



Modbus Communications
For Models
PVI 50/60TL

Revision A

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1. Yaskawa – Solectria Solar PVI 50/60TL Modbus

1.1. Introduction

This manual explains the Modbus protocol used for Yaskawa – Solectria Solar’s PVI 50/60TL inverters. This does not include all the Modbus protocol details. It is expected that the person(s) reading this manual have a clear understanding of Modbus protocol.

Each register/data point contains a raw 16-bit signed or unsigned number. The appropriate multiplier must be applied to each word to obtain the scaled representation.

1.2. Abbreviations

IP	Internet Protocol
MB	Modbus
TCP	Transport Control Protocol
uint16	16bit unsigned integer
uint32	32bit unsigned integer
uint64	64bit unsigned integer
int16	16bit signed integer
int32	32bit signed integer

1.3. Modbus Information

The Yaskawa – Solectria Solar PVI 50/60TL inverters Modbus register listing may contain some registers that are not supported for all inverter models. The inverter will respond with the following values if a feature is not supported for a specific inverter model.

Not Implemented for an int16 is 0x8000.

Not Implemented for an uint16 is 0xFFFF.

Not Implemented for an int32 is 0x80000000.

Not Implemented for an uint32 is 0xFFFFFFFF.

Not Implemented for a string is 0x00.

1.4. Data Encoding

The Modbus specification is not explicit on how to encode numbers other than 16-bit integers. Differences do exist between one manufacturer’s implementation and another’s. 32 bit and 64 bit data for PVI 50/60TL inverters is encoded as described below.

32-bit integer Value

Values are stored in big-endian order per the Modbus specification and consist of two consecutive 16-bit registers.

Modbus Register	1		2	
byte	0	1	2	3
bits	31 - 24	23 - 16	15 - 8	7 - 0

64-bit integer Value

64-bit integers are stored using four registers in big-endian order and consists of 4 consecutive 16-bit registers.

Modbus Register	1		2		3		4	
byte	0	1	2	3	4	5	6	7
bits	63 - 56	55 - 48	47 - 40	39 - 32	31 - 24	23 - 16	15 - 8	7 - 0

1.5. RS485 Modbus

Modbus Mode: RTU

Data Bits: 8

Parity: None

Stop Bits: 1

Mode: Half-Duplex

Baud Rate: 9600 or 19200

2. Inverter Input Registers Data Mapping

The Modbus read function code is 0x04, and the basic register address is 0x0000.

Table 2-1 Input Registers Data Mapping

Modbus Register	Register Size	Description	Type	Unit	Multiplier	RDWR
0x0006	4	Inverter Serial Number. The Serial Number is composed of 13 digits represented as the 13 Least Significant bytes. E.g. 0X0001013011353001 represents Serial Number 1013011353001	uint64	N/A	BCD	RD
0x000A	10	Inverter Model Information. Identifies the Inverter Model information, i.e. PVI-50TL-480 or PVI-60TL-480	string(20)	N/A	1	RD
0x0016	2	Total Lifetime Energy Exported to the Grid	uint32	kWh	1	RD
0x0018	1	Accumulated Energy Production for the Day	uint16	kWh	0.1	RD
0x001A	1	Power factor E.g. 0x0320 represents a PF=0x0320 *0.001=0.8	int16	N/A	0.001	RD
0x001B	1	Maximum Active AC Power during the Day	uint16	kW	0.1	RD
0x001C	1	Number of minutes since the inverter first connected to the grid	uint16	kW	0.1	RD
0x001D	1	Active AC Power	uint16	kW	0.1	RD
0x001E	1	Apparent AC Power	uint16	kVA	0.1	RD
0x001F	1	Grid Voltage Vab	uint16	V	0.1	RD
0x0020	1	Grid Voltage Vbc	uint16	V	0.1	RD
0x0021	1	Grid Voltage Vca	uint16	V	0.1	RD
0x0022	1	Grid A Phase Current	uint16	A	0.1	RD
0x0023	1	Grid B Phase Current	uint16	A	0.1	RD
0x0024	1	Grid C Phase Current	uint16	A	0.1	RD
0x0025	1	DC Voltage, MPPT Zone 1	uint16	V	0.1	RD
0x0026	1	DC Current, MPPT Zone 1	int16	A	0.1	RD
0x0027	1	DC2 Voltage, MPPT Zone 2	uint16	V	0.1	RD
0x0028	1	DC2 Current, MPPT Zone 2	int16	A	0.1	RD
0x0029	1	DC3 Voltage, MPPT Zone 3	uint16	V	0.1	RD
0x002A	1	DC3 Current, MPPT Zone 3	int16	A	0.1	RD

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Modbus Register	Register Size	Description	Type	Unit	Multiplier	RD/WR
0x002B	1	Grid Frequency	uint16	Hz	0.1	RD
0x002C	1	Power Module Heatsink Temperature	int16	C	0.1	RD
0x002D	1	Internal Inverter Temperature	int16	C	0.1	RD
0x002F	1	Inverter Operation State For details see " Section 4 Operation States "	uint16	N/A	1	RD
0x0030	4	Error Timestamp (yyyy-mm-dd-hh-mm-ss-NULL), E.g. 0x2012071615181000=2012-7-16 15:18:10	uint64	N/A	BCD	RD
0x0034	1	Permanent Fault Alarm Register Severity – High The inverter has detected a serious fault and has ceased to generate power. Requires site visit to check the cause. The inverter will stay off until power is cycled. For details see " Section 5 Inverter Fault Codes Descriptor "	uint16	N/A	1	RD
0x0035	1	Warning Alarm Register Severity – Low The inverter detected an anomaly, but will continue to generate power. For details see " Section 5 Inverter Fault Codes Descriptor "	uint16	N/A	1	RD
0x0036	1	Fault0 Alarm Register Severity – Medium The inverter detected a failure such as an AC or DC out of range condition and has ceased to generate power. The inverter will resume power generation when the condition clears. For details see " Section 5 Inverter Fault Codes Descriptor "	uint16	N/A	1	RD
0x0037	1	Fault1 Alarm Register Severity – Medium The inverter detected a failure such as an AC or DC out of range condition and has ceased to generate power. The inverter will resume power generation when the condition clears. For details see " Section 5 Inverter Fault Codes Descriptor "	uint16	N/A	1	RD

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Modbus Register	Register Size	Description	Type	Unit	Multiplier	RD/WR
0x0038	1	<p>Fault2 Alarm Register Severity – Medium</p> <p>The inverter detected a failure such as an AC or DC out of range condition and has ceased to generate power. The inverter will resume power generation when the condition clears.</p> <p>For details see "Section 5 Inverter Fault Codes Descriptor"</p>	uint16	N/A	1	RD
0x0039	1	<p>Fault3 Alarm Register Severity – Medium</p> <p>The inverter detected a failure such as an AC or DC out of range condition and has ceased to generate power. The inverter will resume power generation when the condition clears.</p> <p>For details see "Section 5 Inverter Fault Codes Descriptor"</p>	uint16	N/A	1	RD
0x003A	1	<p>Fault4 Alarm Register Severity – Medium</p> <p>The inverter detected a failure such as an AC or DC out of range condition and has ceased to generate power. The inverter will resume power generation when the condition clears.</p> <p>for detail see "Section 5 Inverter Fault Codes Descriptor"</p>	uint16	N/A	1	RD
0x003B	1	AC reactive power	int16	KVA	0.1k	RD
0x0041	1	A manufacturer specific value that identifies the major version of this device; The data format of FirmVer is 0xAABB. AA indicates DSP firmware revision, and BB indicates MCU firmware revision.	uint16	NULL	NULL	RD

3. Inverter Holding Registers Mapping

The Modbus read function code for the holding (RD/WR) registers is 0x03.

The Modbus write function code is 0x06 for a single register write and 0x10 for multiple register writes.

Note: Please do not write to any of the reserved or unlisted register addresses. Doing so could damage the inverter and void the warranty.

3.1. Holding Registers Mapping

Table 3-1 Holding Register Mapping

Modbus Register	Register Size	Name	Description	Type	Multiplier	Unit	Default Value	Min value	Max value
0x1000	1	On/Off	Inverter Power On or Power Off Command 0xAAAA turns the unit power production on 0X5555 turns the unit power production off The Inverter will automatically turn back on whenever DC power is cycled.	uint16	1	N/A	0xAAAA (On)	0x5555 (Off)	0xAAAA (On)
0x1001	1	PSet	Temporary Active Power Setting (Curtailment) This setting will be reset overnight or when the inverter is power cycled. Curtailment mode must be enabled by writing 1 to register 0x1046. Range [0.0%, 100.%] of nameplate kW rating, e.g. for 75%, then PSet = 0x02EE For PVI 60TL: 60kW * 75% = 45kW	uint16	0.1	%	1000	0	1000

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Modbus Register	Register Size	Name	Description	Type	Multiplier	Unit	Default Value	Min value	Max value
0x1002	1	PFSets	Temporary Power Factor Setting This setting will be reset to its default value overnight or when the inverter is power cycled. Power Factor mode must be enabled by writing 0x02 to register 0x1047. Setting Range [-1.000,-0.800; 0.800, 1.000] e.g. 0.931 then PFSets = 0X03A3	int16	0.001	N/A	1000	-800	1000
0x1003	1	QSet	Remote electric dispatch Reactive Power setting. Q mode must be enabled by writing 0x01 to register 0x1047. Reactive Power value range [-60.0% , 60.0%], E.g. 70.7%, then QSet =0x02c3	int16	0.1	%	N/A	-600	600
0x1004	4	TimeSet	System Time Setting, format as: yyyy-mm-dd-hh-mm-ss-NUL, E.g. 0x2012071615181000 = 2012-7-16 15:18:10	uint64	1	N/A	N/A	N/A	N/A
0x1046	1	RemoteActivePwDispatchModeOption	Enable or Disable Temporary Power 0 = Disable 1 = Enable	uint16	1	N/A	0	0	1
0x1047	1	RemoteReactivePwModeSelect	The reactive mode of Remote dispatch 0: None 1: Dispatch(remote control) 2:Q, Fixed VARs 3:PF, Fixed Power Factor 4:PF(P), Power factor as a function of output power 5:Q(U), Reactive power as a function of terminal voltage	uint16	1	N/A	0	0	5
0x1100	4	SN of Communication card	A manufacturer specific value that uniquely identifies this device within the manufacturer name space. Remark: Serial number is composed of 16 characters (8 bytes) the most significant 3 characters is not used, only used the left 13 characters. Such as 0X0001010091114001 represents the inverter serial number 1010091114001	BCD	1	N/A	N/A	N/A	N/A

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Modbus Register	Register Size	Name	Description	Type	Multiplier	Unit	Default Value	Min value	Max value
0x1104	2	IP Address	IP of the connected Ethernet network card Example: 0x0A7A0136 represents the IP address 10.122.1.54	uint32	1	N/A	N/A	N/A	N/A
0x1106	2	Subnet mask	The same as above	uint32	1	N/A	N/A	N/A	N/A
0x1108	2	Default gateway	The same as above	uint32	1	N/A	N/A	N/A	N/A
0x1110	2	DNS server	The same as above	uint32	1	N/A	N/A	N/A	N/A
0x1112	1	Address range	The address range that the Ethernet network card uses. value=1: 1-32 value=2: 33-64 value=3: 65-96 value=4: 97-128 value=5: 129-160 value=6: 161-192 value=7: 193-224 value=8: 225-255	uint16	1	N/A	N/A	1	8

3.2. Holding Registers Mapping

Note: Some registers are used internally and are not disclosed in this document.

Table 3-2 Assignment of Holding Register Groups

Address Range	Group Number	Group Name
0x2000 ~ 0x20FF	0	Grid Protection Parameters
0x2100 ~ 0x21FF	1	Active Power Derating Parameters
0x2200 ~ 0x22FF	2	Reactive Power Derating Parameters
0x2300 ~ 0x23FF	3	NULL
0x2400 ~ 0x24FF	4	LVRT/HVRT Parameters
0x2500 ~ 0x25FF	5	Others Parameters
0x2600 ~ 0x26FF	6	Enable/Disable Control Parameters
0x2700 ~ 0x27FF	7	Control Command
0x2800 ~ 0x28FF	8	NULL
0x2900 ~ 0x29FF	9	Inverter Basic Information

Table 3-3 Holding Registers Data Mapping

Modbus Register	Register Size	Description	Name	Type	Multiplier	Unit	Min value	Max value
Group 0 Grid Protection Parameters								
0x2000	1	The 1 st maximum operational grid voltage	GridV.Max1	uint16	0.01	%	10000	13500
0x2001	1	The 1 st maximum grid voltage trip time	VolMaxTripTime_1	uint16	0.01	s	0	65500
0x2002	1	The 2 nd maximum operational grid voltage	GridV.Max2	uint16	0.01	%	10000	13500
0x2003	1	The 2 nd maximum grid voltage trip time	VolMaxTripTime_2	uint16	0.01	s	0	65500
0x2004	1	The 3 rd maximum operational grid voltage	GridV.Max3	uint16	0.01	%	10000	13500
0x2005	1	The 3 rd maximum grid voltage trip time	VolMaxTripTime_3	uint16	0.01	s	0	65500

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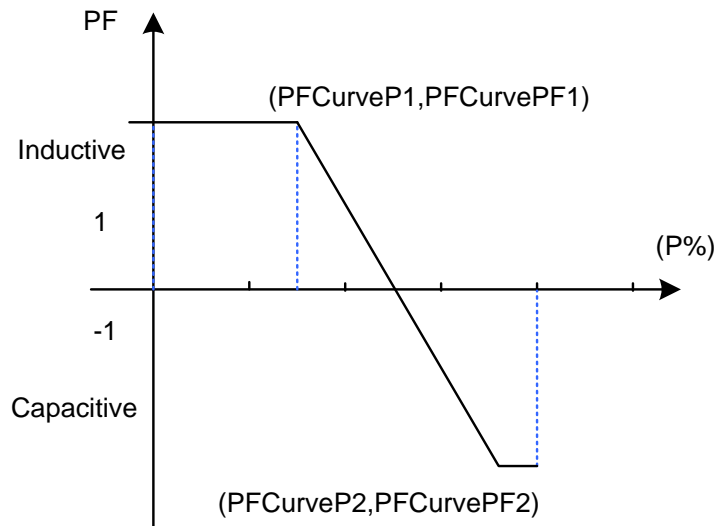
Modbus Register	Register Size	Description	Name	Type	Multiplier	Unit	Min value	Max value
0x2006	1	The 1 st minimum operational grid voltage	GridV.Min1	uint16	0.01	%	3000	10000
0x2007	1	The 1 st minimum grid voltage trip time	VolMinTripTime_1	uint16	0.01	s	0	65500
0x2008	1	The 2 nd minimum operational grid voltage	GridV.Min2	uint16	0.01	%	3000	10000
0x2009	1	The 2 nd minimum grid voltage trip time	VolMinTripTime_2	uint16	0.01	s	0	65500
0x200A	1	The 3 rd minimum operational grid voltage	GridV.Min3	uint16	0.01	%	3000	10000
0x200B	1	The 3 rd minimum grid voltage trip time	VolMinTripTime_3	uint16	0.01	s	0	65500
0x200C	1	The upper limit grid voltage recovery	VMaxRcov	uint16	0.01	1%	8000	13500
0x200D	1	The lower limit grid voltage recovery	VMinRcov	uint16	0.01	%	2000	10000
0x200E	1	The time of grid voltage recovery	VRcovT	uint16	0.01	s	0	65500
0x200F	1	The 1 st maximum operational grid frequency	GridF.Max1	uint16	0.01	Hz	5000@50Hz 6000@60Hz	5500@50Hz 6600@60Hz
0x2010	1	The 1 st maximum grid frequency trip time	FMaxTripTime_1	uint16	0.01	s	0	65500
0x2011	1	The 2 nd maximum operational grid frequency	Gridf.Max2	uint16	0.01	Hz	5000@50Hz 6000@60Hz	5500@50Hz 6600@60Hz
0x2012	1	The 2 nd maximum grid frequency trip time	FMaxTripTime_2	uint16	0.01	s	0	65500
0x2013	1	The 3 rd maximum operational grid frequency	GridF.Max3	uint16	0.01	Hz	5000@50Hz 6000@60Hz	5500@50Hz 6600@60Hz
0x2014	1	The 3 rd maximum grid frequency trip time	FMaxTripTime_3	uint16	0.01	s	0	65500
0x2015	1	The 1 st minimum operational grid frequency	GridF.Min1	uint16	0.01	Hz	4500@50Hz 5400@60Hz	5000@50Hz 6000@60Hz
0x2016	1	The 1 st minimum grid frequency trip time	FMinTripTime_1	uint16	0.01	s	0	65500
0x2017	1	The 2 nd minimum operational grid frequency	GridF.Min2	uint16	0.01	Hz	4500@50Hz 5400@60Hz	5000@50Hz 6000@60Hz
0x2018	1	The 2 nd minimum grid frequency trip time	FMinTripTime_2	uint16	0.01	s	0	65500
0x2019	1	The 3 rd minimum operational grid frequency	GridF.Min3	uint16	0.01	Hz	4500@50Hz 5400@60Hz	5500@50Hz 6600@60Hz
0x201A	1	The 3 rd minimum grid frequency trip time	FMinTripTime_3	uint16	0.01	s	0	65500

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Modbus Register	Register Size	Description	Name	Type	Multiplier	Unit	Min value	Max value
0x201B	1	The upper limit grid frequency recovery	FMaxRcov	uint16	0.01	Hz	4500@50Hz 5400@60Hz	5500@50Hz 6600@60Hz
0x201C	1	The lower limit grid frequency recovery	FMinRcov	uint16	0.01	Hz	4500@50Hz 5400@60Hz	5000@50Hz 6000@60Hz
0x201D	1	The time of grid frequency recovery	FRcovT	uint16	0.01	s	0	65500
0x201E	1	The upper limit grid voltage of moving average filter	VMaxMovAvg	uint16	0.01	%	10000	13500
0x201F	1	The trip time of the upper limit grid voltage of moving average filter	VMaxMovAvgT	uint16	0.01	s	0	65500
0x2020	1	The lower limit grid voltage of moving average filter	VMinMovAvg	uint16	0.01	%	8000	10000
0x2021	1	The trip time of the lower limit grid voltage of moving average filter	VMinMovAvgT	uint16	0.01	s	0	65500
0x2022	1	The moving average filter recovery time	VMovAvgRcovT	uint16	0.01	s	0	65500
0x2023	1	Unbalance rate of grid voltage	VUnbal	uint16	0.01	%	1	1000
Group 1 Active Power Derating Parameters								
0x2100	1	The trigger voltage of overvoltage derating	OVDeratStart	uint16	0.01	%	10000	13500
0x2101	1	The end voltage of overvoltage derating	OVDeratStop	uint16	0.01	%	10000	11000
0x2102	1	The rate of overvoltage derating	OVDeratRate	uint16	0.1	%	1	1000
0x2103	1	The filtering time of overvoltage derating	OVDeratFilterTime	uint16	1	s	1	90
0x2104	1	The trigger frequency of overfrequency derating	OFDeratStart	uint16	0.01	Hz	5000@50Hz 6000@60Hz	6000@50Hz 7200@60Hz
0x2105	1	The end frequency or Rate of overfrequency derating (Depends on the specific standard)	OFDeratStopOrRate	uint16	0.01	Hz	5000@50Hz 6000@60Hz	6000@50Hz 7200@60Hz
0x2106	1	The Rate of overfrequency derating.	OFDeratRate	uint16	0.01	%	1	10000
0x2107	1	The recovery frequency of overfrequency derating	OFDeratRcovFre	uint16	0.01	Hz	4900@50Hz 5880@60Hz	5500@50Hz 6600@60Hz
0x2108	1	The recovery time of overfrequency derating	OFDeratRcovT	uint16	1	s	0	1200
0x2109	1	The trigger frequency of underfrequency derating	UFDeratStart	uint16	0.01	Hz	4500@50Hz 5400@60Hz	5000@50Hz 6000@60Hz

Modbus Register	Register Size	Description	Name	Type	Multiplier	Unit	Min value	Max value
0x210A	1	The end frequency or Rate of underfrequency derating (Depends on the specific standard)	UFDeratStopOrRate	uint16	0.01	Hz	5000@50Hz 6000@60Hz	6000@50Hz 7200@60Hz
0x210B	1	The Ratio of underfrequency derating.	UFDeratRate	uint16	0.01	%	1	10000
0x210C	1	The recovery frequency of underfrequency derating	UFDeratRcovFre	uint16	0.01	Hz	4500@50Hz 5400@60Hz	5000@50Hz 6000@60Hz
0x210D	1	The recovery time of underfrequency derating	UFDeratRcovT	uint16	1	s	0	1200
0x210E	1	The trigger temperature of overtemperature derating	OTDeratStart	uint16	0.1	°C	0	1000
0x210F	1	The end temperature of overtemperature derating	OTDeratStop	uint16	0.1	°C	0	1000
0x2110	1	The rate of overtemperature derating	OTDeratRate	uint16	0.01	N/A	1	10000

Group 2 Reactive Power Derating Parameters

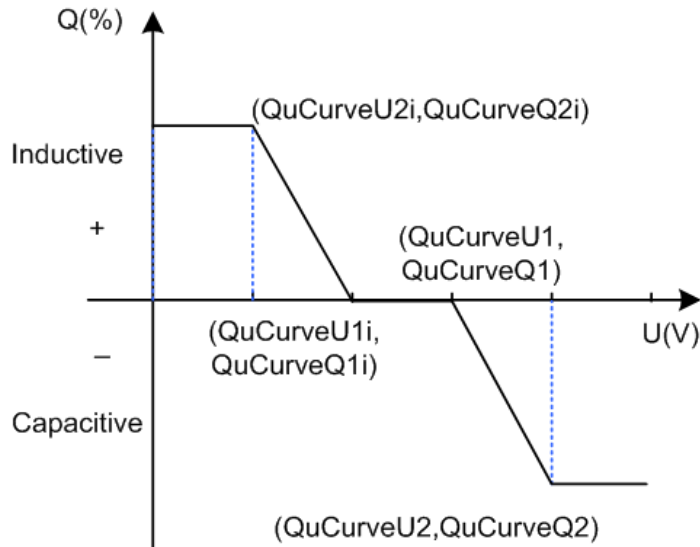


Power factor(PF) as a function of output power (P%).
 Use Registers 0x2200-0x2206
 Set register 0x1047 to 0x03 to enable this function

Note: Positive PF (+) provides VARs, Negative PF (-) absorbs VARs

0x2200	1	Local Power Factor Setting	PFLocal	int16	0.001	N/A	-1000 ~ -800	800 ~ 1000
0x2201	1	Power of PF(P)Curve point 1	PFCurveP1	uint16	0.1	%	0	1000
0x2202	1	PF of PF(P)Curve point 1	PFCurvePF1	int16	0.001	N/A	-1000 ~ -800	800 ~ 1000
0x2203	1	Power of PF(P)Curve point 2	PFCurveP2	uint16	0.1	%	0	1000

Modbus Register	Register Size	Description	Name	Type	Multiplier	Unit	Min value	Max value
0x2204	1	PF of PF(P)Curve point 2	PFCurvePF2	int16	0.001	NULL	-1000 ~ -800	800 ~ 1000
0x2205	1	The trigger voltage of PF(P)Curve	PFCurveLockInV	uint16	0.01	%	10000	11000
0x2206	1	The end voltage of PF(P)Curve	PFCurveLockOutV	uint16	0.01	%	9000	10000

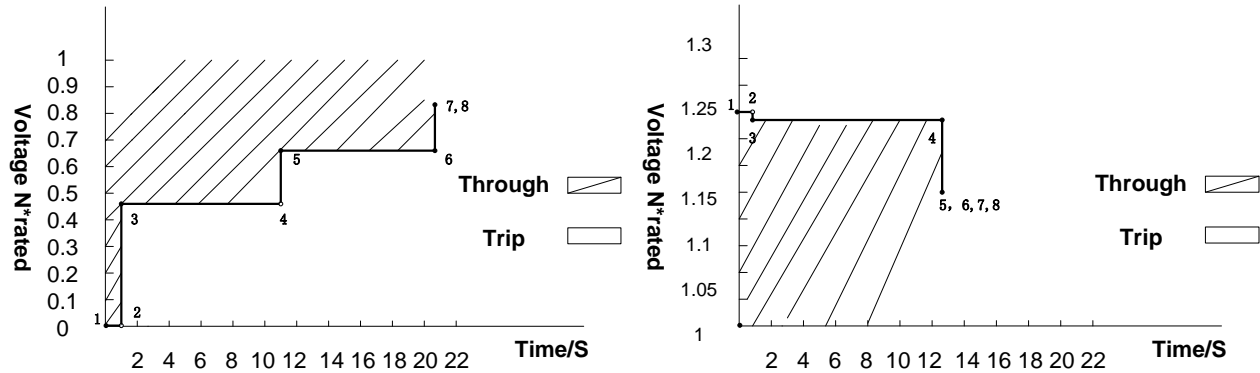


Reactive Power (Q) as a function of terminal voltage (U).
 Use Registers 0x2207-0x2210
 Set register 0x1047 to 0x04 to enable this function

0x2207	1	Voltage of Q(U)Curve point 1	QuCurveU1	uint16	0.01	%	10000	11000
0x2208	1	Reactive power of Q(U)Curve point 1	QuCurveQ1	int16	0.1	%	-600	600
0x2209	1	Voltage of Q(U)Curve point 2	QuCurveU2	uint16	0.01	%	10800	11000
0x220A	1	Reactive power of Q(U)Curve point 2	QuCurveU2	int16	0.1	%	-600	600
0x220B	1	Voltage of Q(U)Curve point 1i	QuCurveU1i	uint16	0.01	%	9000	9500
0x220C	1	Reactive power of Q(U)Curve point 1i	QuCurveQ1i	int16	0.1	%	-600	600
0x220D	1	Voltage of Q(U)Curve point 2i	QuCurveU2i	uint16	0.01	%	8000	9200
0x220E	1	Reactive power of Q(U)Curve point 2i	QuCurveU2i	int16	0.1	%	-600	600
0x220F	1	The trigger voltage of Q(U)Curve	QuCurveLockInP	uint16	0.1	%	50	1000
0x2210	1	The end voltage of Q(U)Curve	QuCurveLockOutP	uint16	0.1	%	50	1000

Modbus Register	Register Size	Description	Name	Type	Multiplier	Unit	Min value	Max value
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Group 4 LVRT/HVRT



Example LVRT and HVRT ride through curves

Use registers 0x2400-0x241F to define the voltage ride through points

Set 0x2608 to 1 to enable LVRT. Set 0x2609 to 1 to enable HVRT

For the HVRT ride through shown, point 5, 6, 7, and 8 are at the same coordinates as only 5 points were needed to draw the curve.

0x2400	1	LVRTVoltPara1	LVRTVoltPara1	uint16	0.01	%	0	10000
0x2401	1	LVRTTimePara1	LVRTTimePara1	uint16	0.01	S	0	65500
0x2402	1	LVRTVoltPara2	LVRTVoltPara2	uint16	0.01	%	0	10000
0x2403	1	LVRTTimePara2	LVRTTimePara2	uint16	0.01	S	0	65500
0x2404	1	LVRTVoltPara3	LVRTVoltPara3	uint16	0.01	%	0	10000
0x2405	1	LVRTTimePara3	LVRTTimePara3	uint16	0.01	S	0	65500
0x2406	1	LVRTVoltPara4	LVRTVoltPara4	uint16	0.01	%	0	10000
0x2407	1	LVRTTimePara4	LVRTTimePara4	uint16	0.01	S	0	65500
0x2408	1	LVRTVoltPara5	LVRTVoltPara5	uint16	0.01	%	0	10000
0x2409	1	LVRTTimePara5	LVRTTimePara5	uint16	0.01	S	0	65500

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Modbus Register	Register Size	Description	Name	Type	Multiplier	Unit	Min value	Max value
0x240A	1	LVRTVoltPara6	LVRTVoltPara6	uint16	0.01	%	0	10000
0x240B	1	LVRTTimePara6	LVRTTimePara6	uint16	0.01	S	0	65500
0x240C	1	LVRTVoltPara7	LVRTVoltPara7	uint16	0.01	%	0	10000
0x240D	1	LVRTTimePara7	LVRTTimePara7	uint16	0.01	S	0	65500
0x240E	1	LVRTVoltPara8	LVRTVoltPara8	uint16	0.01	%	0	10000
0x240F	1	LVRTTimePara8	LVRTTimePara8	uint16	0.01	S	0	65500
0x2410	1	HVRTVoltPara1	HVRTVoltPara1	uint16	0.01	%	10000	13500
0x2411	1	HVRTTimePara1	HVRTTimePara1	uint16	0.01	S	0	65500
0x2412	1	HVRTVoltPara2	HVRTVoltPara2	uint16	0.01	%	10000	13500
0x2413	1	HVRTTimePara2	HVRTTimePara2	uint16	0.01	S	0	65500
0x2414	1	HVRTVoltPara3	HVRTVoltPara3	uint16	0.01	%	10000	13500
0x2415	1	HVRTTimePara3	HVRTTimePara3	uint16	0.01	S	0	65500
0x2416	1	HVRTVoltPara4	HVRTVoltPara4	uint16	0.01	%	10000	13500
0x2417	1	HVRTTimePara4	HVRTTimePara4	uint16	0.01	S	0	65500
0x2418	1	HVRTVoltPara5	HVRTVoltPara5	uint16	0.01	%	10000	13500
0x2419	1	HVRTTimePara5	HVRTTimePara5	uint16	0.01	S	0	65500
0x241A	1	HVRTVoltPara6	HVRTVoltPara6	uint16	0.01	%	10000	13500
0x241B	1	HVRTTimePara6	HVRTTimePara6	uint16	0.01	S	0	65500
0x241C	1	HVRTVoltPara7	HVRTVoltPara7	uint16	0.01	%	10000	13500
0x241D	1	HVRTTimePara7	HVRTTimePara7	uint16	0.01	S	0	65500
0x241E	1	HVRTVoltPara8	HVRTVoltPara8	uint16	0.01	%	10000	13500
0x241F	1	HVRTTimePara8	HVRTTimePara8	uint16	0.01	S	0	65500
Group 5 Others Parameters								
0x2500	1	Startup delay time	StartDelay	uint16	1	s	1	1200
0x2504	1	Normal power step in soft stop	StopPowerStep	uint16	0.01	%	1	10000
0x2505	1	Normal power step in soft startup	PsoftStaStep	uint16	0.01	%	1	10000
0x2506	1	Normal power derating step	PDeratingStep	uint16	0.01	%	1	10000
0x250A	1	The trigger voltage of HVRT	HVRTTripVol	uint16	0.1	%	1000	1350
0x250B	1	The trigger voltage of LVRT	LVRTTripVol	uint16	0.1	%	700	1000

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Modbus Register	Register Size	Description	Name	Type	Multiplier	Unit	Min value	Max value
0x250C	1	The coefficient of positive sequence reactive current	LVRTPosCurrK	uint16	0.1	%	0	3000
0x250D	1	The coefficient of negative sequence reactive current	LVRTNegCurrK	uint16	0.1	%	0	3000
0x250E	1	Remote electric dispatch Active Power setting value	PSet_Percent	uint16	0.1	%	0	1000
0x250F	1	Remote electric dispatch Reactive Power setting value	QSet_Percent	uint16	0.1	%	-600	600
Group 6 Enable/Disable Control Parameters								
0x2600	1	The enabled control parameters group.	CtrlParaGroup	uint16	N/A	N/A	0	4
0x2601	1	The control mode of reactive power 0: Disable dispatch mode. 1: Remote dispatch mode. 2: Local control, by Q 3: Local control, by PF 4: PF(P)curve 5: Q(U) curve	ReactivePwModeSelect	uint16	N/A	N/A	0	5
0x2602	1	The control mode of active power 0: Disable dispatch mode. 1: Remote dispatch mode. 2: Local control.	ActivePwModeSelect	uint16	N/A	N/A	0	2
0x2603	1	MPPT scan enable/disable control 0: Disable 1: Enable	MPPTScanEn	uint16	N/A	N/A	0	1
0x2606	1	PV voltage at start up adjusting enable/disable control 0: Disable 1: Enable	VpvStartUpSetEn	uint16	N/A	N/A	0	1
0x2608	1	LVRT Mode 0: Disable 1: Enable, no reactive power output 2: Enable, reactive power output	LvrtMode	uint16	N/A	N/A	0	2

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Modbus Register	Register Size	Description	Name	Type	Multiplier	Unit	Min value	Max value
0x2609	1	HVRT Mode 0: Disable 1: Enable, no reactive power output	HvrtMode	uint16	N/A	N/A	0	2
0x260A	1	Soft stop enable/disable control	SoftStopEn	uint16	N/A	N/A	0	1
0x2622	1	Soft startup function 0: Disable 1: Enable	PowerMutateRatio (HECO)	uint16	N/A	N/A	0	1
Group 7 Control Command								
0x2700	1	Power on or power off device command, 0x5555 power on, 0x7777 power off	CMD_PowerOnOff	uint16	N/A	N/A	0x5555 (On)	0x7777 (Off)
0x2701	1	Device force restart command, valid value is 0x5AAA	CMD_ForceRestart	uint16	N/A	N/A	0x5AAA	0x5AAA
0x2702	1	Device factory reset command, valid value is 0x5AAA	CMD_FactoryReset	uint16	N/A	N/A	0x5AAA	0x5AAA
0x2703	1	Device auto test command, valid value is 0x5AAA	CMD_AutoTest	uint16	N/A	N/A	0x5AAA	0x5AAA
0x2704	1	MPPT scan command, valid value is 0x5AAA	CMD_MPPTScan	uint16	N/A	N/A	0x5AAA	0x5AAA
0x2705	1	Arc Detection command, valid value is 0x5AAA	CMD_ArcDetect	uint16	N/A	N/A	0x5AAA	0x5AAA
0x2707	1	Remote electric dispatch Power Factor setting value	PF_Remote	uint16	0.001	N/A	-800	800
0x2708	1	Remote electric dispatch Active Power setting value	P_Remote	uint16	0.1%	N/A	0	1000
0x2709	1	Remote electric dispatch Reactive Power setting value	Q_Remote	uint16	0.1%	N/A	-600	600
Group 9 Inverter Basic Information								
0x2901	1	DSP Firmware Version, used by Section 5: Inverter Fault Codes Descriptor	DSPFW Version	BCD	N/A	N/A	N/A	N/A
0x290C	1	Standard setting, Section 6: Standard Descriptor	GridStandard	Hex	N/A	N/A	N/A	N/A
0x290D	1	Neutral Line 0x5A5A : connected to N line 0xA5A5 : not connected to N line	NeutralLine	Hex	N/A	N/A	N/A	N/A

4. Inverter Operation States

Table 4-1 Inverter Operation State Descriptions

Modbus Register	Register Size	RD/WR	Name	Type	Units	Contents	Description
0x002F	1	RD	Mode	uint16	1	0x8000/ 0x4000/ 0x2000/ 0x1000/ 0x0800/	0x8000: Fault 0x4000: Check 0x2000: Standby 0x1000: Running 0x0800: Derate

5. Inverter Fault Codes Descriptor

Inverter fault codes are specified as individual bits in registers 0x8400 to 0x8406. When a bit is set to "1", it indicates that corresponding fault has occurred. If a bit is set to "0", it indicates that the corresponding fault has not occurred. There are 3 main categories of fault codes: *Warn*, *Protect*, and *Fault*. *Warn* means the inverter will not disconnect from the grid. *Protect* means the inverter will disconnect from the grid and will try to reconnect no sooner than 3 minutes after the fault occurred. *Fault* means the inverter will disconnect from the grid and not try to reconnect.

To determine the DSP Version (1.0 or 2.0), see holding register [2901](#).

5.1. Fault Codes for DSP Version 1.0

Table 5-1 Fault Codes for DSP Version 1.0 Register Address	Storing Data		Fault Details	LCD Display
0x8400	Warn	Bit15	Reserved	Warn0150
		Bit14	Reserved	Warn0140
		Bit13	Reserved	Warn0130
		Bi12	Reserved	Warn0120
		Bit11	Reserved	Warn0110

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		Bit10	Reserved	Warn0100
		Bit9	Reserved	Warn0090
		Bit8	Reserved	Warn0080
		Bit7	AC side MOV anomaly	Warn0070
		Bit6	Reserved	Warn0060
		Bit5	Temperature sensor anomaly	Warn0050
		Bit4	DC side lightning protection exception	Warn0040
		Bit3	EEPROM fault	Warn0030
		Bit2	Reserved	CommErr
		Bit1	Internal fan alarm	IntFanErr
		Bit0	External fan alarm	ExtFanErr
0x8401	Fault0	Bit15	Inverter current bias	Protect0010
		Bit14	Over temperature protection	TempOver
		Bit13	Grid connected relay protection	Protect0020
		Bit12	Out of phase	GridV.OutLim
		Bit11	Low frequency of power grid	GridF.OutLim
		Bit10	High frequency of power grid	GridF.OutLim
		Bit9	Inverter current too high	Protect0030
		Bit8	Grid phase voltage over limit	GridV.OutLim
		Bit7	Grid line voltage over limit	GridV.OutLim
		Bit6	PV1 High current	Protect0040
		Bit5	Reserved	N/A
		Bit4	Inverter soft start time out	Protect0050
		Bit3	Bus soft start time out	Protect0060
		Bit2	BUS difference is high	Protect0070
		Bit1	Reserved	Protect0080
Bit0	BUS sum high	Protect0090		
0x8402	Fault1	Bit15	Leakage current sensor fault	Protect0100
		Bit14	Bus hardware over voltage	Protect0110
		Bit13	Reserved	N/A

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		Bit12	Power module protection	Protect0120
		Bit11	Inverter current imbalance	Protect0130
		Bit10	Reserved	N/A
		Bit9	Unbalanced grid voltage	GridV.OutLim
		Bit8	inverter hardware over current	Protect0140
		Bit7	MCU Protect	Protect0150
		Bit6	Reserved	N/A
		Bit5	Inverter cannot identify the frequency	Protect0160
		Bit4	Leakage current is too high	GFCIErr
		Bit3	Insulation impedance is too low	IsolationErr
		Bit2	DCI High current	Protect0170
		Bit1	DCI current bias	Protect0180
		Bit0	Reserved	Protect0190
0x8403	Fault2	Bit15	Reserved	N/A
		Bit14	Reserved	Protect0290
		Bit13	Reserved	Protect0300
		Bit12	PV3 voltage is too high	PV3VoltOver
		Bit11	PV3 input reverse connection	PV3Reverse
		Bit10	PV1 voltage is too high	PV1VoltOver
		Bit9	PV1 input reverse connection	PV1Reverse
		Bit8	Reserved	N/A
		Bit7	Turn on the inverter open loop detection	Protect0230
		Bit6	Abnormal PV source input	Protect0260
		Bit5	PV2 voltage is too high	PV2VoltOver
		Bit4	PV2 input over current	Protect0240
		Bit3	PV2 reverse connection	PV2Reverse
		Bit2	Input / output power mismatch	Protect0220
		Bit1	Internal hardware exception	Protect0210
Bit0	Reserved	Protect0200		
0x8404	Fault3	Bit15	ARC protection	ARC Protect

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		Bit14	Reserved	Protect0320
		Bit13	Reserved	Protect0330
		Bit12	Reserved	Protect0340
		Bit11	Reserved	Protect0350
		Bit10	Reserved	Protect0360
		Bit9	Reserved	Protect0370
		Bit8	Reserved	Protect0380
		Bit7	Reserved	Protect0390
		Bit6	Reserved	Protect0400
		Bit5	CPLD software version exception	Protect0410
		Bit4	Abnormal product model	Protect0420
		Bit3	Abnormal source for drive hardware	Protect0430
		Bit2	Reserved	Protect0440
		Bit1	Boost Hardware overcurrent	Protect0450
		Bit0	Control board 3.3V voltage low	Protect0460
0x8405	Fault4	Bit15	Reserved	Protect0470
		Bit14	Reserved	Protect0480
		Bit13	Reserved	Protect0490
		Bit12	Reserved	Protect0500
		Bit11	Reserved	Protect0510
		Bit10	Reserved	Protect0520
		Bit9	Reserved	Protect0530
		Bit8	Reserved	Protect0540
		Bit7	Reserved	Protect0550
		Bit6	Reserved	Protect0560
		Bit5	Capture phase locked loop check exception	Protect0570
		Bit4	PV3 input over current	Protect0580
		Bit3	Reserved	Protect0590
		Bit2	Arc board fault	Arcboard Err
		Bit1	Steady state GFCI protection	Protect0610

		Bit0	Control board 5V voltage low	Protect0620
0x8406	PFault	Bit15	Control board voltage and drive power failure	Fault0160
		Bit14	Open loop self-detection failure	Fault0150
		Bit13	Internal hardware failure	Fault0140
		Bit12	Permanent fault of power module	Fault0010
		Bit11	Reserved	Fault0020
		Bit10	Reserved	Fault0030
		Bit9	Permanent fault of driver source	Fault0040
		Bit8	Inverter hardware overcurrent fault	Fault0050
		Bit7	Bus hardware overvoltage fault	Fault0060
		Bit6	DCI too high fault	Fault0070
		Bit5	Boost hardware overcurrent fault	Fault0080
		Bit4	Steady state GFCI fault	Fault0090
		Bit3	Relay fault	Fault0100
		Bit2	Bus differential high fault	Fault0110
		Bit1	Permanent fault of 3.3V voltage low	Fault0120
		Bit0	Bus sum high fault	Fault0130

5.2. Fault Codes for DSP Version 2.0

Table 5-2 Fault Codes for DSP Version 2.0

Register Address	Storing Data	Fault Details	LCD Display	
0x8400	Warn	Bit15	Reserved	Warn0150
		Bit14	Reserved	Warn0140
		Bit13	Reserved	Warn0130
		Bit12	Reserved	Warn0120
		Bit11	Reserved	Warn0110
		Bit10	AC side MOV anomaly	Warn0100
		Bit9	Reserved	Warn0090

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		Bit8	Reserved	Warn0080
		Bit7	Reserved	Warn0070
		Bit6	Reserved	Warn0060
		Bit5	Temperature sensor anomaly	Warn0050
		Bit4	DC side lightning protection exception	Warn0040
		Bit3	EEPROM fault	Warn0030
		Bit2	Reserved	CommErr
		Bit1	Internal fan alarm	IntFanErr
		Bit0	External fan alarm	ExtFanErr
0x8401	Fault0	Bit15	Inverter current bias	Protect0010
		Bit14	Over temperature protection	TempOver
		Bit13	Grid connected relay protection	Protect0020
		Bit12	Out of phase	GridV.OutLim
		Bit11	Low frequency of power grid	GridF.OutLim
		Bit10	High frequency of power grid	GridF.OutLim
		Bit9	High inverter current	Protect0030
		Bit8	Grid phase voltage over limit	GridV.OutLim
		Bit7	Grid line voltage over limit	GridV.OutLim
		Bit6	PV1 High current	Protect0040
		Bit5	Reserved	N/A
		Bit4	Inverter Soft start time out	Protect0050
		Bit3	Bus Soft start time out	Protect0060
		Bit2	BUS difference is high	Protect0070
		Bit1	Reserved	Protect0080
		Bit0	BUS sum high	Protect0090
0x8402	Fault1	Bit15	Leakage current sensor fault	Protect0100
		Bit14	Bus hardware over voltage	Protect0110
		Bit13	Reserved	N/A
		Bit12	Power module protection	Protect0120
		Bit11	Inverter current imbalance	Protect0130

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		Bit10	Reserved	N/A
		Bit9	Unbalanced grid voltage	GridV.OutLim
		Bit8	inverter hardware over current	Protect0140
		Bit7	MCU Protect	Protect0150
		Bit6	Reserved	N/A
		Bit5	Inverter cannot identify the frequency	Protect0160
		Bit4	Leakage current is too high	GFCIErr
		Bit3	Insulation impedance is too low	IsolationErr
		Bit2	DCI High current	Protect0170
		Bit1	DCI current bias	Protect0180
		Bit0	Reserved	Protect0190
0x8403	Fault2	Bit15	Reserved	N/A
		Bit14	Reserved	Protect0290
		Bit13	Reserved	Protect0300
		Bit12	PV3 voltage is too high	PV3VoltOver
		Bit11	PV3 input reverse connection	PV3Reverse
		Bit10	PV1 voltage is too high	PV1VoltOver
		Bit9	PV1 input reverse connection	PV1Reverse
		Bit8	Reserved	N/A
		Bit7	Turn on the inverter Open loop detection	Protect0230
		Bit6	Reserved	Protect0260
		Bit5	PV2 voltage is too high	PV2VoltOver
		Bit4	PV2 input over current	Protect0240
		Bit3	PV2 reverse connection	PV2Reverse
		Bit2	Reserved	Protect0220
		Bit1	Internal hardware exception	Protect0210
Bit0	Reserved	Protect0200		
0x8404	Fault3	Bit15	ARC protection	ARC Protect
		Bit14	Reserved	Protect0320
		Bit13	Hardware driver power exception	Protect0330

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		Bit12	Reserved	Protect0340
		Bit11	Reserved	Protect0350
		Bit10	Reserved	Protect0360
		Bit9	Reserved	Protect0370
		Bit8	Reserved	Protect0380
		Bit7	Reserved	Protect0390
		Bit6	Reserved	Protect0400
		Bit5	Reserved	Protect0410
		Bit4	Reserved	Protect0420
		Bit3	Reserved	Protect0430
		Bit2	Reserved	Protect0440
		Bit1	Reserved	Protect0450
		Bit0	Reserved	Protect0460
0x8405	Fault4	Bit15	Reserved	Protect0470
		Bit14	Reserved	Protect0480
		Bit13	Reserved	Protect0490
		Bit12	Reserved	Protect0500
		Bit11	Reserved	Protect0510
		Bit10	CPLD clock exception	Protect0520
		Bit9	CPLD program version exception	Protect0530
		Bit8	Product model exception	Protect0540
		Bit7	Boost hardware overcurrent	Protect0550
		Bit6	Control board 3.3V voltage low	Protect0560
		Bit5	Capture phase locked loop check exception	Protect0570
		Bit4	PV3 input over current	Protect0580
		Bit3	DC/AC overload protection	Protect0590
		Bit2	Arc board fault	Arcboard Err
		Bit1	Steady state GFCI protection	Protect0610
Bit0	Control board 5V voltage low	Protect0620		
0x8406	PFault	Bit15	Control board voltage and drive power failure	Fault0160

	Bit14	Open loop self-detection failure	Fault0150
	Bit13	Internal hardware failure	Fault0140
	Bit12	Permanent fault of power module	Fault0010
	Bit11	Bus hardware overvoltage fault	Fault0020
	Bit10	Reserved	Fault0030
	Bit9	Reserved	Fault0040
	Bit8	Inverter hardware overcurrent fault	Fault0050
	Bit7	CPLD clock failure	Fault0060
	Bit6	DCI too high fault	Fault0070
	Bit5	Boost hardware overcurrent fault	Fault0080
	Bit4	Steady state GFCI fault	Fault0090
	Bit3	Relay fault	Fault0100
	Bit2	Bus differential high fault	Fault0110
	Bit1	Reserved	Fault0120
	Bit0	Bus sum high fault	Fault0130

6. Standard Descriptor

Holding register [0x290C](#) refers to a hex value denoting which standard the inverter settings comply with, as shown below.

Table 6-1 Standard Descriptor

Standard Value	Corresponding Standards and Regulations
0	NONE
10	IEEE1547
19	Rule-21
20	HECO-HM
21	HECO-ML

7. Input Registers Data Mapping

As with the holding registers, the input registers are organized into blocks. Each block has an address range, as shown on the following table. The Modbus read function code for the input registers is 0x04.

Table 7-1 Input Register Block Address Allocation

Address range	Data type
0x8000 ~ 0x80FF	Grid status information
0x8100 ~ 0x81FF	Inverter output status information data area
0x8200 ~ 0x82FF	Inverter (PV) input status information data area
0x8300 ~ 0x83FF	Inverter internal state information data area
0x8400 ~ 0x84FF	Inverter fault status information data area

Table 7-2 Input Register Allocation

Register address	Data variable description	Unit / Storage format	Read / Write	Explanation
Grid status information				
0x8000	Line voltage Vab / Uab	0.1 V / Hex	Read	N/A
0x8001	Line voltage Vbc / Ubc	0.1 V / Hex	Read	N/A
0x8002	Line voltage Vca / Uca	0.1 V / Hex	Read	N/A
0x8003	A Phase voltage Va / Ua	0.1 V / Hex	Read	N/A
0x8004	B Phase voltage Vb / Ub	0.1 V / Hex	Read	N/A

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0x8005	C Phase voltage Vc / Uc	0.1 V / Hex	Read	N/A
0x8006	A phase power grid frequency / FreqGridR	0.1Hz / Hex	Read	N/A
0x8007	B phase power grid frequency / FreqGridS	0.1Hz / Hex	Read	N/A
0x8008	C phase power grid frequency / FreqGridT	0.1Hz / Hex	Read	N/A
0x8009	Grid phase sequence / PhaseSequence	0: NA, 1: Positive, 2: negative	Read	N/A
0x800A	Voltage unbalance degree of power network / GridVolUnbalanceDegree	0.1% / Hex	Read	N/A
0x800B	Frequency of power grid system	0.1Hz / Hex	Read	N/A
0x800C	Voltage between N line and PE in power grid	1V / Hex	Read	NPEVolt
0x800D	MiniMCU detected power grid R phase current	1A / Hex	Read	N/A
0x800E	MiniMCU detected power grid S phase current	1A / Hex	Read	N/A
0x800F	MiniMCU detected power grid T phase current	1A / Hex	Read	N/A
0x8010	MiniMCU detection power grid R phase voltage	1V/ Hex	Read	N/A
0x8011	MiniMCU detection power grid S phase voltage	1V/ Hex	Read	N/A
0x8012	MiniMCU detection power grid T phase voltage	1V/ Hex	Read	N/A
Inverter output status information data area				
0x8100	A phase current	0.1A	Read	N/A

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	/ Ia	/ Hex		
0x8101	B phase current / Ic	0.1A / Hex	Read	N/A
0x8102	C phase current / Ic	0.1A / Hex	Read	N/A
0x8103	A phase active power	0.1KW / Hex	Read	N/A
0x8104	B phase active power	0.1KW / Hex	Read	N/A
0x8105	C phase active power	0.1KW / Hex	Read	N/A
0x8106	3 phase total active power	0.1KW / Hex	Read	N/A
0x8107	A phase Reactive power	0.1KVar / Hex	Read	N/A
0x8108	B phase Reactive power	0.1KVar / Hex	Read	N/A
0x8109	C phase Reactive power	0.1KVar / Hex	Read	N/A
0x810A	3 phase Total reactive power	0.1KVar / Hex	Read	N/A
0x810B	A phase power factor	0.01 / Hex	Read	N/A
0x810C	B phase power factor	0.01 / Hex	Read	N/A
0x810D	C phase power factor	0.01 / Hex	Read	N/A
0x810E	Three phase power factor	0.1V / Hex	Read	N/A
0x810F	Inverter A phase voltage	0.1V / Hex	Read	N/A

0x8110	Inverter B phase voltage	0.1V / Hex	Read	N/A
0x8111	Inverter C phase voltage	0.1V / Hex	Read	N/A
Inverter (PV) input status information data area				
0x8200	PV connection mode / Pv Link Type	0: Not detected 1: Parallel connection 2: Independent	Read	N/A
0x8201	Total input power of DC / Pdc	0.1KW / Hex	Read	N/A
0x8202	PV voltage 1 / Upv1	0.1V / Hex	Read	N/A
0x8203	PV current 1 / Ipv1	0.1A / Hex	Read	N/A
0x8204	PV voltage 2 / Upv2	0.1V / Hex	Read	N/A
0x8205	PV current 2 / Ipv2	0.1A / Hex	Read	N/A
0x8206	PV voltage 3 / Upv3	0.1V / Hex	Read	N/A
0x8207	PV current 3 / Ipv3	0.1A / Hex	Read	N/A
0x8208	Boost1 Current	0.1A / Hex	Read	N/A
0x8209	Boost2 Current	0.1A / Hex	Read	N/A
0x820A	Boost3 Current	0.1A / Hex	Read	N/A
0x820B	Boost4 Current	0.1A / Hex	Read	N/A

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0x820C	Boost5 Current	0.1A / Hex	Read	N/A
0x820D	Boost6 Current	0.1A / Hex	Read	N/A
Inverter internal state information data area				
0x8300	Inverter operation mode / Opreation Status	Hex	Read	Refer to Inverter Operation States
0x8301	LCD switch command execution state feedback	Hex	Read	If the LCD does not send the switch command, then reply to 0xFFFF
0x8302	Module temperature	0.1°C / Hex	Read	N/A
0x8303	Internal temperature	0.1°C / Hex	Read	N/A
0x8304	Insulation impedance detection (ISO)	1KΩ / Hex	Read	N/A
0x8305	Leakage current detection value (GFCI)	1mA / Hex	Read	N/A
0x8306	A phase direct current component (DCI)	1mA / Hex	Read	N/A
0x8307	B phase direct current component (DCI)	1mA / Hex	Read	N/A
0x8308	C phase direct current component (DCI)	1mA / Hex	Read	N/A
0x8309	Positive Bus voltage	1V / Hex	Read	N/A
0x830A	Negative Bus voltage	1V / Hex	Read	N/A
0x830B	Positive and negative Bus voltage	1V / Hex	Read	N/A
0x830C	Starting the countdown	1s / Hex	Read	N/A

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0x830D	ISO sampling circuit detection voltage	1V / Hex	Read	N/A
Inverter fault status information data area				
0x8400	Internal warning failure / Warn	Hex	Read	Bit resolution: See Fault Codes for DSP Version 1.0 or Fault Codes for DSP Version 2.0
0x8401	Internal recoverable failure 1 / Fault 0			
0x8402	Internal recoverable failure 2 / Fault 1			
0x8403	Internal recoverable failure 3 / Fault 2			
0x8404	Internal recoverable failure 4 / Fault 3			
0x8405	Internal recoverable failure 5 / Fault 4			
0x8406	Internal permanent fault			