zaptronix METERING

Certified Standards
IEC 62053-21
IEC 62053-23

Supported standards
IEC 62052-11
IEC 62056-21
IEC 62056-61

ZAPλ3AM Three Phase Energy Demand Logging Multi-Tariff AMR Meter

Product Description
Operating Instructions
Features and Technical Data
Maintenance Instructions
Diagrams and Figures

ZAPTRONIX LIMITED

1st Floor Solutions House
Gazelle Close Corporate Park
Old Pretoria Road Midrand Gauteng South Africa
Tel: +27 11 238 2000
Fax: +27 11 238 2075

www.zaptronix.co.za
info@zaptronix.co.za

TABLE OF CONTENTS

1. Features and Measurement

The ZAPλ3AM multi-function electricity meter meets the IEC 62053-21(Class 1) standard for static energy meters. The main features of ZAPλ3AM include none physical adjustment components, digital signal processing, digital filters, digital error correction, digital calibration, immunity to temperature fluctuation, and excellent stability. Due to its overload multiplier (x12), the ZAPλ3AM meter can record energy usage of extremely low loads. Its accurate measurements of voltage, current, power factors and power can replace a series of indicating instruments and transmitters.

The basic functions of ZAPλ3AM include measurement and registration of active and apparent bi-directional (import and export) energy, reactive four-quadrant energy, maximum demand indications and other related functions.

Data can be retrieved through an energy registering system, which consists of a load-control terminal or other data terminal devices via RS485 bus or IR optical port. The communication protocol complies with IEC 62056-21. Data is displayed with large characters on the LCD to IEC 62056-61 compliant OBIS codes.

The ZAPλ3AM meter data processing functions include:

1.1 Energy Metering

1. Energy measurement using digital measuring chips, metering precision can therefore be digitally verified
2. High overload-multiplier energy metering (12 times multiplier metering for class 0.5S) by applying variable gain measurement and multi-section digital compensation
3. Active import and export energy, reactive 4-quadrant energy and apparent energy metering through data provided by energy measuring integrated chips. Reverse units will be recorded into sum KWh
4. 4-Tariffs and total energy metering of active import and export energy, reactive 4-quadrant energy, and apparent energy
5. Energy displays in 8 digits, decimal points configurable from 0 to 3 digits. User can select to display Primary values or Secondary values. Energy units are also programmable as ‘k’ or ‘M’, i.e. kWh/MWh, kvarh/Mvarh, kVAh/MVAh
6. Pulse indication of energy metering using two bright LED’s, which indicate active energy on the left and reactive energy on the right. The duty cycle of LED output is 50%
7. 4 Channels of pulse outputs are available to other devices. The pulse width is 80 ms. The first channel of pulse output is active import energy, second channel of pulse output is active export energy, third channel of pulse output is reactive energy Q1 and Q2 (first quadrant and second quadrant), fourth channel of pulse output is reactive energy Q3 and Q4 (third quadrant and fourth quadrant)
8. KWh and Kvarh per Phase: ZAPλ3AM measures per phase import and export active and reactive energy including:
   - Phase A +KWh, -KWh, +kvarh, -kvarh

- Phase B +KWh, -KWh, +kvarh, -kvarh
- Phase C +KWh, -KWh, +kvarh, -kvarh

9. All these values can be displayed on LCD or read from communication ports.

1.2 Maximum Demand Indication

1. Calculating functions of active import and export energy, reactive four-quadrant 4-tariff demands include total 30 demand data with the occurrence time of each demand data. The format of the time stamp is "month, date, hour, minute". The indication range of energy demand (including power) is 0 - 99.9999 kW/kvar/kVA or 0-99.9999 MW/Mvar/MVA
2. The calculating mode can be Block or Rolling. Sliding/Rolling Mode: Rolling interval can be set to 1, 2, 3, or 5 minutes and demand cycle can be set to 5, 10, 15, 30, or 60 minutes. If the demand cycle is set to 60 minutes, the rolling interval can only be set to 2, 3, or 5 minutes. The demand cycle must be an integer multiple of rolling interval
3. Block Mode: demand cycle can be set to 5, 10, 15, 30, or 60 minutes
4. The average power of each demand cycle is calculated and recorded, which can be displayed or read through the load profile
5. Total demand is not affected when the time block is changed, but a rolling interval before the change will be skipped when calculating tariff demand. The recording will start from zero by eliminating the previous rolling interval. In general, total demand equals a certain tariff demand. However, total demand may exceed all the combined demand readings. In other words, the maximum demand is recorded when a tariff is changed.
6. While recording the apparent max demand KVA, the ZAPλ3AM will record the coincidental active average power KW of demand cycle for user to calculate power factor.

1.3 Instrumentation Data Measurement & Display

1. Phase voltage(ABC) & current(ABCN), power factors(Total, ABC) can be read through RS-485 port or optical port using IEC 62056-21 protocol, or displayed directly on LCD. Meterview software will be required to program the optical port. For instructions and more information – please refer to the Meterview Manual or contact Zaptronix directly.
2. Measurement of harmonics values (optional).
3. Measurement of phase angles

NOTES:
Display for phase sequence is not supported, but if current and phase are matched, the meter will record the electrical energy and maximum demand correctly, even when the phase rotation/sequence is incorrect.

4. Active instantaneous power kW (ABC total), reactive instantaneous power kvar (ABC total), and apparent power kVA (ABC total) per second can be read through RS485 or optical port
5. Temperature measurement

6. Instant value of Frequency (Hz)

1.4 Time of Use (TOU) Revenue

- TOU can be controlled by configuring the parameters that are based on the meter's internal hardware real-time clock
- There are 3 levels of TOU controls, in preferential sequence, they are: "Public Holiday", "Weekend" and "Season"
- There are 4 sets of "daily-profile" tables: Public day, weekend and season can be controlled by selecting one of 4 "daily-profile" tables
- TOU for public holidays can be set to 24 days for every year format: month day daily profiles or month week daily profiles), and can be set for 100 special days (format: year month day daily-profiles)
- Weekend TOU can have up to 2 days as weekends for each week
- A year can be divided into up to 4 time sections. The shortest section is one day and the longest section is one year
- "Daily-profile" can divide a day into 10 time sections. Each section can select one of 4 tariffs. The shortest time is one minute, and the longest one day.

1.5 Automatic Data Recording – End of Billing Period

- ZAPλ3AM meter can be configured to record dynamic data at a pre-selected time as billing information, including energy storing and demand reset. The time is specified by 'day/date' and 'hour'
- The automatic data recording cycle is per month. The date of automatic data recording can be set as a non-zero value, namely date XX hour XX. A meter-reading date can be selected from 1 to 28
- Automatic data recording can be configured to execute energy recording and demand reset automatically, up to 16 historical energy and demand data can be recorded.

1.6 Load Profile Recording

The ZAPλ3AM meter provides a scrolling recording function of load profile data. Data sampling intervals are programmable from 1 to 60 minutes. It can be selected to record differential values or accumulative values. There are 25 channels of data samplings:

1) Active Import Energy
2) Active Export Energy
3) Active Energy
4) Reactive Import Energy
5) Reactive Export Reactive
6) Reactive Energy
7) Import Apparent Energy
8) Export Apparent Energy
9) Apparent Energy
10) Quadrant 1 Reactive Energy
11) Quadrant 2 Reactive Energy

12) Quadrant 3 Reactive Energy
13) Quadrant 4 Reactive Energy
14) Quadrant 1 Apparent Power
15) Quadrant 2 Apparent Power
16) Quadrant 3 Apparent Power
17) Quadrant 4 Apparent Power
18) Reactive Import Power
19) Reactive Export Power
20) Total Active Power
21) Active Import Power
22) Active Export Power
23) Phase A voltage, phase B voltage, phase C voltage
24) Phase A current, phase B current, phase C Current
25) Phase A power factor, phase B power factor, phase C power factor, total power factor

Non volatile memory size for load profile is 2M bytes. Data recording uses cyclic mode. If 4 channels are selected at 20 minute intervals, the meter can record 900 days of load profile data in memory

NOTE: Changing the meter clock might erase the existing load profile record: IT IS HIGHLY RECOMMENDED TO READ THE LOAD PROFILE RECORD BEFORE SETTING THE METER CLOCK

1.7 Event registration of Terminal Cover Open

The ZAPλ3AM housing features a complete unit, and there is no need to weld the top cover or monitor the top cover open events.

ZAPλ3AM will register the terminal cover open events with open & closing times. The meter will save the last 8 records ready for being read into the PC software.

1.8 Event Registration of Phase Failure

If the voltage of any phase drops to below 20 V, the meter will record the phase failure.

- It can record cumulative counts and minutes of phrase failure and cumulative active import/export energy while one or two phases fail. Up to 7 historical data points can be stored in the ZAPλ3AM meter. The reset command will not clear current data
- It can respectively record the latest 8 times of start and stop times (month/date/hour/minute) of phase failure.

1.9 Event Registration of Phase Voltage Loss

If any phase voltage is under 70% Un and the corresponding phase current is above 2%In, the meter will record phase voltage loss.

- It can record cumulative counts and minutes of phase voltage loss. Up to 7 historical data points can be stored. The reset command will not clear current data
- It can record the last 8 times of start and stop times (month/date/hour/ minute) of phase voltage loss.

1.10 Event Registration of Phase Current Loss (CT Open)

If any phase current is less than 2% In, the meter will record phase current loss. It will record cumulative counts and minutes, as well as start and stop times of phase current loss.

1.11 Event Registration of Voltage Imbalance

If the result of (maximum phase voltage – other phase voltage) / maximum phase voltage is greater than 10 %, the meter considers this as phase voltage imbalance, it will record start and stop times if user chooses to record.

1.12 Event Registration of Current Imbalance

If maximum phase current is greater than 5% In and the result of (maximum phase current – other phase current) / maximum phase current is greater than 30 %, the meter considers this as phase current imbalance. It will record the cumulative counts and minutes, as well as start and stop times of current imbalance.

1.13 Event & Programming Log

- The meter can record 255 events with time stamps; and snapshot of three phase voltage, current and power factor at occurrence and restoring time; user can choose what events to record
- The meter can record 200 programming records which include parameter settings.

1.14 Data Displaying on LCD

Energy and demand data can be displayed on the LCD, IEC 62056-61 standard compliant OBIS code.

One row of monitoring voltage and current data is added at the bottom of LCD, which can display voltage secondary value, current secondary value, power factors of ABC phases and total power factors in real time so that user can monitor running status of meter or power supply network.

1.15 Primary Metering - CT and PT ratio

The user can program the CT and PT values, and as well as read it through the communications ports; the user can also program the meter to display the CT and PT values and view it on the LCD screen. Energy and Demand can also have their own independent Multipliers.

The user can select the options to display Energy kWh and demand kW values in Primary values, i.e. with CT/PT ratio multiplied, or Secondary values, i.e. without CT/PT multiplied.

Because the ZAPλ3AM can be configured to display the energy data as Primary value or Secondary value, it is recommended to clear the energy data to avoid incorrect readings before changing the CT/PT values.

1.16 Inputs and outputs

- Passive pulse output interface with optical-coupling insulation for Voltage Free contact of 12-80 VDC/VAC
- Relay output for device control signal (optional)
- Auxiliary voltage supply input optional to power up the ZAPλ3AM meter (optional)
- Up to 2 digital number input signal connections (optional)
- Channels of impulse outputs programmable to +/- kWh, +/-kvarh, and +/- kVAh.

1.17 Communication Options

The ZAPλ3AM meter features a number of communication channel choices for meter reading as follows:

- Through the magnetic optical port on the meter front, the user can read and program the ZAPλ3AM meter as per IEC 1107, or the latest version of 62056-21, default BPS 9600
- ZAPλ3AM provides the option of up to 2 channels of RS485/232. The second serial port RS-485/232 can use either the push-fit terminal connectors or the Ethernet RJ45 connector if Ethernet is not enabled. Default BPS 9600.

2. OPERATING INSTRUCTIONS

1.18 Running and Display

Operation

There are 2 modes after data processing unit powers up:

- Running Mode: In this mode, ZAPλ3AM meter can perform TOU metering, demand calculating and load monitoring, and automatically display data at given time as programmed.
- Programming mode: ZAPλ3AM will switch to this mode after holding *Reset* button for 8 seconds. In this mode, LCD will display message “PRG”. It will continue to process energy metering, demand calculating and time switch only; it will not display data. ZAPλ3AM will exit from this mode when reset button is pushed again, or exit automatically if no button was pushed for 10 minutes.

When data processing unit is running, LED will flash once an effective energy pulse is registered, no matter which mode it is in.

1.19 Data display

1. There are 2 types of data display modes:

    1. Automatic Display: The display is automatic scrolling and can be used for routine monitoring.
    2. Pushbutton Display: User may continuously push display button until the needed data is displayed on LCD. This can be used to check data records in the meter.

Detailed descriptions of two types of data display modes are as follows:

1) Automatic Display : In this mode, display will not stop after it finishes one sequence of display. Instead, it will start from the beginning again. If display is interrupted due to reset or other operations, it resumes after 1 minutes maximum.

2) Pushbutton Display: ZAPλ3AM will switch to this mode once display button is pushed. In this mode, display time of each data item extends 60 times longer. For example, if original display time is set as 8 seconds for each data, display time for the same data extends to 8 minutes. Next data will be displayed once display button is pushed again. If display button is not pushed throughout the period when a data is being displayed, meter will automatically switch to Continuous display Mode after data display finishes.

2. Configuring display data

Due to the large amount of data available, some data can be configured to exclude from display if not interested in order to set the display intuitively and precisely for meter reading. The configuration can be set through RS485 interface, or optical port using handheld terminals.

All available data are listed in PC's program software, from which user can select which data to display.

3. High precision display

After holding the display button for 5 seconds, the meter will enter high precision display mode, and the energy data will be displayed in 5 integer with 3 decimal digits. The high precision display will be ended by another button pressing for 5 seconds or meter power off, or new calendar day beginning.

If the meter has been configured to display 3 or more decimal digits, this high precision display mode will not take effective even pushing buttons for 5 seconds.

For detailed ZAPλ3AM LCD display information - Please see Appendix A and Appendix B.

1.20 Programming

ZAPλ3AM meter's parameters can be configured from PC or from handheld programmer, both with user level password. For detailed operation instructions, please see PC programming software manual or programming meter reader handbook.

2.3.1 Three Level Programming Protection

The ZAPλ3AM meter provides 3 levels of programming protection:

- Lead-seal
- Push button
- Programming password.

In order to ensure data security and prevent non-authorized operation, the user must enter "programming status" by pressing the reset button after breaking the seal. The user should first break the seal on the right side of the LCD to unlock the seal lid, and then press the reset button (for approximately 8 seconds) until the LCD screen displays "PrG". Now the data processing unit is ready for programming.

2.3.2 Tracking of User Access

The ZAPλ3AM meter will record the last user programming date and time and the counts that the user has programmed the ZAPλ3AM meter. If the meter is programmed on multiple counts during a 5-minute period, the program count will only be incremented once.

3. Specifications and Technical Data

1.21 Power supply

3 Phase 4 Wire	3x57.7/100 – 240/415V, 3x5(15)A
3 Phase 3 Wire	3x110-480V, 3x1(10)A
50/60Hz	

ZAPλ3AM will work properly at phase voltages from 57.7 to 240V, any two phases not connected, or any one phase and neutral not connected.

1.22 Maximum demand indication

Calculation method: rolling or block
Calculation cycle: 5, 10, 15, 30, or 60 minutes
Rolling interval: 1, 2, 3, or 5 minutes
Recording range: 99.9999 kW
Additional error: ± (0.5+0.05 Pm/Pn) %
Pm - power value at Imax (cosϕ=1.0)
Pn - equivalent real power value on demand indicator
Reset mode: manual, automatic, infrared, and RS485

1.23 Clock

Electric clock: displaying year, month, day, week, hour, minute, second; in 24-hour format.
Error at 23h±2m: ±0.5 seconds/day
Error limits under working condition: ±2 seconds/day

1.24 Backup battery

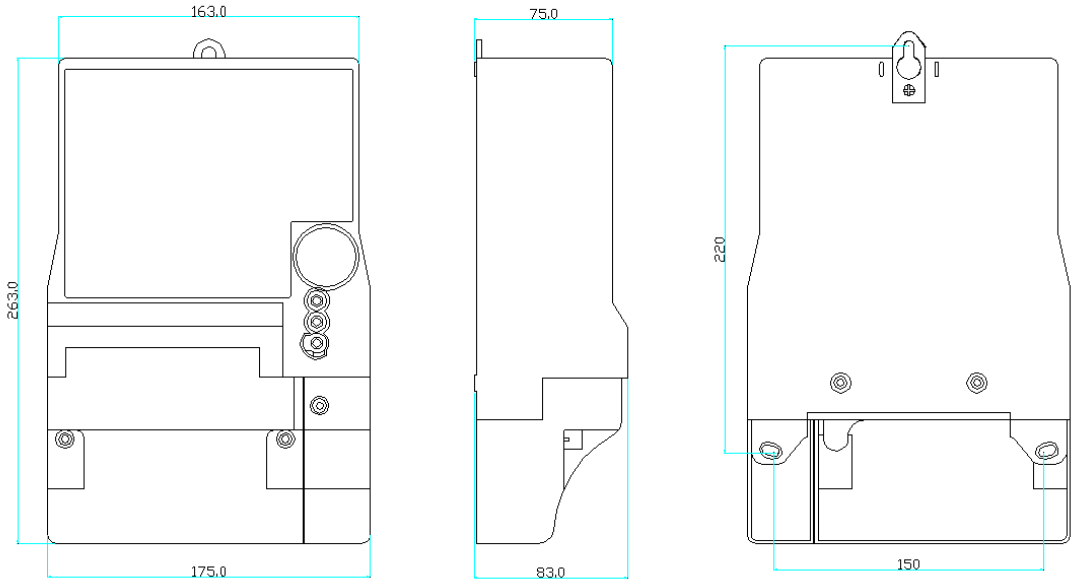
One long-lifetime super lithium battery is provided as power-down protection for clock, data and time block settings. One extra button lithium battery is also provided as backup for the super lithium battery.

Lifetime of the button lithium battery: ≥10 years. Lifetime of the super lithium battery: ≥30 years.

ZAPλ3AM has internal super capacitor, which will supply power to meter clock during mains power failure; it can sustain for about 2 weeks. The lithium battery will start working only after super capacitor consumes all of its power.

1.25 External size and weight

Size 263 x 175 x 83 mm
Weight 1.5 kg (3.5 lbs)



4. Usage, Transportation and Storage Conditions

- Requirements as applicable for use of indoor meters
- The number of piling layers should not exceed five in original package
- Moisture absorbent must be provided inside sealed package
- It is strictly forbidden to store the meter in the environment of high temperature or dense moisture for long periods of time
- ZAPλ3AM's LCD and meter cover are anti-ultraviolet. However, to extend the LCD service life, it is recommended that the meters are not installed where they are exposed to direct sunlight.

5. Warranty

- All Zaptronix products will be repaired or replaced free of charge within 12 months from date of purchase, at the full discretion of Zaptronix Limited. The warranty applies to faulty material and workmanship. The following exclusions to the warranty will apply:
  1. Abuse of the product through incorrect handling, storage or installation
  2. Products installed by unqualified staff
  3. Products exposed to extreme environmental factors such as fire and flooding
  4. Electrical damage caused by conditions outside of the IEC standard certified for the meter
  5. The warranty does not cover incidents of a force majeure nature
  6. Damage or loss of goods during transit

- It is the purchaser's responsibility to ensure that products are installed to industry standards
- Opening the meter enclosure will render the warranty invalid. A broken manufacturer's seal will be sufficient proof thereof
- All faulty meters must be returned to Zaptronix Limited in Midrand – see page 1 for address and contact details

6. Ordering

Meter types and specifications must be specified in all orders. Either pulse output or data output should be specified. If data output is selected, please indicate whether a two-line or four-line connection pattern is preferred.

7. Appendix A: Register (OBIS) Codes as per IEC 62056-61

Register Name	OBIS ID
Total active import energy	1-1:1.8.0
Total active export energy	1-1:2.8.0
Total reactive Import energy	1-1:3.8.0
Total reactive export energy	1-1:4.8.0
Total reactive energy Q1	1-1:5.8.0
Total reactive energy Q2	1-1:6.8.0
Total reactive energy Q3	1-1:7.8.0
Total reactive energy Q4	1-1:8.8.0
Total apparent import energy	1-1:9.8.0
Total apparent export energy	1-1:10.8.0
Total active import energy at the end of the previous month	1-1:1.8.0* X(0<X<16)
Total active export energy at the end of the previous month	1-1:2.8.0* X(0<X<16)
Total reactive import energy at the end of the previous month	1-1:3.8.0* X(0<X<16)
Total reactive export energy at the end of the previous month	1-1:4.8.0* X(0<X<16)
Total reactive energy Q1 at the end of the previous month	1-1:5.8.0* X(0<X<16)
Total reactive energy Q2 at the end of the previous month	1-1:6.8.0* X(0<X<16)
Total reactive energy Q3 at the end of the previous month	1-1:7.8.0* X(0<X<16)
Total reactive energy Q4 at the end of the previous month	1-1:8.8.0* X(0<X<16)
Total apparent import energy at the end of the previous month	1-1:9.8.0* X(0<X<16)
Total apparent export energy at the end of the previous month	1-1:10.8.0* X(0<X<16)
Active import energy of the current month in F1	1-1:1.8.1
Active import energy of the current month in F2	1-1:1.8.2
Active import energy of the current month in F3	1-1:1.8.3
Active import energy of the current month in F4	1-1:1.8.4
Active export energy of the current month in F1	1-1:2.8.1
Active export energy of the current month in F2	1-1:2.8.2
Active export energy of the current month in F3	1-1:2.8.3
Active export energy of the current month in F4	1-1:2.8.4
Reactive energy Q1 of the current month in F1	1-1:5.8.1
Reactive energy Q1 of the current month in F2	1-1:5.8.2
Reactive energy Q1 of the current month in F3	1-1:5.8.3
Reactive energy Q1 of the current month in F4	1-1:5.8.4
Reactive energy Q2 of the current month in F1	1-1:6.8.1
Reactive energy Q2 of the current month in F2	1-1:6.8.2
Reactive energy Q2 of the current month in F3	1-1:6.8.3
Reactive energy Q2 of the current month in F4	1-1:6.8.4
Reactive energy Q3 of the current month in F1	1-1:7.8.1
Reactive energy Q3 of the current month in F2	1-1:7.8.2
Reactive energy Q3 of the current month in F3	1-1:7.8.3

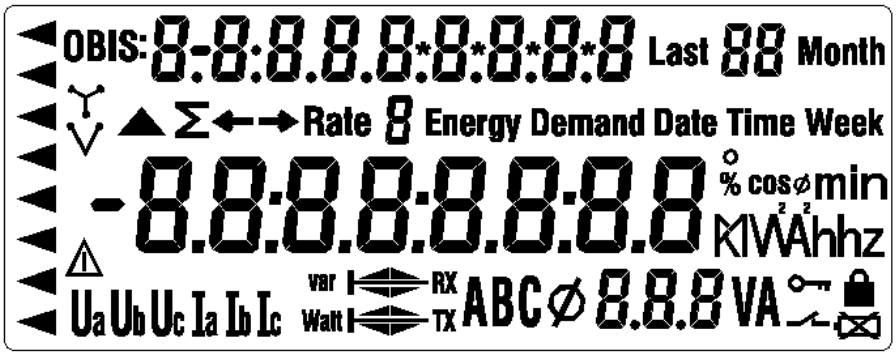
Reactive energy Q3 of the current month in F4	1-1:7.8.4
Reactive energy Q4 of the current month in F1	1-1:8.8.1
Reactive energy Q4 of the current month in F2	1-1:8.8.2
Reactive energy Q4 of the current month in F3	1-1:8.8.3
Reactive energy Q4 of the current month in F4	1-1:8.8.4
Active import energy of the previous month in F1	1-1:1.8.1* X(0<X<16)
Active import energy of the previous month in F2	1-1:1.8.2* X(0<X<16)
Active import energy of the previous month in F3	1-1:1.8.3* X(0<X<16)
Active import energy of the previous month in F4	1-1:1.8.4* X(0<X<16)
Active export energy of the previous month in F1	1-1:2.8.1* X(0<X<16)
Active export energy of the previous month in F2	1-1:2.8.2* X(0<X<16)
Active export energy of the previous month in F3	1-1:2.8.3* X(0<X<16)
Active export energy of the previous month in F4	1-1:2.8.4* X(0<X<16)
Reactive energy Q1 of the previous month in F1	1-1:5.8.1* X(0<X<16)
Reactive energy Q1 of the previous month in F2	1-1:5.8.2* X(0<X<16)
Reactive energy Q1 of the previous month in F3	1-1:5.8.3* X(0<X<16)
Reactive energy Q1 of the previous month in F4	1-1:5.8.4* X(0<X<16)
Reactive energy Q2 of the previous month in F1	1-1:6.8.1* X(0<X<16)
Reactive energy Q2 of the previous month in F2	1-1:6.8.2* X(0<X<16)
Reactive energy Q2 of the previous month in F3	1-1:6.8.3* X(0<X<16)
Reactive energy Q2 of the previous month in F4	1-1:6.8.4* X(0<X<16)
Reactive energy Q3 of the previous month in F1	1-1:7.8.1* X(0<X<16)
Reactive energy Q3 of the previous month in F2	1-1:7.8.2* X(0<X<16)
Reactive energy Q3 of the previous month in F3	1-1:7.8.3* X(0<X<16)
Reactive energy Q3 of the previous month in F4	1-1:7.8.4* X(0<X<16)
Reactive energy Q4 of the previous month in F1	1-1:8.8.1* X(0<X<16)
Reactive energy Q4 of the previous month in F2	1-1:8.8.2* X(0<X<16)
Reactive energy Q4 of the previous month in F3	1-1:8.8.3* X(0<X<16)
Reactive energy Q4 of the previous month in F4	1-1:8.8.4* X(0<X<16)
Phase A active import energy	1-1:21.8.0
Phase B active import energy	1-1:41.8.0
Phase C active import energy	1-1:61.8.0
Phase A active export energy	1-1:22.8.0
Phase B active export energy	1-1:42.8.0
Phase C active export energy	1-1:62.8.0
Phase A reactive import energy	1-1:23.8.0
Phase B reactive import energy	1-1:43.8.0
Phase C reactive import energy	1-1:63.8.0
Phase A reactive export energy	1-1:24.8.0
Phase B reactive export energy	1-1:44.8.0
Phase C reactive export energy	1-1:64.8.0

Active Maximum demand (import)	1-1:1.6.0
Active Maximum demand (export)	1-1:2.6.0
Active Maximum demand (import) in F1	1-1:1.6.1
Active Maximum demand (import) in F2	1-1:1.6.2
Active Maximum demand (import) in F3	1-1:1.6.3
Active Maximum demand (import) in F4	1-1:1.6.4
Active Maximum demand (export) in F1	1-1:2.6.1
Active Maximum demand (export) in F2	1-1:2.6.2
Active Maximum demand (export) in F3	1-1:2.6.3
Active Maximum demand (export) in F4	1-1:2.6.4
Reactive Maximum demand (import)	1-1:3.6.0
Reactive Maximum demand (export)	1-1:4.6.0
Apparent Maximum demand (import)	1-1:9.6.0
Apparent Maximum demand (export)	1-1:10.6.0
import active total power at apparent demand	1-1:1.5.0
import active tariff 1 power at apparent demand	1-1:1.5.1
import active tariff 2 power at apparent demand	1-1:1.5.2
import active tariff 3 power at apparent demand	1-1:1.5.3
import active tariff 4 power at apparent demand	1-1:1.5.4
export active total power at apparent demand	1-1:2.5.0
export active tariff 1 power at apparent demand	1-1:2.5.1
export active tariff 2 power at apparent demand	1-1:2.5.2
export active tariff 3 power at apparent demand	1-1:2.5.3
export active tariff 4 power at apparent demand	1-1:2.5.4
Instantaneous active import power of phase A	1-1:21.7.0
Instantaneous active export power of phase A	1-1:22.7.0
Instantaneous reactive import power of phase A	1-1:23.7.0
Instantaneous reactive export power of phase A	1-1:24.7.0
Instantaneous apparent import power of phase A	1-1:29.7.0
Instantaneous apparent export power of phase A	1-1:30.7.0
Instantaneous current of phase A	1-1:31.7.0
Instantaneous voltage of phase A	1-1:32.7.0
Instantaneous power factor of phase A	1-1:33.7.0
Instantaneous active import power of phase B	1-1:41.7.0
Instantaneous active export power of phase B	1-1:42.7.0
Instantaneous reactive import power of phase B	1-1:43.7.0
Instantaneous reactive export power of phase B	1-1:44.7.0

Instantaneous apparent import power of phase B	1-1:49.7.0
Instantaneous apparent export power of phase B	1-1:50.7.0
Instantaneous current of phase B	1-1:51.7.0
Instantaneous voltage of phase B	1-1:52.7.0
Instantaneous power factor of phase B	1-1:53.7.0
Instantaneous active import power of phase C	1-1:61.7.0
Instantaneous active export power of phase C	1-1:62.7.0
Instantaneous reactive import power of phase C	1-1:63.7.0
Instantaneous reactive export power of phase C	1-1:64.7.0
Instantaneous apparent import power of phase C	1-1:69.7.0
Instantaneous apparent export power of phase C	1-1:70.7.0
Instantaneous current of phase C	1-1:71.7.0
Instantaneous voltage of phase C	1-1:72.7.0
Instantaneous power factor of phase C	1-1:73.7.0
Instantaneous active import power	1-1: 1.7.0
Instantaneous active export power	1-1: 2.7.0
Instantaneous reactive import power	1-1: 3.7.0
Instantaneous reactive export power	1-1: 4.7.0
Instantaneous apparent import power	1-1: 9.7.0
Instantaneous apparent export power	1-1:10.7.0
Instantaneous power factor	1-1:13.7.0

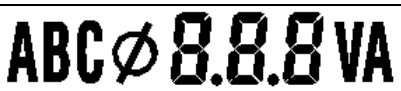
8. Appendix B: ZAPλ3AM LCD Display

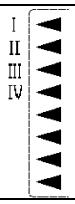
B.1 Full screen self-check



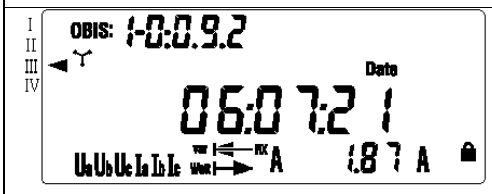
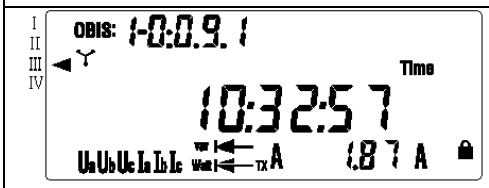
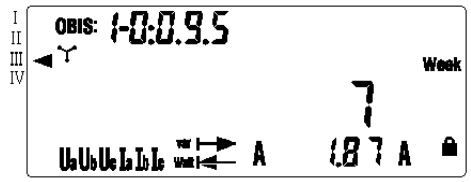
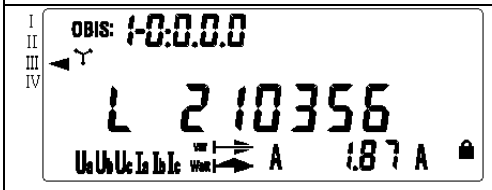
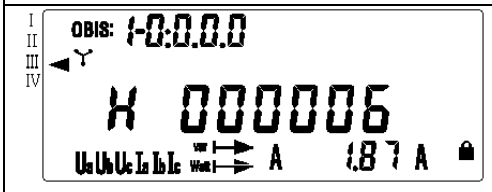
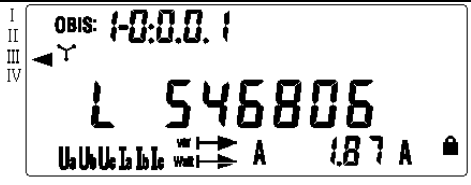
B.2 Screen display sign explanation

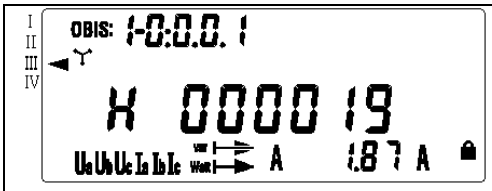
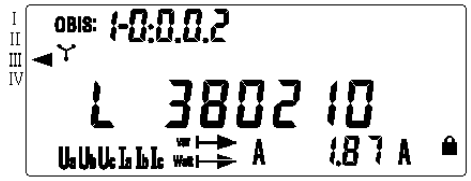
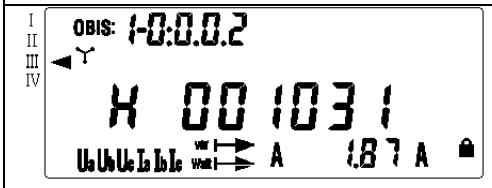
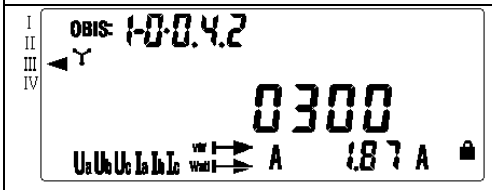
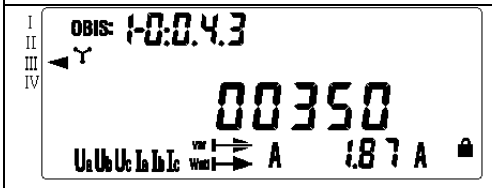
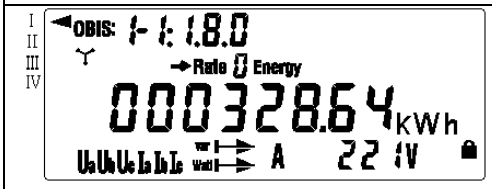
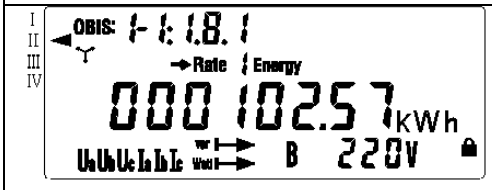
Sign	Explain

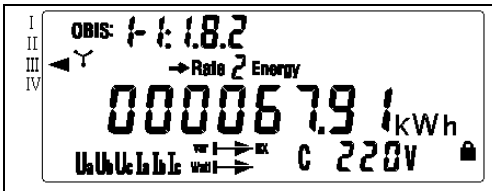
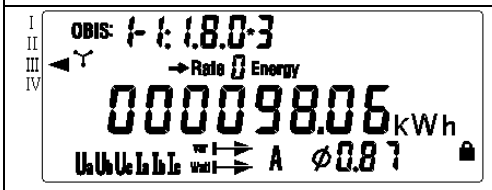
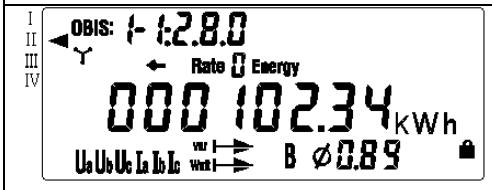
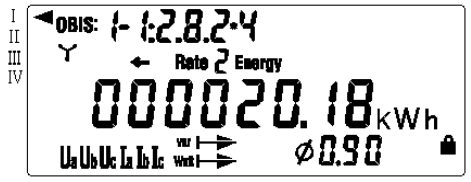
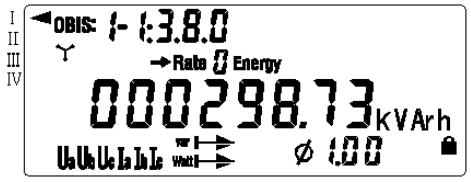
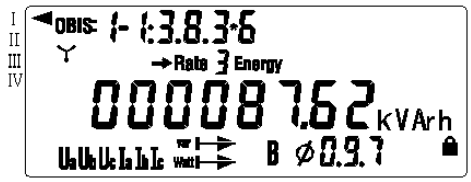
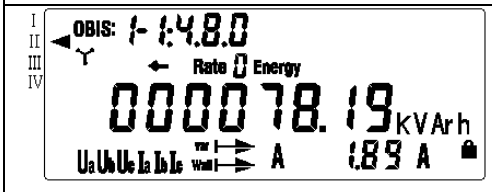
	Data display code in compliance with IEC 62056-61.
	Data unit displays: kWh / MWh (active energy) kW / MW (active power) kvarh / Mvarh (reactive energy) kvar / mvar (reactive power) kVAh / MVAh (apparent energy) kVA / MVA (apparent power) Hz (Frequency)
	A/B/C represents phase A, B and C respectively when displaying the instantaneous values of the three phases, including Voltage, Current and Power Factor V is the unit for Voltage, A is the unit for Current, Φ means the current value is power factor A/B/C and Φ displayed with number means the power factor per phase Φ displayed with number means the total power factor
	Under normal working condition, “Ua Ub Uc ” should all be displayed If there is a Phase Failure, the corresponding character will not show If Voltage is lost, the corresponding character flashes If all Phases are lost or Voltage Sequence Reversed, “Ua Ub Uc” will all flash Under normal working condition, “Ia Ib Ic ” should all display If Current is lost, the corresponding character does not show If there is a Current imbalance, the corresponding character flashes
	Arrowhead on the right of var shows current reactive direction Arrowhead on the right of Watt shows current active direction Arrowhead pointing to the right shows import Arrowhead pointing to the left shows export These arrows will indicate reverse connections on LCD
	Displayed only when lack of battery energy
	Displayed when meter is in level 2 program protect to be programmed, and the seal must be opened
RX TX	RX display shows the meter is receiving data TX display shows the meter is transferring data

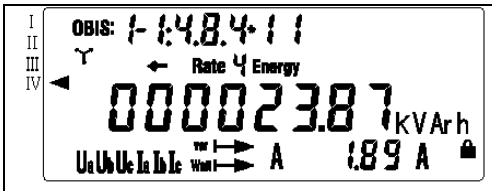
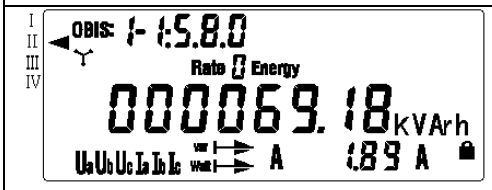
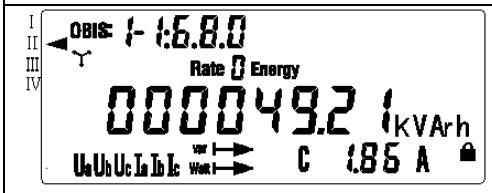
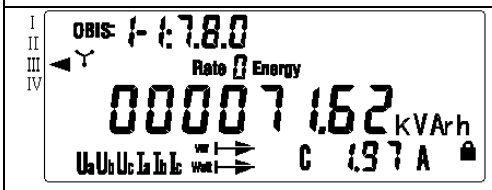
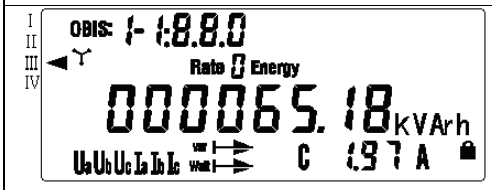
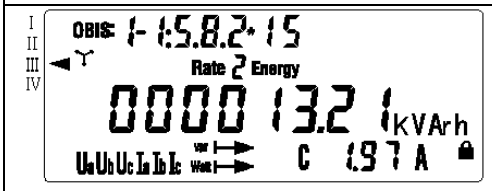
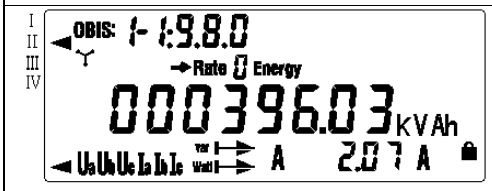
	If this flashes, it means that it is overloading
min	If Min is displaying, it indicates that the unit for the current data is minutes of time
	The top 4 arrows indicate the current active tariff No. 5 & 6 &7 & 8 are reserved
	If this flashes, it means that warning or error event happened
	The upper one indicates 3 phase 4 wire connection The lower one indicates 3 phase 3 wire connection

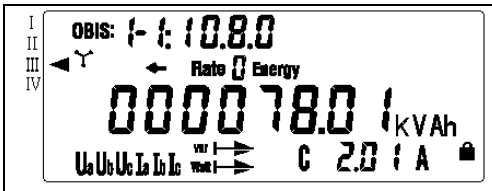
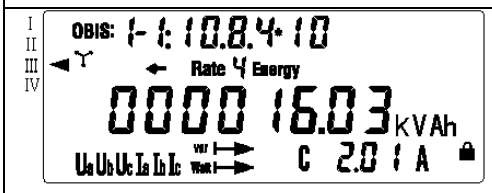
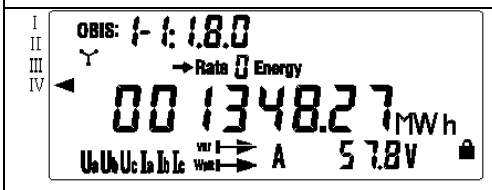
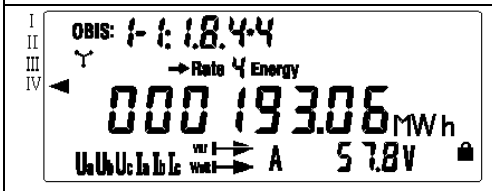
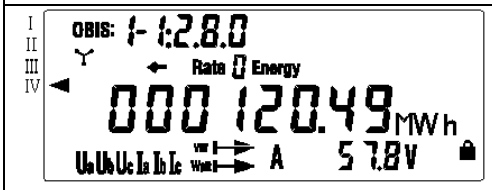
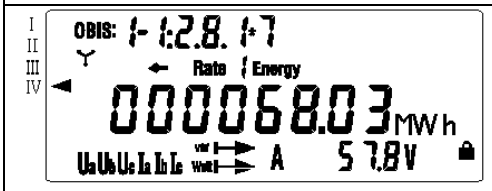
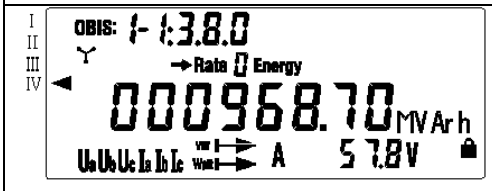
B.3 display Explanations

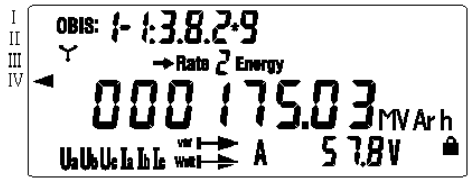
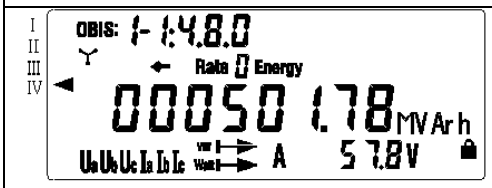
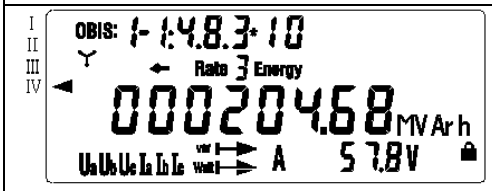
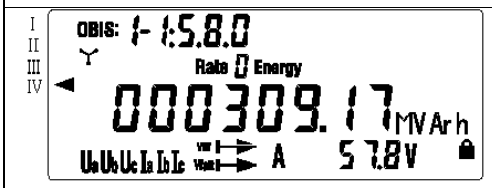
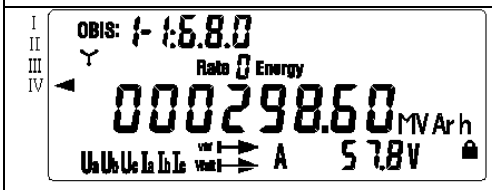
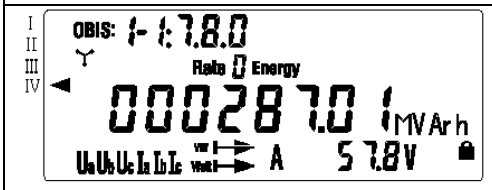
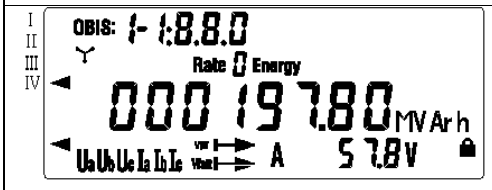
Display	Explanation
	Current date is 06/07/21 Year/Month/Day
	Current time is 10:32:57 (Phase A Current is 1.87A)
	Display shows current day as Sunday 1: Monday 2. Tuesday 3. Wednesday 4. Thursday 5: Friday 6. Saturday 7. Sunday
	Low 6 digits of Meter No. is 210356
	High 6 digits of Meter No. is 000006
	Low 6 digits of User No. is 5456806

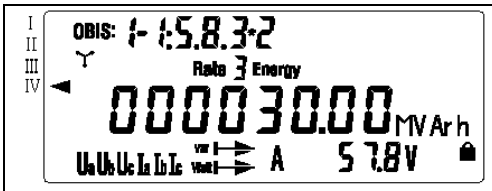
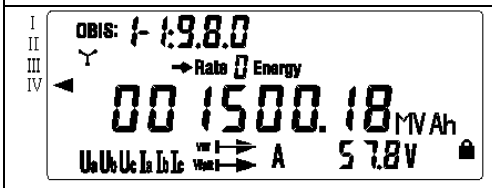
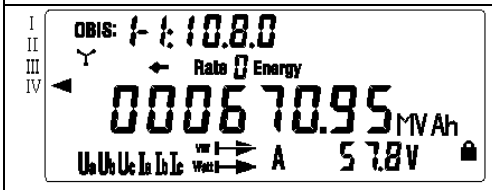
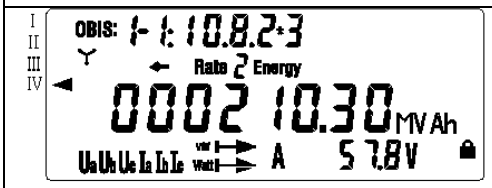
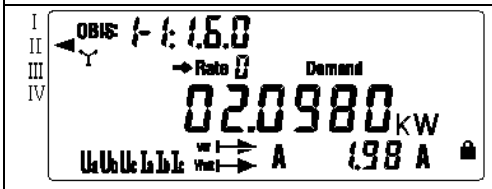
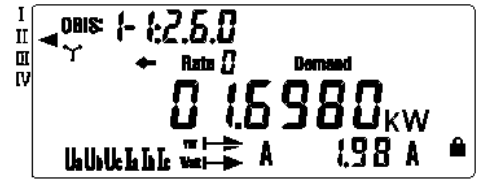
	High 6 digits of User No. is 000019
	Low 6 digits of Device No. is 380210
	High 6 digits of User No. is 001031
	CT Ratio is 300.
	PT Ratio is 350.
	Current import active total energy is 328.64 kWh (Current Phase A Voltage 221V)
	Current import active tariff 1 energy is 102.57kWh (Current Phase B Voltage 220V)

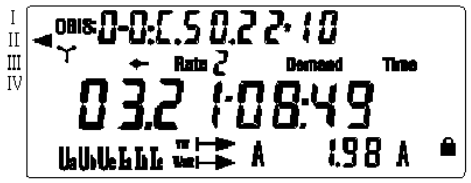
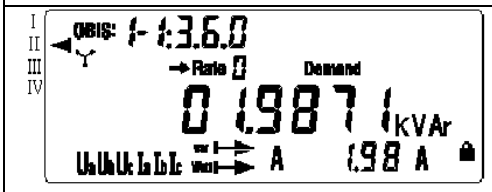
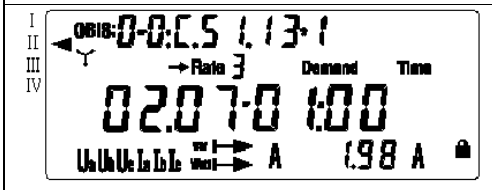
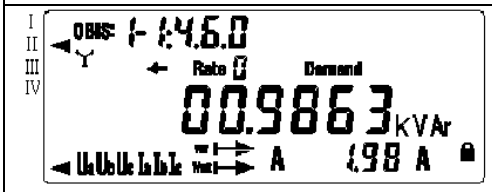
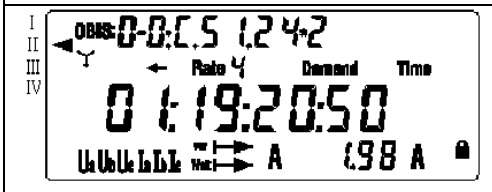
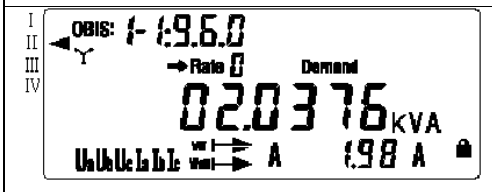
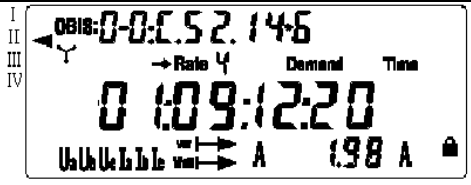
	Current import active tariff 2 energy is 67.91kWh (Current Phase C Voltage 220V)
	The 3rd historical import active tariff 3 energy is 98.06 kWh (Current Phase A Power Factor 0.87)
	Current Export active total energy is 102.34 kWh (Current Phase A Power Factor 0.89)
	The 4th historical export active tariff 2 energy is 20.18 kWh
	Current import reactive total energy is 298.73kvarh
	The 6th historical import reactive tariff 3 energy is 87.62 kvarh
	Current export reactive total energy is 78.19 kvarh

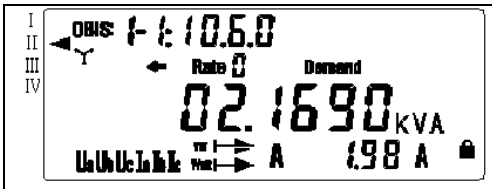
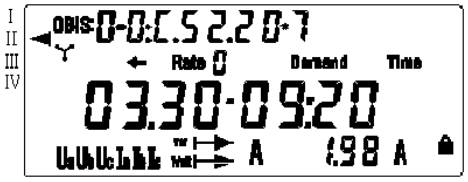
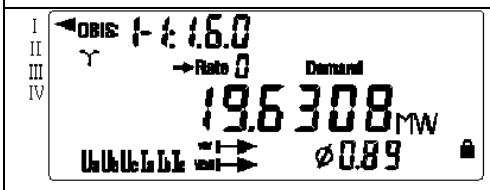
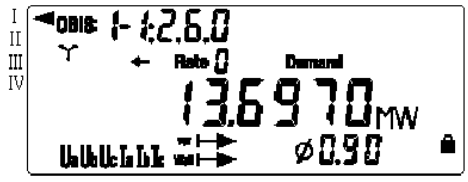
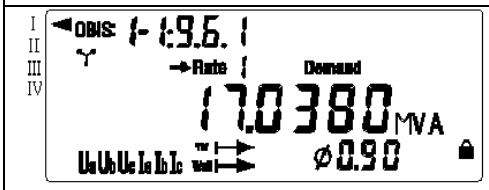
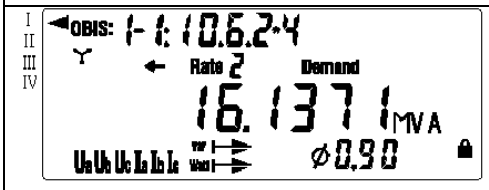
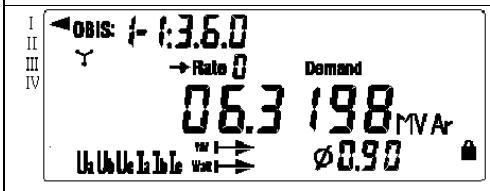
	The 11th historical export reactive tariff 4 energy is 23.87 kvarh
	Current Quadrant 1 reactive total Energy is 69.18kvarh
	Current Quadrant 2 reactive total Energy is 69.18kvarh
	Current Quadrant 3 reactive total Energy is 71.62kvarh
	Current Quadrant 4 reactive total Energy is 65.18kvarh
	The 15th historical Quadrant 4 reactive tariff 2 energy is 13.21 kvarh
	Current import apparent total energy is 396.03 kVAh

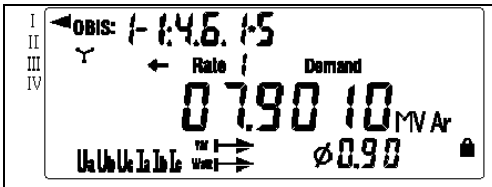
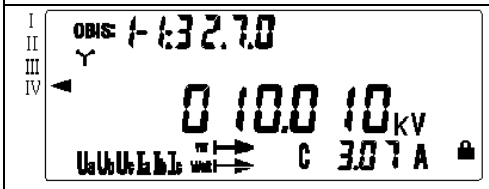
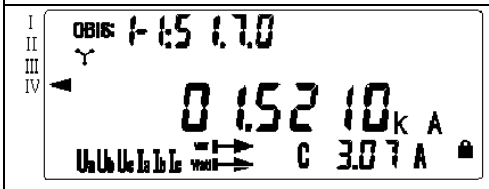
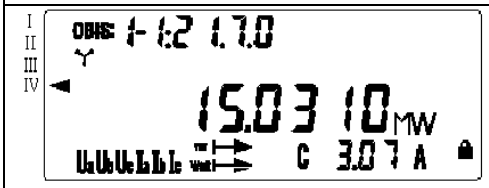
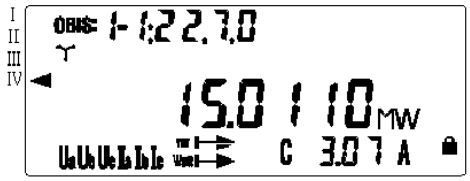
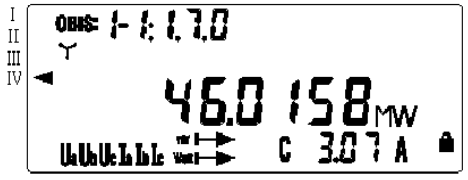
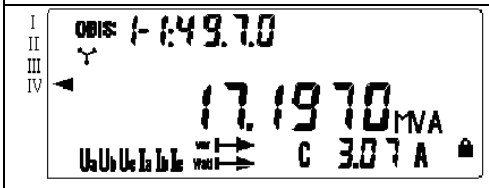
	Current export apparent total energy is 78.01 kVAh
	The 10th historical export apparent tariff 4 energy is 16.03 kVAh
	Current import active total energy is 1348.27MWh Displaying Primary value, i.e. with CT & PT ratio multiplied
	The 4th historical import active tariff 4 energy is 193.06MWh. Displaying Primary value, i.e. with CT & PT ratio multiplied
	Current export active total energy is 120.49MWh Displaying Primary value, i.e. with CT & PT ratio multiplied
	The 7th historical export active tariff 1 energy is 68.03MWh. Displaying Primary value, i.e. with CT & PT ratio multiplied
	Current import reactive total energy is 968.70Mvarh Displaying Primary value, i.e. with CT & PT ratio multiplied

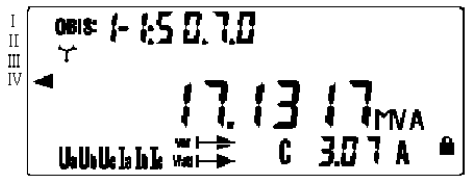
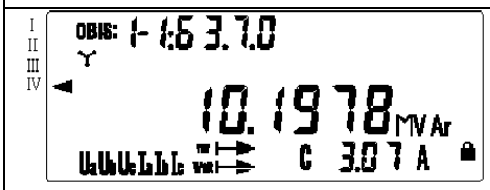
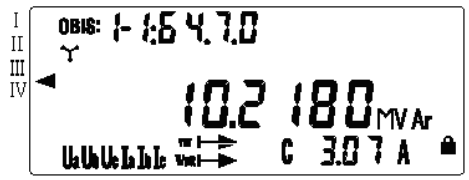
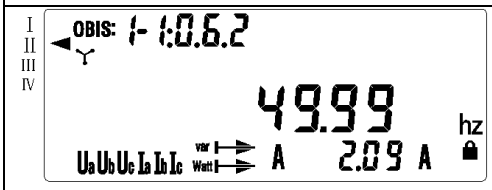
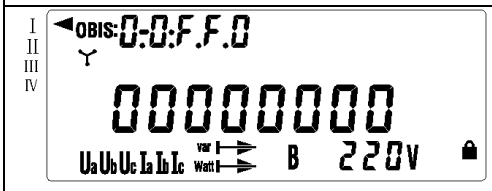
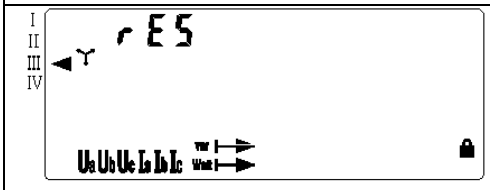
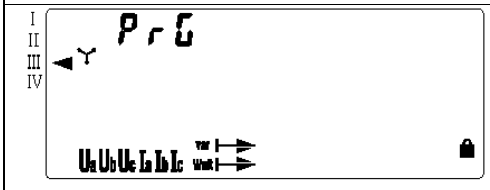
	The 9th historical import reactive tariff 2 energy is 175.03Mvarh Displaying Primary value, i.e. with CT & PT ratio multiplied
	Current export reactive total energy is 501.78Mvarh Displaying Primary value, i.e. with CT & PT ratio multiplied
	The 10th historical export reactive tariff 3 energy is 204.68Mvarh Displaying Primary value, i.e. with CT & PT ratio multiplied
	Current Quadrant 1 reactive total energy is 309.17Mvarh Displaying Primary value, i.e. with CT & PT ratio multiplied
	Current Quadrant 2 reactive total energy is 29860Mvarh Displaying Primary value, i.e. with CT & PT ratio multiplied
	Current Quadrant 3 reactive total energy is 287.01Mvarh Displaying Primary value, i.e. with CT & PT ratio multiplied
	Current Quadrant 4 reactive total energy is 197.80Mvarh Displaying Primary value, i.e. with CT & PT ratio multiplied

	The 2nd historical Quadrant 4 reactive tariff 3 energy is 30.00Mvarh Displaying Primary value, i.e. with CT & PT ratio multiplied
	Current import apparent total energy is 1500.18MVArh Displaying Primary value, i.e. with CT & PT ratio multiplied
	Current export apparent total energy is 670.95MVArh Displaying Primary value, i.e. with CT & PT ratio multiplied.
	The 3rd historical export apparent tariff 2 energy is 210.30Mvarh Displaying Primary value, i.e. with CT & PT ratio multiplied
	Current import active total max demand is 2.0980kW Displaying Secondary value, i.e. without CT & PT ratio multiplied
	The date of 2nd historical import active tariff 1 max demand date is 03/1710:30 (month: day hour: minute)
	Current export active total max demand is 1.6980kW Displaying Secondary value, i.e. without CT & PT ratio multiplied

	The date of 10th historical export active tariff 2 max demand date is 03/21.08:49 (month: day. hour: minute)
	Current import reactive total max demand is 1.9871kW Displaying Secondary value, i.e. without CT & PT ratio multiplied
	The date of 1st historical import reactive tariff 3 max demand date is 02/07 01:00 (month. day .hour: minute)
	Current export reactive total max demand is 0.9863kW Displaying Secondary value, i.e. without CT & PT ratio multiplied
	The date of 2nd historical export reactive tariff 4 max demand date is 01/19.20:50 (month: day. hour: minute)
	Current import apparent total max demand is 2.0376kVA Displaying Secondary value, i.e. without CT & PT ratio multiplied
	The date of 6th historical import apparent tariff 4 max demand date is 01/0912:20 (month: day.hour: minute)

	Current export apparent total max demand is 2.1690kVA Displaying Secondary value, i.e. without CT & PT ratio multiplied
	The date of 7th historical export apparent total max demand date is 03/30 09:20 month. day. hour: minute);
	Current import active total max demand is 19.6308MW Displaying Primary value, i.e. with CT & PT ratio multiplied
	Current export active total max demand is 13.6970MW Displaying Primary value, i.e. with CT & PT ratio multiplied
	Current import apparent tariff 1 max demand is 17.0380MVA Displaying Primary value, i.e. with CT & PT ratio multiplied
	The 4th historical export apparent tariff 2 max demand is 16.1371MVA Displaying Primary value, i.e. with CT & PT ratio multiplied
	Current import apparent tariff 1 max demand is 17.0380MVA Displaying Primary value, i.e. with CT & PT ratio multiplied

	The 5th historical export reactive tariff 1 max demand is 07.9010Mvar Displaying Primary value, i.e. with CT & PT ratio multiplied
	The Voltage of phase A is 10,010kV Displaying Primary voltage value, i.e. with PT ratio multiplied
	The Current of phase B is 1.5210kA Displaying Primary Current value, i.e. with CT ratio multiplied
	The import active power of phase A is 15.0310MW Displaying Primary value, i.e. with CT & PT ratio multiplied
	The export active power of phase A is 15.0310MW Displaying Primary value, i.e. with CT & PT ratio multiplied
	The import active power is 46.0158MW Displaying Primary value, i.e. with CT & PT ratio multiplied
	The import apparent power of phase B is 17.1970MVA Displaying Primary value, i.e. with CT & PT ratio multiplied

	The export apparent power of phase B is 17.1317MVA Displaying Primary value, i.e. with CT & PT ratio multiplied
	The import reactive power of phase C is 10.1978Mvar Displaying Primary value, i.e. with CT & PT ratio multiplied
	The export reactive power of phase C is 10.12180Mvar Displaying Primary value, i.e. with CT & PT ratio multiplied
	The frequency is 49.99Hz
	The error code is 0000 0000, Meter is Ok
	Reset state display: When the user presses the reset button for more than 3 seconds, the screen will display on the left. If the button is released, the meter will reset , current energy will be stored, and current demand will be cleared
	Program state display: When the user presses the reset button for more than 8 seconds, the meter will display as left, and will be ready for programming

B.4 Factory Default Settings for Push-Button & Automatic Display

Full screen	Full screen self check display
0-0:C.50.1*0	Day profiles 1 display **Notes:** If push button is not pressed, day profiles 2-4 and season will be displayed
1-0:0.0.0	High 6 digitals of Meter No (H)
1-0:0.0.0	Low 6 digitals of Meter No (L)
1-0:0.0.2	High 6 digitals of Device No (H)(Ether IP H)
1-0:0.0.2	Low 6 digitals of Device No (L)(Ether IP L)
1-0:0.9.2	Current date
1-0:0.9.1	Current time
1-0:0.4.2	CT
1-0:0.4.3	PT
1-1:1.8.0	active import total energy (+kWh)
1-1:1.8.1	active import tariff 1 energy (+kWh)
1-1:1.8.2	active import tariff 2 energy (+kWh)
1-1:1.8.3	active import tariff 3 energy (+kWh)
1-1:1.8.4	active import tariff 4 energy (+kWh)
1-1:2.8.0	active export total energy (-kWh)
1-1:2.8.1	active export tariff 1 energy (-kWh)
1-1:2.8.2	active export tariff 2 energy (-kWh)
1-1:2.8.3	active export tariff 3 energy (-kWh)
1-1:2.8.4	active export tariff 4 energy (-kWh)
1-1:3.8.0	reactive import total energy (+kvarh)
1-1:3.8.1	reactive import tariff 1 energy (+kvarh)
1-1:3.8.2	reactive import tariff 2 energy (+kvarh)
1-1:3.8.3	reactive import tariff 3 energy (+kvarh)
1-1:3.8.4	reactive import tariff 4 energy (+kvarh)
1-1:4.8.0	reactive export total energy (-kvarh)
1-1:4.8.1	reactive export tariff 1 energy (-kvarh)
1-1:4.8.2	reactive export tariff 2 energy (-kvarh)
1-1:4.8.3	reactive export tariff 3 energy (-kvarh)
1-1:4.8.4	reactive export tariff 4 energy (-kvarh)
1-1:9.8.0	apparent import total energy (+kVAh)
1-1:10.8.0	apparent export total energy (-kVAh)
1-1:1.6.0	Active import total demand (+kW)
1-1:2.6.0	Active export total demand (-kW)
1-1:9.6.0	Apparent import total demand (+kVA)
1-1:10.6.0	apparent export total demand (-kVA)
1-0:0.3.3	Active meter constant
1-0:0.3.4	Reactive meter constant

B.5 Error Information

	Error Info	

Error code	0000 0001	Clock ‘s Oscillator Error
	0000 0010	Read/Write Clock Error
	0000 0100	Read/Write EEPROM Error
	0000 1000	Read /Write measure chip Error
	0001 0000	CPU Program Error
	0010 0000	reserved
	0100 0000	Low Battery Voltage
	1000 0000	SPI Read or Write Error
Warning Code	0000 0001	Over Voltage
	0000 0010	Under Voltage
	0000 0100	Voltage Loss
	0000 1000	phase failure
	0001 0000	Active Energy Reverse of Phase A,B,C
	0010 0000	Active Energy Reverse
	0100 0000	Current Loss
	1000 0000	Phase Voltage sequence reverse

NOTE:

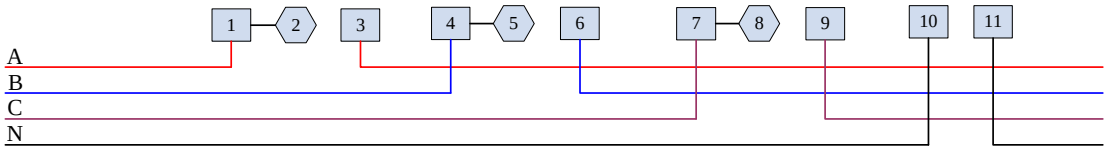
1. Every Error Event Uses One Unique ID Number

2. All the above events can be displayed on LCD; error / warning will be flagged by flashing of the following symbol on the LCD:

9. Appendix C: Connection Diagrams

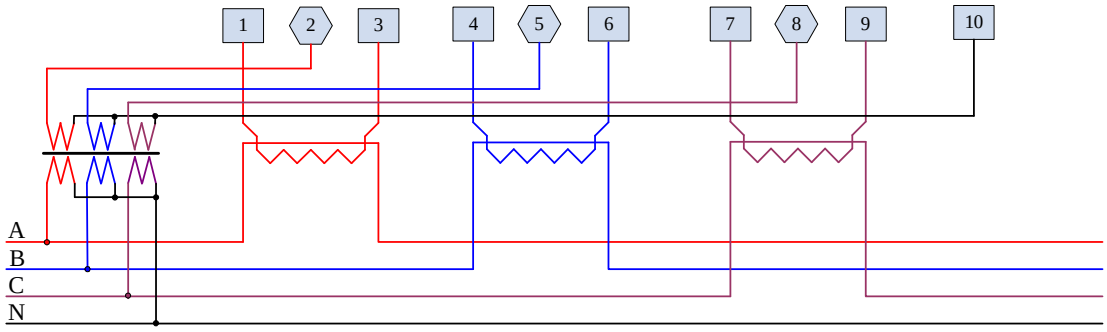
C.1 3 Phase 4 Wire – Direct Connected

Direct Connection (Whole Current)



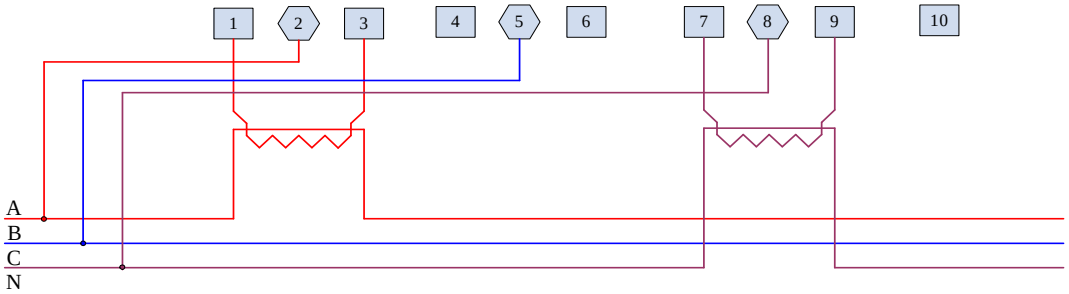
C.2 3 Phase 4 Wire - 3CT

Connected through Current Transformer (CT) & Voltage Transformer (PT)



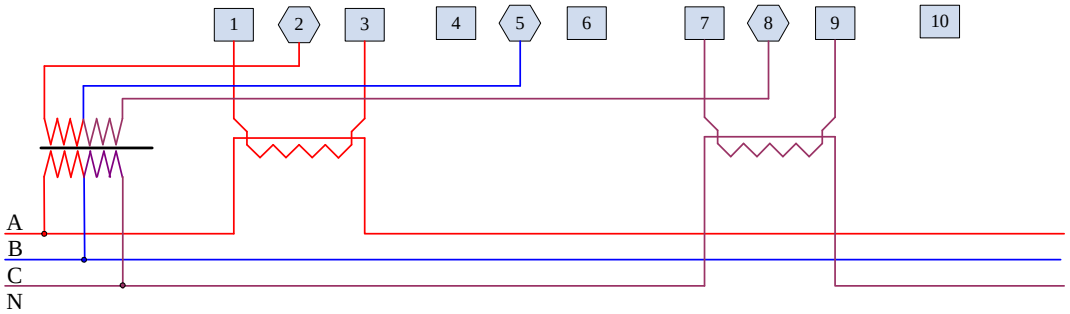
C.3 3 Phase 3 Wire (2-Element) – CT Connected

Connected through Current Transformer (CT)

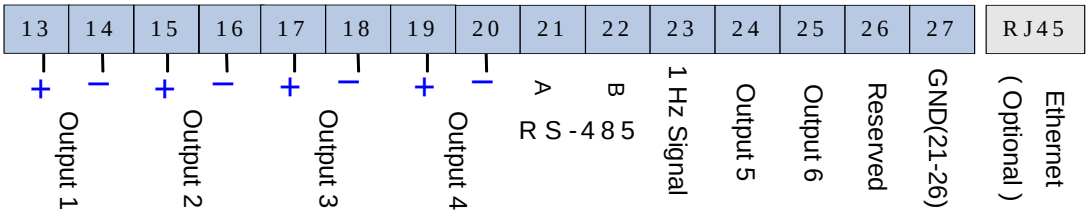


C.4 3 Phase 3 Wire (2-Element) – CTPT Connected

Connected through Current Transformer (CT) & Voltage Transformer (PT)



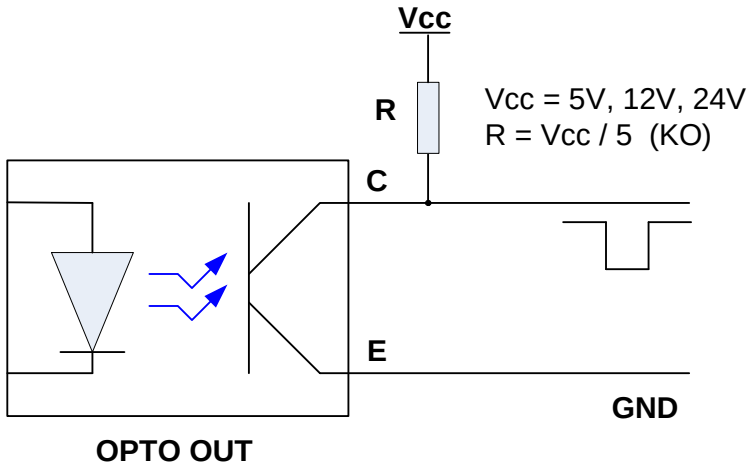
C.5 Signal Terminals



Note:

- ZAPλ3AM has an optional embedded GPRS module, which has its own plug-in slot and is not shown in this terminal diagram.
- The RS-485/232 port #2 is overlapped to the Ethernet port RJ45 connector only when Ethernet is not enabled as the communication option.

C.6 Programmable Impulse Outputs



NOTE:
Impulse output shown in C.5 channels P1-P6 are programmable to the following options:

No.1:	active import energy output (+kWh)
No.2:	active export energy output (-kWh)
No.3:	reactive import energy output (Q1 + Q2 kvarh)
No.4:	reactive export energy output (Q3 + Q4 kvarh)
No.5:	active energy output (kWh)
No.6:	reactive energy output (Q1+Q2+Q3+Q4 kvarh)