YASKAWA SOLECTRIA SOLAR

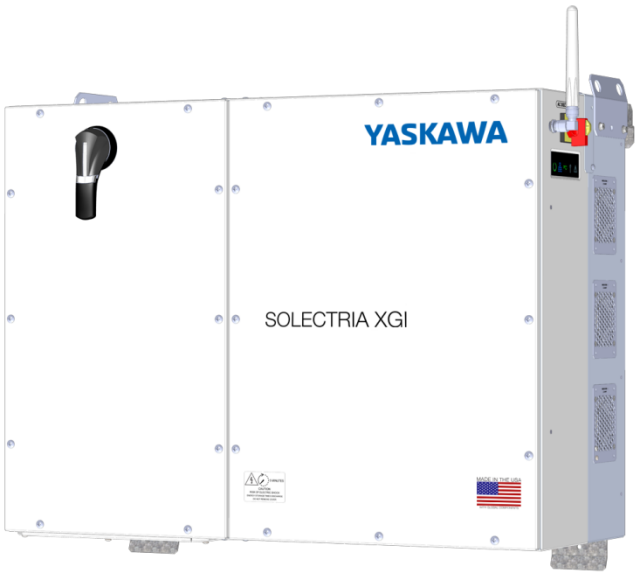
Commercial 1500VDC String Inverter

SOLECTRIA® XGI 1500

Smart Grid Feature and Modbus Manual

Models: XGI 1500-125/125 XGI 1500-125/150

XGI 1500-150/166 XGI 1500-166/166



Contents

1 Introduction

This manual explains the SunSpec protocol using Modbus for SOLECTRIA XGI 1500 inverters. This does not include the history of either SunSpec or Modbus or the details regarding the creation of the protocols. It is expected that the person(s) reading this manual have a clear understanding of both SunSpec and Modbus.

1.1 SunSpec Overview

SunSpec organizes all registers into defined groups called models. Each model begins with a header to identify it and its length. Only the models listed in this document are supported by SOLECTRIA XGI 1500 inverters. See Section 2.3 for the list of supported models.

Within each model, not all registers are supported. Unsupported registered are marked as “Reserved”. Only use supported registers.

1.2 Data Types

Several data types are used in this document.

- **acc32:** An accumulated value that fills two registers. This is used for a value that increases over time.
- **bitfield16:** Group of 16 individual bits that fills one register. This is used to select non-mutually exclusive options, such as alarms.
- **bitfield32:** Group of 32 individual bits that fills two registers. This is used to select non-mutually exclusive options, such as alarms.
- **enum16:** Enumerated type that fills one register. This is used to select mutually exclusive options, such as the state of the inverter.
- **float32:** Floating point number that fills two registers.
- **int16:** Signed integer that fills one register.
- **string:** Group of registers that are used to hold an alphanumeric value. Size depends on the string and must be read for each string.
- **sunssf:** SunSpec scale factor.
- **uint16:** Unsigned integer that fills one register.
- **uint32:** Unsigned integer that fills two registers.
- **uint64:** Unsigned integer that fills four registers.

2 Modbus Overview

Registers can be read using Modbus function code three (3) and certain registers can be written with Modbus function code six (6). When reading or writing to a group of registers, such as reading a string, make sure that the read command starts at the lowest address of the group and is of the appropriate length size for the group.

2.1 Value, Scale Factor, and Units

Many registers use a scale factor to communicate the value as an integer. The scale factor and units explain how the value is read. See Equation 2.1 as an example of how to interpret the result of reading Address 40075, as shown in Table 2.1.

Table 2.1 Example of Value, Scale Factor, and Units

Address	Size	Name	Value	Type	Units	Scale factor	R/W	Description
40075	1	AphC	-	uint16	A	A_SF	R	Phase C AC current
40076	1	A_SF	-1	uint16	-	-	R	Scale factor - AC current

Equation 2.1 Example of Applying Value, Scale Factor, and Units

$$Phase\ C\ AC\ Current = Value\ (Address\ 40075) * 10^{-1}\ A$$

2.2 Read/Write

The R/W column determines whether a value is read-only (R), write-only (W), or read-write (RW). Only write to W or RW registers.

The response time for a Modbus command is ≤ 10mS.

2.3 Model Overview

Table 2.2 SunSpec Model Overview

Address	Size	Name	Value	Type	R/W	Description
40000	2	SunSpecID	SunS	string	R	SunSpec ID
40002	68	1	-	-	-	Model 1 - Common
40070	52	103	-	-	-	Model 103 - Inverter (3 Phase)
40122	72	113	-	-	-	Model 113 - Inverter (3 Phase) FLOAT
40184	28	120	-	-	-	Model 120 - Nameplate
40212	32	121	-	-	-	Model 123 - Basic settings
40244	46	122	-	-	-	Model 123 - Measurement Status
40290	26	123	-	-	-	Model 123 - Immediate Controls
40316	62	129	-	-	-	Model 129 - LVRTD
40378	62	130	-	-	-	Model 130 - HVRTD
40440	62	135	-	-	-	Model 135 - LFRT

40502	62	136	-	-	-	Model 136 - HFRT
40654	54	16	-	-	-	Model 16 - Simple IP Network 0 (eth1)
40708	54	16001	-	-	-	Model 16001 - Simple IP Network 1 (eth2)
40762	54	16002	-	-	-	Model 16002 - Simple IP Network 2 (Bridge)
40816	54	16003	-	-	-	Model 16003 - Simple IP Network 3 (WiFi API)
40870	51	64190	-	-	-	Model 64190 - Solectria Variables
40921	1	SunSpecEnd	0xFFFF	-	R	SunSpec End

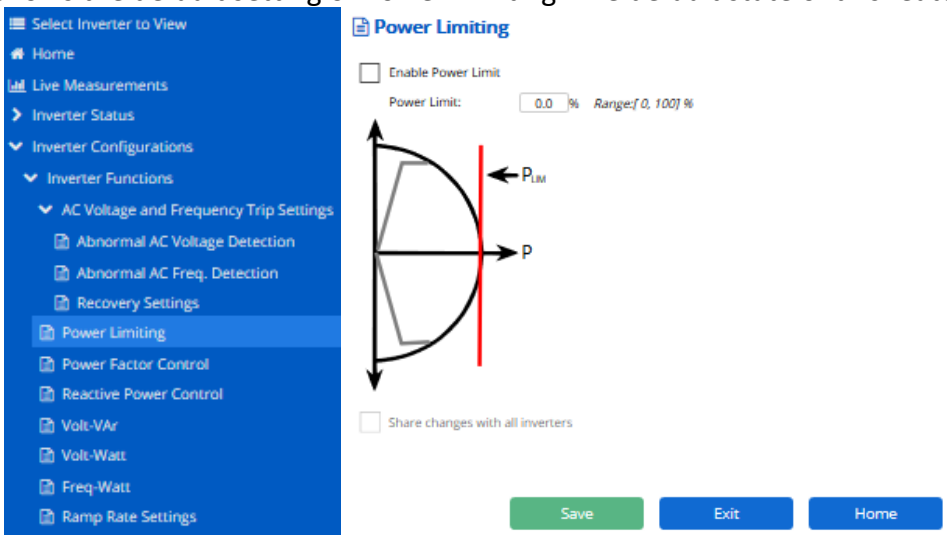
For more information on the models see Section 15.

3 XGI1500 Smart Grid Features

The XGI1500 firmware provides several grid support features to help maintain grid stability and reliability. These features can either be activated, deactivated or updated via web-based GUI or using software which supports Modbus TCP/IP.

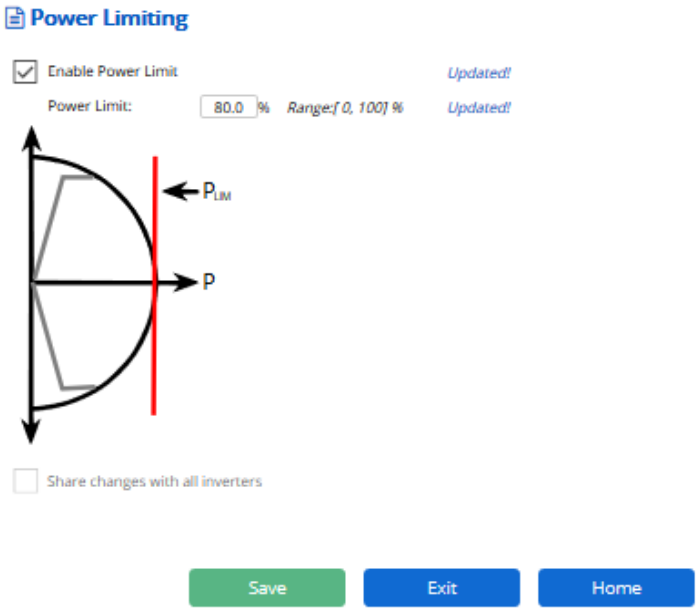
4 Power Limiting

This feature allows the inverter to reduce the output from what it could produce given available resources. Power limiting request typically occurs because of transmission congestion or lack of transmission access. It can also occur due to excess generation during low load periods.
The image below shows the default setting of Power Limiting. The default state of this feature is deactivated.



Example:

If the cutomer wants to enable this feature and run the inverter at 80% of rated power. The procedure via the web-based GUI is shown below.



- Write " 80.0 " to Power Limit
- Click the little box on the top left corner of the configuration window to enable Power Limiting
- Click "Save" button to apply the settings to local inverter

The alternative method is to use software which supports Modbus TCP/IP. The register address is shown below.

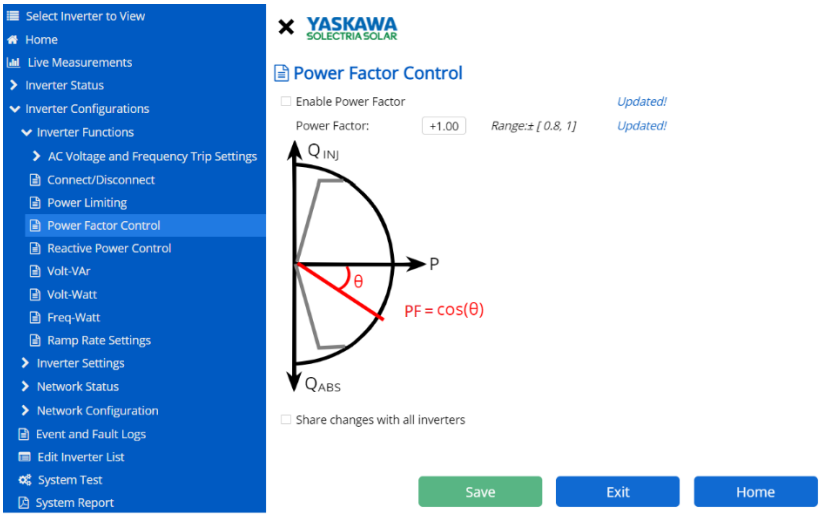
Register	Sunspec Model DID	Sunspec Offset	Name	Description	Unit	Min	Max	Default Value
40295	123	5	SSPEC_123_WMAXLIMPCT	Real Power Limit - Percentage	%Wmax	0	1000	0
40299	123	9	SSPEC_123_WMAXLIM_ENA	Throttle enable/disable control for power limit		0	1	0

To implement the same setting, the procedure is shown below.

- Write " 800 " to register 40295
- Write " 1 " to register 40299

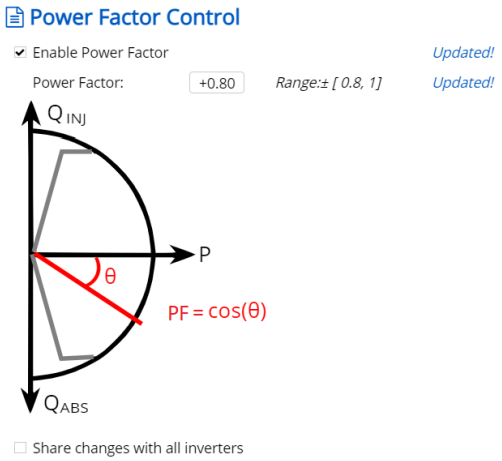
5 Power Factor Control

This feature allows inverter to control the power factor at the point of common coupling (PCC). This can maintain the power quality and stability of the overall electrical system. A power factor adjustment gives the utility greater flexibility to supply the power quality required by the loads.
The image below shows the default setting of the Power Factor Control. The default state of this feature is deactivated.



Example:

If the cutomer wants to enable this feature and set the PF to +0.8. The procedure via the web-based GUI is shown below.



- Write " +0.8 " to Power Factor
- Click the little box on the top left corner of the configuration window to enable Power Factor
- Click "Save" button to apply the setting to local inverter

The alternative method is to use software which supports Modbus TCP/IP. The register address is shown below.

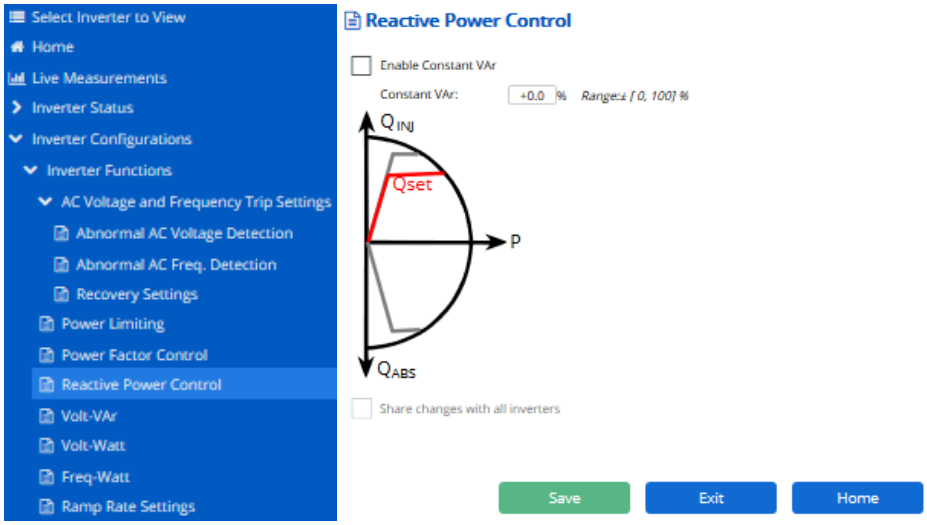
Register	Sunspec Model DID	Sunspec Offset	Name	Description	Unit	Min	Max	Default Value
40300	123	10	SSPEC_123_OUTPFSET	Set power factor to specific value	cos()	80	100	100
40304	123	14	SSPEC_123_OUTPFSET_ENA	Fixed power factor enable/disable control		0	1	0

To implement the same setting, the procedure is shown below.

- Write “ 80 “ to register 40300
- Write “ 1 “ to register 40304

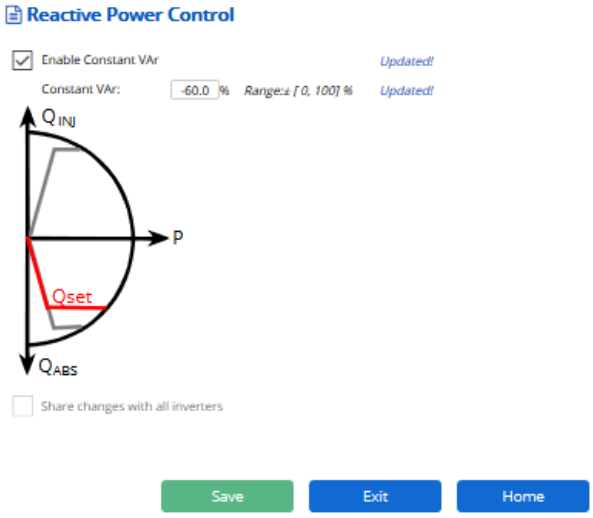
6 Reactive Power Control

The feature allows inverter to stabilize the grid by compensating the reactive power. The image below shows the default setting of Reactive Power Control. The default state of this feature is deactivated.



Example:

If the cutomer wants to enable this feature and set the inverter to run at 60% of maximum reactive power capability. The procedure via the web-based GUI is shown below.



- Write “ -60 ” to Constant Var
- Click the little box on the top left corner of the configuration window to enable Reactive Power Control
- Click Save button to apply the settings to local inverter

The alternative method is to use software which supports Modbus TCP/IP. The register address is shown below.

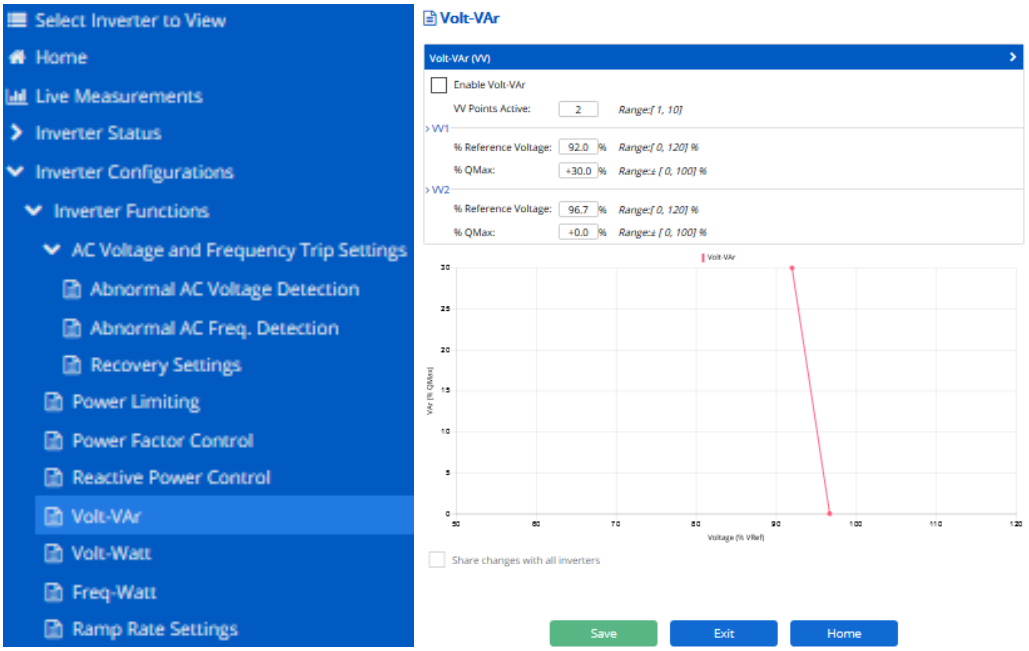
Register	Sunspec Model DID	Sunspec Offset	Name	Description	Unit	Min	Max	Default Value
40306	123	16	SSPEC_123_VARMAXPCT	Reactive power in percent of VArMax	% VArMax	-1000	1000	0
40312	123	22	SSPEC_123_VARPCT_ENA	Percent limit VAr enable/disable control		0	1	0

To implement the same settings, the procedure is shown below.

- Write “ -600 “ to register 40306
- Write “ 1 “ to register 40312

7 Volt-Var Control

This feature allows the inverter to supply or absorb reactive power as a function of voltage, in order to maintain a stable grid voltage. A curve must be defined to use this feature.
The image below shows the default setting of Volt-Var Control. The default state of this feature is deactivated.



Example:

If the cutomer wants to enable this feature. The procedure via the web-based GUI is shown below.

- Write " 4 " to VV Points Active
- Write " 90.0" to VV1 %Voltage Ref
- Write " +30.0 to VV1 %QMax
- Write " 95.0" to VV2 %Voltage Ref
- Write " +0.0 to VV2 %QMax
- Write " 105.0" to VV3 %Voltage Ref
- Write " +0.0 to VV3 %QMax
- Write " 110.0" to VV4 %Voltage Ref
- Write " -30.0 to VV4 %QMax
- Click the little box on the top left corner of the configuration window to enable Volt-Var
- Click Save button to apply the settings to local inverter

The alternative method is to use software which supports Modbus TCP/IP. The register address is shown below.

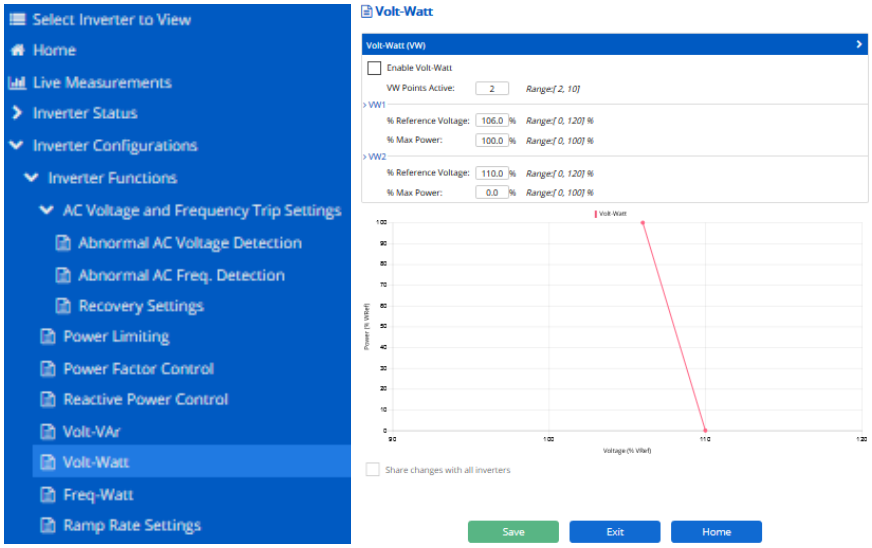
Register	Sunspec Model DID	Sunspec Offset	Name	Description	Unit	Min	Max	Default Value
40931	126	3	SSPEC_126_MODENA	Volt Var - Enable Flag		0	1	0
40936	126	8	SSPEC_126_NPT	Volt Var - Max Curve Points		10	10	10
40940	126	12	SSPEC_126_ACTPT	Volt Var - Num Points		1	10	2
40942	126	14	SSPEC_126_V1	Volt Var - Volt 1	%Vref	0	1200	920
40943	126	15	SSPEC_126_VAR1	Volt Var - Var 1	%Var	-1000	1000	300
40944	126	16	SSPEC_126_V2	Volt Var - Volt 2	%Vref	0	1200	967
40945	126	17	SSPEC_126_VAR2	Volt Var - Var 2	%Var	-1000	1000	0
40946	126	18	SSPEC_126_V3	Volt Var - Volt 3	%Vref	0	1200	1030
40947	126	19	SSPEC_126_VAR3	Volt Var - Var 3	%Var	-1000	1000	0
40948	126	20	SSPEC_126_V4	Volt Var - Volt 4	%Vref	0	1200	1070
40949	126	21	SSPEC_126_VAR4	Volt Var - Var 4	%Var	-1000	1000	-300
40950	126	22	SSPEC_126_V5	Volt Var - Volt 5	%Vref	0	1200	1070
40951	126	23	SSPEC_126_VAR5	Volt Var - Var 5	%Var	-1000	1000	-300
40952	126	24	SSPEC_126_V6	Volt Var - Volt 6	%Vref	0	1200	1070
40953	126	25	SSPEC_126_VAR6	Volt Var - Var 6	%Var	-1000	1000	-300
40954	126	26	SSPEC_126_V7	Volt Var - Volt 7	%Vref	0	1200	1070
40955	126	27	SSPEC_126_VAR7	Volt Var - Var 7	%Var	-1000	1000	-300
40956	126	28	SSPEC_126_V8	Volt Var - Volt 8	%Vref	0	1200	1070
40957	126	29	SSPEC_126_VAR8	Volt Var - Var 8	%Var	-1000	1000	-300
40958	126	30	SSPEC_126_V9	Volt Var - Volt 9	%Vref	0	1200	1070
40959	126	31	SSPEC_126_VAR9	Volt Var - Var 9	%Var	-1000	1000	-300
40960	126	32	SSPEC_126_V10	Volt Var - Volt 10	%Vref	0	1200	1070
40961	126	33	SSPEC_126_VAR10	Volt Var - Var 10	%Var	-1000	1000	-300

To implement the same curve, the procedure is shown below.

- Write " 4 " to register 40940
- Write " 900" to register 40942
- Write " 300 to register 40943
- Write " 950" to register 40944
- Write " 0 to register 40945
- Write " 1050" to register 40946
- Write " 0 to to register 40947
- Write " 1100" to register 40948
- Write " -300 to register 40949
- Write "1" to register 40931 to enable Volt-Var Control

8 Volt-Watt Control

This feature helps to support the grid voltage by changing the inverters active power output as the grid voltage fluctuates. A curve must be defined to use this feature.
The image below shows the default setting of Volt-Vatt Control. The default state of this feature is deactivated.



Example:

If the cutomer wants to enable this feature. The procedure via the web-based GUI is shown below.

- Write “ 4 ” to VW Points Active
- Write “ 102.0 ” to VW1 Voltage Ref
- Write “ 100.0 ” to VW1 Max Power
- Write “ 105.0 ” to VW2 Voltage Ref
- Write “ 90.0 ” to VW2 Max Power
- Write “ 108.0 ” to VW3 Voltage Ref
- Write “ 50.0 ” to VW3 Max Power
- Write “ 110.0 ” to VW4 Voltage Ref
- Write “ 0.0 ” to VW4 Max Power
- Click the little box on the top left corner of the configuration window to enable Volt Watt Control
- Click Save button to apply the settings to local inverter

The alternative method is to use software which supports Modbus TCP/IP. The register address is shown below.

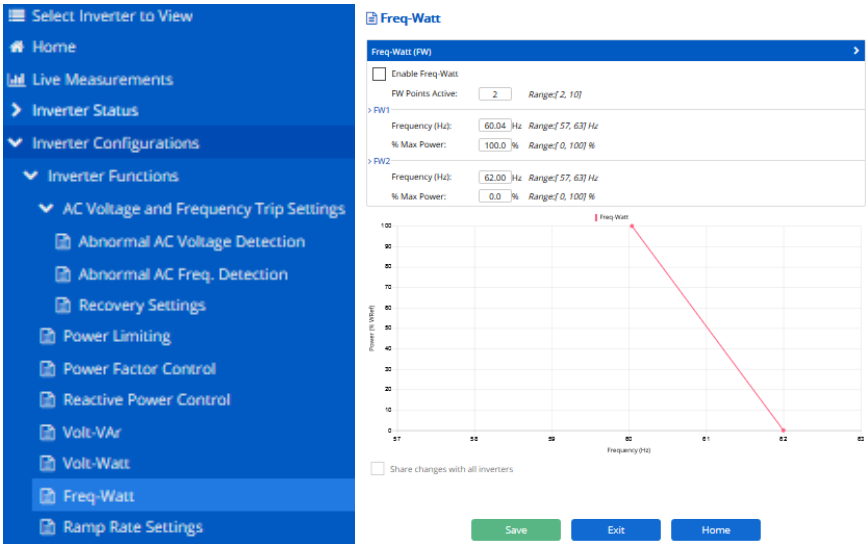
Register	Sunspec Model DID	Sunspec Offset	Name	Description	Unit	Min	Max	Default Value
41002	132	8	SSPEC_132_NPT	VoltWatt - Max Curve Points		10	10	10
40997	132	3	SSPEC_132_MODENA	VoltWatt - Enable Flag		0	1	0
41006	132	12	SSPEC_132_ACTPT	VoltWatt - Active Points		2	10	2
41008	132	14	SSPEC_132_V1	Volt Watt - Volt 1	%Vref	0	1200	1060
41009	132	15	SSPEC_132_W1	Volt Watt - Watt 1	%Wref	0	1000	1000
41010	132	16	SSPEC_132_V2	Volt Watt - Volt 2	%Vref	0	1200	1100
41011	132	17	SSPEC_132_W2	Volt Watt - Watt 2	%Wref	0	1000	0
41012	132	18	SSPEC_132_V3	Volt Watt - Volt 3	%Vref	0	1200	1100
41013	132	19	SSPEC_132_W3	Volt Watt - Watt 3	%Wref	0	1000	0
41014	132	20	SSPEC_132_V4	Volt Watt - Volt 4	%Vref	0	1200	1100
41015	132	21	SSPEC_132_W4	Volt Watt - Watt 4	%Wref	0	1000	0
41016	132	22	SSPEC_132_V5	Volt Watt - Volt 5	%Vref	0	1200	1100
41017	132	23	SSPEC_132_W5	Volt Watt - Watt 5	%Wref	0	1000	0
41018	132	24	SSPEC_132_V6	Volt Watt - Volt 6	%Vref	0	1200	1100
41019	132	25	SSPEC_132_W6	Volt Watt - Watt 6	%Wref	0	1000	0
41020	132	26	SSPEC_132_V7	Volt Watt - Volt 7	%Vref	0	1200	1100
41021	132	27	SSPEC_132_W7	Volt Watt - Watt 7	%Wref	0	1000	0
41022	132	28	SSPEC_132_V8	Volt Watt - Volt 8	%Vref	0	1200	1100
41023	132	29	SSPEC_132_W8	Volt Watt - Watt 8	%Wref	0	1000	0
41024	132	30	SSPEC_132_V9	Volt Watt - Volt 9	%Vref	0	1200	1100
41025	132	31	SSPEC_132_W9	Volt Watt - Watt 9	%Wref	0	1000	0
41026	132	32	SSPEC_132_V10	Volt Watt - Volt 10	%Vref	0	1200	1100
41027	132	33	SSPEC_132_W10	Volt Watt - Watt 10	%Wref	0	1000	0

To implement the same curve, the procedure is shown below.

- Write " 4 " to register 41006
- Write " 1020" to register 41008
- Write " 1000 to register 41009
- Write " 1050" to register 41010
- Write " 900" to register 41011
- Write " 1080" to register 41012
- Write " 500" to to register 41013
- Write " 1100" to register 41014
- Write " 0 " to register 41015
- Write "1" to register 40997 to enable Volt-Watt control

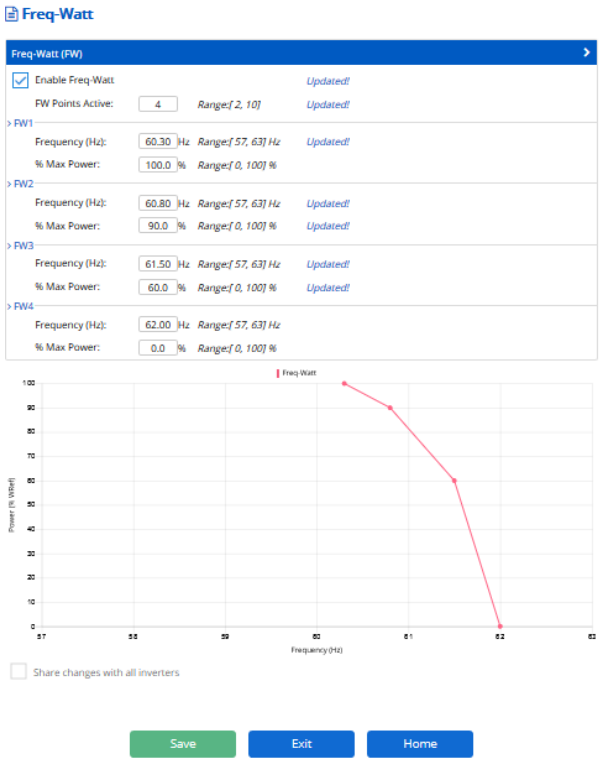
9 Frequency-Watt Control

This function helps to change inverter active power output with fluctuations in grid frequency. This will provide frequency support to the electric grid. As frequency increases, the desired response of the inverter is to decrease active power output.
The image below shows the default setting of Freq-Watt Control. The default state of this function is deactivated.



Example:

If the cutomer wants to enable this funtion. The procedure via the web-based GUI is shown below.



- Write “ 4 ” to FW Points Active
- Write “ 60.30 ” to Frequency
- Write “ 100.0 ” to % Max Power
- Write “ 60.80 ” to Frequency
- Write “ 90.0 ” to % Max Power
- Write “ 61.50 ” to Frequency
- Write “ 60.0 ” to % Max Power
- Write “ 62.00 ” to Frequency
- Write “ 0.0 ” to % Max Power
- Click the little box on the top left corner of the configuration window to enable Freqency-Watt Control
- Click Save button to apply the settings to local inverter

The alternative method is to use software which supports Modbus TCP/IP. The register address is shown below.

Register	Sunspec Model DID	Sunspec Offset	Name	Description	Unit	Min	Max	Default Value
41068	134	8	SSPEC_134_NPT	FreqWatt - Max Curve Points	%Wref	10	10	10
41063	134	3	SSPEC_134_MODENA	FreqWatt - Enable Flag		0	1	0
41072	134	12	SSPEC_134_ACTPT	FreqWatt - Active Points		2	10	2
41073	134	13	SSPEC_134_HZ1	FreqWatt - Hz 1	Hz	5700	6300	6004
41074	134	14	SSPEC_134_W1	FreqWatt - Watts 1	Watts	0	1000	1000
41075	134	15	SSPEC_134_HZ2	FreqWatt - Hz 2	Hz	5700	6300	6200
41076	134	16	SSPEC_134_W2	FreqWatt - Watts 2	Watts	0	1000	0
41077	134	17	SSPEC_134_HZ3	FreqWatt - Hz 3	Hz	5700	6300	6200
41078	134	18	SSPEC_134_W3	FreqWatt - Watts 3	Watts	0	1000	0
41079	134	19	SSPEC_134_HZ4	FreqWatt - Hz 4	Hz	5700	6300	6200
41080	134	20	SSPEC_134_W4	FreqWatt - Watts 4	Watts	0	1000	0
41081	134	21	SSPEC_134_HZ5	FreqWatt - Hz 5	Hz	5700	6300	6200
41082	134	22	SSPEC_134_W5	FreqWatt - Watts 5	Watts	0	1000	0
41083	134	23	SSPEC_134_HZ6	FreqWatt - Hz 6	Hz	5700	6300	6200
41084	134	24	SSPEC_134_W6	FreqWatt - Watts 6	Watts	0	1000	0
41085	134	25	SSPEC_134_HZ7	FreqWatt - Hz 7	Hz	5700	6300	6200
41086	134	26	SSPEC_134_W7	FreqWatt - Watts 7	Watts	0	1000	0
41087	134	27	SSPEC_134_HZ8	FreqWatt - Hz 8	Hz	5700	6300	6200
41088	134	28	SSPEC_134_W8	FreqWatt - Watts 8	Watts	0	1000	0
41089	134	29	SSPEC_134_HZ9	FreqWatt - Hz 9	Hz	5700	6300	6200
41090	134	30	SSPEC_134_W9	FreqWatt - Watts 9	Watts	0	1000	0
41091	134	31	SSPEC_134_HZ10	FreqWatt - Hz 10	Hz	5700	6300	6200
41092	134	32	SSPEC_134_W10	FreqWatt - Watts 10	Watts	0	1000	0

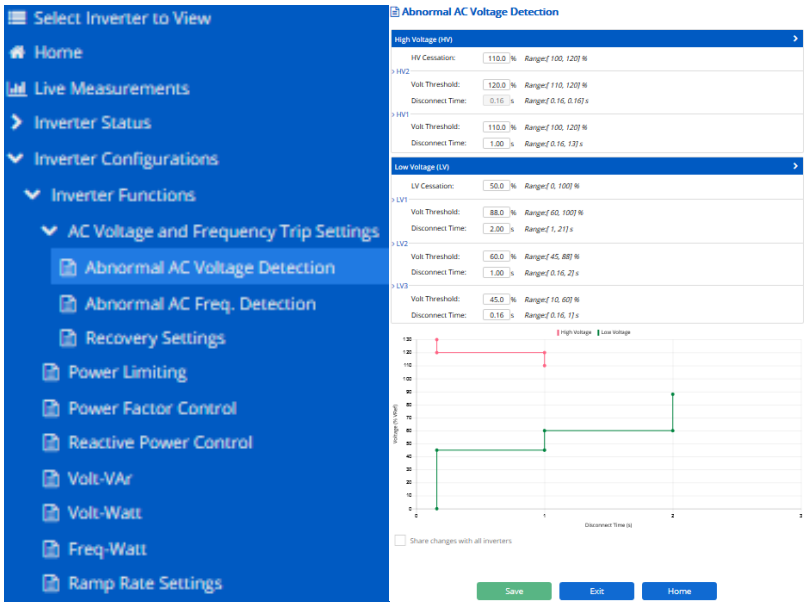
To implement the same curve, the procedure is shown below.

- Write " 4 " to register 41072
- Write " 6030" to register 41073
- Write " 1000 to register 41074
- Write " 6080" to register 41075
- Write " 900" to register 41076
- Write " 6150" to register 41077
- Write " 600" to to register 41078
- Write " 6200" to register 41079
- Write " 0 " to register 41080
- Write "1" to register 40963 to enable Freq-Watt Control

10 Voltage Ride Through

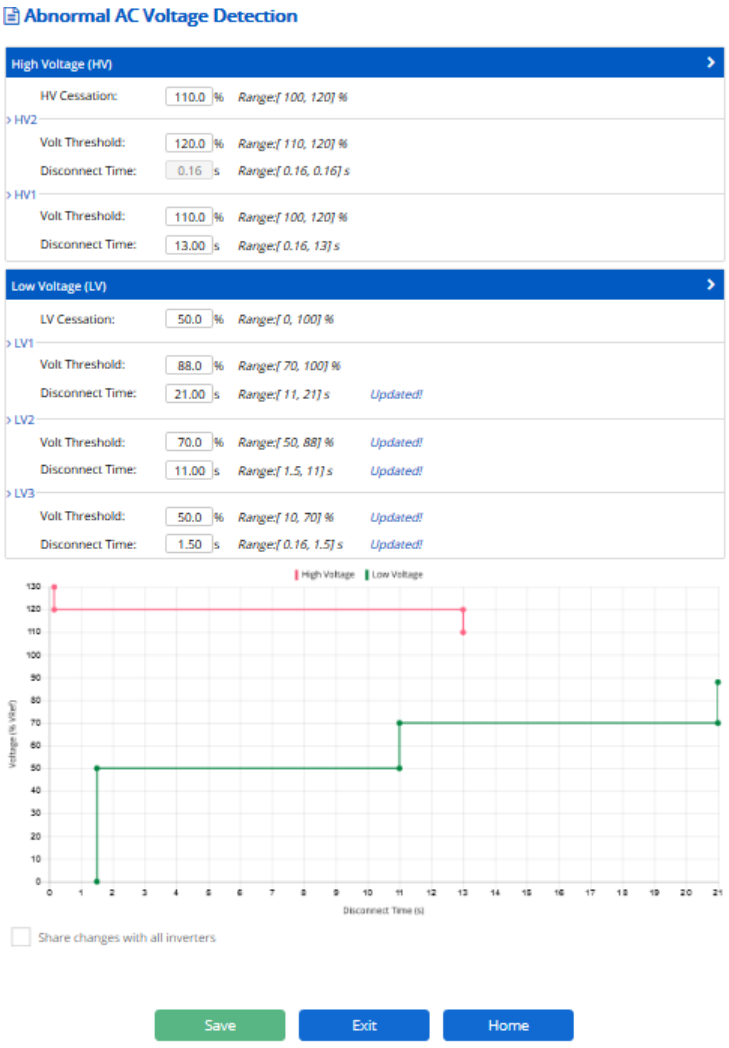
This function allows inverter to response to low and high voltage transients that are outside the normal operation range of the electric gird.

The image below shows the default setting of abnormal voltage trip settings. The default setting follows IEEE1547-2014 and the function is always enabled.



Example:

If the cutomer wants to change to Rule 21 instead of IEEE1547. The procedure via the web-based GUI is shown below.



- Write “ 120 ” to HV2 Volt Threshold
- Write “ 110 ” to HV1 Volt Threshold
- Write “ 13.0 ” to HV1 Disconnect Time
- Write “ 88 ” to LV1 Volt Threshold
- Write “ 21.0 ” to LV1 Disconnect Time
- Write “ 70 ” to LV2 Volt Threshold
- Write “ 11.0 ” to LV2 Disconnect Time
- Write “ 50 ” to LV3 Volt Threshold
- Write “ 1.5 ” to LV3 Disconnect Time
- Click Save button to apply the settings to local inverter

The alternative method is to use software which supports Modbus TCP/IP. The register address is shown below.

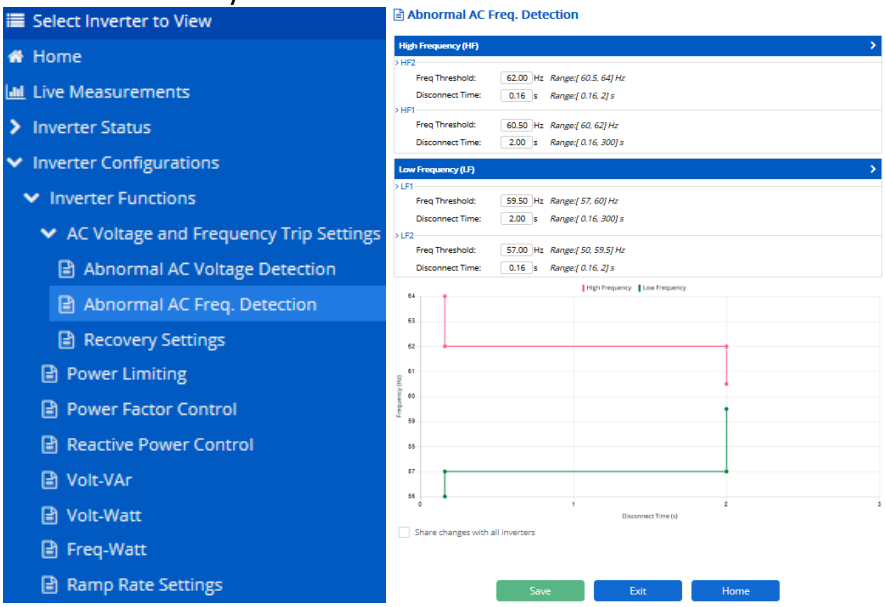
Register	Sunspec Model DID	Sunspec Offset	Name	Description	Unit	Min	Max	Default Value
40393	130	15	SSPEC_130_TMS2	Over Voltage Trip Time 2	0.01s	16	16	16
40394	130	16	SSPEC_130_V2	Over Voltage Magnitude 2	%Vref	1000	1200	1200
40397	130	19	SSPEC_130_TMS4	Over Voltage Trip Time 1	0.01s	16	1300	100
40398	130	20	SSPEC_130_V4	Over Voltage Magnitude 1	%Vref	1000	1200	1100
41208	140	16	SSPEC_140_V2	HVRT Momentary Cessation	%Vref	1000	1200	1100
40331	129	15	SSPEC_129_TMS2	Under Voltage Trip Time 3	0.01s	16	100	16
40332	129	16	SSPEC_129_V2	Under Voltage Magnitude 3	%Vref	100	600	450
40335	129	19	SSPEC_129_TMS4	Under Voltage Trip Time 2	0.01s	16	200	100
40336	129	20	SSPEC_129_V4	Under Voltage Magnitude 2	%Vref	450	880	600
40339	129	23	SSPEC_129_TMS6	Under Voltage Trip Time 1	0.01s	100	2100	200
40340	129	24	SSPEC_129_V6	Under Voltage Magnitude 1	%Vref	600	1000	880
41146	139	16	SSPEC_139_V2	LVRT Momentary Cessation	%Vref	0	1000	500

To implement the same curve, the procedure is shown below.

- Write “ 16 ” to register 40393 for HV2 Disconnect Time
- Write “ 1200 ” to register 40394 for HV2 Volt Threshold
- Write “ 100 ” to register 40397 for HV1 Disconnect Time
- Write “ 1100 ” to register 40398 for HV1 Volt Threshold
- Write “ 150 ” to register 40331 for LV3 Disconnect Time
- Write “ 500 ” to register 40332 for LV3 Volt Threshold
- Write “ 1100 ” to register 40335 for LV2 Disconnect Time
- Write “ 700 ” to register 40336 for LV2 Volt Threshold
- Write “ 2100 ” to register 40339 for LV1 Disconnect Time
- Write “ 880 ” to register 40340 for LV1 Volt Threshold

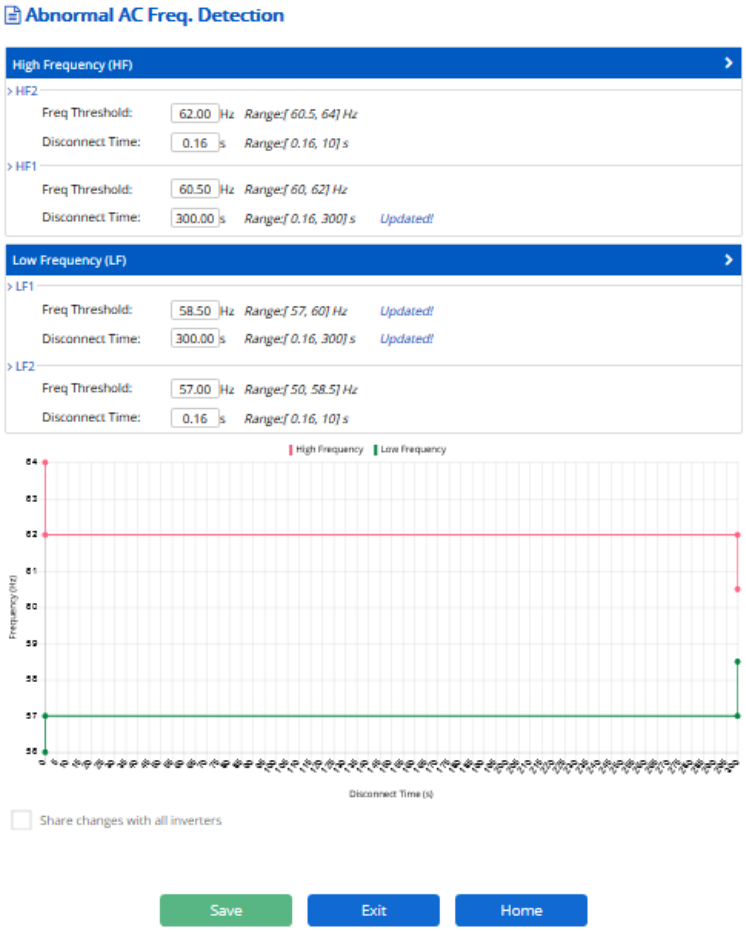
11 Frequency Ride Through

The feature allows inverter to response to low and high frequency excursions that are outside the normal operation range of electric grid.
The image below shows the default setting of abnormal frequency trip settings. The default setting follows IEEE1547-2014 and this feature is always enabled.



Example:

If the cutomer wants to change to Rule 21 instead of IEEE1547. The procedure via web-based GUI is shown below.



- Write “ 62.0 ” to HF2 Freq Threshold
- Write “ 0.16 ” to HF2 Disconnect Time
- Write “ 60.5 ” to HF1 Freq Threshold
- Write “ 300.00 ” to HF1 Disconnect Time
- Write “ 58.5 ” to LF1 Freq Threshold
- Write “ 300.00 ” to LF1 Disconnect Time
- Write “ 57.00 ” to LF2 Freq Threshold
- Write “ 0.16 ” to LF2 Disconnect Time
- Click Save button to apply the settings to local inverter

The alternative method is to use software which supports Modbus TCP/IP. The register address is shown below.

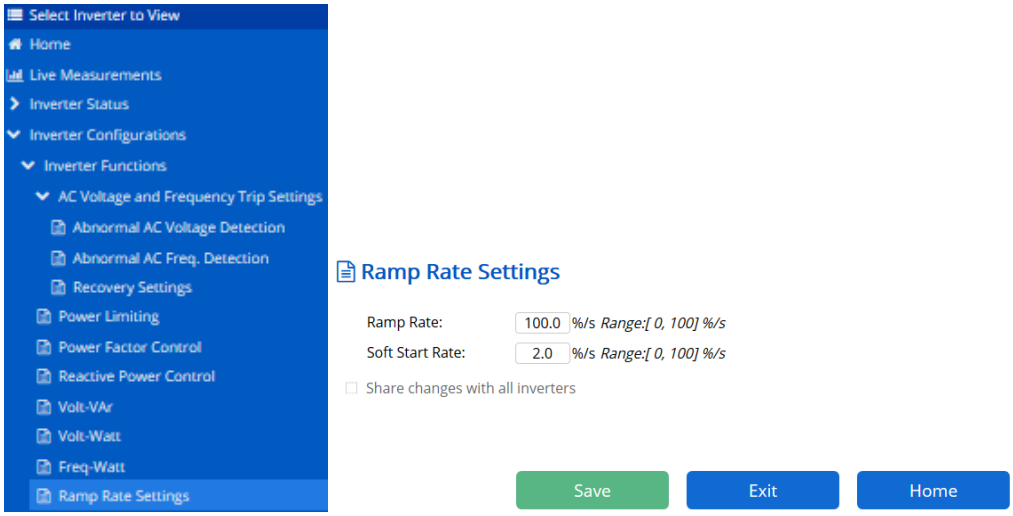
Register	Sunspec Model DID	Sunspec Offset	Name	Description	Unit	Min	Max	Default Value
40517	136	15	SSPEC_136_TMS2	Over Frequency Trip Time 2 (Very High)	%s	16	200	16
40518	136	16	SSPEC_136_HZ2	Over Frequency Magnitude 2 (Very High)	%Hz	6050	6400	6200
40521	136	19	SSPEC_136_TMS4	Over Frequency Trip Time 1 (High)	%s	16	30000	200
40522	136	20	SSPEC_136_HZ4	Over Frequency Magnitude 1 (High)	%Hz	6000	6200	6050
40455	135	15	SSPEC_135_TMS2	Under Frequency Trip Time 2 (Very Low)	%s	16	200	16
40456	135	16	SSPEC_135_HZ2	Under Frequency Magnitude 2 (Very Low)	%Hz	5000	5950	5700
40459	135	19	SSPEC_135_TMS4	Under Frequency Trip Time 1 (Low)	%s	16	30000	200
40460	135	20	SSPEC_135_HZ4	Under Frequency Magnitude 1 (Low)	%Hz	5700	6000	5950

To implement the same curve, the procedure is shown below.

- Write “ 16 ” to register 40517 for HF2 Disconnect Time
- Write “ 6200 ” to register 40518 for HF2 Freq Threshold
- Write “ 30000 ” to register 40521 for HF1 Disconnect Time
- Write “ 6050 ” to register 40522 for HF1 Freq Threshold
- Write “ 16 ” to register 40455 for LF2 Disconnect Time
- Write “ 5700 ” to register 40456 for LF2 Freq Threshold
- Write “ 30000 ” to register 40459 for LF1 Disconnect Time
- Write “ 5850 ” to register 40460 for LF1 Freq Threshold

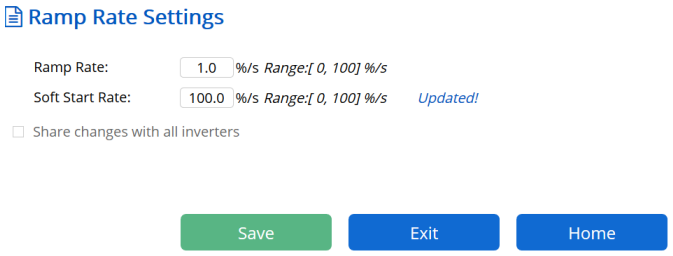
12 Ramp Rate Settings

The feature allows the inverter to establish ramp-up rates for solar systems. It helps smooth transitions from one output level to another output level.
Although a single system might not impact the electric grid through a single sharp transition, aggregated systems responding to a specific event could cause significant rapid jumps in overall output if they do not ramp to the new power level.
The image below shows the default setting of Ramp Rate functions. The default setting for normal ramp rate is 100% of rated current per second and 2% of rated current per second for inverter soft-start ramp rate.



Example:

If the cutomer wants to implement a much slower ramp rate (1% of rated current per second) during normal operation, and the customer also wants to have a really fast recover during soft-start (100% of rated current per second). The procedure via web-based GUI is shown below.



- Write “ 1.0 ” to ramp rate
- Write “ 100.0 ” to soft start rate
- Click Save button to apply the settings to local inverter

The alternative method is to use software which supports Modbus TCP/IP. The register address is shown below.

Register	Sunspec Model DID	Sunspec Offset	Name	Description	Unit	Min	Max	Default Value
41256	145	2	SSPEC_145_NOMRMPUPRTE	Normal Ramp Up Rate	%Wref/s	0	10000	10000
41260	145	6	SSPEC_145_CONNRMPUPRTE	Soft Start Ramp Up Rate	%Wref/s	0	10000	200

To implement the same setting, the procedure is shown below.

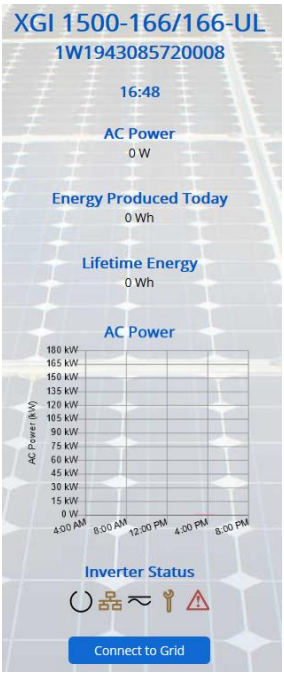
- Write “ 100 ” to register 41256 for Ramp Rate
- Write “ 10000 ” to register 41260 for Soft Start Rate

13 Power Enable/Disable

The feature allows inverter to connect to the grid and produce power (Enabled) or disconnect from grid (Disabled). The default setting for this feature is enabled.

Example:

If the cutomer wants to disconnect inverter from the grid, click “Disconnect from Grid” button in the home page via web-based GUI. After that, inverter will stop producing power and open the contactor. The button will change to “Connect to Grid”.



The alternative method is to use software which supports Modbus TCP/IP. The register address is shown below.

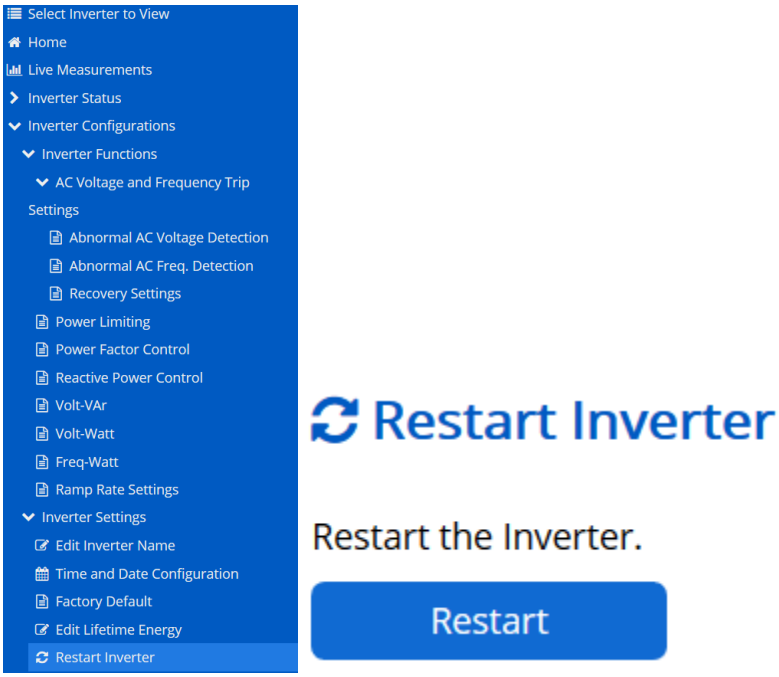
Register	Sunspec Model DID	Sunspec Offset	Name	Description	Unit	Min	Max	Default Value
40294	123	4	SSPEC_123_CONN	Connection control for connect disconnect		0	1	1

To implement the same step, the procedure is shown below.

- Write “ 0 ” to register 40294 for disconnecting from the grid.

14 Inverter Restart

This feature allows inverter control MCU to reset. It will clear all the faults and restart the inverter.



Example:

If cutomer wants to reset and restart inverter, click “Restart” button via web-based GUI. After that, inverter will stop producing power, reset MCU and restart itself.

The alternative method is to use software which supports Modbus TCP/IP. The register address is shown below.

Register	Sunspec Model DID	Sunspec Offset	Name	Description	Unit	Min	Max	Default Value
40921	64190	51	SSPEC_64190_RESET_DSP	DSP Reset command. Shutdown the inverter and reset the DSP.		577	577	0

To implement the same step, the procedure is shown below.

- Write “ 577 ” to register 40921 for restarting inverter.

15 Models

15.1 Model 1 – Common

Table 15.1 Model 1

Address	Size	Name	Value	Type	Units	Scale factor	R/W	Description
40002	1	ID	1	uint16	-	-	R	Model number
40003	1	L	68	uint16	-	-	R	Model length
40004	16	Manufacturer	YaskawaSolectriaSolar	uint16	-	-	R	Manufacturer name
40020	16	Model	-	uint16	-	-	R	Inverter model
40036	8	Options	-	string	-	-	R	Inverter option
40044	8	Version	-	string	-	-	R	Inverter version
40052	16	Serial Number	-	string	-	-	R	Inverter serial number
40068	1	Device Address	-	uint16	-	-	R	Modbus device address
40069	1	Reserved	-	-	-	-	R	Reserved

15.2 Model 103 – Inverter (Three Phase)

Table 15.2 Model 103

Address	Size	Name	Value	Type	Units	Scale factor	R/W	Description
40070	1	ID	103	uint16	-	-	R	Model number
40071	1	L	50	uint16	-	-	R	Model length
40072	1	A	-	uint16	A	A_SF	R	AC current – sum of phases (rms)
40073	1	AphA	-	uint16	A	A_SF	R	Phase A AC current (rms)
40074	1	AphB	-	uint16	A	A_SF	R	Phase B AC current (rms)
40075	1	AphC	-	uint16	A	A_SF	R	Phase C AC current (rms)
40076	1	A_SF	-1	uint16	-	-	R	Scale factor - AC current
40077	1	PPVphAB	-	uint16	V	V_SF	R	Phase voltage AB (rms)
40078	1	PPVphBC	-	uint16	V	V_SF	R	Phase voltage BC (rms)
40079	1	PPVphCA	-	uint16	V	V_SF	R	Phase voltage CA (rms)
40080	1	PPVphA	-	uint16	V	V_SF	R	Phase voltage AN (rms)
40081	1	PPVphB	-	uint16	V	V_SF	R	Phase voltage BN (rms)
40082	1	PPVphC	-	uint16	V	V_SF	R	Phase voltage CN (rms)
40083	1	V_SF	-1	uint16	-	-	R	Scale factor - phase voltage
40084	1	W	-	uint16	W	W_SF	R	AC Power
40085	1	W_SF	-1	uint16	-	-	R	Scale factor - AC Power
40086	1	Hz	-	uint16	Hz	Hz_SF	R	Line frequency
40087	1	Hz_SF	-1	uint16	-	-	R	Scale factor – line frequency
40088	1	VA	-	uint16	VA	VA_SF	R	Apparent Power

40089	1	VA_SF	-1	uint16	-	-	R	Scale factor - apparent power
40090	1	VAr	-	uint16	VAr	VAr_SF	R	Reactive Power
40091	1	VAr_SF	-1	uint16	-	-	R	Scale factor - reactive power
40092	1	PF	-	uint16	PF	PF_SF	R	Power Factor
40093	1	PF_SF	-1	uint16	-	-	R	Scale factor - power factor
40094	2	Wh	-	uint16	Wh	WH_SF	R	AC energy
40096	1	Wh_SF	-1	uint16	-	-	R	Scale factor - AC energy
40099	1	DCV	-	uint16	DCV	DCV_SF	R	DC voltage
40100	1	DCV_SF	-1	uint16	-	-	R	Scale factor - DC voltage
40103	3	Reserved	-	-	-	-	R	Reserved
40106	1	TmpOt	-	uint16	C	Tmp_SF	R	IMI temperature
40107	1	Tmp_SF	-1	uint16	-	-	R	Scale factor - temperature
40108	1	St	-	enum16	-	-	R	Operating state, see St Enumerated
40109	1	StVnd	-	enum16		-	R	Vender state, see StVnd Enumerated
40110	2	Evt1	-	bitfield32	-	-	R	Event, see Evt1 Bitfield
40112	2	Reserved	-	-	-	-	R	Reserved
40114	2	EvtVnd1	-	bitfield32	-	-	R	Vendor Event 1, see EvtVnd1 Bitfield
40116	2	EvtVnd2	-	bitfield32	-	-	R	Vendor Event 2, see EvtVnd2 Bitfield
40118	2	EvtVnd3	-	bitfield32	-	-	R	Vendor Event 3, see EvtVnd3 Bitfield
40120	2	Reserved	-	-	-	-	R	Reserved

15.2.1 St Enumerated

Table 15.3 St Enumerated

Value	Description
3	Starting
4	MPPT Mode
5	Throttled
6	Shutting Down
7	Fault
8	Standby

15.2.2 StVnd Enumerated

Table 15.4 StVnd Enumerated

Value	Description
1	Initializing

2	Recovery
3	Normal Operation with Factory Configuration
4	Normal Operation with Manufacturing Configuration
5	Setup of Custom Configuration
6	Normal Operation with Custom Configuration
7	Normal Operation with Communication Fault
8	Administrator Configuration
9	Software Update
10	Normal Shutdown

15.2.3 Evt1 Bitfield

Table 15.5 Evt1 Bitfield

Bit	Description
0	Ground Fault
1	DC Over Voltage
2	AC Disconnected
4	Grid Shutdown
6	Manual Shutdown
7	Over Temp
8	Over Frequency
9	Under Frequency
10	AC Over Voltage
11	AC Under Voltage
14	Memory loss (program or data Flash/ RAM memory corruption) or internal communication error
15	Hardware Test Failure

15.2.4 EvtVnd1 Bitfield

Table 15.6 Evt1Vnd Bitfield

Code	Bit	Description
CRIT-1	0	Software Parameter Load Failure
CRIT-2	1	Internal Communication 1 Failure
CRIT-3	2	Internal Communication 2 Failure
CRIT-4	3	Arc Fault Detected
CRIT-5	4	AC Contactor Failure
CRIT-6	5	Over Temperature
CRIT-7	6	Excessive Leakage Current
CRIT-8	7	Low Isolation Resistance
CRIT-9	8	Internal Hardware Failure
CRIT-10	9	Ground Fault Detection Failure
CRIT-11	10	Self-Check Failure
CRIT-12	11	Self-Check Startup Failure
CRIT-13	12	Hardware self test failure

15.2.6 EvtVnd2 Bitfield

Table 15.7 Evt2Vnd Bitfield

Code	Bit	Description
WARN-1	0	Over Voltage Current
WARN-2	1	Phase lock loop failure
WARN-3	2	Island Detected
WARN-4	3	Open Phase Detected
WARN-5	4	Low Frequency 1 (LF1)
WARN-6	5	Low Frequency 2 (LF2)
WARN-7	6	High Frequency 1 (HF1)
WARN-8	7	High Frequency 2 (HF2)
WARN-9	8	Low Voltage 1 (LV1)
WARN-10	9	Low Voltage 2 (LV2)
WARN-11	10	Low Voltage 3 (LV3)
WARN-12	11	High Voltage 1 (HV1)
WARN-13	12	High Voltage 2 (HV2)
WARN-24	23	Communications System Fault
WARN-25	24	Communications 1 Fault
WARN-26	25	Communications 2 Fault
WARN-27	26	Communications 3 Fault
WARN-28	27	Network Fault
WARN-29	28	Software Update Fault
WARN-30	29	Unauthorized Network Access Fault
WARN-31	30	Invalid Configuration Request

15.2.7 EvtVnd3 Bitfield

Table 15.8 Evt3Vnd Bitfield

Code	Bit	Description
INFO-1	0	Power Derating – Temperature
INFO-2	1	Power Derating – Customer Command
INFO-3	2	Remote Shutdown Command
INFO-4	3	Shutdown Command from AC Switch
INFO-5	4	Shutdown Command from Digital Input
INFO-6	5	External Fan Damaged
INFO-7	6	Internal Fan Damaged

15.4 Model 113 – Inverter (Three-Phase) FLOAT

Table 15.9 Model 113

Address	Size	Name	Value	Type	Units	Scale factor	R/W	Description
40122	1	ID	113	uint16	-	-	R	Model number
40123	1	L	62	uint16	-	-	R	Model length
40124	2	A	-	float32	A	-	R	AC Current
40126	2	AphA	-	float32	A	-	R	Phase A current
40128	2	AphB	-	float32	A	-	R	Phase B current
40130	2	AphC	-	float32	A	-	R	Phase C current
40132	2	PPVphAB	-	float32	V	-	R	Phase voltage AB
40134	2	PPVphBC	-	float32	V	-	R	Phase voltage BC
40136	2	PPVphCA	-	float32	V	-	R	Phase voltage CA
40138	2	PhVphA	-	float32	V	-	R	Phase voltage AN
40140	2	PhVphB	-	float32	V	-	R	Phase voltage BN
40142	2	PhVphC	-	float32	V	-	R	Phase voltage CN
40144	2	W	-	float32	W	-	R	AC Power
40146	2	Hz	-	float32	Hz	-	R	Line Frequency
40148	2	VA	-	float32	VA	-	R	AC Apparent Power
40150	2	VAr	-	float32	var	-	R	AC Reactive Power
40152	2	PF	-	float32	Pct	-	R	AC Power Factor
40154	2	WH	-	float32	Wh	-	R	AC Energy
40158	2	DCV	-	float32	V	-	R	DC voltage
40162	6	Reserved	-	-	-	-	R	Reserved
40168	2	TmpOt	-	float32	C	-	R	IMI temperature
40170	1	St	-	enum16	-	-	R	Operating state, see St Enumerated
40171	1	StVnd	-	enum16	-	-	R	Vender state, see StVnd Enumerated
40172	2	Evt1	-	bitfield32	-	-	R	Event, see Evt1 Bitfield
40174	2	Reserved	-	-	-	-	R	Reserved
40176	2	EvtVnd1	-	bitfield32	-	-	R	Vendor Event 1, see EvtVnd1 Bitfield
40178	2	EvtVnd2	-	bitfield32	-	-	R	Vendor Event 2, see EvtVnd2 Bitfield
40180	2	EvtVnd3	-	bitfield32	-	-	R	Vendor Event 3, see EvtVnd3 Bitfield
40182	2	Reserved	-	-	-	-	R	Reserved

15.4.1 St Enumerated

Table 15.10 St Enumerated

Value	Description
3	Starting
4	MPPT Mode
5	Throttled
6	Shutting Down
7	Fault
8	Standby

15.4.2 StVnd Enumerated

Table 15.11 StVnd Enumerated

Value	Description
1	Initializing
2	Recovery
3	Normal Operation with Factory Configuration
4	Normal Operation with Manufacturing Configuration
5	Setup of Custom Configuration
6	Normal Operation with Custom Configuration
7	Normal Operation with Communication Fault
8	Administrator Configuration
9	Software Update
10	Normal Shutdown

15.4.3 Evt1 Bitfield

Table 15.12 Evt1 Bitfield

Bit	Description
0	Ground Fault
1	DC Over Voltage
2	AC Disconnect
4	Grid Shutdown
6	Manual Shutdown
7	Over Temp
8	Over Frequency
9	Under Frequency
10	AC Over Voltage
11	AC Under Voltage
14	Memory loss (program or data Flash/ RAM memory corruption) or internal communication error
15	Hardware Test Failure

15.4.4 EvtVnd1 Bitfield

Table 15.13 Evt1Vnd Bitfield

Code	Bit	Description
CRIT-1	0	Software Parameter Load Failure
CRIT-2	1	Internal Communication 1 Failure
CRIT-3	2	Internal Communication 2 Failure
CRIT-4	3	Arc Fault Detected
CRIT-5	4	AC Contactor Failure
CRIT-6	5	Over Temperature
CRIT-7	6	Excessive Leakage Current
CRIT-8	7	Low Isolation Resistance
CRIT-9	8	Internal Hardware Failure
CRIT-10	9	Ground Fault Detection Failure
CRIT-11	10	Self-Check Failure
CRIT-12	11	Self-Check Startup Failure
CRIT-13	12	Hardware self test failure

15.4.5 EvtVnd2 Bitfield

Table 15.14 Evt2Vnd Bitfield

Code	Bit	Description
WARN-1	0	Over Voltage Current
WARN-2	1	Phase lock loop failure
WARN-3	2	Island Detected
WARN-4	3	Open Phase Detected
WARN-5	4	Low Frequency 1 (LF1)
WARN-6	5	Low Frequency 2 (LF2)
WARN-7	6	High Frequency 1 (HF1)
WARN-8	7	High Frequency 2 (HF2)
WARN-9	8	Low Voltage 1 (LV1)
WARN-10	9	Low Voltage 2 (LV2)
WARN-11	10	Low Voltage 3 (LV3)
WARN-12	11	High Voltage 1 (HV1)
WARN-13	12	High Voltage 2 (HV2)
WARN-24	23	Communications System Fault
WARN-25	24	Communications 1 Fault
WARN-26	25	Communications 2 Fault
WARN-27	26	Communications 3 Fault
WARN-28	27	Network Fault
WARN-29	28	Software Update Fault
WARN-30	29	Unauthorized Network Access Fault
WARN-31	30	Invalid Configuration Request

15.4.6 EvtVnd3 Bitfield

Table 2.4.6 - Evt3Vnd Bitfield

Code	Bit	Description
INFO-1	0	Power Derating – Temperature
INFO-2	1	Power Derating – Customer Command
INFO-3	2	Remote Shutdown Command
INFO-4	3	Shutdown Command from AC Switch
INFO-5	4	Shutdown Command from Digital Input
INFO-6	5	External Fan Damaged
INFO-7	6	Internal Fan Damaged

15.5 Model 120 – Nameplate

Table 15.15 Model 120

Address	Size	Name	Value	Type	Units	Scale Factor	R/W	Description
40186	1	ID	120	uint16	-	-	R	Model number
40185	1	L	26	uint16	-	-	R	Model length
40186	1	DERTyp	4	enum16	-	-	R	Type of DER device, see DERTyp Enumerated
40187	1	WRtg	-	uint16	W	WRtg_SF	R	Continuous output power capability of the inverter
40188	1	WRtg_SF	3	sunssf	-	-	R	Scale factor – output power rating
40189	1	VARtg	-	uint16	VA	VARtg_SF	R	Continuous output Volt-Ampere capability of the inverter
40190	1	VARtg_SF	3	sunssf	-	-	R	Scale factor – output Volt-Ampere rating
40191	5	Reserved	-	-	-	-	R	Reserved
40196	1	ARtg	-	uint16	A	ARtg_SF	R	Continuous output current capability of the inverter
40197	1	ARtg_SF	-1	sunssf	-	-	R	Scale factor – output current rating
40198	14	Reserved	-	-	-	-	R	Reserved

15.5.1 DERTyp Enumerated

Table 15.16 DERTyp Enumerated

Value	Description
4	Photovoltaic
82	Photovoltaic Storage

15.6 Model 121 – Basic Settings

Table 15.17 Model 121

Address	Size	Name	Value	Type	Units	Scale Factor	R/W	Description
40212	1	ID	121	uint16	-	-	R	Model number
40213	1	L	30	uint16	-	-	R	Model length
40214	1	WMax	-	uint16	W	WMax_SF	R	Setting for maximum power output
40215	1	VRef	-	uint16	V	VRef_SF	R	Voltage from PCC to inverter
40216	1	VRefOfs	0	uint16	V	VRefOfs_SF	RW	Address from PCC to inverter
40217	2	Reserved	-	-	-	-	R	Reserved
40219	1	VAMax	-	uint16	VA	VAMax_SF	R	Setpoint for maximum apparent power
40220	5	Reserved	-	-	-	-	R	Reserved
40225	1	PFMinQ1	90	int16		PFMin_SF	R	Setpoint for minimum power factor in quadrant 1
40226	2	Reserved	-	-	-	-	R	Reserved
40228	1	PFMinQ4	90	int16		PFMin_SF	R	Setpoint for minimum power factor in quadrant 4
40229	1	Reserved	-	-	-	-	R	Reserved
40230	1	ClcTotVA	1	enum16	-	-	R	Calculation method for apparent power, see ClcTotVA Enumerated
40231	1	Reserved	-	-	-	-	R	Reserved
40232	1	ECPNomHz	-	uint16	Hz	ECPNomHz_SF	R	Setpoint for nominal frequency at the PCC
40233	1	Reserved	-	-	-	-	R	Reserved
40234	1	WMax_SF	3	sunssf	-	-	R	Scale factor – real power
40235	1	VRef_SF	0	sunssf	-	-	R	Scale factor – voltage at the PCC
40236	1	VRefOfs_SF	-	sunssf	-	-	R	Scale factor – Address voltage
40237	1	Reserved	-	-	-	-	R	Reserved
40238	1	VAMax_SF	3	sunssf	-	-	R	Scale factor – apparent power
40239	1	VArMax_SF	3	sunssf	-	-	R	Scale factor – reactive power
40240	1	Reserved	-	-	-	-	R	Reserved
40241	1	PFMin_SF	-2	sunssf	-	-	R	Scale factor – maximum power factor
40242	1	Reserved	-	-	-	-	R	Reserved
40243	1	ECPNomHz_SF	-2	sunssf	-	-	R	Scale factor – nominal frequency

15.6.1 ClcTotVA Enumerated

Table 15.18 ClcTotVA Enumerated

Value	Description
1	Vector
2	Arithmetic

15.7 Model 122 – Measurement Status

Table 15.19 Model 122

Address	Size	Name	Value	Type	Units	Scale Factor	R/W	Description
40244	1	ID	122	uint16	-	-	R	Model number
40245	1	L	44	uint16	-	-	R	Model length
40246	1	PVConn	-	bitfield32	-	-	R	PV inverter present/ available status, see PVConn Bitfield
40247	43	Reserved	-	-	-	-	R	Reserved

15.7.1 PVConn Bitfield

Table 15.20 PVConn Bitfield

Bit	Description
0	Connected
1	Available
2	Operating
3	Test

15.8 Model 123 – Immediate Controls

Table 15.21 Model 123

Address	Size	Name	Value	Type	Units	Scale Factor	R/W	Description
40290	1	ID	123	uint16	-	-	R	Model number
40291	1	L	24	uint16	-	-	R	Model length
40292	2	Reserved	-	-	-	-	R	Reserved
40294	1	Conn	-	enum16	-	-	RW	Connection control, see Conn Enumerated
40295	1	WMaxLimPct	-	uint16	%W Max	WMaxLimPCT_SF	RW	Set power output to specified value
40296	3	Reserved	-	-	-	-	R	Reserved
40299	1	WMaxLim_Ena	-	enum16	-	-	RW	Throttle enable/disable control, see WMaxLimPCt_Ena Enumerated
40300	1	OutPFSet	-	int16		OutPFSet_SF	RW	Set power factor to specified value – cosine of angle
40301	3	Reserved	-	-	-	-	R	Reserved
40304	1	OutPFSet_Ena	-	enum16	-	-	RW	Fixed power factor control enable/disable, see OutPFSet_Ena Enumerated
40305	8	Reserved	-	-	-	-	R	Reserved
40313	1	WMaxLimPct_SF	-1	sunssf	-	-	R	Scale factor – power output percent
40314	1	OutPFSet_SF	-2	sunssf	-	-	R	Scale factor – power factor
40315	1	Reserved	-	-	-	-	R	Reserved

15.8.1 Conn Enumerated

Table 15.22 Conn Enumerated

Value	Description
0	Disconnect
1	Connect

15.8.2 WMaxLimPCt_Ena Enumerated

Table 15.23 WMaxLimPCt_Ena Enumerated

Value	Description
0	Disconnect
1	Connect

15.8.3 OutPFSet_Ena Enumerated

Table 15.24 OutPFSet_Ena Enumerated

Value	Description
0	Disconnect
1	Connect

15.9 Model 129 – LVRTD

Table 15.25 Model 129

Address	Size	Name	Value	Type	Units	Scale Factor	R/W	Description
40316	1	ID	129	uint16	-	-	R	Model number
40317	1	L	60	uint16	-	-	R	Model length
40318	1	Reserved	-	-	-	-	R	Reserved
40319	1	ModEna	1	bitfield16	-	-	RW	LVRT control mode, enables active curve, see ModEna Bitfield
40320	3	Reserved	-	-	-	-	R	Reserved
40323	1	NCrv	1	uint16	-	-	R	Number of curves supported
40324	1	NPt	3	uint16	-	-	R	Number of points supported
40325	1	Tms_SF	-2	sunssf	-	-	R	Scale factor – duration
40326	1	V_SF	-1	sunssf	-	-	R	Scale factor – %VRef
40327	1	Reserved	-	-	-	-	R	Reserved
40328	1	ActPt	6	uint16	-	-	RW	Number of active points
40329	2	Reserved	-	-	-	-	R	Reserved
40331	1	Tms2	-	uint16	S	Tms_SF	RW	Point 2 must disconnect - duration
40332	1	V2	-	uint16	% Vref	V_SF	RW	Point 2 must disconnect - voltage
40333	2	Reserved	-	-	-	-	R	Reserved
40335	1	Tms4	-	uint16	S	Tms_SF	RW	Point 4 must disconnect - duration
40336	1	V4	-	uint16	% Vref	V_SF	RW	Point 4 must disconnect - voltage
40337	2	Reserved	-	-	-	-	R	Reserved
40339	1	Tms6	-	uint16	S	Tms_SF	RW	Point 6 must disconnect - duration
40340	1	V6	-	uint16	% Vref	V_SF	RW	Point 6 must disconnect - voltage
40341	37	Reserved	-	-	-	-	R	Reserved

15.9.1 ModEna Bitfield

Table 15.26 ModEna Bitfield

Bit	Description
0	Enabled

15.10 Model 130 – HVRTD

Table 15.27 Model 130

Address	Size	Name	Value	Type	Units	Scale factor	R/W	Description
40378	1	ID	130	uint16	-	-	R	Model number
40379	1	L	60	uint16	-	-	R	Model length
40380	1	Reserved	-	-	-	-	R	Reserved
40381	1	ModEna	1	bitfield16	-	-	RW	HVRT control mode, enables active curve, see ModEna Bitfield
40382	3	Reserved	-	-	-	-	R	Reserved
40385	1	NCrv	1	uint16	-	-	R	Number of curves supported
40386	1	NPt	3	uint16	-	-	R	Number of points supported
40387	1	Tms_SF	-2	sunssf	-	-	R	Scale factor – duration
40388	1	V_SF	-1	sunssf	-	-	R	Scale factor – %VRef
40389	1	Reserved	-	-	-	-	R	Reserved
40390	1	ActPt	6	uint16	-	-	RW	Number of active points
40391	2	Reserved	-	-	-	-	R	Reserved
40393	1	Tms2	-	uint16	S	Tms_SF	RW	Point 2 must disconnect - duration
40394	1	V2	-	uint16	% Vref	V_SF	RW	Point 2 must disconnect - voltage
40395	2	Reserved	-	-	-	-	R	Reserved
40397	1	Tms4	-	uint16	S	Tms_SF	RW	Point 4 must disconnect - duration
40398	1	V4	-	uint16	% Vref	V_SF	RW	Point 4 must disconnect - voltage
40399	2	Reserved	-	-	-	-	R	Reserved
40401	1	Tms6	-	uint16	S	Tms_SF	RW	Point 6 must disconnect - duration
40402	1	V6	-	uint16	% Vref	V_SF	RW	Point 6 must disconnect - voltage
40403	37	Reserved	-	-	-	-	R	Reserved

15.10.1 ModEna Bitfield

Table 15.28 ModEna Bitfield

Bit	Description
0	Enabled

15.11 Model 135 – LFRT

Table 15.29 Model 135

Address	Size	Name	Value	Type	Units	Scale Factor	R/W	Description
40440	1	ID	135	uint16	-	-	R	Model number
40441	1	L	60	uint16	-	-	R	Model length
40442	1	Reserved	-	-	-	-	R	Reserved
40443	1	ModEna	1	bitfield16	-	-	RW	LFRT control mode, enables active curve, see ModEna Bitfield
40444	3	Reserved	-	-	-	-	R	Reserved
40447	1	NCrv	1	uint16	-	-	R	Number of curves supported
40448	1	NPt	3	uint16	-	-	R	Number of points supported
40449	1	Tms_SF	-2	sunssf	-	-	R	Scale factor – duration
40450	1	V_SF	-1	sunssf	-	-	R	Scale factor – %VRef
40451	1	Reserved	-	-	-	-	R	Reserved
40452	1	ActPt	6	uint16	-	-	RW	Number of active points
40453	2	Reserved	-	-	-	-	R	Reserved
40455	1	Tms2	-	uint16	S	Tms_SF	RW	Point 2 must disconnect - duration
40456	1	V2	-	uint16	% Vref	V_SF	RW	Point 2 must disconnect - voltage
40457	2	Reserved	-	-	-	-	R	Reserved
40459	1	Tms4	-	uint16	S	Tms_SF	RW	Point 4 must disconnect - duration
40460	1	V4	-	uint16	% Vref	V_SF	RW	Point 4 must disconnect - voltage
40461	41	Reserved	-	-	-	-	R	Reserved

15.11.1 ModEna Bitfield

Table 15.30 ModEna Bitfield

Bit	Description
0	Enabled

15.12 Model 136 – HFRT

Table 15.31 Model 136

Address	Size	Name	Value	Type	Units	Scale Factor	R/W	Description
40502	1	ID	136	uint16	-	-	R	Model number
40503	1	L	60	uint16	-	-	R	Model length
40504	1	Reserved	-	-	-	-	R	Reserved
40505	1	ModEna	1	bitfield16	-	-	RW	HFRT control mode, enables active curve, see ModEna Bitfield
40506	3	Reserved	-	-	-	-	R	Reserved
40509	1	NCrv	1	uint16	-	-	R	Number of curves supported
40510	1	NPt	3	uint16	-	-	R	Number of points supported
40511	1	Tms_SF	-2	sunssf	-	-	R	Scale factor – duration
40512	1	V_SF	-1	sunssf	-	-	R	Scale factor – %VRef
40513	1	Reserved	-	-	-	-	R	Reserved
40514	1	ActPt	6	uint16	-	-	RW	Number of active points
40515	2	Reserved	-	-	-	-	R	Reserved
40517	1	Tms2	-	uint16	S	Tms_SF	RW	Point 2 must disconnect - duration
40518	1	V2	-	uint16	% Vref	V_SF	RW	Point 2 must disconnect - voltage
40519	2	Reserved	-	-	-	-	R	Reserved
40521	1	Tms4	-	uint16	S	Tms_SF	RW	Point 4 must disconnect - duration
40522	1	V4	-	uint16	% Vref	V_SF	RW	Point 4 must disconnect - voltage
40523	41	Reserved	-	-	-	-	R	Reserved

15.12.1 ModEna Bitfield

Table 15.32 ModEna Bitfield

Bit	Description
0	Enabled

15.13 Model 16 – Simple IP Network (eth1)

Table 15.33 Model 16

Address	Size	Name	Value	Type	Units	Scale Factor	R/W	Description
40654	1	ID	16	uint16	-	-	R	Model number
40655	1	L	52	uint16	-	-	R	Model length
40656	4	Nam	eth1	string	-	-	R	Interface name
40660	1	Cfg	-	enum16	-	-	R	Force IPv4 configuration method, see Cfg Enumerated
40661	1	Ctl	3	enum16	-	-	R	Bitmask value configuration, see Ctl Enumerated
40662	8	Addr	-	string	-	-	R	IP address
40670	8	Msk	-	string	-	-	R	Netmask
40678	8	Gw	-	string	-	-	R	Gateway IP address
40686	16	Reserved	-	-	-	-	R	Reserved
40702	4	MAC	-	uint64	-	-	R	IEEE MAC address
40706	1	LnkCtl	3	bitfield16	-	-	RW	Link control flags, see LnkCtl Bitfield
40707	1	Reserved	-	-	-	-	R	Reserved

15.13.1 Cfg Enumerated

Table 15.34 Enumerated

Value	Description
0	Static IP Address is Assigned
1	DHCP Used to Acquire IP Address

15.13.2 Ctl Enumerated

Table 15.35 Ctl Enumerated

Value	Description
0	Enable DNS
1	Enable NTP

15.13.3 LnkCtl Bitfield

Table 15.36 ModEna Bitfield

Bit	Description
0	Auto-Negotiate
1	Full Duplex

15.14 Model 16001 – Simple IP Network (eth2)

Table 15.37 Model 16001

Address	Size	Name	Value	Type	Units	Scale Factor	R/W	Description
40708	1	ID	16	uint16	-	-	R	Model number
40709	1	L	52	uint16	-	-	R	Model length
40710	4	Nam	eth2	string	-	-	R	Interface name
40714	1	Cfg	-	enum16	-	-	R	Force IPv4 configuration method, see Cfg Enumerated
40715	1	Ctl	3	enum16	-	-	R	Bitmask value configuration, see Ctl Enumerated
40716	8	Addr	-	string	-	-	R	IP address
40724	8	Msk	-	string	-	-	R	Netmask
40732	8	Gw	-	string	-	-	R	Gateway IP address
40740	16	Reserved	-	-	-	-	R	Reserved
40756	4	MAC	-	uint64	-	-	R	IEEE MAC address
40760	1	LnkCtl	3	bitfield16	-	-	RW	Link control flags, see LnkCtl Bitfield
40761	1	Reserved	-	-	-	-	R	Reserved

15.14.1 Cfg Enumerated

Table 15.38 Cfg Enumerated

Value	Description
0	Static IP Address is Assigned
1	DHCP Used to Acquire IP Address

15.14.2 Ctl Enumerated

Table 15.39 Ctl Enumerated

Value	Description
0	Enable DNS
1	Enable NTP

15.14.3 LnkCtl Bitfield

Table 15.40 ModEna Bitfield

Bit	Description
0	Auto-Negotiate
1	Full Duplex

15.15 Model 16002 – Simple IP Network (Bridge)

Table 15.41 Model 16002

Address	Size	Name	Value	Type	Units	Scale Factor	R/W	Description
40762	1	ID	16002	uint16	-	-	R	Model number
40763	1	L	52	uint16	-	-	R	Model length
40764	4	Nam	Bridge	string	-	-	R	Interface name
40768	1	Cfg	-	enum16	-	-	R	Force IPv4 configuration method, see Cfg Enumerated
40769	1	Ctl	3	enum16	-	-	R	Bitmask value configuration, see Ctl Enumerated
40770	8	Addr	-	string	-	-	R	IP address
40778	8	Msk	-	string	-	-	R	Netmask
40786	8	Gw	-	string	-	-	R	Gateway IP address
40794	16	Reserved	-	-	-	-	R	Reserved
40810	4	MAC	-	uint64	-	-	R	IEEE MAC address
40814	1	LnkCtl	3	bitfield16	-	-	RW	Link control flags, see LnkCtl Bitfield
40815	1	Reserved	-	-	-	-	R	Reserved

15.15.1 Cfg Enumerated

Table 15.42 Cfg Enumerated

Value	Description
0	Static IP Address is Assigned
1	DHCP Used to Acquire IP Address

15.15.2 Ctl Enumerated

Table 15.43 Ctl Enumerated

Value	Description
0	Enable DNS
1	Enable NTP

15.15.3 LnkCtl Bitfield

Table 15.44 ModEna Bitfield

Bit	Description
0	Auto-Negotiate
1	Full Duplex

15.16 Model 16003 – Simple IP Network (WiFi AP)

Table 15.45 Model 16003

Address	Size	Name	Value	Type	Units	Scale Factor	R/W	Description
40816	1	ID	16003	uint16	-	-	R	Model number
40817	1	L	52	uint16	-	-	R	Model length
40818	4	Nam	WiFi AP	string	-	-	R	Interface name
40822	1	Cfg	-	enum16	-	-	R	Force IPv4 configuration method, see
40823	1	Ctl	3	enum16	-	-	R	Bitmask value configuration, see
40824	8	Addr	-	string	-	-	R	IP address
40832	8	Msk	-	string	-	-	R	Netmask
40840	8	Gw	-	string	-	-	R	Gateway IP address
40848	16	Reserved	-	-	-	-	R	Reserved
40864	4	MAC	-	uint64	-	-	R	IEEE MAC address
40868	1	LnkCtl	3	bitfield16	-	-	RW	Link control flags
40869	1	Reserved	-	-	-	-	R	Reserved

15.16.1 Cfg Enumerated

Table 15.46 Cfg Enumerated

Value	Description
0	Static IP Address is Assigned
1	DHCP Used to Acquire IP Address

15.16.2 Ctl Enumerated

Table 15.47 Ctl Enumerated

Value	Description
0	Enable DNS
1	Enable NTP

15.16.3 LnkCtl Bitfield

Table 15.48 ModEna Bitfield

Bit	Description
0	Auto-Negotiate
1	Full Duplex

15.17 Model 64190 – Solectria Variables

Table 15.49 Model 64190

Address	Size	Name	Value	Type	Units	Scale Factor	R/W	Description
40870	1	ID	64190	uint16	-	-	R	Model number
40871	1	L	49	uint16	-	-	R	Model length
40872	1	AFRT	-	uint16	S	AFRT_SF	RW	Abnormal recovery time
40873	1	AFRT_SF	0	sunssf	-	-	R	Scale factor – abnormal recovery time
40874	2	WH	-	float32	Wh	-	R	Today's energy production
40876	16	InvName	-	string	-	-	RW	Inverter name
40892	1	Password	-	string	-	-	W	Password
40893	2	ClrEvt1	-	bitfield32	-	-	W	Clears Evt1 (40110, 40176), see Evt1 Bitfield
40895	2	ClrEvtVnd1	-	bitfield32	-	-	W	Clears EvtVnd1 (40111, 40177), see EvtVnd1 Bitfield
40897	2	ClrEvtVnd2	-	bitfield32	-	-	W	Clears EvtVnd2 (40112, 40178), see EvtVnd2 Bitfield
40899	2	ClrEvtVnd3	-	bitfield32	-	-	W	Clears EvtVnd3 (40113, 40179), see EvtVnd3 Bitfield
40901	2	Reserved	-	-	-	-	R	Reserved
40903	1	LedStat	-	bitfield16	-	-	R	LED status
40904	1	InputZone	-	uint16	-	-	RW	Input zone number configuration
40905	11	Reserved	-	-	-	-	R	Reserved
40916	1	stStrtArcTst	-	enum16	-	-	RW	Arc test start
40917	1	stStrtIRTst	-	enum16	-	-	RW	Insulation resistance test start
40918	1	stStrtIMITst	-	enum16	-	-	RW	Isolation monitor interrupter test start
40919	1	AFRWT	-	uint16	S	AFRWT_SF	RW	Abnormal recovery wait time
40920	1	AFRWT_SF	0	sunssf	-	-	R	Scale factor – abnormal recovery wait time

15.17.1 Evt1 Bitfield

Table 15.50 Evt1 Bitfield

Bit	Description
0	Ground Fault
1	DC Over Voltage
2	AC Disconnect
4	Grid Shutdown
6	Manual Shutdown
7	Over Temp
8	Over Frequency
9	Under Frequency
10	AC Over Voltage
11	AC Under Voltage
14	Memory loss (program or data Flash/ RAM memory corruption) or internal communication error
15	Hardware Test Failure

15.17.2 EvtVnd1 Bitfield

Table 15.51 Evt1Vnd Bitfield

Code	Bit	Description
CRIT-1	0	Software Parameter Load Failure
CRIT-2	1	Internal Communication 1 Failure
CRIT-3	2	Internal Communication 2 Failure
CRIT-4	3	Arc Fault Detected
CRIT-5	4	AC Contactor Failure
CRIT-6	5	Over Temperature
CRIT-7	6	Excessive Leakage Current
CRIT-8	7	Low Isolation Resistance
CRIT-9	8	Internal Hardware Failure
CRIT-10	9	Ground Fault Detection Failure
CRIT-11	10	Self-Check Failure
CRIT-12	11	Self-Check Startup Failure
CRIT-13	12	Hardward self test failure

15.17.3 EvtVnd2 Bitfield

Table 15.52 Evt2Vnd Bitfield

Code	Bit	Description
WARN-1	0	Over Voltage Current
WARN-2	1	Phase lock loop failure
WARN-3	2	Island Detected
WARN-4	3	Open Phase Detected
WARN-5	4	Low Frequency 1 (LF1)
WARN-6	5	Low Frequency 2 (LF2)
WARN-7	6	High Frequency 1 (HF1)

WARN-8	7	High Frequency 2 (HF2)
WARN-9	8	Low Voltage 1 (LV1)
WARN-10	9	Low Voltage 2 (LV2)
WARN-11	10	Low Voltage 3 (LV3)
WARN-12	11	High Voltage 1 (HV1)
WARN-13	12	High Voltage 2 (HV2)
WARN-24	23	Communications System Fault
WARN-25	24	Communications 1 Fault
WARN-26	25	Communications 2 Fault
WARN-27	26	Communications 3 Fault
WARN-28	27	Network Fault
WARN-29	28	Software Update Fault
WARN-30	29	Unauthorized Network Access Fault
WARN-31	30	Invalid Configuration Request

15.17.4 EvtVnd3 Bitfield

Table 15.53 Evt3Vnd Bitfield

Code	Bit	Description
INFO-1	0	Power Derating – Temperature
INFO-2	1	Power Derating – Customer Command
INFO-3	2	Remote Shutdown Command
INFO-4	3	Shutdown Command from AC Switch
INFO-5	4	Shutdown Command from Digital Input
INFO-6	5	External Fan Damaged
INFO-7	6	Internal Fan Damaged

15.17.5 LedStat Bitfield

Table 15.54 LedStat Bitfield

Bit	Description
0	Inverter Warning/Fault
1	Inverter Service
2	Inverter AC Power Generation
3	Inverter Network Status
4	System Ready

15.17.6 stStrtArcTest Enumerated

Table 15.55 stStrtArcTest Enumerated

Value	Description
0	Off
1	Start
2	Running

15.17.7 stStrtIRTest Enumerated

Table 15.56 stStrtIRTest Enumerated

Value	Description
0	Off
1	Start
2	Running

15.17.8 stStrtIMITest Enumerated

Table 15.57 stStrtIMITest Enumerated

Value	Description
0	Off
1	Start
2	Running