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Product range 2026

Rogowski coils

For precise, linear and reliable current measurement.

Flexible solution for demanding current measurements

- Perfect for precise measurements of fast or large alternating currents
- Linear measurement behaviour over a wide range
- Ideal when classic current transformers reach their limits

Rogowski coils
Innovative technology for accurate current measurement

The Rogowski coil FASK:
Flexible current transformers for primary currents up to 100 kA

Technical fundamentals

In addition to conventional current transformers, Rogowski coils can also be used for current measurement. Due to the absence of an iron core, there are no non-linear influences from the iron core. Rogowski coils can be easily installed and removed without disconnecting the circuit, i.e. without major installation work. Unlike current transformers, high short-circuit currents in power distribution do not cause high forces and losses in Rogowski coils.

There are also no saturation or remanence effects that are detrimental to the measurement, which require time-consuming demagnetisation in normal current transformers.

Likewise, no dangerous voltages can be generated in open operation, which means that there is no danger for electricians in this respect.

Air coil / Rogowski coil

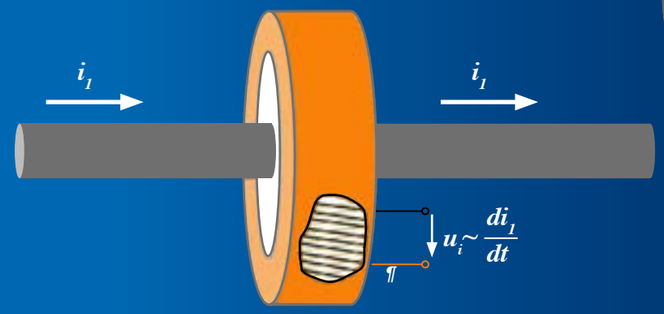


Figure 1: Rogowski coil with primary conductor

As can be seen in the figure, the output signal of the passive Rogowski coil is a voltage signal that is proportional to the change in the primary current. If the primary current is a 50 Hz sinusoidal signal, as is common in electrical power distribution systems in Europe, the following expression applies.

$$i_1 = \hat{i}_1 \times \sin(2\pi f \times t)$$

To determine the slope of the tangents at point t, the derivative of function i_1 with respect to t is calculated. This results in the equation.

$$\frac{di_1}{dt} = 2\pi f \times \hat{i}_1 \times \cos(2\pi f \times t)$$

The output voltage of the Rogowski coil is therefore proportional to the derivative of i1 with respect to time. Since the cosine function is offset by -90° relative to the sine function, the voltage signal u_i is also shifted by -90° relative to the primary current i_1.

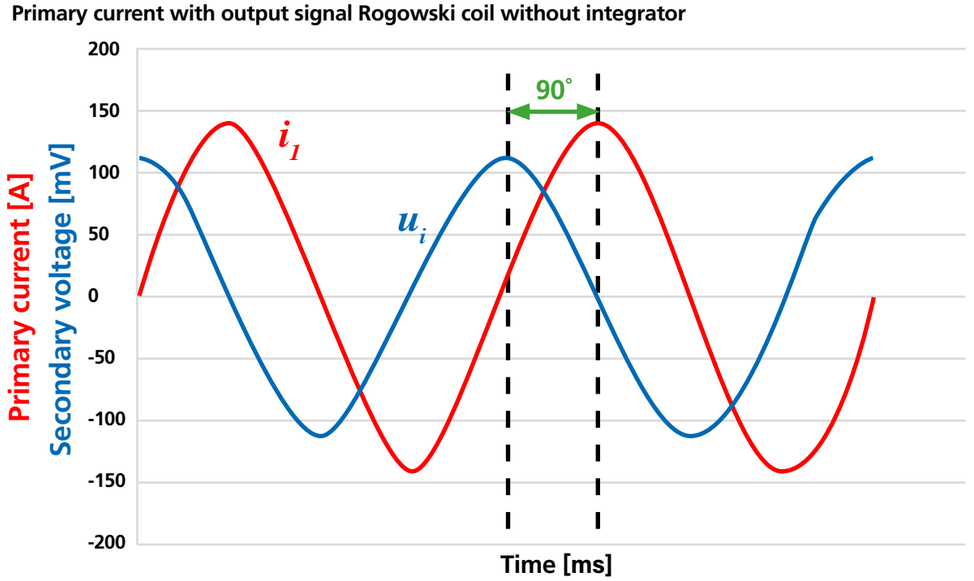


Figure 2: Comparison of primary current and output signal of a passive Rogowski coil

If the Rogowski coil is now tuned to the current signal to be measured at 50 Hz, the current value i can be calculated by taking into account the transformation factor and the phase shift of -90°.
If the rated frequency of the signal now changes, the amplitude value of u_i is also affected.

$$u_i \sim \frac{di_1}{dt} = 2\pi f \times \hat{i}_1 \times \cos(2\pi f \times t)$$

These effects can be cancelled out in an electronic integrator circuit. Mathematically speaking, the derivative with respect to t is integrated. The cosine function becomes the sine function again, and the 90-degree phase shift is cancelled out. An integrator that provides a current signal as its output results in the following equivalent circuit diagram.

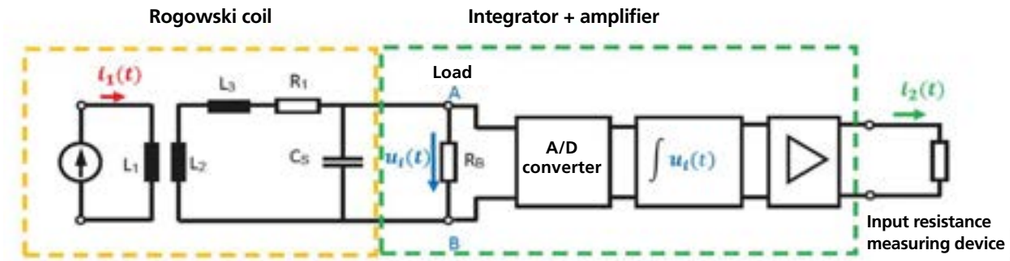


Figure 3: Electrical equivalent circuit diagram of Rogowski coil + 1 A integrator

The Rogowski coil FASK:
Convincing advantages for flexible measurements

The MBS Rogowski models FASK are available in four different diameters (100, 150, 200 and 300 mm). The closure has a slot for a cable tie, which is used to secure the coil to the primary conductor.

Figure 4: The FASK 100 Rogowski coil

General characteristics

In order to achieve maximum accuracy when measuring with Rogowski coils, the following points must be observed:

- The Rogowski coil, including the supply cable, should be completely shielded to avoid parasitic influences.
- The output voltage of Rogowski coils is usually specified in mV/kA. Since voltage signals are generally considered to be more susceptible to interference, the coil should generate as large a voltage signal as possible at the output, because if smaller primary currents flow, the output signal can be influenced by noise or interference signals, so that the specified class accuracies are no longer achieved.
- The position of the primary conductor often influences the accuracy. During installation, are should be taken to position the coil in such a way that the best accuracy is achieved.

Advantages of the FASK Rogowski coil

- The FASK 100, 150, 200 and 300 Rogowski coils are fully shielded and thus largely protected from interference.
- All Rogowski coils generate a relatively large output signal of 100 mV/kA. Thanks to the good linearity of the coil, even smaller primary currents well below 1 kA can be measured accurately
- The FASK Rogowski coils have a phase error between -0.4 and -0.5 degrees, so that a fixed correction factor can also be used in the measuring device.
- The materials allow use in very harsh ambient temperatures. The coils do not generate any waste heat.
- Shortening of the supply line without loss of accuracy.

As with any Rogowski coil, the positioning of the primary conductor affects accuracy. The FASK series is designed so that the smallest error occurs directly at the closure and thus in the area where it can be fixed. The following illustration clarifies this fact and defines the exact error values.

Primary conductor position	Common mistake [%]
Directly on the closure	< 0,5
Centred on the outer edges of the coils	< 0,8
Directly on the opposite side of the closure	< 1,0

Figure 5: Primary conductor position with typical error values

Assembly

Installing these sensors is extremely simple. The coil is placed around the primary conductor and secured with the fastener in just a few simple steps. The primary conductor does not need to be disconnected.

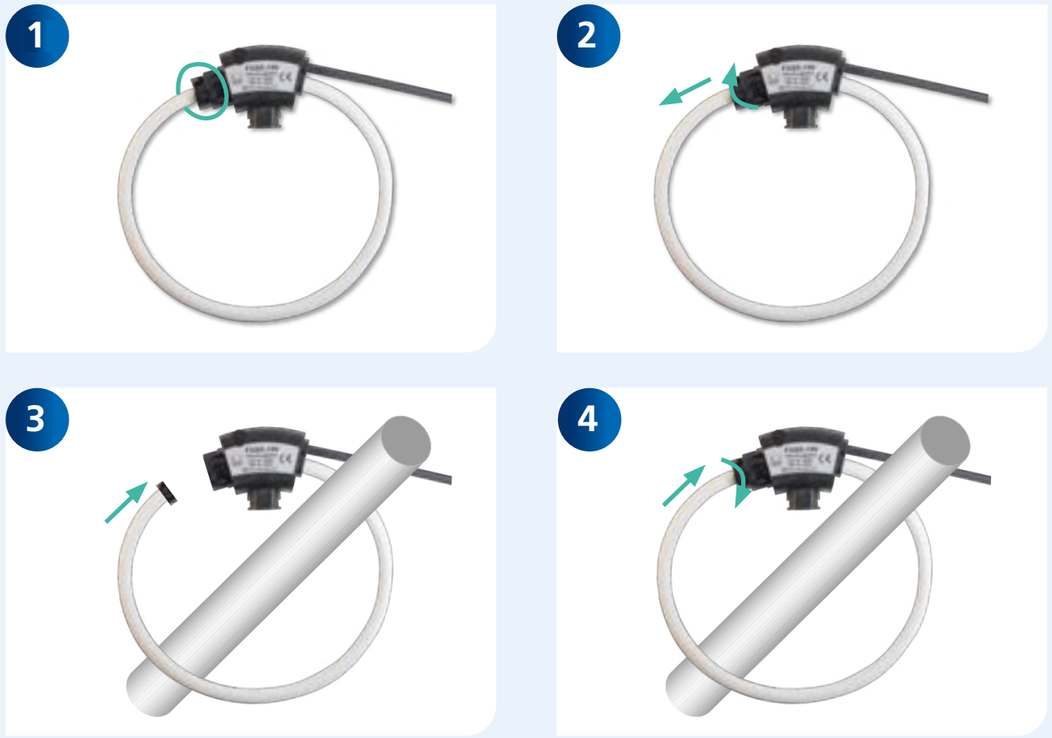


Figure 6: Installation of the FASK

The FASK Rogowski coil: Innovative technology

Model	FASK-100	FASK-150	FASK-200	FASK-300
Coil length	395 mm	525 mm	665 mm	965 mm
Coil window size	100 mm	150 mm	200 mm	300 mm
Reference current	0-10 kA	0-10 kA	0-10 kA	0-10 kA
Weight	approx. 100- 160 g			
Transmission ratio	100 mV/kA @ 50 Hz			
Transmission error	< 0,5 % at the central position on the fastener @ 25 °C			
Phase error	≤ 0,5 ° (30 angular minutes)			
Maximum measurable current	100 kA			
Coil resistance	lies between 100 and 250 Ohm			
Coil diameter	8 mm			
Lead length	3 m / 5 m / 10 m	3 m / 10 m	3 m / 10 m	3 m / 10 m
Temperature coefficient	400 ppm/K			
Position error	± 1 % maximum			
Linearity error	± 0,2 % maximum of the measured value			
Bandwidth	1 Hz up to 100 kHz (- 3dB)			
Operating temperature range	-30 up to +80 °C			
Storage temperature range	-40 up to +90 °C			

Materials used

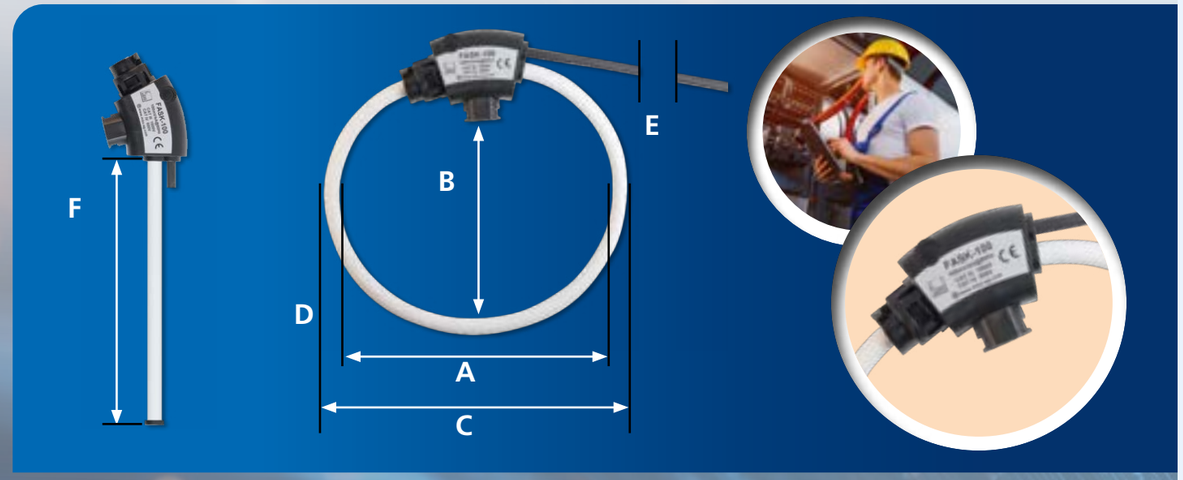
Model	FASK 100, 150, 200 and 300
Coil & cable	Thermoplastic rubber flame retardant according to UL 94 V-0
Connector	According to PA6 UL 94 V-0
Colour (coil)	Blue
Shielding	100 % coil and 100 % supply cable

Safety

Model	FASK 100, 150, 200 and 300
Certifications	CE certified
	Fulfils the EMC EN 61326-1:2006
	IP 68
Insulation voltage	Coil: 3000 V
	Supply line: 1000 V
Safety	1000 V CATIII; 600 V CATIV

Subject to technical changes.
Please note that the above specifications are standard values. Different values are available on request.

The perfect dimensions for every application



Name	Description	FASK-100	FASK-150	FASK-200	FASK-300
A	Window size A [mm]	135	165	210	310
B	Window size B [mm]	100	150	200	300
C	Outer diameter of coil [mm]	151	181	226	326
D	Coil diameter [mm]	8			
E	Length of supply cable [m]	3 / 5 / 10	3 / 10	3 / 10	3 / 10
F	Coil length [mm]	395	525	665	965

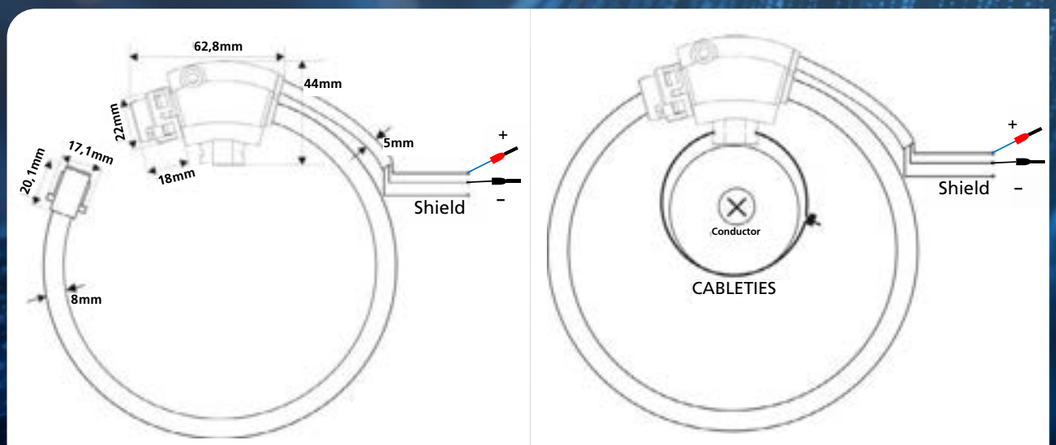


Figure 7: Connections and other dimensions of the FASK 100, 150, 200 and 300

The ROI-3 integrator: Practical solution with three-phase integrator

An integrator circuit is required to correct the phase angle of the passive Rogowski coil by 90°. At the same time, it is desirable to obtain a standard signal to ensure compatibility with common measuring instruments.

The three-phase integrator ROI-3 is ideally suited for an output of 3 x 1 A. Three Rogowski coils can be connected simultaneously. A 24 VDC source is required as the power supply.

Installation is intended on a 35 mm DIN top-hat rail.

The output signal (1A) may only be connected to the measuring device using potential-separated 1A current transformer inputs.

Connecting the input or output signal to an external voltage is not permitted and may result in damage to the ROI-3 transmitter.

Figure 8: 3-phase integrator ROI-3

Mode of action of ROI-3

- An integrator is essential for balancing the output signal of the Rogowski coils and shifting it by 90°. It consists of an active electronic circuit with negligible offset and good linearity.
- The output voltage signal of the Rogowski coil is converted to the standard signal 1 A.
- The output voltage signal of the passive Rogowski coil is proportional to the frequency of the measured current. The built-in equaliser guarantees a signal that is linear to the primary current over a wide frequency range.
- When ordering in conjunction with the FASK Rogowski coil, the primary rated current must be specified. This results in a fixed transmission ratio as with a conventional current transformer (e.g. 1,000 / 1 A). The primary measuring range of 0-1000 A is mapped to the secondary measuring range of 0-1 A.

Advantages of the ROI-3

- Compact housing for connecting three FASK
- The ROI-3 does not measure direct currents in conjunction with the FASK, but unlike a current transformer, it can perform accurate measurements of the alternating current component even if there is a large superimposed direct current component, as no iron core causes saturation. This function is particularly useful for measuring ripple currents, for example in battery charging systems.
- The ROI-3 integrator has relatively good frequency response.

Pin assignment

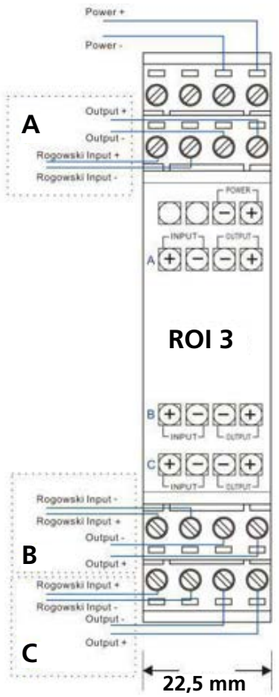


Figure 9: Connection diagram of the ROI-3

Specifications

Model	ROI-3
Number of phase connections	3
Rated output signal	1A AC rms ; 333 mV
Max. output signal (overload)	1,5 A AC rms
Primary rated currents [A]	250; 400; 630; 1.000; 1.500; 2.000; 4.000; 6.000; 10.000
Translation accuracy	0,5 % translation accuracy at1 % of primary rated current @ 25 °C
Phase error	≤ 0,5 °
Linearity	± 0,2 % of the measured value (at 10 – 120 % of the rated current)
Bandwidth	30 Hz up to 5 kHz
Maximum load per phase	0,5 Ω
Power consumption	10 W
Output at 0A (zero drift)	≤ 0,01 A
Temperature drift	200 ppm/K
Weight	185 g
Dimensions	114 x 100 x 22,5 mm
Supply voltage	24V DC
Operating temperature range	-30 °C up to +70 °C
Storage temperature range	-30 °C up to +70 °C
Relative humidity	80 % maximum without condensation
Protection rating	IP 20
Certification	CE certified

Dimensions

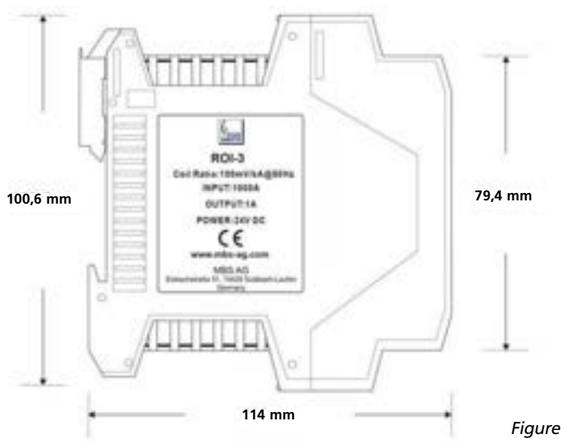
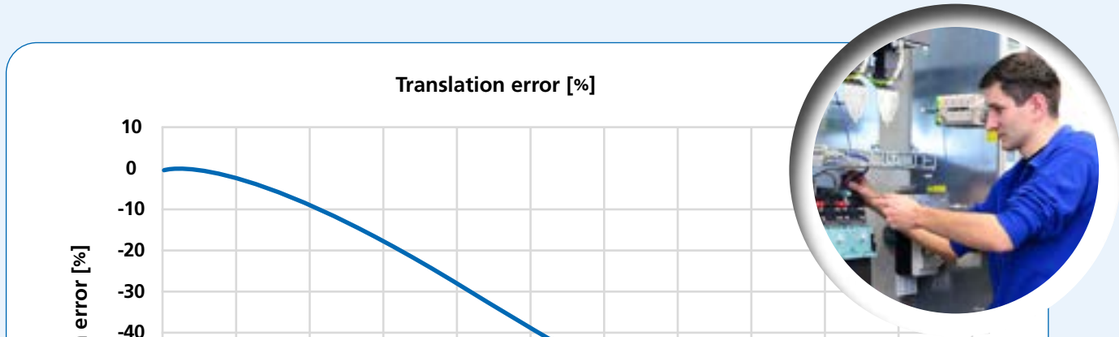


Figure 10: Dimensions of the ROI-3

Frequency transmission behaviour of the ROI-3



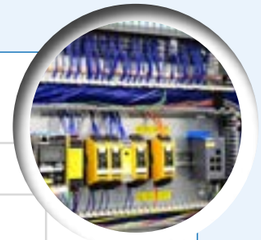


Figure 11: Frequency transfer behaviour of the ROI-3 with a FASK 150 (amplitude error and phase error)

Ordering table for Rogowski coils FASK and integrator ROI-3

Product	Translation ratio	Description	Item no.
FASK-100 (3 m)	100 mV / kA	FASK 100 100 mV/kA 3m	100131-10001
FASK-100 (5 m)	100 mV / kA	FASK 100 100 mV/kA 5m	100131-10002
FASK-100 (10m)	100 mV / kA	FASK 100 100 mV/kA 10m	100131-10006
FASK-150 (3 m)	100 mV / kA	FASK 150 100 mV/kA 3m	100131-10003
FASK-150 (10m)	100 mV / kA	FASK 150 100 mV/kA 10m	100131-10007
FASK-200 (3 m)	100 mV / kA	FASK 200 100 mV/kA 3m	100131-10004
FASK-200 (10m)	100 mV / kA	FASK 200 100 mV/kA 10m	100131-10008
FASK-300 (3 m)	100 mV / kA	FASK 300 100mV/kA 3m	100131-10005
FASK-300 (10m)	100 mV / kA	FASK 300 100 mV/kA 10m	100131-10009
ROI-3 (250 A)	250 / 1A	ROI 3 100mV/kA 0,25kA	100121-10101
ROI-3 (400 A)	400 / 1A	ROI 3 100mV/kA 0,4kA	100121-10102
ROI-3 (630 A)	630 / 1A	ROI 3 100mV/kA 0,63kA	100121-10103
ROI-3 (1 kA)	1000 / 1A	ROI 3 100mV/kA 1kA	100121-10104
ROI-3 (1,5 kA)	1500 / 1A	ROI 3 100mV/kA 1,5kA	100121-10105
ROI-3 (2 kA)	2000 / 1A	ROI 3 100mV/kA 2kA	100121-10106
ROI-3 (4 kA)	4000 / 1A	ROI 3 100mV/kA 4kA	100121-10107
ROI-3 (6 kA)	6000 / 1A	ROI 3 100mV/kA 6kA	100121-10108
ROI-3 (10 kA)	10000 / 1A	ROI 3 100mV/kA 10kA	100121-10109
ROI-3 (250 A)	250 / 333 mV	ROI 3 100mV/kA 0,25kA	100121-10201
ROI-3 (400 A)	400 / 333 mV	ROI 3 100mV/kA 0,4kA	100121-10202
ROI-3 (630 A)	630 / 333 mV	ROI 3 100mV/kA 0,63kA	100121-10203
ROI-3 (1 kA)	1000 / 333 mV	ROI 3 100mV/kA 1kA	100121-10204
ROI-3 (1,5 kA)	1500 / 333 mV	ROI 3 100mV/kA 1,5kA	100121-10205
ROI-3 (2 kA)	2000 / 333 mV	ROI 3 100mV/kA 2kA	100121-10206
ROI-3 (4 kA)	4000 / 333 mV	ROI 3 100mV/kA 4kA	100121-10207
ROI-3 (6 kA)	6000 / 333 mV	ROI 3 100mV/kA 6kA	100121-10208
ROI-3 (10 kA)	10000 / 333 mV	ROI 3 100mV/kA 10kA	100121-10209

Safety instructions

Read these instructions carefully to ensure safe operation of the Rogowski coil or integrator and to be able to use all features and functions properly! Safe operation can only be guaranteed if the Rogowski coil is used for its intended purpose and within the specified range, and if the technical constraints are observed.

Attention

Failure to observe the warnings may result in serious injury and/or damage to property!

The current sensor may only be installed and commissioned by appropriately trained specialist personnel. The relevant national regulations must be observed during installation and operation of the current sensor. The current sensor must be used in compliance with the applicable standards and safety requirements and in accordance with the operating instructions of the respective system and component manufacturers.

During operation of the sensor or integrator, certain parts of the control cabinet or power distribution system may be under dangerous voltage (e.g. primary conductors). The user must ensure that all necessary measures are taken to protect against electric shock. The sensor or integrator is a built-in device that contains conductive parts that must not be accessible after installation. A protective enclosure or additional insulation barrier may be required. Installation and maintenance must be carried out with the main power supply disconnected, unless there are no dangerous live parts in or in the immediate vicinity of the system. In addition, the applicable national regulations must be fully complied with.

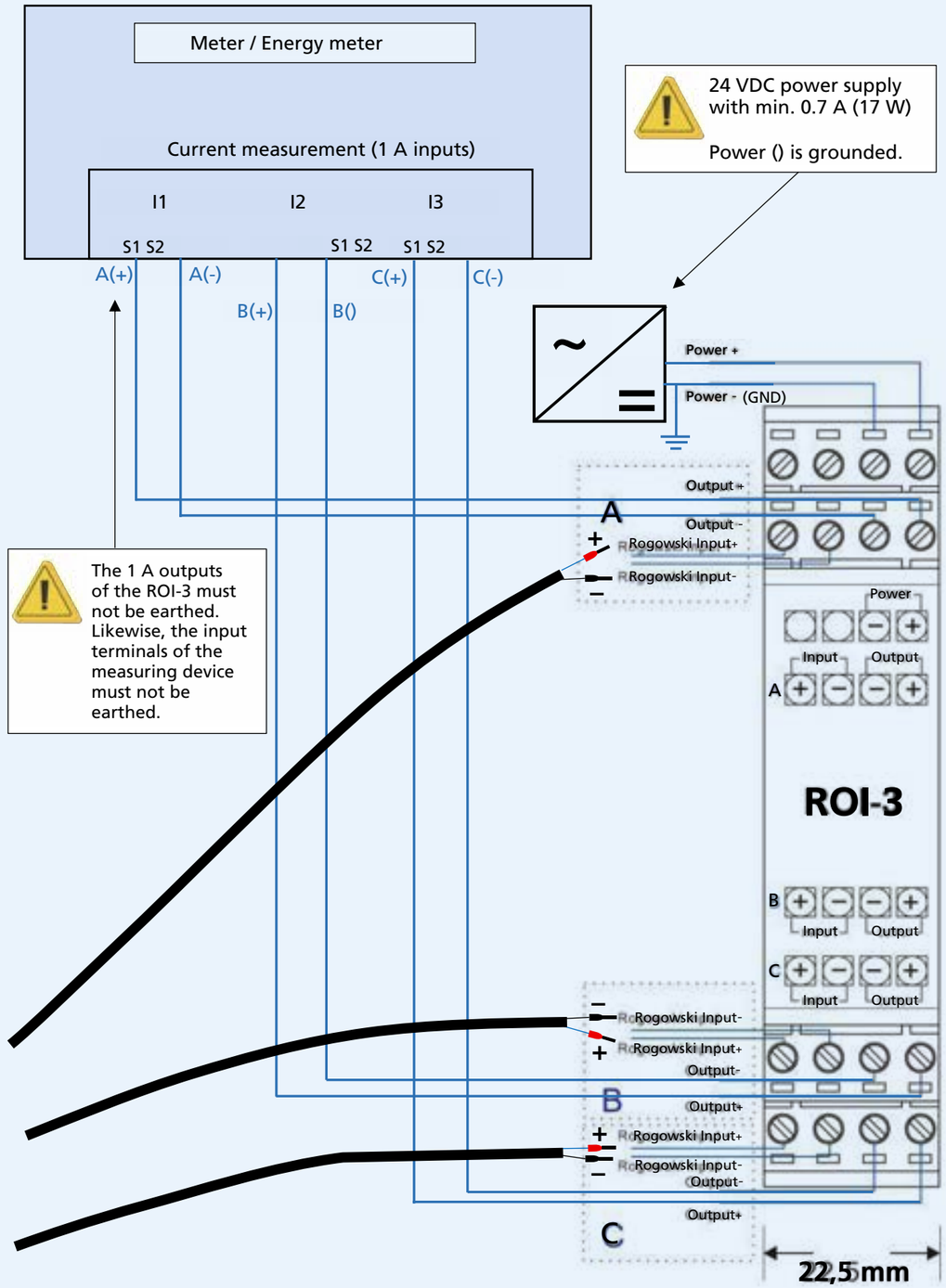
Safe and trouble-free operation of this sensor or integrator can only be guaranteed if transport, storage and installation are carried out properly. The technical specifications must not be violated during operation. Maintenance must be carried out carefully.

Warning

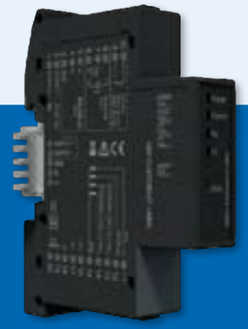
Do not exert any mechanical force on the coil (twisting, piercing, excessive pressure, bending too much, etc.). This can significantly impair the accuracy of the device.

Operating and connection example

to a meter with 1 A current transformer inputs



QE-485 universal converter:
With analogue and Modbus output



Application

The universal current and voltage converter QE-485 is the all-in-one solution for all your measurements, monitoring and analyses. It enables the connection of Rogowski coils, current transformers, transducers and universal current sensors (Hall transducers).

It also offers the option of monitoring the temperature at the same time. On the output side, the converter offers a freely configurable analogue output, a digital output and an RS485 Modbus RTU interface.

Features / Benefits

- Input for:
  - Rogowski coils
  - Current transformers with secondary current 5 A or 1 A
  - Voltage ± 10 V_{pk} or ± 1 V_{pk}
  - Current transformers with secondary voltage 333mV
  - Transducers 20 mA or 100 mA AC / DC
  - All-current sensors (Hall effect sensors) ± 15 V DC
- Additional temperature measurement (PT100 or NTC)
- Output: RS485 Modbus RTU 0...10 V / 0...20 mA (freely configurable) OptoMOS relay, max. 50 mA; max. 30 V DC
- Flexible use thanks to simple configuration via free software (download from www.mbs-ag.com)
- Easy mounting on 35 mm DIN rail
- Auxiliary power supply: 10...30 V DC; Power consumption: max. 2.5 VA

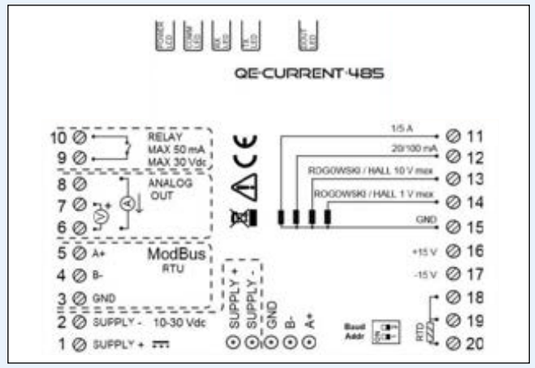
General technical characteristics

- Operating temperature range: -10 °C … +60 °C
- Storage temperature range: -40 °C … +85 °C
- Humidity: 10 – 90 %, no condensation
- Operating height: ≤ 2000 m
- Protection class: IP20
- Sampling rate: 6400 Hz @ 50 Hz
- Accuracy of analogue output: 0.1 %
- Baud rate: 1200...115,200 baud (default: 9600 baud)
- Weight: approx. 55 g

Accuracy

Entrance:	Crest Factor	Measurement error	Temp. coefficient	Band-width
5 A / 1 A	4 (@ 5A)	50 mA ... 250 mA: ± 1% 250 mA ... 5 A: ± 0,5%	< 100 ppm/°C	> 2 kHz
20 / 100 mA	4 (@ 100mA)	1 mA ... 5 mA: ±1% 5 mA ... 100 mA: ±0,5%	< 100 ppm/°C	> 2 kHz
± 1 V_{pk}		10 mV ... 50 mV: ± 1% 50 mV ... 1 V: ± 0,5%	< 100 ppm/°C	> 2 kHz
± 10 V_{pk}		100 mV ... 500 mV: ± 1% 500 mV ... 10 V: ± 0,5%	< 100 ppm/°C	> 800 Hz

Connection overview



Ordering table / available measurements

Item no.	I_{RMS}	max. I_{RMS}	min. I_{RMS}	Ø. I_{RMS}	Ah (I_{RMS})	I_{DC}	max. I_{DC}	min. I_{DC}	Ø. I_{DC}	Ah (I_{DC})	IAC	max. I_{AC}	min. I_{AC}	Ø. I_{AC}	Ah (I_{AC})	Hz	Crest-Factor	I_{peak}	THD	Tempe-rature	Internal tempe-rature	Measure-ment up to the 63rd harmonic
100120-00001	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•			•		
100120-00002	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•

Accessories

Product	item number
Modbus USB stick	120-00100

Universal converter QE-485:
Settings options in the software