Power Quality and Energy Measurement

Transparency for electrical installations

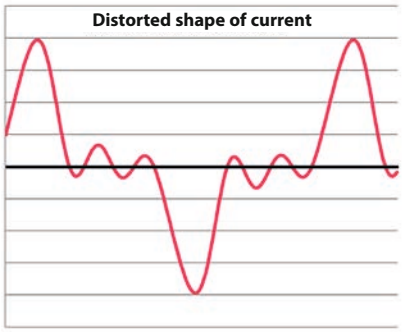
Electrical supply systems are becoming larger over time. It is not rare that failures and disturbances are the consequence of overloaded systems. By means of a monitoring system comprising universal PEM series measuring devices of the potential impacts on protective measures, risks due to overloads or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

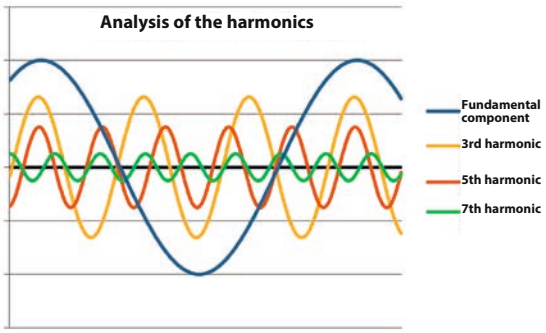
Design of the monitoring system

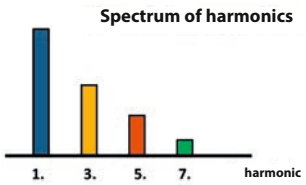
A granular design of the monitoring system allows:

- Energy data acquisition by cost centres
- Faster fault localisation in the event of a fault
- An economic pyramid structure

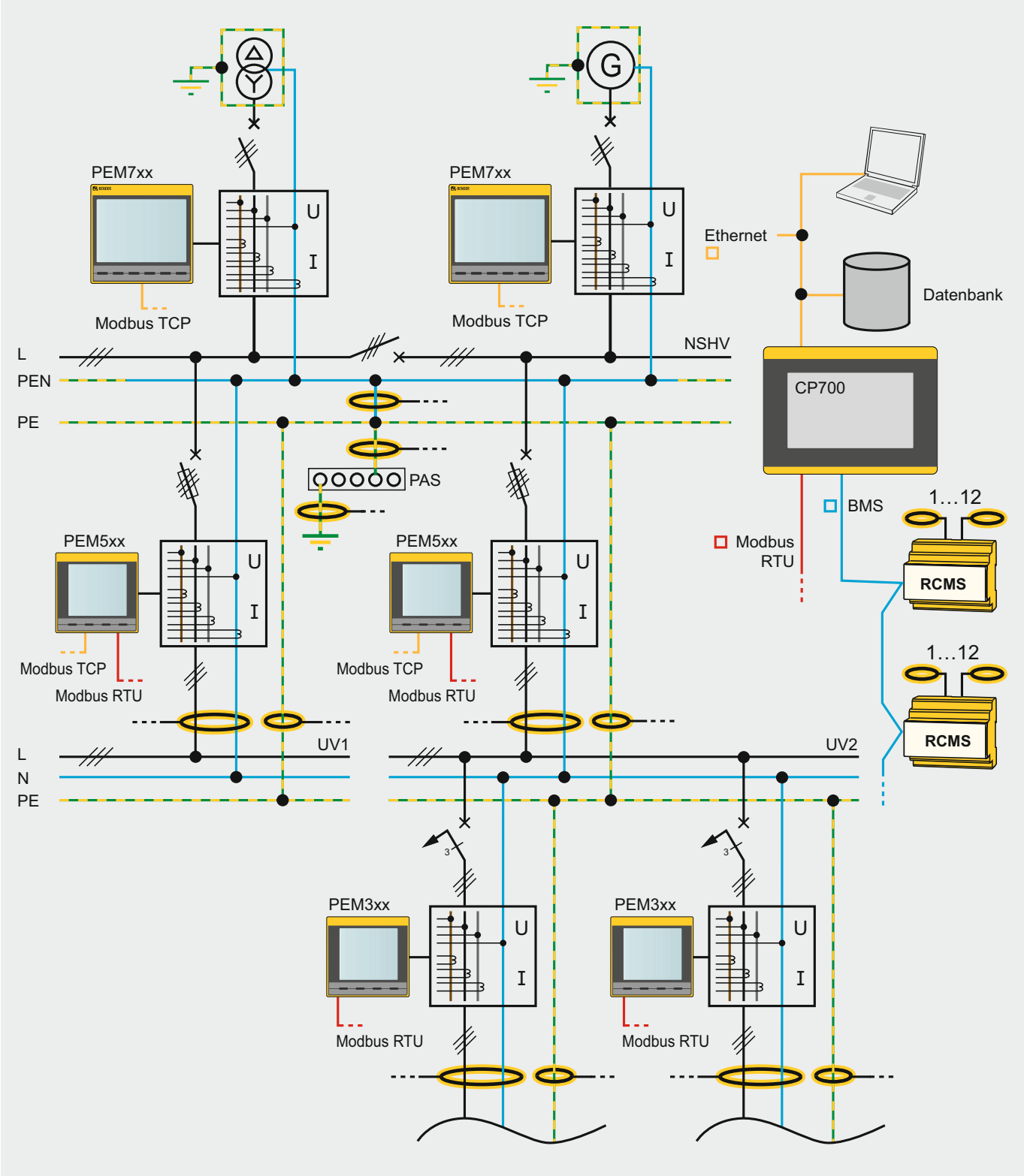
The goal of a monitoring system must be to recognise even small changes in relevant measuring quantities such as leakage current or the harmonic content and to generate a prewarning in the event of deviations at the earliest possible stage.
A single measuring point in an electrical installation is not sufficient to generate curves of relevant measuring quantities that adequately represent voltage quality or leakage currents. Several measuring points need to be installed and adapted to correspond to the structure of the system.







Example for system set-up



Universal measuring devices
Power Quality and Energy Measurement PEM

		 LINETRAXX® PEM330	 LINETRAXX® PEM333	 LINETRAXX® PEM533	 LINETRAXX® PEM555	 LINETRAXX® PEM575	 LINETRAXX® PEM735
Normative requirements	Accuracy class according to IEC 62053-22	0.5 S	0.5 S	0.5 S	0.5 S	0.2 S	0.2 S
	DIN EN 50160	–	–	–	–	–	■
	DIN EN 61000-4-7, DIN EN 61000-4-15, DIN EN 61000-4-30	–	–	–	–	–	■
Measured quantities	Phase conductor voltages/ line conductor voltages	■	■	■	■	■	■
	Phase currents	■	■	■	■	■	■
	Neutral current I_4				■	■	■
	Neutral current I_4 (calculated)	■	■	■	■	■	■
	Frequency/phase angle	■	■	■	■	■	■
	Reactive and active power import/ Reactive and active power export	■	■	■	■	■	■
	Voltage unbalance/current unbalance	■	■	■	■	■	■
	Power	per phase and total S in kVA, P in kW, Q in kvar					
	Displacement factor cos (φ)/ power factor λ	■	■	■	■	■	■
	Total harmonic distortion (THD_U/THD_I)	up to the 15th	up to the 15th	up to the 31st	up to the 31st	up to the 63rd	up to the 63rd
	Harmonic components voltage	–	–	up to the 31st	up to the 31st	up to the 63rd	up to the 63rd
	Harmonic components current	–	–	up to the 31st	up to the 31st	up to the 63rd	up to the 63rd
	Transient detection	–	–	–	longer than 80 µs	longer than 80 µs	longer than 40 µs
	Overvoltage (swell)	–	–	–	–	■	■
	Undervoltage (sag)	–	–	–	–	■	■
	Flicker severity P_{ST}	–	–	–	–	–	■
Features	Digital inputs	–	2	6	6	6	8
	Digital outputs	–	2	2	3	3	3
Technical aspects	Voltage supply	AC 95…260 V (47…440 Hz)/DC					
	Sampling rate	1.6 kHz	1.6 kHz	3.2 kHz	6.4 kHz	12.8 kHz	25.6 kHz
	Temperature	-25…+55 °C					
	Communication	–	Modbus RTU	Modbus RTU	Modbus RTU & TCP	Modbus RTU & TCP	Modbus RTU & TCP

Ordering information

Digital inputs/outputs	Nominal system voltage	Interface		Current input	Type	Art. No.
		RS-485	Ethernet			
–	3(N)AC 230/400 V	–	–	5 A	PEM330	B 9310 0330
				1 A	PEM330-251	B 9310 0331
2/2	3(N)AC 230/400 V	■	–	5 A	PEM333	B 9310 0333
				1 A	PEM333-251	B 9310 0334
2 pulse outputs (kWh/kvarh)	3(N)AC 230/400 V	■	–	5 A	PEM333-255P	B 9310 0335
				1 A	PEM333-251P	B 9310 0336
6/2	3(N)AC 230/400 V	■	–	5 A	PEM533	B 9310 0533
				1 A	PEM533-251	B 9310 0534
	3(N)AC 400/690 V	■	–	5 A	PEM533-455	B 9310 0535
				1 A	PEM533-451	B 9310 0536
6/3	3(N)AC 230/400 V	■	■	5 A	PEM555	B 9310 0555
				1 A	PEM555-251	B 9310 0556
	3(N)AC 400/690 V	■	■	5 A	PEM555-455	B 9310 0557
				1 A	PEM555-451	B 9310 0558
6/3	3(N)AC 230/400 V	■	■	5 A	PEM575	B 9310 0575
				1 A	PEM575-251	B 9310 0576
	3(N)AC 400/690 V	■	■	5 A	PEM575-455	B 9310 0577
				1 A	PEM575-451	B 9310 0578
8/3	3(N)AC 100…690 V	■	■	1/5 A	PEM735	B 9310 0735

Energy meters and measuring current transformers

Energy meter

Along with numerous measuring values, all PEM series devices can measure energy and power values. If, however, a measuring point is used for billing purposes, special requirements must to be met (subject to obligatory calibration). Energy meters with the Measurement Instrument Directive (MID) conformity mark meet these requirements.

Ordering information

Description	Type	Art. No.
Energy meter 1Ph/32 A MID Modbus RTU	ALD1	B 9310 1005
Energy meter 3Ph/65 A MID Modbus RTU	ALE3	B 9310 1006
Energy meter 3Ph/6 A MID Modbus RTU	AWD3	B 9310 1007
S0 pulse counter (four-fold) with Modbus RTU	PCD7	B 9310 1008
Sealable cover for ALD1 (two per counter)	–	B 9310 1009
Sealable cover for ALE3/AWD3 (four per counter)	–	B 9310 1010

Measuring current transformers

All PEM series measuring devices can be operated with standard measuring current transformers (1 A or 5 A). To comply with the accuracy class (e.g. 0.5 S), the measuring device and the measuring current transformers used must comply with class 0.5 S or better.

Ordering information

Primary current	Accuracy	Secondary current	Type	Design	Art. No.
60	1	5	WL605 KL.1	CTB41	B 9808 6001
		1	WL60-1 KL.1	CTB41	B 9808 6002
75	1	5	WL755 KL.1	CTB41	B 9808 6003
		1	WL75-1 KL.1	CTB41	B 9808 6004
125	0.5	5	WL1255 KL.0,5	CTB41	B 9808 6005
		1	WL125-1 KL.0,5	CTB41	B 9808 6006
	1	5	WL125-5 KL.1	CTB41	B 9808 6007
		1	WL125-1 KL.1	CTB41	B 9808 6008
150	0.5	5	WL1505 KL.0,5	CTB41	B 9808 6009
		1	WL150-1 KL.0,5	CTB41	B 9808 6010
	1	5	WL150-5 KL.1	CTB41	B 9808 6011
		1	WL150-1 KL.1	CTB41	B 9808 6012
200	0.5	5	WL2005 KL.0,5	CTB41	B 9808 6013
		1	WL200-1 KL.0,5	CTB41	B 9808 6014
	1	5	WL200-5 KL.1	CTB41	B 9808 6015
		1	WL200-1 KL.1	CTB41	B 9808 6016
250	0.5	5	WL2505 KL.0,5	CTB41	B 9808 6017
		1	WL250-1 KL.0,5	CTB41	B 9808 6018
	1	5	WL250-5 KL.1	CTB41	B 9808 6019
		1	WL250-1 KL.1	CTB41	B 9808 6020
300	0.5	5	WL3005 KL.0,5	CTB41	B 9808 6021
		1	WL300-1 KL.0,5	CTB41	B 9808 6022
	1	5	WL300-5 KL.1	CTB41	B 9808 6023
		1	WL300-1 KL.1	CTB41	B 9808 6024

Primary current	Accuracy	Secondary current	Type	Design	Art. No.
400	0.5	1	WL400-1 KL.0,5	CTB41	B 9808 6025
	1	5	WL400-5 KL.1	CTB41	B 9808 6026
	0.5	5	WL400-5 KL.0,5	CTB41	B 9808 6027
	1	1	WL400-1 KL.1	CTB41	B 9808 6028
500	1	5	WL500-5 KL.1	CTB41	B 9808 6029
	0.5	5	WL500-5 KL.0,5	CTB41	B 9808 6031
	1	1	WL500-1 KL.1	CTB41	B 9808 6032
	0.5	1	WL500-1 KL.0,5	CTB41	B 9808 6033
600	1	5	WL600-5 KL.1	CTB51	B 9808 6034
	0.5	5	WL600-5 KL.0,5	CTB51	B 9808 6035
	1	1	WL600-1 KL.1	CTB51	B 9808 6036
	0.5	1	WL600-1 KL.0,5	CTB51	B 9808 6037
800	1	5	WL800-5 KL.1	CTB51	B 9808 6038
	0.5	5	WL800-5 KL.0,5	CTB51	B 9808 6039
	1	1	WL800-1 KL.1	CTB51	B 9808 6040
	0.5	1	WL800-1 KL.0,5	CTB51	B 9808 6041
1000	1	5	WL1000-5 KL.1	CTB51	B 9808 6042
	0.5	5	WL1000-5 KL.0,5	CTB51	B 9808 6043
	1	1	WL1000-1 KL.1	CTB51	B 9808 6044
	0.5	1	WL1000-1 KL.0,5	CTB51	B 9808 6045
50	3FS5	1	WLS501 KL3FS5	KBR18	B 9808 6046
100	3FS5	1	WLS1001 KL.3FS5	KBR18	B 9808 6047
150	3FS5	1	WLS1501 KL.3FS5	KBR18	B 9808 6048
250	3FS5	1	WLS2501 KL.3FS5	KBR32	B 9808 6049
500	3FS5	1	WLS5001 KL.1FS5	KBR32	B 9808 6050