# MFC150

## Flexible Rogowski coil

- Suitable to measure currents from mA to hundreds of kA
- High linearity
- Wide dynamic range
- Very useful with large size or awkward shaped conductors or in places with limited access
- No danger from open-circuited secondary
- Not damaged by large overloads
- Non-intrusive, no power drawn from the main
- Thanks to its light weight, it can be hanged on the measured conductor
- Coil length over 2 m
- Totally shielded

### General description

MFC150 is a flexible current transducer based on Rogowski principle, particularly suitable for measurement in combination with portable devices.

MFC150 coils are available in different sizes and can be supplied according to customer's design, with a length over 2 m, therefore they can be used in all those applications, in which traditional transducers are not fitting due to its size and/or weight.

Due to its specific features, flexible Rogowski coil is an extremely confortable solution for current measurement and can be used in a number of cases where traditional current transducer is not the adequate solution.

MFC150 coil is provided with a shield against the influence of external magnetic fields, therefore it grants a stable measurement from low currents to hundreds of kiloamps.

The Rogowski coils must be connected to an electronic integrator for 90° phase shift compensation and frequency equalization.

Our portable and panel meters can interface Rogowski coils directly without the need of the external integrators. This is an advantage because there is no external boxes or any power supply with consequent ease of use.

The particular features of the Rogowski coils combined with the extremely flexible input programming of our portable meters, allow to carry out measurement by all applications.

### Benefits

- Due to its structure, flexible Rogowski coils allows to embrace conductors or grouped cables, which are large and difficult to reach, without any hazard.
- The coil output gives a low voltage signal, therefore there is no danger from open-circuited secondary. This makes Rogowski transducers extremely suitable for temporary measurements, for example in combination with portable analysers.
- Unlike traditional current transformer with magnetic core, the Rogowski coil is a non-intrusive transducer. Since it has no hard core, it draws no power from the main circuit carrying the current to be measured.
- The absence of magnetic core grants a wide frequency response, up to hundreds of kHz. This make MFC150 particularly suitable for measurement of harmonic content and transients.

### Applications

- Measuring devices, lab instrumentation
- Power monitoring & control systems
- DC ripple measurement
- Harmonics and transients monitoring
- Very high current monitoring

## What is a Rogowski coil?

Rogowski coils have been used for the detection and measurement of electric currents for decades. They are based on a simple principle: an "air-cored" coil is placed around the conductor in a toroidal fashion and the magnetic field produced by the current induces a voltage in the coil. The voltage output is proportional to the rate of change of current. This voltage is integrated, thus producing an output proportional to the current.

By using precision winding techniques, especially developed for the purpose, the coils are manufactured so that their output is not influenced by the position of the conductor within the toroid, and to reject interference from external magnetic fields caused, for example, from nearby conductors.

Basically, a Rogowski coil current measuring system consists of a combination of a coil and conditioning electronics (see picture below).

Rogowski coil current transducers are used for the AC measurement.

They can be used in similar circumstances to current transformers but for many applications they have considerable advantages:

- Wide dynamic range. The same coil can be used to measure currents from milliamps to hundred of kiloamps, it is enough to change the RC value in the integrator.
- High linearity. According to the manufacturing (size, inductance value, ...) the maximum measurable frequency can range up to hundreds of kHz and in some special models also MHz.
- Very useful with large size or awkward shaped conductors or in places with limited access. Thanks to the structure without hard core, the coil can be easily manufactured according to the application or to the available space.
- Unlike traditional current transducers, there is no danger from open-circuited secondaries.
- They cannot be damaged by large overloads.
- They are non-intrusive. They draw no power from the main circuit carrying the current to be measured.
- They are also light weighted and in some applications are light enough to be suspended on the conductor being measured.

The transducer does not measure direct currents but, unlike a current transformer, it can carry out accurate measurements of AC component even if there is a large superimposed DC component, since there is no iron core causing saturation. This feature is particularly useful for measuring ripple currents for example in battery charging systems.

## Specifications

### Transducer

| | |
|---|---|
| Coil length: | from 35 to 270 cm |
| Locking: | bayonet holder |
| Weight: | from 90 to 650 g |
| Material: | thermoplastic rubber UL94-V0 |

### Connection Cable

| | |
|---|---|
| Type: | 2 x 0.15 mm + shield |
| Length: | approx. 3 m |
| Material: | thermoplastic rubber UL94-V0 |

### Electrical characteristics

| | |
|---|---|
| Output level (RMS) (1): | 40 or 100 mV / 1 kA @ 50 Hz (other values on request) |
| Output permissible load: | › 15 kOhm for best accuracy |
| Coil resistance: | from 20 to 140 Ohm (100 mV) from 7 to 40 Ohm (40 mV) |
| Accuracy (2): | ± 2% without calibration, better than ±1% with calibration resistor |
| Frequency range (3) (4): | approx 8 Hz to 20 kHz the range depends on the coil length |
| Working voltage: | 1000 $V_{RMS}$ max installation category CAT III pollution degree 2 |
| Test voltage: | 7400 $V_{RMS}$ / 1 min |

### Environmental conditions

| | |
|---|---|
| Operating temperature: | from -20°C to +80°C |
| Relative humidity: | 95% max. without condensation |

### Standards compliance

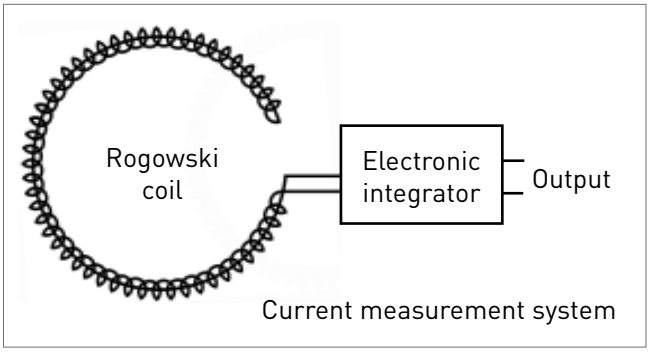
| | |
|---|---|
| Safety: | EN61010-1, EN61010-031, EN61010-2-031, EN61010-2-032 standards |

(1) The Rogowski coil output is proportional to the rate of change of current. The calculation formula is: Ampere RMS x Hertz x K x $10^{-6}$, where K depends on manufacturing. The K value is 2 for 100 mV model and 0.8 for 40 mV model.

(2) All accuracies are specified at 23°C (± 2°C) with conductor carrying the current centered in the coil.

(3) The low limit is approximate and it is determined by noise effect on very low signals.

(4) For 1V/1kA@50Hz the frequency range is 8 Hz to 1 kHz.



Current measurement system

## ORDER CODE

AVF | | | | | | | | | | | | |

**MFC150**

**Series**
A = Algodue
C = Custom

**Coil length**
Value expressed in cm.
From 35 to 270 cm.
E.g.
035 = 35 cm
270 = 270 cm

**Output value**
Value expressed in mV/kA @50 Hz and it depends on the manufacturing.
Standard values are 40 and 100 mV.
E.g.
040 = 40 mV/1kA @ 50 Hz
100 = 100 mV/1kA @ 50 Hz
V01 = 1V/1kA @ 50 Hz

**Accuracy**
S = ‹ 1% - calibrated
(calibration resistor included)
3 = S + FRB connector
(for portable power meters)

**Cable length**
Value expressed in cm.
Standard value is 300 cm.
E.g.
300 = 300 cm

**Colour**
B = Blue (standard)
R = Red

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# GPC80

## Split rigid Rogowski coil

- Suitable to measure currents from mA to kA
- High linearity
- Wide dynamic range
- No danger from open-circuited secondary
- Not damaged by large overloads
- Non-intrusive, no power drawn from the mains
- Thanks to its light weight, it can be hanged on the measured conductor
- Coil diameter from 35 to 100 mm
- Very useful for measurements in places with limited available space

### General description

GPC80 is a split rigid current transducer based on Rogowski principle, particularly suitable for measurement in places with limited available space.

GPC80 coils are available in different sizes, starting from a 35 mm length. They can be used in all those applications, in which traditional transducers are not fitting due to its size and/or weight.

GPC80 coils offer a very good linearity when subjected to very high currents because they are not affected by saturation. They are particularly suitable for current measurement in high power and/or high frequency control devices, welding machine, etc.

The excellent transient response make them also suitable as current transducers for protection systems.

The Rogowski coils must be connected to an electronic integrator for 90° phase shift compensation and frequency equalization.

Our portable and panel meters can interface Rogowski coils directly without the need of the external integrators. This is an advantage because there is no external boxes or any power supply with consequent ease of use.

The particular features of the Rogowski coils combined with the extremely flexible input programming of our portable meters, allow to carry out measurement by all applications.

### Benefits

- GPC80 is small and lightweight. It can be used for current measurement in places with limited available space like for example junction boxes. It is lightweighted therefore it is not necessary to fix the transducer, allowing time and cost saving on mounting.
- The coil output gives a low voltage signal, therefore there is no danger from open-circuited secondary. This makes Rogowski transducers also suitable for temporary measurements, for example in combination with portable analysers.
- Unlike traditional current transformer with magnetic core, the Rogowski coil is a non-intrusive transducer. Since it has no hard core, it draws no power from the main circuit carrying the current to be measured.
- The absence of magnetic core grants a wide frequency response, up to hundreds of kHz. This make GPC80 particularly suitable for measurement of harmonic content and transients.

### Applications

- Power monitoring & protection systems
- Welding machine control
- DC ripple measurement
- Harmonics and transients monitoring
- Very high current monitoring

## What is a Rogowski coil?

Rogowski coils have been used for the detection and measurement of electric currents for decades. They are based on a simple principle: an "air-cored" coil is placed around the conductor in a toroidal fashion and the magnetic field produced by the current induces a voltage in the coil. The voltage output is proportional to the rate of change of current. This voltage is integrated, thus producing an output proportional to the current.

By using precision winding techniques, especially developed for the purpose, the coils are manufactured so that their output is not influenced by the position of the conductor within the toroid, and to reject interference from external magnetic fields caused, for example, from nearby conductors.

Basically, a Rogowski coil current measuring system consists of a combination of a coil and conditioning electronics (see picture below).

Rogowski coil current transducers are used for the AC measurement.

They can be used in similar circumstances to current transformers but for many applications they have considerable advantages:

- Wide dynamic range. The same coil can be used to measure currents from milliamps to hundred of kiloamps, it is enough to change the RC value in the integrator.
- High linearity. According to the manufacturing (size, inductance value, ...) the maximum measurable frequency can range up to hundreds of kHz and in some special models also MHz.
- Very useful with large size or awkward shaped conductors or in places with limited access. Thanks to the structure without hard core, the coil can be easily manufactured according to the application or to the available space.
- Unlike traditional current transducers, there is no danger from open-circuited secondaries.
- They cannot be damaged by large overloads.
- They are non-intrusive. They draw no power from the main circuit carrying the current to be measured.
- They are also light weighted and in some applications are light enough to be suspended on the conductor being measured.

The transducer does not measure direct currents but, unlike a current transformer, it can carry out accurate measurements of AC component even if there is a large superimposed DC component, since there is no iron core causing saturation. This feature is particularly useful for measuring ripple currents for example in battery charging systems.

## Specifications

### Transducer

| | |
|---|---|
| Coil diameter: | approx 35 to 100 mm |
| Locking: | cable tie |
| Colour: | black |
| Weight: | from 30 to 80 g |
| Material: | thermoplastic rubber UL94-V0 |

### Connection cable

| | |
|---|---|
| Type: | 2 x 0.15 mm + shield |
| Length: | approx. 3 m |
| Material: | thermoplastic rubber UL94-V0 |

### Electrical characteristics

| | |
|---|---|
| Output level (RMS) (1): | 150 or 180 mV / 1 kA @ 50Hz (other values on request) |
| Output permissible load: | › 15 kOhm for best accuracy |
| Coil resistance: | from 20 to 25 Ohm |
| Accuracy (2): | ± 2% without calibration, better than ±1% with calibration resistor |
| Frequency range (3): | approx 8 Hz to 100 kHz |
| Working voltage: | 600 $V_{RMS}$ max installation category CAT III pollution degree 2 |
| Test voltage: | 4000 $V_{RMS}$ / 1min |

### Environmental conditions

| | |
|---|---|
| Operating temperature: | from -10°C to +80°C |
| Relative humidity: | 95% max. without condensation |

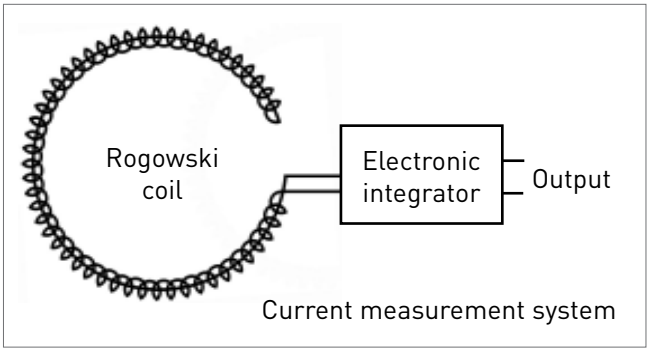
### Standards compliance

| | |
|---|---|
| Safety: | EN61010-1, TC44 SC |
| Other: | ISO 10656 |

(1) The Rogowski coil output is proportional to the rate of change of current. The calculation formula is: Ampere RMS x Hertz x K x $10^{-6}$, where K depends on manufacturing. The K value is 3 for 150mV model and 3.6 for 180mV model.

(2) All accuracies are specified at 23°C (± 2°C) with conductor carrying the current centered in the coil.

(3) The low limit is approximate and it is determined by noise effect on very low signals.



Current measurement system

## ORDER CODE

| AVS | | X | | | | | | | | | | S |
|---|---|---|---|---|---|---|---|---|---|---|---|---|

**GPC80**

**Series**
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**Coil diameter**
Value expressed in mm.
From 35 to 100 mm.
E.g.
035 = 35 mm
100 = 100 mm

**Output value**
Value expressed in mV/kA @50 Hz according to the manufacturing.
Standard values are 150 and 180 mV.
E.g.
150 = 150 mV/1kA @ 50 Hz
180 = 180 mV/1kA @ 50 Hz

**Accuracy**
S = ‹ 1% - calibrated
(calibration resistor included)

**Cable length**
Value expressed in cm.
Standard value is 300 cm.
E.g.
300 = 300 cm

Subject to change without notice

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