

# Power Quality and Energy Measurement

Transparency for electrical installations



# Measure more, display less!

## Power Quality

In modern power distribution systems, interference is an increasingly frequent occurrence due to the increased usage of modern power electronics. Non-linear loads such as frequency converters, switched-mode power supplies or electronic ballasts are the cause of this problem.

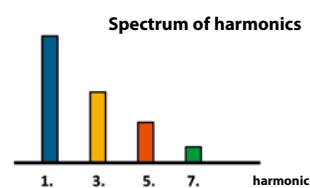
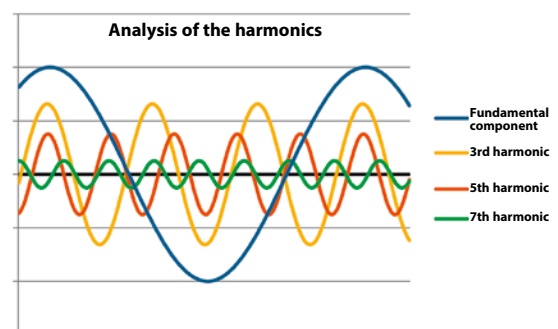
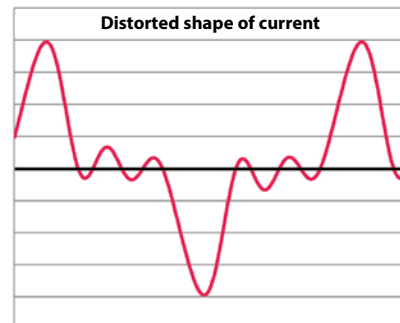
Typical system interactions are harmonics, changes in the r.m.s. value of the voltage or luminance fluctuations (so-called flicker).

## Safety

High harmonic components in the design current can lead to overloading in wiring systems and even cause a fire. These effects were already addressed in the standards: Recommendations for the adaptation of the conductor cross section in the event of high harmonic components are specified in IEC 60364-5-52:2009<sup>1)</sup> for example. If an overloading of the neutral conductor is to be expected due to harmonics, IEC 60364-4-43:2008<sup>2)</sup> recommends overload detection for the neutral conductor. The effectiveness of such measures largely depends on the operational status of the electrical installation. An evaluation can only be realised by continuous monitoring of the harmonic content and by measuring the operational currents in order to ensure safe and secure operation of the electrical installation.

## Availability

Electrical supply systems are becoming larger over time. It is not rare that failures and disturbances are the consequence of overloaded networks. By means of a monitoring system comprising universal measuring devices of the PEM series potential impacts on protective measures, risks due to overloads or changes in energy consumption can be assessed, already before the next expansion stage.



Universal measuring device PEM353

<sup>1)</sup> IEC 60364-5-52:2009 Low-voltage electrical installations - Part 5-52: Selection and erection of electrical equipment - Wiring systems

<sup>2)</sup> IEC 60364-4-43:2008 Low-voltage electrical installations - Part 4-43: Protection for safety - Protection against overcurrent

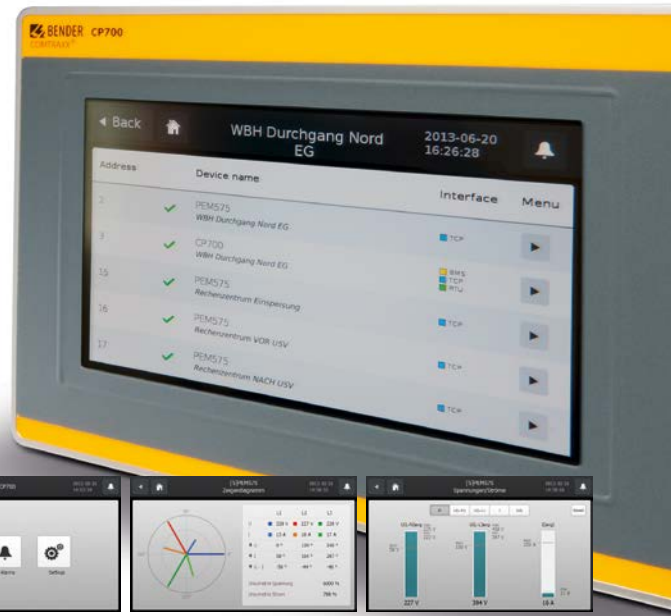
## Design of the monitoring system

A granular design of the monitoring system allows:

- energy data acquisition by cost centres
- faster fault localisation in the event of a fault
- an economic pyramid structure

The goal of a monitoring system must be to recognise even small changes of relevant measuring quantities such as leakage current or the harmonic content and to generate a pre-warning in the event of deviations at the earliest possible stage.

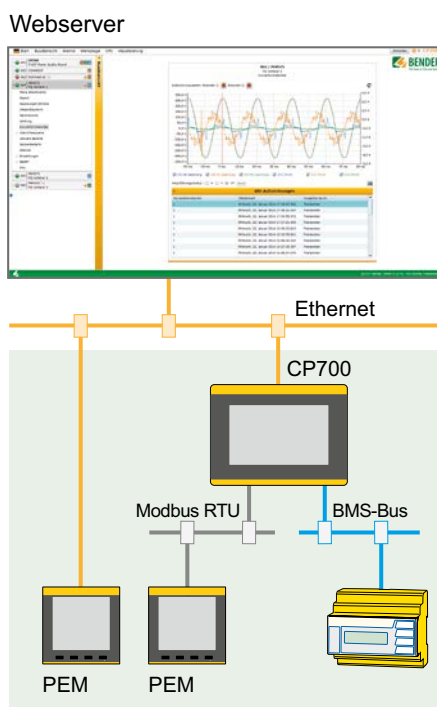
You cannot have trend curves of relevant measuring quantities appropriately monitored for voltage quality or leakage currents by using a single measuring point in an electrical installation. Several measuring points are to be installed and adapted to correspond to the structure of the system.



Representation of device data on the touch screen (COMTRAXX® CP700)

## System control centre

Several measured values per second are generated by a monitoring system. This information is collected automatically, evaluated dependent on the individual system and processed to take account of the user groups. This all is accomplished by a single device, the system control centre CP700.



## CP700

- Overview of the entire electrical system
- Active alarm generation
- Simple access to the parameters relating to the devices in use
- Guided support in fault analysis
- Easy documentation of measured values and device parameters
- User-definable visualisation
- Overview of several systems
- Access to information everywhere and at all times via PC
- Viable for the future by improving and expanding the functionality by means of software updates
- Use of existing IT infrastructure
- Provision of messages and measured values for higher-level systems
- Browser-based application (multiple user compatible/licence-free)

### Power Quality and Energy Measurement (PEM)

Ordering information	Type	IEC 62053-22	Communication	Nominal system voltage	Art. No.
	PEM735	Class 0,2 S	Modbus TCP and Modbus RTU	3(N) AC 100...690 V	B93100735
	PEM575	Class 0,2 S	Modbus TCP and Modbus RTU	3(N) AC 230/400 V	B93100575
	PEM575-251	Class 0,2 S	Modbus TCP and Modbus RTU	3(N) AC 230/400 V	B93100576
	PEM575-155	Class 0,2 S	Modbus TCP and Modbus RTU	3(N) AC 69/120 V	B93100579
	PEM575-151	Class 0,2 S	Modbus TCP and Modbus RTU	3(N) AC 69/120 V	B93100580
	PEM353	Class 0,5 S	Modbus RTU, BACnet MS/TP, DNP	3(N) AC 230/400 V, 3(N) AC 400/690 V <sup>1)</sup>	B93100355
	PEM353-P	Class 0,5 S	Modbus RTU, BACnet MS/TP, DNP	3(N) AC 230/400 V, 3(N) AC 400/690 V <sup>1)</sup>	B93100354
	PEM353-N	Class 0,5 S	Modbus RTU, BACnet MS/TP, DNP	3(N) AC 230/400 V, 3(N) AC 400/690 V <sup>1)</sup>	B93100353
	<sup>1)</sup> TN systems				
Condition Monitor					
Type	Communication		Supply voltage $U_s$	Art. No.	
CP700	Modbus/TCP, Modbus/RTU BMS		DC 24 V	B95061030	

Devices listed in the table above feature a 5 A current input and a nominal voltage of 230/400 V. Devices with a 1 A current input and a nominal voltage of 400/690 V are available too. Please refer to [www.bender.de/en/products/power-quality-overview](http://www.bender.de/en/products/power-quality-overview)

### Energy meter

Along with numerous measuring values, all devices of the PEM series can measure energy and power values. If, however, a measuring point is used for billing purposes, special requirements are to be met (subject to obligatory calibration). For this purpose, energy meters with MID (Measurement Instrument Directive) conformity mark are suitable. Bender provides a selection of energy meters. For details refer to [www.bender.de/en/products/power-quality-overview](http://www.bender.de/en/products/power-quality-overview)

### Measuring current transformers

All PEM measuring devices can be operated with standard measuring current transformers. It should be ensured that the measuring device and the measuring current transformers used at least comply with accuracy class 0.5 S or higher. The secondary current of the current transformer has to be adjusted to the current input of the measuring device. Bender provides a selection of measuring current transformers that are suitable for the operation of Power Quality and Energy Measurement devices. You will find a selection on [www.bender.de/en/products/power-quality-overview](http://www.bender.de/en/products/power-quality-overview)



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