

POWER FOR THE CONTROL CABINET

COMPACT INSTRUMENTS FOR
MONITORING ALL ASPECTS OF
POWER DISTRIBUTION

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Top hat rail device
for the comprehensive
power analysis



The SINEAX DM5000 is a compact instrument to measure and monitor in heavy current grids. It provides a wide range of functionalities which may even be extended by optional components. The connection of the process environment may be performed by communication interfaces, via digital I/Os, analog outputs or relays. The optional display excels in display quality and intuitive on-site operation. The device has 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 device may be completely adapted to the requirements on site either via web server or the optional TFT display. A special software is neither needed for configuration nor for data visualization.

FLEXIBLE

Universal measuring inputs for any type of grid

Freely selectable mean value and meter measuring variables

Configurable access authorisation

SCALABLE

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

Optional data logger (load profiles, meter readings, events, disturbances)

Integration as a standard object into the SMARTCOLLECT software

MULTIFUNCTIONAL

Varied monitoring options via limit values and their logical linkage

Central alarm function via display or web page

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

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

CLEAR

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

Consistently visible status information (alarms, password protection, data recording)

Identical design of web page and local display



Version: with display, with UPS



Version: without display, without UPS

	DM5000
Input channels voltage / current Measurement interval [#cycles]	4 / 4 10/12 (50/60Hz); 1/2
MEASURED VALUES Instantaneous values Extended reactive power analysis Imbalance analysis Neutral current Earth wire current (calculated) Zero displacement UNE Energy balance analysis Harmonic analysis Operating hour counters device / general Monitoring functions Visualisation waveform U/I	<ul style="list-style-type: none"> ▪ ▪ ▪ measured / calculated ▪ measured / calculated ▪ ▪ (incl. phase angle) 1 / 3 ▪ ▪
MEASUREMENT UNCERTAINTY Voltage, current Active, reactive, apparent power Frequency Active energy (IEC 62053-21/22) Reactive energy (IEC 62053-24)	<p>±0.1%</p> <p>±0.2%</p> <p>±10mHz</p> <p>Class 0.5S</p> <p>Class 0.5S</p>
DATA LOGGER (Option) Periodic recording Event recording Disturbance recorder (with pretrigger) a) 1/2 cycle RMS progression U/I b) Curve shape U/I [#cycles]	<p>≥16GB</p> <ul style="list-style-type: none"> ▪ ▪ <p>≤3min.</p> <p>5/6 (pretrigger) +10/12</p>
COMMUNICATION Ethernet: Modbus/TCP, web server, NTP IEC61850 PROFINET IO RS485: Modbus/RTU Standard I/Os Extension modules (optional)	<p>(standard)</p> <p>(option)</p> <p>(option)</p> <p>(standard)</p> <p>1 dig. IN ; 2 dig. OUT max. 2 modules</p>
POWER SUPPLY	100-230V AC/DC 24-48V DC
DESIGN Colour display	TFT 3,5" (320x240px)



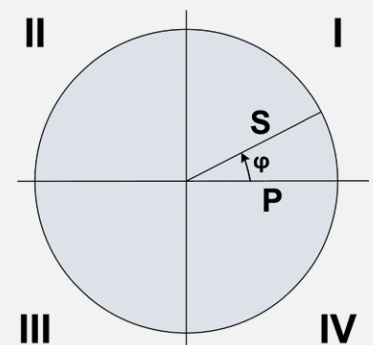
MEASURED VALUES

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 50 th	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 Operating hours of the device	Monitoring of service and maintenance intervals of equipments

DEMAND / SUPPLY / INDUCTIVE / CAPACITIVE

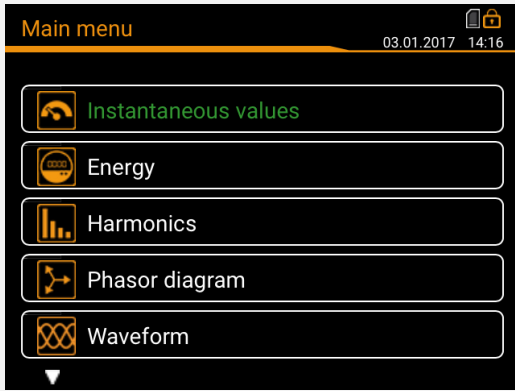
The device provide information for all of the four quadrants. Depending on whether the measured system is considered from a generator or consumer perspective, the interpretation of the quadrants changes: The energy formed from active power in Quadrants I+IV can then be regarded, e.g., as supplied or 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.





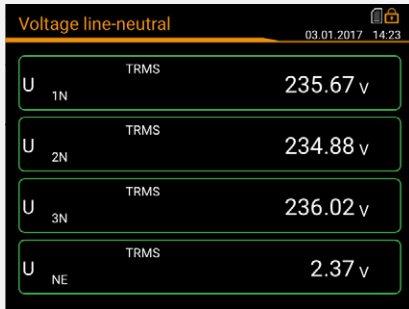
DISPLAY OPTIONS



MAIN MENU - accessible via ESC

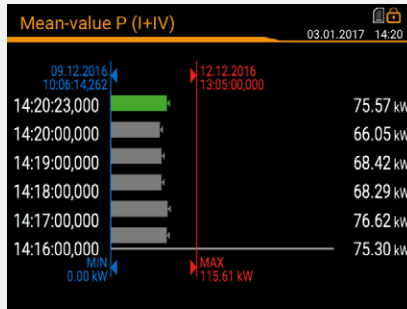
The language-specific main menu arranges the available measured data in easily comprehensible groups.

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.



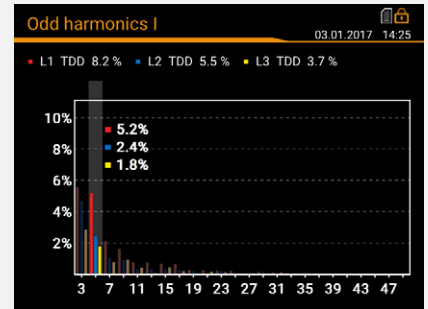
INSTANTANEOUS VALUES

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.



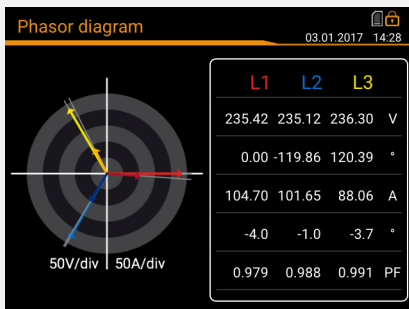
ENERGY

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



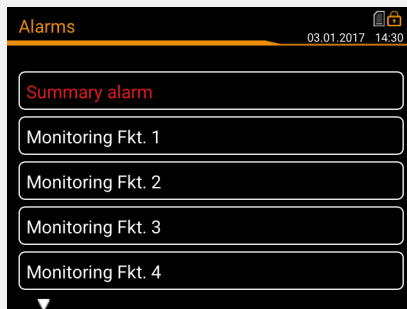
HARMONICS

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



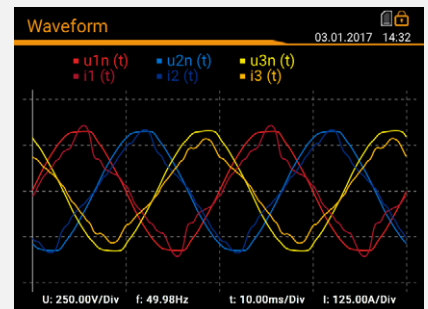
PHASOR DIAGRAM

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

Displays the waveform of voltages and currents.



MONITORING AND ALARMS

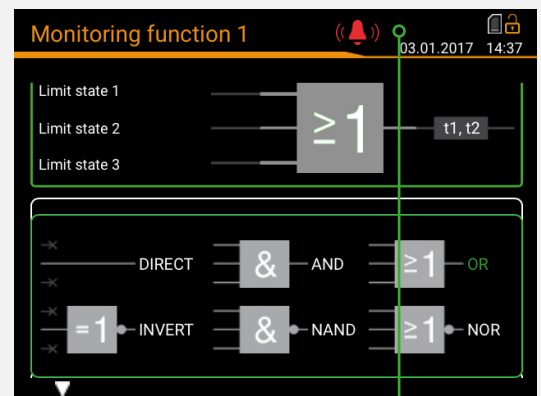
The instruments of the DM5000 support the on-site analysis of acquired measured data in order to initiate directly immediate or delayed measures without involving a separate control. This facilitates the protection of equipment and also monitoring of service intervals.

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

The devices may be equipped with a high-performance data logger 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 10s to 1h) or periodic meter readings (e.g. daily, weekly, monthly).

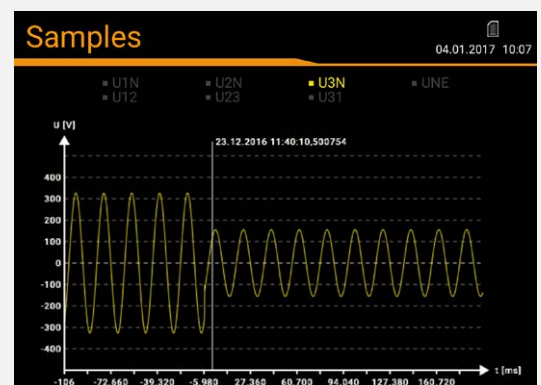
• EVENTS

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 cycle RMS values. The additional registration of the waveform during the disturbance is also possible. This type of registration corresponds to the requirements of the EN 61000-4-30 power 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 web page of the device.



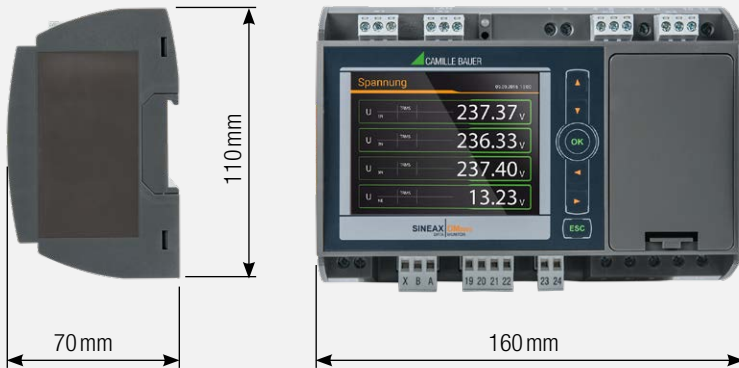


TECHNICAL DATA

INPUTS		BASIC UNCERTAINTY ACCORDING IEC/EN 60688	
NOMINAL CURRENT	1 ... 5 A (max. 7.5A)	Voltage, current	±0.1 %
Maximum	7.5A	Power	±0.2 %
Overload capacity	10A permanent 100A, 5x1 s, interval 300 s	Power factor	±0.1°
NOMINAL VOLTAGE	57.7 ... 400V _{LN} , 100 ... 693V _{LL}	Frequency	±0.01 Hz
Maximum	520V _{LN} , 900V _{LL} (sinusoidal)	Imbalance U, I	±0.5 %
Overload capacity	520V _{LN} , 900V _{LL} permanent 800V _{LN} , 1386V _{LL} , 10x1 s, interval 10 s	Harmonic	±0.5 %
Nominal frequency	42 ... 50 ... 58 Hz, 50.5 ... 60 ... 69.5 Hz	THD U, I	±0.5 %
Measurement TRMS	Up to 60th harmonic	Active energy	Class 0.5S (EN 62 053-22)
		Reactive energy	Class 0.5S (EN 62 053-24)
		INTERFACES	
POWER SUPPLY VARIANTS		ETHERNET	Standard
Nominal voltage	100 ... 230V AC/DC 24 ... 48V DC	Connection	RJ45 socket
Consumption	≤ 20VA, ≤ 12W	Physics	Ethernet 100Base TX
		Mode	10/100 Mbit/s, full/half duplex, autonegotiation
		Protocols	Modbus/TCP, http, NTP (time synchronisation)
TYPES OF CONNECTION		IEC61850	optional
Single phase or split phase (2-phase system)		Physics	Ethernet 100BaseTX, RJ45 sockets, 2 ports
3 or 4-wire balanced load		Mode	10/100 Mbit/s, full/half duplex, auto-negotiation
3-wire balanced load [2U, 1I]		Protocol	IEC 61850, NTP
3-wire unbalanced load, Aron connection		PROFINET IO	optional
3 or 4-wire unbalanced load		Conformance class	CC-B
4-wire unbalanced load, Open-Y		Physics	Ethernet 100BaseTX, RJ45-Buchsen, 2 ports
		Mode	10/100 Mbit/s, full/half duplex, auto-negotiation
		Protocol	PROFINET, LLDP, SNMP
I/O-INTERFACE		MODBUS/RTU	Standard
ANALOG OUTPUTS	(optional)	Physics	RS-485, max. 1200 m (4000 ft)
Linearization	Linear, kinked	Baud rate	9.6 to 115.2 kBaud
Range	±20 mA (24 mA max.), bipolar	Number of participants	≤ 32
Accuracy	±0.2% of 20 mA	TIME REFERENCE	Internal clock
Burden	≤ 500 Ω (max. 10 V/20 mA)	Clock accuracy	± 2 minutes/month (15 to 30°C)
Burden influence	≤ 0.2 %	Synchronisation	NTP server or GPS
Residual ripple	≤ 0.4 %	Power reserve	> 10 years
DIGITAL INPUTS PASSIVE		ENVIRONMENTAL CONDITIONS, GENERAL INFORMATION	
Nominal voltage	12/24V DC (30V max.)	Operating temperature	-10 to 15 to 30 to +55 °C
Logical ZERO	-3 to +5V	Storage temperature	-25 to +70 °C
Logical ONE	11 to 30V	Temperature influence	0.5 x basic uncertainty per 10 K
DIGITAL INPUTS ACTIVE	(optional)	Long-term drift	0.5 x basic uncertainty per year
Open circuit voltage	≤ 15V	Others	Application group II (EN 60 688)
Short circuit current	< 15 mA	Relative air humidity	<95 % without condensation
Current at R _{ON} = 800 Ω	≥ 2 mA	Operating altitude	≤2000 m above MSL
DIGITAL OUTPUTS		Only to be used in buildings!	
Nominal voltage	12/24V DC (30V max.)	MECHANICAL PROPERTIES	
Nominal current	50 mA (60 mA max.)	Mounting	Top hat rail 35x15 or 35x7.5 mm
FAULT CURRENT MONITORING	For grounded systems (optional)	Housing material	Polycarbonate (Makrolon)
Number of meas. channels	2 (2 measurement ranges each)	Flammability class	V-0 according UL94, self-extinguishing, not dripping, free of halogen
Measurement range 1 (1A)	Earth current measurement	Weight	600 g
• Measuring transformer	1/1 up to 1/1000 A	SAFETY	
• Alarm limit	30 mA up to 1000 A	Current inputs are galvanically isolated from each other.	
Measurement range 2 (2mA)RCM with connection monitoring		Protection class	II (protective insulation, voltage inputs via protective impedance)
• Measuring transformer	Residual current transformer 500/1 up to 1000/1 A	Pollution degree	2
• Alarm limit	30 mA up to 1 A	Protection	IP40 (front), IP30 (housing), IP20 (terminals)
TEMPERATURE INPUTS	(optional)	Measurement category	U: 600 V CAT III, I: 300 V CAT III
Number of channels	2		
Measurement sensor	Pt100 / PTC; 2-wire		
RELAYS	(optional)		
Contacts	Changeover contact		
Load capacity	250V AC, 2A, 500VA; 30V DC, 2A, 60W		



DIMENSIONAL DM5000



ORIENTATION DM5000



Not allowed for device versions
with uninterruptible power supply

ORDER CODE

ORDER CODE DM5000-

ORDER CODE DM5000-			
1. BASIC DEVICE FOR RAIL MOUNTING DM5000		8. EXTENSION 2	
Without display	0	Without	0
With TFT display	1	2 relays	1
2. INPUT FREQUENCY RANGE		2 analog outputs, bipolar (± 20 mA)	2
4 Current transformer inputs,		4 analog outputs, bipolar (± 20 mA)	3
42 ... <u>50</u> ... 58 Hz, 50.5 ... <u>60</u> ... 69.5 Hz	1	4 digital inputs passive	4
3. POWER SUPPLY		4 digital inputs active	5
Nominal voltage 100 ... 230 V AC/DC	1	Fault current detection, 2 channels	6
Nominal voltage 24 ... 48 V DC	2	GPS connection module	7
4. BUS CONNECTION		Temperature monitoring, 2 channels	C
RS485 (Modbus/RTU) + Ethernet (web server, Modbus/TCP)	1	9. TEST PROTOCOL	
5. UNINTERRUPTIBLE POWER SUPPLY		Without	0
Without	0	Test protocol in German	D
With uninterruptible power supply	1	Test protocol in English	E
6. DATA LOGGER			
Without	0		
With data logger: Periodic Data + events	1		
With data logger: Disturbance recorder + events	2		
With data logger: Periodic Data + events + disturbance recorder	3		
7. EXTENSION 1		ACCESSORIES	ARTICLE NO.
Without	0	Documentation on USB stick	156 027
2 relays	1	Interface converter USB <> RS485	163 189
2 analog outputs, bipolar (± 20 mA)	2	GPS receiver 16x-LVS, configured	181 131
4 analog outputs, bipolar (± 20 mA)	3	Transformers for fault current detection see accessory current transformers	
4 digital inputs passive	4		
4 digital inputs active	5		
Fault current detection, 2 channels	6		
GPS connection module	7		
Profinet interface	A		
IEC 61850 interface	B		
Temperature monitoring, 2 channels	C		



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

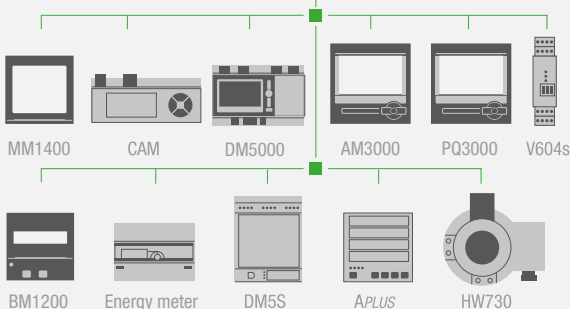
- MS SQL database (depending on the scope Express or Server)
- Contains the collected data
- Open and unencrypted

SMARTCOLLECT SERVER



SMARTCOLLECT SERVER

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

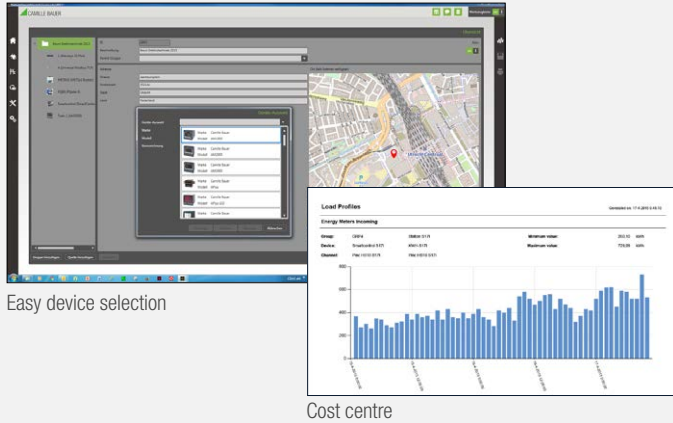


SMARTCOLLECT software components may be installed on an individual system or on several servers or computers.



SMARTCOLLECT PM10 - BASIC MODULE

The basic PM10 module acquires measured data in an easy manner and stores it in an open MS SQL database. The module offers basic functionalities for data analysis and smooth energy monitoring and facilitates the preparation and dispatch of reports. Employing a sophisticated graphic user interface, SMARTCOLLECT provides clearly arranged software and is easily operated.



Camille Bauer and Gossen Metrawatt devices are easily and quickly integrated using merely a few clicks. Energy data may be allocated to cost centres and merged into reports in relation to a desired period of time. Variables like temperature, voltages or currents may be visualised in an overview report. Users can store these reports or forward them automatically via email.

SMARTCOLLECT PM20 - POWER QUALITY

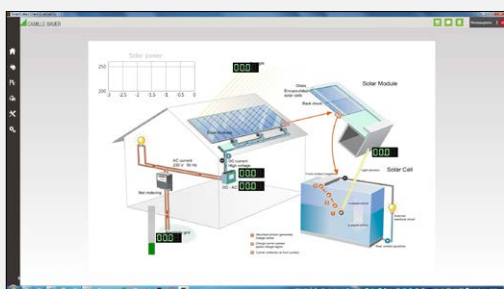
The PM20 module extends the basic PM10 module by varied visualising and analysis options for system quality instruments. The PQDIF files of system quality instruments are imported, converted and written into the database. Measured data may be issued as a report according to EN 50160.



After the export of PQDIF files from the system quality instrument, they are both unpacked and stored in the database and may also be stored on a hard disk in original format, if required. The PM20 module graphic interface permits visualising of the most varied measured values of an instrument.

SMARTCOLLECT PM30 - VISUALIZATION

The PM30 module, in turn, builds on the PM20 module and supplements it to visualise plants, processes and procedures. Individual images, diagrams or drawings with live measured data, switching statuses and limit values may be linked to develop extensive visualising.



Using the integrated designer, any background can be extended to become an individual SCADA overview image. Digital displays, analog indicators, signal lamps, switches and many more items may be arranged as desired and inserted in the image.

Visualizing of a photovoltaic plant

GMC INSTRUMENTS

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