EG4 3000 EHV-48

Modbus_RTU RS232 communication protocol
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Modbus_RTU communication protocol

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● Communication data format

During communication, the data is returned with the form of words (WORD— 2 bytes). Each word is returned, the high byte is first and the low byte is last. If two words are returned continuously (such as long integer), the high word comes first, and the lower word comes last.

Data type	Number of registers	Number of bytes	Description
Character type	1	1	Send back two characters at a time, if there are less than two, use 0 to supple
Integer	1	2	Send back at one time, high byte first, low byte last
Long integer	2	4	sent back in two words, with the high word in the front and the low word in the back

● Frame format

Register content querying (function code 03H)

The start and end address of the query must be a complete data block from the start address to end address, otherwise the returned data is incorrect. For example: the start address of the register of the device serial number is 186 and the length is 12, the start address cannot be between 186 to 198 when querying. As the same，the end address (start address + the number of read registers) cannot fall in this range （186 to 198）

Sending frame format of the host computer

Byte Order	Code	Example	Description
0	Device address	01H	Device address (1~247)
1	03H	03H	Function code
2	Start register address high byte	00H	Register address high 8 bits
3	Starting register address low byte	10H	Register address low 8 bits
4	High byte of the number of registers	00H	High 8 bits of the number of registers
5	Low byte of the number of registers	02H	Low 8 bits of the number of registers
6	High byte of CRC16 checking	C0H	CRC16 checking high 8 bits
7	low byte of CRC16 checking	CBH	CRC16 checking low 8 bit

Returning frame format after the lower computer parses successfully

Byte order	Code	Description
0	Device address	Device address (1~247)
1	03H	Function code
2	Number of returned data bytes(N)	N = number of registers*2
3	High byte of the first register data	
4	Low byte of the first register data	
.....		
.....		
	Nth register data high byte	
	Nth register data low byte	
N+3	High byte of CRC16 checking	
N+4	Low byte of CRC16 checking	

Returning frame format after the lower computer parses error data

Byte order	Code	Description
0	Device address	Device address (1~247)
1	03H	Function code
2	Number of returned data bytes(N)	N = number of registers*2
3	The First 0	returns a total of Nth 0
4	The Second 0	
.....		
.....		
	The N+1th 0	
	The Nth 0	
N+3	High byte of CRC16 checking	
N+4	Low byte of CRC16 checking	

Reading register data for example:

Reading the data from the effective value of the mains voltage (start register 202) to the average value of the mains power, where the mains voltage returns 220.0v, the mains frequency returns 50.0Hz, and the average value of mains power returns 1200w

Host computer: 01 03 00 CA 00 03 25 F5
Lower computer: 01 03 06 08 FC 13 88 04 B0 F7 F3

Register content setting (function code 10H)

Sending frame format of the host computer

Byte Order	Code	Example	Description
0	Device address	01H	address range(1~247)
1	10H	10H	Function code
2	High byte of start register address	01H	Register address high 8 bits
3	Low byte of Start register address	10H	Register address low 8 bits
4	High byte of the number of registers	00H	High 8 bits of the number of registers (Constantly equal to 0)
5	Low byte of the number of registers	02H	Low 8 bits of the number of registers
6	Number of bytes to be written (N)		N = number of registers*2
7	High byte of the first register data		
8	Low byte of the first register data		
.....	.....		
.....	.....		
	High byte of the Nth register data		
	Low byte of the Nth register data		
N+7	High byte of CRC16 checking		CRC16 checking high 8 bits
N+8	Low byte of CRC16 checking		CRC16 checking low 8 bits

Returning frame format after the lower computer parses successfully

Byte Order	Code	Example	Description
0	Device address	01H	address range (1~247)
1	10H	10H	Function code
2	High byte of start register address	01H	Register address high 8 bits
3	Low byte of start register address	10H	Register address low 8 bits
4	High byte of the number of registers	00H	High 8 bits of the number of registers (Constantly equal to 0)
5	Low byte of the number of registers	02H	Low 8 bits of the number of registers
6	High byte of CRC16 checking	41H	CRC16 checking high 8 bits
7	Low byte of CRC16 checking	F1H	CRC16 checking low 8 bits

Returning frame format after the lower computer parses error data

Byte Order	Code	Description
0	Device address	address range(1~247)
1	90H	Function code
2	Error Code	Error Code
3	High byte of CRC16 checking	CRC16 check high 8 bits
4	Low byte of CRC16 checking	CRC16 check low 8 bits

Error code description

Code	Description
01H	Read- only register
03H	Write data beyond the acceptable range
07H	Registers are not allowed to be modified in the current working mode

Writing register data for example:

Set the output voltage (start register 320) as 220v

Host computer: 01 10 01 40 00 01 08 98 C7 B2

Lower computer: 01 10 01 40 00 01 01 E1

● Device register address

- ➢ **R:** it could be only-read and 03 H command could be supported.
- ➢ **W:** it could be only-written and 10 H command could be supported.
- ➢ **Int:** integer; **Long:** long integer; **UInt:** unsigned integer; **ULong:** unsigned long integer; **ASC:** ASCII code
- ➢ **Max:** Maximum value; **Min:** Minimum value

All addresses are expressed with decimal in the following table

Data Name	Unit	Data format	Initial Address	Number of registers	Read	Remarks
Fault code		ULong	100	2	R	32-bit fault code, each bit corresponds to a fault code, see the fault code table for details, fault code 1 corresponds to bit1, fault code 2 corresponds to bit2, and so on
Reserve			102	2		Reserve address
Reserve			104	2		Reserve address
Reserve			106	2		Reserve address
Obtain warning code		ULong	108	2	R/W	32-bit warning code see the warning code description for details
Reserve			110	61		Reserve address
Reserve			171	1	R	Reserve address
Reserve			172	12		Reserve address
Invalid data		UInt	184	1	R	
Reserve			185	1		Reserve address
Series NO.		ASC	186	12	R	
Reserve			198	2		Reserve address
Invalid data		UInt	200	1		Internal command
Working Mode		UInt	201	1	R	0: Power On Mode

						1: Standby mode 2: Mains mode 3: Off-Grid mode 4: Bypass mode 5: Charging mode 6: Fault mode
Effective mains voltage	0.1V	Int	202	1	R	
Mains Frequency	0.01Hz	Int	203	1	R	
Average mains power	1w	Int	204	1	R	
Affective inverter voltage	0.1V	Int	205	1	R	
Affective inverter current	0.1A	Int	206	1	R	
Inverter frequency	0.01Hz	Int	207	1	R	
Average inverter power	1W	Int	208	1	R	Positive numbers indicate inverter output, negative numbers indicate inverter input
Inverter charging power	1W	Int	209	1	R	
Output effective voltage	0.1V	Int	210	1	R	
Output effective Current	0.1A	Int	211	1	R	
Output frequency	0.01Hz	Int	212	1	R	
Output active power	1W	Int	213	1	R	
Output apparent power	1VA	Int	214	1	R	
Battery average voltage	0.1V	Int	215	1	R	
Battery average Current	0.1A	Int	216	1	R	
Battery average power	1w	Int	217	1	R	
invalid data			218	1		Internal command
PV average voltage	0.1V	Int	219	1	R	
PV average Current	0.1A	Int	220	1	R	
Reserve			221	2		Reserve address
PV average power	1W	Int	223	1	R	
PV charging average power	1W	Int	224	1	R	
load percentage	1%	Int	225	1	R	
DCDC Temperature	1 ℃	Int	226	1	R	
Inverter Temperature	1 ℃	Int	227	1	R	
Reserve			228	1		Reserve address
Battery percentage	1%	UInt	229	1	R	
Invalid Data			230	1		Internal command
Reserve			231	1		Reserve address
Battery average current	0.1A	Int	232	1	R	Positive number means charging, negative number means discharging
Inverter charging average	0.1A	Int	233	1	R	

current						
PV charging average current	0. 1A	Int	234	1	R	
Invalid Data			235	1		Internal command
Invalid Data			236	1		Internal command
Reserve			237	63		Reserve address
Output Mode		Uint	300	1	R/W	0:Single; 1: Parallel; 2: 3 Phase-P1 3: 3 Phase-P2 4: 3 Phase-P3 5: Split Phase-P1 6: Split Phase-P2
Output priority		Uint	301	1	R/W	0: Utility-PV-Battery 1:PV-Utility-Battery 2: PV-Battery-Utility
Input voltage range		Uint	302	1	R/W	0: Wide range 1: Narrow range
Buzzer mode		Uint	303	1	R/W	0: Mute in all situations; 1: Sound when the input source is changed or there is a specific warning or fault; 2: Sound when there is a specific warning or fault; 3: Sound when fault occurs;
Reserve			304	1	R/W	Reserve address
LCD backlight		Uint	305	1	R/W	0: Timed off; 1: Always on;
LCD automatically returns to the homepage		Uint	306	1	R/W	0: Do not return automatically; 1: Automatically return after 1 minute;
Energy-saving mode		Uint	307	1	R/W	0: Energy-saving mode is off; 1: Energy-saving mode is on;
Overload automatic restart		Uint	308	1	R/W	0: Overload failure will not restart; 1: Automatic restart after overload failure;
Over temperature automatic restart		Uint	309	1	R/W	0: Over temperature failure will not restart; 1: Automatic restart after over-temperature fault

Overload transfer to bypass enabled		Uint	310	1	R/W	0: Disable; 1: Enable;
Reserve			311	2		Reserve address
Battery Eq mode is enabled		Uint	313	1	R/W	0: Disable; 1: Enable;
Reserve			314	2		Reserve address
Reserve			316	1		Reserve address
Reserve			317	3		Reserve address
Output voltage	0.1v	Uint	320	1	R/W	
Output frequency	0.01Hz	Uint	321	1	R/W	
Reserve			322	1		Reserve address
Battery overvoltage protection point	0.1V	Uint	323	1	R/W	
Max charging voltage	0.1V	Uint	324	1	R/W	
Floating charging voltage	0.1V	Uint	325	1	R/W	
Battery discharge recovery point in mains mode	0.1V	Uint	326	1	R/W	
Battery low voltage protection point in mains mode	0.1V	Uint	327	1	R/W	
Reserve			328	1		Reserve address
Battery low voltage protection point in off-grid mode	0.1V	Uint	329	1	R/W	
Reserve			330	1		Reserve address
Battery charging priority		Uint	331	1	R/W	0: Utility priority; 1: PV priority; 2: PV is at the same level as the Utility; 3: Only PV charging is allowed
Maximum charging current	0.1A	Uint	332	1	R/W	
Maximum mains charging current	0.1A	Uint	333	1	R/W	
Eq Charging voltage	0.1V	Uint	334	1	R/W	
bat_eq_time	min	Uint	335	1	R/W	Range: 0~900
Eq Timeout exit	min	Uint	336	1	R/W	Range: 0~900
Two Eq charging intervals	day	Uint	337	1	R/W	Range:1~90
Reserve			338	1		Reserve address
Reserve			339	65		Reserve address
Invalid data			404	1		Internal command

Reserve			405	1		Reserve address
Turn on mode		Uint	406	1	R/W	0: Can be turn-on locally or remotely 1: Only local turn-on 2: Only remote turn-on
Reserve			407	13		Reserve address
Remote switch		Uint	420	1	R/W	0: Remote shutdown 1: Remote turn-on
Invalid data			421	1		Internal command
Reserve			422	3		
Reserve			425			
Exit the fault mode		Uint	426		W	1: Exit the fault state(only when the inverter enters the fault mode , it could be available)
Invalid data			427	1		Internal command
Reserve			428	22		Reserve address
Invalid data			450	7		Internal command
Reserve			457	3		Reserve address
Reserve			460	1		Reserve address
Reserve			461	1		Reserve address
Invalid data			462	6		Internal command
Reserve			468	32		Reserve address
Invalid data			500	34		Internal command
Reserve			534	66		Reserve address
Invalid data			600	34		Internal command
Reserve			634	7		Reserve address
Reserve			641	2		Reserve address
Rated Power	W	Uint	643	1	R	
Reserve			644	1		Reserve address
Reserve			645	55		Reserve address
Reserve			700	2		Reserve address
Reserve			702	1		Reserve address
Reserve			703	26		Reserve address
Reserve			729	16		Reserve address
Reserve			745	5		Reserve address

● Fault code table

Fault Code	Description
1	Reserve
2	Over temperature of DCDC module
3	Battery over voltage
4	Reserve
5	Output short circuited
6	Over Inverter voltage
7	Output over load
8	Bus over voltage
9	Bus soft start times out
10	PV over current
11	PV over voltage
12	Battery over current
13	Inverter over current
14	Bus low voltage
15	Reserve
16	Inverter DC component is too high
17	Reserve
18	The zero bias of Output current is too large
19	The zero bias of inverter current is too large
20	The zero bias of battery current is too large
21	The zero bias of PV current is too large
22	Inverter low voltage
23	Inverter negative power protection
24	The host in the parallel system is lost
25	Synchronization signal abnormal in the parallel system
26	Reserve
27	Parallel versions are incompatible

● Warning code description

The system warning is a 32-bit unsigned long integer. Each bit corresponds to a warning. Each bit can be masked by the warning mask. After masking, the corresponding warning will not be read on the LCD, and it won't be read through commands.

Warning code table

Warming code	Description
bit 0	Zero crossing loss of mains power
bit 1	Mains waveform abnormal
bit 2	Mains over voltage
bit 3	Mains low voltage
bit 4	Mains over frequency
bit 5	Mains low frequency
bit 6	PV low voltage

bit 7	Over temperature
bit 8	Battery low voltage
bit 9	Battery is not connected
bit 10	Overload
bit 1 1	Battery Eq charging
bit 12	Battery is discharged at a low voltage and it has not been charged back to the recovery point
bit 13	Output power derating
bit 14	Fan blocked
bit 15	PV energy is too low to be used
bit 16	Parallel communication interrupted
bit 17	Output mode of Single and Parallel systems is inconsistent
bit 18	Battery voltage difference of parallel system is too large
bit 19~31	Reserve

- **CRC checking algorithm**

Reference model: CRC-16/MODBUS X16+X15+X2+1

C language code

```
const 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
} ;
const 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 sModbusCrc16(INT8U *chMsg, INT16U dataLen)
{
    unsigned char ubCRCHi = 0xFF;
    unsigned char ubCRCLo = 0xFF;
    unsigned char duwIndex;
    while (dataLen --)
    {
        duwIndex = 0xff&(ubCRCHi ^ *chMsg++);
        ubCRCHi = 0xff&(ubCRCLo ^ auchCRCHi[duwIndex]);
        ubCRCLo = auchCRCLo[duwIndex];
    }
    return (ubCRCHi << 8 | ubCRCLo);
}
```