

Technical Manual

DTSD545 Three-Phase CT Operated Smart Meter



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1 Meter Installation, Connection and Dimension Diagram

1.1 Introduction

The meter user manual is intended for technically qualified personnel of energy supply companies responsible for the meter planning, installation, operation and maintenance.

The user manual contains all the information required for application of the meters for the intended purpose. This includes:

- Provision of knowledge concerning characteristics, construction and function of the meter
- Information about possible dangers, their consequences and measures to prevent any danger
- Details concerning the performance of all work throughout the service life of the meter

Field of application

DTSD545 series meter is designed for direction or transformer connection application. The direct connection meter Max. current can be 10A, 100A.

The meter is equipped with several communication port, it has a remote communication cabin, which is using GSM/GPRS/3G/4G/RF communication modem for AMI system. The flexible but most useful design, extended functionality and highest precision metering accuracy enables customers to meet these new requirements successfully.

Measuring and time of use

- High accuracy of IEC standards, class 1.0 Class B certified to EN 50470-3
- Measurement of active (kWh), reactive(kvarh), total/separated energy registers for import and export
- 12 period history energy records for utility analysis
- Up to four tariffs per day and custom billing cycles
- Precision internal real time clock (RTC) with backup long-life Li-battery
- Instantaneous per phase values of voltage, current and power factor (option)

Advanced features and functions

- Polycarbonate case and IP54 protection

- Nonvolatile memory for energy data
- Instant kw power consumption bar indicated
- Back light display, with 8 digits LCD easy to read
- 3 decimal fractions in test mode for energy detect
- Low self-consumption and long-life operation

Security and temper-proof

- Reverse energy flow detection with LCD alarm indicated
- Immune to external magnetic interference, alarm in the display when detect the interference
- Independent sealing of the meter body and terminal cover.
- Multiple level password permission of meter program

Interface and Communication

- DIN-S0 Pulse output for kWh, high-light LED indicated for accuracy test
- Data readout by optical port according to IEC 62056-21 data with OBIS identifiers (IEC 62056-61 DLMS/COSEM)
- RS-485 communication ability for customer interface

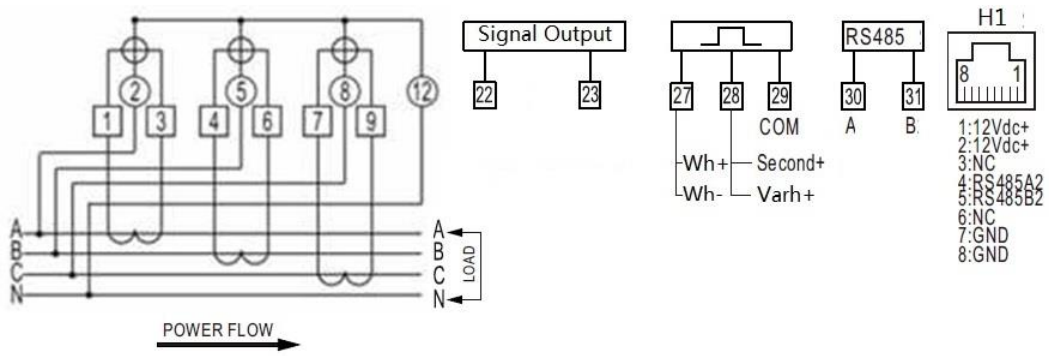
Standards

Standard	Description
IEC62052-11	Electricity metering equipment (a.c.) – General requirements, tests and test conditions – Part 11: Metering equipment
IEC62053-21	Electricity metering equipment (a.c.) – Particular requirements –Part 21: Static meters for active energy (classes 1and 2)
IEC 62053-22	Electricity metering equipment (a.c.) – static meters for active energy (classes 0.2 and 0.5)
IEC62053-23	Electricity metering equipment (a.c.) – Particular requirements –Part 23: Static meters for reactive energy (classes 2 and 3)
IEC62053-24	Part 24: Static meters for fundamental component reactive energy (classes 0,5 S, 1S and 1)
IEC 62054-21	Electricity metering (a.c.) – Tariff and load

	control – Particular requirements for time switches
IEC 62056-21	Electricity metering – Data exchange for meter reading, tariff and load control – Part 21: Direct local data exchange"
IEC 62056-42	Electricity metering-Data exchange for meter reading, tariff and load control-Part 42: physical layer services and procedures for connection-oriented asynchronous data exchange.
IEC 62056-46	Electricity metering-Data exchange for meter reading, tariff and load control-Part 46: data link layer using HDLC protocol.
IEC 62056-47	Electricity metering – Data exchange for meter reading, tariff and load control –COSEM transport layers for IP networks
IEC 62056-53	Electricity metering-Data exchange for meter reading, tariff and load control-Part53: COSEM application layer.
IEC 62056-61	Electricity metering-Data exchange for meter reading, tariff and load control-Part61: object identification system (OBIS).
IEC 62056-62	Electricity metering – Data exchange for meter reading, tariff and load control –Interface classes
EN 50470-1	Electricity metering equipment (a.c.) Part 1: General requirements, tests and test conditions - Metering equipment (class indexes A, B and C)
EN 50470-3	Electricity metering equipment (a.c.) Part 3: Particular requirements -Static meters for active energy (class indexes A, B and C)
EN / IEC 60529	Degrees of protection provided by enclosures.
EN/IEC 62058-11	Electricity metering equipment (A.C.) - Acceptance inspection Part 11: General acceptance inspection methods
EN/IEC 62058-31	Electricity metering equipment (AC) - Acceptance inspection - Part 31: Particular requirements for static meters for active energy (classes 0,2 S, 0,5 S, 1 and 2)
EN/IEC 60068-2-6	Basic environmental testing Procedures Part 2: Tests. Test EA : shock
EN/IEC 60068-2-30	Basic environmental testing Procedures Part 2: Tests. Test Db and guidance: Damp, neat cyclic (12 +

	12 - hour cycle).
EN/IEC 60695-2-1	Fire hazard testing part 2: test methods. Glow wire test and guidance.
EN/IEC 60695-2-2	Fire hazard testing part 2: Test methods Needle flame test.
CENELEC / TC13	CENELEC technical body responsible for equipment for electrical energy measurement and load control.
IEC 62055-31	Electricity metering – Payment systems – Part 31: Particular requirements – Static payment meters for active energy (classes 1 and 2)

1.4 Detailed Connection Diagram



2 Meter Function Introduction

2.1 Function and Performance Specification

Item	Sub-item	Parameter
Basic Parameter	Meter type	3P4W
	Active accuracy class	CT meter: Class B (EN 50470-3) or Class C
	Reactive accuracy class	Class 2 (IEC 62053-23)
	Nominal voltage	3P4W meter: 3x 230/400 V Operating voltage: 0.8Un~1.12Un
	Nominal frequency	50Hz +/-2%
	Current specification	CT meter: 5(10)A
	Starting current	CT meter: 0.002Ib
	Pulse constant	CT meter: 10000imp/kWh, 10000imp/kvarh,
	Power consumption	Current circuit: active power consumption<0.5VA Voltage circuit: active consumption<2.0W, apparent power consumption<5VA
	Operating temperature range	-40°C ~ +70°C
	Storage temperature range	-40°C ~ +70°C
	Humidity range	5%~95%RH
Waterproof and dustproof level	IP51	
Special Test Type	Pulse voltage	6KV
Communication	Communication port	One near-infrared communication port, 300-9600bps One RS485 communication port, 9600bps One GSM/GPRS/3G/4G communication port, 9600-19200bps
	Communication protocol	Near-infrared communication: IEC62056-21 E mode RS485 communication: HDLC DLMS/COSEM 2G/4G communication: TCP DLMS/COSEM
Metering	Active energy	Import active energy(1-0.1.8.0.255) = +A1 + +A2 + +A3 Or= +A1 + +A2 + +A3 + -A1 + -A2 + -A3 Export reactive energy(1-0.2.8.0.255) = -A1 + -A2 + -A3

	Reactive energy	<p>Import reactive energy(1-0.3.8.0.255) $+R= +Ri + +Rc$ Export reactive energy(1-0.4.8.0.255) $-R= -Ri + -Rc$ (+Ri: reactive quadrant 1 +Rc:reactive quadrant 2 -Ri: reactive quadrant 3 -Rc: reactive quadrant 4)</p>
	Reactive energy of 4 quadrant	Reactive energy of quadrant: I, II, III, IV
	Absolute energy	<p>Absolute active energy (1-0.15.8.0.255) $= +A1 + +A2 + +A3 + -A1 + -A2 + -A3$</p>
	Apparent energy	<p>Import apparent energy(1-0.9.8.0.255) $= +A1 + +A2 + +A3$ Or=$+A1 + +A2 + +A3 + -A1 + -A2 + -A3$ Export apparent energy(1-0.10.8.0.255) $= -A1 + -A2 + -A3$</p>
	Split-phase energy	<p>A/B/C Import active energy (1-0.21/41/61.8.0.255) $= +A$ or $+A + -A$ A/B/C Export active energy (1-0.22/42/62.8.0.255) $= -A$ A/B/C Import reactive energy (1-0.23/43/63.8.0.255) $+R= +Ri + +Rc$ A/B/C Export reactive energy(1-0.24/44/64.8.0.255) $-R= -Ri + -Rc$</p>
	Instantaneous values	<p>Voltage (A/B/C) Current (A/B/C) Power factor (total/ A/B/C) Active power (total/ A/B/C) Export active power(A/B/C) Reactive power (Total/ A/B/C) Export reactive power(A/B/C) Apparent power (Total/ A/B/C) Power grid frequency Voltage angle (AB/AC) Voltage and current angle (A/B/C)</p>
LED and LCD Display	LED indicator	One active pulse output, one reactive pulse output, one alarm light
	LCD indicator	Electricity display mode: 5+3/6+2/7+1/8+0 configurable, decimals of power off is the same as power on
	Display mode	Auto display mode Button display mode

		Power-off display mode: (display items are the same as button mode)
	Display operation	Normal display time is configurable: 1~99s, default is 10s. Button display: Press to wake up and switch to auto display mode without operation in 30s (details refer to display part) Power-off display: press to wake up. LCD displays about 8s and then off.
	Display content	Two display list, details refer to display part
TOU	TOU	<ul style="list-style-type: none"> - Up to 6 tariff - 12 day profile table (10 time span per day profile) - 12 week profile table (7 typical days per week profile) - 12 season profile table (1 typical week per season profile) - 100 definable special holidays
	Clock	≤0.5s/day (in 23°C ,5PPM)
	Daylight saving time	Support
	Battery life	10 years battery operation life; Operate for at least 3 years in case of any power failure
Load Profile, Maximum Demand & Billing Data	Load capture period	Capture period is configurable: 1~60 min
	Load profile 1 (energy & demand)	Up to 24 capture object Capture interval: 1~60min, default is 30 min Storage: more than 120 days 30 minutes interval (4800 records)
	Load profile 2 (instantaneous)	Up to 24 capture object Capture interval: 1~60min, default is 30 min Storage: more than 120 days 30 minutes interval (4800 records)
	Maximum demand period	Period is configurable: 1min, 5min, 10 min, 15 min, 30 min, 60 min Sliding number: 1-15
	Billing way	Manually billing: pressing the programming button for over 5s and reset max. demand. Programming billing: billing by PC software and reset max. demand. Automatically billing: billing automatically on billing days.

	Billing data	<p>Billing data are configurable and can store latest 12 times data.</p> <p>Data capture objects are as follows:</p> <p>Billing time</p> <p>Meter number</p> <p>Import/Export active tariff energy of total and split</p> <p>Import/Export reactive tariff energy of total and split</p> <p>Reactive total and split tariff energy of Q1</p> <p>Reactive total and split tariff energy of Q2</p> <p>Reactive total and split tariff energy of Q3</p> <p>Reactive total and split tariff energy of Q4</p> <p>Total import apparent energy</p> <p>Total export apparent energy</p> <p>Import/Export active MD and occurrence time of total and split tariff</p> <p>Alarm status</p> <p>Billing times</p>
Event	Event log	<p>Support latest 100 items at most</p> <p>Details see 2.2.8</p>
	Event operation Parameter setting	<p>Details see 2.2.8</p>
Data Security	Data security	<p>Client users have access to meter:</p> <p>Management user (21);</p> <p>Technical user (23);</p> <p>Module management user (22);</p> <p>Upgrade user (20);</p> <p>Read user (16);</p> <p>Management user, technical user, module management user and upgrade user adopt LN access mode and LLS encryption mode to access the meter, and the secret key of each user is different.</p> <p>Read user can access the meter by LN mode.</p> <p>Please pay attention to the differences of access to data among each user.</p>

2.2 Meter Function Description

2.2.1 Energy Metering

1) Metering method:

Import active energy= |+ A1 |+ |+ A2 |+ |+ A3 |+ |- A1 |+ |- A2 |+
|- A3 |

Or = |+ A1 |+ |+ A2 |+ |+ A3 |

Export active energy= |- A1 |+ |- A2 |+ |- A3 |

Import reactive energy= |+Ri |+ |+Rc |

Export reactive energy= |-Ri |+ |-Rc |

(The +Ri is Q1, the +Rc is Q2, the -Ri is Q3, the -Rc is Q4)

The metering method of apparent energy is the same as active metering; Import active energy and apparent energy can be set by sending order

2) Metering accuracy

- CT meter: active class 1/Class B, reactive class 2

3) Metering item:

- Import active tariff energy of total and split
- Export active tariff energy of total and split
- Import reactive tariff energy of total and split
- Export reactive tariff energy of total and split
- Total reactive energy of quadrant 4
- Total import apparent energy
- Total export apparent energy
- Total import/export active energy of split-phase
- Total import/export reactive energy of split-phase

2.2.2 Demand

1) Recording mode:

- Block mode:
Periodic time: 1/5/10/15/30/60 minutes (configurable)
- Slip mode: the ratio between interval period time/ slip period time ratio must not more than 15

2) Maximum demand reset

- Manually billing: pressing the programming button for over 5s and reset current maximum demand.
- Programming billing: billing by PC software and reset current maximum demand.
- Automatic billing: billing automatically on billing days.

3) Definition:

- Demand: average power consumption of user during period
- Maximum demand: maximum demand during billing period
- Cumulative maximum demand: Maximum demand during the whole working period

4) Billing items:

- Import/Export active MD and occurrence time of total and split tariff
- Import/Export reactive MD and occurrence time of total and split tariff
- Total import apparent MD and occurrence time
- Total export apparent MD and occurrence time

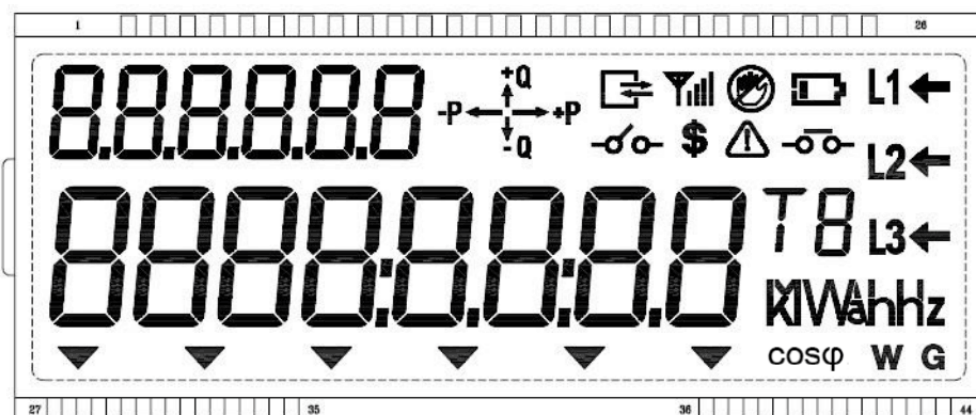
2.2.3 Instantaneous values

- Voltage (A/B/C)
- Current (A/B/C)
- Power factor (Total/A/B/C)
- Active power (Total)
- Import active power (A/B/C)
- Export active power (A/B/C)
- Reactive power (Total)
- Import reactive power (A/B/C)
- Export reactive power (A/B/C)
- Apparent power (Total/A/B/C)
- Power grid frequency
- Voltage angle (AB/AC)
- Voltage and current angle (A/B/C)

2.2.4 Display










2.2.4.1 LCD Display

1) LCD full display:



2) LCD status and alarm display






LCD Symbol	Description
	Value display
	OBIS
	Communication indicator Meter is communicated if displayed
kVarh	Combined unit of kWh, kvarh, VA, V, A, W
	From left to right: 1 st triangle: successful connection of GPRS\RF\PLC 2 nd triangle: meter terminal cover open 3 rd triangle: meter cover open 4 th triangle: magnetic influence 5 th triangle: removal of GPRS\RF\PLC (unused) 6 th triangle: reversed phase sequence
L1	Keep display: phase A voltage is normal Keep flash: overvoltage or undervoltage Without display: loss of phase
L2	Keep display: phase B voltage is normal Keep flash: overvoltage and undervoltage Without display: loss of phase
L3	Keep display: phase C voltage is normal Keep flash: overvoltage or undervoltage Without display: loss of phase
L1 L2 L3	If L1/L2/L3 flash at the same time, take reversed phase sequence into first consideration, and then consider overvoltage and undervoltage
T8	“T1”: current working tariff 1 “T2”: current working tariff 2 “T3”: current working tariff 3 “T4”: current working tariff 4 “T5”: current working tariff 5 “T6”: current working tariff 6
	Q1: Active power and reactive power both import
	Q2: Active power export, reactive power import
	Q3: Active power and reactive power both export
	Q4: Active power import, reactive power export

	Low-battery alarm
	Without display: meter has no module or module has no SIM card Meter failed to obtain IP if the symbol 'Y' flash  mean IP has been obtained and indicates the intensity of signal
	Current reversed event
	Alarm indicator: power control disconnection
	Temper indicator: it will display in the condition of meter cover open, terminal cover open and magnetic influence
	It will display when relay is disconnected remotely. If the relay is closed remotely and the symbol keep flashing, then only the switch be closed manually can power be supplied normally It will flash when relay is disconnected manually
	It will display when meter is disconnected because of normal load capacity. It will flash when meter is disconnected because of urgent load capacity.
	Relay is in closed status

2.2.4.2 Display Mode

- 1) Auto scroll display
- 2) Manual button display
- 3) Power failure display

2.2.4.3 Display Time

-  Auto scroll display : 1 to 99 configurable, default is 10s;
-  Manual button display: the LCD will keep in this mode for 30s and turn to auto display mode if there is no more button display;
-  Power failure display: when there is power failure, the LCD will not display until pressing the button, and it can keep display for 12s if there is no more button pressing.
-  Backlight display time: 5 to 60 configurable, it can be awakened by power on and button (backlight will be closed when voltage of three phases are all less than 150V)
- 

2.2.4.4 Display Contents

Auto display mode and button display mode are divided into two scroll display lists. Each list can support 60 items at most. Pressing button to wake up button display list, and LCD will switch to scroll display list after 30s. Specific display contents are as follows:

OBIS	Description	Unit
1.8.0	Total Import Active Energy	kWh
1.8.1	Import Active Energy of T1	kWh
1.8.2	Import Active Energy of T2	kWh
1.8.3	Import Active Energy of T3	kWh
1.8.4	Import Active Energy of T4	kWh
1.8.5	Import Active Energy of T5	kWh
1.8.6	Import Active Energy of T6	kWh
2.8.0	Total Export Active Energy	kWh
2.8.1	Export Active Energy of T1	kWh
2.8.2	Export Active Energy of T2	kWh
2.8.3	Export Active Energy of T3	kWh
2.8.4	Export Active Energy of T4	kWh
2.8.5	Export Active Energy of T5	kWh
2.8.6	Export Active Energy of T6	kWh
3.8.0	Total Import Reactive Energy	kvarh
3.8.1	Import Reactive Energy of T1	kvarh
3.8.2	Import Reactive Energy of T2	kvarh
3.8.3	Import Reactive Energy of T3	kvarh
3.8.4	Import Reactive Energy of T4	kvarh
3.8.5	Import Reactive Energy of T5	kvarh
3.8.6	Import Reactive Energy of T6	kvarh
4.8.0	Total Export Reactive Energy	kvarh
4.8.1	Export Reactive Energy of T1	kvarh
4.8.2	Export Reactive Energy of T2	kvarh
4.8.3	Export Reactive Energy of T3	kvarh
4.8.4	Export Reactive Energy of T4	kvarh
4.8.5	Export Reactive Energy of T5	kvarh
4.8.6	Export Reactive Energy of T6	kvarh
9.8.0	Total Import Apparent Energy	kVAh
10.8.0	Total Export Apparent Energy	kVAh
5.8.0	Total Reactive Energy of Q1	kvarh
6.8.0	Total Reactive Energy of Q2	kvarh
7.8.0	Total Reactive Energy of Q3	kvarh
8.8.0	Total Reactive Energy of Q4	kvarh

21.8.0	Total Import Active Energy of L1	kWh
41.8.0	Total Import Active Energy of L2	kWh
61.8.0	Total Import Active Energy of L3	kWh
22.8.0	Total Export Active Energy of L1	kWh
42.8.0	Total Export Active Energy of L2	kWh
62.8.0	Total Export Active Energy of L3	kWh
23.8.0	Total Import Reactive Energy of L1	kvarh
43.8.0	Total Import Reactive Energy of L2	kvarh
63.8.0	Total Import Reactive Energy of L3	kvarh
24.8.0	Total Export Reactive Energy of L1	kvarh
44.8.0	Total Export Reactive Energy of L2	kvarh
64.8.0	Total Export Reactive Energy of L3	kvarh
1.6.0	Total Import Active MD and Occurrence Time	kW
1.6.1	Import Active MD and Occurrence Time of T1	kW
1.6.2	Import Active MD and Occurrence Time of T2	kW
1.6.3	Import Active MD and Occurrence Time of T3	kW
1.6.4	Import Active MD and Occurrence Time of T4	kW
1.6.5	Import Active MD and Occurrence Time of T5	kW
1.6.6	Import Active MD and Occurrence Time of T6	kW
2.6.0	Total Export Active MD and Occurrence Time	kW
2.6.1	Export Active MD and Occurrence Time of T1	kW
2.6.2	Export Active MD and Occurrence Time of T2	kW
2.6.3	Export Active MD and Occurrence Time of T3	kW
2.6.4	Export Active MD and Occurrence Time of T4	kW
2.6.5	Export Active MD and Occurrence Time of T5	kW
2.6.6	Export Active MD and Occurrence Time of T6	kW
3.6.0	Total Import Reactive MD and Occurrence Time	kvar
3.6.1	Import Reactive MD and Occurrence Time of T1	kvar
3.6.2	Import Reactive MD and Occurrence Time of T2	kvar
3.6.3	Import Reactive MD and Occurrence Time of T3	kvar
3.6.4	Import Reactive MD and Occurrence Time of T4	kvar
3.6.5	Import Reactive MD and Occurrence Time of T5	kvar
3.6.6	Import Reactive MD and Occurrence Time of T6	kvar
4.6.0	Total Export Reactive MD and Occurrence Time	kvar
4.6.1	Export Reactive MD and Occurrence Time of T1	kvar
4.6.2	Export Reactive MD and Occurrence Time of T2	kvar
4.6.3	Export Reactive MD and Occurrence Time of T3	kvar
4.6.4	Export Reactive MD and Occurrence Time of T4	kvar
4.6.5	Export Reactive MD and Occurrence Time of T5	kvar
4.6.6	Export Reactive MD and Occurrence Time of T6	kvar
9.6.0	Total Import Apparent MD and Occurrence Time	kVA

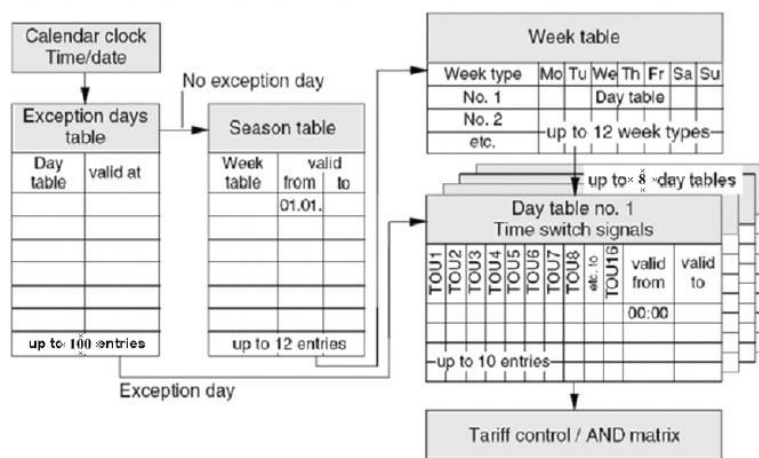
10.6.0	Total Export Apparent MD and Occurrence Time	kVA
32.7.0	Phase A Voltage	V
52.7.0	Phase B Voltage	V
72.7.0	Phase C Voltage	V
31.7.0	Phase A Current	A
51.7.0	Phase B Current	A
71.7.0	Phase C Current	A
14.7.0	Frequency	Hz
1.7.0	Import Active Power	kW
21.7.0	Import Active Power of Phase A	kW
41.7.0	Import Active Power of Phase B	kW
61.7.0	Import Active Power of Phase C	kW
23.7.0	Import Reactive Power of Phase A	kvar
43.7.0	Import Reactive Power of Phase B	kvar
63.7.0	Import Reactive Power of Phase C	kvar
9.7.0	Total Apparent Power	kVA
29.7.0	Apparent Power of Phase A	kVA
49.7.0	Apparent Power of Phase B	kVA
69.7.0	Apparent Power of Phase C	kVA
22.7.1	Export Active Power of Phase A	kW
42.7.1	Export Active Power of Phase B	kW
62.7.1	Export Active Power of Phase C	kW
24.7.1	Export Reactive Power of Phase A	kvar
44.7.1	Export Reactive Power of Phase B	kvar
64.7.1	Export Reactive Power of Phase C	kvar
13.7.0	Total Power Factor	
33.7.0	Power Factor of Phase A	
53.7.0	Power Factor of Phase B	
73.7.0	Power Factor of Phase C	
0.9.1	Time	hh:mm:ss
0.9.2	Date	DD-MM-YY
0.9.6	BillingTimes	
0.9.5	Billing Time	
0.2.2	Current Tariff Name	
C.1.0	Meter Number	12 digits
C.13.1	Power Grid Information (display in real time when in alarm status)	

2.2.4.5 Alarm Code

Definition of power grid information(C.13.1) are as follows:(from left to right, 0 means not occur, 1means occurred):

BIT7	BIT6	BIT5	BIT4	BIT3	BIT2	BIT1	BIT0
Reversed phase sequence	Loss of current	Reverse	Reversed phase A/B/C	Loss of Neutral line	Loss of phase	Undervoltage	Overvoltage

2.2.5 TOU



It contains two switchable tariff scheme: immediate activation and periodic activation

Item	Value
Tariff	6
Day Time Span	24
Day Profile Table	8
Week Profile Table	12
Season Profile Table	12
Definable special days	100

2.2.6 Clock

- 1) Auto-switch of leap year.
The clock error $\leq 0.5s/Day$ (in 23°C, 5ppm)
- 2) Built-in battery life: 10 years battery operation life; Operating for at least 3 years in case of any power failure.

2.2.7 Daylight Saving Time

The meter can be set to daylight saving time which can be switched at any time of each year or specified year. The format is XX Year XX Month XX Week XX

Day XX Hour ~ XX Year XX Month XX Week XX Day XX Hour, and time difference is -120min~+120min (configurable). Day light saving time will be closed when time difference turns into 0

Setting rules:

- 1) Year: If the year is unspecified, then daylight saving time is valid for every year; If the year is specified, then the start and end year of daylight saving time must be set within the same year instead of beyond the year.
- 2) Month: 1 to 12 configurable, and month cannot be unspecified
- 3) Day: Day 1~28, last second days and last day of one month are configurable, and day cannot be unspecified.
- 4) Week: Monday ~ Friday, unspecified and configurable.
 - If week is unspecified, then week is invalid and day is valid
 - If week is specified, then day is invalid and week is valid. Day 1~7 is the first week; day 8~14 is the second week; day 15~21 is the third week; day 22~28 is the fourth week; the last second days of one month means the last second week of the month; the last day of one month means the last week of the moth; for example, 12th, Wednesday means the second Wednesday of this month.
- 5) Hour: 00~23 configurable,
When meter is in the daylight saving time mode, the symbol of current operation tariff will flash, and if the meter drops out daylight saving mode, the mark will stop flashing. The tariff symbol will stop flashing no matter whether it is in daylight saving time mode or not during power failure. If the switch time of daylight saving time is during power failure, then the next switch time is the integral minute after power on.

2.2.8 Event

2.2.8.1 Standard Event

Record latest 100 events, and the contents are as follows;

Event	Event
Meter reset (display during power off, battery removal and discharging)	Meter is introspected falsely
Firmware is upgraded successfully	Meter is introspected successfully
Programming event	Start of battery undervoltage
Total event reset	End of battery undervoltage
Password error	Start of daylight saving time
Clock setting	End of daylight saving time
Seasonal variation	

2.2.8.2 Power Grid Event

Record latest 100 power grid event, and the contents are as follows:

Event	Event
Phase A reversed current start	Phase A losing start
Phase A reversed current end	Phase A losing end
Phase B reversed current start	Phase B losing start
Phase B reversed current end	Phase B losing end
Phase C reversed current start	Phase C losing start
Phase C reversed current end	Phase C losing end
Phase A overvoltage 1/2 start	Phase A undervoltage 1/2 start
Phase A overvoltage 1/2 end	Phase A undervoltage 1/2 end
Phase B overvoltage 1/2 start	Phase B undervoltage 1/2 start
Phase B overvoltage 1/2 end	Phase B undervoltage 1/2 end
Phase C overvoltage 1/2 start	Phase C undervoltage 1/2 start
Phase C overvoltage 1/2 end	Phase C undervoltage 1/2 end
Unbalanced current start	Phase A current losing start
Unbalanced current end	Phase A current losing end
Unbalanced voltage start	Phase B current losing start
Unbalanced voltage end	Phase B current losing end
Reversed phase sequence start	Phase C current losing start
Reversed phase sequence end	Phase C current losing end
Reversed polarity start	Phase A with current and no voltage start
Reversed polarity end	Phase A with current and no voltage end
Power off start	Phase B with current and no voltage start
Power off end	Phase B with current and no voltage end
Neutral line losing start	Phase C with current and no voltage start
Neutral line losing end	Phase C with current and no voltage end

2.2.8.3 Relay Event

Record latest 100 relay connecting and disconnecting event, and contents are as follows:

Event	Description
Remote disconnect/connect	Record the event when switch is disconnected and connected by sending orders remotely
Local disconnect/connect	Record the disconnecting power value of overload and overpower simultaneously
R1 On/Off	R1 On and Off event

R2 On/Off	R2 On and Off event
Tariff variation	Inner tariff variation

2.2.8.4 Tamper Event

Record latest 100 tampering events, and contents are as follows:

Event	Event
Open terminal cover start	Phase A reversed current start
Open terminal cover end	Phase A reversed current end
Strong magnetic influence test start	Phase B reversed current start
Strong magnetic influence test end	Phase B reversed current end
Open meter cover start	Phase C reversed current start
Open meter cover end	Phase C reversed current end

2.2.8.5 GPRS Event

Record latest 100 GPRS relevant event, and contents are as follows:

Event	Event
GPRS signal lose	GPRS IP lose
GPRS signal built	GPRS IP obtain

2.2.8.6 Clock Setting Event

Record latest 100 clock setting events:

Event	Description
Clock setting	Record the clock data of before and after setting

2.2.8.7 Total Event Reset

Record latest 100 times total resetting events.

2.2.8.8 LED Alarm

When the events of meter cover open, terminal cover open, magnetic influence, reversed phase sequence and unset alarm occur, the alarm light will keep on and alarm light will off when these events end.

2.2.8.9 Parameter Setting

Event	Event judgment conditions and delay
Overvoltage	1-600V configurable, overvoltage 1 < overvoltage 2
Undervoltage	1-600V configurable, undervoltage 1 > undervoltage 2
Undervoltage/overvoltage judgment time	Delay 1-60s (configurable), Renew the judgment time immediately once the start time change, and renew the judgment time until the next event happen when end time change (the following judgment time are same as this one)
Loss of phase	Delay 1~60s (configurable), threshold: undervoltage > undervoltage > loss of phase
Reverse	Delay 1~60s (configurable) Judgment condition: direct current > 12mA, and power is reverse; mutual current > 5mA, and power is reverse
Reverse phase sequence	Delay 1~60s (configurable) Three phase voltage must > 0, angle BA > CA + 5°
With current and no voltage	Delay 3s Judgment condition: current > 20mA, voltage < phase losing value
Loss of current	Delay 30s If current of each phase is no more than judgment threshold, it was loss of current
Reversed polarity	Delay 1~60s (configurable) Judgment condition: 1, the value of reverse polarity voltage * 1.73 is between ±5V of other two measured value 2, The angle between one phase and another is from 25° to 35°, and angle between one phase and the rest one is from 325° to 335°.
Unbalanced voltage	Delay 1~60s (configurable) Judgment condition: (max - min) > (max * 50%)
Unbalanced current	Delay 1~60s (configurable) Unbalanced judgment conditions: (max - min) > (max * 50%)
Loss of Neutral line	Delay 3s, one detection period is 6s
Detection of meter cover, terminal cover and magnetic influence	Delay 3s, Meter cover and terminal cover can be opened for detection during power failure

2.2.9 Load Record

Support two load profile: energy & demand load profile and instantaneous

load profile, each profile can store 512000 byte at most.

2.2.9.1 Energy and Demand Load Profile

- 1) Support 24 channel at most (configurable)
- 2) Load recording time: 1~60 minute configurable, default is 30 minutes, load capacity: storage cycle is 30min, and can store 4 month data at least.
- 3) Load record resetting
- 4) Support split channel reading
- 5) Load recording contents:

Capture Object
Capture Time
Total Import Active Demand
Total Export Active Demand
Total Import Reactive Demand
Total Export Reactive Demand
Total Import Apparent Demand
Total Export Apparent Demand
Total Import Apparent MD and Occurrence Time
Total Export Apparent MD and Occurrence Time
Import Active Tariff Energy of Total and Split
Export Active Tariff Energy of Total and Split
Import Reactive Tariff Energy of Total and Split
Export Reactive Tariff Energy of Total and Split
Reactive Total Energy of Q1
Reactive Total Energy of Q2
Reactive Total Energy of Q3
Reactive Total Energy of Q4
Total Import Apparent Energy
Total Export Apparent Energy

2.2.9.2 Instantaneous Load Profile

- 1) Support 24 channel at most (configurable)
- 2) Load recording time: 1~60 minutes configurable, default is 30min.
- 3) Load capacity: storage cycle is 30min, can store 100 days data at least
- 4) Load record resetting
- 5) Support split channel reading
- 6) Load recording contents:

Capture Object
Capture Time
A/B/C Phase Voltage (Ins,Max,Min,Avg)
A/B/C Phase Current (Ins,Max,Min,Avg)
Active Power of Total/A/B/C (Ins,Max,Min,Avg)

Reactive Power of Total/A/B/C(Ins,Max,Min,Avg)
Apparent Total/A/B/C Power(Ins,Max,Min)
Power Grid Frequency (Ins)
Frequency Factor of Total /A/B/C (Ins,Max,Min,Avg)
Voltage and Current Angle of A/B/C Phase (Ins,Max,Min)
Voltage Angle of AB, AC Phase (Ins,Max,Min)

2.2.10 Billing

2.2.10.1 Billing Method

- 1) Manually billing: keep pressing the programming button for over 5s and reset current maximum demand.
- 2) Programming billing: billing by PC software and reset current maximum demand.
- 3) Automatic billing: billing automatically on billing days. Date and time are configurable (Month: 1~28, Time: 00:00:00 ~23:00:00), and store latest 12 times data.
- 4) Billing channel can be programmed flexibly, and supportive billing objects see following chart; resetting object is billing profile clearing.
- 5) Support split channel reading.

2.2.10.2 Billing Profile

- 1) Billing object

OBIS	Description	Unit
1-0.1.8.0.255	Total Import Active Energy	kWh
1-0.1.8.1.255	Import Active Energy of T1	kWh
1-0.1.8.2.255	Import Active Energy of T2	kWh
1-0.1.8.3.255	Import Active Energy of T3	kWh
1-0.1.8.4.255	Import Active Energy of T4	kWh
1-0.1.8.5.255	Import Active Energy of T5	kWh
1-0.1.8.6.255	Import Active Energy of T6	kWh
1-0.2.8.0.255	Total Export Active Energy	kWh
1-0.2.8.1.255	Export Active Energy of T1	kWh
1-0.2.8.2.255	Export Active Energy of T2	kWh
1-0.2.8.3.255	Export Active Energy of T3	kWh
1-0.2.8.4.255	Export Active Energy of T4	kWh
1-0.2.8.5.255	Export Active Energy of T5	kWh
1-0.2.8.6.255	Export Active Energy of T6	kWh
1-0.3.8.0.255	Total Import Reactive Energy	kvarh
1-0.3.8.1.255	Import Reactive Energy of T1	kvarh
1-0.3.8.2.255	Import Reactive Energy of T2	kvarh
1-0.3.8.3.255	Import Reactive Energy of T3	kvarh

1-0.3.8.4.255	Import Reactive Energy of T4	kvarh
1-0.3.8.5.255	Import Reactive Energy of T5	kvarh
1-0.3.8.6.255	Import Reactive Energy of T6	kvarh
1-0.4.8.0.255	Total Export Reactive Energy	kvarh
1-0.4.8.1.255	Export Reactive Energy of T1	kvarh
1-0.4.8.2.255	Export Reactive Energy of T2	kvarh
1-0.4.8.3.255	Export Reactive Energy of T3	kvarh
1-0.4.8.4.255	Export Reactive Energy of T4	kvarh
1-0.4.8.5.255	Export Reactive Energy of T5	kvarh
1-0.4.8.6.255	Export Reactive Energy of T6	kvarh
1-0.5.8.0.255	Total Reactive Energy of Q1	kvarh
1-0.6.8.0.255	Total Reactive Energy of Q2	kvarh
1-0.7.8.0.255	Total Reactive Energy of Q3	kvarh
1-0.8.8.0.255	Total Reactive Energy of Q4	kvarh
1-0.1.6.0.255	Total Import Active MD and Occurrence Time	kW
1-0.1.6.1.255	Import Active MD and Occurrence Time of T1	kW
1-0.1.6.2.255	Import Active MD and Occurrence Time of T2	kW
1-0.1.6.3.255	Import Active MD and Occurrence Time of T3	kW
1-0.1.6.4.255	Import Active MD and Occurrence Time of T4	kW
1-0.1.6.5.255	Import Active MD and Occurrence Time of T5	kW
1-0.1.6.6.255	Import Active MD and Occurrence Time of T6	kW
1-0.2.6.0.255	Total Export Active MD and Occurrence Time	kW
1-0.2.6.1.255	Export Active MD and Occurrence Time of T1	kW
1-0.2.6.2.255	Export Active MD and Occurrence Time of T2	kW
1-0.2.6.3.255	Export Active MD and Occurrence Time of T3	kW
1-0.2.6.4.255	Export Active MD and Occurrence Time of T4	kW
1-0.2.6.5.255	Export Active MD and Occurrence Time of T5	kW
1-0.2.6.6.255	Total Export Active MD and Occurrence Time	kW
1.0.9.6.0.255	Total Import Apparent MD and Occurrence Time	kVA
1.0.10.6.0.255	Total Export Apparent MD and Occurrence Time	kVA
1-0.0.1.0.255	Billing times	
0.0.96.1.0.255	Meter number	
0.0.97.98.0.255	Alarm status	

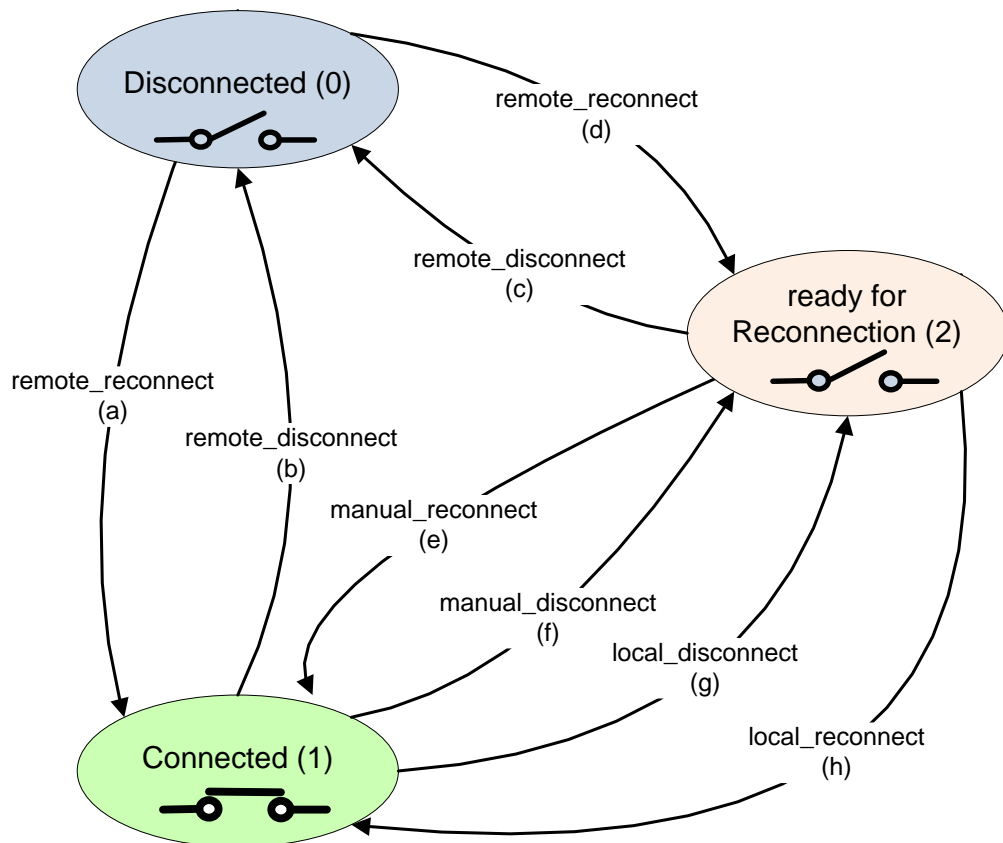
2.2.11 Daily Freezing

Meter will freeze data one time at 0 o'clock daily. Freezing energy data are as follows (data are configurable and will be cleared if reset), Supporting split channel reading

1.8.0	Total Import Active Energy	kWh
1.8.1	Import Active Energy of T1	kWh
1.8.2	Import Active Energy of T2	kWh

1.8.3	Import Active Energy of T3	kWh
1.8.4	Import Active Energy of T4	kWh
1.8.5	Import Active Energy of T5	kWh
1.8.6	Import Active Energy of T6	kWh
2.8.0	Total Export Active Energy	kWh
2.8.1	Export Active Energy of T1	kWh
2.8.2	Export Active Energy of T2	kWh
2.8.3	Export Active Energy of T3	kWh
2.8.4	Export Active Energy of T4	kWh
2.8.5	Export Active Energy of T5	kWh
2.8.6	Export Active Energy of T6	kWh
3.8.0	Total Import Reactive Energy	kvarh
3.8.1	Import Reactive Energy of T1	kvarh
3.8.2	Import Reactive Energy of T2	kvarh
3.8.3	Import Reactive Energy of T3	kvarh
3.8.4	Import Reactive Energy of T4	kvarh
3.8.5	Import Reactive Energy of T5	kvarh
3.8.6	Import Reactive Energy of T6	kvarh
4.8.0	Total Export Reactive Energy	kvarh
4.8.1	Export Reactive Energy of T1	kvarh
4.8.2	Export Reactive Energy of T2	kvarh
4.8.3	Export Reactive Energy of T3	kvarh
4.8.4	Export Reactive Energy of T4	kvarh
4.8.5	Export Reactive Energy of T5	kvarh
4.8.6	Export Reactive Energy of T6	kvarh
5.8.0	Total Reactive Energy of Q1	kvarh
6.8.0	Total Reactive Energy of Q2	kvarh
7.8.0	Total Reactive Energy of Q3	kvarh
8.8.0	Total Reactive Energy of Q4	kvarh
9.8.0	Total Import Apparent Energy	kVAh
10.8.0	Total Export Apparent Energy	kVAh

2.2.12 Relay Control



2.2.12.1 Mode 0

Relay keeps connecting, and no permission to disconnection

2.2.12.2 Mode 1

- 1) Remote control: allow remote disconnecting operation and force relay into “disconnection” status (b and c). Remote reconnecting order forces relay into “ready for reconnection” status (d), and then reconnect the relay manually by pressing button (e).
- 2) Manual control: allow manual disconnecting and reconnecting operation. Manual disconnecting order forces relay into “ready for reconnection” status (f), and then reconnect the relay manually by pressing button (e).
- 3) Local control: allow local disconnecting operation and force relay into “ready for reconnection” status (g), and then reconnect the relay manually by pressing button (e).

2.2.12.3 Mode 2 (for CT Meter only)

- 1) Remote control: allow remote disconnecting operation and force relay into “disconnection” status (b and c). Remote connecting order forces relay into “ready for connection” status (a), and then reconnect the relay manually by pressing button (a).

- 2) Manual control: Allow manual disconnecting and connecting operation. Manual disconnecting order forces relay into “ready for reconnection” status (f), and then reconnect the relay manually by button (e).
- 3) Local control: allow local disconnecting operation and force relay into “ready for reconnection” status (g), and then reconnect the relay manually by pressing button (e).

2.2.12.4 Mode 3

- 1) Remote control: allow remote disconnecting operation and force relay into “disconnection” status. Remote reconnecting order forces relay into “ready for reconnection” status (d), and then reconnect the relay manually by pressing button (e).
- 2) Manual control: No permission to manual disconnection. Manual reconnecting operation is allowed after remote and local disconnecting operation (e).
- 3) Local control: allow local disconnecting operation and force relay into “ready for reconnection” status (g), and then reconnect the relay manually by pressing button (e).

2.2.12.5 Mode 4

- 1) Remote control: allow remote disconnecting operation and force relay into “disconnection” status (b and c). Remote reconnecting order force relay into “ready for reconnection” status (d), and then reconnect the relay manually by pressing button (e).
- 2) Manual control: No permission to manual disconnection. Manual reconnecting operation is allowed after remote and local disconnecting operation (e).
- 3) Local control: allow local disconnecting operation and force relay into “ready for reconnection” status (g), and then reconnect the relay manually by pressing button (e).

2.2.12.6 Mode 5

- 1) Remote control: allow remote disconnecting operation and force relay into “disconnection” status (b and c). Remote reconnecting order force relay into “ready for reconnection” status (d), and then reconnect the relay manually by pressing button (e).
- 2) Manual control: allow manual disconnecting operation.
- 3) Local control: allow local disconnecting operation and force relay into “ready for reconnection” status (g), and then reconnect the relay manually by button (e).

2.2.12.7 Mode 6

- 1) Remote control: allow remote disconnecting operation and force relay into “disconnection” status (b and c). Remote reconnecting order force relay into “ready for reconnect” status (d), and then reconnect the relay manually by button.
- 2) Manual control: no permission to manual disconnection. Manual reconnection

will be allowed after local disconnecting operation (e).

- 3) Local control: allow local disconnecting operation and force relay into “ready for reconnection” status (g), and then reconnect the relay manually by pressing button (e) or connect the relay locally to get into “connection” status (h) which will connect automatically.

2.2.12.8 Parameter setting of local disconnection and connection

Direct meter adopts built-in power relay.

- 1) Selective mode of normal and urgent power control
- 2) Function selection of normal power control
- 3) Threshold of normal power control
- 4) Punishing time of normal power control
- 5) Function selection of urgent power control
- 6) Threshold of urgent power control
- 7) Punishing time of urgent power control
- 8) Control mode of relay
- 9) Detection time of urgent power control

2.2.13 Communication

2.2.13.1 Optical communication

- 1) Communication rate range: 1200~19200bps, handshaking baud rate: 300bps
- 2) Communication protocol: IEC62056-21 E mode, HDLC protocol
- 3) Special handling of optical communication ((IEC readout)

Optical communication must support mode E and mode A simultaneously, and data will return orderly according to given contents and formats.

Returned configurable data include current energy, demand energy, historical energy and real-time information of power grid and so on.

Returned data can be set separately by PC software.

Configuration to historical returned data can decrease the amount of returned data and improve efficiency.

2.2.13.2 RS485 Communication

- 1) Communication rate: 9600bps
- 2) Communication protocol: HDLC

2.2.13.3 2G/4G Communication

User can program and copy meter data by remote GSM/GPRS/3G/4G communication, the protocol of application layer is DLMS/COSEM Protocol IPV4.

- 1) 2G/4G Module Drawing



2) Operating Steps

- ✚ Step 1: Insert SIM card into 2G/4G Module, and then set parameters by PC software. Parameters are as follows:

TCP port	7011
APN name	cmnet
Server IP	218.108.107.78
PDP user name	
PDP password	
GPRS mode	Client mode
GPRS heartbeat interval	10 minutes;

- ✚ Step 2: Check the signal intensity on LCD, if the signal mark appears, meter will carry out remote GPRS communication, and the show of first triangle mark indicates that the meter and GPRS module are connected to main station successfully. Meter need to be re-activated in order to ensure normal connection between meter, GPRS module and the main station on condition that meter number and parameters are changed.

NOTE: After finishing the parameter setting and accessing with the internet, user can read other meters which are connected by the port of the module and meter. The communication protocol between module and meter is DLMS-HDL.

2.2.13.4 Communication Security

- ✚ Factory state: Meter can alter all parameter and not support billing.
- ✚ User state: Not be able to modify and clear energy.
- ✚ The unit of meter number is 12.

2.2.13.5 Remote Update

User can communicate and upgrade the hardware remotely by optical and RS485 communication.