MEDIUM VOLTAGE PRODUCT

KEVA 24 Cxx(c) and KEVA xx C2 4.1(c) Indoor voltage sensors for NEXANS

Instructions for installation, use and maintenance

Scope of Contents

Instructions for installation, use and maintenance for the KEVA 24 Cxx(c) and KEVA xx C2 4.1(c) indoor voltage sensors

These instructions for installation, use and maintenance are valid for KEVA 24 Cxx(c) and KEVA xx C2 4.1(c) types voltage sensors (Electronic voltage transformers according to IEC 60044-7 and low-power passive voltage transformers according to IEC 61869-11 standards) operating in indoor conditions.

The voltage sensors type KEVA 24 Cxx(c) and KEVA xx C2 4.1(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 NEXANS separable cable connectors. Due to their compact size and optimized design sensors can be used for retrofit purposes as well as in new installations. The housing of sensors is made from plastic; the internal parts are shielded and earthed.

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 (K)944 TB/G; (K)400 TE/G (K)400 BE/G-E KAA4 400PB-xSA (x = up to 24 kV)	M16
KEVA 24 C24 KEVA 24 C24c	Nexans-Euromold	(K)430 TB (K)300 PBM/G-630 A 300 SA-10-xN (x = up to 24 kV)	M16
KEVA 24 C2 4.1 KEVA 24 C2 4.1c	Nexans - Euromold	(K)480 TB/G; (K)484 TB/G; (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) KAA8	M16
KEVA 36 C2 4.1 KEVA 36 C2 4.1c	Nexans - Euromold	M480 TB/G M800 PB/G M484 TB/G M804 PB/G M489 TB/G M809 PB/G 800 SA-10-xN (x=30,33,36) M480 BE/G	M16
KEVA 40.5 C2 4.1 KEVA 40.5 C2 4.1c	Nexans - Euromold	M480 TB/G M800 PB/G M484 TB/G M804 PB/G M489 TB/G M809 PB/G 800 SA-10-xN (x=30,33,36) M480 BE/G	M16

1. Operating conditions

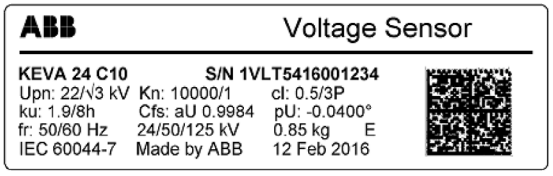
The sensors should be mounted in dry, indoor conditions without excess ingress of dust and corrosive gases. The sensors shall be protected against unusually heavy deposits of dust or similar pollution, as well as against direct sunshine.

The sensors are designed for standard ambient temperature between -25°C and +80°C (storage and transportation temperature between -40°C and +80°C). The altitude for mounting should be lower than 1000 m above sea level. The sensors may also be used at higher altitudes when agreed upon with the manufacturer.

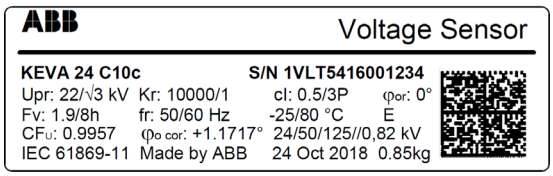
—
01a Example of rating plate on a switchboard (IEC 60044-7)
—
01b Example of rating plate on the sensor (IEC 60044-7)
—
02a Example of rating plate on a switchboard (IEC 61869-11)
—
02b Example of rating plate on the sensor (IEC 61869-11)

2. Technical details

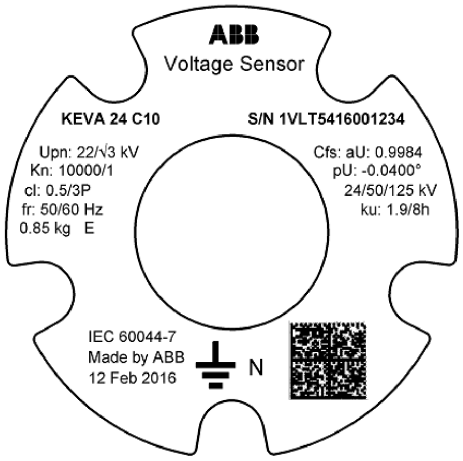
For sensor dimensions see dimension drawings at the end of these instructions. Interface of KEVA 24 C10(c) sensor (dimensions of sensor cone) is compatible with CENELEC EN 50180 & 50181 type C. Interface of sensors KEVA 24 C24(c) and KEVA xx C2 4.1(c) is given by NEXANS, please refer to the sensor drawings below. Rated values for each individual sensor are mentioned on the rating plate glued to the sensor. Values mentioned on the rating plate must not be exceeded.



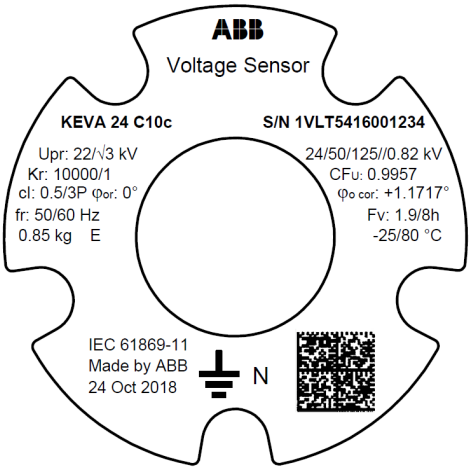
—
01a



—
02a



—
01b



—
02b

KEVA 24 C10	Type code (KEVA xx C10/C24/C10c/ C24c/C2 4.1/C2 4.1c)
S/N	Serial number 1VLT5416001234
Upn	Rated primary voltage
Kn	Divider ratio
cl	Accuracy class
ku	Rated voltage factor
Cfs	Correction factors used for voltage sensor. Correction factors are measured and calculated separately for each sensor. Amplitude correction factor (aU) is a number by which the output signal of the sensor shall be multiplied in order to have minimum amplitude error. Phase error correction factor (pU) is a number by which the output signal of the sensor shall be increased or decreased (depending on the sign) in order to have minimum phase error.
aU	Amplitude correction factor of a voltage sensor
pU	Phase error correction factor of a voltage sensor in degrees
fr	Rated frequency in Hz
24/50/125 kV	Insulation level
0.85 kg	Weight
E	Insulation class
IEC 60044-7	IEC – standard referred to
12 Feb 2016	Date of production

Tab. 2. Labels abbreviation definitions

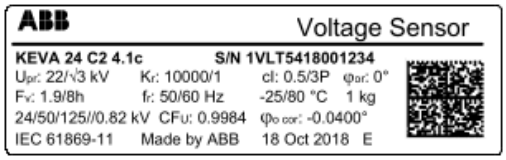
KEVA 24 C10c	Type code (KEVA xx C10/C24/C10c/ C24c/C2 4.1/C2 4.1c)
S/N	Serial number 1VLT5416001234
Upr	Rated primary voltage
Kr	Divider ratio
cl	Accuracy class
Fv	Rated voltage factor
Cfu	Correction factors used for voltage sensor. Correction factors are measured and calculated separately for each sensor. Amplitude correction factor is a number by which the output signal of the sensor shall be multiplied in order to have minimum amplitude error.
$\varphi_{0\,cor}$	Correction factors used for voltage sensor. Correction factors are measured and calculated separately for each sensor. Phase error correction factor is a number by which the output signal of the sensor shall be increased or decreased (depending on the sign) in order to have minimum phase error.
fr	Rated frequency in Hz
24/50/125 kV	Insulation level
0.82 kV	Insulation requirement for secondary terminal - power frequency voltage withstand capacity
0.85 kg	Weight
E	Insulation class
IEC 61869-11	IEC – standard referred to
-25/80°C	Ambient temperature
24 Oct 2018	Date of production

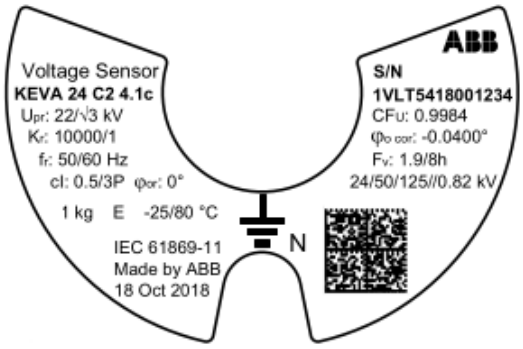
Tab. 3. Labels abbreviation definitions

—
03
Example of rating plate on a switchboard and on the sensor (IEC 61869-11)

—
04
Example of data stored in 2D Bar Code

—
05 Example of Amplitude and Phase error correction factors setting for voltage sensor into REF615 according to label parameters in picture 01a and 01b (IEC 60044-7). Same principle can be applied with label parameters in 02a and 02b (IEC 61869-11).





—
03

POSITION	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
DATA	K	E	V	A		2	4		C	1	0					S	/	N	
POSITION	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38
DATA	1	V	L	T	5	4	1	6	0	0	1	2	3	4			1	2	
POSITION	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57
DATA	F	E	B		2	0	1	6			C	f	s	:		a	U	:	
POSITION	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	
DATA	0	.	9	9	8	4		p	U	:		-	0	.	0	4	0	0	

—
04

—
05

REF615 - Parameter Setting

Group / Parameter Name	IED Value	PC Value	Unit	Min	Max
Voltage (3U,VT)					
Primary voltage		22,000	kV	0,100	440,000
Secondary voltage		100	V	60	210
VT connection		Wye			
Amplitude Corr A		0,9984		0,9000	1,1000
Amplitude Corr B		0,9984		0,9000	1,1000
Amplitude Corr C		0,9984		0,9000	1,1000
Division ratio		10000		1000	20000
Voltage input type		CVD sensor			
Angle Corr A		-0,0400	deg	-20,0000	20,0000
Angle Corr B		-0,0400	deg	-20,0000	20,0000
Angle Corr C		-0,0400	deg	-20,0000	20,0000

—
06 Sensor mounting system
—
07 Paper towel, glove, mounting grease, smearing of mounting grease by brush or glove

3. Instructions for installation

Safety instruction
Always ground the sensor grounding terminal.

Installation conditions
The sensor should be installed in dry, indoor conditions. The temperature during the assembly shall be between 0 and +40°C. The sensor cable shall not be moved or bent if the temperature is below 0°C.

Mechanical installation
The sensors can be mounted into the multiple types of cable connectors according to the used type according Tab. 1. The mounting position for voltage sensor is shown in Fig. 5. The sensor is screwed into the cable connectors. Proper mounting is ensured by the tightening hex nut of size 24 mm which is part of the grounding cover (recommended tightening torque.

—
06

Before mounting of sensor remove dust from the surface of sensor using a paper towel. Then a mounting grease (Nexans-Euromold: Novagard G687 or PE 1352 WT; or any other recommended by producers of cable connectors) must be used on the contact surface between the sensor and the cable connector to avoid the formation of air bubbles. The mounting grease contributes in making interfaces watertight and easy to install, see Fig. 6. Use a brush or a glove for lightly lubricating of the mounting grease.

—
07

—
08 KEVA 24 C10(c) sensor mechanical installation

Mechanical installation KEVA 24 C10 and KEVA 24 C10c

The KEVA 24 C10(c) sensors are designed to be fixed to the cable connector using the screw M16 which is a part of the cable connectors, see Fig. 7 – pictures 4, 5 and 6.

Attention: Be careful when unpacking and handling to avoid damages to the sensor. Damages that occur during unpacking or poor handling will not be covered by the warranty.

Important notes: Do not allow hydrocarbon oils or solvents to contaminate the E.P.D.M. rubber of cable connector.

Mechanical installation according to the next steps, see Fig. 7:

0 step — the state before of installation process, see picture 0

1 step — remove the plug cover, see picture 1

2 step — remove the insulating plug, see picture 2

3 step — clean the inside surface of the connector by paper towel, consistently must be checked that on the surface of inside cone are not the metal burrs, see picture 3

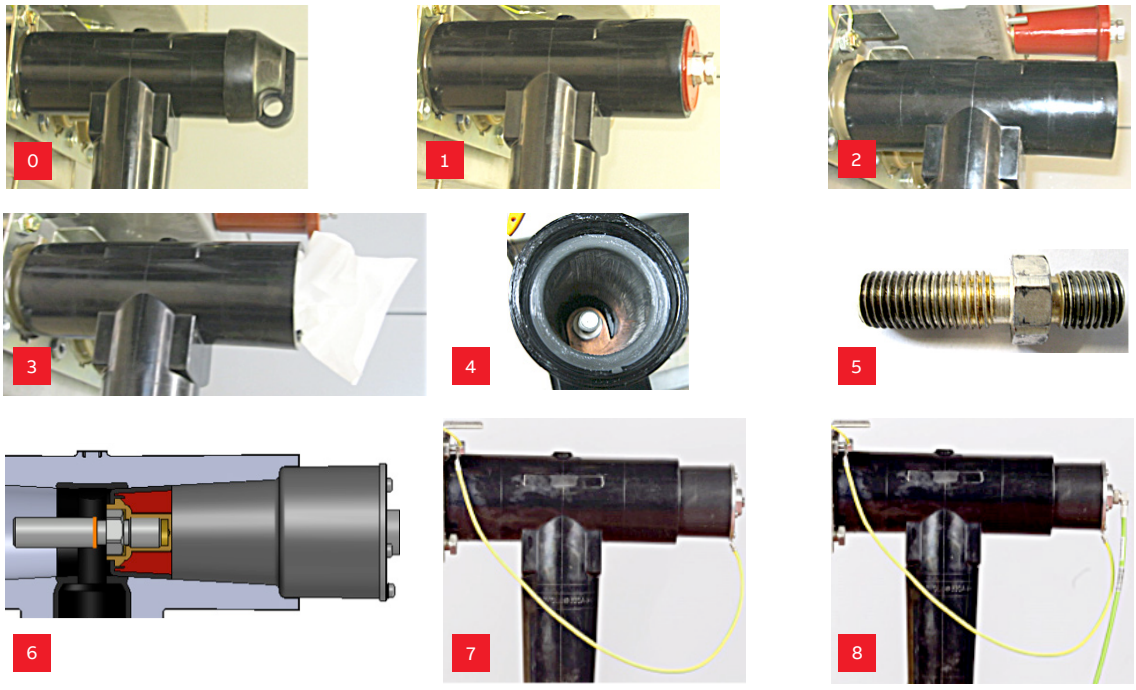
4 step — check the tightening of the screw M16, the tightening hex nut of size 22 mm, recommended tightening torque 50 Nm for Nexans shall be used, see picture 4 and 5, in order to achieve the correct applied torque ensure that there is no lubricant on the threaded parts

5 step — lightly lubricate the Nexans-Euromold: Novagard G687 or PE 1352 WT mounting grease on the inside connector surface (where there is contact between the sensor and the cable connector, see picture 6) by brush or glove, first consistently must be checked that on the surface of inside cone are not any metal burrs, see picture 4

6 step — screw the KEVA 24 C10(c) sensor, the tightening hex nut of size 24 mm, recommended tightening torque 50 Nm shall be used, see picture 6, in order to achieve the correct applied torque ensure that there is no lubricant on the threaded parts

7 step — connect the grounding wire by a screw M8 which is at the frame, see picture 7

8 step — connect the secondary cable of sensor KEVA 24 C10(c) to the BNC connector (check that secondary cable with the same ID number as mentioned on the sensor label is connected), see picture 8



—
08

09 KEVA 24 C24(c) sensor mechanical installation

Mechanical installation KEVA 24 C24 and KEVA 24 C24c

The KEVA 24 C24(c) sensors are designed to be fixed to the cable connector using the screw M16 which is a part of the cable connectors, see Fig. 8 – pictures 4, 5 and 6.

Attention: Be careful when unpacking and handling to avoid damages to the sensor. Damages that occur during unpacking or poor handling will not be covered by the warranty.

Important notes: Do not allow hydrocarbon oils or solvents to contaminate the E.P.D.M. rubber of cable connector.

Mechanical installation according to next steps, see Fig. 8:

0 step the state before of installation process, see picture 0

1 step remove the plug cover, see picture 1

2 step remove the insulating plug, see picture 2

3 step clean the inside surface of the connector by paper towel or dry cloth, consistently must be checked that on the surface of inside cone are not the metal burrs, see picture 3,

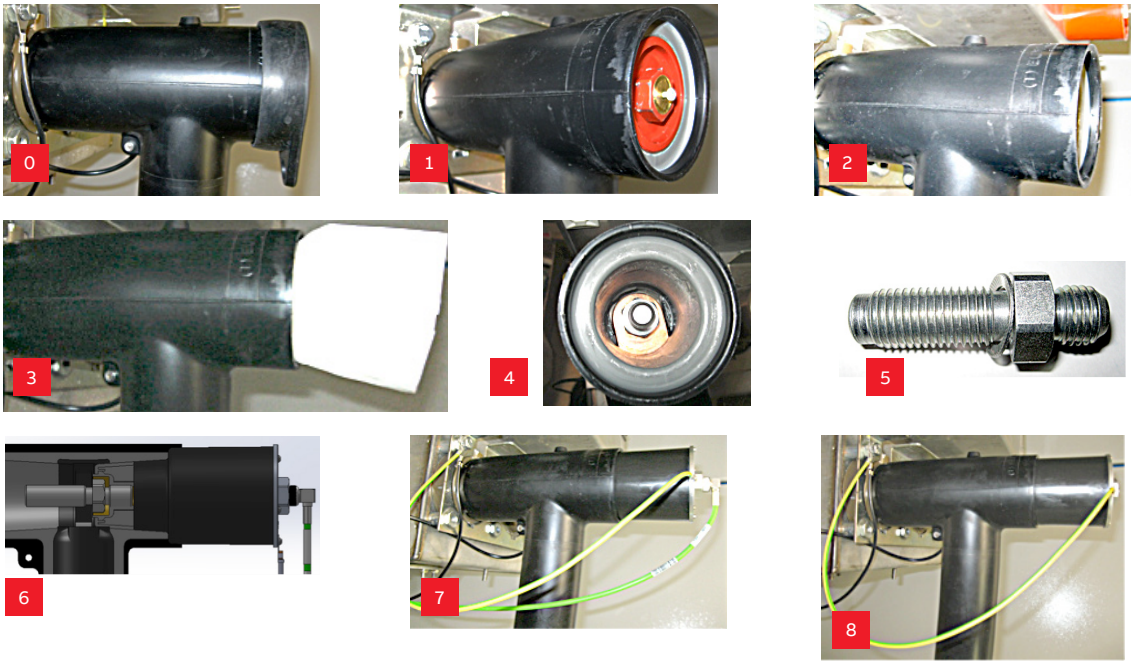
4 step check the tightening of the screw M16, the tightening hex nut of size 22 mm, recommended tightening torque 50 Nm for Nexans-Euromold shall be used, see picture 4 and 5, in order to achieve the correct applied torque ensure that there is no lubricant on the threaded parts

5 step lightly lubricate the Nexans-Euromold: Novagard G687 or PE 1352 WT silicone grease on the inside connector surface (where there is contact between the sensor and the cable connector, see picture 6) by brush or glove, first consistently must be checked that on the surface of inside cone are not any metal burrs, see picture 4

6 step screw the KEVA 24 C24(c) sensor, the tightening hex nut of size 24 mm, recommended tightening torque 30 Nm shall be used, see picture 6, in order to achieve the correct applied torque ensure that there is no lubricant on the threaded parts

7 step connect the grounding wire by a screw M8 which is at the frame, see picture 7

8 step connect the secondary cable of sensor KEVA 24 C24(c) to the BNC connector (check that secondary cable with the same ID number as mentioned on the sensor label is connected), see picture 8



09

—
10 KEVA xx C2 4.1(c) sensor mechanical installation

Mechanical installation KEVA xx C2 4.1(c)

The KEVA xx C2 4.1(c) sensors are designed to be fixed to the cable connector using the screw M16 which is a part of the cable connectors, see Fig. 9 – pictures 4, 5 and 6.

Attention: Be careful when unpacking and handling to avoid damages to the sensor. Damages that occur during unpacking or poor handling will not be covered by the warranty.

Important notes: Never disconnect the connector from energised equipment nor energise a disconnected connectorwithout previously installing on its appropriate corresponding mating part. Do not allow hydrocarbon oils or solvents to contaminate the E.P.D.M. rubber of cable connector. In the event of contamination, wipe the surface clean with a dry cloth.

Mechanical installation according to the next steps, see Fig. 9:

0 step — the state before of installation process, see picture 0

1 step — remove the protective cap, see picture 1

2 step — remove the insulating plug, see picture 2

3 step — clean the inside surface of the connector by paper towel, consistently must be checked that on the surface of inside cone are not the metal burrs, see picture 3

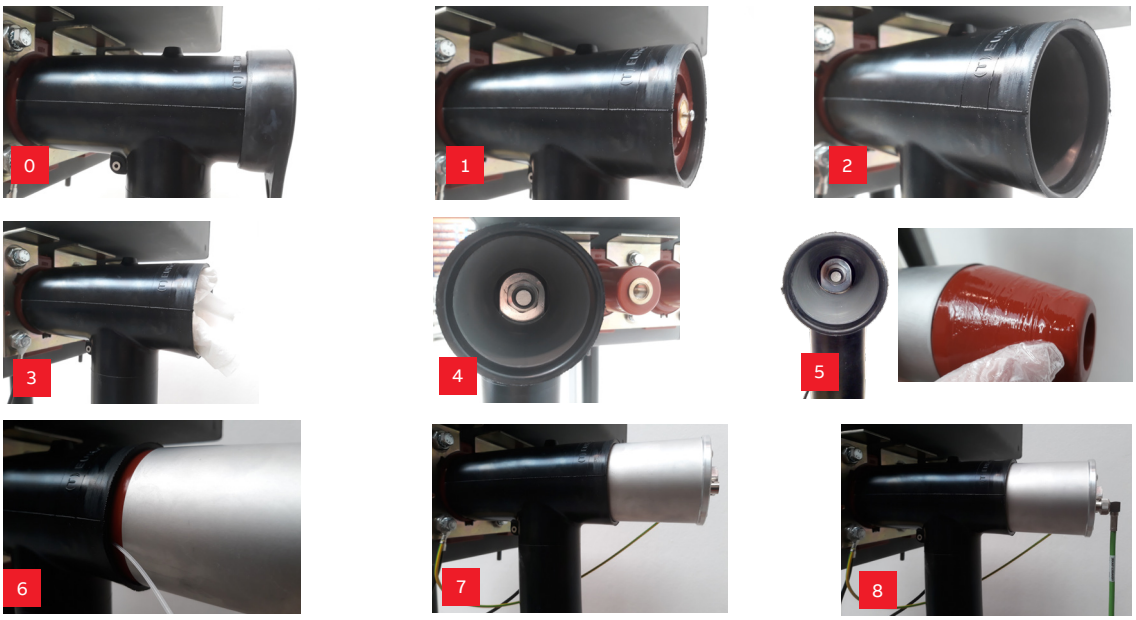
4 step — check the tightening of the screw M16, the tightening hex nut of size 22 mm, recommended tightening torque 50 Nm for Nexans shall be used, see picture 4 and 5, in order to achieve the correct applied torque ensure that there is no lubricant on the threaded parts

5 step — lightly lubricate the PE 1352 WT silicone grease on the inside connector surface (where there is contact between the sensor and the cable connector) by glove, first consistently must be checked that on the surface of inside cone are not any metal burrs, see picture 4. Clean & lubricate KEVA xx C2 4.1(c) cone interface.

6 step — Insert the nylon vent rod into the receptacle to exhaust the air during the assembly. Screw the KEVA xx C2 4.1(c) sensor, the tightening hex nut of size 22 mm, recommended tightening torque 30 Nm shall be used, see picture 6, in order to achieve the correct applied torque ensure that there is no lubricant on the threaded parts. Remove the venting rod after installation

7 step — connect the grounding wire by a screw M8 which is at the frame, see picture 7

8 step — connect the secondary cable of sensor KEVA xx C2 4.1(c) to the BNC connector (check that secondary cable with the same ID number as mentioned on the sensor label is connected), see picture 8



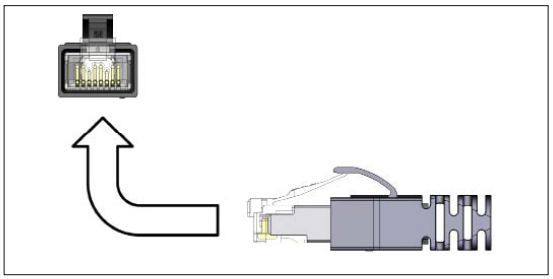
—
10

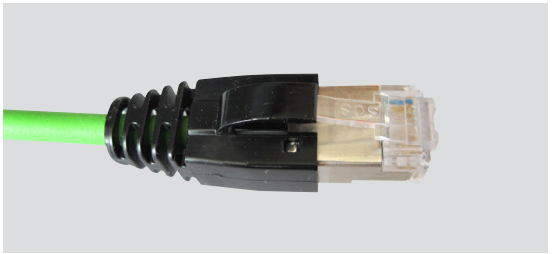
Secondary cable, secondary connections
The secondary cable is a special shielded cable designed to give maximum EMI shielding. The secondary cable is inseparable part of each sensor and cannot be additionally extended, shortened, branched, modified, withdrawn or changed due to the guarantee of accuracy and performance of the sensor.

The cable shall be connected directly (or via a connector adapter if needed - for more information about connector adapters and coupling adapter refer to Doc. No. 1VLC000710 - Sensor Accessories.) to Intelligent Electronic Device (e.g. protection relay). The electrical shielding of cable is connected to connector shielding and shall be earthed on IED side. The cable shall be fixed close to metal wall or inserted inside of metal cable tray far from power cables! The minimal bending radius for the secondary cable is 35 mm. The cable cannot to be moved if the temperature is below 0°C. If cable, connector or connector grommet is damaged please contact the manufacturer for instructions.

Connection to the IED
The sensor cable is terminated by shielded RJ45 plug connector that shall be connected to the inputs of the IED.

See Appendix 1. in case IED is not complying with the same input impedance as defined by IEC 61869-11 standard (2 MOhm / 50 pF).





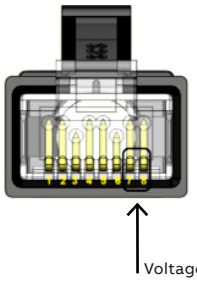
—
11 RJ45 connector

—
12 KEVA 24 Cxx(c) and KEVA xx C2 4.1(c) sensors plug connector pin's assignment

—
13
Example of connection KEVA 24 C10 and KECA 80 C85 sensors with cable RJ45 connectors & REF615 with RJ45 connector =>adapter AR4 (I+U)

Note: It is recommended to use a cable tie to fasten long sensor cables approximately 10 cm from the RJ45 socket.

The sensor plug connector pin's assignment is shown on Fig. 11. (Front view).



Sensor wires connected acc. following assignment:

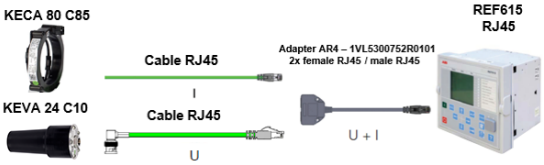
PIN 7 - a
PIN 8 - ⏚
Other pins remain unused

—
12

A cable not connected to the IED can be left open or short-circuited without any harm for the sensor. Nevertheless it is a good safety practice to earth cables not connected to the IED.

RJ45 plug connector has 8 contacts and locking latch coupling. The sensor connector plug shall be inserted properly with the IED matting receptacle before completing the coupling with the bayonet lock. Take care and do not use excessive force to plug-in and plug-out these connectors.

The used RJ45-type connectors (EIA/TIA 568A Standard) are screened and designed to guarantee low resistance shielding; they are particularly adapted to applications where electromagnetic compatibility (EMC) is important. The connectors are robust but it is necessary to be careful during their assembly – do not use force!



—
13

Grounding terminal
The sensor grounding terminal is located on the same side as the sensor secondary cable and shall be connected to the ground during the sensor operation. To ground the sensor the grounding wire (length 0,5 m) with the cable eye M8 is used.

—
14 The sensor grounding terminal and cable eye

—
14

4. Instructions for use

The voltage sensors are used:

- To convert large voltages in the primary circuit of the network to the appropriate signal for the secondary equipment (e.g. IEDs);
- To insulate primary and secondary circuits from each other;
- To protect secondary equipments from harmful effects or large voltages during abnormal situations in the network.

The use of a sensor for other purposes than those described above is forbidden.

Routine test report
The routine test report includes following tests:

a) Verification of terminal marking;
b) Power-frequency withstand test on primary voltage terminal;
c) Partial discharge measurement;
d) Test for accuracy.

Correction factors are measured separately for each sensor during routine testing and are marked on the rating plate. The use of correction factors is required condition in order to achieve the declared accuracy class.

5. Instructions for maintenance

Excessive dust or other kinds of pollution must be brushed off the sensor. Polluted sensors can be cleaned with spirit or petrol. Otherwise, during normal use the sensors do not need any additional maintenance.

6. Transport and storage

The permissible transport and storage temperature for sensors is -40°C...+80°C. During transport and storage the sensors shall be protected against direct sunshine. The sensors are delivered packed into paper boxes or transport pallets. The conical surface must be protected against damage.

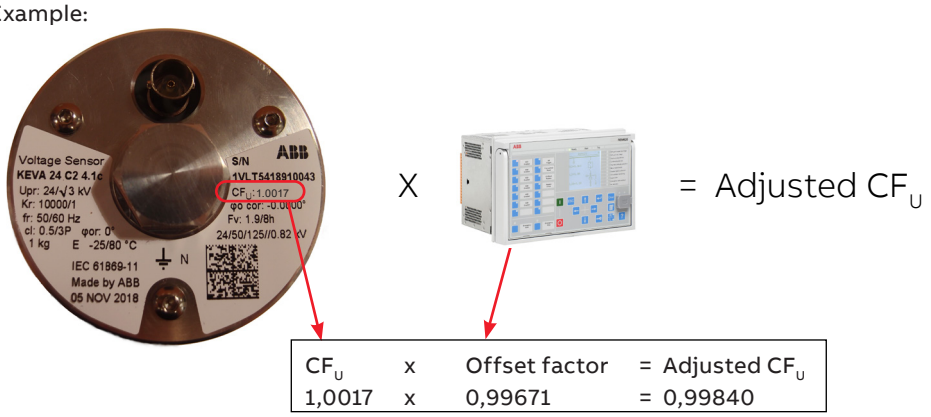
7. Recommended procedure for disposal of the sensor

The sensor does not contain environmentally hazardous materials. For disposal of the product after it has been taken out of use, local regulations, if there are any, should be followed.

Appendix 1.
Offset factor

If the voltage sensors designed according to IEC 61869-11 standard are used with IED which is not complying with the same input impedance as defined by IEC 61869-11 standard (2 MOhm / 50 pF), the “Offset factor” shall be used to compensate input impedance matching error. The final amplitude correction factor („Adjusted CF_U“) shall be then set to IED and shall be calculated in the following way.

Example:



CF_U	x	Offset factor	= Adjusted CF_U
1,0017	x	0,99671	= 0,99840

Where:

- CF_U is an amplitude correction factor mentioned on sensor nameplate or in Routine test report
- Offset factor is an unique factor for each IED type calculated to compensate impedance matching error between Sensor rated burden (2 MOhm / 50 pF) and IED input impedance – see the table below for IEDs
- Adjusted CF_U is a final amplitude correction factor which shall be set to IED

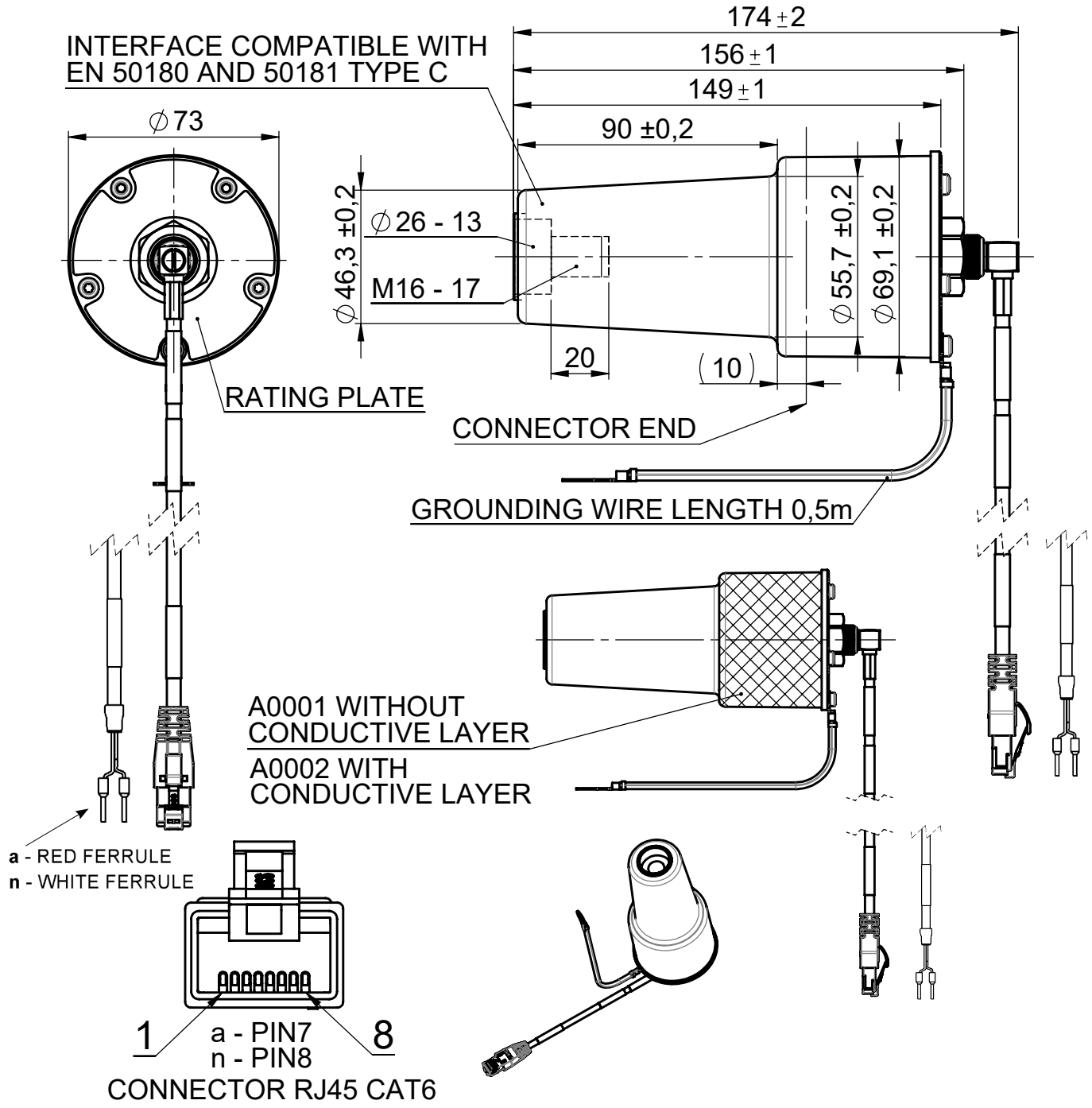
KEVA 24 C2 4.1 KEVA 36 C2 4.1 KEVA 40.5 C2 4.1	**RIO 600**	**615 / 620 SERIES**	**640 SERIES**
			
Offset factor			
KEVA 24 C2 4.1	**0.99910**	**0.99671**	**0.99256**
KEVA 36 C2 4.1	**0.99870**	**0.99187**	**0.98174**

Tab. 1: Offset factors for selected compatible IEDs

Appendix 2.
Dimensional Drawings

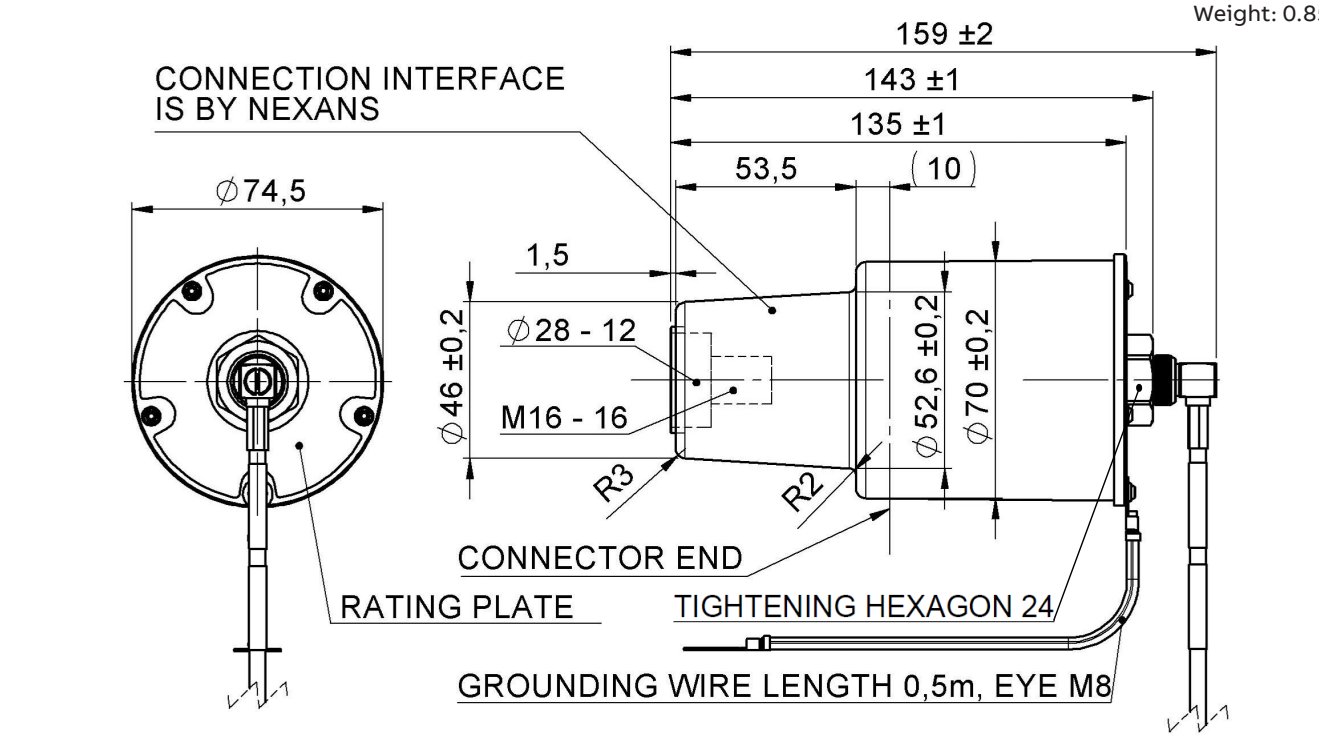
KEVA 24 C10(c)

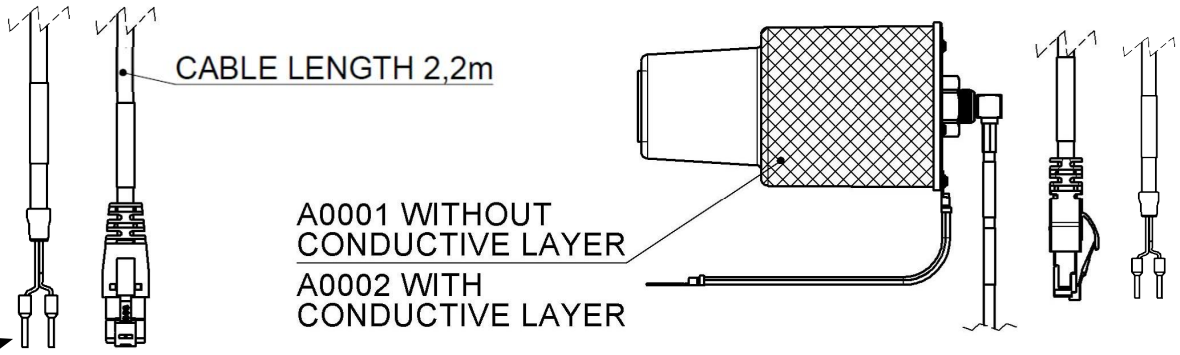
Outline drawing numbers:
2RKA015654A0001 (KEVA 24 C10)
2RKA015654A0002 (KEVA 24 C10c)
Weight: 0.85 kg

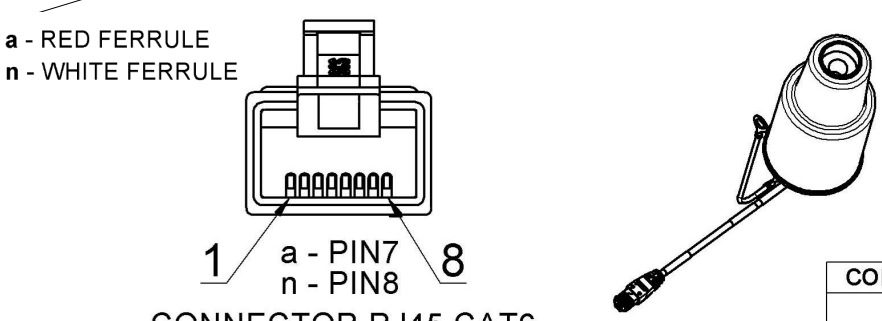


KEVA 24 C24(c)

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





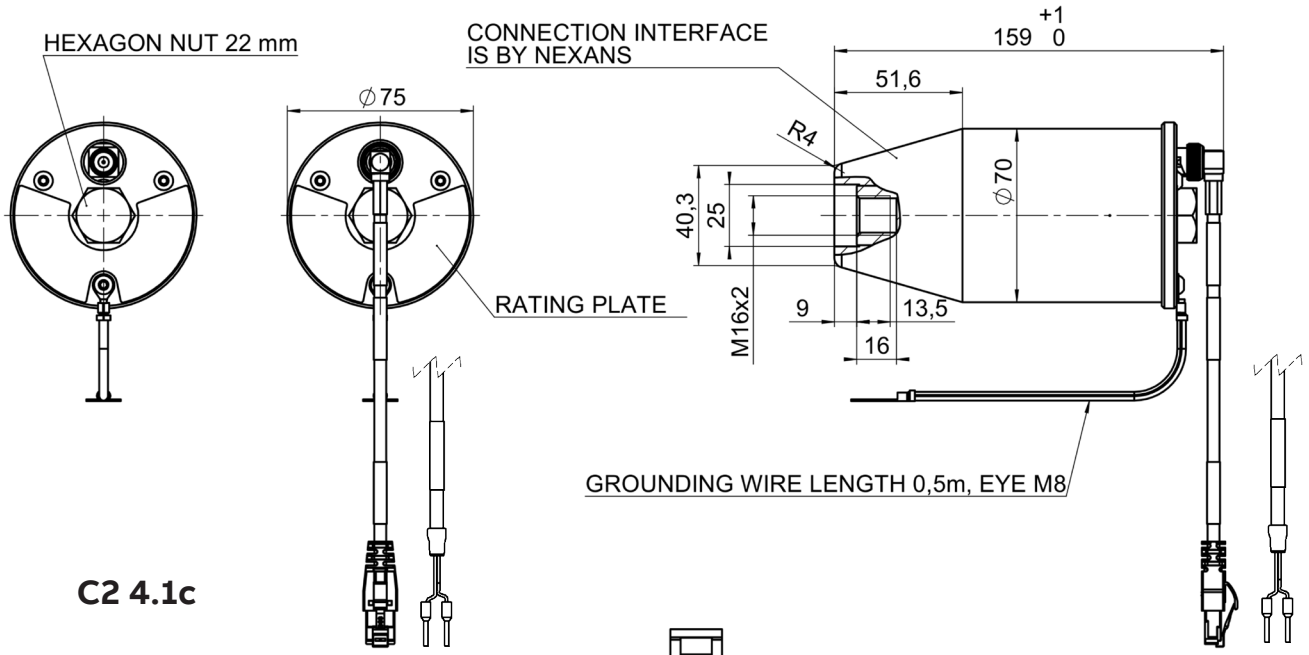


configuration	type
A0001	KEVA 24 C24
A0002	KEVA 24 C24c

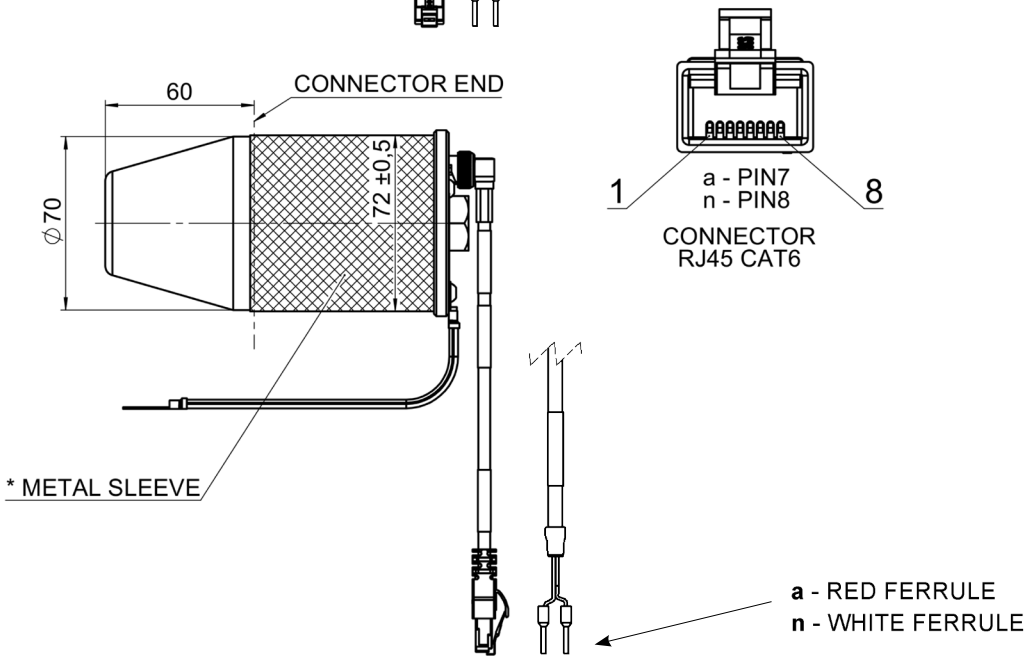
KEVA 24 C2 4.1(c)
KEVA 36 C2 4.1(c)
KEVA 40.5 C2 4.1(c)

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

C2 4.1



C2 4.1c



CONTACT US
ABB s.r.o.
ELDS Brno
Videnska 117, 619 00 Brno,
Czech Republic
Tel.: +420 547 152 021
+420 547 152 854
Fax: +420 547 152 626
E-mail: kontakt@cz.abb.com

www.abb.com

NOTE
We reserve the right to make technical changes or modify the contents of this document without prior notice. With regard to purchase orders, the agreed particulars shall prevail. ABB does not accept any responsibility whatsoever for potential errors or possible lack of information in this document.

1VLM000808 Rev.5, en 2022.06.16