SUN2000-12/15/17/20/25K-MB0 Modbus Interface Definitions

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1 Supported Models

1.1 Model Description

Table 1-1 Supported models and firmware versions

Model	Model ID	Earliest Firm Version
SUN2000-12KTL-M5	473	V200R022C10
SUN2000-15KTL-M5	474	V200R022C10
SUN2000-17KTL-M5	475	V200R022C10
SUN2000-20KTL-M5	476	V200R022C10
SUN2000-25KTL-M5	477	V200R022C10
SUN2000-15KTL-ZHM5	478	V200R022C10
SUN2000-17KTL-ZHM5	479	V200R022C10
SUN2000-20KTL-ZHM5	480	V200R022C10
SUN2000-25KTL-ZHM5	481	V200R022C10
SUN2000-15K-MB0-ZH	492	V200R023C10PSC110
SUN2000-17K-MB0-ZH	493	V200R023C10PSC110
SUN2000-20K-MB0-ZH	494	V200R023C10PSC110
SUN2000-25K-MB0-ZH	495	V200R023C10PSC110
SUN2000-12K-MB0	487	V200R023C10PSC110
SUN2000-15K-MB0	488	V200R023C10PSC110

Model	Model ID	Earliest Firm Version
SUN2000-17K-MB0	489	V200R023C10PSC110
SUN2000-20K-MB0	490	V200R023C10PSC110
SUN2000-25K-MB0	491	V200R023C10PSC110
SUN600-15KTL-ZHM0	482	V200R022C10
SUN600-17KTL-ZHM0	483	V200R022C10
SUN600-20KTL-ZHM0	484	V200R022C10
SUN600-23KTL-ZHM0	485	V200R022C10
SUN600-25KTL-ZHM0	486	V200R022C10

The maximum active power (P_{max}), maximum reactive power (Q_{max}), and rated power (P_n) corresponding to each model can be obtained from the register interface. The model ID is the unique code of the model.

2 Overview

2.1 Terms and Abbreviations

Table 2-1 Terms and abbreviations

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	A register address is recorded in two bytes.
U16	Unsigned integer (16 bits)
U32	Unsigned integer (32 bits)
I16	Signed integer (16 bits)
I32	Signed integer (32 bits)
STR	Character string
MLD	Multiple bytes
Bitfield16	16-bit data expressed by bit
Bitfield32	32-bit data expressed by bit
N/A	Not applicable

Name	Description
s	Second
Epoch seconds	The number of seconds that have elapsed since 1970-01-01 00:00:00
RO	Data that is readable only
RW	Data that is readable and writable
WO	Data that is writable only

3 Register Definitions

Table 3-1 Register definitions

No.	Signal name	Read and write	Type	Unit	Gain	Address	Number of Reg	Scope
1	Model	RO	STR			30000	15	Nameplate name of the machine, original "model name"
2	SN	RO	STR			30015	10	Device SN, which is obtained from the electronic label of the entire system.
3	PN	RO	STR			30025	10	Product Code
4	Firmware Version	RO	STR			30035	15	Character string reporting: initial version VX00R00X (default VR version) VX00R00XD01, VX00R00XD02... (D0X is provided by the test and certification personnel.) Different country codes may be displayed differently.
5	Software version	RO	STR			30050	15	In V800R021C10SPCXXX, the offering name

								and software version are displayed on the display page.
6	Protocol version [Modbus]	RO	U32			30068	2	high-character: main version; Upgrade on Incompatible Changes low-letter: revision; Compatible upgrade The baseline version is D8.0. 0x00080000
7	Model ID	RO	U16			30070	1	Model ID. For details, see the Inverter Model Definition.xlsm.
8	Number of PV strings	RO	U16		1	30071	1	
9	Number of MPPTs	RO	U16		1	30072	1	
10	Rated power	RO	U32	kW	1000	30073	2	Pn
11	Maximum active power (Pmax)	RO	U32	kW	1000	30075	2	Read-only interface to 42027
12	Maximum apparent (Smax)	RO	U32	kVA	1000	30077	2	Read-only interface to 42025
13	Real-time maximum reactive power (Qmax, fed to the	RO	I32	kVar	1000	30079	2	Reported to the monitoring, indicating the reactive power adjustment range. Feature data is updated when the power grid standard code and derating

	power grid)							change except for model differences.
14	Real-time maximum reactive power (-Qmax, absorbed from the power grid)	RO	I32	kVar	1000	30081	2	Reported to the monitoring, indicating the reactive power adjustment range. Feature data is updated when the power grid standard code and derating change except for model differences.
15	Maximum active power (Pmax_real)	RO	U32	kW	1000	30083	2	The default maximum active power capacity is fixed on the nameplate of the machine, and the maximum active power capacity will not change for one machine. as a set upper limit for the reference range (42027); The relationship is as follows: 0<Pmax≤Smax≤Pmax_real≤Smax_real Or the 0<Pmax≤Pmax_real≤Smax≤Smax_real
16	Maximum apparent capability (Smax_real)	RO	U32	kVA	1000	30085	2	The default apparent maximum capacity value is fixed on the machine nameplate, and one machine will not change. as a set upper limit for the reference range (42025);

								The relationship is as follows: 0<Pmax≤Smax≤Pmax_real≤Smax_real Or the 0<Pmax≤Pmax_real≤Smax≤Smax_real
17	Product sales area	RO	STR			30105	2	XX: Two uppercase letters, indicating the sales area or application area of the product, mainly related to the AC power system. CN: Chinese mainland; EU: Europe; JP: Japan; US: North America (US/Canada/and regions with the same grid or certification requirements as the US); UK: United Kingdom; Default value: CN/EU: All areas where CE certification requirements are applicable. Huawei FusionSolar Smart PV Solution and Product Naming Specifications
18	Product software ID	RO	U16			30107	1	Unique ID of the software publishing entity. Used for processing the compatibility of the power grid standard code.

19	Product Software Version Number	RO	U16			30108	1	Software release entity specific release version sequence number Used to process the compatibility of the power grid standard code.
20	Power Grid Standard Code Protocol Version	RO	U16			30109	1	Protocol loading and verification is similar to CAN1.0 and CAN2.0.
21	Unique ID of the software.	RO	U16			30110	1	Unique ID of a software version. Upgrade packages with different IDs cannot be upgraded to each other. (Broadcast Upgrade Signature)
22	Number of upgrade packages	RO	U16		1	30111	1	The number of upgrade packages must be sufficient because more and more devices need to be upgraded.
23	Information about subpackage 1	RO	U32			30112	2	high-character: file type ID; Low character: device type ID.
24	Subpackage 2 information	RO	U32			30114	2	high-character: file type ID; Low character: device type ID.
25	Information about subpackage 3	RO	U32			30116	2	high-character: file type ID; Low character: device type ID.

26	Subpackage 4 information	RO	U32			30118	2	high-character: file type ID; Low character: device type ID.
27	Subpackage 5 information	RO	U32			30120	2	high-character: file type ID; Low character: device type ID.
28	Information about subpackage 6	RO	U32			30122	2	high-character: file type ID; Low character: device type ID.
29	Subpackage 7 information	RO	U32			30124	2	high-character: file type ID; Low character: device type ID.
30	Subpackage 8 information	RO	U32			30126	2	high-character: file type ID; Low character: device type ID.
31	Subpackage 9 information	RO	U32			30128	2	high-character: file type ID; Low character: device type ID.
32	Information about subpackage 10	RO	U32			30130	2	high-character: file type ID; Low character: device type ID.
33	[Third-party labeling] SN	RO	STR			30191	10	Serial number of third-party OEM equipment, customized by third-party manufacturers
34	[Third-party label] Manufacturer model	RO	U16			30201	1	Model of third-party OEM equipment manufacturer

35	Subdevice Support ID	RO	Bitfield32			30207	2	
36	Subdevice presence flag.	RO	Bitfield32			30209	2	
37	Hardware version	RO	STR		1	31000	15	
38	Monitoring Board SN	RO	STR			31015	10	From the electronic label of the monitoring board
39	Monitoring software version	RO	STR			31025	15	MCU1 version
40	Main DSP version	RO	STR			31040	15	MCU2 version
41	CPLD version number	RO	STR			31070	15	MCU4 version
42	AFCI version number	RO	STR			31085	15	MCU5 version
43	Registration code	RO	STR		1	31200	10	
44	[Remote communication] Single-node remote communication	RO	Bitfield16			32000	1	Reported by IEC104, which indicates the merged PCS running status.

45	[Remote signal] Running status (monitoring)	RO	Bitfield16			32002	1	
46	[Remote signal] Running status (power processing)	RO	Bitfield32		1	32003	2	
47	[Remote signal] Alarm 1	RO	Bitfield16			32008	1	For details, see the Alarm Mapping sheet.
48	[Remote signal] Alarm 2	RO	Bitfield16			32009	1	For details, see the Alarm Mapping sheet.
49	[Remote signal] Alarm 3	RO	Bitfield16			32010	1	For details, see the Alarm Mapping sheet.
50	Device SN feature code	RO	U16			32015	1	Indicates the CRC16 value of the SN, which is the key data ID. Used to prevent incorrect energy yield from being modified due to incorrect energy yield reported by devices with the same address. The SN CRC is added to ensure that the energy yield source is correct.

51	PV1 voltage	RO	I16	V	10	32016	1	When bit 9 of power parameter mask 14 is 0, the signal name is PV1 voltage. When bit 9 of the power parameter mask 14 is 1, the processing logic is as follows: When DC Input Display Mode 30205 is set to 0, the signal name is PV1 Voltage. When DC input 30205 is set to 1, the signal name is MPPT1 Voltage.
52	PV1 current	RO	I16	A	100	32017	1	When bit 9 of power parameter mask 14 is 0, the signal name is PV1 current. When bit 9 of power parameter mask 14 is 1, the following logic is used: When DC input display mode 30205 is set to 0, the signal name is PV1 current. When DC Input Display Mode 30205 is set to 1, the signal name is MPPT1 Current.
53	PV2 Voltage	RO	I16	V	10	32018	1	When bit 9 of power parameter mask 14 is 0, the signal name is PV2 voltage. When bit 9 of the power parameter mask 14 is 1, the processing logic is as follows: When DC Input

								Display Mode 30205 is set to 0, the signal name is PV2 Voltage. When DC input 30205 is set to 1, the signal name is MPPT2 Voltage.
54	PV2 current	RO	I16	A	100	32019	1	When bit 9 of power parameter mask 14 is 0, the signal name is PV2 current. When bit 9 of the power parameter mask 14 is 1, the following logic is used: When DC Input Display Mode 30205 is set to 0, the signal name is PV2 Current. When DC input display mode 30205 is set to 1, the signal name is MPPT2 current.
55	PV3 Voltage	RO	I16	V	10	32020	1	
56	PV3 current	RO	I16	A	100	32021	1	
57	PV4 Voltage	RO	I16	V	10	32022	1	
58	PV4 current	RO	I16	A	100	32023	1	
59	PV5 voltage	RO	I16	V	10	32024	1	
60	PV5 current	RO	I16	A	100	32025	1	
61	PV6 voltage	RO	I16	V	10	32026	1	
62	PV6 current	RO	I16	A	100	32027	1	

63	DC power	RO	I32	kW	1000	32064	2	
64	Power grid line A and B voltage	RO	U16	V	10	32066	1	When the output mode is L/N, the signal name is Grid Voltage. When Output Mode is set to L1/L2/N or L1/L2, the signal name is UW Grid Voltage.
65	Power grid B/C line voltage	RO	U16	V	10	32067	1	This parameter is invalid when the output mode is L/N, L1/L2/N, or L1/L2.
66	Power grid CA line voltage	RO	U16	V	10	32068	1	This parameter is invalid when the output mode is L/N, L1/L2/N, or L1/L2.
67	Power grid phase A voltage	RO	U16	V	10	32069	1	This parameter is invalid when the output mode is L/N. When Output Mode is set to L1/L2/N or L1/L2, the signal name is UO Grid Voltage. Not displayed in off-grid mode
68	Power grid phase B voltage	RO	U16	V	10	32070	1	This parameter is invalid when the output mode is L/N. When Output Mode is set to L1/L2/N or L1/L2, the signal name is WO Grid Voltage. Not displayed in off-grid mode
69	Power grid phase C	RO	U16	V	10	32071	1	This parameter is invalid when the output mode is L/N,

	voltage							L1/L2/N, or L1/L2.
70	Power grid phase A current	RO	I32	A	1000	32072	2	When the output mode is L/N, L1/L2/N, or L1/L2, the signal name is Grid Current.
71	Power grid phase B current	RO	I32	A	1000	32074	2	This parameter is invalid when the output mode is L/N, L1/L2/N, or L1/L2.
72	Power grid phase C current	RO	I32	A	1000	32076	2	This parameter is invalid when the output mode is L/N, L1/L2/N, or L1/L2.
73	Peak active power of the current day	RO	I32	kW	1000	32078	2	
74	Active power	RO	I32	kW	1000	32080	2	
75	reactive power	RO	I32	kVar	1000	32082	2	
76	Power factor	RO	I16		1000	32084	1	
77	Grid frequency	RO	U16	Hz	100	32085	1	
78	Inverter efficiency	RO	U16	%	100	32086	1	When PCS is used to generate power, it indicates the power generation efficiency. When PCS is used to absorb, it indicates the absorption efficiency.
79	Internal temperature	RO	I16	°C	10	32087	1	
80	Insulati	RO	U1	M	1000	32088	1	

	on impedance		6	Ω				
81	Device Status	RO	E16			32089	1	
82	Fault Code	RO	U16			32090	1	Fault code corresponding to the alarm with the highest priority. For details, see the Alarm Description sheet.
83	Start-up time	RO	Epoch Second	s	1	32091	2	Monitoring Calculation
84	Shutdown time	RO	Epoch Second	s	1	32093	2	Monitoring Calculation
85	Accumulated power generation	RO	U32	kWh	100	32106	2	
86	Total DC Input Power	RO	U32	kWh	100	32108	2	
87	Statistical time of the current energy yield.	RO	Epoch Second	s	1	32110	2	
88	Current Hour Electricity	RO	U32	kWh	100	32112	2	

89	Current-day power generation	RO	U32	kWh	100	32114	2	
90	Electricity generated in the current month	RO	U32	kWh	100	32116	2	
91	Electricity generated in the current year	RO	U32	kWh	100	32118	2	
92	Number of critical alarms	RO	U16		1	32151	1	
93	Number of major alarms	RO	U16		1	32152	1	
94	Number of Minor Alarms	RO	U16		1	32153	1	
95	Number of Warning Alarms	RO	U16		1	32154	1	
96	Alarm clearance SN	RO	U16			32155	1	After the alarm is cleared, the serial number increases by 1. After the alarm is reversed, the serial number starts from 1 and skips 0.

97	Last Hour Power Statistics Time	RO	Epoch Second	s	1	32156	2	include generate/absorbed power
98	Electricity generated in the previous hour	RO	U32	kWh	100	32158	2	
99	Electricity statistics time of the previous day	RO	Epoch Second	s	1	32160	2	include generate/absorbed power
100	Electricity generated in the previous day	RO	U32	kWh	100	32162	2	
101	Statistical time of the previous month.	RO	Epoch Second	s	1	32164	2	include generate/absorbed power
102	Electricity generated in the previous month	RO	U32	kWh	100	32166	2	
103	Electricity statistics time	RO	Epoch Sec	s	1	32168	2	include generate/absorbed power

	of the previous year		ond					
104	Electricity generated in the previous year	RO	U32	kWh	100	32170	2	
105	Serial number of the latest active alarm.	RO	U32			32172	2	When a new active alarm is generated, the serial number increases by 1.
106	Latest Historical Alarm Serial Number	RO	U32			32174	2	When an active alarm is transferred to the historical alarm, the serial number of the historical alarm is the same as the serial number of the last active alarm transferred to the historical alarm.
107	Total bus voltage	RO	I16	V	10	32176	1	Data reported by PID, used in single-level scenarios
108	Maximum PV voltage	RO	I16	V	10	32177	1	Data reported by PID, used in single-level scenarios
109	Minimum PV voltage	RO	I16	V	10	32178	1	Data reported by PID, used in single-level scenarios
110	Average PV negative-to-ground voltage	RO	I16	V	10	32179	1	Data reported by PID, used in single-level scenarios
11	Maximu	RO	I16	V	10	32180	1	Data reported by

1	m PV positive-to-ground voltage							PID, used in single-level scenarios
112	Minimum PV negative-to-ground voltage	RO	I16	V	10	32181	1	Data reported by PID, used in single-level scenarios
113	Inverter-to-PE withstand voltage	RO	U16	V	1	32182	1	Data reported by PID, used in single-level scenarios To be compatible with PID 2.0, the PCS reports 1502. 0:100 V or 1100 V inverter; 1500: HAV1 inverter; 1502: HAV2 inverter;
114	ISO feature information	RO	Bitfield16		1	32183	1	Data reported by PID, used in single-level scenarios
115	Built-in PID running status	RO	E16			32190	1	
116	PV negative-to-ground voltage	RO	I16	V	10	32191	1	
117	Direction of the built-in PID compensation	RO	E16			32192	1	
118	Total DC	RO	U32	kWh	100	32212	2	TD Tech NMS GUI Display [5/4]

	energy yield of MPPT1							
119	Total DC energy yield of MPPT2	RO	U32	kWh	100	32214	2	TD Tech NMS GUI Display [5/4]
120	MPPT3 DC Total Energy Yield	RO	U32	kWh	100	32216	2	TD Tech NMS GUI Display [5/4]
121	MPPT4 DC Accumulated Energy Yield	RO	U32	kWh	100	32218	2	TD Tech NMS GUI Display [5/4]
122	Monitoring alarm 1	RO	Bitfield16			32252	1	GroupID:0xFF00
123	Monitoring alarm 2	RO	Bitfield16			32253	1	GroupID:0xFF01
124	Monitor alarm 3	RO	Bitfield16			32254	1	GroupID:0xFF02
125	[External] Power alarm 1	RO	Bitfield16			32255	1	GroupID:0x0000
126	[External] Power alarm 2	RO	Bitfield16			32256	1	GroupID:0x0001
127	[External] Power	RO	Bitfield			32257	1	GroupID:0x0002

	alarm 3		6					
128	[External] Power alarm 4	RO	Bitfield16			32258	1	GroupID:0x0003
129	[External] Power alarm 5	RO	Bitfield16			32259	1	GroupID:0x0004
130	[External] Power alarm 6	RO	Bitfield16			32260	1	GroupID:0x0005
131	[External] Power alarm 7	RO	Bitfield16			32261	1	GroupID:0x0006
132	[External] Power alarm 8	RO	Bitfield16			32262	1	GroupID:0x0007
133	[External] Power alarm 9	RO	Bitfield16			32263	1	GroupID:0x0008
134	[External] Power alarm 10	RO	Bitfield16			32264	1	GroupID:0x0009
135	[External] Power alarm 11	RO	Bitfield16			32265	1	GroupID:0x000A
136	[External] Power alarm 12	RO	Bitfield16			32266	1	GroupID:0x000B
13	[External]	RO	Bitfiel			32267	1	GroupID:0x000C

7	Power alarm 13		d16					
138	Internal PID alarm	RO	Bitfield16			32268	1	GroupID:0x000D
139	[External] Power alarm 15	RO	Bitfield16			32269	1	GroupID:0x000E
140	Monitor alarm 4	RO	Bitfield16			32271	1	GroupID:0xFF03
141	Monitor alarm 5	RO	Bitfield16			32272	1	GroupID:0xFF04
142	Monitor alarm 6	RO	Bitfield16			32274	1	GroupID:0x0010
143	Stent System Status	RO	Bitfield32			34000	2	BIT0–BIT15: state of support system 1–16; BIT16–BIT31: reserved for future expansion.
144	Running time of capacitor bank	RO	U32	hour	10	35000	2	Used to inspect data.
145	Internal fan 1 running time	RO	U32	hour	10	35002	2	Used to inspect data.
146	Internal alarm	RO	U16	V	1	35010	1	Used for R&D data storage.
14	Internal	RO	I16	°C	10	35021	1	Temperature of INV

7	Temperature 1							module A Used for R&D 5-minute data recording.
148	Internal Temperature 2	RO	I16	℃	10	35022	1	Temperature of INV module B Used for R&D 5-minute data recording.
149	Internal Temperature 3	RO	I16	℃	10	35023	1	INV module C temperature Used for R&D 5-minute data recording.
150	Internal Temperature 4	RO	I16	℃	10	35024	1	Temperature sampling of anti-reverse module 1 Used for R&D 5-minute data recording.
151	Internal Temperature 5	RO	I16	℃	10	35025	1	Output board relay, ambient temperature - maximum temperature Used for R&D 5-minute data recording.
152	Internal Temperature 6	RO	I16	℃	10	35026	1	Output board, power board input, and power board inverter temperature sampling - maximum temperature Used for R&D 5-minute data recording.
153	Internal temperature 7	RO	I16	℃	10	35027	1	Temperature sampling of anti-reverse module

								2 Used for R&D 5-minute data recording.
154	Internal temperature 8	RO	I16	°C	10	35028	1	DC terminal temperature 1 / 2 - maximum temperature Used for R&D 5-minute data recording.
155	Internal temperature 9	RO	I16	°C	10	35029	1	AC Terminal Temperature 1 / 2 / 3 - Maximum Temperature Used for R&D 5-minute data recording.
156	Internal temperature 10	RO	I16	°C	10	35030	1	Used for R&D data storage.
157	Internal temperature 11	RO	I16	°C	10	35031	1	Used for R&D data storage.
158	Internal temperature 12	RO	I16	°C	10	35032	1	Used for R&D data storage.
159	Phase A DC component DCI	RO	I16	A	1000	35038	1	Used for R&D 5-minute data recording.
160	Phase B DC component DCI	RO	I16	A	1000	35039	1	Used for R&D 5-minute data recording.
161	Phase C DC component DCI	RO	I16	A	1000	35040	1	Used for R&D 5-minute data recording.

162	Leakage current RCD	RO	I16	mA	1	35041	1	Used for R&D 5-minute data recording.
163	Positive bus voltage	RO	I16	V	10	35042	1	Used for R&D 5-minute data recording.
164	Negative bus voltage	RO	I16	V	10	35043	1	Used for R&D 5-minute data recording.
165	BUS negative voltage to ground	RO	I16	V	10	35044	1	Used for R&D 5-minute data recording.
166	I-V scan status	RO	E16			35094	1	
167	I-V scanning capability	RO	E16			35095	1	
168	Deferred activation state	RO	E16			35115	1	
169	Active power adjustment status	RO	MLD			35300	4	
170	Reactive power adjustment status	RO	MLD			35304	4	
171	Inverter comprehensive status	RO	Bitfield16			37518	1	

172	Inverter integrated status support flag	RO	U16		1	37519	1	
173	System time (local time)	RW	Epoch Second	s	1	40000	2	The data is in the epoch second format, that is, the local time.
174	Q-U characteristic curve mode	RW	E16			40037	1	
175	Q-U Scheduling Trigger Power Percentage	RW	I16	%	1	40038	1	
176	Active power is derated by a fixed value.	RW	U16	kW	10	40120	1	
177	Power factor	RW	I16		1000	40122	1	
178	Reactive power compensation (Q/S) [low precision]	RW	I16		1000	40123	1	The equipment end converts the value into a fixed Q value for reactive power control. S is Smax.
179	Reactive power	RW	U16	s	1	40124	1	Change requirement: The "Reactive power

	adjustment time							adjustment time" broadcast interface is added to the Q-P characteristic curve and cosphi-P characteristic curve delivery interface, which is the same as the Q-U characteristic curve 20190918.
180	Active power percentage derating (low precision)	RW	I16	%	10	40125	1	Active power fine adjustment interface
181	Active power is derated by a fixed value.	RW	U32	W	1	40126	2	Value range: [0, Pmax]
182	Night reactive power compensation (Q/S)	RW	I16		1000	40128	1	The equipment end converts the value into a fixed Q value for reactive power control. S is Smax.
183	Fixed value of reactive power at night	RW	I32	kVar	1000	40129	2	
184	Cos?-P/Pn characteristic curve	RW	MLD			40133	21	
185	Q-U charact	RW	MLD			40154	21	

	eristic curve							
186	PF-U characteristic curve	RW	MLD			40175	21	
187	[Characteristic curve] Reactive power adjustment time	RW	U16	s	1	40196	1	Change requirement: The "Reactive power adjustment time" broadcast interface is added to the Q-P characteristic curve and cosphi-P characteristic curve delivery interface, which is the same as the Q-U characteristic curve 20190918.
188	Q-U Scheduling Exit Power Percentage	RW	I16	%	1	40198	1	
189	Active power percentage control [low precision]	RW	I16	%	10	40199	1	This interface is used in distributed mode. It is used to control the active power percentage. It is issued to the power software in the anti-backflow control, and controls the upper limit of the output active power when the power is increased due to underfrequency.
190	Start the system.	WO	E16			40200	1	
191	Shut down.	WO	E16			40201	1	

192	Quick power-on and power-off	WO	E16			40202	1	Not affected by shutdown gradient
193	reset	WO	E16			40205	1	After receiving the command, the DSP responds immediately and then resets. After receiving the command, the inverter monitoring module sends the command to the DSP. After receiving a normal response, the inverter monitoring module sends the command to the northbound port. After 3s, the system is reset. Otherwise, the system does not restart.
194	Q-P characteristic curve	RW	MLD			40354	21	
195	Q-U characteristic curve minimum PF limit	RW	U16		1000	40375	1	This MPI is used to limit the reactive power output by the QU curve by limiting the current PF value. The country code that is not required by this function is set to 0 by default, indicating that the reactive power output is not limited. The country code in EN50549 can be set to 0 to 1, and the

								default value is 0.9.
196	Q-U characteristic curve validity delay time	RW	U16	s	1	40376	1	After the QU curve reaches the trigger voltage, the reactive power starts to change after a period of time is delayed. Italy CEI0-16/21 requires that the default value be 3s, indicating that the QU curve takes effect after the triggering delay is 3s, which can be set on the GUI. For other countries, the default value is 0.
197	Power grid standard code	RW	U16		1	42000	1	CHINA_MV800 For details about the scope, see the Power Grid Standard Code.
198	Output mode	RW	E16			42001	1	On the customer interface, only read signals can be displayed. Currently, only three-phase three-wire signals are supported. No configuration is required. In the future, the interface changes will be used to notify each interface.
199	Voltage level	RW	U16	V	1	42002	1	Vn
200	Frequency Class	RW	U16	Hz	1	42003	1	Fn
201	Remote power scheduling	RW	E16			42014	1	If this parameter is disabled, the inverter will be locked.

202	reactive power gradient	RW	U32	%/s	1000	42015	2	
203	Active power change gradient	RW	U32	%/s	1000	42017	2	Limits the speed at which the power changes caused by the power scheduling command
204	Scheduled instruction hold time	RW	U32	s	1	42019	2	Permanently valid when the value is 0.
205	Maximum apparent power	RW	U32	kVA	1000	42021	2	["Maximum active power",Smax]
206	Maximum active power	RW	U32	kW	1000	42023	2	[0.1,Pmax]
207	apparent power reference	RW	U32	kVar	1000	42025	2	Sn: upper limit of the maximum active power (PMax), which is used as the reference for reactive power scheduling (Q/S).
208	Active power reference	RW	U32	kW	1000	42027	2	Set the lower limit of the maximum apparent value (SMax), which is also used as the reference for active power scheduling (percentage).
209	Plant active power gradient	RW	U16	min/100%	1	42029	1	China standards require that the active power change caused by light fluctuation must

								meet the speed requirements during normal operation of the equipment.
210	Plant active average filtering time	RW	U32	ms	1	42030	2	
211	Filtering time for PF-U voltage detection	RW	U16	s	10	42032	1	
212	Dry contact scheduling	RW	E16			42033	1	
213	Audible and visual alarm	RW	E16			42034	1	
214	Frequency Active Power Derating Recovery Delay Time	RW	U16	s	1	42040	1	
215	Frequency Active Power Derating Effective Delay Time	RW	U16	ms	1	42041	1	
216	Frequency	RW	E16			42042	1	

	active power derating hysteresis							
217	Frequency modulation control response dead band	RW	U16	Hz	1000	42043	1	
218	PQ mode	RW	E16			42046	1	
219	PV Panel Type	RW	E16			42047	1	
220	PID compensation direction	RW	E16			42048	1	
221	String connection mode	RW	E16			42049	1	
222	Isolation Settings	RW	E16			42050	1	On the customer interface, only read signals can be displayed. Currently, only the input is not grounded and transformer is supported. Interface changes will be used to notify each interface during setting.
223	Frequency modula	RW	U16	%/min	1	42051	1	

	tion control power change gradient							
224	Frequency modulation control power change limiting amplitude	RW	U16	%	10	42052	1	
225	FM control delay response time	RW	U16	ms	1	42053	1	Polish national requirements, open and configurable Initial delay in the frequency sensitive mode
226	MPPT multimodal scanning	RW	E16			42054	1	
227	MPPT scanning interval	RW	U16	min	1	42055	1	
228	Predicted MPPT power	RO	U32	kW	1000	42056	2	
229	Power grid fault recovery automatic startup	RW	E16			42061	1	
23	Power	RW	E1			42062	1	

0	limit 0% shutdown		6					
231	Automatic power-off when communication is disconnected	RW	E16			42063	1	In a parallel system, the system automatically shuts down when the communication link is interrupted by default. The communication interruption duration is 1 minute. The PCS power system determines the priority of the default power policy and the parameter setting. The affected parameters include all parameters under "Communication Disconnection Protection".
232	Automatic power-on after communication recovery	RW	E16			42064	1	
233	Power Quality Optimization Mode	RW	E16			42065	1	
234	RCD Enhancement	RW	E16			42066	1	
235	Night reactive	RW	E16			42067	1	

	power							
236	Night PID protection	RW	E16			42069	1	
237	Night reactive power parameters take effect	RW	E16			42070	1	
238	Communication Disconnection Detection Time	RW	U16	s	1	42072	1	This parameter is displayed when the protection against communication disconnection is enabled.
239	AFCI	RW	E16			42073	1	
240	AFCI detection adaptation mode	RW	E16			42074	1	
241	Communication link failure protection	RW	E16			42075	1	Used to initiate the security protection function after the communication between the device and the northbound interface is interrupted.
242	Failure protection active power mode	RW	E16			42076	1	This parameter is displayed when the protection against communication disconnection is enabled.
243	Active Power Limit	RW	U32	kW	10	42077	2	This parameter is displayed only when the communication

	for Failure Protection [kW] [Low Precision]							link failure protection is set to Enable and the active power mode is set to a fixed value.
244	Failure protection reactive power mode	RW	E16			42079	1	This parameter is displayed when the protection against communication disconnection is enabled.
245	Frequency rate protection	RW	E16			42080	1	
246	Frequency change rate protection point	RW	U16	Hz/s	10	42081	1	
247	Frequency change rate protection time	RW	U16	s	10	42082	1	
248	Reactive power limit for failure protection [Q/S] [low precision]	RW	I16		1000	42083	1	(Deliver Q/S value) This parameter is displayed only when Communication Disconnection Failure Protection is set to Enable and Reactive Power Mode is set to Q/S.
249	Power-on voltage upper	RW	U16	V	10	42084	1	Parameters for normal reconnection

	limit for grid connection							
250	Power-on voltage lower limit for grid connection	RW	U16	V	10	42085	1	Parameters for normal reconnection
251	Power-on frequency upper limit for grid connection	RW	U16	Hz	100	42086	1	Parameters for normal reconnection
252	Power-on frequency lower limit for grid connection	RW	U16	Hz	100	42087	1	Parameters for normal reconnection
253	Power grid reconnection voltage upper limit	RW	U16	V	10	42088	1	Parameters for reconnection after a fault
254	Power Grid Reconnection Voltage Lower Threshold	RW	U16	V	10	42089	1	Parameters for reconnection after a fault

255	Power grid reconnection frequency upper limit	RW	U16	Hz	100	42090	1	Parameters for reconnection after a fault
256	Power grid reconnection frequency lower limit	RW	U16	Hz	100	42091	1	Parameters for reconnection after a fault
257	Automatic Power Grid Reconnection Time	RW	U16	s	1	42092	1	
258	Insulation impedance protection point	RW	U16	MΩ	1000	42097	1	Value range: [0.02, 1.5] Actual protection is implemented by the inverter based on the DC voltage. 600 V DC inverter: [0.02, 1.5] 1000 V DC inverter: [0.033, 1.5] 1500 V DC inverter: [0.05, 1.5]
259	Voltage unbalance protection threshold	RW	U16	%	10	42098	1	
260	Phase protecti	RW	U16	°	10	42099	1	

	on point							
261	Power-on soft start time due to power grid faults	RW	U16	s	1	42100	1	Power rise gradient during equipment startup after a power grid fault
262	Cos?-P/Pn trigger voltage	RW	U16	%	1	42101	1	
263	Cos?-P/Pn exit voltage	RW	U16	%	1	42102	1	
264	Startup soft start time	RW	U16	s	1	42103	1	
265	Power grid fault recovery time	RW	U16	s	1	42104	1	
266	Time for determining short-term power grid interruption	RW	U32	ms	1	42105	2	Quick Start After Power Grid Fault is enabled and can be set.
267	Shutdown gradient	RW	U32	%/s	1000	42107	2	
268	Line loss compen	RW	U16	%	10	42109	1	

	sation							
269	Grid fault zero current mode	RW	E16			42110	1	
270	Grid voltage jump trigger threshold	RW	U16	%	10	42111	1	This parameter can be set only for the VDE4120.
271	HVRT	RW	E16			42112	1	
272	HVRT Trigger Threshold	RW	U16	V	10	42113	1	
273	HVRT positive sequence reactive power compensation factor	RW	U16		10	42114	1	
274	Short-term power grid interruption and quick startup	RW	E16			42116	1	Indicates whether to enable the fast startup function after the power grid recovers from a short-term interruption. If this parameter is set to 0, the power grid is connected according to the normal startup process after a short-term interruption. If this parameter is set to 1, the power grid is enabled. After a

								short-term interruption occurs on the power grid, the quick startup process is used. Some detection items are skipped and the power grid is quickly connected to the power grid. Whether a short-term interruption occurs on the power grid depends on whether the power grid can be recovered within the "short-term interruption time".
275	LVRT active current maintenance coefficient	RW	U16		100	42118	1	
276	LVRT	RW	E16			42119	1	By default, this function is enabled in the BDEW standard. In other standards, this function is disabled by default.
277	LVRT Trigger Threshold	RW	U16	V	10	42120	1	Sets the threshold for triggering low voltage ride-through. The threshold must comply with the local power grid standards.
278	Power grid voltage protection	RW	E16			42121	1	It is used to set whether the voltage protection function needs to be shielded during the voltage

	shield during VRT							ride-through.
279	LVRT positive sequence reactive power compensation factor	RW	U16		10	42122	1	During the low voltage ride through (LVRT), the device needs to generate positive-sequence reactive power to support the power grid. This parameter is used to set the positive-sequence reactive power emitted by the device. For example, if the LVRT positive-sequence reactive power compensation factor is set to 2, the positive-sequence reactive current generated by the device increases by 20% of the rated current every time the AC voltage decreases by 10% during the low-voltage ride-through process.
280	VRT exit hysteresis threshold	RW	U16	V	10	42123	1	Sets the LVRT/HVRT recovery threshold. LVRT recovery threshold = LVRT trigger threshold + VRT exit hysteresis threshold HVRT recovery threshold = HVRT trigger threshold – VRT exit hysteresis threshold

281	VRT active current limiting percentage	RW	U16	%	1	42124	1	
282	VRT active power recovery gradient	RW	U16	%/s	1	42125	1	
283	HVRT negative sequence reactive compensation factor	RW	U16		10	42126	1	
284	LVRT negative sequence reactive power compensation factor	RW	U16		10	42127	1	During low voltage ride through (LVRT), the device needs to generate negative-sequence reactive power to support the power grid. This parameter is used to set the negative-sequence reactive power emitted by the device. For example, if the LVRT negative sequence reactive power compensation factor is set to 2, the negative sequence reactive current generated by the device increases by 20% of the rated

								current every time the AC voltage decreases by 10% during the low voltage ride-through process.
285	phase angle deviation protection	RW	E16			42128	1	
286	Active Islanding Protection	RW	E16			42129	1	
287	Passive Islanding Protection	RW	E16			42130	1	
288	OVGR Associated Shutdown	RW	E16			42131	1	
289	Dry contact function	RW	E16			42132	1	
290	LVRT reactive current limiting percentage	RW	U16	%	1	42133	1	During low voltage ride-through, the equipment needs to limit the reactive current emitted by the equipment. For example, if LVRT Reactive Current Limit Percentage is set to 50, the upper limit of the reactive current of the device is 50% of the rated

								current during low voltage ride-through.
291	LVRT zero current mode threshold	RW	U16	V	10	42134	1	If the zero current mode is enabled and the voltage of the grid is less than the zero current mode threshold during LVRT, the zero current mode is used. Otherwise, the zero current mode is used.
292	LVRT mode	RW	E16			42135	1	
293	RCD current limit	RW	U16	mA	10	42136	1	
294	Voltage rise suppression	RW	E16			42138	1	
295	Voltage rise suppression reactive power adjustment point	RW	U16	%	10	42139	1	The value of "Voltage Rise Reject Active Derating Point" must be greater than the value of "Voltage Rise Reject Reactive Adjust Point".
296	Voltage rise suppression active derating threshold	RW	U16	%	10	42140	1	The value of "Voltage Rise Reject Active Derating Point" must be greater than the value of "Voltage Rise Reject Reactive Adjust Point".
297	frequency modulation	RW	E16			42141	1	According to the standards of some countries or regions, the power grid

	control							frequency changes around the rated value. If the device needs to fine-tune the active power output based on the frequency modulation control adjustment rate to help stabilize the power grid frequency, set this parameter to Enable. Frequency sensitive mode (FSM), which is required by the G99 standard.
298	frequency modulation control differential modulation rate	RW	U16	%	1	42142	1	Frequency sensitive mode (FSM) Droop, which is required by the G99 standard.
299	Overfrequency derating	RW	E16			42143	1	If this parameter is set to Enable, the device derates the active power based on a certain gradient when the power grid frequency exceeds the triggering frequency of overfrequency derating.
300	Overfrequency derating cutoff frequency	RW	U16	Hz	100	42144	1	Specifies the cutoff frequency for overfrequency derating.
30	Overfre	RW	U1	%	1	42145	1	Indicates the cutoff

1	quency derating cut-off power		6					power point for overfrequency derating.
302	Triggering frequency of overfrequency derating	RW	U16	Hz	100	42146	1	According to the standards in some countries or regions, the active power output by the device must be derated when the power grid frequency exceeds a specified value.
303	Overfrequency derating exit frequency	RW	U16	Hz	100	42147	1	Specifies the exit frequency of overfrequency derating.
304	Overfrequency derating power recovery gradient	RW	U16	%/min	1	42148	1	Indicates the speed at which the overfrequency derating power recovers.
305	Underfrequency Power Increase	RW	E16			42151	1	According to the standards in some countries or regions, the power grid frequency is lower than the triggering frequency of underfrequency power increase. In this case, the active power output needs to be increased to help increase the power grid frequency. In this case, set this parameter to Enable.

306	Underfrequency Power Increase Recovery Gradient	RW	U16	%/min	1	42152	1	Indicates the speed for recovering the underfrequency power increase.
307	LVRT characteristic curve	RW	MLD			42155	21	Set the low-voltage ride-through capability of the equipment. For details, see the Key Information Description Table. The SmartLogger and NMS support batch settings and provide a separate GUI for users to edit.
308	Cutoff frequency of underfrequency power increase	RW	U16	Hz	100	42176	1	Indicates the cutoff frequency for underfrequency power increase.
309	Cut-off power for underfrequency power increase	RW	U16	%	1	42177	1	Indicates the cutoff power point for underfrequency power increase.
310	Underfrequency Power Increase Triggering Frequency	RW	U16	Hz	100	42178	1	Set the triggering frequency for underfrequency power increase.
311	Underfrequenc	RW	U16	Hz	100	42179	1	Specifies the exit frequency for

	y Power Increase Exit Frequency							underfrequency power increase.
312	Built-in PID mode	RW	E16			42180	1	
313	PID output voltage	RW	I16	V	10	42181	1	Fixed output. This interface is reserved. The GUI is closed.
314	PID	RW	E16			42182	1	Currently reserved only for equipment
315	Night off-grid repair	RW	E16			42183	1	
316	Active power change gradient	RW	U32	%/s	1000	42192	2	Dedicated broadcast interface for the SmartLogger, which does not support incremental reporting and is used in the remote output scenario in Japan.
317	Q-U curve	RW	MLD			42200	21	
318	P-U curve	RW	MLD			42221	21	
319	P-U curve adjustment time	RW	U16	s	100	42242	1	
320	Undervoltage protection threshold for 10 minutes	RW	U16	V	10	42287	1	Vn: indicates the voltage level, which is related to the power grid code.
32	Ten-minute	RW	U3	ms	1	42288	2	

1	undervoltage protection time		2					
322	Ten-minute overvoltage protection threshold	RW	U16	V	10	42290	1	Vn: indicates the voltage level, which is related to the power grid code.
323	Ten-minute overvoltage protection time	RW	U32	ms	1	42291	2	
324	Level-1 overvoltage protection threshold	RW	U16	V	10	42293	1	Vn: indicates the voltage level, which is related to the power grid code.
325	Level-1 overvoltage protection time	RW	U32	ms	1	42294	2	
326	Level-2 overvoltage protection threshold	RW	U16	V	10	42296	1	Vn: indicates the voltage level, which is related to the power grid code.
327	Level 2 Overvoltage Protection Time	RW	U32	ms	1	42297	2	
32	Level-3	RW	U1	V	10	42299	1	Vn: indicates the

8	overvoltage protection threshold		6					voltage level, which is related to the power grid code.
329	Level-3 overvoltage protection time	RW	U32	ms	1	42300	2	
330	Level-4 overvoltage protection threshold	RW	U16	V	10	42302	1	Vn: indicates the voltage level, which is related to the power grid code.
331	Level-4 overvoltage protection time	RW	U32	ms	1	42303	2	
332	Level-5 overvoltage protection threshold	RW	U16	V	10	42305	1	Vn: indicates the voltage level, which is related to the power grid code.
333	Level-5 overvoltage protection time	RW	U32	ms	1	42306	2	
334	Level-6 overvoltage protection threshold	RW	U16	V	10	42308	1	Vn: indicates the voltage level, which is related to the power grid code.
33	Level-6	RW	U3	ms	1	42309	2	

5	overvoltage protection time		2					
336	Level-1 undervoltage protection threshold	RW	U16	V	10	42311	1	Vn: indicates the voltage level, which is related to the power grid code.
337	Level-1 Undervoltage Protection Time	RW	U32	ms	1	42312	2	
338	Level-2 undervoltage protection threshold	RW	U16	V	10	42314	1	Vn: indicates the voltage level, which is related to the power grid code.
339	Level 2 Undervoltage Protection Time	RW	U32	ms	1	42315	2	
340	Level-3 undervoltage protection threshold	RW	U16	V	10	42317	1	Vn: indicates the voltage level, which is related to the power grid code.
341	Level-3 Undervoltage Protection Time	RW	U32	ms	1	42318	2	
342	Level-4 undervoltage	RW	U16	V	10	42320	1	Vn: indicates the voltage level, which is related to the

	protection threshold							power grid code.
343	Level-4 Undervoltage Protection Time	RW	U32	ms	1	42321	2	
344	Level-5 undervoltage protection threshold	RW	U16	V	10	42323	1	Vn: indicates the voltage level, which is related to the power grid code.
345	Level-5 Undervoltage Protection Time	RW	U32	ms	1	42324	2	
346	Level-6 undervoltage protection threshold	RW	U16	V	10	42326	1	Vn: indicates the voltage level, which is related to the power grid code.
347	Level-6 Undervoltage Protection Time	RW	U32	ms	1	42327	2	
348	Level-1 overfrequency protection threshold	RW	U16	Hz	100	42329	1	Fn: indicates the frequency level, which is related to the power grid code.
349	Level-1 Overfrequency	RW	U32	ms	1	42330	2	

	Protection Time							
350	Level-2 overfrequency protection threshold	RW	U16	Hz	100	42332	1	Fn: indicates the frequency level, which is related to the power grid code.
351	Level-2 overfrequency protection time	RW	U32	ms	1	42333	2	
352	Level-3 overfrequency protection threshold	RW	U16	Hz	100	42335	1	Fn: indicates the frequency level, which is related to the power grid code.
353	Level-3 overfrequency protection time	RW	U32	ms	1	42336	2	
354	Level-4 overfrequency protection threshold	RW	U16	Hz	100	42338	1	Fn: indicates the frequency level, which is related to the power grid code.
355	Level-4 overfrequency protection time	RW	U32	ms	1	42339	2	
356	Level-5 overfrequency protection	RW	U16	Hz	100	42341	1	Fn: indicates the frequency level, which is related to the power grid code.

	threshold							
357	Level-5 overfrequency protection time	RW	U32	ms	1	42342	2	
358	Level-6 overfrequency protection threshold	RW	U16	Hz	100	42344	1	Fn: indicates the frequency level, which is related to the power grid code.
359	Six-level overfrequency protection time	RW	U32	ms	1	42345	2	
360	Level-1 underfrequency protection threshold	RW	U16	Hz	100	42347	1	Fn: indicates the frequency level, which is related to the power grid code.
361	Level-1 Underfrequency Protection Time	RW	U32	ms	1	42348	2	
362	Level-2 underfrequency protection threshold	RW	U16	Hz	100	42350	1	Fn: indicates the frequency level, which is related to the power grid code.
36	Level-2	RW	U3	ms	1	42351	2	

3	underfrequency protection time		2					
364	Level-3 underfrequency protection threshold	RW	U16	Hz	100	42353	1	Fn: indicates the frequency level, which is related to the power grid code.
365	Level-3 underfrequency protection time	RW	U32	ms	1	42354	2	
366	Level-4 underfrequency protection threshold	RW	U16	Hz	100	42356	1	Fn: indicates the frequency level, which is related to the power grid code.
367	Level-4 Underfrequency Protection Time	RW	U32	ms	1	42357	2	
368	Level-5 underfrequency protection threshold	RW	U16	Hz	100	42359	1	Fn: indicates the frequency level, which is related to the power grid code.
369	Level-5 Underfrequenc	RW	U32	ms	1	42360	2	

	y Protection Time							
370	Level-6 underfrequency protection threshold	RW	U16	Hz	100	42362	1	Fn: indicates the frequency level, which is related to the power grid code.
371	Level-6 Underfrequency Protection Time	RW	U32	ms	1	42363	2	
372	Delayed upgrade	RW	E16			42590	1	
373	Intelligent string monitoring	RW	E16			42594	1	
374	String detection reference asymmetry coefficient	RW	U16		100	42595	1	
375	String detection start power percentage	RW	U16	%	1	42596	1	
376	Communication Interrup	RW	I16	min	1	42597	1	

	tion Time							
377	PMI	WO	E16			42730	1	Broadcast command interface Note: The instruction range extension design is made here. The higher eight bits are used to mask specified inspection actions in the inspection function. This feature improves the inspection efficiency for specific purposes. Shen Yanbai 20190702
378	IV Curve Scanning	WO	E16			42779	1	Broadcast command interface
379	[System Time] Year	WO	U16		1	43000	1	
380	[System Time] Month	WO	U16		1	43001	1	
381	[System time] day	WO	U16		1	43002	1	
382	[System time] hour	WO	U16		1	43003	1	
383	[System Time] Min.	WO	U16		1	43004	1	
384	[System Time] Second	WO	U16		1	43005	1	
385	Time zone	RW	I16	min	1	43006	1	

386	Clock source	RW	E16			43007	1	
387	City code	RW	U32			43008	2	(UTC+08:00) Beijing
388	Inverter Installation Position Longitude	RW	I32	°	10000000	43014	2	Set this parameter only on the app. The NMS can read the data.
389	Inverter Installation Position Latitude	RW	I32	°	10000000	43016	2	Set this parameter only on the app. The NMS can read the data.
390	[RS485-1] Protocol Type	RW	E16			43018	1	
391	[RS485-1] Communication address	RW	U16		1	43019	1	0: broadcast address; 1–247: device address; 248–255: reserved
392	[RS485-1] Baud Rate	RW	E16			43020	1	115200 baud rate, corresponding to bit 26 of feature code 3.
393	[RS485-1] Verification mode	RW	E16			43021	1	
394	[RS485-1] Port mode	RW	E16			43022	1	
395	[RS485-1] Modbus Protocol Model Version	RW	E16			43023	1	This parameter is used only when the northbound port is used in the old model replacement scenario.

396	[RS485-2] Protocol Type	RW	E16			43033	1	
397	[RS485-2] Communication address	RW	U16		1	43034	1	0: broadcast address 1–247: device address 248–255: reserved
398	[RS485-2] Baud Rate	RW	E16			43035	1	115200 baud rate, corresponding to bit 27 of feature code 3.
399	[RS485-2] Verification Mode	RW	E16			43036	1	
400	[RS485-2] Port mode	RW	E16			43037	1	
401	Device name	RW	STR			43349	10	This parameter is left blank by default. It is used by the customer to modify the device name.
402	[App] Initial power-on flag	RW	E16			43359	1	After the SmartLogger is deployed, the power-on flag needs to be cleared.
403	Restore factory settings.	WO	E16			45000	1	
404	Clearing active alarms	WO	MLD			45001	2	
405	Alarm setting	WO	MLD			45003	2	
406	Alarm clearance	WO	E16			45005	1	

407	Alarm masking	WO	E16			45006	1	
408	AFCI self-check start	WO	U16		1	45007	1	Set the field to 0. Associate the AFCI controller in the in-position ID of the subdevice.
409	Accumulated energy yield correction	WO	U32	kWh	100	45008	2	
410	Clear historical battery level.	WO	E16			45010	1	Including the accumulated power generation capacity and accumulated charging capacity on the power side
411	Clear the running time information.	WO	E16			45011	1	Clears the accumulated running time, fault duration, and grid-tied running time.
412	Spot Check	WO	E16			45012	1	
413	ESN validation command	WO	U16		1	45015	1	
414	Restore the default password.	WO	MLD		1	45016	10	Enter the equipment ESN in the Data field.

NOTICE

Signals marked with * are supported only by certain models or standard codes.

4 Customized Interfaces

4.1 Obtaining the System Information of Optimizers

Data synchronization mechanism: The host is driven to refresh the system information of optimizers by the change of the serial number (SN).

Synchronization process: For details, see 6.3.7.1 Uploading Files.

Data storage of the solar inverters: After the device search and positioning are complete, the record is updated. The record format is as follows:

File type: 0x45

Table 4-1 File format(V102)

Data	Length (Bytes)	Remarks
File version	4	V103
Feature data sequence number	2	
Length	2	
Reserved	1	The reserved byte 0 is defined as the status. bit0: inverter disconnection status (1=disconnected)
	3	
Number of optimizers	2	Total number, including

Data	Length (Bytes)	Remarks
		the offline optimizers.
Feature data of optimizer 1	108	For details about the data domain definition, see the Optimizer Feature Data Domain Definition.
Feature data of optimizer 2	108	
Feature data of optimizer...	108	
Feature data of optimizer N	108	

Table 4-2 Feature data unit format(V102)

Data	Length (Bytes)	Remarks
Optimizer address	2	RS485 address
Online status	2	0: offline 1: online 2: disconnected
String number	2	
Position in current string	2	relative positive connection starting point
SN	20	
Software version	30	
Alias	20	
Model	30	

Table 4-3 Record format(V101)

Data	Length (Byte)	Remarks
Format version	4	V101
SN	2	-
Length	2	-

Data	Length (Byte)	Remarks
Reserved	4	-
Number of optimizers	2	*n*, including the offline optimizers
Feature data of optimizer 1	78	-
Feature data of optimizer 2	78	-
...	...	-
Feature data of optimizer *n*	78	-

Table 4-4 Feature data format (V101)

Data	Length (Byte)	Remarks
Optimizer address	2	Logical communication address
Status	2	0: offline 1: online
String number	2	-
Relative position of the PV string	2	1: near DC wiring terminals of the solar inverters
SN	20	-
Software version	30	-
Alias	20	-

4.2 Obtaining Real-time Data of Optimizers

Data synchronization mechanism: fifteen-minute interval

Synchronization process: uploads the files and synchronizes data according to the time period; uploads the most recent data if there is no filter condition. For details, see 6.3.7.1 Uploading Files.

Data storage: stores real-time data at five-minute intervals.

File type: 0x44

Table 4-5 Record format

Data	Length (Byte)	Remarks
File version	4	V101
Reserved	8	-
Optimizer data unit 1	N	12 + 26 x Number of optimizers , For details about the definition of this unit, see the data unit format.
Optimizer data unit 2	N	-
...	-	-
Optimizer data unit *n*	N	*n* indicates the number of data records that meet the filter condition. Each piece of data contains all optimizer data for a time node.

Table 4-6 Data unit format (V101)

Data	Length (Byte)	Remarks
Time	4	Epoch seconds, local time
Reserved	4	-
Length	2	-
Number of optimizers	2	-
Real-time data of optimizer 1	26	For details about the definition of this unit, see the real-time data format.
Real-time data of optimizer 2	26	-
...	-	-
Real-time data of optimizer *n*	26	*n* is the number of optimizers.

Table 4-7 Real-time data format

Data	Length (Byte)	Remarks
Optimizer address	2	Logical communication address
Output power	2	Gain: 10 Unit: W
Voltage to ground	2	Gain: 10 Unit: V
Alarm	4	Bit00: input overvoltage Bit01: input undervoltage Bit02: output overvoltage Bit04: overtemperature Bit06: output short circuit Bit07: EEPROM fault Bit08: internal hardware fault Bit09: abnormal voltage to ground Bit 10: power-off due to heartbeat timeout Bit 11: fast shutdown Bit 12: request escape alarm Bit 13: version mismatch alarm Bit 16: input overvoltage Bit 17: overtemperature Bit 18: output short circuit Bit 19: internal hardware fault Bit 20: version mismatch alarm Bit 21: backfeed alarm Bit 22: abnormal output voltage Bit 23: upgrade failure Bit 31: alarm display selection, 1=Display bit 16 to bit 30 alarms, 0: Bits 0 to 15 are displayed.
Output voltage	2	Gain: 10 Unit: V
Output current	2	Gain: 100

Data	Length (Byte)	Remarks
		Unit: A
Input voltage	2	Gain: 10 Unit: V
Input current	2	Gain: 100 Unit: A
Temperature	2	Gain: 10 Unit: °C
Running status	2	0: offline 1: standby 3: faulty 4: running 12: power-off
Accumulated energy yield	4	Gain: 1000 Unit: kWh

5 Interface Instructions

5.1 Alarm Information

Table 5-1 Alarm information

No.	Alarm	Bit	Alarm Name	Alarm ID	Level
1	Alarm 1	0	High String Input Voltage	2001	Major
2	Alarm 1	1	DC Arc Fault[1]	2002	Major
3	Alarm 1	2	String Reverse Connection	2011	Major
4	Alarm 1	3	String Current Backfeed	2012	Warning
5	Alarm 1	4	Abnormal String Power	2013	Warning
6	Alarm 1	5	AFCI Self-Check Fail.[1]	2021	Major
7	Alarm 1	6	Phase Wire Short-Circuited to PE	2031	Major
8	Alarm	7	Grid Loss	2032	Major

No.	Alarm	Bit	Alarm Name	Alarm ID	Level
	1				
9	Alarm 1	8	Grid Undervoltage	2033	Major
10	Alarm 1	9	Grid Overvoltage	2034	Major
11	Alarm 1	10	Grid Volt. Imbalance	2035	Major
12	Alarm 1	11	Grid Overfrequency	2036	Major
13	Alarm 1	12	Grid Underfrequency	2037	Major
14	Alarm 1	13	Unstable Grid Frequency	2038	Major
15	Alarm 1	14	Output Overcurrent	2039	Major
16	Alarm 1	15	Output DC Component Overhigh	2040	Major
17	Alarm 2	0	Abnormal Residual Current	2051	Major
18	Alarm 2	1	Abnormal Grounding	2061	Major
19	Alarm 2	2	Low Insulation Resistance	2062	Major
20	Alarm 2	3	Overtemperature	2063	Minor
21	Alarm 2	4	Device Fault	2064	Major
22	Alarm 2	5	Upgrade Failed or Version Mismatch	2065	Minor
23	Alarm 2	6	License Expired	2066	Warning
24	Alarm 2	7	Faulty Monitoring Unit	61440	Minor
25	Alarm	8	Faulty Power Collector[2]	2067	Major

No.	Alarm	Bit	Alarm Name	Alarm ID	Level
	2				
26	Alarm 2	9	Battery abnormal	2068	Minor
27	Alarm 2	10	Active Islanding	2070	Major
28	Alarm 2	11	Passive Islanding	2071	Major
29	Alarm 2	12	Transient AC Overvoltage	2072	Major
30	Alarm 2	13	Peripheral port short circuit[3]	2075	Warning
31	Alarm 2	14	Churn output overload[4]	2077	Major
32	Alarm 2	15	Abnormal PV module configuration	2080	Major
33	Alarm 3	0	Optimizer fault[5]	2081	Warning
34	Alarm 3	1	Built-in PID operation abnormal[6]	2085	Minor
35	Alarm 3	2	High input string voltage to ground.	2014	Major
36	Alarm 3	3	External Fan Abnormal	2086	Major
37	Alarm 3	4	Battery Reverse Connection[7]	2069	Major
38	Alarm 3	5	On-grid/Off-grid controller abnormal[4]	2082	Major
39	Alarm 3	6	PV String Loss	2015	Warning
40	Alarm 3	7	Internal Fan Abnormal	2087	Major
41	Alarm 3	8	DC Protection Unit Abnormal[8]	2088	Major

NOTICE

The preceding table lists the alarm information about Huawei solar inverters. Some alarms can be detected only after corresponding functional modules are configured.

NOTE

[1] AFCI functional unit

[2] Power collector or power meter connected to the solar inverters

[3] Detection of the external ports of the solar inverters that provide the 12 V power supply

[4] This item can be detected when a built-in or external on-grid/off-grid functional unit is configured.

[5] This item can be detected when optimizers are configured on the DC side.

[6] This item can be detected when the solar inverters are configured with PID functional units.

[7] This item can be detected when energy storage units (ESUs) are configured.

[8] Some models have DC protection units.

5.2 Power Grid Scheduling

This section describes the curve configuration format and precautions for power grid scheduling by curve.

5.2.1 cosϕ-P/Pn Characteristic Curve

Table 5-2 cosϕ-P/P_n characteristic curve definition

Description	Data Type	Gain	Unit	Value Range
Number of points	U16	1	N/A	[2, 10]
P/P_n value at point 1	U16	10	%	[0, 100]
cosϕ value at point 1	I16	1000	N/A	(–1, –0.8]U[0.8, 1]
P/P_n value at point 2	U16	10	%	[0, 100]
cosϕ value at point 2	I16	1000	N/A	(–1, –0.8]U[0.8, 1]
P/P_n value at point 3	U16	10	%	[0, 100]
cosϕ value at point 3	I16	1000	N/A	(–1, –0.8]U[0.8, 1]
P/P_n value at point 4	U16	10	%	[0, 100]
cosϕ value at point 4	I16	1000	N/A	(–1, –0.8]U[0.8, 1]
P/P_n value at point 5	U16	10	%	[0, 100]

Description	Data Type	Gain	Unit	Value Range
cosϕ value at point 5	I16	1000	N/A	(–1, –0.8]U[0.8, 1]
P/P_n value at point 6	U16	10	%	[0, 100]
cosϕ value at point 6	I16	1000	N/A	(–1, –0.8]U[0.8, 1]
P/P_n value at point 7	U16	10	%	[0,100]
cosϕ value at point 7	I16	1000	N/A	(–1,–0.8]U[0.8,1]
P/P_n value at point 8	U16	10	%	[0, 100]
cosϕ value at point 8	I16	1000	N/A	(–1, –0.8]U[0.8, 1]
P/P_n value at point 9	U16	10	%	[0, 100]
cosϕ value at point 9	I16	1000	N/A	(–1, –0.8]U[0.8, 1]
P/P_n value at point 10	U16	10	%	[0, 100]
cosϕ value at point 10	I16	1000	N/A	(–1, –0.8]U[0.8, 1]

5.2.2 Q-U Characteristic Curve

Table2 Q-U Characteristic Curve definition

Description	Data Type	Gain	Unit	Value Range
Number of points	U16	1	N/A	[2, 10]
U/U_n value at point 1	U16	10	%	[80, 136]
Q/S value at point 1	I16	1000	N/A	[–0.6, 0.6]
U/U_n value at point 2	U16	10	%	[80, 136]
Q/S value at point 2	I16	1000	N/A	[–0.6, 0.6]
U/U_n value at point 3	U16	10	%	[80, 136]
Q/S value at point 3	I16	1000	N/A	[–0.6, 0.6]
U/U_n value at point 4	U16	10	%	[80, 136]
Q/S value at point 4	I16	1000	N/A	[–0.6, 0.6]
U/U_n value at point 5	U16	10	%	[80, 136]
Q/S value at point 5	I16	1000	N/A	[–0.6, 0.6]

Description	Data Type	Gain	Unit	Value Range
U/U_n value at point 6	U16	10	%	[80, 136]
Q/S value at point 6	I16	1000	N/A	[–0.6, 0.6]
U/U_n value at point 7	U16	10	%	[80, 136]
Q/S value at point 7	I16	1000	N/A	[–0.6, 0.6]
U/U_n value at point 8	U16	10	%	[80, 136]
Q/S value at point 8	I16	1000	N/A	[–0.6, 0.6]
U/U_n value at point 9	U16	10	%	[80, 136]
Q/S value at point 9	I16	1000	N/A	[–0.6, 0.6]
U/U_n value at point 10	U16	10	%	[80, 136]
Q/S value at point 10	I16	1000	N/A	[–0.6, 0.6]

NOTICE

In Italian standards, this curve may be used together with the **Q-U characteristic curve mode**, **Q-U dispatch trigger power (%)**, and **Q-U power percentage to exit scheduling** parameters.

5.2.3 PF-U Characteristic Curve

Table3 PF-U Characteristic Curve definition

Description	Data Type	Gain	Unit	Value Range
Number of points	U16	1	N/A	[2, 10]
U/U_n value at point 1	U16	10	%	[80, 136]
PF value at point 1	I16	1000	N/A	(–1, –0.8]U[0.8, 1]
U/U_n value at point 2	U16	10	%	[80, 136]
PF value at point 2	I16	1000	N/A	(–1, –0.8]U[0.8, 1]
U/U_n value at point 3	U16	10	%	[80, 136]
PF value at point 3	I16	1000	N/A	(–1, –0.8]U[0.8, 1]
U/U_n value at point 4	U16	10	%	[80, 136]
PF value at point 4	I16	1000	N/A	(–1, –0.8]U[0.8, 1]

Description	Data Type	Gain	Unit	Value Range
U/U_n value at point 5	U16	10	%	[80, 136]
PF value at point 5	I16	1000	N/A	(–1, –0.8]U[0.8, 1]
U/U_n value at point 6	U16	10	%	[80, 136]
PF value at point 6	I16	1000	N/A	(–1, –0.8]U[0.8, 1]
U/U_n value at point 7	U16	10	%	[80, 136]
PF value at point 7	I16	1000	N/A	(–1, –0.8]U[0.8, 1]
U/U_n value at point 8	U16	10	%	[80, 136]
PF value at point 8	I16	1000	N/A	(–1, –0.8]U[0.8, 1]
U/U_n value at point 9	U16	10	%	[80, 136]
PF value at point 9	I16	1000	N/A	(–1, –0.8]U[0.8, 1]
U/U_n value at point 10	U16	10	%	[80, 136]
PF value at point 10	I16	1000	N/A	(–1, –0.8]U[0.8, 1]

5.3 Grid Codes

Table 5-3 List of grid codes

No.	Standard	Applicable Country or Region
0	VDE-AR-N-4105	Germany
1	NB/T 32004	China
2	UTE C 15-712-1(A)	France
3	UTE C 15-712-1(B)	France
4	UTE C 15-712-1(C)	France
5	VDE 0126-1-1-BU	Bulgaria
6	VDE 0126-1-1-GR(A)	Greece
7	VDE 0126-1-1-GR(B)	Greece
8	BDEW-MV	Germany

No.	Standard	Applicable Country or Region
9	G59-England	UK
10	G59-Scotland	UK
11	G83-England	UK
12	G83-Scotland	UK
13	CEI0-21	Italy
14	EN50438-CZ	Czech Republic
15	RD1699/661	Spain
16	RD1699/661-MV480	Spain
17	EN50438-NL	Netherlands
18	C10/11	Belgium
19	AS4777	Australia
20	IEC61727	General
21	Custom (50 Hz)	Custom
22	Custom (60 Hz)	Custom
23	CEI0-16	Italy
24	CHINA-MV480	China
25	CHINA-MV	China
26	TAI-PEA	Thailand
27	TAI-MEA	Thailand
28	BDEW-MV480	Germany
29	Custom MV480 (50 Hz)	Custom
30	Custom MV480 (60 Hz)	Custom
31	G59-England-MV480	UK
32	IEC61727-MV480	General
33	UTE C 15-712-1-MV480	France
34	TAI-PEA-MV480	Thailand
35	TAI-MEA-MV480	Thailand
36	EN50438-DK-MV480	Denmark

No.	Standard	Applicable Country or Region
37	Japan standard (50 Hz)	Japan
38	Japan standard (60 Hz)	Japan
39	EN50438-TR-MV480	Turkey
40	EN50438-TR	Turkey
41	C11/C10-MV480	Belgium
42	Philippines	Philippines
43	Philippines-MV480	Philippines
44	AS4777-MV480	Australia
45	NRS-097-2-1	South Africa
46	NRS-097-2-1-MV480	South Africa
47	KOREA	South Korea
48	IEEE 1547-MV480	USA
49	IEC61727-60Hz	General
50	IEC61727-60Hz-MV480	General
51	CHINA_MV500	China
52	ANRE	Romania
53	ANRE-MV480	Romania
54	ELECTRIC RULE NO.21-MV480	California, USA
55	HECO-MV480	Hawaii, USA
56	PRC_024_Eastern-MV480	Eastern USA
57	PRC_024_Western-MV480	Western USA
58	PRC_024_Quebec-MV480	Quebec, Canada
59	PRC_024_ERCOT-MV480	Texas, USA
60	PO12.3-MV480	Spain
61	EN50438_IE-MV480	Ireland
62	EN50438_IE	Ireland

No.	Standard	Applicable Country or Region
63	IEEE 1547a-MV480	USA
64	Japan standard (MV420-50 Hz)	Japan
65	Japan standard (MV420-60 Hz)	Japan
66	Japan standard (MV440-50 Hz)	Japan
67	Japan standard (MV440-60 Hz)	Japan
68	IEC61727-50Hz-MV500	General
70	CEI0-16-MV480	Italy
71	PO12.3	Spain
72	Japan standard (MV400-50 Hz)	Japan
73	Japan standard (MV400-60 Hz)	Japan
74	CEI0-21-MV480	Italy
75	KOREA-MV480	South Korea
76	Egypt ETEC	Egypt
77	Egypt ETEC-MV480	Egypt
78	CHINA_MV800	China
79	IEEE 1547-MV600	USA
80	ELECTRIC RULE NO.21-MV600	California, USA
81	HECO-MV600	Hawaii, USA
82	PRC_024_Eastern-MV600	Eastern USA
83	PRC_024_Western-MV600	Western USA
84	PRC_024_Quebec-MV600	Quebec, Canada
85	PRC_024_ERCOT-MV600	Texas, USA
86	IEEE 1547a-MV600	USA

No.	Standard	Applicable Country or Region
87	EN50549-LV	Ireland
88	EN50549-MV480	Ireland
89	Jordan-Transmission	Jordan
90	Jordan-Transmission-MV480	Jordan
91	NAMIBIA	Namibia
92	ABNT NBR 16149	Brazil
93	ABNT NBR 16149-MV480	Brazil
94	SA_RPPs	South Africa
95	SA_RPPs-MV480	South Africa
96	INDIA	India
97	INDIA-MV500	India
98	ZAMBIA	Zambia
99	ZAMBIA-MV480	Zambia
100	Chile	Chile
101	Chile-MV480	Chile
102	CHINA-MV500-STD	China
103	CHINA-MV480-STD	China
104	Mexico-MV480	Mexico
105	Malaysian	Malaysia
106	Malaysian-MV480	Malaysia
107	KENYA_ETHIOPIA	East Africa
108	KENYA_ETHIOPIA-MV480	East Africa
109	G59-England-MV800	UK
110	NIGERIA	Nigeria
111	NIGERIA-MV480	Nigeria
112	DUBAI	Dubai

No.	Standard	Applicable Country or Region
113	DUBAI-MV480	Dubai
114	Northern Ireland	Northern Ireland
115	Northern Ireland-MV480	Northern Ireland
116	Cameroon	Cameroon
117	Cameroon-MV480	Cameroon
118	Jordan-Distribution	Jordan
119	Jordan-Distribution-MV480	Jordan
120	Custom MV600-50 Hz	Custom
121	AS4777-MV800	Australia
122	INDIA-MV800	India
123	IEC61727-MV800	General
124	BDEW-MV800	Germany
125	ABNT NBR 16149-MV800	Brazil
126	UTE C 15-712-1-MV800	France
127	Chile-MV800	Chile
128	Mexico-MV800	Mexico
129	EN50438-TR-MV800	Turkey
130	TAI-PEA-MV800	Thailand
131	Philippines-MV800	Philippines
132	Malaysian-MV800	Malaysia
133	NRS-097-2-1-MV800	South Africa
134	SA_RPPs-MV800	South Africa
135	Jordan-Transmission-MV800	Jordan
136	Jordan-Distribution-MV800	Jordan
137	Egypt ETEC-MV800	Egypt
138	DUBAI-MV800	Dubai

No.	Standard	Applicable Country or Region
139	SAUDI-MV800	Saudi Arabia
140	EN50438_IE-MV800	Ireland
141	EN50549-MV800	Ireland
142	Northern Ireland-MV800	Northern Ireland
143	CEI0-21-MV800	Italy
144	IEC 61727-MV800-60Hz	General
145	NAMIBIA_MV480	Namibia
146	Japan (LV202-50 Hz)	Japan
147	Japan (LV202-60 Hz)	Japan
148	Pakistan-MV800	Pakistan
149	BRASIL-ANEEL-MV800	Brazil
150	Israel-MV800	Israel
151	CEI0-16-MV800	Italy
152	ZAMBIA-MV800	Zambia
153	KENYA_ETHIOPIA-MV800	East Africa
154	NAMIBIA_MV800	Namibia
155	Cameroon-MV800	Cameroon
156	NIGERIA-MV800	Nigeria
157	ABUDHABI-MV800	Abu Dhabi
158	LEBANON	Lebanon
159	LEBANON-MV480	Lebanon
160	LEBANON-MV800	Lebanon
161	ARGENTINA-MV800	Argentina
162	ARGENTINA-MV500	Argentina
163	Jordan-Transmission-HV	Jordan
164	Jordan-Transmission-HV480	Jordan

No.	Standard	Applicable Country or Region
165	Jordan-Transmission-HV 800	Jordan
166	TUNISIA	Tunisia
167	TUNISIA-MV480	Tunisia
168	TUNISIA-MV800	Tunisia
169	JAMAICA-MV800	Jamaica
170	AUSTRALIA-NER	Australia
171	AUSTRALIA-NER-MV480	Australia
172	AUSTRALIA-NER-MV800	Australia
173	SAUDI	Saudi Arabia
174	SAUDI-MV480	Saudi Arabia
175	Ghana-MV480	Ghana
176	Israel	Israel
177	Israel-MV480	Israel
178	Chile-PMGD	Chile
179	Chile-PMGD-MV480	Chile
180	VDE-AR-N4120-HV	Germany
181	VDE-AR-N4120-HV480	Germany
182	VDE-AR-N4120-HV800	Germany
183	IEEE 1547-MV800	USA
184	Nicaragua-MV800	Nicaragua
185	IEEE 1547a-MV800	USA
186	ELECTRIC RULE NO.21-MV800	California, USA
187	HECO-MV800	Hawaii, USA
188	PRC_024_Eastern-MV800	Eastern USA
189	PRC_024_Western-MV800	Western USA
190	PRC_024_Quebec-MV800	Quebec, Canada

No.	Standard	Applicable Country or Region
191	PRC_024_ERCOT-MV800	Texas, USA
192	Custom-MV800-50Hz	Custom
193	RD1699/661-MV800	Spain
194	PO12.3-MV800	Spain
195	Mexico-MV600	Mexico
196	Vietnam-MV800	Vietnam
197	CHINA-LV220/380	China
198	SVG-LV	Dedicated
199	Vietnam	Vietnam
200	Vietnam-MV480	Vietnam
201	Chile-PMGD-MV800	Chile
202	Ghana-MV800	Ghana
203	TAIPOWER	Taiwan
204	TAIPOWER-MV480	Taiwan
205	TAIPOWER-MV800	Taiwan
206	IEEE 1547-LV208	USA
207	IEEE 1547-LV240	USA
208	IEEE 1547a-LV208	USA
209	IEEE 1547a-LV240	USA
210	ELECTRIC RULE NO.21-LV208	USA
211	ELECTRIC RULE NO.21-LV240	USA
212	HECO-O+M+H-LV208	USA
213	HECO-O+M+H-LV240	USA
214	PRC_024_Eastern-LV208	USA
215	PRC_024_Eastern-LV240	USA
216	PRC_024_Western-LV208	USA

No.	Standard	Applicable Country or Region
217	PRC_024_Western-LV240	USA
218	PRC_024_ERCOT-LV208	USA
219	PRC_024_ERCOT-LV240	USA
220	PRC_024_Quebec-LV208	USA
221	PRC_024_Quebec-LV240	USA
222	ARGENTINA-MV480	Argentina
223	Oman	Oman
224	Oman-MV480	Oman
225	Oman-MV800	Oman
226	Kuwait	Kuwait
227	Kuwait-MV480	Kuwait
228	Kuwait-MV800	Kuwait
229	Bangladesh	Bangladesh
230	Bangladesh-MV480	Bangladesh
231	Bangladesh-MV800	Bangladesh
232	Chile-Net_Billing	Chile
233	EN50438-NL-MV480	Netherlands
234	Bahrain	Bahrain
235	Bahrain-MV480	Bahrain
236	Bahrain-MV800	Bahrain
238	Japan-MV550-50Hz	Japan
239	Japan-MV550-60Hz	Japan
241	ARGENTINA	Argentina
242	KAZAKHSTAN-MV800	Kazakhstan
243	Mauritius	Mauritius
244	Mauritius-MV480	Mauritius
245	Mauritius-MV800	Mauritius
246	Oman-PDO-MV800	Oman

No.	Standard	Applicable Country or Region
247	EN50438-SE	Sweden
248	TAI-MEA-MV800	Thailand
249	Pakistan	Pakistan
250	Pakistan-MV480	Pakistan
251	PORTUGAL-MV800	Portugal
252	HECO-L+M-LV208	USA
253	HECO-L+M-LV240	USA
254	C10/11-MV800	Belgium
255	Austria	Austria
256	Austria-MV480	Austria
257	G98	UK
258	G99-TYPEA-LV	UK
259	G99-TYPEB-LV	UK
260	G99-TYPEB-HV	UK
261	G99-TYPEB-HV-MV480	UK
262	G99-TYPEB-HV-MV800	UK
263	G99-TYPEC-HV-MV800	UK
264	G99-TYPED-MV800	UK
265	G99-TYPEA-HV	UK
266	CEA-MV800	India
267	EN50549-MV400	Europe
268	VDE-AR-N4110	Germany
269	VDE-AR-N4110-MV480	Germany
270	VDE-AR-N4110-MV800	Germany
271	Panama-MV800	Panama
272	North Macedonia-MV800	Nprth Macedonia
273	NTS	Spain
274	NTS-MV480	Spain

No.	Standard	Applicable Country or Region
275	NTS-MV800	Spain

NOTICE

Set the grid code based on local laws and regulations.

5.4 Energy Storage Specifications

Table 5-4 Format description of parameters for time-of-use electricity price periods

Description	Data Type	Gain	Unit	Value Range
Number of periods	U16	1	N/A	[0, 10]
Start time of period 1	U16	1	min	[0, 1440]. The value is the elapsed minutes since 00:00 a.m. The start time should be earlier than the end time.
End time of period 1	U16	1	min	[0, 1440]. The value is the elapsed minutes since 00:00 a.m. The start time should be earlier than the end time.
Electricity price in period 1	U32	1000	N/A	N/A
Start time of period 2	U16	1	min	[0, 1440]. The value is the elapsed minutes since 00:00 a.m. The start time should be earlier than the end time.
End time of period 2	U16	1	min	[0, 1440]. The value is the elapsed minutes since 00:00 a.m. The start time should be earlier than the end

Description	Data Type	Gain	Unit	Value Range
				time.
Electricity price in period 2	U32	1000	N/A	N/A
...	...	...	...	...
Start time of period 10	U16	1	min	[0, 1440]. The value is the elapsed minutes since 00:00 a.m. The start time should be earlier than the end time.
End time of period 10	U16	1	min	[0, 1440]. The value is the elapsed minutes since 00:00 a.m. The start time should be earlier than the end time.
Electricity price in period 10	U32	1000	N/A	N/A

Table 5-5 Format description of parameters for fixed charging and discharging periods

Description	Data Type	Gain	Unit	Value Range
Number of periods	U16	1	N/A	[0, 10]
Start time of period 1	U16	1	min	[0, 1440]. The value is the elapsed minutes since 00:00 a.m. The start time should be earlier than the end time.
End time of period 1	U16	1	min	[0, 1440]. The value is the elapsed minutes since 00:00 a.m. The start time should be earlier than the end time.
Charging and discharging power in period 1	I32	1	W	[Discharging power limit, Charging power limit]. For details, see the description of the

Description	Data Type	Gain	Unit	Value Range
				supported model.
Start time of period 2	U16	1	min	[0, 1440]. The value is the elapsed minutes since 00:00 a.m. The start time should be earlier than the end time.
End time of period 2	U16	1	min	[0, 1440]. The value is the elapsed minutes since 00:00 a.m. The start time should be earlier than the end time.
Charging and discharging power in period 2	I32	1	W	[Discharging power limit, Charging power limit]. For details, see the description of the supported model.
...	...	...	...	...
Start time of period 10	U16	1	min	[0, 1440]. The value is the elapsed minutes since 00:00 a.m. The start time should be earlier than the end time.
End time of period 10	U16	1	min	[0, 1440]. The value is the elapsed minutes since 00:00 a.m. The start time should be earlier than the end time.
Charging and discharging power in period 10	I32	1	W	[Discharging power limit, Charging power limit]. For details, see the description of the supported model.

6 Overview of the Communications Protocol

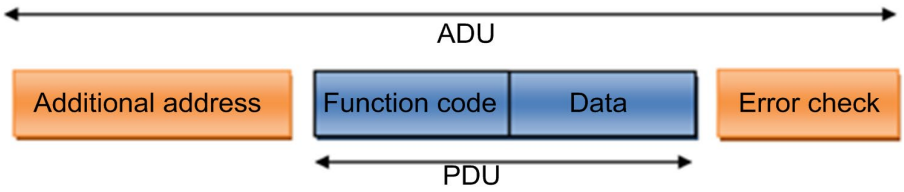
6.1 Physical Layer

Huawei solar inverters provide Modbus communication based on physical media such as MBUS, RS485, WLAN, FE, and 4G. MBUS and RS485 comply with the Modbus-RTU format. The communication through the WLAN, FE, and 4G media is based on the TCP link and complies with the Modbus-TCP format.

6.2 Data Link Layer

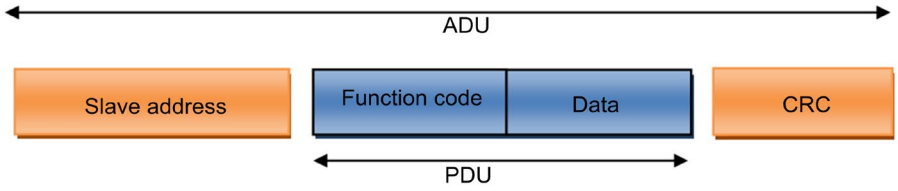
The following figure shows the generic frame structure of the Modbus protocol.

Figure 6-1 Modbus generic frame format



6.2.1 Modbus-RTU

Figure 6-2 Modbus-RTU frame format



6.2.1.1 ADU Length

The application data unit (ADU) consists of 256 bytes based on the serial bus.

1. Slave address: 1 byte
2. Cyclic redundancy check (CRC): 2 bytes
3. PDU: 253 bytes

6.2.1.2 Communications Address

As shown in Figure 6-2, Modbus-RTU is usually used for serial communication. Slave address represents the address of a slave solar inverter. The address range is allocated as follows:

Table 6-1 Serial link address allocation

Broadcast Address	Slave Node Address	Reserved Address
0	1–247	248–255

Reserved addresses are used for access control of the communication extension modules. Huawei reserves the right to allocate the reserved addresses.

6.2.1.3 CRC

CRC applies to all bytes in front of the CRC code, which consists of 16 bits. The reference code is as follows:

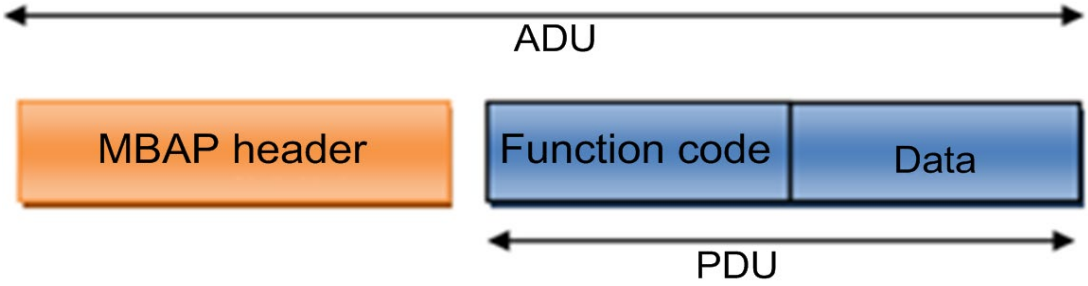
```
static unsigned char auchCRCHi[] = {
0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0, 0x80, 0x41, 0x01, 0xC0, 0x80, 0x41, 0x00, 0xC1, 0x81,
0x40, 0x01, 0xC0, 0x80, 0x41, 0x00, 0xC1, 0x81, 0x40, 0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0,
0x80, 0x41, 0x01, 0xC0, 0x80, 0x41, 0x00, 0xC1, 0x81, 0x40, 0x00, 0xC1, 0x81, 0x40, 0x01,
0xC0, 0x80, 0x41, 0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0, 0x80, 0x41, 0x01, 0xC0, 0x80, 0x41,
0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0, 0x80, 0x41, 0x00, 0xC1, 0x81, 0x40, 0x00, 0xC1, 0x81,
0x40, 0x01, 0xC0, 0x80, 0x41, 0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0, 0x80, 0x41, 0x01, 0xC0,
0x80, 0x41, 0x00, 0xC1, 0x81, 0x40, 0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0, 0x80, 0x41, 0x01,
0xC0, 0x80, 0x41, 0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0, 0x80, 0x41, 0x00, 0xC1, 0x81, 0x40,
0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0, 0x80, 0x41, 0x01, 0xC0, 0x80, 0x41, 0x00, 0xC1, 0x81,
```

```
0x40, 0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0, 0x80, 0x41, 0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0,
0x80, 0x41, 0x01, 0xC0, 0x80, 0x41, 0x00, 0xC1, 0x81, 0x40, 0x00, 0xC1, 0x81, 0x40, 0x01,
0xC0, 0x80, 0x41, 0x01, 0xC0, 0x80, 0x41, 0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0, 0x80, 0x41,
0x00, 0xC1, 0x81, 0x40, 0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0, 0x80, 0x41, 0x00, 0xC1, 0x81,
0x40, 0x01, 0xC0, 0x80, 0x41, 0x01, 0xC0, 0x80, 0x41, 0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0,
0x80, 0x41, 0x00, 0xC1, 0x81, 0x40, 0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0, 0x80, 0x41, 0x01,
0xC0, 0x80, 0x41, 0x00, 0xC1, 0x81, 0x40, 0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0, 0x80, 0x41,
0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0, 0x80, 0x41, 0x01, 0xC0, 0x80, 0x41, 0x00, 0xC1, 0x81,
0x40
} ;
/*CRC values for the low-order byte*/
static char auchCRCLo[] = {
0x00, 0xC0, 0xC1, 0x01, 0xC3, 0x03, 0x02, 0xC2, 0xC6, 0x06, 0x07, 0xC7, 0x05, 0xC5, 0xC4,
0x04, 0xCC, 0x0C, 0x0D, 0xCD, 0x0F, 0xCF, 0xCE, 0x0E, 0x0A, 0xCA, 0xCB, 0x0B, 0xC9, 0x09,
0x08, 0xC8, 0xD8, 0x18, 0x19, 0xD9, 0x1B, 0xDB, 0xDA, 0x1A, 0x1E, 0xDE, 0xDF, 0x1F, 0xDD,
0x1D, 0x1C, 0xDC, 0x14, 0xD4, 0xD5, 0x15, 0xD7, 0x17, 0x16, 0xD6, 0xD2, 0x12, 0x13, 0xD3,
0x11, 0xD1, 0xD0, 0x10, 0xF0, 0x30, 0x31, 0xF1, 0x33, 0xF3, 0xF2, 0x32, 0x36, 0xF6, 0xF7,
0x37, 0xF5, 0x35, 0x34, 0xF4, 0x3C, 0xFC, 0xFD, 0x3D, 0xFF, 0x3F, 0x3E, 0xFE, 0xFA, 0x3A,
0x3B, 0xFB, 0x39, 0xF9, 0xF8, 0x38, 0x28, 0xE8, 0xE9, 0x29, 0xEB, 0x2B, 0x2A, 0xEA, 0xEE,
0x2E, 0x2F, 0xEF, 0x2D, 0xED, 0xEC, 0x2C, 0xE4, 0x24, 0x25, 0xE5, 0x27, 0xE7, 0xE6, 0x26,
0x22, 0xE2, 0xE3, 0x23, 0xE1, 0x21, 0x20, 0xE0, 0xA0, 0x60, 0x61, 0xA1, 0x63, 0xA3, 0xA2,
0x62, 0x66, 0xA6, 0xA7, 0x67, 0xA5, 0x65, 0x64, 0xA4, 0x6C, 0xAC, 0xAD, 0x6D, 0xAF, 0x6F,
0x6E, 0xAE, 0xAA, 0x6A, 0x6B, 0xAB, 0x69, 0xA9, 0xA8, 0x68, 0x78, 0xB8, 0xB9, 0x79, 0xBB,
0x7B, 0x7A, 0xBA, 0xBE, 0x7E, 0x7F, 0xBF, 0x7D, 0xBD, 0xBC, 0x7C, 0xB4, 0x74, 0x75, 0xB5,
0x77, 0xB7, 0xB6, 0x76, 0x72, 0xB2, 0xB3, 0x73, 0xB1, 0x71, 0x70, 0xB0, 0x50, 0x90, 0x91,
0x51, 0x93, 0x53, 0x52, 0x92, 0x96, 0x56, 0x57, 0x97, 0x55, 0x95, 0x94, 0x54, 0x9C, 0x5C,
0x5D, 0x9D, 0x5F, 0x9F, 0x9E, 0x5E, 0x5A, 0x9A, 0x9B, 0x5B, 0x99, 0x59, 0x58, 0x98, 0x88,
0x48, 0x49, 0x89, 0x4B, 0x8B, 0x8A, 0x4A, 0x4E, 0x8E, 0x8F, 0x4F, 0x8D, 0x4D, 0x4C, 0x8C,
0x44, 0x84, 0x85, 0x45, 0x87, 0x47, 0x46, 0x86, 0x82, 0x42, 0x43, 0x83, 0x41, 0x81, 0x80, 0x40
};
unsigned short CRC16 ( puchMsg, usDataLen ) /* The function returns the CRC as a unsigned short type */
unsigned char *puchMsg ; /* message to calculate CRC upon */
unsigned short usDataLen ; /* quantity of bytes in message */
{
unsigned char uchCRCHi = 0xFF ; /* high byte of CRC initialized */
unsigned char uchCRCLo = 0xFF ; /* low byte of CRC initialized */
unsigned uIndex ; /* will index into CRC lookup table */
while (usDataLen--) /* pass through message buffer */
{
uIndex = uchCRCLo ^ *puchMsg++ ; /* calculate the CRC */
uchCRCLo = uchCRCHi ^ auchCRCHi[uIndex] ;
uchCRCHi = auchCRCLo[uIndex] ;
}
return (uchCRCHi << 8 | uchCRCLo) ;
}
```

Code source: *MODBUS over Serial Line Specification and Implementation Guide V1.02*

6.2.2 Modbus-TCP

Figure 6-3 Modbus-TCP frame format



6.2.2.1 ADU Length

The recommended frame length is 260 bytes based on the standard. When some extended functions are applied, the data service provider may extend the ADU to a proper length based on the resources it possesses, to improve network transmission efficiency. The ADU length is indicated by the length field in the MBAP packet header.

6.2.2.2 MBAP Packet Header

If Modbus is applied to TCP/IP, a dedicated MBAP packet header (Modbus application protocol packet header) is used to identify the Modbus ADU. The Modbus packet header consists of four fields and seven bytes, which are defined as follows.

Table 6-2 MBAP definition

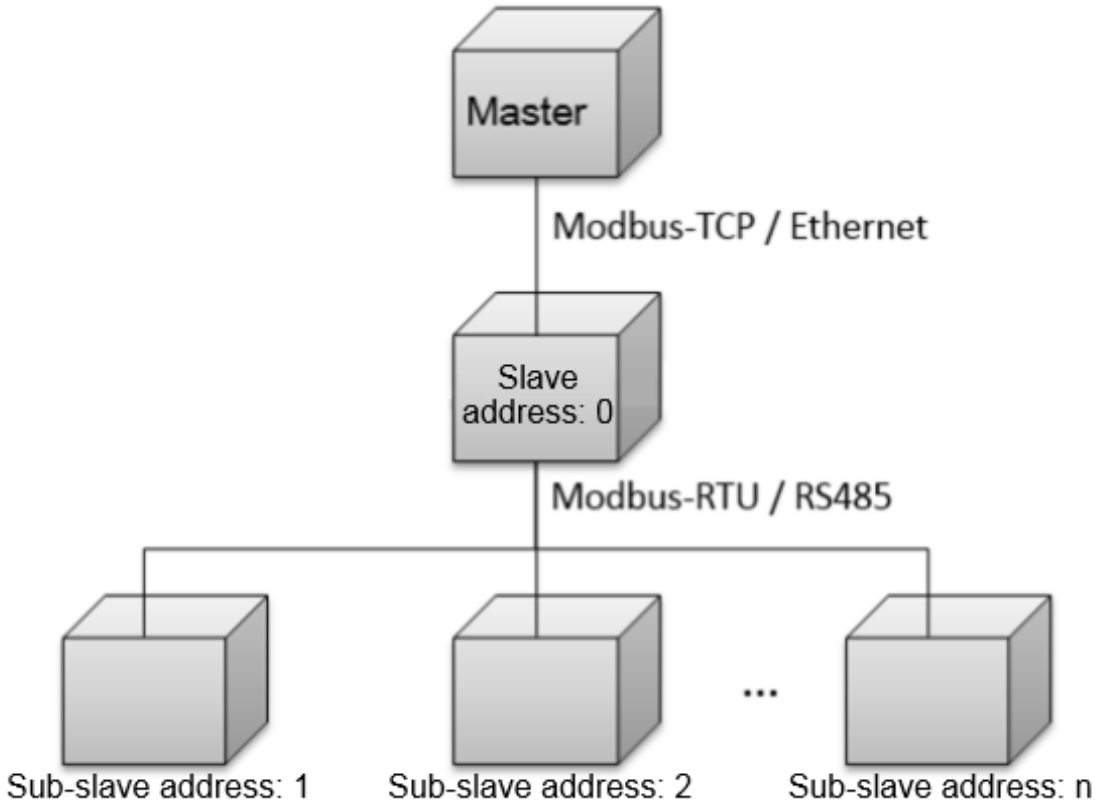
Data Field	Length (Byte)	Description	Client	Server
Transmission identifier	2	Matching identifier between a request frame and a response frame	Assigned by the client; better be unique for each data frame	The identifier of the response frame from the server must be consistent with that of the request frame.
Protocol type	2	0 = Modbus protocol	Assigned by the client; 0 by default	The identifier of the response frame from

Data Field	Length (Byte)	Description	Client	Server
				the server must be consistent with that of the request frame.
Data length	2	Follow-up data length	Assigned by the client based on the actual data frame	Assigned by the server based on the actual frame length
Logical device ID	1	0	Assigned by the client based on the actual data frame request	The identifier of the response frame from the server must be consistent with that of the request frame.

6.2.2.3 Communications Address

Based on the TCP communications host, unit 0 is used by default to access the directly connected slave node, and other addresses are used to access the downstream devices of the slave node. The default address of the slave node is 0. The address is adjustable.

Figure 6-4 Communications address of the three-layer object structure



6.2.2.4 TCP Port

In a local area network or VPN environment, the master node may actively initiate TCP socket link establishment to the slave node. The master node can use the 502 port to request data services from the slave node.

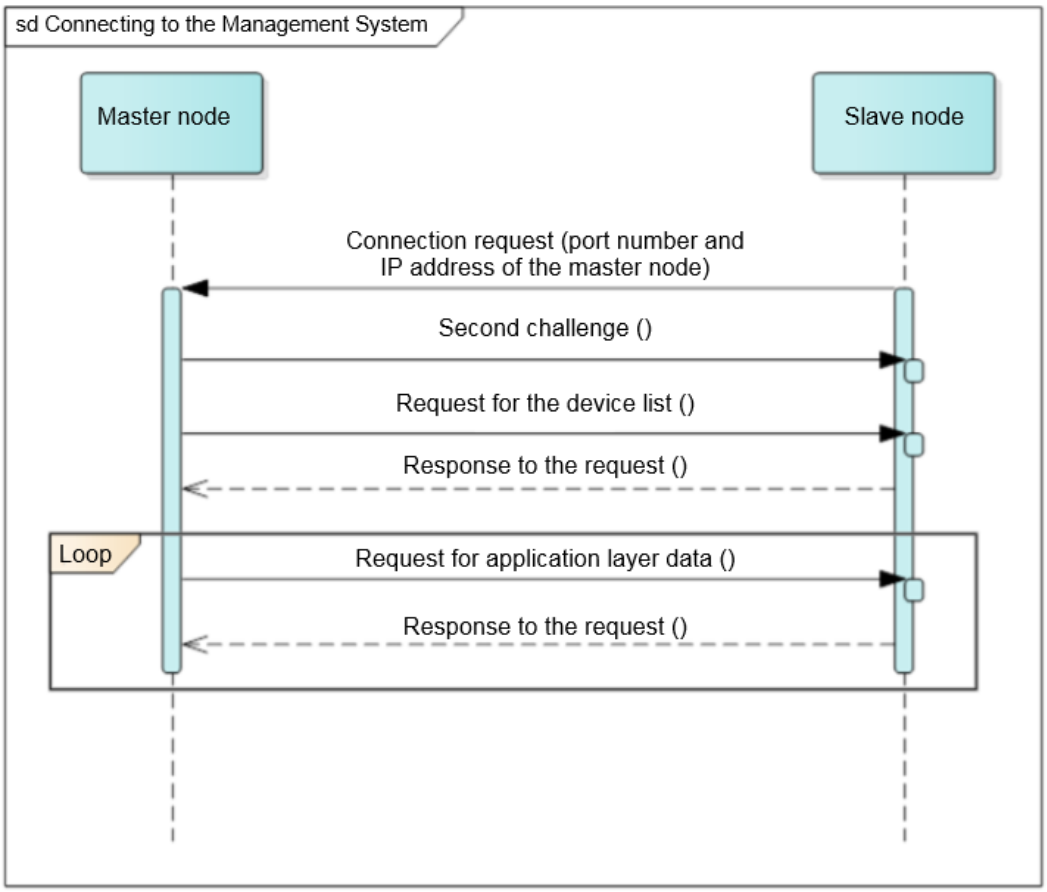
In a non-VPN environment across the public network, the device deployed on the internal network needs to initiate TCP socket link establishment to the master node exposed on the public network. In this case, you need to preset the fixed access port number of the master node on the slave node. To ensure security and reduce traffic, the master node must provide at least one encrypted port and one non-encrypted port.

6.2.2.5 TCP Link Establishment Process

This section focuses on the cross-public network application.

The following figure shows the process of connecting a slave node.

Figure 6-5 Process of establishing a secure TCP connection



6.3 Application Layer

6.3.1 Function Code List

Table 6-3 Function code list

Function Code	Meaning	Remarks
0x03	Read registers.	Continuously reads a single register or multiple registers.
0x06	Write a single register.	Writes into a single register.
0x10	Write multiple registers.	Continuously writes into multiple registers.

6.3.2 Exception Code List

The exception codes must be unique for each network element (NE) type. The names and descriptions should be provided in both the Chinese and English 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 6-4 Exception codes returned by an NE (0x00–0x8F are for common exception codes)

Code	Name	Description
0x01	Illegal function	The function code received in the query is not an allowable action for the server (or slave node). 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 (or slave node) is in the wrong state to process a request of this type, for example because it is not configured and is being asked to return register values.
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 operate on registers 96, 97, 98, 99 and 100, and there is no register with address 100.
0x03	Illegal data value	The value contained in the query data field is not an allowable value for the server (or slave). The value indicates a fault in the structure of the remainder of a complex request, such as an incorrectly implied length. 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.

Code	Name	Description
0x04	Slave node failure	An error occurred while the server was attempting to perform the requested action.
0x06	Slave device busy	The server cannot accept a Modbus request PDU. A client application determines whether and when to resend the request.
0x80	No permission	An operation is not allowed because of a permission authentication failure or permission expiration.

6.3.3 Reading Registers (0x03)

6.3.3.1 Frame Format of a Request from a Master Node

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

6.3.3.2 Frame Format of a Normal Response from a Slave Node

Data Field	Length (Byte)	Description
Function code	1	0x03
Number of bytes	1	2 x N
Register value	2 x N	N/A

N refers to the number of registers.

6.3.3.3 Frame Format of an Abnormal Response from a Slave Node

Data Field	Length (Byte)	Description
Function code	1	0x83
Exception code	1	See 6.3.2 Exception Code List.

6.3.3.4 Examples

This section takes the Modbus-TCP communications frames as an example. The differences between Modbus-RTU and Modbus-TCP lie in the additional address field and the CRC. Pay attention to the differences when using the Modbus-RTU frames. This also works for the follow-up examples.

The master node sends a query request (register address: 32306/0X7E32) to the slave node (logical device ID: 00).

Description		Frame Data
MBAP header	Protocol identifier	00
		01
	Protocol type	00
		00
	Data length	00
		06
	Logical device ID	00
Function code		03
Data	Register address	7E
		32
	Number of registers	00
		02

Normal response from the slave node

Description		Frame Data
MBAP header	Protocol identifier	00
		01
	Protocol type	00
		00
	Data length	00
		07

Description		Frame Data
	Logical device ID	00
Function code		03
Data	Number of bytes	04
	Register data	00
		00
		00
		01

Abnormal response from the slave node

Description		Frame data
MBAP header	Protocol identifier	00
		01
	Protocol type	00
		00
	Data length	00
		03
	Logical device ID	00
Function code		83
Data	Error code	03

6.3.4 Writing a Single Register (0x06)

6.3.4.1 Frame Format of a Request from a Master Node

Data Field	Length (Byte)	Description
Function code	1	0x06
Register address	2	0x0000–0xFFFF
Register value	2	0x0000–0xFFFF

6.3.4.2 Frame Format of a Normal Response from a Slave Node

Data Field	Length (Byte)	Description
Function code	1	0x06
Register address	2	0x0000–0xFFFF
Register value	2	0x0000–0xFFFF

6.3.4.3 Frame Format of an Abnormal Response from a Slave Node

Data Field	Length (Byte)	Description
Function code	1	0x86
Exception code	1	See 6.3.2 Exception Code List.

6.3.4.4 Examples

A master node sends a command (register address: 40200/0X9D08) to a slave node (address: 00).

Description		Frame data
MBAP header	Protocol identifier	00
		01
	Protocol type	00
		00
	Data length	00
		06
	Logical device ID	00
Function code		06
Data	Register address	9D
		08
	Register data	00
		00

Normal response from the slave node

Description		Frame Data
MBAP header	Protocol identifier	00
		01
	Protocol type	00
		00
	Data length	00
		06
	Logical device ID	00
Function code		06
Data	Register address	9D
		08
	Register data	00
		00

Abnormal response from the slave node

Description		Frame Data
MBAP header	Protocol identifier	00
		01
	Protocol type	00
		00
	Data length	00
		03
	Logical device ID	00
Function code		86
Data	Error code	04

6.3.5 Writing Multiple Registers (0x10)

6.3.5.1 Frame Format of a Request from a Master Node

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

N refers to the number of registers.

6.3.5.2 Frame Format of a Normal Response from a Slave Node

Data Field	Length (Byte)	Description
Function code	1	0x10
Register address	2	0x0000–0xFFFF
Number of registers	2	0x0000–0x007b

6.3.5.3 Frame Format of an Abnormal Response from a Slave Node

Data Field	Length (Byte)	Description
Function code	1	0x90
Exception code	1	See 6.3.2 Exception Code List.

6.3.5.4 Examples

The master node sets the register address 40118/0X9CB6 to 2 and the register address 40119/0X9CB7 to 50 for the slave node (address: 00). The request frame format is as follows.

Description		Frame Data
MBAP header	Protocol identifier	00

Description		Frame Data
		01
	Protocol type	00
		00
	Data length	00
		0B
	Logical device ID	00
Function code		10
Data	Register address	9C
		B6
	Number of registers	00
		02
	Number of bytes	04
	Register data	00
		02
		00
		32

Normal response from the slave node

Description		Frame Data
MBAP header	Protocol identifier	00
		01
	Protocol type	00
		00
	Data length	00
		06
	Logical device ID	00
Function code		10
Data	Register address	9C

Description		Frame Data
		B6
	Number of registers	00
		02

Abnormal response from the slave node

Description		Frame Data
MBAP header	Protocol identifier	00
		01
	Protocol type	00
		00
	Data length	00
		03
	Logical device ID	00
Function code		90
Data	Error code	04

6.3.6 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 interface 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:

1. Basic device identifier: All objects of this type are mandatory, such as the vendor name, product code, and revision version.
2. Normal device identifier: Except basic data objects, the device provides additional and optional identifiers and data object description. Define all types of objects according to definitions in the standard, but the execution of this type of objects is optional.
3. Extended device identifier: In addition to the normal data objects, the device provides additional and optional identifiers and special data object description. All the data is related to the device.

Table 6-5 Reading device identifiers

Object ID	Object Name or Description	Type	Mandatory or Optional (M/O)	Type
0x00	Manufacturer name	ASCII character string	M	Basic
0x01	Product code	ASCII character string	M	
0x02	Main revision version	ASCII character string	M	
0x03–0x7F	-	-	-	Normal
0x80–0xFF	-	-	-	Expansion

6.3.6.1 Command for Querying Device Identifiers

Table 6-6 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 6-7 Frame format for a normal response

Data Field	Length (Byte)	Description
Function code	1	0x2B
MEI type	1	0x0E
ReadDevId code	1	01
Consistency level	1	01
More	1	-

Data Field			Length (Byte)	Description
Next object ID			1	-
Number of objects			1	-
Object list	First object	Object ID	1	0x00
		Object length	1	N
		Object value	N	-
	...	...	...	...

Table 6-8 Object list

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

Table 6-9 Frame format for an abnormal response

Data Field	Length (Byte)	Description
Function code	1	0xAB
Exception code	1	See 6.3.2 Exception Code List.

6.3.6.2 Command for Querying a Device List

Table 6-10 Request frame format

Data Field	Length (Byte)	Description
Function code	1	0x2B
MEI type	1	0x0E

Data Field	Length (Byte)	Description
ReadDevId code	1	03
Object ID	1 byte	0x87

Table 6-11 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	-
Next object ID			1	-
Number of objects			1	-
Object list	First object	Object ID	1	0x87
		Object length	1	N
		Object value	N	-
	...	...	...	...

Table 6-12 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	Description about the first device	ASCII character string See the device description	Returns only description about the first device if a NE allows only

Object ID	Object Name	Type	Description
		definitions.	one device to be connected to each RS485 address.
0x8A	Description about the second device	-	-
-	-	-	-
0xFF	Description about the 120th device	-	-

6.3.6.3 Device Description Definition

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

"Attribute ID=%s;attribute ID=%s;... attribute ID=%s"

For example:
"1=SUN2000MA-XXKTL;2=V100R001C00SPC100;3=P1.0-D5.0;4=123232323;5=1;6=1.1"

Table 6-13 Attribute definition

Attribute ID	Name	Type	Description
1	Device model	ASCII character string	SUN2000
2	Device software version	ASCII character string	-
3	Port protocol version	ASCII character string	See the interface protocol version definitions.
4	ESN	ASCII character string	-
5	Device ID	int	0, 1, 2, 3...(assigned by NEs; 0 indicates the master device into which the Modbus card is inserted)
6	Feature version	ASCII character	-

Attribute ID	Name	Type	Description
		string	

Table 6-14 Frame format for an abnormal response

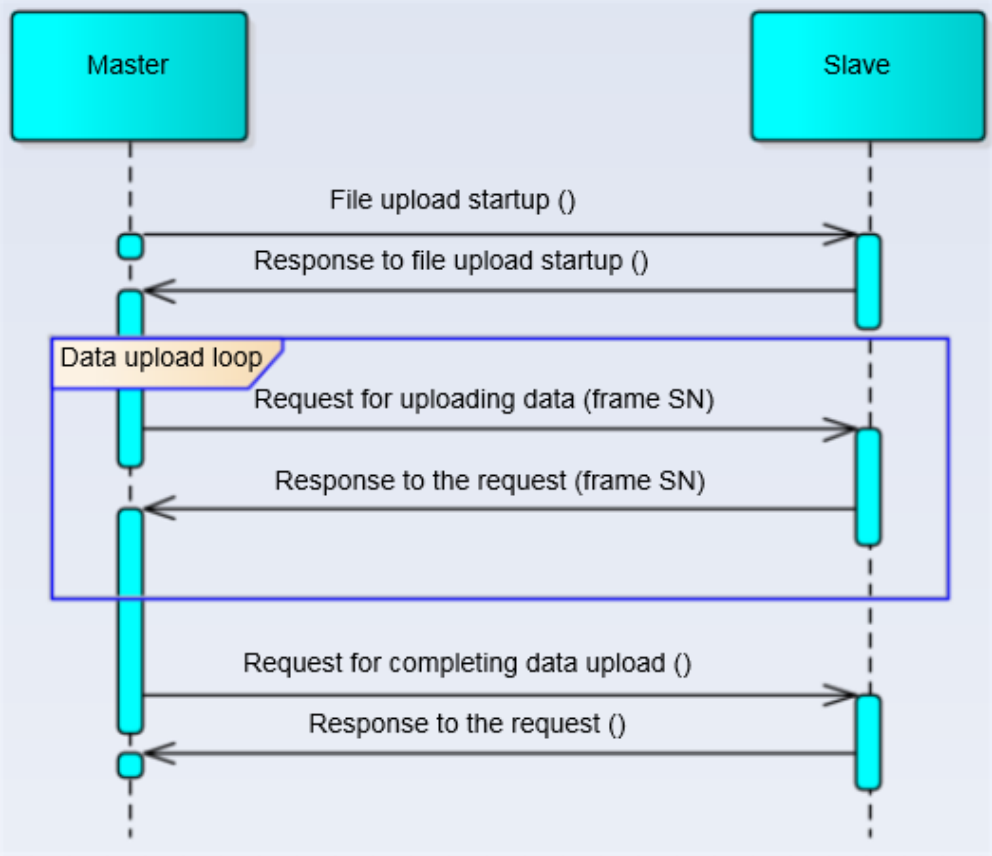
Data Field	Length (Byte)	Description
Function code	1	0xAB
Exception code	1	See 6.3.2 Exception Code List.

6.3.7 Huawei-defined Functions (0x41)

6.3.7.1 Uploading Files

Uploading files means uploading them by stream data from a slave node to a master node. The following figure shows the file uploading process.

Figure 6-6 File uploading process



6.3.7.1.1 Starting the Upload

Frame format of a request from a master node

Table 6-15 PDU data field of the request frame for starting upload (0x05)

PDU Data Field	Length (Byte)	Description
Function code	1	0x41
Sub-function code	1	0x05
Data length	1	1 + N
File type	1	Unique ID of a file
Customi	N	-

PDU Data Field	Length (Byte)	Description
zed data		

Table 6-16 PDU data field of the response frame for starting upload (0x05)

Data Field	Length (Byte)	Description
Function code	1	0x41
Sub-function code	1	0x05
Data length	1	6 + N
File type	1	Unique ID of a file
File length	4	-
Data frame length	1	-
Customized data	N	-

Table 6-17 PDU data field in the abnormal response frame of the slave node

PDU Data Field	Length (Byte)	Description
Error code	1	0xC1
Exception code	1	See 6.3.2 Exception Code List.

If the exception code is 0x06, resend the request after 10 seconds. A request can be resent for no more than six times.

6.3.7.1.2 Uploading Data

Table 6-18 Request frame for uploading data (0x06)

PDU Data Field	Length (Byte)	Description
Function code	1	0x41
Sub-function code	1	0x06
Data length	1	3
File type	1	Unique ID of a file
Frame No.	2	0x0000–0xFFFF

Table 6-19 Response frame for uploading data (0x06)

PDU Data Field	Length (Byte)	Description
Function code	1	0x41
Sub-function code	1	0x06
Data length	1	3 + N
File type	1	-
Frame No.	2	0x0000–0xFFFF
Frame data	N	-

Table 6-20 Abnormal response frame for uploading data

PDU Data Field	Length (Byte)	Description
Error code	1	0xC1
Exception code	1	See 6.3.2 Exception Code List.

6.3.7.1.3 Completing the Data Upload

Table 6-21 Request frame for completing the data upload

PDU Data Field	Length (Byte)	Description
Function code	1	0x41
Sub-function code	1	0x0c
Data length	1	1
File type	1	-

Table 6-22 Response frame for completing the data upload

PDU Data Field	Length (Byte)	Description
Function code	1	0x41
Sub-function code	1	0x0c
Data length	1	3
File type	1	-
File CRC	2	-

Table 6-23 Abnormal response frame for completing the data upload

Data Field	Length (Byte)	Description
Error code	1	0xC1
Exception code	1	See 6.3.2 Exception Code List.

6.3.7.1.4 Timeout Processing

Table 6-24 Processing specifications of sub-process timeout

Name	Restraints
Response timeout period for starting an upload	10s

Name	Restraints
Response timeout period for uploading data	10s
Number of times of resending a data upload command	6
Response timeout period for completing a data upload	10s