

MEDIUM VOLTAGE PRODUCTS

AdvaSense™ KEVA C

Indoor Voltage Sensors



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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 40.5 kV

Sensor Parameters	Value
Rated primary voltage, U_{pn}/U_{pr}	22/√3 kV 33/√3 kV 38/√3 kV
Highest voltage for equipment, U_m	24 kV 36 kV 40.5 kV
Rated power frequency withstand voltage	50 kV 70 kV 95 kV
Rated lightning impulse withstand voltage	125 kV 170 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	2.5; 5; 8; 9.9 m

Sensor principles

AdvaSense™ voltage sensors (Electronic voltage transformers according to IEC 60044-7 and low-power passive voltage transformers according to IEC 61869-11 standards) 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.

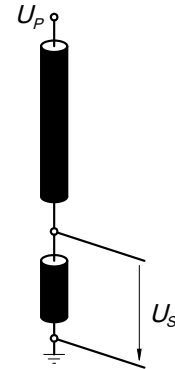
Sensor characteristics

Construction of ABB's AdvaSense™ 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:



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

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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 (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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Sensor applications

The AdvaSense™ voltage sensors type KEVA C are intended for use in voltage measurement in gas insulated medium voltage switchgear. The voltage sensors are designed as easy replacement of originally used insulating plugs in the cable connectors. Due to their compact size and optimized design sensors can be used for retrofit purposes as well as in new installations.



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Sensor variants

Sensor type designation	Metal coated (conductive surface)	Picture
KEVA 24 Cxx KEVA 24 C2 4.1 KEVA 36 C2 4.1 KEVA 40.5 C2 4.1	✗	
KEVA 24 Cxxc KEVA 24 C2 4.1c KEVA 36 C2 4.1c KEVA 40.5 C2 4.1c	✓	

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

Note: Voltage sensor KEVA 24 C30 is available only in sensor design variant without conductive surface.

Sensor type designation	Cable connectors		
	Manufacturer	Type	Connecting screw for sensor
KEVA 24 C10 KEVA 24 C10c	Nexans-Euromold	(K)400 TB/G; (K)440 TB/G	M16
		(K)944 TB/G; (K)400 TE/G	
		(K)400 BE/G-E	
		KAA4	
		400PB-xSA (x = up to 24 kV)	
	Cellpack	CTS-S 630A	
	Prysmian	FMCTs-400	
		FMCTs-400/1250 (C/D)	
		FMCTxs-630/C	
	Südkabel	MSCT/EC-630-C	
KEVA 24 C11 KEVA 24 C11c	Nexans-Euromold	SEHDT 13, 23	M16
		MUT 33	
		(K)400 TB/G; (K)440 TB/G	
		(K)944 TB/G; (K)400 TE/G	
		(K)400 BE/G-E	
	Cellpack	KAA4	
		400PB-xSA (x = up to 24 kV)	
	Prysmian	CTS-S 630A	
		FMCTs-400	
		FMCTs-400/1250 (C/D)	
KEVA 24 C21 KEVA 24 C21c	ABB Kabeldon	FMCTxs-630/C	M16
		MSCT/EC-630-C	
		SEHDT 13, 23	
		MUT 33	
		CSE-A 12630, CSE-A 24630	
		CSEP-A 12630, CSEP-A 24630	
KEVA 24 C22 KEVA 24 C22c	NKT	SOC 630 (older)	M12
		CSAP-A 6/12/24 kV	
		CB 12-630, CB 24-630	
		CC 12-630, CC 24-630	
		CBC 40,5 630 (max for 24 kV)	
		CSA M12	
	TE connectivity	CB 36-400 (for max 24 kV)	
		RSTI L56xx	
		RSTI-CC L56xx	

Sensor type designation	Cable connectors		
	Manufacturer	Type	Connecting screw for sensor
KEVA 24 C23 KEVA 24 C23c	TE connectivity	RSTI 58xx/39xx	M16 (For use in NKT connectors with M16 screw shall be used the correct screw)
		RSTI-CC 58xx/39xx	
		RSTI LCxx/LAxx (older)	
	NKT	CB 12-630, CB 24-630	
		CC 12-630, CC 24-630	
		CBC 40,5 630 (max for 24 kV)	
KEVA 24 C24 KEVA 24 C24c	Nexans-Euromold	CSA M16	M16
		(K)430 TB	
		(K)300 PBM/G-630 A	
	Prysmian	300 SA-10-xN (x = up to 24 kV)	
		FMCEAs 630/400	
KEVA 24 C25 KEVA 24 C25c	Cellpack	MSCEA/EC-630-C	M16
		CTS 630A 24kV	
		CTKS 630A 24 kV	
		CTKSA 630A 24kV	
KEVA 24 C26 KEVA 24 C26c	Südkabel	SET 12, 24, SAT 12,24	M16
		SEHDK 13.1, 23.1, SAK 12,24	
		SEHDT 23.1	
		MUT 23, MUT 23.1	
		AD 23.1 SP	
KEVA 24 C30	TE connectivity	RICS 51x3, 51x9, 51x7	M16
KEVA 24 C2 4.1 KEVA 24 C2 4.1c	Nexans - Euromold	(K)480 TB/G; (K)484 TB/G;	M16
		(K)489 TB/G; (K)800 PB/G;	
		(K)804 PB/G; (K)809 PB/G;	
		(K)480 BE/G;	
		800 SA-10-xN (x = up to 24 kV)	
KEVA 36 C2 4.1 KEVA 36 C2 4.1c	Nexans - Euromold	KAA8	M16
		M480 TB/G	
		M800 PB/G	
		M484 TB/G	
		M804 PB/G	
		M489 TB/G	
		M809 PB/G	
KEVA 40.5 C2 4.1 KEVA 40.5 C2 4.1c	Nexans - Euromold	800 SA-10-xN (x=30,33,36)	M16
		M480 BE/G	
		P480 TB/G	
		P800 PB/G	
		P484 TB/G	
		P804 PB/G	
		P489 TB/G	
		P809 PB/G	
		800 SA-10-xN (x=30,33,36)	
		P480 BE/G	

Tab. 2. Sensor variants and use in cable connectors

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

04 Combined accuracy class

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

06a Example of a sensor label (IEC 61869-11)

06b Example of a sensor label (IEC 61869-11)

Differences between Sensors and Instrument Transformers

There are some noticeable differences between Sensors and conventional Instrument Transformers:

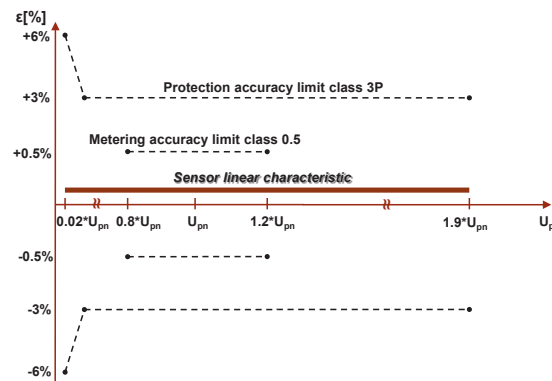
Linearity

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 (see picture 4).

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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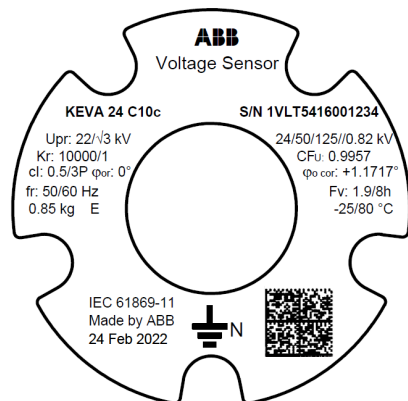


ABB Voltage Sensor	
KEVA 24 C10c	S/N 1VLT5416001234
Upr: 22/√3 kV	Kr: 10000/1
cl: 0.5/3P	φcor: 0°
Fv: 1.9/8h	fr: 50/60 Hz
CFu: 0.9957	φo cor: +1.1717°
IEC 61869-11	Made by ABB 24 Feb 2022 0.85kg

06a

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

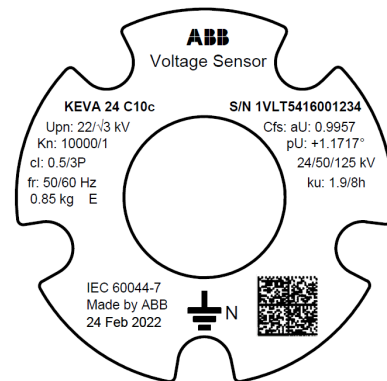


ABB Voltage Sensor	
KEVA 24 C10c	S/N 1VLT5416001234
Upr: 22/√3 kV	Kn: 10000/1
ku: 1.9/8h	Cfs: aU: 0.9957
fr: 50/60 Hz	24/50/125 kV
IEC 60044-7	Made by ABB 24 Feb 2022

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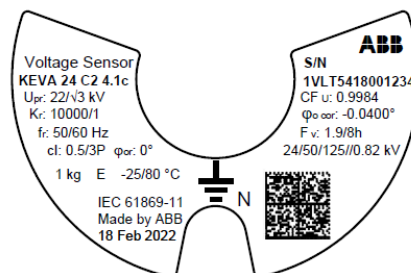


ABB Voltage Sensor	
KEVA 24 C2 4.1c	S/N 1VLT5418001234
Upr: 22/√3 kV	Kr: 10000/1
Fv: 1.9/8h	fr: 50/60 Hz
CFu: 0.9984	φo cor: -0.0400°
IEC 61869-11	Made by ABB 18 Feb 2022 E

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07 Connector RJ45 for
ABB sensors according
to IEC 60044-8 standard

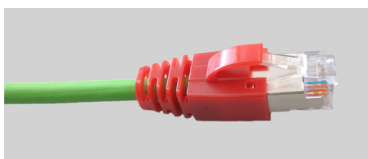
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08 Connector RJ45
according to the IEC
61869-10 standard

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.

Sensor type designation	Highest voltage for equipment U_m (kV)	Rated power frequency test voltage (kV)	Rated lightning impulse test voltage (kV)
KEVA 24 Cxx	24	50	125
KEVA 24 C2 4.1(c)	24	50	125
KEVA 36 C2 4.1(c)	36	70	170
KEVA 40.5 C2 4.1(c)	40.5	90	200

Tab. 3. Highest voltage for equipment and test voltages

Standards

- IEC 60044-7 (1999-12) Instrument transformers - Part 7: Electronic voltage transformers - some of them are available also acc. to this standard
- IEC 61869-11 (2017-12) Instrument transformers - Part 11: Additional requirements for low-power passive voltage transformers
- HD 629.1 S2 (02/2006) + A1 (09/2008) Table 10, test requirements (KEVA 24 C10(c)/ C24(c)/ C25(c)/ C2 4.1(c))
- HD 629.1 S3 (2019) Table 17 on cable accessories for system 18/30 (36) kV + HD 629.1 S2 (2006- 02) DC voltage dry for (KEVA 36 C2 4.1 / C2 4.1c)

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 μ s

Voltage sensor, rated values

Sensor type designation	Rated primary voltage U_{pn}/U_{pr} (kV)
KEVA 24 Cxx	22/ $\sqrt{3}$
KEVA 24 C2 4.1(c)	22/ $\sqrt{3}$
KEVA 36 C2 4.1(c)	33/ $\sqrt{3}$
KEVA 40.5 C2 4.1(c)	38/ $\sqrt{3}$

Tab. 4. Rated primary voltage, U_{pn}/U_p

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

Temperature category

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

Cable

- Length: 2.2; 5; 8; 9.9 m
- Connector: RJ45 (CAT-6)
- Grounding wire length: 0.5 m

Sensor type designation	IEC Standard	Secondary cable length			
		2.2 m	5 m	9.9 m	8 m
KEVA 24 C10	IEC 60044-7	1VL5400061V0101	1VL5400061V0103	1VL5400061V0102	1VL5400061V0104
	IEC 61869-11	1VL5400061V1101	1VL5400061V1103	1VL5400061V1102	1VL5400061V1104
KEVA 24 C10c	IEC 60044-7	1VL5400061V0201	1VL5400061V0203	1VL5400061V0202	1VL5400061V0204
	IEC 61869-11	1VL5400061V1201	1VL5400061V1203	1VL5400061V1202	1VL5400061V1204
KEVA 24 C11	IEC 61869-11	1VL5400175V1101	1VL5400175V1103	1VL5400175V1102	1VL5400175V1104
	IEC 61869-11 ($R_{br} = 10 \text{ M}\Omega$)	1VL5400174V1101	1VL5400174V1103	1VL5400174V1102	1VL5400174V1104
KEVA 24 C11c	IEC 61869-11	1VL5400175V1201	1VL5400175V1203	1VL5400175V1202	1VL5400175V1204
	IEC 61869-11 ($R_{br} = 10 \text{ M}\Omega$)	1VL5400174V1201	1VL5400174V1203	1VL5400174V1202	1VL5400174V1204
KEVA 24 C21	IEC 60044-7	1VL5400062V0101	1VL5400062V0103	1VL5400062V0102	1VL5400062V0104
	IEC 61869-11	1VL5400062V1101	1VL5400062V1103	1VL5400062V1102	1VL5400062V1104
KEVA 24 C21c	IEC 60044-7	1VL5400062V0201	1VL5400062V0203	1VL5400062V0202	1VL5400062V0204
	IEC 61869-11	1VL5400062V1201	1VL5400062V1203	1VL5400062V1202	1VL5400062V1204
KEVA 24 C22	IEC 60044-7	1VL5400063V0101	1VL5400063V0103	1VL5400063V0102	1VL5400063V0104
	IEC 61869-11	1VL5400063V1101	1VL5400063V1103	1VL5400063V1102	1VL5400063V1104
KEVA 24 C22c	IEC 60044-7	1VL5400063V0201	1VL5400063V0203	1VL5400063V0202	1VL5400063V0204
	IEC 61869-11	1VL5400063V1201	1VL5400063V1203	1VL5400063V1202	1VL5400063V1204
KEVA 24 C23	IEC 60044-7	1VL5400064V0101	1VL5400064V0103	1VL5400064V0102	1VL5400064V0104
	IEC 61869-11	1VL5400064V1101	1VL5400064V1103	1VL5400064V1102	1VL5400064V1104
KEVA 24 C23c	IEC 60044-7	1VL5400064V0201	1VL5400064V0203	1VL5400064V0202	1VL5400064V0204
	IEC 61869-11	1VL5400064V1201	1VL5400064V1203	1VL5400064V1202	1VL5400064V1204
KEVA 24 C24	IEC 60044-7	1VL5400078V0101	1VL5400078V0103	1VL5400078V0102	1VL5400078V0104
	IEC 61869-11	1VL5400078V1101	1VL5400078V1103	1VL5400078V1102	1VL5400078V1104
KEVA 24 C24c	IEC 60044-7	1VL5400078V0201	1VL5400078V0203	1VL5400078V0202	1VL5400078V0204
	IEC 61869-11	1VL5400078V1201	1VL5400078V1203	1VL5400078V1202	1VL5400078V1204
KEVA 24 C25	IEC 60044-7	1VL5400079V0101	1VL5400079V0103	1VL5400079V0102	1VL5400079V0104
	IEC 61869-11	1VL5400079V1101	1VL5400079V1103	1VL5400079V1102	1VL5400079V1104
KEVA 24 C25c	IEC 60044-7	1VL5400079V0201	1VL5400079V0203	1VL5400079V0202	1VL5400079V0204
	IEC 61869-11	1VL5400079V1201	1VL5400079V1203	1VL5400079V1202	1VL5400079V1204
KEVA 24 C26	IEC 60044-7	1VL5400080V0101	1VL5400080V0103	1VL5400080V0102	1VL5400080V0104
	IEC 61869-11	1VL5400080V1101	1VL5400080V1103	1VL5400080V1102	1VL5400080V1104
KEVA 24 C26c	IEC 60044-7	1VL5400080V0201	1VL5400080V0203	1VL5400080V0202	1VL5400080V0204
	IEC 61869-11	1VL5400080V1201	1VL5400080V1203	1VL5400080V1202	1VL5400080V1204
KEVA 24 C30	IEC 60044-7	1VL5400081V0101	1VL5400081V0103	1VL5400081V0102	1VL5400081V0104
KEVA 24 C2 4.1	IEC 61869-11	1VL5400084V1101	1VL5400084V1103	1VL5400084V1102	1VL5400084V1104
KEVA 24 C2 4.1c	IEC 61869-11	1VL5400084V1201	1VL5400084V1203	1VL5400084V1202	1VL5400084V1204
KEVA 36 C2 4.1	IEC 61869-11	1VL5400085V1101	1VL5400085V1103	1VL5400085V1102	1VL5400085V1104
KEVA 36 C2 4.1c	IEC 61869-11	1VL5400085V1201	1VL5400085V1203	1VL5400085V1202	1VL5400085V1204
KEVA 40.5 C2 4.1	IEC 61869-11	1VL5400133V1101	1VL5400133V1103	1VL5400133V1102	1VL5400133V1104
KEVA 40.5 C2 4.1c	IEC 61869-11	1VL5400133V1201	1VL5400133V1203	1VL5400133V1202	1VL5400133V1204

Tab. 5. Ordering numbers by sensor type, standard and cable length

Dimensional Drawing

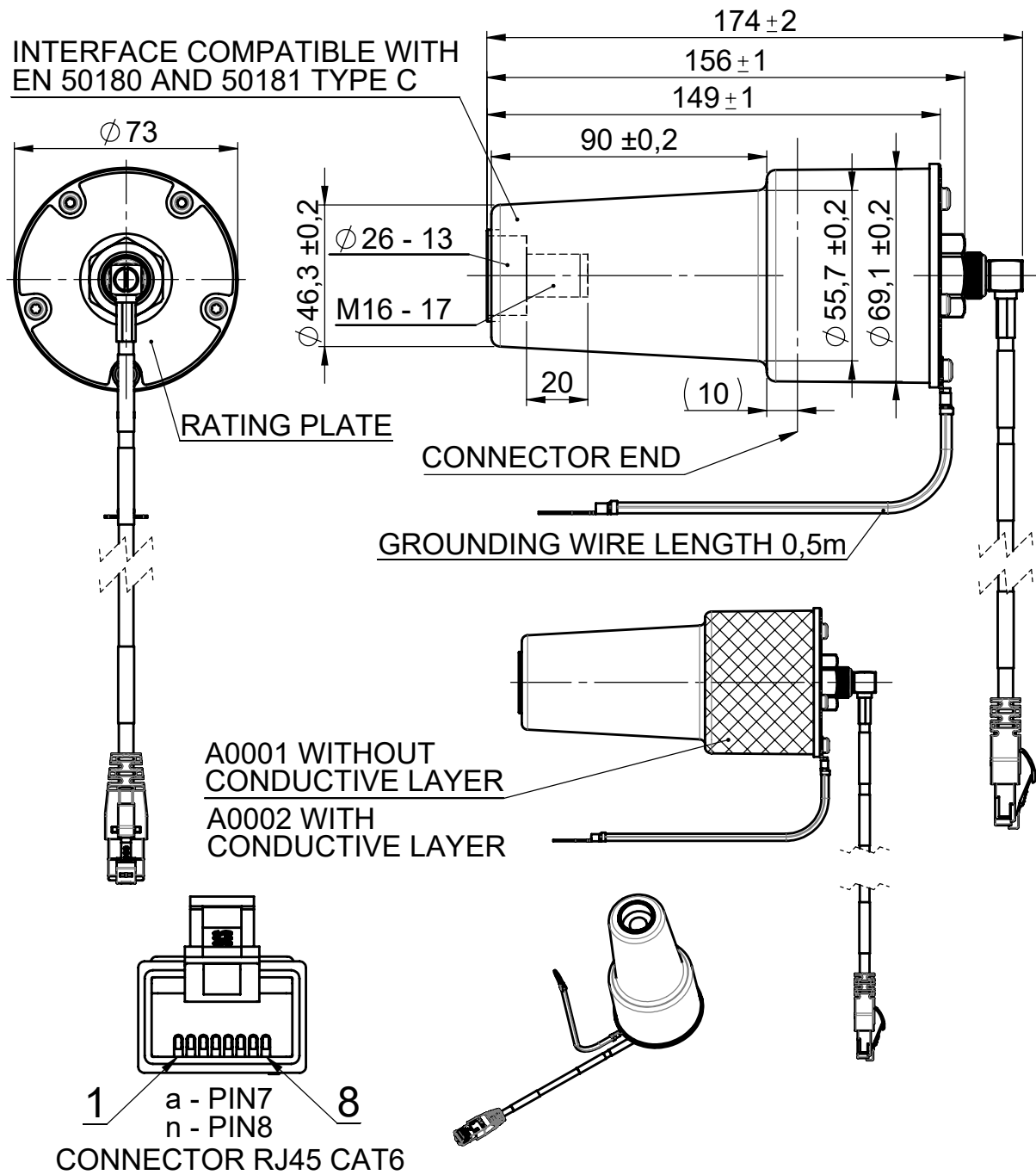
KEVA 24 C10(c)

Outline drawing numbers:

2RKA015654A0001 (KEVA 24 C10)

2RKA015654A0002 (KEVA 24 C10c)

Weight: 0.85 kg



Dimensional Drawing

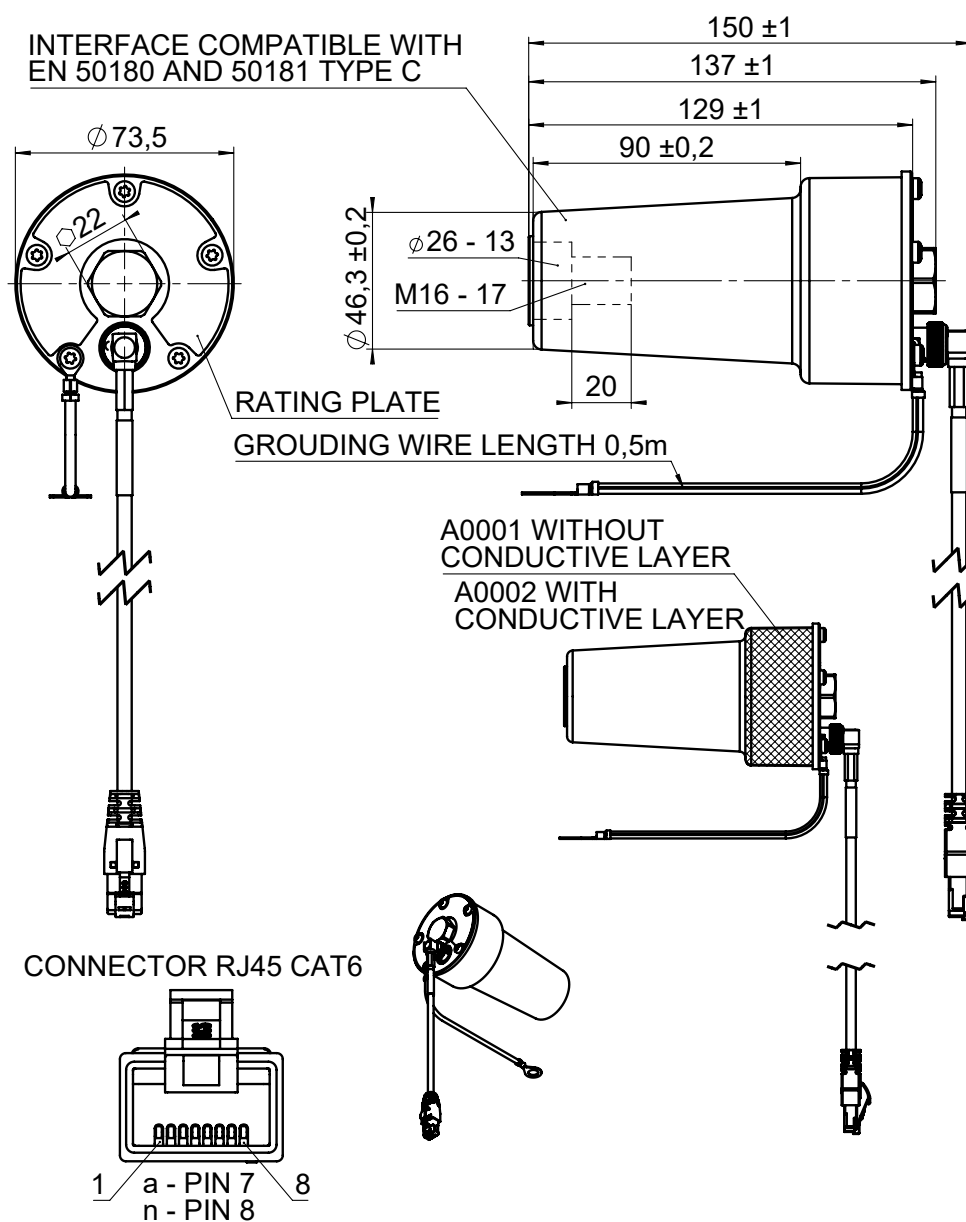
KEVA 24 C11(c)

Outline drawing numbers:

2RKA029214A0001 (KEVA 24 C11)

2RKA029214A0002 (KEVA 24 C11c)

Weight: 0.65 kg



Dimensional Drawing

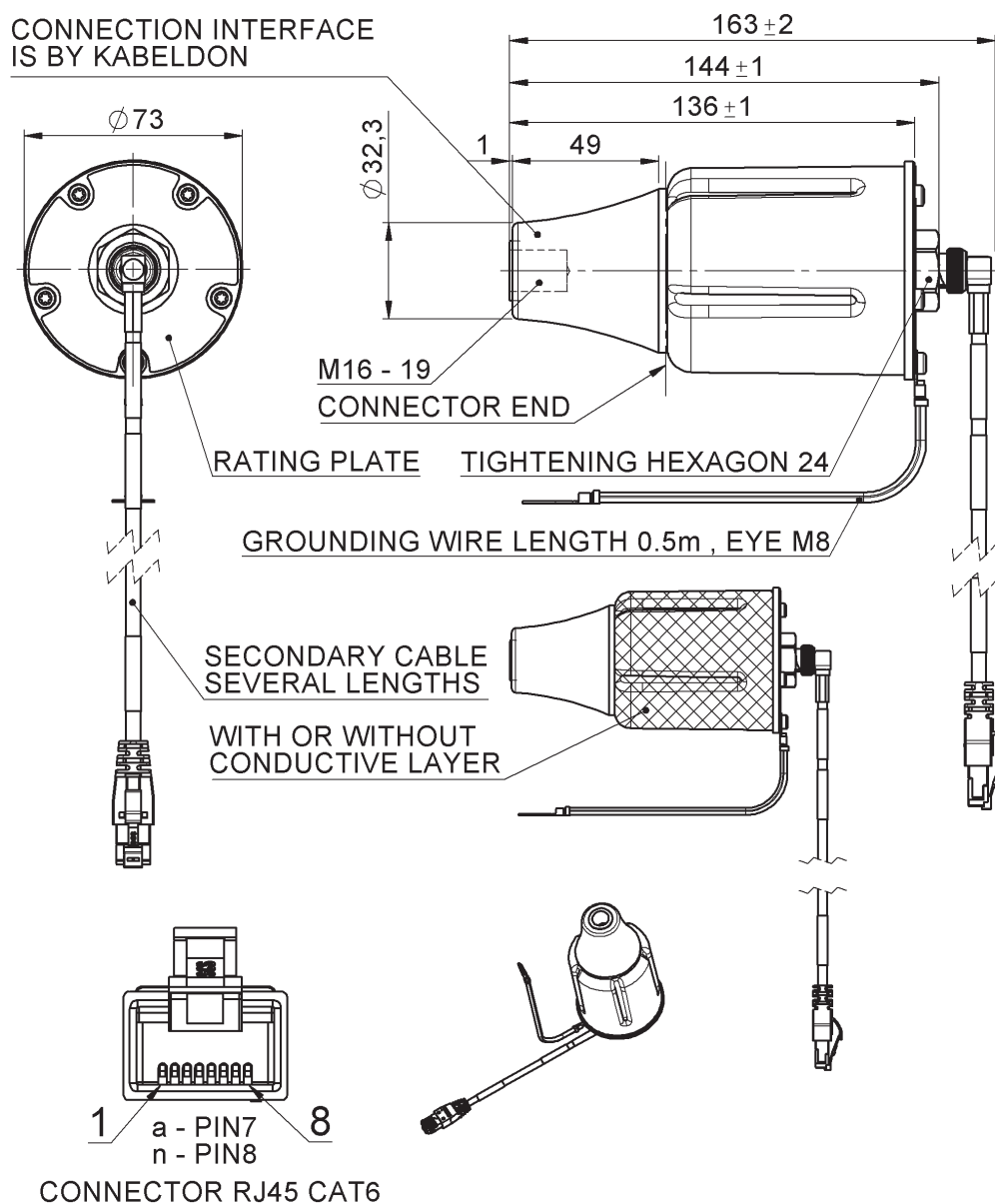
KEVA 24 C21(c)

Outline drawing numbers:

2RKA017064A0001 (KEVA 24 C21)

2RKA017064A0002 (KEVA 24 C21c)

Weight: 0.85 kg



Dimensional Drawing

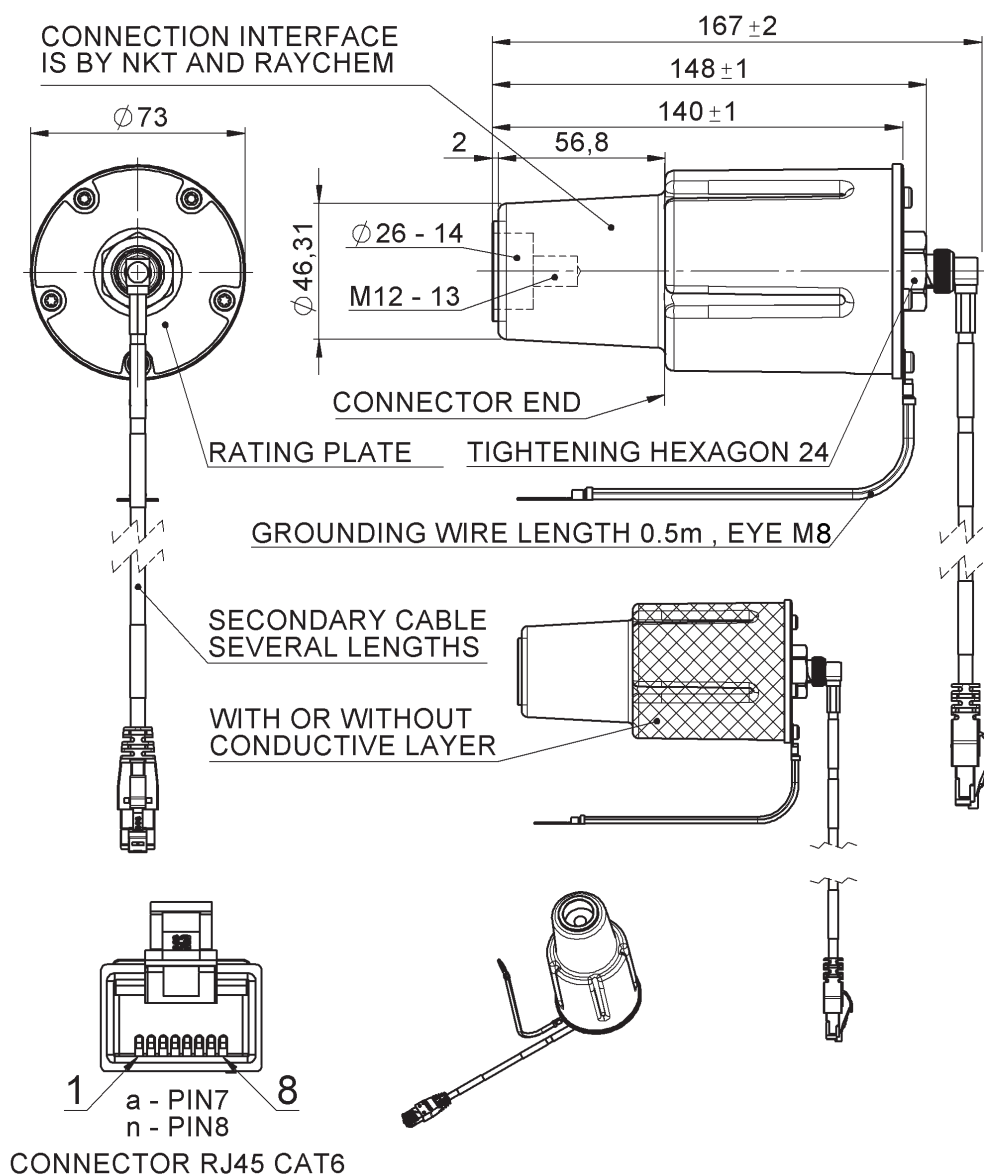
KEVA 24 C22(c)

Outline drawing numbers:

2RKA017065A0001 (KEVA 24 C22)

2RKA017065A0002 (KEVA 24 C22c)

Weight: 0.85 kg



Dimensional Drawing

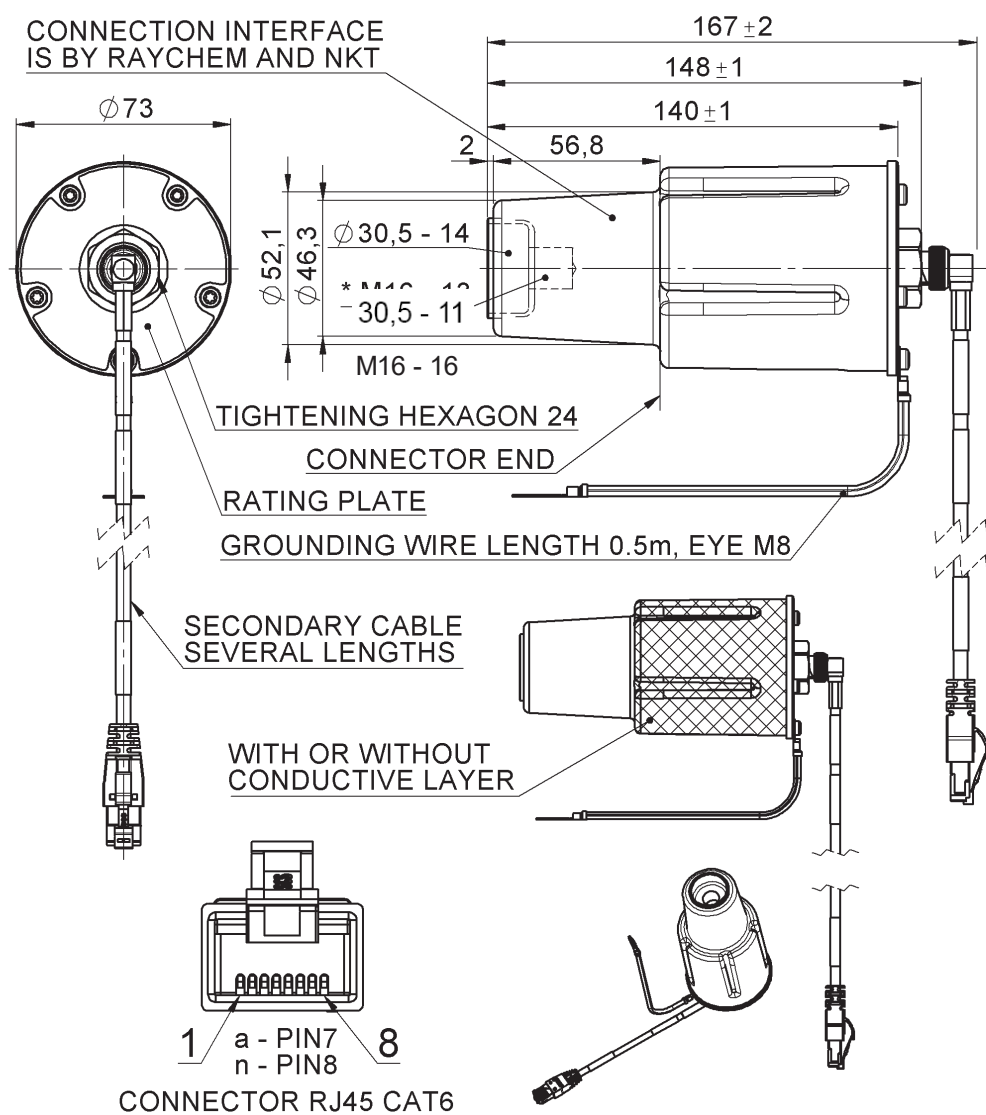
KEVA 24 C23(c)

Outline drawing numbers:

2RKA017066A0001 (KEVA 24 C23)

2RKA017066A0002 (KEVA 24 C23c)

Weight: 0.85 kg

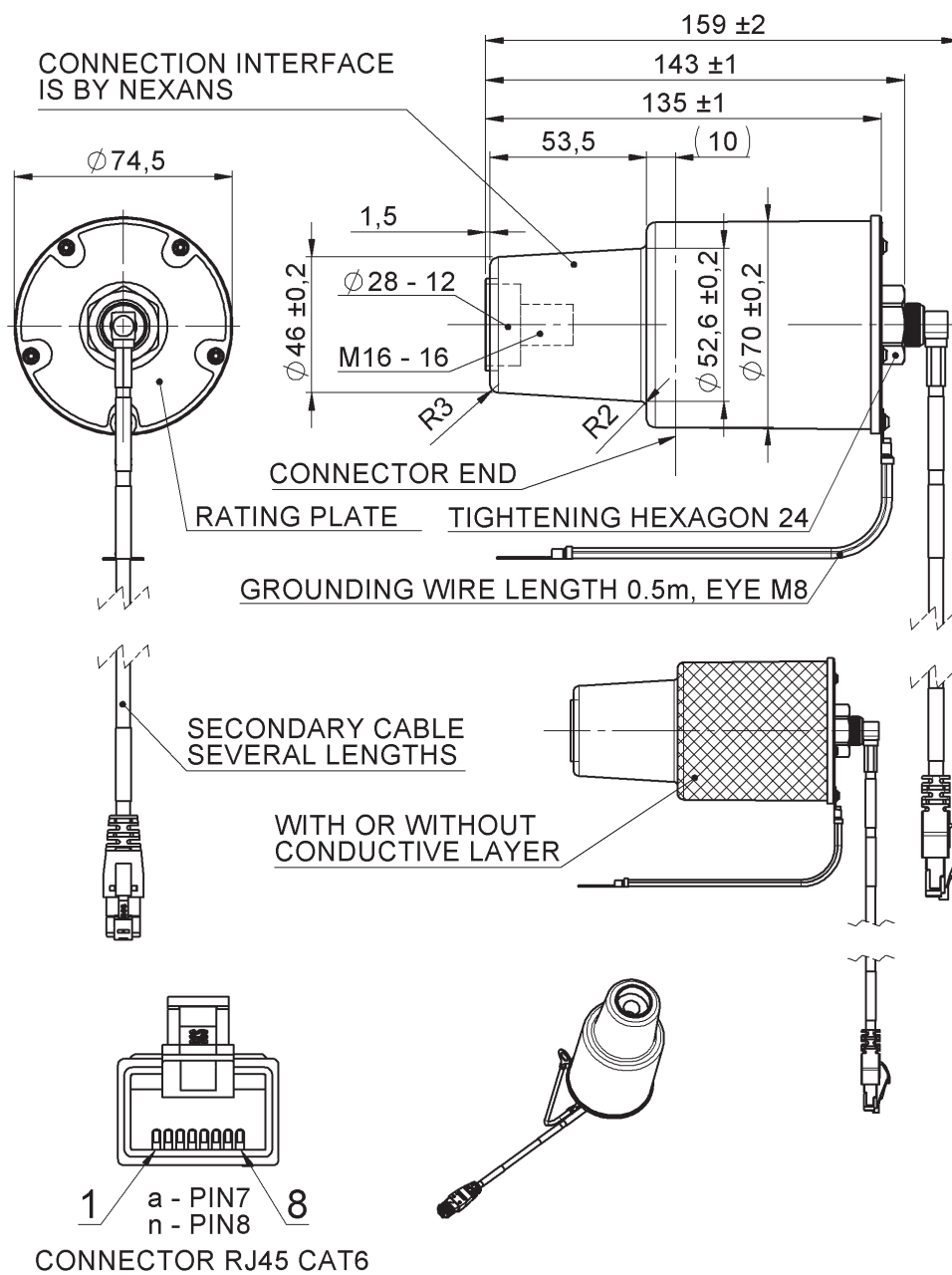


* AVAIBLE REDUCTION M16/M12

Dimensional Drawing

KEVA 24 C24(c)

Outline drawing numbers:
 2RKA019520A0001 (KEVA 24 C24)
 2RKA019520A0002 (KEVA 24 C24c)
 Weight: 0.85 kg



Dimensional Drawing

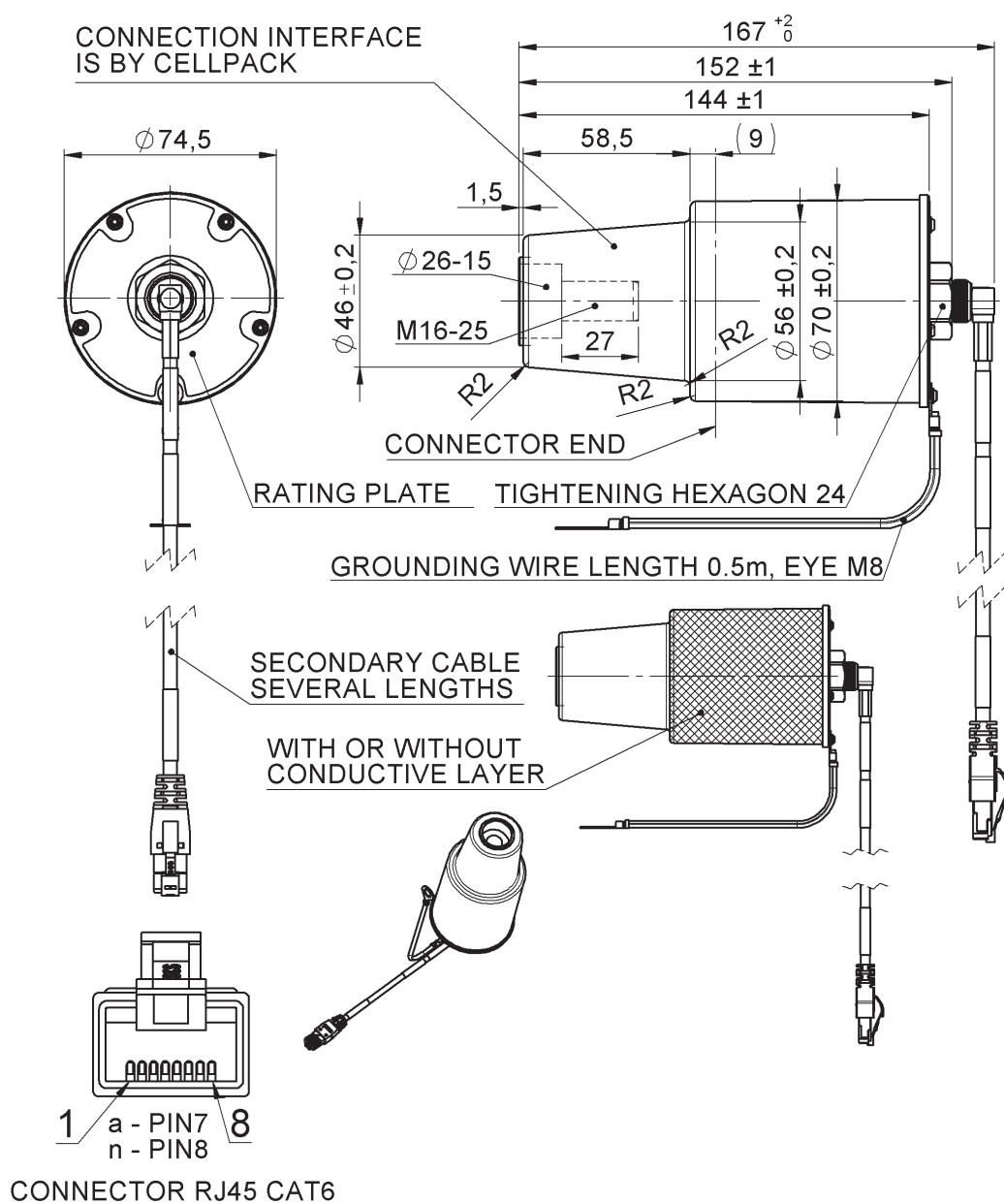
KEVA 24 C25(c)

Outline drawing numbers:

2RKA019522A0001 (KEVA 24 C25)

2RKA019522A0002 (KEVA 24 C25c)

Weight: 0.85 kg



Dimensional Drawing

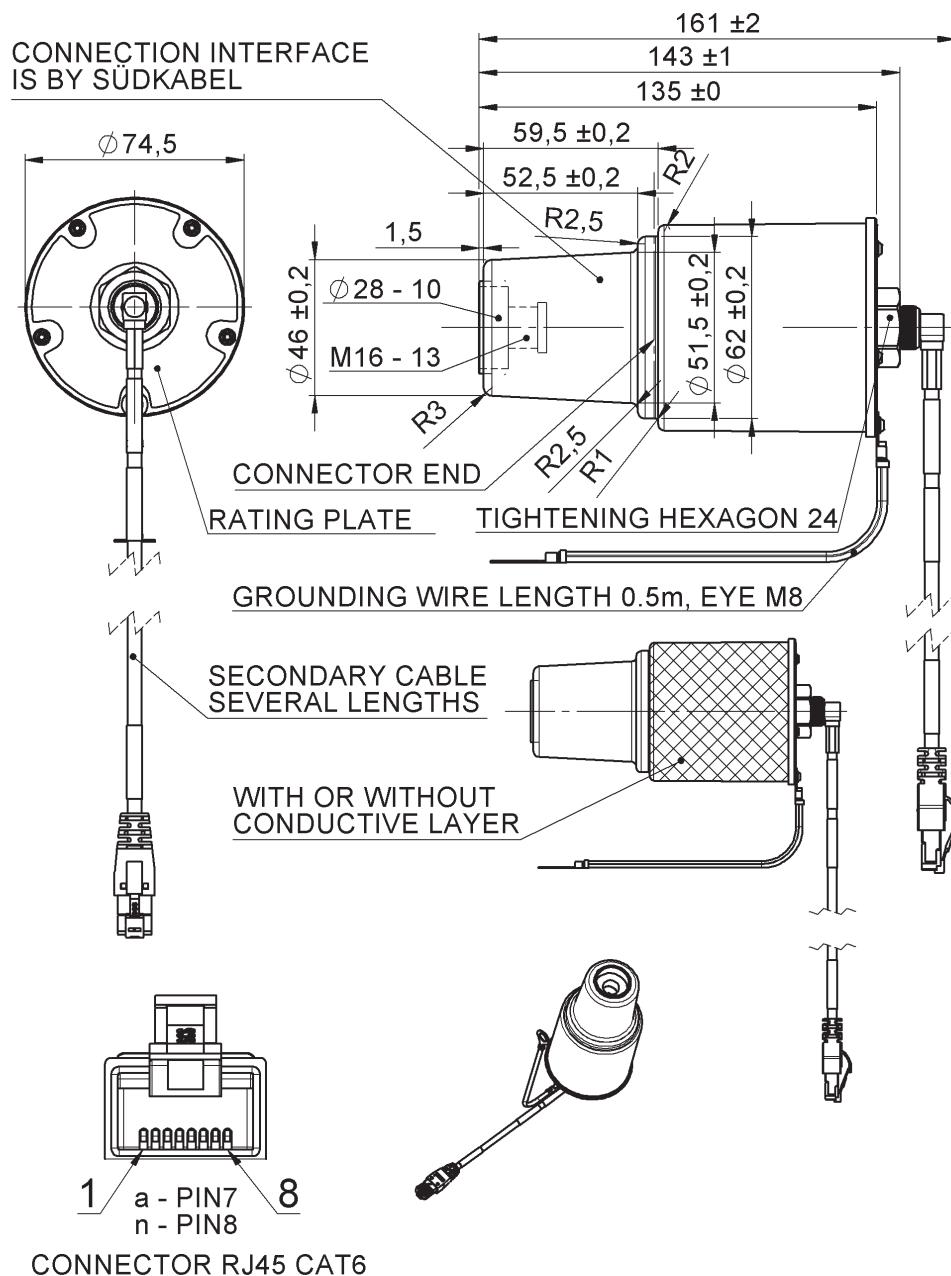
KEVA 24 C26(c)

Outline drawing numbers:

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2RKA019784A0002 (KEVA 24 C26c)

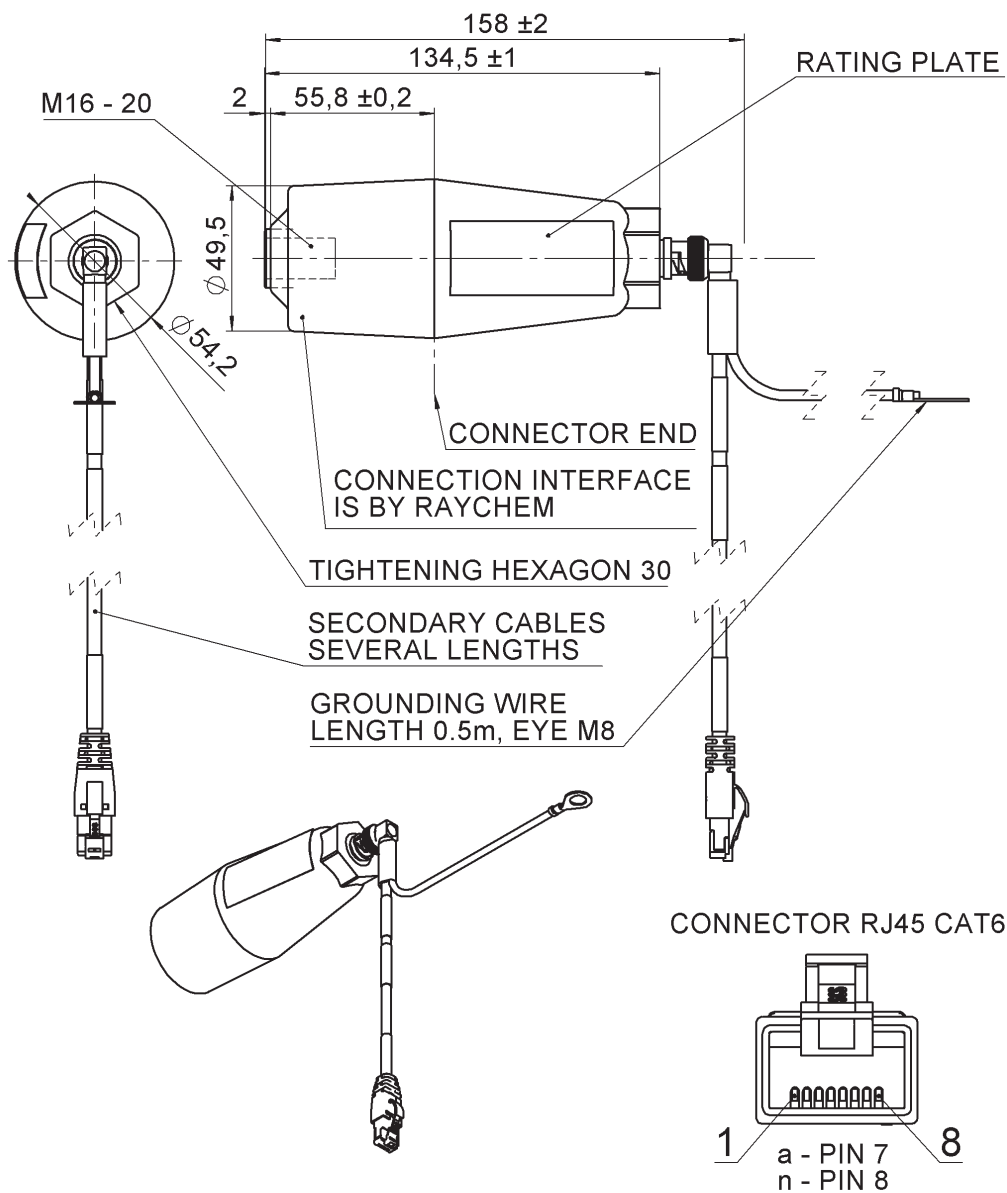
Weight: 0.85 kg



Dimensional Drawing

KEVA 24 C30(c)

Outline drawing number:
2RKA020039A0001 (KEVA 24 C30)
Weight: 0.85 kg



Dimensional Drawing

KEVA 24 C2 4.1(c)

KEVA 36 C2 4.1(c)

KEVA 40.5 C2 4.1(c)

Outline drawing numbers:

2RKA024667A0001 (KEVA 24 C2 4.1)

2RKA024667A0002 (KEVA 24 C2 4.1c)

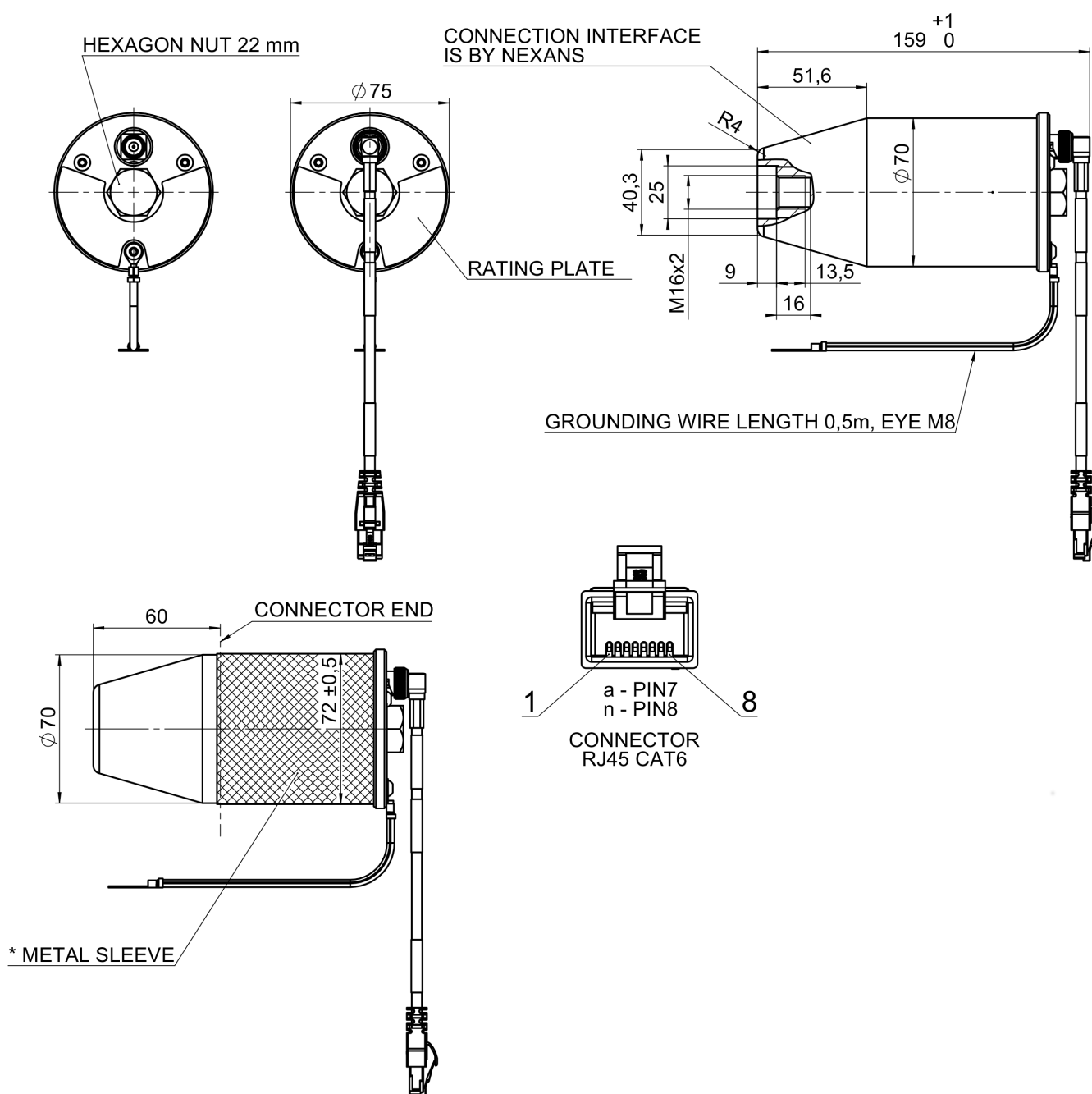
2RKA024667A0003 (KEVA 36 C2 4.1)

2RKA024667A0004 (KEVA 36 C2 4.1c)

2RKA024667A0005 (KEVA 40.5 C2 4.1)

2RKA024667A0006 (KEVA 40.5 C2 4.1c)

Weight: 1 kg





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