Modbus RTU registers map for TRIO

Version: GB00

Contents

1 Introduction

The main purpose of this document is to describe the Modbus RTU registers map for the monitoring and control of the TRIO over a RS-485 serial line.

2 Peripheral Settings

- **Interface:** RS-485 (half duplex);
- **Baud Rate:** 2400, 4800, 9600 (default value), 19200, 38400, 57600 or 115200bps;
- **Start bit:** 1;
- **Stop bit:** 1;
- **Parity:** No parity;
- **Data bits:** 8;

3 Function codes

- 03 (0x03) Read holding registers;
- 04 (0x04) Read input registers;
- 06 (0x06) Write single register;
- 16 (0x10) Write multiple registers.

4 Exception codes supported

- 01 Illegal function;
- 02 Illegal data address;
- 03 Illegal data value;
- 04 Server device failure;
- 06 Server device busy.

5 Registers

5.1 Holding Registers

Register address [1]	Number of registers	Register content description	Range	Default value	Unit	Data type	Notes
0190	1	Permanent and dynamic mode - Power ramping interval - Holds time interval used by Inverter when write commands to registers *0200*, *0202*, *0210* or *0212* are received	0 to 250 [10ms to 1000s]	15	4s	Unsigned Integer	
0191	1	Dynamic mode - Timeout - Holds initial value of countdown timer used by Inverter to time out a Dynamic Mode command of Active or Reactive Power. It is read when new values of PF or Active Power are written to registers *0200* or *0210*, respectively.	0 to 250	1	min	Unsigned Integer	
0192 to 0197	5	RESERVED					

Register address [1]	Number of registers	Register content description	Range	Default value	Unit	Data type	Notes
0198	1	Configuration Smooth register LSB (value = 128 Trip Time mode value = 0 Fix Slope mode) MSB (bit0=0 smooth time x4s bit0=1 smooth time x1s)	0 to 65535	0	N/A	Unsigned Integer	
0199	1	RESERVED					
0200	2	Dynamic Mode - Reactive Power management by fixed PF	-1.0 to 1.0	1	N/A	IEEE 32 Float	Set a negative value for over-excited (capacitive injection) or a positive value for under-excited (inductive injection). Must be used with registers *0190* and *0191*
0202	2	Permanent Mode - Reactive Power management by fixed PF	-1.0 to 1.0	1	N/A	IEEE 32 Float	Set a negative value for over-excited (capacitive injection) or a positive value for under-excited (inductive injection). Must be used with register *0190*
0204	1	RESERVED					
0205	1	Permanent Mode - Reset PF to 1	0 or 1 (Toggle bit)	0	Decimal	Unsigned Integer	When the register is written to 1, the Inverter resets PF setting from current value to 1 and the register value resets to 0
0206 to 0209	4	RESERVED					
0210	1	Dynamic Mode - Active Power management; set Active Power expressed as percentage of Nominal Power (P_{NOM}) in 1% steps	5 to 100	100	%	Unsigned Integer	Must be used with registers *0190* and *0191*
0211	1	RESERVED					
0212	1	Permanent Mode - Active Power management; set Active Power expressed as percentage of Nominal Power (P_{NOM}) in 1% steps	5 to 100	100	%	Unsigned Integer	Must be used with register *0190*
0213 to 0214	2	RESERVED					
0215	1	Permanent Mode - Reset Active Power to 100% of Nominal Power (P_{NOM})	0 or 1 (Toggle bit)	0	Decimal	Unsigned Integer	When the register is written to 1, the Inverter resets Active Power setting from current value to 100% of P_{NOM} and the register value resets to 0
0216 to 0219	4	RESERVED					
0220	2	Dynamic Mode - Reactive power management; set fixed Q by conventional PF	-1.0 to 1.0	1	N/A	IEEE 32 Float	Set a negative value for over-excited (capacitive injection)

Register address [1]	Number of registers	Register content description	Range	Default value	Unit	Data type	Notes
							or a positive value for under-excited (inductive injection). Must be used with registers *0190* and *0191*
0222	2	Permanent Mode - Reactive power management; set fixed Q by conventional PF	-1.0 to 1.0	1	N/A	IEEE 32 Float	Set a negative value for over-excited (capacitive injection) or a positive value for under-excited (inductive injection). Must be used with register *0190*
0224	1	RESERVED					
0225	1	Dynamic Mode - Reactive Power management; set fixed Q by percentage of Nominal Power (P_{NOM}) in 1% steps	-50 to 50	0	%	Signed Integer	Set a negative value for over-excited (capacitive injection) or a positive value for under-excited (inductive injection). Must be used with registers *0190* and *0191*
0226	1	RESERVED					
0227	1	Permanent Mode - Reactive Power management; set fixed Q by percentage of Nominal Power (P_{NOM}) in 1% steps	-50 to 50	0	%	Signed Integer	Set a negative value for over-excited (capacitive injection) or a positive value for under-excited (inductive injection). Must be used with register *0190*
0299	1	Setting register	0 to 1	1		Unsigned Integer	1 = enable use of reg 198 and 505 0 = disable use of reg 198 and 505
0300	1	Heartbeat counter	0 to 65535	0	Decimal	Unsigned Integer	Increments every second. Resets to 0 automatically when reaches 65535
0301	2	RESERVED					
0303	2	Inverter - Grid Voltage	-	-	V	IEEE 32 Float	Read-only register
0305	2	Inverter - Grid Power	-	-	W	IEEE 32 Float	Read-only register
0307	2	Inverter - Grid Current	-	-	A	IEEE 32 Float	Read-only register
0501	1	Set unit of registers *0507*, *0508*, *0511* and *0512* (% or ‰).	0 to 1	0	Decimal	Unsigned Integer	0 = ‰; 1 = %
0502	1	Set active mode (permanent or dynamic)	0 to 1	0	Decimal	Unsigned Integer	0 = Dynamic mode; 1 = Permanent mode
0503	1	Permanent and dynamic mode - Power ramping interval - Holds time interval used by Inverter when write commands to registers *0507*, *0508*, *0509*, *0511*, *0512* or *0513* are received	0 to 250 [4s to 1000s]	15	4s	Unsigned Integer	
0504	1	Dynamic mode - Timeout - Holds initial value of countdown timer used by Inverter to time out a Dynamic Mode command of Active or Reactive Power. It is read when	0 to 250	2	min	Unsigned Integer	

Register address [1]	Number of registers	Register content description	Range	Default value	Unit	Data type	Notes
		new values of PF or Active Power are written to registers *0507*, *0508* or *0509*, respectively.					
0505	1	Configuration Smooth register LSB (value = 128 Trip Time mode value = 0 Fix Slope mode) MSB (bit0=0 smooth time x4s bit0=1 smooth time x1s)	0 to 65535	0	N/A	Unsigned Integer	
0506	1	Set reactive power control mode (Q fixed or PF fixed)	0 to 1	0	Decimal	Unsigned Integer	0 = PF fixed mode; 1 = Q fixed mode
0507	1	Dynamic Mode - Reactive Power management; set fixed Q by percentage of Nominal Power (P_{NOM}) in 1% steps	-50 to 50 OR -500 to 500	0	% OR ‰	Signed Integer	Set a negative value for over-excited (capacitive injection) or a positive value for under-excited (inductive injection). Must be used with registers *0501*, *0502*, *0503*, *0504* and *0506*.
0508	1	Dynamic Mode - Active Power management; set Active Power expressed as percentage of Nominal Power (P_{NOM}) in 1% steps	5 to 100 OR 50 to 1000	100 OR 1000	% OR ‰	Unsigned Integer	Must be used with registers *0501*, *0502*, *0503* and *0504*.
0509	2	Dynamic Mode - Reactive Power management by fixed PF	-1.0 to 1.0	1	N/A	IEEE 32 Float	Set a negative value for over-excited (capacitive injection) or a positive value for under-excited (inductive injection). Must be used with registers *0502*, *0503*, *0504* and *0506*.
0511	1	Permanent Mode - Reactive Power management; set fixed Q by percentage of Nominal Power (P_{NOM}) in 1% steps	-50 to 50 OR -500 to 500	0	% OR ‰	Signed Integer	Set a negative value for over-excited (capacitive injection) or a positive value for under-excited (inductive injection). Must be used with register *0501*, *0502*, *0503* and *0506*.
0512	1	Permanent Mode - Active Power management; set Active Power expressed as percentage of Nominal Power (P_{NOM}) in 1% steps	5 to 100 OR 50 to 1000	100	% OR ‰	Unsigned Integer	Must be used with register *0501*, *0502* and *0503*.
0513	2	Permanent Mode - Reactive Power management by fixed PF	-1.0 to 1.0	1	N/A	IEEE 32 Float	Set a negative value for over-excited (capacitive injection) or a positive value for under-excited (inductive injection). Must be used with register *0502*, *0503* and *0506*.
0515	1	Reset Active Power management	0 or 1 (Toggle bit)	0	Decimal	Unsigned Integer	When the register is written to 1, the Inverter resets Active Power setting from

Register address [1]	Number of registers	Register content description	Range	Default value	Unit	Data type	Notes
							current value to 100% of P_{NOM} and the register value resets to 0
0516	1	Reset Reactive Power management	0 or 1 (Toggle bit)	0	Decimal	Unsigned Integer	When the register is written to 1, the Inverter resets PF setting from current value to 1 or Q setting from current value to 0 and the register value resets to 0

5.2 Input Registers

5.2.1 Inverter

Register address [1]	Number of registers	Register content description	Unit	Data type	Notes
0100	1	Inverter - Start register	Decimal	Unsigned Integer	Fixed Value: **4370**
0101	1	Inverter - Map size	Decimal	Unsigned Integer	Fixed Value: **72**
0102	1	Inverter - Map Version - Major and minor version in numerical format	Decimal	Unsigned Integer	Fixed Value: **02**
0103	1	Inverter address	Decimal	Unsigned Integer	
0104	1	Inverter - Serial number (SN0)	Decimal (ASCII)	Unsigned Integer	Six bytes in write order: MSB.....LSB SN0 | SN1 | SN2 | SN3 | SN4 | SN5
0105	1	Inverter - Serial number (SN1)	Decimal (ASCII)	Unsigned Integer	
0106	1	Inverter - Serial number (SN2)	Decimal (ASCII)	Unsigned Integer	
0107	1	Inverter - Serial number (SN3)	Decimal (ASCII)	Unsigned Integer	
0108	1	Inverter - Serial number (SN4)	Decimal (ASCII)	Unsigned Integer	
0109	1	Inverter - Serial number (SN5)	Decimal (ASCII)	Unsigned Integer	
0110	1	Inverter - Part number (PN0)	Decimal (ASCII)	Unsigned Integer	Six bytes in write order: MSB.....LSB PN0 | PN1 | PN2 | PN3 | PN4 | PN5
0111	1	Inverter - Part number (PN1)	Decimal (ASCII)	Unsigned Integer	
0112	1	Inverter - Part number (PN2)	Decimal (ASCII)	Unsigned Integer	
0113	1	Inverter - Part number (PN3)	Decimal (ASCII)	Unsigned Integer	
0114	1	Inverter - Part number (PN4)	Decimal (ASCII)	Unsigned Integer	
0115	1	Inverter - Part number (PN5)	Decimal (ASCII)	Unsigned Integer	
0116	1	Inverter - Aurora type (Model number)	Decimal	Unsigned Integer	See Note 2
0117	1	Inverter - Grid type (Country/Grid standard)	Decimal	Unsigned Integer	See Note 3
0118	1	Inverter – Trafo type (Transformer type)	Decimal	Unsigned Integer	See Note 4

Register address [1]	Number of registers	Register content description	Unit	Data type	Notes
0119	1	Inverter - Wind type	Decimal	Unsigned Integer	See Note 5
0120	1	Inverter - Week production - High byte	Decimal (ASCII)	Unsigned Integer	
0121	1	Inverter - Week production - Low byte	Decimal (ASCII)	Unsigned Integer	
0122	1	Inverter - Year production - High byte	Decimal (ASCII)	Unsigned Integer	
0123	1	Inverter - Year production - Low byte	Decimal (ASCII)	Unsigned Integer	
0124	1	Inverter - States (Byte 0) - Global state	Decimal	Unsigned Integer	See Note 6
0125	1	Inverter - States (Byte 1) - Inverter state	Decimal	Unsigned Integer	See Note 7
0126	1	Inverter - States (Byte 2) - DC/DC Channel 1 state	Decimal	Unsigned Integer	See Note 8
0127	1	Inverter - States (Byte 3) - DC/DC Channel 2 state	Decimal	Unsigned Integer	See Note 8
0128	1	Inverter - States (Byte 4) - Alarm state	Decimal	Unsigned Integer	See Note 9
0129	1	Display Board - Presence - Indicates status of board to inverter	Decimal	Unsigned Integer	0= Not Present; 1= Present
0130	1	RESERVED			
0131	1	RESERVED			
0132	2	Inverter - Daily Energy	Wh	Unsigned Long	
0134	2	Inverter - Total Energy	kWh	Unsigned Long	
0136	2	Inverter - Partial Energy	kWh	Unsigned Long	
0138	2	Inverter - Week Energy	kWh	Unsigned Long	
0140	2	Inverter - Monthly Energy	kWh	Unsigned Long	
0142	2	Inverter - Yearly Energy	kWh	Unsigned Long	
0144	2	Inverter - Grid Voltage	V	IEEE 32 Float	
0146	2	Inverter - Grid Current	A	IEEE 32 Float	
0148	2	Inverter - Grid Power	W	IEEE 32 Float	
0150	2	Inverter - Frequency	Hz	IEEE 32 Float	
0152	2	Inverter - Input 1 Power	W	IEEE 32 Float	
0154	2	Inverter - Input 1 Voltage	V	IEEE 32 Float	
0156	2	Inverter - Input 1 Current	A	IEEE 32 Float	
0158	2	Inverter - Input 2 Power	W	IEEE 32 Float	
0160	2	Inverter - Input 2 Voltage	V	IEEE 32 Float	
0162	2	Inverter - Input 2 Current	A	IEEE 32 Float	
0164	2	Inverter - Inverter Temperature	°C	IEEE 32 Float	
0166	2	Inverter - Booster Temperature	°C	IEEE 32 Float	
0168	2	Inverter - Isolation Resistance	MΩ	IEEE 32 Float	

Register address [1]	Number of registers	Register content description	Unit	Data type	Notes
0170	2	Inverter - Wind Generator Frequency	Hz	IEEE 32 Float	
0172	2	Inverter - Cos(φ)	N/A	IEEE 32 Float	
0174	1	Inverter - Presence - Indicates status of board to inverter	Decimal	Unsigned Integer	0= Not Present; 1= Present
0175	1	PMU Board - Presence - Indicates status of board to inverter	Decimal	Unsigned Integer	0= Not Present; 1= Present
0176	1	Ethernet Board- Presence - Indicates status of board to inverter	Decimal	Unsigned Integer	0= Not Present; 1= Present
0177	1	WiFi Board - Presence - Indicates status of board to inverter	Decimal	Unsigned Integer	0= Not Present; 1= Present

5.2.2 Auxiliary Boards

5.2.2.1 Inverter type A

Register address [1]	Number of registers	Register content description	Unit	Data type	Notes
0250	1	Auxiliary Boards - Start register	Decimal	Unsigned Integer	Fixed Value: **8739**
0251	1	Auxiliary Board - Map size	Decimal	Unsigned Integer	Fixed Value: **117**
0252	1	Auxiliary Board - Map Version - Major and minor version in numerical format	Decimal	Unsigned Integer	Fixed Value: **02**
0253	1	RESERVED			
0254	1	Inverter - Serial number (SN0)	Decimal (ASCII)	Unsigned Integer	Six bytes in write order: MSB.....LSB SN0 | SN1 | SN2 | SN3 | SN4 | SN5
0255	1	Inverter - Serial number (SN1)	Decimal (ASCII)	Unsigned Integer	
0256	1	Inverter - Serial number (SN2)	Decimal (ASCII)	Unsigned Integer	
0257	1	Inverter - Serial number (SN3)	Decimal (ASCII)	Unsigned Integer	
0258	1	Inverter - Serial number (SN4)	Decimal (ASCII)	Unsigned Integer	
0259	1	Inverter - Serial number (SN5)	Decimal (ASCII)	Unsigned Integer	
0260 to 0500	16	RESERVED			
0501	1	PMU Board - Serial number (SN0)	Decimal (ASCII)	Unsigned Integer	Six bytes in write order: MSB.....LSB SN0 | SN1 | SN2 | SN3 | SN4 | SN5
0502	1	PMU Board - Serial number (SN1)	Decimal (ASCII)	Unsigned Integer	
0503	1	PMU Board - Serial number (SN2)	Decimal (ASCII)	Unsigned Integer	
0504	1	PMU Board - Serial number (SN3)	Decimal (ASCII)	Unsigned Integer	
0505	1	PMU Board - Serial number (SN4)	Decimal (ASCII)	Unsigned Integer	
0506	1	PMU Board - Serial number (SN5)	Decimal (ASCII)	Unsigned Integer	
0507	1	PMU Board - Part number (PN0)	Decimal	Unsigned	Six bytes in write order:

Register address [1]	Number of registers	Register content description	Unit	Data type	Notes
			(ASCII)	Integer	MSB.....LSB PN0 | PN1 | PN2 | PN3 | PN4 | PN5
0508	1	PMU Board - Part number (PN1)	Decimal (ASCII)	Unsigned Integer	
0509	1	PMU Board - Part number (PN2)	Decimal (ASCII)	Unsigned Integer	
0510	1	PMU Board - Part number (PN3)	Decimal (ASCII)	Unsigned Integer	
0511	1	PMU Board - Part number (PN4)	Decimal (ASCII)	Unsigned Integer	
0512	1	PMU Board - Part number (PN5)	Decimal (ASCII)	Unsigned Integer	
0513	1	PMU Board - Week production - High byte	Decimal (ASCII)	Unsigned Integer	
0514	1	PMU Board - Week production - Low byte	Decimal (ASCII)	Unsigned Integer	
0515	1	PMU Board - Year production - High byte	Decimal (ASCII)	Unsigned Integer	
0516	1	PMU Board - Year production - Low byte	Decimal (ASCII)	Unsigned Integer	
0517	1	PMU Board - States (Byte 0)	Binary	Unsigned Integer	
0518	1	PMU Board - States (Byte 1)	Binary	Unsigned Integer	
0519	1	PMU Board - States (Byte 2)	Binary	Unsigned Integer	
0520 to 0522	3	RESERVED			
0524	2	PMU Board - PT100/ PT1000	°C	IEEE 32 Float	
0526	2	PMU Board - Analog Input 1	V OR mA	IEEE 32 Float	
0528	2	PMU Board - Analog Input 2	V OR mA	IEEE 32 Float	
0530	2	PMU Board - Analog Input 3	V OR mA	IEEE 32 Float	
0532	2	PMU Board - Analog Input 4	V OR mA	IEEE 32 Float	
0534 to 0600	3	RESERVED for PMU Board			

5.2.3 Registers Map Version

Register address [1]	Number of registers	Register content description	Unit	Data type	Notes
3650	1	Registers Map - Type	Decimal (ASCII)	Unsigned Integer	Fixed Value: **71 ('G')**
3651	1	Registers Map - Inverter family supported	Decimal (ASCII)	Unsigned Integer	Fixed Value: **66 ('B')**
3652	1	Registers Map - Major Version	Decimal (ASCII)	Unsigned Integer	Fixed Value: **48 ('0')**
3653	1	Registers Map - Minor Version	Decimal (ASCII)	Unsigned Integer	Fixed Value: **48 ('0')**

6 Notes

1. Register address range is from 1 to 65536 (PLC addresses).

2. Aurora type (Model number):

Aurora inverter type				
Value	**Description**	**Registers Map - Major Version**	**Registers Map - Minor Version**	**Registers Map - Inverter type supported**
67 ('C')	TRIO-5.8(8.5)-TL-OUTD - Output: 400 VAC	48 '0'	51 '3'	65 'A'

3. Grid type (Country/Grid standard):

Grid type	
Value	**Description**
65 ('A')	USA - UL1741 **(-US model)**
69 ('E')	Germany - VDE0126
83 ('S')	Spain - DR 1663/2000
73 ('I')	Italy - ENEL DK 5950
85 ('U')	UK - UK G83
75 ('K')	Australia - AS 4777
70 ('F')	France - VDE French Model
82 ('R')	Ireland - EN50438
66 ('B')	Belgium - VDE Belgium Model
79 ('O')	Korea
71 ('G')	Greece - VDE Greece Model
84 ('T')	Taiwan
67 ('C')	Czech Republic
81 ('Q')	People's Republic of China
63 ('?')	China
97 ('a')	USA - UL1741 Vout = 208 single phase
98 ('b')	USA - UL1741 Vout = 240 single phase
99 ('c')	USA - UL1741 Vout = 277 single phase
88 ('X')	Debug Standard 1
120 'x')	Debug Standard 2
117 'u')	UK – UK-G59
107 ('k')	Israel – Derived from AS 4777
87 ('W')	Germany – BDEW
72 ('H')	Hungary
111 ('o')	Corsica
80 ('P')	Portugal
101 ('e')	VDE AR-N-4105
105 ('i')	CEI

4. Trafo type (Transformer type):

Trafo type	
Value	**Description**
78 ('N')	Transformerless version **(-US model)**
84 ('T')	Transformer version
116 ('t')	Transformer HF version
120 ('x')	Dummy transformer type

5. Wind type:

Wind type	
Value	**Description**
80 ('P')	Photovoltaic version **(-US model)**
87 ('W')	Eolic version
120 ('x')	Dummy transformer type

6. Global state:

Global state	
Value	**Description**
0	Sending Parameters
1	Wait Sun/Grid
2	Checking Grid
3	Measuring Riso
4	DC/DC Start
5	Inverter Start
6	Run
7	Recovery
8	Pause
9	Ground Fault
10	OTH Fault
11	Address Setting
12	Self-Test
13	Self-Test Fail
14	Sensor Test + Meas.Riso
15	Leak Fault
16	Waiting for manual reset
17	Internal Error E026
18	Internal Error E027
19	Internal Error E028
20	Internal Error E029
21	Internal Error E030
22	Sending Wind Table
23	Failed Sending table
24	UTH Fault
25	Remote OFF
26	Interlock Fail
27	Executing Autotest
30	Waiting Sun
31	Temperature Fault
32	Fan Staucked
33	Int. Com. Fault
34	Slave Insertion
35	DC Switch Open
36	TRAS Switch Open
37	MASTER Exclusion
38	Auto Exclusion
98	Erasing Internal EEprom
99	Erasing External EEprom
100	Counting EEprom
101	Freeze
110	Forbidden partner board was found
111	DC string self-test fault
112	Service mode
113	"Safety" memory area error
114	Too many leak fault events for the day
115	Arc fault
116	AF self-test fail
117	Communication loss with Communication Board
150	DSP communication error
200	Dsp Programming

7. Inverter state:

Inverter state	
Value	**Description**
0	Stand By
1	Checking Grid
2	Run
3	Bulk OV
4	Out OC

Inverter state	
Value	**Description**
5	IGBT Sat
6	Bulk UV
7	Degauss Error
8	No Parameters
9	Bulk Low
10	Grid OV
11	Communication Error
12	Degaussing
13	Starting
14	Bulk Cap Fail
15	Leak Fail
16	DC/DC Fail
17	Ileak Sensor Fail
18	Self-Test: relay inverter
19	Self-Test: wait for sensor test
20	Self-Test: test relay DC/DC + sensor
21	Self-Test: relay inverter fail
22	Self-Test timeout fail
23	Self-Test: relay DC/DC fail
24	Self-Test 1
25	Waiting Self-Test start
26	Dc Injection
27	Self-Test 2
28	Self-Test 3
29	Self-Test 4
30	Internal Error
31	Internal Error
40	Forbidden State
41	Input UC
42	Zero Power
43	Grid Not Present
44	Waiting Start
45	MPPT
46	Grid Fail
47	Input OC
…	…
255	Inverter DSP not programmed

8. DC/DC state:

DC/DC Channel X state	
Value	**Description**
0	DC/DC OFF
1	Ramp Start
2	MPPT
3	Not Used
4	Input OC
5	Input UV
6	Input OV
7	Input Low
8	No Parameters
9	Bulk OV
10	Communication Error
11	Ramp Fail
12	Internal Error
13	Input mode Error
14	Ground Fault
15	Inverter Fail
16	DC/DC IGBT Sat
17	DC/DC ILEAK Fail
18	DC/DC Grid Fail
19	DC/DC Comm. Error
…	…
255	DC/DC DSP not programmed

9. Alarm state:

Alarm state		
Value	**Description**	**Code**
0	No Alarm	
1	Sun Low	W001
2	Input OC	E001
3	Input UV	W002
4	Input OV	E002
5	Sun Low	W001
6	No Parameters	E003
7	Bulk OV	E004
8	Comm. Error	E005
9	Output OC	E006
10	IGBT Sat	E007
11	Bulk UV	W011
12	Internal error	E009
13	Grid Fail	W003
14	Bulk Low	E010
15	Ramp Fail	E011
16	Dc/Dc Fail	E012
17	Wrong Mode	E013
18	Ground Fault	---
19	Over Temp.	E014
20	Bulk Cap Fail	E015
21	Inverter Fail	E016
22	Start Timeout	E017
23	Ground Fault	E018
24	Degauss error	---
25	Ileak sens. fail	E019
26	DC/DC Fail	E012
27	Self-Test Error 1	E020
28	Self-Test Error 2	E021
29	Self-Test Error 3	E019
30	Self-Test Error 4	E022
31	DC inj error	E023
32	Grid OV	W004
33	Grid UV	W005
34	Grid OF	W006
35	Grid UF	W007
36	Z grid Hi	W008
37	Internal error	E024
38	Riso Low	E025
39	Vref Error	E026
40	Error Meas V	E027
41	Error Meas F	E028
42	Error Meas Z	E029
43	Error Meas Ileak	E030
44	Error Read V	E031
45	Error Read I	E032
46	Table fail	W009
47	Fan Fail	W010
48	UTH	E033
49	Interlock fail	E034
50	Remote Off	E035
51	Vout Avg error	E036
52	Battery low	W012
53	Clk fail	W013
54	Input UC	E037
55	Zero Power	W014
56	Fan Stuck	E038
57	DC Switch Open	E039
58	Tras Switch Open	E040
59	AC Switch Open	E041
60	Bulk UV	E042

Alarm state		
Value	**Description**	**Code**
61	Autoexclusion	E043
62	Grid df/dt	W015
63	Den switch Open	W016
64	Jbox fail	W017
65	DC Door Open	E044
66	AC Door Open	E045
67	Anti islanding	E047
68	Fuse DC Fail	W020
69	Liquid Cooler Fail	E048
70	SPD AC protection open	W018
71	SPD DC protection open	W019
72	String selftest fail	E046
73	Power reduction start	W021
74	Power reduction end	W025
75	React. power mode changed	W022
76	date/time changed	W023
77	Energy data reset	W024
79	Arc fault	E050
80	Bad "safety" memory area	E051
81	Module Door Open	E052
82	AF self-test fail	E053
83	Communication loss with Communication Board	E054

10. Communication Board states:

Communication Board states	
Byte	**Description**
0	NONE
1	NONE
2	NONE
3	NONE
4	- Bit 0: 0 = OTH not active; 1= OTH is active - Bit 1: 0 = Arc fault is absent; 1 = Arc fault is present - Bit 2: 0 = Arc detector failure is absent; 1 = Arc detector failure is present … - Bit 7: NONE
5	- Bit 0: 0 = SD card is absent; 1 = SD card is present - Bit 1: 0 = SD card fault; 1 = SD card is ok - Bit 2: 0 = Exp. board is absent; 1 = Exp. board is present - Bit 3: 0 = Wi-Fi board is absent; 1 = Wi-Fi board is present - Bit 4: RESERVED - Bit 5: 0 = SPD DC 1 fault; 1 = SPD DC 1 card is ok - Bit 6: 0 = SPD DC 2 fault; 1 = SPD DC 2 is ok - Bit 7: 0 = SPD AC fault; 1 = SPD AC is ok

11. Fuse Control Board states:

Fuse Control Board states (Not used in -US model)	
Byte	**Description**
0	- Bit 0 : 0 = All strings are ok; 1 = One or more strings are in fault - Bit 1 : 0 = Overvoltage not active; 1 = Overvoltage is active - Bit 2 : 0 = All currents are balanced; 1 = One or more unbalanced currents - Bit 3 : 0 = Overcurrent not active; 1 = Overcurrent is active - Bit 4 : 0 = Calibration is ok; 1 = Calibration not ok - Bit 5 : 0 = EEPROM (location 1) is ok; 1 = EEPROM (location 1) not ok - Bit 6 : 0 = EEPROM (location 2) is ok; 1 = EEPROM (location 2) not ok - Bit 7 : 0 = String self-test passed; 1 = String self-test not passed
1	- Bit 0 : 0 = String 2C ok; 1 = String 2C fault - Bit 1 : 0 = String 2B ok; 1 = String 2B fault - Bit 2 : 0 = String 2A ok; 1 = String 2A fault - Bit 3 : 0 = String 1E ok; 1 = String 1E fault - Bit 4 : 0 = String 1D ok; 1 = String 1D fault - Bit 5 : 0 = String 1C ok; 1 = String 1C fault - Bit 6 : 0 = String 1B ok; 1 = String 1B fault

Fuse Control Board states (Not used in -US model)	
Byte	**Description**
	- Bit 7 : 0 = String 1A ok; 1 = String 1A fault
2	… - Bit 6 : 0 = String 2E ok; 1 = String 2E fault - Bit 7 : 0 = String 2D ok; 1 = String 2D fault
3	- Bit 0 : 0 = Current 2C balanced; 1 = Current 2C unbalanced - Bit 1 : 0 = Current 2B balanced; 1 = Current 2B unbalanced - Bit 2 : 0 = Current 2A balanced; 1 = Current 2A unbalanced - Bit 3 : 0 = Current 1E balanced; 1 = Current 1E unbalanced - Bit 4 : 0 = Current 1D balanced; 1 = Current 1D unbalanced - Bit 5 : 0 = Current 1C balanced; 1 = Current 1C unbalanced - Bit 6 : 0 = Current 1B balanced; 1 = Current 1B unbalanced - Bit 7 : 0 = Current 1A balanced; 1 = Current 1A unbalanced
4	- Bit 0 : 0 = String 1B self-test passed; 1 = String 1B self-test not passed - Bit 1 : 0 = String 1A self-test passed; 1 = String 1A self-test not passed … - Bit 6 : 0 = Current 2E balanced; 1 = Current 2E unbalanced - Bit 7 : 0 = Current 2D balanced; 1 = Current 2D unbalanced
5	- Bit 0 : 0 = String 2E self-test passed; 1 = String 2E self-test not passed - Bit 1 : 0 = String 2D self-test passed; 1 = String 2D self-test not passed - Bit 2 : 0 = String 2C self-test passed; 1 = String 2C self-test not passed - Bit 3 : 0 = String 2B self-test passed; 1 = String 2B self-test not passed - Bit 4 : 0 = String 2A self-test passed; 1 = String 2A self-test not passed - Bit 5 : 0 = String 1E self-test passed; 1 = String 1E self-test not passed - Bit 6 : 0 = String 1D self-test passed; 1 = String 1D self-test not passed - Bit 7 : 0 = String 1C self-test passed; 1 = String 1C self-test not passed

7 References

1. Power reduction: "AN101-Aurora Power Reduction"
2. Modbus Organization: "Modbus Application Protocol Specification v1.1b3", 26/04/2012;
3. Modbus Organization: "Modbus over Serial Line - Specification and Implementation Guide v1.02", 20/12/2006.

8 Document revisions

Author	Comment	Date	Revision
Turchini Francesco	- Preliminary revision started from GT03	11/07/2013	0.0
Turchini Francesco	- Review range of many register	27/09/2013	0.1
Turchini Francesco	- Change Data Type of Energy registers from F32 to U32	23/07/2015	0.2
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