DONG-DO

Color TFT LCD display

High Precision Electronic micrometer

ML-CP-R1

User's Guide (Ver. 7.42)

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.

Table of Contents

Product features & composition

1. Features(features could be different from pictures without notice.)

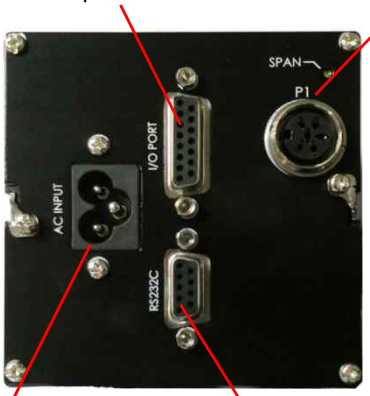
Color TFT LCD & Touch pad

Setup buttons
(up▲, down▼, select▶, mode■
buttons in a row)

Menu

I/O port

HBT probe
connector



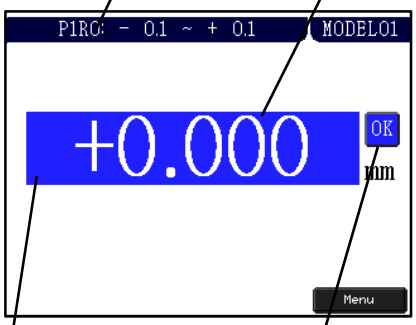
AC power input
(100-220V,50/60Hz)

RS232C communication port

2. Measuring screen

Tolerance

Measured data



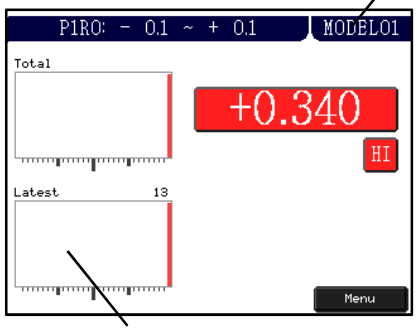
Result

Measured groups(or points)

<Normal Text view>

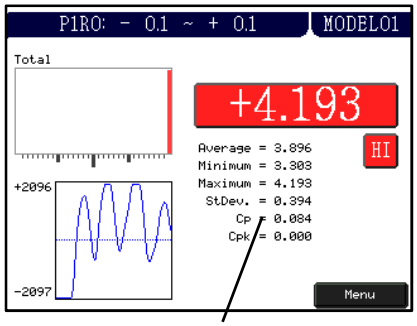
*A wide digital data is shown in this mode. Blue & red color make easy to realize the result.

Model number



Histogram & Flow chart

<Histograms & chart view>



CP/CPK

<Statistics data view>

*If the statistics data view is on, the histogram view is off automatically. And only 2 groups' statistics data are shown max.

Statistics data is disappeared from 3 groups.

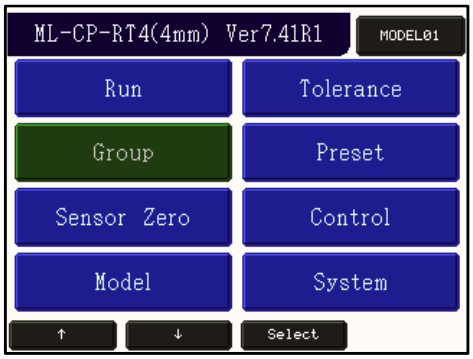
**Simple setting orders.

*** Probe install → Master zero setting → Group → Tolerance → Runout setting → Other options**

a. Probe install(with **Sensor Zero** menu, please check page 6 for the installing).
b. Master zero setting(at **Sensor Zero** menu).
c. **Group** setting to display on the measuring screen. (Doesn't need on the 1ch unit.)
d. **Tolerance** setting to make the decision of OK or NG.
e. **Runout** measuring method selection, by time or signal input.
(at Main → Control → **Runout** menu, please check page 9.)
f. Other settings as like Preset, Display, etc.

1. Main menu

- Main menu is entered by hitting the Mode ■ button(4th button from left) or touching 'menu' on the measuring screen.



<Main Menu>

-The main menu is composed as like the picture at the left.
-Each functions can be chosen by touching screen or ▶ button after cursor is moved by ▲▼buttons.

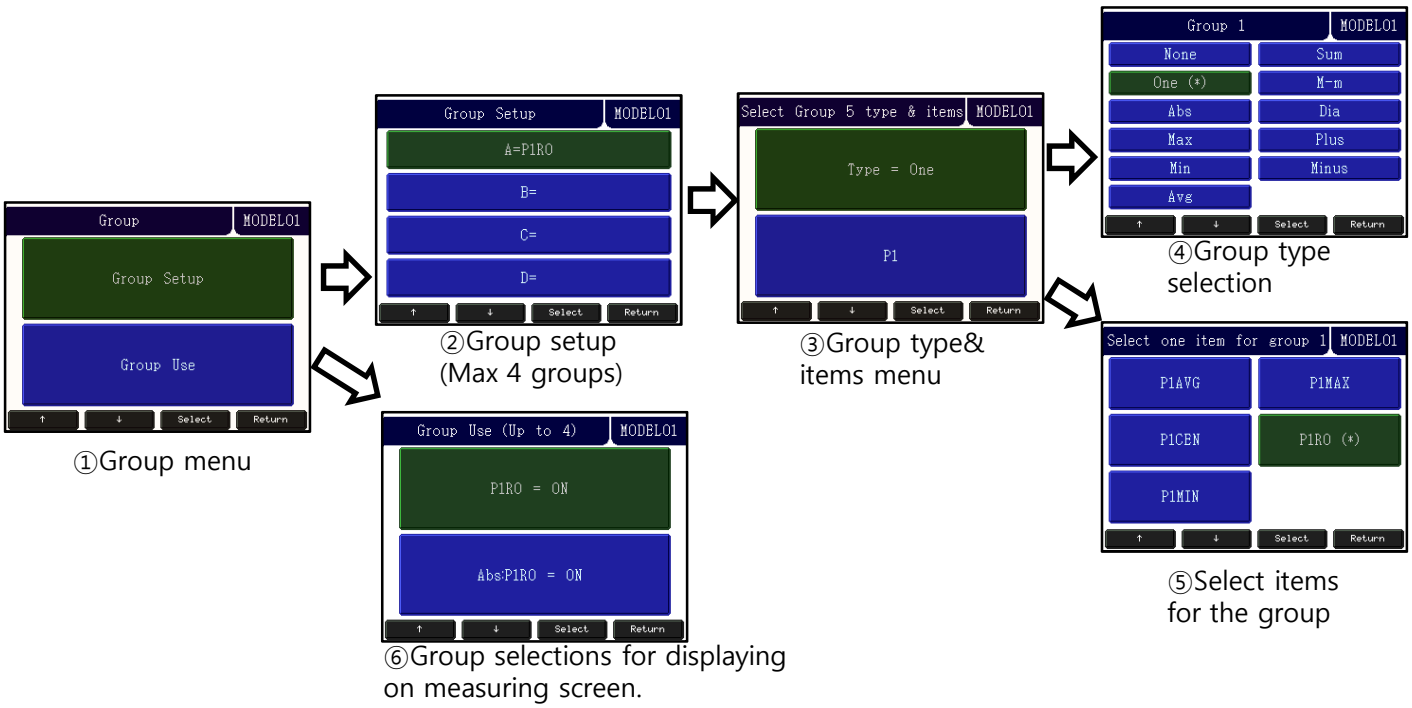
1. Run: To go to the measuring screen.
2. Group: To set the items to display on the measuring screen.
3. Sensor: Calibration sensors by Hi/Low masters.
4. Model :Memory space to save the current settings.
   There are 16 spaces, 0 to 15, and external memory selection by input signal is possible if the model is set to 99.
5. Tolerance: To input the tolerance of the measuring part.
6. Preset: Preset(nominal) value for the measuring data on the LCD display.
7. Control: To set up the display, input/output, serial communication, etc.
8. System : To setup the unit, language, password, etc.

2. Run

-To enter the measuring screen.

3. Group

- To set the items to display on the measuring screen. Various functions can be set in this menu.
- Maximum 4 groups are possible to display on the screen.
- If “Group" is selected on the main menu, the Group setup screen is come out.



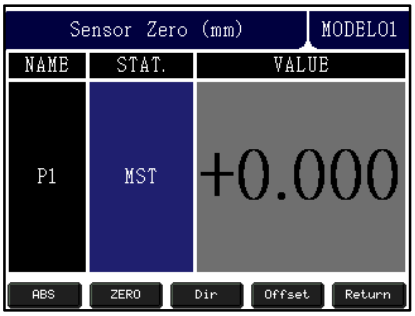
-There are the types of the group: None, One, Peak, R.Peak, Max, Min, Avg, Sum, M-m, Plus, Minus.
1)None: No used
2)One: 1 point
3)Abs: Absolute value of the runout item.
4) Max: Maximum value of the runout item.
5) Min: Minimum value of the runout item.
6) Avg: Average value of the runout item.
7) Sum: Addition value of the runout item.
8) M-m: (Maximum value – minimum value) of the runout item.
9) Dia: Diameter from the runout data.
10) Plus: Addition between two values.
11) Minus: Subtraction between two values.

-There are items for the group.
12) P1MAX: Max. value of the point during runout.
13) P1MIN: Min. value of the point during runout.
14) P1AVG: Avg. value of the point during runout.
15) P1RO : Max-min of the point during runout.
16) P1CEN: (Max-min)/2

*The calculation: 1. Calculate the runout items(P1MAX, P1MIN, etc) → Calculate groups(One, Max, etc.)
Normally, Type = One / Items = P1MAX, P1MIN, P1AVG, P1RO, P1CEN.

4. Sensor Zero

- Setting the master zero and sensor's directions.



- The picture on the left is the screen of the Sensor Zero.
-If user touches the 'Return' or MODE(■) button on the screen, it is out to the main menu with saving the data.

- Sensor zero setting method

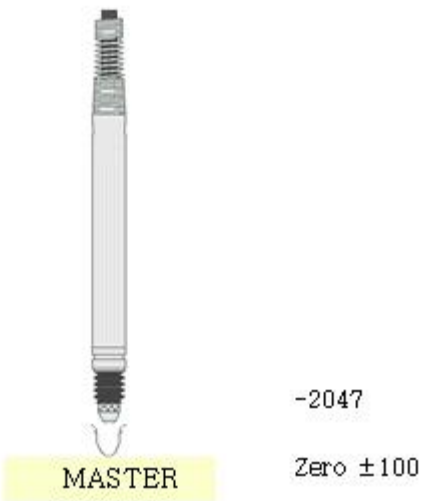
1) Move the probes to the measuring position after a standard product(MASTER) or product to measure is put on the right place.
2) The absolute values of the probes are displayed on real time on the screen if the 'ABS' or the UP(▲) button is pushed once.
3) The 'ZERO' or the DOWN(▼) button is pushed once to set the current values to zero.
※ The last setting values are displayed if user re-enters the 'Sensor Zero' after zero setting.
4) Dir(Direction): To change the direction(sign) of the measured value. Normally, it is increased to the 'POS' direction as the tip of the probes are pushed. Set 'NEG' to change the direction.
!! The zero setting must be done again after the direction is changed.
5) Offset: To give an offset to adjust master.
ex) Measuring result (9.900) – Target value(10.000) = Input data in 'Offset' (-0.100)

< Initial installation of PROBE >

Please set the initial position correctly for standing long use and avoiding damage.

Ex) Installation of DP-S4

1) Press 'ABS' or UP(▲) button in 'Sensor Zero' menu.
(You will see the "-2097" at first and you can check the changes while moving sensor's tip.)
2) Put the standard(MASTER) and move to sensor zero position.
3) Adjust measurement value shown on LCD within ± 100㎛ after the sensor install to bush.
※ If the probes are tighten too strongly, the movement of the probes could be not good.
4) Press 'ZERO' or the DOWN(▼) button to set current values to zero and press 'return' or the MODE(■) button to exit with saving data.



5. Model

- Memory space to save the current settings. And the setting can be recalled.
  There're 16 memory spaces in ML-CP. If the model is set by 99 or External, the model can be changed by external I/O input.

6. Tolerance

- Tolerance to make the decision of OK/NG is put in this menu.

①Group name: No changeable.
②Hi/Low tolerance: Hi and Low tolerance to make the OK/NG decision. If the tolerance to change is selected, the number entering menu is come out.
③Offset: Offset values for groups. Normally set by 0.000.
④Factor: Digital gain for groups. Normally set by 1.000.
Final value = raw value * Factor(at 'Tolerance' menu).
⑥Return: To return to the main menu with saving the setting.

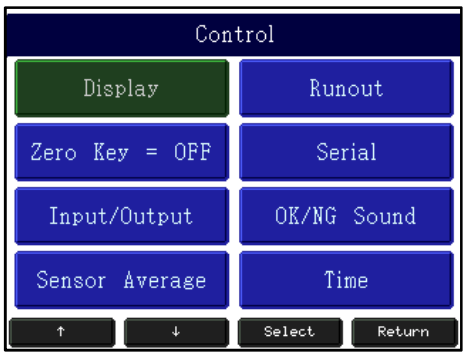
7. Preset

- Preset(nominal) value for the measuring data on the LCD display. Preset is useful to display the real dimension number.

※ The value on the Preset does not effect to the result of the decision. It is just added when the measuring data is displayed.

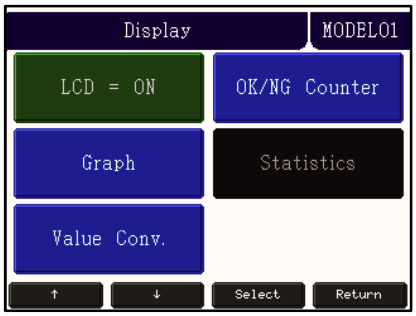
8. Control

- To set up the input/output methods, serial communication, etc.



1) Display:

- To set up display items on the measuring screen .

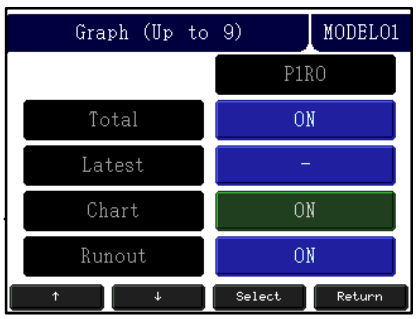


a. LCD on/off:

To set if the LCD display is used during running or not. If the LCD does not used, other processes are faster. The text of <<LCD DISPLAY IS OFF>> is displayed on the screen if it is set 'Off'.

b. Graph:

To set which the histograms & charts are on the measuring screen.



- Graph On/Off : To select if the graph function is used or not.
- Sample Count : This is for 'Latest histogram' & 'Flow chart'.
  It's about how many latest data is used for them.
- Clear Data : To clear the graphs on the measuring screen.
- Selection : To choose which graphs are displayed on the measuring screen.

* There're number limitations of displaying histograms and flow charts.
• By 4 groups : Max. 9 histograms & charts.
• From 5 to 8 groups: Max. 3 histograms & charts.

**There're 4 kinds of display output in the 'Graph' selection menu.

- Total histogram(T.Histo) : Histogram by total data but they're not saved in the memory, but only updated from last histogram.
- Latest histogram(L.Histo) : Histogram by a number of latest data, 1 to 50, and they're saved in the memory.
- Flow chart(F.Chart) : Flow chart by a number of latest data, 1 to 50.
- Runout : Runout graph view.

c. Value conversion:
To setup the end figure of the measured value. There are the options of 'none' (Don't do anything.), 'round', 'raise', and 'cut'.

d. OK/NG counter:
To choose the ok/ng counter on the measuring screen or not.

e. Statistics:
To display statistics data on the measuring screen. Average/Min/Max/Standard Deviation/Cp/Cpk are shown.
*If the statistics data view is on, the histogram view is off automatically. And only 2 groups' statistics data are shown max. Statistics data is disappeared from 3 groups.

2) Zero Key:
- To do the master zero on the measuring screen by DOWN button(▼). The master zero is saved automatically.

3) Input/output:
- To set input / output pins' purpose. (Check page 13).

4) Sensor Average:
-To set how many raw data is used to average them for one measuring sequence.
- The one measuring sequence time could be different by this setting.

5) Runout:
①Runout: 1000Hz data gathering speed depended on the number of channels

1) Stopping method : There're 2 kinds of method of stopping 1 cycle of runout.
  - Stop by start off : stop the cycle when start signal is off.
  - Stop by time out: stop the cycle by time out.
** Starting the runout cycle is always by the start signal on the input port.
2) Read : Read speed can be set. 1~1000Hz.
3) Time : The time to gather the data. Only available when 'Stop by timeout' is set.
4) Display Range : Runout graph high/low view value.
5) Auto Zero On/Off: Zero setting automatically just before start runout.
6) Auto Scale On/Off: To adjust the scale automatically.
7) Zero Line : To show the Zero Line on the Runout graph.
8) Display Scan On/Off: Scanning view during runout measurement.

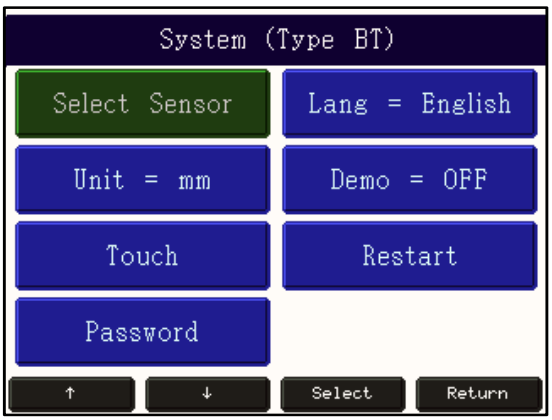
6) Serial:
-To set the RS232C data(Check page 11).

7) OK/NG sound:
-To set if a beep is used at the decision of the OK or NG.

8) Time:
- To set the probe stable time and output signal hold time.

9. System

- To setup the unit, language, password, etc.



1) Select Sensor : 4mm ←→ 10mm. (To change the digital gain for DP-S4 or DP-10.)

2) Unit: unit is changed mm → inch → mil(1/1000 inch).

3) Touch :
   a. Touch Calibration: To check or calibrate the touch pad. To calibrate it, just follow the 5 cross in order. You should press it until a beep is on.
   b. Touch on Run: if 'Off', no touch is worked on the measuring screen. Use mode(■) button to enter the main menu.
   c. Test touch: To check the touch pad is working well. A blue cross will be marked at the touched point. To end of it, press the mode(■) button.

4) Password : To set the password to enter main menu. At the first, password is null, no set.

5) Lang : Menu language selection. English / Korean / Chinese.

6) Demo : To make a random data for a show.

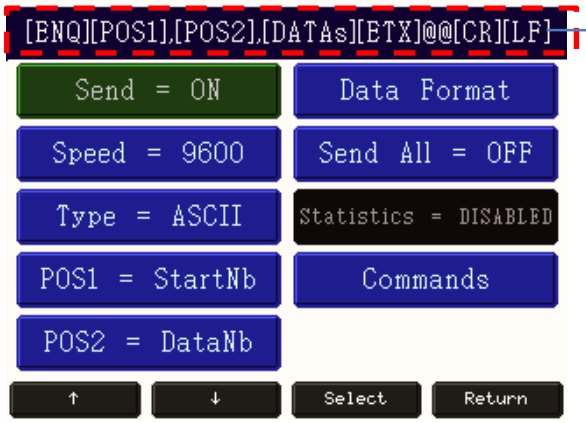
7) Restart : To restart the system(Turn off the power and on again).

10. Initializing

- To initialize all of the setting to the factory set.
- Power on with pressing the mode(■) button. Then a warning message about initializing should be shown. The user setting values are initialized if the select(▶) button is pushed.

※ Every values are initialized to the factory setting. So, write down the values before initializing to save them.

Serial communications



Serial format viewer :
Whenever the settings are changed, the serial format is shown on this viewer.

① Items (At the Main menu → Control → Serial)
- **Send** : To set the use of the RS232C serial output or not.
- **Speed** : Communication speed from 9600 bps to 115200 bps.
- **Type** : ASCII or HEX
- **POS1, POS2** : User can choose one.
  a start number(StartNb), result(OK/NG), a number of data(DataNb), model number(Mdl.Nb), or model name(Mdl.name).
- **Data Format** :
  1)Point On/Off : To put the decimal point on the data or not.
  2)Preset On/Off : To add the 'preset' values for the serial data or not.
  3)Int.Length : To set how many digits are at the front of the decimal point.
  (Only used if 'Point' = ON) ex) In.Length = 4 & Point On/Off = On → +0000.000
  4)Group OK/NG : To send individual 'Group' OK/NG result on each data.

-**Send All** : To send all groups' data even if user doesn't set some groups. i.e. max data output.
-**Statistics On/Off** : If this is on, the statisitics data, Average/Minimum/Maximum/Standard Deviation/ Cp/Cpk, are out with other data. Only worked if user set statistics view is on.
-**Commands** : To give several commands by RS232C.
  1) Commands On/Off: To use the serial commands or not(**Default : Off**).
  2) Use Device ID On/Off: To use the serial command ID when several units connected the line together.
  3) Device ID : The device ID for serial communication. (01 ~ 99, '00' for all unit).

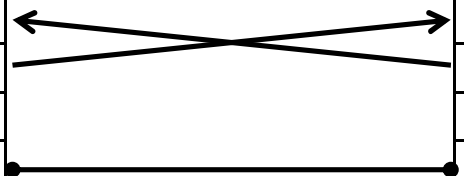
***Serial Commands :**
-START : Starts the measurement once & return the measured data.
-MZERO : No use for Air type.
-MCLEAR : No use for Air type.
-RESET : Initialize the measuring screen (Clear OK/NG counter, Clear graph, ..etc.
-RECALL: Return the current data once without new measurement.

***Serial Commands Format:**
-If no use ID:
[COMMAND] [CR] [LF] → [ACK] returns after 5msec
([ACK] returns only for MZERO, MCLEAR, RESET. For START, RECALL, it gives the data return.)
-If use ID:
[ID] [,] [COMMAND] [CR] [LF] → [ACK] return after 5msec
-[CR] : 0x0D, [LF]: 0x0A, [ACK] : A [CR] [LF] (= A₩r₩n)

Serial communications

② 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 4Pin and 6Pin / Connect 7Pin and 8Pin

Serial communications

③ Examples of the serial communication

- Hex Format

STX (1 Byte)	STATUS (1 Byte)	MEASURING DATA (n Byte)	ETX (1 Byte)

(n = Transmit Data Q'ty x 2)

- ASCII Format

Byte	1	2	1	2	1	-	1	1	2	1	1
Char	ENQ (0x05)	Start Point	,	End Point	,	Data	,	ETX (0x03)	@@	CR	LF

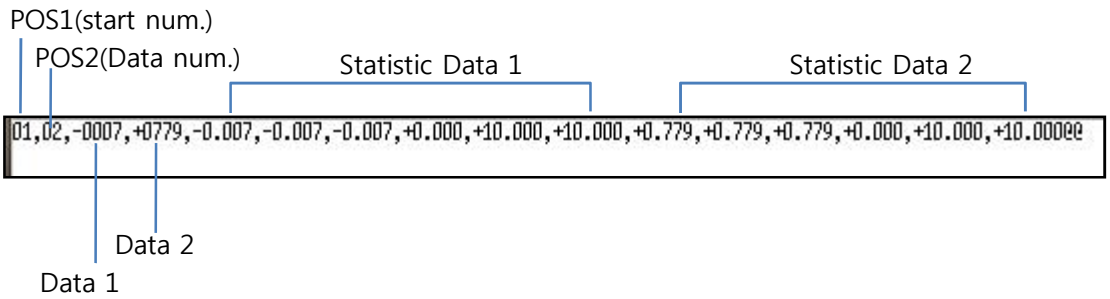
Ex) In case of No. of Data is 2.

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

- ASCII Format with Statistic

Byte	1	2	1	2	1	-	-	1	1	2	1	1
Char	ENQ (0x05)	Start Point	,	End Point	,	Data	Statistic Data	,	ETX (0x03)	@@	CR	LF

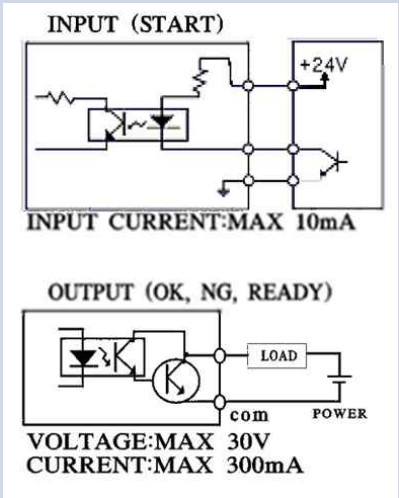
Ex) In case of No. of Data is 2 / Statistics data is 2.



I/O port & operating sequence

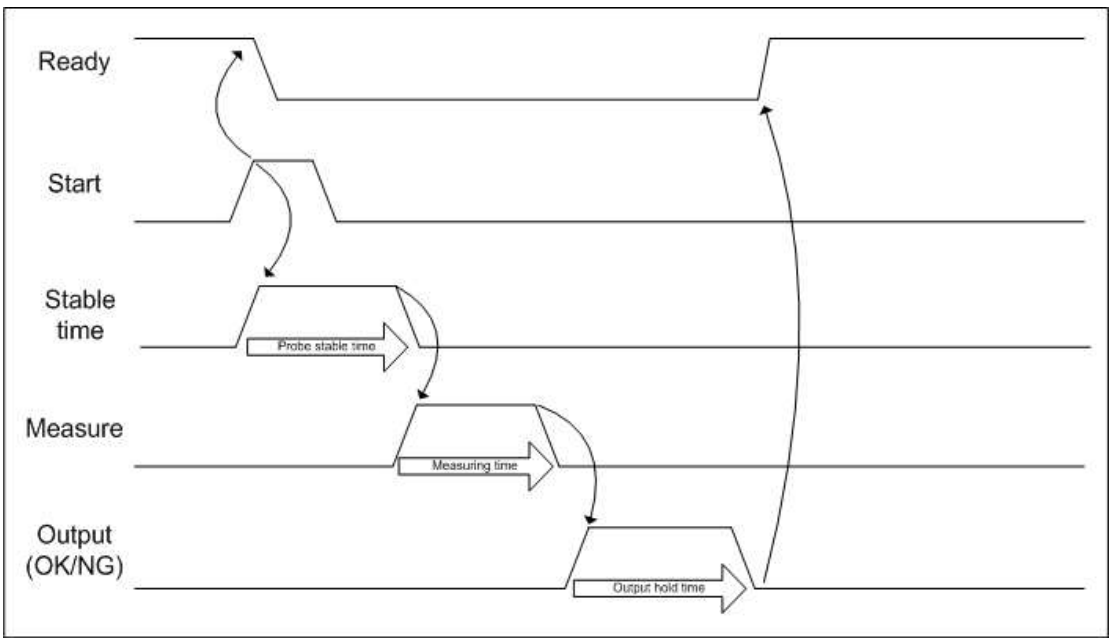
1) I/O pin description

Pin	Name	In/Out		Description	Circuit
1	NCOMMON		0 V	GROUND	
2	PCOMMON		+ 24V		
3	IN6	in	H/L		
4	IN5	in	H/L		
5	IN4	in	H/L		
6	IN3	in	H/L		
7	IN2	in	H/L		
8	IN1	in	H/L		
9	OUT6	out	H/L		
10	OUT5	out	H/L		
11	OUT4	out	H/L		
12	OUT3	out	H/L		
13	OUT2	out	H/L		
14	OUT1	out	H/L		



* User should set how to use the IN/OUT pins at the 'Setup' → 'Input/output'.

2) Timing diagram



Specifications

1. General Specifications

DIVISION	GENERAL
MAIN SUPPLY	AC100-220V~ 50/60Hz
MAX. POWER CONSUMTION	15W
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		SPECIFICATION
LVDT/HBT SENSOR	CHANNELS	2~4ch
	RESOLUTION	1um
DISPLAY	LCD	3.5" TFT COLOR GRAPHIC LCD
DIMENSION		W100×H100×D160(㎜)
WEIGHT		1.0kg
OUTER INTERFACE		RS232C, 9600N81
		I/O port (IN:6, OUT:6)

High Precision Air Type Micrometer

DONG-DO