

## Intelligent ammeter, voltmeter, frequency meter, analog process parameter table T904

### Technical Manual

Version number: EN-V1-03



#### About us

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Thank you very much for choosing TMCON products,  
In order to better use this product, please read the following before using.

## ■ Safety precautions

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### Attention

Do not touch the terminals while power is on, otherwise minor injuries may occur due to electric shock.



Do not allow metal objects, conductors, debris (such as cuttings) from installation work, moisture, or other foreign matter to enter the digital controller, the setup tool ports, or between the pins on the connectors on the Setup Tool cable. Otherwise it may cause electric shock, short circuit or machine malfunction.



Do not use the product where subject to flammable or explosive gas. Otherwise, it may cause mild injury due to the explosion.



Never disassemble, modify, or repair the product or touch any of the internal parts. Otherwise, it may cause mild electric shock, fire, and equipment failure.



This equipment is an open processing controller. Do not use it in a control cabinet where fire may occur. When using more than 2 open-circuit switches, please turn off all switches before repair inspection, so that the product is in a power-off state.



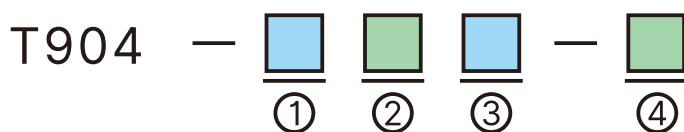
## ■ Main features

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Multi-function panel table, suitable for accurate measurement of current, voltage, frequency, analog sensor signals, friendly docking industrial internet

- Four digit multifunctional panel watch with high-speed sampling (50mS) and powerful functions.
- Wide range of input specifications, suitable for precise measurement of current, voltage , frequency, and analog sensor signals.
- Multiple output types can be selected: relay alarm output, 4-20mA linear current output, etc.
- Preset upper/lower limit display zoom function, can be input signals into the target display range, the maximum display range (-1999~9999) .
- Smooth processing function, making the display smoother and more stable.
- Multifunctional: multiple alarm output modes, maximum and minimum value monitoring functions, zero setting function, display correction function, transmission output function, etc.
- High precision, DC type measurement accuracy level 0.1, AC type measurement accuracy level 0.3.
- AC/DC100~240V or DC12~24V high-performance switching power supply design ensures stable operation of the microcomputer.

## ■ Technical reference

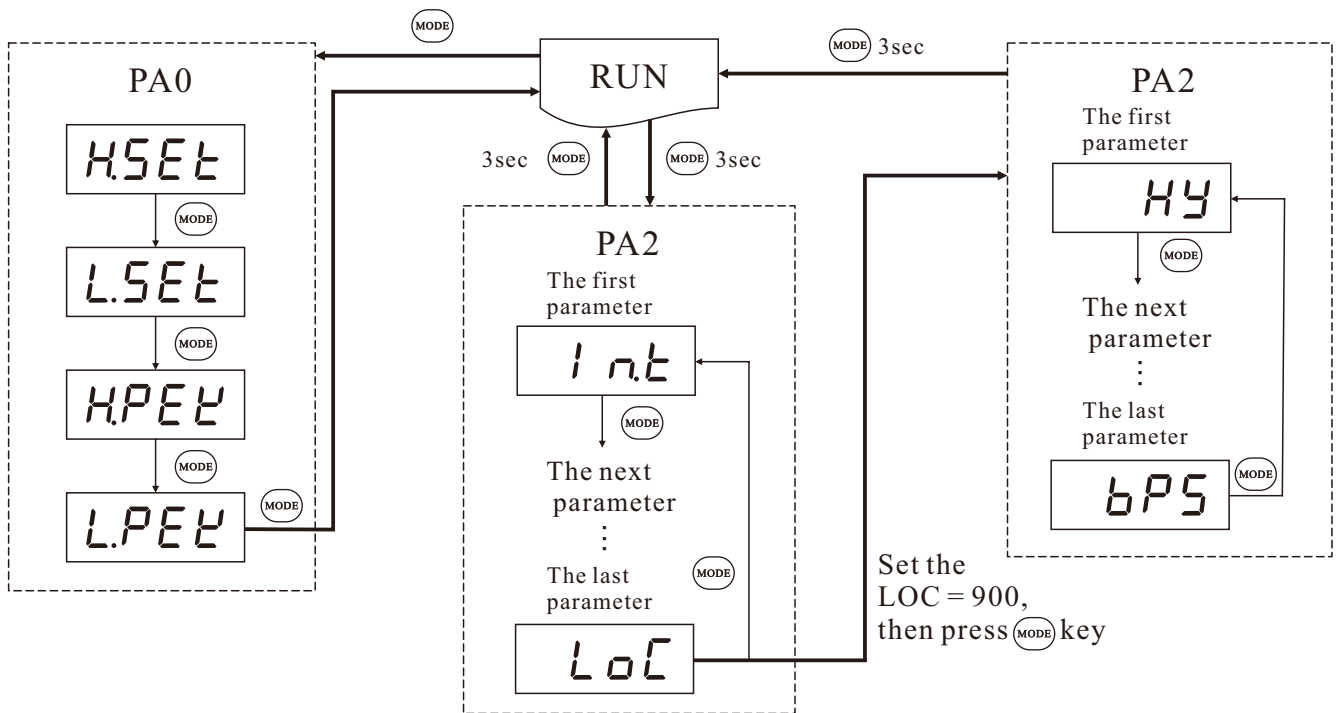


| Models | ①          | ②                 | ③      | ④                 | Description                                 |
|--------|------------|-------------------|--------|-------------------|---|
|        | Panel size | Input Signal Type | Output | Control output    |   |
| T904   |            |                   |        |                   | Multifunctional digital display panel table |
|        | G          |                   |        |                   | 48×48mm panel                               |
|        | F          |                   |        |                   | 48×96mm panel                               |
|        |            | AA                |        |                   | Measure AC current                          |
|        |            | AV                |        |                   | Measure AC voltage                          |
|        |            | DA                |        |                   | Measure DC current                          |
|        |            | DAF               |        |                   | Measure DC current (for 75mV shunt)         |
|        |            | DV                |        |                   | Measure DC voltage                          |
|        |            | Hz(AC)            |        |                   | Measure AC frequency                        |
|        |            | SVA               |        |                   | Measure analog sensor signal                |
|        |            |                   | N      |                   | None  |
|        |            |                   | 0      |                   | Relay output                                |
|        |            |                   | 1      |                   | 4-20mA linear current output                |
|        |            |                   | 2      |                   | R485 communication output                   |
|        |            |                   | 3      |                   | Relay+linear current output                 |
|        |            |                   | 4      |                   | Relay output+R485 communication output      |
|        |            |                   | 5      |                   | Relay+linear current+R485 communication     |
|        |            |                   | 6      |                   | NPN Open collector output                   |
|        |            |                   |        | N or Not to write | Power Supply 100~240V AC                    |
|        |            |                   |        | D                 | Power Supply 12~24V AC/DC                   |

## ■ Technical reference

|                                |   |   |
|--------------------------------|---|---|
| Models                         | T904-G□□  | T904-F□□  |
| External dimension (mm)        | 48(high)×48(wide)×86(depth)   | 48(high)×96(wide)×99(depth)                                       |
| Hole size (mm)                 | 45(high)×45(wide)   | 45(high)×92(wide)   |
| Operating Voltage              | AC100~240V 50/60Hz or AC/DC12~24V<br>(The default delivery is 100~240V, If you need 12~24V, please declare the voltage at the time of ordering)   |   |
| Permissible voltage range      | 85~110%   |   |
| Power consumption              | About 5.5VA (AC240V), about 3.5VA (DC24V)   |   |
| Display mode                   | 4-bit, 7-segment LED digital display  |   |
| Maximum display range          | -1999~9999 (4 digits)   |   |
| Accuracy class                 | 23°C±5°C DC type: F. S ± 0.1% rdg ± 2 bits/AC type: F. S ± 0.3% RDG ± 3 bits,<br>Frequency: F.S ± 0.1% rdg ± 2 bits<br>-10°C~50°C DC/AC type: F.S±0.5%rdg±3 bits  |   |
| Maximum allowed input          | Enter 110% F. S of the specification  |   |
| A/D conversion method          | Oversampling mode of SAR, ADC   |   |
| Sampling period                | 50ms ( DC ) , 16.6ms ( AC 60Hz ) 1/12000  |   |
| AC measurement function        | Average value (AVG)   |   |
| Frequency measurement function | 0.100-9999Hz ( Varies with the position of the decimal point )  |   |
| Alarm output                   | 2-way relay output,<br>contact capacity: 3A/AC250V resistive load   | 3-way relay output,<br>contact capacity: 3A/AC250V resistive load |
| Auxiliary voltage output       | DC24V 50mA.Max  |   |
| Communication function         | Communication interface: RS485 interface<br>Transfer speed: 1200/2400/4800/9600<br>Communication method: 2-wire half duplex<br>Synchronization method: auxiliary synchronization<br>Communication protocol: Modbus RTU communication protocol |   |
| Variable output                | 0-20mA/4-20mA (Selectable settings)   |   |
| Insulation withstand voltage   | AC2000V 50/60Hz 1min  |   |
| Usage environment              | Temperature -10~+60°C (not freezing or exposed), humidity: 25~85% RH  |   |

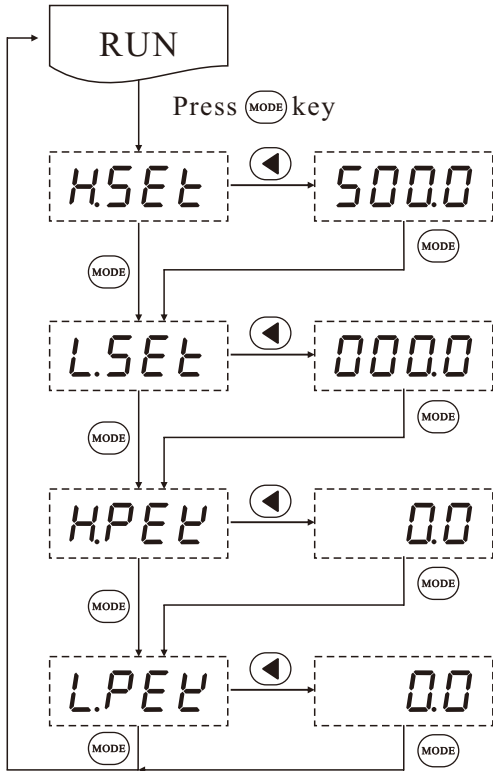
## Parameter setting



- \* Press MODE key in RUN status, it will advance to [PA0](Parameter 0) group.
- \* Press MODE key for 2 sec. in RUN mode, [PA1] is displayed.
- \* set LOC=900 then press the mode key, in [PA1](Parameter 1), [PA2] is displayed.
- \* Press MODE key for 3 sec., it is returned to RUN at any position.
- \* If any key is not touched for 60 sec. in each parameter, it returns to RUN mode.
- \* Press the MODE key in the parameter group can switch the display the next parameter.
- \* It cannot advance to [PA0] when preset output operation mode of [PA1] is [OFF].

## Parameter setting

### [PA0](Parameter 0) group



Set preset High-limit value. (Set with ◀, ▼, ▲ key)  
 \* It is displayed when set the preset only.

When set OFF in  $\text{OUT}\bar{n}$  mode if parameter 1 group, the parameter is not displayed.

Set preset Low-limit value. (Set with ◀, ▼, ▲ key)  
 \* It is displayed when set the preset only.

When set OFF in  $\text{OUT}\bar{n}$  mode if parameter 1 group, the parameter is not displayed.

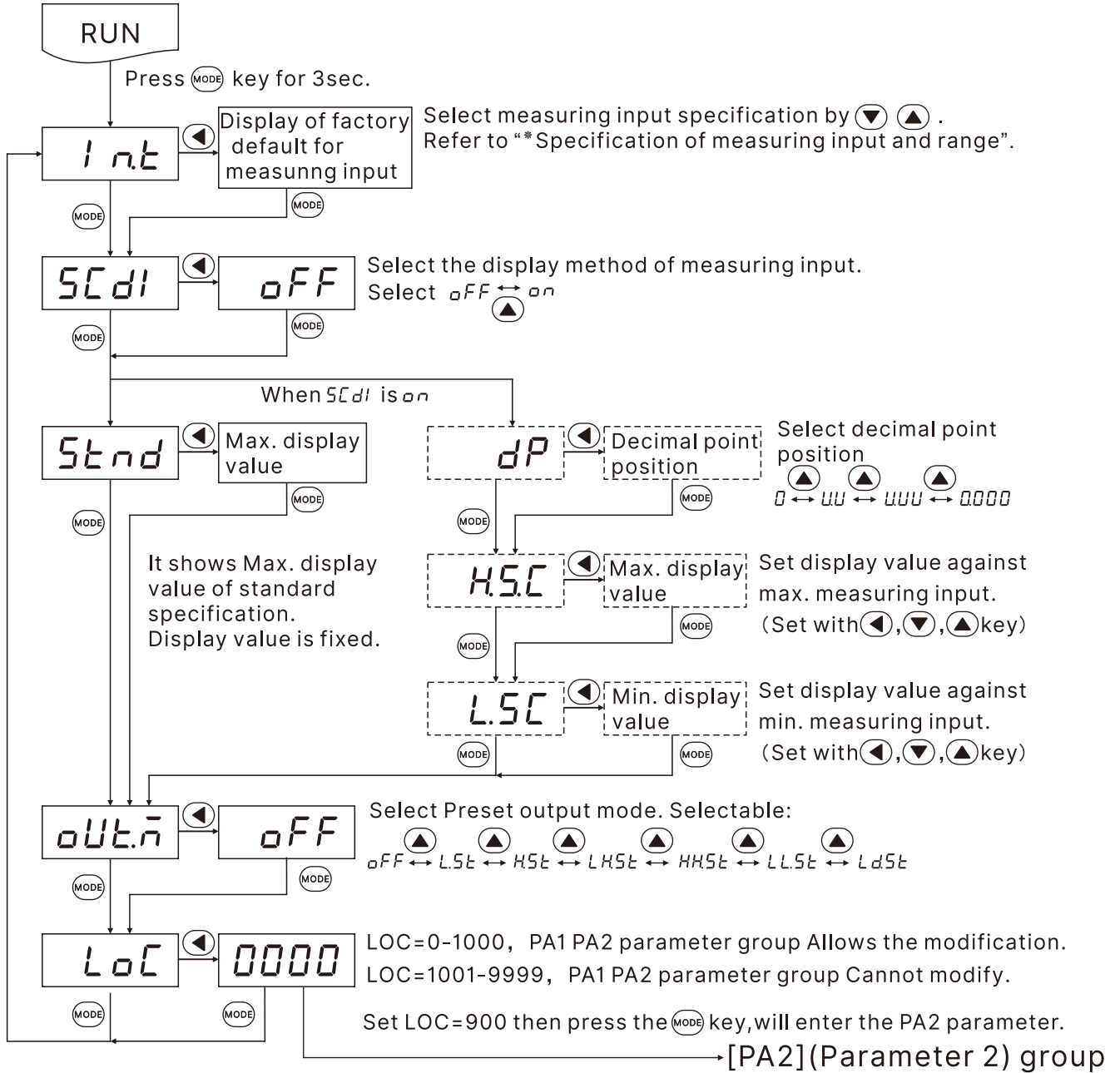
It shows High-limit monitoring value while it is in RUN mode  
 It will be reset by pressing ◀ key.

It shows Low-limit monitoring value while it is in RUN mode  
 It will be reset by pressing ◀ key.

\* If "00" is set in PEEL mode of PA-2, HPEL and LPEL modes will not be displayed.

# Parameter setting

## [PA1](Parameter 1) group



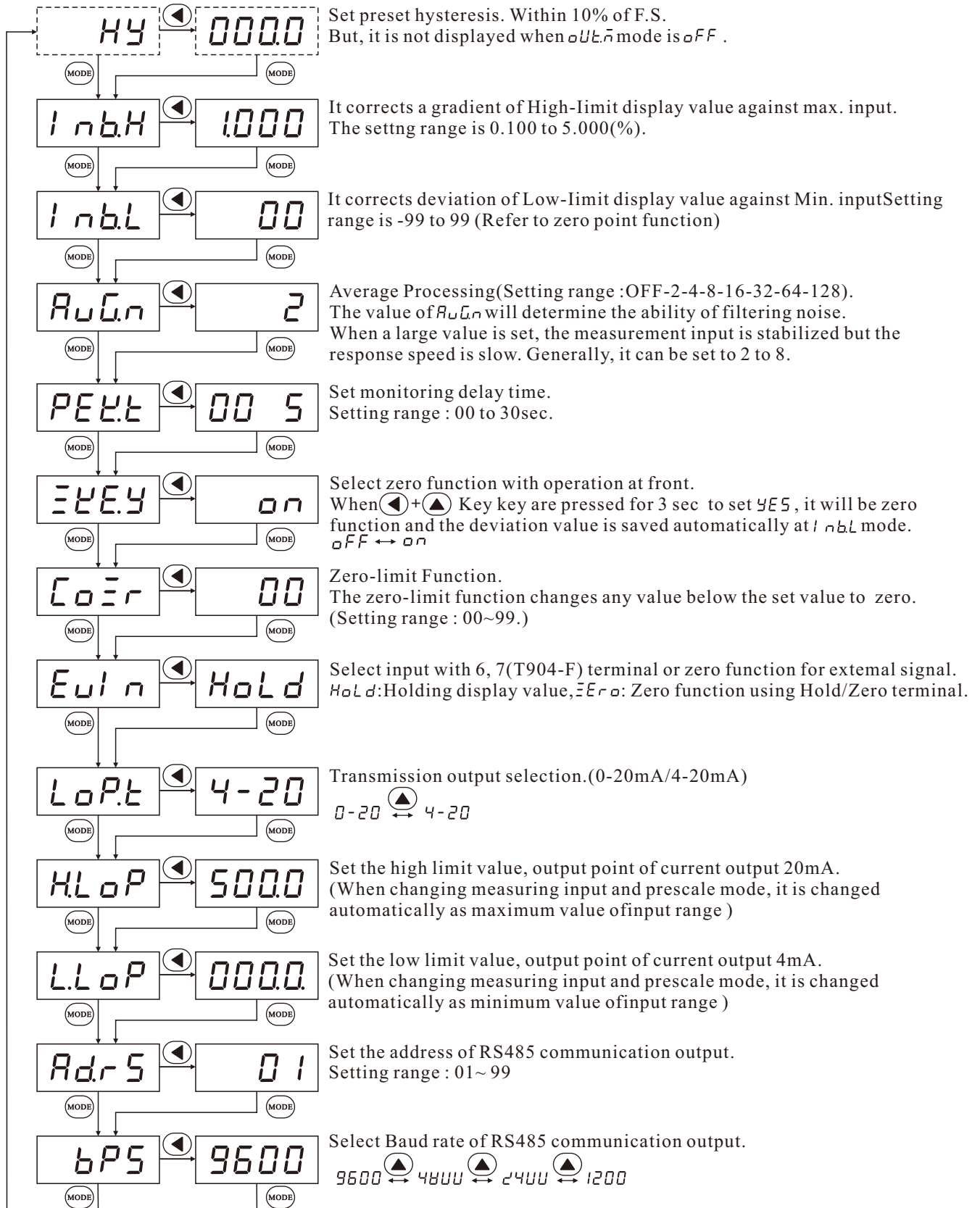
\* Measuring input chart by model.

| Item      | Range of measuring input  |
|-----------|---|
| T904-□AA  | 5A ↔ 1A ↔ 0.2A ↔ 20mA<br>(5A) (1A) (200mA) (20mA)   |
| T904-□AV  | 500V ↔ 200V ↔ 20V ↔ 2V<br>(500V) (200V) (20V) (2V)  |
| T904-□DA  | 5A ↔ 1A ↔ 0.2A ↔ 2mA<br>(5A) (1A) (200mA) (2mA)   |
| T904-□DV  | 500V ↔ 200V ↔ 20V ↔ 2V<br>(500V) (200V) (20V) (2V)  |
| T904-□SVA | 0-20 ↔ 4-20 ↔ 0-10 ↔ 2-10 ↔ 0-5 ↔ 1-5 ↔ 0-1 ↔ 500 ↔ 200 ↔ 100<br>(0-20mA) (4-20mA) (0-10V) (2-10V) (0-5V) (1-5V) (0-1V) (0-500mV) (0-200mV) (0-100mV) |



# Parameter setting

## [PA2](Parameter 2) group

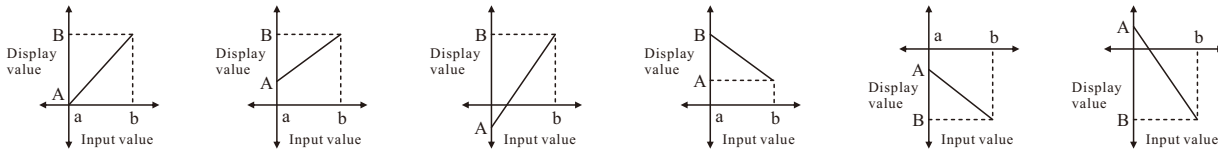


\* After setting each mode, press  $\text{MODE}$  key for 3 sec. to return to RUN mode.

# ■ Functions

•Display scale function[PA1 group: H5L / L5L]

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” and “b” and particular values are “A” and “B”, it will display a=A,b=B as below graphs.



•Gradient correction function[PA2 group: InbH]

It corrects the gradient of prescale value and display value (Picture 1) Display value Y can be used as a, β times against X input value by correction function[InbH] and used as correction function of max. display value(H5L). Adjustment range is 0 100 to 5 000 and multiply current gradient.

Ex)input:200mVDC, Display:3.000 for T904-FDV type

①Select 0-1VDC(1V) for measured input in Parameter 1

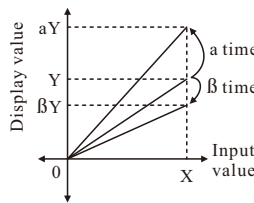
②Standard specification in input: 0-1VDC and 1.000 therefore it has to be 15.000(H5L) for 1VDC (input) in order to display 3.000 for DC200mV(input).

But it is unable due to setting range is 9.999

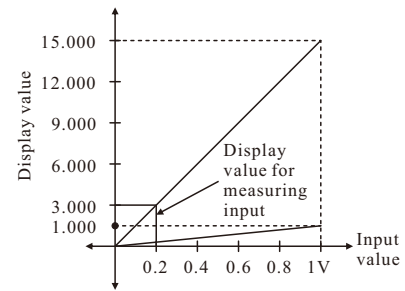
③in this case, please check below chart.

Please set as InbH x H5L=15.000

| setting method | H.SC        | L.SC | Inb.H | note   |
|----------------|-------------|------|-------|--|
| ①              | unavailable | 0    | 1.000 | ——   |
| ②              | 7500        | 0    | 2.000 | In this case, any setting methods display the same display value |
| ③              | 5000        | 0    | 3.000 |  |
| ④              | 3750        | 0    | 4.000 |  |
| ⑤              | 3000        | 0    | 5.000 |  |



(Picture 1)



(Example of gradient correction)

•Error correction function[PA2 : 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)

$$\text{Display value} = (\text{Measured value} \times \text{InbH}) + \text{InbL}$$

When the measured range is 0 to 500V, and the display range is 0 to 500.0. if the low display value is “12” to 0V input, set -12 as the InbL value to display “00” 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 “50 10”, calculate  $500.0/501.0$  (the desired display value/the display value), and set the 0.998 correction value as the InbH to display “5000” by adjusting the gradient of the high value.

\*The offset correction range of InbL is within -99 to for D<sup>0</sup>, D<sup>-1</sup> mdigit regardless of decimal point.

•Average Processing[PA2 : RuLn]

Average processing stabilizes displayed values to minimize flicker by averaging the fluctuating input signals.

Average processing can be performed for the measurement values in either of eight steps (OFF, 2 times, 4 times, 8 times,16 times,32 times,64 times, or 128 times).

This is useful for ignoring rapid fluctuations, e.g., eliminating spike noise.

# ■ Functions

•Zero adjustment function(Deviation correction function of low limit display value)

It adjusts the display value of the optional 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 at saved in *INBL* automatically.

| Operation   | Input correction value   | Front panel key  | External input signal  |
|-------------|--|--|--|
| Description | PA1: Direct input correction value method at <i>INBL</i> mode. | Press both ◀, ▶ keys for 3 sec. at the measuring mode. | Short-circuit external Hold terminal No.6, 7(T904-F)]over min. 50ms.<br>*It is enable to use in option MODE. |

\* Refer to “•Error correction function”, “•Error display function” and “■ Parameter 2” for function and error.

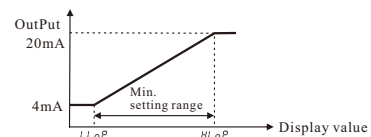
•Current output(DC4-20mA) scale function[PA2 group:*HL OP* / *LL OP*]

It sets current output for the display value at the output current DC 4-20mA.

It sets display value for 4mA at *LL OP* and 20mA at *HL OP* and the range between *HL OP* and *LL OP* should be 10%

\* When min. set interval between *HL OP* and *LL OP* is set as under 10% F.S., it changed as over 10% F.S. automatically.

\* Preset display value is fixed to output as 4mA at under *LL OP* and 20mA at over *HL OP*.



•Monitoring max./min. display value function[PA 0: *HPEL* / *LPEL* , PA2: *PEEL* ]

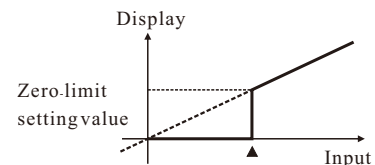
It monitors Max. /Min. display value based on the current displays value and then displays the data at *HPEL* , *LPEL* of parameter 0. Set the delay time(0 to 30sec. ) at *PEEL* of parameter 2 in order to prevent malfunction caused by initial over current or over voltage, when monitoring the peak value.

Delay time is 0 to 30sec. and it starts to monitor the peak value after the set time. When pressing any one of ◀ key at *HPEL* , *LPEL* of parameter 0, the monitored data is initialized.

\* Monitoring function is not displayed when the delay time is set as “00 5” at *PEEL* of parameter 2.

•Zero-limit Function[PA2 : *ZER* ]

The zero-limit function changes any value below the set value to zero. This is useful when you want to change negative values to zero rather than display them, or when you want to make the display in the smallest part of the input range zero.



•Error display function

| Display | Description   |
|---------|---|
| HHHH    | Flashes when measurement input is exceeded the max allowable input (110%)         |
| LLLL    | Flashes when measurement input is exceeded the min allowable input (-10%)         |
| d-HH    | Flashes when display input is exceeded <i>H5C</i> set value                       |
| d-LL    | Flashes when display input is exceeded <i>L5C</i> set value                       |
| H-HH    | Flashes when input frequency is exceeded the max. display value of measured range |
| EE00    | Flashes when it exceeds zero range (+99)  |

•Initialization function

It initializes as the factory default status. If press (MODE), ◀, ▶ keys together for 2sec. in RUN mode, *INLT* mode and the setting value(*no*) is displayed every 0.5 sec. and it will be initialized as the factory default when press (MODE) key after change *no* ↔ *9E5*

# ■ Functions

## • AC frequency measurement function

It measures input signal frequency when it is AC input. It uses fixed decimal point[PA1: *dP*], 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 [PA2: *lnbH*] and [PA2: *lnbE*]. In order to measure frequency normally, input signal, over 10% F.S. of the measured range, should be supplied.

Please select the proper point of

### ① Measuring range

|                        |               |              |             |          |
|------------------------|---------------|--------------|-------------|----------|
| Decimal point position | 0.000         | 00.00        | 000.0       | 0000     |
| Measurement range      | 0.100~9.999HZ | 0.10~99.99HZ | 0.1~999.9HZ | 1~9999HZ |

\* Accuracy of frequency measurement :

Below 1kHz, F.S.  $\pm 0.3rdg \pm 2digit$ .

From 1kHz to 10kHz, F.S.  $\pm 0.3rdg \pm 2digit$ .

② *lnbH*: 0.100 to 9.999 [Gradient adjustment of high value]

③ *lnbE*:  $10^{-2}, 10^{-1}, 10^0, 10^1$  [Index adjustment of *lnbH*]

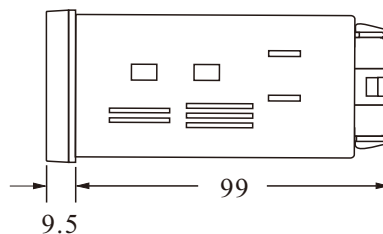
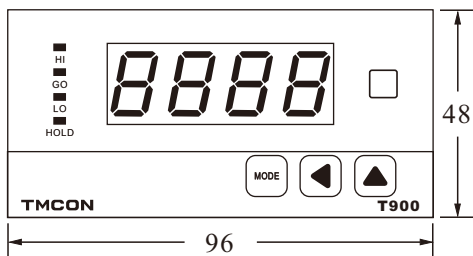
## • Preset output mode[PA1: *oUEn*]

| Mode        | Output operation | Operation  |
|-------------|------------------|--|
|             |                  | <br>HY: Hysteresis   |
| <i>oFF</i>  |                  | No output  |
| <i>LSE</i>  |                  | If is equal or lower than Low setting value, LO output is ON.<br>if it is higher than Low setting value, GO output is ON.  |
| <i>HSE</i>  |                  | If it is equal or higher than High Setting value, HI output is ON.<br>If it is equal or lower than High Setting value, GO output is ON.  |
| <i>LHSE</i> |                  | LO output is ON when it is equal or lower than Low setting Value.<br>HI output is ON when it is equal or higher than High setting value.<br>GO output is ON when it is higher than Low setting value, and lower than High setting value. |
| <i>HHSE</i> |                  | LO output is ON when it is equal or higher than Low setting value.<br>HI output is ON when it is equal or higher than High setting value.<br>GO output is ON when it is lower than Low/High setting value.                               |
| <i>LLSE</i> |                  | LO output is ON when it is lower than Low setting value.<br>HI output is ON when it is equal or lower than High Setting value.<br>GO output is ON when it is higher than Low/High setting value.   |
| <i>LdSE</i> |                  | It is operated same with <i>LSE</i> but LO output does not operated under initial Low setting value, and it is ON from under next Low setting value.<br>If this is higher than Low setting value, GO output is ON                        |

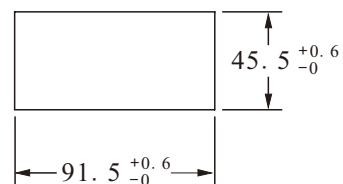
\**HSE* is displayed according to the Setting of output operation mode, when user sets "*oFF*", *HSE* / *LSE* are not displayed.

## ■ DimensionS(Unit:mm)

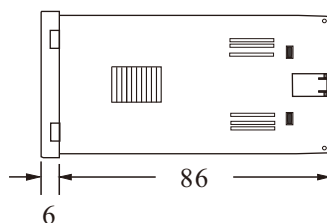
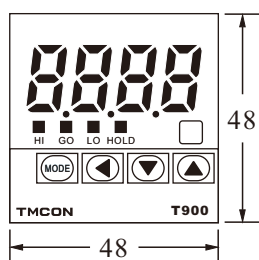
● T904-F ( 48×96mm )



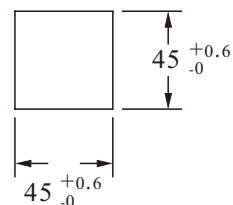
Panel cut-out:



● T904-G ( 48×48mm )







Panel cut-out:



# Terminal connection

| T903-F ( 48×96mm )  |  |
|---|--|
| T904-FAA/T904-FAV/T904-FHZ/T904-FDA/T904-FDV  | T904-FSVA  |
| <p style="text-align: center;">Voltage input</p> <p style="text-align: center;">*No.4, 5 terminal AA for 20mA, DA for 2mA</p>   | <p>input:<br/>                     mA: DC0-20mA/4-20mA.<br/>                     V: DC0-10V/2-10V/0-5V/<br/>                     1-5V/0-1V/0-500mV/<br/>                     0-200mV/0-100mV.</p>  |
| T904-G ( 48×48mm )  |  |
| T904-GAA/T904-GAV/T904-GHZ/T904-GDA/T904-GDV  | T904-GSVA  |
| <p style="text-align: center;">Ampere input<br/>*No.4, 5 terminal AA for 20mA, DA for 2mA</p> <p style="text-align: center;">Voltage input</p> <p style="text-align: center;">* Can only choose one</p> | <p>input:<br/>                     mA: DC0-20mA/4-20mA.<br/>                     V: DC0-10V/2-10V/0-5V/<br/>                     1-5V/0-1V/0-500mV/<br/>                     0-200mV/0-100mV.</p> <p style="text-align: center;">* Can only choose one</p> |

## ■ Front panel identification

| lamp | Explain                               | Key   | Explain  |
|------|---------------------------------------|---|--|
| HI   | HI : High output indication of preset |  | Mode Key, enters parameter mode.                   |
| GO   | GO : GO output indication of preset   |  | Moves digit  |
| LO   | LO : Low output indication of preset  |  | changes Sv , up key                                |
| HOLD | HOLD input signal indication          |  | changes Sv , down KEY<br>(T904-F Without this key) |