CAMILLE BAUER

INTUITIVE NAVIGATION IN ELECTRICAL NETWORKS

COMPREHENSIVE INSTRUMENT FOR MEASUREMENT AND MONITORING OF POWER SYSTEMS

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, analogue 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, password protection, 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

Alarm list with plain-text information for a quick plant status overview

FLEXIBLE

Universal measuring inputs for any type of grid

Freely selectable mean value and meter measuring variables

Configurable access authorisation

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



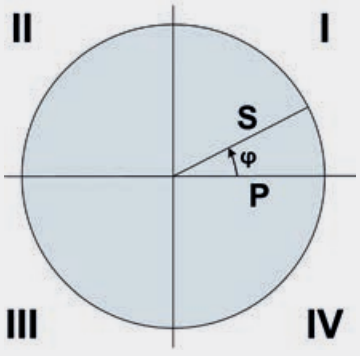
	AM1000	AM2000	AM3000
Input channels voltage / current	3 / 3	3 / 3	4 / 4
Measurement interval [#cycles]	10/12 (50/60Hz); 1/2	10/12 (50/60Hz)	10/12 (50/60Hz); 1/2
MEASURED VALUES			
Instantaneous values	▪	▪	▪
Extended reactive power analysis	▪	▪	▪
Imbalance analysis	▪	▪	▪
Neutral current	calculated	calculated	measured / calculated
Earth wire current (calculated)	--	--	▪
Zero displacement UNE	calculated	calculated	measured / calculated
Energy balance analysis	▪	▪	▪
Harmonic analysis	▪	▪	▪ (incl. phase angle)
Operating hour meters device / general	1 / –	1 / –	1 / 3
MEASUREMENT UNCERTAINTY			
Voltage, current	±0,25%	±0,25%	±0,1%
Active, reactive, apparent power	±0,5%	±0,5%	±0,2%
Frequency	±10mHz	±10mHz	±10mHz
Active energy (IEC 62053-21/22)	Class 1	Class 1	Class 0.5S
Reactive energy (IEC 62053-24)	Class 1	Class 1	Class 0.5S
DATALOGGER (Option, only with ethernet)	internal (≥2GB)	–	Micro SD card (≥2GB)
Periodic recording	▪	–	▪
Event recording	▪	–	▪
Monitoring functions	▪	▪	▪
Visualisation curve shape U/I	–	–	▪
Disturbance recorder (with pretrigger)			
a) 1/2 cycles RMS progression U/I	≤3min.	–	≤3min.
b) Curve shape U/I [#cycles]	–	–	5 (pretrigger) +10/12
COMMUNICATION			
Ethernet: Modbus/TCP, web server, NTP	(option)	–	(standard)
RS485: Modbus/RTU	(option)	(standard)	(option)
Standard I/Os	1 dig. IN ; 1 dig. IN/OUT	1 dig. IN ; 2 dig. OUT	1 dig. IN ; 2 dig. OUT
I/O extension modules (optional)	max. 1 module	max. 4 modules	max. 4 modules
POWER SUPPLY	100…230V AC/DC 24…48V DC	110-230V AC/130-230VDC or 110-200V AC/DC 24…48V DC	110-230VAC/130-230V DC or 110-200V AC/DC 24…48V DC
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

MEASURED VALUES

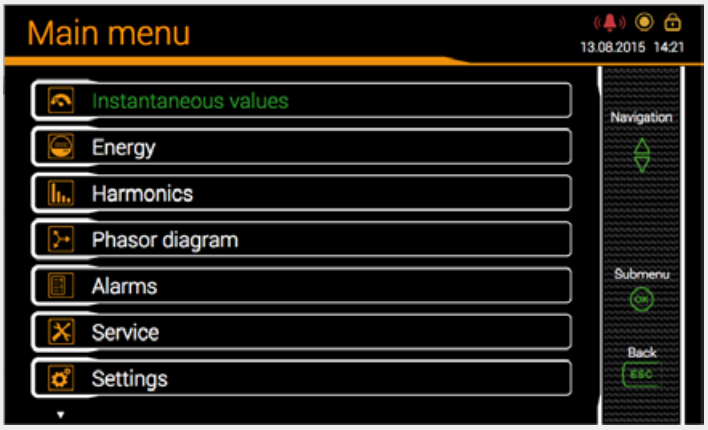
MEASURED VALUE GROUP	APPLICATION
INSTANTANEOUS VALUES	
U, I, IMS, P, Q, S, PF, LF, QF ...	Device operating hours
Angle between voltage vectors	Fault detection, connection check, sense of direction check
Min/max of instantaneous values with time stamp	Determination of grid variable variance with time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

DEMAND / SUPPLY / INDUCTIVE / CAPACITIVE

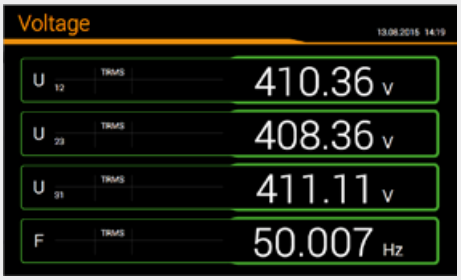
The devices of the SINEAX AM-SERIES provide information for all of the four quadrants. Depending on whether the measured system is considered from a generator or consumer perspective, the interpretation of the quadrants changes: The energy formed from active power in Quadrants I+IV can then be regarded, e.g., as supplied or demanded active energy.
In order to facilitate an independent interpretation of the 4-quadrant information, the terms of 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.
In AM3000, the energy direction may be actively switched by selecting the generator or consumer meter arrow system. This inverts the direction of all currents.



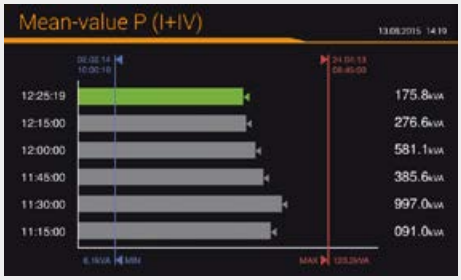
DISPLAY OPTIONS



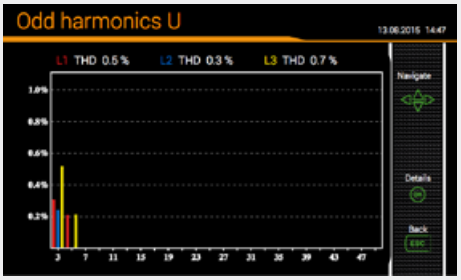
MAIN MENU - accessible via ESC
The language-specific main menu arranges the available measured data in easily comprehensible groups. AM2000 and AM3000 also provide the lateral help bar with further information concerning operation.
The status bar in the top right-hand corner is always available and displays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



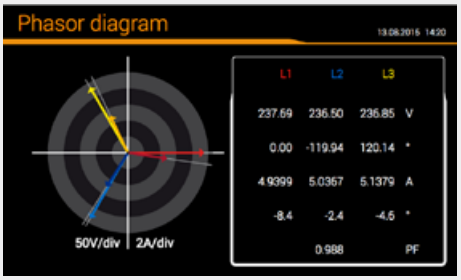
INSTANTANEOUS VALUES
The instantaneous values of voltages, currents, power values, power factors as well as imbalance values and their min/max values are provided either in numbers or graphically in an x/y matrix.



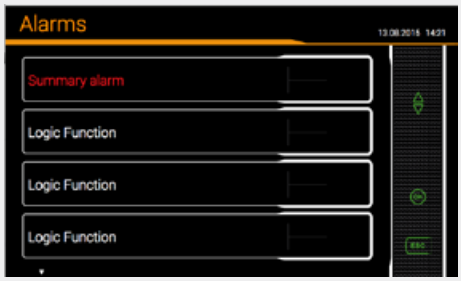
ENERGY
Contains all values required for the preparation of the energy balance, in particular, energy meters as well a mean values with progression and trend.



HARMONICS
Graphic representation of harmonics of all currents and voltages with TDD/THD. Reading option for individual harmonics.



VECTOR DIAGRAM
Time-correct display of voltage and current vectors 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.

FURTHER MEASURED VALUE DISPLAYS
Only AM3000 displays the curve shape of voltages and currents in addition. An individual display matrix may also be composed.

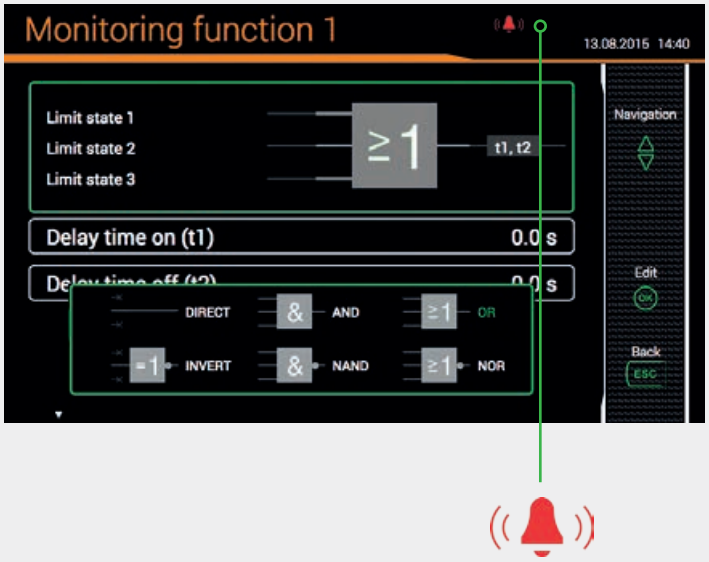
MONITORING AND ALARMS

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 collective 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 collective 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.



DATA RECORDING

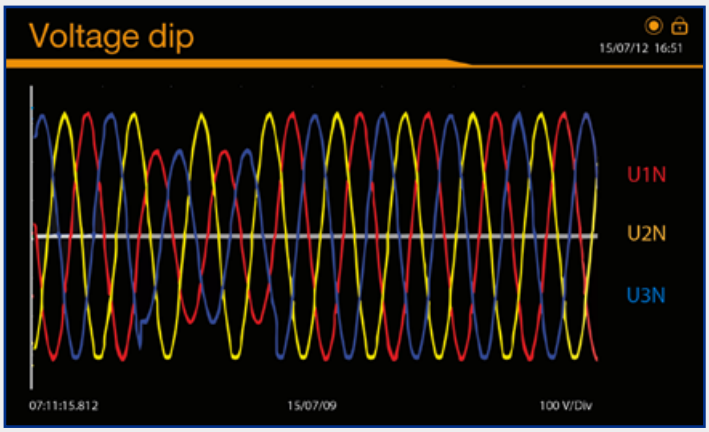
AM1000 and AM3000 may be equipped with a high-performance datalogger which has the following recording options in its comprehensive version:

· **PERIODIC DATA**
Selectable measured values are saved in regular intervals, e.g. to acquire load profiles (intervals of 1s to 1h) or periodic meters readings (e.g. daily, weekly, monthly)

· **EVENTS**
A type of logbook which records the occurrence of events together with time information: Triggering and declining of monitoring functions, changes in configuration, power cuts and much more.

· **DISTURBANCE RECORDER**
Recording of current and voltage progression in case of disturbances on basis of 1/2 cycles RMS values. In AM3000, the additional registration of the curve shape during the disturbance is also possible. This type of registration corresponds to the requirements of the EN 61000-4-30 grid quality standard.

The event list and the recordings of the disturbance recorder may be visualised right on the device. More extensive analyses are available via the webpage of the device.
An SD card is used as a memory element by AM3000 and may be exchanged on the rear of the device. AM1000 uses an internal memory element.



TECHNICAL DATA

INPUTS

NOMINAL CURRENT	1 … 5 A (max. 7,5A)
Maximum	7,5A
Overload capacity	10A permanent
	100A, 5x1 s, interval 300 s
NOMINAL VOLTAGE	57,7 … 400VLN, 100 … 693VLL
Maximum	480VLN, 832VLL (sinusoidal)
Overload capacity	480VLN, 832VLL permanent
	800VLN, 1386VLL, 10x1 s, interval 10 s
Nominal frequency	45 … 50 … 55Hz, 55 … 60 … 65Hz
Measurement TRMS	Up to 60th harmonic

POWER SUPPLY VARIANTS

Nominal voltage	100...230V AC/DC (AM1000)
	110...230V AC, 130...230V DC (AM2000/3000)
	110...200V AC, 110...200V DC (AM2000/3000)
	24…48V DC (AM1000/2000/3000)
Consumption	≤ 20VA

TYPES OF CONNECTION

Single phase or split phase (2-phase system)
3 or 4-wire balanced load
Only 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, kniked
Range	±20mA (24mA max.), bipolar
Accuracy	±0,2% of 20mA
Burden	≤ 500Ω (max. 10 V/20mA)
Burden influence	≤ 0,1 %
Residual rippe	≤ 0,2 %

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

Digital input	
Nominal voltage	12/24V DC (30V max.)
Logical ZERO	–3 to +5V
Logical ONE	11 to 30V

DIGITAL OUTPUTS

Nominal voltage	12/24V DC (30V max.)
Nominal current	50mA (60mA max.)
Load capacity	400Ω … 1MΩ

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 power	Class 1, EN 62053-22	
Reactive power	Class 1, EN 62053-24	

INTERFACES

ETHERNET	Standard (AM3000), optional (AM1000)
Connection	RJ45 socket
Physics	Ethernet 100Base TX
Mode	10/100 MBit/s, full/half duplex, autonegotiation
Protocols	Modbus/TCP, http, NTP (time synchronisation)

MODBUS/RTU	Standard (AM2000), optional (AM1000, AM3000)
Physics	RS-485, max. 1200 m (4000 ft)
Baud rate	2,4 to 155,2 kBaud
Number of participants	≤ 32

TIME REFERENCE	Internal clock
Clock accuracy	± 2 minutes/month (15 to 30°C)
Synchronisation	via synchronous pulse or NTP server
Power reserve	> 10 years

ENVIRONMENTAL CONDITIONS, GENERAL INFORMATION

Operating temperature	–10 to 15 to 30 to +55 °C
Storage temperature	–25 to +70 °C
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 dew
Operating altitude	≤2000 m above MSL

Only to be used in buildings!

MECHANICAL PROPERTIES

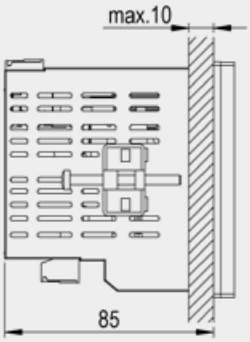
Installation position	Control panel installation
Housing material	Polycarbonate (Makrolon)
Combustibility class	V-0 according UL94, self-extinguishing, not dripping, free of halogen
Weight	500 g

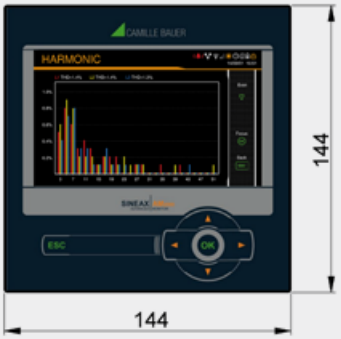
SAFETY

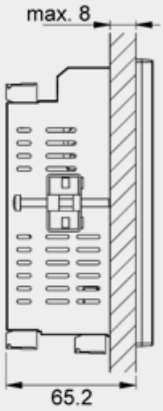
Current inputs are galvanically isolated from each other.

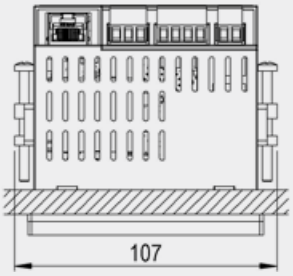
Protection class	II (protective insulation, voltage inputs via protective impedance)
Pollution degree	2
Protection	IP54 (front), IP30 (housing), IP20 (terminals)
Measurement category	CATIII

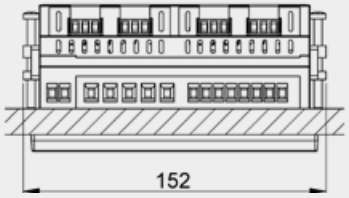
DIMENSIONAL DRAWINGS











ORDER CODE

ORDER CODE AM1000-	
1. BASIC DEVICE AM1000	
With TFT display, for control panel installation	1
2. INPUT I FREQUENCY RANGE	
Current transformer inputs, 45 … 50/60 … 65 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+Webserver)	1
RS485 (Modbus/RTU)	2
Ethernet (Modbus/TCP+Webserver) + RS485 (Modbus/RTU)	3
5. DATALOGGER	
Without	0
Periodic Data + events [1]	1
Disturbance recorder + events [1]	2
Periodic Data + events + disturbance recorder [1]	3
6. I/O-EXTENSION	
Without	0
2 Relays	1
2 analog outputs, bipolar (± 20 mA)	2
4 analog outputs, bipolar (± 20 mA)	3
7. TEST PROTOCOL	
Without	0
Test protocol in German	D
Test protocol in English	E

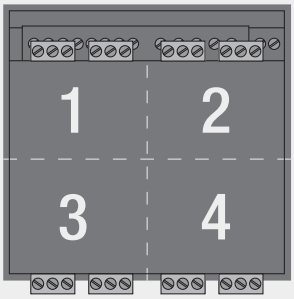
ACCESSORIES	ARTICLE NO.
Documentation CD	156 027
Interface converter USB <> RS485	163 189

[1] Datalogger only possible for device variants with Ethernet

ORDER CODE

ORDER CODE AM2000-	
1. BASIC DEVICE AM2000	
With TFT display, for control panel installation	1
2. INPUT I FREQUENCY RANGE	
Current transformer inputs, 45 … 50/60 … 65 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)	1
5. I/O EXTENSION 1	
Without	0
2 Relays	1
2 analog outputs, bipolar (± 20 mA)	2
4 analog outputs, bipolar (± 20 mA)	3
6. I/O EXTENSION 2	
Without	0
2 Relays	1
2 analog outputs, bipolar (± 20 mA)	2
4 analog outputs, bipolar (± 20 mA)	3
7. I/O EXTENSION 3	
Without	0
2 Relays	1
2 analog outputs, bipolar (± 20 mA)	2
4 analog outputs, bipolar (± 20 mA)	3
8. I/O EXTENSION 4	
Without	0
2 Relays	1
2 analog outputs, bipolar (± 20 mA)	2
4 analog outputs, bipolar (± 20 mA)	3
9. TEST PROTOCOL	
Without	0
Test protocol in German	D
Test protocol in English	E

I/O EXTENSIONS AM2000/AM3000



Maximum one I/O extension with analog outputs may be provided per device.

AM3000: I/O extension 4 only possible for a variant without datalogger.

ORDER CODE AM3000-	
1. BASIC DEVICE AM3000	
With TFT display, for control panel installation	1
2. INPUT I FREQUENCY RANGE	
Current transformer inputs, 45 … 50/60 … 65 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+Webserver)	0
Ethernet (Modbus/TCP+Webserver) + RS485 (Modbus/RTU)	1
5. DATALOGGER	
Without	0
Periodic Data + events	1
Disturbance recorder + events	2
Periodic data + events + disturbance recorder	3
6. I/O EXTENSION 1	
Without	0
2 Relays	1
2 analog outputs, bipolar (± 20 mA)	2
4 analog outputs, bipolar (± 20 mA)	3
7. I/O EXTENSION 2	
Without	0
2 Relays	1
2 analog outputs, bipolar (± 20 mA)	2
4 analog outputs, bipolar (± 20 mA)	3
8. I/O EXTENSION 3	
Without	0
2 Relays	1
2 analog outputs, bipolar (± 20 mA)	2
4 analog outputs, bipolar (± 20 mA)	3
9. I/O EXTENSION 4	
Without	0
2 Relays	1
2 analog outputs, bipolar (± 20 mA)	2
4 analog outputs, bipolar (± 20 mA)	3
10. TEST PROTOCOL	
Without	0
Test protocol in German	D
Test protocol in English	E

ACCESSORIES	ARTICLE NO
Documentation CD	156 027
Interface converter USB <> RS485	163 189

SMARTCOLLECT | PM10

The high-performance SMARTCOLLECT ENERGY software has been particularly designed for applications in the energy sector and industry as well as for service providers and public authorities. It measures, stores and visualises any relevant consumption data of current, gas, water or heat. The software provides transparency and helps in the recognition of weaknesses. This optimises consumption and saves energy costs.

The SMARTCOLLECT software consists of the following components:

- **SMARTCOLLECT CLIENT**
  Graphic visualisation of queried data, export via Excel file, configuration module to determine the data sources to be read out and fault/warning messages via email.

- **SMARTCOLLECT DATABASE**
  Free-of-charge SQL database for collected data.

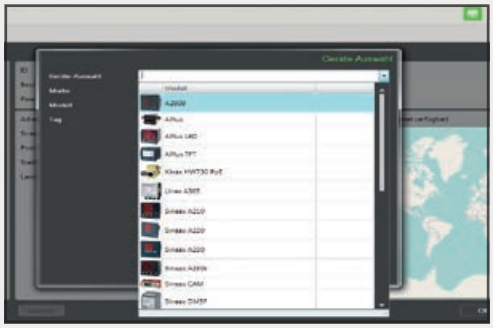
- **SMARTCOLLECT SERVER**
  Collects and configurates data from active sources and channels and writes these directly into the central database.

These components may be installed on a single system or on several servers or computers. The Modbus interface not only permits the integration of Camille Bauer and Gossen Metrawatt products but also instruments of the most varied manufacturers.

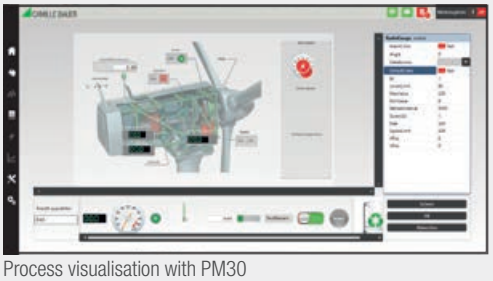
Further variants of the software:

- **SMARTCOLLECT QUALITY (PM20)**
  For the analysis of data of grid quality analysers

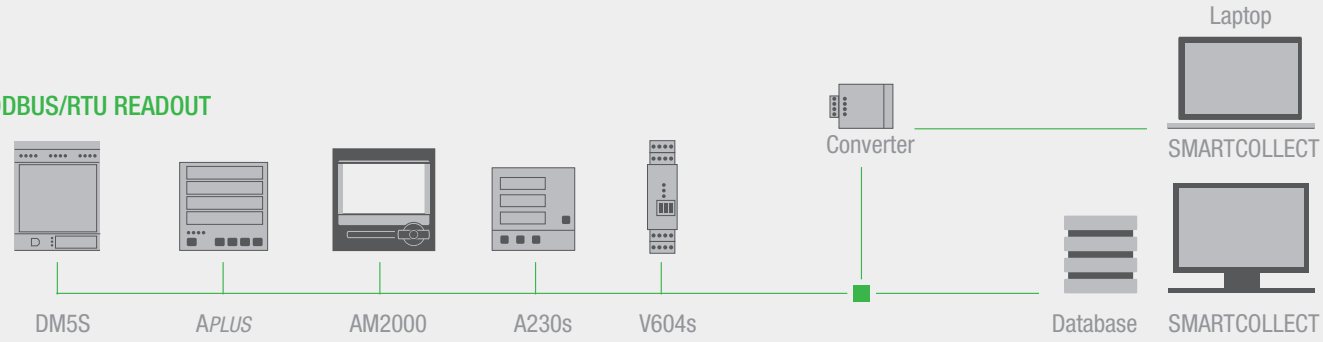
- **SMARTCOLLECT SCADA (PM30)**
  Permits the visualisation of measured data similar to SCADA. Current measured values may be entered into any graph in the background.


Menu-guided device selection

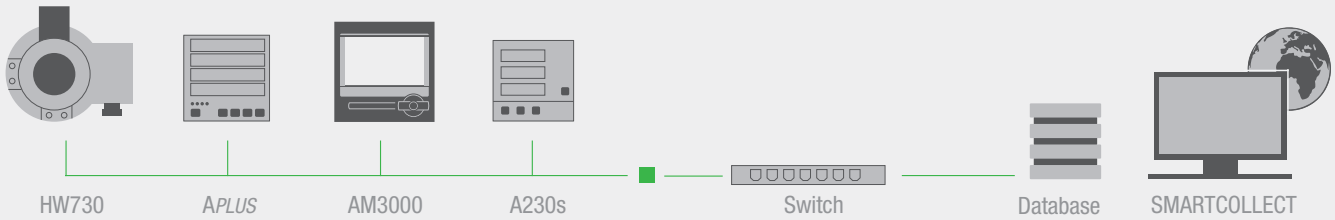

Energy data diagram


Process visualisation with PM30

MODBUS/RTU READOUT



MODBUS/TCP READOUT



GMC INSTRUMENTS

GOSSEN METRAWATT

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