Smart X825 / X835 Multifunction Power Monitor

- Din 96x96mm Panel Mounted
- Accuracy better than class 1
- Dual pulsed output (X825)
- RS485 Modbus RTU (X835)
- Backlit display visible from all angles
- Total Harmonic Distortion as standard
- Easy set up and installation
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Introduction

1. Features

1.1 High Sample Rate: the synchronous sampling rate reaches as high as 6kHz.

1.2 Real-time Operation: within 2mS after very cycle, the meter can liquidate all the RMS value, power and other parameters to meet the requirement of protected-level operation.

1.3 High Communication Rate: RS485:1200 bps-115.2kbps.

1.4 Flexible communication protocol: each meter supports several usual protocol addresses or specially designed protocol addresses.

1.5 Analysis of Higher Harmonic: harmonic measurement: 2nd-60th, the harmonic algorithm accuracy: 0.2%; the accuracy of the whole Meter: 0.5%

1.6 Abundant Statistical Data: the meter can calculate the demand and the maximum or minimum of the voltage, current and power with the RTC time label to choose.

1.7 High Reliability: the meter has passed 4 levels EMC test and can operate with full voltage under the perceptual power-fail intelligent storage system.

2. Functions

The multifunctional panel meter is a top new-generation intelligent panel meter, developed on ARM processor and used not only in the electricity transmission and power distribution system but also in the power consumption measurement and analysis in high voltage and low voltage intelligent power grid.

The multifunctional panel meter can measure the whole power consumption accurately. With the real-time clock installed, it supports time-sharing energy. The harmonic measurement is as high as 60 times and more than 0.5%. The heat-emitting electricity machine model installed inside can be used to protecting the electricity machine of middle and low voltage. The communication port is designed according to MODBUS Protocol. The communication rate is as high as 115.2 kpbs.

The multifunctional panel meter has powerful function and high ratio of performance to price. It is the best choice for intelligent system of electricity transmission and distribution.

The main monitoring and controlling function of the multifunctional panel meters are as followed:

The basic electricity parameters: voltage, current, power, power factor, frequency, time-sharing energy and so on.

The power quality monitoring: 2-60 times harmonic content, the total derivation ratio of odd harmonics, the total harmonics content, unbalance level of three phase voltage and current, sequence analysis of voltage and current.

The demand and the max or min: the average, the maximum, the minimum and the demand of voltage, current and the power.
3. Application

The multifunctional panel meter is mainly used in the occasions when online monitoring and controlling of electrical parameters is needed. It usually acts as the RTU of electricity automation system and the multifunction electricity-analysis meter in electricity distribution system. The software and hardware of the multifunctional panel meter are all designed according to high standards. So they can be used in all environments where the power quality is seriously bad and in the system where requirement for electricity monitoring is very high. The main application fields are as followed:

Switch Panel - The System of Power Transmission and Distribution
Industrial Equipment - The Factory Automation System
Intelligent Building - Energy Management System

Specification

1. Safety Instruction

1.1 Information for Your Own Safety

This manual does not contain all of the safety measures for operation of this equipment (module, device) because special operating conditions, local code requirements or local regulations may necessitate further measures. However, it does contain information which must be adhered to for your own personal safety and to avoid damage to the equipment. This information is highlighted by a warning triangle with an exclamation mark or a lightning bolt depending on the severity of the warning.

![Warning]

Warning

Means that failure to observe the instruction can result in death, serious injury or considerable material damage.

![Caution]

Caution

Means hazard of electric shock and failure to take the necessary safety precautions will result in death, serious injury or considerable material damage.
1.2 Qualified personnel

Installation and operation of this equipment described in this manual may only be performed by qualified personnel.

Only people that are authorized to install, connect and use this equipment and have the proper knowledge about labeling and grounding electrical equipment and circuits and can do so according to safety and regulatory standards are considered qualified personnel in the manual.

1.3 Use for the intended purpose

The equipment (device, module) may only be used for the application cases specified in the catalog and the user manual and only in connection with devices and components recommended and approved by Smart process & controls.

1.4 Proper handling

The prerequisites for perfect, reliable operation of the product are proper transport, storage, installation and connection, as well as proper operation and maintenance. When operating electrical equipment, certain parts of this equipment carry dangerous voltages. Improper handling can therefore result in serious injury or material damage.

- Only use isolated tools suitable for the voltages the meter is used for.
- Do not connect while circuit is live (hot).
- Place the meter only in dry surroundings.
- Do not mount the meter in an explosive area or exposed to dust, mildew and/or insects.
- Make sure the used wires are suitable for the maximum current of this meter.
- Make sure the AC wires are connected correctly before activating the current/voltage to the meter.
- Do not touch the meter’s connection clamps directly with your bare hands, with metal, blank wire or other conducting material as that will cause an electric shock and possibly cause injury.
- Make sure the protection cover is placed after installation.
- Installation, maintenance and repair should only be done by qualified personnel.
- Never break the seals to open the front cover as this might influence the functionality or accuracy of the meter, and will void all warranty.
- Do not drop, or allow physical impact to the meter as there are high precision components inside that may break and render the meter measurement inaccurate.
2. Specifications

2.1 Voltage Inputs

- 20-280 Volts Line To Neutral, 20-480 Volts Line to Line
- Universal Voltage Input
- Input Withstand Capability – Meets IEEE C37.90.1 (Surge Withstand Capability)
- Programmable Voltage Range to Any PT ratio
- Supports: 3 phase 3 or 4 wires, 400/230V, 110/63V, 208/120V
- Burden: 0.36VA per phase Max at 600V, 0.014VA at 120 Volts
- Input wire gauge max (AWG 12 / 2.5mm²)

2.2 Current Inputs

- Class: (0 to 5) A, 5 Amp Nominal
- Fault Current Withstand: 100 Amps for 10 Seconds, 300 Amps for 3 Seconds, 500 Amps for 1 Second
- Programmable Current to Any CT Ratio
- Burden 0.005VA per phase Max at 11Amps
- 5mA Pickup Current
- Pass through wire gauge dimension: 0.177" / 4.5mm
- Continuous current withstand: 20 amps for screw terminated or pass through current connections

2.3 Isolation

All Inputs and Outputs are galvanically isolated to 2500 Volts AC.

2.4 Environmental Rating

Storage: (-25 to +70)° C
Operating: (-10 to +65)° C
Humidity: to 75% RH Non-Condensing
Faceplate Rating: NEMA12 (Water Resistant)
Environment: IP54 standard, IP65 optional
2.5 Sensing Method

- RMS
- Sampling at 120+ Samples per Cycle on all channels measured readings simultaneously
- Harmonic %THD (% of Total Harmonic Distortion)

2.6 Update Rate

- Watts, VAr and VA-100msec
- All other parameters-1second

2.7 Power Supply

Option D2:
- (65 to 275) Volts AC and (90 to 380) Volts DC. Universal AC/DC Supply
Option D:
- 18-60VDC Burden: 10VA max.

2.8 Communication Format

- 2 Com Ports (Back and Face Plate)
- RS485 Port (Through Back Plate)
- 10/100 BaseT Ethernet Modbus TCP (INP10)
- Com Port Baud Rate: (1200 to 115200)
- Com Port Address: 0-247
- 8 Bit, No parity
- Modbus RTU Protocols

2.9 KYZ Pulse

- Type Form A
- On Resistance: 23-35 Ohm
- Peak Voltage: 350 VDC
- Continuous Load Current: 120 mA
- Peak Load Current: 350mA (10ms)
- Off Stat Leakage Current @ 350VDC: 1 mA
- Opto-Isolation: 3750V (60Hz, 1min)
2.10 Meter Accuracy

- kWh: Better than Class 1 per EN 62053-21 & BS 8431
- Kvarh: Better than Class 2 per EN 62053-23 & BS 8431
- kW & kVA: Better than Class 0.5 IEC 60688
- kvar: Better than Class 0.5 IEC 60688
- Amps & Volts: Class 0.2 IEC 60688 (0.01ln – 1.2ln or 0.1Un – 1.2Un)
- PF: ±0.2° (0.05ln – 1.2ln and 0.2Un – 1.2Un)
- Neutral Current: Class 0.5 IEC 60688 (0.05ln – 1.2ln)
### Step by Step set up instructions

1. **Two key mode**

   Each key has two operating modes. Firstly, the key press down and up instantly. Secondly, the key press down about 2 second. The first mode, we call it short-press mode. The second one, we call it long-press mode.

1.1 **In measurement status, keys have the following functions**

<table>
<thead>
<tr>
<th>Key</th>
<th>Key mode</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="Key UI ESC" /></td>
<td>Short press</td>
<td>Enter display volts amps picture</td>
</tr>
<tr>
<td><img src="image" alt="Key M" /></td>
<td>Short press</td>
<td>1. Picture number add 1&lt;br&gt;2. Enter display THD, power factor and frequency picture</td>
</tr>
<tr>
<td><img src="image" alt="Key P" /></td>
<td>Short press</td>
<td>1. Picture number sub 1&lt;br&gt;2. Enter display power picture</td>
</tr>
<tr>
<td><img src="image" alt="Key E" /></td>
<td>Short press</td>
<td>Enter display energy picture</td>
</tr>
<tr>
<td><img src="image" alt="Key UI ESC" /></td>
<td>Long press</td>
<td>Enter or exit auto display status</td>
</tr>
<tr>
<td><img src="image" alt="Key M" /></td>
<td>Long press</td>
<td>Enter or exit Max Demand status</td>
</tr>
<tr>
<td><img src="image" alt="Key P" /></td>
<td>Long press</td>
<td>Transformation of input energy and output energy</td>
</tr>
<tr>
<td><img src="image" alt="Key UI ESC" /></td>
<td>Long press</td>
<td>Enter parameter setting status</td>
</tr>
</tbody>
</table>
1.2 In programming mode, keys have the following functions:

<table>
<thead>
<tr>
<th>Key</th>
<th>Key mode</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1" alt="UI ESC" /></td>
<td>Short press</td>
<td>Picture number sub 1</td>
</tr>
<tr>
<td><img src="image2" alt="M" /></td>
<td>Short press</td>
<td>1. Picture number add 1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. Set the number add 1</td>
</tr>
<tr>
<td><img src="image3" alt="P" /></td>
<td>Short press</td>
<td>1. Picture number sub 1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. Set the number sub 1</td>
</tr>
<tr>
<td><img src="image4" alt="E" /></td>
<td>Short press</td>
<td>Picture number add 1</td>
</tr>
<tr>
<td><img src="image1" alt="UI ESC" /></td>
<td>Long press</td>
<td>exit current mode</td>
</tr>
<tr>
<td><img src="image2" alt="M" /></td>
<td>Long press</td>
<td>No function</td>
</tr>
<tr>
<td><img src="image3" alt="P" /></td>
<td>Long press</td>
<td>No function</td>
</tr>
<tr>
<td><img src="image4" alt="E" /></td>
<td>Long press</td>
<td>Enter next mode</td>
</tr>
</tbody>
</table>
2. Display pictures

2.1 If you want to see phase volts, line volts, phase amps pictures.

<table>
<thead>
<tr>
<th>Phase volts (picture 1)</th>
<th>Line volts (picture 2)</th>
<th>Phase amps (picture 3)</th>
</tr>
</thead>
</table>

Power up, you will see phase volts picture 1

Short press , you will see line volts picture 2

Short press , you will see phase amps picture 3.
2.2 If you want to see system power factor, frequency, phase power factor, volts Total Harmonic Distortion, amps Total Harmonic Distortion pictures.

<table>
<thead>
<tr>
<th>System power factor and frequency (picture 4)</th>
<th>Phase power factor (picture 5)</th>
<th>volts Total Harmonic Distortion (picture 6)</th>
<th>amps Total Harmonic Distortion (picture 7)</th>
</tr>
</thead>
</table>

Power up, you will see phase volts picture 1.

Short press , you will see system power factor and frequency picture 4

Short press , you will see phase power factor picture 5

Short press , you will see volts Total Harmonic Distortion picture 6

Short press , you will see amps Total Harmonic Distortion picture 7
2.3 If you want to see phase watts, phase kvar, phase kVA, system power pictures.

<table>
<thead>
<tr>
<th>Phase watts</th>
<th>Phase var</th>
<th>Phase VA</th>
<th>System power</th>
</tr>
</thead>
<tbody>
<tr>
<td>(picture 8)</td>
<td>(picture 9)</td>
<td>(picture 10)</td>
<td>(picture 11)</td>
</tr>
</tbody>
</table>

Power up, you will see phase volts picture 1.

- short press , you will see phase watts picture 8
- short press , you will see phase var picture 9
- short press , you will see phase VA picture 10
- short press , you will see system power picture 11.

In every picture, you can see KWH energy, if you want to see Kvarh energy, please short press .

(picture 12)
2.4 If you want to see Time-average volts, Time-average amps, Peak time-average volts, Peak time-average amps, Peak hold phase volts, Peak hold phase amps pictures.

<table>
<thead>
<tr>
<th>Time average volts</th>
<th>Time average amps</th>
<th>Peak time average volts</th>
</tr>
</thead>
<tbody>
<tr>
<td>(picture 13)</td>
<td>(picture 14)</td>
<td>(picture 15)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Peak time average amps</th>
<th>Peak hold phase volts</th>
<th>Peak hold phase amps</th>
</tr>
</thead>
<tbody>
<tr>
<td>(picture 16)</td>
<td>(picture 17)</td>
<td>(picture 18)</td>
</tr>
</tbody>
</table>

Power up, you will see phase volts picture 1.

Long press , you will see time average volts picture 13;

Short press , you will see time average amps picture 14;

Short press , you will see peak time average volts picture 15;

Short press , you will see peak time average amps picture 16;

Short press , you will see peak hold phase volts picture 17;

Short press , you will see peak hold phase amps picture 18.
2.5 If you want to see Max system power factor and Max frequency, Min system power factor And Min frequency, Volts Sequence component, Amps sequence component picture.

<table>
<thead>
<tr>
<th>Max system power factor and Max frequency (picture 19)</th>
<th>Min system power factor And Min frequency (picture 20)</th>
<th>Volts Sequence component (picture 21)</th>
<th>Amps sequence component (picture 22)</th>
</tr>
</thead>
</table>

Power up, you will see phase volts picture 1.

Long press , you will see time average volts picture 13;

Short press , you will see Max system power factor and Max frequency picture 19;

Short press , you will see Min system power factor And Min frequency picture 20;

Short press , you will see Volts Sequence component picture 21;

Short press , you will see Amps sequence component picture 22;
2.6 If you want to see Power system demand, Min MD, Peak hold MD, Min system power, Max system power pictures.

<table>
<thead>
<tr>
<th>Power system demand</th>
<th>Min Demand</th>
<th>Peak hold Demand</th>
</tr>
</thead>
<tbody>
<tr>
<td>(picture 23)</td>
<td>(picture 24)</td>
<td>(picture 25)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Min system power</th>
<th>Max system power</th>
</tr>
</thead>
<tbody>
<tr>
<td>(picture 26)</td>
<td>(picture 27)</td>
</tr>
</tbody>
</table>

Long press $\uparrow$, you will see time average volts picture 13

Short press $\downarrow$, you will see Power system demand picture 23

Short press $\downarrow$, you will see Min Demand picture 24

Short press $\downarrow$, you will see Max Demand picture 25

Short press $\downarrow$, you will see Min system power picture 26

Short press $\downarrow$, you will see Max system power picture 27

If you long press $\uparrow$, you will see pictures will auto display one by one.
2.7 If you want to see individual harmonics, please refer to the below steps.

Step 1, long press , you will see . (picture 28), if you input correct password (password is 1000), press , the password will change to 1000, then long press , you can enter into parameter setting main menu . (picture 29).

means that this parameter has child files (submenu) . means child file. means parameter number.
3. Setting parameter

3.2 Set Modbus ID (parameter 1)

long press , you can set Modbus ID 1-254;

3.3 Set RS-485 Baud Rate (parameter 2)

long press , you can set baud rate (1200, 2400, 4800, 9600, 19200, 38400, 115200)
3.4 Set PT, CT (parameter 3-6)

<table>
<thead>
<tr>
<th>Set PT primary  (Parameter 3)</th>
<th>Set PT secondly (Parameter 4)</th>
<th>Set CT primary  (Parameter 5)</th>
<th>Set CT secondly (Parameter 6)</th>
</tr>
</thead>
</table>

The PT1 can be set 100-500000;

The PT2 can be set 100-400;

The CT1 can be set 1-9999;

The CT2 can be set 1-10.

3.5 Set backlight time (parameter 7)

Backlight time can be set from 5s to 65535s.
3.6 Set auto display time interval (parameter 8)

![Set Auto Display Interval](image)

Time interval can be set from 500ms to 9999ms.

3.7 Clear energy KWh Kvarh

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kwh (param 9)</td>
<td>Clear (no)</td>
</tr>
<tr>
<td>Kvarh (param 10)</td>
<td>Clear (no)</td>
</tr>
</tbody>
</table>
3.8 Set password (parameter 11)

3.9 Panel meter information (parameter 12)

<table>
<thead>
<tr>
<th>Meter type</th>
<th>Version number</th>
<th>Software date</th>
</tr>
</thead>
<tbody>
<tr>
<td>di</td>
<td>8888</td>
<td>18 Oct</td>
</tr>
<tr>
<td>Sys</td>
<td>c. 140</td>
<td>18 Oct</td>
</tr>
<tr>
<td>Info</td>
<td>c. 140</td>
<td>18 Oct</td>
</tr>
</tbody>
</table>
3.11 Individual Harmonic (parameter 14)

3.12 Set System connect status (parameter 15)

<table>
<thead>
<tr>
<th>Set phase 1 current forward</th>
<th>Set phase 2 current forward</th>
<th>Set phase 3 current forward</th>
</tr>
</thead>
<tbody>
<tr>
<td>Set meter working mode:</td>
<td>Set hours run (on roads)</td>
<td>Display hours</td>
</tr>
<tr>
<td>3phase 4 wire</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 phase 3 wire</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
3.13 Set volts, amps, power period (parameter 16)

<table>
<thead>
<tr>
<th></th>
<th>Set power period</th>
<th>Set volts, amps period</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(1-60min)</td>
<td>(10-1800s)</td>
</tr>
</tbody>
</table>
**Dimension**

Front

Side

**Wiring Diagram**

Label in the back of the meter

---

**DANGER**

Power: 3W / 65 ~ 265VAC / 80 ~ 380VDC
FREQ: 45 ~ 65Hz
COMM: MODBUS (RS485),
1200 ~ 115200kbps.
Installation

Installation diagram

<table>
<thead>
<tr>
<th>Environment temperature</th>
<th>Minimum Distance</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>a</td>
</tr>
<tr>
<td>&lt; 50°C</td>
<td>25</td>
</tr>
<tr>
<td>≥ 50°C</td>
<td>38</td>
</tr>
</tbody>
</table>

The requirements for installation space

Installation method:

1. The dimension of the hole on the Panel:

   Unit (mm)

   Dimensions of hole

2. Take off the four plastic clamps and install the meter into the hole:
3. Then install the four clamps on the meter

Fix the meter tightly to the board with the four clamps.