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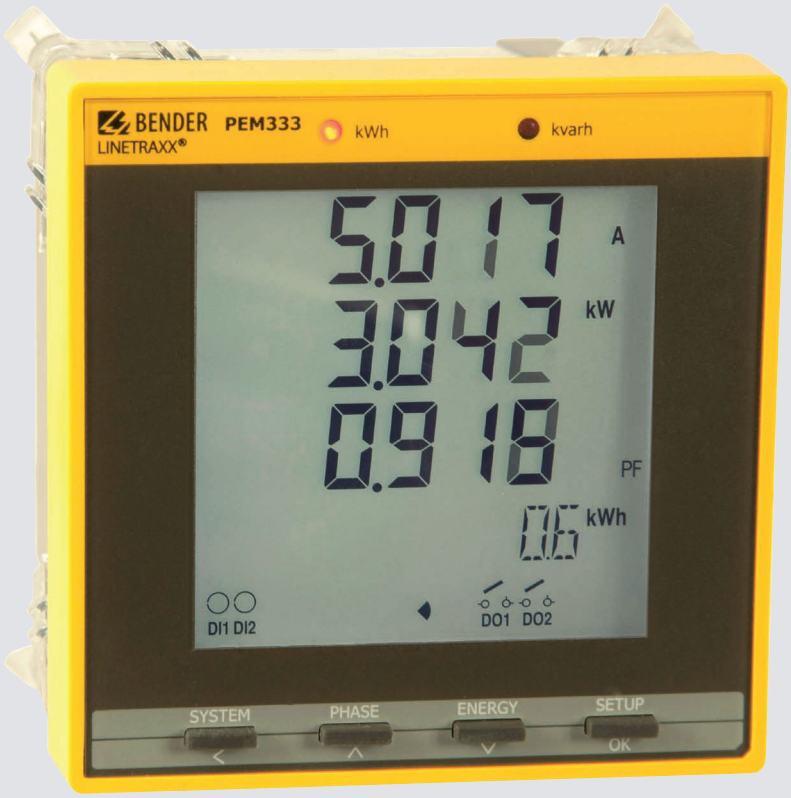
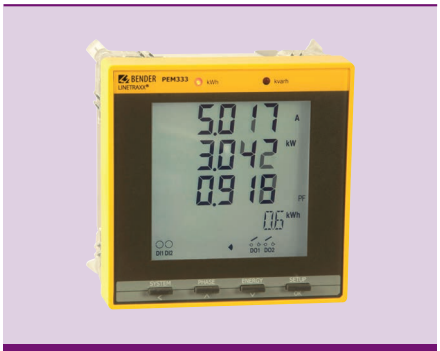
Power Quality and Energy Measurement PEM330/PEM333



PEM330-333_D00004_02_D_XXEN/11.2014

Power Quality and Energy Measurement PEM330/PEM333



PEM333

Device features

- Accuracy class according to IEC 62053-22: 0.5 S
- Measured quantities
  - Phase voltages U_{L1}, U_{L2}, U_{L3} in V
  - Line voltages U_{L1L2}, U_{L2L3}, U_{L3L1} in V
  - Phase currents I_1, I_2, I_3 in A
  - Neutral current (calculated) I_4 in A
  - Frequency *f* in Hz
  - Phase angle for *U* and *I* in °
  - Power per phase conductor S in kVA, P in kW, Q in kvar
  - Total power S in kVA, P in kW, Q in kvar
  - Displacement factor cos (φ)
  - Power factor λ
  - Active and reactive energy import in kWh, kvarh
  - Active and reactive energy export in kWh, kvarh
  - Voltage unbalance in %
  - Current unbalance in %
  - Harmonic distortion (THD) for *U* and *I*
  - k-factor for *I*
- Demands of energy and current for particular time frames
- Peak demands with timestamps

Version PEM333
- Programmable setpoint monitoring
- 2 digital outputs

Version PEM333-P
- Modbus RTU communication via RS-485
- 2 pulse outputs (kWh/kvarh)

Product description

The universal measuring device PEM330/333 is used to record and indicate electrical quantities of a public electricity network. The scope of measurements ranges from currents and voltages through energy consumption and performance to total harmonic distortion and voltage quality assessment. The active energy measurements are in compliance with the DIN EN 62053-22 class 0.5 S accuracy standard.The current inputs are connected via external …/1 A or …/5 A measuring current transformers.

Typical application

- As a compact device for front panel mounting, the PEM330/333 is a replacement for analogue indicating instruments
- Typical application in low and medium-voltage networks (via measuring voltage transformer)
- Power quality monitoring
- Collection of relevant data for energy management systems
- Energy consumption allocation to cost accounting centers

Description of function

- Sampling rate of the measuring channels: 1,6 kHz
- Calculation of the total harmonic distortion THD_U/THD_I: up to the 15th harmonics
- Password protection
- Easy installation with mounting clips, no tools required
- Inputs and outputs (PEM333 only):
  - 2 digital outputs
  - 2 pulse outputs (PEM333-P only)
  - 6 user-programmable setpoints (response values, response delay 0…9999 seconds)
  - System protocol: 32 events, setup changes, DI/setpoint status changes, DO operations
- Communication (PEM333 only):
  - Electrically isolated RS-485 interface (1,200 bit/s to 19,200 bit/s)
  - Modbus-RTU protocol

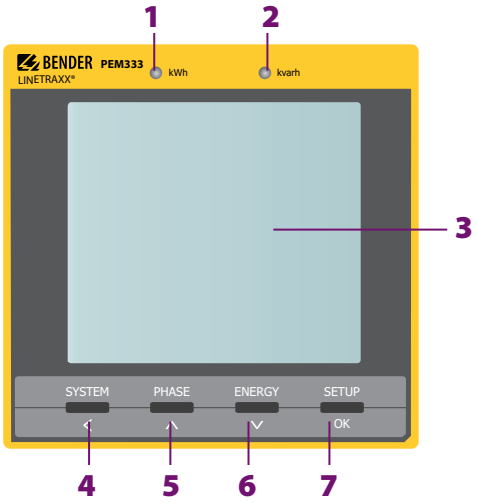
Standards

The universal measuring device for Power Quality and Energy Measurement PEM330/PEM333 was developed in accordance with the following standards: DIN EN 62053-22 (VDE 0418 Part 3-22), DIN EN 61557-12 (VDE 0413-12)

Features

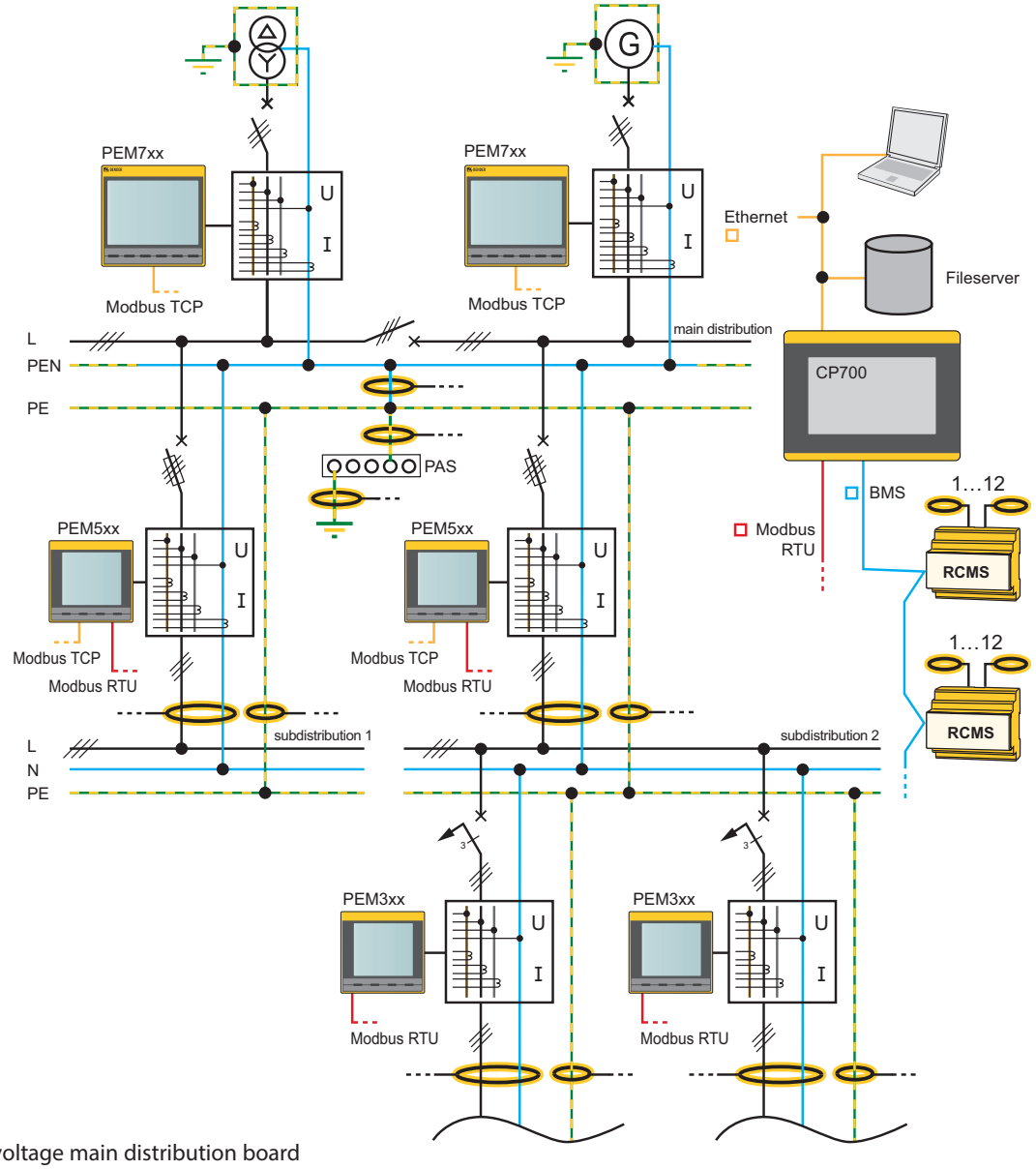
	PEM330	PEM333	PEM333-P
RS-485	–	■	■
Digital inputs	–	2	2
Digital outputs	–	2	–
Digital pulse outputs	–	–	2
Sampling rate	1.6 kHz	1.6 kHz	1.6 kHz
THD calculation	15.	15.	15.

Operating elements



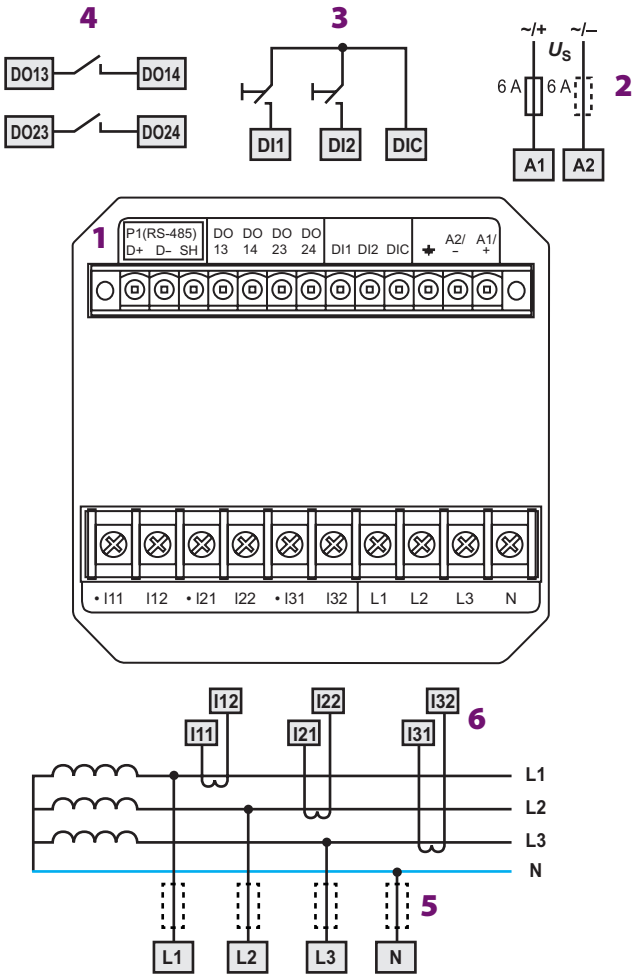
1 - Pulse LED: kWh
2 - Pulse LED: kvarh
3 - Display
4 - “SYSTEM” button: Selection (in the menu)
5 - “PHASE” button: Up (in the menu)
6 - “ENERGY” button: Down (in the menu)
7 - “SETUP” button: OK (in the menu)
Press the “SETUP” button > 1.5 s to enter/leave the Setup menu.

Example for system set-up



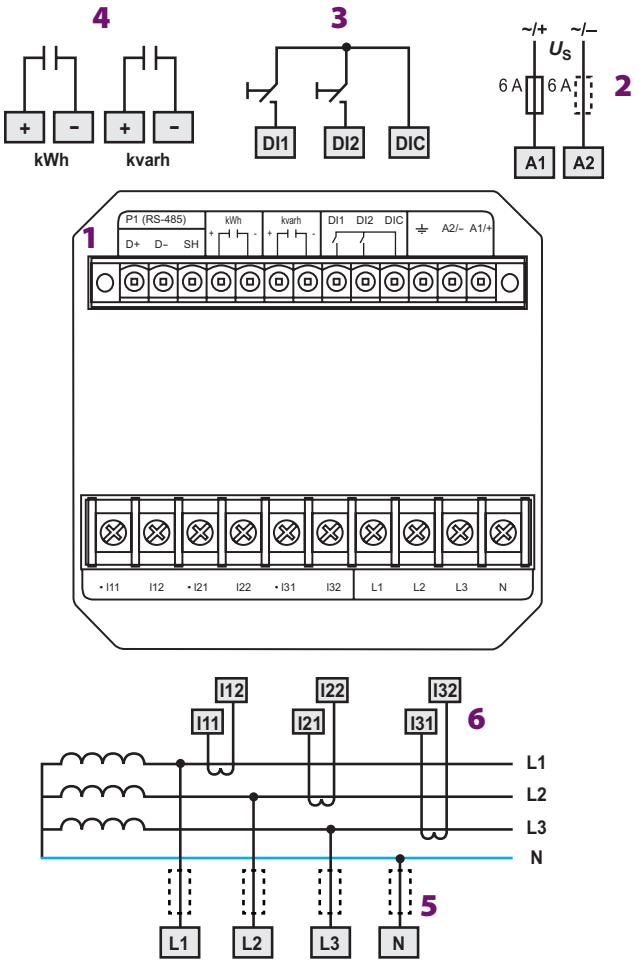
NSHV = Low-voltage main distribution board

Wiring diagram PEM330/PEM333



1 - Connection RS-485 bus
2 - Supply voltage. Power protection by a 6 A fuse, quick response. If being supplied from an IT system, both lines have to be protected by a fuse.
3 - Digital inputs
4 - Digital outputs (N/O contacts)
5 - Measuring voltage inputs: The measuring leads should be protected by appropriate fuses.
6 - Connection to the system to be monitored

Wiring diagram PEM333-P

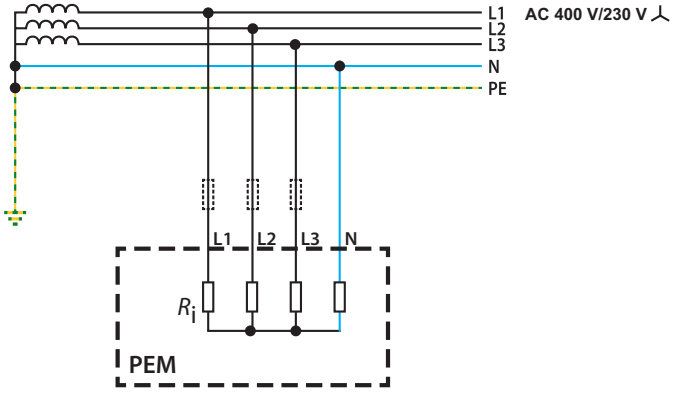


1 - Connection RS-485 bus
2 - Supply voltage. Power protection by a 6 A fuse, quick response. If being supplied from an IT system, both lines have to be protected by a fuse.
3 - Digital inputs
4 - Pulse outputs for kWh and kvarh
5 - Measuring voltage inputs: The measuring leads should be protected by appropriate fuses.
6 - Connection to the system to be monitored

Connection diagram voltage inputs

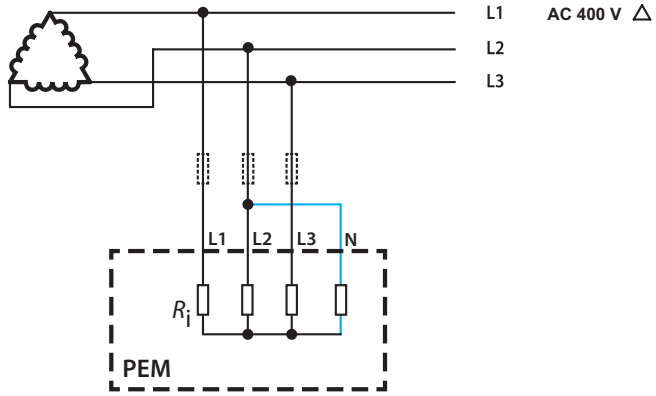
Three-phase 4-wire system (TN, TT, IT systems)

The PEM can be used in three-phase 4-wire systems, independent of the type of distribution system (TN, TT, IT system).



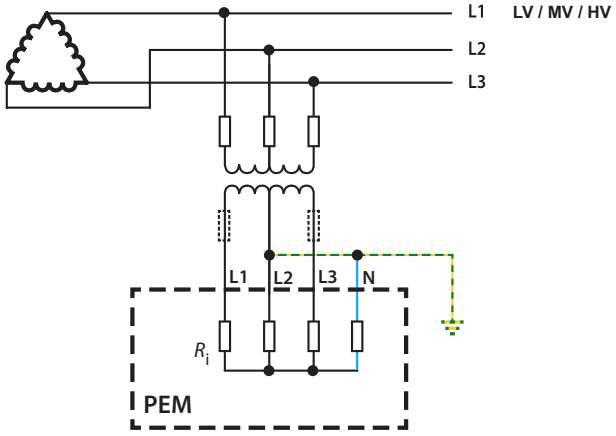
Three-phase 3-wire system

The PEM can be used in three-phase 3-wire systems.
The line-to-line voltage must not exceed AC 400 V.



Connection via voltage transformers

The coupling via measuring voltage transformers allows the use of a measuring device in medium and high voltage systems.
The transformation ratio in PEM330/PEM333 can be adjusted (1…2200).



Technical data

Insulation co-ordination

Measuring circuit

Rated insulation voltage	300 V
Overvoltage category	III
Pollution degree	2

Supply circuit

Rated insulation voltage	300 V
Overvoltage category	II
Pollution degree	2

Supply voltage

Rated supply voltage U_S	95…250 V
Frequency range of U_S	DC, 44…440 Hz
Power consumption	≤ 3 VA

Measuring circuit

Measuring voltage inputs

$U_{L1\text{-}N,L2\text{-}N,L3\text{-}N}$	230 V
$U_{L1\text{-}L2,L2\text{-}L3,L3\text{-}L1}$	400 V
Measuring range	10… 120 % U_n
Rated frequency	45…65 Hz
Internal resistance (L-N)	> 500 kΩ

Measuring current inputs

External measuring current transformer should at least comply with accuracy class 0.5 S	
Burden	n.A., internal current transformers
Measuring range	0.1… 120% I_n
PEM330/333	
I_n	5 A
Measuring current transformer ratio	1…6000
Accuracy class according with 5 A measuring current transformer	0.5
Accuracy class according with 1 A measuring current transformer	1
PEM330-251/PEM333-251	
I_n	1 A
Measuring current transformer ratio	1…30000
Accuracy class according with 1 A measuring current transformer	0.5

Accuracies (of measured value/of full scale value)

Phase voltage $U_{L1\text{-}N}$, $U_{L2\text{-}N}$, $U_{L3\text{-}N}$	± 0.2 % of measured value
Current	± 0.2 % of measured value + 0.05 % of full scale value
Neutral current I_4	1 % of full scale value
Frequency	± 0.02 Hz
Phase position	± 1 °
Active energy measurement according to	DIN EN 62053-22 (VDE 0418 Part 3-22)
r.m.s. voltage measurement according to	DIN EN 61557-12 (VDE 0413-12), chapter 4.7.6
r.m.s. phase current measurement according to	DIN 61557-12 (VDE 0413-12), chapter 4.7.5
Frequency measurement according to	DIN EN 61557-12 (VDE 0413-12), chapter 4.7.4

Interface

PEM333

Interface/protocol	RS-485/Modbus RTU
Baud rate	1.2…19.2 kbits/s
Cable length	0…1200 m
Shielded cable (shield connected to terminal SH on one side)	recommended: J-Y(St)Y min. 2x0.8

Switching elements

PEM333

Outputs				2 N/O contacts
Operating principle				N/O operation
Rated operational voltage	AC 230 V	DC 24 V	AC 110 V	DC 12 V
Rated operational current	5 A	5 A	6 A	5 A
Minimum contact rating				1 mA at AC/DC ≥ 10 V
Inputs				2 electrically separated digital inputs
I_{min}				2.4 mA
U_{DI}				DC 24 V

PEM333-P

Outputs	2 x electronic
Max. permissible extraneous voltage	80 V
Max. switching current	50 mA
Inputs	2 electrically separated digital inputs
I_{min}	2.4 mA
U_{DI}	DC 24 V

Environment/EMC

EMC	DIN EN 61326-1
Operating temperature	-25…+55 °C
Climatic class acc. to DIN EN 60721	
Stationary use	3K5
Classification of mechanical conditions acc. to DIN EN 60721	
Stationary use	3M4
Height	to 4000 m

Connection

Connection	screw-type terminals

Other

Degree of protection, installation	IP20
Degree of protection, front	IP52
Documentation number	D00004
Weight	≤ 550 g

Warning!

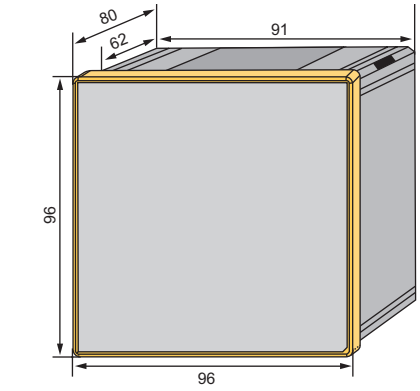
This is a class A Product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

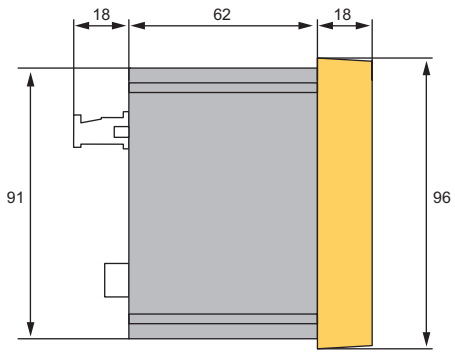
Ordering information

Interface	Digital inputs/outputs	Current input	Type	Art. No.
–	–	5 A	PEM330	B 9310 0330
		1 A	PEM330-251	B 9310 0331
RS-485	2/2	5 A	PEM333	B 9310 0333
		1 A	PEM333-251	B 9310 0334
	2 Puls (kWh/kvarh)	5 A	PEM333-255P	B 9310 0335
		1 A	PEM333-251P	B 9310 0336

Dimension diagram

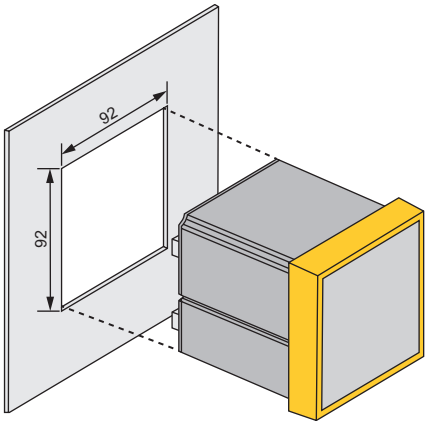
Dimensions in mm





Panel cut out

Dimensions in mm



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