MTR-4

4921220061H

Multi-transducer

Data sheet

Improve Tomorrow

1. MTR-4

1.1 About the MTR-4

The MTR-4 measures, analyses and monitors single-phase or three-phase electrical power networks, including those that require marine approval.

The MTR-4 measures RMS values by means of fast sampling of voltage and current signals, which makes the instrument suitable for acquisition of transient events.

A built-in microcontroller calculates measurements from the measured signals. For example, voltage, current, frequency, energy, power, power factor, THD and phase angle.

Features

- Measurements of instantaneous values, for example, V, A, kW, kVA, kvar, kWh, kvarh, PF, Hz, MD thermal and THD. With configurable outputs for more than 50 parameters.
- Power accuracy class 0.5 (0.4)
- Serial communication, RS-485 up to 115,200 bit/s optional
- Modbus communication protocol
- Up to four analogue outputs or two relay outputs
- Single wide auxiliary power supply range 20 to 300 V DC, 48 to 276 V AC (tolerances included)
- Automatic range of nominal current and voltage (max. 12.5 A and 600 V_{L-N})
- Housing for DIN rail mounting
- User-friendly configuration software

1.2 Standard compliance

Standard	Description
EN 61010-1	Safety requirements for electrical equipment for measurement, control and laboratory use.
EN 60688	Electrical measuring transducers for converting AC electrical variables into analogue and digital signals.
EN 61000-6-2	Electromagnetic compatibility (EMC) – Immunity for industrial environments.
EN 61000-6-4	Electromagnetic compatibility (EMC) – Emission standard for industrial environments.
EN 60 529	Degrees of protection provided by enclosures (IP code).
EN 60 068-2-1/ -2/ -6/ -27/-30	Environmental testing (-1 cold, -2 dry heat, -6 vibration, -27 shock, -30 damp heat).
UL 94	Tests for flammability of plastic materials for parts in devices and appliances.

1.3 Application

The MTR-4 multi-function transducer is used for measuring and monitoring all single-phase or three-phase values.

The range of I/O modules makes MTR-4 the perfect choice for many applications.

MTR-4 supports standard serial communication RS-485 with speeds up to 115,200 baud, which is perfect for simple applications and serial bus interfacing.

The USB 2.0 interface can be used for fast setup, without any need for an auxiliary power supply.

However, the USB 2.0 interface is NOT galvanically separated from the power input and must be used ONLY unconnected to power inputs.

The variants with relay outputs are an ideal solution for retrofitting wind turbine applications to bring them into compliance with the GL requirement for redundant power measurement.

1.4 Programming

The MTR-4 multi-function transducer is fully programmable using M-Set utility software.

Values such as primary-secondary ratio (U, I), energy counter, input and output are all programmed by setting software on the USB or the RS-485 communication.

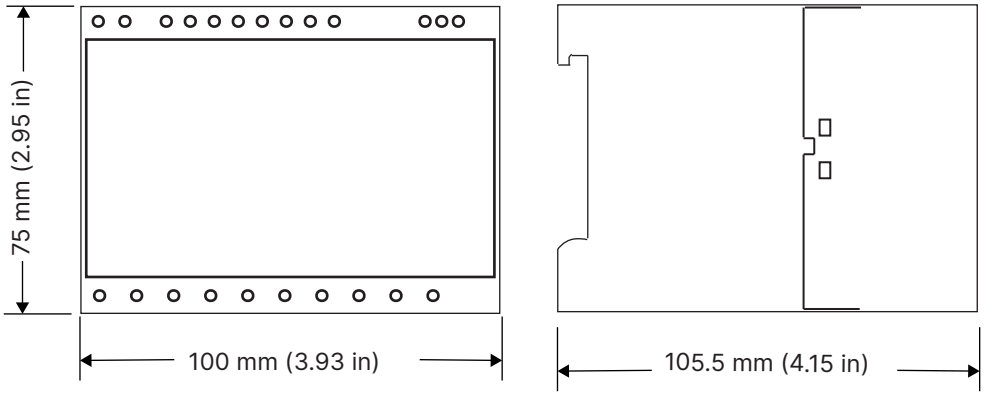
You can choose between many standard output value ranges (±100 to 0 to 100 %).

Value range
-10 to 0 to 10 V
-1 to 0 to 1 V
-20 to 0 to 20 mA
10 to 0 to 10 mA
5 to 0 to 5 mA
1 to 0 to 1 mA

Within these six ranges you can set any linear or non-linear (with maximum 5 break points) output characteristic.

2. Technical specifications

2.1 Dimensions



Category	Specifications
Dimensions	W X H X D: 100 x 75 x 105.5 mm (3.93 x 2.95 x 4.15 in)
Weight	370 g (0.81 lb)

2.2 Accuracy

Measured values	Range		Accuracy class*
RMS current (I1, I2, I3, Iavg, In)	-1/-5 A		0.3 (0.2)**
Maximum current	12.5 A		0.3 (0.2)**
RMS phase voltage (U1, U2, U3, Uavg)	62.5, 125, 250, 500 V $_{L-N}$		0.3 (0.2)**
Maximum voltage	600 V $_{L-N}$		0.3 (0.2)**
RMS phase-to-phase voltage (U12, U23, U31, Uavg)	800 V $_{L-L}$		0.3 (0.2)**
Frequency (f) – actual	50/60 Hz		0.02
Nominal frequency range	16 to 400 Hz		0.02
Power angle (φ)	–180 to 0 to 180°		0.5°
Power factor (PF)	–1 to 0 to +1 U = 50 to 120 % U_n I = 2 % to 20 % I_n I = 20 % to 200 % I_n		0.5
THD	5 to 500 V 0 to 400 %		0.5
Active Power	75 120 250 500 [W/var/VA] I_n = 1 A	375 600 1250 2500 [W/var/VA] I_n = 5 A	0.5 (0.4)**
Reactive power			0.5 (0.4)**
Apparent power			0.5 (0.4)**
Active energy			Class 1
Reactive energy			Class 2

NOTE * All measurements are calculated with high harmonic signals.
** Accuracy on RS-485 Modbus values.

2.3 Analogue inputs

Voltage inputs	
Nominal range values	62.5, 125, 250, 500 V_{LN} - Auto range
Nominal voltage (U_N)	500 V_{LN}
Measuring range (cont.)	2 to 600 V_{LN} (1000 V_{LL}) sinusoidal
Max. allowed value acc. to IEC/EN 60688	2 × U_N, 1 s, 10 times and 10 s interval
Frequency range	50/60, 400 Hz*
Consumption	< U^2/3.3 MΩ per phase
Input impedance	3.3 MΩ per phase

Current inputs	
Nominal range values	1, 5, 10 A – Auto range
Nominal current (I_N)	5 A
Measuring range	1 mA to 12.5 A sinusoidal
Min. measurement (noise reduction)	Settings from *starting current for all powers***
Max. allowed value (thermal)	15 A cont.
acc. to IEC/EN 60 688	20 × I_N, 5 × 1 s, 300 ms interval
Frequency range	50/60, 400 Hz*
Consumption	< I^2 × 0.01 Ω per phase

Frequency	
Nominal frequency (f_N)	50, 60 Hz
Measuring range	16 to 400 Hz***

Universal power supply	
Nominal voltage AC	48 to 276 V (tolerances included)
Nominal frequency	45 to 65 Hz
Nominal voltage DC	20 to 300 V (tolerances included)
Consumption	< 8 VA
Power-on transient	< 20 A, 1 ms

NOTE * MTR-4 for 400 Hz voltage/current measurements needs to be calibrated, available by special request.
** Starting current is set by setting software M-Set/settings/general.
*** For frequency measurement only.

2.4 Analogue outputs

Analogue output general	
Linearisation	Linear, quadratic
No. of break points	5
Output value limits	± 120 % of nominal output
Response time	≤100 ms (standard analogue output) ≤ 50 ms (FAST analogue output)
Residual ripple	< 1 % p.p. (standard analogue output) < 2 % p.p. (FAST analogue output)

DC current output	
Output range values	–100 to 0 to 100 %
-1 to 0 to 1 mA	Range 1
-5 to 0 to 5 mA	Range 2
-10 to 0 to 10 mA	Range 3
-20 to 0 to 20 mA	Range 4
Other ranges	Use M-Set software to set other ranges.
Burden voltage	10 V
External resistance	RB_{max} =10 V/I_{outN}

DC voltage output	
Output range values	–100 to 0 to 100 %
-1 to 0 to 1 V	Range 5
-10 to 0 to 10 V	Range 6
Other ranges	Use M-Set software to set other ranges.
Burden current	20 mA
External resistance	RB_{min} = U_{outN}/20 mA

2.5 Relay outputs

Electromechanical relay output	
Purpose	Alarm, pulse, general purpose digital output.
Type	Electromechanical relay switch
Rated voltage	48 V AC/DC (+40 % max)
Max. switching current	1000 mA
Contact resistance	≤ 100 mΩ (100 mA, 24 V)
Pulse	Max. 4000 pulses/hour
(if used as pulse output)	Min. pulse length 100 ms
Insulation voltage	
Between coil and contact	4000 V DC
Between contacts	1000 V DC

Connection

The terminal connections are designed for a maximum conductor cross-section of 2.5 mm^2 with a pin terminal or 4 mm^2 with a solid wire.

2.6 Communication

Communication		
Interface	RS-485	USB
Type of connection	Network	Direct
Max. connection length	1000 m	3 m
Number of bus stations	≤ 32	-
Terminals	Screw terminals	USB-mini
Insulation	Protection class I, 3.3 kV AC RMS 1 min	No galvanic separation!
Transmission mode	Asynchronous	
Protocol	Modbus RTU	
Transmission speed	2400 to 115,200 bit/s	USB 2.0

2.7 Response time and power status

Feature	Description
Response time input→communication	All calculations are averaged over an interval of between 8 to 256 periods. Preset interval is 64 periods, which is 1.28 s at 50 Hz. Modbus table refresh time is 50 ms.
Power status LED	Red = instrument power ON

2.8 Environmental specifications

Operating conditions and mechanical specifications	
Protection degree	Acc. to IEC/EN 60529 IP20 Protection class II
Pollution degree	2
Installation category	Acc. to EN 61010-1 CAT III, 600 V meas. inputs CAT III, 300 V aux. supply
Galvanic isolation	Acc. to EN 61010-1 UAUX↔AO, COM: 3310 V AC, 50 Hz, 60 s UAUX↔U, I inputs: 3310 V AC, 50 Hz, 60 s U in↔AO, COM: 3310 V AC, 50 Hz, 60 s I in↔AO, COM: 2210V AC, 50 Hz, 60 s U in↔I in: 3310 V AC, 50 Hz, 60 s
Vibration	IEC 60068-2-6, 3 to 13.2 Hz: 2 mmpp. 13.2 to 100 Hz: 0.7 g. Acc. to IEC 60068-2-6 & IACS UR E10
Shock	50 g, 11 ms, half sine. Acc. to IEC 60068-2-27
EMC	Acc. to EN 61000-6-2 and EN 61000-6-4
Mounting	Rail mounting 35 × 15 mm

Operating conditions and mechanical specifications	
	Acc. to DIN EN 50 022
Enclosure material	PC/ABS
Flammability	Acc. to UL 94 V-0
Ambient temperature	Usage group I
	-5 to 0 to 45 to 55 °C (accuracy outside reference temperature range is not more than 2x class)
	Acc. to IEC/EN 60 688
Operating temperature	-30 to +70 °C
Storage temperature	-40 to +70 °C
Average annual humidity	≤ 93 % RH

3. Ordering information

3.1 Order specification

Name	Output				RS-485	Coating	DEIF no.
	1	2	3	4			
MTR-4-015					●		2962390110.01
MTR-4-105	AO						2962390110.02
MTR-4-215	AO	AO			●		2962390110.03
MTR-4-315	AO	AO	AO		●		2962390110.04
MTR-4-415	AO	AO	AO	AO	●		2962390110.05
MTR-4 2RO, 1AO	RO	RO	AO		●		2962390110.09
MTR-4 2RO, 1AO tropical	RO	RO	AO		●	●	2962390110.11

4. Legal information

4.1 Disclaimer and copyright

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