Centrale de mesure
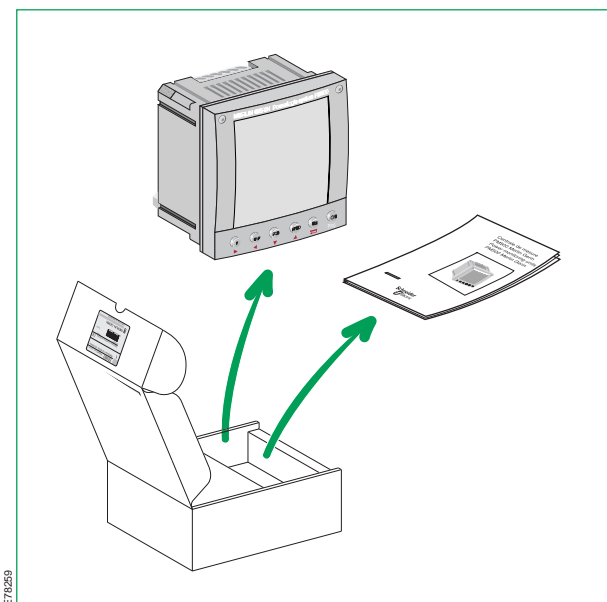# *Power Meter*
PM500 Merlin Gerin

059473_D

Merlin Gerin

Schneider Electric

Introduction and description

Package contents

■ one PM500 power meter with terminal block mounted
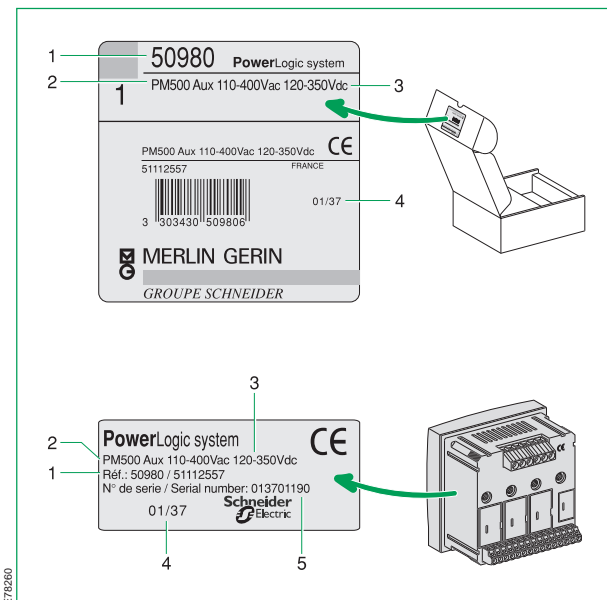■ one installation and user manual

E78259

Device identification

On the package:
1 Part number
2 Product name: PM500
3 Auxiliary-power voltage
4 Manufacturing year/week code

On the device:
1 Part number
2 Product name: PM500
3 Auxiliary-power voltage
4 Manufacturing year/week code
5 Serial number

1 50980 **Power**Logic system
2 PM500 Aux 110-400Vac 120-350Vdc 3

PM500 Aux 110-400Vac 120-350Vdc CE
51112557 FRANCE

3 303430 509806 01/37 4

MERLIN GERIN
GROUPE SCHNEIDER

3

2 **Power**Logic system CE
PM500 Aux 110-400Vac 120-350Vdc
1 Réf.: 50980 / 51112557
N° de serie / Serial number: 013701190
01/37 **Schneider** Electric

4 5

E78260

PM500 characteristics

The PM500 provides all the measurement capabilities required to monitor a low voltage (single-phase, two-phase or three-phase) or high voltage electrical installation. The PM500 carries out true rms four-quadrant measurements and offers energy metering and THD (total harmonic distortion) measurements for both current and voltage as standard features.

PM500		Operation	
		Local	Remote[1]
Instantaneous rms values			
Current	phase and neutral	■	■
Voltage	ph-N and ph-ph	■	■
Frequency		■	■
Active power (four quadrants)	total and per phase	■	■
Reactive power (four quadrants)	total and per phase	■	■
Apparent power (four quadrants)	total and per phase	■	■
Power factor	total and per phase	■	■
Energy values			
Active energy (four quadrants)	0 to 99 999 999 kWh	■	■
Reactive energy (four quadrants)	0 to 99 999 999 kvarh	■	■
Apparent energy	0 to 99 999 999 kVAh	■	■
Operating times	in centihours	■	■
Demand values			
Current	phase and neutral	■	■
Active, reactive, apparent power	total	■	■
Maximum demand values			
Maximum current	phase and neutral	■	■
Maximum active power (four quadrants)	total	■	■
Maximum reactive power (four quadrants)	total	■	■
Maximum apparent power	total	■	■
Power-quality values			
Total harmonic distortion (THD)	current and voltage	■	■
Reset			
Maximum demand current and power		■	■
Energy values and operating times		■	■
Input counter[2]		■	■
Local or remote set-up via optional Modbus RS485 communication module			
Type of distribution system	3-phase 3 or 4-wire with 1, 2 or 3 CTs, two-phase or single-phase	■	■
Rating of current transformers	primary 5 to 9999 A secondary 5 or 1 A	■	■
Current transformers	primary 399 kV max secondary 100, 110, 115, 120, 100/√3, 110/√3, 115/√3, 120/√3	■	■
PF calculation mode	IEC or IEEE	■	■
Calculation interval for demand currents from 5 to 60 minutes or Ext. sync[3]		■	■
Calculation interval for demand power from 5 to 60 minutes or Ext. sync[3]		■	■

[1] remote operation requires the optional Modbus RS485 module
[2] with optional IO22 Alarm module
[3] with optional IO11 Puls module

2

Installation and user manual

Characteristics of PM500 options

Recommendation:
De-energise the PM500 before installing the optional modules.

The PM500 is fully upgradeable and can be equipped with optional modules on site at any time.
The modules are simply clipped into any free slot.
The PM500 can be equipped with a maximum of one optional module from each of the three types available.

IO11 Puls option	Part no. 50983	Operation	
		Local	Remote
Functions			
1 input	external sync.	■	
	or digital		■
1 pulse output for energy metering		■	
Pulse output settings			
Energy: + kWh, - kWh, +kvarh, - kvarh, kVAh		■	■
Units: (0.1, 1, 10, 100 kWh, kvarh or kVAh and 1 or 10 MWh, Mvarh and MVAh)		■	■
Pulse duration	100 ms to 900 ms in 100 ms steps	■	■

IO22 Alarm option	Part no. 50984	Operation	
		Local	Remote
Functions			
2 digital inputs with pulse counting		■	■
2 relay outputs for	control via Modbus		■
	or high/low threshold alarms	■	■
Output settings			
Independent settings for the two outputs	control mode or alarm mode	■	■
Alarm mode settings			
- Type of alarm: 3I, IN, 3U, 3V, ΣP, ΣQ, ΣS, F, ΣPF, THD 3I, THD IN, THD 3U, THD 3V and timer		■	■
		■	■
- High/low thresholds, hysteresis and delay		■	■
- Relay operating mode	NO or NC		

Modbus RS485 option	Part no. 50982	Operation	
		Local	Remote
Functions			
RS485 link	2 wires		
JBus/Modbus ® communication protocol			
Settings			
Communication address	1 to 255	■	
Communication speed	2400 to 38400 bauds	■	
Parity	none, even, odd	■	
Stop bits	1 or 2	■	

2

Installation

Front-panel cut-out

$92^{+\,0,8}_{-\,0,0}$

96

$92^{+\,0,8}_{-\,0,0}$

60 20

96

E78242.art

Recommendations :
• avoid proximity with systems generating electromagnetic disturbances.
• avoid vibrations with accelerations greater than 1 G for frequencies under 60 Hz.
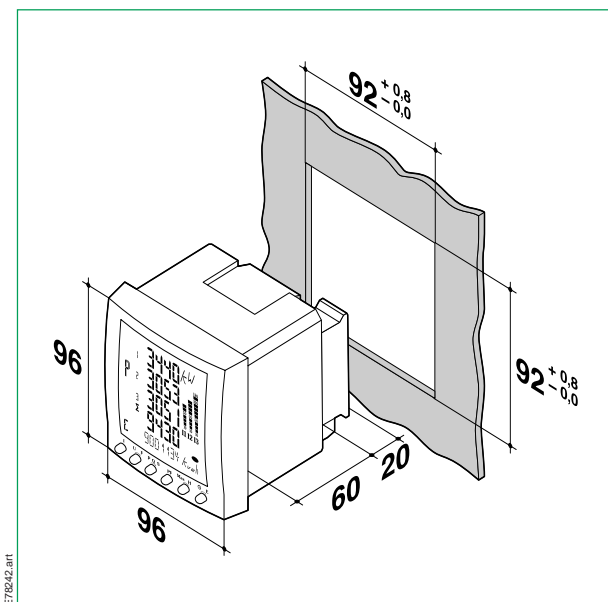
Mounting

No special tools are required to mount the PM500. Simply remove the four clips, insert the PM500 through the cut-out and refit the four clips, pressing them tight against the sheet metal to obtain a spring effect.
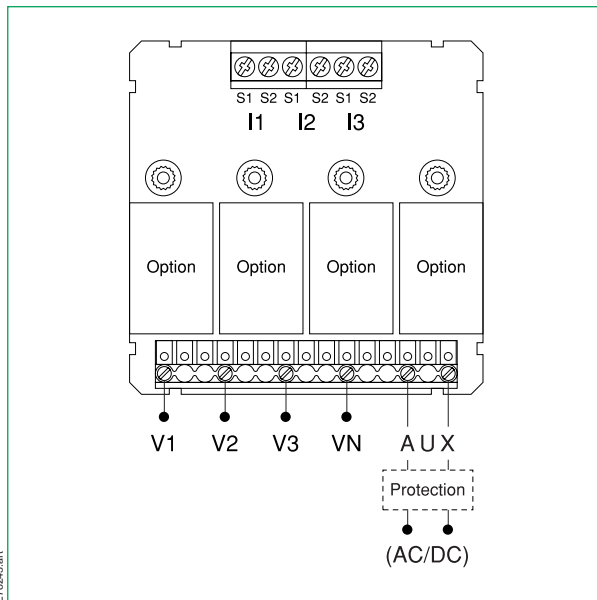

E78261

3

Installation and user manual
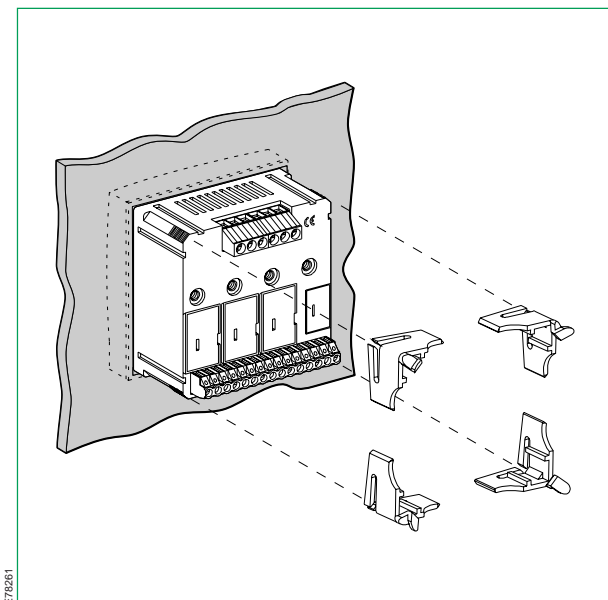
PM500 connections
General

The PM500 comprises a fixed terminal block (6 mm^2 wires) for the currents and a plug-in terminal block (2.5 mm^2 wires) for the voltages and auxiliary power.

E78243.art

Recommendations:
To avoid damaging the device, check the following before making any connections:
• the voltage of the auxiliary power (AUX),
• the frequency of the distribution system (50 or 60 Hz),
• the maximum voltage across the voltage-input terminals, (V1, V2, V3 and VN) 480 V AC phase-to-phase or 300 V AC phase-to-neutral,
• a maximum current of 6 A on the current-input terminals (I1, I2 and I3).
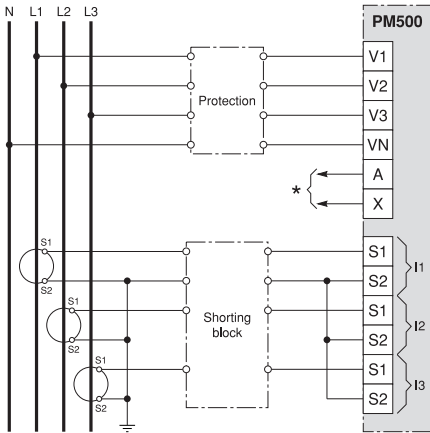
Connection of AC/DC auxiliary power (AUX)

■ check the auxiliary-power voltage for your device:

- part no. 50980: 110 to 400 V AC ± 10 % and 120 to 305 V DC ± 20 %,

- part no. 50981: 24 to 48 V DC ± 20 %.

■ when DC power is used, it is not necessary to respect the polarities.

■ it is advised to protect the auxiliary power supply using protection devices rated for the prospective short-circuit current at the connection points.

4

PM500 connections
Distribution systems up to 480 volts

Unbalanced 3-phase 4-wire system: 4 3CT

Balanced 3-phase 4-wire system: 4 1CT

Unbalanced 3-phase 3-wire system: 3 2-3CT

Balanced 3-phase 3-wire system: 3 1CT

* see page 65.

Recommendation:
The voltage-input protection devices must be rated for the short-circuit current at the connection points.

Unbalanced 3-phase 3-wire system: 3 2-3CT

Note: *The 2-CT solution reduces the phase accuracy by 0.5% (the current is deduced by vector calculations).*

Two-phase 2-wire system: 2 1CT

Single-phase 2-wire system: 1 1CT

* see page 65.

Recommendation:
The voltage-input protection devices must be rated for the short-circuit current at the connection points.
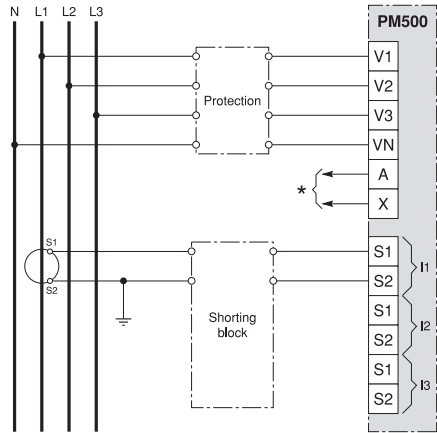
PM500 connections
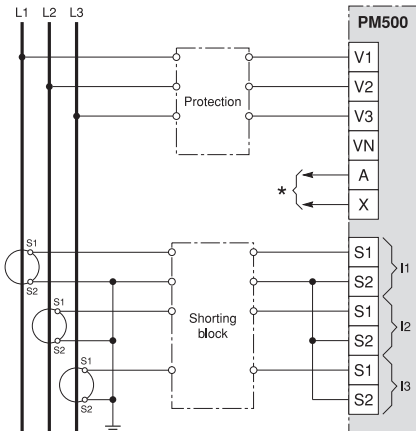## Distribution systems over 480 volts
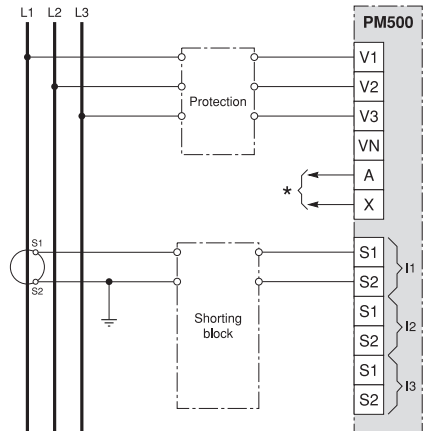
Unbalanced 3-phase 4-wire system: 4 3CT
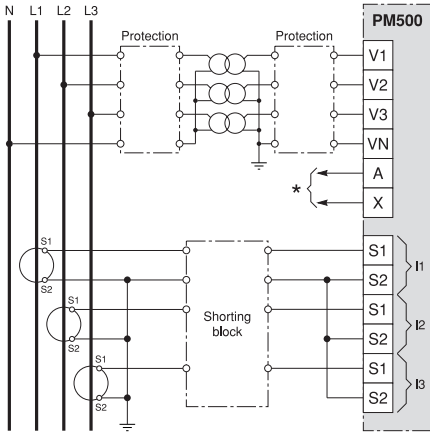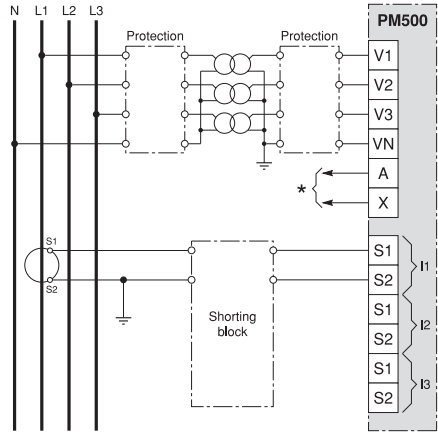
Balanced 3-phase 4-wire system: 4 1CT
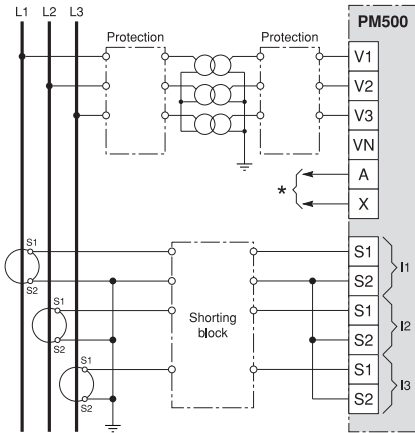
Unbalanced 3-phase 3-wire system: 3 2-3CT
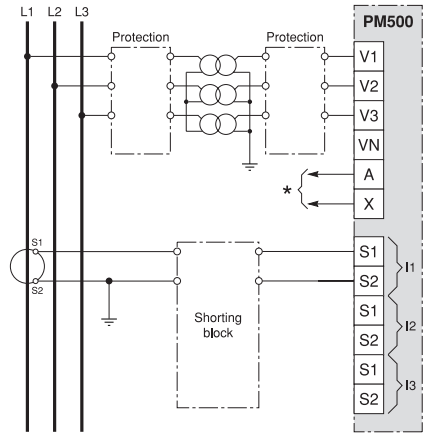
Balanced 3-phase 3-wire system: 3 1CT
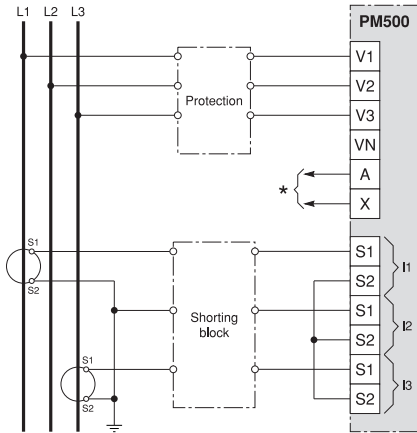

* see page 65.

Recommendation:
The voltage-input protection devices must be rated for the short-circuit current at the connection points.

PM500 connections
Distribution systems over 480 volts (cont.)
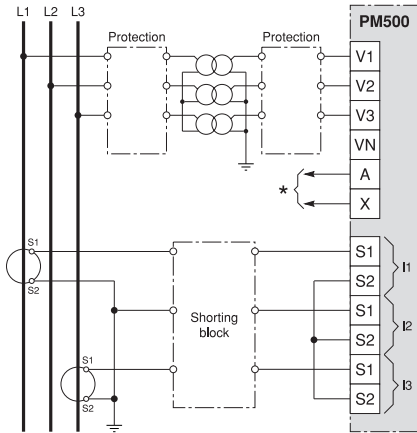
* see page 65.

Note: *The 2-CT solution reduces the phase accuracy by 0.5% (the current is deduced by vector calculations).*

Recommendation:
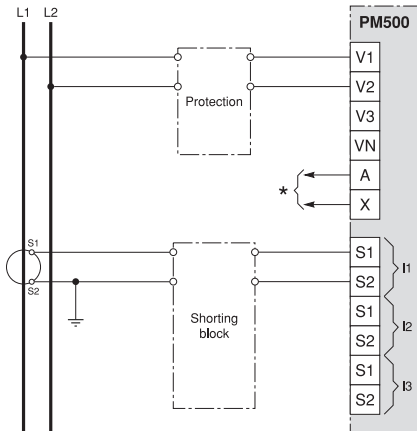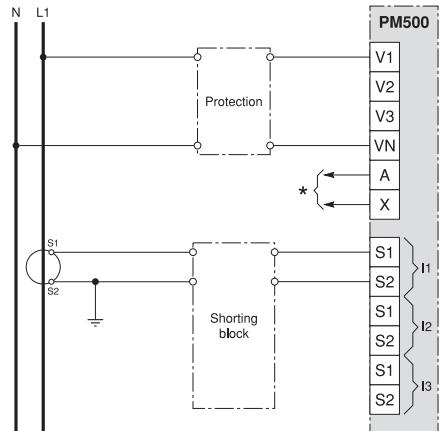*The voltage-input protection devices must be rated for the short-circuit current at the connection points.*

4

IO11 Puls option

IO11 Puls

IN 1 (−)
    2 (+)
Pulse 3 — Pulse receiver
      4

IO22 Alarm option

IO22 Alarm

OUT 1 9 — protection
       10 — load
OUT 2 11 — protection
       12 — load

IN 1 − 13 (−)
      + 14 (+)
IN 2 − 15 (−)
      + 16 (+)
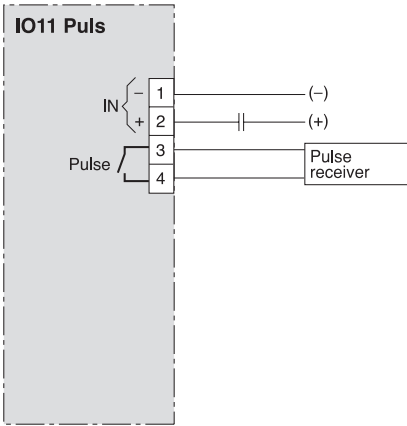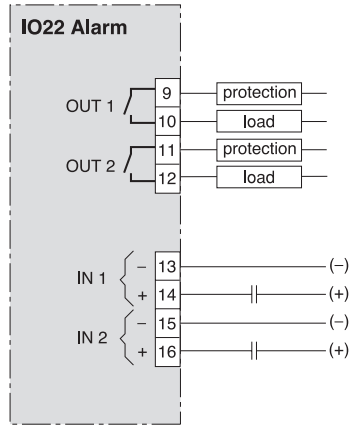
Recommendations :
To avoid damaging the modules, check the operating limits (page 114) before making any connections.

RS485 Modbus option

RS485 Modbus

2-wire link to other slave or master

0V
− L+ (A/A')
+ L- (B/B')

ON 1
   2
(*)
120 Ohms
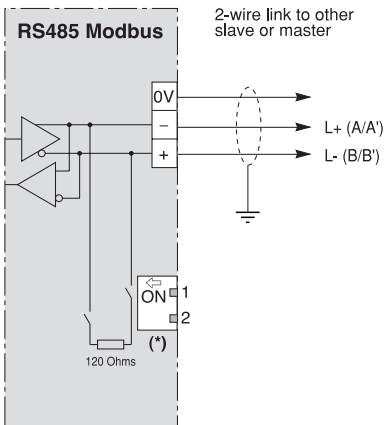
(**∗**) Flip switches 1 and 2 as indicated by the arrow to insert the 120 Ω line-termination resistor.

Note: *For more information on Modbus communication interfaces, see the Schneider Electric Modbus Network Guide.*

4

Operation

Energising
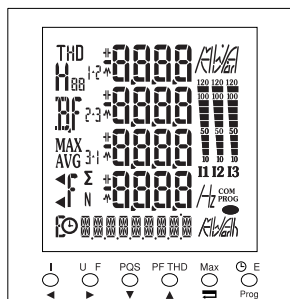
Display test screen
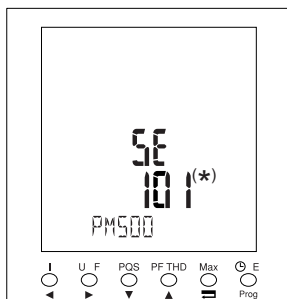
Product-version screen

(*) product version
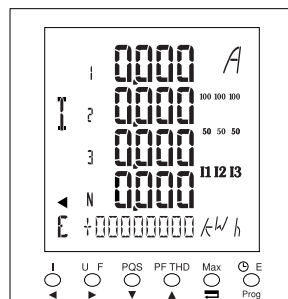
Welcome screen displaying values

Presentation of the front panel

The PM500 is equipped with a large, back-lit LCD display.
It can present up to five measurements simultaneously for fast and direct access to information.

Phase

Values

Type of measurement (I, U, P, Q, S, PF, THD)

Units

IO22 Alarm option:
output 1 status (OUT1)
output 2 status (OUT2)

Bar chart in % current per phase (continuous display)

Neutral, sum (Σ) and frequency (F)

Energy pulse output

Energy, operating time and pulses (optional)

6 function buttons to easily view all values and modify device settings (see page 74)
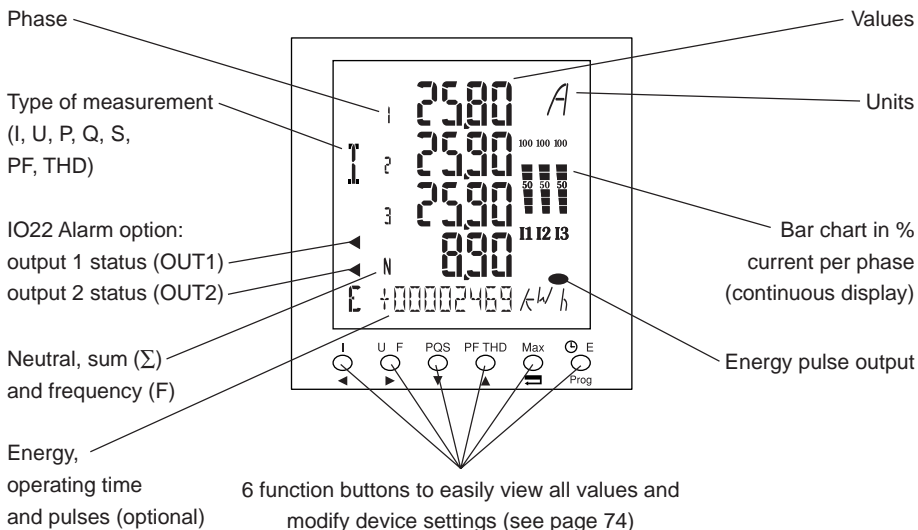
Operation

Viewing measurements

I button:

Press successively to obtain:
- instantaneous currents
- demand currents (AVG)
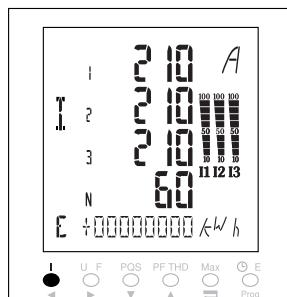
U F button:

Press successively to obtain:
- phase-to-phase voltages and frequency
- phase-to-neutral voltages and frequency

For 3-wire systems, the phase-to-neutral voltages are not displayed.
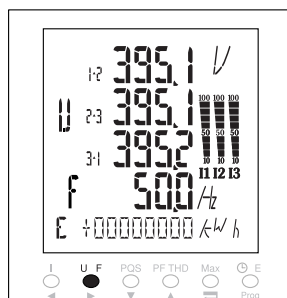
P Q S button:

Press successively to obtain:
- active power (P) per phase and total
- reactive power (Q) per phase and total
- apparent power (S) per phase and total
- total demand active power (P AVG)
- total demand reactive power (Q AVG)
- total demand apparent power (S AVG)
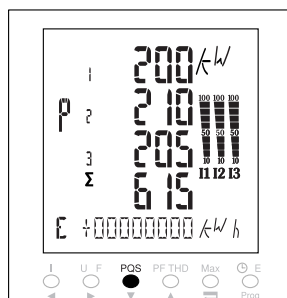
Note: *Display of certain values depends on device settings and the presence of the optional modules.*

5

Operation

Viewing measurements (cont.)

PF THD button:

Press successively to obtain:
- power factor (PF) with the inductive (⋀) and capacitive (⫫) indications
- current Total Harmonic Distortion (THD I)
- voltage Total Harmonic Distortion (THD U)
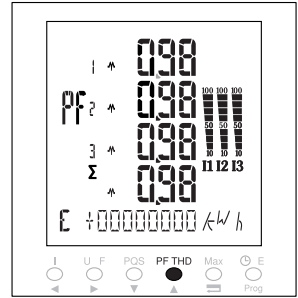
Max button:

Press successively to obtain:
- maximum demand currents (MAX)
- maximum demand active power (P MAX AVG)
- maximum demand reactive power (Q MAX AVG)
- maximum demand apparent power (S MAX AVG)
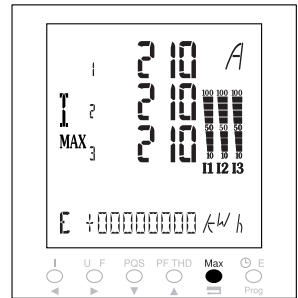
Touche ⏲ E :

Press successively to obtain:
- active energy in (+)
- reactive energy in (+)
- apparent energy in (+)
- active energy out (-)
- reactive energy out (-)
- input 1 pulse counter for IO22 Alarm (C1)
- input 2 pulse counter for IO22 Alarm (C2)
- operating time (⏲)
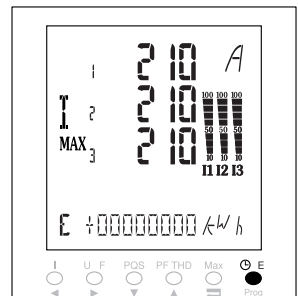
Note: Display of certain values depends on device settings and the presence of the optional modules.

5

Programming
General

Programming mode is used to:
- display or modify PM500 settings and options;
- reset counters (energy, operating time, etc.);
- reset the maxi-meters and mini-meters.

Operations take place in three main steps:
- start programming mode;
- display or modify settings;
- exit programming mode.

The PM500 stores the new settings in memory on exiting programming mode.

Start programming mode

FUNCTION BUTTONS	SCREEN

Start programming mode
- *press the Prog button for at least **three seconds***

◁ ▷ ▽ △ ⬭ ●Prog	**CodE** PROG 000

Enter code 100
- *press ▶ once*

◁ ●▶ ▽ △ ⬭ Prog	**CodE** PROG 010

- *press ▲ once*

◁ ▷ ▽ ●△ ⬭ Prog	**CodE** PROG 100

Confirm the code
- *press ⬭ once*

◁ ▷ ▽ △ ●⬭ Prog	**nEt** PROG 4 3CT

6

Installation and user manual

Programming
General (cont.)

Viewing the settings

Scroll through settings

	Symbols	Order of settings	Modification	Options
● ▼	nEt	Type of distribution system	page 76	
	Ct	Current transformers	page 77	
	Ut	Voltage transformers	page 78	
	rSEt	Maxi-meter reset	page 81	
	PF	Power-factor convention	page 82	
	t INE I	Demand-current calculation interval	page 83	
	t INE P/Q/S	Demand-power calculation interval	page 84	
	OutE	Pulse output	page 85	IO11 Puls
	COM	Modbus communication	page 88	Modbus RS485
● ▲	Out 1	Alarm output 1	page 92	IO22 Alarm
	Out2	Alarm output 2	page 92	IO22 Alarm

Exit programming mode

Exit programming mode
■ *press the Prog button for
at least* **three seconds**
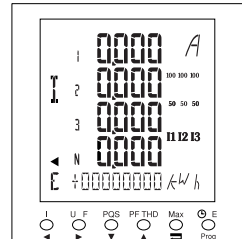
Automatic exit
■ *if no function buttons are pressed for two minutes,
the system automatically exits programming mode*

The default setting is 4 3CT.
If this is correct, simply press
▼ to go on to the next
parameter. To change the
setting, proceed as follows:

```
nEt          PROG
4 3CT
```

Change the type of distribu-
tion system

■ *press ▶ once*

○ ● ○ ○ ○ ○
◄ ▶ ▼ ▲ ⟱ Prog

```
nEt          PROG
```

Select the type of distribution
system

■ *scroll through the choices
by pressing ▼ or ▲ ,*
choices :   4 3CT
                 4 1CT
                 3 2-3CT
                 3 1CT
                 2 1CT
                 1 1CT

○ ○ ● ● ○ ○
◄ ▶ ▼ or ▲ ⟱ Prog

```
nEt          PROG
3 2-3CT
```
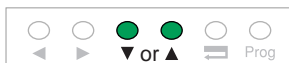
Note: *See the information on connections, pages 66 to 69.*

Confirm your choice

■ *press ⟱ once*

○ ○ ○ ○ ● ○
◄ ▶ ▼ ▲ ⟱ Prog

```
nEt          PROG
3 2-3CT
```

■ *press ▼ once to go on
to the next parameter or
exit programming mode
(see page 75)*

○ ○ ● ○ ○ ○
◄ ▶ ▼ ▲ ⟱ Prog

Programming
Current transformers

The default current transformer setting is 500/5 A. If this is correct, simply press ▼ to go on to the next parameter. To change the setting, proceed as follows:

```
[ t        PROG
00500/5
```

Modify the primary and secondary values
■ *press ▶ once*

```
[ t        PROG
 :'(500/5
```

Set the values
■ *select the digit by pressing ◀ or ▶*
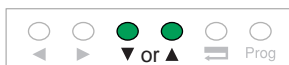
```
[ t        PROG
0_500/5
```

■ *decrement ▼ or increment ▲ the value*

```
[ t        PROG
0 500/5
```

Confirm your choice
■ *press ⟷ once*

```
[ t        PROG
0 500/5
```

■ *press ▼ once to go on to the next parameter or exit programming mode (see page 75)*

Note: *The first five digits set the current for the primary winding of the transformer (1 to 9999 A) and the last digit sets the current for the secondary winding (1 or 5 A).*

6

Programming
Voltage transformers

The default setting is without a voltage transformer. If this is correct, simply press ▼ to go on to the next parameter. To change the setting, proceed as follows:

```
Ut
NO
```
PROG

Modify the setting
■ *press ▶ once*

```
○ ● ○ ○ ○ ○
◄ ▶ ▼ ▲ ⇆ Prog
```

```
Ut
– – –
```
PROG

Indicate that a voltage transformer is present
■ *press ▼ once*

```
○ ○ ● ○ ○ ○
◄ ▶ ▼ ▲ ⇆ Prog
```

```
Ut
YES
```
PROG

Confirm your choice
■ *press ⇆ once*

```
○ ○ ○ ○ ● ○
◄ ▶ ▼ ▲ ⇆ Prog
```

```
Ut
YES
```
PROG

■ *press ▼ once to go on to the next parameter (voltage of the primary winding)*

```
○ ○ ● ○ ○ ○
◄ ▶ ▼ ▲ ⇆ Prog
```

6

Installation and user manual

Set the voltage for the primary winding of the voltage transformers

The default setting is 100 V. If this is correct, simply press ▼ to go on to the next parameter. To change the setting, proceed as follows:

Ut
PROG
PR 000100

Modify the voltage of the primary winding
■ *press ▶ once*

Ut
PROG
PR 000100

Set the voltage of the primary winding
■ *select the digit by pressing ◀ or ▶*

Ut
PROG
PR 000000

■ *decrement ▼ or increment ▲ the value*

Ut
PROG
PR 020000

Note: *The six digits set the voltage of the primary winding of the transformer (maximum 399 999 V).*

Confirm your choice
■ *press ⇄ once*

Ut
PROG
PR 020000

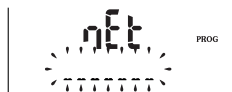■ *press ▼ once to go on to the next parameter (voltage of the secondary winding)*

Programming
Voltage transformers (cont.)

The default setting is 100 V. If this is correct, simply press ▼ to go on to the next parameter. To change the setting, proceed as follows:

```
Ut        PROG
SE  100
```

Modify the voltage of the secondary winding

■ *press ▶ once*

```
○ ● ○ ○ ○ ○
◄ ▶ ▼ ▲ ⧨ Prog
```

```
Ut.       PROG
SE-___
```

Set the voltage of the secondary winding

■ *scroll through the choices*
   by pressing ▼ or ▲,
   choices (in V):   100
                   69 (120/√3)
                   66 (115/√3)
                   64 (110/√3)
                   58 (100/√3)
                   120
                   115
                   110

```
○ ○ ● ● ○ ○
◄ ▶ ▼ or ▲ ⧨ Prog
```

```
Ut.       PROG
SE-115
```

Confirm your choice

■ *press ⧨ once*

```
○ ○ ○ ○ ● ○
◄ ▶ ▼ ▲ ⧨ Prog
```

```
Ut        PROG
SE  115
```

■ *press ▼ once to go on*
to the next parameter or
exit programming mode
(see page 75)

```
○ ○ ● ○ ○ ○
◄ ▶ ▼ ▲ ⧨ Prog
```

6

Installation and user manual

Programming
Resetting the maxi-meters

The default display is Max I NO. If you do not want to reset any maxi-meters, simply press ▼ to go on to the next parameter. To reset a maxi-meter, proceed as follows:

```
  rSEt    PROG
MAX I NO
```

Reset a maxi-meter
■ *press ▶ once*

```
  rSEt    PROG
       NO
```

Select a maxi-meter
■ *scroll through the choices*
  by pressing ▼ or ▲
choices:

MAX I	(maximum demand current)
C2	(input 2 pulse counter for optional IO22 Alarm module)
C1	(input 1 pulse counter for optional IO22 Alarm module)
ER-	(reactive energy out)
EA-	(active energy out)
ES	(apparent energy)
ER+	(reactive energy in)
EA+	(active energy in)
TIME	(operating time)
MAX S	(peak demand apparent power)
MAX -Q	(peak negative demand reactive power)
MAX +Q	(peak positive demand reactive power)
MAX -P	(peak negative demand active power)
MAX +P	(peak positive demand active power)

```
  rSEt    PROG
MAX+P NO
```

■ *press ▶ once*

```
  rSEt    PROG
MAX+P
```
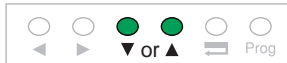
Select YES to enable resetting of the selected maxi-meter
■ *press ▲ once*

```
  rSEt    PROG
MAX+P YES
```

Confirm your choice
■ *press ⇋ once*

```
  rSEt    PROG
MAX+P YES
```

■ *press ▼ once to go on*
to the next parameter or
exit programming mode
(see page 75)

6

Programming
Power-factor convention

The default setting is IEC.
If this is correct, simply
press ▼ to go on to the next
parameter. To change the
setting, proceed as follows:

PF PROG
IEC

Modify the sign convention
■ *press ▶ once*

PF PROG

Select the sign convention
■ *scroll through the choices
  by pressing ▼ or ▲ ,
  choices:* IEC
         IEEE

PF PROG

Confirm your choice
■ *press ⬅ once*

PF PROG
IEEE

■ *press ▼ once to go on
to the next parameter or
exit programming mode
(see page 75)*

6

Programming
Demand-current calculation interval

The default setting is 15 minutes. If this is correct, simply press ▼ to go on to the next parameter.
To change the setting, proceed as follows:

```
AVG
  t IПE    PROG
   I   I0
```

Modify the calculation interval
■ *press ▶ once*

```
○ ● ○ ○ ○ ○
◄  ►  ▼  ▲  ⇆  Prog
```

```
AVG
  t,IПE    PROG
   I  ,---,
```

Select the calculation interval
■ *scroll through the choices*

> *by pressing ▼ or ▲ ,*
> *choices:* 15 (minutes)
> 10
> 8
> 5
> EXT (see note)
> 60
> 30
> 20

```
○ ○ ● ● ○ ○
◄  ►  ▼ or ▲  ⇆  Prog
```

```
AVG
  t IПE    PROG
   I  -,20,-
```

Confirm your choice
■ *press ⇆ once*

```
○ ○ ○ ○ ● ○
◄  ►  ▼  ▲  ⇆  Prog
```

```
AVG
  t IПE    PROG
   I   20
```

■ *press ▼ once to go on*
to the next parameter or
exit programming mode
(see page 75)

```
○ ○ ● ○ ○ ○
◄  ►  ▼  ▲  ⇆  Prog
```

Note: *EXT is displayed if the optional IO11 Puls module is connected. The calculation interval is determined by an external pulse.*

Programming
Demand-power calculation interval

The default setting is 15 minutes. If this is correct, simply press ▼ to go on to the next parameter.
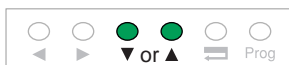To change the setting, proceed as follows:

AVG t IΠE PROG
P/Q/5 15

Modify the calculation interval
■ *press ▶ once*

○ ● ○ ○ ○ ○
◄ ► ▼ ▲ ⊐ Prog

AVG t IΠE PROG
P/Q/5 ‾‾‾‾

Select the calculation interval
■ *scroll through the choices*
   by pressing ▼ or ▲,
   choices: 15 (minutes)
          10
          8
          5
          EXT (see note)
          60
          30
          20

○ ○ ● ● ○ ○
◄ ► ▼ or ▲ ⊐ Prog

AVG t IΠE PROG
P/Q/5 30

Confirm your choice
■ *press ⊐ once*

○ ○ ○ ○ ● ○
◄ ► ▼ ▲ ⊐ Prog

AVG t IΠE PROG
P/Q/5 30

■ *press ▼ once to go on*
to the next parameter or
exit programming mode
(see page 75)

○ ○ ● ○ ○ ○
◄ ► ▼ ▲ ⊐ Prog

Note: EXT is displayed if the optional IO11 Puls module is connected. The calculation interval is determined by an external pulse.

6

Assign a function to the pulse output

The default setting is active energy. If this is correct, simply press ▼ to go on to the next parameter.
To change the setting, proceed as follows:

```
Out E    PROG
  EA+
```

Modify the assignment
■ *press* ▶ *once*

```
Out E    PROG
 ▵▵▵▵
```

Select the desired energy
■ *scroll through the choices by pressing* ▼ *or* ▲,
  choices: EA+
              ER-
              EA-
              ES
              ER+

```
Out E    PROG
 -ER-
```

Confirm your choice
■ *press* ⇆ *once*

```
Out E    PROG
  ER-
```
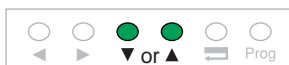
■ *press* ▼ *once to go on to the next parameter (value of the pulse)*

6

Programming
Optional IO11 Puls module (cont.)

Value of the pulse

The default setting is 10 k. If this is correct, simply press ▼ to go on to the next parameter. To change the setting, proceed as follows:

```
OutE    PROG
VAL  10
```

Modify the value of the pulse
■ *press* ▶ *once*

```
OutE    PROG
VAL
```

Select the desired value
■ *scroll through the choices by pressing* ▼ *or* ▲*, choices:* 10 (k)
             1
             0.1
             10000
             1000
             100

```
OutE    PROG
VAL  100
```

Confirm your choice
■ *press* ⇆ *once*

```
OutE    PROG
VAL 100
```
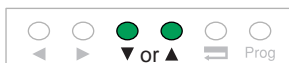
■ *press* ▼ *once to go on to the next parameter (duration of the pulse)*

6

Programming
Optional IO11 Puls module (cont.)

The default setting is 100 ms. If this is correct, simply press ▼ to go on to the next parameter. To change the setting, proceed as follows:

```
OutE     PROG
DUR   100
```

Modify the duration in milliseconds
■ *select the digit by pressing*
▶ *once*

○ ● ○ ○ ○ ○
◄ ▶ ▼ ▲ ⏛ Prog

```
OutE     PROG
DUR -. 00
```

■ *decrement* ▼ *or increment* ▲ *the value*

○ ○ ● ● ○ ○
◄ ▶ ▼ or ▲ ⏛ Prog

```
OutE     PROG
DUR -. 00
```

Confirm your choice
■ *press* ⏛ *once*

○ ○ ○ ○ ● ○
◄ ▶ ▼ ▲ ⏛ Prog

```
OutE     PROG
DUR   300
```

■ *press* ▼ *once to go on to the next parameter or exit programming mode (see page 75)*

○ ○ ● ○ ○ ○
◄ ▶ ▼ ▲ ⏛ Prog

6

Address selection

The default setting is 001.
If this is correct, simply
press ▼ to go on to the next
parameter. To change the
setting, proceed as follows:

```
[ON          PROG
AIR   001
```

Modify the address
■ *select the digit by pressing*
▶ *once*

○ ● ○ ○ ○ ○
◄ ▶ ▼ ▲ ⇄ Prog

```
[ON          PROG
AIR -_01
```

Set the address
■ *decrement* ▼ *or*
increment ▲ *the value*

○ ○ ● ● ○ ○
◄ ▶ ▼ or ▲ ⇄ Prog

```
[ON          PROG
AIR -201
```

Confirm your choice
■ *press* ⇄ *once*

○ ○ ○ ○ ● ○
◄ ▶ ▼ ▲ ⇄ Prog

```
[ON          PROG
AIR   201
```

■ *press* ▼ *once to go on*
to the next parameter
(communication speed)

○ ○ ● ○ ○ ○
◄ ▶ ▼ ▲ ⇄ Prog

Note: *The address may be set from 1 to 255.*

Communication speed

The default setting is 19 200 bauds. If this is correct, simply press ▼ to go on to the next parameter. To change the setting, proceed as follows:

```
 [ON   PROG
BdS 19200
```

Modify the speed
■ *press ▶ once*

```
○ ● ○ ○ ○ ○
◄ ► ▼ ▲ ⇌ Prog
```

```
 [ON    PROG
BdS  ------
```

Select the speed
■ *scroll through the choices*

by pressing ▼ or ▲,
choices: 19200 (bauds)
9600
4800
2400
38400

```
○ ○ ● ● ○ ○
◄ ► ▼ or ▲ ⇌ Prog
```

```
 [ON    PROG
BdS  2400
```

Confirm your choice
■ *press ⇌ once*

```
○ ○ ○ ○ ● ○
◄ ► ▼ ▲ ⇌ Prog
```

```
 [ON    PROG
BdS  2400
```

■ *press ▼ once to go on*
to the next parameter (parity)

```
○ ○ ● ○ ○ ○
◄ ► ▼ ▲ ⇌ Prog
```

6

Programming
Optional Modbus RS485 module (cont.)

The default setting is no parity. If this is correct, simply press ▼ to go on to the next parameter. To change the setting, proceed as follows:

```
 [ ON        PROG
PAR  NO
```

Modify the parity
■ *press* ▶ *once*

```
○ ● ○ ○ ○ ○
◄ ▶ ▼ ▲ ⇄ Prog
```

```
 [ ON        PROG
PAR - - - - -
```

Select the parity
■ *scroll through the choices*
by pressing ▼ *or* ▲ *,*
    choices: NO   (no parity)
            EVEN   (even parity)
            ODD   (odd parity)

```
○ ○ ● ● ○ ○
◄ ▶ ▼ or ▲ ⇄ Prog
```

```
 [ ON        PROG
PAR - EVEN -
```

Confirm your choice
■ *press* ⇄ *once*

```
○ ○ ○ ○ ● ○
◄ ▶ ▼ ▲ ⇄ Prog
```

```
 [ ON        PROG
PAR  EVEN
```

■ *press* ▼ *once to go on*
to the next parameter
(stop bit)

```
○ ○ ● ○ ○ ○
◄ ▶ ▼ ▲ ⇄ Prog
```

6

Programming
Optional Modbus RS485 module (cont.)

Stop bit

The default setting is 1.
If this is correct, simply
press ▼ to go on to the next
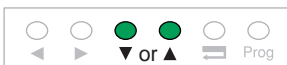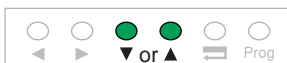parameter. To change the
setting, proceed as follows:

```
 ┌──────────────────┐
 │      [ ON    PROG │
 │  STOP  1         │
 └──────────────────┘
```

Modify the stop bit
■ *press ▶ once*

○ ● ○ ○ ○ ○
◄ ► ▼ ▲ ⇌ Prog

```
 ┌──────────────────┐
 │      [ ON    PROG │
 │  STOP            │
 └──────────────────┘
```

Select the number of stop bits
■ *scroll through the choices
  by pressing ▼ or ▲ ,
  choices:* 1
          2
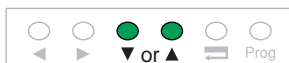
○ ○ ● ● ○ ○
◄ ► ▼ or ▲ ⇌ Prog

```
 ┌──────────────────┐
 │      [ ON    PROG │
 │  STOP 2          │
 └──────────────────┘
```

Confirm your choice
■ *press ⇌ once*

○ ○ ○ ○ ● ○
◄ ► ▼ ▲ ⇌ Prog

```
 ┌──────────────────┐
 │      [ ON    PROG │
 │  STOP 2          │
 └──────────────────┘
```

■ *press ▼ once to go on
to the next parameter or
exit programming mode
(see page 75)*

○ ○ ● ○ ○ ○
◄ ► ▼ ▲ ⇌ Prog

6

Programming
Optional IO22 Alarm module

The programming procedure is identical for both output 1 (OUT 1) and output 2 (OUT 2).

Assign a function to the output

The default setting is control mode via Modbus (CdE).
If this is correct, simply press ▼ to go on to the next parameter. To change the setting, proceed as follows:

Modify the assignment
■ *press ▶ once*

Select the type of alarm
■ *scroll through the choices*
by pressing ▼ or ▲,
choices: CDE
THD V
THD U
THD IN
THD I
TIMER
ΣPF
F
ΣS
ΣQ
ΣP
V
U
IN
I

Confirm your choice
■ *press ▭ once*

■ *press ▼ once to go on to the next parameter (value of the high threshold HT)*

6

Installation and user manual

Programming
Optional IO22 Alarm module (cont.)

Value of the high threshold (HT)

The default setting is 0.
If this is correct, simply
press ▼ to go on to the next
parameter. To change the
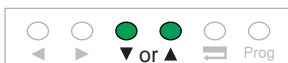setting, proceed as follows:

```
Out 1
Ht        PROG
I 0000  K  A
```

Modify the high threshold
■ *select the digit by pressing*
▶ *once*

```
Out 1
Ht        PROG
I 000  K  A
```

Set the value (0 to 9999)
■ *decrement* ▼ *or*
increment ▲ *the value*

```
Out 1
Ht        PROG
I 2000  K  A
```

Modify the scale factor
■ *select the digit by pressing*
▶ *once*

```
Out 1
Ht        PROG
I 2000     A
```

Set the scale factor
■ *scroll through the choices*
by pressing ▼ *or* ▲*,*
choices: / (x 1)
K (x 1000)
M (x 1000000)

```
Out 1
Ht        PROG
I 2000  /  A
```
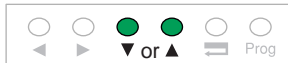
Confirm your choice
■ *press* ▭ *once*

■ *press* ▼ *once to go on*
to the next parameter (value
of the low threshold LT)

```
Out 1
Ht        PROG
I 2000  /  A
```

Value of the low threshold (LT)

The default setting is 0.
If this is correct, simply
press ▼ to go on to the next
parameter. To change the
setting, proceed as follows:

```
Out 1
Lt              PROG
I  0000   K   A
```

Modify the low threshold
■ *select the digit by pressing*
▶ *once*

```
Out 1
Lt              PROG
I  000   K   A
```

Set the value (0 to 9999)
■ *decrement ▼ or*
increment ▲ the value

```
Out 1
Lt              PROG
I  1500   K   A
```

Modify the scale factor
■ *select the digit by pressing*
▶ *once*

```
Out 1
Lt              PROG
I  1500       A
```

Set the scale factor
■ *scroll through the choices*
by pressing ▼ or ▲,
choices: / (x 1)
K (x 1000)
M (x 1000000)

```
Out 1
Lt              PROG
I  1500       A
```

Confirm your choice
■ *press ⬜ once*

```
Out 1
Lt              PROG
I  1500   /   A
```
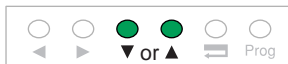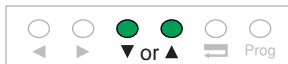
■ *press ▼ once to go on*
to the next parameter
(hysteresis)

Hysteresis

The default setting is 0%.
If this is correct, simply
press ▼ to go on to the next
parameter. To change the
setting, proceed as follows:

```
 Out 1

          PROG
HYST  00
```
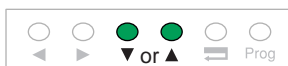
Modify the hysteresis
■ *select the digit by pressing*
▶ *once*

```
 Out 1

          PROG
HYST ⌐,0
```

Set the value (0 to 99%)
■ *decrement ▼ or*
increment ▲ the value

```
 Out 1

          PROG
HYST ⌐ 10
```

Confirm your choice
■ *press ⇄ once*

```
 Out 1

          PROG
HYST  10
```

■ *press ▼ once to go on*
to the next parameter (time
delay)

Time delay

The default setting is 0
seconds. If this is correct,
simply press ▼ to go on to
the next parameter.
To change the setting,
proceed as follows:

```
Out 1

                    PROG
DELAY 000
```

Modify the time delay
■ *select the digit by pressing*
▶ *once*

```
○  ●  ○  ○  ○  ○
◄  ►  ▼  ▲  ⇆  Prog
```

```
Out 1

                    PROG
DELAY 0.0
```

Set the value (0 to 999
seconds)
■ *decrement ▼ or*
increment ▲ the value

```
○  ○  ●  ●  ○  ○
◄  ►  ▼ or ▲  ⇆  Prog
```

```
Out 1

                    PROG
DELAY 0.0
```

Confirm your choice
■ *press ⇆ once*

```
○  ○  ○  ○  ●  ○
◄  ►  ▼  ▲  ⇆  Prog
```

```
Out 1

                    PROG
DELAY 010
```

■ *press ▼ once to go on*
to the next parameter
(operating mode)

```
○  ○  ●  ○  ○  ○
◄  ►  ▼  ▲  ⇆  Prog
```

6

Programming
Optional IO22 Alarm module (cont.)

Operating mode

The default setting for the
relay-output operating mode
is normally open (NO).
If this is correct, simply
press ▼ to go on to the next
parameter. To change the
setting, proceed as follows:

```
 Out 1
                    PROG
 RELAY NO
```

Modify the operating mode
■ *press* ▶ *once*

```
 Out 1
                    PROG
 RELAY      
```

Set the mode
■ *scroll through the choices*

by pressing ▼ *or* ▲ *,*
choices: NO (normally open)
NC (normally closed)

```
 Out 1
                    PROG
 RELAY NC
```

Confirm your choice
■ *press* ⟲ *once*

```
 Out 1
                    PROG
 RELAY NC
```

■ *press* ▼ *once to go on*
to the next parameter or
exit programming mode
(see page 75)

6

Modbus communication

Introduction

The Modbus RS485 communication option can be used to control all PM500 functions and options remotely:

■ display measurements
■ display counters and status of inputs
■ control outputs
■ reset counters, maxi-meters and mini-meters
■ program the PM500

The Modbus RS485 option uses an RS485 type physical link and the Modbus/JBus communication protocol in RTU mode.

The RS485 standard limits the number of physical connection points per segment to 32.
It is however possible to exceed this limit by using a number of segments connected by repeaters.

Maximum number of Modbus slaves	
Per RS485 segment	With repeaters
31	47

Modbus communication
Functions

Access to tables of registers

Decimal address	Hexadecimal address	Type of data	Format	Modbus function
512 … 567	200 … 237	Programming parameters	16 bits 32 bits	Read N words (3)
768 … 912	300 … 390	Measurements (not incl. THD)	32 bits	Read N words (3)
1024 … 1024	400 … 400	Initialisation of maxi-meters, mini-meters and counters	16 bits	Read N words (3) Write 1 word (6) Write N words (16)
1280 … 1337	500 … 539	Alarms, alarm histories and status of inputs and outputs	16 bits 32 bits	Read N words (3)
2304 … 2319	900 … 90F	THD values	16 bits	Read N words (3)
64646 … 64651	FC86 … FC8B	Identification of PM500 and optional modules	16 bits	Read N words (3)

Modbus diagnostics - functions

Function code	Subfunction	Description
8		Management of diagnostic counters
8	1	
8	2	
8	3	
8	4	
8	5	
8	6	

Decimal address	Hexadecimal address	Number of words	Description	Units
512	200	1	Type of distribution system 0: 1 1CT 1: 2 1CT 2: 3 1CT 3: 3 2-3CT 4: 4 1CT 5: 4 3CT	-
513	201	1	Primary winding of current transformer (Ct): 1: 1 A 5: 5 A	A
514[2]	202	1	Primary winding of current transformer (Ct): (interval [1..10000]) Default value: 500	A
515	203	1	Voltage transformer (Ut): 0: No 1: Yes	-
516	204	2	Primary winding of voltage transformer (Ut): (interval [1..399999])	V
518	206	1	Secondary winding of voltage transformer (Ut): 58: 100/√3 V 64: 110/√3 V 66: 115/√3 V 69: 120/√3 V 100: 100 V 110: 110 V 115: 115 V 120: 120 V	V
519	207	1	Calculation interval for demand currents (AVG Time I): 0: External synchronisation[1] 5: 5 minutes 8: 8 minutes 10: 10 minutes 15: 15 minutes 20: 20 minutes 30: 30 minutes 60: 60 minutes	-

☐ Default value

Decimal address	Hexadecimal address	Number of words	Description	Units
520	208	1	Calculation interval for demand power (AVG Time P/Q/S): 0: External synchronisation[1] 5: 5 minutes 8: 8 minutes 10: 10 minutes 15: 15 minutes 20: 20 minutes 30: 30 minutes 60: 60 minutes	-
521[1]	209	1	IO11 Type of energy for pulse output (Out E): 0: kWh + 1: kvarh + 2: kVAh 3: kWh – 4: kvarh -	-
522[1]	20A	1	IO11 Puls: value of pulse (Out E Val): 0: 1/10 1: 1 2: 10 3: 100 4: 1000 5: 10000	kWh kvar h kVAh
523[1]	20B	1	IO11 Puls: duration of pulse (Out E Dur): 1: 100 2: 200 3: 300 4: 400 5: 500 6: 600 7: 700 8: 800 9: 900	ms

Default value

Decimal address	Hexadecimal address	Number of words	Description	Units
527	20F	1	Power-factor sign convention: 0: IEC 1: IEEE	-
551[3]	227	1	IO22 Alarm: output 1 assignment (Out 1 A-Cd): 0: Control 1: I (units: A or kA) 2: U (units: V or kV) 3: ΣP (units: kW or MW) 4: ΣQ (units: kvar or Mvar) 5: ΣS (units: kVA or MVA) 6: F (units: Hz/10) 7: ΣPF (units: 0.01) 8: THD I (units: %) 9: THD U (units: %) 10: IN (units: A or kA) 11: Operating-time counter (units: h or kh) 12: V (units: V or kV) 13: THD In (units: %) 14: THD V (units: %)	-
552[3]	228	1	IO22 Alarm: low threshold for output 1 (Out 1 Lt) (interval [0..9999]): Default value: 0	Dependent on settings
553[3]	229	1	IO22 Alarm: scale factor of low threshold for output 1: 0: x 1 1: x 1000 2: x 1000000	Dependent on settings
554[3]	22A	1	IO22 Alarm: high threshold for output 1 (Out 1 Ht) (interval [0..9999]): Default value: 500	Dependent on settings
555[3]	22B	1	IO22 Alarm: scale factor of high threshold for output 1: 0: x 1 1: x 1000 2: x 1000000	Dependent on settings
556[3]	22C	1	IO22 Alarm: hysteresis for output 1 (Out 1 Hyst) (interval [0..99])	%
557[3]	22D	1	IO22 Alarm: time delay for output 1 (Out 1 Delay) (interval [0..999])	s

Default value

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Decimal address	Hexadecimal address	Number of words	Description	Units
558[3]	22E	1	IO22 Alarm: operating mode of output 1 (Out 1 Relay): 0: open 1: closed	-
559[3]	22F	1	IO22 Alarm: output 2 assignment (Out 2 A-Cd): Same as register 551	-
560[3]	230	1	IO22 Alarm: low threshold for output 2 (Out 2 Lt) (interval [0..9999]): Default value: 0	Dependent on settings
561[3]	231	1	IO22 Alarm: scale factor of low threshold for output 2: 0: x 1 1: x 1000 2: x 1000000	Dependent on settings
562[3]	232	1	IO22 Alarm: high threshold for output 2 (Out 2 Ht) (interval [0..9999]): Default value: 500	Dependent on settings
563[3]	233	1	IO22 Alarm: scale factor of high threshold for output 2: 0: x 1 1: x 1000 2: x 1000000	Dependent on settings
564[3]	234	1	IO22 Alarm: hysteresis for output 2 (Out 2 Hyst) (interval [0…99])	%
565[3]	235	1	IO22 Alarm: time delay for output 2 (Out 2 Delay) (interval [0…999])	s
566[3]	236	1	IO22 Alarm: operating mode of output 2 (Out 2 Relay): 0: open 1: closed	-

[1] register not filled in if IO11 Puls module is not installed.

[2] if the secondary winding of the current transformer is set to 1 A, the interval values are [1..9999], if the secondary winding of the current transformer is set to 5 A, the interval values are [1..9995] in 5 A steps, if the set value is not a multiple of 5, PM500 uses the closest multiple of 5.

[3] register not filled in if IO22 Alarm module is not installed.

☐ Default value

Decimal address	Hexadecimal address	Number of words	Description	Units
768	300	2	I1: instantaneous current, phase 1	mA
770	302	2	I2: instantaneous current, phase 2	mA
772	304	2	I3: instantaneous current, phase 3	mA
774	306	2	IN: neutral current	mA
776	308	2	U12: phase-to-phase voltage, phase 1 to 2	V/100
778	30A	2	U23: phase-to-phase voltage, phase 2 to 3	V/100
780	30C	2	U31: phase-to-phase voltage, phase 3 to 1	V/100
782	30E	2	U1N: phase-to-neutral voltage, phase 1	V/100
784	310	2	U2N: phase-to-neutral voltage, phase 2	V/100
786	312	2	U3N: phase-to-neutral voltage, phase 3	V/100
788	314	2	F: frequency	Hz/100
790	316	2	ΣP: total active power $\pm$	kW/100
792	318	2	ΣQ: total reactive power $\pm$	kvar/100
794	31A	2	ΣS: total apparent power	kVA/100
798	31E	2	P1: active power, phase 1 $\pm$	kW/100
800	320	2	P2: active power, phase 2 $\pm$	kW/100
802	322	2	P3: active power, phase 3 $\pm$	kW/100
804	324	2	Q1: reactive power, phase 1 $\pm$	kvar/100
806	326	2	Q2: reactive power, phase 2 $\pm$	kvar/100
808	328	2	Q3: reactive power, phase 3 $\pm$	kvar/100
810	32A	2	S1: apparent power, phase 1	kVA/100
812	32C	2	S2: apparent power, phase 2	kVA/100
814	32E	2	S3: apparent power, phase 3	kVA/100
822	336	2	I1 AVG: demand current, phase 1	mA
824	338	2	I2 AVG: demand current, phase 2	mA
826	33A	2	I3 AVG: demand current, phase 3	mA
836	344	2	ΣS AVG: total demand apparent power	kVA/100
838	346	2	I1 MAX AVG: maximum demand current, phase 1	mA
840	348	2	I2 MAX AVG: maximum demand current, phase 2	mA
842	34A	2	I3 MAX AVG: maximum demand current, phase 3	mA
844	34C	2	P MAX AVG +: maximum demand active power +	kW/100
846	34E	2	P MAX AVG -: maximum demand active power -	kW/100
848	350	2	Q MAX AVG +: maximum demand reactive power +	kvar/100
850	352	2	Q MAX AVG -: maximum demand reactive power -	kvar/100
852	354	2	S MAX AVG: maximum demand apparent power	kVA/100
854	356	2	Operating-time counter	1/100 h
856	358	2	EA+: active energy in +	kWh
858	35A	2	ER+: reactive energy in +	kvarh

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Decimal address	Hexadecimal address	Number of words	Description	Units
860	35C	2	ES: apparent energy	kVAh
862	35E	2	EA-: active energy out -	kWh
864	360	2	ER-: reactive energy out -	kvarh
866[1]	362	2	C1: input 1 pulse counter	-
868[1]	364	2	C2: input 2 pulse counter	-
870	366	2	PF: total power factor	0.001
872	368	2	PF1: power factor, phase 1	0.001
874	36A	2	PF2: power factor, phase 2	0.001
876	36C	2	PF3: power factor, phase 3	0.001
878	36E	2	IN AVG: demand current in the neutral	mA
880	370	2	ΣP AVG: total demand active power $\pm$	kW/100
882	372	2	ΣQ AVG: total demand reactive power $\pm$	kvar/100
884	374	2	IN MAX AVG: maximum demand current in the neutral	mA
886[1]	376	2	I MIN: minimum current on the three phases	mA
888[1]	378	2	IN MIN: minimum current in the neutral	mA
890[1]	37A	2	U MIN: minimum of phase-to-phase voltages on the three phases	V/100
892[1]	37C	2	F MIN: minimum frequency	Hz/100
894[1]	37E	2	PF MIN: minimum power factor	0.001
896[1]	380	2	P MIN: minimum active power $\pm$	kW/100
898[1]	382	2	Q MIN: minimum reactive power $\pm$	kvar/100
900[1]	384	2	I MAX: maximum instantaneous current on the three phases	mA
902[1]	386	2	IN MAX: maximum current in neutral	mA
904[1]	388	2	U MAX: maximum of phase-to-phase voltages on the three phases	V/100
906[1]	38A	2	F MAX: maximum frequency	Hz/100
908[1]	38C	2	PF MAX: maximum power factor	0.001
910[1]	38E	2	P MAX: maximum total active power $\pm$	kW/100
912[1]	390	2	Q MAX: maximum total reactive power $\pm$	kvar/100

[1] register not filled in if IO22 Alarm module is not installed.

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Decimal address	Hexadecimal address	Number of words	Description	Units
2304	900	1	THD I1	1/10 %
2305	901	1	THD I2	1/10 %
2306	902	1	THD I3	1/10 %
2307	903	1	THD IN	1/10 %
2308	904	1	THD U12	1/10 %
2309	905	1	THD U23	1/10 %
2310	906	1	THD U31	1/10 %
2311	907	1	THD V1	1/10 %
2312	908	1	THD V2	1/10 %
2313	909	1	THD V3	1/10 %
2314[1]	90A	1	MIN THD I: minimum of current THD on the three phases	1/10 %
2315[1]	90B	1	MIN THD IN: minimum current THD in the neutral	1/10 %
2316[1]	90C	1	MIN THD U: minimum of phase-to-phase voltage THD on the three phases	1/10 %
2317[1]	90D	1	MAX THD I: maximum of current THD on the three phases	1/10 %
2318[1]	90E	1	MAX THD IN: maximum current THD in the neutral	1/10 %
2319[1]	90F	1	MAX THD U: maximum of phase-to-phase voltage THD on the three phases	1/10 %

[1] register not filled in if IO22 Alarm module is not installed.

Modbus communication
Alarms and input/outputs

Updating of the alarm and history registers requires the IO22 Alarm option and activation of alarm mode (see chapter 6, Programming IO22 Alarm module).

Active alarm, Output 1 (OUT 1)

Decimal address	Hexadecimal address	Number of words	Description	Units
1280	500	1	Active alarm, output 1 low threshold Logged alarm: type of alarm[1]	-
1281	501	2	Active alarm, output 1 low threshold Value of low threshold	See logged alarm
1283	503	1	Active alarm, output 1 high threshold Logged alarm: type of alarm[1]	-
1284	504	2	Active alarm, output 1 high threshold Value of high threshold	See logged alarm
1286	506	1	Duration of active alarm on output 1	s

Alarm (- 1) output 1 (OUT 1)

Decimal address	Hexadecimal address	Number of words	Description	Units
1287	507	1	Alarm (- 1) output 1 low threshold Logged alarm: type of alarm[1]	-
1288	508	2	Alarm (- 1) output 1 low threshold Value of low threshold	See logged alarm
1290	50A	1	Alarm (- 1) output 1 high threshold Logged alarm: type of alarm[1]	-
1291	50B	2	Alarm (- 1) output 1 high threshold Value of high threshold	See logged alarm
1293	50D	1	Duration of alarm (- 1) on output 1	s

Alarm (- 2) output 1 (OUT 1)

Decimal address	Hexadecimal address	Number of words	Description	Units
1294	50E	1	Alarm (- 2) output 1 low threshold Logged alarm: type of alarm[1]	-
1295	50F	2	Alarm (- 2) output 1 low threshold Value of low threshold	See logged alarm
1297	511	1	Alarm (- 2) output 1 high threshold Logged alarm: type of alarm[1]	-
1298	512	2	Alarm (- 2) output 1 high threshold Value of high threshold	See logged alarm
1300	514	1	Duration of alarm (- 2) on output 1	s

[1] see page 110.

Modbus communication

Alarms and input/outputs (cont.)

Alarm (- 3) output 1 (OUT 1)

Decimal address	Hexadecimal address	Number of words	Description	Units
1301	515	1	Alarm (- 3) output 1 low threshold Logged alarm: type of alarm[1]	-
1302	516	2	Alarm (- 3) output 1 low threshold Value of low threshold	See logged alarm
1304	518	1	Alarm (- 3) output 1 high threshold Logged alarm: type of alarm[1]	-
1305	519	2	Alarm (- 3) output 1 high threshold Value of high threshold	See logged alarm
1307	51B	1	Duration of alarm (- 3) on output 1	s

Active alarm, Output 2 (OUT 2)

Decimal address	Hexadecimal address	Number of words	Description	Units
1308	51C	1	Active alarm, output 2 low threshold Logged alarm: type of alarm[1]	-
1309	51D	2	Active alarm, output 2 low threshold Value of low threshold	See logged alarm
1311	51F	1	Active alarm, output 2 high threshold Logged alarm: type of alarm[1]	-
1312	520	2	Active alarm, output 2 high threshold Value of high threshold	See logged alarm
1314	522	1	Duration of active alarm on output 2	s

Alarm (- 1) output 2 (OUT 2)

Decimal address	Hexadecimal address	Number of words	Description	Units
1315	523	1	Alarm (- 1) output 2 low threshold Logged alarm: type of alarm[1]	-
1316	524	2	Alarm (- 1) output 2 low threshold Value of low threshold	See logged alarm
1318	526	1	Alarm (- 1) output 2 high threshold Logged alarm: type of alarm[1]	-
1319	527	2	Alarm (- 1) output 2 high threshold Value of high threshold	See logged alarm
1321	529	1	Duration of alarm (- 1) on output 2	s

[1] see page 110.

Modbus communication

Alarms and input/outputs (cont.)

Alarm (- 2) output 2 (OUT 2)

Decimal address	Hexadecimal address	Number of words	Description	Units
1322	52A	1	Alarm (- 2) output 2 low threshold Logged alarm: type of alarm[1]	-
1323	52B	2	Alarm (- 2) output 2 low threshold Value of low threshold	See logged alarm
1325	52D	1	Alarm (- 2) output 2 high threshold Logged alarm: type of alarm[1]	-
1326	52E	2	Alarm (- 2) output 2 high threshold Value of high threshold	See logged alarm
1328	530	1	Duration of alarm (- 2) on output 2	s

Alarm (- 3) output 2 (OUT 2)

Decimal address	Hexadecimal address	Number of words	Description	Units
1329	531	1	Alarm (- 3) output 2 low threshold Logged alarm: type of alarm[1]	-
1330	532	2	Alarm (- 3) output 2 low threshold Value of low threshold	See logged alarm
1332	534	1	Alarm (- 3) output 2 high threshold Logged alarm: type of alarm[1]	-
1333	535	2	Alarm (- 3) output 2 high threshold Value of high threshold	See logged alarm
1335	537	1	Duration of alarm (- 3) on output 2	s

Status of input/outputs

Decimal address	Hexadecimal address	Number of words	Description	Units
1336	538	1	Status of IO11 Puls module[2] bit 0: input status (0 = open, 1 = closed)	-
1337	539	1	Status of IO22 Alarm module[3] bit 0: input 1 status (0 = open, 1 = closed) bit 1: input 2 status (0 = open, 1 = closed) bit 4: output 1 status (0 = open, 1 = closed) bit 5: output 2 status (0 = open, 1 = closed)	-

[1] see page 110.
[2] register not filled in if IO11 Puls module is not installed.
[3] register not filled in if IO22 Alarm module is not installed.

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Modbus communication

Alarms and input/outputs (cont.)

Description	Value
No alarm	0
I1 (units: mA)	1
I2 (units: mA)	2
I3 (units: mA)	3
IN (units: mA)	4
U12 (units: V/100)	5
U23 (units: V/100)	6
U31 (units: V/100)	7
ΣP (units: kW/100)	8
ΣQ (units: kvar/100)	9
ΣS (units: kVA/100)	10
F (units: Hz/100)	11
ΣPF (units: 0.001)	12
THD I1 (units: 1/10 %)	15
THD I2 (units: 1/10 %)	16
THD I3 (units: 1/10 %)	17
THD U12 (units: 1/10 %)	18
THD U23 (units: 1/10 %)	19
THD U31 (units: 1/10 %)	20
Operating-time counter (units: 1/100 h)	21
V1 (units: V/100)	22
V2 (units: V/100)	23
V3 (units: V/100)	24
THD IN (units: 1/10 %)	25
THD V1 (units: 1/10 %)	26
THD V2 (units: 1/10 %)	27
THD V3 (units: 1/10 %)	28

Operation of the alarm history

When an alarm occurs, its characteristics (type, value and duration) are recorded in the "active alarm" zone.

When the active alarm drops out, its values are transferred to the alarm (- 1) registers and the "logged alarm" register is set to 0 (no active alarm).

Transfer of the active alarm to alarm (- 1) provokes transfer of alarm (- 1) to alarm (- 2) and of alarm (- 2) to alarm (- 3). The previous alarm (- 3) is lost.

Decimal address	Hexadecimal address	Number of words	Description (value in hexadecimal format)
1024	400	1	Initialisation de :
			0: no initialisation
			1: maximum demand current (registers &346, &348, &34A, &374)
			2: P MAX AVG+ (register &34C)
			4: P MAX AVG- (register &34E)
			8: Q MAX AVG+ (register &350)
			10: Q MAX AVG- (register &352)
			20: S MAX AVG (register &354)
			40: Operating-time counter (register &356)
			80: Ea+ kWh (register &358)
			100: Er+ kvarh (register &35A)
			200: Es kVAh (register &35C)
			400: Ea- kWh (register &35E)
			800: Er- kvarh (register &360)
			1000: all MAX AVG, Operating-time counter and energy values
			2000: C1 (register &362)
			4000: C2 (register &364)
			8001: Min and Max I and IN (registers &376, &378, &384, &386)
			8002: Min and Max U (registers &37A, &388)
			8004: Min and Max frequency (register &37C, &38A)
			8008: Min and Max PF (register &37E, &38C)
			8010: Min and Max P (register &380, &38E)
			8020: Min and Max Q (registre &382, &390)
			8040: Min and Max THD I, THD IN (register &90A, &90B, &90D, &90E)
			8080: Min and Max THD U (register &90C, &90F)
			8100: all min. and max. instantaneous measurements

Note: *It is possible to initialise a number of registers with a single command. Simply add the corresponding values. For example, to initialise the maximum demand current and the operating-time counter, simply write the value &41 (1 + 40) in register &400.*

Modbus communication
PM500 identification and optional module

Decimal address	Hexadecimal address	Number of words	Description	Units
64646	FC86	1	Schneider Electric identification = &0100	-
64647	FC87	1	PM500 identification = &C724	-
64649	FC89	1	Optional modules: see the codes for installed modules	-
64651[1]	FC8B	1	PM500 version	-

[1] the PM500 product version is coded in decimal format. For example, 101 signifies version 1.01.

Codes for installed modules

Description	Value
Bit 0: RS485 Modbus module	0: not installed 1: installed
Bit 1: IO11 Puls module	0: not installed 1: installed
Bit 2: IO22 Alarm module	0: not installed 1: installed

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Appendices
Contents

PM500 electrical characteristics

Auxiliary power supply	PM500 part no. 50980		110 to 400 V AC (± 10 %), 10 VA
			120 to 350 V DC (± 20 %), 10 W
	PM500 part no. 50981		24 to 48 V DC (± 20 %), 10 W
Voltage inputs	Phase to phase (direct)		50 to 480 V AC
	Phase to neutral (direct)		28 to 277 V AC
	Phase to phase (with external VT):		
		Primary	Up to 400 kV AC
		Secondary	58, 64, 66, 69, 100, 110, 115, 120 V AC
	Frequency		45 to 65 Hz
Current inputs	CT:		
		Rating (In)	1 to 10000 A in 1 A steps	5 to 9995 A in 5 A steps
		Secondary	1 A	5 A
	Permissible overload		20 A continuous
	Consumption		0.1 VA

Mechanical characteristics

Dimensions	PM500 alone: overall dimensions	96 x 96 x 80 mm
	PM500 alone: dimensions behind mounting surface	96 x 96 x 60 mm
	PM500 with option: overall dimensions	96 x 96 x 100 mm
	PM500 with option: dimensions behind mounting surface	96 x 96 x 80 mm
Weight	PM500 without options	0.4 kg
Vibration	IEC 60068-2-6	10 to 55 Hz: 2 g

Electrical characteristics of the IO11 Puls option

Input (optocoupler)	Max. positive-sequence voltage	30 V DC
	Min. positive-sequence voltage	10 V DC
	Max. negative-sequence voltage	30 V DC
	For synchronisation use:	
	Min. duration	1 s
	For digital input use:	
	Min. duration	100 ms
Pulse output (REED relay)	Max. voltage	100 V DC
	Max. current	0.5 A
	Max. switched power	10 W
	Number of operations	10^8 (10 mA, 5 V)
	Pulse value (kWh, kvarh, kVAh)	0.1 ; 1 ; 10 ; 100 ; 1000 ; 10000
	Pulse duration	100 to 900 ms in 100 ms steps

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Appendices
Characteristics (cont.)

Electrical characteristics of the IO22 Alarm option

Input (optocoupler)	Max. positive-sequence voltage	30 V DC
	Min. positive-sequence voltage	10 V DC
	Max. negative-sequence voltage	30 V DC
	Min. duration	10 ms
Outputs (relays)	Switching voltage	250 V AC
	Rated current	5 A
	Rated breaking capacity	1500 VA
	Number of operations	4×10^5 (2 A, 250 V AC, AC11) (VDE0660) 5×10^5 (5 A, 30 V DC, resistive load)

Environmental characteristics

CE marking		
The PM500 Power Meter complies with:		
The requirements of the European directive on electromagnetic compatibility (EMC) no. 89/336/CEE dated 3 May 1989, modified by directive no. 92/31/CEE dated 28 April 1992 and by directive no. 93/68/CEE dated 22 July 1993.		
Low voltage directive no. 73/23/CEE dated 19 February 1973, modified by directive no. 93/68/CEE dated 22 July 1993.		
Electromagnetic compatibility		
Immunity to electrostatic discharges	IEC 61000-4-2	Level III
Immunity to radiated radio-frequency fields	IEC 61000-4-3	Level III
Immunity to electrical fast transients/bursts	IEC 61000-4-4	Level IV
Immunity to impulse waves	IEC 61000-4-5	Level IV
Immunity to conducted disturbances	IEC 61000-4-6	Level III
Immunity to power frequency magnetic fields	IEC 61000-4-8	Level IV
Conducted and radiated emissions	CISPR11	Class B
Immunity to voltage dips and short interruptions	IEC 61000-4-11	
Climate		
Operating-temperature range		- 10°C to + 55°C
Storage-temperature range		- 20°C to + 85°C
Insulation		
Installation category	For systems up to 277 / 480 V	III
Degree of pollution		2
Rated impulse withstand voltage	IEC 60947-1	Uimp = 4 kV
Front		Class II
Degree of protection	Front	IP40
	Case	IP30

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Appendices
Characteristics (cont.)

Instantaneous values		Measurement range	Refresh rate	Display
Voltages		50 V to 400 kV	1 s	00.00 V to 400 kV
Currents		0.04 to 2 x In	1 s	0.000 A to 20 kA
Current bar chart		10 to 120 % of In	1 s	1 bar for 10%
Frequency		45 to 65 Hz	1 s	45.00 Hz to 65.00 Hz
Power	Per phase	0 to 1660 MW/ Mvar/ MVA 4 quadrants	1 s	00.00 kW to 1660 MW / Mvar / MVA
	Total	0 to 8000 MW/ Mvar/ MVA 4 quadrants	1 s	00.00 kW to 8000 MW / Mvar / MVA
Power factor		- 1 to + 1, 4 quadrants	1 s	- 1.000 to 1.000
Type of load		4 quadrants	1 s	⊣⊢ or ⋀
THD	Current	1.7 to 999 %	1 s	000.0 % to 999.9 %
	Voltage	1.7 to 15 %	1 s	000.0 % to 999.9 %

Demand values	Measurement range	Refresh rate	Display
Demand current	0.04 to 2 x In	Calc. interval	0.000 A to 20 kA
Total demand power	0 to 8000 MW/ Mvar/ MVA 4 quadrants	Calc. interval	00.00 kW to 8000 MW / Mvar / MVA

Meters	Metering range	Refresh rate	Display
Energy	0 to 99999999 kWh / kvarh / kVAh, 4 quadrants	1 s	00000000 to 99999999 kWh / kvarh / kVAh
Operating times	0 to 99999.99 h	1 s	00000.00 to 99999.99 h
C1 and C2 counters (IO22 inputs)	0 to 999999	1 s	000000 to 999999

Accuracy

Value		Range	Accuracy
Voltage		140 to 480 V AC	0.5 %
Current		0.1 to 2 x In	0.5 %
Power		PF = 0.5 L to 0.8 C	1 % of value
Power factor		0.5 < PF < 1	1 %
Frequency		45 to 65 Hz	0.1 %
THD	Current and ph-N voltage	Up to 31st harmonic	0.2 % (absolute)
	ph-ph voltage		0.4 % (absolute)
Energy	Active		IEC 61036 class 1
	Reactive		IEC 61268 class 2

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Appendices
Abbreviations and symbols

PM500	PM500 + Modbus RS485	PM500 + IO22 Alarm	PM500 + IO11 Puls

Abbreviation	Definition / meaning	Comments
4 3CT	4 wires, 3 current transformers	3-phase system + unbalanced neutral
4 1CT	4 wires, 1 current transformer	3-phase system + balanced neutral
3 2-3CT	3 wires, 2 or 3 current transformers	Unbalanced 3-phase system
3 1CT	3 wires, 1 current transformer	Balanced 3-phase system
2 1CT	2 wires, 1 current transformer	2-phase system
1 1CT	2 wires, 1 current transformer	Single-phase system
A-Cd	Alarm or Command	
ADR	Address	Modbus address
AVG	Average	Demand value
BdS	Bauds	Modbus speed
C1	Pulse counter for input 1	For input 1 of option
C2	Pulse counter for input 2	For input 2 of option
CdE	Command	IO22 output in control mode
COdE	Access code	Access to programming mode
COM	Communication	
CT	Current transformer	
DELAY	Time delay	Time delay for the alarm
DUR	Pulse duration	Pulse output
EA+	Positive active energy	Active energy in
EA-	Negative active energy	Active energy out
ER+	Positive reactive energy	Reactive energy in
ER-	Negative reactive energy	Reactive energy out
ES	Apparent energy	
EVEN	Even	Even parity for Modbus
EXT	External	External synchronisation signal for demand calculation intervals
Ht	High threshold	High threshold for alarm
HYST	Hysteresis	Alarm hysteresis setting
IEC	International Electrotechnical Commission	Convention for power-factor calculation
IEEE	Institute of Electrical and Electronics Engineers	Convention for power-factor calculation
Lt	Low threshold	Low threshold for alarm
Max	Maximum	
Max I	Maximum demand current	Displayed during reset operation
Max +P	Maximum demand active power (positive)	Displayed during reset operation
Max -P	Maximum demand active power (negative)	Displayed during reset operation
Max +Q	Maximum demand active power (negative)	Displayed during reset operation
Max -Q	Maximum demand reactive power (negative)	Displayed during reset operation
Max S	Maximum demand apparent power	Displayed during reset operation
Max AVG	Maximum Average	Maximum demand values

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Appendices
Abbreviations and symbols (cont.)

PM500	PM500 + Modbus RS485	PM500 + IO22 Alarm	PM500 + IO11 Puls

Abbreviation	Definition / meaning	Comments
NC	Normally closed	Output-relay operating mode
Net	Network	Type of distribution system
NO	Normally open	Output-relay operating mode
ODD	Odd	Odd parity for Modbus
Out E	Output Energy	Pulse output
Out 1	Output 1	
Out 2	Output 2	
PAR	Parity	Selection of parity for Modbus
PF	Power factor	
Pr	Primary	Primary winding on Ut transformer
Prog	Programming mode	Programming mode active
RELAY	Relay	Output-relay operating mode
RSEt	Reset	Reset / initialise
SE	Secondary	Secondary winding on Ut transformer
STOP	Stop bit	Number of stop bits for Modbus
TIME	Operating time	Displayed during reset of operating-time
AVG TIME	Average time	Calculation interval for demand values
TIMER	Operating-time counter	Alarm for operating-time counter
THD	Total Harmonic Distorsion	Harmonic distortion
THD I	THD for phase currents	
THD IN	THD for neutral current	
THD U	THD for phase-to-phase voltages	
THD V	THD for phase-to-neutral voltages	
Ut	Voltage transformer	
VAL	Pulse value	Pulse output

Symbol	Definition / meaning	Comments
⊣⊢	Capacitive load	
⋀	Inductive load	
◷	Operating-time counter	
Σ	Sum	
ΣP	Total active power	
ΣQ	Total reactive power	
ΣS	Total apparent power	
ΣPF	Total power factor	

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Ce produit doit être installé, raccordé et utilisé en respectant les normes et/ou les règlements d'installation en vigueur.
This product must be installed, connected and used in compliance with prevailing standards and/or installation regulations.

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