Network Analyser
MC760
Network Recorder
MC750

PROPERTIES

- **Evaluation of the electricity supply quality in compliance with SIST EN 50160 (only MC760)**
- **Measurements of instantaneous values of more than 140 quantities (U, I, P, Q, S, PF, PA, f, φ, THD, MD, energy, energy cost by tariffs, etc.)**
- **Accuracy class 0.5 (optional 0.2)**
- **Harmonic analysis of phase, phase-to-phase voltages and currents up to the 63rd harmonic (only MC760)**
- **Recording up to 32 measurands 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 232/RS 485 communication up to 115,200 bit/s or Ethernet/USB communication**
- **MODBUS and DNP3 communication protocol**
- **Memory card (MMC or SD) for data transmission, setting and upgrading**
- **Up to 4 inputs or outputs (analogue outputs, analogue inputs, pulse outputs, alarm outputs, tariff inputs, digital inputs)**
- **Additional communication port (COM2)**
- **Universal or AC power supply**
- **Graphical LCD; 128 x 64 dots with illumination**
- **Automatic range of nominal current and voltage (max. 12.5 A and 750 V)**
- **Adjustable tariff clock, display of electric energy consumption in optional currency**
- **Multilingual support**
- **User-friendly PC MiQen software**

DESCRIPTION

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

USE

The MC760 network analyser is used for 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. Optional limits and required quality in a monitored period can be defined for each monitored characteristic. The following characteristics are measured and recorded:
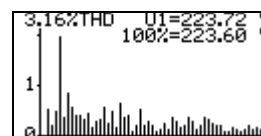
- Frequency deviations
- Voltage deviations
- Voltage dips
- Voltage interruptions
- Voltage unbalances
- Over-voltages
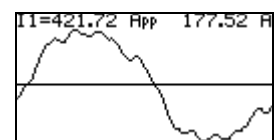- Fast voltage changes
- Flicker intensity
- THD
- Harmonics

COMPLIANCE WITH STANDARDS:

Standard SIST EN	Description
61010-1	Safety requirements for electrical equipment for measurement, control and laboratory use
60529	Degrees of protection provided by enclosures (IP code)
50160	Voltage characteristics of electricity supplied by public distribution systems
62052−11* 62052−21*	Electricity metering equipment – General requirements, tests and test conditions

* − Partial compliance

DESCRIPTION OF PROPERTIES

MEASURANDS

- RMS values of currents and voltages
- Measurements of energy, power and power factors in all 4 quadrants
- Minimal / maximal values
- Average values of measurands per interval
- Measurement of THD values of current and voltage (from 0 to 400 %)
- Harmonic analysis of phase, phase-to-phase voltages and currents up to the 63rd harmonic

RECORDER

A built-in recorder (8Mb) enables storing measurements and detected alarms. The recorder is additionally used for measurements related to the inspection of voltage quality.

ALARMS

The meter supports recording and storing of 32 alarms in four groups. A time constant of maximal values in a thermal mode, a delay time and switch-off hysteresis are defined for each group of alarms.

COMMUNICATION

The meter is equipped with RS232 and RS485 communication via the DB9 terminal or Ethernet communication via the RJ-45 terminal and standard USB port. Communication enables transfer of instantaneous measurements, records in the memory, settings and updating. Communication supports MODBUS and DNP3 protocols.

MEMORY CARD

The meter is provided with a slot for a full size MMC or SD (128MB to 2GB) formatted to FAT16. It is used for transfer of measurements from the internal memory, the meter setting and software updating.

INPUT / OUTPUT MODULES

The modules are available with double inputs/outputs. Each module has three terminals.
The meter is available without, with one or with two modules. The following modules are available:

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

SUPPLY

Power supply connection of the meters (MC) is adaptive. A universal power supply enables connection of the meter to DC (20−300 V) or AC voltage (48−230 V / 50 Hz).
AC power supply enables connection of the meter to AC voltage (57.7 / 63.5 / 100 / 110 / 230 / 400 / 500 V).

HANDLING THE COSTS

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

MIQEN

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

DATA DISPLAY

Data are displayed on 128 x 64 dot graphic LCD with illumination (37 x 69 mm). Indication symbols on the front side that are illuminated at the access to Memory card, communication and alarm are of additional help.

TECHNICAL DATA

EU DIRECTIVES:

Decree on electrical equipment designed for use within certain voltage limits **URLRS 53/00**
(Directive **73/23/EEC** on low voltage):
SIST EN 61010-1: 2004
Safety requirements for electrical equipment for measurement, control and laboratory use, part 1: General requirements
EMC SIST EN 61236-1:1998
Meters for active energy (classes 1and 2).

SAFETY:

- Protection: protection class **II**
  600 V rms, installation category **II**
  300 V rms, installation category **III**
  pollution degree 2
  in compliance with **SIST EN 61010-1**: 2004
- Enclosure material: PC/ABS
  incombustibility–self-extinguishability, complying with **UL 94 V-0**
- Enclosure protection: IP 52 (IP 20 for terminals)
  in compliance with **SIST EN 60529**: 1997
- Cutting for installation: $92^{+0,8}$ mm
- Converter mass: approx. 600 g

AMBIENT CONDITIONS:

- Climatic class: 3
  in compliance with **SIST EN 62052−11**: 2004
  in compliance with **SIST EN 62052−21**: 2005
- Temperature range of operation: -10 to +65°C
- Storage temperature range: -40 to +70°C
- Average annual humidity: $\leq$ 75% r.h.

INPUTS

Input signals	Current	Voltage
Nominal frequency range	50, 60 Hz	
Measuring frequency range	16−400 Hz	
Nominal value (In, Un)	5 A	500 V $_{L-N}$
Maximal vale	12.5 A	750 V $_{L-N}$
Consumption	< 0.1 VA	< 0.1 VA

POWER SUPPLY

Power supply	Universal	AC
Nominal voltage AC	48−230 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	< 5 VA	< 7 VA

RTC

A built-in capacitor enables the clock operation and recording the measurements in the RTC memory with the time flag.
- Life span   approx. 2 days

REFERENCE CONDITIONS

- Ambient temperature: −10, 22 and 55°C
- Input: 0…100 % Un
- (connected to a measuring transformer)   0…100 % In
- Active/reactive power, factor: cosφ =1 / sinφ =1
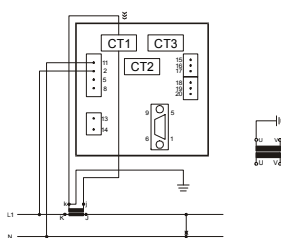- Waveform: Sinus

ACCURACY

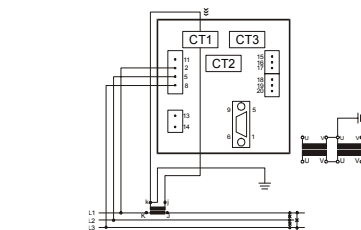Accuracy is presented as percentage from nominal value of the measurand except when it is stated as an absolute value.

Measurand		Accuracy
Rms current (I1, I2, I3, Iavg, In)		0.5 (optional 0.2)
Rms phase voltage (U1, U2, U3, Uavg)	62.5−750 V	<0.5 (optional 0.2)
	10−500 V	0.5 (optional 0.2
Phase-to-phase voltage (U12, U23, U31, Uavg)		0.5
Frequency (f)		10 mHz
Power factor (PF)		0.5
Phase and phase-to-phase angle (φ, φ12, φ23, φ31)		0.5
THD	0…400 %	0.5

Measurand		Accuracy
Active, reactive and apparent power		0.5 (optional 0.2)
Active energy	SIST EN 62052-11	Class 1
Reactive energy	SIST EN 61268	Class 2

REAL TIME CLOCK (RTC):
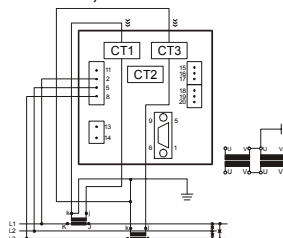RTC accuracy 1 min/month (30 ppm)

CONNECTION

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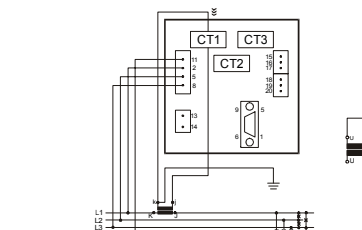Current inputs shall be connected to network via a corresponding current transformer.
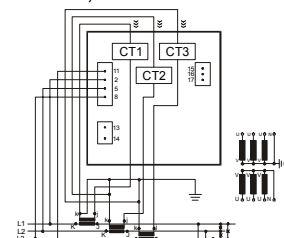

3b − three-wire, uniform load

4b − four-wire, uniform load

1b − single wire, uniform load

3u − three-wire, non-uniform load

4u − four-wire, non-uniform load

Inputs / Quantities		Terminals	
Measuring inputs:	AC current	IL1	1,3
		IL2	4,6
		IL3	7,9
	AC voltage	UL1	2
		UL2	5
		UL3	8
		N	11
Auxiliary power supply:		+ / AC	13
		− / AC	14
Inpt / Output modules	Module 1	I/O−1	15
		C−12	16
		I/O−2	17
	Module 2	I/O−3	18
		C−34	19
		I/O−4	21

TYPE OF COMMUNICATION

Communication		Terminals	
DB9 female	RS 232	Rx	3
		.	5
		Tx	2
	RS 485	B	7
		A	8
RJ-45	Ethernet	TD+	1
		TD−	2
		RD+	3
		RD−	6
Screw terminals (COM2)	RS 232	Rx	18
		.	19
		Tx	20
	RS 485	B	20
		A	18

DIMENSIONAL DRAWING

TERMINALS

Connection	Max. conductor cross-sections
Voltage inputs (4)	≤ 5 mm^2; one conductor
Current inputs (3)	≤ Ø 6 mm; one conductor with insulation
Power supply (2)	≤ 2.5 mm2; one conductor
Modules (2 x 3)	≤ 2.5 mm2; one conductor

COMMUNICATION CONNECTION

	Ethernet	RS 232	RS 485
Type of connection	Direct		Network
Max. connection length	-	3 m	1000 m
Terminals	RJ-45	DB9 female	
Insulation	3.7 kV rms., 1 minute between terminals and other circuits		
Transfer mode	Asynchronous		
Protocol	MODBUS RTU / DNP3		
Transfer rate	10/100Mb/s autodetect	1.200 do 115.200 bit/s	

DATA FOR ORDERING

Measuring centre:

The following data shall be stated:
- Type of a meter
- Type of power supply
- Type of communication
- Type of a module(s)

Supplement:
- MiQen software

ORDERING

When ordering the meter, all required specifications shall be stated in compliance with the ordering code.
The meters automatic range of input current (up t 5 A) and voltage (up to 500 V_{L-N}) is not stated in the code.

EXAMPLE OF ORDERING:

The MC760 network analyser is connected to secondary phase voltage up to 500 V_{L-N} and 5 A secondary current. A universal supply is built-in the meter. RS 232/RS 485 communication and two modules are applied The first module is an alarm output and the second one is a pulse output.
Ordering code:
MC760−EDC/AC−RS−2AL 2PO

GENERAL ORDERING CODE

All specifications are obligatory
An example of a completely filled-in ordering code:

MC760 EDC/AC−RS−2AL 2PO

Meter type

MC760	
MC750	

Power supply

EDC/AC	Universal
E57,7V	57.7 V AC
E63,5V	63.5 V AC
E100V	100 V AC
E110V	110 V AC
E230V	230 V AC
E400V	400 V AC
E500V	500 V AC

Communication (COM1)

RS	RS 232 / RS 485
EU	Ethernet / USB

Module 1 / Module 2

WO	Without
2AL	2 X Alarm output
2AN	2 X Analogue output
2AI	2 X Analogue input
2PO	2 X Pulse output
2TI	2 X Tariff input
1BAL	1 X Bistable alarm output
2DI	2 X Digital input
RS2	1 X RS 232 (COM2) – only module 2
RS4	1 X RS 485 (COM2) – only module 2

Dictionary:

RMS	*Root Mean Square*
Flash	*Type of a memory module that keep its content in case of power supply failure*
Ethernet	*IEEE 802.3 data layer protocol*
MODBUS / DNP3	*Industrial protocol for data transmission*
MMC	*Multi Media Card*
MiQen	*Software for MC meters*
AC	*Alternating current*
PA	*Power angle (angle between current and voltage)*
PF	*Power factor*
THD	*Total harmonic distortion*
MD	*Measurement of average values in time interval*
Harmonic voltage – harmonic	*Sine voltage with frequency equal to integer multiple of basic frequency*
Hand-over place	*Connection spot of consumer installation in public network*
Flicker	*Voltage fluctuation causes changes of luminous intensity of lamps, which causes the so-called flicker*
RTC	*Real Time Clock*

TÜV
SÜD
Management Service

CE

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