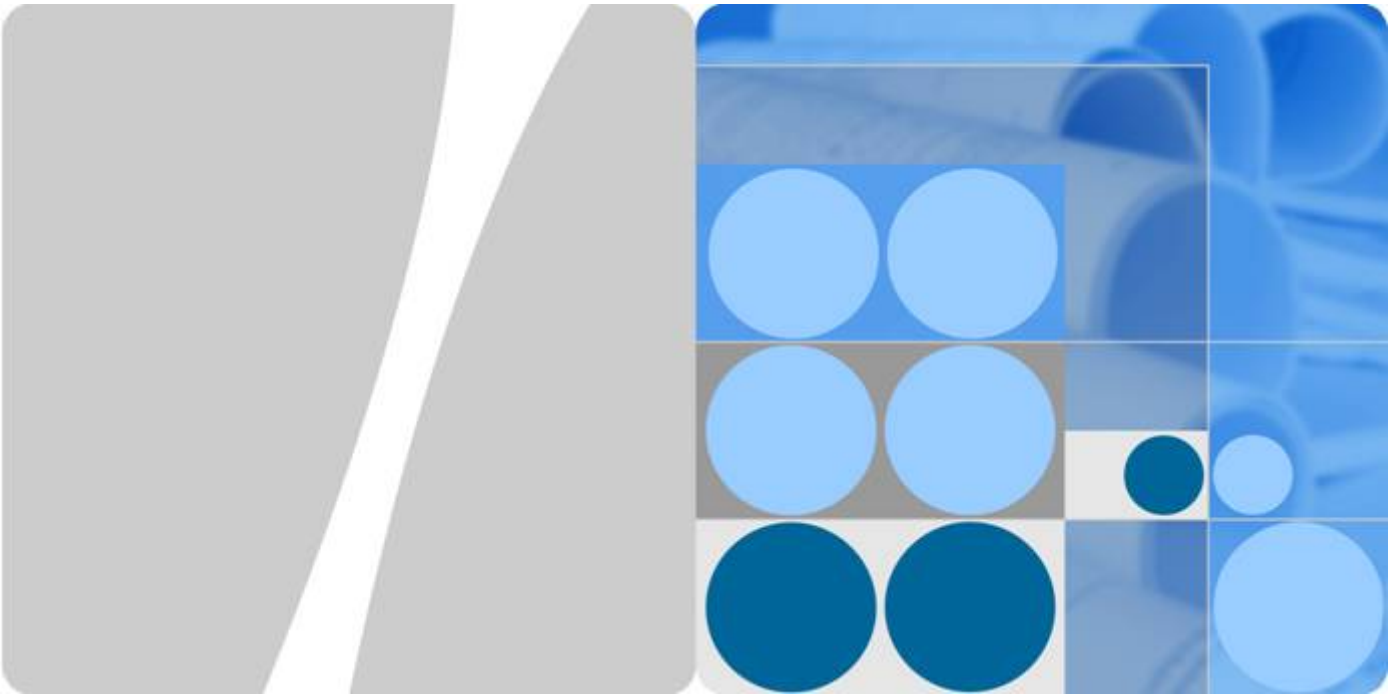

SUN2000

V200R002

MODBUS Interface Definitions

Issue 05

Date 2017-04-27

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Change History

Change History

Issue	Date	Description
05	2017-04-27	Added inverter models
04	2017-02-15	Added inverter models
03	2016-09-02	Baseline Document for Test.
02	2016-04-11	Update alarm list.
01	2016-01-13	This issue is the first official release.

Contents

1 Introduction

The ModBus-RTU protocol is a widely used industrial communications protocol. It is a common language for electrical communications terminals, and has become an industrial standard which enables inverters from different manufacturers to be networked and centrally monitored. By using this protocol, inverters can communicate with each other or with other devices in a network, such as through the RS485 bus. The protocol defines master and slave nodes, the processes in which the master node accesses other devices using various requests, how a slave node responds to requests from other devices, and how both parties involved in a communications process detect and record errors. It also specifies the message field formats and detailed data content.

As the Huawei inverter business continues to expand, more and more general and customized inverters use the ModBus protocol for communication. This document provides information about the ModBus protocol used in Huawei inverters, and can be used to regulate and restrict follow-up third-party integration R&D and customizations.

1.1 Terms and Abbreviations

Table 1-1 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.

Name	Description
Register address	The address of a register 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	String
MLD	Multiple bytes
N/A	Not applicable
s	Second

1.2 System Requirements

Applicable model:

SUN2000-50KTL-C1

SUN2000-50KTL

SUN2000-42KTL

SUN2000-36KTL

SUN2000-33KTL-JP

SUN2000-40KTL-JP

SUN2000-43KTL-IN-C1

SUN2000-24.7KTL-JP

SUN2000-40KTL-US

SUN2000-33KTL-US

SUN2000-36KTL-US

SUN2000-33KTL-A

Firmware version: V200R002C00/C01 or later

1.3 Inverter Models and Rated Power

Table 1-2 Rated inverter capacity

SN	Model	Pmax(kW)	Qmax (kVar)	Rated Power (kW)
24	SUN2000-50KTL-C1	52.5	31.5	47.5
26	SUN2000-42KTL	47	28.2	42
27	SUN2000-36KTL	40	24	36
28	SUN2000-33KTL-JP	33.3	22.8	33.3
29	SUN2000-40KTL-JP	40	27.6	40
30	SUN2000-50KTL	50.5	30.3	46
31	SUN2000-43KTL-IN-C1	52.5	31.5	43
32	SUN2000-24.7KTL-JP	24.7	18	24.7
35	SUN2000-40KTL-US	44	26.4	40
36	SUN2000-33KTL-US	36.6	21.96	33.3
37	SUN2000-36KTL-US	40	24	36
43	SUN2000-33KTL-A	33	19.8	30

2 Register Definitions

2.1 Signal Definitions

Table 2-1 Huawei inverters support 0X03, 0X06, and 0X10 commands

SN	Signal Name	Read / Write	Type	Unit	Gain	Address	Quantity	Scope
1	Rated inverter power	RO	U16	N/A	1	32001	1	For details, see the description in 1.3
2	Output mode	RO	U16	N/A	1	32002	1	0:three-phase, four-wire 1:three-phase, three-wire
3	ESN	RO	STR	N/A	1	32003	10	
4	System Time	RO	U32	N/A	1	32200	2	
5	PV1 Voltage	RO	I16	V	10	32262	1	
6	PV1 Current	RO	I16	A	10	32263	1	
7	PV2 Voltage	RO	I16	V	10	32264	1	
8	PV2 Current	RO	I16	A	10	32265	1	
9	PV3 Voltage	RO	I16	V	10	32266	1	
10	PV3 Current	RO	I16	A	10	32267	1	
11	PV4 Voltage	RO	I16	V	10	32268	1	

SN	Signal Name	Read / Write	Type	Unit	Gain	Address	Quantity	Scope
12	PV4 Current	RO	I16	A	10	32269	1	
13	PV5 Voltage	RO	I16	V	10	32270	1	
14	PV5 Current	RO	I16	A	10	32271	1	
15	PV6 Voltage	RO	I16	V	10	32272	1	
16	PV6 Current	RO	I16	A	10	32273	1	
17	Uab	RO	U16	V	10	32274	1	
18	Ubc	RO	U16	V	10	32275	1	
19	Uca	RO	U16	V	10	32276	1	
20	Ua	RO	U16	V	10	32277	1	
21	Ub	RO	U16	V	10	32278	1	
22	Uc	RO	U16	V	10	32279	1	
23	Ia	RO	U16	A	10	32280	1	
24	Ib	RO	U16	A	10	32281	1	
25	Ic	RO	U16	A	10	32282	1	
26	Frequency	RO	U16	Hz	100	32283	1	
27	Power factor	RO	I16	N/A	1000	32284	1	
28	Inverter efficiency	RO	U16	%	100	32285	1	
29	Cabinet temperature	RO	I16	ºC	10	32286	1	

SN	Signal Name	Read / Write	Type	Unit	Gain	Address	Quantity	Scope
30	Inverter status	RO	U16	N/A	1	32287	1	0x0000:Idle: Initializing 0x0001:Idle: Detecting ISO 0x0002:Idle: Detecting irradiation 0x0003:Idle: Grid detecting 0x0100:Starting 0x0200:On-grid 0x0201:On-grid: Power limit 0x0202:On-grid:self derating 0x0300:Shutdown: Fault 0x0301:Shutdown: Command 0x0302:Shutdown: OVGR 0x0303:Shutdown: Communication disconnected 0x0304:Shutdown: Power limit 0x0305:Shutdown: Start manually 0x0401:Grid dispatch: cos(Phi)-P curve 0x0402:Grid dispatch: Q-U curve 0xA000:Idle: No irradiation 0x0500:Spot-check 0x0501:Spot-checking 0x0600:Inspecting 0X0700:AFCI self-check 0X0800:IV scanning

SN	Signal Name	Read / Write	Type	Unit	Gain	Address	Quantity	Scope
31	Active power peak of current day	RO	I32	kW	1000	32288	2	
32	Active power	RO	I32	kW	1000	32290	2	
33	Reactive power	RO	I32	kVar	1000	32292	2	
34	Total input power	RO	U32	kW	1000	32294	2	
35	Current electricity yield collection time	RO	U32	N/A	1	32296	2	
36	E-Hour	RO	U32	kWh	100	32298	2	
37	E-Day	RO	U32	kWh	100	32300	2	
38	E-Month	RO	U32	kWh	100	32302	2	
39	E-Year	RO	U32	kWh	100	32304	2	
40	E-Total	RO	U32	kWh	100	32306	2	
41	PV7 voltage	RO	I16	V	10	32314	1	
42	PV7 current	RO	I16	A	10	32315	1	
43	PV8 voltage	RO	I16	V	10	32316	1	
44	PV8 current	RO	I16	A	10	32317	1	
45	Locking	RO	U16	N/A	1	32320	1	0:locked 1:not locked
46	Zero voltage ride through protection	RO	U16	N/A	1	32321	1	BitOffset:0 0：NO; 1：YES;
47	LVRT protection	RO	U16	N/A	1	32321	1	BitOffset:1 0：NO; 1：YES;
48	Islanding protection status	RO	U16	N/A	1	32321	1	BitOffset:2 0：NO; 1：YES;
49	Inverter on-grid	RO	U16	N/A	1	32322	1	00:off-grid 01:on-grid
50	Insulation resistance	RO	U16	MΩ	1000	32323	1	

SN	Signal Name	Read / Write	Type	Unit	Gain	Address	Quantity	Scope
51	Start time	RO	U32	s	1	32325	2	
52	Shutdown time	RO	U32	s	1	32327	2	
53	Electricity yield collection time for previous hour	RO	U32	N/A	1	32343	2	
54	Electricity yield in previous hour	RO	U32	kWh	100	32345	2	
55	Electricity yield collection time for previous day	RO	U32	N/A	1	32347	2	
56	Electricity yield on previous day	RO	U32	kWh	100	32349	2	
57	Electricity yield collection time for previous month	RO	U32	N/A	1	32351	2	
58	Electricity yield in previous month	RO	U32	kWh	100	32353	2	
59	Electricity yield collection time for previous year	RO	U32	N/A	1	32355	2	
60	Electricity yield in previous year	RO	U32	kWh	100	32357	2	
61	MPPT1 total input power	RO	U32	kW	1000	33022	2	
62	MPPT2 total input power	RO	U32	kW	1000	33024	2	
63	MPPT3 total input power	RO	U32	kW	1000	33026	2	
64	MPPT4 total input power	RO	U32	kW	1000	33070	2	
65	System time	RW	U32	N/A	1	40000	2	[946684800, 3155759999]
66	Reactive power compensation	RW	U16	N/A	1	40117	1	[0,6]
67	Active power control	RW	U16	N/A	1	40118	1	[0,4]

SN	Signal Name	Read / Write	Type	Unit	Gain	Address	Quantity	Scope
68	Active power derating (%)	RW	U16	%	1	40119	1	[0,100]
69	Active power derating (fixed value)	RW	U16	kW	10	40120	1	[0,Pmax]
70	Active power deration gradient	RW	U16	%/s	10	40121	1	[0.1,1000]
71	Reactive power compensation (PF)	RW	I16	N/A	1000	40122	1	(-1,-0.8]U[0.8,1]
72	Reactive power compensation(Q/S)	RW	I16	N/A	1000	40123	1	(-1,1]
73	Reactive power adjustment time	RW	U16	s	1	40124	1	[5,120]
74	Active power derating percent(0.1%)	RW	U16	%	10	40125	1	[0,100]
75	cos(Phi)-P/Pn characteristic curve	RW	MLD	N/A	1	40133	21	
76	Q-U characteristic curve	RW	MLD	N/A	1	40154	21	
77	Power on	WO	U16	N/A	1	40200	1	0
78	Power off	WO	U16	N/A	1	40201	1	0
79	Active power derating percent(0.1%)	WO	U16	%	1	40232	1	[0,100]
80	Active power deration percent(1%)	WO	U16	%	1	40234	1	[0,100]
81	Active power deration fixed value	WO	U16	kW	10	40235	1	[0,Pmax]
82	Reactive power compensation Q/S	WO	I16	N/A	1000	40236	1	(-1,1]

SN	Signal Name	Read / Write	Type	Unit	Gain	Address	Quantity	Scope
83	Reactive power compensation factor instruction(PF)	WO	I16	N/A	1000	40237	1	(-1,-0.8]U[0.8,1]
84	Level-1 OV prot. time	RW	U32	ms	1	42045	2	[50,7200000]
85	Level-2 OV prot. time	RW	U32	ms	1	42047	2	[50,7200000]
86	Level-1 UV prot.time	RW	U32	ms	1	42049	2	[50,7200000]
87	Level-2 UV prot.time	RW	U32	ms	1	42051	2	[50,7200000]
88	Level-1 OF prot.time	RW	U32	ms	1	42053	2	[50,7200000]
89	Level-2 OF prot.time	RW	U32	ms	1	42055	2	[50,7200000]
90	Level-1 UF prot.time	RW	U32	ms	1	42057	2	[50,7200000]
91	Level-2 UF prot.time	RW	U32	ms	1	42059	2	[50,7200000]
92	10-min OV protec.time	RW	U32	ms	1	42061	2	[50,7200000]
93	Level-1 OV prot.	RW	U16	V	10	42063	1	[1*Vn,1.36*Vn]
94	Level-2 OV prot.	RW	U16	V	10	42064	1	[1*Vn,1.36*Vn]
95	Level-1 UV prot.	RW	U16	V	10	42065	1	[0.15*Vn,1*Vn]
96	Level-2 UV prot.	RW	U16	V	10	42066	1	[0.15*Vn,1*Vn]
97	Level-1 OF prot.	RW	U16	Hz	100	42067	1	[1*Fn,1.15*Fn]
98	Level-2 OF prot.	RW	U16	Hz	100	42068	1	[1*Fn,1.15*Fn]
99	Level-1 UF prot.	RW	U16	Hz	100	42069	1	[0.85*Fn,1*Fn]
100	Level-2 UF prot.	RW	U16	Hz	100	42070	1	[0.85*Fn,1*Fn]
101	10-min OV protec.	RW	U16	V	10	42071	1	[1*Vn,1.36*Vn]
102	Grid code	RW	U16	N/A	1	42072	1	
103	Insulation res. protec.	RW	U16	MΩ	1000	42074	1	[0.033,1.5]

SN	Signal Name	Read / Write	Type	Unit	Gain	Address	Quantity	Scope
104	Unbal.volt. protec.	RW	U16	%	10	42075	1	[0,50]
105	Soft startup time after grid failure	RW	U16	s	1	42083	1	[20,800]
106	LVRT	RW	U16	N/A	1	42084	1	[0,1]
107	Soft start time	RW	U16	s	1	42085	1	[20,1800]
108	Feed grid recovery time	RW	U16	s	1	42086	1	[0,900]
109	Islanding protection	RW	U16	N/A	1	42087	1	0:Disable 1:Enable
110	LVRT reactive power compensation factor	RW	U16	N/A	10	42089	1	[0,3]
111	Reactive power compensation (cosψ-P) trigger voltage	RW	U16	%	1	42090	1	[100,110]
112	Reactive power compensation (cosψ-P) exit voltage	RW	U16	%	1	42091	1	[90,100]
113	Overfrequency deration trigger threshold	RW	U16	Hz	100	42092	1	50Hz:[45,55] 60Hz:[55,65]
114	Overfrequency deration exit threshold	RW	U16	Hz	100	42093	1	50Hz:[45,55] 60Hz:[55,65]
115	Overfrequency deration recovery gradient	RW	U16	%/min	1	42094	1	[5,20]
116	Q-U characteristic curve mode	RW	U16	N/A	1	42095	1	[0,1]
117	Q-U dispatch trigger power percent	RW	U16	%	1	42096	1	[10,100]

SN	Signal Name	Read / Write	Type	Unit	Gain	Address	Quantity	Scope
118	MPPT multi-peak scanning	RW	U16	N/A	1	42097	1	0:Disable 1:Enable
119	MPPT scanning interval	RW	U16	min	1	42101	1	[5,30]
120	Level-3 OV prot.	RW	U16	V	10	42151	1	[1*Vn,1.36*Vn]
121	Level-3 OV prot. time	RW	U32	ms	1	42152	2	[50,7200000]
122	Level-4 OV prot.	RW	U16	V	10	42154	1	[1*Vn,1.36*Vn]
123	Level-4 OV prot. time	RW	U32	ms	1	42155	2	[50,7200000]
124	Level-3 UV prot.	RW	U16	V	10	42157	1	[0.15*Vn,1*Vn]
125	Level-3 UV prot. time	RW	U32	ms	1	42158	2	[50,7200000]
126	Level-4 UV prot.	RW	U16	V	10	42160	1	[0.15*Vn,1*Vn]
127	Level-4 UV prot. time	RW	U32	ms	1	42161	2	[50,7200000]
128	Shutdown at 0% power limit	RW	U16	N/A	1	42174	1	0:Disable 1:Enable
129	System time: year	RW	U16	N/A	1	42300	1	[2000,2069]
130	System time: month	RW	U16	N/A	1	42301	1	[1,12]
131	System time: day	RW	U16	N/A	1	42302	1	[1,31]
132	System time: hour	RW	U16	N/A	1	42303	1	[0,23]
133	System time: minute	RW	U16	N/A	1	42304	1	[0,59]
134	System time: second	RW	U16	N/A	1	42305	1	[0,59]
135	Active power derating	RW	U16	%	1	42320	1	[0,100]
136	Reactive power compensation	RW	I16	N/A	1000	42321	1	(-1,-0.8]U[0.8,1]
137	Remote power schedule	RW	U16	N/A	1	42333	1	0:Disable 1:Enable

2.2 Dispatch curve definitions

Table 2-2 Dispatch curve definitions

Curve Name	Description	Type	Gain	Unit	Range
cosψ-P/Pn characteristic curve settings	cosψ-P/Pn characteristic curve points	U16	1	N/A	2 - 10
	cosψ-P/Pn curve point 1 P/Pn value	U16	10	%	0 - 100
	cosψ-P/Pn curve point 1 cosψ value	I16	1000	N/A	- 0.8 to 0.8
	cosψ-P/Pn curve point 2 P/Pn value	U16	10	%	0 - 100
	cosψ-P/Pn curve point 2 cosψ value	I16	1000	N/A	- 0.8 to 0.8
	cosψ-P/Pn curve point 3 P/Pn value	U16	10	%	0 - 100
	cosψ-P/Pn curve point 3 cosψ value	I16	1000	N/A	- 0.8 to 0.8
	cosψ-P/Pn curve point 4 P/Pn value	U16	10	%	0 - 100
	cosψ-P/Pn curve point 4 cosψ value	I16	1000	N/A	- 0.8 to 0.8
	cosψ-P/Pn curve point 5 P/Pn value	U16	10	%	0 - 100
	cosψ-P/Pn curve point 5 cosψ value	I16	1000	N/A	- 0.8 to 0.8
	cosψ-P/Pn curve point 6 P/Pn value	U16	10	%	0 - 100
	cosψ-P/Pn curve point 6 cosψ value	I16	1000	N/A	- 0.8 to 0.8
	cosψ-P/Pn curve point 7 P/Pn value	U16	10	%	0 - 100
	cosψ-P/Pn curve point 7 cosψ value	I16	1000	N/A	- 0.8 to 0.8
	cosψ-P/Pn curve point 8 P/Pn value	U16	10	%	0 - 100
	cosψ-P/Pn curve point 8 cosψ value	I16	1000	N/A	- 0.8 to 0.8
	cosψ-P/Pn curve point 9 P/Pn value	U16	10	%	0 - 100
	cosψ-P/Pn curve point 9 cosψ value	I16	1000	N/A	- 0.8 to 0.8
	cosψ-P/Pn curve point 10 P/Pn value	U16	10	%	0 - 100
	cosψ-P/Pn curve point 10 cosψ value	I16	1000	N/A	- 0.8 to 0.8
Q-U characteristic curve settings	Q-U characteristic curve points	U16	1	N/A	2 - 10
	Q-U curve point 1 U/Un value	U16	10	%	80 - 115
	Q-U curve point 1 Q/S value	I16	1000	N/A	-0.6~0.6
	Q-U curve point 2 U/Un value	U16	10	%	80 - 115
	Q-U curve point 2 Q/S value	I16	1000	N/A	-0.6~0.6

Curve Name	Description	Type	Gain	Unit	Range
	Q-U curve point 3 U/Un value	U16	10	%	80 - 115
	Q-U curve point 3 Q/S value	I16	1000	N/A	-0.6~0.6
	Q-U curve point 4 U/Un value	U16	10	%	80 - 115
	Q-U curve point 4 Q/S value	I16	1000	N/A	-0.6~0.6
	Q-U curve point 5 U/Un value	U16	10	%	80 - 115
	Q-U curve point 5 Q/S value	I16	1000	N/A	-0.6~0.6
	Q-U curve point 6 U/Un value	U16	10	%	80 - 115
	Q-U curve point 6 Q/S value	I16	1000	N/A	-0.6~0.6
	Q-U curve point 7 U/Un value	U16	10	%	80 - 115
	Q-U curve point 7 Q/S value	I16	1000	N/A	-0.6~0.6
	Q-U curve point 8 U/Un value	U16	10	%	80 - 115
	Q-U curve point 8 Q/S value	I16	1000	N/A	-0.6~0.6
	Q-U curve point 9 U/Un value	U16	10	%	80 - 115
	Q-U curve point 9 Q/S value	I16	1000	N/A	-0.6~0.6
	Q-U curve point 10 U/Un value	U16	10	%	80 - 115
	Q-U curve point 10 Q/S value	I16	1000	N/A	-0.6~0.6

2.3 Alarms

Table 2-3 Alarms List

SN	Address	Bit	Parent Alarm Name	Alarm ID	Cause ID	Severity
1	50000	0X0A	Software Ver. Unmatch	504	1	Minor
2	50000	0X0C	Upgrade Failed	505	1	Major
3	50000	0X0D	Flash Fault	61440	1	Minor
4	50001	0X01	Software Ver. Unmatch	504	2	Minor
5	50001	0X02	Software Ver. Unmatch	504	3	Minor
6	50001	0X03	System Fault	400	1	Major
7	50001	0X04	System Fault	400	27	Major
8	50001	0X06	Abnormal Inv. Circuit	202	20	Major
9	50001	0X07	Abnormal Resid. Cur.	318	1	Major

SN	Address	Bit	Parent Alarm Name	Alarm ID	Cause ID	Severity
10	50001	0X08	Cabinet Overtemp.	321	1	Major
11	50001	0X0A	System Fault	400	28	Major
12	50001	0X0B	Fan Fault	320	1	Minor
13	50001	0X0C	Abnormal SPI Comm.	322	1	Major
14	50001	0X0E	System Fault	400	29	Major
15	50002	0X00	Low Insulation Res.	313	1	Major
16	50002	0X01	AFCI Self-test Fault	411	1	Major
17	50002	0X02	DC Arc Fault	412	1	Major
18	50002	0X03	AFCI Self-test Fault	411	2	Major
19	50002	0X04	AFCI Self-test Fault	411	3	Major
20	50002	0X07	System Fault	400	30	Major
21	50002	0X08	System Fault	400	31	Major
22	50002	0X09	String 3 Reversed	122	1	Major
23	50002	0X0C	DC Arc Fault	412	2	Major
24	50002	0X0D	DC Arc Fault	412	3	Major
25	50002	0X0E	DC Arc Fault	412	4	Major
26	50002	0X0F	System Fault	400	23	Major
27	50003	0X01	String 1 Reversed	120	1	Major
28	50003	0X02	String 2 Reversed	121	1	Major
29	50003	0X03	Abnormal DC Circuit	200	12	Major
30	50003	0X06	String 4 Reversed	123	1	Major
31	50003	0X07	String 5 Reversed	124	1	Major
32	50003	0X08	String 6 Reversed	125	1	Major
33	50003	0X09	High DC Input Volt.	103	1	Major
34	50003	0X0A	High DC Input Volt.	103	2	Major
35	50003	0X0B	High DC Input Volt.	103	3	Major
36	50003	0X0C	High DC Input Volt.	103	4	Major
37	50003	0X0F	Abnormal DC Circuit	200	15	Major
38	50004	0X02	String 1 Reversed	120	2	Warning
39	50004	0X03	String 2 Reversed	121	2	Warning

SN	Address	Bit	Parent Alarm Name	Alarm ID	Cause ID	Severity
40	50004	0X04	String 7 Reversed	126	1	Major
41	50004	0X05	String 7Reversed	126	2	Warning
42	50004	0X06	String 8 Reversed	127	1	Major
43	50004	0X07	String 8 Reversed	127	2	Warning
44	50004	0X0C	String 3 Reversed	122	2	Warning
45	50004	0X0D	String 4 Reversed	123	2	Warning
46	50004	0X0E	String 5 Reversed	124	2	Warning
47	50004	0X0F	String 6 Reversed	125	2	Warning
48	50005	0X01	Abnormal DC Circuit	200	3	Major
49	50005	0X02	Abnormal Auxiliary power	410	4	Major
50	50005	0X04	Abnormal DC Circuit	200	10	Major
51	50005	0X05	Abnormal DC Circuit	200	11	Major
52	50005	0X06	Abnormal DC Circuit	200	30	Major
53	50006	0X06	System Fault	400	3	Major
54	50006	0X0A	Abnormal Inv. Circuit	202	13	Major
55	50006	0X0C	Abnormal Inv. Circuit	202	14	Major
56	50007	0X01	Abnormal Inv. Circuit	202	16	Major
57	50007	0X05	System Fault	400	21	Major
58	50008	0X00	Abnormal Grid Volt.	301	4	Major
59	50008	0X03	Abnormal Grid Volt.	301	16	Major
60	50008	0X06	Frequency Abnormal	305	2	Major
61	50008	0X07	Frequency Abnormal	305	4	Major
62	50008	0X08	Abnormal Grid Volt.	301	28	Major
63	50008	0X09	Abnormal Grid Volt.	301	29	Major
64	50008	0X0A	Abnormal Ground.	326	1	Major
65	50008	0X0B	Abnormal Grid Volt.	301	26	Major
66	50008	0X0C	Frequency Abnormal	305	5	Major
67	50009	0X00	Abnormal Grid Volt.	301	31	Major
68	50009	0X01	Abnormal Grid Volt.	301	32	Major
69	50009	0X02	Abnormal Grid Volt.	301	33	Major

SN	Address	Bit	Parent Alarm Name	Alarm ID	Cause ID	Severity
70	50009	0X08	Abnormal Grid Volt.	301	19	Major
71	50016	0X00	Abnormal String 1	106	1	Warning
72	50016	0X01	Abnormal String 2	107	1	Warning
73	50016	0X02	Abnormal String 3	108	1	Warning
74	50016	0X03	Abnormal String 4	109	1	Warning
75	50016	0X04	Abnormal String 5	110	1	Warning
76	50016	0X05	Abnormal String 6	111	1	Warning
77	50016	0X06	Abnormal String 7	112	1	Warning
78	50016	0X07	Abnormal String 8	113	1	Warning

3 Direct Power Adjustment for Inverters

3.1 Active Power Adjustment

The inverter provides five active power adjustment modes and supports adjustment of the active power derating response time through Active power deration gradient (register 40121).

Table 3-1 Active Power Adjustment

SN	Interface Name	Read/ Write	Type	Unit	Gain	Address	Quantity	Restraints
1	Active power control	RW	U16	N/A	1	40118	1	These interfaces store data but do not support high-frequency write operations.
2	Active power deration setting [1%]	RW	U16	%	1	40119	1	
3	Active power deration setting [fixed value]	RW	U16	kW	10	40120	1	
4	Active power change gradient	RW	U16	%/s	10	40121	1	
5	Active power deration setting [0.1%]	RW	U16	%	10	40125	1	
6	Active power deration percent command[0.1%]	WO	U16	%	10	40232	1	These interfaces support high-frequency write operations but do not store data.

SN	Interface Name	Read/ Write	Type	Unit	Gain	Address	Quantity	Restraints
7	Active power deration percent command[1%]	WO	U16	%	1	40234	1	
8	Active power deration command [fixed value]	WO	U16	kW	10	40235	1	

NOTE

- If both storage and high-frequency write interfaces are required, ensure that the inverter version is V100R001C81SPC107 or V200R001C00SPC106, or a later version.
- If the Active power deration fixed value interface is required, ensure that the inverter version is V100R001C81SPC107 or V200R001C00SPC106, or a later version.

3.1.1 Disable Active Power Limiting

The inverter does not accept any derating instruction. It can run with power up to 110% of the rated power. Other register interfaces are not required.

Operation: Set Active power control (register 40118) to 0.

NOTE

After the mode of Active power control (register 40118) is changed, the inverter automatically saves the register value. You do not need to write the value repeatedly. If you need to send a value periodically, send the value at intervals greater than 12 minutes.

3.1.2 Communication Limit Percentage

The inverter switches to remote control mode and receives the active power derating instruction in percentage. The reference value of the percentage is the maximum active power of the inverter (Pmax). Pmax varies depending on the inverter model. For details, see the description in the table in 2.1.

Operation:

- Scenario in which the derating precision is 1%: Change the value of Active power control (register 40118) to 1, and change the value of Active power deration percent (register 40234) to the target value (%).
- Scenario in which the derating precision is 0.1%: Change the value of Active power control (register 40118) to 1, and change the value of Active power deration percent (precision) (register 40232) to the target value (%).

NOTE

- After the mode of Active power control (register 40118) is changed, the inverter automatically saves the register value. You do not need to write the value repeatedly. If you need to send a value periodically, send the value at intervals greater than 12 minutes.
- Active power deration percent (register 40234) and Active power deration percent (precision) (register 40232) need to be sent by the external device periodically at intervals no more than 10 minutes. Otherwise, the inverter will automatically restore the active output to 100% of Pmax. The inverter does not save the derating instruction set in Active power deration percent (register 40234) or Active power deration percent (precision) (register 40232) mode. After the inverter is powered on again, the power is restored to 100% of Pmax.

3.1.3 Parameter Setting Absolute Value kW

The external device delivers the active scheduling target value, which is an absolute value measured in kW. The adjustment precision is 0.1 kW. The maximum value is the Pmax of the inverter, and the minimum value is 0.

Operation: Change the value of Active power control (register 40118) to 2, and then change the value of Active power deration setting [fixed value] (register 40120) to the target value (kW).

NOTE

- After the mode of Active power control (register 40118) is changed, the inverter automatically saves the register value. You do not need to write the value repeatedly. If you need to send a value periodically, send the value at intervals greater than 12 minutes.
- After Active power deration setting [fixed value] (register 40120) is set, the inverter applies and saves the setting. The value does not need to be sent periodically. If you need to send a value periodically, send the value at intervals greater than 12 minutes.

3.1.4 Parameter Setting Percentage

The external device sends an active power derating instruction in percentage. The reference value of the percentage is the maximum active power of the inverter (Pmax). Pmax varies depending on the inverter model. For details, see the description in the table in 2.1.

Operation:

- Scenario in which the derating precision is 1%: Change the value of Active power control (register 40118) to 3, and change the value of Active power deration setting [percentage] (register 40119) to the target value (%).
- Scenario in which the derating precision is 0.1%: Change the value of Active power control (register 40118) to 3, and change the value of Active power deration setting [percentage] (precision) (register 40125) to the target value (%).

NOTE

- After the mode of Active power control (register 40118) is changed, the inverter automatically saves the register value. You do not need to write the value repeatedly. If you need to send a value periodically, send the value at intervals greater than 12 minutes.
- After Active power deration setting [percentage] (register 40119) or Active power deration setting [percentage] (precision) (register 40125) is set, the inverter applies and saves the setting. The value does not need to be sent periodically. If you need to send a value periodically, send the value at intervals greater than 12 minutes.

3.1.5 Communication Limit Fixed Value

The inverter switches to remote control mode. It receives the active derating instruction in the form of a fixed value measured in kW. The adjustment precision is 0.1 kW. The maximum value is the Pmax of the inverter, and the minimum value is 0.

Operation: Change the value of Active power control (register 40118) to 4, and then change the value of Active power deration fixed value (register 40235) to the target value (kW).

NOTE

- After the mode of Active power control (register 40118) is changed, the inverter automatically saves the register value. You do not need to write the value repeatedly. If you need to send a value periodically, send the value at intervals greater than 12 minutes.
- Active power deration fixed value (register 40235) needs to be sent by the external device at intervals no more than 10 minutes. Otherwise, the inverter will automatically restore active power output to 100% of Pmax. The inverter does not save the derating instruction set in Active power deration fixed value mode. After the inverter is powered on again, the power is restored to 100% of Pmax.

3.2 Reactive Power Adjustment

The inverter provides five reactive power adjustment modes and supports adjustment of the reactive power derating response time through Reactive power adjustment time (register 40124).

Table 3-2 Reactive Power Adjustment

SN	Interface Name	Read/ Write	Type	Unit	Gain	Address	Quantity	Restraints
1	Reactive power compensation	RW	U16	N/A	1	40117	1	These interfaces store data but do not support high-frequency write operations.
2	Reactive power compensation setting [power factor]	RW	I16	N/A	1000	40122	1	
3	Reactive power compensation setting [Q/S]	RW	I16	N/A	1000	40123	1	
4	Reactive power adjustment time	RW	U16	s	1	40124	1	
5	Reactive power compensation setting [Q/S]	WO	I16	N/A	1000	40236	1	These interfaces support high-frequency write operations but do not store data.
6	Reactive power compensation setting [power factor]	WO	I16	N/A	1000	40237	1	

NOTE

- If both storage and high-frequency write interfaces are required, ensure that the inverter version is V100R001C81SPC107 or V200R001C00SPC106, or a later version.
- If the Reactive power compensation Q/S interface is required, ensure that the inverter version is V100R001C81SPC107 or V200R001C00SPC106, or a later version.

3.2.1 Disable Reactive Power Output

The inverter does not provide reactive power. The on-grid power factor is 1. Additional register interfaces are not required.

Operation: Change the value of Reactive power compensation (register 40117) to 0.

NOTE

After the mode of Reactive power compensation (register 40117) is changed, the inverter automatically saves the register value. You do not need to write the value repeatedly. If you need to send a value periodically, send the value at intervals greater than 12 minutes.

3.2.2 Communication Adjustment Power Factor

The inverter switches to remote control mode and receives reactive the power derating instruction in the form of a power factor.

Operation: Change the value of Reactive power compensation (register 40117) to 1 and then change the value of Reactive power compensation power factor (register 40237) to the target value.

NOTE

- After the mode of Reactive power compensation (register 40117) is changed, the inverter automatically saves the register value. You do not need to write the value repeatedly. If you need to send a value periodically, send the value at intervals greater than 12 minutes.
- Reactive power compensation power factor (register 40237) needs to be sent by the external device at intervals no more than 10 minutes. Otherwise, the inverter will automatically disable reactive power output.

3.2.3 Parameter Setting Q/S

The external device sends a reactive power adjustment instruction in the form of Q/S. Q is the reactive power target value (kVar), and S is the maximum apparent power of the inverter (kVA). The maximum apparent power varies depending on the inverter model. For details, see the description in the table in 2.1.

Operation: Change the value of Reactive power compensation (register 40117) to 2, and then change the value of Reactive power compensation setting [Q/S] (register 40123) to the target value (kW).

NOTE

- After the mode of Reactive power compensation (register 40117) is changed, the inverter automatically saves the register value. You do not need to write the value repeatedly. If you need to send a value periodically, send the value at intervals greater than 12 minutes.
- After Reactive power compensation setting [Q/S] (register 40123) is set, the inverter applies and saves the setting. The value does not need to be sent periodically. If you need to send a value periodically, send the value at intervals greater than 12 minutes.

3.2.4 Parameter Setting Power Factor

The external device sends a reactive power adjustment instruction in the form of a power factor. The inverter output reactive power is related to the output active power.

Operation: Change the value of Reactive power compensation (register 40117) to 3, and then change the value of Reactive power compensation setting [power factor] (register 40122) to the target value (kW).

NOTE

- After the mode of Reactive power compensation (register 40117) is changed, the inverter automatically saves the register value. You do not need to write the value repeatedly. If you need to send a value periodically, send the value at intervals greater than 12 minutes.
- After Reactive power compensation setting [power factor] (register 40122) is set, the inverter applies and saves the setting. The value does not need to be sent periodically. If you need to send a value periodically, send the value at intervals greater than 12 minutes.

3.2.5 Communication Adjustment Q/S

The inverter switches to remote control mode and receives reactive power adjustment instruction in the form of Q/S.

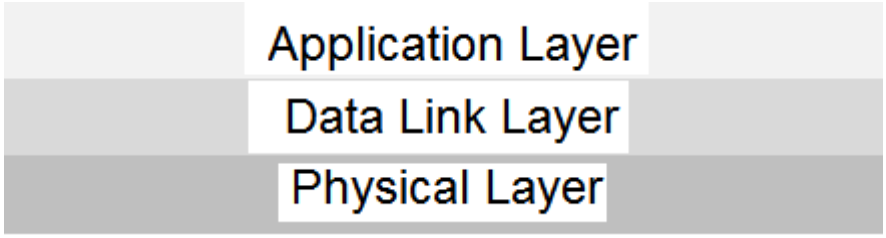
Operation: Change the value of Reactive power compensation (register 40117) to 6 and then change the value of Reactive power compensation Q/S (register 40236) to the target value.

NOTE

- After the mode of Reactive power compensation (register 40117) is changed, the inverter automatically saves the register value. You do not need to write the value repeatedly. If you need to send a value periodically, send the value at intervals greater than 12 minutes.
- Reactive power compensation Q/S (register 40236) needs to be sent by the external device at intervals no more than 10 minutes. Otherwise, the inverter will automatically disable reactive power output.

4 Communications Protocol Overview

The ModBus communications protocol consists of the following layers:



4.1 Physical Layer

- Communicate in the two-line RS485 mode
- Baud rate: 4800 bps, 9600 bps, or 19200 bps
- Data is transferred in asynchronous RTU mode
- One start bit
- Eight payload data bits
- No parity
- One stop bit

4.2 Data Link Layer

4.2.1 Addressing Mode

The protocol supports unicast and broadcast. The following table describes the address allocation rule:

Table 4-1 The address allocation rule

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

4.2.2 Frame Structure

Table 4-2 Frame structure

Address	Function Code	Payload Data	CRC Code
1 byte	1 byte	2 x N byte	2 byte

NOTE

- A frame can contain a maximum of 256 bytes.
- In a CRC code, the bit on the leftmost is least significant.
- Frame structure definitions in this document include only the function code and payload data.

4.2.3 Data Encoding

ModBus uses a big-Endian to represent addresses and payload data. When multiple bytes are sent, the most significant payload bit is sent first.

Example:

Table 4-3 Data encoding

Register Size	Value
16 bits	0x1234

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

4.2.4 Interaction Process

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

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

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

4.2.5 CRC Checking

CRC checking 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

};

/* Insignificant CRC bit*/

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 an
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*

4.3 Application Layer

4.3.1 Function Code List

Table 4-4 Function code list

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

4.3.2 Exception Code List

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

Table 4-5 Exception codes returned by an NE (0x00 – 0x8F are for common exception codes)

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

Code	Name	Item
0x03	ILLEGAL DATA VALUE	A value contained in the query data field is not an allowable value for server. This indicates a fault in the structure of the remainder of a complex request, such as that the implied length is incorrect. This does not mean that a register stores a value not expected by an application because the ModBus protocol does not understand the meaning of a special value in a register.
0x04	SERVER DEVICE FAILURE	An unrecoverable error occurred while the server was attempting to perform the requested action.
0x05	ACKNOWLEDGE	Specialized use in conjunction with programming commands. The server has accepted the request and is processing it, but a long duration of time will be required to do so. This response is returned to prevent a timeout error from occurring in the client. The client can next issue a Poll Program Complete message to determine if processing is completed.
0x06	SERVER DEVICE BUSY	The server does not accept a ModBus request PDU. A client application determines when to resend the request.

Code	Name	Item
0x08	MEMORY PARITY ERROR	Specialized use in conjunction with function codes 20 and 21 and reference type 6, to indicate that the extended file area failed to pass a consistency check. The server or slave node cannot read the file, but identifies a parity verification error in the register. The client can retry the request, but service may be required on the server device.
0x0A	GATEWAY PATH UNAVAILABLE	Applies to the TCP/IP protocol.
0x0B	GATEWAY TARGET DEVICE FAILED TO RESPOND	Applies to the TCP/IP protocol.
0x80	No permission	An operation is not allowed because of a permission authentication failure or permission expiration.

4.3.3 Reading Registers (0X03)

4.3.3.1 Frame Format for a Request from a Master Node

Table 4-6 Frame Format for a Request from a Master Node

Data Field	Length (Byte)	Description
Slave node address	1	1 – 247
Function code	1	0x03
Register starting address	2	0x0000 – 0xFFFF
Number of registers	2	1 – 125
CRC	2	N/A

4.3.3.2 Frame Format for a Normal Response from a Slave Node

Table 4-7 Frame Format for a Normal Response from a Slave Node

Data Field	Length (Byte)	Description
Slave node address	1	1 – 247
Function code	1	0x03
Number of bytes	1	2 x N
Register value	2 x N	N/A
CRC	2	N/A

NOTE

N indicates the number of registers.

4.3.3.3 Frame Format for an Abnormal Response from a Slave Node

Table 4-8 Frame Format for an Abnormal Response from a Slave Node

Data Field	Length (Byte)	Description
Slave node address	1	1 – 247
Function code	1	0x83
Exception code	1	See **Exception Code List**
CRC	2	N/A

4.3.3.4 Example

A master node sends an instruction for querying **Active power derating** (register address: 40120) to a slave node whose address is 01. The frame format is as follows:

01 03 9C B8 00 01 2A 7F

Normal response from the slave node:

01 03 02 00 00 b8 44

Abnormal response from the slave node:

01 83 04 40 F3

4.3.4 Writing a Single Register (0X06)

4.3.4.1 Frame Format for a Request from a Master Node

Table 4-9 Frame Format for a Request from a Master Node

Data Field	Length (Byte)	Description
Slave node address	1	0 – 247
Function code	1	0x06
Register address	2	0x0000 – 0xFFFF
Register value	2	0x0000 – 0xFFFF
CRC	2	N/A

4.3.4.2 Frame Format for a Normal Response from a Slave Node

Table 4-10 Frame Format for a Normal Response from a Slave Node

Data Field	Length (Byte)	Description
Slave node address	1	1 – 247
Function code	1	0x06
Register address	2	0x0000 – 0xFFFF
Register value	2	0x0000 – 0xFFFF
CRC	2	N/A

4.3.4.3 Frame Format for an Abnormal Response from a Slave Node

Table 4-11 Frame Format for an Abnormal Response from a Slave Node

Data Field	Length (Byte)	Description
Slave node address	1	1 – 247
Function code	1	0x86
Exception code	1	See **Exception Code List**
CRC	2	N/A

4.3.4.4 Example

A master node sends an instruction for setting **Active power derating** (register address: 40120) to a slave node whose address is 01. The frame format is as follows:

01 06 9C B8 00 01 E6 7F

Normal response from the slave node:

01 06 9C B8 00 01 E6 7F

Abnormal response from the slave node:

01 83 04 40 F3

4.3.5 Writing Multiple Registers (0X10)

4.3.5.1 Frame Format for a Request from a Master Node

Table 4-12 Frame Format for a Request from a Master Node

Data Field	Length (Byte)	Description
Slave node address	1	0 – 247
Function code	1	0x10
Register starting address	2	0x0000 – 0xFFFF
Number of registers	2	0x0000 – 0x007b
Number of bytes	1	2 x N
Register value	2 x N	Value
CRC	2	N/A

NOTE

N indicates the number of registers.

4.3.5.2 Frame Format for a Normal Response from a Slave Node

Table 4-13 Frame Format for a Normal Response from a Slave Node

Data Field	Length (Byte)	Description
Slave node address	1	1 – 247
Function code	1	0x10
Register address	2	0x0000 – 0xFFFF
Number of registers	2	0x0000 – 0x007b
CRC	2	N/A

4.3.5.3 Frame Format for an Abnormal Response from a Slave Node

Table 4-14 Frame Format for an Abnormal Response from a Slave Node

Data Field	Length (Byte)	Description
Slave node address	1	1 – 247
Function code	1	0x90
Exception code	1	See **Exception Code List**
CRC	2	N/A

4.3.5.4 Example

A master node sends an instruction for setting **Active power derating** (register address: 40120,data:0) and **Reactive power compensation (PF)** (register address: 40122, data:1) and to a slave node whose address is 01. The frame format is as follows:

01 10 9C B8 00 03 06 00 00 00 00 03 E8 A2 91

Normal response from the slave node:

01 10 9C B8 00 03 2E 7D

Abnormal response from the slave node:

01 90 04 4D C3

4.3.6 Reading Device Identifiers (0X2B)

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

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

A data element consists of three objects:

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

Table 4-15 Reading Device Identifiers

Object ID	Object Name or Description	Type	M/O	Category
0x00	Manufacturer name	ASCII character string	M	Basic
0x01	Product code	ASCII character string	M	
0x02	Main revision	ASCII character string	M	
0x03 – 0x7F	--	--	--	Normal
0x80 – 0xFF	--	--	--	Extensive

4.3.6.1 Commands for Querying Device Identifiers

Table 4-16 Request frame format

Data Field	Length (Byte)	Description
Slave node address	1	1 – 247
Function code	1	0x2B
MEI type	1	0x0E
ReadDeviId code	1	01
Object ID	1	0x00
CRC	2	N/A

Table 4-17 Frame format for a normal response

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

Data Field			Length (Byte)	Description
Object list	First object	Object ID	1	0x00
		Object length	1	N
		Object value	N	N/A
	...	...	...	...
CRC			2	N/A

Table 4-18 Object list

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

Table 4-19 Frame format for an abnormal response

Data Field	Length (Byte)	Description
Slave node address	1	1 – 247
Function code	1	0xAB
Exception code	1	See **Exception Code List**
CRC	2	N/A

4.3.6.2 Command for Querying a Device List

Table 4-20 Request frame format

Data Field	Length (Byte)	Description
Slave node address	1	1 – 247
Function code	1	0x2B
MEI type	1	0x0E
ReadDeviId code	1	03

Data Field	Length (Byte)	Description
Object ID	1	0x87
CRC	2	N/A

Table 4-21 Frame format for a normal response

Data Field			Length (Byte)	Description
Slave node address			1	1 – 247
Function code			1	0x2B
MEI type			1	0x0E
ReadDeviId code			1	03
Consistency level			1	03
More			1	N/A
Next object ID			1	N/A
Number of objects			1	N/A
Object list	First object	Object ID	1	0x87
		Object length	1	N
		Object value	N	N/A
	...	...	...	...
CRC			2	N/A

Table 4-22 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.

Object ID	Object Name	Type	Description
0x88	Information about the first device	ASCII character string See the device description definitions below.	Returns information only for the first device if a network element allows only one device to be connected to each RS485 address.
0x8A	Information about the second device	N/A	N/A
.....	.....	.....	.....
0xFF	Information about the 120th device	N/A	N/A

4.3.6.3 Device Description Definitions

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

Attribute label=%s;attribute label=%s;…attribute label=%s

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

Table 4-23 Attribute definitions

Attribute Label	Attribute Name	Type	Description
1	Device Model	ASCII character string	SUN2000
2	Software version	ASCII character string	N/A
3	Version of the communications protocol	ASCII character string	See the interface protocol version definitions.
4	ESN	ASCII character string	N/A
5	Device number	int	0,1,2,3...(Assigned by NE; 0 indicates the master device to which the ModBus card is inserted)
6	Character version	ASCII character string	N/A

Table 4-24 Frame format for an abnormal response

Data Field	Length (Byte)	Description
Slave node address	1	1 – 247
Function code	1	0xAB
Exception code	1	See **Exception Code List**
CRC	2	N/A