Autonics

PANEL METER
MT4W SERIES

M A N U A L

: It indicates an upgraded part.

Thank you very much for selecting Autonics products.
For your safety, please read the following before using.

▣ Caution for your safety

※Please keep these instructions and review them before using this unit.

※Please observe the cautions that follow;
⚠ **Warning** Serious injury may result if instructions are not followed.
⚠ **Caution** Product may be damaged, or injury may result if instructions are not followed.

※The following is an explanation of the symbols used in the operation manual.
⚠caution:Injury or danger may occur under special conditions.

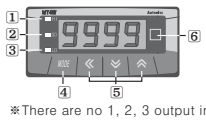
⚠ Warning

1. **In case of using this unit with machineries(Nuclear power control, medical equipment, vehicle, train, airplane, combustion apparatus, entertainment or safety device etc), it requires installing fail-safe device, or contact us for information on type required.**
   It may result in serious damage, fire or human injury
2. **It must be mounted on Panel.**
   It may give an electric shock.
3. **Do not connect terminals when it is power on.**
   It may give an electric shock.
4. **Do not disassemble and modify this unit, when it requires. If needs, please contact us.**
   It may give an electric shock and cause a fire.
5. **Please check the number of terminal when connect power line or measuring input.**
   It may cause a fire.

⚠ Caution

1. **This unit shall not be used outdoors.**
   It might shorten the life cycle of the product or give an electric shock.
2. **When wire connection, No.20AWG(0.50mm²) should be used and screw bolt on terminal block with 0.74N・m to 0.90N・m strength.**
   It may result in malfunction or fire due to contact failure.
3. **Please observe specification rating.**
   It might shorten the life cycle of the product and cause a fire.
4. **Do not use the load beyond rated switching capacity of Relay contact.**
   It may cause insulation failure, contact melt, contact failure, relay broken, fire etc.
5. **In cleaning the unit, do not use water or an oil-based detergent**
   It might cause an electric shock or fire that will result in damage to the product.
6. **Do not use this unit at place where there are flammable or explosive gas, humidity, direct ray the sun, radiant heat, vibration, impact etc.**
   It may cause explosion.
7. **Do not inflow dust or wire dregs into inside of this unit.**
   It may cause a fire or mechanical trouble.
8. **Please connect properly after checking the polarity of measuring terminals.**
   It may cause a fire or explosion.

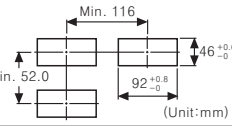
▣ Front panel identification



① HI:High output indication of preset
② GO:GO output indication of preset
③ LO:Low output indication of preset
④ MD Key:Mode Key
⑤ ≪ ≫ ≫:Control key
⑥ Unit

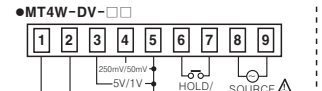
※There are no 1, 2, 3 output indication in Indication type.

▣ Panel cut-out

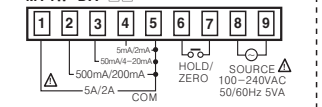


▣ Terminal connection

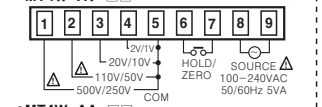
●MT4W-DV-□□



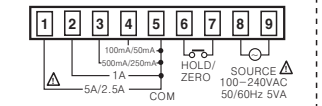
●MT4W-DA-□□



●MT4W-AV-□□

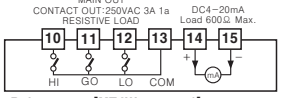


●MT4W-AA-□□

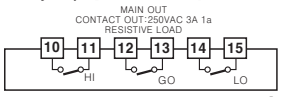


〈Option〉

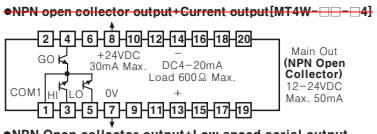
●Relay output+Current output[MT4W-□□-□0]



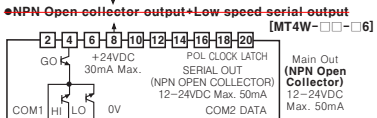
●Relay output[MT4W-□□-□1]



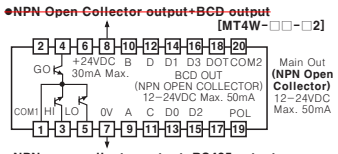
●NPN open collector output+Current output[MT4W-□□-□4]



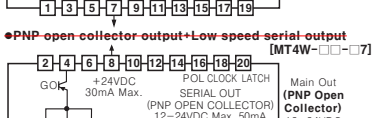
●NPN Open collector output+Low speed serial output [MT4W-□□-□6]



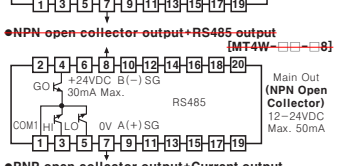
●NPN Open Collector output+BCD output [MT4W-□□-□2]



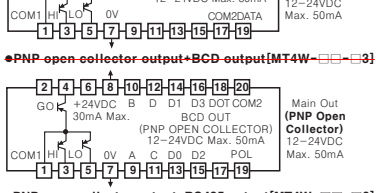
●PNP open collector output+Low speed serial output [MT4W-□□-□7]



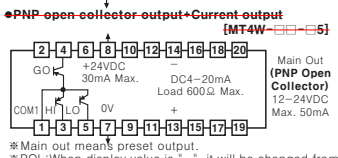
●NPN open collector output+RS485 output [MT4W-□□-□8]



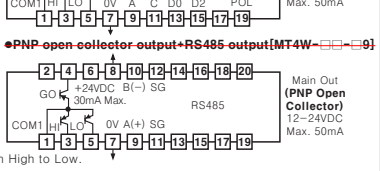
●PNP open collector output+BCD output [MT4W-□□-□3]



●PNP open collector output+Current output [MT4W-□□-□5]



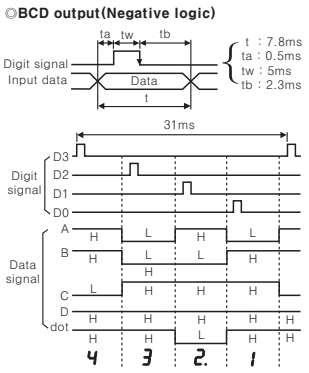
●PNP open collector output+RS485 output [MT4W-□□-□9]



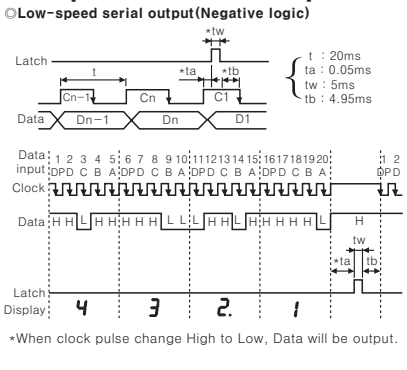
※Main out means preset output.
※POL:When display value is "−", it will be changed from High to Low.

▣ Time chart of serial output and BCD output

◎BCD output(Negative logic)



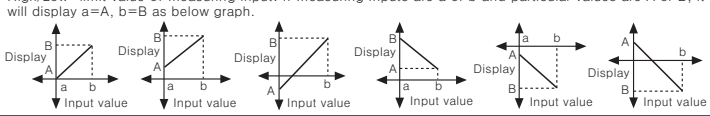
◎Low-speed serial output(Negative logic)



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

▣ Prescale function[PA1 : H-SC/L-SC mode]

This function is to display setting(−1999 to 9999) of particular High/Low−limit value in order to display High/Low−limit value of measuring input. If measuring 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	Measuring input exceeds available max.input range:110%F・S
LLLL	Measuring input exceeds available min.input range: −10%F・S
d−HH	Indication value for measuring input exceeds max.indication range:9999
d−LL	Indication value for measuring input exceeds max.indication range:−1999
F−HH	Indication value for measuring frequency exceeds max. measuring range:9999
ovEr	Exceeds zero adjusting range: ≠99

※"LLLL" indication is only for 4~20mA input terminal of MT4W−DA model.
※Zero point adjusting error is returning to measuring mode after "ovEr" is flickering 2 times.
※Refer to "▣ Measuring AC frequency function" for frequency measuring range.

※The above specifications are subject to change without notice.

▣ Specifications

Model	MT4W−□□−4□	MT4W−□□−1□
Power supply	100~240VAC 50/60Hz(90 to 110% of rated voltage)	12~24VDC(90 to 110% of rated voltage)
Power consumption	5VA	5W
Display method	7Segment LED Display(Red)	
Display accuracy	23℃±5℃ ☞ DC Type: F.S.±0.1% rdg±2digit / AC Type: F.S.±0.3% rdg±3digit (Frequency: F.S.±0.1% rdg±2digit) F.S +0.3% rdg +3digit max. only for 5A terminal −10℃~50℃☞ DC/AC Type: F.S.±0.5% rdg±3digit	
Input	VDC/Current, VAC/Current, AC Frequency	
Max. input	110% for input spec.	
A/D conversion method	Practical over sampling using successive approximation ADC.	
Sampling cycle	50ms(DC), 16.6ms(AC 60Hz)	
Max. indication range	1/12,000	
Max. indication digit	−1999 ~ 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, Transmission method:2wires half duplex, Transmission code:ASCII Code(8Bit), Tuning method:Sub−syschronization, Protocol:Modbus type • Serial/BCD output ☞ NPN Open collector output, 12~24VDC Max. 50mA(Resistive load) • 4~20mA output ☞ Resolution: 8000 division(Load resistance max. 600Ω), Response time:Max. 450ms	
AC measuring function	Selectable RMS or AVG	
Frequency measuring function	Measurement range:0.100~ 9999Hz(Differ according to decimal point position)	
Hold function	Includes(Outer hold function)	
Ambient temperature	−10 ~ 50℃(at non−freezing status)	
Storage temperature	−20 ~ 60℃(at non−freezing status)	
Ambient humidity	35 ~ 85%RH	
Insulation type(※1)	▣	
Approval	CE cULus	——
Weight	Approx. 211g	

※(※1)" ▣ " Mark indicated that equipment protected throughout by double insulation or reinforced insulation.

▣ Specification and range

Type	Measuring input and range	Input impedance	Standard [Stnd] Display range [Fixed]	Prescale [SCAL] Display range [Variable]
DC Volt	0−500V [500u]	4.33315MΩ	0.0~500.0(Fixed)	−1999~9999(Variable) −1999~9999(Variable) −1999~9999(Variable) −1999~9999(Variable) (Display point will be different according to decimal point position.) ※Please connect proper terminal with max. input voltage is in 30~100% of the input voltage. When it is bigger than input voltage, it cause the terminal breakdown and over−range indication. The accuracy is decreased when it is connected to the terminal under 30%.
	0−100V [100u]	4.33315MΩ	0.0~100.0(Fixed)	
	0−50V [50u]	433.15kΩ	0~50.00(Fixed)	
	0−10V [10u]	433.15kΩ	0.00~10.00(Fixed)	
	0−5V [5u]	43.15kΩ	0.00~5.000(Fixed)	
	0−1V [1u]	43.15kΩ	0.000~1.000(Fixed)	
	0−250mV [025u]	2.15kΩ	0.00~250.00(Fixed)	
	0−50mV [50mu]	2.15kΩ	0.00~50.00(Fixed)	
DC Ampere	0−5A [5A]	0.01Ω	0.000~5.000(Fixed)	
	0−2A [2A]	0.01Ω	0.000~2.000(Fixed)	
	0−500mA [0.5A]	0.1Ω	0.0~500.0(Fixed)	
	0−200mA [020A]	0.1Ω	0.00~200.0(Fixed)	
	0−50mA [50mA]	1.0Ω	0.00~50.00(Fixed)	
	4~20mA [20mA]	1.0Ω	00.00~20.00(Fixed)	
	0−5mA [5mA]	10.0Ω	0.000~5.000(Fixed)	
	0~2mA 2mA	10.0Ω	0.000~2.000(Fixed)	
AC Volt	0−500V [500u]	4.987MΩ	0.0~500.0(Fixed)	
	0−250V [250u]	4.987MΩ	0.0~250.0(Fixed)	
	0−110V [110P]	1.087MΩ	0.0~440.0(Fixed)	
	0−50V [50u]	1.087MΩ	0.00~50.00(Fixed)	
	0−20V [20u]	200kΩ	0.00~20.00(Fixed)	
	0−10V [10u]	200kΩ	0.00~10.00(Fixed)	
	0−2V [2u]	20kΩ	0.000~2.000(Fixed)	
	0−1V [1u]	20kΩ	0.000~1.000(Fixed)	
AC Ampere	0−5A [5A]	0.01Ω	0.000~5.000(Fixed)	
	0−2.5A [25A]	0.01Ω	0.000~2.500(Fixed)	
	0−1A [1A]	0.05Ω	0.000~1.000(Fixed)	
	0−500mA [0.5A]	0.1Ω	0.0~500.0(Fixed)	
	0−250mA [025A]	0.1Ω	0.00~250.0(Fixed)	
	0−100mA [01A]	0.5Ω	0.00~100.0(Fixed)	
	0−50mA [50mA]	0.5Ω	0.00~50.0(Fixed)	

▣ Display cycle delay function [PA 2 : d15.t mode]

It is difficult to read as display value follows the measuring input value.
Display when the measuring input value is fluctuating. In this case it is able to make display value stable by delaying display cycle.Display cycle displaying time can be changed in d15.t mode of Parameter 2.
If select 4.0s, the display value is displayed every 4sec. averaging input value for 4sec.

▣ Monitoring function for Peak display value [PA 0 : H.PEU/L.PEU mode, PA 2 : PEU.t mode]

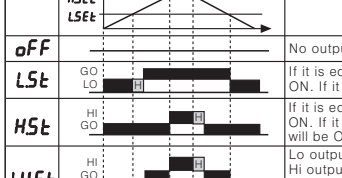
It is to observe Max./Min. value of display value by current display value and then display the data in H.PEU mode and L.PEU mode of parameter 0. Set delay time(0 to 30sec.) in PEU.t mode of parameter 2 in order to prevent malfunction caused by initial over current or over voltage, when it monitor the peak value. Delay time is 0~30sec. and it will monitor the peak value after setting time. If press ≪ ≫ ≫ key at H.PEU and L.PEU mode of parameter 0, monitoring data will be initialized.
※Monitoring function is not indicated when set the PEk.t of parameter 2 as "0".

▣ Initialization function

It initializes parameter setting state. When it press ≪ ≫ ≫ key over 5 seconds at the same time in measuring mode, former changed state is canceled and it changes as initial state.

▣ Current output (DC4-20mA) Scale adjusting function [PA2 : FS-H / FS-L mode]

It set current output for preset indication value at the current output DC4−20mA. It set output indiction value for 4mA and 20mA. Min.setting range between FS−H(FS-H) and FS−L(FS-L) is 10% F・S. (When it set as under 10% F・S, it changed as over 10% F・S automatically.) Preset indication value is outputted fixedly as 4mA at under FS-L and 20mA at over FS-H.



▣ Measuring AC frequency function [PA1 : diSP mode]

It measures input signal frequency when it is an AC input. It uses fixed decimal point[PA1 : dot mode], measuring range can be changed by setting and measuring range of decimal point place is as below.
It is available to adjust the upper inclination with[PA1 : I.nbH mode] and [PA1 : I.nbE mode]. In order to measure frequency normally, input signal, over 10% F・S of measuring range should be supplied. Please select the proper point of measuring terminal.

①Measuring range

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

②I.nbH:0.100~9.999[Inclination adjustment of high value]
③I.nbE:10−2, 10−1, 10−0, 10 1[Index adjustment of I.nbH]

▣ Correction function [PA1 : I.nbH / I.nb.L mode]

This function is for correcting display value error of measuring input.
I.nb.L:±99[Adjust deviation of Low value],
I.nbH:5.000 to 0.100[Correct gradient(%) of High value]
Display value=(Measuring value×I.nbH) + I.nb.L
Ex)When the user desires measuring input specification is 0 to 500V and display value is 0 to 500.0, it is able to remove the offset of Low display value to set −12(Offset correcting value) in I.nb.L(When Low display value is "□□ 1.2" in 0V input)
※The offset correction range of I.nb.L is within −99 to +99 for D⁻⁰, D⁻¹digit regardless of decimal point. Display value for measuring input(500V) is decided by offset adjustment of low value. In case display value is "501.0" display value will be 500.0 by adjusting the gradient of high display value if 0.998 of correcting value is set at I.nbH by calculating 500.0/ 501.1(Target display value/Current display value)

▣ Adjusting zero point function

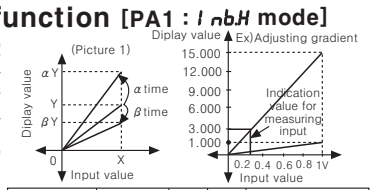
It adjusts the indication value of the optioanl configured input value as zero by force, zero point error can be adjusted with 3 ways as below.
When zero point adjustment with front key and Hold terminal is finished normally, zero point of measuring terminal is displayed and the adjusted value is saved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

Operation	Input correction value	Front side key	Input external signal
Description	PA 1 : Direct input correction value method at I.nb.L mode.	Press ≪ ≫ key for 3sec. at the at measuring mode.	Short−circuit Hold terminal of external No. 6, 7 over min. 50m.

※Refer to description [▣ Error correction function], [▣ Error indication function] and [▣ Parameter 2] for function and error.

▣ Gradient correction function [PA1 : I.nbH mode]

This function is to correct a 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[I.nbH]. And also can be 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 for measuring 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 I.nbH×H-SC=15.000



Setting method	H-SC	L-SC	I.nbH	Remark
①	Unavailable to set	0.000	1.000	——
②	7.500	0.000	2.000	It will be same indication value whichever user choose the method among setting ways.
③	5.000	0.000	3.000	
④	3.750	0.000	4.000	
⑤	3.000	0.000	5.000	

▣ Preset output Mode[PA 2 : oUt.t mode]

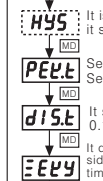
Mode	Output operation	Operation
	HSEt LSEt	H:Hysterisis
oFF		No output
LSt	GO LO H	If it is equal or smaller than Low setting value, LO output will be ON. If it is bigger than Low setting value, GO output will be ON.
HSt	HI GO H	If it is equal or bigger than High setting value, HI output will be ON. If it is equal or smaller than High setting value, GO output will be ON.
LHSt	HI GO LO H H	Lo output is ON when it is smaller or same with Low set value. Hi output is ON when it is bigger or same with High set value. Go output is ON when it is bigger than Low set value, smaller than High set.
HHSt	HI GO LO H H	Lo output is ON when it is bigger or same with Low set value. Hi output is ON when it is bigger or same with High set value. Go output is ON when it is smaller than Low set, High set vale.
LLSt	HI GO LO H H H	**Lo output is ON when it is smaller with Low set value. Hi output is ON when it is smaller or same with High set value. Go output is ON when it is bigger than Low set, High set vale.**
Ld.St	GO LO H	It is operated same with L.St but Lo output does not operated under initial Low set value. It i ON from under next Low set value. If this is higher than Low set value, Go output will be ON.

※HSEt will be displayed from the setting of output operation mode, when user set "oFF", HSEt/LSEt does not displayed.

▣ Parameter

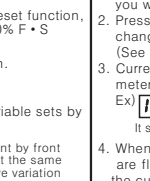
Parameter	Display	Function	Note
PA 1 (Parameter 1)	In-t Input type	Selectable RMS/AVG in AC type	Available AC type only.
	In-r Input range	Selection of input range	
	diSP Display	Selection of indication type	Selectable Stnd / SCAL / FrE9
	Stnd Standard	Standard scale range	Display Max. display value of Stnd
	FrE9 Frequency	Frequency display	Available AC type only.
	SCAL Scale	Scale range	These mode indicates at SCAL. It sets max. display value/ min. display value(−1999 to 9999)
	H-SC High scale	Set max. value of display range	
	L-SC Low scale	Set min. value of display range	
	dot Dot	Set Dot position	Display only SCAL/FrE9 describe position
	InbH Input bias high	Compensate High−limit value of display value	Stnd/SCAL:Correction range 0.100~5.000 FrE9:Correction range 0.100~9.999
	InbL Input bias low	Compensate Low−limit value of display value	Set range:−99 to +99
	InbE Input bias exponent	Set indication index of frequency mode	Set range:10^{-2}/ 10^{-1}/ 10^{0}/ 10^{1}
PA 2 (Parameter 2)	oUt.t Out type	Set operation mode of preset output	Selectable oFF/L.St/H.St/LH.St/HH.St /LL.St/Ld.St
	HYS Hysteresis	Set hysteresis value	Setting range 1 ~ 10% F・S
	PEU.t Peak time	Set monitoring delay time for peak value(sec)	Setting range:00sec ~ 30sec
	diS.t Display time	Set sampling time(sec.)	Variable by 0.1sec unit of 0.1~5.0sec
	ZEro Zero Key	Set usage of front side zero adjustment key	No:Set usage of front side zero adjustment key Yes:Usage of front side zero adjustment key
	Eu.In Event Input	Set external terminal(6, 7) function	Hold:Use external terminal as Hold terminal Zero:Use external terminal as zero point adjustment terminal
	FS-H Full scale High	Set the upper value output point or PV output	Min. set range:Min. 10% F・S
	FS-L Full scale Low	Set the lower value output point or PV output	Max. set range:Max. FS−H 10%
	Adr5 Address	Set communication address	Set range:01 to 99
	bPS Bit per second	Set baudrate(bps)	Selectable 1200/2400/4800/9600
	LoC Lock	Set lock function	Selectable oFF/Loc1/Loc2/Loc3
PA 0 (Parameter 0)	H.SEt High set	Set High setting value	Setting range can be set within indication range of Stnd/SCAL
	L.SEt Low set	Set Low setting value	
	H.PEU High peak	Max. value by data monitoring	Return to initial status by pressing ≪ key
	L.PEU Low peak	Min. value by data monitoring	

▣ Parmeter setting



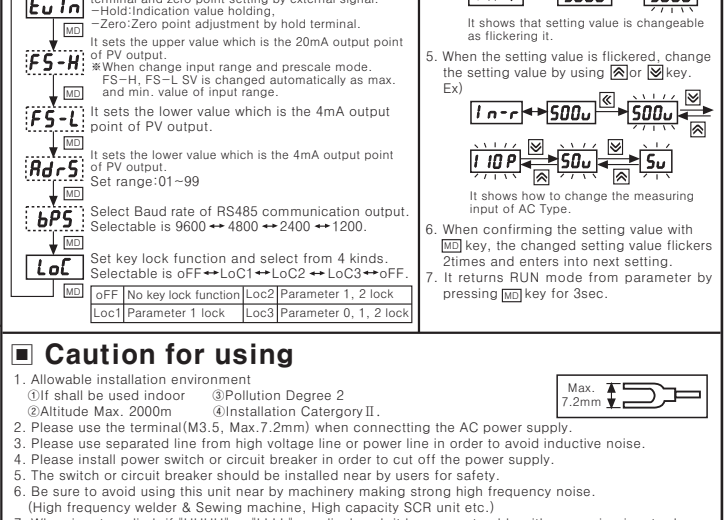
※If press MD key for 3sec. in RUN mode PA 1 is displayed.
※If press MD key for 4sec. in RUN mode, PA 2 will be displayed after PA 1.
In case of pressing MD Key continually, indication is stopped at PA 2.
※When it pulled out from MD key at PA1 or PA2, it will be entered into indicating parameter.
※It will e returned to RUN when MD key is pressed for 3 second at each parameter.
※After returning to RUN, if MD key is pressed within about 2 seconds again, it is entered into PA1 or PA2 again.
(Refer to the below each parameter setting description.)

▣ Parameter 0



Set preset High−limit value. (When set the preset only)
※Change to set with ≪ ≫ ≫ keys.
Set preset Low−limit value. (When set the preset only)
※Change to set with ≪ ≫ ≫ keys.
It shows High−limit monitoring value (High Peak) in RUN mode. It will be initialized by pressing ≪ ≫ ≫ key.
It shows Low−limit monitoring value (Low Peak) in RUN mode. It will be initialized by pressing ≪ ≫ ≫ key.
※When PEk.t of Parameter2 is set as"0", monitoring function is not displayed.

▣ Parameter 1



〈Specification chart of measuring input by each items〉

Item	Range of measuring input
MT4W−DV	500u≠100u≠50u≠10u≠5u≠1u≠0.25u≠50mu≠500u
MT4W−DA	5A≠2A≠0.5A≠0.2A≠50mA≠4-20mA≠5mA≠2mA≠5A
MT4W−AV	500u≠250u≠1 10P(☆)≠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 para−meter setting value

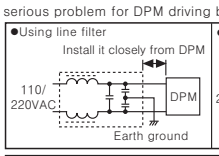
1. Press MD key continuously in RUN mode, then release the MD key at the parameter you want. (See "▣ Parmeter setting")
2. Press MD key at the parameter in order to change the mode of parameter. (See "▣ Parmeter")
3. Current setting value and mode in para−meter are flickered repeatedly.
   Ex) In-r ↔ 500u
   It shows that current measuring input is 500V.
4. When the current setting value and mode are flickered, if press ≪, ≫, ≫key, only the current setting value is flickered.
   Ex) In-r ↔ 500u (≪) ↔ 500u
   It shows that setting value is changeable as flickering it.
5. When the setting value is flickered, change the setting value by using ≫or ≫key.
   Ex) In-r ↔ 500u ↔ 500u (≫) ↔ 1.10P ↔ 50u ↔ 5u
   It shows how to change the measuring input of AC Type.
6. When confirming the setting value with MD key, the changed setting value flickers 2times and enters into next setting.
7. It returns RUN mode from parameter by pressing MD key for 3sec.

▣ Caution for using

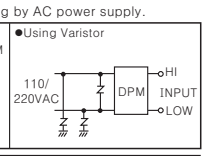
1. Allowable installation environment
   ①If shall be used indoor ③Pollution Degree 2
   ②Altitude Max. 2000m ④Installation Catergory Ⅱ.
2. Please use the terminal(M3.5, Max.7.2mm) when connectting the AC power supply.
3. Please use separated line from high voltage line or power line in order to avoid inductive noise.
4. Please install power switch or circuit breaker in order to cut off the power supply.
5. The switch or circuit breaker should be installed near by users for safety.
6. Be sure to avoid using this unit near by machinery making strong high frequency noise. (High frequency welder & Sewing machine, High capacity SCR unit etc.)
7. When input applied, if "HHHH" or "LLLL" are displayed, it has some trouble with measuring input, please check the line after power off.
8. Noise inflowing from power line can cause serious problem for DPM driving by AC power supply. Even though there is condenser for protec−ting noise between lines at primary side of power transformer, but it is very difficult to install protection components at small size product like DPM. Therefore, please use noise absorber circuit such as line filter, varistor in external lines when voltage failure is occurred by power relay, magnet S/W and high frequency equipment are operated in same line or surge is occurred by spark of high voltage or thunder etc.
9. Input line:Shield wire must be used when the measuring input line is getting longer in the place occurring lots of noise.

Max. 7.2mm

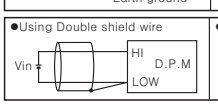
●Using line filter



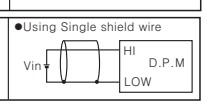
●Using Varistor



●Using Double shield wire



●Using Single shield wire



※It may cause malfunction if above instructions are not followed.

▣ Major products

- Proximity sensors
- Photoelectric sensors
- Area sensors
- Fiber optic sensors
- Door/Door side sensors
- Pressure sensors
- Rotary encoders
- Sensor controllers
- Switching power supply
- Temperature controllers
- Temperature/Humidity transducers
- Power controllers
- Tachometer/Pulse(Rate) meters
- Recorders
- Panel meters
- Indicators
- Signal converters
- Counters
- Timers
- Display units
- Graphic/Logic panel
- Stepping Motors & Drivers & Motion controllers

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