98301F

Column Type Air Micrometer

CAG3000
Instruction Manual

Thank you for your purchase of the CAG3000

- In order to use this product safely and correctly, please read through the manual thoroughly and understand it very well.
- After reading the manual, please have it readily available for future use.

Please read before using the device

- Please follow all 『Safety Precautions』 to avoid fire、 electric shock and other related injuries.
- After reading the manual, please ensure to store it in an accessible area.
- In case the unit is used by other persons, give the unit together with this manual.
- This device is manufactured under Japan laws so it is for domestic use only. In case this device is used overseas, please observe the safety laws implemented by the country.
- Warranty coverage shall be based on SKS 's warranty policies.
  - Even if the device is under warranty , if the cause of the breakdown is due to the negligence of the user, the repair cost shall be charged to the customer.
  - In case the device becomes defective due to modifications made by customer, there shall be cases that SKS can refuse to accept the repair.
  - The repair is based upon receipt of the defective unit. Even if the device is under warranty, in case the repair will need on site visit, the cost of the trip shall be charged to the customer.

Table of Contents

SKS CORPORATION

1 . Safety Precautions

Before using this device, make sure you read the safety precautions thoroughly. Please comply with the directions and use the device properly.

Warning display

Important notice for usage :

⚠ Warning　⚠ Caution　Important

is classified by the above symbols.

⚠ Warning ● May cause death or severe injuries if used improperly.

⚠ Caution ● May cause severe injuries if used improperly.

Important ● May result to damage to the device if used improperly.

For those items marked with ⚠ Caution depending on the conditions, it can still result in serious siutations. All safety related important details are written here so please follow them by all means.

⚠ Warning

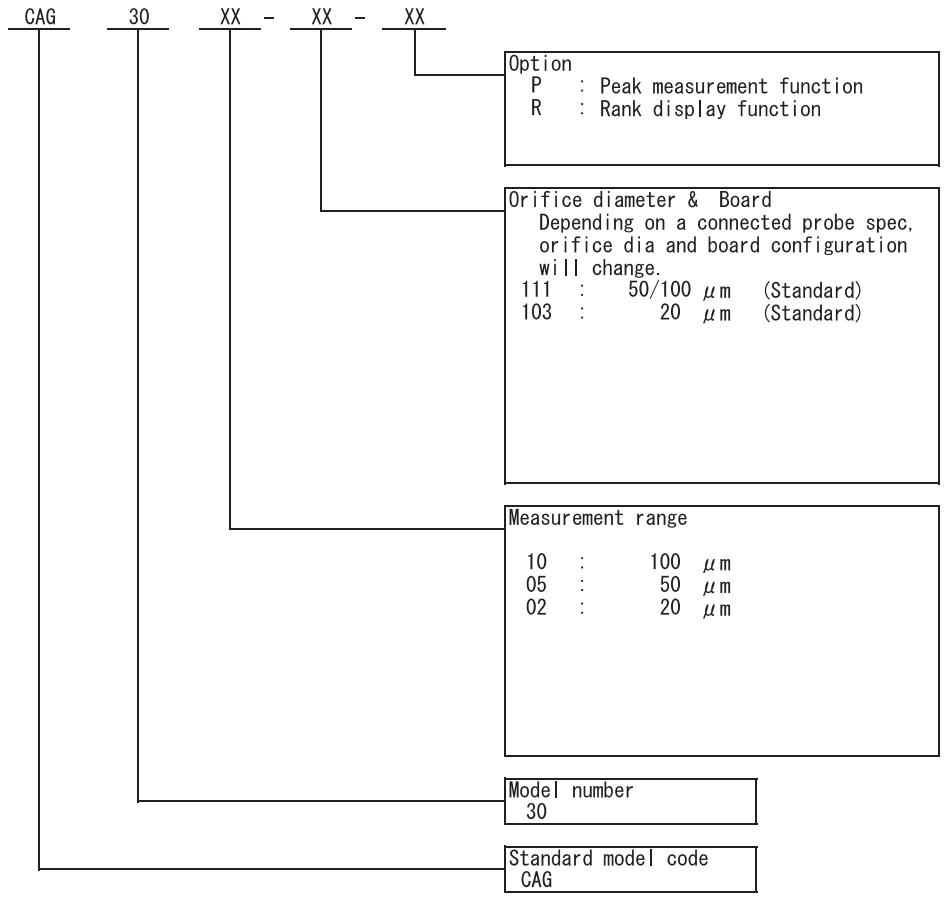
1. Do not modify or disassemble the device. Modification or disassembly of the device by unqualified personnel can cause malfunction and possible fire, electric shock and injuries.
2. Do not let an unqualified personnel repair the device. Repair by an unqualified personnel can cause malfunction and possible fire, electric shock and injuries.
3. Please supply the correct power rating as stated in the instruction manual. Any power supply that is out of spec can cause fire and electric shock. The main unit operates on 5 to 7 VDC. The device is provided with AC adaptor (standard accessory)that runs at 85~264VAC.
4. During air connection, installation or movement of the device, please remove the electric cable from the main unit. Doing these with the electric cables still plugged in can cause electric shock.
5. Connect the device to a ground line. No proper grounding can cause electric shock when device breakdown or short circuit.
6. Check the power line is securely plugged in the power source. Power lines that are loosely plugged-in can cause fire and electric shock.
7. Do not use damaged cables or plugs. Damaged cables or plugs are possible causes of fire and electric shock.
8. Power cable must be checked periodically. Do not use damaged cables anymore. Damaged cables are possible causes of fire and electric shock.
9. Check extension cord periodically. Do not use if it is damaged already. Damaged extension cords are possible causes of fire and electric shock..
10. Before plugging in the power line to the power source, check if the 「Power SW」 is turned "OFF". If the 「Power SW」 is turned "ON" before plugging, it can cause electric shock.
11. When unplugging the power cable, do not pull the cable out from the power source. Pulling the cable from the power source can damage it and cause fire and electric shock.
12. When power cables are placed near places that are heated, oily or cornered, do not let it be damaged. If the power cable is damaged, it can cause fire and electric shock.
13. Clean dirt on power cable periodically. If the dirt piles up, it can cause fire.
14. During maintenance/repair of the device, disconnect the power cable. If the power cable is left plugged in during maintenance, it can cause electric shock.
15. In case the device will not be used for long period of time, unplug the power cable from the source. Deterioration can cause fire and electric shock.
16. Do not use the device in humid places or wet environment. This can lead to electrical failure and can cause fire and electric shock.
17. Do not use the device in unstable places. The device can become defective if it is turned over, dropped with great impact. In case the device is turned over or dropped, please contact our company.
18. Do not put objects inside the device. Any objects like conductive materials inserted on the main body's small openings can cause the unit to fail.
19. Do not use benzene or thinner in cleaning the device. It can cause the unit to discolor.

2 . Overview

Specifications

Item			Specifications			Notes
Product name			Column type air micrometer			
Model			CAG3000			
Basic Specifications						
	No. of channels		1			
	Measurement items		1			
	Measurement range[μm]		20	50	100	Preset prior to shipment.
	Display range [μm]		16	40	80	Depends on the prescribed range.
	Display resolution[μm]		0.2	0.5	1.0	Depends on the measurement range
	Error margin [μm]		0.4	1.0	2.0	
Mastering						
	MASTER adjustment		Electric type			The air type model will have no
						ZERO/MAG knobs in the future.
	Master Set function		Minimum・Maximum			
Measurement						
	Measurement function		Real time			＊Option: Peak measurement
	Display					
		Measured value	101dot BAR LED			
			2″ TFT LCD			
		Judgement result	BAR LED Color			OK = GREEN, NG = RED
			TFT LCD Color			＊Option: Rank display
Setting						
	Display		2″ TFT LCD			
	MENU display language		Chinese, Japanese, English			Can be changed through settings.
	No. of programs		10			
Interface(I/F)						
	RS232C	OUT	1 port			Output meas.value/judgement result
	Ext SW(DRY port)	IN	4ports(measure, RESET, min, max)			Push button SW/Foot SW connector
Environment condition						
	Operating temp [℃]		5 - 40			
	Air supply [MPa]		0.4 - 0.6			
	Flowrate [L/min]		50			
	Power [V]		DC 7 - 12			EXT cable adaptor is for AC85-264[V].
	Current consumption [A]		2			
	Weight [kg]		2.5			

Model



Standard Accessories

- AC adaptor

3 . Names/Functions of each part

① BAR LED
Displays the meas. value

② LCD display
Displays the meas. value, judgement result and set values.

③ Panel switch for mastering
Used to change mode and set values for each type.

④ Pressure adjustment valve
Used when a mastering error occurs during measuring jig replacement.

⑤ ZERO/MAG Adjustment Knob
Used when a mastering error occurs during measuring jig replacement.

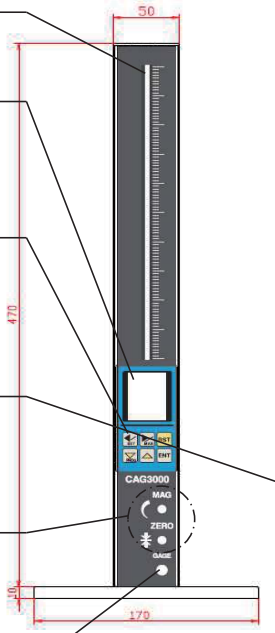
⑥ GAGE port
Connects the measuring jig like the measuring head and measuring block.

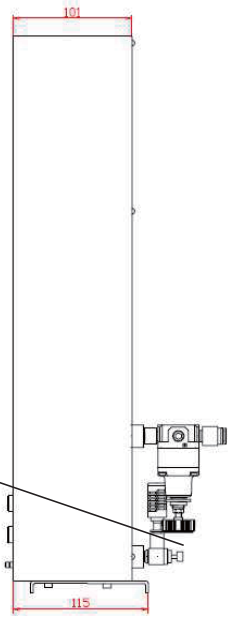
⑦ Power switch
Used to power ON/OFF the device.

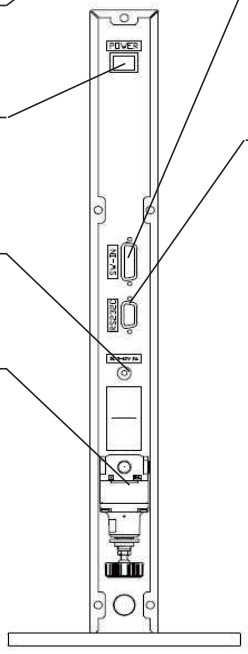
⑧ Power connector
Connects the AC adaptor.

⑨ Precision regulator
Supply pressure
0.4 - 0.6[MPa]
Please use clean air.

Used to adjust pressure.
Please do not operate the handle.



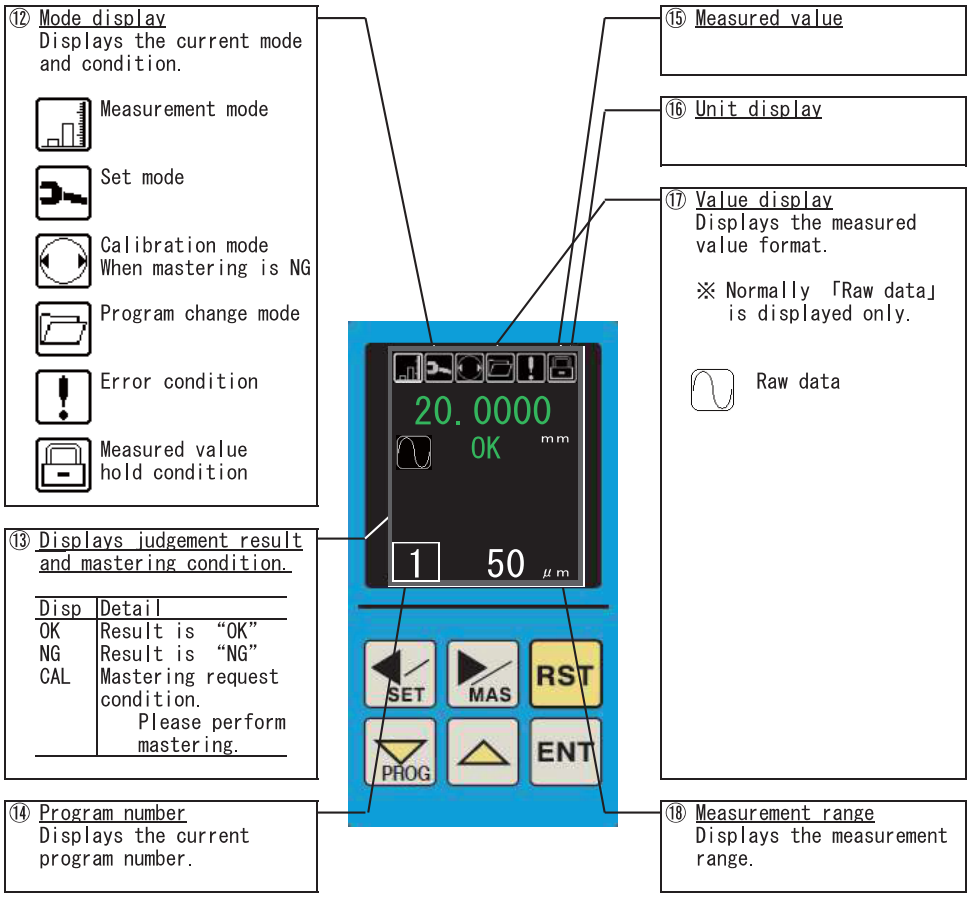




⑩ External switch input
Used to connect push button or foot switch.

⑪ RS232C port
Used to connect the RS232C cable.

②.LCD display detail



4 . Installation

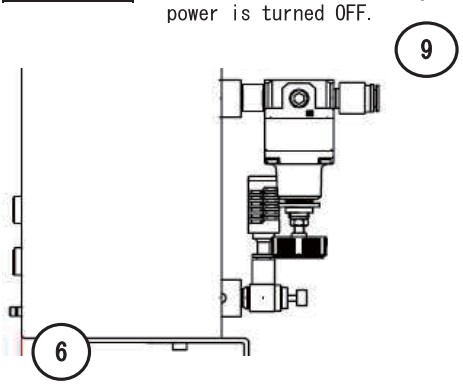
Installing the device

Important ● Install the device on a stable and level surface with no vibrations.

Set the device on the desired place.

Connect the air hose.

⚠ Warning ● Connect the air hose only when power is turned OFF.



1	Turn OFF the 「⑦.Power switch」.
2	Connect the air hose of the measuring block to the 「⑥.GAGE port」.
3	Connect the air hose from the filter to the 「⑨.Precision regulator」.

Connect the AC adaptor

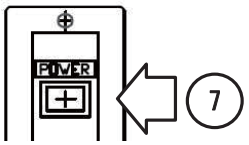
Please connect the 「AC Adaptor」 following the procedure below.

1	Turn "OFF" the 「⑥.Power switch」.
2	Unplug the AC adaptor from the power source.
3	Connect the AC adaptor to the 「⑨.Power connector」.

5 . Power “ON” “OFF”

Supply the power

1	Plug the AC adaptor to the power source.
2	Turn "ON" the 「⑦.Power switch」.

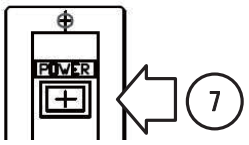


3	The opening demo will be shown.

Software version shall be displayed.

Turn the power OFF

1	Turn "OFF" the 「⑦.Power switch」.



2	Unplug the AC adaptor from the power source.

6 . Operating Procedure

Preparations before measurement

Important

● Air micrometer is a comparative measuring device.
The precision cannot be guaranteed if there are dirt, scratch, dent or rust on the master or measurement jig.

● Precision is not guaranteed if measurement jigs made by other companies is connected to the device.

● Air micrometer is weak on water and oil.
In case water or oil gets in the device, the following conditions may happen :
- Precision becomes bad.
- The displayed value becomes unstable.
- Different values are displayed for the same measured object.

By periodically replacing the filter element, the above conditions can be prevented from happening.

We recommend the overhaul of the device if water or oil gets inside the main unit.

1	Check the filter condition. ● Is water or oil clogged up?
2	Check the measure jigs and master. ● Any dirt, scratch, dent or rust?
3	With compressed air, turn the power "ON".
4	After the opening demo, 「CAL」 shall be displayed. Please perform mastering.

Chinese

English

Mastering

Perform calibration by master.

Important

● Mastering must be done on any of the following conditions.
- Every 2 to 4 hours
- When power or air supply is turned "ON".
- When indicated value looks abnormal.

5	Press MAS for more than 2 secs. Mode display will change to .

6	Set 「Min master」 the measurement jig. Once the indicator stabilizes, press ENT .
7	Set 「Max master」 on measurement jig. Once the indicator stabilizes, press ENT . Perform 「Max mastering」.
8	Check the display of 「TFT LCD」. 「MAS OK」 Mastering is successful. Proceed to measurement. 「ERR ZERO」 「ERR MAG 」 There is error if any of 「ERR REV 」 these three appears. Please deal with the cause of the mastering error.

Mastering error processing

If error occurs, please confirm and correct the condition.
- Is the supply pressure correct?
- Was the min master and max master taken by mistake?
- Is there any dirt, scratch, dent or rust on the measure jig or master?
- If none of the above, proceed to 8. Adjustments and perform the task.

Measurement

Measure the work object.

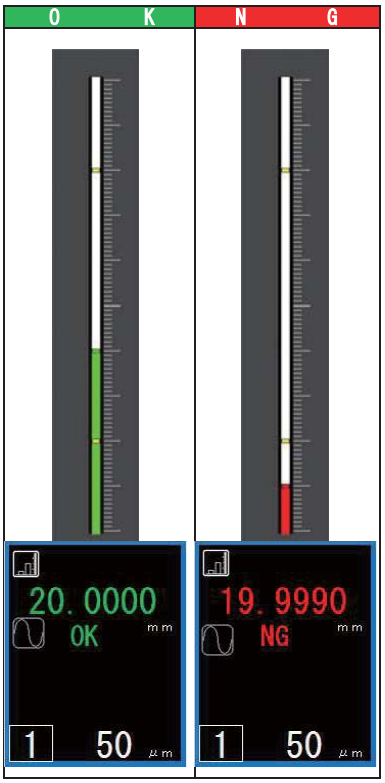
⚠ Caution

● During measurement mode,
By pressing MAS for more than 2 secs.
the mode will change to Master mode.

In order to maintain the measurement accuracy, perform mastering about every 2 hours.

1 Set the work object on the measurement jig.

2 The measured value and judgement result shall be displayed.
If the color of the「BAR LED」is …
"green", value is OK and in range.
"red", value is out of range.



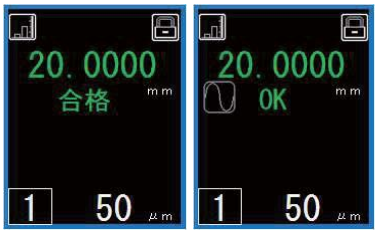
Hold/Output meas. value

Hold the measured value and output it to RS232C.

⚠ Caution

● If the mastering is NG, you cannot hold and output the measured value.

1 With the mode display at , press ENT .
The measured value shall be held and hold condition is displayed.
The measured value and judegement result shall output to RS232C.



2 If RST is pressed,
the display shall disappear
and reset the measured value hold condition.

7 . Setting Procedure

Program change

Input new set values to a program.

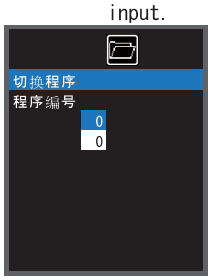
⚠ Caution

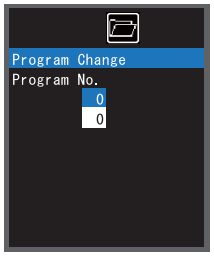
● In case you will change the settings of the current program, do the following procedure 「Input set value」.

1 Turn "ON" the power.
After the opening demo,
「 CAL 」 shall be displayed.

Chinese | Japanese / English

2 Press PROG for more than 2 secs.
The mode display will change to .
Press ENT .
Upper box displays current program no.
Lower box displays the new program no. input.





4 The program is selected by PROG.
Press ENT and the mode display will change to .

Input set value

Input the new set value of the measurement jig. It is possible to store up up to 10 types of measurement conditions.

⚠ Caution

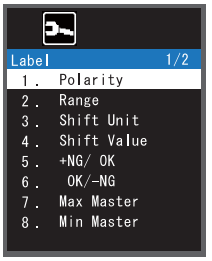
● Changing the measurement range
The user cannot change the measurement range.
In case you need to change the setting, the device has to be pulled out for modification.

● Changing the measure jig JET diameter
In case you need to change the measurement jig JET diameter, the device maybe pulled out for modification.

Important

● The set mode has 2 component displays.
「Set items」 selection display and
「 Set values 」 input display.

● Selection of set items procedure



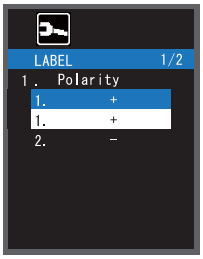
There are multiple pages.

Under set item display

Press PROG to 「Select」

then press ENT to 「Set」

● Set values input procedure



Upper box displays current value.
Lower box displays changed value.
Press SET MAS to move input digit.

Press PROG to change the value.

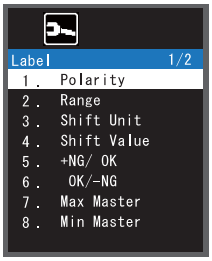
Press ENT to set value.

1 Press SET for more 2 seconds

Display will change to as below

Chinese

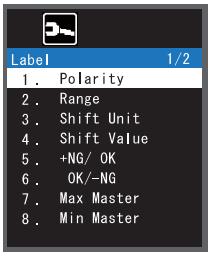
English



2 Setting the polarity.
Select 「 Polarity 」 then SET.
For Inner diameter, 「 1.＋ 」
For outer diameter, 「 2.－ 」

Chinese

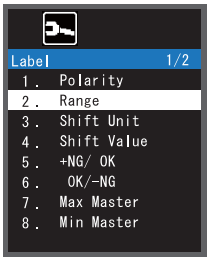
English



3 Setting the measurement range.
Select 「 Range 」 then SET.
Select the measurement range as stated on the nameplate of the measurement jig.

Chinese

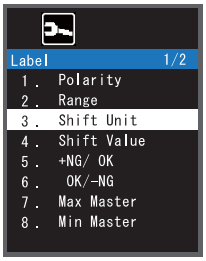
English



4 Setting the measured value display unit.
Select 「 Shift unit 」 then SET.
If in μm, select 「 1. μm 」
If in mm, select 「 2. mm 」

Chinese

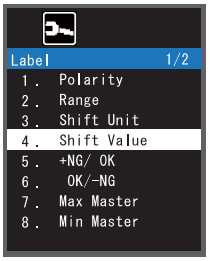
English



5 Setting shift value of measurements.
Select 「 Shift Value 」 then SET.
Input 「Work tolerance target value(median)」.

Chinese

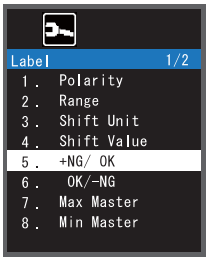
English



6 Setting work upper tolerance limit value.
Select 「 +NG/OK 」 then SET.
Input upper tolerance limit value.

Chinese

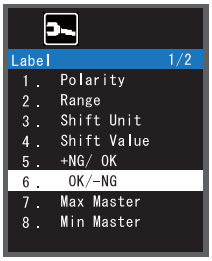
English



7 Setting work lower tolerance limit value.
Select 「 OK/-NG 」 then SET.
Input lower tolerance limit value.

Chinese

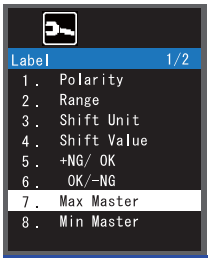
English



8 Setting the max master value.
Select 「 Max Master 」 then SET.
Input the engraved characters value on the max master.

Chinese

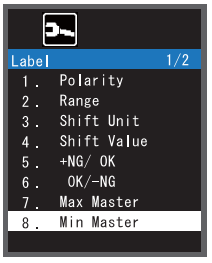
English



9 Setting the min master value.
Select 「 Min Master 」 then SET.
Input the engraved characters value on the min master.

Chinese

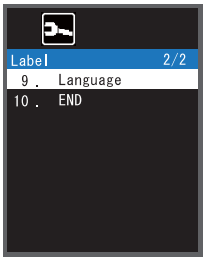
English



10 Setting the language.
Select 「 Language 」 then SET.
Select preferred display language.

Chinese

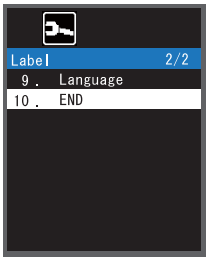
English



11 Setting all the values changed.
Select 「 End 」 then SET.
Select 「Cancel」 if you don't want to save the set values.
Select 「Write」 if you want to save the set values.

Chinese

English



This concludes the program setting.
Proceed to 「8.Adjustment」

8 . Adjustment

Adjust the standard pressure

Adjust CAG measurement standard pressure.

1 Press MAS for more than 2 secs.
The mode display will change to

Chinese

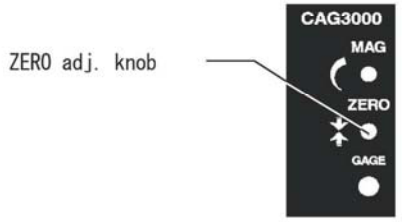
English

2 Press MAS .
「ADJ」 will be displayed.

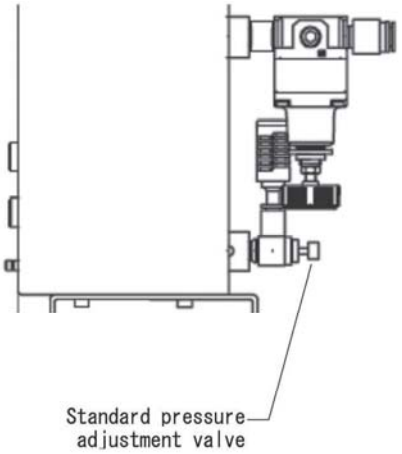
Chinese

English

3 Turn the ZERO adj knob full to the right then turn it to the left 2.5 times.

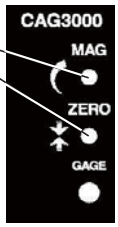


4 When the min master and max master is placed, adjust the standard pressure valve so the position of the BAR LED display is divided in the center.



ZERO・MAG Adjustment

Adjusts the ZERO and MAG position of the measurement jig and CAG.
The magnification is adjusted with 「MAG 」 and zero is adjusted with 「ZERO」 knob.



● Adjustment procedure
For inner diameter measurement, proceed to 5.
For outer diameter measurement, proceed to 8.

Inner diameter measurement

5 Set min master on the measurement jig. Adjust 「ZERO 」 so the indicator is close to the min master value.

6 Set max master on the measurement jig. Adjust 「MAG 」 so the indicator is close to the max master value.

7 Set min master on the measurement jig. When the indicator is close to the min master value, the adjustment is completed. Proceed to 11.

Green bar dot display :
Upper part 「Max master」
Lower part 「Min master」
(set values)

Outer diameter measurement

8 Set max master on the measurement jig. Adjust 「ZERO 」 so the indicator is close to the max master value.

9 Set min master on the measurement jig. Adjust 「MAG 」 so the indicator is close to the min master value.

10 Set max master on the measurement jig. When the indicator is close to the max master value, the adjustment is completed. Proceed to 11.

Calibration

Calibration of the min master
and max master.

⚠ Caution

- Master
  Use only those with no rust or dirt on it.
- Frequency of calibration
  In order to maintain the accuracy, it is highly suggested to do the calibration every 2 hours.

11 After the adjustment is completed, press ENT .

「1. Min Master」 is displayed.

Chinese

English

12 Set 「Min Master」 on measurement jig. After the indicators stabilizes, press ENT .

After 「Min Master」 is performed, 「 2.Max Master 」 is displayed.

Chinese

English

13 Set 「Max Master」 on measurement jig. After the indicators stabilizes, press ENT .

「Max Master」 is performed.

Chinese

English

14 Check the display of 「TFT LCD」.
「MAS OK」 Mastering is successful.
Proceed to measurement.

Chinese

English

「ERR ZERO」
「ERR MAG 」 There is error if any of
「ERR REV 」 these three appears.

After pressing ENT, proceed to 2

9 . RS232C Output

It is possible to output the measured data(value and judgement) to the RS232C.

⚠ Caution

- If mastering is NG, it is not possible to output the measured results.
- Use cable length of up to 15m only.

Connect the RS232C cable

- Connector cable
  The 「RS232C connector」 at the rear side is the connection port.

Signal label	No
	1
RxD	2
TxD	3
	4
GND	5

No	Signal label
6	
7	RTS
8	CTS
9	

- Serial port settings

Setting label	Set value
Bits / second	9600
Data bits	8
Parity	none
Stop bits	1

- Output data composition
  The output data is composed of the 14 characters found below.

  - Measured value 8 chars
  - Space(SP) 1 char
  - Judgement 3 chars
  - Control character(CR) 1 char
  - Control character(LF) 1 char

Measured value	SP	Judgement	CR	LF

Measured results output

1 While the mode display is , input “D” only.

2 The data below is transmitted out.

Ex .
Measured value 「 20.0000」
In case judgement is 「OK」

20.0000								SP	OK			CR	LF
SP	2	0	.	0	0	0	0	SP	SP	0	K	CR	LF

10 . External Switch Input

External switch input

If the device is connected with external push button or foot switch, the following operations are possible.

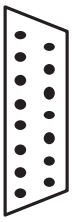
- Output and Hold of measured value.
- Mastering

⚠ Caution

- Use cable length of up to 2m only.
- It is possible to connect no voltage contact point push button/foot switch.

- Input connector
  Connect to D-SUB15P(Male).

Signal label	No
	1
	2
	3
	4
	5
GND	6
MEAS	7
RESET	8



No	Signal labe
9	Max Master
10	Min Master
11	
12	
13	
14	
15	

Meas. Value Hold/Output

The output to RS232C and hold of measured value is done with the use of the external switch.

⚠ Caution

- If the mastering result is NG, the output and hold of measured value is not possible.

1 With the mode display at , turn "ON" the External Switch Input「MEAS」. The icon is displayed to show the measure hold condition. The measured value and judgement result shall be output to the RS232C.

2 Turn "ON" the External Switch Input「RESET」. The icon will disappear to show the measured value hold condition is RESET.

Mastering

Calibration of masters with the use of external switch.

3 Set 「Min Master」 on measurement jig. After the indicators stabilizes, turn "ON" the External Switch Input 「Min Master」. 「Min Master」 is performed.

4 Set 「Max Master」 on measurement jig. After the indicators stabilizes, turn "ON" the External Switch Input 「Max Master」. 「Max Master」 is performed.

5 If this mark disappears, mastering is successful. Proceed to measurement.

If this mark is blinking, mastering is failed. Please deal with the cause of the mastering error.

11 . Appendix

General setting

Page	No	設定項目名 Japanese	Label English	设定项目名称 Chinese	Set Values
1/2	1	極性	Polarity	极性	□ 1 . ＋ □ 2 . －
	2	測定レンジ	Range	选择量程	□ 1 . 20 μm □ 2 . 50 μm □ 3 . 100 μm
	3	シフト単位	Shift Unit	公差中间单位	□ 1 . μm □ 2 . mm
	4	シフト値	Shift Value	公差中间值	
	5	上限判定限界値	+NG/ OK	上限超差值	
	6	下限判定限界値	OK/-NG	下限超差值	
	7	大範マスタ	Max Master	上限标准件值	
	8	小範マスタ	Min Master	下限标准件值	
2/2	9	Language(言語)	Language	Language(语言)	□ 1 . ENGLISH □ 2 . JAPANESE □ 3 . CHINESE
	10	終了	END	结束	

MEMO

MEMO

Warranty

After purchasing, fill in the product model, serial number, date of purchase, and customer information and keep it in a safe place.

① Model number	⑤ Warranty period from purchased date One year
② Serial number	
③ Purchased date (yyyy/mm/dd)	

⑥ Customer	Company name or name of purchaser
	Address
	TEL:
	FAX:

Warranty regulations

During the warranty period, we will repair the product at free of charge only in case of failure that occurs at our responsibility.

Please present or attach this warranty sheet when requesting no charge repair.

- The product warranty area is limited within Japan.
- The warranty covers only the purchased product itself.

The following costs and damages are not covered by the warranty

1) Transportation costs associated with this product
2) Cost of removal, installation and other incidental work when the product is connected to or incorporated in another device.
3) Consequential damage to the user due to a failure of this product, such as loss of usage opportunities and/or downtime of the operation
4) Any other consequential or incidental damage.

There is a charge for repairs caused by the following cases

1))In case of using under undesignated operational conditions such as with the special regulator specifications, the special air supply piping and etc. In case of using under the operational circumstances such as a high temperature/high humidity, near magnetic field, and improper supply air conditions.
2) Failure caused by the equipment systems where the product is built-in.
3) In case of modification or repair by the other company.
4) In case of natural disaster, fire, abnormal voltage, etc.
5) Failure caused by improper handling not following the cautions in the operation manual or failure caused by insufficient maintenance.
6) In case of a consumable part is deteriorated and needs to be replaced.

※ Repair support period for measuring and control devices

The measuring and control devices can be repairable within a period of 3 years from the date of discontinuation.

The major spare parts for repairs are also available in the same period.
Electronic parts may have some difficulties for procurement and production due to its short life cycle.

Please note repair may not be possible even during the period.

※ Repair request

Please contact your local distributor for repair requests.

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