DONG-DO

Color TFT LCD display

High Precision Electronic micrometer

ML-MP-Sx

User's Guide

The contents of this manual could be different according to the software version and it can be changed without notice.
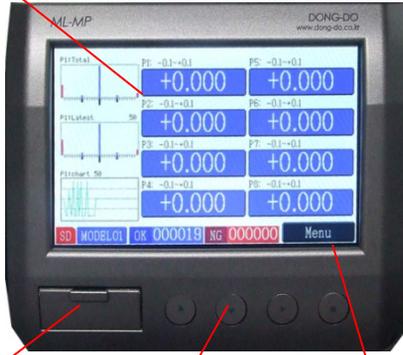Please use this good after reading the manual thoroughly.

Table of Contents

Product features & composition

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

Color TFT LCD & Touch pad

I/O port
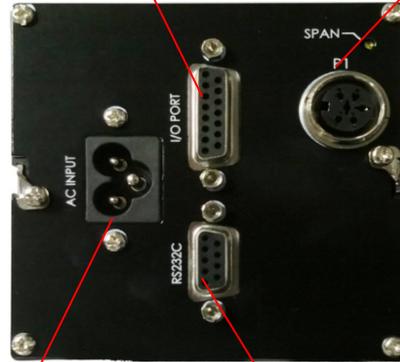
HBT probe connector

SD card

Menu

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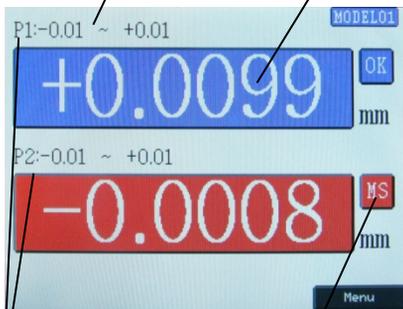(up▲, down▼, select▶, mode■
buttons in a row)

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

RS232C communication port

2. Measuring screen

Tolerance   Measured data

Model number

Result

Measured groups(or points)

Histogram & Flow chart

CP/CPK

〈Normal Text view〉

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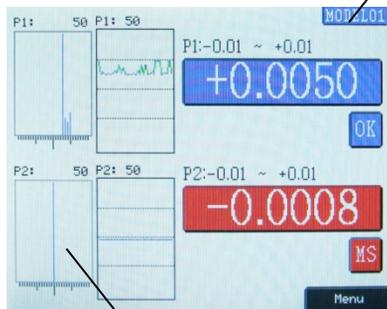
〈Histograms & chart view〉

*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.

〈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.

3

Functions
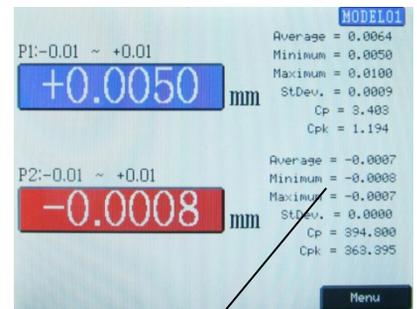
**Simple setting orders.
* **Probe install → Master zero setting → Group → Tolerance → Other options**

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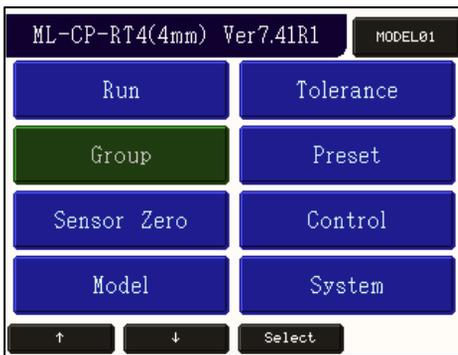
-The main menu is composed as like the picture at the left.
-Each functions can be chosen by touching screen or ▶ button after cursor is moved by ▲▼buttons.

ML-CP-RT4(4mm) Ver7.41R1	MODEL01
Run	Tolerance
Group	Preset
Sensor Zero	Control
Model	System
↑ ↓ Select	

〈**Main Menu**〉

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.
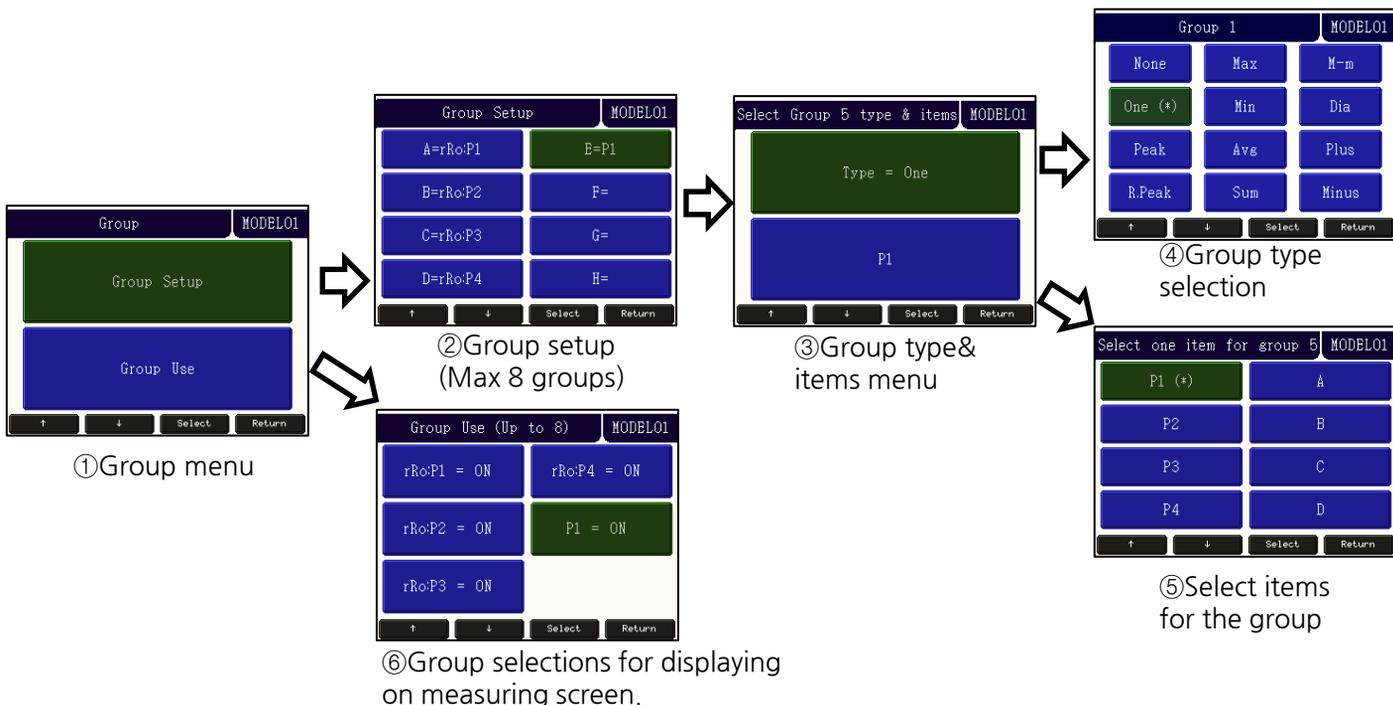8. System : To setup the unit, language, password, etc.

2. Run
-To enter the measuring screen.

Functions

3. Group (*1ch unit doesn't have this menu.)

- To set the items to display on the measuring screen. Various functions can be set in this menu.
- Maximum 20 groups are possible to display on the screen.
- If "Group" is selected on the main menu, the Group setup screen is come out.

①Group menu

②Group setup
(Max 8 groups)

③Group type&
items menu

④Group type
selection

⑤Select items
for the group

⑥Group selections for displaying
on measuring screen.

-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)Peak: High peak data hold.
　　　To clear the peak data, press ▲up button or give clear signal to I/O port.
4)R.Peak: Low peak data hold.
　　　To clear the peak data, press ▲up button or give clear signal to I/O port.
5) Max: Maximum value in the selected points or groups.
6) Min: Minimum value in the selected points or groups.
7) Avg: Average value in the selected points or groups.
8) Sum: Addition value of the selected points or groups.
9) M-m: (Maximum value - minimum value) in the selected points or groups.
10) Plus: Addition between two values.
11) Minus: Subtraction between two values.

4. Sensor Zero
- Setting the master zero and sensor's directions.

Sensor Zero (mm)		MODEL01
NAME	STAT.	VALUE
P1	MST	+0.000
P2	MST	+0.000
P3	MST	+0.000
P4	MST	+0.000
ABS	ZERO	Dir Offset Return

- 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.
- **Individual channel's master setting is also possible.**
If the 'STAT.' of the channel is pushed, its absolute value is come out. And then the channel's value is pushed, its master zero is set.

- 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.
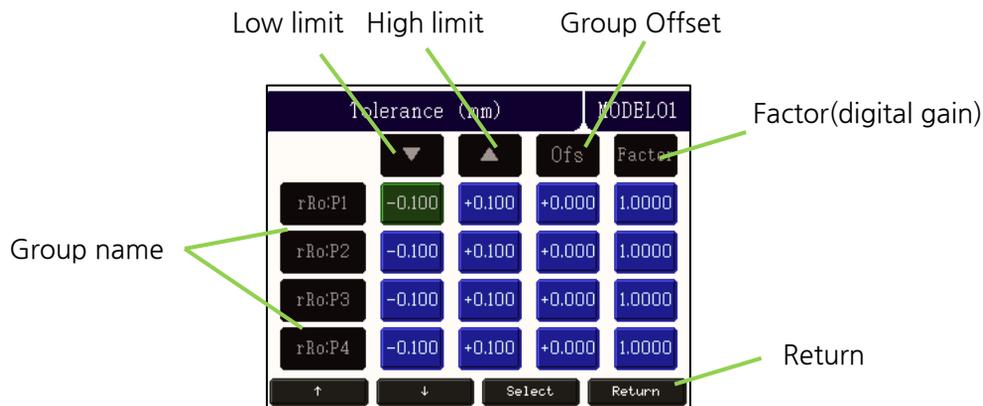
-2047

Zero ±100

MASTER

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.

Low limit   High limit   Group Offset

Factor(digital gain)

Group name

Return

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.

** +NG / +OK / OK / -OK / -NG setting (Showed only when 1 group is used)

| -NG | -OK | OK | +OK | +NG |

-Tol   -Add tol   +Add tol   +Tol
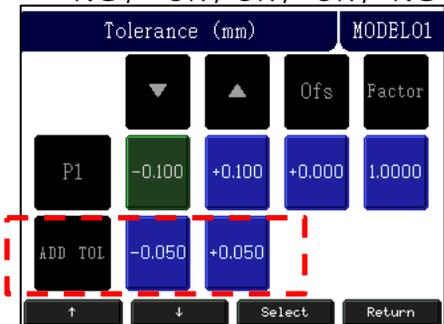
If 'Add tol' is used, Output signal can be selected for the +NG / +OK / OK / -OK / -NG. Please check page 15.

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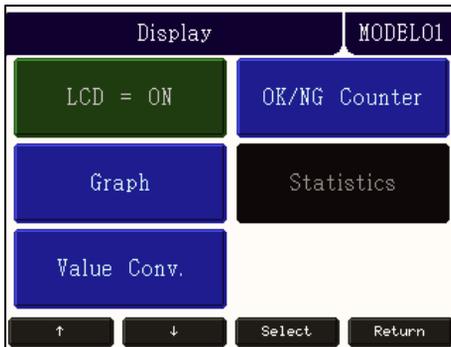
8. Control
- To set up the input/output methods, serial communication, etc.

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 3 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.

Functions

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 14, 15, 16).
- Filter Time : To prevent a noise input from outside, if an input signal is shorter than the setting time, our unit thinks it's a noise.

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) Start Method:
a. Start:
- Auto : Start the measuring continuously.
- Semi-Auto : Data is updated continuously on the screen.
　　　　　　But the measured data is gotten when 'start' signal is inputted.
- Manual : give the start signal from outside(▶ button or from I/O port).
b. Wait Start Off :
　　If this is 'ON', starting the measuring sequence is waited until the 'Start' signal is off.
　　If this is 'Off', the measuring sequence is continued until the 'Start' signal is on.
　　Work with the 'Start Method' is 'Manual' or 'Semi-auto'.

c. Set Probe Start :
If 'On', user can give the start signal by Probes. The measuring sequence is started once when the probe value is bigger than 'Start-On Pos'.
And the sequence is reset if the probe is lower than 'Start Off Pos'
The ABS value of the probe is used on it.(Not from master zero.)

6) Serial:
-To set the RS232C data(Check page 12).

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

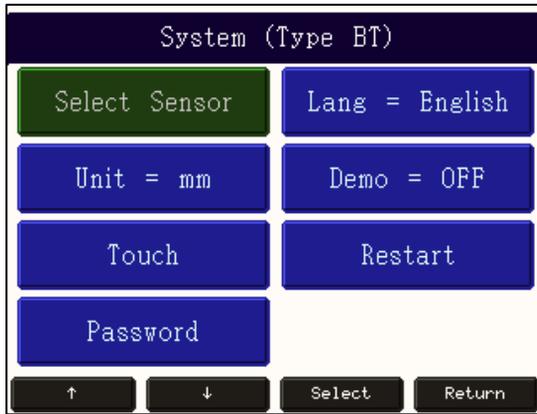## 8) Time:
- To set the probe stable time and output signal hold time.

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

`[ENQ][POS1],[POS2],[DATAs][ETX]@@[CR][LF]`

Send = ON	Data Format
Speed = 9600	Send All = OFF
Type = ASCII	Statistics = DISABLED
POS1 = StartNb	Commands
POS2 = DataNb	

| ↑ | ↓ | Select | Return |

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)

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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

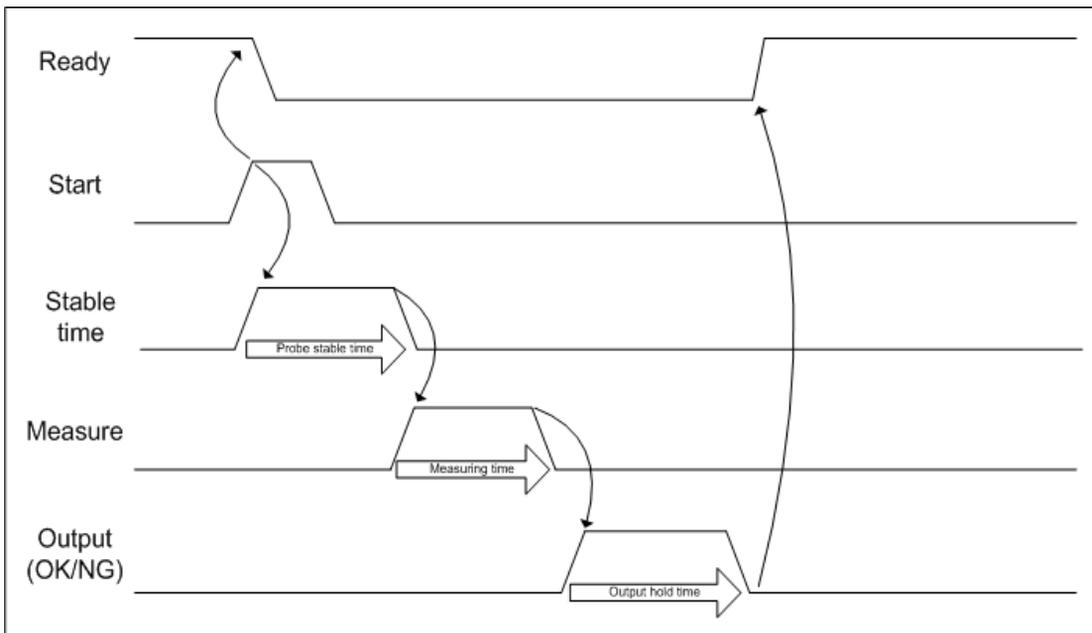Ex) In case of No. of Data is 2 / Statistics data is 2.

POS1(start num.)
POS2(Data num.)   Statistic Data 1   Statistic Data 2

01,02,-0007,+0779,-0.007,-0.007,-0.007,+0.000,+10.000,+10.000,+0.779,+0.779,+0.779,+0.000,+10.000,+10.000@@
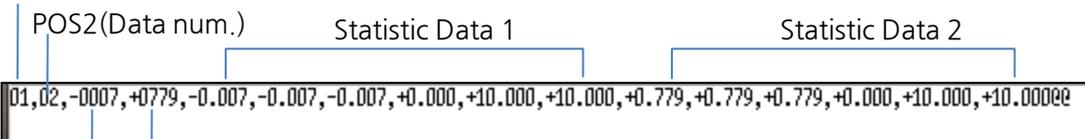
Data 2
Data 1

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		

Circuit column:

INPUT (START)
+24V
INPUT CURRENT:MAX 10mA

OUTPUT (OK, NG, READY)
LOAD
com   POWER
VOLTAGE:MAX 30V
CURRENT:MAX 300mA

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

2) Timing diagram

Ready

Start

Stable time — Probe stable time

Measure — Measuring time

Output (OK/NG) — Output hold time

I/O port & operating sequence

3) How to set the IO port
-Path: Main Menu → Control → Input/Output → Input or Output

Input

Input Signals		Select Input Bit ffor Clear		Input Signals

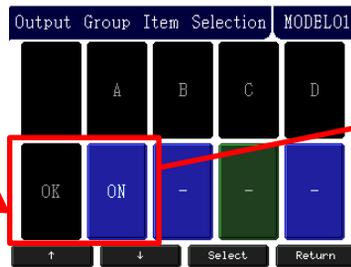To setup a pin to 'Clear' function   Select a pin   Pin number 5 is set to 'Clear'.
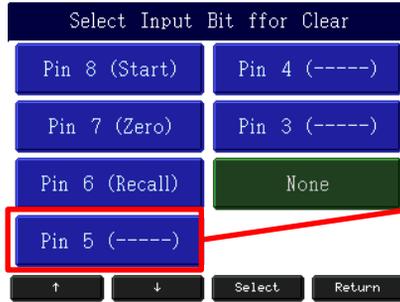
Output

To setup a pin a function

Select one function. → DONE.
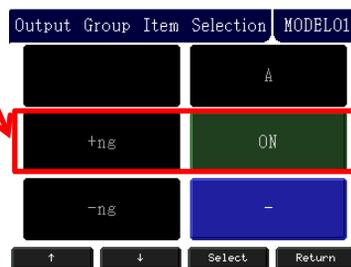*For -NG/OK/+NG, select 'Group OK/NG'

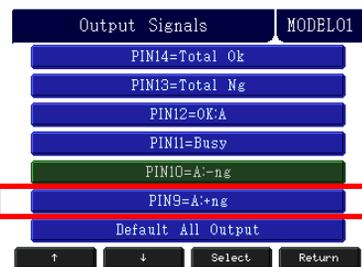Then press 'Set Group'

Choose one from '-NG/OK/+NG'

If press 'OK' tap.

The pin2 is set to OK(for A group)
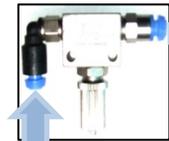
If press '+NG' tap.

The pin9 is set to +NG(for A group)

A simple system by Pneumatic(Vacuum) type probe

④ **Fine air pressure control as low as it works.**

One way valve

Air in　　　　　**Tip out**

Pneumatic type probes

⑤ **Work piece measuring**
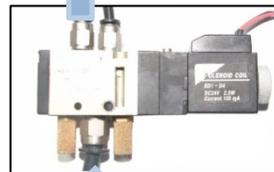
Measured data

③ Air supply

② Sol. ON signal

Air regulator 0.7~1.5 bar setup
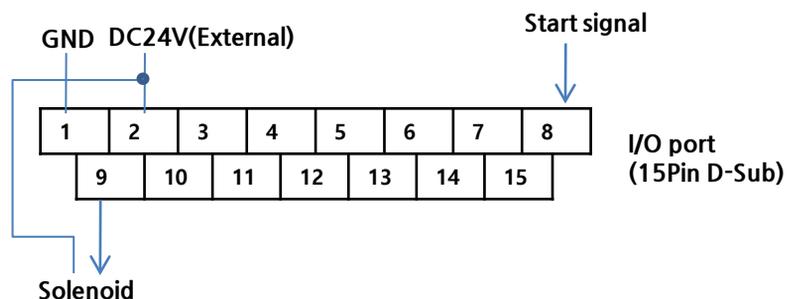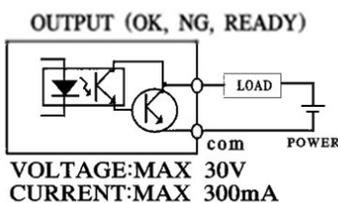
Air solenoid
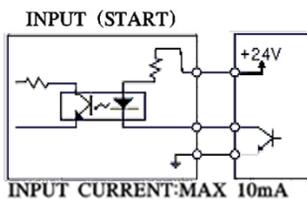
Air source input (Minimum, 4 bar)

① Start signal

ML-CP/MP/LP

⑥ **Measured data & result transferring**

A simple system is made by Pneumatic type probes without any other mechanics.

I/O Pin features - ML-CP/MP/LP

INPUT (START)

+24V

INPUT CURRENT:MAX 10mA

OUTPUT (OK, NG, READY)

LOAD

com　POWER

VOLTAGE:MAX 30V
CURRENT:MAX 300mA

GND　DC24V(External)　　　　　　　Start signal

1	2	3	4	5	6	7	8
9	10	11	12	13	14	15	

I/O port (15Pin D-Sub)

Solenoid

Pin 1: GND
Pin 2: DC24V (Just for ML-CP/MP/LP)
Pin 3~8: Input port
Pin 9~14: Output port

＊Setting on display.
1) Connect one of the output pins to the air solenoid.
2) **Set 'Air probe' at the IO 'Output' menu.**
3) The 'Probe stable' time at 'Time' menu should be set enough as like 1~2sec.

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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 SAVE ON SD CARD

2. Specifications

DIVISION		SPECIFICATION
LVDT/HBT SENSOR	CHANNELS	1~8ch
	RESOLUTION	1um
DISPLAY	LCD	4.3" TFT COLOR GRAPHIC LCD
DIMENSION		W128×H100×D160(㎜)
WEIGHT		1.2kg
OUTER INTERFACE		RS232C, 9600N81
		I/O port (IN:6, OUT:6)

High Precision Electronic Micrometer

DONG-DO