CAMILLE BAUER

MEASUREMENT & MONITORING IN POWER SYSTEMS

MULTIFUNCTIONAL POWER
MEASUREMENT DEVICE FOR
PANEL MOUNTING

144 mm
144 mm

96 mm
96 mm

SINEAX AM-SERIES

SINEAX AM1000 ▪ SINEAX AM2000 ▪ SINEAX AM3000

Panel installation devices for a clear view into electrical networks

The SINEAX AM-SERIES devices are compact instruments to measure and monitor in heavy current grids. They excel in display quality and intuitive operation. The devices provide a wide range of functionalities which may even be extended by optional components. They are connected to the process environment by communication interfaces, via digital I/Os, analog outputs or relays.

The devices have been designed for universal use in industrial plants, building automation or in energy distribution.

Nominal voltages of up to 690 V and measurement category CATIII can be directly connected in low voltage systems.

The universal measuring system permits the direct use of the devices in any type of grid, from single-phase mains through to 4-wire unbalanced load systems.

The AM series devices may be completely adapted to requirements on site via TFT display. Versions with an Ethernet interface permit webpage configuration without any special software.

CLEAR

High resolution, colour TFT display for the pin-sharp indication of measured data

Consistently visible status information (alarms, user management, data recording, time/date and much more)

Clear design

INTUITIVE

Easy device operation with language-specific plain text menu guidance

Topical arrangement of measured data information for quick access to desired data

Service area for maintenance and commissioning

MULTIFUNCTIONAL

Varied monitoring options via limit values and their logical linkage

Central alarm function via display or Webpage

Automatic data export of load profile data to SFTP server

FLEXIBLE

Universal measuring inputs for any type of grid

Freely selectable mean value and meter measuring variables

Comprehensive cyber security protection (RBAC, HTTPS, syslog, audit log)

SCALABLE

Combinable device version (functionality, interfaces, I/Os, power supply)

Front dimension options (96x96 or 144x144mm)

Integration as a standard object into the SMARTCOLLECT software

	AM1000	AM2000	AM3000
Input channels voltage / current	3 / 3	3 / 3	4 / 4
Measurement interval [#cycles]	10/12 (50/60Hz); 1/2	10/12 (50/60Hz)	10/12 (50/60Hz); 1/2
MEASURED VALUES			
Instantaneous values	▪	▪	▪
Extended reactive power analysis	▪	▪	▪
Imbalance analysis	▪	▪	▪
Neutral current	calculated	calculated	measured / calculated
Earth wire current (calculated)	--	--	▪
Zero displacement UNE	calculated	calculated	measured / calculated
Energy balance analysis	▪	▪	
Harmonic analysis	▪	▪	▪ (incl. phase angle)
Operating hour counters device / general	1 / 3	1 / –	1 / 3
Monitoring functions	▪	▪	▪
Visualisation waveform U/I	▪	–	▪
MEASUREMENT UNCERTAINTY			
Voltage, current	±0.2%	±0.2%	±0.1%
Active, reactive, apparent power	±0.5%	±0.5%	±0.2%
Frequency	±10mHz	±10mHz	±10mHz
Active energy (IEC 62053-21/22)	Class 0.5S	Class 0.5S	Class 0.2S
Reactive energy (IEC 62053-24)	Class 0.5S	Class 0.5S	Class 0.2S
DATA LOGGER (Option, only with Ethernet)	internal (≥8GB)	Micro SD card (≥16GB)	Micro SD card (≥16GB)
Periodic recording	▪	▪	▪
Event recording	▪	▪	▪
Disturbance recorder (option)			
a) 1/2 cycle RMS progression U/I	≤3min.	–	≤3min.
b) Waveform U/I [#cycles]	5/6 (pretrigger) +10/12	–	5/6 (pretrigger) +10/12
COMMUNICATION			
Ethernet: Modbus/TCP, web server, NTP	(option)	(option)	(standard)
IEC 61850	(option)	(option)	(option)
PROFINET IO	(option)	(option)	(option)
RS485: Modbus/RTU	(option)	(option)	(option)
Standard I/Os	1 dig. OUT ; 1 dig. IN/OUT	1 dig. IN ; 2 dig. OUT	1 dig. IN ; 2 dig. OUT
Extension modules (optional)	max. 1 module	max. 4 modules	max. 4 modules
POWER SUPPLY	100-230V AC/DC 24-48V DC	110-230V AC/130-230V DC 110-200V AC/DC 24-48V DC	110-230V AC/130-230V DC 110-200V AC/DC 24-48V DC
Consumption	≤18 VA, ≤8 W	≤30 VA, ≤13 W	≤30 VA, ≤13 W
DESIGN			
Colour display	TFT 3.5" (320x240px)	TFT 5.0" (800x480px)	TFT 5.0" (800x480px)
Front dimensions	96 x 96 mm	144 x 144 mm	144 x 144 mm
Mounting depth	85 mm	65.2 mm	65.2 mm

OPTIONAL EXTENSIONS

With extension modules, the functionality of the devices can be expanded and thus optimally adapted to the process environment.

FAULT CURRENT DETECTION
- 2 channels with 2 measuring ranges each
- Residual current monitoring (RCM)
- Earth wire current monitoring

ANALOG OUTPUTS (2 OR 4 CHANNELS)
- Bipolar ±20mA, up to 9 break points
- Connection to control systems
- Remote controllable

TEMPERATURE MEASUREMENT
- 2 channels
- Pt100 or PTC sensor, 2-wire
- Short circuit / break monitoring of the sensors

RELAY OUTPUTS (2 CHANNELS, CHANGEOVER CONTACT)
- Load capacity 230V AC / 2A; 30V DC / 2A
- Alarm or consumer control
- Remotely controllable

IEC 61850 COMMUNICATION
- Standardized protocol for power distribution systems
- Automatic, configurable reporting of measurement data to a control system

DIGITAL INPUTS (4 CHANNELS)
- Counter pulse acquisition
- Acquire external switching states
- Versions with active or passive inputs

PROFINET IO COMMUNICATION
- Transmission of a cyclic process image with up to 62 measured values
- Applications in automation

GPS TIME SYNCHRONIZATION
- Highly accurate time base for events and consumption data
- Alternative to NTP

UNINTERRUPTIBLE POWER SUPPLY
- Bridging of power failures of 3 times 5 minutes
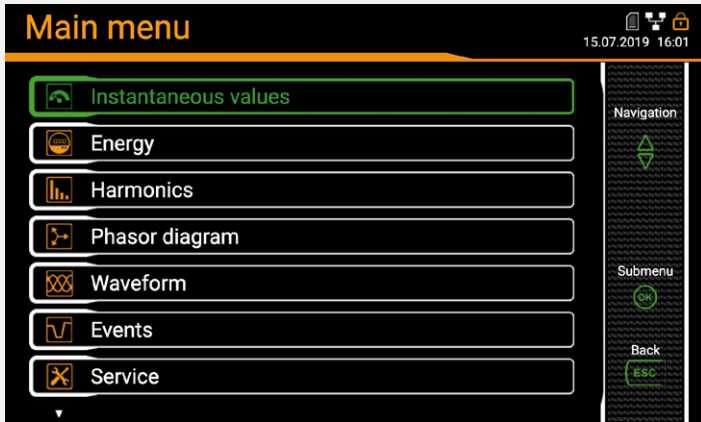- Safe detection of voltage dips with the optional fault recorder

ALTERNATIVE DESIGNS

The SINEAX AM1000 is also available in versions for DIN rail mounting, with or without display.
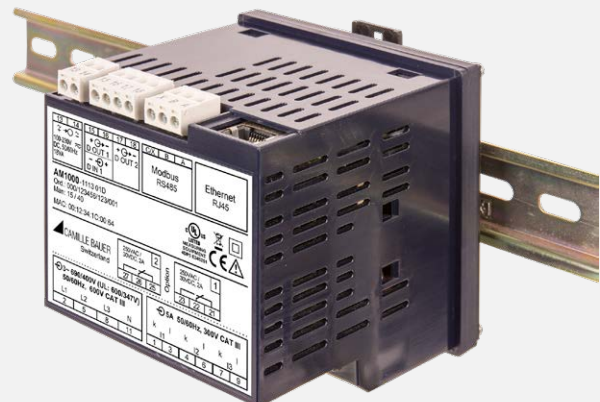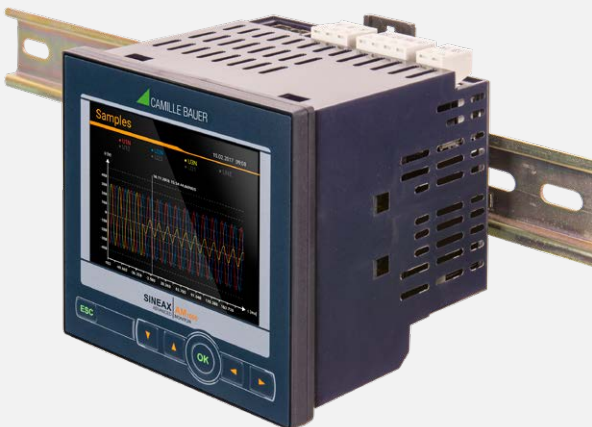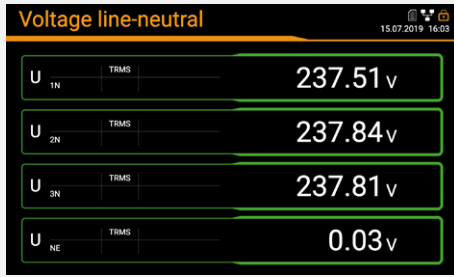
DISPLAY OPTIONS

Main menu
15.07.2019 16:01

- Instantaneous values
- Energy
- Harmonics
- Phasor diagram
- Waveform
- Events
- Service

Navigation

Submenu
OK

Back
ESC

MAIN MENU - accessible via ESC
The language-specific main menu arranges the available measured data in easily comprehensible groups. AM2000 and AM3000 also provide the lateral help bar with further information concerning operation.
The status bar in the top right-hand corner is always available and displays the current statuses of alarm monitoring, the password protection system and data recording as well as time / date.

Voltage line-neutral
15.07.2019 16:03

U 1N	TRMS	237.51 v
U 2N	TRMS	237.84 v
U 3N	TRMS	237.81 v
U NE	TRMS	0.03 v

Mean-value S
15.07.2019 16:02

16:02:15,000	81.87 kVA
16:02:00,000	86.93 kVA
16:01:00,000	83.48 kVA
16:00:00,000	79.78 kVA
15:59:00,000	75.65 kVA
15:58:00,000	84.38 kVA

Odd harmonics I
15.07.2019 16:10

L1 TDD 6.3 %   L2 TDD 4.2 %   L3 TDD 3.1 %

Navigate

Details

Back
ESC

INSTANTANEOUS VALUES
The instantaneous values of voltages, currents, power values, power factors as well as imbalance values and their min/max values are provided either in numbers or graphically in an x/y matrix.
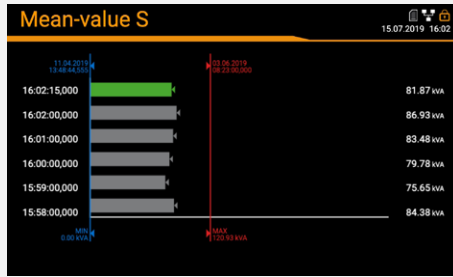
ENERGY
Contains all values required for the preparation of the energy balance, in particular, energy meters as well a mean values with progression and trend.
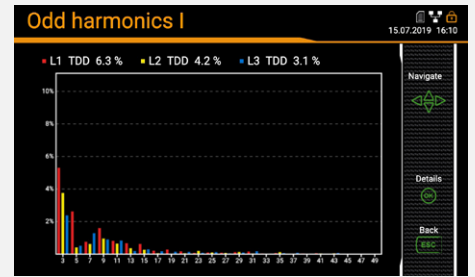
HARMONICS
Graphic representation of harmonics of all currents and voltages with TDD/THD. Reading option for individual harmonics.

Phasor diagram
15.07.2019 16:13

	L1	L2	L3	
	237.10	237.40	237.75	V
	0.00	-119.84	120.29	°
	124.97	114.07	115.76	A
	-11.0	-7.7	-15.5	°
	0.974	0.986	0.961	PF

50V/div   50A/div

Alarms
16.07.2019 10:08

Summary alarm	1.1
U1N high	1.2
Monitoring Fkt. 2	
Monitoring Fkt. 3	

Navigation

OK

Back
ESC

Waveform
15.07.2019 16:11

u1n (t)   u2n (t)   u3n (t)   une (t)
i1 (t)   i2 (t)   i3 (t)   in (t)

Config

Back
ESC

U: 250.00V/Div   f: 49.99Hz   t: 10.00ms/Div   I: 125.00A/Div
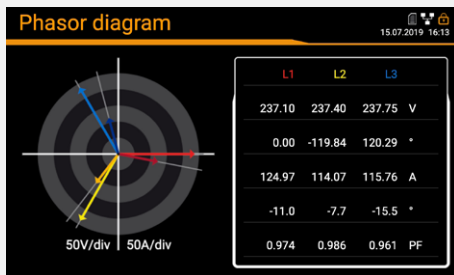
PHASOR DIAGRAM
Time-correct display of voltage and current phasors and power factors of all phases. Incorrect phase sequences false senses of rotation or reverse currents can thus be safely recognised.
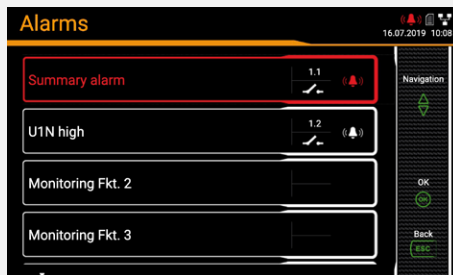
ALARMS
This list displays the statuses of all monitoring functions, possibly including the status of the allocated output. The first entry is the higher-ranking collective alarm which can be reset here.
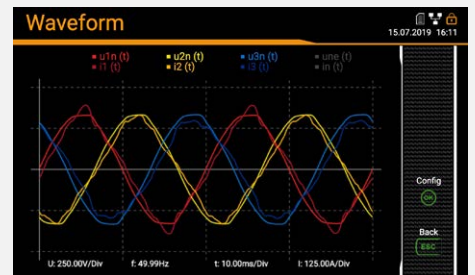
WAVEFORM
AM1000 and AM3000 displays the waveform of voltages and currents in additionally.

DATA RECORDING

The devices may be equipped with a high-performance data logger which has the following recording options in its comprehensive version:

• PERIODIC DATA

This enables data to be collected at regular intervals, especially for energy management. Average power values and meter readings serve as a basis. Typical applications are the acquisition of load curves (intervals from 10s to 1h) or the determination of energy consumption from the difference of meter readings.

Mean values are recorded in each case with fluctuation bandwidth, i.e. the maximum and minimum RMS values per interval. Mean values can also be recorded for freely selectable basic variables.

Additional basic variables can also be monitored for meter readings, e.g. per phase or only in relation to the fundamental oscillation.

• EVENTS

The occurrence of self-defined events or alarms is recorded here in list form with time information. In each case, the state transitions or the response and drop-out of limit value states or monitoring functions are registered, classified as alarm or event, or the violation of pre-alarm or alarm limits for the optional temperature and fault current inputs.

• DISTURBANCE RECORDER (AM1000 / AM3000 ONLY)

Recording of current and voltage waveforms during disturbances based on 1/2-period RMS values, with additional registration of the waveform during the disturbance. Voltage dips, swells and sags are monitored, according to the requirements of the power quality standard IEC 61000-4-30.

• AUDIT-LOG

This list, located in the service area, logs all security-relevant operations that could either affect data consistency or endanger IT security. It replaces the operator list of older firmware versions and cannot be deleted or changed by the user. In the audit log, every connection to the device, every login attempt (whether successful or not), every logout (active or on timeout), every change to the device configuration, every reset of data, every firmware update, every display of the audit log, and much more is registered, each with user information.

The content of the audit log can also be sent to a central network monitoring server using the syslog protocol. An example of an audit log is shown in the Cyber Security section.

The memory used allows to save data for several years under normal conditions. If the memory portion allocated to the data groups is full, the oldest data of this group is deleted. Further analyses are possible via web page of the device.
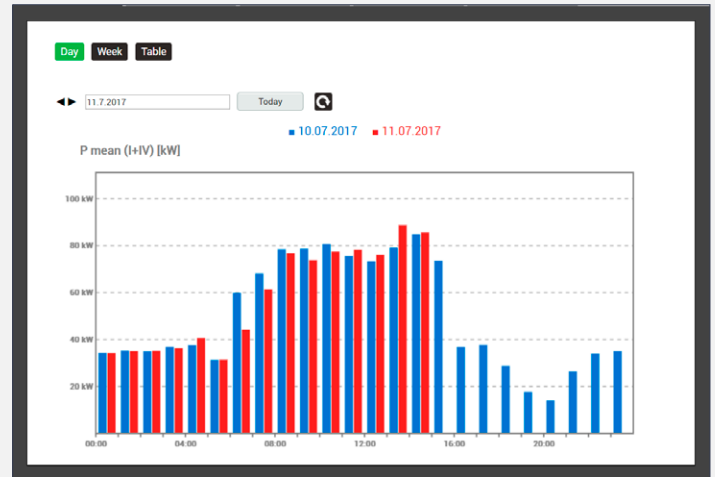
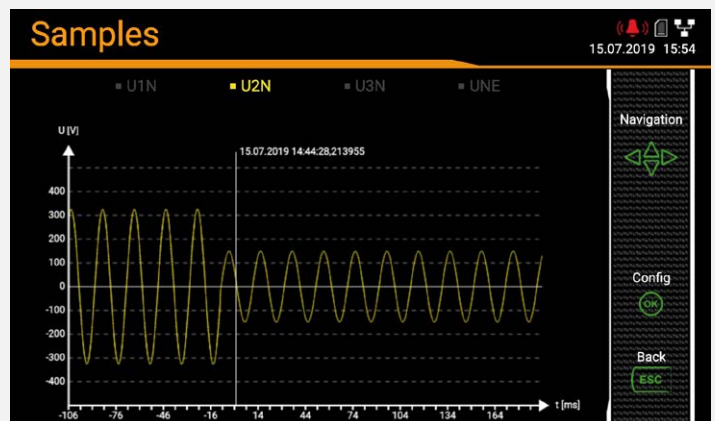Current daily load profile with previous day values via web page of the device

List of recorded disturbance letters

Indication of voltage dip on local display

CYBER SECURITY

Critical infrastructures - and this undoubtedly includes the supply of electrical energy - are increasingly the target of cyber attacks. There is not only the attempt of stealing data by unauthorised access or eavesdropping of communication but also the limitation or even interruption of energy supplies by manipulating data or data traffic.

A comprehensive safety concept on plant level comprising each grid component is required to repel such attacks. The safety mechanisms integrated into the device support such concepts, thus contributing to safe energy supplies.

SAFETY MECHANISMS

- **Role-Based Access Control (RBAC)**: Allows different users to be granted individual rights or to restrict them to those activities that correspond to their role. Each available menu item, whether measured value, setting value or service function, can thus be displayed, hidden, changeable or locked. As soon as the RBAC is active, even software can only access data of the device via access keys.
  During the login process, information is never transmitted in plain text, and the latency time is constantly increased in the event of repeated, unsuccessful login attempts.

- **Encoded data transmission via HTTPS** using root certificates

- **Audit log**: Logging of all activities relevant to safety. Transfer option to central grid monitoring server by Syslog.

- **Client white list**: Limitation of computers with access authorisation

- **Digitally signed firmware files** for secure updates

Audit log with filter option

RBAC access rights of different users

COMMISSIONING AND SERVICE

A wide range of tools are available via the service menu for safe and simple commissioning and maintenance of the devices. Some are listed below:

Vector diagram / phase sequence indicator

With these displays, you can easily verify whether the measuring inputs have been correctly connected. Non-conforming rotational directions of voltages and currents, reverse polarity current connections and interchanged current or voltage connections are immediately recognised.

Simulation

Output values of analog and digital outputs can be simulated during commissioning to test downstream circuits.

Communication tests

Permit the verification of effected network settings and provide quick answers to these questions:

- Can the gateway be reached?
- Can the URL of the NTP server be resolved via DNS?
- Is NTP a time server and is the time synchronisation working?
- Does the data storage on the SFTP server work?

Operating instructions

The operating instructions are stored in the device as a PDF file and can be opened in the browser or downloaded to a PC at any time. The instructions are respectively updated in any firmware update thus always documenting the implemented state.

Deletion of data

Recordings of measured data may be selectively deleted or reset. Every one of these activities can be protected via the Role Based Access Control system (RBAC) and is logged with the user identification upon execution.
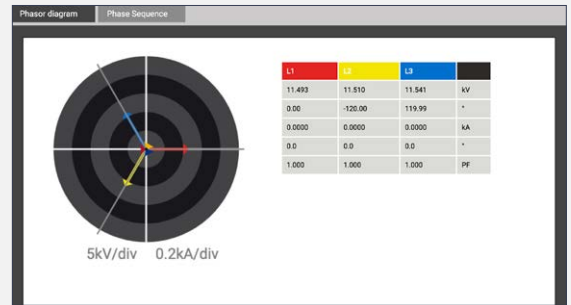
Vector diagram to control connections

Communication tests: Control of network structure

OPERATION
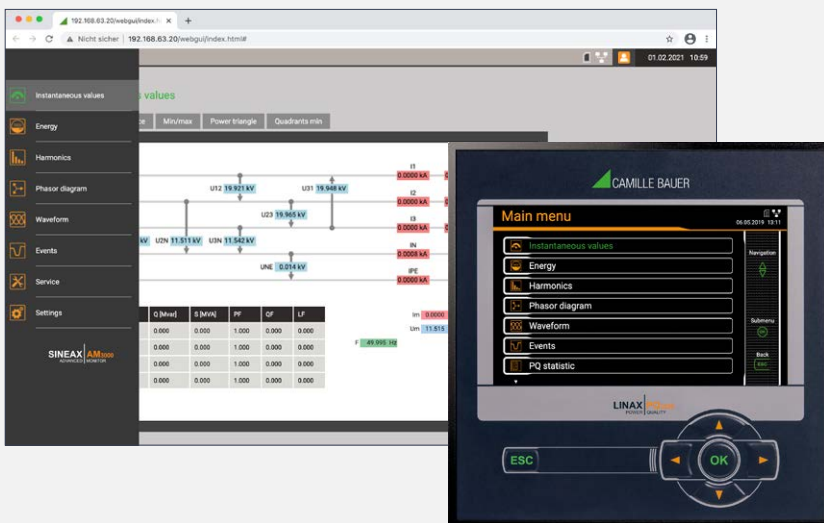
The local operation at the device itself and the access via web interface are structured identically. The access to

- Measured data
- Service functions
- Settings of the measuring device

can thus be intuitively effected via a topically arranged, language-specific menu structure.

The extent of the indicated menu structure may be different for the local display and the device website, if this has been respectively determined via the access control system (RBAC). It might also be necessary that users first log in order to have a menu displayed.

The top-right status bar informs on the current states of alarm monitoring as well as network, access control system, data memory and UPS and also indicates the time and date of the device.

DATA EXPORT

Automated

If the device is equipped with a data logger, information about mean value curves (e.g. load curves) can be sent periodically to an SFTP server using the data export scheduler. This is done in the form of CSV files for a selectable time range. Files can alternatively or additionally also be stored locally in the device.

Tasks may be prepared for the generation of files which will then run automatically and are linked to the actions of store locally and / or push to SFTP server. Data locally saved in the device may be transferred to a computer via the device website or the REST interface.

The Secure File Transfer Protocol (SFTP) facilitates the encoded transfer of files. It may also be used for the transmission of measured value information via secured network structures, e.g. via Smart Meter Gateways.

Manually

If the network structure is not available or for measurement data that cannot be exported automatically, measurement data can also be saved manually to CSV files on a PC via the device's website. This export option is available for event lists, mean value curves, the waveform display or events of the optional disturbance recorder.
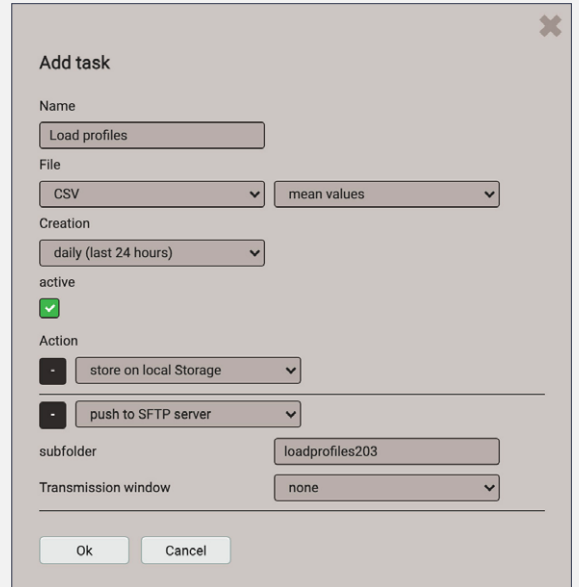
Task for daily saving / forwarding of average data

CSV: *Comma Separated Value*

MONITORING AND ALARMS

The instruments of the AM series support the on-site analysis of acquired measured data in order to initiate directly immediate or delayed measures without involving a separate control. This facilitates the protection of equipment and also monitoring of service intervals.
The following items are available:

• 12 limit values
• 8 monitoring functions with 3 inputs each
• 1 summary alarm as a combination of all monitoring functions
• 3 operating hour counters with definable running conditions

The available digital outputs may be used directly for the transmission of limit values and monitoring functions as well as the resettable summary alarm.

A text may be allocated to each monitoring function which is used both for the alarm list and the event entries in the datalogger.
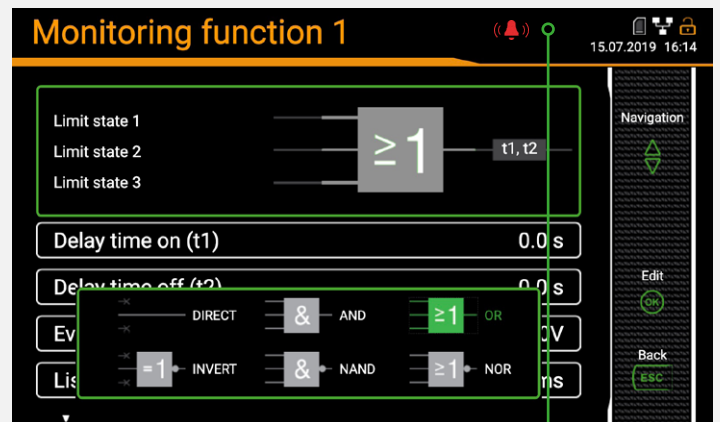
MEASURED VALUES

MEASURED VALUE GROUP	APPLICATION
INSTANTANEOUS VALUES U, I, IMS, P, Q, S, PF, LF, QF ... Angle between voltage phasors Min/max of instantaneous values with time stamp	Transparent monitoring of present system state Fault detection, connection check, sense of rotation check Determination of grid variable variance with time reference
EXTENDED REACTIVE POWER ANALYSIS Total reactive power, fundamental frequency, harmonics $\cos\phi$, $\tan\phi$ of fundamental frequency with min values in all quadrants	Reactive power compensation Verification of specified power factor
HARMONICS ANALYSIS (ACCORDING TO EN 61 000-4-7) Total harmonics content THD U/I and TDD I Individual harmonics U/I up to 50th	Evaluation of the thermic load of equipment Analysis of system perturbation and consumer structure
IMBALANCE ANALYSIS Symmetrical components (positive, negative, zero sequence system) Imbalance (from symmetrical components) Deviation from U/I mean value	Equipment overload protection Fault/earth contact detection
ENERGY BALANCE ANALYSIS Meters for the demand/supply of active/reactive power, high/low tariff, meters with selectable fundamental variable Power mean values active/reactive power, demand and supply, freely definable mean values (e.g. phase power, voltage, current and much more). Mean value trends	Preparation of (internal) energy billing Determination of energy consumption versus time (load profile) for energy management or energy efficiency verification Energy consumption trend analysis for load management
OPERATING HOURS 3 operating hour counters with programmable running condition (only AM1000/AM3000) Operating hours of the device	Monitoring of service and maintenance intervals of equipments

DEMAND / SUPPLY / INDUCTIVE / CAPACITIVE

The devices of the SINEAX AM-SERIES provide information for all of the four quadrants. Depending on whether the measured system is considered from a generator or consumer perspective, the interpretation of the quadrants changes: The energy formed from active power in Quadrants I+IV can then be regarded, e.g., as supplied or demanded active energy. In order to facilitate an independent interpretation of the 4-quadrant information, the terms demand, supply as well as inductive or capacitive load are avoided in the display of data. They are expressed by stating Quadrant I, II, III or IV or a combination of these. The energy direction may be actively switched by selecting the generator or consumer arrow system. This inverts the direction of all currents.
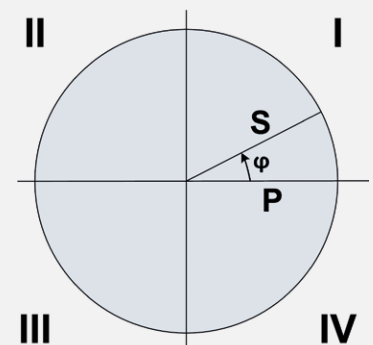
TECHNICAL DATA

INPUTS

NOMINAL CURRENT 1 … 5 A (max. 7.5 A)
Maximum 7.5 A
Overload capacity 10 A permanent
100 A, 5x1 s, interval 300 s

NOMINAL VOLTAGE 57.7 … 400 V_{LN}, 100 … 693 V_{LL}
Maximum 480 V_{LN}, 832 V_{LL} (sinusoidal)
Overload capacity 480 V_{LN}, 832 V_{LL} permanent
800 V_{LN}, 1386 V_{LL}, 10x1 s, interval 10 s
Nominal frequency 42 … 50 … 58 Hz, 50.5 … 60 … 69.5 Hz

SAMPLING RATE 18 kHz

POWER SUPPLY VARIANTS
Nominal voltage 100 … 230 V AC/DC (AM1000)
110 … 230 V AC, 130 … 230 V DC (AM2000/3000)
110 … 200 V AC, 110 … 200 V DC (AM2000/3000)
24 … 48 V DC (AM1000/2000/3000)

UNINTERRUPTIBLE POWER SUPPLY (UPS) (ONLY AM3000)
Type (3,7 V) VARTA Easy Pack EZPAckL, UL listed MH16707
Bridging time 5 times 3 minutes

TYPES OF CONNECTION
Single phase or split phase (2-phase system)
3 or 4-wire balanced load
Only AM1000/AM3000: 3-wire balanced load [2U, 1I]
3-wire unbalanced load, Aron connection
3 or 4-wire unbalanced load
4-wire unbalanced load, Open-Y

I/O-INTERFACE

ANALOG OUTPUTS (optional)
Linearization Linear, kinked
Range ±20 mA (24 mA max.), bipolar
Accuracy ±0.2% of 20 mA
Burden ≤ 500 Ω (max. 10 V/20 mA)

DIGITAL INPUTS PASSIVE
Nominal voltage 12/24 V DC (30 V max.)

DIGITAL INPUTS ACTIVE (optional)
Open circuit voltage ≤ 15 V

DIGITAL OUTPUTS
Nominal voltage 12/24 V DC (30 V max.)
Nominal current 50 mA (60 mA max.)

FAULT CURRENT MONITORING For grounded systems (optional)
Number of meas. channels 2 (2 measurement ranges each)

Measurement range 1 (1A) Earth current measurement
• Measuring transformer 1/1 up to 1/1000 A
• Alarm limit 30 mA up to 1000 A

Measurement range 2 (2mA) RCM with connection monitoring
• Measuring transformer Residual current transformer 500/1 up to 1000/1 A
• Alarm limit 30 mA up to 1 A

TEMPERATURE INPUTS (optional)
Number of channels 2
Measurement sensor Pt100 / PTC; 2-wire

RELAYS (optional)
Contacts Changeover contact
Load capacity 250 V AC, 2 A, 500 VA; 30 V DC, 2 A, 60 W

BASIC UNCERTAINTY ACCORDING IEC/EN 60688

	AM1000/2000	AM3000	
Voltage, current	±0.2 %	±0.1 %	
Power	±0.5 %	±0.2 %	
Power factor	±0.2°	±0.1°	
Frequency	±0.01 Hz		
Imbalance U, I	±0.5 %		
Harmonic	±0.5 %		
THD U, I	±0.5 %		
Active energy	Class 0.5S	Class 0.2S	(EN 62053-22)
Reactive energy	Class 0.5S	Class 0.5S	(EN 62053-24)

INTERFACES

ETHERNET Standard (AM3000), optional (AM1000/AM2000)
Physics Ethernet 100Base TX; RJ45 socket
Mode 10/100 MBit/s, full/half duplex, autonegotiation
Protocols Modbus/TCP, http, https, NTP, IPv4, IPv6

IEC61850 option
Physics Ethernet 100Base TX; RJ45 socket, 2 ports
Mode 10/100 MBit/s, full/half duplex, autonegotiation
Protocols IEC61850, NTP

PROFINET IO optional
Conformance class CC-B
Physics Ethernet 100BaseTX, RJ45-Buchsen, 2 ports
Mode 10/100 Mbit/s, full/half duplex, auto-negotiation
Protocol PROFINET, LLDP, SNMP

MODBUS/RTU Standard (AM2000), optional (AM1000 / AM3000)
Physics RS-485, max. 1200 m (4000 ft)
Baud rate 9.6 to 115.2 kBaud

TIME REFERENCE Internal clock
Clock accuracy ± 2 minutes/month (15 to 30 °C)
Synchronisation NTP server or GPS

ENVIRONMENTAL CONDITIONS, GENERAL INFORMATION
Operating temperature without UPS: −10 up to 15 up to 30 up to + 55 °C
with UPS: 0 up to 15 up to 30 up to + 35 °C
(Condition for battery pack loading)
Storage temperature Base device: −25 up to + 70 °C
Battery pack UPS: −20 … 60 °C (<1 month)
−20 … 45 °C (< 3 months)
−20 … 30 °C (< 1 year)

Temperature influence 0.5 x basic uncertainty per 10 K
Long-term drift 0.5 x basic uncertainty per year
Others Application group II (EN 60688)
Relative air humidity <95 % without condensation
Operating altitude ≤2000 m above MSL
Only to be used in buildings!

MECHANICAL PROPERTIES
Installation position Control panel installation
Housing material Polycarbonate (Makrolon)
Flammability class V-0 according UL94, self-extinguishing, not dripping, free of halogen
Weight 800 g (AM2000/AM3000), 400 g (AM1000)

SAFETY
Current inputs are galvanically isolated from each other.
Protection class II (protective insulation, voltage inputs via protective impedance)
Pollution degree 2
Protection IP54 (front), IP30 (housing), IP20 (terminals)
Measurement category U: 600 V CAT III, I: 300 V CAT III

DIMENSIONAL DRAWINGS AM1000

Panel cut-out
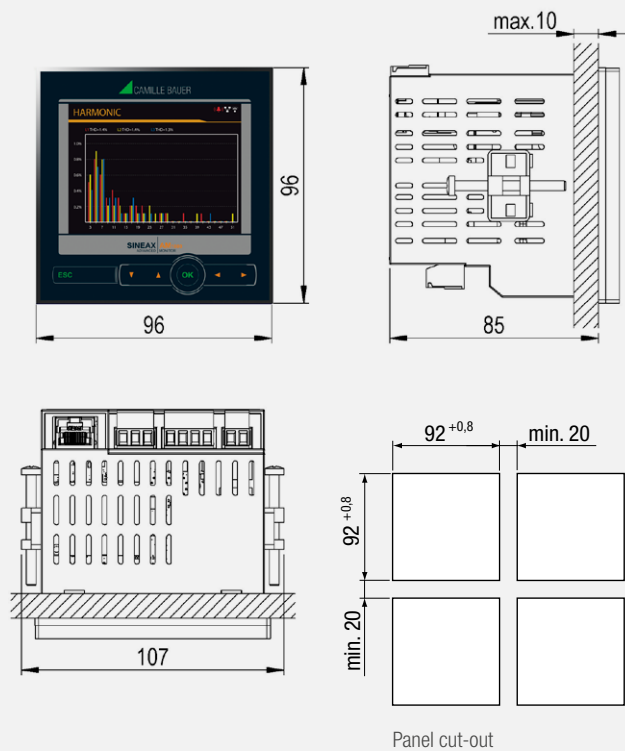
DIMENSIONAL DRAWINGS AM2000 / AM3000

Panel cut-out
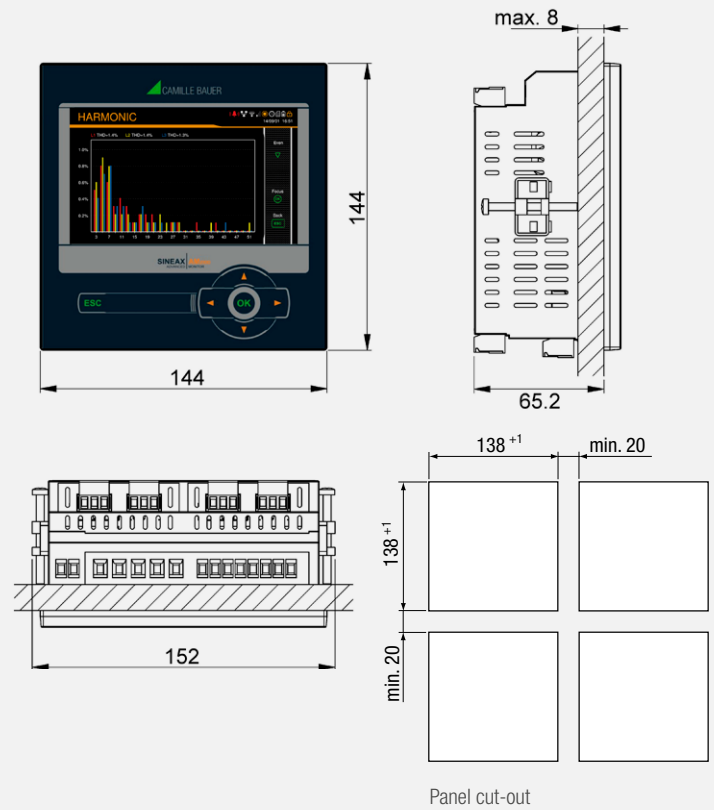
ORDER CODE

ORDER CODE AM1000- ....

1.	BASIC DEVICE, 3 U / 3 I MEASURING INPUTS, 1 DIGITAL OUTPUT, 1 DIGITAL INPUT OR OUTPUT	
	With TFT display, for control panel installation	1
	With TFT display, for rail mounting	2
	Without display, for rail mounting	3
2.	**INPUT	FREQUENCY RANGE**	
	Current transformer inputs, 42 … 50/60 … 69.5 Hz	1
3.	**POWER SUPPLY**	
	Nominal voltage 100 … 230 V AC/DC	1
	Nominal voltage 24 … 48 V DC	2
4.	**BUS CONNECTION**	
	Without	0
	Ethernet (Modbus/TCP + web server)	1
	RS485 (Modbus/RTU)	2
	Ethernet (Modbus/TCP + web server) + RS485 (Modbus/RTU)	3
5.	**DATA LOGGER**	
	Without	0
	Periodic Data + events [1]	1
	Disturbance recorder + events [1]	2
	Periodic Data + events + disturbance recorder [1]	3

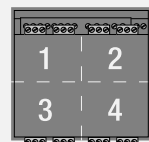| 6.	EXTENSION	
	Without	0
	2 relays	1
	2 analog outputs, bipolar (± 20 mA)	2
	4 analog outputs, bipolar (± 20 mA)	3
	4 digital inputs passive	4
	4 digital inputs active	5
	Fault current detection, 2 channels	6
	GPS connection module	7
	Profinet interface	A
	IEC61850 interface	B
	Temperature monitoring, 2 channels	C
7.	**TEST PROTOCOL**	
	Without	0
	Test protocol in German	D
	Test protocol in English	E

ACCESSORIES	ARTICLE NO.
Documentation on USB stick	156 027
Interface converter USB <> RS485	163 189
GPS receiver 16x-LVS, configured	181 131
Transformers for fault current detection see accessory current transformers	

[1] Datalogger only possible for device variants with Ethernet

ORDER CODE AM2000- ....

1.	**BASIC DEVICE, 3 U / 3 I MEASURING INPUTS, 1 DIGITAL INPUT, 2 DIGITAL OUTPUTS**	
	With TFT display, for control panel installation	1
2.	**INPUT | FREQUENCY RANGE**	
	Current transformer inputs, 42 … <u>50/60</u> … 69.5 Hz	1
3.	**POWER SUPPLY**	
	Nominal voltage 110 … 230 V AC, 130 … 230 V DC	1
	Nominal voltage 24 … 48 V DC	2
	Nominal voltage 110 … 200 V AC, 110 … 200 V DC	3
4.	**BUS CONNECTION**	
	Without	0
	RS485 (Modbus/RTU slave)	1
	RS485 (Modbus/RTU slave) + Ethernet (web server)	2
	RS485 (Modbus/RTU slave) + Ethernet (Modbus/TCP protocol + web server)	3
	RS485 (Modbus/RTU) + Ethernet (Modbus/TCP + web server) + data logger (periodic data + events)	4
5.	**EXTENSION 1**	
	Without	0
	2 relays	1
	2 analog outputs, bipolar (± 20 mA)	2
	4 analog outputs, bipolar (± 20 mA)	3
	4 digital inputs passive	4
	4 digital inputs active	5
	Fault current detection, 2 channels	6
	GPS connection module	7
	Temperature monitoring, 2 channels	C
6.	**EXTENSION 2**	
	Without	0
	2 relays	1
	2 analog outputs, bipolar (± 20 mA)	2
	4 analog outputs, bipolar (± 20 mA)	3
	4 digital inputs passive	4
	4 digital inputs active	5
	Fault current detection, 2 channels	6
	GPS connection module	7
	Profinet interface	A
	IEC61850 interface	B
	Temperature monitoring, 2 channels	C
7.	**EXTENSION 3**	
	Without	0
	2 analog outputs, bipolar (± 20 mA)	2
	4 analog outputs, bipolar (± 20 mA)	3
	4 digital inputs passive	4
	4 digital inputs active	5
	Fault current detection, 2 channels	6
	Temperature monitoring, 2 channels	C
8.	**EXTENSION 4**	
	Without	0
	2 relays	1
	2 analog outputs, bipolar (± 20 mA)	2
	4 analog outputs, bipolar (± 20 mA)	3
	4 digital inputs passive	4
	4 digital inputs active	5
	Fault current detection, 2 channels	6
	Temperature monitoring, 2 channels	C
9.	**TEST PROTOCOL**	
	Without	0
	Test protocol in German	D
	Test protocol in English	E

ORDER CODE AM3000- ....

1.	**BASIC DEVICE, 4 U / 4 I MEASURING INPUTS, 1 DIGITAL INPUT, 2 DIGITAL OUTPUTS, HTTPS, MODBUS/TCP**	
	With TFT display, for control panel installation	1
2.	**INPUT | FREQUENCY RANGE**	
	Current transformer inputs, 42 … <u>50/60</u> … 69.5 Hz	1
3.	**POWER SUPPLY**	
	Nominal voltage 110 … 230 V AC, 130 … 230 V DC	1
	Nominal voltage 24 … 48 V DC	2
	Nominal voltage 110 … 200 V AC, 110 … 200 V DC	3
4.	**BUS CONNECTION**	
	Ethernet (Modbus/TCP + web server)	1
	Ethernet (Modbus/TCP + web server) + RS485 (Modbus/RTU)	2
5.	**DATA LOGGER**	
	Without	0
	Periodic data + events	1
	Disturbance recorder + events	2
	Periodic data + events + disturbance recorder	3
6.	**EXTENSION 1**	
	Without	0
	2 relays	1
	2 analog outputs, bipolar (± 20 mA)	2
	4 analog outputs, bipolar (± 20 mA)	3
	4 digital inputs passive	4
	4 digital inputs active	5
	Fault current detection, 2 channels	6
	GPS connection module	7
	Temperature monitoring, 2 channels	C
7.	**EXTENSION 2**	
	Without	0
	2 relays	1
	2 analog outputs, bipolar (± 20 mA)	2
	4 analog outputs, bipolar (± 20 mA)	3
	4 digital inputs passive	4
	4 digital inputs active	5
	Fault current detection, 2 channels	6
	GPS connection module	7
	Profinet interface	A
	IEC61850 interface	B
	Temperature monitoring, 2 channels	C
8.	**EXTENSION 3**	
	Without	0
	2 analog outputs, bipolar (± 20 mA)	2
	4 analog outputs, bipolar (± 20 mA)	3
	4 digital inputs passive	4
	4 digital inputs active	5
	Fault current detection, 2 channels	6
	Uninterruptible power supply	8
	Temperature monitoring, 2 channels	C
9.	**EXTENSION 4**	
	Without	0
	2 relays	1
	2 analog outputs, bipolar (± 20 mA)	2
	4 analog outputs, bipolar (± 20 mA)	3
	4 digital inputs passive	4
	4 digital inputs active	5
	Fault current detection, 2 channels	6
	Temperature monitoring, 2 channels	C
10.	**TEST PROTOCOL**	
	Without	0
	Test protocol in German	D
	Test protocol in English	E

EXTENSIONS AM2000/AM3000

Maximum one extension with analog outputs may be provided per device.
Extension 4 only possible for a variant without data logger.

ACCESSORIES	ARTICLE NO
Documentation on USB stick	156 027
Interface converter USB <> RS485	163 189
GPS receiver 16x-LVS, configured	181 131
Transformers for fault current detection see accessory current transformers	

SMARTCOLLECT

SMARTCOLLECT is a data management software which can acquire measured data in an easy manner and store the same in an open MS SQL database. This software offers basic functionalities for data analysis and for easy energy monitoring as well as the easy preparation and disposal of reports.

Providing a mature graphic user interface, the SMARTCOLLECT software is clearly structured and easily operated.

SMARTCOLLECT is modularly designed and permits supplementing modules or functions at any time.

CUSTOMER BENEFITS
- Easy data communication via Modbus RTU / TCP, ECL and SmartControl-Direct
- Connection also via OPC
- Devices of Camille Bauer and Gossen Metrawatt are already predefined and selectable in the software
- Open for the devices of all manufacturers
- Data is stored in an open MS SQL database (depending on the scope Express or Server)
- Modular cost / performance model – basic version may be extended at any time

MODULAR DESIGN

COMPONENTS
The SMARTCOLLECT data management software consists of the following components:

SMARTCOLLECT CLIENT   MORE CLIENTS POSSIBLE

SMARTCOLLECT CLIENT

- Graphic visualisation of queried data
- Export via Excel file
- User interface to define the data sources to be read out as well as error and warning messages via email.

SQL DATABASE

SMARTCOLLECT DATABASE

- MS SQL database (depending on the scope Express or Server)
- Contains the collected data
- Open and unencrypted

SMARTCOLLECT SERVER

SMARTCOLLECT SERVER

- Collects and configures data from active sources and channels and writes the same directly into the central database.

MM1400   CAM   AM1000   AM3000   PQ3000   V604s

BM1200   Energy meter   DM5S   A*PLUS*   HW730
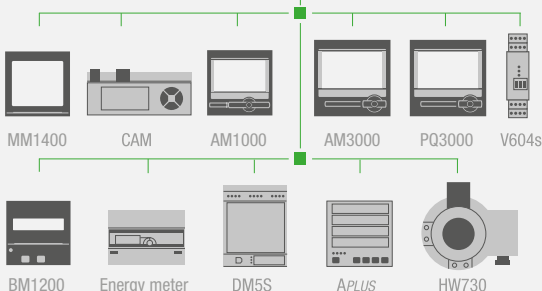
SMARTCOLLECT software components may be installed on an individual system or on several servers or computers.

GMC INSTRUMENTS

GOSSEN METRAWATT

CAMILLE BAUER