Operating Instructions

MAVOLOG 10L/ 10N/ 10S
Mains analyzer

GOSSEN METRAWATT CAMILLE BAUER

1.01-1099-15

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I. First Inspection

Check whether instrument and accessories supplied with the instrument are complete and undamaged just after receipt:

Unpacking

Handle the instrument with the usual care for electronic instruments.

The transport packing is made of recycling material and provides for sufficent protection during transport. In case of repacking use aquivalent packing material.

Visual inspection

Compare order code and type code on the packing and/or instrument with the data on the delivery note.

Ascertain whether accessories are complete.

Check packing, instrument and accessories on eventual transport damage.

Claims

In case of finding out damages please reclaim at the carrier without delay (keep packaging). When other defects occur or in case of repair inform the representative in charge. or apply to our service department directly (see adress on rear cover).

II Safety Warnings

The MAVOLOG 10L/N/S is constructed and tested in compliance with the safety rules of IEC 61010-1/EN 61010-/-VDE 0411 T1 and meets protection class I. When properly used, the safety of both the user and the instrument is assured. It is not assured, however, if the instrument is misused or carelessly handled.

To maintain the safe and proper condition of the instrument and to assure its safe operation, it is absolutely necessary to carefully and completely read these operating instruction before using the instrument. These instructions must be followed in all respects.

WARNING!.
An instruction note, a practical application etc. with this notice must be kept in order to maintain the safety protection of the instrument and avoid injurance of persons.

ATTENTION!
An instruction note, a practical application etc. with this notice must be kept in order to avoid damage of the instrument and to maintain correct operation.

WARNING 1

The instrument must only be operated by persons who understand the danger of shock hazards and know how to apply safety precautions.

Shock hazards exist wherever voltages of more than 30V (TRMS) can appear.

WARNING 2

When making installations or measurements where shock hazards exist, avoid from working allone. In this case a second person must be present.

WARNING 3

The maximal permissable potential between current/voltage inputs and ground is when connected to circuits of

- overvoltage category	II	600V
	III	300V

WARNING 4

Do not exceed the permissible overload limits of the measuring inputs. The maximum permissable overload is:

- of the voltage inputs each	600V
- of the current inputs each	7A
- of the auxiliary inputs U_H	36VDC

WARNING 5

The instrument must not be used on circuits with corona discharge (high voltage).

WARNING 6

Be particularly careful when measuring on HF circuits. Dangerous composite voltages may exist there.

WARNING 7

Take into account that unexpected high voltages can occur on devices under test conditions (e.g. defective instruments) Capacitors may be charged to a dangerously high voltage, for instance.

WARNING 8

Measurements under moist environmental conditions are not permitted.

WARNING 9

Verify that the test leads are in proper condition, e.g no cracked insulation, no open circuits in the leads or connectors.

WARNING 10

When it must be assumed that safe operation of the instrument is no longer possible, take the device out of service and secure it against unintentional and accidental use.

It is assumed that safe operation is no longer possible,

- when the instrument shows obvious signs of damage,
- when the instrument does not longer function corretly,
- after prolonged storage under adverse conditions,
- after severe transport stress.

WARNING 11

When opening the instrument, live parts may be exposed. Therefore, the instrument must be disconnected from the measuring circuit prior to opening the housing for repair, replacement of parts or recalibration. If repair or recalibration cannot be avoided unless the instrument is opend and live, this work must be carried out only by a quailfied person who understands the danger involved.

1. Techncal Description

1.1 Applications

The three phase mains analyzers of the series **MAVOLOG 10L/N/S** preferably were designed for testing the quality of the electrical power supply (voltage quality). Furthermore it allows for measuring the essential power line quantities and recording the course of effecive values or interval measuring data (recorder mode). With the additional current inputs the type **MAVOLOG 10S** provides for measuring quantities in the fields of current distortion and power demand values for power clearing. Therewith a wide range of application in the fields of electrical power measuring, quality testing and energy control can be covered.

In the field of „testing of voltage characteristics of electrical power supply“ (power quality) the test duration extends to several days or weeks. In addition some characteristics have to be measured in several sites of a supply area. Therefore the MAVOLOG 10L/N/S is designed for mounting on panel or hat rail.

1.2. General Description

1.2.1 Common Characteristics

Current, voltage, and phase shift are measured and processed directly in a DSP (digital signal processor). The relevant measuring data are stored in the intern storage. Via the built-in interface (RS485) and the PC software METRAwin 10 for Mavolog, they are read out onto the PC. In addition, events can be signalled over the programmable alarm output performing as a collecting alarm (relay contact).

The voltage inputs are directly connected to the low voltage mains. The MAVOLOG incorporates voltage measuring inputs for 100 or 400V.

For the current inputs (MAVOLOG 10S), the measuring ranges 5A or 1A are available. An adaptation to the current to be measured is possible via suitable current transformers X/1A or X/5A (in exceptions, clip on current transformer with current output X/1A can be used). The selection is set up via software METRAwin 10 for MAVOLOG.

With the use of a standard host computer, no RS485 interface is usually available. Therefore, the connection between MAVOLOG 10L/N/S and computer is set up via the interface converter MAVOLOG PS/C contained in the delivery program.

1.2.2 RS485 Field Bus

For applications which require several measurement points, the devices are meshed over the RS485 field bus. Up to 32 devices of different configuration can be connected to a bus.

At bigger plants, several buses which are summarized in workstations are installed already from reasons of the spatial extension. The combination between workstations and place of work is meshed by a second network (e.g Ethernet LAN). This easy to service construction guarantees the clarity and a secure management.

1.3 Storage Organisation

1.3.1 Operation Modes

The internal storage with a capacity of 256kByte (128K words) can be operated in two modes:

- ***FIFO-Mode (First-in-first-out mode):*** In this mode, the in each case oldest data are overwritten by the new ones (push-up storage).
- ***STOP-Mode:*** The data are maintained when data flow exceeds the stoage capacity (write protection storage). In this case, the data must be erased via an external information available in the storage.

1.3.2 Storage Functions

A maximum of 40 data points can be selected simultaneously from the available measurement quantities and evaluations for recording. The selection is carried out via software METRAwin 10 for MAVOLOG.

The storage can be configured as an event logger, graph-event logger and data logger. The following combinations are possible (description in words):

(1) 128K eventlogger
(2) 128K graph-event logger
(3) 128K data logger
(4) 64K eventlogger + 64K data logger
(5) 64K graph-event logger+64K data logger

The simultaneous operation in the FIFO mode and STOP mode is possible. In such a way, e.g. in store function mode (4) one can operate of the event loggers in the STOP mode while the data logger runs in the FIFO mode.

1.4 Storage of Events

Events are single fluctuations of measuring signals exceeding the given limits or compatibility levels which occur at a time which is not predictable. As a result, an individual recording is caused.

1.4.1 Eventlogger

The measured value formed after the relevant requirements (10sec mean value, instantaneous value, 10min mean value) is compared with the corresponding limit value. Exceedings are stored and available in alphanumeric form with type of error, value, date and time.

Every characteristic of the voltage and of the current is assigned with a limit value or compatibility level according to the standards. A recording is activated automatically by exceeding a limit value or a compatibility level.

Note 1: The event storage is the basis for all further analyses. It includes all data those are required by statistical evaluations. With the software METRAwin 10 for MAVOLOG, the data transmitted onto the PC can further be prepared for different normative characteristics. In such a way, e.g. a fault statistics for both according to EN 50160 (week evaluation) and appropriately for different industrial standards (day evaluation) can be compiled.

Note 2: Transients can not be registered. However, conclusions are possible if a limit exceeding of the 10ms rms value is present and the event was stored in the graph-event logger function. Interharmonic voltages are not registered at present.

1.4.2 Graph-Event Logger

In this supplementary function, the graphic process of events can be recorded over the fixed time interval of 2 seconds

The trigger position is determined with 50% post trigger by which the releasing event is in the middle of the recording interval and 50% pre history and 50% post-history are recorded. The sampling frequency of 6,4 kHz is fixed, that corresponds to 128 samples per period at 50 Hz.

Events which occur while recording of a current event are ignored. After recording the standby state (armed position) is set up automatically again. Following the trigger position to 50% and the fixed recording period of 2 seconds, a time interval of at least 1 second results for the registration of two succeeding events.

The stored events can be read out onto a PC and further processed via the PC software METRAwin 10 for MAVOLOG.

1.5 Datalogger

A measuring run consists of the lot of all measuring points, parameters and unchanged time interval. Recording is unaffected by events of which the time of occurence is not predictable. Measuring runs are filed in the datalogger storage function.

Recording of the measured values can be carried out in the selectable time intervals of 1, 10 or 15 minutes and 1 or 24 hours. A measuring run is started immediately after activation of recording via the software METRAwin 10 for MAVOLOG. Before activation of measurement, prestored measurement points can be erased manually. The recorded measuring value corresponds to the measured value directly before end of a time interval.

Note: For continuous, uninterrupted recording, the time interval must be chosen in accordance with the measuring interval (e.g. 10 minutes for 10- minute mean values according to EN 50160). If the measuring interval deviates from the selected time interval, the data points are recorded with that measured value, that was captured immediately before end of every time interval (e.g. instantaneous values for maximum and minimums within a 10-minute mean interval). Synchronisation of the start times between time interval and measuring interval is carried out automatically.

1.6 Measuring Intervals and Observation Periods

1.6.1 Forming Basic Measuring Values

Forming of measuring values follows the standardized representation after DIN 40110-1 94:

$$V = \sqrt{\frac{1}{T}\int_0^T v^2\,dt}$$

T: period length
v: signal waveform
V: effective value of voltage

Corresponding is valid for the current **I**.

Voltage signal waveform (v) is sampled with a frequency of 6,4 kHz, digitalized and squared. Integration is carried out by a digital low-pass filter with a basic frequency of 35 Hz. The output value of the digital filter is determined every 10 ms. The square root of it represents the effective value in a 10 msec interval, which is used for all subsequent measuring value formations.

RMS Value
The measuring interval for the RMS value is 1 second, which is 50 periods at 50 Hz.

10- Second mean value
Over the instantaneous values registered continuously and gaplessly, the mean value is formed by 10 seconds in the time period.

10-Minute-Mean-Value
The measuring interval for the 10-minutes-mean value is 10 minutes, which is 30000 periods at 50 Hz.

1.6.2 Collective Power

For the instantanous value of the collective power (three phase power) applies according to DIN 40110-2 96:

$$P_\Sigma(t) = \sum_{\mu=1}^{n} P_\mu(t) = \sum_{\mu=1}^{n} v_{\mu 0} i_\mu = \sum_{\mu=1}^{n} v_{\mu n} i_\mu$$

For the three phase mains the „collective quantities“ are determined according to DIN 40110-2 96 as follows:

$$I_\Sigma = \sqrt{\sum_{\mu=1}^{3} I_\mu^2} \quad \text{and} \quad V_\Sigma = \sqrt{\sum_{\mu=1}^{3} V_{\mu 0}^2}$$

From that the collective apparant power is defined:

$$S_\Sigma = V_\Sigma I_\Sigma .$$

1.6.3 Interval Energy

For calculation of Interval energy and power demand resulting from it, the power consumption in each 15 minutes period is cumulated and stored. Further cumulation intervals agreed between electric utility and power consumer (e.g. 30 minutes, 96- hour time shift period) are derived via the software METRAwin 10 for MAVOLOG. Synchronization with the utility time impulse is not planned in the MAVOLOG.

1.6.4 Window Width

For harmonic measurements, the FFT is carried out with a window width of 8 fundamental periods at synchronous scanning every 3 seconds time interval. The measurement is planned for quasi-stationary harmonics. Further references can be found in the standard EN 61000-4-7.

1.6.5 Observation Period

The basic observation period is a day interval (24 hour interval). It begins at00:00 o'clock and ends on the same day at 24:00 o'clock. Further periods required for statistics purpose (e.g. week period for evaluations after EN 50160) are calculated via software METRAwin 10 for MAVOLOG. In case of a corresponding memory setup all intervals, partial intervals included, are stored

Note: Beginning and end of the observation period are selected after transfer of the measuring data to the PC. In this way, the data can be used for evaluation of different national and international normative standards.

1.7 Relay Output

The built-in relay serves for signalling of limit or compatibility level exceedings. The potential free relay contact performing as a common alarm can be programmed as opener (NC = normally closed) or closer (NO = normally opend). Moreover, the signalling mode is programmable as follows:

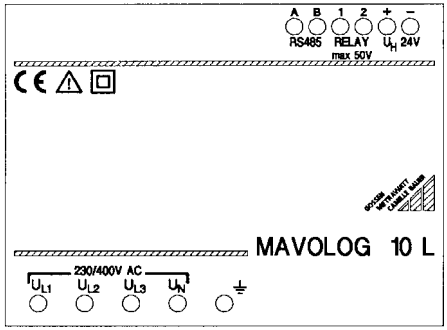
Signalling mode	OFF	no signalling
	TIME	signalling duration programmable
	EXT	reset of signalling via PC software

As a common alarm, all exceedings of limits and compatibility levels act combined. The first event occurred releases the alarm.
Further alarms are ignored until the relay returns into the standby mode. A selective alarm of events which are to be assigned to different measurement quantities is not possible.

In the TIME alarm mode, the period of the announcement can be adjusted between 2 and 65335 seconds. After this time, the relay resets to standby position without external acknowledgement. A reset with acknowledgement is possible via software METRAwin 10 for MAVOLOG.

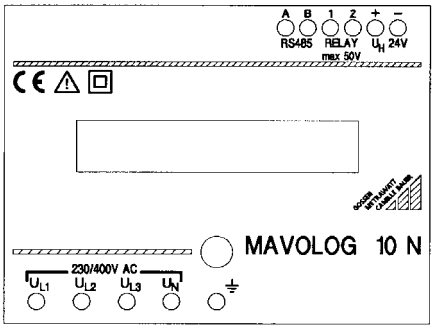
1.8 MAVOLOG-Types

MAVOLOG 10L



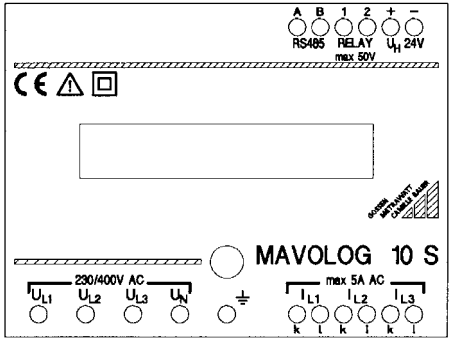
The version MAVOLOG 10L without current inputs and LCD display constructed for voltage quality testing and additionally serves as voltage recorder. The measured values together with the relevant evaluations are recorded to the internal storage.
Via the built-in relay, exceedings of limits and compatibility levels are signalled. Programming and data transfer are carried out via the software METRAwin 10 for MAVOLOG.

MAVOLOG 10N



The MAVOLOG 10N incorporates an additional LCD display. In this way, it serves for observation of measured values on site. Over a key klick, at maximum 10 programmable measurement quantities can be selected and displayed on the LCD display. If the key remains pressed, the programmed measurement parameters appear in successive order. In the other respects, the version corresponds to the type MAVOLOG 10L.

MAVOLOG 10S



The MAVOLOG 10S with LCD display and its additional current inputs represents a universally suitable mains analyzer. It is used equally for the registration of the process of essential measuring quantities in the power line (current/voltage/power recorder), for testing the characteristics of the mains voltage (voltage quality) and for energy recording in corporation with the software METRAwin 10 for MAVOLOG.

2. Available Measuring Quantities and Evaluations

2.1 Standard Requirements

The close interaction between electric utility and power consumer is reflected in volume and complexity of the international and national standards as well as of the EU guidelines. In addition to recording instantanous values and mean values, characteristics of voltage fluctuations and current retroactivities are calculated and evaluated against the compatibility levels described in the standards for electromagnetic compatibility (EN 50160, IEC 61000- ff/EN 61000- ff, NRS 048 etc.). As far as required by statistical evaluations, the compatibility levels are calculated in the MAVOLOG 10L/N/S. Together with the other measuring data they are availabel for further evaluations (e.g. daily, weekly and long-term statistics) via software METRAwin 10 for MAVOLOG.

2.1.1 Voltage chacteristics

For the conforming to standards evaluation of voltage fluctuations, in particular in public supply networks, the course of the rms voltage is observed permanently and uninterrupted and evaluated according to the criteria described in the relevant standards.

On account of the random characterized appearance of variations in line voltage, statistical and probabilitiy theoretical means of evaluation are applied. On the one hand, this requires an early recognition of voltage changes, on the other hand a mean value calculation over representative periods. In such a way, voltage drops e.g. must be recognized within 10 ms; For the frequency, a mean value period is planned by 10 seconds while slow variations in line voltage and harmonic fluctuations are to be evaluated as a mean value at the 10- minute period.

The characteristics voltage dips and voltage drops can be valued both after EN 50160 and in accordance with classification indicated in the following table. The specifications they correspond to is the standard NRS 048-2: 1996. With it the voltage dips are determined depending on dip magnitude and duration.

category	dip magnitude	duration
Y	10 % - 20 %	20 ms - 3000 ms
X	20 % - 60 %	20 ms – 150 ms
S	20 % - 60 %	150 ms – 600 ms
T	60 % - 100 %	20 ms – 600 ms
Z	20 % - 100 %	600 ms – 3000 ms

2.1.2 Current Retroactivities

The evaluation follows the guidelines for quasi-stationary and slowly fluctuating harmonic currents according to IEC 1000-4-7 and EN 61000-4-7 respectively . After this a continuous but not uniterrupted measuring sequence is required.

In intervals of 3 seconds, probes are taken for every phase and every rms value of the harmonic current. The corresponding data are filed in the storage in case of the assessed value exceeds the compatibility level.

Note: A mean value calculation like at the voltage is indeed possible, however assessment according to standards is not relevant.

2.2 Listing of Measuring Quantities and Evaluations

2.2.1 General Notes

In the following tables, the basic measuring quantities are stated. In combination with the stated measuring types, the relevant evaluations result. For the assessment of supply quality, the following special terms for voltage characteristics are not identified by separate:

- Slow voltage fluctuation
- Fast voltage fluctuation
- Voltage dips
- Short supply interruptions
- Long voltage interruptions
- Temporary linefrequent overvoltage

Default limits and compatibility values are recorded via trigger conditions. With it an evaluation by value and numerical analysis can be carried out on site over defined time periods.

2.2.2 Common Measuring Quantities

			Measuring Type								
Measuring quantity	**Description**	**Unit**	ilnstantanous value [4]	maximum [1]	minimum [1]	10-sec mean-value	10-min mean.value	daily maximum [2]	daily minimum [2]	energy meter	event counter [3]
Phase-to-eart voltage (effektive value)	U1N, U2N, U3N	V	●	●	●		●	●	●		●
Phase-to-phase-voltage (effektive value)	U12, U23, U32	V	●	●	●		●	●	●		●
Neutral-to-eart-voltage in the 4-wire system (effektive value)	UNPE	V	●	●				●			
Collective voltage (effektive value)	UΣ	V	●	●							
Voltage unbalance (effektive value)	USAD	%					●				●
Line frequency	f	Hz				●					●
Interruptions of auxiliary supply		-									●

2.2.3 Additional Measuring Quantities with the MAVOLOG 10 S

			Measuring Type								
Measuring quantity	**Description**	**Unit**	ilnstantanous value [4]	maximum [1]	minimum [1]	10-sec mean-value	10-min mean.value	daily maximum [2]	daily minimum [2]	energy meter	event counter [3]
Phase current (effektive value)	I1, I2, I3	A	●	●			●	●	●		●
Neutral current (effektive value)	IN	A	●	●			●	●	●		●
Active power per phase	P1, P2, P3	W	●	●				●			
Active power, collective	PΣ	W	●	●				●			
Reactive power, collective	QΣ	Var	●	●			●	●			●
Apperant power, collective	SΣ	VA	●	●			●	●			●
Active energy, collective, consumption and delivery	+WPΣ, -WPΣ	Wh							●	●	
Reactive energy, collective	WQΣ	varh							●	●	
Apperant energy, collective	SQΣ	Vah							●	●	
Power factor, collective	PFΣ	-	●								

2.2.4 Common Optional Measuring Quantities

			Measuring Type								
Measuring quantity	**Description**	**Unit**	ilnstantanous value [4]	maximum [1]	minimum [1]	10-sec mean-value	10-min mean.value	daily maximum [2]	daily minimum [2]	energy meter	event counter [3]
Basic harmonic voltage	U1H01, U2H01,U3H01	V	●	●	●		●	●	●		●
Voltage harmonics 2nd to 40th order	U1H02 ... U1H40 U2H02 ... U2H40 U3H03 ... U3H40	%	●	●	●		●	●	●		●
Total harmonic disturbance THD-U per phase	U1THD, U2THD, U3THD	%	●	●				●			
Short term flicker severity Pst	U1Pst, U2Pst, U3Pst	-					●				
Long term flicker severity Plt	U1Plt, U2Plt, U3Plt	-					5)				●

2.2.5 Additional Optional Mesuring Quantities with MAVOLOG 10 S

			Measuring Type								
Measuring quantity	**Description**	**Unit**	iInstantanous value [4]	maximum [1]	minimum [1]	10-sec mean-value	10-min mean.value	daily maximum [2]	daily minimum [2]	energy meter	event counter [3]
Basic harmonic current	I1H01, I2H01,I3H01	A	●	●			●	●			●
Current harmonics 2nd to 40th order	I1H02 ... I1H40 I2H02 ... I2H40 I3H03 ... I3H40	A	●	●	●		●	●			●
Total harmonic disturbance THD-I per Phase	I1THD, I2THD, I3THD	%	●	●			●	●			●

Legend:

[1]) 1-second-instantanous value in the selected storage interval 1 / 10 / 15 minutes and 1 / 24 hours respectively.
[2]) Daily maximum out of all daily 10-min mean-values.
[3]) Total number of exceedings of given compatibility levels within the storage interval.
[4]) Window width for harmonic measurements: 8 periods
[5]) The Plt-value is calculated from 12 successive Pst-values according to EN 61000-4-15, this corresponds with a 2 hours observation interval.

3. Technical Data

Inputs

Voltage

Number	4 (UL1, UL2, UL3, UN)
Measuring range	100V/400V selectable via PC-Software
Voltage measurement	phase-to-earth 0...(57,7) 230...300V phase-to-phase 0...(100) 400...520V
Overload	max. 600 VAC
Line connection	4-wire/3-wire with artifical Star point
Measuring method	effektive value (RMS, AC), DIN 40110-1 and 2
Mean time interval	1 second
Frequency	45...65 Hz
Impedanz	2,4 MΩ
Ratio	Voltage ratio programmable from 1,00 to 655,35

Frequency measurement in voltage input UL1 only

Current (MAVOLOG 10S)

Number	4 (IL1, IL2, IL3), neutral current measurement via internal sum-current transformer
Current measurement:	
Measuring range 1:	0...1...1,2A
Measuring range 2:	0...5...6A selectable via external software
Overload	1,2-fold
Surge overload	50A 1sec
Measuring method	effektive value (RMS, AC), DIN 40110-1 and2
Mean time interval	1 second
Frequency	45...65 Hz
Impedanz	typ. 40mΩ
Ratio	current ratio programmable from 1 to 65535

Option FFT/FSA

Harmonic analysis

- to 40th harmonic order for voltage and current
- Total harmonic distortion THD

Accuracy: Class B according to EN 61000-4-7

Flicker severity

Measurement Pst, Plt per Voltage input

Measuring error corresponding to EN61000-4-15 (to 4% of voltage change of declared magnitude)

Storage continuous
Mean time interval Pst 10 min/ Plt 120 min

Sample frequency 6,4 kHz, this corresponds to 128 samples per periode at 50 Hz

Resolution 12 bit

Reference conditions

Ratio:	Uratio, Iratio = 1
Frequency:	50 Hz ± 1Hz
Ambient temperature:	23°C ± 2K
Relative humidity:	50% ± 5%
Auxiliary. supply:	24V ± 10%
cosφ	1
Wave shape:	sinusodial, distortion factor ≤ 1%

Measuring error from nominal value

Voltage:	class 0,2
Current:	class 0,2
Power:	class 0,4
Frequency:	± 0,1 % of rdg.

Ambient conditions

Climatic class:	3z/55/75	
Temperature range:	operation/function:	0°C...+55°C
	storage/transport:	-25°C...+75°C
Application:	Indoor, altitude up to 2000m NN	

Auxiliary supply

Voltage range:	18-36VDC
Power consumption:	< 3W
By-pass duration:	
functions:	typ. 100ms at 24VDC
clock	appr. 12 hours

Real time clock

Resolution:	max. 10 ms
Accuracy:	±25 ppm at 20°C per month
Date:	DD/MM/JJJJ
Time:	hh/mm/ss,ss

Mechanical construction

Housing:	panel mounting housing „CombiNorm“
Dimensions:	100 x 75 x 105 mm
Mounting:	panel mounting or hat rail EN 50022/32mm
Connections:	Screw terminals max. 2,5 mm^2

Electrical safety:

Overvoltage category:	III according to EN 61010
Protection class:	II
Protection type:	IP 40 housing IP 00 connections
Nominal voltage:	300 V

Test voltage 1):

Inputs ⇒ Interface, aux. supply, relay	3,7 kV
Inputs ⇒ Housing	3,7 kV

1) homologation test (protective impedance)

Elektromagnetic compatibility

Interference immunity according to EN 50082-2

Device	8kV ESD - air 10 V/m fields
Power line	symmetrical 2 kV burst symmetrical 1 kv burst asymmetrical 2 kV burst

Radio interference suppression according to EN 50081-2

Limit class	B

Interface

Type	RS 485
Baudrate	19,2 kB standard, 115 kB, 57 kB, 9,6 kB
Dummy load	1,2 kOhm (extern)
Bus capacity	32 users without bus coupling

Alarm output

Number	1
Switching element	Relais
Type of contact	closer/opener, programmable
Switching capability	50V; 0,5A
Assignment	Event or even group resp. programmable (collective alarm)

Data storage

Memory capacity	256 kByte (corresponding to 128 words)
Operation modes	FIFO-mode (First-in-first-out) STOP-mode (overwrite protection)
Functios	**Eventlogger**: Storage of events after limit exceeding in alpha-numeric form together with event type, value, data and time. **Graph/-eventlogger:** Eventlogger with supplementary storage of rms process for a time interval of 2 seconds, triggerposition fixed at 50% pre/posttrigger. **Datalogger**: Recording of measuring quantities and evaluations as measuring run. 40 measuring quantities can be recorded simultaneously by the available ones. Selection is carried out via the external software.

Delivery scope: Device MAVOLOG 10 L / N or S
Instruction manual

MAVOLOG 10-Types

MAVOLOG 10L	M830A
MAVOLOG 10L incl. FFT / FSA	M830D
MAVOLOG 10N	M830B
MAVOLOG 10N incl. FFT / FSA	M830E
MAVOLOG 10S	M830C
MAVOLOG 10S incl. FFT / FSA	M830F

Accessories

MAVOLOG PS/C power supply and interface converter	Z863D
MAVOLOG BP battery pack	Z863E
METRAwin 10 for MAVOLOG programming, representation and analyses software	Z852D
Clip on current transformer Z3512 0,5 ... 1000 A~, 1 mA/A, 52mm ∅	GTZ 3512000R0001

3.1 Applied regulations and standards

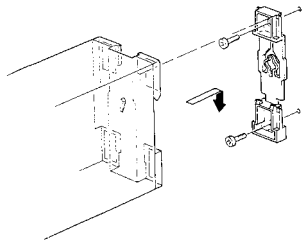
IEC 1010-1 / EN 61010-1	Safety regulations for electric measuring, control, regulation and lab devices
DIN VDE 0470 / EN 60 529	Test instruments and test procedures - Degree of protection provided by enclosures (IP-Code)
DIN 40110-1	Quantities used in alternating current theory: two-line circuits
E DIN 40110-2	Quantities used in alternating current theory: multi-line circuits
VDI VDE 3540	Reliability of measuring, control and regulation instruments.
DIN EN 50 081-2	Generic emission standard residental, commercial and light industry
DIN EN 50082-2	Generic immunity standard residental, commercial and light industry
VDE 0846-4-15	Flickermeter; functional and design specifications
EN 50160 / DINVDE 0839-160	Voltage Characteristics of electricity supplied by public distribution systems
EN 61000-3-2 / VDE 0838-2	Limits for harmonic current emissions (equipment input current ≤ 16 A per phase)
EN 61000-3-3 / VDE 0838-3	Limitation of voltage fluctuations and flicker in low-voltage supply systems for equipment with rated current ≤ 16A
EN 61000-4-7 / VDE 0847-4-7	General guide on harmonics and interharmonics measurements and instrumentation, for power supply systems and equipments connected thereto
NRS-048-2: 1996	Electricity supply/Quality of Supply

4. Setting into Operation

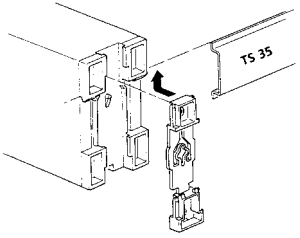
WARNING! Setting into operation works are to be carried out with the connecting cabels beeing voltage free. Before works on the device, the measuring inputs must be disconnected from the mains!

4.1 Mechanical Mounting

The case is designed as wall mounting housing. Fitting is made with the aid of a snap in foot (contained in scope of delivery) on a hat rail TS35 according to DIN EN 50022 or directly onto a panel.

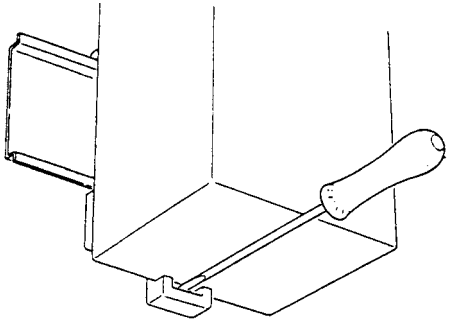


Wall Mounting



Mounting on Hat Rail

For dismantling, the latch (snap-in foot) is to be released with a suitable tool (screwdriver):



4.2 Electrical Connections

4.2.1 Measuring Connection

The instrument is connected to the measuring circuits via the built in screw terminals. They are suitable onto a nominal cross section area of 2,5 mm^2.

4.2.2 Interface Connection

Several MAVOLOGs and the interface converter MAVOLOG PS/C are linked together via the the RS485 field bus in 2-wire technique (twisted pair). The maximum
extension between a MAVOLOG and the interface converter is approx. 1200m.

4.2.3 Auxiliary Supply

For auxiliary supply, a power unit is necessary with secure el. separation. The power supply unit MAVOLOG PS/C (ID.Nr.: Z863D) with integrated and galvanically separated interface RS485/RS232 (half duplex) meets these requirements.

5. Setup of Operation Parameters, Operation

5.1 Gereral Notes

- The device is operated exclusively via the computer. In the case of the models with built-in LCD display, the pushbutton is used to display the current measurement quantities and evaluations (a maximum of 10) on site.
- The setup of all parameters (Iratio, Uratio, measuring quantities, measuring ranges, memory configuration, assignment of the alarm output etc.) is done via software. Further information you can find in the operating manual METRAwin 10 for MAVOLOG.
- If the key remains pressed for a longer time than 3 s, the programmed measurement parameters are displayed in successive order (MAVOLOG 10 N/S).
- The measuring data are filed in the intern storage and can be read out at any date. Therefore, a permanent connection of the computer is required only for the online signalling of an event over the alarm output.
- An initialization routine is started after activation of auxiliary supply. Therefore the measurement parameters appear only after some seconds at devices with LCD display .
- Further information you can find in chapters 1.3 "storage organization" and 1.3.2 "storage functions".

5.2 Storage Configuration

The memory configuration is programmable via software METRAwin 10 for MAVOLOG. A configuration chosen once is kept even if the stored data are deleted. On the contrary, the storage contents is erased automatically when the memory configuration is changed.

5.3 Alarm Output

The relay is programmable as opener or closer-contact. Moreover, the signalling mode can be set to "off" or "duration 1 to 65335 seconds or "permanently" via software METRAwin 10 for MAVOLOG. In the signalling mode "Ext" (= external), the alarm condition is reset via software.

5.4 Standard Settings

5.4.1 Common Standard Settings

Voltage measuring range:	400V
Uratio	1
Alarm output:	closer
Storage configuration:	
Operation mode	STOP-mode
Storage function:	Eventlogger

Settings with MAVOLOG 10 S:

Current measuring range:	5A
Iratio	1

5.4.2 Measuring Quantities with MAVOLOG 10 L and 10 N

Slow voltage fluctuations for L1, L2, L3
Voltage drops for L1, L2, L3
Voltage dips, total for L1/L2/L3
Voltage unbalance (%)
Line frequency (in L1)

Additional Settings with Option FFT/FSA (harmonics/flicker)

Basic harmonic L1, L2, L3
Odd harmonics 3, 5, 7, 9, 11, 13, 15 for L1, L2, L3
Long term flicker Plt for L1, L2, L3

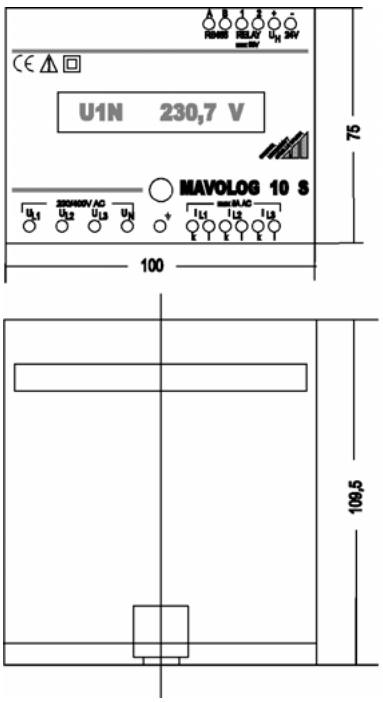
5.4.3 Measuring Quantities with MAVOLOG 10 S

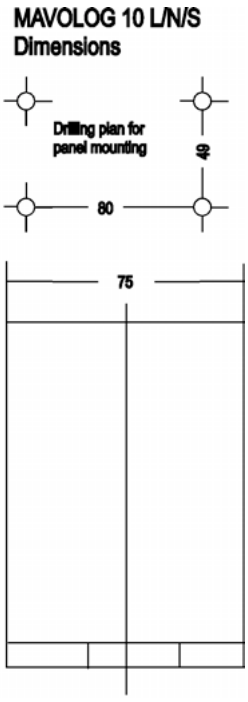
Phase-to eart voltage for L1, L2, L3
Phase current for L1, L2, L3
Active power for L1, L2, L3
Active power, collective PΣ
Reactive power , collective QΣ
Apperant power, collective SΣ
Power factor, collective PFΣ
Maximum of current for L1, L2, L3
Maximum of collective active power
Maximum of collective reactive power
Maximum of collective apperant power
Energy meter for collecive active energy WPΣ
Energy meter for collective reactive energy WQΣ

Additional Settings with Option FFT/FSA (harmonics/flicker)

Basic harmonics L1, L2, L3
Total harmonic disturbance for L1, L2, L3
Odd harmonics 3, 7 for L1, L2, L3
Long term flicker Plt for L1, L2, L3

6. Dimensions and Electrical Connections





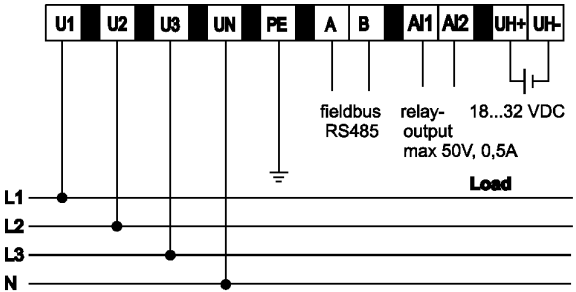


Fig 1: Connections in low voltage systems

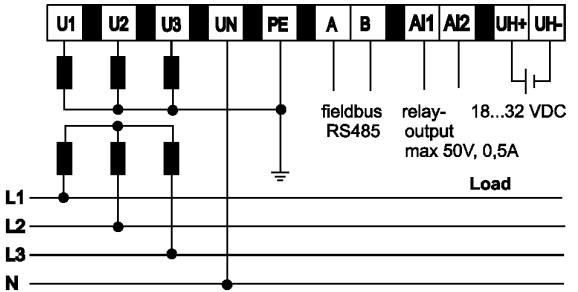


Fig 2: Connections in medium-high voltage systems with earthpoint

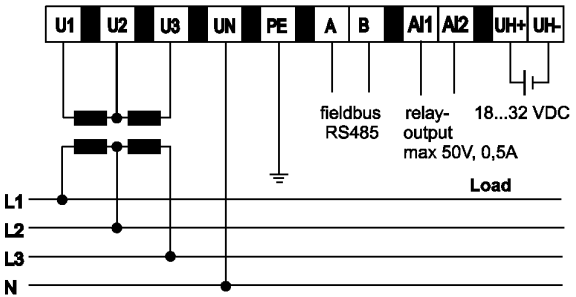


Fig 3: Connections in medium-high voltage systems without eartpoint

MAVOLOG 10L/10N/10S
Connections for auxiliary supply, interface and relay output

MAVOLOG 10L/10N
Measuring connections in 4-wire 3-phase systems

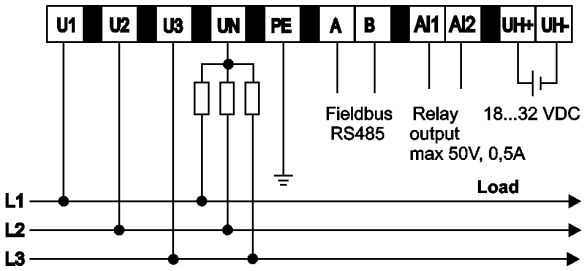


Fig. 4: Connections in low-voltage power line

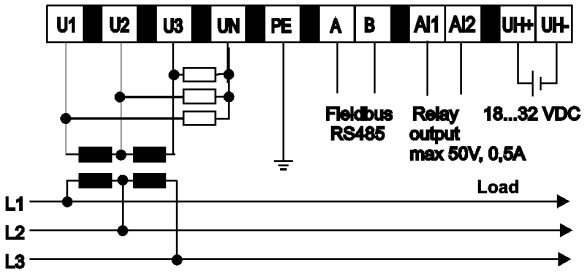


Fig. 6: Connections without earthpoint in medium-voltage power line

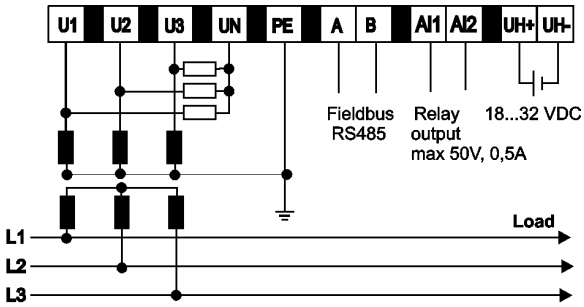


Fig. 5: Connections with earthpoint in medium-voltage power line

MAVOLOG 10L/10N/10S
Connection for auxiliary supply, interface and relay output

MAVOLOG 10L/10N
Measuring connections in 3-wire three phase system

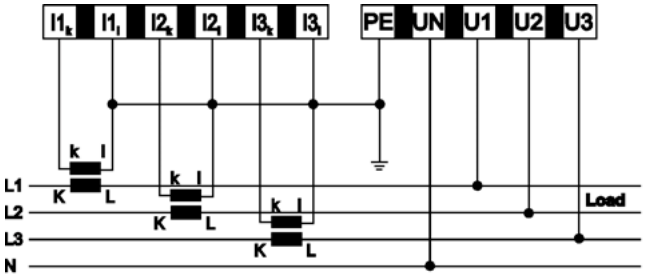


Fig 7: Connections in low voltage systems

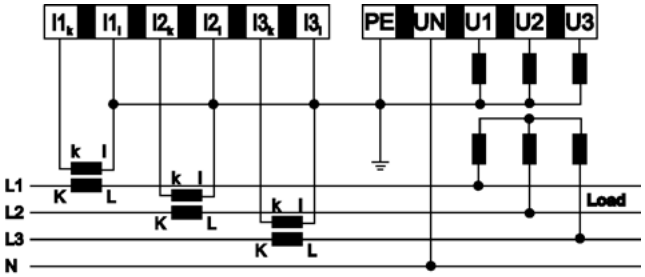


Fig 8: Connections in medium-high voltage systems with earthpoint

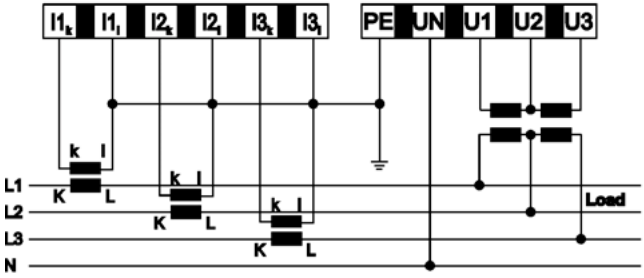


Fig 9: Connections in medium-high voltage system without earthpoint

MAVOLOG 10S
Measuring connections in 4-wire 3-phase systems

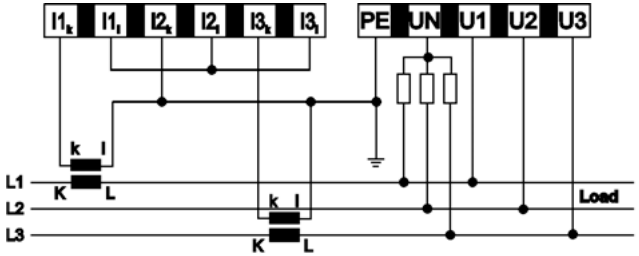


Fig. 10: Connection in low-voltage power line

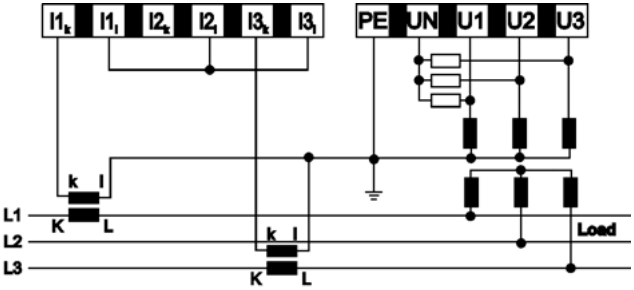


Fig. 11: Connection with earthpoint in medium-voltage power line

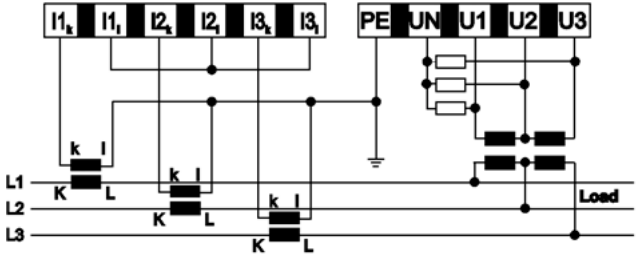
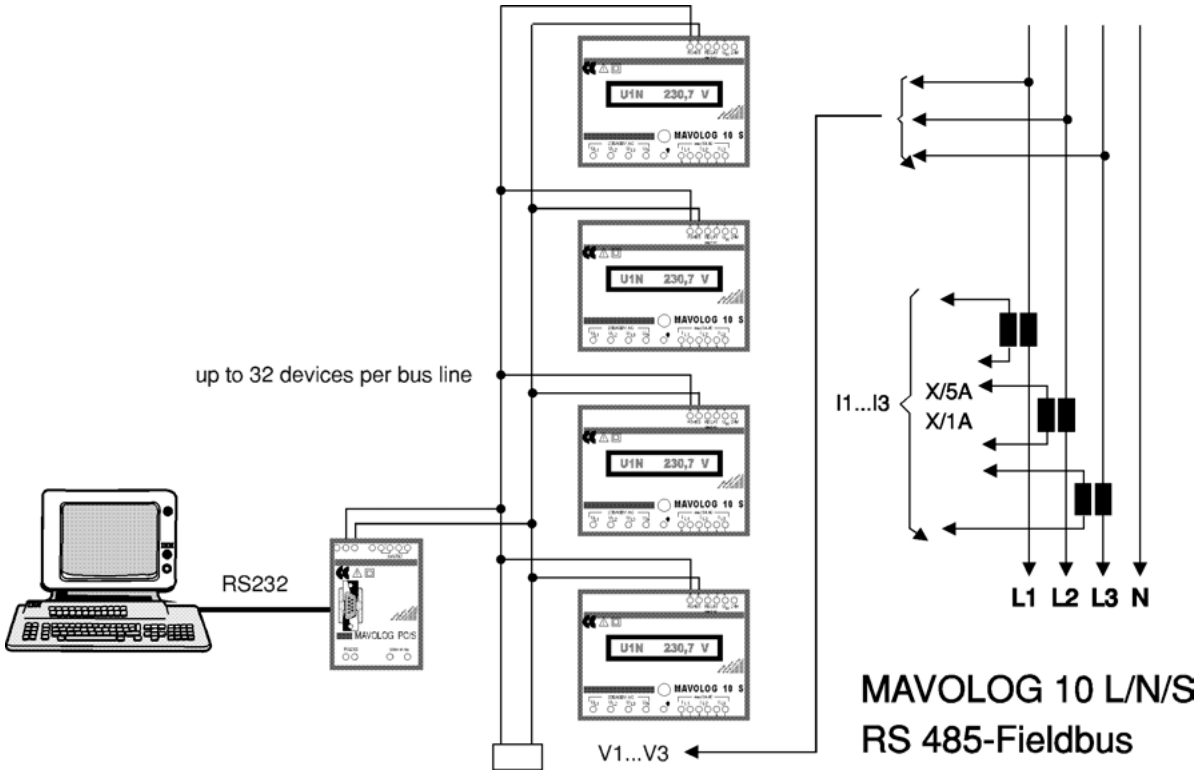


Fig. 12: Connection without earthpoint in medium-voltage power line

MAVOLOG 10S
Measuring connection in 3-wire three phase system


U1N 230,7 V
MAVOLOG 10 S
up to 32 devices per bus line
RS232
MAVOLOG PC/S
I1...I3
X/5A
X/1A
L1 L2 L3 N
V1...V3
MAVOLOG 10 L/N/S
RS 485-Fieldbus

7. Maintenance

A special maintenance of the case is not necessary. Pay attention to a clean surface. Use a slightly moist cloth for cleaning. Avoid the effort of plaster, barn or solvents.

8. Repair and Replacement Parts Service

If required, please contact:

GMC-Instruments Deutschland GmbH
Service
Thomas-Mann-Straße 16 - 20
D-90471 Nürnberg
Telefon +49 911 8602-410/411
Telefax +49 911 8602-253

9. Productsupport

If required, please contact:

GMC-Instruments Deutschland GmbH
Product Support Hotline
Telefon +49 911 8602- 112
Telefax +49 911 8602- 709

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