DRW170799AC

Autonics

PANEL METER
MT4W SERIES
INSTRUCTION MANUAL

Thank you for choosing our Autonics products.
Please read the following safety considerations before use.

▣ Safety Considerations

※'Please observe all safety considerations for safe and proper product operation to avoid hazards
※ ⚠ symbol represents caution due to special circumstances in which hazards may occur

⚠ Warning Failure to follow these instructions may result in serious injury or death
⚠ Caution Failure to follow these instructions may result in personal injury or product damage.

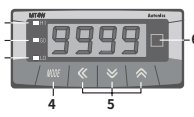
⚠ Warning

1. **Fail-safe device must be installed when using the unit with machinery that may cause serious injury or substantial economic loss. (e.g. nuclear power control, medical equipment, ships, vehicles, railways, aircraft, combustion apparatus, safety equipment, crime/disaster prevention devices, etc.)**
   Failure to follow this instruction may result in personal injury, economic loss or fire.
2. **Do not use the unit in the place where flammable/explosive/corrosive gas, high humidity, direct sunlight, radiant heat, vibration, impact, or salinity may be present.**
   Failure to follow this instruction may result in explosion or fire.
3. **Install on a device panel to use.**
   Failure to follow this instruction may result in fire or electric shock.
4. **Do not connect, repair, or inspect the unit while connected to a power source.**
   Failure to follow this instruction may result in fire or electric shock.
5. **Check 'Connections' before wiring.**
   Failure to follow this instruction may result in fire.
6. **Do not disassemble or modify the unit.**
   Failure to follow this instruction may result in fire or electric shock.

⚠ Caution

1. **When connecting the power/measurement input and relay output, use AWG 24(0.20mm²) to AWG 15(1.65mm²) cable and tighten the terminal screw with a tightening torque of 0.98 to 1.18N·m. Use proper cables for the rated load current.**
   Failure to follow this instruction may result in fire or malfunction due to contact failure.
2. **Use the unit within the rated specifications.**
   Failure to follow this instruction may result in fire or product damage.
3. **Use dry cloth to clean the unit, and do not use water or organic solvent.**
   Failure to follow this instruction may result in fire or electric shock.
4. **Keep the product away from metal chip, dust, and wire residue which flow into the unit.**
   Failure to follow this instruction may result in fire or product damage.

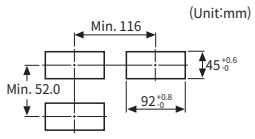
▣ Front Panel Identification



1. HI: High output indication of preset
2 GO: GO output indication of preset
3 LO: Low output indication of preset
4. MODE: MODE Key
5. ▽△: Control key
6. Unit label part
※There are no 1, 2, 3 output indication in Indication type.

▣ Panel Cut-Out

(Unit:mm)



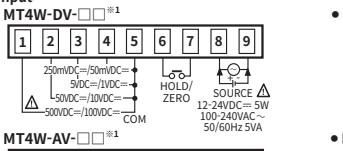
▣ Connections

※Use teminals of size specified below.
※Use the Copper-conductor wire with the temperature class 60°C.

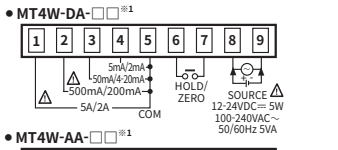
	a	b
<Forked>	Min. 3.5mm	Max. 7.0mm

<Input>

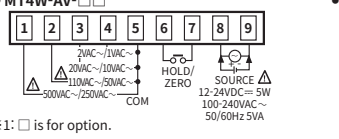
- **MT4W-DV-□□**※1



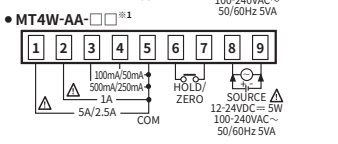
- **MT4W-DA-□□**※1



- **MT4W-AV-□□**※1



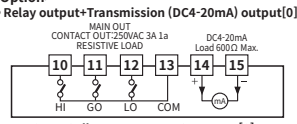
- **MT4W-AA-□□**※1



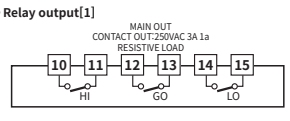
※1: □ is for option.

<Option>

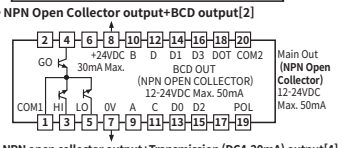
- **Relay output+Transmission (DC4-20mA) output[0]**



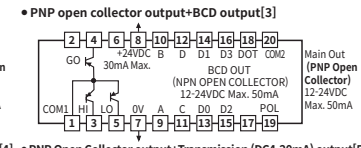
- **Relay output[1]**



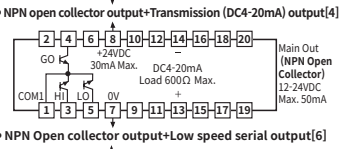
- **NPN Open Collector output+BCD output[2]**



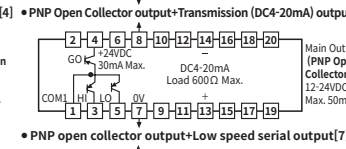
- **PNP open collector output+BCD output[3]**



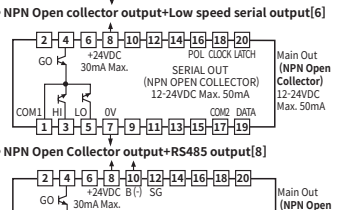
- **NPN Open Collector output+Transmission (DC4-20mA) output[4]**



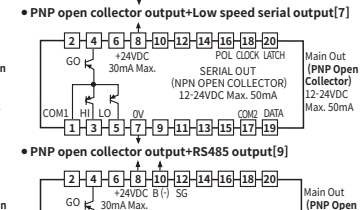
- **PNP Open Collector output+Transmission (DC4-20mA) output[5]**



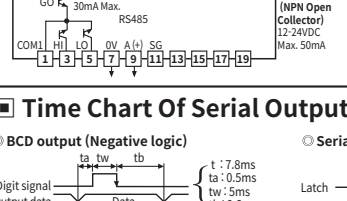
- **NPN Open collector output+Low speed serial output[6]**



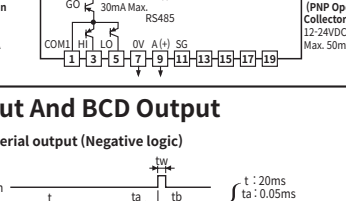
- **PNP open collector output+Low speed serial output[7]**



- **NPN Open Collector output+RS485 output[8]**

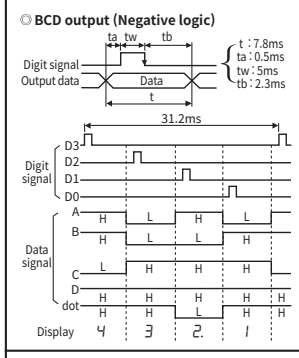


- **PNP open collector output+RS485 output[9]**

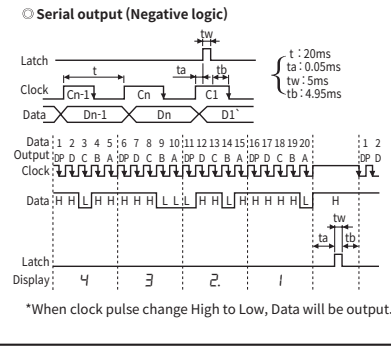


▣ Time Chart Of Serial Output And BCD Output

◎ **BCD output (Negative logic)**



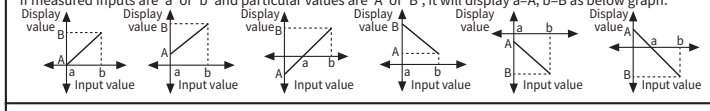
◎ **Serial output (Negative logic)**



*When clock pulse change High to Low, Data will be output.

▣ Prescale Function [PA1: H-SC/L-SC]

This function is to display setting (-1999 to 9999) of particular High/Low-limit value in order to display High/Low-limit value of measured input.
If measured inputs are 'a' or 'b' and particular values are 'A' or 'B', it will display a=A, b=B as below graph.



▣ Error Display Function

Display	Description
HHHH	Flashes when measurement input is exceeded the max. allowable input (110%)
LLLL	Flashes when measuremnet input is exceeded the min. allowable input (-10%)
d-HH	Turns ON when display input is exceeded the max. display range (9999) or H-SC setting value
d-LL	Turns ON when display input is exceeded the min. display range (-1999) or L-SC setting value
F-HH	Turns ON when input frequency is exceeded the max. display value of measured range
ouEr	Flashes when it exceeds zero range (±99)

※Error display is released automatically when it is in the measured and display range.
※'LLLL' is displayed when the input specification is DC.
※After flashing 'OVER' 2 times when it exceeds the zero range, it returns to RUN mode.

※The above specifications are subject to change and some models may be discontinued without notice.
※Be sure to follow cautions written in the instruction manual and the technical descriptions (catalog, homepage).

▣ Specifications

Model	MT4W-□□-4□	MT4W-□□-1□
Power supply	100-240VAC~ 50/60Hz	12-24VDC⎓
Allowable voltage range	90 to 110%	
Power consumption	5VA	5W
Display method	7 Segment LED display (red) (Character height: 14.2mm)	
Display accuracy	23°C±5°C - DC Type: F.S.±0.1% rdg±2digit / AC Type: F.S.±0.3% rdg±3digit DC/AC Type: F.S.+0.3% rdg +3digit max. only for 5A terminal -10°C to 50°C - DC/AC Type: F.S.±0.5% rdg±3digit	
Input	DC Voltage/Current, AC Voltage/Current, AC Frequency	
Max. allowable input	110% for each measured input range	
A/D conversion method	ΣΔ (Sigma Delta) ADC	
Sampling cycle	DC type: 50ms, AC type: 16.6ms	
Max. indication range	-1999 to 9999 (4digit)	
Preset output	• Relay output - Contact capacity: 250VAC~ 3A, 30VDC⎓ 3A/Contact composition: N.O (1a) • NPN/PNP Open Collector output - 12-24VDC⎓ ±2V 50mA Max. (Load resistance)	
Sub output (Transmission output)	• RS485 communication output - Baud rate:1200/2400/4800/9600, Communication method : 2-wire half duplex,Synchronous method: Asynchronous method , Protocol : Modbus type • Serial/BCD output - NPN Open collector output, 12-24VDC⎓ Max. 50mA (Resistive load) • DC4-20mA output - Resolution: 12,000 division (Load resistance max. 600Ω), Response time:Max. 450ms	
Insulation resistance	Over 100MΩ (at 500VDC⎓ megger) between external terminal and case	
Dielectric stength	2,000VAC~ for 1minute between external terminal and case	
Noise immunity	±2kV the square wave noise (pulse width: 1μs) by the noise simulator	
Vibration - Mechanical	0.75mm amplitude at frequency of 10 to 55Hz (for 1 min) in each X, Y, Z direction for 2 hours	
Vibration - Malfunction	0.5mm amplitude at frequency of 10 to 55Hz (for 1 min) in each X, Y, Z direction for 10 min	
Shock - Mechanical	100m/s² (approx. 10G) in each X, Y, Z direction for 3 times	
Shock - Malfunction	300m/s² (approx. 30G) in each X, Y, Z direction for 3 times	
Relay life cycle - Mechanical	Min. 20,000,000 operations	
Relay life cycle - Malfunction	Min. 100,000 operations (250VAC~ 3A Load current)	
Environment - Ambient temperature	-10 to 50°C, Storage: -20 to 60°C	
Environment - Ambient humidity	35 to 85%RH, Storage: 35 to 85%RH	
Insulation type	Double insulation or reinforced insulation (Mark: ⊡, dielectric strength between the measuring input part and the power part: 1kV)	
Approval	CE cULus	CE
Weight※1	Approx. 326g (approx. 211g)	

※1: The weight includes packaging. The weight in parenthesis is for unit only.
※ Environment resistance is rated at no freezing or condensation.

▣ Measurement Input [PA 1: In-r]

Type	Measured input and range		Input impedance	Display range [Stnd]	Prescale Display range [SCAL]
DC Volt	0-500V	[500u]	4.33348MΩ	0.0 to 500.0 (fixed)	
	0-100V	[100u]	4.33348MΩ	0.0 to 100.0 (fixed)	
	0-50V	[50u]	433.48kΩ	0.00 to 50.00 (fixed)	
	0-10V	[10u]	433.48kΩ	0.00 to 10.00 (fixed)	
	0-5V	[5u]	43.48kΩ	0.000 to 5.000 (fixed)	
	0-1V	[1u]	43.48kΩ	0.000 to 1.000 (fixed)	
	0-250mV	[0.25u]	2.28kΩ	0.0 to 250.0 (fixed)	
	0-50mV	[50mu]	2.28kΩ	0.00 to 50.00 (fixed)	
DC Ampere	0-5A	[5A]	0.022Ω	0.000 to 5.000 (fixed)	
	0-2A	[2A]	0.022Ω	0.000 to 2.000 (fixed)	
	0-500mA	[0.5A]	0.222Ω	0.0 to 500.0 (fixed)	
	0-200mA	[0.2A]	0.222Ω	0.0 to 200.0 (fixed)	
	0-50mA	[50mA]	2.222Ω	0.00 to 50.00 (fixed)	
	4-20mA	[4-20]	2.222Ω	4.00 to 20.00 (fixed)	
	0-5mA	[5mA]	22.222Ω	0.000 to 5.000 (fixed)	
	0-2mA	[2mA]	22.222Ω	0.000 to 2.000 (fixed)	
AC Volt	0-500V	[500u]	5.01092MΩ	0.0 to 500.0 (fixed)	
	0-250V	[250u]	5.01092MΩ	0.0 to 250.0 (fixed)	
	0-110V	[110P]	1.11092MΩ	0.0 to 440.0 (fixed)	
	0-50V	[50u]	1.11092MΩ	0.00 to 50.00 (fixed)	
	0-20V	[20u]	200.92kΩ	0.00 to 20.00 (fixed)	
	0-10V	[10u]	200.92kΩ	0.00 to 10.00 (fixed)	
	0-2V	[2u]	20.92kΩ	0.000 to 2.000 (fixed)	
	0-1V	[1u]	20.92kΩ	0.000 to 1.000 (fixed)	
AC Ampere	0-5A	[5A]	0.02Ω	0.000 to 5.000 (fixed)	
	0-2.5A	[2.5A]	0.02Ω	0.000 to 2.500 (fixed)	
	0-1A	[1A]	0.102Ω	0.000 to 1.000 (fixed)	
	0-500mA	[0.5A]	0.202Ω	0.0 to 500.0 (fixed)	
	0-250mA	[0.25A]	0.202Ω	0.0 to 250.0 (fixed)	
	0-100mA	[0.1A]	1.022Ω	0.0 to 100.0 (fixed)	
	0-50mA	[50mA]	1.022Ω	0.00 to 50.00 (fixed)	

dot	Display range
0	-1999 to 9999
0.0	-199.9 to 999.9
0.00	-19.99 to 99.99
0.000	-1.999 to 9.999

(Display range is variable according to decimal point position.)

※Connect to the input terminals whose 30% to 100% of the input range includs the max. value of the input range to measure.
When the max. input value is under the 30% of the input terminal range, display accuracy is degraded.
When the max. input value is over the 100%, it may result in input terminal damage.

※In case of 0 to 110V [110P] of AC voltage range and using P.T (potential transformer) for 440V/110VAC, if 110V is input, and the unit displays 440V automatically by preset scale value for P.T user's convenient.

※When "HHHH" or "LLLL" is flashes with a certain measurement input, disconnect power supply and then check the cables.

▣ Display Cycle Delay Function [PA 2: dISt]

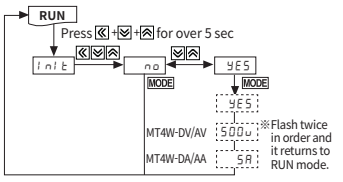
In some applications the measured input may fluctuate which in turn causes the display to fluctuate.
By adjusting the display cycle delay function time at dISt parameter 2, the operator can adjust the display time within a range of 0.1 sec to 5 sec. For example, if the operator sets the display cycle time to 4.0 sec, the display value displayed will be the average input value over 4 sec and also will show any changes if any every 4 sec.

▣ Monitoring Max./Min. Display Value Function [PA 0: HPEU/LPEU, PA 2: PEUt]

It monitors Max./Min. display value based on the current displays value and then displays the data at HPEU, LPEU of parameter 0. Set the delay time (0 to 30 sec) at PEUt of parameter 2 in order to prevent malfunction caused by initial over current or over voltage, when monitoring the peak value. Delay time is 0 to 30 sec and it starts to monitor the peak value after the set time. When pressing any one of ▽△ key at HPEU, LPEU of parameter 0, the monitored data is initialized.
※Monitoring function is not displayed when the delay time is set as "00 S" at PEUt of parameter 2.

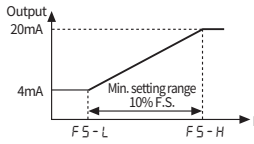
▣ Initialization Function

This function is to initialize parameter as factory difault.



▣ Current Output (DC4-20mA) Scale adjustment function [PA 2: FS-H/FS-L]

It sets current output for the display value at the current output DC 4-20mA.
It sets display value for 4mA at FS-L and 20mA at FS-H and the range between FS-H and FS-L should be 10% F.S. (When it sets as under 10% F.S., it changed as over 10% F.S. automatically.) Preset display value is fixed to output as 4mA at under FS-L and 20mA at over FS-H.



▣ Error Correction Function [PA 1: InbH/InbL]

It corrects display value error of measured input.
InbL: ±99 [Adjust deviation of low value]
InbH: 5.000 to 0.100 [Correct gradient (%) of high value]
Diplay value= (Measured value × InbH) + InbL
When the measured range is 0 to 500V, and the display range is 0 to 500.0. If the low display value is "1.2" to 0V input, set -12 as the InbL value to display "0.0" by adjusting the offset of the low value.
The display value to the 500V measured input varies by adjusting the offset of the low value. If this display value is "501.0", calculate 500.0/501.0 (the desired display value/the display value), and set the 0.998 correction value as the InbH to display "500.0" by adjusting the gradient of the high value.
※The offset correction range of InbL is within -99 to 99 for D⁰, D¹ digit regardless of dicimal point.

▣ Zero Adjustment Function

It adjusts the indication value of the optioanl configured input value as zero by force, zero point error can be adjusted with 3 ways as below.
When zero point adjustment with front key and Hold terminal is finished normally, zero point of measurement terminal is displayed and the adjusted value is saved at InbL automatically.

Operation	Input correc-tion value	Front side key	Input external signal
Description	PA 1: Direct input correction value method at InbL.	Press ◁, △ key for 3sec at the at RUN mode.	Short-circuit external Hold terminal no. 6, 7 over min. 50m.

※Refer to description "▣ Error Correction Function", "▣ Error Display Function", "▣ Parameter 2" for function and error.

▣ Gradient Correction Function [PA 1: InbH]

It corrects the gradient of prescale value and display value. (Picture 1) Display value Y can be used as α, β times against X input value by correction function[InbH] and used as correction function of max. display value[H-SC]. Adjustment range is 0.100 to 5.000 and multiply current gradient.
Ex)Input:200mVDC⎓, Display:3.000 for MT4W-DV type
①Select 0-1VDC⎓ (1V) for measured input in Parameter 1.
②Standard specification in input: 0-1VDC⎓ and 1.000 therefore it has to be 15.000[H-SC] for 1VDC⎓ (Input) in order to display 3.000 for 200mVDC⎓ (Input). But it is unable due to setting range is 9.999
③In this case, please check below chart. Please set as InbH × H-SC = 15.000

Setting method	H-SC	L-SC	InbH	Note
①	Unavailable	0.000	1.000	-
②	7.500	0.000	2.000	In this case, any setting methods display the same display value.
③	5.000	0.000	3.000	
④	3.750	0.000	4.000	
⑤	3.000	0.000	5.000	

▣ AC Frequency Measurement Function [PA1: diSP]

It measures input signal frequency when it is AC input. It uses fixed decimal point[PA1:dot], measured range can be changed by setting and measured range of decimal point position is as below chart.
It is available to adjust the upper gradient at [PA1: InbH] and [PA1: InbE]. In order to measure frequency normally, input signal, over 10% F.S. of measured range should be supplied. Please select the proper point of measurement terminal.
① Measured range

Decimal point position	0.000	0.00	0.0	0
Measurement range	0.100 to 9.999Hz	0.10 to 99.99Hz	0.1 to 999.9Hz	1 to 9999Hz

※Accuracy of frequency measurement: Below 1kHz, F.S. ±0.1rdg ±2digit. From 1kHz to 10kHz, F.S ±0.3rdg ±2digit.
② InbH: 00.100 to 9.999 [Gradient adjustment of high value]
③ InbE: 10², 10¹, 10⁰, 10⁻¹ [Index adjustment of InbH]

▣ Preset Output Mode [PA 2: oUt.t]

Mode	Output operation	Operation
	H.SEt L.SEt	H: Hysterisis
oFF		No output
L.St	GO LO H	If it is equal or lower than Low setting value, LO output is ON. If it is higher than Low setting value, GO output is ON.
H.St	HI GO H	If it is equal or higher than High setting value, HI output is ON. If it is equal or lower than High setting value, GO output is ON.
LH.St	HI GO LO H	LO output is ON when it is equal or lower than Low setting value. HI output is ON when it is equal or higher than High setting value. GO output is ON when it is higher than Low setting value, and lower than High setting value.
HH.St	HI GO LO H	LO output is ON when it is equal or higher than Low setting value. HI output is ON when it is equal or higher than High setting value. GO output is ON when it is lower than Low/High setting value.
LL.St	HI GO LO H	LO output is ON when it is lower than Low setting value. HI output is ON when it is equal or lower than High setting value. GO output is ON when it is higher than Low/High setting value.
Ld.St	GO LO H	It is operated same with L.St but LO output does not operated under initial Low setting value, and it is ON from under next Low setting value. If this is higher than Low setting value, GO output is ON.

※H.SEt is displayed according to the setting of output operation mode, when user sets "oFF", H.SEt/L.SEt are not displayed.

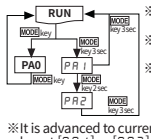
▣ Startup Compensation Timer Function [PA 2: StAt]

This time function limits the operation of an output until the measured input (overvoltage or inrush current) is stable at moment of power on. All outputs are off during startup compensation time setting after power is supplied.
Setting range: 00.0 to 99.9 (unit: sec), Factory default: 00.0

▣ Parameter

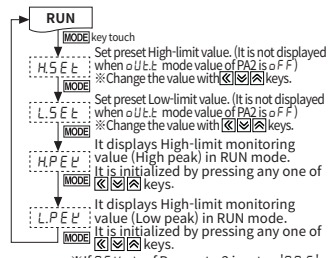
Parameter	Display		Function	Note
PA1 (Parameter1)	In-t	Input type	Selectable RMS/AVG in AC type	Available AC type only.
	In-r	Input range	Selection of input range	—
	diSP	Display	Selection of display type	Setting range: Stnd, SCAL, FrE9
	Stnd	Standard	Standard scale range	Display Max. display value of Stnd
	FrE9	Frequency	Frequency display	Available AC type only.
	SCAL	Scale	Scale range	These are displayed at SCAL
	H-SC	High scale	Set max. value of display range	It sets max. display value/min. display value (-1999 to 9999)
	L-SC	Low scale	Set min. value of display range	
	dot	Dot	Set decimal point position	It is dispayed at SCAL /FrE9 only and set the decimal point position
	InbH	Input bias high	Correct High-limit value of display value	Stnd/SCAL: Correction range 0.100 to 5.000 FrE9: Correction range 0.100 to 9.999
	InbL	Input bias low	Correct Low-limit value of display value	Setting range: -99 to +99
	InbE	Input bias exponent	Set display index of frequency mode	Setting range: 10^{-2}, 10^{-1}, 10^{0}, 10^{1}
PA2 (Parameter2)	oUt.t	Out type	Set operation mode of preset output	Setting range: oFF, L.St, H.St, LH.St, HH.St, LL.St, Ld.St
	HYS	Hysteresis	Set hysteresis value	Setting range: 1 to 10% F.S.
	StAt	Startup compen-sation time	Set startup compensation time.	Setting range: 00 to 99.9sec
	PEUt	Peak time	Set monitoring delay time for peak value (sec)	Setting range: 00 to 30sec
	dISt	Display time	Set sampling time (sec)	Setting range: 0.1 to 5.0 sec (Variable by 0.1sec)
	ZEro	Zero Key	Set usage of front side zero adjustment key	no: Not use front side zero adjustment key YES: Use front side zero adjustment key
	Evin	Event Input	Set external terminal (6, 7) function	Hold: Use external terminal as Hold terminal ZEro: Use external terminal as zero point adjustment terminal
	F5-H	Full scale High	Set the upper value output point or PV output	Min. set range: Min. 10% F.S.
	F5-L	Full scale Low	Set the lower value output point or PV output	Max. set range: Max. F5-H 10%
	Adr5	Address	Set communication address	Setting range: 01 to 99
	bPS	Bit per second	Set baudrate (bps)	Setting range: 1200, 2400, 4800, 9600
	LoC	Lock	Set lock function	Setting range: oFF, LoC1, LoC2, LoC3
PA 0 (Parameter0)	H.SEt	High set	Set High setting value	Setting range can be set within the display range of Stnd/SCAL
	L.SEt	Low set	Set Low setting value	
	H.PEU	High peak	Max. value by data monitoring	Initializes the monitored data value by pressing any one of ◁▽△ keys.
	L.PEU	Low peak	Min. value by data monitoring	

▣ Parameter Setting



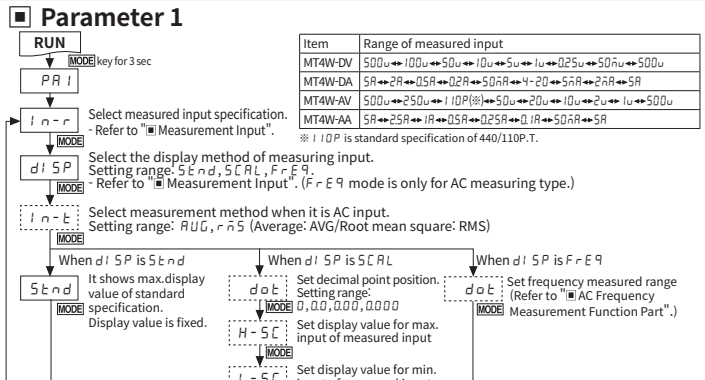
※Press MODE key in RUN mode and it enters PA 0 group.
※Press MODE key for over 3 sec in RUN mode, it displays [PA1].
※Press MODE key for over 5 sec in RUN mode, it displays [PA2] after [PA1]. When pressing MODE key continually, it stops displaying at [PA2].
※It is advanced to current display parameter releasing MODE key at [PA1] or [PA2].
※Press MODE key for over 3 sec in any parameter groups, it returns to RUN mode.
※If any key is not entered for 60 sec in each parameter, it returns to RUN mode.
※After returning to RUN mode, press MODE key within 2 sec, it returns to previous parameter. (Refer to the below descriptions of each parameter group.)
※PA 0 group cannot be entered when preset output mode of [PA2] group is OFF.

▣ Parameter 0



※If PEU.t of Parameter2 is set as '00 S', H.PEU and L.PEU are not displayed.

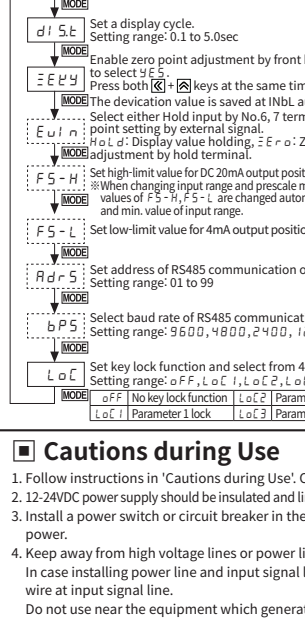
▣ Parameter 1



Item	Range of measured input
MT4W-DV	500u↔100u↔50u↔10u↔5u↔1u↔0.25u↔50mu↔500u
MT4W-DA	5A↔2A↔0.5A↔0.2A↔50mA↔4-20↔5mA↔2mA↔5A
MT4W-AV	500u↔250u↔110P(※)↔50u↔20u↔10u↔2u↔1u↔500u
MT4W-AA	5A↔2.5A↔1A↔0.5A↔0.25A↔0.1A↔50mA↔5A

※110P is standard specification of 440/110P.T.

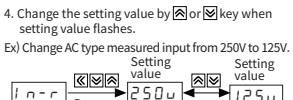
▣ Parameter 2



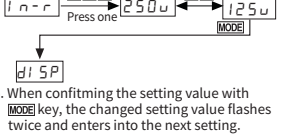
oFF	No key lock function	LoC2	Parameter 1, 2 lock
LoC1	Parameter 1 lock	LoC3	Parameter 0, 1, 2 lock

▣ Change The Parameter Setting Value

1. Advance to the parameter to be changed when pressing MODE key continuously in RUN mode and releasing MODE key at the parameter.
(Refer to "▣ Parameter Setting")
2. When pressing MODE key in each parameter, the initial mode of the parameter is displayed.
(Refer to the description of each parameter.)
3. When pressing one of ◁▽△ keys in display mode, the saved setting value is displayed.



4. Change the setting value by △ or ▽ key when setting value flashes.
Ex) Change AC type measured input from 250V to 125V.



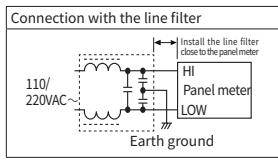
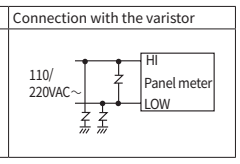
5. When confitming the setting value with MODE key, the changed setting value flashes twice and enters into the next setting.
6. It returns RUN mode from parameter by pressing MODE key for 3 sec.

▣ User Manual For Communication

Visit our website (**www.autonics.com**) to download the user manaul for communication of MT series.

▣ Cautions during Use

1. Follow instructions in 'Cautions during Use'. Otherwise, It may cause unexpected accidents.
2. 12-24VDC power supply should be insulated and limited voltage/current or Class 2, SELV power supply device.
3. Install a power switch or circuit breaker in the easily accessible place for supplying or disconnecting the power.
4. Keep away from high voltage lines or power lines to prevent inductive noise.
   In case installing power line and input signal line closely, use line filter or varistor at power line and shielded wire at input signal line.
   Do not use near the equipment which generates strong magnetic force or high frequency noise.

Connection with the line filter	Connection with the varistor
	

5. This unit may be used in the following environments.
   ①Indoors (in the environment condition rated in 'Specifications')
   ②Altitude max. 2,000m
   ③Pollution degree 2
   ④Installation category II

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