SPM33

MODBUS Protocol and register List

V1.5

ZHUHAI PILOT TECHNOLOGY CO.,LTD

目　　录

1. Introduction

This document describes the input and output command, information and data of the SPM33 under MODBUS communication mode. So it is convenient for the 3rd part using and developing.

1.1 Purpose of the Communication Protocol

The purpose of the SPM33 MODBUS communications protocol is to allow setup information and measured data to be efficiently transferred between a MODBUS Master Station and SPM33. It includes:

1) Allowing setting and reading all SPM33 set-up parameters from a MODBUS Master Station.
2) Allowing reading all data measured by a SPM33 and SOE (Event log).

1.2 Version of Communication Protocol

This document is proper for all versions of SPM33 meters. It will be declared, if any change happens later.

2. Detailed Description of the SPM33 Modbus Protocol

2.1. SPM33 Modbus Protocol Rules

The following rules define the protocol rules for information transfer between a MODBUS Master device and the SPM33 in a RS-485 serial communications loop.

1) All communications on the RS-485 loop conforms to a MASTER/SLAVE scheme. In this scheme, information and data is transferred between a MODBUS MASTER device and up to 32 SLAVE monitoring devices.
2) The MASTER will initiate and control all information transfer on the RS-485 communications loop.
3) Under no circumstances will a SLAVE device initiate a communications sequence.
4) All communications activity on the RS-485 loop occurs in the form of "PACKETS", a packet being simply a serial string of 8-bit bytes. The maximum number of bytes contained within one packet is 255. The bytes that comprise a packet consist of standard asynchronous serial data, which are generated using equipment similar to that used for RS-232C.
5) The packages from MASTER are named request. The packages from SLAVE are named response.
6) Under any circumstance, Slave can just respond one request.

2.2. Modes of Transmission

MODBUS protocol supports ASCII and RTU modes of transmissions. The SPM33 supports only the RTU mode of transmission with 8 data bits, no parity, and one stop bit.

2.3. Description of the Modbus Packet Structure

Every MODBUS packet consists of four fields:

1) The Address Field
2) The Function Field
3) The Data Field

4) The Error Check field

2.3.1. Address Field

The address field is 1-byte long and identifies which slave device the packet is for. Valid addresses range between 1 and 247. The slave device whose address matches the value in this field will perform the command specified in the packet.

2.3.2. Function Field

The function field is 1-byte long and tells the addressed salve which function to perform. Slave response packet should include same function field byte as request. The Modbus functions supported by SPM33 are listed as below:

Function Code	Meaning	Action
0x01	Read Relay Output Status	Obtains ON/ OFF information of one or more relay output in SPM33 (0/1)
0x03	Read Holding Registers	Obtains the current value in one or more holding registers of the SPM33.
0x05	Relay control	Write 0xFF00 to close (ON) the relay Write 0x0000 to open (OFF) the relay
0x10	Preset Multiple Registers	Places specific binary values into a series of consecutive holding registers of the SPM33

2.3.3. Data Field

The length of Data Field is varies in length depending on its function. In general, MODBUS supports “BIG INDIAN” mode, it means high-order byte first, low-order byte second.
For example,
One 16 byte register value is 0x12AB; register is transmitted in below sequence:
High-order byte = 0x12
Low-order byte = 0x0AB

2.3.4. Error Check Field

In Modbus RTU mode, the 16-bit Cyclic Redundancy Check (CRC-16) is used. The sending device calculates a 16-bit value, based on the information stored in the address, function and data fields using the CRC-16 algorithm and appends it to the end of the packet. The receiving device performs the same calculation upon the reception of a packet. If the result does not match the checksum stored in the packet, transmission errors have occurred and the packet will be ignored by the receiving device.
For detail of CRC16 parity arithmetic, please refer to Section 4 .

2.4. Abnormal Responses

If a Modbus master device sends a noneffective command to a SPM33 or attempts to read a non-effective holding register, an exception response will be generated. The exception response consists of the slave address, function code, error code, and error check field. The high order bit of

the function code is set to 1 to indicate that the packet is an exception response.

Below list describes the meanings of exception codes:

Function Code	Meaning
01 illegal function code	SPM33 Modbus support the function code include: 01H, 02H, 03H, 05H, and 10H. This code means the slave device receive an illegal function code, or the SPM33 receive the error command.
02 illegal function code	SPM33 receive the address referenced in the data field is an invalid address.
03 illegal function code	The requested register number is too long.

2.5. Broadcast Packets

The SPM33 support broadcast commands when communicating in MODBUS mode.

Do write command 0x10 for timing.

3. Packet Communication

Two MODBUS functions are supported by the SPM33. The standard MODBUS protocol supports only 16-bit registers, which limit the maximum value of any measurement to 65535.

Section 3.1 will describe the format of Read/ Response Packet of relay output.
Section 3.2will describe the format of Read/ Response Packet of holding register.
Section 3.3will describe the relay control command
Section 3.4will describe Preset Multiple Registers packet and the acknowledge packet.

3.1 Read the Relay Output Status (Function Code 01H)

Use 01 command to read the relay status. Relays are addressed starting at 0: relay 1 is addressed as 0.

The relay status data in response packet is packed as one bit for one relay. 1= ON, 0 = OFF.
The LSB (Least Significant Bit) of the first data byte contains the request addressing output. Other relay is same as this, until to the high bit of this byte, and rank from low bit to high bit in the followed byte.
If the return output Num. is not a multiple of 8, it will use zero to fill in the remainder bit of last data byte (until to the high bit of the byte). The byte count field specifies all byte num. of the data.

Request Packet (Master→SPM33)		**Response Packet （SPM33→Master）**	
Unit ID/ Slave address	1 byte	Unit ID/ Slave address	1 byte
01H (Function Code)	1 byte	01H (Function Code)	1 byte
Starting address	2 bytes	Byte num. (N)	1 byte
Relay num.	2 bytes	Relay status	N bytes
CRC check code	2 bytes	CRC check code	2 bytes

N= output num.÷ 8, if remainder ≠0, then N=N+1.

3.2. Read Holding Registers (Function Code 03H)

This command packet requests that the SPM33 responds all valid registers. The value of reserved registers is 0.

Request Packet (Master→SPM33)		**Response Packet (SPM33→Master)**	
Unit ID/ Slave address	1 byte	Unit ID/ Slave address	1 byte
03 H (Function Code)	1 byte	03 H (Function Code)	1 byte
Start register address	2 bytes	Byte num. (2 * register num.)	1 byte
Registers num.	2 bytes	First register data	2 bytes
CRC check code	2 bytes	Second register data	2 bytes
		... ...	
		CRC check code	2 bytes

3.3 Relay Control (Function Code 05H)

Use 05 command to control the relay. Relays are addressed starting at 0

Data Field is 0xFF00, request the relay to be ON.
Data Field is 0x0000, request the relay to be OFF.

Request Packet (Master→SPM33)		**Response Packet (SPM33→Master)**	
Unit ID/ Slave address	1 byte	Unit ID/ Slave address	1 byte
05 H (Function Code)	1 byte	05 H (Function Code)	1 byte
Start register address	2 bytes	Start register address	2 bytes
Data field	FF	Data field	FF
Data field	00	Data field	00
CRC check code	2 bytes	CRC check code	2 bytes

3.4. Preset Multiple Registers (Function code 10H)

This command packet allows the Master to program the SPM33 setup parameters.

Preset Registers Format (Master→SPM33)		**Response Format (SPM33→Master)**	
Unit ID/ Slave address	1 byte	Unit ID/ Slave address	1 byte
10 H (Function Code)	1 byte	10 H (Function Code)	1 byte
Start register address	2 bytes	Start register address	2 bytes
Register num.	2 bytes	Register num.	2 bytes
Byte num. (2 * register num.)	1 byte	CRC check code	2 bytes
First register data			

Second register data			
...			
CRC check code	2 bytes		

Note: SPM33 presume all registers are continuous from the first one.

4. Calculating the CRC-16 Error Check Field

This section describes the procedure for obtaining the CRC-16 error check field. A packet can be considered as a continuous, serial stream of binary data (0, 1). The 16-bit checksum is obtained by multiplying the serial data stream by 216 (10000000000000000) and then dividing it by the ***generator polynomial*** $x^{16}+x^{15}+x^2+1$, which can be expressed as a binary data 11000000000000101. The quotient is ignored and the 16-bit remainder is the checksum and is appended to end of the packet.

In calculating the CRC, all arithmetic operations (additions and subtractions) are performed using MODULO TWO, or EXCLUSIVE OR operation.

Steps for the Generating the CRC-16 Checksum:

1) Form a new polynomial by dropping the MSB (Most Significant Bit) of the generator polynomial and reversing the bit sequence. This yields the binary number 1010 0000 0000 0001 or A0 01 Hex.
2) Load a 16-bit register with initial value FF FF Hex.
3) Exclusive OR the first data byte with the loworder byte of the 16-bit register, storing the result in the 16-bit register.
4) Shift the 16-bit register one bit to the right.If overflow bit is 1, then turn to step 5). Otherwise, turn to step 6)
5a) If the bit shifted out to the right is one, Exclusive OR the 16-bit register with the new generator polynomial, with result stored in the16-bit register. Return to step 4.
5b) If the bit shifted out to the right is zero, return to step 4.
6) Repeat steps 4 and 5 until 8 shifts have been performed.
7) Exclusive OR the next data byte with the 16-bit register.
8) Repeat steps 4 through 7 until all bytes of the packet have been calculate by XOR
9) The content of the 16-bit register is CRC-16

Procedure for Calculating the 6403 Bytes of 16 Hex.

Step	Byte	Action	Register	Bit#	Shift
2		Initial Value	1111 1111 1111 1111		
	1	Load the first byte	0000 0000 0110 0100		
3		XOR	1111 1111 1001 1011		
4		SHIFT 1 bit to the right	0111 1111 1100 1101	1	1
5a		XOR polynomial	1101 1111 1100 1100		

4		SHIFT 1 bit to the right	0110 1111 1110 0110	2	0
4		SHIFT 1 bit to the right	0011 0111 1111 0011	3	0
4		SHIFT 1 bit to the right	0001 1011 1111 1001	4	1
5a		XOR polynomial	1011 1011 1111 1000		
4		SHIFT 1 bit to the right	0101 1101 1111 1100	5	0
4		SHIFT 1 bit to the right	0010 1110 1111 1110	6	0
4		SHIFT 1 bit to the right	0001 0111 0111 1111	7	0
4		SHIFT 1 bit to the right	0000 1011 1011 1111	8	1
5a		SHIFT 1 bit to the right	1010 1011 1011 1110		
	2	Load the second byte	0000 0000 0000 0011		
7		XOR	1010 1011 1011 1101		
4		SHIFT 1 bit to the right	0101 0101 1101 1110	1	1
5a		XOR polynomial	1111 0101 1101 1111		
4		SHIFT 1 bit to the right	0111 1010 1110 1111	2	1
5a		XOR polynomial	1101 1010 1110 1110		
4		SHIFT 1 bit to the right	0110 1101 0111 0111	3	0
4		SHIFT 1 bit to the right	0011 0110 1011 1011	4	1
5a		XOR polynomial	1001 0110 1011 1010		
4		SHIFT 1 bit to the right	0100 1011 0101 1101	5	0
4		SHIFT 1 bit to the right	0010 0101 1010 1110	6	1
5a		XOR polynomial	1000 0101 1010 1111		
4		SHIFT 1 bit to the right	0100 0010 1101 0111	7	1
5a		XOR polynomial	1110 0010 1101 0110		
4		SHIFT 1 bit to the right	0111 0001 0110 1011	8	0
		CRC-16	0111 0001 0110 1011		

5. Description of SPM33 Registers

All SPM33 measured and setup parameters are treated as HOLDING REGISTERS having addresses **4xxxx** when communicating in MODBUS protocol. According to the MODBUS Protocol, in response to a request for register **4xxxx** of a particular slave device (SPM33), the MODBUS master reads register **xxxx-1** from the slave (SPM33). For example register 40011 corresponds to register 10.

5.1 Real-time Data Register List

Register address	Read/write attribute	Definition	Data Type	Description
40001	RO	Phase A voltage	UNIT16	Secondary side L-N voltage, Calculation factor: 0.01, unit: V
40002	RO	Phase B voltage		
40003	RO	Phase C voltage		
40004	RO	Line AB voltage	UNIT16	Secondary side L-L voltage, Calculation factor: 0.01, unit: V
40005	RO	Line BC voltage		
40006	RO	Line CA voltage		
40007	RO	Phase A current	UNIT16	Secondary Side current, Calculation factor: 0.001, unit: A. If use CT, then customers need to multiply by CT ratio.
40008	RO	Phase B current		
40009	RO	Phase C current		
40010	RO	Neutral current		
40011	RO	Total active power low word	LINT32	Secondary side active power. Calculation factor: 0.1,unit: W. If use CT, then customers need to multiply by CT ratio.
40012	RO	Total active power high word		
40013	RO	Total reactive power low word	LINT32	Secondary side reactive power. Calculation factor: 0.1,unit: Var. If use CT, then customers need to multiply by CT ratio.
40014	RO	Total reactive power high		

		word		
40015	RO	Total power factor	INT16	Calculation factor: 0.001.
40016	RO	Phase A active power	INT16	Secondary side active power. Calculation factor: 0.1,unit: W. If use CT, then customers need to multiply by CT ratio. Only when it is 3 phase 4 wires connection mode can the value valid.
40017	RO	Phase Bactive power		
40018	RO	Phase Cactive power		
40019	RO	Phase A reactive power	INT16	Secondary side reactive power. Calculation factor: 0.1,unit: W. If use CT, then customers need to multiply by CT ratio. Only when it is 3 phase 4 wires connection mode can the value valid.
40020	RO	Phase B reactive power		
40021	RO	Phase Creactive power		
40022	RO	Phase A power factor	INT16	Calculation factor: 0.001. Only when it is 3 phase 4 wires connection mode can the value valid.
40023	RO	Phase B power factor		
40024	RO	Phase C power factor		
40025	RO	Frequency	UNIT16	Calculation factor: 0.01, unit: Hz
40026	RO	Total active energy low word	LUINT32	Calculation factor: 0.1, unit: kWh Range: 0-99,999,999.9
40027		Total active energy high word		
40028	RO	Total reactive energy low word	LUINT32	Calculation factor: 0.1, unit: kvarh Range: 0-99,999,999.9
40029		Total reactive energy low word		

40030	RO	Input active energy low word	LUINT32	Calculation factor: 0.1, unit: kWh Range: 0-99,999,999.9
40031		Input active energy highword		
40032	RO	Output active energy lowword	LUINT32	Calculation factor: 0.1, unit: kWh Range: 0-99,999,999.9
40033		Output active energy highword		
40034	RO	Input reactive energy lowword	LUINT32	Calculation factor: 0.1, unit: kvarh Range: 0-99,999,999.9
40035		Input reactive energy highword		
40036	RO	Output reactive energy lowword	LUINT32	Calculation factor: 0.1, unit: kvarh Range: 0-99,999,999.9
40037		Output reactive energy highword		
40038	RO	On-off status	WORD16	D0 means 1 channel D1 means 2 channel D2 means 3 channel … D12 means 13 channel D13 means 14 channel 0 means off 1 means on
40039	RO	Relay status		D0 means 1channel D1 means 2 channel D2 means 3 channel D3 means 4 channel 0 means off 1 means on
40040	RO	Alarm status	WORD16	1 means alarm, 0 means no alarm

				Bit 1: over voltage Bit 2: under voltage Bit 3: over current Bit 4: under current Bit 5: Frequency too high Bit 6: Frequency too low Bit 7: over load Bit 8: phase loss Bit 9: Status 1 off
40041	RO	CT Ratio		
40042	RO	Reserved		
40043	RO	Average phase voltage	UINT16	Calculation factor: 0.01, unit: V
40044	RO	Average line voltage		Calculation factor: 0.01, unit: V
40045	RO	Average phase current	UINT16	Calculation factor: 0.001, unit: A
40046	RO	Current unbalance rate		Calculation factor: 0.001
40047	RO	Phase A apparent power	UINT16	Calculation factor: 0.1, unit: VA
40048	RO	Phase B apparent power		
40049	RO	Phase C apparent power		
40050	RO	Total apparent power lowword	LUINT32	
40051		Total apparent power highword		
40052	RO	Grid input active energy low word	LUINT32	Monitoring Primary side kWh Calculation factor: 0.1, unit: kWh Value range: 0-99,999,999.9
40053		Grid input		

		active energy highword		
40054	RO	Grid output active energy low word	LUINT32	Monitor primary side kWh Calculation factor: 0.1, Unit kWh Value range: 0-99,999,999.9
40055		Grid output active energy high word		
40056	RO	Grid total active energy low word	LUINT32	Monitor primary side kWh Calculation factor: 0.1, Unit kWh Value range: 0-99,999,999.9
40057		Grid total active energy high word		
40058	RO	Grid input reactive energy low word	LUINT32	Monitor primary side kvarh Calculation factor: 0.1, Unit: kvarh Value range: 0-99,999,999.9
40059		Grid input reactive energy high word		
40060	RO	Grid output reactive energy low word	LUINT32	Monitor primary side kvarh Calculation factor: 0.1, Unit: kvarh Value range: 0-99,999,999.9
40061		Grid output reactive energy high word		
40062	RO	Grid totalreactive energy low word	LUINT32	Monitor primary side kvarh Calculation factor: 0.1, Unit: kvarh Value range: 0-99,999,999.9
40063		Grid totalreactive energy high word		
40064	RO	Generator Input active energy low word	LUINT32	Monitor primary side kWh Calculation factor: 0.1, Unit: kWh Value range: 0-99,999,999.9
40065		Generator		

		Input active energy high word		
40066	RO	Generator output active energy low word	LUINT32	Monitor primary side kWh Calculation factor: 0.1, Unit: kWh Value range: 0-99,999,999.9
40067		Generator output active energy high word		
40068	RO	Generator total active energy low word	LUINT32	Monitor primary side kWh Calculation factor: 0.1, Unit: kWh Value range: 0-99,999,999.9
40069		Generator total active energy high word		
40070	RO	Generator input reactive energy low word	LUINT32	Monitor primary side kvarh Calculation factor: 0.1, Unit: kvarh Value range: 0-99,999,999.9
40071		Generator input reactive energy high word		
40072	RO	Generator output reactive energy low word	LUINT32	Monitor primary side kvarh Calculation factor: 0.1, Unit: kvarh Value range: 0-99,999,999.9
40073		Generator output reactive energy high word		
40074	RO	Generator total reactive energy low word	LUINT32	Monitor primary side kvarh Calculation factor: 0.1, Unit: kvarh Value range: 0-99,999,999.9
40075		Generator total reactive		

		energy high word		
40076	RO	Ferroelectric fault	UINT16	0 means normal 1 means abnormal
40077	RO	Real-time sampling Inner REF value	UINT16	
40078	RO	Total apparent energy low word	LUINT32	Monitor primary side kVAh Calculation factor: 0.1, Unit: kVAh Value range: 0-99,999,999.9
40079		Total apparent energy high word		
40080	RO	Grid total apparent energy low word	LUINT32	Monitor primary side kVAh Calculation factor: 0.1, Unit: kVAh Value range: 0-99,999,999.9
40081		Grid total apparent energy high word		
40082	RO	Generator total apparent energy low word	LUINT32	Monitor primary side kVAh Calculation factor: 0.1, Unit: kVAh Value range: 0-99,999,999.9
40083		Generator total apparent energy high word		

5.2 List of demand data registers

Register address	Read/write attribute	Definition	Data type	Description
40701	RO	Phase A current demand	UINT16	Calculation factor: 0.001, unit: A
40702	RO	Phase B current demand		
40703	RO	Phase C current		

		demand		
40704	RO	Phase A active power demand	UINT16	Calculation factor: 0.1, unit: W
40705	RO	Phase Bactive power demand		
40706	RO	Phase Cactive power demand		
40707	RO	Total active power demandlow word	LINT32	Calculation factor: 0.1, unit: W
40708		Total active power demandhigh word		
40709	RO	Maximum phase A current demand	UNIT16	Calculation factor: 0.001, unit: A
40710	RO	Maximum phase B current demand		
40711	RO	Maximum phase A current demand		
40712	RO	Maximum phase A active power demand	UNIT16	Calculation factor: 0.1, unit: W
40713	RO	Maximum phase B active power demand		
40714	RO	Maximum phase C active power demand		
40715	RO	Total active power demand low word	LINT32	Calculation factor: 0.1, unit: W
40716		Total active power demand high word		
40717	RO	Phase Areactive power demand	INT16	Calculation factor: 0.1, unit: var
40718	RO	Phase Breactive power demand		Calculation factor: 0.1, unit: var

40719	RO	Phase Creactive power demand		Calculation factor: 0.1, unit: var
40720	RO	Totalreactive power demand low word	LINT32	Calculation factor: 0.1, unit: var
40721		Totalreactive power demand high word		
40722	RO	Phase Aapparent power demand	INT16	Calculation factor: 0.1, unit: VA
40723	RO	Phase B apparent power demand		Calculation factor: 0.1, unit: VA
40724	RO	Phase Capparent power demand		Calculation factor: 0.1, unit: VA
40725	RO	Total apparent power demand low word	LINT32	Calculation factor: 0.1, unit: VA
40726		Total apparent power demand high word		
40727	RO	Phase Areactive powerMax. demand	INT16	Calculation factor: 0.1, unit: var
40728	RO	Phase Breactive powerMax. demand		Calculation factor: 0.1, unit: var
40729	RO	Phase Creactive powerMax. demand		Calculation factor: 0.1, unit: var
40730	RO	Total reactive powerMax. demand low word	LINT32	Calculation factor: 0.1, unit: var
40731		Total reactive powerMax. demand high word		
40732	RO	Phase Aapparent	INT16	Calculation factor: 0.1, unit: VA

		powerMax. demand		
40733	RO	Phase Bapparent powerMax. demand		Calculation factor: 0.1, unit: VA
40734	RO	Phase C apparent powerMax. demand		Calculation factor: 0.1, unit: VA
40735	RO	Total apparent powerMax. demand low word	LINT32	Calculation factor: 0.1, unit: VA
40736		Total apparent powerMax. demand high word		

5.3 List of harmonic data registers

Register address	Read/write attribute	Definition	Data type	Description
40801	RO	Va - THD	UNIT16	Calculation factor: 0. 1
40802	RO	Vb - THD		
40803	RO	Vc - THD		
40804	RO	Ia – THD	UNIT16	Calculation factor: 0. 1
40805	RO	Ib – THD		
40806	RO	Ic – THD		
40807	RO	2nd harmonic component of Va	UINT16	Calculation factor: 0. 1, Unit: %
40808	RO	3rd harmonic component of Va		
40809 -40835	RO	…		
40836	RO	31st harmonic component of Va		
40837	RO	2nd harmonic	UINT16	Calculation factor: 0. 1, Unit: %

		component of Vb		
40838	RO	3rd harmonic component of Vb		
40839 -40865	RO	…		
40866	RO	31st harmonic component of Vb		
40867	RO	2nd harmonic component of Vc	UINT16	Calculation factor: 0. 1, Unit: %
40868	RO	3rd harmonic component of Vc		
40869 -40895	RO	…		
40896	RO	31st harmonic component of Vc		
40897	RO	2nd harmonic component of Ia	UINT16	Calculation factor: 0. 1, Unit: %
40898	RO	3rd harmonic component of Ia		
40899 -40925	RO	…		
40926	RO	31st harmonic component of Ia		
40927	RO	2nd harmonic component of Ib	UINT16	Calculation factor: 0. 1, Unit: %
40928	RO	3rd harmonic component of Ib		
40929 -40955	RO	…		
40956	RO	31st harmonic component of Ia		
40957	RO	2nd harmonic component of Ic	UINT16	Calculation factor: 0. 1, Unit: %
40958	RO	3rd harmonic component of Ic		
40959-409	RO	…		Calculation factor: 0. 1, Unit: %

85				
40986	RO	31st harmonic component of Ic		Calculation factor: 0. 1, Unit: %

5.4 List of configuration registers

Register address	Read/write attribute	Definition	Data type	Description
40201	RW	Communication Address	UINT16	1--247
40202	RW	CT Primary side value	UINT16	1--50000
40203	RW	Connection mode	UINT16	0--1 0：3 phases 4 wires 1：3 phases 3 wires
40204	RW	PT primary side value	UINT16	1—650.00 Calculation factor: 0.01, unit: kV
40205	RW	PT secondary side value	UINT16	100 -400 (settable), Unit: V
40206	RW	Baud rate	UINT16	0--1 0：4800 1：9600 2: 19200
40207	RW	Status input 1	UINT16	0: Normal function 1: Special function
40208	RW	Control object of status input 1	UINT16	0-6 0: All 1: Voltage 2: Current 3: Frequency 4: Power 5: Voltage fault 6: Status 1 cut-off
40209	RW	Control object of status input 2	UINT16	
40210	RW	Current Channel of 1st Voltage mapping	UINT16	Default 1, 1st forward current 1 means 1st forward current 2 means 2nd forward current 3 means 3rd forward current 0x8001 means 1st

				reverse current 0x8002 means 2nd reverse current 0x8003 means 3rd reverse current
40211	RW	Current Channel of 2nd Voltage mapping	UINT16	Default 2, 2nd forward current 1 means 1st forward current 2 means 2nd forward current 3 means 3rd forward current 0x8001 means 1st reverse current 0x8002 means 2nd reverse current 0x8003 means 3rd reverse current
40212	RW	Current Channel of 3rd Voltage mapping	UINT16	Default 3, 3rd forward current 1 means 1st forward current 2 means 2nd forward current 3 means 3rd forward current 0x8001 means 1st reverse current 0x8002 means 2nd reverse current 0x8003 means 3rd reverse current
40213	RW	Working status of relay 1	UINT16	0—1, default 0, remote 0 means remote control 1 means auto alarm
40214	RW	Return time of relay 1	UINT16	Default 0 0~120 (s) 0 means blocking.
40215	RW	Working status of relay 2	UINT16	0—1, default 0, remote 0 means remote control 1 means auto alarm

40216	RW	Return time of relay 2	UINT16	Default 0 0~120 (s) 0 means blocking.
40217		Reserved		
40218		Reserved		
40219	RW	Operation value of voltage upper limit low word	LUINT32	Calculation factor: 0.01, Unit:V 0 means closed For 100V – 650,000V, default 0.
40220		Operation value of voltage upper limit high word		
40221	RW	Action time of voltage upper limit	UINT16	0-120s。
40222	RW	Operation value of voltage lower limit low word	LUINT32	Calculation factor: 0. 1, Unit:V 0 means closed For 100V – 650,000V, default 0.
40223		Operation value of voltage lower limit high word		
40224	RW	Action time of voltage lower limit	UINT16	0-120s。
40225	RW	Operation value of current upper limit (low word)	LUINT32	Primary value of current. Calculation factor: 0.1, Unit: A 0 means closed 1.0A-50000.0A
40226		Operation value of current upper limit (high word)		
40227	RW	Action time of current upper limit	UINT16	0-120s
40228	RW	Operation value of current lower limit (low word)	LUINT32	Primary value of current. Calculation factor: 0.1, Unit: A 0 means closed 1.0A-50000.0A
40229		Operation value of current lower limit (high word)		
40230	RW	Action time of current lower limit	UINT16	0-120s
40231	RW	Operation value of frequency upper limit	UINT16	Calculation factor: 0.01, Unit: Hz 0 means closed 45Hz – 65Hz
40232	RW	Action time of frequency upper limit	UINT16	0-120s

40233	RW	Operation value of frequency lower limit	UINT16	Calculation factor: 0.01, Unit: Hz 0 means closed 45Hz – 65Hz
40234	RW	Action time of frequency lower limit	UINT16	0-120s
40235	RW	Operation value of active power upper limit (low word)	LINT32	Primary side value Calculation factor: 0.1, Unit: kW 0.1-99,999,999.9kW
40236		Operation value of active power upper limit (high word)		
40237	RW	Action time of active power upper limit	UINT16	0-120s
40238	RW	Setting for phase loss alarm	UINT16	0 means closed 1 means open When phase A or phase B < 110V, it means phase loss. When phase A, phase B and phase C all < 110V, it means work normal.
40239	RW	Alarm status	UINT16	0 means closed 1 means open.
Note: Register 40219—40239 should be set once time. What's more, the upper limit must higher than lower limit.				

5.5 Register for command and clear energy

Register address	Read/write attribute	Data type	Definition	Description
40252	WO	U16	Clear Maximum value of demand	Write 888
40253	WO	U16	Clear energy	Write 78
40254	WO	U32	Input active energy	Calculation factor: 0.1, Unit: kWh
40255				
40256	WO	U32	Output active energy	
40257				
40258	WO	U32	Input reactive energy	Calculation factor: 0.1, Unit: kvarh
40259				
40260	WO	U32	Output reactive energy	

40261				

Note: Register 40254~40261 should be read /write once time

5.6 List of device information registers

Register address	Read/write attribute	Definition	Data Type	Description
49001	RW	Device No.	LUINT32	
49002				
49003	WO	Recover user system	UINT16	Write 888
49004	WO	Recover factory setting	UINT16	Write 888
49005	RO	Firmware version	UINT16	1.0.5 <Main version>.<Sub version>.<Modify version> Bit [15:12] <Main version> Bit [11:8] <Sub version> Bit [7:0] <Modify version>
49006	RO	Hardware version	UINT16	1.0.5 <Main version>.<Sub version>.<Modify version> Bit [15:12] <Main version> Bit [11:8] <Sub version> Bit [7:0] <Modify version>

Notice:

PILOT reserves the right to modify this manual without prior notice in view of continued improvement.

Email: overseamarket@pmac.com.cn

Zhuhai Pilot Technology Co., Ltd.

Add: No. 15, Keji 6 Road, Chuangxin Haian, Tangjia High-tech Zone, Zhuhai,Guangdong,519085 China

Tel: +86 -756-3629687/ 3629688

Fax: +86-756-3629600/ 3629670

http://www.pmac.com.cn