POWER FACTOR CONTROLLER - 3PH

TECHNICAL MANUAL OF INSTALLATION

PFC06DB3 - PFC12DB3

INDEX

*AVAILABLE OPTIONAL COMMUNICATION MODULE PC-USB / RS485 / TTL - ORDER CODE: SCUSB485
REGISTERS MODBUS-RTU TABLE ON REQUEST*

⚠ **!!! IMPORTANT !!! READ THE INSTALLATION MANUAL BEFORE USE.**

THE SAFETY OF THE PRODUCT IS STRICTLY RELATED TO ITS USE THAT HAS
TO BE DONE AS SPECIFIED BY THE MANUFACTURER.

1.1 Indication LEDs:

IND - Inductive load.

CAP - Capacitive load.

ALARM - All Alarms.

COSφ - Cosφ measured.

VOLTAGE - Mains Input voltage of phase N-L1 / N-L2 / N-L3.

CURRENT - Load current of phase L1 / L2 / L3.

W - Load watt of phase L1 / L2 / L3.

VAr - Load VAr of phase L1 / L2 / L3.

VA - Load VA of phase L1 / L2 / L3.

THD% - **V**: Harmonic distortion of voltage in % of L1 / L2 / L3.

THD% - **A**: Harmonic distortion of current in % of L1 / L2 / L3.

Hr - Work hours.

TEMP - Temperature surround the controller (internal temperature sensor).

k - Multiplied the value display show (kilo = x1000).

M - Multiplied the value display show (Mega = x1000000).

AUT - Automatic/Manual operation mode selected. (ON = Automatic / OFF = Manual).

1.2 Buttons:

MAN/AUT - Button selection for the operation mode, Manual or Automatic operation.

MODE - Button to advance on the Measurements menu or to enter the Menu.

← - Button to decrease the set value.

+> - Button to increase the set value.

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2 - DESCRIPTION:

Control and digital Cosφ regulation device with accurate and reliable Cosφ readings.
Thanks to particular devices and algorithms, the instrument, controls even electric lines with an high harmonic content.

Calculating reactive power:
It allows to intervene in an aimed and timely way in the introduction/connection of the capacitor banks, which permits the best utilization of them both in the number of operations and in the equal rating of the capacitor banks.

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3 - OPERATION:

> At start the displays and LEDs are all ON for 3 seconds, then while upper display shows sequence LED, central display show model steps number and down display shows the firmware version.

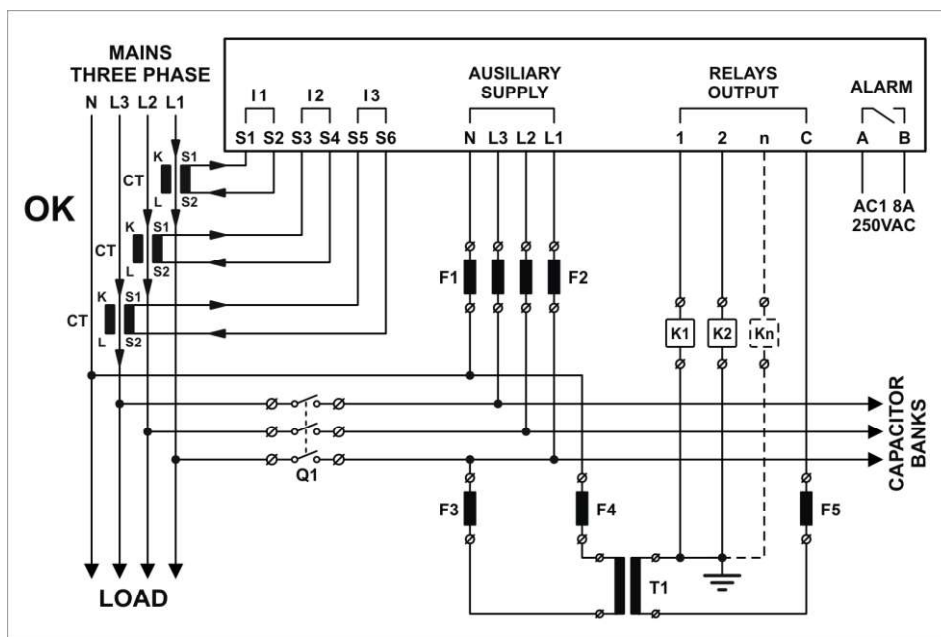| BOX	Model Type	Display LED	Steps
144x144	PFC06DB3	5t.06	06
144x144	PFC12DB3	5t.12	12

> **Output relays switching on test:**

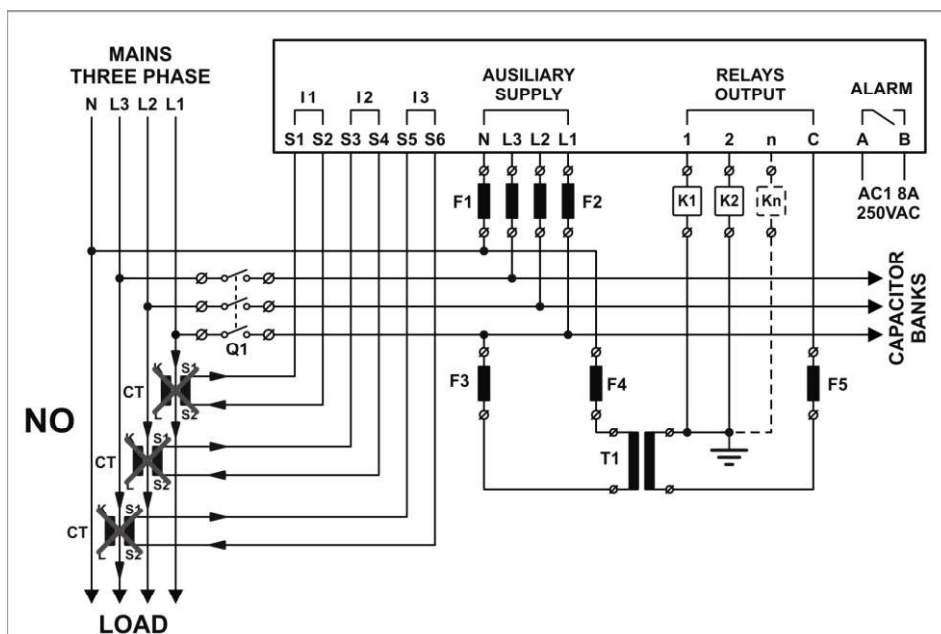The parameters $P.01$ to $P.07$ must be programmed first (see basic set-up Menu).

Pressing button ⟨— or +⟩ the respective outputs and the LED will be activated, letting you test the connections.

4 - ELECTRICAL DIAGRAM FOR INSTALLATION:

Correct Connection (1)

Wrong Connection (2)

NOTE:

The auxiliary transformer is used for:
- Isolate the supply/measurements circuit of the device from the contactor coil supply circuit.
- When the contactor coil is different from the mains voltage.

On the connection circuit (2), the Cosφ measured remain constant when we switch on the capacitors.
It is necessary to change the connection of CT, before the connection of voltage.

> TO ENTER THE BASIC SET-UP MENU:

a) The Cosφ controller must be set on MANUAL operation and all capacitors must be OFF.

b) Press the button **MODE** for 5 seconds.

c) The display will show $5Et$

d) The LED **AUT** will flash with intermittent of 0.5 second.

e) Press the button **MODE** to enter and then scroll the parameters programming $P.~0I >>> P.~07$

f) Press the button **<—** to decrease or the button **+>** to increase the value set.

g) In case of parameter $P.~05$, press both the buttons **<—** and **+>** to modify connection step type:

  $3~PH.~-~LI~-~L2$ or $L3$ (the connection type is show in bottom display).

  $3~PH.$ Three-phase L1-L2-L3 connection.

  LI Single-phase connection on L1 phase, $L2$ Single-phase on L2 phase, $L3$ Single-phase on L3 phase.

h) Press the button **MAN AUT** to return to the previous parameter.

i) Proceed on the Menu and program all parameters until the last $P.~07$

j) Press the button **MODE** to save all data and exit the Basic set-up Menu.
  All LEDs will light for a few seconds and the displays will show $5RUE$ and PRr

k) If the display shows Err, it means that an error has happened and was not possible to save the data.
  Therefore it will be necessary to program again all the parameters on the Basic set-up menu.
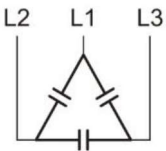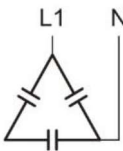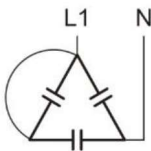
5.1 Basic set-up Menu:

PARAMETER	DESCRIPTION	RANGE	DEFAULT
$P.~0I$	Primary current transformer. ($t.cur.$)	5...10000	5
$P.~02$	Rated power (nameplate) in VAr of the smallest capacitor. ($5.URr$)	100...300000	100
$P.~03$	Rated capacitor voltage (nameplate) in volt. ($C.uoL.$)	80...750	400
$P.~04$	Reconnection time of the same step, in seconds. ($rEc.t.$) (CAPACITOR DISCHARGE TIME)	1...600	30
$P.~05$ (LED 1)	Step 1 VAr **(a)**	0...300000	0
$P.~05$ (LED 2)	Step 2 VAr **(a)**	0...300000	0
$P.~05$ (LED X)	Follow the same programming as above for the other steps except for the last step. **(a)**	0...300000	0
$P.~05$ (LED N)	Programming of the last step VAr **(a)**. Or external fan **(b)**	0... 300000 FRn	0
$P.~06$	Desired Cosφ. ($C.dE5.$)	0.85 IND 0.90 CAP	0.90 IND
$P.~07$	Sensitivity (second/step). ($5En5.$)	5-600	30

(a) See to next page "CAPACITOR CALCULATION TABLE"

(b) External fan: press the button **<—** until the display shows FRn

  The temperature operation control should be set on the Advance Menu $R.~II$ and $R.~I2$

> CAPACITOR CALCULATION TABLE:

CAPACITOR POWERS (Q)	3 PHASE CONNECTION (Q/3)	PHASE - NEUTRAL CONNECTION (Q/6)	PHASE - NEUTRAL BRIDGE CONNECTION (2xQ/9)	PHASE - NEUTRAL CONNECTION
0.5 kvar	0.16 kvar	0.08 kvar	0.11 kvar	0.16 kvar
1 kvar	0.33 kvar	0.16 kvar	0.22 kvar	0.33 kvar
1.5 kvar	0.5 kvar	0.25 kvar	0.33 kvar	0.49 kvar
2.5 kvar	0.83 kvar	0.41 kvar	0.55 kvar	0.82 kvar
5 kvar	1.66 kvar	0.83 kvar	1.11 kvar	1.65 kvar
7.5 kvar	2.5 kvar	1.25 kvar	1.66 kvar	2.48 kvar
10 kvar	3.33 kvar	1.66 kvar	2.22 kvar	3.3 kvar
15 kvar	5 kvar	2.5 kvar	3.33 kvar	4.95 kvar
20 kvar	6.66 kvar	3.33 kvar	4.44 kvar	6.61 kvar
25 kvar	8.3 kvar	4.1 kvar	5.5 kvar	8.26 kvar
30 kvar	10 kvar	5 kvar	6.66 kvar	9.91 kvar

- In second column reactive power value of single three-phase capacitor in three-phase system.
- In third & fourth columns total reactive power value of the three-phase capacitor in single-phase system.
- In fifth column reactive power value of single-phase capacitor in single-phase system.

> TO ENTER THE ADVANCE MENU:

a) The Cosφ controller must be set on MANUAL operation and all capacitors must be OFF.

b) Press the button **MODE** for 5 seconds.

c) The display will show SEt

d) The LED **AUT** will flash with intermittent of 0.5 second.

e) Press both buttons together **←** and **+›** for 2 seconds until the display shows $SEtA$

f) Press the button **MODE** to enter and then scroll the parameters programming $A. \ 01 >>> A. \ 19$

g) Press the button **←** to decrease or the button **+›** to increase the value set.

h) Press the button **MODE** to advance to the next parameter programmed.

i) Press the button **MAN/AUT** to return on the previous parameter programmed.

j) Proceed on the Menu and program all parameters until the last $A. \ 19$

k) Press the button **MODE** to save the data and exit the Advance Menu.

    All LEDs will light for a few seconds and the displays will show $SAVE$ and PAr

l) If the display shows Err, it means that an error has happened and was not possible to save the data.
    Therefore it will be necessary to program again all the parameters on the Advance Menu again.

5.2 Advance Menu:

PARAMETER	DESCRIPTION									RANGE	DEFAULT
A. 01	Mains Connection	0 = Three Phase (3 Ph.)								0	0
A. 02	Sense of CT current	1 = CT in phase (dir.)				2 = CT reversed (inu.)				1 … 2	1
A. 03	Frequency	1 = 50 Hz (50h2)				2 = 60 Hz (60h2)				1 … 2	1
A. 04	Serial interface TTL	0 = Disable (Addr.)				1-99 = Enable (Addr.)				0 … 99	1*
A. 05	Temperature Alarm	0 = Disable (r.t.AL.)				1 = Enable (r.t.AL.)				0 … 1	0
A. 06	Temperature unit	0 = °C (C)				1 = °F (F)				0 … 1	0
A. 07	Alarm THD(%) I (trES.)									110 … 130	120
A. 08	THD(%) alarm delay on (seconds) (t.dEL.)									1 … 240	5
A. 09	Alarm relay (see Table pag.10)	0 = nOnE	2 = A.-HU**	4 = A.-H I***		6 = A.-HC	8 = A.-th			0 … 9	1
		1 = ALL.	3 = A.-LU	5 = A.-L I		7 = A.-LC	9 = A.-CS				
A. 10	Time to switch off all the capacitors because of low current. (seconds) (d ISC.)									1 … 240	120
A. 11	Min temp. to switch off the fan relay. (attention to the set unit) (_ °C / _ °F)									1 … 240	30
A. 12	Max temp. to switch on the fan relay. (attention to the set unit) (_ °C / _ °F)									1 … 240	50
A. 13	Mains Voltage. (uoLt)									220 / 230 380 / 400 / 440	400
A. 14	Alarm relay contact type	0 = Open (nO A.)				1 = Close (nC A.)				0 … 1	0
A. 15	Fixed Step Selection	0 = nOnE / Other (St. F.)								0 … 12	0
A. 16	0 = kvar with subtraction fixed step (nor.)					1 = Real kvar (no c.)				0 … 1	1
A. 17	Serial Protocol Type	0	ProP.	Poprietary	9600 Bds	EVEN	1 Bit Stop			0 … 15	0
		1	19E.1	Modbus	19200 Bds	EVEN	1 Bit Stop				
		2	96E.1	Modbus	9600 Bds	EVEN	1 Bit Stop				
		3	48E.1	Modbus	4800 Bds	EVEN	1 Bit Stop				
		4	24E.1	Modbus	2400 Bds	EVEN	1 Bit Stop				
		5	12E.1	Modbus	1200 Bds	EVEN	1 Bit Stop				
		6	19O.1	Modbus	19200 Bds	ODD	1 Bit Stop				
		7	96O.1	Modbus	9600 Bds	ODD	1 Bit Stop				
		8	48O.1	Modbus	4800 Bds	ODD	1 Bit Stop				
		9	24O.1	Modbus	2400 Bds	ODD	1 Bit Stop				
		10	12O.1	Modbus	1200 Bds	ODD	1 Bit Stop				
		11	19n.1	Modbus	19200 Bds	NONE	1 Bit Stop				
		12	96n.1	Modbus	9600 Bds	NONE	1 Bit Stop				
		13	48n.1	Modbus	4800 Bds	NONE	1 Bit Stop				
		14	24n.1	Modbus	2400 Bds	NONE	1 Bit Stop				
		15	12n.1	Modbus	1200 Bds	NONE	1 Bit Stop				
A. 18	Anti-Hunting	0 = Disable (nor.)				0.90 … 1.00 = Enable (A.Hun.)				0 / .90 … 1.00	0
A. 19	Threshold for Cosφ alarm	0 = Disable (nor.)				0.50 … 0.95 = Enable (S.A.CS)				0 / 0.50 … 0.95	0

  * The values 1 to 99 indicate the device number when the units are connect on a serial interface (99 max).
  ** Alarm run when the single phase is out of range.
*** Alarm run when all phases are out of range.

5.3 RESET DEFAULT PARAMETERS:

- In A. 01 parameter, press all buttons together [MAN AUT] [MODE] [←] [+→] for 5 seconds, the displays will shows SAUE and
PAr now the device will restart.

  ATTENTION: All settings made on the device will be lost and all steps are will restored to default setting.

6 - SETTING PASSWORD:

Default password is 000 and isn't active (unlocked).

a) The controller must be set on MANUAL operation and all capacitors must be OFF.

b) Press the button **MODE** for 5 seconds.

c) The display will show SEt

d) The LED **MAN** and **AUT** will flash with intermittent of 0.5 second.

e) Press the button **MAN/AUT** for 10 seconds until display will show $S.PAS$.

f) To change password value press **←** or **+→**.

g) To exit without save password press **MAN/AUT**.

h) To save new password press **MODE** for 5 seconds until displays will show $SAuE$ and PAr

i) Now you can view but not modify the parameters.

l) When you try to change the parameters the display show $PAS.$, then pressing the keys **←** or **+→** set the password and confirm by pressing **MODE**.

m) If the password is correct you have access to edit parameters for 5 minutes after which everything will relock.

n) If the password is incorrect the display show Err.

o) If when the instrument requires entering the password do not press any button for 30 seconds the system will exit the menu and resume normal operation.

p) To disable the password set the value 000, or in the extreme cases carry out reset (5.3 - RESET DEFAULT PARAMETERS).

7 - SETTING AUTORECOGNIZED CAPACITOR BANK:

a) The controller must be set on MANUAL operation and all capacitors must be OFF.

b) Press the button **MODE** for 5 seconds.

c) The display will show SEt

d) The LED **MAN** and **AUT** will flash with intermittent of 0.5 second.

e) Press repeatedly the button **MODE** until the display show the parameters value $P.\ 05$

f) Press the button **MODE** for 10 seconds until displays will show $rEAd$ and $StEP$ and start the automatic recognition of steps VAr. This operation can take some minutes, at the end the display show $P.\ 05$
The autorecognized, recognized both single phase and three phase capacitors.
Warning, the load must be stable during recognition, else wrong values of steps will be set.
However, when recognition is finish, you can see and eventually set the steps manually if values are wrong.

g) Press repeatedly the button **MODE** for scroll through the steps and see the banks acquired.

h) If the value is wrong press the button **+→** to increase or the button **←** to decrease the value set.

i) Press the button **MODE** to save all data and exit the Basic set-up Menu.
All LEDs will light for a few seconds and the displays will show $SAuE$ and PAr

ATTENTION: Capacity below 100VAr are recognized as 0.

8 - MEASUREMENTS FUNCTIONS:

a) Standard display shows the Cosφ of the installation, and if the total load are inductive [IND] or capacitive [CAP].
For single phase if the decimal point on 4th display digit is ON, the phase Cosφ is capacitive.
For single phase, if the decimal point on 1st digit (from left) flashing is because the system working as generator and the sense of current is inverted (verify correct CT connection or if all three-phase is inverted modify parameter $A. 02$).

b) Press the button [MODE] to scroll the measurements available and indicated by the related LED illuminated.

If [k] LED is ON, the value must be multiplied x1000 (kilo)

If [M] LED is ON, the value must be multiplied x1000000 (Mega)

c) Selecting the [COSφ] measure, if you push the button [←] then the top display will show the desired Cosφ.

d) Selecting the [VOLTAGE] measure, if you push the button [←] then the displays will show the voltage PH/PH in thi mode:
 - 1° display L1 / L2
 - 2° display L2 / L3
 - 3° display L3 / L1

e) Selecting the [VAr] measure, if you push the button [←] then the displays will show the real reactive power of the minimum step.

f) Selecting the [VAr] measure, if you push the button [+>] then the displays will show the required step units for Cosφ correction.

g) If the [VAr] LED [IND] is ON, it means that the installation is inductive and needs to switch on the capacitor to reach the value of Cosφ programmed for the application.

h) If the [VAr] LED [CAP] is ON, it means that the Cosφ of the installation is capacitive and needs to switch off the capacitor to reduce the Cosφ to the value programmed.

i) If no button is pressed for 30 sec, the display of the device will returned to the Cosφ indication of the installation.

9 - COSφ SET-UP AND SENSITIVITY SET-UP:

9.1 Cosφ Set-up:
To set this parameter ($P. 06$) you should follow the instruction at paragraph 5.1 (Basic Set-up menu).

The LED [IND] is ON indicates that the Cosφ value is inductive.

The LED [CAP] and the decimal point on 4th display are ON, indicates that the Cosφ value is capacitive.

9.2 Sensitivity:
Is the time available for the unit to measure the average Cosφ of the installation and calculate the reactive power needed to reach the Cosφ programmed for the installation, switching ON or OFF the steps relays (therefore the capacitors).

The unit of sensitivity is: Second/kvar (The kvar of the lowest capacitor programmed on $P. 02$).

To set this parameter ($P. 07$) you should follow the instruction at paragraph 5.1 (Basic Set-up menu).

The time to turn ON the step relay depends on the time of reconnection of the step. (see $P. 04$).

9.3 Example:
We need to switch ON 15 kvar on L1 phase, 20 kvar on L2 phase and 8 kvar on L3 phase.

- The device consider the most bigger value of kvar and then, in this case, it take L2 phase value (20 kvar).
- Parameters programmed on the device: $P. 02$ (lowest step): 10 kvar
- Sensitivity programmed: 60 s/kvar (lowest step on $P. 02$)

We will have: Reactive power needed of 20 kvar is equal to 2 x 10 kvar (lowest step $P. 02$)
Therefore, **the device will switch On the step in: 60s / 2x10 kvar = 30 seconds.**

!!! ATTENTION !!!

The operating mode can't be changed if the **LED** [☀ VAr] is on.

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1. Press the button [MAN/AUT] for 1 second to select the mode of operation desired, Manual or Automatic.

2. The LED [☀ AUT] ON indicates the operation mode selected is Automatic, if this LED is OFF the selected mode is Manual.

3. The operating mode remains stored even in absence of supply voltage.

10.1 MANUAL OPERATION MODE:

During Manual operation mode , the status of step relays is stored even in the absence of supply voltage to the unit.
When the power returns back the unit will return to the stored status.

1. Press the button [←] or [+›] to select the step relay to be activated, the correspondent LED blink.

2. Press the button [MODE] within 5 seconds of step selection, to modify the status of the output relay (turn On or turn OFF).

3. Repeat the above operation for the next steps to be examined.

4. If the last step is programmed as FAN relay, then the relay cannot be command manually.

Note: During Manual operation the device controls the reconnection time of the capacitors (same as capacitor discharged time of the capacitor $P.\ 04$), therefore to switch ON the same step it will be necessary to elapse the reconnection time programmed.

10.2 AUTOMATIC OPERATION MODE:

In this mode the device algorithm will work to keep the real Cosφ as close as possible to the programmed one.

1. If the LED [☀ AUT] is blinking, it means that the controller is ready to switch ON or OFF the step.

2. If the time's too long is because the Cosφ controllers is waiting to elapse the reconnection time setted ($P.\ 04$)

3. The device algorithm always uses the best combination of the following factors, according to a decreasing priority:
   a) Reactive power needed.
   b) Reconnection time for the step selected.
   c) Number of switching necessary to reach the Cosφ desired.
   d) Number of the effected insertions (historical data).
   e) Total time need of the effected insertions (historical data).

4. The algorithm also includes a capacitor protection function: Anti-Hunting.
   This prevents the system from inserting a large capacitor bank due to a small amount of reactive power, thus causing the system to become capacitative and therefore immediately de-inserting it.
   It then intervenes by preventing the insertion of further steps when the real cosφ is very close to the desired one and there are no small capacitor banks to be approached further, thus avoiding a damaging loop for the system.
   So keeping the system always in the inductive field, avoiding entering the capacitive field.

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1. In manual mode the alarms are active only visual.

2. Pressing the [MODE] button the visual alarm can momentarily be cancelled, and the readings can be accessed to verify the causes of the alarms. If for 30s no button is pressed the visual alarm returns until its removing.

3. The alarm relay run only in automatic mode.

Code	Description	Delay	Intervention Parameter	Display LED
$A.-HU$	Too high voltage	15min	Voltage over +10% set value.	Display $A.-HU$ **V** LED blink
$A.-LU$	Too low voltage	5s	Voltage under -15% set value	Display $A.-LU$ **V** LED blink
$A.-H1$	Too high current	2min	Current exceeds 110% of the rated value.	Display $A.-H1$ **A** LED blink
$A.-L1$	Too low current	5s	Current is lower than 2.5% rated value. If the alarm condition persists for a time exceeding 2 minutes, then the outputs are disabled.	Display $A.-L1$ **A** LED blink
$A.-HC$	Overcompensation	2min	Capacitors are all disconnected and the Cosφ is higher than the preset value.	Display $A.-HC$ alternated with **Cosφ**
$A.-LC$	Under Compensation	15min	Capacitors are all connected and the Cosφ is lower than the preset value.	Display $A.-LC$ alternated with **Cosφ**
$A.-Ot$	Over temperature	10s	The temperature is to 60°C from at least 10 seconds.	Display $A.-Ot$ alternated with **Cosφ**
$A.-th$	THD % I	5s	The THD is higher than the value set on $A.\ 07$	Display $A.-th$ alternated with **THD%**
$A.-PS$	Parameters error	-	The setting parameters read by the EEPROM aren't correct. To restore is necessary "reset default parameters" (sec. 5.3).	Display $A.-PS$
$A.-PC$	Adjustment/setting parameters error	-	The device operates with the default parameters. There could be error in the calculated measures. The user cannot do the setting. It is necessary to return the unit to manufacturer.	Display $A.-PC$
$A.-PU$	Parameters/ counters error	-	The following parameters read by the EEPROM aren't correct (set Cosφ, sensitivity, operation mode, counters). It is necessary to return the unit to manufacturer.	Display $A.-PU$
$A.-EE$	EEPROM error	-	It is necessary to return the unit to manufacturer.	Display $A.-EE$
$A.-Fr$	Frequency error	0	If frequency is out of +-5% of selected in $A.\ 03$ Probably you must set parameter $A.\ 03$ correctly. The frequency is checked only at power on.	Display $A.-Fr$
$A.-CS$	Low Cosφ	60s	When the Cosφ is lower than the value set on $A.\ 18$	Display $A.-CS$ alternated with **Cosφ**

Supply Circuit	
Supply Voltage	3x400V$\sim$ +N
Operating Limits	-15%…+10% Ue
Rated Frequency	50 or 60Hz
Power Consumption L/L - 400VAC	3.7 VA
Immunity Time for Microbreakings	<6ms
Measurement/Overvoltage Category	Class II

Current Input	
Rated Current	5A
Operating Limits	0.125…5.5A
Rated Voltage	230V$\sim$
Overload Capacity	1.1Ie
Overload Peak	10 Ie for 1s
Measurement/Overvoltage Category	Class II

Reading and Control Range	
Voltage Reading Limits	180...485V$\sim$
Current Reading Limits	0.125…5.5A
Type of Current and Voltage Readings	TRMS
Cosφ Adjustment	0.85 inductive…0.90 capacitive
Tripping Sensitivity	5…600 s/step
Reconnection Time of the Same Step	1…600 seconds
FFT - Harmonic Spectrum	THD% - 64st

Relay outputs	6 STEP	12 STEP
Number of Outputs	06	12
Contact Arrangement	1NO	
Contacts Capacity	8A - 250V$\sim$ (AC1)	
Maximum Capacity the Common Contacts	10A	
Insulating Category/Rated Voltage VDE0110	C/250 - B/400	
Maximum Switching Voltage	250V$\sim$	
Electrical Contact Life	20×100^{6} ops	
Mechanical Contact Life	100×10^{3} ops	

Enclosure and Connections	6 STEP	12 STEP
Cable Type for connection	Only 105°C - 1.5/2.5mm^2 - 16/14 AWG	
Working Temperature	-20 / +60 °C	
Storage Temperature	-30 / +70 °C	
Operating Altitude	Up to 2000m	
Pollution Degree	2	
Electrical Insulation – Mains/Contacts	4 kV	
Protection Degree	IP41 Front - IP20 Terminals	
Relative Humidity w/o Condensation	95 RH%	
Enclosure Version	Flush Mount	
Dimensions	149 x 149 x 60mm	
Weight	720g	770g

Serial Interface	
TTL	Standard
Communication Protocol	Proprietary / MODBUS RTU
Connector Type	RJ11

Serial Adapter TTL / USB / 485	ALL MODELS
Connector RJ11 / USB / 485	Optional order code SCUSB485

EC Directives: - 2014/30/UE - EMC
                              - 2014/35/UE - LVD

Norms Compliance: CE marking
- IEC EN 55022   - IEC EN 61000-4-2   - IEC EN 61000-4-3   - IEC EN 61000-4-4   - IEC EN 61000-4-5
- IEC EN 61000-4-6   - IEC EN 61000-4-11   - IEC EN 61000-6-2   - IEC EN 61000-6-4   - IEC EN 61010-1
- IEC EN 61010-2-030

13 - TERMINAL CONNECTIONS:

14 - DIMENSIONS: