

Instruction Manual

WMS-HE2D□
-00A□00

Slim Power Meter(440V direct input)

Thank you for purchasing *watanabe* products.
This manual explains handling, connection, and setup procedures.
Settings can be adjusted via the front panel.

Note: Content may change without notice due to product improvements.

This device is manufactured and inspected under strict quality control standards, ensuring your satisfaction. In case of issues such as transport damage, please contact our company or the store of purchase as soon as possible.

- Package contents:
- Main unit × 1

User manual × 1

IO/RS485 communication connector (attached to the unit) × 1

Voltage/Power input connector (attached to the unit) × 1

*For detailed device settings, download the User Manual from our website:
<https://www.watanabe-electric.co.jp/en/>

● Free downloads available from our website (see above URL).

Product	Model code • Document No.
Modbus Communication Manual	SI-0611

1. Caution

To ensure safe and proper use of this product:

- Read this manual thoroughly before use.
- Keep it handy for future reference.

Usage Restrictions

● Do not use this device as part of equipment intended for life support.

● Do not use this device in ways that could directly cause injury or damage in case of failure.

- 1-1. Regarding usage environment and conditions
- Do not use in the following locations as it may cause malfunction or shorten product life:
- Areas where ambient temperature exceeds -10 to 55°C.

• Areas with ambient humidity above 90%RH, or where freezing/condensation occurs.

• Areas with excessive dust or metal particles.

(housing with dustproof design and heat dissipation measures required)

• Areas with corrosive gases, salt, or oil mist.

• Areas subject to vibration or impacts .

• Areas exposed to rain or water droplets.

• Areas with strong electromagnetic fields or external noise.

- 1-2. Installation and Connection
- Before installation or connection, carefully read this instruction manual and ensure that someone with specialized technical skills performs the installation and connection.

• Do not route wiring for the voltage/power input line, CT input line, or IO/RS485 communication connector near noise sources or relay drive lines.

• Bundling with lines affected by noise or storing in the same duct may cause measurement inaccuracies or operational anomalies.

• This product can be used almost immediately after power-on, but full functionality requires 30 minutes of continuous power supply.

- 1-3. Check before use
- Ensure the installation site complies with the usage environment and conditions.

• Confirm the input voltage rating (power factor, frequency, etc.).

- 1-4. Usage Instructions
- This device is not a certified measuring instrument. It cannot be used as a trade or proof instrument as defined by the Measurement Act.

• Before use, be sure to read this instruction manual and the user manual available for download on our website.

• Use the device within the rated range specified in this instruction manual. Usage outside the rated range may cause malfunction, device failure, or risks such as fire or damage.

⚠ Caution

○Regarding this device:

• To measure power, this device requires connection to current and voltage. Ensure proper order of voltage phase (e.g. R, N, S, T) and correct direction/orientation of current (K, L, k, l) and phase. Incorrect CT orientation, installation site, or order will result in inaccurate measurement.

• Power supply is necessary for this device. Voltage input doubles as power input. For equipment and circuit protection, installation of breakers or fuses is recommended.

• Measurement will not occur without voltage/power input.

• Follow the connection diagram carefully when wiring. Improper wiring may result in equipment failure, fires, or electric shock.

• Do not perform live-line work. It may cause electric shock, equipment failure, burning, or fires due to short circuits.

• Use C-type grounding (previously known as third-class grounding). Insufficient grounding may result in malfunction.

• Use appropriately rated wires. Improper wires may overheat and cause fires.

• Use wire crimp terminals matching the wire's specifications. Improper terminals may cause disconnection, poor contact, malfunction, failure, burning, or fires.

• After tightening screws, ensure none are left loose. Loose screws may result in malfunction, fires, or electric shock.

• Over-tightened screws may break the terminal or screw, while under-tightened screws may cause malfunction, fires, or electric shock.

○About inverters:

This device measures power in circuits with 50/60Hz sine waves. It cannot accurately measure power in inverter circuits outside the 45–65Hz range or with non-sine wave voltage. When measuring inverter power, measure the inverter's primary (50/60Hz) circuit.

○About CT:

Avoid live-line work when installing CT. It may lead to electric shock or CT damage. Split CT includes protective elements on the secondary side, allowing open-circuit secondary-side work. However, leaving the secondary circuit open for extended periods during live primary-side operation may degrade protective elements.

○About VT:

Only AC110/220/440V can be connected to the power measurement voltage input of this unit.
When measuring circuits with a voltage higher than (AC6600V, etc.), use VT (pt) and Wire from the secondary side of VT (PT) to this instrument.

○Other:

For FG (Frame Ground), directly ground it in high-noise areas; use C-type grounding in low-noise areas.
Do not disassemble or modify the device. It may cause failure, electric shock, or fires.
Handle this precision measuring device carefully; avoid impacts such as dropping.

- 1-5. Repair and Handling Abnormalities
- If unusual sounds, smells, smoke, or overheating occur, immediately turn off the power.

• Before assuming a malfunction, please recheck the following:

1) Is the power supply applied correctly?

2) Are there no wiring errors, shorts, or open circuits?

3) Is the setting correct?

4) Is the communication line not shorted or disconnected?

5) Is the polarity of the communication line correct?

6) Is the RS485 address not overlapping with other devices?

- 1-6. Maintenance and Inspection
- Clean surface dirt with a soft cloth. For heavy dirt, turn off the power, wet a cloth with water, wring it out thoroughly, and wipe.

• Do not use organic solvents like benzene or thinner.

• Perform regular inspections to prolong the product's lifespan:

1) Check for damage.

2) Ensure no abnormal sounds, odors, or overheating.

3) Verify there are no display abnormalities.

4) Check for loose installation or connections (ensure power is off).

• Please note the following during power relay testing:

1) The withstand voltage between the power and FG terminals is 2000 V for 1 minute. However, as it is capacitor-coupled, a current of less than 5 mA may flow. If this current may affect other devices, avoid applying voltage between these terminals.

2) The allowable overvoltage input is defined in the table below. Do not exceed these limits during relay testing.

Voltage		Current	
Input	Input allowable time	Input	Input allowable time
Rated 120%	Continuous	Rated 120%	Continuous
Rated 130%	10 seconds	Rated 200%	10 seconds

- 1-7. Disposal
- Dispose of this product as general industrial waste.

2. Product Overview

This instrument is a product that can measure power from an AC voltage input and an AC current input using a dedicated CT, and output the amount of power in a unit pulse or accumulate the pulse input.
Various settings can be made using the display on the front of the main unit, the operation switch.

3. Functions and features

- With a width of 28.5 mm, it is a thin size that can be installed in a distribution board.

• Direct AC440V input is possible.

• Up to 4 circuits for single-phase 2-wires, up to 2 circuits for single-phase 3-wire / 3-phase 3-wire, and 1 circuit for 3-phase 4-wire can be measured with one unit.

• The display part of the main unit and the operation switch can be set and measured independently.

• 2 digital outputs or 2 digital inputs can be selected depending on the model.

• It is equipped with a voltage-less measurement function that enables temporary operation before power outage construction.

• CT wiring is a simple one-touch connection using a dedicated cable.

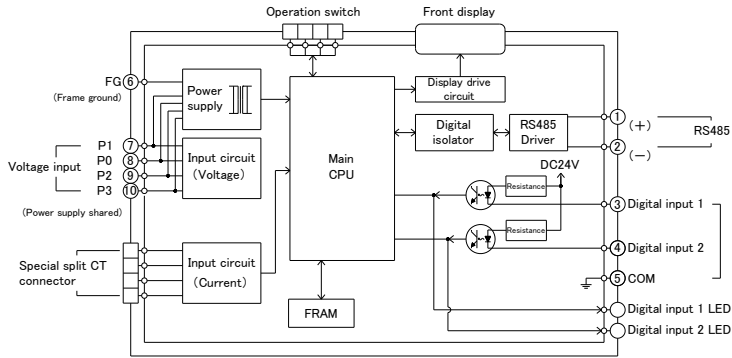
• In consideration of ease of maintenance and workability, all terminals are removable.

• Equipped with a simple miswiring detection function.

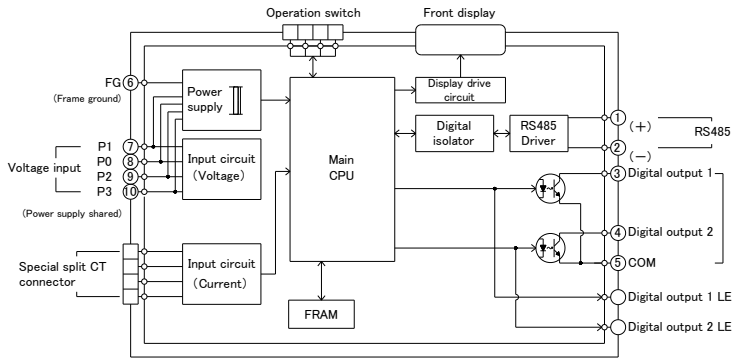
• Mounting is DIN rail mounting. (Can be attached in close contact)

4. Circuit block diagram

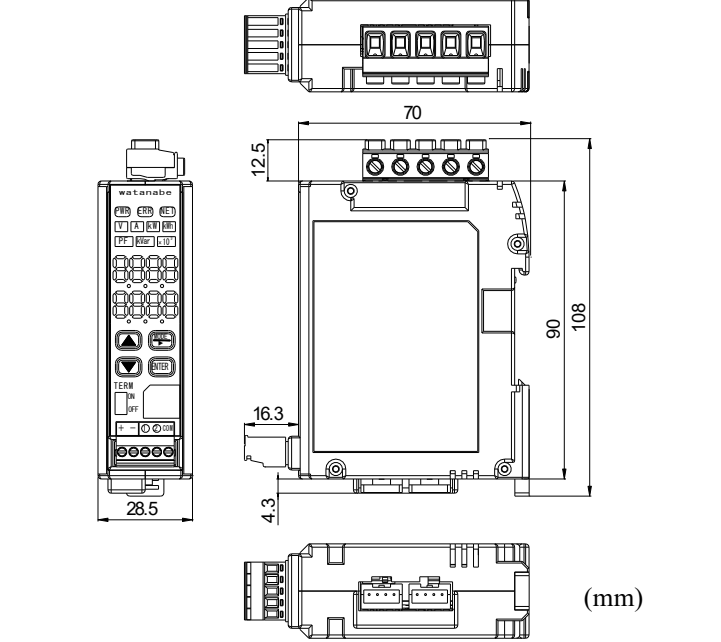
- WMS-HE2DI



- WMS-HE2DO



5. Dimensions



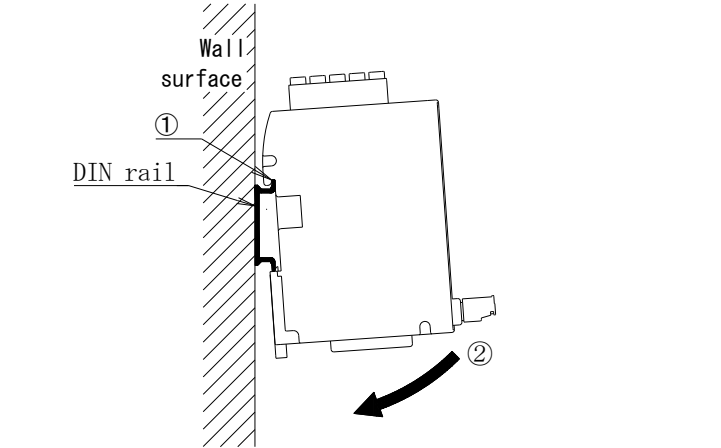
6. Mounting method

- DIN rail mounting
- << mounting method>>
- ① Hook the DIN rail mounting groove on the back of the instrument to the DIN rail

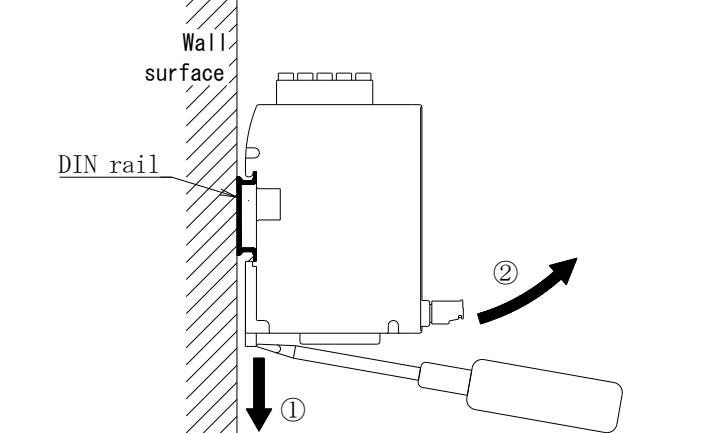
② Press the lower part of the instrument in the direction of the arrow in the figure until you hear a "click"

③ Make sure that the instrument is securely fastened to the DIN rail.

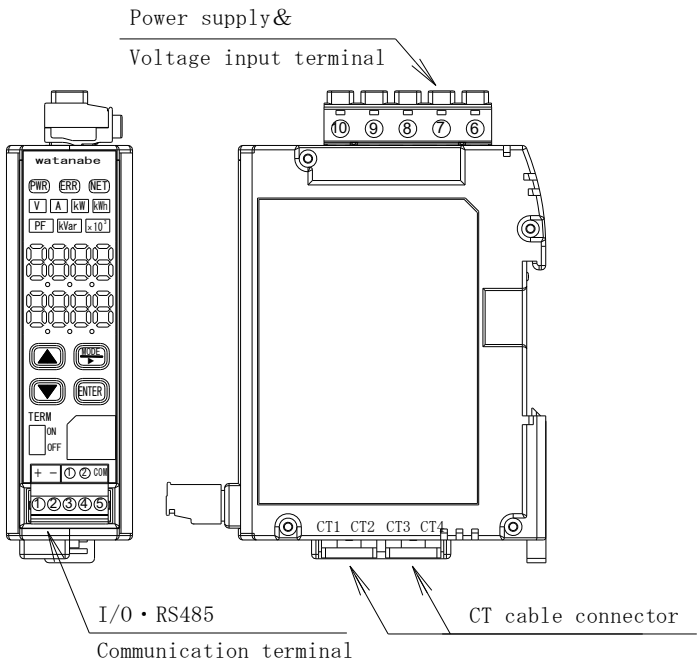
④ When installing multiple units, this instrument can be attached in close contact.



<< How to remove>>
Insert a flat-blade screwdriver into the groove of the slider of the socket and remove it by pulling the lower part of the unit toward you (2) while pulling it in the direction of the arrow (1) in the figure.



7. Terminal Arrangement



■WMS-HE2DI

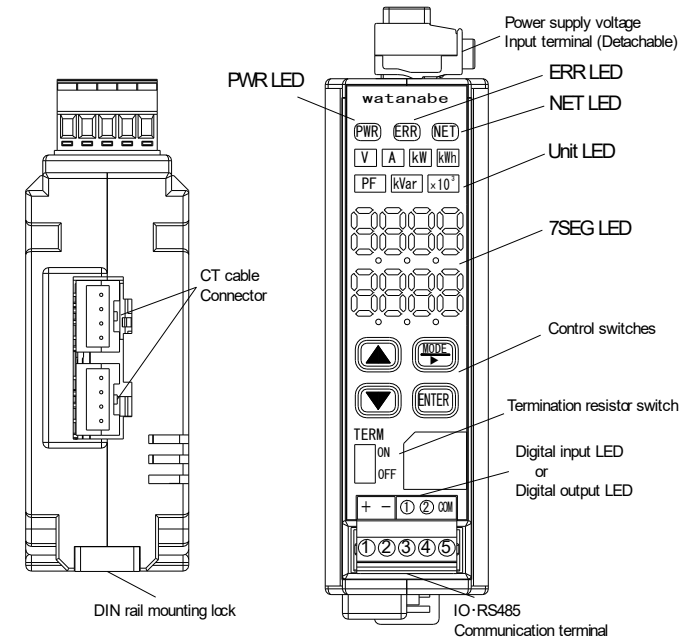
Terminal		Name		Description
Input & RS-485 Communication terminal	1	RS485	+	RS-485 connector communication line
	2		-	
	3	INPUT	1	DI1 terminal
	4		2	DI2 terminal
	5		COM	Common
CT connector	-	CT1 ~ CT4		Special CT connecting cable
Power supply & Voltage input terminal	6	FG		Frame ground terminal
	7	Voltage	P1	Power supply &
	8		P0	Voltage input terminal
	9		P2	(Power and voltage shared)
	10		P3	100 to 440V AC

■WMS-HE2DO

Terminal		Name		Description
Output & RS-485 Communication terminal	1	RS485	+	RS-485 connector communication line
	2		-	
	3	OUTPUT	1	DO1 terminal
	4		2	DO2 terminal
	5		COM	Common
CT connector	-	CT1 ~ CT4		Special CT connecting cable
Power supply & Voltage input terminal	6	FG		Frame ground terminal
	7	Voltage	P1	Power supply &
	8		P0	Voltage input terminal
	9		P2	(Power and voltage shared)
	10		P3	63.5 to 240V AC

Electroic Systems		Terminals			
		P3	P2	P0	P1
1P2W	Single-phase 2-wire			N	1
1P3W	Single-phase 3-wire		2	N	1
3P3W	Three-phase 3-wire		T	S	R
3P4W	Three-phase 4-wire	T	S	N	R

8. Names and functions of each part



Display LED

Name	Color	Overview
7SEG LED	Green	Displays measured values, status, and operating settings
Digital input LED※1	Green	Lights up synchronously with the digital input
Digital output LED※1		Flashes synchronously to the digital output
POWER, NET, Unit LED	Green	Indicates the status of power supply and communication and the unit of display value
ERR LED	Red	Indicates the occurrence of an error, etc.

*1 If the model is WMS-HE2DI, it is a digital input, and if it is WMS-HE2DO, it is a digital output.

Other

Name	Overview
Operation SW	It is used to operate the instrument, such as setting the operation
Termination resistor SW	Termination Resistor (120Ω) Enable/Disable SW
Power supply and voltage Input terminal blocks	Voltage input and FG wiring for operating power supply and power measurement (power supply and voltage input shared)
CT Cable Connection Connector	Connecting the cable from the CT for power measurement connector
IO & RS485 Communication Connector	Digital input or digital output is performed. (Selectable depending on model) It is also used for RS485 communication.
DIN rail mounting lock	This is a fixing mechanism when mounted on a DIN rail

9. Wiring method

9.1 Wiring of power supply/voltage signal for power measurement

The FG of the instrument and the voltage input for control power supply and power measurement are wired to the connectors on the side of the instrument. Please see below for the procedure and precautions to be taken.

- (1) Loosen the screws on the connector
- (2) Insert the wiring under the washer of the loosened screw
- (3) Tighten the screws on the connector to secure it.

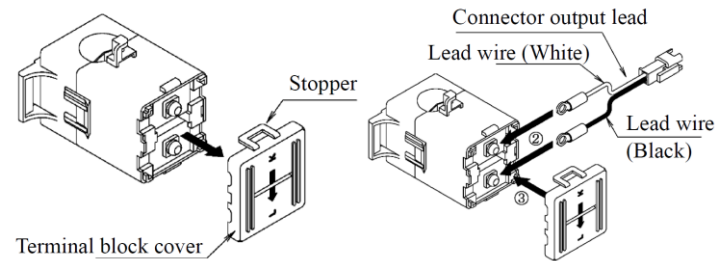
* For details on voltage wiring from each phase in power measurement, please refer to 10.

Caution
Only AC110/220/440V can be connected to the power measurement voltage input of this unit.
When measuring circuits with a voltage higher than (AC6600V, etc.), use VT (PT) and wire from the secondary side of VT (PT) to this instrument.

9.2 Connection of current signal (CT) for power measurement

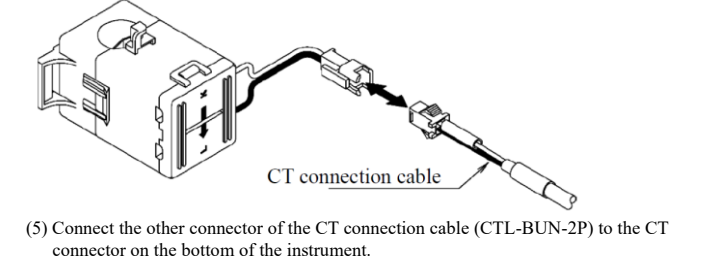
9-2-1 WCTF connection

- (1) Unfold the stopper of the terminal block cover at the bottom of the CT and remove the terminal block cover from the CT body.
- (2) Screw the connector output lead supplied with the CT to the CT bottom terminal block. At that time, connect the lead wire (white) to K of the terminal block and the lead wire (black) to the L of the terminal block.
Tightening torque : 0.5-0.6 [N・m]
- (3) Attach the removed terminal block cover to the CT main unit.

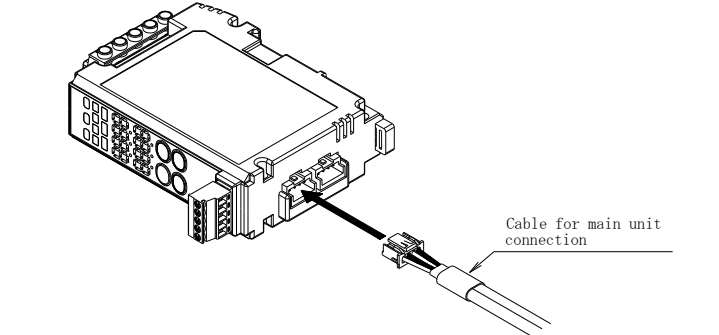


Caution
○ Be sure to wire the lead for connector output correctly k and l to the CT terminal block. If the wrong wiring is performed, power measurement will not be performed properly.
○ Be sure to attach the terminal block cover to the CT before use. If the cover is not covered, it may cause a short circuit accident or electric shock.

- (4) Connect the connector of the connector output lead attached to the CT to the connector of the CT connection cable (CTL-BUN-2P).



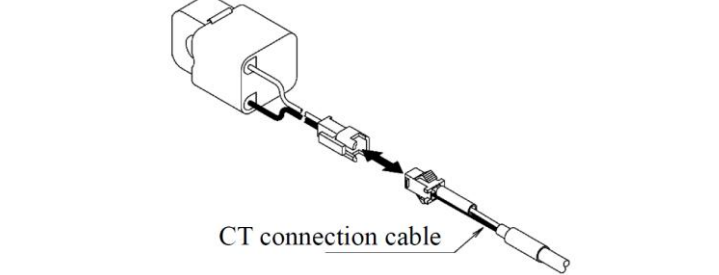
- (5) Connect the other connector of the CT connection cable (CTL-BUN-2P) to the CT connector on the bottom of the instrument.



* The cable length of the CT connection cable (CTL-BUN-2P) is 2 m. If the cable length is insufficient, use a CT extension cable (CTL-EN-03, cable length 3 m) to extend it. (3 longest 11m)
Additionally, CTL-BUN-10 (cable length 10m), CTL-BUN-20 (cable length 20m) We also have them prepared, so please use the appropriate one.

9-2-2 Connecting CTL-10-CLS9

- (1) Connect the connector of the lead wire extending from the CT to the connector of the CT connection cable (CTL-BUN-2P).

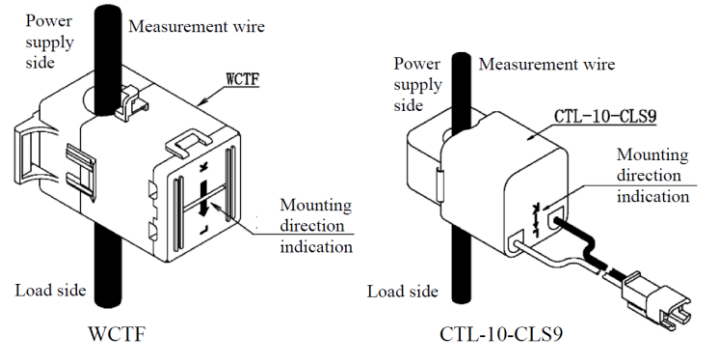


- (2) Connect the other connector of the CT connection cable (CTL-BUN-2P) to the CT connector on the bottom of the instrument.
* The cable length of the CT connection cable (CTL-BUN-2P) is 2 m. If the cable length is insufficient, use a CT extension cable (CTL-EN-03, cable length 3 m) to extend it.
Additionally, CTL-BUN-10 (cable length 10m), CTL-BUN-20 (cable length 20m) We also have them prepared, so please use the appropriate one.

10. Power Metering Wiring

10-1 Installing WCTF/CTL-10-CLS9

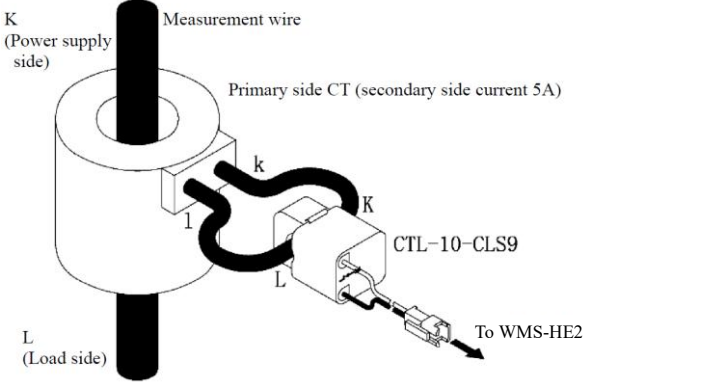
When attaching a CT for power measurement, pay attention to the mounting direction display on the CT body.
(K: Power supply side, L: Load side)



10-2 Measurement of circuits with a current value greater than 600A

When measuring a circuit with a current value of more than 600A, install the CT in the following way.

- (1) Install a CT (primary CT) of 5A on the secondary side of the measuring wire.
- (2) Short-circuit the secondary output terminals (k, l) of the primary CT.
- (3) Install the CTL-10-CLS9 on the wire with the secondary output terminal shorted.
At this time, pay attention to the mounting direction (K, L) of the CTL-10-CLS9 with respect to the current direction (k→l) of the electric wire with which the secondary output terminal is short-circuited.



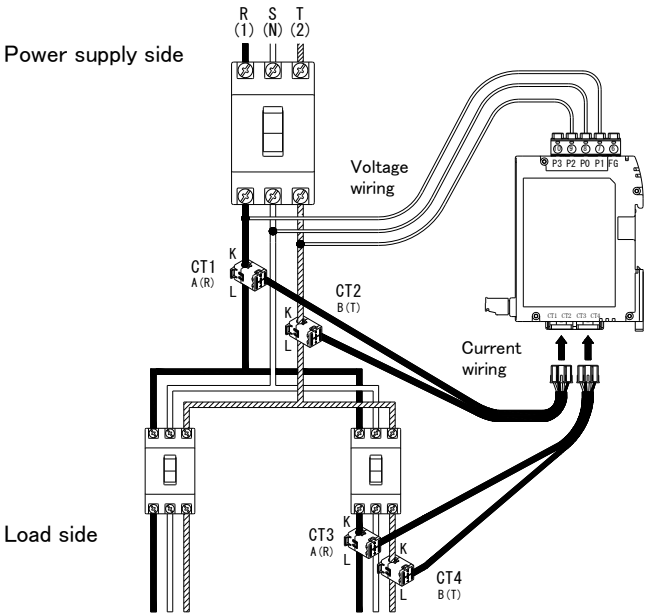
Caution
○ When installing the CT, install it in the correct mounting direction (K: power supply side, L: load side). If the mounting direction is wrong, power measurement cannot be performed correctly.
○ If foreign matter such as dust adheres to the core cross-section of the CT, the performance will deteriorate, so be careful not to adhere to the core cross-section when attaching the CT. In addition, do not touch the core cross-section, as it may cause debris to adhere.
○ The CT for 600A measurement (WCTF-600A-K) is sandwiched with rust prevention paper at the time of shipment, so please remove this paper before use. In addition, it may cause rust or foreign matter adhesion, so never touch the core cross-section.
○ The dedicated split CT (WCTF/CTL-10-CLS9) cannot be used in high-voltage circuits exceeding 600 VAC. When measuring high-voltage circuits, use a combination of a commercially available high-voltage CT and the CTL-10-CLS9.
○ WCTF can only be used in circuits of 300 V AC or less in the case of bare wires.
Do not use in circuits above 300 VAC.

10-3 Wiring example

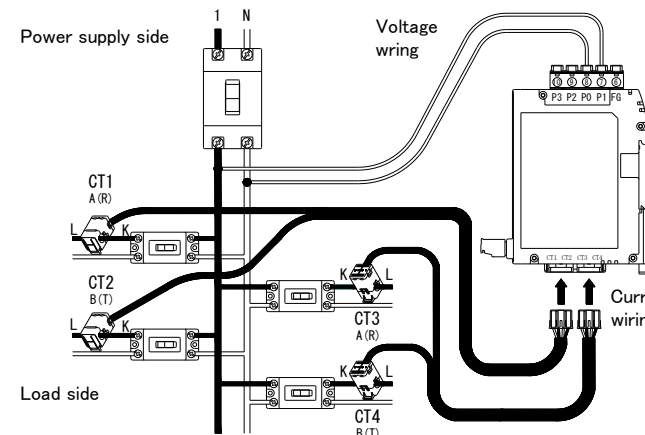
Please ensure correct wiring as follows to measure power accurately:

- 1) Match the voltage phase with the wiring example.
- 2) Verify the CT connection cable markings and clamp the CT to the corresponding phase as shown in the wiring example.
- 3) Ensure the CT's K and L orientation matches the power/load side as shown in the wiring example.

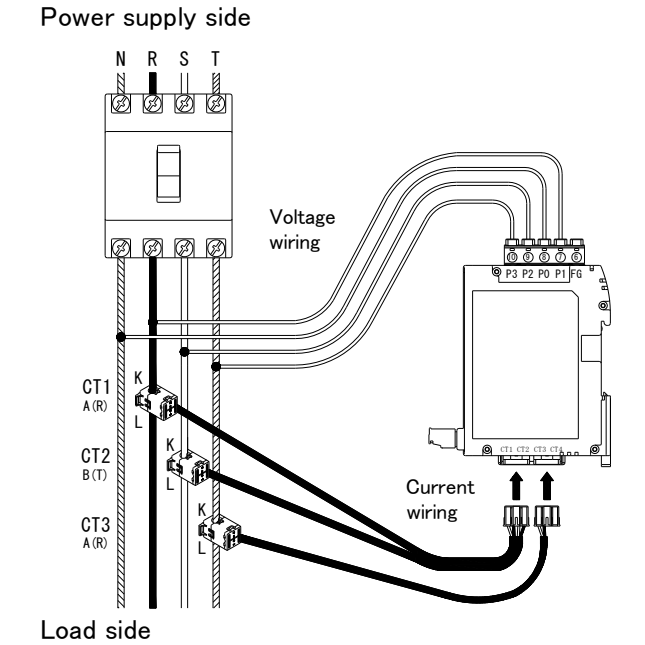
Single-phase 3-wire / 3-phase 3-wire wiring example



Single-phase 2-wire wiring example



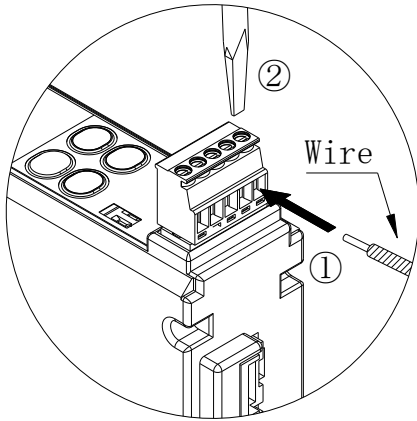
Three-phase 4-wire wiring example



11. Wiring of digital input wire, digital output wire

11-1 Wiring of digital input and digital output wires

- Loosen the screws on the front terminal block of the instrument with a flathead screwdriver. (The terminal block is removable.)
- Insert the wire into the hole of the terminal block and tighten the screw to fix it.



Recommended lead wire size: Wire diameter 0.2 ~ 1.5 mm² (AWG28 ~ 14)
Stripping length : 6~7mm
M2 screw tightening torque: 0.2 [N • m]

* When stranded wire is used for wiring, bar terminals with insulated covers (DIN46228-4 compliant product) is recommended.

Recommended bar terminals: AI0.34-8TQ (for AWG22)
AI0.5-8WH (for AWG20)
Crimping Tool : CRIMPFOX6
(All made by Phoenix contact Co., Ltd.)

Caution

- When using ferrules for wiring, be careful of contact between ferrules. If the conductive part of one ferrule touches that of another, it will not function properly.
- When removing the wire, remove the wire with the screw loosened in the same way.

12. RS485 communication wire wiring

12-1 About RS485 communication lines

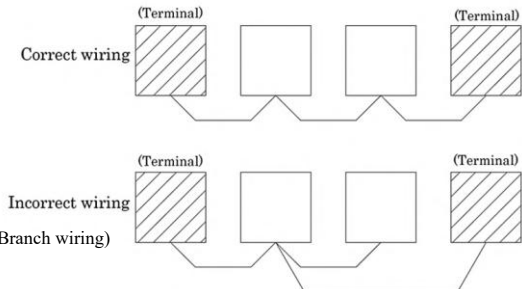
For the communication line, use a twisted-pair cable that meets the following specifications.

Recommended communication lines

Cable	Size	Equivalent
Shielded Twisted pair cable	AWG24 ~ AWG16	Proterial, Ltd. CO-SPEV-SB(A) 1Px0.3SQ LF, etc. (AWG22 equivalent)

12-2 Wiring between devices

Wire the communication lines to connect to the Master device and other Slave devices. The RS485 communication line between the devices should be wired as shown in the figure below.



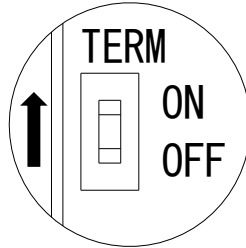
Caution

- Please wire according to the following contents. If the wiring is not correct, it may cause a communication error.
- The total length of the communication line should not exceed 1200m.
- Use only one type of communication line. Do not mix two or more types of communication lines.
- In places with poor noise environments, use a shielded twisted-pair cable.
- When using a shielded cable for the RS485 transmission line, use one-sided grounding (Class D grounding).

- Do not share the grounding with other grounding wires.
- If the polarity of the communication line is wrong, communication will not be possible, so please wire according to the polarity between the devices.
- In the RS485 transmission line, wire across each module. Branch wiring is not allowed.

12-3 Termination Resistors

When the termination resistor SW on the front of the instrument is set to "ON", the termination resistor (120 Ω) is enabled.



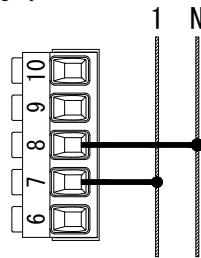
The WMS-HE2, which enables the termination resistor, should only be used for equipment corresponding to the (Terminal) section in the diagram in "12-2 Wiring Between devices".
* Please follow the "Correct wiring" configuration.

13. Wiring of power supply and voltage input lines

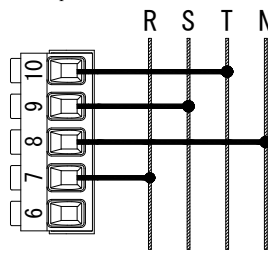
13-1 Wiring of power supply and voltage input wires

Wire the power supply and voltage input to terminals 7~10 of the power/voltage connector. Depending on the phase line classification, wire as shown in the figure below.

Single-phase 2 wires



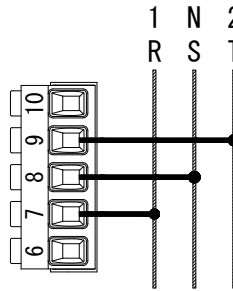
Three-phase 4 wires



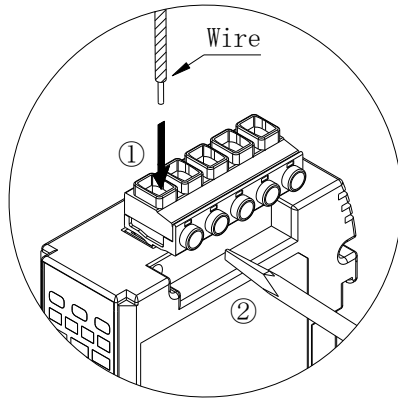
Single-phase 3 wires / Single-phase 2 wires /

Single-phase 3 wires branched from single-phase/ 3 wires + Single-phase 2 wires

3-phase 3 wires



- Loosen the screws on the top terminal block of the instrument with a flathead screwdriver. (The terminal block is removable.)
- Insert the electric wire into the hole of the terminal block and tighten the screw to fix it.



Recommended lead wire size: Wire diameter 0.2 ~ 2.5 mm² (AWG28 ~ 12)
Stripping Length: 7~8mm
M2.5 screw tightening torque: 0.5 [N • m]

14. Measurement items

(1) Measurement phase line classification

(The setting can be changed by the front operation switch or the Master device.)
Single-phase 2-wire, single-phase 3-wire, three-phase 3-wire, three-phase 4-wire
Single-phase 2-wire branched from single-phase 3-wire
Single-phase 3-wire + single-phase 2-wire

(2) Display elements

Voltage, Current, Active Power, Reactive Power, Power Factor,
Active Energy (Received), Conversion Value

* Voltage and current are measured for each phase.

Voltage Measurement

Single-phase 3-wire: 1-N voltage, 2-N voltage, 1-2 voltage
Three-phase 3-wire: R-S voltage, S-T voltage, T-R voltage
Three-phase 4-wire: R-N interphase voltage, S-N interphase voltage, T-N interphase voltage, R-S interline voltage, S-T interline voltage, T-R interline voltage

Current measurement

Single-phase 3-wire: 1-phase current, 2-phase current, N-phase current
Three-phase 3-wire: R-phase current, T-phase current, S-phase current
Three-phase 4-wire: R-phase current, T-phase current, S-phase current, N-phase current

* The sign of the power factor is displayed as positive for delay and negative for advance.

* For digital input specifications, cumulative ON time and cumulative pulse count will be additionally displayed.

15. Tolerance (excluding CT error) *at 23°C

15-1 Measurement mode (power measurement by voltage and current input)

Active power	±1.0%FS(COSφ=0.5~1 advance, lag)
Reactive power	±1.0%FS(COSφ=0~0.866 Advance and lag)
Active energy	±1.0%FS(COSφ=1), ±1.5%FS(COSφ=0.5)
Reactive energy	±1.0%FS(COSφ=0), ±1.5%FS(COSφ=0.866)
Voltage & current	±1.0%FS(in equilibrium)
Power factor	±2.0%FS(COSφ=0.5~1 in equilibrium)

15-2 Voltageless measurement mode

(Provisional measurement of power by input of current only)

Active power	* The accuracy of the measurement results is not guaranteed. Please use it as a reference value.
Reactive power	
Active energy	
Reactive energy	
Electric current	±1.0%FS(50/60Hz input, balanced)
Power factor	This is the value set as the external VT rating and virtual power factor.

16. Specification

16-1 Measurement specifications in measurement mode

(Power measurement by voltage and current input)

Input Frequency	50/60Hz
Measuring range	Current: Low cut setpoint ~ rated 120% Voltage: Rated 80~110% Active power, reactive power Single-phase 2-wire rated value Rated primary current × rated primary voltage Single-phase 3-wire rated value Rated primary current × rated primary voltage×2 Three-phase 3-wire rated value Rated primary current × rated primary voltage×√3 Three-phase 4-wire rated value Rated primary current × rated primary line voltage×√3 It is ±144% of the above rated power. If the rated power × current is below the low-cut value, it is set to 0. Received active energy If the rated power × current is below the low-cut value, it is set to 0. In the event of overflow, it is accumulated again from 0. Power factor: -0.00%~100%~+0.00% In the unmeasured state, the power factor is assumed to be 100%.
Calculation method	Current/voltage: RMS calculation method Active power and reactive power: Time-division multiplication calculation method Power factor: Calculated by the following formula from active power and reactive power Power Factor = Active Power / √ (Active Power× Active Power + Reactive Power × Reactive Power)
Influence of ambient temperature	±0.1%FS/°C
Voltage Input	Rating: Single-phase 2-wire AC110,220,440V Single-phase 3-wire AC110,220V Three-phase 3-wire AC110,220,440V Three-phase 4-wire, AC110,220,440V
Current Input	Dedicated CT split type AC 5, 50, 100, 200, 400, 600A Current Range: AC 5, 50, 100, 200, 400, 600A (Configurable setting)
Overtyping	5ACT can be used in combination with CT with 5A output Voltage 120% continuous 130% for 10 seconds Current: 120% continuous, 200%, for 10 seconds

16-2 Measurement specifications in voltageless measurement mode (Provisional measurement of power using current-only input) * Input of the starting voltage of this unit is required.	
Input Frequency	50/60Hz
Measuring range	Current: Low cut setpoint ~ rated 120% Voltage: Sets the set value of the external VT rating as a virtual value. Active power, reactive power Single-phase 2-wire rated value Rated primary current × rated primary voltage Single-phase 3-wire rated value Rated primary current × rated primary voltage×2 Three-phase 3-wire rated value Rated primary current × rated primary voltage×√3 Three-phase 4-wire rated value Rated primary current × rated primary line voltage×√3 It is ±144% of the above rated power. If the rated power × current is below the low-cut value, it is set to 0. Active energy If the rated power × current is below the low-cut value, it is set to 0. In the event of overflow, it is accumulated again from 0. Accumulation only on the receiving side Power factor: Set the virtual value in the range of 0~100% (delay).
Calculation method	Current: RMS calculation method Active power and reactive power: Calculated from current measurement values and virtual voltage and virtual power factor settings Voltage and power factor: Displays the set virtual value
Influence of ambient temperature	±0.1%FS/°C
Current Input	Same specifications as in measurement mode
Overtyping	Current: 120% continuous, 200%, for 10 seconds

16-3 Basic specifications	
Rated input voltage (Shared power and voltage)	AC100V~480V (50/60Hz) 2.2VA (AC110V)、3.2VA(AC440V)
Input voltage range	80%~110% of rated voltage
Operating temperature and humidity range	Temperature: -10~+55°C Humidity 10%~90%RH or less (non-condensing, non-freezing)
Storage temperature and humidity range	-20°C~+60°C 90%RH (non-condensing, non-freezing)
External dimensions	28.5 (W) × 90 (H) × 70 (D) mm protrusions not included
Weight	Approx. 110g
Mounting method	DIN rail mounting, magnet (sold separately)
Case material and color	Self-extinguishing polycarbonate resin, black Flame retardant grade: UL94V-0

16.4 Insulation Specifications	
Insulation Resistance	FG terminal - Power supply & Voltage input terminal / CT input terminal - Digital input/output terminal - Communication terminal mutual DC500V Megger 100MΩ or more
Dielectric strength	FG terminal - Power supply & Voltage input terminal / CT input terminal - Digital input/output terminal - Communication terminal mutual AC2000V 1 minute

16-5 Digital Output Specification (WMS-HE2DO)	
Output Signal	Open Collector
Number of outputs	2 points
Output Common	1 common for every 2 outputs
Output Rating	DC30V 50mA
Output saturation voltage	1.2 V or less
Pulse Output Element	Received active energy
Establishment	Output Operation, Pulse Weight, Pulse Output Width, Alarm Circuit Assignment, Alarm HI/LO, Alarm kW/A, Hysteresis Width, Alarm Judgment HI/LO (Active Power or Phase Current), Output OFF Delay, Simulated Output

16-6 Digital Input Specification (WMS-HE2DI)	
Input Signal	Pulse/non-voltage contacts or transistors
Number of inputs	2 points
Input Sense Current	Approx. 5 mA (when the ON resistance is 0 Ω)
Input pull-up voltage	DC24V±10% (internal pull-up)
Input pulse ON time	10ms or more
Input pulse OFF time	10ms or more
Pulse Input Frequency	50Hz or less
Input Common	Minus common (1 common for every 2 inputs)
Establishment	Pulse Accumulation Reset, Time Accumulation Reset, Simulated Input, Pulse Max

17. Optional accessories (Sold separately)

Product Name	Form	Specifications
CT connection cable	CTL-BUN-2P	2m dedicated CT connection cable.
	CTL-BUN-10	10m dedicated CT connection cable.
	CTL-BUN-20	20m dedicated CT connection cable.
For installation Magnet	WMS-MG-02	One-touch installation on distribution boards and similar devices

Extension cable	CTL-EN-03	Connection cable for 3m extension. Up to 3 connections can be extended (Can be extended up to 11 m together with CT connection cable)
Dedicated split CT	CTL-10-CL-S-9-00	5A/50A dual-use connector output lead integrated type
	WCTF-100A-K	100A connector output lead included
	WCTF-200A-K	200A connector output lead included
	WCTF-400A-K	400A connector output lead included
	WCTF-600A-K	600A connector output lead included

18. Warranties

- 18-1. Warranty period**
The warranty period of this product is one year after delivery.
- 18-2. Warranty Coverage**
If a malfunction occurs due to our fault within the warranty period, we will provide a replacement or repair the defective product free of charge.
However, if the cause of the failure falls under the following, it will be excluded from the scope of this warranty.
- (1) When the product is used in a manner that deviates from the conditions, environment, and handling described in this instruction manual.
 - (2) In the event of modification or repair of the structure, performance, specifications, etc. by someone other than the Company.
 - (3) When caused by a cause other than this product
 - (4) When it could not be foreseen at the level of science and technology at the time of shipment by the Company.
 - (5) In the event of other causes that are not the responsibility of the Company, such as natural disasters, disasters, or force majeure.

The warranty referred to here is limited to the warranty of the product alone, and damage caused by the failure or defect of the product shall be excluded from the warranty.

Limitation of Liability
Under no circumstances shall the Company be liable for any damage caused by this product.

19. Mode of operation

- The instrument has the following two modes:
- (1) Measurement mode
Power is measured from the values of voltage and current inputs, and the output of unit pulses or the sum of digital inputs is performed. In addition, the measured value is displayed.
*Voltage-less measurement
This is a mode for measuring power using only current input.
As with the normal measurement mode, it displays measurement values with unit pulse output or pulse input.
Power is calculated using the external VT rating, power factor setting, and the measured current value.
However, a voltage input of at least 50V is required for product activation.
- (2) Setting mode
This mode performs settings changes, simple miswiring diagnostics, and internal error diagnostics.
Settings changes will be applied collectively when transitioning from this mode to another mode.
Except for diagnostic operations, measurement, pulse output, and pulse input operations will be performed using the previously configured settings during setting adjustments.

20. Indication of measurement mode

You can download the "User's Manual" that illustrates the details of the operation settings and specific setting examples from our website
<https://www.watanabe-electric.co.jp/en/> .
Please refer to it in conjunction with this document.

After power-up, the 7SEG LED displays the measured amount of active energy in the A circuit.

- 20-1. Circuit switching**
Each time the MODE/▷ button is pressed, the circuit A → circuit B → circuit C → circuit D → (1 input) are switched.
* In the case of WMS-HE2DO, the digital/pulse input item is not displayed.
Regardless of the measured value displayed before the circuit switching, the active power amount will be displayed after the circuit switching.

Depending on the setting of the phase line classification, the circuits that can be measured and displayed differ as shown in the table below.
Circuits that cannot be measured or displayed are skipped and not displayed even if the [MODE/▷] button is pressed. It also does not display the target circuit that has been disabled.
* The default circuit enable/disable setting for circuit B ~ circuit D is disabled.

O measurable circuit by phase line classification					
Electrical systems	Max. circuit	Circuit A	Circuit B	Circuit C	Circuit D
Single-phase 2-wire	4 circuits	○	○	○	○
Single-phase 3-wire	2 circuits	○		○	
Three-phase 3-wire	2 circuits	○		○	
Three-phase 4-wire	1 circuit	○			
Single-phase 2-wire branched from Single-phase 3-wire	4 circuits	○	○	○	○
Single-phase 3-wire + Single-phase 2-wire	1P3W: 1 circuits	○			
	1P2W: 2 circuits			○	○

- 20-2. Switching of measurement values (switching of measurement elements of each circuit)**
When you press the [▽] button, the next measurement element is switched to the next measurement element, and each time you press the [△] button, the active power amount (power received), → the active power → active power the current → current → voltage → power factor → conversion value → (DI1 ON time integration), → (DI1 pulse integration number), → (DI2 ON time integration), → (DI2 pulse integration number) are switched.
* () shows only WMS-HE2DI
* From any screen in the measurement mode, press and hold the [ENTER] button for 2 seconds to move to the setting mode.

List of measurement items								
Measure ment item details				Mesurement parameters				
No.	Name	Description	Display	Upper display		Lower display	Unit	
A-1~D-1	Active Energy (Receiving)	Display Active Energy (Receiving)	KWH	A.1	Circuit A : 1	Most Significant Digit(4 digits)	【KWh】	
				A.2	Circuit A : 2	Middle Digit(4 digits)		
				A.3	Circuit A : 3	Least Significant Digit(4 digits)		
A-2~D-2	Active Power	Display Active Power	KW	A.1	Circuit A : 1	Most Significant Digit(3 digits)	【KW】	
				A.2	Circuit A : 2	Least Significant Digit(3 digits)		
A-3~D-3	Reactive Power	Display Reactive Power	KVAR	A.1	Circuit A : 1	Most Significant Digit(3 digits)	【Kvar】	
				A.2	Circuit A : 2	Least Significant Digit(3 digits)		
A-4~D-4	Current	Display Current	A	1P2W	None	Circuit A : 1 Phase Current	1 phase Current Measurement	【A】
					A.1	Circuit A : 1 Phase Current	1 phase Current Measurement	
					A.2	Circuit A : 2 Phase Current	2 phase Current Measurement	
				1P3W	A.N	Circuit A : N Phase Current	N phase Current Measurement	
					A.R	Circuit A : R Phase Current	R phase Current Measurement	
					A.T	Circuit A : T Phase Current	T phase Current Measurement	
				3P3W	A.S	Circuit A : S Phase Current	S phase Current Measurement	
					A.R	Circuit A : R Phase Current	R phase Current Measurement	
					A.T	Circuit A : T Phase Current	T phase Current Measurement	
				3P4W	A.S	Circuit A : S Phase Current	S phase Current Measurement	
					A.N	Circuit A : N Phase Current	N phase Current Measurement	
					1P2W	None	Circuit A : 1 Phase Voltage	
A-5~D-5	Voltage	Display Voltage	V	1P3W	A.1-N	Circuit A : 1 Phase Voltage	1-n phase Voltage Measurement	【V】
					A.2-N	Circuit A : 2 Phase Voltage	2-n phase Voltage Measurement	
					A.1-2	Circuit A : 1-2 Phase Voltage	1-2 phase Voltage Measurement	
				3P3W	A.R-S	Circuit A : R-S Phase Voltage	R-S phase Voltage Measurement	
					A.S-T	Circuit A : S-T Phase Voltage	S-T phase Voltage Measurement	
					A.1-R	Circuit A : 1-R Phase Voltage	T-R phase Voltage Measurement	
				3P4W	A.R-N	Circuit A : R-N Phase Voltage	R-N phase Voltage Measurement	
					A.S-N	Circuit A : S-N Phase Voltage	S-N phase Voltage Measurement	
					A.T-N	Circuit A : T-N Phase Voltage	T-N phase Voltage Measurement	
				A.R-S	Circuit A : R-S Phase Voltage	R-S phase Voltage Measurement		
				A.S-T	Circuit A : S-T Phase Voltage	S-T phase Voltage Measurement		
				A.1-R	Circuit A : 1-R Phase Voltage	T-R phase Voltage Measurement		
A-6~D-6	Power factor	Display Power factor	PF	A.COS	Circuit A : Power factor	power Factor Measurement	【%】	
A-7~D-7	Conversion value	Display Conversion value	RATE	A.1	Circuit A : 1	Most Significant Digit(4 digits)	-	
				A.2	Circuit A : 2	Middle Digit(4 digits)		
				A.3	Circuit A : 3	Least Significant Digit(4 digits)		
DI-1	DI1 ON-Time Totalization	Display DI1 ON-Time Totalization	ONH1	DI1.1	DI1 ON-Time Totalization:1	Most Significant Digit(3 digits)	【min】	
DI-2	DI1 Pulse Totalization	Display DI1 Pulse Totalization	PCN1	DI1.1	DI1 Pulse Totalization:1	Most Significant Digit(4 digits)	【Cnt】	
				DI1.2	DI1 Pulse Totalization:2	Least Significant Digit(4 digits)		
DI-3	DI2 ON-Time Totalization	Display DI2 ON-Time Totalization	ONH2	DI2.1	DI2 ON-Time Totalization:1	Most Significant Digit(3 digits)	【min】	
				DI2.2	DI2 ON-Time Totalization:2	Least Significant Digit(4 digits)		
DI-4	DI2 Pulse Totalization	Display DI2 Pulse Totalization	PCN2	DI1.1	DI2 Pulse Totalization:1	Most Significant Digit(4 digits)	【Cnt】	
				DI1.2	DI2 Pulse Totalization:2	Least Significant Digit(4 digits)		

21. Indication of setting mode

You can download the "User's Manual" that illustrates the details of the operation settings and specific setting examples from our website
<https://www.watanabe-electric.co.jp/en/> .
Please refer to it in conjunction with this document.

- 21-1. Transition to setting mode**
Hold down the [ENTER] button on the measurement value screen in measurement mode for 2 seconds.
You will enter the setting mode and display the first setting item, the phase classification setting screen.

- 21-2. Switching the setting type**
When transitioning from the measurement mode to the setting mode, the initial screen will display the common settings for circuits A to D.
Each time the 【MODE/▷】 button is pressed, the screen will switch in the following order: Common settings for circuits A to D → Circuit A settings → (Circuit B settings) → (Circuit C settings) → (Circuit D settings) → Modbus communication settings → (Pulse output settings or pulse input settings) → Other settings.

*Circuits A to D have different display circuits depending on the phase line division settings.

- 21-3. Set each setting item**
Press the [ENTER] button on each settings type screen to switch to the settings item screen for that type.
Press the [▽] button to move to the next setting item, and press the [△] button to move to the previous setting item.
For details about each setting item, please refer to the "User's Manual."
In each setting item, select a value and press the confirm button to temporarily finalize the selected setting value. Additionally, you can navigate through setting items using the up and down keys.

- 21-4. Confirm the settings and return to the measurement mode.**
Press and hold the 【ENTER】 button for 2 seconds.
The measurement mode screen will appear, and at this point, the provisionally determined settings from Section 21-3 will be collectively applied to the operation.
Additionally, pressing and holding the 【MODE/▷】 button for 2 seconds will discard the settings and return to the measurement mode.

List of setting items					
No.	Setting Item			Unit	Initial Value
1 Unit (circuit) Common Settings: U AL					
1-1	Electrical systems	1-phase 2-wire / 1-phase 3-wire / 3-phase 3-wire / 3-phase 4-wire / 1-phase 2-wire branched from 1-phase 3-wire / 1-phase 3-wire+1-phase 2-wire	-		3P3W
1-2	Rated Voltage Input	110V / 220V / 440V	[V]		440V
1-3	External VT Rating	Setting Range (Numeric Input): 110-77000V	[V]		440V
2-5 Unit (Circuit) individual Settings: U A to U D					
2-1~5-1	Circuit Enable/Disable	OFF / ON	-		OFF
2-2~5-2	Rated Current Input	5A /50A /100A /200A /400A /600A	[A]		600A
2-3~5-3	External CT Rating	Setting Range (Numeric Input): 5~9999A	[A]		600A
2-4~5-4	Digital Output Terminal Assignment	OFF / OU1 / OUT2	-		OFF
2-5~5-5	Current Low-cut	Setting Range (Numeric Input): 0.0-9.9%	[%]		0.10%
2-6~5-6	Measurement Voltage Setting	Between 1-N / 2-N / 1-2	-		1-N
2-7~5-7	Voltage-Less Measurement ON/OFF	OFF / ON	-		OFF
2-8~5-8	Virtual Power Factor	Setting Range (Numeric Input): 0.0~100.0%	[%]		100.0
2-9~5-9	Conversion Coefficient	Setting Range (Numeric Input): 0.000~9.999	-		0.555
2-10~5-10	Energy Preset	Setting Range (Numeric Input): 0.000~999,999,999kWh	[kWh]		0.000kWh
2-11~5-11	Total Energy Reset (Individual Circuit)	Execute Reset of Total Energy	-		-
2-12~5-12	Quick Wiring Error Diagnosis	Display Diagnostic Result	-		-
6 Modbus Communication Settings: RTU					
6-1	Address	Setting Range (Numeric Input): 0-99	-		0
6-2	Baud rate	4800 / 9600 / 19200 / 38400	[bps]		19200bps
6-3	Stop Bit	1 / 2	-		1
6-4	Parity	NONE / ODD / EVEN	-		EVEN
6-5	Transmission delay time	Setting Range (Numeric Input): 0-99 ms	[ms]		0 ms
7 Digital / Pulse output Settings : POUT (For WMS-PE2DO Only)					
7-1-7-14	DO1 / DO2 Output Operation Selection	OFF / Pulse Totalization Output / Alarm Operation	-		OFF
7-2-7-15	DO1 / DO2 Unit Pulse Weight Setting	0.001 kWh / 0.01kwh / 0.1kwh / 0.5kwh / 1kwh / 10kwh / 100kwh	[kWh]		0.1kwh
7-3-7-16	DO1 / DO2 Pulse Output Width Setting	100 ms / 250ms / 500ms / 1000ms	[ms]		1000ms
7-4-7-17	DO1/DO2 Alarm Circuit Assignment	1-phase 2-wire	Circuit A / Circuit B / Circuit C / Circuit D	-	Circuit A
		1-phase 3-wire,	Circuit A / Circuit C		
		3-phase 3-wire			
		3-phase 4-wire	Circuit A		
7-4-7-17	DO1/DO2 Alarm Circuit Assignment	1-phase 2-wire branched from	Circuit A / Circuit B / Circuit C / Circuit D	-	Circuit A
		1-phase 3-wire			
		1-phase 3-wire +1-phase 2-wire	Circuit A / Circuit C / Circuit D		
7-5-7-18	DO1/DO2 Alarm HI/LO Setting	HI / LO	-		HI
7-6-7-19	DO1/DO2 Alarm kW/A Setting	1-phase 2-wire	kW / 1-phase current	-	kW
		1-phase 3-wire	kW / 1-phase current / 2-phase current/ N-phase current		
		3-phase 3-wire	kW / R-phase current / T-phase current/ S-phase current		
		3-phase 4-wire	kW / R-phase current / T-phase current/ S-phase current / N-phase current		
7-6-7-19	DO1/DO2 Alarm kW/A Setting	1-phase 2-wire branched from	kW / 1-phase current	-	kW
		1-phase 3-wire	kW Circuit A : 1 / 2 / N-phase current		
		+1-phase 2-wire	Circuit C / D : 1-phase current		
7-7-7-20	DO1/DO2 Alarm HI Threshold(Active Power)	Setting Range (Numeric Input): ±9,999,999 kW	[kW]		9999,999kW
7-8-7-21	DO1/DO2 Alarm HI Threshold(Phase Current)	Setting Range (Numeric Input): 0000-9999 A	[A]		999.9A
7-9-7-22	DO1/DO2 Alarm LO Threshold(Active Power)	Setting Range (Numeric Input): ±9,999,999 kW	[kW]		-9999,999kW
7-10-7-23	DO1/DO2 Alarm LO Threshold(Phase Current)	Setting Range (Numeric Input): 0000-9999 A	[A]		0.0A
7-11-7-24	DO1/DO2 Hysteresis Width(Active Power)	Setting Range (Numeric Input): 0-9,999,999 kW	[A]		0.000kW
7-12-7-25	DO1/DO2 Hysteresis Width(Phase Current)	Setting Range (Numeric Input): 0000-1000 A	[A]		0.0A
7-13-7-26	DO1/DO2 Output Off Delay	Setting Range (Numeric Input): 0-99 s	[s]		0.0s
7-27-7-28	DO1/DO2 Simulated Output	OFF / ON	-		OFF
7 Digital / Pulse Input Settings: PIN (For WMS-PE2DI Only)					
7-1-7-7	DI1/DI2 Pulse Totalization Preset	Setting Range (Numeric Input): 0-99,999,999 cnt	[cnt]		0cnt
7-2-7-8	DI1/DI2 ON-Time Totalization Preset	Setting Range (Numeric Input): 0-5,999,999 minutes	[min]		0min
7-3-7-9	DI1/DI2 Pulse Totalization Reset	Execute Pulse Totalization Reset	-		-
7-4-7-10	DI1/DI2 ON-Time Totalization Reset	Execute ON-Time Totalization Reset	-		-
7-5-7-11	DI1/DI2 Pulse Totalization Coefficient	Setting Range (Numeric Input): 0.001-100.000	-		1.000
7-6-7-12	DI1/DI2 Pulse Totalization Max. Value	Setting Range (Numeric Input): 1-99,999,999 cnt	[cnt]		99999999cnt
7-13-7-14	DI1/DI2 Simulated Input	OFF / ON	-		OFF
8 Other Setting: ETC					
8-1	Auto Display OFF	OFF / 1.0 min / 5.0 min / 10.0 min	[min]		OFF
8-2	Initialize Settings	Execute initialization of settings (Factory default settings)	-		-
8-3	Communication Reception Test	Execute communication receive test	-		-
8-4	Communication Transmission Test	Execute communication transmit test	-		-
8-5	Reset Total Energy (All)	Reset Total energy for all circuit	-		-
8-6	Setting Protection	OFF / ON	-		OFF
8-7	Brightness Adjustment	Bright / Standard / Dark	-		Standard