

• 15N0102B200 •

**SINUS PENTA  
PENTA MARINE  
IRIS BLUE  
SOLARDRIVE PLUS**

# **SPARE ES927 CONTROL BOARD**

## **- USER MANUAL -**

Issued on 22/05/17  
R.01

*English*

- This manual is integrant and essential to the product. Carefully read the instructions contained herein as they provide important hints for use and maintenance safety.
- This device is to be used only for the purposes it has been designed to. Other uses should be considered improper and dangerous. The manufacturer is not responsible for possible damages caused by improper, erroneous and irrational uses.
- Enertronica Santerno S.p.A. is responsible for the device in its original setting.
- Any changes to the structure or operating cycle of the device must be performed or authorized by the Engineering Department of Enertronica Santerno S.p.A..
- Enertronica Santerno S.p.A. assumes no responsibility for the consequences resulting by the use of non-original spare-parts.
- Enertronica Santerno S.p.A. reserves the right to make any technical changes to this manual and to the device without prior notice. If printing errors or similar are detected, the corrections will be included in the new releases of the manual.
- The information contained herein is the property of Enertronica Santerno S.p.A. and cannot be reproduced. Enertronica Santerno S.p.A. enforces its rights on the drawings and catalogues according to the law.



Enertronica Santerno S.p.A.  
Via della Concia, 7 – 40023 Castel Guelfo (BO) Italy  
Tel. +39 0542 489711 – Fax +39 0542 489722  
[santerno.com](http://santerno.com) [info@santerno.com](mailto:info@santerno.com)

## TABLE OF CONTENTS

1. OVERVIEW .....	3
2. PART NUMBERS .....	3
2.1. ES927 CONTROL BOARD .....	3
3. CONFIGURATION PROCEDURE .....	5
3.1. USING THE KEYPAD .....	8
3.2. USING THE REMOTEDRIVE/IRISCONTROL SOFTWARE.....	10
3.3. USING THE SERIAL LINK (MODBUS) .....	12
4. SPECIFIC SETTINGS FOR REGENERATIVE APPLICATION .....	16

## 1. OVERVIEW

This manual explains how to configure an ES927 control board used as a “spare” board instead of a ready-made control board mounted on a Santerno drive.

The following can be used to configure the ES927 control board:

- The keypad (see Using the Keypad)
- The RemoteDrive/IrisControl software (see Using the RemoteDrive/IrisControl Software)
- The serial link (ModBus) (see Using the Serial Link (ModBus))

## 2. PART NUMBERS

### 2.1. ES927 Control Board

Part Number (P/N)	Description	Product
ZZ0102310	SINUS PENTA ES927 CONTROL BOARD	Sinus Penta / Penta Marine / Solardrive Plus
ZZ0102310 AA256	SINUS PENTA ES927 CONTROL BOARD FOR REGEN	Sinus Penta / Penta Marine / Regenerative Application
ZZ0102311	IRIS BLUE ES927 CONTROL BOARD	Iris Blue



#### CAUTION

Do not use an ES927 control board with a P/N that is different from the P/N requested by the product the control board will be mounted on. The usage of a wrong P/N may result in damage to the control board.

SINUS PENTA  
PENTA MARINE  
IRIS BLUE  
SOLARDRIVE PLUS



SPARE ES927 CONTROL  
BOARD  
USER MANUAL



### 3. CONFIGURATION PROCEDURE

When using a spare ES927 control board, the following screen appears at power on:


```

SPARE!!!
→ + 0.00rpm
→ + 0.00rpm
MEA PAR CF [IDP]
```

Also, the FWD and REV LEDs blink at a time to indicate that the drive cannot be started up (this applies to SINUS PENTA drives only).

The parameters below allow configuring the spare ES927 board and allow starting the drives. Parameters are displayed with different IDs depending on the configuration from keypad or PC via the Remote Drive/Iris Control software:

Parameters		Description	Default Value
Keypad ID	RemoteDrive ID		
<b>S000</b>	SPR0	Voltage Class	4T
<b>S001</b>	SPR1	PIN (Part Identification Number)	0020 S12
<b>S002</b>	SPR2	Current Class	0020
<b>S013</b>	SPR3	Fan Control Selection	7=Fan, Status, NTC
<b>S017</b>	SPR4	CPU Power Supply	D=from DC-bus
<b>S099</b>	SPR5	Serial Number S/N	0
<b>S100</b>	SPR6	Serial Number Low	0
Parameters and Measurements for Adjustment		Description	Default Value
Keypad ID	RemoteDrive ID		
<b>M029</b>	SPM029	Measurement of the DC-Link Voltage	----
<b>S003</b>	SPR029	<b>M029</b> Vdc Readout Adjustment	1.000
<b>M026</b>	SPM026	Measurement of the RMS Output Current	----
<b>S004</b>	SPR026	<b>M026</b> Iout Readout Adjustment	1.000
<b>M062</b>	SPM062	Measurement of the Ambient Temperature detected on the Control Board Surface	----
<b>S011</b>	SPR062	CPU Temperature Readout Adjustment ( <b>M062</b> )	1.0000
<b>M064</b>	SPM064	<b>M064</b> IGBT Heatsink Temperature Measurement	----
<b>S012</b>	SPR064	IGBT Heatsink Temperature Readout Adjustment ( <b>M064</b> )	1.0000

	<b>NOTE</b>	<p>The first five values to be entered can be got in sequence from the “SPARE CODE” label placed next to the “S/N” label. To view the “SPARE CODE” label, remove the drive keypad. Example:</p> <div style="border: 1px solid black; padding: 5px; margin: 10px auto; width: fit-content;"> Spare code: 4T-S12-0030-0025-FSN-A  J1: 2-3 </div> <table border="1" style="margin: 10px auto; width: 80%; border-collapse: collapse;"> <thead> <tr> <th style="width: 60%;">Parameter</th> <th style="width: 40%;">Value to be entered</th> </tr> </thead> <tbody> <tr> <td>Voltage Class</td> <td style="text-align: center;">4T</td> </tr> <tr> <td>PIN (Part Identification Number)</td> <td style="text-align: center;">0030</td> </tr> <tr> <td>Current Class</td> <td style="text-align: center;">0025</td> </tr> <tr> <td>Fan Control Selection</td> <td style="text-align: center;">FSN = Fan, Status, NTC</td> </tr> <tr> <td>CPU Power Supply</td> <td style="text-align: center;">A = from AC mains</td> </tr> </tbody> </table> <p>The Serial Number is given in the “S/N” label. In case of a Serial Number made up of a number of digits lower than or equal to 8, the Serial Number Low value is to be set to 0.</p>	Parameter	Value to be entered	Voltage Class	4T	PIN (Part Identification Number)	0030	Current Class	0025	Fan Control Selection	FSN = Fan, Status, NTC	CPU Power Supply	A = from AC mains
Parameter	Value to be entered													
Voltage Class	4T													
PIN (Part Identification Number)	0030													
Current Class	0025													
Fan Control Selection	FSN = Fan, Status, NTC													
CPU Power Supply	A = from AC mains													

The Fan Control Selection parameter is coded as follows:

Current Labelling	Fan Control Selection Parameter
---	0: None
-S-	1: NoFan-Status-NoNTC
F--	2: Fan-NoStatus-NoNTC
FS-	3: Fan-Status-NoNTC
--N	4: NoFan-NoStatus-NTC
-SN	5: NoFan-Status-NTC
F-N	6: Fan-NoStatus-NTC
FSN	7: Fan-Status-NTC
Older Labelling	Fan Control Selection Parameter
B	0: None
P	3: Fan-Status-NoNTC
S	4: NoFan-NoStatus-NTC
N	7: Fan-Status-NTC

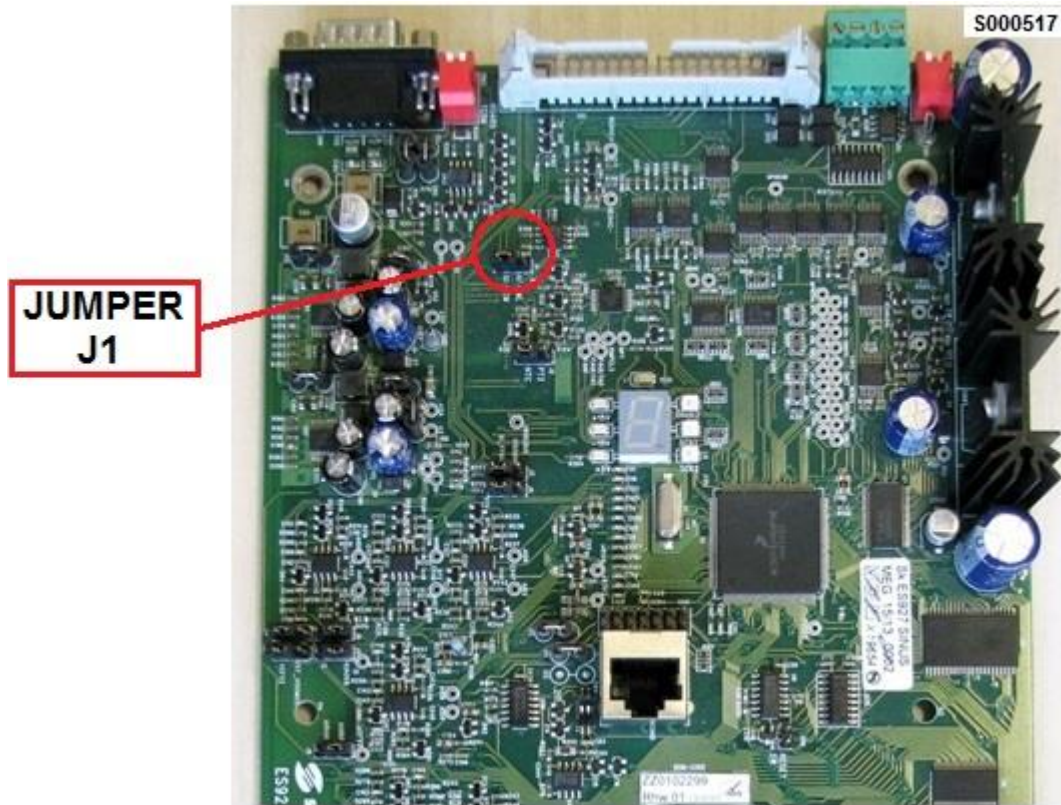
After entering the Serial Number and the values of the five parameters required, it is necessary to change the parameters for the readout adjustment of: DC-bus voltage, output current, control board temperature and IGBT heatsink temperature. After confirming these values, the FWD and REV LEDs stop flashing (SINUS PENTA only) and the drive gets ready to start.

In addition, for Regenerative Application on Sinus Penta and Penta Marine only, it is necessary to carry out the operations referred to in paragraph SPECIFIC SETTINGS FOR REGENERATIVE APPLICATION .

At the end, properly set jumper J1 according to line 2 in the “SPARE CODE” label based on the table below:

Position	Wording on the control board
1-2	IU CAL
2-3	IU LEM

Jumper J1 is located in the top left corner of the control board.



When the equipment is next is powered on, the following screen is displayed:

```
INVERTER OK
→ + 0.00rpm
→ + 0.00rpm
MEA PAR CF [IDP]
```

The instructions for configuring the ES927 control board using the keypad, the RemoteDrive/IrisControl software and the serial link are given in the sections below—Using the Keypad, Using the RemoteDrive/IrisControl Software and Using the Serial Link (ModBus) respectively.



**NOTE**

IMPORTANT: After confirmation of the above-mentioned parameters, the Penta drive is ready to start and no other preset parameter can be selected. For more details, please contact ENERTRONICA SANTERNO S.P.A. Customer Service.

### 3.1. Using the Keypad

Press the SAVE/ENTER key from the root page:

```
PRODUCT MENU
Language
Selection and
Inverter Data
```

Press the DEC key:

```
[IDP] S000-S099
SERVICE
```

Press the SAVE/ENTER key to access the Service Menu:

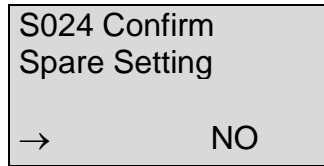
```
Active User
Level
→ Service
```

The pages contained in the Service Menu can be accessed using the INC and DEC keys. Their values can be changed with the editing modes allocated to the SAVE/ENTER and INC/DEC keys. The parameters that can be accessed are listed in the table below. Some parameters are displayed along with a measurement that allows easier tuning.

Parameter/Measurement	RemoteDrive ID	Description
<b>S000</b>	SPR0	Voltage Class
<b>S001</b>	SPR1	PIN
<b>S002</b>	SPR2	Current Class
<b>S003</b>	SPR029	Vdc Readout Adjustment
<b>M029</b>	SPM029	Measurement of the DC-Link Voltage
<b>S004</b>	SPR026	Iout Readout Adjustment
<b>M026</b>	SPM026	Measurement of the RMS Output Current
<b>S011</b>	SPR062	CPU Temperature Readout Adjustment
<b>M062</b>	SPM062	Measurement of the Ambient Temperature Detected on the Control Board Surface
<b>S012</b>	SPR064	IGBT Heatsink Temperature Readout Adjustment
<b>M064</b>	SPM064	IGBT Temperature Measurement
<b>S013</b>	SPR3	Fan Control Selection
<b>S017</b>	SPR4	CPU Power Supply



The new values are to be confirmed by selecting YES.



After selecting YES, the FWD and REV LEDs turn off (for SINUS PENTA only), and three dashes (---) appear instead of "NO" on page S024. This means that the Penta drive is ready to start.



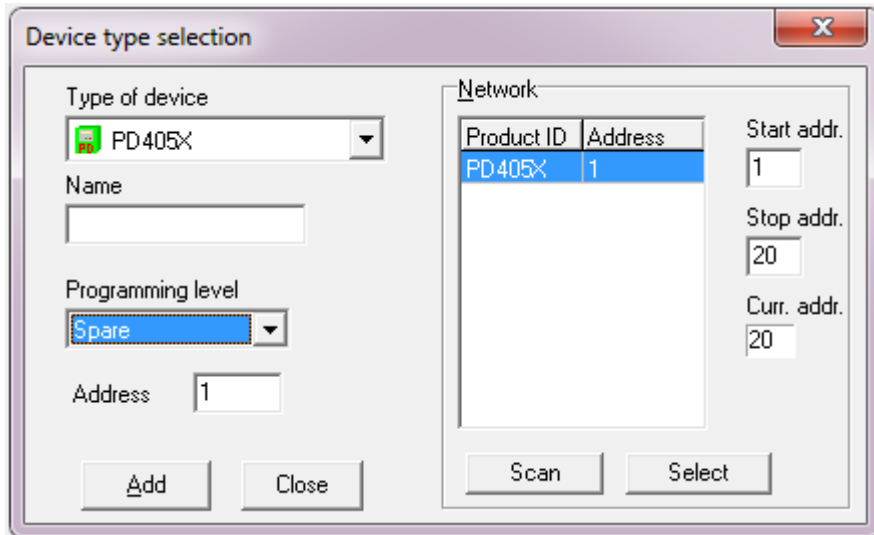
**NOTE**

Parameters S099 and S100 comprising the serial number cannot be set up via keypad. This means that the Fire Mode is disabled and the relevant menu cannot be accessed. However, any other functionality of the drive is still available.

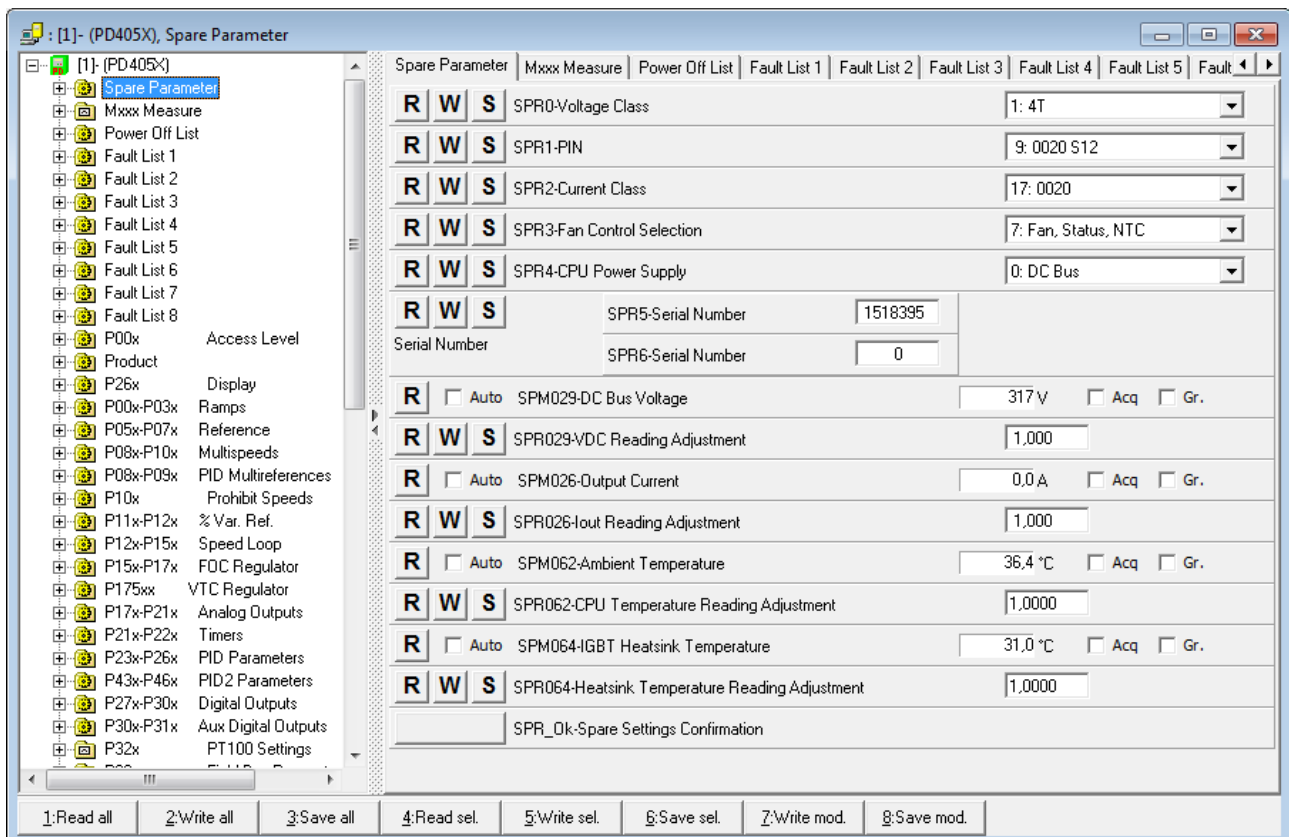
In order to access the Fire Mode, the serial number must be properly set up using the RemoteDrive/IrisControl.

### 3.2. Using the RemoteDrive/IrisControl Software

From the “Device type selection” window, select “Spare” in the “Programming level” field.



The “Spare Parameter” menu is added to the menus accessible from the RemoteDrive/IrisControl.



The following parameters can be accessed from the “Spare Parameters” menu:

Parameter ID	Keypad Display	Description
SPR0	S000	Voltage Class
SPR1	S001	PIN
SPR2	S002	Current Class
SPR3	S013	Fan Selection Control
SPR4	S017	CPU Power Supply
SPR5	S099	Serial Number S/N
SPR6	S100	Serial Number Low
SPR029	S003	Vdc Readout Adjustment
SPR026	S004	Iout Readout Adjustment
SPR062	S011	CPU Temperature Readout Adjustment
SPR064	S012	IGBT Heatsink Temperature Readout Adjustment

From the “Spare Parameter” menu it is possible to access the following measurements to check tuning values:

Measurement ID	Keypad Display	Description
SPM029	M029	Measurement of the DC-Link Voltage
SPM026	M026	Measurement of the RMS Output Current
SPM062	M062	Measurement of the Ambient Temperature Detected on the Control Board Surface
SPM064	M064	Measurement of the IGBT Heatsink Temperature

The parameters above can be confirmed by pressing the **SPR Ok – Confirm Spare Settings** button.

When the “Spare” programming level is selected and you attempt to change a parameter value, an error message appears, because parameter write is not allowed for ES927 control board in Spare mode. Example of error message:



**NOTE**



### 3.3. Using the Serial Link (ModBus)

The same results as described in Using the Keypad and Using the RemoteDrive/IrisControl Software can be obtained by using the serial link, as detailed in the table below:

ID	Description	Address (dec)	Min	Max
SPR0	Voltage Class	235	0	Up to 4 (depending on the product)
SPR1	PIN (Part Identification Number)	481	0	Up to 51 (depending on the product)
SPR2	Current Class	482	0	Up to 96 (depending on the product)
SPR3	Fan Selection Control	243	0	7
SPR4	CPU Power Supply	247	0	1
SPR5	Serial Number S/N	1827/1828	0	99999999
SPR6	Serial Number Low	1829/1830	0	99999999
SPR029	Vdc Readout Adjustment	483	900	1100
SPR026	Iout Readout Adjustment	484	940	1060
SPR062	CPU Temperature Readout Adjustment	241	9000	11000
SPR064	IGBT Heatsink Temperature Readout Adjustment	242	9000	11000
SPROk	Confirm Spare Settings	251	0	2

“Voltage Class” table: index (SPR0) at address 235

Value	Voltage Class
0	2T
1	4T
2	5T
3	6T

“PIN” table: index (SPR1) at address 481

Value	PIN	Value	PIN
0	0004 S12	26	0129
1	0004 S14	27	0162
2	0007	28	0164
3	0014	29	0172
4	0015	30	0200
5	0018 S12	31	0201
6	0018 S14	32	0202
7	0020 S05	33	0250
8	0020 S10	34	0259
9	0020 S12	35	0260
10	0021	36	0399
11	0024	37	0401
12	0030 S10	38	0402
13	0030 S12	39	0459
14	0032	40	0523
15	0033	41	0524
16	0035	42	0598
17	0036	43	0748
18	0037	44	0828
19	0040	45	0831
20	0049	46	0832
21	0051	47	0964
22	0067	48	1128
23	0069	49	1129
24	0086	50	1296
25	0088	51	2076

“Current Class” table: index (SPR2) at address 482

Value	PIN	Value	PIN	Value	PIN	Value	PIN
0	0003	25	0033	50	0179	75	0524
1	0004	26	0034	51	0180	76	0526
2	0005	27	0035	52	0181	77	0598
3	0006	28	0036	53	0200	78	0599
4	0007	29	0037	54	0201	79	0600
5	0008	30	0038	55	0202	80	0748
6	0009	31	0040	56	0216	81	0749
7	0010	32	0042	57	0217	82	0750
8	0011	33	0049	58	0218	83	0800
9	0012	34	0051	59	0250	84	0828
10	0013	35	0060	60	0259	85	0831
11	0014	36	0062	61	0260	86	0832
12	0015	37	0067	62	0290	87	0850
13	0016	38	0069	63	0312	88	0960
14	0017	39	0074	64	0313	89	0964
15	0018	40	0076	65	0314	90	0965
16	0019	41	0086	66	0366	91	1128
17	0020	42	0088	67	0367	92	1129
18	0021	43	0113	68	0368	93	1130
19	0022	44	0129	69	0399	94	1296
20	0023	45	0131	70	0401	95	1800
21	0024	46	0150	71	0402	96	2076
22	0025	47	0162	72	0457		
23	0030	48	0164	73	0459		
24	0032	49	0172	74	0523		

“Fan Control Selection” table: index (SPR3) at address 243

Value	Fan Control Selection
0	B = No
1	S = Status
2	P = PT2
3	N = NTC

Software versions of the spare board from 1.680:

Value	Fan Control Selection
0	0: None
1	1: NoFan-St-NoNTC
2	2: Fan-NoSt-NoNTC
3	3: Fan-St-NoNtc
4	4: NoFan-NoSt-NTC
5	5: NoFan-St-NTC
6	6: Fan-NoSt-NTC
7	7: Fan-St-NTC

“CPU Power Supply” table: index (SPR4) at address 247

Value	CPU Power Supply
0	D = from DC Bus
1	A = from AC Bus

“Confirm Spare Settings” table: index (SPROk) at address 251

Value	Confirm Spare Settings
0	Confirm
1	Spare (SPARE!!!)
2	Non Spare (INVERTER OK)

## 4. SPECIFIC SETTINGS FOR REGENERATIVE APPLICATION

For Regenerative Application on Sinus Penta and Penta Marine only, it is necessary, after setting the parameters referred to in chapter CONFIGURATION PROCEDURE, to adjust the calibrations of the following application-specific measures: DC Bus Voltage, Voltage of R-S, S-T and T-R phases, Reactive Power Delivered.

Parameters and Measurements for Adjustment		Description	Default value	Address (dec)	Min	Max
Keypad ID	RemoteDrive ID					
<b>M501</b>	SPM501	DC Bus Voltage	----	1651	----	----
<b>S003</b>	SPR003	<b>M501</b> VDC Readout Adjustment	100.0% (1000)	483	90.0% (900)	110.0% (1100)
<b>M509</b>	SPM509	Voltage of R-S Phase RMS	----	1659	----	----
<b>S007</b>	SPR007	<b>M509</b> Vrs Readout Adjustment	1.000 (1000)	486	0.001 (1)	32.000 (32000)
<b>M510</b>	SPM510	Voltage of S-T Phase RMS	----	1660	----	----
<b>S008</b>	SPR008	<b>M510</b> Vst Readout Adjustment	1.000 (1000)	487	0.001 (1)	32.000 (32000)
<b>M511</b>	SPM511	Voltage of T-R Phase RMS	----	1661	----	----
<b>S009</b>	SPR009	<b>M511</b> Vtr Readout Adjustment	1.000 (1000)	488	0.001 (1)	32.000 (32000)
<b>M506</b> [*]	SPM506	Reactive Power Delivered	----	1656	----	----
<b>S545</b> [*]	SPR545	Compens. of Mains Angle Phase Shift	0.1060 rad (1060)	287	-3.2768 (-32768)	3.2767 (32767)
<b>S546</b> [*]	SPR546	Compens. of Reactive Power ( <b>M506</b> )	0.07 rad (700)	288	-3.2768 (-32768)	3.2767 (32767)

[\*] Contact Enertronica Santerno S.p.A. for the adjustment of the Reactive Power Delivered.

Check that all DIP-switches are on OFF position:



**CAUTION**

