DDZY 566-M Meter User's Manual

Single Phase Two Wires
Electronic Meter

Content

1.   Properties

1.1.   Common

This DDZY566-M meter is single phase two wire multifunctional energy meter. It adopts the advanced technology of LSI (Large Scale Integrated circuit) and digital signal processing. The craft works of our product are exquisite and the functions provided are comprehensive and client-oriented. The energy meter is an intelligent instrument equipped with leading technology.

The function of DDZY566-M energy meter including active & reactive energy, demand measurement, instantaneous measurement for voltage, current, frequency, power factor and power, optical port, TTL interface with module communication, TOU, anti-tamper protection and event record, relay operation, power quality detection, load profile, pulse output for test, self check.

1.2.   Appropriate Use

The electricity meter DDZY566-M is allowed to be used for measuring electrical energy.

1.3.   Technical standard

File name	Title
EN 50470-1	Electricity metering equipment (AC) -Part 1: General requirements, test and test conditions Metering equipment (class indexes A, B, and C)
EN 50470-3	Electricity metering equipment (AC) -Part 3: Particular requirement-Static meters for active energy(class indexes A, B, and C);
IEC 62052-31:2015	Electricity metering equipment(AC)-General requirements, tests and test conditions - Part 31: Product safety requirements and tests.
IEC 62053-21:2020	Static meters for active energy (classes 0.5, 1 and 2)
IEC 62053-23:2020	Static meters for reactive energy (classes 2 and 3)
IEC 62052-11: 2020	Electricity metering equipment (AC)-General requirements, tests and test conditions – part 11: metering equipment
IEC 62056-21	Electricity metering – Data exchange for meter reading, tariff and load control – Part 21: Direct local data exchange
IEC 62056-53	Electricity metering – data exchange for meter reading, tariff and load control – part 53: COSEM application layer
IEC 62056-62	Electricity metering – data exchange for meter reading, tariff and load control – part 62: Interface classes
IEC 62056-61	Electricity metering – data exchange for meter reading, tariff and load control – part 61: Object Identification System (OBIS)

IEC 62059-41: 2006	Electrical energy measurement equipment. Reliability. Part 41:Reliability prediction.
IEC 62059-31-1:2008	Accelerated Reliability test
WELMEC-Guide 7.2	software guide

1.4. Technical data

Type	Single phase direct connection electric meter
Voltage	
Nominal voltage U_n	120 V_{AC}
Voltage range	0.8 – 1.15 U_n
Frequency	
Nominal frequency f_n	60 Hz
Frequency range	0.98 – 1.02 f_n
Current	
Reference current $I_{ref} = I_b$	5 A
Maximum current I_{max}	80A
Minimum current I_{min}	0.2A
Starting current I_{st}	$\leq 0.004\ I_b$
Accuracy	Class 1 for active, Class 2 for reactive
Measuring	Active and reactive energy, demand
Meter constant	
LED-Output	1000 imp/kWh, 1000imp/kvarh
Telecontrol-Output	1000 imp/kWh, 1000imp/kvarh
Display	
LCD	8digit with additional symbols
Life cycle	> 12 years
Communication interface	
Optical port	
RS485 port	
TTL interface for communication module	Suitable for Cellular/RF/PLC/LoRa and etc.
Power Consumption	
Voltage circuit	< 2 W / 10 VA at U_n
Current circuit	< 4 VA at I_b
Temperature Range	

Typical Operation	-25 ℃ to +60 ℃
Storage	-40 ℃ to +85 ℃
EMC Properties	
Isolation	4 kV AC, 50 Hz, 1min
High voltage	10 kV, Impulse 1.2/50 μs
Environment	
Mechanical environment	Class M1 as per 2014/32/EU Directive
Electromagnetic environment	Class E2 as per 2014/32/EU Directive
Utilization category	UC2
Housing	
Dimension	218.9x129.5x71.5 mm
Material	fiber-glass reinforced Polycarbonate (flame resistant EN 62053-21, recyclable)
Class of protection	II
Degree of protection	IP 54
Weight	
Weight	appr. 1.1kg

Tab1-1: Technical Properties

2. Frame work introduction
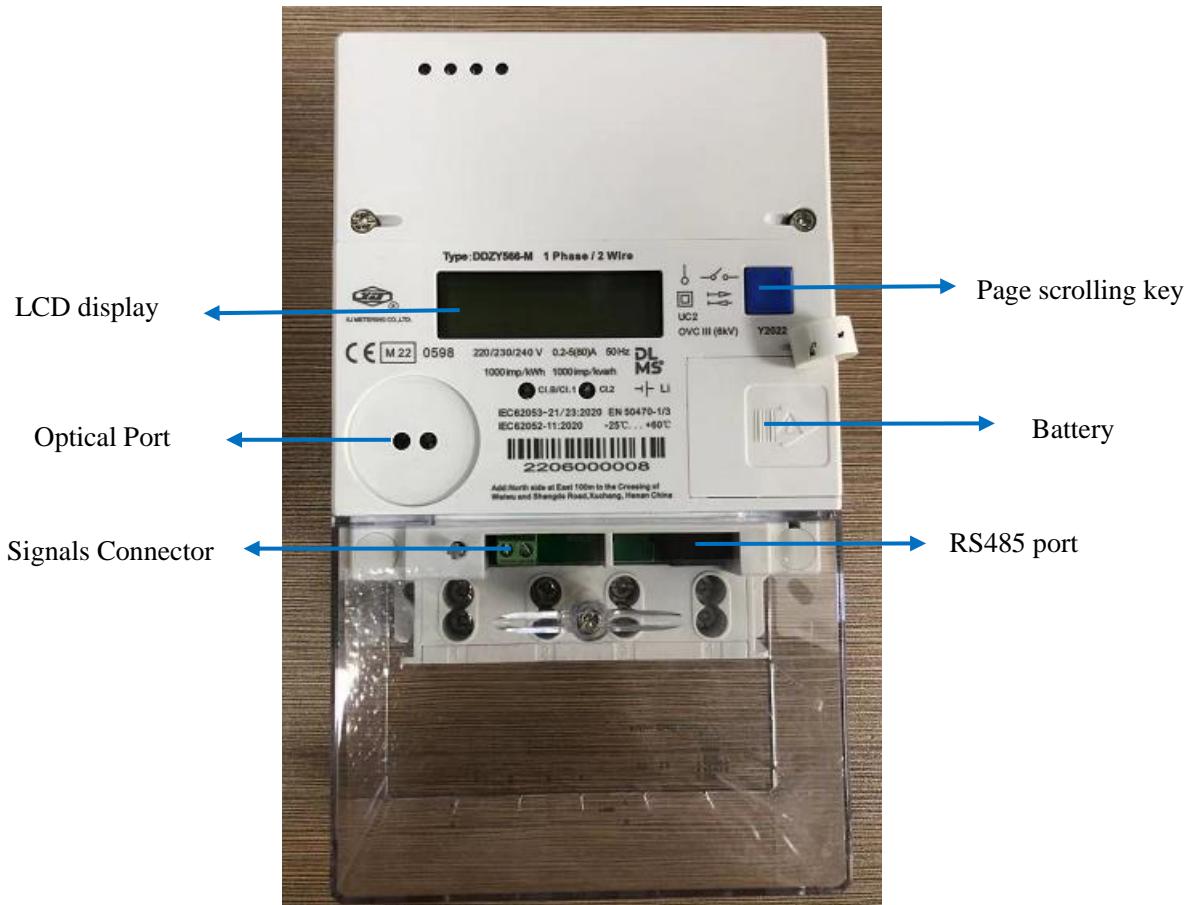
Fig. 2-1: Meter Picture

3. Service condition

No.	Items	Data
1.	Environmental conditions, storage	The meter need to stored within temperature -40℃ to +85℃, the humidity is lower than 75%, and avoid direct sunlight.
2.	Environmental conditions, operation, including	Mechanical conditions: The meter should be fixed on site installation, and it needs operate without vibration and shock. Climatic conditions: The degree of protection(dust and water) is IP 54, and it is indoor installation or outdoor installation with a meter box. The operating temperature is -25℃ to +60℃; the humidity is lower than 95%; The altitude is up to 3000 meters, and the pollution is degree 2.

Tab. 3-1 Service condition

Item	Condition
Limit range for storage and transportation temperature	-40℃ to +85℃
Limit range for operation temperature	-25℃ to +60℃
Rated current (Ib)	5 (A)
Maximum current (Imax)	80 (A)
Rated Voltage	120V
Frequency	60Hz

Tab.3-2 Service condition

4. LCD display

4.1. Display interface

Meter provides the high-contrast and easy-to-read Liquid Crystal Display (LCD), which offers a wide array of the information and flexibility.

The meter display is comply with clause 5.10 "display of measured values" of IEC 62052-11 2016.

The value on the display is real-time update according to meter measurement, the refresh frequency is per second.

The LCD has the following format:
LCD size:56.5mm $\times$ 17.2mm
Digit size:8.13mm $\times$ 5mm
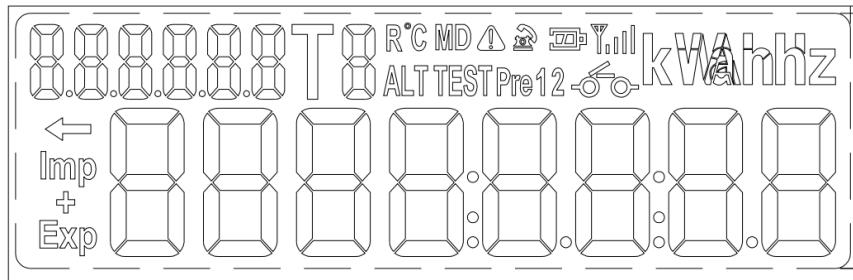
Fig. 4-1: LCD

The display information as below table, it includes data area, status area, indicator, unit and so on..

Nr.	Element	Function
1		OBIS code for display item, it's not fixed.
2	Imp + Exp	Imp: import energy and demand Exp: export energy and demand
3	MD	Max demand
4		According defined display list
5	kWvarhHz	Unit of the displayed value(kWh, kvarh, kW, kvar, W, var, VA, V, A, Hz)
6	T	Current tariff indication. T1, T2, T3, T4 are used energy and demand measurement.
7	ALT	ALT display mode indication
8	TEST	Dial test display mode indication
9	←	Display: current reverse occurred Blinking: current reverse is occupying
10		: It means normal condition, the battery is full.

		The inner symbols meaning different level of battery voltage. : it's under lower or without battery condition
11		Signal strength
12		Communication indication
13		Alarm symbol Display: The historical status word occurred Blinking: The current status word occurred
14	Pre12	Pre1:history one month energy data Pre2:history two month energy data
15		Relay identification

Tab.4-2: LCD

4.2. Backlight

Backlight will be on after pressing page up key, it's useful to read meter through LCD when it's in dark environment. Its light on time is 20 seconds if up key pressed.

5. Relay

5.1. Internal relay specification

The meter have an internal latch relay for customer load control(disconnecting and connecting).

- The rated operational voltage is up to 150V , The rated operational current is up to 100A.

- The short-circuit breaking capacity 3000 A

- The service breaking capacity Ics equal to the rated operational current 100A.

- The number of operating cycles is more than 10000 times.

- The utilization category is UC2, and the meter are passed the relay test according to IEC 62052-31.

- The Relay will operate normally during the external magnetic interference of 400mT.

- The latching relay will maintain its contact position after the control power has been removed (power off).

- The meter supports to measure the voltage of load side, so that the meter can truly reflect the status of relay (disconnected or reconnected) to avoid misjudgment.

5.2. Disconnect and reconnect

The meter support relay control operation according to DLMS standard, the control_state of relay will be

switch according to below diagram.

The control_mode can be configurable from mode 0 to mode 6, the default is mode 5.
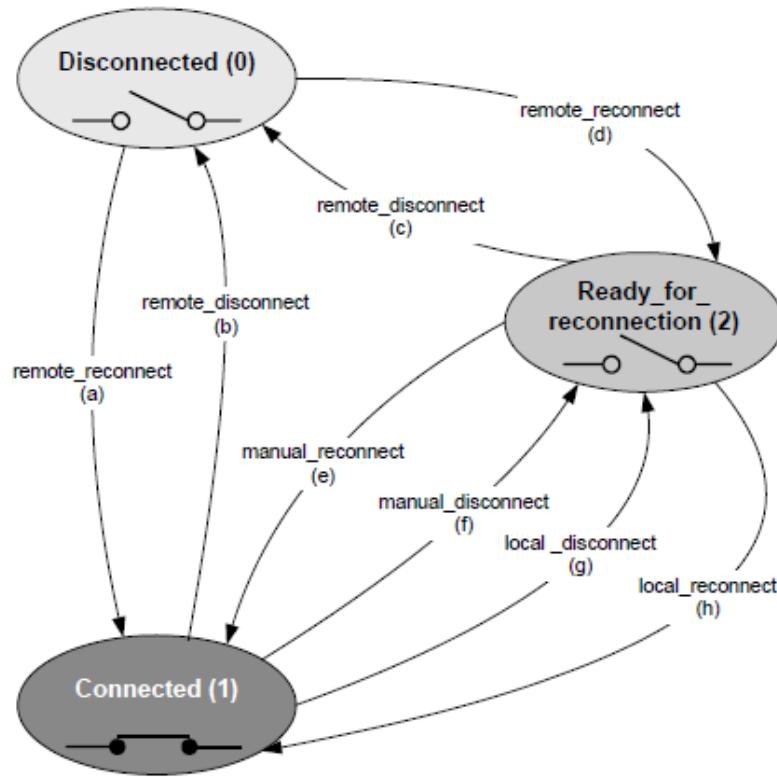
Fig.5-1 State Diagram of the Disconnect Control Object

control_mode   Configures the behaviour of the disconnect control object for all triggers, i.e. the possible state transitions.

control _mode	Disconnection				Reconnection			
	Remote		Manual	Local	Remote		Manual	Local
enum:	(b)	(c)	(f)	(g)	(a)	(d)	(e)	(h)
(0)	–	–	–	–	–	–	–	–
(1)	x	x	x	x	–	x	x	–
(2)	x	x	x	x	x	–	x	–
(3)	x	x	–	x	–	x	x	–
(4)	x	x	–	x	x	–	x	–
(5)	x	x	x	x	–	x	x	x
(6)	x	x	–	x	–	x	x	x
NOTE 3	In Mode (0) the disconnect control object is always in 'connected' state.							
NOTE 4	Local disconnection is always possible unless the corresponding trigger is inhibited.							

Fig.5-2 Control_Mode

5.2.1. Remote operating

The meter supports disconnect/reconnect the relay when received disconnect/ reconnect control commands from the local device or remote system (HHU,Gateway,DCU,modem) and AMR/AMM Server).

5.2.2. Manual operating

The meter supports disconnect/reconnect the relay by manual (push the the button on meter cover).

The operation.

–   Press key more than 5sec to perform the action (disconnect or reconnect).

6. Test LEDs

The meter has two pulse LEDs:
Active energy: 1000imp/kWh.
Reactive energy: 1000imp/kvarh

7. Signal terminal pulse output

On the signal terminal, there is a pulse output which can be configured for active or reactive energy, and it's independent with LED pulse and configurable. It can be configured before delivery.
The default pulse constant value is 1000imp/kWh for active, and 1000imp/kvarh for reactive.

8. Interface

The meter provides one optical communication port, one RS485 port and one module interface for data reading and setting locally and remotely.

8.1. Optical port

The optical port can be used to locally access the meter to configure the meter parameters, read all the meter data and troubleshooting the network connection issue.

Optical port for meter reading and program according to IEC62056-21 MODE E and IEC62056-53/61/62
Initial baud rate: 300bps
Communication baud rate: 9600bps

8.2. RS485 port

This port RS485 is used to local access the meter to configure the meter parameters, read all the meter data and troubleshooting the network connection issue.

Also it can be connected with external communication device,such as GSM/GPRS/WCDMA/LTE/4G/WIFI/PLC/NB-IOT module, Gateway and etc.

Once the meter connected external communication device, The meter shall operate as a slave RS-485 communication unit, while communication device operates as its master unit.

Also this port can be used for locally Laptop reading via RS485 communication cable.

RS485 port for meter reading and program according to IEC62056-53/61/62, Communication baud rate: 9600bps

RJ-45 pin-out configuration as below:

RJ45
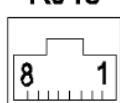
Pin No.	1.	2.	3.	4.	5.	6.	7.	8.

Pin-out	9Vdc+	RS485 (+)	RS485 (+)	NC	GND (Vdc-)	NC	NC	NC

8.3. Module interface

TTL interface is used for different communication module, including Cellular/RF/PLC/LoRa and etc.

After install the communication module, the meter can have Bi-directional communication with HES/DCU directly.

9. Battery

The meter equips a lithium battery and super capacitor, they are supply power for RTC.

The battery is easy to replacement it without soldering when meter in service.

Nominal capacity: 1200mAh

Lifetime: ＞15 years

Back up time for RTC when power outage: ＞2 year

10. The whole block diagram

The block diagram for whole system is as following:
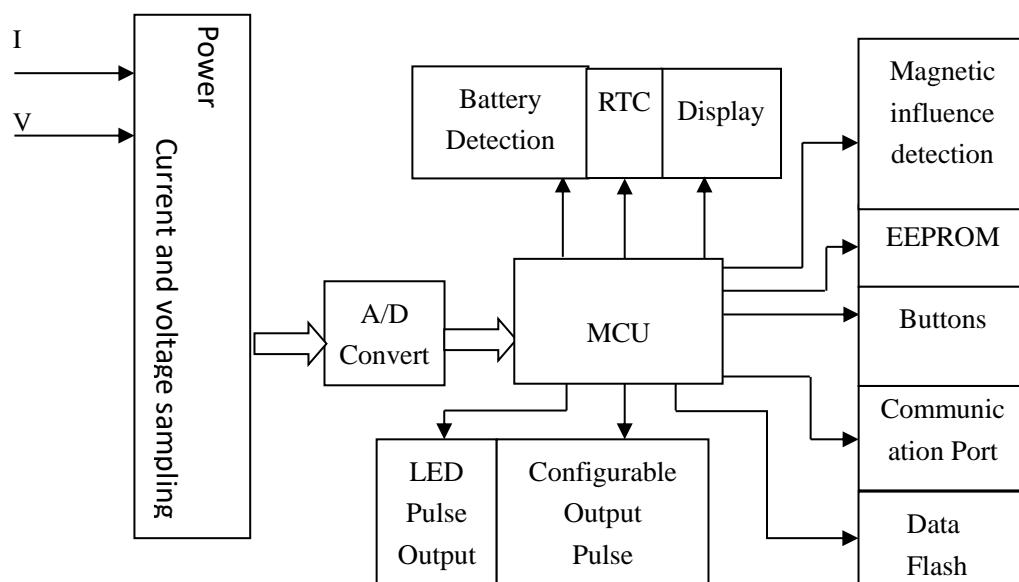
Fig. 10-1: Block diagram

10.1. Functionality

10.1.1. Metering for energy and demand

According to IEC standard, the four quadrants, import and export for active and reactive definition as following:
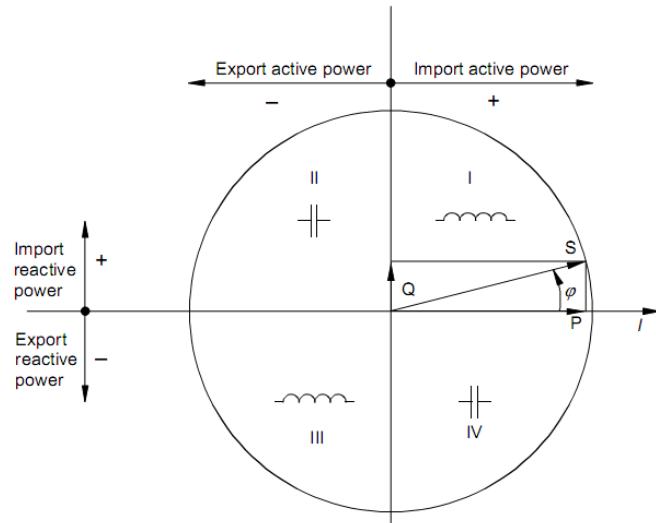
Fig.10-2: Active and reactive Power

Metering Functions:
◆ Active import and export energy measurement
◆ Reactive import and export energy measurement
◆ Active import and export maximum demand registers
◆ Reactive import and export maximum demand registers
◆ Maximum demand calculation base on demand interval
◆ Up to 12 months' history energy and demand data
◆ Up to 30 days' history energy and demand data

10.1.2. Energy channel

The meter provides below energy registers.

– Basic energy measurement, total 11 registers.

1	∑Li Import active energy (QI+QIV)
2	∑Li Export active energy (QII+QIII)
3	∑Li Import reactive energy (QI+QII)
4	∑Li Export reactive energy (QIII+QIV)
5	∑Li Reactive energy (QI)
6	∑Li Reactive energy (QII)

7	∑Li Reactive energy (QIII)
8	∑Li Reactive energy (QIV)
9	∑Li Import apparent energy (QI+QIV)
10	∑Li Export apparent energy (QII+QIII)
11	∑Li Active energy(abs(QI+QIV)+(abs(QII+QIII))

Tab 10-1 energy register

All the energy register in the above Table with 4 tariffs.

10.1.3. Demand channel configuration

- Basic demand measurement, total 10 registers.

1	∑Li Import active demand (QI+QIV)
2	∑Li Export active demand (QII+QIII)
3	∑Li Import reactive demand (QI+QII)
4	∑Li Export reactive demand (QIII+QIV)
5	∑Li Reactive demand (QI)
6	∑Li Reactive demand (QII)
7	∑Li Reactive demand (QIII)
8	∑Li Reactive demand (QIV)
9	∑Li Import apparent demand (QI+QIV)
10	∑Li Export apparent demand (QII+QIII)

Tab 10-2 demand register

10.1.4. Maximum Demand

The maximum demand quantities to be recorded are the same items as the current average demand registers.

When the block method for demand integration is used, in every integration time the maximum demand registers should be updated.

When the sliding window method for demand integration is used, in every sub-interval the maximum demand registers should be updated.

The date and time of occurrence of the maximum demand is recorded

10.1.5. Demand calculation method
The meter supports sliding and block methods for demand calculation:
Demand interval is programmable, the interval can be configured as 5, 10, 15, 30, 60minutes.
The default interval is 15 minutes.

10.1.6. Reset type

Nr.	Ways of Demand Reset	Description
1	Reset on normal demand reset date	Reset automatically at a configurable time of month. The time can be set from 1st day to 28th day.
2	Demand reset by software	Demand can be reset by software through infrared or RS485 interface
3	Demand reset by manual(optional)	Press the clear demand button exceed 5 senconds

Tab 10-3 Reset type

When demand reset occurs, the current energy and the maximum demand will be automatically saved for the last month.

10.1.7. History data record
There are 12 months history EOB profile .(The channels can be configured as customer required)

The EOB reset date&time is configurable, The default automatic EOB reset time & date is at 00h 00m on the first day of every month.

With EOB reset (triggered by internal clock) and Manual reset (triggered by push-key or on-command), the maximum demand registers are reset to zero (0) after transferring the data to the historical registers.

The channels can be configurable, and the default channels are as below.

No.	Channels	OBIS
1	Current date/time	0.0.1.0.0.255;attr2;index 0
2	ΣLi Import active energy (QI+QIV) [current billing period]	1.0.1.9.0.255;attr2;index 0
3	ΣLi Import reactive energy (QI+QII) [current billing period]	1.0.3.9.0.255;attr2;index 0
4	ΣLi Export active energy (QII+QIII) [current billing period]	1.0.2.9.0.255;attr2;index 0
5	ΣLi Export reactive energy (QIII+QIV) [current billing period]	1.0.4.9.0.255;attr2;index 0

6	Maximum demand register - ΣLi Import active power (QI+QIV) [Total]	1.0.1.6.0.255;attr2;index 0
7	Maximum demand register - ΣLi Import active power (QI+QIV) [Tariff 1]	1.0.1.6.1.255;attr2;index 0
8	Maximum demand register - ΣLi Import active power (QI+QIV)[Tariff 2]	1.0.1.6.2.255;attr2;index 0
9	Maximum demand register - ΣLi Import active power (QI+QIV) [Tariff 3]	1.0.1.6.3.255;attr2;index 0

Tab 10-4 EOB profile channels

There are 30 days history daily profile (The channels can be configured as customer required)

The Daily energy profile reset date&time is configurable, The default Reset on every day at daytime 23:00:00.

The channels can be configurable, and the default channels are as below.

No.	Channels	OBIS
1	Current date/time	0.0.1.0.0.255;attr2;index 0
2	Profile status 2	0.0.96.10.2.255;attr2;index 0
3	ΣLi Import active energy (QI+QIV) [Total]	1.0.1.8.0.255;attr2;index 0
4	ΣLi Export active energy (QII+QIII) [Total]	1.0.2.8.0.255;attr2;index 0
5	ΣLi Import reactive energy (QI+QII) [Total]	1.0.3.8.0.255;attr2;index 0
6	ΣLi Export reactive energy (QIII+QIV) [Total]	1.0.4.8.0.255;attr2;index 0
7	Maximum demand register - ΣLi Import active power (QI+QIV) [Total]	1.0.1.6.0.255;attr2;index 0
8	Maximum demand register - ΣLi Import active power (QI+QIV) [Tariff 1]	1.0.1.6.1.255;attr2;index 0
9	Maximum demand register - ΣLi Import active power (QI+QIV)[Tariff 2]	1.0.1.6.2.255;attr2;index 0
10	Maximum demand register - ΣLi Import active power (QI+QIV) [Tariff 3]	1.0.1.6.3.255;attr2;index 0

Tab 10-5 Daily profile channels

All this history data can be read out via remotely/locally through any communication port.

10.1.8. Instantaneous parameter measurements

The instantaneous parameter can be displayed on LCD and be read out via communication. Instantaneous parameter measurements support:

- Voltage and current
- Power factor
- Active and reactive, apparent power
- Frequency
- Angle between current and voltage

The profile is used to read instantaneous data together, The maximum record number is 1 unit, the record items can be configurable, the default channels are as below.

No.	Channels	OBIS
1	Current date/time	0.0.1.0.0.255;attr2;index 0
2	Instantaneous current L1	1.0.31.7.0.255;attr2;index 0
3	Instantaneous voltage L1	1.0.32.7.0.255;attr2;index 0

Tab 10-6 Power Quality Request – On Demand default channels

10.1.9. Load profile

Number of LP channels: max. 20 channels.

Quantities to be recorded can be programmed by users among the registers, and default quantities as below.

No.	Channels	OBIS
1	Current date/time	0.0.1.0.0.255;attr2;index 0
2	Profile status 1	0.0.96.10.1.255;attr2;index 0
3	ΣLi Interval Import active energy (QI+QIV) [Total]	1.0.1.29.0.255;attr2;index 0
4	ΣLi Interval Export active energy (QII+QIII) [Total]	1.0.2.29.0.255;attr2;index 0
5	ΣLi Interval Import reactive energy (QI+QII) [Total]	1.0.3.29.0.255;attr2;index 0
6	ΣLi Interval Export reactive energy (QIII+QIV) [Total]	1.0.4.29.0.255;attr2;index 0
7	ΣLi Average Import active power (QI+QIV)	1.0.1.4.0.255;attr2;index 0
8	ΣLi Average Import reactive power (QI+QII)	1.0.3.4.0.255;attr2;index 0
9	ΣLi Average Import apparent power (QI+QIV)	1.0.9.4.0.255;attr2;index 0
10	ΣLi Average Export active power (QII+QIII) [Total]	1.0.2.4.0.255;attr2;index 0
11	ΣLi Average Export reactive power (QIII+QIV) [Total]	1.0.4.4.0.255;attr2;index 0
12	ΣLi Average Export apparent power (QII+QIII) [Total]	1.0.10.4.0.255;attr2;index 0
13	Average voltage L1	1.0.32.4.0.255;attr2;index 0
14	Average current L1	1.0.31.4.0.255;attr2;index 0
15	Total power factor	1.0.13.4.0.255;attr2;index 0

Tab 10-7 Load profile channels

The instantaneous data can be captured as average value, Max value or Min value.

Time period of LP: it can be programmed from 5, 15, 30, 60 min, and default is 15min.

Each LP date is identifiable to its respective date and time. The end of the last LP period in a day is match

with 00:00 hr.

The meter has sufficient memory capacity to store all TOU registers, maximum demand registers and LP registers for more than 90 days when the time period of LP is 30 min. When the storage is full, the new data will overwrite the oldest stored data [FIFO method].

Full LP data transmission period: within 15 minutes.

10.2. Tariff characteristics

10.2.1. Energy and demand tariff control

There are 4 tariffs, T1, T2, T3, T4 are used for energy and demand measurement, and tariff control using internal clock.

10.2.2. Real time clock (RTC)

AC power, battery and super capacity are powering the internal clock.

Built-in 32.768kHz quartz oscillator, frequency adjusted for high precision ($\pm 5 \times 10^{-6}$ at ambient temperature is 25)

Clock accuracy: $< \pm 0.5$ sec/day at 23 ℃, the variation of the time-keeping accuracy with temperature is less than 0.15s/ ℃/day).

The RTC use Gregorian calendar. (100 years calendar including leap year).

Time and date can be set through the optical port and RS485 communication interface by locally, also the clock of the meter is able to be automatically synchronized with the time/date of the AMR system.

The time and date can be set between at 00:00:00, 01/01/2015 to 23:59:59, 31/12/2045.

The real-time clock supplies the time stamp for maximum demand measurement, energy tariff switching, billing reset, all events inside the meter, such as time stamp for voltage interruptions, reverse polarity etc.

Each profile entries have a time stamp, each events record have a time stamp (starting or ending).

When the time of the Real Time Clock is changed, both the time before changed and the time after changed will be recorded.

When the meter is under reader level, the meter time is not allowed to update during the meter time is 00:00±10 minutes.

The real-time clock supplies the time stamp for maximum demand measurement, all events inside the meter, such as time stamp for voltage interruptions, reverse polarity etc.

10.2.3. Time of Use (TOU), DST & Holidays

The meter is TOU (time of use) meter with four tariffs. It can set DST data of 10 years including beginning date, ending date and time difference from standard time.

Count:

100holidays, 12seasons, 10 week profiles, 10 day types, 12 daytime periods in each day type,
all of above are programmable remotely or locally.

The priority determine: Season<holiday

What's tariff of meter running now according to current date and time, please reference flow chart as the following:
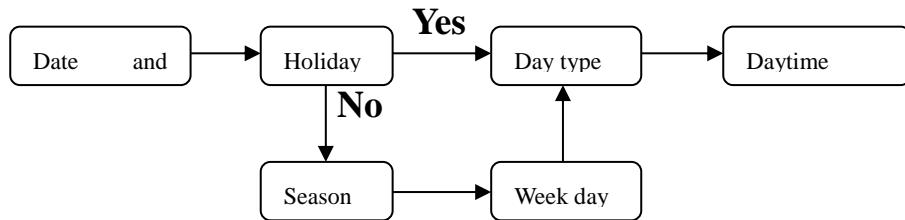
Fig.10-3: TOU

10.3. Display

10.3.1. Display Mode

Auto mode, ALT mode, and Power down mode are used in this meter.

In Auto mode, the meter LCD display will automatically scroll to show pre-configured information, such as basic customer information.

In ALT mode, the meter will show other information, such as version, instantaneous data.

In the Auto Mode and ALT Mode, the display items can be configured by the user via the optical port or RS485 interface.

	Display Mode	Technical parameters	
1	Auto mode	Display pages：	Programmable configuration, max 64 pages.
		Entry mode：	Power on, enter auto mode automatically.
		Exit mode：	Power down; Detect the short press button; Detect the press button, then switch to the ALT mode.
2	ALT mode	Display pages：	Programmable configuration, max 64 pages.
		Entry mode：	In auto mode, detect the short press button, switch to the ALT mode;
		Exit mode：	Power down; When the timeout has expired, it will return to auto mode.The time out period can be configured by the MMS. Detect the long press button, then switch

			to the auto mode.
3	Power down mode	Display pages：	The same as ALT mode
		Entry mode：	Detect the short press button when power down;
		Exit mode：	When the timeout has expired, it will exit.The time out period is 60 seconds.

Tab.10-8: Display modes

10.3.1.1. Normal Mode, ALT Mode and Power down mode

In the Normal Mode and ALT Mode, the display items can be configured by the user via the optical port or RS485 interface. Each mode can support maximum 64 items.

The units and the number of decimals to be displayed will be as follows.

Value	Decimal	Leading Zero	Unit
Energy	0~3 configureable	Y	kWh, kvarh, kVAh
Demand	0~3 configureable	N	kW, kvar, kVA
Voltage	2	N	Volt
Current	3	N	Amp
Power	0	N	W, var, VA
Power Factor	3	N	N/A
Frequency	2	N	Hz

Tab.10-9: Data format

In case the metered energy values exceed eight (8) digits, the displayed value will be rolled over to zero (0). After the rollover, the lowest eight (8) digits will be displayed.

10.4. Back light

Back light will on after press button, it's useful to read meter through LCD when it in dark environment. Its light on time is 20 seconds.

10.5. Status

The Status information is used to show the meter's status (during the last LP period) caused by those events

in above table and be captured into the profile object. The Bit mapping table will be cleared automatically at the end of every load profile interval.

The Bit mapping table of the object as below.

Bits	Definition	Description

BIT7	PDN	Power down
BIT6	Reserved	Reserved
BIT5	CAD	Clock adjusted
BIT4	Reserved	Reserved
BIT3	DST	Daylight saving
BIT2	DNV	Data not valid
BIT1	CIV	Clock invalid
BIT0	ERR	Critical error

Table 10-10 Bit mapping table

10.6. Security functions

10.6.1. None volatile memory

The meter provides the measurement data, configurable parameters by registers.

All programmed/configured parameters and registered data are retained in a non-volatile memory (ie. EEPROM flash memory). It offers at least 20 years of data retention during power on, over voltage/ under voltage, even power failure.

All register data are written into the non-volatile memory once per quarter, and whenever power failure or clock initialization occurs.

In case of power lack, basic data like consumed energy, demand will be saved in none volatile memory.

If the meter parameters were modified and power outage, the meter will record events.

The meter have validation mechanism to protect the stored data (measurement data, configuration and etc) in the meter memory.

The meter will validate the completeness of data based on CRC checksum, If the data is incomplete, the meter will use the backup data from another area in memory.

For Firmware, the meter have self-diagnosis and watchdog to protect the firmware application, if the meter found the running firmware is incorrect, the watchdog will be triggered to recover the meter.

10.6.2. Event log

The meter has Anti-tampering/Anti-fraud functions that has indication and registration locally in the meter and can be read via the software or AMR system.

Any abnormal states, events and alarms can be recorded in Event log of the meter and displayed on the LCD within maximum one minute after the state change of abnormal state, events and alarms mentioned. If the source of the abnormal states is removed, then the blinking states are stopped and cleared from the LCD Display.

Meter detects and records the following event(including 8 type),

- The detection thresholds for events are configurable by remotely or locally.

- The meter detects the event and record the time stamp, event code and parameters (if required) accordingly.

- The meter has sufficient memory capacity to store 30 points for each Event Log data mentioned in the

supplementary OBIS code specification respectively. When the storage is full, the new data shall overwrite the oldest stored data.

- All the recorded events can be read out locally or remotely.

No.	Classification	OBIS code						Interface Class
		A	B	C	D	E	F	
1	Disconnector control log	0	0	99	98	2	255	Profile Generic (Class id=7, version: 1)
2	Standard event log	0	0	99	98	0	255	Profile Generic (Class id=7, version: 1)
3	Fraud detection log	0	0	99	98	1	255	Profile Generic (Class id=7, version: 1)
4	Communication log	0	0	99	98	5	255	Profile Generic (Class id=7, version: 1)
5	Power failure event log	1	0	99	97	0	255	Profile Generic (Class id=7, version: 1)
6	Power quality log	0	0	99	98	4	255	Profile Generic (Class id=7, version: 1)
7	Phase interruption log	1	0	99	97	1	255	Profile Generic (Class id=7, version: 1)
8	Tariff activation	0	0	99	98	27	255	Profile Generic (Class id=7, version: 1)

Fig.10-4 Event log

The events code as below (Please noted multi-phase events code will be not applicable for DDZY566-M).

Event code	Name	Description
1	Power Down	Indicates a complete power down of the device. Please note that this is related to the device and not necessarily to the network.
2	Power Up	Indicates that the device is powered again after a complete power down.
4	Clock adjusted (old date/time)	Indicates that the clock has been adjusted. The date/time that is stored in the event log is the old date/time before adjusting the clock.
5	Clock adjusted (new date/time)	Indicates that the clock has been adjusted. The date/time that is stored in the event log is the new date/time after adjusting the clock.
6	Clock invalid	Indicates that clock may be invalid, i.e., if the power reserve of the clock has exhausted. It is set at power up.
7	Replace Battery	Indicates that the battery must be exchanged due to the expected end of life time.
8	Battery voltage low	Indicates that the current battery voltage is low.
9	Passive TOU activated	Indicates that the passive TOU has been activated.
10	Error register cleared	Indicates that the error register was cleared.
11	Alarm register	Indicates that the alarm register was cleared.

	cleared	
12	Program memory error	Indicates a physical or a logical error in the program memory.
13	RAM error	Indicates a physical or a logical error in the RAM.
14	NV memory error	Indicates a physical or a logical error in the nonvolatile memory.
15	Watchdog error	Indicates a watch dog reset or a hardware reset of the microcontroller.
16	Measurement system error	Indicates a logical or physical error in the measurement system.
17	Firmware ready for activation	Indicates that the new firmware has been successfully downloaded and verified, i.e., it is ready for activation.
18	Firmware activated	Indicates that a new firmware has been activated
19	Passive TOU programmed	The passive structures of TOU or a new activation date/time were programmed.
21	CTVT Parameter Change	CTVT Parameter Change
40	Terminal cover removed	Indicates that the terminal cover has been removed.
41	Terminal cover closed	Indicates that the terminal cover has been closed.
44	Meter cover removed	Indicates that the meter cover has been removed.
45	Meter cover closed	Indicates that the meter cover has been closed.
46	Association authentication failure (n time failed)	Indicates that a user tried to gain LLS access with wrong password (intrusion detection) or HLS access challenge processing failed n-times.
47	One or more parameters changed	Para changed
48	Global key(s) changed	One or more global keys changed.
49	Decryption or authentication failure (n time failure)	Decryption with currently valid key (global or dedicated) failed to generate a valid APDU or authentication tag
50	Replay attack	Receive frame counter value less or equal to the last successfully received frame counter in the received APDU Event signalizes as well the situation when the DC has lost the frame counter synchronization.
51	FW verification failed	Indicates the transferred firmware verification
52	Unexpected consumption	Indicates consumption is detected at least on one phase when the disconnector has been disconnected
53	Maintenance Equipment	Maintenance Equipment
54	Error normal	Error normal
55	Error logical	Error logical

56	Error software	Error software
57	Estado Comunicaciones	Disponible o no Disponible
58	reserved for future use	reserved for future use
62	Remote disconnection	Indicates that the disconnector has been remotely disconnected.
63	Remote connection	Indicates that the disconnector has been remotely connected.
64	Local disconnection	Indicates that the disconnector has been locally disconnected (i.e., via the limiter or current supervision monitors).
65	Limiter threshold exceeded	Indicates that the limiter threshold has been exceeded.
66	Limiter threshold ok	Indicates that the monitored value of the limiter dropped below the threshold.
67	Limiter threshold changed	Indicates that the limiter threshold has been changed.
68	Disconnect/Reconnect failure	Indicates that a failure of disconnection or reconnection has happened (control state does not match output state)
69	Local reconnection	Indicates that the disconnector has been locally re-connected (i.e., via the limiter or current supervision monitors).
70	Supervision monitor 1 threshold exceeded	Indicates that the supervision monitor threshold has been exceeded.
71	Supervision monitor 1 threshold ok	Indicates that the monitored value dropped below the threshold.
72	Supervision monitor 2 threshold exceeded	Indicates that the supervision monitor threshold has been exceeded.
73	Supervision monitor 2 threshold ok	Indicates that the monitored value dropped below the threshold.
74	Supervision monitor 3 threshold exceeded	Indicates that the supervision monitor threshold has been exceeded.

75	Supervision monitor 3 threshold ok	Indicates that the monitored value dropped below the threshold.
76	Under voltage L1	Indicates under voltage(≤0.85Un) on Phase L1 was detected
79	Overvoltage L1	Indicates overvoltage (≥1.1Un) on Phase L1 was detected.
82	Missing voltage L1	Indicates that the voltage on Phase L1 has fallen below the Umin threshold for longer than the time delay.
85	Voltage L1 normal	Indicates that the mains voltage is in normal limits again, e.g., after overvoltage.
88	Phase sequence reversal	Indicates wrong mains connection. Usually indicates fraud or wrong installation. For poly Phase connection only!
90	Phase Asymmetry	Indicates phase asymmetry due to large unbalance of loads connected
91	Current Reversal	Energy export happens, it's for devices which are configured for energy import measurement only
92	Bad Voltage Quality L1	In power quality profile recoding every period, detecting the average voltage L1 is not normal.
95	Indicación sentido energá	Change in flow direction (import / export). Change from import to export, or from export to import.
96	Potencia Máxima demandada	The meter has to trigger an event every time the interval power demand reaches the maximum for the current billing cycle
97	Expected Energy export	Energy export happens, it's for devices which are configured for energy import and export measurement
98	reserved for future use	reserved for future use
99	reserved for future use	reserved for future use
107	reserved for future use	reserved for future use
108	reserved for future use	reserved for future use
109	reserved for future use	reserved for future use
117	reserved for future use	reserved for future use
118	reserved for future use	reserved for future use

119	reserved for future use	reserved for future use
137	reserved for future use	reserved for future use
138	Unexpected APDU	The message received from the HES is malformed according to the application layer rules, or the data structure as defined in the object model
139	Unauthorized access	The message received has not the correct access right of the related object and attribute do not exist in the object model
140	No connection timeout	There has been no remote communication on application layer for a predefined period of time; i.e. meter could not be reached remotely.
141	Modem Initialization failure	Modem's response to initialization AT command(s) is invalid or ERROR or no response received
142	SIM Card failure	SIM card is not inserted or is not recognized. The detection of the SIM card status is supported by the corresponding AT commands as listed in 3GPP TS 27.007
143	SIM Card ok	SIM card has been correctly detected
145	GPRS registration failure	Modem's registration on GPRS network was not successful
149	Modem SW reset	Modem restarted by SW reset
150	Modem HW reset	Modem restarted by HW reset (this event is not issued after a general power resume)
154	Diagnostic failure	Modem's response to diagnostic AT command(s) ("+CPIN?", "+CSQ", "+CREG?", "+CGREG?", "+COPS?", "+CGACT?", "+CPMS?") is invalid or ERROR or no response received.
156	Communication not ready	Signal strength too low, not known, or not detectable
157	Communication ready	Signal strength enough, connect the network
158	Local communication attempt	Indicates a successful communication on any local port has been initiated.
159	reserved for future use .	reserved for future use
201	Power up/down reset	Manufacturer define
203	Reverse polarity start	Manufacturer define
204	Reverse polarity end	Manufacturer define
213	Bad power factor	The average power factor for month is not between 0.93ind to 0.95cap.

214	THD_V	In the 15min average voltage of any continuous 7 days (＞95%), the voltage harmonic is exceeded 8%
215	THD_I	In the 15min average current of any continuous 7 days (＞95%), the current harmonic is exceeded 8%
232	Front cover open	Manufacturer define
233	Front cover closed	Manufacturer define
237	Phase sequence reversal end	Manufacturer define
238	Local port locked start	Local port locked start
239	Local port locked end	Local port locked end
242	Tariff1 activation	Tariff1 has been activated
243	Tariff1 finish	Tariff1 has finished
244	Tariff2 activation	Tariff2 has been activated
245	Tariff2 finish	Tariff2 has finished
246	Tariff3 activation	Tariff3 has been activated
247	Tariff3 finish	Tariff3 has finished
248	Tariff4 activation	Tariff4 has been activated
249	Tariff4 finish	Tariff4 has finished
251	Clear all	Manufacturer define
252	Flash memory error	Manufacturer define
253	Current reverse end	Manufacturer define
254	profiles cleared	Any of the profiles cleared. NOTE: If it appears in Standard Event Log then any of the E-load profiles was cleared. If the event appears in the M-Bus Event log then one of the M-Bus load profiles was cleared.
255	Event log cleared	Indicates that the event log was cleared. This is always the first entry in an event log. It is only stored in the affected event log.

Tab 10-11 event code

10.6.3. Security access

The meter is provided with three(3) different programmable security codes (passwords) for programming/configuring the meter, reading the data from the meter and reset.

The meter will reject the access with wrong password, judge it as unauthorized access

The meter defined 3 associations with the different IDs and password. The meter can allow only one client to access per each association at the same time (the multiple accesses are not allowed).

Only after the meter successfully verified the security, the meter is able to exchange data/message with

client based on DLMS protocol, there have checksum mechanism to ensure the completeness and authenticity of exchanged data.

10.7. Firmware upgrading

The meter supports Both meter and Module firmware upgrading locally or remotely. The upgrading process is fully according to DLMS standard.

- 1. Image transfer initiate

- 2. Image block transfer

- 3. Image verify

- 4. Image Activate

10.8. Data transport security

implementation method of the data transport security shall be compliant with clause "5. Information Security in DLMS" of IEC 62056-5-3 and clause   "9.2. Information security" of DLMS GreenBook Ed. 9.

The security feature can be configurable as disable/enable via local or remote communications (default: disabled).

- Security policy can be configurable.

- Security suite: Security suite ID "0".

Security suite Id	Authentication algorithm	Encryption algorithm	Key transport method
0	AES-GCM-128	AES-GCM-128	Key wrapping using AES-GCM-128

- Cryptographic keys and their management.

- Master key
- Global unicast encryption key
- Global broadcast encryption key
- Authentication key (Global)
- Dedicated (unicast) encryption key

For each association, the cryptographic keys are able to be changed.
Once the meter shifted to HES mode, The invocation counter can be configured for optical, RS485 ports and module ports.
The meter access control is supported to block unauthorized access to critical data such as cryptographic key stored in the meter.

- Mutual authentication is supported between the meter and DLMS client devices locally (HHU) and remotely (Gateway, DCU, AMR server).

– Access to each data in the meter is restricted and varied on conditions such as user association level and access rights.

11. Accuracy Test

The accuracy of the meter is done with the pulse LEDs. For testing the following quantity of minimum pulses dependant from the load are recommended:

Load(I)	Min. quantity pulses
I_{st} - I_{ref}	1
I_{ref}	3
I_{max}	60

Tab.11-1: Quantity of pulses

12. Assembling and Installation

12.1. Outline of the meter

Fig.12-1: Housing

12.2. Overall dimensions
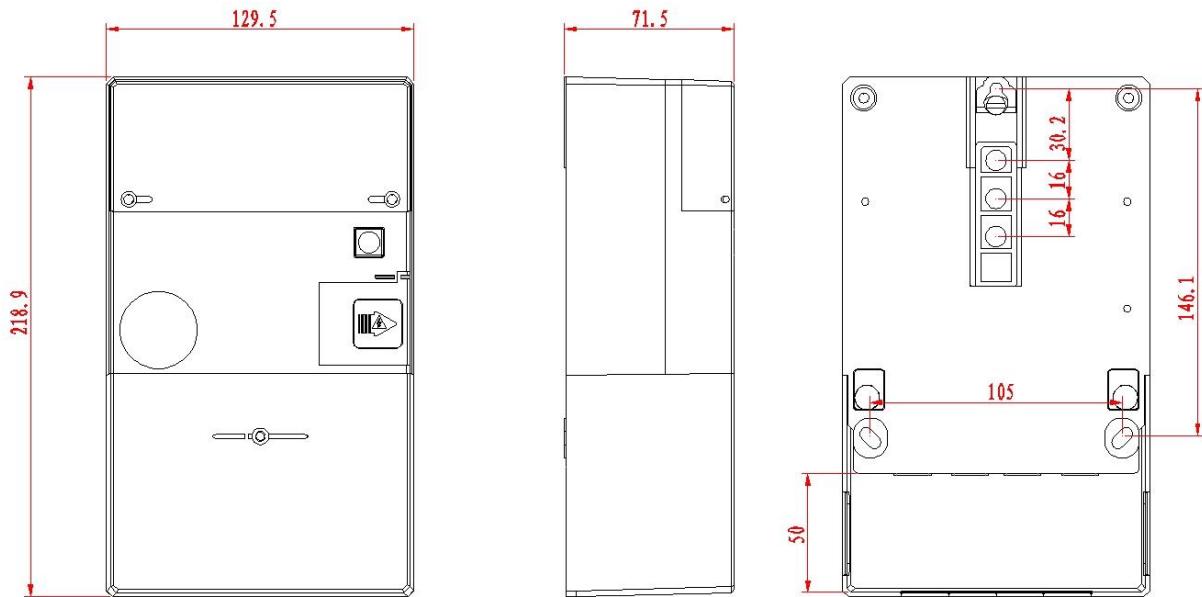
Fig. 12-2: Housing Dimensions(unit：mm)s

12.3. Terminal block

The terminal block is covered by terminal covers, so that no live terminals become accessible without removing the terminal cover.

The terminal is made by brass and the holes diameter is 10mm which is sufficient for conductor as per the current range,there are two screws for each conductor.
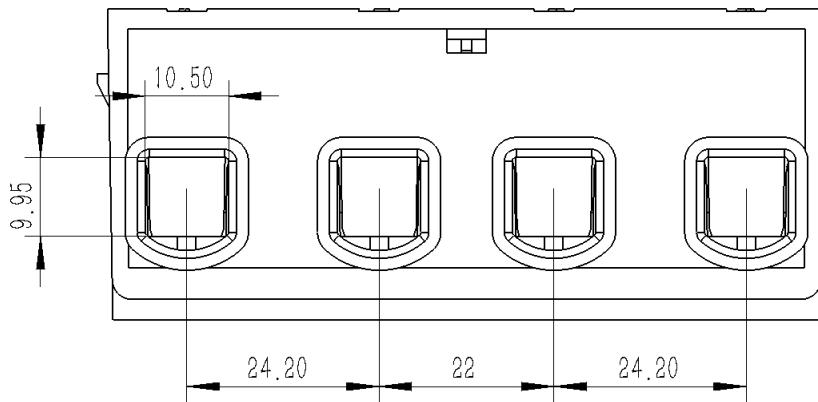

Fig. 12-3: Terminal Block(unit：mm)

12.4. Connections diagram

The connection diagram printed inside of terminal cover needs to be considered connecting the meter to the mains power.
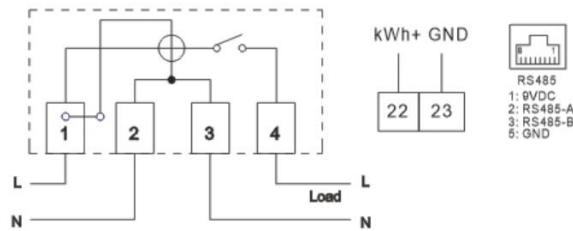
Fig. 12-4: Connection diagram

Terminal	Number	Terminal Screw	Recommend cable	Torque M [Nm]
Terminal L	1, 4	M6	4mm^2~50mm^2	2.0Nm < M <2.5Nm
Terminal N	2, 3			
Pulse Output +	22	M3	AWG 30-14	0.5Nm < M <0.6Nm
Pulse Output GND	23			

Tab.12-1: Connection diagram

12.5. Sealing

There are seven positions for meter casing sealing to protect the meter from illegal access, the casing cannot be removed without breaking the seals.

No.1,No.2,No.3, and No.4 for meter cover sealing;

No.5 for Battery box sealing.

No.6   for terminal cover.
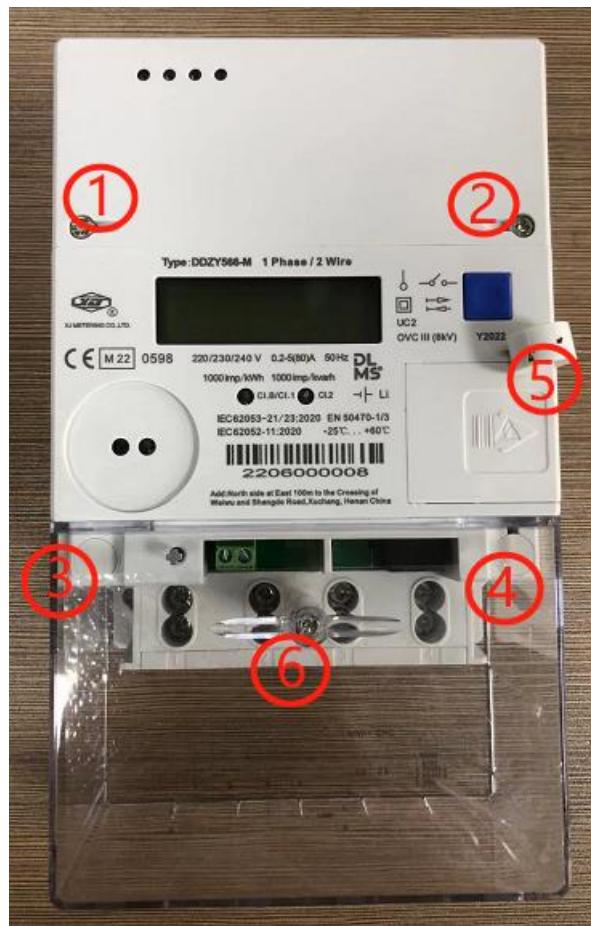
Fig. 12-5: Sealing Position

12.6. Nameplate
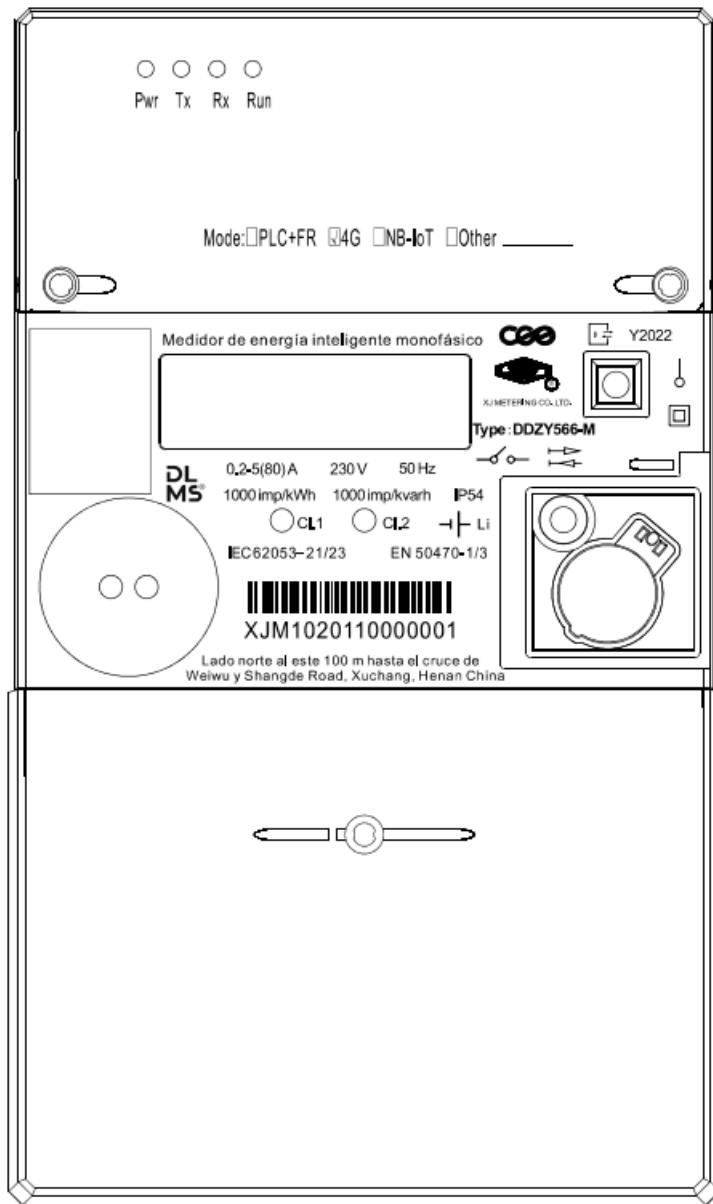
Fig. 12-6: Nameplate

Description of the nameplate

Nr	Element	Description
1	Symbol for single phase	(symbol)
2	Insulation class	(symbol)
3	Symbol for relay	(symbol)
4	Two energy directions	Import and Export energy measurement
5	Technical standards	EN 50470-1/3, IEC 62052-11, IEC62053-21/23
6	Frequency	60Hz
7	Meter serial number	QR code
8	DLMS protocol	(symbol)

| 9	Impulse voltage	6kV
10	Meter type	DDZY 566-M
11	Pulse test LED	1000 imp/kWh for active, 1000 imp/kvarh for reactive
12	Technical nominal data	120V, 0.2-5(80)A
13	Approval information	CE sign, manufacturer year, number for MID approval, named body for MID approval
14	Operation temperature	-25 ℃... +60 ℃
15	Utilization category	UC2

Tab.12-2: Nameplate

12.7. Installation

13. Handling

The meter packing carton box include 10 unit meter.

During the unpacking and handling, please noted the meter need to be handled with great care, If some meter fell down, please pick out it and store in separate place, and then do the retesting for confirmation.

The carton box drawing as below.
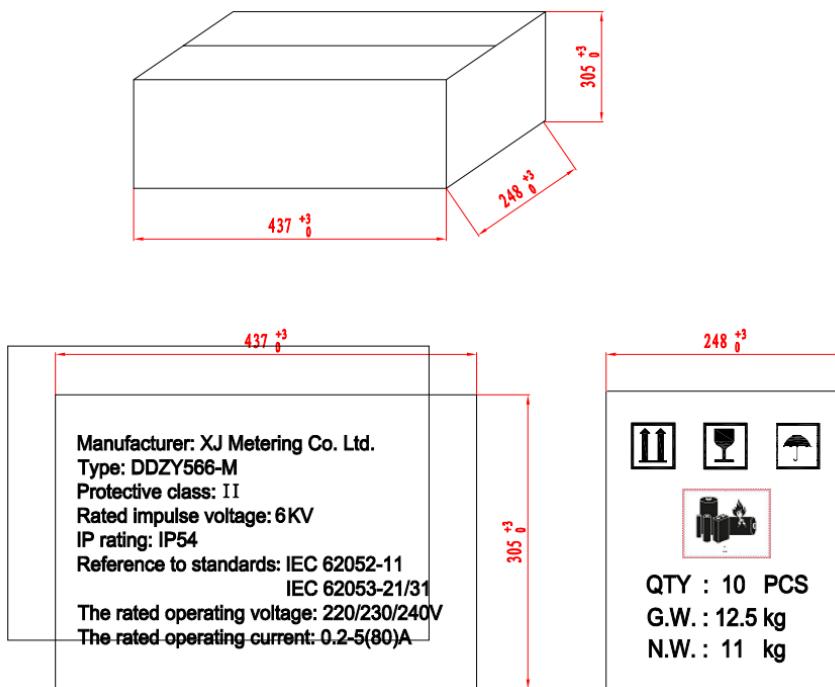
Fig. 13-1:Carton box

13.1. Prepare the tools and accessories

| Tools and accessories	
Screwdriver(Slotted) for M6 screw	
Screwdriver(Slotted) for M5 screw	
Sealing & Sealing pliers	For sealing of terminal cover
Optical communication cable	

Terminal cover & Screws	

Tab. 13-1: Description of the tools

13.2. Installation

Before the installation, must make sure the power supply is isolated to make sure whole installation process is safe.

13.3. Fixing

Use the M5 screws to fixing the meter on the meter box/Plate.
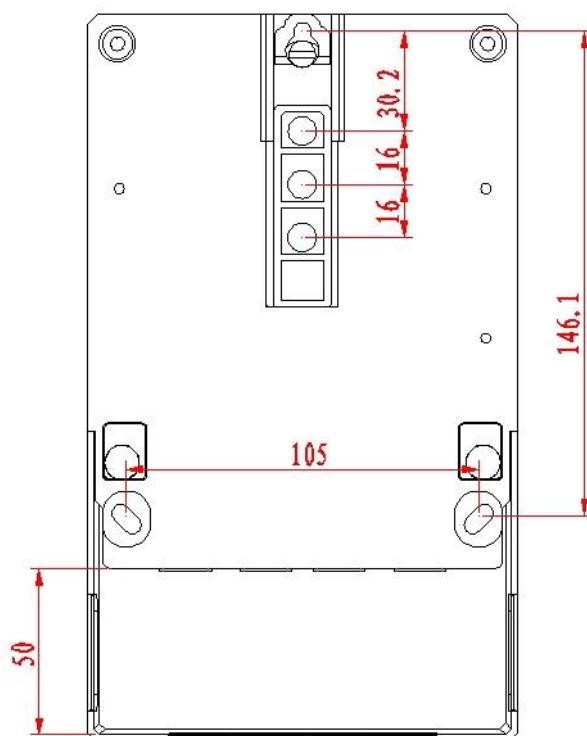
Fig.13-2: fix the meter

13.4. Wiring

For main voltage /current terminal.

- Connection of current/voltage cable according to the connection diagram.

- Insert the cable in the hole of the Main terminal. (Noted: The aperture of terminal is 10 mm)

- Suggested cable is 35 square mm multi-strand wire.

- Use the Screwdriver tightening the M6 screws (The torque is 2.0-2.5Nm).

For Signal terminal.

- Insert the cable in the hole of the signal terminal.(Noted: The aperture of terminal is 2.5 mm)

- Suggested cable is single core or strand wire, the wire diameter is AWG 30-AWG 12.

−   Use the Screwdriver tightening the screws (The torque is 0.5-0.6Nm).

13.5. Install the terminal cover

After wiring, use the M4 screws to fixing the terminal cover on the meter.

13.6. Testing

a)   Check after installation
    ✓   Check the wiring whether is correct
    ✓   Check the Screws whether are tight

b)   After confirm the wiring and screws, then power the meter, and check below items.

    ✓   Check the meter is work normal
    ✓   Check the LCD symbols for judge whether have some abnormal status
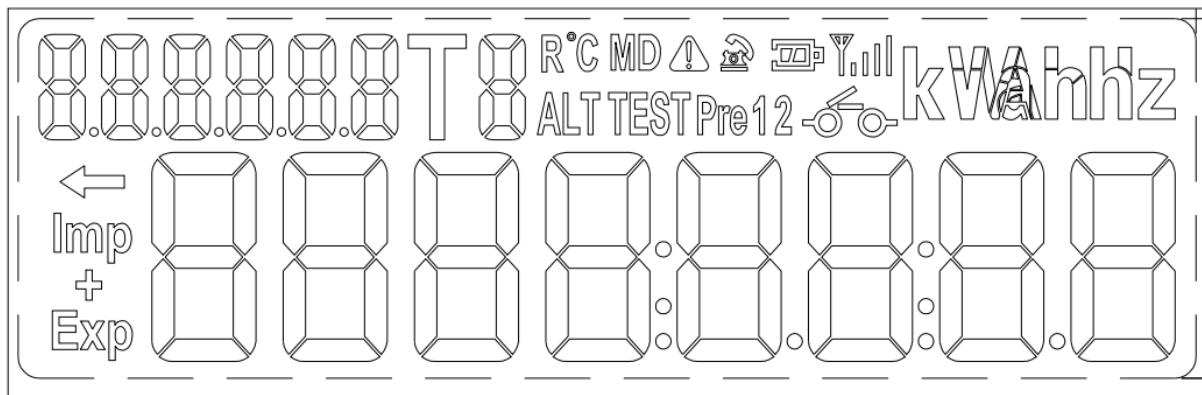
14. Maintenance

14.1. General Maintenance

①   Check the Sealing and wiring is correct

②   Check if meter is working properly

③   Check the alarm on the LCD
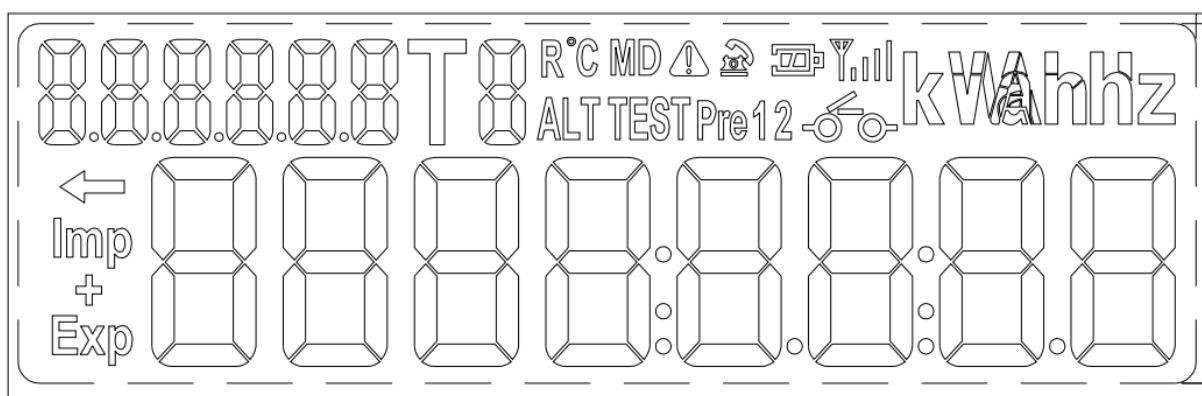
14.2. Clean

Normally the meter no need to be cleaned during whole meter life.

But we can wipe the outside surface of meter casing with dry towel to clean the dust if needed.

14.3. Replace the battery

When found the symbol on LCD is flashing. It means battery of meter is Low or depleted and need to replace the battery.

The meter supports replace battery during the power on condition.The steps of replacement of battery:

①　 Cut the sealing of battery cover;

②　 Take out the old battery;

③　 Install the new battery;

④　 Wait around 10 sec, and check the symbol will appear,it means installation is successful;

⑤　 Reseal the battery cover.

CAUTION – Risk of fire if battery is replaced with incorrect type or polarity. Dispose of used batteries according to instructions.

15. FCC warning statements:

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

· Reorient or relocate the receiving antenna.

· Increase the separation between the equipment and receiver.

· Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.

· Consult the dealer or an experienced radio/TV technician for help.

Caution: Any changes or modifications to this device not explicitly approved by manufacturer could void

your authority to operate this equipment.

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

The device has been evaluated to meet general RF exposure requirement. This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment.
This equipment should be installed and operated with minimum distance 20cm between the radiator & your body.