Programmable AC Voltage Transducer
MT416

Iskra MIS

CLASS 0.5

RS 232 485

USB 2.0

- ***RMS AC voltage or frequency measurements***
- ***Voltage auto range measurements up to 600 V_{L-N}***
- ***Frequency measurement range 16 – 400 Hz***
- ***AC or universal wide auxiliary power supply range 24 – 300 Vdc, 40 – 276 Vac***
- ***Accuracy class 0.5 (EN 60688)***
- ***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 voltage, frequency and THD U**
- **Accuracy class 0.5 (EN 60688)**
- **Input frequency range: 50/60 Hz, 400 Hz**
- **RS 232/RS 485 communication up to 115, 200 bit/s and USB 2.0 communication**
- **MODBUS communication protocol**
- **Universal power supply or transformer power supply**
- **Automatic range (max. 600 V_{L-N})**
- **Housing for DIN rail mounting**
- **User-friendly PC MiQen software**

DESCRIPTION

MT416 is intended for measuring and monitoring single-phase voltage or frequency. Voltage input is electrically isolated from the system by means of voltage transformer. It measures RMS voltage value by means of fast sampling of voltage signals, which makes instruments suitable for acquisition of transient events. A built-in microcontroller calculates *measurands* (voltage, frequency, THD U, MD) from the measured signals. Measurands (U, 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.

COMPLIANCE WITH STANDARDS:

Standard EN	Description
61010-1:2001	Safety requirements for electrical equipment for measurement, control and laboratory use
60688:1995/A2:2001	Electrical measuring transducers for converting AC electrical variables into analogue and digital signals
61326-1:2006	EMC requirements for electrical for measurements, control and laboratory use- Part 1:General requirements
60529:1997/A1:2000	Degrees of protection provided by enclosures (IP code)
60068-2-1/ -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

APPLICATION

The MT416 programmable AC voltage transducer is used for a permanent monitoring of a single-phase voltage and frequency values. MT416 is delivered configured to default values. Subsequent customer configuration is possible with user friendly setting software MiQen. MT416 supports standard serial RS232/485 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.

TECHNICAL DATA

MEASUREMENT INPUT

Nominal frequency range	50/60, 400 Hz

Voltage measurements:

Nominal values	62.5, 125, 250, 500 V_{LN}
Rated voltage (U_N)	500 V_{LN}
Max. measured value (cont.)	600 V_{LN}
Max. allowed value (acc. to EN 60688)	2 × U_N; 10 s
Input impedance	500 kΩ
Consumption	U^2/500 kΩ

Frequency measurement:

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

System:

Voltage input can be connected either directly to low-voltage network or via a high-voltage transformer to high-voltage network.

BASIC ACCURACY UNDER REFERENCE CONDITIONS

Total accuracy (measurements and analogue output) according to EN 60688

Accuracy is presented as percentage of range of the measurand's 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)	
Voltage rms	0.5	0.3[1]
Frequency (f)	10 mHz	2 mHz[1]
THD(U) (0 … 400 %)	0.5	

[1]On communication

COMMUNICATION

MT416 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
RS232	RS232 + USB
RS485	RS485 + USB

WARNING:

USB communication port is NOT galvanically isolated and can ONLY be used unconnected to aux. supply AND measuring inputs.
USB connector is placed on the bottom of the MT416, behind removable cap.
After installation it is not accessible any more.
Instrument will establish an USB connection with the PC approx. 3 seconds after physical connection to USB port.
When connected, MT416 is powered by USB port.

USB [1]:	
Connection type	Direct
Connection terminals	mini USB-B
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 connects directly to the CPU, thus no serial settings are needed. (firmware at least V1.17)

[1] After installation of instrument onto DIN rail not accesible any more

Serial communication:	RS232	RS485
Connection type	Direct	Network
Connection terminals	screw terminals	
Function	Settings, measurements and records acquisition, firmware upgrade	
Isolation	Protection class II, 5.2 kV_{ACRMS} 1 min	
Max. connection length	3 m	1000 m
Transfer mode	Asynchronous	
Default settings	#33 \ 115200 \ N \ 8 \ 2	
Protocol	MODBUS RTU	
Transfer rate	2.4 kBaud to 115.2 kBaud	
Number of bus stations	/	≤ 32

ANALOGUE OUTPUT

Analogue output is fully programmable and can be set to any of 6 hardware 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
Max. external resistance	R_{Bmax} =10 V / I_{outN}

Programmable DC voltage output:

Output range values 0 … 100%

0 … 1 V	Range 5
0 … 10 V	Range 6
other ranges possible	by MiQen software
Max. burden current	20 mA
Min. external resistance	R_{Bmin} = U_{outN} / 10 mA

General:

Max. voltage on output (open circuit current output)	33 V
Linearization	Linear, Quadratic
No. of break points	5
Output value limits	120% of nominal output
Response time (measurement and analogue output)	< 100 ms (1)
Response time (measurement and analogue output)	< 50 ms (1)
Residual ripple	< 1 % p.p.
Residual ripple of fast analogue output	< 2 % p.p.

(1) Not for frequency, frequency response time:

typical	300 ms
maximum	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, but a supplementary error results (see INTRINSIC ERROR).

POWER SUPPLY

Universal power supply:

Nominal voltage AC range	40 … 276 V
Nominal frequency range	45 … 65 Hz
Nominal voltage DC range	24 … 300 V
Consumption	< 5VA
Power-on transient current	< 20 A; 1 ms

Transformer power supply:

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

SAFETY:

Protection:	protection class II
Pollution degree	2
Installation category	CAT III; 600 $V_{⏚}$ meas. inputs Universal aux. power supply CAT III; 300 V Transformer aux. power supply CAT III; 600 V Acc. to EN 61010-1
Test voltages	I input ↔ Output, U_{AUX}, COM 5200 VAC_{rms} Transformer aux. power supply U_{AUX} ↔ Output, COM 5200 VAC_{rms} Universal aux. power supply 3500 VAC_{rms} Output ↔ COM 500 VAC_{rms}
Enclosure material	PC/ABS Acc. to UL 94 V-0
Enclosure protection	IP 20

MECHANICAL

Dimensions	W45 × H75 × D105 mm
Mounting	Rail mounting 35 × 15 mm acc. to EN 50022
Enclosure material	PC/ABS
Vibration withstand	7g, 3 … 100 Hz, 1 oct/min 10 cycles in each of three axes
Shock withstand	300g, 8ms pulse 6 shocks in each of three axes
Connection terminals	≤ 4.0 mm^2 solid wire ≤ 2.5 mm^2 stranded wire
Flammability	Acc. to UL 94 V-0
Weight	Transformer aux. power supply 340 g Universal aux. power supply 170 g

ENVIRONMENTAL CONDITIONS:

Ambient temperature	usage group II 0 … 15 … 30 … 45 °C Acc. to EN 60688
Operating temperature	-30 to +70 °C
Storage temperature	-40 to +70 °C
Temperature koefficient	+-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.
Voltage input	57.7…500V
Frequency	45…65Hz
Waveform	Sinus

INTRINSIC-ERROR (FOR ANALOGUE OUTPUTS):

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

Linear characteristic

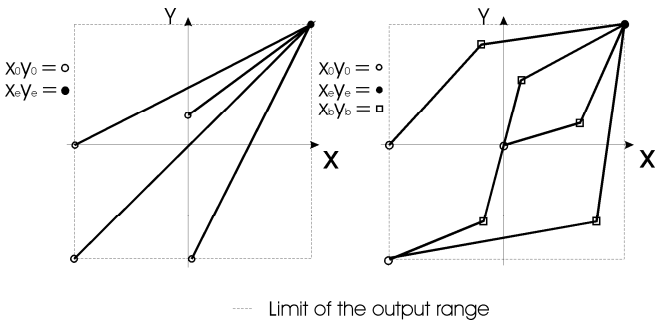
$$c = \frac{1 - \frac{y_0}{y_e}}{1 - \frac{x_0}{x_e}} \quad or \quad c = 1$$

Bent characteristic

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

b – number of break point (1 to 5)

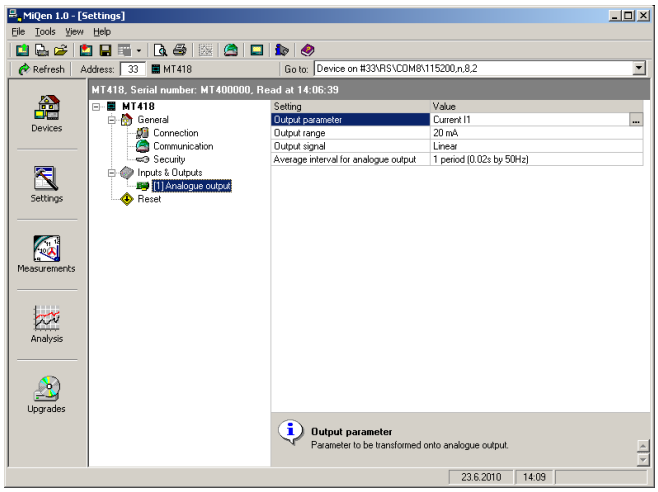
$$c = \frac{y_b - y_{b-1}}{x_b - x_{b-1}} \cdot \frac{x_e}{y_e} \quad or \quad c = 1$$



Examples of settings with linear and bent characteristic

MiQen - SETTING AND ACQUISITION SOFTWARE

MiQen software is intended for supervision of MT416 and many other instruments 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 operating systems.

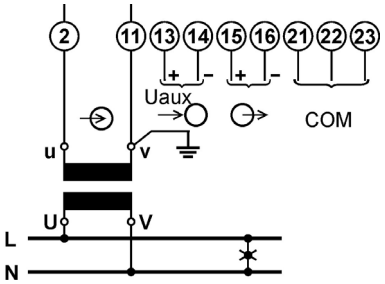


MiQen setting and acquisition software

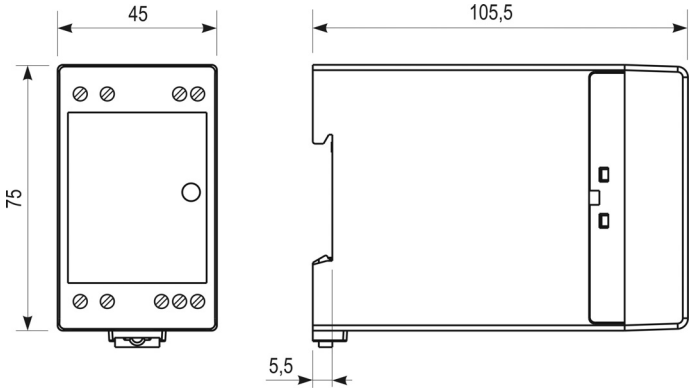
MiQen software is intended for:

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

CONNECTION



DIMENSIONAL DRAWING



Dimensions for MT416

CONNECTION TABLE

Function			Connection
Measuring input:	AC voltage	U	2/11
Analogue output:		+	15
		–	16
Auxiliary power supply:		+ / AC	13
		– / AC	14
Communication:	RS232/485	Rx / A	21
		GND / C	22
		Tx / B	23

ORDERING

Supplement:

MiQen software

When ordering an MT416, all required specifications should be stated in compliance with the ordering code. Additional information could be stated regarding functionality of analogue output. Default settings for analogue output provided that no ordering information is given will be:

Input quantity	Output quantity
Uin: 0 … 500 V	Iout: 0 ... 20 mA

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

EXAMPLE OF ORDERING:
MT416 transducer with frequency range 50/60 Hz, RS485 communication, normal analogue output and an universal supply. Ordering code:
MT416 – 1 2 1 1

GENERAL ORDERING CODE

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

1. Transducer type:

MT416

1. Input frequency

1	50/60 Hz
2	400 Hz

2. Communication type

0	Without
1	RS232
2	RS485

3. Analogue output

1	Normal
2	Fast

4. Power supply

1	Universal – switching power supply
2	230 V – transformer power supply
3	110 V – transformer power supply

TÜV SÜD Management Service

CE

Iskra MIS, d.d.
Ljubljanska c. 24a, SI-4000 Kranj, Slovenia
Tel.: +386 4 237 21 12, Fax: +386 4 237 21 29
E-mail: info@iskra-mis.si, www.iskra-mis.si

Iskra® Iskra MIS

Printed in Slovenia • Subject to change without notice • Version 1.04 / Apr-2012 • GB P 22.496.501