

ENERGY SECTOR

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PYRAMID CONTROL INSTRUMENT

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ELECTRICAL MEASURING INSTRUMENTS PROGRAMME



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MEASURING CENTRES

iMC 784/ MC 784 - ADVANCED POWER QUALITY ANALYZER



iMC 784



USE

The iMC 784/MC 784 Advanced Power Quality Analyser can be used as a standalone PQ monitoring device for detection and analysis of local PQ deviations, transients, alarms and periodic measurements. For this purpose it is normally positioned at the point-of-common-coupling (PCC) of industrial and commercial energy consumers to monitor quality of delivered electric energy or at medium or low voltage feeders to monitor, detect and record possible disturbances caused by operation of consumers. Identifying relevant fixed measuring points is the most important task prior to complete system installation. The implementation of a PQ system itself will not prevent disturbances in network but rather help diagnose their origins and effects by comparing and scrutinizing data from multiple time synchronized measurement points.

The iMC 784/MC 784 can be used in power utilities (for evaluation against standards) as well as for industry purposes (monitoring supplied power quality). It performs measurements in compliance with regulatory requested standard EN 61000-4-30 and evaluates recorded parameters for analysis according to parameters defined in European power quality standard EN50160.

The device enables storage of a wide variety of highly detailed oscillography data in 8GB of internal flash memory based on a sophisticated trigger settings mechanism. Data can be stored in standardized PQDIF (IEEE 1159-3) and COMTRADE (IEEE C37.111) file formats which can easily be exchanged with third party PQ analysis SW systems.

Apart from this, the iMC 784/MC 784 also supports monitoring and recording of the most commonly used auxiliary sensor analogue or digital I/O data (e.g. temperature, pressure, gas/water/heat consumption, intrusion detection etc.). These readings can also be used for alarming and control purposes. The most extensive benefits are achieved when iMC 784/MC 784 is used as a part of an energy monitoring system comprising of strategically positioned meters connected to the MiSMART system software solution.

FEATURES

- Power Quality analysis according to EN50160 with automatic PQ report generation
- High accuracy (0.1%) as required within EN61000-4-30 Ed. 3 Class A
- User friendly setting and analysis software MiQen
- Waveform and transient recorder with programmable sampling time (> 600 samples / period), pre-trigger and post-trigger time
- Internal memory (up to 8GB) for recording all measured parameters, disturbances, waveforms, alarms, PQ reports and time-stamped
- Details about anomalies.
- Automatic measuring range up to 1000 VRMS, 12.5 A direct connection
- Measurement of 4 Voltages and 4 Currents with 32 kHz sampling time
- Serial, USB and Ethernet communication with support for MODBUS, DNP3 and IEC61850 (optional) protocol.
- Up to 20 Input and Output modules for control purposes and monitoring of other physical parameters (temp., wind speed, pressure...)
- Standardized PQDIF and COMTRADE format support for storing recorder data
- Comprehensive 0.2S energy measurement feature (4 quadrant energy measurement, 8 counters, up to 4 tariffs, tariff clock, pulse outputs...)
- Available with standard 5,7" color TFT display (iMC 784) or 128 x 64 pixel display (MC 784 - option)
- Wide frequency measurement range 16 – 400 Hz

MEASURING CENTRES

IMC 784 - ADVANCED POWER QUALITY ANALYZER

INPUT / OUTPUT MODULES

The meter can be equipped with up to two double I/O modules (module 1 and 2) and up to two octuple I/O modules (module A and B). Modules 1 and 2 are equipped with three connection terminals each. The following options are available for module 1 and 2:

• Analogue output	2 x 4 ...20 mA
• Pulse output	2
• Relay (alarm) output	2
• Bistable relay (alarm) output	1
• Analogue input (mA _{DC})	2
• Analogue input (V _{DC})	2
• Analogue input (R/Temp.)	2
• Digital input (230 V _{AC/DC})	2
• Digital input (110 V _{AC/DC})	2
• Digital input (5...48 V _{AC/DC})	2
• Pulse input (5...48 V _{DC})	2
• Tariff input (230 V _{AC/DC})	2
• Tariff input (110 V _{AC/DC})	2
• Tariff input (5...48 V _{AC/DC})	2
• Status output	1
• Relay (alarm) output	1

Modules A and B are equipped with nine connection terminals. Following options are available:

• Relay output (module A only)	1 x 8
• Digital input (230 V _{AC/DC})	2 x 8
• Digital input (110 V _{AC/DC})	2 x 8
• Digital input (48 V _{AC/DC})	2 x 8

MEASURING CENTRES

MC 774 - POWER QUALITY ANALYZER



USE

MC 774 is an important device for permanent monitoring of power quality from its production (especially renewable), transmission, distribution to final consumers, who are most affected by insufficient quality of voltage. Lack of information about supplied quality of voltage can lead to unexplained production problems and malfunction or even damage to equipment used in production process. Therefore, MC 774 can be used for utility purposes (evaluation against standards) as well as for industry purposes (monitoring supplied power quality).

MC 774 performs measurements in compliance with regulatory requested standard EN 61000-4-30 and evaluates recorded parameters for analysis according to parameters defined in European supply quality standard EN 50160:2011.

MC 774 Quality Analyser can be used as a standalone PQ monitoring device for detection of local PQ deviations. For this purpose it is normally positioned at the point-of-common-coupling (PCC) of small and medium industrial and commercial energy consumers to monitor quality of delivered electric energy or at medium or low voltage feeders to monitor, detect and record possible disturbances caused by (unauthorized) operation of consumers.

FEATURES

- High accuracy-class A (0.1 %) - measurements (certified by PSL - Power Standards Lab)
- Evaluation of the electricity supply quality in compliance with EN 50160 with automatic report generation
- Measurements of instantaneous values of more than 140 quantities including harmonics, flicker, power line signalling voltage, unbalance ...
- Four quadrant energy measurement with class 0.2S for active energy, 8 programmable counters, up to four tariffs, tariff clock...
- Automatic range selection of 4 current and 4 voltage channels (max. 12.5 A and 1000 V_{RMS}) with 32 kHz sampling rate
- Recording all measured parameters including all voltage and current harmonics up to 63rd, 32 adjustable alarms, anomalies and quality reports in the internal memory
- Measurements of 40 minimal and maximal values in different time intervals (from 1 to 256 periods)
- Frequency range from 16 Hz to 400 Hz
- Up to three independent communication ports (RS 232/485 up to 115,200 bit/s, Ethernet and USB 2.0)
- MODBUS and DNP3 communication protocols
- Support for GPS, IRIG-B (modulated and digital) and NTP real time synchronisation
- Up to 20 inputs and outputs (analogue inputs/outputs, digital inputs/outputs, alarm/watchdog outputs, pulse input/outputs, tariff inputs)
- Multilingual support
- Universal power supply (two voltage ranges)
- 144 mm square panel mounting
- User-friendly setting and evaluation software, MiQen

MEASURING CENTRES

MC 774 - POWER QUALITY ANALYZER

INPUT / OUTPUT MODULES

The meter can be equipped with up to two double I/O modules (module 1 and 2) and up to two octuple I/O modules (module 3 and 4). Modules 1 and 2 are equipped with three connection terminals. Following options are available:

- Relay output 2
- Status (watchdog) & relay output 2
- Analogue output 2 x 20 mA
- Pulse output 2
- Bistable alarm output 1
- Analogue input 2
- Pulse input 2
- Digital input 2
- Tariff input 2

Modules A and B are equipped with nine connection terminals. Following options are available:

- Relay output 8
- Digital input 8

MEASURING CENTRES

MC 764 - NETWORK ANALYZER



USE

The MC764 Network Analyzers are designed for environments where beside measurement of three-phase electrical power network additional analogue or digital measurements/controls must be made without additional hardware (PLC, OPLC, ...). Meters are housed in enclosure 144 mm x 144 mm.

The meter is intended for measuring, analysing and monitoring single-phase or three-phase electrical power network. The meter measures RMS value according to the principle of fast sampling of voltage and current signals. A built-in microprocessor calculates measurands (voltage, current, frequency, energy, power, power factor, THD phase angles, etc.) from the measured signals.

FEATURES

- Evaluation of the electricity supply quality in compliance with EN 50160
- Measurements of instantaneous values of more than 140 quantities (U, I, P, Q, S, PF, PA, f, ϕ , THD, MD, energy, energy cost by tariffs, etc.)
- Accuracy class 0.2
- Harmonic analysis of phase, phase-to-phase voltages and currents up to the 63rd harmonic
- Recording up to 32 measurands and 32 alarms in the internal memory
- Measurements of 40 minimal and maximal values in different time periods
- 32 adjustable alarms
- Frequency range from 16 Hz to 400 Hz
- RS 232/RS 485 communication up to 115,200 bit/s or Ethernet & USB communication
- MODBUS and DNP3 communication protocol
- Additional I/O modules with up to 16 digital inputs or outputs, or up to 8 analogue outputs
- Additional communication port (COM2)
- Up to 4 inputs or outputs (analogue outputs, pulse outputs, alarm outputs, tariff inputs, pulse input, analogue input, bistable alarm, digital input)
- Additional I/O modules with up to 16 digital inputs or outputs, or up to 8 analogue outputs
- Additional communication port (COM2)
- Universal power supply
- Automatic range of nominal current and voltage (max. 12.5 A and 750 V)
- User-friendly PC MiQen software

MEASURING CENTRES

MC 764 - NETWORK ANALYZER

INPUT / OUTPUT MODULES

The meter can be equipped with up to two double I/O modules (module 1 and 2) and up to two octuple I/O modules (module 3 and 4). Modules 1 and 2 are equipped with three connection terminals. Following options are available:

• Relay output	2	• Pulse input	2
• Status (watchdog) & relay output	2	• Digital input	2
• Analogue output	2 x 20 mA	• Tariff input	2
• Pulse output	2	• Additional comm. port (COM2)	1
• Bistable alarm output	1	• Comm. port for analogue extender EX104	1
• Analogue input	2		

Modules A and B are equipped with nine connection terminals. Following options are available:

• Relay output	8
• Digital input	8
• Analogue output	4 x 20 mA

MEASURING CENTRES

MC 754 - NETWORK RECORDER



USE

The MC754 Network Analyzers are designed for environments where beside measurement of three-phase electrical power network additional analogue or digital measurements/controls must be made without additional hardware (PLC, OPLC, ...). Meters are housed in enclosure 144 mm x 144 mm.

The meter is intended for measuring, analysing and monitoring single-phase or three-phase electrical power network. The meter measures RMS value according to the principle of fast sampling of voltage and current signals. A built-in microprocessor calculates measurands (voltage, current, frequency, energy, power, power factor, THD phase angles, etc.) from the measured signals.

FEATURES

- Measurements of instantaneous values of more than 140 quantities (U, I, P, Q, S, PF, PA, f, φ , THD, MD, energy, energy cost by tariffs, etc.)
- Accuracy class 0.2
- Recording up to 32 measurands and 32 alarms in the internal memory
- Measurements of 40 minimal and maximal values in different time periods
- 32 adjustable alarms
- Frequency range from 16 Hz to 400 Hz
- RS 232/RS 485 communication up to 115,200 bit/s or Ethernet & USB communication
- MODBUS and DNP3 communication protocol
- Additional I/O modules with up to 16 digital inputs or outputs, or up to 8 analogue outputs
- Additional communication port (COM2)
- Up to 4 inputs or outputs (analogue outputs, pulse outputs, alarm outputs, tariff inputs, pulse input, analogue input, bistable alarm, digital input)
- Additional I/O modules with up to 16 digital inputs or outputs, or up to 8 analogue outputs
- Additional communication port (COM2)
- Universal power supply
- Automatic range of nominal current and voltage (max. 12.5 A and 750 V)
- User-friendly PC MiQen software

MEASURING CENTRES

MC 754 - NETWORK RECORDER

INPUT / OUTPUT MODULES

The meter can be equipped with up to two double I/O modules (module 1 and 2) and up to two octuple I/O modules (module 3 and 4). Modules 1 and 2 are equipped with three connection terminals. Following options are available:

• Relay output	2	• Pulse input	2
• Status (watchdog) & relay output	2	• Digital input	2
• Analogue output	2 x 20 mA	• Tariff input	2
• Pulse output	2	• Additional comm. port (COM2)	1
• Bistable alarm output	1	• Comm. port for analogue extender EX104	1
• Analogue input	2		

Modules A and B are equipped with nine connection terminals. Following options are available:

• Relay output	8
• Digital input	8
• Analogue output	4 x 20 mA

MEASURING CENTRES

MC 744 - MULTIFUNCTION METER



USE

The MC744 Multifunction meters are designed for environments where beside measurement of three-phase electrical power network additional analogue or digital measurements/controls must be made without additional hardware (PLC, OPLC, ...). Meters are housed in enclosure 144 mm x 144 mm.

The meter is intended for measuring, analysing and monitoring single-phase or three-phase electrical power network. The meter measures RMS value according to the principle of fast sampling of voltage and current signals. A built-in microprocessor calculates measurands (voltage, current, frequency, energy, power, power factor, THD phase angles, etc.) from the measured signals.

FEATURES

- Measurements of instantaneous values of more than 140 quantities (U, I, P, Q, S, PF, PA, f, ϕ , THD, MD, energy, energy cost by tariffs, etc.)
- Accuracy class 0.2
- Measurements of 40 minimal and maximal values in different time periods
- 32 adjustable alarms
- Frequency range from 16 Hz to 400 Hz
- RS 232/RS 485 communication up to 115,200 bit/s or Ethernet & USB communication
- MODBUS and DNP3 communication protocol
- Additional I/O modules with up to 16 digital inputs or outputs, or up to 8 analogue outputs
- Additional communication port (COM2)
- Up to 4 inputs or outputs (analogue outputs, pulse outputs, alarm outputs, tariff inputs, pulse input, analogue input, bistable alarm, digital input)
- Additional I/O modules with up to 16 digital inputs or outputs, or up to 8 analogue outputs
- Additional communication port (COM2)
- Universal power supply
- Automatic range of nominal current and voltage (max. 12.5 A and 750 V)
- User-friendly PC MiQen software

MEASURING CENTRES

MC 744 - MULTIFUNCTION METER

INPUT / OUTPUT MODULES

The meter can be equipped with up to two double I/O modules (module 1 and 2) and up to two octuple I/O modules (module 3 and 4). Modules 1 and 2 are equipped with three connection terminals. Following options are available:

• Relay output	2	• Pulse input	2
• Status (watchdog) & relay output	2	• Digital input	2
• Analogue output	2 x 20 mA	• Tariff input	2
• Pulse output	2	• Additional comm. port (COM2)	1
• Bistable alarm output	1	• Comm. port for analogue extender EX104	1
• Analogue input	2		

Modules A and B are equipped with nine connection terminals. Following options are available:

• Relay output	8
• Digital input	8
• Analogue output	4 x 20 mA

MEASURING CENTRES

MC 760 - NETWORK ANALYZER



USE

The MC 760 network analyzer is used for permanent analysis of electric voltage quality in compliance with the EN 50160 standard. Records are stored in the internal memory for the period of the last 3 years. Moreover, more than 170,000 deviations of the measured quantities from the standard values are stored, which enables finding of eventual reasons for the problems on network. Optional limits and required quality in a monitored period can be defined for each monitored characteristic.

The meter measures and records the following characteristics: Frequency deviations, voltage deviations, voltage dips, voltage interruptions, voltage unbalances, over-voltages, fast voltage changes, flicker intensity, THD, harmonics.

FEATURES

- Evaluation of the quality of electric voltage in compliance with EN 50160
- Measurement of instantaneous values of more than 130 quantities (U, I, P, Q, S, PF, PA, f, φ, THD, MD, energy, energy cost by tariffs, etc.)
- Accuracy class 0.2
- Harmonic analysis of phase, phase-to-phase voltages and currents up to the 63rd harmonic
- Recording up to 32 measured quantities and alarms in the internal memory (8 MB flash)
- Measurements of 40 minimal and maximal values in different time periods
- 32 adjustable alarms
- Frequency range from 16 Hz to 400 Hz
- RS 232/RS 485 communication up to 115,200 bit/s or Ethernet communication
- MODBUS and DNP3 communication protocol
- Up to 4 inputs or outputs (analogue outputs, pulse outputs, alarm outputs, tariff inputs, pulse input, analogue input, bistable alarm, digital input)
- Universal or AC power supply
- Automatic range of nominal current and voltage (max. 5 A and 500 V)
- User-friendly PC MiQen software

INPUT / OUTPUT MODULES

The modules are available with double inputs/outputs using a common connection contact (except a bistable alarm module - 1 output, 3 terminals). The meter is available without, with one or with two modules. The following modules are available:

• Relay output	2	• Pulse input	2
• Status (watchdog) & relay output	2	• Digital input	2
• Analogue output	2 x 20 mA	• Tariff input	2
• Pulse output	2	• Additional comm. port (COM2)	1
• Bistable alarm output	1	• Comm. port for analogue extender EX104	1
• Analogue input	2		

MEASURING CENTRES

MC 750 - NETWORK RECORDER



USE

The MC 750 are intended for monitoring, measuring and recording of electrical quantities of a three-phase electric-energy distribution system. The meter is provided with 32 adjustable alarms, 8MB flash recorder (up to 64 measurands and 32 alarms), up to four input or output modules and communication. With the RS 232/RS 485 or Ethernet/USB communication the meter can be set, measurements checked and stored data downloaded.

The meter functions also as an electricity meter, with the additional function of cost management by tariffs. A tariff input or a tariff clock can be set. At tariff clock setting, four periods and four work groups as well as electric energy price for each period and a work group (16 different price periods) are available. Additionally, 20 places are available for setting holidays or days when special tariff rules are valid. As an electricity meter it records energy in all four quadrants in four tariffs.

FEATURES

- Measurement of instantaneous values of more than 130 quantities (U, I, P, Q, S, PF, PA, f, ϕ , THD, MD, energy, energy cost by tariffs, etc.)
- Accuracy class 0.2
- Recording up to 32 measured quantities and alarms in the internal memory (4 MB flash)
- Measurements of 40 minimal and maximal values in different time periods
- 32 adjustable alarms
- Frequency range from 16 Hz to 400 Hz
- RS 232/RS 485 communication up to 115,200 bit/s or Ethernet communication
- MODBUS and DNP3 communication protocol
- Up to 4 inputs or outputs (analogue outputs, pulse outputs, alarm outputs, tariff inputs, pulse input, analogue input, bistable alarm, digital input)
- Universal or AC power supply
- Automatic range of nominal current and voltage (max. 5 A and 500 V)
- User-friendly PC MiQen software

INPUT / OUTPUT MODULES

The meter is available without, with one or with two modules. The following modules are available:

• Relay output	2	• Pulse input	2
• Status (watchdog) & relay output	2	• Digital input	2
• Analogue output	2 x 20 mA	• Tariff input	2
• Pulse output	2	• Additional comm. port (COM2)	1
• Bistable alarm output	1	• Comm. port for analogue extender EX104	1
• Analogue input	2		

MEASURING CENTRES

MC 740 - MULTIFUNCTION METER



USE

The MC 740 multifunction meter is used for monitoring and measuring electrical quantities of a three-phase electric-energy distribution system. The meter is provided with 32 program adjustable alarms, up to four inputs or outputs and communication. The meter can be set and measurements can be checked with the RS 232/RS 485 or Ethernet communication. The meter also functions as an electricity meter, with the additional function of cost management by tariffs. A tariff input or a tariff clock can be set. At tariff clock setting, four periods and four work groups as well as electric energy price for each period and a work group (16 different price periods) are available. Additionally, 20 places are available for setting holidays or days when special tariff rules are valid. As an electricity meter it records energy in all our quadrants in four tariffs.

FEATURES

- Measurement of instantaneous values of more than 130 quantities (U, I, P, Q, S, PF, PA, f, φ, THD, MD, energy, energy cost by tariffs, etc.)
- Accuracy class 0.2
- Measurements of 40 minimal and maximal values in different time periods
- 32 adjustable alarms
- Frequency range from 16 Hz to 400 Hz
- RS 232/RS 485 communication up to 115,200 bit/s or Ethernet communication
- MODBUS and DNP3 communication protocol
- Up to 4 inputs or outputs (analogue outputs, pulse outputs, alarm outputs, tariff inputs, pulse input, analogue input, bistable alarm, digital input)
- Universal or AC power supply
- Automatic range of nominal current and voltage (max. 5 A and 500 V)
- Adjustable tariff clock, display of electric energy consumption in optional currency
- User-friendly PC MiQen software

INPUT / OUTPUT MODULES

The modules are available with double inputs/outputs using a common connection contact (except a bistable alarm module - 1 output, 3 terminals). The meter is available without, with one or with two modules. The following modules are available:

• Relay output	2	• Pulse input	2
• Status (watchdog) & relay output	2	• Digital input	2
• Analogue output	2 x 20 mA	• Tariff input	2
• Pulse output	2	• Additional comm. port (COM2)	1
• Bistable alarm output	1	• Comm. port for analogue extender EX104	1
• Analogue input	2		

MEASURING CENTRES

FAMILY OF MC 7x0/UMC 7x0, MC 7x4

COMPARISON AND COMMON CHARACTERISTICS								
TYPE								
DIN 96						MC 760	MC 750	MC 740
DIN 144	iMC 784 MC 784	MC 774	MC 764	MC 754	MC 744			
POWER, ENERGY AND DEMAND								
Voltage/current per phase, average, unbalance	●	●	●	●	●	●	●	●
Power (real, apparent, power factor, frequency)	●	●	●	●	●	●	●	●
Energy (bi-directional, total, import, export, net)	●	●	●	●	●	●	●	●
Demand (block, rolling block, thermal)	●	●	●	●	●	●	●	●
Cost management for energy	●	●	●	●	●	●	●	●
Min./Max. values	●	●	●	●	●	●	●	●
Measuring frequency range in Hz	16%...400	16%...400	16%...400	16%...400	16%...400	16%...400	16%...400	16%...400
Accuracy	class A	class A						
U, I, φ, THD, PF	0.1	0.1	0.2	0.2	0.2	0.2	0.2	0.2
P	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Q	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
S	0.2	0.2	0.5	0.5	0.5	0.5	0.5	0.5
Active energy	0.2S	0.2S	0.5S	0.5S	0.5S	0.5S	0.5S	0.5S
Reactive energy	0.5S	0.5S	2	2	2	2	2	2
POWER QUALITY								
Sag/Swell monitoring	●	●	●			●		
Symmetrical components (zero, positive, negative)	●	●	● positive			● positive		
Transient detection, microseconds	>32 μs							
Total Harmonic Distortion (THDu, THDi)	●	●	●	●	●	●	●	●
Harmonics (individual, even, odd, total; up to:)	63 rd	63 rd	63 rd	63 rd	63 rd	63 rd	63 rd	63 rd
Inter-harmonics	●	●						
Sampling rate, maximum samples per cycle	625	625	128	128	128	128	128	128
Flicker, (harmonics to EN 50160, IEC 6100-4-7/4-15)	●	●	●			●		
Class A certified according to IEC 61000-4-30	● (Ed.3)	●						
LOGGING AND RECORDING								
Standard memory capacity	8MB + 8GB	8MB	8MB	8MB		8MB	8MB	
Min./Max. logging for any parameter	●	●	●	●		●	●	
Historical logs, maximum # of channels	64+ alarms PQ reports & events	64+ alarms PQ reports & events	64+ alarms PQ reports & events	64+ alarms		64+ alarms PQ reports & events	64+ alarms	
Waveform logs, maximum# pre/post trigger in seconds, maximum# samples/cycle	^{1/40} (0.5/20 at max.) s, 625 samp./s							
½ or full cycle RMS values, maximum# of pre/post trigger in cycles	3000/60000 cyc.							
Historical data formats	Pqdlf + Comtrade + dedicated (export to csv via MiQen SW)	dedicated (export to csv via MiQen SW)	dedicated (export to csv via MiQen SW)	dedicated (export to csv via MiQen SW)		dedicated (export to csv via MiQen SW)	dedicated (export to csv via MiQen SW)	
Timestamp resolution for alarms (limit function) in seconds	1	1	1	1		1	1	
Timestamp resolution for PQ events in seconds	0.001	0.001	1					
Time synchronization (GPS, IRIG-B, NTP)	●	●	● NTP	● NTP	● NTP	● NTP	● NTP	● NTP
Display	iMC 784 5.7" color TFT MC 784 graphical LCD	graphical LCD	graphical LCD	graphical LCD	graphical LCD	graphical LCD	graphical LCD	graphical LCD
Waveform on display	● *	● (single quantity)	● (single quantity)	● (single quantity)	● (single quantity)	● (single quantity)	● (single quantity)	● (single quantity)
Harmonic diagram on display	● *	● (single quantity)	● (single quantity)	● (single quantity)	● (single quantity)	● (single quantity)	● (single quantity)	● (single quantity)
Phasor diagram on display	● *							

* only iMC 784
MC 784 (single quantity)

MEASURING CENTRES

FAMILY OF MC 7x0/UMC 7x0, MC 7x4

COMPARISON AND COMMON CHARACTERISTICS

TYPE								
DIN 96						MC 760	MC 750	MC 740
DIN 144	iMC 784 MC 784	MC 774	MC 764	MC 754	MC 744			
COMMUNICATIONS AND I/O OPTIONS								
RS232/485 ports	●	●	●	●	●	●	●	●
RS485 or RS232 port		●	●	●	●	●	●	●
RS485 analogue extender port (for up to 4 x 4 analogue output modules)			●	●	●	●	●	●
Baud rate	1200...115200 bps	1200...115200 bps	1200...115200 bps	1200...115200 bps	1200...115200 bps	1200...115200 bps	1200...115200 bps	1200...115200 bps
Memory Card slot		●	●	●	●	●	●	●
Ethernet + USB	●	●	●	●	●	●	●	●
USB			●	●	●	●	●	●
Modbus RTU & DNP3 on serial	●	●	●	●	●	●	●	●
Modbus TCP through Ethernet	●	●	●	●	●	●	●	●
XML	●	●	●	●	●	●	●	●
IEC 61850	●							
MQTT	●							
Programmable alarms (limit function), maximum # alarms	32	32	32	32	32	32	32	32
Analog outputs	4	4	4+4+4	4+4+4	4+4+4	4	4	4
Analog inputs	4	4	4	4	4	4	4	4
Digital status inputs	4+8+8	4+8	4+8+8	4+8+8	4+8+8	4	4	4
Digital status outputs	4	4	4+8+8	4+8+8	4+8+8	4	4	4
Relay outputs (standard)	4+8	4+8+8	4+8+8	4+8+8	4+8+8	4	4	4
Relay outputs (bistabil)	2	2	2	2	2	2	2	2
Pulse outputs	2	2	2	4	4	4	4	4
Tariff inputs	2	2	2	2	2	2	2	2
Watchdog + relay output	1	1	1	1	1	1	1	1
Maximum # of I/O	20	20	20/12	20/12	20/12	4	4	4
POWER SUPPLY, CONNECTION AND DIMENSIONS								
Power supply	AC/DC (86...300 V DC, 80...276 V AC)	AC/DC (19...70 V DC, 48...77 V AC); AC/DC (70...300 V DC, 80...276 V AC)	AC/DC (20...300 V DC, 48...276 V AC)	AC/DC (20...300 V DC, 48...276 V AC)	AC/DC (20...300 V DC, 48...276 V AC)	AC/DC (20...300 V DC, 48...276 V AC); AC various ranges	AC/DC (20...300 V DC, 48...276 V AC); AC various ranges	AC/DC (20...300 V DC, 48...276 V AC); AC various ranges
Connecton type (1 phase, 3 phase 3W, 3 phase 4W)	●	●	●	●	●	●	●	●
Connection via CT 1/5 A	●	●	●	●	●	●	●	●
Mounting	panel	panel	panel	panel	panel	panel	panel	panel
Dimensions in mm	144x144x81	144x144x81	144x144x81	144x144x81	144x144x81	96x96x90	96x96x90	96x96x90

LEGEND:

- feature supported

MEASURING CENTRES

MC 350 - NETWORK RECORDER

MC 350H - NETWORK RECORDER WITH HARMONICS



USE

The MC 350/MC 350H meter is intended for monitoring and measuring electrical quantities of single and three-phase electric-energy system. It records energy like the electricity meter in all four quadrants in up to four tariffs.

Various inputs and outputs are available for measurements control. The meter can use pulse output as alarm output. Outputs type is available as mechanical relay or open collector outputs (S0).

The MC 350/ MC 350H meter has memory for recording data in 8MB flash with time for analyse the network. With various communication options RS 232, RS 485 or USB communication the meter can be set and measurements can be checked.

FEATURES

- Measurement of instantaneous values of more than 60 quantities (U, I, P, Q, S, PF, PA, f, φ , THD, MD, etc.)
- Harmonics measurements up to 31st harmonic (MC 350H only)
- Harmonics of minimum and maximum values (MC 350H only)
- 4 energy counters
- Accuracy class U, I, P, 0.5 (active energy Class 1, optional Class 0.5s)
- Frequency range from 16 Hz to 400 Hz
- 8 MB flash memory for recorder
- 16 adjustable alarms
- Isolated communication RS485 or RS232 up to 115,200 bit/s or USB 2.0
- MODBUS, DNP3 and PROFIBUS communication protocol supported
- Up to 4 inputs or outputs (pulse, relay or analogue outputs, tariff and digital) (option)
- AC or Universal (option) power supply
- Graphical LCD: 128 x 64 dots with illumination
- User-adjustable display of measurements
- Automatic range of nominal current (max. 12.5 A) and voltage (option)
- Multilingual support
- 96 mm square panel mounting
- User-friendly PC MiQen software

INPUT / OUTPUT MODULES

The modules are available with double inputs/outputs. Each module has three terminals.

The meter is available without, with one or with two modules. The following modules are available:

- | | |
|-------------------|-----------|
| • Relay output | 2 |
| • Pulse output | 2 |
| • Digital input | 2 |
| • Tariff input | 2 |
| • Analogue output | 2 x 20 mA |

MEASURING CENTRES

MC 330 - MULTIMETER



USE

The MC 330 meter is intended for monitoring and measuring electrical quantities of single and three-phase electric-energy system. The MC 330 record energy like the electricity meter in all four quadrants in up to four tariffs.

Up to 2 pulse outputs or 2 tariff inputs are available for measurements control. MC 330 can use pulse output as alarm output. Outputs type is available as mechanical relay or open collector outputs (SO). With various communication options RS 232, RS 485 or USB communication the meter can be set and measurements can be checked.

FEATURES

- Measurement of instantaneous values of more than 60 quantities (U, I, P, Q, S, PF, PA, f, ϕ , THD, MD, etc.)
- 4 energy counters
- Accuracy class U, I, P, 0.5 (active energy Class 1, optional Class 0.5s)
- Frequency range from 16 Hz to 400 Hz
- 16 adjustable alarms
- Isolated communication RS485 or RS232 up to 115,200 bit/s or USB 2.0 or service USB (not galvanic isolated) (option)
- MODBUS, DNP3 and PROFIBUS communication protocol supported
- Up to 2 tariff inputs (option)
- Up to 2 pulse or alarm outputs (option)
- AC or Universal (option) power supply
- Graphical LCD: 128 x 64 dots with illumination
- User-adjustable display of measurements
- Automatic range of nominal current (max. 12.5 A) and voltage (option)
- Multilingual support
- 96 mm square panel mounting
- User-friendly PC MiQen software

INPUT / OUTPUT MODULES

The modules are available with double inputs/outputs. Each module has three terminals.

The meter is available without, with one or with two modules. The following modules are available:

- | | |
|-----------------|---|
| • Relay output | 2 |
| • Pulse output | 2 |
| • Digital input | 2 |
| • Tariff input | 2 |

MEASURING CENTRES

FAMILY OF MC 3x0

COMPARISON AND COMMON CHARACTERISTICS			
TYPE			
DIN 96	MC 330	MC 350	MC 350H
POWER, ENERGY AND DEMAND			
Voltage/current per phase, average, unbalance	●	●	●
Power (real, apparent, power factor, frequency)	●	●	●
Energy (bi-directional, total, import, export, net)	●	●	●
Demand (block, rolling block, thermal)	thermal	thermal	thermal
Min./Max. values			●
Measuring frequency range in Hz	16%...400	16%...400	16%...400
Accuracy			
U, I, φ , THD, PF	0.5	0.5	0.5
P	0.5	0.5	0.5
Q	1	1	1
S	1	1	1
Active energy	0.5S	0.5S	0.5S
Reactive energy	2	2	2
POWER QUALITY			
Total Harmonic Distortion (THDu, THDi)	●	●	●
Harmonics (individual, even, odd, total; up to)			31 st
Sampling rate, maximum samples per cycle	128	128	128
LOGGING AND RECORDING			
Standard memory capacity		8MB	8MB
Min./Max. logging for any parameter		●	●
Historical logs, maximum # of channels		32+ alarms	32+ alarms
Historical data formats		dedicated (export to csv via MiQen SW)	dedicated (export to csv via MiQen SW)
Timestamp resolution for alarms (limit function) in seconds		1	1
Display	graphical LCD	graphical LCD	graphical LCD
Waveform on display			● (single quantity)
Harmonic diagram on display			● (single quantity)
COMMUNICATIONS AND I/O OPTIONS			
RS485 or RS232 port	●	●	●
Baud rate	1200...115200 bps	1200...115200 bps	1200...115200 bps
Profibus	●	●	●
USB	●	●	●
Service USB	●	●	●
M-Bus	●	●	●
Mudbus RTU & DNP3 on serial	●	●	●
Programmable alarms (limit function), maximum # alarms	16	16	16
Analog outputs		2	2
Digital status inputs	2	2	2
Digital status outputs	2	2	2
Relay outputs (standard)	2	2	2
Pulse outputs	2	2	2
Tariff inputs	2	2	2
Maximum # of I/O	4	4	4
POWER SUPPLY, CONNECTION AND DIMENSIONS			
Power supply	AC/DC (20...300 V DC, 48...276 V AC); AC various ranges	AC/DC (20...300 V DC, 48...276 V AC); AC/DC (100...265 V DC, 85...265 V AC); AC various ranges	AC/DC (20...300 V DC, 48...276 V AC); AC/DC (100...265 V DC, 85...265 V AC); AC various ranges
Connecton type (1phase, 3 phase 3W, 3 phase 4W)	●	●	●
Connection via CT 1/5 A	●	●	●
Mounting	panel	panel	panel
Dimensions in mm	96x96x81	96x96x81	96x96x81

LEGEND:

- feature supported

MEASURING CENTRES FOR RAIL MOUNTING

MC 660/MC 666 - NETWORK ANALYZER



USE

The instrument is used for permanent analysis of electricity supply quality in compliance with the EN 50160 standard. A partition in the internal memory is reserved for storing reports for a period of the last seven years. The internal memory capacity enables storing of more than 170,000 variations of the measurements from the standard values, which enables finding eventual reasons for the problems in network. Limits and required quality in a monitored period can be defined for each monitored characteristic. The following characteristics are measured and recorded:

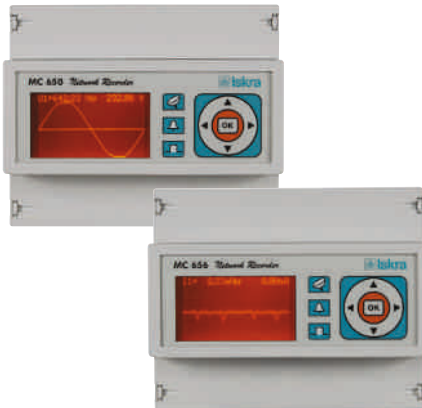
- Frequency variations
- Voltage variations
- Voltage unbalances
- Voltage dips
- Voltage interruptions
- Rapid voltage changes
- Flickers Pst & Pit
- Temporary over voltages
- THD's
- Harmonics

FEATURES

- Evaluation of the electricity supply quality in compliance with EN 50160
- Measurements of instantaneous values of more than 150 quantities (U, I, P, Q, S, PF, PA, f, ϕ , THD, MD, energy, energy cost by tariffs, etc.)
- Accuracy class 0.5
- Harmonic analysis of phase, phase-to-phase voltages and currents up to the 63rd harmonic
- Recording up to 32 measurements and 32 alarms in the internal memory (8 MB flash)
- Measurements of 40 minimal and maximal values in different time periods
- 32 adjustable alarms
- Frequency range from 16 Hz to 400 Hz
- RS485 communication up to 115,200 bit/s
- MODBUS and DNP3 communication protocol supported
- Up to 4 (2+2) inputs or outputs (pulse outputs, alarm outputs, tariff inputs, digital inputs)
- Universal power supply 48-276 V AC, 20-300 V DC
- Graphical LCD: 128 x 64 dots with illumination
- Direct 65 A connection (MC 666)
- CT 5 A connection (MC 660)
- Housing for DIN rail mounting
- Adjustable tariff clock, display of electric energy consumption in optional currency
- Multilingual support
- User-friendly PC MiQen software

MEASURING CENTRES FOR RAIL MOUNTING

MC 650/MC 656 - NETWORK RECORDER



USE

The instrument is used for monitoring, measuring and recording measurements of electric quantities of electrical power distribution system. Up to 32 measurements and up to 32 alarms are recorded in the internal memory. The memory is separated into two sections for measurements (A and B) and one section for recording alarms. The memory division is defined by the user via communication.

FEATURES

- Measurements of instantaneous values of more than 150 quantities (U, I, P, Q, S, PF, PA, f, φ , THD, MD, energy, energy cost by tariffs, etc.)
- Accuracy class 0.5
- Harmonic analysis of phase, phase-to-phase voltages and currents up to the 31st harmonic
- Recording up to 32 measurements and 32 alarms in the internal memory (8 MB flash)
- Measurements of 40 minimal and maximal values in different time periods
- 32 adjustable alarms
- Frequency range from 16 Hz to 400 Hz
- RS485 communication up to 115,200 bit/s
- MODBUS and DNP3 communication protocol supported
- Up to 4 (2+2) inputs or outputs (pulse outputs, alarm outputs, tariff inputs, digital inputs)
- Universal power supply 48-276 V AC, 20-300 V DC
- Graphical LCD: 128 x 64 dots with illumination
- Direct 65 A connection (MC 666)
- CT 5 A connection (MC 660)
- Housing for DIN rail mounting
- Adjustable tariff clock, display of electric energy consumption in optional currency
- Multilingual support
- User-friendly PC MiQen software

MEASURING CENTRES FOR RAIL MOUNTING

MC 640/MC 646 - MULTIFUNCTION METER



USE

The instrument is used for monitoring and measuring electric quantities of three-phase electrical power distribution system. The meter is provided with 32 program adjustable alarms, a serial communication port, two pulse (alarm) outputs and two tariff (digital) inputs. The meter can be set and measurements can be checked with the RS485 communication. The meter also functions as an energy counter, with the additional function of cost management by tariffs. A tariff clock can be set. At tariff clock setting, four seasons and four day groups as well as energy cost for each period and a day group (16 different cost periods) are available. Additional, 20 places are available for setting holidays. As an energy counter it can record energy in all four quadrants in four tariffs.

FEATURES

- Measurements of instantaneous values of more than 150 quantities (U, I, P, Q, S, PF, PA, f, ϕ , THD, MD, energy, energy cost by tariffs, etc.)
- Accuracy class 0.5
- Harmonic analysis of phase, phase-to-phase voltages and currents up to the 31st harmonic
- Measurements of 40 minimal and maximal values in different time periods
- 32 adjustable alarms
- Frequency range from 16 Hz to 400 Hz
- RS485 communication up to 115,200 bit/s
- MODBUS and DNP3 communication protocol supported
- Up to 4 (2+2) inputs or outputs (pulse outputs, alarm outputs, tariff inputs, digital inputs)
- Universal power supply 48-276 V AC, 20-300 V DC
- Graphical LCD: 128 x 64 dots with illumination
- Direct 65 A connection (MC 666)
- CT 5 A connection (MC 660)
- Housing for DIN rail mounting
- Adjustable tariff clock, display of electric energy consumption in optional currency
- User-adjustable display of measurements
- Multilingual support
- User-friendly PC MiQen software

MEASURING CENTRES FOR RAIL MOUNTING

FAMILY OF MC 6x0/MC 6x5

COMPARISON AND COMMON CHARACTERISTICS						
TYPE						
DIN rail	MC 640	MC 646	MC 650	MC 656	MC 660	MC 666
POWER, ENERGY AND DEMAND						
Voltage/current per phase, average, unbalance	●	●	●	●	●	●
Power (real, apparent, power factor, frequency)	●	●	●	●	●	●
Energy (bi-directional, total, import, export, net)	●	●	●	●	●	●
Demand (block, rolling block, thermal)	●	●	●	●	●	●
Cost management for energy	●	●	●	●	●	●
Min./Max. values	●	●	●	●	●	●
Measuring frequency range in Hz	16%...400	16%...400	16%...400	16%...400	16%...400	16%...400
Accuracy						
U, I, φ , THD, PF	0.5	0.5	0.5	0.5	0.5	0.5
P	0.5	0.5	0.5	0.5	0.5	0.5
Q	1	1	1	1	1	1
S	1	1	1	1	1	1
Active energy	1	1	1	1	1	1
Reactive energy	2	2	2	2	2	2
POWER QUALITY						
Sag/Swell monitoring					●	●
Symmetrical components (zero, positive, negative)					● positive	● positive
Total Harmonic Distortion (THDu, THDi)	●	●	●	●	●	●
Harmonics (individual, even, odd, total; up to:)	63 rd	63 rd	63 rd	63 rd	63 rd	63 rd
Sampling rate, maximum samples per cycle	128	128	128	128	128	128
Flicker, (harmonics to EN 50160, IEC 6100-4-7/4-15)					●	●
LOGGING AND RECORDING						
Standard memory capacity			8MB	8MB	8MB	8MB
Min./Max. logging for any parameter			●	●	●	●
Historical logs, maximum # of channels			64+ alarms	64+ alarms	64+ alarms PQ reports & events	64+ alarms PQ reports & events
Historical data formats			dedicated (export to csv via MiQen SW)	dedicated (export to csv via MiQen SW)	dedicated (export to csv via MiQen SW)	dedicated (export to csv via MiQen SW)
Timestamp resolution for alarms (limit function) in seconds			1	1	1	1
Timestamp resolution for PQ events in seconds					1	1
Time synchronization (GPS, IRIG-B, NTP)	● NTP					
Display	graphical LCD	graphical LCD	graphical LCD	graphical LCD	graphical LCD	graphical LCD
Waveform on display	● (single quantity)	● (single quantity)	● (single quantity)	● (single quantity)	● (single quantity)	● (single quantity)
Harmonic diagram on display	● (single quantity)	● (single quantity)	● (single quantity)	● (single quantity)	● (single quantity)	● (single quantity)
COMMUNICATIONS AND I/O OPTIONS						
RS485 or RS232 port	●	●	●	●	●	●
Baud rate	1200...115200 bps	1200...115200 bps	1200...115200 bps	1200...115200 bps	1200...115200 bps	1200...115200 bps
Mudbus RTU & DNP3 on serial	●	●	●	●	●	●
Programmable alarms (limit function), maximum # alarms	32	32	32	32	32	32
Pulse outputs	2	2	2	2	2	2
Tariff inputs	2	2	2	2	2	2
Maximum # of I/O	4	4	4	4	4	4
POWER SUPPLY, CONNECTION AND DIMENSIONS						
Power supply	AC/DC (20...300 V DC, 48...276 V AC)	AC/DC (20...300 V DC, 48...276 V AC)	AC/DC (20...300 V DC, 48...276 V AC)	AC/DC (20...300 V DC, 48...276 V AC)	AC/DC (20...300 V DC, 48...276 V AC)	AC/DC (20...300 V DC, 48...276 V AC)
Connection type (1phase, 3 phase 3W, 3 phase 4W)	●	●	●	●	●	●
Connection via CT 1/5 A	●		●		●	
Direct connection up to 65 A		●		●		●
Mounting	DIN rail	DIN rail	DIN rail	DIN rail	DIN rail	DIN rail
Dimensions in mm	108x90x65	108x90x65	108x90x65	108x90x65	108x90x65	108x90x65

LEGEND:

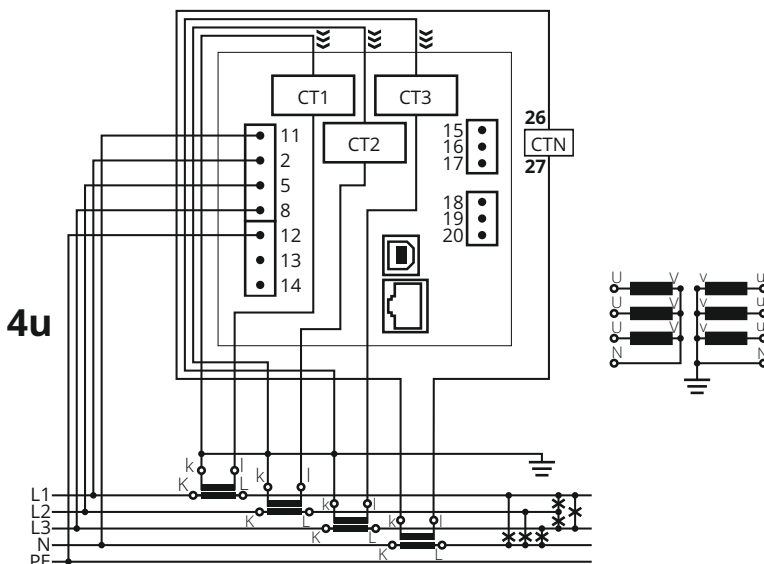
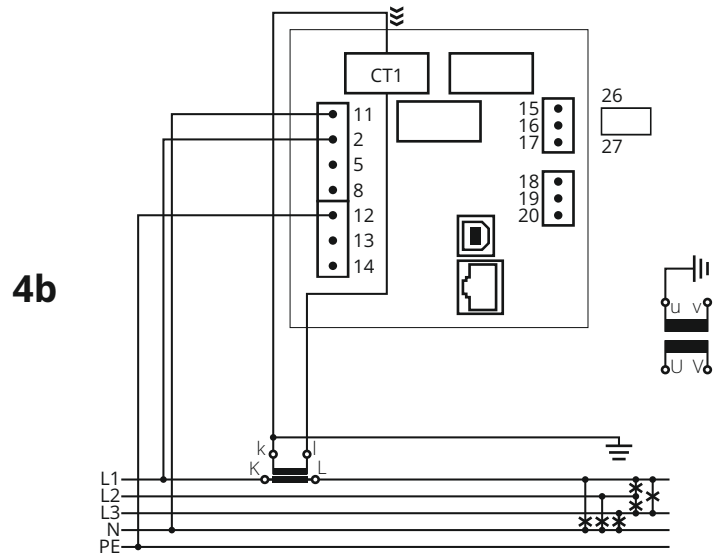
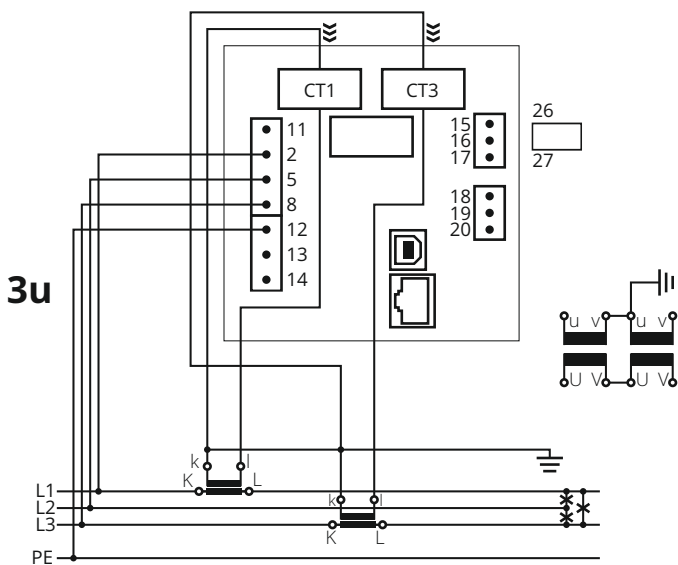
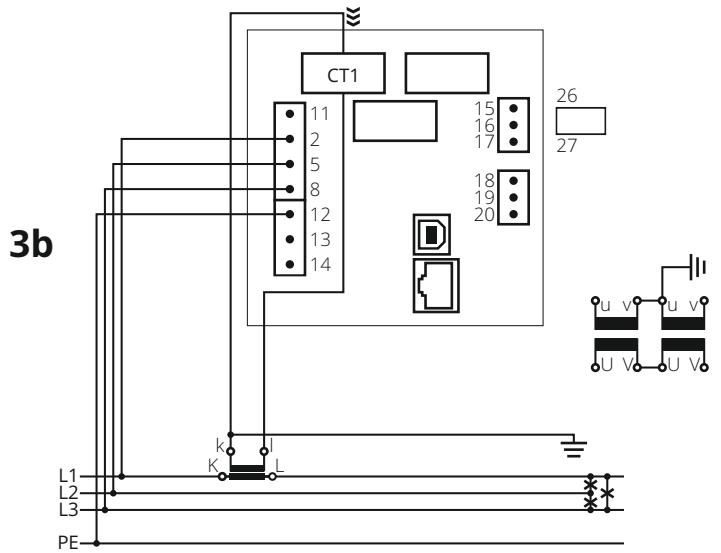
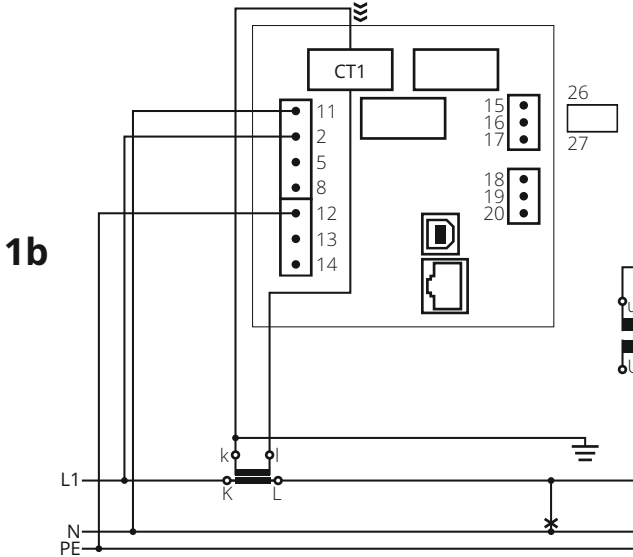
- feature supported

MEASURING CENTRES

iMC 784 / MC 784

CONNECTION DIAGRAMS

MC 784

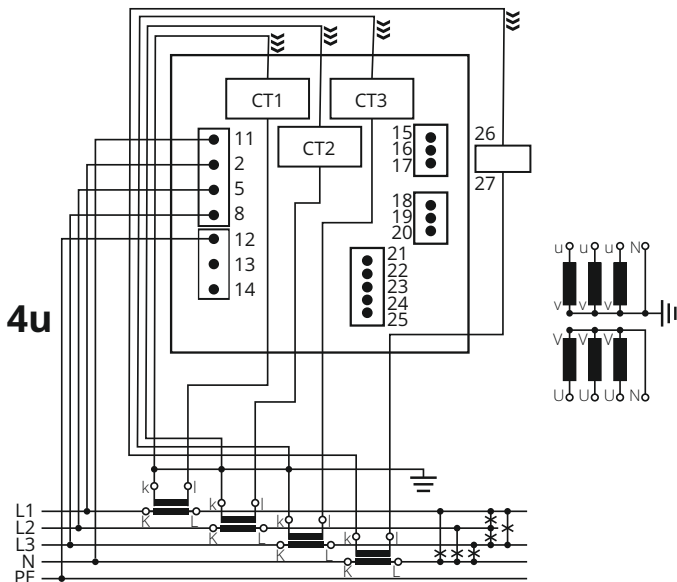
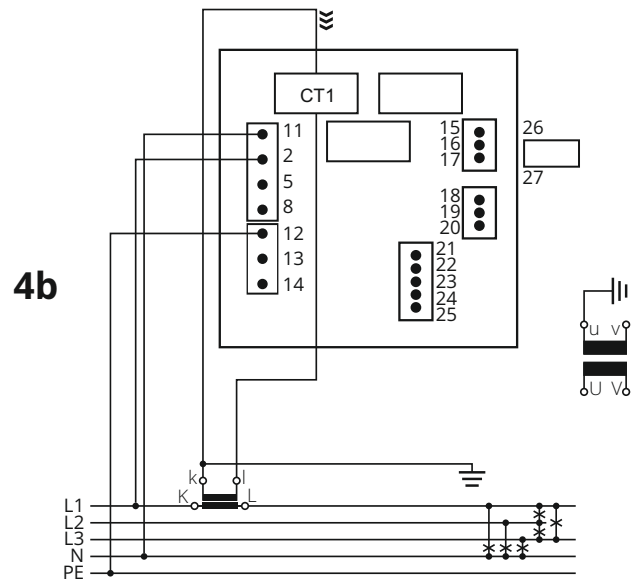
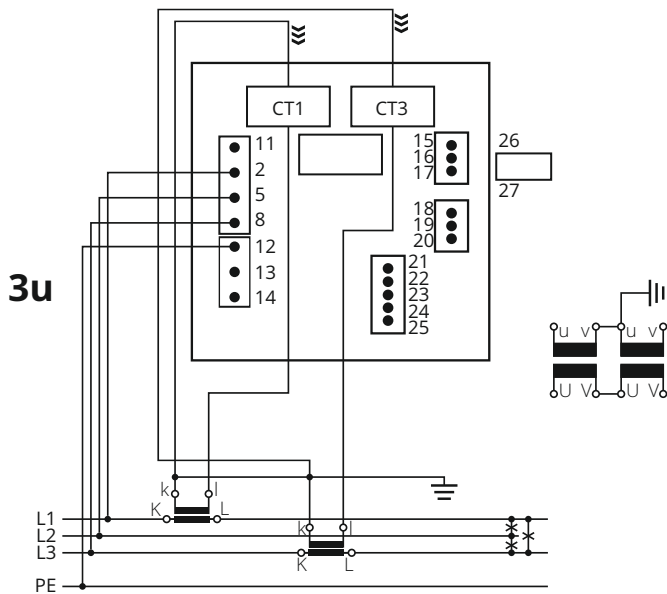
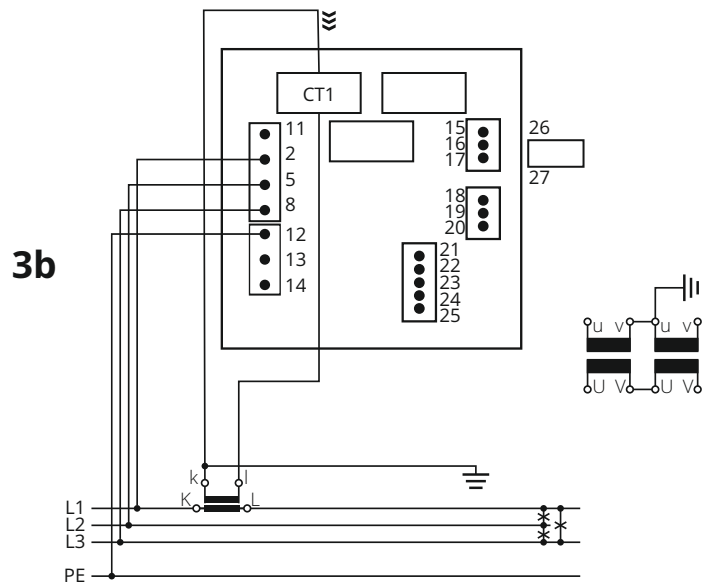
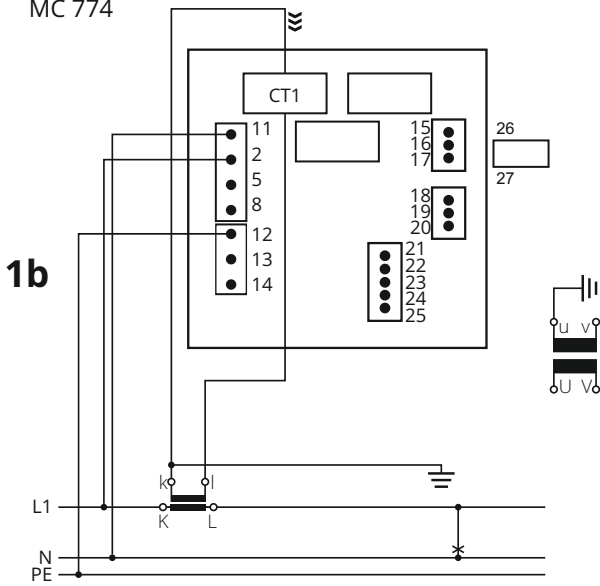


MEASURING CENTRES

MC 774

CONNECTION DIAGRAMS

MC 774

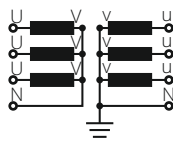
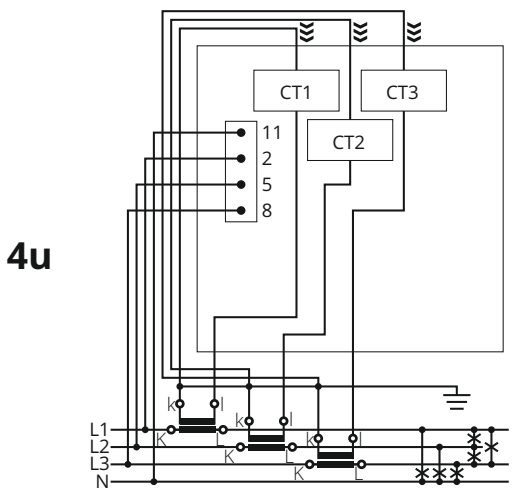
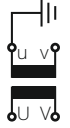
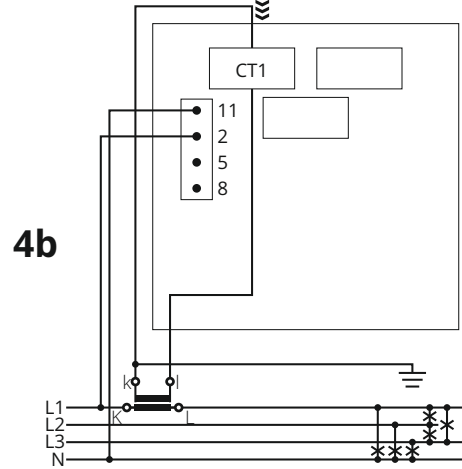
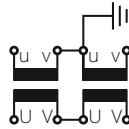
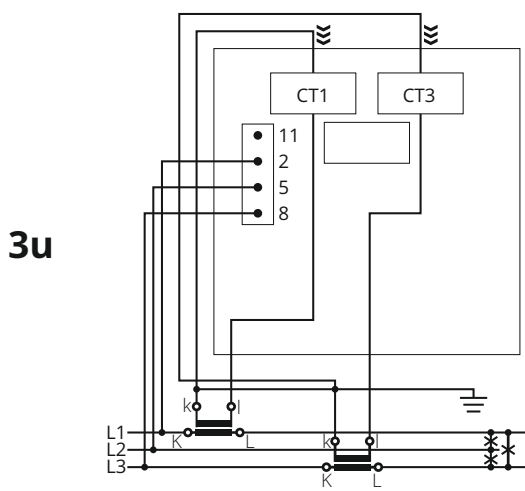
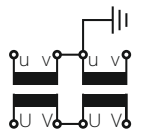
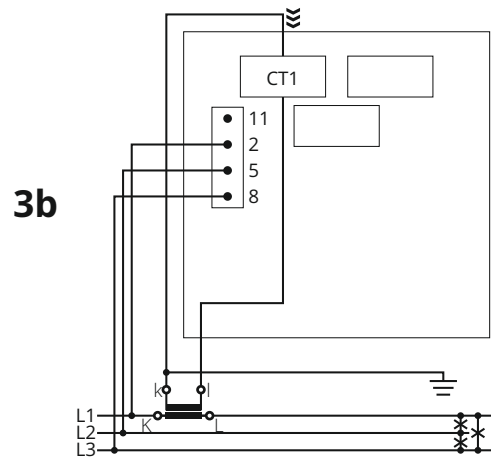
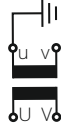
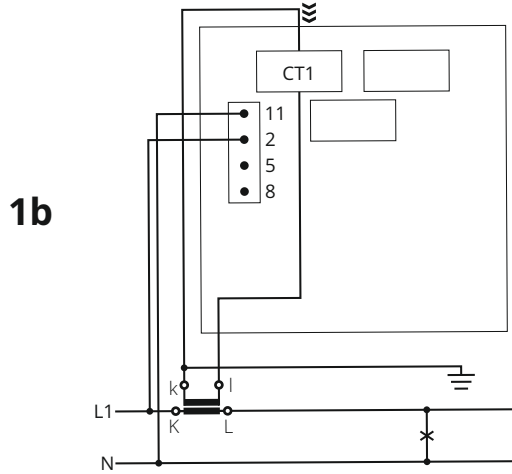


MEASURING CENTRES

FAMILY OF MC 7x0, MC 7x4

CONNECTION DIAGRAMS

MC 7x0, MC 7x4



MEASURING CENTRES FOR RAIL MOUNTING

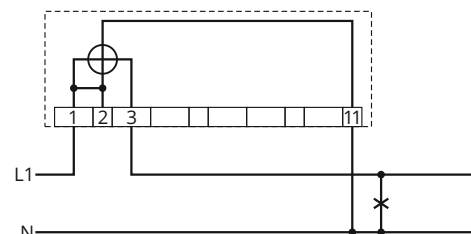
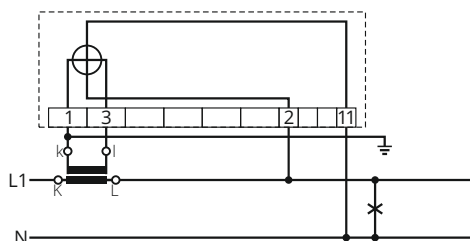
FAMILY OF MC 6x0/MC 6x5

CONNECTION DIAGRAMS

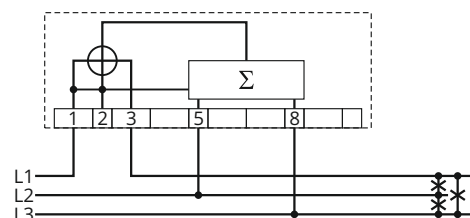
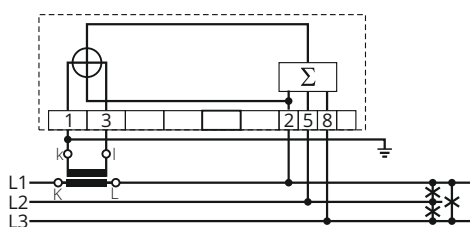
MC6x0

MC6x6

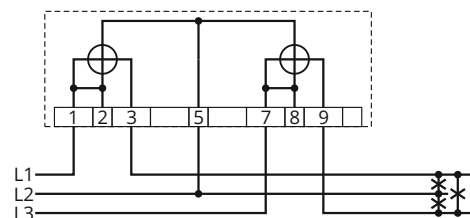
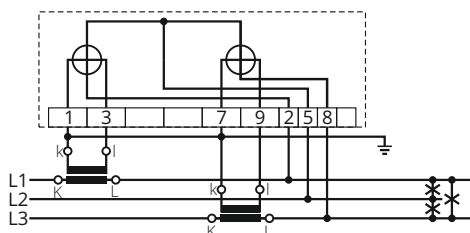
1b



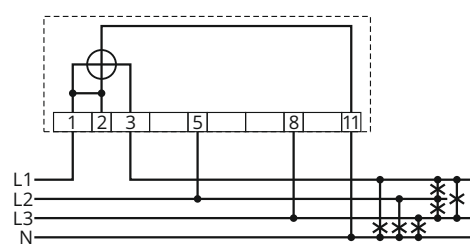
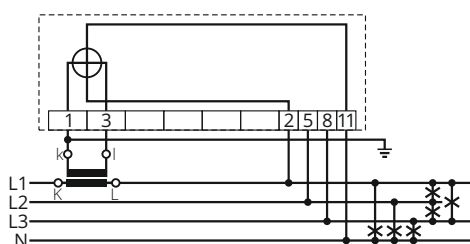
3b



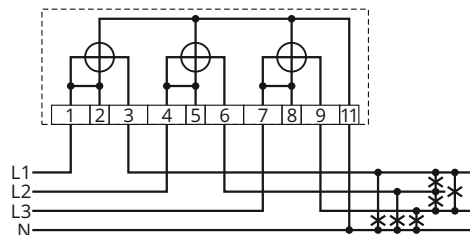
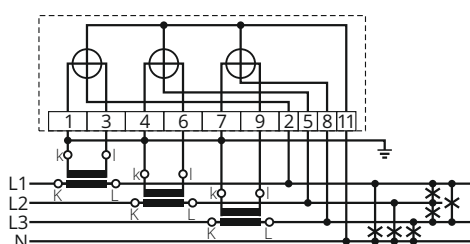
3u



4b



4u

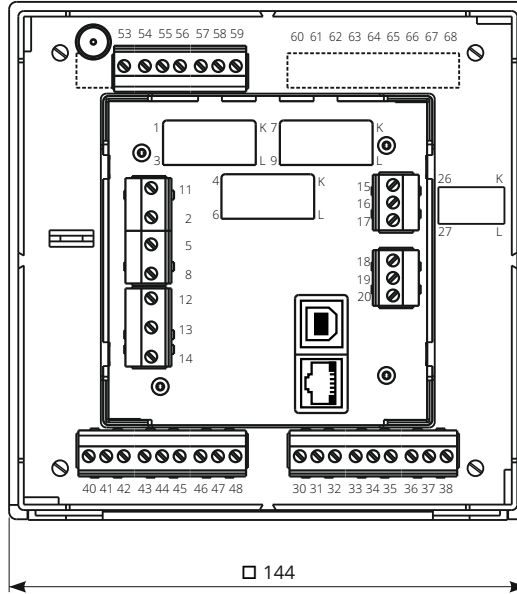
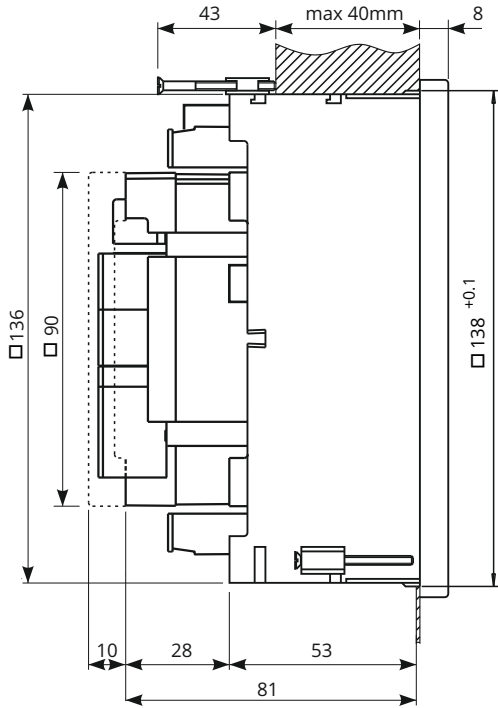


MEASURING CENTRES

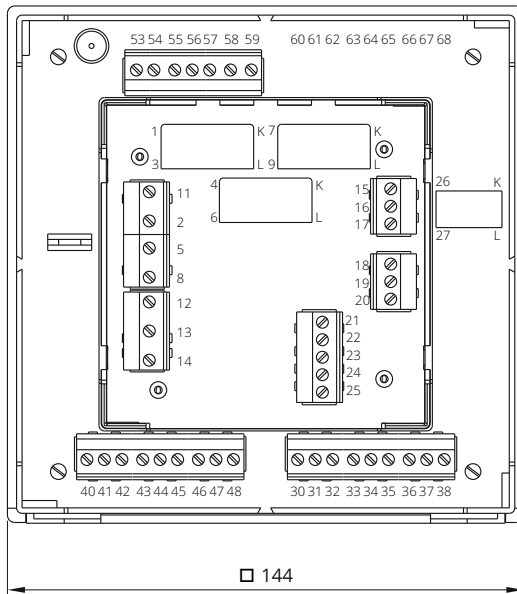
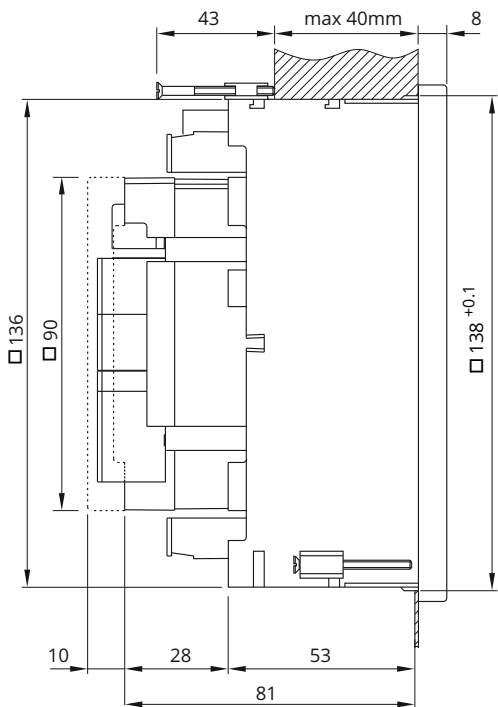
FAMILY OF MC 7x0, MC 7x4

DIMENSIONS (in mm)

MC 784



MC 774

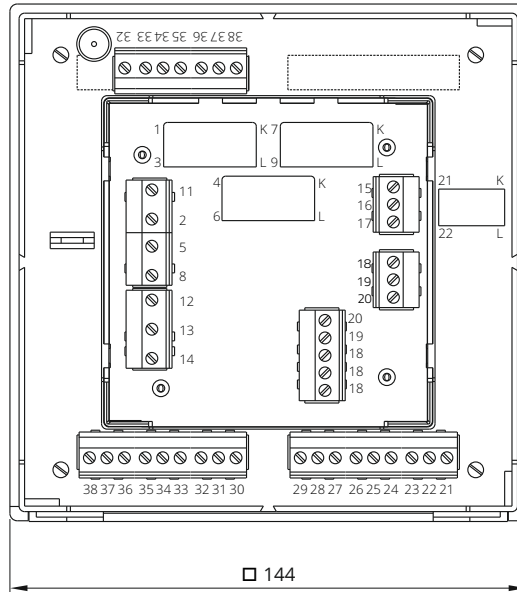
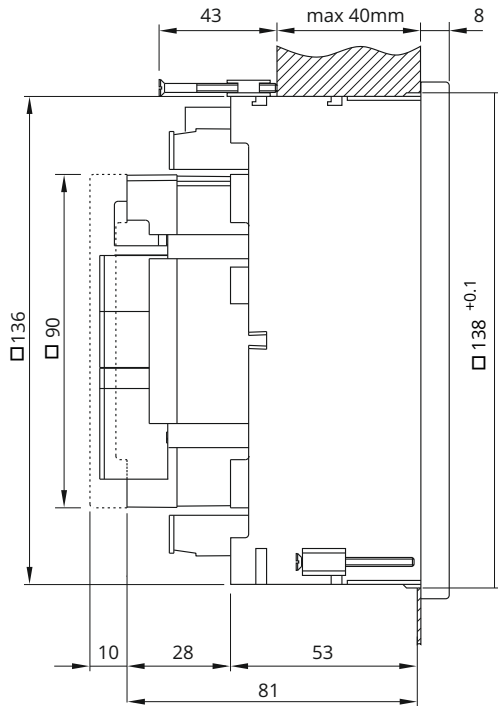


MEASURING CENTRES

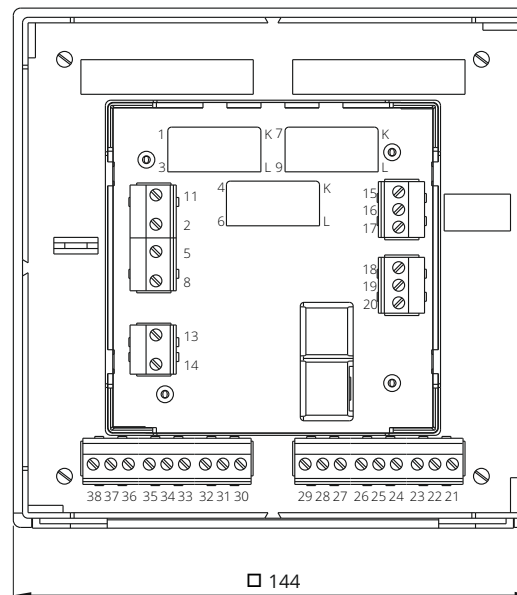
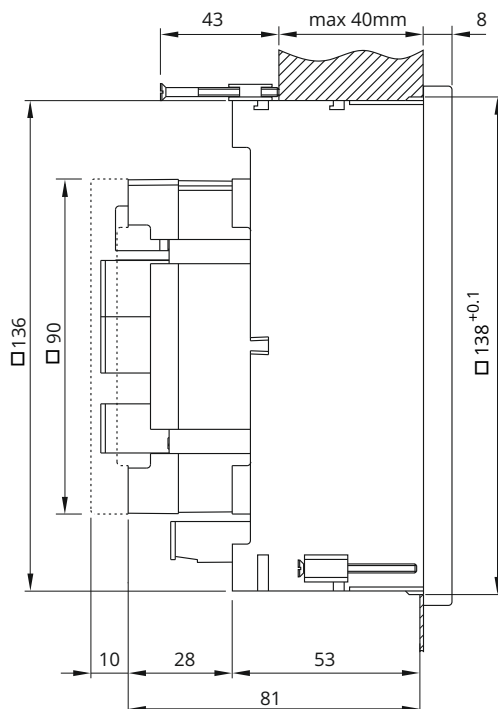
FAMILY OF MC 7x0, MC 7x4

DIMENSIONS (in mm)

MC 764



MC 7x4

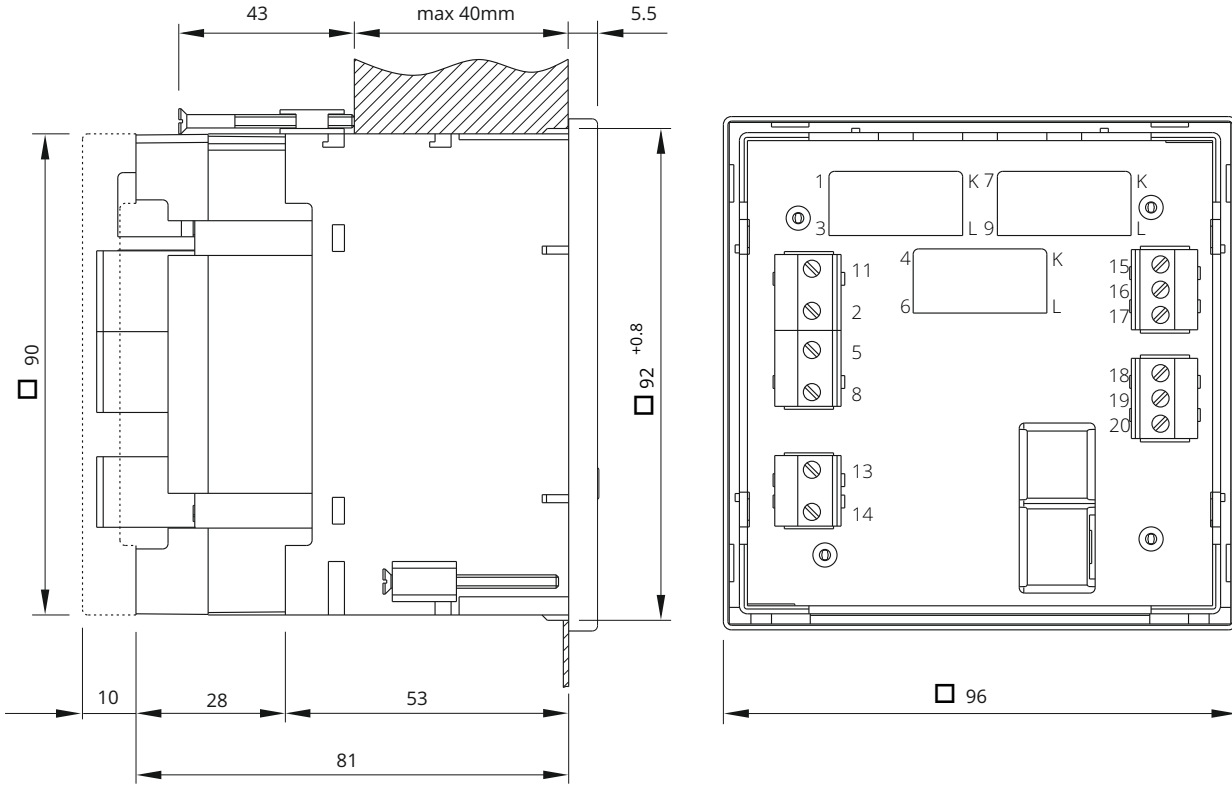


MEASURING CENTRES

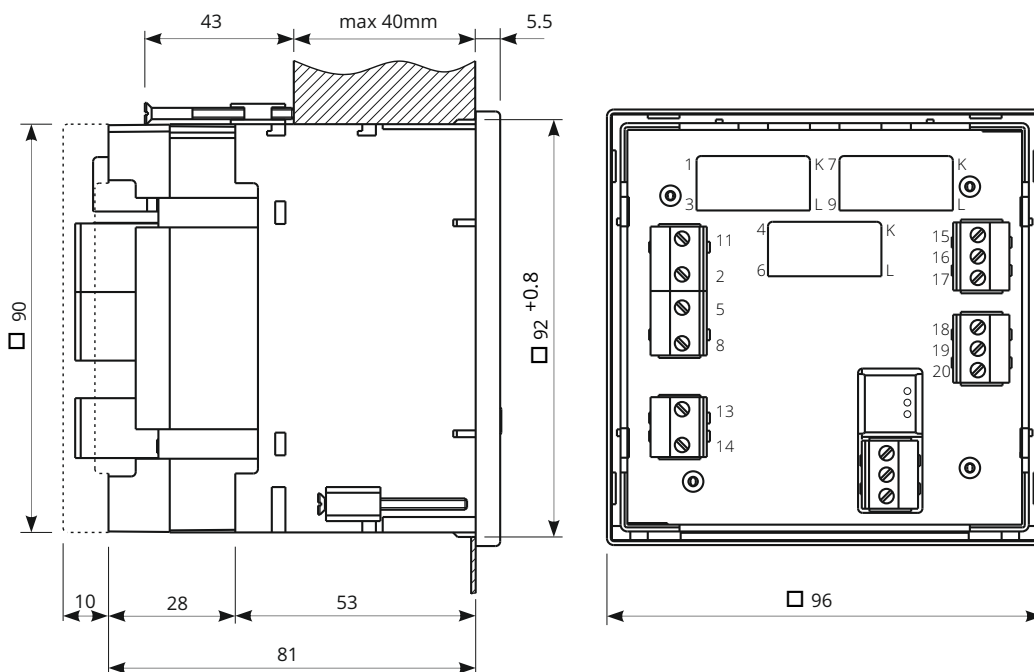
FAMILY OF MC 7x0, MC 3xx

DIMENSIONS (in mm)

MC 7x0



MC 3xx

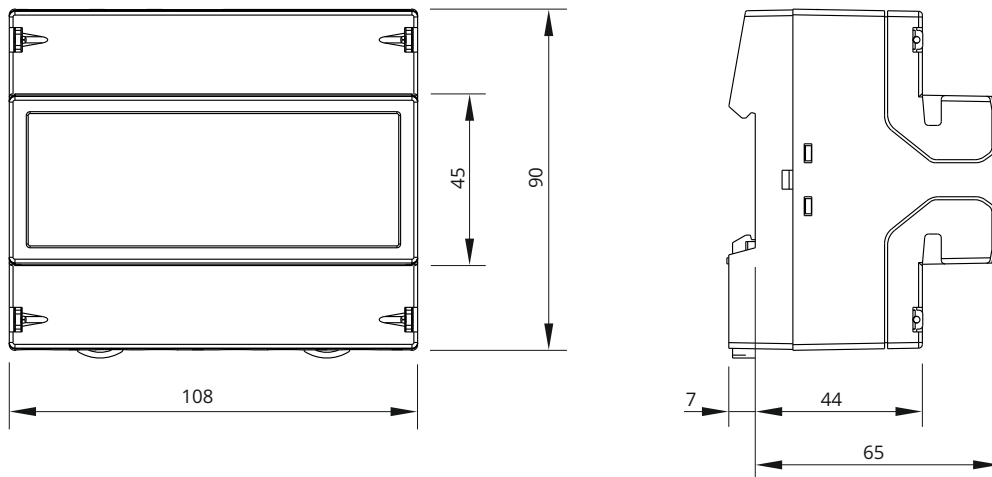


MEASURING CENTRES

FAMILY OF MC 6xx

DIMENSIONS (in mm)

MC 6xx



MEASURING TRANSDUCERS

MT 560/UMT 560 - TRANSDUCERS AND ANALYZER

USE



The MT 560/UMT 560 multi transducers and analyzer is used for a permanent analysis of electricity supply quality in compliance with the EN 50160 standard. Records are stored in the internal memory for the period of the last three years. Moreover, more than 100,000 deviations of the measurands from the standard values are stored, which enables finding eventual reasons for the problems in network.

Input ranges width enables measurement of all basic AC voltages and currents. The transducer generates and accepts different I/O signals. An analogue output signal is proportional to measurand and is intended for the control of analogue and digital devices. A pulse output is intended for sending data to devices for checking and supervising consumed energy.

FEATURES

- Frequency deviations
- Voltage deviations
- Voltage clips
- Voltage interruptions
- Voltage unbalances
- Over-voltages
- Fast voltage changes
- Flicker intensity
- THD
- Harmonics

Besides the features listed in the chapter „Family of Measuring Transducers MT 5x0/UMT 5x0 - comparison and common characteristics”, the transducers also has other features:

- Harmonic analysis of phase, phase-to-phase voltages and currents up to the 63rd harmonic (only MT/UMT 560)
- 32 adjustable alarms
- Recording up to 32 measurands and 32 alarms in the internal memory (8 MB flash)

MEASURING TRANSDUCERS

MT 550/UMT 550 - TRANSDUCERS AND RECORDER



USE

The MT 550/UMT 550 transducer and analyzer is used for monitoring, measuring and recording measurements of electric quantities in electrical power distribution system. Measurements are stored in internal flash memory (8 MB). Measuring transducers (U)MT 550 measure basic parameters (U, I, P) very precisely with accuracy class 0.2 according to the IEC EN 60688 standard.

Input range width enables measurement of all basic AC voltage or current. The transducer generates and accepts different I/O signals. An analogue output signal is proportional to measurand and is intended for the control of analogue and digital devices. A pulse output is intended for sending data to devices for checking and supervising consumed energy.

FEATURES

- Frequency deviations
- Voltage deviations
- Voltage clips
- Voltage interruptions
- Voltage unbalances
- Over-voltages
- Fast voltage changes
- Flicker intensity
- THD
- Harmonics

Besides the features listed in the chapter „Family of Measuring Transducers MT 5x0/UMT 5x0 - comparison and common characteristics“, the transducers also has other features:

- Harmonic analysis of phase, phase-to-phase voltages and currents up to the 31st harmonic
- 32 adjustable alarms
- Recording up to 32 measurands and 32 alarms in the internal memory (8 MB flash, only MT/UMT 550))

MEASURING TRANSDUCERS

MT 540/UMT 540 - MULTIFUNCTION TRANSDUCERS

USE



The instrument is used for monitoring and measuring electric quantities of three-phase electrical power distribution system. The meter is provided with 32 program adjustable alarms, up to four input or output modules and communication. With the RS232/RS485 or Ethernet & RS485 & USB communication, the meter can be set and measurements can be checked.

The meter also functions as an energy counter, with the additional function of cost management by tariffs. A tariff input or a tariff clock can be set. At tariff clock setting, four seasons and four day groups as well as energy cost for each period and a day group (16 different cost periods) are available. Additionally, the instrument can store up to 20 holidays. As an energy counter it can record energy in four tariffs in all four quadrants of the load power diagram.

FEATURES

- Frequency deviations
- Voltage deviations
- Voltage clips
- Voltage interruptions
- Voltage unbalances
- Over-voltages
- Fast voltage changes
- Flicker intensity
- THD
- Harmonics

Besides the features listed in the chapter „Family of Measuring Transducers MT 5x0/UMT 5x0 - comparison and common characteristics”, the transducers also has other features:

- Harmonic analysis of phase, phase-to-phase voltages and currents up to the 31st harmonic
- 32 adjustable alarms

MEASURING TRANSDUCERS

FAMILY OF MT 5x0/UMT 5x0

FEATURES

- Accuracy 0.2 (IEC/EN 60688), 0.1 (on communication)
- 4 I/O modules:
 - up to 4 analogue outputs
 - up to 4 analogue inputs
 - up to 4 digital inputs
 - up to 4 digital outputs
 - up to 4 pulse outputs
 - up to 2 tariff inputs
 - up to 4 alarms
 - with combination of previously listed inputs/outputs
 - watchdog relay output
- An additional COM2 serial communication module can be set instead of the 4th I/O module
- Pulse outputs can be set separately for the chosen tariff and for all tariffs together
- For an analogue output with the ranges +/- 20 mA and +/- 10 V, other ranges are set with software
- Analogue inputs support bipolar voltage (+/- 10 V) or bipolar current (+/- 20 mA) or two-wire temperature (PT1000; -200°C to +850°C) and resistance (up to 4 kΩ)
- 2 communication ports:
 - COM1: 3 ways of communication, always just one available: serial (RS232/485) or Ethernet & USB & RS485
- Communication protocols: Modbus (115,200 b/s), DNP3
- A transducers automatically detects communication protocols (MODBUS/DNP3)
- Frequency ranges: 16 2/3 Hz / 45-65 Hz / 400 Hz
- Real-time clock
- Universal auxiliary supply
- Dimension UMT 5x0 160 mm (weight) x 75 mm (height) x 125 mm (depth)
- User friendly and powerful settings software MiQen

TARIFF INPUTS

- **Rated voltage:** 230 V or 110 VAC ± 20 %
- **Max. current:** <0.6 mA
- **Frequency range:** 45 ... 65 Hz
- **SET voltage:** 40 ... 120 % of rated voltage
- **RESET voltage:** 0 ... 10 % of rated voltage

COMPLIANCE WITH STANDARDS

- EN 61010-1: 2001 Safety requirements for electrical equipment for measurement, control and laboratory use
- EN 60688: 1995 / A2: 2001 Electrical measuring transducers for converting AC electrical variables into analogue and digital signals
- EN 50160: 2010 Voltage characteristics of electricity supplied by public distribution networks
- EN 61326-1: 2006 EMC requirements for electrical equipment for measurement, control and laboratory use - Part 1: General requirements
- EN 60529: 1997/ A1: 2000 Degrees of protection provided by enclosures (IP code)
- EN 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

MEASURING TRANSDUCERS

FAMILY OF MT 5x0/UMT 5x0

COMPARISON AND COMMON CHARACTERISTICS

TYPE			
ANSI type	UMT 540	UMT 550	UMT 560
DIN type	MT 540	MT 550	MT 560
MEASUREMENTS - SINGLE PHASE			
Voltage	●	●	●
Current	●	●	●
Power (real, apparent, power factor)	●	●	●
Frequency	●	●	●
THD (U or/and I)	●	●	●
Max and dynamic demand	●	●	●
MEASUREMENTS - THREE PHASE			
Voltage/current per phase, average, unbalance	●	●	●
Power (real, apparent, power factor, frequency)	●	●	●
THD (U and I)	●	●	●
Max and dynamic demand	●	●	●
MEASUREMENTS - GENERAL			
Energy: bi-directional, total, import, export, net	●	●	●
Demand: block, rolling block, thermal	●	●	●
Cost management for Energy	●	●	●
Min/Max values	●	●	●
Measuring frequency range in Hz	16%...400	16%...400	16%...400
Accuracy			
U, I, φ , THD, PF (or process quantities)	0.2	0.2	0.2
P	0.2	0.2	0.2
Q	0.5	0.5	0.5
S	0.5	0.5	0.5
Active energy	0.5S	0.5S	0.5S
Reactive energy	2	2	2
POWER QUALITY			
Sag/Swell monitoring			●
Symmetrical components: zero, positive, negative			● positive
Total Harmonic Distortion (THDu, THDi)	●	●	●
Harmonics (individual, even, odd, total; up to)	63 rd	63 rd	63 rd
Sampling rate, maximum samples per cycle	128	128	128
Flicker, (harmonics to EN50160, IEC 61000-4-7/4-15)			●
LOGGING AND RECORDING			
Standard memory capacity		8MB	8MB
Min./Max. logging for any parameter		●	●
Historical logs, maximum # of channels		64+ alarms	64+ alarms+PQ reports & events
Historical data formats		dedicated (export to csv via MiQen SW)	dedicated (export to csv via MiQen SW)
Timestamp resolution for alarms (limit function) in seconds		1	1
Timestamp resolution for PQ events in seconds		1	1
Time synchronization (GPS, IRIG-B, NTP)	● NTP	● NTP	● NTP
Display - optional remote display RD 500	Via RD communication input / Graphical LCD	Via RD communication input / Graphical LCD	Via RD communication input / Graphical LCD
Waveform on display	● (single quantity)	● (single quantity)	● (single quantity)
Harmonic diagram on display	● (single quantity)	● (single quantity)	● (single quantity)

LEGEND:

- feature supported

MEASURING TRANSDUCERS

FAMILY OF MT 5x0/UMT 5x0

COMPARISON AND COMMON CHARACTERISTICS

TYPE			
ANSI type	UMT 540	UMT 550	UMT 560
DIN type	MT 540	MT 550	MT 560
COMMUNICATIONS AND I/O OPTIONS			
RS232/485 ports	●	●	●
RS485 or RS232 port	●	●	●
Ethernet + USB + RS485	●	●	●
RS485 analogue extender port (for up to 2 x 4 analogue output modules)	●	●	●
Baud rate	1200...115200 bps	1200...115200 bps	1200...115200 bps
Mudbus RTU & DNP3 on serial	●	●	●
Modbus TCP through Ethernet	●	●	●
XML	●	●	●
Programmable alarms (limit function), maximum # alarms	32	32	32
Analog outputs	4	4	4
Analog inputs	4	4	4
Digital status outputs	4	4	4
Relay outputs (standard)	4	4	4
Pulse outputs	4	4	4
Watchdog output	4	4	4
Maximum # of I/O	4	4	4
Analogue output braking points, zoom-in	●	●	●
Programmable I/O	●	●	●
POWER SUPPLY, CONNECTION AND DIMENSIONS			
Power supply	AC/DC (20...300 V DC, 48...276 V AC); AC various ranges	AC/DC (20...300 V DC, 48...276 V AC); AC various ranges	AC/DC (20...300 V DC, 48...276 V AC); AC various ranges
Connecton type (1phase, 3 phase 3W, 3 phase 4W)	●	●	●
Mounting	DIN rail	DIN rail	DIN rail
Dimensions in mm	96x96x81	96x96x81	96x96x81

LEGEND:

- feature supported

MEASURING TRANSDUCERS

RD 500 - REMOTE DISPLAY FOR MEASURING

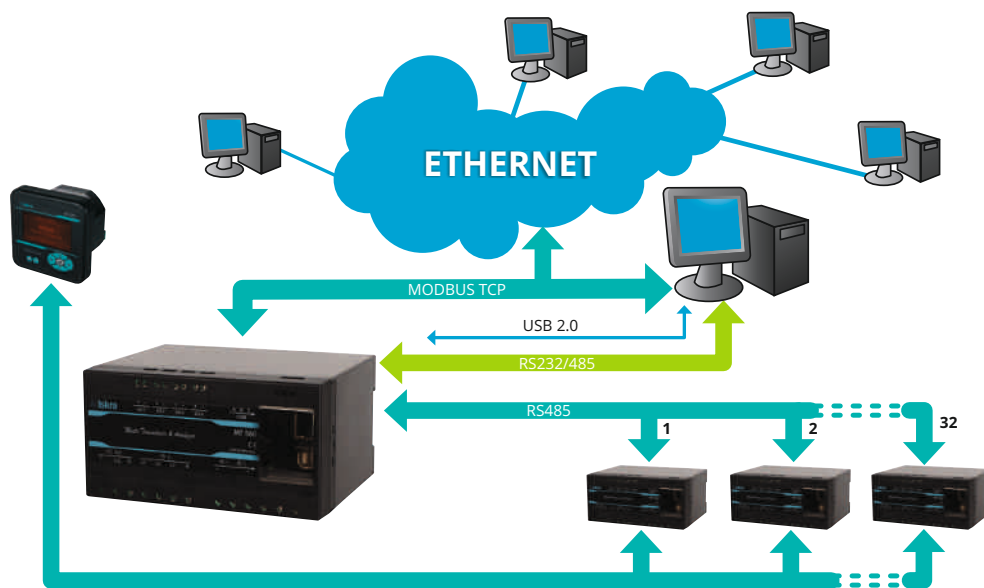


USE

Remote display is very useful for a quick survey of all measured parameters or for setting up the (U)MT5xx measuring transducers without the PC. Navigation keys and graphical LCD display enable remote application and remote display settings. By choosing different RD 500 target communication addresses it is possible to track measurements and change settings for up to 32 (U)MT 5x0 measuring transducers.

FEATURES

- Remote application for measuring transducers (U)MT560, (U)MT550, (U)MT540
- Network connection for up to 32 transducers
- RS485 communication
- Universal power supply 48-276 V AC, 20-300 V DC
- Graphical LCD 128 x 64 dots
- Remote display is available as ANSI Style 4" Round version or DIN Style 96x96 mm version
- Multilingual support



MEASURING TRANSDUCERS

MT 510/ UMT 510 - POWER TRANSDUCERS



USE

UMT 510 is intended for measuring and monitoring single-phase electrical power network. Voltage and current inputs are electrically isolated from the system by means of highly resistive input chain and current transformer respectively.

It measures true RMS values by means of fast sampling of voltage and current signals, which makes instruments suitable for acquisition of transient events. A built-in microcontroller calculates measurands (voltage, current, frequency, energy, power, power factor, power angles, THD U, THD I, MD) from the measured signals.

FEATURES

- Measurements of instantaneous values of all single phase values; U, I, P, Q, S, f, φ , energy, THD U, THD I, MD
- Power accuracy class 0.2
- 16 adjustable alarms
- Wide frequency range from 16 Hz to 400 Hz
- RS232/RS485 communication up to 115,200 bit/s or Ethernet & USB & RS485 communication simultaneously
MODBUS communication protocol
- Up to 2 inputs or outputs (analogue outputs, digital inputs, alarm (digital) outputs, pulse outputs)
- Universal power supply (two voltage ranges)
- Automatic range of nominal current and voltage (max. 12.5 A and 600 V_{L-N})
- Housing for a DIN rail mounting
- User-friendly PC MiQen software
-

MEASURING TRANSDUCERS

MT 511/UMT 511 POWER TRANSDUCERS & RECORDER



USE

(U)MT 511 is intended for measuring and monitoring single-phase electrical power network. Voltage and current inputs are electrically isolated from the system by means of highly resistive input chain and current transformer, respectively.

It measures true RMS values by means of fast sampling of voltage and current signals, which makes instruments suitable for acquisition of transient events. A built-in microcontroller calculates measurands (voltage, current, frequency, energy, power, power factor, power angles, THD U, THD I, MD) from the measured signals.

FEATURES

- Measurements of instantaneous values of all single phase values; U, I, P, Q, S, f, φ , energy, THD U, THD I, MD
- Power accuracy class 0.2
- Recording of up to 8 measurands and 16 alarms in the internal memory (8 MB flash)
- 16 adjustable alarms
- Wide frequency range from 16 Hz to 400 Hz
- RS232/RS485 communication up to 115,200 bit/s or Ethernet & USB & RS485 communication simultaneously
MODBUS communication protocol
- Up to 2 inputs or outputs (analogue outputs, digital inputs, alarm (digital) outputs, pulse outputs)
- Universal power supply (two voltage ranges)
- Automatic range of nominal current and voltage (max. 12.5 A and 600 V_{L-N})
- Housing for a DIN rail mounting
- User-friendly PC MiQen software
-

MEASURING TRANSDUCERS

MT 516/UMT 516 - VOLTAGE TRANSDUCERS



USE

(U)MT 516 is intended for measuring and monitoring single-phase electrical power network. Voltage input is electrically isolated from the system by means of highly resistive input chain. It measures true RMS voltage value by means of fast sampling of voltage signals, which makes instruments suitable for acquisition of transient events. A built-in micro-controller calculates measurands (voltage, frequency, THD U) from the measured signals. Measurands can then be converted into load independent DC current or voltage which is proportional to the true RMS measured value for the purpose of regulating analogue and/or digital devices.

FEATURES

- Measurements of true RMS voltage, frequency, THD U
- High accuracy class 0.2 (IEC-688)
- 16 adjustable alarms
- Wide frequency range from 16 Hz to 400 Hz
- RS232/RS485 communication up to 115,200 bit/s or Ethernet & USB & RS485 communication simultaneously
MODBUS communication protocol
- Up to 2 inputs or outputs (analogue outputs, digital inputs, alarm outputs, digital outputs)
- Universal power supply (two voltage ranges)
- Automatic range of nominal voltage (max. 600 V_{L-N})
- Housing for a DIN rail mounting
- User-friendly PC MiQen software
-

MEASURING TRANSDUCERS

MT 518/UMT 518 - CURRENT TRANSDUCERS



USE

(U)MT 518 is intended for measuring and monitoring single-phase electrical power network. Input current is electrically isolated from the system by means of current transformer. (U)MT518 measures true RMS current value by means of fast sampling of current signals, which makes instruments suitable for acquisition of transient events. A built-in micro-controller calculates measurands (current, frequency, THD I) from the measured signals. Measurands can then be converted into load independent DC current or voltage which is proportional to the true RMS measured value for the purpose of regulating analogue and/or digital devices.

FEATURES

- Measurements of true RMS current, frequency, THD I
- High accuracy class 0.2 (IEC-688)
- 16 adjustable alarms
- Wide frequency range from 16 Hz to 400 Hz
- RS232/RS485 communication up to 115,200 bit/s or Ethernet & USB & RS485 communication simultaneously
MODBUS communication protocol
- Up to 2 inputs or outputs (analogue outputs, digital inputs, alarm outputs, digital outputs)
- Universal power supply (two voltage ranges)
- Automatic range of nominal current (max. 12.5 A)
- Housing for a DIN rail mounting
- User-friendly PC MiQen software
-

MEASURING TRANSDUCERS

FAMILY OF MT 51x/UMT 51x

COMPARISON AND COMMON CHARACTERISTICS				
TYPE				
ANSI type	UMT 510	UMT 511	UMT 516	UMT 518
DIN type	MT 510	MT 511	MT 516	MT 518
MEASUREMENTS - SINGLE PHASE				
Voltage	●	●	●	
Current	●	●		●
Power (real, apparent, power factor)	●	●		
Frequency	●	●	●	●
THD (U or/and I)	●	●	●	●
Max and dynamic demand	●	●	●	●
MEASUREMENTS - GENERAL				
Energy: bi-directional, total, import, export, net	●	●		
Demand: block, rolling block, thermal	thermal	thermal	thermal	thermal
Measuring frequency range in Hz	16%...400	16%...400	16%...400	16%...400
Accuracy				
U, I, φ, THD, PF (or process quantities)	0.2	0.2	0.2	0.2
P	0.2	0.2		
Q	0.2	0.2		
S	0.2	0.2		
Active energy	1	1		
Reactive energy	2	2		
POWER QUALITY				
Total Harmonic Distortion (THDu, THDi)	●	●	●	●
Sampling rate, maximum samples per cycle	128	128	128	128
LOGGING AND RECORDING				
Standard memory capacity		8MB		
Min./Max. logging for any parameter		●		
Historical logs, maximum # of channels		16+ alarms		
Historical data formats		dedicated (export to csv via MiQen SW)		
COMMUNICATIONS AND I/O OPTIONS				
RS232/485 ports	●	●	●	●
RS485 or RS232 port	●	●		
Ethernet + USB + RS485	●	●	●	●
Baud rate	1200...115200 bps	1200...115200 bps	1200...115200 bps	1200...115200 bps
Modbus RTU	●	●	●	●
Modbus TCP through Ethernet	●	●	●	●
Programmable alarms (limit function), maximum # alarms	16	16	16	16
Analog outputs	2	2	2	2
Digital status inputs	2	2	2	2
Digital status outputs	2	2	2	2
Relay outputs (standard)	2	2	2	2
Pulse outputs	2	2		
Watchdog output	2	2	2	2
Maximum # of I/O	2	2	2	2
Analogue output braking points, zoom-in	●	●	●	●
Programmable I/O	●	●	●	●
POWER SUPPLY, CONNECTION AND DIMENSIONS				
Power supply	AC/DC (19...70 V DC, 48...77 V AC); AC/DC (70...300 V DC, 80...276 V AC)	AC/DC (19...70 V DC, 48...77 V AC); AC/DC (70...300 V DC, 80...276 V AC)	AC/DC (19...70 V DC, 48...77 V AC); AC/DC (70...300 V DC, 80...276 V AC)	AC/DC (19...70 V DC, 48...77 V AC); AC/DC (70...300 V DC, 80...276 V AC)
Connection type (1phase, 3 phase 3W, 3 phase 4W)	1 ph	1 ph	1 ph	1 ph
Mounting	DIN rail	DIN rail	DIN rail	DIN rail
Dimensions in mm	100x75x124	100x75x124	100x75x124	100x75x124

LEGEND:

- feature supported

MEASURING TRANSDUCERS

MT 406 - AC VOLTAGE SELF POWERED TRANSDUCERS



USE

MT 406 is intended for measuring and monitoring voltage in electrical power network. Voltage input is electrically insulated from the system by means of voltage transformer. The signal is rectified, smoothed and amplified into an independent DC current output.

Application

The MT 406 voltage transducer is used for a permanent monitoring of a single-phase voltage value. PLCs, PCs, micro-processor control, indicators, alarms units etc. can be operated by the output signal. Voltage input can be connected either directly to low-voltage network or shall be connected to network via a corresponding voltage transformer (with standard 100 V output).

FEATURES

- Sinusoidal AC voltage measurements
- Voltage range measurements up to 500 V_{L-N}
- Galvanic insulation between input and output
- Accuracy class 0.5
- Self powered
- Housing for a DIN rail mounting

Note:

Power supply from a measuring circuit only. Communication port and auxiliary power supply are not available. Output 0.5 mA, 20 mA.

MEASURING TRANSDUCERS

MT 408 - AC CURRENT SELF POWERED TRANSDUCERS



USE

MT 408 is intended for measuring and monitoring single-phase electrical power network. Current input is electrically insulated from the system by means of current transformer. The signal is rectified, smoothed and amplified into an independent DC current output.

Application

The MT 408 current transducer is used for a permanent monitoring of a single-phase current value. PLCs, PCs, micro-processor control, indicators, alarms units etc. can be operated by the output signal. Current input 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).

FEATURES

- Sinusoidal AC current measurements
- Current range measurements up to 6 A
- Galvanic insulation between input and output
- Accuracy class 0.5
- Self powered
- Housing for a DIN rail mounting

Note:

Power supply from a measuring circuit only. Communication port and auxiliary power supply are not available. Output 0.5 mA, 20 mA.

MEASURING TRANSDUCERS

MT 416 - PROGRAMMABLE AC VOLTAGE TRANSDUCERS

USE



MT 416 is intended for measuring and monitoring single-phase electrical power network. Voltage input is electrically isolated from the system by means of voltage transformer. It measures true 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 true RMS measured value for the purpose of regulation of analogue and/or digital devices.

Application

The MT 416 voltage transducer is used for a permanent monitoring of a single-phase voltage and frequency values. MT 416 is delivered configured to default values. Subsequent customer configuration is possible with user friendly setting software MiQen. MT 416 supports standard serial RS232/485 with speed up to 115,200 bit/s. 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.

FEATURES

- Measurements of true RMS voltage, frequency THD U and MD
- Voltage auto range measurements up to 600 V_{L-N}
- Input frequency range: 50/60 Hz, 400 Hz
- AC or universal wide auxiliary power supply range 24 - 300 V DC, 40 - 276 V AC
- Accuracy class 0.5 (EN 60688)
- RS 232/RS485 communication up to 115, 200 bit/s and USB 2.0 communication
- MODBUS communication protocol
- Sophisticated analogue output; 2 voltage and 4 current ranges, non-linear characteristics ...
- Simple USB setting without auxiliary power supply
- Housing for DIN rail mounting
- User-friendly PC MiQen software

MEASURING TRANSDUCERS

MT 418 - PROGRAMMABLE AC CURRENT TRANSDUCERS



USE

MT 418 is intended for measuring and monitoring single-phase electrical power network. Current input is electrically isolated from the system by means of current transformer. It measures true 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 true RMS measured value for the purpose of regulation of analogue and/or digital devices.

Application

The MT 418 current transducer is used for a permanent monitoring of a single-phase current and frequency values. MT 418 is delivered configured to default values. Subsequent customer configuration is possible with user friendly setting software MiQen. MT 418 supports standard serial RS232/485 with speed up to 115,200 bit/s. 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.

FEATURES

- Measurements of true RMS current, frequency, THD I and MD
- Current auto range measurements up to 12 A
- Input frequency range: 50/60 Hz, 400 Hz
- AC or universal wide auxiliary power supply range 24 - 300 V DC, 40 - 276 V AC
- Accuracy class 0.5 (EN 60688)
- RS 232/RS485 communication up to 115, 200 bit/s and USB 2.0 communication
- MODBUS communication protocol
- Sophisticated analogue output; 2 voltage and 4 current ranges, non-linear characteristics ...
- Simple USB setting without auxiliary power supply
- Housing for DIN rail mounting
- User-friendly PC MiQen software

MEASURING TRANSDUCERS

FAMILY OF MT 41x

COMPARISON AND COMMON CHARACTERISTICS

COMPARISON AND COMMON CHARACTERISTICS				
TYPE				
DIN type	MT 406	MT 408	MT 416	MT 418
MEASUREMENTS - SINGLE PHASE				
Voltage	●		●	
Current		●		●
Frequency			●	●
THD (U or/and I)			●	●
Max and dynamic demand				●
MEASUREMENTS - GENERAL				
Demand: block, rolling block, thermal				thermal
Measuring frequency range in Hz	+/- 10% fn	+/- 10% fn	+/- 10% fn	+/- 10% fn
Accuracy				
U, I, φ , THD, PF (or process quantities)	0.5	0.5	0.5	0.5
POWER QUALITY				
Total Harmonic Distortion (THDu, THDi)			●	●
Sampling rate, maximum samples per cycle	128	128	128	128
COMMUNICATIONS AND I/O OPTIONS				
RS485 or RS232 port			●	●
Baud rate			1200...115200 bps	1200...115200 bps
Service USB			●	●
Mudbus RTU & DNP3 on serial			●	●
Analog outputs	1	1	1	1
Maximum # of I/O	1	1	1	1
Analogue output braking points, zoom-in			●	●
Programmable I/O			●	●
POWER SUPPLY, CONNECTION AND DIMENSIONS				
Power supply	selfpowered	selfpowered	AC/DC (24...300 V DC, 40...276 V AC); AC various ranges	AC/DC (24...300 V DC, 40...276 V AC); AC various ranges
Connecton type (1phase, 3 phase 3W, 3 phase 4W)	1 ph	1 ph	1 ph	1 ph
Mounting	DIN rail	DIN rail	DIN rail	DIN rail
Dimensions in mm	44.8x75x105.5	44.8x75x105.5	44.8x75x105.5	44.8x75x105.5

LEGEND:

- feature supported

MEASURING TRANSDUCERS

MT 440 - MULTIFUNCTIONAL TRANSDUCERS

USE



MT 440 are intended for measuring and monitoring single-phase or three-phase electrical power network. They measure RMS value by means of fast sampling of voltage and current signals, which makes instruments suitable for acquisition of transient events. A built-in microcontroller calculates measurands (voltage, current, frequency, energy, power, power factor, THD phase angles, etc.) from the measured signals.

Application

The MT 440 multifunction transducer is used for measuring and monitoring of all single-phase or three-phase values. Wide range of various I/O modules makes MT 440 a perfect choice for numerous applications. MT 440 is delivered unconfigured for customer configuration with user friendly setting software MiQen. MT 440 supports standard serial communication RS232 or RS485 with speed up to 115,200 bit/s baud, which is perfect for simple applications and serial bus interfacing. 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 power inputs (aux. supply and measurement inputs) and can be used ONLY unconnected to power inputs.

FEATURES

- Measurements of instantaneous values of more than 50 quantities
- (V, A, kW, kVA, kvar, kWh, kvarh, PF, Hz, MD thermal, THD, etc)
- Power accuracy class 0.5
- 16 adjustable alarms
- Input frequency range: 50/60 Hz, 400 Hz
- Serial communication (RS232 or RS485 up to 115,200 bit/s) and USB 2.0
- MODBUS communication protocol
- Up to 4 I/O
- (analogue outputs, alarm outputs, pulse outputs, general purpose relay output, general purpose solid-state output)
- Universal wide auxiliary power supply range 24 - 300 V DC, 40 - 276 V AC
- Automatic range of current and voltage (max. 12.5 A and 600 V_{L-N})
- Sophisticated analogue output; 2 voltage and 4 current ranges, non-linear characteristics ...
- Simple USB setting without auxiliary power supply
- Housing for DIN rail mounting
- User-friendly PC MiQen software

MEASURING TRANSDUCERS

MT 440 - MULTIFUNCTIONAL TRANSDUCERS

COMPARISON AND COMMON CHARACTERISTICS

TYPE	
DIN type	MT 440
MEASUREMENTS - SINGLE PHASE	
Voltage	●
Current	●
Power (real, apparent, power factor)	●
Frequency	●
THD (U or/and I)	●
Max and dynamic demand	●
MEASUREMENTS - THREE PHASE	
Voltage/current per phase, average, unbalance	●
Power (real, apparent, power factor, frequency)	●
THD (U and I)	●
Max and dynamic demand	●
MEASUREMENTS - GENERAL	
Energy: bi-directional, total, import, export, net	●
Demand: block, rolling block, thermal	thermal
Measuring frequency range in Hz	16%...400
Accuracy	
U, I, φ , THD, PF (or process quantities)	0.3
P	0.5
Q	0.5
S	0.5
Active energy	1
Reactive energy	2
POWER QUALITY	
Total Harmonic Distortion (THDu, THDi)	●
Sampling rate, maximum samples per cycle	128
LOGGING AND RECORDING	
Display - optional remote display RD 500	Via standard serial RS485 communication / Graphical LCD
COMMUNICATIONS AND I/O OPTIONS	
RS485 or RS232 port	●
Baud rate	1200...115200 bps
Service USB	●
Mudbus RTU & DNP3 on serial	●
Programmable alarms (limit function), maximum # alarms	32
Analog outputs	4
Analog outputs (fast)	4
Digital status outputs	4
Relay outputs (standard)	4
Pulse outputs	4
Maximum # of I/O	4
Analogue output braking points, zoom-in	●
Programmable I/O	●
POWER SUPPLY, CONNECTION AND DIMENSIONS	
Power supply	AC/DC (20...300 V DC, 48...276 V AC); AC various ranges (only one output!)
Connecton type (1phase, 3 phase 3W, 3 phase 4W)	●
Mounting	DIN rail
Dimensions in mm	100x5x105.5

LEGEND:

- feature supported

MEASURING TRANSDUCERS

MI 45x



USE

Measuring transducer of family MI 45x are designed for use in industrial process for conversion of DC current in to appropriate DC current or DC voltage signals.

Versions

- MI 458 - DC current
- MI 456 - DC voltage
- MI 454 - TAP position
- MI 452 - Resistance
- MI 450 - Temperature with Pt 100

DESCRIPTION

- **MI 458** - Accuracy class 0.5
 - Inputs: $I = 1 \dots 10 \text{ mA DC}$; $I = 10 \dots 100 \text{ mA DC}$
 - Housing width (a): 45 mm
- **MI 456** - Accuracy class 0.5
 - Inputs: $U = 50 \text{ mV} \dots 1 \text{ V DC}$; $U = 1 \text{ V} \dots 50 \text{ V DC}$; $U = 50 \text{ V} \dots 400 \text{ V DC}$
 - Housing width (a): 45 mm
- **MI 454** - Accuracy class 0.5
 - Inputs: $100 \Omega \dots 50 \text{ k}\Omega$; $1000 \Omega \dots 500 \text{ k}\Omega$
 - Housing width (a): 45 mm
- **MI 452** - Accuracy class 0.5
 - Inputs: $R = 0 \dots 10 \Omega \dots 50 \text{ k}\Omega$; $R = 0 \dots 100 \Omega \dots 500 \text{ k}\Omega$
 - Housing width (a): 45 mm
- **MI 450** - Accuracy class 0.5
 - Inputs: 2-wire, 3-wire, 4-wire
 - Housing width (a): 45 mm
- AC auxiliary power supply: 57, 63.5, 100, 110, 230, 400, 500 V
- **Options:**
 - RS 232 or RS 485 serial communication port
 - Universal auxiliary power supply for DC & AC 24 ... 300 V DC / 40 ... 276 V AC

MEASURING TRANSDUCERS

MI 45x

COMPARISON AND COMMON CHARACTERISTICS					
TYPE					
DIN type	MI 450	MI 452	MI 454	MI 456	MI 458
MEASUREMENTS - PROCESS QUANTITIES					
Voltage DC				●	
Current DC					●
TAP position			●		
Resistance		●			
Temperature - RTD sensors	●				
MEASUREMENTS - GENERAL					
Accuracy					
U, I, ϕ , THD, PF (or process quantities)	0.5	0.5	0.5	0.5	0.5
POWER QUALITY					
Sampling rate, maximum samples per cycle	128	128	128	128	128
COMMUNICATIONS AND I/O OPTIONS					
RS485 or RS232 port	●	●	●	●	●
Baud rate	1200...115200 bps	1200...115200 bps	1200...115200 bps	1200...115200 bps	1200...115200 bps
Mudbus RTU & DNP3 on serial	●	●	●	●	●
Analog outputs	1	1	1	1	1
Maximum # of I/O	1	1	1	1	1
Analogue output braking points, zoom-in	●	●	●	●	●
Programmable I/O	●	●	●	●	●
POWER SUPPLY, CONNECTION AND DIMENSIONS					
Power supply	AC/DC (24...300 V DC, 40...276 V AC); AC various ranges	AC/DC (24...300 V DC, 40...276 V AC); AC various ranges	AC/DC (24...300 V DC, 40...276 V AC); AC various ranges	AC/DC (24...300 V DC, 40...276 V AC); AC various ranges	AC/DC (24...300 V DC, 40...276 V AC); AC various ranges
Mounting	DIN rail	DIN rail	DIN rail	DIN rail	DIN rail
Dimensions in mm	44.8x75x105.5	44.8x75x105.5	44.8x75x105.5	44.8x75x105.5	44.8x75x105.5

LEGEND:

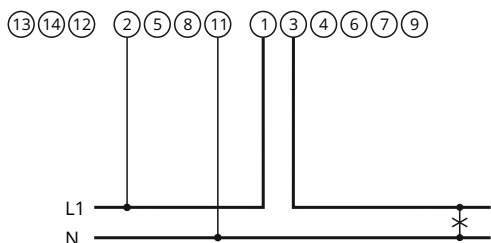
- feature supported

MEASURING TRANSDUCE

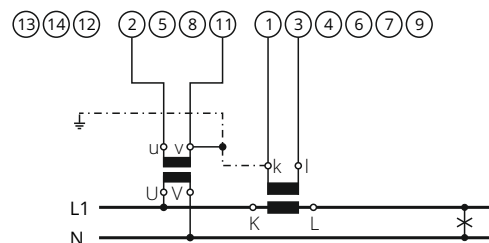
FAMILY OF MT 5x0/UMT 5x0

CONNECTION DIAGRAMS

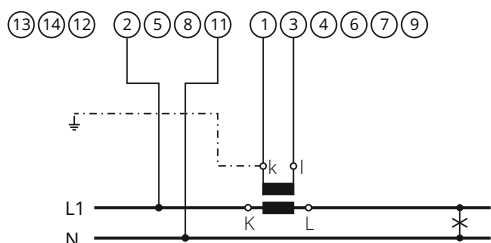
1b - single phase



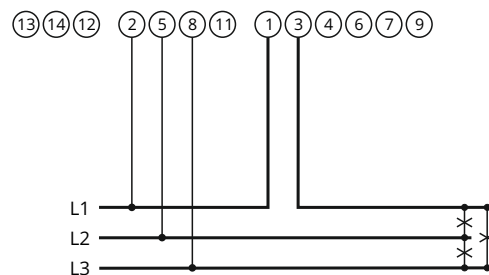
1b - single phase



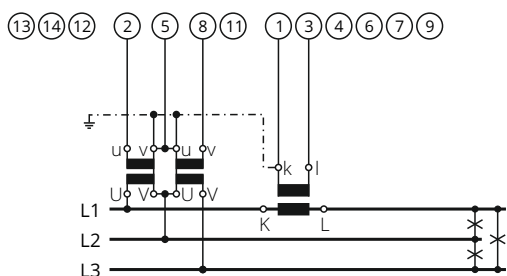
1b - single phase



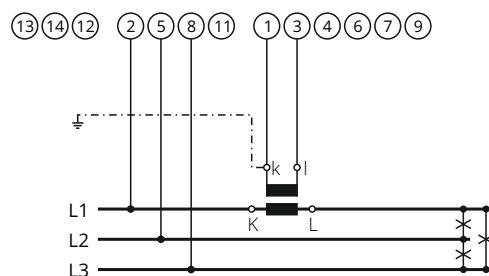
3b - three-phase, three wires, balanced load



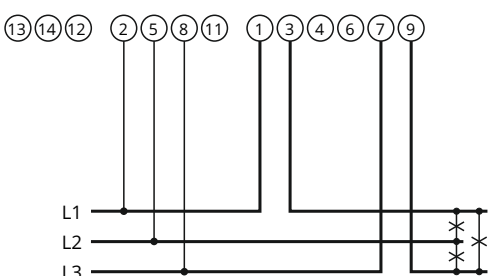
3b - three-phase, three wires, balanced load



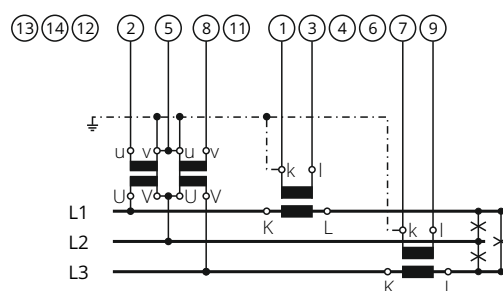
3b - three-phase, three wires, balanced load



3u - three-phase, three wires, unbalanced load



3u - three-phase, three wires, unbalanced load

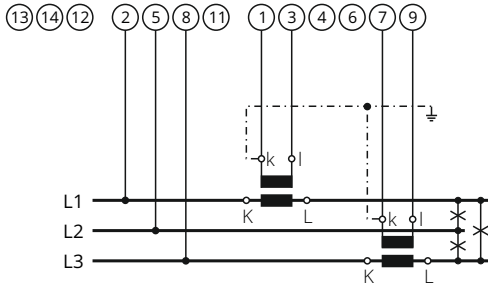


MEASURING TRANSDUCE

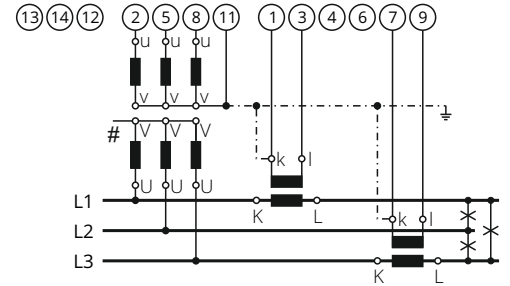
FAMILY OF MT 5x0/UMT 5x0

CONNECTION DIAGRAMS

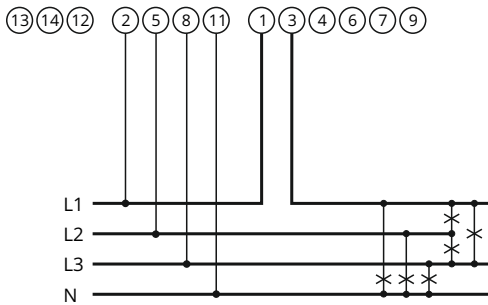
3u - three-phase, three wires, unbalanced load



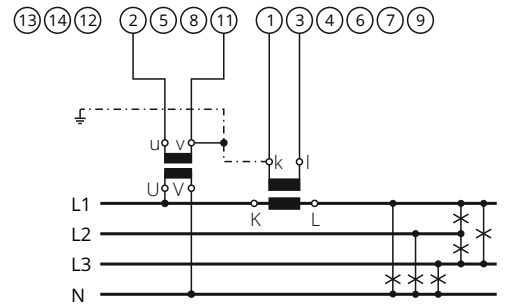
3u - three-phase, three wires, unbalanced load



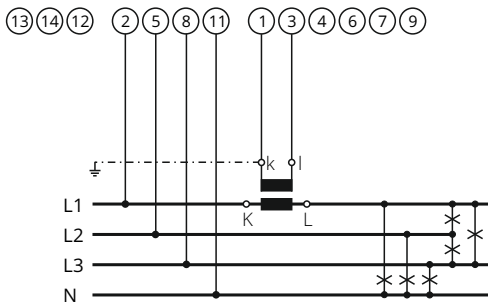
4b - three-phase, four wires, balanced load



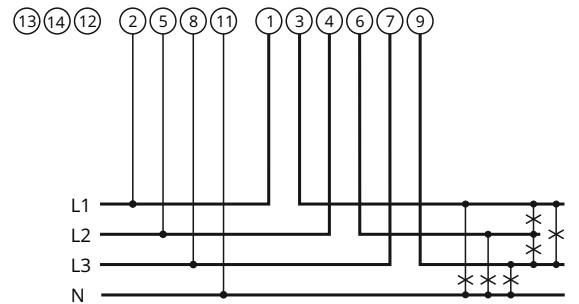
4b - three-phase, four wires, balanced load



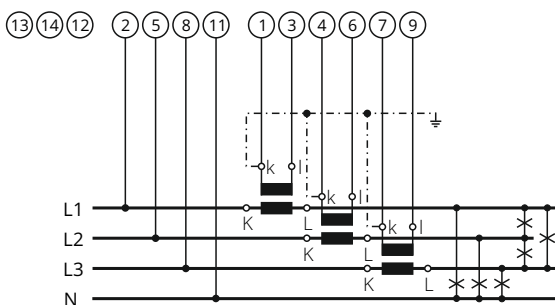
4b - three-phase, four wires, balanced load



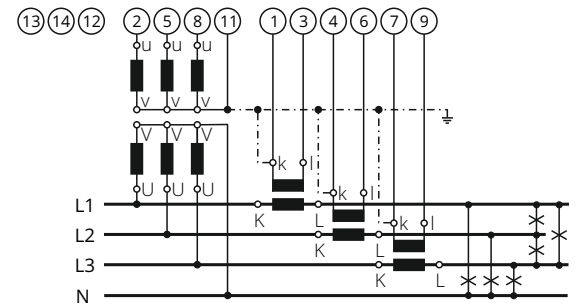
4u - three-phase, four wires, unbalanced load



4u - three-phase, four wires, unbalanced load



4u - three-phase, four wires, unbalanced load

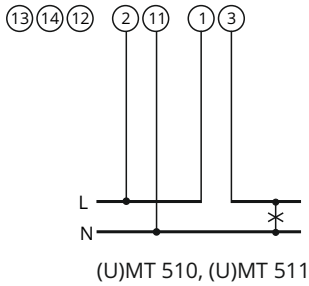


MEASURING TRANSDUCERS

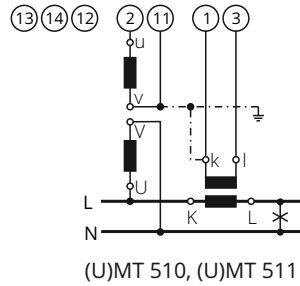
FAMILY OF MT 51x/UMT 51x, MT 4xx

CONNECTION DIAGRAMS

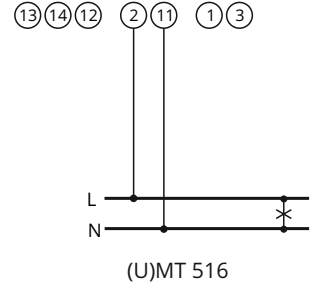
1b - single phase



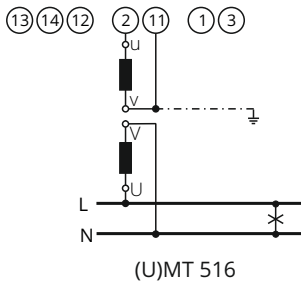
1b - single phase



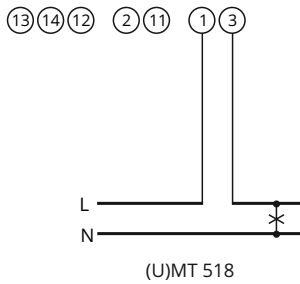
1b - single phase



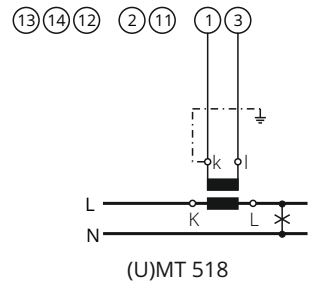
1b - single phase



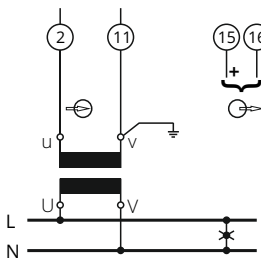
1b - single phase



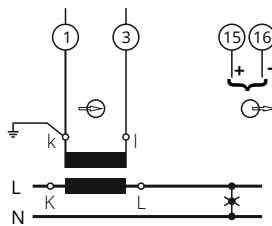
1b - single phase



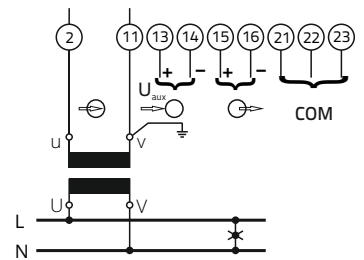
MT 406



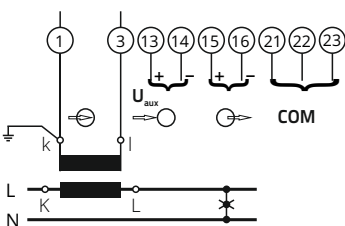
MT 408



MT 416



MT 418

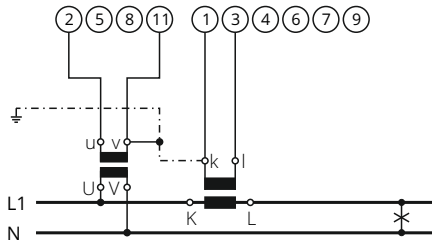


MEASURING TRANSDUCERS

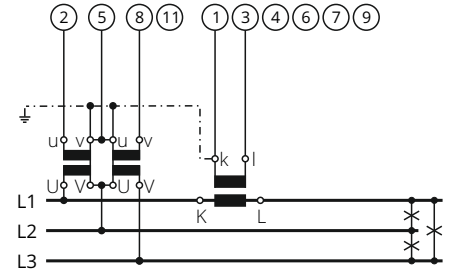
MT 440

CONNECTION DIAGRAMS

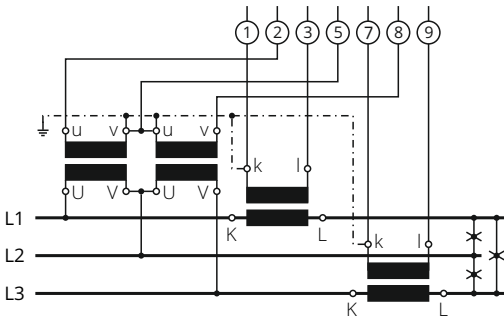
1b



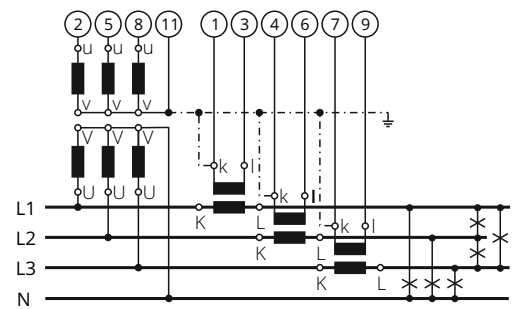
3b



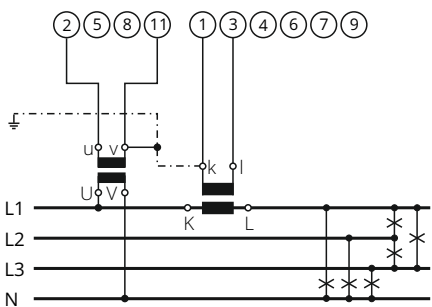
3u



4u



4b

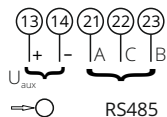


MEASURING TRANSDUCERS

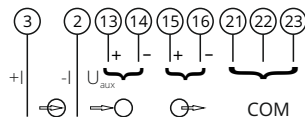
FAMILY OF MI 4xx

CONNECTION DIAGRAMS

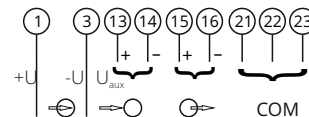
MI 488



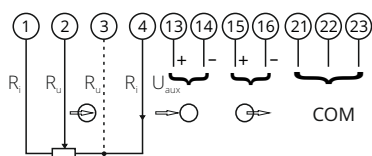
MI 458



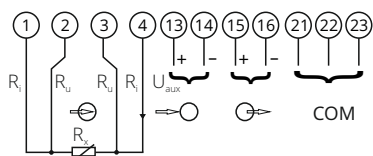
MI 456



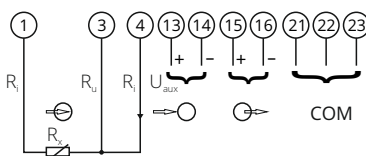
MI 454



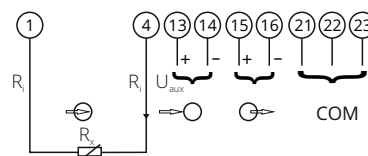
MI 452, 4-wire



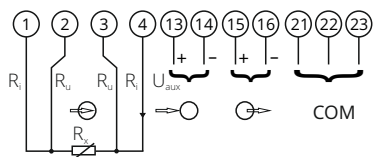
MI 452, 3-wire



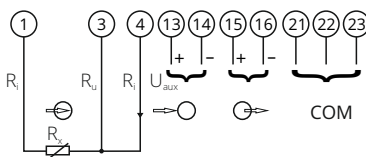
MI 452, 2-wire



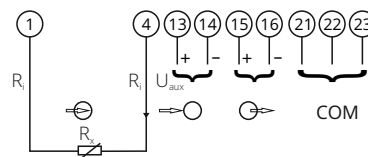
MI 450, 4-wire



MI 450, 3-wire

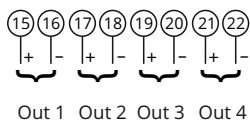


MI 450, 2-wire



MT 440

Transducers can have up to four analogue outputs



Note:

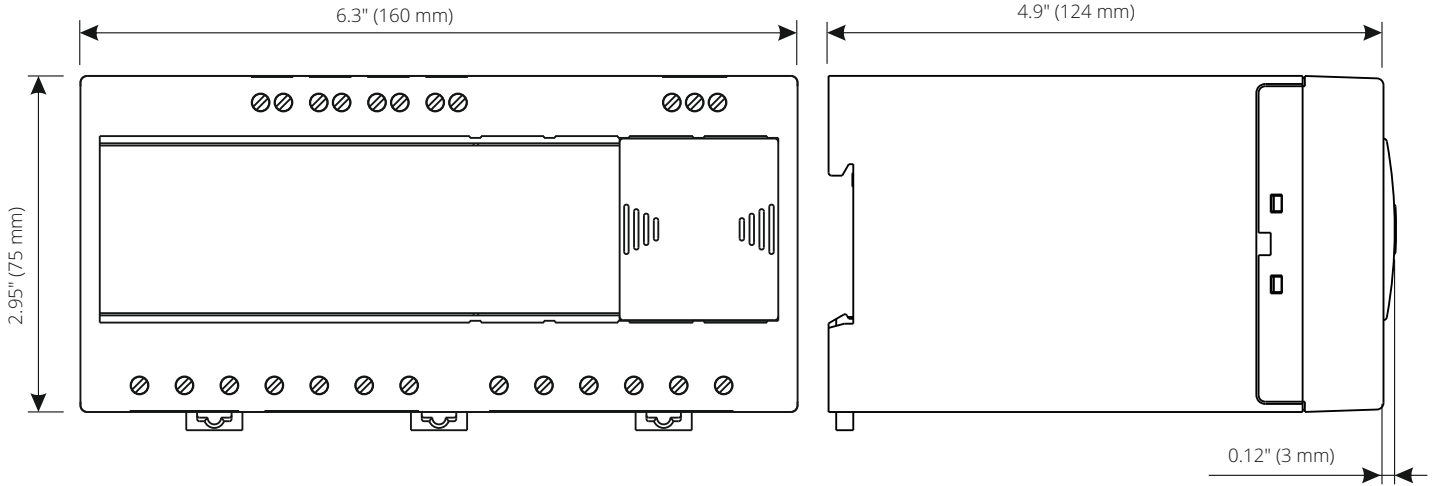
Auxiliary supply on connection terminals 13 (-) and 14 (+), output on connection terminals 15 (-) and 16 (+).

MEASURING TRANSDUCERS

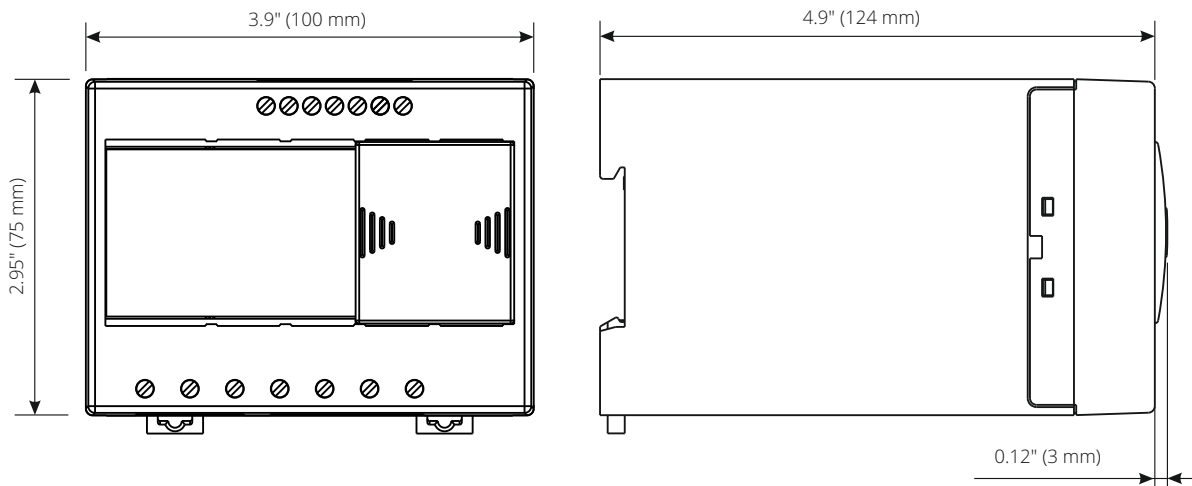
FAMILY OF MT 5xx, MT 4xx

DIMENSIONS (in mm)

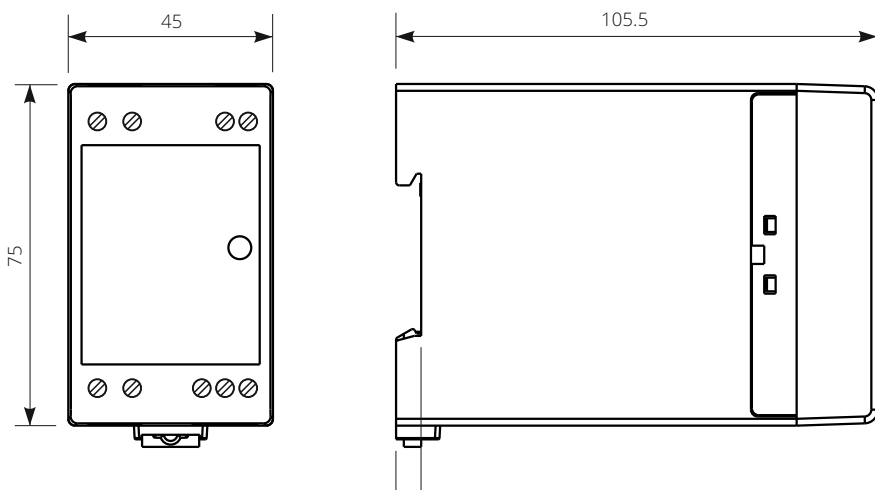
MT5x0/UMT5x0



MT51x/UMT51x



MT4xx

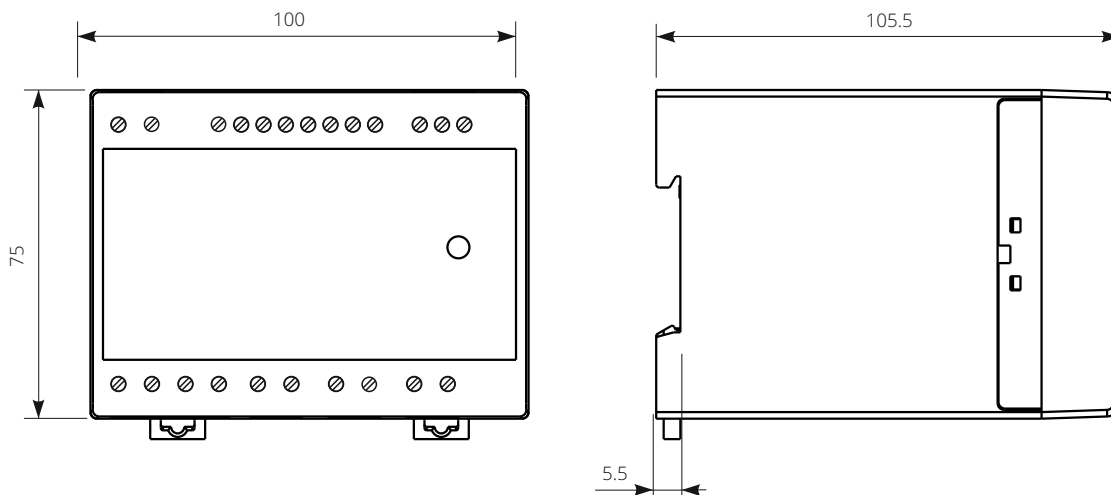


MEASURING TRANSDUCERS

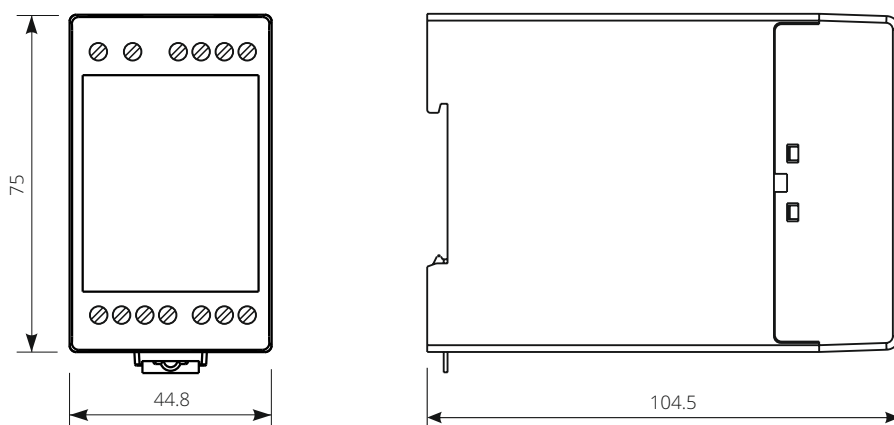
FAMILY OF MI 4xx, MT 440, RD 500

DIMENSIONS (in mm)

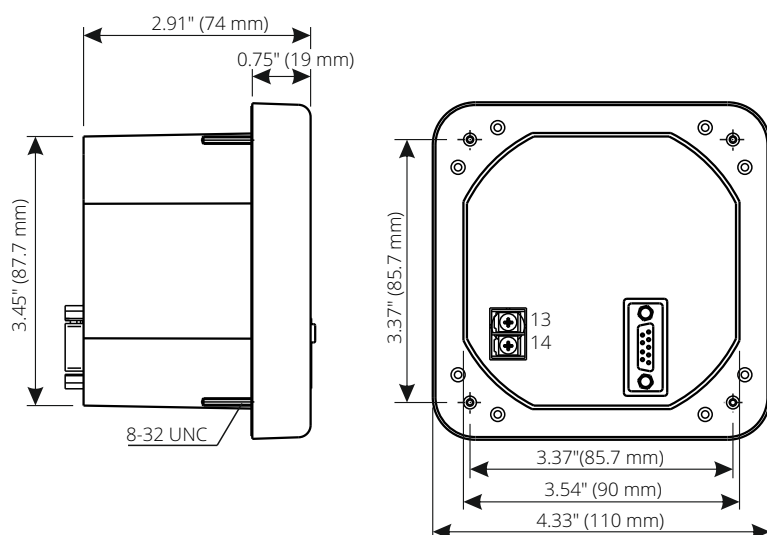
MT440



MI4xx



RD 500



SUPERVISION RELAY

SR 100

USE



SR100 is intended for measuring and monitoring single-phase or three-phase electrical power network. It measures RMS network values and all significant deviations from the nominal values by means of fast sampling of voltage and current signals. There is an option in MiQen Settings Studio software to select also the measurements based only on positive sequence fundamental wave, which does not include harmonics measurements. This option can be found under MiQen Settings menu. With this option included all corresponding values are replaced by IEC 61400-21 Annex C measurements. This makes SR100 suitable for acquisition and validation of fast changes in the network. A built-in microcontroller calculates measured values (voltage, current, frequency, energy, power, power factor, THD phase angles, deviations) and sends these data over a reliable CANopen communication interface to the CAN master devices.

Application

SR100 supervision relay is used for measuring and monitoring of all single-phase or three-phase values and detecting predefined faults. With measuring ten different network deviations SR100 could be used as simple but efficient supervision relay. SR100 is delivered un-configured for customer configuration with user friendly setting software MiQEN. SR100 supports standard serial communication RS232/RS485 with speed up to 115200 baud and CANopen communication for speeds up to 1 Mbit/s which is perfect for integration into large systems.

Additional USB 2.0 interface can only be used for a fast set-up without the need for auxiliary power supply. This interface is provided with only BASIC insulation and can be used ONLY unconnected to power inputs.

FEATURES

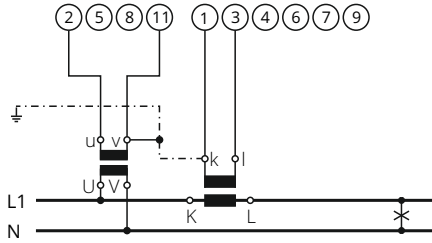
- Voltage and current auto range measurements up to 600V_{LNr} 12.5A
- Active, reactive, apparent power calculation based on IEC 61400-21 Annex C
- Power accuracy class 0.5
- 4 configurable energy counters (import, export, active, reactive)
- 10 supervision functions (under/over voltage, under/over frequency, asymmetry – voltage/phase imbalance, load overrun/underrun, LoM –phase shift/ROCOF)
- Up to 4 configurable relay outputs (normal, inverse, latched, pulsed)
- Simple USB setting without auxiliary power supply
- Reliable communication option over CANopen protocol and RS232/RS485
- Universal wide auxiliary power supply range 20 – 300 Vdc, 48 – 276 Vac
- Housing for DIN rail mounting
- User-friendly PC MiQen software

SUPERVISION RELAY

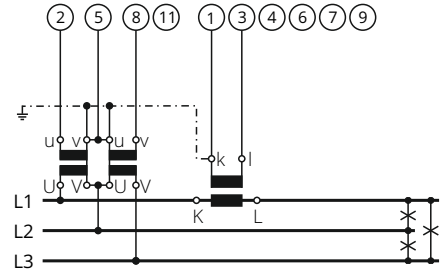
SR 100

CONNECTION DIAGRAMS

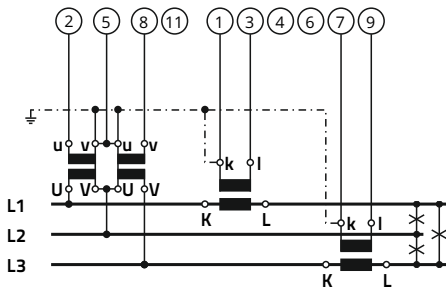
1b - single phase



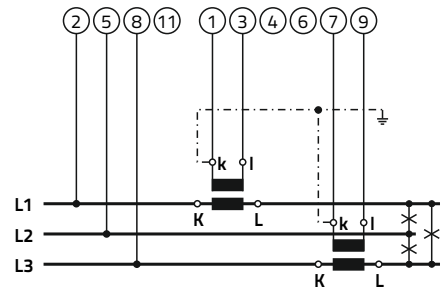
3b - three-phase, three wires, balanced load



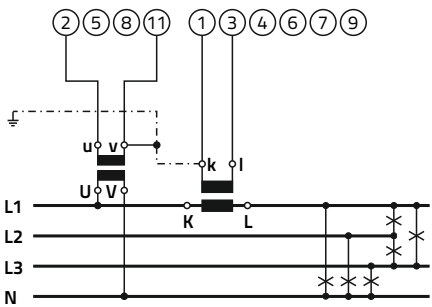
3u - three-phase, three wires, unbalanced load



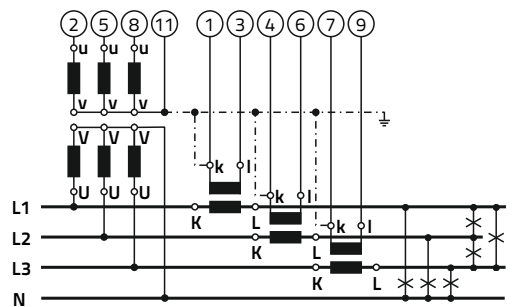
3u - three-phase, three wires, direct connection



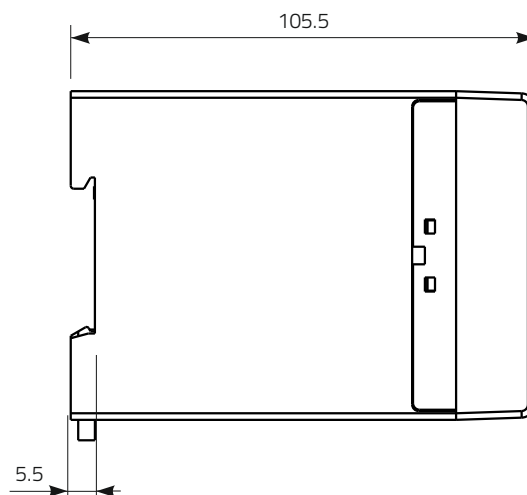
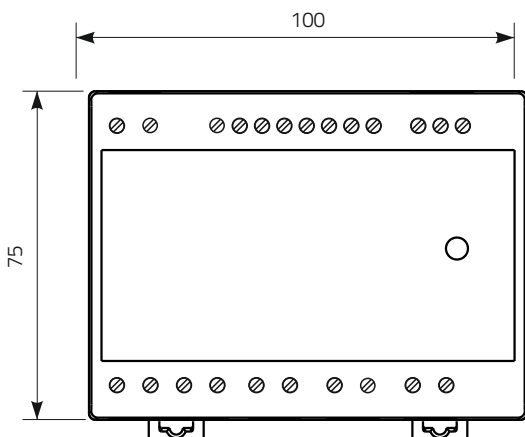
4b - three-phase, four wires, balanced load



4u - three-phase, four wires, unbalanced load



DIMENSIONS (in mm)



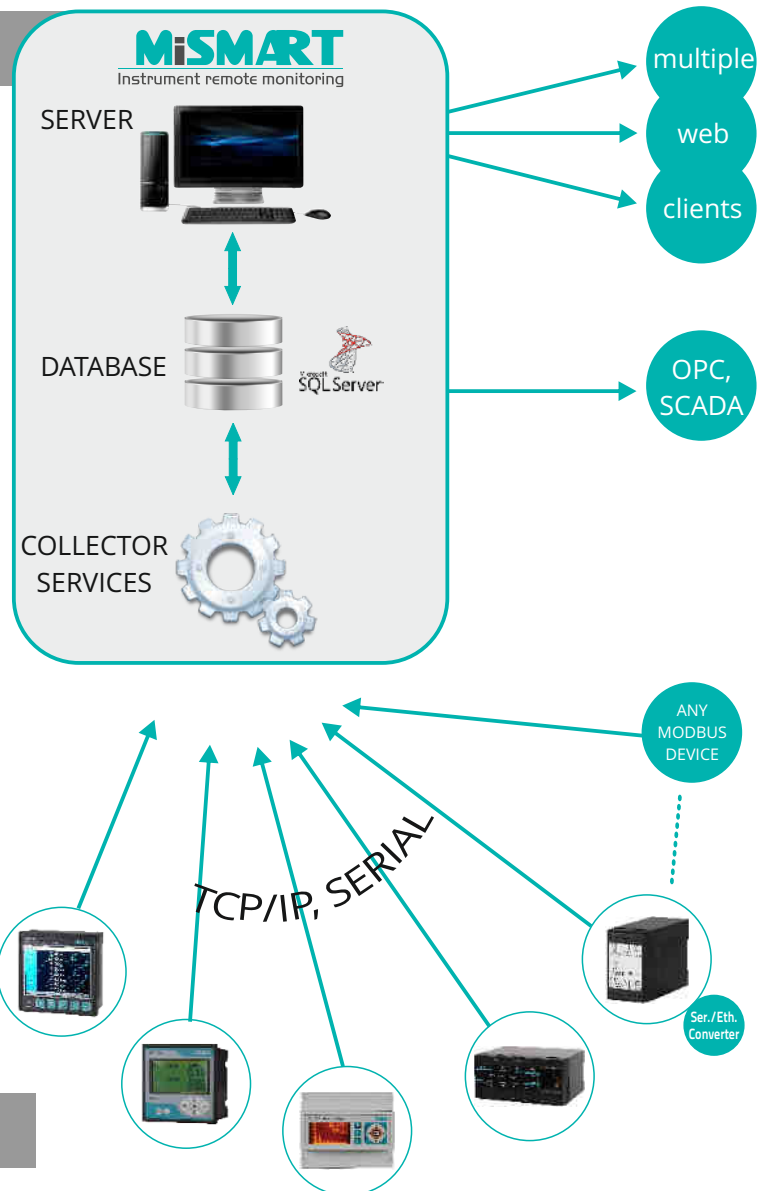
INSTRUMENT DATA MANAGEMENT SOFTWARE

MiSMART, MiQEN

MAIN FEATURES OF MiSMART

The MiSMART server centrally collects instrument data from many meter points. It is primarily targeted for use in the industry as well as in the energy distribution and production sectors. The system collects electrical energy, gas or water consumption data, as well as many other power quality (PQ) related electrical parameters (power, current, voltage, frequency, power factor,...) The system also includes alarms and power quality data which are quickly available to any energy manager or power quality operator and enable:

- **Measurement monitoring** providing the means for electrical parameter monitoring as well as control over electric energy gas/water consumption and losses within the company,
- **Alarm monitoring** enabling more reliable operation as well as equipment maintenance,
- **Statistical functions** (histogram, percentile, peak power, alarms, load symmetry) for better equipment investment planning based on historic consumption and PQ data,
- **PQ event analysis and reporting according to EN50160** aimed at improving electrical power quality on the long term,
- **Table or chart data displaying,**
- **Excel and PQDIF data exporting,**
- **Network data filtering and comparing** data from different meter points,
- **Supports OPC, SCADA** standard protocols (IEC 60870-5-101/104), MODBUS/TCP direct poll.



DESCRIPTION OF MiSMART COMPONENTS

The MiSMART server can be installed locally or available from the cloud as a service and consists of the following components:

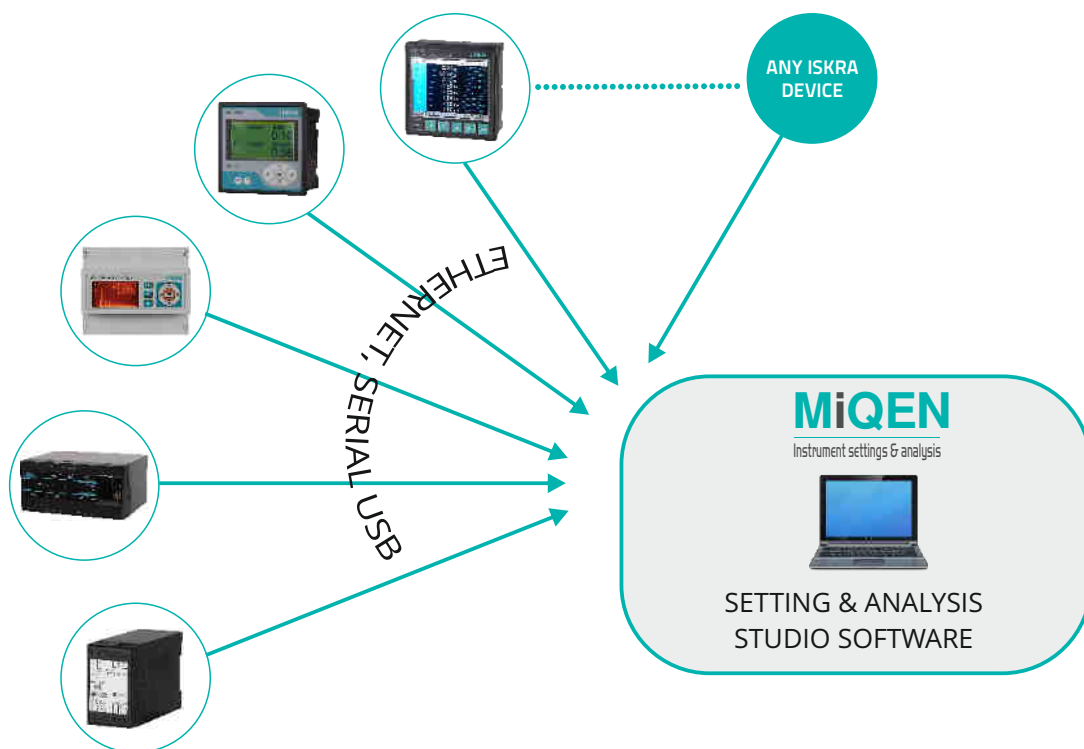
- **MiSMART collector services:** reliably collects data from remote instruments supporting the following ways of communication:
 - proprietary XML push package receiver,
 - MODBUS/TCP poll collector for direct device access (also 3rd party device)
 - SMS receiver.
- **SQL Database:** stores all collected data in a MS SQL database,
- **Clients using a web based application:** enables multiple users with different user credentials and data access to access the system according to their role in the company. The application consists of 2 parts:
 - Configuration Tool for administrators (Instrument data management System grid structure, user Management, access control)
 - Data Monitor for data overview and analysis (data monitoring, Statistics, PQ analysis, Table or chart data displaying, data exporting data filtering, Comparing data from different meter points...)



MiSMART
Instrument remote monitoring

INSTRUMENT DATA MANAGEMENT SOFTWARE

MiSMART, MiQEN



DESCRIPTION OF MiQEN COMPONENTS

The MiQEN setting & analysis studio is a freely available PC based software which supports all Iskra instruments. It offers a user friendly user interface for simple instrument management and enables communication with one device simultaneously. It enables the following features:

- **Setting-up instruments** with suitable settings for a particular application,
- **Observing online Measurements** directly via direct instrument MODBUS communication in graphical and table form,
- **Instrument Data Analysis** based on memory readings (measurements, alarms, waveforms, transients, PQ reports, PQ events)
- **Upgrading devices** – the system alerts the users about the latest instrument firmwares and offers them for for download and upgrade,
- **Interactive instrument** enabling remote direct instrument manipulation through device user interface,
- **My devices** where every already accessed instrument can be stored for later quick access within a grid-like structure,
- **Browse devices** for reviewing a list of all instruments which are currently available.

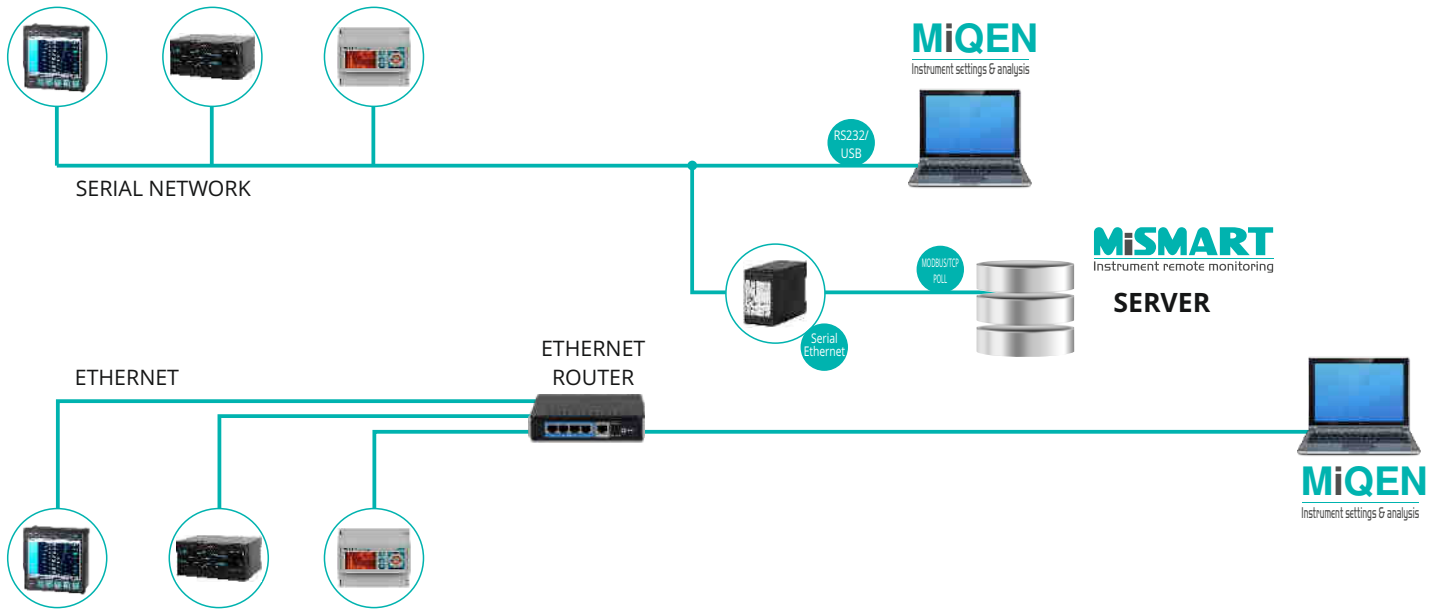


MiQEN
Instrument settings & analysis

INSTRUMENT DATA MANAGEMENT SOFTWARE

MiSMART, MiQEN

A typical application of the Iskra instrument data management software is shown in the figure below. The software can be used for applications with just one or a few instruments as well as for widespread applications with several hundreds of instruments where the software is a vital monitoring central block.



TYPICAL CUSTOMERS



- LV transformer stations
- PV power plants

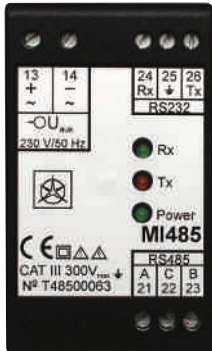
- Paper factory
- Chemical

- Public
- Residential buildings
- IT centres

COMMUNICATION ADAPTERS

MI 485 - RS232/RS485 INTERFACE

USE



MI 485 can be used for integrating devices with RS232 communication into RS485 network or as a connection between RS485 network and a control device (PC, PLC, etc.)

The MI 485 communication adapter is used for converting RS485 signal to RS232 signal and vice versa. Signals are electrically isolated. No settings are required and the device is ready for use. Communication speed is up to 115,200 bps.



CONNECTIONS

- Auxiliary supply - connected with connection terminals 13, 14
- RS232 communication - max. length 3 m

MI 485	Computer - DB9
Tx (26)	Rx (2)
Rx (24)	Tx (3)
GND (25)	GND (5)

- RS485 communication - up to 32 devices, a line should be terminated with a 120 W resistor

MI 485	Instruments with RS485
A (21)	DATA +
B (23)	DATA -

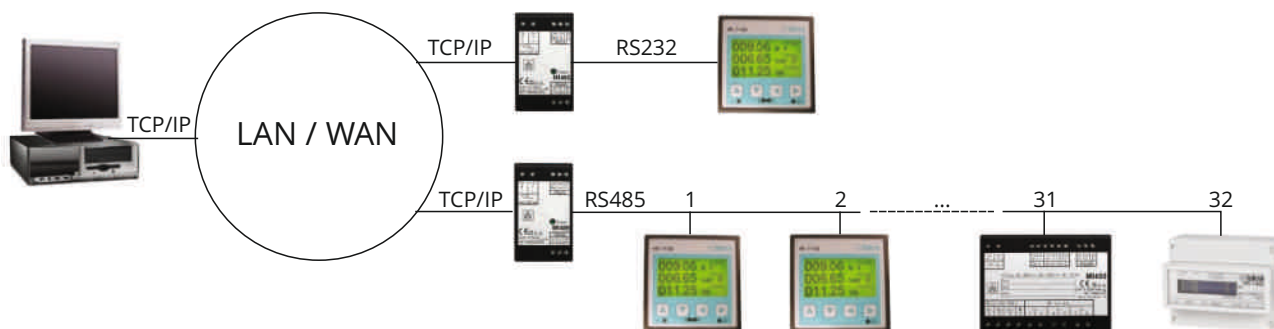
COMMUNICATION ADAPTERS

MI 486 - RS232 / MI 488 - RS485 INTERFACE - TCP/IP

USE



The MI 486, MI 488 communication adapters are used for connecting the instruments with RS232 or RS485 communication on the Ethernet network. The instruments are connected to the computer through the Ethernet network. Signals are electrically isolated. Data are read from the instruments through interfaces. Communication speed is up to 115,200 bps.



CONNECTIONS

- **Auxiliary supply** - connected with connection terminals 13, 14
- **Ethernet connection** - connected with 10/100 Rj45 connection terminal
- **RS232 communication** - max. length 3 m

MI 486	Computer - DB9
Tx (26)	Tx (2)
Rx (24)	Rx (3)
GND (25)	GND (5)

- **RS485 communication (for MI 488)** - up to 32 devices, a line should be terminated with a 120 W resistor

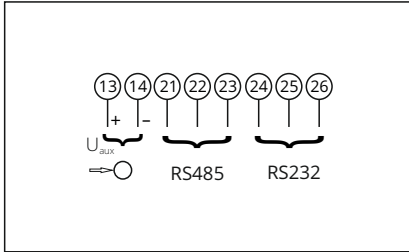
MI 488	Instruments with RS485
A (21)	DATA +
B (23)	DATA -

COMMUNICATION ADAPTERS

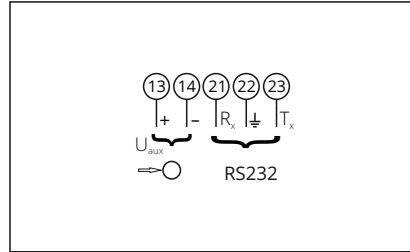
MI 485 , MI 486

CONNECTION DIAGRAMS

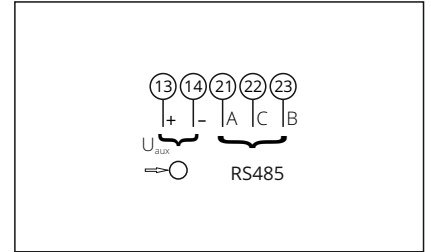
MI 485



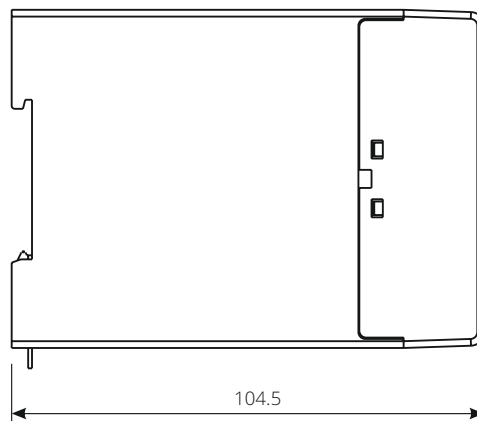
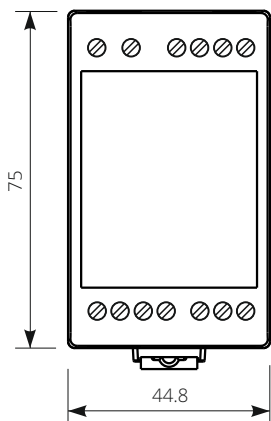
MI 486



MI 488



DIMENSIONS (in mm)



SYNCHRONIZATION METERS

SQ 0104, SQ 0114, SQ 0204, SQ 0214



USE

If you are looking for manually or semi-automatically synchronise generators and bus bars, you have come to the right place. Our synchronization meters are truly unique products. They measure phase differences between generator and bus bar, voltages and the frequencies of the two systems. They can replace up to five instruments, occupying less space and giving you more information, for a lower price. Furthermore, they are equipped with status output, they are also appropriate for mounting on ships. They are equipped with LED diodes, so you can actually see the phase difference. When synchronising conditions are set, the synchronizing relay is activated.

If you want to synchronise a generator and a bus bar manually or semi-automatically, SQ 0xx4 and SQ 0xx4 are the right instruments for you.

Our synchronization meters are very unique products, especially SQ 0214. Synchronization meters are intended for manual or semi-automatic synchronization of two electric-energy distribution systems. SQ 0204, SQ 0214 synchro-scopes are the instruments for measuring a phase angle between two electric-energy distribution systems.

The SQ 0214 type also measures voltages and frequencies of both systems. On request, both types can be on request provided with a built-in relay output which signalises if the conditions for synchronization have been met.

Ship versions of the SQ 0204 meters are available on request.

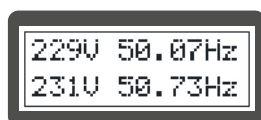
CHARACTERISTICS

TYPE	SQ 0104	SQ 0114	SQ 0204	SQ 0214
Front frame (mm)	144 x 144	144 x 144	96 x 96	96 x 96
Cutting for mounting (mm)	138 x 138	138 x 138	92 x 92	92 x 92
Scale length (mm)	360 °	360 °	360 °	360 °
Accuracy class	+/- 1° el.	+/- 1° el.	+/- 1° el.	+/- 1° el.
RATING				
110 V, 230 V	●	●	●	●
400 V	●	●	●	●
500 V	●**	●**	●**	●**
600 V	●**	●**	●**	●**
Frequency		●		●

** Other ratings on demand

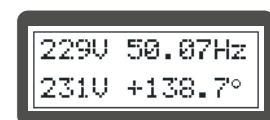
Two voltages (U_{gen} , U_{bb}) and two frequencies (f_{gen} , f_{bb}) are displayed on LCD at SQ 0214. When the difference between F_{gen} and f_{bb} is smaller than 0.02 Hz, U_{BUS} and F_{BUS} and $\Delta\phi$ are displayed.

Generator voltage U_{gen} Generator frequency f_{gen}



Bus-bar voltage U_{bb} Bus-bar frequency f_{bb}

Generator voltage U_{gen} bBUS-BAR frequency f_{bb}

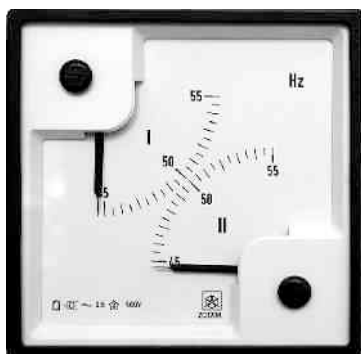


Bus-bar voltage U_{bb} Phase difference $\Delta\phi$

SYNCHRONIZATION METERS

ZQ 1108, ZQ 1207, ZQ 1208

USE



ZQ 1208

ZQ 1108, ZQ 1207 or ZQ 1208 are two-system frequency meter used for measuring frequencies in two networks.

Ship versions of the ZQ 1208 meters are available on request.

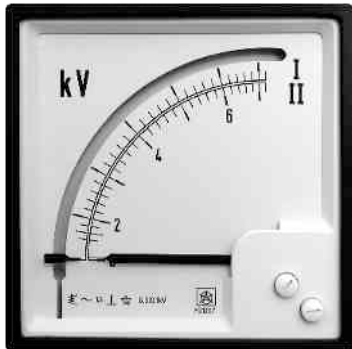
CHARACTERISTICS			
TYPE	ZQ 1108	ZQ 1207	ZQ 1208
Front frame (mm)	144 x 144	96 x 96	96 x 96*
Cutting for mounting (mm)	138 x 138	92 x 92	92 x 92
Scale length (mm)	2 x 50	92/72	2 x 50
Accuracy class	0.5	0.5	0.5
RATING			
110 V, 230 V	●	●	●
400 V	●	●	●
500 V	●		
Frequency	●	●	●

* ZQ 1208 for front frame 144 x 144 mm on request.

SYNCHRONIZATION METERS

FQ 1108, FQ 1207, FQ 1208

USE



FQ 1207

FQ 1108, FQ 1207 and FQ 1208 double voltage meter measures voltages in two networks.

Ship versions of the FQ 1208 meters are available on request.

CHARACTERISTICS

TYPE	FQ 1108	FQ 1207	FQ 1208
Front frame (mm)	144 x 144	96 x 96	96 x 96*
Cutting for mounting (mm)	138 x 138	92 x 92	92 x 92
Scale length (mm)	2 x 50	92/72	2 x 50
Accuracy class	1.5	1.5	1.5
RATING			
110 V, 230 V	●	●	●
400 V	●	●	●
500 V	●		●
600 V	●		●

* FQ 1208 for front frame 144 x 144 mm on request.

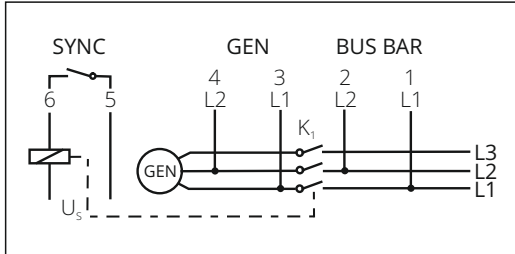
TYPE	Front frame a	Cutting for mounting ab	Bezel height c (mm)	Base d
SQ 0204	96	92 ^{+0.8}	5.5	48.5
SQ 0104	144	138 ⁺¹	8	28
SQ 0114	144	138 ⁺¹	8	28
SQ 0214	96	92 ^{+0.8}	5.5	48.5
ZQ 1207	96	92 ^{+0.8}	5.5	54.3
ZQ 1208	96	92 ^{+0.8}	5.5	54.3
FQ 1207	96	92 ^{+0.8}	5.5	54.3
FQ 1208	96	92 ^{+0.8}	5.5	54.3

SYNCHRONIZATION METERS

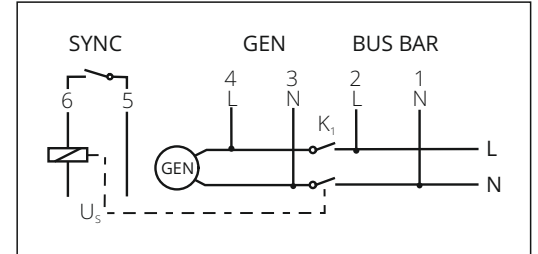
FAMILY OF SQ 0xx4, ZQ 1x0x, FQ 1x0x

CONNECTION DIAGRAMS

SQ 02x4, SQ 01x4

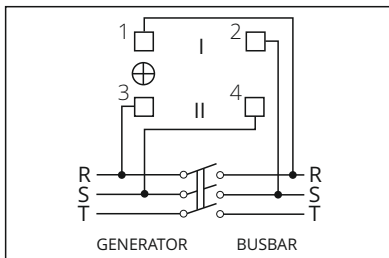


Phase to phase connection



Phase to neutral connection

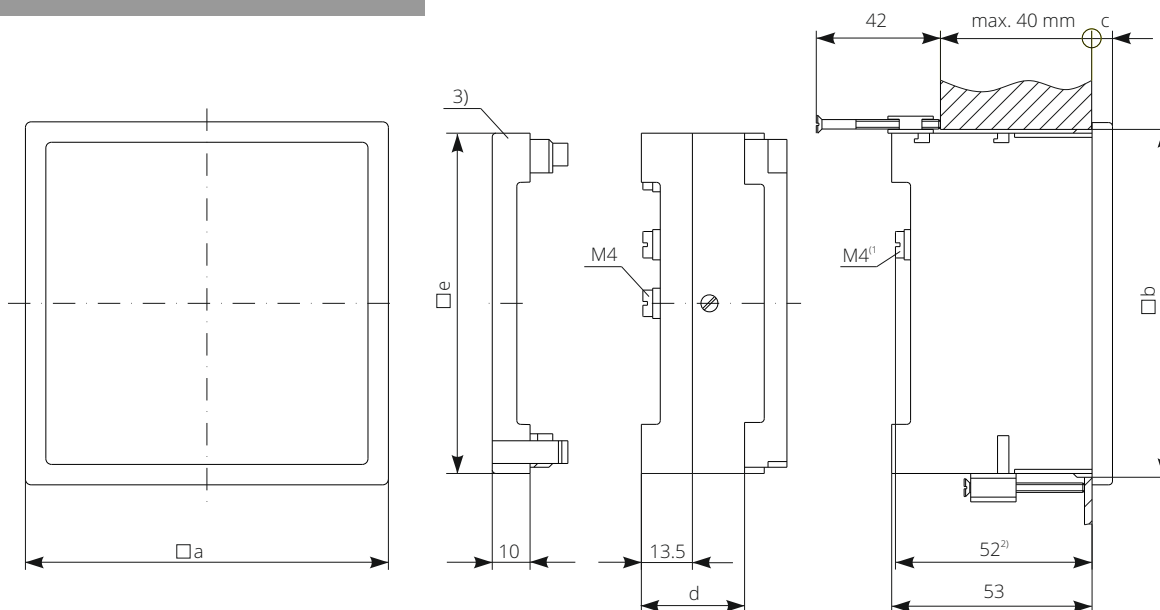
ZQ 1x0x, FQ 1x0x



Connection terminal number	Connection designation	Use of terminal
1	L1 ¹⁾	System voltage
2	L2 ¹⁾	System voltage
3	L1 ¹⁾	Generator voltage
4	L2 ¹⁾	Generator voltage
5	SYNC.	Relay output
6	SYNC.	Relay output
7	STATUS	Status output
8	STATUS	Status output

* In the case of phase to neutral connection, the connection scheme on the back side of the synchronoscope (upper pictures) is different, connection terminal designations are „L” and „N”.

DIMENSIONS (in mm)



¹⁾ For ranges FQ = 30 ... 60 A: M6

²⁾ For ranges FQ = 30 ... 60 A: 59 mm

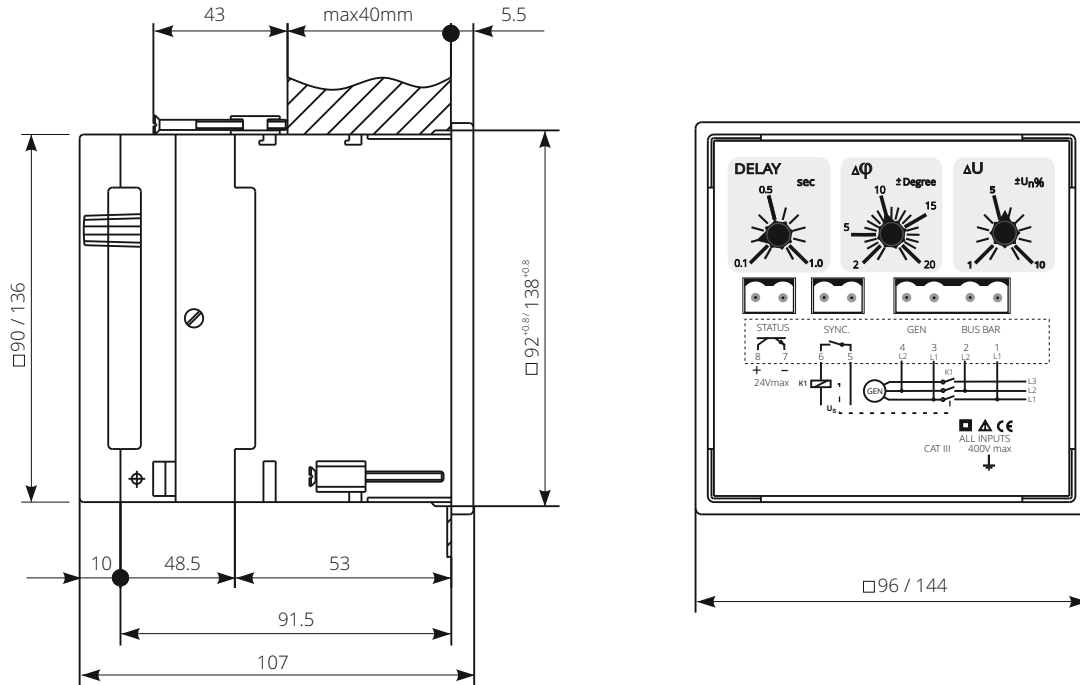
³⁾ Protection cover e = Q96 and Q144 = 90 mm

SYNCHRONIZATION METERS

FAMILY OF SQ 0xx4, ZQ 1x0x, FQ 1x0x

DIMENSIONS (in mm)

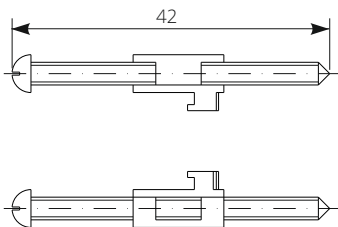
SQ 0104, SQ 0114 - front frame 96x96 mm / SQ 0104, SQ 0114 - front frame 96x96 mm



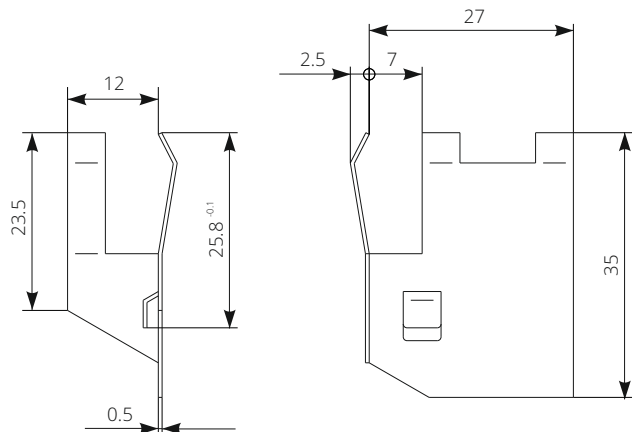
FIXING ELEMENTS

SQ 0xx4, ZQ 1x0x, FQ 1x0x

with a screw



for mosaic fixing

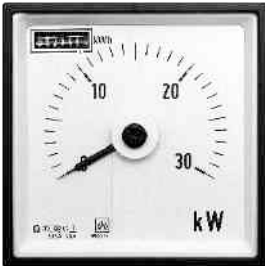


ENERGY METERS WITH POWER DISPLAY

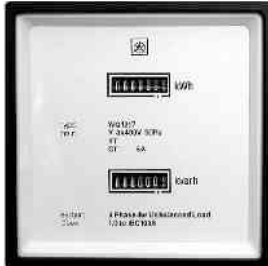
FAMILY OF WQ x2x7

USE

WQ 2207



WQ 1217



Energy meters display instantaneous power in single and three-phase systems with balanced or unbalanced load.

Accuracy classes are 1 for energy measurement (EN 61036), 1.5 for power measurement and 2.5 power factor measurement.

WQ 0217



WQ 0207



CHARACTERISTICS

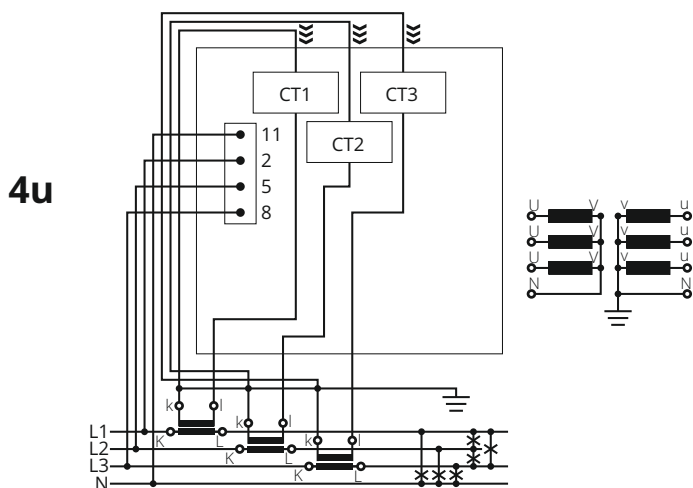
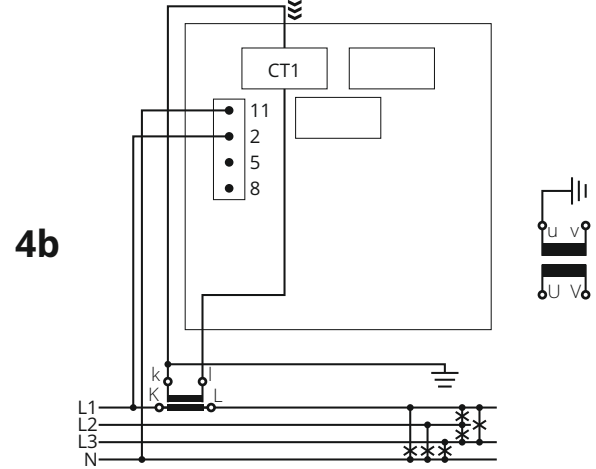
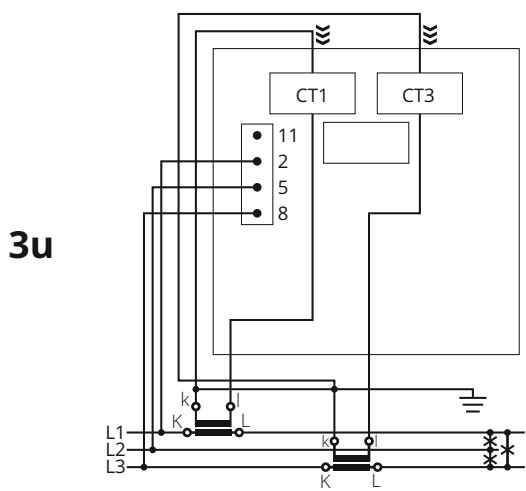
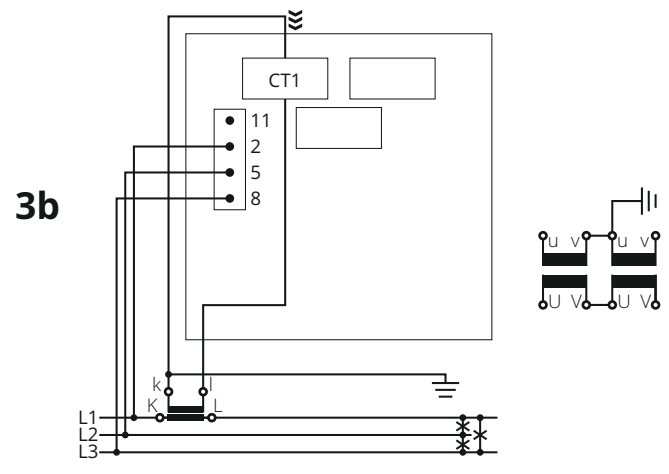
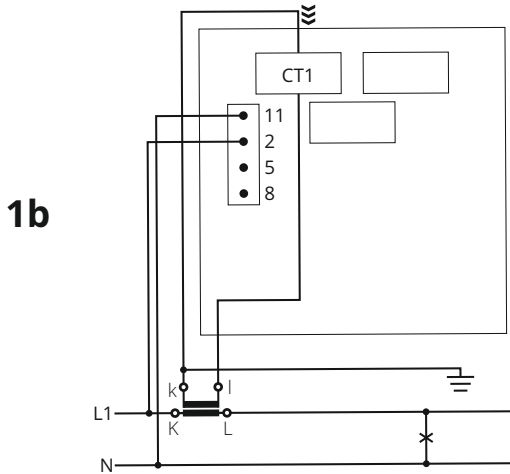
TYPE	WQ 0217	WQ 1217	WQ 0207	WQ 2207
Front frame (mm)	96 x 96	96 x 96	96 x 96	96 x 96
Cutting for mounting (mm)	92 x 92	92 x 92	92 x 92	92 x 92
Scale length (mm)	- / 1	- / 2	95 / 1	125 / 1
Voltage input 100 V, 110 V, 230 V, 400 V, 500 V				
Current input 1 A, 5 A				
1b, 1br single phase system	●	●	●	●
3b, 3br three-phase system with balanced load system	●	●	●	●
3u, 3ur three-phase three-wire balanced load system	●	●	●	●
4b, 4br three-phase four-wire balanced load system	●	●	●	●
4u, 4ur three-phase four-wire unbalanced load system	●	●	●	●
OPTION				
One impulse output	●	●	●	●
Two impulse outputs	●	●	●	●
Auxiliary supply 57 V, 110 V, 230 V, 400 V AC	●	●	●	●

ENERGY METERS WITH POWER DISPLAY

WQ 0217, WQ 1217, WQ 0207, WQ 2207

CONNECTION DIAGRAMS

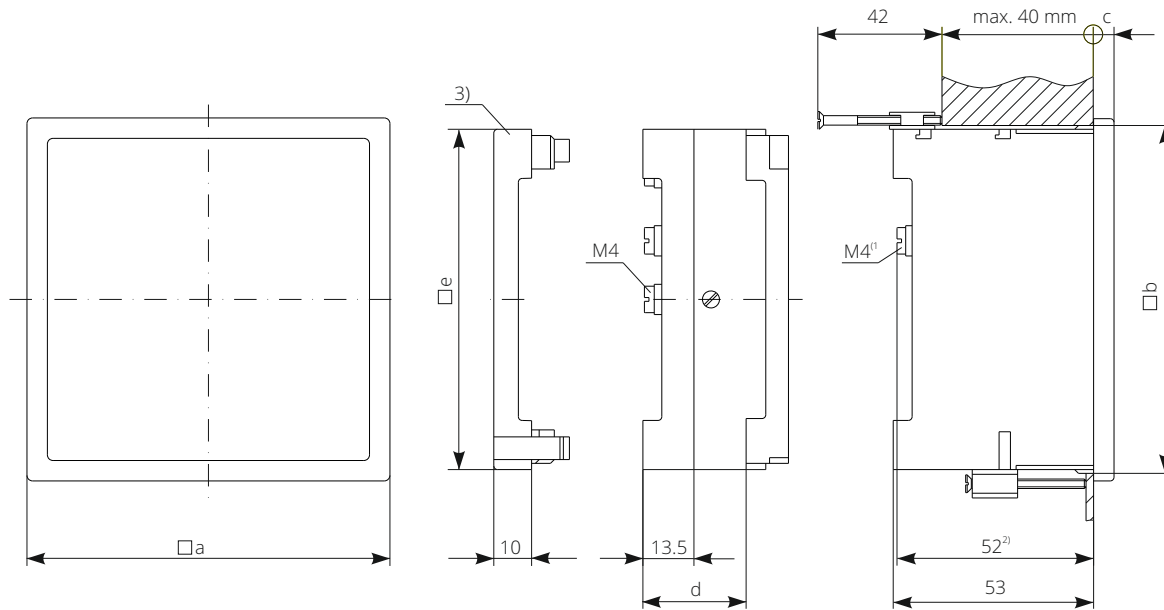
WQ x2x7



ENERGY METERS WITH POWER DISPLAY

FAMILY OF WQ x2x7

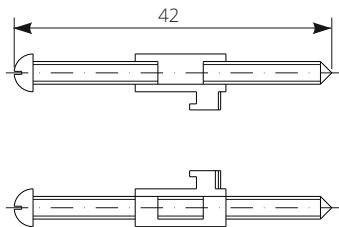
DIMENSIONS (in mm)



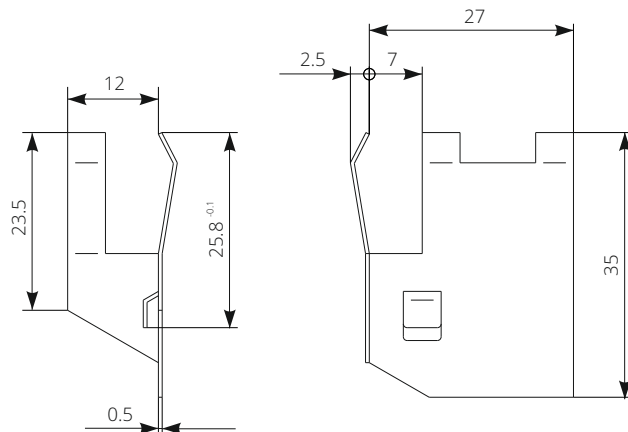
TYPE	WQ 0217	WQ 1217	WQ 0207	
Front frame a (mm)	96	96	96	96
Cutting for mounting b (mm)	$92^{+0.8}$	$92^{+0.8}$	$92^{+0.8}$	$92^{+0.8}$
Dimensions (mm) - Bezel height c	5.5	5.5	5.5	5.5
Base d	54.3	54.3	54.3	54.3
Dimensions with packing (mm)	160 x 105 x 102	160 x 105 x 102	160 x 105 x 102	160 x 105 x 102
Volume with packing (dm ³)	1.71	1.71	1.71	1.71
Weight with packing (dm ³)	0.90	0.95	0.90	0.95

FIXING ELEMENTS

with a screw



for mosaic fixing



ENERGY METERS

OVERVIEW

MEASUREMENT

see catalogue of Energy Meters

DIGITAL SINGLE-PHASE ENERGY METERS



WS 0010
WS 0011

Direct till 32 A

1 module DIN

DIGITAL SINGLE-PHASE ENERGY METERS



WS 0014

Direct till 45 A

1 module DIN

DIGITAL SINGLE-PHASE ENERGY METERS



WM1-6

Direct till 65 A

2 modules DIN

DIGITAL THREE-PHASE ENERGY METERS



WM3-6

Direct till 65 A

3 modules DIN

DIGITAL SINGLE-PHASE ENERGY METERS



WS 0021

Direct till 80 A

2 modules DIN

DIGITAL THREE-PHASE ENERGY METERS



WS 0030
WS 0031

Direct till 65 A

3 modules DIN

ENERGY METERS

OVERVIEW

MEASUREMENT

see catalogue of Energy Meters

DIGITAL THREE-PHASE ENERGY METERS



WS 0101
WS 0102
WS 1102

Direct till 65 A

6 modules DIN

DIGITAL THREE-PHASE ENERGY METERS



WS 0301
WS 0302
WS 1302

Connection through CT

6 modules DIN

DIGITAL SINGLE-PHASE ENERGY METERS



ECS1-32
ECS1-32MID

Direct till 32 A

1 module DIN

DIGITAL SINGLE-PHASE ENERGY METERS



ECS1-80
ECS1-80 MID

Direct till 80 A

2 modules DIN

DIGITAL SINGLE-PHASE ENERGY METERS



ECS1-125
ECS1-125 M-Bus
ECS1-125 Modbus

Direct till 125 A

3 modules DIN

DIGITAL THREE-PHASE ENERGY METERS



ECS3-80
ECS3-80 MID
ECS3-5
ECS3-5 MID

Direct till 80 A
Connection through CT
5 A till 10.000
5 A

3 modules DIN

ENERGY METERS

OVERVIEW

MEASUREMENT

see catalogue of Energy Meters

DIGITAL THREE-PHASE ENERGY METERS



ECS3-125
ECS3-125 MID

Direct till 125 A

6 modules DIN

SINGLE-PHASE ENERGY METERS



ECS1-32 CP M-Bus
ECS1-32 CP Modbus

Direct till 32 A

1 module DIN

SINGLE-PHASE ENERGY METERS



ECS1-63 CP KNX

Direct till 63 A

2 modules DIN

SINGLE-PHASE ENERGY METERS



ECS1-63 CP S0
ECS1-63 CP M-Bus
ECS1-63 CP Modbus

Direct till 63 A

2 modules DIN

DIGITAL SINGLE-PHASE ENERGY METERS



ECS3 1-5 CP

Connection through CT

4 modules DIN

THREE-PHASE ENERGY METERS



ECS3-1-5 CP KNX

Connection through CT

4 modules DIN

ENERGY METERS

OVERVIEW

MEASUREMENT

see catalogue of Energy Meters

THREE-PHASE ENERGY METERS



ECS3 1-5 CP M-Bus
ECS3 1-5 CP Modbus

Connection through CT

4 modules DIN

THREE-PHASE ENERGY METERS



ECS3-63 CP

Direct till 63 A

4 modules DIN

THREE-PHASE ENERGY METERS



ECS3-63 CP KNX

Direct till 63 A

4 modules DIN

THREE-PHASE ENERGY METERS



ECS3-63 CP M-Bus
ECS3 1-5 CP Modbus

Connection through CT

2 modules DIN

ENERGY METERS

OVERVIEW

COMMUNICATION

see catalogue of Energy Meters

ADD-ON MODULES - M-Bus



1 module DIN

ADD-ON MODULES - Modbus



1 module DIN

ADD-ON MODULES - KNX



1 module DIN

ADD-ON MODULES - SD-CARD



1 module DIN

ADD-ON MODULES - LAN TCP/IP



1 module DIN

ADD-ON MODULES - eVision



1 module DIN

HOUR METERS

HK 46, HK 47, HK 48, HK 49, HK 30

USE



Hour meters show operation time of machines, equipment and other devices. When you need accurate information for testing, maintenance or warranty purposes, choose from a wide range of HK hour meters produced by Iskra MIS. AC applications: business machines, control panels, compressors, generators, pumps, air conditioning DC applications: garden and farm equipment, Gen-sets, construction equipment.

MECHANICAL DATA

TYPE		HK 46	HK 47	HK 48, HK 49	HK 30
Front dimension	mm	48 x 48	φ 58	HK 48: 72 x 72 ; HK 49: 96 x 96	36 x 24 (standard)
Display			AC: 5 integers, 2 decimals DC: 6 integers, 1 decimals	AC indicator, without reset	AC: 5 integers, 2 decimals DC: 6 integers, 1 decimals
Digit height	mm			4	without reset
Digit color	integer decimal			white on black	
Counting range				50 Hz - red on black ; 60 Hz - red on white	
Reading accuracy				AC: 99999,99 ; DC: 999999,9	
Weight	g	50	52	HK 48: 125 ; HK 49: 172	32
Housing color	mm			standard black	
Bezels	mm	52 x 52 55 x 55 72 x 72 and φ 80	φ 72 mm (for mtg. H) φ 80 mm (for mtg. C)	-	48 x 24, 48 x 48, 54 x 29 φ 58, φ 72, 72 x 72
Mounting options		A - aluminium clamp C - anti-vibration boot & clamp D - DIN rail F - snap fastener G - retainer	A - aluminium clamp C - anti-vibration boot & clamp φ 80 mm H - 3-screw front mount φ 72 mm	X- two fixing screws	D - DIN rail E - 48 x 48 DIN case G - front 36 x 24 mm with retainer R - front 40.6 x 27.5 mm with retainer S - 2-screws front 52 x 26 mm

ELECTRICAL DATA

Operating voltage	AC DC	V	24, 48, 60, 110, 120, 220, 230, 240, 400 (±10%), 50 or 60 Hz		
Current consumption	AC DC	mA	6 - 30, 10 - 80, 110 , 220 (±10%) max. 8 max. 9		
Accuracy	AC DC	A	± 0.02 % ± 0.002 %		
Connection			flat pin 6.3 x 0.8 with screw flat pin 6.3 x 0.8 screw terminal	flat pin 6.3 x 0.8 with screw flat pin 6.3 x 0.8 screw terminal	flat pin 6.3 x 0.8 with screw flat pin 6.3 x 0.8

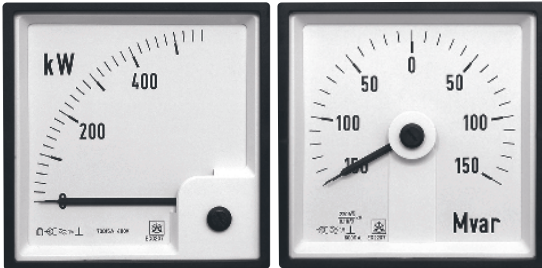
AMBIENT CONDITIONS

Operating temperature	AC DC	°C	-25 ... + 80 -20 ... + 70		
Storage temperature	AC DC	°C	-40 ... + 80 -20 ... + 70		
Relative humidity			max. 80 % at +25 °C		
Protection			IP40 front IP65 front (on request) IP20 terminals	IP65 front IP00 terminals	IP40 front IP00 terminals IP20 terminals with back cover
Approvals			IP67 front (transparent housing) IP67 totally sealed housing IP00 terminals CE, UL E171200, RoHs compliant		

ANALOGUE METERS

ACTIVE OR REACTIVE POWER METERS EQ 0x07, EQ 2x07

USE



EQ 0207

EQ 2207

Power meters are electronic meters intended for measuring active or reactive power in single phase or three-phase networks, with balanced or unbalanced load. The accuracy class is 1.5. The scale value depends on primary values of current and voltage. It is defined by the following formulas:

	Active power	Reactive power
for single phase system	1b $I_{prim} \times U_{prim} \times \cos \varphi$	1br $I_{prim} \times U_{prim} \times \sin \varphi$
for three-phase system	3u $\sqrt{3} I_{prim} \times U_{prim}^* \times \cos \varphi$	3ur $\sqrt{3} I_{prim} \times U_{prim}^* \times \sin \varphi$
for three-phase system	4u $3 I_{prim} \times U_{prim} \times \cos \varphi$	4ur $3 I_{prim} \times U_{prim} \times \sin \varphi$

* U_{LL} In the equations U means phase voltage at single phase network and three-phase four-wire network 4u as well as line-to-line voltage at three-phase three-wire network 3u. Ratio between the selected final scale value and calculated power should be within the limits from 0.6 to 1.2 at $\cos \varphi = 1$ or $\sin \varphi = 1$.

CHARACTERISTICS

TYPE	EQ 0307	EQ 0207	EQ 0107	EQ 2307	EQ 2207	EQ 2107
Front frame □a (mm)	72	96	144	72	96	144
Cutting for mounting □b (mm)	68 ^{+0.8}	92 ^{+0.8}	138 ^{+0.8}	68 ^{+0.8}	92 ^{+0.8}	138 ^{+0.8}
Dimensions (mm) - Bezel height c	5.5	5.5	8	5.5	5.5	8
Base d	29	27.3	27.3	29	27.3	27.3
Dimensions with packing (mm)	102 x 76 x 104	102 x 120 x 105	155 x 155 x 137	102 x 76 x 104	102 x 120 x 105	155 x 155 x 137
Volume with packing (dm ³)	0.81	1.29	3.29	0.81	1.29	3.29
Weight with packing (dm ³)	0.24	0.35	0.60	0.28	0.45	0.65
Scale		90°			240°	
Scale length (mm)	63	95	135	113	135	220
Voltage input* 100 V, 110 V, 230 V, 400 V						
Current input 1 A, 5 A						
1b single phase system	●	●	●	●	●	●
3b three-phase three-wire system with balanced load	●	●	●	●	●	●
3u three-phase three-wire system with unbalanced load	●	●	●	●	●	●
4b three-phase four-wire system with balanced load	●	●	●	●	●	●
4u three-phase four-wire system with unbalanced load	●	●	●	●	●	●
OPTION						
Separated AC auxiliary supply 57 V, 63.5 V, 100 V, 230 V, 400 V	-	●	●	-	●	●

Class 1 on request (only for 90 degree dials). Self-consumption of current circuit approx. 0.1 VA and voltage circuits 0.2 VA.

Max. voltage input for EQ 0307, EQ 2307 for 3u, 3b: 150 V/250 V AC
Max. voltage input for EQ 0307, EQ 2307 for 4u, 4b, 1b: 230 V/400 V AC

Ship version meters EQ 0207, EQ 0107 are available on request.

ANALOGUE METERS

POWER FACTOR METERS YQ 0x07, YQ 2x07

USE

Power factor meters are intended for measurement of power factor ($\cos \phi$) in a three-phase three-wire network with a balanced load of phases or in a single phase network. The accuracy class is 1.5.



YQ 0207



YQ 2207

CHARACTERISTICS

TYPE	YQ 0307	YQ 0207	YQ 0107	YQ 2307	YQ 2207	YQ 2107
Front frame (mm)	72 x 72	96 x 96	144 x 144	72 x 72	96 x 96	144 x 144
Cutting for mounting (mm)	68 x 68	92 x 92	138 x 138	68 x 68	92 x 92	138 x 138
Scale		90 °			240 °	
Scale length (mm)	63	95	135	113	135	220
Voltage input*	100 V, 110 V, 230 V, 400 V					
Current input	1 A, 5 A					
Measuring range	0.5 cap. ... 1 ... 0.5 ind. 0.8 cap. ... 1 ... 0.3 ind.					
1b single phase system	●	●	●	●	●	●
3b three-phase three-wire system with balanced load	●	●	●	●	●	●
3u three-phase three-wire system with unbalanced load	●	●	●	●	●	●
4b three-phase four-wire system with balanced load	●	●	●	●	●	●
4u three-phase four-wire system with unbalanced load	●	●	●	●	●	●
Measuring range	import 0.1 cap. ... 1 ... 0 ind export 0 ... 1 ... 0.1 cap.					
OPTION						
Separated AC auxiliary supply	–	●	●	–	●	●
57 V, 63.5 V, 100 V, 230 V, 400 V						

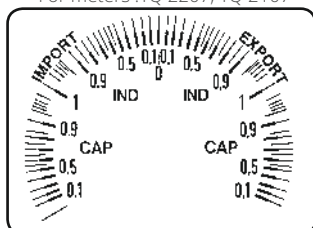
* Max. voltage input for YQ 0307, YQ 2307 for 3u, 3b: 150 V/250 V AC

* Max. voltage input for YQ 0307, YQ 2307 for 4u, 4b, 1b: 230 V/400 V AC

Ship version meters YQ 0207 are available on request.

SCALE OUTLOOK

*For meters: YQ 2207, YQ 2107



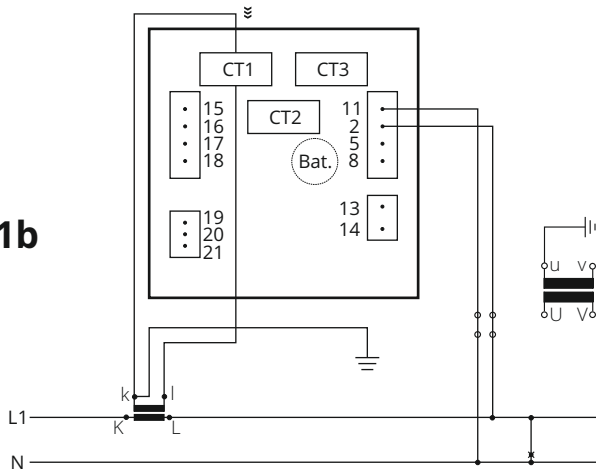
ANALOGUE METERS

ACTIVE OR REACTIVE POWER METERS EQ 0x07, EQ 2x07

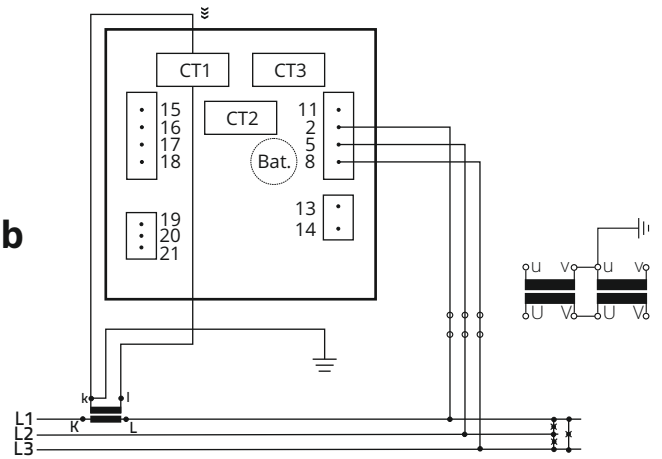
POWER FACTOR METERS YQ 0x07, YQ 2x07

CONNECTION DIAGRAMS

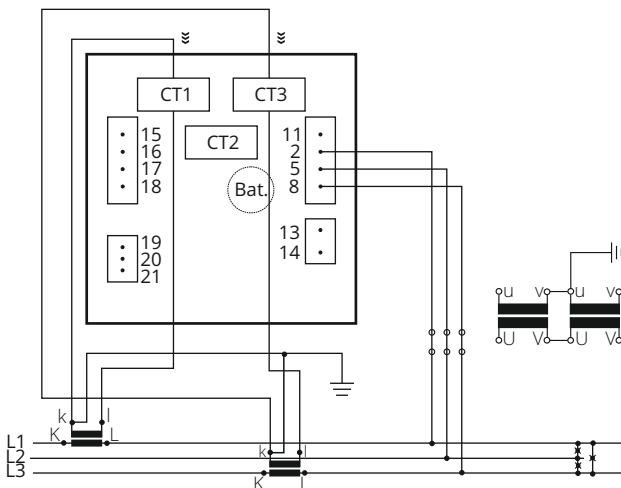
1b



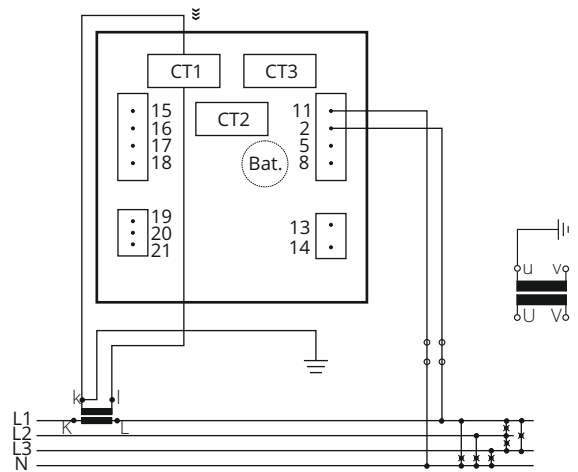
3b



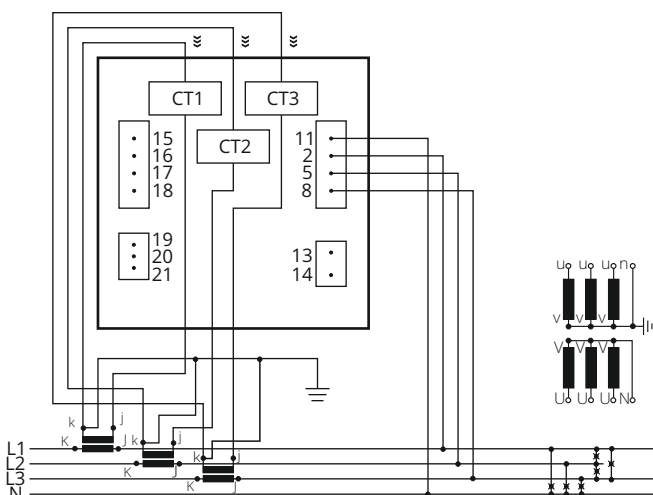
3u



4b



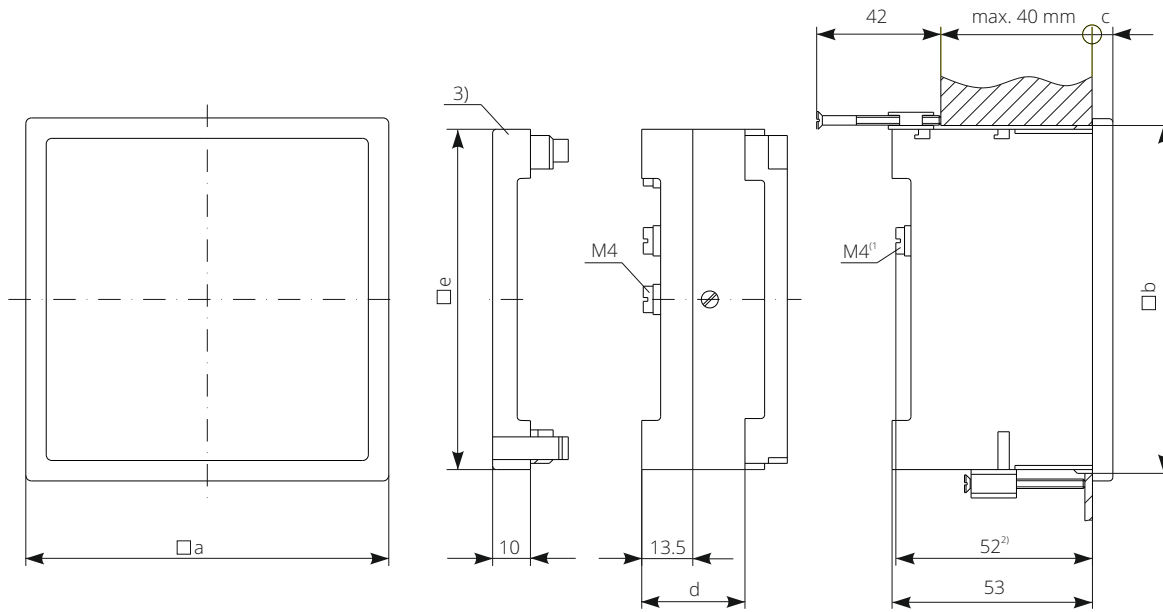
4u



ANALOGUE METERS

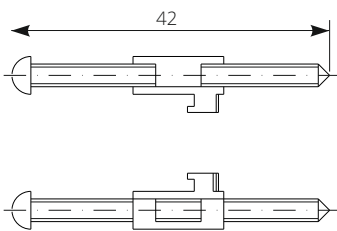
ACTIVE OR REACTIVE POWER METERS EQ 0x07, EQ 2x07
POWER FACTOR METERS YQ 0x07, YQ 2x07

DIMENSIONS (in mm)



FIXING ELEMENTS

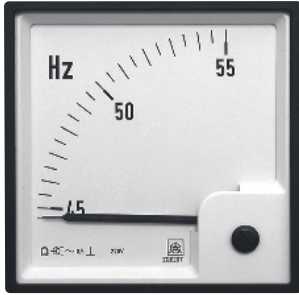
with a screw



ANALOGUE METERS

POINTER FREQUENCY METERS ZQ 0x07, ZQ 2x07

USE



ZQ 0207



ZQ 0507

Pointer frequency meters are intended for measurement of frequencies in the range from 45 Hz to 65 Hz. Accuracy class is 0.5.

CHARACTERISTICS

TYPE	ZQ 0507	ZQ 0407	ZQ 0307	ZQ 0207	ZQ 0107	ZQ 2307	ZQ 2207	ZQ 2107
Front frame □a (mm)	45	48	72	96	144	72	96	144
Cutting for mounting □b (mm)	-	45 ^{+0.6}	68 ^{+0.8}	92 ^{+0.8}	138 ⁺¹	68 ^{+0.8}	92 ^{+0.8}	138 ⁺¹
Dimensions (mm) - Bezel height c	-	5	5.5	5.5	8	5.5	5.5	8
Dimensions with packing (mm)	-	55 x 55 x 75	80 x 75 x 75	102 x 102 x 75	155 x 155 x 80	100 x 90 x 120	160 x 105 x 102	150 x 150 x 137
Volume with packing (dm ³)	-	0.23	0.45	0.78	1.92	1.08	1.71	3.08
Weight with packing (dm ³)	-	0.16	0.20	0.20	0.40	0.20	0.20	0.40
Scale	90 °			240 °				
Scale length (mm)	41	41	65	95	135	101	135	220
MEASURING RANGE	VOLTAGE (V)							
45 ... 55 Hz	57, 63, 100, 110, 230, 400, 500	•	•	•	•	•	•	•
55 ... 65 Hz	57, 63, 100, 110, 230, 400, 500	•	•	•	•	•	•	•
48 ... 52 Hz	57, 63, 100, 110, 230, 400, 500	•	•	•	•	•	•	•
45 ... 65 Hz	57, 63, 100, 110, 230, 400, 500	•	•	•	•	•	•	•

Other ratings are available on request.

* Max. voltage input for YQ 0307, YQ 2307 for 3u, 3b: 150 V/250 V AC

* Max. voltage input for YQ 0307, YQ 2307 for 4u, 4b, 1b: 230 V/400 V AC

Ship version of the meters ZQ 0307, ZQ 0207, ZQ 0107 are available on request.

Two-system frequency meters ZQ 1207, ZQ 1208 are on page 70.

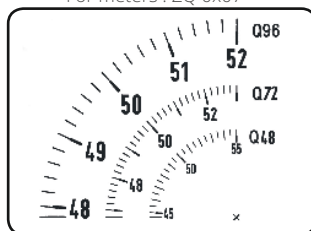
SCALE OUTLOOK

For meters : ZQ 2x07



SCALE OUTLOOK

For meters : ZQ 0x07

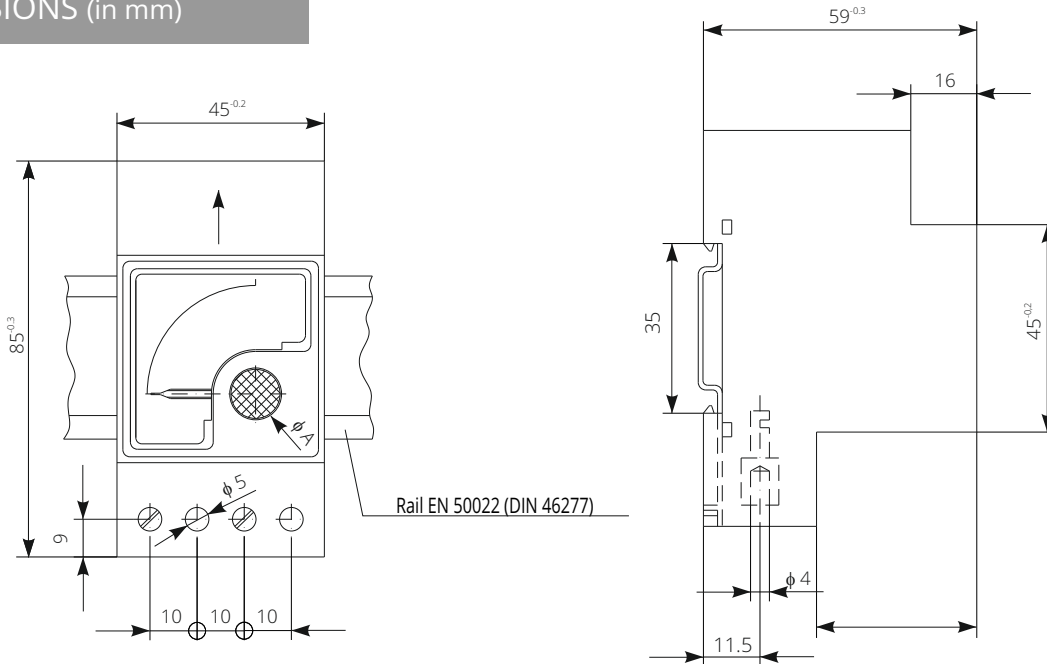


ANALOGUE METERS

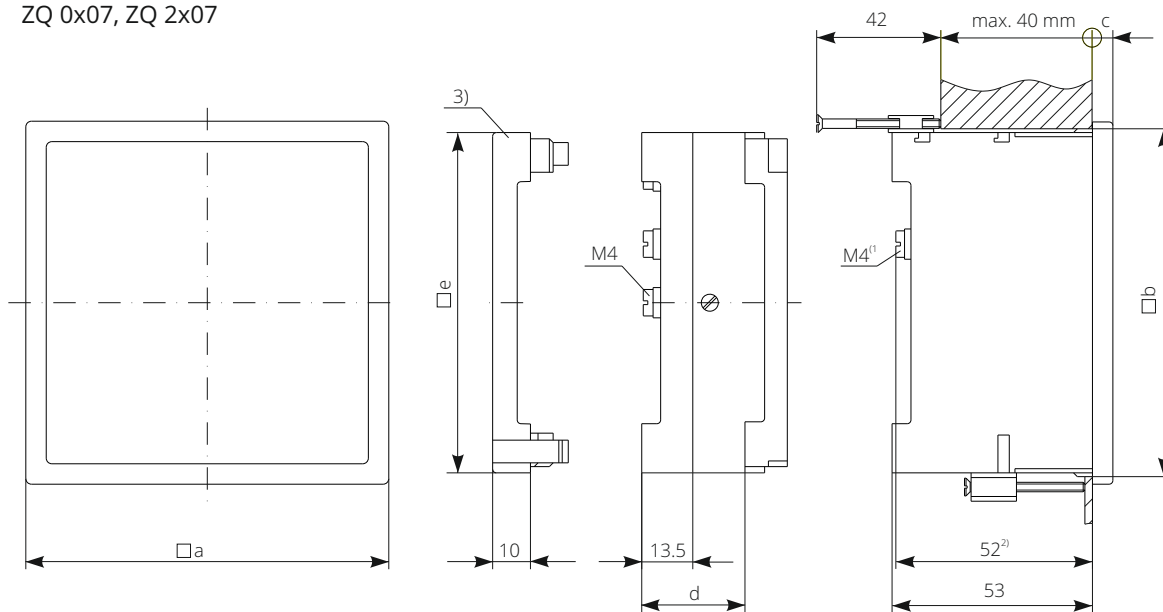
POINTER FREQUENCY METERS ZQ 0x07, ZQ 2x07

DIMENSIONS (in mm)

ZQ 0507



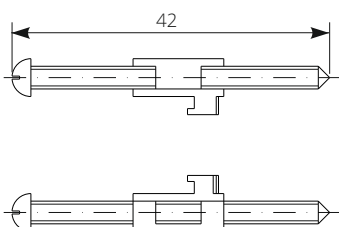
ZQ 0x07, ZQ 2x07



FIXING ELEMENTS

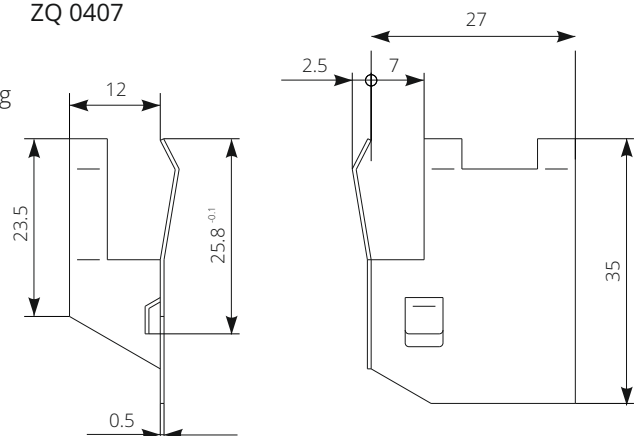
ZQ 0307, ZQ 0207, ZQ 0107
ZQ 2307, ZQ 2207, ZQ 2107

with a screw



ZQ 0407

for mosaic fixing



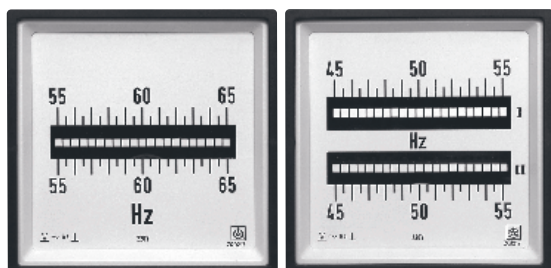
ANALOGUE METERS

REED FREQUENCY METERS ZQ 0x17, ZQ 1x17

USE

Reed frequency meters are intended for measurement of frequencies in the range from 45 Hz to 65 Hz. The accuracy class is 0.5.

Two-systems reed frequency meters are intended for measurement of two frequencies in the system for synchronisation. Accuracy class is 0.5.



ZQ 0217

ZQ 1217

CHARACTERISTICS

TYPE		ZQ 0317	ZQ 0217	ZQ 0117
Front frame □a (mm)		72	96	144
Cutting for mounting □b (mm)		68 ^{+0.8}	92 ^{+0.8}	138 ⁺¹
Dimensions (mm) - Bezel height c		5.5	5.5	8
Dimensions with packing (mm)		100 x 90 x 85	120 x 110 x 85	170 x 160 x 85
Volume with packing (dm ³)		0.77	1.12	2.31
Weight with packing (dm ³)		0.22	0.32	0.52
MEASURING RANGE	VOLTAGE (V)	NO. OF REEDS		
47 ... 53 Hz	100, 110, 230	13	●	●
	400, 500		●	●
57 ... 63 Hz	100, 110, 230	13	●	●
	400, 500		●	●
45 ... 55 Hz	100, 110, 230	21	●	●
	400, 500		●	●
55 ... 65 Hz	100, 110, 230	21	●	●
	400, 500		●	●

Self-consumption at 110 - 220 V range is 6 ... 7 mA/system
At other rangers it is 3 ... 4 mA/system.

Ship version of the meters ZQ 0317, ZQ 0217, ZQ 0117 are available on request.

TWO-SYSTEMS REED FREQUENCY METERS

TYPE		ZQ 1217	ZQ 1117
Front frame □a (mm)		96	144
Cutting for mounting □b (mm)		92 ^{+0.8}	138 ⁺¹
Dimensions (mm) - Bezel height c		5.5	8
Dimensions with packing (mm)		120 x 110 x 85	170 x 160 x 85
Volume with packing (dm ³)		1.12	2.31
Weight with packing (dm ³)		0.43	0.75
MEASURING RANGE	VOLTAGE (V)	NO. OF REEDS	
2 x 47 ... 53 Hz	100, 110, 230	2 x 13	●
	400, 500		●
2 x 57 ... 63 Hz	100, 110, 230	2 x 13	●
	400, 500		●
2 x 45 ... 55 Hz	100, 110, 230	2 x 21	●
	400, 500		●
2 x 55 ... 65 Hz	100, 110, 230	2 x 21	●
	400, 500		●

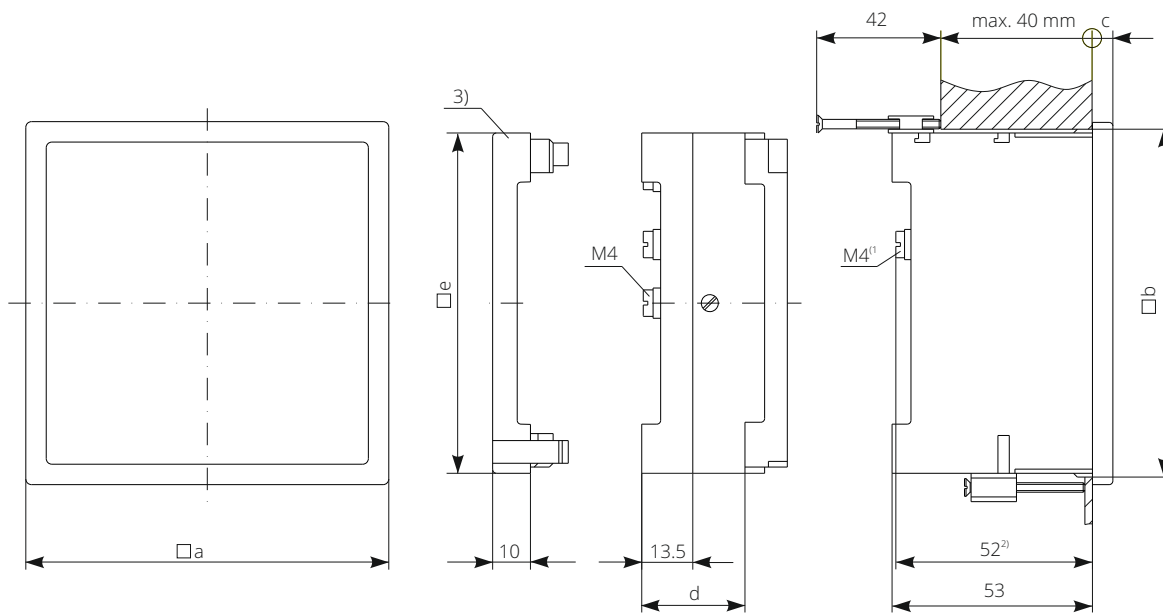
Self-consumption at 110 - 220 V range is 6 ... 7 mA/system
At other rangers it is 3 ... 4 mA/system.

Ship version of the meters ZQ 1217, ZQ 1117 are available on request.

ANALOGUE METERS

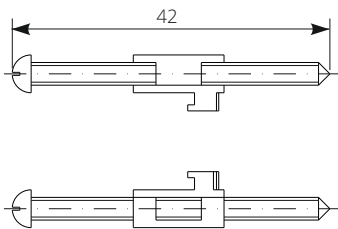
REED FREQUENCY METERS ZQ 0x17, ZQ 1x17

DIMENSIONS (in mm)



FIXING ELEMENTS

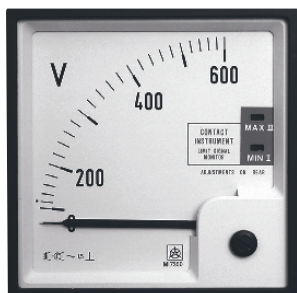
with a screw



ANALOGUE METERS

METER WITH LIMIT CONTACT MI 7350

USE



MI 7350 can signal minimal and maximal setting limits (MIN and MAX). The meter is provided with two output relays of 600 VA switching power. Setting over or under the limits is displayed with a LED on the meter scale. DC or AC currents or voltages, frequency and temperature can be signalised.

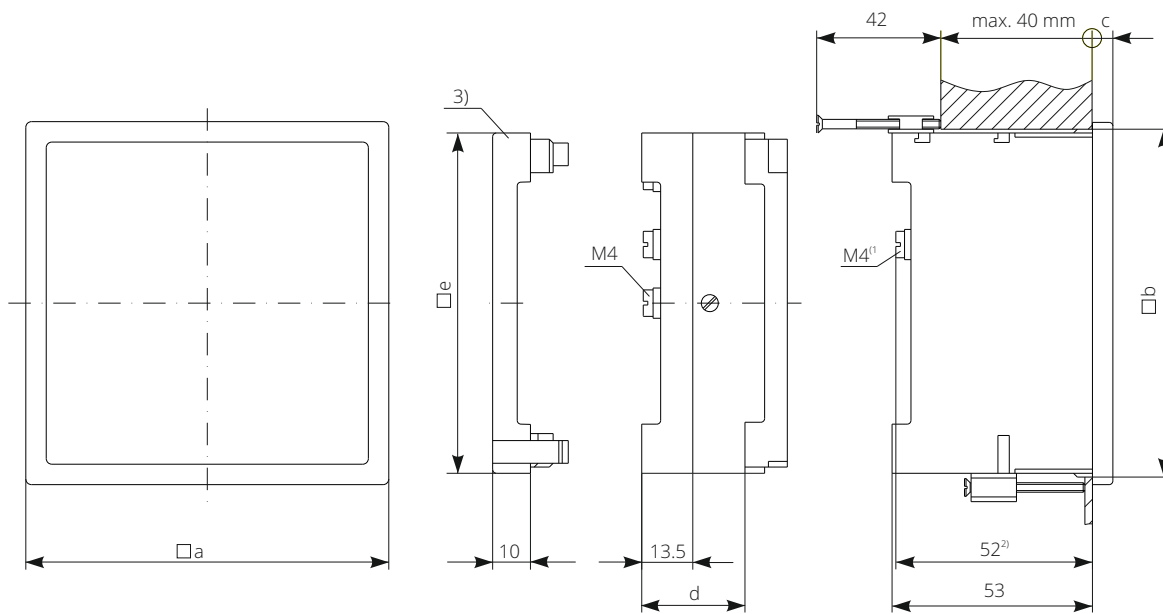
CHARACTERISTICS		
TYPE		MI 7350
Front frame □a (mm)		96
Cutting for mounting □b (mm)		92 ^{+0.8}
Dimensions (mm) - Bezel height c		5.5
Base d		37
Dimensions with packing (mm)		98 x 152 x 100
Volume with packing (dm ³)		1.49
Weight with packing (kg)		0.60
Scale length (mm)		95
MEASURED QUANTITY		
DC U	40 ... 800 mV	●
	1 ... 60 V	●
	100 ... 600 V	●
AC U	40 ... 800 mV	●
	1 ... 60 V	●
	100 ... 600 V	●
DC I	25 ... 600 μA	●
	1 ... 60 mA	●
	100 ... 600 mA	●
AC I	1 ... 5 A	●
	1 ... 6 mA	●
	100 ... 600 mA	●
AC Ief	1 ... 5 A	●
	1/2 A, 1.5/3 A, 2.5/5 A	●
	4/8 A, 5/10 A	●
Frequency (f)	45 ... 55 Hz	●
	48 ... 52 Hz	●
	45 ... 65 Hz	●
	55 ... 65 Hz	●
Thermocouple (J, K, S)	0 ... 250 °C	●
	0 ... 600 °C	●
	0 ... 1200 °C	●
Temperature dependent resistor PT100 (W)	0 ... 1600 °C	●
	-200 ... +800 °C	●
	ΔT ... 50 °C min	●

Standard supply 230 V AC; 24 V, 48 V, 60 V, 110 V DC on request.

ANALOGUE METERS

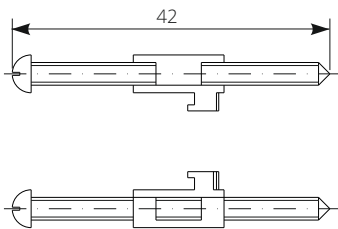
METER WITH LIMIT CONTACT MI 7350

DIMENSIONS (in mm)



FIXING ELEMENTS

with a screw



ANALOGUE METERS

METERS FOR DC VOLTAGE OR CURRENT WITH MOVING COIL
BQ 0x07, BQ 2x07

USE



BQ 2207



BQ 0507

Meters with a moving coil are intended for measurement of direct currents or voltages. A measuring system with a core magnet is not sensitive to external electromagnetic fields and is resistant to mechanical impacts and vibrations. The scale is entirely linear and interchangeable. The accuracy class is 1.5.

CHARACTERISTICS

TYPE	BQ 0507	BQ 0407	BQ 0307	BQ 0207	BQ 0107	BQ 2507	BQ 2407	BQ 2307	BQ 2207	BQ 2107
Front frame □a (mm)	45	48	72	96	144	45	48	72	96	144
Cutting for mounting □b (mm)	–	45 ^{+0.6}	68 ^{+0.8}	92 ^{+0.8}	138 ⁺¹	–	45 ^{+0.6}	68 ^{+0.8}	92 ^{+0.8}	138 ⁺¹
Dimensions (mm) - Bazel height c	–	5	5.5	5.5	8	–	5	5.5	5.5	8
Dimensions with packing (mm)	–	55 x 55 x 75	80 x 75 x 75	102 x 102 x 75	155 x 155 x 80	–	75 x 60 x 85	100 x 90 x 85	120 x 110 x 85	170 x 160 x 85
Volume with packing (dm ³)	–	0.23	0.45	0.78	1.92	–	0.38	0.77	1.12	2.31
Weight with packing (kg)	–	0.10	0.16	0.20	0.43	–	0.16	0.20	0.30	0.44
RATING										
0 - 40 µA ... 60 µA	–	●	●	●	●	–	●	●	●	●
0 - 100 µA ... 600 µA	●	●	●	●	●	●	●	●	●	●
0 - 1 mA ... 600 mA	●	●	●	●	●	●	●	●	●	●
4 ... 20 mA ²⁾	●	●	●	●	●	●	●	●	●	●
0 - 1A ... 6 A	●	●	●	●	●	●	●	●	●	●
0 - 10 A ... 25 A	–	●	●	●	●	–	●	●	●	●
0 - 40 A, 60 A	–	–	●	●	●	–	–	●	●	●
xA/60 mV ¹⁾	●	●	●	●	●	●	●	●	●	●
0 - 100 mV ... 600 mV	●	●	●	●	●	●	●	●	●	●
0 - 1 V ... 600 V	●	●	●	●	●	●	●	●	●	●

AMMETERS RATINGS AND INTERNAL RESISTANCE

BQ 0x07	µA / Ω	10/5650, 60/4710, 100/2250, 150/1950, 250/990, 400/350, 600/150
BQ 2x07	µA / Ω	100/5900, 150/5100, 250/4000, 400/2400, 500/1500, 600/1300
BQ 0x07	mA / Ω	1/65, 1.5/25, 2.5/11, 4/6, 5/4.5, 6/4, 10/2.6, 15/4, 20/3, 25/2.4, 40/1.5, 50/1.2, 60/1, 100/0.6, 150/0.4, 250/0.24, 400/0.15, 600/0.1
BQ 2x07	mA / Ω	1/370, 1.5/200, 2.5/780, 4/25, 5/8.4, 6/15, 10/7, 15/5, 20/3.9 mA: 25, 40, 50, 60, 100, 150, 250, 400, 600 - voltage drop on terminals approx. 60mV
BQ 0x07, BQ 2x07	A ²⁾	1, 1.5, 2.5, 4, 6, 10, 15, 25, 40, 60 - voltage drop on terminlas approx. 60 mV xA/60 mV ²⁾

VOLTMETERS RATINGS

BQ 0x07	mV ²⁾	60, 100, 150, - 5 mA system
BQ 2x07	mV ²⁾	60, 100, 150, 200, 300 - 5 mA system
BQ 0x07, BQ 2x07	V	1, 1.5, 2.5, 4, 6, 10, 15, 25, 40, 60, 150, 250, 400, 600 - 1 mA system - characteristic resistance 1 kΩ/V

¹⁾ A meter for connection to a separate shunt, calibrated to resistance of connection terminals 0.035 Ω.

²⁾ Current through a meter approx 5 mA.

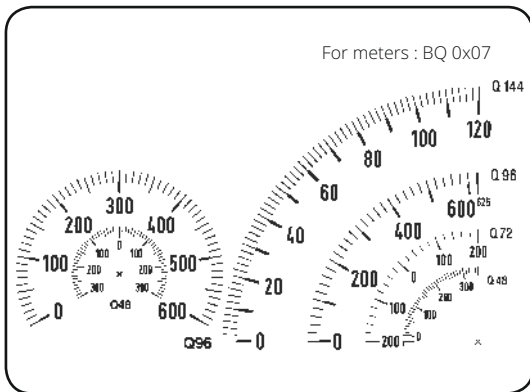
³⁾ A version with electrical zero point suppression. A version with mechanical zero point suppression available on request.

Ship meter versions of BQ 0407, BQ 0307, BQ 0207, BQ 0107 available on request.

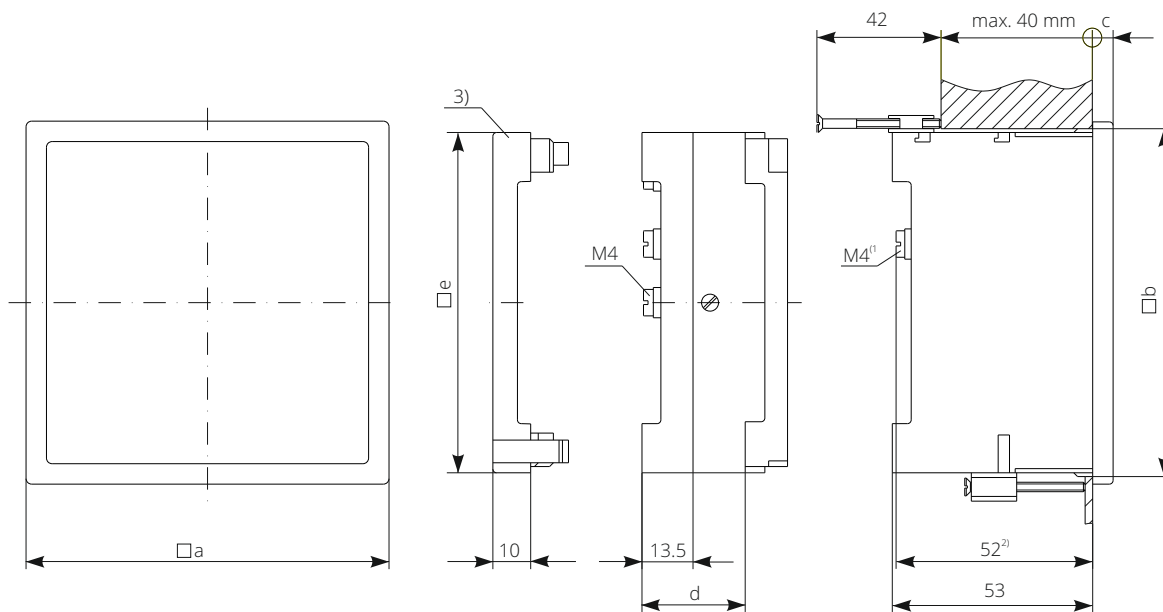
ANALOGUE METERS

METERS FOR DC VOLTAGE OR CURRENT WITH MOVING COIL
POWER FACTOR METERS BQ 0x07, BQ 2x07

SCALE OUTLOOK



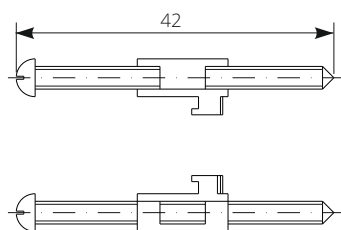
DIMENSIONS (in mm)



FIXING ELEMENTS

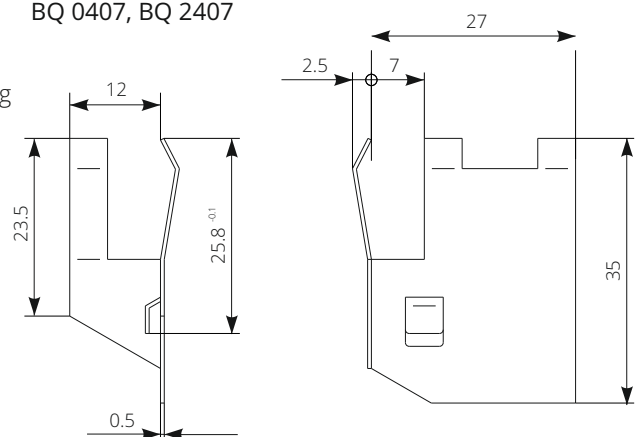
BQ 0x07, BQ 2x07

with a screw



BQ 0407, BQ 2407

for mosaic fixing

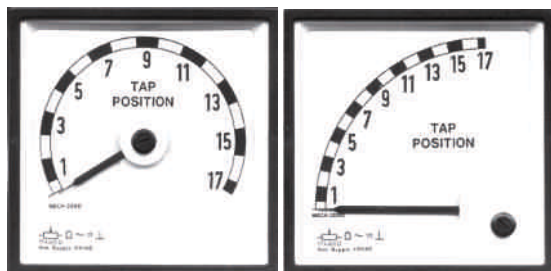


ANALOGUE METERS

TAP POSITION METERS WITH MOVING COIL AND A RECTIFIER CQ 2207, CQ 0207

USE

TAP meters with a moving coil are intended for measurement of tap position with auxiliary supply AC voltage. The position indicator monitors transformer tap position, hoist or valve position etc. It employs a bridge system. 1-2 positions can be provided using $400\ \Omega$ or $50\ \Omega$ per step. A measuring system with a core magnet is not sensitive to external electromagnetic fields. It is resistant to mechanical shocks and vibrations complying with EN 60051. The scale is entirely linear and interchangeable.



CQ 2207

CQ 0207

FEATURES

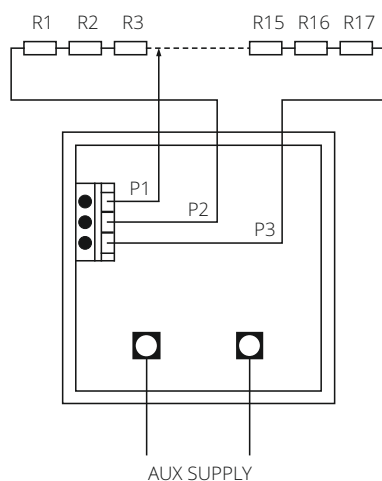
- For measurement of tap position
- Linear scale
- Interchangeable dial
- Resistant to mechanical vibrations and shocks
- Protective cover for terminal

CHARACTERISTICS

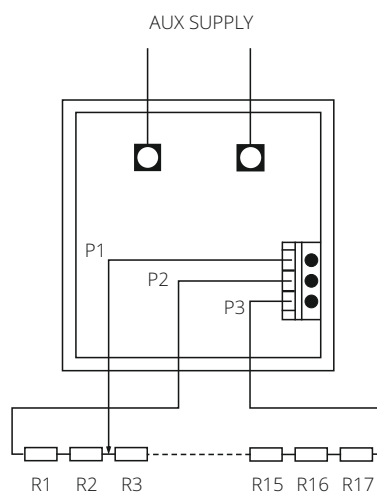
TYPE	CQ 0207	CQ 2207
Front frame □ a (mm)	96	96
Cutting for mounting □ b (mm)	$92^{+0.8}$	$92^{+0.8}$
Dimensions (mm) - Bezel height c	5.5	5.5
Dimensions with packing (mm)	102 x 102 x 75	120 x 110 x 85
Volume with packing (dm ³)	0.78	1.12
Weight with packing (dm ³)	0.22	0.30
Scale	90 °	240 °
Scale length (mm)	95	155

CONNECTION DIAGRAMS

CQ 2207



CQ 0207



ANALOGUE METERS

METERS FOR AC VOLTAGE OR CURRENT WITH MOVING COIL
AND A RECTIFIER CQ 0x07, CQ 2x07

USE



CQ 2407



CQ 0507

Meters with a moving coil and a rectifier are intended for measurement of AC currents or voltages in the frequency range from 40 Hz to 65 Hz (higher frequency ranges on request) where low consumption of the meter is required. The meters measure a mean value of rectified current or voltage. The scale is expressed in rms values at sine form of the measured quantity. Distortion or deviation from the sine form for more than 1% entails additional errors. The scale is interchangeable. The accuracy class is 1.5.

CHARACTERISTICS

TYPE	CQ 0507	CQ 0407	CQ 0307	CQ 0207	CQ 0107	CQ 3207 ^{*)}	CQ 2507	CQ 2407	CQ 2307	CQ 2207	CQ 2107
Front frame □a (mm)	45	48	72	96	144	96	45	48	72	96	144
Cutting for mounting □b (mm)	-	45 ^{+0.6}	68 ^{+0.8}	92 ^{+0.8}	138 ⁺¹	92 ^{+0.8}	-	45 ^{+0.6}	68 ^{+0.8}	92 ^{+0.8}	138 ⁺¹
Dimensions (mm) - Bazel height c	-	5	5.5	5.5	8	5.5	-	5	5.5	5.5	8
Dimensions with packing (mm)	-	55 x 55 x 75	80 x 75 x 75	102 x 102 x 75	155 x 155 x 80	102 x 102 x 75	-	75 x 60 x 85	100 x 90 x 85	120 x 110 x 85	170 x 160 x 85
Volume with packing (dm ³)	-	0.23	0.45	0.78	1.92	0.78	-	0.38	0.77	1.12	2.31
Weight with packing (kg)	-	0.10	0.16	0.22	0.44	0.32	-	0.16	0.20	0.30	0.44
Scale										9°	240°
Scale length (mm)	41	41	63	95	140	95	71	71	113	155	235
RATING											
0 - 100 μA ... 600 μA	●	●	●	●	●	-	●	●	●	●	●
0 - 1 mA ... 10 mA	●	●	●	●	●	-	●	●	●	●	●
xA/1 A, xA/5 A ¹⁾ (max. 7.5 A)	●	●	●	●	●	●	●	●	●	●	●
0 - 2.5 V ... 500 V	●	●	●	●	●	-	●	●	●	●	●
0 - 600 V	●	●	●	●	●	-	●	●	●	●	●

AMMETERS RATINGS

μA	100, 150, 250, 400, 500, 600
mA	1, 1.5, 2.5, 4, 5, 6, 10
Voltage drop approx. 1.5 V	
A/Voltage drop (V) x/1 A - 0.1 V, x/5 A - 0.03 V	

VOLTMETERS RATINGS

V	2.5, 4, 6, 10, 15, 25, 40, 60, 100, 150, 250, 400, 500, 600
---	---

- characteristic resistance 1 kΩ/V

* CQ 3207 4-stage selector switch is built in the meter for measurement of current in three individual phases. At current switch-over the circuit is not interrupted.

¹⁾ Meters for connection to a current measuring transformer.

OVERLOADS OF SHORT DURATION

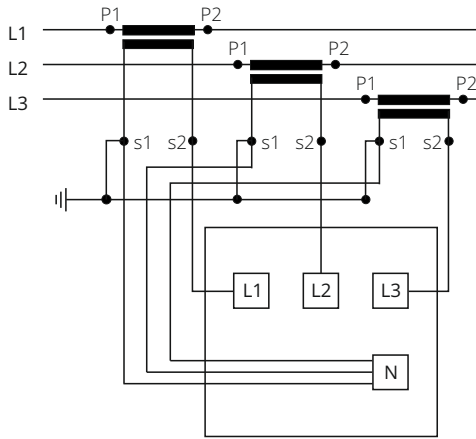
TYPE	RANGE	TEST CONDITIONS	STANDARDS REQUIREMENTS
CQ 2207	1 A	0.5 s ; 25 x I _n	According to 60051-1:2000 Direct acting indicating analogue electrical measuring instruments and their accessories - Part 1: Definitions and general requirements common to all parts 10 x I _n - 9 x 0.5 s + 1 x 5 s/60 s 2 x U _n - 9 x 0.5 s + 1 x 5 s/60 s
	1 A	0.5 s ; 30 x I _n	
	1 A	0.5 s ; 50 x I _n	
	1 A	1 s ; 25 x I _n	
	1 A	1 s ; 30 x I _n	
	1 A	1 s ; 50 x I _n	
	5 A	0.5 s ; 25 x I _n	
	5 A	0.5 s ; 30 x I _n	
	5 A	0.5 s ; 40 x I _n	
	5 A	1 s ; 25 x I _n	
	5 A	1 s ; 30 x I _n	
	5 A	1 s ; 40 x I _n	

ANALOGUE METERS

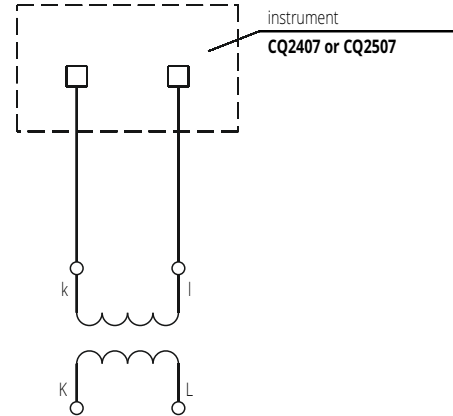
METERS FOR AC VOLTAGE OR CURRENT WITH MOVING COIL
AND A RECTIFIER CQ 0x07, CQ 2x07

CONNECTION DIAGRAMS

CQ 3207

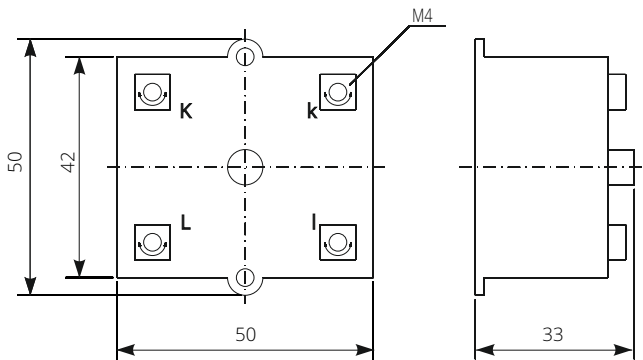


Mesuring transformer for add-on
1 or 5 A for CQ 0407 and CQ 2407



DIMENSIONS (in mm)

Mesuring transformer for add-on 1 or 5 A for CQ 0407 and CQ 2407

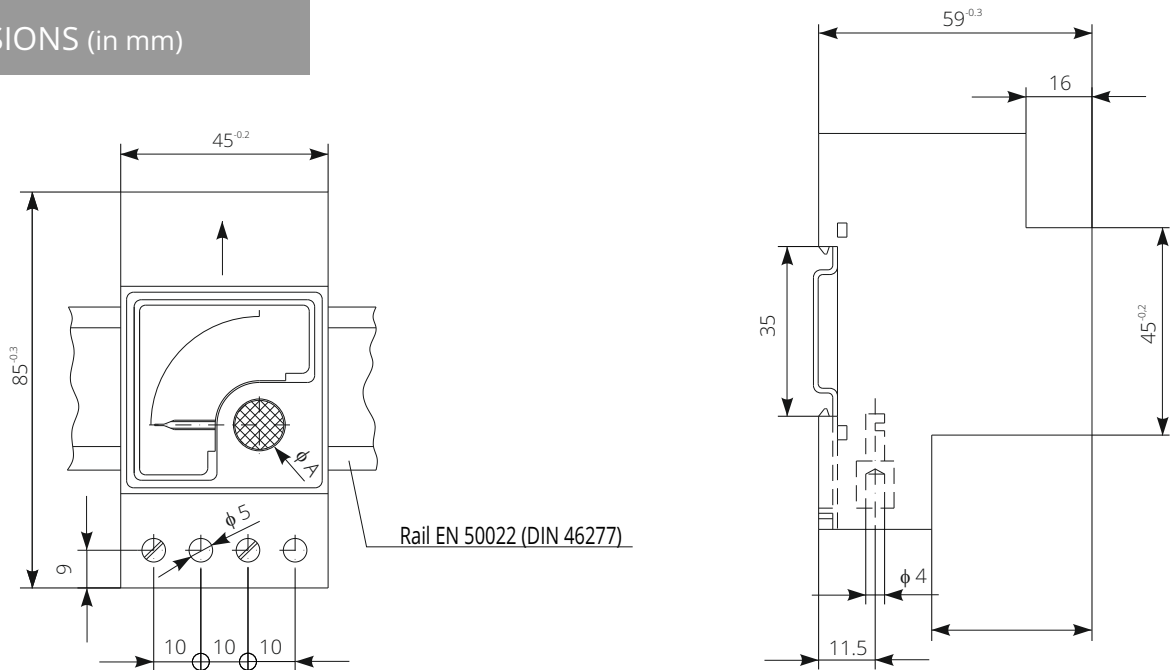


ANALOGUE METERS

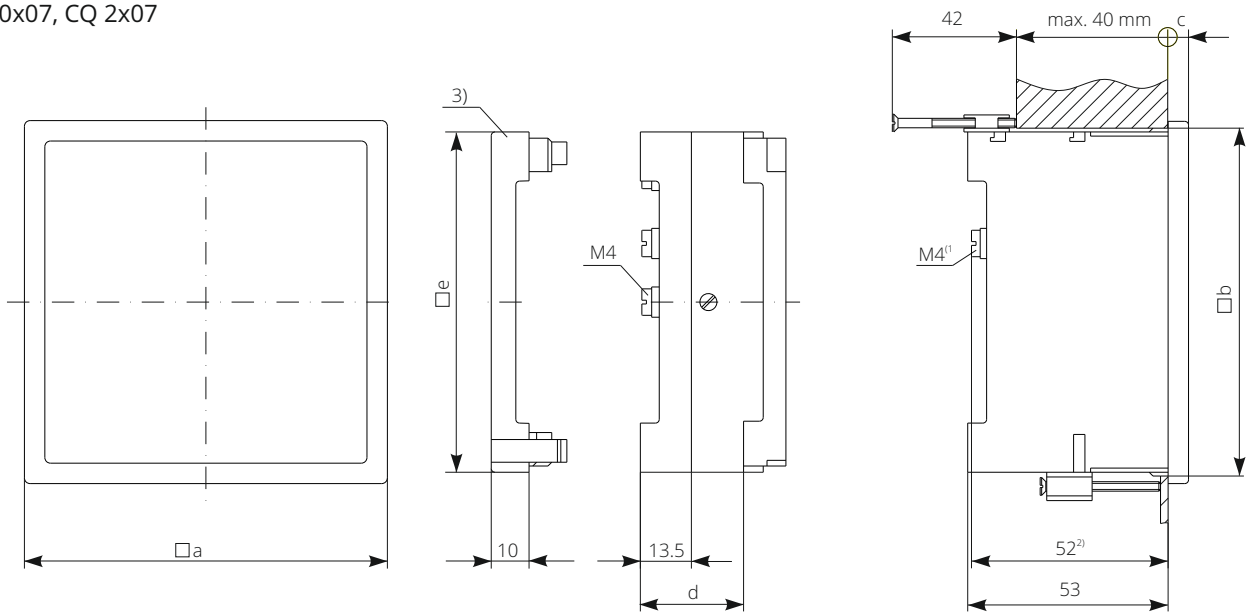
METERS FOR AC VOLTAGE OR CURRENT WITH MOVING COIL
AND A RECTIFIER CQ 0x07, CQ 2x07

DIMENSIONS (in mm)

CQ 0507



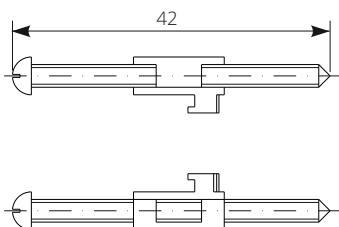
CQ 0x07, CQ 2x07



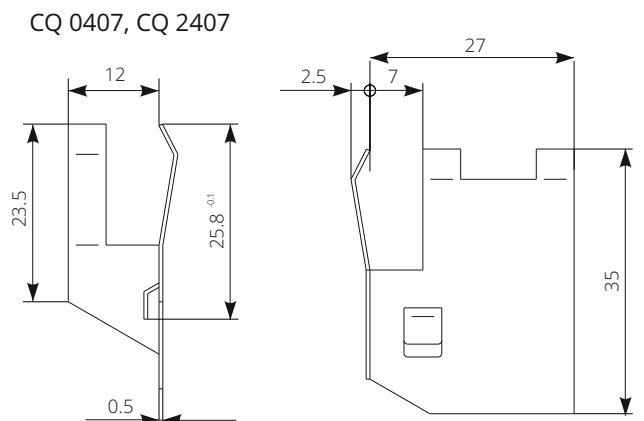
FIXING ELEMENTS

CQ 0307, CQ 0207, CQ 0107
CQ 3207, CQ 2307, CQ 2207, CQ 2107

with a screw



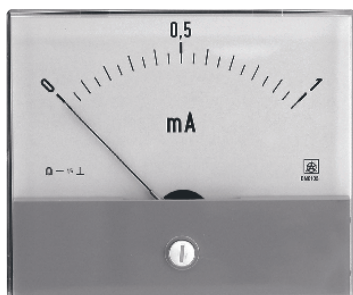
for mosaic fixing



ANALOGUE METERS

METERS FOR DC AND AC VOLTAGE OR CURRENT WITH MOVING COIL BN 0x03, CN 0x03

USE



BN 0103, CN 0103

Owing to a special form and available colours, BN and CN meters are especially convenient for building into different control devices. The accuracy class is 1.5. The scale is not interchangeable. BN meters are intended for DC currents or voltages, and CN meters for AC currents or voltages.

CHARACTERISTICS

TYPE	BN 0103	BN 0203	CN 0103	CN 0203
Front frame (mm)	86 x 72	115 x 96	86 x 72	115 x 96
Cutting for mounting (mm)	∅ 65	∅ 65	∅ 65	
Scale length (mm)	60	90	60	90
RATING				
0 - 40 µA ... 60 µA	●	●	–	–
0 - 100 µA ... 600 µA	●	●	●	●
0 - 1 mA ... 10 mA	●	●	●	●
0 - 15 mA ... 600 mA	●	●	–	–
4 ... 20 mA ³⁾	●	●	–	–
0 - 1 A ... 6 A	●	●	–	–
0 - 10 A ... 25 A	●	●	–	–
0 - 40 A, 60 A	●	●	–	–
xA/ 1 A, xA/5 A ²⁾	–	–	●	●
xA/ 60 mV ¹⁾	●	●	–	–
0 - 100 mV ... 600 mV	●	●	–	–
0 - 1 V ... 600 V	●	●	●	●

¹⁾ A meter for connection to a separate shunt.

²⁾ A meter for connection to a current measuring transformer

³⁾ A version with electrical zero point suppression.

A version with mechanical zero point suppression available on request.

AMMETERS RATINGS AND INTERNAL RESISTANCE

BN 0103, BN 0203	
A / Ω	40 / 5650, 60 / 4710, 100 / 2250, 150 / 1950, 250 / 990, 400 / 350, 600 / 150
A ¹⁾	1, 1.5, 2.5, 4, 6, 10, 15, 25, 40, 60
Voltage drop on terminals approx. 60 mV	
CN 0103, CN 0203	
µA	100, 150, 250, 400, 500, 600
mA	1, 1.5, 2.5, 4, 5, 6, 10
Voltage drop approx. 1.5 V	
A/Voltage drop (V) x/1A - 0.1 V, x/5A - 0.03 V	

VOLTMETERS RATINGS

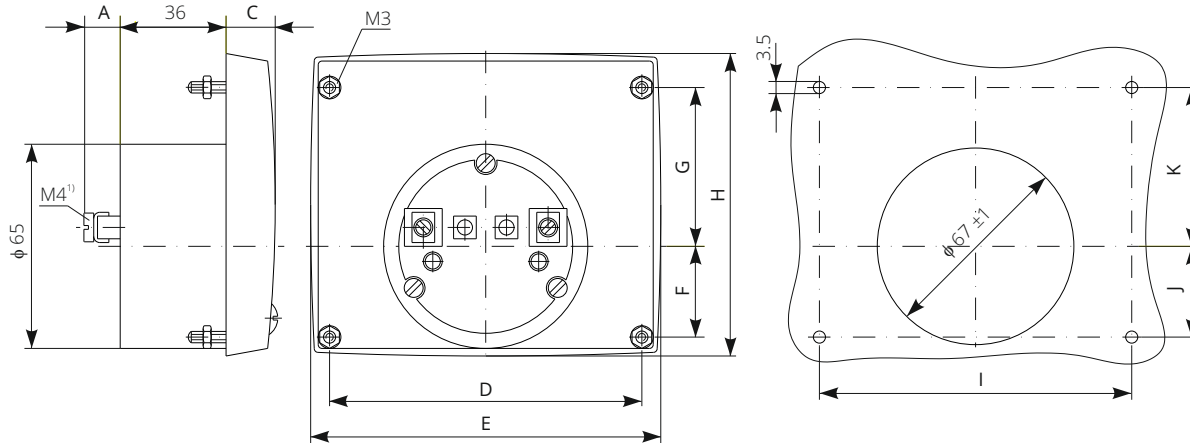
BN 0103, BN 0203	
mV ¹⁾	60, 100, 150 - 5 mA system
V	1, 1.5, 2.5, 4, 6, 10, 15, 25, 40, 60, 100, 150, 250, 400, 600 - 1 mA system
- characteristic resistance 1 kΩ/V	
CN 0103, CN 0203	
V	2.5, 4, 6, 10, 15, 25, 40, 60, 100, 150, 250, 400, 500, 600
- characteristic resistance 1 kΩ/V	

1) Current through a meter approx. 5 mA

ANALOGUE METERS

METERS FOR DC AND AC VOLTAGE OR CURRENT WITH MOVING COIL BN 0x03, CN 0x03

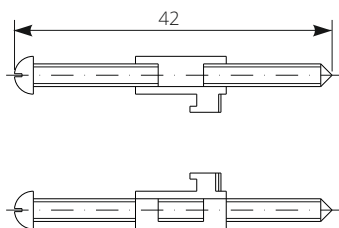
DIMENSIONS (in mm)



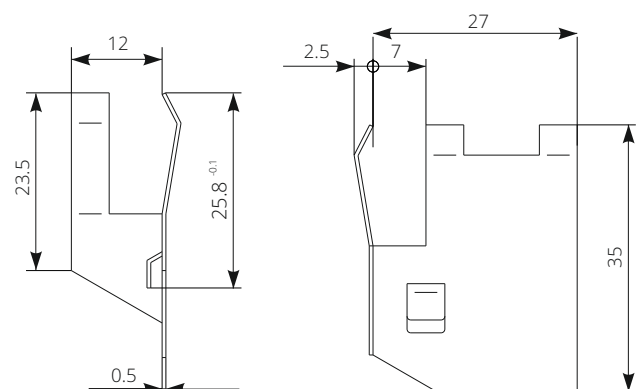
TYPE		DIMENSIONS (in mm)						
		A	C	D	E	F	G	H
BN 0103	for ratings from 7.5 A to 60 A	13	11.5	64 ^{+0.2}	85	25 ^{+0.2}	25 ^{+0.2}	72
BN 0203	for ratings from 7.5 A to 60 A	13	16	103 ^{+0.2}	105	31 ^{+0.2}	51 ^{+0.2}	96
BN 0103		16.5	11.5	64 ^{+0.2}	85	25 ^{+0.2}	25 ^{+0.2}	72
BN 0203		16.5	16	103 ^{+0.2}	105	31 ^{+0.2}	51 ^{+0.2}	96
CN 0103		13	11.5	64 ^{+0.2}	85	25 ^{+0.2}	25 ^{+0.2}	72
CN 0203		13	16	103 ^{+0.2}	105	51 ^{+0.2}	51 ^{+0.2}	96

FIXING ELEMENTS

with a screw



for mosaic fixing



ANALOGUE METERS

METERS FOR AC VOLTAGE OR CURRENT WITH MOVING IRON FQ 0x07, FQ 3x07, FN 0x0x

USE



Meters with a moving iron are intended for measurement of AC currents or voltages of frequencies from 15 Hz to 100 Hz. They measure rms values independently on the signal form of current or voltage. The accuracy class is 1.5. As the beginning of the scale is non-linear, reading from 15% of rating onwards is possible. Ammeters with rating for double, triple or even six-time value of rated current are available on request. The overload range is extremely non-linear. The scale is interchangeable.

CHARACTERISTICS

TYPE	FQ 0507	FQ 0407	FQ 0307	FQ 0207	FQ 0107	FQ 3307	FQ 3207*	FQ 3107*	FN 0103*	FN 0201*
Front frame □a (mm)	45 x 45	48 x 48	72 x 72	96 x 96	144 x 144	72 x 72	96 x 96	144 x 144	86 x 72	115 x 96
Cutting for mounting □b (mm)	-	45 ^{+0.6}	68 ^{+0.8}	92 ^{+0.8}	138 ⁺¹	68 ^{+0.8}	92 ^{+0.8}	138 ⁺¹	φ 65	φ 65
Dimensions (mm) - Bazel height c	-	5	5.5	5.5	8	5.5	5.5	5.5	-	-
Dimensions with packing (mm)	-	55 x 55 x 75	80 x 75 x 75	102 x 102 x 75	155 x 155 x 80	-	102 x 102 x 75	100 x 90 x 85	120 x 110 x 85	170 x 160 x 85
Volume with packing (dm ³)	-	0.23	0.45	0.78	1.92	-	0.78	0.77	1.12	2.31
Weight with packing (kg)	-	0.10	0.16	0.24	0.40	-	0.32	0.20	0.30	0.44
Scale	9 °									
Scale length (mm)	41	41	63	95	140	63	95	140	60	60
RATING										
0 - 100 mA ... 600 mA	●	●	●	●	●	-	-	-	●	●
0 - 1 A ... 10 A	●	●	●	●	●	-	-	-	●	●
0 - 15 A, 25 A	●	●	●	●	●	-	-	-	●	●
0 - 40 A	-	-	●	●	●	-	-	-	●	●
0 - 60 A	-	-	●	●	●	-	-	-	●	●
x A/1 A, x A/5 A	●	●	●	●	●	-	-	-	●	●
Without dial x A/1 A, x A/5 A	●	●	●	●	●	-	-	-	-	-
0 - 6 V ... 600 V	●	●	●	●	●	●	●	●	●	●
x V/100 V, x V/110 V	●	●	●	●	●	●	●	●	●	●

* A dial is not interchangeable

FQ 3107, FQ 3307 are intended for measurement of phase and line-to-line voltages in three-phase system. Required phase or line-to-line voltage or current is selected with a selector switch.

AMMETERS RATINGS AND INTERNAL RESISTANCE

mA	100, 150, 200, 250, 300, 400, 500, 600
A	1, 1.5, 2.5, 4, 6, 10, 15, 25, 40, 60
A	x A/1 A, x A/5 A
- for connection to a current measuring transformer	

VOLTMETERS RATINGS

V	6, 10, 15, 25, 40, 60, 100, 150, 250, 300, 400, 500, 600
V	.../100, .../110
- for connection to a voltaget measuring transformer	

SELF-CONSUMPTION

- ammeters	from 0.3 VA to 1.2 VA x/1 A ... 0.4 VA x/5 A ... 0.7 VA
- voltmeters	from 1.2 VA to 4 VA

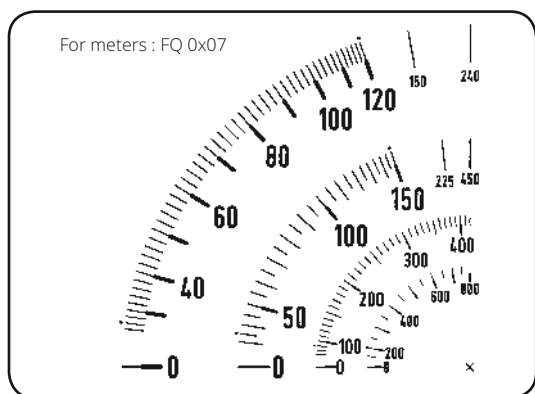
Meters for connection to a measuring transformer have the following standard ratings: 1 - 1.2-1.5-2-2.5-3-4-5-6-7.5 (8) and decade multiples.

Ship version meters FQ 0407, FQ 0307, FQ 0207, FQ 0107 available on request.

ANALOGUE METERS

METERS FOR AC VOLTAGE OR CURRENT WITH MOVING IRON FQ 0x07, FQ 3x07, FN 0x0x

SCALE OUTLOOK



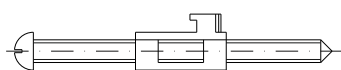
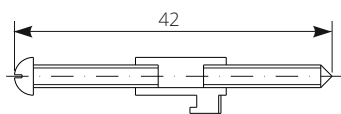
OVERLOADS OF SHORT DURATION

TYPE	RANGE	TEST CONDITIONS	STANDARDS REQUIREMENTS
FQ 0207	1 A	0.5 s ; 25 x I _n	2 x U _n According to 60051-1:2000 Direct acting indicating analogue electrical measuring instruments and their accessories - Part 1: Definitions and general requirements common to all parts 10 x I _n - 9 x 0.5 s + 1 x 5 s/60 s 2 x U _n - 9 x 0.5 s + 1 x 5 s/60 s
	1 A	0.5 s ; 30 x I _n	
	1 A	0.5 s ; 50 x I _n	
	1 A	1 s ; 25 x I _n	
	1 A	1 s ; 30 x I _n	
	1 A	1 s ; 50 x I _n	
	5 A	0.5 s ; 25 x I _n	
	5 A	0.5 s ; 30 x I _n	
	5 A	0.5 s ; 50 x I _n	
	5 A	1 s ; 50 x I _n	

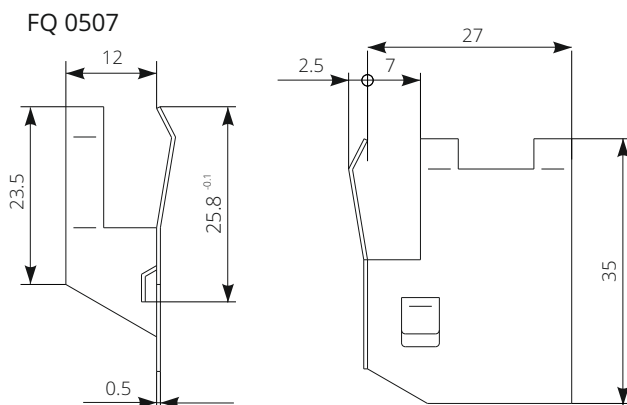
FIXING ELEMENTS

FQ 0307, FQ 0207, FQ 0107, FQ 3307, FQ 3207, CQ 3107

with a screw

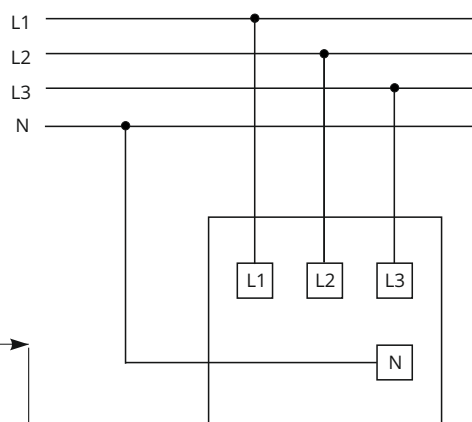


for mosaic fixing



CONNECTION DIAGRAMS

FQ 3107, FQ 3207, FQ 3307

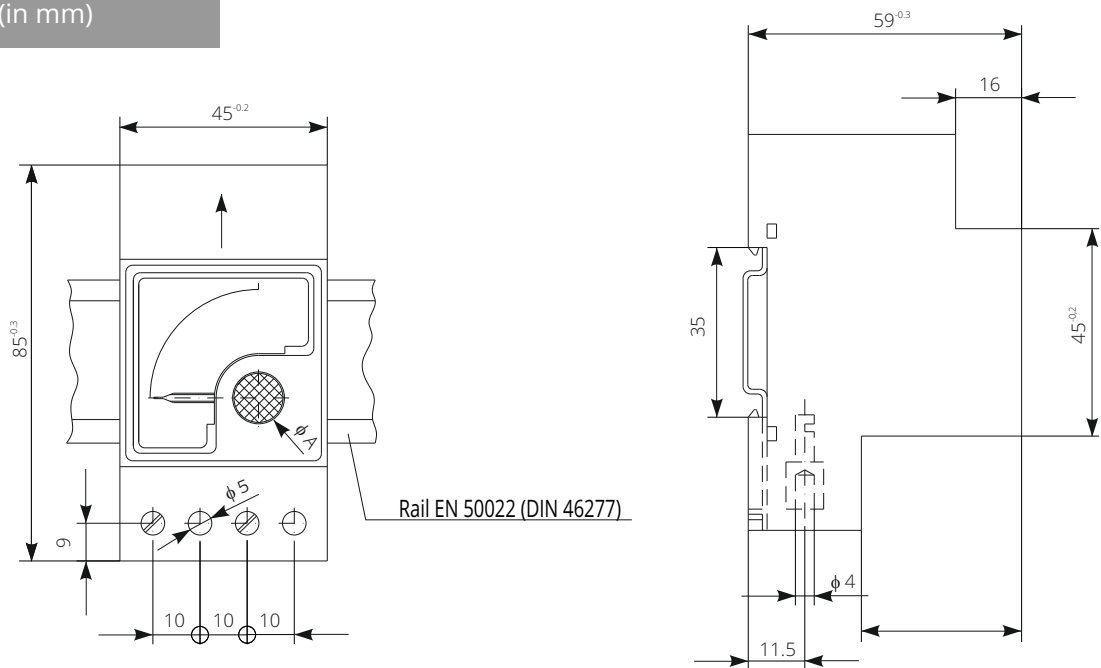


ANALOGUE METERS

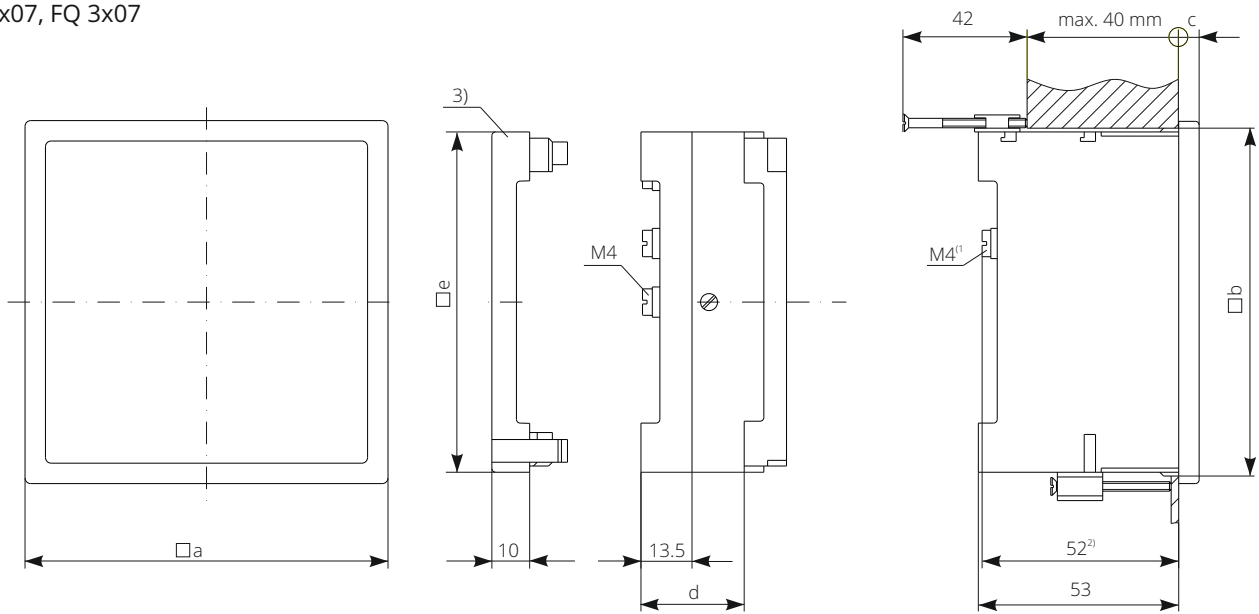
METERS FOR AC VOLTAGE OR CURRENT WITH MOVING IRON FQ 0x07, FQ 3x07, FN 0x0x

DIMENSIONS (in mm)

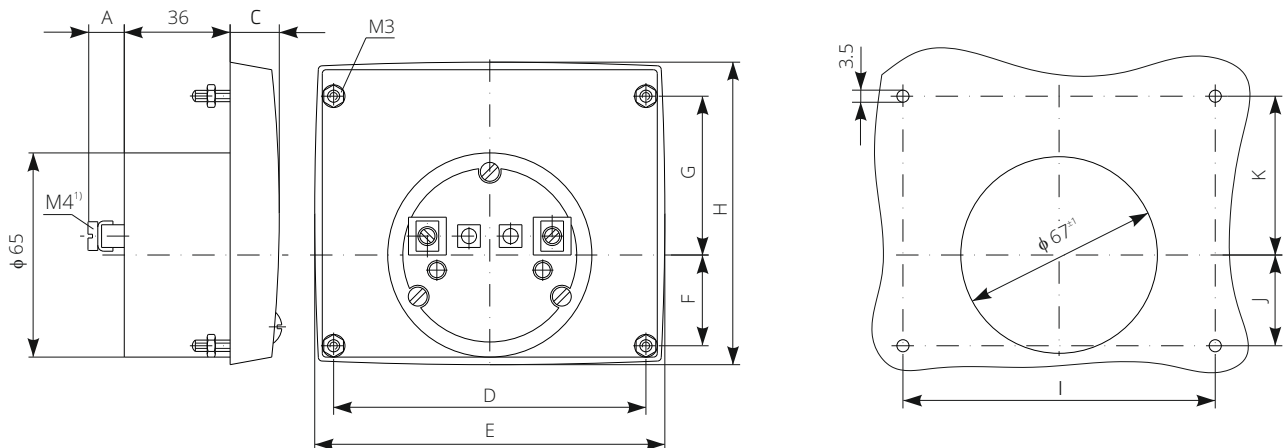
FQ 0507



FQ 0x07, FQ 3x07



FN 0103, FN 0201



ANALOGUE METERS

BIMETAL MAXIMUM CURRENT METERS MQ 0x07

USE



MQ 0207



MQ 0507

Bimetal maximum current meters with a bimetal measuring system are intended for testing thermal load of transformers, cables, electrical machines, etc. They indicate average rms current value in an 8 minutes setting period (on request 15, 20 and 30 minutes for MQ 0207 and MQ 0307).

The accuracy class is 3. The meters are provided with an interchangeable scale. Meters 96 x 96 mm with a protecting transformer are also available on request.

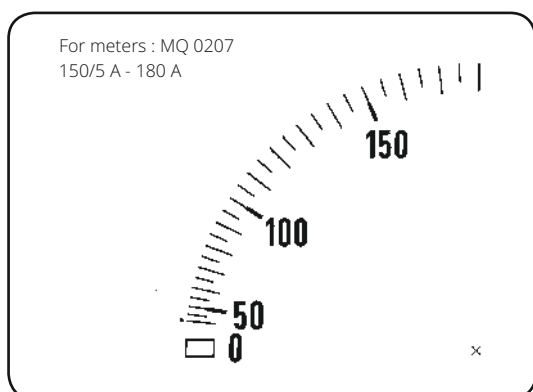
CHARACTERISTICS

TYPE	MQ 0507	MQ 0407	MQ 0307	MQ 0207	MQ 0107
Front frame □a (mm)	45	48	72	96	144
Cutting for mounting □b (mm)	-	45 ^{+0.6}	68 ^{+0.8}	92 ^{+0.8}	138 ⁺¹
Dimensions (mm) - Bazel height c	-	5	5.5	5.5	8
Dimensions with packing (mm)	-	75 x 60 x 85	100 x 90 x 85	120 x 110 x 85	170 x 160 x 85
Volume with packing (dm ³)	-	0.38	0.77	1.12	2.31
Weight with packing (kg)	-	0.12	0.15	0.22	0.50
Scale	90°				
Scale length (mm)	37	37	63	95	140
RATING					
1.2 A, x A/1 A ¹⁾ 8 min. *	●	●	●	●	●
6 A, x A/5 A ¹⁾ 8 min. *	●	●	●	●	●

¹⁾ The rating is 20% higher than the current transformer ratio.
Self-consumption: 1.2 VA at 1.2 A; 2.2 VA at 6 A.

* Other setting period (15, 20 and 30 minutes) on request.

SCALE OUTLOOK

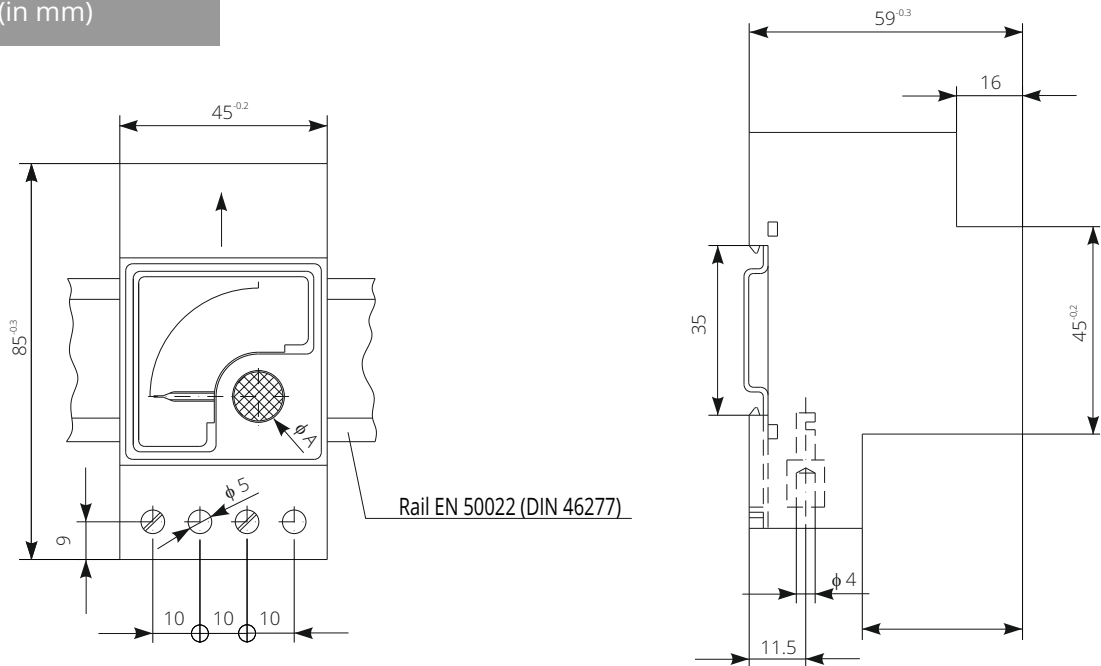


ANALOGUE METERS

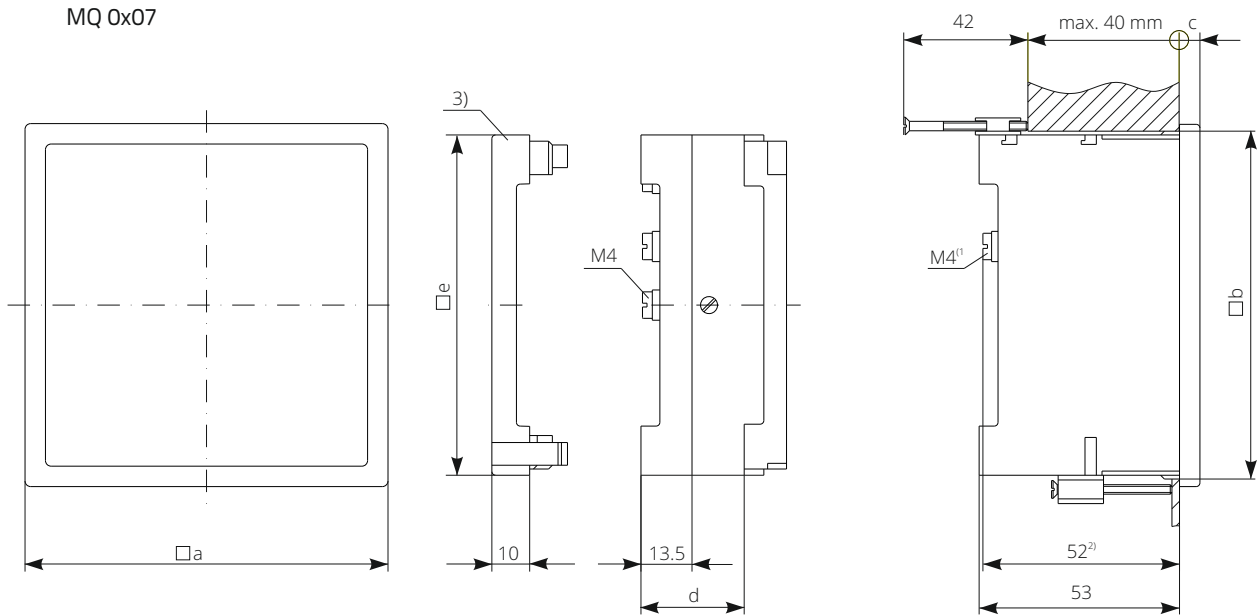
BIMETAL MAXIMUM CURRENT METERS MQ 0x07

DIMENSIONS (in mm)

MQ 0507



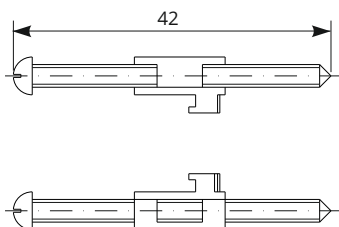
MQ 0x07



FIXING ELEMENTS

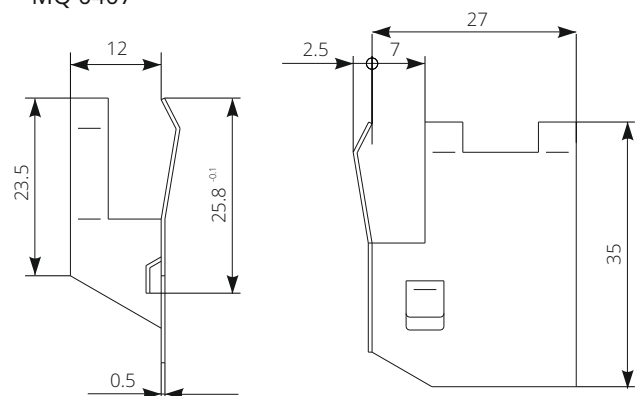
MQ 0307, MQ 0207, MQ 0107

with a screw



for mosaic fixing

MQ 0407



ANALOGUE METERS

COMBINED BIMETAL MAXIMUM CURRENT METERS MQ 0x17

USE



MQ 0217

Combined bimetal maximum current meters are provided with a built-in bimetal system and a system with a moving iron. The meters are intended for testing momentary and thermal load of transformers, cables, electrical machines, etc. Meters 96 x 96 mm with a protecting transformer are also available on request.

The accuracy class for average rms current value is 3, and for momentary value 1.5. The meters are provided with an interchangeable scale.

CHARACTERISTICS

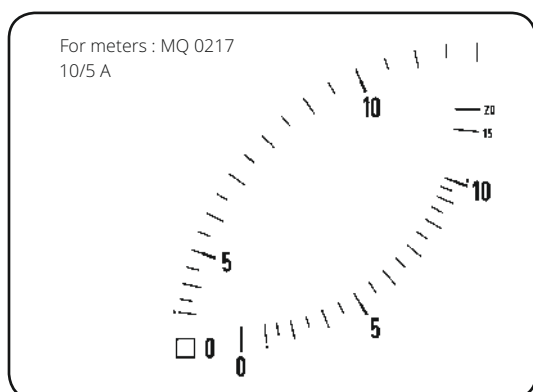
TYPE	MQ 0317	MQ 0217	MQ 0117
Front frame □a (mm)	72	96	144
Cutting for mounting □b (mm)	68 ^{+0.8}	92 ^{+0.8}	138 ⁺¹
Dimensions (mm) - Bazel height c	5.5	5.5	8
Dimensions with packing (mm)	100 x 90 x 85	120 x 110 x 85	170 x 160 x 85
Volume with packing (dm ³)	0.77	1.12	2.31
Weight with packing (kg)	0.19/0.31*	0.27	0.55
Scale length (mm)	63/43	95/72	140/120
RATING			
1.2 A, x A/1 A ¹⁾ 8 min. **	●	●	●
6 A, x A/5 A ¹⁾ 8 min. **	●	●	●

¹⁾ Rating of average current is 20% higher than the current transformer ratio.
The meter for a momentary value can indicate either 20% or 100% overload.
Self-consumption: 1.8 VA at 1.2 A: 2.8 VA at 6 A.

* with/without transformer

** Other setting period (15, 20 and 30 minutes) on request.

SCALE OUTLOOK

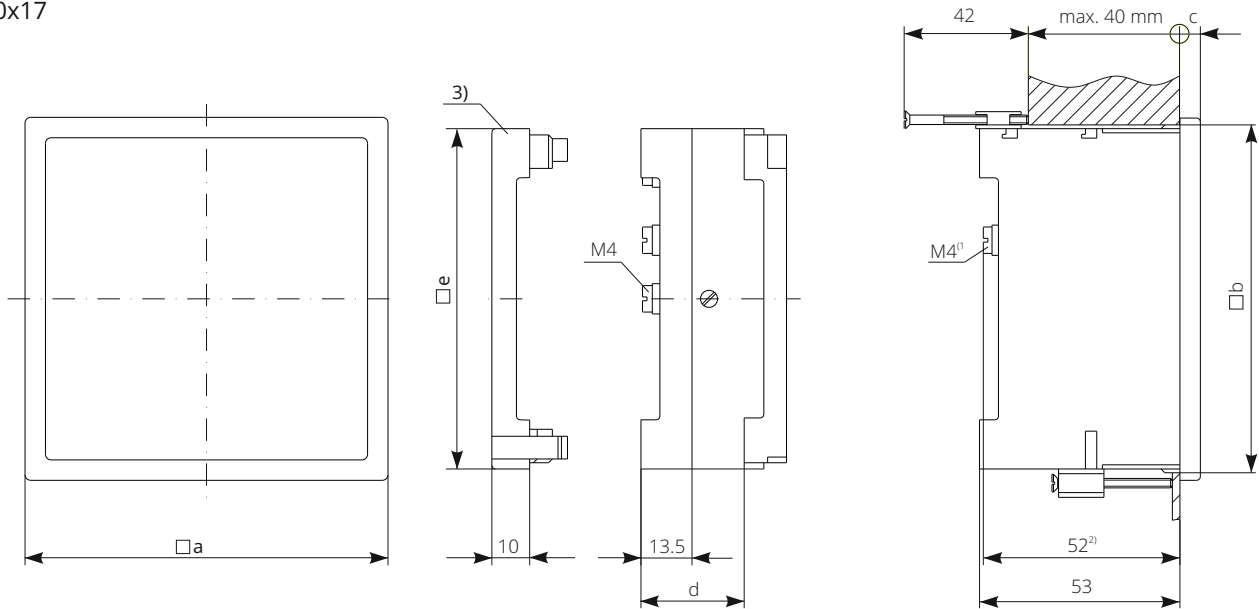


ANALOGUE METERS

COMBINED BIMETAL MAXIMUM CURRENT METERS MQ 0x17

DIMENSIONS (in mm)

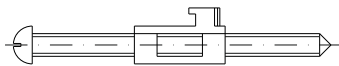
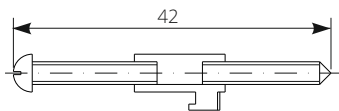
MQ 0x17



FIXING ELEMENTS

MQ 0317, MQ 0217, MQ 0117

with a screw



ANALOGUE METERS

PHASE SEQUENCE INDICATOR SQ 0201, SQ 0301

USE

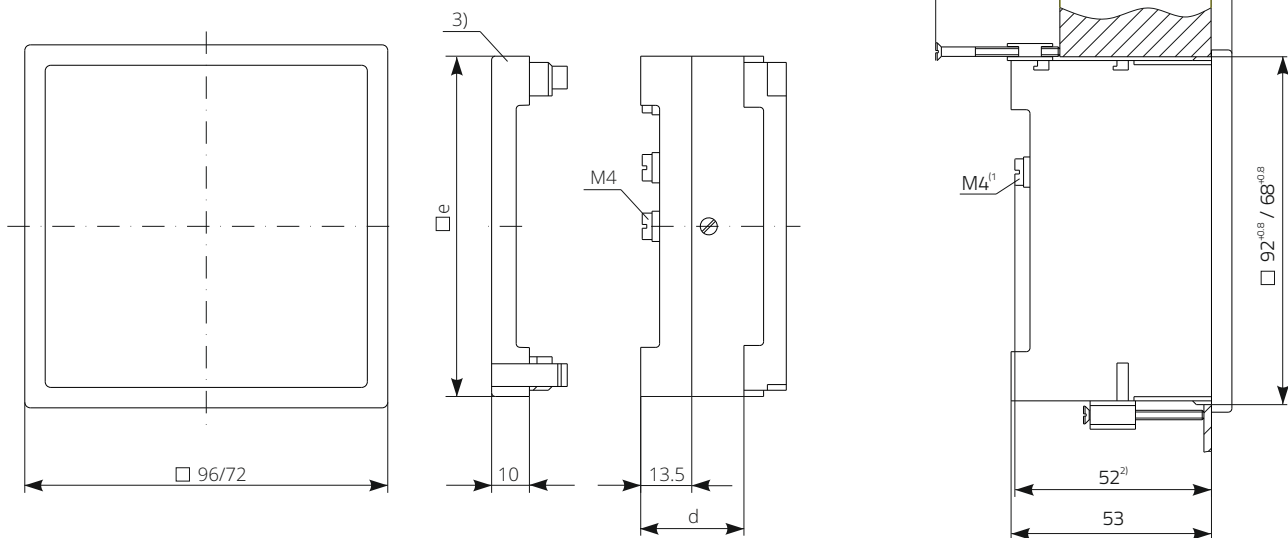


SQ 0217

A phase sequence indicator is intended for determining phase sequences in a three-phase network, from 200 V to 500 V and from 50 Hz to 60 Hz. The indicator is provided with two built-in glow lamps indicating L1, L2, L3 phase sequence.

DIMENSIONS (in mm)

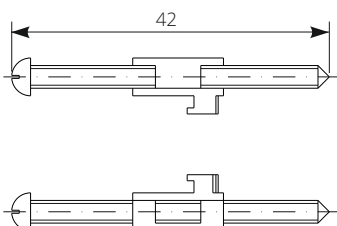
SQ 0201 (96 x 96 mm), SQ 0301 (72 x 72 mm)



FIXING ELEMENT

SQ 0201, SQ 0301

with a screw



ANALOGUE METERS

ANALOGUE MULTIWATTMETER MI 7033

USE



An analogue multiwattmeter is used for direct measurement of DC power, voltage, current and active and reactive power, voltage, current, $\cos \phi$ and phase sequence in three-phase three-wire systems with uniform load and active power, voltage, current, $\cos \phi$ in single phase AC systems. The selection of current and voltage ratings meets the majority of requirements for power measurement in repair shops, production premises and in laboratories for fast and less accurate measurements.

CHARACTERISTICS

TYPE	MI 7033
Operation mode	TDM (Time Division Multiplication)
Voltage inputs	50 V, 100 V, 250 V, 500 V
Current inputs	0.25 A, 1 A, 5 A, 25 A
Rating	12.5 W ... 25,000 W
Frequency range	10 ... 16 ... 65 ... 400 Hz
Accuracy class	power: 1.5 voltage, current: 2.5 $\cos \phi$: 5
Dimensions	110 x 181 x 62
Supply	2 x gV IEC 6F22
Weight with packing	700 g

ANALOGUE METERS

MULTIMETERS MI7054, MI 7056, MI 7065

USE



Due to electric and constructional features the analogue and digital universal meters are intended for a wide range of users. They are especially convenient for repair shops, electric, radio and electronic professions as well as for the field work. Ratings are protected against overloads when the meters are connected to 250 V.

CHARACTERISTICS

TYPE		MI 7054	MI 7056	MI 7065
Voltage	=	30 V ... 600 V	100 mV ... 600 V	100 mV ... 300 V
	-	30 V ... 600 V	100 mV ... 600 V	3 V ... 300 V
Current	=	0.3 A ... 15 A	50 μ A ... 1 A	100 μ A ... 3 A
	-	0.3 A ... 15 A	3 mA ... 3 A	100 μ A ... 3 A
Characteristic resistance	=	1.45 k Ω /V	20 k Ω /V	10 M Ω
	-	1.45 k Ω /V	6.67 k Ω /V	10 M Ω
Number of ratings		15	24	25
Resistance	Ω x	1, 10, 100	1, 10, 100	-
Level dB		-	●	-
Polarity induction		-	-	-
Accuracy		2.5 \cong	2.5 \cong	3 ∞
				2 \cong
Special features		Full protection	-	Zero in the middle of the scale
Supply		1 x 1.5 V R6	1 x 1.5 V R6	1 x 9 V 6F22
Dimensions (mm)		102 x 142 x 40	102 x 142 x 40	96 x 132 x 33
Weight with packing (g)		470	340	400

PORTABLE METERS

EDUCATIONAL PROGRAMME

USE



Portable meters for schools are indispensable for exercises in physics and practical work. The meters enable a wide range of measurements and are adapted for pupils' work. They excel in a high degree of protection against overloads, user-friendly application as well as an accurate readout and extremely high reliability.

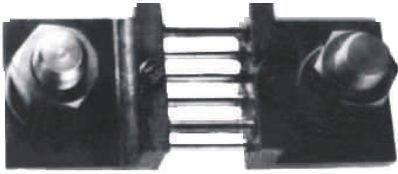
CHARACTERISTICS

TYPE	07035.00	07036.00	07037.00	07038.00	07039.00	07027.01	07021.01	07026.00	
Type of measurement	Voltmeter	Ammeter	Voltmeter =	Ammeter =	Galvanometer =	Multimeter	Multimeter	Multimeter	
Voltage	=	0.3 V ... 300 V	60 mV	5/15 V	-	-	0.06 ... 60 V	240 mV ... 600 V	0.1 V ... 1000 V
	~	10 V ... 300 V	-	5/15 V	-	-	6 V ... 60 V	6 V ... 600 V	0.1 V ... 1000 V
Current	=	-	1 mA ... 3 A	-	1/5 A	3.5 mA	100 µA ... 6 A	0.12 mA ... 6 A	0.1 A ... 10 A
	~	-	1 mA ... 3 A	-	1/5 A	3.5 mA	6 mA ... 6 A	6 mA ... 6 A	1 mA ... 10 A
Resistance (Ωx)	-	-	-	-	-	-	-	-	1, 10, 100
Level (db)	-	-	-	-	-	-	-	-	-10 ... +12
Input resistance	=	30 kΩ/V	-	1 kΩ/V	-	-	10 kΩ/V	10 kΩ/V	12 kΩ/V
	~	10 kΩ/V	-	-	-	-	-	-	-
Accuracy	2.5 ≅	2.5 ≅	1.5	1.5	1.5	2.5 ≅	1.5 = 2.5 ∞	1.5 = 2.5 ∞	
Frequency range	15 Hz ... 40 kHz	-	-	-	-	15 Hz ... 40 kHz	20 Hz ... 10 kHz	15 Hz ... 11 kHz	
Special features	-	-	Scale with a mirror	Scale with a mirror	Zero point in the middle of the scale	Zero point in the middle of the scale	Scale with a mirror	Scale with a mirror	
Supply	-	-	-	-	-	-	-	-	
Dimensions (mm)	-	-	-	100 x	65 x 55	-	-	-	
Weight with packing (g)	360	430	290	280	270	520	550	520	

EQUIPMENT AND ACCESSORIES

SHUNTS

USE



Separate shunts increase DC current ratings when connected with the meter with a moving coil. Voltage drop is 60 mV. Connection wires with 0.035Ω resistance are enclosed to the shunt. Dimensions comply with DIN 43703. The accuracy class is 0.5.

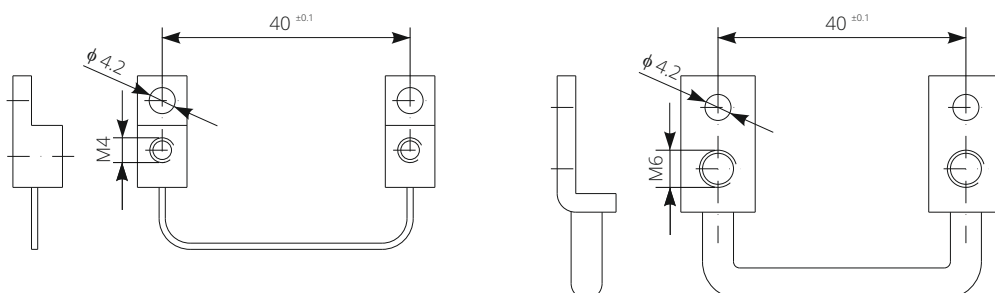
CHARACTERISTICS

RATED CURRENT (A)/ 60 mV	MASS (kg)
1, 1.5	0.18
2.5, 4, 6, 10, 15, 25	0.20
40, 60, 100, 150	0.14
250	0.55
400	0.80
600	0.84
1000	1.50
1500	2
2500	3

SHUNTS FOR ADD-ON

Dimensions of shunts are adapted to meter connection contacts and can be easily fixed with M4 screws. The basic meter is provided with the measuring system 5 mA and measures voltage drop 60 mV. Only a corresponding scale has to be inserted. The shunts can be used on the housings 96 x 96 mm and 72 x 72 mm, and BN 0103 and BN 0203 meters. The accuracy class is 0.5.

AR 0105



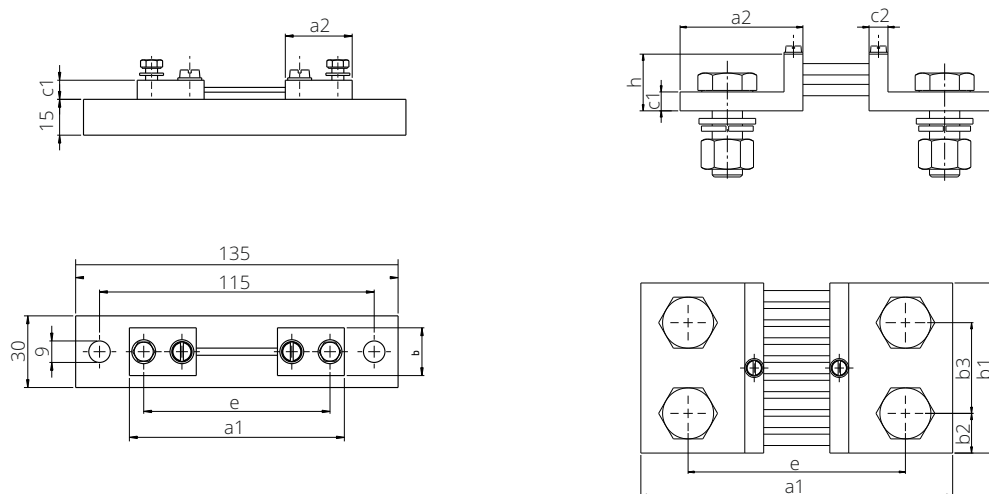
CHARACTERISTICS

RATED CURRENT (A)/ 60 mV
1, 1.5, 2, 2.5, 4, 5, 6, 8, 10, 15, 20

EQUIPMENT AND ACCESSORIES

SHUNTS

DIMENSIONS (in mm)



CHARACTERISTICS

DIMENSIONS (mm)	CURRENT THROUGH SEPARATE SHUNT (A)							
	1, 1.5, 2.5, 4 6, 10, 15, 25	40, 60, 100, 150	250	400	600	1000	1500	2500
	Possibility A		Possibility B					
a1	90	100	145			165		
a2	28	33	55			65		
b1	20	20	30	40	40	60	90	120
b2	-	-	15	20	20	30	21	30
b3	-	-	-			-	48	60
c1	8	8				10		
c2	-	-				10		
e	78	80	106			115		
h	-	-	48	55	55	65	55	65
No. of terminals	2 x 1	2 x 1	2 x 1	2 x 1	2 x 1	2 x 2	2 x 2	2 x 2
Fixing screws	M5 x 12	M8 x 15	M12 x 40	M16 x 45	M16 x 45	M20 x 50	M16 x 45	M20 x 50
Washer DIN 125	5.3	8.4	13.5	17	17	21	17	21
Spring washer DIN 127	-	-	12	16	16	20	16	20
Nut	-	-	M12	M16	M16	M20	M16	M20
Voltage terminals	2 cylindrical screws M5 x 8 (DIN 84-4) and 2 washers 5.3							

EQUIPMENT AND ACCESSORIES

CURRENT MEASURING TRANSFORMERS

USE



Current measuring transformers are used for measuring AC currents. Secondary current is 5 A, rated frequency from 50 Hz to 60 Hz. The accuracy class is 1.

CHARACTERISTICS

TYPE	POWER	I PRIM/5 A	PRIMARY CABLE
ASR 20.3	1 VA ... 7.5 VA	50 A ... 300 A	φ 21 mm
ASR 201.3	1 VA ... 7.5 VA	50 A ... 300 A	φ 21 mm
ASR 21.3	1 VA ... 10 VA	100 A ... 600 A	φ 22.5 mm
ASR 22.3	1 VA ... 15 VA	40 A ... 600 A	φ 22.5 mm
ASR 22.3 2U	2.5 VA ... 10 VA	100 A ... 600 A	φ 22.5 mm
ASK 205.3	1 VA ... 10 VA	60 A ... 400 A	20 x 5 mm, φ 17.5 mm
ASK 21.3	1 VA ... 15 VA	40 A ... 600 A	20 x 10 mm, φ 19.2 mm
ASK 231.5	1 VA ... 15 VA	50 A ... 600 A	30 x 10 mm, φ 28 mm
ASK 31.3	1 VA ... 10 VA	50 A ... 750 A	30 x 10 mm, 2 x 20 x 10 mm, φ 26 mm
ASK 31.3 2U	2.5 VA ... 15 VA	100 A ... 600 A	30 x 10 mm, 2 x 20 x 10 mm, φ 26 mm
ASK 318.3	1 VA ... 15 VA	60 A ... 750 A	31 x 18 mm, φ 26 mm
ASK 31.4	1.25 VA ... 15 VA	50 A ... 750 A	30 x 10 mm, 2 x 20 x 10 mm, φ 28 mm
ASK 31.4 2U	2.5 VA ... 15 VA	100 A ... 600 A	30 x 10 mm, 2 x 20 x 10 mm, φ 28 mm
ASK 31.4 3U	2.5 VA ... 15 VA	100 A ... 600 A	30 x 10 mm, 2 x 20 x 10 mm, φ 28 mm
ASK 31.5*	1 VA ... 30 VA	40 A ... 750 A	30 x 10 mm, 2 x 20 x 10 mm, φ 28 mm
ASK 31.5 2U	2.5 VA ... 15 VA	75 A ... 600 A	30 x 10 mm, 2 x 20 x 10 mm, φ 28 mm
ASK 41.3	1 VA ... 15 VA	100 A ... 800 A	40 x 12 mm, 32 x 18 mm, φ 26 mm
ASK 421.4	1 VA ... 30 VA	30 A ... 500 A	20 x 10 mm, φ 20 mm
ASK 41.4	1.25 VA ... 30 VA	50 A ... 1000 A	40 x 10 mm, 2 x 30 x 5 mm, φ 32 mm
ASK 41.4 2U	2.5 VA ... 15 VA	100 A ... 1000 A	40 x 10 mm, 2 x 30 x 5 mm, φ 32 mm
ASK 41.4 3U	2.5 VA ... 15 VA	100 A ... 1000 A	40 x 10 mm, 2 x 30 x 5 mm, φ 32 mm
ASK 412.4	1.25 VA ... 30 VA	50 A ... 800 A	40 x 10 mm, 30 x 15 mm, φ 30.5 mm
ASK 541.4	1 VA ... 30 VA	30 A ... 1000 A	40 x 10 mm, 2 x 30 x 5 mm, φ 32 mm
ASK 51.4	1.5 VA ... 30 VA	100 A ... 1250 A	50 x 12 mm, 2 x 40 x 10 mm, φ 44 mm
ASK 51.4 2U	2.5 VA ... 30 VA	200 A ... 1200 A	50 x 12 mm, 2 x 40 x 10 mm, φ 44 mm
ASK 51.4 3U	2.5 VA ... 15 VA	200 A ... 1200 A	50 x 12 mm, 2 x 40 x 10 mm, φ 44 mm
ASK 561.4	2.5 VA ... 30 VA	200 A ... 1250 A	60 x 10 mm, 2 x 50 x 10 mm, φ 44 mm
ASK 61.4*	1.5 VA ... 30 VA	200 A ... 1600 A	63 x 10 mm, 2 x 50 x 10 mm, φ 44 mm
ASK 61.4 2U	2.5 VA ... 30 VA	250 A ... 1600 A	63 x 10 mm, 2 x 50 x 10 mm, φ 44 mm
ASK 61.4 3U	2.5 VA ... 15 VA	200 A ... 1600 A	63 x 10 mm, 2 x 50 x 10 mm, φ 44 mm
ASK 63.4	1.5 VA ... 15 VA	300 A ... 2000 A	60 x 30 mm, 50 x 40 mm, φ 44 mm
ASK 63.6	1.5 VA ... 30 VA	200 A ... 2000 A	60 x 30 mm, φ 30 mm
ASK 81.4	2.5 VA ... 45 VA	400 A ... 2000 A	80 x 10 mm, 60 x 30 mm, 2 x 60 x 10 mm, φ 55 mm
ASK 81.4 2U	5 VA ... 30 VA	500 A ... 2000 A	80 x 10 mm, 60 x 30 mm, 2 x 60 x 10 mm, φ 55 mm
ASK 101.4	5 VA ... 45 VA	500 A ... 2500 A	100 x 10 mm, 2 x 80 x 10 mm, φ 70 mm
ASK 103.3	5 VA ... 45 VA	750 A ... 3000 A	2 x 100 x 10 mm, 3 x 80 x 10 mm, φ 85 mm
ASK 123.3	5 VA ... 45 VA	1000 A ... 4000 A	123 x 30 mm, 3 x 100 x 10 mm, φ 100 mm
ASK 129.10	5 VA ... 45 VA	1000 A ... 7500 A	120 x 90 mm
WSK 30	2.5 VA ... 5 VA	1 A ... 20 A	-
WSK 40	2.5 VA ... 15 VA	1 A ... 40 A	-
WSK 60	2.5 VA ... 15 VA	5 A ... 30 A	-
WSK 70.6	2.5 VA ... 15 VA	25 A ... 150 A	-
Snap-on mounting for ASK type			

¹⁾ on stock ASK 31.5 2.5 VA 50, 75 A; 5 VA 100-600 A, ASK 61.4 10 VA 800, 1000, 1200, 1500 A

Other ratings and accuracy classes by agreement

EQUIPMENT AND ACCESSORIES

CURRENT MEASURING TRANSFORMERS

DIMENSIONS (in mm)

CHARACTERISTICS

TYPE	FRONT		BOTTOM		FROM SIDE	
1. ASR 20.3 2. ASR 201.3						
1. ASR 21.3 2. ASR 22.3 ASR 22.3 2U						
1. ASK 205.3 2. ASK 21.3						
1. ASK 231.5 2. ASK 31.3 ASK 31.3 2U						
1. ASK 318.3 2. ASK 31.4 ASK 31.4 2U, ASK 31.4 3U						
1. ASK 31.5 ASK 31.5 2U 2. ASK 41.3						
1. ASK 421.4 2. ASK 41.4 ASK 41.4 2U, ASK 41.4 3U						
1. ASK 412.4 2. ASK 541.4						
1. ASK 51.4 ASK 51.4 2U ASK 51.4 3U 2. ASK 561.4						

EQUIPMENT AND ACCESSORIES

CURRENT MEASURING TRANSFORMERS

DIMENSIONS (in mm)

CHARACTERISTICS

TYPE	FRONT		BOTTOM		FROM SIDE	
1. ASK 61.4 ASK 61.4 2U ASK 61.4 3U 2. ASK 63.4	1	2	1	2	1	2
1. ASK 63.6 2. ASK 81.4 ASK 81.4 2U	1	2	1	2	1	2
1. ASK 101.4 ASK 101.4 2U 2. ASK 103.3	1	2	1	2	1	2
1. ASK 123.3 2. ASK 129.10	1	2	1	2	1	2
1. WSK 30 2. WSK 40	1	2	1	2	1	2
1. WSK 60 2. WSK 70.6	1	2	1	2	1	2

EQUIPMENT AND ACCESSORIES

CURRENT MEASURING TRANSFORMERS

DIMENSIONS (in mm)

CHARACTERISTICS							
TYPE	WIDTH	HEIGHT	DEPTH (WITH PEDESTAL)	PRIMARY CABLE	DIAMETER	WEIGHT	RANGE
ASR 20.3	44	65	30 (62)	-	21	0.152	0.191
ASR 201.3	44	64.5	30	-	21	0.150	0.190
ASR 21.3	48.5	66	30 (62)	-	22.5	0.230	0.280
ASR 22.3	60	78.5	30 (62)	-	22.5	0.250	0.280
ASK 205.3	48.5	65	30 (62)	20 x 5	17.5	0.200	0.198
ASK 21.3	60	78.5	30 (62)	20 x 10	19.2	0.315	0.268
ASK 231.5	49.5	70	50 (82)	30 x 10	28	0.340	0.320
ASK 31.3	60	78.5	30 (62)	30 x 10.2 x 20 x 10	26	0.267	0.240
ASK 318.3	60	78.5	30 (62)	31 x 18	26	0.238	0.250
ASK 31.4	60	78.5	70 (72)	30 x 10.2 x 20 x 10	28	0.375	0.300
ASK 31.5	60	78.5	50 (82)	30 x 10.2 x 20 x 10	28	0.450	0.350
ASK 41.3	60	78.5	30 (62)	40 x 13.32 x 18	28	0.220	0.240
ASK 421.4	70	88.5	40 (72)	20 x 10	26	0.712	0.420
ASK 41.4	70	88.5	40 (72)	40 x 10.2 x 30 x 5	20	0.462	0.345
ASK 412.4	70	88.5	40 (72)	40 x 10.2 x 30 x 5	32	0.475	0.420
ASK 541.4	85	101.5	40 (72)	40 x 10.2 x 30 x 5	30.5	0.910	0.450
ASK 51.4	85	101.5	40 (72)	50 x 12.2 x 40 x 10	32	0.536	0.460
ASK 561.4	85	101.5	40 (72)	60 x 10.2 x 50 x 10	44	0.472	0.490
ASK 61.4	95	108.5	40 (72)	63 x 10.2 x 50 x 10	44	0.520	0.490
ASK 63.4	95	108.5	40 (72)	60 x 30.5 x 40	44	0.420	0.430
ASK 63.6	88	132	60 (92)	60 x 30	44	0.740	0.835
ASK 81.4	120	126.5	40 (72)	80 x 10.6 x 30.2 x 6 x 10	30	1.000	0.565
ASK 101.4	130	144	40 (72)	100 x 10.2 x 80 x 10	55	0.550	0.713
ASK 103.3	172	187.5	31 (62)	2 x 100 x 10.3 x 80 x 10	70	0.800	0.750
ASK 123.3	172	187.5	31 (62)	123 x 30.3 x 100 x 10	85	0.800	0.850
ASK 129.1	250	250	100 (62)	120 x 90	100	3.000	3.400
WSK 30	60	78.5	30 (62)	-	-	0.290	0.270
WSK 40	70	88.5	70 (72)	-	-	0.320	0.412
WSK 60	70	88.5	60 (92)	-	-	0.410	0.460
WSK 70.6	70	85	60 (76)	-	-	0.520	0.580