ML-SP

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.

Index

1. Introduction

Thanks so much for purchasing one of our products.

1.1 Description

There are some merits when you use the type of touching displacement sensor(LVDT/HBT) for a high accuracy

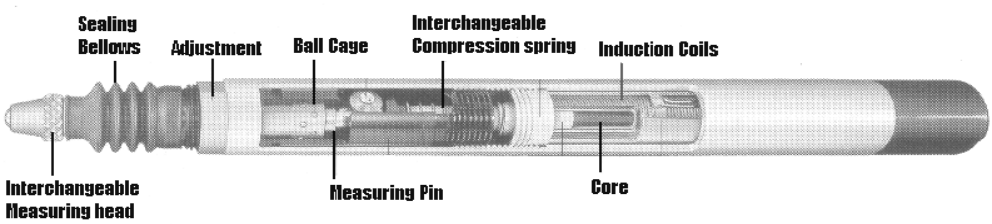
- The sensor is hypersensitive itself and precise.
- It has high resistance to the influence of environment(temperature changes, humidity, etc...)
- Heavy duty, small size and light weight

For that reason this sensor can be used for several measuring field.
To operate the type of touching displacement sensor(LVDT/HBT) needs Amplifier or Indicator. we developed this product("Electrical micrometer") user centered who has Amplifier or Indicator. A feature of this product is we sell and develop it based on user's purpose. One thing we have model could measure manufacture's thickness, difference of height, flatness, perpendicularity rate, etc...

These are our advantages for the new product.
- It has many functions that can be provide you easy directions for your needs.
- It will print formatted data and results for the quality control directly using the built in serial port(RS232C/PLC Interface)

1.2 Structure and Fundamental

1) Structure of the type of touching displacement sensor(LVDT/HBT PROBE)
Displacement sensor include differential transformer that can convert with the change of Core & Coil's position into electrical signals. The Bobbin twisted with coil is insulated material, so that might be used by lower temperature modulus and core might be used by



[Figure.1] Structure of sensor.(LVDT/HBT)

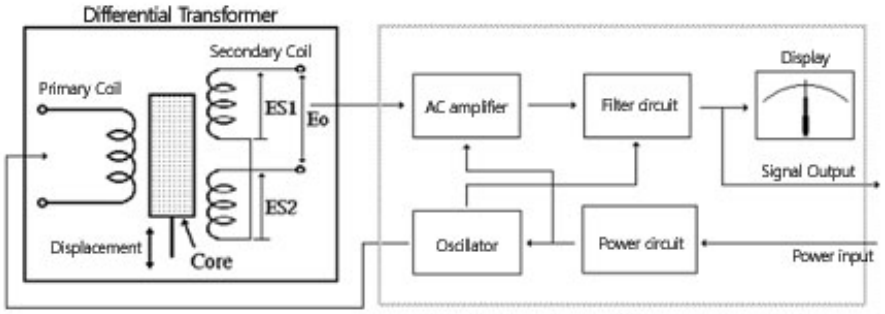
high saturation magnetic flux density or resistivity.

2) Fundamental of measurement

[Figure.2]is differential transformer electric circuit. Magnetize primary coil into an A.C on the differential transformer. According to core's displacement it will show D.C signal after check the secondary sign of proportional change.

When the Core is on the center of Coil[Figure.2] out voltage is 0(Zero) and it will change directly according to the Core's displacement.

After Being taken out voltage passes through the Amplifier and Filter circuit, the user will get the final rectified voltage which is based on Core's position.



[Figure.2] Signal processor circuit

1.3 System specifications

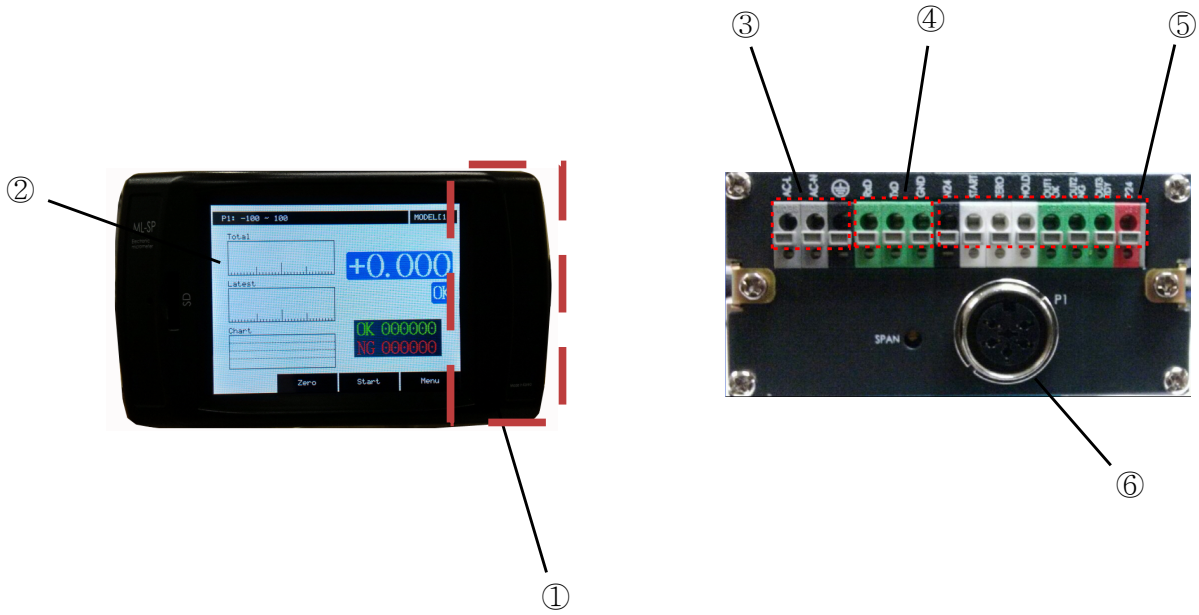
1) General

DIVISION	G E N E R A L
MAIN SUPPLY	AC100-220V~ 50/60Hz
MAX.POWER CONSUMTION	4W
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		General
LVDT/HBT (AMP.)	INNER POWER	±15V, +5V, +24V
	PROBE INPUT	Max. 1ch.
	MEASUREMET RANGE	Defends on models
DISPLAY	LCD	2.8" TFT color LCD
	BACKLIGHT	-
	SIZE	
DIMENSION		W106×H64×D147(㎜)
WEIGHT		600g
OUTER INTERFACE		PLC I/F(IN:2, OUT:3)

1.4 Physical Description and functions



1) General features

① Function keys : To select menu & change values.

② Color TFT LCD & Touch pad: To display the measuring data and show variable menu for data setting. And it has a touch function.

③ Power input : AC100~220V input.

④ RS232C CONNECTOR : A serial port for communicating computer or PLC.

⑤ INPUT / OUTPUT CONNECTOR : To connect outer PLC or controller.

⑥ LVDT / HBT PROBE connector : To connect with displacement sensor.

1.5 Directions for use

- Master setting require Probe's value up to ± 100um.
- Before use meter please set the master value for avoiding error.
- Before use meter please inspect the sensor for its useful life.
- If you keep the old meter model without use, inner battery might be discharge also the initial value can be change. It is not a faulty product. Please follow instructions and reset the meter.

1.6 Directions for installation

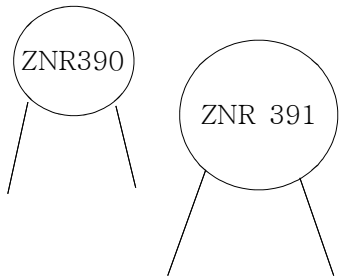
When you install the product must be careful of your micrometer and sensor. It is very sensitive and accuracy. Follow the instructions below to install easily not only our product but also inspection and measurement equipment.

1) The cable of signal of the displacement sensor is treated by shield but it might be influenced by organic voltage, therefore please keep the distance(more than 30mm) all the PLC input/output, motor related, power cabels.

2)Please connect spark killer or varistor(ZNR/TNR) with the induction load power(or signal cable and RELAY, MAGNETIC CONTACTOR, MOTOR, PARTS FEEDER, etc)
when the induction load power on have no problem but off make strong counter electromotive force(20times of power voltage) and it will have affect on results.
Please reduce counter electromotive force for the reliable results.

e.g. 1) USING 24V RELAY : USE ZNR 390($39x10^{0}$)
(or, CUTTING OVER 39V SURGE VOLTAGE)

e.g. 2) USING 220V MAGNETIC CONTACTOR : USE ZNR 391($39x10^{1}$)
(or, CUTTING OVER 390V SURGE VOLTAGE)



3) In case of using the motor for equipment's operation. This electric force might affect the results. In this case please make mounting bracket to be insulated materials(MC NYLON, BAKELITE)

2. Operating method

2.1 Display & Main menu

– Display : After press ON button a screen will appear like the below, which is showed text or graph.※ Please refer to the 'How to setup ML-SP' for the detailed setup.

① Tolerance : User setting tolerance.

② Histograms : To display the results by histograms.(The histogram options are changed at the ‘Main Menu-> Control -> Graph'.)

③ Model number : The model number that is measuring.

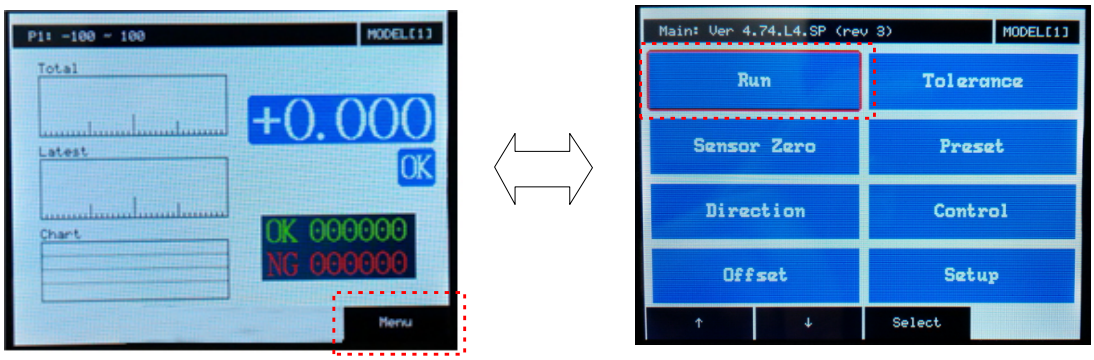
*Old setup data is recalled by changing the model number.

④ Measuring data : The digit of the number is changeable among the user setting.

⑤ The results of decision : The results of decisions by user's tolerance setting.(OK/NG)

⑥ A counter of the result : Display the number of OK or NG. This number is clear by 0 if the main power is off.

⑦ Main Menu : To enter the main menu. (It is the same as the [MODE] button ■)



2.2 Operation by buttons & touch screen

ML-SP is basically handled by touch sreen.

And also, it is operated by the 4 button, ▲[UP] ▼[DOWN] ▶[SELECT] ■[MODE] on the front panel.

- [UP]/[DOWN] buttons are used to move the cursor.(sometimes, they're used other functions. It is displayed at the bottom of the screen)
- [SELECT] button is used to select the item on the cursor.
- [MODE] button is used to exit current menu or to enter the main menu from the measuring screen.

2.3 Measuring method

1) A data is measured and displayed if user pushes the [SELECT] button on the front panel. And a result is displayed by 'OK' or 'NG' among the user's tolerance(limit) setting.

2) A start signal is inputted at the I/O port.

※ Please refer to the chapter 6, 'I/O & operating sequence' about the start signal.

3) To measure the data continuously without any operations, user change the 'Hold' to 'Scan' at the 'Control' ->'Start' menu.

2.4 Measuring sequence

To get a measured data, ML-SP does the sequence below one time. And the sequence is repeated if the 'Scan' is set at the 'Start' menu.

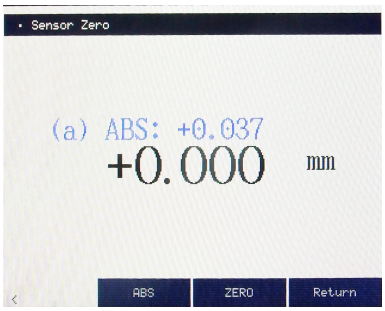
* State to wait → A start signal input → Delay for a probe stable time → Measuring & making a decision → Display & output the result → Keep the result for the output hold time → State to wait & output a ready signal

※ It is only possible to measure and zero setting at the state to hold.

3. How to setup ML-SP

This is the explanations about the functions and setup method at Main menu.

3-1. Sensor Zero



- The picture on the left is the screen of the Sensor Zero at the main menu.

-If user touches the 'Return' or [MODE] button on the screen, it is out to the main menu.

- 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 [DOWN] button is pushed once.

3) The 'ZERO' or the [SELECT] button is pushed once to set the current values to zero.

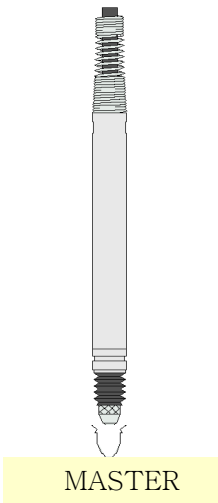
※ The last setting values are displayed if user reenters the 'Sensor Zero' after zero setting.

< Initial installation of PROBE >

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

Ex) Installation of DP-S4

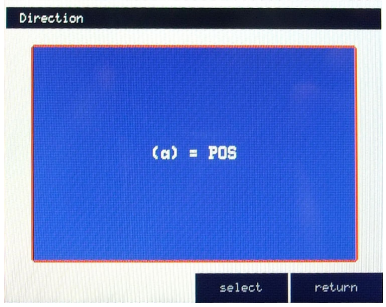
1) Press 'ABS' or [DOWN] button in 'Sensor Zero' menu.
   (You will see the "-2047" at first and you can check the changes while moving sensor's tip.)
2) Put the standard(MASTER) and move to sensor zero position.
3) Adjust measurement value shown on LCD within ± 100㎛ after the sensor install to bush.



※ If the probes are tighten too strongly, the movement of the probes could be not good.

4) Press 'ZERO' or the [SELECT] button to set current values to zero and press 'return' or the [MODE] button to exit with saving data.

3-2. Direction



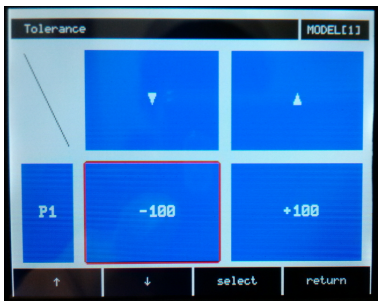
- To change the direction(sign) of the measured value. Normally, it is increased to the '+' direction as the tip of the probes are pushed. Set 'NEG' to change the direction.

!! The zero setting must be done again after the direction is changed.

3-3. Offset

- OFFSET : To give an offset to measuring value.

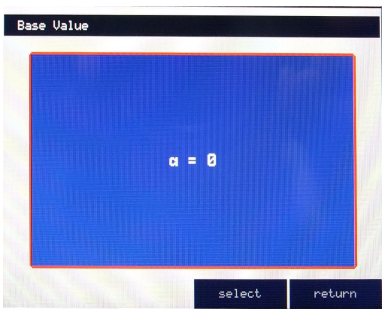
3-4. Tolerance



- To set the high and low limits about the measuring data. So, the result of decision at the measuring screen should be OK or NG depends on the data is in these limits or not.

※ Please refer to the I/O & operating sequence for more details.

3-5. Preset

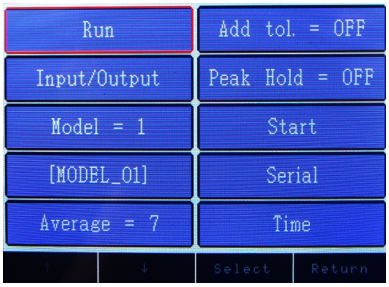


- Preset : To add a nominal value on the measuring data when the data is displayed on the screen.

Preset is useful to display whole of the measuring area of a part.

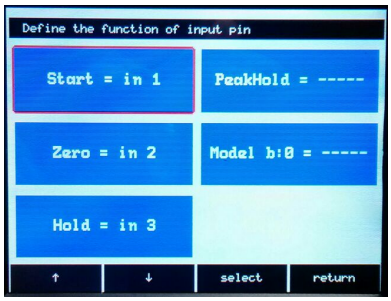
※ The value on the Preset does not effect to the result of the decision. It is just added when the measuring data is displayed.

3-6. Control



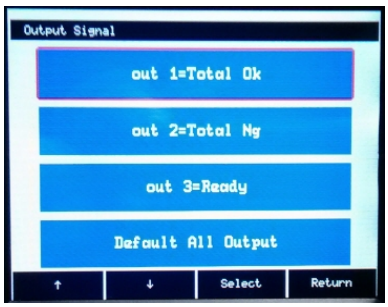
- There are the articles to set up the input/output methods, serial comunication, etc.

3-6-1. Input



- To change the use of the input signals on the Input Port.
- User choose an item and set an input pin number.

3-6-2. Output



- To change the use of the output signals. The output pin map is different depend on the modes. Please refer to I/O & operating sequence for more details.

3-6-3. I/O test

- To verify the current I/O state. 1 and 0 are repeated to the output port.

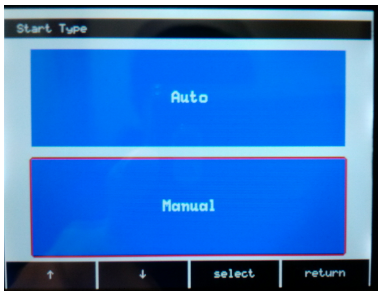
3-6-4. Model

- 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.

3-6-5. Average

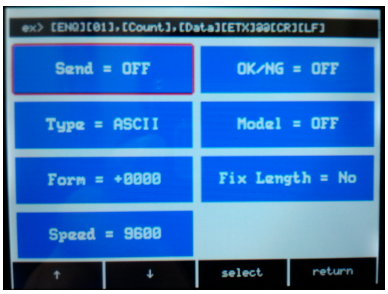
- To set how many raw data is used to average them for one measuring sequence.
- The measuring time could be different by this setting.

3-6-6. Start



- Auto : the measuring sequence is proceeded continuously.
- Manual : A measuring start signal should be in to proceed the measuring sequence from the 'state to wait'.

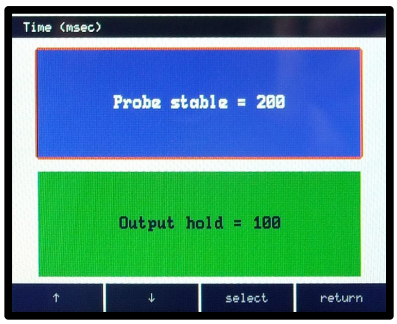
3-6-7. Serial



- SEND : To set the use of the RS232C serial output or not.
- Type : To set the output form of the serial data.
- Format : To set the output form of the ACSII.
- SPEED : To set the communication speed.
- OK/NG : To output the result
- MODEL : To output the current model number.

※ Please refer to the 'RS232C' for more details.

3-6-8. Time



- Probe stable time : The stable time before getting the data from probes.
- Output hold time : The holding time of the output signals. Set '0' to hold the output signal until next measuring.

※ The time of a measuring sequence could be different depend on the time setting. Please refer to the I/O & measuring sequence for more details.

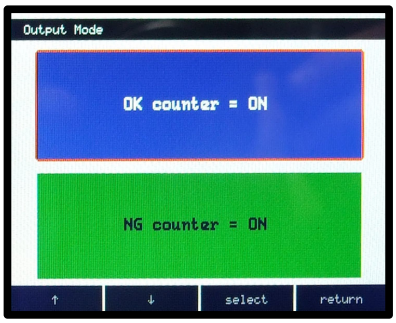
3-7. Setup

- To setup the unit, sound, font, etc.

3-7-1. Zero Key

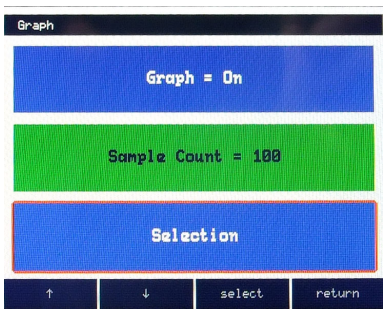
To set if user uses the [DOWN] button to make the sensor value to zero or not at the measuring screen.

3-7-2. Counter



- To set the use of the counter of the decision of the result on the measuring screen.

3-7-3. Graph



- Graph On/Off : To set the use of the graph on the measuring screen. The measured data is displayed by text only if it is set to 'Off'.
- Sample Count : The size of the stack for the data on the graph. (If the number of the measured data is bigger than this stack, the newest data is in and the oldest data is out.)
- Selection : The types of the graphs are chosen here.

3-7-4. Value Conversion

- To setup of the end figure of the measured value.

There are the options of 'none' (Don't do anything.), 'round', 'raise', and 'cut'.

3-7-5. Set Decimal Point

- To setup of the decimal point for the measuring data. x.xxx or x.xx

3-7-6. Sound

- To set if a beep is used at the decision of the OK or NG.

3-7-7. Unit

- To choose the unit of the data on the measuring screen. [mm] <-> [Inch]

3-7-8. 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'.

3-7-9. Touch

- Touch Calibration : To calibrate the touch pad when it doesn't work well.
- Touch during Run : To choose if user uses the touch pad or not at the measuring screen. User can enter the main menu by pressing the [MODE] button.

3-7-10. Demo

- To make a random data for a show. This should be off for normal measuring.

3-7-11. Restart

- To restart and initialize the system. It is often used for software updating.

4. RS-232 (Serial communication)

- General specifications

Item	Specification
· Interface · Port · Method	- RS232C - Pin points port - Asynchronous
· Character · Baud rate	- DATA BIT ⇨ 8 Bit - PARITY BIT ⇨ none - STOP BIT ⇨ 1 Bit - 9600 bps

- Interface specifications

Micrometer		Cable connection & direction	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

※ At the serial port of the computer side: Pin 4 and pin 6, pin 7 and pin 8 must be connected.

- RS232C communication protocol

1) Binary format

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

(n = Transmit Data Q'ty x 2)

2) ASCII format

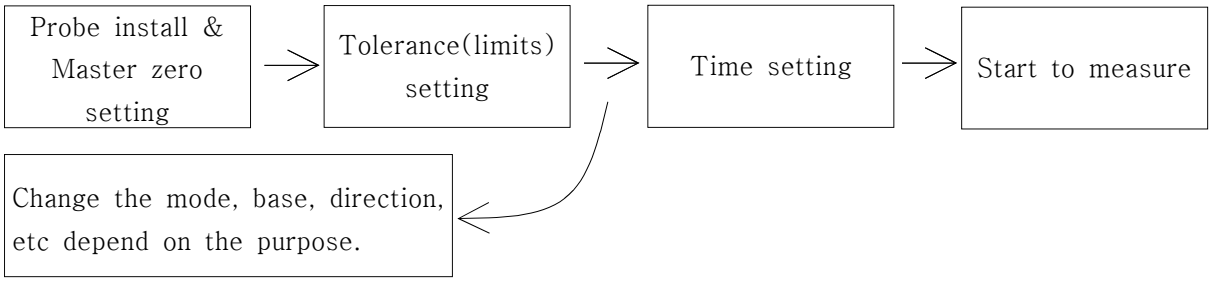
Byte	1	2	1	2	1	5*n+(n-1)	1	1	2	1	1
Char	ENQ	Result	,	Data Num.	,	Data	,	ETX	@@	CR	LF

ex) OK decision with 2 data output.

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

5. ML-SP operating flow chart

1) The operating flow chart



2) Other functions

- Initialize : Power on with pressing the [MODE] button. Then a message about initialize 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.

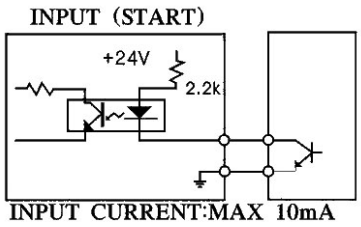
6. I/O & operating sequence

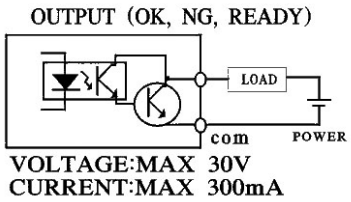
※ The below chart is about a standard model.(The I/O pins functions are changed by user's setting.)

▶ Input/Output (3 points each)

Pin	Name	Direction		Note
1	NCOMMON		0 V	GND
2	IN1 (START)	IN	H/L	Start
3	IN2 (ZERO)	IN	H/L	Zero
4	IN3 (HOLD)	IN	H/L	Hold
5	OUT1 (OK)	OUT	H/L	OK
6	OUT2 (NG)	OUT	H/L	NG
7	OUT3 (READY)	OUT	H/L	Ready
8	PCOMMON		+24V	+24V DC

▶ Circuit





▶ I/O signal timing