL5400151V1111	1VL5400151V1113	1VL5400151V1117	1VL5400151V1115
		200 kΩ/350 pF	1VL5400152V1111	1VL5400152V1113	1VL5400152V1117	1VL5400152V1115
KEVA 24 B21	20/√3 kV	2 MΩ/50 pF	1VL5400151V1112	1VL5400151V1114	1VL5400151V1118	1VL5400151V1116
		200 kΩ/350 pF	1VL5400152V1112	1VL5400152V1114	1VL5400152V1118	1VL5400152V1116

Tab. 4. Secondary cables with ferrules connection - Ordering numbers by sensor type, standard and cable length

Dimensional Drawings

KEVA 17.5 B20

Outline drawing number: 2RKA015214A0001
Weight: 1.96 kg



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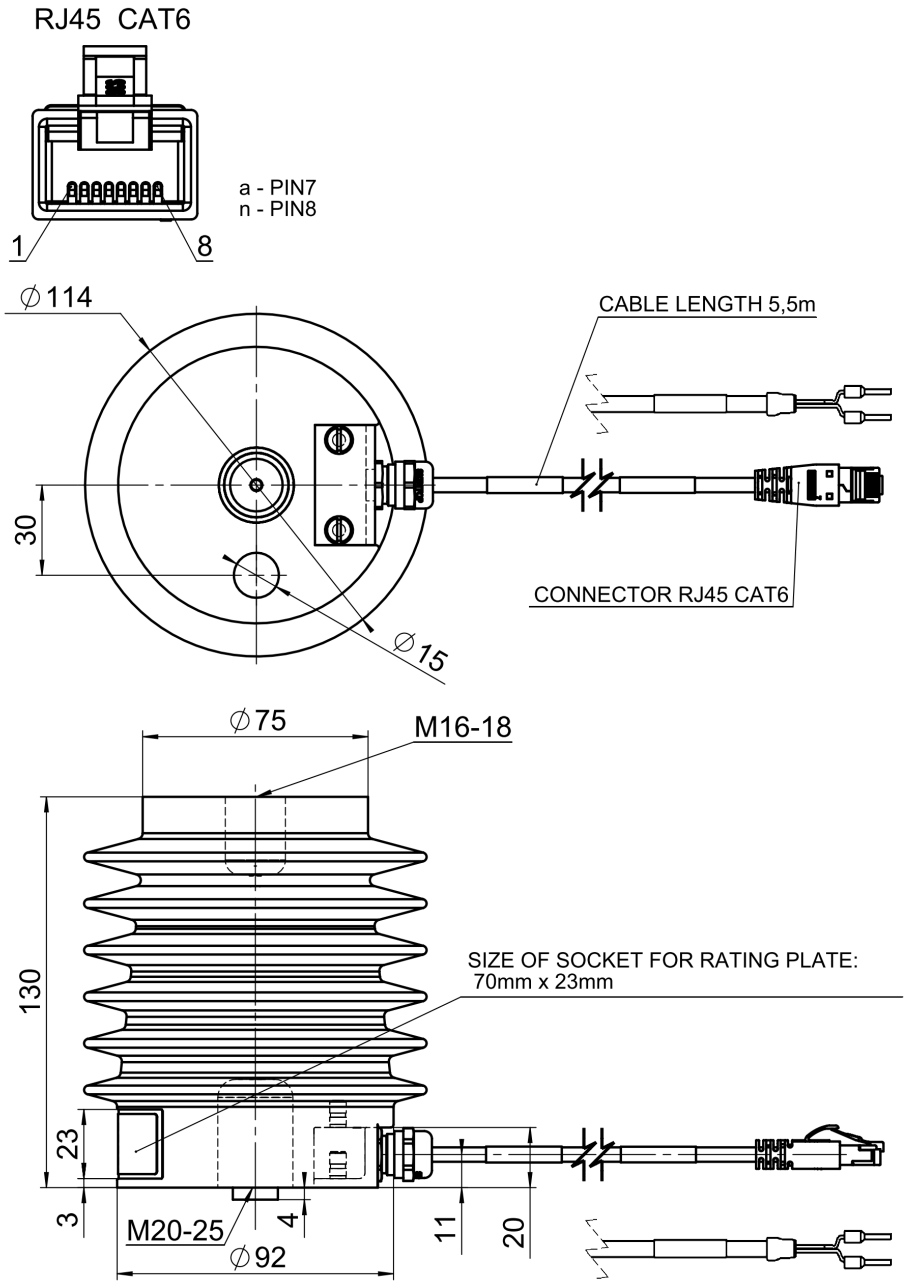
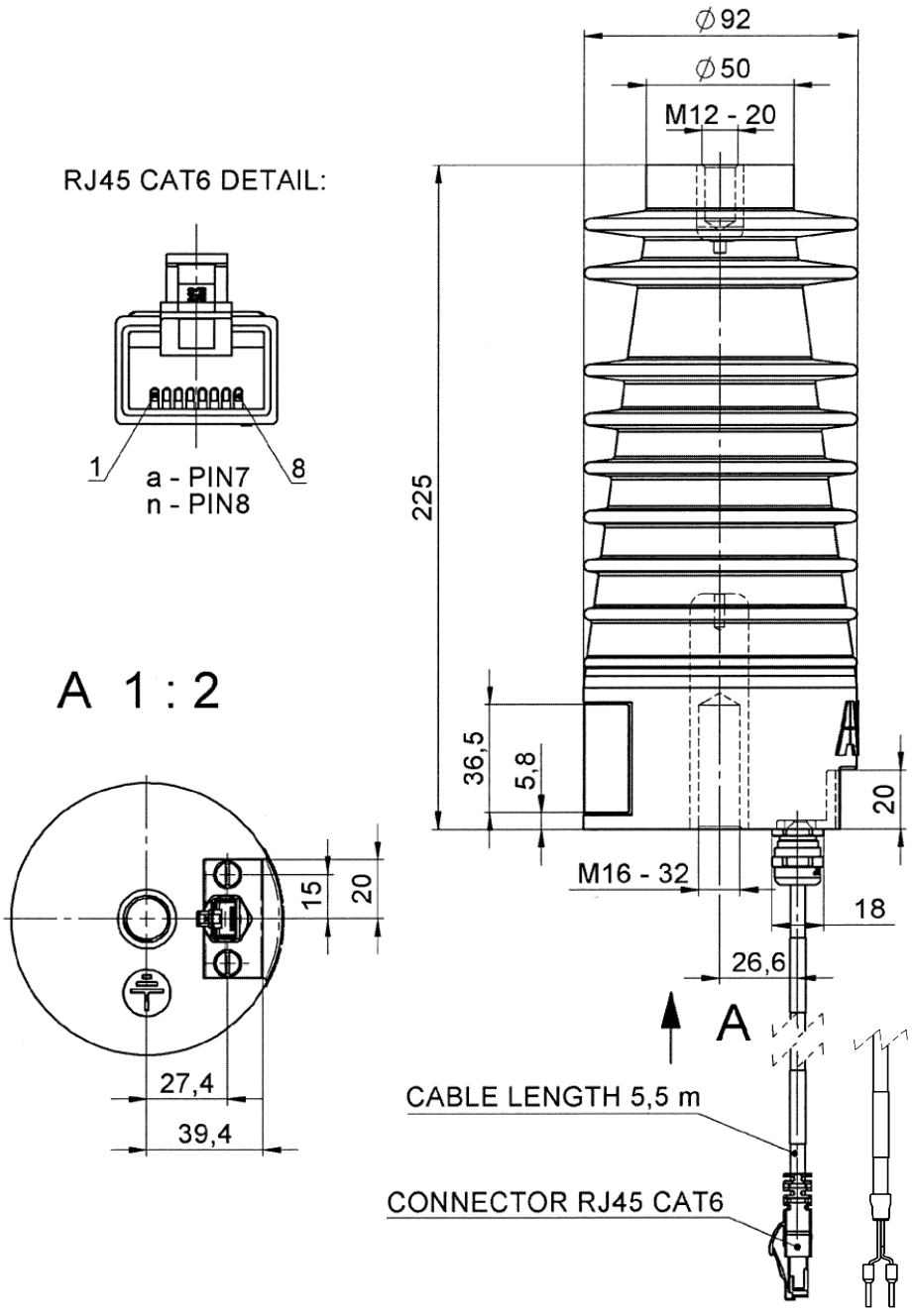
KEVA 17.5 B21

Outline drawing number: 2RKA015214A0002
Weight: 1.96 kg



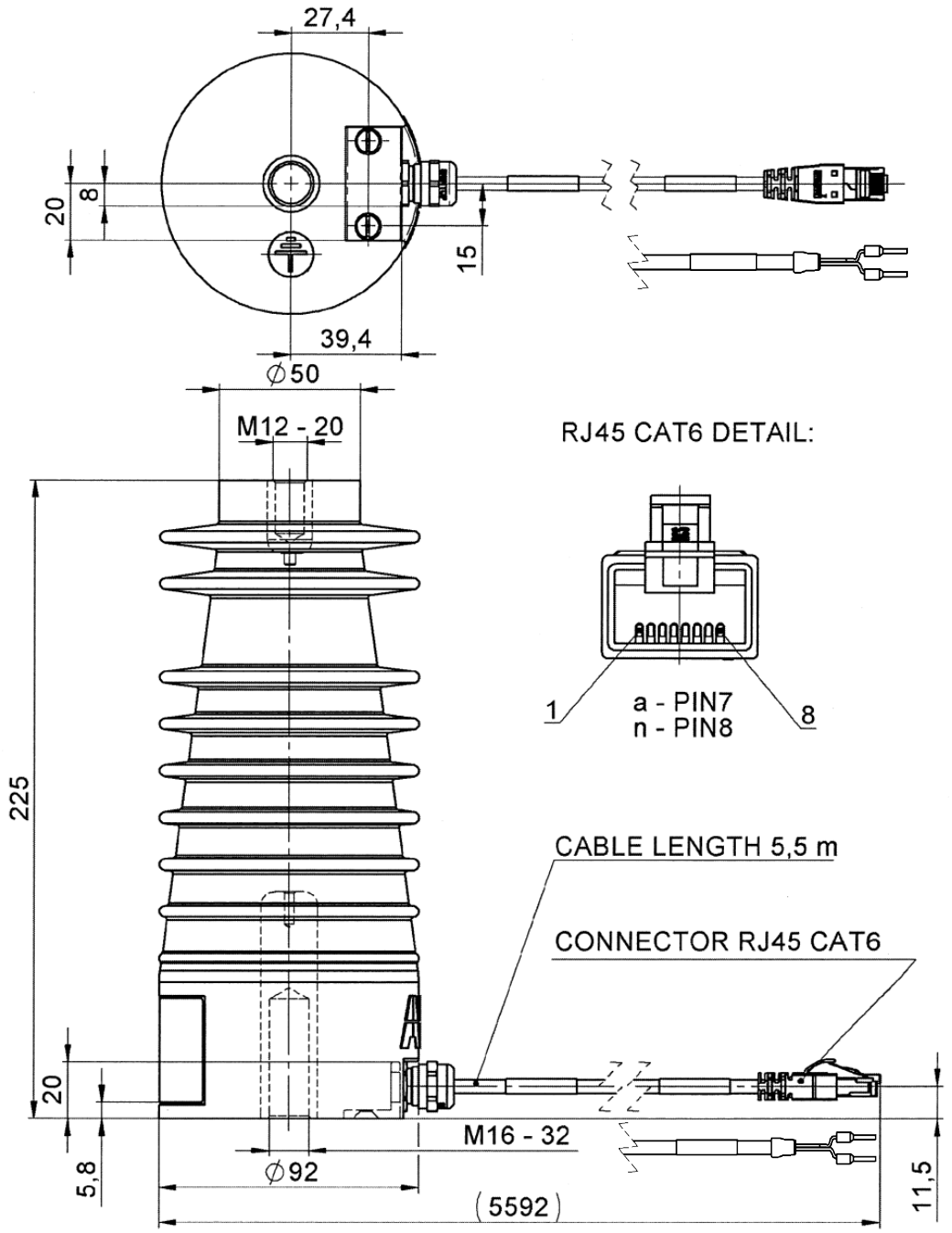
KEVA 24 B20

Outline drawing number: 2RKA017572A0001
Weight: 2.52 kg



KEVA 24 B21

Outline drawing number: 2RKA017556A0001
Weight: 2.52 kg



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