CL 30, CL 33, and CL 50 inverter:

Modbus Interface Guide

Overview

Objective

The objective of this Guide is to describe the CL 30, CL 33, and CL 50 inverter's Modbus communication capability and how its implementation can quickly and easily interface the inverter with any third-party Modbus devices.The Modbus register address map is used to configure, control, and monitor the CL Series.

The information in this document is intended for use only by qualified persons who have a detailed technical understanding of the Modbus protocol and with serial communications in general.

The Modbus map is divided into rows of Modbus registers. Each row indicates the Modbus register address, its name, data type, data range, units, and applicable notes as required.

External Modbus Master devices can read and write the Modbus registers to configure, control, or monitor the device remotely.

Document Applicability

The CL Series Device Modbus Map applies to the following products, as listed in *Table 1*.

Table 1 Applicable products

Product ID	Product Description
PVSCL30	CL 30
PVSCL33	CL 33
PVSCL50	CL 50

Schneider Electric

⚠ DANGER

RISK OF FIRE, ELECTRIC SHOCK, EXPLOSION, AND ARC FLASH

ThisGuideis in addition to, and incorporates by reference, the relevant product manuals for each product in the CL Series inverter range. Before reviewing this Guide you must read the relevant product manuals. Unless specified, information on safety, specifications, installation, and operation is as shown in the primary documentation received with the product. Ensure you are familiar with that information before proceeding.

Failure to follow these instructions will result in death or serious injury.

⚠ WARNING

UNINTENDED OPERATION

The use of this product with Modbus communications requires expertise in the design, operation, and programming of the device. Only qualified persons should program, install, alter, and commission this product. When writing values to the device, you must ensure other persons are not working with the device.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

⚠ WARNING

LOSS OF CONTROL

Do not assign the same address to two Modbus devices. The entire serial bus may behave unexpectedly if the master device cannot communicate with all the slave devices on the bus.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

Abbreviations and Acronyms

ASCII	American Standard Code for Information Interchange
CRC	Cyclic Redundancy Character
DSP	Digital Signal Processing
HMI	Human Machine Interface
ISO-flt	Isolation Fault
MPP	Maximum Power Point
PV	Photovoltaic
RTU	Remote Terminal Unit
SPD	Surge Protective Device

Introduction

Modbus is a simple and robust open communication protocol used to provide interoperability between products from many different vendors.

The CL Series inverter performs Modbus communications according to the Modbus register definition.

Key Points

- The inverter can communicate via the RS-485 serial communication only. The RS-485 allows for multiple devices on the same bus and same network.

- All communications on the network conform to a master/slave scheme. The master can be a data logger or any monitoring solution. In this scheme, information and data are transferred between a Modbus master and up to 31 slave devices.

- The master device initiates and controls all the information transfer on the Modbus serial bus network. There is only one master for any Modbus network.

- A slave device never initiates a communication sequence, and must remain silent unless addressed specifically by the master.

- All the communication activity on the Modbus serial bus network occurs in the form of packets. A packet is a serial string of up to 255 8-bit bytes.

- All packets transmitted by the master are requests. All the packets transmitted by a slave are responses.

- At most, one slave can respond to a single request from a master.

Related Documents

- *CL 30, CL 33, CL 50 Owner's Guide (document number: 990-91392)*

- *Modbus Application Protocol Specification (from www.modbus.org, version 1.1b)*

- *Modbus over Serial Line Specification and Implementation Guide (from www.modbus.org, version 1.02)*

- *SunSpec Information Model Specification (document number: 12041, version 1.9).*

- *SunSpec Inverter Models (document number: 12020, version 1.5 DRAFT).*

Modbus Physical Layer

The CL Series inverter supports the Modbus communication protocol via the RS-485 physical interface. The location of the terminals on the communication card are shown below, where the RS-485 connection can be wired through RS-485 bus terminal connectors.

A switch on the communications card connects the 120 ohm terminating resistor where it is required. The terminating resistor is required at the start and end of a daisy chain.

Modbus RS485 Connection

Figure 1 RS485 communication card connector
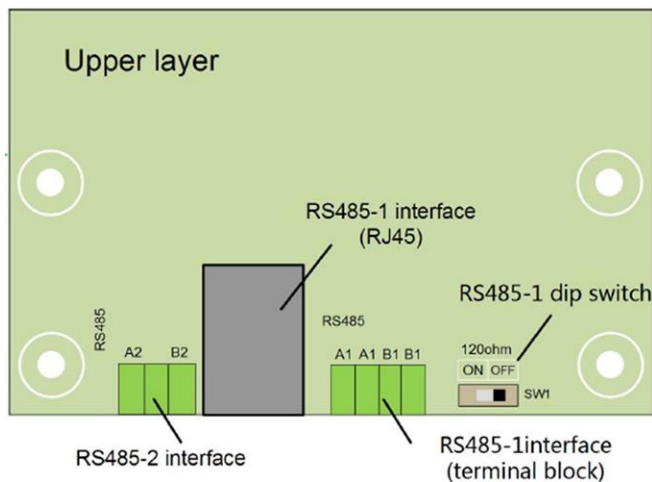
| NOTICE |
| --- |
| **RISK OF EQUIPMENT DAMAGE** |
| Make sure the other end of the Modbus (RS485) connection is also Modbus (RS485). Connection to any other type of communication port, such as Ethernet, may result in equipment damage. |
| Install a suitably rated surge protection devices on the RS485 line. |
| **Failure to follow these instructions can result in equipment damage.** |

Modbus RS485 Daisy Chain Connection

The RS-485 bus is a multi-drop bus and can be implemented as a daisy chain as shown below. The RS485 Bus terminals and connectors are provided to ease the daisy chain connection. Either port can be connected to the upstream or downstream devices.

Figure 2 Modbus daisy chain illustration
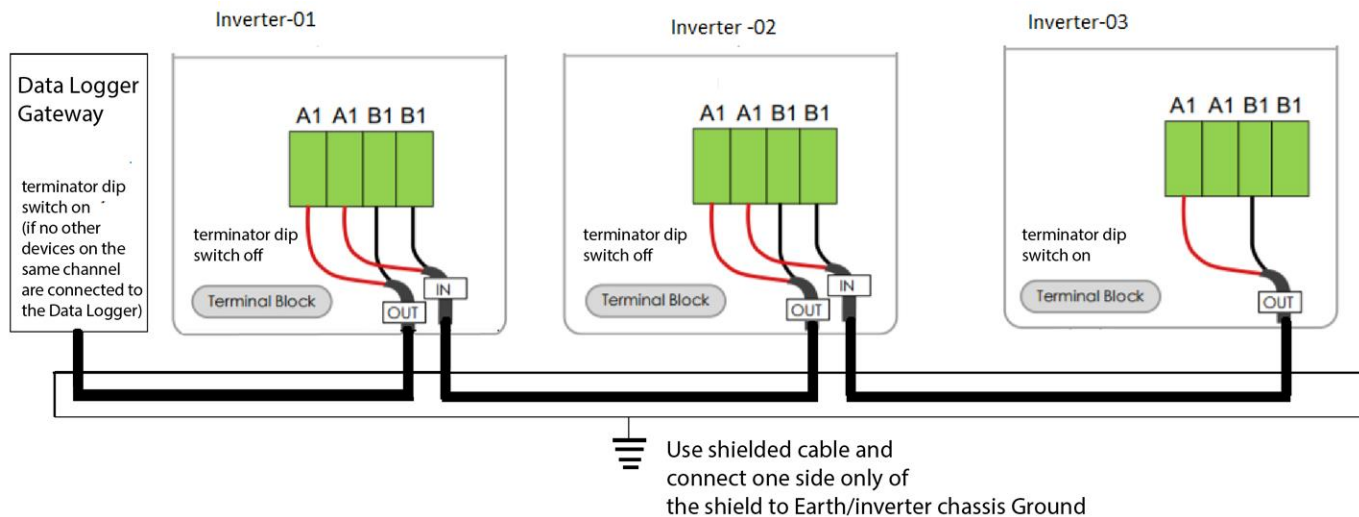
NOTE:
■ Using the incorrect pinout for the RS-485 cable and interchanging the GND pins may result in discontinuity on the network and poor communication.
■ It is recommended to use 24 AWG, 1.5 STP cable with ferrules.

Communication Parameters for RS485

Table 2 shows the communication parameters used by the RS-485 Modbus interface on the inverter.

These parameters must be set identically on the Modbus Master device or PC program used to communicate with the inverter. To determine how to set the communication parameters of the Modbus Master device, see the documentation that accompanies the device.

Table 2 Data format for the RS485 connection

| Parameter	Default Value	Allowed Values
Baud rate	9600	9600 19200
Data bits	8	8
Stop bits	1	1
Parity	None	None
Appliance interface	RS-485 two-wire cable connection	
Slave address	1	1-247

Inverter Configuration

Setting the Modbus Slave Address Through Insight Mobile App

The Modbus slave address (or Inverter ID) must be unique for each device on the Modbus network. The Modbus slave address may be read and/or modified via the Insight Mobile App. The CL Series inverter address is selected using the menus shown below.

To access the Communication parameters screen, tap **Settings** > **Setup**. This option controls the inverters Modbus RS485 communication settings.

Once the desired CL Series inverter address and baud rate is selected, press the back button to confirm the address and baud rate. The CL Series inverter address can be any number between 1 and 247.

Figure 3Setting parameters using the Insight Mobile App
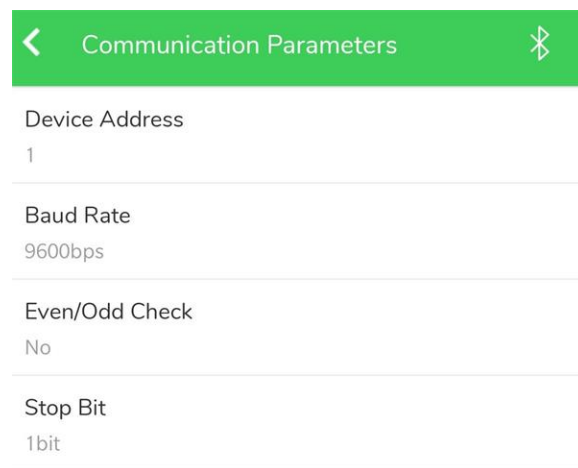
Supported Modbus Data Types

Table 3 Modbus data types

Format	Data Type	Range
UINT16	16-bit unsigned integer	0 to 65,535
INT16	16-bit signed integer	-32,768 to +32,767
UINT32	32-bit unsigned integer	0 to 4,294,967,295
INT32	32-bit signed integer	-2,147,483,648 to +2,147,483,647
UINT8	8-bit unsigned character	0 to 255

Modbus RS485 Logical Layer

Modbus Packet Structure

Every Modbus packet consists of four fields:

- Slave address field
- Function field
- Data field
- Error check field (checksum)

NOTE: The values shown in the packets are in hexadecimal format.

In *Table 4* that shows the packet structure, the DATA field of the packet is shown in cells with white background.

Table 4 Modbus packet structure

Address	Function Code	Data	Checksum

Slave Address Field

The slave address field of a Modbus packet is one byte in length and uniquely identifies the slave device involved in the transaction. Valid addresses range between 1 and 247.

A slave device performs the command specified in the packet when it receives a request packet with the slave address field matching its own address.

A response packet generated by the slave has the same value in the slave address field.

Function Field

The function field of a Modbus request packet is one byte in length and tells the addressed slave which function to perform. Similarly, the function field of a response packet tells the master what function the addressed slave has just performed.

Data Field

The data field of a Modbus request is of variable length, and depends on the function. This field contains information required by the slave device to perform the command specified in a request packet or data being passed back by the slave device in a response packet.

Data in this field is contained in 16-bit registers. Registers are transmitted in the order of high-order byte first, low-order byte second.

Example:

A 16-bit register contains the value 0x12AB. This register is transmitted:

- High order byte = 0x12
- Low order byte = 0xAB

This register is transmitted in the order 12 AB.

Error Check Field (Checksum)

The checksum field lets the receiving device determine if a packet is corrupted with transmission errors. In Modbus RTU mode, a 16-bit Cyclic Redundancy Check (CRC-16) is used.

The sending device calculates a 16-bit value, based on every byte in the packet, using the CRC-16 algorithm. The calculated value is inserted in the error check field.

The receiving device performs the calculation, without the error check field, on the entire packet it receives. The resulting value is compared to the error check field. Transmission errors are indicated when the calculated checksum does not equal the checksum stored in the incoming packet. The receiving device ignores a bad packet.

Packet Communications

This section describes the Modbus functions supported by the inverter.

Table 5 Data format for the RS485 connection

Function (Decimal /Hex)	Meaning	Action	See...
03/03h	Read Holding Registers	Reads a value from one or more consecutive holding registers in the inverter.	Function 03: Read Holding Registers Example *on page 11*
04/04h	Read Input Registers	This function code is used to read from 1 to 125 contiguous input registers in a remote device. Input registers are read-only.	
06/06h	Write Holding Registers	Writes a value into one holding register in the inverter.	Function 06h
16/10h	Write Multiple Registers	Writes a value into one or more consecutive holding registers in the inverter.	Function 16: Write Multiple Registers. Example *on page 12*

Function 03: Read Holding Registers Example

To read the inverter parameter values, a master must send the slave device (inverter) a Read Holding Registers request packet.

The Read Holding Registers request packet specifies a start register and number of registers to read (you can read one or more registers). The start register may be from 0 to 65535 (0xFFFF).

NOTE: Addresses are 0-based ("on the wire" addressing) and not 1-based ("traditional" addressing).

The inverter responds with a packet containing the values of the registers in the range defined in the request.

Table 6 Read holding registers packet structure

Request packet (master to slave)	Response packet (slave to master)
Unit ID/slave address (1 byte)	Unit ID/slave address (1 byte)
04 (function code) (1 byte)	04 (function code) (1 byte)
Start register (sr) (2 bytes)	Byte count (2 x nr) (1 byte)
# of registers to read (nr) (2 bytes)	First register in range (2 bytes)
CRC checksum	CRC checksum (2 bytes)

Example

The inverter is configured as a Modbus slave device with slave address 5. The master requests to read the MPPT1 voltage. This parameter is made available in the Modbus map at address 0x1392 with a scaling factor of 0.1V.

Table 7 Request packet

Slave	Function	Start register		# of registers (3)		CRC Checksum	
05	04	13	92	00	01	95	27

Table 8 Response packet

Slave	Function	Byte count	Register 1		CRC checksum	
05	04	02	17	70	46	E4

The master retrieves the data from the response:

- Register 0x1392: 0x1770 = 6000*0.1= 600V

Function 16: Write Multiple Registers Example

The Write Multiple Registers command packet allows a Modbus master to configure or control the slave inverter.

A Write Multiple Registers data-field request packet contains a definition of a range of registers to write to, and the values that are written to those registers.

The slave inverter responds with a packet indicating that a write was performed to the range of registers specified in the request.

The Preset Multiple Registers request and response packet formats are shown in the following example transaction.

Table 9 Preset Multiple Registers packet structure

Request packet (master to slave)	Response packet (slave to master)
Unit ID/slave address (1 byte)	Unit ID/slave address (1 byte)
16 (function code) (1 byte)	16 (function code) (1 byte)
Start register (sr) (2 bytes)	Start register (sr) (2 bytes)

# of registers to write (nr) (2 bytes)	# of registers written (nr) (2 bytes)
Byte count (2 x nr) (1 byte)	CRC checksum (2 bytes)
First register in range (2 bytes)	
Second register in range (2 bytes)	

NOTE: Except for the register data fields, the Preset Registers Response packet has the same fields as the Read Registers Request packet.

Example

Under "Active Power Control" section enable the "power limitation switch" and write the required value to "power limitation setting" registers of the inverter at Modbus address 05 (0x05).

The power limitation switch and power limitation setting are available at the registers start from 0x138E.

The value 0xAA enables the Power limitation switch to ON condition and value of 0226h reduces the active power percentage to 55%.

The tables below show the request packet and response from inverter.

Table 10 Request packet

Slave	Function (Hex)	Start register		# of registers	Byte count	Register 1		CRC Checksum	
05	10	13	8E	0002	04	0x0 0AA	0x0 226	16	D9

Table 11 Response packet

Slave	Function	Start register		# of registers (3)		CRC Checksum	
05	10	13	8E	00	02	24	E3

Broadcasts over RS485

Broadcast request packets from the master are supported. Broadcasts are valid only with Function code16 and 06, and are triggered by setting the slave address in the request packet to zero (0). All slaves will receive and execute the request, but will not respond.

NOTE: Broadcast is valid only on RS485 Modbus connection and after the broadcast, it is recommended to read back the registers and confirm the values written are valid.

Modbus Data Types

This section describes the data types supported by the inverter. The available formats may vary, depending on your inverter type and firmware.

Table 12 Modbus data types

Format	Data type	Range
UINT16	16-bit unsigned integer	0 to 65,535
INT16	16-bit signed integer	-32,768 to +32,767

UINT32	32-bit unsigned integer	0 to 4,294,967,295
INT32	32-bit signed integer	-2,147,483,648 to +2,147,483,647
UINT8	8-bit unsigned character	0 to 255

16-bit Integer Format

The unsigned and signed 16-bit integer formats are the smallest addressable units when using the Modbus protocol. Each input register to the module corresponds to one 16-bit Modbus holding register output.

32-bit Integer Format

To accommodate values that can reach beyond the 16-bit range, the Modbus Slave module provides a 32-bit integer format as an output option.

A 32-bit register is passed via communications as two 16-bit registers—one high-order register and one low-order register.

High-order register

- $register_{high}$ = value/65536

Low-order register

- $register_{low}$ = value modulus 65536

Example on unsigned 32-bit

The "Energy production Lifetime" is a 32-bit value and stored across two modbus registers at an address 0x138B as shown.

Assume the value is 234591 is stored in unsigned 32-bit integer format:

- $Register_{low(0x138B)}$ = 0x945F

- $Register_{high(0x138C)}$ = 0x0003

- value = $register_{high}$ x 65536 + $register_{low}$

- 234591 = 0x0003945F

8-bit Unsigned Character Format

The 8-bit Unsigned Character format is used to encode ASCII strings within the Modbus registers.

The characters are stored in the order they occur within the string, and populate the Most Significant Byte (MSB) of the Modbus 16-bit register followed by the Least Significant Byte (LSB) of the Modbus 16-bit register. For example, the serial number of inverters strored in register 0x137D of size 10 as a ASCII string "A19120XXXX".

Table 13 Modbus ASCII string encoding example

Register 1		Register 2		Register 3	
0x137D		0x137E		0x137F	
41	31	39	31	32	30

Modbus Event Responses

If the inverter receives an unsupported Modbus request, it returns an exception response informing the Modbus master of the nature of the event.

The Modbus Event Response message has two fields that differentiate it from a normal response: Function Code Field and Data Field.

Function Code Field

In a normal response, the inverter echoes the function code of the original request in the function code field of the response. All the function codes have a most-significant bit (MSB) of 0 (their values are all below 0x80).

In an exception response, the inverter sets the MSB of the function code to 1. This makes the function code value in an exception response exactly 0x80 higher than the value for a normal response. For example, a normal response of 0x03 (Read Holding Registers), becomes 0x83 (Unable to Read Holding Registers).

Data Field

In an event response, the inverter uses the data field of the response packet to return an event code to the Modbus Master. Four error codes are supported, as shown in the table below.

Table 14 Modbus error codes

Event code	Event name	Event description
01	Illegal Function	The inverter does not support the function code specified in the Modbus Request Packet.
02	Illegal Address	The address range specified in the Modbus Request Packet contains an illegal register address. **NOTE:** Refer to *Table 5* for supported function
03	Illegal Data Value	The Modbus Request Packet contains an illegal number of bytes in the data field. **NOTE:** All unused address contains a value 0xFF and no exception occurs in CL Series.
04	Slave Device Error	An unrecoverable event occurred while the inverter (slave) was attempting to perform the requested action

Registers

This section describes the Modbus registers for the CL Series.

Section 1: Operation Variables

Read operation variables using Modbus function code 0x04

Modbus Address	Register Description	Data type	Data Range/ Default Value	Unit	Notes
0x137D	Serial Number	UTF-8			Data type :UTF-8 Example: A912071368
0x1387	Device type code	U16			Device code for CL 30 = 0x2C1B Device code for CL 33 = 0x2C17 Device code for CL 50 = 0x2C18
0x1388	Nominal active power	U16		0.1kW	
0x1389	Output type	U16	0-two phase; 1-3P4L; 2-3P3L		
0x138A	Daily power yields	U16		0.1 kWh	
0x138B	Total power yields	U32		kWh	
0x138D	Total running time	U32		h	
0x138F	Internal temperature	S16		0.1℃	
0x1390	Total apparent power	U32		VA	
0x1392	MPPT 1 voltage	U16		0.1V	Valid for inverters: CL 30 CL 33 CL 50
0x1393	MPPT 1 current	U16		0.1A	
0x1394	MPPT 2 voltage	U16		0.1V	
0x1395	MPPT 2 current	U16		0.1A	
0x1396	MPPT 3 voltage	U16		0.1V	
0x1397	MPPT 3 current	U16		0.1A	
0x1398	Total DC power	U32		W	
0x139A	A-B line voltage/phase A voltage	U16		0.1 V	Output type (address: x1389) is 1: upload phase voltage; 2: upload line voltage

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Modbus Address	Register Description	Data type	Data Range/ Default Value	Unit	Notes
0x139B	B-C line Voltage/phase B Voltage	U16		0.1 V	Output type (address: 5002) is 1: upload phase voltage; 2: upload line
0x139C	C-A line Voltage/Phase C voltage	U16		0.1 V	Output type (address: 5002) is 1: upload phase voltage; 2: upload line voltage
0x139D	Phase A current	U16		0.1 A	
0x139E	Phase B current	U16		0.1 A	
0x139F	Phase C current	U16		0.1 A	
0x13A6	Total active power	U32		W	
0x13A8	Total reactive power	S32		var	
0x13AA	Power factor	S16		0.001	>0 means leading <0 means lagging
0x13AB	Grid frequency	U16		0.1 Hz	
0x13AD	Operating State	U16			Data of address 5039 – 5045 are additional Event/Alarm code (5039 – 5045) are valid only when the device work state is event (0x5500) or alarm (0x9100).
0x13AE	Event/Alarm time: Year	U16			
0x13AF	Event/Alarm time: Month	U16			
0x13B0	Event/Alarm time: Day	U16			
0x13B1	Event/Alarm time: Hour	U16			
0x13B2	Event/Alarm time: Minute				
0x13B3	Event/Alarm time: Second	U16			
0x13B4	Event/Alarm code	U16			
0x13B8	Nominal reactive power	U16		0.1kvar	
0x13CE	Array insulation resistance	U16	1- 20000 (0xFFFF: Invalid)	1kΩ	
0x13CF	Reserved				

Modbus Address	Register Description	Data type	Data Range/ Default Value	Unit	Notes
0x13F8	Daily running time	U16		1min	
0x13FA	MPPT 4 voltage	U16		0.1V	Valid for inverters: CL 50
0x13FB	MPPT 4 current	U16		0.1A	Valid for inverters: CL 50
0x13FC	MPPT 5 voltage	U16		0.1V	Valid for inverters: CL 50
0x13FD	MPPT 5 current	U16		0.1A	Valid for inverters: CL 50
0x1407	Monthly power Yields	U32		0.1kWh	
0x1416	Reserved				
0x1417	Total power yields	U32		0.1kWh	(Display accuracy increased to 0.1Kwh)
0x1419	Negative voltage to the ground	S16	-15000~15000	0.1V	
0x141A	Bus voltage	U16	0 – 15000	0.1V	
0x141B	Grid frequency	U16		0.01Hz	(Display accuracy increased to 0.01Hz)
0x141C	Reserved	U16	0~15000	0.1V	
0x141D	PID work state	U16	2: PID Recover Operation 4: Anti-PID Operation 8: PID Abnormity		
0x141E	PID alarm code	U16	432: PID res abnormal 433: PID function abnormal 434: PID overvolt/overcurrent protection		

Modbus Address	Register Description	Data type	Data Range/ Default Value	Unit	Notes
0x1B64	String 1 current	U16	0.01A		
0x1B65	String 2 current	U16	0.01A		
0x1B66	String 3 current	U16	0.01A		
0x1B67	String 4 current	U16	0.01A		
0x1B68	String 5 current	U16	0.01A		CL 30: 6 strings: 0x1B64-0x1B69
0x1B69	String 6 current	U16	0.01A		CL 33: 6 strings: 0x1B64-0x1B69
0x1B6A	String 7 current	U16	0.01A		CL 50: 10 strings: 0x1B64-0x1B6D
0x1B6B	String 8 current	U16	0.01A		
0x1B6C	String 9 current	U16	0.01A		
0x1B6D	String 10 current	U16	0.01A		

Section 2: Configuration Parameters

Read configuration parameters using Modbus function code 0x03.

Write configuration parameters using Modbus function codes 0x06 or 0x10.

Table 15 Configuration parameters

Modbus Address	Register Description	Data Type	Data Range/ Default Value	Units	Notes
0x1387	System clock Year	U16			Set date and time. It is recommended that the monitoring system writes date and time, so that the inverter time is in sync with the monitoring system.
0x1388	System clock Month	U16	1 – 12		
0x1389	System clock Day	U16	1 – 31		
0x138A	System clock Hour	U16	0 – 23		
0x138B	System clock Minute	U16	0 – 59		
0x138C	System clock Second	U16	0 – 59		
0x138D	Start/Stop Inverter	U16	0xCF: Start 0xCE: Stop		
0x138E	Power limitation switch	U16	0xAA: Enable 0x55: Disable		
0x138F	Power limitation settings	U16	0 – 1100	0.001	Available when the power limitation switch (0x138E) is enabled
0x1390	Reserved	U16			
0x139A	Power factor setting	U16	-1000 – (-800) 800 – 1000	0.001	Available when the reactive power adjustment switch (0x13AB) is set to power factor setting valid (0xA1) > 0 means leading < 0 means lagging
0x139B	Reserved	U16			
0x13AA	Night SVG Switch	U16	0xAA: Enable 0x55: Disable		
0x13AB	Reactive power adjustment mode	U16	0x55: OFF, power factor returns to 1, reactive power percentage returns to 0; 0xA1: Power factor setting valid, reactive power percentage returns to 0 ; 0xA2: Reactive power percentage setting valid, power factor returns to 1 ; 0xA3: Enable Q(P) curve configuration; 0xA4: Enable Q(U) curve configuration		
0x13AC	Reactive power percentage setting	S16	0-1000 -1000-0	0.001	Available when the reactive power adjustment switch (5036) is set to Reactive power percentage setting valid (0xA2).
0x13AD	Reserved	U16			

Modbus Address	Register Description	Data Type	Data Range/ Default Value	Units	Notes
0x13AE	Power limitation adjustment	U16	CL 30: 0-300 CL 33: 0-363 CL 50: 0-550	0.1 kW	
0x13AF	Reactive power adjustment	S16	CL 30: 0-198 CL 33: -218~218 CL 50: -330~330	0.1 kVar	
0x13B0	PID Recovery	U16	0xAA: Enable; 0x55: Disable		
0x13B1	Reserved	U16			
0x13FB	Q(P) Curve	U16	See *Section 3: Inverter Operating States*		The reactive power adjustment switch (5036) is set to Enable Q(P) curve (0xA3)
0x140E	Q(U) Curve	U16	See *Section 4: Country Code Information*		The reactive power adjustment switch (5036) is set to Enable Q(U) curve (0xA4)
0x1422	Reserved	U16			

Section 3: Inverter Operating States

Device Operating State (0x13AD)			
State	**Values in Hex**	**Values in Decimal**	**Note**
Run	0	0	
Stop	0x8000	32768	
Key Stop	0x1300	4864	
Emergency Stop	0x1500	5376	
Standby	0x1400	5120	
Initial Standby	0x1200	4608	
Starting	0x1600	5632	
Alarm run	0x9100	37120	
Derating Run	0x8100	33024	
Dispatch Run	0x8200	33280	
Event	0x5500	21760	

Section 4: Country Code Information

Table 16 Country code Information

Code	Country short name	Country	Note
0	GB	Great Britain	
1	DE	Germany	
2	FR	France	
3	IT	Italy	
4	ES	Spain	
5	AT	Austria	
6	AU	Australia	
7	CZ	Czech	
8	BE	Belgium	
9	DK	Denmark	
10	GR_L	Greece Land	
11	GR_IS	Greece Island	
12	NL	Netherlands	
13	PT	Portugal	
14	CHN	China	
15	SE	Sweden	
16	Other 50Hz		
17	RO	Romania	
18	TH	Thailand	
19	TK	Turkey	
20	AU-WEST	Australia (west)	
21	Reserved		
25	Vorarlberg (Austria)	Vorarlberg	District
26-59	Reserved		
60	CA	Canada	
61	US	America	
62	Other 60Hz		
70	JP 50Hz		
71	JP 60Hz		

Section 5: Alarm Codes

NOTE: If any problems persist, contact technical support at: http://solar.schneider-electric.com/tech-support.

Table 17 Alarm codes

Alarm Code (Decimal)	Alarm Code (Hex)	Description	Note
2	0x0002	The grid voltage exceeds the inverter's permissible range. NOTE: Protection time and protection thresholds depend on the utility's requirements.	Measure the grid voltage. Follow instructions in the DANGER message *on page 2*. If the grid voltage exceeds the inverter's permissible range, contact the utility company for suggestions. If the grid voltage is within the inverter's permissible range, contact technical support.
3	0x0003	Grid transient voltage exceeds the permissible range.	This is a short term event caused by transients in the grid. Wait for the inverter to recover automatically. If the problem persists, contact technical support.
4	0x0004	The grid voltage is below the inverter's permissible lower limit. **NOTE:** Protection time and protection thresholds depend on the utility's requirements.	Measure the grid voltage. Follow instructions in the DANGER message *on page 2*. If the measured grid voltage is below the permissible operational limit, contact the utility company for suggestions. If the measured grid voltage is within the permissible operating range of the inverter and the event persists, contact technical support.
5	0x0005	The grid voltage is below the utility's under- voltage protection limit.	This could be a short term event due to grid conditions. Wait for the inverter to recover automatically. If the problem persists, contact technical support.
6	0x0006	The AC output current exceeds the inverter's protection limit.	The inverter will resume operation when the AC output current falls below the protection limit. If the event persists, contact technical support.
7	0x0007	Transient AC over current	This may be a short term event. The inverter can recover automatically. Wait for a few minutes for the inverter to recover but if the event persists, contact technical support.
8	0x0008	The grid frequency exceeds the inverter's permissible operating upper limit.	Measure the grid frequency. Follow instructions in the DANGER message *on page 2*. If the grid frequency is within the permissible operating range of the inverter and the event persists, contact technical support.
9	0x0009	The grid frequency is below the inverter's permissible operating lower limit.	If the grid frequency is not within the permissible operating range of the inverter, contact the utility company for suggestions.

Alarm Code (Decimal)	Alarm Code (Hex)	Description	Note
10	0x000A	Islanding	Check whether the AC breaker at the AC combiner box is turned ON. Check whether the inverter's AC disconnect switch is turned ON. Measure the grid voltage at the AC connection to the inverter. Follow instructions in the DANGER message *on page 2*. Check whether AC cables are all properly connected. Check whether the grid is in service. If the problem persists, contact technical support.
11	0x000B	The DC component of the AC current exceeds the inverter's limit.	This may be a short term event. The inverter can recover automatically. Wait for a few minutes for the inverter to recover but if the event persists, contact technical support.
12	0x000C	Residual current leakage detected is high.	Check whether the insulation is low on the PV array or a higher leakage current in the inverter. If the problem persists, contact technical support.
13	0x000D	A grid condition event is detected that is outside of normal operations.	This condition may occur when grid voltage exceeds or falls below the inverter's permissible operating range. Contact the utility company for suggestions. The inverter can recover automatically. Wait for a few minutes for the inverter to recover but if the event persists, contact technical support.
14	0x000E	Average grid over-voltage (10 minutes)	This condition occurs when grid voltage exceeds the inverter's permissible operating limit for an average of 10 minutes. Contact the utility company for suggestions. The inverter can recover automatically. Wait for a few minutes for the inverter to recover but if the event persists, contact technical support.
15	0x000F	Grid overvoltage	Verify that the type and size of AC cables as well as transformer impedance are specified according to the CL Series Solution Guides (located on the product pages at https://solar.schneider-electric.com/) or local electrical regulations. Wait for the inverter to recover automatically. If the problem persists, contact technical support.
16	0x0010	AC output overload	Wait for the inverter to recover automatically. If the problem persists, contact technical support.
17	0x0011	Grid voltage imbalance	Wait for the inverter to recover automatically. Test the grid voltage to confirm the imbalance. If the problem persists, contact technical support.

Alarm Code (Decimal)	Alarm Code (Hex)	Description	Note
19	0x0013	High transient DC bus voltage	Wait for the inverter to recover automatically. If the problem persists, contact technical support.
20	0x0014	High DC bus voltage	Wait for the inverter to recover automatically. If the problem persists, contact technical support.
21	0x0015	PV input over current	Check the PV configuration and connection. If the problem persists, contact technical support.
22	0x0016	Over current protection	If the grid or PV current is within the permissible operating range of the inverter and the event persists, contact technical support.
23	0x0017	PV configuration mode has changed during normal operation.	Check the PV configuration. Restart the inverter.
24	0x0018	Voltage imbalance at neutral point	Wait for the inverter to recover automatically when the deviation falls within the permissible range. If the problem persists, contact technical support.
25	0x0019	Transient unbalance of voltage neutral point	Wait for the inverter to recover automatically when the deviation falls within the permissible range. If the problem persists, contact technical support.
30	0x001E	Clamp capacitance over-voltage event is detected.	Wait for the inverter to recover automatically. If the problem persists, contact technical support.
31	0x001F	Clamp capacitance under-voltage event is detected.	Wait for the inverter to recover automatically. If the problem persists, contact technical support.
32	0x0020	Clamp capacitance imbalance event is detected.	Wait for the inverter to recover automatically. If the problem persists, contact technical support.
33	0x0021	Clamp capacitance pre-charge ground fault is detected	Wait for the inverter to recover automatically. If the problem persists, contact technical support.
34	0x0022	??	Wait for the inverter to recover automatically. If the problem persists, contact technical support.
36	0x0024	Module temperature is too high.	Verify that the DC input power is not greater than the DC:AC ratio of 1.5. If it is, then reduce DC input power. Check whether the inverter is directly placed under the sun and intense sun exposure is causing the inverter's module temperature to rise. Install a proper shade to shield the inverter from direct sunlight. If the problem persists, contact technical support.

Alarm Code (Decimal)	Alarm Code (Hex)	Description	Note
37	0x0025	Internal ambient temperature is too high.	Check the functionality of the fans. Replace any broken fan if necessary.?? We removed fan replacement from the Owner's manual?? Clean the air outlet grates. If the problem persists, contact technical support.
38	0x0026	Line tie relay contacts have welded or are open.	Wait for the inverter to recover automatically. If the problem persists, contact technical support.
39	0x0027	Inverter insulation resistance event (ISO-flt)	Wait for the inverter to recover automatically. Test for insulation damages in the wiring. If the problem persists, contact technical support.
40	0x0028	AC (or DC) over-current or DC over- voltage event is detected.	Wait for the inverter to recover automatically. If the problem persists, contact technical support.
41	0x0029	Current leakage sampling channel event	Wait for the inverter to recover automatically. If the problem persists, contact technical support.
42	0x002A	AC current imbalance	Wait for the inverter to recover automatically. If the problem persists, contact technical support.
43	0x002B	The ambient temperature falls below - 25 °C (-13 °F)	Stop operating the inverter and disconnect it from all power sources. Wait for the ambient temperature to rise within the permissible operating range and then restart the inverter.
44	0x002C	DC/AC inversion circuit event	Wait for the inverter to recover automatically. If the problem persists, contact technical support.
47	0x002F	PV configuration mode set on the HMI does not match the design.	Disconnect the inverter from all power sources. See the *CL 30, CL 33, CL 50 Owner's Guide (document number: 990-91392)* for more information under PV Array Connection to reconnect the PV strings and reselect PV configuration mode.
48	0x0030	Phase-R current sampling channel event	Wait for the inverter to recover automatically. If the problem persists, contact technical support.
49	0x0031	Phase-S current sampling channel event	Wait for the inverter to recover automatically. If the problem persists, contact technical support.
50	0x0032	Phase-T current sampling channel event	Wait for the inverter to recover automatically. If the problem persists, contact technical support.

Alarm Code (Decimal)	Alarm Code (Hex)	Description	Note
53	0x0035	Grid voltage redundancy event is detected.	Measure the grid voltage. Follow instructions in the DANGER message *on page 2*. If the measured grid voltage exceeds the permissible operational limit, contact the utility company for suggestions. If the problem persists, contact technical support.
54	0x0036	Grid frequency redundancy event is detected.	Measure the grid frequency. Follow instructions in the DANGER message *on page 2*. If the grid frequency exceeds the inverter's permissible range, contact the utility company for suggestions. If the problem persists but the grid frequency is within the inverter's permissible range, contact technical support.
55	0x0037	Inverter insulation resistance redundancy event is detected.	Wait for the inverter to recover automatically. If the problem persists, contact technical support.
56	0x0038	Inverter leakage current redundancy event is detected.	Check if there is a ground fault at the PV string. If the problem persists, contact technical support.
59	0x003B	Main DSP communication redundancy event is detected.	Wait for the inverter to recover automatically. If the problem persists, contact technical support.
60	0x003C	Main DSP data comparison event is detected.	Wait for the inverter to recover automatically. If the problem persists, contact technical support.
70	0x0046	Fan event	Stop operating the inverter by disconnecting it from all power sources. Remove and replace the fan. .?? We removed fan replacement from the Owner's manual?? See the *CL 30, CL 33, CL 50 Owner's Guide (document number: 990-91392)* for more information. To know which fan is affected, refer to the fan operation status in the HMI. If the problem persists, contact technical support.
71	0x0047	AC side SPD event	For AC SPD, contact technical support.
72	0x0048	DC side SPD event	For DC SPD, see the *CL 30, CL 33, CL 50 Owner's Guide (document number: 990-91392)* for more information. ??I'm not sure we have any info on servicing SPDs in the Owner's guide??
74	0x004A	Communication event	An event has occurred in the internal communication of the inverter. However, the inverter continues feeding into the grid. If the problem persists, contact technical support.

Alarm Code (Decimal)	Alarm Code (Hex)	Description	Note
75	0x004B	Solar irradiation is not sufficient for inverter operation	Wait for sufficient sunlight. If this event recurs when irradiation is sufficient, check the PV system design and adjust the connection of PV inputs.
76	0x004C	PV overload condition	Check the PV system design and adjust the connection of PV inputs.
78	0x004E	PV 1 power event warning	Check the PV input terminals for loose connections. Tighten the connections according to torque specifications found in the *CL 30, CL 33, CL 50 Owner's Guide (document number: 990-91392)* for more information. If the problem persists, contact technical support.
79	0x004F	PV 2 power event warning	Check the PV input terminals for loose connections. Tighten the connections according to torque specifications found in the *CL 30, CL 33, CL 50 Owner's Guide (document number: 990-91392)* for more information. If the problem persists, contact technical support.
80	0x0050	PV 3 power event warning	Check the PV input terminals for loose connections. Tighten the connections according to torque specifications found in the *CL 30, CL 33, CL 50 Owner's Guide (document number: 990-91392)* for more information. If the problem persists, contact technical support.
81	0x0051	PV 4 power event warning	Check the PV input terminals for loose connections. Tighten the connections according to torque specifications found in the *CL 30, CL 33, CL 50 Owner's Guide (document number: 990-91392)* for more information. If the problem persists, contact technical support.
87	0x0057	AFD module abnormal	Refer to the *CL 30, CL 33, CL 50 Owner's Guide (document number: 990-91392)* for more information. If the problem persists, contact technical support.
88	0x0057	AFD module abnormal	Refer to the *CL 30, CL 33, CL 50 Owner's Guide (document number: 990-91392)* for more information. If the problem persists, contact technical support.
89	0x0059	AFD module Disabled	Refer to the *CL 30, CL 33, CL 50 Owner's Guide (document number: 990-91392)* for more information. If the problem persists, contact technical support.
105	0x0069	Self test did not pass	Refer to the *CL 30, CL 33, CL 50 Owner's Guide (document number: 990-91392)* for more information. If the problem persists, contact technical support.

Alarm Code (Decimal)	Alarm Code (Hex)	Description	Note
106	0x006A	Grounding cable event	Refer to the *CL 30, CL 33, CL 50 Owner's Guide (document number: 990-91392)* for more information. If the problem persists, contact technical support.
116	0x0074	Device abnormal	Refer to the *CL 30, CL 33, CL 50 Owner's Guide (document number: 990-91392)* for more information. If the problem persists, contact technical support.
117	0x0075	Device abnormal	Refer to the *CL 30, CL 33, CL 50 Owner's Guide (document number: 990-91392)* for more information. If the problem persists, contact technical support.
220	0x00DC	PV5 abnormal	Refer to the *CL 30, CL 33, CL 50 Owner's Guide (document number: 990-91392)* for more information. If the problem persists, contact technical support.
532	0x0214	String 1 reverse connection alarm	Refer to the *CL 30, CL 33, CL 50 Owner's Guide (document number: 990-91392)* for more information. If the problem persists, contact technical support.
533	0x0215	String 2 reverse connection alarm	Refer to the *CL 30, CL 33, CL 50 Owner's Guide (document number: 990-91392)* for more information. If the problem persists, contact technical support.
534	0x0216	String 3 reverse connection alarm	Refer to the *CL 30, CL 33, CL 50 Owner's Guide (document number: 990-91392)* for more information. If the problem persists, contact technical support.
535	0x0217	String 4 reverse connection alarm	Refer Conext CL30/33/50 Owner's Guide (document number: 975-xxxx-xx-xx for more information. If the problem persists, contact technical support
536	0x0218	String 5 reverse connection alarm	Refer to the *CL 30, CL 33, CL 50 Owner's Guide (document number: 990-91392)* for more information. If the problem persists, contact technical support.
537	0x0219	String 6 reverse connection alarm	Refer to the *CL 30, CL 33, CL 50 Owner's Guide (document number: 990-91392)* for more information. If the problem persists, contact technical support.
538	0x021A	String 7 reverse connection alarm	Refer to the *CL 30, CL 33, CL 50 Owner's Guide (document number: 990-91392)* for more information. If the problem persists, contact technical support.

Alarm Code (Decimal)	Alarm Code (Hex)	Description	Note
539	0x021B	String 8 reverse connection alarm	Refer to the *CL 30, CL 33, CL 50 Owner's Guide (document number: 990-91392)* for more information. If the problem persists, contact technical support.
540	0x021C	String 9 reverse connection alarm	Refer to the *CL 30, CL 33, CL 50 Owner's Guide (document number: 990-91392)* for more information. If the problem persists, contact technical support.
541	0x021D	String 10 reverse connection alarm	Refer to the *CL 30, CL 33, CL 50 Owner's Guide (document number: 990-91392)* for more information. If the problem persists, contact technical support.
548	0x0224	String 1 abnormal alarm	Refer to the *CL 30, CL 33, CL 50 Owner's Guide (document number: 990-91392)* for more information. If the problem persists, contact technical support.
549	0x0225	String 2 abnormal alarm	Refer to the *CL 30, CL 33, CL 50 Owner's Guide (document number: 990-91392)* for more information. If the problem persists, contact technical support.
550	0x0226	String 3 abnormal alarm	Refer to the *CL 30, CL 33, CL 50 Owner's Guide (document number: 990-91392)* for more information. If the problem persists, contact technical support.
551	0x0227	String 4 abnormal alarm	Refer to the *CL 30, CL 33, CL 50 Owner's Guide (document number: 990-91392)* for more information. If the problem persists, contact technical support.
552	0x0228	String 5 abnormal alarm	Refer to the *CL 30, CL 33, CL 50 Owner's Guide (document number: 990-91392)* for more information. If the problem persists, contact technical support.
553	0x0229	String 6 abnormal alarm	Refer to the *CL 30, CL 33, CL 50 Owner's Guide (document number: 990-91392)* for more information. If the problem persists, contact technical support.
554	0x022A	String 7 abnormal alarm	Refer to the *CL 30, CL 33, CL 50 Owner's Guide (document number: 990-91392)* for more information. If the problem persists, contact technical support.
555	0x022B	String 8 abnormal alarm	Refer to the *CL 30, CL 33, CL 50 Owner's Guide (document number: 990-91392)* for more information. If the problem persists, contact technical support.

Alarm Code (Decimal)	Alarm Code (Hex)	Description	Note
556	0x022C	String 9 abnormal alarm	Refer to the *CL 30, CL 33, CL 50 Owner's Guide (document number: 990-91392)* for more information. If the problem persists, contact technical support.
557	0x022D	String 10 abnormal alarm	Refer to the *CL 30, CL 33, CL 50 Owner's Guide (document number: 990-91392)* for more information. If the problem persists, contact technical support.
448	0x01C0	String 1 reverse connection event	Refer to the *CL 30, CL 33, CL 50 Owner's Guide (document number: 990-91392)* for more information. If the problem persists, contact technical support.
449	0x01C1	String 2 reverse connection event	Refer to the *CL 30, CL 33, CL 50 Owner's Guide (document number: 990-91392)* for more information. If the problem persists, contact technical support.
450	0x01C2	String 3 reverse connection event	Refer to the *CL 30, CL 33, CL 50 Owner's Guide (document number: 990-91392)* for more information. If the problem persists, contact technical support.
451	0x01C3	String 4 reverse connection event	Refer to the *CL 30, CL 33, CL 50 Owner's Guide (document number: 990-91392)* for more information. If the problem persists, contact technical support.
452	0x01C4	String 5 reverse connection event	Refer to the *CL 30, CL 33, CL 50 Owner's Guide (document number: 990-91392)* for more information. If the problem persists, contact technical support.
453	0x01C5	String 6 reverse connection event	Refer to the *CL 30, CL 33, CL 50 Owner's Guide (document number: 990-91392)* for more information. If the problem persists, contact technical support.
454	0x01C6	String 7 reverse connection event	Refer to the *CL 30, CL 33, CL 50 Owner's Guide (document number: 990-91392)* for more information. If the problem persists, contact technical support.
455	0x01C7	String 8 reverse connection event	Refer to the *CL 30, CL 33, CL 50 Owner's Guide (document number: 990-91392)* for more information. If the problem persists, contact technical support.
456	0x01C8	String 9 reverse connection event	Refer to the *CL 30, CL 33, CL 50 Owner's Guide (document number: 990-91392)* for more information. If the problem persists, contact technical support.

Alarm Code (Decimal)	Alarm Code (Hex)	Description	Note
457	0x01C9	String 10 reverse connection event	Refer to the *CL 30, CL 33, CL 50 Owner's Guide (document number: 990-91392)* for more information. If the problem persists, contact technical support.

Event Code	Event Code (Hex)	Description	Solution
002	0x0002	The grid voltage exceeds the inverter's allowable range. Protection time and protection thresholds depend on the country's requirements.	Generally, the inverter will be reconnected to the grid after the grid returns to normal. If the event occurs repeatedly: 1. Measure the grid voltage. Follow the DANGER message at the beginning of this chapter. 2. Check whether the protection parameters are appropriately set via the Related Products 3. 3. Check whether the cross-sectional area of the AC cable meets the requirement. 4. Check if voltage drops are within acceptable limits. If the grid voltage exceeds the inverter's allowable range, contact the utility company for suggestions.
003	0x0003	Grid transient voltage exceeds the allowable range.	This is a short term event caused by the grid. Wait for the inverter to recover automatically. If the problem persists, contact technical support.

004	0x0004	The grid voltage is below the inverter's allowable lower limit. Protection time and protection thresholds depend on the country's requirements.	Generally, the inverter will be reconnected to the grid after the grid returns to normal. If the event occurs repeatedly: 1. Measure the grid voltage. Follow the DANGER message at the beginning of this chapter. 2. Check whether the protection parameters are appropriately set via the Related Products 3. 3. Check whether the AC cable is firmly in place. 4. Check if voltage drops are within acceptable limits. If the grid voltage is lower than the inverter's allowable range, contact the utility company for suggestions. If the problem persists, contact technical support.
005	0x0005	The grid voltage is lower than the set protection value	Generally, the inverter will be reconnected to the grid after the grid returns to normal. If the event occurs repeatedly: 1. Measure the grid voltage. Follow the DANGER message at the beginning of this chapter. 2. Check whether the protection parameters are appropriately set via the Related Products 3. 3. Check whether the AC cable is firmly in place. 4. Check if voltage drops are within acceptable limits. This is a short term event caused by the grid. Wait for the inverter to recover automatically. If the problem persists, contact technical support.
007	0x0007	AC instantaneous over current, AC output current exceeds the upper limit of the inverter.	Wait for the inverter to recover automatically.
008	0x0008	The grid frequency exceeds the inverter's allowable upper limit.	Measure the grid frequency. Follow the DANGER message at the beginning of this chapter. Check whether the protection parameters are appropriately set via the Related Products 3.
009	0x0009	The grid frequency exceeds the inverter's allowable lower limit.	If the grid frequency exceeds the inverter's allowable range, contact the utility company for suggestions.

010	0x000A	Grid power outage, AC switch or circuit is disconnected.	Check whether the AC circuit breaker is connected and turned on. Check whether AC cables are all properly connected. Check whether the grid is in service. If the problem persists, contact technical support.
011	0x000B	Device anomaly	Wait for the inverter to recover automatically. Disconnect the AC and DC switches, and reconnect the AC and DC switches 15 minutes later to restart the inverter. If the problem persists, contact technical support.
012	0x000C	Excessive current leakage is detected.	The event can be caused by excessive leakage current if the AC and DC cables with lower insulation resistance are installed in a damp environment. The inverter will be reconnected to the grid after the environment has improved. If the environment is normal, check whether the AC and DC cables are well insulated. If the problem persists, contact technical support.
013	0x000D	Grid abnormal, the grid voltage or frequency is out of the permissible range, and the inverter cannot be connected to the grid normally.	If the grid voltage or frequency exceeds the inverter's allowable range, contact the utility company for suggestions. If the problem persists but the grid voltage is within the inverter's allowable range, contact technical support.
014	0x000E	The average grid voltage keeps exceeding the allowable range for over 10 minutes.	Wait for the inverter to recover automatically. If the grid voltage exceeds the inverter's allowable range, contact the utility company for suggestions. If the problem persists, contact technical support.
015	0x000F	Grid overvoltage, the grid voltage is higher than the set protection value	Generally, the inverter will be reconnected to the grid after the grid returns to normal. If the event occurs repeatedly: 1. Measure the grid voltage. Follow the DANGER message at the beginning of this chapter. 2. Check whether the protection parameters are appropriately set via the Related Products 3. 3. Check whether the overall grid impedance of the AC cable meets the requirement. Wait for the inverter to recover automatically. If the grid voltage exceeds the inverter's allowable range, contact the utility company for suggestions. If the problem persists, contact technical support.

016	0x0010	AC output overload The configured module power is excessively large and out of the normal operation range of the inverter.	Wait for the inverter to recover automatically. Check whether the DC/AC ratio is well within the specified limit (<1.3). If the problem persists, contact technical support.
017	0x0011	Grid voltage imbalance	Generally, the inverter will be reconnected to the grid after the grid returns to normal. If the event occurs repeatedly: 1. Measure the actual grid voltage. If grid phase voltages differ greatly, contact the power company for solutions. 2. If the voltage difference between the three phases is within the permissible range of the local power company, modify the grid voltage imbalance parameter through the Related Products 3. If the problem persists, contact technical support.
019 020	0x0013 0x0014	Device anomaly.	Wait for the inverter to recover automatically. Disconnect the AC and DC switches, and reconnect the AC and DC switches 15 minutes later to restart the inverter. If the problem persists, contact technical support.
021 022	0x0015 0x0016	Device anomaly.	Wait for the inverter to recover automatically. Disconnect the AC and DC switches, and reconnect the AC and DC switches 15 minutes later to restart the inverter. If the problem persists, contact technical support.
024 025 030 031 032 033 034	0x0018 0x0019 0x001E 0x001F 0x0020 0x0021 0x0022	Device anomaly.	Wait for the inverter to recover automatically. Disconnect the AC and DC switches, and reconnect the AC and DC switches 15 minutes later to restart the inverter. If the problem persists, contact technical support.
036	0x0024	Power module temperature is too high.	Check whether the inverter is directly exposed to sunlight. If so, take some shading measures. Check and clean the air ducts. Check whether there is 070 (fan anomaly) alarm via the Related Products 3. If the problem persists, contact technical support.

037	0x0025	Internal ambient temperature is too high.	Check whether the inverter is directly exposed to sunlight. If so, take some shading measures. Check and clean the air ducts. Check whether there is 070 (fan anomaly) alarm via the Related Products 3. If the problem persists, contact technical support. If the problem persists, contact technical support.
038	0x0026	Device anomaly	Wait for the inverter to recover automatically. Disconnect the AC and DC switches, and reconnect the AC and DC switches 15 minutes later to restart the inverter. If the problem persists, contact technical support.
039	0x0027	Low system insulation resistance, which is generally caused by poor insulation to ground of the module/cable or by rainy and damp environment.	Wait for the inverter to return to normal. If the event occurs repeatedly: 1. Check whether the ISO resistance protection value is excessively high via the Related Products 3, and ensure that it complies with the local regulations. 2. Check the resistance to ground of the string and DC cable. Take corrective measures in case of short circuit or damaged insulation layer. 3. If the cable is normal and the event occurs on rainy days, check it again when the weather is not damp. If the event still occurs, then you need to improve the cable resistance. If the problem persists, contact technical support.
040 041 042	0x0028 0x0029 0x002A	Device anomaly	Wait for the inverter to recover automatically. Disconnect the AC and DC switches, and reconnect the AC and DC switches 15 minutes later to restart the inverter. If the problem persists, contact technical support.
043	00x002B	Ambient temperature is lower than the temperature at which the inverter can operate normally	Stop operating the inverter and disconnect it from all power sources. Wait for the ambient temperature to rise within the allowable range and then restart the inverter.
044 045 046	0x002C ??045 and 046 missing from older Modbus doc	Device anomaly	Wait for the inverter to recover automatically. Disconnect the AC and DC switches, and reconnect the AC and DC switches 15 minutes later to restart the inverter. If the problem persists, contact technical support.
047	0x002F	PV input configuration abnormal, PV input mode error	Disconnect the inverter from all power sources. Check all the PV inputs to ensure the parameters are well within the specification and check each PV input connection.

048	0x0030	Device anomaly	Wait for the inverter to recover automatically.
049	0x0031		
050	0x0032		Disconnect the AC and DC switches, and reconnect the AC and
053	0x0035		DC switches 15 minutes later to restart the inverter.
054	0x0036		
055	0x0037		If the problem persists, contact technical support.
056	0x0038		
059	0x003B		
060	0x003C		
070	0x0046	Fan alarm	Stop operating the inverter, disconnect from all power sources. Check the fan for excessive dust or debris and clean as required. If the problem persists, contact technical support.
071	0x0047	AC side SPD event	If the problem persists, contact technical support.
072	0x0048	DC side SPD event	
076	0x004C	Device anomaly	Check the PV system design and adjust the connection of PV inputs. Wait for the inverter to recover automatically. Disconnect the AC and DC switches, and reconnect the AC and DC switches 15 minutes later to restart the inverter.
078	0x004E	PV1 abnormal	Check the PV input terminals for loose connections. Tighten the connections according to torque specifications found in *"Torque Values" on page 1*.
079	0x004F	PV2 abnormal	
080	0x0050	PV3 abnormal	Check if the DC fuse of particular string is damaged . If so, replace the fuse.
081	0x0051	PV4 abnormal	If the problem persists, contact technical support.
087	0x0057	Electric arc detection module abnormal	The inverter can operate normally. Check whether the related cable connection and terminals are abnormal, and check whether the ambient environment is abnormal. If so, remove the corresponding abnormity. If the problem persists, contact technical support.
088	0x0088	Electric arc event	Disconnect the DC inputs and check whether DC cables are damaged, whether the wiring terminals or fuses are loose or in poor contact, and whether component parts are burnt. If so, take corresponding corrective measures. After taking corresponding measures above, reconnect the DC inputs. Remove the arc event through the Related Products 3 so that the inverter will recover to be normal. If the problem persists, contact technical support.

089	0x0059	Electric arc detection disabled	Enable the AFD function through the Related Products 3 so that the inverter will recover to be normal. If the problem persists, contact technical support.
105	0x0069	Protection self-check event on grid side	Check the grid is within the specifications of the inverter. If its well within the range, restart the inverter or clear the event through the Related Products 3. If the problem persists, contact technical support.
106	0x006A	AC ground fault	Check whether the AC cable is correctly connected. Check whether the insulation between the ground cable and the live wire is normal. If the problem persists, contact technical support.
116 117	0x0074 0x0075	Device anomaly	Wait for the inverter to return to normal. Disconnect the AC and DC switches, and reconnect the AC and DC switches 15 minutes later to restart the inverter. If the problem persists, contact technical support.
220 221 222 223 224 225 226 227	0x00DC 0x00DD 0x00DE 0x00DF 0x00E0 0x00E1 0x00E2 0x00E3	PV5 Abnormal PV6 Abnormal PV7 Abnormal PV8 Abnormal PV9 Abnormal PV10 Abnormal PV11 Abnormal PV12 Abnormal	Check the PV input terminals for loose connections or bad crimps/terminations. Tighten the connections according to torque specifications found in *"Torque Values" on page 1*. Check if the crimping or termination of the particular string is damaged or incorrect. If the problem persists, contact technical support.
448 to 457	0x01C0 to 0x01C9	String x reverse connection event	Check whether the corresponding string is of reverse polarity. If so, disconnect the DC switch and adjust the polarity when the solar radiation is low and the string current drops below 0.5 A. If the problem persists, contact technical support. The code 448 to code 471 are corresponding to string 1 to string 24 respectively.
532 to 541	0x0214 to 0x021D	String x reverse connection alarm	Check whether the corresponding string is of reverse polarity. If so, disconnect the DC switch and adjust the polarity when the solar radiation is low and the string current drops below 0.5 A. If the problem persists, contact technical support. The code 532 to code 547 are corresponding to string 1 to string 16 respectively.

548 to 557	0x0224 to 0x022D	String x output current anomaly	Check whether the corresponding module is sheltered. If so, remove the shelter and ensure module cleanness. Check the module for abnormal aging. If the problem persists, contact technical support. The code 548 to code 563 are corresponding to string 1 to string 16 respectively.
564 to 571	0x0235 to 0x023B	String x reverse connection alarm	Check whether the corresponding string is of reverse polarity. If so, disconnect the DC switch and adjust the polarity when the solar radiation is low and the string current drops below 0.5A. If the problem persists, contact technical support. The code 564 to code 571 are corresponding to string 17 to string 24 respectively.
580 to 587	0x0244 to 0x0255	String x output current anomaly	Check whether the corresponding module is sheltered. If so, remove the shelter and ensure module cleanness. Check the module for abnormal aging. If the problem persists, contact technical support. The code 580 to code 587 are corresponding to string 17 to string 24 respectively.

Exclusion for Documentation

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Document Number: 990-91443   **Date:** April 2021

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