KM50-C Smart Power Monitor

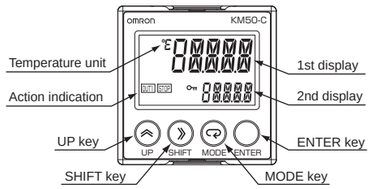
OMRON

EN **INSTRUCTION MANUAL**

OMRON Corporation

9911216-0 A

■Nomenclature



■Display Screen

1) 1st display
Displays the measurement value or type of setting data.
2) 2nd display
Displays the unit or the parameter name of the measurement data or setting data.
3) Operation display
・OUT1: The light turns ON in conjunction with the output set to the OUT1 terminal.
・STOP: Lights ON when power is supplied after the time measurement function stops following back-up power failure during power OFF. Lights OFF by setting time data. When using the product with lights ON, measurement data log cannot be recorded.
・Oᴛ (Key): Lights ON at protect setting.
4) Temperature unit
When selecting Celsius in the temperature unit setting, °C is shown.
When choosing Fahrenheit, °F is shown.

■Segment display

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R
7SEG	A	b	C	d	E	F	G	H	i	J	P	L	n	o	o	P	q	r
11SEG	A	b	C	d	E	F	G	H	i	J	K	L	M	N	o	P	Q	R

	S	T	U	V	W	X	Y	Z	0	1	2	3	4	5	6	7	8	9
7SEG	5	t	U	u	W	x	y	z	0	1	2	3	4	5	6	7	8	9
11SEG	5	t	U	V	W	x	y	Z	0	1	2	3	4	5	6	7	8	9

■Basic usage

Setting Examples

Applicable circuit type: 1-phase 3-wire
Dedicated CT type: 5ACT
Time: March 5, 2010, 17:15

A. After checking the wiring, turn ON the power supply.

"PWSOC" is displayed and EEPROM is read ("WAIT" is displayed for 16 sec max). When the power is turned ON for the first time, "E-t 1" is displayed and STOP turns ON because time has not been set. 3 sec later, active power in measurement mode is displayed. (STOP remains ON).

B. Set applicable circuit type to 1-phase 3-wire.

1. Press the MODE key for more than 3 sec to go to applicable circuit type "00.tYP" in operation setting mode.
2. Press the UP key to shift to setting state. Press the UP key to change the applicable circuit type from "3P3W" to " 1P3W", and then press the ENTER key to confirm.

C. Set dedicated CT type to 5ACT.

1. Press the SHIFT key to move to dedicated CT type "0 1.C.RG".
2. Press the UP key to shift to setting state. Press the UP key to change the dedicated CT type from " 100A" to "5A", and then press the ENTER key.

D. Set the time to March 5, 2010, 17:15.

To use the log function, time setting is required.
1. Press the SHIFT key to move to time setting " 1 1.tim".
2. Press the UP key to shift to setting state.
Check that the year is "20 10", and then press the ENTER key.
3. Change the value of Month/Date with the UP key and shift the digit with the SHIFT key to change the value from "0 1/0 1" to "03/05", and then press the ENTER key.
4. Change the value of Hour-Minute with the UP key and shift the digit with the SHIFT key to change the value from "00-00" to " 17- 15", and then press the ENTER key. The content of the time setting will be saved and STOP will be turned OFF.
5. Press the MODE key for more than 3 sec to move to measurement mode (measurement start). When you move to measurement mode, the setting will be saved and "SAVE" is displayed.
This completes the basic settings.

■Mode configuration and key operation

1) Mode configuration

Mode Group			Meaning	Necessity of operation and setting
Measurement mode		Basic level	Read the measurement data of the basic level	Operate only at reading
		Pro level	Read the measurement data of the Pro level	Operate only at reading
Protect setting mode			Limit the function	Set only when needed
Setting mode	Operation setting mode	Basic level	Set the basic level function	Setting required at first setting
		Pro level	Set the Pro level function	Set only when needed
	Communication setting mode		Set the communication function	Set only when using the communication function

2) Key operation
Monitoring state is a state in which setting value is displayed in protect setting mode and setting mode.
Setting state is a state in which setting can be changed.

Symbol	Basic Meaning	Mode	State	Operation	Description
ENTER key	・Mode switching ・Determination	Measurement mode	Measurement history (current day)	press for more than 3 sec	Clear the currently displayed MAX and MIN value of the present day.
		Protect setting mode, Setting mode	Setting state	click	Determine the setting value.
		Operation setting mode	Monitoring state	click	Move to communication setting mode.
		Communication setting mode	Monitoring state	click	Move to operation setting mode.
MODE key	・Mode switching ・Cancel	Measurement mode	Present measurement value, measurement history	press for more than 3 sec	Move to operation setting mode.
			Measurement history	click	Move to present measurement value.
		Setting mode	Monitoring state	press for more than 3 sec	Move to measurement mode.
			Setting state	click	Cancel setting state.
		Measurement mode, Setting mode	Pro level	click	Move to "PROLV" of the basic level.
SHIFT key	・Transition	Measurement mode	Present measurement value	click	Change parameters.
			Measurement history	click	Switch measurement history display.
		Setting mode	Monitoring state	click	Change parameters.
			Setting state	click	Change digits.
UP key	・Shift to setting state ・Change the setting value	Measurement mode	Present measurement value	click	Move to measurement history.
			Measurement history	click	Move from measurement history.
		Setting mode	Monitoring state	click	Shift to setting state.
			Setting state	click	Change the setting value.
		Measurement mode, Setting mode	Basic level ("PROLV" remains displayed)	click	Move to Pro level.
MODE+SHIFT (Press the SHIFT key while holding the MODE key)	・Reverse transition	Measurement mode	Present measurement value	click	Change parameters in reverse.
			Measurement history	click	Switch the measurement history display.
		Setting mode	Monitoring state	click	Change parameters in reverse.
			Setting state	click	Change digits in reverse.
MODE+UP (Press the UP key while holding the MODE key)	・Change the setting value in reverse	Measurement mode	Measurement history	click	Transit measurement history in reverse.
		Setting mode	Setting state	click	Change the setting value in reverse.
MODE+ENTER	・Mode switching	Measurement mode	Present measurement value, measurement history	press for more than 3 sec	Move to protect setting mode.
		Protect setting mode	Monitoring state	press for more than 3 sec	Move to measurement mode.

■Setting mode

Operation setting mode Basic level

Item	Setting range (1st display)	2nd display	Initial value	Remarks
Applicable circuit type	1P2W, 1P3W, 3P3W	00.tYP	3P3W	1P2W: 1-phase 2-wire, 1P3W: 1-phase 3-wire, 3P3W: 3-phase 3-wire
Dedicated CT type	5A, 50A, 100A, 200A, 400A, 600A	0 1.C.RG	100A	
Rated primary side current value	5 to 9999	02.5Ct	5	Effective only when the dedicated CT type is 5A.
VT setting — VT primary side voltage value	NONE, 220, 440, 3300, 6600, 1 1000, 22000, 33000	03.V.RG	NONE	When the simple measurement is ON, sequentially measure the reactive voltage, VT primary voltage, and VT secondary voltage. Unit: V
VT setting — VT secondary side voltage value	1 10, 220	V.RG2	1 10	
Current low-cut value	0. 1 to 19.9	04.CUt	0.6	Unit: %
Pulse output unit	1, 10, 100, 1k, 2k, 5k, 10k, 20k, 50k, 100k	05.PLS	100	Unit: Wh
Display refresh period	oFF, 0.5, 1.0, 2.0, 4.0	06.REF	1.0	oFF is instantly updated. Unit: Sec
Averaging times.	oFF, 2, 4, 8, 16, 32, 64, 128, 256, 512, 1024	07.AVG	8	
Simple measurement setting — Simple measurement	oFF, oN	08.SMP	oFF	At ON, set voltage and power factor, Frequency is 50 Hz fixed.
Simple measurement setting — Fixed voltage value.	0.0 to 9999.9	V.Lt	1 10.0	Can be set only at simple measurement ON.
Simple measurement setting — Fixed power factor value.	0.00 to 1.00	PF	1.00	Can be set only at simple measurement ON.
CO_2 conversion factor	0.000 to 99.999	10.Co2	0.387	Unit: kg-CO_2/kWh
Charge conversion setting (Rate setting and price unit setting)	0.000 to 99.999 JPY, USd, EUR, CNY, KRW A to Z, 0 to 9, /, -, . (Space)	11.CHG	10.000 JPY	Sequentially set the rate and price unit display. 4-digit price unit can be set.
Pulse conversion 1 setting (Pulse conversion target, factor, decimal point position and display unit)	C-t.d, C- 1.d, C-2.d, C-t.R, C- 1.R, C-2.R 0000 to 9999 0000, 000.0, 00.00, 0.000 A to Z, 0 to 9, /, -, . (Space)	12.CV 1	C- 1.d 000 1 0000 M3- 1	Sequentially set the pulse conversion target, conversion factor, display unit. 4-digit display unit can be set. C-t.d: Sum of pulse input counts C- 1.d: Pulse input count 1 C-2.d: Pulse input count 2 C-t.R: Sum of total pulse input counts C- 1.R: Total pulse input count 1 C-2.R: Total pulse input count 2
Pulse conversion 2 setting (Pulse conversion target, factor, decimal point position and display unit)	C-t.d, C- 1.d, C-2.d, C-t.R, C- 1.R, C-2.R 0000 to 9999 0000, 000.0, 00.00, 0.000 A to Z, 0 to 9, /, -, . (Space)	13.CV2	C-2.d 000 1 0000 M3-2	
Time setting (Year, month/day, hour/minute)	20 10 to 2099 0 1/0 1 to 12/3 1 00-00 to 23-59	14.tim	20 10 0 1/0 1 00-00	Year, month/day, and hour/minute should be set continuously. If it was canceled in process, all values will return to previous values. As soon as setting hour and minute, the settings are reflected.
Initialization	SEt, MAX, MIN, tNtEG, M.PRo, tiG, ALL	15.tNt	SEt	SEt: Initialize all setting values except time setting. MAX: Initialize all the max value of parameters of the present day. MIN: Initialize all the min value of parameters of the present day. tNtEG: Initialize the total integral power consumption. M.PRo: Initialize the measurement values in the Pro level in measurement mode of the present day. tiG: Initialize all the measurement histories. ALL: Initialize set values other than clock time and all measurement histories.
Moving average time Setting	00 1~ 120	16.AVt	120	Set the moving average time of the Moving average Current. Cancel it during the input or set a value out of the range, come back before a change.

Operation setting mode Pro level

Item	Setting range (1st display)	2nd display	Initial value	Remarks
Event input setting	P.CSP, H-oN, 3-St	30.EC5	P.CSP	P.CSP: Electric power consumption rate, H-oN: Pulse input ON time, 3-St: 3-STATE
Event input 1 NPN/PNP input mode setting	NPN, PNP	3 1.PN 1	PNP	NPN: None voltage input PNP: Voltage input
Event input 2 NPN/PNP input mode setting	NPN, PNP	32.PN2	PNP	NPN: None voltage input PNP: Voltage input
Event input 1 N-O/N-C input mode setting	N-o, N-C	33.CN 1	N-o	N-o: Normally open N-C: Normally close
Event input 2 N-O/N-C input mode setting	N-o, N-C	34.CN2	N-o	N-o: Normally open N-C: Normally close
Measurement start time (*1)	00-00 to 23-59	35.StC	00-00	Time setting later than the measurement end time cannot be made.
Measurement end time (*1)	00-0 1 to 24-00	36.EtC	24-00	Time setting earlier than the measurement start time cannot be made.
Output terminal 1 function setting	oFF, P.oUt, ALARM	50.o 1	P.oUt	P.oUt: Integral power consumption pulse output, ALARM: Alarm output, When selecting "ALARM", the screen moves to the ON/OFF setting of various alarm outputs.
Active power alarm output (Upper/lower thresholds, hysteresis and OFF-/ON-delay)	0.0 to 150.0 0.0 to 19.9 0.0 to 99.9	52.P.AL (*2)	See the remarks.	Sequentially set the upper/lower thresholds, hysteresis and OFF-/ON-delay. Upper threshold: 80.0%, Lower threshold: 0.0%, Hysteresis: 5.0%, OFF-delay: 3.0 sec, ON-delay: 0.0 sec
Regenerated power alarm output (Upper/lower thresholds, hysteresis and OFF-/ON-delay)	0.0 to 150.0 0.0 to 19.9 0.0 to 99.9	53.r.AL (*2)	See the remarks.	Sequentially set the upper/lower thresholds, hysteresis and OFF-/ON-delay. Upper threshold: 80.0%, Lower threshold: 0.0%, Hysteresis: 5.0%, OFF-delay: 3.0 sec, ON-delay: 0.0 sec
Current alarm output (Upper/lower thresholds, hysteresis and OFF-/ON-delay)	0.0 to 120.0 0.0 to 19.9 0.0 to 99.9	54.A.AL (*2)	See the remarks.	Sequentially set the upper/lower thresholds, hysteresis and OFF-/ON-delay. Upper threshold: 110.0%, Lower threshold: 0.0%, Hysteresis: 5.0%, OFF-delay: 3.0 sec, ON-delay: 0.0 sec
Voltage alarm output (Upper/lower thresholds, hysteresis and OFF-/ON-delay)	0.0 to 120.0 0.0 to 19.9 0.0 to 99.9	55.V.AL (*2)	See the remarks.	Sequentially set the upper/lower thresholds, hysteresis and OFF-/ON-delay. Upper threshold: 110.0%, Lower threshold: 0.0%, Hysteresis: 5.0%, OFF-delay: 3.0 sec, ON-delay: 0.0 sec
Power factor alarm output (Upper/lower thresholds, hysteresis and OFF-/ON-delay)	0 to 100 0 to 19 0.0 to 99.9	56.PF.A (*2)	See the remarks.	Sequentially set the upper/lower thresholds, hysteresis and OFF-/ON-delay. Upper threshold: 100%, Lower threshold: 0%, Hysteresis: 5%, OFF-delay: 3.0 sec, ON-delay: 0.0 sec
Reactive power alarm output (Upper/lower thresholds, hysteresis and OFF-/ON-delay)	0.0 to 150.0 0.0 to 19.9 0.0 to 99.9	57.0.AL (*2)	See the remarks.	Sequentially set the upper/lower thresholds, hysteresis and OFF-/ON-delay. Upper threshold: 80.0%, Lower threshold: 0.0%, Hysteresis: 5.0%, OFF-delay: 3.0 sec, ON-delay: 0.0 sec
Integral power consumption saving selection	-W, VAR.d, VAR.G, VAR.A	60.C.SL	-W	-W: Integral regenerated power consumption VAR.d: Integral leading reactive power consumption VAR.G: Integral lagging reactive power consumption VAR.A: Integral total reactive power consumption
Automatic rotation setting — Automatic rotation	oFF, oN	61.Rtt	oFF	At ON, set the transition time.
Automatic rotation setting — Transition time	1 to 99	RtiM	3	Can be set only at automatic rotation ON.
Measurement parameter display selection	oFF, oN	62.d.SL	See the remarks.	Set it for each parameter of the measurement mode. For the charge conversion value, pulse conversion 1 and 2, integral regenerated power consumption, integral leading/lagging/total reactive power consumptions and simple temperature, these initial values are oFF.
Display lighting time	0 to 99	63.dSP	0	0 is always lighting, Unit: Min
Incorrect voltage wiring detection	oFF, oN	64.V-E	oN	
Simple temperature setting — Temperature unit	C, F	65.d-U	C	Sequentially set the temperature unit and the temperature correction value. C: Celsius, Unit: °C, F: Fahrenheit, Unit: °F
Simple temperature setting — Temperature correction value	-50.0 to 50.0	t.Ad	0.0	

*1 It applies to the pulse input count, power consumption rate, pulse input ON time.
*2 When thresholds or hysteresis is set, the operating value which is converted from the setting value (%) is displayed.

■Communication setting mode

Item	Setting range (1st display)	2nd display	Initial value	Remarks
Protocol select	CoMPF, Modb	80.PSL	CoMPF	CoMPF: CompoWay/F, Modb: Modbus
Unit No.	CompoWay/F: 0 to 99, Modbus: 1 to 99	8 1.U.no	1	
Baud rate	1.2k, 2.4k, 4.8k, 9.6k, 19.2k, 38.4k	82.bPS	9.6k	Unit: bps
Data bit length (*1)	7, 8	83.LEN	7	Unit: bit
Stop bit length (*2)	1, 2	84.Sbt	2	Unit: bit
Vertical parity	NONE, odd, EVEN	85.PRt	EVEN	
Time to wait for sending	0 to 99	86.SdW	20	Unit: ms

*1 When protocol is Modbus, data bit length is 8-bit fixed.
*2 When protocol is Modbus, stop bit length cannot be set due to automatic setting.
When vertical parity is NONE, the length is 2, when vertical parity is ODD or EVEN, the length is 1.

■Protected mode

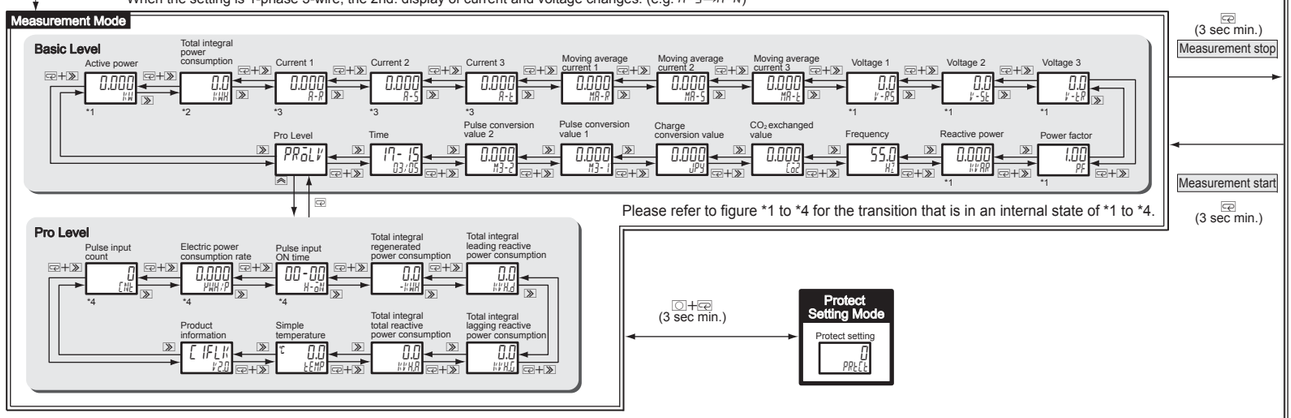
Setting content	Limit content				
	Displayed value transition	Move to setting mode	Move to pro level	Clear measurement history	Change setting content
0	Yes	Yes	Yes	Yes	Yes
1	Yes	Yes	Yes	No	No
2	Yes	Yes	No	No	No

Yes: Permission / No: Prohibited

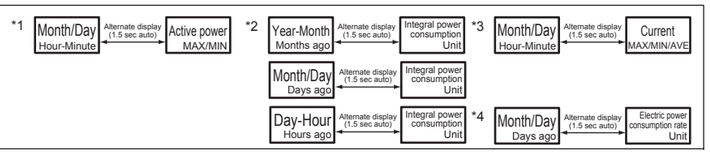
■State Transition

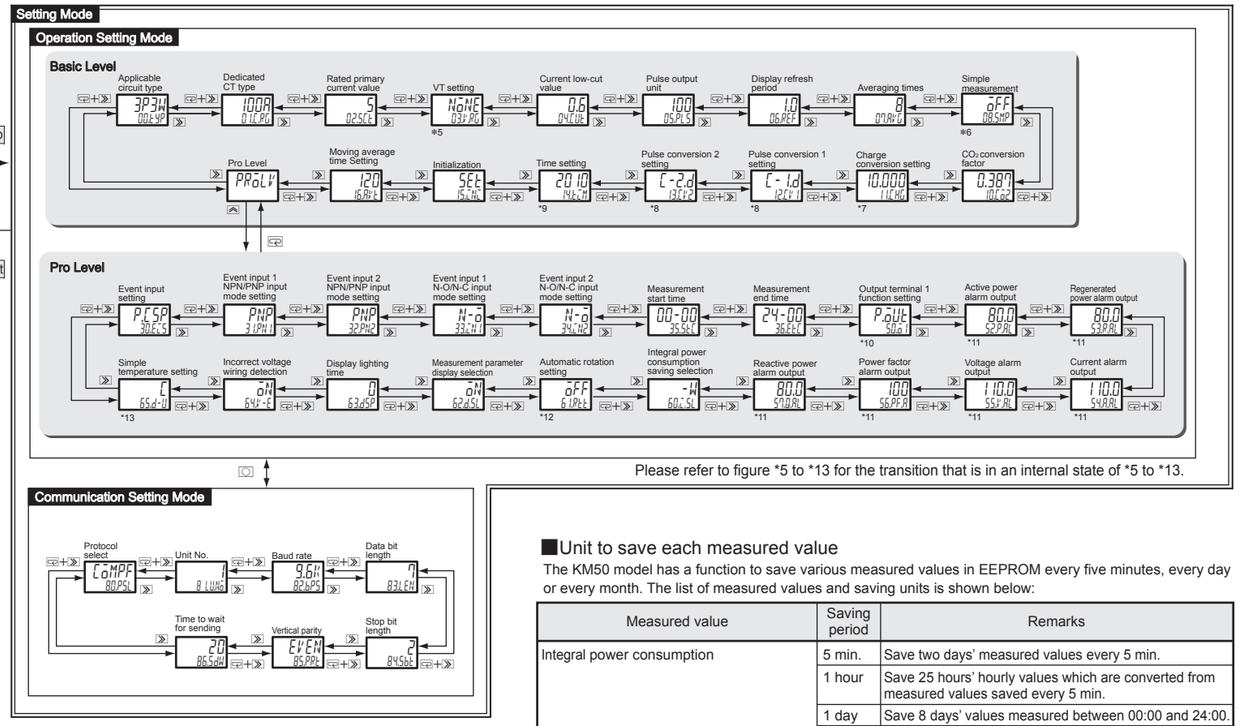
Power ON

*Example of 3-phase 3-wire
When the setting is 1-phase 2-wire, the current 2, 3 and the voltage 2, 3 are not displayed.
When the setting is 1-phase 3-wire, the 2nd. display of current and voltage changes. (e.g. R-S→R-N)



The measurement mode can display a past measured value. (*1 to *4)
While it is in condition to display a past measured value, display the date and time and a measured value in turn.
Please refer to a right figure.





■Unit to save each measured value

The KM50 model has a function to save various measured values in EEPROM every five minutes, every day or every month. The list of measured values and saving units is shown below:

Measured value	Saving period	Remarks
Integral power consumption	5 min.	Save two days' measured values every 5 min.
	1 hour	Save 25 hours' hourly values which are converted from measured values saved every 5 min.
	1 day	Save 8 days' values measured between 00:00 and 24:00.
	1 month	Save 13 months' values measured for a month.
Active power, current, voltage and power factor (Maximum and minimum values)	1 day	Save 8 days' values measured between 00:00 and 24:00. (After saving, measured values are reset.)*
Moving average current (Only the maximum values)	—	Save the current maximum values of the moving average time. (The moving average current with a product Ver.3.0.)
Pulse input count	5 min.	Save two days' measured values every 5 min.
Electric power consumption rate Pulse input ON time	1 day	Save 8 days' values measured between 00:00 and 24:00.
Integral regenerated power consumption Integral reactive power consumption	5 min.	Save two days' measured values every 5 min. Save only items selected in the setting.
Total pulse count inputs	5 min.	Overwrite save the measured value every 5 min.

Note 1. At the time of power failure, the clock time data is retained for 7 days.
Note 2. User can check the data every 5 min. only through communication.

■Error indication

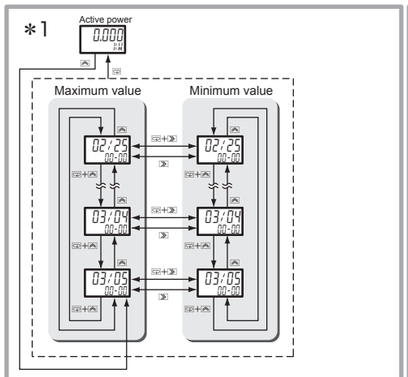
Description of error	Display	Operation	Restoration method
KM50 internal clock time has not been set.	E-t1	Indicates error at startup and "STOP" is turned ON. Measurement stops and operation disabled during error indication.	Time setting
Built-in memory error (RAM error) (*1)	E-M1	Measurement stop, operation disabled	Hardware repair (*2)
EEPROM error (*1)	E-M2	Measurement stop, operation disabled	Hardware repair (*2)
EEPROM data failed (*1)	E-M3	Measurement stop, operation disabled	Hardware repair (*2)
Calibration value error (*1)	E-M4	Measurement stop, operation disabled	Hardware repair (*2)
Excessive voltage input (*3)	E-S1	Displays error and measurement value alternately and continues measurement.	Restore the input signal within to the rated range.
Excessive current input (*3)	E-S2	Displays error and measurement value alternately and continues measurement.	Restore the input signal within to the rated range.
Frequency input error (*3)	E-S3	Displays error and measurement value alternately and continues measurement.	Restore the input signal (voltage) within to the rated range.
Incorrect wiring detection (*4)	E-S4	Displays error and measurement value alternately and continues measurement.	Correct the input signal (voltage) wiring in phase sequence.

*1 When any of E-M1 – M4 errors occurs, all outputs stop and any key operation is not accepted.
*2 Consult your OMRON representative.
*3 An error will occur when the input of voltage exceeds 110% of the rated value, current exceeds 120% of the rated value, frequency is below 45 Hz or more than 65 Hz.
When the voltage input is 20 V or less, frequency error isn't displayed.
When VT is set, the set value of secondary voltage becomes the rated voltage.
*4 For E-S4 error, only when the incorrect voltage wiring detection is set to ON, the error is displayed.

■Troubleshooting

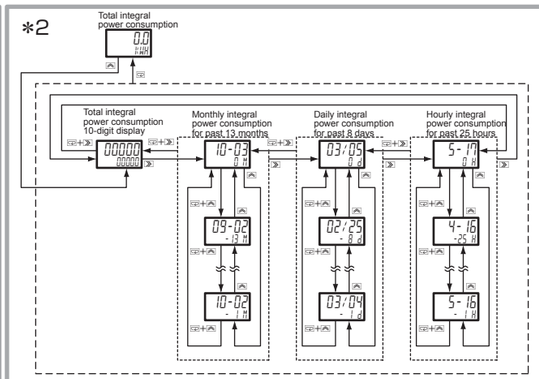
Phenomenon	Description	Point to be checked
Voltage and current are measured but electric power is not correctly measured.	Has CT (Current Transformer) been correctly wired (not in reverse)?	If negative electric power is measured, it might be all the CTs have been mounted oppositely. On the other hand, if the measured value is nearly 0, it might be one of the CTs has been mounted oppositely.
	Is the voltage phase sequence correct?	If the voltage phase sequence is not correct, electric power cannot be measured correctly. Perform correct wiring.

*1



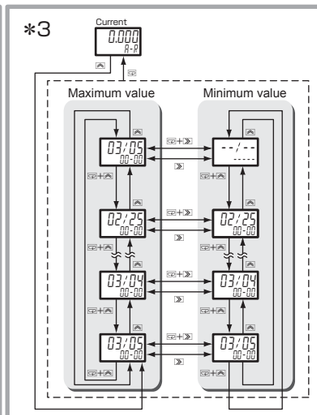
・Example of active power
・Alternately displays the time when maximum and minimum values were recorded, and the maximum and minimum values, for each day.
・Reactive power displays only the maximum and minimum values of the current day.

*2



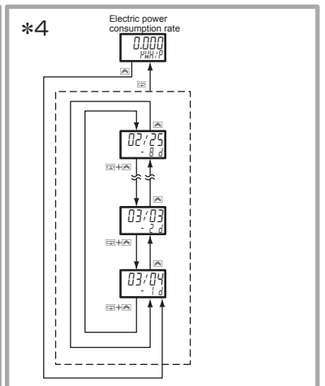
・On monthly display, the 1st. display alternately displays Year-Month of when the integral power consumption was recorded, and the value of integral power consumption. The 2nd. display alternately displays "how many months ago" and a unit.
・On daily display, the 1st. display alternately displays Month/Day of when the integral power consumption was recorded, and the value of integral power consumption. The 2nd. display alternately displays "how many days ago" and a unit.
・On hourly display, the 1st. display alternately displays Date-Hour of when the integral power consumption was recorded, and the integral power consumption. The 2nd. display alternately displays "how many hours ago" and a unit.

*3



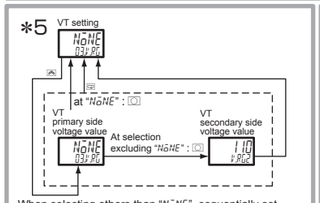
・Alternately displays the time when maximum and minimum values were recorded, and the maximum and minimum values, for each day.
・Moving average current displays only the maximum value.
minimum value is non-compliant. (display "-"mark)

*4



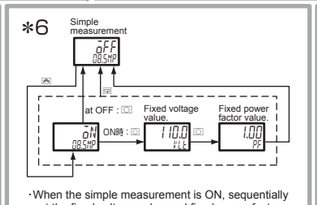
・Example of electric power consumption rate
・The 1st. display alternately displays Month/Day of when electric power consumption rate was recorded, and the electric power consumption rate. The 2nd. display alternately displays "how many days ago" and a unit.

*5



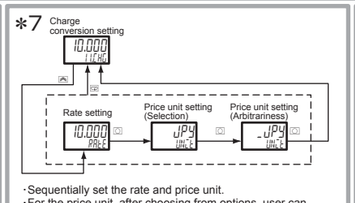
・When selecting others than "NONE", sequentially set VT primary side voltage and VT secondary voltage.

*6



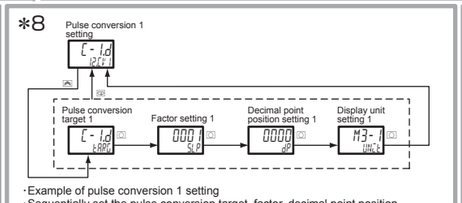
・When the simple measurement is ON, sequentially set the fixed voltage value and fixed power factor value.

*7



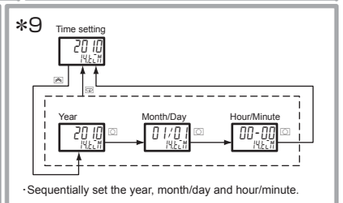
・Sequentially set the rate and price unit.
・For the price unit, after choosing from options, user can change it to any unit.

*8



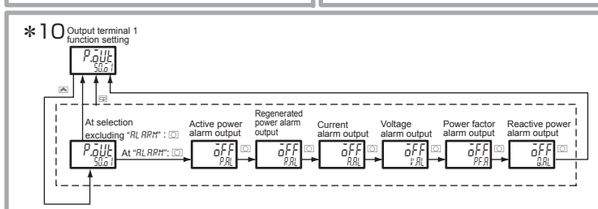
・Example of pulse conversion 1 setting
・Sequentially set the pulse conversion target, factor, decimal point position and display unit.

*9



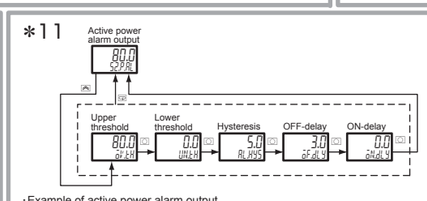
・Sequentially set the year, month/day and hour/minute.

*10



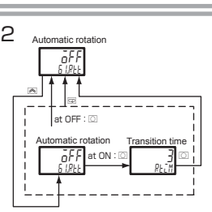
・Example of output terminal 1 function setting
・When selecting "ALARM", set each alarm to ON/OFF.

*11



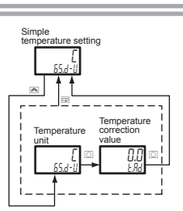
・Example of active power alarm output
・Sequentially set upper/lower thresholds, hysteresis and OFF-/ON-delay.
・The second displays of upper/lower thresholds and hysteresis switch to operating values calculated from the threshold after 1.5 sec.

*12



・When the automatic rotation is ON, set the transition time.

*13



・Sequentially set the temperature unit and temperature correction value.