DIGITAL AIR MICROMETER

DAG2000 Instruction Manual

SKS CORPORATION

■ REQUEST DURING USE

In order to use this product safely, please follow the items below:

[Danger]

(1) The inside of this product has hundreds of volts of electric voltage.
During installation, transfer, maintenance, and inspection of this product or connections, please shut down all the power and remove from the product the power and connection cables first.

(2) Standard attached power cable is for 100V. When using power voltage exceeding 125V, please prepare separate 250V cable.

(3) Please do not trample or pull the connection cables that will be used for connecting the power cable to the equipment.
Also, when removing power cable or connection cables, please be sure to hold the plug part. There is danger of damage to the cable. By any means please do not use damaged power cables or connection cables. This is a high voltage object and there is danger of electrical shock.

(4) Please make sure to install ground.
There is danger of electric shock during breakdown or short circuit.

[Warning]

(1) This product is a precise measuring device that performs measurement through air. For the air supply, please prepare pure air with dirt, moisture and oils removed.

(2) Please make sure not to put foreign materials through the gaps of this product or the connecting machines.
There is danger of incurring serious injury from electric shock, fire and breakdown.

[On bringing to overseas]

When bringing this product overseas, please confirm beforehand since there are various restrictions. Please understand beforehand that when this product is brought overseas and accidents occur, this company will be held responsible.

[About this manual]

(1) This manual was created doubly sure but if by chance suspicious points, omissions and such are noticed, please inquire with our sales department.

(2) Diversion or reproduction of all or part of the contents without permission is not allowed.

(3) For purposes of improvements, changes can be made to product specifications, contents of the manual, and appearance without notice in the future.

[About the warranty]

Warranty will be in accordance with the warranty regulations of this company

(1) Even during warranty period, expenses required for repairs will be charged if breakdown and damages are caused by mishandling by the customer.

(2) There may be cases also when repairs for alteration made by customers cannot be accepted.

(3) Claims repair is standard. For business trip repairs, separate business trip expenses will be charged even during warranty period.

TABLE OF CONTENTS

CHAPTER 1 INTRODUCTION

Thank you for purchasing the Digital Air Micrometer (DAG2000).
This manual is explained such that even first time users of the Air Micrometer will be able to use the abundant functions of this product efficiently. Please read the manual thoroughly to use this product well.

1.1 Outline

- This product is a measurement device that detects the air pressure changes based on the dimensions of the measurement subject through sensors, and makes judgments based on digital dimension indicators and lamps.
- This product is a comparison measurement device.
  Measure the master for reference and then do measurements. With regular master calibrations, good precision measurements are possible.
- This product judges independently if the measurement value is OK or NG.
  Judgment result display can be quickly distinguished through the indicator color of the main display and judgment LED.
  Also, regular master calibrations can be done through the panel key.

1.2 Merits

① Judgment result (OK or NG) of measurement value can be distinguished through the number and lamp color.
② Measurement value unit display can be switched (μm or mm) by changing the settings.
③ Master calibration is easy.
④ Peak measurement [Optional]
- +PEAK, -PEAK, TIR(=+PEAK-(-PEAK)), TIR/2(=(+PEAK-(-PEAK))/2)
- Auto measurement start stop function

⑤ 5 ranks (-NG, -OK, OK, +OK, +NG) judgment is possible
Maximum of 99 ranks judgment is possible
⑥ Abundant external I/O functions
- Serial communications function
  To PC printer via RS232C
  Measurement value and judgment result can be outputted. [Standard]
- External button input function [Standard]
  Measurement command and master calibration command input is possible via foot switch and push button.
- Digimatic output function [Optional]
  Capable of outputting measurement value to Digimatic printer.
- DC I/O function
  Capable of outputting judgment result to the lamp sequencer and also BCD output of the measurement value.

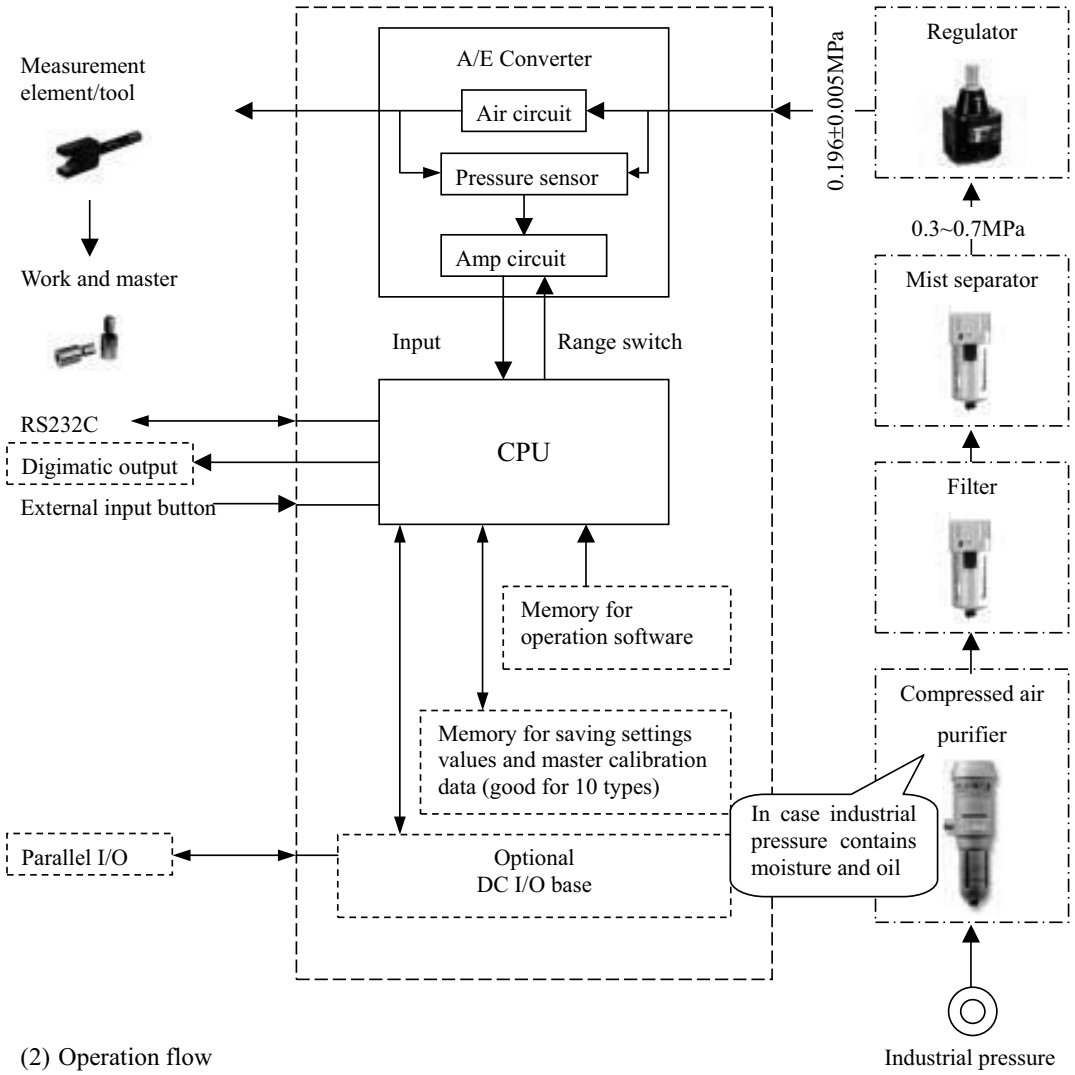
⑦ Compact
120(W) X 180 (D) X 150(H)mm, 300(D)mm when regulator is fitted
⑧ Accessories
- Handle for easily carrying [Optional]
- Tuner (dial) cover [Optional]
- Cable for each type of external I/O [Optional]

1.3 Block Diagram

(1) Structure

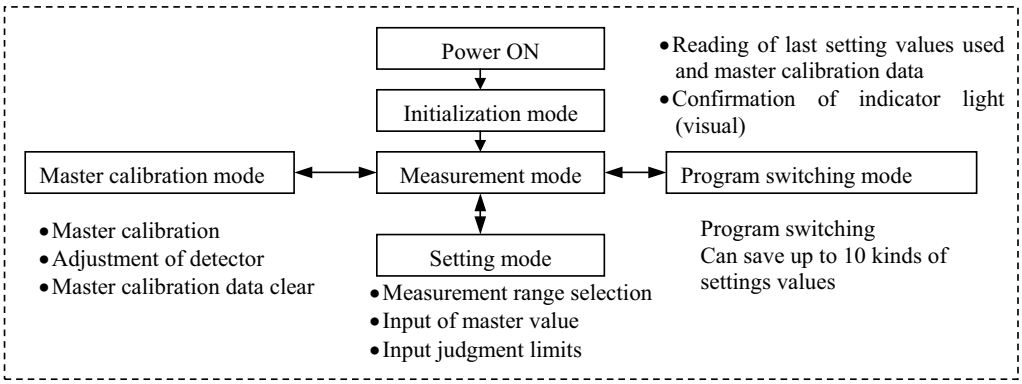
Arrow represents the direction of air and electric signal.

is optional.

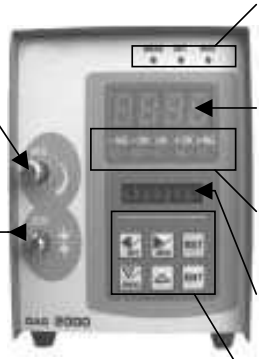


(2) Operation flow

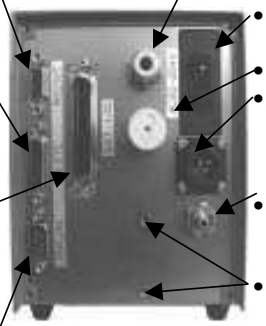
Shown below is the software operations diagram starting from turning on power.



CHAPTER 2 NAME AND FUNCTION OF EACH PART



- Sensitivity (MAG) adjustment tuner
  Adjusts the sensitivity of the air circuit. No need for adjustments except during measurement tool replacement and master calibration error.
- Zero adjustment tuner
  Adjusts the zero position of the air circuit. No need for adjustments except during measurement tool replacement and master calibration error.
- Mode lamp
  Displays the current mode and master calibration condition.
- Main display
  4 digits 3 colors digital display. Displays the measurement value and judgment result (rank no.).
- Judgment lamp
  Displays the judgment results.
- English display
  Displays simple bar, measurement value, settings item name, settings value, etc.
- Panel switch
  Used for mode switching, settings item selection, settings value input, etc.



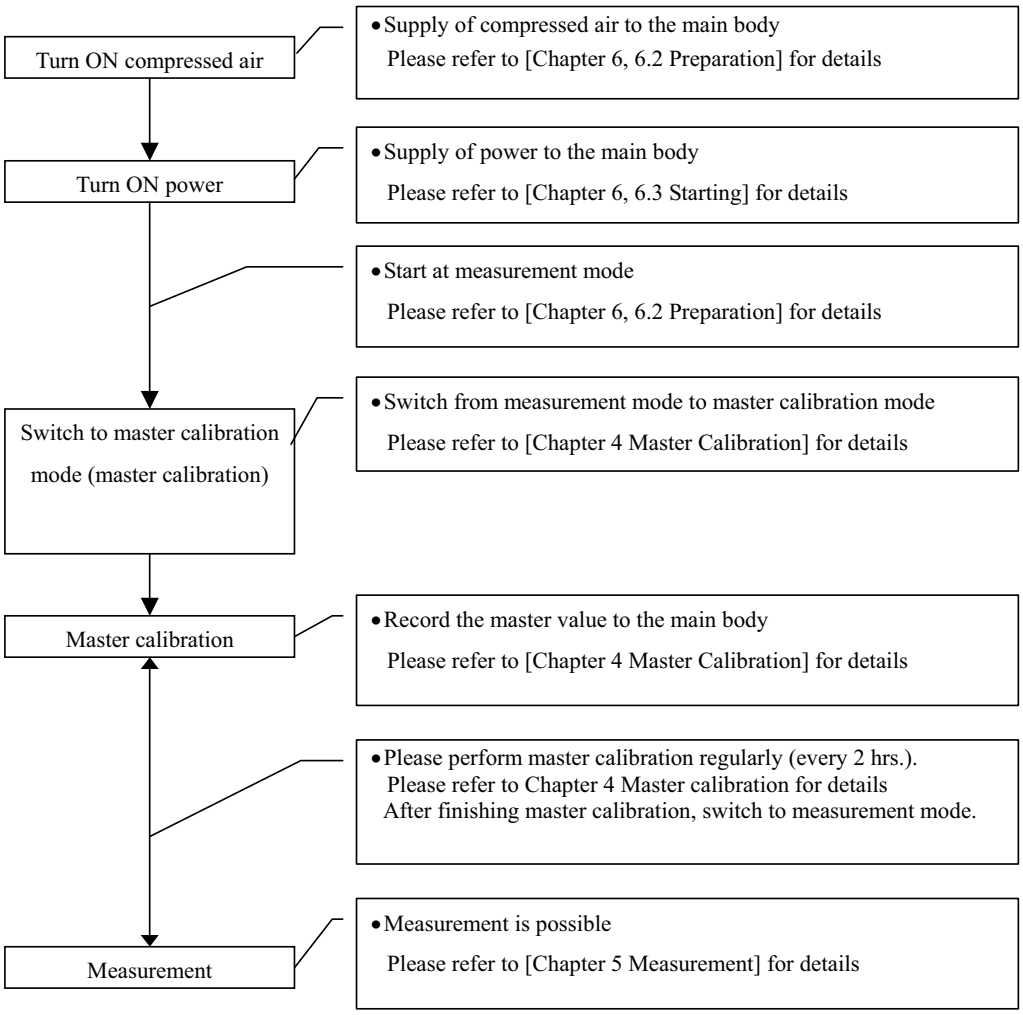
- RS232C Connector
  Connector for serial communications used for connecting the PC to the printer.
- Switch input connector
  Connector for measurement command and master calibration input done by external push button. Optional foot switch and push button is available. Cannot be used expect for foot switch and push button.
- DC input connector
  [Optional]
  Connector for connecting to the lamp, PLC, etc. There are 2 types – judgment output and BCD output. Capable of measurement command and master calibration input.
- Analog input connector
  [Optional]
  Please inquire to the maker on how to use.
- Air pressure input
  Please supply pure air at 0.196±0.005MPa. Optional precision regulator and filter is available.
- Power switch
- Silencer
- Power connector (Input)
  Can be used at AC85~264V range but for the cable included, please use within AC85~125V.
- Measurement nozzle port
  Please connect measurement tool.
- Regulator bracket
  Hole for fitting (M3)

CHAPTER 3 PROCEDURE UP TO MEASUREMENT

Procedures up to the measurement corresponding to each condition are mentioned in this chapter.

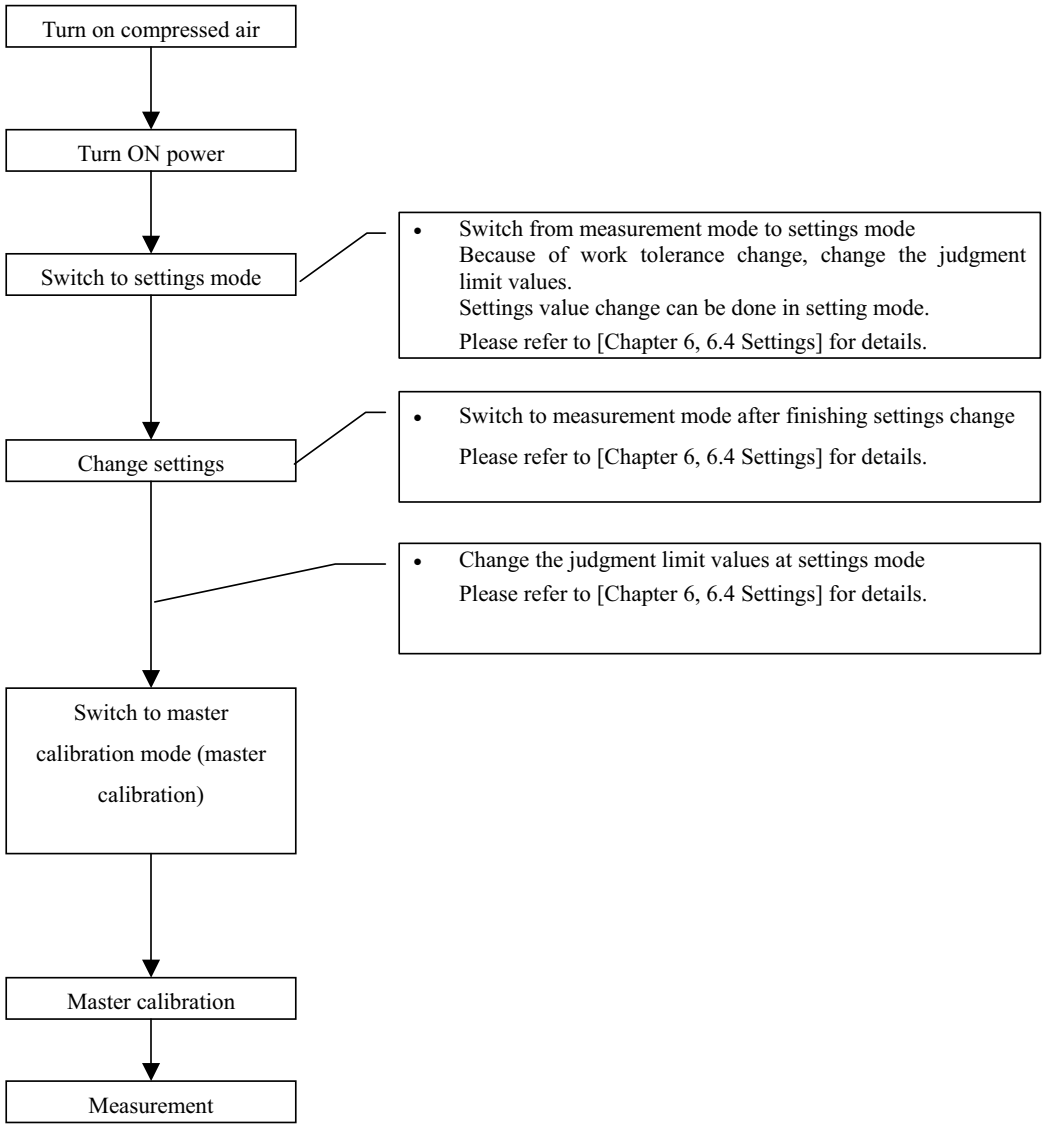
3.1 For normal cases

Shown here is the procedure up to measurement for normal cases.



3.2 For work tolerance (judgment limits) change cases

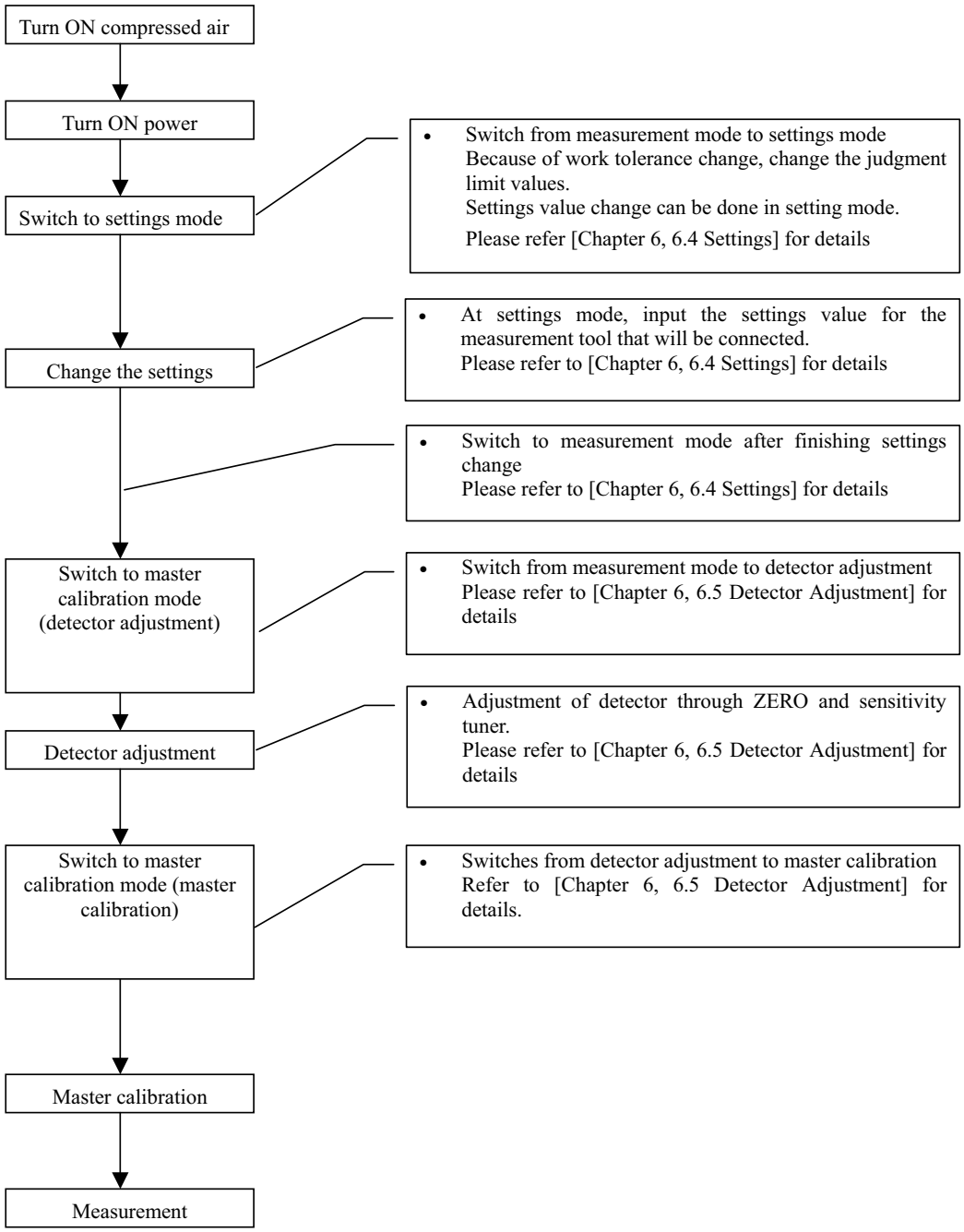
Shown here is the procedure up to measurement wherein work tolerance is changed.



3.3 For first time measurement tool connection cases

Shown here is the procedure up to measurement wherein measurement tool is connected to the main body for the first time.

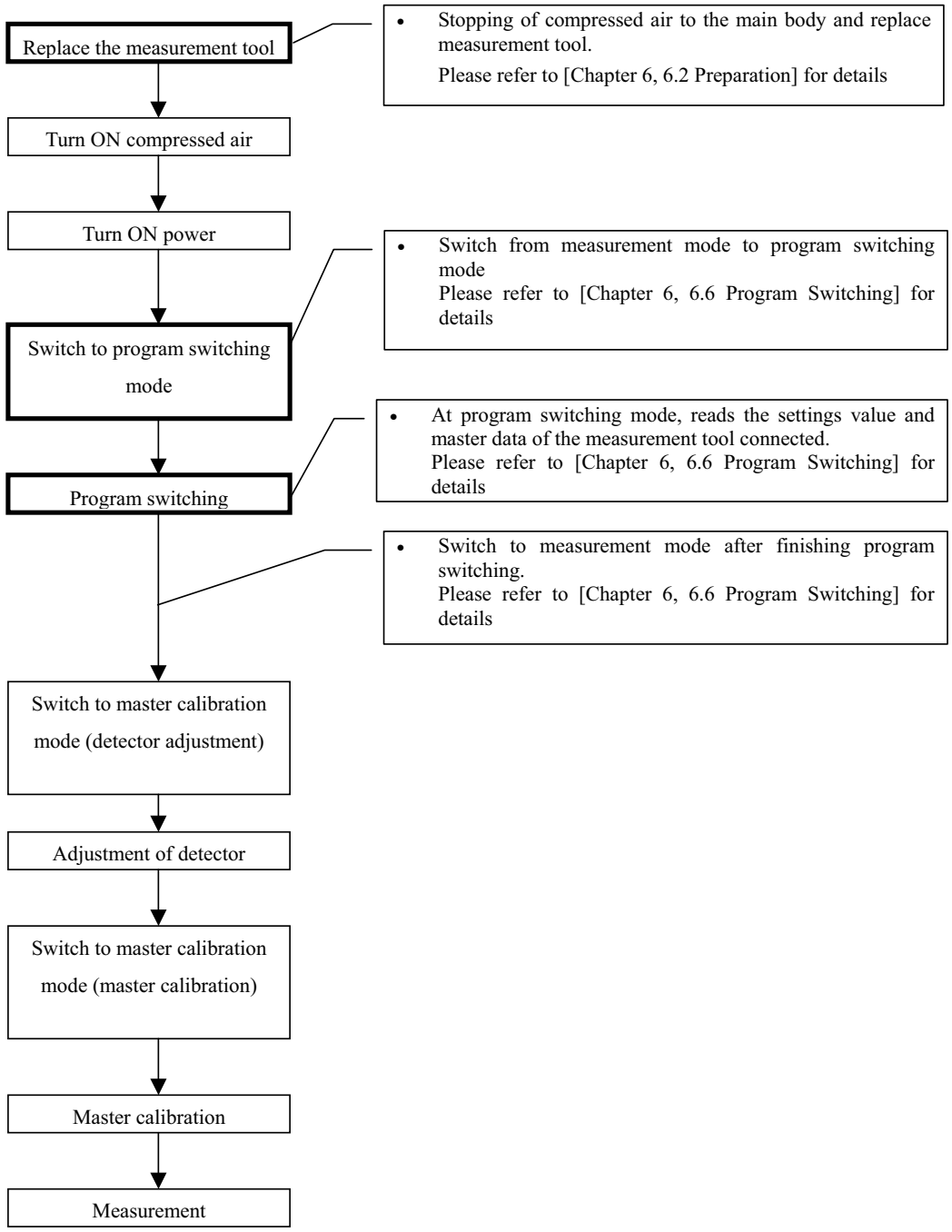
Note: There are cases wherein detector adjustment is not needed depending on the measurement tool.



3.4 For several measurement tools connection cases

Shown here is the procedure up to measurement for cases wherein multiple measurement tools are connected to 1 main body.

Please refer to [Chapter 3, 3.3 For first time measurement tool connection cases] when inputting of settings for measurement tools that will be connected are not finished.



CHAPTER 4 MASTER CALIBRATION

This product is a comparison measurement device therefore master calibration (correction of measurement value) by the use of a master is necessary.
Also, precise measurements can be made possible by regularly doing master calibrations.

There are 2 selections of master calibration method for this product:

- Master calibration (ZERO and sensitivity correction) by 2 masters (small range and big range).
- Master calibration (ZERO correction only) by 1 master (ZERO master).

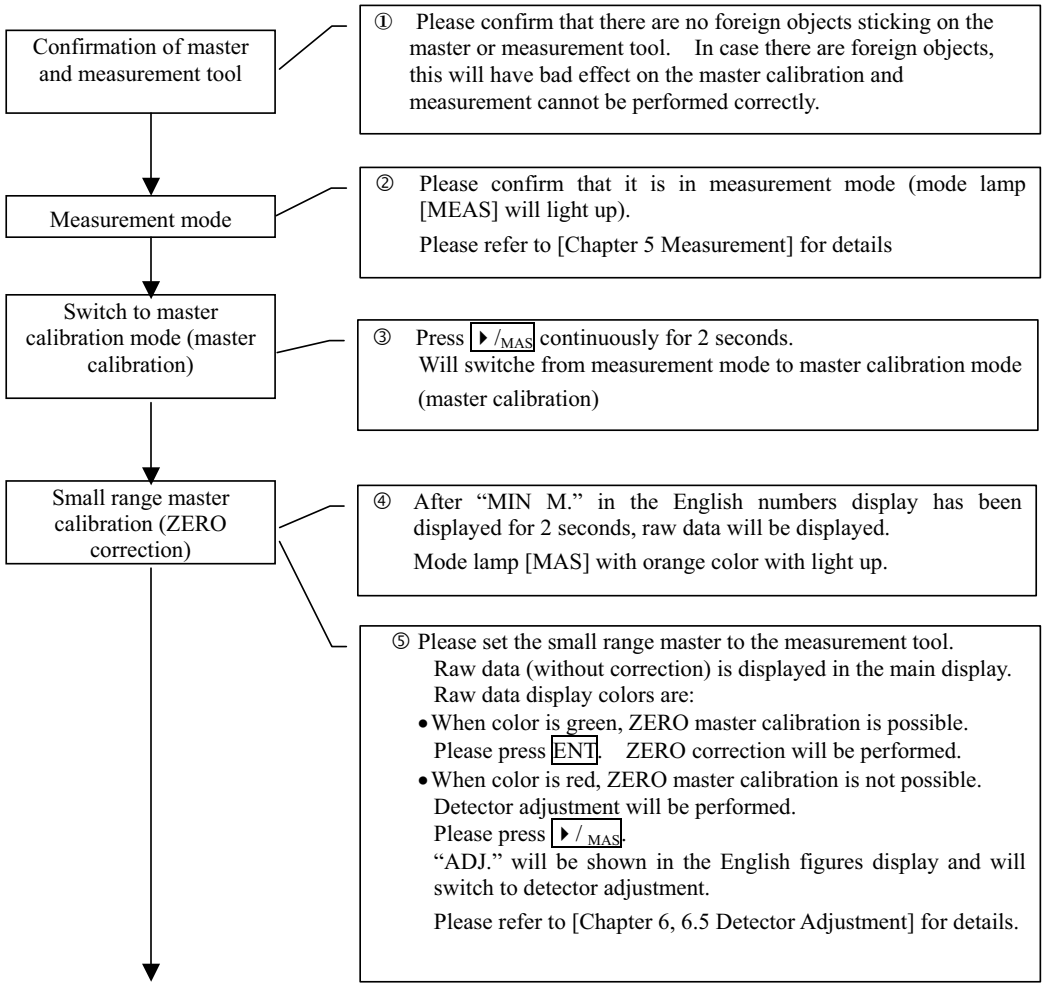
At the [Cal Mode] of the settings item, 2 masters master calibration will be performed when [MIN & MAX] is selected. 1 master calibration will be performed when [ZERO M.] is selected.

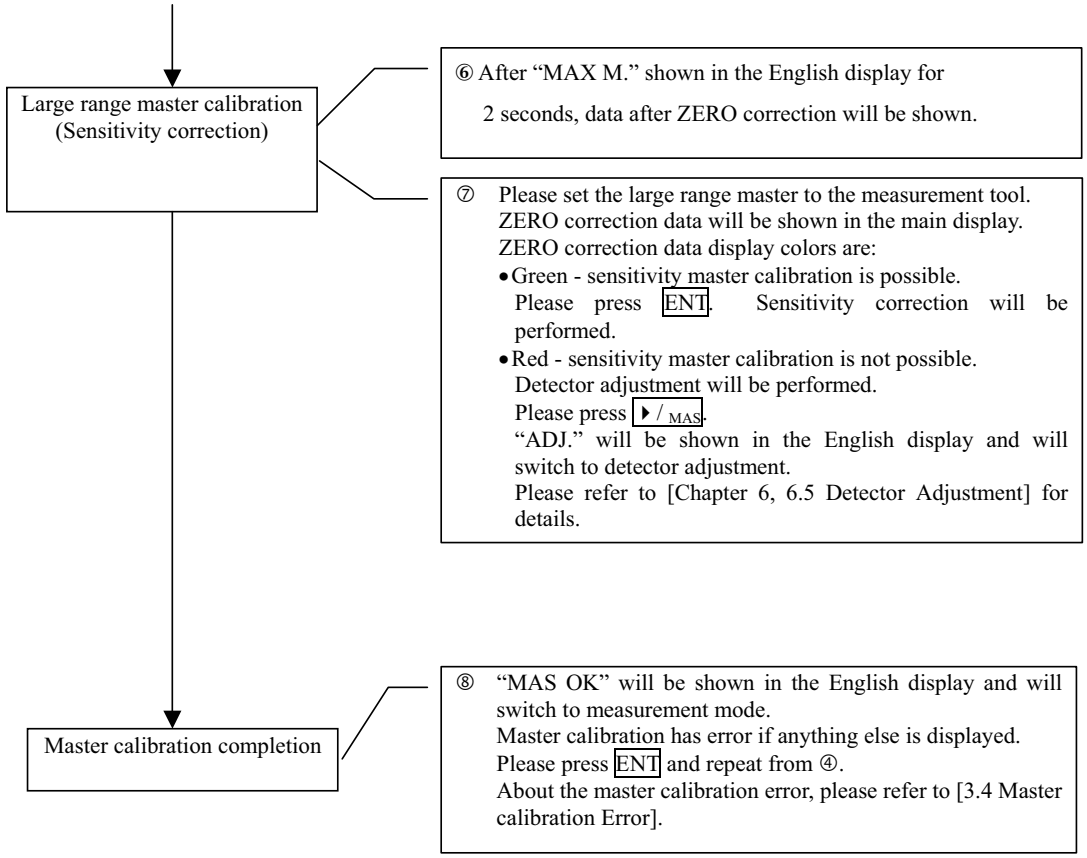
CAUTION

- Please perform again master calibration when ZERO and sensitivity tuning is operated after master calibrations.
- Master calibration is NG when the mode lamp [MAS] lights up in red.
  Please perform master calibration.

4.1 Master calibration by 2 masters

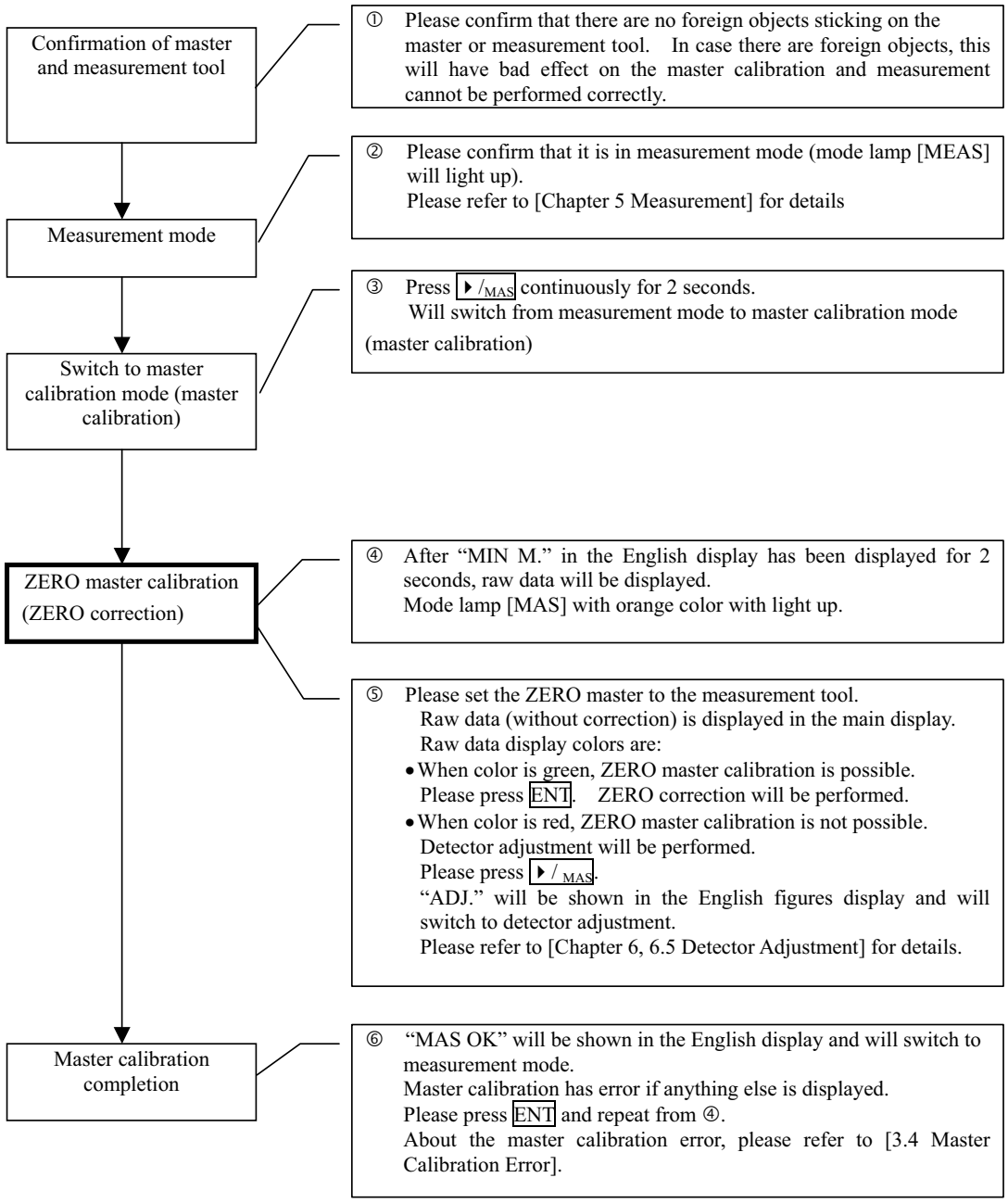
Shown here is the method for performing ZERO correction by small range master and sensitivity correction by large range master.
Will be activated by selecting [MIN & MAX] at settings item [CalMode]




Large range master calibration
(Sensitivity correction)
⑥ After “MAX M.” shown in the English display for
2 seconds, data after ZERO correction will be shown.
⑦ Please set the large range master to the measurement tool.
ZERO correction data will be shown in the main display.
ZERO correction data display colors are:
• Green - sensitivity master calibration is possible.
Please press ENT. Sensitivity correction will be performed.
• Red - sensitivity master calibration is not possible.
Detector adjustment will be performed.
Please press ▸ / MAS.
“ADJ.” will be shown in the English display and will switch to detector adjustment.
Please refer to [Chapter 6, 6.5 Detector Adjustment] for details.
Master calibration completion
⑧ “MAS OK” will be shown in the English display and will switch to measurement mode.
Master calibration has error if anything else is displayed.
Please press ENT and repeat from ④.
About the master calibration error, please refer to [3.4 Master calibration Error].

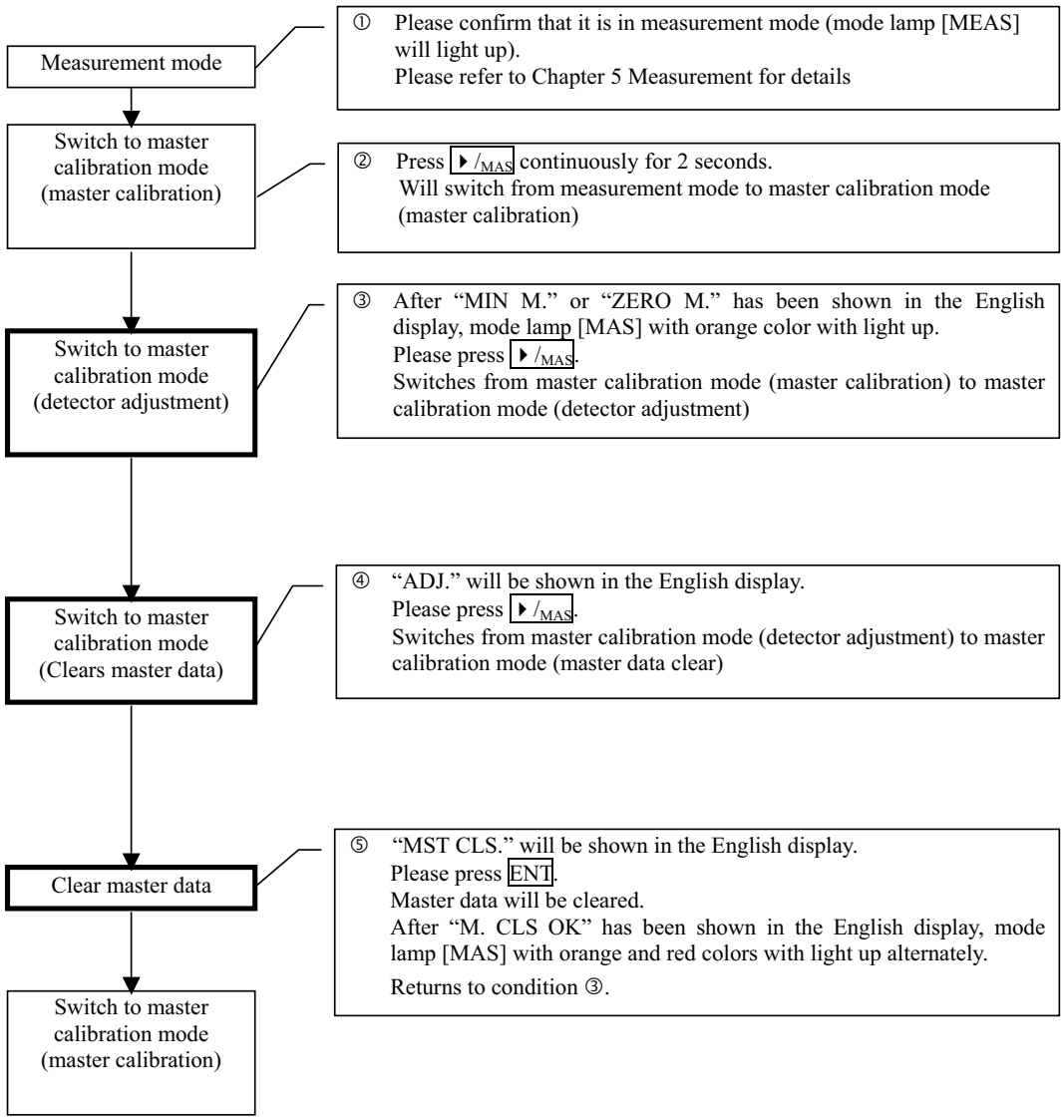
4.2 Master calibration by 1 master

Shown here is the method on how to perform ZERO correction by ZERO master.
Valid for cases when [ZERO M.] in the [CAL MODE] settings item is selected.
Sensitivity correction data will use the master calibration results of the 2 masters performed previously.
If 2 masters adjustment has not been performed, please perform first [Chapter 6, 6.5 Detector Adjustment].



4.3 Clearing of master data

Shown here is the clearing method of ZERO correction and sensitivity correction data
Ordinarily not used. Please use for wear check of measurement tool.



4.4 Master calibration error

In case of master calibration error, the following error details will be shown in the English display:

"ERR ZERO"	ZERO correction is out of range
"ERR MAG"	Sensitivity correction is out of range
"ERR REV"	Data during ZERO correction is smaller than data during sensitivity correction

In case the above errors are displayed, it is necessary to adjust through the ZERO/sensitivity adjustment tuner.
Please refer to [Chapter 6, 6.5 Detector Adjustment] for details.

CHAPTER 5 MEASUREMENT

Measurement is possible when [MEAS] mode lamp is lit and LED of [MAS] is unlit.

If [MAS] LED is blinking, this means that master calibration has not been performed so please perform first [Chapter 4 Master Calibration].

5.1 Measurement value display

Display contents for the main display and English display can be changed by setting it.

Display device	Display contents	Settings item name	Settings	Remarks
Main display	Measurement value [μm]	MainDisp	MEASURED μm	Displays the measurement value in μm
	Measurement value [mm]	Ditto	MEASURED mm	Displays the measurement value in mm
	Judgment result	Ditto	JUDGMENT	-OK=1, OK=2, +OK=3, -NG & +NG=no display
	Not used	Ditto	NO USE	
English display	Measurement value [mm]	CharDisp	MEASURED	Displays the measurement value in mm
	Judgment result	Ditto	JUDGMENT	The left 3 digits is the program number. The right 4 digits is the judgment result
	Plain bar	Ditto	BAR	Position display of measurement value within the measurement range

✪ Please select in settings item [RESOLUTION] for the resolution function in the measurement values display.

5.2 Display color of main display

Display color of the main display changes depending on the judgment result.

If judgment result is:

OK, the color will be GREEN.

-OK and +OK, color will be ORANGE,

-NG and +NG, color will be RED.

5.3 Measurement value hold

If ENT command is inputted during measurement, measured value will be on hold (saved) and if external I/F is being used, measurement value and judgment results will be outputted.

Also, display color will change from light to dark.

To cancel measurement value saving, RST or input RESET.

Note: Cannot hold (save) when master calibration in NG.

CHAPTER 6 DETAILS OF EACH PROCEDURE

6.1 Installation

Please place the main body and measurement tool on a location that can withstand heavy weight and that is stable.

6.2 Preparation

(1) Air piping

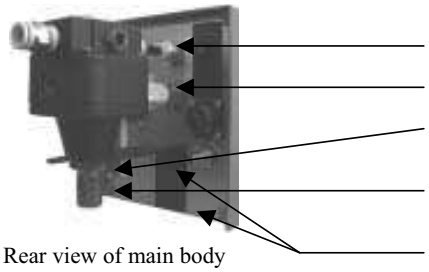
Pipe layout for the air to be used in measurement.

Please supply pure air with dirt, moisture, and oil removed.

Please prepare air environment friendly high performance filter.

Note: Please make sure to connect in such a way that air does not leak when connecting the hose to the joint.

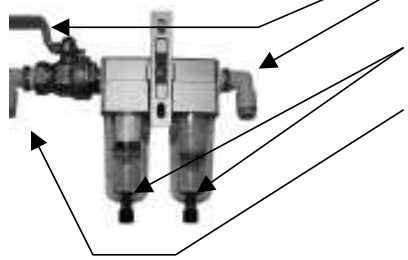
a) Connection of main body and regulator (optional)



Rear view of main body

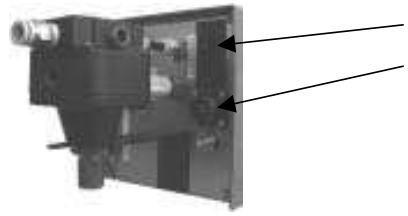
① Please connect hose (outer diameter 6, inner diameter 4, length 50) to the regulator joint (OUT).
② Please connect the silencer.
③ Please fit the regulator bracket to the regulator.
Note: Please do not touch the regulator pressure adjustment part since regulator pressure has already been adjusted to 0.196±0.005Mpa.
④ Please fix the regulator bracket to the regulator bracket hole (M3).

b) Connection of filter (optional)



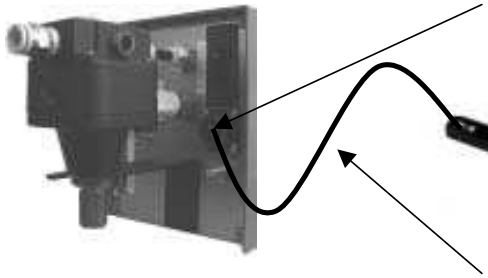
① Please turn the COCK off.
② Please connect the hose (outer diameter 8, inner diameter 6) in between the filter and regulator.
③ Please fix the screw for draining so that it faces downwards. Turn counterclockwise and please drain 1 or more times per day.
④ Please supply compressed air (0.3 ~ 0.7Mpa)

(2) Connection of power cable



① Please set the power switch to OFF (○ will come out).
② Please connect the power cable to the power connector (input). For the power cable included, please use within AC85 ~ 125V.

(3) Connection of measurement tool

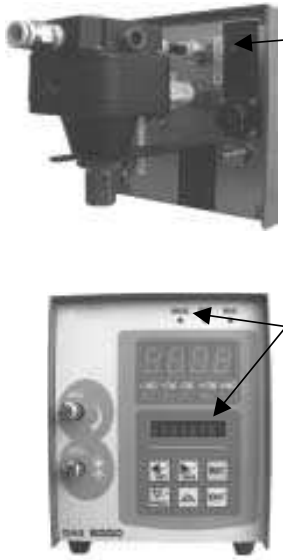


① Please connect the measurement element or measurement tool to the measurement nozzle port.

● Measurement element
(PO type, POT type)

Note: If hose length is long, this will have effect on the responsiveness.

6.3 Starting



① Please switch On the power switch (press ○).

② The following are shown in the English display:
- Software version
- Option information

③ Last used values of the following will be read:
- Settings value
- Master calibration data

④ Confirms (visual) the lighting of the display device.

⑤ Starts in the measurement mode (mode lamp [MEAS] lights up).

Point
Measurement mode will start right after turning on power.
(mode lamp [MEAS] lights up)

6.4 Settings

(1) How to switch to settings mode

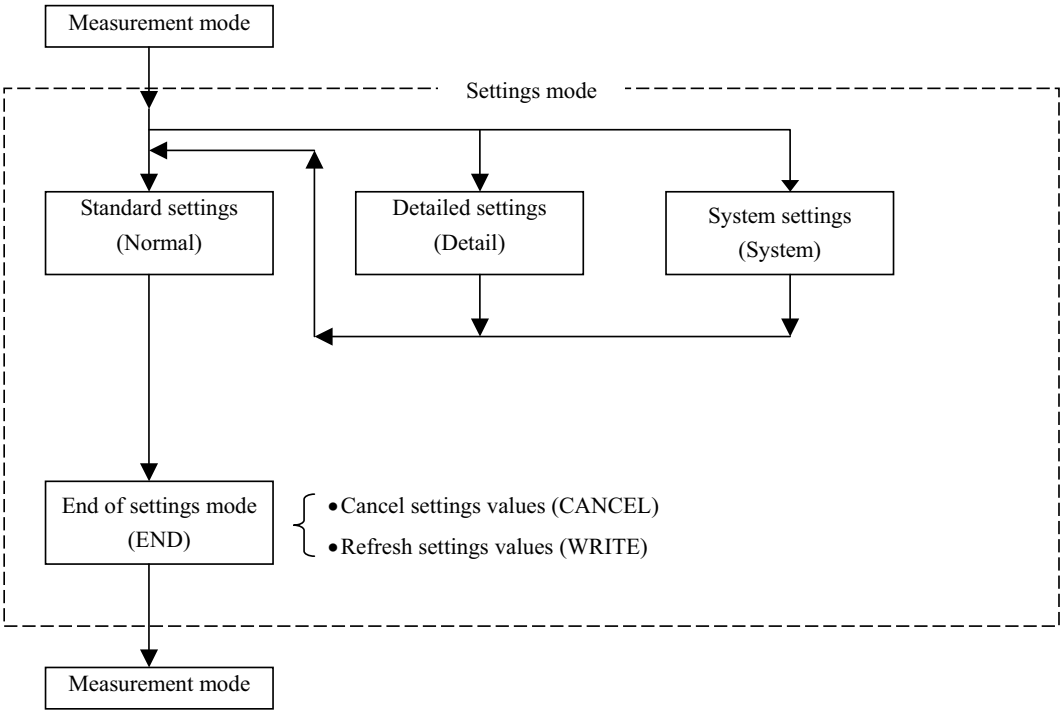
① At settings mode (mode lamp [MEAS] is lit), please press ◀ / SET continuously for 2 seconds.

② Switches to settings mode (mode lamp [SET] lights up in orange color).

Point

At measurement mode, if ◀ / SET is pressed for 2 seconds, mode will switch to settings mode (mode lamp [SET] will light up in orange color)

(2) Structure of settings mode



(3) Settings details

This explains the settings item name and settings details at the settings mode.

Settings mode is mainly divided into the following 3:

- Normal [Standard settings] --- master values, judgment limit values can be set
- Detail [Detailed settings] --- measurement range, display analysis function, polarity ditto
- System [System settings] --- display data, moving average ditto

① Settings item names and settings details at Normal [Standard settings]

● Settings concerning master values

- [MIN M.] --- Please input the small range master values used in master calibration (2 masters).
- [MAX M.] --- Please input the large range master values used in master calibration (2 masters).
- [ZERO M.] --- Please input the ZERO master values used in master calibration (1 master).

● Settings concerning judgment limit values

- [-NG/-OK] --- Please input the limit values of –NG and -OK
- [-OK/ OK] --- Please input the limit values of –OK and OK
- [OK/+OK] --- Please input the limit values of OK and +OK
- [+OK/+NG] --- Please input the limit values of +OK and +NG

In case judgment of –OK is not needed, please set the same settings values to [-NG/-OK] and [-OK/OK] and in case judgment of +OK is not needed, please set the same settings values to [OK/+OK] and [+OK/+NG].

● Settings concerning master

•[CORRECT] --- Machine difference correction values can be set
Adds and displays the above data to the master correction data.

② Settings item name and settings details at Detail [Detailed settings]

•[RANGE] --- Measurement range can be selected
10μm is optional.

•[RESOLUTION] --- display analysis function ditto

● Settings concerning detector

•[POL] --- Polarity
Please select + for inner diameter measurement and – for outer dimension measurement

•[GAIN] --- Sensitivity rough adjustment values can be set
Normally, settings values is fixed depending on the selected measurement range.
Please input:
24 if measurement range 100μm is selected
33 if measurement range 50μm is selected
68 if measurement range 20μm is selected
(204 if measurement range 10μm is selected)
In case measurement range is changed, the above values will be set.

•[CONSTANT] --- Sensitivity fine adjustment constant can be set
Normally, please input 1.000.

● Settings concerning master

•[CalMode] --- Master calibration method can be selected
Please select:
[MIN & MAX] for master calibration by small range or large range master.
[ZERO M.] for master calibration by ZERO master.

③ Settings item name and settings details at System [System settings]

•[MEAS SW] --- External button input movement can be selected

•[SMOOTH] --- Moving average ditto

● Settings concerning display

Data shown in:

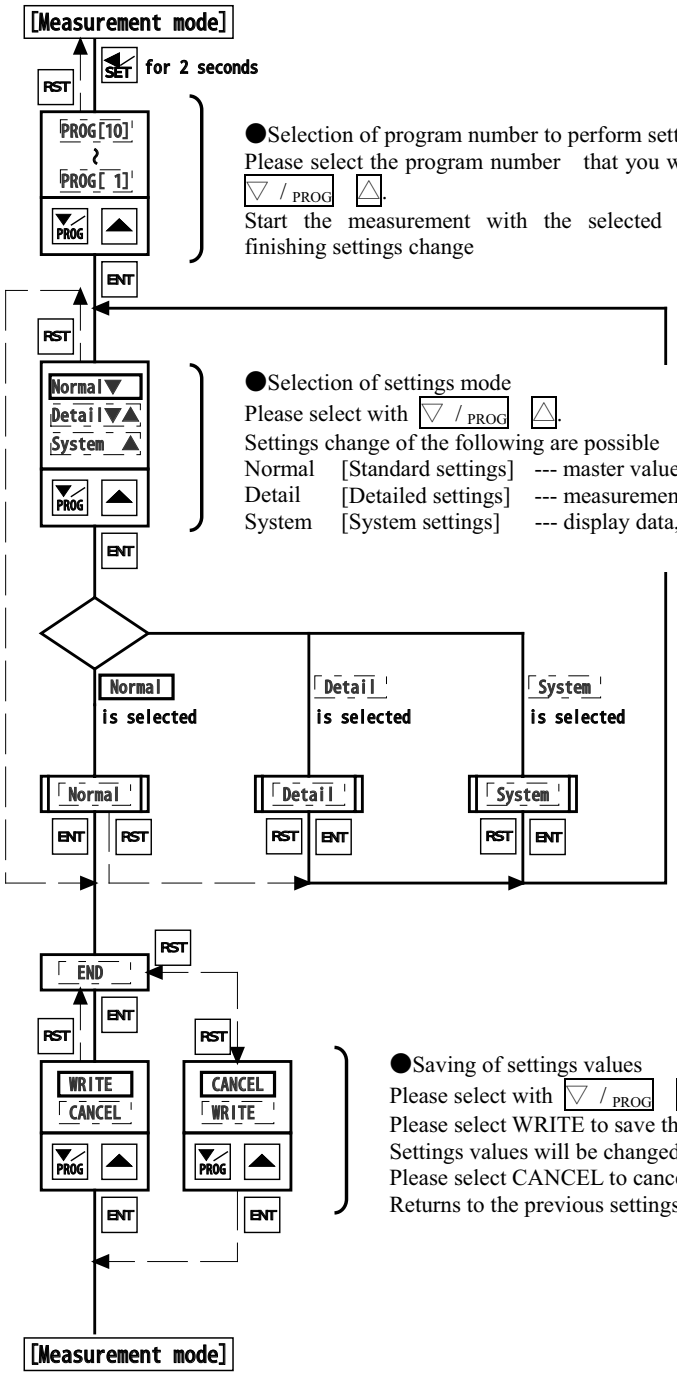
•[MainDisp] --- Main display can be selected

•[CharDisp] --- English display ditto

(4) Operation flow at settings mode

Shown here is about the settings mode operation.

① Whole, general, entire



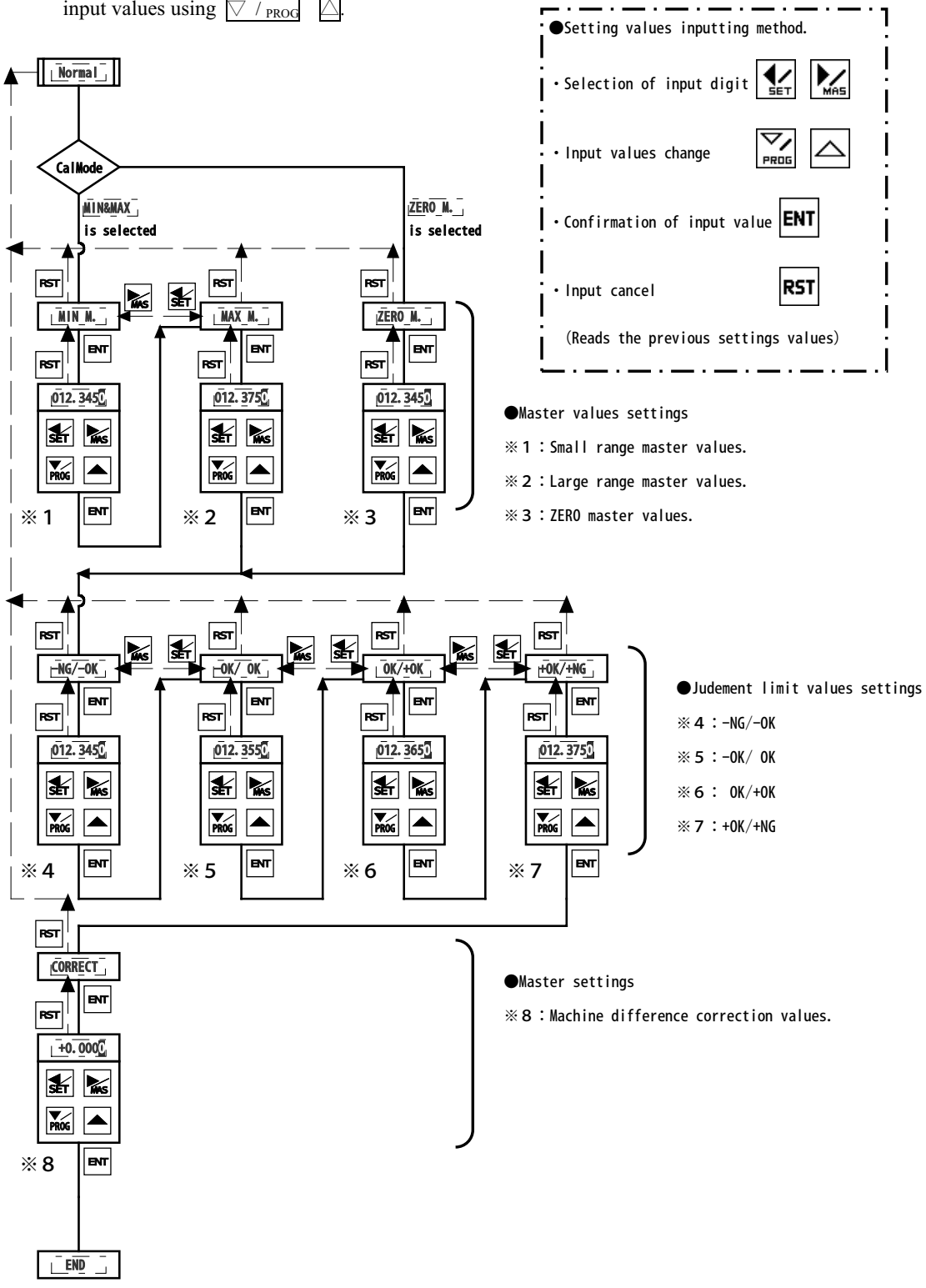
●Selection of program number to perform settings
Please select the program number that you want to perform with the ▽ / PROG △.
Start the measurement with the selected program number after finishing settings change

●Selection of settings mode
Please select with ▽ / PROG △.
Settings change of the following are possible
Normal [Standard settings] --- master values, judgment limit values
Detail [Detailed settings] --- measurement range, display analysis function
System [System settings] --- display data, moving averages frequency

●Saving of settings values
Please select with ▽ / PROG △.
Please select WRITE to save the settings values.
Settings values will be changed.
Please select CANCEL to cancel the settings values.
Returns to the previous settings values.

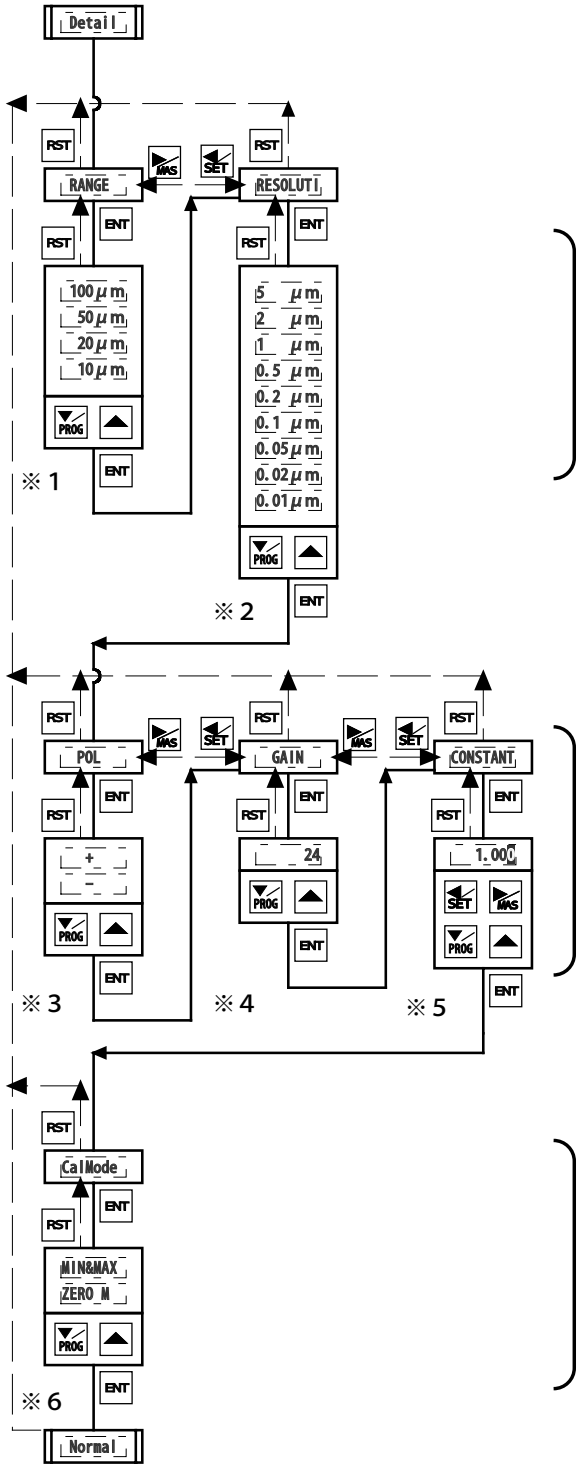
② Normal [Standard settings]

Please select the input digit with the ◀ / SET ▶ /MAS to change the settings values and change the input values using ▽ / PROG △.



③ Detail [Detailed settings]

Please change the settings with ▽/PROG △. Confirm the settings value by pressing ENT. Sensitivity fine adjustment constant (✻ 5) is selected by inputting the digit with ◀/SET ▶/MAS, and please change the input value with ▽/PROG △.



※1：Measurement range

※2：Display resolution

●Detector settings

※3：Polarity selection.

※4：Sensitivity rough adjustment values.

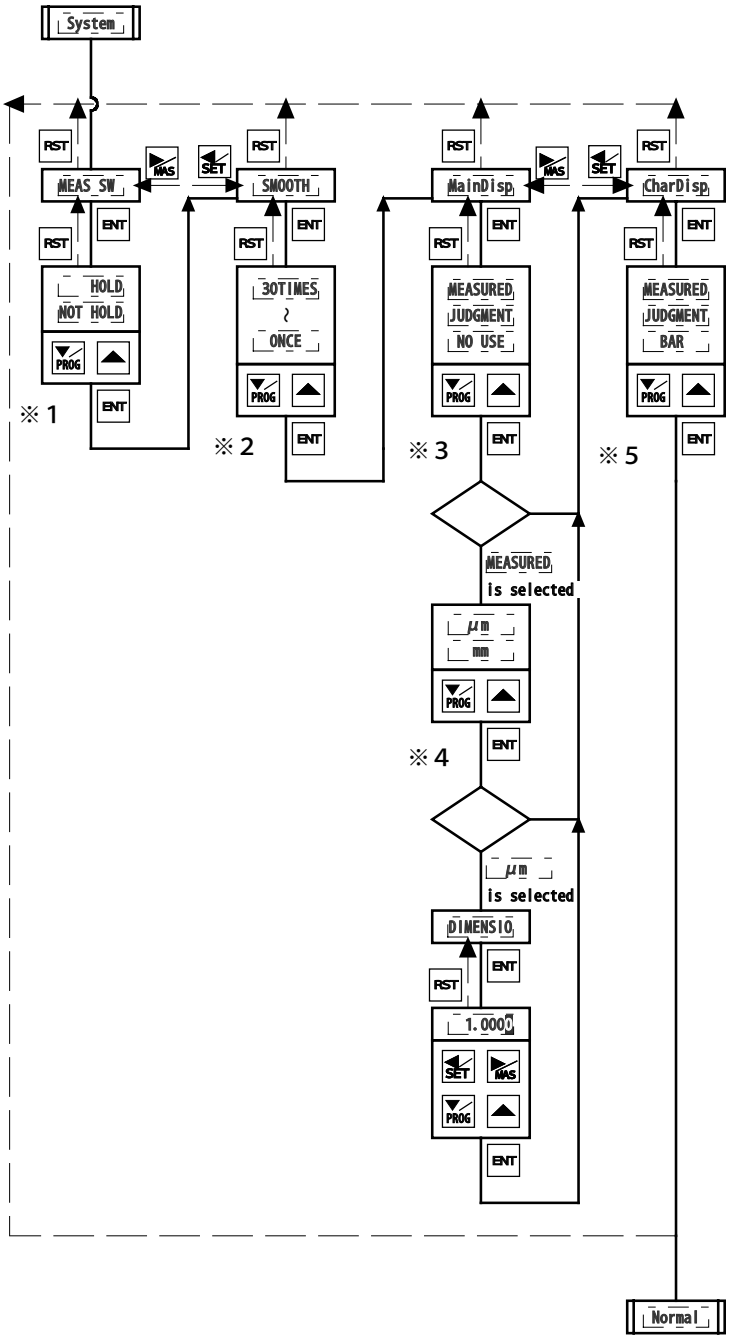
※5：Sensitivity fine adjustments contants.

●Master setting

※6：Selection of master calibration method.

④ System [System settings]

Please change the settings with ▽/PROG △. Confirm the settings value by pressing ENT.



※1：External button movement.

※2：Moving average frequency.

●Display settings

Selection of display data at measurement mode

※3：Data shown in main display.

※4：Unit.

※5：Data shown in English display.

6.5 Detector Adjustment

Please perform detector adjustment when measurement tool is replaced.

(1) How to switch to master calibration method

① Press [▶ /MAS] continuously for 2 seconds.
② Switches to master calibration mode (mode lamp [MAS] lights up in orange color)

Point
If [◀ /SET] at measurement mode is pressed for 2 seconds, mode will switch to settings mode.
(mode lamp [MAS] will light up in orange color)

③ Press [▶ / MAS] once.
④ Adjustment of detector
⑤ By pressing [△] [▽ /PROG] , settings values of sensitivity rough adjustment [GAIN] can be changed.
Ordinarily, there is no need to change.

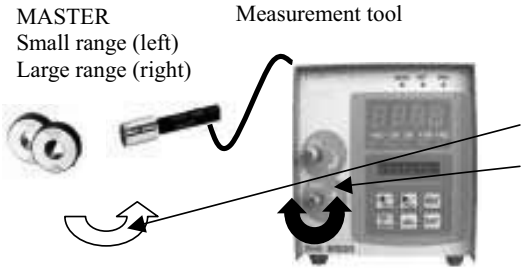
(2) Detector adjustment

Adjustment method for inner diameter measurement and outer diameter measurement is different.

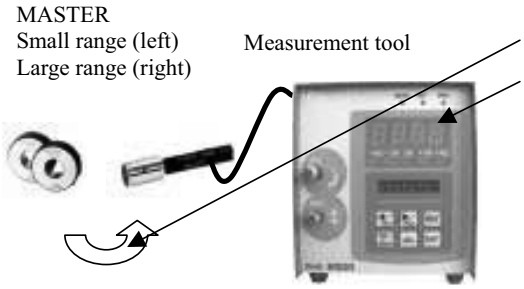
For inner diameter measurement, small range master is adjusted through ZERO position and large range is through sensitivity adjustment. Please refer to 1).

For outer diameter measurement, large range master is adjusted through ZERO position and small range is through sensitivity adjustment. Please refer to 2).

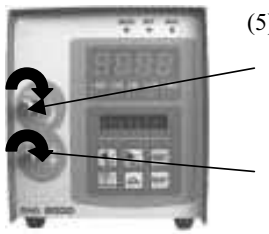
1) For inner diameter measurement



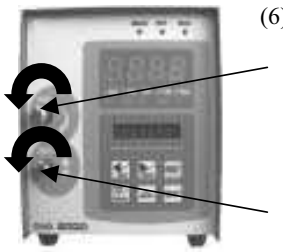
(1) Set the small range master to the measurement tool
(2) Turn the ZERO adjustment tuner and adjust the readings on the main display so that the value is close to the master value.



(3) Set the large range master to the measurement tool
(4) In the main display, if value:
- Is near the large range master, calibration is finished. Please perform (7).
- Is not attained, sensitivity is insufficient. Please perform (5).
- Exceeds, there is over sensitivity. Please perform (6).



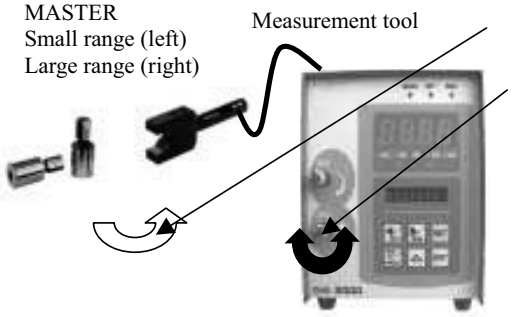
(5) In case of insufficient sensitivity
a) Turn the sensitivity adjustment tuner clockwise with the large range master set to the measurement tool.
Please add from the large range master value 5 times the minus amount from the large range master value.
b) Turn the ZERO adjustment tuner clockwise and adjust to the large range master value.
c) Please repeat starting from (1)



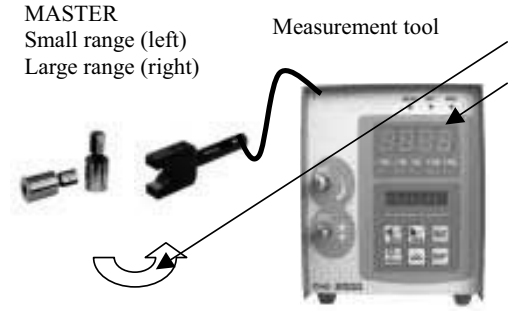
(6) In case of over sensitivity
a) Turn the sensitivity adjustment tuner counterclockwise with the large range master set to the measurement tool.
Please subtract from the large range master value 5 times the plus amount from the large range master value.
b) Turn the ZERO adjustment tuner counterclockwise and adjust to the large range master value.
c) Please repeat starting from (1)

(7) End of adjustment
Aside from these there is no need for adjustments using the tuner (excluding special cases).
Please proceed to (3).

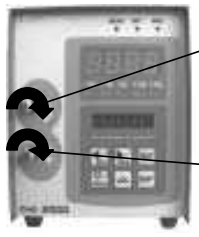
2) For outer diameter measurement



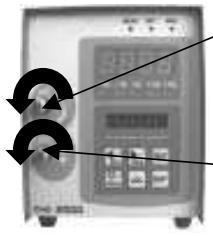
(1) Set the large range master to the measurement tool
(2) Turn the ZERO adjustment stop and adjust the readings on the main display so that it becomes near the value of the large range master.



(3) Set the small range master to the measurement tool
(4) In the main display, if shown is:
- Near the small range master calibration is finished. Please do (7).
- Exceeding, sensitivity is insufficient. Please do (5).
- Did not reach, there is over sensitivity. Please do (6).



(5) In case of insufficient sensitivity
a) Turn the sensitivity adjustment tuner clockwise with the small range master set to the measurement tool.
Please subtract from the small range master value 5 times the plus amount from the small range master value.
b) Turn the ZERO adjustment stop clockwise and adjust to the small range master value.
c) Please repeat starting from (1)

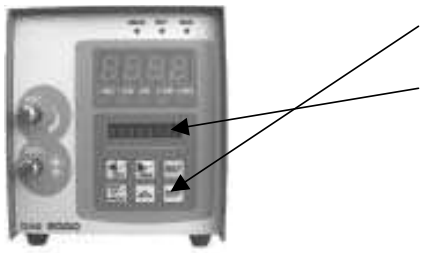


(6) In case of over sensitivity
a) Turn the sensitivity adjustment tuner counterclockwise with the small range master set to the measurement tool.
Please add from the small range master value 5 times the minus amount from the small range master value.
b) Turn the ZERO adjustment tuner counterclockwise and adjust to the small range master value.
c) Please repeat starting from (1)

⑦ End of adjustment

Aside from these there is no need for adjustments through tuner (excluding special cases). Please proceed to (3)

(3) Switching to master calibration mode (master calibration)

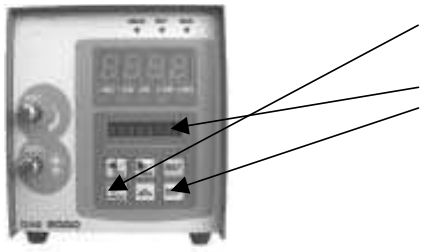


① Please press ENT.

② In the English display,

"MIN M." or "ZERO M." will be displayed.
"MIN M." is for master calibration with 2 masters.
"ZERO M." is for master calibration with 1 master.
Raw data (without correction) is shown in the main display.

6.6 Program Switching



① At measurement mode, please press ▽/PROG continuously for 2 seconds.
② "PROG" will appear in the English display.
③ Please press ENT.
The current program number being used will be shown.
④ Please press △ or ▽/PROG, select the program number (0~9), and then press ENT.
⑤ Program switching mode ends and switches to measurement mode.

Point
When the machine is powered on, it will start with the last selected program number.

CHAPTER 7 EXTERNAL I/O FUNCTION

7.1 Serial (RS232C) communications function

(1) Outline

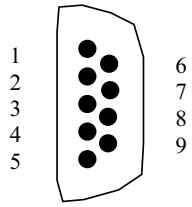
This product uses serial communications and is capable of outputting the measurement value and judgement to the printer or PC.

(2) Preparation

The RS232C back side of the main body is the connection port to printer and PC.
Please connect to the main body the optional communications cable D-sub9P (OSS).

(3) RS232C Connector

Note: Please set the cable length within 15m.



Pin No.	Signal name
1	
2	RxD
3	TxD
4	
5	GND
6	
7	RTS
8	CTS

(4) Serial port settings

Settings name	Settings details
Bow rate	9600
Bit/letter	8
Stop bit	1
Start bit	1
Parity bit	none

(5) Measurement results output

Outputs the measurement value and judgment result.

① Simple command
Please transmit “D” only. Returns the output data of ② (below).

② Simple output data
Returns the data shown below:

③ When "D" is received, the measured value will be held.
Please send only "R" after receiving the data.

Letter:	Measurement value								SP	Judgment			CR	LF
ASCII code:	20	20	31	2E	32	33	34	35	20	20	4F	4B	0D	0A
Example:	SP	SP	1	.	2	3	4	5	SP	SP	O	K	CR	LF

* SP represents SPACE.

8 letters, 3 letters

14 letters

Judgment is outputted as “-NG”, “-OK”, “OK”, “+OK”, “+NG”

(6) Data transmission method from the main body

At measurement mode, please press ENT or the measurement button (refer to 7.2 External button input for details).
Transmits in [(5) ② Simple Output Data] format.

Note: Data cannot be transmitted when master calibration is NG.

7.2 External button input

(1) Outline

This device allows the connection of the non-electrical contact of the external button or foot switch to the [SW, ETC] at the back of the main body.
Measurements, RESET, large range master calibrations, and small range master calibrations can be performed.

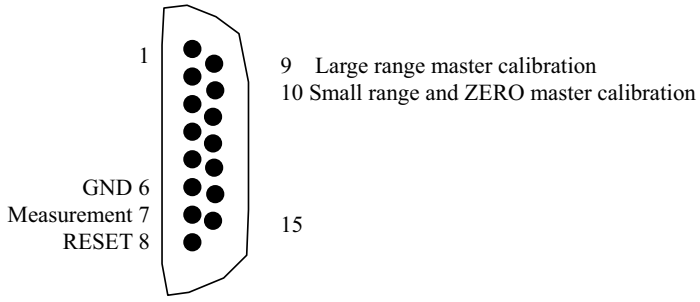
(2) Preparation

[SW. ETC] at the back of this device is the connection port to the external button.
D-sub 15P (OSS) can be connected.

(3) Switch input connector

External button and also non electric contacting foot switch can be connected.
Input can be activated by short circuiting to the ground pin (6).
Please use D-sub 15P (OSS).

Note: Please set the cable length within 2m.
Cannot use other than push button or foot switch.
Please use DS I/O base (optional) for the connection of sequencer and relay.
Please do not connect to the pin number that has no signal name. This becomes cause of accidents.



(4) Movement based on external button

a. Measurement button

(1) At measurement mode, please press [Measurement Button].
Outputs the measurement value to external machine
Note: Cannot output when master calibration is NG

(2) At settings item [MEAS SW],
If [HOLD] is selected, measurement value will be on hold (saved), and data will be outputted.
If [NOT HOLD] is selected, data will only be outputted.

b. RESET button (Reset)

(1) Cancels hold.

c. Large range master calibration

(1) At measurement mode, please set the large range master to the measurement tool.
(2) Please press the [Large range master calibration button] when measurement value stabilizes.
Returns to measurement mode after performing large range master calibration.
Note: The above movement will not be performed when [ZERO M.] at settings item [CalMode] is selected.

d. Small range master calibration

(1) At measurement mode, please set the small range/ZERO master to the measurement tool.
(2) Please press the [Small range master calibration button] when measurement value stabilizes.
Performs small range/ZERO master calibration and then returns to measurement mode.

CHAPTER 8 MAINTENANCE

(1) Please use alcohol for removing dirt on the main body.
If thinner is used, color will fade and become dull.

(2) Filter will get clogged as a result of being used for long period of time.
Please replace the ELEMENT 2 years after start of use or when the pressure falls to 0.1MPa.

(3) Cleaning of A/E converter
Trash could be sticking inside the air circuit as a result of being used for long period of time.
In case there is too much oil sticking, we recommend the use of the compressed air purifier.

① Please record the position of the front ZERO position/sensitivity adjustment tuner (distance from the main body to the tip).
Master calibration will be easy after finishing cleaning.

② Turn the ZERO position/sensitivity adjustment tuner counterclockwise and pull out from the main body.

③ Please inspect the O ring of the needle part. In case there is scratch, it should be replaced.

④ Please clean if the needle is dirty.
Please clean also the hole (∅ 3) in contact with the needle using cotton buds soaked with alcohol.

⑤ Insert the needle into the main body.
If the screw seems to be loose, widen the split screw with a screw driver tip, etc.
Please be careful not to over bend.

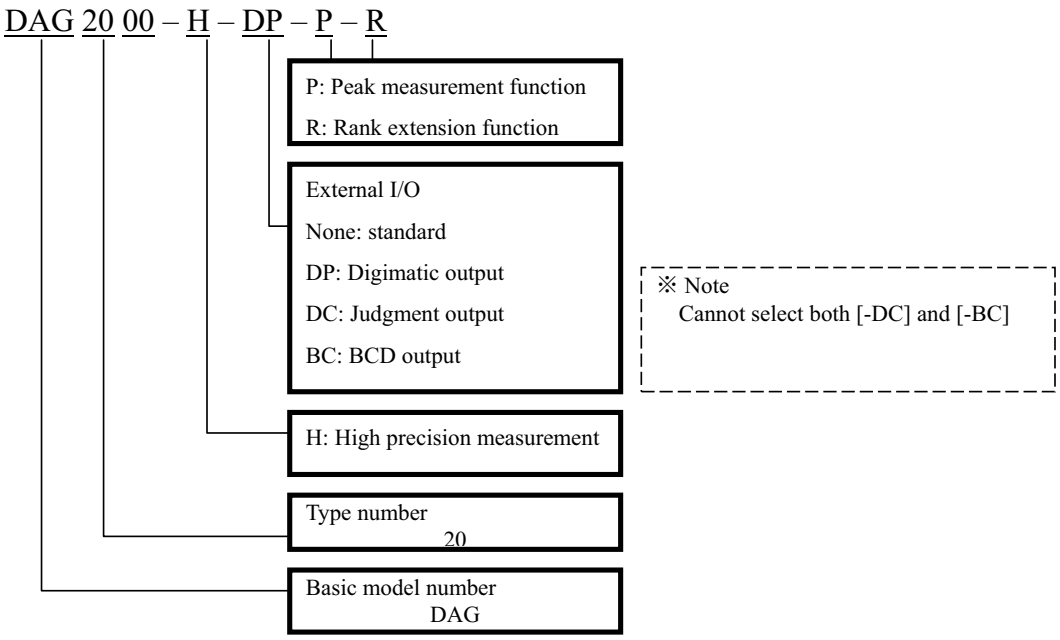
⑥ Turn the needle clockwise and insert into the position initially recorded.
Please perform adjustment or master calibration through the ZERO position/sensitivity adjustment tuner.

CHAPTER 9 CAUSES OF FAILURE AND COUNTERMEASURES

Phenomenon	Failure and adjustment NG location	Countermeasure
Repeatability accuracy is not stable	① Supplied pressure is not stable ② Regulator function NG ③ Nozzle is worn out ④ There is leak in the piping, joint, etc. ⑤ Water and oil is mixed inside the main body	① Set the source pressure of the regulator to 300kPa or above. ② Overhaul or replacement of regulator ③ Replace the nozzle with a new one ④ Check for leak and then tighten ⑤ Clean the main body (use compressed air purifier)
ZERO position adjustment tuner does not work	① Supplied pressure is low or high ② There is leak in the piping, joint, etc. ③ Nozzle gap is too small ④ Nozzle gap is too big	① Set the regulator pressure settings to 196kPa. ② Check for leak and then tighten ③④ Adjust to the appropriate gap
Main display does not operate	① Proper power is not supplied ② ZERO position adjustment NG ③ In measurement value hold mode Display color is green (dark) or red (dark) ④ In settings mode	① Supply AC85 ~ 264V ② Perform master calibration ③ Cancel using RST ④ End the settings mode
Display device does not lit	① Power is not supplied ② Fuse is busted ③ Power/internal circuit failure ④ Display settings	① Supply AC85 ~ 264V ② Replace fuse (3A) ③ Request to maker for repairs ④ Change the settings item [MainDisp]

CHAPTER 10 OTHERS

10.1 Model



10.2 Optional

(1) Basic accessories

①	High precision measurement	Measurement range 10μm
②	Digimatic output	Output to printer (DP-1) ※with cable
③	Judgment output	5 rank (-NG, -OK, OK, +OK, +NG) output (with DC I/O base extension, connector) Individual output is up to 16 ranks, 17 ranks and or more is code output.
④	Rank extension function	Capable of judging up to maximum of 99 ranks (OK range)
⑤	BCD output	Code output of BCD data (with DC I/O base extension, connector)
⑥	Peak measurement function	Measurement value change (+PEAK, -PEAK, TIR(=(+PEAK)-(-PEAK)), TIR/2(=(+PEAK)-(-PEAK))/2) can be obtained.

(2) Sold separately

①	Filter	(DAG2000-0P-AF)	Air filter + mist separator
②	Filter	(DAG2000-0P-AFA)	Air filter + mist separator (with auto drain)
③	Regulator	(DAG2000-0P-AR)	Precision regulator
④	Serial communications cable	(DAG2000-0P-CB-1)	D-sub 9 pin connector (EIA-232) for PC ※with sample software
		(DAG2000-0P-CB-2)	D-sub25 pin connector (EIA-574) for PC
		(DAG2000-0P-CB-3)	D-sub25 pin connector (EIA-574) for printer
⑤	Compressed air purifier	(DAG2000-0P-HAF)	High moisture and oil removal rate
⑥	Foot switch	(DAG2000-0P-FSW-1)	Single type
		(DAG2000-0P-FSW-2)	2 consecutive type

10.3 Specifications

ITEM			SPECIFICATIONS	REMARKS
Input module			Air 1 Channel	Built-in AE2000 multi
No. of measurement items			1	
No. of programs			10	PROG 1~10
Measurement range [unit: μm]			100	Set to each program
			50	10μm range is optional
			20	
			10	
Display resolution [unit: μm]			5	Set to each program
			2	
			1	
			0.5	
			0.2	
			0.1	
			0.05	Can be selected except when range is 100
			0.02	Can be selected when range is 10, 20
			0.01	Can only be selected when range is 10
Main display (Display color)			4 digits (Red, green, orange, light dark)	Measurement value, judgment result
Multi-function display			40DOT/F.S.	Measurement value is displayed in analog dots
Automatic master calibration			8 digits (Red)	Judgment result, settings values (English, numbers)
Automatic master range			Small range, large range	
			ZERO correction	Within ±50% of measurement range
			Sensitivity correction	Within ±50% of measurement range And within 0.5 ~ 2.0X
Electric voltage			AC85~264V	Attached cable for AC100V
Frequency			50/60Hz common	
Electric capacity			30VA	
Dimension (L X W X H) [unit: μm]			120 x 180 x 150	During fitting of regulator 300 (depth) mm
Weight			2.2kg	2.8kg (with regulator)
Operating temperature			0~45°C	
Push button input Foot switch			4 points	Measurement command, RESET, master calibration (2)
Serial communications			RS232C 1 port	Output of measurement value and judgment result
Optional	High precision measurement		Measurement range 10μm	
	Digimatic output		1 port	Attached DP-1 connection cable
	Judgment output	Input signal 8 points	Measurement command, Reset Master calibration Program switching	
	BCD output	Output signal Open corrector 24 points	READY Master OK	Common signal at 1, 2
			1. Rank output 2. BCD output	1, 2 or either one
	Foot switch	Single type	Measurement command	
		2 consecutive type	Measurement command, RESET	
	Serial communications cable		For RS232C	
	Peak measurement function		+PEAK, -PEAK, TIR(=+PEAK-(-PEAK)), TIR/2, (+PEAK+(-PEAK)/2	Based on measurement value change With auto measurement function
	Rank extension function		99 ranks maximum	OK range
	Regulator			Precision regulator
	Filter			
	Compressed air purifier			When there is too much moisture and oil

CHAPTER 11 WORKSHEET

Production No.:

Settings mode name	Settings item name	Model name			
		Program No.		[1]	[2]
Details ▼▲	Measurement range	RANGE			
	Display resolution	RESOLUTION			
	Polarity	POL	+		
			-		
	Sensitivity rough adjustment value	GAIN (10~225)			
	Sensitivity fine adjustment constant	CONSTANT (0.100~9.999)			
	Master calibration method	CalMode	MIN & MAX		
			ZERO M.		
Normal ▼	Small range master value	MIN M. (input the actual dimensions)			
	Large range master value	MAX M. (ditto)			
	ZERO master value	ZERO M. (ditto)			
	Machine difference correction	CORRECT (-0.9999~+0.9999)			
	Judgment limit values	-NG (input the actual dimensions)			
		-OK (ditto)			
		OK (ditto)			
		+OK (ditto)			
		+NG (ditto)			
System ▲	External switch operation	EXT SW	HOLD		
			NOT HOLD		
	Moving average frequency	SMOOTH (1~30)			
	Main display	MainDisp			
	English display	CharDisp			

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