



Measuring centers MC3x0 series

Network recorders – MC350 & MC350H

Multimeter – MC330

Energy meter – MC320

- Voltage and current auto range measurements up to 600 V_{L-N}, 12.5 A
- Active energy accuracy class 0.5S
- Up to four I/O modules (analogue output, pulse output, alarm output, tariff input)
- 4 Energy counters with tariff clock or tariff input
- Internal recorder 8MB
- Certified ship version

PROPERTIES

- Measurements of instantaneous values of more than 60 quantities (U, I, P, Q, S, PF, PA, f, ϕ , THD, MD ...)
- Harmonics measurements up to 31st harmonic
- Measurements of minimum and maximum values
- 8 MB flash memory for recorder
- 4 Energy counters
- Accuracy class U, I, P... 0.5
- Active energy Class 0.5S
- Frequency range from 16 Hz to 400 Hz
- Up to 4 I/O (two modules with 2 I/O): 2 tariff inputs, 2 digital inputs, 2 digital outputs (SO or relay) or 2 analogue outputs
- AC or Universal (option) power supply
- Graphical LCD; 128 x 64 dots with illumination
- Automatic range of nominal current (max. 12.5 A) and voltage (600 V_{L-N})
- User-adjustable display of measurements
- Multilingual support
- Isolated communication RS485 or RS232 up to 115.200 bit/s, USB 2.0 or PROFIBUS up to 12Mbit/s
- MODBUS and DNP3 or PROFIBUS DP-V0 communication protocol supported
- Tropical version according to DIN EN 40040
- Certified ship version
- MiQen – user-friendly PC software for setting via communication

APPLICATION

The meter is intended for monitoring and measuring electrical quantities of single and three-phase electric energy system. It measures true 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, phase angles, etc.) from the measured signals.

It records energy like the electricity meter in all four quadrants in up to four tariffs.

Since it also measures active and reactive power in all directions it can provide data about power direction (like ANSI code 32).

By using input/output modules it is possible to use meter for process control. Meter supports 2 optional I/O slots ready for use with double input or output modules. Available options are analogue output, digital output (open collector (SO) or mechanical relay) or tariff input. Digital output can be used as pulse or alarm output.

Alarms are useful tool for fast detection of exceeded parameters, monitoring proper magnitude level and notification in combination with alarm (relay) outputs. Thus function can be used for secondary over/under voltage/frequency protection, overload protection switch...

Internal memory (8MB) is used for recording of real time measurements and alarms, all equipped with a time stamp.

Various types of communication modules are available. Serial RS485 or PROFIBUS can be used for connecting device in to the network, standard USB and serial RS232 for connection of device to computer or controller and service USB communication (not galvanic separated) that can be used for a fast set-up without need for auxiliary power supply.

Available combinations, supported functions and types can be seen in options table.

Special “ship version” is available, certified by Bureau Veritas.

PROGRAMING

Complete programming of a meter and downloading and analysing of stored data can be done via communication with user friendly MiQen software (free download from Iskra d.d. web page).

Setting of basic functions and navigation through illuminated LCD can easily be done via 5 buttons placed on the meter front panel.

DESCRIPTION OF PROPERTIES

Measurands

- True RMS values of currents and voltages (MC330, MC350, MC350H only)
- Active, reactive, apparent power and power factor (MC330, MC350, MC350H only)
- Energy in all 4 quadrants
- THD values of current and voltage (MC330, MC350, MC350H only)
- Harmonics up to 31st on current and voltage (MC350H only)
- Minimum and maximum values (MC350H only)

Memory (MC350, MC350H only)

A built-in recorder (8Mb) enables storing of up to 32 measurements (two partitions) and detected alarms all equipped with a time stamp.

Sampling time of measurements recorder can be set from 1 to 60 min. Minimum, maximum, average or actual value of selected quantity can be stored.

Alarms (MC330, MC350, MC350H only)

The meter supports setting of up to 16 alarms that are divided in to two alarm groups. Alarms can be set for any of measured parameters by setting condition and a limit value. A time constant of maximum demand values in a thermal mode, a delay time and switch-off hysteresis are defined for each group of alarms. To each of two alarm groups an alarm output (solid-state or electromechanical relay) can be dedicated.

Communication

Meter can be equipped with communication module. Different options are possible:

- Serial RS485
- Serial RS232
- USB 2.0 (MC330, MC350, MC350H only)
- PROFIBUS + Service USB (MC330, MC350, MC350H only)
- Service USB (MC320, MC330 only)

Service USB communication uses USB Mini-B type connector that is not galvanic separated. Advantage is that in this case meter do not need a power supply to communicate. Communication via service USB communication is time limited.

When using service USB communication, power supply and measuring voltages needs to be disconnected.

All devices with PROFIBUS communication are equipped also with service USB communication.

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:

- Pulse (digital) output (S0) 2 outputs
- Relay output (MC330, MC350, MC350H only) 2 outputs
- Analogue output (MC350, MC350H only) 2 outputs
- Tariff input 2 inputs
- Digital input (MC330, MC350, MC350H only) 2 inputs

Pulse (digital) output module is available as:

Pulse output according EN 62053-31 (27 V, 27 mA)

Aux power supply

Standard AC power supply enables connection of the meter to a specific AC voltage (57.7 / 63.5 ... V).

There are also two options with a universal power supply:

- Full range - DC (20–300 V) or AC (48–276 V / 40-65 Hz) voltage
- High range - DC (100–265 V) or AC (85–265 V / 40-65 Hz) voltage (MC350, MC350H only)

Data display

Data are displayed on 128 x 64 dot graphic LCD with illumination (37 x 69 mm). An indication symbols on the front side are optical LED for energy flow and active alarm (MC330, MC350, MC350H only).

Miqen

User friendly MiQen software is intended for supervision of the meter on PC. It enables easy parameterisation of the network and the meter, displaying and recording of real time values, downloading and analysis of stored data via the serial, USB or Ethernet communication. The information and stored measurements can be exported in standard Windows formats. MiQen is multilingual software and it functions on Windows 8, 7, XP, NT, 2000 operating systems. MiQen can be downloaded from Iskra d.d. webpage www.iskra.eu.

TECHNICAL DATA

Measurement inputs

VOLTAGE MEASUREMENTS:

| | |
|----------------------------------|--|
| Measuring range | 10...600 V _{LN} |
| Nominal voltage(U _N) | 50...500 V _{LN} |
| Max. measured value (cont.) | 600 V _{LN} ; 1000 V _{LL} |
| Overload | 2 × U _N ; 10 s |
| Consumption | < 0.1 VA |
| Input impedance | 3.3 MΩ per phase |

CURRENT MEASUREMENTS:

| | |
|-----------------------------------|--------------------------|
| Measuring range | 0,01...10 A |
| Nominal current (I _N) | 1 / 5 A |
| Max. measured value | 12.5 A sinusoidal |
| Max. allowed value (thermal) | 15 A cont. |
| Overload | 20 × I _N ; 1s |

FREQUENCY MEASUREMENT

| | |
|-------------------------------------|--------------------------|
| Frequency measuring range | 16 ... 400 Hz (on comm.) |
| (Only for frequency meas.) | f _N ± 30 Hz |
| | (on analogue out) |
| Nominal frequency (f _N) | 50/60 Hz |
| Optional nominal frequencies | 16.6, 200, 400 Hz |

Basic accuracy under reference conditions

Accuracy is presented as an accuracy class according to EN 61557-12 except when it is stated as an absolute value

| Measurand | Accuracy class |
|---|-------------------------|
| Rms current (I ₁ , I ₂ , I ₃ , I _{avg} , I _n) | 0.5 |
| Voltage Rms P-N and P-P | 0.5 |
| Power (P, S) | 0.5 |
| Reactive power (Q) | 1 |
| Power factor (PF) | 0.5 |
| Frequency (f) | 10 mHz |
| P-N and P-P angle | 0.5° |
| THD (U), THD (I) (0 ... 400 %) | 0.5 % |
| Active energy | EN 62053-21 Class 1 |
| Active energy | EN 62053-22 Class 0.5S |
| Reactive energy | EN 62053-23 Class 2 |
| Pulse output | EN 62053-31 Class A & B |

Communication

SERIAL COMMUNICATION RS232

| | |
|------------------------|--------------------------|
| Connection type | Direct |
| Insulation | Protection class II |
| | 3.5 kV AC RMS 1 min |
| Max. connection length | 3 m |
| Transfer mode | Asynchronous |
| Protocol | MODBUS RTU / DNP3 |
| Transfer rate | 2.4 kBaud to 115.2 kBaud |

SERIAL COMMUNICATION RS485

| | |
|------------------------|--|
| Connection type | Network |
| Insulation | Protection class II 3.5 kV AC RMS 1 min |
| Max. connection length | 1000 m |
| Transfer mode | Asynchronous |
| Protocol | MODBUS RTU / DNP3 |
| Transfer rate | 2.4 kBaud to 115.2 kBaud |

PROFIBUS COMMUNICATION

| | |
|------------------------|--|
| Connection type | Network |
| Insulation | Protection class II 2.5 kV AC RMS 1 min |
| Max. connection length | As per PROFIBUS-DP networks |
| Transfer mode | DP-V0 |
| Transfer rate | 9.6 kBaud to 12 MBaud |

USB COMMUNICATION

| | |
|---|--|
| Connection type | Direct |
| Max. connection length | 5 m |
| Insulation | Protection class II 3.5 kV AC RMS 1 min |
| Insulation – Service USB communication (see warning below) | Protection class I 2.2 kV AC RMS 1 min |
| Transfer mode | Asynchronous |
| Protocol | MODBUS RTU / DNP3 |
| Transfer rate | USB 2.0 |

Warning!

Service USB communication is provided with only BASIC insulation and can ONLY be used unconnected to aux. supply AND power inputs.

INPUT / OUTPUT modules
ELECTROMECHANICAL RELAY OUTPUT (MC330, MC350, MC350H)

| | |
|------------------------------------|---|
| Purpose | alarm, pulse, general purpose digital output |
| Type | Electromechanical Relay switch |
| Rated voltage AC | 250 V AC |
| Max. switching current AC | 1000 mA AC |
| Rated voltage DC | 250 V DC |
| Max. switching current DC | 200 mA DC (valid for resistive load) |
| Contact resistance | ≤ 100 mΩ (100 mA, 24V) |
| Pulse (if used as pulse output) | Max. No.4000 imp/hour Min. length 100 ms |
| Insulation voltage | |
| Between coil and contact | 4 kV AC RMS |
| Between contacts | 1 kV AC RMS |

PULSE (DIGITAL) OUTPUT (SO)

| | |
|---|---|
| Purpose | pulse, alarm, general purpose digital output |
| Type | Optocoupler open collector switch |
| Rated voltage | 40 V AC/DC |
| Max. switching current | 30 mA (RONmax = 8Ω) |
| Pulse length (if used as pulse output) | programmable (2...1000 ms) |

TARIFF INPUT

| | |
|-----------------|--|
| Rated voltage | 230 V ± 20 % AC/DC 75...110 V AC/DC |
| Max. current | < 0.6 mA |
| Frequency range | 45...65 Hz |
| ON voltage | 40...120 % of rated voltage |
| OFF voltage | 0...10 % of rated voltage |

DIGITAL INPUT (MC330, MC350, MC350H)

| | |
|-----------------|---|
| Rated voltage | 230 V ± 20 % AC/DC 75...110 V AC/DC 24 V DC |
| Max. current | < 0.6 mA |
| Frequency range | 45...65 Hz |
| ON voltage | 40...120 % of rated voltage |
| OFF voltage | 0...10 % of rated voltage |

ANALOGUE OUTPUT (MC350, MC350H)
Note!

Analogue output is available only in combination with High range Universal power supply.

| | |
|---|---|
| Output range | 0...20 mA |
| Accuracy | 0.5 % of range |
| Maximum load | 150 Ω |
| Max. voltage on output (open circuit current output) | 5 V |
| Linearization | Linear, Quadratic |
| Max. No. of break points | 5 |
| Output value limits | 120% of nominal output |
| Response time of analogue output | Depends on set Average interval (8 – 256 periods) |
| Residual ripple | < 1 % p.p. |

All outputs may be either short or open-circuited. They are electrically insulated from all other circuits.

Output range value can be altered subsequently (zoom scale) using the setting software, but a supplementary error results.

INTRINSIC-ERROR (FOR ANALOGUE OUTPUTS)

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

Linear characteristic

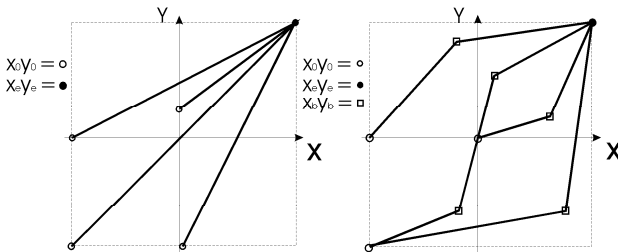
$$c = \frac{1 - \frac{y_0}{y_e}}{1 - \frac{x_0}{x_e}} \quad \text{or} \quad c = 1$$

Bent characteristic

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

b – number of break point (1 to 5)

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



--- Limit of the output range

AUX POWER SUPPLY

UNIVERSAL SUPPLY – FULL RANGE

| | |
|--------------------------|--------------|
| Nominal voltage AC range | 48 ... 276 V |
| Nominal frequency range | 40 ... 65 Hz |
| Nominal voltage DC range | 20 ... 300 V |
| Consumption | < 3.5 VA |

UNIVERSAL SUPPLY – HIGH RANGE (MC350, MC350H)

| | |
|----------------------------|---------------|
| Nominal voltage AC range | 85 ... 265 V |
| Nominal frequency range | 40 ... 65 Hz |
| Nominal voltage DC range | 100 ... 265 V |
| Consumption | < 3.5 VA |
| Power-on transient current | < 20 A; 3 ms |

AC POWER SUPPLY

| | |
|-------------------------|---|
| Nominal voltage AC | 57.7 / 63.5 / 100 / 110 / 230 / 240 / 400 / 440 / 500 V |
| Nominal frequency range | 40 ... 65 Hz |
| Consumption | < 3.5 VA |

SAFETY

| | |
|----------------------|---|
| Protection | protection class II |
| | 600 V rms, installation category II |
| | 300 V rms, installation category III |
| | pollution degree 2 |
| | in compliance with EN 61010-1 |
| Enclosure material | PC/ABS |
| | incombustibility–self-extinguishability |
| | complying with UL 94 V-0 |
| Enclosure protection | IP 52 front side |
| | IP 00 for terminals |
| | (IP20 with protection cover) |
| | in compliance with EN 60529 |

ENVIRONMENTAL CONDITIONS

| | |
|-----------------------|---------------------------|
| Ambient temperature | usage group III |
| Operating temperature | - 10 to +60 °C |
| Storage temperature | - 40 to +70 °C |
| Maximum humidity | ≤ 95% r.h. non-condensing |
| Altitude | ≤ 2000 m |

EU DIRECTIVES

Directive 2006/95/EC on low voltage.
 Directive 2004/108EC on electromagnetic compatibility.
 Directive on RoHS 2011/65/EU.

TERMINALS

| | |
|--------------------|---------------------------------------|
| Connection | Max. conductor cross-sections |
| Voltage inputs (4) | 2.5 mm ² with pin terminal |
| | 4 mm ² solid wire |
| Current inputs (3) | ≤ Ø 6 mm; one conductor |
| | with insulation |
| Power supply (2) | ≤ 2.5 mm ² ; one conductor |
| Modules (3 each) | ≤ 2.5 mm ² ; one conductor |

MECHANICAL

| | |
|---------------------------|-----------------------|
| Vibration withstand | 0.7g, 3 ... 100 Hz |
| Mounting | Pannel mounting |
| Cutting for installation: | 92 ^{+0,8} mm |
| | acc. to DIN EN 50 022 |
| Weight (max) | 500 g |

CONNECTION

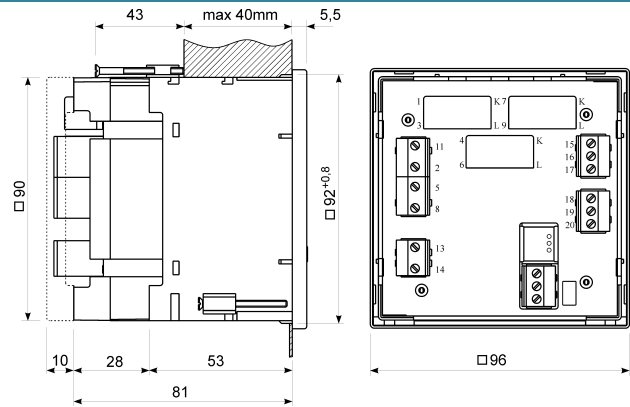
System:

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

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

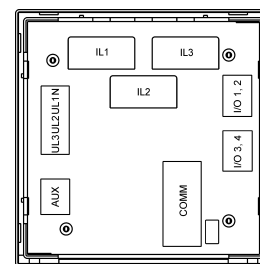
| System/ connection | Terminal assignment |
|---|---------------------|
| Single-phase connection 1b (1W) | |
| Three-phase three-wire connection with balanced load 3b (1W3) | |
| Three-phase three-wire connection with unbalanced load 3u (2W3) | |
| Three-phase four wire connection with balanced load 4b (1W4) | |
| Three-phase four wire connection with unbalanced load 4u (3W4) | |

DIMENSIONAL DRAWING



CONNECTION TERMINALS AND MARKINGS

| Function | | Connection | | |
|------------------------|-------------|---------------|--------|--|
| Measuring input | AC current | IL1 | CT1 | |
| | | IL2 | CT2 | |
| | | IL3 | CT3 | |
| Measuring input | AC voltage | UL1 | 2 | |
| | | UL2 | 5 | |
| | | UL3 | 8 | |
| | | N | 11 | |
| Inputs / outputs | I/O 1, 2 | I/O - 1 | 15 | |
| | | Common (1, 2) | 16 | |
| | I/O 3, 4 | I/O - 2 | 17 | |
| | | I/O - 3 | 18 | |
| | | Common (3, 4) | 19 | |
| Auxiliary power supply | + / AC (L) | 13 | | |
| | - / AC (N) | 14 | | |
| Communication | RS232/RS485 | Rx / A | 23 | |
| | | GND / NC | 24 | |
| | | Tx / B | 25 | |
| | PROFIBUS | D-SUB 9pin | 3 - A | |
| | | | 8 - B | |
| | | | 6 - 5V | |
| 5 - GND | | | | |
| USB | USB type B | | | |
| Service USB | Mini USB | | | |



COMPLIANCE WITH STANDARDS

| Standard EN | Description |
|-------------|---|
| 61557-12 | Electrical safety in low voltage distribution systems up to 1000 V a.c. and 1500 V d.c. - Equipment for testing, measuring or monitoring of protective measures |
| 61010-1 | Safety requirements for electrical equipment for measurement, control and laboratory use |
| 62053-21* | Electricity metering equipment (a.c.) Particular requirements |
| 62053-22* | Electricity metering equipment (a.c.) Particular requirements |
| 62053-23* | Electricity metering equipment (a.c.) Particular requirements |
| 62053-31* | Electricity metering equipment (a.c.) Particular requirements |
| 61326-1 | EMC requirements for electrical equipment for measurement, control and laboratory use Part 1: General requirements |
| 60529 | Degrees of protection provided by enclosures (IP code) |
| UL 94 | Tests for flammability of plastic materials for parts in devices and appliances |
| IEC 61158 | Industrial communication networks – Fieldbus specifications (Type 3) |

* - Partial compliance

DATA FOR ORDERING

When ordering the meter, all required specifications shall be stated in compliance with the ordering code. Also additional information could be stated if needed. Most typical options are shown as an example.

EXAMPLE OF ORDERING

The MC350 meter is connected to secondary phase voltage up to 500 VL-N and 5 A secondary current. There are no special requirements for energy accuracy. A universal supply and two modules are built-in the meter. The first module is a relay output and the second one is a tariff input (230 V AC). Meter has USB communication, it is calibrated to frequency 50, 60 Hz, finish is standard.

Ordering code example:

MC350 S ARNG S U U M T A

ORDERING CODE:

| Type | Energy Accuracy Class | Voltage Input | Calibration Frequency | Aux Power Supply | Communication (COM1) | Input/Output 1&2 | Input/Output 3&4 | Finish |
|--------|-----------------------|---------------|-----------------------|------------------|----------------------|------------------|------------------|---|
| MC3x0x | X | X | X | X | X | X | X | X |
| | | | | | | | | A Standard |
| | | | | | | | | P IP54 |
| | | | | | | | | H HVE (Tropical Seal) |
| | | | | | | | | S Ship Version <i>(not supported with PROFIBUS)</i> |
| | | | | | | | D | 2x Digital input 230 V <i>(MC330, MC350, MC350H only)</i> |
| | | | | | | | E | 2x Digital input 75...110 V <i>(MC330, MC350, MC350H only)</i> |
| | | | | | | | F | 2x Digital input 24 V DC <i>(MC330, MC350, MC350H only)</i> |
| | | | | | | | T | 2x Tariff input 230 V |
| | | | | | | | Z | 2x Tariff input 75...110 V |
| | | | | | | | N | Without |
| | | | | | | | A | 2x Analogue output <i>(MC350, MC350H with aux. power supply type H only)</i> |
| | | | | | | S | | 2x Pulse output |
| | | | | | | M | | 2x Relay output <i>(MC330, MC350, MC350H only)</i> |
| | | | | | | N | | Without |
| | | | | S | | | | RS232 |
| | | | | D | | | | RS485 |
| | | | | P | | | | PROFIBUS + Service USB <i>(MC330, MC350, MC350H only; excludes Ship Version)</i> |
| | | | | U | | | | USB |
| | | | | N | | | | Without <i>(MC320, MC330 only)</i> |
| | | | | M | | | | Service USB <i>(MC320, MC330 only)</i> |
| | | | | U | | | | 20...300 V DC, 48...276 V AC (Uni. power supply - Full range) |
| | | | | A | | | | 57.7 V AC |
| | | | | B | | | | 63.5 V AC |
| | | | | C | | | | 100 V AC |
| | | | | D | | | | 110 V AC |
| | | | | E | | | | 230 V AC |
| | | | | F | | | | 400 V AC |
| | | | | G | | | | 500 V AC |
| | | | | I | | | | 240 V AC |
| | | | | J | | | | 440 V AC |
| | | | | H | | | | 100...265 V DC, 85...265 V AC <i>(MC350, MC350H only)</i> |
| | | | | | | | | (Uni. power supply - High range) |
| | | | S | | | | | 50, 60 Hz <i>Calibration frequency is valid only for measuring inputs and not for power supply!</i> |
| | | | A | | | | | 400 Hz |
| | | | B | | | | | 16.6 Hz |
| | | | C | | | | | 200 Hz |
| | | ARNG | | | | | | Autorange - 50...500 V |
| | | 63V5 | | | | | | 57.7...63.5 V <i>(MC320, MC330 only)</i> |
| | | 110V | | | | | | 100...110 V <i>(MC320, MC330 only)</i> |
| | | 240V | | | | | | 230...240 V <i>(MC320, MC330 only)</i> |
| | H | | | | | | | Active cl. 0.5S/Reactive cl.2 |
| | S | | | | | | | Active cl. 1/Reactive cl.2 |
| MC320 | | | | | | | | Energy meter |
| MC330 | | | | | | | | Multimeter |
| MC350 | | | | | | | | Network recorder |
| MC350H | | | | | | | | Network recorder with individual harmonics measurements |

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