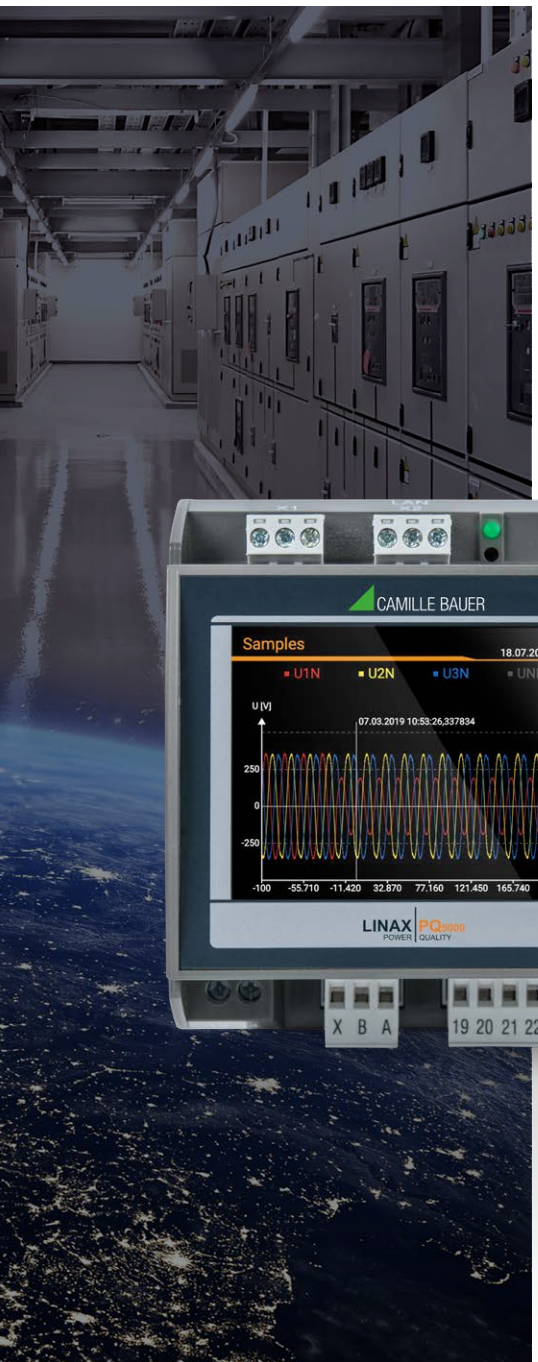
CAMILLE BAUER

POWER QUALITY MONITORING

COMBINED POWER QUALITY AND ENERGY CONSUMPTION MEASUREMENT

CONFORMITY REPORT VIA BROWSER
WITHOUT EXTRA SOFTWARE

PQ-EASY REPORT



Certified by METAS

LINAX PQ-SERIES

LINAX PQ3000 ▪ LINAX PQ5000

Comprehensive instrument for power quality monitoring in electric mains

Power quality monitoring is frequently only considered after equipment failures, plant breakdowns, process interruptions or communication failures.

Continuous monitoring analyses breakdowns immediately and eliminates their causes in a sustainable manner. In addition, long-term acquisition permits the early recognition of changes in order to improve supply security and thus system availability.

The products of the LINAX PQ3000 and PQ5000 series are independently certified Class A measurement devices according to IEC 61000-4-30 Ed. 3. They provide reliable and comparable information for regulatory authorities, negotiations with energy suppliers or internal quality control.

The flexible approach without any software excels both in autarchy and flexible software integration options. It is based on standardised interfaces, generates conformity reports directly via the device website and excels with a comprehensive cyber security concept.

MULTIFUNCTIONAL

Certified power quality analysis according to IEC61000-4-30 Ed.3 in Class A

Energy flow analysis: Active energy Class 0.2S, load profiles

Grid state and fault current monitoring

SAFE

Role-based access control (RBAC)

Encoded communication via HTTPS, Syslog and SFTP

Classified logging of security-relevant activities (Audit-Log, Syslog)

OPEN

Web-based, no additional software required

Data export via PQDIF, COMTRADE and CSV, periodically or event-controlled

REST interface, IEC 61850, Profinet, Modbus RTU/TCP

FLEXIBLE

PQ Easy-Report: Direct conformity reports via website

Freely selectable average value and meter variables for trend recording and analysis

Monitoring of freely definable alarm conditions, including collective alarm and logging

SCALABLE

Selectable recording time for PQ events

Selectable device design (interfaces, I/Os, UPS, auxiliary energy)

Direct integration into SMARTCOLLECT and PQVIEW4

AVOIDING POWER QUALITY PROBLEMS - THROUGH CONTINUOUS MONITORING

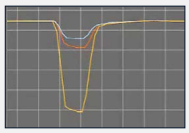
Disruptions of the energy supply may result in production or equipment outages. Often people do not react until great financial damage has been caused. Yet, many of these incidents could be avoided if the signs were recognised in the continuous monitoring of the situation.

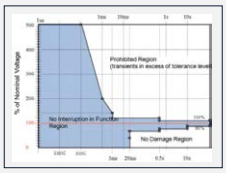
Any power quality monitoring provides both trend analyses for statistical assessment permitting a comparison with standards (e.g. EN 50160) or supply contracts and recording of grid events (e.g. voltage drop) to enable the analysis of causes and consequences.

Power quality according to IEC 61000-4-30

Power quality data

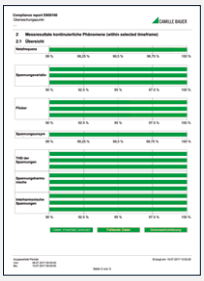
Voltage events





Classification according to ITIC curve

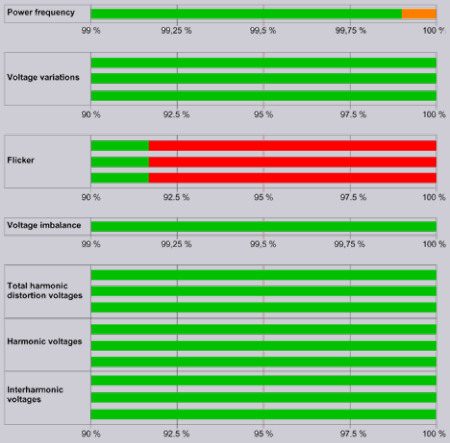
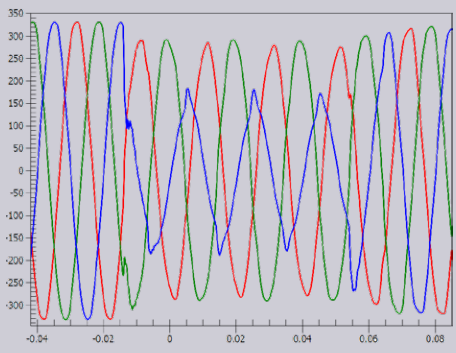
Statistical assessment

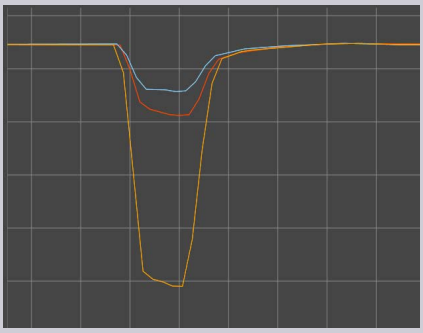
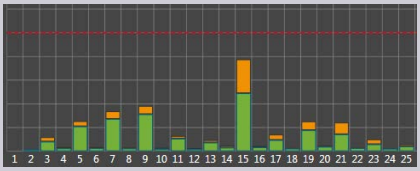
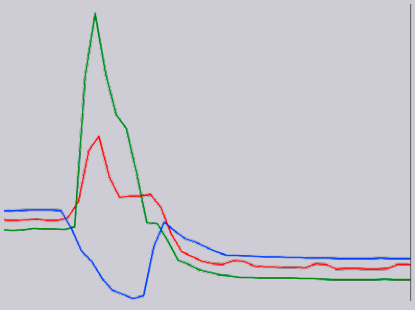


Assessment according to

- EN 50160
- IEC 61000-2-2 (NS)
- IEC 61000-2-4 (Industry)
- IEC 61000-2-12 (MS)

+ further standards in progress

POWER QUALITY EVALUATION	DESCRIPTION	BENEFIT
Statistical evaluation 	Relevant supply voltage parameters are monitored, statistically averaged and compared to the limit values of a standard or specified values. This way, one can either prove compliance or call attention to possible problems. In addition to the voltages, also magnitude, harmonic content and unbalance of currents are recorded. But, a statistical evaluation is carried out only if corresponding limit values exist, for example for harmonics in IEEE 519.	Verification of the compliance with standards (e.g. EN 50160) or contracts between energy suppliers and energy consumers. Users may adapt the specified values as they desire. By observing changes in the results, one can detect any deterioration of power quality early on and identify the causes. Introduced improvements can be verified immediately.
Recording of malfunctions 	All voltages are monitored for disturbances, such as dip, interruption or swell. These incidents are registered as event. A statistical evaluation is not required because there is no limitation for such events. For a configurable period of time, any event recording contains for all voltages and currents: • The curve shape • The progression of RMS half-cycle values	The evaluation of malfunction recording lets you identify the cause of the malfunction and - at best - establish a correlation with the events witnessed (such as outage of control systems or equipment). Suitable remedies may then be derived.

MONITORED PHENOMINA	CAUSES	POSSIBLE CONSEQUENTIAL PROBLEMS
Mains frequency	• Loss of power generators • Large load changes	• Instability of the mains power supply
Magnitude of supply voltage 	• Changes in grid load	• Disruption of equipment • System shut-down • Loss of data
Flicker and rapid voltage changes (RVC)	• Frequent load changes • Start of engines	• Flickering lighting • Impairment of the performance of exposed people
Supply voltage dips and swells 	• Large load changes • Short circuit, contact to earth • Thunderstorm • Power supply overload • Feed-in of renewable energies such as wind or photovoltaic energy	• Disruption of equipment such as control or drive systems • Operational interruption • Data loss in control systems and computers
Voltage interruptions	• Short circuit • Blown fuses • Component failures • Planned supply interruption	• Production stoppage • Process interruptions • Data loss in control systems and computers
Supply voltage unbalance	• Uneven load on phases due to one or two-phase consumers • One or multi-phase short circuits to earth	• Current in the neutral conductor • Overload / overheating of equipment • Increase of harmonics
Voltage harmonics 	• Non-linear loads such as frequency converters, rectifiers, switching power supplies, arc furnaces, computers, fluorescent tubes etc.	• Reduction of machine efficiency • Increased energy losses • Overload / overheating of equipment • Current in the neutral conductor
Voltage interharmonics, mains signalling voltage on the supply voltage	• Frequency converters and similar control devices	• Flicker • Malfunction of ripple control
Excessive currents 	• Start-up currents of consumers • Switching operations • Voltage drops	• Fuse activation • Voltage drop • Plant shutdown

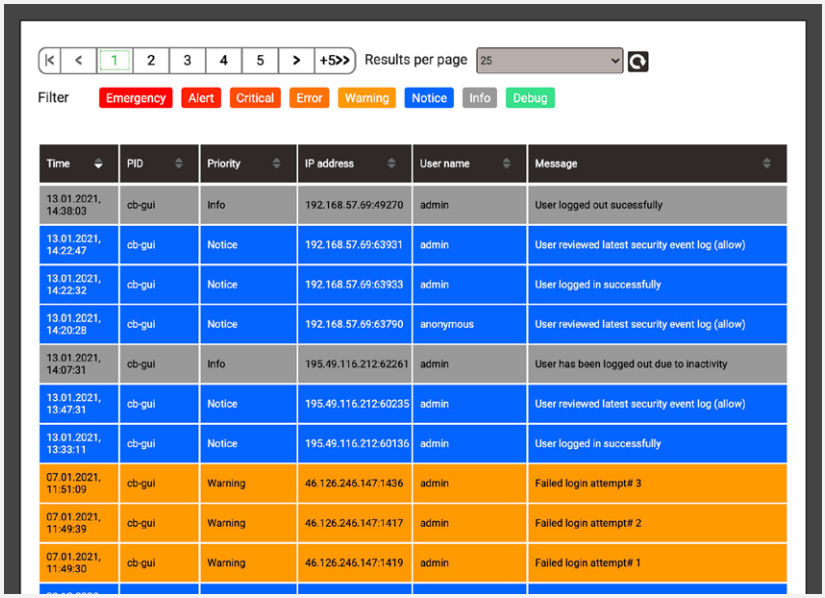
CYBER SECURITY

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.

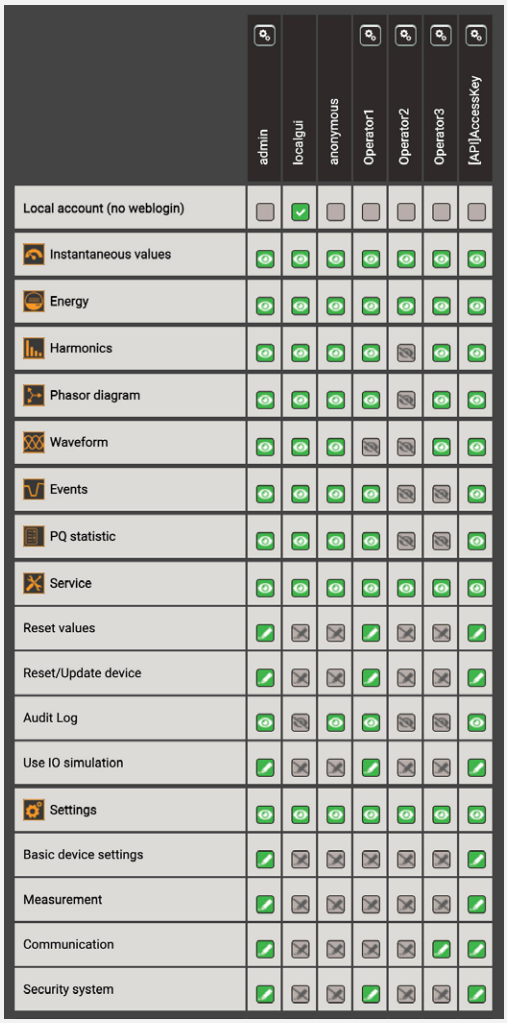
A comprehensive safety concept on plant level comprising each grid component is required to repel such attacks. The safety mechanisms integrated into LINAX PQx000 support such concepts, thus contributing to safe energy supplies.

SAFETY MECHANISMS

- **Role-Based Access Control (RBAC)**: Only those access rights are granted to users which they need for their activities, no plain-text transmission of login information, increase of the latency period in case of repeated login attempts, software access only via access keys
- **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 safe updates**



Audit log with filter option



RBAC access rights of different users

CERTIFIED POWER QUALITY MONITORING

- Independent certification by Federal Institute of Metrology
- Device type PQI-A FI2 acc. IEC 62586-1
- Proven at 230V / 50 Hz and 120V / 60Hz
- Flicker meter class F1
- Flagging concept: Multiphase approach in accordance with IEC 61000-4-30

Thanks to the certification according to IEC 62586-2 (standard for verifying compliance with IEC 61000-4-30) the device can serve as a reliable and comparable source of information for regulatory agencies, for negotiations with energy suppliers or for internal quality control.

DATA RECORDING

The device features different recording options to provide historical data for the assessment of power quality, energy management or grid management.

- **POWER QUALITY STATISTICS**
  All of the trend values required for a Class A device according to IEC 61000-4-30 Ed.3 are automatically recorded. They permit the subsequent verification of standard conformity.

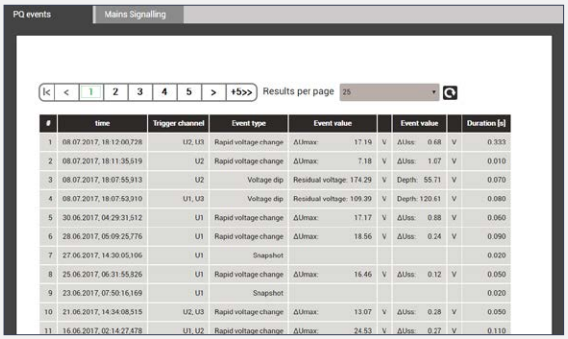
- **POWER QUALITY EVENTS**
  Power quality events serve the proof of temporary grid availability limitations, fault analyses and the discovery of the causes of disturbances. PQ events are available in lists containing the most important details. The selection of an entry takes you directly to the graphic representation of the event. Depending on the configured recording time, the following items may be assessed for all voltages and currents:
  - Curve shape: Up to 1 second before and 5 seconds after the event
  - RMS ½ values: Up to 1 second before and 3 minutes after the event

- **PERIODIC DATA**
  Periodic data, in particular for energy management, is acquired. The data is based on power averages and meter readings which are saved in regular intervals.
  Typical applications are the acquisition of load profiles (intervals of 10s to 1h) or the determination of the energy consumption from the difference of meter readings.
  Averages are respectively acquired with a range of fluctuation, i.e. maximum and minimum RMS values per interval. Averages may also be acquired for freely selectable base variables.
  Further base variables can also be monitored for meter readings, e.g. per phase or only related to the basic cycle.

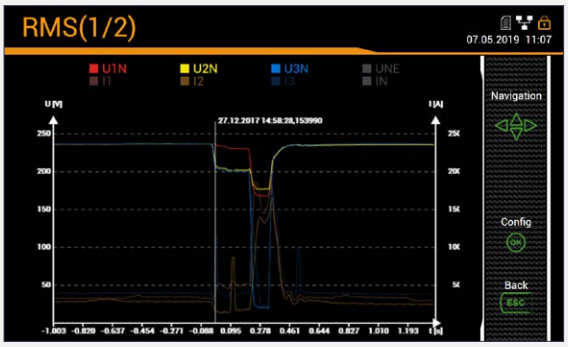
- **EVENTS**
  Events or alarms - which users have determined in addition to continually monitored power quality events - are stated in lists including time information. State transitions or the activation or deactivation of limit value states or monitoring functions, which users have classified as alarms or events, or the infringement on pre-alarm or alarm limits of optional temperature and fault current inputs are respectively registered.

- **AUDIT-LOG**
  This list of the service area logs all activities relevant to safety which might impair data consistency or endanger IT safety. It replaces the operator list of older firmware versions and cannot be deleted or changed by users. Any connection to the device, any login attempt (be it successful or not), any logoff (be it active or by timeout), any change in the device configuration, any reset of data, any firmware update, any display of the audit log and much more is respectively registered including user information. The content of the audit log may also be forwarded to a central grid monitoring server by Syslog.

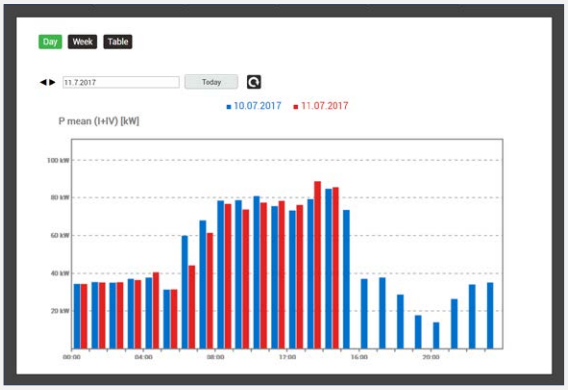
The memory used (16 GB) permits saving data under normal application conditions for several years. Once the memory share allocated to the data groups has been fully used, the oldest data of this group is deleted.



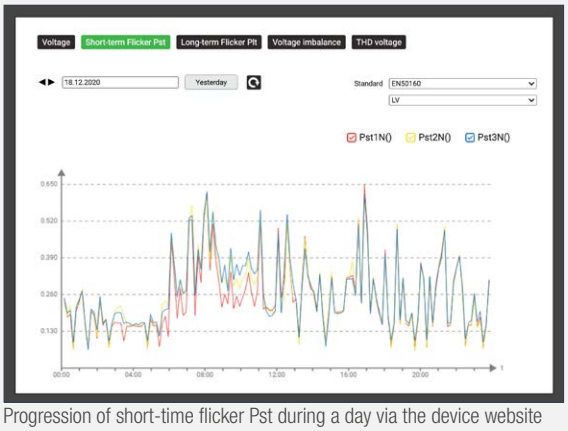
PQ event list via device website



Voltage drop shown on local display



Current load profile of the day with values of the previous day via the device website



Progression of short-time flicker Pst during a day via the device website

PQ DATA ANALYSIS

All of the PQ data acquired by the device can be directly visualised and analysed via the device website. Additional software is not required.

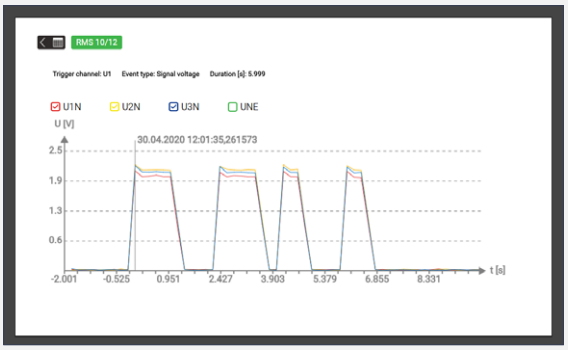
PQ events

- PQ event list with trigger source, event type, event duration and characteristic event values
- Direct display of event details by selecting an entry in the event list: Measured value progressions of RMS ½ values and curve shapes for all currents and voltages with time zoom and value display
- Recording of ripple control sequences to verify the ripple control level and pulse sequences at the receiver

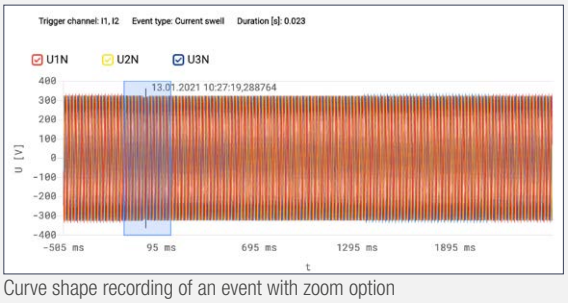
PQ statistics

- Overview of conformity with a selectable standard. Depending on the standard selected, more or less criteria are taken into consideration.
- Daily progressions of all acquired PQ trend values, display with/without limit values and fluctuation range
- PQ easy report: Preparation of a conformity report (pdf format) of a selectable extent

Using the data export options and due to standardised formats like PQDIF and COMTRADE, the analysis of PQ data can also be delegated to software solutions like SMARTCOLLECT PM20 or PQView4 or freely available viewers like PQDiffractor of Electrotek Concepts may be used.



Ripple control sequence acquired as an event



Curve shape recording of an event with zoom option

PQ EASY-REPORT

PQ-EASY REPORT

- Preparation of reports via the device web interface
- Tamper-resistant PDF format
- Selectable report scope (overview, statistic details, event overview)
- Direct compliance assessment of standards EN 50160, IEC 61000-2-2 / 2-4 / 2-12, GB/T, IEEE 519 or customer specific limits
- Customer specific logo in the report

DATA EXPORT

Automated

Measured value information may not only be monitored directly but can also be saved in files in the device or forwarded to an SFTP server using a data export scheduler. The following systems are supported:

- CSV files: To make average progressions, load profiles or meter readings available
- PQDIF for event-controlled forwarding / saving of PQ event recordings
- PQDIF for periodic forwarding / saving of all PQ data (trends and events)

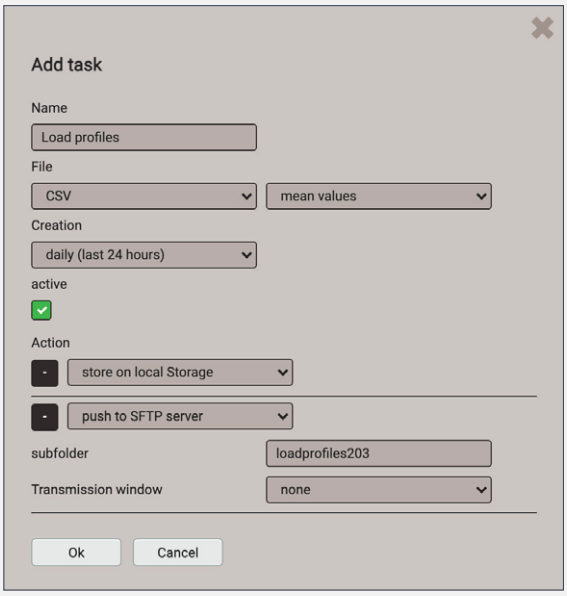
Tasks may be prepared for the generation of files which will then run automatically and are linked to the actions of save locally and / or send to SFTP server. Data locally saved in the device may be transferred to a computer via the device website or the REST interface.

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 a network structure is not available, it may make sense to prepare files manually via the device website and to save them on the PC:

- CSV files: For event lists, average progressions, curve shape representation, PQ event recordings
- PQDIF files of all PQ data of a selectable day or the current day



Task for daily saving / forwarding of average data

File formats

- ***CSV**: Comma Separated Value*
- ***PQDIF**: Power Quality Data Interchange Format according to IEEE 1159.3*

MONITORING AND ALARMING

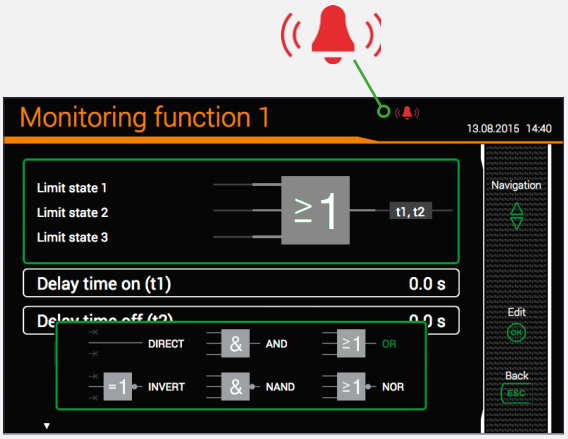
The instrument supports the on-site analysis of acquired measured data in order to initiate directly immediate or delayed actions. This facilitates the protection of equipment and also monitoring of service intervals.

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 hourcounters 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 and can be used for both the alarm and event list in the data logger.



Monitoring function for «OR linking» of 3 limit values

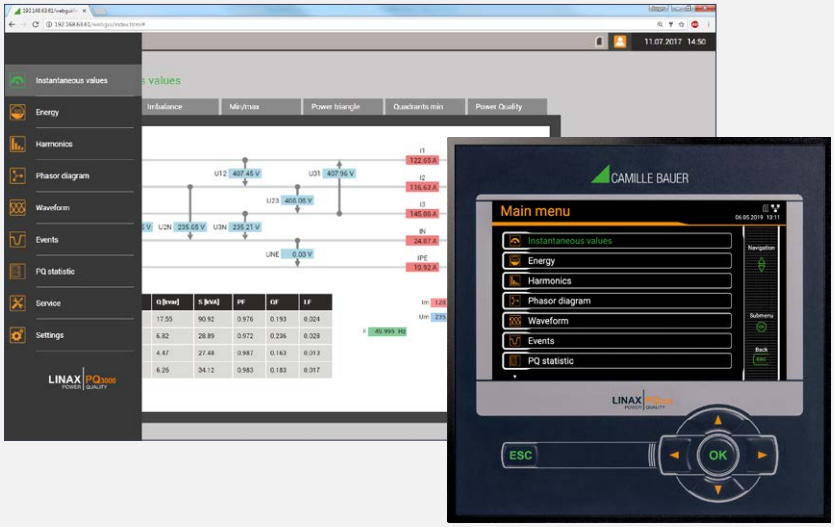
Logging

If desired, all state changes of the monitored limit values and monitoring functions can also be logged with time specification in the alarm or event list. Configurable texts are used per channel for clear identification.

Transfer

Digital outputs may be directly used for the transfer of the states of limit values and / or monitoring functions as well as the resettable collective alarm.

OPERATION AND ANALYSIS



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.

COMMISSIONING AND SERVICE

The device provides versatile tools for safe and easy commissioning and maintenance. 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:

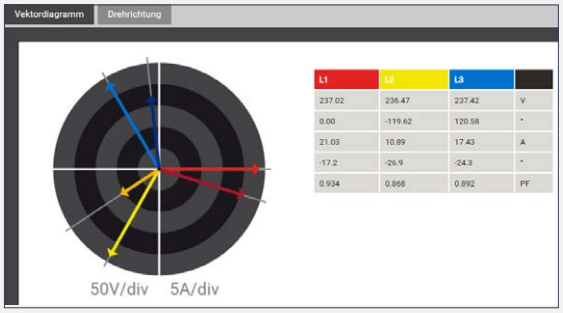
- Can the gateway be reached?
- Can the URL of the NTP server be cancelled via DNS?
- Is NTP a time server and is the time synchronisation working?
- Does the data storage on the SFTP server work?

Operating instructions

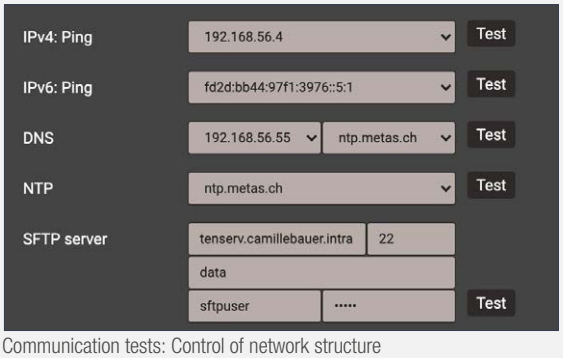
The operating instructions are stored in the device as a PDF file and can be opened in the browser or downloaded to a PC at any time. The instructions are respectively updated in any firmware update thus always documenting the implemented state.

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

MEASURED VALUES

MEASURED VALUE GROUP	APPLICATION
INSTANTANEOUS VALUES	
• U, I, IMS, P, Q, S, PF, LF, QF ...	» Transparent monitoring of present system state
• Angle between voltage phasors	» Fault detection, connection check, sense of rotation 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 IEC 61000-4-7)	
• Total harmonics content THD U/I and TDD I	» Evaluation of the thermic load of equipment
• Individual harmonics / interharmonics U/I	» Analysis of system perturbation and consumer structure
IMBALANCE ANALYSIS	
• Symmetrical components (positive, negative, zero sequence system)	» Equipment overload protection
• Imbalance (derived from symmetrical components)	» Failure/earth fault detection
• Deviation from U/I mean value	
ENERGY BALANCE ANALYSIS	
• Meter for acquisition/supply of active/reactive energy, high/low-rate tariff, meter with selectable base 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 counters with programmable running condition	» Monitoring of service and maintenance intervals
• Operating hours of the device	
POWER QUALITY	
Certified functionality according to IEC 62586-2, Class A Chap. 6.1 Power frequency Chap. 6.2 Magnitude of supply voltage Chap. 6.3 Flicker Chap. 6.4 Supply voltage dips / swells Chap. 6.5 Voltage interruptions Chap. 6.6 Harmonics of voltages Chap. 6.7 Interharmonics of voltages Chap. 6.8 Voltage harmonics Chap. 6.9 Measurement of low and high deviation Chap. 6.10 Mains signalling voltage on the supply voltage Chap. 6.11 Uncertainty of time information Chap. 6.12 Variations due to external influencing variables Chap. 6.13 Current (magnitude, harmonics, interharmonics) Chap. 6.14 Amperage Chap. 6.15 Harmonics of currents Chap. 6.16 Interharmonics of currents Chap. 6.17 Imbalance of currents	• Device type PQI-A FI2 (IEC 62586-1) • Independent and accredited laboratory: Federal Institute of Metrology METAS. Tested at both 230V / 50Hz and 120V / 60Hz. Certified in 230V / 50 Hz and 120V / 60Hz applications. • Thanks to the certification according to IEC 62586-2 (standard for verifying compliance with IEC 61000-4-30) the device can serve as a reliable and comparable source of information for regulatory agencies, for negotiations with energy suppliers or for internal quality control. • Generation of conformity reports using the device website according to selectable standards. • Improving the quality and reliability of the mains supply. • Identifying causes of disruptions.

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	PQ3000: 480 V_{LN}, 832 V_{LL} (sinusoidal) PQ5000: 520 V_{LN}, 900 V_{LL} (sinusoidal)
Overload capacity	PQ3000: 480 V_{LN}, 832 V_{LL} permanent PQ5000: 520 V_{LN}, 900 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 (PQ5000) 110…230 V AC, 130…230 V DC (PQ3000) 110…200 V AC, 110…200 V DC (PQ3000) 24…48 V DC (PQ3000 / PQ5000)
Consumption	≤ 27 VA, ≤ 12 W (PQ5000); ≤ 30 VA, ≤ 13 W (PQ3000)

UNINTERRUPTIBLE POWER SUPPLY (UPS)

Type (3.7 V)	VARTA Easy Pack EZPAckL, UL listed MH16707

TYPES OF CONNECTION

- Single phase or split phase (2-phase system)
- 3 or 4-wire balanced load
- 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)
Linearisation	Linear, kinked
Range	± 20 mA (24 mA max.), bipolar
Accuracy	± 0.2 % von 20 mA
Burden	≤ 500 Ω (max. 10 V/20 mA)
RELAYS	(optional)
Contacts	Changeover contact
Load capacity	250 V AC, 2 A, 500 VA; 30 V DC, 2 A, 60 W

DIGITAL INPUTS PASSIVE

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

DIGITAL INPUTS ACTIVE (optional)

Open circuit voltage	≤ 15 V

DIGITAL OUTPUTS	2, Standard
Nominal voltage	12/24 V DC (30 V 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

BASIC UNCERTAINTY ACCORDING IEC/EN 60688

Voltage, current	±0.1 %
Power	±0.2 %
Power factor	±0.1°
Frequency	±0.01 Hz
Imbalance U, I	±0.5 %
Harmonic	±0.5 %
THD U, I	±0.5 %
Active energy	Class 0.5S (IEC/EN 62053-22) (Meter class certified by METAS)
Reactive energy	Class 0.5S (IEC/EN 62053-24)

INTERFACES

ETHERNET	Standard
Physics	Ethernet 100Base TX; RJ45 socket
Mode	10/100 MBit/s, full/half duplex, autonegotiation
Protocols	Modbus/TCP, http, https, NTP, IPv4, IPv6
IEC61850	**optional**
Physics	Ethernet 100BaseTX, RJ45 sockets, 2 ports
Mode	10/100 Mbit/s, full/half duplex, auto-negotiation
Protocol	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 (PQ5000), optional (PQ3000)
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	via 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	–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 (IEC/EN 60 688)
Relative air humidity	<95 % without condensation
Operating altitude	≤2000 m above NN

Only to be used in buildings!

MECHANICAL PROPERTIES

Housing material	Polycarbonate (Makrolon)
Flammability class	V-0 according UL94, self-extinguishing, not dripping, free of halogen
Weight	800 g (PQ3000), 600g (PQ5000)

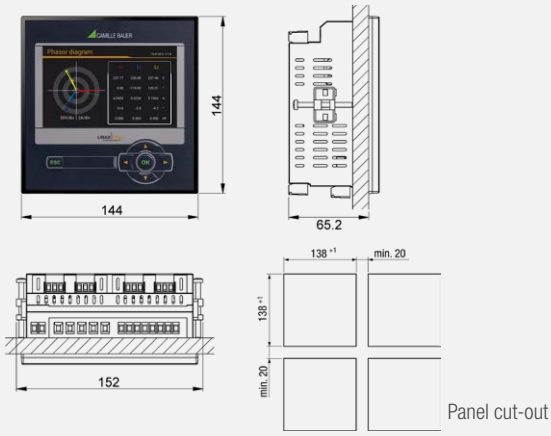
SAFETY

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

ORDER CODE PQ3000-	
1. BASIC DEVICE, 4 U / 4 I MEASURING INPUTS, 1 DIGITAL INPUT, 2 DIGITAL OUTPUTS, HTTPS, MODBUS/TCP	
With TFT display	1
2. INPUT I FREQUENCY RANGE	
Current transformer inputs, 42 … 50/60 … 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 protocol+web server)	1
Ethernet (Modbus/TCP+web server)+RS485 (Modbus/RTU)	2
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
Uninterruptible power supply	8
Temperature monitoring, 2 channels	C
8. TEST CERTIFICATE	
Without	0
Test certificate in German	D
Test certificate in English	E

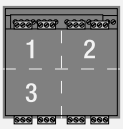
DIMENSIONAL DRAWING PQ3000



Panel cut-out

ORDER CODE PQ5000-	
1. BASIC DEVICE, 4 U / 4 I MEASURING INPUTS, 1 DIGITAL INPUT, 2 DIGITAL OUTPUTS, HTTPS, MODBUS/TCP	
Without display	0
With TFT display	1
2. INPUT I 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	
Ethernet (Modbus/TCP+web server) + RS485 (Modbus/RTU)	1
5. UNINTERRUPTIBLE POWER SUPPLY	
Without	0
With uninterruptible power supply	1
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
Profinet interface	A
IEC61850 interface	B
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
Temperature monitoring, 2 channels	C
8. TEST CERTIFICATE	
Without	0
Test certificate in German	D
Test certificate in English	E

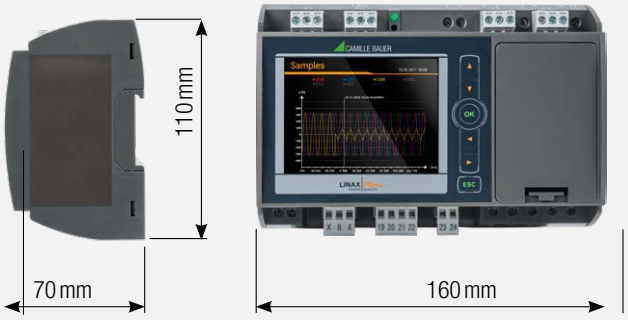
ACCESSORIES	ARTICLE NO
Documentation on USB stick	156 027
Interface converter USB <> RS485	163 189
GPS receiver 16x-LVS, configured	181 131
Transformers for fault current detection see accessory current transformers	



EXTENSIONS PQ3000

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

DIMENSIONAL DRAWING PQ5000



ALTERNATIVE DESIGNS

LINAX PQ5000 MOBILE

The device is based on LINAX PQ5000 and designed for temporary monitoring of power quality and energy consumption, primarily in low voltage distribution. It is specially devised for repeated measurements at up to 20 different measuring points.

Design

- All functions of LINAX PQ5000
- Up to 20 measuring point configurations can be stored in the device
- Start / stop of recording via a button on the device or website
- Hardware variants: Current measurement via Rogowski coils (2000A) or current clamps (10/100/1000 A)
- Power supply plug 100 to 230 VAC
- Integrated Uninterrupted Power Supply (UPS): Bridging 5 times for 3 minutes in case of an interruption of supply
- Waterproof due to high ingress protection IP65
- GPS time synchronisation (option)

Communication

- Commissioning, configuration and data analysis via LAN or WLAN
- Extensive cyber security protection
- Remote access via safe transmission channel via LAN or mobile radio network upon request

Device design for current measurement using fourfold Rogowski converter

LINAX PQ5000 RACK

The device in **19“ rack design according to EN 60297** is based on LINAX PQ5000 and can also monitor several measuring points.

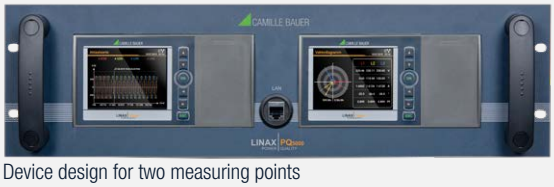
Design

- All functions of LINAX PQ5000
- Current inputs for 5A or 3V
- 12 digital inputs to acquire grid states or trigger event recording and 1 digital output to issue different system conditions (option)
- 4 analog outputs or Modbus/RTU interface (option)
- Design for one or two measuring points (double bus bar, transformer)
- Power supply 100 to 230 VAC/DC
- Integrated Uninterrupted Power Supply (UPS): Bridging 5 times for 3 minutes in case of an interruption of supply
- Input for GPS time synchronisation

Communication

- Commissioning, configuration and data analysis via LAN (front and rear): Modbus/TCP, NTP, http, https, IPv4, IPv6
- 3G/4G router (option)
- IEC 61850 (option)
- Extensive cyber security protection

Device design for one measuring point

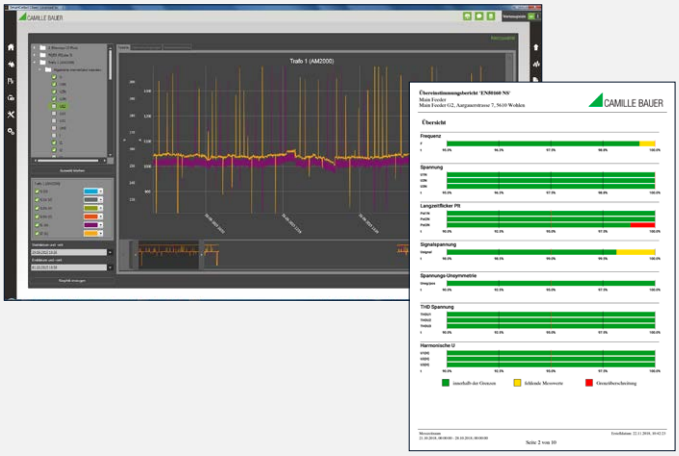


Device design for two measuring points

SMARTCOLLECT

POWERFUL DATA MANAGEMENT SOFTWARE

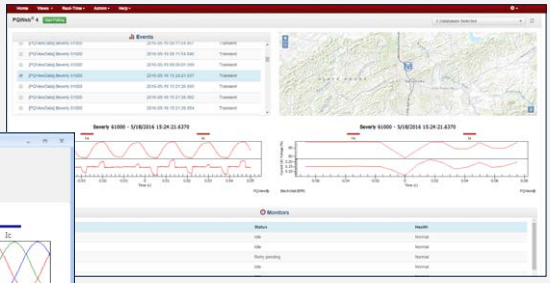
- Measured data acquisition in system applications
- Evaluation
- Data analysis
- Energy monitoring
- Automatic reporting
- SCADA-Light functionality
- Easy integration of different measuring devices via Modbus RTU/TCP
- Data storage in an open SQL database
- Modular cost/performance model – basic version may be extended at any time

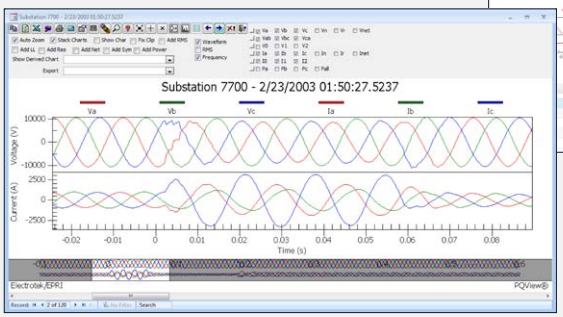


PQVIEW

INTELLIGENT SOFTWARE TO ANALYSE POWER QUALITY

- Works as a system controller and user surface
- Automated communication with connected devices via supported communication methods
- Application from medium-sized system through to large multipoint, plant or supply monitoring
- Data like trends, real-time displays and reports may be easily exchanged or verified, e.g. Word, Excel
- Client server architecture (database)
- Web-based access is possible
- Available in three application versions (Express, Standard, Professional)

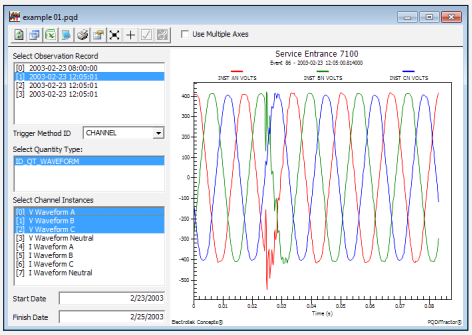


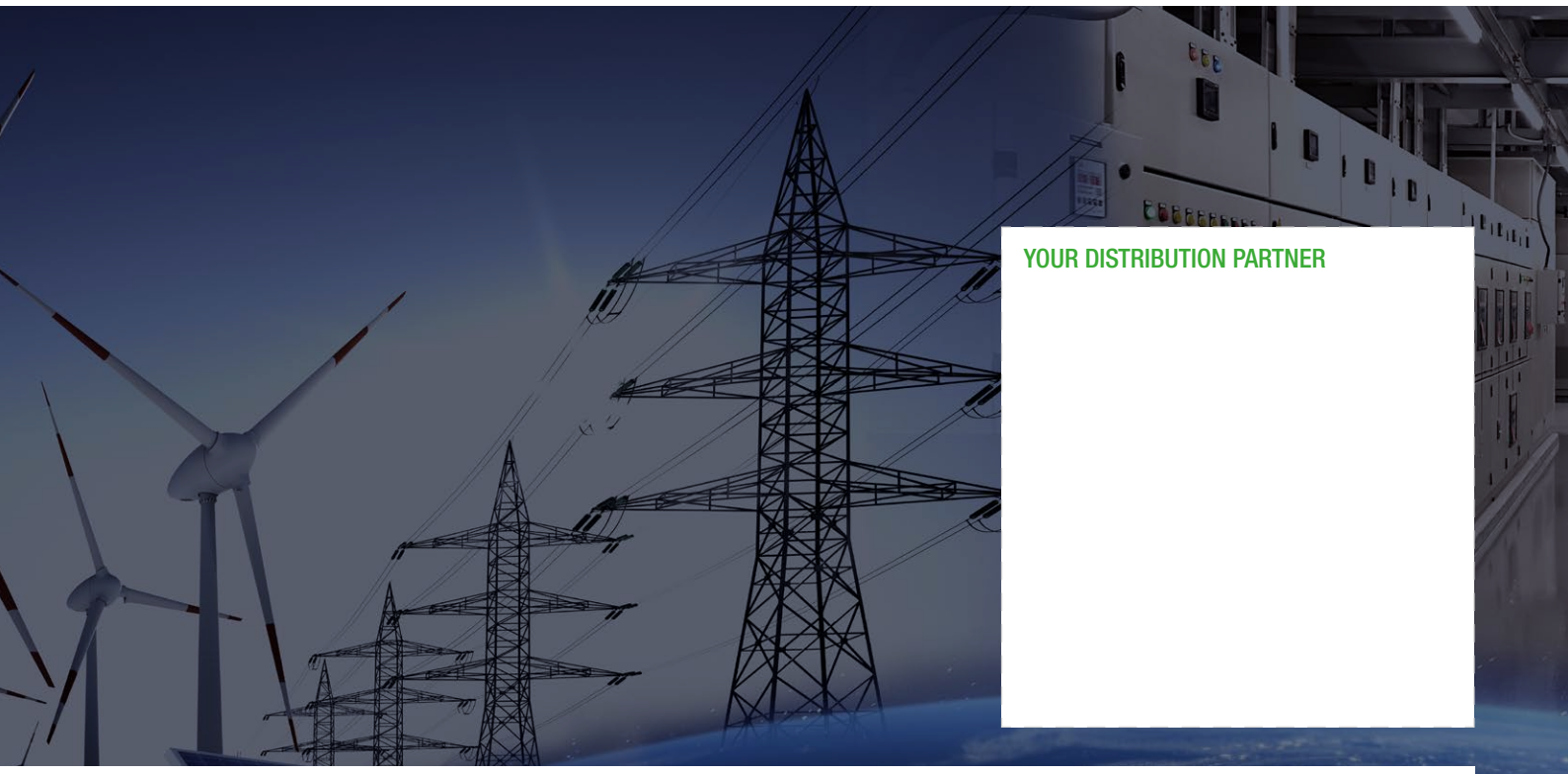


PQ-DIFFRACTOR

FREE ANALYSIS SOFTWARE

- Viewer for PQDIF files
- Viewer for COMTRADE files





YOUR DISTRIBUTION PARTNER

GMC INSTRUMENTS

GOSSEN METRAWATT

CAMILLE BAUER

Camille Bauer Metrawatt AG
Aargauerstrasse 7 ▪ 5610 Wohlen ▪ Switzerland
TEL +41 56 618 21 11 ▪ FAX +41 56 618 21 21

www.camillebauer.com ▪ info@cbmag.com

Subject to change without notice ▪ SM-1039-000-03-EN-12.20