SmartLogger

ModBus Interface Definitions

Issue 43

Date 2023-10-21

HUAWEI TECHNOLOGIES CO., LTD.

Trademarks and Permissions


and other Huawei trademarks are trademarks of Huawei Technologies Co., Ltd.
All other trademarks and trade names mentioned in this document are the property of their respective holders.

Notice

The purchased products, services and features are stipulated by the contract made between Huawei and the customer. All or part of the products, services and features described in this document may not be within the purchase scope or the usage scope. Unless otherwise specified in the contract, all statements, information, and recommendations in this document are provided "AS IS" without warranties, guarantees or representations of any kind, either express or implied.

The information in this document is subject to change without notice. Every effort has been made in the preparation of this document to ensure accuracy of the contents, but all statements, information, and recommendations in this document do not constitute a warranty of any kind, express or implied.

Huawei Technologies Co., Ltd.

Address: Huawei Industrial Base
Bantian, Longgang
Shenzhen 518129
People's Republic of China

Website: https://e.huawei.com

Contents

1 Change History

Issue	Date	Change Description
43	2023-10-21	The active power gradient register (42728) is added.
42	2023-08-28	The following registers are added: Subarray energy storage PCS startup (44373), subarray energy storage PCS shutdown (44374), and subarray PV inverter microgrid adaptability (44375)
41	2023-6-2	The following registers are added: PV array PCS working mode (44364)

Issue	Date	Change Description
40	2022-4-14	The following registers are added: PV array black start (44360), PV array black start status (44361), PCS working mode (44365), VSG control voltage adjustment value (44366), VSG control frequency adjustment value (44367), PV shutdown (40196), PV startup (40197), ESS shutdown (40198), ESS startup (40199), active PV power adjustment in fixed value (40378), active PV power adjustment in percentage (40380), and active ESS power adjustment in fixed value (40381), active ESS power adjustment in percentage (40383), reactive ESS power adjustment in fixed value (40384), reactive ESS power adjustment in fixed value (40386), active PV power (40388), reactive PV power (40390), active ESS power (40392), reactive ESS power (40394), rated PV power (40396), rated ESS power (40398), highest PV active adjustment (40400), lowest PV reactive adjustment (40402), lowest PV reactive power adjustment (40404), highest ESS reactive power adjustment (40406), lowest ESS reactive power adjustment (40408), SOH (40516), SOE (40517), rated ESS capacity (40518), alarm 5 (50004), alarm 6 (50005), active power adjustment (high-priority) (40430), reactive power adjustment (high-priority) (40432), status information (40578), ESS end-of-discharge SOC (40217), ESS end-of-charge SOC (40218), Energy charged today (40468), Energy discharged today (40470), Total energy charged (40472), Total energy discharged (40476), Today's power supply from grid (40438), Total power supply from grid (40464), Quantity of running ESS PCSs (40207), Quantity of running PV inverters (40206), Highest stable charge power of ESS (40494), Highest stable discharge power of ESS (40496), Active power control mode (41889), Reactive power control mode (44165), Array in operation (40535), Array shut down (40536), PV inverter in operation (40537), PV inverter shut down (40538), ESS PCS in operation (40539), ESS PCS shut down (40540), Working mode(42256) 2. Modified the description of the adjustment range of the active and reactive power adjustment interfaces.

Issue	Date	Change Description
39	2021-07-31	The following register types are changed: Changed the register type of active power adjustment by percentage (40428) from U16 to I16. Changed the register type of active power adjustment (40420), highest active power adjustment (40697), active power scheduling target (40738), and active power scheduling percentage (40802) from U32 to I32. The following register ranges are changed: Changed the range of active power adjustment by percentage (40428) and active power scheduling percentage (40802) from [0, 100] to [–100, 100]. The following registers are added: Lowest active power adjustment value (40412), chargeable capacity (40480), dischargeable capacity (40482), rated ESS capacity (40484), and SOC (40515) Highest ESS charge power (40490) and highest ESS discharge power (40492)
38	2021-05-18	Added two enumerated values for reactive power control mode (40740): 12: PF-U characteristic curve; 14: Q-P characteristic curve. Added the description of the power direction of meters.
37	2020-06-24	Added register alarm 3 (50002) and register alarm 4 (50003) for alarms related to management system 1; added alarm cause ID 2 for alarm IDs 1120, 1121, and 1122 to identify certificate alarms related to management system 1.
36	2020-04-13	Add the following registers in SmartLogger Register Definitions Table: Plant status (Qinghai new) (40541); Plant status (Shanxi) (40542).
35	2020-02-20	Add the following registers in SmartLogger Register Definitions Table: Plant status (40543), Communication abnormal shutdown (41947), Communication abnormal detection time (41948) and Auto start upon communication recovery (41949). Modified about SmartLogger Alarm Definitions Table: Delete Alarm SubID 1-3 of Abnormal Active Schedule (Alarm ID 1100), SubID 1-3 of Abnormal Reactive Schedule (Alarm ID 1101) and Abnormal Power Meter Data (Alarm ID 1102), and add Alarm ID 1116-1131. Meanwhile its detail description is modified in Alarm Descriptions and Impacts Table.

Issue	Date	Change Description
34	2019-05-28	Update enumeration name of "Active power control mode" and "Reactive power control mode"
33	2019-04-22	Added Alarm ID: License Expired (supported by V200R002C20SPC118 and later version)
32	2018-11-15	Added the definition of the power meter register: (supported by V100R001C00SPC118 and later version) **Phase A active power** **Phase B active power** **Phase C active power** **Total active electricity** **Total reactive electricity** **Negative active electricity** **Negative reactive electricity** **Positive active electricity** **Positive reactive electricity**
31	2018-03-13	Added **Duration of daily power generation** Added **Plant status** Added **Uab**, **Ubc**, **Uca**
30	2018-01-12	Added Table 2 Environmental Monitor Instrument Register Definitions of 2.7 Remapped Modbus definitions (supported by V200R002C20 and later version) Changed the power meter **Apparent power** to I32
29	2017-12-14	Added the definition of the power meter register: (supported by V200R002C20 and later version) **Custom 1** ~ **Custom 10**
28	2017-12-11	Added **CO_2 emission reduction coefficient**
27	2017-11-09	Changed **Reactive power control mode**, add new: Distributed power factor closed-loop control (supported by V100R001C00SPC113 and later version)

Issue	Date	Change Description
26	2017-08-22	Added **Power on/off** (supported by V200R002C10SPC100 and later version) Added **Transfer trip** (supported by V200R002C10SPC100 and later version) Added **Active adjustment** (supported by V200R002C10SPC100 and later version) Added **Reactive adjustment** (supported by V200R002C10SPC100 and later version) Added the definition of the power meter register: (supported by V200R002C10SPC100 and later version) **Electricity in positive active electricity price segment 1** **Electricity in positive active electricity price segment 2** **Electricity in positive active electricity price segment 3** **Electricity in positive active electricity price segment 4** **Electricity in negative active electricity price segment 1** **Electricity in negative active electricity price segment 2** **Electricity in negative active electricity price segment 3** **Electricity in negative active electricity price segment 4** Added 2.7 Remapped Modbus definitions (supported by V200R002C10SPC100 and later version) Changed **Active power control mode**, add new: Remote output control Changed **Reactive power control mode**, add new: Power factor closed-loop control
25	2017-08-15	Added **CO_2 reduction** Added the definition of the power meter register: **Positive active electricity** **Positive reactive electricity**
24	2017-07-26	Added **Active scheduling percentage** Added **PV module capacity** Added **Rated plant capacity** Added **Total rated capacity of grid-connected inverters** Added **Conversion coefficient** Added **Communication status** Added **Daily irradiation amount**, Unit: kWh/m^2 Added **Daily irradiation amount 2**, Unit: kWh/m^2 Changed the register type of power meter **Phase A current**, **Phase B current**, and **Phase C current** to I32

Issue	Date	Change Description
23	2016-10-22	Added **DC current 2** Deleted **Device feature code 1~4** Added **the 24V power failure alarm**.
22	2016-09-02	Baseline Document for Test.
21	2016-06-02	Added the following signals: ● Current error during scanning ● Inspection ● IV curve scanning Changed **Device feature code 1,** add new Bit9: IV curve scanning
20	2016-05-24	Add alarm **AC SPD fault** and **DI1–8 custom alarm** Added the following signals: ● Current radiation 2 ● Daily Radiation 2 ● Custom 1 ● Custom 2
19	2015-11-03	Added the entries of device feature codes 1–4. Added the entry of device list change number.
18	2015-10-19	Added the **Device Address Conflict** alarm.
17	2015-09-21	Added **Reactive electricity** and **Apparentpower** to the power meter. Added **Port number** and **Physicaladdress** to the common register. Added the entry of array reset.
16	2015-04-10	Changed the delete device signal to the device operation signal. Adjusted the register address for the subsequent signals.
15	2015-04-07	Updated the description for City.
14	2015-03-28	Added the following signals: ● Active power adjustment by percentage ● Power factor adjustment
13	2015-03-23	Added the Reactive power scheduling curve mode signal.

Issue	Date	Change Description
12	2015-02-28	Added the following signals: ● Active power scheduling mode ● Active power scheduling target value ● Reactive power scheduling mode ● Reactive power scheduling target value
11	2015-02-26	Added System reset, Device search, Device search status , Delete device and Device search status signals.
10	2014-11-21	Added the DI group status.
09	2014-11-10	Added the Daily radiation read-only signals.
08	2014-09-24	Added Max. reactive adjustment, Min. reactive adjustment, and Max. active adjustment read-only signals.
07	2014-08-30	Added the public register device alias.
06	2014-08-21	Added the Abnormal Cubicle alarm.
05	2014-07-29	Changed the gain of Active electricity to 10 for an electricity meter.
04	2014-07-10	Added active alarm serial numbers and historical alarm serial numbers.
03	2014-06-06	Added the device connection status public device interface.
02	2014-03-28	Updated EMI and power meter, and added a time setting interface.
01	2013-09-22	Initial release.

2 Introduction

The Modbus-TCP protocol is a well-known factual automation standard. This document describes ModBus-TCP functions related to communications in the SmartLogger.

This document provides details about the Modbus protocol used in the SmartLogger and devices managed by the SmartLogger, such as inverters, environment monitor instrument, and power meter. It can be used to regulate and restrict follow-up third-party integration R&D and customizations.

2.1 Definitions of Terms and Abbreviations

Table 2-1 Terms Definitions

Name	Description
Master node	During master-slave communication, the party that initiates a communication request is referred to as the master node.
Slave node	During master-slave communication, the party that responds to a communication request is referred to as the slave node.
Broadcast address	Fixed to 0.
Register address	The address of a register is recorded in two bytes.
U16	Unsigned integer (16 bits)
U32	Unsigned integer (32 bits)
U64	Unsigned integer (64 bits)

Name	Description
I16	Signed integer (16 bits)
I32	Signed integer (32 bits)
I64	Signed integer (64 bits)
STR	String
MLD	Multiple bytes
N/A	Not applicable

2.2 System Requirements

Applicable model: SmartLogger

Firmware version:

SUN2000 V100R001C95 or later

SmartLogger V100R001C00 or later

SmartLogger V100R002C00 or later

SmartLogger V200R001C00 or later

SmartLogger V300R001C00 or later

3 Register Definitions

RW signals are permanently valid, will be retained until updated the next time, and support 0X03, 0X06, and 0X10 instructions.

WO signals do not support the 0X03 query instruction, but support the 0X06 and 0X10 instructions.

RO signals support only the 0X03 instruction.

3.1 Register Definitions for the SmartLogger

NOTE

In the following table, the operation object of the register is the SmartLogger. In the Modbus-TCP communications protocol, the logic device ID is fixed to 0.

Table 3-1 SmartLogger Register Definitions

No.	Signal	Read / Write	Type	Unit	Gain	Address	Quantity	Range
1	Date&Time	RW	U32	N/A	1	40000	2	Epoch seconds UTC

No.	Signal	Read / Write	Type	Unit	Gain	Address	Quantity	Range
2	City	RW	U32	N/A	1	40002	2	
3	Daylight Saving Time (DST)	RW	U16	N/A	1	40004	1	0: Disabled 1: Enabled
4	Time Zone	RO	I32	s	1	40005	2	Time zone offset measured in seconds
5	DST state	RO	U16	N/A	1	40007	1	1: DST not started 1: DST started
6	DST offset	RO	U16	mins	1	40008	1	N/A
7	Local time	RO	U32	N/A	1	40009	2	Epoch seconds, local time of the SmartLogger
8	PV inverter shutdown	WO	U16	N/A	N/A	40196	1	The data field can only be 0, which shuts down PV inverters.
9	PV inverter startup	WO	U16	N/A	N/A	40197	1	The data field can only be 0, which starts up PV inverters.
10	ESS shutdown	WO	U16	N/A	N/A	40198	1	The data field can only be 0, which shuts down ESS devices.
11	ESS startup	WO	U16	N/A	N/A	40199	1	The data field can only be 0, which starts up ESS devices.
12	Startup	WO	U16	N/A	1	40200	1	The data field can only be 0, which starts up inverters and ESS devices.

No.	Signal	Read / Write	Type	Unit	Gain	Address	Quantity	Range
13	Shutdown	WO	U16	N/A	1	40201	1	The data field can only be 0, which shuts down inverters and ESS devices.
14	Startup/ Shutdown	WO	U16	N/A	1	40202	1	0: Shutdown 1: Startup
15	Startup/ Shutdown	WO	U16	N/A	1	40203	1	0: Startup 1: Shutdown
16	Transfer trip	RW	U16	N/A	1	40204	1	0: In operation 1: Shut down due to faults The device shuts down when it stops due to faults and does not respond to the startup request.
17	Array reset	WO	U16	N/A	1	40205	1	The data field can only be 0, which indicates reset.
18	Quantity of running PV inverters	RO	U16	N/A	1	40206	1	Quantity of inverters that are in operation in the array.
19	Quantity of running ESS PCSs	RO	U16	N/A	1	40207	1	Quantity of PCSs that are in operation in the array.
20	ESS end-of-discharge SOC	RO	U16	%	10	40217	1	Array-level end-of-discharge SOC calculated based on the end-of-discharge SOC of battery racks in the array.

No.	Signal	Read / Write	Type	Unit	Gain	Address	Quantity	Range
21	ESS end-of-charge SOC	RO	U16	%	10	40218	1	Array-level end-of-charge SOC calculated based on the end-of-charge SOC of battery racks in the array.
22	Active PV power adjustment in fixed value	RW	U32	kW	10	40378	2	[0, Total rated active power of inverters in the array] The command will not be executed if the value in it is beyond the valid range.
23	Active PV power adjustment in percentage	RW	U16	%	10	40380	1	[0,100.0]
24	Active ESS power adjustment in fixed value	RW	I32	kW	10	40381	2	[–Total rated active power of PCSs in the array, Total rated active power of PCSs in the array] The command will not be executed if the value in it is beyond the valid range.
25	Active ESS power adjustment in percentage	RW	I16	%	10	40383	1	[–100.0,100.0]. A negative value indicates charging.

No.	Signal	Read / Write	Type	Unit	Gain	Address	Quantity	Range
26	Reactive PV power adjustment in fixed value	RW	I32	kVar	10	40384	2	[–Total rated apparent power of inverters in the array, Total rated apparent power of inverters in the array] The command will not be executed if the value in it is beyond the valid range.
27	Reactive ESS power adjustment in fixed value	RW	I32	kVar	10	40386	2	[–Total rated apparent power of PCSs in the array, Total rated apparent power of PCSs in the array] The command will not be executed if the value in it is beyond the valid range.
28	Active PV power	RO	U32	kW	1000	40388	2	Actual active output power of PV devices in the PV array
29	Reactive PV power	RO	I32	kVar	1000	40390	2	Actual reactive output power of PV devices in the PV array
30	Active ESS power	RO	I32	kW	1000	40392	2	Actual active output power of ESS devices in the PV array
31	Reactive ESS power	RO	I32	kVar	1000	40394	2	Actual reactive output power of ESS devices in the PV array

No.	Signal	Read / Write	Type	Unit	Gain	Address	Quantity	Range
32	Rated PV power	RO	U32	kW	1000	40396	2	Rated power of PV devices in the PV array Note: Only statistics about grid-tied devices are collected for northbound open-loop scheduling.
33	Rated ESS power	RO	U32	kW	1000	40398	2	Rated power of ESS devices in the PV array Note: Only statistics about grid-tied devices are collected for northbound open-loop scheduling.
34	Maximum active PV power adjustment value	RO	U32	kW	1000	40400	2	Highest available active power of PV devices in the PV array
35	Maximum reactive PV power adjustment value	RO	U32	kVar	1000	40402	2	Highest available reactive power of PV devices in the PV array
36	Minimum reactive PV power adjustment value	RO	I32	kVar	1000	40404	2	Lowest available reactive power of PV devices in the PV array

No.	Signal	Read / Write	Type	Unit	Gain	Address	Quantity	Range
37	Maximum reactive ESS power adjustment value	RO	U32	kVar	1000	40406	2	Highest available reactive power of ESS devices in the PV array
38	Minimum reactive ESS power adjustment value	RO	I32	kVar	1000	40408	2	Lowest available reactive power of ESS devices in the PV array
39	Minimum active power adjustment value	RO	I32	kW	10	40412	2	Maximum charge power (negative value) supported by the ESS devices in the array. The value is 0 for the PV array.

No.	Signal	Read / Write	Type	Unit	Gain	Address	Quantity	Range
40	Active power adjustment	RW	I32	kW	10	40420	2	Adjusts the total active output power of all inverters/PCSs connected to the SmartLogger. Out-of-range scheduling values are discarded. If ESSs are deployed, this parameter can be set to a negative value, indicating that the active power is supplied from the power grid. [–Total rated active power of PCSs in the array, Total rated active power of inverters and PCSs in the array]
41	Reactive power adjustment	RW	I32	kVar	10	40422	2	Adjusts the total reactive output power of all inverters/PCSs connected to the SmartLogger. Out-of-range scheduling values are discarded. [–Total rated apparent power of inverters and PCSs in the array, Total rated apparent power of inverters and PCSs in the array]

No.	Signal	Read / Write	Type	Unit	Gain	Address	Quantity	Range
42	Active power adjustment	RW	U32	kW	10	40424	2	Adjusts the total active output power of all inverters/PCSs connected to the SmartLogger.
43	Reactive power adjustment	RW	I32	kVar	10	40426	2	Adjusts the total reactive output power of all inverters/PCSs connected to the SmartLogger.
44	Active power adjustment in percentage	RW	I16	%	10	40428	1	Adjusts the total active output power of all inverters/PCSs connected to the SmartLogger. The value range is –100% to 100%. If ESSs are deployed, this parameter can be set to a negative value, indicating that the active power is supplied from the power grid.
45	Power factor adjustment	RW	I16	N/A	1000	40429	1	Adjusts the total reactive output power of all inverters/PCSs connected to the SmartLogger. The range is (–1,–0.8]U[0.8,1].

No.	Signal	Read / Write	Type	Unit	Gain	Address	Quantity	Range
46	Active power adjustment (highest-priority)	RW	I32	kW	1000	40430	2	[–Total rated active power of PCSs in the array, Total rated active power of inverters and PCSs in the array] The command will not be executed if the value in it is beyond the valid range.
47	Reactive power adjustment (highest-priority)	RW	I32	kVar	1000	40432	2	[–Total rated apparent power of inverters and PCSs in the array, Total rated apparent power of inverters and PCSs in the array] The command will not be executed if the value in it is beyond the valid range.
48	Power supply from grid today	RO	U32	kWh	100	40438	2	
49	Total power supply from grid	RO	I64	kWh	100	40464	4	
50	Energy charged today	RO	U32	kWh	100	40468	2	
51	Energy discharged today	RO	U32	kWh	100	40470	2	

No.	Signal	Read / Write	Type	Unit	Gain	Address	Quantity	Range
52	Total energy charged	RO	I64	kWh	100	40472	4	
53	Total energy discharged	RO	I64	kWh	100	40476	4	
54	Chargeable capacity	RO	U32	kWh	1000	40480	2	Total chargeable capacity of all ESSs
55	Dischargeable capacity	RO	U32	kWh	1000	40482	2	Total dischargeable capacity of all ESSs
56	Rated ESS capacity	RO	U32	kWh	1000	40484	2	Total rated capacity of all ESSs
57	Maximum ESS charge power	RO	U32	kW	1000	40490	2	Total highest real-time charge power of all ESSs in a plant
58	Maximum ESS discharge power	RO	U32	kW	1000	40492	2	Total highest real-time discharge power of all ESSs in a plant
59	Highest stable charge power of ESS	RO	U32	kW	1000	40494	2	Maximum charge rate of ESSs in the array. Compared with the value of "Maximum ESS charge power", the value of this signal also includes the charge power of battery racks bypassed due to full discharge.

No.	Signal	Read / Write	Type	Unit	Gain	Address	Quantity	Range
60	Highest stable discharge power of ESS	RO	U32	kW	1000	40496	2	Maximum discharge rate of ESSs in the array. Compared with the value of "Maximum ESS discharge power", the value of this signal also includes the discharge power of battery racks bypassed due to full charge.
61	DC current	RO	I16	A	10	40500	1	Total input DC current of all inverters. The value covers only inverters in PV-only scenarios and does not cover ESS devices. If the value exceeds the I16 representation range, register 40554 is recommended.
62	SOC	RO	U16	%	10	40515	1	Aggregated battery SOC at the plant level
63	SOH	RO	U16	%	10	40516	1	Aggregated battery SOH at the plant level
64	SOE	RO	U16	%	10	40517	1	Aggregated battery SOE at the plant level
65	Rated ESS capacity in Ah	RO	U32	Ah	10	40518	2	Total rated battery capacity (Ah) at the plant level

No.	Signal	Read / Write	Type	Unit	Gain	Address	Quantity	Range
66	Input power	RO	U32	kW	1000	40521	2	Total input power of all inverters. The value covers only inverters in PV-only scenarios and does not cover ESS devices.
67	CO_2 reduced	RO	U32	kg	10	40523	2	Total CO_2 reduction of all inverters. If the value exceeds the U32 representation range, register 40550 is recommended.
68	Active power	RO	I32	kW	1000	40525	2	Total output active power of all inverters/ PCSs
69	Power factor	RO	I16	N/A	1000	40532	1	Calculated based on the total active power and total reactive power of grid-tied inverters/ PCSs in the array.
70	Array in operation	RO	U16	N/A	N/A	40535	1	0: Invalid 1: In operation An array is regarded in operation if any inverter or PCS in the array is in operation.

No.	Signal	Read / Write	Type	Unit	Gain	Address	Quantity	Range
71	Array shut down	RO	U16	N/A	N/A	40536	1	0: Invalid 1: Shut down An array is regarded shut down only when all inverters and PCSs in the array are shut down (including all not-in-operation states, such as faulty, standby, and shut down).
72	PV inverter in operation	RO	U16	N/A	N/A	40537	1	0: Invalid 1: In operation An array is regarded in operation if any inverter in the array is in operation.
73	PV inverter shut down	RO	U16	N/A	N/A	40538	1	0: Invalid 1: Shut down An array is regarded shut down only when all inverters in the array are shut down (including all not-in-operation states, such as faulty, standby, and shut down).
74	ESS PCS in operation	RO	U16	N/A	N/A	40539	1	0: Invalid 1: In operation An array is regarded in operation if any PCS in the array is in operation.

No.	Signal	Read / Write	Type	Unit	Gain	Address	Quantity	Range
75	ESS PCS shut down	RO	U16	N/A	N/A	40540	1	0: Invalid 1: Shut down An array is regarded shut down only when all PCSs in the array are shut down (including all not-in-operation states, such as faulty, standby, and shut down).
76	Plant status	RO	U16	N/A	1	40541	1	Used in Qinghai (added in 2020) and applicable to PV-only inverters. 1: In operation 2: Standby 3: Unavailable 4: Communication failure
77	Plant status	RO	U16	N/A	1	40542	1	Used in Shaanxi and applicable to PV-only inverters. 1: In operation 2: Standby 3: Unavailable 4: Communication failure

No.	Signal	Read / Write	Type	Unit	Gain	Address	Quantity	Range
78	Plant status	RO	U16	N/A	1	40543	1	Used in Qinghai and applicable to PV-only inverters. 1: Running without restrictions 2: Running with restrictions 3: Standby 4: Unavailable (faulty or under maintenance) 5: Communication failure
79	Reactive power	RO	I32	kVar	1000	40544	2	Total output reactive power of all inverters/ PCSs
80	CO_2 reduced	RO	U64	kg	100	40550	4	Total CO_2 reduction of all inverters. This register represents a larger value range compared with register 40523.
81	DC current 2	RO	I32	A	10	40554	2	Total input DC current of all inverters/PCSs This register represents a larger value range compared with register 40500.
82	Total energy yield	RO	U32	kWh	10	40560	2	Total energy yield of all inverters/PCSs

No.	Signal	Read / Write	Type	Unit	Gain	Address	Quantity	Range
83	Yield today	RO	U32	kWh	10	40562	2	Energy yield of all inverters/ PCSs today
84	Today's power generation hours	RO	U32	h	10	40564	2	Longest power generation hours of PV inverters in the array from 00:00 of the current day.
85	Plant status	RO	U16	N/A	1	40566	1	Used in Xinjiang and applicable to PV-only inverters. 0: Standby 1: On-grid at normal power 2: On-grid at self-derated power 3. On-grid at derated power due to curtailment 4: Shut down as planned 5: Shut down due to curtailment 6: Shut down due to faults 7: Communication failure
86	Plant status	RO	U16	N/A	1	40567	1	Used in Ningxia and applicable to PV-only inverters. 1: On-grid 2: Shut down 3: Under maintenance 4: Standby

No.	Signal	Read / Write	Type	Unit	Gain	Address	Quantity	Range
87	Active alarm sequence number	RO	U32	N/A	1	40568	2	N/A
88	Historical alarm sequence number	RO	U32	N/A	1	40570	2	N/A
89	Phase A current of grid	RO	I16	A	1	40572	1	Total phase A current of all inverters/PCSs
90	Phase B current of grid	RO	I16	A	1	40573	1	Total phase B current of all inverters/PCSs
91	Phase C current of grid	RO	I16	A	1	40574	1	Total phase C current of all inverters/PCSs
92	A-B line voltage of grid	RO	U16	V	10	40575	1	
93	B-C line voltage of grid	RO	U16	V	10	40576	1	
94	C-A line voltage of grid	RO	U16	V	10	40577	1	

No.	Signal	Read / Write	Type	Unit	Gain	Address	Quantity	Range
95	Status information	RO	U16	N/A	1	40578	1	Status feedback in panoramic surveillance scenarios. Bit 00: Emergent active power control overriding Bit 01: Emergent reactive power control overriding Bits 02 to 15: Reserved 0: Not overriding 1: Overriding
96	Reserved	RO	U16	N/A	1	40608	10	N/A
97	Inverter efficiency	RO	U16	%	100	40685	1	N/A
98	Maximum reactive power adjustment value	RO	U32	kVar	10	40693	2	Total maximum inductive reactive power of the PV inverters and/or PCSs in the adjustable parallel state of the array.
99	Minimum reactive power adjustment value	RO	I32	kVar	10	40695	2	Total maximum capacitive reactive power of PV inverters and PCSs in the adjustable parallel state of the array.
100	Maximum active power adjustment value	RO	I32	kW	10	40697	2	Total maximum power of all inverters/PCSs connected to the parallel system.

No.	Signal	Read / Write	Type	Unit	Gain	Address	Quantity	Range
101	Locking status	RO	U16	N/A	1	40699	1	0: Locked 1: Unlocked
102	DI group state	RO	U16	N/A	1	40700	1	Bit 0: DI1 ~ Bit 7: DI8 1: On 0: Off
103	Equipment serial number (ESN)	RO	STR	N/A	1	40713	10	N/A
104	System reset	WO	U16	N/A	1	40723	1	Resets the SmartLogger. The data field is not checked.
105	Fast device access	WO	U16	N/A	1	40724	1	Automatically allocates and searches for devices.
106	Device operation	WO	MLD	N/A	1	40725	11	First 10 registers: determine the device to be operated based on the ESN. The register content is the device ESN. Last register: If the operation type is 0, the SmartLogger deletes inverters. If the operation type is 1, the inverter alarm is reset on the SmartLogger side.

No.	Signal	Read / Write	Type	Unit	Gain	Address	Quantity	Range
107	Device access status	RO	U16	N/A	1	40736	1	0: Search completed 1: Search in progress 2: Search failed
108	Active power control mode	RO	U16	N/A	1	40737	1	0: No restriction 1: Active power scheduling via DI port 3. Limit in percentage (open loop) 4: Remote communication scheduling 6: Grid connection with limited power (kW) 200: Remote output control 65533: Slave SmartLogger 65534: No scheduling
109	Active power scheduling target value	RO	I32	kW	10	40738	2	Target total active power for the SmartLogger active power scheduling

No.	Signal	Read / Write	Type	Unit	Gain	Address	Quantity	Range
110	Reactive power control mode	RO	U16	N/A	1	40740	1	0: No output 1: Reactive power scheduling via DI port 2. Reactive power in absolute value 3: Power factor in fixed value 4: Q-U characteristic curve 5: cos(Phi)-P/Pn characteristic curve 6: Q-U hysteresis curve (CEI0-16) 7: Remote communication scheduling 9: Power factor closed-loop control (old policy) 10: Power factor closed-loop control 12: PF-U characteristic curve 14: Q-P characteristic curve 65533: Slave SmartLogger 65534: No scheduling
111	Reactive power scheduling curve mode	RO	U16	N/A	1	40741	1	0: Power factor 1: Reactive power in fixed value

No.	Signal	Read / Write	Type	Unit	Gain	Address	Quantity	Range
112	Reactive power scheduling target value	RO	I32	kVar	10/1000	40742	2	SmartLogger reactive power adjustment target value: power factor or total reactive power. The specific meaning depends on the reactive power scheduling mode. When the mode is the power factor, the gain is 1000. When the mode is the reactive power in fixed value, the gain is 10.
113	Active power scheduling in percentage	RO	I32	%	1	40802	2	[-100, 100]
114	CO_2 emission reduction coefficient	RW	U16	kg/kWh	1000	41124	1	[0, 10]

No.	Signal	Read / Write	Type	Unit	Gain	Address	Quantity	Range
115	Active power control mode	RW	U16	N/A	N/A	41889	1	0: No restriction 1: Active power scheduling via DI port 3. Limit in percentage (open loop) 4: Remote communication scheduling 6: Grid connection with limited power (kW) 200: Remote output control Value 6 includes feed-in limitation.
116	PV module capacity	RO	U32	kW	1000	41934	2	[0, 2000000]
117	Rated plant capacity	RO	U32	kW	1000	41936	2	Used for remote output control scenarios in Japan.
118	Total rated capacity of grid-tied inverters	RO	U32	kW	1000	41938	2	Rated power of grid-tied inverters and PCSs in the array, used for northbound open-loop scheduling.
119	Conversion coefficient	RO	U32	N/A	1000	41940	2	Used for remote output control scenarios in Japan.

No.	Signal	Read / Write	Type	Unit	Gain	Address	Quantity	Range
120	Communication status	RO	U16	N/A	1	41942	1	Status of communication between the SmartLogger and the servers of Japanese power companies: 0: Connection succeeded 1: Connection failed
121	Shut down array upon communication timeout	RW	U16	N/A	N/A	41947	1	0: Disabled 1: Enabled
122	Time for communication exception detection	RW	U16	s	N/A	41948	1	[60, 1800]
123	Start up array upon communication recovery	RW	U16	N/A	N/A	41949	1	0: Disabled 1: Enabled
124	System time: year	RW	U16	N/A	1	42017	1	2000–2068 (local time)
125	System time: month	RW	U16	N/A	1	42018	1	1~12
126	System time: day	RW	U16	N/A	1	42019	1	1~31
127	System time: hour	RW	U16	N/A	1	42020	1	0~23

No.	Signal	Read / Write	Type	Unit	Gain	Address	Quantity	Range
128	System time: minute	RW	U16	N/A	1	42021	1	0~59
129	System time: second	RW	U16	N/A	1	42022	1	0~59
130	Current error during scanning	RW	U16	N/A	100	42150	1	0~2
131	Working mode	RW	U16	N/A	N/A	42256	1	0: No control 1: Reserved 2: Maximum self-consumption 3: Reserved 4: Fully fed to grid 5: Time Of Use 6: Charge/ Discharge based on grid dispatch 7: Time Of Use (fixed power)
132	The active power gradient register	WO	U32	%/s	1000	42728	2	[0.100, 5000.000]
133	Inspection control	WO	U16	N/A	1	42730	1	00: Start inspection 01: Stop inspection
134	I-V curve scanning	WO	U16	N/A	1	42779	1	00: Stop 01: Start (64 points) 02: Start (128 points) 03: Start (256 points)

No.	Signal	Read / Write	Type	Unit	Gain	Address	Quantity	Range
135	Reactive power control mode	RW	U16	N/A	N/A	44165	1	0: No output 1: Reactive power scheduling via DI port 2. Reactive power in absolute value 3: Power factor in fixed value 4: Q-U characteristic curve 5: cos(Phi)-P/Pn characteristic curve 6: Q-U hysteresis curve (CEI0-16) 7: Remote communication scheduling 9: Power factor closed-loop control (old policy) 10: Power factor closed-loop control
136	Array black start	RW	U16	N/A	N/A	44360	1	0: Disabled 1: Black start preparation 2: Black start voltage establishment

No.	Signal	Read / Write	Type	Unit	Gain	Address	Quantity	Range
137	Array black start status	RO	U16	N/A	N/A	44361	1	0: Not started 1: Preparing for black start 2: Ready for black start 3: Establishing voltage for black start 4: Voltage established for black start 5: Black start failed
138	PV array PCS working mode	RO	U16	N/A	N/A	44365	1	0: PQ 1: VSG
139	PCS working mode	WO	U16	N/A	N/A	44365	1	0: PQ 1: VSG
140	Voltage adjustment value for VSG synchronous control	RW	I16	%	100	44366	1	[-10.00,10.00]
141	Frequency adjustment value for VSG synchronous control	RW	I16	%	100	44367	1	[-10.00,10.00]
142	Power on the PCS of the Subarray	WO	U16	N/A	N/A	44373	1	0：Power On

No.	Signal	Read / Write	Type	Unit	Gain	Address	Quantity	Range
143	Shut down the PCS of the Subarray	WO	U16	N/A	N/A	44374	1	0: Shut Down
144	Subarray PV inverter microgrid adaptability	WO	U16	N/A	N/A	44375	1	0: Disable 1: Enable
145	Alarm 1	RO	U16	N/A	1	50000	1	N/A
146	Alarm 2	RO	U16	N/A	1	50001	1	N/A
147	Alarm 3	RO	U16	N/A	1	50002	1	N/A
148	Alarm 4	RO	U16	N/A	1	50003	1	N/A
149	Alarm 5	RO	U16	N/A	1	50004	1	N/A
150	Alarm 6	RO	U16	N/A	1	50005	1	N/A

3.2 Alarm Definitions for the SmartLogger

Table 3-2 Alarm Definitions

Alarm ID	Alarm Name	Alarm Sub-ID	Alarm Cause	Severity	Register Address	Bit
1100	Abnormal Active Schedule	4	If **Active Power Control Mode** is set to **Dry contact remote control,** the four DI ports read instruction combinations not configured.	Major	50000	3

Alarm ID	Alarm Name	Alarm Sub-ID	Alarm Cause	Severity	Register Address	Bit
1101	Abnormal Reactive Schedule	4	If **Reactive Power Control Mode** is set to **Dry contact remote control**, the four DI ports read instruction combinations not configured.	Major	50000	11
1103	MCB Disconnect	1	The general AC circuit breaker at the grid-connection point is OFF.	Major	50001	1
1104	Abnormal Cubicle	1	The Cubicle device has detected an exception at the grid-connection point.	Major	50001	2
1105	Device Address Conflict	1	The address set on the SmartLogger conflicts with an existing access device address.	Major	50001	3
1106	AC SPD fault	1	Communication box SPD fault	Major	50001	4
1107	DI1 custom alarm	1	The dry contact signal from the peripheral to the corresponding DI port on the SmartLogger is abnormal.	Adaptable	50001	5
1108	DI2 custom alarm	1			50001	6
1109	DI3 custom alarm	1			50001	7
1110	DI4 custom alarm	1			50001	8
1111	DI5 custom alarm	1			50001	9
1112	DI6 custom alarm	1			50001	10
1113	DI7 custom alarm	1			50001	11

Alarm ID	Alarm Name	Alarm Sub-ID	Alarm Cause	Severity	Register Address	Bit
1114	DI8 custom alarm	1			50001	12
1115	24V power failure	1	Communication box 24V power failure	Major	50001	13
1116	WebUI server certificate invalid	1	WebUI server certificate invalid	Warning	50002	0
1117	WebUI server certificate to expire	1	WebUI server certificate to expire	Warning	50002	1
1118	WebUI server certificate expired	1	WebUI server certificate expired	Major	50002	2
1119	License Expired	1	1. The privilege certificate has entered the grace period. 2. The privilege feature will be invalid soon.	Warning	50001	14
1120	Management system certificate invalid	1	The management system certificate is not yet valid.	Warning	50002	3
1121	Management system certificate to expire	1	The management system certificate is about to expire.	Warning	50002	4
1122	Management system certificate expired	1	The management system certificate has expired.	Major	50002	5

Alarm ID	Alarm Name	Alarm Sub-ID	Alarm Cause	Severity	Register Address	Bit
1120	Management System Certificate Invalid	2	The digital signature certificate of management system 1 has not taken effect.	Warning	50003	0
1121	Management System Certificate to Expire	2	The digital signature certificate of management system 1 is about to expire.	Warning	50003	1
1122	Management System Certificate Expired	2	The digital signature certificate of management system 1 has expired.	Major	50003	2
1123	Remote Control Certificate invalid	1	Remote output control certificate invalid	Warning	50002	6
1124	Remote Control Certificate to expire	1	Remote output control certificate to expire	Warning	50002	7
1125	Remote Control Certificate expired	1	Remote output control certificate expired	Major	50002	8
1126	ESGCC Certificate invalid	1	Poverty alleviation monitoring center certificate invalid	Warning	50002	9
1127	ESGCC Certificate to expire	1	Poverty alleviation monitoring center certificate to expire	Warning	50002	10
1128	ESGCC Certificate expired	1	Poverty alleviation monitoring center certificate expired	Major	50002	11
1129	SmartLogger Certificate Invalid	1	SmartLogger Certificate Invalid	Warning	50002	12

Alarm ID	Alarm Name	Alarm Sub-ID	Alarm Cause	Severity	Register Address	Bit
1130	SmartLogger Certificate About to Expire	1	SmartLogger Certificate About to Expire	Warning	50002	13
1131	SmartLogger Certificate Expired	1	SmartLogger Certificate Expired	Major	50002	14
1132	One or Two Smart Rack Controller Cables Not Connected to DC Bus	1	One or two cables of a Smart Rack Controller are not connected to the DC bus.	Major	50002	15
1133	Smart Tracker Out of Control	1	One or more trackers in the array are not controlled by the smart tracking algorithm.	Major	50004	0
1134	One or Two Smart PCS Cables Not Connected to DC Bus	1	One or two cables of a Smart PCS are not connected to the DC bus.	Major	50003	3
1135	Insufficient SDS License Capacity	1	The license capacity of the SDS is insufficient.	Major	50004	1
1140	Array Black Start Failed	1	The black start command is not delivered in the correct time sequence.	Minor	50005	0

Alarm ID	Alarm Name	Alarm Sub-ID	Alarm Cause	Severity	Register Address	Bit
1140	Array Black Start Failed	2	The array running status does not meet the condition for a black start.	Minor	50005	1
1140	Array Black Start Failed	3	No available ESS.	Minor	50005	2
1140	Array Black Start Failed	4	The ESS does not support black start.	Minor	50005	3
1140	Array Black Start Failed	5	The PCS does not support black start.	Minor	50005	4
1140	Array Black Start Failed	6	The black start of the ESS failed.	Minor	50005	5
1140	Array Black Start Failed	7	No available PCS.	Minor	50005	6
1140	Array Black Start Failed	8	The black start of the PCS failed.	Minor	50005	7
1141	ESS Shutdown upon STS Switch-off	1	The medium-voltage side or low-voltage side of the STS is switched off, causing the shutdown of PCSs and ESS devices in the PV array.	Major	50005	8

NOTE

Alarm ID 1106~1115 is only supported in the V200R001 version or later.

Table 3-3 Alarm Descriptions and Impacts

Alarm ID	Alarm Name	Alarm Description	Impact on the System
1100	Abnormal Active Schedule	After the active power control is enabled on the SmartLogger, an abnormal external input occurs or a target device becomes faulty.	The SmartLogger disables the active power control, and the active power output of the power station may fail to satisfy the requirements of the power grid company.
1101	Abnormal Reactive Schedule	After the reactive power control is enabled on the SmartLogger, an abnormal external input occurs or a target device becomes faulty.	The SmartLogger disables the reactive power control, and the reactive power output of the power station may fail to satisfy the requirements of the power grid company.
1103	MCB Disconnect	The SmartLogger has detected that the general AC circuit breaker at the grid-connection point is OFF.	The power station stops feeding the power grid, all inverters shut down, and the SmartLogger disables the power control function.
1104	Abnormal Cubicle	This alarm is triggered when the dry contact point of a cubicle device connected to the SmartLogger is open or closed during the joint test for the relay used in the Japanese market.	The alarm indicates the joint test result for relays, and does not affect other service functions. The SmartLogger displays and reports the alarm.

Alarm ID	Alarm Name	Alarm Description	Impact on the System
1105	Device Address Conflict	The SmartLogger address configured for data forwarding using Modbus-TCP conflicts with the address of a connected device.	The SmartLogger forwarding address is 0 by default. If the configured address conflicts with the access device address, data of the access device fails to be forwarded using Modbus-TCP.
1106	AC SPD fault	This alarm warns you that the dry contact signal sent to the SmartLogger is abnormal in the communication box scenario because the SPD inside the communication box is faulty.	A faulty SPD is unable to protect the SmartLogger from lightning, and therefore the SmartLogger may be damaged under thunderstorms.
1107~1114	DI1~8 custom alarm	This alarm is generated when the SmartLogger detects that the dry contact signal from the peripheral is abnormal.	The peripheral may be abnormal, which may impact the system running.
1115	24V power failure	This alarm warns you that the dry contact signal sent to the SmartLogger is abnormal in the communication box scenario because the 24V power inside the communication box is faulty.	The meteorological sensor in the communication box does not work properly due to no power supply.
1116	WebUI server certificate invalid	WebUI server certificate valid date is future time	NA
1117	WebUI server certificate to expire	WebUI server certificate about to expire	NA
1118	WebUI server certificate expired	WebUI server certificate has expired	NA
1119	License Expired	1. The privilege certificate has entered the grace period. 2. The privilege feature will be invalid soon.	The privilege feature will be invalid soon.

Alarm ID	Alarm Name	Alarm Description	Impact on the System
1120	Management system certificate invalid	Management system certificate valid date is future time	Can't connect to management system
1121	Management system certificate to expire	Management system certificate will be deadline after 60 days	The link to management system will be disconnected after 60 days
1122	Management system certificate expired	Management system certificate is expired	Unable to connect to management system
1123	Remote Control Certificate invalid	Remote Control Certificate valid date is future time	Unable to connect to remote output control server
1124	Remote Control Certificate to expire	Remote Control Certificate will be deadline after 60 days	The link to remote output control server will be disconnected after 60 days
1125	Remote Control Certificate expired	Remote Control Certificate is expired	Unable to connect to remote output control server
1126	ESGCC Certificate invalid	Poverty alleviation monitoring center certificate valid date is future time	Unable to connect to poverty alleviation monitoring center
1127	ESGCC Certificate to expire	Poverty alleviation monitoring center certificate will be deadline after 60 days	The link to poverty alleviation monitoring center will be disconnected after 60 days
1128	ESGCC Certificate expired	Poverty alleviation monitoring center certificate is expired	Unable to connect to poverty alleviation monitoring center
1129	SmartLogger Certificate Invalid	SmartLogger Certificate valid date is future time	NA

Alarm ID	Alarm Name	Alarm Description	Impact on the System
1130	SmartLogger Certificate About to Expire	SmartLogger Certificate will be deadline after 60 days	Links pose security risks after certificate expired
1131	SmartLogger Certificate Expired	SmartLogger Certificate is expired	Links pose security risks after certificate expired
1132	One or Two Smart Rack Controller Cables Not Connected to DC Bus	NA	NA
1133	Smart Tracker Out of Control	NA	NA
1134	One or Two Smart PCS Cables Not Connected to DC Bus	NA	NA
1135	Insufficient SDS License Capacity	NA	NA
1140	Array Black Start Failed	The black start command is not delivered in the correct time sequence.	NA
1140	Array Black Start Failed	The array running status does not meet the condition for a black start.	NA
1140	Array Black Start Failed	No available ESS.	NA
1140	Array Black Start Failed	The ESS does not support black start.	NA
1140	Array Black Start Failed	The PCS does not support black start.	NA
1140	Array Black Start Failed	The black start of the ESS failed.	NA
1140	Array Black Start Failed	No available PCS.	NA

Alarm ID	Alarm Name	Alarm Description	Impact on the System
1140	Array Black Start Failed	The black start of the PCS failed.	NA
1141	ESS Shutdown upon STS Switch-off	NA	NA

3.3 Register Definitions for the Environmental Monitor Instrument

NOTE

In the following table, the operating object of the register is an environmental monitor instrument. In the Modbus-TCP communications protocol, the logic device ID is set to the RS485 address of the environmental monitor instrument.

Table 3-4 Register Definitions

SN	Signal Name	Read / Write	Type	Unit	Gain	Register Address	Quantity
1	Wind speed (WSP)	RO	I16	m/s	10	40031	1
2	Wind direction (WD)	RO	I16	°	1	40032	1
3	PV module temperature	RO	I16	ºC	10	40033	1
4	Ambient temperature	RO	I16	ºC	10	40034	1
5	Total irradiance	RO	I16	W/m^2	10	40035	1
6	Daily irradiation amount	RO	U32	MJ/m^2	1000	40036	2
7	Total irradiance 2	RO	I16	W/m^2	10	40038	1
8	Daily irradiation amount 2	RO	U32	MJ/m^2	1000	40039	2
9	Custom 1	RO	I16	N/A	10	40041	1
10	Custom 2	RO	I16	N/A	10	40042	1

SN	Signal Name	Read / Write	Type	Unit	Gain	Register Address	Quantity
11	Daily irradiation amount	RO	U32	kWh/m^2	1000	40043	2
12	Daily irradiation amount 2	RO	U32	kWh/m^2	1000	40045	2

3.4 Register Definitions for the Power Meter

NOTE

In the following table, the operating object of the register is a power meter. In the Modbus-TCP communications protocol, the logic device ID is set to the RS485 address of the power meter.

On the smart meter connected to the SmartLogger, a positive value indicates the power fed to the grid, and a negative value indicates the power supplied from the grid.

Table 3-5 Register Definitions

SN	Signal Name	Read/ Write	Type	Unit	Gain	Address	Quantity
1	Phase A voltage	RO	U32	V	100	32260	2
2	Phase B voltage	RO	U32	V	100	32262	2
3	Phase C voltage	RO	U32	V	100	32264	2
4	A-B line voltage	RO	U32	V	100	32266	2
5	B-C line voltage	RO	U32	V	100	32268	2
6	C-A line voltage	RO	U32	V	100	32270	2
7	Phase A current	RO	I32	A	10	32272	2
8	Phase B current	RO	I32	A	10	32274	2
9	Phase C current	RO	I32	A	10	32276	2
10	Active power	RO	I32	kW	1000	32278	2
11	Reactive power	RO	I32	kVar	1000	32280	2
12	Active electricity (Reserved)	RO	I32	kWh	10	32282	2

SN	Signal Name	Read/ Write	Type	Unit	Gain	Address	Quantity
13	Power factor	RO	I16	N/A	1000	32284	1
14	Reactive electricity (Reserved)	RO	I32	kvarh	10	32285	2
15	Apparent power	RO	I32	kVA	1000	32287	2
16	Positive active electricity (Reserved)	RO	I32	kWh	100	32289	2
17	Positive reactive electricity (Reserved)	RO	I32	kvarh	100	32291	2
18	Electricity in positive active electricity price segment 1	RO	I32	kWh	100	32299	2
19	Electricity in positive active electricity price segment 2	RO	I32	kWh	100	32301	2
20	Electricity in positive active electricity price segment 3	RO	I32	kWh	100	32303	2
21	Electricity in positive active electricity price segment 4	RO	I32	kWh	100	32305	2
22	Electricity in negative active electricity price segment 1	RO	I32	kWh	100	32307	2
23	Electricity in negative active electricity price segment 2	RO	I32	kWh	100	32309	2
24	Electricity in negative active electricity price segment 3	RO	I32	kWh	100	32311	2
25	Electricity in negative active electricity price segment 4	RO	I32	kWh	100	32313	2
26	Custom 1	RO	I32	N/A	1000	32315	2
27	Custom 2	RO	I32	N/A	1000	32317	2
28	Custom 3	RO	I32	N/A	1000	32319	2

SN	Signal Name	Read/ Write	Type	Unit	Gain	Address	Quantity
29	Custom 4	RO	I32	N/A	1000	32321	2
30	Custom 5	RO	I32	N/A	1000	32323	2
31	Custom 6	RO	I32	N/A	1000	32325	2
32	Custom 7	RO	I32	N/A	1000	32327	2
33	Custom 8	RO	I32	N/A	1000	32329	2
34	Custom 9	RO	I32	N/A	1000	32331	2
35	Custom 10	RO	I32	N/A	1000	32333	2
36	Phase A active power	RO	I32	kW	1000	32335	2
37	Phase B active power	RO	I32	kW	1000	32337	2
38	Phase C active power	RO	I32	kW	1000	32339	2
39	Total active electricity	RO	I64	kWh	100	32341	4
40	Total reactive electricity	RO	I64	kvarh	100	32345	4
41	Negative active electricity	RO	I64	kWh	100	32349	4
42	Negative reactive electricity	RO	I64	kvarh	100	32353	4
43	Positive active electricity	RO	I64	kWh	100	32357	4
44	Positive reactive electricity	RO	I64	kvarh	100	32361	4

NOTE

SN16 ~ SN25 registers are supported only by DL/T 645 power meters.

3.5 Register Definitions for the SUN2000

NOTE

The operating object of the register is an SUN2000 inverter. In the Modbus-TCP communications protocol, the logic device ID is set to the RS485 address of the inverter.

For the detailed register definitions, see the *SUN2000VXXXRXXXCXX MODBUS Protocol*.

3.6 Public Register Definitions

The SmartLogger provides signals listed in the following table for all types of devices connected to it, even if the devices do not provide the signals.

Table 3-6 Register Definitions

SN	Signal Name	Read/ Write	Type	Unit	Gain	Address	Quantity
1	Device list change number	RO	U16	N/A	1	65521	1
2	Port number	RO	U16	N/A	1	65522	1
3	Device Address	RO	U16	N/A	1	65523	1
4	Device name	RW	STR	N/A	1	65524	10
5	Device connection status	RO	U16	N/A	1	65534	1

NOTE

Data definitions for Device connection status are as follows:

0XB000; Disconnection

0XB001; Online

Data restrictions for Device name re as follows:

A device name consists of a maximum of 20 bytes (excluding the terminator), and can contain only visible characters whose ASCII codes are in the range from 0x20 to 0x7e, including letters (a–z, A–Z), digits (0–9), and single-byte punctuation (excluding ', ", and \).

3.7 Remapped Modbus definitions

NOTE

The mapped registers are accessed by the SmartLogger address. By default, each device takes up 25 registers, the register address is derived from the initial register address, offset address, and device address translation. Device address for Modbus physical address. Supported devices: inverter, environmental monitor instrument.

The formula is as follows:

- Register address = Initial register address + (25 * (Device address – 1)) + Offset address
- Initial register address = 51000
- For the registers must be set in sequence, the device address must be in strict accordance with the continuous number to avoid waste of registers.

Table 3-7 Inverter Register Definitions

SN	Signal Name	Read / Write	Type	Unit	Gain	Offset Address	Quantity	Scope
1	Active power	RO	I32	kW	1000	0	2	
2	Reactive power	RO	I32	kVAR	1000	2	2	
3	Total DC input current	RO	I16	A	100	4	1	
4	Total input power	RO	U32	kW	1000	5	2	
5	Insulation resistance	RO	U16	MΩ	1000	7	1	
6	Power factor	RO	I16	N/A	1000	8	1	

SN	Signal Name	Read / Write	Type	Unit	Gain	Offset Address	Quantity	Scope
7	Inverter status	RO	U16	N/A	1	9	1	In addition to the Modbus interface protocol of the specific inverter, the following two states are added by the SmartLogger: 0xB000: Communication interrupt 0xC000: Uploading
8	Spare8	RO	I16	N/A	N/A	10	1	
9	Cabinet temperature	RO	I16	℃	10	11	1	
10	Major Fault Code	RO	U32	N/A	N/A	12	2	Alarm ID (Bit31–16) + Cause ID (Bit15–0)
11	Minor Fault Code	RO	U32	N/A	N/A	14	2	Alarm ID (Bit31–16) + Cause ID (Bit15–0)
12	Warning Code	RO	U32	N/A	N/A	16	2	Alarm ID (Bit31–16) + Cause ID (Bit15–0)
13	Spare1	RO	U16	N/A	N/A	18	1	
14	Spare2	RO	U16	N/A	N/A	19	1	
15	Spare3	RO	U16	N/A	N/A	20	1	
16	Spare4	RO	U16	N/A	N/A	21	1	

SN	Signal Name	Read/ Write	Type	Unit	Gain	Offset Address	Quantity	Scope
17	Spare5	RO	U16	N/A	N/A	22	1	
18	Spare6	RO	U16	N/A	N/A	23	1	
19	Spare7	RO	U16	N/A	N/A	24	1	

Table 3-8 Environmental Monitor Instrument Register Definitions

SN	Signal Name	Read/ Write	Type	Unit	Gain	Offset Address	Quantity	Scope
1	Wind speed (WSP)	RO	I16	m/s	10	0	1	
2	Wind direction (WD)	RO	I16	°	1	1	1	
3	PV module temperature	RO	I16	℃	10	2	1	
4	Ambient temperature	RO	I16	℃	10	3	1	
5	Total irradiance	RO	I16	W/m^2	10	4	1	
6	Daily irradiation amount	RO	U32	MJ/m^2	1000	5	2	
7	Total irradiance 2	RO	I16	W/m^2	10	7	1	
8	Daily irradiation amount 2	RO	U32	MJ/m^2	1000	8	2	
9	Custom 1	RO	I16	N/A	10	10	1	
10	Custom 2	RO	I16	N/A	10	11	1	

SN	Signal Name	Read/ Write	Type	Unit	Gain	Offset Address	Quantity	Scope
11	Daily irradiation amount	RO	U32	kWh/m^2	1000	12	2	
12	Daily irradiation amount 2	RO	U32	kWh/m^2	1000	14	2	
13	Spare1	RO	U16	N/A	N/A	16	1	
14	Spare2	RO	U16	N/A	N/A	17	1	
15	Spare3	RO	U16	N/A	N/A	18	1	
16	Spare4	RO	U16	N/A	N/A	19	1	
17	Spare5	RO	U16	N/A	N/A	20	1	
18	Spare6	RO	U16	N/A	N/A	21	1	
19	Spare7	RO	U16	N/A	N/A	22	1	
20	Spare8	RO	U16	N/A	N/A	23	1	
21	Spare9	RO	U16	N/A	N/A	24	1	

4 Power Adjustment for Inverters

The MODBUS-TCP interface provided by the SmartLogger can directly access the inverter.

The built-in power interface of the SmartLogger can be used for array-level power adjustment. If the power interface is used, the power adjustment instruction is first processed by the SmartLogger and then forwarded to the inverter.

Related interfaces are as follows.

Table 4-1 Register Definitions

No.	Signal	Read/ Write	Type	Unit	Gain	Address	Quantity	Constraints
1	Active power adjustment	RW	I32	kW	10	40420	2	[–Total rated active power of PCSs in the array, Total rated active power of inverters and PCSs in the array] The command will not be executed if the value in it is beyond the valid range.

No.	Signal	Read/ Write	Type	Unit	Gain	Address	Quantity	Constraints
2	Reactive power adjustment	RW	I32	kVar	10	40422	2	[–Total rated apparent power of inverters and PCSs in the array, Total rated apparent power of inverters and PCSs in the array] The command will not be executed if the value in it is beyond the valid range.
3	Active power adjustment	RW	U32	kW	10	40424	2	
4	Reactive power adjustment	RW	I32	kVar	10	40426	2	
5	Active power adjustment in percentage	RW	I16	%	10	40428	1	[-100.0, 100.0]
6	Power factor adjustment	RW	I16	N/A	1000	40429	1	(-1,-0.8]U[0.8,1]
7	Maximum reactive power adjustment value	RO	U32	kVar	10	40693	2	Read only interface
8	Minimum reactive power adjustment value	RO	I32	kVar	10	40695	2	

No.	Signal	Read/ Write	Type	Unit	Gain	Address	Quantity	Constraints
9	Maximum active power adjustment value	RO	I32	kW	10	40697	2	
10	Minimum active power adjustment value	RO	I32	kW	10	40412	2	
11	Active PV power adjustment in fixed value	RW	U32	kW	10	40378	2	[0, Total rated active power of inverters in the array] The command will not be executed if the value in it is beyond the valid range.
12	Active PV power adjustment in percentage	RW	U16	%	10	40380	1	[0,100.0]
13	Active ESS power adjustment in fixed value	RW	I32	kW	10	40381	2	[–Total rated active power of PCSs in the array, Total rated active power of PCSs in the array] The command will not be executed if the value in it is beyond the valid range.

No.	Signal	Read/ Write	Type	Unit	Gain	Address	Quantity	Constraints
14	Active ESS power adjustment in percentage	RW	I16	%	10	40383	1	[–100.0,100.0]. A negative value indicates charging.
15	Reactive PV power adjustment in fixed value	RW	I32	kVar	10	40384	2	[–Total rated apparent power of inverters in the array, Total rated apparent power of inverters in the array] The command will not be executed if the value in it is beyond the valid range.
16	Reactive ESS power adjustment in fixed value	RW	I32	kVar	10	40386	2	[–Total rated apparent power of PCSs in the array, Total rated apparent power of PCSs in the array] The command will not be executed if the value in it is beyond the valid range.

No.	Signal	Read/ Write	Type	Unit	Gain	Address	Quantity	Constraints
17	Active power adjustment (highest-priority)	RW	I32	kW	1000	40430	2	[–Total rated active power of PCSs in the array, Total rated active power of inverters and PCSs in the array] The command will not be executed if the value in it is beyond the valid range.
18	Reactive power adjustment (highest-priority)	RW	I32	kVar	1000	40432	2	[–Total rated apparent power of inverters and PCSs in the array, Total rated apparent power of inverters and PCSs in the array] The command will not be executed if the value in it is beyond the valid range.

4.12 40432: Reactive Power Adjustment (High-Priority)

4.1 40420, 40424: Active Adjustment

The external device sends an absolute active power value for active power adjustment. The value is the sum of all inverters connected to the SmartLogger.

After the SmartLogger receives the instruction value, it synchronizes the value in percentage to all connected inverters.

4.2 40422, 40426: Reactive Adjustment

The external device sends an absolute reactive power value for reactive power adjustment. The value is the sum of all inverters connected to the SmartLogger.

After the SmartLogger receives the instruction value, it synchronizes the value in the form of Q/S to all connected inverters.

4.3 40428: Active Power Adjustment by Percentage

The external device sends the active power adjustment target value in percentage.

After the SmartLogger receives the instruction value, it synchronizes the value in percentage to all connected inverters.

The reference value of this percentage value is the sum of the rated power of all inverters.

4.4 40429: Power Factor Adjustment

The external device sends the reactive power adjustment target value in the form of a power factor.

After the SmartLogger receives the instruction value, it synchronizes the value in the form of a power factor to all connected inverters.

4.5 40378: PV Active Power Adjustment in Fixed Value

The external device sends an absolute active power value for active PV power adjustment. The value is the total active power of all PV inverters connected to the SmartLogger.

The independent PV adjustment port supports only arrays with AC coupling between PV and ESS.

After the SmartLogger receives the instruction value, it synchronizes the value in percentage to all connected PV inverters.

4.6 40380: PV Active Power Adjustment in Percentage

The external device sends the active PV power adjustment target value in percentage.

The independent PV adjustment port supports only arrays with AC coupling between PV and ESS.

After the SmartLogger receives the instruction value, it synchronizes the value in percentage to all connected PV inverters.

The value applies to the total rated power of all grid-tied PV inverters, which can be queried in rated PV power (register 40396).

4.7 40381: ESS Active Power Adjustment in Fixed Value

The external device sends an absolute active power value for active ESS power adjustment. The value is the total active power of all ESS PCSs connected to the SmartLogger.

The independent PV adjustment port supports only arrays with AC coupling between PV and ESS.

After the SmartLogger receives the instruction value, it synchronizes the value in percentage to all connected PCSs.

4.8 40383: Active ESS Power Adjustment in Percentage

The external device sends the active ESS power adjustment target value in percentage.

The independent PV adjustment port supports only arrays with AC coupling between PV and ESS.

After the SmartLogger receives the instruction value, it synchronizes the value in percentage to all connected ESS PCSs.

The value applies to the total rated power of all grid-tied PCSs, which can be queried in rated ESS power (register 40398).

4.9 40384: Reactive PV Power Adjustment in Fixed Value

The external device sends an absolute reactive power value for reactive PV power adjustment. The value is the total reactive power of all PV inverters connected to the SmartLogger.

The independent PV adjustment port supports only arrays with AC coupling between PV and ESS.

After the SmartLogger receives the instruction value, it synchronizes the value in the form of Q/S to all connected PV inverters.

4.10 40386: Reactive ESS Power Adjustment in Fixed Value

The external device sends an absolute reactive power value for reactive ESS power adjustment. The value is the total reactive power of all ESS PCSs connected to the SmartLogger.

The independent PV adjustment port supports only arrays with AC coupling between PV and ESS.

After the SmartLogger receives the instruction value, it synchronizes the value in the form of Q/S to all connected PCSs.

4.11 40430 Active Power Adjustment (High-Priority)

The external device sends an absolute active power value for array active power adjustment. The value is the total active power of all inverters connected to the SmartLogger.

This interface is provided only for the source control terminal. When this function is enabled, other active power adjustment interfaces will be blocked. When value **0x7FFFFFFF** is issued, this function is disabled.

After the SmartLogger receives the instruction value, it synchronizes the value in percentage to all connected ESS PCSs.

4.12 40432: Reactive Power Adjustment (High-Priority)

The external device sends an absolute reactive power value for array reactive power adjustment. The value is the total reactive power of all inverters connected to the SmartLogger.

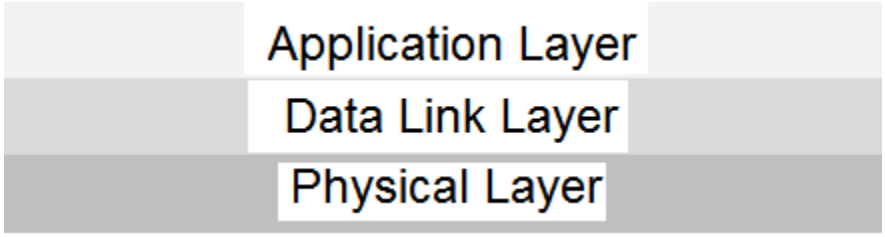
This interface is provided only for the source control terminal. When this function is enabled, other reactive power adjustment interfaces will be blocked. When value **0x7FFFFFFF** is issued, this function is disabled.

After the SmartLogger receives the instruction value, it synchronizes the value in the form of Q/S to all connected inverters.

5 Communication Protocol Overview

The ModBus-TCP communication protocol consists of the following layers:

Figure 5-1 Layers of the ModBus-TCP communication protocol



5.1 Physical Layer

Communicates over an Ethernet.

Port number: 502

5.2 Data Link Layer

5.2.1 Addressing Mode

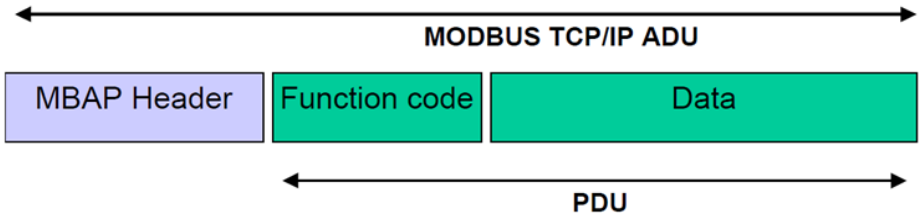
ModBus-TCP data frames identify devices by logic device IDs. The following table describes how logic device IDs are allocated.

NOTE

The address of an access device is an RS485 address which can be read on the LCD or built-in WebUI of the SmartLogger.

SmartLogger Local Address	Access Device Address	Reserved
0	1–247	248–255

5.2.2 Frame Structure



NOTE

A ModBus-TCP frame can contain a maximum of 256 bytes.

The following table describes the format of an MBAP header:

Table 5-1 MBAP Definitions

Data Field	Length (Bytes)	Description	Master Node	Slave Node
Transmission identifier	2	Matching identifier between a request frame and a response frames	Assigned by the master node; better be unique for each data frame.	The identifier of the response frame from the slave node must be consistent with that of the request frame.
Protocol type	2	0 = Modbus protocol	Assigned by the master node; 0 by default.	The identifier of the response frame from the slave node must be consistent with that of the request frame.

Data Field	Length (Bytes)	Description	Master Node	Slave Node
Data length	2	Follow-up data length	Assigned by the master node based on the actual data frame.	Assigned by the slave node based on the actual frame length.
Logic device ID	1	Identifies a SmartLogger device or a subdevice accessed by the SmartLogger. 0: SmartLogger 1–247: Inverters or other device	Assigned by the master node based on the actual data frame request.	The identifier of the response frame from the slave node must be consistent with that of the request frame.

5.2.3 Data Encoding

Modbus uses a big-Endian to represent addresses and data. When multiple bytes are sent, the payload digit leftmost is sent first.

Example:

Register Size	Value
16 bits	0x1234

The system sends 0x12, and then sends 0x34.

5.2.4 Interaction Process

A communication process is always initiated by a master node. Slave nodes do not initiate communication processes.

In unicast mode, a slave node returns one response for each request from the master node. If the master node does not receive any response from the slave node in 5s, the communication process is regarded as timed out.

In broadcast mode, slave nodes receive instructions from the master node, but do not respond to the instructions.

5.3 Application Layer

5.3.1 Function Code List

Table 5-2 Function code list

Function Code	Meaning	Remarks
0x03	Read registers.	Supports continuous reading of single or multiple registers.
0x06	Write a single register.	Supports writing into a single register.
0x10	Write multiple registers.	Supports continuous writing into multiple registers.
0x2B	Read device identifiers.	Obtains device types and version numbers.

5.3.2 Exception Code List

The exception codes must be unique for each NE type. The names and descriptions are provided in the NE interface document. Different versions of the same NE type must be backward compatible. Exception codes in use cannot be assigned to other exceptions.

Table 5-3 Table of exception codes returned by an NE (0x00–0x8F are for common exception codes)

Code	Name	Meaning
0x01	ILLEGAL FUNCTION	The function code received in the query is not an allowable action for the server. This may be because the function code is only applicable to newer devices, and was not implemented in the unit selected. It could also indicate that the server is in the wrong state to process a request of this type, for example because it is unconfigured and is being asked to return register values.

Code	Name	Meaning
0x02	ILLEGAL DATA ADDRESS	The data address received in the query is not an allowable address for the server. More specifically, the combination of reference number and transfer length is invalid. For a controller with 100 registers, the PDU addresses the first register as 0, and the last one as 99. If a request is submitted with a starting register address of 96 and a quantity of registers of 4, then this request will successfully operate (address-wise at least) on registers 96, 97, 98, 99. If a request is submitted with a starting register address of 96 and a quantity of registers of 5, then this request will fail with Exception Code 0x02 "Illegal Data Address" since it attempts to perform operations on registers 96, 97, 98, 99 and 100, and there is no register with address 100.

Code	Name	Meaning
0x03	ILLEGAL DATA VALUE	A value contained in the query data field is not an allowable value for server. This indicates a fault in the structure of the remainder of a complex request, such as that the implied length is incorrect. It specifically does not mean that a data item submitted for storage in a register has a value outside the expectation of the application program, since the Modbus protocol is unaware of the significance of any particular value of any particular register.
0x04	SERVER DEVICE FAILURE	An unrecoverable error occurred while the server was attempting to perform the requested action.
0x05	ACKNOWLEDGE	Specialized use in conjunction with programming commands. The server has accepted the request and is processing it, but a long duration of time will be required to do so. This response is returned to prevent a timeout error from occurring in the client. The client can next issue a Poll Program Complete message to determine if processing is completed.

Code	Name	Meaning
0x06	SERVER DEVICE BUSY	Specialized use in conjunction with programming commands. The server is engaged in processing a long–duration program command. The client should retransmit the message later when the server is free.
0x08	MEMORY PARITY ERROR	Specialized use in conjunction with function codes 20 and 21 and reference type 6, to indicate that the extended file area failed to pass a consistency check. The server attempted to read record file, but detected a parity error in the memory. The client can retry the request, but service may be required on the server device.
0x0A	GATEWAY PATH UNAVAILABLE	Specialized use in conjunction with gateways, indicates that the gateway was unable to allocate an internal communication path from the input port to the output port for processing the request. Usually means that the gateway is misconfigured or overloaded.
0x0B	GATEWAY TARGET DEVICE FAILED TO RESPOND	Specialized use in conjunction with gateways, indicates that no response was obtained from the target device. Usually means that the device is not present on the network.

Code	Name	Meaning
0x80	NO PERMISSION	An operation is not allowed because of a permission authentication failure or permission expiration.

5.3.3 Reading Registers (0X03)

5.3.3.1 Frame Format for a Request from a Master Node

Data Field	Length	Description
Function code	1 byte	0x03
Register start address	2 byte	0x0000–0xFFFF
Number of registers	2 byte	1–125

5.3.3.2 Frame Format for a Normal Response from a Slave Node

Data Field	Length	Description
Function code	1 byte	0x03
Number of bytes	1 byte	2×N
Register value	2xN byte	N/A

NOTE

N indicates the number of registers.

5.3.3.3 Frame Format for an Abnormal Response from a Slave Node

Data Field	Length	Description
Function code	1 byte	0x83
Exception code	1 byte	See the **5.3.2 Exception Code List**

5.3.3.4 Example

A master node sends a request to a slave node (logic device ID: 01) to query register whose address is 32306/0X7E32. The request frame format is as follows:

Description	MBAP Header							Function Code	Data			
	Protocol Identifier		Protocol Type		Data Length		Logic Device ID		Register Address		Number of Registers	
Data frame	00	01	00	00	00	06	00	03	7E	32	00	02

Frame format of a normal response from the slave node:

Description	MBAP Header							Function Code	Data				
	ProtocolIdentifier		Protocol Type		Data Length		LogicDeviceID		Bytes	RegisterValue			
Data frame	00	01	00	00	00	07	00	03	04	00	00	00	01

Frame format of an abnormal response from the slave node:

Description	MBAP Header							Function Code	Data
	ProtocolIdentifier		Protocol Type		Data Length		LogicDeviceID		Error Code
Data frame	00	01	00	00	00	03	00	83	03

5.3.4 Writing a Single Register (0X06)

5.3.4.1 Frame Format for a Request from a Master Node

Data Field	Length	Description
Function code	1 byte	0x06
Register Address	2 bytes	0x0000–0xFFFF
Register Value	2 bytes	0x0000–0xFFFF

5.3.4.2 Frame Format for a Normal Response from a Slave Node

Data Field	Length	Description
Function code	1 byte	0x06
Register Address	2 bytes	0x0000–0xFFFF
Register Value	2 bytes	0x0000–0xFFFF

5.3.4.3 Frame Format for an Abnormal Response from a Slave Node

Data Field	Length	Description
Function code	1 byte	0x86
Exception code	1 byte	See the **5.3.2 Exception Code List**

5.3.4.4 Example

A master node sends a Power-On instruction(register address: 40200/0X9D08) to a slave node whose address is 01. The request frame format is as follows:

Description	MBAP Header							Function Code	Data			
	Protocol Identifier		Protocol Type		Data Length		Logic device ID		Register Address		Register Value	
Data frame	00	01	00	00	00	06	00	06	9D	08	00	00

Frame format of a normal response from the slave node:

Description	MBAP Header							Function Code	Data			
	Protocol Identifier		Protocol Type		Data Length		Logic Device ID		Register Address		Register Value	
Data frame	00	01	00	00	00	06	00	06	9D	08	00	00

Frame format of an abnormal response from the slave node:

Description	MBAP Header							Function Code	Data
	Protocol Identifier		Protocol Type		Data Length		Logic Device ID		Error Code
Data frame	00	01	00	00	00	03	00	86	04

5.3.5 Writing Multiple Registers

5.3.5.1 Frame Format for a Request from a Master Node

Data Field	Length	Description
Function code	1 byte	0x10
Register start address	2 byte	0x0000–0xFFFF
Number of registers	2 byte	0x0000–0x007b
Number of bytes	1 byte	2×N
Register value	2×N byte	Value

NOTE

N indicates the number of registers.

5.3.5.2 Frame Format for a Normal Response from a Slave Node

Data Field	Length	Description
Function code	1 byte	0x10
Register address	2 bytes	0x0000–0xFFFF
Number of registers	2 bytes	0x0000–0x007b

5.3.5.3 Frame Format for an Abnormal Response from a Slave Node

Data Field	Length	Description
Function code	1 byte	0x90
Exception code	1 byte	See the **5.3.2 Exception Code List**

5.3.5.4 Example

A master node sends an instruction to a slave node whose address is 01 to set the active power control mode (register address: 40118/0X9CB6) to 2, and set the active power deration (register address: 40119/0X9CB7) to 50%. The request frame format is as follows:

Description	MBAP Header							Function Code	Data								
	Protocol Identifier		Protocol Type		Data Length		Logic device ID		Register Address		Number of Registers		Bytes	Register Value			
Data frame	00	01	00	00	00	0B	00	10	9C	B6	00	02	04	00	02	00	32

Frame format of a normal response from the slave node:

Description	MBAP Header				Function Code	Data	
	Protocol Identifier	Protocol Type	Data Length	Logic Device ID		Register Address	Number of Registers

Dataframe	00	01	00	00	00	06	00	10	9C	B6	00	02

Frame format of an abnormal response from the slave node:

Description	MBAP Header							Function Code	Data
	Protocol Identifier		Protocol Type		Data Length		Logic Device ID		Error Code
Dataframe	00	01	00	00	00	03	00	90	04

5.3.6 Reading Device Identifiers (0X2B)

This command code allows reading identifiers and added packets that are relevant to the physical and function description of the remote devices.

Simulate the port of the read device identifier as an address space. This address space consists of a set of addressable data elements. The data elements are objects to be read, and the object IDs determine these data elements.

A data element consists of three objects:

- Basic device identifier: All objects of this type are mandatory, such as the manufacturer name, product code, and revision version.
- Normal device identifier: Except the basic data objects, the device provides additional and optional identifiers and data object description. Normal device identifiers define all types of objects according to standard definitions, but the execution of this type of objects is optional.
- Extensive device identifier: Except the basic data objects, the device provides additional and optional identifiers and special data object description. All these data objects are related to the device.

Table 5-4 Reading Device Identifiers

Object ID	Object Name or Description	Type	M/O	Category
0x00	Manufacturer name	ASCII character string	M	Basic
0x01	Product code	ASCII character string	M	
0x02	Main revision	ASCII character string	M	
0x03–0x7F				Normal

Object ID	Object Name or Description	Type	M/O	Category
0x80–0xFF				Extensive

5.3.6.1 Commands for Querying Device Identifiers

Table 5-5 Request frame format

Data Field	Length (Byte)	Description
Function code	1	0x2B
MEI type	1	0x0E
ReadDevId code	1	01
Object ID	1	0x00

Table 5-6 Frame format for a normal response

Data Field			Length (Byte)	Description
Slave node address			1	1–247
Function code			1	0x2B
MEI type			1	0x0E
ReadDevId code			1	01
Consistency level			1	01
More			1	N/A
Next object ID			1	N/A
Number of objects			1	N/A
Object list	First object	Object ID	1	0x00
		Object length	1	N
		Object value	N	N/A

Table 5-7 Object list

Object ID	Object Name or Description	Description	Category
0x00	Manufacturer name	HUAWEI	Basic
0x01	Product code	SUN2000	
0x02	Main revision	ASCII character string, software version	

Table 5-8 Frame format for an abnormal response

Data Field	Length (Byte)	Description
Function code	1	0xAB
Exception code	1	See the **5.3.2 Exception Code List**

5.3.6.2 Command for Querying a Device List

Table 5-9 Request frame format

Data Field	Length (Byte)	Description
Function code	1	0x2B
MEI type	1	0x0E
ReadDevId code	1	03
Object ID	1	0x87

Table 5-10 Frame format for a normal response

Data Field	Length (Byte)	Description
Function code	1	0x2B
MEI type	1	0x0E
ReadDevId code	1	03
Consistency level	1	03
More	1	N/A

Data Field			Length (Byte)	Description
Next object ID			1	N/A
Number of objects			1	N/A
Object list	First object	Object ID	1	0x87
		Object length	1	N
		Object value	N	N/A
	...			

Table 5-11 Object list

Object ID	Object Name	Type	Description
0x80-0x86	Reserved		Returns a null object with a length of 0.
0x87	Number of devices	int	Returns the number of devices connected to the RS485 address.
0x88	Information about the first device	ASCII character string See the device description definitions below.	Returns information only for the first device if a network element allows only one device to be connected to each RS485 address.
0x89	Information about the second device	Same as above	Same as above
...	...	...	...
0xFF	Information about the 120th device	Same as above	Same as above
0x00	Information about the 121st device	Same as above	Same as above
0x01	Information about the 122nd device	Same as above	Same as above
...	...	...	...

5.3.6.3 Device Description Definitions

Each device description consists of all"attribute = value" strings.

Attribute label=%s;attribute label=%s;...attribute label=%s

For example:1=SUN2000;2=V100R001C01SPC120;3=P1.0-D1.0;4=123232323;5=2;6=1.

Table 5-12 Attribute definitions

Attribute Label	Attribute Name	Type	Description
1	Device Model	ASCII character string	SUN2000
2	Software version	ASCII character string	N/A
3	Version of the communications protocol	ASCII character string	See the interface protocol version definitions.
4	ESN	ASCII character string	N/A
5	Device number	int	0,1,2,3...(Assigned by NE; 0 indicates the master device to which the ModBus card is inserted)
6	Parallel network number	int	0, 1, 2, 3, ... (assigned by NE) 0xFF: invalid value; indicates that a unit does not belong to any parallel system If not applicable, this attribute is not returned.

Table 5-13 Frame format for an abnormal response

Data Field	Length (Byte)	Description
Function code	1	0xAB
Exception code	1	See the **5.3.2 Exception Code List**

6 Reference Documents

Modbus_Application_Protocol_V1_1b3

Modbus over serial line specification and implementation guide V1.02

Modbus_Messaging_Implementation_Guide_V1_0b

