User Manual

Three Phase Active and Reactive Energy Smart Meter Model

No.: IQ0304100f1

JHB Energy

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Safety Instructions

⚠ WARNING

Read all safety information and operating instructions before using the meter to avoid personal injury.

Transport and Storage

Refer to clause 14 “Transport and storage”.

Installation

Power must be cut off before installation or removal of the meter. Refer to clause 13“Meter Installation” for more details.

Operation

Do not break the seal and remove terminal cover without authorization.

Do not break the seal and remove communicate module without authorization.

Never remove the meter cover while the meter is in operation. The exposed circuits and components may lead to injuries or damage to the meter.

Meter working voltage should be less than 120% nominal voltage (120%Un), load current should be less than 120% maximum current (120% Imax). Long time over voltage and over load may lead to damage the meter.

Do not operate the meter with wet hands.

Notice

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Amendment

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1. Overview

This document is the guideline for users to install, operate and maintain the IQ0102065 single phase smart meter with direct connection.

IQ0102065 single phase meter is designed for measuring and monitoring energy parameters, such as total active/reactive energy in both directions, instantaneous voltage and current, Power Factor, Vrms, Irms, active and reactive power in one-phase two-wire network. It provides a P1 Port to push data to customer device. It provides P0 port for Local configuration and maintenance through infrared communication. The remote communication module is modular designed with its own box and embedded into the meter box. This makes it flexible to support different type of communication modules. There is segment LCD display and push-button for user to read metering information on site.

1.1. Abbreviation

A	Active energy
+A	Active energy import
-A	Active energy export
+R	Reactive energy import
-R	Reactive energy export
R1	Reactive energy QI
R2	Reactive energy QII
R3	Reactive energy QIII
R4	Reactive energy QIV
P	Active power
+P	Active power import
-P	Active power export
Q	Reactive power
+Q	Reactive power import
-Q	Reactive power export
MD	Maximum Demand
PF	Power Factor
TOU	Time Of Use
RTC	Real Time Clock
HES	Head End System
IHD	In Home Display
HHU	Hand Held Unit
AA	Application Association
AARE	Application Association Response
AARQ	Application Association Request
ACSE	Association Control Service Element
APDU	Application Protocol Data Unit
ASE	Application Service Element
HDLC	High-level Data Link Control
HLS	COSEM High Level Security

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IC COSEM Interface Class
KEK Key Encrypting Key
LAN Local Area Network
MAC Medium Access Control
PLC Power line carrier
PKI Public Key Infrastructure
WZ Service Interface
H1 Consumer Interface
M2 Multi Utility Interface

1.2. Reference

The meter complies with the following standards.

No.	Standard No.	Title
1	EN 50470-1, 2006	General requirements, tests and test conditions –Metering equipment.
2	EN 50470-3, 2006	Particular requirements-Static meters for active energy.
3	IEC 62052-11, 2003	General requirements, tests and test conditions for metering equipment
4	IEC 62052-21, 2002	General requirements, tests and test conditions for tariff equipment
5	IEC 62053-21, 2003	Electricity metering equipment for active energy class indexes 1 and 2
6	IEC 62053-23, 2003	Electricity metering equipment for reactive energy class indexes 2 and 3
7	IEC 62053-61, 1998	Electricity Metering Equipment (a.c.) - Particular Requirements - Part 61: Power Consumption And Voltage Requirements
8	IEC 62054-21, 2004	Electricity metering (a.c.) Tariff and load control Part 21
9	DIN 43857, 1978	Part 2: Watt-hour meters in molded insulation case without instrument transformers up to 60A rated maximum current; Part 4: Principal dimensions for three-phase meters.
10	EN 13757	Communication system for meters and remote reading of meters: Part 3: Dedicated application layer; Part 4: Wireless meter readout (Radio meter reading for operation in the 868 MHz to 870 MHz SRD band);
11	IEC 60529, 2001	Degrees of protection provided by enclosures
12	IEC 62055-31, 2005	Sections 7.9.3 Performance requirements for load switching
13	IEC 62053-31, 1999	Pulse output devices for electromechanical and electronic meters
14	IEC 62056-21, 2002	Electricity metering – data exchange for meter reading, tariff and load control – Part 21 Direct local data exchange

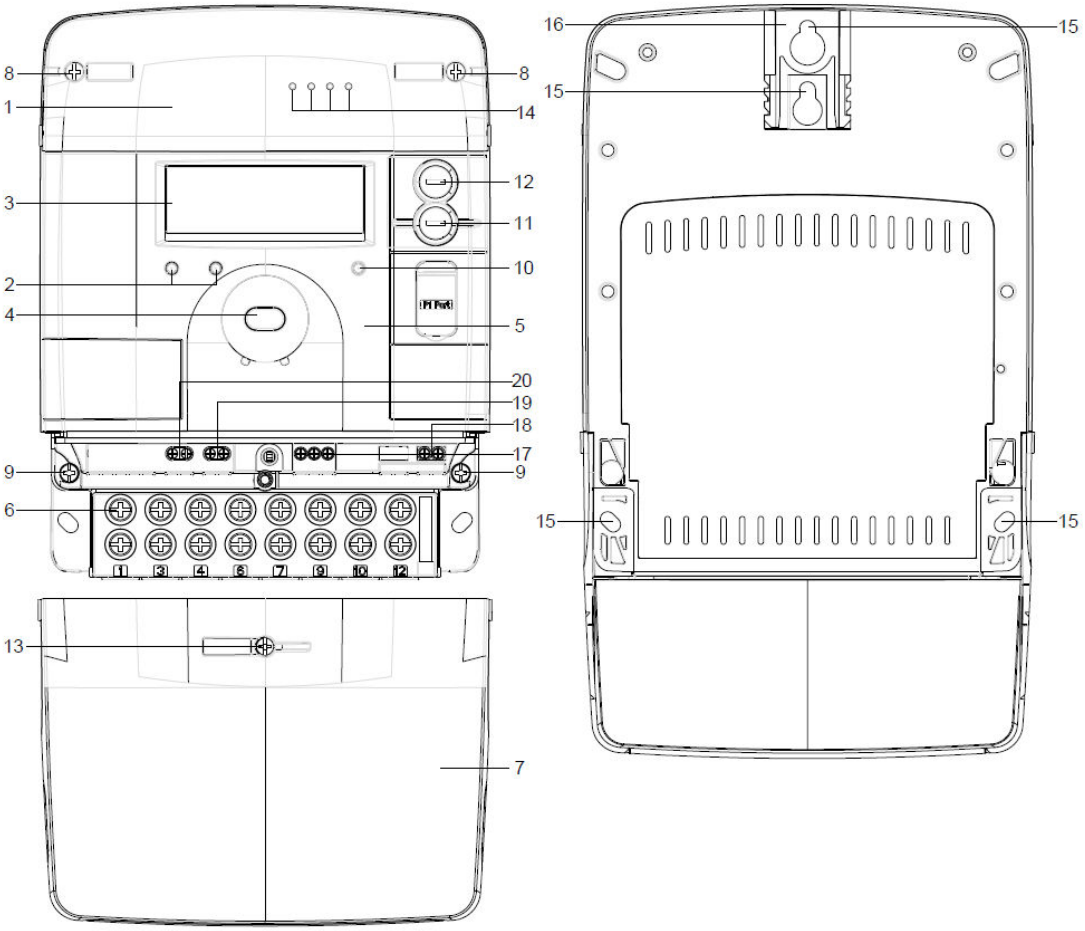
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15	IEC 62056-46, 2002	Electricity metering – Data exchange for meter reading, tariff and load control - Part 46: Data link layer using HDLC protocol
16	IEC 62056-53, 2001	Electricity metering - Data exchange for meter reading, tariff and load control - Part 53 Part: COSEM Application layer
17	IEC 62056-61, 2001	Electricity metering - Data exchange for meter reading, tariff and load control - Part 61 Part: Object identification system (OBIS)
18	IEC 62056-62, 2001	Electricity metering - Data exchange for meter reading, tariff and load control - Part 62: Interface classes

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2. General Description

2.1. Front View and Rear View



(1) Module cover
(2) Status indicate LED
(3) LCD
(4) Optical Port
(5) Meter cover
(6) Main terminal screws
(7) Terminal cover
(8) Communication module seal screws
(9) Meter metrology seal screws
(10) Status LED (Reserved for future use)
(11) Seal button
(12) Display button
(13) Terminal cover seal screw
(14) Communication module LED
(15) Meter mounting hole
(16) Meter mounting bracket
(17) RS485 port
(18) Analog output
(19) Digital output 2
(20) Digital output 1

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2.2. Measurement System

The meter is designed to measure active/reactive power/energy and equipped with a manganin guauge for current measurement. The results of the manganin guauge and the Voltage Divider, which are both analog signals, is then routed to an ASIC with a built-in Analog Digital Converter (ADC) for further processing. The obtained analog-measured signals are digitized in the ADC at a very high sampling rate to guarantee accurate results. Afterwards the ASIC computes the active or reactive powers, sums them to the corresponding energies and converts the accumulated energy to pulse frequency for the "Energy pulse LED". As depicted in figure 2.2, processed results of the ASIC are sent to a MCU to calculate more advanced parameters and aggregated data such as Tariff Management, Maximum Demand, Power Quality, and Load Profile and perform more sophisticated functions such as Event Record, Load Control etc.

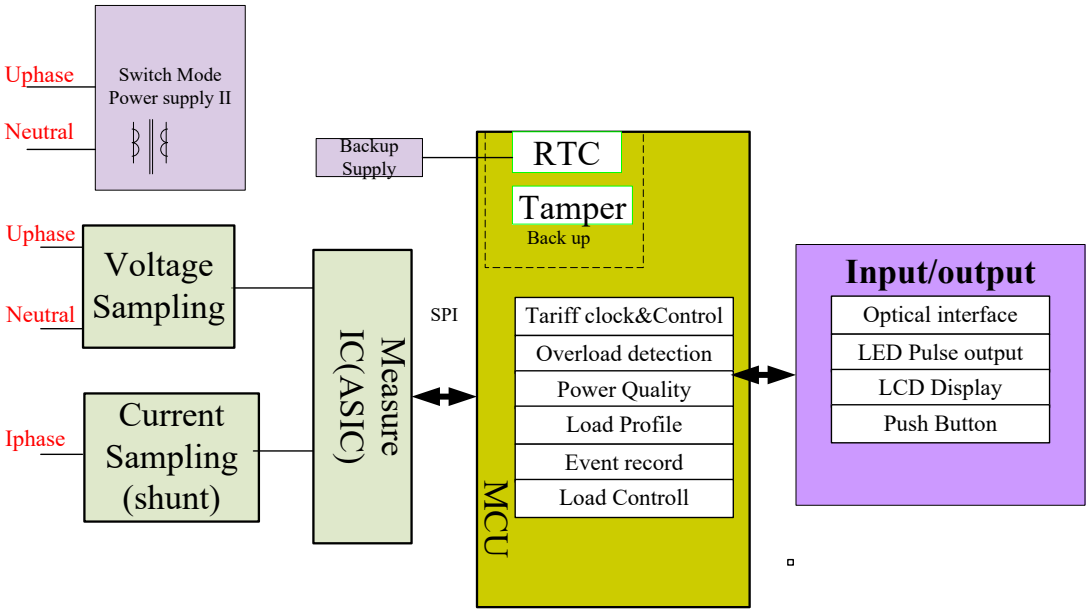


Figure 2.2 Measurement System

Formulas listed below are used to calculate average voltage, current, active power and reactive power.

$$V_{eff} = \sqrt{\frac{1}{T}\int_{t_0}^{t_0+T} v_{inst}^2(t).dt} \qquad I_{eff} = \sqrt{\frac{1}{T}\int_{t_0}^{t_0+T} i_{inst}^2(t).dt}$$

Active power and reactive power measure principium:

Parameter	Phase 1	Phase 2	Phase 3	Algebraic aggregation
Active power	P1 = ∫ v1.i1.cos	P2 = ∫ v2.i2.cos	P3 = ∫ v3.i3.cos	P1 + P2 + P3
Reactive power	Q1 = V1fond.I1fond.sin	Q2 = V2fond.I2fond.sin	Q3 = V3fond.I3fond.sin	Q1 + Q2 + Q3

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Apparent power	S1 = V1eff x I1eff	S2 = V2eff x I2eff	S3 = V3eff x I3eff	S1 + S2 + S3

$$E(t_0) = \int_{t_0}^{t_0+T} u(t) * i(t)dt; \quad \text{with T=1 second}$$

Energy cumulative principle:

The meter is programmed to calculate the instantaneous energy by adding the instantaneous energy from each phase. Depending on the sign of the sum, the sum gets accumulated either in the (A+ or R+) or negative (A- or R-) energy register. The meter is designed to accommodate 2 tariffs for each direction.

Instantaneous and average parameters

The handling of Instantaneous and average parameters follows the definition of the power quality handling in section 12.1 Instantaneous Power values.

2.3. Features List

Measurement accuracy	Active: Class B Reactive: Class 2
Connection type	3-Phase 4-Wire
Nominal voltage(Un)	3*230V / 400 V
Voltage range	0.8Un~1.2Un
Current range	0.25~5(100)A
Starting current	0.4%Ib
Frequency	50 Hz (± 5%)
Meter constant	2000 imp./kWh(kvarh)
Power consumption	Voltage circuit: < 2W / 10 VA per phase Current circuit: < 0.5 VA per phase
LCD	Segment type LCD
Backlight	NONE
Energy LED	One LED for active energy and one LED for reactive energy, Three states for LED: 1) Off: default status 2) Blink: indicates energy import or export for relative energy type. 3) Off: between the two pulses, the LED is off
Buttons	A button for display control, A button for manual billing
Communication interfaces	Optical port, DLMS/COSEM, HDLC on IEC 62056-21. DLMS/COSEM direct HDLC profile. P1 Port GPRS CAT M + NB RS485
RTC	Compliant with IEC 62054-21
Data retention	Over15years

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Backup power supply	Super capacitor (support 5 days without the main supply)
Mechanical	Weight: 1.3 kg Ingress protection rating: IP54 without suction Dimension: 282.8 x 170.4 x 86.9(mm)
Environmental	Limit temperature range: -40°C ~ +70°C Temperature range of storage and transport: -40°C ~ +80°C. Relative humidity: Up to 95% non-condensing

2.4. Function Characteristics

Energy parameters	+A, -A +R, -R Import/Export energy TOU energy
Instantaneous parameters	U, I, P, Q, S, PF, Frequency
Tariff	• 2 tariffs switching scripts • 4 weeks profiles • 6 seasons profiles • 4 days profiles • 200 special days Refer to **Annexure II** for default configuration.
Load profile	Load profiles: • 15 minutes cumulative energy load profile • Daily load profile • Power quality profile • Data of billing period 1
Tamper detection	Terminal cover removal detection (even when power off) Meter cover removal detection (even when power off) Inverse current detection Magnetic field detection
Event log	Refer to clause of event logs
Self-diagnosis	The meter diagnoses the hardware at power on, or new firmware is deployed, periodically. Refer to **Annexure III** for meter status.
Measure period	The measuring period output (15min) over the optical interface
general block transfer	In the same time, only one client communication via GBT is supported. The maximum GBT length can support to get full entries load profile 1.
Certification mode	Define the Energy register resolution on the display

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3. Meter Construction

3.1. Enclosure

Features of meter enclosure:

The case is double insulated to protective class II.

The case provides an ingress protection rating of IP54 without suction.

The terminal block is molded in glass-filled polycarbonate.

The main terminals are cage type.

The main cover is fixed to the base during manufacturing and sealed with seal caps. It is impossible to open the main cover without breaking the seal cap.

The terminal cover can be sealed for limit access to the main meter connections.

The meter has face cover and terminal cover removal detection.

The metal ring of the optical port is fixed under the face cover.

One button is provided for display scrolling.

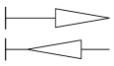
The name plate is laser printed on the face cover and terminal cover.

The wiring diagram is laser printed on face cover

3.2. Marking of the Meter

Front plate:

- 

: Meter constant
- 3-Phase, 4-Wire
3x230/400V
50Hz
0,25-5(100)A : Metrological parameters and accuracy
- -40°C ~ +70°C : Temperature range of operation
-  : Bidirectional meter
- kwhiq : Manufacture logo.
- Type: IQ0304
Model: 100f1 : Meter type no.
- 

: Meter Serial number + Barcode(depend on the customer needs)
- T12399
CE M22 0122 : MID certificate markings

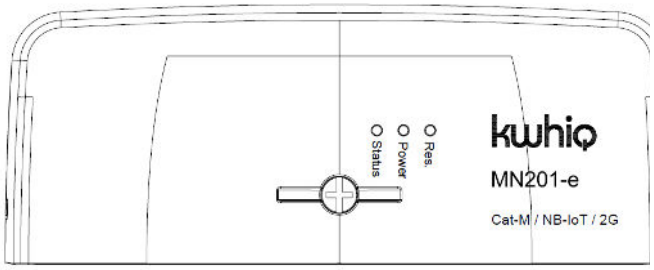
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- : Double insulation
- : Import and export
- : Communication protocol

2021 : Year of manufacture

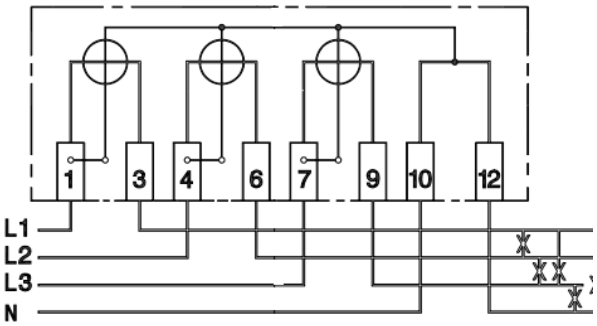
1.1.1. Module plate:

Communication Module no.



Wiring diagram:

- 3 phase 4 wire



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3.3. Sealing of Meter

The meter has one seals for the communication module.

The meter has three seals for the meter face cover to seal the metrology part of the meter. It is impossible to touch the meter metrology part unless break the seals, the seals and the meter face cover or base are physically and clearly destroyed. Below picture –figure 3.3 shows the sealing position of the meter.

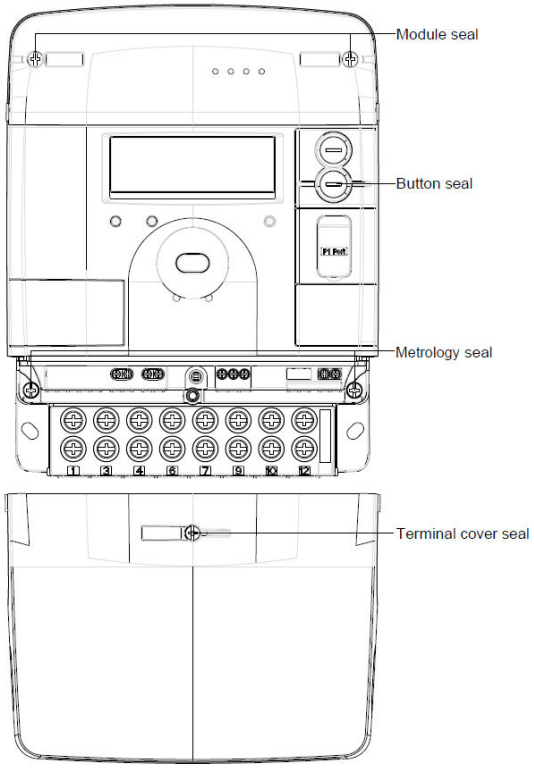


Figure 3.3 Sealing of meter

3.4. Push Button

The meter provides buttons.

The display button is used to alternate the display parameters manually.

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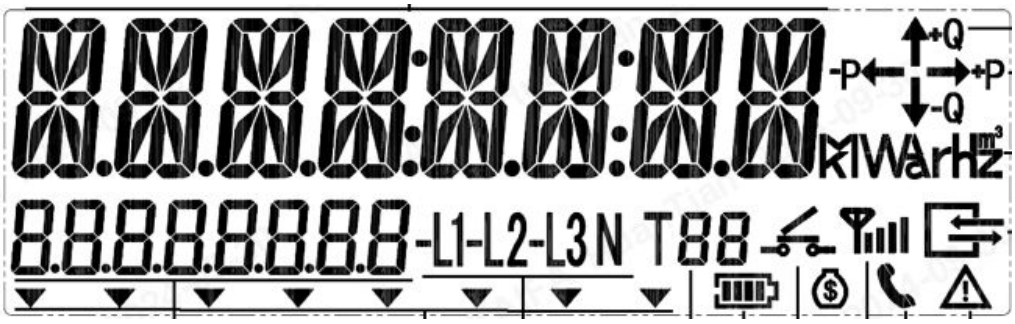
4. Display Control

4.1. Display Introduction

The meter provides a display and push buttons as the local user interface.

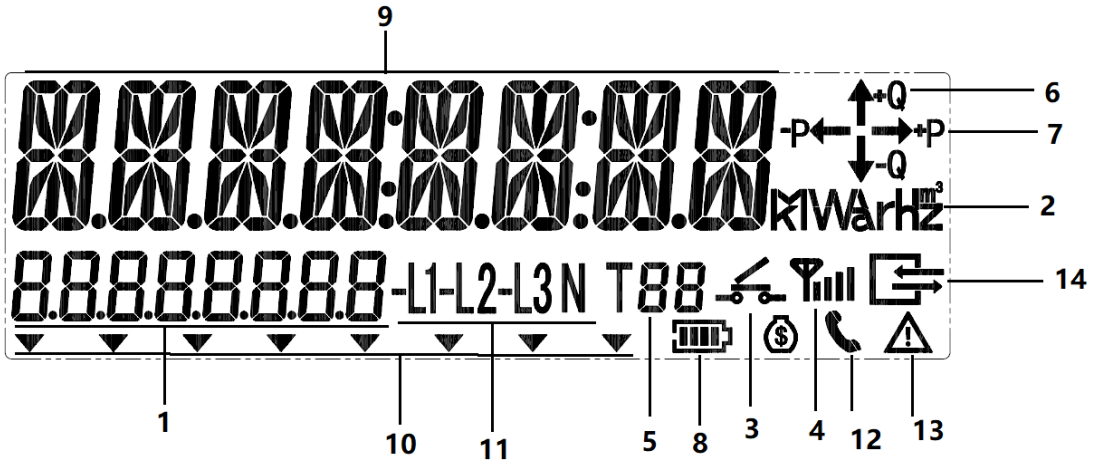
Using the push button, the user can step through a menu structure on the display to check the consumption data and further information.

As shown in the below figure, the LCD is portioned into different segments, each fulfilling distinct needs.



4.2. Basic Layout

The basic layout shows all indication possibilities of the LCD.



1	Alphanumeric row
2	Unit indications
3	Main breaker state indication
4	signal strength
5	Rate indication
6	Reactive energy direction indication(+Q:import,-Q:export)
7	Active energy direction indication(+P:import,-P:export)
8	Battery indication
9	Numeric row
10	Icons(more details: Special characters on display)
11	Voltage phase presence
12	Local communication on going
13	Internal error detected. (Critical error indicator)

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4.3. Display operating modes

The meter has 2 operating modes for the display. In each mode, the display list is configurable. For the complete configurable display items, please refer to the object model.

1. **Auto Scroll Mode (default mode)**
   In this mode the information on the display is refreshed every 5 seconds.
   The display list of auto scroll mode:

1-0:0.9.1.255	local time
1-0:0.9.2.255	local date
1-0:1.8.0.255	Active energy import (+A)-current value

2. **Button Scroll Mode**
   This mode can be activated manually by pressing the button. The display will turn back to the “Auto Scroll Mode” 60 seconds after releasing.
   The display list of manual scroll mode:

1-0:0.9.1.255	local time
1-0:0.9.2.255	local date
0-0:96.1.0.255	Device ID1, manufacturing number
1-0:1.8.0.255	Active energy import (+A)-current value
1-0:2.8.0.255	Active energy export (-A)-current value
1-0:5.8.0.255	Reactive energy import (Q1) -current value
1-0:6.8.0.255	Reactive energy export (Q2)- current value
1-0:7.8.0.255	Reactive energy import (Q3) -current value
1-0:8.8.0.255	Reactive energy export (Q4)- current value
1-0:1.7.0.255	Instantaneous active import power (+P)
1-0:2.7.0.255	Instantaneous active export power (-P)
1-0:3.7.0.255	Instantaneous reactive import power (+Q)
1-0:4.7.0.255	Instantaneous reactive export power (-Q)
1-0:32.7.0.255	Voltage of L1
1-0:31.7.0.255	Current of L1
1-0:13.7.0.255	Power factor (for sp)
1-0:14.7.0.255	Frequency
0-0:13.0.0.255	Active calendar name

Alphanumeric row



- Shows the OBIS code. And shows the local time value with item 1-0:0.9.1.255.

Numeric row



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- During normal operation, where the display is in “auto scroll mode”, the lower 9 numeric digit row on the display shows the total active energy and total reactive energy for each direction on a 5 second cycle.
-

Special characters on display

Symbol	Description	Purpose
	Unit identifier	Indicates the unit of measurement for the quantity shown on the display
	signal strength	The signal strength is categorized as following: No reception: RSSI < -111 dBm low reception: -111 <= RSSI < -105 dBm second reception: -105 <= RSSI < -97 dBm third reception: -97 <= RSSI < -89 dBm high reception: RSSI >= -89 dBm
	Active energy	Displays the actual flow direction of active energy
	Reactive energy	Displays the actual flow direction of reactive energy, reserve for future use.
	Icon	Triangle for specific function including indicate status of alarm etc. For example, in the three phase, it could be defined as follows: F: Meter cover opened T: Terminal cover opened M: Strong magnetic field detected R: Voltage phase sequence reverse
	Phase indication	Voltage phase presence

4.4. Display Mode and Menu

The following display modes are available using 1 push buttons:

- Auto-Scroll Display mode
- Button Display mode

The meter support different display mode including automatically scrolling, manual operation and customer specific one.

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The scrolling durations are configurable in steps of 1 second.

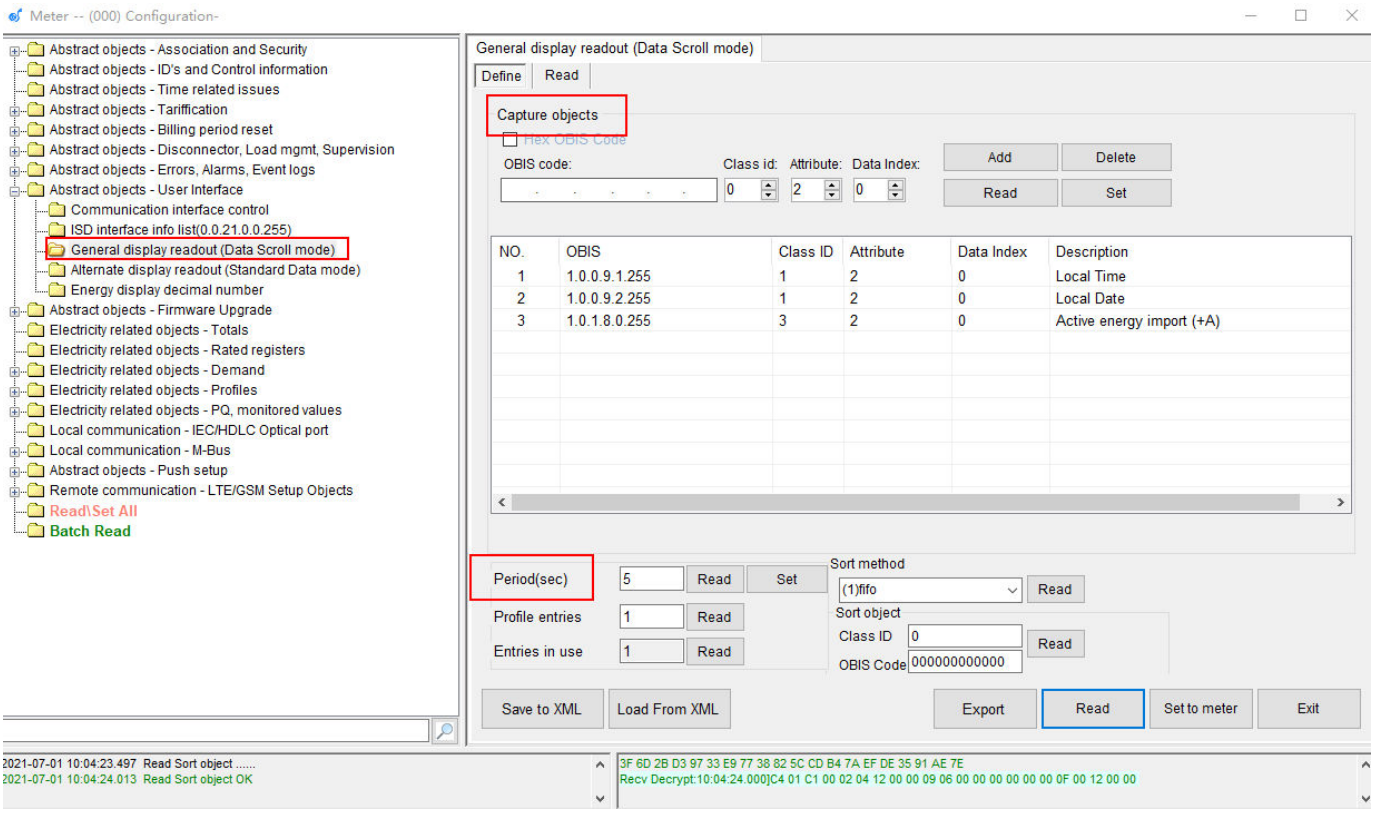
The display lists are configurable remotely and locally.

When the meter is power on, it will display firmware version of metrology part for five seconds. Then, the meter will run Auto display mode, it will scroll every five seconds automatically, this period is configurable from 5 to 60 seconds. In the duration, the meter will run Manual display mode if any display button press. Then, you could scroll the display item by short press (short than two seconds, but suggest more than 200ms). If there is not button press for 60 seconds default, the meter will back to Auto display mode. This period is also configuration from 1 to 300 seconds.

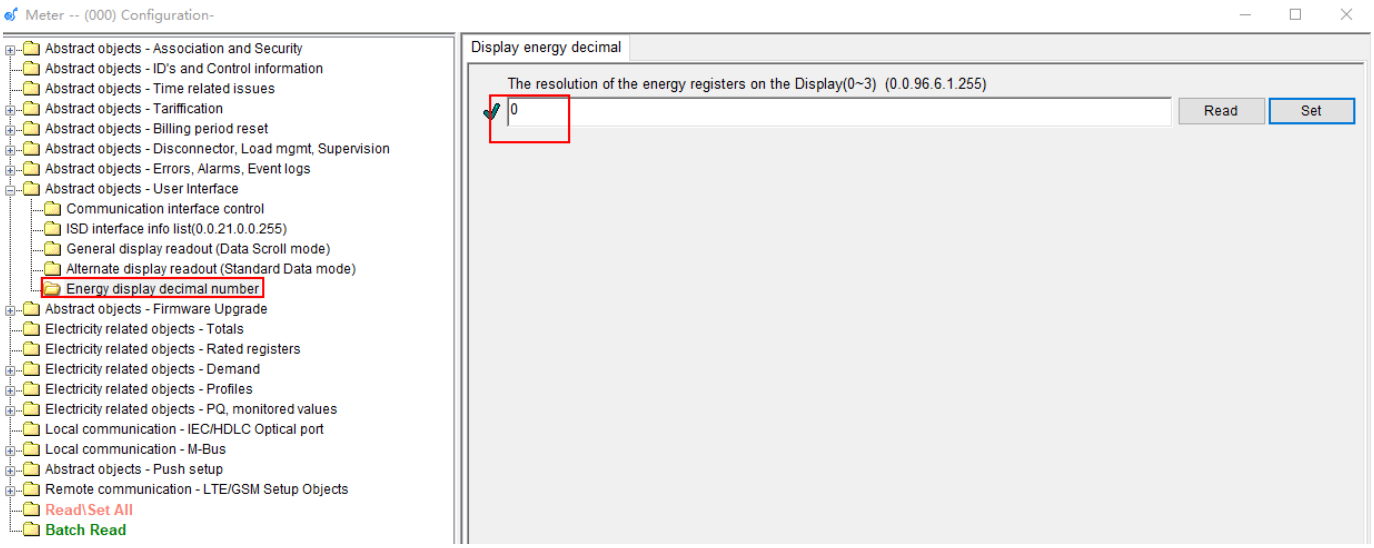
The meter support separates the information into several screens once it's more than 9 characters.

Operation Guide

The display list could be configured using SmartSet.



The energy display decimal number (default 0, range 0~3) can also be configured using smartest:



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5. Alarm and Event Handling

A lot of events are generated by the meter itself or by its environment. All these events are logged in several event logs. Additionally, they are also used to set and clear errors as well as to trigger.

5.1. Alarm and Error

Some of the events can trigger alarms or error. If one of these events occurs, the corresponding flag in the alarm or error registers is set and an alarm and error is then raised via communication channel. All alarm or error flags in the alarm registers remain active until the alarm registers are cleared.

Each bit in the alarm registers represents a different alarm. If the bit is set (logical 1) the alarm (corresponding to position of the set bit) was recorded. The value in the Alarm Registers is a summary of all active and inactive alarms at that time.

Depending on the capabilities of the HES and the policy of the utility, not all possible alarms are wanted. Therefore, the Alarm Filters can be programmed to mask out unwanted alarms. The structure of the filter is the same as the structure of the Alarm Registers. To mask out unwanted alarms, the corresponding bits in Alarm Filters should be set to logical 0.

5.2. Alarm and Error Registers

Assignment of Error Register/Alarm Register 1 bits

Bit	Alarm	**Triggering event ID**(please check the object model if needed)
0	Clock invalid	6
1	Reserve	-
2	Reserve	-
3	Reserve	-
4	Reserve	-
5	Reserve	-
6	Reserve	-
7	Reserve	-
8	Program memory error	12
9	ram_error	13
10	nv_mem_err	14
11	Measurement system error	16
12	Watchdog error	15
13	Fraud attempt	40,42,44,46,49,50
14	Reserve	-
15	Reserve	-
16	Reserve	-
17	Reserve	-
18	Reserve	-
19	Reserve	-
20	Reserve	-
21	Reserve	-
22	Reserve	-
23	Reserve	-

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24	Reserve	-
25	Reserve	-
26	Reserve	-
27	Reserve	-
28	Reserve	-
29	Reserve	-
30	Reserve	-
31	Reserve	-

Table 5.2.1 Assignment of Error Register/Alarm Register 1

Assignment of Alarm Register 2 bits

Bit	**Alarm**	**Triggering event ID**(please check the object model if needed)
0	Total Power Failure	01
1	Power Resume	02
2	Voltage Missing Phase L1	82
3	Reserve	83
4	Reserve	84
5	Voltage Normal Phase L1	85
6	Reserve	86
7	Reserve	87
8	Reserve	-
9	Phase Asymmetry	90
10	Current Reversal	91
11	Wrong Phase Sequence (PP only)	88
12	Reserve	-
13	Key Exchanged	48
14	Bad Voltage Quality L1	92
15	Reserve	93
16	Reserve	94
17	Reserve	-
18	Local communication attempt	53
19	Reserve	-
20	Reserve	-
21	Reserve	-
22	Reserve	-
23	Reserve	-
24	Reserve	-
25	Reserve	-
26	Reserve	-
27	Reserve	-
28	Reserve	-

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29	Reserve	-
30	Reserve	-
31	Reserve	-

Table 5.2.2 Assignment of Alarm Register 2

5.3. Event log profile

Log profile	capacity	objects	sorted method:
Standard Event Log	100	clock_time; standard event code	unsorted (FIFO)
Fraud detection Event Log	100	clock_time; fraud detection event code	unsorted (FIFO)
Power Quality log	100	clock_time; Power Quality event code	unsorted (FIFO)
Communication Log	100	clock_time; communication event code	unsorted (FIFO)

Table 5.3 Event log profile list

5.3.1 Standard Event Log

Event name	Event code	Trigger corresponding event
Power Down	1	Power Down
Power Up	2	Power Up
Daylight saving time enabled or disabled	3	Daylight saving time enabled or disabled
Clock adjusted (old date/time)	4	Clock change by user
Clock adjusted (new date/time)	5	Clock change by user
Clock invalid	6	Clock invalid
TOU activated	9	New TOU activated
Error register cleared	10	Error register cleared
Alarm register cleared	11	Alarm register cleared
Program memory error	12	Program memory error
RAM error	13	RAM Error
NV memory error	14	NV memory Error
Watchdog error	15	Watchdog error
Measurement system error	16	Measurement System Error
Firmware ready for activation	17	Firmware ready for activation
Firmware activated	18	Firmware activated
Passive TOU programmed	19	Change the passive TOU
One or more parameters changed	47	One or more parameters changed
Global key(s) changed	48	Global key(s) changed
FW verification/activation failed	51	FW verification/activation failed
Phase sequence reversal	88	Phase sequence reversal
Load profile cleared	254	Load profile cleared
Event log cleared	255	Event log cleared

Table 5.3.1 Standard Event list

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5.3.2 Fraud detection Event Log

Event name	Event code	Trigger corresponding event	Trigger corresponding alarm
Strong DC field detection	42	Strong DC field detection ,start time threshold:3s	Fraud attempt
No strong DC field anymore	43	No strong DC field anymore	None
Meter cover open	44	Meter cover open ,start time threshold:0s	Fraud attempt
Terminal cover open	40	Terminal cover open ,start time threshold:0s	Fraud attempt
Fail login attempt	46	key error	Fraud attempt
Meter cover closed	45	Meter cover closed ,end time threshold:0s	
Terminal cover closed	41	Terminal cover closed ,end time threshold:0s	None
Decryption or authentication failure	49	Decryption or authentication failure	Fraud attempt
Replay attack	50	Replay attack	Fraud attempt
Current Reversal	91	Current Reversal	Current Reversal
Module removed	214	Module removed	None
Module inserted	215	Module inserted	None
Event log cleared	255	Event log cleared	None

Table 5.3.2 Fraud detection Event list

5.3.3 Power Quality log

Event name	Event code	Trigger corresponding event	Trigger corresponding alarm
Undervoltage L1	76	U =< 90%Un && U > Ucut, 60s	None
Overvoltage L1	79	U >= 110%Un, 60s	None
Missing voltage L1	82	U <= 50%Un, 60s	None
Voltage L1 normal	85	90%<=U<=110%.	None
Event log cleared	255	Event log cleared	None

Table 5.3.4 Power Quality Event list

5.3.4 Communication log

Event name	Event code	Trigger corresponding event
No connection timeout	140	No connection timeout
Modem Initialization failure	141	Modem Initialization failure
SIM Card failure	142	SIM Card failure
SIM Card ok	143	SIM Card ok
GSM registration failure	144	GSM registration failure
GPRS registration failure	145	GPRS registration failure
PDP context established	146	PDP context established

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PDP context destroyed	147	PDP context destroyed
PDP context failure	148	PDP context failure
Modem SW reset	149	Modem SW reset
Modem HW reset	150	Modem HW reset
GSM incoming connection	152	GSM incoming connection
GSM hang-up	153	GSM hang-up
Diagnostic failure	154	Diagnostic failure
User initialization failure	155	User initialization failure
Signal quality low	156	Signal quality low
Auto Answer Number of calls exceeded	157	Auto Answer Number of calls exceeded
Event log cleared	255	Event log cleared

Table 5.3.4 Communication Event list

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6. Real Time Clock

The RTC complies with IEC 62054-21. At reference voltage and reference temperature (23°C), clock accuracy is better than ±0,5 s/day. The variation of the clock accuracy with the temperature shall be less than (±0,15 s/°C/24 h).

The RTC supports leap year, day light saving time. In case of power cut, the RTC of the meter can continue to run for about 5 days when the meter, with the support of super capacitor. If the RTC loses current time due to a long power down of more than 5 days, when the meter is powered on, RTC will continue to run with the time of last power down. However, the chronology of the measurement values will be sustained. In the case that tariff registers are used, a default tariff (tariff 1) will be used until the meter's clock is synchronized to a correct clock.

Meter time and date synchronization is possible through central system as well as via the optical interface. If the difference between the setting time and meter time is bigger than 7 seconds. The time will be set to the RTC. Time synchronization event will be logged in the log file.

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7. Tariff Management

The meter calendar and tariff handling follows the same rules as defined in the IDIS package 2 specification [D]:

Tariffication activity calendar

The activity calendar supports the following:

- 6 seasons profiles
- 4 weeks profiles
- 8 days profiles
- 8 switching times per day

Within the “Tariffication activity calendar”, the integrity must be verified from season to days in the following way:
=> Each season profile references a valid week profile which again references valid day profiles

- keeping week profiles that are not referenced by a season profile is allowed
- keeping day profiles that are not referenced by a week profile is allowed

For setting the activate_passive_calendar_time attribute, the following conditions apply:

- Current date and time as local time (hundredths of seconds must be ignored)
- Day of Week must be handled correctly
- Deviation must be set to 0x8000
- Status must be set to 0xFF

Tariffication special days table

Special days table must support a 200 entries.
The relevant entries take precedence over the “Tariffication activity calendar” object driven selection of a day profile.
The day profile referenced in the “Tariffication special days table” activates the day_schedule of the day_profile_table in the “Tariffication activity calendar” object by referencing through the day_id.
If there is no valid day_id available in the day_profile_table, the special day request is simply ignored.
On special day table updates, the current “Tariffication activity calendar” actions and schedules are updated immediately.

Default tariffication script

Holds the script selector number as defined in the Tariffication Script Table which must be activated in the case of invalid tariff information or invalid clock.

Currently active energy tariff

Holds the name of the currently active mask as defined in the Register activation, the currently active energy tariff always display on LCD.
During the tariff activation and configuration, the meter records some tariff-related event log. Please see table 5.1 Standard Event Log.

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8. Load Profiles

8.1. Load Profile Characteristics

Each load profile has the following characteristics:

A circular buffer is used for each load profile.

Each entry of load profile has a time stamp and load profile status word.

The capture interval of each load profile is programmable, configurable within below values: 900 seconds, 1800 seconds, 3600 seconds, and the default value is 900 seconds (15 minutes).

If power off cross capture points, the meter will supplement the missing points after power on.

The load profile supports read by range and by entry, also supports selectable capture objects.

8.2. Load Profile Status Word

Each load profile entry includes a load profile status word with eight bits:

Bit #	Description
7	**Power down(PDN):** This bit is set to indicate that a total power outage has been detected during the affected capture period.
6	**Reserved:** The reserved bit is always set to 0.
5	**Clock adjusted(CAD):** The bit is set when the clock has been adjusted by more than the synchronization limit.
4	**Reserved:** The reserved bit is always set to 0.
3	**Daylight saving(DST):** Indicates whether or not the daylight saving time is currently active. The bit is set if the daylight saving time is active (summer) and cleared during normal time (winter).
2	**Data not valid(DNV):** Indicates that the current entry may not be used for billing purposes without further validation because a special event has occurred.
1	**Clock invalid(CIV):** The power reserve of the calendar clock has been exhausted. The time is declared as invalid. At the same time the DNV bit is set.
0	**Critical error(ERR):** A serious error such as a hardware failure or a checksum error has occurred. If the ERR bit is set then also the DNV bit is set.

Table 9.2 load profile status

8.3. Load Profile List

The meter supports following load profiles:

Load Profile	Interval	Capacity	Capture Objects

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Cumulative energy load profile(1-0:99.1.0.255)	15 Minutes	5280	{8,0-0:1.0.0.255,2} (Date Time) Time in load profile include the time zone {1,0-0:96.10.1.255,2} (AMR Profile Status Code Emeter) {3,1-0:1.8.0.255,2} (Active energy Import) {3,1-0:2.8.0.255,2} (Active energy Export) {3,1-0:5.8.0.255,2}, Reactive energy Q1 {3,1-0:6.8.0.255,2}, Reactive energy Q2 {3,1-0:7.8.0.255,2}, Reactive energy Q3 {3,1-0:8.8.0.255,2}, Reactive energy Q4
Power quality load profile(1-0:99.14.0.255)	10 Minutes	2160	{8,0-0:1.0.0.255,2} (Date Time) {1,0-0:96.10.3.255,2} Profile status - Power quality profile {3,1-0:1.27.0.255.2} Average +P {3,1-0:2.27.0.255.2} Average -P {3,1-0:3.27.0.255.2} Average +Q {3,1-0:4.27.0.255.2} Average -Q {3,1-0:32.25.0.255.2} Average voltage L1 {3,1-0:31.25.0.255.2} Average current L1 {3,1-0:13.25.0.255.2} Average power factor {3,1-0:33.25.0.255.2} Average power factor (L1)
Billing Profile with period1 - Monthly(1-0:98.1.0.255)	externally triggered via "End of monthly billing period" 0:00:00 on the 1st of every month by default.	13	{8,0-0:1.0.0.255,2,0} (Date Time) {3,1-0:1.8.0.255,2} (Active energy Import) {3,1-0:2.8.0.255,2} (Active energy Export) {3,1-0:5.8.0.255,2}, Reactive energy Q1 {3,1-0:6.8.0.255,2}, Reactive energy Q2 {3,1-0:7.8.0.255,2}, Reactive energy Q3 {3,1-0:8.8.0.255,2}, Reactive energy Q4
Billing Profile with period 2 - daily(1-0:98.2.0.255)	externally triggered via "End of daily billing period" 86400s (each day)	31	{8,0-0:1.0.0.255,2,0} (Date Time) {3,1-0:1.8.0.255,2} (Active energy Import) {3,1-0:2.8.0.255,2} (Active energy Export) {3,1-0:5.8.0.255,2}, Reactive energy Q1 {3,1-0:6.8.0.255,2}, Reactive energy Q2 {3,1-0:7.8.0.255,2}, Reactive energy Q3 {3,1-0:8.8.0.255,2}, Reactive energy Q4

8.4. Load Profile Event Handling

IDIS describes the behaviour of the profile and the setting of the status bits considering different events.

Please refer to the following section of the IDIS package2 specifications [D]:

- 7.5.8 Events

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9. Power Quality

The smart meter refreshes the instantaneous value in real time, monitoring sag, swell and power fail of the voltage. And calculate the average value, maximum value and minimum value of the current and voltage in each measurement period 2.

9.1. Instantaneous Power values

For the monitoring of the instantaneous power values, the following functionality must be available:

- Instantaneous Voltage per phase.
- Instantaneous Current total and per phase.
- Instantaneous Frequency.
- Instantaneous power +P/-P/+Q/-Q total and per phase.
- Instantaneous power factor total and per phase.
- Average voltage.

Instantaneous measurements are supported by the following objects (captured object configurable):

Object / Attribute Name	Class	Ver.	OBIS code
Instantaneous voltage L1	3	0	1-0:x.7.0.255 x=32
Instantaneous current L1	3	0	1-0:x.7.0.255 x=31
Instantaneous net frequency	3	0	1-0:14.7.0.255
Instantaneous power +P;-P;+Q;-Q ;	3	0	1-0:x.7.0.255 x=1,2,3,4,21, 22, 23, 24
Instantaneous power factor import (+P/+S) total,L1	3	0	1-0:x.7.0.255 x=13
Average voltage L1	3	0	1-0:x.25.0.255 x=32

9.2. Sag and Swell detection

For the monitoring of sags and swells, the following functionality must be available:

- Number of sags and swells L1

Furthermore, the following configuration items are supported:

- Threshold for voltage sag (default 207V range:120~228)
- Time threshold for voltage sag (default 60s range:1~300)
- Threshold for voltage swell (default 253V range 232~300)
- Time threshold for voltage swell (default 60s range 1~300)

The events will be recoded in a specific Power Quality event log.

The event time stamps in the power quality event log represent the start time of the Sag-, Swell- or Normal condition. It is not the timestamp of logging the event into the power quality log.

Voltage sag and swell (long under and over voltage) detection is supported by the following objects:

Object / Attribute Name	Class	Ver.	OBIS code

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Threshold for voltage sag(long under voltage)	3	0	1-0:12.31.0.255
Time threshold for voltage sag (long under voltage)	3	0	1-0:12.43.0.255
Number of Voltage Sags L1	1	0	1-0:x.32.0.255 x=32
Threshold for voltage swell (long over-voltage)	3	0	1-0:12.35.0.255
Time threshold for long-term voltage swell (long over-voltage)	3	0	1-0:12.44.0.255
Number of Voltage Swells L1	1	0	1-0:x.36.0.255 x=32

9.3. Power Quality profile

The Power Quality Profile periodically records objects based on the options below:

- the average Voltage per phase
- the min Voltage per phase
- the max Voltage per phase

The period length for the averaging of voltage and current as well as the monitoring interval for the min / max detection is based on the configuration of the object “Measurement Period 2 for Instantaneous values” described below,

Power Quality

Capacity: 2160 entries (per 10 minutes in 15 days)

Structure: clock_time, profile_status, values

capture period: 1,5,10,15,30,60 min, the value is equal to the measurement period of all the captured objects. Further, the measurement period of the captured objects and the capture_period must be synchronised.

The default setting is 10 minutes.

Captured objects: the default value is

clock	{8,0-0:1.0.0.255,2}
Profile status - Power quality profile	{1,0-0:96.10.3.255,2}
Average +P	{3,1-0:1.27.0.255.2}
Average -P	{3,1-0:2.27.0.255.2}
Average +Q	{3,1-0:3.27.0.255.2}
Average -Q	{3,1-0:4.27.0.255.2}
Average voltage L1	{3,1-0:32.25.0.255.2}
Average current L1	{3,1-0:31.25.0.255.2}
Average power factor	{3,1-0:13.25.0.255.2}

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Average power factor L1	{3,1-0:33.25.0.255.2}

Buffer encoding: normal: clock with every entry
Selective access: by range and by entry
Sorted method: unsorted (FIFO)

Average voltage and current

The algorithm of the averaging calculation is based on the number of captured instantaneous voltage and current samples within the interval period. This allows to generate meaningful data in the event of a disrupted interval due to power failure or a time change event.

For example:

⇨ Voltage of 220V and Current of 10A with an averaging period of 10min
When there is power off for 5min within this period, the results for the average voltage and current would be still 220V and 10A based on the collected samples while the device was powered.

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10. Firmware Update

The meter firmware is designed according to WELMEC software guide 7.2. The metrological part of the firmware is separated from all other firmware elements.

The meter supports remote and local firmware update for metrological part, non-metrological part. The update of the firmware only starts after the new firmware is completely downloaded to the meter by checking the signature of the firmware.

Firmware update list:

Firmware	description
Legal	Legal upgrade image, include measurement /load profile/demand/low derive related.
Non Legal	Application upgrade image,

Both remote and local meter firmware update is protected with security level 6 and 7 of HLS. The meter records the event log for the firmware update.

The remote FW update follows the definition of the IDIS package 2 specification [D].

Please refer to the following section of the IDIS package2 specifications [D]:

- 6.9 Firmware Update

The meter supports only a single instance of the Image Transfer.

In case the meter supports the download of multiple parts of the firmware, it is the manufacturer's responsibility to ensure the proper identification and activation of these images.

Every image for download to the E-meter requires a digital signature.

The meter specifies the usage of the following algorithm

=> ECDSA P-256.

The activation of a new FW image requires the successful validation of the digital signature. The activation must be rejected in case the verification fails.

As part of the image verification, the E-meter checks the integrity of the received image and verifies the correctness of the image_identifier and image_size information (manufacturer specific data provided during the image transfer initialisation)

- Supported block size: 64 to 1024.
- The image file is encrypted using AES-128.
- Image transfer activation for scheduler.
- The FW Update client can be used for the image distribution via broadcast.

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11. Communication Interfaces and Communication

The meter provides up to 4 communication interfaces:

Interface	Purpose	Baud Rate	Protocol
Optical port	Local communication	9600 bps	DLMS/COSEM HDLC profile basing on
P2P	Remote communication	38400 bps	DLMS/COSEM
P1	Communication to IHD	115200 bps	DLMS/COSEM
RS485	Communication to external device	9600 bps	MODBUS

The optical port on the base meter. NB-IoT or GPRS or Cat-M are on communication module. The modular designed communication module supports plug and play. The communication module can be replaced without de-energizing the meter. All communication parameters and data are stored in the base meters.

11.1. Optical Port Communication

This optical port is used to read meter, to configure the meter parameter or to control the meter locally. In general, HHU or PC software is used to communicate with meter via this optical port.
Access to meter via this port is protected in a secure way as described in the security section.
The meter can be configured through the optical port only when local programmable mode is activated.

11.2. GPRS Profile

The DLMS/COSEM communication via the WAN interface is based on TCP over the IPv4 or IPv6 stack in combination with the GPRS cellular radio transport layer. A detailed description of the DLMS/COSEM related ommunication profiles

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and service is available in the P2P WAN Implementation Guide [3].

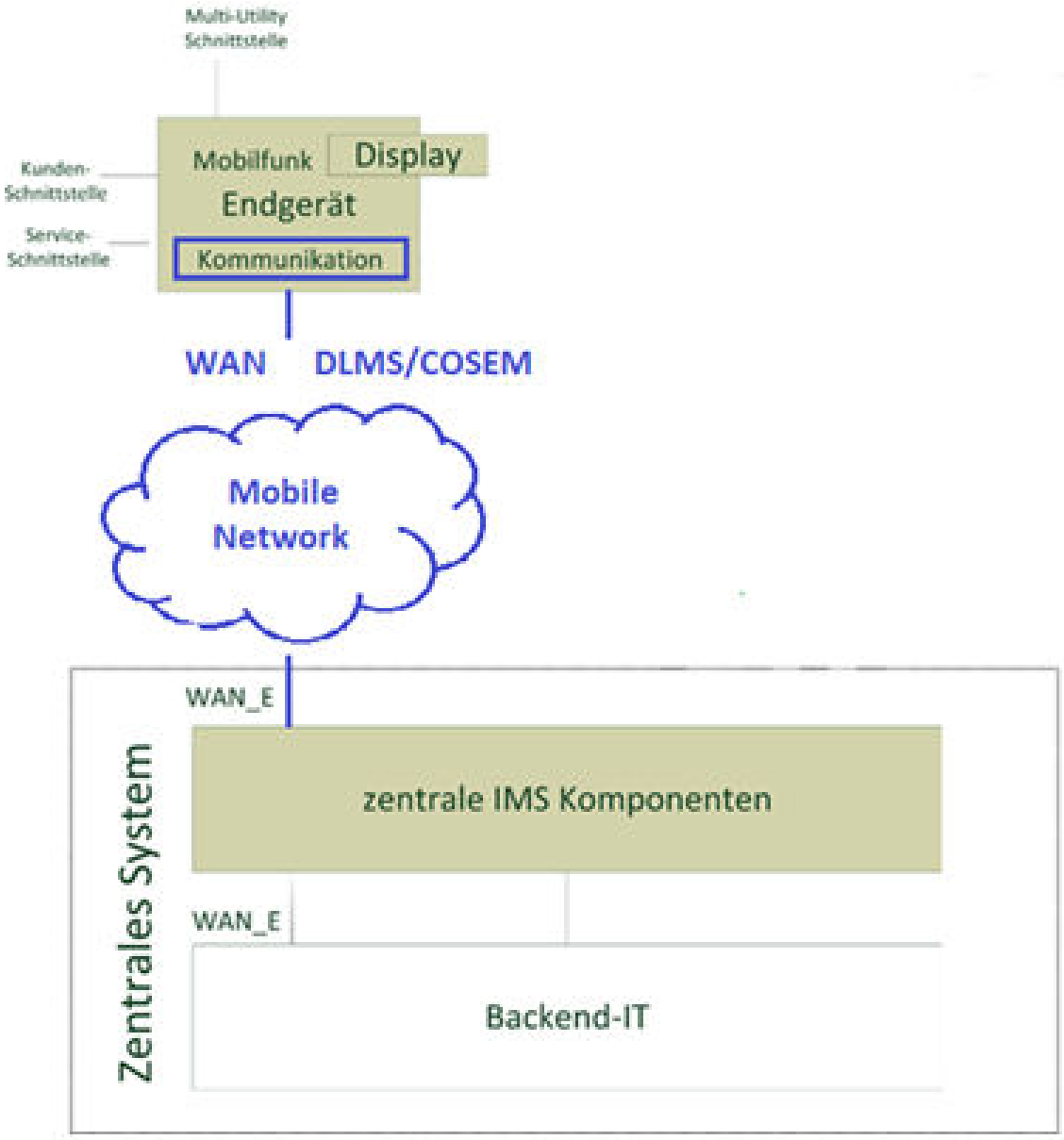


Figure 12.2.1 P2P-based metering profile

The P2P communication modem will act as a bridge between meters and Central Systems by enabling IP based transfers of meter data through mobile networks. On the network side, the modem shall be responsible for establishing and maintaining reliable IP connections to the customer's network. Contrarily on the meter side, the modem will act as a server towards the meter, enabling the meter to have full control over the data that is sent or retrieved from the modem (through a set of AT-commands defined by the modem supplier).

11.3. P2P Functionality Description

The P2P communication interface is designed to directly access the meter by using mobile technology, such as LTE CATM and NBIOT. The interface conforms to the latest 3GPP standard release v14. The main features of the communication interface include:

Communication bands: FDD-LTE B3 /B8//B20;

LTE CAT-M1(eMTC) - Uplink up to 1119kbps, Downlink up to 588kbps;

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NB-IOT - Uplink up to 66kbps, Downlink up to 34kbps;
Data network access authentication with APN, Username, and Password;
Support of push-Events, notification, and pull data;
IP message & domain name resolution;
PHY randomization procedure (preventing meters to send network registration request simultaneously)
Support self-diagnostics (auto reset in case of network anomalies)
Periodic ping to designated destinations;
Register communication data volume including uplink and downlink

11.4. Communication to IHD

The communication interface between E-meter and IHD is P1 interface, and it complies with SSMR5_Annex 02-5 Dutch Smart Meter Requirements v5.0.2 Final P1. After the IHD has paired with the E-meter, the E-meter and IHD is in a one-way communication. The E-meter transmits the data to the IHD periodically.

- The message transmitted by the meter includes:
- Equipment identifier
- Actual meter energy reading of electricity meter
- Actual electrical power
- Short messages

11.5. RS485 – MODBUS

This communication port is mainly for MODBUS protocol, meter can retrieve data from MODBUS sub-devices and convert them to DLMS data type with proper objects definition. Up to 16 channels are supported as the sub-device, and there could be up to 48 registers in each MODBUS channel.
Meter also supports some other third-party defined communication protocol, such as Solax protocol and Omnik protocol under the implementation of “MODBUS” communication protocol. For more detailed information about these protocols, you may refer to “FS-IQ10083619 IQO102065BNEM03 RS-485 functionality.pdf”
The default communication interface settings are as follows:

Start bit	1
Data bits	8
Parity	Even
Stop bit	1
Baud rate	9600
Reply timeout (ms)	5000

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12. Digital and analog output

Meter type IQ0304100f1 is equipped with 2 digital output Interfaces and 1 analog output interface located as shown in chapter front view and rear view. The digital output is likely switch on/off control. The analog outputs a voltage range from 0.00 to 5.00V with the maxim current for 5mA. By default, the digital output Interfaces are set as off, the analog is set 0.00V output. Customers can modify it as they want.

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13. Security

13.1. Physical Security

The meter comply with double insulation of protective Class II followed EN62052-11. It could withstand 4KV AC voltage and 6KV impulse voltage test.

The meter has three seals for the meter face cover to seal the metrology part of the meter. It is impossible to access the metrological part of the meter unless the seals, the seals and the meter face cover or base are physically and clearly destroyed. The meter records the meter cover removal event and terminal cover removal event in both power on condition and power off condition with super cap charged.

The meter immunes magnetic field disturbance and records the magnetic field disturbance event.

The meter supports following anti-tamper features:

Event Code	Name	Description
40	Terminal cover removed	Indicates that the terminal cover has been removed.
41	Terminal cover closed	Indicates that the terminal cover has been closed.
42	Strong DC field detected	Indicates that a strong magnetic DC field has been detected.
43	No strong DC field anymore	Indicates that the strong magnetic DC field has disappeared.
44	Meter cover removed	Indicates that the meter cover has been removed.
45	Meter cover closed	Indicates that the meter cover has been closed.
214	Module removed	Indicates that meter detect a module has been removed
215	Module Inserted	Indicates that meter detect a module has been inserted

Table 13.1.1 Fraud event – physical Interfaces

13.2. Communication Security

The meter support DLMS Suite 0 and could be upgraded to Suite 1.

		Security mechanism	Cryptographic Standard
HES/HHU -> electricity meter	data access security	High level of safety (HLS)	HLS-5 GMAC as specified in IST SP 800-38D:2007
	Data transmission security	Authentication Encryption	AES-GCM-128 as defined in FIPS PUB 197:2001

Unique keys are supported by the meter accordingly.

Security parameter	Default value (hex)
LLS default password	00000001
Authentication key	0xD0 D1 D2 D3 D4 D5 D6 D7 D8 D9 DA DB DC DD DE DF

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Broadcast key	0x0F 0E 0D 0C 0B 0A 09 08 07 06 05 04 03 02 01 00
Encryption key	0x00 01 02 03 04 05 06 07 08 09 0A 0B 0C 0D 0E 0F
Master key	0X00 11 22 33 44 55 66 77 88 99 AA BB CC DD EE FF

There are at least three access level supported with different keys. “Admin” and “Maintenance” could do the configuration and “Operator” can only read.

All the communication interface could be activated and deactivated by the following object.

Objects	OBIS	Description
Communication interface control (class_id 1)	0-1:94.31.128.255	1: communication activated 0: communication deactivated Bit0: cellular module interface Bit1: wM-Bus interface Bit2: P1 interface Bit3: Optical interface

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13.3. Clients

The logical device can have several associations. The following section defines the usage and capabilities of these clients. There is a one to one assignment between the clients and the physical interface.

The access rights of these clients are indicated in Table 13.6.1: Client list.

Below type of clients need to be supported

- Public client (LAN/WAN)
- Management client (LAN/WAN)
- Data Readout client (LAN/WAN)
- Maintenance client (LAN/WAN)

Client	**SPA ID**	**Access port**	**Mandatory Services**	**Establishment**	**Security setting**
Public	16	LAN/WAN	● Block-transfer-with-get ● Get ● General-block-transfer ● Action ● Access	LOWEST SECURITY	LOWEST SECURITY
Management	1	LAN/WAN	● Block-transfer-with-get ● Block-transfer-with-set ● Get ● Set ● Multiple-references ● Selective Access ● Action ● General-block-transfer ● General-protection ● Access	HLS5&LLS	● Security suite 0 ● Security policy = all messages are authenticated and encrypted ● Applicable keys: Global Unicast Encryption key Global Authentication key
Data Readout	2	LAN/WAN	● Block-transfer-with-get ● Block-transfer-with-set ● Get ● Set ● Multiple-references ● Selective Access ● Data-Notification ● Action	LLS	LLS Key

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			• General-block-transfer • General-protection • Access		
Maintenance	6	LAN/WAN	• Block-transfer-with-get • Block-transfer-with-set • Get • Set • Multiple-references • Selective Access • Action • General-block-transfer • General-protection • Access	HLS5&LLS	• Security suite 0 • Security policy = all messages are authenticated and encrypted • Applicable keys: Global Unicast Encryption key Global Authentication key

Table 13.3.1 Client list

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14. Meter Installation

The meter should be installed at a dry and well-ventilated place. The installation board should be fixed on a solid, fire-resistant and sturdy wall.

14.1. Meter Dimension

The dimension of is 282.8mm×170.4mm×86.9mm. illustrate to figure 14.1.

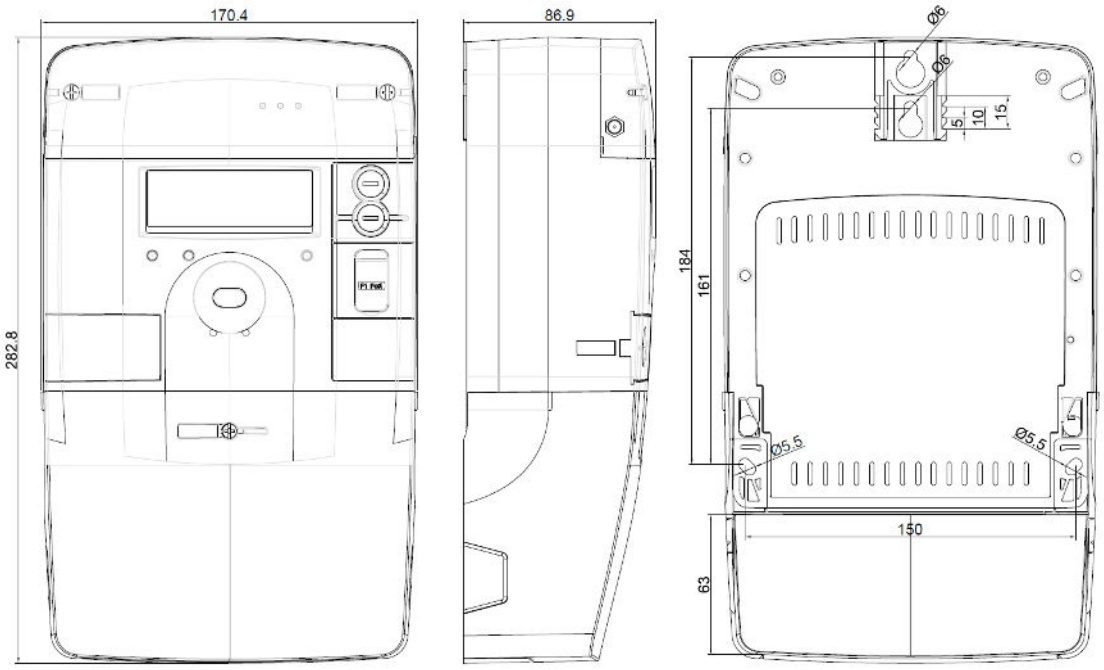


Figure 14.1 Dimension of meter

14.2. Wiring Diagram

The wiring diagram of meter in figure 14.2:

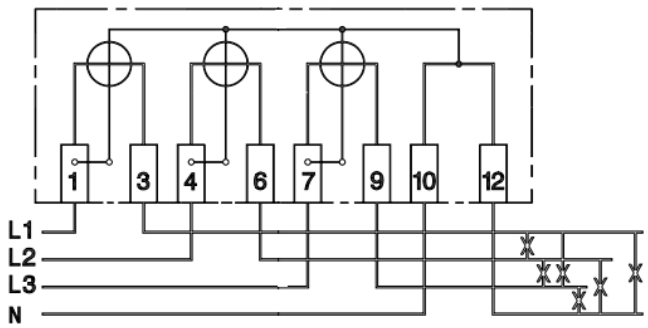


Figure 14.2 Wiring diagram

14.3. Tools for Installation

The following tools are needed for the meter installation:

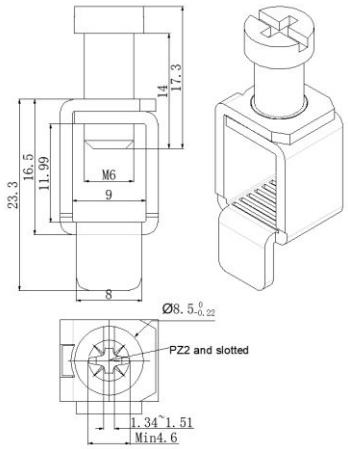
1) Screw driver: Hexagon screw driver for main terminal screw and PZ 2 screw driver for sealing screw.

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Fixing screw and Hook screw: M5 slotted countersunk (flat) head tapping screw.

2) Electric drill with M5 broach and plastic plug for concrete wall installation.

Three phase meter main terminal



14.4. Installation Steps

Step 1: Inspect meter before installation.

Before installation, please make sure there is no damage, broken or other defect on the meter. If defect is found, please don't install the meter.

Step 2: Fixing

The meter is a 3 points mounted meter, fixed by 1 hook and 2 fixing screws.

There are three hook points choice, supporting 3 different installation dimensions as below picture. The distance between hook and fixing hole is adjustable as following figure 14.5.1.

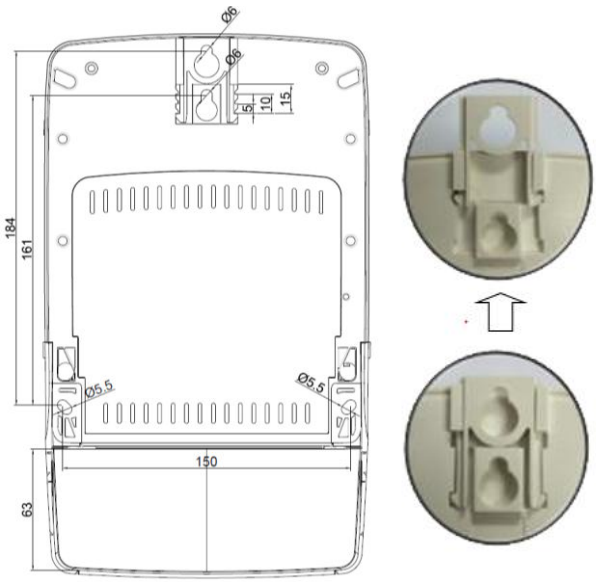


Figure 14.4.1 Installation hook

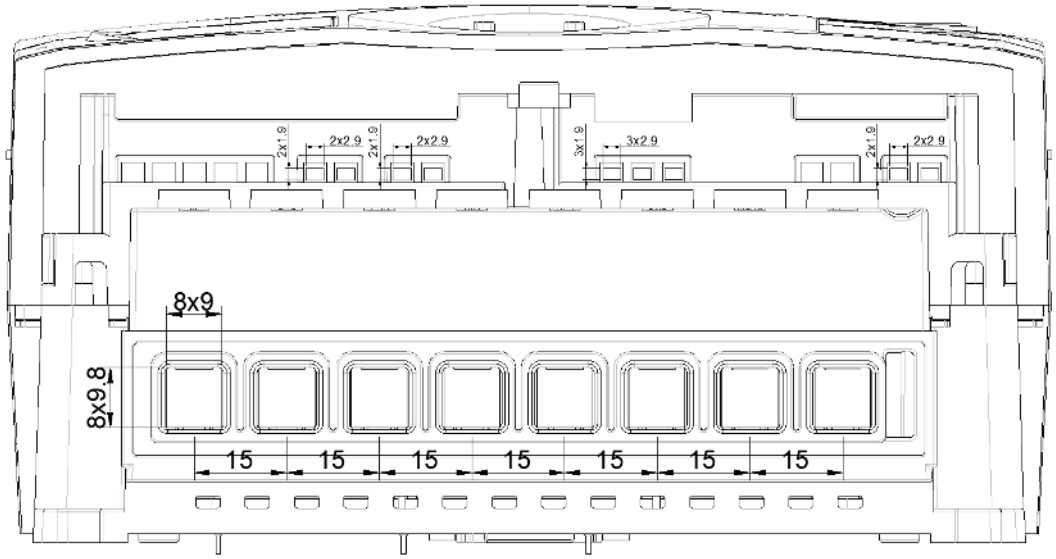
To fix meter, hang the meter by hook then fasten two fixing screws.

Step 3: Connect power wire

1. Turn off the power, [Notice: To ensure safety, you should cut-off power before connect wire to meter]
2. connect power wire according to wiring diagram which marked on the face cover
3. Check wire connect according to wire diagram
4. Resume power supply to meter
5. Check meter self-diagnostic with LCD display include wire connection indication

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6. Then close the terminal cover.



Unit: mm

Figure 14.4.2 Terminal block

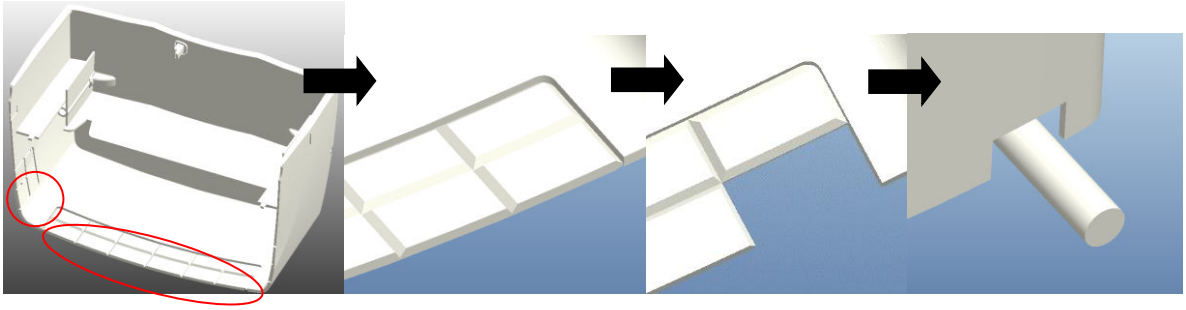
Connect power lines and fasten screw by Hexagon screw driver.

NOTICE

To insure the reliable connection, install torque must higher than 3.5Nm.

Weakening for cable entry for terminal cover

When the meter is connected the wire for 4-35mm² (DC meter), it needs to cut a large hole as shown below



14.5. GPRS/NB-IoT port installation as illustrated below

Adhere to the following procedures when installing or replacing the module.
Installing the module:
Step 1: Break the GPRS/RF cover seals.
Step 2: Remove the screws and take off the cover, shown on picture 14.5.1
Step 3: If applicable: Firmly grasp the module and pull it from the meter.

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Replacing the module:
Step 1: Firmly grasp the module and push it into the meter until it locks in place.
Step 2: Install the cover and ensure the cover is sealed again.
Step 3: Once the meter is in normal operation mode, the configuration of the module starts automatically.

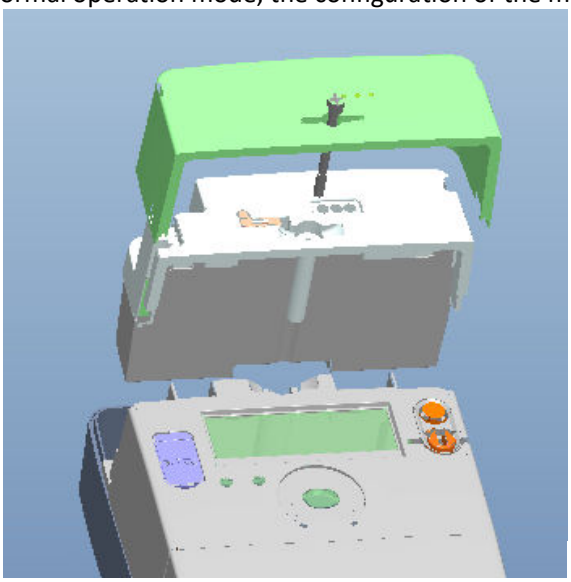


Figure 14.5.1 : Removal of the modem cover

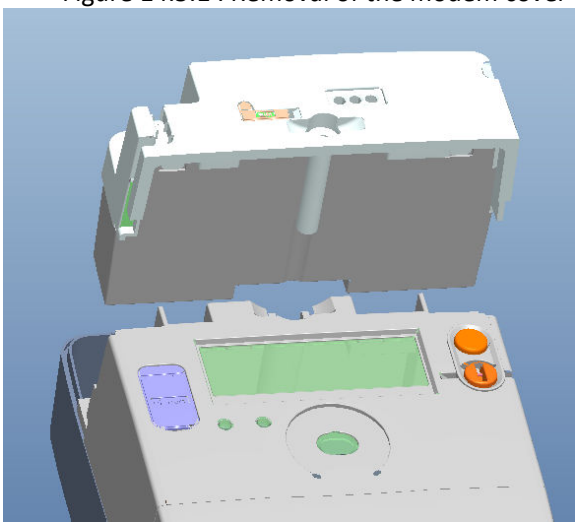
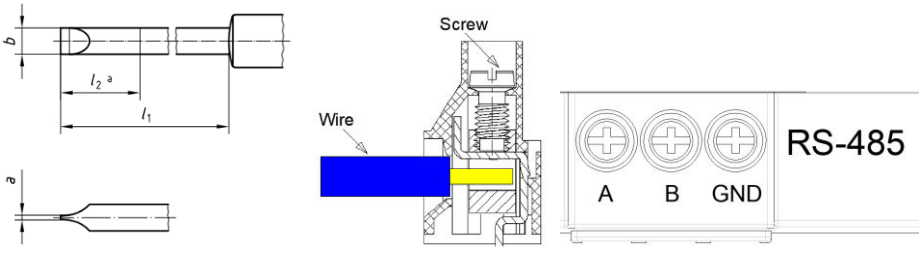


Figure 14.5.2: Removal of the mode

14.6. RS485 Installation

To install RS485, you should prepare a screw driver with 0.6x3mm tip or PH1 for operating auxiliary terminals.



axb=0.6x3mm

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Connect the wires according to the marking on the terminals.
The auxiliary terminal support 0.4~1.5mm^2 solid or stranded wire, the strip wire length is 6~7mm.
Notice: The recommended operating torque is 0.4 $\pm$ 0.05 N·m.

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15. Transport and Storage

The meters should be placed on kickstands and the height should not exceed 4 layers. The storage condition should be clean, with an environmental temperature of between -40°C and +80°C, relative humidity of less than 96% and with an absence of rusty matter in the air.

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16. Annexure I Display Item List

Auto-Scroll Display mode list:

Auto display mode list	OBIS CODE	OBIS CODE/Index	Description
1	{3,1-0:1.8.0.255,2},	1.8.0	Active energy import (+A)-current value
2	{3,1-0:2.8.0.255,2},	2.8.0	Active energy export (-A)-current value
3	{3,1-0:1.7.0.255,2},	1.7.0	Instantaneous active import power (+P)
4	{3,1-0:2.7.0.255,2},	2.7.0	Instantaneous active export power (-P)

Button Display mode list:

Manual display mode list	OBIS CODE	OBIS CODE/Index	Description
1	{8,0-0:1.0.0.255,2},	/	local date-time
2	{1,0-0:97.98.0.255,2},	97.98.0	Alarm Register 1
3	{1,0-0:138.0.0.255,2},	138.0.0	RS-485 interface status
4	{3,1-0:1.8.0.255,2},	1.8.0	Active energy import (+A)-current value
5	{3,1-0:2.8.0.255,2},	2.8.0	Active energy export (-A)-current value
6	{3,1-0:1.8.1.255,2},	1.8.1	Active energy import (+A)-Tariff 1
7	{3,1-0:1.8.2.255,2},	1.8.2	Active energy import (+A)-Tariff 2
8	{3,1-0:2.8.1.255,2},	2.8.1	Active energy export (-A)-Tariff 1
9	{3,1-0:2.8.2.255,2},	2.8.2	Active energy export (-A)-Tariff 2
10	{3,1-0:14.7.0.255},	14.7.0	Frequency
11	{3,1-0:16.7.0.255,2,0},	16.7.0	Instantaneous active power (|+P|-|-P|)
12	{3,1-0:32.7.0.255},	32.7.0	Voltage of L1
13	{3,1-0:52.7.0.255},	52.7.0	Voltage of L2
14	{3,1-0:72.7.0.255},	72.7.0	Voltage of L3
15	{3,1-0:31.7.0.255},	31.7.0	Current of L1
16	{3,1-0:51.7.0.255},	51.7.0	Current of L2
17	{3,1-0:71.7.0.255},	71.7.0	Current of L3
18	{3,1-0:33.7.0.255},	33.7.0	Power factor of L1 (for pp)
19	{3,1-0:13.7.0.255},	13.7.0	Power factor (for sp)
20	{47,0-0:25.6.0.255,2},	25.6.0	GSM diagnostic-operator
21	{47,0-0:25.6.0.255,3},	25.6.0	GSM diagnostic-status
22	{47,0-0:25.6.0.255,5},	25.6.0	GSM diagnostic-ps_status
23	{1,0-1:94.31.6.255,2},	94.31.6	Modem signal indicate
24	{1,0-1:94.31.7.255,2},	94.31.7	Modem rsrp
25	{1,0-1:94.31.8.255,2},	94.31.8	Modem rsrq
26	{1,0-1:94.31.9.255,2},	94.31.9	Modem rssi
27	{45,0-0:25.4.0.255,5},	25.4.0	GPRS modem setup
28	{1,0-1:94.31.4.255,2},	94.31.4	Modem iccid

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29	{42,0-0:25.1.0.255,5},	25.1.0	IPV4 IP address
30	{1,1-0:0.2.0.255,2},	0.2.0	Active legal firmware identifier
31	{1,1-1:0.2.0.255,2},	0.2.0	Active application firmware identifier 1

The following OBIS codes can be configured into the auto display list and manual display list.

1	{1,1-0:0.9.1.255,2},	0.9.1	local time
2	{1,1-0:0.9.2.255,2},	0.9.2	local date
3	{1,0-0:96.1.0.255,2},	96.1.0	Device ID1, manufacturing number
4	{3,1-0:1.8.0.255,2},	1.8.0	Active energy import (+A)-current value
5	{3,1-0:1.8.1.255,2},	1.8.1	Active energy import (+A)-current value(Rate T = 1)
6	{3,1-0:1.8.2.255,2},	1.8.2	Active energy import (+A)-current value(Rate T = 2)
7	{3,1-0:1.8.3.255,2},	1.8.3	Active energy import (+A)-current value(Rate T = 3)
8	{3,1-0:1.8.4.255,2},	1.8.4	Active energy import (+A)-current value(Rate T = 4)
9	{3,1-0:2.8.0.255,2},	2.8.0	Active energy export (-A)-current value
10	{3,1-0:2.8.1.255,2},	2.8.1	Active energy export (-A)-current value(Rate T = 1)
11	{3,1-0:2.8.2.255,2},	2.8.2	Active energy export (-A)-current value(Rate T = 2)
12	{3,1-0:2.8.3.255,2},	2.8.3	Active energy export (-A)-current value(Rate T = 3)
13	{3,1-0:2.8.4.255,2},	2.8.4	Active energy export (-A)-current value(Rate T = 4)
14	{3,1-0:3.8.0.255,2},	3.8.0	Reactive energy import (+R) -current value
15	{3,1-0:3.8.1.255,2},	3.8.1	Reactive energy import (+R) -current value(Rate T = 1)
16	{3,1-0:3.8.2.255,2},	3.8.2	Reactive energy import (+R) -current value(Rate T = 2)
17	{3,1-0:3.8.3.255,2},	3.8.3	Reactive energy import (+R) -current value(Rate T = 3)
18	{3,1-0:3.8.4.255,2},	3.8.4	Reactive energy import (+R) -current value(Rate T = 4)
19	{3,1-0:4.8.0.255,2},	4.8.0	Reactive energy export (-R)- current value
20	{3,1-0:4.8.1.255,2},	4.8.1	Reactive energy export (-R)- current value(Rate T = 1)
21	{3,1-0:4.8.2.255,2},	4.8.2	Reactive energy export (-R)- current value(Rate T = 2)
22	{3,1-0:4.8.3.255,2},	4.8.3	Reactive energy export (-R)- current value(Rate T = 3)
23	{3,1-0:4.8.4.255,2},	4.8.4	Reactive energy export (-R)- current value(Rate T = 4)
24	{3,1-0:5.8.0.255,2},	5.8.0	Reactive energy import (Q1) -current value
25	{3,1-0:5.8.1.255,2},	5.8.1	Reactive energy import (Q1) -current value(Rate T = 1)
26	{3,1-0:5.8.2.255,2},	5.8.2	Reactive energy import (Q1) -current value(Rate T = 2)
27	{3,1-0:5.8.3.255,2},	5.8.3	Reactive energy import (Q1) -current value(Rate T = 3)
28	{3,1-0:5.8.4.255,2},	5.8.4	Reactive energy import (Q1) -current value(Rate T = 4)
29	{3,1-0:6.8.0.255,2},	6.8.0	Reactive energy export (Q2)- current value
30	{3,1-0:6.8.1.255,2},	6.8.1	Reactive energy export (Q2)- current value(Rate T = 1)
31	{3,1-0:6.8.2.255,2},	6.8.2	Reactive energy export (Q2)- current value(Rate T = 2)
32	{3,1-0:6.8.3.255,2},	6.8.3	Reactive energy export (Q2)- current value(Rate T = 3)
33	{3,1-0:6.8.4.255,2},	6.8.4	Reactive energy export (Q2)- current value(Rate T = 4)

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34	{3,1-0:7.8.0.255,2},	7.8.0	Reactive energy import (Q3) -current value
35	{3,1-0:7.8.1.255,2},	7.8.1	Reactive energy import (Q3) -current value(Rate T = 1)
36	{3,1-0:7.8.2.255,2},	7.8.2	Reactive energy import (Q3) -current value(Rate T = 2)
37	{3,1-0:7.8.3.255,2},	7.8.3	Reactive energy import (Q3) -current value(Rate T = 3)
38	{3,1-0:7.8.4.255,2},	7.8.4	Reactive energy import (Q3) -current value(Rate T = 4)
39	{3,1-0:8.8.0.255,2},	8.8.0	Reactive energy export (Q4)- current value
40	{3,1-0:8.8.1.255,2},	8.8.1	Reactive energy export (Q4)- current value(Rate T = 1)
41	{3,1-0:8.8.2.255,2},	8.8.2	Reactive energy export (Q4)- current value(Rate T = 2)
42	{3,1-0:8.8.3.255,2},	8.8.3	Reactive energy export (Q4)- current value(Rate T = 3)
43	{3,1-0:8.8.4.255,2},	8.8.4	Reactive energy export (Q4)- current value(Rate T = 4)
44	{3,1-0:1.7.0.255,2,0},	1.7.0	Instantaneous active import power (+P)
45	{3,1-0:2.7.0.255,2,0},	2.7.0	Instantaneous active export power (-P)
46	{3,1-0:3.7.0.255,2,0},	3.7.0	Instantaneous reactive import power (+Q)
47	{3,1-0:4.7.0.255,2,0},	4.7.0	Instantaneous reactive export power (-Q)
48	{3,1-0:32.7.0.255},	32.7.0	Voltage of L1
49	{3,1-0:31.7.0.255},	31.7.0	Current of L1
50	{3,1-0:33.7.0.255},	33.7.0	Power factor of L1 (for pp)
51	{3,1-0:13.7.0.255},	13.7.0	Power factor (for sp)
52	{3,1-0:14.7.0.255},	14.7.0	Frequency
53	{47,0-0:25.6.0.255,2},	25.6.0	GSM diagnostic-operator
54	{47,0-0:25.6.0.255,3},	25.6.0	GSM diagnostic-status
55	{47,0-0:25.6.0.255,5},	25.6.0	GSM diagnostic-ps_status
56	{1,0-1:94.31.6.255,2},	94.31.6	Modem signal indicate
57	{1,0-1:94.31.7.255,2},	94.31.7	Modem rsrp
58	{1,0-1:94.31.8.255,2},	94.31.8	Modem rsrq
59	{1,0-1:94.31.9.255,2},	94.31.9	Modem rssi
60	{45,0-0:25.4.0.255,5},	25.4.0	GPRS modem setup
61	{1,0-1:94.31.4.255,2},	94.31.4	Modem iccid
62	{42,0-0:25.1.0.255,5},	25.1.0	IPV4 IP address
63	{1,1-0:0.2.0.255,2},	0.2.0	Active legal firmware identifier
64	{1,1-1:0.2.0.255,2},	0.2.0	Active application firmware identifier 1
65	{1,0-0:138.0.0.255,2},	138.0.0	RS-485 interface status

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17. Annexure II Default Tariff Table

The default tariff table will be initialized during the manufacture process. It can be changed according to customer's order.

Season Table:

Season Profile Name	Start Date	Week Profile
S01	January1st	W0

Week Table:

Week Profile Name	Mon	Tues.	Wed.	Thur.	Fri.	Sat.	Sun.
W0	0	0	0	0	0	0	0

Special Day Table:

Holiday index	Month	Day	Day ID

Day Table:

Day ID	Time duration(Hour : Minute)	Energy Tariff (T)
0	Daily from 00.00 till 24.00	T1

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