



## *Measuring Transducer MT4xx series*

# Programmable AC Current Transducer MT418

- RMS AC current or frequency measurements
- Current auto range measurements up to 12 A
- Frequency measurement range 16 – 400 Hz
- AC or universal wide auxiliary power supply range (20 – 300 V dc, 48 – 276 V ac)
- Accuracy class 0.5 (EN 60 688)
- Serial (RS232 or RS485) communication
- Sophisticated analogue output; 2 voltage and 4 current ranges, non-linear characteristics ...
- Simple USB setting without auxiliary power supply

## PROPERTIES

- Measurements of RMS current, frequency, THD I and MD
- Power accuracy class 0.5
- Input frequency: 50 / 60 Hz, 400 Hz
- Serial communication (RS232 or RS485 up to 115,200 bit/s) and USB 2.0
- MODBUS RTU communication protocol
- Universal power supply or transformer power supply
- Automatic range (max. 12 A)
- Housing for DIN rail mounting
- User-friendly setting software, MiQen

## DESCRIPTION

MT418 is intended for measuring and monitoring single-phase current or frequency. Current input is electrically isolated from the system by means of current transformer. It measures RMS current value by means of fast sampling of current signals, which makes instruments suitable for acquisition of transient events. A built-in microcontroller calculates measurands (current, frequency, THD U, MD) from the measured signals. Measurands (I, f) can be then converted into load independent DC current or voltage which is proportional to the RMS measured value for the purpose of regulation of analogue and / or digital devices.

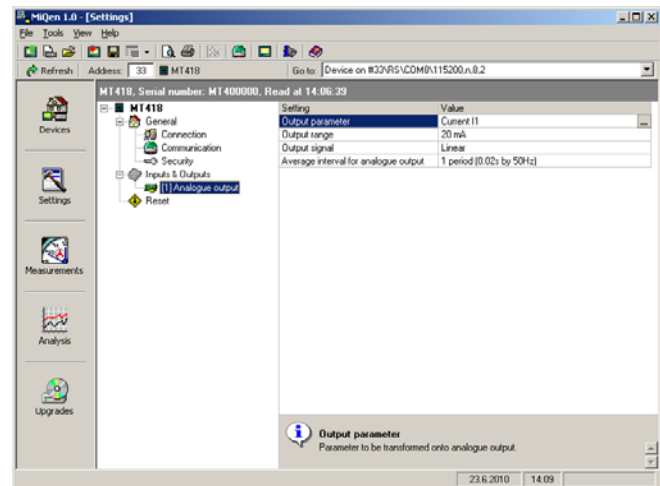
## APPLICATION

The MT418 programmable AC current transducer is used for a permanent monitoring of a single-phase current and frequency values. MT418 is delivered configured to default values. Subsequent customer configuration is possible with user friendly setting software MiQen. MT418 supports standard serial RS232/RS485 with speed up to 115200 bps. USB 2.0 can be used for a fast set-up or memory acquisition (after installation USB connection is not possible any more).

Additional USB 2.0 interface can only be used for a fast set-up without need for auxiliary power supply. This interface is NOT galvanically isolated from analogue output and can be used ONLY unconnected to aux. supply and measuring inputs.

## SETTING AND ACQUISITION

MiQen software is intended for supervision of MT418 on a PC. Network and the transducer setting, display of measured and stored values and analysis of stored data in the transducer are possible via the serial or USB communication. The information and stored measurements can be exported in standard Windows formats. Multilingual software functions on Windows 98, 2000, NT, XP, Vista, Windows 7 / 8 / 10 operating systems.



MiQen software is intended for:

- Setting all of the instruments parameters (online and offline)
- Viewing current measured readings
- Searching the net for devices
- Virtual interactive instrument
- Comprehensive help support

## COMPLIANCE WITH STANDARDS:

| Standard EN                 | Description                                                                                                          |
|-----------------------------|----------------------------------------------------------------------------------------------------------------------|
| 61010                       | Safety requirements for electrical equipment for measurement, control and laboratory use                             |
| 60688                       | Electrical measuring transducers for converting AC electrical variables into analogue and digital signals            |
| 61326-1                     | EMC requirements for electrical equipment for measurement, control and laboratory use - Part 1: General requirements |
| 60529                       | Degrees of protection provided by enclosures (IP code)                                                               |
| 60 068-2-1/ -2/ -6/ -27/-30 | Environmental testing (-1 Cold, -2 Dry heat, -30 Damp heat, -6 Vibration, -27 Shock)                                 |
| UL 94                       | Tests for flammability of plastic materials for parts in devices and appliances                                      |

## TECHNICAL DATA

### Measurement input

Nominal frequency ( $f_N$ ) 50 / 60 Hz

### CURRENT MEASUREMENTS

Nominal values 1 A, 5 A and 10 A

Nominal current ( $I_N$ ) 5 A

Max. measured value 12.5 A sinusoidal

Max. allowed value (thermal) 15 A cont.

Max. allowed value  $20 \times I_N; 5 \times 1s$

(acc. to EN 60 688)

Consumption  $< I^2 \times 0.01 \Omega$

### FREQUENCY MEASUREMENT

Frequency measuring range 16 ... 400 Hz  
(Only for frequency meas.)

### SYSTEM

Current inputs can be connected either directly to low-voltage network or shall be connected to network via a corresponding current transformer (with standard 1 A or 5 A output).

For more information about different system connections see CONNECTION on page 6.

### Basic accuracy under reference conditions

Total accuracy (measurements and analogue output) according to EN 60 688.

Accuracy is presented as percentage of measurands nominal value except when it is stated as an absolute value. Presented accuracy is valid only for a full output range. In case if used output range is less than full output range (zoom-characteristics) see Intrinsic-error on page 5. Defined accuracy of analogue output is valid only after 45 minutes after power up, due to self-heating.

| Measurand             | Accuracy ( ± % of range ) |                      |
|-----------------------|---------------------------|----------------------|
| Current Rms           | 0.5                       | 0.3 <sup>(1)</sup>   |
| Frequency (f)         | 10 mHz                    | 2 mHz <sup>(1)</sup> |
| THD (I) (0 ... 400 %) | 0.5                       |                      |

<sup>(1)</sup> On Communication

### Communication

MT418 has one galvanic separated communication port, which can be equipped with RS232 or RS485 or left open (to be specified with order).

Different configurations are possible (to be specified with order):

| Configuration | COM                        |
|---------------|----------------------------|
| WO            | USB <sup>(2)</sup>         |
| RS232         | RS232 + USB <sup>(2)</sup> |
| RS485         | RS485 + USB <sup>(2)</sup> |

<sup>(2)</sup> Please read WARNING below

| Serial communication:  | RS232                                             | RS485   |
|------------------------|---------------------------------------------------|---------|
| Connection type        | Direct                                            | Network |
| Connection terminals   | Screw terminals                                   |         |
| Function               | Settings, measurements and firmware upgrade       |         |
| Insulation             | Protection class I, 3.3 kV <sub>ACRMS</sub> 1 min |         |
| Max. connection length | 3 m                                               | 1000 m  |
| Transfer mode          | Asynchronous                                      |         |
| Protocol               | MODBUS RTU                                        |         |
| Transfer rate          | 2.4 kBaud to 115.2 kBaud                          |         |
| Default settings       | #33 \ 11520 \ N \ 8 \ 2                           |         |
| Number of bus stations | /                                                 | ≤ 32    |

Additionally, MT418 has a USB communication port, located on the bottom, behind removable cap. When connected to this communication port MT418 is powered by USB.

### WARNING:

USB communication port is NOT galvanically isolated and can ONLY be used unconnected to aux. supply AND measuring inputs.

After installation of instrument on DIN rail, USB port is not accessible any more.

**USB:**

|                        |                                                                                                                           |
|------------------------|---------------------------------------------------------------------------------------------------------------------------|
| Connection type        | Direct                                                                                                                    |
| Connection terminal    | USB-mini                                                                                                                  |
| Max. connection length | 3 m                                                                                                                       |
| Function               | Settings and records acquisition, firmware upgrade                                                                        |
| Isolation              | None, directly coupled with analogue output                                                                               |
| Transfer mode          | Asynchronous                                                                                                              |
| Protocol               | MODBUS RTU                                                                                                                |
| Transfer rate          | USB 2.0                                                                                                                   |
|                        | USB communication port is NOT galvanically isolated and can ONLY be used unconnected to aux. supply AND measuring inputs. |

The USB cover should not remain open. It should be closed immediately after the initial setting through USB port was done and should remain closed during all time of storing & operation. If unit operates without USB cover the warranty is void.

### Output module

#### ANALOGUE OUTPUT

Each of up to four analogue outputs is fully programmable and can be set to any of 6 full-scale ranges (4 current and 2 voltage) without opening an instrument. They all use the same output terminals.

#### Programmable DC current output:

Output range (0 ... 100 %)

|                       |                   |
|-----------------------|-------------------|
| 0 ... 1 mA            | Range 1           |
| 0 ... 5 mA            | Range 2           |
| 0 ... 10 mA           | Range 3           |
| 0 ... 20 mA           | Range 4           |
| other ranges possible | by MiQen software |

|                     |                                             |
|---------------------|---------------------------------------------|
| Max. burden voltage | 10 V                                        |
| External resistance | $R_{B\max} = 10\text{ V} / I_{\text{outN}}$ |

#### Programmable DC voltage output:

Output range (0 ... 100 %)

|                       |                   |
|-----------------------|-------------------|
| 0 ... 1 V             | Range 5           |
| 0 ... 10 V            | Range 6           |
| Other ranges possible | By MiQen software |

|                     |                                              |
|---------------------|----------------------------------------------|
| Max. burden current | 20 mA                                        |
| External resistance | $R_{B\min} = U_{\text{outN}} / 10\text{ mA}$ |

**General:**

|                                                                |                               |
|----------------------------------------------------------------|-------------------------------|
| Max. current on output (short circuit voltage output)          | 33 mA                         |
| Linearization                                                  | Linear, Quadratic             |
| No. of break points                                            | 5                             |
| Output value limits                                            | $\pm 120\%$ of nominal output |
| Response time <sup>(3)</sup> (measurement and analogue output) | < 100 ms                      |
| Response time of fast <sup>(3)</sup> analogue output           | $\leq 50\text{ ms}$           |
| Residual ripple                                                | < 1 % p.p.                    |
| Residual ripple of fast analogue output                        | < 2 % p.p.                    |

<sup>(3)</sup> Response time for frequency is:

|                              |         |
|------------------------------|---------|
| Typical:                     | 300 ms  |
| Max; (freq. change > 10 Hz): | 3000 ms |

The output may be either short or open-circuited. It is electrically isolated from all other circuits.

All output range values can be altered subsequently (zoom scale) using the setting software with a supplementary error (see Intrinsic-error on page 5).

### Aux power supply

|                            |              |
|----------------------------|--------------|
| Universal power supply     |              |
| Nominal voltage AC range   | 48 ... 276 V |
| Nominal frequency range    | 45 ... 65 Hz |
| Nominal voltage DC range   | 20 ... 300 V |
| Consumption                | < 5 VA       |
| Power-on transient current | < 20 A; 1 ms |

#### TRANSFORMER POWER SUPPLY

|                         |              |
|-------------------------|--------------|
| Nominal voltage AC      | 110 V, 230 V |
| Nominal frequency range | 45 ... 65 Hz |
| Consumption             | < 5 VA       |

#### SAFETY

|                       |                                                                                                                                                                                                                                                              |
|-----------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Protection:           | protection class II                                                                                                                                                                                                                                          |
| Pollution degree      | 2                                                                                                                                                                                                                                                            |
| Installation category | CAT III; 600 V <sub>⊥</sub> meas. Inputs<br>Universal aux. power supply<br>CAT III; 300 V <sub>⊥</sub> Transformer aux. power supply<br>CAT III; 600 V <sub>⊥</sub> aux. AC supply<br>Acc. to EN 61010-1                                                     |
| Test voltages         | I Input↔Output, U <sub>AUX</sub> , COM:<br>5200 V <sub>ACRMS</sub><br>Transformer aux. power supply<br>U <sub>AUX</sub> ↔Output: COM: 5200 V <sub>ACRMS</sub><br>Universal aux. power supply<br>3500 V <sub>ACRMS</sub><br>Output↔COM 500 V <sub>ACRMS</sub> |
| Enclosure material    | PC / ABS<br>Acc. to UL 94 V-0                                                                                                                                                                                                                                |
| Enclosure protection  | IP20                                                                                                                                                                                                                                                         |

**MECHANICAL**

|                      |                                                                              |
|----------------------|------------------------------------------------------------------------------|
| Dimensions           | W45 × H75 × D105 mm                                                          |
| Mounting             | Rail mounting 35 × 15 mm<br>acc. to DIN EN 50 022                            |
| Enclosure material   | PC / ABS                                                                     |
| Vibration withstand  | 0.7 g, 3 ... 100 Hz, 1 oct / min<br>10 cycles in each of three<br>axes       |
| Shock withstand      | 300 g, 8 ms pulse<br>6 shocks in each of three axes                          |
| Flammability         | Acc. to UL 94 V-0                                                            |
| Weight               | Transformer aux.power<br>supply 370 g<br>Universal aux.power supply<br>170 g |
| Enclosure protection | IP 20                                                                        |

**ENVIRONMENTAL CONDITIONS**

|                         |                                                                             |
|-------------------------|-----------------------------------------------------------------------------|
| Ambient temperature     | usage group II<br>0 ... <u>15...30</u> ... 45 °C<br>Acc. to IEC / EN 60 688 |
| Operating temperature   | - 30 to + 70 °C                                                             |
| Storage temperature     | - 40 to +70 °C                                                              |
| Temperature coefficient | ± 0.1 % per 10 °C                                                           |
| Average annual humidity | ≤ 93 % r.h.                                                                 |
| Altitude                | ≤ 2000 m                                                                    |

**REFERENCE CONDITIONS**

|                     |              |
|---------------------|--------------|
| Ambient temperature | 0 ... 45 °C  |
| Relative humidity   | ≤ 93 % r.h.  |
| Current input       | 0.31 ... 5 A |
| Frequency           | 45 ... 65 Hz |
| Waveform            | Sinus        |

**INTRINSIC-ERROR (FOR ANALOGUE OUTPUTS)**

For intrinsic-error for analogue outputs with bent or linear-zoom characteristic multiply accuracy class with correction factor (c). Correction factor c (the highest value applies):

Linear characteristic:

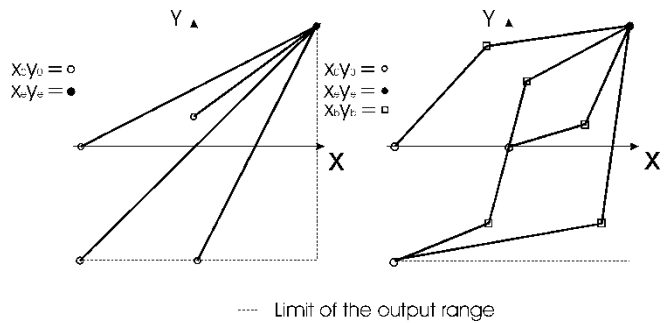
$$c = \frac{1 - \frac{y_0}{y_e}}{1 - \frac{x_0}{x_e}} \quad \text{or} \quad c = 1$$

Bent characteristic:

$$x_{b-1} \leq x \leq x_b$$

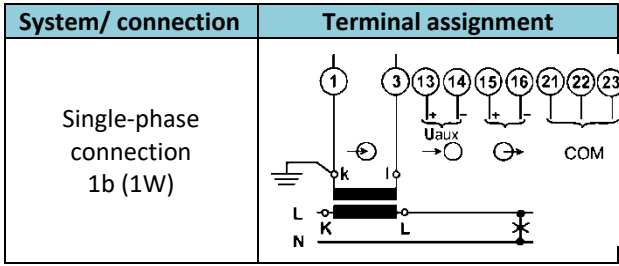
b – number of break point (1 to 5)

$$c = \frac{y_b - y_{b-1} \cdot \frac{x_e}{x_b - x_{b-1}}}{y_e} \quad \text{or} \quad c = 1$$



Examples of settings with linear and bent characteristic.

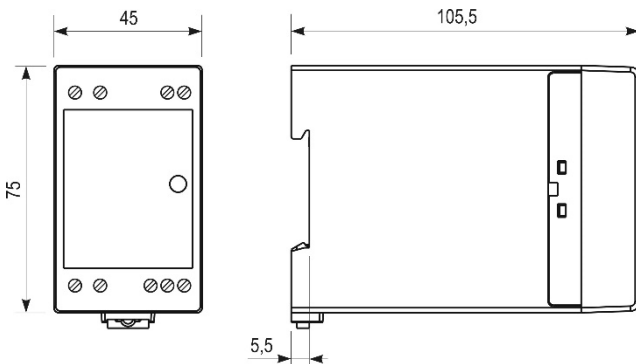
**CONNECTION**



**CONNECTION TABLE**

| Function               |             |                         | Connection |
|------------------------|-------------|-------------------------|------------|
| Measuring input        | AC current  | $I \ominus$             | 1/3        |
| Analogue output        |             | $+ \ominus \rightarrow$ | 15         |
|                        |             | $- \ominus \rightarrow$ | 16         |
| Auxiliary power supply |             | + / AC                  | 13         |
|                        |             | - / AC                  | 14         |
| Communication          | RS232/RS485 | Rx / A                  | 21         |
|                        |             | GND / C                 | 22         |
|                        |             | Tx / B                  | 23         |

**DIMENSIONAL DRAWING**



Dimensions for MT418.

**DATA FOR ORDERING**

When ordering MT418, all required specifications should be stated in compliance with the ordering code. Additional information could be stated regarding functionality of analogue outputs. Default settings for analogue outputs provided that no ordering information is given will be:

| Input quantity | Output quantity   |
|----------------|-------------------|
| lin: 0 ... 5 A | lout: 0 ... 20 mA |

If different analogue output settings are required, a proper input quantity / output quantity pair for each analogue output should be provided.

**EXAMPLE OF ORDERING**

Example of ordering code for MT418: Nominal frequency 45 ... 65 Hz; High power supply; Without communication COM1; Analogue output; Standard finish.

**MT418 S U N H A**

**General ordering code**

All specifications are obligatory except function of analogue output(s), which should be stated in a form of description.

| Type  | Nominal Frequency | Power supply | Communication (COM1) | Output | Finish                             |
|-------|-------------------|--------------|----------------------|--------|------------------------------------|
| MT418 | X                 | X            | X                    | X      | X                                  |
|       |                   |              |                      |        | A Standard *                       |
|       |                   |              |                      |        | H HVE (Tropical Seal)              |
|       |                   |              |                      | A      | Analogue output *                  |
|       |                   |              |                      | H      | Analogue output (Fast)             |
|       |                   |              | S                    |        | RS232                              |
|       |                   |              | D                    |        | RS485                              |
|       |                   |              | N                    |        | Without *                          |
|       |                   | U            |                      |        | 20 ... 300 V DC, 48 ... 276 V AC * |
|       |                   | D            |                      |        | 110 V AC                           |
|       |                   | E            |                      |        | 230 V AC                           |
|       | S                 |              |                      |        | 45 ... 65 Hz *                     |
|       | A                 |              |                      |        | 400 Hz                             |

\* - standard

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