



Accessories

106

Approvals

109



Motor Condition Monitors

PFC 65 - Power Factor Controller

112

MCM

113

MCMSCADA

115



Measuring Transducers

Family of MT 5x0/UMT 5x0 - Measuring Transducers

116

MT 560/UMT 560 – Transducer & Analyser

118

MT 550/UMT 550 – Transducer & Recorder

119

MT 540/UMT 540 – Multifunction Transducer

119

RD 500 – Remote Display for Measuring Transducers MT 5xx/UMT 5xx

120

MI 404

121

MI 401

122

MI 400

123

MI 4xx

124



Measuring Centres

MC 760/UMC 760 - Network Analyzer, MC 750/UMC 750 - Network Recorder

125

MC 740 - Multifunction Meter

127

MC 720/UMC 720 - Energy Meter, MC 710/UMC 710 - Power Meter

129

Family of MC 7x0/UMC 7x0 Measuring Centres

130

MC 660/MC 666 – Network Analyzer for Rail Mounting

132

MC 650/MC 656 – Network Recorder for Rail Mounting

133

MC 640/MC 646 – Multifunction Meter for Rail Mounting

134

MIQEN

135



Energy Meters for Rail Mounting

WS 0030, WS 0031

137

WS 0010, WS 0011

138

WS 0101, WS 0102, WS 1102

139

WS 0301, WS 0302, WS 1302

140



Hour Meters & Pulse Counters

Hour Meters HK 30 - HK 49

141

Pulse Counters SI 63, SI 64, SI 65, MC 703, MC 723

142



Communication Adapters

MI 480

143

MI 485

145

MI 486, MI 488

146



Synchronization Meters

147



Energy Meters with Power Display

148

Analogue Meters

Active or Reactive Power Meters	149
Power Factor Meters	150
Pointer Frequency Meters	151
Reed Frequency Meters	152
Meter with Limit Contact	153
Meters for DC Voltage or Current with Moving Coil	154
TAP Position Meters with Moving Coil	156
Meters for AC Voltage or Current with Moving Coil and a Rectifier	157
Meters for AC Voltage or Current with Moving Coil	158
Meters for AC Voltage or Current with Moving Iron	159
Bimetal Maximum Current Meters	161
Combined Bimetal Maximum Current Meters	162
Phase Sequence Indicator and Temperature Meters	163

Portable Meters

MI 7033 Analogue Multiwattmeter	164
Multimeters	165
Educational Programme	166
MI 7022 Digital Temperature Meter	167

Equipment and Accessories

Shunts	168
Current Measuring Transformers	169

Special Demands

General Explanations

Dimensional Drawings

Conection Diagrams

Instruments Conformity to Standards

General Sales Conditions

Index in alphanumeric order

FAMILY OF MC 6x0 MEASURING CENTRES FOR RAIL MOUNTING

details on page 132



Connection through current
measuring transformers

FAMILY OF MC 6x6 MEASURING CENTRES FOR RAIL MOUNTING

details on page 132



Direct connection

FAMILY OF MT 5xx/UMT 5xx MEASURING TRANSDUCERS

details on page 116



EN 50160 analysis, class 0.2,
wide selection of inputs/outputs,
seperate connection of RD 500
Remote Display

RD 500 REMOTE DISPLAY

details on page 120



Remote displaying of
electric quantities and
setting up MT 5xx/UMT 5xx
Measuring Transducers

UMC 760 & UMC 750

details on page 125



EN 50160-analysis

UMC 740

details on page 127



Electrical network monitoring
– ANSI housing

UMC 720 & UMC 710

details on page 129



Energy & power
measurements

MC 760 & MC 750

details on page 125



EN 50160 analysis

MC 740

details on page 127



**Electrical network
monitoring**

MC 720 & MC 710

details on page 129



**Energy & power
measurements**

MI 404

details on page 121



**Up to 4 analogue
outputs**

MI 480

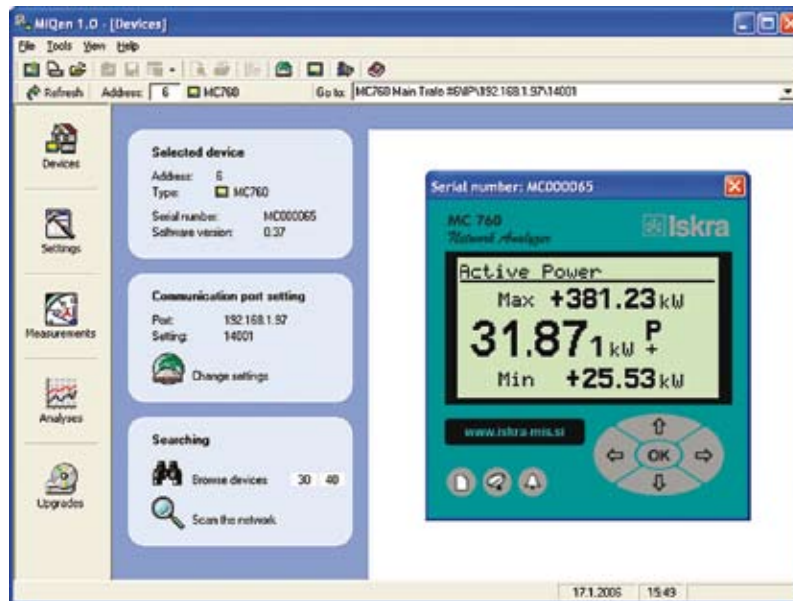
details on page 144



**GPRS modem - connection
for web portal, SMS alarms**

MIQEN

details on page 135



Software for data analysis,
for Iskra MIS instruments

MCM - MOTOR CONDITION MONITOR

details on page 113



Prediction of motor failures

MSC DIGITAL SOFT STARTER

details on page 94



Energy optimising soft starter

WS 0030 & WS 0031

details on page 137



Three phase energy meters

WS 0010 & WS 0011

details on page 138



Single phase energy meter

WS x10x

details on page 139



Active energy according to MID directive

PFC 65

details on page 112



Power factor controller



PFC 65 - POWER FACTOR CONTROLLER



USE

PFC 65 is designed for controlling power factor of 3-phase motors. It can measure power factor (PF), and provide 6 relay outputs. Outputs are realized for driving solid state relays that provide unlimited switches.

PFC 65 has an integrated Synchronization input for hold function.

FEATURES

- Controlling power factor of 3-phase motor
- 6 output relays
- Semiconductor output relay assures unlimited switches
- 0.4" three digit LED display for setting and measuring
- Adjustable range of power factor between 0.1 – 0.99
- Adjustable delay to eliminate starting of motor
- Synchronization input for hold function
- 4-MODULE, DIN rail mounted

Dimensional drawings on page 183.

Connection diagrams on page 197.

MCM - MOTOR CONDITION MONITOR System for predictive maintenance



Main features are:

- Early and accurate alarms
- Continuous monitoring and maintenance scheduling
- Standard current and voltage transformers can be used as sensors
- The degree of fault is presented on simple sliding scale by LED's
- Detecting both electrical and mechanical fault by single device
- There are no external background effects that can interfere in MCM monitoring capability
- Ideal solution for inaccessible motors
- Measurement of I, U, PF, PA, P, f, THD...
- Phase order indication
- RS485 or RS422 communication via MODBUS protocol
- Easy integration into specially designed MCMSCADA system

USE

MCM Motor Condition Monitor is a device that can be used for monitoring of 3-phase electric motors and motor-based machinery and equipment used in industrial processes, especially where motor failure can cause critical damage to the process.

It is a software and hardware-based product, operating on unique model-based monitoring technology that has the ability to detect impending mechanical and electrical failures such as unbalance, misalignment, bearing and rotor faults, static and dynamic eccentricity, core damage, leakages, valve and vane misadjustments, stator isolation problem,... on the motor or motor driven process. Therefore it helps preventing unexpected failures to occur, planning and scheduling maintenance work, lowering maintenance costs, and enables to run equipment with high productivity and performance levels.

UNIQUE COMBINATION OF FEATURES

- An ideal solution for inaccessible motors
- Continuous monitoring for maintenance scheduling
- Monitors both the motor and its driven system
- Energy quality measurements, Three phase RMS current and voltages, Three phase current and voltage balances, Power factor, Active power, Harmonic levels up to 13th harmonic and THD (Total Harmonic Distortion)
- Outputs are condition assessments rather than measurements
- Can be used to assess the effectiveness of servicing
- Easy to install (in the motor control panel)
- Detects both electrical and mechanical faults
- Outputs are both repeatable and reliable
- Events can be reported by e-mail using MCMSCADA
- Devices can be networked



MCM - MOTOR CONDITION MONITOR

System for predictive maintenance

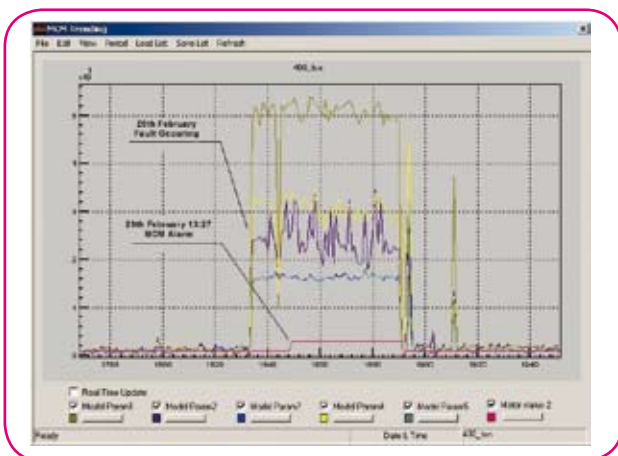
MCM is manufactured as a small, box-shaped device which is suitable for installation on motor control panels. After the device completes a learning period, it starts to monitor the system by acquiring real-time data from the motor and processing that data to compare the actual condition with the one obtained during the learning mode. If the difference exceeds a set of thresholds, the user is warned by means of an LCD and a number of LEDs on the front panel of the device. Different LEDs are lit up depending on the severity of the impending fault. Fluctuations in line and load conditions are also indicated by lighting up other LEDs. The device measures only three-phase voltage and current signals of a motor, therefore it is highly immune to external influences such as the ones present in vibration measurements.

Type		MCM LV-Line	MCM LV-Inverter	MCM MV in HV
Case	Dimensions	96 x 96 mm	96 x 96 mm	96 x 96 mm
	Enclosure	Aluminium	Aluminium	Aluminium
Applicable range				
Inputs	Voltage L-L rms	380 - 480 V AC	380 - 480 V AC	380 - 480 V AC
	Current	5 A	250 mA (depends on sensor) Inverter type requires external Hall Effect sensor or assemblies	5 A
Accuracy class:	Frequency	50-60 Hz	50-60 Hz	50-60 Hz
Auxiliary power supply	Power	90 - 240 V AC	90 - 240 V AC	90 - 240 V AC
	Voltage	15 W	15 W	12 W
	Frequency	50 Hz	50 Hz	50 Hz
		RS485 or RS422	RS485 or RS422	RS485 or RS422
	Speed bit/s	max. 19200	max. 19200	max. 19200
Alarm output		•	•	•

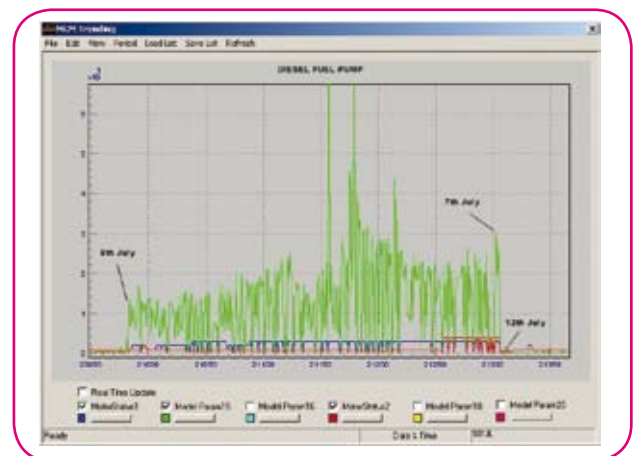
MCMSCADA - REMOTE MONITORING, TRENDING AND ANALYSIS



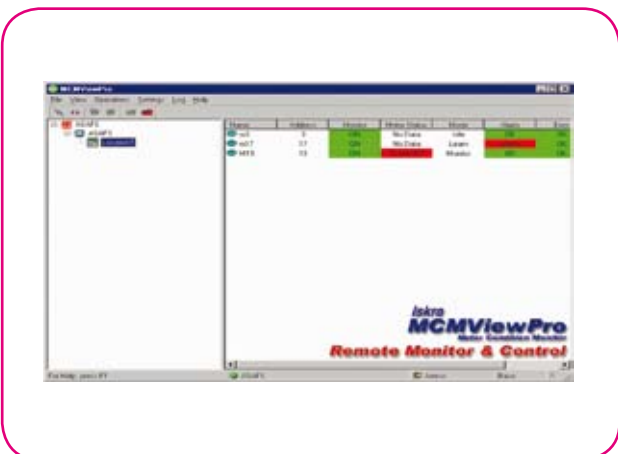
MCMSCADA is the software package for viewing and displaying data from one or more MCM units. With its graphical interface, MCMSCADA enables a user to obtain and display data in real-time from networked devices and subsequently retrieve data for display from its database in a transparent and intuitive manner. MCMSCADA harnesses the power afforded by modern networking techniques and allows remote access to the database so that the status of motors monitored by MCM can be viewed from within the local area network. Using MCMSCADA database, the past history of each parameter from a monitored motor can be trended and used as a basis for maintenance scheduling and fault diagnosis. When developing motor faults occur, they can be automatically reported by e-mail to selected users in real time. Its database is fully compliant to both SQL and ODBC standards and can be accessed easily to share information with other systems.



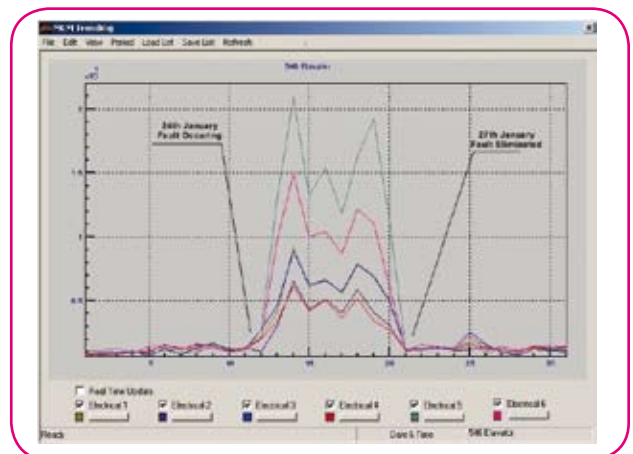
example of trend analysis



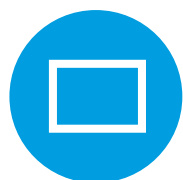
example of trend analysis



MCMSCADA



example of trend analysis



FAMILY OF MT 5x0/UMT 5x0 - Comparison and common characteristics

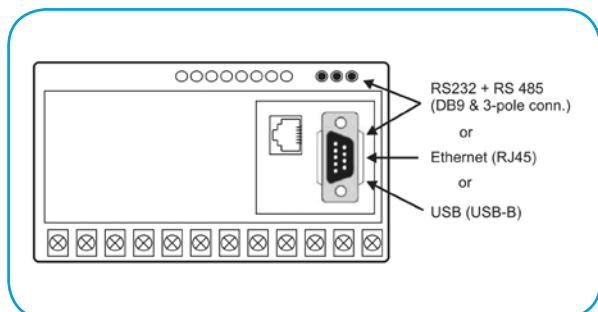


Figure 1: COM1

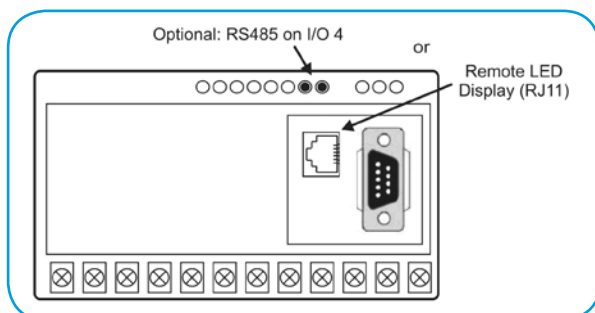


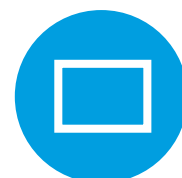
Figure 2: Connection of separate LED display or RS485 serial communication

Main features of all MT 5xx/UMT 5xx Measuring Transducers

- Accuracy 0.2 (IEC EN 60688)
- 4 I/O modules:
 - up to 4 analogue outputs
 - up to 4 digital inputs
 - up to 4 digital outputs
 - up to 4 pulse outputs
 - up to 2 tariff inputs
 - up to 4 alarms (only at MT 550/UMT 550, MT 560/UMT 560)
 - with combination of previously listed inputs/outputs
- 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
- 2 communication inputs:
 - COM1: 3 ways of communication, always just one available: RS232/485, Ethernet, USB (serial/Ethernet & USB or just Ethernet/USB)
- Communication protocols: Modbus (115,200 b/s), DNP3 (level 2)
- A transducer response to a communication demand in spite of communication (Modbus/DNP3) without previous addressing
- Frequency ranges: 16 2/3 Hz / 45 Hz / 65 Hz / 400 Hz
- Real-time clock
- Universal auxiliary supply
- 2 types of protective inputs (auxiliary supply, voltage, current):
 - American connectors
 - European connectors
- Communication connectors (DB9/RJ45/USB, RJ11) hidden under a sliding cap
- Dimension UMT 5x0 160 mm (weight) x 75 mm (height) x 125 mm (depth)
- User friendly and powerful settings software MiQen

Characteristics:

	Mechanical range	Semiconductor relay
Voltage range	250 V - 6 A - 1500 VA (AC) (250 V AC - 6 A, non-reactive AC load, 100,000 operations)	35 V - 6 A - 210 VA (DC) (30 V DC - 6 A, non-reactive AC load, 500,000 operations)
Voltage inputs	Max.. 260 V (AC) Max.. 100 V (DC)	
Insulation	1,000 V (AC) between contacts 4,000 V (AC) between coil and contacts	
Impulses	x 4,000 imp/hour	x 40,000 imp/hour
	Min. lenght: 100 ms	



Tariff inputs:

- Nominal voltage –Un: 230 V
- Voltage supply: 0.8..1, 15 Un
- Current at nominal voltage < 0.5 mA
- Tariff inputs are electrically isolated from other circuits.

Legend:

- feature not supported
- standard feature
- optional feature
- PO - pulse output
- TI - tariff input
- AL - alarm output

- AN - analogue output
- DI - digital input
- DO - digital output
- TF - thermal function
- FW - fixed window
- SW - sliding window
- / - or

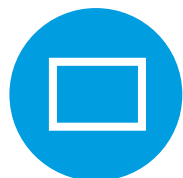
Table: Family of MT 5x0/UMT 5x0 - comparison and common characteristics

Instrument Description	Multifunction Transducer	Network Recorder	Network Analyzer
ANSI type	UMT 540	UMT 550	UMT 560
DIN type	MT 540	MT 550	MT 560
Hardware Configuration			
Accuracy class (typical, of reading) %	0.2	0.2	0.2
Power supply	Uni-LO / Uni-HI*	Uni-LO / Uni-HI*	Uni-LO / Uni-HI*
Energy counters	4	4	4
Real time clock	•	•	•
Remote display connection***	•	•	•
FLASH Memory size	-	8 Mb	8 Mb
Autorange Current	•	•	•
Autorange Voltage	•	•	•
Input Range			
Current - In=5 A, max.12 A	•	•	•
Voltage - Un=500 V L-N, max. 750 V L-N sin	•	•	•
Frequency - 16 2/3 Hz or 45 to 65 Hz or 300 Hz or 400 Hz	•	•	•
Communication			
Communication ports	1 Standard + 1 Optional ***	1 Standard + 1 Optional ***	1 Standard + 1 Optional ***
Comm. type: Serial (RS485 + RS232)/Ethernet/USB/Ethernet & USB**	•/•/•/•	•/•/•/•	•/•/•/•
Comm. protocol: Modbus (RTU, TCP) and DNP3	•	•	•
Inputs/Outputs			
I/O 1: AN / DI / DO / PO / TI / AL	◦/◦/◦/◦/◦/◦	◦/◦/◦/◦/◦/◦	◦/◦/◦/◦/◦/◦
I/O 2: AN / DI / DO / PO / TI / AL	◦/◦/◦/◦/◦/◦	◦/◦/◦/◦/◦/◦	◦/◦/◦/◦/◦/◦
I/O 3: AN / DI / DO / PO / TI / AL	◦/◦/◦/◦/◦/◦	◦/◦/◦/◦/◦/◦	◦/◦/◦/◦/◦/◦
I/O 4: AN / DI / DO / PO / TI / AL / COM2*	◦/◦/◦/◦/◦/◦/◦	◦/◦/◦/◦/◦/◦/◦	◦/◦/◦/◦/◦/◦/◦
Available Functions			
Programmable refresh time (Communication)	•	•	•
MD calculation (TF, FW, SW)	•	•	•
Tariff clock	•	•	•
Cost management	•	•	•
Programmable alarms	32	32	32
Alarms recording	-	•	•
Measurements recording	-	•	•
Power supply quality EN50160	-	-	•
PC Software	MiQen	MiQen	MiQen
Available Measurements			
Actual values: U, I, P, Q, S, PF, PA, f, φ	•	•	•
Energy	•	•	•
Maximum demands	•	•	•
Minimum values: U, I, P, Q, S, PF, PA, f, φ	•	•	•
Maximum values: U, I, P, Q, S, PF, PA, f, φ	•	•	•
THD	•	•	•
Harmonics	up to 31 st	up to 31 st	up to 63 rd

* Uni-LO: low voltage (45...70 V AC, 19...70 V DC); Uni-HI: high voltage (70...276 V AC, 70...300 V DC)

** With some limits (see User's Manual MT/UMT 5xx)

*** The optional communication port (COM2) excludes the remote LED display connection and supports only RS485 serial communication type through the 4th I/O connector slot



MT 560/UMT 560 - TRANSDUCER & ANALYZER

USE

The MT 560/UMT 560 multi transducer and analyzer is used for a permanent analysis of electricity supply quality in compliance with the SIST 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.



The transducer measures and records the following characteristics:

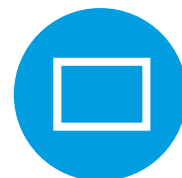
- Frequency deviations
- Voltage deviations
- Voltage clips
- Voltage interruptions
- Voltage unbalances
- Over-voltages
- Fast voltage changes
- Flicker intensity
- THD
- Harmonics

Besides the features listed in the chapter "Family of Measuring Transducers MT 5xx/UMT 5xx – comparison and common characteristics", the transducer also has other features:

- Evaluation of the electricity supply quality in compliance with SIST EN 50160
- 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)

Dimensional drawings 184.
Connection diagrams 194, 195, 196.
Software on pages 135, 136.

MT 550/UMT 550 – TRANSDUCER & ANALYZER, MT 540/UMT 540 - MULTIFUNCTION TRANSDUCER



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). Both measuring transducers (U)MT 550 and (U)MT 540 measure basic parameters (U, I, P) very precisely with accuracy class 0.2 according to the IEC EN 60688 standard.

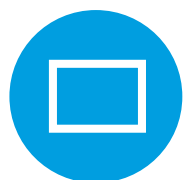
Input range width enables measurement of all basic AC voltage or current. The transducer generates and accepts different I/O signals. An analogue output signal is proportional to measurand and is intended for the control of analogue and digital devices. A pulse output is intended for sending data to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



Besides the features listed in the chapter “Family of Measuring Transducers MT 5xx/UMT 5xx – comparison and common characteristics”, the transducer 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).

Dimensional drawings 184.
Connection diagrams 194, 195, 196.
Software on pages 135, 136.



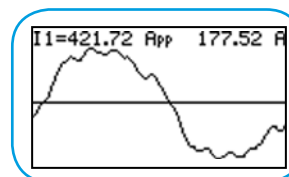
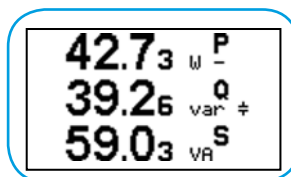
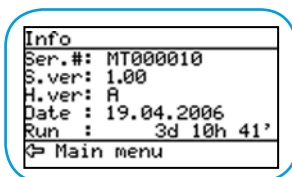
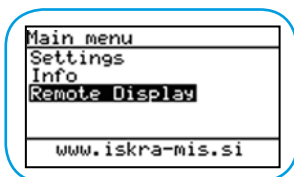
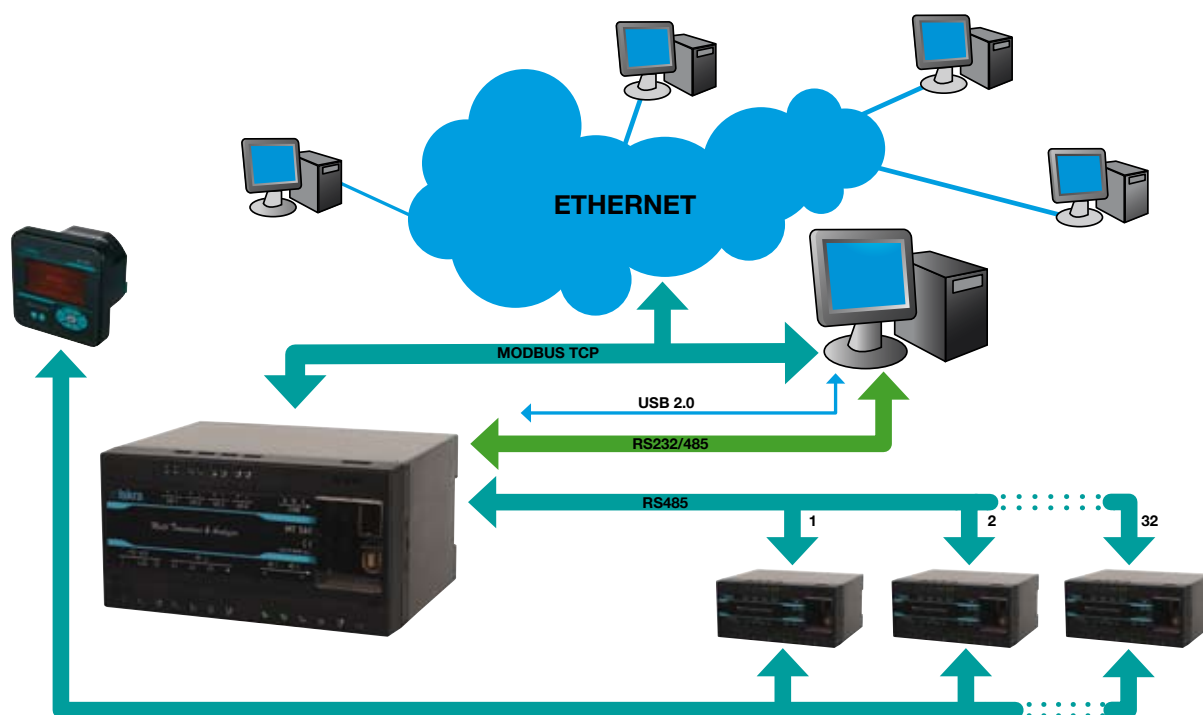
RD 500 – REMOTE DISPLAY FOR MEASURING TRANSDUCERS MT 5x0/UMT 5x0



Features:

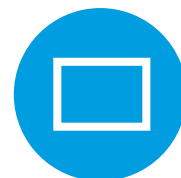
- Remote application for measuring transducers (U)MT560, (U)MT550, (U)MT540
- Network connection for up to 32 transducers
- RS485 communication
- Universal power supply 48-276 V AC, 20-300 V DC
- Graphical LCD 128 x 64 dots
- Multilingual support

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 RD500 target communication addresses it is possible to track measurements and change settings for up to 32 (U)MT5xx measuring transducers.



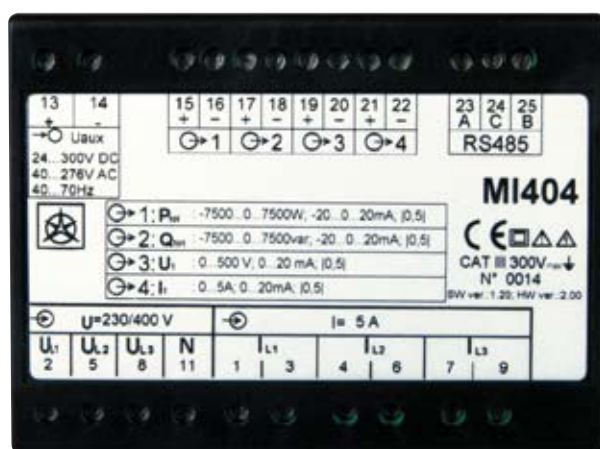
Dimensional drawings on page 184.

MI 404



The MI 404 programmable measuring transducer generates 4 electrically insulated, load independent analogue output signals (DC voltage or DC current). A large input range enables the measurement of any standard AC current and voltage. The analogue output signal is proportional to the measured value and it is appropriate for the control of analogue and digital devices.

The ease of programmability of transducer is an important feature in the provision of cost effective system control. Systems can be easily changed or expanded as required.



Main features are:

- Multifunction - more than 50 measured parameters (V, A, kW, kVA, kvar, PF, Hz, MD, THD, etc.)
- Programmable inputs and outputs
- Low power consumption
- Wide range universal AC/DC aux. power supply (19..300 V DC, 40..276 V AC)
- Typical accuracy: class 0.5
- Serial communication RS232 or RS485 (very high speed data rate: up to 115,200 bit/s, MODBUS protocol)
- Housing for DIN rail mounting
- Up to 4 analogue output modules

TECHNICAL DATA AND PROGRAMMING

Measuring Inputs:

- Nominal input voltage: 50 to 500 V (phase to neutral)
- Nominal input current: 0.5 to 5 A
- Nominal frequency fn: 50/60 Hz
- Frequency range: 45...65 Hz

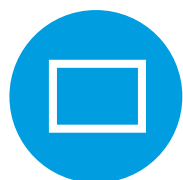
Analogue outputs (for modules 1, 2, 3 and 4)

Output values are programmed ¹⁾ by setting MIQEN software via RS232 or RS485 communication. It is possible to choose between several standard output value ranges (-100...0...100%):

- 1...0...1 V,
- 10...0...10 V,
- 1...0...1 mA,
- 5...0...5 mA and
- 20...0...20 mA.

Within these five ranges it is possible to set any linear or bent (with maximum 5 break points) output characteristic.

¹⁾ - Programming is not possible in versions without communication
Dimensional drawings on page 184.
Connection diagrams on page 198.
Software on pages 135, 136.



MI 401

The MI 401 programmable measuring transducer supervises quantities of an electrical system. A large input range enables the measurement of any standard AC current and voltage. It generates up to 3 electrically insulated, load independent analogue (DC voltage or DC current) or pulse (solid-state relay) output signals. The analogue output signal is proportional to the measured value and it is appropriate for the control of analogue and digital devices. A pulse output is designed for sending data to the devices for checking and monitoring consumed energy. The ease of programmability of transducer by PC software is an important feature in the provision of cost effective system control. Systems can be easily changed or expanded as required.



Main features are:

- Multifunction - more than 50 measured parameters (V, A, kW, kVA, kvar, kWh, kVAh, kvarh, PF, Hz, MD, THD, etc.)
- Programmable input and output modules
- Low power consumption
- Universal AC/DC power supply
- Typical accuracy: class 0.5
- Serial communication RS232 or RS485 (very high speed data rate: up to 115,200 bit/s, MODBUS protocol)
- Housing for DIN rail mounting
- Max. three input or output modules
- Tariff input (option)
- Pulse output (option)
- Analogue output (option)

	Input		Frequency	Module 1)			Supply	Communication	Bent characteristic of analogue output
				Tariff input	Pulse output	Analogue output			
Programmable	500 V	5 A	50 / 60 Hz	0, 1 or 2	Programmable via communication Pulse / Energy 1, 2 or 3 ²⁾	5 mA 20 mA 10 V 0, 1 ali 2	Universal or AC ³⁾ : 57 V 100 V 230 V 400 V 500 V	RS232 or RS485	Programmable via communication
Pre-configured or fixed configuration	57.74 V 63.5 V 100 V 110 V 230 V 250 V 400 V 500 V on request from 50 V ... 600 V	1 A 5 A on request from 0.2 A to 5 A	50 / 60 Hz	100 V/ $\sqrt{3}$ 110 V/ $\sqrt{3}$ 230 V	To be specified at the placing order	5 mA 10 mA 20 mA 4...20 mA 10 V other on request	Universal or AC ³⁾ : 57 V 100 V 230 V 400 V 500 V	RS232 or RS485	To be specified at placing order

1.) Input or output type has to be specified for each module

2.) MI 401 has at least one pulse output

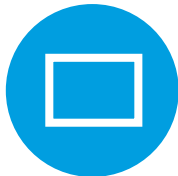
3.) AC auxiliary power supply is available only at transducers with one pulse output

Dimensional drawings on page 184.

Connection diagrams on page 199.

Software on pages 135, 136.

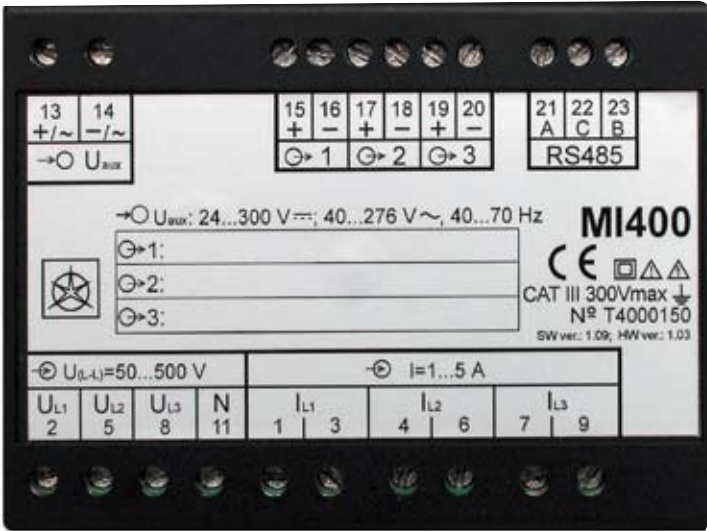
MI 400



The MI 400 programmable measuring transducer supervises an electrical system. Large input range allows use of transducer for measuring of any standard AC current and voltage. It generates 3 electrically insulated, load independent analogue output signals (DC voltage or DC current). The analogue output signal is proportional to the measured value and it is appropriate for the control of analogue and digital devices.

Main features are:

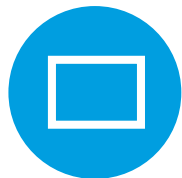
- Measurement of TRMS values of voltages and currents
- Multifunction - more than 50 measured parameters (TRMS voltage, TRMS current, kW, kvar, kVA, PF, Hz, MD, THD, etc.)
- Modularity - max. three configurable analogue outputs
- RS 232 or RS 485 serial communication (MODBUS protocol)
- Programmable outputs
- Programmable CT, VT ratios and outputs with PC software
- AC or universal auxiliary power AC/DC without voltage change-over
- Rail mounting in compliance with SIST EN 60715



Type / Description	Accuracy class	Inputs	Housing width (a)
MI 400 Programmable Multi-Transducer	0.5	$U = 50 \dots 500 \text{ V}$, $I = 0.5 \dots 5 \text{ A AC}$	100 mm
Options			
1 analogue output AC aux. power supply or universal aux. power supply			
2 analogue outputs and universal aux. power supply			
3 analogue outputs and universal aux. power supply			
AC auxiliary power supply: 57, 63.5, 100, 110, 230, 400, 500 V *			
RS 232 or RS 485 serial communication port			
Universal aux. power supply for DC & AC 24 ... 300V DC / 40 ... 276 V AC			

* for 1 analogue output only

Dimensional drawings on page 184.
Connection diagrams on pages 199, 200.
Software on pages 135, 136.



MI 4xx



It measures:

- Active power MI 413
- Reactive power MI 414
- Frequency MI 420
- Power factor MI 421
- 3 x AC voltage MI 436
- 3 x AC current MI 438
- AC voltage MI 406 and MI 416
- AC current MI 408 and MI 418
- Resistance MI 452
- DC voltage MI 456
- DC current MI 458
- Temperature with Pt 100 MI 450
- TAP position MI 454

Type / Description	Accuracy class	Inputs	Housing width (a)
MI 406 AC voltage *	0.5	U = 50 ... 500 V AC	45 mm
MI 408 AC current *	0.5	I = 0.5 ... 5 A AC	45 mm
MI 413 Active power, 4u, 4b, 3u, 3b, 1b	0.5	U = 50 ... 500 V, I = 0.5 ... 5 A AC	100 mm
MI 414 Reactive power, 4ur, 4b, 3u, 3b, 1b	0.5	U = 50 ... 500 V, I = 0.5 ... 5 A AC	100 mm
MI 416 RMS AC voltage	0.5	U = 50 ... 500 V AC	45 mm
MI 418 RMS AC current	0.5	I = 0.5 ... 5 A AC	45 mm
MI 420 Frequency	0.2	U = 50 ... 500 V AC	45 mm
MI 421 Power factor, 4u, 4b, 3u, 3b, 1b	0.5	U = 50 ... 500 V, I = 0.5 ... 5 A AC	100 mm
MI 436 3 x RMS AC voltage	0.5	U = 50 ... 500 V AC	100 mm
MI 438 3 x RMS AC current	0.5	I = 0 ... 5 A AC	100 mm
MI 450 Temperature with Pt 100, Pt 1000, Ni 100	0.5	2-wire, 3-wire, 4-wire	45 mm
MI 452 Resistance	0.5	R = 0 ... 10 Ω ... 50 k Ω R = 0 ... 100 Ω ... 500 k Ω	45 mm
MI 454 TAP position	0.5	100 Ω ... 50 k Ω 1000 Ω ... 500 k Ω	45 mm
MI 456 DC voltage	0.5	U = 50 mV ... 1 V DC U = 1 V ... 50 V DC U = 50 V ... 400 V DC	45 mm
MI 458 DC current	0.5	I = 1 ... 10 mA DC I = 10 ... 100 mA DC	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 aux. power supply for DC & AC 24 ... 300 V DC / 40 ... 276 V AC

* Power supply from a measuring circuit only. Communication port and aux. power supply are not available. Output 0.5 mA, 10 mA, 20 mA.

Dimensional drawings on page 184.
 Connection diagrams on pages 199, 200.
 Software on pages 135, 136.

MC 760/UMC 760 - NETWORK ANALYZER, MC 750/UMC 750 - NETWORK RECORDER



USE

The MC 760/UMC 760 network analyzer is used for permanent analysis of electric voltage quality in compliance with the SIST EN 50160 standard. Records are stored in the internal memory for the period of the last 3 years. Moreover, more than 100,000 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.

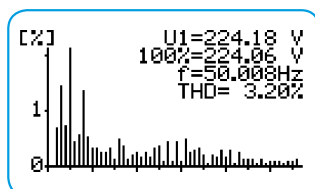
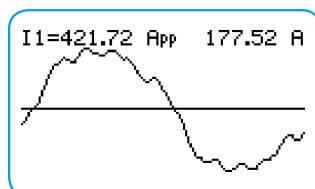


The meter measures and records the following characteristics:

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

Main features are:

- Evaluation of the quality of electric voltage in compliance with SIST EN 50160 (only MC 760/UMC 760)
- Measurements of instantaneous values of more than 140 quantities (U, I, P, Q, S, PF, PA, f, ϕ , THD, MD, energy, energy price by tariffs, etc.).
- Accuracy class 0.5
- Harmonic analysis of phase, phase-to-phase voltages and currents up to the 63th harmonic (only MC 760/UMC 760)
- Recording up to 32 measured quantities and alarms in the internal memory (8 MB flash - MC 760/UMC 760, 4 MB flash - MC 750/ 750)
- Measurements of 40 minimal and maximal values in different time periods
- 32 adjustable alarms
- Wide 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
- MMC memory card for data transmission, setting and upgrading
- Up to 4 inputs or outputs (analogue outputs, pulse outputs, alarm outputs, tariff inputs)
- Universal or AC power supply
- Graphical LCD 128 x 64 dots with illumination
- Automatic range of nominal current up to 5 A and nominal voltage up to 500 V
- Adjustable tariff clock, display of electric energy consumption in optional currency
- Multilingual support
- User-friendly PC MiQen software

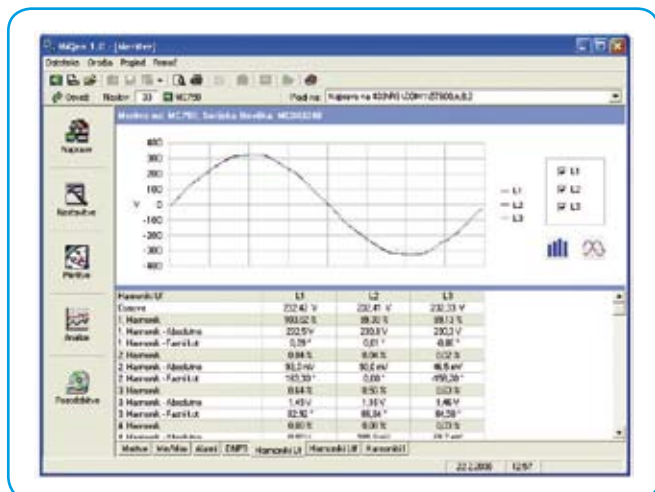


E1	332.55	EUR
E2	54.74	EUR
E3	2.79	EUR
E4	21.58	EUR
Σ	411.66	EUR

Active Power	
Max	+381.23 kW
132.47 kW	P
Min	+13.55 kW



MC 760/UMC 760 - NETWORK ANALYZER, MC 750/UMC 760 - NETWORK RECORDER



Handling the costs

A special meter function is cost evaluation of energy (active, reactive and total) by tariffs. The meter itself enables tracing the energy costs in optional currency. The meter calculates consumption in optional currency by means of the adjustable tariff clock and electric energy price.

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:

- Alarm output 2 outputs
- Analogue output 2 x 20 mA outputs
- Pulse output 2 outputs
- Tariff input 2 inputs
- Bistable alarm output 1 output
- Additional communication port (COM2)

Dimensional drawings on page 184.
Connection diagrams on pages 189, 190.
Software on pages 135, 136.

MC 740/UMC 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 four quadrants in four tariffs.

Main features are:

- Measurement of instantaneous values of more than 130 quantities (U, I, P, Q, S, PF, PA, f, ϕ , MD, energy, energy price by tariffs, etc.).
- Accuracy class 0.5
- Measurement of 40 minimum and maximum values in different time periods
- 32 adjustable alarms
- Wide 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 protocols
- MMC memory card for setting and upgrading the meter
- Up to 4 inputs or outputs (analogue outputs, pulse outputs, alarm outputs, tariff inputs)
- Universal or AC power supply
- Graphic LCD 128 x 64 dots with illumination
- Automatic range of nominal current up to 5 A and nominal voltage up to 500 V
- Adjustable tariff clock, display of electric energy consumption in optional currency
- Multilingual support
- User-friendly PC MiQen software

3.12 U1%
2.92 %THD
3.43 U3%
%THD

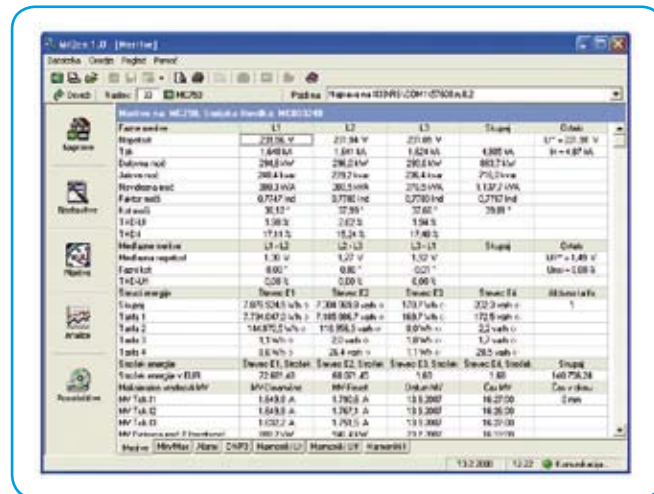
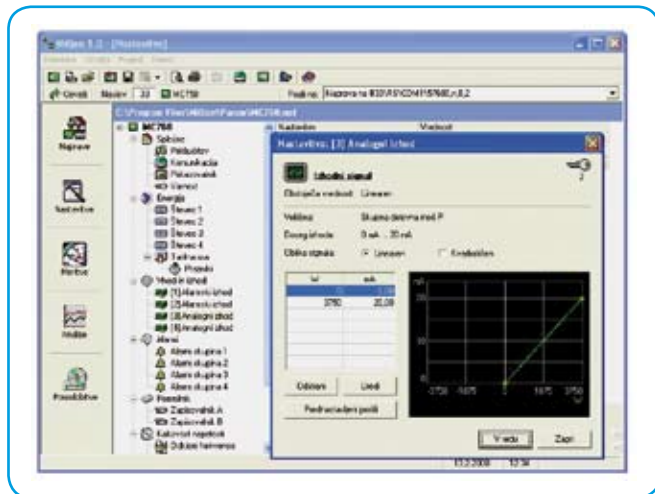
MD values
P+=143.20 kW
MD at 18. 1. 8:19
P+=184.50 kW

MMC card
MMC info
Save data
Save settings
Load settings
Software update
⇌ Main menu

1■ 3325.45 kWh
T1> 3282.73 kWh
T2 15.25 kWh
T3 6.44 kWh
T4 21.01 kWh



MC 740/UMC 740 - MULTIFUNCTION METER



Handling the costs

A special meter function is cost evaluation of energy (active, reactive and total) by tariffs. The meter itself enables tracing the energy costs in optional currency. The meter calculates consumption in optional currency by means of the adjustable tariff clock and electric energy price.

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:

- Alarm output 2 outputs
- Analogue output 2 x 20 mA outputs
- Pulse output 2 outputs
- Tariff input 2 inputs
- Bistable alarm output 1 output

Dimensional drawings on page 184.
Connection diagrams on pages 189, 190.
Software on pages 135, 136.

MC 720/UMC 720 - ENERGY METER, MC 710/UMC 710 - POWER METER



USE

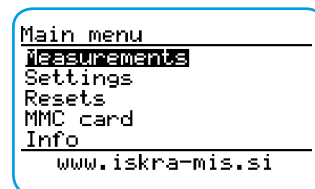
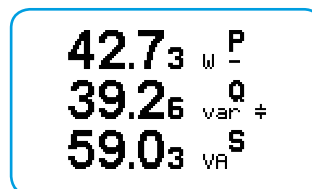
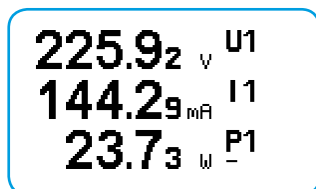
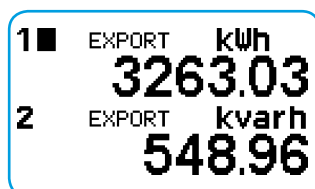
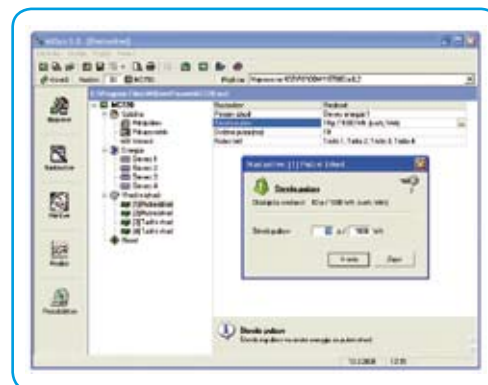
The meter is intended for monitoring and measuring electrical quantities of three-phase electric-energy distribution system. It can be set and software can be upgraded by means of the MMC memory card.

The MC 720 energy meter records energy like the electricity meter in all four quadrants in four tariffs. Up to 4 pulse outputs or tariff inputs are available for measurement control.



Main features are:

- Measurements of instantaneous values of 70 quantities (U, I, P, Q, S, PF, PA, f, ϕ ...)
- Energy (only MC 720/UMC 720)
- Accuracy class 0.5
- Wide frequency range from 16 Hz to 400 Hz
- MMC memory card for setting and upgrading the meter
- Up to 4 inputs or outputs (pulse outputs, tariff inputs) - only MC 720/UMC 720
- Universal or AC power supply
- Graphic LCD 128 x 64 dots with illumination
- Automatic range of nominal current up to 5 A and nominal voltage up to 500 V
- Multilingual support
- User-friendly PC MiQen software for setting via MMC



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:

- Pulse output 2 outputs
- Tariff input 2 inputs

Dimensional drawings on page 184.
Connection diagrams on pages 189, 190.
Software on pages 135, 136.



FAMILY OF MC 7x0/UMC 7x0 - comparison and common characteristics

Instrument						
DIN 96		MC 710	MC 720	MC 740	MC 750	MC 760
ANSI 100		UMC 710	UMC 720	UMC 740	UMC 750	UMC 760
Hardware configuration						
Backlight LCD 128x64		•	•	•	•	•
Keyboard keys		5	5	5		
MMC card		•	•	•	•	•
Power supply		univ., AC	univ., AC	univ., AC	univ., AC	univ., AC
Energy meters		-	4	4	4	4
Real time clock		-	-	•	•	•
Memory size		-	-	-	4 Mb	8 Mb
Auto Range Current		•	•	•	•	•
Auto Range Voltage		•	•	•	•	•
Communication						
Communication ports		-	-	1	1	1
RS232 & RS485 / Ethernet		- , - / -	- , - / -	• , • / •	• , • / •	• , • / •
Modbus and DNP3		- , -	- , -	•	•	•
Inputs and Outputs (I/O)						
I/O Slot 1 (2 PO / 2 TI / 2 AL / 2 AN / 1 BA)		- / - / - / - / -	o / o / - / - / -	o / o / o / o / o	o / o / o / o / o	o / o / o / o / o
I/O Slot 2 (2 PO / 2 TI / 2 AL / 2 AN / 1 BA)		- / - / - / - / -	o / o / - / - / -	o / o / o / o / o	o / o / o / o / o	o / o / o / o / o
Available functions						
Setup wizard		•	•	•	•	•
Wrong connection warning		•	•	•	•	•
Custom screens		•	•	•	•	•
Reset default settings		•	•	•	•	•
Demonstration screen cycling		• , -	• , -	• , •	• , •	• , •
Programmable refresh time (LCD , Comm.)		- , - , -	• , - , -	• , • , •	• , • , •	• , • , •
MD calculation (TF , FW, SW)		-	-	•	•	•
Tariff clock		-	-	•	•	•
Cost management		-	-	32	32	32
Programmable alarms		-	-	-	•	•
Alarms recording		-	-	-	•	•
Measurement recording		-	-	-	-	•
EN 50160 analysis		MIQen (MMC)	MIQen (MMC)	MIQen	MIQen	MIQen
PC software						
Available measurements		•	•	•	•	•
Actual values: U, I, P, Q, S, PF, PA, f, φ		-	•	•	•	•
Energy		-	• (TF)	•	•	•
Minimum values: U, I, P, Q, S, PF, PA, f, φ		-	-	•	•	•
Maximum values: U, I, P, Q, S, PF, PA, f, φ		-	-	•	•	•
THD (actual, min., max.)		-	-	•	•	•
Harmonics (up to 63rd)		-	-	to 31°	to 31°	to 63°

* Additional COM 2 (RS232 or RS485), optional for MC 740/UMC 740, MC 750/UMC 750, MC 760/UMC 760. COM2 replaces I/O modules 3 and 4.

Legend:

- - standard feature
- - optional feature
- PO - pulse output
- TI - tariff input
- AL - alarm output
- AN - analogue output
- BA - bistable alarm
- TF - thermal function
- FW - fixed window
- SW - sliding window

FAMILY OF MC 7x0/UMC 7x0

- comparison and common characteristics



INPUT		
Input signals	Current	Voltage
Nominal frequency range	50, 60 Hz	
Measuring frequency range	16 $\frac{2}{3}$ - 400 Hz	
Nominal value (I _n , U _n)*	5 A	500 V _{L-N}
Maximum value (sinus curve)	12.5 A	750 V _{L-N}
Rating	1 - 5 A	57.7 - 500 V _{L-N}
Consumption	< 0.1 VA	< 0.1 VA

* Automatic range

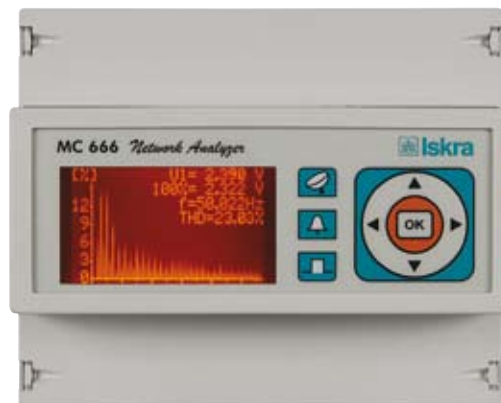
POWER SUPPLY		
Power supply	Universal	AC
Nominal voltage AC 48 - 276 V	57.7 / 63.5 / 100 / 110 / 230 / 400 / 500 V	
Nominal frequency	40 - 65 Hz	40 - 65 Hz
Nominal voltage DC	20 - 300 V	-
Consumption	< 7 VA	< 8 VA

ACCURACY		
Measured quantity		Accuracy
Rms current (I ₁ , I ₂ , I ₃ , I _{avg} , I _n)		0.5
Rms phase voltage 62.5 - 750 V		<0.5
(U ₁ , U ₂ , U ₃ , U _{avg}) 10 - 500 V		0.5
Phase-to-phase voltage (U ₁₂ , U ₂₃ , U ₃₁ , U _{avg})		0.5
Frequency (f)		0.01
Power factor (PF)		0.5
Phase and phase-to-phase angle (φ, φ ₁₂ , φ ₂₃ , φ ₃₁)		0.5
THD 0...400 %		0.5
Active, reactive and apparent power		1
Active energy SIST EN 62053-21		Class 1
Reactive energy SIST EN 62053-23		Class 2
Real time clock *		1 min/month (30 ppm)
Analogue output		±0.2 mA

* Only at MC 740/UMC 740, MC 750/UMC 750, MC 760/UMC 760



MC 660/MC 666 NETWORK ANALYZER FOR RAIL MOUNTING



USE

The instrument is used for permanent analysis of electricity supply quality in compliance with the SIST 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 & Plt
- Temporary over voltages
- THD's
- Harmonics

FEATURES:

- Evaluation of the electricity supply quality in compliance with SIST EN 50160
- Measurements of instantaneous values of more than 150 quantities (U, I, P, Q, S, PF, PA, f, ϕ , T HD, 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
- RS 485 communication up to 115.200 bit/s
- MODBUS and DNP3 communication protocol
- Up to 4 (2+2) inputs or outputs (pulse outputs, alarm outputs, tariff inputs, digital inputs)
- Universal power supply 48-276V AC, 20-300V 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

MC 650/MC 656 NETWORK RECORDER FOR RAIL MOUNTING



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
- RS 485 communication up to 115.200 bit/s
- MODBUS and DNP3 communication protocol
- 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 656)
- CT 5 A connection (MC 650)
- Housing for DIN rail mounting
- Adjustable tariff clock, display of electric energy consumption in optional currency
- Multilingual support
- User-friendly PC MiQen software

Dimensional drawings on page 184.

Connection diagrams on pages 191, 192.

Software on pages 135, 136.



MC 640/MC 646 MULTIFUNCTION METER FOR RAIL MOUNTING



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 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, 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 , 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
- RS 485 communication up to 115,200 bit/s
- MODBUS and DNP3 communication protocol
- 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 (MC646)
- CT 5 A connection (MC640)
- 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

Dimensional drawings on page 184.
Connection diagrams on pages 191, 192.
Software on pages 135, 136.



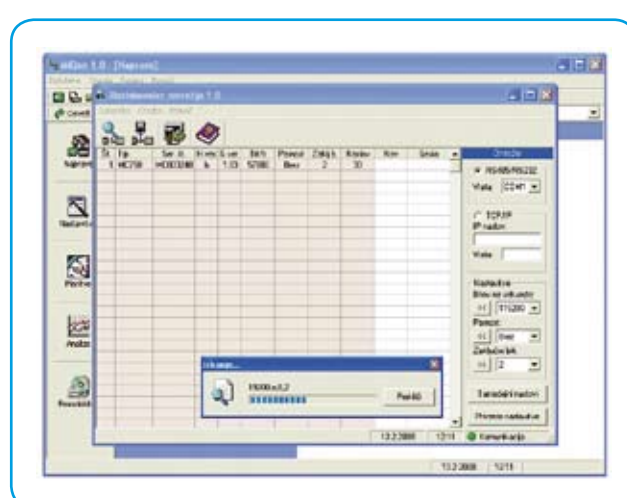
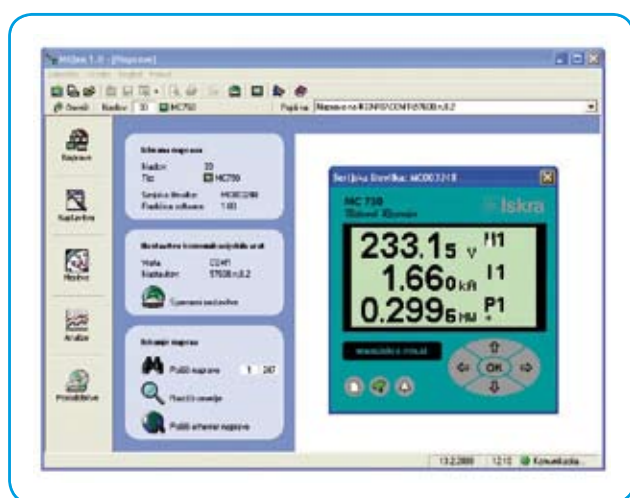
MiQen software is a tool for complete monitoring of the measuring instruments. RS485/RS232 or TCP/IP communication is used for connection with a PC. A user-friendly interface consists of five segments: device management, counter settings, real-time measurements, data analyses and programs updating.

Device management

As easy as possible.

Just select the device in a favourites line.

Use the network explorer to set and explore the devices network. Communication parameters of all devices and their addresses in network can be easily set.

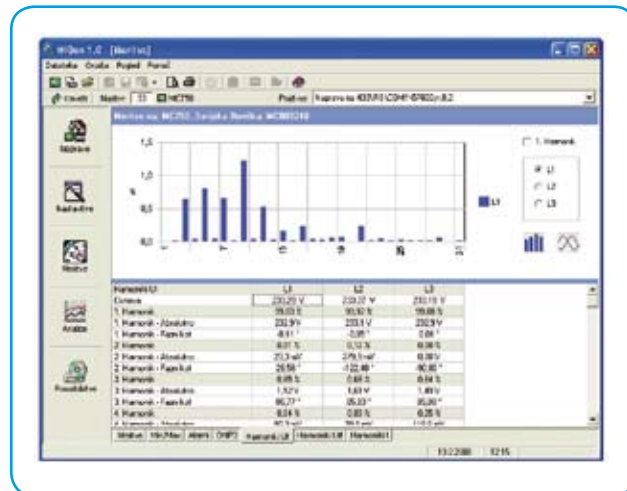
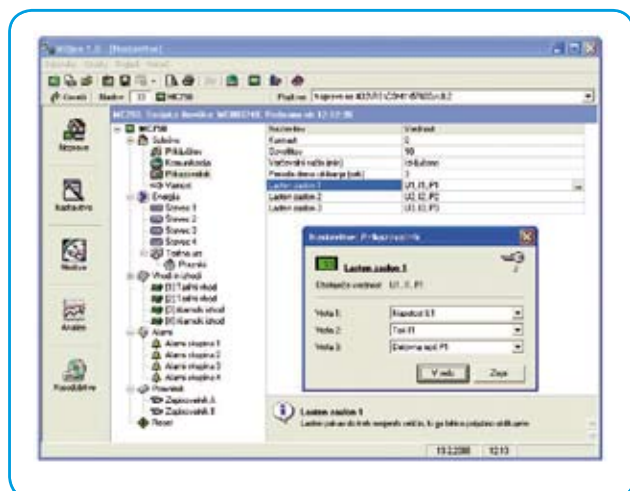


Instrument setting

Multi Register Edit technology assures a simple modification of settings that are organised in tree structures. Besides settings transfer into the instrument, storing and reading from the setting files and MMCs are also available.

Real-time measurement

All supported measurements can be seen in real time in a table form, while harmonics and their time-reconstructed signals are also displayed graphically. For further processing of the results of measurements, copying via a clipboard into standard Windows formats is supported.

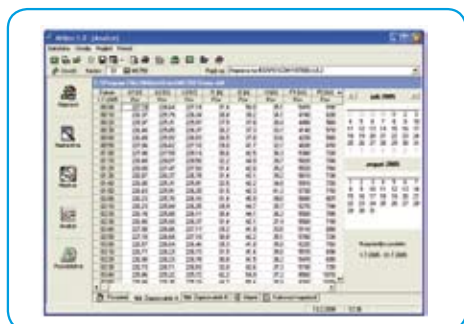




MIQEN

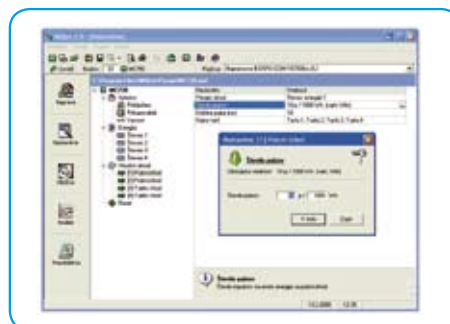
Data analysis

Analysis can be performed for the instruments with a built-in memory. Recorded quantities can be monitored in a tabular or graphical form, events that triggered alarms can be analysed or a report on quality of supply voltage can be made. All data can be exported to the Access data base, Excel worksheets or text files.



Programs updating

Always use the latest version of software, both MiQen and software in the instrument. The program automatically informs you on available upgrades that can be transferred from the web site and used for upgrading.



System requirements:

Windows 98, 2000, Millennium, XP, NT4.0, 100 MB capacity on a hard disc, VGA Screen, 64 MB RAM, CD drive, RS232 communication port

There are two versions of MIQEN software:

- **standard edition** - all functions available except for data analysis, free of charge
- **professional edition** - all functions available for installation, you have to buy a CD key

PC SOFTWARE SUPPORT			
Type		Type	
MT 560/UMT 560	YES	MI 456	YES
MT 550/UMT 550	YES	MI 458	YES
MT 540/UMT 540	YES	WS 0101	YES
MI 400	YES	WS 0102	YES
MI 401	YES	WS 1102	YES
MI 404	YES	WS 1302	YES
MI 413	YES	WS 0301	YES
MI 414	YES	WS 0302	YES
MI 418	YES	MC 660/MC 666	YES
MI 420	YES	MC 650/MC 656	YES
MI 421	YES	MC 640/MC 646	YES
MI 436	YES	MC 760/UMC 760	YES
MI 438	YES	MC 750/UMC 750	YES
MI 450	YES	MC 740/UMC 740	YES
MI 452	YES	MC 720/UMC 720	* Settings via MMC
MI 454	YES	MC 710/UMC 710	* Settings via MMC

WS 0030, WS 0031



WS 0030 and WS 0031 are electronic three-phase active energy meters. Meters measure positive active energy directly in 4-wire networks. There are two versions, one with a pulse output (WS 0031) and the other without it (WS 0030). Accuracy of the meters is class 1, according to the EN SIST 62053-21 standard for an active energy meter. Meters can be mounted on a DIN-rail.



Features:

- Three-phase direct connected DIN-rail mounted meter
- Accuracy class 1 according to EN62053-21 and EN62052-11
- Maximum current 65 A (I_{max})
- Base current (I_b) 10 A
- Starting current 0.004 I_b
- 3x 230/400 V rated system voltage input (U_n)
- Voltage operating range -20%...+15% U_n
- Reference frequencies 50 or 60 Hz
- Power consumption voltage circuit < 6 VA at U_n
- Power consumption current circuit < 0.85 W at I_{max}
- Temperature range: climatic condition as indoor meter according to IEC62051-11
- Display 6+1 digits (100 Wh resolution)
- Red LED for indication of energy flow and testing
- LED rate for energy flow 500 p/kWh
- Pulse output (WS0031 only) according to EN62053-31:2001
- Pulse output rate 500 p/kWh
- Pulse output type: an optocoupler with a transistor-open collector

Dimensional drawings on page 183.

Connection diagrams on page 188.



WS 0010, WS 0011

WS 0010 and WS 0011 are electronic single phase active energy to meters. Meters measure positive active energy directly in 2- wire networks. There are two versions, one with pulse output (WS 0011) and the other without it (WS 0010). Accuracy of the meters is class 1, according to the EN SIST 62053-21 standard for active energy meter. Meters can be mounted on a DIN-rail.



FEATURES:

- Single phase direct connected DIN-rail mounting meter
- Class of meter 1 according to EN62053-21 and EN62052-11 standards
- Maximum current 32 A (I_{max})
- Base current (I_b) 5 A
- Starting current 0,004 I_b
- 120 V or 230 V rated system voltage input (U_n)
- Voltage operating range -20%...+15% U_n
- Reference frequencies 50 or 60 Hz
- Power consumption voltage circuit < 6V A at U_n
- Power consumption current circuit < 0.1 W at I_{max}
- Temperature range climatic condition as indoor meter according to IEC62051-11
- Display 6+1 digit (100 Wh resolution)
- Red LED for indication of energy flow and testing
- LED rate for energy flow 640 p/kWh
- Pulse output according to EN62053-31:2001 standard (WS0011 only)
- Pulse output rate 640 p/kWh
- Pulse output type: an optocoupler with transistor-open collector

Dimensional drawings on page 184.
Connection diagrams on page 188.

WS 0101, WS 0102, WS 1102



Energy meters displays energy in three-phase electric energy distribution system for direct connection 65 A. They can give you information about energy consumption in production plants.

Main features are:

- Measurement of active and/or reactive or import and/or export energy
- Microprocessor control
- One or two pulse outputs (option)
- Protection covers for terminals
- Rail mounting in compliance with SIST EN 60715
- Case in compliance with DIN 43880, 6 modules (108 mm)
- One or two tariff inputs (option)
- Communication (option)
- Active energy - approved by PTB according to MID directive (standard EN 504070 - 1, EN 504070 - 3 class B)



TYPE	WS 0101	WS 0102	WS 1102
Accuracy class			
Active Energy, EN 61036	1	1	1
Reactive energy, EN 61268	2	2	2
Counter type:	Electromechanical	Electromechanical	LCD
Number of counters	1 x 7 digit	2 x 7 digit	2 x 9 digit
Voltage input:	230 V, 400 V		
Current input:	63 A		
4u, 4ur Three-phase four-wire system with unbalanced load	•	•	•
3u, 3ur Three-phase three-wire system with unbalanced load	•	•	•
Options:			
One impulse output	•	•	•
Two impulse outputs	•	•	•
Communication RS485	•	•	•
Tariff input	•	•	•

Dimensional drawings on page 184.

Connection diagrams on page 188.

Software on pages 135, 136.



WS 0301, WS 0302, WS 1302

Energy meters display energy in a three-phase electric energy distribution system, for connection through current measuring transformers.

Main features are:

- Measurement of active and/or reactive or import and/or export energy
- Microprocessor control
- Selection of primary CT ratios through communication
- Pulse output (option)
- Protection covers for terminals
- Rail mounting in compliance with SIST EN 60715
- Case in compliance with DIN 43880 6 modules (108 mm)
- One or two tariff inputs (option)
- Communication (option)



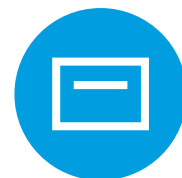
TYPE	WS 0301	WS 0302	WS 1302
Case: in compliance with DIN 43 880, length 108 mm	•	•	•
For rail mounting in compliance with SIST EN 60715	•	•	•
Accuracy class			
Active energy, EN 61036	1	1	1
Reactive energy, EN 61268	2	2	2
Counter type:	Electromechanical	Electromechanical	LCD
Number of counters	1 x 7 digit	2 x 7 digit	2 x 9 digit
Voltage input:	230 V, 400 V		
Current input:	1 A, 5 A		
3u Three-phase three-wire unbalanced load system	•	•	•
4u Three-phase four-wire system with unbalanced load	•	•	•
Option			
One impulse output	•	•	•
Two impulse outputs	•	•	•
RS485 Communication	•	•	•
Tariff input	•	•	•

Dimensional drawings on page 184.

Connection diagrams on page 188.

Software on pages 135, 136.

HOUR METERS HK46, HK 47, HK 48, HK 49, HK 30



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.

HK 46



HK 47



HK 48, HK 49



HK 30















		HK 46	HK 47
Voltages	AC	24 V, 48 V, 60 V, 110 V, 120 V, 230 V, 240 V, 400 V ($\pm 10\%$)	24 V, 48 V, 60 V, 110 V, 120 V, 230 V, 240 V, 400 V ($\pm 10\%$)
Frequency		50 Hz, 60 Hz	50 Hz, 60 Hz
Counting range		99999.99 hours	99999.99 hours
Number of digits		5 integers, 2 decimals	5 integers, 2 decimals
Operating temperature		-25°C ... +80°C	-25°C ... +80°C
Voltages	DC	6-30 V, 10-80 V, 110 V ($\pm 10\%$)	6-30 V, 10-80 V, 110V ($\pm 10\%$)
Counting range		999999.9 hours	999999.9 hours
Number of digits		6 integers, 1 decimal	6 integers, 1 decimal
Operating temperature		-20°C ... +70°C	-20°C ... +70°C

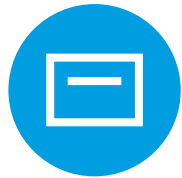
		HK 48, HK 49	HK 30
Voltages	AC	24 V, 48 V, 60 V, 110 V, 120 V, 230 V, 240 V, 400 V ($\pm 10\%$)	24 V, 48 V, 60 V, 110 V, 120 V, 230 V, 240 V, 400 V ($\pm 10\%$)
Frequency		50 Hz, 60 Hz	50 Hz, 60 Hz
Counting range		99999.99 hours	99999.99 hours
Number of digits		5 integers, 2 decimals	5 integers, 2 decimals
Operating temperature		-25°C ... +80°C	-25°C ... +70°C
Voltages	DC	6-30 V, 10-80 V, 110 V ($\pm 10\%$)	6-12 V, 12-36 V, 36-80 V, 110 V ($\pm 10\%$)
Counting range		999999.9 hours	999999.9 hours
Number of digits		6 integers, 1 decimal	6 integers, 1 decimal
Operating temperature		-20°C ... +70°C	-10°C ... +55°C

Protection	IP40 - front side	IP40 - front side
	IP20 - terminals	IP00 - terminals
Front dimensions	48 x 48 mm	Ø 58 mm
Adapter frames	52x52, 55x55, 72x72, Ø 80 mm	Ø 72 mm, Ø 80 mm
Special protection	IP 20 - terminals	IP 00 - terminals
Approval	UL	UL
Connection	screw terminals	plug 6.3 x 0.8 mm with screw plug 6.3 x 0.8 mm

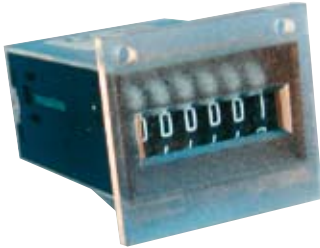
Protection	IP40 - front side	IP40 - front side
	IP00 - terminals	IP00 - terminals
Front dimensions	HK 487 x 72 mm - HK 49 96 x 96 mm	36 x 24 mm
Adapter frames		48 x 24, 54 x 29, 48 x 48, 55 x 55, Ø 72 x 72 mm 52 mm and Ø 72 mm
Special protection	P 20 - terminals	IP65 - front side (transparent housing)
Approval	UL	IP 00 - terminals
Connection	screw terminals	plug 6.3 x 0.8 mm with screw plug 6.3 x 0.8 mm

Mounting	Type	HK 46 CUTOUT	HK 47 CUTOUT
aluminium clamp	A	 45x45 mm chamfer edge Ø 51 mm, 45 mm	 Ø 50 mm
retainer	G	 45x45 mm chamfer edge Ø 51 mm, 45 mm	
DIN rail	D	 UL	
snap fastener	F		
anti-vibration rubber Ø 88 mm	C		 Ø 71 mm
3-screw front mounting Ø 72 mm	H	screw terminals	 Ø 58 mm

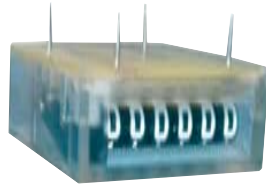
Mounting	Type	HK 48, HK 49 CUTOUT	HK 30 CUTOUT
retainer mount	G		 32 x 32 mm
DIN rail to DIN EN 50022	D		 Ø 50 mm
3-screw front mounting Ø 72 mm	H		 min. Ø 50 mm
two fixing screws	K	 HK48: 68 mm HK49: 92 mm	



PULSE COUNTERS SI 63, SI 64, SI 65, MC 703 & MC 723



SI 63



MC 703, MC 723



SI 64

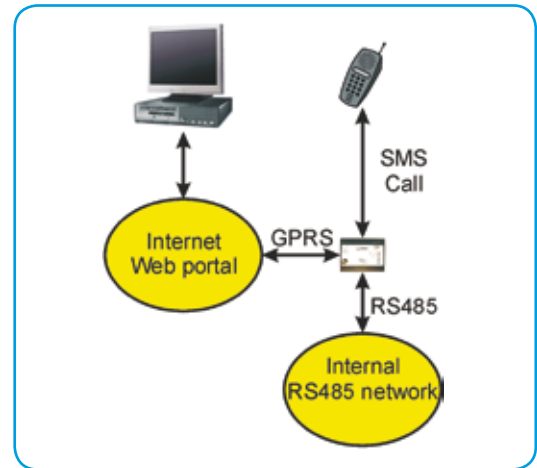
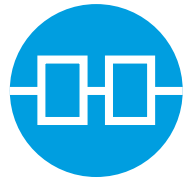
Pulse counters are used to keep record of repetitive operations. Typical applications are event counting, quantity counting, coin handling etc.

Type	SI 63	SI 64	SI 65	MC 703, MC 723
	totalizing counters without reset	totalizing counters without reset	mini pulse counter with manual reset	totalizing counters without reset
Supply voltage DC	6 V, 9 V, 12 V, 24 V ($\pm 10\%$)	12 V, 24 V ($\pm 10\%$)	12 V, 24 V ($\pm 10\%$)	3 V, 5 V, 12 V, 24 V ($\pm 10\%$)
Supply voltage AC		24/115/230 V ($\pm 10\%$)	24/115/230 V ($\pm 10\%$)	
Display	6-digit	6-digit	5-digit	6-digit or 7-digit
Counting range	999999	9999	999999	999999 or 9999999
Power consumption	1W	approx. 2 W - V DC approx. 2.9 VA - V AC	approx. 0.5 W - V DC approx. 0.75 VA - V AC 115V AC	approx. 300 mW at 3 and 5 V DC approx. 500 mW at 12 and 24 V DC approx. 1.5 V AC 230 V AC
Max counting speed	10 pulses/sec.	25 pulses/sec. - V DC 18 pulses/sec.	10 pulses/sec.	10 pulses/sec.
Duration of operation	IP 20			IP 31 - versions C and D IP 65 - versions A and B
Connection	wire lead 200 mm	silver plated round pins dia 1.5 mm	150 mm flying leads AWG 22	wire lead 140 mm or soldering pins ϕ 0.6 mm

VERSION & MOUNTINGS

Type	Front dimensions	Cutout
SI 63.0 rear screw mounting; aluminium housing	30 x 18.9 mm	30 x 18.9 mm
SI 63.1 snap fastener mounting; transparent plastic housing	33.4 x 27.1 mm	30.5 x 24.5 mm
SI 63.2 2-screw front snap fastener mounting; transparent plastic housing	33.4 x 30 mm	min.30.5 x 22 mm
MC 703.xxA front reading, 4 pins on the top, PCB mount	25.2 x 13.5 mm	–
MC 703.xxB top reading, 4 pins on the bottom, PCB mount	25.2 x 31 mm	–
MC 703.xxC front reading, 2 pins behind, rear screw mount	25.2 x 13.8 mm	25.2 x 13.8 mm
MC 703.xxD front reading, wire lead behind, rear screw mount	25.2 x 13.8 mm	25.2 x 13.8 mm
MC 723.xxC front reading, 2 pins behind, snap faster mount	30 x 20 mm	26.5 x 13.8 mm
MC 723.xxD front reading, wire lead behind, snap fastener mount	30 x 20 mm	26.5 x 13.8 mm
xx: 60 (6-digit) or 70 (7-digit)		

MI 480 - GSM DEVICE FOR REMOTE CONTROL



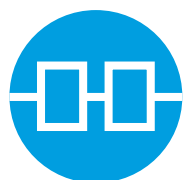
MI 480 is a device with a built-in GPRS modem interface for collecting and sending measurements from the connected instruments to the web portal. It is ideal for controlling distant objects, such as power plants, pumps, transformer stations, measuring stations, temperature monitoring...).

Data are collected in the MI 480 internal memory and sent in packets via the GPRS communication to the web portal. Alarms can be immediately forwarded to various mobile phone numbers.

Main features are:

- Alarms via an SMS message to a mobile phone
- Trend alarms via an SMS message to a mobile phone
- Data on instantaneous measurements via SMS
- Sending measurement packages to the server for further processing
- Survey of all measurements via a web portal
- All settings are accessible via a web portal

Due to its characteristics, MI 480 is an ideal instrument to be used in systems where permanent or periodical monitoring, storing the measurements for momentary and later analysis and processing are required. The system can be adapted to the needs and requirements of the individual user or system to which it is built-in.



MI 480 - GSM DEVICE FOR REMOTE CONTROL

RS 485 communication

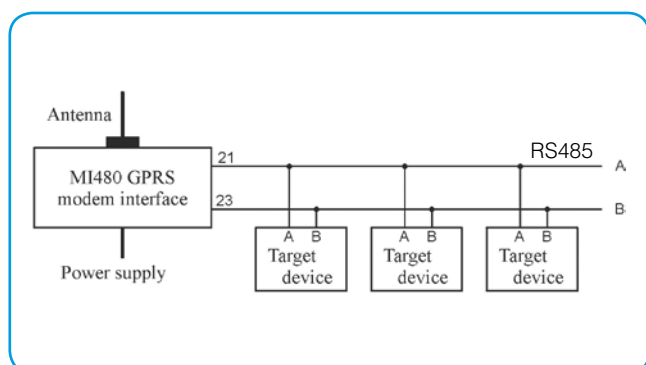
RS 485 communication enables connection of up to 32 instruments with one MI 480 device. It is limited to the maximum connection length of 1000 m. Connection of the RS 485 communication is described in tables and figures below.

MI 480	RS 485	Measuring centres	Measuring transducers
A (21)	DATA +	A (8)	A (21)
B (23)	DATA -	B (7)	B (23)

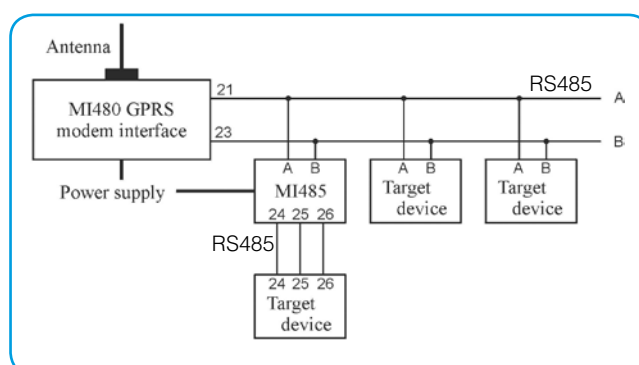
Contacts for RS485 communication

MI 480	MI 485 RS485	MI 485 RS232	Measuring centres	Measuring transducers
A (21)	A (21)	Rx (24)	Rx (3)	Rx (24)
		GND (25)	GND (5)	GND (25)
B (23)	B (23)	Tx (26)	Tx (2)	Tx (26)

Contacts for connection via MI485 interface



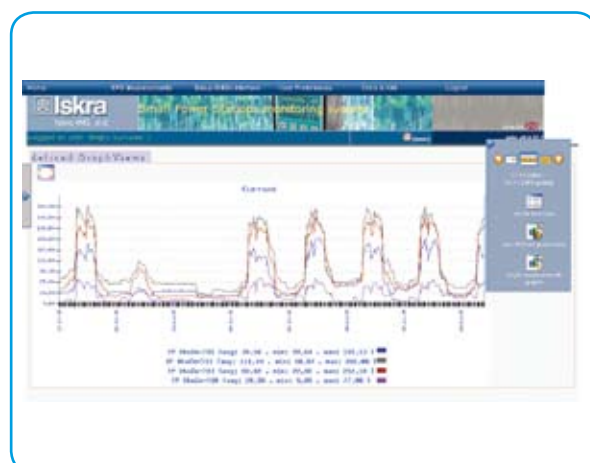
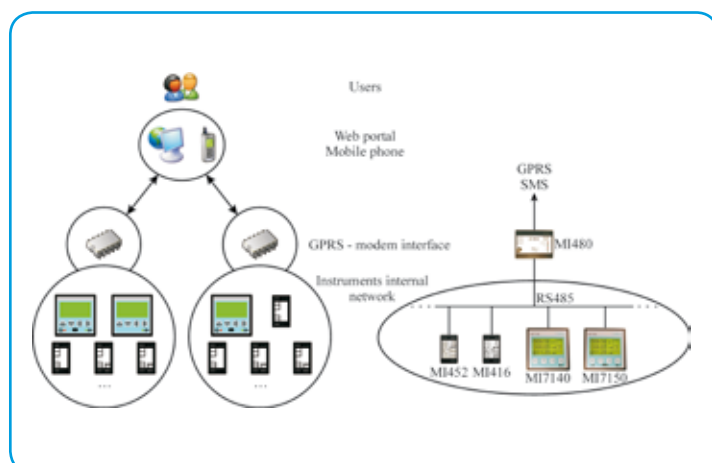
Connection of modem interface



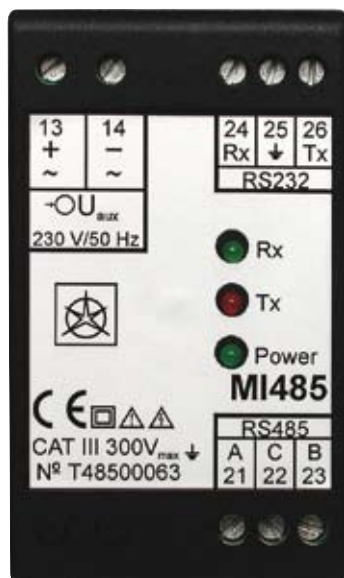
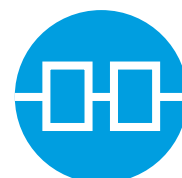
Connection of the instrument via MI 485 interface

Web portal

The web portal is the user's access point for setting and analysing collected data. It is used in a remote control system for a small power station and a system for detecting cut transmission lines and controlling transformer station defects. Both can be seen in Low-Voltage Services section at the end of this catalogue. URL of the web portal is <http://lisa.emeasurements.com>. For better understanding of information flow see the figure below.

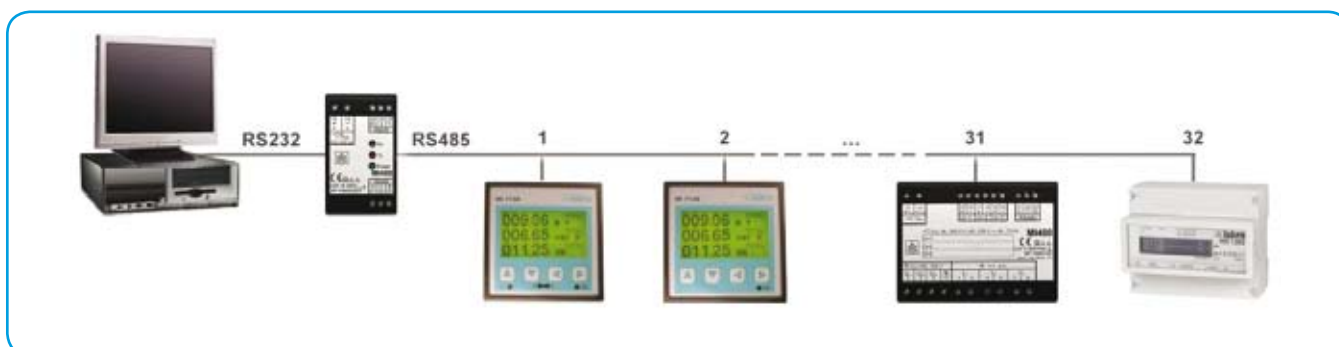


MI 485 - RS232/RS485 INTERFACE



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 RS 485 signal to RS 232 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:

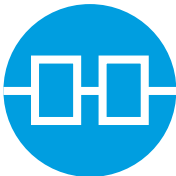
- **Auxiliary supply** - connected with connection terminals 13, 14
- **RS 232 communication**, max. length 3 m

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

- **RS 485 communication**, up to 32 devices, a line should be terminated with a 120 Ω resistor.

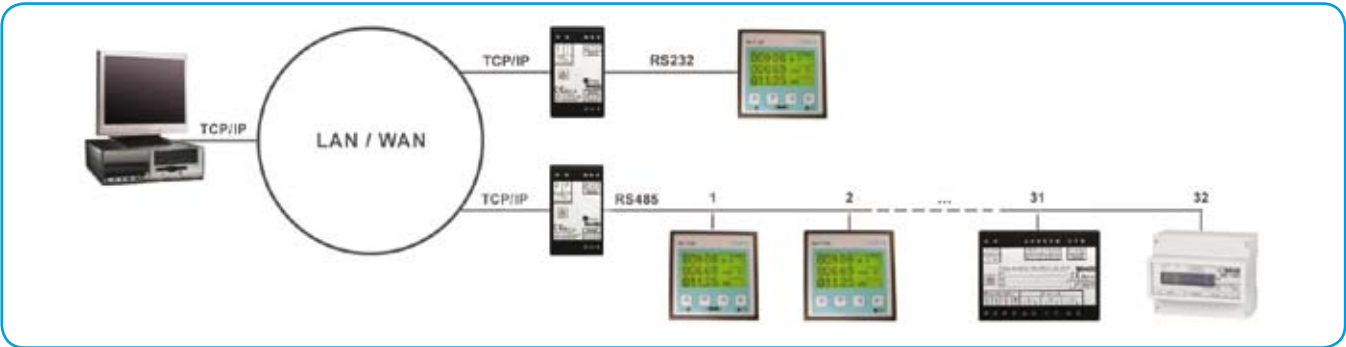
MI 485	RS 485-instruments
A (21)	DATA +
B (23)	DATA -

Dimensional drawings on page 184
Connection diagrams on page 200.



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

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
 - RS 232 communication (for MI 486), max. length 3 m

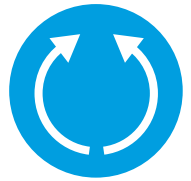
MI 486	Computer - DB9
Tx (26)	Tx (2)
Rx (24)	Rx (3)
GND (25)	GND (5)

- RS 485 communication (for MI 488), up to 32 devices, a line should be terminated with a 120 Ω resistor.

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

Dimensional drawings on page 184.

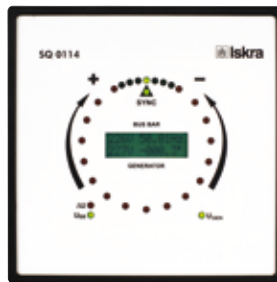
SQ 0104, SQ 0114, SQ 0204, SQ 0214, ZQ 1207, FQ 1207, ZQ 1208, FQ 1208



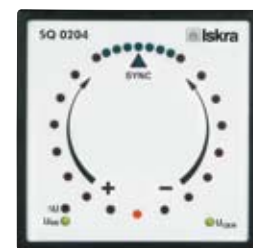
If you want to synchronise a generator and a bus bar manually or semi-automatically, SQ 0214 and SQ 0204 are the right instruments for you. Our synchronization meters are very unique products, especially SQ 0214. Synchronization meters are intended for manual or semiautomatic synchronization of two electric-energy distribution systems. SQ 0204, SQ 0214 synchrosopes 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 signals if the conditions for synchronization have been met. ZQ 1207 or ZQ 1208 two-system frequency meter is used for measuring frequencies in two networks. FQ 1207 or FQ 1208 double voltage meter measures voltages in two networks.



SQ 0104



SQ 0114



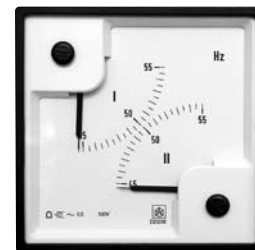
SQ 0204



SQ 0214



ZQ 1207
FQ 1207



ZQ 1208
FQ 1208

TYPE	SQ 0104	SQ 0114	SQ 0204	SQ 0214	ZQ 1207	ZQ 1108	ZQ 1208	FQ 1207	FQ 1108	FQ 1208
Front frame (mm)	144 x 144	144 x 144	96 x 96	96 x 96	96 x 96	144 x 144*	96 x 96*	96 x 96*	144 x 144*	96 x 96*
Cutting for mounting (mm)	138 x 138	138 x 138	92 x 92	92 x 92	92 x 92	138 x 138	92 x 92	92 x 92	138 x 138	92 x 92
Scale length (mm)	360°	360°	360°	360°	92/72	2 x 50	2 x 50	92/72	2 x 50	2 x 50
Accuracy class	+/-1° el.	+/-1° el.	+/-1° el.	+/-1° el.	0.5	0.5	0.5	1.5	1.5	1.5
RATING										
100 V, 230 V	•	•	•	•	•	•	•	•	•	•
400 V	•	•	•	•	•	•	•	•	•	•
500 V	•**	•**	•**	•**	•	•	•	•	•	•
600 V	•**	•**	•**	•**	•	•	•	•	•	•
Frequency			•		•					

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

** Other ratings on demand

Connection diagrams on page 201.
Dimensional drawings on page 183.

Ship version meters SQ 0204, SQ 0214, ZQ 1207 and FQ 1207 are available on request.

Connection diagrams for SQ 0204, SQ 0214, ZQ 1207, ZQ 1208, FQ 1207, FQ 1208 are shown on page 153.

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} , U_{GEN} , F_{BUS} and $\Delta\phi$ are displayed.

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

229V 50.07Hz
231V 50.73Hz

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

Generator voltage U_{gen} Phase difference $\Delta\phi$

229V 50.07Hz
231V +138.7°

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



WQ 0217, WQ 1217, WQ 0207, WQ 2207, WQ 1247

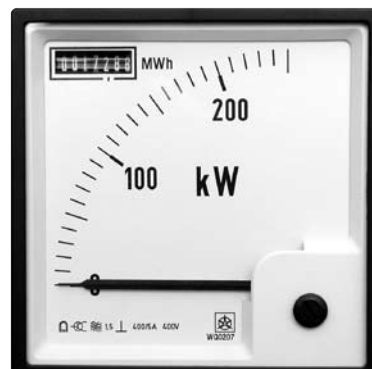
Energy meters display instantaneous power in single and three-phase systems with balanced or unbalanced load. Accuracy classes are 1 for energy measurement (EN 61036), 1.5 for power measurement and 2.5 power factor measurement.



WQ 0217



WQ 1217



WQ 0207



WQ 2207



WQ 1247

TYPE	WQ 0217	WQ 1217	WQ 0207	WQ 2207	WQ 1247
Front frame (mm)	96 x 96	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	92 x 92
Scale length (mm) / Number of counters	- / 1	- / 2	95 / 1	125 / 1	- / 2LCD
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 three-wire 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	•	•	•	•	•
57 V, 110 V, 230 V, 400 VAC Auxiliary supply	•	•	•	•	•

Dimensional drawings on pages 180, 182.
Connection diagrams on page 193.

ACTIVE OR REACTIVE POWER METERS



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_{L-L} 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 $\cos \phi = 1$ or $\sin \phi = 1$.



EQ 0207



EQ 2207

TYPE	EQ 0307	EQ 0207	EQ 0107	EQ 2307	EQ 2207**	EQ 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°			scale 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 circuits 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

** Overloads of short duration on page 202.

Ship version meters EQ0207, EQ0107 are available on request.

Dimensional drawings on pages 180, 182.

Connection diagrams on page 193.



POWER FACTOR METERS

Power factor meters are intended for measurement of power factor ($\cos\varphi$) 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



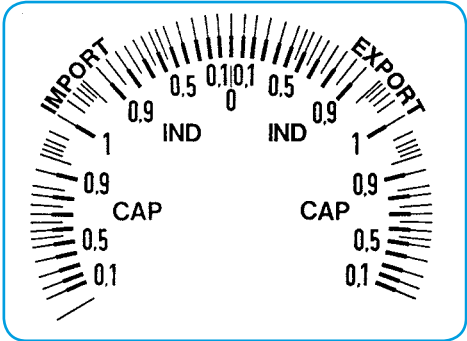
YQ 2207

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°			scale 240°		
Scale length (mm)	63	95	135	113	135	220
Voltage input*	100 V, 110 V, 230 V, 400 V, 500 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 balanced load system	•	•	•	•	•	•
3u Three-phase three-wire unbalanced load system	•	•	•	•	•	•
4b Three-phase four-wire balanced load system	•	•	•	•	•	•
4u Three-phase four-wire unbalanced load system	•	•	•	•	•	•
MEASURING RANGE	import 0.1 cap. ... 1 ... 0 ind. 0 ...1... 0.1 cap. export					
Option:						
Separated AC auxiliary supply	-	•	•	-	•	•
57 V, 63.5 V, 100 V, 110 V, 230 V, 400 V						

Ship version meters YQ 0207 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

Dimensional drawings on pages 180, 182.
Connection diagrams on page 193.

SCALE OUTLOOK
* For meters: YQ 2207, YQ 2107



POINTER FREQUENCY METERS



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



ZQ 0207



ZQ 2207



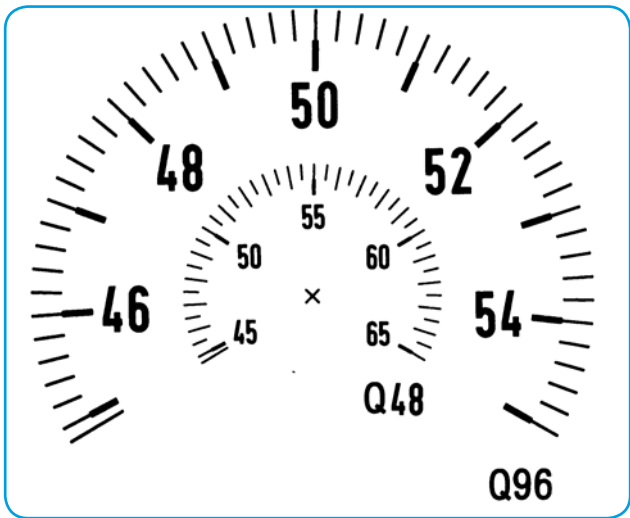
ZQ 0507

TYPE		ZQ 0507	ZQ 0407	ZQ 0307	ZQ 0207	ZQ 0107	ZQ 2307	ZQ 2207	ZQ 2107
Front frame (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
Cutting for mounting (mm)		-	45 x 45	68 x 68	92 x 92	138 x 138	68 x 68	92 x 92	138 x 138
		scale 90°					scale 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!
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 147. Dimensional drawings are on pages 180, 182.

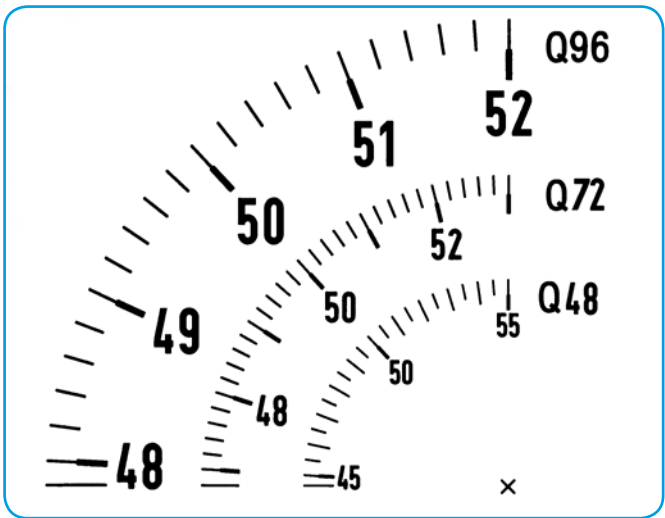
SCALES IN FULL-SIZE

For meters: ZQ 2x07



DETAIL ONLY

For meters: ZQ 0x07





REED FREQUENCY METERS

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



ZQ 0217

TYPE			ZQ 0317	ZQ 0317	ZQ 0317
Front frame (mm)			72 x 72	96 x 96	144 x 144
Cutting for mounting (mm)			68 x 68	92 x 92	138 x 138
RATING	RATING (V)	RATING			
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			•	•

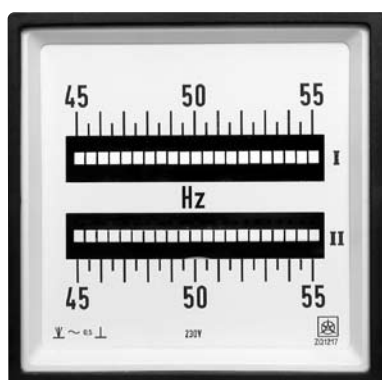
Self-consumption at 110-220 V range is 6...7 mA/system.

At other ranges it is 3...4 mA/system.

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

Dimensional drawings on pages 180, 182.

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



ZQ 1217

TYPE			ZQ 1217	ZQ 1117
Front frame (mm)			96 x 96	144 x 144
Cutting for mounting (mm)			92 x 92	138 x 138
RATING	Voltage (V)	No. of reeds		
2x 47...53 Hz	100, 110, 230	2 x 13	•	•
	400, 500		•	•
2x 57...63 Hz	100, 110, 230	2 x 13	•	•
	400, 500		•	•
2x 45...55 Hz	100, 110, 230	2 x 21	•	•
	400, 500		•	•
2x 55...65 Hz	100, 110, 230	2 x 21	•	•
	400, 500		•	•

Self-consumption at 110-230 V range is 6...7 mA/system.

At other ranges it is 3...4 mA/system.

Ship version meters ZQ 1217 and ZQ 1117 are available on request.

Dimensional drawings on pages 180, 182.

METER WITH LIMIT CONTACT



MI 7350

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.

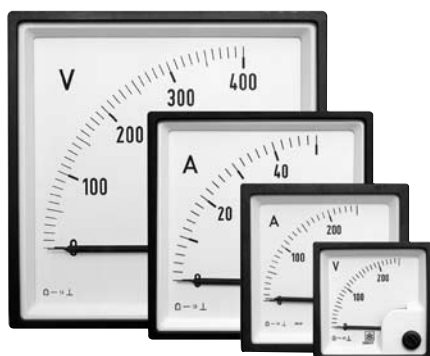
TYPE		MI 7350
Front frame (mm)		96 x 96
Cutting for mounting (mm)		92 x 92
Scale length (mm)		95
MEASURED QUANTITY		
DC U	40...800 mV	•
	1...60 V	•
	100...600 V	•
AC U	100...800 mV	•
	6...60 V	•
	100...600 V	•
DC I	25...600 μ A	•
	1...60 mA	•
	100...600 mA	•
	1...5 A	•
AC I	1...6 mA	•
	100...600 mA	•
	1...5 A	•
	8 min. 1.2 A	–
	8 min. 6 A	–
AC Ief	100...600 mA	•
	1...5 A	•
	1/2 A, 1.5/3 A, 2.5/5 A	•
	4/8A, 5/10A	•
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	•
	0...1600°C	•
TEMP. DEPENDENT RESISTOR PT100 (W)		•
	-200...+800°C	•
	ΔT ...50°C min	•
		•

Standard supply 230 V AC; 24 V, 48 V, 60 V, 110 V DC on request.
Dimensional drawings on pages 180, 182.



METERS FOR DC VOLTAGE OR CURRENT WITH MOVING COIL

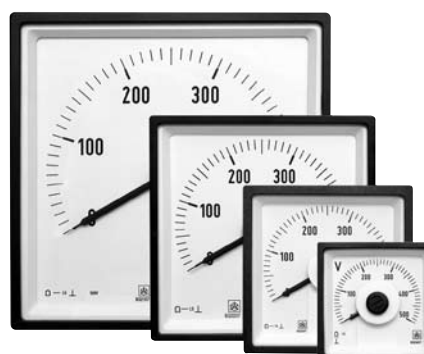
Meters with a moving coil are intended for measurement of direct currents or voltages. A measuring system with a core magnet is not sensitive to external electromagnetic fields and is resistant to mechanical impacts and vibrations. The scale is entirely linear and interchangeable. The accuracy class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



BQ 0x07



BQ 0507



BQ 2x07



BQ 2507

TYPE	BQ 0507	BQ 0407	BQ 0307	BQ 0207	BQ 0107	BQ 2507	BQ 2407	BQ 2307	BQ 2207	BQ 2107
Front frame (mm)	45 x 45	48 x 48	72 x 72	96 x 96	144 x 144	45 x 45	48 x 48	72 x 72	96 x 96	144 x 144
Cutting for mounting (mm)	-	45 x 45	68 x 68	92 x 92	138 x 138	-	45 x 45	68 x 68	92 x 92	138 x 138
	scale 90°					scale 240°				
Scale length (mm)	41	41	63	95	140	71	71	113	155	235
RATING										
0-40 μ A...60 μ A	-	•	•	•	•	-	-	-	-	-
0-100 μ A...600 μ A	•	•	•	•	•	•	•	•	•	•
0-1 mA...600 mA	•	•	•	•	•	•	•	•	•	•
4...20 mA ³⁾	•	•	•	•	•	•	•	•	•	•
0-1A...6A	•	•	•	•	•	•	•	•	•	•
0-10 A...25 A	-	•	•	•	•	-	•	•	•	•
0-40 A, 60 A	-	-	•	•	•	-	-	•	•	•
xA/60 mV ¹⁾	•	•	•	•	•	•	•	•	•	•
0-100 mV...600 mV	•	•	•	•	•	•	•	•	•	•
0-1V...600 V	•	•	•	•	•	•	•	•	•	•

AMMETERS:

RATINGS and INTERNAL RESISTANCES

BQ 0x07

μ A / Ω

40/5650, 60/4710, 100/2250, 150/1950, 250/990, 400/350, 600/150

BQ 2x07

μ A / 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. 60 mV

BQ 0x07, BQ 2x07

A²⁾: 1, 1.5, 2.5, 4, 6, 10, 15, 25, 40, 60

- voltage drop on terminals approx. 60 mV xA/60 mV²⁾

METERS FOR DC VOLTAGE OR CURRENT WITH MOVING COIL



VOLTMETERS :

RATINGS

BQ 0x07

mV²⁾: 60, 100, 150 - 5 mA system

BQ 2x07

mV²⁾: 60, 100, 150, 200, 300 - 5 mA system

BQ 0x07, BQ 2x07

V: 1, 1.5, 2.5, 4, 6, 10, 15, 25, 40, 6000, 150, 250, 400, 600 - 1 mA system

- characteristic resistance 1 k Ω /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.

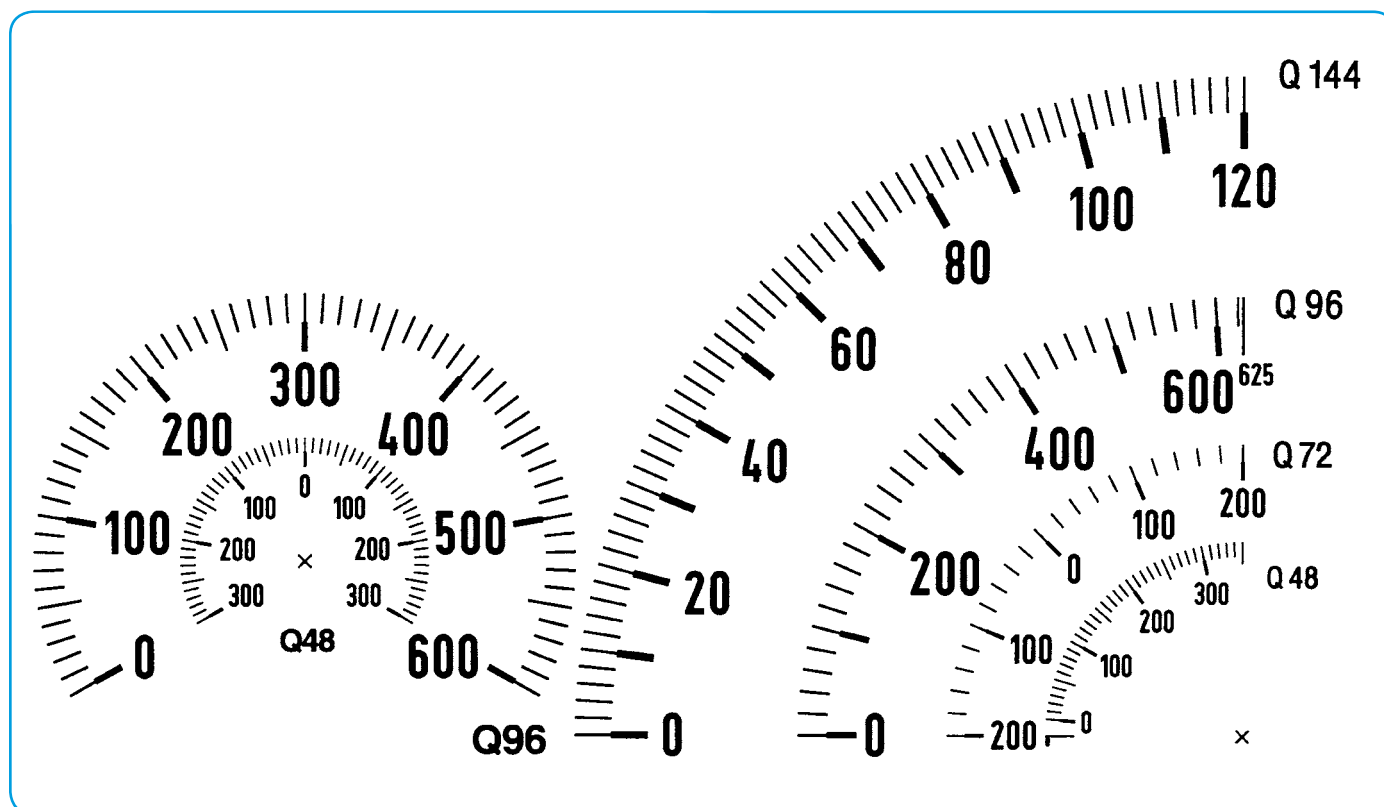
Special meters available on request; page 170.

Dimensional drawings on pages 180, 182.

SCALES IN FULL-SIZE

For meters: BQ 2x07
CQ 2x07
EQ 2207
WQ 2207

BQ 0x07
CQ 0x07
EQ 0307, EQ 0207, EQ 0107
WQ 0207
KQ 0207, KQ 0307
MI 7350





TAP POSITION METERS WITH MOVING COIL

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 Ω or 50 Ω 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

Dimensions

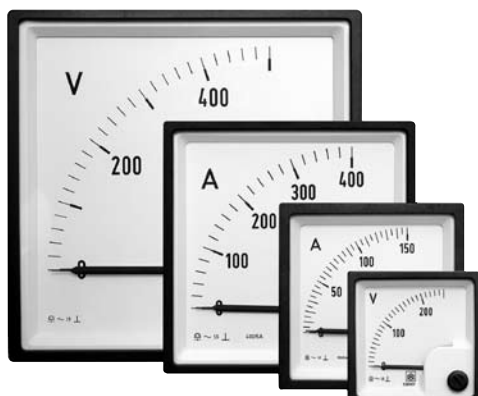
TYPE	CQ 2207	CQ 0207
Front frame (mm)	96 X 96	96 x 96
Cutting for mounting (mm)	92 X 92	92 x 92
Scale	240°	90°

Dimensional drawings on page 180.
Connection diagrams on page 197.

METERS FOR AC VOLTAGE OR CURRENT WITH A MOVING COIL AND RECTIFIER



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.



CQ 0x07



CQ 0507



CQ 3207

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 (mm)	45 x 45	48 x 48	72 x 72	96 x 96	144 x 144	96 x 96	45 x 45	48 x 48	72 x 72	96 x 96	144 x 144
Cutting for mounting (mm)	-	45 x 45	68 x 68	92 x 92	138 x 138	92 x 92	-	45 x 45	68 x 68	92 x 92	138 x 138
	scale 90°						scale 240°				
Scale length (mm)	41	41	63	95	140	95	71	71	113	155	
RATING											
0-100 μ A...600 μ A	•	•	•	•	•	-	•	•	•	•	•
0-1 mA...10 mA	•	•	•	•	•	-	•	•	•	•	•
xA/1A, xA/5A ¹⁾ (max. 7.5 A)	•	•	•	•	•	•	•	•	•	•	•
0-2.5 V...500 V	•	•	•	•	•	-	•	•	•	•	•
0-600 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.

** Overloads of short duration on page 202.

AMMETERS:

RATINGS

μ A: 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 k Ω /V

1) Meters for connection to a current measuring transformer.

Special versions of the meters available on request; page 170.

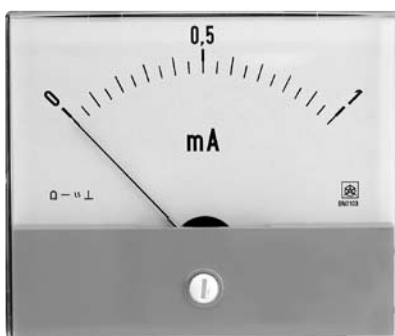
2) Connection diagram and dimensional drawing of transformer for CQ 0407, CQ 2407 on page 138 and CQ 3207 on page 153.

Dimensional drawings on pages 180, 182.



METERS FOR DC VOLTAGE OR CURRENT WITH MOVING COIL

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.



BN 0103, CN 0103

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)	φ 65	φ 65	φ 65	φ 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 / 1A, xA / 5A 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.

Dimensional drawings on page 180, 181.

AMMETERS:
RATINGS & INTERNAL RESISTANCE
BN 0103, BN 0203
A / Ohm: 40/5650, 60/4710, 100/2250, 150/1950, 250/990, 400/350, 600/150
A1) : 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

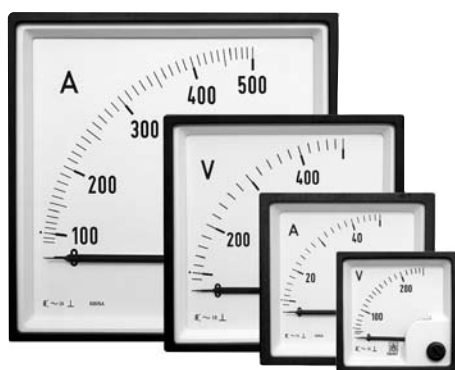
VOLTMETERS:
RATINGS
BN 0103, BN 0203
mV1): 60, 100, 150 – 5 mA system
V: 1, 1.5, 2.5, 4, 6, 10, 15, 25, 40, 60, 100, 150, 250, 400, 600 – 1 mA system
- characteristic resistance 1 k Ohm/V
CN 0103, CN 0203
V: 2.5, 4, 6, 10, 15, 25, 40, 60, 100, 150, 250, 400, 500, 600
- characteristic resistance 1 kOhm/ V

1) Current through a meter approx. 5 mA.

METERS FOR AC VOLTAGE OR CURRENT WITH MOVING IRON



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



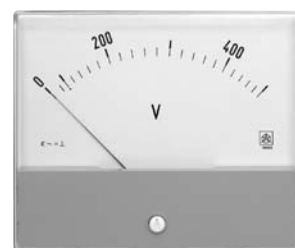
FQ 0x07



FQ 0507



FQ 3107
FQ 3207
FQ 3307



FN 0201
FN 0103

TYPE	FQ 0507	FQ 0407	FQ 0307	FQ 0207**	FQ 0107	FQ 3307	FQ 3207*	FQ 3107*	FQ 0103*	FQ 0201*
Front frame	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 (mm)	-	45 x 45	68 x 68	92 x 92	138 x 138	68 x 68	92 x 92	138 x 138	φ 65	φ 65
scale 90°										
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 xA/1A, xA/5 A	•	•	•	•	•	-	-	-	-	-
0-6 V...600 V	•	•	•	•	•	•	•	•	•	•
xV/100 V, xV/110 V	•	•	•	•	•	•	•	•	•	•

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.

*A dial is not interchangeable

**Overloads of short duration on page 202.



METERS FOR AC VOLTAGE OR CURRENT WITH MOVING IRON

AMMETERS: RATINGS

mA 100, 150, 200, 250, 300, 400, 500, 600

A 1, 1.5, 2.5, 4, 6, 10, 15, 25, 40, 60

A xA/1A, xA/5A

- 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 voltage measuring transformer

Self-consumption for: - ammeters: from 0.3 VA to 1.2 VA

x/1A ...0.4 VA

x/5A ...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.

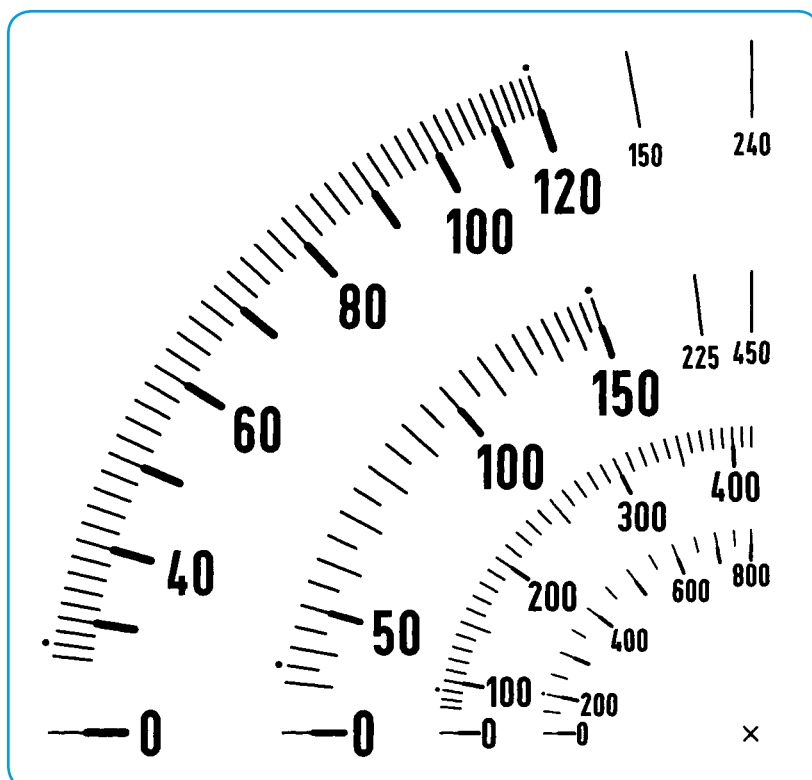
Ship version meters FQ 0407, FQ 0307, FQ 0207, FQ 0107 available on request.

Special version meters available on request; on page 170.

Dimensional drawings on pages 180, 182.

Connection diagram for FQ 3107, FQ 3207, FQ 3307 on page 201.

SCALES IN FULL SIZE FOR METERS: FQ 0x07



2 times overload

3 times overload

BIMETAL MAXIMUM CURRENT METERS



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.



MQ 0507



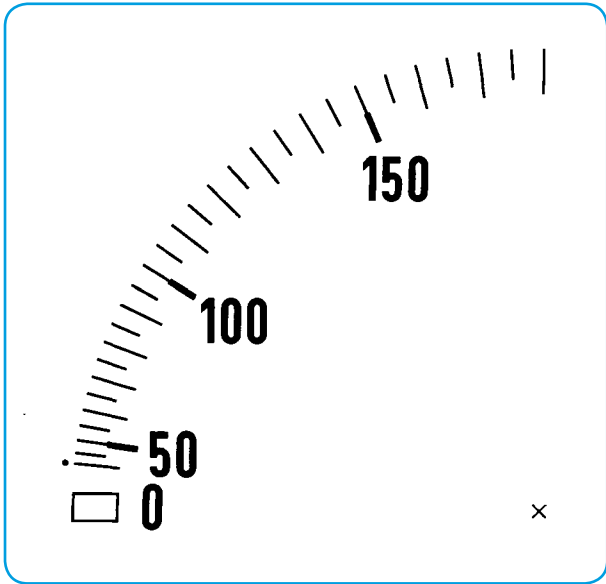
MQ 0207

TYPE	MQ 0507	MQ 0407	MQ 0307	MQ 0207	MQ 0107
Front frame (mm)	45 x 45	48 x 48	72 x 72	96 x 96	144 x 144
Cutting for mounting (mm)	-	45 x 45	68 x 68	92 x 92	138 x 138
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. *	•	•	•	•	•

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

Dimensional drawings on pages 180, 182.

SCALE IN FULL-SIZE
For meters: MQ 0207





COMBINED BIMETAL MAXIMUM CURRENT METERS

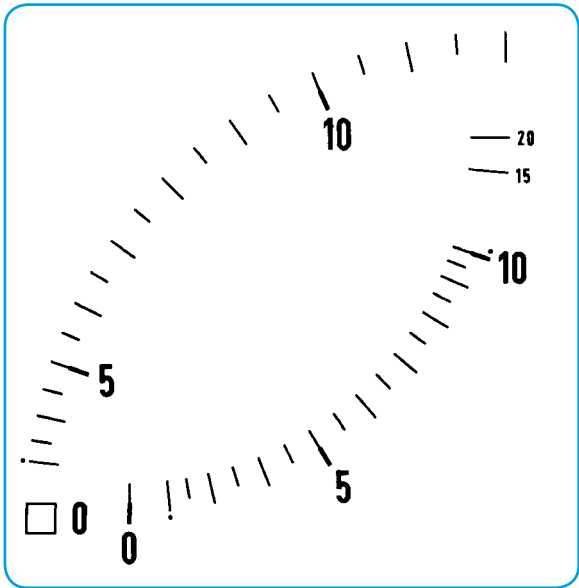
Combined bimetal maximum current meters are provided with a built-in bimetal system and a system with a moving iron. The meters are intended for testing momentary and thermal load of transformers, cables, electrical machines, etc. Meters 96 x 96 mm with a protecting transformer are also available on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

SCALES IN FULL-SIZE

For meters: MQ 0207



MQ 0217



10/5 A

TYPE	MQ 0317	MQ 0217	MQ 0117
Front frame (mm)	72 x 72	96 x 96	144 x 144
Cutting for mounting (mm)	68 x 68	92 x 92	138 x 138
Scale length (mm)	63/43	95/72	140/120
RATING			
1.2 A x A/1 A* 8 min.	•	•	•
6 A x A/5 A* 8 min.	•	•	•

*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.

Other setting period (15, 20 and 30 minutes) on request.
Dimensional drawings on pages 180, 182.

PHASE SEQUENCE INDICATOR SQ 0201 AND TEMPERATURE METERS



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.

Temperature meters are intended for connection to various thermocouples or temperature dependant resistors with the possibility of analogue output. The accuracy class is 1.5.



SQ 0201



KQ 0x07

TYPE		KQ 0307	KQ 0307	KQ 0207	KQ 0207
Front frame (mm)		72 x 72	72 x 72	96 x 96	96 x 96
Cutting for mounting (mm)		68 x 68	68 x 68	92 x 92	92 x 92
Scale length (mm)		65	65	95	95
ANALOGUE OUTPUT		-	0...10 mA Rmax. = 200 Ω	-	0...10 mA Rmax. = 200 Ω
MEASURING RANGE					
Resistor probe Pt 100	+/-50°C	•	•	•	•
	0...100°C	•	•	•	•
	0...200°C	•	•	•	•
	0...300°C	•	•	•	•
	0...400°C	•	•	•	•
Thermocouple J Fe-CuNi	0...200°C	•	•	•	•
	0...400°C	•	•	•	•
	0...600°C	•	•	•	•
Thermocouple K NiCr-Ni	0...600°C	•	•	•	•
	0...800°C	•	•	•	•
	0...1200°C	•	•	•	•
Thermocouple S PtRh-Pt	0...1400°C	•	•	•	•
	0...1600°C	•	•	•	•

Supply: 230 V ~ +/-10% (50...60 Hz)
On request: KQ 0207, KQ 0307
110 V +/-10% (50...60 Hz)

Other thermocouples on request.
Dimensional drawings on pages 180, 182.



MI 7033 ANALOGUE MULTIWATTMETER

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.



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 and 2.5
	$\cos \phi$: 5
Dimensions	110 x 181 x 62 mm
Supply	2 x 9V IEC 6F22
Weight with packing	700 g

MULTIMETERS



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. The MI 7054 and MI 7056 multimeters are provided with a rubber border which increases mechanical resistance. Ratings are protected against overloads when the meters are connected to 250 V.



MI 7054



MI 7056



MI 7065

TYPE		MI 7054	MI 7056	MI 7065
Voltage	=	30 V ... 600 V	100 mV ... 600 V	100 mV-300 V
	-	30 V ... 600 V	10 V ... 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
	-	1.33 k Ω /V	6.67 k Ω /V	10 M Ω
Number of ratings		15	24	25
Resistance	$\Omega \times$	1, 10, 100	1, 10, 100	-
Level dB		-	•	-
Polarity indication		-	-	-
Accuracy		2.5 \approx	2.5 \approx	3 ~ 2 \approx
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		470 g	340 g	400 g



EDUCATIONAL PROGRAMME

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.



07035.00



07038.00



07039.00



07021.01



07026.00

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 V ... 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	1 V ... 1000 V
	=	-	1 mA	-	3.5 mA	100 μ A ... 6 A	0.12 mA ... 6 A	0.1 mA ... 10 A
	~	-	3 A	1/5 A	3.5 mA	6 mA ... 6 A	6 mA ... 6 A	1 mA ... 10 A
Resistance (Ω x)	-	-	-	-	-	-	-	1,10,100
Level (dB)	-	-	-	-	-	-	-	-10...+12
Input resistance	=	30 k Ω /V	-	1 k Ω /V	-	10 k Ω /V	10 k Ω /V	12 k Ω /V
	~	10 k Ω /V	-	-	-	4 k Ω /V	4 k Ω /V	4 k Ω /V
Accuracy	2.5 \cong	2.5 \cong	1.5	1.5	1.5	2.5 \cong	1.5= 2.5~	1.5= 2.5~
Frequency range	15 Hz ... 10 kHz	-	-	-	-	15 Hz ... 11 kHz	20 Hz ... 10 kHz	15 Hz ... 11 kHz
	-	-	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	-	-	-	-	-	-	-	2 x 1.5 V R6
Dimensions (mm)	100 x 165 x 55							
Weight with packing	360 g	430 g	290 g	280 g	270 g	520 g	550 g	520 g

MI 7022 DIGITAL TEMPERATURE METER



It has a 3 1/2-digit display and is appropriate for measuring of foodstuffs by the HACCP system.
By means of appropriate Pt100 sensors, temperature can be measured from: -50°C to +200°C.
Error: < 0.2° K
Dimensions: 135 x 69 x 28 mm
Supply: 2 x 1.5 V LR03



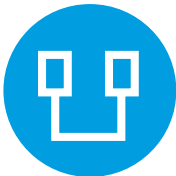
TIP TEMPERATURE SENSORS FOR MI 7022

Application range	-50°C...+ 200°C.
Sensor	Pt 100, conforms standard IEC-751, error 1/3 B
Dimensions of the tip part	φ 3 mm x 150 mm

We produce two types of sensors:

AT0621 for direct connection to the measuring device

AT0622 with a connection cable (1400 mm) and a handle



SHUNTS

SEPARATE SHUNTS

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



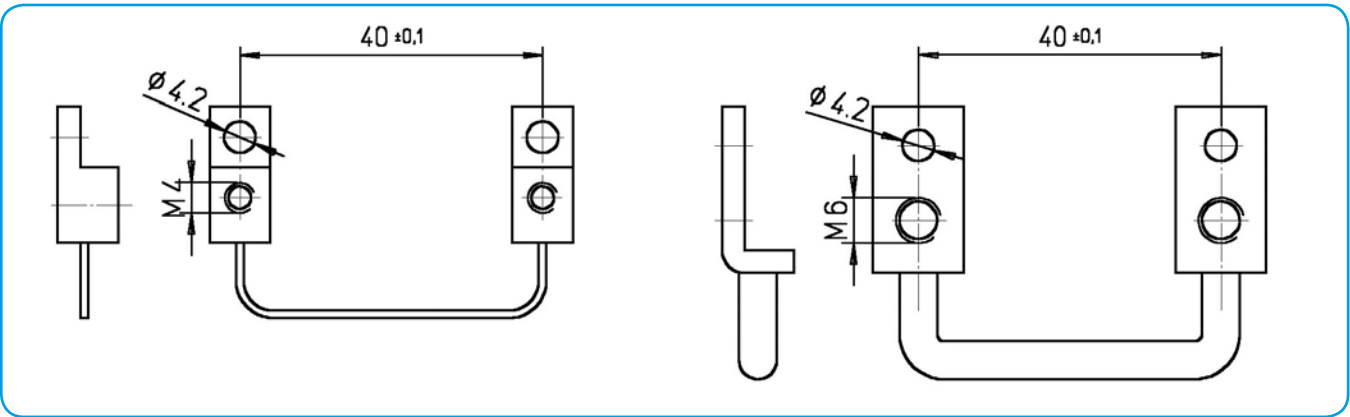
AR 0101

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

Other ratings and voltage drops are available on request.
Dimensional drawings on page 187.

SHUNTS FOR ADD-ON

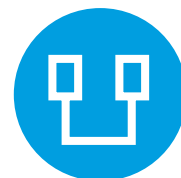
Dimensions of shunts are adapted to meter connection contacts and can be easily fixed with M4 screws. The basic meter is provided with the measuring system 5 mA and measures voltage drop 60 mV. Only a corresponding scale has to be inserted. The shunts can be used on the housings 96 x 96 mm and 72 x 72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



AR 0105

RATED CURRENT (A)/60 mV
1, 1.5, 2, 2.5, 4, 5, 6, 8, 10, 15, 20
25, 30, 40, 50, 60

CURRENT MEASURING TRANSFORMERS



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.



ASK 31.5



ASK 61.4

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

Snap-on mounting for ASK type

Other ratings and accuracy classes by agreement.

* 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

Dimensional drawings are on pages 185, 186.



It is technically not possible to satisfy all the below stated special requirements at each standard version. A previous agreement is therefore required.

General

- Increased mechanical resistance
- Non-brilliant pane
- Mechanically resistant pane (plastic)
- Front frame in another colour (red, blue, yellow)
- Tropical version in compliance with DIN 40040 -
 - mechanical meters HVE
 - electronic meters JVE
- Adjustable pointer 1x
- Adjustable pointer 2x
- Protection of the front side IP 54
- Protection of the front side IP 65 (see page 182)
- Ship version:
 - mechanical meters
 - electronic meters
- Luminescent scale (72x72 and 96x96 mm)
- DC supply 24 V, 48 V, 60 V
- DC supply 110 V, 230 V
- Non-standard mounting position
- Protection cover for protection of connection terminals:
 - Q144, Q96, Q72, Q48
- Spare fixing elements:
 - H1
 - mosaic fixing

Meters with moving coil

- Zero point in the middle or at an optional position
- Non-standard rating
- Additional rating
- Non-standard internal resistance
- Built-in potentiometer for range extension
- Increased damping
- Increased accuracy (error 1%),
 - scale 90°
 - scale 240°
- Mechanical zero point suppression

Meters with moving iron

- Non-standard rating
- Calibration for DC and AC quantity
- Increased damping
- Calibration for higher frequency (from 100 Hz to 500 Hz)
- Ammeters with 100% overload
- Ammeters with triple or multiple overload (max. 6 times)
- Additional ratings
- Increased accuracy (1% in one selected point)

Dial

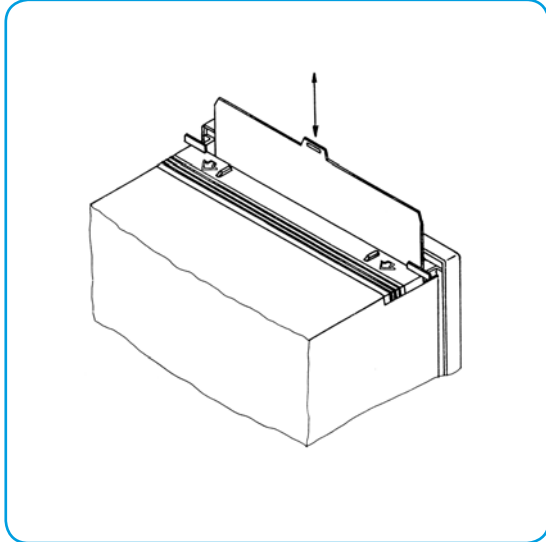
- Dial with a standard scale
- Dial with a non-standard scale
- Non-printed scale
- Scale by a table, a curve, a calibration
- Additional designations on a scale (max. 15 characters)
- Colour designation on a scale
- Colour field on a scale
- Non-standard scale division
- Black dial, white or yellow designations
- Transparent dial

Other meters and accessories

- MQ.. with protecting transformer
- MQ../5A with setting times 15, 20 and 30 min.
- ZQ.. with another measuring range (16 2/3...400 Hz)
- Separate shunts with voltage drop 75 mV
- Separate shunts with voltage drop 100 mV
- Separate shunts with accuracy 0.2%




Interchangeable scale at panel meters



Scales can be interchanged at square panel meters and at meters for rail mounting (35 mm) with digit 7 at the end of a type designation (e.g. FQ 0207) both at new and already used instruments. This is especially convenient for the meters which are connected to a current or voltage measuring transformer or a shunt. Push a cover towards the upper part in the direction of an arrow and draw out the scale with a suitable tool. When the scale is replaced, carefully close the slot with the cover. The scale colour complies with RAL 9010.

Ship version

Special versions are available for panel mounting into ships. These are mechanically resistant and additionally sealed meters which comply with the requirements of CRS (Croatian Register of Shipping Co. Ltd). The meter housing is marked with an anchor  and L is added to the type designation. (e. g. FQ 0207L)

Housing

All square panel meters which comply with DIN 43700 are made of mechanically and temperature resistant dark grey (RAL 9011) thermoplastic material; incombustibility complies with UL 94 V-0. The black (RAL9005) front frame complies with DIN 43718. At customer request a special cover for the protection of connection terminals from contact can be added to the meter (IP20).

Pointer

At square meters the pointer is a standard type with a narrowed point. Sensitive meters and multimeters are provided with a tube or a narrowed tube pointer.

standard pointer



tube pointer



knife-edge pointer





Fixing

The panel meters are fixed to the switchboard with the enclosed fixing elements:

- the Q square meters are usually fixed with screws (figure on page 181).
- by agreement, the meters (48 mm x 48 mm) can be fixed with special fixing elements for two versions of mosaic mounting (see page 181).

Degree of protection

A type of protection complies with DIN 40050: for a housing IP 52 and for connection terminals IP 00.

IP20 with protection cover (optional)

IP54 protection provides for additional sealing of the front side (optional).

IP65 with silicon protection cover (optional, see page 182).

Accuracy

The accuracy class according to EN60051 indicates permitted deviation in percentage from the final measuring value and is stated for each group separately.

Temperature and climatic conditions

Standard meters operate in the ambient temperature range from -25°C to 55°C. Max. relative humidity is 80%. According to IEC 60721-2-1 (Classification of environmental conditions) our instruments comply with WDaE type of climate. For more difficult ambient conditions when slight damping (but no moulds) occurs, a special “conditionally tropic” version is available: HVE (from -25°C to +55°C) for standard meters without electronics and JVE (from -10°C to +55°C) for the meters with built-in electronics.

Resistance to vibrations and shocks

Resistance to vibrations and shocks of analogue panel meters complies with EN 60051 or DIN VDE 0410/3.86 standard.



Position and marks

Normal operating position of the panel meters is vertical. The position is marked on the scale and the meters are correspondingly calibrated.

- \perp vertically
- \sqcap horizontally
- $\angle \alpha^\circ$ at an angle (e.g. 60° regarding the horizontal position)

OTHER SYMBOLS ON THE SCALE AND THE HOUSING COMPLY WITH EN60051 AND EN61010.

Significance of symbols































	Measuring system with a moving coil
	Measuring system with a moving coil
	Measuring system with a moving iron
	Bimetal measuring system
	Combined meter with a bimetal system and a moving iron
	Meter with electronics
	Vibrating measuring system
	Terminal for a protective conductor
	Warning: see Application Instructions
	Test voltage not compliant with VDE
	DC
	AC
	DC and AC
	Three-phase three-wire system with balanced load
	Three-phase four-wire system with balanced load
	Three-phase three-wire system with unbalanced load (two measuring systems)
	Accuracy class

Ratings in compliance with DIN 43780

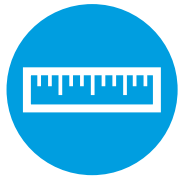
Standard ratings are selected from the sequence 1-1.2-1.5--2.5-3-4-5-6-7.5-(8) also considering decade multiples of the stated numbers. Units on the scale are marked according to DIN 1301.



GENERAL DATA

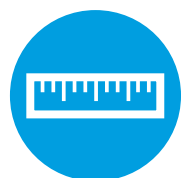
FORM	Type of measur.	U,I 	U,I 	U,I 	I 	I 	f 	f 	P 	W 	cos φ 	T 			
	Symbol of measuring system												Ship version	Interch-angeable dial	Page in cata-logue
Type of meter															
	BQ 0...	•											•	•	154, 155
	FQ 0...			•									•	•	159, 160
	MQ 0...				•	•								•	161, 162
	CQ 0...		•											•	157
	ZQ 0...							•					•	•	151
	YQ 0...										•		•	•	150
	EQ 0...								•				•	•	149
	WQ 0...									•					148
	MI 7350	•	•	•	•	•		•						•	153
	KQ 0...												•	•	163
	BQ 2...	•												•	154, 155
	CQ 2...		•											•	157
	ZQ 2...							•						•	151
	YQ 2...										•			•	150
	EQ 2...								•					•	149
	FQ 1...			•									•	•	147
	ZQ 1...							•					•	•	147
	ZQ..17						•						•	•	152
	BN 0...	•													158
	FN 0...			•											159
	CN 0...		•												158
	BQ 0507	•												•	154, 155
	FQ 0507			•										•	159, 160
	MQ 0507				•									•	161
	BQ 2507	•												•	154, 155
	CQ 2507		•											•	157

PANEL METERS



TYPE	Front frame □ a	Cutting for mounting □ b	Dimensions (mm) Bezel height c	Base d	Dimensions with packing (mm)	Volume with packing (dm ³)	Weight with packing (kg)
BQ 0407	48	45 ^{+0.6}	5	-	55x55x75	0.23	0.10
BQ 0307	72	68 ^{+0.8}	5.5	-	80x75x75	0.45	0.16
BQ 0207	96	92 ^{+0.8}	5.5	-	102x102x75	0.78	0.20
BQ 0107	144	138 ⁺¹	8	-	155x155x80	1.92	0.43
BQ 2407	48	45 ^{+0.6}	5	-	75x60x85	0.38	0.16
BQ 2307	72	68 ^{+0.8}	5.5	-	100x90x85	0.77	0.20
BQ 2207	96	92 ^{+0.8}	5.5	-	120x110x85	1.12	0.30
BQ 2107	144	138 ⁺¹	8	-	170x160x85	2.31	0.44
CQ 0407	48	45 ^{+0.6}	5	-	55x55x75	0.23	0.10
CQ 0307	72	68 ^{+0.8}	5.5	-	80x75x75	0.45	0.16
CQ 0207	96	92 ^{+0.8}	5.5	-	102x102x75	0.78	0.22
CQ 0107	144	138 ⁺¹	8	-	155x155x80	1.92	0.44
CQ 2407	48	45 ^{+0.6}	5	-	75x60x85	0.38	0.16
CQ 2307	72	68 ^{+0.8}	5.5	-	100x90x85	0.77	0.20
CQ 2207	96	92 ^{+0.8}	5.5	-	120x110x85	1.12	0.30
CQ 2107	144	138 ⁺¹	8	-	170x160x85	2.31	0.44
CQ 3207	96	92 ^{+0.8}	5.5	-	102x102x75	0.78	0.32
FQ 0407	48	45 ^{+0.6}	5	-	55x55x75	0.23	0.10
FQ 0307	72	68 ^{+0.8}	5.5	-	80x75x75	0.45	0.16
FQ 0207	96	92 ^{+0.8}	5.5	-	102x102x75	0.78	0.24
FQ 0107	144	138 ⁺¹	8	-	155x155x80	1.92	0.40
FQ 3207	96	92 ^{+0.8}	5.5	-	102x102x75	0.78	0.32
ZQ 0317	72	68 ^{+0.8}	5.5	-	100x90x85	0.77	0.22
ZQ 0217	96	92 ^{+0.8}	5.5	-	120x110x85	1.12	0.32
ZQ 0117	144	138 ⁺¹	8	-	170x160x85	2.31	0.52
ZQ 1217	96	92 ^{+0.8}	5.5	-	120x110x85	1.12	0.43
ZQ 1117	144	138 ⁺¹	8	-	170x160x85	2.31	0.75
MQ 0407	48	45 ^{+0.6}	5	-	75x60x85	0.38	0.12
MQ 0317	72	68 ^{+0.8}	5.5	-	100x90x85	0.77	0.19/0.31*
MQ 0307	72	68 ^{+0.8}	5.5	-	100x90x85	0.77	0.15
MQ 0217	96	92 ^{+0.8}	5.5	-	120x110x85	1.12	0.27
MQ 0207	96	92 ^{+0.8}	5.5	-	120x110x85	1.12	0.22
MQ 0107	144	138 ⁺¹	8	-	170x160x85	2.31	0.50
MQ 0117	144	138 ⁺¹	8	-	170x160x85	2.31	0.55
ZQ 0407	48	45 ^{+0.6}	5	-	55x55x75	0.23	0.16
ZQ 0307	72	68 ^{+0.8}	5.5	-	80x75x75	0.45	0.20
ZQ 0207	96	68 ^{+0.8}	5.5	-			
ZQ 0107	144	138 ⁺¹	8	-			
ZQ 2307	72	68 ^{+0.8}	5.5	-	100x90x120	1.08	0.20
ZQ 2207	96	92 ^{+0.8}	5.5	-	160x105x102	1.71	0.20
ZQ 2107	144	138 ⁺¹	8	-	150x150x137	3.08	0.40
YQ 0307	72	68 ^{+0.8}	5.5	29	102x76x104	0.81	0.24
YQ 0207	96	92 ^{+0.8}	5.5	27.3	102x120x105	1.29	0.35

Note: * with/without transformer

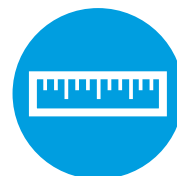


PANEL METERS

TYPE	Front frame □ a	Cutting for mounting □ b	Dimensions (mm) Bezel height c	Base d	Dimensions with packing (mm)	Volume with packing (dm ³)	Weight with packing (kg)
YQ 0107	144	138 ⁺¹	8	27.3	155x155x137	3.29	0.60
YQ 2307	72	68 ^{+0.8}	5.5	29	102x76x104	0.81	0.28
YQ 2207	96	92 ^{+0.8}	5.5	27.3	102x120x105	1.29	0.45
YQ 2107	144	138 ⁺¹	8	27.3	155x155x137	3.29	0.65
EQ 0307	72	68 ^{+0.8}	5.5	29	102x76x104	0.81	0.24
EQ 0207	96	92 ^{+0.8}	5.5	27.3	102x120x105	1.29	0.35
EQ 0107	144	138 ⁺¹	8	27.3	155x155x137	3.29	0.60
EQ 2307	72	68 ^{+0.8}	5.5	29	102x76x104	0.81	0.28
EQ 2207	96	92 ^{+0.8}	5.5	27.3	102x120x105	1.29	0.45
EQ 2107	144	138 ⁺¹	8	27.3	155x155x137	3.29	0.65
WQ 0217	96	92 ^{+0.8}	5.5	54.3	160x105x102	1.71	0.90
WQ 1217	96	92 ^{+0.8}	5.5	54.3	160x105x102	1.71	0.95
WQ 1208	96	92 ^{+0.8}	5.5	54.3	160x105x102	1.71	0.90
WQ 0207	96	92 ^{+0.8}	5.5	54.3	160x105x102	1.71	0.95
WQ 2207	96	92 ^{+0.8}	5.5	54.3	160x105x102	1.71	0.95
WQ 1247	96	92 ^{+0.8}	5.5	27.3	102x115x95	1.11	0.90
KQ 0207	96	92 ^{+0.8}	5.5	-	105x105x95	1.05	0.30
MI 7350	96	92 ^{+0.8}	5.5	54.3	98x152x100	1.49	0.60
SQ 0204	96	92 ^{+0.8}	5.5	48.5	102x102x120	1.25	0.50
SQ 0104	144	138 ⁺¹	8	28	150x150x140	2.57	0.71
SQ 0114	144	138 ⁺¹	8	28	150x150x140	2.57	0.71
SQ 0214	96	92 ^{+0.8}	5.5	48.5	102x102x120	1.25	0.55
ZQ 1207	96	92 ^{+0.8}	5.5	54.3	160x105x102	1.71	0.50
ZQ 1208	96	92 ^{+0.8}	5.5	54.3	97x61x97	0.57	0.26
FQ 1207	96	92 ^{+0.8}	5.5	54.3	160x105x102	0.78	0.45
FQ 1208	96	92 ^{+0.8}	5.5	54.3	102x102x75	1.39	0.50
MC 710, MC 720 AC supply	96	92 ^{+0.8}	5.5	37	213x138x152	5.03	0.75
MC 710, MC 720 DC supply	96	92 ^{+0.8}	5.5	37	213x138x152	5.03	0.65
MC 740, MC 750 AC supply	96	92 ^{+0.8}	5.5	37	213x138x152	5.03	0.80
MC 740, MC 750 DC supply	96	92 ^{+0.8}	5.5	37	213x138x152	5.03	0.65
MC 760 AC supply	110	87.7 ^{+0.8}	19	-	213x138x152	5.03	0.80
MC 760 DC supply	110	87.7 ^{+0.8}	19	-	213x138x152	5.03	0.65
UMC 740 AC supply	110	87.7 ^{+0.8}	19	-	213x138x152	5.03	0.80
UMC 740 DC supply	110	87.7 ^{+0.8}	19	-	213x138x152	5.03	0.65
UMC 750 AC supply	110	87.7 ^{+0.8}	19	-	213x138x152	5.03	0.80
UMC 750 DC supply	110	87.7 ^{+0.8}	19	-	213x138x152	5.03	0.65
UMC 760 AC supply	110	87.7 ^{+0.8}	19	-	213x138x152	5.03	0.75
UMC 760 DC supply	110	87.7 ^{+0.8}	19	-	213x138x152	5.03	0.65

Note: * with/without transformer

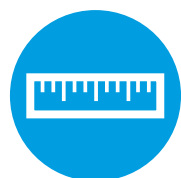
SCALES, MEASURING TRANSDUCERS - weight, dimensions



Scales			
TYPE	Dimensions (mm)	Spread without cutout (mm)	Weight (g)
xQ x107	131 x 129.6	16980	19.81
xQ x207	84.7 x 86.3	7310	8.53
xQ x307	62.7 x 61.4	3850	4.49
xQ x407	39.4 x 40.1	1580	1.84
xQ x507	39.4 x 40.1	1580	1.84

Measuring transducers - weight					
TYPE	Powered from measuring circuit	Universal power supply		AC power supply	
	Weight - kg	Weight - kg	Weight of transducer with communication and 3 outputs - kg	Weight - kg	Weight of transducer with communication - kg
MI 400			0.453	0.445	0.586
MI 401			0.453	0.445	0.586
MI 404			0.453	0.445	0.586
MI 406	0.306				
MI 408	0.306				
MI 413			0.453	0.445	0.586
MI 414			0.453	0.445	0.586
MI 416		0.252		0.342	
MI 418		0.252		0.342	
MI 420		0.252		0.445	
MI 421			0.453	0.455	0.586
MI 436			0.453	0.455	0.586
MI 438			0.453	0.372	0.586
MI 450		0.282		0.372	
MI 452		0.282		0.372	
MI 454		0.282		0.372	
MI 456		0.282		0.372	
MI 458		0.282		0.372	
MI 485		0.293			

Note: Weight in the table includes packing



MEASURING TRANSDUCERS, MEASURING CENTRES, COMMUNICATION ADAPTERS - weight, dimensions

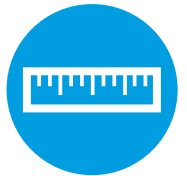
Measuring transducers - dimensions		
TYPE	Dimensions with packing - mm	Volume with packing - dm ³
MT 560/UMT 560	212 x 138 x 155	4.535
MT 550/UMT 550	212 x 138 x 155	4.535
MT 540/UMT 540	212 x 138 x 155	4.535
MI 400	112 x 82 x 105	0.964
MI 401	112 x 82 x 105	0.964
MI 404	112 x 82 x 105	0.964
MI 406	123 x 61 x 87	0.653
MI 408	123 x 61 x 87	0.653
MI 413	112 x 82 x 105	0.964
MI 414	112 x 82 x 105	0.964
MI 416	123 x 61 x 87	0.653
MI 418	123 x 61 x 87	0.653
MI 420	123 x 61 x 87	0.653
MI 421	112 x 82 x 105	0.964
MI 436	112 x 82 x 105	0.964
MI 438	112 x 82 x 105	0.964
MI 450	123 x 61 x 87	0.653
MI 452	123 x 61 x 87	0.653
MI 454	123 x 61 x 87	0.653
MI 456	123 x 61 x 87	0.653
MI 458	123 x 61 x 87	0.653
MI 485	123 x 61 x 87	0.653

Measuring centres			
TYPE	Dimensions with packing (mm)	Volume with packing (dm ³)	Weight (kg)
MC 640, MC 650, MC 660	155 x 215 x 93	3.099	0.4
MC 646, MC 656, MC 666	155 x 215 x 93	3.099	0.55

Communication adapters			
TYPE	Dimensions with packing (mm)	Volume with packing (dm ³)	Weight (kg)
MI 480	123 x 87 x 111	1.19	0.53 AC/0.33 UNI*
MI 485	123 x 87 x 60	0.64	0.32 AC/0.24 UNI*
MI 486/488	123 x 87 x 60	0.64	0.36 AC/0.25 UNI*

* AC -auxiliary power supply; UNI-universal power supply.

ENERGY METERS FOR RAIL MOUNTING - weight, dimensions



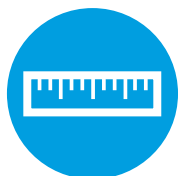
Energy meters for rail mounting - weight, dimensions					
TYPE	WS 0010	WS 0011	WS 0101	WS 0102	WS 1102
Weight (kg)	0.08	0.08	0.64	0.65	0.71
Dimensions with packing	110 x 75 x 25	110 x 75 x 25	127 x 110 x 90	127 x 110 x 90	127 x 110 x 90

Energy meters for rail mounting - weight, dimensions					
TYPE	WS 0301	WS 0302	WS 1302	WS 0030	WS 0031
Weight (kg)	0.45	0.46	0.50	0.25	0.25
Dimensions with packing	127 x 110 x 90	127 x 110 x 90	127 x 110 x 90	275 x 90 x 80 *	275 x 90 x 80 *

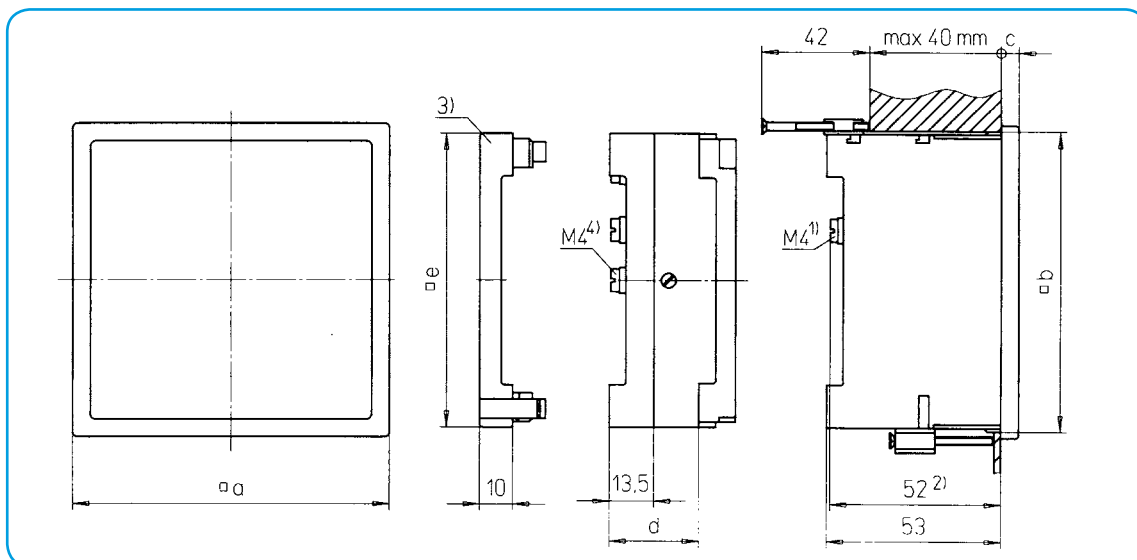
* Packing includes 5 pcs of WS 003x.

Dimensions (on special request)					
TYPE		EQ 0107 YQ 0107	EQ 2107 YQ 2107	EQ 0207 YQ 0207	EQ 2207 YQ 2207
Bezel height (mm)	a	144	144	96	96
Panel cut-out (mm)	b	138 ^{+1.0}	138 ^{+1.0}	92 ^{+0.8}	92 ^{+0.8}
Bezel height (mm)	c	144	144	96	96
Protection cover (mm)	e	90	90	90	92
Scales length (mm)		135	135	95	95
Base (mm)	d	54	54	28	54
Weight approx.		0.9	1.1	0.5	0.7

* Figure on page 180



Panel meters: dimensions

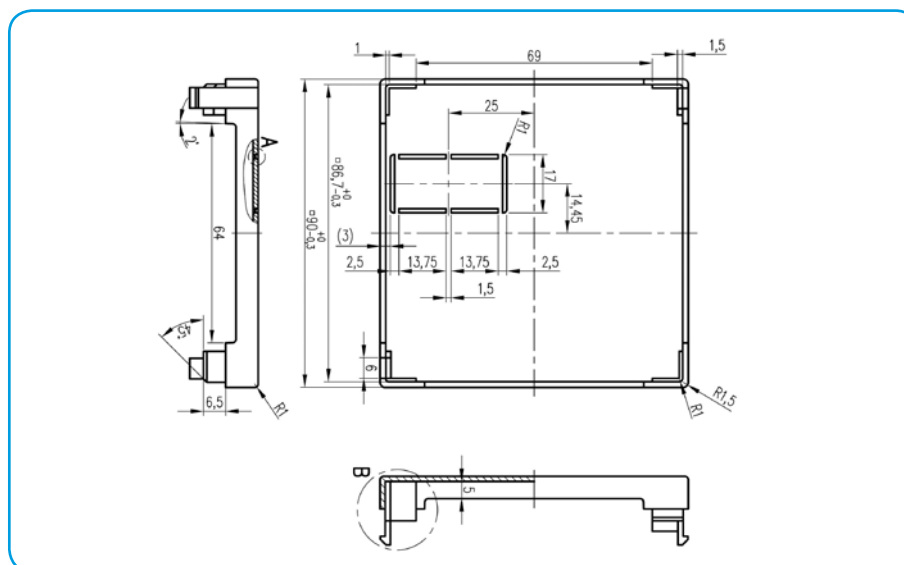


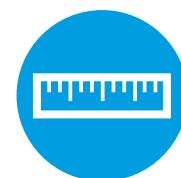
- 1) For ranges FQ = 30...60 A and BQ = 7.5...60 A: M6
- 2) For ranges FQ = 30...60 A and BQ = 7.5...60 A: 59 mm
- 3) Protection cover $e=(Q48 = 42.5 \text{ mm}, Q72=66.5 \text{ mm}, Q96 \text{ and } Q144 = 90 \text{ mm})$

Note: Dimensions of $\square a$, $\square b$, $\square c$ can be seen in table on page 176.

Dimensional drawings of SQ 0xx4 can be seen in table on page 183 and MC/UMC 7x0 on page 184.

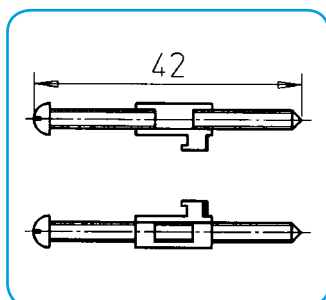
Protection cover for Q96 instruments



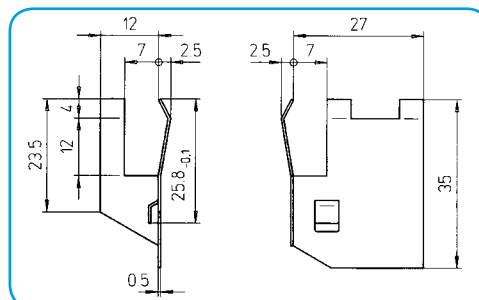


Fixing elements

with a screw

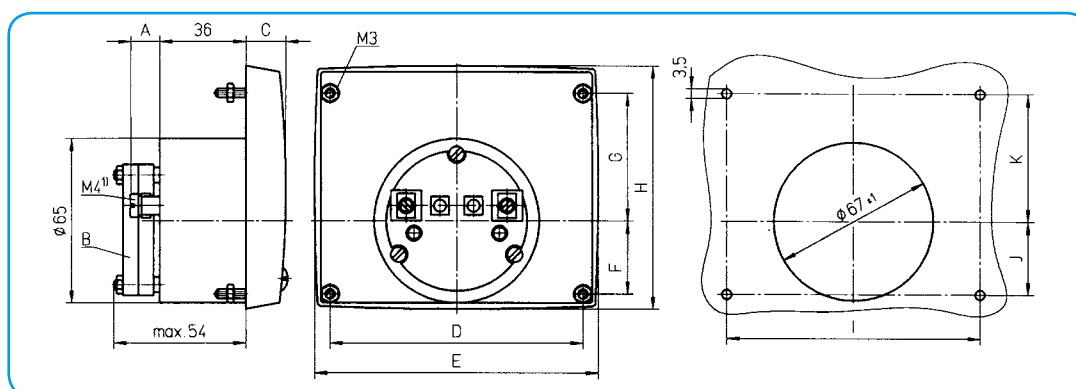


for mosaic fixing

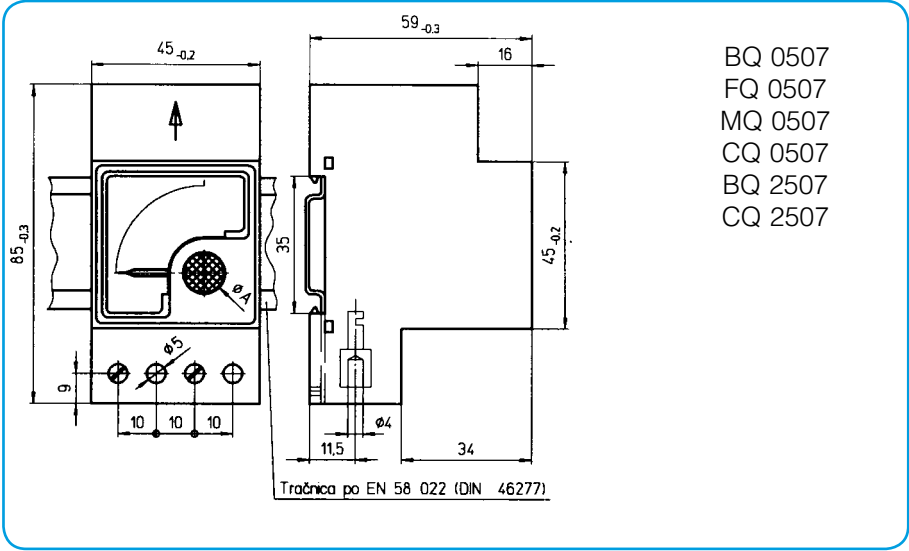
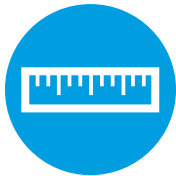


TYPE	DIMENSIONS (mm)							
		A	C	D	E	F	G	H
BN 0103	for ratings from 7.5 A to 60 A	13	11.5	64 ^{+/-0.2}	85	25 ^{+/-0.2}	25 ^{+/-0.2}	72
BN 0103		16.5	11.5	64 ^{+/-0.2}	85	25 ^{+/-0.2}	25 ^{+/-0.2}	72
BN 0203	for ratings from 7.5 A to 60 A	13	16	103 ^{+/-0.2}	105	31 ^{+/-0.2}	51 ^{+/-0.2}	96
BN 0203		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	31 ^{+/-0.2}	51 ^{+/-0.2}	96
FN 0103		132 ¹⁾	11.5	103 ^{+/-0.2}	85	25 ^{+/-0.2}	25 ^{+/-0.2}	72
FN 0201		132 ¹⁾	16	103 ^{+/-0.2}	105	31 ^{+/-0.2}	51 ^{+/-0.2}	96

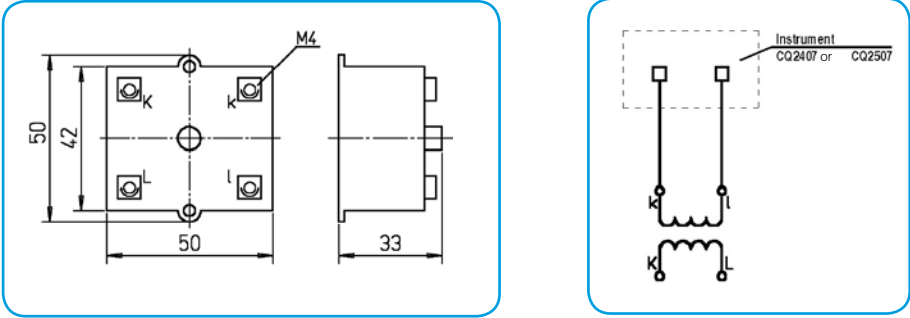
1) for ranges FN = 15...60 A and BN = 7.5...60 A : M6



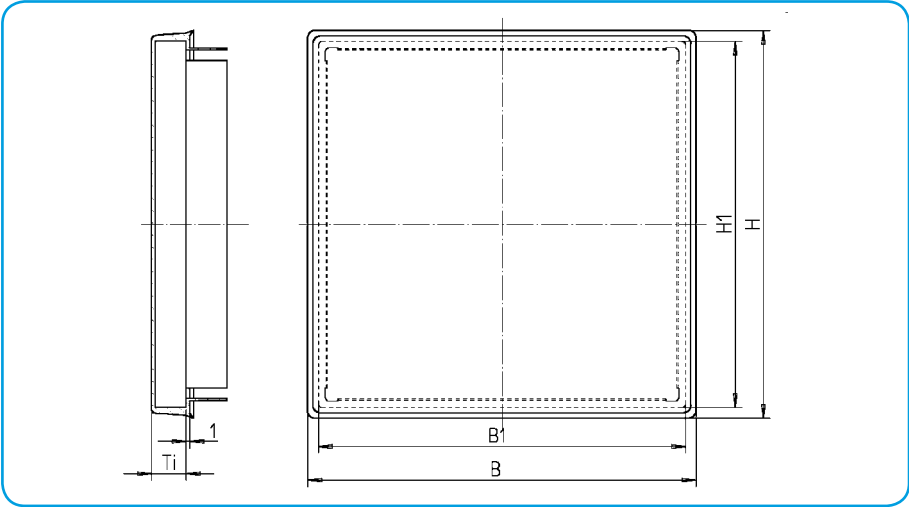
1) for ranges FN = 15...60 A and BN = 7.5...60 A: 16.5 mm



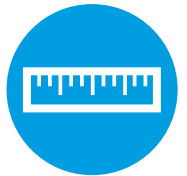
Measuring transformer for add-on 1 or 5 A for CQ 0407 and CQ 2407



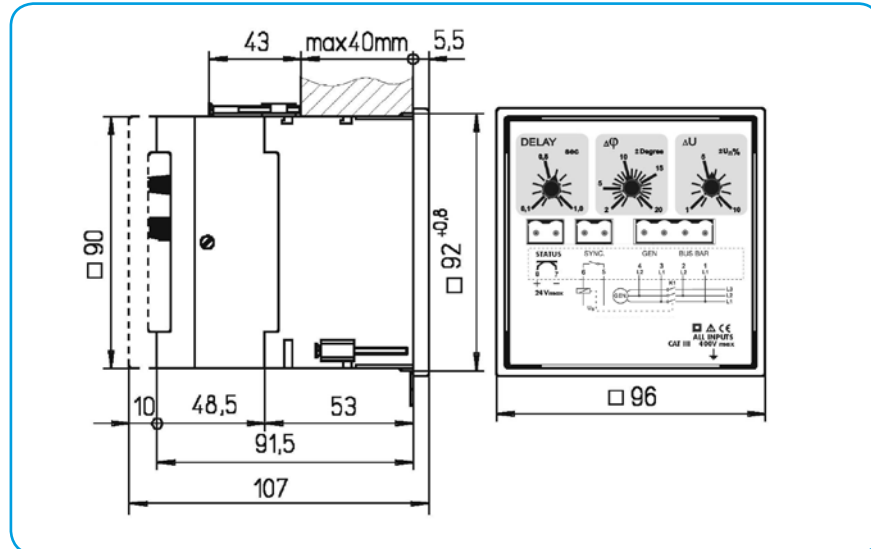
Protection of front side IP65



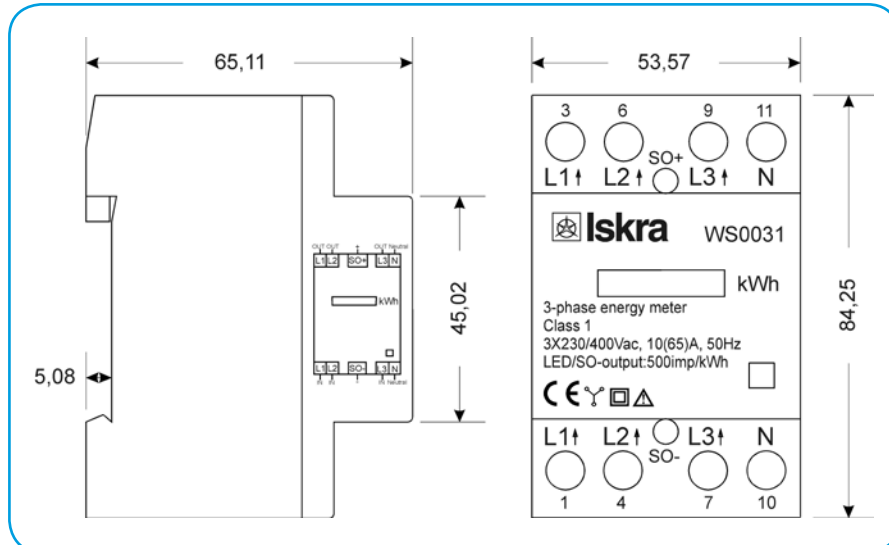
B	H	Ti	B1	H1	Size
54	54	8	48.4	48.4	Q 48
78	78	8	72.4	72.4	Q 72
102	102	8	96.4	96.4	Q 96
150	150	9	144.4	144.4	Q 144



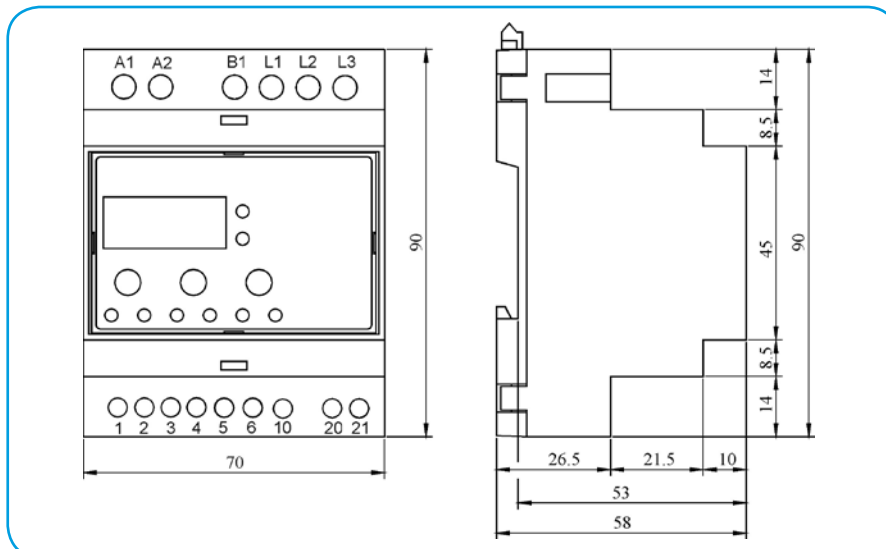
Synchroscope

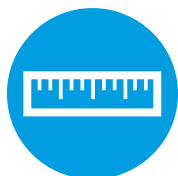


PFC 65

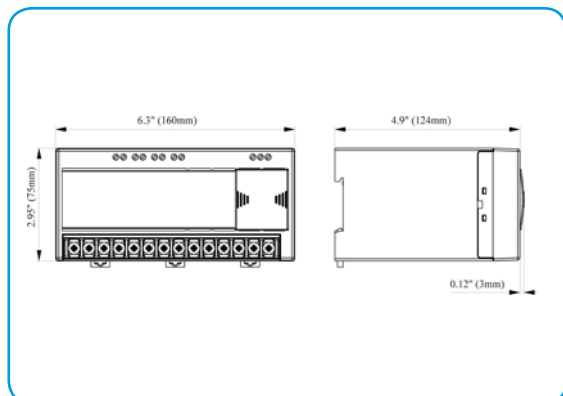


WS 003x

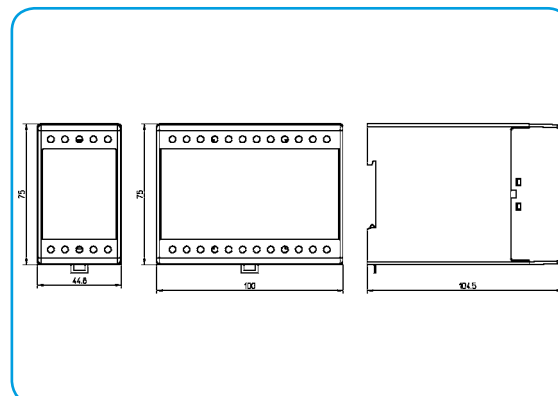




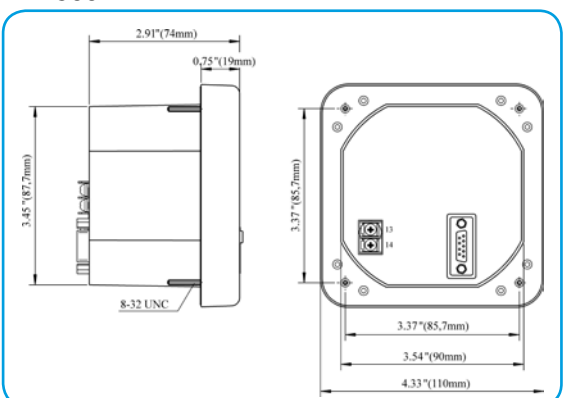
MT 5x0/UMT5x0



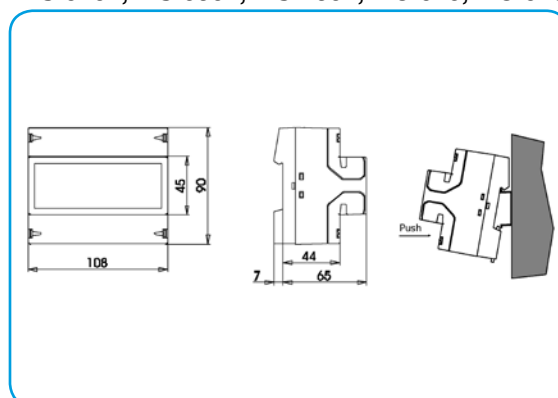
MI 4xx



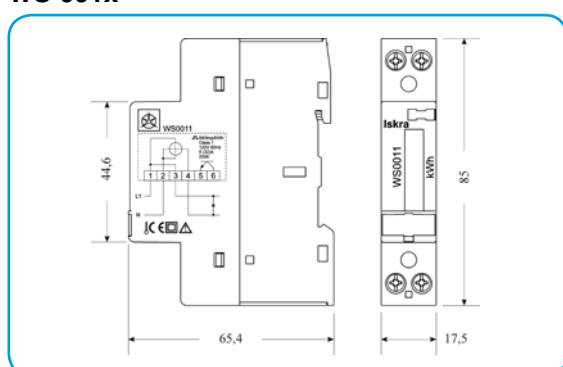
RD 500



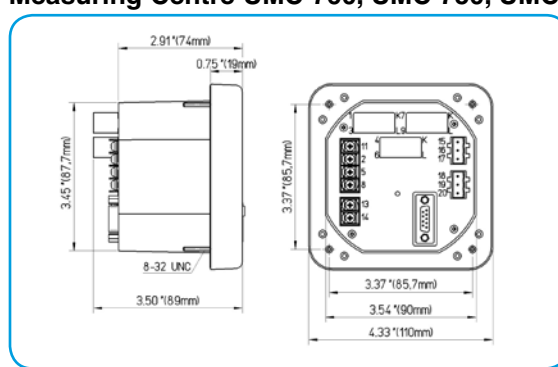
WS 010x, WS 030x, WS 1302, MC 6x0, MC 6x6



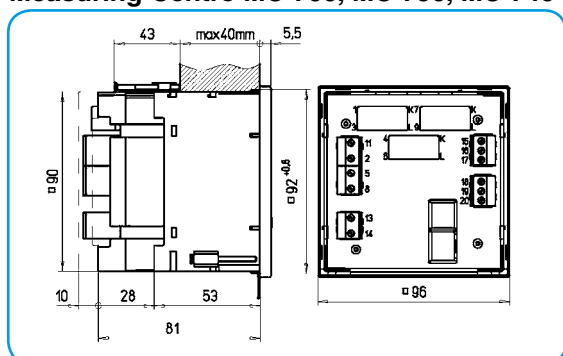
WS 001x



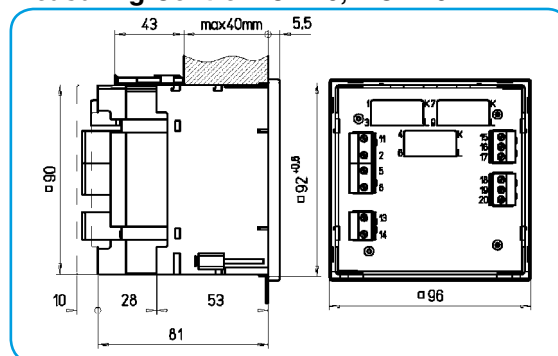
Measuring Centre UMC 760, UMC 750, UMC 740



Measuring Centre MC 760, MC 750, MC 740



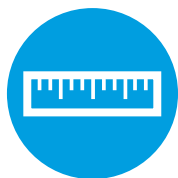
Measuring Centre MC 720, MC 710



CURRENT MEASURING TRANSFORMERS



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						
1. ASK 61.4, ASK 61.4 2U, ASK 61.4 3U 2. ASK 63.4						



CURRENT MEASURING TRANSFORMERS

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

Measuring transformers - dimensions

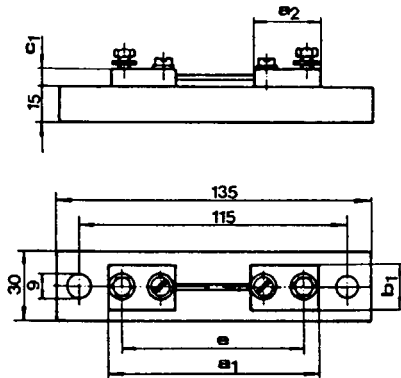
TYPE	Width	Height	Depth (with pedestal)	Primary cable	Diameter	Weight range	
ASR 20.3	44	65	30 (62)	-	21	0.152	0.191
ASR 201.3	44	64.5	30	-	21	0.150	0.190
ASR 21.3	48,5	65	30 (62)	-	22,5	0.230	0.280
ASR 22.3	60	78.5	30 (62)	-	22,5	0.250	0.280
ASK 205.3	48,5	65	30 (62)	20 x 5	17,5	0.200	0.198
ASK 21.3	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	40 (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 15	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 (132)	120 x 90	100	3.000	3.400
WSK 30	60	78.5	30 (62) mm	-	-	0.290	0.270
WSK 40	70	88.5	40 (72) mm	-	-	0.320	0.412
WSK 60	70	88.5	60 (92) mm	-	-	0.410	0.460
WSK	70	85	60 (76) mm	-	-	0.520	0.580

All dimensions are in mm

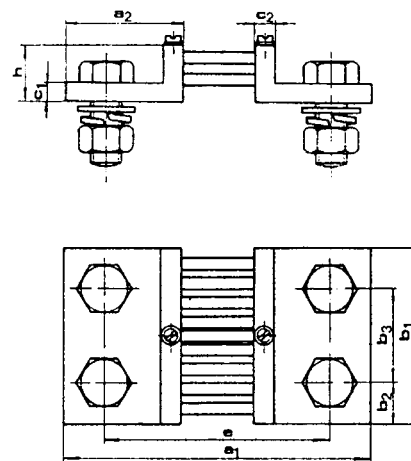
SHUNTS



A



B

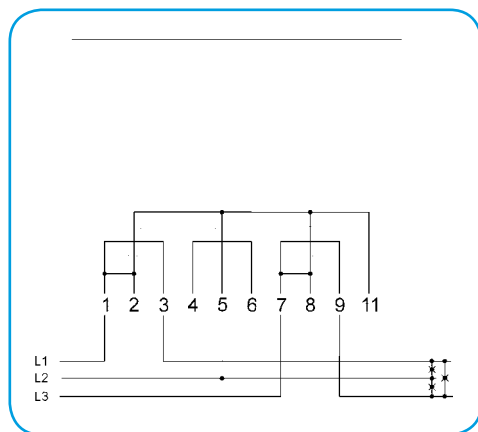


Dimensions (mm)	Current through separate shunt (A)							
	1, 1.5, 2.5, 4 6 10 15 25	40 60 100 150	250	400	600	1000	1500	2500
	Possibility A		Possibility B					
a1	90	100	145			165		
a2	28	33	55			65		
b1	20	20	30	40	40	60	90	120
b2	-	-	15	20	20	30	21	30
b3	-	-	-			-	48	60
c1	8	8	10					
c2	-	-	10					
e	78	80	105			115		
h1	-					30		
No. of terminals			2 x 1			2 x 2		
Fixing screw	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							

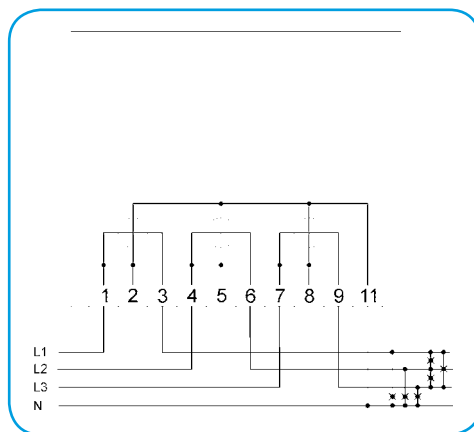


CONNECTION DIAGRAMS FOR WS x1xx, WS x3xx, WS 001x, WS 0030, WS 0031

WS x1xx

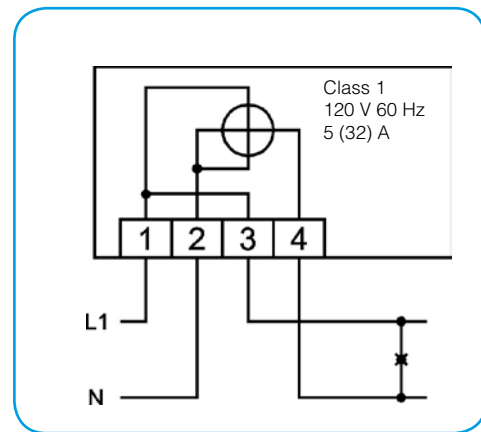


3u



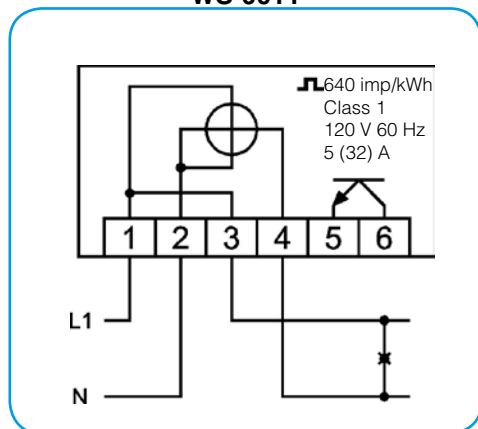
4u

WS 0010



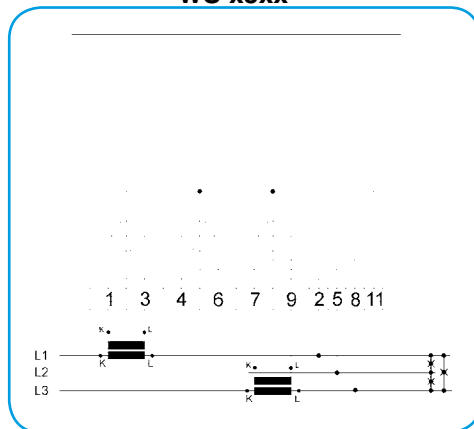
4u

WS 0011

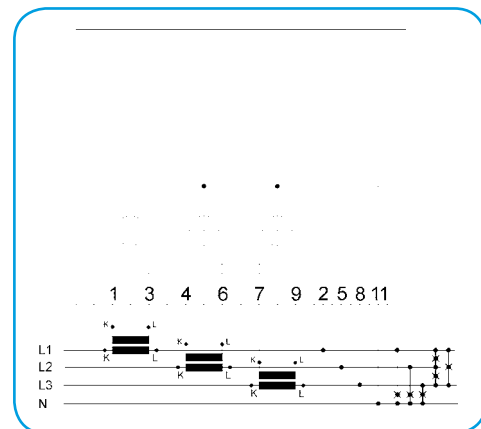


WS 0011

WS x3xx

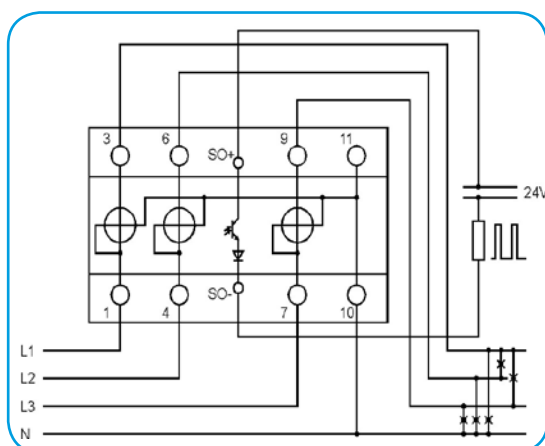


3u

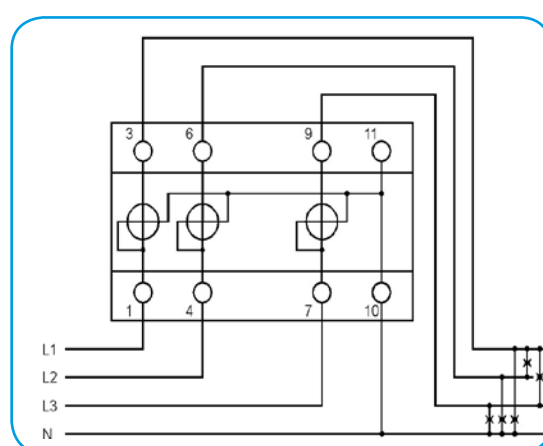


4u

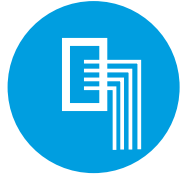
WS 0030



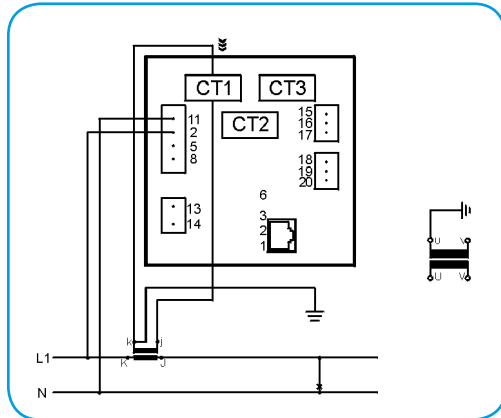
WS 0031



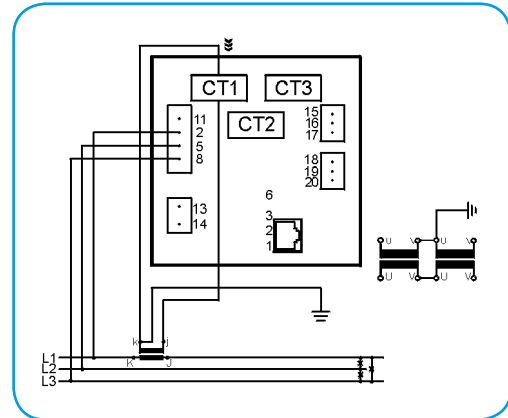
CONNECTION DIAGRAMS FOR MC 7x0/UMC 7x0 - Ethernet



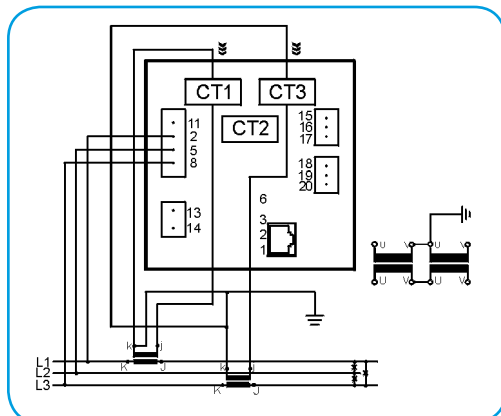
Converter voltage inputs can be connected directly to low-voltage network or they can be connected via a high-voltage transformer to high-voltage network. Current inputs shall be connected to network via a corresponding current transformer.



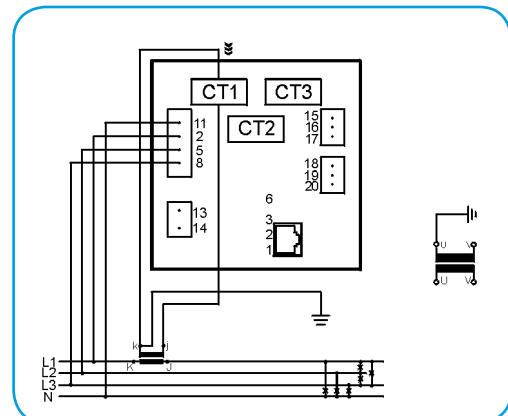
1b - single phase, balanced load



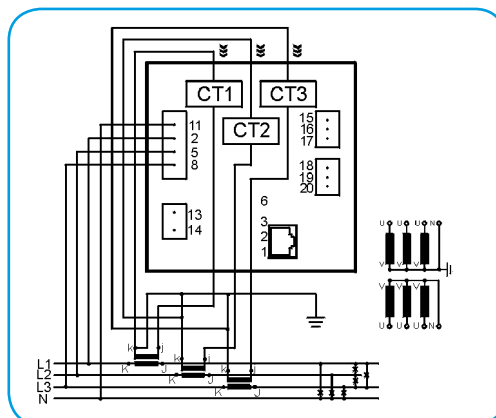
3b - three-phase, three wires, balanced load



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



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

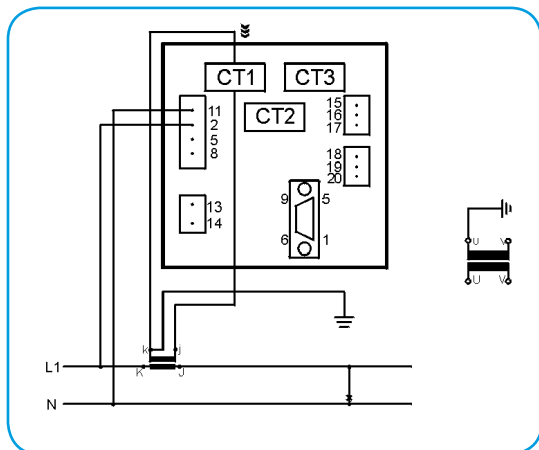


4u - three-phase, four wires, unbalanced load

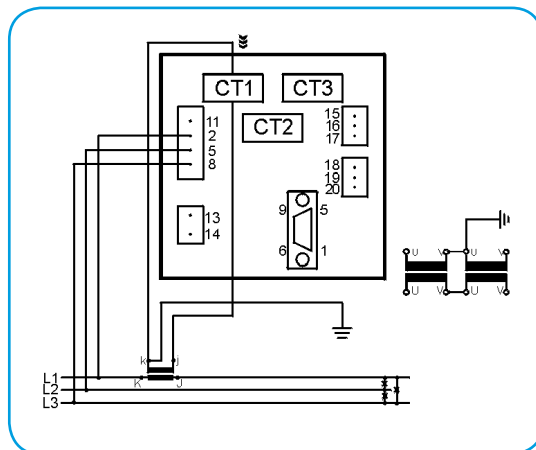


CONNECTION DIAGRAMS FOR MC 7x0/UMC 7x0 - RS232/485

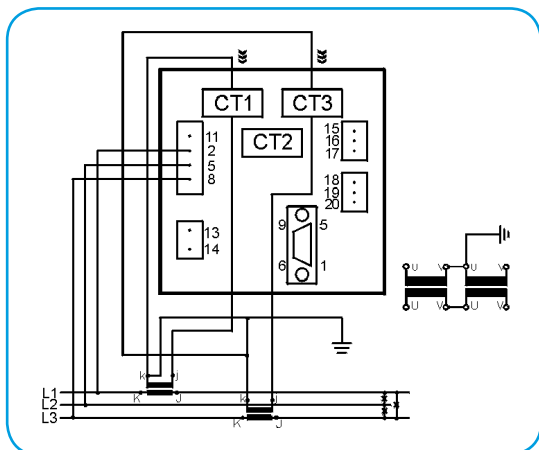
Converter voltage inputs can be connected directly to low-voltage network or they can be connected via a high-voltage transformer to high-voltage network. Current inputs shall be connected to network via a corresponding current transformer.



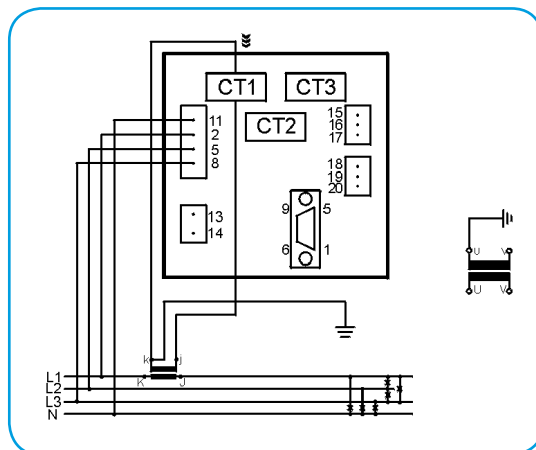
1b - single phase, balanced load



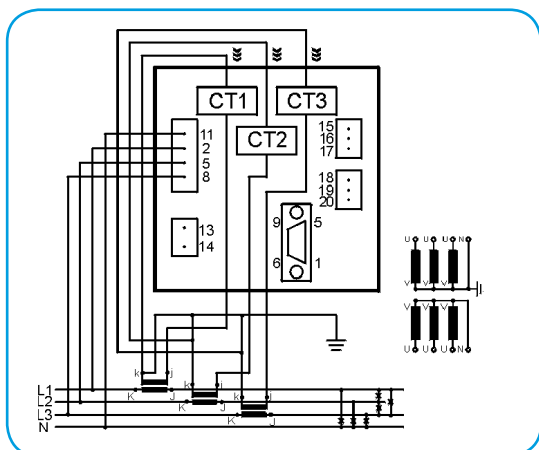
3b - three-phase, three wires, balanced load



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

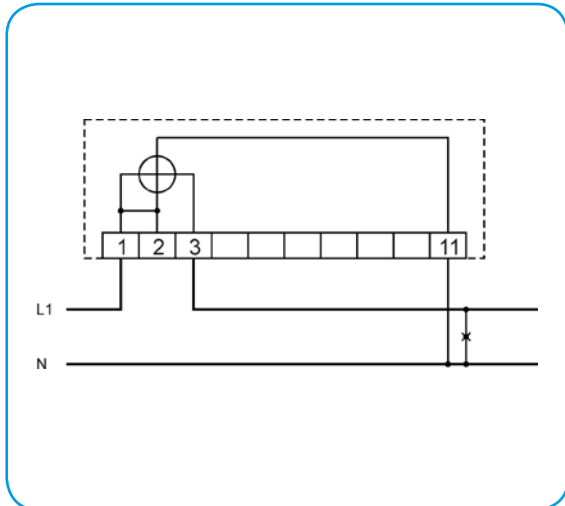


4b - three-phase, four wires, balanced load

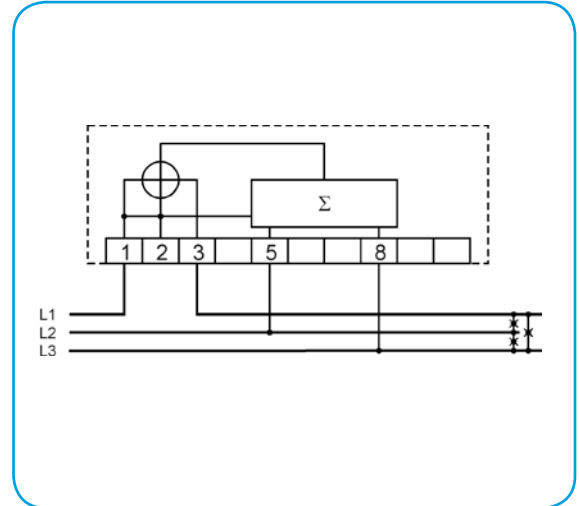


4u - three-phase, four wires, unbalanced load

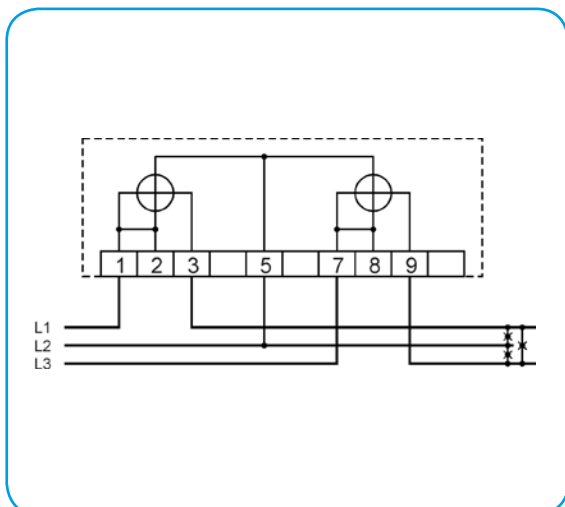
CONNECTION DIAGRAMS FOR MC 6x6 (DIRECT CONNECTION)



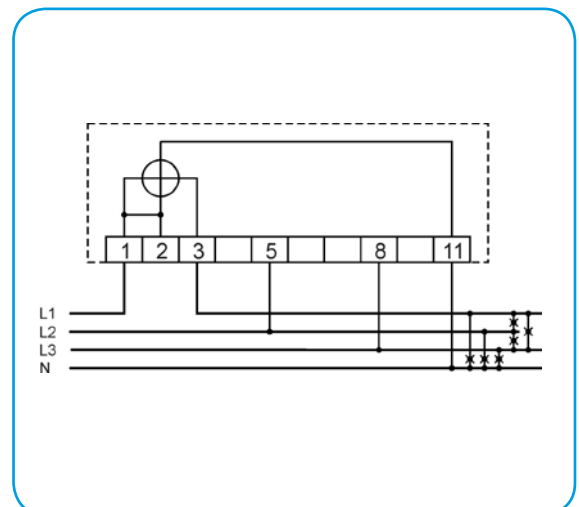
1b – single phase, balanced load



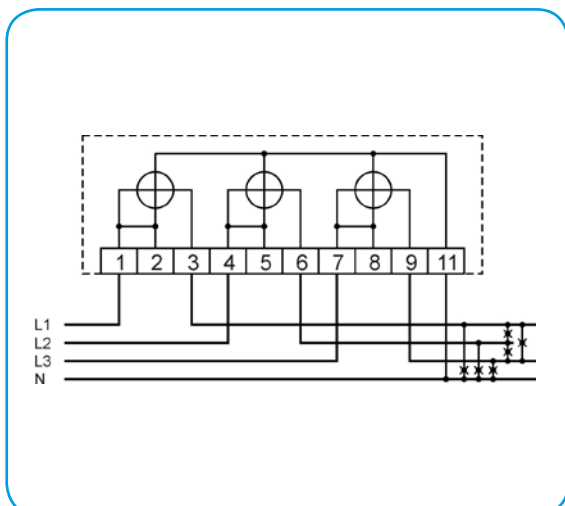
3b – three-phase, three wires, balanced load



3u – three-phase, three wires, balanced load



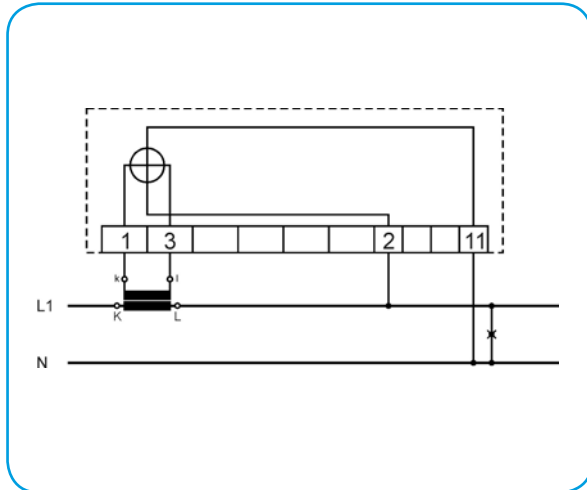
4b – three-phase, four wires, balanced load



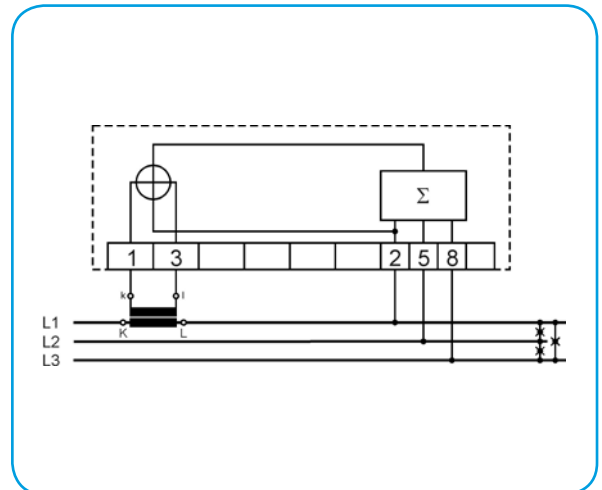
4u –three-phase, four wires, unbalanced load



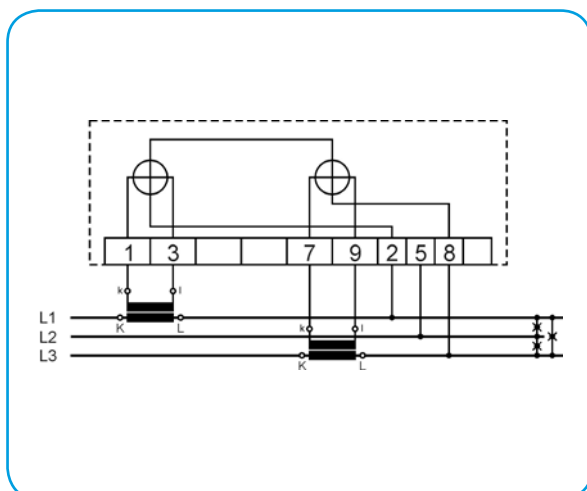
CONNECTION DIAGRAMS FOR MC 6x0 (CONNECTION VIA CURRENT TRANSFORMER)



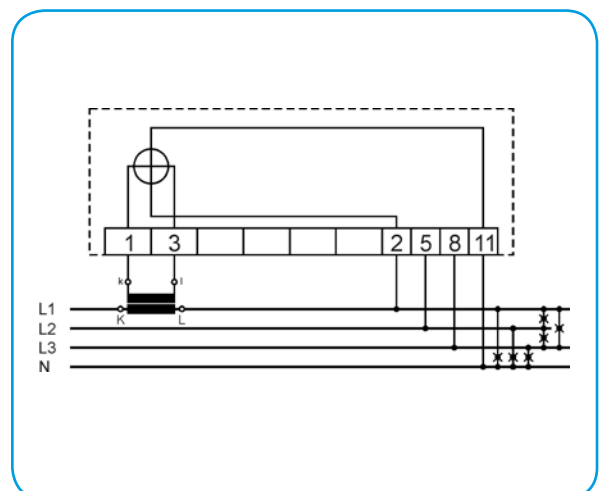
1b – single phase, balanced load



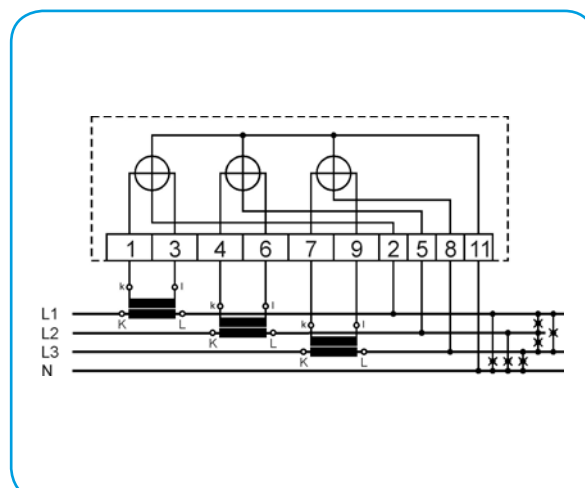
3b – three-phase, three wires, balanced load



3u – three-phase, three wires, balanced load

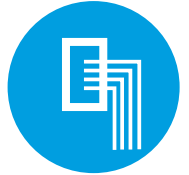


4b – three-phase, four wires, balanced load



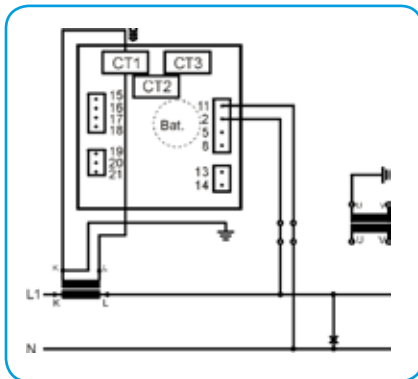
4u – three-phase, four wires, unbalanced load

CONNECTION DIAGRAMS FOR PANEL METERS

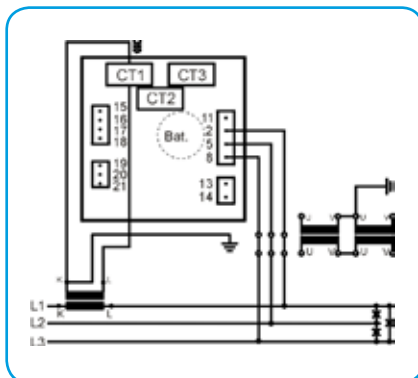


	1b	3b	3u	4b	4u
YQ xx07	*	*	*	*	*
EQ xx07		*	*	*	*
WQ xx07	*	*	*	*	*

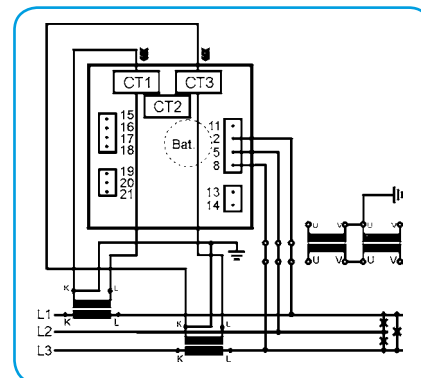
b – balanced load
u – unbalanced load



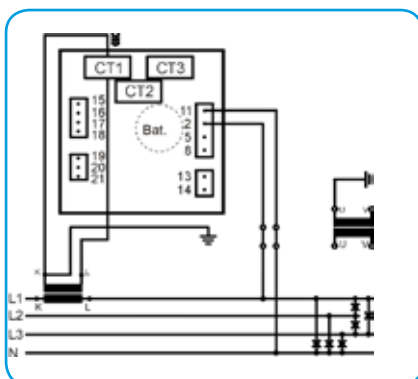
1b



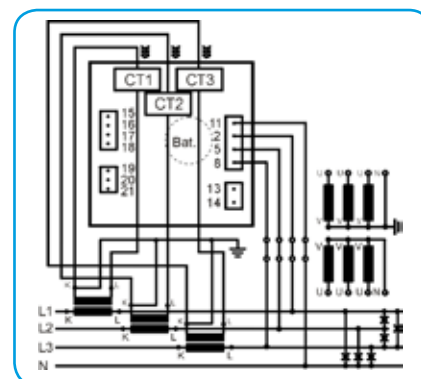
3b



3u



4b



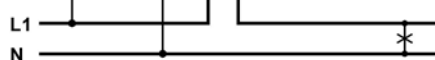
4u

Note: Connection terminals 19,20,21 are missing at EQ YQ, WQ types.
 Connection terminals 13, 14 are available only for instruments with external power supply.



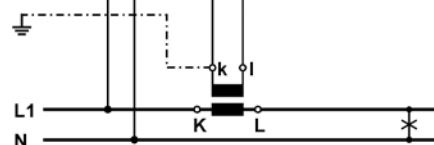
CONNECTION DIAGRAMS FOR MT 5x0/UMT 5x0 MEASURING TRANSDUCTORS

13 14 12 2 5 8 11 1 3 4 6 7 9



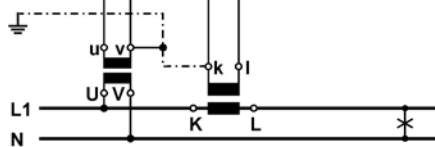
1b – single phase

13 14 12 2 5 8 11 1 3 4 6 7 9



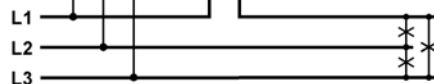
1b – single phase

13 14 12 2 5 8 11 1 3 4 6 7 9



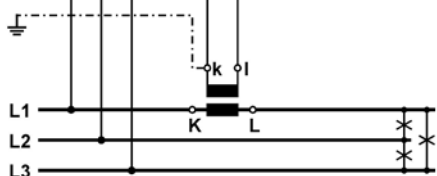
1b – single phase

13 14 12 2 5 8 11 1 3 4 6 7 9



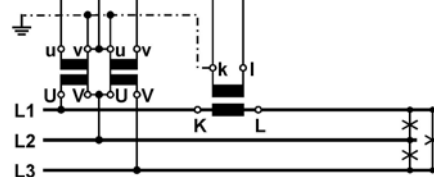
3b – three-phase, three wires, balanced load

13 14 12 2 5 8 11 1 3 4 6 7 9



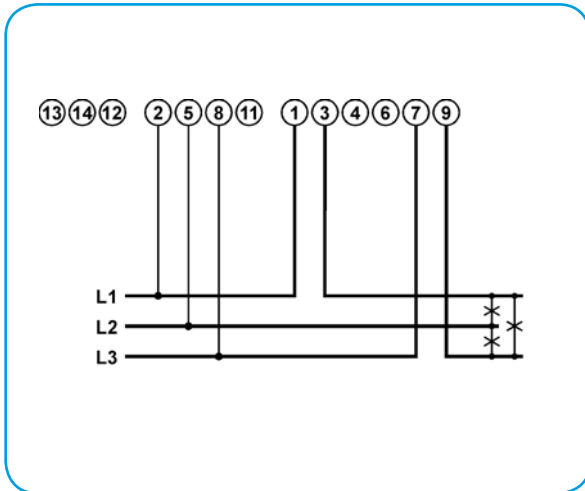
3b – three-phase, three wires, balanced load

13 14 12 2 5 8 11 1 3 4 6 7 9

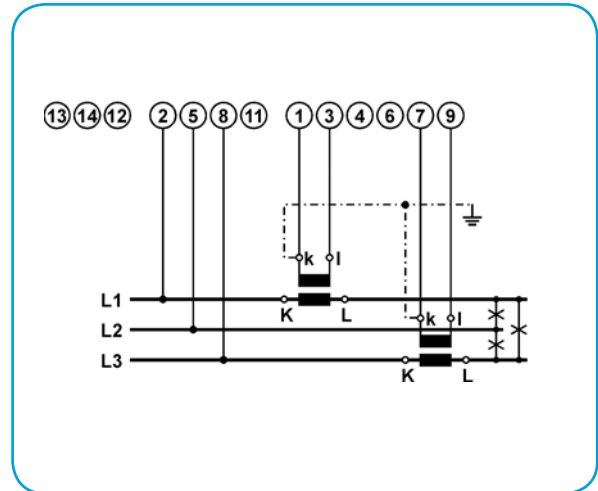


3b – three-phase, three wires, balanced load

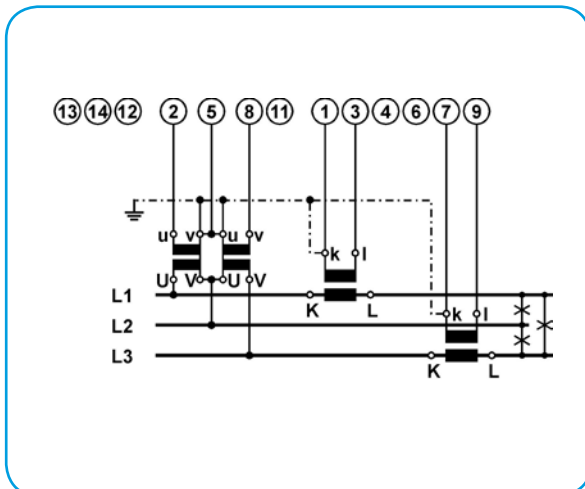
CONNECTION DIAGRAMS FOR MT 5x0/UMT 5x0 MEASURING TRANSDUCTORS



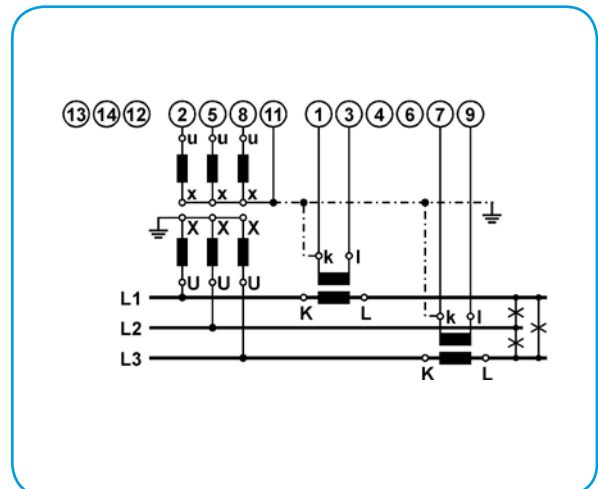
3u – three-phase, three wires, unbalanced load



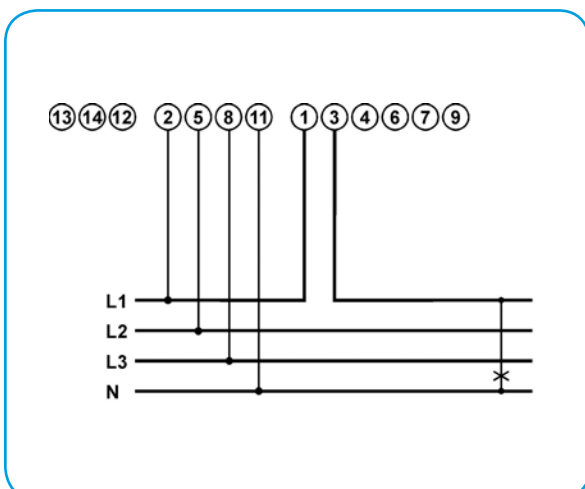
3u – three-phase, three wires, unbalanced load



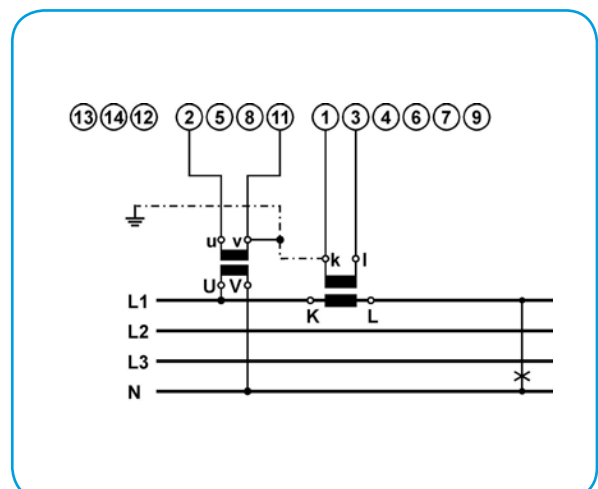
3u – three-phase, three wires, unbalanced load



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



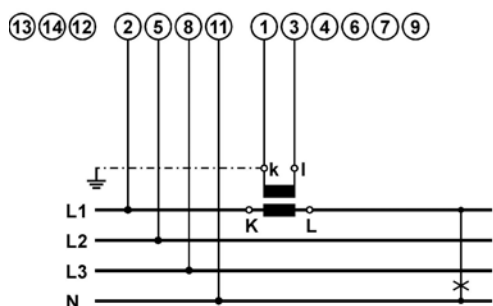
4b – three-phase, four wires, unbalanced load



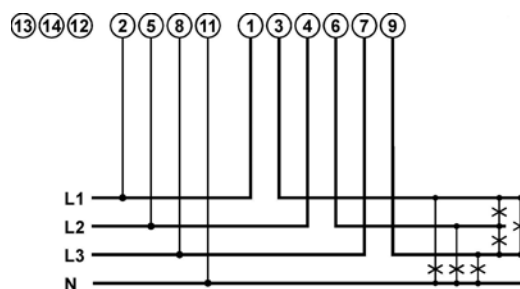
4b – three-phase, four wires, unbalanced load



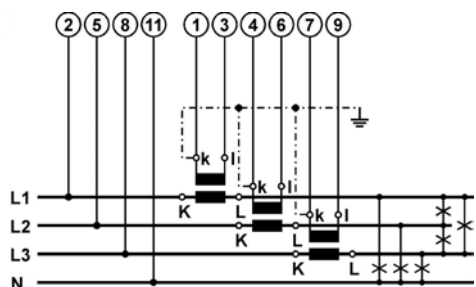
CONNECTION DIAGRAMS FOR MT 5x0/UMT 5x0 MEASURING TRANSDUCTORS



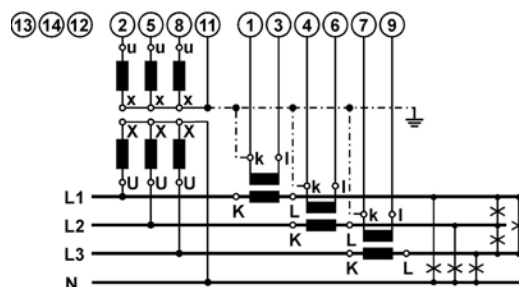
4b – three-phase, four wires, unbalanced load



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

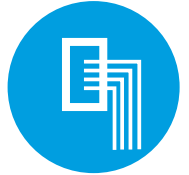


4u – three-phase, four wires, unbalanced load

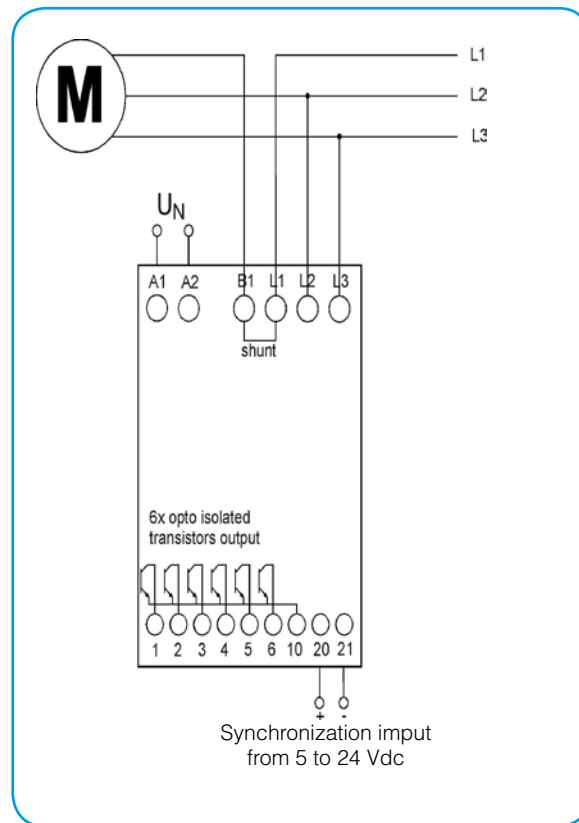


4u – three-phase, four wires, unbalanced load

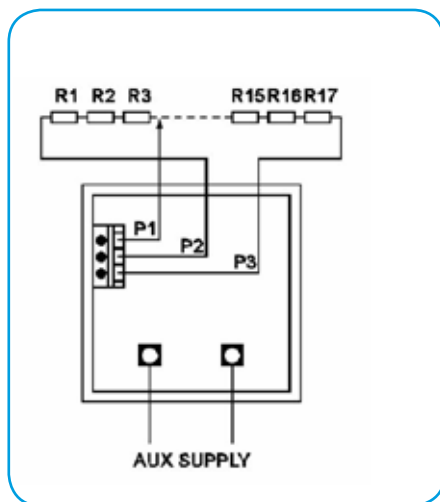
CONNECTION DIAGRAMS FOR PFC 65 AND FOR TAP POSITION METERS



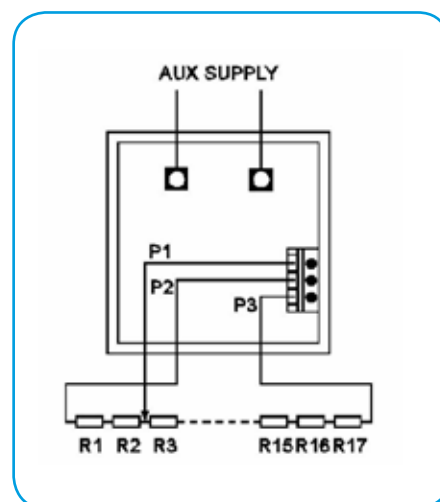
CONNECTION DIAGRAM FOR PFC 65



CONNECTION DIAGRAMS FOR TAP POSITION METERS



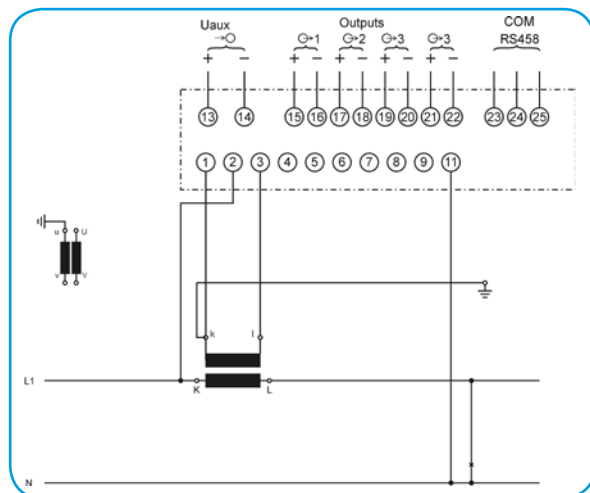
CQ 2207



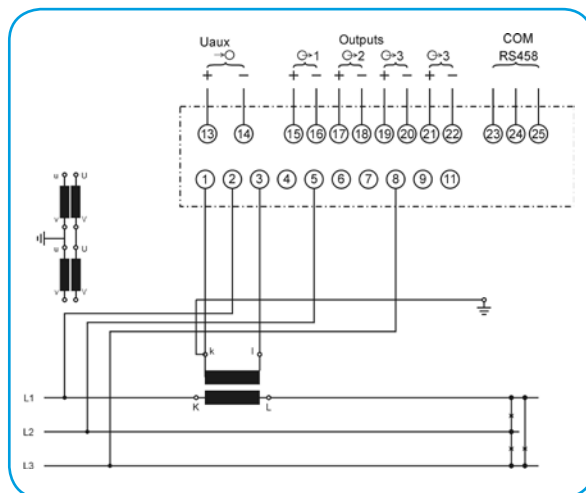
CQ 0207



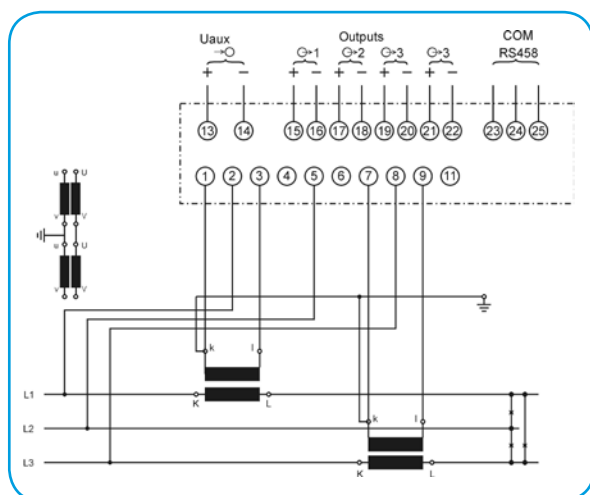
CONNECTION DIAGRAMS FOR MEASURING TRANSDUCER MI 404



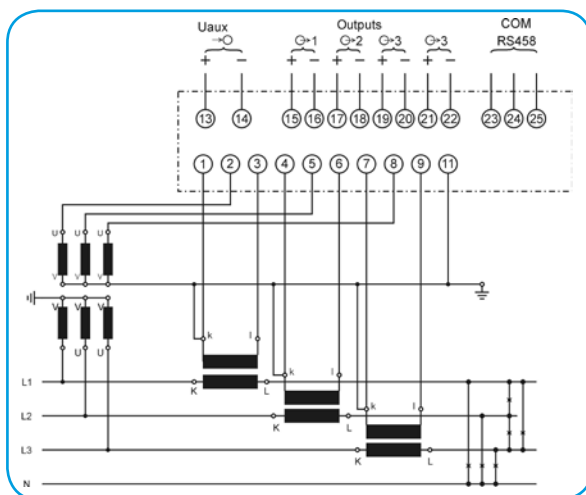
MI 404 – 1b



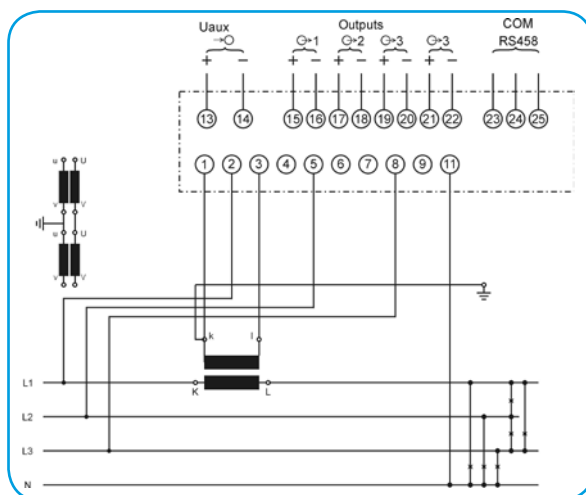
MI 404 – 3b



MI 404 – 3u

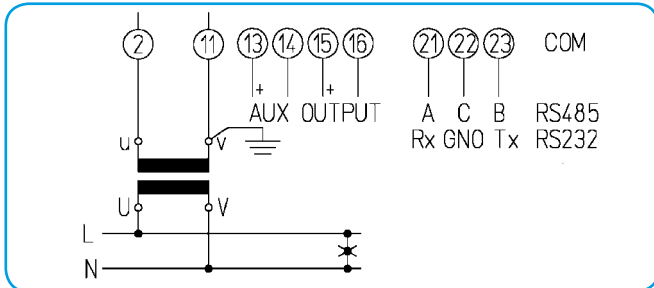


MI 404 – 4u

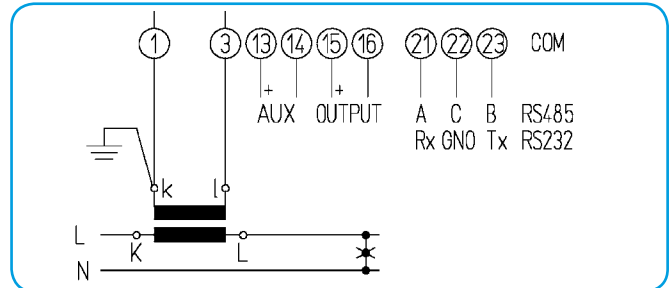


MI 404 – 4b

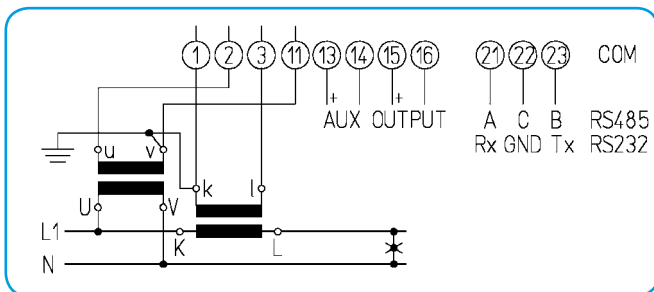
CONNECTION DIAGRAMS FOR MEASURING TRANSDUCERS MI 4xx



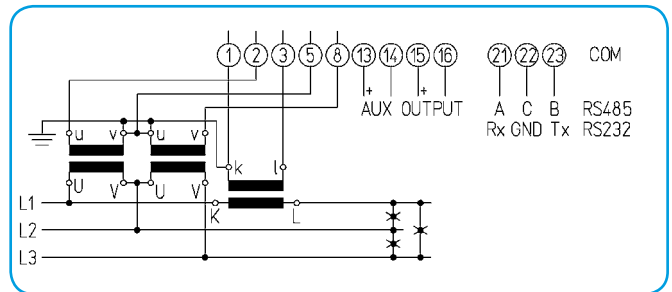
MI 406*, MI 416, MI 420, * without AUX and COM



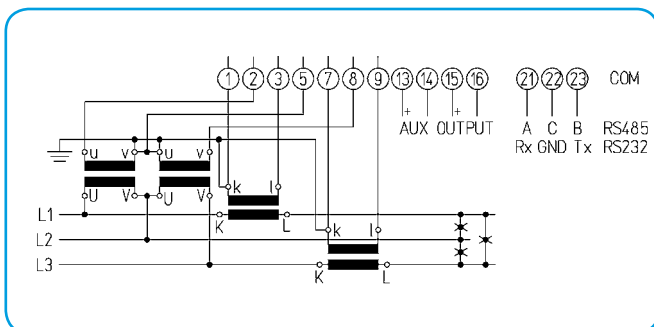
MI 408*, MI 418 * without AUX and COM



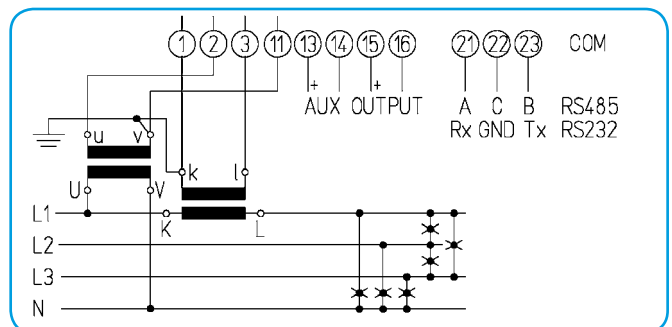
MI 400, MI 413-1b, MI 414-1br, MI 421-1b



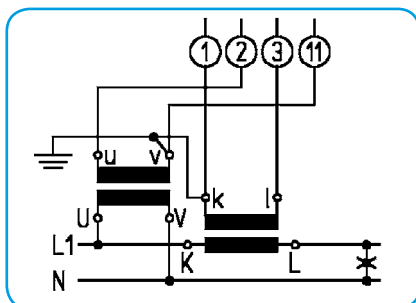
MI 400, MI 413-3b, MI 414-3br, MI 421-3b



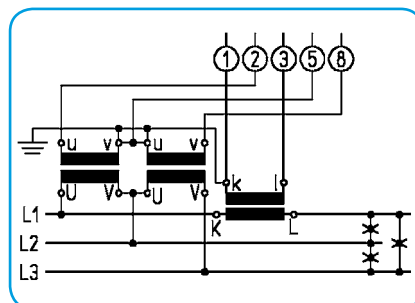
MI 400, MI 413-3u, MI 414-3ur, MI 421-3u



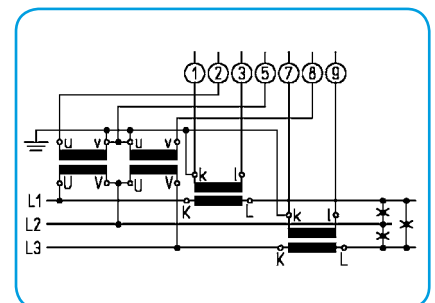
MI 400, MI 413-4b, MI 414-4br, MI 421-4b



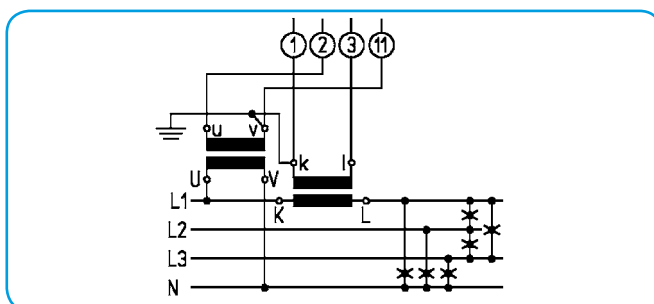
MI 401- 1b



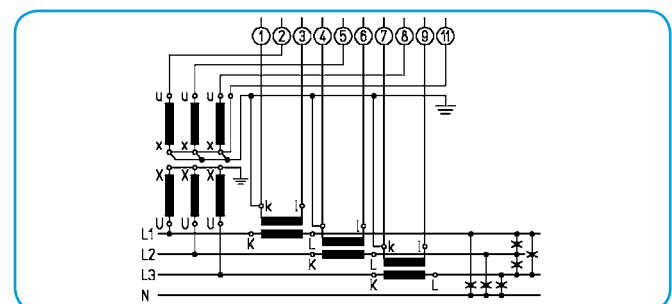
MI 401 -3b



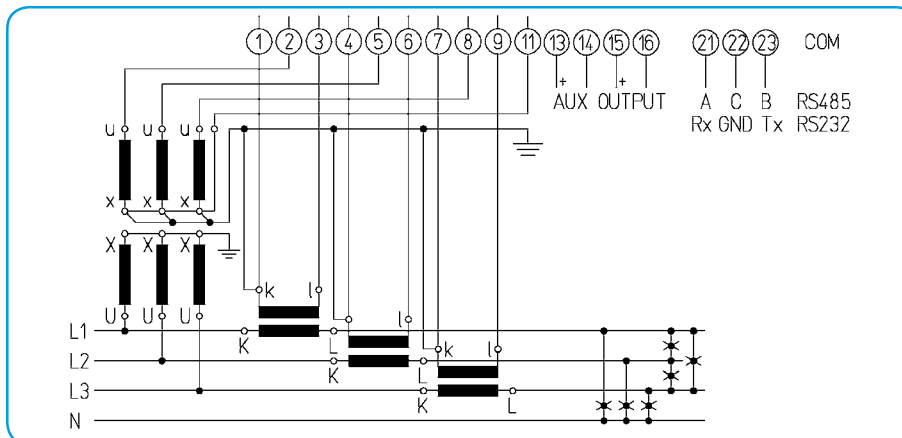
MI 401 - 3u



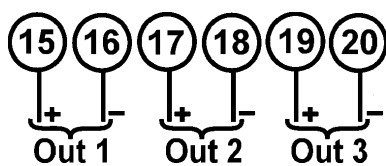
MI 401- 4b



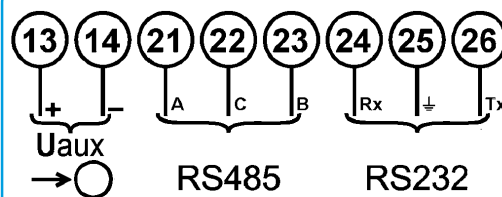
MI 401 - 4u



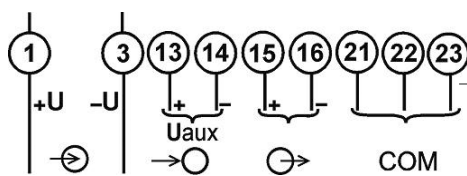
MI 400, MI 413-4u, MI 414-4ur, MI 421-4u



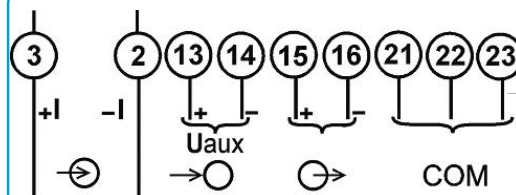
Transducers can have up to four analogue outputs



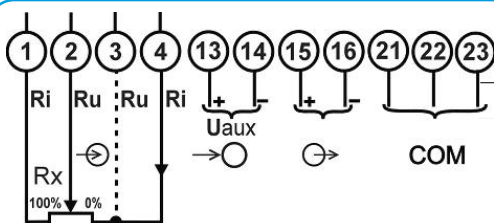
MI 485



MI 456

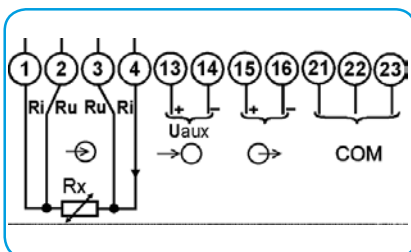


MI 458

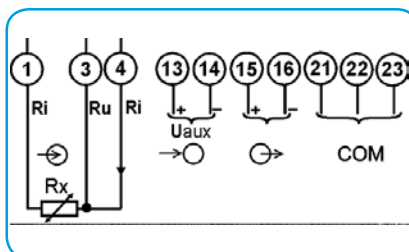


MI 454

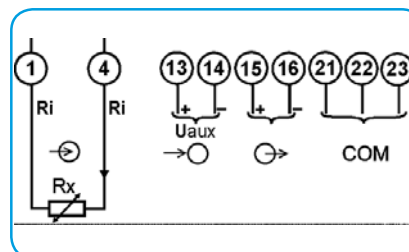
Note:
Auxiliary supply on connection
terminals 13 (-) and 14 (+),
output on connection terminals 15 (-)
and 16 (+).



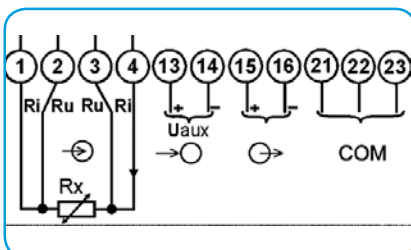
MI 452, 4-wire



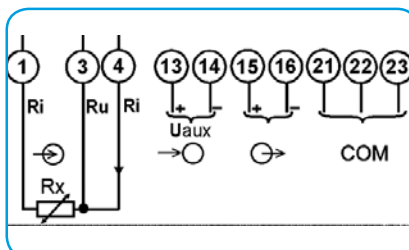
MI 452, 3-wire



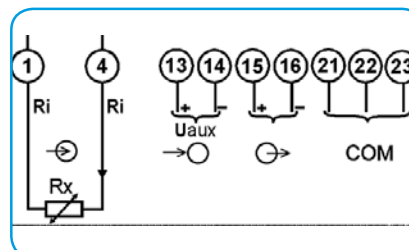
MI 452, 2-wire



MI 450, 4-wire



MI 450, 3-wire



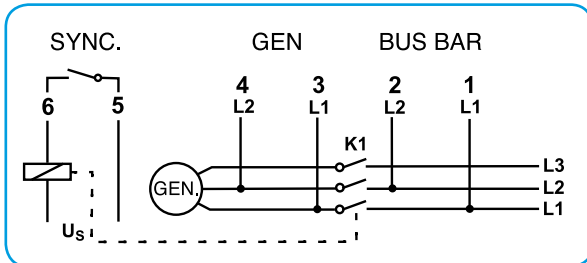
MI 450, 2-wire

CONNECTION DIAGRAMS

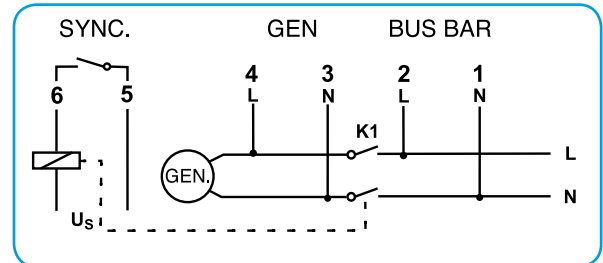
for ZQ 120x, FQ 120x, CQ 3207, FQ 3x07, SQ 02x4, SQ 01x4, FQ 1108, ZQ 1108



Connection diagram for: SQ 02x4, SQ 01x4



Phase to phase connection

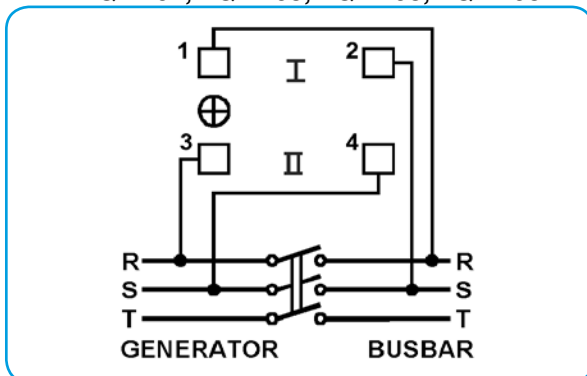


Phase to neutral connection

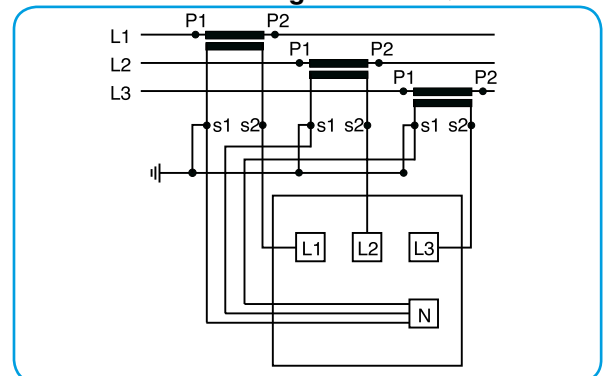
Connection terminal number	Connection designation	Use of terminal
1	L1 ¹⁾	System voltage
2	L2 ¹⁾	System voltage
3	L1 ¹⁾	Generator voltage
4	L2 ¹⁾	Generator voltage
5	SYNC.	Relay output
6	SYNC.	Relay output
7	STATUS	Status output
8	STATUS	Status output

¹⁾ In the case of phase to neutral connection, the connection scheme on the back side of the synchroscope (upper pictures) is different, connection terminal designations are "L" and "N".

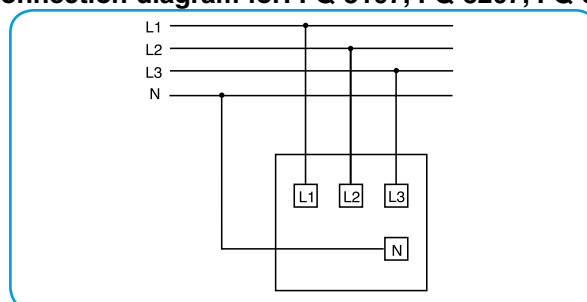
Connection diagram for: ZQ 1207, ZQ 1208, FQ 1207, FQ 1208, FQ 1108, ZQ 1108



Connection diagram for: CQ 3207



Connection diagram for: FQ 3107, FQ 3207, FQ 3307



OVERLOADS OF SHORT DURATION

Test specimen	Span	After test	Overload current	Remark
CQ 2207	1 A	OK	0.5 s; 25 x I _n	
CQ 2207	1 A	OK	0.5 s; 30 x I _n	
CQ 2207	1 A	OK	0.5 s; 50 x I _n	
CQ 2207	1 A	OK	1 s; 25 x I _n	
CQ 2207	1 A	OK	1 s; 25 x I _n	
CQ 2207	1 A	OK	1 s; 25 x I _n	
CQ 2207	5 A	OK	0.5 s; 25 x I _n	
CQ 2207	5 A	OK	0.5 s; 30 x I _n	
CQ 2207	5 A	NOK	0.5 s; 50 x I _n	Max. current, 202 A
CQ 2207	5 A	OK	1 s; 25 x I _n	
CQ 2207	5 A	OK	1 s; 30 x I _n	
CQ 2207	5 A	OK	1 s; 40 x I _n	
EQ 2207	1 A	OK	0.5 s; 25 x I _n	
EQ 2207	1 A	OK	0.5 s; 30 x I _n	
EQ 2207	1 A	OK	0.5 s; 50 x I _n	
EQ 2207	1 A	OK	1 s; 25 x I _n	
EQ 2207	1 A	OK	1 s; 30 x I _n	
EQ 2207	1 A	OK	1 s; 50 x I _n	
EQ 2207	5 A	OK	1 s; 25 x I _n	
EQ 2207	5 A	OK	1 s; 30 x I _n	
EQ 2207	5 A	OK	1 s; 50 x I _n	
FQ 0207	1 A	OK	0.5 s; 25 x I _n	
FQ 0207	1 A	OK	0.5 s; 30 x I _n	
FQ 0207	1 A	OK	0.5 s; 50 x I _n	
FQ 0207	1 A	OK	1 s; 25 x I _n	
FQ 0207	1 A	OK	1 s; 30 x I _n	
FQ 0207	1 A	OK	1 s; 50 x I _n	
FQ 0207	5 A	OK	0.5 s; 25 x I _n	
FQ 0207	5 A	OK	0.5 s 30 x I _n	
FQ 0207	5 A	OK	0.5 s; 50 x I _n	
FQ 0207	5 A	OK	1 s; 50 x I _n	

Type of product

Conformity to standard

Measuring centres

MC 760	IEC 62052-11 : 2004 - Electricity metering equipment (ac) General requirements, tests and test conditions Part 11: Metering equipment* IEC 62053-21:2003 - Electricity metering equipment (a.c.) Particular requirements - Part 21: Static meters for active energy (classes 1 and 2) IEC 62053-31:2003 - Electricity metering equipment (a.c.) Particular requirements - Part 31: Pulse output devices for electro mechanical and electronic meters (two wires only) IEC 61010-1: 2001- Safety requirements for electrical equipment for measurement , control and laboratory use - Part 1: General requirements IEC 61326-1: 2003 - EMC requirements for electrical equipment for measurement, control and laboratory use - Part 1: General requirements IEC 61000-4-5: 2001 - Electromagnetic compatibility (EMC) - Part 4-5: Testing and measurements techniques - Surge immunity test IEC 61000-4-7: 2002 - Electromagnetic compatibility (EMC) - Part 4-7: Testing and measurements techniques - General guide on harmonics and interharmonics measurements and instrumentation, for power supply systems and equipment connected thereto IEC 61000-4-15: 2003 - Electromagnetic compatibility (EMC) - Part 4: Testing and measurements techniques - Section 15: Flickermeter - Functional and design specifications IEC 61000-4-30: 2003 - Electromagnetic compatibility (EMC) - Part 4-30: Testing and measurements techniques - Power quality measurement methods
MC 750, MC 740, MC 720	IEC 62052-11 : 2004 - Electricity metering equipment (ac) General requirements, tests and test conditions Part 11: Metering equipment* IEC 62053-21:2003 - Electricity metering equipment (a.c.) Particular requirements - Part 21: Static meters for active energy (classes 1 and 2) IEC 61010-1: 2001 - Safety requirements for electrical equipment for measurement, control and laboratory use - Part 1: General requirements IEC 61326-1: 2003 - EMC requirements for electrical equipment for measurement, control and laboratory use - Part 1: General requirements IEC 61000-4-5: 2001 - Electromagnetic compatibility (EMC) - Part 4-5: Testing and measurements techniques - Surge immunity test
MC 710	IEC 61010-1: 2001 - Safety requirements for electrical equipment for measurement, control and laboratory use - Part 1: General requirements IEC 61326-1: 2003 - EMC requirements for electrical equipment for measurement, control and laboratory use - Part 1: General requirements IEC 61000-4-5: 2001 - Electromagnetic compatibility (EMC) - Part 4-5: Testing and measurements techniques - Surge immunity test

Measuring transducers

MI 401	IEC 62052-11 : 2004 - Electricity metering equipment (ac) General requirements, tests and test conditions Part 11: Metering equipment* IEC 62053-21 : 2004 - Particular requirements Part 21: Static meters for active energy (classes 1 and 2)* IEC 62053-23 : 2004 - Particular requirements Part 23: Static meters for reactive energy (classes 2 and 3)* IEC 60688 : 1995, A1 : 2001 , A2 : 2002 - Electrical measuring transducers for converting a.c. electrical quantities to analogue or digital signals IEC 61010-1: 2001 - Safety requirements for electrical equipment for measurement, control and laboratory use - Part 1: General requirements
--------	--

Energy meters

WS 0101, WS 0102, WS 1102, WS 0203, WS 1302, WS 0301, WS 0302	IEC 62052-11 : 2004 - Electricity metering equipment (ac) General requirements, tests and test conditions Part 11: Metering equipment* IEC 62053-21 : 2004 - Particular requirements Part 21: Static meters for active energy (classes 1 and 2) IEC 62053-23 : 2004 - Particular requirements Part 23: Static meters for reactive energy (classes 2 and 3)
WQ 0207, WQ 0217, WQ 1217, WQ 2207	EN61036 : 1996 - Alternating current static watt-hour meters for active energy (classes 1 and 2) EN61010-1 : 1993 + Amendment A3 : 1995 Safety requirements for electrical equipment for measurement, control and laboratory use. Part 1-General requirements

Communication adapters

MI 480, MI 485, MI 486, MI 488	IEC 55024: 2000 - Information technology equipment - Immunity characteristics - Limits and method of measurement (CISPR 24: 1997, modified) IEC 61010-1: 2001 - Safety requirements for electrical equipment for measurement, control and laboratory use - Part 1: General requirements IEC 61326-1: 2003 - EMC requirements for electrical equipment for measurement, control and laboratory use - Part 1: General requirements IEC 61000-4-3: 1995-2 - Electromagnetic compatibility (EMC) - Part 4: Testing and measurements techniques - Section 3 Radiated, radio-frequency, electromagnetic field immunity test
--------------------------------	--

Measuring transducers

MI 400, MI 401, MI 404, MI 413, MI 414, MI 421, MI 436, MI 438	IEC 688 : 1992 - Electrical measuring transducers for converting a.c. electrical quantities to analog or digital signals EN 61326 : 1997+ Amendment A1 : 1998 - Electrical equipment for measurement, control and laboratory use EMC requirements "EN 61000-6-2 : 1999 - Electromagnetic compatibility (EMC) Part 6-2 : Generic standards - Immunity for industrial environments" IEC 61010-1: 2001 - Safety requirements for electrical equipment for measurement, control and laboratory use - Part 1: General requirements
MI 406 , MI 408, MI 416, MI 418, MI 420	IEC 688 : 1992 - Electrical measuring transducers for converting a.c. electrical quantities to analog or digital signals EN 61326 : 1997+ Amendment A1 : 1998 - Electrical equipment for measurement, control and laboratory use EMC requirements IEC 61010-1: 2001 - Safety requirements for electrical equipment for measurement, control and laboratory use - Part 1: General requirements
MI 450, MI 452, MI 454, MI 456 and MI 458	CEI IEC 60770-1 / 1999-02 - Transmitters for use in industrial-process control system CEI IEC 1298-1 / 1995-07 - Process measurements and control devices - General methods and procedures for evaluating performance; • General considerations CEI IEC 1298-2 / 1995-07 - Process measurements and control devices - General methods and procedures for evaluating performance; • Tests under reference conditions CEI IEC 1298-3 / 1995-07 - Process measurements and control devices - General methods and procedures for evaluating performance; •Tests for effects of influence quantities

INSTRUMENTS CONFORMITY TO STANDARDS

CEI IEC 1298-4 / 1995-07 - Process measurements and control device - General methods and procedures for evaluating performance; • Evaluation report content
IEC 61010-1: 2001 - Safety requirements for electrical equipment for measurement, control and laboratory use - Part 1: General requirements

Energy meters

WQ 0207, WQ 0217, WQ 1217, WQ 2207
EN61036 : 1996 - Alternating current static watt-hour meters for active energy (classes 1 and 2)
EN61010-1 : 1993 + Amendment A3 : 1995 - Safety requirements for electrical equipment for measurement, control and laboratory use. Part 1 - General requirements

Synchronization meters

SQ 0204 in SQ 0214
SIST EN60051-5 : 1995 - Direct acting indicating analogue electrical measuring instruments and their accessories. Special requirements for phase meters, power factor meters and synchrosopes.
SIST EN 61010-1 : 2002 - Safety requirements for electrical equipment for measurement, control and laboratory use. Part 1- General requirements
SIST EN 61326 : 1998 - Electrical equipment for measurement, control and laboratory use - EMC requirements
ZQ 1207
SIST EN 61326: 1998 - Electrical equipment for measurement, control and laboratory use - EMC requirements
SIST EN 60051-1: 2000 - Direct acting indicating analogue electrical instruments and their accessories - Part 1: Definitions and general requirements to all parts
SIST EN 60051-4: 1995 - Direct acting indicating analogue electrical instruments and their accessories - Part 4: Special requirements for frequency meters
SIST EN 60051-9: 1995 - Direct acting indicating analogue electrical instruments and their accessories - Part 9: Recommended test methods
EN61010-1 : 2002 - Safety requirements for electrical equipment for measurement, control and laboratory use. Part 1- General requirements
FQ 1207
SIST EN 60051-1: 2000 - Direct acting indicating analogue electrical instruments and their accessories - Part 1: Definitions and general requirements to all parts
SIST EN 60051-2: 1995 - Direct acting indicating analogue electrical instruments and their accessories - Part 2: Special requirements for Ammeters and Voltmeters
SIST EN 60051-9: 1995 - Direct acting indicating analogue electrical instruments and their accessories - Part 9: Recommended test methods
EN61010-1 : 2002 - Safety requirements for electrical equipment for measurement, control and laboratory use. Part 1- General requirements

Power meters and power factor meters

EQ 0107, EQ 0207, EQ 2107, EQ 2207,
YQ 0107, YQ 0207, YQ 2107, YQ 2207
SIST EN 61236 : 1998 - Electrical equipment for measurements, control and laboratory use, EMC requirements
SIST EN 60051-1 : 2000 - Direct acting indicating analogue electrical measuring instruments and their accessories - Part 1 : Definitions and general requirement
SIST EN 60051-3: 1995 - Direct acting indicating analogue electrical measuring instruments and their accessories - Part 3 : Special requirements for wattmeters and varmeters
SIST EN 60051-9: 1995 - Direct acting indicating analogue electrical measuring instruments and their accessories - Part 9 : Recommended test methods
SIST EN 61010-1 : 2002 - Safety requirements for electrical equipment for measurement, control and laboratory use - Part 1 General requirements
:
EQ 0307, EQ 2307, YQ 0307, YQ 2307
SIST EN 61236 : 1998 - Electrical equipment for measurements, control and laboratory use, EMC requirements
SIST EN 60051-1 : 2000 - Direct acting indicating analogue electrical measuring instruments and their accessories - Part 1 : Definitions and general requirements
SIST EN 60051-3: 1995 - Direct acting indicating analogue electrical measuring instruments and their accessories - Part 3 : Special requirements for wattmeters and varmeters
SIST EN 60051-5: 1995 - Direct acting indicating analogue electrical measuring instruments and their accessories - Part 5 : Special requirements for phase meters, power factor meters and synchrosopes.
SIST EN 60051-9: 1995 - Direct acting indicating analogue electrical measuring instruments and their accessories - Part 9 : Recommended test methods
SIST EN 61010-1 : 2002 - Safety requirements for electrical equipment for measurement, control and laboratory use - Part 1 General requirements
:

Frequency meters

ZQ 0207, ZQ 0407, ZQ 0307, ZQ 0107,
ZQ 2307, ZQ 2207, ZQ 2107
SIST EN 61326: 1998 - Electrical equipment for measurement, control and laboratory use - EMC requirements
EN60051-1 1994 - Direct acting indicating analogue electrical measuring instruments and their accessories
- General requirements
EN60051-4 1984 - Direct acting indicating analogue electrical measuring instruments and their accessories
- Frequency meters
EN60051-9 1988 - Direct acting indicating analogue electrical measuring instruments and their accessories
- Recommended test methods.
EN61010-1 : 2002 - Safety requirements for electrical equipment for measurement, control and laboratory use. Part 1- General requirements

Reed frequency meters

ZQ 0317, ZQ 0217, ZQ 0117,
ZQ 1217, ZQ 1117
SIST EN 60051-1: 2000 - Direct acting indicating analogue electrical instruments and their accessories - Part 1: Definitions and general requirements to all parts
SIST EN 60051-4: 1995 - Direct acting indicating analogue electrical instruments and their accessories - Part 4: Special requirements for frequency meters
SIST EN 60051-9: 1995 - Direct acting indicating analogue electrical instruments and their accessories - Part 9: Recommended test methods
EN61010-1 : 2002 - Safety requirements for electrical equipment for measurement, control and laboratory use. Part 1- General requirements

Meters for DC voltage or current with moving coil

BQ 0107, BQ 0207, BQ 0307,
BQ 0407, BQ 0507

SIST EN 60051-1: 2000 - Direct acting indicating analogue electrical instruments and their accessories - Part 1: Definitions and general requirements to all parts
SIST EN 60051-2: 1995 - Direct acting indicating analogue electrical instruments and their accessories - Part 2: Special requirements for Ammeters and Voltmeters
SIST EN 60051-9: 1995 - Direct acting indicating analogue electrical instruments and their accessories - Part 9: Recommended test methods
EN61010-1 : 2002 - Safety requirements for electrical equipment for measurement, control and laboratory use. Part 1- General requirements

BQ 2107, BQ 2207, BQ 2307, BQ 2407,
BQ 2507

SIST EN 60051-1: 2000 - Direct acting indicating analogue electrical instruments and their accessories - Part 1: Definitions and general requirements to all parts
SIST EN 60051-2: 1995 - Direct acting indicating analogue electrical instruments and their accessories - Part 2: Special requirements for Ammeters and Voltmeters
SIST EN 60051-9: 1995 - Direct acting indicating analogue electrical instruments and their accessories - Part 9: Recommended test methods
EN61010-1 : 2002 - Safety requirements for electrical equipment for measurement, control and laboratory use. Part 1- General requirements

Meters for DC voltage or current with moving coil and rectifier

CQ 0107, CQ 0207, CQ 0307, CQ 0407,
CQ 0507, CQ 2107, CQ 2207, CQ 2307,
CQ 2407, CQ 2507

SIST EN 61326: 1998 - Electrical equipment for measurement, control and laboratory use - EMC requirements
SIST EN 60051-1: 2000 - Direct acting indicating analogue electrical instruments and their accessories - Part 1: Definitions and general requirements to all parts
SIST EN 60051-2: 1995 - Direct acting indicating analogue electrical instruments and their accessories - Part 2: Special requirements for Ammeters and Voltmeters
SIST EN 60051-9: 1995 - Direct acting indicating analogue electrical measuring instruments and their accessories
EN61010-1 : 2002 - Safety requirements for electrical equipment for measurement, control and laboratory use. Part 1- General requirements

Meters for AC voltage or current with moving iron

FQ0107, FQ0207, FQ0307,
FQ0507, FQ0407

SIST EN 60051-1: 2000 - Direct acting indicating analogue electrical instruments and their accessories - Part 1: Definitions and general requirements to all parts
SIST EN 60051-2: 1995 - Direct acting indicating analogue electrical instruments and their accessories - Part 2: Special requirements for Ammeters and Voltmeters
SIST EN 60051-9: 1995 - Direct acting indicating analogue electrical instruments and their accessories - Part 9: Recommended test methods
EN61010-1 : 2002 - Safety requirements for electrical equipment for measurement, control and laboratory use. Part 1- General requirements

FQ 3207 in FQ 3307

SIST EN 60051-1: 2000 - Direct acting indicating analogue electrical instruments and their accessories - Part 1: Definitions and general requirements to all parts
SIST EN 60051-2: 1995 - Direct acting indicating analogue electrical instruments and their accessories - Part 2: Special requirements for Ammeters and Voltmeters
SIST EN 60051-9: 1995 - Direct acting indicating analogue electrical instruments and their accessories - Part 9: Recommended test methods
EN61010-1 : 2002 - Safety requirements for electrical equipment for measurement, control and laboratory use. Part 1- General requirements

Bimetal maximum current meters

MQ 0507, MQ 0407, MQ 0307,
MQ 0207, MQ 0107

EN60051-1 1994 - Direct acting indicating analogue electrical measuring instruments and their accessories
- General requirements
EN60051-9 1988 - Direct acting indicating analogue electrical measuring instruments and their accessories
- Recommended test methods.
EN61010-1 : 2002 - Safety requirements for electrical equipment for measurement, control and laboratory use. Part 1- General requirements

Combined bimetal maximum current meters

MQ 0117, MQ 0217, MQ 0317

EN60051-1 1994 - Direct acting indicating analogue electrical measuring instruments and their accessories
- General requirements
EN60051-9 1988 - Direct acting indicating analogue electrical measuring instruments and their accessories
- Recommended test methods.
SIST EN 60051-2: 1995 - Direct acting indicating analogue electrical instruments and their accessories - Part 2: Special requirements for Ammeters and Voltmeters
ESI 50-2 Bimetallic Ammeters
EN61010-1: 2002 - Safety requirements for electrical equipment for measurement, control and laboratory use. Part 1- General requirements

Multimeters

MI 7054

SIST EN 61326: 1998 - Electrical equipment for measurement, control and laboratory use - EMC requirements
EN60051-1 1994 - Direct acting indicating analogue electrical measuring instruments and their accessories
- General requirements
EN60051-7 1984 - Direct acting indicating analogue electrical measuring instruments and their accessories
- Multi-function instruments
EN60051-9 1988 - Direct acting indicating analogue electrical measuring instruments and their accessories
- Recommended test methods.
EN61010-1 : 2002 - Safety requirements for electrical equipment for measurement, control and laboratory use. Part 1- General requirements

INSTRUMENTS CONFORMITY TO STANDARDS

MI 7056	<p>SIST EN 61326: 1998 - Electrical equipment for measurement, control and laboratory use - EMC requirements</p> <p>EN60051-1 1994 - Direct acting indicating analogue electrical measuring instruments and their accessories</p> <p>- General requirements</p> <p>EN60051-7 1984 - Direct acting indicating analogue electrical measuring instruments and their accessories</p> <p>- Multi-function instruments</p> <p>EN60051-9 1988 - Direct acting indicating analogue electrical measuring instruments and their accessories</p> <p>- Recommended test methods</p> <p>EN61010-1 : 2002 - Safety requirements for electrical equipment for measurement, control and laboratory use.</p> <p>Part 1 - General requirements</p>
MI 7065	<p>SIST EN 61326: 1998 - Electrical equipment for measurement, control and laboratory use- EMC requirements</p> <p>EN60051-1 1994 - Direct acting indicating analogue electrical measuring instruments and their accessories</p> <p>- General requirements</p> <p>EN60051-7 1984 - Direct acting indicating analogue electrical measuring instruments and their accessories</p> <p>- Multi-function instruments</p> <p>EN60051-9 1988 - Direct acting indicating analogue electrical measuring instruments and their accessories</p> <p>- Recommended test methods</p> <p>EN61010-1 : 2002 - Safety requirements for electrical equipment for measurement, control and laboratory use.</p> <p>Part 1 - General requirements</p>
Educational Programme 07035.00	<p>SIST EN 61326: 1998 - Electrical equipment for measurement, control and laboratory use - EMC requirements</p> <p>EN60051-1 1994 - Direct acting indicating analogue electrical measuring instruments and their accessories</p> <p>- General requirements</p> <p>EN60051-7 1984 - Direct acting indicating analogue electrical measuring instruments and their accessories</p> <p>- Multi-function instruments</p> <p>EN60051-9 1988 - Direct acting indicating analogue electrical measuring instruments and their accessories</p> <p>- Recommended test methods</p> <p>EN61010-1 : 2002 - Safety requirements for electrical equipment for measurement, control and laboratory use.</p> <p>Part 1 - General requirements</p>
07038.00	<p>SIST EN 61326: 1998 - Electrical equipment for measurement, control and laboratory use - EMC requirements</p> <p>EN60051-1 1994 - Direct acting indicating analogue electrical measuring instruments and their accessories</p> <p>- General requirements</p> <p>EN60051-2 1984 - Direct acting indicating analogue electrical measuring instruments and their accessories</p> <p>- Special requirements for ammeters and voltmeters</p> <p>EN60051-9 1988 - Direct acting indicating analogue electrical measuring instruments and their accessories</p> <p>- Recommended test methods</p> <p>EN61010-1 : 2002 - Safety requirements for electrical equipment for measurement, control and laboratory use.</p> <p>Part 1 - General requirements</p>
07021.01	<p>SIST EN 61326: 1998 - Electrical equipment for measurement, control and laboratory use - EMC requirements</p> <p>EN60051-1 1994 - Direct acting indicating analogue electrical measuring instruments and their accessories</p> <p>- General requirements</p> <p>EN60051-7 1984 - Direct acting indicating analogue electrical measuring instruments and their accessories</p> <p>- Multi-function instruments</p> <p>EN60051-9 1988 - Direct acting indicating analogue electrical measuring instruments and their accessories</p> <p>- Recommended test methods.</p> <p>EN61010-1 : 2002 - Safety requirements for electrical equipment for measurement, control and laboratory use.</p> <p>Part 1 - General requirements</p>
07026.00	<p>SIST EN 61326: 1998 - Electrical equipment for measurement, control and laboratory use - EMC requirements</p> <p>EN60051-1 1994 - Direct acting indicating analogue electrical measuring instruments and their accessories</p> <p>- General requirements</p> <p>EN60051-7 1984 - Direct acting indicating analogue electrical measuring instruments and their accessories</p> <p>- Multi-function instruments</p> <p>EN60051-9 1988 - Direct acting indicating analogue electrical measuring instruments and their accessories</p> <p>- Recommended test methods.</p> <p>EN61010-1 : 2002 - Safety requirements for electrical equipment for measurement, control and laboratory use.</p> <p>Part 1 - General requirements</p>
Digital temperature meters MI 7022	<p>SIST EN 61326 : 1998 - Electrical equipment for measurement, control and laboratory use - EMC requirements</p> <p>A1:1998 Amendment A1</p>
Shunts	<p>AR 0101 SIST EN 60051-1: 2000 - Direct acting indicating analogue electrical instruments and their accessories - Part 1: Definitions and general requirements to all parts</p> <p>SIST EN 60051-8: 1995 - Direct acting indicating analogue electrical instruments and their accessories - Part 8: Special requirements for accessories.</p> <p>SIST EN 60051-9: 1995 - Direct acting indicating analogue electrical instruments and their accessories - Part 9: Recommended test methods</p> <p>EN61010-1 : 2002 - Safety requirements for electrical equipment for measurement, control and laboratory use. Part 1- General requirements.</p>
Common standards	<p>DIN 43701 : measuring ratings</p> <p>IEC 61554:1999 Electrical measuring instruments-dimensions for panel mounting</p> <p>DIN 43802 : pointers , scales</p> <p>DIN1451 : inscriptions</p> <p>SIST EN 60529:1997 Degrees of protection provided enclosures (IP code)</p> <p>UL 94V-0 : self extinguishable materials</p> <p>SIST EN 61010-1:2002 Safety requirements for electrical equipment for measurement, control and laboratory use</p> <p>SIST EN 61036:1998/A1:2001 Alternating current static watt-hour meters for active energy (Razreds 1 and 2)</p> <p>DIRECTIVE 2002/96/EC of 27 January 2003 on waste electrical and electronic equipment (WEEE)</p> <p>DIRECTIVE 2002/95/EC of 27 January 2003 on the restriction of the use of certain hazardous substances in EEE</p> <p>Installation categories according to standardi EN 61010-1 and data on the label on the instrument.</p>

Range of Products and Contents

Technical data stated in the catalogue and prospectus material are only informative. Data are subject to alteration without prior notice.

The catalogue provides a short outline of our sales programme. Prices and other sales conditions will be sent to you after receiving your detailed inquiry.

Cancellation of Order

In case of cancelled, modified order or deferred delivery date by a customer, the customer is obliged to cover the expenses or indemnity up to the order value.

Warranty

The manufacturer warrants to repair the product free of charge for the period of 12 months from the date of purchase if the product has been used in compliance with the instructions. Spare parts are available for the period of 6 years from the date of purchase.

Claims

For an efficient and timely settlement of claims we kindly ask you to send us the following data immediately by e-mail or fax if any defect/damage/failure is observed upon the acceptance of goods or later:

- Defect/damage/failure is observed:
 - o Upon acceptance (quantity and quality)
 - o During regular use within the warranty period ..*)
- Invoice number, position in the invoice and invoice date
- Quantity of claimed products and serial number, if available
- Description of defect/damage/failure and your opinion about the reasons
- Packing is damaged: YES/NO
- Your proposal for solving the problem (regarding the time limits and type of defect/damage/failure):
 - o Return for a free repair
 - o Replacement delivery and subsequent evaluation for justifying the claim:
 - Damaged/wrong products will be returned later
 - Damaged/wrong products will not be returned
 - o Other
- Your internal claim designation/reference number

(..) If a defect is found later and the connection with the invoice is not possible, copy and send data stated on the product label.*

When data are received, our opinion and instructions for returning the product (a forwarder, mode of import, documents and references) will be sent to you by e-mail or fax.

In case an immediate replacement delivery is required, we shall state the first feasible delivery term, the cost of manufacturing new instruments and our suggestion concerning the damaged products. Upon receipt of your confirmation order we shall issue an order for the manufacture of new products and will submit our order confirmation to you, as usual.

INDEX IN ALPHANUMERIC ORDER

0	page	ASR 21.3	169	EQ 0307	149
		ASR 22.3	169	EQ 2107	149
07021.01	166	ASR 22.3 2U	169	EQ 2207	149
07026.00	166			EQ 2307	149
07027.01	166	B	page	ESB-S/V-MS	110
07035.00	166				
07036.00	166	BN 0103	158	F	page
07037.00	166	BN 0203	158		
07038.00	166	BQ 0107	154	FI	79
07039.00	166	BQ 0207	154	FQ 0103	159
		BQ 0307	154	FQ 0107	159
A	page	BQ 0407	154	FQ 0201	159
		BQ 0507	154	FQ 0207	159
AR 0101	168	BQ 2107	154	FQ 0307	159
AR 0105	168	BQ 2207	154	FQ 0407	159
ASK 101.4	169	BQ 2307	154	FQ 0507	159
ASK 101.4 2U	169	BQ 2407	154	FQ 1108	147
ASK 103.3 5	169	BQ 2507	154	FQ 1207	147
ASK 123.3	169	BR 6	16	FQ 1208	147
ASK 129.10	169	BS	99	FQ 3107	159
ASK 205.3	169	BS-MS 0	110	FQ 3207	159
ASK 21.3	169			FQ 3307	159
ASK 231.5	169	C	page		
ASK 31.3	169			H	page
ASK 31.3 2U	169	CDB3X	77		
ASK 31.4	169	CN 0103	158	HK 30	141
ASK 31.4 2U	169	CN 0203	158	HK 46	141
ASK 31.4 3U	169	CQ 0107	157	HK 47	141
ASK 31.5	169	CQ 0207	157	HK 48	141
ASK 31.5 2U	169	CQ 0207 - TAP	156	HK 49	141
ASK 318.3	169	CQ 0307	157		
ASK 41.3	169	CQ 0407	157	I	page
ASK 41.4	169	CQ 0507	157		
ASK 41.4 2U	169	CQ 2107	157	IK21	41
ASK 41.4 3U	169	CQ 2207	157	IK40	41
ASK 412.4	169	CQ 2207 - TAP	156	IK63	41
ASK 421.4	169	CQ 2307	157	IKA20	41
ASK 51.4	169	CQ 2407	157	IKA20-R	52
ASK 51.4 2U	169	CQ 2507	157	IKA25	41
ASK 51.4 3U	169	CQ 3207	157	IKA25-R	52
ASK 541.4	169			IKD20	41
ASK 561.4	169	D	page	IKD20-R	52
ASK 61.4	169			IKD25	41
ASK 61.4 2U	169	D120	85	IKD25-R	52
ASK 61.4 3U	169	D121	85	IKN	58
ASK 63.4	169	DST-U	109	INO	78
ASK 63.6	169			IPO	78
ASK 81.4	169	E	page		
ASK 81.4 2U	169				
ASR 20.3	169	EQ 0107	149		
ASR 201.3	169	EQ 0207	149		

INDEX IN ALPHANUMERIC ORDER

K	page
K03C	10
K03C	10
K03M	10
K07C	10
K07CF	10
K07CG (DC)	10
K07M	10
K07MF	10
K07MG (DC)	10
KC12	39
KC16	39
KC20	39
KC25	39
KC33	39
KC40	39
KC60	39
KMPL12	83
KMPL16	83
KMPL22	83
KMPL9	83
KNL110	32
KNL115	35
KNL12	18
KNL12G	25
KNL145	35
KNL16	18
KNL16G	25
KNL18	18
KNL180	35
KNL22	18
KNL22G	25
KNL250	35
KNL30	18
KNL30G	25
KNL40	29
KNL400	35
KNL500	35
KNL6	18
KNL630	35
KNL630/1000	35
KNL65	29
KNL6G	25
KNL80	32
KNL9	18
KNL90	32
KNL95	35
KNL9G	25
KPL12	83
KPL16	83
KPL22	83

KPL9	83
KQ 0207	163
KQ 0207	163
KQ 0307	163
KQ 0307	163
M	page
M 25	110
MC 640	134
MC 646	134
MC 650	133
MC 656	133
MC 660	132
MC 666	132
MC 703	142
MC 710	129
MC 720	129
MC 723	142
MC 740	127
MC 750	125
MC 760	125
MCM	113
MCMSCADA	115
MDS	98
MI 400	123
MI 401	122
MI 404	121
MI 406	124
MI 408	124
MI 413	124
MI 414	124
MI 416	124
MI 418	124
MI 420	124
MI 421	124
MI 436	124
MI 438	124
MI 450	124
MI 452	124
MI 454	124
MI 456	124
MI 458	124
MI 480	143
MI 485	145
MI 486	146
MI 488	146
MI 7022	167
MI 7033	164
MI 7054	165
MI 7056	165
MI 7065	165

MI 7350	153
MQ 0107	161
MQ 0117	162
MQ 0207	161
MQ 0217	162
MQ 0307	161
MQ 0317	162
MQ 0407	161
MQ 0507	161
MS20	59
MS25	59
MS32	64
MSB32	64
MSC	94
MSS	94
MSS-3L	110
MST20	59
MST25	59
MT 540	119
MT 550	119
MT 560	118

N	page
NFI	79

O	page
OS1	108
OS2	108
OS3	108
OS4	108
OS5	108
OS6	108

P	page
PFC 65	112

R	page
R221	88
R420	88
RD 500	120
RFI2	81
RI120	74
RI60	70
RS	76
RS9	88
RV 120	76
RV 60	76

INDEX IN ALPHANUMERIC ORDER

S page

S320	91
S321	91
SD16	91
SI 63	142
SI 64	142
SI 65	142
SQ 0104	147
SQ 0114	147
SQ 0204	147
SQ 0214	147

T page

TRE 701	102
TRE 702	103
TRE 703	104
TRE 704	105
TRE 705	106
TRE 706	107

U page

UMC 710	129
UMC 720	129
UMC 740	127
UMC 750	126
UMC 760	126
UMP90	109
UMP90 E	109
UMT 540	119
UMT 550	119
UMT 560	118

W page

WK	109
WQ 0207	148
WQ 0217	148
WQ 1217	148
WQ 1247	148
WQ 2207	148
WS 0010	138
WS 0011	138
WS 0030	137
WS 0031	137
WS 0101	139
WS 0102	139
WS 0301	140
WS 0302	140
WS 1102	139

WS 1302	140
---------	-----

WSK 30	169
--------	-----

WSK 40	169
--------	-----

WSK 60	169
--------	-----

WSK 70.6	169
----------	-----

Y page

YQ 0107	150
---------	-----

YQ 0207	150
---------	-----

YQ 0307	150
---------	-----

YQ 2107	150
---------	-----

YQ 2207	150
---------	-----

YQ 2307	150
---------	-----

Z page

ZK	84
----	----

ZQ 0107	151
---------	-----

ZQ 0207	151
---------	-----

ZQ 0307	151
---------	-----

ZQ 0407	151
---------	-----

ZQ 0507	151
---------	-----

ZQ 1108	147
---------	-----

ZQ 1207	147
---------	-----

ZQ 1208	147
---------	-----

ZQ 2107	151
---------	-----

ZQ 2207	151
---------	-----

ZQ 2307	151
---------	-----

[illegible]

This image shows a single sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.