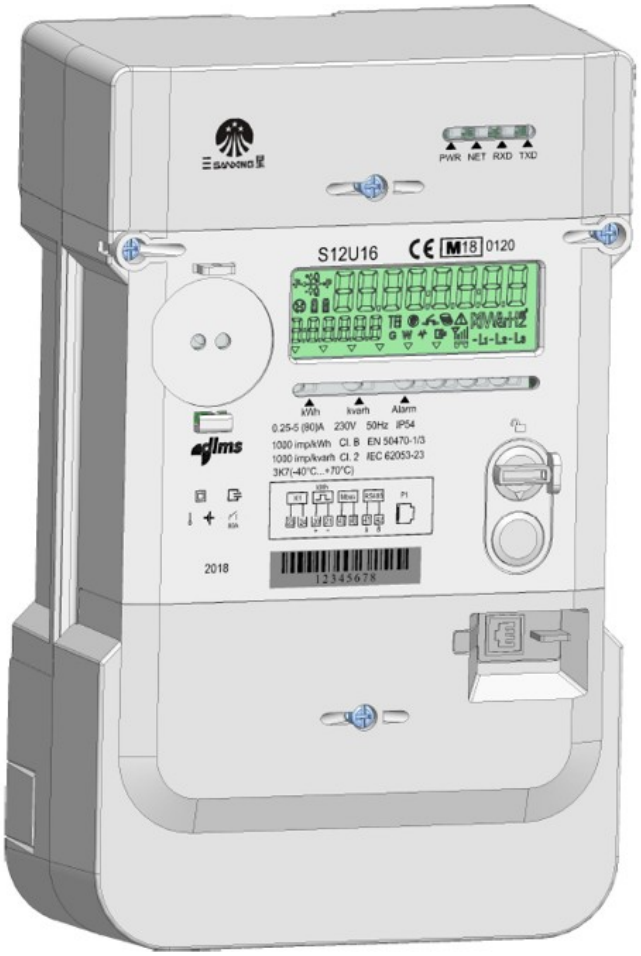
Electricity Meters IEC/MID

Residential

S12U16 1-phase meter

User Manual



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Revision History

Version	Date	Comments

About this Document

Range of validity

The present manual applies to the second generation **S12U16 1-phase** electricity meters.

For a detailed explanation of the type designation see *section 1.4*.

Purpose

The user manual contains all information required for meter applications for the intended purpose. This includes:

- Provision of knowledge concerning the characteristics, construction and knowledge of meters
- Information about possible dangers, their consequences and measures to prevent any danger
- Details concerning the performance of all work throughout the service life of the meters (parameterization, installation, commissioning, operation, maintenance, decommissioning and disposal)

Target group

The content of this user manual is intended for technically qualified personnel of energy supply companies, responsible for system planning, installation and commissioning, operation, maintenance, decommissioning and disposal of meters.

Typographical conventions

The following typographical conventions are used throughout this document:

Font	Description
Bold	Font style used for menu items and keys in user interface and for keys on keyboard.
Italics	Font style for *new terminology* and for references to other documents or other parts within this document. For example: A general description of the display user interface is given in *section 5.1 "Display"*.
	Symbol for additional information, hints and other important notifications.

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1 Description of Unit

1.1 General View

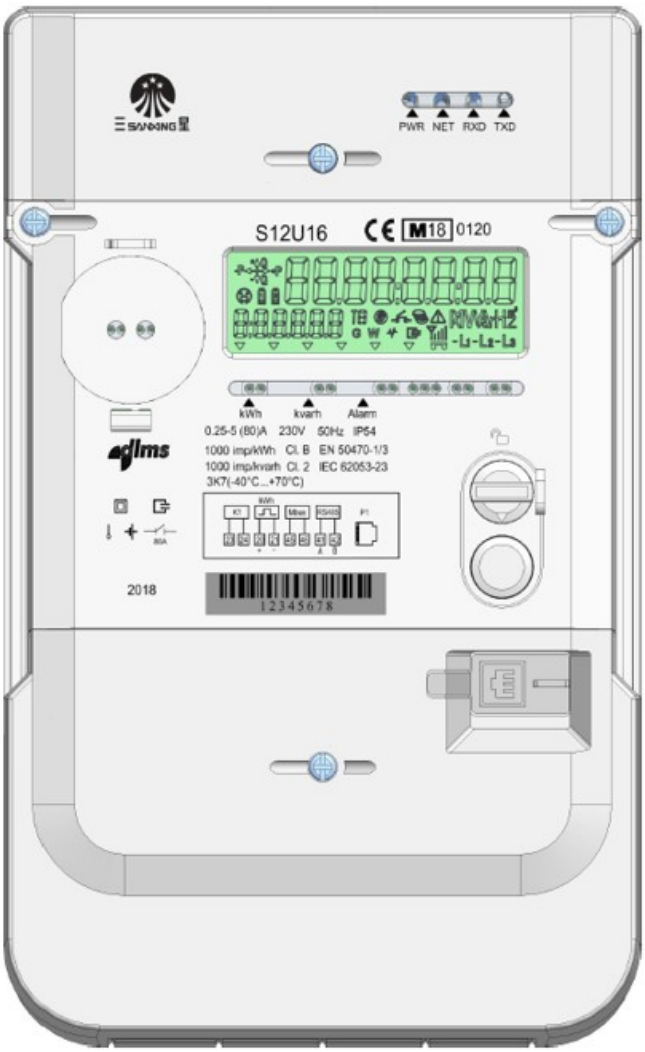


Fig. 1.1 General view of meter

1.2 Functional Overview

S12U16 is a smart electricity meter offering reliable performance with versatile functionality including support for multi energy reading and control. With functionalities on smart energy management and communication capabilities over 4G/ PLC/RF/NB-IoT, the meters are aimed to be used for AMI/AMR/AMM and smart grids.The protocol over the communication is always dlms.

1.3 Characteristics

S12U16 meters have the following main characteristics:

- Recording of active and reactive energy in all 4 quadrants with up to 4 rates
- Data display on LCD
- Active energy measurement accuracy: Class B (EN 50470-1/3) and Class 1 (IEC 62052-11/62053-21)
- Reactive energy measurement accuracy: Class 2 (IEC 62053-23)
- Meter designed according to standard DIN 43857.
- Wide range measurement from starting current to maximum current
- Serial interface with optical input/output for automatic readout of data on the spot and for service functions
- Two-way communication to metering system with 4G/PLC/RF/NB-IoT
- Customer local interface P1
- Wired M-Bus interface supports 4 slave device (gas, water, heating)
- Internal disconnector for full disconnection of energy, controllable remotely from system, or locally with ALT key or via local communication interfaces
- Inputs and Outputs
  - 1 relay outputs: Relay output 1 is a mechanical on-off latching relay
- Installation aids (e.g. phase voltages and direction of energy)
  - Presence of phase voltages (voltage values are displayed)
  - Pulse output on LED
  - Display of energy direction
  - Wrong phase rotation indication (L1L2L3 blinking)
- Anti-tampering measures
  - Detection of terminal cover opening
  - Detection of meter cover opening
  - Detection of front cover opening
  - Detection of strong DC magnetic field
- Storage of event information (e.g. power outages)

1.4 Type Designation

The exact configuration of S12 U16 meters is expressed in a type code printed on the device faceplate. The type code can also be read by the metering system.

Example: S12 U16	-	D	2	D	3	2	-	Y	I	2	O	1
Connection standard		|	|	|	|	|		|	|	|	|	|
DIN standard		D	|	|	|	|		|	|	|	|	|
BS standard		B	|	|	|	|		|	|	|	|	|
Voltage & Current			|	|	|	|		|	|	|	|	|
230V,0.25-5 (100) A			1	|	|	|		|	|	|	|	|
230V,0.25-5 (80) A			2	|	|	|		|	|	|	|	|
230V,0.25-5 (60) A			3	|	|	|		|	|	|	|	|
Reserved				|	|	|		|	|	|	|	|
Accuracy				|	|	|		|	|	|	|	|
Active Calss A				A	|	|		|	|	|	|	|
Active Calss B				B	|	|		|	|	|	|	|
Active Calss A. Rective Class 2				C	|	|		|	|	|	|	|
Active Calss B. Rective Class 2				D	|	|		|	|	|	|	|
Reserved					|	|		|	|	|	|	|
Const					|	|		|	|	|	|	|
400					1	|		|	|	|	|	|
800					2	|		|	|	|	|	|
1000					3	|		|	|	|	|	|
1600					4	|		|	|	|	|	|
Reserved						|		|	|	|	|	|
Mechanical(Terminal cover)						|		|	|	|	|	|
Long transparent terminal cover						1		|	|	|	|	|
Long none transparent terminal cover						2		|	|	|	|	|
Short transparent terminal cover						3		|	|	|	|	|
Short none transparent terminal cover						4		|	|	|	|	|
Reserved								|	|	|	|	|
Neutral measurement								|	|	|	|	|
Yes								Y	|	|	|	|
No								N	|	|	|	|
Auxiliary Power									|	|	|	|
Interal Battery									I	|	|	|
External Battery									E	|	|	|
Super-capacitor									S	|	|	|
Internal + External battery									1	|	|	|
Internal Battery + Supercap									2	|	|	|
Externall Battery + Supercap									3	|	|	|
Internal Battery + External Battery									F	|	|	|
Reserved										|	|	|
Optical interface											|	|
Optical interface											O	|
Infrared interface											I	|
None											N	|
Reserved												|
Local customer interface												|
1 P1 port												1

1.5 Measuring Principle

1.5.1 Overview

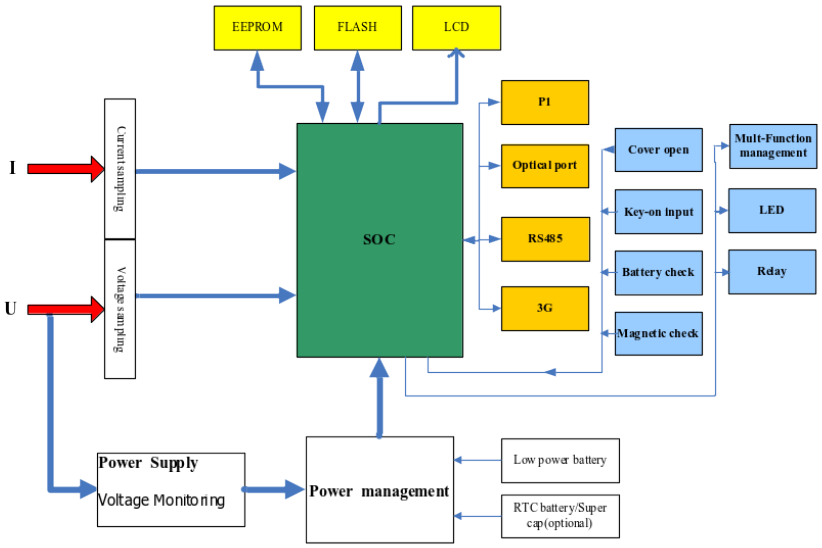


Fig. 1.2 Block diagram

Inputs

The main meter inputs are:

- Phase connection L1 and neutral for
  - energy measurement
  - power supply to the meter
  - 4G/PLC/RF/NB-IoT communication with communication module
- Display key
- ALT key
- Wired M-Bus interface supporting 4 slave device

Outputs

The main meter outputs (some of which are also inputs) are:

- LCD to display measured values and the corresponding OBIS code
- Pulse output (red LED, for active and reactive energy)
- Alarm status output (red LED)
- Mechanical on-off latching relay 5 A, 230 VAC
- P1 port (RJ21)
- Optical interface for automatic data readout on site by means of a suitable HHU(Hand held unit)
- PLC communication interface for connection to a metering system via the low voltage network

Power supply

The supply voltage for the meter electronics is taken from the three-phase system. It works correctly as soon as at least one phase and neutral are connected to mains voltage. In the event of mains failure a voltage monitor ensures the safe storage of meter data and manages the restart when mains voltage is restored.

Memory

Meter parameters are stored in non‑volatile (FLASH and EEPROM) memory which protects the parameters in the event of power fail

1.5.2 Signal Processing

Calibration

The measurement system is calibrated during the manufacturing process of the meter. Calibration data is stored in a non-volatile (EEPROM) memory and cannot be altered

Start detection

The high accuracy measuring chip will compares the measured power with the minimum starting power. Signals are only passed on for summation if the minimum starting power is exceeded

Measured quantities

The following energy values can be measured and stored in the registers:

- Active energy (A)
- Reactive energy (R)
- Apparent energy (VA)

The signals +A and +R are calculated by the summation of *imported* measured active and reactive energy.

The signals -A and -R are calculated by the summation of *exported* measured active and reactive energy.

The combined totals are the sum of the absolute values of +A and -A or +R and -R.

Energy type:	kWh, kvarh, kVAh
Direction:	Import, export, ± reactive, reactive by quadrant
Instantaneous Values:	Voltage, current, frequency, active power, power factor

Measurement channels

There are 9 independent measurement channels. Each of the measured quantities is assigned to one of these channels.

Energy registers

Each measurement channel has a total energy register and 4 rated energy registers assigned to it.

All internal registers have 10 digits. The internal register magnitude is Wh (Watt-Hours). Internal registers cannot be reset, when the register reaches 4294967295, it rolls over to 0. The display and readout formats vary from the internal format

Rates

The meter is designed for up to 4 rates.

Rate control

Rate control is performed by the built-in time of use (TOU).

Four-quadrant measurement

The reactive energy (±Rc, ±Ri) is allocated to the four quadrants as follows:

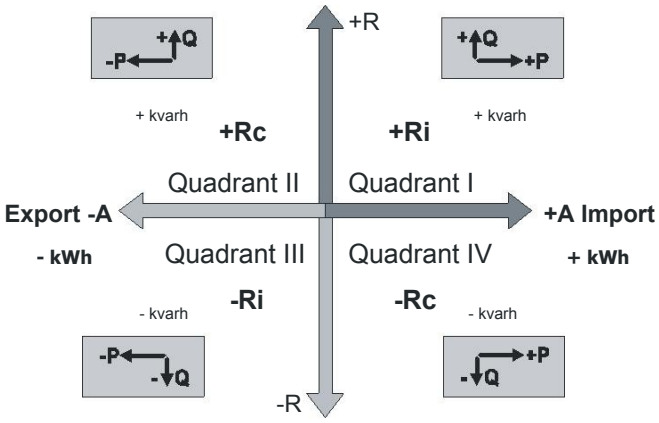


Fig. 1.5 Four-quadrant measurement

Channel configuration The 9 measurement channels register fixed defined measurement quantities as given in the table below:

Description			OBIS code
ME1	Active energy import	+A (QI+QIV)	1.8.0
ME2	Active energy export	-A (QII+QIII)	2.8.0
ME3	Reactive energy import	+R (QI+QII)	3.8.0
ME4	Reactive energy export	-R (QIII+QIV)	4.8.0
ME5	Reactive energy (Q1)	+Ri	5.8.0
ME6	Reactive energy (Q2)	+Rc	6.8.0
ME7	Reactive energy (Q3)	-Ri	7.8.0
ME8	Reactive energy (Q4)	-Rc	8.8.0
ME9	Active energy combined total, absolute	|+A|+|-A|	15.8.0

1.6 Relay Outputs

Relay output 1 (terminals 23 and 24) is a 5 A mechanical on-off latching relay.

Relay outputs of the S12U16 meters is operated in inverted mode.

In the inverted mode the relay functions are inverted, i.e. the relay will report state "open" if it is closed, and state "closed" if it is open. Similarly, the inverted relay will open after command "close", and will close after command "open".

The inverted mode allows to switch loads

1.7 Disconnector

The S12U16 meter is equipped with a disconnector to connect or disconnect the premises of the consumer. The disconnector can be operated manually via ALT key, remotely by commands via any communication channel, via locally through control functions integrated in the meter itself.

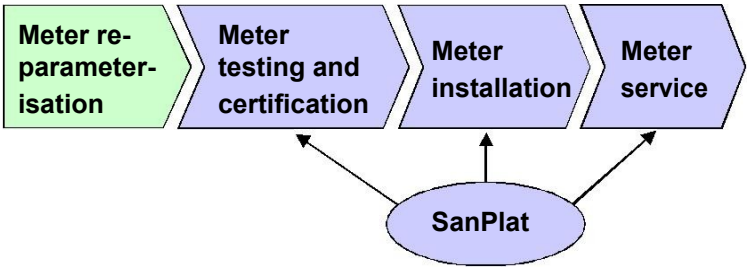
Disconnector control is designed so that it enables the customer to use the disconnector as:

- A manual switch for connecting or disconnecting the customer premises
- A manual switch for disconnecting the premises when the customers move away
- Disconnection if max. power or current has been exceeded over a specified time
- Remotely disconnected, with no possibility to reconnect locally or alternatively, the maximum demand can be limited remotely.

Disconnector not suitable as main switch
Do not use the disconnector as a main switch for installation or maintenance purposes. The disconnector is not equipped with a thermal and/or short circuit protection device.

1.8 Software Tools

Sanxing provide software tools to ensure optimum support of the meters throughout the products life. The Sanxing SanPlat Tool is used for the test and installation of meters and for field servicing.



2 Safety

2.1 Safety Information

The following symbols are used to draw your attention to the relevant danger level, i.e. the severity and probability of any danger, in the individual chapters of this document:

Danger
Identifies an extraordinarily great and immediate danger that could lead to serious physical injury or death.

Warning
Indicates a potentially hazardous situation that may result in minor physical injury or material damage.

Note
Indicates general details and other useful information to help you with your work.

In addition to the danger level, safety information also describes the type and source of the danger, its possible consequences and measures for avoiding the danger.

2.2 Responsibilities

The owner of the meters – usually the utility company – is responsible for assuring that all persons engaged in working with meters:

- Have read and understood the relevant sections of the user manual.
- Are appropriately qualified for the work to be performed.
- Strictly observe the safety regulations (laid down in *section* 2.3) and the operating instructions as specified in the individual sections.

In particular, the owner of the meters bears responsibility for the protection of persons, prevention of material damage and the training of personnel.

For this purpose, Sanxing provides training on a variety of products and solutions. Please contact your Sanxing representative if interested.

2.3 Safety Regulations

The following safety regulations must be observed at all times:

- The meter connections must be disconnected from all voltage sources during installation or when opening.
- Contact with live parts can be fatal. The main fuses should, therefore, be removed and kept in a safe place until the work is completed so that other persons cannot replace them unnoticed.
- Local safety regulations must be observed. Only technically qualified and appropriately trained personnel are authorised to install the meters.
- Protection earth connection must not be switched with the disconnector.
- Only "useful" tools have to be used. This means a screw driver has to have the correct size for the screws and the metallic part of a screw driver has to be insulated.
- The meters must be held securely during installation. They can cause injuries if dropped.
- Meters that have been dropped must not be installed, even if no damage is apparent, but must be returned to the service and repair department (or the manufacturer) for testing. Internal damage may result in malfunctions or short-circuits.
- The meters must never be cleaned under running water or with compressed air. Water ingress can cause short-circuits.

3 Mechanical Construction

3.1 Case

The meter case is made of antistatic plastic (polycarbonate). The LCD display,ALT key,display key and optical interface are always visible.

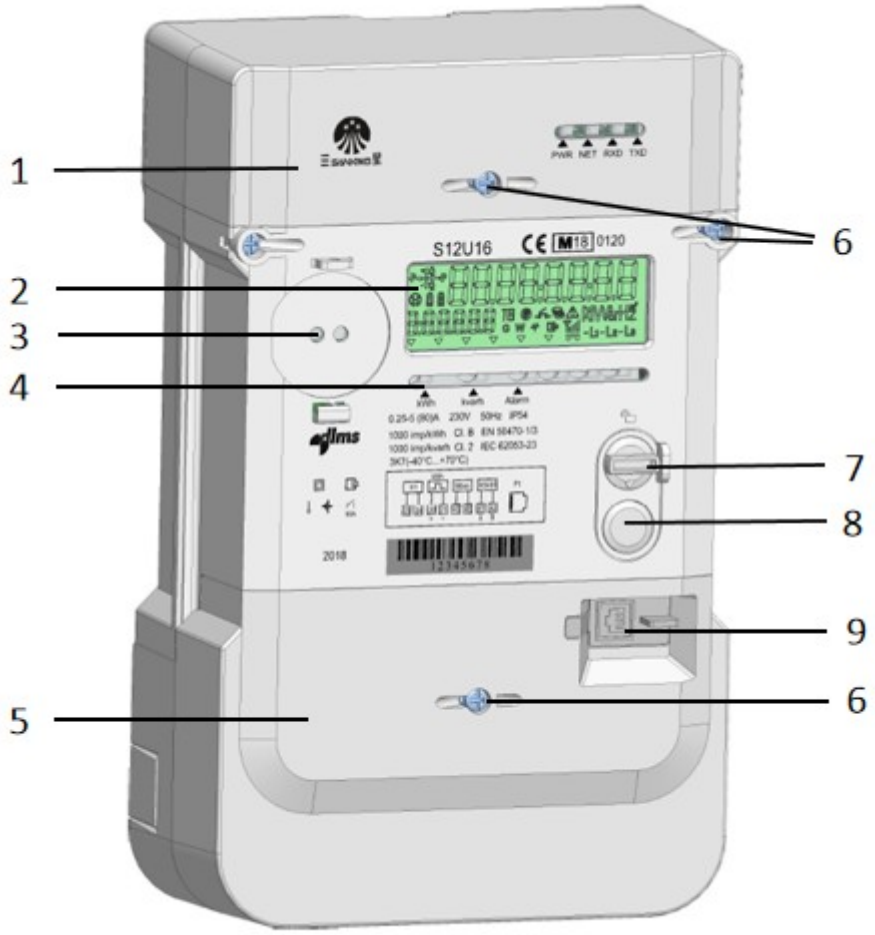


Fig. 3.1 Sliding cover in its normal position

1 Front cover
2 LCD display
3 Optical interface
4 LED output（pulse and alarm status）
5 Terminal cover
6 Sealing screw covers
7 ALT key
8 Display key
9 P1 port

3.2 Nameplate

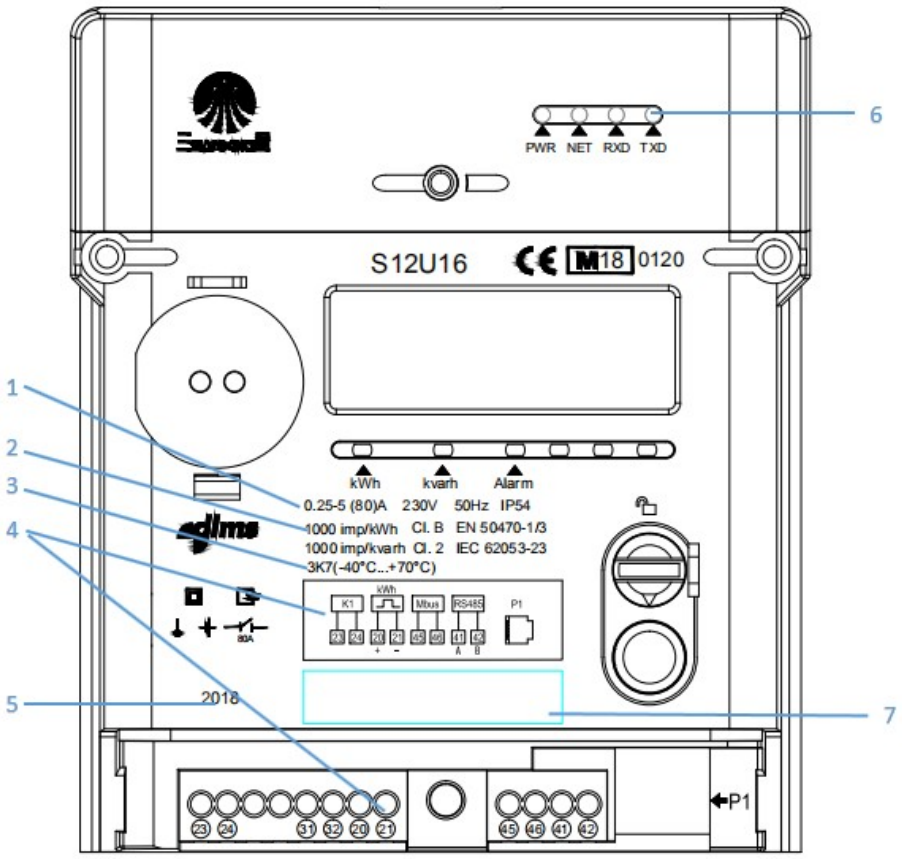


Fig. 3.6 S12U16 nameplate

1 *Nominal connection values (voltage, current range, frequency)*
2 *Impulse constant of test LED and class for active and reactive measurement*
3 *Nominal operating temperature range*
4 *Auxiliary terminal number inscription*
41/42: RS485
45/46: Wired M-Bus
20/21: pulse output（active）
23/24: 5 A latching relay (relay output 1)
RJ12： P1 port
5 *Year of manufacture*
6 *Module running status*
7 *Bar code*

3.3 Control Elements

The S12U16 meter has two control keys:

- A display key for scrolling through menus and reconnect the disconnector.
- A ALT key for locally disconnect the disconnector .

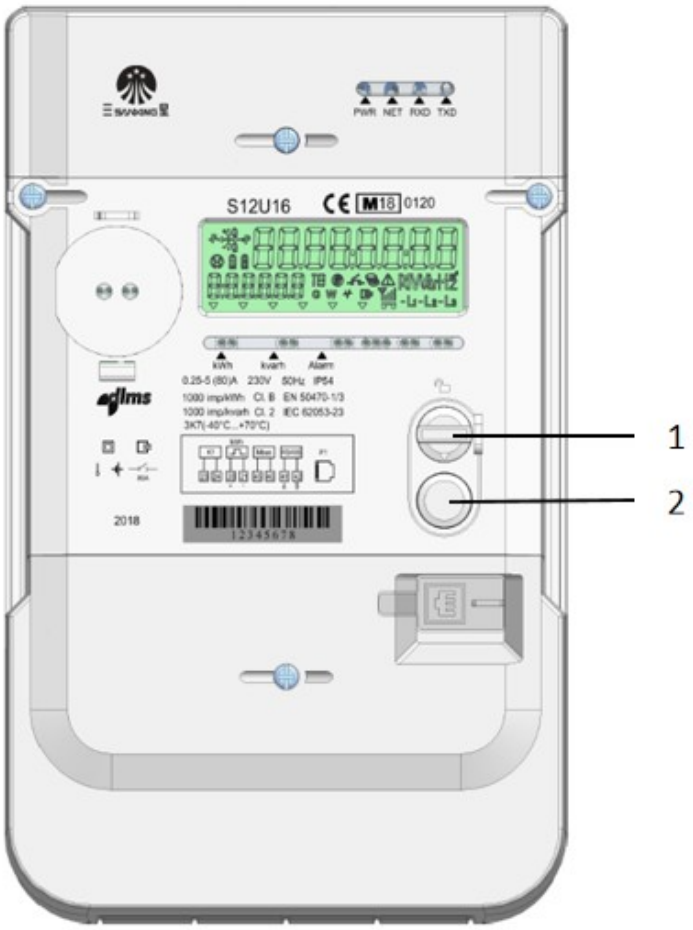


Fig. 3.7 Control elements

1 ALT key
2 Display key

The ALT key is protected by the seal.

3.4 Dimensions

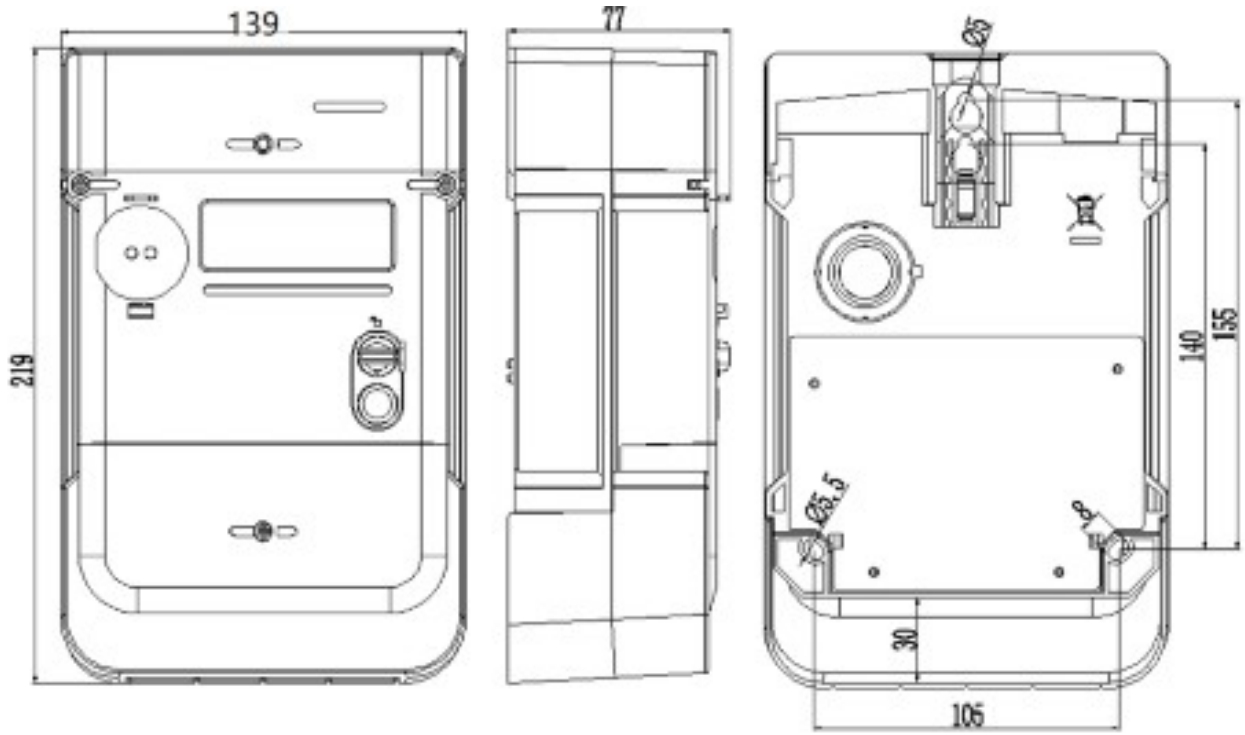


Fig. 3.8 Meter dimensions

3.5 Connections

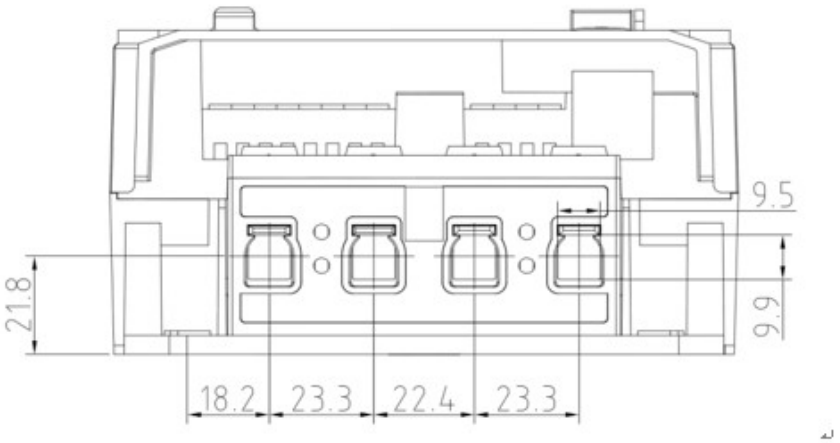


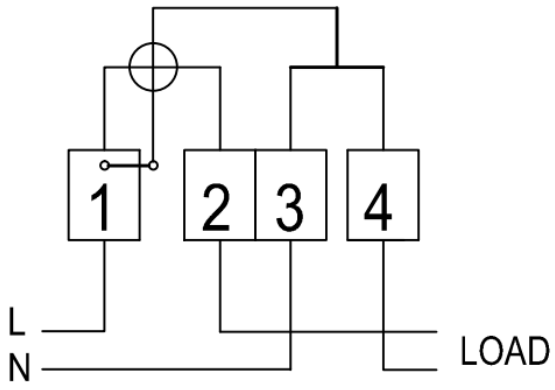
Fig. 3.9 Terminal layout and dimensions

The terminals have an opening diameter of 9.5 mm.

3.6 Connection Diagrams (Examples)

Where to find relevant diagrams

The diagrams relevant for the installation are shown on the meter's face-plate (inputs/outputs) and inside the terminal cover (mains connections).



4 Installation

Do not touch live parts
Dangers can arise from live electrical installations to which the meters are connected. Touching live parts is dangerous to life. All safety information should therefore be strictly observed.

Intended environmental conditions for meter installations:

- The meter is intended to be installed in a mechanical environment "M1", with shock and vibrations of low significance, as per 2014/32/EU Directive.
- The meter is intended to be installed in electromagnetic environment "E2", as per 2014/32/EU Directive.
- Meters are to be installed indoors.
- Meters are to be installed in non-condensing humidity conditions.
- Meter should be installed with copper conductors. The use of aluminium conductors can result in corrosion. Please seek advice before using this meter with aluminium conductors.
- The installation site must meet the requirements of the device's protect-tion class (IP54) and the operating temperature range (-40 … +70°C). Avoid installing the device on direct sun exposure walls and direct sunlight. If necessary, use an additional shield or visor to protect the outdoor installation case from direct sunlight (shield not provided by Sanxing).

4.1 Introduction

The following conditions must be met for installation and commissioning of the meter:

- The work described below must only be conducted by technically qualified and suitably trained persons.
- These persons must be familiar with and observe the local safety regulations.
- Strict observance of the details contained in *section* 2 *"Safety"*, in particular the safety regulations, as well as safe operation.
- Before starting work ensure that the materials and tools required are all present.

4.2 Before Installation

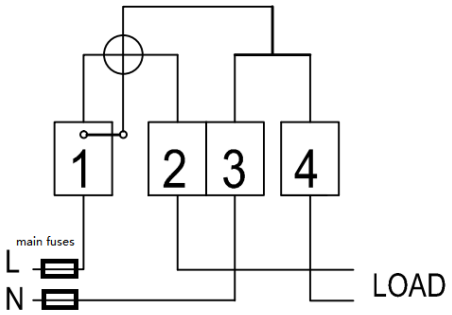


Fig. 4.1 Meter connection with phases and neutral

Dangerous voltage on conductors
The connecting wires at the place of installation must not be live when fitting the meter. Touching live parts is dangerous to life. The main fuses should be removed and kept in a safe place until work is completed, so that they cannot be replaced by anyone unnoticed.

No overcurrent protection and automatic disconnection
As the meter has no internal overcurrent protection and no method of disconnection from the mains, this must be provided by the end installation.

Protect disconnector against overcurrent
In case the meter has a disconnector, this must be protected against overcurrent. As the disconnector is not equipped with a thermal and/or short circuit protection device, it needs to be protected with an external fuse or overload switch.

4.3 Mounting

Observe safety instructions
Prior to start mounting of the meter read and strictly observe the general safety instructions given in *section 4.2 "Before Installation"*.

The meter should be mounted as follows on the meter board or similar device provided for this purpose (see also *section 3.4 "Dimensions"*):

1. Find the correct position for the meter. Ensure there are no wires underneath the holes to be drilled.
2. Determine the desired form of fixing (open or covered meter mounting).

3. Set the meter suspension eyelet in the correct position. See following figure.

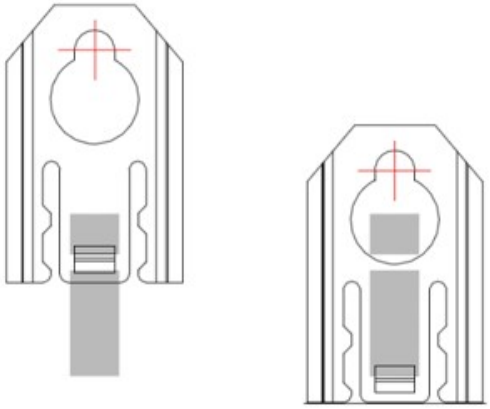


Fig. 4.2 Suspension eyelet positions

4. Check whether the connecting wires are live using a phase tester or universal measuring instrument. Remove the main fuses and keep them in a safe place until installation is completed.
5. Drill the three holes.
6. Open the sealing screw covers and unscrew the meter terminal cover.
7. Fit the meter with the three fixing screws on the mounting surface.
8. Connect the phase connection wires and the inputs and outputs as described in *section 4.4 "Connecting"*.

4.4 Connecting

Observe safety instructions

Prior to start connecting of the meter read and strictly observe the general safety instructions given in *section 4.2 "Before Installation"*. The meter must be mounted as described in *section 4.3 "Mounting"* before it is connected.

4.4.1 Connecting the Phase and Neutral Connection Wires

1. Cut the phase and neutral connecting wires to the required length and strip their ends.
   The insulation of the connecting line must extend as far as the terminal indentation, i.e. there must be no further bare part of the connecting line visible above the terminal edge. The stripped part of the connecting wire should be shortened if necessary.
2. If stranded wire is used as a phase and neutral connection line, it has to be provided with a ferrule for connection.

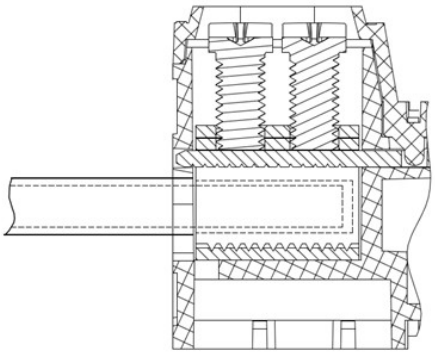


Fig. 4.3 phase connection terminal

3. Insert the phase and neutral connecting wires in the relevant terminals (the terminals are numbered as shown in the connection diagram) and tighten the terminal screws firmly.
   - For wires with small conductor cross-sections (≤ 6 mm^2) the connecting line must be placed carefully in the middle of the terminal, so that it cannot move sideways when tightening the terminal screws. When tightening, ensure that the connecting line remains between the copper inside the terminal and the screw.
   - It is recommended that the beginning and end of the relevant conductors are identified using a suitable test unit (e.g. buzzer) to ensure that the right consumer is connected to the meter output.

Insufficiently tightened screws causes power loss

Failure to tighten terminal screws sufficiently can lead to power loss and heating.

Do not withdraw connecting wires with closed terminals

Never withdraw connecting wires with the terminal closed, as this can damage the terminal.

4.4.2 Connecting Inputs and Outputs

Avoid any contact of input and output wires with mains terminals
The inputs and outputs are usually insulated circuits or extra-low voltage circuits. Avoid any contact of input and output wires with phase connection terminals by proper arrangement of the wires under the terminal cover. Make sure that the input and output wires are not squeezed or damaged in the vicinity of the phase connection terminals.

Connect the respective wires to the relay outputs, P1 port and the M-Bus interface (if required).

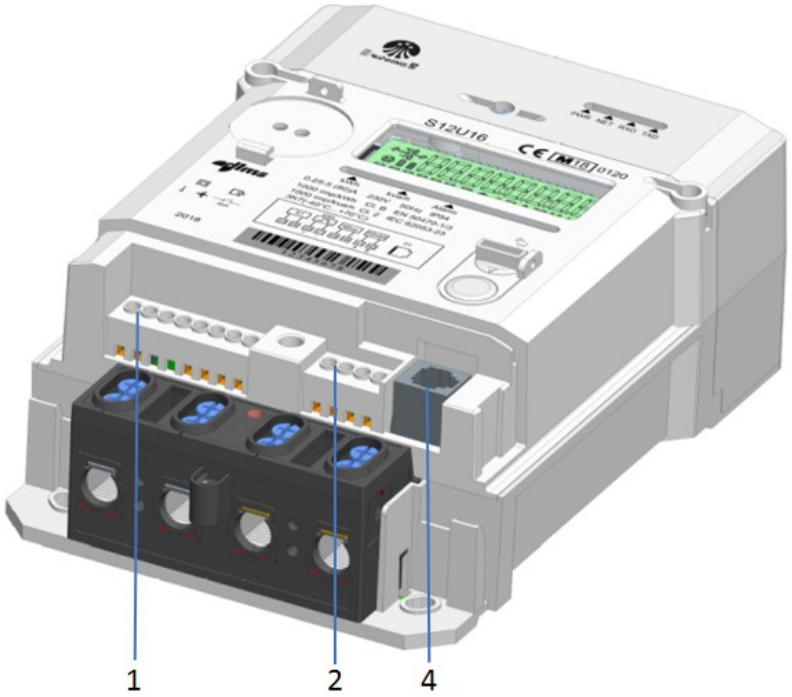


Fig. 4.4 I/O terminal positions

1 Relay output 1: connectors 23, 24
2 M-Bus: connectors 28, 29 (optional)
3 P1 port

Relay outputs require overcurrent protection
The relay outputs 1 must be protected against overcurrent by exter-nal fuses. Overcurrent will damage the relay!
Relay output 1: 5 A maximum current

4.4.3 Checking the Phase Connections and the Input/Output Connections

Before putting the meter into operation the following points must be checked and corrected if necessary:

1. Has the correct meter (with correct identification number) been installed at the measuring point of the relevant consumer?
2. Are all thrust screws for the phase connections and neutral tightened sufficiently?
3. Are the mains inputs and outputs connected correctly? The conductor from the house connection or from the main fuse must be present at the input, those of the meter to the consumer at the output.
4. Is the neutral conductor connected to terminals 10 and 12?
5. Are the auxiliary outputs (relays) connected correctly?
6. Attach the terminal cover.
7. Close the terminal cover's sealing screw covers.
8. Check the installation as described in *section 4.5 "Commissioning and Functional Check"*.

4.5 Commissioning and Functional Check

The installed meter should be put into service and checked as follows:

1. Insert the main fuses removed before installation. The meter is switched on.
2. Check the display (no error message) and with no load connected that the virtual output (creep indicator) is displayed.
3. Connect a load and check that the output LED starts blinking.
4. Check that the meter is measuring correctly. Display indicators and their functions are described in section 5.1 "Display".
5. Check 4G signal is displayed?(if required)
6. Perform the set-up process for the required communication devices (connected M-Bus devices) as described in *section 4.6 "Installation Support for Communication* Devices".(if required)
7. Check that the disconnector is closed (see disconnector state indication on display), otherwise press display key.
8. When the meter is successfully installed, seal the terminal.

4.6 Installation Support for Communication Devices

Remote and local communication devices can be installed using optical interface.

4.6.1 Wired M-Bus Communication

4.6.1.1 Installation of Wired M-Bus Devices

1. Use Sanxing SanPlat to send the install command (Write\M-Bus configure\M-Bus client\M-Bus client channel 1-4\slave install)
2. Read the M-Bus device ID1 channel 1-4,if there have data mean install success. (water and gas meter can check LCD see 5.1.2)

4.6.1.2 De-installation of Wired M-Bus Devices

1. Use Sanxing SanPlat to send the deinstall command (Write\M-Bus configure\M-Bus client\M-Bus client channel 1-4\slave deinstal)
2. Read the M-Bus device ID1 channel 1-4,The data is empty mean deinstall success? (water and gas meter can check LCD see 5.1.2)

4.7 De-installing the Meter

Remove main fuses before disconnecting
The connecting wires at the place of installation must not be live when removing the meter. Touching live parts is dangerous to life. The corresponding main fuses should be removed and kept in a safe place until work is completed, so that they cannot be replaced by anyone unnoticed.

Remove the meter from the network as follows:

1. Switch off the voltage. The display goes off.
2. Open the sealing screw covers and remove the seals.
3. Release and remove the terminal cover.
4. Ensure with a phase checker that the connecting wires have no voltage. If there is voltage, remove the main fuses.
5. Remove the connecting wires of the inputs and outputs, if available.
6. Loosen the terminal screws of the phase and neutral connecting wires with a suitable screwdriver and withdraw the wires from the terminals.
7. Unscrew and remove the meter.
8. Fix a substitute the meter with the three fixing screws on the mounting surface.
9. Connect the substitute meter as described in *section 4.4 "Connecting"* and the following sections.

5 Operation

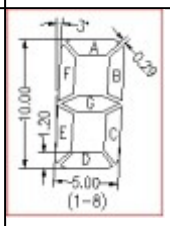
5.1 Display

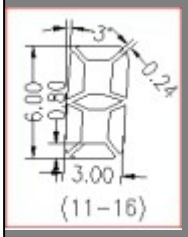
5.1.1 Basic Layout

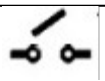
The basic layout shows all indication possibilities of the display.

Fig. 5.1 LCD display

5.1.2 Display Symbols

Symbol	Description
	The energy direction field shows energy flow by quadrants, e.g. if the energy is in the 1st quadrant, +Q and +P arrows are lit.
	Presence of phase voltages L1/L2/L3 On: phase voltage present Off: phase voltage not present Blinking: phase voltage low or high
	On: current is reversed Off: current is not reversed
	 These eight 7-segment digits located at up right area on LCD are for displaying data and menu items. The size of each digit is 10mm X 5mm.

<table>
<tr><td>  </td><td>These six 7-segment digits located at bottom left corner on LCD are the OBIS code display zone. For simplicity, only C.D.E out of whole OBIS code are displayed. Abbreviations for value group C are given below.
 

<table><tr><th colspan="2">Abbreviations for Value Group C</th></tr><tr><td>OBIS code</td><td>Display code</td></tr><tr><td>96</td><td>C</td></tr><tr><td>97</td><td>F</td></tr><tr><td>98</td><td>L</td></tr><tr><td>99</td><td>P</td></tr></table></td></tr>
<tr><td>  </td><td>Units indicator</td></tr>
<tr><td>  </td><td>On: Indicator for local communication locked
Flash: Indicator for ongoing successful communication</td></tr>
<tr><td>  </td><td>Indicator for connected of disconnector</td></tr>
<tr><td>  </td><td>On: Indicator for disconnected of disconnector
Flash: Indicator for ready to reconnection of disconnector</td></tr>
<tr><td>  </td><td>Indicator of GPRS signal level and communicate status
<table><tr><td>ON</td><td>Network communication setup</td></tr><tr><td>OFF</td><td>Meter doesn’t communicate with modem for 5 minutes.</td></tr><tr><td>Flash</td><td>Meter exchange data with modem.</td></tr><tr><td></td><td>signal 0-5 no signal at all, can’t communicate</td></tr><tr><td></td><td>signal 6-9 very weak, communicate sometimes</td></tr><tr><td></td><td>Signal 10-14 weak, can communicate</td></tr><tr><td></td><td>Signal 15-19 well ,can communicate</td></tr><tr><td></td><td>Signal 20-31 very well ,can communicate</td></tr></table></td></tr>
</table>

	Indicator of PLC running status (option) ON: Exist PLC module OFF: Meter doesn't communicate with modem for 30 minutes. Flash: Meter exchange data with modem.
	Indicators for two batteries, up is inside battery under is outside battery on: no battery off: battery is ok blinking: low battery
	Indicator of active tariff
	Tamper: controlled by fraud tamper status
	Alarm
	Indicator gas meter was installed
	Indicator water meter was installed
	These triangle symbols are suggesting areas for special events. Please refer to Fig. 5.3

Fig. 5.2–LCD symbols

DC Magnetic interference	Overload	Meter cover removed	Terminal cover removed	Top cover removed	Res.

Fig. 5.3–triangle symbols

5.2 Display Modes

S12U16 meter has two display modes:

- Auto display mode (default)

- Manual scroll mode

The Auto display mode is the default mode and the display will return to it from Manual scroll mode after a set time (default 60 seconds).

The scroll key is located on the right side of the display. The following is the operation of scroll key:

- Scroll key

    - A short press < 3 seconds will scroll to the next displayed data item.

    - A long press > 3 seconds will enter Manual scroll mode, then LCD will display manual display sequence.

Note: If the meter's built-in relay is disconnected, a manual reconnecting action may be performed depending on the configuration of relay control.

5.2.1 Display Navigation

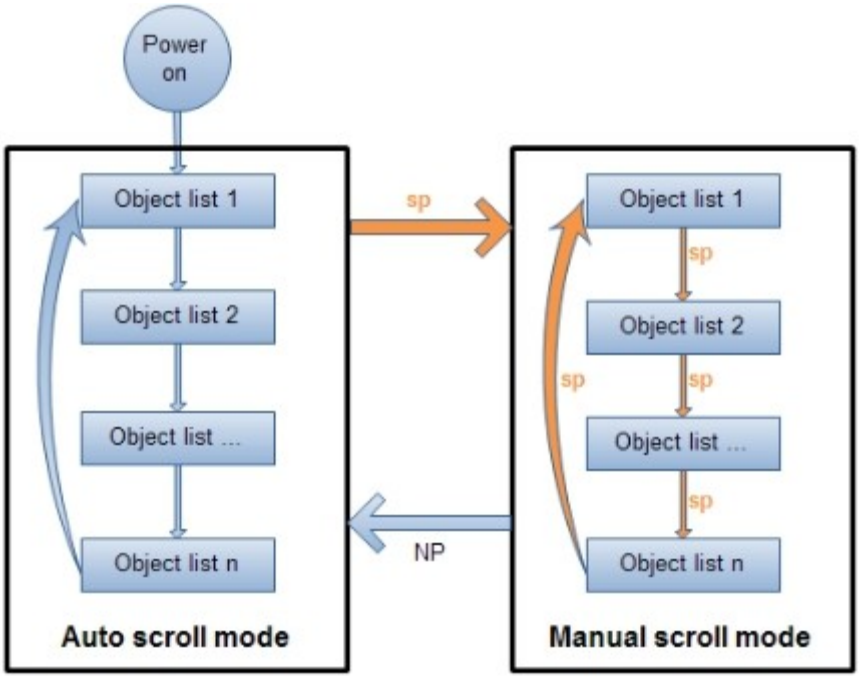


Fig. 5.4– display navigation

5.2.2 Power-off Display

The meter supports power-off display. This function can be invoked three times in one power-off gap by means of pressing the scroll key when the low-voltage battery is inserted to meter. Power-off display list is same to manual display sequence.

5.2.3 OBIS Codes of Displayed Values

The following table shows a list of commonly used display items and their OBIS codes.

Value	**Displayed OBIS Code**
Time	0.9.1
Date	0.9.2
Active energy import (+A) , total	1.8.0
Active energy export (-A) , total	2.8.0
Reactive energy import(+R), total	3.8.0
Reactive energy export(-R), total	4.8.0
Reactive energy (QI), total	5.8.0
Reactive energy (QII), total	6.8.0
Reactive energy (QIII), total	7.8.0
Reactive energy (QIV), total	8.8.0
Apparent energy import(+VA), total	9.8.0

Apparent energy export(-VA), total	10.8.0
Active energy import (+A) rate x	1.8.x
Active energy export (-A) rate x	2.8.x
Reactive energy import (+R) rate x	3.8.x
Reactive energy export (-R) rate x	4.8.x
Demand Register 1 - Active energy import (+A)	1.4.0
Demand Register 2 - Active energy export (−A)	2.4.0
Demand Register 3 - Reactive energy import (+R)	3.4.0
Demand Register 4 - Reactive energy export (−R)	4.4.0
Last Average Demand Register 1 - Active energy import (+A)	1.5.0
Last Average Demand Register 2 - Active energy export (−A)	2.5.0
Last Average Demand Register 3 - Reactive energy import (+R)	3.5.0
Last Average Demand Register 4 - Reactive energy export (-R)	4.5.0
Maximum Demand Register - Active energy import (+A)	1.6.0
Maximum Demand Register - Active energy import (+A) - rate x	1.6.x
Maximum Demand Register - Active energy export (−A)	2.6.0
Maximum Demand Register - Active energy export (-A) - rate x	2.6.x
Maximum Demand Register - Reactive energy import (+R)	3.6.0
Maximum Demand Register - Reactive energy import (+R) - rate x	3.6.x
Maximum Demand Register - Reactive energy export (−R)	4.6.0
Maximum Demand Register - Reactive energy export (-R) - rate x	4.6.x
Instantaneous voltage L1	32.7.0
Instantaneous current L1	31.7.0
Instantaneous current(sum over all phases)	90.7.0
Instantaneous active import power (+A)	1.7.0
Instantaneous active export power (-A)	2.7.0
Instantaneous reactive import power (+R)	3.7.0
Instantaneous reactive export power (-R)	4.7.0
Instantaneous apparent import power(+VA)	9.7.0
Instantaneous apparent export power(-VA)	10.7.0
Instantaneous import Power factor	13.7.0
Instantaneous export Power factor	84.7.0
Angle of U(L1) - I(L1)	81.7.40
Supply frequency	14.7.0

Note: where x is the number of the corresponding rate (range 1 … 4)

5.3 Meter Configuration and Update

The initial configuration of the meter is defined when ordering the meter at Sanxing.

5.4 Disconnector Control

The S12U16 has an integrated disconnector to connect or disconnect power to the customer premises. The disconnector can be controlled:

- Manually, with an integrated push key (Duration of push ALT key between 3 seconds and 10 seconds)
- Remotely, with dlms commands via RS485, optical port or metering system; also with predefined disconnect control scheduler
- Locally, with limitation (exceeded the threshold).

The disconnector has three status: disconnected, **c**onnected and ready for reconnection

There are seven different operating modes for disconnector control available. These modes define in which situation the disconnector can be controlled remotely, locally or manually.

The mode is defined within the meter configuration. Details on the operating modes are described in the Sanxing functional description.

Disconnector not suitable as main switch

Do not use the disconnector as a main switch for installation or maintenance purposes. The disconnector is not equipped with a thermal and/or short circuit protection device.

The current state of the disconnector is displayed on the meter display (see *section 5.1 "Display"*).

5.5 Relay Control

The S12U16 has a relay output to connect or disconnect loads. The relay can be controlled:

- Manually, with an integrated push key(push ALT key more than 10 seconds)
- Remotely, with dlms commands via RS485, optical port or metering system;
- Locally, with calendar

The relay has three status: disconnected, **c**onnected and ready for reconnection.

There are only two different operating modes(mode 4 and mode 6) for relay control available. These modes define in which situation the relay can be controlled remotely, locally or manually.

The mode is defined within the meter configuration.

6

6 Maintenance

6.1 Service

The S12U16 meter has no serviceable parts.

Device service is available from the Sanxing representative.

6.2 Troubleshooting

If the meter is not operating correctly, check the error displays and LED (see *section 5.1 "Display"* for instructions on how to use the display). The following points should be checked first if there are problems in the meter operation:

1. Is the mains voltage present (check display of meter)?
2. Is the 4G/PLC/RF/NB-IoT device communication status OK?
3. Has the maximum ambient temperature not been exceeded?
4. Is the meter visibly damaged?
5. Is there any error code displayed (code F.F.0 in the display list)? The error codes are described in *section 6.2.1 "Error Codes"*.

6.2.1 Error Codes

The meter performs regular internal self-tests.

Errors are assigned to an error category depending on severity:

- Critical errors
- Communication errors
- Other errors

Critical Errors

Critical errors indicate severe problems but the device can still operate. However the data measured and stored in the meter may be corrupted and it is recommended that meters showing critical errors are returned to the Sanxing service centre.

Communication Errors

Due to the temporary nature of communication errors do get stored in the error register. They are cleared when communication is restored. Communication errors do not usually require meter replacement.

Other Errors

These errors do cause the F.F.0 register to be stored in the error register. The meter continues normal operation and doesn't usually have to be replaced.

6.2.1.1 Representation of Error Codes

The error code is split up in four groups of two digits.

Each digit of the error code represents four errors (i.e. four bits of the error register). The status of the four bits is shown in hexadecimal code i.e. the single digits may show values between 0 (no error message set) and F (all four error messages set).

Error codes are added

As all errors are shown in hexadecimal code, a single error can appear in various ways depending on the presence of other errors.

Example:

Two errors are shown as: FF0 **01**00**02**00

Another two errors occur: FF0 **02**00**08**00

The register reads: FF0 **03**00**0A**00

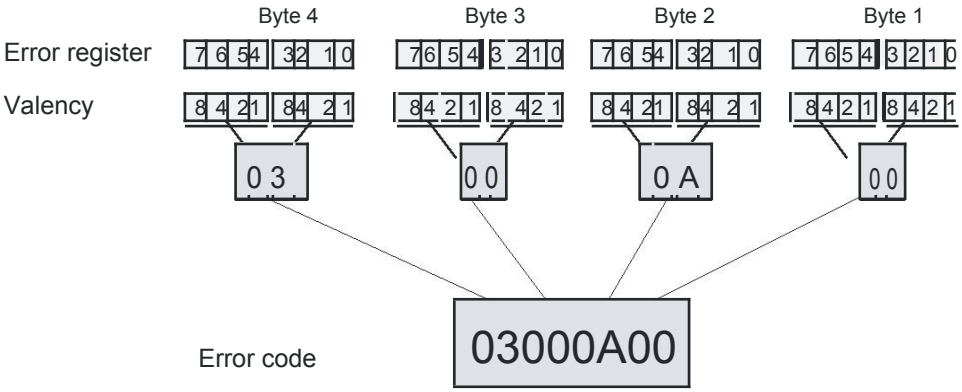


Fig. 6.1 Display of error codes

6.2.1.2 Error Definitions

F.F.0 00 00 00 01 **Clock Invalid Error**

Purpose:	Indicates an invalid time and date. This error appears after long mains power failure when the power reserve of the clock is exhausted
Category:	Other errors
Reset:	The error is cleared automatically when the clock is reset.

F.F.0 00 00 00 02 **Replace Battery**

Purpose:	Indicates that the battery voltage low, must be exchanged.
Category:	Other errors
Reset:	The error is cleared automatically when the battery voltage. Is normal.

F.F.0 00 00 01 00 **Program Memory Error**

Purpose:	Indicates a checksum failure in the parameter data
Category:	Critical error
Reset:	The error is not reset automatically; the register must be cleared via communication.

F.F.0 00 00 02 00 **RAM Error**

Purpose:	Indicates an error in the internal program memory (RAM)
Category:	Critical error
Reset:	No reset possible, the device must be replaced.

F.F.0 00 00 04 00 **Non−volatile Memory Access Error**

Purpose:	Indicates an access error (physical error) to the non-volatile memory, i.e. Flash
Category:	Critical error
Reset:	The error is not reset automatically; the register must be cleared via communication. Event 'Error register cleared' is triggered.

F.F.0 00 00 08 00 **Measurement System Error**

Purpose:	Indicates measuring system access failures
Category:	Critical error
Reset:	The error is not reset automatically; the register must be cleared via communication. Event 'Error register cleared' is triggered. If repeated the meter must be exchanged.

F.F.0 00 00 10 00 **Watchdog Error**

Purpose:	Indicates an invalid start-up sequence
Category:	Critical error
Reset:	The error is not reset automatically; the register must be cleared via communication. Event 'Error register cleared' is triggered. If repeated the meter must be exchanged.

F.F.0 00 01 00 00 **Communication M-Bus Channel 1 Error**

Purpose: Indicates an error in accessing the M-Bus slave on Channel 1

Category: Communication errors

Reset: The error is cleared automatically if the communication is successful again.

F.F.0 00 02 00 00 Communication M-Bus Channel 2 Error

See F.F.0 00 01 00 00

F.F.0 00 04 00 00 Communication M-Bus Channel 3 Error

See F.F.0 00 01 00 00

F.F.0 00 08 00 00 Communication M-Bus Channel 4 Error

See F.F.0 00 01 00 00

7 Decommissioning and Disposal

7.1 Decommissioning

The procedure for disconnecting and removing the meter from the mains is described in *section 4.7 "De-installing the Meter"*.

7.2 Disposal

Electronic waste treatment

This product must not be disposed of in regular waste. Use a professional electronic waste treatment process.

The components used to manufacture the device can, in the main, be bro-ken down into constituent parts and sent for suitable recycling or disposal. When the product is removed from use, the whole product must be sent to a professional electronic waste treatment process. The waste treatment company must be accepted by the officials.

End processing of the product and recycling of its components must always be carried out in accordance with the local laws and instructions given by the officials of the country where the end processing and recycling are done.

By request, Sanxing will give more information about the environmental influence of the product.

Disposal and environmental protection regulations

The following are general guidelines and should NOT take priority over local disposal and environmental policies which should be adhered to with-out compromise.

Components	Disposal
Printed circuit boards	Electronic waste: delivered to recycling plants.
Metal parts	Sorted and delivered to metal recycling plants.
Plastic components	Sorted and delivered to re-granulation if at all possible.

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