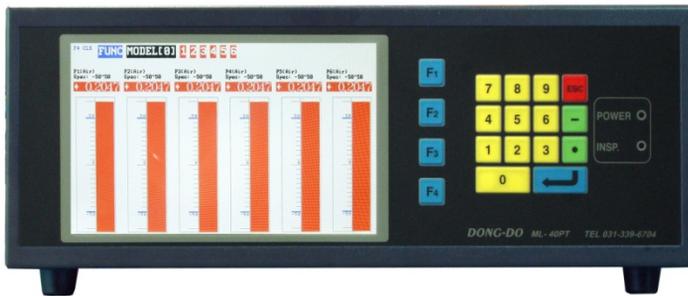


7" Color TFT LCD Multi-channel Display.



High Precision Air type Electronic micrometer

ML-16/32PT-Ax

User's Guide

The contents of this manual could be different according to the software version and it can be changed without notice.

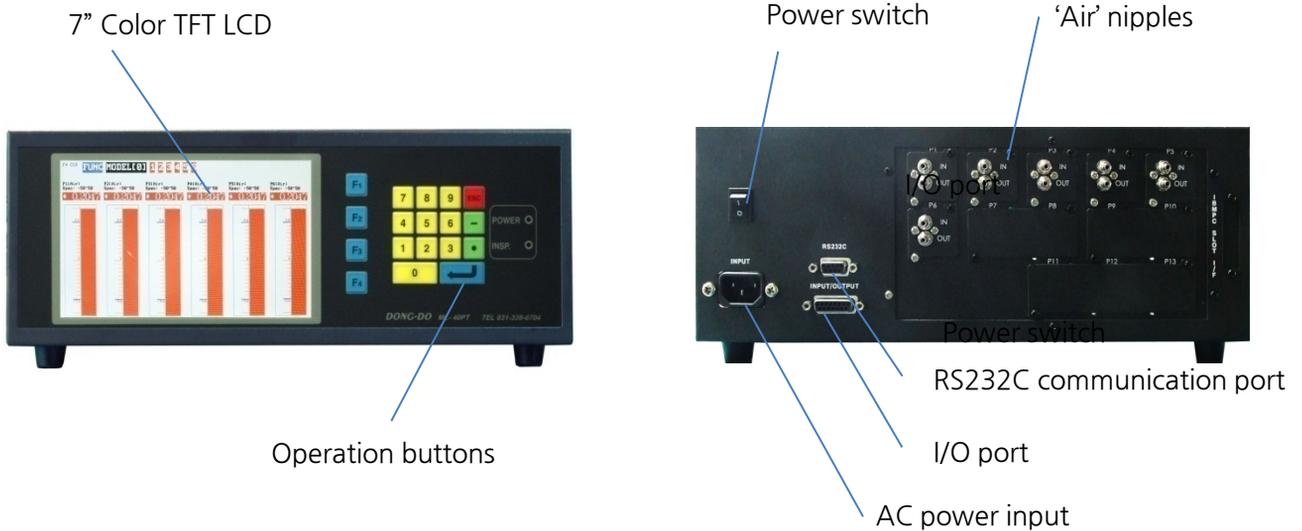
Please use this good after reading the manual thoroughly.

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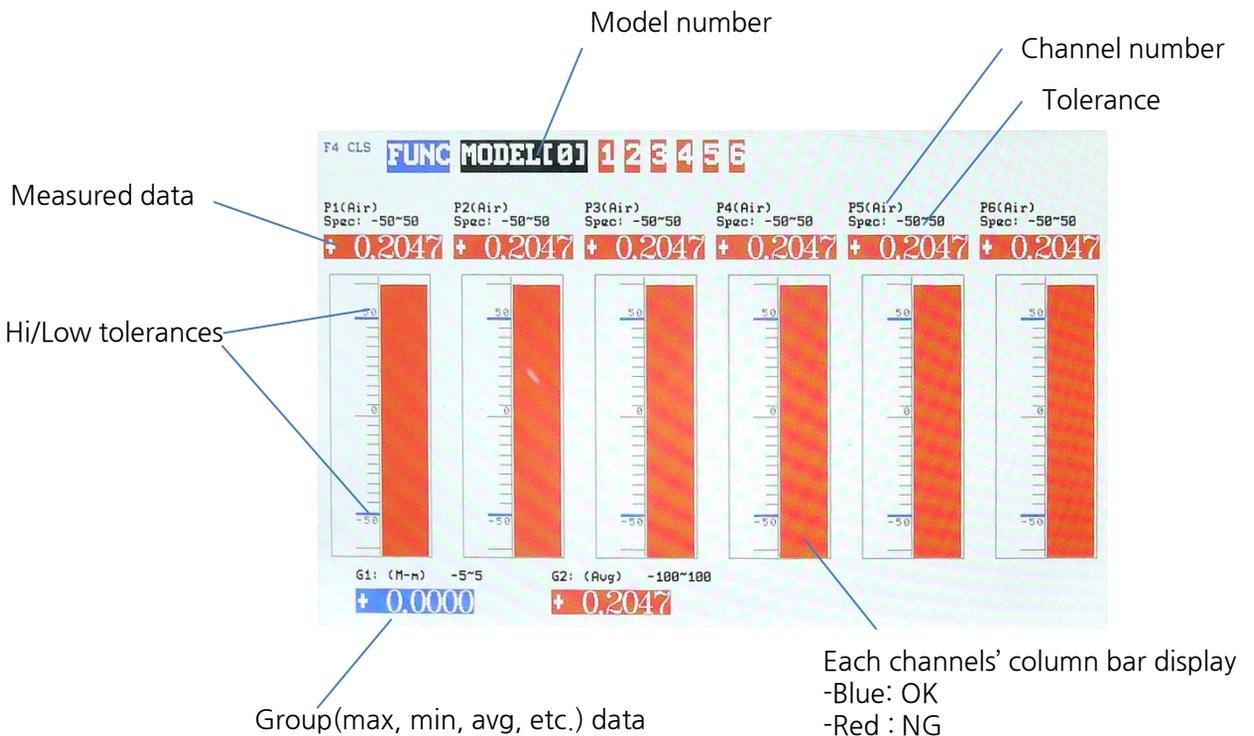
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Product features & composition

1. Features



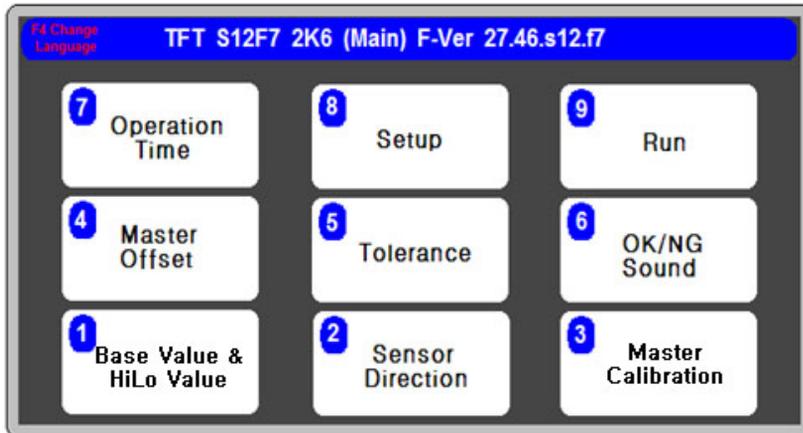
2. Measuring screen



Functions

1. Main menu

- Main menu is entered by hitting ESC button. On the any screen, if the ESC button is hit several times, Main menu is reached. Each menu can be entered by hitting their numbers.



-The main menu is composed as like the picture at the left.

-Each functions can be chosen by ► button after cursor is moved by ▲▼ buttons.

1. Base Value & HiLo Value : Base(nominal) value and Hi/Low masters' dimension setting.
2. Sensor Direction : Sensor direction setting
3. Master Calibration : Calibrating sensors by Hi/Low master rings.
4. Master Offset : Master offset setting.
5. Tolerance : To input the tolerances of the measuring part.
6. OK/NG Sound : To make a beep sound at the NG or OK states.
7. Operation Time : To input the stable time for the sensor / output signal holding time.
8. Setup : To setup the serial option, Group functions, I/O, etc.
9. Run: To go to the measuring screen.

Functions

**Simple setting orders.

- **Base Value & Hi / Lo Value** → **Master Calibration** → **Tolerance** → **Other options**

a. Hi / Lo Master Size input(at **Base Value & Hi / Lo Value** menu).

ex1) If, Hi master(Max) : 10.053 / Low master(Min) : 10.028,

If base is set by 10.000, put in the Hi value : 53um / Low value : 28um.

ex2) If, Hi master(Max) : 10.053 / Low master(Min) : 10.028,

If base is set by 10.020, put in the Hi value : 33um / Low value : 8um.

ex3) If, Hi master(Max) : 10.022 / Low master(Min) : 9.985,

If base is set by 10.000, put in the Hi value : 22um / Low value : -15um.

*At ex1 and ex2, the Hi/Low values are different depended on the base value, but

the deviation is the same.

*Hi(Max) value should be bigger than Low(Min) value.

*The base(nominal) value does not effect to the result of the decision.

b. Hi/Lo Master Calibration(at **Master Calibration** menu).

c. **Tolerance** setting to make the decision of OK or NG(at **Tolerance** menu).

d. Other settings as like group, time, serial, etc.

2. Base Value & Hi / Lo Value

-Base(nominal) value and Hi/Low masters' dimension setting.

1) Base value: Base(nominal) value for the measuring data on the LCD display.

This value does not effect to the result of the decision. Base is useful to display the real dimension number.

2) Hi master value: Put in the hi master's size.

3) Low master value: Put in the low master's size.

*Please see the 'Simple setting order' at the top of this page.

3. Sensor direction

- Sensor direction setting menu. Pos ↔ Neg. Default setting is Pos.

• Pos : to measure inner diameter. So, the value is increased as the hole size is bigger.

• Neg : to measure outer diameter. So, the value is increased as the part size is bigger.

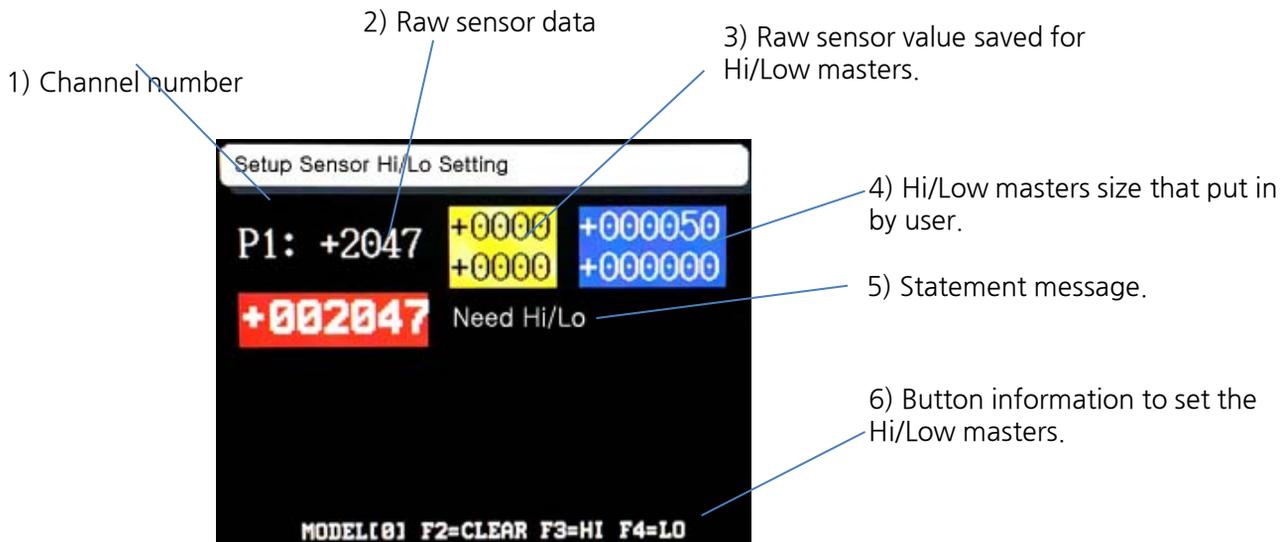
Functions

4. Master Calibration

- To calibrate the real sensor value to the Hi and Low master values that are put in by user.

If the Hi/Low master values are wrong, the calibration should be wrong!

At the multi-channels model, the calibration should be done all together or every single channel. If the channel to calibrate is selected, the screen below is shown.



1) Channel number : Current channel number to calibrate.

2) Raw sensor data : Current sensor's raw data. Normally it is shown around -1900~-1800 if there's no air input. But it could be different depended on models.

3) Raw sensor value saved for Hi/Low masters :

Saved raw sensor value for masters. It is shown as '0' before setting.

If the setting is done well, the color is changed to blue. If not, become red.

*Put in the air with Hi master ring → Hit 'F3' button → Hi master setting is done.

*Put in the air with Low master ring → Hit 'F4' button → Low master setting is done.

*Check the data 2~3 times between Hi and Low settings.

4) Hi/Low masters size : Hi/Low masters size that put in by user at the 'Base value & HiLo value' menu.

If user put in the Hi value lower than Low value, the color is shown as red.

5) Statement message : the statement messages for master calibration. Check the below chart for details.

6) Button information : The buttons' information to use. F2,F3,F4 button is used.

To save the setting, ESC button is used.

Functions

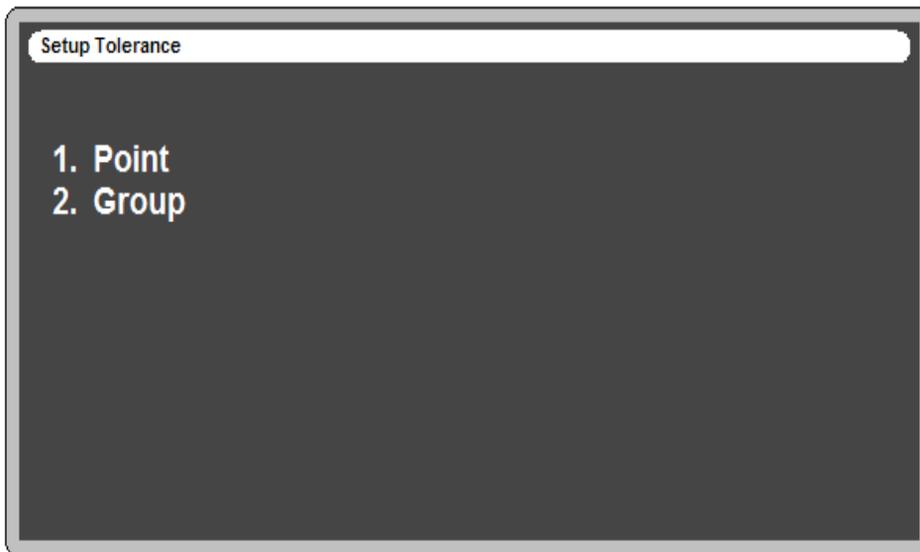
5. Master Offset

- After making Master product if there is the difference between target and measured result, in the case of this it will compensate the difference.

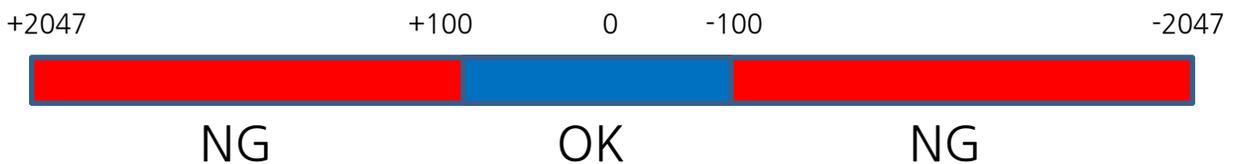
$$\text{Ex) Measured result - Target(Drawing) = Input data}$$
$$9.900 - 10.000 = -0.100$$

6. Tolerance

- To input the tolerances of the measuring part to make a decision of OK and NG.



-If you set the tolerance range as $\pm 100\mu\text{m}$ that looks like below it will print "OK" within the +/- tolerances.



7. OK/NG sound

- To make or off the beep sound at the NG or OK states.

Functions

8. Operation time

- To input the stable time for the sensor / output signal holding time.



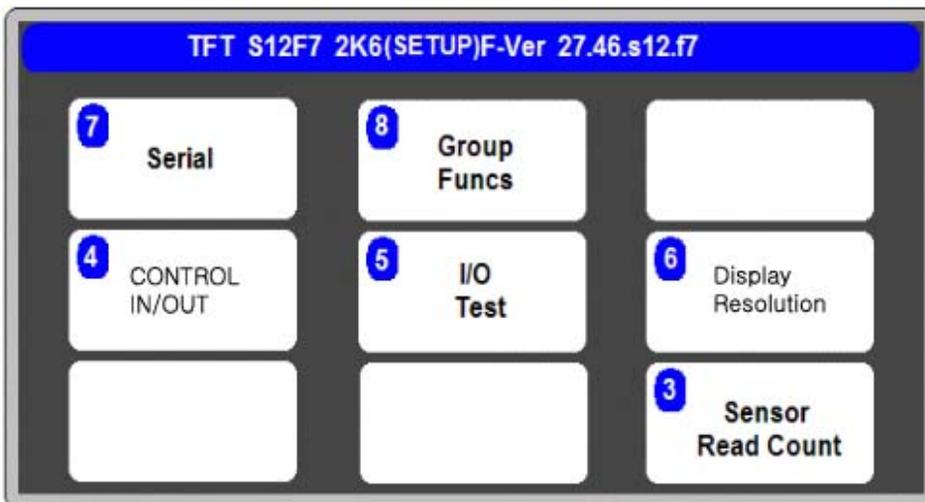
-Probe stable time : After receiving sign of start measurement it delays for a moment as you set and it will start to measure.

-Output hold time : After measured by sign of start measurement. it will set the output range of OK/NG.

Set "0" : Continue to print until set the next sign of start.

9. Setup

- To setup the serial option, Group functions, I/O, etc.



Functions

1) Sensor Read Count

The value is average of sensor value on measuring screen.

2) Control IN/OUT

- Wait Start off : In case of be selected "YES" Elec' micrometer wait start signal off after measurement. To measure start, the start signal should ON after OFF. This item valid when Auto Measure is not use.

- Auto Measure : When selected "YES" Elec's micrometer do measuring operation continuously although there's no start signal by external.

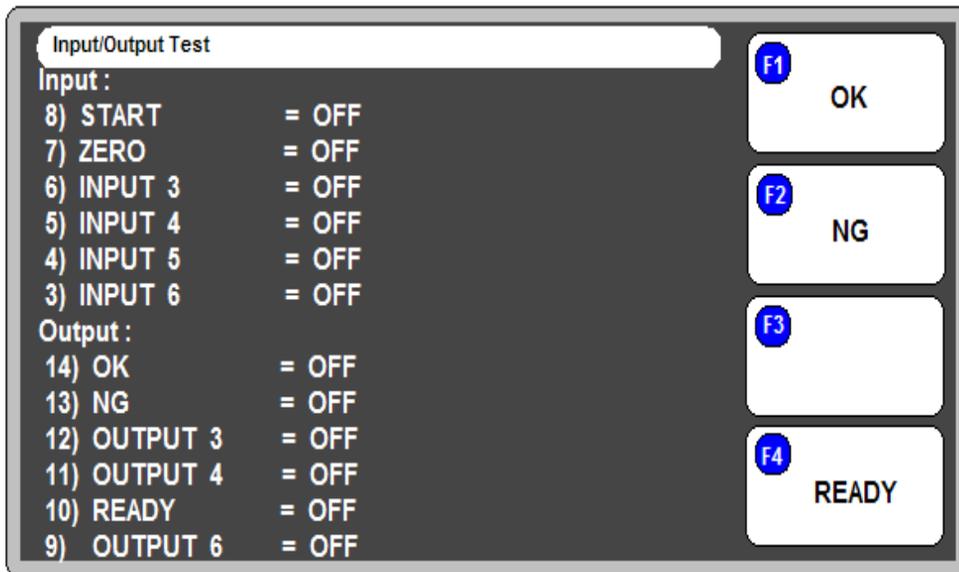
※ **Caution!** When using Auto Measure, measuring result and data output continuously by serial port & output port(D-Sub 15Pin).

3) I/O Test

You can test connection condition of in/output port. You can confirm input condition & output signal on outer PLC. Input signal is on, when the "off" changes to "on".

You can test press F1~F4 key or No.1~6 key.

※ **In/Output test is not operating automatically.**



4) Display Resolution

Display resolution can be selected to 0.01mm or 0.001mm.

Functions

5) Serial



- Send : Turns communication ON or OFF.
- ASCII : Sets Control units.(Off : HEX format.)
- 19200 : Sets communication speed. Use(19200bps)/No use(9600bps)
- POINT : Sets Output format. In case of "USE" output data value include decimal point and bas Base value.

a. Transmit setting

Division	Specification
<ul style="list-style-type: none"> Interface Port 	<ul style="list-style-type: none"> - RS232C - RS232C PORT ⇔ 1 Channel - Asynchronous
<ul style="list-style-type: none"> Character organization Control units Communication speed Connection 	<ul style="list-style-type: none"> - DATA BIT ⇔ 8 Bit - PARITY BIT ⇔ None - STOP BIT ⇔ 1 Bit - ASCII Code - 9600 Baud (Fixed) - One

b. Cable setting

Elec' micrometer		Direction of signal	Computer	
Signal	Pin No.		Pin No.	Signal
N.C	1		1	DC
RD	2		2	RD
TD	3		3	TD
N.C	4		4	DTR
SG	5		5	SG
N.C	6		6	DSR
N.C	7		7	RTS
N.C	8		8	CTS
N.C	9		9	RI

- Cable of computer serial working terminal - Connect 4P, 6P & Connect 7P, 8P

Functions

c. Output types for communication

- Hex Format

STX (1 Byte)	STATUS (1 Byte)	MEASURING DATA (n Byte)	ETX (1 Byte)
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(n = Transmit Data Q'ty x 2)

- ASCII Format / POINT = NO

Byte	1	2	1	2	1	5*n+(n-1)	1	1	2	1	1
Char	ENQ	Start Point	,	End Point	,	Data	,	ETX	@@	CR	LF

Ex) In case of No. of Data is 2.

1	2	1	2	1	5	1	5	1	1	2	1	1
ENQ	01	,	02	,	+0043	,	-0025	,	ETX	@@	CR	LF

- ASCII Format / POINT = YES

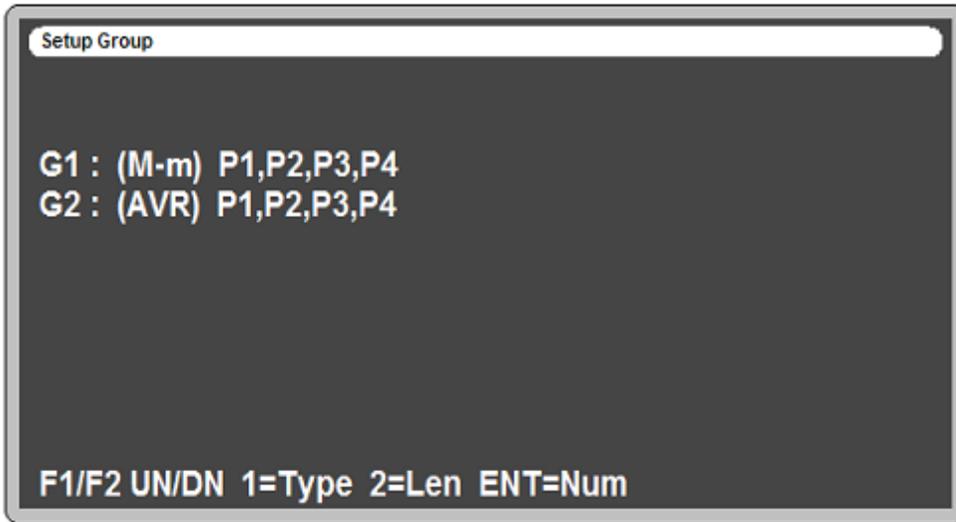
Byte	1	2	1	2	1	8*n+(n-1)	1	1	2	1	1
Char	ENQ	Start Point	,	End Point	,	Data	,	ETX	@@	CR	LF

Ex) In case of No. of Data is 2.

1	2	1	2	1	8	1	8	1	1	2	1	1
ENQ	01	,	02	,	+023.932	,	-015.725	,	ETX	@@	CR	LF

Functions

6) Group Funcs



Each sensing point be grouped for calculation by Group funcs.

- Setting method

a. Select group by using function key F1/F2.

b. Press keypad 1 and then the operation type be indicated.

1. Point One	Each sensing point
2. Group Max-min	Maximum value - minimum value of grouped point
3. Value - Value	Point value - Point value
4. Group Sum	Sum value of grouped point
5. Group Average	Average value of grouped point
6. Group Sum /2	Sum value of grouped point / 2
7. Group Max	Maximum value of grouped point
8. Group Min	Minimum value of grouped point

c. Select point which you want to group by using Enter key(moving to cursor : F1/F2). Press Enter key to cancel select.

d. Press ESC to move main menu. Set Tolerance of group.

※ When you setting group function the first time, there's no tolerance of group. So, it is valid when the tolerance has some value.

Ex) G1 : Max-min value of P1, P2, P3, P4

Main Menu -> 8 KEY(SETUP) -> 8 KEY(Group Func) -> 1 KEY(Operation type of G1) -> 2 KEY(Select Group Max-min) -> ENTER(P1~P4 Use) -> Set the tolerance of group -> Move to measuring screen and confirm " G1 (M-m) ".

Functions

10. Reset

- Reset : Turn off the meter first. Press "F4" and "Power on" at the same time. Enter to reset after message.

※ Please note your settings before reset. (set as default status.)

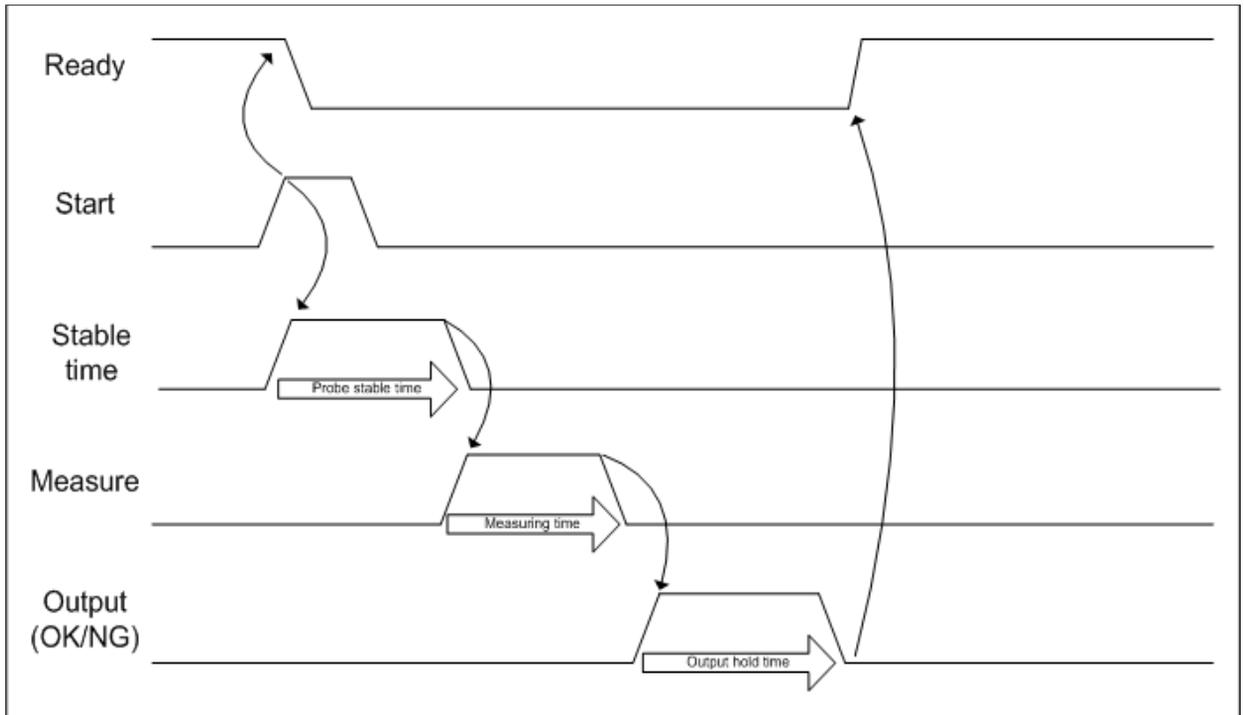
11. I/O pin configuration

1) I/O pin description

Pin	Name	In/Out		Description	Circuit																									
1	NCOMMON		0 V	GROUND	<p>INPUT (START)</p> <p>INPUT CURRENT:MAX 10mA</p> <p>OUTPUT (OK, NG, READY)</p> <p>VOLTAGE:MAX 30V CURRENT:MAX 300mA</p> <table border="1"> <tr> <td>MODEL</td> <td></td> <td>4</td> <td>5</td> <td>6</td> </tr> <tr> <td>MODEL0</td> <td></td> <td>OFF</td> <td>OFF</td> <td>OFF</td> </tr> <tr> <td>MODEL1</td> <td></td> <td>OFF</td> <td>OFF</td> <td>ON</td> </tr> <tr> <td colspan="5" style="text-align:center">...</td> </tr> <tr> <td>MODEL7</td> <td></td> <td>ON</td> <td>ON</td> <td>ON</td> </tr> </table>	MODEL		4	5	6	MODEL0		OFF	OFF	OFF	MODEL1		OFF	OFF	ON	...					MODEL7		ON	ON	ON
MODEL		4	5	6																										
MODEL0		OFF	OFF	OFF																										
MODEL1		OFF	OFF	ON																										
...																														
MODEL7		ON	ON	ON																										
3	RECALL	in	H/L	RECALL serial output																										
4	MODEL BIT2	in	H/L	Model control bit 2																										
5	MODEL BIT1	in	H/L	Model control bit 1																										
6	MODEL BIT0	in	H/L	Model control bit 0																										
7	ZERO	in	H/L	Zero signal																										
8	START	in	H/L	Meas. Start signal																										
9	ERROR	out	H/L	Error signal																										
10	READY	out	H/L	READY signal																										
11	N.C																													
12	N.C																													
13	NG	out	H/L	NG signal																										
14	OK	out	H/L	OK signal																										

Functions

2) Timing diagram



Specifications

1. General Specifications

DIVISION	GENERAL
MAIN SUPPLY	AC100-220V~ 50/60Hz
MAX.POWER CONSUMTION	30W
INNER FUSE	Fuse T2AL 250V
OPERATING TEMPERATURE	5 ~ 40℃
RELATIVE HUMIDITY	Up To 70%
OPERATING CONDITION	NO CORROSIVE GAS AND DUST
SUPPORTING OUTAGE	DATA BACK UP BY INNER FLASH MEMORY

2. Specifications

DIVISION		SPECIFICATIONS
AIR SENSOR	CHANNELS	16PT: Air 1 ~ 4CH. 32PT: Air 1 ~ 13CH.
	RESOLUTION	0.1um
DISPLAY	LCD	7" TFT COLOR GRAPHIC LCD
	SIZE	800×480(pixel)
DIMENSION		16PT: W280×D290×H140(mm) 32PT: W360×D290×H151(mm)
WEIGHT		About 6kg
OUTER INTERFACE		RS232C, 9600N81
		PLC I/F(IN:6, OUT:6)

High Precision Electronic Micrometer

DONG-DO