

Electronic Multi-Measuring Instrument
Types: ME96SSHB-MB / ME96SSRB-MB / ME96SSEB-MB
User's Manual (Digest version)

Be sure to read this manual carefully in order to properly use this instrument.
This manual must be forwarded to the end user and be kept ready to hand and accessible for future use at all times.

Features

- Common to every type
- This instrument measures the load status by wiring the secondary sides of VT (Voltage Transformer) and CT (Current Transformer) and displays various measured values.
- The password protection prevents accidental setting change and losing measured data.
- The MODBUS RTU communication function transmits measured data to superior monitoring systems.
- The standard complies with the requirements of CE marking, UL standards, KC mark, and FCC/IC.
- The support function for confirming input wiring connections can determine the wiring condition in the test mode. When incorrect wiring occurs by either voltage input or current input, the function displays the wrong parts on the screen, and also shows the phase angle for current/voltage and the active power/voltage/current value.
- ME96SSHB-MB and ME96SSRB-MB also have the following features:
 - The measurement of high-order harmonics is supported.
 - Active energy can be measured by dividing into three time period such as peak/off-peak/shoulder. (Periodic active energy)
 - This instrument enables measurement of the energy in a block of any period (interval) (Rolling demand).
- By using the option plug-in module:
 - The transmission function such as CC-Link communication or MODBUS TCP communication send the measured data to superior monitoring systems.
 - The logging function enables the backup of measured values even when MODBUS RTU communication error occurs.
 - Only one unit can output key measuring elements such as current, voltage, active power, power factor, and active energy at the power receiving point. It is ideal for remote monitoring.
- The built-in logging function provides the logging of measured values, alarm logs, and system logs into the instrument.
 - *MODBUS is a registered trademark of SCHNEIDER ELECTRIC USA, INC in the United States.
 - *Ethernet is a trademark of FUJIFILM Business Innovation Corp.

1. Safety precaution

For personnel and product safety, be sure to read and observe the precautions in this section.

CAUTION The caution icon (⚠) on the main unit indicates that incorrect handling may cause hazardous conditions. Always follow the subsequent instructions (⚠) because they are important to personal safety. Otherwise, there is danger of an electric shock, a fire, an erroneous operation, or damage to the instrument. If the instrument is not handled in a manner specified by the manufacturer, it might impair the protection provided by the product.

CAUTION The terminals of auxiliary power (MA, MB) and voltage inputs (P1, P2, P3, PN) have hazards of electric shock, explosion, or arc flash. Turn off the auxiliary power and the power supply of the input circuit prior to working on the product.

- Precautions on operating environment and conditions
 - Do not use the instrument in the following places. Otherwise, there is danger of a malfunction or reduction life of the product.
 - The ambient temperature exceeds the range -5°C to +55°C
 - The relative humidity exceeds the range 0 to 85%RH, or condensation occurs
 - Exposed to much dust, corrosive gas, salty environment, or oil mist
 - Transient over voltage: 4000 V (Note 1)
 - Exposed to rain or water drips
 - Pieces of metal or similar substances are scattered
 - Note 1. For the definition of the Pollution Degree and the Transient over voltage category, refer to EN61010-1:2010. Dust, dirt, small insect and so on will cause such faults as poor contacts, and reduced insulation due to those accumulated and moisture-absorbed. In an atmosphere where conductive powder floats, it will cause such as malfunction of the instrument, deteriorated insulation and so on in a short time. In such a case, the instrument is needed to take adequate measures such as placing in a totally enclosed enclosure. Also, if the in-enclosure temperature rises, take measures for that.

- Precautions on installation and wiring connection
 - A qualified electrician must install and wire the instrument for safety.
 - Do not supply power to the instrument until completing its assembly work on the cabinet's door.
 - The instrument is to be mounted on a panel. All connections must be kept inside the cabinet.
 - This equipment is class A as per EN55011. This equipment is not intended for use in residential environments and may not provide adequate protection to radio reception in such environments.
 - The following table shows specifications on the input/output terminal.
 - Auxiliary power supply and measuring elements.

Auxiliary power supply	100 to 240 V AC (±15%) 50 Hz to 60 Hz 100 to 240 V DC (-30% + 15%)	MA, MB terminals
Elements	3-phase 4-wire: Max 277 V AC (L-N)/480 V AC (L-L)	Category III P1, P2, P3, PN terminals
	3-phase 3-wire: (DELTA) Max 220 V AC (L-L) (STAR) Max 440 V AC (L-L)	
	1-phase 3-wire: Max 220 V AC (L-N)/440 V AC (L-L)	
	1-phase 2-wire: (DELTA) Max 220 V AC (L-L) (STAR) Max 440 V AC (L-L)	
Current	5 A (CT secondary side), Max 30 V AC	Category III +C1, C1, +C2, C2, +C3, C3 terminals
Frequency	50 / 60 Hz	

- The current input terminals must be connected to CT, external equipment, with basic insulation. Be sure to continuously connect the terminals for voltage-measuring circuit and current-measuring circuit during operation.
- Others
 - MODBUS RTU communication** T/R+ / T/R- SG terminals Max 35 V DC
- Do not drop the instrument from high place. If you drop it and crack its display, do not touch the liquid leaking from the broken LCD or do not get it in your mouth. If you touch the liquid, rinse it off with soapy water at once.
- Keep the protection sheet affixed to the front of the instrument during the work.
- Do not work in live-line condition. Otherwise, there is danger of a failure, an electric shock, or a fire.
- When tapping or wiring, take care not to enter any foreign objects such as chips and wire pieces into the instrument.
- If the terminal wiring is pulled with a strong force, the terminals may come off. (Tensile load: 39.2 N or less)
- Check the wiring diagram carefully. Wrong wiring can cause an instrument failure, an electric shock, or a fire.
- Use an appropriate wire size compatible with the rated current. Otherwise, there is danger of a fire due to heat generation.
- Use a crimped terminal compatible with the wire size. Otherwise, there is danger of a malfunction/failure of the instrument, burnout, or a fire due to damage to the terminal or contact failure.
- Tighten the terminal screws with a specified torque and use a suitable pressure connector. Excessive tightening can cause damage to the terminals and screws.
- Be sure to confirm the wiring connection strictly after its work. Forgetting to connect can cause a malfunction of the instrument, an electric shock, or a fire.
- In order to prevent the invasion of noise, communication wires, auxiliary power supply wires, and other signal wires must not be placed close to or bound together with power lines or high voltage lines. When lying parallel to the power lines or high voltage lines, refer to the following table for the separation distance. (except the input part of the terminal block)

Conditions	Distance
Power lines of 600 V AC or less	300 mm or more
Other power lines	600 mm or more

- Protective conductor terminals for mains circuits shall be at least equivalent in current-carrying capacity to the mains supply terminals.
- If the protective conductor terminals are also used for other bonding purposes, the protective conductor shall be applied first and secured independently of other connections.

- Precautions on operation
 - Before operating the instrument, check that active bare wire does not exist around it. If any bare wire exists, stop the operation immediately, and take an appropriate action such as isolation protection.
 - If a power outage occurs during the setting, the instrument will be not set correctly. Set it again after power recovery.
 - Do not disassemble or modify the instrument. Otherwise, an instrument failure, an electric shock, or a fire could be caused.
 - Use the instrument within the ratings specified in the manual. If it is used outside the ratings, it can cause not only malfunctions or failure but also ignition or burnout.
 - Do not open the secondary side of the CT circuit. If the CT is not connected properly or if the secondary side of the CT is open, it will result in high voltage on the secondary side of the CT and the temperature rise. Therefore, the insulation of the secondary winding wire can be broken. This may cause burnout.
 - When the external terminals are connected to external equipment, the external equipment and the instrument must not be powered and not be used until its definitive assembly on the cabinet's door.
 - The rating of the terminal of external equipment must satisfy that of the external terminal of the instrument.

- Precautions on maintenance
 - Wipe dirt off the surface with a soft dry cloth.
 - Do not contact a chemical cloth to the instrument for a long time, or do not wipe it with benzene, thinner, or alcohol.
 - Check for the following items to use this instrument properly for a long time.
 - (1) Daily maintenance (a) No damage on the instrument (b) No abnormality with LCD indicator (c) No abnormal noise, smell, or heat
 - (2) Periodical maintenance (Every 6 months to 1 year) (a) No looseness with installation and wire connection

CAUTION Do periodical maintenance under power outage condition. Failure to do so may cause electric shock, instrument failure, or fire. Tighten the terminal regularly to prevent fire.

- Precautions on storage
 - To store the instrument, turn off the power, remove the wires, and put them in a plastic bag. For long-time storage, avoid the following places. Otherwise, there is danger of a failure or reduction life of the product.
 - The ambient temperature exceeds the range -25°C to +75°C
 - The relative humidity exceeds the range 0 to 85%RH or condensation occurs
 - Exposed to much dust, corrosive gas, salty environment, or oil mist
 - Pieces of metal or similar substances are scattered
 - Exposed to excessive vibration or impact
 - Exposed to rain or water drips
 - Exposed to direct sunlight

- Precautions on disposal
 - When disposing of the instrument, treat it as industrial waste.
 - ME-000BU-SS96 or ME-000BU25-SS96, an optional plug-in module, has built-in lithium battery. Lithium batteries are disposed of according to the local regulations.
 - In EU member states, there is a separate collection system for waste batteries. Dispose of batteries properly at the local community waste collection/recycling center. The symbol shown the right is printed on the packaging of the unit.
 - [Note] This symbol mark is for EU countries only. This symbol mark is according to the directive 2012/19/EU Article 14 Information for users and Annex IX, and to the directive 2006/66/EC Article 20 Information for end-users Annex II.
 - This symbol means that electrical and electronic equipment, batteries and accumulators, at their end-of-life, should be disposed of separately from your household waste.
- Replacement cycle of product
 - It is recommended that you renew the product every ten years although it depends on your use condition. The long-term use of the product may cause discoloration of the LCD or a product malfunction.
- Warranty
 - The warranty period is 1 year from the date of your purchase or 18 months after manufacturing, whichever is earlier. However, if failure of the product is caused by the user's intent or negligence, the charge will be made for such repair even under warranty.
 - Our company shall not be liable to compensate for any loss arising from events not attributable to our company, the opportunity loss and lost profits of the customer due to failure of the product, and the loss, secondary loss, accident compensation, damage to other products besides our products, and other operations caused by special reasons regardless of our company's predictability.

CAUTION When abnormal sound, odor, smoke, or heat is confirmed, stop using the instrument and turn off the power immediately.

- FCC Rules
 - This instrument complies with part 15 of the FCC Rules. Operation is subject to the following two conditions:
 - (1) This instrument may not cause harmful interference, and
 - (2) This instrument must accept any interference received, including interference that may cause undesired operation.

3. Contained harmful substances

电器电子产品有害物质限制使用标识

根据《电器电子产品有害物质限制使用管理办法》，该标识适用于在中国销售的电器电子产品，其中的数字为产品的环保使用期限。只要遵守本产品在使用和使用的注意事项，从生产日期算起的环保使用期限内不会造成环境污染或对人体、财产产生深刻的影响。

注：产品正常使用废弃后，应按照国家和地方的法律法规完成该电器电子产品的回收和再利用。

产品中有有害物质的名称及含量

本产品中所含的6种有害物质的名称、含有信息及含有部件如下表所示。

部件名称	铅 (Pb)	汞 (Hg)	镉 (Cd)	六价铬 (Cr(VI))	多溴联苯 (PBB)	多溴二苯醚 (PBDE)
基板	×	○	○	○	○	○
箱子	○	○	○	○	○	○
金属零件	○	○	○	○	○	○
螺钉	○	○	○	○	○	○
端子盖	○	○	○	○	○	○
铭牌	○	○	○	○	○	○

- 本表格依据SJ/T11364的规定编制。
- ：表示该有害物质在该部件所有均质材料中的含量均在GB/T 26572规定的限量要求以下。
- ×：表示该有害物质至少在该部件的某一均质材料中的含量超出GB/T26572规定的限量要求。
- 且虽然目前业界没有成熟的替代方案，但是符合RoHS指令要求。

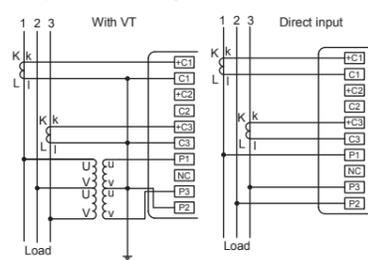
5. Wiring diagram

Rated voltage for each phase/wire system

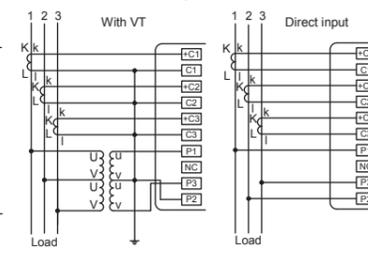
Phase / Wire	Connection	Rated voltage	Figure
3-phase 4-wire	Star	Max 277 V AC (L-N)/480 V AC (L-L)	Figure 1
3-phase 3 wire	Delta	Max 220 V AC (L-L)	Figure 2
	Star	Max 440 V AC (L-L)	Figure 3
1-phase 3 wire	—	Max 220 V AC (L-N)/440 V AC (L-L)	Figure 4
1-phase 2-wire (Note)	Delta	Max 220 V AC (L-L)	Figure 5
	Star	Max 440 V AC (L-L)	Figure 6

Note: The circuit derived from the 3-phase 3-wire delta connection and the 1-phase 2-wire transformer circuit have the maximum rating of 220 V AC. The circuits derived from the 3-phase 4-wire and 3-phase 3-wire star connections and 1-phase 3-wire connection have the maximum rating of 440 V AC.

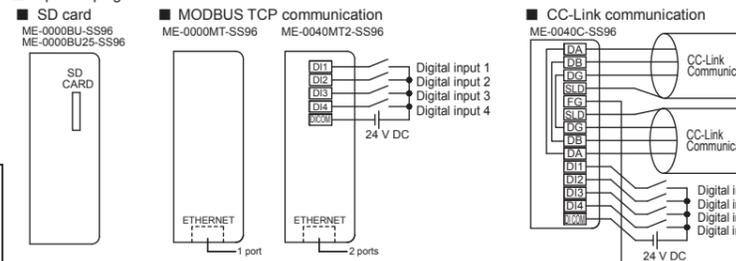
3 phase 3-wire 2CT system



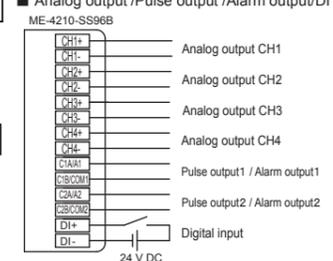
3-phase 3-wire 3CT system



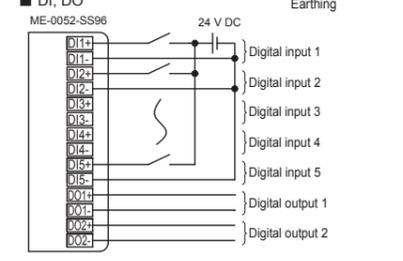
Optional plug-in module



Analog output / Pulse output / Alarm output/DI



DI, DO



DI1-, DI2-, DI3-, DI4-, DI5- are connected inside.

2. Check on your delivery

Check all the contents by following the below table when unpacking your package.

Parts name	Quantity	Specification
User's Manual (This manual)	1	A3 size
Mounting bracket with a screw	2	

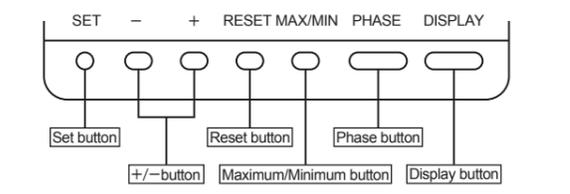
4. Display and Button Function

Display



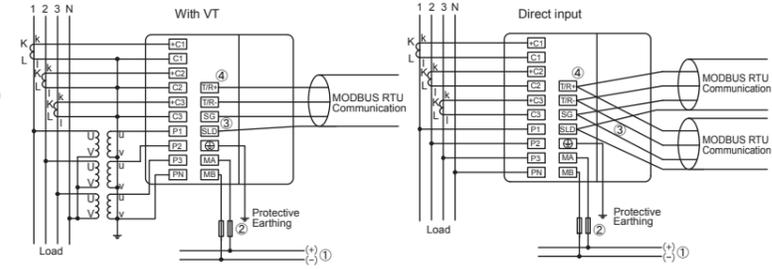
1 LEAD status	8 Test mode status
2 LAG status	9 Clock status
3 Built-in Logging status	10 Upper/lower limit alarm status
4 Digital element display	11 Communication status
5 Digital display	12 Harmonics status
6 Unit	13 Metering status
7 Setup status	

Function of operation buttons



Button	Function
○ (press)	Switch display
○ (press)	Switch phase
○ (press)	Enter/Exit Max/Min value mode
○ (press)	Clear the displayed alarm
○ (press)	Clear all alarms at once
○ (press)	Enter setup value
○ (press)	Enter setup value confirmation mode

3-phase 4-wire system / MODBUS RTU communication



- Auxiliary power supply: 100 V AC to 240 V AC or 100 V DC to 240V DC
- Fuse (recommendation): Rated Current: 0.5A, Breaking Capacity: 250 V AC 1,500 A / 250 V DC 1,500A (UL certified)
- Some MODBUS RTU equipment does not have a SG terminal. In this case, the wiring between SG terminals is unnecessary.
- A 120 Ω terminating resistor should be connected in the line between TR+ and T/R- when this instrument is placed on each end of MODBUS RTU communication line. Note: For a low voltage circuit, it is not necessary to ground the secondary sides of VT and CT.

CAUTION

- Do not connect terminals or RJ-45 connectors to the product in live-line condition.
- Do not insert or remove a SD card under live-line condition.
- Do not open the secondary side of CT during power on the primary side current.
- Avoid the short circuit of the secondary side of VT.
- Use an appropriate wire size compatible with the rated current and voltage.

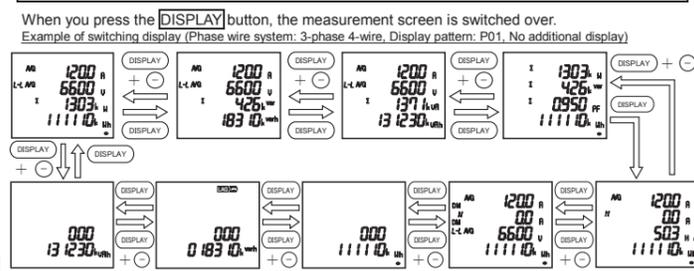
Product type	Screw type	Wire for use	Tightening torque
ME96SSHB-MB, ME96SSRB-MB	M3	For crimped terminal: AWG 26 to 14 (Connection up to two wires) Appropriate crimped terminal: One for M3 screw 6.0 mm or less in outer diameter Single wire, Stranded wire: AWG 24 to 14 (For stranded wire, possible in combination with rod terminals) The peeling size of the cable sheath: 10 to 11 mm *1: If complying with UL standards, follow the conditions listed below. - Single wire, Stranded wire: AWG 24 to 18 - Rod terminals are not available. *2: When using a rod terminal with insertion points of two wires, select the terminal that insertion hole depth of the terminal block is 12 to 13 mm as a guide.	0.8 N·m 0.5 N·m
Optional plug-in module: ME-4210-SS96B, ME-0052-SS96, ME-0040C-SS96	Non-screw	Single wire, Stranded wire: AWG 24 to 16 (For stranded wire, possible in combination with rod terminals) The peeling size of the cable sheath: 8 mm Rod terminals (without plastic sleeve): 0.2 to 1.5 mm ² Rod terminals (with plastic sleeve): 0.2 to 0.75 mm ²	—

When using bare crimped terminals, prevent electric shock or short circuit by providing the necessary insulation with an insulating tube not to expose the charger.

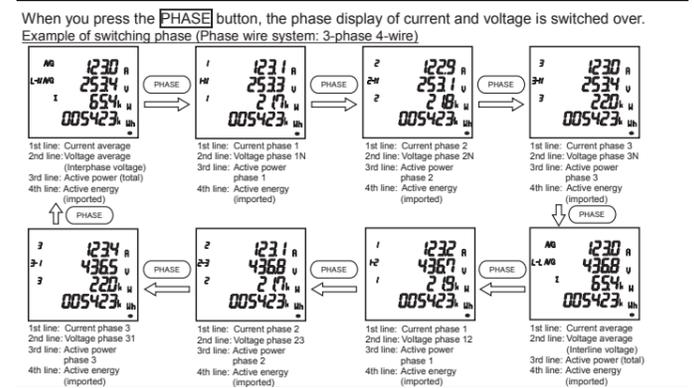
- To use ME-000BU-SS96 or ME-000BU25-SS96, an optional SD card is necessary. Use EMU4-SD2GB, which is a SD card manufactured by Mitsubishi Electric Corporation.
- For MODBUS TCP communication, use an appropriate cable compatible with IEEE802.3.

6. Operation

6.1 How to switch measurement screen



6.2 How to switch phase display



6.3 How to display Maximum/Minimum value

- Display Maximum/Minimum value
 - When you press the MAX/MIN button, the maximum and minimum values are displayed. Press it again and return to the present value display.
 - Reset Maximum/Minimum value
 - On the Maximum/Minimum value display screen, press the RESET button for two seconds. The maximum and minimum values displayed will be reset to the present values. Moreover, on this screen, pressing the RESET and + button simultaneously for two seconds provides a complete reset. All the maximum and minimum values will be reset to the present values.

6.4 Alarm display and How to reset

Alarm output, display, and reset
Alarm output: When a measured value exceeds its alarm setup value, some parts on the displayed screen will blink. The alarm contact is closed.

Alarm reset: Clear an alarm to return to the normal display. The alarm contact is open.

Alarm reset method	Alarm condition	Normal condition
Automatic (Auto)	Display [ALARM] or [LO] blink Alarm contact Close	Normal mode Open
Manual (Hold)	Display [ALARM] or [LO] blink (During alarm output) Alarm contact Close	Normal mode (Alarm reset) Open

Alarm reset

Method	Explanation
Automatic (Auto)	If a measured value falls below its alarm setup value, the alarm will be automatically reset.
Manual (Hold)	Even after a measured value falls below its alarm setup value, the alarm state is maintained. Display the item where an alarm generates and press the RESET button to clear the alarm.

Alarm delay time

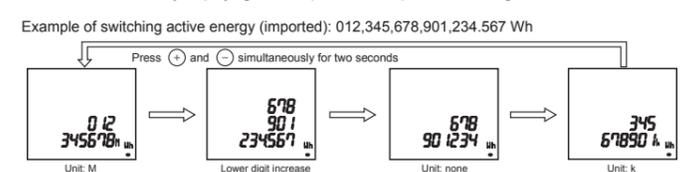
If a situation beyond a threshold continues and passes an alarm delay time, it will reach an alarm state. Set the alarm delay time to prevent unnecessary alarm output caused by some problems such as instantaneous overload and noises.

6.5 Harmonics display

- Harmonic RMS value and distortion ratio is displayed.
 - Measurement items
 - ME96SSHB-MB: Harmonic total, From 1st to 31st (only odd number)
 - ME96SSRB-MB: Harmonic total, From 1st to 19th (only odd number)
 - ME96SSEB-MB: Harmonic total
 - Degree change
 - Pressing the H or D button switches the harmonic degree.
 - Pressing the PHASE button switches between the RMS value and distortion ratio.

6.6 Expanded counting display

- Display Active/Reactive/Apparent energy
 - For active energy, reactive energy, and apparent energy, the upper or lower digits of the measured values are confirmed by displaying the unit (M, k, or none) or the lower digits.



- Reset Active/Reactive/Apparent energy to zero
 - When you press the SET, RESET, and PHASE button simultaneously for two seconds, the values of active energy, reactive energy, and apparent energy will be reset to zero. This is available only on the present value display screen.

