

## Quick start

**This short operating instruction does not replace the manual!**

You will find the manual on the website

[www.bender-de.com](http://www.bender-de.com)

Make sure that the personnel has read this manual and understood all instructions relating to safety.



## Intended use

The universal measuring device PEM533 is suitable for

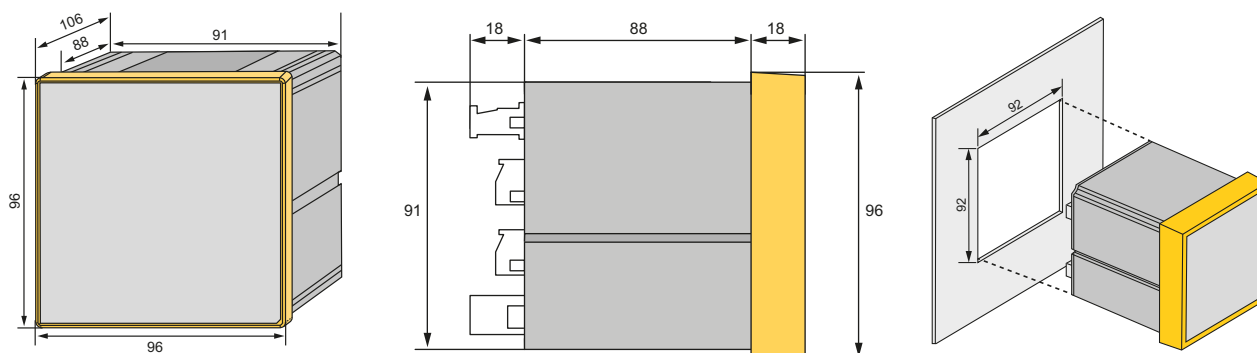
- the analysis of energy and power (Power Analyzer)
- monitoring of the power supply quality (Power Quality)
- data recording for energy management (Energy Management).

As a compact device for front panel mounting, it is suitable to replace analogue indicating instruments. The PEM533 is suitable for 3 and 4-wire systems and can be used in TN, TT and IT systems. The current measurement inputs of the PEM are connected via external  $\pm 1$  A or  $\pm 5$  A measuring current transformers.

Measurement in medium and high-voltage systems are principally carried out using measuring current and voltage transformers. The accuracy of the active energy metering corresponds to class 0.5 S in compliance with the DIN EN 62053-22 (VDE 0418 Part 3-22):2003-11.

## Installing the device

Front-panel mounting (front view, side view, panel cutout)



A front-panel cutout of 92 mm x 92 mm is required for the device.

1. Insert the device into the installation opening of the front panel.
2. Insert the two installation clips into the equipment rail from behind.
3. Push the installation clips towards the front panel and tighten the screws by hand.
4. Check the device to ensure that it is firmly mounted in the front panel.

## Scope of delivery

- 1 PEM533
- Safety instructions
- This short operating instructions
- 1 sealing frame "IP54"

## Safety instruction



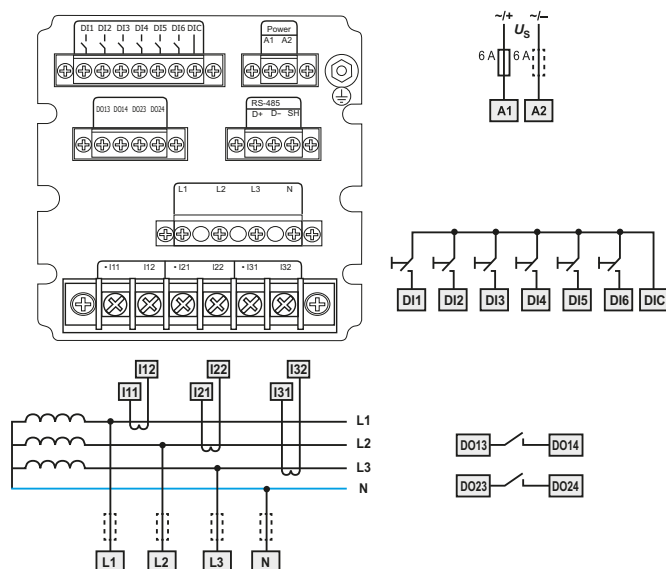
### **Danger of electric shock!**

Follow the basic safety rules when working with electricity.


**Consider the data on the rated voltage and supply voltage as specified in the technical data!**

## Connection of the device


### Wiring diagram




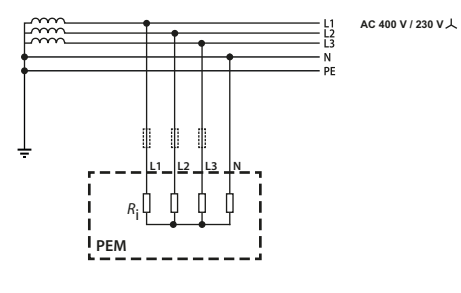
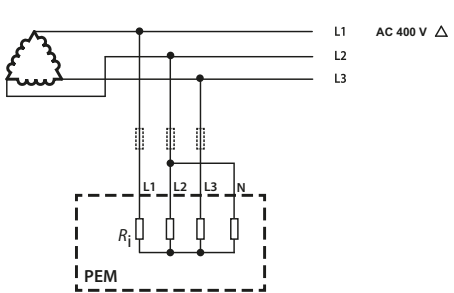
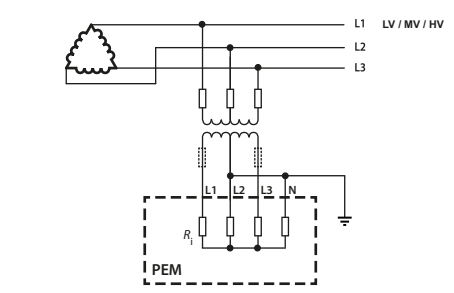
### Key Wiring diagram

Terminal	Description
A1, A2, 	Connection to supply voltage, 6 A fuse (when supplied by IT systems, both phase conductors have to be protected).
DI1...DI6, DIC	Digital inputs
DO13, DO14, DO23, DO24	Digital outputs (N/O contacts)
I11, I12, I21, I22, I31, I32	Connection to the system to be monitored
D+, D-, SH	Connection RS-485 bus (PEM333 only)
L1, L2, L3, N	Measuring voltage inputs: The measuring leads should be protected with appropriate fuses.

### Connection

1. Connect the device according the wiring diagram. The connections are located on the rear of the device. Connect the PEM533 to the supply voltage (terminals A1 and A2 resp. +/-). Connect terminal " " to the protective conductor.
2. Line protection: 6 A fuse recommended. If being supplied from an IT system, both lines have to be protected by a fuse.
3. Connection to the RS-485 bus is made via the terminals D+, D- and SH. Up to 32 devices can be connected to the bus. The maximum cable length for the bus connection of all devices is 1200 m.

## Connection diagram voltage inputs

Three-phase 4-wire system (TN, TT, IT systems)	Three-phase 3-wire system	Connection via voltage transformers
The PEM can be used in three-phase 4-wire systems, independent of the type of distribution system (TN, TT, IT system).	The PEM can be used in three-phase 3-wire systems. The line conductor voltage must not exceed AC 400 V.  When used in 3-wire systems, the connection type ( <b>TYPE</b> ) has to be set to delta connection ( <b>DELTA</b> ). For this purpose, <b>the measuring inputs L2 and N are to be bridged</b> .	The coupling via measuring current transformers allows the use of the measuring device in medium and high voltage systems. The transformation ratio can be adjusted in the PEM533 (1...2200).
		

## Commissioning of the device

### Check proper connection

Observe the relevant standards and regulations that have to be observed for installation and connection as well as the manual of the respective device.

### Before switching on

Before switching on think carefully about these questions:

1. Does the connected supply voltage  $U_S$  correspond to the nameplates information?
2. Is the nominal system voltage of the measuring current transformer not exceeded?
3. Does the measuring current transformer's maximum current correspond to the nameplate information of the connected device?

### After switching on

After switching on, proceed as follows:

1. Connect the supply voltage.
2. Set the bus address/IP address.
3. Set the CT transformer ratio (for each channel).
4. Change the measuring current transformer's counting direction, if required.
5. Set the nominal voltage.
6. Select wye connection or delta connection.

## Display and operating controls



### Key

LED "kWh" and LED "kvarh": pulse outputs

"V/I" button: displays mean values and total values (current, voltage);

In the menu:

moves the cursor to the left if the parameter to be changed is a numeric value

"POWER" button: displays energy-related parameters.

In the menu: to move up to the next entry;

in case of numeric values: increments the value.

"HARMONICS" button: displays harmonics.

In the menu: moves down to the next entry;

in case of numeric values: decrements the value

"ENERGY" button:

Press > 3 s:

toggles between the setup menu and the standard mode.

Displays measuring values: Active and reactive energy import/active and reactive energy export (line 5).

In the menu: selects the parameters for modification;

confirms parameter change.

## Data display via buttons

All measuring values can be obtained from the device via the buttons without having to use the communications interface. Which button is to be activated to obtain the individual values is described in more detail in the manual.

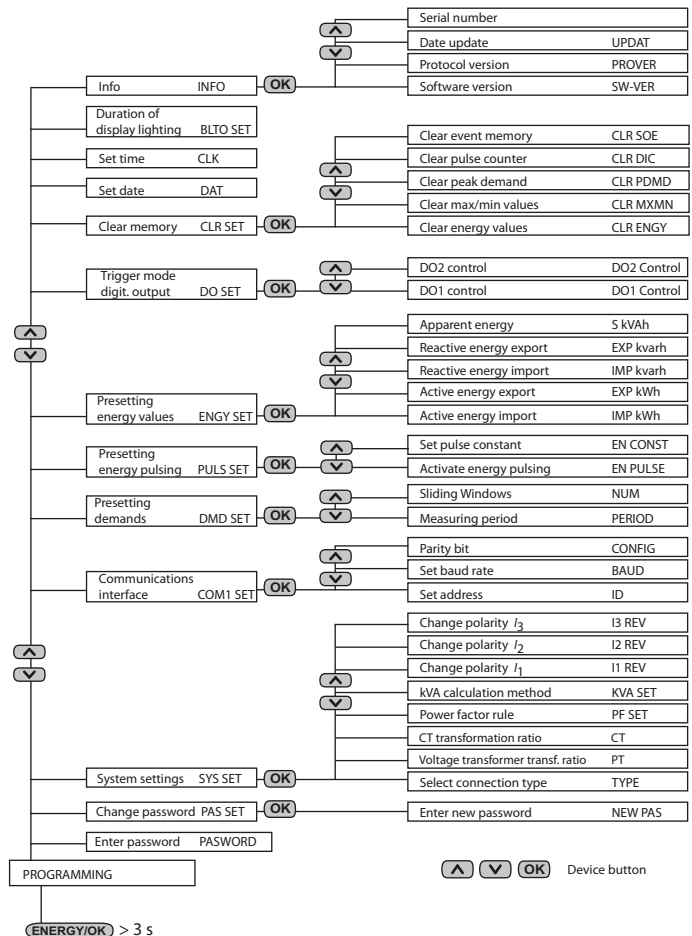
## Start

Pressing the "ENERGY/OK" button enters the setup mode (> 3 s). Pressing the "ENERGY/OK" again (> 3 s) returns to the display mode.



A correct password must be entered before changes are allowed. (factory setting: 0)

The following diagram will help you to familiarise yourself with the menu:



## Data display via communication interface

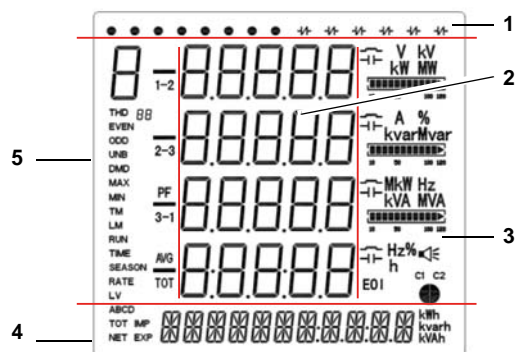
All measuring values can be obtained via the communications interface. Details on the Modbus register assignment can be found in the manual.

## Setup example

Measuring current transformer setting  
transformation ratio 1000:5 (= 200)

Button	Indication display	Description
ENERGY/OK > 3 s	PROGRAMMING	
∧	PASSWORD ****	
OK (or password)	PASSWORD 0	0 flashes
OK	PASSWORD 0	0 Factory setting
∧	PAS SET NO	
∧	SYS SET NO	
OK	SYS SET NO	NO flashes
∧ or V	SYS SET YES	YES flashes
OK	SYS SET YES	
∧	TYPE WYE	Factory setting
∧	PT 1	Factory setting
∧	CT 1	Factory setting
OK	CT 1	1 flashes (units place)
V	CTERR 0	0 flashes (units place)
<	CTERR 00	0 on the left flashes (tens place)
<	CTERR 0 0	0 on the left flashes (hundreds place)
∧∧	CT 200	2 flashes
OK	CT 200	CT ratio 200 adjusted
ENERGY/OK > 3 s	Standard display	

## Standard display indications















## Standard display indications (continuation of the left column)

### Legend to the display areas

- Shows the status of the digital inputs and outputs (DI Status, DO Status)
- Measured values
- Harmonic Distortion HD, voltage unbalance (unb), quadrant, measurement units
- Shows energy information such as active energy (import, export, net energy and total energy in kWh), reactive energy (import, export, energy net amount and total energy in kvar), apparent energy ( $S_{ges}$  in kVAh)
- Shows parameters such as voltage, current, fundamental component, power, total harmonic distortion THD, TOHD, TEHD (2. to 31. harmonic), k-factor, unbalance (unb), phase angle for voltages and currents, demands.

### Description of standard display indications (areas 1, 3 and 4)

Area	Segments	Symbol description		
1		 DI open	 DI closed	
		 DO open	 DO closed	
3		V, kV, A, %, Hz Measurement units for U, I, THD, f	kW, MW, kvar, kVA, MVA Measurement units for P, Q, S	
		 Current value expressed as a percentage	 inductive, capacitive	
		C1 Status communications interface	 Alarm symbol	 Quadrant
4		IMP kWh Active energy import	EXP kWh Active energy export	NET kWh Active energy net amount
		TOT kWh Total active energy	IMP kvarh Reactive energy import	EXP kvarh Reactive energy export
		NET kvar Reactive energy net amount	TOT kvarh Total reactive energy	 kVA h Apparent energy

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