

SMART X96-1A

Smart Power Analyzer for Single and Three Phase System



- Measures kWh, kVArh, KW, kVA, PF, Hz, dmd, V, A, etc.
- Up to 63rd THD and IHD
- Bi-directional measurement IMP & EXP
- CT and PT operated
- 2 Pulse outputs
- RS485 Modbus RTU communication
- Bar Graph for power indication
- Three phase self-power supply
- Backlit LCD display for full viewing angles
- Accuracy class 0.5s

User Manual V1.6

Application

The multifunction energy analyzer SMART X96 series is a top new-generation intelligent panel meter, used not only in the electricity transmission and power distribution system, but also in the power consumption measurement and analysis in high voltage intelligent power grid.

This document provides operating, maintenance and installation instructions for the Eastron SMART X96 series. The unit measures and displays the characteristics of single phase two wires, three phase three wires and three phase four wires supplies, including voltage, frequency, current, power and active and reactive energy, imported or exported, Harmonic, Power factor, Max. Demand etc. Energy is measured in terms of kWh, kVAh. Maximum demand current can be measured over preset periods of up to 60minutes. In order to measure energy, the unit requires voltage and current inputs in addition to the supply required to power the product. The requisite current input(s) are obtained via current transformers The SMART X96 can be configured to work with a wide range of CTs, giving the unit a wide range of operation. Built-in interfaces provide pulse and RS485 Modbus RTU outputs. Configuration is password protected.

PART 1 Specification

Input

Norminal input voltage	50-276V AC(L-N) 87-480V AC(L-L)
Max.short duration input voltage	2x nominal voltage for 0.5 second
Nominal input voltage burden	< 0.2VA per phase
Nominal input current	100mA
Nom. input current burden	< 0.1VA
Max. continuous input overload current	120% of nominal
Max. short duration input current	20x nominal current for 0.5 second
Starting current	0.08% Ib

Power Supply

Operating range	three phase self-power supply
Supply burden	<2W/ 10VA

Measured Range

Voltage(V)	50-276V AC(L-N) 87-480V AC(L-L)
Current(A)	5-120% of nominal
Frequency(Hz)	45- 66 Hz
Power(W, VAr, VA)	5-120% of nominal (bi-directional)
Energy	8 digits, up to 9999999.9kWh
Power factor	4 quadrants
THD	0-40% up to 63 rd harmonic

Accuracy

Voltage(V)	0.5% of range maximum
Current(A)	0.5% of range maximum
Frequency(Hz)	0.2% of mid-frequency
Power factor(PF)	1% of unity
Active power(W)	1% of range maximum
Reactive power(VAr)	1% of range maximum
Apparent power(VA)	1% of range maximum
Active energy(kWh)	Class 0.5s IEC62053-22
Reactive energy(kVArh)	Class 2 IEC62053-23
THD	2% to 63 rd harmonic

Environment

Operating temperature	-25°C to +55°C
Storage and transportation temperature	-40°C to +70°C
Relative humidity	0 to 95%, non-condensing
Altitude	up to 2000m
Warm up time	3s
Installation category	CAT III
Mechanical environment	M1
Electromagnetic environment	E2
Ingress protection	IP51(Indoor)
Degree of pollution	2

Output

Pulse output

The meter provides two pulse outputs. Both pulse outputs are passive type.

Pulse output 1 is configurable. The pulse output can be set to generate pulses to represent total/ import/ export kWh or kVArh.

The pulse constant can be set to generate 1 pulse per: 0.001/ 0.01/ 0.1/ 1/ 10/ 100/ 1000 kWh/kVArh.

Pulse width: 200/ 100/ 60ms

Pulse output 2 is non-configurable. It is fixed to total kWh. The constant is 3200imp/kWh.

RS485 output for Modbus RTU

The meter provides a RS485 port for remote communication. Modbus RTU is the protocol applied. For Modbus RTU, the following RS485 communication parameters can be configured by the Modbus command.

Baud rate: 2400, 4800, 9600, 19200, 38400 bps. Default: 9600 bps

Parity: NONE/ EVEN/ ODD

Stop bits: 1 or 2

Modbus address: 1 to 247

PART 2 Operation

Start-up Screens

	<p>The first screen lights all display segments and can be used as a display check.</p>
	<p>The second screen indicates the firmware installed in the unit and its build number.</p>
	<p>Next the unit performs a self-test and indicates if the test passes.</p>

After a short delay, the default measurement screen appears.



Measurements

The buttons operate as follow

Buttons	Click	Press 2S
	<ul style="list-style-type: none"> ➤ Displays power, voltage, current and energy information of each phase ➤ Escape the menu 	<ul style="list-style-type: none"> ➤ Automatic Scroll display ON / OFF
	<ul style="list-style-type: none"> ➤ Display Voltage and current information of the selected system type. (3p4w, 3p3w and 1p2w) ➤ Left side move 	<ul style="list-style-type: none"> ➤ Individual Harmonic Distortion of Voltage up to 63rd
	<ul style="list-style-type: none"> ➤ Display power factor, frequency, Max. Demand. ➤ Up page or add value 	<ul style="list-style-type: none"> ➤ Individual Harmonic Distortion of Current up to 63rd
	<ul style="list-style-type: none"> ➤ Display active power, reactive power and apparent power information of the selected system type. ➤ Down page or reduce value 	
	<ul style="list-style-type: none"> ➤ Display total / import / export active or reactive energy information of the selected system type. ➤ Right side move 	<ul style="list-style-type: none"> ➤ Set-up mode entry ➤ Confirmation

Display Mode Screen Sequence

Click button	3 Phase 4 Wire		3 Phase 3 Wire		1 Phase 2 Wire	
	Screen	Parameters	Screen	Parameters	Screen	Parameters
	1	Phase 1 – Power Voltage Current kWh	1	Phase 1 – Power Current kWh	1	Phase 1 – Power Voltage Current kWh
	2	Phase 2 – Power Voltage Current kWh	2	Phase 2 – Power Current kWh		
	3	Phase 3 – Power Voltage Current kWh	3	Phase 3 – Power Current kWh		
	4	Phase 1 – Power Voltage Current kVArh	4	Phase 1 – Power Current kVArh	2	Phase 1 – Power Voltage Current kVArh

	5	Phase 2 – Power Voltage Current kVArh	5	Phase 2 – Power Current kVArh		
	6	Phase 3 – Power Voltage Current kVArh	6	Phase 3 – Power Current kVArh		
	1	Voltage L1-N Voltage L2-N Voltage L3-N			1	Voltage L1-N
	2	Voltage L1-L2 Voltage L2-L3 Voltage L3-L1	1	Voltage L1-L2 Voltage L2-L3 Voltage L3-L1		
	3	Current L1 Current L2 Current L3 Current Neutral	2	Current L1 Current L2 Current L3	2	Current L1
	4	THD% of Voltage L1 THD% of Voltage L2 THD% of Voltage L3	3	THD% of Voltage L1-2 THD% of Voltage L2-3 THD% of Voltage L3-1	3	THD% of Voltage L1
	5	THD% of Current L1 THD% of Current L2 THD% of Current L3	4	THD% of Current L1 THD% of Current L2 THD% of Current L3	4	THD% of Current L1
	6	Phase Sequence	5	Phase Sequence		
	1	Total Power Factor Frequency	1	Total Power Factor Frequency	1	Total Power Factor Frequency
	2	PF L1 PF L2 PF L3	2	PF L1 PF L2 PF L3		
	3	Max. DMD of Current L1 Max. DMD of Current L2 Max. DMD of Current L3	3	Max. DMD of Current L1 Max. DMD of Current L2 Max. DMD of Current L3	2	Max. DMD of Current L1
	4	Max. DMD of W Max. DMD of Var Max. DMD of VA	4	Max. DMD of W Max. DMD of Var Max. DMD of VA	3	L1 Max. DMD of W L1 Max. DMD of Var L1 Max. DMD of VA
	1	Active Power L1 Active Power L2 Active Power L3	1	Active Power L1 Active Power L2 Active Power L3		

	2	Reactive Power L1 Reactive Power L2 Reactive Power L3	2	Reactive Power L1 Reactive Power L2 Reactive Power L3		
	3	Apparent Power L1 Apparent Power L2 Apparent Power L3	3	Apparent Power L1 Apparent Power L2 Apparent Power L3		
	4	Total Active Power Total Reactive Power Total Apparent Power	4	Total Active Power Total Reactive Power Total Apparent Power	1	L1 Active Power L1 Reactive Power L1 Apparent Power
	1	Total kWh	1	Total kWh	1	Total kWh
	2	Total kVAh	2	Total kVAh	2	Total kVAh
	3	Import kWh	3	Import kWh	3	Import kWh
	4	Export kWh	4	Export kWh	4	Export kWh
	5	Import kVAh	5	Import kVAh	5	Import kVAh
	6	Export kVAh	6	Export kVAh	6	Export kVAh

Individual Harmonic Distortion:

	<p>Press button for 2 seconds to check Harmonic distortion of Voltage 2~63rd Harmonic Distortion of Voltage</p>
	<p>Press button for 2 seconds to check Harmonic distortion of Current 2~63rd Harmonic Distortion of Current</p>

Set Up

1. Password Entry

	<p>Setting-up mode is password protected, please enter the correct password.</p> <p>Long press to enter the set-up interface. The default password is 1000. If the input is wrong, the LCD displays "PASS Err".</p> <p>Press the button exit set-up interface.</p>
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2. Communication

	<p>Long press enter the communication setting menu.</p>
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2.1 Modbus address

	<p>The default address is 001.</p> <p>Long press to activate the modification.</p> <p>Use and buttons to set the address with the range 001~247, and long press the button for confirmation.</p>
<p>Long press to confirm the setting and press to return to the main set-up menu.</p>	

2.2 Baud rate

	<p>From the set-up menu, use and buttons to select the baud rate option. The default is 9600bps.</p>
	<p>Long press to enter the selection routine. The baud rate setting will flash. Use and buttons to choose baud rate 2.4k, 4.8k, 9.6k, 19.2k, 38.4k.</p>
<p>Long press to confirm the setting and press to return to the main set-up menu.</p>	

2.3 Parity

	<p>From the set-up menu, use and buttons to select the parity option. Parity options: NONE, EVEN, ODD. Default: NONE.</p>
	<p>Long press to enter the selection routine. The current setting will flash. Use and buttons to choose parity.</p>
<p>Long press confirm the setting and press to return to the main set-up menu.</p>	

2.4 Stop bit

	<p>From the set-up menu, use and buttons to select the stop bit option. Stop bit options: 1 or 2. Default: 1.</p>
	<p>Long press to enter the selection routine. The current setting will flash. Use and buttons to choose stop bit. Please note stop bits can only be set 2 when parity is NONE.</p>
<p>Long press to confirm the setting and press to return to the main set-up menu.</p>	

3. CT

	<p>From the set-up menu, use and buttons to select the CT option. Note: For MID approved version device, user will only have one opportunity to set the ratio.</p>
	<p>Long press to enter the CT secondary current selection routine. CT2 options: 0.1A</p>

	<p>Long press to enter the CT primary set-up interface. CT1 range: 0001~9999. Default: 0005.</p>
<p>Long press to confirm the setting and press to return to the main set-up menu.</p>	

4. PT

	<p>From the set-up menu, use and buttons to select the PT option.</p>
	<p>Long press to enter the PT secondary current selection routine. Press and buttons to choose PT2. PT2 range: 100~230(L-N) 100~480(L-L). Default: 230V.</p>
	<p>Long press to enter the PT primary selection routine. Press and buttons to choose PT1. PT1 range: 0100~500000. Default is 0230V.</p>
<p>Long press to confirm the setting and press to return to the main set-up menu.</p>	

5. Pulse

	<p>This option allows you to configure the pulse output. The output can be set to provide a pulse for a defined amount of energy active or reactive.</p> <p>From the set-up menu, use and buttons to select the PT option.</p>
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5.1 Pulse output 1

	<p>Long press to enter the pulse output 1 routine.</p> <p>Press and buttons to choose pulse output 1.</p> <p>Output type options: total kWh, import kWh, export kWh, total kVAh, import kVAh, export kVAh. Default: total kWh</p>
<p>Long press to confirm the setting and press to return to the main set-up menu.</p>	

5.2 Pulse constant

	<p>Long press to enter the pulse constant routine.</p> <p>Press and buttons to choose pulse constant.</p> <p>Pulse constant options: 0.001 , 0.01 , 0.1 , 1, 10, 100, 1000 kWh / kVAh per Pulse Default : 0.001 kWh / kVAh per pulse</p>
<p>Long press confirm the setting and press to return to the main set-up menu.</p>	

5.3 Pulse duration

	<p>Long press to enter the pulse duration routine.</p> <p>Press and buttons to choose pulse duration.</p> <p>Pulse duration options: 200, 100, 60ms Default : 100ms</p>
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Long press to confirm the setting and press to return to the main set-up menu.

6. Demand

	From the set-up menu, use and buttons to select the demand option.
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6.1 DIT(Demand integration time)

	From the set-up menu, use and buttons to select the dit option. The screen will show the currently selected integration time. DIT options: off, 5, 8, 10, 15, 20, 30, 60 minutes. Default is 60 minutes.
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Long press to confirm the setting and press to return to the main set-up menu.

6.2 Demand method

	From the set-up menu, use and buttons to select the demand calculation method. Options: Fix and Slid
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	Long press enter the selection routine. The setting will flash. Use and buttons to choose options..
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Long press to confirm the setting and press to return to the main set-up menu.

7. Time

	<p>From the set-up menu, use and buttons to select the time options.</p>
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7.1 Backlit time

The meter provides a function to set the white backlit lasting time.

	<p>The backlit lasting time is settable. Default lasting time is 60minutes. For example, if it's set as 5, the backlit will be off in 5minutes. Notes: If it's set as 0, the backlit will always be on.</p>
	<p>Long press enter the selection routine. Use and buttons to select the time options. The options can be: 0/ 5/ 10/ 30/ 60/ 120minutes</p>
<p>Long press to confirm the setting and press to return to the main set-up menu.</p>	

7.2 Display scroll time

	<p>From the set-up menu, use and buttons to select page. Long press the button to activate the modification on the time. Use the and to choose options. Options: 255 s s Default is 5 seconds.</p>
<p>Long press to confirm the setting and press to return to the main set-up menu.</p>	

8. System

Use this section to set the type of power supply being monitored.

	<p>From the set-up menu, use and buttons to select the time options.</p>
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8.1 System type

	<p>From the set-up menu, use and buttons to select the system option. The screen will show the currently selected power supply.</p>
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	<p>Long press to enter the selection routine. The current selection will flash.</p> <p>Use and buttons to select the required system option: 3P4W, 3P3W or 1P2W.</p>
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Long press to confirm the setting and press to return to the main set-up menu.

8.2 System connection

	<p>This units support reverse connected current inputs correction setting.</p> <p>From the set-up menu, use and buttons to select system connection page.</p> <p>Options: Frd (forward) and Rev (reverse) The default is Frd (forward)</p>
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	<p>Long press to enter Phase 1.</p> <p>Long press , the setting will flash. Use and to choose options.</p>
	<p>Long press to enter Phase 2.</p> <p>Long press , the setting will flash. Use and to choose options.</p>
	<p>Long press to enter Phase 3.</p> <p>Long press , the setting will flash. Use and to choose options.</p>
<p>Long press to confirm the setting and press to return to the main set-up menu.</p>	

8.3 Change password

	<p>Use the and to choose the change password option. Default: 1000 Options: 0000~9999</p>
	<p>Long press the setting will flash.</p> <p>Use and to choose options.</p>

Long press to confirm the setting and press to return to the main set-up menu.

8.4 Automatic display scroll

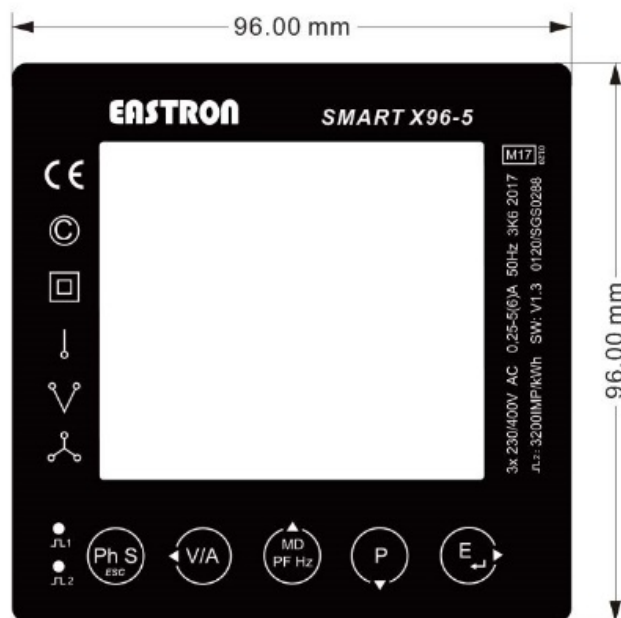
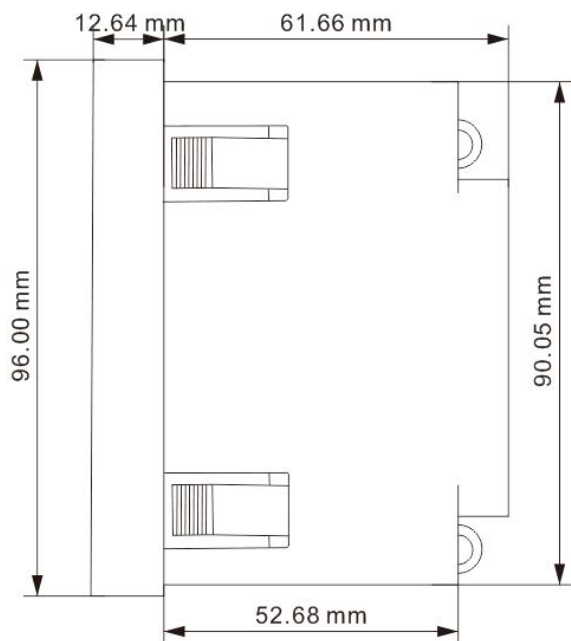
	<p>From the set-up menu, use and buttons to select the system option. The screen will show the currently selected power supply. Options: off or on</p>
	<p>Long press the setting will flash. Use and to choose options.</p>
<p>Long press to confirm the setting and press to return to the main set-up menu.</p>	

9. Reset

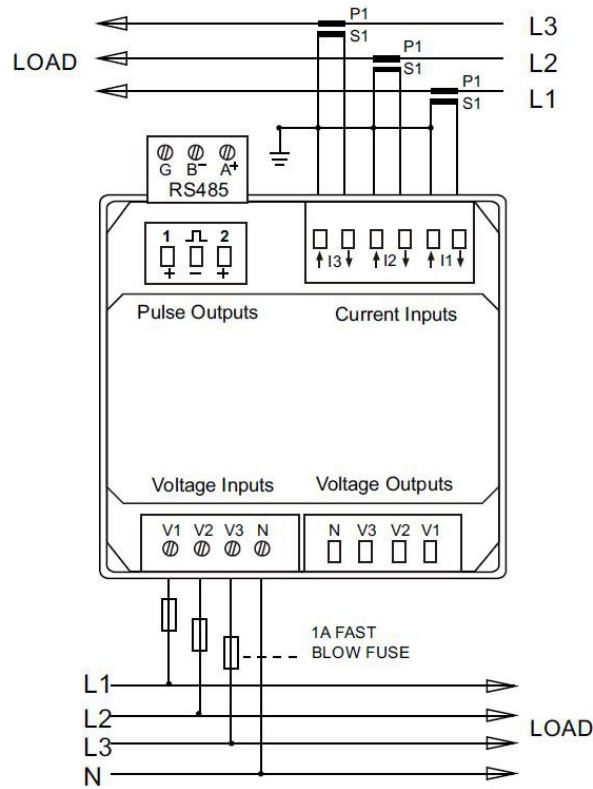
	<p>From the set-up menu, use and buttons to select reset page. Please note MID version don't allow to reset the energy.</p>
	<p>Use and to choose options. This option is to reset energy. Long press the setting will flash. Long press again to confirm.</p>

<p>SEt PSEt dād</p>	<p>Use and to choose options. This option is to reset demand.</p> <p>Long press the setting will flash. Long press again to confirm.</p>
<p>SEt PSEt ALL</p>	<p>Use and to choose options. This option is to reset all information.</p> <p>Long press the setting will flash. Long press again to confirm.</p>
<p>Long press to confirm the setting and press to return to the main set-up menu.</p>	

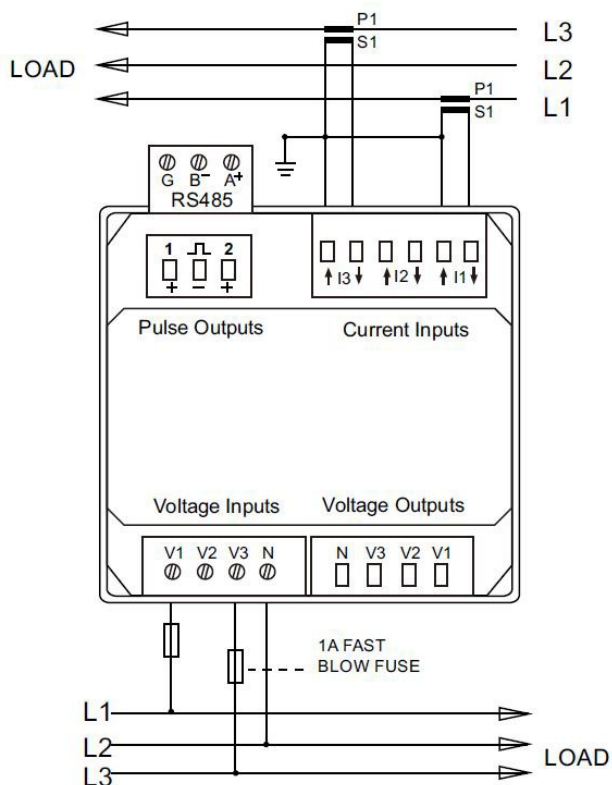
Dimensions



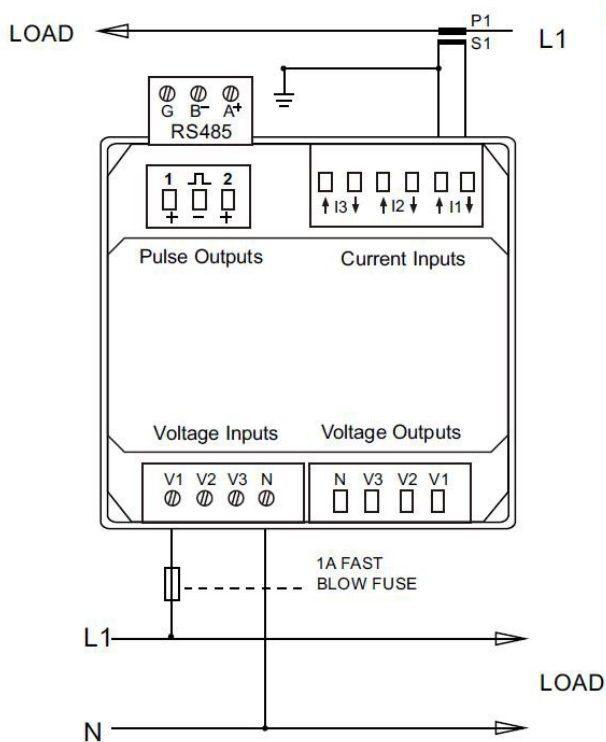
Wiring Diagram



3-Phase 4-Wire



3-Phase 3-Wire



1-Phase 2-Wire