Centrale de mesure
Power Meter
Central de medida
PM500 Merlin Gerin

Notice d'installation et d'utilisation
Installation and user manual
Manual de instalación y utilización

Merlin Gerin

⚠ Danger et avertissement

Le montage de ces matériels ne peut être effectué que par des professionnels.
Le non respect des indications de la présente notice ne saurait engager la responsabilité du constructeur.

RISQUE D'ELECTROCUTION, DE BRULURES OU D'EXPLOSION
■ l'installation et l'entretien de cet appareil ne doivent être effectués que par du personnel qualifié.
■ avant toute intervention sur l'appareil, coupez ses entrées tensions, court-circuitez le secondaire de chaque transformateur de courants et coupez l'alimentation auxiliaire de l'appareil.
■ utilisez toujours un dispositif de détection de tension approprié pour confirmer l'absence de tension.
■ replacez tous les dispositifs, les portes et les couvercles avant de mettre cet appareil sous tension.
■ utilisez toujours la tension assignée appropriée pour alimenter cet appareil.
Si ces précautions n'étaient pas respectées, cela pourrait entraîner des blessures graves.

⚠ Danger and warning

This equipment must be mounted only by professionals.
The manufacturer shall not be held responsible for failure to comply with the instructions in this manual.

RISK OF ELECTROCUTION, BURNS OR EXPLOSION
■ *the device must be installed and serviced only by qualified personnel.*
■ *prior to any work on or in the device, isolate the voltage inputs and auxiliary power supplies and short-circuit the secondary winding of all current transformers.*
■ *always use an appropriate voltage detection device to confirm the absence of voltage.*
■ *put all mechanisms, door and covers back in place before energising the device.*
■ *always supply the device with the correct rated voltage.*
Failure to take these precautions could cause serious injuries.

⚠ Advertencia

El montaje de estos materiales sólo puede ser efectuado por profesionales.
No respetar las indicaciones del presente manual exime de responsabilidad al fabricante.

RIESGO DE ELECTROCUCIÓN, DE QUEMADURAS O DE EXPLOSIÓN
■ *la instalación y mantenimiento de este aparato debe ser efectuado por personal cualificado.*
■ *antes de cualquier intervención en el aparato, cortar sus entradas de tensión, corto-circuitar el secundario de cada transformador de intensidad y cortar la alimentación auxiliar del aparato.*
■ *utilizar siempre un dispositivo de detección de tensión apropiado para asegurar la ausencia de tensión.*
■ *volver a colocar todos los dispositivos, tapas y puertas antes de poner el aparato en tensión.*
■ *utilizar siempre la tensión asignada apropiada para alimentar el aparato.*
No respetar estas precauciones podría entrañar un serio riesgo de producir heridas graves.
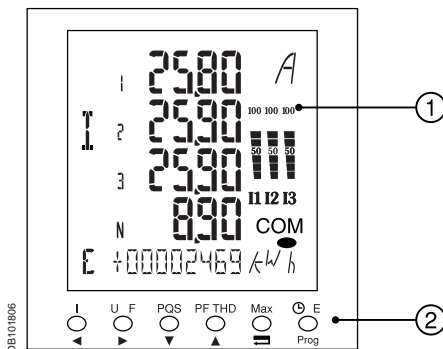
Repérage face avant

1 Affichage LCD rétro éclairé.
2 Clavier de 6 boutons poussoirs à double fonctionnalité pour visualisation et programmation.

Front-panel identification

1 Back-lit LCD display.
2 Six dual-function pushbuttons for measurement display and programming.

Identificación de la cara delantera

1 Pantalla LCD retroiluminada.
2 Teclado de de 6 botones pulsadores de doble funcionalidad para visualización y programación.

Repérage face arrière
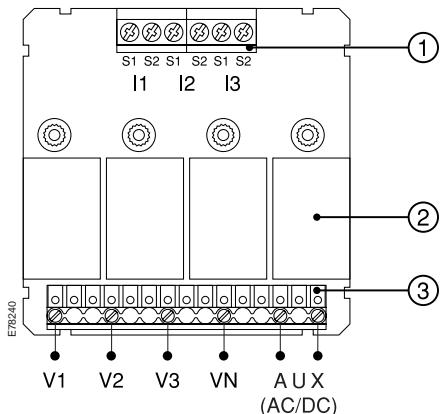
1 Bornier entrées courants.
2 Emplacements des options.
3 Bornier débrochable entrées tensions et alimentation auxiliaire.

Rear-panel identification

1 Terminal block for input currents.
2 Slots for optional modules.
3 Plug-in terminal block for input voltages and auxiliary power.

Identificación de la cara posterior

1 Bornero de entrads de intensidades.
2 Emplazamiento para los módulos opcionales.
3 Bornero desmontable para entradas de tensión y de alimentación auxiliar.

Sommaire

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9 Appendices

Introduction and description

Package contents

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

E78259
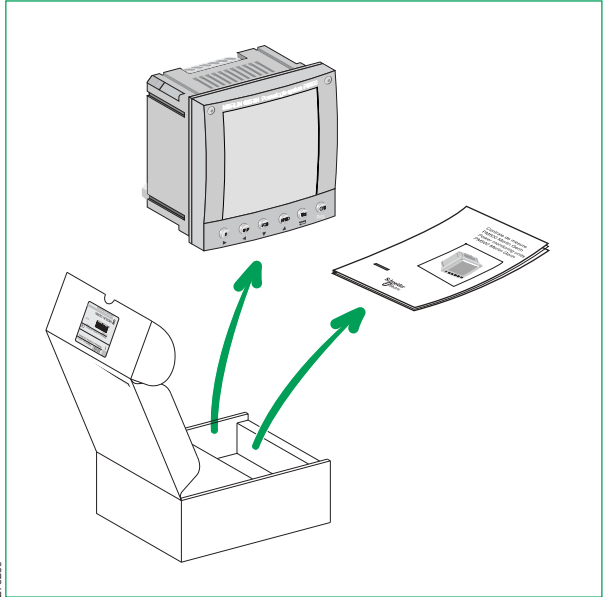
Device identification

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

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

1

E78432
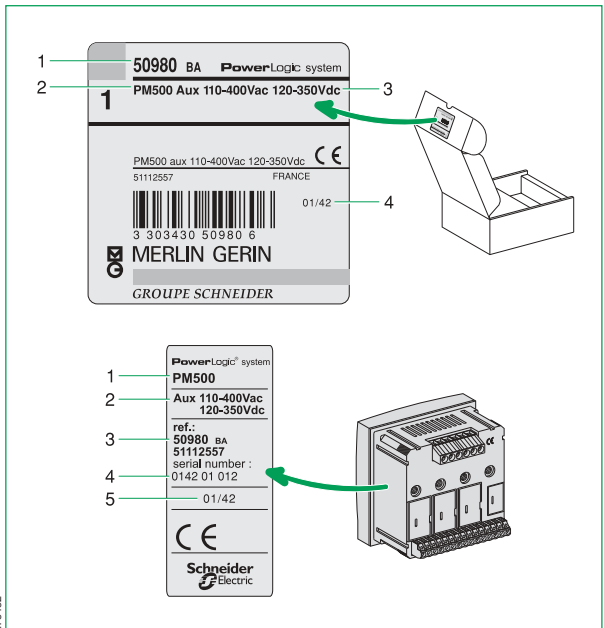
PM500 characteristics

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	■	■
Maximum instantaneous values			
Maximum current[2]	3 phases and neutral	■	■
Maximum ph-ph voltage[2]	3 phases	■	■
Maximum frequency[2]		■	■
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	■	■
Total demand active, reactive and 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 instantaneous value[2]		■	■
Maximum demand values		■	■
Energy values and operating times		■	■
Input counter[2][3]		■	■

[1] remote operation requires the optional Modbus RS485 module

[2] with optional IO22 Alarm module

[3] with optional IO11 Puls module

PM500 characteristics

PM500		Operation	
		Local	Remote[1]
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 10000 A secondary 5 or 1 A	■	■
Current transformers	primary 400 kV max secondary 100, 110, 115, 120, $100/\sqrt{3}$, $110/\sqrt{3}$, $115/\sqrt{3}$, $120/\sqrt{3}$	■	■
Product[4] CT ratio x Ut ratio	⩽ 2000000	■	■
Bar-chart scale		■	■
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

[3] with optional IO11 Puls module

[4] e.g.: Supply: Primary 110 kV   CT: Primary 2000 A
                        Secondary 110 V   Secondary 1 A
        In this case, the product of 110000/110 x 2000/1 = 2000000.

2

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 5 types available.

2

Modbus RS485 option	Part no. 50982	Operation	
		Local	Remote
Functions			
RS485 link	2 wires		■
JBus/Modbus ® communication protocol			
Settings			
Communication address	1 to 247		■
Communication speed	2400 to 38400 bauds		■
Parity	none, even, odd		■
Stop bits	1 or 2		■

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, AVG ΣP, AVG ΣQ, AVG ΣS, AVG 3I, AVG IN and timer		■	■
- High/low thresholds, hysteresis and delay		■	■
- Relay operating mode	NO or NC	■	■

AO20 4-20mA option	Part no. 50985	Operation	
		Local	Remote
Functions			
2 analogue outputs			■
Power supply (Pwr) to IO11 and IO22 module inputs		■	
Analogue-output settings			
- Type of analogue output, either 0-20mA or 4-20mA or Pwr		■	■
- Assigned values: I1, I2, I3, IN, U12, U23, U31, V1, V2, V3, ΣP, ΣQ, ΣS, ΣPFL, F and ΣPFC		■	■
- Value corresponding to 0/4 mA, value corresponding to 2 mA		■	■

Characteristics of PM500 options

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	■	■

IO02 2 Puls option	Part no. 50986	Operation	
		Local	Remote
Function			
2 impulse outputs 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	■	■

2

Installation

Front-panel cut-out

E78242

3
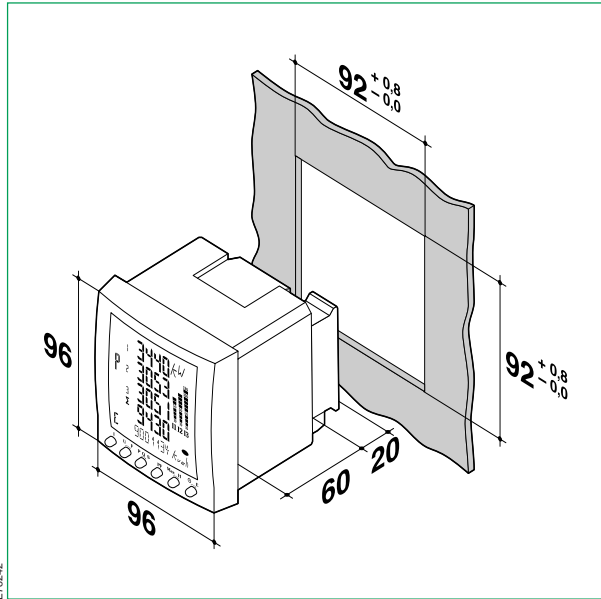
Recommendations :
• avoid proximity with systems generating electromagnetic disturbances.
• avoid vibrations with accelerations greater than 1 G for frequencies under 60 Hz.

Mounting

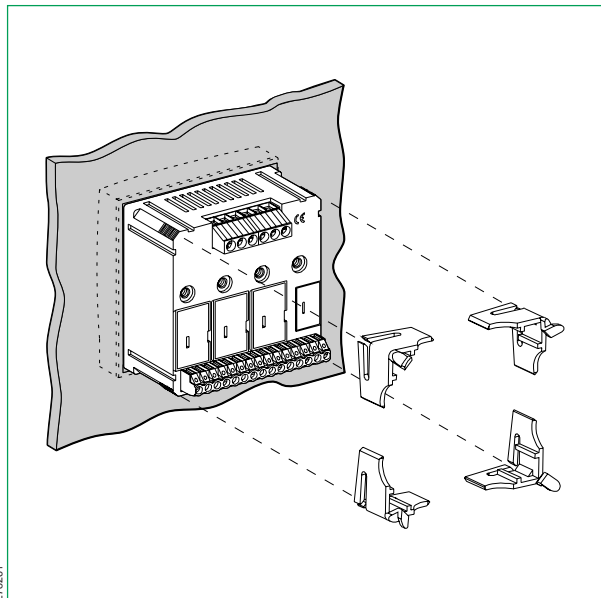No special tools are required to mount the PM500. Simply remove the four clips, insert the PM500 through the cut-out and refit the four clips, pressing them tight against the sheet metal to obtain a spring effect.

E78261

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.

Note:
The maximum tightening torque for each screw is 0.4 Nm.

S1 S2 S1 S2 S1 S2
I1 I2 I3
Option Option Option Option
V1 V2 V3 VN A U X
Protection
(AC/DC)

E78243
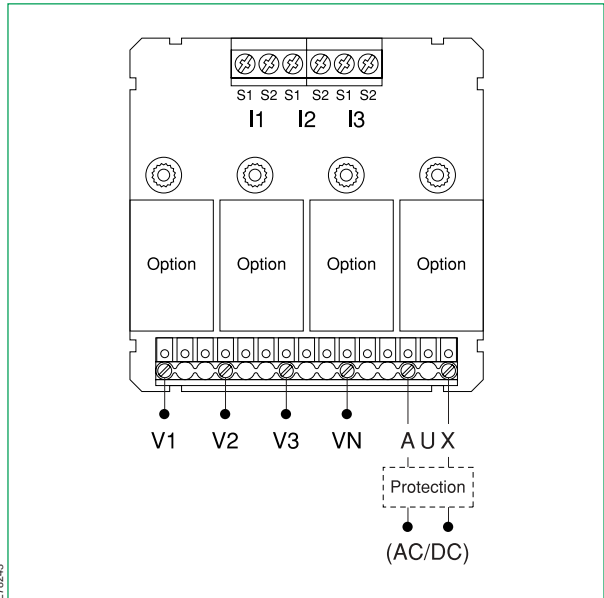
> **Recommendations:**
> *To avoid damaging the device, check the following before making any connections:*
> *• the voltage of the auxiliary power (AUX),*
> *• the frequency of the distribution system (50 or 60 Hz),*
> *• the maximum voltage across the voltage-input terminals, (V1, V2, V3 and VN) 480 V AC phase-to-phase or 300 V AC phase-to-neutral,*
> *• a maximum current of 20 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.

PM500 connections
Distribution systems up to 480 volts

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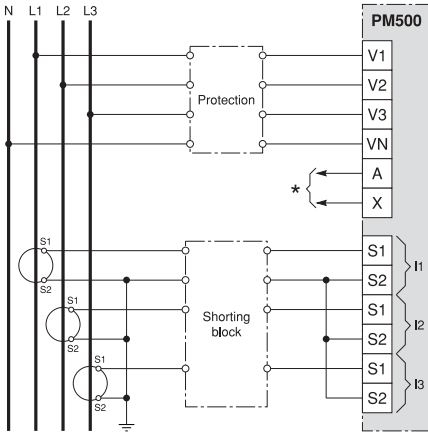
Balanced 3-phase 4-wire system: 4 1CT

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

Balanced 3-phase 3-wire system: 3 1CT
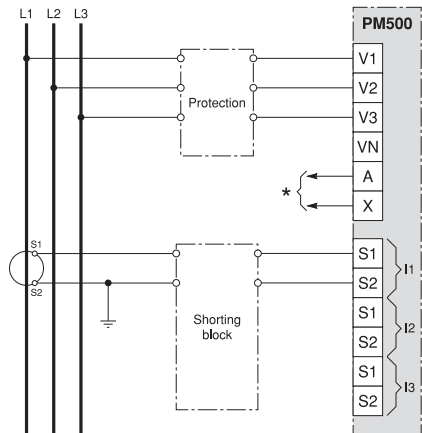
* see page 87.

Recommendation:
• the voltage-input protection devices must be rated for the short-circuit current at the connection points
• when connecting PM500 current inputs, always short the secondaries of each current transformer. This can be done easily using the shorting block.

PM500 connections
Distribution systems up to 480 volts (cont.)

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

Note:
- *the solution with two CTs reduces by 0.5 % the accuracy on the phase from which the current is deduced*
- *always respect the direction of current flow in the CT primary:*
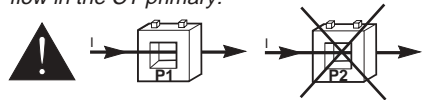
Two-phase 2-wire system: 2 1CT
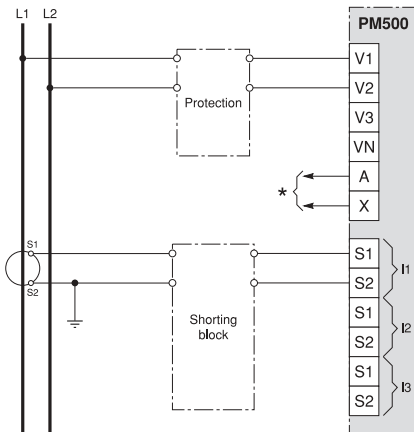
Single-phase 2-wire system: 1 1CT
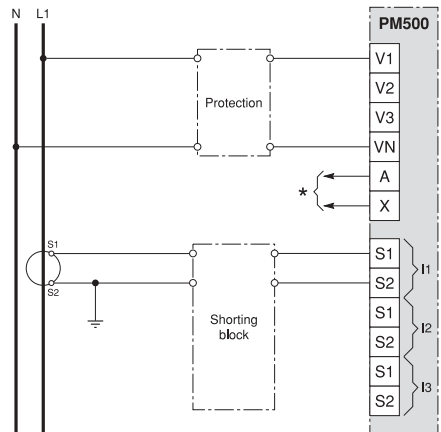
* see page 87.

Recommendation:
- *the voltage-input protection devices must be rated for the short-circuit current at the connection points*
- *when connecting PM500 current inputs, always short the secondaries of each current transformer. This can be done easily using the shorting block.*
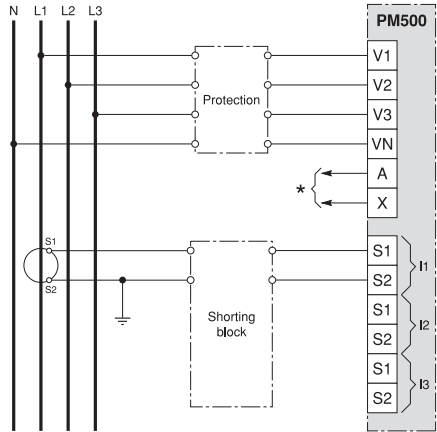
PM500 connections
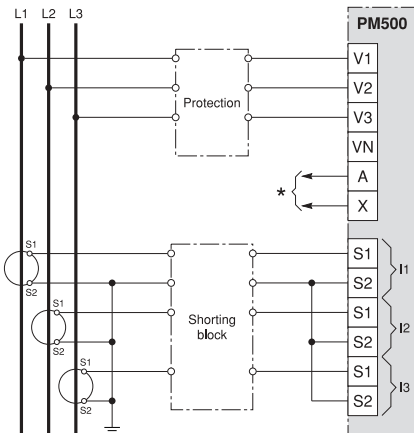## Distribution systems over 480 volts

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 87.

Recommendation:
• the voltage-input protection devices must be rated for the short-circuit current at the connection points
• when connecting PM500 current inputs, always short the secondaries of each current transformer. This can be done easily using the shorting block.

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

Note:
• the solution with two CTs reduces by 0.5 % the accuracy on the phase from which the current is deduced
• always respect the direction of current flow in the CT primary:

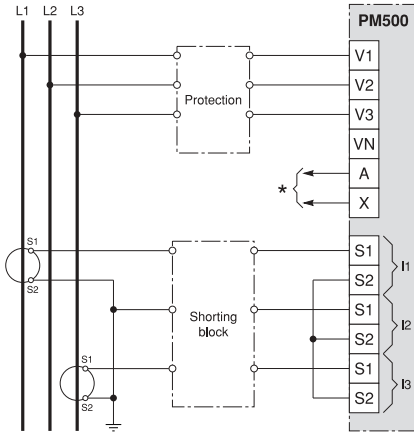### Unbalanced 3-phase 3-wire system: 3 2-3CT
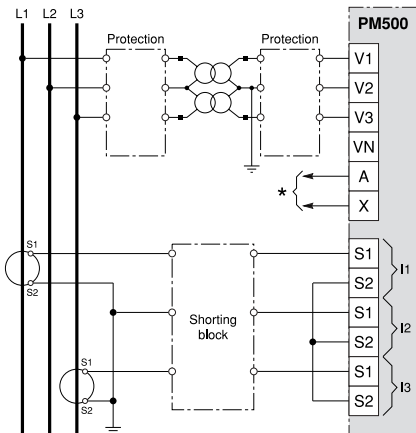
* see page 87.

Recommendation:
• the voltage-input protection devices must be rated for the short-circuit current at the connection points
• when connecting PM500 current inputs, always short the secondaries of each current transformer. This can be done easily using the shorting block.

Connection of the optional modules

IO11 Puls option

IO11 Puls

Pulse 0 — 1, 2 — Pulse receiver

IN (∗) − 3 — (−)
IN (∗) + 4 — (+)
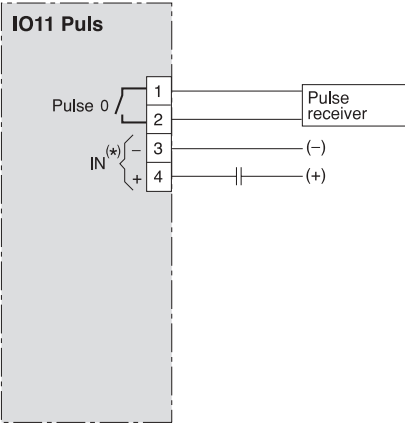
(∗) volt free (external power supply)

IO22 Alarm option

IO22 Alarm

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

IN 1 (∗) − 13 — (−)
IN 1 (∗) + 14 — (+)
IN 2 (∗) − 15 — (−)
IN 2 (∗) + 16 — (+)
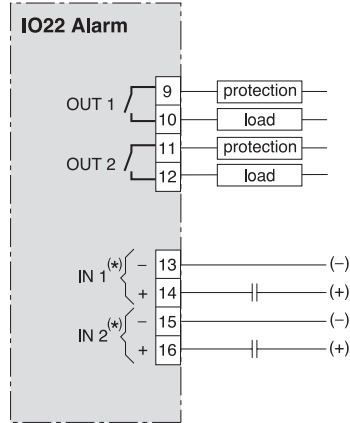
(∗) volt free (external power supply)

> **Recommendation:**
> *To avoid damaging the modules, check the operating limits (page 151) before making any connections.*

RS485 Modbus option

RS485 Modbus

2-wire link to other slave or master

0V — Common
− — L+ (A/A') D0
+ — L- (B/B') D1

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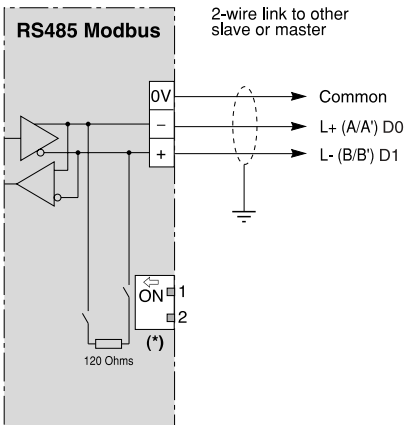
(∗) Flip switches 1 and 2 as indicated by the arrow
to insert the 120 Ω line-termination resistor.

IO02 2 Puls option

IO02 2 Puls

Pulse 1 — 17, 18 — Pulse receiver
Pulse 2 — 19, 20 — Pulse receiver
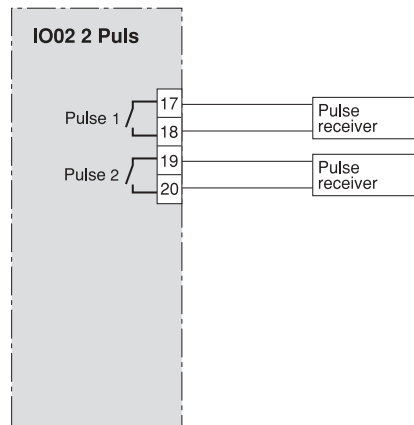
Note: *For more information on Modbus communication interfaces, see the Schneider Electric Modbus Network Guide.*

Connection of the optional modules

AO20 4-20mA option
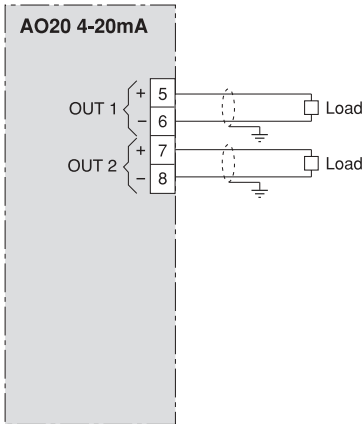
AO20 4-20mA

OUT 1	+	5	Load
	−	6	
OUT 2	+	7	Load
	−	8	

4

Recommendation:
*To avoid damaging the modules, check the operating limits
(page 151) before making any connections.*

4

Operation

Energising
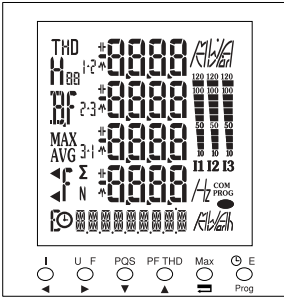
Display test screen
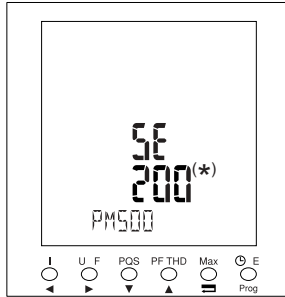
Product-version screen

(∗) product version
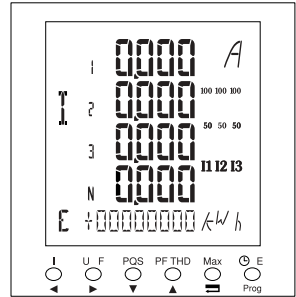
Welcome screen displaying values

5

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

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

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

Neutral, sum (Σ) and frequency (F)

Energy,
operating time
and pulses (optional)

Values

Units

Bar chart in % current per phase (continuous display)

Activity indicator on the communication bus

Energy-metering indicator
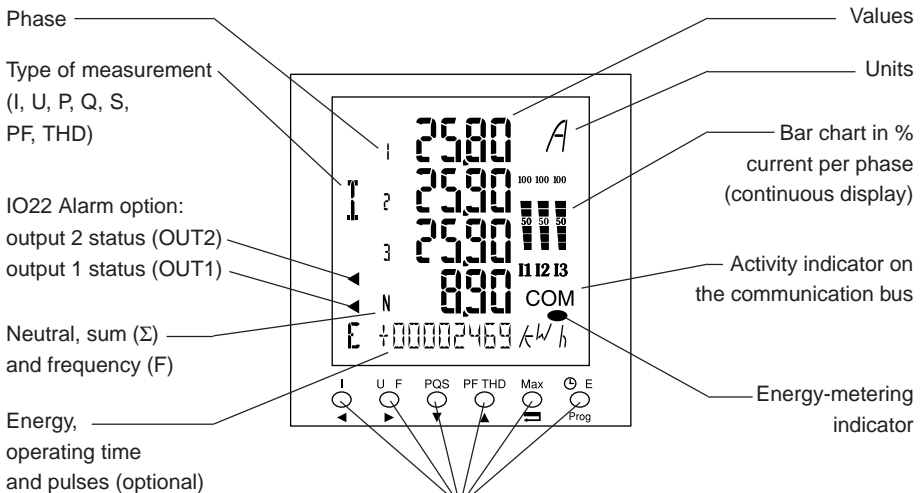
6 function buttons to easily view all values and modify device settings (see page 98)

Operation

Viewing measurements

Press successively to obtain:
■ instantaneous currents
■ demand currents (AVG)
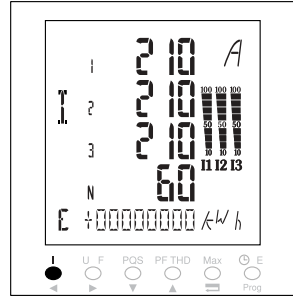
Press successively to obtain:
■ phase-to-phase voltages and frequency
■ phase-to-neutral voltages and frequency

For 3-wire systems, the phase-to-neutral voltages are not displayed.
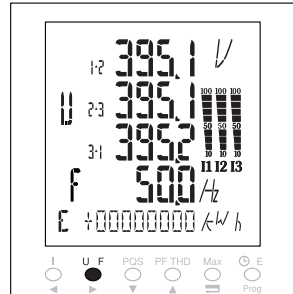
Press successively to obtain:
■ active power (P) per phase and total
■ reactive power (Q) per phase and total
■ apparent power (S) per phase and total
■ total demand active power (P AVG)
■ total demand reactive power (Q AVG)
■ total demand apparent power (S AVG)
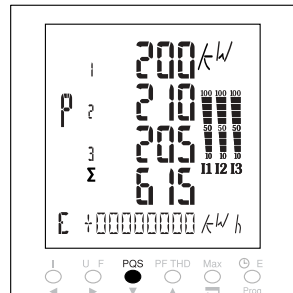
Note: *Display of certain values depends on device settings and the presence of the optional modules.*

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)
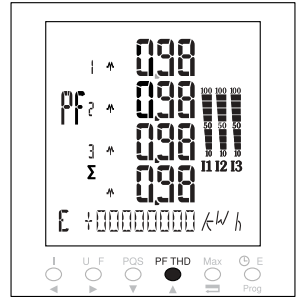
Max button:

Press successively to obtain:
- maximum demand currents (I MAX AVG)
- maximum demand active power (P MAX AVG)
- maximum demand reactive power (Q MAX AVG)
- maximum demand apparent power (S MAX AVG)
- maximum instantaneous current for highest phase (I MAX)
  maximum instantaneous neutral current (IN MAX)
- maximum ph-ph voltage for highest phase (U MAX)
  maximum frequency (F MAX)
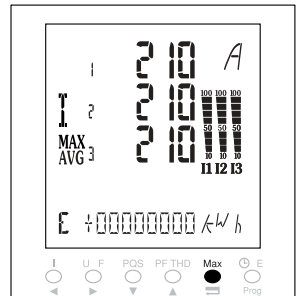
⊙ E button:

Press successively to obtain:
- active energy in (+)
- reactive energy in (+)
- apparent energy
- active energy out (-)
- reactive energy out (-)
- input pulse counter for IO11 Puls (C0)
- input 1 pulse counter for IO22 Alarm (C1)
- input 2 pulse counter for IO22 Alarm (C2)
- operating time (⊙)
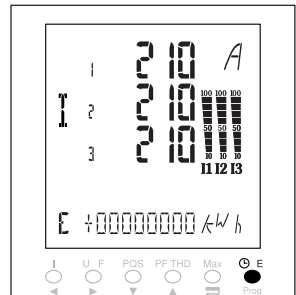
Note: Display of certain values depends on device settings and the presence of the optional modules.

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.

6

Start programming mode

FUNCTION BUTTONS	SCREEN

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

Enter code 100
■ *press ▶ once*

Confirm the code
■ *press ⇄ once*
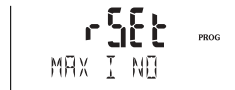
Programming
General (cont.)
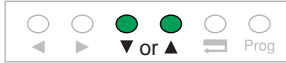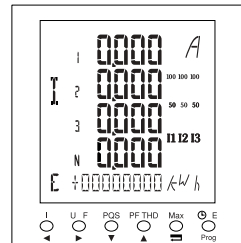
Programming
Resetting the maxi-meters

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
```
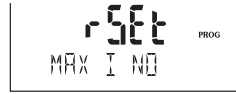
Reset a maxi-meter
■ *press* ▶ *once*

```
○ ● ○ ○ ○ ○
◀ ▶ ▼ ▲ ⇆ Prog
```

```
rSEt    PROG
     NO
```

6

Select a maxi-meter
■ *scroll through the choices*

```
○ ○ ● ● ○ ○
◀ ▶ ▼ or ▲ ⇆ Prog
```

```
rSEt    PROG
MAX↓P NO
```
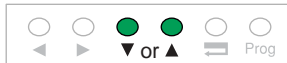
by pressing ▼ *or* ▲ *,*
choices:

MAX I	(maximum demand current) and (maximum instantaneous currents for optional IO22 Alarm module)
MAX U	(maximum phase-to-phase voltages for optional IO22 Alarm module)
MAX F	(maximum frequency for optional IO22 Alarm module)
C2	(input 2 pulse counter for optional IO22 Alarm module)
C1	(input 1 pulse counter for optional IO22 Alarm module)
C0	(input pulse counter for optional IO11 Puls 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)

■ *press* ▶ *once*

```
○ ● ○ ○ ○ ○
◀ ▶ ▼ ▲ ⇆ Prog
```

```
rSEt    PROG
MAX↓P
```

Select YES to enable resetting of the selected maxi-meter
■ *press* ▲ *once*

```
○ ○ ○ ● ○ ○
◀ ▶ ▼ ▲ ⇆ Prog
```

```
rSEt    PROG
MAX↓P YES
```

Confirm your choice
■ *press* ⇆ *once*

```
○ ○ ○ ○ ● ○
◀ ▶ ▼ ▲ ⇆ Prog
```

```
rSEt    PROG
MAX↓P YES
```

■ *press* ▼ *once to go on*
to the next parameter or exit
programming mode (see page 99)

```
○ ○ ● ○ ○ ○
◀ ▶ ▼ ▲ ⇆ Prog
```

Programming
Type of distribution system

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 distribution system
■ *press ▶ once*

```
 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

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

6
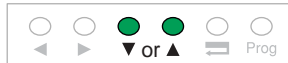
Note: *See the information on connections, pages 88 to 91.*

Confirm your choice
■ *press ▱ once*

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

■ *press ▼ once to go on to the next parameter or exit programming mode (see page 99)*

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
```

6

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

```
○ ● ○ ○ ○ ○
◀  ▶  ▼  ▲  ⇄  Prog
```

```
[ t          PROG
_ 0500/5
```

Set the values
■ *select the digit by pressing* ◀ *or* ▶
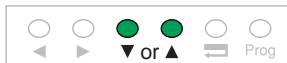
```
● ● ○ ○ ○ ○
◀ or ▶  ▼  ▲  ⇄  Prog
```

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

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

```
○ ○ ● ● ○ ○
◀  ▶  ▼ or ▲  ⇄  Prog
```

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

Confirm your choice
■ *press* ⇄ *once*

```
○ ○ ○ ○ ● ○
◀  ▶  ▼  ▲  ⇄  Prog
```

```
[ t          PROG
0 1500/5
```

■ *press* ▼ *once to go on to the next parameter or exit programming mode (see page 99)*

```
○ ○ ● ○ ○ ○
◀  ▶  ▼  ▲  ⇄  Prog
```

Note:
• *the first five digits set the current for the primary winding of the transformer (1 to 10000 A) and the last digit sets the current for the secondary winding (1 or 5 A).*
• *modification of the CT ratings requires resetting of the bar-chart scale with the new value of the primary winding (see page 106).*

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*

Ut
PROG

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

Ut
YES
PROG

Confirm your choice
■ *press 🔁 once*

Ut
YES
PROG

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

6

Programming
Voltage transformers (cont.)

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 000 100

6

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

○ ● ○ ○ ○ ○
◀ ▶ ▼ ▲ ⮐ Prog

Ut PROG
PR·_00 100

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

● ● ○ ○ ○ ○
◀ or ▶ ▼ ▲ ⮐ Prog

Ut PROG
PR 0_0000

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

○ ○ ● ● ○ ○
◀ ▶ ▼ or ▲ ⮐ Prog

Ut PROG
PR 020000

Note: The six digits set the voltage of the primary winding of the transformer (maximum 400 000 V).

Confirm your choice
■ *press* ⮐ *once*

○ ○ ○ ○ ● ○
◀ ▶ ▼ ▲ ⮐ Prog

Ut PROG
PR 020000

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

○ ○ ● ○ ○ ○
◀ ▶ ▼ ▲ ⮐ Prog

Programming
Voltage transformers (cont.)

Set the voltage for the secondary 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
SE  100
```

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

```
○  ●  ○  ○  ○  ○
◄  ▶  ▼  ▲  ⇄  Prog
```

```
Ut        PROG
SE ----
```

6

Set the voltage of the secondary winding
■ *scroll through the choices*
by pressing ▼ *or* ▲ *,*
  choices (in V): 100
                69 (120/$\sqrt{3}$)
                66 (115/$\sqrt{3}$)
                64 (110/$\sqrt{3}$)
                58 (100/$\sqrt{3}$)
                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 99)

```
○  ○  ●  ○  ○  ○
◄  ▶  ▼  ▲  ⇄  Prog
```

Programming
Bar-chart scale

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

```
bAr          PROG
00500
```

Modify the bar-chart scale
■ *press* ▶ *once*

```
○ ● ○ ○ ○ ○
◄ ► ▼ ▲ ⇄ Prog
```

```
bAr          PROG
00500
```

Enter the scale
■ *select the digit by pressing*
◄ *or* ▶
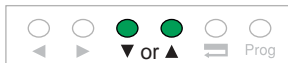
```
● ● ○ ○ ○ ○
◄ or ►  ▼ ▲ ⇄ Prog
```

```
bAr          PROG
00500
```

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

```
○ ○ ● ● ○ ○
◄ ► ▼ or ▲ ⇄ Prog
```

```
bAr          PROG
00400
```

Confirm your choice
■ *press* ⇄ *once*

```
○ ○ ○ ○ ● ○
◄ ► ▼ ▲ ⇄ Prog
```

```
bAr          PROG
00400
```

■ *press* ▼ *once to go on*
to the next parameter or exit
programming mode
(see page 99)

```
○ ○ ● ○ ○ ○
◄ ► ▼ ▲ ⇄ Prog
```

6

Note: The above programming can only be done after choosing the CT ratings (see page 102).

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
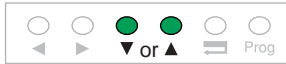
PF PROG

6

Confirm your choice
■ *press* ⬅ *once*

PF PROG
IEEE

■ *press* ▼ *once to go on to the next parameter or exit programming mode (see page 99)*

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 IME
PROG
I 15

Modify the calculation interval
■ *press* ▶ *once*

◯ ● ◯ ◯ ◯ ◯
◄ ▶ ▼ ▲ ⇆ Prog

AVG
t.IME
PROG
I -----

6

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 IME
PROG
I -20-

Confirm your choice
■ *press* ⇆ *once*

◯ ◯ ◯ ◯ ● ◯
◄ ▶ ▼ ▲ ⇆ Prog

AVG
t IME
PROG
I 20

■ *press* ▼ *once to go on to the next parameter or exit programming mode (see page 99)*

◯ ◯ ● ◯ ◯ ◯
◄ ▶ ▼ ▲ ⇆ Prog
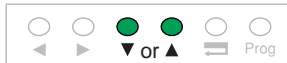
Note: EXT is displayed if the optional IO11 Puls module is connected. The calculation interval is determined by an external pulse.

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 IɳE        PROG
P/Q/5   15
```

Modify the calculation interval
■ *press* ▶ *once*

```
○ ● ○ ○ ○ ○
◄ ► ▼ ▲ ⇌ Prog
```

```
AVG
  t IɳE        PROG
P/Q/5 - - -
```

6

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 IɳE        PROG
P/Q/5  30
```

Confirm your choice
■ *press* ⇌ *once*

```
○ ○ ○ ○ ● ○
◄ ► ▼ ▲ ⇌ Prog
```

```
AVG
  t IɳE        PROG
P/Q/5  30
```

■ *press* ▼ *once to go on to the next parameter or exit programming mode*

```
○ ○ ● ○ ○ ○
◄ ► ▼ ▲ ⇌ Prog
```

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

The programming procedure is identical for outputs E0 (IO11 Puls), E1 and E2 (IO02 2 Puls).

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
  E0        PROG
EA+
```

6

Modify the assignment
■ *press ▶ once*

```
Out E
  E0        PROG
. . . . .
```

Select the desired energy
■ *scroll through the choices*
  by pressing ▼ or ▲ ,
  choices: EA+
         ER-
         EA-
         ES
         ER+
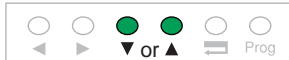
```
Out E
  E0        PROG
ER-
```

Confirm your choice
■ *press ▭ once*

■ *press ▼ once to go on*
to the next parameter
(value of the pulse)

```
Out E
  E0        PROG
ER-
```

Programming

Value of the pulse

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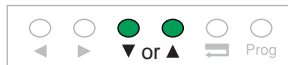parameter. To change the
setting, proceed as follows:

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

Select the desired value
■ *scroll through the choices*

by pressing ▼ *or* ▲ *,*
choices: 10 (k)
1
0.1
10000
1000
100
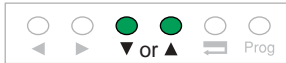
Confirm your choice
■ *press* ⇄ *once*

■ *press* ▼ *once to go on*
to the next parameter
(duration of the pulse)

6

Note: *the value of the pulse must be chosen so that there is never more than 1 pulse/*
second.

Duration of the pulse

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
   EO
DUR  100
PROG
```

6

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

```
OutE
   EO
DUR - [O
PROG
```

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

```
OutE
   EO
DUR - 300
PROG
```

Confirm your choice
■ *press* ⇆ *once*

■ *press* ▼ *once to go on*
to the next parameter or exit
programming mode
(see page 99)

```
OutE
   EO
DUR  300
PROG
```

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:

```
    ┌ ┌ ┌┐
    │ │ │ │      PROG
    ┘ └ └┘
ADR   001
```

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

```
○ ● ○ ○ ○ ○
◄ ► ▼ ▲ ⇄ Prog
```

```
    ┌ ┌ ┌┐
    │ │ │ │      PROG
    ┘ └ └┘
ADR - 001
```

6

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

```
○ ○ ● ● ○ ○
◄ ► ▼ or ▲ ⇄ Prog
```

```
    ┌ ┌ ┌┐
    │ │ │ │      PROG
    ┘ └ └┘
ADR - 201
```

Confirm your choice
■ *press ⇄ once*

```
○ ○ ○ ○ ● ○
◄ ► ▼ ▲ ⇄ Prog
```

```
    ┌ ┌ ┌┐
    │ │ │ │      PROG
    ┘ └ └┘
ADR  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
```

6

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

Parity

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:

```
 ___
|   |  PROG
|___|
PAR  NO
```

Modify the parity
■ *press ▶ once*

◁ ●▶ ▽ △ ⇄ Prog

```
 ___
|   |  PROG
|___|
PAR
```

Select the parity
■ *scroll through the choices*

by pressing ▼ or ▲ ,
choices: NO   (no parity)
       EVEN (even parity)
       ODD   (odd parity)

◁ ▷ ●▼ or ●▲ ⇄ Prog

```
 ___
|   |  PROG
|___|
PAR  EVEN
```

Confirm your choice
■ *press ⇄ once*

◁ ▷ ▽ △ ●⇄ Prog

```
 ___
|   |  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:

```
 CON
        PROG
STOP 1
```

6

Modify the stop bit
■ *press ▶ once*

```
○ ● ○ ○ ○ ○
◄ ► ▼ ▲ ⇐ Prog
```

```
 CON
        PROG
STOP
```

Select the number of stop bits
■ *scroll through the choices*
  by pressing ▼ or ▲ ,
  choices: 1
            2

```
○ ○ ● ● ○ ○
◄ ► ▼ or ▲ ⇐ Prog
```

```
 CON
        PROG
STOP 2
```

Confirm your choice
■ *press ⇐ once*

```
○ ○ ○ ○ ● ○
◄ ► ▼ ▲ ⇐ Prog
```

```
 CON
        PROG
STOP 2
```

■ *press ▼ once to go on*
to the next parameter or exit
programming mode
(see page 99)

```
○ ○ ● ○ ○ ○
◄ ► ▼ ▲ ⇐ Prog
```

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

Type of analogue output

The default setting is 4-20mA. If this is correct, simply press ▼ to go on to the next parameter. To change the setting, proceed as follows:

```
Out 1
20mA        PROG
TYPE 4/20
```

Modify the type of analogue output
■ *press* ▶ *once*

```
Out 1
20mA        PROG
TYPE ----
```

Select the type
■ *scroll through the choices by pressing* ▼ *or* ▲ ,

  choices: 0-20mA
           4-20mA
           Pwr*

```
Out 1
20mA        PROG
TYPE 0/20
```

* When set to Pwr mode, the output can be used to power the volt-free inputs of the IO11 and IO22 modules.

Confirm your choice
■ *press* ⇄ *once*

```
Out 1
20mA        PROG
TYPE 0/20
```

■ *press* ▼ *once to go on to the next parameter (assignment of the analogue output)*

6

Programming
Optional AO20 4-20mA module (cont.)

Assignment of the analogue output

The default setting is I1.
If this is correct, simply
press ▼ to go on to the next
parameter. To change the
setting, proceed as follows:

```
Out1
20mA        PROG
    I1
```

6

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

○ ● ○ ○ ○ ○
◄ ▶ ▼ ▲ ⮂ Prog

```
Out1
20mA        PROG
  ˙˙˙
```

Select a parameter
■ *scroll through the choices*
   by pressing ▼ *or* ▲ *,*
   choices: I1
               I2
               I3
               IN
               U12
               U23
               U31
               V1
               V2
               V3
               ΣP
               ΣQ
               ΣS
               ΣPFL
               F
               ΣPFC

○ ○ ● ● ○ ○
◄ ▶ ▼ or ▲ ⮂ Prog

```
Out1
20mA        PROG
  I2
```

Confirm your choice
■ *press* ⮂ *once*

○ ○ ○ ○ ● ○
◄ ▶ ▼ ▲ ⮂ Prog

```
Out1
20mA        PROG
    I2
```

■ *press* ▼ *once to go on*
to the next parameter (value
at 0 or 4 mA (LV))

○ ○ ● ○ ○ ○
◄ ▶ ▼ ▲ ⮂ Prog

Programming
Optional AO20 4-20mA module (cont.)

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

```
Out 1
20mA
LV 0000 K  A   PROG
```
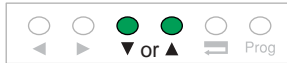
Modify the value
■ *select the digit by pressing*
▶ *once*

```
Out 1
20mA
LV  000 K  A   PROG
```

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

```
Out 1
20mA
LV  1000 K  A   PROG
```

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

```
Out 1
20mA
LV 1000   A   PROG
```

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

```
Out 1
20mA
LV 1000 /  A   PROG
```

Confirm your choice
■ *press ⇆ once*

```
Out 1
20mA
LV 1000 /  A   PROG
```

■ *press ▼ once to go on*
to the next parameter (value
20 mA HV)

6

*Note: When the output is assigned to a signed value (ΣP and ΣQ), the value at 0 or 4 mA
(LV) is negative.*

Value 20 mA (HV)

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

```
Out1
20mA      PROG
HV  0000 K   A
```

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

```
Out1
20mA      PROG
HV  _000 K   A
```

6

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

```
Out1
20mA      PROG
HV  2000 K   A
```

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

```
Out1
20mA      PROG
HV  2000 -   A
```

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

```
Out1
20mA      PROG
HV  2000 /   A
```

Confirm your choice
■ *press* ⟵ *once*

```
Out1
20mA      PROG
HV  2000 /   A
```

■ *press* ▼ *once to go on*
to the next parameter or exit
programming mode

The programming procedure is identical for outputs 1 (OUT 1) and 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:
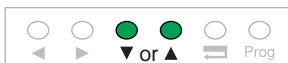
```
Out 1
A-Cd      PROG
CdE
```

Modify the assignment
■ *press* ▶ *once*

```
Out 1
A-Cd      PROG
```

6

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

▼ or ▲

```
Out 1
A-Cd      PROG
```

Confirm your choice
■ *press* ⬲ *once*

```
Out 1
A-Cd      PROG
```

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

Programming
Optional IO22 Alarm module (cont.)

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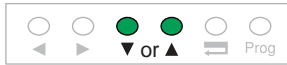
Modify the high threshold
■ *select the digit by pressing*
▶ *once*

```
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
```

Programming
Optional IO22 Alarm module (cont.)

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:

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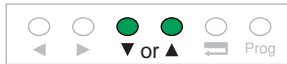- *select the digit by pressing*
▶ *once*

Set the value (0 to 9999)
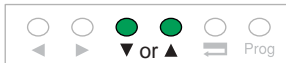- *decrement* ▼ *or increment*
▲ *the value*
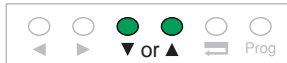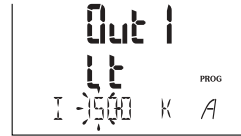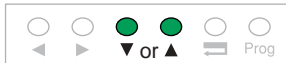
Modify the scale factor
- *select the digit by pressing*
▶ *once*

Set the scale factor
- *scroll through the choices*
  by pressing ▼ *or* ▲ *,*
  choices: / (x 1)
          K (x 1000)
          M (x 1000000)
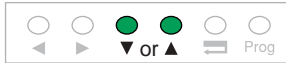
Confirm your choice
- *press* ⇄ *once*

- *press* ▼ *once to go on*
to the next parameter
(hysteresis)

6

Programming
Optional IO22 Alarm module (cont.)

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
```

6

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 ⸎⸎0
```

Confirm your choice
■ *press* ▭ *once*

```
  Out 1

              PROG
HYST   10
```
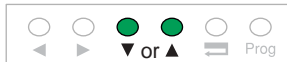
■ *press* ▼ *once to go on*
to the next parameter
(time delay)

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*

```
Out 1

                    PROG
DELAY 0̲0̲
```

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

```
Out 1

                    PROG
DELAY 0̲0̲
```
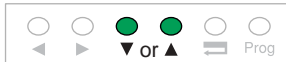
Confirm your choice
■ *press* ▭ *once*

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

```
Out 1

                    PROG
DELAY 0 0
```

6

Programming
Optional IO22 Alarm module (cont.)

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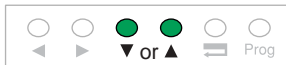If this is correct, simply press ▼ to go on to the next parameter. To change the setting, proceed as follows:

```
Out 1
                    PROG
RELAY NO
```

6

Modify the operating mode
■ *press ▶ once*

```
○ ● ○ ○ ○ ○
◄ ▶ ▼ ▲ ⊐ Prog
```

```
Out 1
                    PROG
RELAY ⁝⁝⁝⁝
```

Set the mode
■ *scroll through the choices*
   by pressing ▼ or ▲ ,
   choices: NO (normally open)
              NC (normally closed)
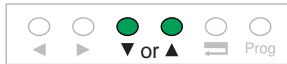
```
○ ○ ● ● ○ ○
◄ ▶ ▼ or ▲ ⊐ Prog
```

```
Out 1
                    PROG
RELAY ⁝NC⁝
```

Confirm your choice
■ *press ⊐ once*

```
○ ○ ○ ○ ● ○
◄ ▶ ▼ ▲ ⊐ Prog
```

```
Out 1
                    PROG
RELAY NC
```

■ *press ▼ once to go on*
to the next parameter or exit
programming mode
(see page 99)

```
○ ○ ● ○ ○ ○
◄ ▶ ▼ ▲ ⊐ Prog
```

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.

7

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

Recommendation:
To ensure correct operation of the RS485 Modbus option, set the master TimeOut (supervisor) to the minimum value (250 ms).

Modbus communication

Functions

Access to tables of registers

Modbus register no.	JBus decimal address	Type of data	Format	Modbus function
513 … 573	512 … 572	Programming parameters	16 bits 32 bits	Read N words (3) Write 1 word (6) Write N words (16)
769 … 915	768 … 914	Measurements (not incl. THD)	32 bits	Read N words (3)
1025	1024	Initialisation of maxi-meters, mini-meters, counters and alarms	16 bits	Read N words (3) Write 1 word (6) Write N words (16)
1281 … 1338	1280 … 1337	Alarms, alarm histories and status of inputs and outputs	16 bits 32 bits	Read N words (3)
1537	1536	Backup of programming parameters	16 bits	Read N words (3) Write 1 word (6) Write N words (16)
2305 … 2320	2304 … 2319	THD values	16 bits	Read N words (3)
64647 … 64652	64646 … 64651	Identification of PM500 and optional modules	16 bits	Read N words (3)

Note: *the RS485 option accepts diffusion requests.*

Special case of data in 32-bit format (2 words)

■ organisation :
- register n: most significant bits;
- register n + 1: least significant bits.
■ access: The requests must concern the two words.
An attempt to read/write data coded over two words with a request to read/write one word results in a PM500 exception message.

Modbus diagnostics - functions

Function code	Subfunction	Description
8	1 to 6	Management of diagnostic counters

Modbus communication

Programming parameters

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	Secondary 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..400000])	V
518	206	1	Secondary winding of voltage transformer (Ut): 58: $100/\sqrt{3}$ V 64: $110/\sqrt{3}$ V 66: $115/\sqrt{3}$ V 69: $120/\sqrt{3}$ 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

7

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 Puls: type of energy for pulse output (Out E E0): 0: kWh + 1: kvarh + 2: kVAh 3: kWh – 4: kvarh -	-
522[1]	20A	1	IO11 Puls: value of pulse (Out E E0 Val): 0: 1/10 1: 1 2: 10 3: 100 4: 1000 5: 10000	kWh kvarh kVAh
523[1]	20B	1	IO11 Puls: duration of pulse (Out E E0 Dur): 1: 100 2: 200 3: 300 4: 400 5: 500 6: 600 7: 700 8: 800 9: 900	ms

[   ] Default value

7

Decimal address	Hexadecimal address	Number of words	Description	Units
527	20F	1	Power-factor sign convention: 0: IEC 1: IEEE	-
530	212	1	Bar-chart scale in current (interval [1..10000]): Default value: 500	A
539[4]	21B	1	AO20 4-20mA: type of output 1 (Out 1 20mA): 0: 0-20 mA 1: 4-20 mA 2: Pwr	-
540[4]	21C	1	AO20 4-20mA: assignment of output 1 (Out 1 20mA): 0: I1 (units: A or kA) 1: I2 (units: A or kA) 2: I3 (units: A or kA) 3: IN (units: A or kA) 4: U12 (units: V or kV) 5: U23 (units: V or kV) 6: U31 (units: V or kV) 7: ΣP (units: kW or MW) 8: ΣQ (units: kvar or Mvar) 9: ΣS (units: kVA or MVA) 10: ΣPFL (units: 0.001) 11: V1 (units: V or kV) 12: V2 (units: V or kV) 13: V3 (units: V or kV) 14: F (units: Hz/10) 15: ΣPFC (units: 0.001)	-
541[4][5]	21D	1	AO20 4-20mA: value at 0 or 4 mA (Out 1 20mA LV) (interval [0..9999]): Default value: 0	Dependent on settings
542[4]	21E	1	AO20 4-20mA: scale factor value at 0 or 4 mA (Out 1 20mA): 0: x 1 1: x 1000 2: x 1000000	Dependent on settings

☐ Default value

Decimal address	Hexadecimal address	Number of words	Description	Units
543[5]	21F	1	AO20 4-20mA: value at 20 mA (Out 1 20mA HV) (interval [0..9999]): Default value: 500	Dependent on settings
544[4]	220	1	AO20 4-20mA: scale factor of value at 20 mA (Out 1 20mA): 0: x 1 1: x 1000 2: x 1000000	Dependent on settings
545[4]	221	1	AO20 4-20mA: type of output 2 (Out 2 20mA): 0: 0-20 mA 1: 4-20 mA 2: Pwr	-
546[4]	222	1	AO20 4-20mA: assignment of output 2 (Out 2 20mA): 0: I1 (units: A or kA) 1: I2 (units: A or kA) 2: I3 (units: A or kA) 3: IN (units: A or kA) 4: U12 (units: V or kV) 5: U23 (units: V or kV) 6: U31 (units: V or kV) 7: ΣP (units: kW or MW) 8: ΣQ (units: kvar or Mvar) 9: ΣS (units: kVA or MVA) 10: ΣPFL (units: 0.001) 11: V1 (units: V or kV) 12: V2 (units: V or kV) 13: V3 (units: V or kV) 14: F (units: Hz/10) 15: ΣPFC (units: 0.001)	-
547[4][5]	223	1	AO20 4-20m: value at 0 or 4 mA (Out 2 20mA LV) (interval [0..9999]): Default value: 0	Dependent on settings
548[4]	224	1	AO20 4-20mA: scale factor of value at 0 or 4 mA (Out 2 20mA): 0: x 1 1: x 1000 2: x 1000000	Dependent on settings

[ ] Default value

Decimal address	Hexadecimal address	Number of words	Description	Units
549[4]	225	1	AO20 4-20mA: value at 20 mA (Out 2 20mA HV) (interval [0..9999]): Default value: 500	Dependent on settings
550[4]	226	1	AO20 4-20mA: scale factor of value at 20 mA (Out 2 20mA): 0: x 1 1: x 1000 2: x 1000000	Dependent on settings
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: SP (units: kW or MW) 4: SQ (units: kvar or Mvar) 5: SS (units: kVA or MVA) 6: F (units: Hz/10) 7: SPF (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: %) 15: AVG I (units: A or kA) 16: AVG IN (units: A or kA) 17: AVG ΣP (units: kW or MW) 18: AVG ΣQ (units: kvar or Mvar) 19: AVG ΣS (units: kVA or MVA)	-
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

 ☐ Default value

Decimal address	Hexadecimal address	Number of words	Description	Units
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
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 address 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])	%

7

Default value

Decimal address	Hexadecimal address	Number of words	Description	Units
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	-
567[6]	237	1	IO02 2 Puls: type of energy for pulse output (Out E E1) : $\boxed{\text{0: kWh +}}$ 1: kvarh + 2: kVAh 3: kWh – 4: kvarh -	-
568[6]	238	1	IO02 2 Puls: value of pulse (Out E E1 Val): 0: 1/10 $\boxed{\text{1: 1}}$ 2: 10 3: 100 4: 1000 5: 10000	kWh kvarh kVAh
569[6]	239	1	IO02 2 Puls: duration of pulse (Out E E1 Dur): $\boxed{\text{1: 100}}$ 2: 200 3: 300 4: 400 5: 500 6: 600 7: 700 8: 800 9: 900	ms

7

☐ Default value

Decimal address	Hexadecimal address	Number of words	Description	Units
570[6]	23A	1	IO02 2 Puls: type of energy for pulse output (Out E E2): 0: kWh + 1: kvarh + 2: kVAh 3: kWh – 4: kvarh -	-
571[6]	23B	1	IO02 2 Puls: value of pulse (Out E E2 Val): 0: 1/10 1: 1 2: 10 3: 100 4: 1000 5: 10000	kWh kvarh kVAh
572[6]	23C	1	IO02 2 Puls : duration of pulse (Out E E2 Dur): 1: 100 2: 200 3: 300 4: 400 5: 500 6: 600 7: 700 8: 800 9: 900	ms

[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..10000],
if the secondary winding of the current transformer is set to 5 A, the interval values are [5..10000] 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.

[4] register not filled in if AO20 4-20mA module is not installed.

[5] when the output is assigned to a signed value (ΣP and ΣQ), the value set toat 0 or 4 mA (LV) is negative.

[6] register not filled in if IO02 2 Puls module is not installed.

[ ] Default value

Modbus communication
Backup of programming parameters

PM500 programming parameters may be modified via the Modbus communication port:

■ write the new parameters in registers 513 to 573;

■ save the programming parameters.

The PM500 resets and takes into account the new parameters.

Decimal address	Hexadecimal address	Number of words	Description
1536	600	1	Write 0: backup of programming parameters

7

Warning:
Before backing up the new data, make sure there are no inconsistencies in the new parameters.

Modbus communication

Measurements (not including THD)

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 ±	kW/100
792	318	2	ΣQ: total reactive power ±	kvar/100
794	31A	2	ΣS: total apparent power	kVA/100
798	31E	2	P1: active power, phase 1 ±	kW/100
800	320	2	P2: active power, phase 2 ±	kW/100
802	322	2	P3: active power, phase 3 ±	kW/100
804	324	2	Q1: reactive power, phase 1 ±	kvar/100
806	326	2	Q2: reactive power, phase 2 ±	kvar/100
808	328	2	Q3: reactive power, phase 3 ±	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 : puissance apparente moyenne totale	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 ±	kW/100
882	372	2	ΣQ AVG: total demand reactive power ±	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 ±	kW/100
898[1]	382	2	Q MIN: minimum reactive power ±	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 ±	kW/100
912[1]	390	2	Q MAX: maximum total reactive power ±	kvar/100
914[2]	392	2	C0: input 0 pulse counter	-

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

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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 144.

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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 of words	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 144.

Modbus communication

Alarms and input/outputs (cont.)

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 144.
[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.)

Alarm type codes

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
I1 AVG (units: mA)	29
I2 AVG (units: mA)	30
I3 AVG (units: mA)	31
IN AVG (units: mA)	32
ΣP AVG (units: kW/100)	33
ΣQ AVG (units: kvar/100)	34
ΣS AVG (units: kVA/100)	35

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.

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Decimal address	Hexadecimal address	Number of words	Description (value in hexadecimal format)
1024	400	1	Initialisation of: 0: no initialisation 1: maximum demand current (address &346, &348, &34A, &374) 2: P MAX AVG+ (address &34C) 4: P MAX AVG- (address &34E) 8: Q MAX AVG+ (address &350) 10: Q MAX AVG- (address &352) 20: S MAX AVG (address &354) 40: Operating-time counter (address &356) 80: Ea+ kWh (address &358) 100: Er+ kvarh (address &35A) 200: Es kVAh (address &35C) 400: Ea- kWh (address &35E) 800: Er- kvarh (address &360) 1000: all MAX AVG, Operating-time counter and energy values 2000: C1 (address &362) 4000: C2 (address &364) 4001: C0 (address &392) 8001: Min and Max I and IN (address &376, &378, &384, &386) 8002: Min and Max U (address &37A, &388) 8004: Min and Max frequency (address &37C, &38A) 8008: Min and Max PF (address &37E, &38C) 8010: Min and Max P (address&380, &38E) 8020: Min and Max Q (address &382, &390) 8040: Min and Max THD I, THD IN (address &90A, &90B, &90D, &90E) 8080: Min and Max THD U (address &90C, &90F) 8100: all min. and max. instantaneous measurements 8201: active alarm and history registers output 1 (OUT 1) 8202: active alarm and history registers output 2 (OUT 2) 8203: active alarm and history registers outputs 1 and 2 (OUT 1 and 2)

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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	-
64650[(1)]	FC8A	2	PM500 version	-

[(1)] the PM500 product version is coded in decimal format. For example, 200 signifies version 2.00

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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
Bit 3: AO20 4-20mA module	0: not installed 1: installed
Bit 4: IO02 2 Puls module	0: not installed 1: installed

Trouble-shooting

Problem	Probable cause	Solution
Nothing appears on the display after the Power Meter is turned on	The Power Meter may not be receiving power with the required characteristics	Check that the power received at the "AUX" auxiliary supply terminals of the Power Meter has the following characteristics: ■ cat. no. 50980 : 110 to 400 V AC ±10 % or 120 to 350 V DC ±20 % ■ cat. no. 50981: 24 to 48 V DC ±20 %
The voltage values are zero	The device protecting the voltage measurement inputs is open	Check the device protecting the voltage measurement inputs
	No voltage on the measurement input terminals	Check the presence of Power Meter voltages V1, V2, V3, VN using a multimeter
The current values are zero	The CT secondaries are shorted	Remove the bars used to short the CT secondaries or open the shorting block
	Primary current absent or insufficient	The minimum current on the CT secondary must be > 25 mA
The data displayed are inexact or do not correspond to the expected values	The CT transformer ratio, chosen according to the rated current of the load, and the value programmed do not correspond	Check the programmed CT ratio
	Incorrect configuration values	Check that the correct values have been entered for the Power Meter configuration parameters (type of distribution system, CTs, VTs, power factor convention, etc.). See instructions in the "Programming" section of the manual
	Incorrect voltage measurement inputs	Check the presence of Power Meter voltages V1, V2, V3, VN and that their values are within the permissible tolerances
	Incorrect current measurement inputs	Check phase concordance on the CTs and VTs. Check that the current in the CTs flows in the direction P1 to P2. Check that the bars used to short the CT secondaries are not present or open the shorting block. See the "PM500 connection" section of the manual.
The total power values are incorrect	CTs and/or VTs not connected properly	Check phase concordance on the CTs and VTs. Check that the current in the CTs flows in the direction P1 to P2
	The wiring does not correspond to the type of distribution system programmed	Check the type of distribution system programmed (see the "Programming" section of the manual)

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Trouble-shooting

Problem	Probable cause	Solution
The power per phase values are incorrect	CTs and/or VTs not connected properly	Check phase concordance on the CTs and VTs. Check that the current in the CTs flows in the direction P1 to P2
The reactive power value is much higher than expected	Excessive THD in the installation	Reduce the THD (for example by installing harmonic filters)
No communication with Power Meter	The RS485 connection is not properly wired	Respect standard EIA485 (characteristic impedance of the communication cable, 2-wire or 4-wire medium, load, termination and bias resistors, etc.
	The TimeOut value is too short	Set the TimeOut of the master (supervisor) to at least 250 ms
	Incorrect Power Meter address	Make sure the addresses have been properly assigned (master-slave)
	Incorrect Power Meter communication speed (transmission rate) setting	Make sure the Power Meter transmission rate is the same as that of all the other devices connected to the communication link. See instructions in the "Programming" section of the manual.
	Incorrect Power Meter parity setting	Make sure the Power Meter parity setting is the same as that of all the other devices connected to the communication link. See instructions in the "Programming" section of the manual.
	Incorrect Power Meter stop-bit setting	Make sure the Power Meter stop-bit setting is the same as that of all the other devices connected to the communication link. See instructions in the "Programming" section of the manual.
	Electromagnetic (EMC) compatibility problem	Carry out wiring in accordance with standard practices (running of power and communication cables, earthing of exposed conductive parts, cable shielding, etc.)

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Trouble-shooting

Problem	Probable cause	Solution
Values on local display different from those read on the remote supervisor	Electromagnetic (EMC) compatibility problem	Carry out wiring in accordance with standard practices (running of power and communication cables, earthing of exposed conductive parts, cable shielding, etc.)
	Difference of 1 between Modbus and Jbus register addresses	Check whether the supervisor uses Modbus or Jbus communication protocol. Modbus and Jbus register addresses differ by a value of 1. See the "Modbus communication" section of the manual
	Incorrect data format	See the "Modbus communication" section of the manual
A frame sent by the Power Meter includes an exception code	Modbus function not supported by Power Meter	See the "Modbus communication" section of the manual
	The register address read is incorrect	See the "Modbus communication" section of the manual
	The number of words read is incorrect	See the "Modbus communication" section of the manual

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Appendices

Contents

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Appendices
Characteristics

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	Primary	Up to 400 kV AC
	(with external VT)	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 10000 A in 5 A steps
		Secondary	1 A	5 A
	Permissible overload		20 A continuous 48 A 10 s 150 A 1 s
	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	5 to 13.2 Hz : ± 1 mm 13.2 to 100 Hz : 0.7 g

Electrical characteristics of the IO11 Puls and IO02 2 Puls options

Input (optocoupler) (IO11 only)	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
Impulse output (REED relay) (IO11 and IO02)	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
	Maximum number of pulses/second	1

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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)

Electrical characteristics of the AO20 4-20mA option

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Analogue outputs	Load resistance	0 to 600 ohms including cables
	Response time	1 s
	Accuracy (full scale)	0,5 %
IO11 and IO22 inputs power supply (Pwr type)	Maximum number	8

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 face		Classe II
Degree of protection	Front	IP5X
	Case	IP30

Appendices
Characteristics (cont.)

Measurement ranges

Instantaneous values		Measurement range	Refresh rate	Display
Voltages		50 V to 400 kV	1 s	00.00 V to 400 kV
Currents		25 mA to 10 A	1 s	0.000 A to 20 kA
Current bar chart		10 to 120 % of bar	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	18 mA to 10 A	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
C0, C1 and C2 counters (IO11 and 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		Class 1 as per IEC 62053-21 (or 61036)
	Reactive		Class 2 as per IEC 62053-23 (or 61268)

PM500	PM500 + RS485 Modbus	PM500 + IO22 Alarm	PM500 + IO11/IO02 Puls	PM500 +AO20 4-20mA

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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
Bar	Bar-chart	Bar-chart scale
BdS	Bauds	Modbus speed
C0	Pulse counter for input	For input of IO 11 option
C1 and C2	Pulse counter for input 2	For inputs 1 and 2 of the option
CdE	Command	IO22 output in control mode
COdE	Access code	Access to programming mode
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 (only with IO11)
Ht	High threshold	High threshold for alarm
HV	High value	Value to 20 mA on the analogue output
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
LV	Low value	Value to 0 or 4 mA on the analogue output
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 reactive 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

PM500	PM500 + RS485 Modbus	PM500 + IO22 Alarm	PM500 + IO11/IO02 Puls	PM500 + AO20 4-20mA

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 and 2	Outputs 1 and 2	
PAR	Parity	Selection of parity for Modbus
PF	Power factor	
Pr	Primary	Primary winding on Ut transformer
Prog	Programming mode	Programming mode active
Pwr	Power	Power supply to volt-free inputs
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	
TYPE	Type	Operating mode of analogue output (0-20 or 4-20mA or Pwr)
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	
ΣPFL	Inductive power factor	
ΣPFC	Capacitive power factor	

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