PMAC201HW

ПЕРЕЧЕНЬ
РЕГИСТРОВ
ПРОТОКОЛА
MODBUS

1.0

ZHUHAI PILOT TECHNOLOGY CO., LTD.

Содержание

1. Введение

Ниже описан порядок ввода и вывода инструкций, информации и данных на устройстве PMAC201HW с помощью протокола MODBUS, облегчающего использование и модернизация устройства третьими лицами.

1.1 Роль протокола последовательной связи

Роль протокола заключается в обмене информацией и данными между хост-компьютером (ведущее устройство) и PMAC 201-HW и включает в себя:

1) Разрешение ведущему устройству доступа и установки параметров PMAC 201-HW

2) Открытие доступа ко всем измерительным данным и событиям PMAC201HW

1.2 Версия протокола MODBUS

Данный протокол связи работает со всеми версиями устройства PMAC201HW. Любые изменения будут указаны в дальнейшем.

2. Подробное описание протокола MODBUS

2.1 Основные правила использования

Данные правила используются контроллерами с портами RS485 или RS232C, а также другим оборудованием с портом последовательной связи

RS485:

1) Все цепи RS485 работают в режиме ведущее устройство/ведомое устройство. Таким образом, информация и данные могут передаваться между одним ведущим и до 32 ведомых устройств (аппаратурой мониторинга).

2) Ведущее устройство управляет всей информацию в цепях связи RS485.

3) Сеанс связи нельзя активировать с ведомого устройства.

4) Передача данных происходит пакетным методом. Пакет состоит из простой строки (8 цифр). Один пакет может содержать до 255 байт. Эти байты представляют собой стандартные асинхронные последовательные данные и передаются в следующем режиме: восемь битов данных, 1 стоп-бит, без бита четности. Последовательный поток данных генерируется оборудованием, используемым RS232C.

5) Пакет, отправленный с ведущего устройства, называется запрос, с ведомого — ответ.

6) Ведомое устройство может отвечать только на 1 запрос.

2.2 Режим передачи данных

Протокол MODBUS может передавать данные в режиме ASCII или RTU. PMAC201HW поддерживает только режим RTU на восемь бит данных, 1 стоп-бит, без контроля четности

2.3 Описание структуры пакета MODBUS

1) Адресное поле
2) Поле кода функции
3) Поле данных
4) Проверочное поле

2.3.1 Адресное поле

Длина адресного поля ведомого устройства MODBUS составляет 1 байт, включая адрес ведомого устройства, отправленный в пакете. Допустимый адрес ведомого устройства: от 1 до 247. После получения информации из адресного поля ведомое устройство сравнивает адрес со своим и при необходимости выполняет команду. В ответном пакете содержится собственный адрес устройства.

Т.к. с помощью интерфейса HMI можно подключиться и обмениваться данными с контроллером по любому адресу, запрос, отправленный через такой интерфейс, имеет адрес 0.

2.3.2 Поле кода функции

Длина поля кода функции в составляет 1 байт, который используется для информирования ведомого устройства о том, чем именно надо управлять. В ответном пакете поле кода функции должно совпадать с запросом. Функциональные коды PMAC201HW:

Код функции	Определение	Функции
0x03	Считывание регистра	Получение одного или более фактических значений регистра
0x10	Настройка регистра	Внести указанное значение в один или более регистров PMAC201HW

2.3.3 Поле данных

Длина поля данных не фиксирована, она зависит от конкретной функции.

Данные в поле данных используют порядок big-endian, от старших байтов к младшим.

Пример 2.1:
16-разрядный регистр содержит значение 0x12AB, значение передается в соответствии с запросом:
Старший байт =
0x12 Младший
байт = 0x0AB

2.3.4 Проверочное поле

Режим MODBUS-RTU работает с 16-разрядной проверкой CRC, передающее устройство должно выполнять расчет CRC16 для данных внутри пакета, принимающее устройство также должно выполнять этот расчет для каждого типа данных (кроме проверочного поля) пакета. После сравнения результатов и проверочного поля принимаются только пакеты с одинаковыми данными. Для получения более подробной информации об алгоритме CRC см. приложения.

2.4Некорректный ответ

Если ведущее устройство посылает некорректный пакет или запрашивает недопустимый регистр, устройство выдаст некорректный ответ. В него входит адрес ведомого устройства, код функции, код ошибки и проверочное поле. Если старший бит кода функции 1, это обозначает некорректный ответ. В следующей таблице описаны значения неправильных кодов:

Функция	Описание
01 код неправильной	PMAC201HW MODBUS поддерживает только код
	03H и 10H. Данный код означает, что ведомое устройство получило неправильный код функции или
02 неправильный адрес данных	PMAC201HW получил неправильный адрес данных или регистр находится за пределами
03 неправильное	Диапазон значений не соблюден.

2.5 Трансляция

Протокол MODBUS PMAC201HW поддерживает команду трансляции (0x10) для синхронизации использования.

3. Пакет связи

PMAC201HW поддерживает два кода функции, а стандарт протокола MODBUS — только 16-разрядный режим передачи данных, то есть максимальное значение измеряемой величины составляет 65535.
Описание формата чтения и отправки данных приведено в главе 3.1; описание формата записи и отправки данных — в главе 3.2;

3.1 Считывание регистров (код функции 03H)

Запрос от ведущего устройства к PMAC201HW ответа обо всех

допустимых регистрах, содержание неопределенно.

Формат считывания (ведущее устройство → PMAC201HW)			**Формат ответа (PMAC201HW → ведущее устройство)**	
Адрес ведомого устройства;	1 байт		Адрес ведомого устройства	1 байт
Код функции 03H	1 байт		Код функции 03H	1 байт
Начальный адрес	2 байта		Байты (кол-во регистров*2)	1 байт
Количество	2 байта		Данные первого	2 байта
CRC-код проверки	2 байта		Данные второго	2 байта
			……	
			CRC-код проверки	2 байта

3.2 Запись регистров (код функции 10H)

Эта команда позволяет настраивать рабочие параметры PMAC201HW с ведущего устройства:

Формат записи (ведущее устройство → PMAC201HW)			**Формат ответа (PMAC201HW → ведущее устройство)**	
Адрес ведомого устройства;	1 байт		Адрес ведомого устройства	1 байт
Код функции 10H	1 байт		Код функции 10H	1 байт
Начальный адрес	2 байта		Начальный адрес	2 байта
Количество	2 байта		Количество регистров	2 байта

регистров				
Байты (кол-во	1 байт		CRC-код проверки	2 байта
Данные первого регистра				
Данные второго регистра				
…….				
CRC-код проверки	2 байта			

Совет:
Регистры записи идут непрерывно начиная с первого.

4. Расчет CRC-16

Эта часть описывает процесс расчета CRC-16. Байты в кадре определяется как строка двоичных данных (0,1). Проверка проходит следующим образом: поток последовательных данных умножается на 216, а затем делится на многочлен (X16 + X15 + X2 + 1), процесс в двоичном виде — 1100000000000101. Коэффициент игнорируется, 16-битный остаток представляет собой значение CRC. Расчет CRC-16 происходит по модулю 2 или на основе алгоритме XOR (X0R). Для проведения проверки выполните следующие действия:

1) Определить наиболее значимый бит генератора пропуска, сформировать обратный порядок бит и новый многочлен, результат — 1010000000000001 или шестнадцатеричный A001.

2) Поместить все 1 или шестнадцатеричные FFFF в 16-разрядный регистр.
3) Использовать средний или младший байт для расчета XOR первого байта, результат сохранить в 16-разрядном регистре.
4) Переместить 16-разрядный регистр на один бит вправо, если бит переполнения — 1, вернуться к пункту 5, в противном случае перейти к пункту 6.
5) Использовать новый многочлен для расчета MOR 16-разрядных регистров, сохранить результат.
6) Повторить пункт 4 до сдвига разрядной единицы в 8 раз.
7) Использовать байт первого порядка 16-разрядного регистра для расчета XOR с ближайшим байтом данных, сохранить результат в 16-разрядном регистре.
8) Повторять пункты 4-7 до расчет всех байтов в пакете.
9) Содержание 16-разрядного регистра является CRC-16.

Пример расчета CRC для байта 6403.

Steps	Bytes	Action	Register	Bit#	Bit shift
2		Primary value	1111 1111 1111 1111		
	1	Input the first byte	0000 0000 0110 0100		
3		XOR	1111 1111 1001 1011		
4		Right 1 bit	0111 1111 1100 1101	1	1
5a		XOR polynomial	1101 1111 1100 1100		

4		Right 1 bit	0110	1111	1110	2	0
			0110				
4		Right 1 bit	0011 0011	0111	1111	3	0
4		Right 1 bit	0001 1001	1011	1111	4	1
5a		XOR polynomial	1011 1000	1011	1111		
4		Right 1 bit	0101 1100	1101	1111	5	0
4		Right 1 bit	0010 1110	1110	1111	6	0
4		Right 1 bit	0001 1111	0111	0111	7	0
4		Right 1 bit	0000 1111	1011	1011	8	1
5a		XOR polynomial	1010 1110	1011	1011		
	2	Put to the second byte	0000 0011	0000	0000		
7		XOR	1010 1101	1011	1011		
4		Right 1 bit	0101 1110	0101	1101	1	1
5a		XOR polynomial	1111 1111	0101	1101		
4		Right 1 bit	0111	1010	1110	2	1

			1111				
5a		XOR polynomial	1101 1110	1010	1110		
4		Right 1 bit	0110 0111	1101	0111	3	0
4		Right 1 bit	0011 1011	0110	1011	4	1
5a		XOR polynomial	1001 1010	0110	1011		
4		Right 1 bit	0100 1101	1011	0101	5	0
4		Right 1 bit	0010 1110	0101	1010	6	1
5a		XOR polynomial	1000 1111	0101	1010		
4		Right 1 bit	0100 0111	0010	1101	7	1
5a		XOR polynomial	1110 0110	0010	1101		
4		Right 1 bit	0111 1011	0001	0110	8	0
		CRC-16	0111 1011	0001	0110		

5. Инструкции по использованию регистров

Все регистры PMAC201HW (в том числе регистры в режиме реального времени и регистры настройки) имеют базовый адрес 4XXXX протокола MODBUS. В соответствии с протоколом MODBUS при запросе регистра с адресом 4XXXX в PMAC201HW ведущее устройство на самом деле считывает XXXX-1, например, при запросе 40011 ведущее устройство считывает регистр 10.

Коэффициент пересчета

Для обхода предела данных в PMAC201HW используется коэффициент пересчета, т.е. для определения истинного значения необходимо умножить данные на соответствующий коэффициент.

Например: коэффициент для регистра мощности равен 0,001, считываемое значение —892, т.е. истинное значение составляет 892/1000 = 0.892

Пункт	Вид	Описание
1	RO	Только чтение
2	WO	Только запись
3	RW	Чтение и запись
4	U16	16-разрядный неподписанный регистр
5	S16	16-разрядный подписанный регистр
6	U32	32-разрядный неподписанный регистр
7	S32	32-разрядный подписанный регистр

5.1 Real time measure registers

Register address	Property	Data type	Definition	Remark
40001	RO	U16	Phase A voltage	Calculation factor 0.01, unit: V
40002	RO	U16	Phase B voltage	Calculation factor 0.01, unit: V
40003	RO	U16	Phase C voltage	Calculation factor 0.01, unit: V
40004	RO	U16	Average L-N voltage	Calculation factor 0.01, unit: V
40005	RO		Reserved	
40006	RO	U16	Line AB voltage	Calculation factor 0.01, unit: V
40007	RO	U16	Line BC voltage	Calculation factor 0.01, unit: V
40008	RO	U16	Line CA voltage	Calculation factor 0.01, unit: V
40009	RO	U16	Average L-L voltage	Calculation factor 0.01, unit: V
40010	RO	U16	Frequency	Calculation factor 0.01, unit: Hz
40011	RO	U16	Circuit 1 phase A current	Calculation factor 0.00001, unit: A
40012	RO	U16	Circuit 1 phase	Calculation factor

			B current	0.00001, unit: A	
40013	RO	U16	Circuit 1 phase C current	Calculation factor 0.00001, unit: A	
40014	RO	U16	Circuit 2 phase A current	Calculation factor 0.00001, unit: A	
40015	RO	U16	Circuit 2 phase B current	Calculation factor 0.00001, unit: A	
40016	RO	U16	Circuit 2 phase C current	Calculation factor 0.00001, unit: A	
40017	RO	U16	Circuit 3 phase A current	Calculation factor 0.00001, unit: A	
40018	RO	U16	Circuit 3 phase B current	Calculation factor 0.00001, unit: A	
40019	RO	U16	Circuit 3 phase C current	Calculation factor 0.00001, unit: A	
40020	RO	U16	Circuit 4 phase A current	Calculation factor 0.00001, unit: A	
40021	RO	U16	Circuit 4 phase B current	Calculation factor 0.00001, unit: A	
40022	RO	U16	Circuit 4 phase C current	Calculation factor 0.00001, unit: A	
40023	RO		Reserved		
40024	RO		Reserved		
40025	RO		Reserved		
40026	RO		Reserved		
40027	RO	S16	Circuit 1 phase A	Calculation factor 0.001,	

			active power	unit: W
40028	RO	S16	Circuit 1 phase B active power	Calculation factor 0.001, unit: W
40029	RO	S16	Circuit 1 phase C active power	Calculation factor 0.001, unit: W
40030	RO	S16	Circuit 2 phase A active power	Calculation factor 0.001, unit: W
40031	RO	S16	Circuit 2 phase B active power	Calculation factor 0.001, unit: W
40032	RO	S16	Circuit 2 phase C active power	Calculation factor 0.001, unit: W
40033	RO	S16	Circuit 3 phase A active power	Calculation factor 0.001, unit: W
40034	RO	S16	Circuit 3 phase B active power	Calculation factor 0.001, unit: W
40035	RO	S16	Circuit 3 phase C active power	Calculation factor 0.001, unit: W
40036	RO	S16	Circuit 4 phase A active power	Calculation factor 0.001, unit: W
40037	RO	S16	Circuit 4 phase B active power	Calculation factor 0.001, unit: W
40038	RO	S16	Circuit 4 phase C active power	Calculation factor 0.001, unit: W
40039	RO	S32	Circuit 1 total active power low word	Calculation factor 0.001, unit: W

40040			Circuit 1 total active power high word	
40041	RO	S32	Circuit 2 total active power low word	Calculation factor 0.001, unit: W
40042			Circuit 2 total active power high word	
40043	RO	S32	Circuit 3 total active power low word	Calculation factor 0.001, unit: W
40044			Circuit 3 total active power high word	
40045	RO	S32	Circuit 4 total active power low word	Calculation factor 0.001, unit: W
40046			Circuit 4 total active power high word	
40047	RO	S16	Circuit 1 phase A reactive power	Calculation factor 0.001, unit: VAR
40048	RO	S16	Circuit 1 phase B reactive power	Calculation factor 0.001, unit: VAR
40049	RO	S16	Circuit 1 phase C reactive	Calculation factor 0.001, unit: VAR

			power	
40050	RO	S16	Circuit 2 phase A reactive power	Calculation factor 0.001, unit: VAR
40051	RO	S16	Circuit 2 phase B reactive power	Calculation factor 0.001, unit: VAR
40052	RO	S16	Circuit 2 phase C reactive power	Calculation factor 0.001, unit: VAR
40053	RO	S16	Circuit 3 phase A reactive power	Calculation factor 0.001, unit: VAR
40054	RO	S16	Circuit 3 phase B reactive power	Calculation factor 0.001, unit: VAR
40055	RO	S16	Circuit 3 phase C reactive power	Calculation factor 0.001, unit: VAR
40056	RO	S16	Circuit 4 phase A reactive power	Calculation factor 0.001, unit: VAR
40057	RO	S16	Circuit 4 phase B reactive power	Calculation factor 0.001, unit: VAR
40058	RO	S16	Circuit 4 phase C reactive power	Calculation factor 0.001, unit: VAR
40059	RO	S32	Circuit 1 total reactive power Low word	Calculation factor 0.001, unit: VAR
40060			Circuit 1 total	

			reactive power high word	
40061 40062	RO	S32	Circuit 2 total reactive power Low word Circuit 2 total reactive power high word	Calculation factor 0.001, unit: VAR
40063 40064	RO	S32	Circuit 3 total reactive power Low word Circuit 3 total reactive power high word	Calculation factor 0.001, unit: VAR
40065 40066	RO	S32	Circuit 4 total reactive power Low word Circuit 4 total reactive power high word	Calculation factor 0.001, unit: VAR
40067	RO	S16	Circuit 1 phase A power factor	Calculation factor 0.001
40068	RO	S16	Circuit 1 phase B power factor	Calculation factor 0.001
40069	RO	S16	Circuit 1 phase C power factor	Calculation factor 0.001
40070	RO	S16	Circuit 2 phase A	Calculation factor 0.001

			power factor	
40071	RO	S16	Circuit 2 phase B power factor	Calculation factor 0.001
40072	RO	S16	Circuit 2 phase C power factor	Calculation factor 0.001
40073	RO	S16	Circuit 3 phase A power factor	Calculation factor 0.001
40074	RO	S16	Circuit 3 phase B power factor	Calculation factor 0.001
40075	RO	S16	Circuit 3 phase C power factor	Calculation factor 0.001
40076	RO	S16	Circuit 4 phase A power factor	Calculation factor 0.001
40077	RO	S16	Circuit 4 phase B power factor	Calculation factor 0.001
40078	RO	S16	Circuit 4 phase C power factor	Calculation factor 0.001
40079	RO	S16	Circuit 1 total power	Calculation factor 0.001
40080	RO	S16	Circuit 2 total power factor	Calculation factor 0.001
40081	RO	S16	Circuit 3 total power	Calculation factor 0.001
40082	RO	S16	Circuit 4 total power factor	Calculation factor 0.001
40083	RO	U16	Circuit 1 phase A apparent	Calculation factor 0.001, unit: VA

40084	RO	U16	Circuit 1 phase B apparent power	Calculation factor 0.001, unit: VA
40085	RO U16		Circuit 1 phase C apparent power	Calculation factor 0.001, unit: VA
40086	RO	U16	Circuit 2 phase A apparent power	Calculation factor 0.001, unit: VA
40087	RO U16		Circuit 2 phase B apparent power	Calculation factor 0.001, unit: VA
40088	RO	U16	Circuit 2 phase C apparent power	Calculation factor 0.001, unit: VA
40089	RO U16		Circuit 3 phase A apparent power	Calculation factor 0.001, unit: VA
40090	RO	U16	Circuit 3 phase B apparent power	Calculation factor 0.001, unit: VA
40091	RO U16		Circuit 3 phase C apparent power	Calculation factor 0.001, unit: VA
40092	RO	U16	Circuit 4 phase A apparent power	Calculation factor 0.001, unit: VA
40093	RO U16		Circuit 4 phase B apparent	power

Calculation factor 0.001, unit:
VA

40094	RO	U16	Circuit 4 phase C apparent power	Calculation factor 0.001, unit: VA
40095	RO	U32	Circuit 1 total apparent power low word	Calculation factor 0.001, unit: VA
40096			Circuit 1 total apparent power high word	
40097	RO	U32	Circuit 2 total apparent power low word	Calculation factor 0.001, unit: VA
40098			Circuit 2 total apparent power high word	
40099	RO	U32	Circuit 3 total apparent power low word	Calculation factor 0.001, unit: VA
40100			Circuit 3 total apparent power high word	
40101	RO	U32	Circuit 4 total apparent power low word	Calculation factor 0.001, unit: VA
40102			Circuit 4 total apparent power high word	

40103	RO	Reserved
40104	RO	Reserved

5.2 Demand Data Registers

Register address	Property	Data type	Definition	Remark	
40161	RO	U16	Circuit 1 phase A Demand for Current	Calculation 0.00001, unit: A	factor
40162	RO	U16	Circuit 1 phase B Demand for Current	Calculation 0.00001, unit: A	factor
40163	RO	U16	Circuit 1 phase C Demand for Current	Calculation 0.00001, unit: A	factor
40164	RO	U16	Circuit 2 phase A Demand for Current	Calculation 0.00001, unit: A	factor
40165	RO	U16	Circuit 2 phase B Demand for Current	Calculation 0.00001, unit: A	factor
40166	RO	U16	Circuit 2 phase C Demand for Current	Calculation 0.00001, unit: A	factor
40167	RO	U16	Circuit 3 phase A	Calculation	factor

			Demand for Current	0.00001, unit: A	
40168	RO	U16	Circuit 3 phase B Demand for Current	Calculation 0.00001, unit: A	factor
40169	RO	U16	Circuit 3 phase C Demand for Current	Calculation 0.00001, unit: A	factor
40170	RO	U16	Circuit 4 phase A Demand for Current	Calculation 0.00001, unit: A	factor
40171	RO	U16	Circuit 4 phase B Demand for Current	Calculation 0.00001, unit: A	factor
40172	RO	U16	Circuit 4 phase C Demand for Current	Calculation 0.00001, unit: A	factor
40173	RO	S16	Circuit 1 phase A Demand for Active Power	Calculation factor 0.001, unit: W	
40174	RO	S16	Circuit 1 phase B Demand for Active Power	Calculation factor 0.001, unit: W	
40175	RO	S16	Circuit 1 phase C Demand for Active Power	Calculation factor 0.001, unit: W	
40176	RO	S16	Circuit 2 phase A	Calculation factor 0.001,	

			Demand for Active Power	unit: W
40177	RO	S16	Circuit 2 phase B Demand for Active Power	Calculation factor 0.001, unit: W
40178	RO	S16	Circuit 2 phase C Demand for Active Power	Calculation factor 0.001, unit: W
40179	RO	S16	Circuit 3 phase A Demand for Active Power	Calculation factor 0.001, unit: W
40180	RO	S16	Circuit 3 phase B Demand for Active Power	Calculation factor 0.001, unit: W
40181	RO	S16	Circuit 3 phase C Demand for Active Power	Calculation factor 0.001, unit: W
40182	RO	S16	Circuit 4 phase A Demand for Active Power	Calculation factor 0.001, unit: W
40183	RO	S16	Circuit 4 phase B Demand for Active Power	Calculation factor 0.001, unit: W
40184	RO	S16	Circuit 4 phase C Demand for Active Power	Calculation factor 0.001, unit: W
40185	RO	S32	Circuit 1	Calculation factor 0.001,

40186			Demand for Total Active Power low word Circuit 1 Demand for Total Active Power high word	unit: W
40187 40188	RO	S32	Circuit 2 Demand for Total Active Power low word Circuit 2 Demand for Total Active Power high word	Calculation factor 0.001, unit: W
40189 40190	RO	S32	Circuit 3 Demand for Total Active Power Low word Circuit 3 Demand for Total Active Power high word	Calculation factor 0.001, unit: VAR
40191	RO	S32	Circuit 4 Demand for Total Active Power Low word	Calculation factor 0.001, unit: VAR

40192			Circuit 4 Demand for Total Active Power high word	

5.3 Energy data registers

Under 3 phase 3 wire connection, only total energy data, no separated phase energy data.

Register address	Property	Data type	Definition	Remarks
40201 40202	RO	U32	Line 1 phase A input active energy low word Line 1 phase A input active energy high word	Calculation factor 0. 1, unit: kWh
40203	RO	U32	Line 1 phase B input active energy low word	Calculation factor 0.1, unit: kWh
40204			Line 1 phase B input active energy high word	
40205	RO	U32	Line 1 phase C input active	Calculation factor 0.1, unit: kWh

40206			energy low word Line 1 phase C input active energy high word	
40207	RO	U32	Line 2 phase A input active energy low word	Calculation factor 0.1, unit: kWh
40208			Line 2 phase A input active energy high word	
40209 40210	RO	U32	Line 2 phase B input active energy low word Line 2 phase B input active energy high word	Calculatio factor 0.1, n unit: kWh
40211	RO	U32	Line 2 phase C input active energy low word	Calculatio factor 0.1, n unit: kWh
40212			Line 2 phase C input active energy high word	
40213	RO	U32	Line 3 phase A	Calculation factor 0.1,

40214			input active energy low word Line 3 phase A input active energy high word	unit: kWh
40215	RO	U32	Line 3 phase B input active energy low word	Calculatio factor 0.1, n unit: kWh
40216			Line 3 phase B input active energy high word	
40217	RO	U32	Line 3 phase C input active energy low word	Calculatio factor 0.1, n unit: kWh
40218			Line 3 phase C input active energy high word	
40219	RO	U32	Line 4 phase A input active energy low word	Calculation factor 0.1, unit: kWh
40220			Line 4 phase A input active energy high word	

40221 40222	RO	U32	Line 4 phase B input active energy low word Line 4 phase B input active energy high word	Calculation factor 0.1, unit: kWh
40223	RO	U32	Line 4 phase C input active energy low word	Calculation factor 0.1, unit: kWh
40224			Line 4 phase C input active energy high word	
40225 40226	RO	U32	Line 1 total input active energy low word Line 1 total input active energy high word	Calculation factor 0.1, unit: kWh
40227	RO	U32	Line 2 total input active energy low word	Calculation factor 0.1, unit: kWh
40228			Line 2 total input active energy high word	
40229	RO	U32	Line 3 total input	Calculation factor 0.1,

40230			active energy low word Line 3 total input active energy high word	unit: kWh
40231	RO	U32	Line 4 total input active energy low word	Calculation factor 0.1, unit: kWh
40232			Line 4 total input active energy high word	
40233	RO	U32	Line 1 phase A output active energy low word	Calculation factor 0.1, unit: kWh
40234			Line 1 phase A output active energy high word	
40235	RO	U32	Line 1 phase B output active energy low word	Calculation factor 0.1, unit: kWh
40236			Line 1 phase B output active energy high word	

40237 40238	RO	U32	Line 1 phase C output active energy low word Line 1 phase C output active energy high word	Calculation factor 0.1, unit: kWh
40239	RO	U32	Line 2 phase A output active energy low word	Calculation factor 0.1, unit: kWh
40240			Line 2 phase A output active energy high word	
40241 40242	RO	U32	Line 2 phase B output active energy low word Line 2 phase B output active energy high word	Calculation factor 0.1, unit: kWh
40243	RO	U32	Line 2 phase C output active energy	Calculation factor 0.1, unit: kWh

			low word	
40244			Line 2 phase C output active energy high word	
40245	RO	U32	Line 3 phase A output active energy low word	Calculation factor 0.1, unit: kWh
40246			Line 3 phase A output active energy high word	
40247	RO	U32	Line 3 phase B output active energy low word	Calculation factor 0.1, unit: kWh
40248			Line 3 phase B output active energy high word	
40249	RO	U32	Line 3 phase C output active energy low word	Calculation factor 0.1, unit: kWh
40250			Line 3 phase C output	

			active energy high word	
40251	RO	U32	Line 4 phase A output active energy low word	Calculation factor 0.1, unit: kWh
40252			Line 4 phase A output active energy high word	
40253	RO	U32	Line 4 phase B output active energy low word	Calculation factor 0.1, unit: kWh
40254			Line 4 phase B output active energy high word	
40255	RO	U32	Line 4 phase C output active energy low word	Calculation factor 0.1, unit: kWh
40256			Line 4 phase C output active energy high word	
40257	RO	U32	Line 1 total	Calculation factor 0.1,

40258			output active energy low word Line 1 total output active energy high word	unit: kWh
40259	RO	U32	Line 2 total output active energy low word	Calculation unit: kWh factor 0.1,
40260			Line 2 total output active energy high word	
40261	RO	U32	Line 3 total output active energy low word	Calculation unit: kWh factor 0.1,
40262			Line 3 total output active energy high word	
40263	RO	U32	Line 4 total output active energy low word	Calculation unit: kWh factor 0.1,
40264			Line 4 total output active energy high word	

40265 40266	RO	U32	Line 1 phase A input reactive energy low word Line 1 phase A input reactive energy high word	Calculation unit: kVarh factor 0.1,
40267	RO	U32	Line 1 phase B input reactive energy low word	Calculation unit: kVarh factor 0.1,
40268			Line 1 phase B input reactive energy high word	
40269 40270	RO	U32	Line 1 phase C input reactive energy low word Line 1 phase C input reactive energy high word	Calculation unit: kVarh factor 0.1,
40271	RO	U32	Line 2 phase A input reactive energy	Calculation unit: kVarh factor 0.1,

			low word	
40272			Line 2 phase A input reactive energy high word	
40273 40274	RO	U32	Line 2 phase B input reactive energy low word Line 2 phase B input reactive energy high word	Calculation factor 0.1, unit: kVarh
40275	RO	U32	Line 2 phase C input reactive energy low word	Calculation factor 0.1, unit: kVarh
40276			Line 2 phase C input reactive energy high word	
40277 40278	RO	U32	Line 3 phase A input reactive energy low word Line 3 phase A input	Calculation factor 0.1, unit: kVarh

			reactive energy high			
40279	RO	U32	Line 3 phase B input reactive energy low word	Calculation unit: kVarh	factor	0.1,
40280			Line 3 phase B input reactive energy high word			
40281	RO	U32	Line 3 phase C input reactive energy low word	Calculation unit: kVarh	factor	0.1,
40282			Line 3 phase C input reactive energy high word			
40283	RO	U32	Line 4 phase A input reactive energy low word	Calculation unit: kVarh	factor	0.1,
40284			Line 4 phase A input reactive energy high word			
40285	RO	U32	Line 4 phase B	Calculation	factor	0.1,

40286			input reactive energy low Line 4 phase B input reactive energy high word	unit: kVarh
40287	RO	U32	Line 4 phase C input reactive energy low word	Calculation factor 0.1, unit: kVarh
40288			Line 4 phase C input reactive energy high word	
40289	RO	U32	Line 1 total input reactive energy low word	Calculation factor 0.1, unit: kVarh
40290			Line 1 total input reactive energy high word	
40291	RO	U32	Line 2 total input reactive energy low word	Calculation factor 0.1, unit: kVarh
40292			Line 2 total input reactive	

			energy high word	
40293 40294	RO	U32	Line 3 total input reactive energy low word Line 3 total input reactive energy high word	Calculation factor 0.1, unit: kVarh
40295	RO	U32	Line 4 total input reactive energy low word	Calculation factor 0.1, unit: kVarh
40296			Line 4 total input reactive energy high word	
40297 40298	RO	U32	Line 1 phase A output reactive energy low word Line 1 phase A output reactive energy high word	Calculation factor 0.1, unit: kVarh
40299	RO	U32	Line 1 phase B output reactive energy	Calculation factor 0.1, unit: kVarh

			low word	
40300			Line 1 phase B output reactive energy high word	
40301 40302	RO	U32	Line 1 phase C output reactive energy low word Line 1 phase C output reactive energy high word	Calculation factor 0.1, unit: kVarh
40303	RO	U32	Line 2 phase A output reactive energy low word	Calculation factor 0.1, unit: kVarh
40304			Line 2 phase A output reactive energy high word	
40305 40306	RO	U32	Line 2 phase B output reactive energy low word Line 2 phase B output	Calculation factor 0.1, unit: kVarh

			reactive energy high			
40307	RO	U32	Line 2 phase C output reactive energy low word	Calculation unit: kVarh	factor	0.1,
40308			Line 2 phase C output reactive energy high word			
40309	RO	U32	Line 3 phase A output reactive energy low word	Calculation unit: kVarh	factor	0.1,
40310			Line 3 phase A output reactive energy high word			
40311	RO	U32	Line 3 phase B output reactive energy low word	Calculation unit: kVarh	factor	0.1,
40312			Line 3 phase B output reactive energy high word			
40313	RO	U32	Line 3 phase C	Calculation	factor	0.1,

40314			output reactive energy low Line 3 phase C output reactive energy high word	unit: kVarh
40315	RO	U32	Line 4 phase A output reactive energy low word	Calculation unit: kVarh factor 0.1,
40316			Line 4 phase A output reactive energy high word	
40317	RO	U32	Line 4 phase B output reactive energy low word	Calculation unit: kVarh factor 0.1,
40318			Line 4 phase B output reactive energy high word	
40319	RO	U32	Line 4 phase C output reactive energy low word	Calculation unit: kVarh factor 0.1,

40320			Line 4 phase C output reactive energy high word	
40321 40322	RO	U32	Line 1 total output reactive energy low word Line 1 total output reactive energy high word	Calculation factor 0.1, unit: kVarh
40323	RO	U32	Line 2 total output reactive energy low word	Calculation factor 0.1, unit: kVarh
40324			Line 2 total output reactive energy high word	
40325 40326	RO	U32	Line 3 total output reactive energy low word Line 3 total output reactive energy high word	Calculation factor 0.1, unit: kVarh
40327	RO	U32	Line 4 total output reactive	Calculation factor 0.1, unit: kVarh

		energy low word	
40328		Line 4 total output reactive energy high word	

5.4 Device parameter setting registers

Register address	Property	Data type	Definition	Remarks
45001	RW		Reserved	
45002	RW	U16	Measurement mode	0 -1
				0: 3 phase - 4 wire
				1: 3 phase - 3 wire
45003	RW		Reserved	
45004	RW	U16	Communication address	1 - 247
45005	RW	U16	Baud rate	0-5
				0:1200
				1:2400
				2:4800
				3:9600
				4:19200
				5:38400
45006	RW	U16	Check code	0-2
				0: no parity

				1: odd
				2: even
45007	RW	U16	Stop bit	1-2
				1: 1bit stop bit
				2: 2 bits stop bit
45008	RW	U16	Pulse 1 constant	500-1000
45009	RW	U17	Reserved	
45010	RW	U16	Pulse 1 width	60-100ms
45011	RW	U16	Pulse 2 constant	500-1000
45012	RW	U17	Reserved	
45013	RW	U16	Pulse 2 width	60-100ms
45014	RW	U16	Pulse 3 constant	500-1000
45015	RW	U17	Reserved	
45016	RW	U16	Pulse 3 width	60-100ms
45017	RW	U16	Pulse 4 constant	500-1000
45018	RW	U17	Reserved	
45019	RW	U16	Pulse 4 width	60-100ms
45020	RW	U16	Power on/off current threshold values	1-10000, unit: mA
45021	RW	U16	Reserved	
45022	RW	U16	Voltage phase sequence of current circuit 1 phase A	0: phase A, 1: phase B, 2: phase C

45023	RW	U16	Voltage phase sequence of current circuit 1 phase B	0: phase A, 1: phase B, 2: phase C
45024	RW	U16	Voltage phase sequence of current circuit 1 phase C	0: phase A, 1: phase B, 2: phase C
45025	RW	U16	Voltage phase sequence of current circuit 2 phase A	0: phase A, 1: phase B, 2: phase C
45026	RW	U16	Voltage phase sequence of current circuit 2 phase B	0: phase A, 1: phase B, 2: phase C
45027	RW	U16	Voltage phase sequence of current circuit 2 phase C	0: phase A, 1: phase B, 2: phase C
45028	RW	U16	Voltage phase sequence of current circuit 3 phase A	0: phase A, 1: phase B, 2: phase C
45029	RW	U16	Voltage phase sequence of current circuit 3	0: phase A, 1: phase B, 2: phase C

			phase B	
45030	RW	U16	Voltage phase sequence of current circuit 3 phase C	0: phase A, 1: phase B, 2: phase C
45031	RW	U16	Voltage phase sequence of current circuit 4 phase A	0: phase A, 1: phase B, 2: phase C
45032	RW	U16	Voltage phase sequence of current circuit 4 phase B	0: phase A, 1: phase B, 2: phase C
45033	RW	U16	Voltage phase sequence of current circuit 4 phase C	0: phase A, 1: phase B, 2: phase C

5.5 Three phase circuit CT primary side value setting

Register address	Property	Data type	Definition		Remarks	
40501	WO	U16	CT1 circuit primary side value setting		Setting range: 1-5000	
40502	WO	U16	CT2 circuit primary side			

			value setting
40503	WO	U16	CT3 circuit primary side value setting
40504	WO	U16	CT4 circuit primary side value setting
40505	WO	U16	CT5 circuit primary side value setting
40506	WO	U16	CT6 circuit primary side value setting
40507	WO	U16	CT7 circuit primary side value setting
40508	WO	U16	CT8 circuit primary side value setting
40509	WO	U16	CT9 circuit primary side value setting
40510	WO	U16	CT10 circuit primary side value setting
40511	WO	U16	CT11 circuit

			primary side value setting	
40512	WO	U16	CT12 circuit primary side value setting	

5.6 Bulk memory registers

1.Do the data retrieval before read the data from memory. Firstly send retrieval command (i.e. retrieval data string), write the retrieval command string to register address: 47001 ~ 47006 (write this 6 registers simultaneously, otherwise, the data retrieval will not success), then read the data from register: 47007~47052.

2.The procedure to read data from memory: Firstly write to register 47001~47006, secondly read register 47007~47052.
For example: If we need to read the 2nd string of data on March 28, 2012, firstly write "0, 12, 3, 28, 2, 1" to register 47001 ~ 47006, then read the register 47007~47052.

Register address	Property	Data type	Definition	Remarks
47001	WO	U16	Reserved	Write 0
47002	WO	U16	Year	0-99
47003	WO	U16	Month	1-12
47004	WO	U16	Date	1-31

47005	WO	U16	Time point (every 5 minutes as a point)	1-288
47006	WO	U16	Number of data record	Write 1
47007	RO	U32	Unix time low word	
47008	RO	U32	Unix time high word	
47009	RO	U16	Phase A voltage	Calculation factor 0.01, Unit V
47010	RO	U16	Phase B voltage	Calculation factor 0.01, Unit V
47011	RO	U16	Phase C voltage	Calculation factor 0.01, Unit V
47012	RO	U16	Circuit 1 phase A current	Calculation factor 0.00001, Unit A
47013	RO	U16	Circuit 1 phase B current	Calculation factor 0.00001, Unit A
47014	RO	U16	Circuit 1 phase C current	Calculation factor 0.00001, Unit A
47015	RO	U16	Circuit 2 phase A current	Calculation factor 0.00001, Unit A
47016	RO	U16	Circuit 2 phase B current	Calculation factor 0.00001, Unit A
47017	RO	U16	Circuit 2 phase	Calculation factor

			C current	0.00001, Unit A
47018	RO	U16	Circuit 3 phase A current	Calculation factor 0.00001, Unit A
47019	RO	U16	Circuit 3 phase B current	Calculation factor 0.00001, Unit A
47020	RO	U16	Circuit 3 phase C current	Calculation factor 0.00001, Unit A
47021	RO	U16	Circuit 4 phase A current	Calculation factor 0.00001, Unit A
47022	RO	U16	Circuit 4 phase B current	Calculation factor 0.00001, Unit A
47023	RO	U16	Circuit 4 phase C current	Calculation factor 0.00001, Unit A
47024	RO	U16	Frequency	Calculation factor 0.01, unit: Hz
47025	RO	S32	Circuit 1 total active power low word	Calculation factor 0.001, unit: W
47026	RO	S32	Circuit 1 total active power high word	Calculation factor 0.001, unit: W
47027	RO	S32	Circuit 2 total active power low word	Calculation factor 0.001, unit: W
47028	RO	S32	Circuit 2 total active power	Calculation factor 0.001, unit: W

			high word		
47029	RO	S32	Circuit 3 total active power low word	Calculation 0.001, unit: W	factor
47030	RO	S32	Circuit 3 total active power high word	Calculation 0.001, unit: W	factor
47031	RO	S32	Circuit 4 total active power low word	Calculation 0.001, unit: W	factor
47032	RO	S32	Circuit 4 total active power high word	Calculation 0.001, unit: W	factor
47033	RO	S16	Circuit 1 total power factor	Calculation 0.001	factor
47034	RO	S16	Circuit 2 total power factor	Calculation 0.001	factor
47035	RO	S16	Circuit 3 total power factor	Calculation 0.001	factor
47036	RO	S16	Circuit 4 total power factor	Calculation 0.001	factor
47037	RO	U32	Circuit 1 total active energy low word	Calculation 0.1, unit: kWh	factor
47038	RO	U32	Circuit 1 total active energy high	Calculation 0.1, unit: kWh	factor

			word		
47039	RO	U32	Circuit 2 total active energy low word	Calculation 0.1, unit: kWh	factor
47040	RO	U32	Circuit 2 total active energy high word	Calculation 0.1, unit: kWh	factor
47041	RO	U32	Circuit 3 total active energy low word	Calculation 0.1, unit: kWh	factor
47042	RO	U32	Circuit 3 total active energy high word	Calculation 0.1, unit: kWh	factor
47043	RO	U32	Circuit 4 total active energy low word	Calculation 0.1, unit: kWh	factor
47044	RO	U32	Circuit 4 total active energy high word	Calculation 0.1, unit: kWh	factor
47045	RO	U32	Circuit 1 total reactive energy low word	Calculation 0.1, unit: kVarh	factor
47046	RO	U32	Circuit 1 total reactive	Calculation 0.1, unit: kVarh	factor

			energy high word	
47047	RO	U32	Circuit 2 total reactive energy low word	Calculation factor 0.1, unit: kVarh
47048	RO	U32	Circuit 2 total reactive energy high word	Calculation factor 0.1, unit: kVarh
47049	RO	U32	Circuit 3 total reactive energy low word	Calculation factor 0.1, unit: kVarh
47050	RO	U32	Circuit 3 total reactive energy high word	Calculation factor 0.1, unit: kVarh
47051	RO	U32	Circuit 4 total reactive energy low word	Calculation factor 0.1, unit: kVarh
47052	RO	U32	Circuit 4 total reactive energy high word	Calculation factor 0.1, unit: kVarh

5.7 Command and control registers

Register	Property	Data	Definition	Remarks

address		type		
45201	WO	U16	Clear energy data	Write 888
45202			Reserved	
45203	WO	U16	Clear parameter revising record	Write 888
45204	WO	U16	Clear power on/off event record	Write 888
45205			Reserved	
45206			Reserved	
45207			Reserved	
45208			Reserved	
45209			Reserved	
45210	WO	U16	Reset to factory default	Write 888
45212	WO	U16	Clear extended memory module data	Write 888

5.8 Device information data registers

Register address	Property	Data type	Definition	Remarks
49001	RO	U16	Device ID	
49002	RW	U16		
49003	RW	U16	Manufacturing No.	Should write or read

			low word	these two register together
49004	RW	U16	Manufacturing No. high word	
49005	RW	U16	Hardware version	
49006	RO	U16	Software version	
49007-49010	RO	U16	Reserved	
49011	RW	U16	Timing register low word	The starting second from Jan. 1st, 1970, Greenwich time, support radio command
49012	RW	U16	Timing register high word	
49013	RO	U16	Error code	
49014	RW	U16	Second	0-59
49015	RW	U16	Minute	0-59
49016	RW	U16	Hour	0-23
49017	RW	U16	Date	1-31
49018	RW	U16	Month	1-12
49019	RW	U16	Year	0-99

Tip:

1. The UNIX system time register 49011~49012 must write simultaneously.
2. The Clock register 49014~49019 must read/ write simultaneously. Time of origin: Jan 1, 2000.

5.9 Multi-tariff (TOU) data registers

Register No.	Access	Description	Remark
45301	RW	1st period tariff in spring working time	High word means finish time period. Users can divide one day (1~24 hours, 0 can't be set) up to 8 periods, and set 4 tariff maximum. Low word means tariff. Settable range is 0~3.Please note that the finish time of the latter time period must bigger than the former. If the meter detect the illegal setting or "24" hours later, it will work based on the last correct tariff. Eight hours a day at most .
45302	RW	2nd period tariff in spring working time	
45303	RW	3rd period tariff in spring working time	
45304	RW	4th period tariff in	

		spring working time	
45305	RW	5th period tariff in spring working time	
45306	RW	6th period tariff in spring working time	
45307	RW	7th period tariff in spring working time	
45308	RW	8th period tariff in spring working time	
45309	RW	1st period tariff in spring weekend	
45310	RW	2nd period tariff in spring weekend	
45311	RW	3rd period tariff in spring weekend	
45312	RW	4th period tariff in spring weekend	
45313	RW	5th period tariff in spring weekend	
45314	RW	6th period tariff in spring weekend	
45315	RW	7th period tariff in spring weekend	
45316	RW	8th period tariff in spring weekend	
45317	RW	1st period tariff in spring	

		holiday	
45318	RW	2nd period tariff in spring holiday	
45319	RW	3rd period tariff in spring holiday	
45320	RW	4th period tariff in spring holiday	
45321	RW	5th period tariff in spring holiday	
45322	RW	6th period tariff in spring holiday	
45323	RW	7th period tariff in spring holiday	
45324	RW	8th period tariff in spring holiday	
45325	RW	1st period tariff in summer working time	
45326	RW	2nd period tariff in summer working time	
45327	RW	3rd period tariff in summer working time	
45328	RW	4th period tariff in summer working time	
45329	RW	5th period tariff in summer working time	
45330	RW	6th period tariff in	

		summer working time	
45331	RW	7th period tariff in summer working time	
45332	RW	8th period tariff in summer working time	
45333	RW	1st period tariff in summer weekend	
45334	RW	2nd period tariff in summer weekend	
45335	RW	3rd period tariff in summer weekend	
45336	RW	3rd period tariff in summer weekend	
45337	RW	5th period tariff in summer weekend	
45338	RW	6th period tariff in summer weekend	
45339	RW	7th period tariff in summer weekend	
45340	RW	8th period tariff in summer weekend	
45341	RW	1st period tariff in summer holiday	
45342	RW	2nd period tariff in summer holiday	
45343	RW	3rd period tariff in	

		summer holiday	
45344	RW	4th period tariff in summer holiday	
45345	RW	5th period tariff in summer holiday	
45346	RW	6th period tariff in summer holiday	
45347	RW	7th period tariff in summer holiday	
45348	RW	8th period tariff in summer holiday	
45349	RW	1st period tariff in Autumn working time	
45350	RW	2nd period tariff in Autumn working time	
45351	RW	3rd period tariff in Autumn working time	
45352	RW	4th period tariff in Autumn working time	
45353	RW	5th period tariff in Autumn working time	
45354	RW	6th period tariff in Autumn working time	
45355	RW	7th period tariff in Autumn working time	
45356	RW	8th period tariff in	

		Autumn working time	
45357	RW	1st period tariff in Autumn weekend	
45358	RW	2nd period tariff in Autumn weekend	
45359	RW	3rd period tariff in Autumn weekend	
45360	RW	4th period tariff in Autumn weekend	
45361	RW	5th period tariff in Autumn weekend	
45362	RW	6th period tariff in Autumn weekend	
45363	RW	7th period tariff in Autumn weekend	
45364	RW	8th period tariff in Autumn weekend	
45365	RW	1st period tariff in Autumn holiday	
45366	RW	2nd period tariff in Autumn holiday	
45367	RW	3rd period tariff in Autumn holiday	
45368	RW	4th period tariff in Autumn holiday	
45369	RW	5th period tariff in	

		Autumn holiday	
45370	RW	6th period tariff in Autumn holiday	
45371	RW	7th period tariff in Autumn holiday	
45372	RW	8th period tariff in Autumn holiday	
45373	RW	1st period tariff in Winter working time	
45374	RW	2nd period tariff in Winter working time	
45375	RW	3rd period tariff in Winter working time	
45376	RW	4th period tariff in Winter working time	
45377	RW	5th period tariff in Winter working time	
45378	RW	6th period tariff in Winter working time	
45379	RW	7th period tariff in Winter working time	
45380	RW	8th period tariff in Winter working time	
45381	RW	1st period tariff in Winter weekend	
45382	RW	2nd period tariff in	

		Winter weekend	
45383	RW	3rdperiod tariff in Winter weekend	
45384	RW	4thperiod tariff in Winter weekend	
45385	RW	5th period tariff in Winter weekend	
45386	RW	6thperiod tariff in Winter weekend	
45387	RW	7thperiod tariff in Winter weekend	
45388	RW	8thperiod tariff in Winter weekend	
45389	RW	1stperiod tariff in Winter holiday	
45390	RW	2ndperiod tariff in Winter holiday	
45391	RW	3rdperiod tariff in Winter holiday	
45392	RW	4thperiod tariff in Winter holiday	
45393	RW	5thperiod tariff in Winter holiday	
45394	RW	6thperiod tariff in Winter holiday	
45395	RW	7thperiod tariff in	

		Winter holiday	
45396	RW	8thperiod tariff in Winter holiday	
45397	RW	Season that January belong to	Range from 0~3: 0 -- Spring 1 -- Summer 2 -- Autumn 3 -- Winter
45398	RW	Season that February belong to	
45399	RW	Season that March belong to	
45400	RW	Season that April belong to	
45401	RW	Season that May belong to	
45402	RW	Season that June belong to	
45403	RW	Season that July belong to	
45404	RW	Season that August belong to	
45405	RW	Season that September belong to	
45406	RW	Season that October belong to	

45407	RW	Season that November belong to	
45408	RW	Season that December belong to	

Note: Multi-tariff register No. 45397~45408 must be read/ write together

5.10 Multi-tariff (TOU) Energy registers

Register No.	Access	Description	Remark
46501	RW	Tariff 1 total kWh (low word), Outgoing circuit 1	
46502	RW	Tariff 1 total kWh (high word), Outgoing circuit 1	
46503	RW	Tariff 1 total kWh (low word), Outgoing circuit 2	
46504	RW	Tariff 1 total kWh (high word), Outgoing circuit 2	
46505	RW	Tariff 1 total kWh (low word), Outgoing circuit 3	

46506	RW	Tariff 1 total kWh (high word), Outgoing circuit 3	
46507	RW	Tariff 1 total kWh (low word), Outgoing circuit 4	
46508	RW	Tariff 1 total kWh (high word), Outgoing circuit 4	
46509	RW	Tariff 1 total kWh (low word), Outgoing circuit 5	
46510	RW	Tariff 1 total kWh (high word), Outgoing circuit 5	
46511	RW	Tariff 1 total kWh (low word), Outgoing circuit 6	
46512	RW	Tariff 1 total kWh (high word), Outgoing circuit 6	
46513	RW	Tariff 1 total kWh (low word), Outgoing circuit 7	
46514	RW	Tariff 1 total kWh (high word), Outgoing circuit 7	
46515	RW	Tariff 1 total kWh (low word), Outgoing circuit 8	
46516	RW	Tariff 1 total kWh (high word), Outgoing circuit 8	
46517	RW	Tariff 1 total kWh (low word), Outgoing circuit 9	
46518	RW	Tariff 1 total kWh (high word), Outgoing circuit 9	

46519	RW	Tariff 1 total kWh (low word), Outgoing circuit 10	
46520	RW	Tariff 1 total kWh (high word), Outgoing circuit 10	
46521	RW	Tariff 1 total kWh (low word), Outgoing circuit 11	
46522	RW	Tariff 1 total kWh (high word), Outgoing circuit 11	
46523	RW	Tariff 1 total kWh (low word), Outgoing circuit 12	
46524	RW	Tariff 1 total kWh (high word), Outgoing circuit 12	
46525	RW	Tariff 1 total kWh (low word), Outgoing circuit 1-3	
46526	RW	Tariff 1 total kWh (high word), Outgoing circuit 1-3	
46527	RW	Tariff 1 total kWh (low word), Outgoing circuit 4-6	
46528	RW	Tariff 1 total kWh (high word), Outgoing circuit 4-6	
46529	RW	Tariff 1 total kWh (low word), Outgoing circuit 7-9	
46530	RW	Tariff 1 total kWh (high word), Outgoing circuit 7-9	
46531	RW	Tariff 1 total kWh (low word), Outgoing circuit 10-12	

46532	RW	Tariff 1 total kWh (high word), Outgoing circuit 10-12	
46533	RW	Tariff 1 total kvarh (low word), Outgoing circuit 1	
46534	RW	Tariff 1 total kvarh (high word), Outgoing circuit 1	
46535	RW	Tariff 1 total kvarh (low word), Outgoing circuit 2	
46536	RW	Tariff 1 total kvarh (high word), Outgoing circuit 2	
46537	RW	Tariff 1 total kvarh (low word), Outgoing circuit 3	
46538	RW	Tariff 1 total kvarh (high word), Outgoing circuit 3	
46539	RW	Tariff 1 total kvarh (low word), Outgoing circuit 4	
46540	RW	Tariff 1 total kvarh (high word), Outgoing circuit 4	
46541	RW	Tariff 1 total kvarh (low word), Outgoing circuit 5	
46542	RW	Tariff 1 total kvarh (high word), Outgoing circuit 5	
46543	RW	Tariff 1 total kvarh (low word), Outgoing circuit 6	
46544	RW	Tariff 1 total kvarh (high word), Outgoing circuit 6	

46545	RW	Tariff 1 total kvarh (low word), Outgoing circuit 7	
46546	RW	Tariff 1 total kvarh (high word), Outgoing circuit 7	
46547	RW	Tariff 1 total kvarh (low word), Outgoing circuit 8	
46548	RW	Tariff 1 total kvarh (high word), Outgoing circuit 8	
46549	RW	Tariff 1 total kvarh (low word), Outgoing circuit 9	
46550	RW	Tariff 1 total kvarh (high word), Outgoing circuit 9	
46551	RW	Tariff 1 total kvarh (low word), Outgoing circuit 10	
46552	RW	Tariff 1 total kvarh (high word), Outgoing circuit 10	
46553	RW	Tariff 1 total kvarh (low word), Outgoing circuit 11	
46554	RW	Tariff 1 total kvarh (high word), Outgoing circuit 11	
46555	RW	Tariff 1 total kvarh (low word), Outgoing circuit 12	
46556	RW	Tariff 1 total kvarh (high word), Outgoing circuit 12	
46557	RW	Tariff 1 total kvarh (low word), Outgoing circuit 1-3	

46558	RW	Tariff 1 total kvarh (high word), Outgoing circuit 1-3	
46559	RW	Tariff 1 total kvarh (low word), Outgoing circuit 4-6	
46560	RW	Tariff 1 total kvarh (high word), Outgoing circuit 4-6	
46561	RW	Tariff 1 total kvarh (low word), Outgoing circuit 7-9	
46562	RW	Tariff 1 total kvarh (high word), Outgoing circuit 7-9	
46563	RW	Tariff 1 total kvarh (low word), Outgoing circuit 10-12	
46564	RW	Tariff 1 total kvarh (high word), Outgoing circuit 10-12	
46565	RW	Tariff 2 total kWh (low word), Outgoing circuit 1	
46566	RW	Tariff 2 total kWh (high word), Outgoing circuit 1	
46567	RW	Tariff 2 total kWh (low word), Outgoing circuit 2	
46568	RW	Tariff 2 total kWh (high word), Outgoing circuit 2	
46569	RW	Tariff 2 total kWh (low word), Outgoing circuit 3	
46570	RW	Tariff 2 total kWh (high word), Outgoing circuit 3	

46571	RW	Tariff 2 total kWh (low word), Outgoing circuit 4	
46572	RW	Tariff 2 total kWh (high word), Outgoing circuit 4	
46573	RW	Tariff 2 total kWh (low word), Outgoing circuit 5	
46574	RW	Tariff 2 total kWh (high word), Outgoing circuit 5	
46575	RW	Tariff 2 total kWh (low word), Outgoing circuit 6	
46576	RW	Tariff 2 total kWh (high word), Outgoing circuit 6	
46577	RW	Tariff 2 total kWh (low word), Outgoing circuit 7	
46578	RW	Tariff 2 total kWh (high word), Outgoing circuit 7	
46579	RW	Tariff 2 total kWh (low word), Outgoing circuit 8	
46580	RW	Tariff 2 total kWh (high word), Outgoing circuit 8	
46581	RW	Tariff 2 total kWh (low word), Outgoing circuit 9	
46582	RW	Tariff 2 total kWh (high word), Outgoing circuit 9	
46583	RW	Tariff 2 total kWh (low word), Outgoing circuit 10	

46584	RW	Tariff 2 total kWh (high word), Outgoing circuit 10	
46585	RW	Tariff 2 total kWh (low word), Outgoing circuit 11	
46586	RW	Tariff 2 total kWh (high word), Outgoing circuit 11	
46587	RW	Tariff 2 total kWh (low word), Outgoing circuit 12	
46588	RW	Tariff 2 total kWh (high word), Outgoing circuit 12	
46589	RW	Tariff 2 total kWh (low word), Outgoing circuit 1-3	
46590	RW	Tariff 2 total kWh (high word), Outgoing circuit 1-3	
46591	RW	Tariff 2 total kWh (low word), Outgoing circuit 4-6	
46592	RW	Tariff 2 total kWh (high word), Outgoing circuit 4-6	
46593	RW	Tariff 2 total kWh (low word), Outgoing circuit 7-9	
46594	RW	Tariff 2 total kWh (high word), Outgoing circuit 7-9	
46595	RW	Tariff 2 total kWh (low word), Outgoing circuit 10-12	
46596	RW	Tariff 2 total kWh (high word), Outgoing circuit 10-12	

46597	RW	Tariff 2 total kvarh (low word), Outgoing circuit 1	
46598	RW	Tariff 2 total kvarh (high word), Outgoing circuit 1	
46599	RW	Tariff 2 total kvarh (low word), Outgoing circuit 2	
46600	RW	Tariff 2 total kvarh (high word), Outgoing circuit 2	
46601	RW	Tariff 2 total kvarh (low word), Outgoing circuit 3	
46602	RW	Tariff 2 total kvarh (high word), Outgoing circuit 3	
46603	RW	Tariff 2 total kvarh (low word), Outgoing circuit 4	
46604	RW	Tariff 2 total kvarh (high word), Outgoing circuit 4	
46605	RW	Tariff 2 total kvarh (low word), Outgoing circuit 5	
46606	RW	Tariff 2 total kvarh (high word), Outgoing circuit 5	
46607	RW	Tariff 2 total kvarh (low word), Outgoing circuit 6	
46608	RW	Tariff 2 total kvarh (high word), Outgoing circuit 6	
46609	RW	Tariff 2 total kvarh (low word), Outgoing circuit 7	

46610	RW	Tariff 2 total kvarh (high word), Outgoing circuit 7	
46611	RW	Tariff 2 total kvarh (low word), Outgoing circuit 8	
46612	RW	Tariff 2 total kvarh (high word), Outgoing circuit 8	
46613	RW	Tariff 2 total kvarh (low word), Outgoing circuit 9	
46614	RW	Tariff 2 total kvarh (high word), Outgoing circuit 9	
46615	RW	Tariff 2 total kvarh (low word), Outgoing circuit 10	
46616	RW	Tariff 2 total kvarh (high word), Outgoing circuit 10	
46617	RW	Tariff 2 total kvarh (low word), Outgoing circuit 11	
46618	RW	Tariff 2 total kvarh (high word), Outgoing circuit 11	
46619	RW	Tariff 2 total kvarh (low word), Outgoing circuit 12	
46620	RW	Tariff 2 total kvarh (high word), Outgoing circuit 12	
46621	RW	Tariff 2 total kvarh (low word), Outgoing circuit 1-3	
46622	RW	Tariff 2 total kvarh (high word), Outgoing circuit 1-3	

46623	RW	Tariff 2 total kvarh (low word), Outgoing circuit 4-6	
46624	RW	Tariff 2 total kvarh (high word), Outgoing circuit 4-6	
46625	RW	Tariff 2 total kvarh (low word), Outgoing circuit 7-9	
46626	RW	Tariff 2 total kvarh (high word), Outgoing circuit 7-9	
46627	RW	Tariff 2 total kvarh (low word), Outgoing circuit 10-12	
46628	RW	Tariff 2 total kvarh (high word), Outgoing circuit 10-12	
46629-46692	RW	Tariff 3 total kvarh, Outgoing circuit 1-12 (the same as above)	

5.11 Multi-tariff bulk memory registers

Tip: Use 10H function code to send checking order

1. Step for read out bulk memory data

Send checking order (which means check field), write checking order on register 2501~3506 (Only valid when all of these 6 registers are written. Otherwise, it will default invalid. Definition of register per below)

After checking, read 43507~43706 register, then can read out the data that need to check.

For example, if we want to read tariff 1 data of March 28, 2012, then write 12, 3, 28, 1, 0, 0 to register 3501~3506 respectively, the we can read the data record of this date.

Every data record should has time point:

2. When reading bulk memory data, read 3501~3506 register first then read 43507~43706 register data

   For example, if we need to read tariff 2 kWh value of outgoing circuit 11. First write 12, 3, 28, 2, 0, 0, to register 43501 ~43706 respectively, then read 43507~43706, get value 5000 on 43527 register, multiply calculation factor 0.1 – 500.0. Then we know the kWh on that date is 500kWh.

3. When read invalid date, point and future time, then all will return “ER” ox4552

Register address	Property	Data type	Definition	Remarks
43501	WO	U8	Year	1-99
43502	WO	U8	Month	1-12
43503	WO	U8	date	1-31
43504	WO	U8	tariff	1-3 (means 3 tariff rates)
43505	WO	U8	reserve	Write 0
43506	WO	U8	reserve	Write 0

Read data register

Register No.	Access	Description	Remark

43507	RO	Tariff X total input kWh (low word), Outgoing circuit 1	
43508	RO	Tariff X total input kWh (high word), Outgoing circuit 1	
43509	RO	Tariff X total input kWh (low word), Outgoing circuit 2	
43510	RO	Tariff X total input kWh (high word), Outgoing circuit 2	
43511	RO	Tariff X total input kWh (low word), Outgoing circuit 3	
43512	RO	Tariff X total input kWh (high word), Outgoing circuit 3	
43513	RO	Tariff X total input kWh (low word), Outgoing circuit 4	
43514	RO	Tariff X total input kWh (high word), Outgoing circuit 4	
43515	RO	Tariff X total input kWh (low word), Outgoing circuit 5	
43516	RO	Tariff X total input kWh (high word), Outgoing circuit 5	
43517	RO	Tariff X total input kWh (low word), Outgoing circuit 6	
43518	RO	Tariff X total input kWh (high word), Outgoing circuit 6	
43519	RO	Tariff X total input kWh (low word), Outgoing circuit 7	

43520	RO	Tariff X total input kWh (high word), Outgoing circuit 7	
43521	RO	Tariff X total input kWh (low word), Outgoing circuit 8	
43522	RO	Tariff X total input kWh (high word), Outgoing circuit 8	
43523	RO	Tariff X total input kWh (low word), Outgoing circuit 9	
43524	RO	Tariff X total input kWh (high word), Outgoing circuit 9	
43525	RO	Tariff X total input kWh (low word), Outgoing circuit 10	
43526	RO	Tariff X total input kWh (high word), Outgoing circuit 10	
43527	RO	Tariff X total input kWh (low word), Outgoing circuit 11	
43528	RO	Tariff X total input kWh (high word), Outgoing circuit 11	
43529	RO	Tariff X total input kWh (low word), Outgoing circuit 12	
43530	RO	Tariff X total input kWh (high word), Outgoing circuit 12	
43531	RO	Tariff X total input kWh (low word), Outgoing circuit 1-3	
43532	RO	Tariff X total input kWh (high word), Outgoing circuit 1-3	

43533	RO	Tariff X total input kWh (low word), Outgoing circuit 4-6	
43534	RO	Tariff X total input kWh (high word), Outgoing circuit 4-6	
43535	RO	Tariff X total input kWh (low word), Outgoing circuit 7-9	
43536	RO	Tariff X total input kWh (high word), Outgoing circuit 7-9	
43537	RO	Tariff X total input kWh (low word), Outgoing circuit 10-12	
43538	RO	Tariff X total input kWh (high word), Outgoing circuit 10-12	
43539	RO	Tariff X total kvarh (low word), Outgoing circuit 1	
43540	RO	Tariff X total kvarh (high word), Outgoing circuit 1	
43541	RO	Tariff X total kvarh (low word), Outgoing circuit 2	
43542	RO	Tariff X total kvarh (high word), Outgoing circuit 2	
43543	RO	Tariff X total kvarh (low word), Outgoing circuit 3	
43544	RO	Tariff X total kvarh (high word), Outgoing circuit 3	
43545	RO	Tariff X total kvarh (low word), Outgoing circuit 4	

43546	RO	Tariff X total kvarh (high word), Outgoing circuit 4	
43547	RO	Tariff X total kvarh (low word), Outgoing circuit 5	
43548	RO	Tariff X total kvarh (high word), Outgoing circuit 5	
43549	RO	Tariff X total kvarh (low word), Outgoing circuit 6	
43550	RO	Tariff X total kvarh (high word), Outgoing circuit 6	
43551	RO	Tariff X total kvarh (low word), Outgoing circuit 7	
43552	RO	Tariff X total kvarh (high word), Outgoing circuit 7	
43553	RO	Tariff X total kvarh (low word), Outgoing circuit 8	
43554	RO	Tariff X total kvarh (high word), Outgoing circuit 8	
43555	RO	Tariff X total kvarh (low word), Outgoing circuit 9	
43556	RO	Tariff X total kvarh (high word), Outgoing circuit 9	
43557	RO	Tariff X total kvarh (low word), Outgoing circuit 10	
43558	RO	Tariff X total kvarh (high word), Outgoing circuit 10	

43559	RO	Tariff X total kvarh (low word), Outgoing circuit 11	
43560	RO	Tariff X total kvarh (high word), Outgoing circuit 11	
43561	RO	Tariff X total kvarh (low word), Outgoing circuit 12	
43562	RO	Tariff X total kvarh (high word), Outgoing circuit 12	
43563	RO	Tariff X total kvarh (low word), Outgoing circuit 1-3	
43564	RO	Tariff X total kvarh (high word), Outgoing circuit 1-3	
43565	RO	Tariff X total kvarh (low word), Outgoing circuit 4-6	
43566	RO	Tariff X total kvarh (high word), Outgoing circuit 4-6	
43567	RO	Tariff X total kvarh (low word), Outgoing circuit 7-9	
43568	RO	Tariff X total kvarh (high word), Outgoing circuit 7-9	
43569	RO	Tariff X total kvarh (low word), Outgoing circuit 10-12	
43570	RO	Tariff X total kvarh (high word), Outgoing circuit 10-12	
43571	RO	Tariff X total output kWh (low word), Outgoing circuit 1	

43572	RO	Tariff X total output kWh (high word), Outgoing circuit 1	
43573	RO	Tariff X total output kWh (low word), Outgoing circuit 2	
43574	RO	Tariff X total output kWh (high word), Outgoing circuit 2	
43575	RO	Tariff X total output kWh (low word), Outgoing circuit 3	
43576	RO	Tariff X total output kWh (high word), Outgoing circuit 3	
43577	RO	Tariff X total output kWh (low word), Outgoing circuit 4	
43578	RO	Tariff X total output kWh (high word), Outgoing circuit 4	
43579	RO	Tariff X total output kWh (low word), Outgoing circuit 5	
43580	RO	Tariff X total output kWh (high word), Outgoing circuit 5	
43581	RO	Tariff X total output kWh (low word), Outgoing circuit 6	
43582	RO	Tariff X total output kWh (high word), Outgoing circuit 6	
43583	RO	Tariff X total output kWh (low word), Outgoing circuit 7	
43584	RO	Tariff X total output kWh (high word), Outgoing circuit 7	

43585	RO	Tariff X total output kWh (low word), Outgoing circuit 8	
43586	RO	Tariff X total output kWh (high word), Outgoing circuit 8	
43587	RO	Tariff X total output kWh (low word), Outgoing circuit 9	
43588	RO	Tariff X total output kWh (high word), Outgoing circuit 9	
43589	RO	Tariff X total output kWh (low word), Outgoing circuit 10	
43590	RO	Tariff X total output kWh (high word), Outgoing circuit 10	
43591	RO	Tariff X total output kWh (low word), Outgoing circuit 11	
43592	RO	Tariff X total output kWh (high word), Outgoing circuit 11	
43593	RO	Tariff X total output kWh (low word), Outgoing circuit 12	
43594	RO	Tariff X total output kWh (high word), Outgoing circuit 12	
43595	RO	Tariff X total output kWh (low word), Outgoing circuit 1-3	
43596	RO	Tariff X total output kWh (high word), Outgoing circuit 1-3	
43597	RO	Tariff X total output kWh (low word), Outgoing circuit 4-6	

43598	RO	Tariff X total output kWh (high word), Outgoing circuit 4-6	
43599	RO	Tariff X total output kWh (low word), Outgoing circuit 7-9	
43600	RO	Tariff X total output kWh (high word), Outgoing circuit 7-9	
43601	RO	Tariff X total output kWh (low word), Outgoing circuit 10-12	
43602	RO	Tariff X total output kWh (high word), Outgoing circuit 10-12	
43603	RO	Tariff X Max. Active Power Demand, Outgoing circuit 1	
43604	RO	Tariff X Max. Active Power Demand, Outgoing circuit 2	
43605	RO	Tariff X Max. Active Power Demand, Outgoing circuit 3	
43606	RO	Tariff X Max. Active Power Demand, Outgoing circuit 4	
43607	RO	Tariff X Max. Active Power Demand, Outgoing circuit 5	
43608	RO	Tariff X Max. Active Power Demand, Outgoing circuit 6	
43609	RO	Tariff X Max. Active Power Demand, Outgoing circuit 7	
43610	RO	Tariff X Max. Active Power Demand, Outgoing circuit 8	

43611	RO	Tariff X Max. Active Power Demand, Outgoing circuit 9	
43612	RO	Tariff X Max. Active Power Demand, Outgoing circuit 10	
43613	RO	Tariff X Max. Active Power Demand, Outgoing circuit 11	
43614	RO	Tariff X Max. Active Power Demand, Outgoing circuit 12	
43615	RO	Tariff X Max. Active Power Demand (low word), Outgoing circuit 1-3	
43616	RO	Tariff X Max. Active Power Demand (high word), Outgoing circuit 1-3	
43617	RO	Tariff X Max. Active Power Demand (low word), Outgoing circuit 4-6	
43618	RO	Tariff X Max. Active Power Demand (high word), Outgoing circuit 4-6	
43619	RO	Tariff X Max. Active Power Demand (low word), Outgoing circuit 7-9	
43620	RO	Tariff X Max. Active Power Demand (high word), Outgoing circuit 7-9	

43621	RO	Tariff X Max. Active Power Demand (low word), Outgoing circuit 10-12	
43622	RO	Tariff X Max. Active Power Demand (high word), Outgoing circuit 10-12	

5.12 Power on/ Power off even record registers

Register address	Property	Data type	Definition	Remarks
43001	RO	U16	Number of Power On / Power off Even	
43002 -43007	RO		1st even record	
43008 -43013	RO		2nd even record	
43014 -43235	RO		….	
43236 -43241	RO		40th even record	

5.13 Power on/ Power off even registers

Register address	Property	Data type	Definition	Remarks
1	RO	U16	Phase	1: Circuit 1 Phase A 2: Circuit 1 Phase B 3: Circuit 1 Phase C 4: Circuit 2 Phase A 5: Circuit 2 Phase B 6: Circuit 2 Phase C 7: Circuit 3 Phase A 8: Circuit 3 Phase B 9: Circuit 3 Phase C 10: Circuit 4 Phase A 11: Circuit 4 Phase B 12: Circuit 4 Phase C
2	RO		Last power on / off duration time (Low word)	Unit: Second
3	RO		Last power on / off duration time (high word)	Unit: Second
4	RO		Present Status	0: Power off 1: Power on
5	RO		Happen time (Low	UNIX second low

			word)	word
6	RO	U16	Happen time (high word)	UNIX second high word

5.14 Modify Parameter even record register

Register address	Property	Data type	Definition	Remarks
42001	RO	U16	Number of Modify Parameter	
42002 -42007	RO		1st even record	
42008 -42013	RO		2nd even record	
42014 -42054	RO		…..	
42055 -42061	RO		10th even record	

5.15 Modify Parameter even record register

Register address	Property	Data type	Definition	Remarks
1	RO	U16	Type	1: Reserve
				2: System testing mode
				3: Reserve
				4: Communication Address
				5: Communication Baud rate
				6: Communication Parity
				7: Communication Stop bit
				8: Pulse 1 constant
				9: Reserve
				10: Pulse 1 width
				11: Pulse 2 constant
				12: Reserve
				13: Pulse 2 width
				14: Pulse 3 constant
				15: Reserve
				16: Pulse 3 width
				17: Pulse 4 constant

	18: Reserve
	19: Pulse 4 width
	20: Power on/ off Current threshold
	21: Reserve
	22: Current Channel 1, A voltage phase identification
	23: Current Channel 1, B voltage phase identification
	24: Current Channel 1, C voltage phase identification
	25: Current Channel 2, A voltage phase identification
	26: Current Channel 2, B voltage phase identification
	27: Current Channel 2, C voltage phase identification
	28: Current Channel 3, A voltage phase identification

				29: Current Channel 3, B voltage phase identification
				30: Current Channel 3, C voltage phase identification
				31: Current Channel 4, A voltage phase identification
				32: Current Channel 4, B voltage phase identification
				33: Current Channel 4, C voltage phase identification
2	RO	U16	New value	New value after modify
3	RO	U16	Reserve	
4	RO	U16	Old value	Old value before modify
5	RO	U16	Happen time (low word)	UNIX second low word
6	RO	U16	Happen time (high word)	UNIX second high word

10. Информация о производителе и представителе:

Информация о представителе:

Zhuhai Pilot Technology Co., Ltd.
Адрес: No. 15, Keji 6 Road, Chuangxin Haian, Tangjia High-tech Zone,
Zhuhai, Guangdong, 519085 China

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2. Телефон технической поддержки: +7 495 510-1104.
3. Отдел послепродажного обслуживания: +7 495 510-1104
4. Email: Energometrika@mail.ru