• 15R0710B300 •

SUNWAY TG
SUNWAY TG TE

THREE-PHASE SOLAR INVERTER

PROGRAMMING INSTRUCTIONS

Issued on 04/12/2012
R.02
Software Version 1.72

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.
- Elettronica Santerno 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 Elettronica Santerno.
- Elettronica Santerno assumes no responsibility for the consequences resulting by the use of non-original spare-parts.
- Elettronica Santerno 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 Elettronica Santerno and cannot be reproduced. Elettronica Santerno enforces its rights on the drawings and catalogues according to the law.

SANTERNO
CARRARO GROUP

Elettronica Santerno S.p.A.
Strada Statale Selice, 47 – 40026 Imola (BO) Italy
Tel. +39 0542 489711 – Fax +39 0542 489722
santerno.com sales@santerno.com

TABLE OF CONTENTS

Index of Chapters

Index of Figures

Index of Tables

1. SCOPE OF THIS MANUAL

Elettronica Santerno is committed to update its User Manuals available for download from santerno.com with the latest software version officially released. Please contact Elettronica Santerno if you require technical documents related to previous software versions.

2. HOW TO USE THIS MANUAL

2.1. Basic Information

This manual explains how to program and monitor the inverters of the Sunway TG/Sunway TG TE series.

Programming/monitoring is made possible through the following (even simultaneously):

- through the display/keypad unit
- via serial link through standard RS485 port
- through ES822 optional board (RS485/RS232 optoisolated serial board)
- through ES851 Data Logger and optional communication board.

Information about how to use and remote the display/keypad and about the display/keypad signals and function keys is given in the Installation Instructions Manual.
The RemoteSunway software provided by Elettronica Santerno allows data exchange to and from the inverter. The RemoteSunway software allows image capture, keypad emulation, oscilloscope function and multifunction tester function, Data Logger, table compiler functionality containing operation history data, parameter setting and data reception-transmission-storage to and from the computer, scan function for the automatic detection of the connected inverters (up to 247).
Users can also create their own dedicated software to be used via serial link. Information concerning addressing (Address field) and scaling (Range field) for the inverter interfacing is given in this manual.

2.2. Parameters Menus and Measures Menus

In this manual, menus are presented as they appear on the display/keypad and the in RemoteSunway.
The programming parameters and measure parameters are arranged as follows:

2.2.1. "M" Measures

(Read-only)

Mxxx	**Range**	Board representation (integer).	Display on the display/keypad and the RemoteSunway (may be a decimal figure) plus unit of measure.
	Active	This field indicates if and when the measure is active. When this field is not present, the measure concerned is considered as ALWAYS active.	
	Address	Modbus address which the measure can be read from (integer).	
	Level	User level (BASIC/ADVANCED/ENGINEERING)	
	Function	Description of the measure.	

2.2.2. "P, R, I, C" Parameters

Pxxx	**Range**	Device representation (integer)	Display on the display/keypad and the RemoteSunway (may be a decimal figure) plus unit of measure.
Parameter Name	**Default**	Factory-setting of the parameter (as represented for the inverter).	Factory-setting of the parameter (as displayed) plus unit of measure.
	Level	User level (BASIC/ADVANCED/ENGINEERING)	
	Active	This field indicates if and when the parameter is active. When this field is not present, the parameter concerned is considered as ALWAYS active.	
	Address	Modbus address which the parameter can be read from/written to (integer).	
	Function	Description of the parameter.	

NOTE

Pxxx Parameters: *read/write access.*

Rxxx Parameters: *read/write access, but unlike Pxxx and Cxxx parameters, they require the inverter to be restarted to take effect after modifying.*

Ixxx Inputs*: read/write access, but their value is not stored to non-volatile memory. When the inverter is started up, their value is always set to 0.*

Cxxx Parameters: *read access when the inverter is running; read/write access when the inverter is stopped.*

NOTE

When a parameter is modified from the display/keypad, you may activate its new value immediately (flashing cursor) or when you quit the programming mode (fixed cursor).

Typically, numeric parameters immediately come to effect, while alphanumeric parameters come to effect after quitting the programming mode.

NOTE

When you change a parameter using the RemoteSunway software, the inverter will immediately use the new parameter value.

2.3. Alarms and Warnings

The last part of this manual covers Axxx alarms and Wxxx warnings displayed by the inverter:

Axxx	Description	
Alarm Name	Event	
	Possible cause	
	Solutions	

2.4. Menu Tree and Navigation Mode

S	T	O	P			W	A	I	T				E	N	A
M	0	0	3	=	+					0	.	0	k	W	
M	0	0	7	=					5	4	1	.	2	V	
[	M	E	A	]	P	A	R		C	F		I	D	P	

Starting page on the display/keypad

Line 4 on the display/keypad shows the main menus of the menu tree:

MEA: Contains the inverter measures and the Fault List.

PAR: Contains the programming parameters of the inverter. The programming parameters can be changed even when the inverter is running.

CF: Contains the configuration parameters of the inverter. The Configuration parameters CANNOT be changed when the inverter is running.

IDP: Product ID.

The square brackets include the selected menu (MEA in the figure above). Use the , keys to select a different menu; press **ESC** to access the selected menu.

A navigation example is given on the next page, followed by a parameter programming example. Navigation in the FAULT LIST MENU is detailed in the section covering the MEASURES [MEA] MENU.

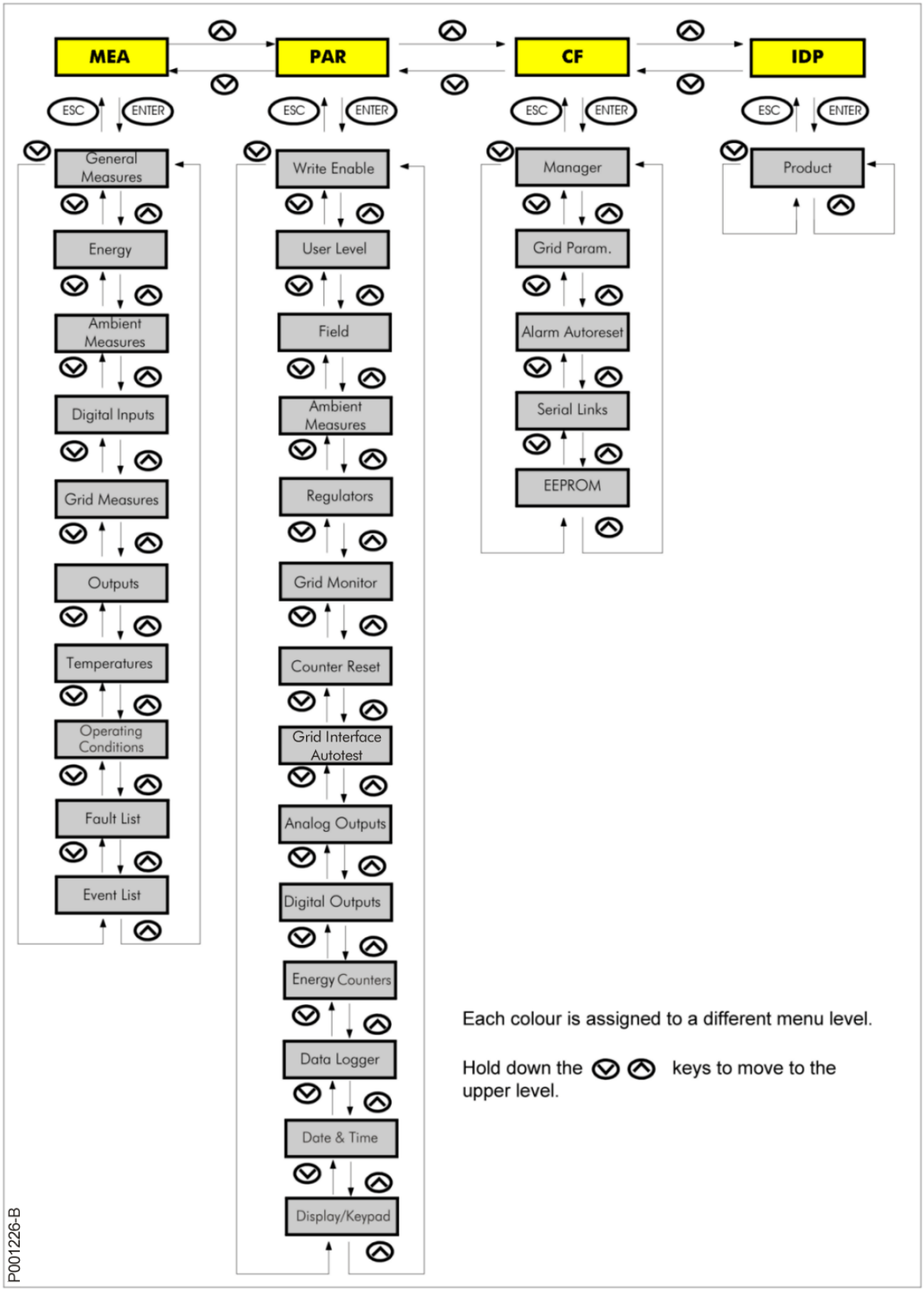
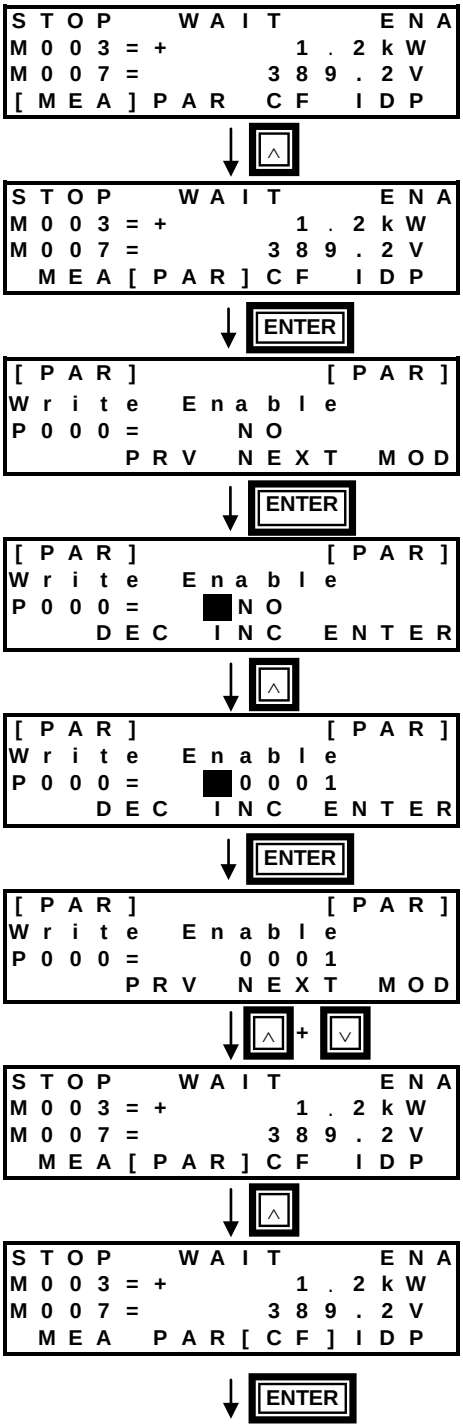
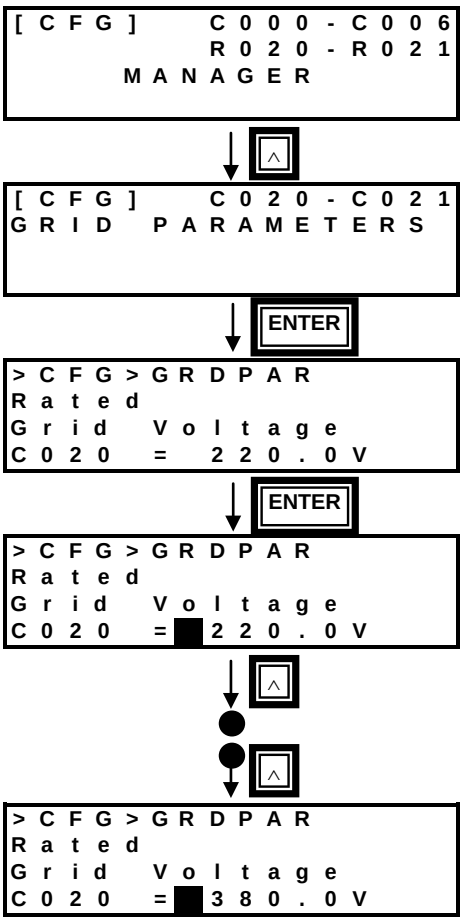


Figure 1: Navigating in the Menu Tree

Parameter programming example:
Before changing the parameter value, enable parameter write (P000= 0001).





Press ESC to confirm the new parameter value. The new value is not stored to non-volatile memory; when the inverter is next powered on, the previous parameter value will be used.

Press ENTER to confirm the new parameter value and to store it to non-volatile memory (the new value is not cleared when the inverter is powered off).

2.5. Parameter and Measure List

2.5.1. "M" Measures

Menu	Parameter	FUNCTION	User Level	Modbus Address
GENERAL MEASURES MENU [MEA]	**M000**	Photovoltaic Field Voltage Reference	BASIC	1650
	M001	Grid Frequency	BASIC	1651
	M003	Delivered Active Energy	BASIC	1653
	M006	Inverter Voltage	BASIC	1656
	M007	Grid Voltage	BASIC	1657
	M008	Inverter Current	BASIC	1658
	M009	Grid Current	BASIC	1659
	M010	Photovoltaic Field Voltage	BASIC	1660
	M011	Photovoltaic Field Current	BASIC	1661
	M012	Photovoltaic Field Power	BASIC	1662
	M019	Grid KO Event Counter	BASIC	1669
	M020	Radiation KO Event Counter	BASIC	1670
	M021	System Warning	BASIC	1671
ENERGY MENU [MEA]	**M200**	Total Energy Count Value	BASIC	1621, 1622
	M201	Partial Energy Count Value	BASIC	1623, 1624
	M013	Delivered Active Energy/External Energy Counter n.1	BASIC	1663, 1664
	M015	External Energy Counter n.2	BASIC	1665, 1666
	M017	Energy from PV Field	BASIC	1667, 1668
	U000	Partial Active Energy	BASIC	1644, 1645
	U004	Partial Active Energy from PV Field	BASIC	1648, 1649
AMBIENT MEASURES MENU [MEA]	**M024**	Ambient Measure 1	BASIC	3218
	M025	Ambient Measure 2	BASIC	3219
	M026	Ambient Measure 3	BASIC	3220
	M027	Ambient Measure 4	BASIC	3221
	M028	Ambient Measure 5	BASIC	3222
	M029	Ambient Measure 6	BASIC	3223
	M077	Intermediate Ambient Measure 1	ADVANCED	1627
	M078	Intermediate Ambient Measure 2	ADVANCED	1628
	M079	Intermediate Ambient Measure 3	ADVANCED	1629
	M080	Intermediate Ambient Measure 4	ADVANCED	1630
	M081	Intermediate Ambient Measure 5	ADVANCED	1631
	M082	Intermediate Ambient Measure 6	ADVANCED	1632
DIGITAL INPUTS MENU [MEA]	**M032**	Instantaneous Digital Inputs	BASIC	1682
	M033	Digital Inputs from Environmental Sensors and I/Os Expansion Board (ES847)	BASIC	1683

Menu	Parameter	FUNCTION	User Level	Modbus Address
GRID MEASURES MENU [MEA]	**M037**	R-S Voltage (RMS)	BASIC	1687
	M038	S-T Voltage (RMS)	BASIC	1688
	M039	T-R Voltage (RMS)	BASIC	1689
	M040	RMS Line Voltage, Phase R	BASIC	1690
	M041	RMS Line Voltage, Phase S	BASIC	1691
	M042	Grid-side, RMS Line Voltage (Phase T)	BASIC	1692
	M043	PLL State for the Synchronization with the Grid	BASIC	1693
	M044	Grid State 2	BASIC	1694
	M045	Grid State 1	BASIC	1695
	M046	Inverter Current (RMS), Phase R	BASIC	1696
	M047	Inverter Current (RMS), Phase S	BASIC	1697
	M048	Inverter Current (RMS), Phase T	BASIC	1698
	M049	RMS Current Asymmetry	BASIC	1699
	M065	RMS Line Voltage, Phase R	BASIC	1715
	M066	RMS Line Voltage, Phase S	BASIC	1716
	M067	RMS Line Voltage, Phase T	BASIC	1717
	M071	Line Active Power, Phase R	BASIC	1721
	M072	Line Active Power, Phase S	BASIC	1722
	M073	Line Active Power, Phase T	BASIC	1723
OUTPUTS MENU [MEA]	**M034**	Analog Output 1	BASIC	1684
	M035	Analog Output 2	BASIC	1685
	M036	Analog Output 3	BASIC	1686
	M056	Digital Outputs	BASIC	1706
	M057	Auxiliary Digital Outputs	BASIC	1707
TEMPERATURES MENU [MEA]	**M061**	Voltage of A/D Converter for Ambient Temperature Measure	BASIC	1711
	M062	Control Board Temperature Measure	BASIC	1712
	M063	Voltage of A/D Converter for IGBT Temperature Measure	BASIC	1713
	M064	IGBT Temperature Measure	BASIC	1714
OPERATING CONDITIONS MENU [MEA]	**M089**	Inverter State	BASIC	1739
	M090	Active Alarm	BASIC	1740
	M091	Isolation Alarm	BASIC	1825
	M095	Hardware Condition	BASIC	1745
	M097	Delivery Time	BASIC	1746, 1747
	M098	Operation Time	BASIC	1702, 1703
	M099	Supply Time	BASIC	1704, 1705

Table 1: “M” Measures at a glance

2.5.2. "P" Parameters

Menu	Parameter	FUNCTION	User Level	Modbus Address
WRITE ENABLE MENU AND USER LEVEL MENU [PAR]	**P000**	Write Enable	BASIC	867
	P001	User Level	BASIC	1457
FIELD MENU [PAR]	**P019**	Min. Radiation for Start Up	ADVANCED	619
	P020	Field Voltage Reference, Manual MPPT	ADVANCED	620
	P021	Min. Time for Radiation OK	ADVANCED	621
	P022	Min. Power for Radiation KO	ENGINEERING	622
	P023	Min. Instantaneous Power for Radiation KO	ENGINEERING	623
	P024	Min. Power Radiation KO Time	ENGINEERING	624
	P025	Min. Instantaneous Power Radiation KO Time	ENGINEERING	625
	P026	MPPT Enable	ADVANCED	626
	P027	MPPT Computing Cycle Time	ADVANCED	627
	P028	MPPT Field Voltage Reference Variation	ADVANCED	628
GRID MONITOR MENU [PAR]	**P072**	Peak Overvoltage Trip Time	ENGINEERING	672
	P073	Instantaneous Overvoltage Threshold	(*)	673
	P074	Inst. Overvoltage Release Ratio	(*)	674
	P075	Inst. Overvoltage Trip Time	(*)	675
	P076	Inst. Overvoltage Reset Time	(*)	676
	P077	Max. Voltage Trip Threshold	(*)	677
	P078	Max. Voltage Release Ratio	(*)	678
	P079	Max. Voltage Trip Time	(*)	679
	P080	Max. Voltage Reset Time	(*)	680
	P081	Min. Voltage Trip Threshold	(*)	681
	P082	Min. Voltage Release Ratio	(*)	682
	P083	Min. Voltage Trip Time	(*)	683
	P084	Min. Voltage Reset Time	(*)	684
	P085	Inst. Undervoltage Threshold	(*)	685
	P086	Inst. Undervoltage Release Ratio	(*)	686

(*) See section 7.1 Default Values by Country.

Menu	Parameter	FUNCTION	User Level	Modbus Address
GRID MONITOR MENU [PAR]	**P087**	Inst. Undervoltage Trip Time	(*)	687
	P088	Inst. Undervoltage Reset Time	(*)	688
	P089	Max. Frequency Trip Threshold	(*)	689
	P090	Max. Frequency Release Ratio	(*)	690
	P091	Max. Frequency Trip Time	(*)	691
	P092	Max. Frequency Reset Time	(*)	692
	P093	Min. Frequency Trip Threshold	(*)	693
	P094	Min. Frequency Release Ratio	(*)	694
	P095	Min. Frequency Trip Time	(*)	695
	P096	Min. Frequency Reset Time	(*)	696
	P097	Max. Frequency Derivative Trip Threshold	ENGINEERING	697
	P098	Max. Frequency Derivative Release Ratio	ENGINEERING	698
	P099	Max. Frequency Derivative Trip Time	ENGINEERING	699
	P100	Max. Frequency Derivative Reset Time	ENGINEERING	700
	P100a	Minimum Trip Threshold for Start Up Voltage	ENGINEERING	643
	P100b	Maximum Trip Threshold for Start Up Frequency	ENGINEERING	644
	P100c	Maximum Trip Threshold for Start Up Voltage	ENGINEERING	645
	P100d	Minimum Trip Threshold for Start Up Frequency	ENGINEERING	646
GRID POWER CONTROL MENU [PAR]	**P300**	Grid Power Control Enable	ENGINEERING	900
	P301	Grid Power Control Factor 1	ENGINEERING	901
	P302	Grid Power Control Factor 2	ENGINEERING	902
	P303	Grid Power Control Factor 3	ENGINEERING	903
	P304	Grid Power Control Factor 4	ENGINEERING	904
	P305	Grid Power Control Factor 5	ENGINEERING	905
	P306	Grid Power Control Factor 6	ENGINEERING	906
	P307	Grid Power Control Factor 7	ENGINEERING	907
	P308	Grid Power Control Factor 8	ENGINEERING	908
	P309	Grid Power Control Factor 9	ENGINEERING	909
	P310	Grid Power Control Factor 10	ENGINEERING	910
	P311	Grid Power Control Factor 11	ENGINEERING	911
	P312	Grid Power Control Factor 12	ENGINEERING	912
	P313	Grid Power Control Factor 13	ENGINEERING	913
	P314	Grid Power Control Factor 14	ENGINEERING	914
	P315	Grid Power Control Factor 15	ENGINEERING	915
	P316	Not used	-	-
	P317	Entry Table Selector	ENGINEERING	917
	P318	Active Power Setpoint	ENGINEERING	918
	P319	Cosphi Setpoint	ENGINEERING	919
	P320	Reactive Power Setpoint	ENGINEERING	920
	P321	Grid Cosphi Setpoint Factor 1	ENGINEERING	921
	P322	Grid Cosphi Setpoint Factor 2	ENGINEERING	922
	P323	Grid Cosphi Setpoint Factor 3	ENGINEERING	923
	P324	Grid Cosphi Setpoint Factor 4	ENGINEERING	924
	P325	Grid Cosphi Setpoint Factor 5	ENGINEERING	925
	P326	Grid Cosphi Setpoint Factor 6	ENGINEERING	926
	P327	Grid Cosphi Setpoint Factor 7	ENGINEERING	927

(*) See section 7.1 Default Values by Country.

Menu	Parameter	FUNCTION	User Level	Modbus Address
	P328	Grid Cosphi Setpoint Factor 8	ENGINEERING	928
	P329	Grid Power Control Factor 9	ENGINEERING	929
	P330	Grid Power Control Factor 10	ENGINEERING	930
	P331	Grid Power Control Factor 11	ENGINEERING	931
	P332	Grid Power Control Factor 12	ENGINEERING	932
	P333	Grid Power Control Factor 13	ENGINEERING	933
	P334	Grid Power Control Factor 14	ENGINEERING	934
	P335	Grid Power Control Factor 15	ENGINEERING	935
	P336	Lock_in Voltage for Power Factor (P)	ENGINEERING	936
	P337	Lock_out Voltage for Power Factor (P)	ENGINEERING	937
	P338	Lock_in Power for Q(U)	ENGINEERING	938
	P339	Lock_out Power for Q(U)	ENGINEERING	939
	P341	Breakpoint 1 Pactive of the Power Factor Characteristic (P)	ENGINEERING	936
	P342	Breakpoint 1 Power Factor of the PF Characteristic (P)	ENGINEERING	937
	P343	Breakpoint 2 Pactive of the Power Factor Characteristic (P)	ENGINEERING	938
	P344	Breakpoint 2 Power factor of the PF Characteristic (P)	ENGINEERING	939
	P345	Breakpoint 1 Vgrid of the Q(U) Characteristic	ENGINEERING	940
	P346	Breakpoint 1 Preactive of the Q(U) Characteristic	ENGINEERING	941
	P347	Breakpoint 2 Vgrid of the Q(U) Characteristic	ENGINEERING	942
	P348	Breakpoint 2 Preactive of the Q(U) Characteristic	ENGINEERING	948
	P358	V1s Point of the Q(U) Characteristic	ENGINEERING	958
	P359	V1t Point of the Q(U) Characteristic	ENGINEERING	959
	P030	Offset Angle	ENGINEERING	630
	P036	Ramp for Power Gain Variation of 100%	ENGINEERING	636
	P037	Compensation Ramp for Reactive Power Reference	ENGINEERING	637
	P038	Settling Time for 100% Output Power (at Start)	ENGINEERING	638
	P039	Settling Time for 100% Output Power (Control)	ENGINEERING	639
HFRT MENU [PAR]	**P349**	Start Frequency Derate	ENGINEERING	949
	P350	Frequency Release Delay	ENGINEERING	950
	P351	Path Type	ENGINEERING	951
	P352	Frequency Derate Slope	ENGINEERING	952
	P353	Release Frequency Derate	ENGINEERING	953
	P354	Dynamic	ENGINEERING	954
	P355	Settling time after Frequency Fault Recover	ENGINEERING	955

Menu	Parameter	FUNCTION	User Level	Modbus Address
LVRT MENU [PAR]	**P360**	LVRT Control Enable	ADVANCED	960
	P361	Phase-to-Phase RMS Voltage Selector or Phase Voltage Selector for LVRT	ADVANCED	961
	P362	Voltage Sag Detection Threshold	ADVANCED	962
	P363	Normal Operation Restore Threshold after Voltage Sag	ADVANCED	963
	P364	Normal Operation Restore Time after Voltage Sag	ADVANCED	964
	P365	Voltage Profile Duration v0	ADVANCED	965
	P366	Voltage Profile Duration v1	ADVANCED	966
	P367	Voltage Profile Duration v2	ADVANCED	967
	P368	Voltage Profile Duration v3	ADVANCED	968
	P369	Voltage Profile Duration v4	ADVANCED	969
	P370	Voltage Profile Duration v5	ADVANCED	970
	P371	Voltage Profile Duration v6	ADVANCED	971
	P372	Voltage Profile Duration v7	ADVANCED	972
	P373	Voltage Profile Duration t0	ADVANCED	973
	P374	Voltage Profile Duration t1	ADVANCED	974
	P375	Voltage Profile Duration t2	ADVANCED	975
	P376	Voltage Profile Duration t3	ADVANCED	976
	P377	Voltage Profile Duration t4	ADVANCED	977
	P378	Voltage Profile Duration t5	ADVANCED	978
	P379	Voltage Profile Duration t6	ADVANCED	979
	P380	Voltage Profile Duration t7	ADVANCED	980
	P381	Selector Switch for Grid Voltage Reactive Current Injection in LVRT	ADVANCED	981
	P382	Selector Switch for Reactive Current Injection Mode in LVRT	ADVANCED	982
	P383	K-factor of Reactive Current Injection in LVRT	ADVANCED	983
	P384	RMS Voltage Dead Zone for Reactive Current in LVRT	ADVANCED	984
	P385	Maximum Reactive Current for K-factor LVRT	ADVANCED	985
	P386	Reset Time after LVRT (Reactive Injection Hold)		
ANALOG OUTPUTS MENU [PAR]	**P176**	Analog Output 1 Mode	ADVANCED	776
	P177	Analog Output 1 Offset	ADVANCED	777
	P178	Analog Output 1 Filter	ADVANCED	778
	P181	Analog Output 2 Mode	ADVANCED	781
	P182	Analog Output 2 Offset	ADVANCED	782
	P183	Analog Output 2 Filter	ADVANCED	783
	P187	Analog Output 3 Mode	ADVANCED	787
	P188	Analog Output 3 Offset	ADVANCED	788
	P189	Analog Output 3 Filter	ADVANCED	789
	P207	Analog Output 1 Gain	ADVANCED	807
	P208	Analog Output 2 Gain	ADVANCED	808
	P209	Analog Output 3 Gain	ADVANCED	809
	P210	Analog Output 1 Address	ADVANCED	810
	P211	Analog Output 2 Address	ADVANCED	811
	P212	Analog Output 3 Address	ADVANCED	812

Menu	Parameter	FUNCTION	User Level	Modbus Address
DIGITAL OUTPUTS MENU [PAR]	**P224**	UDM1 Logic Level	ADVANCED	824
	P225	Enable Delay for UDM1	ADVANCED	825
	P226	Disable Delay for UDM1	ADVANCED	826
	P227	Watchdog Timeout UDM1	ADVANCED	827
	P228	UDM1Output Signal Selection	ADVANCED	828
	P230	UDM2 Logic Level	ADVANCED	830
	P231	Enable Delay for UDM2	ADVANCED	831
	P232	Disable Delay for UDM2	ADVANCED	832
	P233	UDM2 Output Signal Selection	ADVANCED	833
	P171	PAR Input Initialization Value*	ADVANCED	771
	P172	Par Input Default Value*	ADVANCED	772
	I071	Input for Communication Detection	ADVANCED	1458
	P144	Upper Full-scale Value for Ambient Measure 6	ADVANCED	744
	P144bis	Lower Full-scale Value for Ambient Measure 6	ADVANCED	752
	P145	Offset for Ambient Measure 6	ADVANCED	745
	P154	Operating Mode for Ambient Measure 6	ENGINEERING	754
ENERGY COUNTERS MENU [PAR]	**P110**	Energy Count Value per kWh	ENGINEERING	710
	P111	External Energy Counter n.1 Function	ENGINEERING	711
	P112	External Energy Counter n.2 Function	ENGINEERING	712
	P113	Pulses per kWh - External Energy Counter n.1	ENGINEERING	713
	P114	Pulses per kWh - External Energy Counter n.2	ENGINEERING	714
	P115L	Preset x0.01 Energy Counter n.1	ENGINEERING	715
	P115H	Preset x100 Energy Counter n.1	ENGINEERING	716
	P116L	Preset x0.01 Energy Counter n.2	ENGINEERING	717
	P116H	Preset x100 Energy Counter n.2	ENGINEERING	718
	P117L	Preset x0.01 PV Energy Counter	ENGINEERING	759
	P117H	Preset x100 PV Energy Counter	ENGINEERING	760
	P119	Energy Counter Gain	ENGINEERING	719
DATE & TIME [PAR]	**P391**	Day of the Week to be changed	BASIC	991
	P392	Day of The Month to be changed	BASIC	992
	P393	Month to be Changed	BASIC	993
	P394	Year to be Changed	BASIC	994
	P395	Time (Hours) to be Changed	BASIC	995
	P396	Time (Minutes) to be Changed	BASIC	996
	P398	Clock/Calendar Editing Command	BASIC	998
EEPROM MENU [CFG]	**P267**	Password for Write Enable	ENGINEERING	867
PRODUCT MENU [IDP]	**P263**	Dialog Language	BASIC	863

Table 2: “P” Parameters at a glance

2.5.3. “I” Parameters

Menu	Parameter	FUNCTION	User Level	Modbus Address
COUNTER RESET MENU [PAR]	**I002**	Grid KO Event Counter Reset	ADVANCED	1389
	I003	Radiation KO Event Counter Reset	ADVANCED	1390
	I004	Active Energy Counter Reset	ADVANCED	1391
	I005	External Energy Counter n.2 Reset	ADVANCED	1392
	I006	Photovoltaic Field Energy Counter Reset	ADVANCED	1393
	I008	Partial Energy Counter Reset	ADVANCED	1395
GRID INTERFACE AUTOTEST MENU [PAR]	**I030**	Grid Min. Voltage Test	BASIC	1417
	I031	Grid Max. Voltage Test	BASIC	1418
	I032	Grid Min. Frequency Test	BASIC	1419
	I033	Grid Max. Frequency Test	BASIC	1420
AMBIENT MEASURES MENU [PAR]	**I022**	External Ambient Variable 1	BASIC	1409
	I025	External Ambient Variable 2	BASIC	1412
	I026	External Ambient Variable 3	BASIC	1413
	I027	External Ambient Variable 4	BASIC	1414
	I029	External Ambient Variable 5	BASIC	1416
	I034	External Ambient Variable 6	BASIC	1421
EEPROM MENU[CFG]	**I012**	EEPROM Control	BASIC	1399

Table 3: “I” Parameters at a glance

2.5.4. “C” Parameters

Menu	Parameter	FUNCTION	User Level	Modbus Address
MANAGER MENU [CFG]	**C000**	Waiting Time Stand-by 4 (StartUp)	ENGINEERING	1000
	C001	Waiting Time Stand-by 5 (Grid Interface)	ENGINEERING	1001
	C002	Time for Starting OK	ENGINEERING	1002
	C003	Number of Starting Attempts	ENGINEERING	1003
	C004	Remote Control	ENGINEERING	1004
	C005	Operating mode of Environmental Sensors and I/Os Expansion Board (ES847)	ENGINEERING	180
	C006	Auxiliary Power Supply Option	ENGINEERING	308
	C008	Grid Check Timeout at Start	ENGINEERING	1008
GRID PARAMETERS MENU [CFG]	**C020**	Rated Grid Voltage	BASIC	1020
	C021	Rated Grid Frequency	ENGINEERING	1021
ALARM AUTORESET MENU [CFG]	**C255**	Number of Autoreset Attempts	ENGINEERING	1255
	C256	Autoreset Attempt Count Reset	ENGINEERING	1256
	C257	Alarm Reset at Power On	ENGINEERING	1257
	C258	Alarm TLP/KM1 Fault Autoreset Enable	ENGINEERING	1258
	C260	Alarm Tlext Fault Autoreset Enable	ENGINEERING	1260
	C261	Thermal Protection Autoreset Enable	ENGINEERING	1261
	C262	Heatsink Overtemperature Autoreset Enable	ENGINEERING	1262
	C263	CPU Overtemperature Autoreset Enable	ENGINEERING	1263
	C264	Fan Fault Autoreset Enable	ENGINEERING	1264
	C265	By-Pass Fault Autoreset Enable	ENGINEERING	1265
	C266	IGBT Fault Autoreset Enable	ENGINEERING	1266
	C267	Overcurrent Autoreset Enable	ENGINEERING	1267
	C268	Overvoltage Autoreset Enable	ENGINEERING	1268
	C269	Serial Link Fault Autoreset Enable	BASIC	1269
	C271	Ref (and Analog Inputs) < 4mA Autoreset Enable	BASIC	1271
	C272	Cooling Time	ENGINEERING	1272
	C273	PV Field Isolation KO	ENGINEERING	1273
	C275	Inverter Asymmetric Current Alarm Autoreset Enable	ENGINEERING	1275

Table 4: “C” Parameters at a glance

2.5.5. “R” Parameters

Menu	Parameter	FUNCTION	User Level	Modbus Address
DATA LOGGER MENU [PAR]				
Ethernet & Modem Menu [PAR]	**R100**	IP Address High	BASIC	1332
	R101	IP Address Low	BASIC	1333
	R102	IP Mask High	BASIC	1334
	R103	IP Mask Low	BASIC	1335
	R104+R105+ R106	SMS 1 Phone Number	BASIC	569, 570, 571
	R108+R109+ R110	SMS 2 Phone Number	ADVANCED	572, 573, 574
	R111	PPP IN Username	BASIC	575
	R112	PPP IN Password	BASIC	576
	R113	PPP OUT Username	BASIC	577
	R114	PPP OUT Password	BASIC	578
	R115	SIM Card PIN	BASIC	563
MANAGER MENU [CFG]	**R020**	Data Logger Option	ENGINEERING	219
	R021	Presence of Environmental Sensors and I/Os Expansion Board (ES847)	ENGINEERING	301
SERIAL LINKS MENU [CFG]				
List of Programmable Parameters [CFG]	**R001**	Inverter Modbus Address for Serial Link 0	ENGINEERING	588
	R002	Response Delay for Serial Link 0	ENGINEERING	589
	R003	Baud Rate for Serial Link 0	ENGINEERING	590
	R004	Time Added to 4byte–Time for Serial Link 0	ENGINEERING	591
	R005	Watchdog Time for Serial Link 0	ENGINEERING	592
	R006	Parity Bit for Serial Link 0	ENGINEERING	593

Table 5: “R” Parameters at a glance

3. MEASURES [MEA] MENU

3.1. Description

The Measures Menu contains the variables measured by the inverter and that can be used by the user.
In the display/keypad, measures are divided into subgroups.
The measure subgroups are the following:

- **General Measures Menu**

This menu contains the measures for current, voltage, power and energy delivered by the inverter; the counters for Grid KO and Radiation KO events; the Delivery Time counter.

- **Energy Menu**

This menu contains the measures for the Energy Delivered and the Energy Count.

- **Ambient Measures Menu**

This menu contains the measures concerning the values acquired from the ambient sensors.

- **Digital Inputs Menu**

This menu contains the measures concerning the digital inputs of the inverter.

- **Line Measures Menu**

This menu contains the measures of the output current and the output voltage and the measures of the internal grid monitor.

- **Outputs Menu**

This menu contains the state of the inverter digital outputs and analog outputs.

- **Temperatures Menu**

This menu contains the measures of the control board temperatures and the IGBT heatsink temperatures.

- **Operating Conditions Menu**

This menu displays the inverter state, the active alarms and the inverter hardware condition.

- **Fault List Menu**

This menu contains the last eight alarms tripped (inverter faults which cause the equipment to stop) along with the time when the alarms tripped and the main measures detected when the alarms tripped.

- **Event List Menu**

This menu contains the last sixteen events, along with the time when the events fired and the main measures detected when the events fired.

NOTE

The values of the measures are given as an indication. Their typical accuracy is not over 1%.

3.2. General Measures Menu - M000 to M021

This menu displays the main electric items of the inverter: DC-side (PV-side) voltage, current, power; AC-side (grid-side) voltage, current, power.

Parameter	FUNCTION	User Level	Modbus Address
M000	Photovoltaic Field Voltage Reference	BASIC	1650
M001	Grid Frequency	BASIC	1651
M003	Delivered Active Energy	BASIC	1653
M006	Inverter Voltage	BASIC	1656
M007	Grid Voltage	BASIC	1657
M008	Inverter Current	BASIC	1658
M009	Grid Current	BASIC	1659
M010	Photovoltaic Field Voltage	BASIC	1660
M011	Photovoltaic Field Current	BASIC	1661
M012	Photovoltaic Field Power	BASIC	1662
M019	Grid KO Event Counter	BASIC	1669
M020	Solar Radiation KO Event Counter	BASIC	1670
M021	System Warning	BASIC	1671

Table 6: List of Measures M000 to M021

M000 Photovoltaic Field Voltage Reference

M000	Range	0 ÷ 10000	0 ÷ 1000.0 V
Photovoltaic Field Voltage Reference	Address	1650	
	Level	BASIC	
	Function	When the inverter is running, this is the PV field voltage required for the MPPT; when the inverter is not running, this is the measure of the PV field voltage.	

M001 Grid Frequency

M001	Range	± 10000	± 100.00 Hz
Grid Frequency	Address	1651	
	Level	BASIC	
	Function	Measure of the grid frequency.	

M003 Delivered Active Energy

M003	Range	± 32000	± 3200.0 kW
Delivered Active Energy	Address	1653	
	Level	BASIC	
	Function	Delivered active energy. The inverter stops if the active power is not exceeding the value in P022 for a time longer than the time set in P024.	

M006 Inverter Voltage

M006	Range	0 ÷ 10000	0 ÷ 1000.0 V
Inverter Voltage	Address	1656	
	Level	BASIC	
	Function	Output voltage of the inverter (the output voltage is measured between the inverter and the output transformer).	

M007 Grid Voltage

M007	Range	0 ÷ 10000	0 ÷ 1000.0 V
Grid Voltage	Address	1657	
	Level	BASIC	
	Function	Measure of the grid voltage.	

M008 Inverter Current

M008	Range	0 ÷ 65000	0 ÷ 6500.0 A
Inverter Current	Address	1658	
	Level	BASIC	
	Function	Current delivered from the converter (the output current is measured between the converter and the output transformer).	

M009 Grid Current

M009	Range	0 ÷ 65000	0 ÷ 6500.0 A
Grid Current	Address	1659	
	Level	BASIC	
	Function	Grid current (measured downstream of the output transformer).	

M010 Photovoltaic Field Voltage

M010	Range	0 ÷ 10000	0 ÷ 1000.0 V
Photovoltaic Field Voltage	Address	1660	
	Level	BASIC	
	Function	Measure of the PV field voltage. This is also the voltage measured in the inverter electrolytic capacitors when the DC disconnecting switch is closed.	

M011 Photovoltaic Field Current

M011	Range	0 ÷ 65000	0 ÷ 6500.0 A
Photovoltaic Field Current	Address	1661	
	Level	BASIC	
	Function	PV field current measured by the inverter.	

M012 Photovoltaic Field Power

M012	Range	± 32000	± 3200.0 kW
Photovoltaic Field Power	Address	1662	
	Level	BASIC	
	Function	Power generated from the photovoltaic field.	

NOTE

*For the description of measures **M013 (Delivered Active Energy/External Energy Counter n.1)**, **M015 (External Energy Counter n.2)**, **M017 (Energy from PV Field),** please refer to the ENERGY MENU M200, M201, M013 ÷ M017, U000, U004.*

M019 Grid KO Event Counter

M019	Range	0 ÷ 65000	0 ÷ 65000
Grid KO Event Counter	Address	1669	
	Level	BASIC	
	Function	Number of power off events due to Grid KO conditions. This counter can be reset by the user with parameter I002.	

M020 Solar Radiation KO Event Counter

M020	Range	0 ÷ 65000	0 ÷ 65000
Radiation KO Event Counter	Address	1670	
	Level	BASIC	
	Function	Number of power off events due to Radiation KO conditions. This counter can be reset by the user with parameter I003.	

M021 System Warning

	Range	Bit-controlled measure	See Table 7
System Warning	Address	1671	
	Level	BASIC	
	Function	Status of the system.	

Bit N.	Description
0	Aux mains OK
1	Inverter Enable
2	Aux 3
3	DC switch closed
4	Grid Protection tripped
5	PV field isolation loss
6	Grid contactor closed
7	Fuse KO
8	Inverter thermal limit

Table 7: Coding of measure M021

3.3. ENERGY MENU M200, M201, M013 ÷ M017, U000, U004

This menu includes the measures of the active energy produced by the inverter.
The overall energy measure is the amount of energy produced by the PV field from its first startup.
The partial energy measures allow the user to monitor the energy amount produced in a given time period.

Parameter	FUNCTION	User Level	Modbus Address
M200	Total Energy Count Value	BASIC	1621
M201	Partial Energy Count Value	BASIC	1623
M013	Delivered Active Energy/External Energy Counter n.1	BASIC	1663, 1664
M015	External Energy Counter n.2	BASIC	1665, 1666
M017	Energy from PV Field	BASIC	1667, 1668
U000	Partial Active Energy	BASIC	1644, 1645
U004	Partial Active Energy from PV Field	BASIC	1648, 1649

Table 8: List of Measures M200÷M201, M013, M015, M017, U000, U004

M200 Total Energy Count Value

M200			
Total Energy Count Value	**Range**	± 2147483647	± 214748364.7 Euros
	Level	BASIC	
	Address	1621, 1622 (LSword, MSword)	
	Function	This measure is the total value of the accumulated Energy Count.	

M201 Partial Energy Count Value

M201			
Partial Energy Count Value	**Range**	± 2147483647	± 214748364.7 Euros
	Level	BASIC	
	Address	1623, 1624 (LSword, MSword)	
	Function	This measure is the partial Energy Count value. This is a 32-bit value including two words (16-bit each): low part and high part.	

M013 Delivered Active Energy/External Energy Counter n.1

M013			
Delivered Active Energy/ External Energy Counter n.1	**Range**	± 2147483647	± 214748364.7 kWh
	Address	1663,1664 (LSWord, MSWord)	
	Level	BASIC	
	Function	Counter of the active energy delivered to the grid since the inverter was first started. This is a 32-bit value including two Words (16-bit each): low part and high part. This measure can be programmed to represent either the internal counter for the energy delivered or an external, pulsed-signal counter. This counter can be reset by the user (I004). The programming parameter is P111: P111 = 0: Internal Counter for Delivered Active Energy P111 = 1: External Energy Counter n.1	

M015 External Energy Counter n.2

M015	Range	± 2147483647	± 214748364.7 kWh
External Energy Counter n.2	Active	This parameter is active only if P112>0	
	Address	1665,1666 (LSWord, MSWord)	
	Level	BASIC	
	Function	External, pulsed-signal counter. This is a 32-bit value including two words (16-bit each): low part and high part. This measure can be programmed to represent either the Absorbed Energy count or the difference between Delivered Energy and Absorbed Energy. This counter can be reset by the user (I005). The programming parameter is P112: P112 = 0: Disabled Counter P112 = 1: External Energy Counter n.2 P112 = 2: Difference between Delivered Energy and Absorbed Energy.	

M017 Energy from PV Field

M017	Range	0 ÷ 4294967295	0 ÷ 429496729.5 kWh
Energy from PV Field	Address	1667,1668 (LSWord, MSWord)	
	Level	BASIC	
	Function	Counter of the overall energy generated starting from the inverter startup. This is a 32-bit value including two Words (16-bit each): low part and high part. This counter can be reset by the user (I006); in that case, U004 is also reset.	

U000 Partial Active Energy

U000	Range	± 320000000	± 32000000.0 kWh
Partial Active Energy	Address	1644, 1645 (LSWord, MSWord)	
	Level	BASIC	
	Function	Partial counter of the active energy delivered to the grid. This is a 32-bit value including two Words (16-bit each): low part and high part. This counter can be reset by the user (I008); in that case, U004 is also reset.	

U004 Partial Active Energy from PV Field

U004	Range	± 320000000	± 32000000.0 kWh
Partial Active Energy from PV Field	Address	1648, 1649 (LSWord, MSWord)	
	Level	BASIC	
	Function	Partial counter of the active energy generated from the photovoltaic field. This is a 32-bit value including two Words (16-bit each): low part and high part. This counter can be reset by the user (I008); in that case, U000 is also reset.	

3.4. AMBIENT MEASURES MENU - M024 to M029, M077 to M082

This menu can be viewed on the display/keypad only when optional board ES847 (expansion of environmental sensors and field I/Os) is activated.
This menu displays six variables acquired from the PV field and converted into electric signals. The inputs provided are the following: 0÷100mV, 0÷10V, 0/4÷20mA, PT100; they allow interfacing with most types of sensors. All inputs can be configured as physical variables; the first four sensors can be electrically configured (you can choose the type of transducer to be connected).
Factory-setting allows using the analog inputs as sensors able to acquire the main ambient variables (module radiation and horizontal radiation, ambient temperature and module temperature, wind speed and wind direction) of the photovoltaic generator.

CAUTION

Changing factory settings through the dedicated parameters in the AMBIENT MEASURES MENU - P120 to P154 allows changing the parameter function. The Modbus addresses of the measures concerned will change accordingly.

Ambient variables can be acquired and viewed from external devices connected via Modbus to the inverter. See AMBIENT MEASURES MENU - P120 to P154.

Parameter	FUNCTION	User Level	Modbus Address
M024	Ambient Measure 1	BASIC	3218
M025	Ambient Measure 2	BASIC	3219
M026	Ambient Measure 3	BASIC	3220
M027	Ambient Measure 4	BASIC	3221
M028	Ambient Measure 5	BASIC	3222
M029	Ambient Measure 6	BASIC	3223
M077	Intermediate Measure for Analog Channel 1	ADVANCED	1727
M078	Intermediate Measure for Analog Channel 2	ADVANCED	1728
M079	Intermediate Measure for Analog Channel 3	ADVANCED	1729
M080	Intermediate Measure for Analog Channel 4	ADVANCED	1730
M081	Intermediate Measure for Analog Channel 5	ADVANCED	1731
M082	Intermediate Measure for Analog Channel 6	ADVANCED	1732

Table 9: List of Measures M024 to M029, M077 to M082

M024 Ambient Measure 1

M024	Range	± 32000	± 3200.0
Ambient Measure 1	Address	3218	
	Level	BASIC	
	Function	Measure value depending on the setting of parameters **P120, P121, P122, P123**. With preset values, this is the measure of module radiation. Optional Environmental Sensors and I/Os Expansion Board (ES847) is required.	

M025 Ambient Measure 2

M025	Range	± 32000	± 3200.0
Ambient Measure 2	Address	3219	
	Level	BASIC	
	Function	Measure value depending on the setting of parameters **P125, P126, P127, P128**. With preset values, this is the measure of horizontal radiation. Optional Environmental Sensors and I/Os Expansion Board (ES847) is required.	

M026 Ambient Measure 3

M026	Range	± 32000	± 3200.0
Ambient Measure 3	Address	3220	
	Level	BASIC	
	Function	Measure value depending on the setting of parameters **P130, P131, P132, P133.** With preset values, this is the measure of the ambient temperature. Optional Environmental Sensors and I/Os Expansion Board (ES847).	

M027 Ambient Measure 4

M027	Range	± 32000	± 3200.0
Ambient Measure 4	Address	3221	
	Level	BASIC	
	Function	Measure value depending on the setting of parameters **P135, P136, P137, P138**. With preset values, this is the measure of the module temperature. Optional Environmental Sensors and I/Os Expansion Board (ES847).	

M028 Ambient Measure 5

M028	Range	± 32000	± 3200.0
Ambient Measure 5	Address	3222	
	Level	BASIC	
	Function	Measure value depending on the setting of parameters **P140, P141, P142**. With preset values, this is auxiliary measure 1, 0-10V. Optional Environmental Sensors and I/Os Expansion Board (ES847).	

M029 Ambient Measure 6

M029	Range	± 32000	± 3200.0
Ambient Measure 6	Address	3223	
	Level	BASIC	
	Function	Measure value depending on the setting of parameters **P143, P144, P145**. With preset values, this is auxiliary measure 2, 0-10V. Optional Environmental Sensors and I/Os Expansion Board (ES847).	

M077 Intermediate Measure for Analog Channel 1

M077	Range	0 ÷ 65000	0 ÷ 65000
Intermediate Measure for Analog Channel 1	Address	1727	
	Level	ADVANCED	
	Function	Value of the electric measure in analog channel 1. Measure value depending on the setting of parameters **P125, P126, P127, P128** and of DIP-switches SW1-2/3/4 (please refer to the "INSTALLATION INSTRUCTIONS" manual).	

M078 Intermediate Measure for Analog Channel 2

M078	Range	0 ÷ 65000	0 ÷ 65000
Intermediate Measure for Analog Channel 2	Level	ADVANCED	
	Address	1628	
	Function	Measure value depending on the setting of parameters **P125, P126, P127, P128** and of DIP-switches SW1-6/7/8 (please refer to the Installation Instructions Manual).	

M079 Intermediate Measure for Analog Channel 3

M079	Range	0 ÷ 65000	0 ÷ 65000
Intermediate Measure for Analog Channel 3	Address	1629	
	Level	ADVANCED	
	Function	Value of the electric measure in analog channel 3. Measure value depending on the setting of parameters **P130, P131, P132, P133** and of DIP-switches SW2-1/2/3/4 (please refer to the Installation Instructions Manual).	

M080 Intermediate Measure for Analog Channel 4

M080	Range	0 ÷ 65000	0 ÷ 65000
Intermediate Measure for Analog Channel 4	Address	1630	
	Level	ADVANCED	
	Function	Value of the electric measure in analog channel 4. Measure value depending on the setting of parameters **P135, P136, P137, P138** and of DIP-switches SW2-5/6/7/8 (please refer to the Installation Instructions Manual).	

M081 Intermediate Measure for Analog Channel 5

M081	Range	0 ÷ 65000	0 ÷ 65000
Intermediate Measure for Analog Channel 5	Address	1631	
	Level	ADVANCED	
	Function	Value of the electric measure in analog channel 5. Measure value depending on the setting of parameters **P140, P141, P142**.	

M082 Intermediate Measure for Analog Channel 6

M082	Range	0 ÷ 65000	0 ÷ 65000
Intermediate Measure for Analog Channel 6	Address	1632	
	Level	ADVANCED	
	Function	Value of the electric measure in analog channel 6. Measure value depending on the setting of parameters **P143, P144, P145**.	

3.5. Digital Inputs Menu M032-M033

The Digital Inputs menu allows checking the status of the digital inputs.

Parameter	FUNCTION	User Level	Modbus Address
M032	Digital Inputs	BASIC	1682
M033	Digital Inputs from ES847 I/O Expansion Board	BASIC	1683

Table 10: List of Measures M032 and M033

M032 Digital Inputs

M032			
Digital Inputs	**Range**	Bit-controlled measure.	See Table 11.
	Address	1682	
	Level	BASIC	
	Function	Status of the control terminals used by the inverter. The meaning of the signals varies based on the product model (Sunway TG or Sunway TG TE).	

		Description	
Bit N.	**Digital Input**	**Sunway TG**	**Sunway TG TE**
0	MDI1	Auxiliary grid status	Auxiliary grid status
1	MDI2	Enable	Enable
2	MDI3	-	AC switch status
3	MDI4	DC switch status	DC switch status
4	MDI5	TLP contactor status	TLP contactor status
5	MDI6	Status of external interface protection (if fitted)	Status of external interface protection (if fitted)
6	MDI7	Insulation control status	Insulation control status
7	MDI8	-	PWM synchronisation input

Table 11: Coding of Measure M032

M033 Digital Inputs from ES847 Expansion Board

M033			
Digital Inputs from ES847 Expansion Board	**Range**	Bit-controlled measure.	See Table 13
	Active	This measure can be viewed only if ES847 Expansion Board is fitted.	
	Address	1683	
	Level	BASIC	
	Function	State of the digital terminals in expansion board ES847 (if fitted). The meaning of the signals varies based on the product model (Sunway TG or Sunway TG TE).	

		Description	
Bit N.	**Digital Input**	**Sunway TG**	**Sunway TG TE**
0	AUX_DIN 1	Power Control(*) - 1	Power Control(*) - 1
1	AUX_DIN 2	Power Control(*) - 2	Power Control(*) - 2
2	AUX_DIN 3	External Energy Counter 1	External Energy Counter 1
3	AUX_DIN 4	External Energy Counter 2	External Energy Counter 2
4	AUX_DIN 5	Power Control(*) - 3	Power Control(*) - 3
5	AUX_DIN 6	-	Fuse compartment input
6	AUX_DIN 7	Power Control(*) - 4	Power Control(*) - 4
7	AUX_DIN 8	-	Status of external AC switches

Table 12: Coding of Measure M033

(*) Auxiliary digital input controlling the power delivered.

The status of the DC-Parallel fuses is given in Measure **M033f** below.

M033f Status of DC-Parallel Fuses

M033f	**Range**	1 ÷ 2	1: Fuse Warning 2: Fuse OK
Status of DC-Parallel Fuses	**Active**	Active if optional Environmental Sensors and I/Os Expansion Board (ES847) is fitted.	
	Address	3266	
	Level	BASIC	
	Function	Status of the DC-Parallel fuses when the DC-Parallel is fitted.	

3.6. GRID MEASURES MENU M037 to M049, M065 to M067, M071 to M073

This menu includes the measures of the inverter RMS voltage and RMS current—detected upstream of the output transformer—as well as the measures of the line RMS voltage and RMS current—detected downstream of the output transformer). It also displays the status of the PLL for the synchronization with the grid and the status of the grid monitor.

Parameter	FUNCTION	User Level	Modbus Address
M037	R-S Voltage (RMS)	BASIC	1687
M038	S-T Voltage (RMS)	BASIC	1688
M039	T-R Voltage (RMS)	BASIC	1689
M040	RMS Line Voltage, Phase R	BASIC	1690
M041	RMS Line Voltage, Phase S	BASIC	1691
M042	Grid-side, RMS Line Voltage (Phase T)	BASIC	1692
M043	PLL State for the Synchronization with the Grid	BASIC	1693
M044	Grid State 2	BASIC	1694
M045	Grid State 1	BASIC	1695
M046	Inverter Current (RMS), Phase R	BASIC	1696
M047	Inverter Current (RMS), Phase S	BASIC	1697
M048	Inverter Current (RMS), Phase T	BASIC	1698
M049	RMS Current Asymmetry	BASIC	1699
M065	RMS Line Voltage, Phase R	BASIC	1715
M066	RMS Line Voltage, Phase S	BASIC	1716
M067	RMS Line Voltage, Phase T	BASIC	1717
M071	Line Active Power, Phase R	BASIC	1721
M072	Line Active Power, Phase S	BASIC	1722
M073	Line Active Power, Phase T	BASIC	1723

Table 13: List of Measures M037 to M049, M065 to M067, M071 to M073

M037 R-S Voltage (RMS)

M037	Range	0 ÷ 10000	0 ÷ 1000.0 V
R-S Voltage (RMS)	Address	1687	
	Level	BASIC	
	Function	Grid-side, RMS line voltage (V_{RS}).	

M038 S-T Voltage (RMS)

M038	Range	0 ÷ 10000	0 ÷ 1000.0 V
S-T Voltage (RMS)	Address	1688	
	Level	BASIC	
	Function	Grid-side, RMS line voltage (V_{ST}).	

M039 T-R Voltage (RMS)

M039	Range	0 ÷ 10000	0 ÷ 1000.0 V
T-R Voltage (RMS)	Address	1689	
	Level	BASIC	
	Function	Grid-side, RMS line voltage (V_{TR}).	

M040 RMS Line Voltage, Phase R

M040	Range	± 32000	± 3200.0 A
RMS Line Voltage, Phase R	Address	1690	
	Level	BASIC	
	Function	Grid-side, RMS line voltage (phase R).	

M041 RMS Line Voltage, Phase S

M041	Range	± 32000	± 3200.0 A
RMS Line Voltage, Phase S	Address	1691	
	Level	BASIC	
	Function	Grid-side, RMS line voltage (phase S).	

M042 Grid-side, RMS Line Voltage (Phase T)

M042	Range	± 32000	± 3200.0 A
Grid-side, RMS Line Voltage (Phase T)	Address	1692	
	Level	BASIC	
	Function	Grid-side, RMS line voltage (phase T).	

M043 PLL State for the Synchronization with the Grid

M043	Range	0 ÷ 4	See Table 14.
PLL State for the Synchronization with the Grid	Address	1693	
	Level	BASIC	
	Function	M043 displays the state of PLL, which checks the grid phase sequence. When operating in ordinary conditions, the value displayed should be 3:LOCK POS or 4:LOCK NEG, for a positive phase sequence or a negative phase sequence respectively in the input phases.	

N.	Value	Description
0	IDLE	PLL idling.
1	INIT POS.	Acknowledged positive phase sequence waiting for synchronization.
2	INIT NEG	Acknowledged negative phase sequence waiting for synchronization.
3	LOCK POS	Synchronized positive phase sequence.
4	LOCK NEG	Synchronized negative phase sequence.

Table 14: Coding of Measure M043

M044 Grid State 2

M044	Range	0 ÷ 1023 0x0000h÷0x03ffh	See Table 15
Grid State 2	Address	1694	
	Level	BASIC	
	Function	M044 displays the grid faults from the internal grid monitor (see configuration of the parameters in the GRID MONITOR MENU - P072 to P100). If a value other than 0 is displayed, this means that the internal grid interface protective device tripped.	

Bit n.	Description
0	Max. voltage, phase R
1	Max. voltage, phase S
2	Max. voltage, phase T
3	Min. voltage, phase R
4	Min. voltage, phase S
5	Min. voltage, phase T
6	Max. frequency
7	Min. frequency
8	PLL fault

Table 15: Bits of M044

M045 Grid State 1

M045	Range	0 ÷ 2047 0x0000h÷0x07ffh Bit-controlled measure.	See Table 16
Grid State 1	Address	1695	
	Level	BASIC	
	Function	M045 displays the state of grid faults detected from the internal grid monitor (see configuration of the Grid Monitor parameters). If a value other than 0 is displayed, this means that the internal grid interface protective device tripped.	

Bit n.	Description
0	Phase R overvoltage
1	Phase S overvoltage
2	Phase T overvoltage
3	Phase R undervoltage
4	Phase S undervoltage
5	Phase T undervoltage
6	RMS fault, phase R
7	RMS fault, phase S
8	RMS fault, phase T
9	Max. frequency derivative
10	PLL fault

Table 16: Bits of M045

M046 Inverter Current (RMS), Phase R

M046	Range	± 32000	± 3200.0 A
Inverter Current (RMS), Phase R)	Address	1696	
	Level	BASIC	
	Function	RMS of line current in phase R (between the inverter and the transformer).	

M047 Inverter Current (RMS), Phase S

M047	Range	± 32000	± 3200.0 A
Inverter Current (RMS), Phase S	Address	1697	
	Level	BASIC	
	Function	RMS of line current in phase S (between the inverter and the transformer).	

M048 Inverter Current (RMS), Phase T

M048	Range	± 32000	± 3200.0 A
Inverter Current (RMS), Phase T	Address	1698	
	Level	BASIC	
	Function	RMS of line current in phase T (between the inverter and the transformer).	

M049 RMS Current Asymmetry

M049	Range	0 ÷ 99	0.0 ÷ 9.9
RMS Current Asymmetry	Address	1699	
	Level	BASIC	
	Function	Measure for the comparison with the asymmetry threshold of the converter output current (see P036).	

M065 RMS Line Voltage, Phase R

M065	Range	0 ÷ 10000	0 ÷ 1000.0 V
RMS Line Voltage, Phase R	Address	1715	
	Level	BASIC	
	Function	This is the measure of RMS line voltage in phase R.	

M066 RMS Line Voltage, Phase S

M066	Range	0 ÷ 10000	0 ÷ 1000.0 V
RMS Line Voltage, Phase S	Address	1716	
	Level	BASIC	
	Function	This is the measure of RMS line voltage in phase S.	

M067 RMS Line Voltage, Phase T

M067	Range	0 ÷ 10000	0 ÷ 1000.0 V
RMS Line Voltage, Phase T	Address	1717	
	Level	BASIC	
	Function	This is the measure of RMS line voltage in phase T.	

M071 Line Active Power, Phase R

M071	Range	± 32000	± 3200.0 kW
Line Active Power, Phase R	Address	1721	
	Level	BASIC	
	Function	This is the measure of the active power delivered for phase R.	

M072 Line Active Power, Phase S

M072	Range	± 32000	± 3200.0 kW
Line Active Power, Phase S	Address	1722	
	Level	BASIC	
	Function	This is the measure of the active power delivered for phase S.	

M073 Line Active Power, Phase T

M073	Range	± 32000	± 3200.0 kW
Line Active Power, Phase T	Address	1723	
	Level	BASIC	
	Function	This is the measure of the active power delivered for phase T.	

3.7. OUTPUTS MENU - M034 to M036, M056-M057

The Outputs menu allows checking the state of the digital outputs and the analog outputs of the inverter.

Parameter	FUNCTION	User Level	Modbus Address
M034	Analog Output 1	BASIC	1684
M035	Analog Output 2	BASIC	1685
M036	Analog Output 3	BASIC	1686
M056	Digital Outputs	BASIC	1706
M057	Auxiliary Digital Outputs (optional Environmental Sensors and I/Os Expansion Board -ES847))	BASIC	1707

Table 17: List of Measures M034 to M036, M056-M057

M034 Analog Output 1

M034	Range	0 ÷ 10.0V	0 ÷ 2PN kW Power = (Vout/10)x2xPN
Analog Output 1	Address	1684	
	Level	BASIC	
	Function	Delivered active power reproduced on AO1 analog output, with a full-scale value equal to twice the inverter rated power.	

M035 Analog Output 2

M035	Range	0 ÷ 10.0V	0 ÷ 1000 V Field voltage = (Vout/10)x1000
Analog Output 2	Address	1685	
	Level	BASIC	
	Function	Field voltage reproduced on AO2 analog output, with a full-scale value of 1000V.	

M036 Analog Output 3

M036	Range	0 ÷ 10.0V	(0 ÷ 2xPN) /500) A Field current = Vout/10 x (2xPN/500)
Analog Output 3	Address	1686	
	Level	BASIC	
	Function	Field voltage reproduced on AO3 analog output with a full-scale value equal to twice the inverter rated power divided by 500V (reference voltage).	

M056 Digital Outputs

M056	Range	Bit-controlled measure.	See Table 18.
Digital Outputs	Address	1706	
	Level	BASIC	
	Function	State of digital outputs MDO1-4.	

Bit n.	Digital Output
0	MDO1
1	MDO2 (Status of UDM1 Multifunction Digital Output)*
2	MDO3 (State of TLP command)
3	MDO4 (State of TLM command)

Table 18: Coding of Measure M056

*MDO2 digital output is allocated to the control of UDM1 if the EXTERNAL contactor is MONOSTABLE (please consult the Installation Instructions Manual).

M057 Auxiliary Digital Outputs (optional Environmental Sensors and I/Os Expansion Board (ES847)

M057	Range	Bit-controlled measure	See Table 19
Auxiliary Digital Outputs (optional Environmental Sensors and I/Os Expansion Board (ES847)	Address	1707	
	Level	BASIC	
	Function	Status of auxiliary digital outputs AUX_DOUT 1÷6.	

Bit n.	Auxiliary Digital Outputs
0	AUX_DOUT 1
1	AUX_DOUT 2
2	AUX_DOUT 3
3	AUX_DOUT 4 (Status of UDM1 Multifunction Digital Output)*
4	AUX_DOUT 5 Status of UDM2 Multifunction Digital Output)
5	AUX_DOUT 6

Table 19: Coding of Measure M057

*AUX_DOUT 4 (auxiliary digital output) is allocated to the control of UDM1 if the EXTERNAL contactor is BISTABLE (see Installation Instructions Manual).

3.8. Temperatures Menu - M061 to M064

The Temperatures menu allows displaying the temperature measures detected within the inverter module, as well as the voltage values of the analog channels connected to the respective sensors.

Parameter	FUNCTION	User Level	Modbus Address
M061	Voltage of A/D Converter for CPU Temperature Measure	BASIC	1711
M062	CPU Temperature Measure	BASIC	1712
M063	Voltage of A/D Converter for IGBT Temperature Measure	BASIC	1713
M064	IGBT Temperature Measure	BASIC	1714

Table 20: List of Measures M061 to M064

M061 Voltage of A/D Converter for CPU Temperature Measure

M061	Range	0 ÷ 3300	0 ÷ 3.30 V
Voltage of A/D Converter for CPU Temperature Measure	Address	1711	
	Level	BASIC	
	Function	Voltage detected in A/D converter used for CPU temperature detection.	

M062 CPU Temperature Measure

M062	Range	± 32000	± 320.0 °C
Control Board Temperature Measure	Address	1712	
	Level	BASIC	
	Function	Measure of the ambient temperature detected on the surface of the control board.	

M063 Voltage of A/D Converter for IGBT Temperature Measure

M063	Range	0 ÷ 3300	0 ÷ 3.30 V
Voltage of A/D Converter for IGBT Temperature Measure	Address	1713	
	Level	BASIC	
	Function	Voltage detected in A/D converter used for IGBT temperature detection.	

M064 IGBT Temperature Measure

M064	Range	± 32000	± 320.0 °C
IGBT Temperature Measure	Address	1714	
	Level	BASIC	
	Function	Measure of IGBT temperature.	

3.9. OPERATING CONDITIONS Menu - M089 to M099

This menu displays the measures relating to the inverter operating conditions.

Parameter	FUNCTION	User Level	Modbus Address
M089	Inverter State	BASIC	1739
M090	Active Alarm	BASIC	1740
M091	Isolation Alarm	BASIC	1825
M095	Hardware Condition	BASIC	1745
M097	Delivery Time	BASIC	1746, 1747
M098	Operation Time	BASIC	1702, 1703
M099	Supply Time	BASIC	1704, 1705

Table 21: List of Measures M089 to M099

M089 Inverter State

M089	Range	See Table 22.	See Table 22.
Inverter State	Address	1739	
	Level	BASIC	
	Function	This parameter describes the current operating conditions of the inverter.	

Digit	Coding	Description
0	Precharge	Starting precharge; the inverter is waiting for DC bus voltage to reach Vdc_min.
1	STOP wait Ena.	Inverter in STOP waiting for the ENABLE command.
2	Inverter in STOP	Inverter in STOP waiting for the RUN command.
3	STOP Run OK!	After receiving the RUN command (START key) and checking the radiation conditions, the inverter is switching to STANDBY2 after forcing external contactor/KM2 to close and is waiting for external contactor/KM2 closing signal…
4	SB1 GRID KO	STANDBY1: Inverter in STOP because the hardware grid interface protective device is detecting a grid fault.
5	To STOP ###ms	The inverter is Stopping due to the depression of the STOP button or the opening of the ENABLE contact.
6	To Standby1 ###ms	The inverter is switching to the state of STANDBY1 due to a fault detected by the hardware interface device.
7	SB2 Rad. ###.# s	STANDBY2: The inverter is ready to start (RUN command received) but is waiting for stronger radiation.
8	SB3 VR SQL KO	STANDBY3: The inverter is ready to start (RUN command and Radiation OK command received); the grid is OK, but the inverter is waiting for the control to be ready (accomplishment of ADC offset measure).
9	SB4 = #####.#s	STANDBY4: Inverter in STOP waiting for a timeout due to too many restart attempts.
10	SB5 = #####.#s	STANDBY5: Inverter in STOP waiting for a timeout due to the reset of the grid interface protective device (previously on StandBY1).
11	SYNCHRO	SYNCHRO: The inverter has started; the transformer is fluxing and the inverter is synchronizing with the grid before closing TLP.
12	Close TLP/KM1 ####ms	The inverter is switching to the PARALLEL state; it has forced TLP/KM1 to close after synchronizing with the grid and is waiting for TLP/KM1 closing signal.
13	Open TLP/KM1 ####ms	TLP/KM1 is opening due to an event causing the inverter disconnection from the grid; the inverter is waiting for TLP/KM1 opening signal.
14	Run P=#####.#kW	PARALLEL: The inverter is delivering energy to the grid.
15	Power Off	POWER OFF: The inverter is disconnecting from the switch and is suppressing power delivered to the grid before opening TLP/KM1.
16	Alarm 1 A###	ALARM1: A fault occurred; the inverter is switching to the ALARM2 state.
17	Alarm 2 B###	ALARM2: The inverter is locked in emergency condition.
18	Resetting ##.#s	The inverter is resetting the alarm tripped.
19	SB6 Rad. ###.#s	STANDBY6: The inverter is ready to start (RUN command received) but is waiting for stronger solar radiation (this is the same as STANDBY2 state; the only difference is that the external contactor/KM2 is open; when radiation is OK, the external contactor/KM2 is closed first—the inverter switches to state 3—and the inverter switches to STANDBY2 state).
21	Sb3 Vg Min. KO	STANDBY3: The inverter is ready to start (RUN command and Radiation OK command received) and is waiting for the grid to be OK, but undervoltage is detected in one (or more) of the three phases.
22	Sb3 Vg Max. KO	STANDBY3: The inverter is ready to start (RUN command and Radiation OK command received) and is waiting for the grid to be OK, but undervoltage is detected in one (or more) of the three phases.
23	Sb3 Fgrid KO	STANDBY3: The inverter is ready to start (RUN command and Radiation OK command received) and is waiting for the grid to be OK, but frequency is out of range.
24	Sb3 PLL KO	STANDBY3: The inverter is ready to start (RUN command and Radiation OK command received), is waiting for the grid to be OK and is waiting for PLL synchronization.
25	TUNING SYNCHRO	TUNING (SYNCHRO): The inverter has started; the transformer is fluxing and the inverter is synchronizing with the grid, but it will not close the TLP to allow for the tuning of sensors and shift angles (this is enabled by SERVICE parameters only).
26	OL t = ####.# s	COOLING: Inverter overheated waiting for the cooling time set in C272 to elapse.
30	SB1 AUX GRID KO	STANDBY1: Inverter in STOP because the aux grid input is detecting a fault.

Table 22: Coding of the Inverter State

M090 Active Alarm

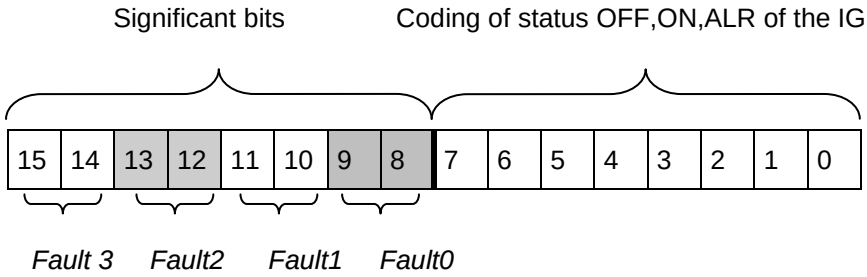
M090	**Range**	See the List of the Alarm Codes.	See the List of the Alarm Codes.
Active Alarm	**Address**	1740	
	Level	BASIC	
	Function	Alarm tripped at the moment.	

M091 Isolation Alarm

M091	**Range**	0 ÷ 1	0: NO Alarm 1: Isolation alarm
Isolation Alarm	**Address**	1825	
	Level	BASIC	
	Function	Binary indication for the isolation of the PV field.	

M095 Hardware Condition

M095	**Range**	See Table 23.	See Table 23.
Hardware Condition	**Address**	1745	
	Level	BASIC	
	Function	Hardware conditions of the inverter.	



The IGBT condition when the alarm tripped may be one of the following:

ON: IGBTs on.

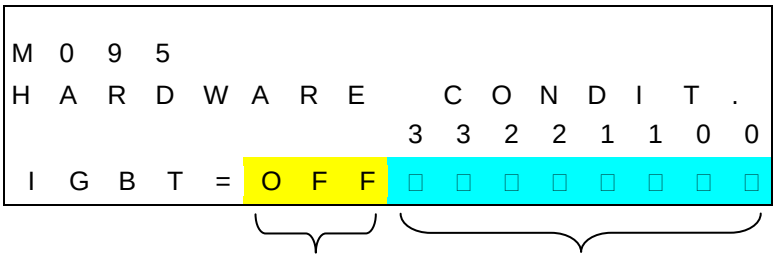
OFF: IGBTs off.

ALR: IGBTs in an emergency.

Fault N.	Type of Fault	Description of Each Bit (1 = True; 0 = False)
0	IGBT power converter fault	Bit 8: Fault signal edge indication
		Bit 9: Current state of the fault signal
1	Hardware Overcurrent (OC) signal	Bit 10: Fault signal edge indication
		Bit 11: Current state of the fault signal
2	Fan fault	Bit 12: Fault signal edge indication
		Bit 13: Current state of the fault signal
3	PWMENA; return of the IGBT drive command.	Bit 14: Command return indication.
		Bit 15: Current state of IGBT command return.

Table 23: Type of Hardware Fault

The display will show the following:



M097 Delivery Time

M097	**Range**	$0 \div 2^{32}$	$0 \div 2^{32}$ in units of 200 ms displayed as hh:min:sec
Delivery Time	**Address**	1746, 1747 (LSword, MSword)	
	Level	BASIC	
	Function	Time (hours) when the inverter delivers power to the grid. This is a 32-bit value including two words (16-bit each): low part and high part. This time counter may be reset by the user via parameter I007.	

M098 Operation Time (OT)

M098	**Range**	$0 \div 2^{32}$	$0 \div 2^{32}$ in units of 200ms displayed as hh:min:sec
Operation Time	**Address**	1702, 1703 (LSword, MSword)	
	Level	BASIC	
	Function	The Operation Time is the activation time of the inverter IGBTs. This measure is expressed in 32bits divided into two 16-bit words: the low part and the high part.	

M099 Supply Time (ST)

M099	**Range**	$0 \div 2^{32}$	$0 \div 2^{32}$ in units of 200ms displayed as hh:min:sec
Supply Time	**Address**	1704, 1705 (LSword, MSword)	
	Level	BASIC	
	Function	The Supply Time is the time when the inverter is powered on. This measure is expressed in 32bits divided into two 16-bit words: the low part and the high part.	

3.10. FAULT LIST MENU

The Fault List menu contains the last eight alarms stored by the inverter as well as the measure of some characteristic variables detected when each alarm tripped.

The **Fault List** is a tree-based menu.
Level 1 displays the codes of the last eight alarms tripped: A1, A2 ... A8.
Press **ENTER** from Level 1 to Level 2 relating to the submenu concerning the displayed submenu.
Level 2 displays the measures detected from the inverter when the alarm tripped. These measures are listed in Table 24 relating to Alarm 01 (the last alarm tripped).

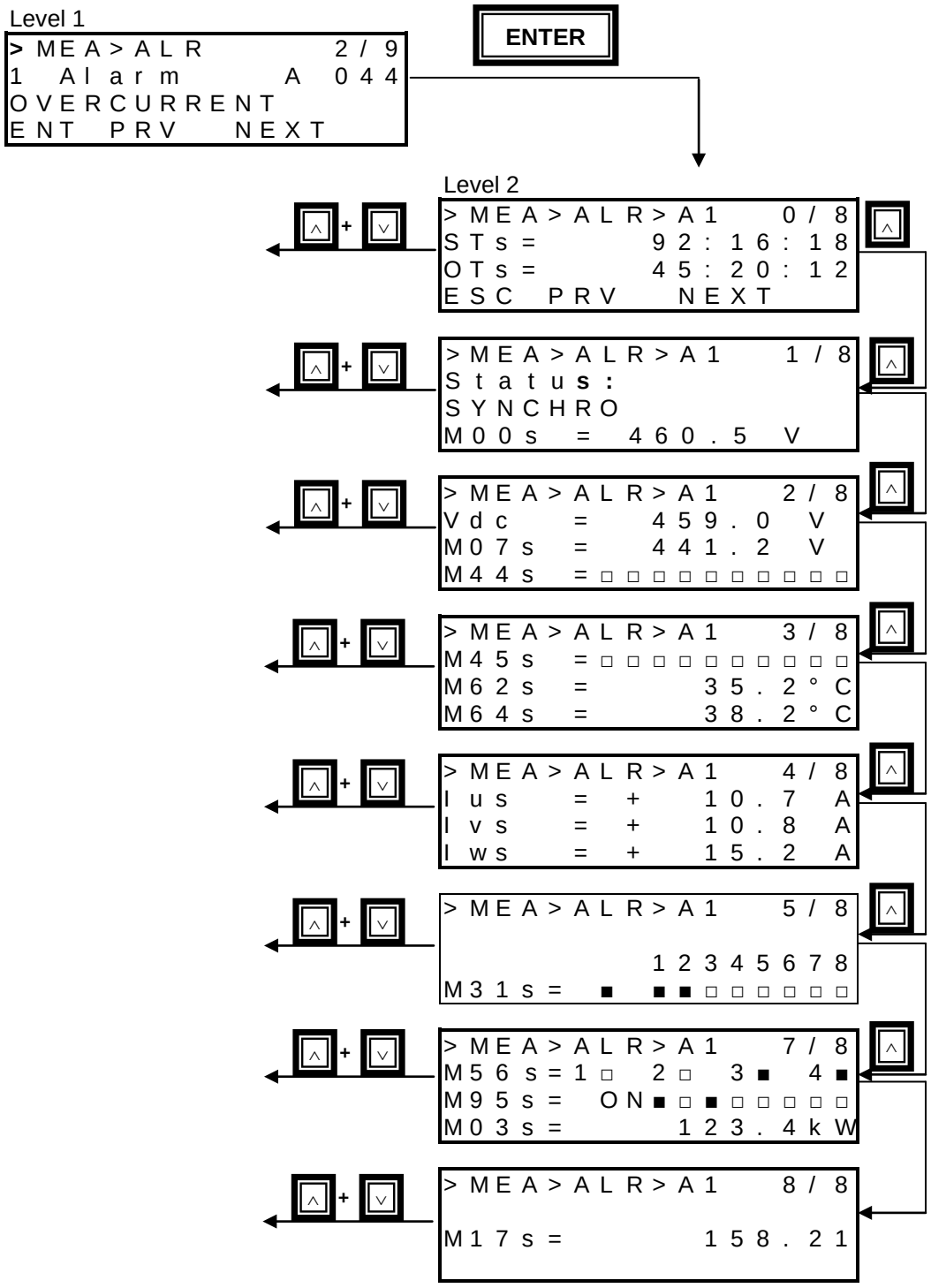
Menu	Code	DESCRIPTION	User Level	Modbus Address
[MEA]/[ALRM1]		Code of Alarm 1 (See the List of the Alarm Codes	BASIC	7712
	STs	Supply Time, Record 1	BASIC	7715
	Ots	Operating Time, Record 1	BASIC	7713
	Status	Inverter Status	BASIC	7717
	M00s	DC-bus voltage reference	BASIC	7718
	M10s	DC-bus voltage	BASIC	7719
	M07s	Grid voltage	BASIC	7720
	M44s	Grid State 2	BASIC	7721
	M45s	Grid State 1	BASIC	7722
	M62s	CPU Temperature	BASIC	7723
	M64s	IGBT Heatsink Temperature	BASIC	7724
	Ius	Instantaneous Current, Phase U	BASIC	7725
	Ivs	Instantaneous Current, Phase V	BASIC	7726
	Iws	Instantaneous Current, Phase W	BASIC	7727
	M31s	Logic input terminals	BASIC	7728
	M56s	Internal Digital Outputs (MD01-02-03-04)	BASIC	7729
	M95s	Type of Fault in IGBT Converter, Side A	BASIC	7730
	M03s	Delivered Active Power	BASIC	7731
	M17s	PV Field Active Energy	BASIC	7734

Table 24: Coding of the MEASURES in the FAULT LIST menu

Table 24 states the coding of the measures relating to ALARM n.1, which is the most recent alarm.
Alarms are stored using the FIFO technique: when an alarm trips, the vector containing the measures of the prior alarms is shifted left, so the new alarm is the first in the list. Alarm n.8 is deleted.
Measures and addresses for alarms n. 2, 3, 4, … 8 must always match. To do so, a fixed OFFSET is summed to the addresses of the measures relating to alarm 1 (right column in Table 24).
The OFFSET depends on the alarm to be read. The following is the matching between the alarm n. and the fixed OFFSET:

- ALARM n. 2 => OFFSET = 32 x 1 = 32
- ALARM n. 3 => OFFSET = 32 x 2 = 64
- ALARM n. 4 => OFFSET = 32 x 3 = 96
- ALARM n. 5 => OFFSET = 32 x 4 = 128
- ALARM n. 6 => OFFSET = 32 x 5 = 160
- ALARM n. 7 => OFFSET = 32 x 6 = 192
- ALARM n. 8 => OFFSET = 32 x 7 = 224

The next page shows how to navigate in the **Fault List** Menu. The example refers to alarm n. 1 – A1. Note that A1 is the last alarm tripped, while A8 is the first alarm tripped.



3.11. Event List Menu

The Event List menu displays the list of the last 16 events fired. It also contains the measures of some characteristic variables detected when the events fired while the Sunway TG inverter was operating.
The list of the possible events is given in Table 25.

Coding	Description
E095 Controlled stop	The STOP key in the display/keypad has been depressed.
E096 Starting OK	Successful starting; Sunway T is operating in parallel with the grid.
E097 Grid Interface KO	External grid interface protective device (optional) tripped.
E098 Grid frequency KO	The grid frequency is out of the preset range (see GRID MONITOR MENU - P072 to P100).
E099 Grid Min. V	The grid voltage has dropped below the preset min. value (see GRID MONITOR MENU - P072 to P100).
E100 Grid Max. V	The grid voltage has exceeded the preset max. value (see GRID MONITOR MENU - P072 to P100).
E101 Aux Grid KO	Auxiliary grid failure.
E102 Low field V	The field voltage is too weak.
E103 Low field power	The field power is too weak.
E104 PLL KO	The synchronization with the grid failed.
E105 Power Off	The inverter has shut off.

Table 25: Description of the Events

The **Event List** is a tree-based menu.
Level 1 displays the codes of the last sixteen events fired: E1, E2 ... E16.
Press **ENTER** from Level 1 to Level 2, relating to the submenu of the event displayed.
Level 2 displays the measures detected from the inverter when the event fired. These measures are listed in Table 26 relating to Event 01 (the last event fired).

Menu	Code	DESCRIPTION	User Level	Modbus Address
[MEA]/[EVNT]		Code of Event 1 (see Coded Events)	BASIC	5044
	STs	Supply Time, Record 1	BASIC	5047
	Ots	Operating Time, Record 1	BASIC	5045
	Status	Inverter Status	BASIC	5049
	M00s	DC-bus voltage reference	BASIC	5050
	M10s	DC-bus voltage	BASIC	5051
	M07s	Grid voltage	BASIC	5052
	M44s	Grid State 2	BASIC	5053
	M45s	Grid State 1	BASIC	5054
	M62s	CPU Temperature	BASIC	5055
	M64s	IGBT Heatsink Temperature	BASIC	5056
	Ius	Instantaneous Current, Phase U	BASIC	5057
	Ivs	Instantaneous Current, Phase U	BASIC	5058
	Iws	Instantaneous Current, Phase W	BASIC	5059
	M31s	Delayed logic input terminals	BASIC	5060
	M56s	Internal Digital Outputs (MD01-02-03-04)	BASIC	5061
	M95s	Type of Fault in IGBT Converter, Side A	BASIC	5062
	M03s	Delivered Active Power	BASIC	5063
	M17s	PV Field Active Energy	BASIC	5066

Table 26: Coding of the MEASURES in the EVENT LIST menu

Sixteen events are stored to the EVENT list. Table 26 states the coding of the measures relating to EVENT n.1, which is the most recent event.
Events are stored using the FIFO technique: when an event fires, the vector containing the measures of the prior events is shifted left, so the new event is the first in the list. Event n.16 is then deleted.
Measures and addresses for events n. 2, 3, 4, … 16 must always match. To do so, a fixed OFFSET is summed to the addresses of the measures relating to event 1 (right column in Table 26).
The OFFSET depends on the event to be read. The following is the matching between the event n. and the fixed OFFSET:

- EVENT n. 2 => OFFSET = 32 x 1 = 32
- EVENT n. 3 => OFFSET = 32 x 2 = 64
- EVENT n. 4 => OFFSET = 32 x 3 = 96
- EVENT n. 5 => OFFSET = 32 x 4 = 128
- EVENT n. 6 => OFFSET = 32 x 5 = 160
- EVENT n. 7 => OFFSET = 32 x 6 = 192
- EVENT n. 8 => OFFSET = 32 x 7 = 224
- EVENT n. 9 => OFFSET = 32 x 8 = 256
- EVENT n. 10 => OFFSET = 32 x 9 = 288
- EVENT n. 11 => OFFSET = 32 x 10 = 320
- EVENT n. 12 => OFFSET = 32 x 11 = 352
- EVENT n. 13 => OFFSET = 32 x 12 = 384
- EVENT n. 14 => OFFSET = 32 x 13 = 416
- EVENT n. 15 => OFFSET = 32 x 14 = 448
- EVENT n. 16 => OFFSET = 32 x 15 = 480

The navigation mode in the Event List is the same as the navigation mode in the Fault List.

4. PARAMETERS [PAR] MENU

4.1. Description

The Parameters Menu includes all the variables to be altered for the inverter programming.

- **Write Enable Menu and User Level Menu**

The Write Enable menu allows editing the parameter values; the User Level menu allows selecting the user level for parameter settings.

- **Field Menu**

This menu contains the threshold parameters for the photovoltaic field and the control of the operating point.

- **Ambient Measures Menu (available only if the Environmental Sensors and I/Os Expansion Board is activated)**

This menu contains the parameters allowing selecting the type of analog inputs and its scale factor.

- **Grid Monitor Menu**

This menu contains the parameters for the interface protection.

- **Grid Power Control Menu**

This menu contains the parameters pertaining to limitation of the delivered active power.

- **Counter Reset Menu**

This menu contains the parameters allowing resetting the event counter and the partial energy counter.

- **Grid Interface Autotest Menu**

This menu contains the parameters relating to the prescriptions for the connection to the local LV grid.

- **Analog Outputs Menu**

This menu contains the configuration parameters for the analog outputs.

- **Digital Outputs Menu**

This menu contains the configuration parameters for the digital outputs.

- **Energy Counters Menu**

This menu contains the measures for the Energy Count and the configuration parameters for the energy counters.

- **Data Logger Menu (available only if the Data Logger Option is activated)**

This menu contains the parameters allowing programming ES851 Data Logger board.

- **Data & Time Menu (available only if the Data Logger Option is activated)**

This menu contains the Clock/Calendar.

- **Display/Keypad Menu**

This menu contains the parameters setting the navigation modes for the display/keypad.

4.2. WRITE ENABLE MENU AND USER LEVEL MENU - P000 and P001

In the Write Enable menu, parameter P000 enables altering the inverter parameters.
The User Level menu permits to change the user level allowing accessing the inverter parameters.

Parameter	Function	User Level	Modbus Address
P000	Write Enable	BASIC	867
P001	User Level	BASIC	1457

Table 27: List of Parameters P000-P001

P000 Write Enable

P000	**Range**	00000÷32767	00000: [No] ÷32767
Write Enable	**Default**	0	0: No
	Level	BASIC	
	Address	Cannot be accessed via serial link. Parameter write from serial link is always enabled.	
	Function	Set the correct value in P000 to allow parameter alteration. You can use your custom password to access parameter write by setting the new password in P267 (see the EEPROM MENU).	

P001 User Level

P001	**Range**	0÷2	0: Basic 1: Advanced 2: Engineering
User Level	**Default**	0	0 : Basic
	Level	BASIC	
	Address	1457	
	Function	The programming parameters are divided into groups based on user levels depending on function complexity. The user level set in the display/keypad affects which menus or which parts of them can be viewed by the user. If a Basic user level is set up, once the inverter is properly parameterized, navigation is easier because the user can view a basic parameter set, including only the most frequently used parameters. **In this manual, the preset user level is mentioned in the Level field.**	

4.3. FIELD MENU - P019 to P028

The Field submenu includes the parameters controlling the inverter commissioning; the inverter operation when the MPPT function is activated; the inverter stoppage.
The inverter starts up when the field voltage set in P020 is reached for the time set in P021.
The inverter stops when the level of the power delivered to the grid is lower than the value set in P022 for the time set in P024, or when the level of the power delivered to the grid is lower than P023 for the time set in P025.
The MPPT mode is enabled via P026. The inverter refreshes the maximum power point every P027 seconds and changes the MPPT reference based on the voltage value set in P028.

Parameter	FUNCTION	User Level	Modbus Address
P019	Min. Solar Radiation for Inverter Start Up	ADVANCED	619
P020	Field Voltage Reference, Manual MPPT	ADVANCED	620
P021	Min. Time for Radiation OK	ADVANCED	621
P022	Min. Power for Radiation KO	ENGINEERING	622
P023	Min. Instantaneous Power for Radiation KO	ENGINEERING	623
P024	Min. Power Radiation KO Time	ENGINEERING	624
P025	Min. Instantaneous Power Radiation KO Time	ENGINEERING	625
P026	MPPT Enable	ADVANCED	626
P027	MPPT Computing Cycle Time	ADVANCED	627
P028	MPPT Field Voltage Reference Variation	ADVANCED	628

Table 28: List of Parameters P020 to P028

P019 Min. Solar Radiation for Inverter Start Up

P019	Range	50 ÷ 1000	50 ÷ 1000 W/m^2
Min. Solar Radiation for Inverter Start Up	**Default**	50	50 W/m^2
	Level	ADVANCED	
	Address	619	
	Function	This parameter sets the minimum solar radiation value for the inverter start up if a physical interface with an external solar radiation sensor is installed.	

P020 Field Voltage Reference, Manual MPPT

P020	Range	TG 600V: 315 ÷ 630 TG 800V: 415 ÷ 760 TG 900V: 495 ÷ 820 TG 1000V: 525 ÷ 820 (*)	TG 600V: 315 ÷ 630 V TG 800V: 415 ÷ 760 V TG 900V: 495 ÷ 820 V TG 1000V: 525 ÷ 820 V (*)
Field Voltage Reference, Manual MPPT	**Default**	TG 600V: 420 TG 800V: 580 TG 900V: 680 TG 1000V: 720 (*)	TG 600V:420 V TG 800V: 580 V TG 900V: 680 V TG 1000V: 720 V (*)
	Level	ADVANCED	
	Address	620	
	Function	This parameter sets the field voltage reference in Manual MPPT mode (P026 = Inactive); in Automatic MPPT mode (P026 = Active), this parameter is the field voltage reference starting the max. power point tracking. P020*1.10 is the min. voltage value required for starting.	

(*) The voltage range and default value of the parameter depend on the inverter model

P021 Min. Time for Radiation OK

P021	Range	0 ÷ 6000	0 ÷ 600.0 s
Min. Time for Radiation OK	Default	2400	240.0 s
	Level	ADVANCED	
	Address	621	
	Function	Min. time during which the no-load voltage of the PV field should exceed P020*1.10 to enable the equipment starting.	

P022 Min. Power for Radiation KO

P022	Range	0 ÷ 1000	0 ÷ 10.00 kW
Min. Power for Radiation KO	Default	--	Corresponding to 1% of the rated power
	Level	ENGINEERING	
	Address	622	
	Function	Min. level of delivered power required for the RUN status. If a power level lower than P022 is delivered for the Min. Power Radiation KO Time (P024), the inverter automatically stops. The default value corresponds to 1% of the rated power. Example: Rated power 220 kW -> P020 = 2.2 kW.	

P023 Min. Instantaneous Power for Radiation KO

P023	Range	-1000 ÷ 1000	± 10.00 kW
Min. Instantaneous Power for Radiation KO	Default	0	0.00 kW
	Level	ENGINEERING	
	Address	623	
	Function	Min. level of delivered instantaneous power required for the RUN status. The greater value of the power range is limited to the current value in P022, because the value set in P023 cannot be higher than the value set in P022. If a power level lower than P023 is delivered for the Min. Instantaneous Power Radiation KO Time (P025), the equipment automatically disables and stops.	

P024 Min. Power Radiation KO Time

P024	Range	0 ÷ 60000	0 ÷ 6000.0 s
Min. Power Radiation KO Time	Default	2400	240.0 s
	Level	ENGINEERING	
	Address	624	
	Function	Time for min. power delivered. See P022.	

P025 Min. Instantaneous Power Radiation KO Time

P025	Range	0 ÷ 100	0 ÷ 10.0 s
Min. Instantaneous Power Radiation KO Time	Default	30	3.0 s
	Level	ENGINEERING	
	Address	625	
	Function	Time for min. instantaneous power delivered. See P023.	

P026 MPPT Enable

P026	Range	0 ÷ 1	0 : Inactive 1: Active
MPPT Enable	Default	1	1: Active
	Level	ADVANCED	
	Address	626	
	Function	MPPT enable: if P026 = Active, the MPPT algorithm is enabled and P020 is the field voltage value enabling the maximum power point tracking. If P026 is set to “Inactive”, the MPPT function operates in manual mode and the field voltage reference is the value set in P020.	

P027 MPPT Computing Cycle Time

P027	Range	0 ÷ 300	0 ÷ 30.0 s
MPPT Computing Cycle Time	Default	20	2.0 s
	Level	ADVANCED	
	Address	627	
	Function	In Automatic MPPT mode (P026 = Active), this parameter sets the time period when the field voltage reference is kept constant. When the time set in P027 is over, the algorithm for MPPT computing is performed again.	

P028 MPPT Field Voltage Reference Variation

P028	Range	10 ÷ 1000	0.10 ÷ 10.00 V
MPPT Field Voltage Reference Variation	Default	150	1.50 V
	Level	ADVANCED	
	Address	628	
	Function	In Automatic MPPT mode, this parameter sets the increment/decrement of the field voltage reference used between two cycles of the algorithm computing for the maximisation of the delivered power.	

4.4. AMBIENT MEASURES MENU - P120 to P154

The Ambient Measures Menu can be viewed on the display/keypad only if Environmental Sensors and I/Os Expansion Board (ES847) is installed.
This menu contains the programming parameters of input analog channels for ES847 board. Any type of signals acquired from channels 1-4 can be configured (see the Installation Instructions Manual). The other two channels are factory-set to 0 ÷ 10V.

4.4.1. Standard Ambient Measures and Programmable Ambient Measures

The “standard” ambient measures are the factory-set measures (see table below):

STANDARD AMBIENT MEASURES	UNIT OF MEASURE	F.S. Value	Modbus Address
M024 – Module radiation	Wm2	0.0 - 1000.0	3218
M025 – Horizontal radiation	Wm2	0.0 - 1000.0	3219
M026 – Ambient temperature	°C	-50.0 - 125.0	3220
M027 – Module temperature	°C	-50.0 - 125.0	3221
M028 – Wind direction	° (degrees)	-360.0 - 360.0	3222
M029 – Wind speed	m/s	0 – 100.0	3223

Table 29: Standard ambient measures

When parameter settings for standard ambient measures (P120-P154) are manually altered, their Modbus addresses are changed as follows:

GENERAL AMBIENT MEASURE	Modbus Address
Measure 1	1674
Measure 2	1675
Measure 3	1676
Measure 4	1677
Measure 5	1678
Measure 6	1679

Table 30: Modbus address for general ambient measures

Every ambient measure can be detected also from external devices and can be sent to the inverter via serial link and the Modbus protocol. The “Ambient Measure Mode” parameters are used to acquire an ambient measure from an external device; the operating mode to be selected is Mode 5: External Variable.
The acquired numeric values are processed as decimal numbers with one decimal digit. For example, “12345” is acquired as 1234.5 and allocated as 1234.5 to the corresponding measure.
The Modbus addresses for the external ambient measures are listed below.

Parameter	FUNCTION	User Level	Modbus Address
I022	External Ambient Variable 1	BASIC	1409
I025	External Ambient Variable 2	BASIC	1412
I026	External Ambient Variable 3	BASIC	1413
I027	External Ambient Variable 4	BASIC	1414
I029	External Ambient Variable 5	BASIC	1416
I034	External Ambient Variable 6	BASIC	1421

Table 31: Modbus addresses for external ambient variables

4.4.2. List of Programmable Parameters P120 to P154

Ambient Measure	Parameter	FUNCTION	User Level	Modbus Address
Ambient Measure 1	P120	Type of Ambient Measure	ADVANCED	720
	COD1	Unit of Measure	ADVANCED	1867
	P121	Upper Full-scale Value	ADVANCED	721
	P121bis	Lower Full-scale Value	ADVANCED	747
	P122	Offset	ADVANCED	722
	P123	Operating Mode	ENGINEERING	723
	P124	Alarm Enable	ADVANCED	724
Ambient Measure 2	P125	Type of Ambient Measure	ADVANCED	725
	COD2	Unit of Measure	ADVANCED	1869
	P126	Upper Full-scale Value	ADVANCED	726
	P126bis	Lower Full-scale Value	ADVANCED	748
	P127	Offset	ADVANCED	727
	P128	Operating Mode	ENGINEERING	728
	P129	Alarm Enable	ADVANCED	729
Ambient Measure 3	P130	Type of Ambient Measure	ADVANCED	730
	COD3	Unit of Measure	ADVANCED	1871
	P131	Upper Full-scale Value	ADVANCED	731
	P131bis	Lower Full-scale Value	ADVANCED	749
	P132	Offset	ADVANCED	732
	P133	Operating Mode	ENGINEERING	733
	P134	Alarm Enable	ADVANCED	734
Ambient Measure 4	P135	Type of Ambient Measure	ADVANCED	735
	COD4	Unit of Measure	ADVANCED	1873
	P136	Upper Full-scale Value	ADVANCED	736
	P136bis	Lower Full-scale Value	ADVANCED	750
	P137	Offset	ADVANCED	737
	P138	Operating Mode	ENGINEERING	738
	P139	Alarm Enable	ADVANCED	739
Ambient Measure 5	P140	Type of Ambient Measure	ADVANCED	740
	COD5	Unit of Measure	ADVANCED	1875
	P141	Upper Full-scale Value	ADVANCED	741
	P141bis	Lower Full-scale Value	ADVANCED	751
	P142	Offset	ADVANCED	742
	P153	Operating Mode	ENGINEERING	753
Ambient Measure 6	P143	Type of Ambient Measure	ADVANCED	743
	COD6	Unit of Measure	ADVANCED	1877
	P144	Upper Full-scale Value	ADVANCED	744
	P144bis	Lower Full-scale Value	ADVANCED	752
	P145	Offset	ADVANCED	745
	P154	Operating Mode	ENGINEERING	754

Table 32: List of Parameters P120 to P154

P120 - P125 - P130 - P135 - P140 - P143 Type of Ambient Measure

P120 - P125 - P130 - P135 - P140 - P143	**Range**	0 ÷ 21	0: Disable -> General Ambient Measure 1: Radiation [W/m²] 2: Module Surface Radiation [W/m²] 3: Horizontal Radiation [W/m²] 4: Temperature [°C] 5: Temperature [°F] 6: Module Temperature [°C] 7: Module Temperature [°F] 8: Ambient Temperature [°C] 9: Ambient Temperature [°F] 10: General Angular Direction [°degrees] 11: Wind Angular Direction [°degrees] 12: Speed [m/s] 13: Speed [rpm] 14: Wind Speed [m/s] 15: Pressure [bars] 16: Pressure [atmospheres] 17: Capacity [m^3/s] 18: Capacity [m^3/h] 19: Shift [m] 20: Torque [Nm] 21: Percentage [%]
Type of Ambient Measure	**Default**	P120 - Ambient Measure 1	1: Radiation [W/m²]
		P125 - Ambient Measure 2	1: Radiation [W/m²]
		P130 - Ambient Measure 3	4: Temperature [°C]
		P135 - Ambient Measure 4	4: Temperature [°C]
		P140 - Ambient Measure 5	11: Wind Angular Direction [°degrees]
		P143 - Ambient Measure 6	14: Wind Speed [m/s]
	Level	ADVANCED	
	Address	720, 725, 730, 735, 740, 743	
	Function	Physical variable to be measured.	

COD1 - COD2 - COD3 - COD4 - COD5 - COD6 Unit of Measure for Ambient Measure

COD1 - COD2 - COD3 - COD4 - COD5 - COD6	**Range**	0 ÷ 0xB0000000h	Any match of 3 ASCII codes
Unit of Measure for Ambient Measure	**Default**	0x015D255B	[%]
	Active	This parameter can be viewed only if P120, P125, P130, P135, P140, P143 = 0.	
	Level	ADVANCED	
	Address	1867, 1869, 1871, 1873, 1875, 1877	
	Function	This parameter allows setting the unit of measure for a general ambient measure. You can set up any 3-character measure.	

P121 - P126 - P131 - P136 - P141 - P144 Full-scale Value for Ambient Measure

P121	**Range**	0 ÷ 30000	0 ÷ 3000.0
Full-scale Value for Ambient Measure	**Default**	10000	1000.0
	Level	ADVANCED	
	Address	721	
	Function	Full-scale value for ambient measures 1-6: this is the value of the physical variable to measure when the electric signal produced by the transducer is the same as the electric full-scale value of inputs 1-6.	

P121bis - P126bis - P131bis - P136bis - P141bis - P144bis Lower Full-scale Value for Ambient Measure

P121bis - P126bis - P131bis - P136bis - P141bis - P144bis	**Range**	-30000 ÷ 30000	-3000.0 ÷ 3000.0
Lower Full-scale Value for Ambient Measure	**Default**	0	0
	Level	ADVANCED	
	Address	747, 748, 749, 750, 751, 752	
	Function	Lower full-scale value: this is the value of the variable to be measured when the electric signal produced by the transducer is the same as the lower electric full-scale value.	

P122 - P127 - P132 - P137 - P142 - P145 Offset for Ambient Measure

P122 - P127 - P132 - P137 - P142 - P145	**Range**	-30000 ÷ 30000	-3000.0 ÷ 3000.0 -300.00 ÷ 300.00 n.a.	if Ambient Measure Mode=1 - 4 - 5 if Ambient Measure Mode=0 - 2 - 3 if Ambient Measure Mode=5
Offset for Ambient Measure	**Default**	0	0	
	Level	ADVANCED		
	Address	722		
	Function	Offset value. An offset value can be assigned to the intermediate electric measure in order to rectify possible errors.		

P123 - P128 - P133 - P138 - P153 - P154 Operating Mode for Ambient Measure

P123 - P128 - P133 - P138 - P153 - P154	**Range**	0 ÷ 5	Ambient Measure 1,2,3,4: 0: [0 ÷ 10]V 1: [0 ÷ 100]mV 2: [0 ÷ 20]mA 3: [4 ÷ 20]mA 4: PT100 5: EXTERNAL Variable Ambient Measure 5, 6: 0: [0 ÷ 10]V 5: EXTERNAL Variable
Operating Mode for Ambient Measure	**Default**	P123 - Ambient Measure 1	1: [0 ÷ 100]mV
		P128 - Ambient Measure 2	1: [0 ÷ 100]mV
		P133 - Ambient Measure 3	4: PT100
		P138 - Ambient Measure 4	4: PT100
		P153 - Ambient Measure 5	0: [0 ÷ 10]V
		P154 - Ambient Measure 6	0: [0 ÷ 10]V
	Level	ADVANCED	
	Address	723 - 728 - 733 - 738 - 753 - 754	
	Function	Electric configuration of the input based on the type of signal of the transducer to be connected. Important: Configuration of DIP-switch 1 in control board ES847 depends on the type of acquisition (see the Installation Instructions Manual).	

P124 - P129 - P134 - P139 Alarm Enable for Ambient Measure 1,2,3,4

P124 - P129 - P134 - P139	**Range**	0 ÷ 1	0: Disable 1: Enable
Alarm Enable for Ambient Measure 1,2,3,4	**Default**	0	0: Disable
	Level	ADVANCED	
	Address	724 - 729 - 734 - 739	
	Function	If the input is set to [4 ÷ 20]mA, you can activate an alarm that trips when the transducer current drops below 4mA (wiring fault or sensor fault).	

4.5. GRID MONITOR MENU - P072 to P100

The Grid Monitor Menu contains the operating parameters relating to the 3-phase grid. The default values of these parameters allow the smooth operation of the interface protection in compliance with the local regulations in force. Any variation of the parameters contained in the Grid Monitor Menu must be authorised by Elettronica Santerno only after checking the new functionality.

Parameter	FUNCTION	User Level	Modbus Address
P072	Peak Overvoltage Trip Time	ENGINEERING	672
P073	Instantaneous Overvoltage Threshold	(*)	673
P074	Inst. Overvoltage Release Ratio	(*)	674
P075	Inst. Overvoltage Trip Time	(*)	675
P076	Inst. Overvoltage Reset Time	(*)	676
P077	Max. Voltage Trip Threshold	(*)	677
P078	Max. Voltage Release Ratio	ENGINEERING	678
P079	Max. Voltage Trip Time	(*)	679
P080	Max. Voltage Reset Time	(*)	680
P081	Min. Voltage Trip Threshold	(*)	681
P082	Min. Voltage Release Ratio	ENGINEERING	682
P083	Min. Voltage Trip Time	(*)	683
P084	Min. Voltage Reset Time	(*)	684
P085	Inst. Undervoltage Threshold	(*)	685
P086	Inst. Undervoltage Release Ratio	(*)	686
P087	Inst. Undervoltage Trip Time	(*)	687
P088	Inst. Undervoltage Reset Time	(*)	688
P089	Max. Frequency Trip Threshold	(*)	689
P090	Max. Frequency Release Ratio	(*)	690
P091	Max. Frequency Trip Time	(*)	691
P092	Max. Frequency Reset Time	(*)	692
P093	Min. Frequency Trip Threshold	(*)	693
P094	Min. Frequency Release Ratio	(*)	694
P095	Min. Frequency Trip Time	(*)	695
P096	Min. Frequency Reset Time	(*)	696
P097	Max. Frequency Derivative Trip Threshold	ENGINEERING	697
P098	Max. Frequency Derivative Release Ratio	ENGINEERING	698
P099	Max. Frequency Derivative Trip Time	ENGINEERING	699
P100	Max. Frequency Derivative Reset Time	ENGINEERING	700
P100a	Minimum Trip Threshold for Start Up Voltage	ENGINEERING	643
P100b	Maximum Trip Threshold for Start Up Frequency	ENGINEERING	644
P100c	Maximum Trip Threshold for Start Up Voltage	ENGINEERING	645
P100d	Minimum Trip Threshold for Start Up Frequency	ENGINEERING	646

Table 33: List of Parameters P072 to P100

(*) See section 7.1 Default Values by Country.

P072 Peak Overvoltage Trip Time

P072	Range	0 ÷ 1000	0 ÷ 1000ms
Peak Overvoltage Trip Time	Default	10	10ms
	Level	ENGINEERING	
	Address	672	
	Function	Time when the peak overvoltage trip must persist for the activation of the grid overvoltage fault.	

P073 Instantaneous Overvoltage Threshold

P073	Range	110÷160	[110÷160]%
Instantaneous Overvoltage Threshold	Default	(*)	
	Level	(*)	
	Address	673	
	Function	This parameter is expressed as a percentage of the grid rated voltage; it sets the trip threshold for the Grid Overvoltage fault.	

P074 Inst. Overvoltage Release Ratio

P074	Range	950÷1000	0.95÷1
Inst. Overvoltage Release Ratio	Default	970	0.97
	Level	(*)	
	Address	674	
	Function	This parameter sets the ratio between the trip voltage for the Overvoltage fault and its reset threshold.	

P075 Inst. Overvoltage Trip Time

P075	Range	1÷1000	0.001 ÷ 1.000 s
Inst. Overvoltage Trip Time	Default	(*)	
	Level	(*)	
	Address	675	
	Function	This is the time when the instantaneous overvoltage trip condition is maintained for the grid Instantaneous Overvoltage fault.	

P076 Instantaneous Overvoltage Reset Time

P076	Range	1÷1000	0.001 ÷ 1.000 s
Instantaneous Overvoltage Reset Time	Default	60	0.06s
	Level	(*)	
	Address	676	
	Function	This is the time when the instantaneous overvoltage reset condition is maintained to deactivate the grid Instantaneous Overvoltage fault.	

P077 Max. Voltage Trip Threshold

P077	Range	105÷130	[105÷130]%
Max. Voltage Trip Threshold	Default	(*)	
	Level	(*)	
	Address	677	
	Function	This parameter is expressed as a percentage of the grid rated voltage; it sets the trip threshold for the grid Max. Voltage fault.	

(*) See section 7.1 Default Values by Country.

P078 Max. Voltage Release Ratio

P078	Range	900÷1000	0.900÷1.000
Max. Voltage Release Ratio	Default	950	0.95
	Level	ENGINEERING	
	Address	678	
	Function	This parameter sets the ratio between the trip voltage for the Max. Voltage fault and its reset threshold.	

P079 Max. Voltage Trip Time

P079	Range	20÷1000	0.020÷1.000 s
Max. Voltage Trip Time	Default	(*)	
	Level	(*)	
	Address	679	
	Function	This is the time when the max. voltage trip condition is maintained for the grid Max. Voltage fault.	

P080 Max. Voltage Reset Time

P080	Range	20 ÷ 32767	0.020 ÷32.767 s
Max. Voltage Reset Time	Default	(*)	
	Level	(*)	
	Address	680	
	Function	This is the time when the max. voltage reset condition is maintained to deactivate the grid Max. Voltage fault.	

P081 Min. Voltage Trip Threshold

P081	Range	60÷90	[60÷90]% of Vn
Min. Voltage Trip Threshold	Default	(*)	
	Level	(*)	
	Address	681	
	Function	This parameter is expressed as a percentage of the grid rated voltage; it sets the trip threshold for the grid Min. Voltage fault	

P082 Min. Voltage Release Ratio

P082	Range	1000÷1200	1.000÷1.200
Min. Voltage Release Ratio	Default	1050	1.05
	Level	ENGINEERING	
	Address	682	
	Function	This parameter sets the ratio between the trip voltage for the Min. Voltage fault and its reset threshold.	

P083 Min. Voltage Trip Time

P083	Range	20÷5000	0.020 ÷ 5.000 s
Min. Voltage Trip Time	Default	(*)	
	Level	(*)	
	Address	683	
	Function	This is the time when the min. voltage trip condition is maintained for the grid Min. Voltage fault.	

(*) See section 7.1 Default Values by Country.

P084 Min. Voltage Reset Time

P084	Range	20 ÷ 32767	0.020 ÷32.767 s
Min. Voltage Reset Time	Default	(*)	
	Level	(*)	
	Address	684	
	Function	This is the time when the max. voltage reset condition is maintained to deactivate the grid Max. Voltage fault.	

P085 Inst. Undervoltage Threshold

P085	Range	0÷90	[0÷90]% of Vn
Inst. Undervoltage Threshold	Default	(*)	
	Level	(*)	
	Address	685	
	Function	This parameter is expressed as a percentage of the grid rated voltage; it sets the trip threshold for the grid Instantaneous Undervoltage fault.	

P086 Inst. Undervoltage Release Ratio

P086	Range	1000÷1100	1.0÷1.2
Inst. Undervoltage Release Ratio	Default	1060	1.06
	Level	(*)	
	Address	686	
	Function	This parameter sets the ratio between the trip voltage for the Instantaneous Undervoltage fault and its reset threshold.	

P087 Inst. Undervoltage Trip Time

P087	Range	1÷1000	0.001÷1.000 s
Inst. Undervoltage Trip Time	Default	(*)	
	Level	(*)	
	Address	687	
	Function	This is the time when the instantaneous undervoltage trip condition is maintained for the grid Instantaneous Undervoltage fault.	

P088 Inst. Undervoltage Reset Time

P088	Range	1÷32767	0.001 ÷32.767 s
Inst. Undervoltage Reset Time	Default	32000	32.0 s
	Level	(*)	
	Address	688	
	Function	This is the time when the instantaneous undervoltage reset condition is maintained to deactivate the grid Instantaneous Undervoltage fault.	

P089 Max. Frequency Trip Threshold

P089	Range	10÷300	[0.1÷3.00] Hz
Max. Frequency Trip Threshold	Default	(*)	
	Level	(*)	
	Address	689	
	Function	This parameter sets the max. frequency value if compared to the rated frequency which determines the grid Max. Frequency fault.	

(*) See section 7.1 Default Values by Country.

P090 Max. Frequency Release Ratio

P090	Range	995÷1000	0.995 ÷1.0
Max. Frequency Release Ratio	Default	998	0.98
	Level	(*)	
	Address	690	
	Function	This parameter sets the ratio between the trip frequency for the Max. Frequency fault and its reset threshold.	

P091 Max. Frequency Trip Time

P091	Range	40÷999	0.040 ÷0.999 s
Max. Frequency Trip Time	Default	(*)	
	Level	(*)	
	Address	691	
	Function	This is the time when the max. frequency trip condition is maintained for the grid Max. Frequency fault.	

P092 Max. Frequency Reset Time

P092	Range	1÷32767	0.001 ÷32.767 s
Max. Frequency Reset Time	Default	(*)	
	Level	(*)	
	Address	692	
	Function	This is the time when the max. frequency reset condition is maintained to deactivate the grid Max. Frequency fault.	

P093 Min. Frequency Trip Threshold

P093	Range	-300 ÷ -10	[-3 ÷ -0.1] Hz
Min. Frequency Trip Threshold	Default	(*)	
	Level	(*)	
	Address	693	
	Function	This parameter sets the max. frequency value if compared to the rated frequency which determines the grid Min. Frequency fault.	

P094 Min. Frequency Release Ratio

P094	Range	1000 ÷1006	1.000 ÷1.006
Min. Frequency Release Ratio	Default	(*)	
	Level	(*)	
	Address	694	
	Function	This parameter sets the ratio between the trip frequency for the Min. Frequency fault and its reset threshold.	

P095 Min. Frequency Trip Time

P095	Range	40 ÷ 5000	0.040 ÷ 5.000 s
Min. Frequency Trip Time	Default	(*)	
	Level	(*)	
	Address	695	
	Function	This is the time when the min. frequency trip condition is maintained for the grid Min. Frequency fault.	

(*) See section 7.1 Default Values by Country.

P096 Min. Frequency Reset Time

P096	Range	1÷32767	0.001 ÷32.767 s
Min. Frequency Reset Time	Default	(*)	
	Level	(*)	
	Address	696	
	Function	This is the time when the min. frequency reset condition is maintained to deactivate the grid Min. Frequency fault.	

P097 Max. Frequency Derivative Trip Threshold

P097	Range	10 ÷ 100	0.10 ÷ 1.00 Hz/s
Max. Frequency Derivative Trip Threshold	Default	50	0.50 Hz/s
	Level	ENGINEERING	
	Address	697	
	Function	This parameter sets the max. frequency derivative for the grid Max. Frequency Derivative fault trip.	

P098 Max. Frequency Derivative Release Ratio

P098	Range	900 ÷ 1000	0.900 ÷ 1.000
Max. Frequency Derivative Release Ratio	Default	950	0.950
	Level	ENGINEERING	
	Address	698	
	Function	This parameter sets the ratio between the trip frequency for the Max. Frequency derivative fault and its reset threshold.	

P099 Max. Frequency Derivative Trip Time

P099	Range	40 ÷ 1000	0.040 ÷ 1.000 s
Max. Frequency Derivative Trip Time	Default	100	0.100 s
	Level	ENGINEERING	
	Address	699	
	Function	This is the time when the min. frequency trip condition is maintained for the grid Max. Frequency fault trip.	

P100 Max. Frequency Derivative Reset Time

P100	Range	40 ÷ 1000	0.040 ÷ 1.000 s
Max. Frequency Derivative Reset Time	Default	120	0.120 s
	Level	ENGINEERING	
	Address	700	
	Function	This is the time when the max. frequency derivative reset condition is maintained to deactivate the Max. Frequency Derivative fault.	

(*) See section 7.1 Default Values by Country.

P100a Minimum Trip Threshold for Start Up Voltage

P100a	Range	75 ÷ 99	75÷99 %
Minimum Trip Threshold for Start Up Voltage	Default	(*)	
	Level	ENGINEERING	
	Address	643	
	Function	The inverter voltage must not drop below this voltage threshold, otherwise the inverter will not start up.	

P100b Maximum Trip Threshold for Start Up Frequency

P100b	Range	1 ÷ 250	0.01 ÷ 2.50 Hz
Maximum Trip Threshold for Start Up Frequency	Default	(*)	
	Level	ENGINEERING	
	Address	644	
	Function	The inverter voltage must not exceed this frequency threshold, otherwise the inverter will not start up.	

P100c Maximum Trip Threshold for Start Up Voltage

P100c	Range	105 ÷ 140	105 ÷ 140 %
Maximum Trip Threshold for Start Up Voltage	Default	(*)	
	Level	ENGINEERING	
	Address	645	
	Function	The inverter voltage must not drop below this overvoltage threshold, otherwise the inverter will not start up.	

P100d Minimum Trip Threshold for Start Up Frequency

P100d	Range	1 ÷ 250	0.01 ÷ 2.50 Hz
Minimum Trip Threshold for Start Up Frequency	Default	(*)	
	Level	ENGINEERING	
	Address	646	
	Function	The inverter frequency (subtracted to the rated frequency) must not drop below this underfrequency threshold, otherwise the inverter will not start up.	

(*) See section 7.1 Default Values by Country.

4.6. GRID POWER CONTROL MENU P300 ÷ P335

This menu contains the parameters related to the adjustment function of the power output from the inverter, as well as the parameters supporting the grid voltage adjustment function.

All the Sunway TG and TG TE inverters enable modulating the active power delivered and enable exchanging the reactive power with the grid.
These operating functions can be accessed through the special parameters described in this section.

The reduction, or modulation, of the active power can be programmed in one of the following ways:

- Setpoint from parameter

4-wire interface, by using 4 inputs available on the Environmental Sensors and I/Os Expansion Board (ES847)

- Interface with 0-10V analogue signal, by using the REF input of the control board
- Setpoint from preset tables
- Power factor characteristics (P) with enable and disable voltage parameters
- Reactive power characteristics Q(U) with enable and disable power parameters

The operating mode is chosen via parameter P300. See the description of P300 below for details.

In this section, the acronym GPC is used for Grid Power Control.

NOTE

*Notwithstanding the limitation set, the algorithm has a minimum delivery threshold of P022*1.15, whose purpose is to ensure the continuous operation of the device.*

Please refer to the Installation Instructions manual of the Sunway TG or Sunway TG TE inverter.

Parameter	FUNCTION	Access Level	MODBUS Address
P300	Grid Power Control Enable	ENGINEERING	900
P301	Grid Power Control Factor 1	ENGINEERING	901
P302	Grid Power Control Factor 2	ENGINEERING	902
P303	Grid Power Control Factor 3	ENGINEERING	903
P304	Grid Power Control Factor 4	ENGINEERING	904
P305	Grid Power Control Factor 5	ENGINEERING	905
P306	Grid Power Control Factor 6	ENGINEERING	906
P307	Grid Power Control Factor 7	ENGINEERING	907
P308	Grid Power Control Factor 8	ENGINEERING	908
P309	Grid Power Control Factor 9	ENGINEERING	909
P310	Grid Power Control Factor 10	ENGINEERING	910
P311	Grid Power Control Factor 11	ENGINEERING	911
P312	Grid Power Control Factor 12	ENGINEERING	912
P313	Grid Power Control Factor 13	ENGINEERING	913
P314	Grid Power Control Factor 14	ENGINEERING	914
P315	Grid Power Control Factor 15	ENGINEERING	915
P316	Not used	-	-
P317	Entry table selector	ENGINEERING	917
P318	Active Power Setpoint	ENGINEERING	918
P319	Cosphi Setpoint	ENGINEERING	919
P320	Reactive Power Setpoint	ENGINEERING	920
P321	Grid Cosphi Setpoint Factor 1	ENGINEERING	921
P322	Grid Cosphi Setpoint Factor 2	ENGINEERING	922
P323	Grid Cosphi Setpoint Factor 3	ENGINEERING	923
P324	Grid Cosphi Setpoint Factor 4	ENGINEERING	924
P325	Grid Cosphi Setpoint Factor 5	ENGINEERING	925
P326	Grid Cosphi Setpoint Factor 6	ENGINEERING	926
P327	Grid Cosphi Setpoint Factor 7	ENGINEERING	927
P328	Grid Cosphi Setpoint Factor 8	ENGINEERING	928
P329	Grid Power Control Factor 9	ENGINEERING	929
P330	Grid Power Control Factor 10	ENGINEERING	930
P331	Grid Power Control Factor 11	ENGINEERING	931
P332	Grid Power Control Factor 12	ENGINEERING	932
P333	Grid Power Control Factor 13	ENGINEERING	933
P334	Grid Power Control Factor 14	ENGINEERING	934
P335	Grid Power Control Factor 15	ENGINEERING	935
P336	Lock_in Voltage for Power Factor (P)	ENGINEERING	936
P337	Lock_out Voltage for Power Factor (P)	ENGINEERING	937
P338	Lock_in Power for Q(U)	ENGINEERING	938
P339	Lock_out Power for Q(U)	ENGINEERING	939
P341	Breakpoint 1 Pactive of the Power Factor Characteristic (P)	ENGINEERING	941
P342	Breakpoint 1 Power Factor of the Power Factor Characteristic (P)	ENGINEERING	942
P343	Breakpoint 2 Pactive of the Power Factor Characteristic (P)	ENGINEERING	943

Parameter	FUNCTION	Access Level	MODBUS Address
P344	Breakpoint 2 Power factor of the PF Characteristic (P)	ENGINEERING	944
P345	Breakpoint 1 Vgrid of the Q(U) Characteristic	ENGINEERING	945
P346	Breakpoint 1 Preactive of the Q(U) Characteristic	ENGINEERING	946
P347	Breakpoint 2 Vgrid of the Q(U) Characteristic	ENGINEERING	947
P348	Breakpoint 2 Preactive of the Q(U) Characteristic	ENGINEERING	948
P358	V1s Point of the Q(U) Characteristic	ENGINEERING	958
P359	V1t Point of the Q(U) Characteristic	ENGINEERING	959
P030	Offset angle	ENGINEERING	630
P036	Ramp for Power Gain Variation of 100%	ENGINEERING	636
P037	Compensation Ramp for Reactive Power Reference	ENGINEERING	637
P038	Settling Time for 100% Output Power (at Start)	ENGINEERING	638
P039	Settling Time for 100% Output Power (Control)	ENGINEERING	639

Table 34: List of Parameters P300 to P343

P300 Grid Power Control Enable

P300	**Range**	0 ÷ 7	0: Not Active 1: Active, entry selected by Modbus parameter 2: Active, P/Cosphi setpoint by Modbus parameters 3: Active, P/Q setpoint by Modbus parameters 4: Active, Analog input REF 5: Active, four-wire digital interface 6: Active, Cosphi(P) characteristic 7: Active, Q(U) characteristic
Grid Power Control Enable	**Default**	0	0: Disabled
	Level	ENGINEERING	
	Address	900	
	Function	This parameter enables Grid Power Control. 0: Not active 1: Active, entry selected by Modbus parameter. The entry in Table 35 is selected by P317. The inverter working point depends on the selected entry in Table 35. 2: Active, setpoint P/Cosphi by Modbus parameters. The inverter working point depends on P318 GPC Active Power Limit, and P319 GPC Cosphi Setpoint. 3: Active, setpoint (P,Q) by Modbus parameters. The inverter working point depends on P318 GPC Active Power Limit, and P320 GPC Reactive Power Setpoint. 4: Active, Analogue input REF The inverter working point depends on the 0-10V analogue signal provided to REF input on the control board. 5: Active, 4-wire interface. The entry is selected by 4-wire interface. The inverter working point depends on the selected entry in Table 35. 6: Cosphi(P) Characteristic The inverter working point depends on a linear Cosphi(P) characteristic defined by two points, two coordinates each. 7: Q(U) Characteristic The inverter working point depends on a linear Q(U) characteristic defined by two points, two coordinates each.	

P301 ÷ P315 GPC Factor 1÷15

P301 ÷ P315	Range	0 ÷ 10000	0 ÷ 100.00%
GPC Factor 1÷15	Default	P301 - 10000	100.00% (*)
	Level	ENGINEERING	
	Address	901 ÷ 915	
	Function	Active power limit corresponding to the configuration set by means of the 4-wire interface. (*)The limit corresponding to 0% forces a minimum threshold equal to 115% of parameter **P022**, thus ensuring the continuous operation of the inverter. With the default values, the inverter keeps operating at a power level equal to 1% of the rated power. See Table 35.	

P321 ÷ P335 GPC Factor 1÷15

P321 ÷ P335	Range	900 ÷ 1100	0.90 lead ÷ 0.90 lag
GPC Factor 1÷15	Default	100	1.000
	Level	ENGINEERING	
	Address	921 ÷ 935	
	Function	This parameter defines the tables for the setpoint power factor values. The PF setpoint correspond to the value selected through P317. From 900 to 1000, the reactive power is conventionally absorbed (inductive behaviour). From 1000 to 1100, the reactive power is set as conventionally delivered (capacitive behaviour).See Table 35.	

P317 GPC Entry Table Select

P317	Range	0 ÷ 15	Entry 0 ÷ 15
GPC Entry Table Select	Default	0	Entry 0
	Active	Only if P300 = 1	
	Level	ENGINEERING	
	Address	917	
	Function	This parameter selects the actual input on the inverter. The set value defines one among parameters P321-P322 and P321 to P335 as the setpoint. E.g.: P317 = 1. The active setpoints are P301 and P321. See Table 35.	

P318 GPC Active Power Limit Set

P318	Range	0 ÷ 10000	0 ÷ 100.00%
GPC Active Power Limit Set	Default	10000	100.00%
	Active	Only if P300 = 2 or P300 = 3	
	Level	ENGINEERING	
	Address	918	
	Function	It defines the active power limit if P300 = 2, P300 = 3.	

P319 GPC Cosphi Setpoint

P319			
GPC Cosphi Setpoint Set	Range	900 ÷ 1100	0.90 lead ÷ 0.90 lag
	Default	1000	1.000
	Active	Only if P300 = 2	
	Level	ENGINEERING	
	Address	919	
	Function	This parameter defines the power factor (cosphi) if P300 = 2 (see Figure 7). From 90 to 100, the reactive power is set in advance (negative sign of the power factor—inductive behaviour). From 1000 to 1100, the reactive power is set on a delay (positive sign of the power factor—capacitive behaviour).	

P320 GPC Reactive Q Setpoint

P320			
GPC Reactive Q Setpoint	Range	-1000 ÷ 1000	100% lead ÷ 100% lag
	Default	0	Cosphi 1.00
	Active	Only if P300 = 3	
	Level	ENGINEERING	
	Address	920	
	Function	Reactive Q Limit Power Selection -1000 means that the inverter delivers 100% of the current in advance (inductive behaviour). 1000 means that the inverter delivers 100% of the current on a delay (capacitive behaviour). This parameter defines the reactive power if P300 = 3 (see Figure 3).	

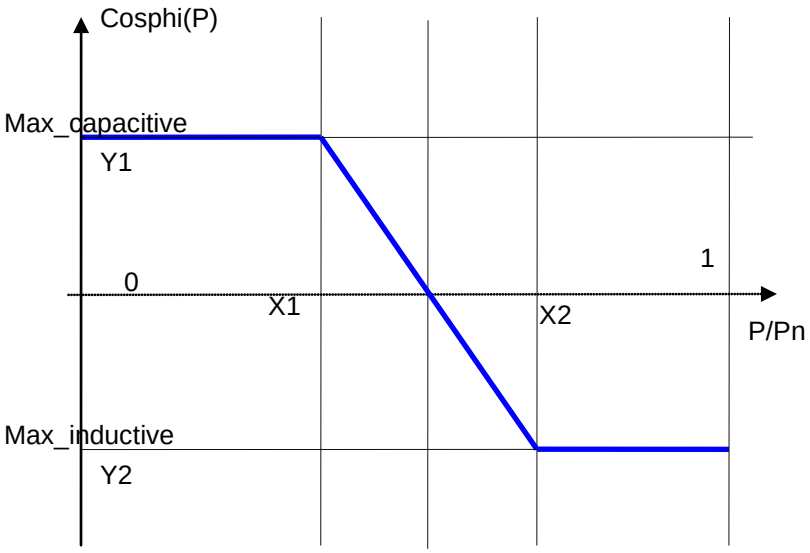


Figure 2: Cosphi(P) characteristic

P336 Lock_in Voltage for Power Factor(P)

P336	Range	100 ÷ 130	100% ÷ 130% of Vn
Lock_in Voltage for Power Factor(P)	Default	105	105%
	Active	Only if P300 =6.	
	Level	ENGINEERING	
	Address	936	
	Function	The power factor (P) is activated only when voltage exceeds the value percent of the rated voltage given in parameter P336.	

P337 Lock_out Voltage for Power Factor(P)

P337	Range	90 ÷ 120	90% ÷ 120% of Vn
Lock_out Voltage for Power Factor(P)	Default	100	100%
	Active	Only if P300 =6.	
	Level	ENGINEERING	
	Address	937	
	Function	The power factor (P) is deactivated only when voltage exceeds the rated voltage percent given in parameter P337.	

P338 Lock_in Power for Q(U)

P338	Range	0 ÷ 100	0% ÷ 100% of Vn
Lock_in Power for Q(U)	Default	10	10%
	Active	Only if P300 =7	
	Level	ENGINEERING	
	Address	938	
	Function	The Q(U) characteristic is activated only when power exceeds the rated power percent given in parameter P338.	

P339 Lock_out Power for Q(U)

P339	Range	0 ÷ 100	0% ÷ 100% of Vn
Lock_out Power for Q(U)	Default	90	90%
	Active	Only if P300 =7	
	Level	ENGINEERING	
	Address	939	
	Function	The Q(U) characteristic is deactivated only when power exceeds the rated power percent given in parameter P339.	

P341 Breakpoint 1 Pactive of the Power Factor Characteristic (P)

P341	Range	40 ÷ 1000	4.0% ÷ 100.0%
Breakpoint 1 Pactive of the Power Factor Characteristic (P)	Default	100	10.0%
	Active	Only if P300 = 6, Reactive Power defined by Cosphi(P) (Figure 2). This is the value for “X1”.	
	Level	ENGINEERING	
	Address	941	
	Function	Coordinate “X1” in Figure 2. If P/Pn < X1, the reactive power is defined by “Y1”, otherwise it is defined by the loop line.	

P342 Breakpoint 1 Power Factor of the PF Characteristic (P)

P342	Range	900 ÷ 1100	0.9 lead ÷ 0.9 lag
Breakpoint 1 Power Factor of the PF Characteristic (P)	Default	1000	1
	Active	Only if P300 = 6, Reactive Power defined by Cosphi(P) characteristic (Figure 2). This is the value for “Y1” and is the max. capacitive cosphi value.	
	Level	ENGINEERING	
	Address	942	
	Function	Coordinate “Y1” in Figure 2.	

P343 Breakpoint 2 Pactive of the Power Factor Characteristic (P)

P343	Range	40 ÷ 1000	4.0% ÷ 100.0%
Breakpoint 2 Pactive of the Power Factor Characteristic (P)	Default	900	90.0%
	Active	Only if P300 = 6, Reactive Power defined by Cosphi(P) characteristic (Figure 2). This is the value for “X2”.	
	Level	ENGINEERING	
	Address	943	
	Function	Coordinate “X2” in Figure 2. If P/Pn > X2, the reactive power is defined by “Y2”, otherwise it is defined by the loop line.	

P344 Breakpoint 2 Power Factor of the PF Characteristic (P)

P344	Range	900 ÷ 1100	0.900 lead ÷ 0.900 lag
Breakpoint 2 Power factor of the PF Characteristic (P)	Default	1000	1
	Active	Only if P300=6, Reactive Power defined by Cosphi(P) characteristic (Figure 2). This is the value for “Y2” and is the max. inductive cosphi value.	
	Level	ENGINEERING	
	Address	944	
	Function	Coordinate “Y2” in Figure 2.	

P345 Breakpoint 1 Vgrid of the Q(U) Characteristic

P345	Range	100 ÷ 1000	10.0% ÷ 100.0%
Breakpoint 1 Vgrid of the Q(U) Characteristic	Default	900	90.0%
	Active	Only if P300 =7, Reactive Power defined by Q(U) characteristic (Figure 3).	
	Level	ENGINEERING	
	Address	945	
	Function	Coordinate “X1” in Figure 3. If V/Vn < X1, the reactive power is defined by “Y1”, otherwise it is defined by the loop line.	

P346 Breakpoint 1 Preactive of the Q(U) Characteristic

P346	Range	-1000 ÷ 1000	100.0 % lead (induct) ÷ 100.0% lag (cap)
Breakpoint 1 Preactive of the Q(U) Characteristic	Default	0	0%
	Active	Only if P300 =7, Reactive Power defined by Q(U) characteristic (Figure 3).	
	Level	ENGINEERING	
	Address	946	
	Function	Coordinate “Y1” in Figure 3. It defines the maximum value of Q when V/Vn < X1.	

P347 Breakpoint 2 Vgrid of the Q(U) Characteristic

P347	Range	1000 ÷ 1300	100.0% ÷ 130.0%
Breakpoint 2 Vgrid of the Q(U) Characteristic	Default	1100	110.0%
	Active	Only if P300 =7, Reactive Power defined by Q(U) characteristic (Figure 3).	
	Level	ENGINEERING	
	Address	947	
	Function	Coordinate “X2” in Figure 3. If V/Vn > X2, the reactive power is defined by “Y2”, otherwise it is defined by the loop line.	

P348 Breakpoint 2 Preactive of the Q(U) Characteristic

P348	Range	-1000 ÷ 1000	100.0% lead (induct) ÷ 100.0% lag (cap)
Breakpoint 2 Preactive of the Q(U) Characteristic	Default	0	0%
	Active	Only if P300 =7	
	Level	ENGINEERING	
	Address	948	
	Function	Coordinate “Y2” in Figure 3. It defines the maximum value of Q when V/Vn > X2).	

P358 V1s Point of the Q(U) Characteristic

P358	Range	1000 ÷ 1300	100.0 ÷ 130.0 % Un
V1s Point of the Q(U) Characteristic	Default	0	0%
	Active	Only if P300 =7	
	Level	ENGINEERING	
	Address	949	
	Function	Point of the characteristic Q(U) where the reactive power is null. The reactive power is null between V1s and V1t l, see Figure 3.	

P359 V1t Point of the Q(U) Characteristic

P359	Range	100 ÷ 1000	10.0 ÷ 100.0 % Un
V1t Point of the Q(U) Characteristic	Default	0	0%
	Active	Only if P300 =7	
	Level	ENGINEERING	
	Address	950	
	Function	Point of the characteristic Q(U) where the reactive power goes from null to a value other than 0. The reactive power is null between V1s and V1t.	

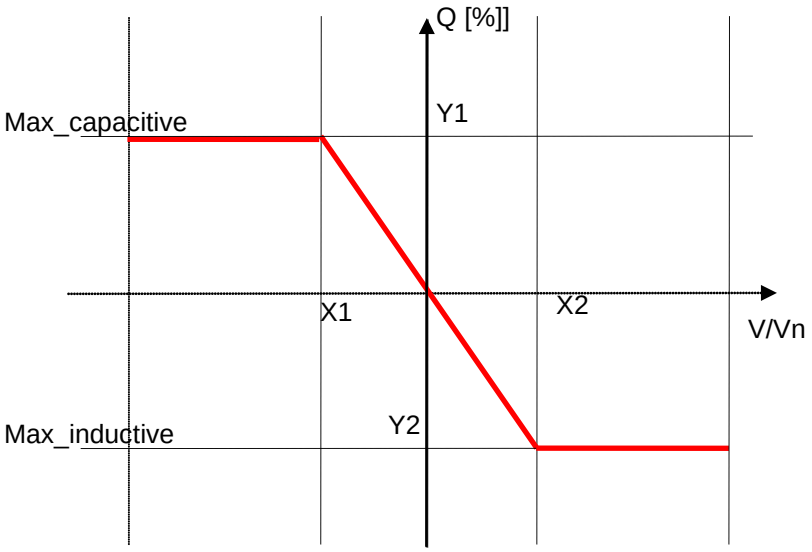


Figure 3: Q(U) characteristic

P030 Offset Angle

	Range	-31415÷31415	-3.14÷3.14 rad
	Default	0	
	Address	630	
	Level	ENGINEERING	
	Function	Phase angle setpoint between the grid voltage and the current injected into the grid. The reactive current deriving from this setpoint is summed up to the other references sent from the GPC.	

P036 Ramp for Power Gain Variation of 100%

	Range	1÷10000	600÷10000 ms
Ramp for Power Gain Variation of 100%	**Default**	600	
	Address	636	
	Level	ENGINEERING	
	Function	Time taken for the power gain to change from 0 to 100%.	

P037 Compensation Ramp for Reactive Power Reference

	Range	1÷32000	1÷32000 ms
Compensation Ramp for Reactive Power Reference	**Default**	100	
	Address	636	
	Level	ENGINEERING	
	Function	Time taken for the reactive power reference to go from 0 to 100% of the rated power.	

P038 Settling Time for 100% Output Power (at Start)

Settling Time for 100% Output Power (at Start)	**Range**	1÷32000	1÷32000 ms
	Default	100	
	Address	636	
	Level	ENGINEERING	
	Function	Time taken for the inverter to reach 100% of the limit power (defined by the power gain) during the start stage.	

4.6.1. Entry Table

A 15-entry table is programmed by the user directly on the inverter. For each entry, an Active Power Limit and a Cosphi setpoint is specified. The input may be forced by the user via a Modbus parameter or the 4-wire interface, based on the configuration of parameter **P300**.

Entry	Active Power Limit [0 ÷ 100%]	Cosphi Setpoint [0.9 lead ÷ 0.9 lag]
0	**n.a. (100%)**	**n.a. (1)**
1	**P301**	**P321**
2	**P302**	**P322**
3	**P303**	**P323**
4	**P304**	**P324**
5	**P305**	**P325**
6	**P306**	**P326**
7	**P307**	**P327**
8	**P308**	**P328**
9	**P309**	**P329**
10	**P310**	**P330**
11	**P311**	**P331**
12	**P312**	**P332**
13	**P313**	**P333**
14	**P314**	**P334**
15	**P315**	**P335**

Table 35: Power Control Entry Table (Active Power and Cosphi)

Example of use of the Entry Table with P300 = 1

Set P300 = 1
P300=1 indicates that GPC is Active; input selected by parameter **P317**. The inverter working point is defined in Table 35.

Example of use of the Grid Power Control functionality with 4-wire interface.

Set P300 = 4:
P300=4 indicates that GPC is Active; input selected by 4-wire digital interface. The inverter working point is defined in Table 35.

Four-wire Power Control Functionality

Power Limit	Four-wire interface configuration			
	XMDI7	XMDI5	XMDI2	XMDI1
100%	**1**	**0**	**0**	**0**
60%	**0**	**1**	**0**	**0**
30%	**0**	**0**	**1**	**0**
0% (P022*1.15)	**0**	**0**	**0**	**1**

Table 36: Default configurations

Digital input	Terminal in Environmental Sensors and I/Os Expansion Board (ES847)	X3 Terminal	Function
XMDI1	39	64-65	Power Control(*) – 1
XMDI2	40	64-66	Power Control(*) – 2
XMDI5	45	64-67	Power Control(*) – 3
XMDI7	47	64-68	Power Control(*) – 4

Table 37: Sunway TG TE digital inputs controlling the delivered power

(*) Auxiliary digital input controlling the delivered power

For further details on the digital or analogue inputs available for the Grid Power Control function, please refer to the Installation Instructions manual of the inverter.

4.7. HFRT (High Frequency Ride Through) Menu

The parameters in the HFRT menu allow setting the power limit values if the measured grid frequency is somewhat different from the rated frequency.
When the grid values are closed to “grid fault thresholds”, the active power derating is proportional to the power measured when the frequency values are not good. The parameters in the HFRT menu allow setting the start and the end of the derating stage as well as the type of derating.

Parameter	FUNCTION	User Level	Modbus Address
P349	Start Frequency Derate	ENGINEERING	655
P350	Release Frequency Delay	ENGINEERING	656
P351	Path Type	ENGINEERING	657
P352	Frequency Derate Slope	ENGINEERING	658
P353	Release Frequency Derate	ENGINEERING	659
P354	Dynamic	ENGINEERING	660
P355	Settling Time after Frequency Fault Recovery	ENGINEERING	661

Table 38: List of parameters P349÷ P355

P349 Start Frequency Derate

P349	Range	0 ÷ 500	0 ÷ 5.00 Hz
Start Frequency Derate	**Default**	20	0.2 Hz
	Level	ENGINEERING	
	Address	655	
	Function	Indicates the frequency threshold for derating. The value of parameter P349 is added to the value of the rated frequency (C021) in order to define the derating start point. For example, if parameter P349 is worth 0.5 Hz and the rated frequency is worth 50.0 Hz, the derating starts at 50.5Hz. This parameter is related to parameter P354, defining the threshold restoring the normal operation of the equipment. P354 shall be lower than P350.	

P350 Frequency Release Delay

P350	Range	0 ÷ 1000	0 ÷ 1000 s
Frequency Release Delay	**Default**	0	0 s
	Level	ENGINEERING	
	Address	656	
	Function	This parameter sets the time that has to pass while frequency is lower than P353 in order to quit the power limiting mode due to frequency (HFRT). When frequency reaches the value set in P353, a countdown for the seconds set in P350 is started; when the countdown is over, the initial value for power delivery is restored.	

P351 Path Type

P351	Range	0 ÷ 1	0: Static 1: Hysteresis
Path Type	Default	0	1: Hysteresis
	Level	ENGINEERING	
	Address	657	
	Function	This parameter sets the type of path for the back profile at the power '"frozen" when the overfrequency event has started (see Figure 4).	

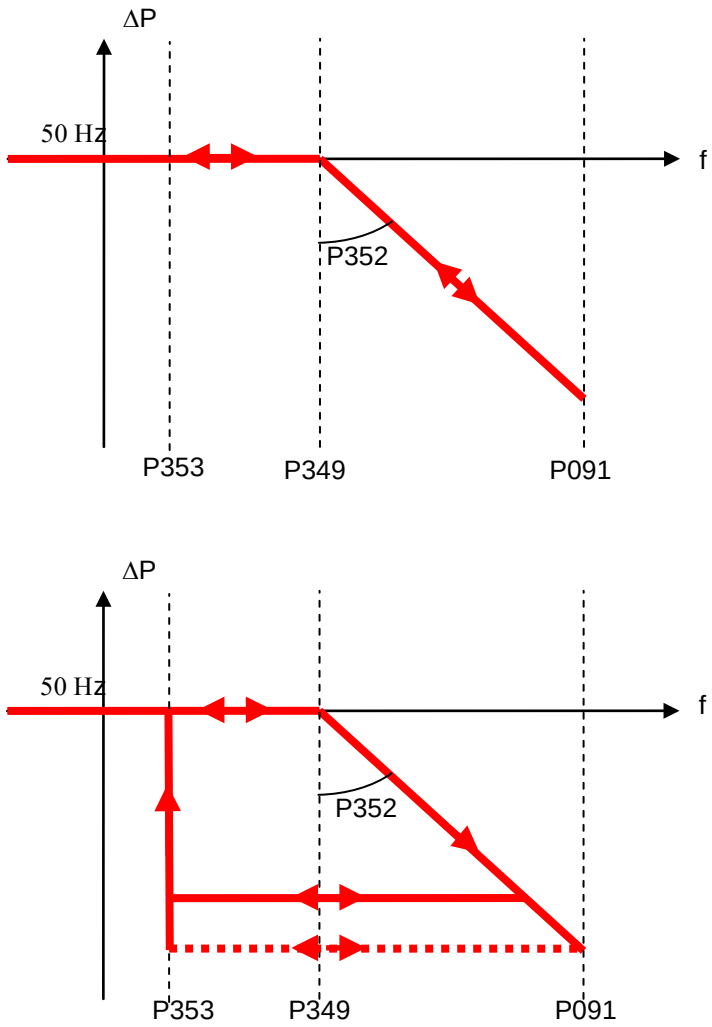


Figure 4: Type of HFRT path set by P057

P352 Frequency Derate Slope

P352	Range	0 ÷ 1000	0% ÷ 100%/Hz
Frequency Derate Slope	Default	400	40%/Hz
	Level	ENGINEERING	
	Address	658	
	Function	Power variation percent (Pm per Hz) Pm is the instantaneous power sampled ("frozen") when the overfrequency exceeds the value in P350. See Figure 4.	

P353 Release Frequency Derate

P353	Range	0 ÷ 500	0 ÷ 5.00 Hz
Release Frequency Derate	Default	5	0.05 Hz
	Level	ENGINEERING	
	Address	659	
	Function	Release overfrequency disabling the power derating. This value is summed to the value in C021 to compute the final value of the release frequency. This parameter is related to parameter P350. It cannot be higher than the value in P350.	

P354 Dynamic

P354	Range	0 ÷ 60	0 ÷ 60 s
Dynamic	Default	*2*	2 s
	Level	ENGINEERING	
	Address	660	
	Function	Derating function response time. This is the time required for the slope. The seconds set in P353 are required to derate the value in P353.	

P355 Settling Time after Frequency Fault Recovery

P355	Range	0 ÷ 1000	0 ÷ 1000 s
Settling Time after Frequency Fault Recovery	Default	10	10 s
	Level	ENGINEERING	
	Address	661	
	Function	Time required to restore the rated power delivery after a frequency fault has occurred.	

Regulations - Country	P349	P353	P350	P352
BDEW - Germany	50.2	50.05	0	40% of Pm/Hz
VDE - Germany	50.2	50.05	0	40% of Pm/Hz
TERNA - Italy	50.3	50.05	300 s	83.3% of Pm/Hz
CEI 0-21 - Italy	50.3	50.05	300 s	83.3% of Pm/Hz

Table 39: HFRT Values by Country

4.8. LVRT MENU P360 to P386

Parameter	FUNCTION	User Level	Modbus Address
P360	LVRT Control Enable	ADVANCED	960
P361	Phase-to-Phase RMS Voltage Selector or Phase Voltage Selector for LVRT	ADVANCED	961
P362	Voltage Sag Detection Threshold	ADVANCED	962
P363	Normal Operation Restore Threshold after Voltage Sag	ADVANCED	963
P364	Normal Operation Restore Time after Voltage Sag	ADVANCED	964
P365	Voltage Profile Duration v0	ADVANCED	965
P366	Voltage Profile Duration v1	ADVANCED	966
P367	Voltage Profile Duration v2	ADVANCED	967
P368	Voltage Profile Duration v3	ADVANCED	968
P369	Voltage Profile Duration v4	ADVANCED	969
P370	Voltage Profile Duration v5	ADVANCED	970
P371	Voltage Profile Duration v6	ADVANCED	971
P372	Voltage Profile Duration v7	ADVANCED	972
P373	Voltage Profile Duration t0	ADVANCED	973
P374	Voltage Profile Duration t1	ADVANCED	974
P375	Voltage Profile Duration t2	ADVANCED	975
P376	Voltage Profile Duration t3	ADVANCED	976
P377	Voltage Profile Duration t4	ADVANCED	977
P378	Voltage Profile Duration t5	ADVANCED	978
P379	Voltage Profile Duration t6	ADVANCED	979
P380	Voltage Profile Duration t7	ADVANCED	980
P381	Selector Switch for Grid Voltage Reactive Current Injection in LVRT	ADVANCED	981
P382	Selector Switch for Reactive Current Injection Mode in LVRT	ADVANCED	982
P383	K-factor of Reactive Current Injection in LVRT	ADVANCED	983
P384	RMS Voltage Dead Zone for Reactive Current in LVRT	ADVANCED	984
P385	Maximum Reactive Current for K-factor LVRT	ADVANCED	985
P386	Reset Time after LVRT (Reactive Injection Hold)	ADVANCED	986

Table 40: List of Parameters P360 to P386

P360 LVRT Control Enable

P360			
LVRT Control Enable	**Range**	0 ÷ 1	0 ÷ 1
	Default	1	1
	Active	Always active	
	Level	ADVANCED	
	Address	960	
	Function	Enables the Low Voltage Ride Through (LVRT) functionality.	

P361 Phase-to-Phase RMS Voltage Selector or Phase Voltage Selector for LVRT

P361	Range	0 ÷ 1	0 ÷ 1
Phase-to-Phase RMS Voltage Selector or Phase Voltage Selector for LVRT	Default	0	0 (phase-to-phase)
	Active	Only if P360=1	
	Level	ADVANCED	
	Address	961	
	Function	Sets the type of voltage used by the algorithm to detect voltage sags and inject reactive current. 0: Phase voltages calculated by the inverter 1: Measured phase-to-phase voltages	

P362 Voltage Sag Detection Threshold

P362	Range	0 ÷ 100	0 ÷ 100%
Voltage Sag Detection Threshold	Default	90	90%
	Active	Only if P360=1	
	Level	ADVANCED	
	Address	962	
	Function	Sets the voltage level (in respect to the rated voltage) enabling voltage sag detection and the LVRT functionality.	

P363 Normal Operation Restore Threshold after Voltage Sag

P363	Range	0 ÷ 100	0 ÷ 100%
Normal Operation Restore Threshold after Voltage Sag	Default	90	90%
	Active	Only if P360=1	
	Level	ADVANCED	
	Address	963	
	Function	Sets the voltage level (in respect to the rated voltage) to be reached by the grid so that the inverter can override the voltage sag. This condition shall be maintained for the time set in **P364**.	

P364 Normal Operation Restore Time after Voltage Sag

P364	Range	0 ÷ 32000	0 ÷ 32.0 ms
Normal Operation Restore Time after Voltage Sag	Default	80	0.080 s
	Active	Only if P360=1	
	Level	ADVANCED	
	Address	964	
	Function	Sets the time for the LVRT to be disabled when the grid voltage has exceeded the threshold set in **P363**.	

P365..P372 Voltage Profile Duration V0…V7

P365…P372	Range	0÷100	0÷100%
Voltage Profile Duration V0…V7	Default	See Table 41	See Table 41
	Active	Only if P360=1	
	Level	ADVANCED	
	Address	965÷972	
	Function	Set the mapping of the voltage-time characteristic for the LVRT mode (8 voltage levels). See Figure 5.	

P373…P380 Voltage Profile Duration t0…t7

P373…P380	Range	0÷8000	0÷15.0s
Voltage Profile Duration t0…t7	Default	[0, 150, 151, 600, 1500, 1502, 1600, 3000]	[0, 150, 151, 600, 1500, 1502, 1600, 3000] ms
	Active	Only if P360=1	
	Level	ADVANCED	
	Address	973÷980	
	Function	Set the voltage-time characteristic for the LVRT mode (8 times). See Figure 5.	

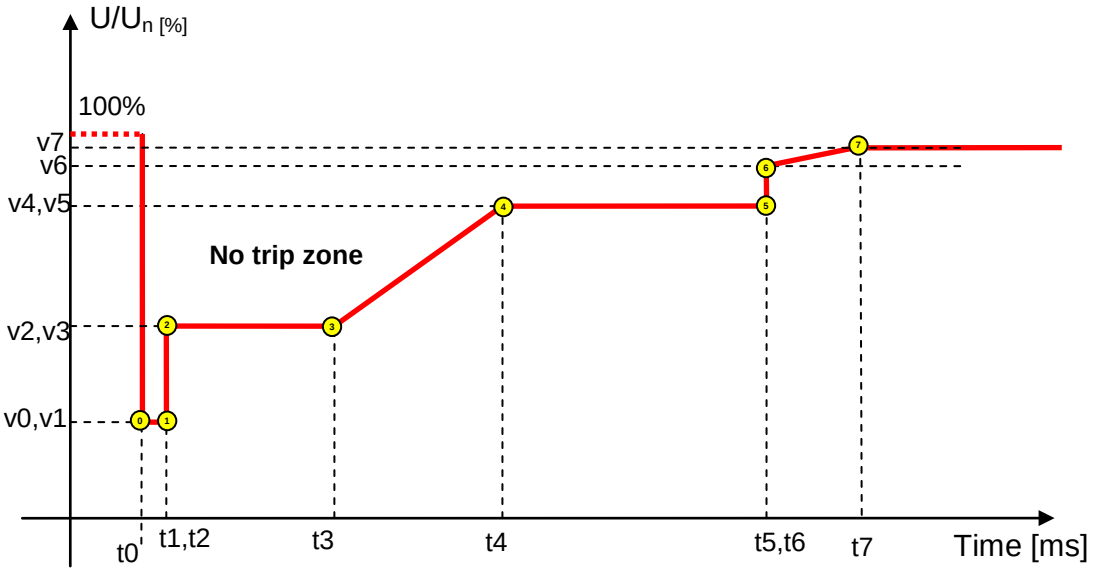


Figure 5: LVRT Mask (see P365 – P380)

Parameter	Default	Range	Parameter	Default	Range
P365 – v0	0%	0÷100%	P373 – t0	50 ms	0÷8000ms
P366 – v1	0%	0÷100%	P374 – t1	250 ms	0÷8000ms
P367 – v2	20%	0÷100%	P375 – t2	251 ms	0÷8000ms
P368 – v3	20%	0÷100%	P376 – t3	450 ms	0÷15000ms
P369 – v4	75%	0÷100%	P377 – t4	451 ms	0÷15000ms
P370 – v5	75%	0÷100%	P378 – t5	1552 ms	0÷15000ms
P371 – v6	75%	0÷100%	P379 – t6	1650 ms	0÷15000ms
P372 – v7	75%	0÷100%	P380 – t7	3050 ms	0÷15000ms

Table 41: Voltage-time limit profile for LVRT functionality

P381 Selector Switch for Grid Voltage Reactive Current Injection in LVRT

P381	Range	0 ÷ 1	0 ÷ 1
Selector Switch for Grid Voltage Reactive Current Injection in LVRT	Default	1	1 (minimum)
	Active	Only if P360=1	
	Level	ADVANCED	
	Address	981	
	Function	Sets the voltage for the algorithm computing the reactive current to be injected into the grid. 0: Minimum voltage U_lvrt=min(Vr,Vs,Vt) 1: Average voltage U_lvrt=(Vr+Vs+Vt)/3	

P382 Selector Switch for Reactive Current Injection Mode in LVRT

P382	Range	0 ÷ 1	0 ÷ 1
Selector Switch for Reactive Current Injection Mode in LVRT	Default	0	1 (hysteresis)
	Active	Only if P360=1	
	Level	ADVANCED	
	Address	982	
	Function	Selects the type of voltage-reactive current characteristic used by the inverter when a voltage sag occurs (see Figure 6). 0: Dead zone 1: Hysteresis	

P383 K-factor of Reactive Current Injection in LVRT

P383	Range	0 ÷ 10000	0 ÷ 10.000 %In/%Un
K-factor of Reactive Current Injection in LVRT	Default	2.000	2.000 %In/%Un
	Active	Only if P360=1	
	Level	ADVANCED	
	Address	983	
	Function	Sets the contribution to the squaring current that the inverter delivers as a percentage of the rated current in the event of 1% grid variation when a voltage sag occurs (see P362). Example: P382 = 1 (hysteresis) P383 = 2 Voltage sag 25%. DV=75%. DIq=K-factor*DV=2*75%=150%. The inverter delivers maximum 150 % of the rated current due to the voltage sag. The maximum deliverable current in LVRT mode depends on parameter P385.	

P384 RMS Voltage Dead Zone for Reactive Current in LVRT

P384	Range	0 ÷ 100	0 ÷ 100 %
RMS Voltage Dead Zone for Reactive Current in LVRT	Default	10	10%
	Active	Only if P360=1	
	Level	ADVANCED	
	Address	984	
	Function	Sets the minimum voltage decrease—in respect to the rated voltage—that has to occur in order for the reactive current injection to start. This value is the same as the voltage sag detection threshold (P362).	

P385 Maximum Reactive Current for K-factor LVRT

P385	Range	0 ÷ 1000	0 ÷ 1000%
Maximum Reactive Current for K-factor LVRT	Default	200	200%
	Active	Only if P360=1	
	Level	ADVANCED	
	Address	985	
	Function	Determines the maximum value, in relative terms in respect to the rated current, that may be delivered due to a voltage sag (in LVRT mode).	

P386 Reset Time after LVRT (Reactive Injection Hold)

P386	Range	0 ÷ 32000	0 ÷ 32000 ms
Reset Time after LVRT (Reactive Injection Hold)	Default	500	500 ms
	Active	Only if P360=1	
	Level	ADVANCED	
	Address	986	
	Function	Time interval when the inverter holds the reactive power injection proportionally to the voltage drop after a voltage sag has occurred.	

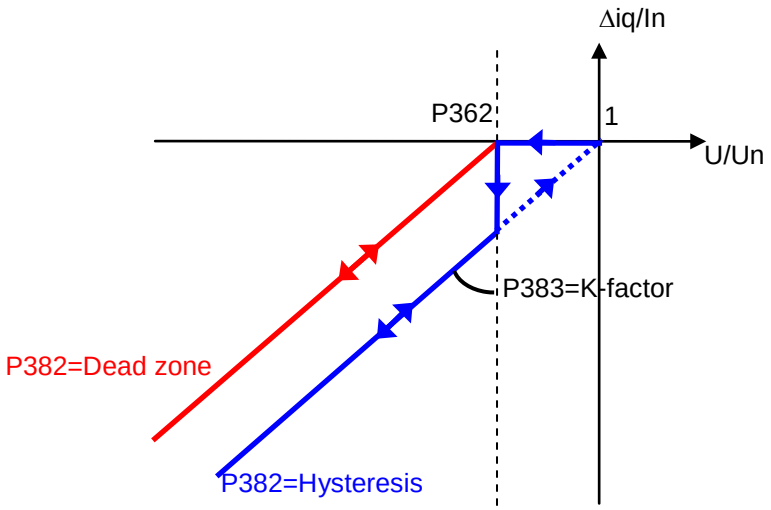


Figure 6: Reactive injection mode (P382)

4.9. COUNTER RESET MENU - I002 to I008

The Counter Reset menu contains the inputs required to reset the Event Counter and the Delivered Energy Counter.

Parameter	FUNCTION	User Level	Modbus Address
I002	Grid KO Event Counter Reset	ADVANCED	1389
I003	Radiation KO Event Counter Reset	ADVANCED	1390
I004	Active Energy Counter Reset	ADVANCED	1391
I005	External Energy Counter n.2 Reset	ADVANCED	1392
I006	Photovoltaic Field Energy Counter Reset	ADVANCED	1393
I008	Partial Energy Counter Reset	ADVANCED	1395

Table 42: List of Inputs I002 to I008

I002 Grid KO Event Counter Reset

I002	Range	0 ÷ 1	0: Inactive 1: Active
Grid KO Event Counter Reset	Default	0	0: Inactive
	Level	ADVANCED	
	Address	1389	
	Function	This parameter allows resetting the counter for grid KO events (M019).	

I003 Radiation KO Event Counter Reset

I003	Range	0 ÷ 1	0: Inactive 1: Active
Radiation KO Event Counter Reset	Default	0	0: Inactive
	Level	ADVANCED	
	Address	1390	
	Function	This parameter allows resetting the counter for radiation KO events (M020).	

I004 Active Energy Counter Reset

I004	Range	0 ÷ 1	0: Inactive 1: Active
Active Energy Counter Reset	Default	0	0: Inactive
	Level	ADVANCED	
	Address	1391	
	Function	This parameter allows resetting the counter for the active energy (M013), which counts different energy values depending on P111: P111 = 0: Internal Counter for Delivered Active Energy P111 = 1: External Energy Counter n.1 The partial counter for the active energy (U000) is reset too.	

I005 External Energy Counter n.2 Reset

I005	Range	0 ÷ 1	0: Inactive 1: Active
External Energy Counter n.2 Reset	Default	0	0: Inactive
	Active	This parameter can be viewed only if P112>0.	
	Level	ADVANCED	
	Address	1392	
	Function	This parameter allows resetting energy counter n.2 (M015), which counts different energy values depending on P112: P112 = 0: Inactive Counter P112 = 1: External Energy Counter n.2 P112 = 2: Difference between Delivered Energy and Absorbed Energy.	

I006 Photovoltaic Field Energy Counter Reset

I006	Range	0 ÷ 1	0: Inactive 1: Active
Photovoltaic Field Energy Counter Reset	Default	0	0: Inactive
	Level	ADVANCED	
	Address	1393	
	Function	This parameter allows resetting the counter for the PV field energy (M017). The partial counter for the active energy (U004) is reset too.	

I008 Partial Energy Counter Reset

I008	Range	0 ÷ 1	0: Inactive 1: Active
Partial Energy Counter Reset	Default	0	0: Inactive
	Level	ADVANCED	
	Address	1395	
	Function	This parameter allows resetting the partial counters for the active energy (U000), the reactive energy (U002) and the PV field energy (U004).	

4.10. GRID INTERFACE AUTOTEST MENU - I030 to I033

The Grid Interface Autotest menu allows checking the operation of the disconnecting devices (interface protections) as required by the Italian Electricity Board ("Guida per le Connessioni alla rete elettrica di Enel Distribuzione", Ed. I - 1/213 December 2008 for Italy). The inverter must be running when the test is executed.

Parameter	FUNCTION	User Level	Modbus Address
I030	Grid Min. Voltage Test	BASIC	1417
I031	Grid Max. Voltage Test	BASIC	1418
I032	Grid Min. Frequency Test	BASIC	1419
I033	Grid Max. Frequency Test	BASIC	1420

Table 43: List of Inputs I030 to I033

I030 Grid Min. Voltage Test

I030	**Range**	0 ÷ 1	0: Inactive 1: Active
Grid Min. Voltage Test	**Default**	0	0: Inactive
	Level	BASIC	
	Address	1417	
	Function	This parameter automatically tests the disconnection of the interface protection due to a grid min. voltage fault.	

I031 Grid Max. Voltage Test

I031	**Range**	0 ÷ 1	0: Inactive 1: Active
Grid Max. Voltage Test	**Default**	0	0: Inactive
	Level	BASIC	
	Address	1418	
	Function	This parameter automatically tests the disconnection of the interface protection due to a grid max. voltage fault.	

I032 Grid Min. Frequency Test

I032	**Range**	0 ÷ 1	0: Inactive 1: Active
Grid Min. Frequency Test	**Default**	0	0: Inactive
	Level	BASIC	
	Address	1419	
	Function	This parameter automatically tests the disconnection of the interface protection due to a grid min. frequency fault.	

I033 Grid Max. Frequency Test

I033	**Range**	0 ÷ 1	0: Inactive 1: Active
Grid Max. Frequency Test	**Default**	0	0: Inactive
	Level	BASIC	
	Address	1420	
	Function	This parameter allows automatically tests the disconnection of the interface protection due to a grid max. frequency fault.	

4.11. ANALOG OUTPUTS MENU - P176 to P212

The Analog Outputs Menu allows the user to configure the three analog outputs available for Sunway TG inverters.
The offset value and the time constant for the acquisition filter can be set up for each output.

Parameter	FUNCTION	User Level	Modbus Address
P176	Analog Output 1 Mode	ADVANCED	776
P177	Analog Output 1 Offset	ADVANCED	777
P178	Analog Output 1 Filter	ADVANCED	778
P181	Analog Output 2 Mode	ADVANCED	781
P182	Analog Output 2 Offset	ADVANCED	782
P183	Analog Output 2 Filter	ADVANCED	782
P187	Analog Output 3 Mode	ADVANCED	787
P188	Analog Output 3 Offset	ADVANCED	788
P189	Analog Output 3 Filter	ADVANCED	789
P207	Analog Output 1 Gain	ADVANCED	807
P208	Analog Output 2 Gain	ADVANCED	808
P209	Analog Output 3 Gain	ADVANCED	809
P210	Analog Output 1 Address	ENGINEERING	810
P211	Analog Output 2 Address	ENGINEERING	811
P212	Analog Output 3 Address	ENGINEERING	812

Table 44: List of Parameters P176 to P212

P176 Analog Output 1 Mode (Delivered Active Power)

P176	**Range**	0 ÷ 4	0: Disable 1: [-10 ÷ +10]V 2: [0 ÷ +10]V 3: [0 ÷ +20]mA 4: [4 ÷ +20]mA
Analog Output 1 Mode	**Default**	1	1: [-10 ÷ +10]V
	Level	ADVANCED	
	Address	776	
	Function	0: Disable 1: [-10 ÷ +10]V 2: [0 ÷ +10]V 3: [0 ÷ +20]mA 4: [4 ÷ +20]mA	

P177 Analog Output 1 Offset

P177	**Range**	-9999 ÷ +9999	-9.999 ÷ +9.999 V or mA
Analog Output 1 Offset	**Default**	0	0.000
	Active	This parameter can be viewed only if P176 ≠ 0.	
	Level	ADVANCED	
	Address	777	
	Function	Value of the offset for analog output 1.	

P178 Analog Output 1 Filter

P178	Range	0 ÷ 65000	0 ÷ 65000 ms
Analog Output 1 Filter	Default	0	0 ms
	Active	This parameter can be viewed only if P176 ≠ 0	
	Level	ADVANCED	
	Address	778	
	Function	Filter time constant for analog output 1.	

P181 Analog Output 2 Mode (Field Voltage)

P181	Range	0 ÷ 4	0: Disable 1: [-10 ÷ +10]V 2: [0 ÷ +10]V 3: [0 ÷ +20]mA 4: [4 ÷ +20]mA
Analog Output 2 Mode (Field Voltage)	Default	1	1: [-10 ÷ +10]V
	Level	ADVANCED	
	Address	781	
	Function	0: Disable 1: [-10 ÷ +10]V 2: [0 ÷ +10]V 3: [0 ÷ +20]mA 4: [4 ÷ +20]mA	

P182 Analog Output 2 Offset

P182	Range	-9999 ÷ +9999	-9.999 ÷ +9.999 V or mA
Analog Output 2 Offset	Default	0	0.000
	Active	This parameter can be viewed only if P181 ≠ 0	
	Level	ADVANCED	
	Address	782	
	Function	Value of the offset for analog output 2.	

P183 Analog Output 2 Filter

P183	Range	0 ÷ 65000	0 ÷ 65000 ms
Analog Output 2 Filter	Default	0	0 ms
	Active	This parameter can be viewed only if P181 ≠ 0	
	Level	ADVANCED	
	Address	783	
	Function	Filter time constant for analog output 2.	

P187 Analog Output 3 Mode (Field Current)

P187	Range	0 ÷ 4	0: Disable 1: [-10 ÷ +10]V 2: [0 ÷ +10]V 3: [0 ÷ +20]mA 4: [4 ÷ +20]mA
Analog Output 3 Mode (Field Current)	Default	1	1: [-10 ÷ +10]V
	Level	ADVANCED	
	Address	787	
	Function	0: Disable 1: [-10 ÷ +10]V 2: [0 ÷ +10]V 3: [0 ÷ +20]mA 4: [4 ÷ +20]mA	

P188 Analog Output 3 Offset

P188	Range	-9999 ÷ +9999	-9.999 ÷ +9.999 V or mA
Analog Output 3 Offset	Default	0	0.000
	Active	This parameter can be viewed only if P187 ≠ 0	
	Level	ADVANCED	
	Address	788	
	Function	Value of the offset for analog output 3.	

P189 Analog Output 3 Filter

P189	Range	0 ÷ 65000	0 ÷ 65000 ms
Analog Output 3 Filter	Default	0	0 ms
	Active	This parameter can be viewed only if P187 ≠ 0	
	Level	ADVANCED	
	Address	789	
	Function	Filter time constant for analog output 3.	

P207 Analog Output 1 Gain

P207	Range	0 ÷ 65000	0 ÷ 65.000
Analog Output 1 Gain	Default	100	0.100
	Level	ADVANCED	
	Address	807	
	Function	This parameter can be viewed only if P176 = 0.	

P208 Analog Output 2 Gain

P208	Range	0 ÷ 65000	0 ÷ 65.000
Analog Output 2 Gain	Default	100	0.100
	Level	ADVANCED	
	Address	808	
	Function	This parameter can be viewed only if P181 = 0.	

P209 Analog Output 3 Gain

P209	Range	0 ÷ 65000	0 ÷ 65.000
Analog Output 3 Gain	Default	100	0.100
	Level	ADVANCED	
	Address	809	
	Function	This parameter can be viewed only if P181 = 0.	

P210 Analog Output 1 Address

P210	Range	1487 ÷ 3211	1487 ÷ 3211
Analog Output 1 Address	Default	2639	2641
	Level	ENGINEERING	
	Active	This parameter can be viewed only if P176 = 0.	
	Address	810	
	Function	Modbus address for the measure assigned to analog output 1.	

P211 Analog Output 2 Address

P211	Range	1487 ÷ 3211	1487 ÷ 3211
Analog Output 2 Address	Default	2641	2641
	Active	This parameter can be viewed only if P181 = 0.	
	Level	ENGINEERING	
	Address	811	
	Function	Modbus address for the measure assigned to analog output 2.	

P212 Analog Output 3 Address

P212	Range	1487 ÷ 3211	1487 ÷ 3211
Analog Output 3 Address	Default	2641	2641
	Active	This parameter can be viewed only if P187 = 0.	
	Level	ENGINEERING	
	Address	812	
	Function	Modbus address for the measure assigned to analog output 3.	

4.12. DIGITAL OUTPUTS MENU - P224 ÷ P233, P171 ÷ P172, I071

This menu allows programming the Multifunction Digital Outputs (UDM1 and UDM2).
The Multifunction Digital Outputs can be programmed by the user. In particular, the output signal, the control logic, the enable/disable delay can be user-defined.

- UDM1 output is allocated for MDO2 when the EXTERNAL contactor is MONOSTABLE, otherwise it is allocated to AUX_DOUT4 (ES847 optional board shall be installed).
- UDM2 is always allocated to AUX_DOUT 5 (ES847 optional board shall be installed).

Special setting is available for UDM1 output; this requires using also I071 input.

For more details on the digital outputs, please refer to the Installation Instructions Manual.

Parameter	FUNCTION	User Level	Modbus Address
P224	UDM1 Logic Level*	ADVANCED	824
P225	Enable Delay for UDM1*	ADVANCED	825
P226	Disable Delay for UDM1*	ADVANCED	826
P227	UDM1Watchdog Timeout*	ADVANCED	827
P228	UDM1Output Signal Selection*	ADVANCED	828
P230	UDM2 Logic Level**	ADVANCED	830
P231	Enable Delay for UDM2**	ADVANCED	831
P232	Disable Delay for UDM2**	ADVANCED	832
P233	UDM2 Output Signal Selection**	ADVANCED	833
P171	PAR Input Initialization Value*	ADVANCED	771
P172	Par Input Default Value*	ADVANCED	772
I071	Input for Communication Detection	ADVANCED	1458

Table 45: List of Parameters P224 ÷ P233, P171, P172, I071

* Can be viewed on the display/keypad either if the external switch is MONOSTABLE, or if the external switch is BISTABLE and optional Environmental Sensors and I/Os Expansion Board (ES847) board is fitted.
** Can be viewed on the display/keypad if optional Environmental Sensors and I/Os Expansion Board (ES847) is fitted.

Input	FUNCTION	User Level	Modbus Address
I071	Input for communication detection	ADVANCED	1458

Table 46: Input I071 for UDM1

P224 UDM1 Logic Level

P224	Range	0 ÷ 1	0: FALSE LOGIC 1: TRUE LOGIC
UDM1 Logic Level	Default	1	TRUE LOGIC
	Level	ADVANCED	
	Address	824	
	Function	Selection of the activation logic for multifunction digital output UDM1.	

P225 Enable Delay for UDM1

P225	Range	0 ÷ 60000	0.00 ÷ 600.00 s
Enable Delay for UDM1	Default	0	0.00 s
	Level	ADVANCED	
	Address	825	
	Function	Enable delay for multifunction digital output UDM1.	

P226 Disable Delay for UDM1

P226	Range	0 ÷ 60000	0.00 ÷ 600.00 s
Disable Delay for UDM1	Default	0	0.00s
	Level	ADVANCED	
	Address	826	
	Function	Disable delay for multifunction digital output UDM1.	

P227 UDM1Watchdog Timeout

P227	Range	0 ÷ 30000	Disabled ÷ 30000 s
UDM1Watchdog Timeout	Default	0	Disabled
	Level	ADVANCED	
	Address	827	
	Function	Timeout of the watchdog for multifunction digital output UDM1 (this is used only when P228 = 9).	

P228 UDM1 Output Signal Selection

P228	**Range**	0 ÷ 10	0: DISAB 1: EN_EROG 2: PV_FIELD_INSULATION_KO 3: WARNING 4: GRID KO 5: INVERTER KO 6: WARNING o ALARM 7: INVERTER ON 8: FAN ON 9: COMMUNICATION TIMEOUT 10: DC RELAY + HTSK
UDM1Output Signal Selection	**Default**	2	2: PV_FIELD_INSULATION_KO
	Level	ADVANCED	
	Address	828	
	Function	0: DISAB: Inactive output; 1: EN_DELIV: One pulse per kWh; 2: PVFIELD_INSULATION_KO: Photovoltaic field isolation fault (see measure M091); 3: WARNING: A Warning is displayed; 4: DV604 KO: Grid fault; 5: INVERTER KO: Inverter locked (inverter in emergency condition); 6: WARNING or ALARM: A warning is displayed or an alarm has tripped 7: INVERTER ON: the inverter is powered on (PWM is switching); 8: FANS ON, signal for machine ventilation ON detected; 9: COMMUNICATION TIMEOUT, recurrent check for communication detection. 10: DC RELAY + HTSK. Checks if the DC Bus voltage is higher than the maximum PV field voltage (depending on the inverter size), checks if the CPU temperature is lower than the preset threshold and checks if the heatsink temperature is lower than the preset threshold.	

P230 UDM2 Logic Level

P230	**Range**	0 ÷ 1	0: FALSE LOGIC 1: TRUE LOGIC
UDM2 Logic Level	**Default**	1	TRUE LOGIC
	Level	ADVANCED	
	Address	830	
	Function	Selection of the activation logic for multifunction digital output UDM2.	

P231 UDM2 Enable Delay

P231	**Range**	0 ÷ 60000	0.00 ÷ 600.00 s
UDM2 Enable Delay	**Default**	0	0.00 s
	Level	ADVANCED	
	Address	831	
	Function	Enable delay for multifunction digital output UDM2.	

P232 UDM2 Disable Delay

P232	Range	0 ÷ 60000	0.00 ÷ 600.00 s
UDM2 Disable Delay	Default	0	0.00s
	Level	ADVANCED	
	Address	832	
	Function	Disable delay for multifunction digital output UDM2.	

P233 UDM2 Output Signal Selection

P233	Range	0 ÷ 8	0: DISAB 1: EN_EROG 2: PV_FIELD_INSULATION_KO 3: WARNING 4: GRID KO 5: INVERTER KO 6: WARNING or ALARM 7: INVERTER ON 8: FAN ON
UDM2 Output Signal Selection	Default	7	7: INVERTER ON
	Level	ADVANCED	
	Address	833	
	Function	0: DISAB: Inactive output; 1: EN_DELIV: One pulse per kWh; 2: PVFIELD_INSULATION_KO: Photovoltaic field isolation fault (see measure M091); 3: WARNING: A Warning is displayed; 4: DV604 KO: Grid fault; 5: INVERTER KO: Inverter locked (inverter in emergency condition); 6: WARNING or ALARM: A warning is displayed or an alarm has tripped; 7: INVERTER ON: the inverter is powered on (PWM is switching); 8: FANS ON, signal for machine ventilation ON detected.	

P171 PAR Input Initialization Value (I071)

P171	Range	0x0000 ÷ 0xFFFF	0x0000 ÷ 0xFFFF
PAR Input Initialization Value (I071)	Default	0xFF00	0xFF00
	Level	ADVANCED	
	Address	771	
	Function	Start value to be set to I071 in order to check periodic writing.	

P172 Par Input Default Value (I071)

P172	Range	0x0000 ÷ 0xFFFF	0x0000 ÷ 0xFFFF
Par Input Default Value (I071)	Default	0xAAAA	0xAAAA
	Level	ADVANCED	
	Address	772	
	Function	Value to be set to I071 when the watchdog timeout begins.	

I071 Input for Communication Detection

I071			
Input for Communication Detection	Range	0x0000 ÷ 0xFFFF	0x0000 ÷ 0xFFFF
	Default	0x00FF	0x00FF
	Level	ADVANCED	
	Address	1458	
	Function	I071 is initialized to the value set in P171. The software watchdog is reset to any value in I071 starting from the first writing. If a time longer than the value set in P227 elapses between two write periods, the same value set in P172 is set to I071. If UDM1 is set with P228 = 9, the least significant bit in I071 is reflected to the digital output which is available at the moment.	

4.13. ENERGY COUNTERS MENU - P110 to P119

This menu contains the parameters and measures relating to the Energy Counters.

Parameter	FUNCTION	User Level	Modbus Address
P110	Energy Count Value per kWh	ADVANCED	710
P111	External Energy Counter n.1 Function	ENGINEERING	711
P112	External Energy Counter n.2 Function	ENGINEERING	712
P113	Pulses per kWh for Energy Counter n.1	ENGINEERING	713
P114	Pulses per kWh for Energy Counter n.2	ENGINEERING	714
P115L	Preset x0.01 Energy Counter n.1	ENGINEERING	715
P115H	Preset x100 Energy Counter n.1	ENGINEERING	716
P116L	Preset x0.01 Energy Counter n.2	ENGINEERING	717
P116H	Preset x100 Energy Counter n.2	ENGINEERING	718
P117L	Preset x0.01 PV Energy Counter	ENGINEERING	759
P117H	Preset x100 PV Energy Counter	ENGINEERING	760
P119	Energy Counter Gain	ENGINEERING	719

Table 47: List of Parameters P110 to P119

P110 Energy Count Value per kWh

P110	**Range**	0÷10000	0.0 Euros ÷10.000 Euros
Energy Count Value per kWh	**Default**	445	0.445 Euros
	Level	ADVANCED	
	Address	710	
	Function	Refund per kWh of the Energy Count.	

P111 External Energy Counter n.1 Function

P111	**Range**	0÷1	0: DISABLED 1: ENERGY COUNTER 1
External Energy Counter n.1 Function	**Default**	0	0: DISABLED
	Level	ENGINEERING	
	Address	711	
	Function	This parameter is allocated to external energy counter n.1. If activated, the counter allows counting (with 0.5 kWh steps) and displaying the energy counted from an external pulsed counter.	

P112 External Energy Counter n.2 Function

P112	**Range**	0÷2	0: Disabled Counter 1: External Energy Counter n.2 2: Difference between Delivered Energy and Absorbed Energy
External Energy Counter n.2 Function	**Default**	0	0: DISABLED
	Level	ENGINEERING	
	Address	712	
	Function	This parameter is allocated to external energy counter n.2. Function 1 allows counting (with 0.5kWh steps) and displaying the energy counted from an external pulsed counter. Function 2 allows forward counting (with 0.5kWh steps) for the energy delivered and backward counting (with 0.5kWh steps) for the energy absorbed.	

P113 Pulses per kWh - Energy Counter n.1

P113	Range	1÷10000	1÷10000 Pulses per kWh
Pulses per KW - Energy Counter n.1	Default	100	100 Pulses kWh
	Level	ENGINEERING	
	Address	713	
	Function	This parameter represents the number of pulses—from external energy counter n. 1—corresponding to 1 kWh of delivered energy or absorbed energy.	

P114 Pulses per kWh – Energy Counter n.2

P114	Range	1÷10000	1÷10000 pulses per kWh
Pulses per KW - Energy Counter n.2	Default	100	100 pulses per kWh
	Level	ENGINEERING	
	Address	714	
	Function	This parameter represents the number of pulses—from external energy counter n. 2—corresponding to 1 kWh of delivered energy or absorbed energy.	

P115L Preset x0.01 Energy Counter n.1

P115L	Range	0÷9999	0.0÷999.9 kWh
Preset x0.01 Energy Counter n.1	Default	0	0
	Level	ENGINEERING	
	Address	715	
	Function	This parameter allows presetting the value stored in the energy counter, with a resolution of 0.01 kWh. **Important:** when presetting is performed, the partial counter for the active energy delivered to the grid (U000) is reset.	

P115H Preset x100 Energy Counter n.1

P115H	Range	0÷10000	1000÷10000000 kWh
Preset x100 Energy Counter n.1	Default	0	0
	Level	ENGINEERING	
	Address	716	
	Function	This parameter allows presetting the value stored in the energy counter, with a resolution of 100 kWh. **Important:** when presetting is performed, the partial counter for the active energy delivered to the grid (U000) is reset.	

P116L Preset x0.01 Energy Counter n.2

P116L	Range	0÷9999	0.0÷999.9 kWh
Preset x0.01 Energy Counter n.2	Default	0	0
	Active	This parameter is active only if P112>0.	
	Level	ENGINEERING	
	Address	717	
	Function	This parameter allows presetting the value stored in the energy counter, with a resolution of 0.01 kWh.	

P116H Preset x100 Energy Counter n.2

P116H			
Preset x100 Energy Counter n.2	Range	0÷10000	1000÷10000000 kWh
	Default	0	0
	Level	ENGINEERING	
	Active	This parameter is active only if P112>0.	
	Address	718	
	Function	This parameter allows presetting the value stored in the energy counter, with a resolution of 100 kWh.	

P117L Preset x0.01 PV Energy Counter

P117L			
Preset x0.01 PV Energy Counter	Range	0÷9999	0.0÷999.9 kWh
	Default	0	0
	Level	ENGINEERING	
	Address	759	
	Function	This parameter allows presetting the value stored in the PV field energy counter, with a resolution of 0.01 kWh. **Important:** When presetting is performed, the partial counter for the energy produced from the photovoltaic field (U004) is reset.	

P117H Preset x100 PV Energy Counter

P117H			
Preset x100 PV Energy Counter	Range	0÷10000	1000÷10000000 kWh
	Default	0	0
	Level	ENGINEERING	
	Address	760	
	Function	This parameter allows presetting the value stored in the PV field energy counter, with a resolution of 100 kWh. Important: when presetting is performed, the partial counter for the energy produced from the photovoltaic field (U004) is reset.	

NOTE

When using the energy counter preset functions (parameters P115L - P115H - P116L - P116H - P117L - P117H), the value set in the programming parameters is transferred to the relevant energy counter only if the parameter setting is refreshed.

For example—if P115L=0 and P115H=123 at power on—when you save P115L=0 (i.e. the same starting value as P115L) no preset function is implemented. To implement the preset function, enter any value other than zero for P115L, or any value other than 123 for P115H.

P119 Energy Counter Gain

P119			
Energy Counter Gain	Range	750÷1500	0.75 ÷1.5
	Default	1000	1
	Level	ENGINEERING	
	Address	719	
	Function	This parameter allows rectifying the gain for energy counters U000, U004 and for measure M013.	

4.14. DATA LOGGER MENU

NOTE

This menu must be used only from the display/keypad and only if communication with the Data Logger board is enabled via a computer. When the Data Logger optional board is activated, always connect a PC to the Data Logger board. For more details, please refer to the Installation Instructions Manual.

The Data Logger menu can be viewed only if the inverter is provided with ES851 optional board, allowing logging weather variables and operating variables of a photovoltaic plant (up to 15 inverters) and allowing interfacing the PV plant to a supervisor computer, even a remote computer, through different connecting modes for data logging and monitoring of the devices connected to the PV plant.
The DATA LOGGER menu allows accessing all programming parameters—both via display/keypad and via the inverter serial link—and measures relating to the status of ES851 Data Logger. Programming affects a subunit of ES851 parameters; for more details, please refer to ES851 Data Logger Programming Instructions manual.

CAUTION

Programming the parameters above consists in runtime overwriting the actual parameters for ES851, but the new values are not stored to non-volatile memory of ES851 Data Logger board. The new parameter settings must then be confirmed by accessing directly the Data Logger Menu (e.g. via the RemoteSunway software).

The Data Logger menu includes 2 submenus.

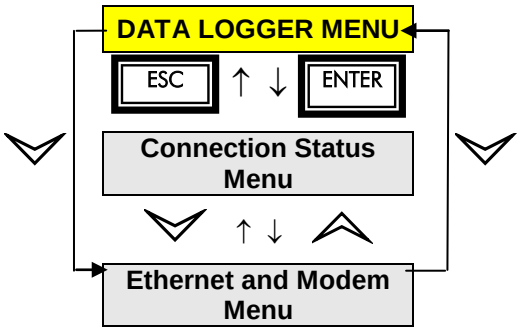


Figure 7: Configuration diagram for the Data Logger Menu

4.14.1. Connection Status Menu

The page containing the menu name displays two measures indicating the status of ES851 and the alarms tripped (if any).

Parameter	FUNCTION	User Level	Modbus Address
	Status of ES851	BASIC	1336
	ES851 Fault	BASIC	1340
	Remote Connection Status	BASIC	1338
	Preset Connection Status	BASIC	1337
	Preset Connections	BASIC	1340

Table 48: Measures in the Connection Status Menu

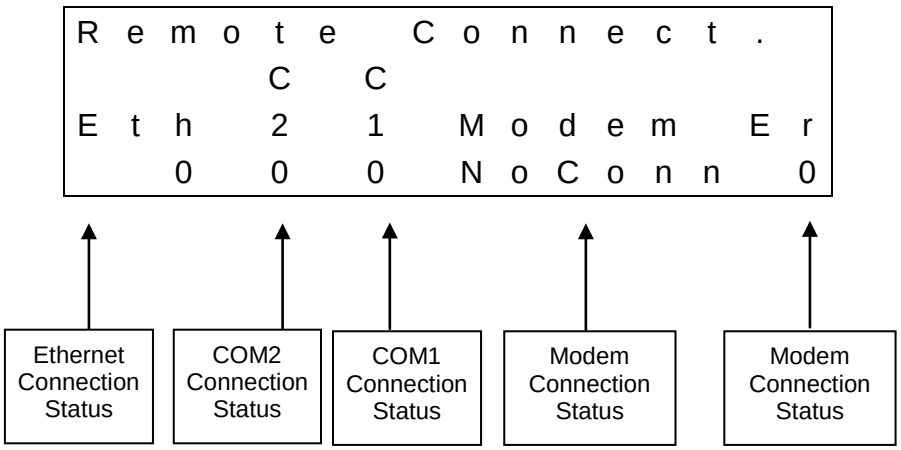
Status of ES851

Status of ES851	**Range**	0 ÷ 2	0: NOT FITTED 1: OK NOT INTERL 2: OK INTERLOCKED
	Active	This measure can be viewed only if ES851 Data Logger board is installed and activated.	
	Address	1336	
	Level	BASIC	
	Function	**0: NOT FITTED**, ES851 is not installed on the inverter (the DATA LOGGER menu cannot be viewed) **1: OK NOT INTERL**, ES851 is operating independently of the inverter where it is installed; only the DATA LOGGER menu and the Connection Status menu can be viewed. For the configuration of ES851, direct connection through the Remote Sunway (computer) is required, or a proper preset is needed in the Connection Status menu (see **Preset Connections**). **2: OK INTERLOCKED**, ES851 is ready to be configured even through the display/keypad of the inverter where it is installed.	

ES851 Fault

ES851 Fault	**Range**	0 ÷ 6 - 99 ÷ 105	0: No alarm. 1: Parameter save fault. 2: Log write error. 3: FBS configuration failure. 4: RS232 Modbus configuration failure. 5: RS485 Modbus configuration failure. 6: TCP/IP stack configuration failure. 99: Flash card lacking or inaccessible. 100: Invalid stream access. 101: TCP/IP socket fault. 102: Dial out connection failure. 103: Clock 821 fault. 104: Modem initialization failure. 105: Modem not fitted or not powered on.
	Active	This measure can be viewed only if ES851 Data Logger board is installed and activated.	
	Address	1340	
	Level	BASIC	
	Function	This indicates a general alarm tripped for ES851. Please contact Elettronica Santerno's Customer Service and indicate the alarm code and name.	

Press Save/Enter from the display/keypad to access the first page of the submenu showing the status of the connections supported by ES851 (Serial links - Ethernet and modem).



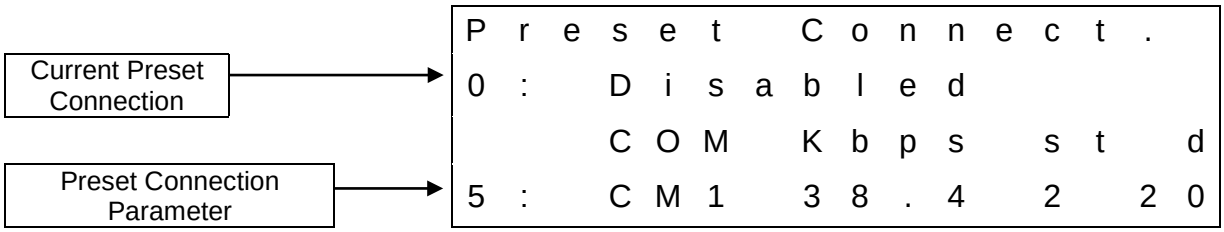
Remote Connection Status

Remote Connection Status	**Range**	Bit-controlled measure.	See Table 49
	Active	This measure can be viewed only if ES851 Data Logger board is installed and activated.	
	Address	1338	
	Level	BASIC	
	Function	Status of the connections supported by ES851. Note that the COM1 serial link is RS232 by default, whereas COM2 is RS485 by default. For more details, please refer to the Programming Instructions manual for ES851 Data Logger.	

Bit n.	Connection	
0-7	Type of modem connection failure.	0: None. 1: Dial KO. 2: Connect KO. 3: Authentication KO. 4: IPCP KO 5: Modem not yet initialized. 6: Modem init KO. 7: Modem not configured. 8: Modem not dial out. 16: Connect end (echo time out). 32: Connect end (idle time out). 64: Connect end (term expired).
8-10	Status of the connection via modem.	0: No conn. 1: Dialling. 2: Connecting. 4: Connected. 5: Attempt finished.
11	COM1	0: No data exchange. 1: Data exchanged.
12	COM2	0: No data exchange. 1: Data exchanged.
13-15	Ethernet	0: No connection. 1: Connection.

Table 49: Bitmap of the connection status

From the second page of the submenu, you can force preset configurations through the Preset Connections parameter. The measure of the current state of the preset connection is shown in line 2.



CAUTION

The preset connections activate only after resetting ES851 Data Logger board.

Preset Connection Status

Preset Connection Status	**Range**	0 ÷ 20	0: No active presetting. 1: Ethernet enabled. 2: PPP null modem. : COM1 Modbus Slave- 38400bps- 2Stop bits- no parity- timeout=2ms 4: COM1 Modbus Slave- 38400bps- 1Stop bit- no parity- timeout=2ms 5: COM1 Modbus Slave- 38400bps- 2Stop bits- no parity- timeout=20ms 6: COM1 Modbus Slave- 38400bps- 1Stop bit- no parity- timeout=20ms 7: COM1 Modbus Slave- 9600bps- 2Stop bits- no parity- timeout=2ms 8: COM1 Modbus Slave- 9600bps- 1Stop bit- no parity- timeout=2ms 9: COM1 Modbus Slave- 9600bps- 2Stop bits- no parity- timeout=20ms 10: COM1 Modbus Slave- 9600bps- 1Stop bit- no parity- timeout=20ms 11: COM2 Modbus Slave- 38400bps- 2Stop bits- no parity- timeout=2ms 12: COM2 Modbus Slave- 38400bps- 1Stop bit- no parity- timeout=2ms 13: COM2 Modbus Slave- 38400bps- 2stop bit- no parity- timeout=20ms 14: COM2 Modbus Slave- 38400bps- 1stop bit- no parity- timeout=20ms 15: COM2 Modbus Slave- 9600bps- 2Stop bits- no parity- timeout=2ms 16: COM2 Modbus Slave- 9600bps- 1Stop bit- no parity- timeout=2ms 17: COM2 Modbus Slave- 9600bps- 2Stop bits- no parity- timeout=20ms 18: COM2 Modbus Slave- 9600bps- 1Stop bit- no parity- timeout=20ms 19: Analog modem. 20: Digital modem.
	Active	This measure can be viewed only if ES851 Data Logger board is installed and activated.	
	Address	1337	
	Level	ENGINEERING	
	Function	It indicates if preset configurations are forced to ES851.	

Preset Connections

Preset Connections	**Range**	0 ÷ 20	0: No active presetting. 1: Ethernet enabled. 2: PPP null modem. : COM1 Modbus Slave- 38400bps- 2stop bit- no parity- timeout=2ms 4: COM1 Modbus Slave- 38400bps- 1stop bit- no parity- timeout=2ms 5: COM1 Modbus Slave- 38400bps- 2stop bit- no parity- timeout=20ms 6: COM1 Modbus Slave- 38400bps- 1stop bit- no parity- timeout=20ms 7: COM1 Modbus Slave- 9600bps- 2stop bit- no parity- timeout=2ms 8: COM1 Modbus Slave- 9600bps- 1stop bit- no parity- timeout=2ms 9: COM1 Modbus Slave- 9600bps- 2stop bit- no parity- timeout=20ms 10: COM1 Modbus Slave- 9600bps- 1stop bit- no parity- timeout=20ms 11: COM2 Modbus Slave- 38400bps- 2stop bit- no parity- timeout=2ms 12: COM2 Modbus Slave- 38400bps- 1stop bit- no parity- timeout=2ms 13: COM2 Modbus Slave- 38400bps- 2stop bit- no parity- timeout=20ms 14: COM2 Modbus Slave- 38400bps- 1stop bit- no parity- timeout=20ms 15: COM2 Modbus Slave- 9600bps- 2stop bit- no parity- timeout=2ms 16: COM2 Modbus Slave- 9600bps- 1stop bit- no parity- timeout=2ms 17: COM2 Modbus Slave- 9600bps- 2stop bit- no parity- timeout=20ms 18: COM2 Modbus Slave- 9600bps- 1stop bit- no parity- timeout=20ms 19: Analog modem. 20: Digital modem.
	Default	0	0: No active presetting.
	Level	ENGINEERING	
	Active	This measure can be viewed only if ES851 Data Logger board is installed and activated.	
	Address	1340	
	Function	This parameter allows forcing one of the connecting modes to ES851 Data Logger. The parameters used for Ethernet connections and modem connections are the ones stored in the inverter (see sections below). Configurations 19 and 20 support both dial in and dial out.	

NOTE

ES851 is forced to Interlocked operating mode after any presetting takes place (see Status of ES851).

When programming is made through the display/keypad, just set the desired preset number. When the serial link is used, also write and save F123 hex code to Modbus address 133.

4.14.2. Ethernet & Modem Menu - R100 to R115

The Ethernet & Modem menu includes the parameters used for the configuration of the Ethernet/modem connections. These parameters activate only after resetting ES851.

Parameter	FUNCTION	User Level	Modbus Address
R100	IP address high	BASIC	1332
R101	IP address low	BASIC	1333
R102	IP mask high	BASIC	1334
R103	IP mask low	BASIC	1335
R104+R105+ R106	SMS 1 Phone Number	BASIC	569, 570, 571
R108+R109+ R110	SMS 2 Phone Number	ADVANCED	572, 573, 574
R111	PPP IN Username	BASIC	575
R112	PPP IN Password	BASIC	576
R113	PPP OUT Username	BASIC	577
R114	PPP OUT Password	BASIC	578
R115	SIM Card PIN	BASIC	563

Table 50: Parameters in Ethernet & Modem menu, R100 to R115

R100 IP Address High

R100	Range	0 ÷ 0xFFFF	0.0 ÷ 255.255
IP Address High	Default	0xC0A8	192.168
	Level	BASIC	
	Address	1332	
	Function	This parameter sets the two high bytes of the static IP address of ES851.	

R101 IP Address Low

R101	Range	0 ÷ 0xFFFF	0.1 ÷ 255.254
IP Address Low	Default	0x2	0.2
	Level	BASIC	
	Address	1333	
	Function	This parameter sets the two low bytes of the static IP address of ES851.	

CAUTION

Addresses X.X.X.0 and X.X.X.255 are locked from the network protocol. The IP addresses to be assigned to ES851 must range from 1 to 254.

R102 IP Mask High

R102			
IP Mask High	Range	0 ÷ 0xFFFF	0.0 ÷ 255.255
	Default	0xFFFF	255.255
	Level	BASIC	
	Address	1334	
	Function	This parameter sets the two high bytes of ES851 IP mask.	

R103 IP Mask Low

R103			
IP Mask Low	Range	0 ÷ 0xFFFF	0.0 ÷ 255.255
	Default	0xFF00	255.0
	Level	BASIC	
	Address	1335	
	Function	This parameter sets the two low bytes of ES851 IP mask.	

R104+R105+R106 SMS 1 Phone Number

R104+R105+R106			
SMS 1 Phone Number	Range	0x0 ÷ 0xFFFFFFFFFFFF	“000000000000” ÷ “FFFFFFFFFFFF”
	Default	0x390000000000	“390000000000”
	Level	BASIC	
	Address	569, 570, 571	
	Function	This parameter is composed of three words and contains the mobile phone number receiving SMS sent by ES851. The mobile phone number is represented as hexadecimal digits; it is to be aligned left and any digit higher than 9 is intended as the number terminator. The first two digits are dedicated to the international code. Italy’s international code is set as the default code.	

R108+R109+R110 SMS 2 Phone Number

R108+R109+R110			
SMS 2 Phone Number	Range	0x0 ÷ 0xFFFFFFFFFFFF	“000000000000” ÷ “FFFFFFFFFFFF”
	Default	0x390000000000	“390000000000”
	Level	ADVANCED	
	Address	572, 573, 574	
	Function	This parameter is composed of three words and contains the mobile phone number receiving SMS sent by ES851. The mobile phone number is represented as hexadecimal digits; it is to be aligned left and any digit higher than 9 is intended as the number terminator. The first two digits are dedicated to the international code. Italy’s international code is set as the default code.	

R111 (R113) PPP Username

R111 (PPP) IN R113 (PPP OUT)	Range	0 ÷ 0xFFFF	“0000” ÷ “FFFF”
PPP Username	Default	0x1111	“1111”
	Level	BASIC	
	Address	575, 577	
	Function	This parameter sets the username for the connection to ES851 from a remote computer (PPP IN) and from ES851 to a remote computer (PPP OUT). Any digit higher than 9 is intended as the number terminator.	

R112 (R114) PPP Password

R112 (PPP IN) R114 (PPP OUT)	Range	0 ÷ 0xFFFF	“0000” ÷ “FFFF”
PPP Password	Default	0x1234	“1234”
	Level	BASIC	
	Address	576, 578	
	Function	This parameter sets the password for the connection from a remote computer to ES851 (PPP IN) and from ES851 to a remote computer (PPP OUT). Any digit higher than 9 is intended as the number terminator.	

R115 SIM Card PIN

R115	Range	0x0 ÷ 0xFFFF	“0000” ÷ “FFFF”
SIM Card PIN	Default	0x0	“0000”
	Level	BASIC	
	Address	563	
	Function	This parameter sets the four digits of the SIM card PIN fitted in the GSM/GPRS modem. PIN is obtained from the hexadecimal representation of the number aligned left.	

4.15. DATE & TIME MENU

The clock/calendar of the control board is a copy of the clock/calendar of ES851, so the Date & Time menu is displayed only if the inverter is provided with the Data Logger option.
The clock/calendar is not currently considering daylight saving time.
The clock/calendar can be updated through special parameters. The display/keypad permits to immediately update the clock/calendar: just select the Set Time page or the Set Date page and press ENTER. On the other hand, if you use the serial link of the inverter where ES851 is installed, the clock/calendar is viewed in the measure parameters below. Use the editing command (P398) after storing the new settings of the clock/calendar in parameters P391 to P396.

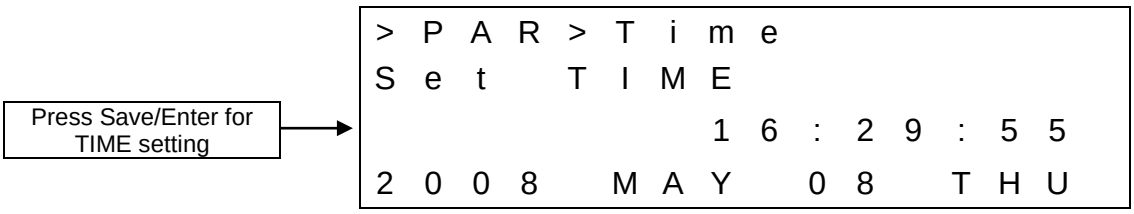


Table 51: First page in the Date & Time menu appearing on the display/keypad

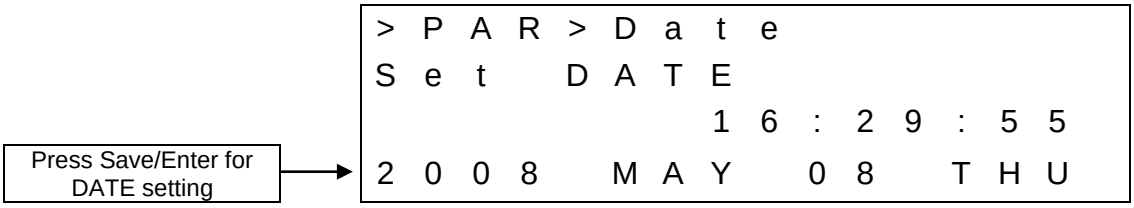


Table 52: Second page in the Date & Time menu appearing on the display/keypad

The date and time on the display/keypad are represented by the measures below:

Time (Hours)

Time (Hours)	Range	0 ÷ 23	0 ÷ 23 hours
	Active	This measure can be viewed only if ES851 Data Logger board is installed and activated.	
	Address	3300	
	Level	BASIC	
	Function	Time - hours (current value).	

Time (Minutes)

Time (Minutes)	Range	0 ÷ 59 min	0 ÷ 59 min
	Active	This measure can be viewed only if ES851 Data Logger board is installed and activated.	
	Address	3301	
	Level	BASIC	
	Function	Minutes (current value).	

Time (Seconds)

Time (Seconds)	**Range**	0 ÷ 59	0 ÷ 59 sec
	Active	This measure can be viewed only if ES851 Data Logger board is installed and activated.	
	Address	3302	
	Level	BASIC	
	Function	Seconds (current value).	

Day of the Week

Day of the Week	**Range**	1 ÷ 7	1: Mon. 2: Tues. 3: Wed. 4: Th. 5: Fri. 6: Sat. 7: Sun.
	Active	This measure can be viewed only if ES851 Data Logger board is installed and activated.	
	Address	3303	
	Level	BASIC	
	Function	Current day of the week.	

Day of the Month

Day of the Month	**Range**	1 ÷ 31	1 ÷ 31 days
	Active	This measure can be viewed only if ES851 Data Logger board is installed and activated.	
	Address	3304	
	Level	BASIC	
	Function	Current day of the month.	

Month

Day of the Month	**Range**	1 ÷ 12	1: January 2. February 3: March 4: April 5: May 6: June 7: July 8: August 9: September 10: October 11: November 12: December
	Active	This measure can be viewed only if ES851 Data Logger board is installed and activated.	
	Address	3305	
	Level	BASIC	
	Function	Current month.	

Year

Year			
	Range	2000 ÷ 2099	2000 ÷ 2099 years.
	Active	This measure can be viewed only if ES851 Data Logger board is installed and activated.	
	Address	3306	
	Level	BASIC	
	Function	Current year.	

Parameter	FUNCTION	User Level	Modbus Address
P391	Day Of The Week To Be Changed	BASIC	991
P392	Day Of The Month To Be Changed	BASIC	992
P393	Month To Be Changed	BASIC	993
P394	Year To Be Changed	BASIC	994
P395	Time (Hours) To Be Changed	BASIC	995
P396	Time (Minutes) To Be Changed	BASIC	996
P398	Clock/Calendar Editing Command	BASIC	998

Table 53: List of Parameters P391 to P398

P391 Day of the Week to be changed

P391	Range	1 ÷ 7	1: Mon. 2: Tues. 3: Wed. 4: Th. 5: Fri. 6: Sat. 7: Sun.
Day of the Week to be changed	Default	1	1: Mon.
	Level	BASIC	
	Active	This parameter can be viewed and changed only if ES851 Data Logger board is installed and activated.	
	Address	991	
	Function	This parameter contains the value of the day of the week to be changed.	

P392 Day of the Month to be changed

P392	Range	1 ÷ 31	1 ÷ 31 days
Day of the Month to be changed	Default	1	1
	Active	This parameter can be viewed and changed only if ES851 Data Logger board is installed and activated.	
	Level	BASIC	
	Address	992	
	Function	This parameter contains the value of the day of the month to be changed.	

P393 Month to be changed

P393	**Range**	1 ÷ 12	1: January 2. February 3: March 4: April 5: May 6: June 7: July 8: August 9: September 10: October 11: November 12: December
Month to be changed	**Default**	1	1: January
	Level	BASIC	
	Active	This parameter can be viewed and changed only if ES851 Data Logger board is installed and activated.	
	Address	993	
	Function	This parameter contains the value of the month to be changed.	

P394 Year to be changed

P394	**Range**	2000 ÷ 2099	2000 ÷ 2099 years.
Year to be changed	**Default**	0	Year 2000
	Level	BASIC	
	Active	This parameter can be viewed and changed only if ES851 Data Logger board is installed and activated.	
	Address	994	
	Function	This parameter contains the value of the year to be changed.	

P395 Time (Hours) to be changed

P395	**Range**	0 ÷ 23	0 ÷ 23 hours
Time (Hours) To Be Changed	**Default**	0	0 hours
	Level	BASIC	
	Active	This parameter can be viewed and changed only if ES851 Data Logger board is installed and activated.	
	Address	995	
	Function	This parameter contains the time (hour) to be changed.	

P396 Time (Minutes) to be changed

P396			
Time (Minutes) to be changed	**Range**	0 ÷ 59	0 ÷ 59 min.
	Default	0	0 minutes
	Level	BASIC	
	Active	This parameter can be viewed and changed only if ES851 Data Logger board is installed and activated.	
	Address	996	
	Function	This parameter contains the time (minutes) to be changed.	

P398 Clock/Calendar Editing Command

P398			
Clock/Calendar Editing Command	**Range**	0 ÷ 1	0 ÷ 1
	Default	0	0
	Level	BASIC	
	Active	This parameter can be viewed and changed only if ES851 Data Logger board is installed and activated.	
	Address	998	
	Function	If this parameter is set to 1, all values set in parameters P391 to P396 are written and stored to the clock/calendar and the measures described above are instantly changed.  ***CAUTION*** ***Also unchanged parameters are written to the clock/calendar. Make sure that unchanged parameters are correct.***	

5. CONFIGURATION [CFG] MENU

The Configuration menu includes the parameters that can be altered only when the inverter is STOPPED.

5.1. Description

The Configuration Menu includes the configuration parameters that can be accessed by the user.
The following submenus are available:

- **Manager Menu**

This menu contains the parameters used for the configuration of plant where the inverter is installed, as well as the parameters relating to the optional Environmental Sensors and I/Os Expansion Board (ES847), the Auxiliary Power Supply option and the Data Logger option.

- **Grid Parameters Menu**

This menu contains the parameters concerning the grid ratings.

- **Alarm Autoreset Menu**

This menu contains the parameters for the Autoreset function of the equipment and the parameters controlling the PV field isolation sensor integrated into the inverter.

- **Serial Links Menu**

This menu contains the parameters allowing serial communications.

- **EEPROM Menu**

This menu contains the parameters allowing accessing the inverter non-volatile memory storing the inverter factory settings and allowing the back-up of custom parameters.

5.2. MANAGER MENU - C000 to C008, R020 to R021

The Manager Menu is used for the restart attempts of the equipment. It aims to reduce the number of restart attempts in case of uncertain weather.

Parameter	FUNCTION	User Level	Modbus Address
C000	Waiting Time Stand-by 4 (Starting)	ENGINEERING	1000
C001	Waiting Time Stand-by 5 (Grid Interface)	ENGINEERING	1001
C002	Time for Starting OK	ENGINEERING	1002
C003	Number of Starting Attempts	ENGINEERING	1003
C004	Remote Control	ENGINEERING	1004
C005	Operating Mode of Environmental Sensors and I/Os Expansion Board (ES847)	ENGINEERING	180
C006	Auxiliary Power Supply	ENGINEERING	308
C008	Grid Check Timeout at Start	ENGINEERING	1008
R020	Data Logger Option	ENGINEERING	219
R021	Presence of Environmental Sensors and I/Os Expansion Board (ES847)	ENGINEERING	301

Table 54: List of Parameters C000 to C008, R020-R021

C000 Waiting Time Stand-by 4 (Starting)

C000	Range	0 ÷ 60000	0 ÷ 6000.0 s
Waiting Time Stand-by 4 (Starting)	Default	18000	1800.0 s
	Level	ENGINEERING	
	Address	1000	
	Function	This parameter sets the time when the inverter is kept in stand-by condition if the number of failed starting attempts is equal to the value set in C004.	

C001 Waiting Time Stand-by 5 (Grid Interface)

C001	Range	0 ÷ 60000	0 ÷ 6000.0 s
Waiting Time Stand-by 5 (DV604)	Default	3000	300.0 s
	Level	ENGINEERING	
	Address	1001	
	Function	This parameter sets the time when the inverter is kept in stand-by condition if the hardware grid interface protective device (option) trips.	

C002 Time for Starting OK

C002	Range	0 ÷ 60000	0 ÷ 6000.0 s
Time for Starting OK	Default	3000	300.0 s
	Level	ENGINEERING	
	Address	1002	
	Function	Time for successful starting; the starting attempt count is reset.	

C003 Number of Starting Attempts

C003	Range	0 ÷ 32000	0 ÷ 32000
Number of Starting Attempts	Default	10	10
	Level	ENGINEERING	
	Address	1003	
	Function	Maximum number of starting attempts failed due to weak solar radiation or grid instability. When this number is exceeded, the equipment is put in timed stand-by condition (time set in parameter C000.)	

C004 Remote Control

C004	Range	0 ÷ 1	0: Disable 1: Enable
Remote Control	Default	0	0: Disable
	Level	ENGINEERING	
	Address	1004	
	Function	This parameter allows enabling the inverter start/stop using a control device (PC or PLC) connected to the inverter instead of using the commands via display/keypad. **Important:** When the Remote Control function is activated, the inverter cannot be started via display/keypad, but it can always be stopped.	

C005 Operating Mode of Environmental Sensors and I/Os Expansion Board (ES847)

C005	Range	0 ÷ 3	0: ADC & ADE Enabled 1: Enable ADC 2: Enable ADE 3: ADC & ADE OFF (ES847 not fitted)
Operating Mode of Environmental Sensors and I/Os Expansion Board (ES847)	Default	3	3: ADC & ADE OFF (ES847 not fitted)
	Level	ENGINEERING	
	Address	180	
	Function	This parameter allows selecting the converter operating mode in Environmental Sensors and I/Os Expansion Board (ES847). Select “1: Enable ADC” when ES847 optional board is fitted and activated in the PV inverters.	

C006 Auxiliary Power Supply

C006	Range	0 ÷ 1	0: No auxiliary power supply 1: Auxiliary power supply present
Auxiliary Power Supply	Default	1	1: Auxiliary power supply present
	Level	ENGINEERING	
	Address	180	
	Function	This parameter enables selecting the presence or absence of the auxiliary power supply.	

C008 Grid Check Timeout at Start

C008	Range	0 ÷ 100	0 ÷ 100 s
Grid Check Timeout at Start	Default	30	30
	Level	ENGINEERING	
	Address	1008	
	Function	This is the timeout for the grid check when the equipment is started.	

R020 ES851 Data Logger

R020	Range	0 ÷ 2	0: ES851 not fitted 1: Any bus Boards 2: ES851 fitted
ES851 Data Logger	Default	0	0: ES851 not fitted
	Level	ENGINEERING	
	Address	219	
	Function	This parameter allows detecting when ES851 Data Logger board is fitted. It also allows accessing the menus relating to ES851 (Data Logger menu, Data & Time menu). Select "2: ES851 fitted" when ES847 optional board is fitted and activated in the PV inverters.	

R021 Presence of Environmental Sensors and I/Os Expansion Board (ES847)

R021	Range	0 ÷ 1	0: ES847 not fitted 1: ES847 fitted
Presence of Environmental Sensors and I/Os Expansion Board (ES847)	Default	0	0: ES847 not fitted
	Level	ENGINEERING	
	Address	301	
	Function	This parameter allows detecting when ES847 Data Logger board is fitted. it also allows accessing the menus relating to ES851 (Data Logger menu, Data & Time menu). Select "2: ES847 fitted" when ES847 optional board is fitted and activated in the PV inverters.	

5.3. GRID PARAMETERS MENU - C020-C021

The rated parameters of the grid are contained in this menu.

Parameter	FUNCTION	User Level	Modbus Address
C020	Rated Grid Voltage	ENGINEERING	1020
C021	Rated Grid Frequency	ENGINEERING	1021

Table 55: List of Parameters C020 to C021

C020 Rated Grid Voltage

C020	Range	1000 ÷ 6900	100.0 ÷ 690.0 V
Rated Grid Voltage	Default	4000	400.0 V
	Level	ENGINEERING	
	Address	1020	
	Function	This parameter sets the rated value of the grid voltage.	

C021 Rated Grid Frequency

C021	Range	400 ÷ 700	40.0 ÷ 70.0 Hz
Rated Grid Frequency	Default	See section 7.1 Default Values by Country	
	Level	ENGINEERING	
	Address	1021	
	Function	This parameter sets the rated value of the grid frequency.	

5.4. ALARM AUTORESET MENU - C255 to C276

The Autoreset function can be enabled in case an alarm trips. You can enter the maximum number of autoreset attempts and the time required for resetting the attempt number. If the Autoreset function is disabled, you can program an autoreset procedure at power on, which resets an active alarm at the inverter power off.

To activate the Autoreset function, set a number of attempts other than zero in parameter C255. If the number of attempts reset within a time interval t < C256 is the same as the value set in C255, the Autoreset function is disabled. Press the RESET key to enable the Autoreset function again.

If the inverter is turned off when an alarm is active, the alarm trip is stored to memory and will be active at next power on. Regardless of the Autoreset function setup, an automatic reset of the last alarm stored can be obtained when the inverter is turned on (C257 [Yes]).
Parameters C258 to C271 and C275 allow disabling the Autoreset function for certain alarms.
Parameter C272 sets the cooling time for the equipment before it restarts in case a thermal protection trips (heatsink overheating, thermoswitch tripped, etc.).

Parameter	FUNCTION	User Level	*Modbus Address*
C255	Number of Autoreset Attempts	ENGINEERING	1255
C256	Autoreset Attempt Count Reset	ENGINEERING	1256
C257	Alarm Reset at Power On	ENGINEERING	1257
C258	Alarm TLP/KM1 Fault Autoreset Enable	ENGINEERING	1258
C260	Alarm Tlext Fault Autoreset Enable	ENGINEERING	1260
C261	Thermal Protection Autoreset Enable	ENGINEERING	1261
C262	Heatsink Overtemperature Autoreset Enable	ENGINEERING	1262
C263	CPU Overtemperature Autoreset Enable	ENGINEERING	1263
C264	Fan Fault Autoreset Enable	ENGINEERING	1264
C265	By-Pass Fault Autoreset Enable	ENGINEERING	1265
C266	IGBT Fault Autoreset Enable	ENGINEERING	1266
C267	Overcurrent Autoreset Enable	ENGINEERING	1267
C268	Overvoltage Autoreset Enable	ENGINEERING	1268
C269	Serial Link Fault Autoreset Enable	ENGINEERING	1269
C271	Ref (and Analog Inputs) < 4mA Autoreset Enable	ENGINEERING	1271
C272	Cooling Time	ENGINEERING	1272
C273	PV Field Isolation KO	ENGINEERING	1273
C275	Inverter Asymmetric Current Alarm Autoreset Enable	ENGINEERING	1275
C276	Sub-field Fuse Status Warning Enable	ENGINEERING	1276

Table 56: List of Parameters C255 to C276

C255 Number of Autoreset Attempts

C255	Range	0 ÷ 10	0: [Disable] ÷ 10
Number of Autoreset Attempts	Default	4	4
	Level	ENGINEERING	
	Address	1255	
	Function	If set different from Disable (Disable = 0), this parameter enables the Autoreset function and sets the max. number of reset attempts for a time interval set in C256. If a time equal to the time set in C256 passes starting from the last alarm tripped, the autoreset attempt count is reset.	

C256 Autoreset Attempt Counter Reset

C256	Range	1 ÷ 1000	1÷ 1000 sec.
Autoreset Attempt Counter Reset	Default	300	300 sec
	Level	ENGINEERING	
	Address	1256	
	Function	This parameter sets the time that passes from the last alarm tripped to reset the autoreset attempt number.	

C257 Alarm Reset at Power On

C257	Range	0 ÷ 1	0: No 1: Yes
Alarm Reset at Power On	Default	0	0: No
	Level	ENGINEERING	
	Address	1257	
	Function	At power on, this parameter enables the automatic reset of the alarms tripped at the inverter power off.	

C258 TLP/KM1 Fault Autoreset Enable

C258	Range	0 ÷ 1	0: No 1: Yes
TLP/KM1 Fault Autoreset Enable	Default	1	1: Yes
	Level	ENGINEERING	
	Address	1258	
	Function	This parameter enables the Autoreset function for the alarms tripped when the state of contactor TLP is inconsistent with the operating mode of the Sunway TG (**A054, A057, A058;** the control mode is inconsistent with the real state of the contactor).	

C260 Tlext Fault Autoreset Enable

C260	Range	0 ÷ 1	0: No 1: Yes
Tlext Fault Autoreset Enable	Default	1	1: Yes
	Level	ENGINEERING	
	Address	1260	
	Function	This parameter enables the Autoreset function for the alarms tripped when the state of the external contactor is inconsistent with the operating mode of the Sunway TG (**A054, A055, A056**; the control mode is inconsistent with the real state of the contactor). This motor-driven contactor/switch is available for the Sunway TG 52 Dual and for the MV series only.	

C261 Thermal Protection Autoreset Enable

C261	Range	0 ÷ 1	0: No 1: Yes
Thermal Protection Autoreset Enable	Default	1	1: Yes
	Level	ENGINEERING	
	Address	1261	
	Function	Enables the Autoreset function for the inverter thermal protection alarm **(A074 Overload).**	

C262 Heatsink Overtemperature Autoreset Enable

C262	Range	0 ÷ 1	0: No 1: Yes
Heatsink Overtemperature Autoreset Enable	Default	1	1: Yes
	Level	ENGINEERING	
	Address	1262	
	Function	Enables the Autoreset function for the Heatsink Overtemperature alarm (A094).	

C263 CPU Overtemperature Autoreset Enable

C263	Range	0 ÷ 1	0: No 1: Yes
CPU Overtemperature Autoreset Enable	Default	1	1: Yes
	Level	ENGINEERING	
	Address	1263	
	Function	Enables the Autoreset function for the Control Board Overtemperature alarm (**A067**).	

C264 Fan Fault Autoreset Enable

C264	Range	0 ÷ 1	0: No 1: Yes
Fan Fault Autoreset Enable	Default	1	1: Yes
	Level	ENGINEERING	
	Address	1264	
	Function	Enables the Autoreset function for the inverter Fan Fault alarm (A083).	

C265 By-Pass Fault Autoreset Enable

C265	Range	0 ÷ 1	0: No 1: Yes
By-Pass Fault Autoreset Enable	Default	1	1: Yes
	Level	ENGINEERING	
	Address	1265	
	Function	This parameter enables the Autoreset function for the By-Pass Fault alarm (**A045, A046, A093,** By-Pass contactor of the precharge resistors).	

C266 IGBT Fault Autoreset Enable

C266	Range	0 ÷ 1	0: No 1: Yes
IGBT Fault Autoreset Enable	Default	1	1: Yes
	Level	ENGINEERING	
	Address	1266	
	Function	This parameter enables the Autoreset function for the IGBT Fault alarm (**A041, A050, A051, A053**, overcurrent detected in the IGBT bridge).	

C267 Overcurrent Autoreset Enable

C267	Range	0 ÷ 1	0: No 1: Yes
Overcurrent Autoreset Enable	Default	1	1: Yes
	Level	ENGINEERING	
	Address	1267	
	Function	This parameter enables the Autoreset function for the Overcurrent alarm (**A044**, overcurrent detected by the inverter software through the current measure channels).	

C268 Overvoltage Autoreset Enable

C268	Range	0 ÷ 1	0: No 1: Yes
Overvoltage Autoreset Enable	Default	1	1: Yes
	Level	ENGINEERING	
	Address	1268	
	Function	This parameter enables the Autoreset function for the DC Bus (**A048**, PV field) Overvoltage alarm.	

C269 Serial Link Fault Autoreset Enable

C269	Range	0 ÷ 1	0: No 1: Yes
Serial Link Fault Autoreset Enable	Default	1	1: Yes
	Level	ENGINEERING	
	Address	1269	
	Function	This parameter enables the Autoreset function for the Serial Link Fault alarm (**A061, A062** and **A081**).	

C271 Ref < 4mA Autoreset Enable

C271	Range	0 ÷ 1	0: No 1: Yes
Ref < 4mA Autoreset Enable	Default	0	0: No
	Level	ENGINEERING	
	Address	1271	
	Function	This parameter enables the Autoreset function for the Analog Inputs when these inputs are programmed in the current range “4 to 20mA” and if the detected current is lower than 4mA.	

C272 Cooling Time

C272	Range	0 ÷ 60000	0 ÷ 6000.0 s
Cooling Time	Default	9000	900.0 s
	Level	ENGINEERING	
	Address	1272	
	Function	Cooling time required after a thermal protection trips, after the Fan Fault alarm trips, after the Heatsink Overtemperature alarm trips.	

C273 PV Field Isolation KO

C273	Range	0 ÷ 2	0: None 1: Warning 2: Alarm
PV Field Isolation KO	Default	2	2: Alarm
	Level	ENGINEERING	
	Address	1273	
	Function	This parameter allows selecting how to use the signal for PV Field Isolation KO. If C273 = 0, the signal has no effect; if C273 = 1, a warning appears in case of fault (the equipment does not stop); if C273 = 2 the equipment stops in emergency condition (A068).	

C275 Inverter Asymmetric Current Alarm Autoreset Enable

C275	Range	0 ÷ 1	0: No 1: Yes
Inverter Asymmetric Current Alarm Autoreset Enable	Default	1	1: Yes
	Level	ENGINEERING	
	Address	1275	
	Function	This parameter enables the Autoreset function for the Inverter Asymmetric Current Alarm (**A052**).	

C276 Sub-field Fuse Status Warning Enable

C276	Range	0 ÷ 1	0: No 1: Yes
Sub-field Fuse Status Warning Enable	Default	1	1: Yes
	Level	ENGINEERING	
	Address	1276	
	Function	Enables **W029** (Fuse Status Warning).	

5.5. SERIAL LINKS MENU

NOTE

Please refer to the Installation Instructions Manual for the description of the serial links and connections.

The inverters of the Sunway TG series are provided with a serial link called “Serial Link 0”. Two-wire RS485 is used, which ensures a better immunity to disturbance even on long cable paths, thus reducing communication errors. The Modbus – RTU communication standard is used.
For the hardware connection of the serial link, please refer to the Installation Instructions Manual.

The inverter will typically behave as a slave device (i.e. it only answers to queries sent by another device). A master device (typically a computer or an ES851 Data Logger board) is then needed to start serial communications.

The following items may be configured for serial link 0:

1. The Modbus address of the inverter.
2. The inverter response delay to a Master query.
3. The baud rate of the serial link (expressed in bits per second).
4. The time added to the 4 byte–time.
5. The serial link watchdog (which is active if the relevant parameter is other than 0).
6. The type of parity used for serial communications.

NOTE

The parameters in the Serial Links Menu are marked with “R”.

Once saved, they are active only when the inverter is turned on again.

5.5.1. WATCHDOG Alarms

Watchdog alarms determined by serial communications may be the following:

- A061 Serial Link 0 WDG Alarm
- A081 Display/Keypad Watchdog

Alarms A061 trips when no legal message is sent from the serial link to the inverter for a time longer than the time set in parameter R005, which is factory-set as “disabled” (R005 = 0).

Alarm A081 trips only if the display/keypad detects a communication loss for a time longer than 2 seconds.

5.5.2. Exception Codes

Code		DESCRIPTION
0x01	ILLEGAL FUNCTION	The function sent by the Master is different from 0x03 (Read Holding Registers) and from 0x10 (Preset Multiple Registers).
0x02	ILLEGAL ADDRESS	The read/write address used by the Master is illegal.
0x03	ILLEGAL DATA VALUE	The numerical value written by the Master is not included in the allowable range.
0x06	DEVICE BUSY	The inverter did not acknowledge the Master's written values (for example, because it is running with a Cxxx parameter).
0x07	ANOTHER USER WRITING	Other users are writing values to the same parameter the Master is trying to use (editing through display/keypad or Upload/Download from keypad).
0x09	BAD USER LEVEL	The Master tried to write a parameter which is not included in the current user level (parameter ADVANCED with BASIC level).

5.5.3. List of Programmable Parameters R001 to R006

Parameter	FUNCTION	User Level	Modbus Address
R001	Inverter Modbus Address for Serial Link 0	ENGINEERING	588
R002	Response Delay for Serial Link 0	ENGINEERING	589
R003	Baud Rate for Serial Link 0	ENGINEERING	590
R004	Time Added to 4byte–Time for Serial Link 0	ENGINEERING	591
R005	Watchdog Time for Serial Link 0	ENGINEERING	592
R006	Parity Bit for Serial Link 0	ENGINEERING	593

Table 57: List of Parameters R001 to R006

R001 Inverter Modbus Address for Serial Link 0

R001	Range	1 ÷ 247	1 ÷ 247
Inverter Modbus Address for Serial Link 0	Default	1	1
	Level	ENGINEERING	
	Address	588	
	Function	This parameter sets the address assigned to the inverter connected through RS485 of serial link 0 (9-pole, male D connector).	

R002 Response Delay for Serial Link 0

R002	Range	1 ÷ 1000	1 ÷ 1000 msec
Response Delay for Serial Link 0	Default	5	5 msec
	Level	ENGINEERING	
	Address	589	
	Function	This parameter sets the inverter response delay after a master's query sent through serial link 0 (9-pole, male D connector).	

R003 Baud Rate for Serial Link 0

R003	**Range**	1 ÷ 7	1: 1200 bps 2: 2400 bps 3: 4800 bps 4: 9600 bps 5: 19200 bps 6: 38400 bps 7: 57600 bps
Baud Rate for Serial Link 0	**Default**	6	6: 38400bps
	Level	ENGINEERING	
	Address	590	
	Function	This parameter sets the baud rate, expressed in bits per second, for serial link 0 (9-pole, male D connector).	

R004 Time Added to 4–Byte–Time for Serial Link 0

R004	**Range**	1 ÷ 10000	1 ÷ 10000 msec
Time Added to 4–Byte–Time for Serial Link 0	**Default**	2	2 msec
	Level	ENGINEERING	
	Address	591	
	Function	This parameter sets the limit time when no character is received from serial link 0 (9-pole, male D connector) and the message sent from the master to the inverter is considered as ended.	

R005 Watchdog Time for Serial Link 0

R005	**Range**	0 ÷ 65000	0 ÷ 6500.0 sec
Watchdog Time for Serial Link 0	**Default**	0	0.0 sec
	Level	ENGINEERING	
	Address	592	
	Function	If this parameter is other than zero, it sets the limit time after which alarm A061 WDG Serial 0 trips if the inverter does not receive any legal message through serial link 0 (9-pole, male D connector).	

R006 Parity Bit for Serial Link 0

R006	**Range**	0 ÷ 3	0: Disabled 1 Stop–bit 1: Disabled 2 Stop–bits 2: Even (1 Stop-bit) 3: Odd (1 Stop-bit)
Parity Bit for Serial Link 0	**Default**	1	1: Disabled 2 Stop–bits
	Level	ENGINEERING	
	Address	593	
	Function	This parameter determines whether the parity bit is used or not when creating the Modbus message through serial link 0 (9-pole, male D connector).	

5.6. EEPROM MENU

The inverter has four different memory zones:

RAM	Volatile memory containing the current parameterization of the inverter.
Default Zone	Non-volatile memory that cannot be accessed by the user. It contains the factory-setting of the inverter parameters.
Work Zone	Non-volatile memory where customized parameters are saved. Whenever the inverter is reset, this parameterization is loaded to RAM.
Back-up Zone	Non-volatile memory storing a new parameterization of the inverter. Back-up parameters are modified only when the user explicitly saves the back–up zone.

Any parameter can be changed by the user. The inverter will immediately use the new parameter value.
The user may save the parameter value to the Work zone. If no new value is saved for a given parameter, at next power on the inverter will use the parameter value stored in the Work zone.

"P" parameters can be written at any moment.

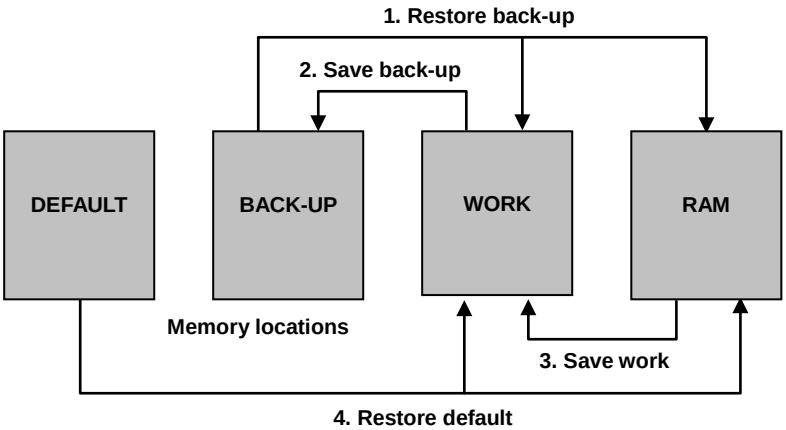
"**C"** parameters can be written only if the inverter is not running.

"**R"** parameters have the same features as "C" parameters, but the new parameter value, once saved, will be used only at next power on. For a prompt use of the new parameter value, just turn off and on the inverter.

The Work zone may be copied to the BACKUP zone through input **I012** included in the Eeprom menu and described in the section below.

The same input permits to copy the Backup zone to the WORK zone to restore the parameter values stored in the WORK zone.

I012 also permits to restore the factory-setting for all parameters in the WORK zone.



5.6.1. EEPROM Menu Parameters

Parameter	FUNCTION	User Level	Modbus Address
UPL	Upload from Inverter	BASIC	Can't be accessed
DNL	Download to Inverter	BASIC	Can't be accessed
I012	EEPROM Control	BASIC	1399
P267	Password for Write Enable	ENGINEERING	867

Table 58: **Parameters in the EEPROM MENU**

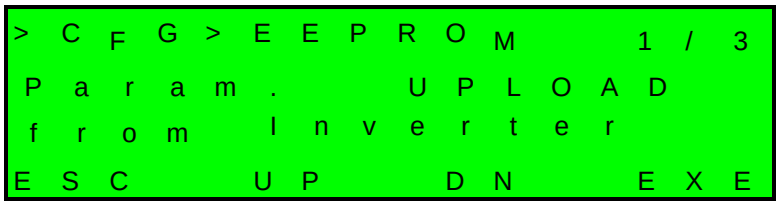
UPLOAD Page

UPL		
UPLOAD Page	**Range**	Neither an input nor a parameter.
	Default	Neither an input nor a parameter.
	Level	BASIC
	Address	Cannot be accessed via Modbus.
	Function	This page performs the user interface for the WORK zone parameter **upload** from the inverter to the keypad. When **UPLOAD** is performed, all parameters in the WORK zone are read by the inverter and stored to non-volatile memory of the inverter keypad.

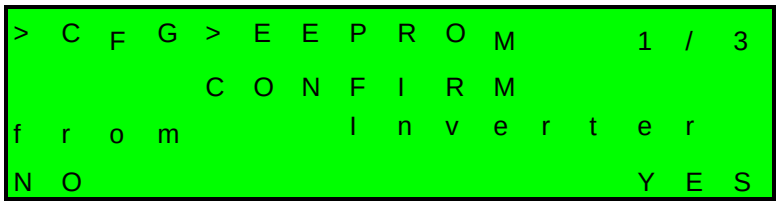
To access the UPLOAD page, hold down the **MENU** and **Tx/Rx** keys.
In the UPLOAD page, the MENU key is disabled.

Press **Tx/Rx** again to switch to the DOWNLOAD page. In the DOWNLOAD page, the MENU key is enabled.

UPLOAD page display:



Press **SAVE/ENTER** to perform upload; confirmation is required:



Press **ESC** to cancel confirmation, press **SAVE/ENTER** to perform the parameter UPLOAD: a flashing warning (**W08 UPLOADING**) is displayed and the Rx LED comes on.

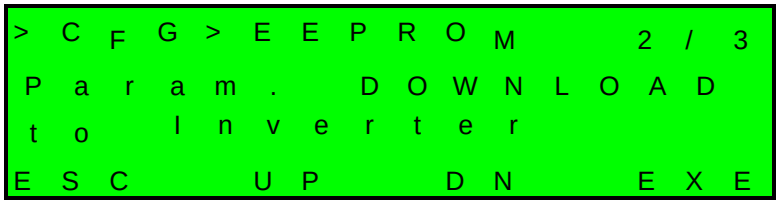
If parameters are successfully uploaded, the following warning is displayed:

W11 UPLOAD OK.

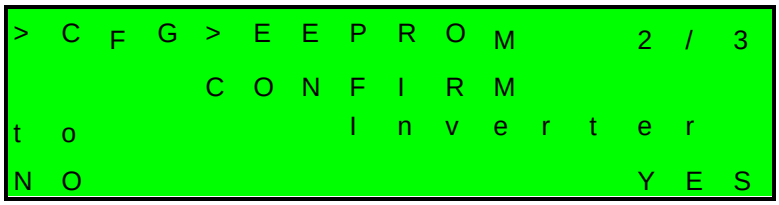
DNL DOWNLOAD Page

DNL		
DOWNLOAD Page	**Range**	Neither an input nor a parameter.
	Default	Neither an input nor a parameter.
	Level	BASIC
	Address	Cannot be accessed via Modbus.
	Function	This page performs the user interface for the WORK zone parameter **download** from the keypad to the inverter. When **DOWNLOAD** is performed, all parameters in the WORK zone are read by the non-volatile memory of the keypad and are written to the inverter memory. If parameters are successfully downloaded, the user shall store all WORK parameters.

DOWNLOAD page display:



Press **SAVE/ENTER** to perform download; confirmation is required:



Press **ESC** to cancel confirmation, press **SAVE/ENTER** to perform the parameter DOWNLOAD. The keypad will check consistency of WORK parameters stored to its non-volatile memory; a flashing warning (**W07 DOWNLOADING**) is displayed and the Tx LED comes on.

If parameters are successfully downloaded, the following warning is displayed:

W09 DOWNLOAD OK.

EEPROM Control

	Range	0, 2, 4, 5, 11	0: No Command 2: Restore Backup 4: Save Backup 5: Save Work 11: Restore Default
EEPROM Control	**Default**	This is not a parameter: at power on and whenever the Eeprom command is executed, I012 is set to zero.	
	Level	BASIC	
	Address	1399	
	Function	This parameter saves and restores the whole parameter set that can be accessed by the user: **2: Restore Backup:** Parameters stored in the Backup zone are copied and stored to the WORK zone. They represent the new RAM parameterization; the previous RAM parameters are cleared. Backup → RAM → Work. **4: Save Backup:** Parameters stored in the WORK zone are stored to a copy of the Backup zone. Work → Backup. **5: Save Work:** The current values of the parameters stored to RAM are saved to non-volatile memory to the Work zone. All parameters are saved at a time. RAM → Work. **11:Restore Default:** Factory-setting values are restored for all parameters; factory-setting is stored to non-volatile memory to the Work zone. Default → RAM → Work.	

P267 Password for Write Enable

P267	**Range**	1 ÷ 32767	1 ÷ 32767
Password for Write Enable	**Default**	1	1
	Level	ENGINEERING	
	Address	867	
	Function	This parameter contains the value assigned to P000 (key parameter, see the PARAMETERS [PAR] MENU), which allows parameter alteration. **IMPORTANT:** Remember to note down the new value. Once P267 is changed, factory setting (P000 = 1) cannot be restored.	

6. IDP [IDP] MENU

6.1. Description

The IDP menu contains the information relating to the product and the functioning time of the inverter, and allows choosing the dialog language for the display/keypad. The following screens are available:

- **Manufacturer**
- **Product ID**

The Product ID page shows the inverter size and voltage class, the implemented type of control and the software version for the DV604 function.

- **Functioning time**

Supply Time (ST) and Operation Time (OT) of the inverter.

- **Serial Number**
- **Production Lot**
- **Language**

Allows selecting the dialog language.

- **Country Settings**

For the correct parameter interpretation, the Country Settings measure shows the Country where the inverter will be installed.

6.2. PRODUCT MENU

The Product menu contains the information about the product and parameter **P263 Language,** allowing choosing the dialog language for the display/keypad.
Information about the product is the following:

Manufacturer	(Read Only)
Product Name	(Read Only)
Product Type	(Read Only)
Implemented SW Version	(Read Only)
Serial Number	(Read Only)
Production Lot	(Read Only)
Inverter Functioning time	(Read Only)

Manufacturer

```
E L E T T R O N I C A
  S A N T E R N O
I M O L A  ( B O )
    I T A L Y
```

Manufacturer	Function	This screen displays the Name of the inverter manufacturer.

Product ID

The Product menu contains the name, the size and the voltage class of the inverter, as well as the control algorithm and the number of software version implemented for grid interface protection functionality.

```
S U N W A Y  T G      2 1 . 0
S T 1  G R I D  C O N N

S W _ V e r s i o n  1 . 6 9
```

Line 1 in the display/keypad shows the name and the size of the inverter (TG21 in the example).
Line 2 shows the control algorithm being used.
Line 4 shows the software version implemented in the inverter.

NOTE

The screen above can be viewed on the display/keypad only.

The PROD ID (product identifier) is available via serial link. The Prod Id is the acronym of the device, ST, coded according to hexadecimal ASCII code.

PROD ID: Product Identifier

PROD ID	Product	Sunway TG	
PROD ID	Value	0x5354 (hexadecimal) **S**:0x53, **T**:0x54 (ASCII codification)	**ST**
	Address	476	
	Function	This measure represents the two hex characters which identify the product.	

Serial Number

Serial Number	Function	This page shows the Serial Number of the inverter.

Production Lot

Production Lot	Function	This page shows the Production Lot of the inverter.

Production Lot MO49TE1MM1

Language - P263

Parameter	FUNCTION	User Level	Modbus Address
P263	Language	BASIC	863

Table 59: Parameter P263

P263 Dialog Language

P263	Range	0 ÷ 4	0: ITALIANO 1: ENGLISH 2: ESPAÑOL 3: FRANÇAIS 4: DEUTSCH
	Default	See 7.1 Default Values by Country	
	Level	BASIC	
	Address	863	
	Function	The default dialog language is based on the Country settings. The MMI (man/machine interface) software version is displayed in the SW Version screen in the Product menu.	

Setting by Country

Setting by Country	**Function**	Shows the Country where the inverter is installed. This affects parameter configuration.

Inverter Functioning Time

Inverter Functioning Time	**Function**	This screen shows the supply time (ST, M098) and the Operation Time (OT, M099) of the inverter. The operation time is the time period when IGBTs are on.

7. SETTINGS BY COUNTRY

7.1. Default Values by Country

Certain parameters are dependent on the Country where the inverter is installed. This applies especially to the grid interface parameters and the dialog language.

Please refer to the Certifications and Interface Protection Booklet.

8. INTERFACE PROTECTION SELF-TEST FUNCTION

8.1. Description

This function allows checking the operation of the grid disconnecting device (interface protection) as required by your National Electricity Board.
The following tests can be performed:

- Checking protection trip due to min. voltage fault.
- Checking protection trip due to max. voltage fault.
- Checking protection trip due to min. frequency fault.
- Checking protection trip due to max. frequency fault.

When testing, the inverter automatically changes the trip threshold until the protection trips because the detected value is the same as the preset threshold, thus allowing checking if the contactor connecting the inverter to the grid opens when required. When this happens, the inverter stops, the interface contactor opens and the trip threshold stops changing and is kept constant to the trip level. At the same time, the trip time for the interface protection is displayed.
After a few seconds, the inverter automatically restarts and the default values are restored.
The inverter disconnecting events after each test stage are stored to the **Event List**.

8.2. Test Procedure

First enable parameter write (**P001=0001**).
The inverter shall operate and be parallel-connected to the grid (RUN and Grid OK LEDs ON).

Select the GRID INTERFACE PROTECTION AUTOTEST [PAR] menu; the display shows:

					T	E	S	T		V	m	i	n	1 / 4
M	0	0	7	=		4	0	0		V				
M	1	0	0	=		3	2	0		V				
I	0	3	0	=		I	n	a	c	t	i	v	e	

Use the arrow keys to go to a different test page.

IO30 Test V Min
M007 = yyyyy
Test = 320V
IO30 = Inactive

IO31 Test V Max
M007 = yyyyy
Test = 480V
IO31 = Inactive

IO32 Test Fmin
M001 = wwww
Test = 49.7Hz
IO32 = Inactive

IO33 Test FMax
M001 = wwww
Test = 50.3Hz
IO33 = Inactive

When testing is inactive, the trip thresholds are fixed and are set to the values required by the standards in force:

Item	Required value	Factory-set rated value	Factory-set trip threshold
Min. voltage value causing protection trip	0.8*grid rated voltage	400 VAC	320VAC
Max. voltage value causing protection trip	1.2*grid rated voltage	400 VAC	480VAC
Min. frequency value causing protection trip	49.7 Hz (49 Hz) (*)	50 Hz	49.7 Hz
Max. frequency value causing protection trip	50.3 Hz (51 Hz) (*)	50 Hz	50.3 Hz

(*) Your National Electricity Board may require to change the ratings in brackets for particular applications. If so, please contact Elettronica Santerno's Customer Service.

Trip times:

Variable	Trip time
Max. voltage trip time	50ms
Min. voltage trip time	50ms
Max. frequency trip time	50ms (**)
Min. frequency trip time	50ms (**)

The trip times that can be checked with the self-test function are the same as the times stated in the table above. Negligible errors can be accepted.

The test procedure is the following:

- Use the arrow [∧] [∨] keys to select the test to be performed;
- Press [ENTER] to enable test editing;
- Press [∧] to select "Active";
- Press [ESC] to enable the testing mode: the trip threshold starts changing until the measured value is detected;
- If the test **succeeds**, the inverter stops and the RUN Led turns off for a few seconds and the display shows the trip threshold causing the inverter to stop. The trip time for the interface protection is displayed below "tms".
- If the test **fails**, the inverter is not stopped. This is due to the malfunctioning of the interface protection. Please contact Elettronica Santerno's Customer Service.

To quit the test mode, press [ESC] until the start menu reappears.

9. ALARMS, WARNINGS AND EVENTS

CAUTION

If a protection trips or the inverter enters the emergency mode, the inverter is locked.

9.1. What Happens when a Protection Trips

NOTE

*Carefully read and understand this section and the following section (**What To Do When an Alarm Trips)** before operating the inverter in emergency condition.*

The inverter alarms are detailed in the sections below.
When a protection or an alarm trips, the **ALARM** LED in the keypad comes on and the page displayed is the first page of the **FAULT LIST**.
Factory-setting: at power on, the inverter is still in emergency condition if the alarm tripped at power off was not reset.
If the inverter is in emergency mode at power on, this could be due to an alarm tripped before the inverter was shut off.
To avoid storing the alarms tripped before the inverter is shut off, set parameter **C257** in the **Autoreset** Menu accordingly.
The inverter stores the moment when an alarm trips to the **FAULT LIST** (supply–time and operation–time).
The inverter state when the alarm tripped, as well as some measures sampled when the alarm tripped, are also stored to the Fault List.
The fault–list can be very useful to detect the cause responsible for the alarm trip and its possible solution (see also the FAULT LIST MENU in the **Measure Menu** described in this manual).

NOTE

*Alarms **A001** to **A039** relate to the main microcontroller (DSP Motorola) of the control board, which detected a fault in the control board. No fault–list is available for Alarms **A001** to **A039** and no Reset command can be sent via serial link; alarms can be reset through the RESET terminal in the terminal board or the RESET key in the keypad. The software for the keypad interface is not available; the inverter parameters and measures cannot be accessed via serial link.*

*Alarms **A033** and **A039** indicate that flash memory is not provided with proper software; the only way to reset alarms **A033** and **A039** is to download proper software for the inverter flash memory.*

9.2. What To Do When an Alarm Trips

Proceed as follows:

- See the **FAULT LIST** stating any information about the alarm tripped, in order to determine the cause responsible for the alarm and its possible solutions.
  Any information stored in the FAULT LIST is also required when contacting Elettronica Santerno's Customer Service.
- In the following sections, look for the code of the alarm tripped and follow the instructions given to reset the alarm.
- Try to solve any problem external to the equipment and responsible for the protection trip.
- If you entered wrong parameter values, set new allowable values and save them.
- Reset the alarm.
- A **RESET** command must be sent to reset an alarm: press the **RESET** key in the display/keypad for some seconds.
- The RESET function be automatic; just set parameter **C255** to a value other than zero. The inverter will try to automatically reset the alarms tripped (see the ALARM AUTORESET MENU - C255 to C27).
- If the alarm condition persists, please contact Elettronica Santerno's Customer Service.

9.3. List of the Alarm Codes

Alarm	Alarm Message	Description
A001 ÷ A039	…	*Control board failure.*
A040	USER ALARM	Alarm intentionally caused by the user.
A033	TEXAS VER KO	Incompatible Texas Software Version.
A039	FLASH KO	Texas Flash blank.
A040	USER ALARM	Alarm caused by the user.
A041	IGBT FAULT Side A	Generic alarm IGBT Hardware, side A.
A043	FALSE SOFTWARE INTERRUPT	*Control board failure.*
A044	OVERCURRENT	Software overcurrent.
A045	BY-PASS FAULT	Fault of precharge By–Pass.
A046	BY-PASS CONNECTOR FAULT	Precharge By–Pass connector fault.
A047	UNDERVOLTAGE	Dc bus voltage lower than Vdc_min.
A048	OVERVOLTAGE	Dc bus voltage exceeding Vdc_max.
A049	RAM FAULT	Inconsistent DSP Texas RAM
A050	IGBT FAULT A	Hardware Fault from IGBT converter, side A.
A051	OVERCURRENT HW A	Hardware overcurrent, side A.
A052	INV ASYMMETRIC I	Inverter Asymmetric Current.
A053	IGBT FAULT PWONA	Hardware failure, IGBT A power on impossible.
A054	TLP or TEL:EXT FAULT	State of external contactor inconsistent with TLP (parallel contactor) state.
A055	TLext NOT OPEN	State of external contactor inconsistent with inverter operation.
A056	TLext NOT CLOSED	State of external contactor inconsistent with inverter operation.
A057	TLP NOT OPEN	Contactor state inconsistent with inverter operation.
A058	TLP NOT CLOSED	Contactor state inconsistent with inverter operation.
A061÷ A062	SERIAL WATCHDOG	Watchdog tripped in serial link 0 or serial link 1.
A063	GENERIC MOTOROLA	*Control board failure.*
A064	FIELD SWITCH OPEN	PV field feedback inconsistent with inverter operation.
A065	GRID C/B OPEN	Auxiliary contact of the circuit breaker inconsistent with the operating conditions of the inverter.
A066	ALR_U_AIN1_LESS_4MA	Ref Input current < 4mA.
A067	CPU OVERTEMPERATURE	CPU temperature exceeding preset threshold (60 °C).
A068	PV ISOLATION KO	Isolation loss of the photovoltaic field.

Alarm	Alarm Message	Description
A069	PAR DOWNLOAD KO	Parameter download error, type 1.
A070	PAR DOWNLOAD KO	Parameter download error, type 2.
A071	1ms INTERRUPT OVERTIME	*Control board failure.*
A074	OVERLOAD	Inverter thermal protection tripped.
A078	MMI KO	*Control board failure.*
A079	ALR_U_GRID_OVERV	*AC-side overvoltage alarm.*
A081	DISPLAY/KEYPAD TIMEOUT	Display/keypad communication timeout.
A082	TLP/KM1 NOT CLOSED 2	Contactor state inconsistent with inverter operation.
A083	FAN FAULT	Fault of inverter cooling fans.
A084	SENSOR 2 FAULT	Heatsink NTC or PTC sensor fault (not included in all inverter sizes).
A087	+/- 15V FAILURE	*Control board failure.*
A088	ADC NOT TUNED	*Control board failure.*
A089 ÷ A090	PAR DOWNLOAD KO	*Control board failure.*
A092	MOTOROLA SW VERSION	*Control board failure.*
A093	PRECHARGE: BYPASS OPEN	By-Pass relay open.
A094	HEATSINK OVERTEMPERATURE	IGBT heatsink temperature too high.
A106÷A109	ALR_U_AMB_CHX	Input current < 4mA in Analog Inputs CH0, CH1, CH2, CH3, if configured as 4-20mA.
A111 ÷ A120	…	*Control board failure.*
A121	WRONG LUT	Illegal values on LVRT lookup table.
A130	RELAY OPEN	Critical relay opening.

Table 60: Alarm list

A001÷A032 Control Board Failure

A001÷A032	Description	Hardware board failure.
Control Board Failure	Event	The board autodiagnostics function constantly checks its operating conditions. Multiple causes may trip alarms A001 to A032.
	Possible Cause	• Electromagnetic disturbance or radiated interference. • Possible failure of the microcontroller or other circuits in the control board.
	Solutions	1. Reset the alarm: send a **RESET** command. 2. If the alarm persists, please contact ELETTRONICA SANTERNO's Customer Service.

A033 Texas Ver KO

A033	Description	Incompatible Texas Software Version.
Texas Ver KO	Event	At power on, DSP Motorola detected an incompatible version of the software downloaded to Flash Texas (software version incompatible with Motorola).
	Possible Cause	Wrong software downloaded.
	Solutions	1. Download the correct software version. 2. Please contact ELETTRONICA SANTERNO's Customer Service.

A039 Texas Flash Blank

A039	Description	Texas Flash not programmed.
Texas Flash Blank	Event	At power on, DSP Motorola detected that Flash Texas is not correctly programmed.
	Possible Cause	A prior attempt to download DSP Texas software failed.
	Solutions	1. Try to download DSP Texas software again. 2. Please contact ELETTRONICA SANTERNO's Customer Service.

A040 User Alarm

A040	Description	Alarm trip caused by the user.
User Alarm	Event	Alarm trip caused by the user.
	Possible Cause	Value 1 was entered to address Modbus 1400 via serial link.
	Solutions	Reset the alarm: send a **RESET** command.

A041 IGBT Fault Side A

A041	Description	Generic alarm IGBT Hardware, side A.
IGBT Fault Side A	Event	Power converter A generated a generic alarm.
	Possible Cause	• Electromagnetic disturbance or radiated interference. • Overcurrent, IGBT overtemperature, IGBT fault.
	Solutions	1. Reset the alarm: send a **RESET** command. 2. If the alarm persists, please contact ELETTRONICA SANTERNO's Customer Service.

A045 By-pass Fault

A045	Description	Fault of precharge By–Pass.
By-pass Fault	Event	The inverter imposed to close its relay or contactor for the short-circuit of precharge resistors in DC-link capacitors (DC bus), but it did not detect the relevant closing signal.
	Possible Cause	• Disconnection of auxiliary signal. • Precharge relay/contactor failure.
	Solutions	1. Reset the alarm: send a **RESET** signal. 2. If the alarm persists, please contact ELETTRONICA SANTERNO's Customer Service.

A046 By-pass Connector Fault

A046	Description	Fault of precharge By–Pass connector.
By-pass Connector Fault	Event	Auxiliary signal for the closing of the by-pass connector of precharge resistor is considered as closed before the relevant closing command is sent.
	Possible Cause	• Precharge by-pass connector reversed. • Precharge relay/contactor failure.
	Solutions	1. Reset the alarm: send a **RESET** command. 2. If the alarm persists, please contact ELETTRONICA SANTERNO's Customer Service.

A047 Undervoltage

A047	Description	DC bus voltage lower than Vdc_min.
Undervoltage	Event	Voltage measured in DC bus capacitors has dropped below the min. value allowed for a proper operation of the inverter class being used.
	Possible Cause	• Radiation is not sufficient for min. voltage of DC bus. • Failure in DC bus voltage measure circuit.
	Solutions	1. Check parameter **M010** (measured DC Bus voltage). 2. If the alarm persists, please contact ELETTRONICA SANTERNO's Customer Service.

A048 Overvoltage

A048	Description	Overvoltage in DC bus (voltage in DC-link).
Overvoltage	Event	Voltage measured in DC bus (DC-link) capacitors has exceeded the max. value allowed for a proper operation of the inverter class being used.
	Possible Cause	Failure in DC bus voltage measure circuit.
	Solutions	1. Check parameter **M010** (measured DC Bus voltage). 2. If the alarm persists, please contact ELETTRONICA SANTERNO's Customer Service.

A050 IGBT Fault A

A050	Description	Hardware fault from IGBT converter, side A.
IGBT Fault A	Event	IGBT drivers of power converter A detected IGBT failure.
	Possible Cause	• Electromagnetic disturbance or radiated interference. • Overcurrent, Overtemperature, IGBTs, IGBT fault.
	Solution	1. Reset the alarm: send a **RESET** command. 2. If the alarm persists, please contact ELETTRONICA SANTERNO's Customer Service.

A051 Overcurrent HW A

A051	Description	Hardware overcurrent, side A.
Overcurrent (Hardware)	Event	Hardware overcurrent detected by the inverter output current circuit.
	Possible Cause	• Abrupt variations of the connected load. • Output short-circuit or ground short-circuit. • Electromagnetic disturbance or radiated interference.
	Solutions	1. Check that the inverter is properly dimensioned for the power of the photovoltaic field. 2. Make sure that no short-circuit is to be found between two phases or between one phase and the ground outgoing from the inverter (terminals U, V, W). 3. Reset the alarm: send a RESET command. 4. If the alarm persists, please contact ELETTRONICA SANTERNO's Customer Service.

A052 Inverter Asymmetric Current

A052	Description	Hardware failure – Inverter output asymmetric current
Inverter Asymmetric Current	Event	Inverter output asymmetric current
	Possible Cause	The wires outgoing from the inverter module are cut off.
	Solutions	1. Reset the alarm: send a **RESET** command. 2. If the alarm persists, please contact ELETTRONICA SANTERNO's Customer Service.

A053 Not PWONA

A053	Description	Hardware failure; IGBT A power-on failure.
Not PWONA	Event	IGBT A power-on controlled by Motorola microcontroller has failed.
	Possible Cause	Control board failure.
	Solutions	1. Reset the alarm: send a **RESET** command. 2. If the alarm persists, please contact ELETTRONICA SANTERNO's Customer Service.

A054 TLP or TLext FAULT

A054	Description	The state of one or both parallel contactors and grid interface is inconsistent with the operating mode of Sunway TG/TG-A.
TLP or TLext FAULT	Event	The inverter forced the external contactor or the parallel contactor to open or close and has detected a failure between the command and the auxiliary contact of the contactors.
	Possible Cause	• Contactor failure. • Wiring failure in the contactor feedback contact.
	Solutions	1. Check wiring. 2. Reset the alarm: send a **RESET** command. 3. If the alarm persists, please contact ELETTRONICA SANTERNO's Customer Service.

A055 TLext Not Open

A055	Description	External contactor closed.
TLext Not Open	Event	The equipment state is inconsistent with the external contactor state. This alarm concerns the Sunway TG 52 DUAL and the MV series only.
	Possible Cause	• Contactor failure. • Wiring failure in the contactor feedback contact.
	Solutions	1. Check conditions of the external contactor. 2. Reset the alarm: send a **RESET** command. 3. If the alarm persists, please contact ELETTRONICA SANTERNO's Customer Service.

A056 Tlext Not Closed

A056	Description	External contactor open.
Tlext Not Closed	Event	The equipment state is inconsistent with the external contactor state. This alarm concerns the Sunway TG 52 DUAL and the MV series only.
	Possible Cause	• Contactor failure. • Wiring failure in the contactor feedback contact.
	Solutions	1. Check conditions of AC14/KM2 and wiring of the contactor feedback contact. 2. Reset the alarm: send a **RESET** command. 3. If the alarm persists, please contact ELETTRONICA SANTERNO's Customer Service.

A057 TLP Not Open

A057	Description	TLP closed.
TLP Not Open	Event	The equipment state is inconsistent with the parallel contactor state.
	Possible Cause	Contactor failure.
	Solutions	1. Check conditions of TLP contactor. 2. Reset the alarm: send a **RESET** command. 3. If the alarm persists, please contact ELETTRONICA SANTERNO's Customer Service.

A058 TLP Not Closed

A058	Description	TLP open.
TLP Not Closed	Event	The equipment state is inconsistent with the parallel contactor state.
	Possible Cause	• Contactor failure. • Wiring failure in the contactor feedback contact.
	Solutions	1. Check conditions of TLP contactor and wiring of contactor feedback contact. 2. Reset the alarm: send a **RESET** command. 3. If the alarm persists, please contact ELETTRONICA SANTERNO's Customer Service.

A061÷ A062 Serial Link Watchdog

A061÷A062 (Serial Link 0 or 1)	Description	A061: Serial Link Watchdog 0 tripped A062: Serial Link Watchdog 1 tripped
Serial Link Watchdog	Event	The serial link watchdog has tripped. Communication failure: no read/write query to serial link is sent for a time longer than the time set in the parameters relating to serial link watchdog (see **Serial Links** Menu).
	Possible Cause	• Serial link is disconnected. • Communication failure on remote master side. • Too short watchdog operating times.
	Solutions	1. Check serial link. 2. Make sure that the remote master constantly sends read/write queries with max. intervals between two queries lower than the preset watchdog operating time. 3. Set longer watchdog operating times (see **R005** for serial link 0).

A064 PV Field Switch Open

A064	Description	The PV field switch is open.
PV Field Switch Open	Event	You are trying to start up the equipment but the PV field switch is open.
	Possible Cause	Wiring failure in the contactor feedback contact.
	Solutions	1. Make sure that the field switch located in the cabinet front part is closed. 2. Reset the alarm: send a **RESET** command. 3. If the alarm persists, please contact ELETTRONICA SANTERNO's Customer Service.

A065 Grid C/B Open

A065	Description	The grid circuit breaker is open.
Grid C/B Open	Event	You are trying to start up the equipment but the grid C/B is open.
	Possible Cause	Aux contact in the grid C/B contactor open.
	Solutions	1. Make sure that the grid C/B on the front panel is open. 2. Reset the alarm: send a **RESET** command. 3. If the alarm persists, please contact ELETTRONICA SANTERNO's Customer Service.

A066 Ref Input Current < 4mA (FUTURE APPLICATIONS)

A066	Description	The Ref input current is lower than 4mA, but the allowable range is 4-20mA.
Ref Input Current < 4mA	Event	Ref input current is lower than 4mA.
	Possible Cause	The wires of the input sensor are cut off.
	Solutions	1. Check wiring of the input sensor. 2. Reset the alarm: send a **RESET** command. 3. If the alarm persists, please contact ELETTRONICA SANTERNO's Customer Service.

A067 CPU Overtemperature

A067	Description	The CPU temperature is exceeding the max. allowable temperature.
CPU Overtemperature	Event	The CPU temperature is exceeding the max. allowable temperature for the control board.
	Possible Cause	Cabinet overheating; fault in the cabinet fan.
	Solutions	1. Reset the alarm: send a **RESET** command. 2. Make sure that the external temperature is not exceeding the allowable range. 3. Check if fans are correctly operating and check the filters in the inverter cabinet. 4. Make sure that the inverter fans are not faulty. 5. If the alarm persists, please contact ELETTRONICA SANTERNO's Customer Service.

A068 PV Isolation KO

A068	Description	Isolation loss of the PV field.
PV Isolation KO	Event	Isolation loss detected by the PV field relay.
	Possible Cause	
	Solutions	1. Check galvanic isolation of the photovoltaic field. 2. Reset the alarm: send a **RESET** command. 3. If the alarm persists, please contact ELETTRONICA SANTERNO's Customer Service.

A069 PAR Download KO

A069	Description	An error occurred while downloading the programming parameters from the keypad.
PAR Download KO	Event	Download error of type 1.
	Possible Cause	
	Solutions	Retry parameter download again.

A070 PAR Download KO

A070	**Description**	An error occurred while downloading the programming parameters from the keypad.
PAR Download KO	**Event**	Download error of type 2.
	Possible Cause	
	Solutions	Retry to download parameters again.

A074 Overload

A074	**Description**	Inverter thermal protection tripped.
Overload	**Event**	The output current has been exceeding the inverter rated current for a long time.
	Possible Cause	• Current equal to: **Imax** + 20% for **3 seconds** • Current equal to: **Imax** for **120 seconds** (S05 to S30) • **Imax** for **60 seconds** (S40 to S70)
	Solutions	Check the inverter current output during ordinary operation (see the MEASURES [MEA] MENU).

A079 Overvoltage Alarm

A079	**Description**	AC-side Overvoltage alarm
Overvoltage Alarm	**Event**	The inverter output voltage has exceeded the Overvoltage threshold.
	Possible Cause	• Power failure. Overvoltage occurs if the grid circuit breaker disconnects from the grid. • Overvoltage may also occur in case of current unbalance.
	Solutions	Make sure that no attempt to open the AC switches at the inverter output is made when the inverter is running.

A081 Display/Keypad Watchdog

A081	**Description**	Malfunctioning of the display/keypad.
	Event	Display/keypad communication loss.
	Possible Cause	• Display/keypad cable disconnected. • One of the two connectors of the display/keypad is faulty. • Display/keypad faulty.
	Solutions	1. Check if the cable of the display/keypad is properly connected. 2. Check if the contacts of the connectors in the display/keypad cable are intact, both on the inverter side and the display/keypad side.

A082 TLP/KM1Not Closed 2

A082	Description	TLP/KM1 open.
TLP/KM1Not Closed 2	Event	The equipment state is inconsistent with TLP/KM1 state.
	Possible Cause	• Contactor failure. • Wiring failure in the contactor feedback contact.
	Solutions	1. Check TLP conditions and wiring of the contactor feedback contact. 2. Reset the alarm: send a RESET command. 3. If the alarm persists, please contact ELETTRONICA SANTERNO's Customer Service.

A083 Fan Fault

A083	Description	Fan fault.
Fan Fault	Event	Power heatsink overheated; fan locked.
	Possible Cause	Fan locked or faulty.
	Solutions	Replace fan.

A084 Sensor 2 Fault

A084	Description	The heatsink overtemperature protection has tripped due to NTC sensor fault or PTC sensor fault (not included in all inverter sizes).
Sensor 2 Fault	Event	Overheating of the IGBT heatsink.
	Possible Cause	• Overload. • Ambient overtemperature.
	Solutions	1. Reset the alarm: send a **RESET** command. 2. Make sure that the external temperature is not exceeding the allowable range. 3. Check if fans are correctly operating and check the filters in the inverter cabinet. 4. Make sure that the inverter fans are not faulty. 5. If the alarm persists, please contact ELETTRONICA SANTERNO's Customer Service.

A093 Precharge: By-pass Open

A093	Description	The by-pass relay is open.
Precharge: By-pass Open	Event	The inverter imposed to close its relay or contactor for the short-circuit of precharge resistors in DC-link capacitors (DC bus), but it **did not detect the relevant closing signal**.
	Possible Cause	Failure in the relay driver circuit or failure in the closing auxiliary signal circuit.
	Solutions	1. Reset the alarm: send a **RESET** command. 2. If the alarm persists, please contact ELETTRONICA SANTERNO's Customer Service.

A094 Heatsink Overtemperature

A094	Description	IGBT heatsink temperature is too high.
Heatsink Overtemperature	Event	IGBT power heatsink overheated even if the cooling fan is on.
	Possible Cause	The ambient temperature of the place where the inverter is installed exceeds 40 °C.
	Solutions	1. Reset the alarm: send a **RESET** command. 2. Make sure that the external temperature is not exceeding the allowable range. 3. Check if fans are correctly operating and check the filters in the inverter cabinet. 4. Make sure that the inverter fans are not faulty. 5. If the alarm persists, please contact ELETTRONICA SANTERNO's Customer Service.

A106÷A109 Input Current < 4mA in Analog Inputs

A094	Description	The Ref input current is lower than 4mA, but the allowable range is 4-20mA.
Heatsink Overtemperature	Event	Analog input current lower than 4mA.
	Possible Cause	• The wires of the input sensor are cut off. • Incorrect configuration of the DIP-switches in Environmental Sensors and I/Os Expansion Board (ES847).
	Solutions	1. Check wiring of the input sensor. 2. Check configuration of DIP-switches in Environmental Sensors and I/Os Expansion Board (ES847). 3. Reset the alarm: send a **RESET** command. 4. If the alarm persists, please contact ELETTRONICA SANTERNO's Customer Service**.**

A043, A063, A071, A078, A087, A088, A092, A111÷A120 Control Board Failure

A043 A063 A071 A078 A087 A088 A092 A111 ÷ A120	Description	Hardware board failure.
Control Board Failure	Event	The board autodiagnostics function constantly checks its operating conditions. Multiple causes may trip Control Board Failure alarms.
	Possible Cause	• Electromagnetic disturbance or radiated interference. • Possible failure of the microcontroller or other circuits in the control board.
	Solutions	1. Reset the alarm. 2. If the alarm persists, please contact ELETTRONICA SANTERNO's Customer Service.

A121 Wrong LVRT LUT

A121	Description	Wrong settings for parameters **P365-P372** (LVRT MENU P360 to P38)
Wrong LVRT LUT	**Event**	The LVRT mask (see Figure 5) is not properly set.
	Possible Cause	The sequence of points P365-P372 is non-monotonous increasing
	Solutions	Set points P365-P372 so that their sequence is monotonous increasing: a given item in the sequence is to be higher than or equal to the previous one.

A130 Relay Open

A130	Description	The relay is critically open
Relay Open	**Event**	IGBT heatsink overheated or CPU overheated or DC overvoltage
	Possible Cause	Too high temperature or too high DC input voltage
	Solutions	1. Reset the alarm: send a **RESET** command. 2. Make sure that the external temperature is not too high 3. Check if the cabinet fans work properly and check the status of the filters in the inverter compartment. 4. Check the efficiency of the inverter fans. 5. Check the value of the DC-Bus voltage measured in M010. 6. If the alarm persists, please contact ELETTRONICA SANTERNO's Customer Service.

9.4. Warnings

Warning messages are displayed in the display/keypad. They are flashing messages appearing in the first three lines of the display.

NOTE

Warnings are neither protections nor alarms, and are not stored to the Fault List.

Some warnings simply state what's happening or suggest what to do when using the keypad.

However, most part of the warning messages are **Coded warnings**: they are displayed with letter **"W" followed by two digits** stating which warning is active at the moment.

Example:

W 3 2 O P E N E n a b l e

Warning messages are detailed in the following section.

9.5. Coded Warnings

Warning	Message	Description
W03	SEARCHING…	The user interface is searching the data of the next page to display.
W06	HOME SAVED	The page displayed has been saved as the home page displayed at power on.
W07	DOWNLOADING	The keypad is **writing** to the inverter the WORK zone parameters saved to its own Flash.
W08	UPLOADING	The keypad is **reading** from the inverter the WORK zone parameters that will be saved to its own Flash.
W09	DOWNLOAD OK	Parameters were successfully downloaded to the inverter (parameter **writing**).
W10	DOWNLOAD KO	Parameter download to the inverter has failed (parameter **writing** failed).
W11	UPLOAD OK	Parameters were successfully uploaded from the inverter (parameter **reading**).
W12	UPLOAD KO	Parameter upload from the inverter has failed (parameter **reading** failed).
W13	NO DOWNLOAD	A Download procedure was queried, but no parameter is saved to flash memory.
W16	PLEASE WAIT	Wait until the system accomplishes the operation required.
W18	PARAMS LOST	Parameters download to the inverter has failed (parameter **writing** failed). Not all parameters have been updated (inconsistent parameters). **Shut off the inverter or try to perform a new parameter download**.
W19	NO PARS LOAD	UPLOAD impossible.
W20	NOT NOW	The function required is not available at the moment.
W21	CONTROL ON	The function required is inhibited because the inverter is running: **CABINET ENABLE SELECTOR SWITCH** is active.
W23	DOWNLD VerKO	Download failed because parameters saved to keypad memory relate to a software version or product ID incompatible with the inverter SW version or product ID.
W24	VERIFY DATA	Download preliminary operation; the system is checking the integrity and compatibility of the parameters saved to keypad memory.
W28	PV ISOL. KO	Isolation loss of the photovoltaic field.
W29	FUSE KO	Subfield fuse KO
W32	OPEN ENABLE	Open and close the **CABINET ENABLE SELECTOR SWITCH** (**MDI2**) signal to enable the inverter.
W33	Write Impos.	Write impossible.
W34	Illegal Data	Illegal value entered.
W35	No Write CTR.	Write impossible because the Control is active and the inverter is running: **CABINET ENABLE SELECTOR SWITCH** is active.
W36	Illegal Address	Illegal address, operation failed.
W37	ENABLE LOCK	The inverter is disabled and does not acknowledge the Enable command because it is writing a “C” parameter.  ***Caution: The inverter starts as soon as writing is over!!!***
W38	P000 == NO	The editing mode cannot be accessed because parameter modification is disabled: P000 is set to 0 (NO).
W39	KEYPAD DISAB	The editing mode cannot be accessed because the display/keypad is disabled.
W40	ES847 KO	Environmental Sensors and I/Os Expansion Board (ES847) board faulty or not correctly programmed.

Table 61: List of the coded warnings

9.6. Events

Events include the inverter start/stop, the interface protection trip, and so on.

When an event fires, this is stored to the starting page in the **EVENT LIST.**

9.7. Coded Events

Event	Description
E095 Controlled Stop	The STOP key in the display/keypad has been depressed.
E096 Startup OK	Successful startup, the Sunway TG is operating in parallel with the grid.
E097 Grid Interface KO	External grid interface protective device (option) tripped.
E098 Grid Frequency KO	The grid frequency is out of range (see the GRID MONITOR MENU - P072 to P100).
E099 Minimum Grid Voltage	The grid voltage has dropped below the minimum preset value (see the GRID MONITOR MENU - P072 to P100).
E100 Maximum grid Voltage	The grid voltage has exceeded the maximum preset value (see the GRID MONITOR MENU - P072 to P100).
E101 Aux Grid KO	Auxiliary grid failure.
E102 Low Field Voltage	The field voltage is too low.
E103 Low Field Power	The field power is too low.
E104 PLL KO	Synchronization failed.
E105 Power Off	The inverter has turned off.

Table 62: Events

10. APPENDIX

10.1. REVISION INDEX

Revision 03 –Software Version 1.72

- Appendix added
- “Scope of This Manual” section added
- “HFRT (High Frequency Ride Through)” menu added
- “LVRT(Low Voltage Ride Through”) menu added
- “General Measures” menu updated
- “Energy” menu updated
- Modbus addresses updated in the “Environmental Measures” menu
- “Field” menu updated
- “Grid Monitor” menu updated
- “Grid Power Control” menu updated
- Parameter P228 in “Digital Outputs” menu updated
- “Manager” menu updated
- Alarms A121 and A130 added
- “Regulators” menu suppressed
- “Display/Keypad” menu suppressed