H900 Series

HRAD

User's Manual

11th edition

SURUGA SEIKI ltd,.

Introduction

Thank you for purchasing our company's product.

To use it properly, read this user's manual carefully before using it.

After reading it, keep it in a safe place for future reference.

Notes

- Please note that the content of this document may be changed without notice in future for improving performance and functions.
  The content displayed on the actual screen may be slightly different from displayed content shown in this document.
- The content of this document is created with extra care, however, if you have any inquiries or questions, please contact our company.

History

Edition	Date	Content of revision
First edition	August 2005	Newly created
2nd edition	October 2005	Description of motor mode and external control added
3rd edition	December 2005	Confirmation message before remote status added
4th edition	April 2006	Description of functions such as automatic dimming, screen expansion function, image data output, polygon measurement standard deviation display added Description of sample software corresponding to command added
5th edition	June 2006	Size of sensor head fixation bolt corrected
6th edition	August 2006	Dimensions in drawing corrected Measurement data clear function added
7th edition	September 2007	External synchronous function in polygon mode added
8th edition	May 2008	Address of Tokyo business office changed
9th edition	April 2010	Address of Tokyo business office changed
10 th edition	March 2011	LD power automatic adjustment convergence condition changed Addresses of head quarters and business office deleted
11 th edition	August 2012	Description of mirror display method selection function added Description of I/O mode selection function added

Accessories

Before using the product, check the following accessories are included with it.

- HSP-100S (or SH): controller..... 1 unit
- I/O connector XW4B-10B1-H1 (made by Omron) ..... 1 piece
- AC power cord for HSP-100S ..... 1 piece
- Sensor head cable (2m)..... 1 piece
- Sensor head (one of followings)..... 1 unit
  H900-P017, H900-P017C, H900-P050C, H900-P090C
- User's Manual (this document) ..... 1 copy
- Target for adjusting light axis..... 1 piece
- C mount rotation ring (only H900-P017C)..... 1 piece

(IMPORTANT)

The included AC power cord is a power cord dedicated to this controller.
Do not use it for other product.

To use the product safely

Before using the product, be sure to read the following precautions. mark means the prohibition.

CAUTION

Be sure to observe precautions shown here. If you do not observe these precautions, you may get injured or physical damage may be caused.

- Precautions on safety and use

- Installation and operation of this product should be carried out by a person who has knowledge on safety of laser equipment.
- If the noise environment is severe, use a table tap with noise filter.
- Be sure to ground the controller. Otherwise, you may get electric shock.
- During the measurement, do not turn OFF the power supply. Otherwise, a part of or all measurement data or setting data may be lost.

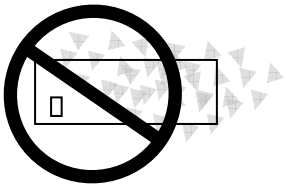
- Wiring

- When you connect and disconnect a cable, turn OFF the power supply of main unit and that of devices to be connected. Otherwise, the main unit may be damaged.
- When you connect a control cable of an external device, check the polarity of the device. If you mistake it, the device may be damaged.
- The calibration is carried out in combination with sensor head and controller when the product is shipped from factory.
  Do not change the combination of head and controller.

- Use environment

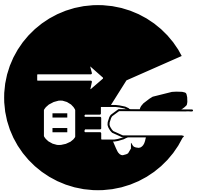
Do not use the product at following places.

- Place with much dust or powder dust
- Place where the temperature changes widely
- Place where there is vibration
- Unstable place where there is slope
- Place exposed to corrosive gas or combustible gas



CAUTION

- Management and storage



If you want to move this product because it is not used for a long time, pull out the power plug from the outlet.

An unexpected accident such as fire and electric shock is prevented.

- Power supply

The power supply can be connected to only AC100-240V power supply outlet.

- Disassembly and modification

Do not carry out disassembly, modification, or improper repair of measurement head or controller chassis.

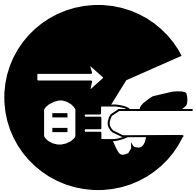
If there is a defect, please contact the sales group, OST business division of or company.

- Request the repair

In the following cases, stop using the product immediately and request the repair to the sales group, OST business division of or company.

If you keep using it without any change, fire, electric shock, or personal injury may be caused.

- There is abnormal sound, abnormal odor, or smoking
- The power cord is damaged
- If water is poured on this product or abnormal object enters the product
- This product is fallen or the cabinet is damaged



For the contact information, refer to page 79.

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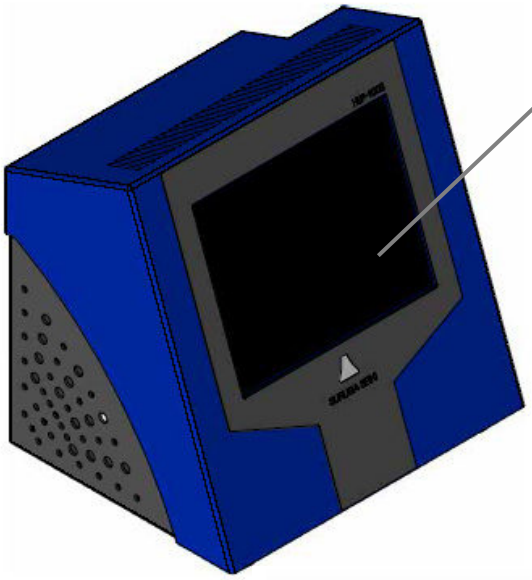
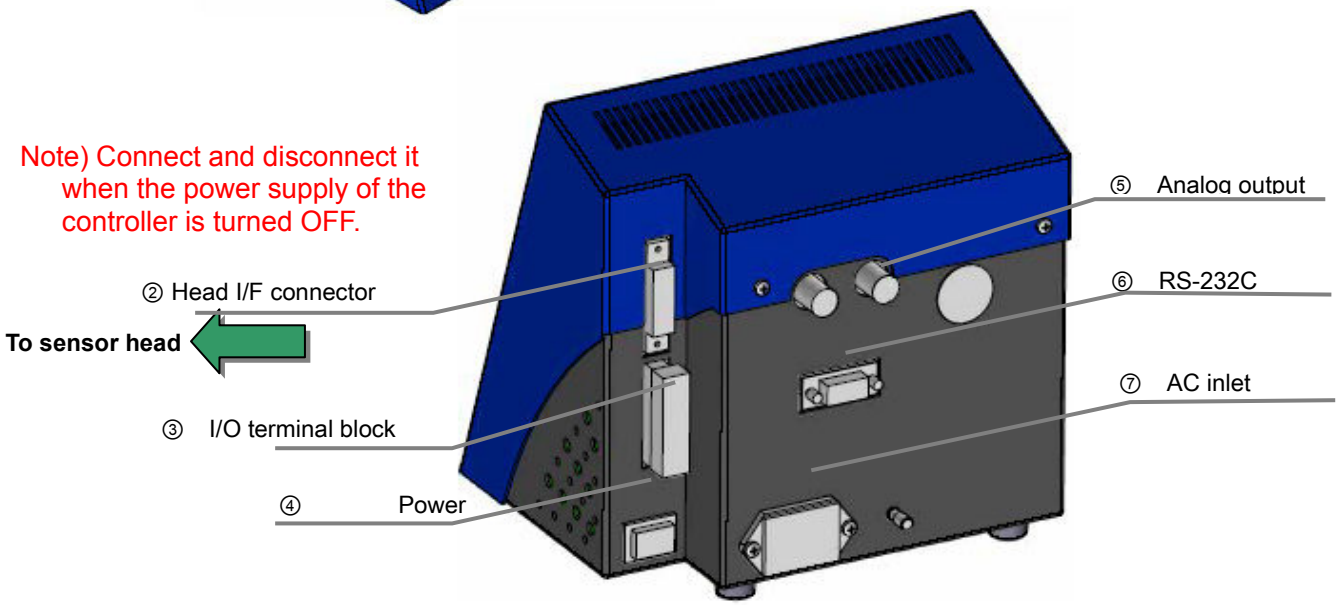
1. Name and function of each part

1-1 Controller (HSP-100S(SH))



Note) When the product is shipped from factory, the calibration is carried out in combination of head and controller.
If the combination of head and controller is changed, the measurement error is generated.

Note) Connect and disconnect it when the power supply of the controller is turned OFF.

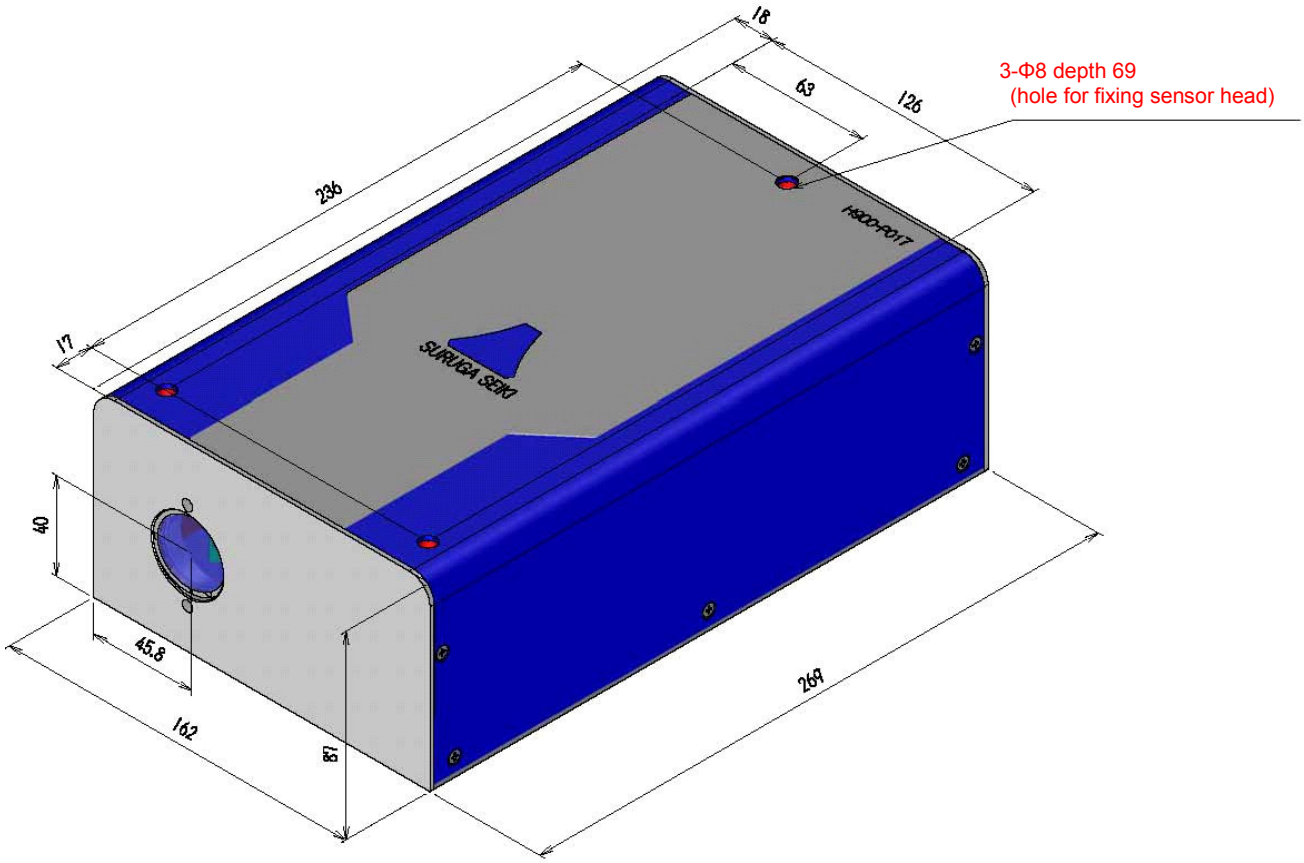


No.	Name	Description
①	Display / touch panel	Touch panel for setting
②	Head I/F connector	Connected to sensor head with a dedicated cable
③	I/O terminal block	General-purpose I/O and external synchronous input terminal Applicable connector: XW4B-10B1-H1 (made by Omron)
④	Power switch	ON/OFF switch of AC power supply
⑤	Analog output (BNC connector)	Connect an oscilloscope etc. (300Ω)
⑥	RS-232C	Dsub 9-pin connector
⑦	AC inlet (3P)	AC100-240V(50/60Hz)

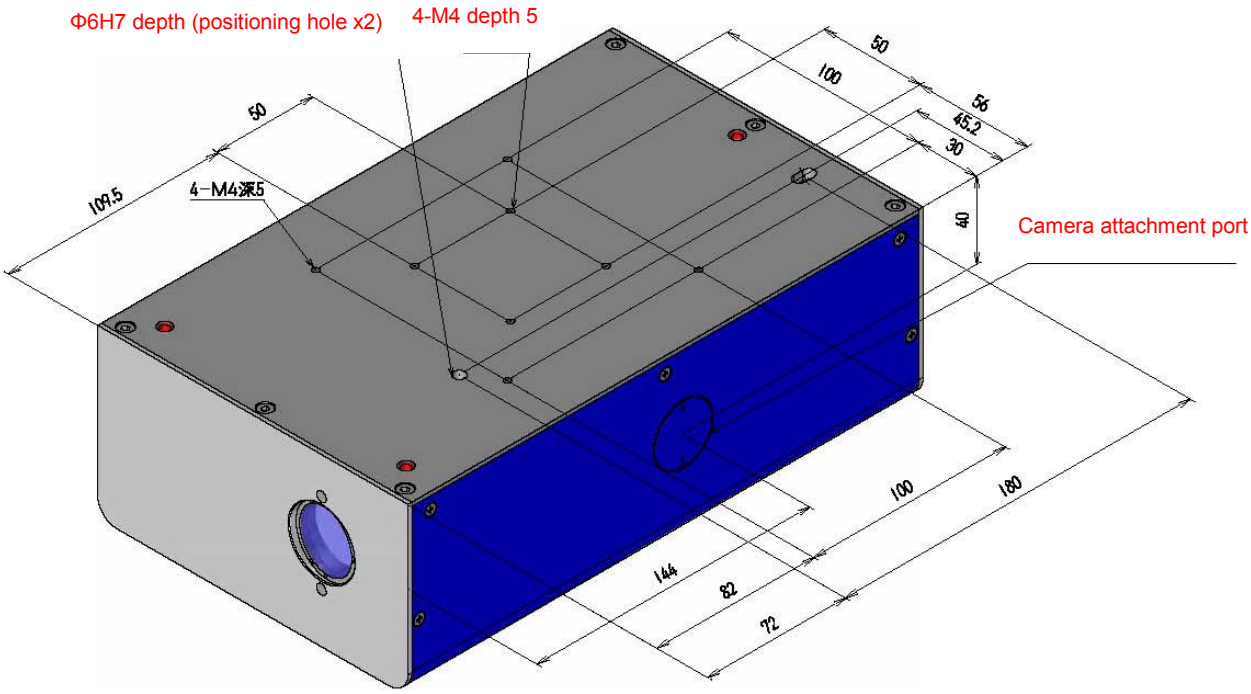
1-2 Sensor head

① **H900-P017C**

Angle range	: ±0.17deg
Light source (wavelength)	: red semiconductor laser(658nm)
Maximum laser output	: 5.0mw or less (Typ2.5mW class 3R)
Outgoing beam diameter	: Φ1.0mm or less (beam window $1/e^2$)
External dimensions	: 162x269x87mm (only main unit)
Weight	: 4.1 Kg
Recommended use environment	: 20±3°C (calibration temperature: 20±1°C)
Storage environment	: 10 to 40°C (no dew condensation)
Accuracy assurance WD	: 230±30mm
Remark	: CCD camera attached to external



* For the bolt used for the sensor head fixation hole, use the bolt whose length is longer than that of hexagon socket bolt M4x25 (3 pieces).


Φ6H7 depth (positioning hole x2)
4-M4 depth 5
50
100
56
45.2
30
40
50
109.5
4-M4深5
Camera attachment port
100
180
144
82
72

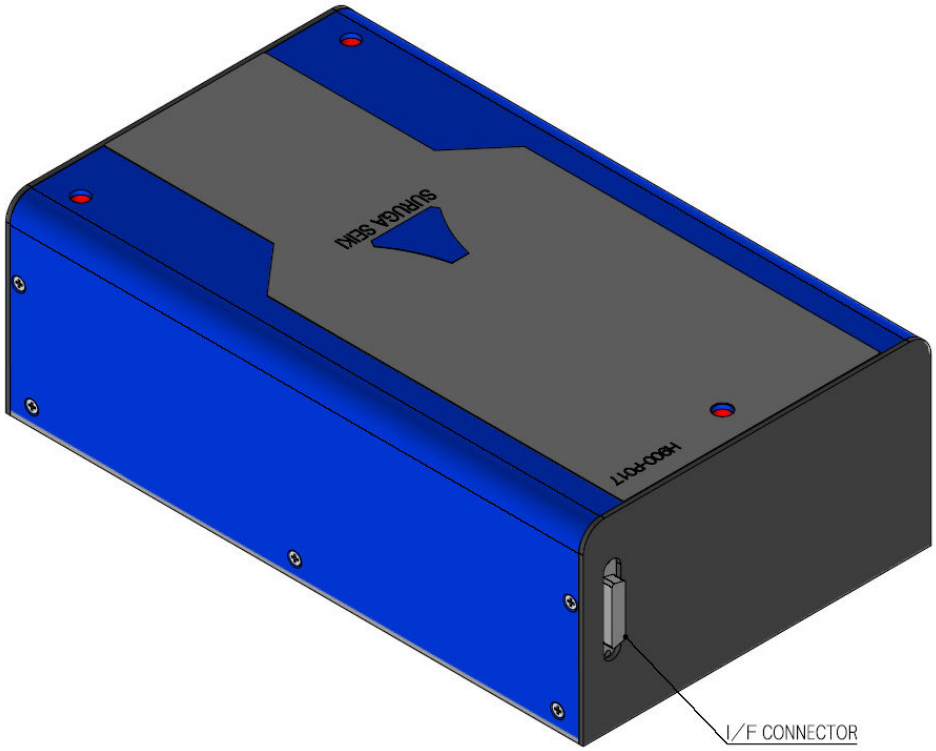


Figure 3. I/F part of head

- Controller I/F connector (CONTROLLER)

  Connect the sensor head cable.

Note) Be sure to turn OFF the power supply of the controller before connecting or disconnecting the cable.

When the product is shipped from factory, the calibration is carried out in the combination of head nad controller. If the combination of head and controller is changed, measurement error is generated.

② H900-P017

Angle range	: ±0. 17deg
Light source (wavelength)	: red semiconductor laser (658nm)
Maximum laser output	: 5.0mw or less (Typ2.5mW class 3R)
Outgoing beam diameter	: Φ1.0mm or less (beam window $1/e^2$)
External dimensions	: 162x269x87mm (only main unit)
Weight	: 4.1 Kg
Recommended use environment	: 20±3°C (calibration temperature: 20±1°C)
Storage environment	: 10 to 40°C (no dew condensation)
Accuracy assurance WD	: 230±30mm

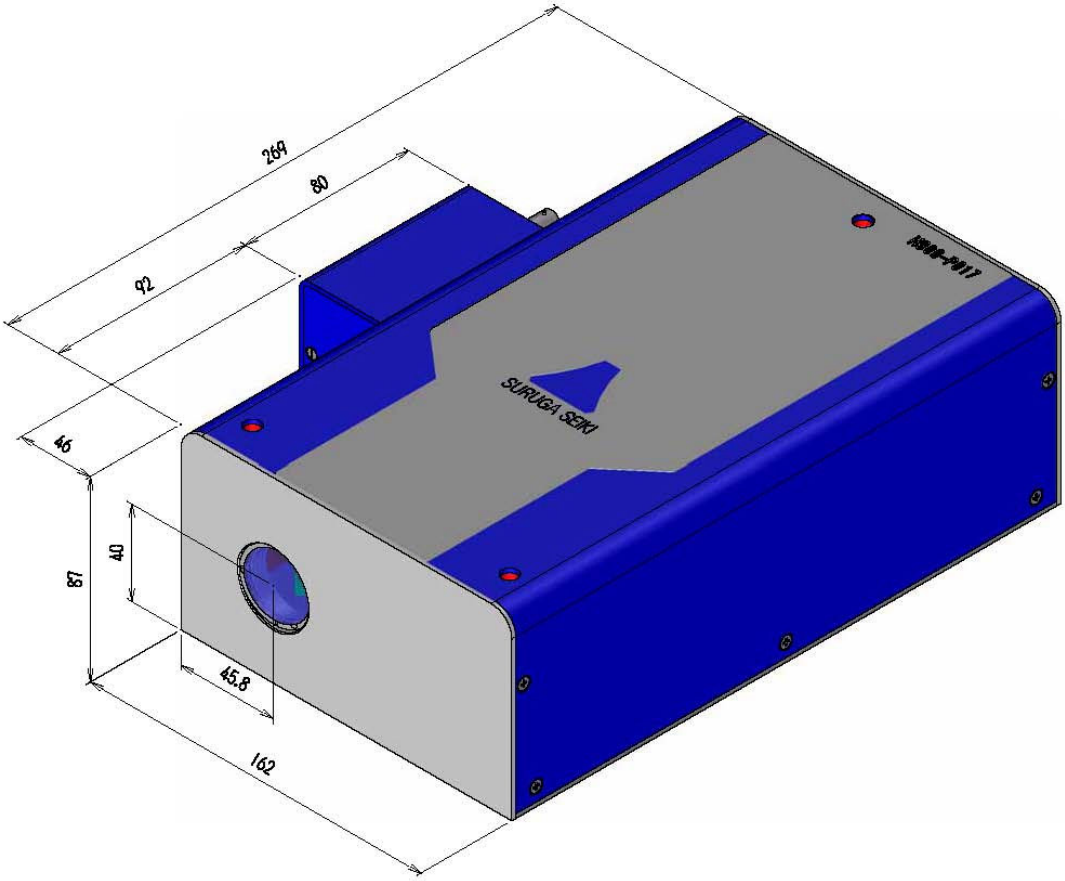


Figure 4. External view

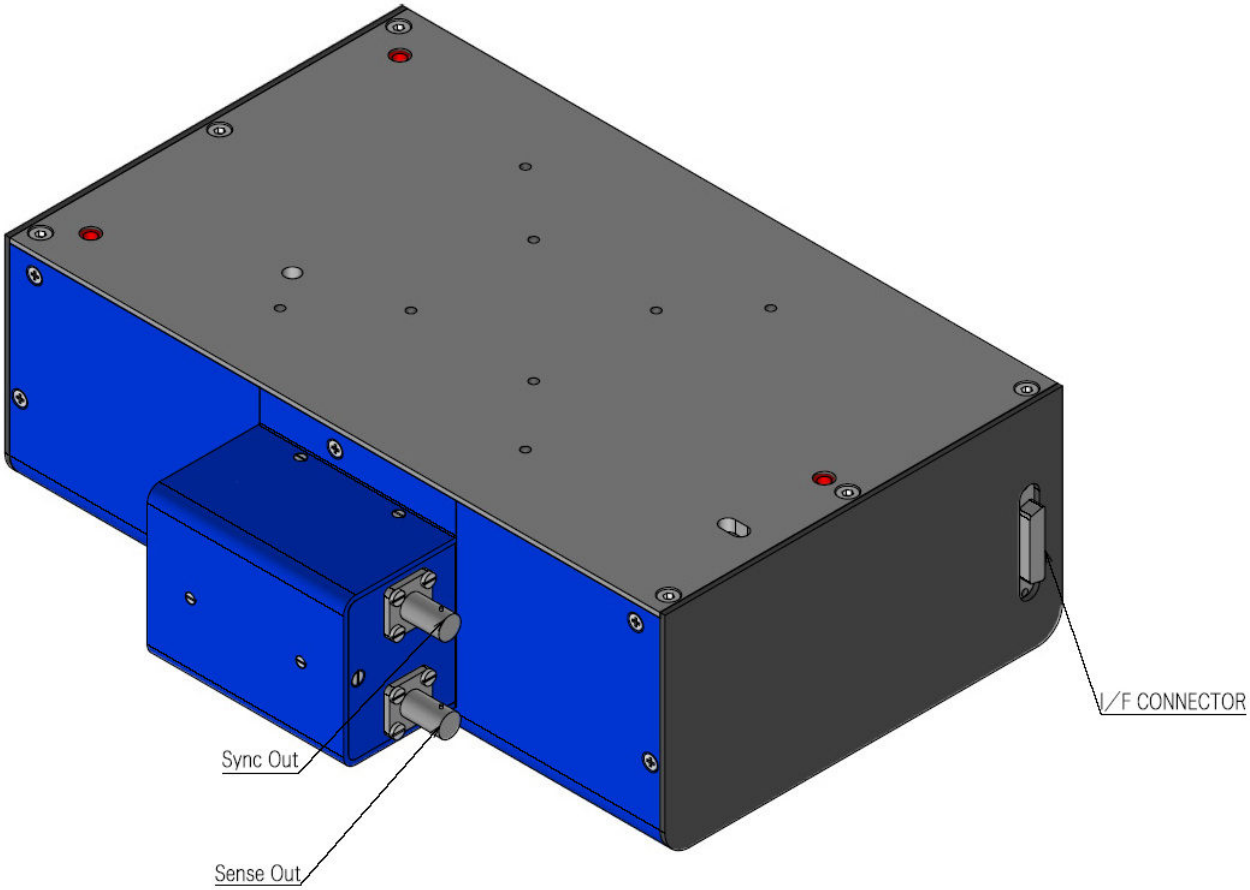


Figure 5. Attachment dimension diagram

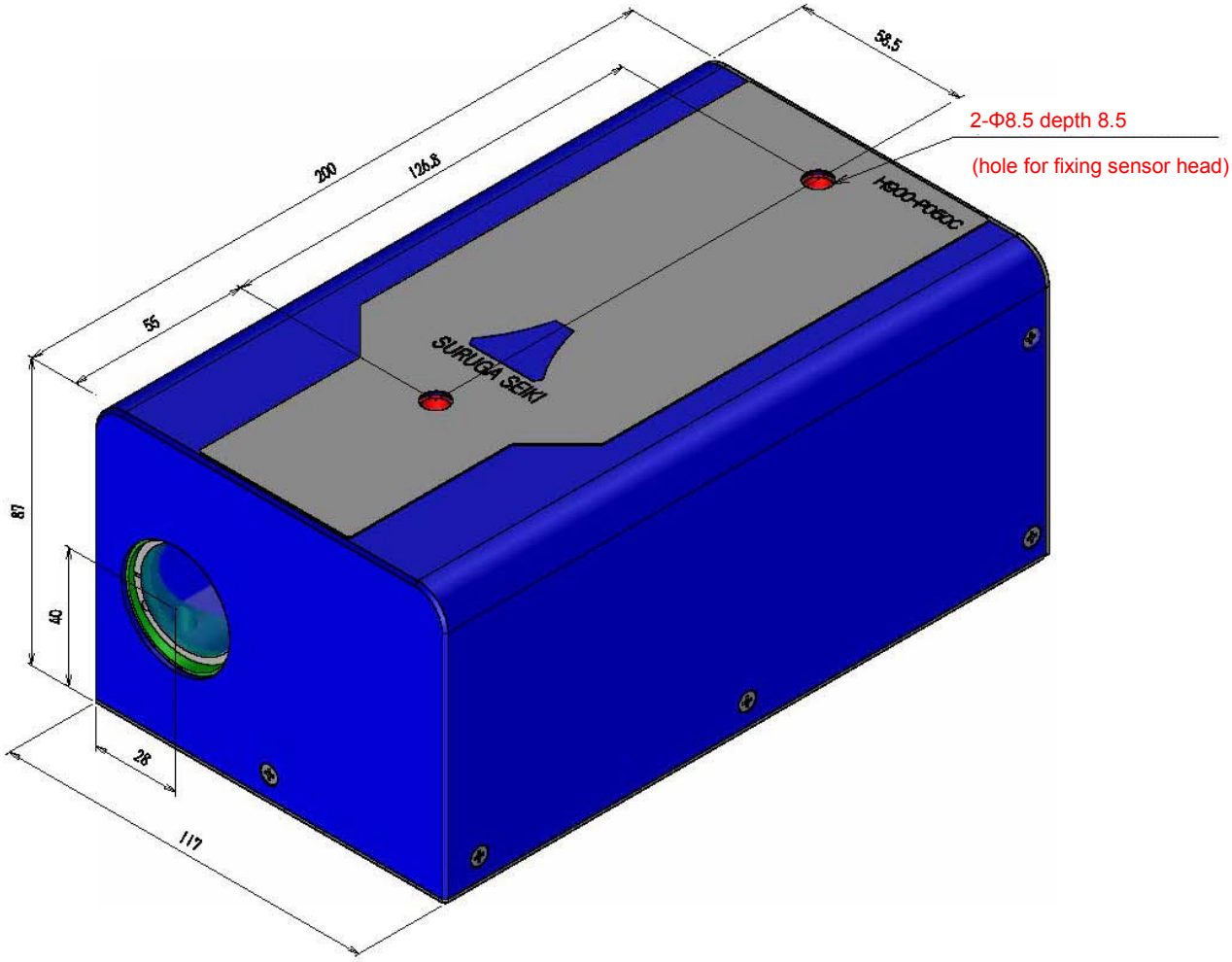
*** The position and dimensions of sensor head attachment hole and positioning hole are common to those of H900-P017C.**

- Controller I/F connector (CONTROLLER)
  Connect the sensor head cable.
- Sense Out
  The received light amount monitor output signal is output.
- Sync Out (PD)
  The polygon mirror surface detection signal is output.

Note: The output impedance of each output terminal is 50Ω. At the connection to a device such as an oscilloscope, set the input to high impedance.

③ H900-P050C, H900-P090C

Angle range	: ±0. 5deg (050C), ±0. 9deg (090C)
Light source (wavelength)	: red semiconductor laser (658nm)
Maximum laser output	: 5.0mw or less (Typ2.5mW class 3R)
Outgoing beam diameter	: Φ1.0mm or less (beam window $1/e^2$)
External dimensions	: 116.8x200.3x88.3mm (only main unit)
Weight	: 1.8 Kg
Recommended use environment	: 20±3°C (calibration temperature: 20±1°C)
Storage environment	: 10 to 40°C (no dew condensation)
Accuracy assurance WD	: 150±30mm
Power supply	: externally supplied by controller
Remark	: equipped with a built-in CCD camera



* For the bolt used for sensor head fixation hole, use the bolt whose length is longer than that of hexagon socket bolt M4x25 (2 pieces).

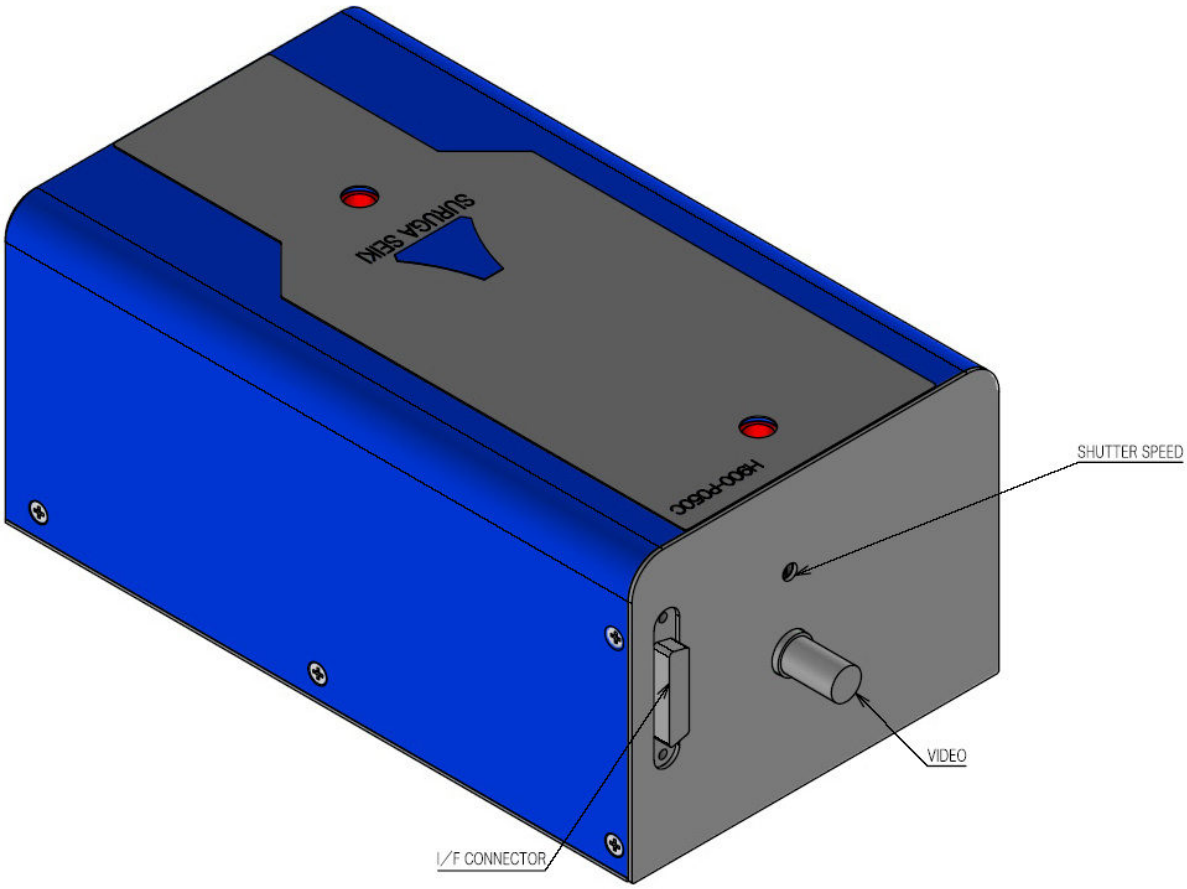


Figure 7. I/F part of head

- Controller I/F connector (CONTROLLER)

  Connect the sensor head cable.

- VIDEO

  The video signal of CCD camera is output (BNC connector).

Note) Be sure to turn OFF the power supply of the controller before connecting or disconnecting the cable.

When the product is shipped from factory, the calibration is carried out in the combination of head nad controller. If the combination of head and controller is changed, measurement error is generated.

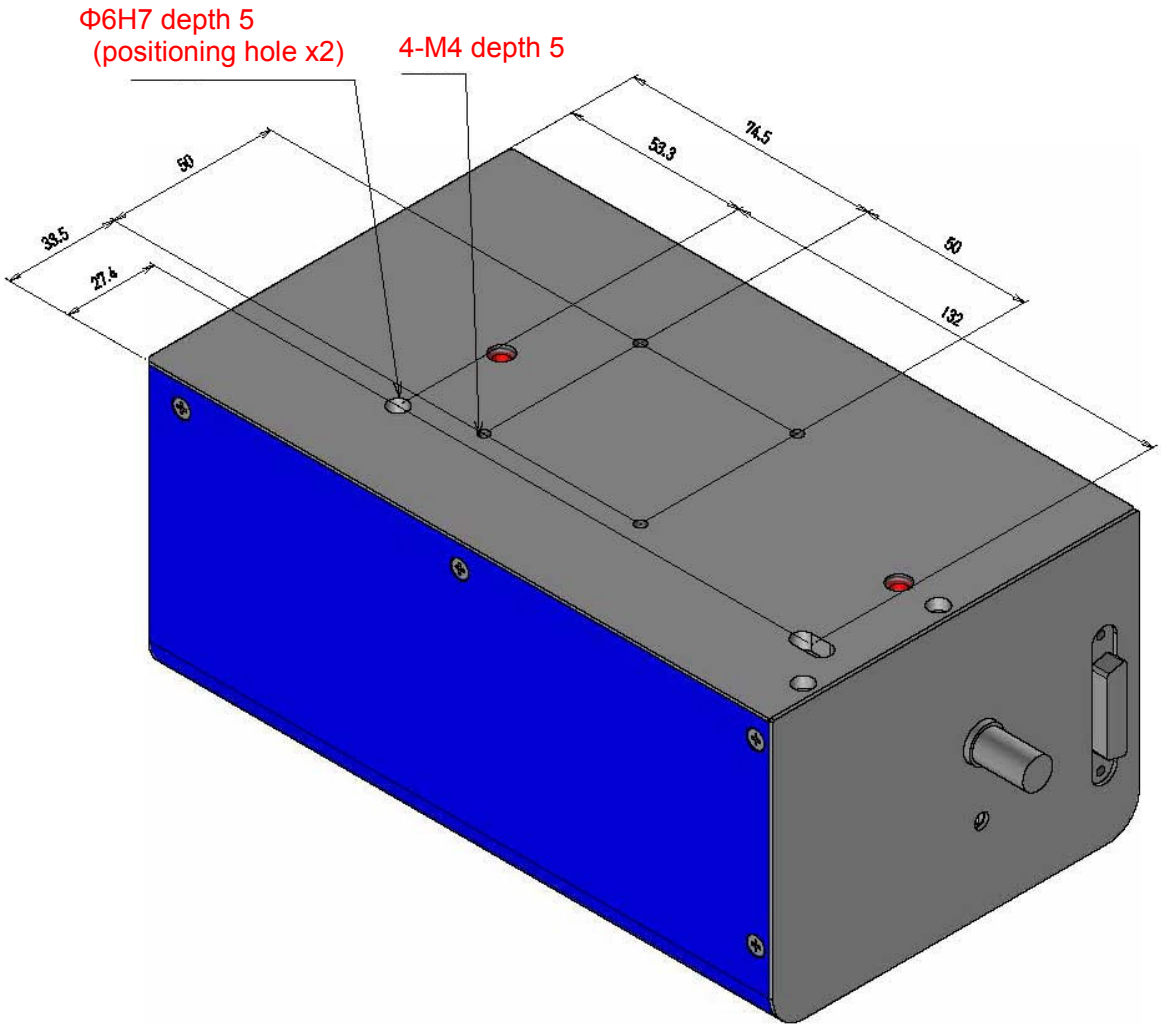
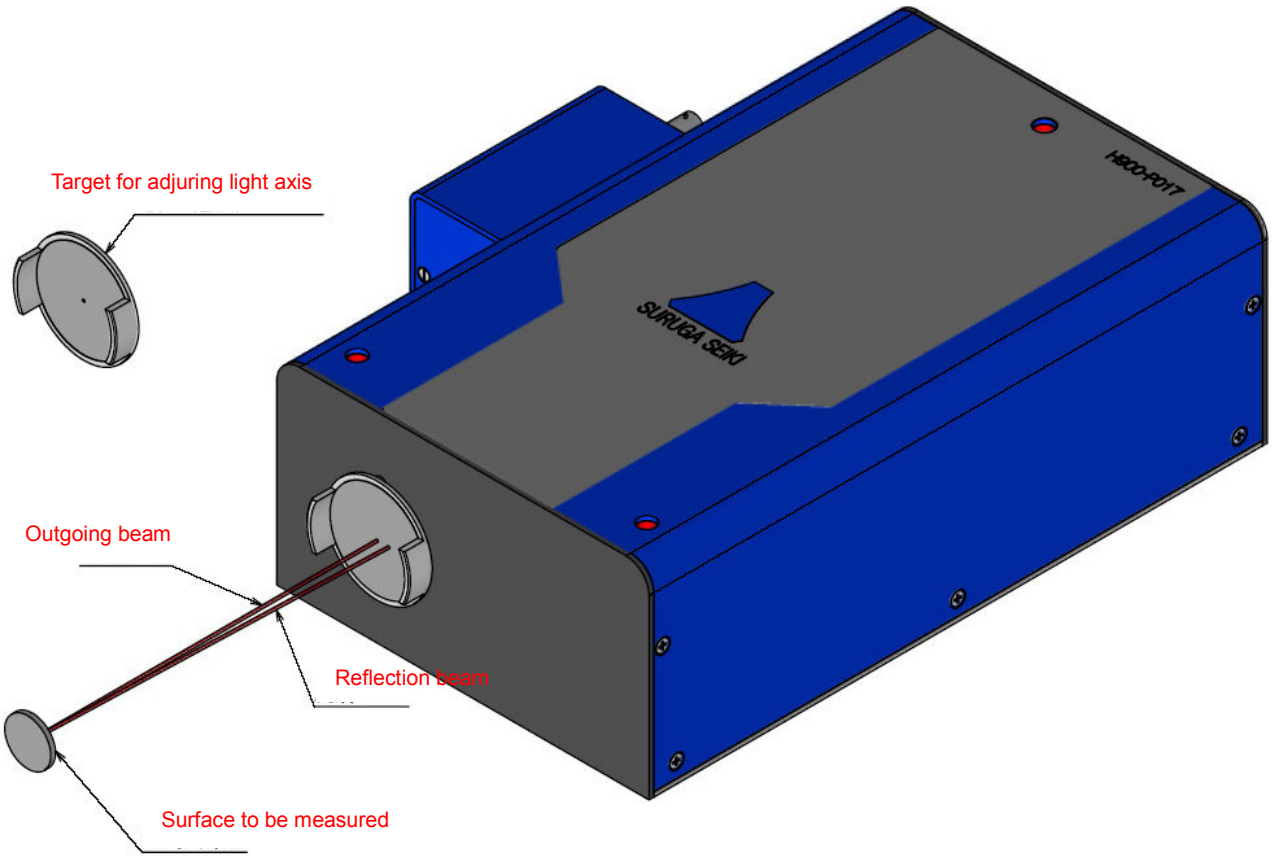


Figure 8. Attachment dimension diagram

How to use the target for adjusting the light axis



Using the included target for adjusting the light axis simplifies the light axis adjustment at installation.

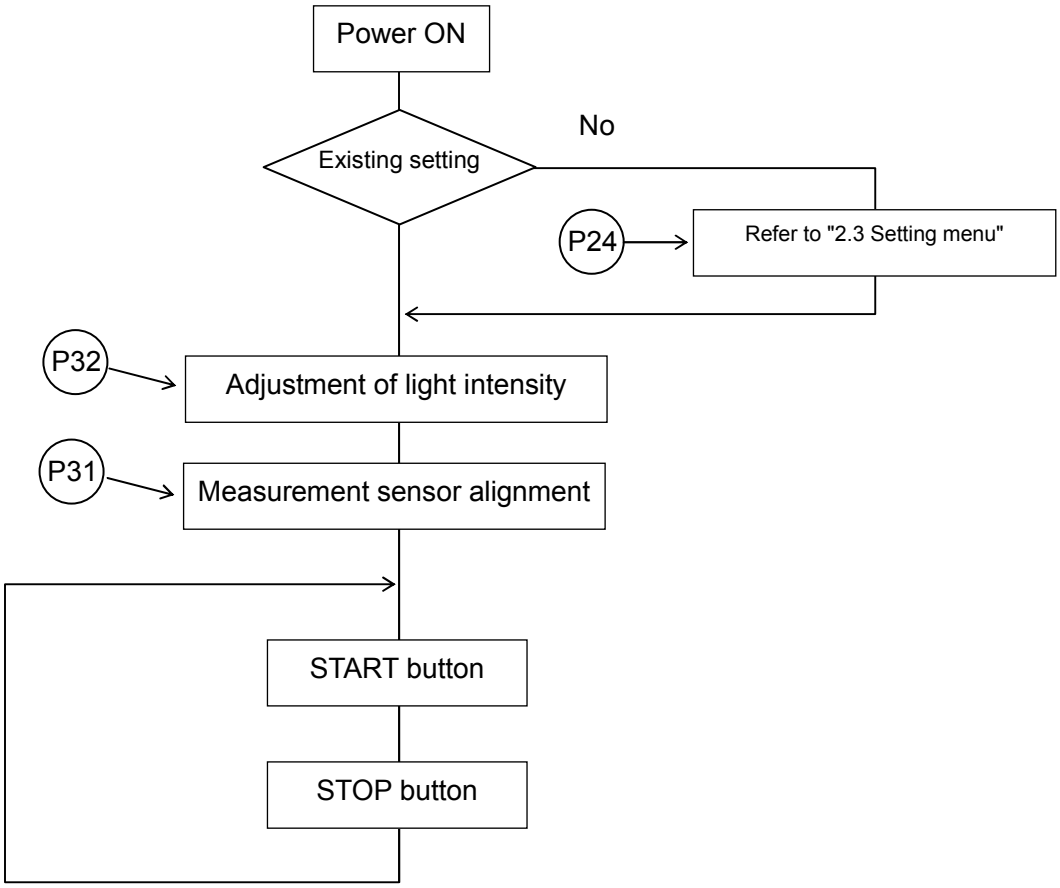
Procedure of adjustment

1. Attach the target for adjusting the light axis to the sensor head so that the outgoing beam passes through the central opening part (Φ1mm) of the target for adjusting the light axis.
2. Adjust the tilt of sensor head so that the reflection beam passes through the central opening part of the target for adjusting the light axis.
3. Carry out the following fine adjustment while checking the monitor screen of the controller.

2. Measurement method

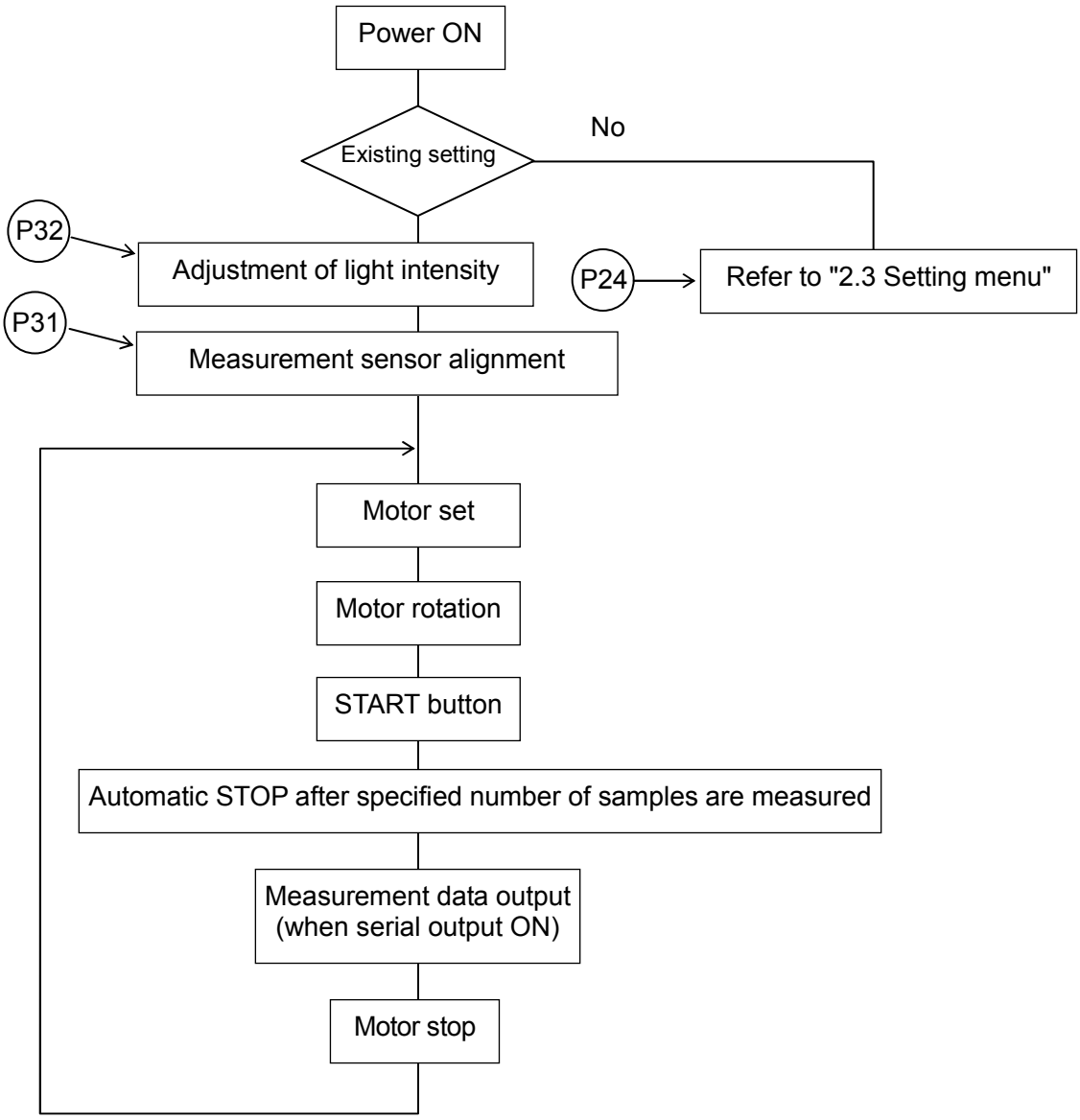
2-1 Setting and measurement flow

1) In standard measurement mode



* The external control by I/O interface or communication command can be carried out.
(Refer to page 60).

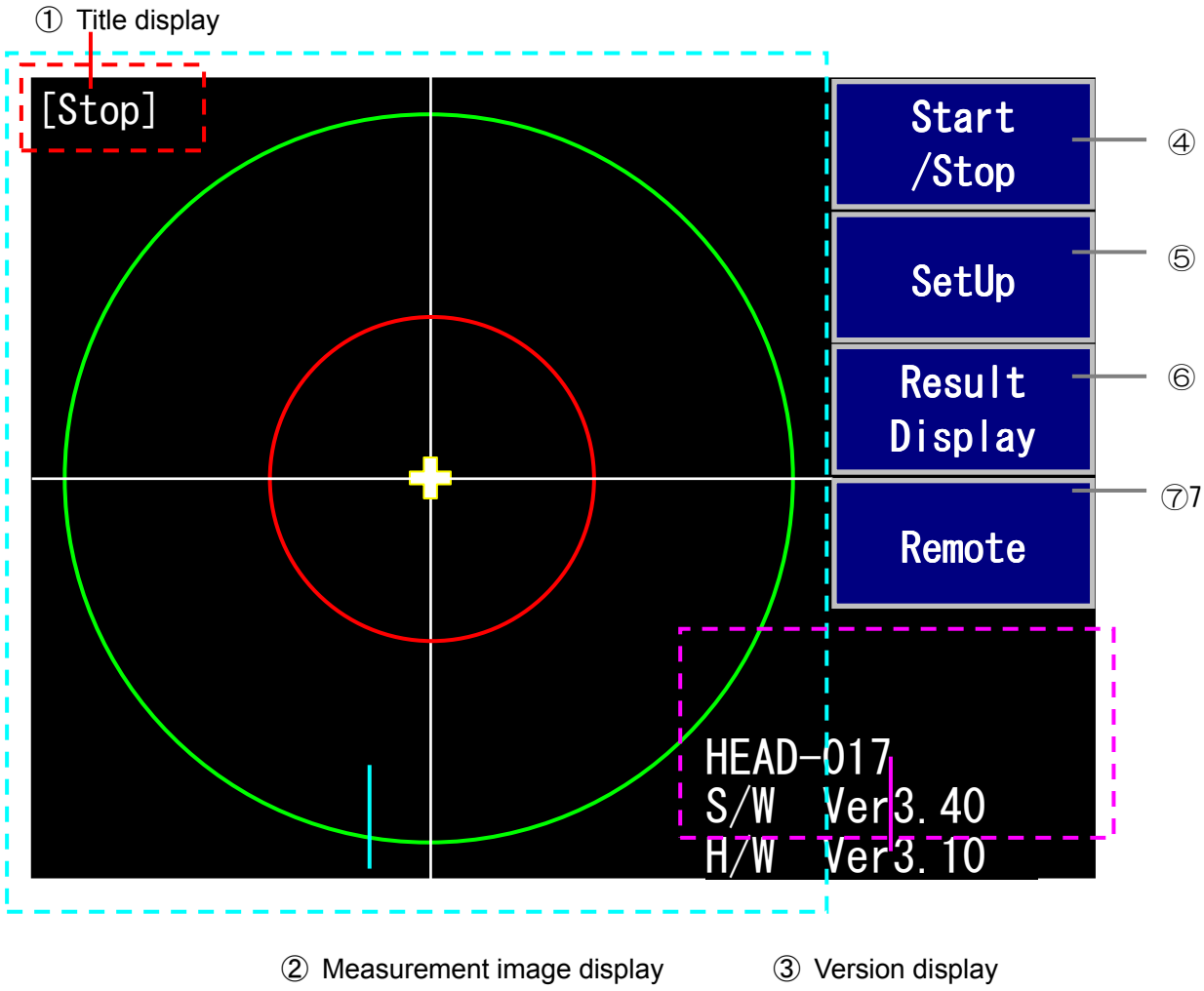
2) In motor, polygon mirror measurement mode



* The external control by I/O interface or communication command can be carried out.
(Refer to page 59)

2-2 Basic operation

2-2-1 Initial screen (after power supply is turned ON)



①: The content displayed on the screen is indicated.

②: The measurement image is displayed.

③: The software (S/W) version and the hardware (H/W) version of main unit are displayed.

④: Measurement start / stop button (refer to page 20)

⑤: Measurement condition set button (refer to page 27)

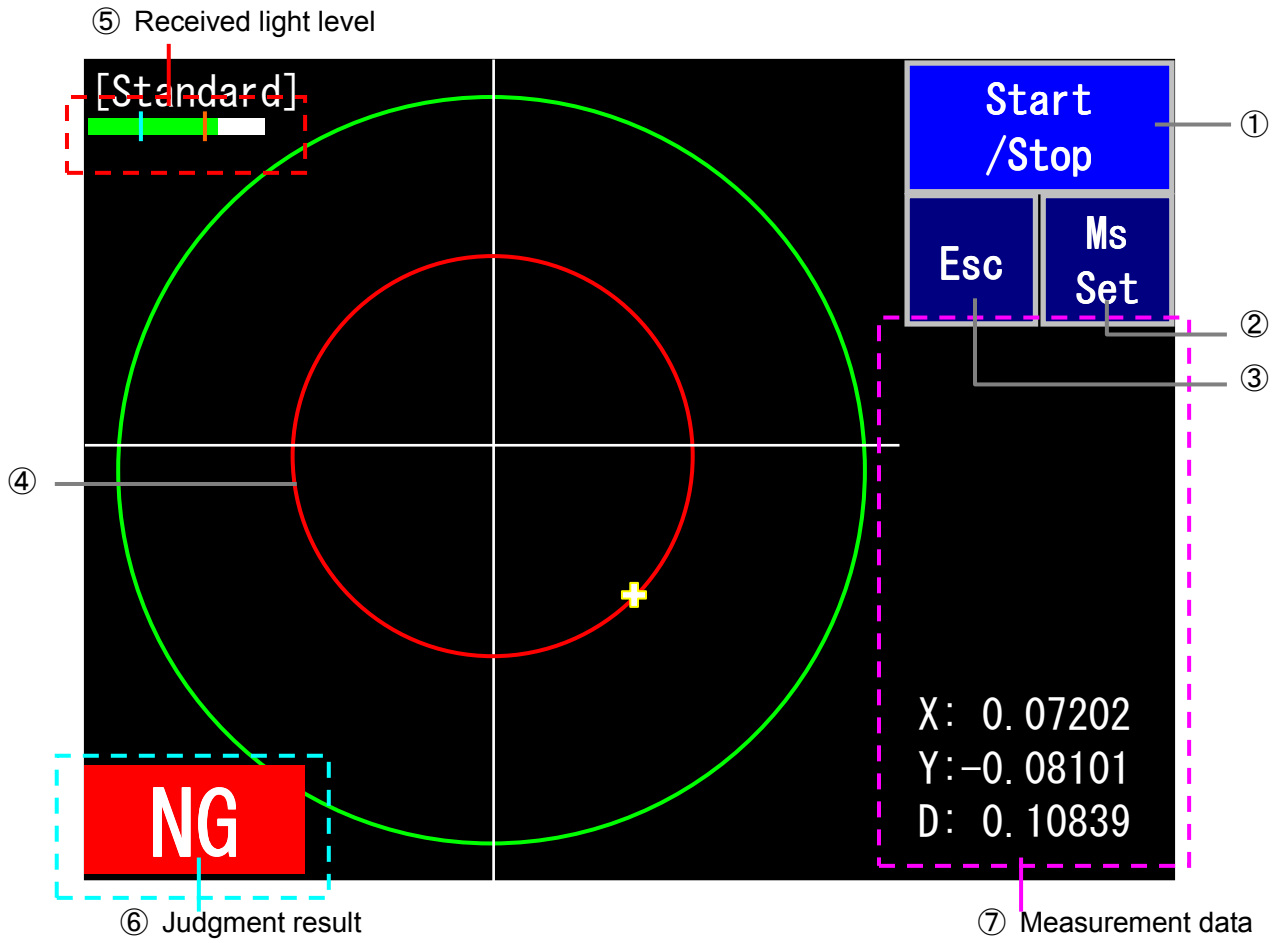
⑥: Measurement result display button (refer to page 54)

⑦: Remote mode switching button (refer to page 58)

2-2-2 Measurement screen

If Start/Stop button is pressed, the measurement is started. If the button is pressed again, the measurement is stopped.

1) Standard measurement mode



①: Start/Stop button

Measurement is started / stopped.

②: SetUp button

The screen is switched to parameter setup screen directly. If it is pressed during measurement, the measurement is stopped.

③: Esc button

The screen is switched to main screen.

④: OK/NG judgment range (circle or rectangle) ..... Refer to page 36

⑤: Light receiving level during measurement (bar graph)

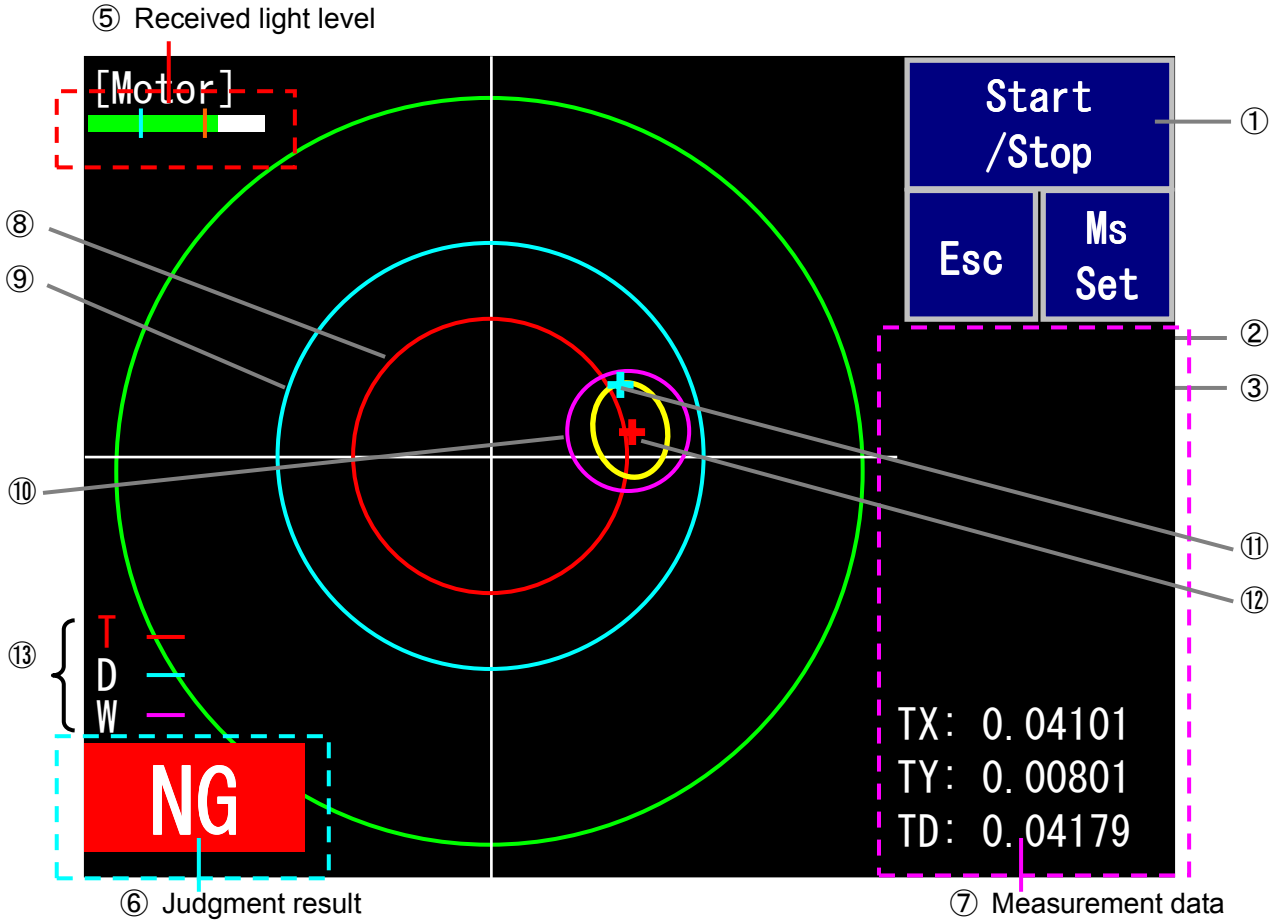
Green: Amount of received light is within proper range

Red: Amount of received light is low or excessive

⑥: Judgment result (OK or NG) ..... Refer to page 36

⑦: Measurement value or measurement result (up to 10 items selected for display menu are displayed)

2) Motor measurement mode



① to ③, ⑤, and ⑥ shown below are same as those of 1) described above.

①: Start/Stop button

②: SetUp button

③: Esc button

⑤: Light receiving level during measurement (bar graph)

⑥: Judgment result (OK or NG)

(Judgment results of ⑧, ⑨, and ⑩ are OR-judged and displayed)

⑦: Measurement value or measurement result (up to 10 items selected for display menu are displayed)

* For the initial setting, axis fallen (TX, TY, TD) is displayed.

⑧: Judgment circle for axis fallen (gravity center) .....Red

⑨: Judgment circle for outermost point (pale blue)

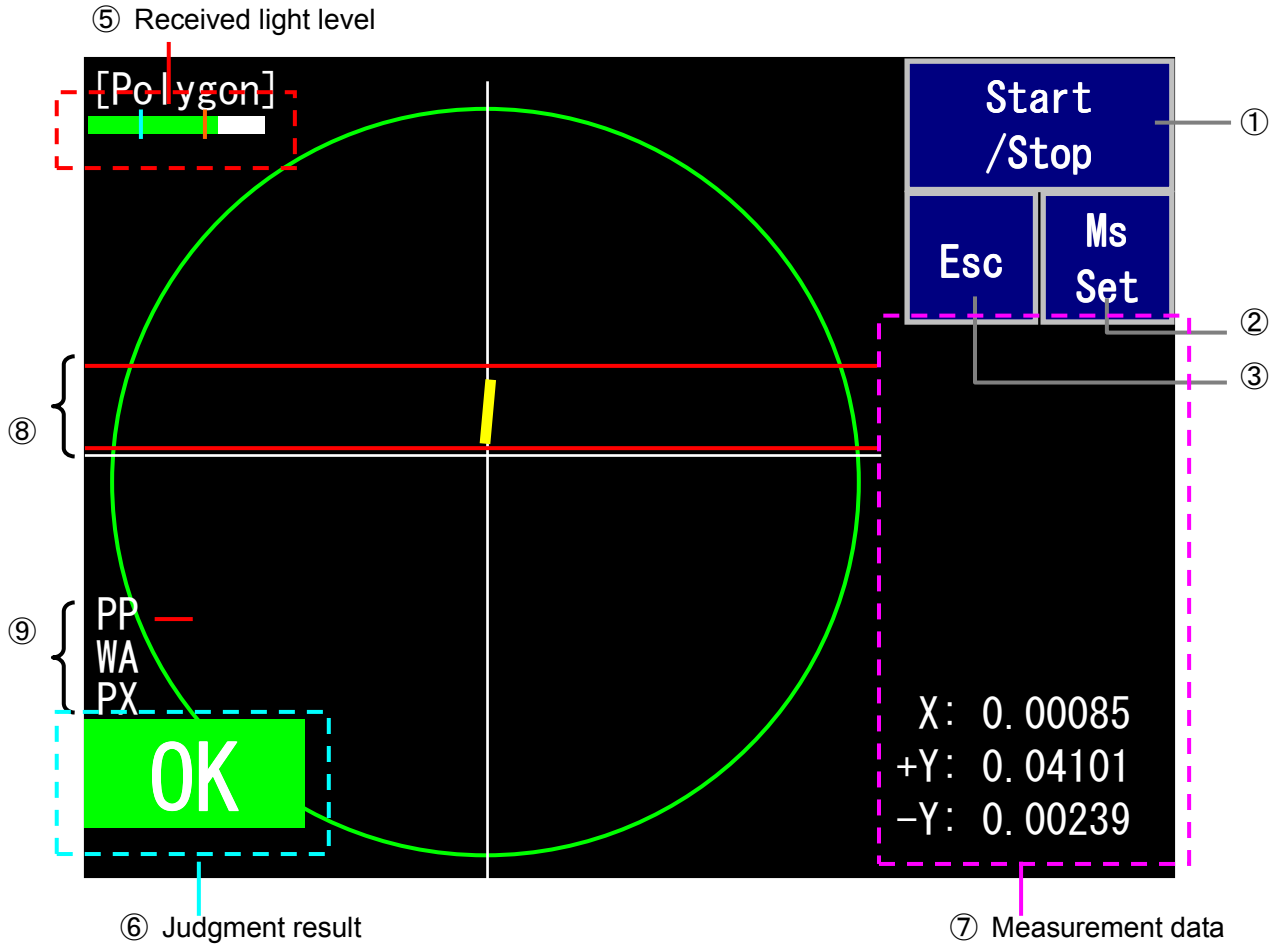
⑩: Judgment circle for amplitude (center of circle is gravity center) .....Red purple

⑪: Outermost point.....Pale blue

⑫: Axis fallen (gravity center).....Red

⑬: The NG item for the judgment of T = axis fallen , D = outermost point, and W = amplitude is displayed in red.

3) Polygon mirror measurement mode



① to ③, ⑤, and ⑥shown below are same as those of 1) described above.

①: Start/Stop button

②: SetUp button

③: Esc button

⑤: Light receiving level during (bar graph)

⑥: Judgment result (OK or NG)

(Judgment results of ⑧, ⑨, and ⑩ are OR-judged and displayed)

⑦: Measurement value or measurement result (up to 10 items selected for display menu are displayed)

* For the initial setting, X (present value X), +Y (maximum Y value), and -Y (minimum Y value) are displayed.

⑧: Judgment range of P-P

Indicated with upper and lower red lines around (maximum value + minimum value)/2 based on the measurement result.

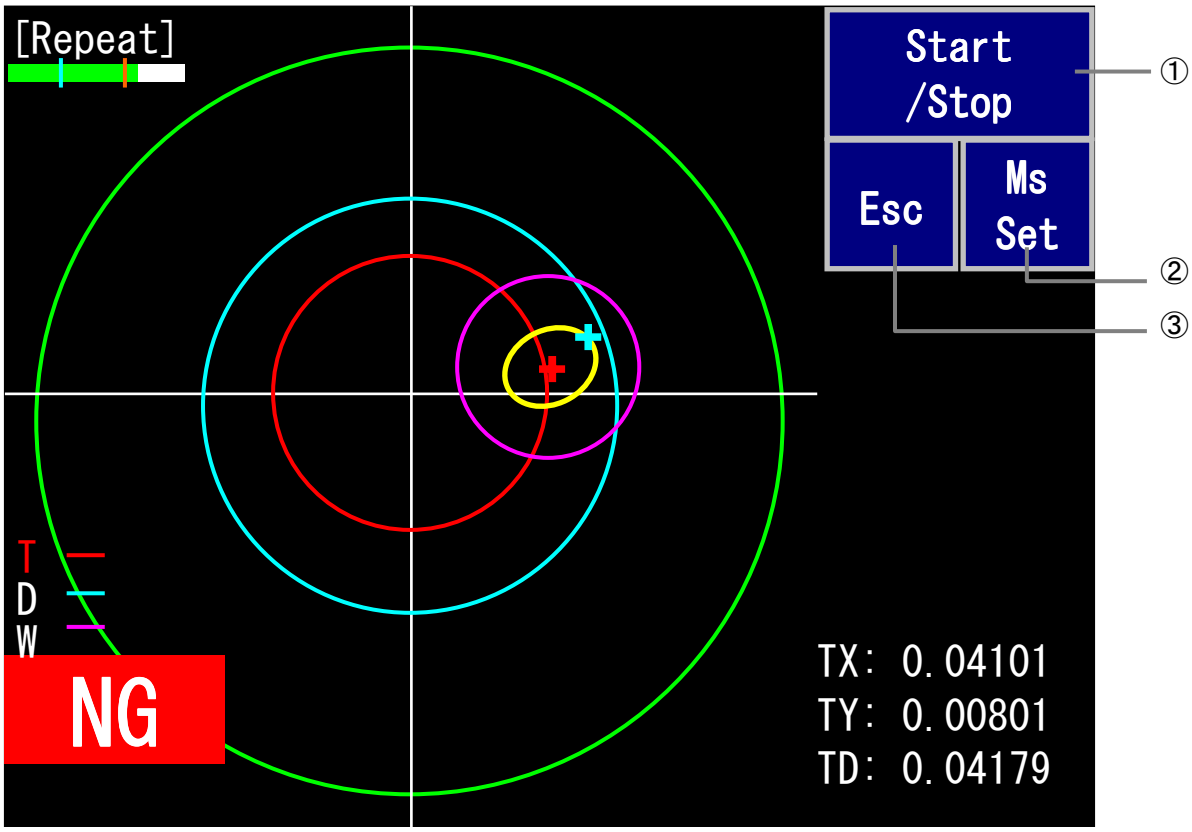
⑨: The NG item for the judgment of PP=P-P, WA= width of average face value and PX= maximum value of proximal angle difference is displayed in red.

4) Repeated measurement screen (e.g.: motor measurement)

This is the operation mode that automatically repeats the measurement.

After 4096 sample data is obtained after the measurement is started, the operation to stop the measurement and display the result is repeated.

the period after measurement stop to next measurement start is 200msec.

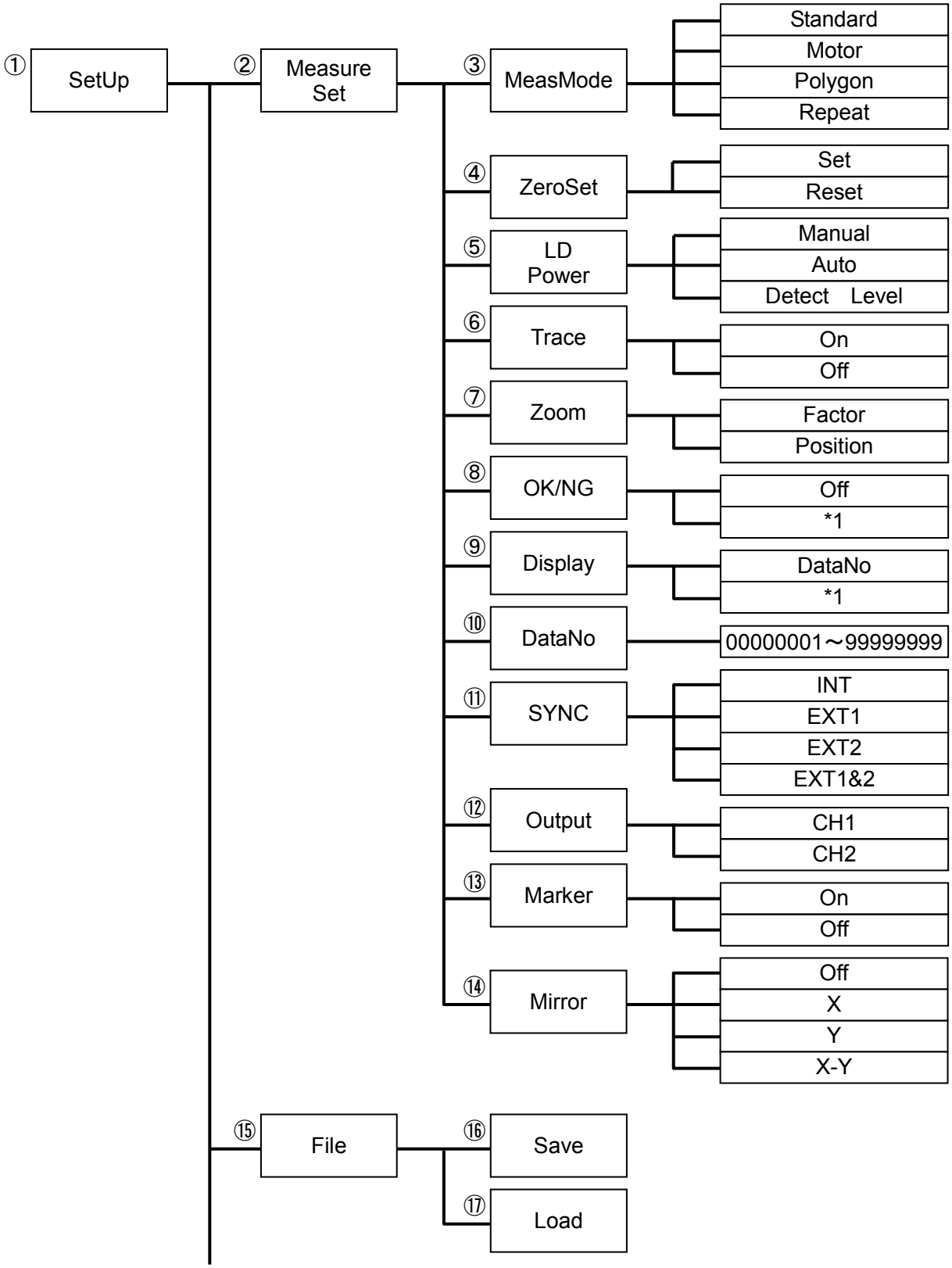


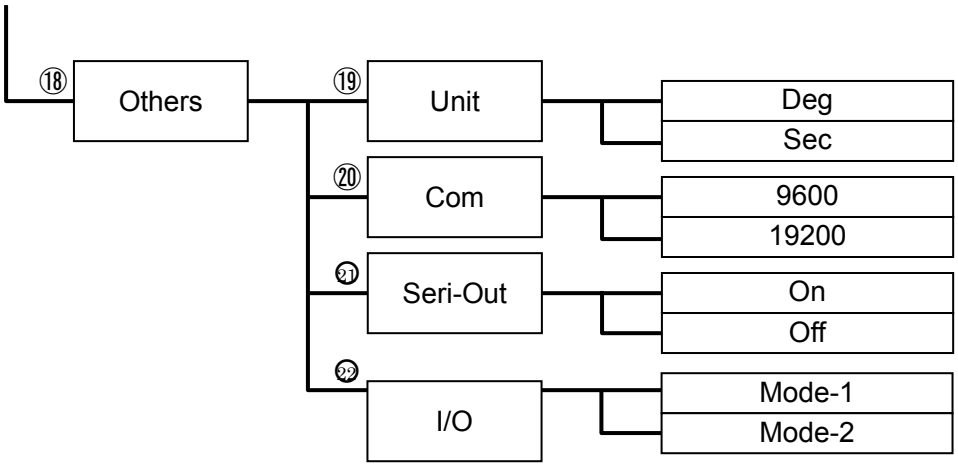
* If the measurement is stopped during measurement by Stop button, Stop I/O or Stop command, the measurement is stopped after 4096 sample data are obtained.

2-3 Setting menu

2-3-1 Menu configuration

The configuration of setting menu is shown in the figure below.





*1 The content in low order varies depending on the operation mode.

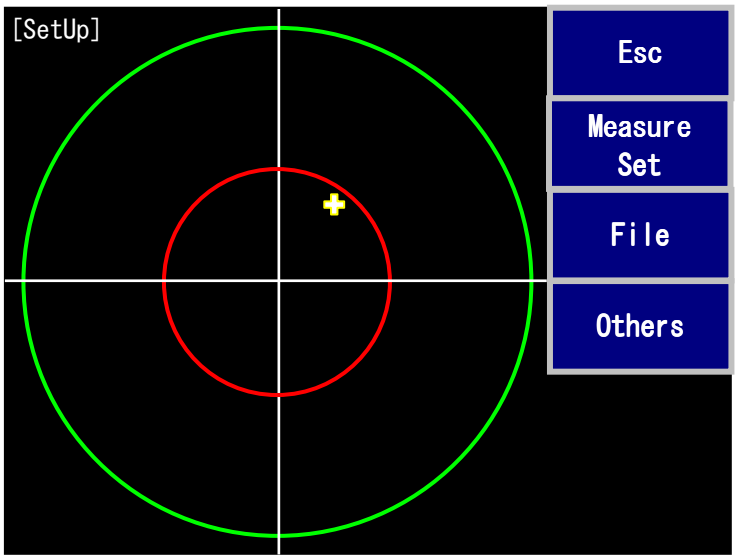
Configuration table

No.	Name of button	Description	Page
①	SetUp	Top order of setting menu Setup screen for measurement condition, item related to file, and other items	P.27
②	Measure Set	Measurement condition item setup screen	P.29
③	MeasMode	Measurement mode setup screen (standard measurement, motor measurement, polygon mirror measurement) Repeated measurement mode setting	P.30
④	ZeroSet	Measurement value zero setup screen	P.31
⑤	LD Power	LD power adjustment & received light level setup screen	P.32
⑥	Trace	Screen display method selection screen	P.34
⑦	Zoom	Zoom display method setup screen	P.35
⑧	OK/NG	Judgment condition screen	P.36
⑨	Display	Measurement result item display setup screen	P.41
⑩	DataNo	Data number setup screen	P.44
⑪	SYNC	Sampling mode setup screen	P.45
⑫	Output	Analog output setup screen	P.46
⑬	Marker	Marker display setup screen	P.47
⑭	Mirror	Mirror display method setup screen	P.47
⑮	File	File operation screen	P.48
⑯	Save	File saving	P.49
⑰	Load	File reading	P.50
⑱	Others	Other setup screen (unit setting, communication speed setting, data output setting)	P.51
⑲	Unit	Unit setup screen	P.51
⑳	Com	Serial communication speed setup screen	P.52
㉑	Seri-Out	Serial data output setup screen	P.52
㉒	I/O	I/O mode setup screen	P.53

* MS Set button on the measurement screen is same as Measure Set button.

① SetUp screen

Setup menu display screen



→ To main screen

→ ② To measurement condition screen

→ ⑮ To setting saving / reading screen

P.48

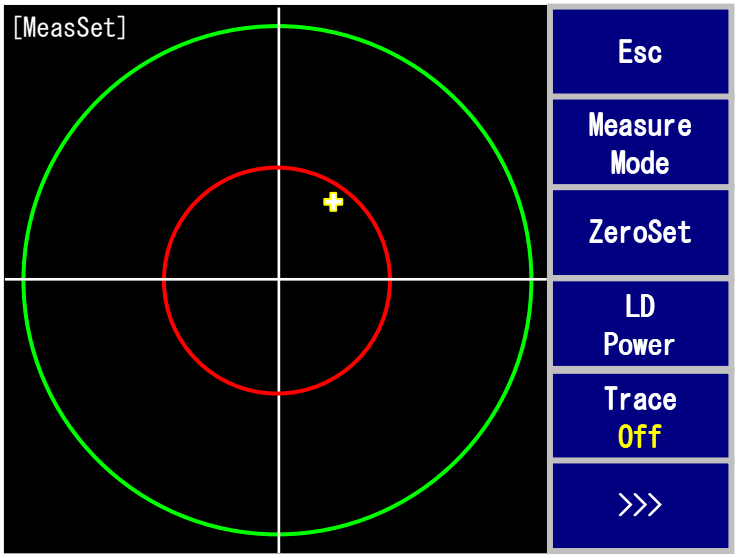
→ ⑱ To other setup screen

P.51

② MeasureSet screen

This is the setup menu screen related to measurement. There are three screens.

②-1 MeasureSet1 screen



→ ①To SetUp screen

→ ③ To measurement mode selection screen

P.29

→ ④ To measurement origin setup screen

P.31

→ ⑤ To LD power adjustment screen

P.32

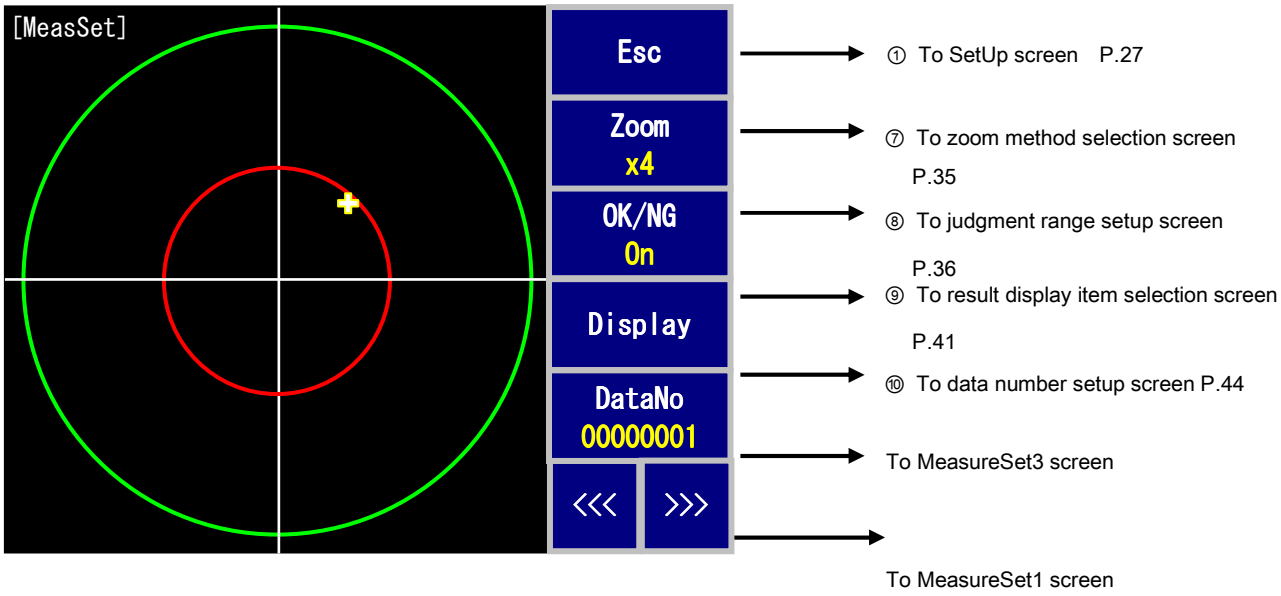
→ ⑥ To trace selection screen

P.34

→ To MeasureSet2 screen

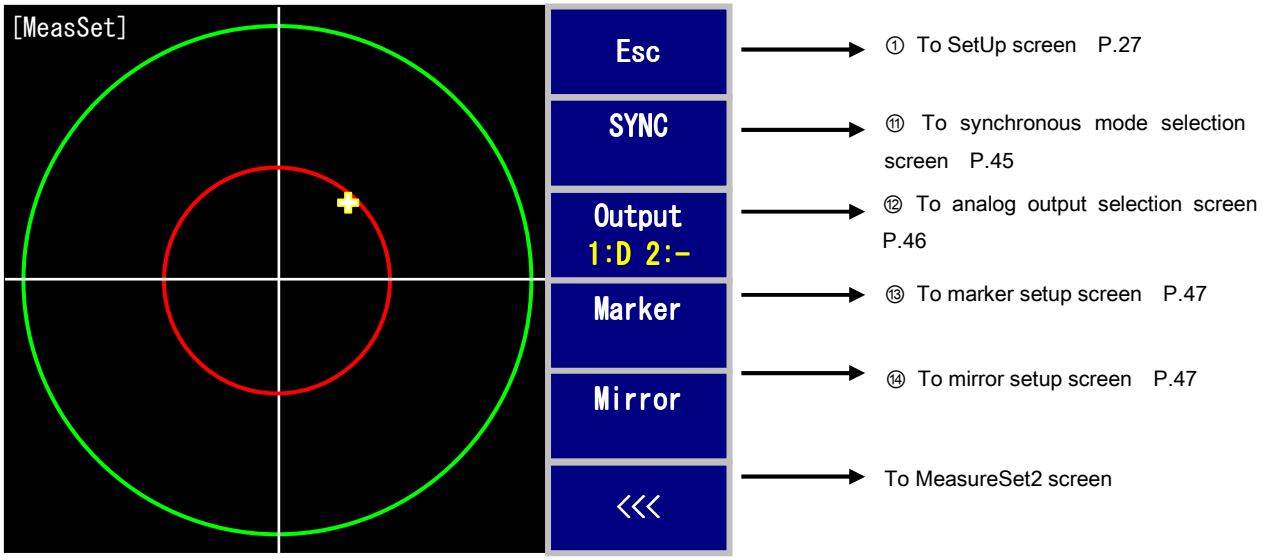
* The yellow characters in the lower part of the button indicate the present setting.

②-2 MeasureSet2 screen



* The yellow characters in the lower part of the button indicate the present setting.

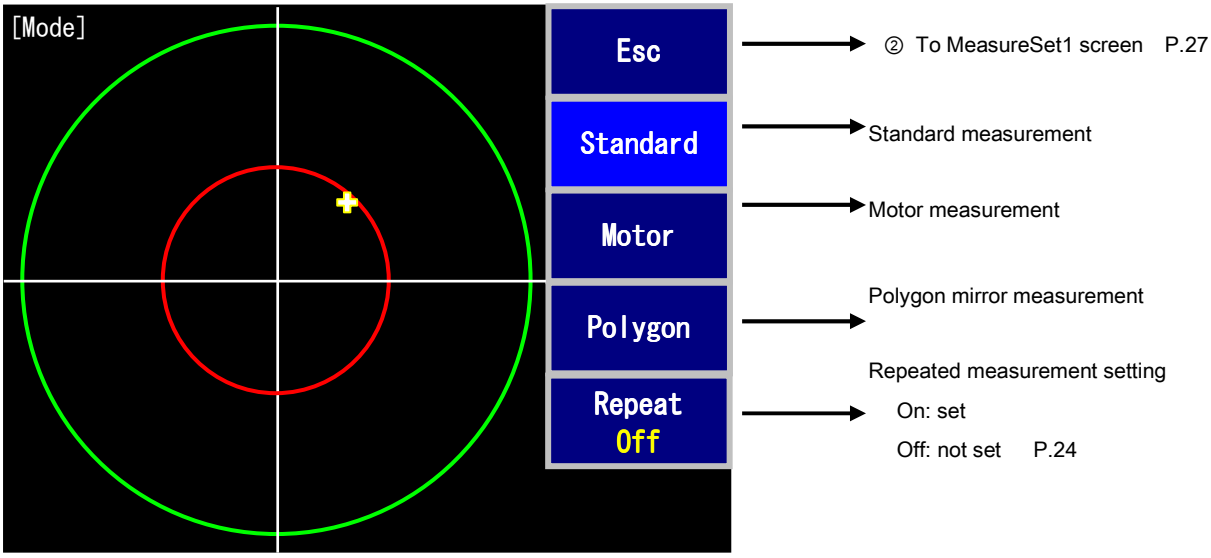
②-3 MeasureSet3 screen



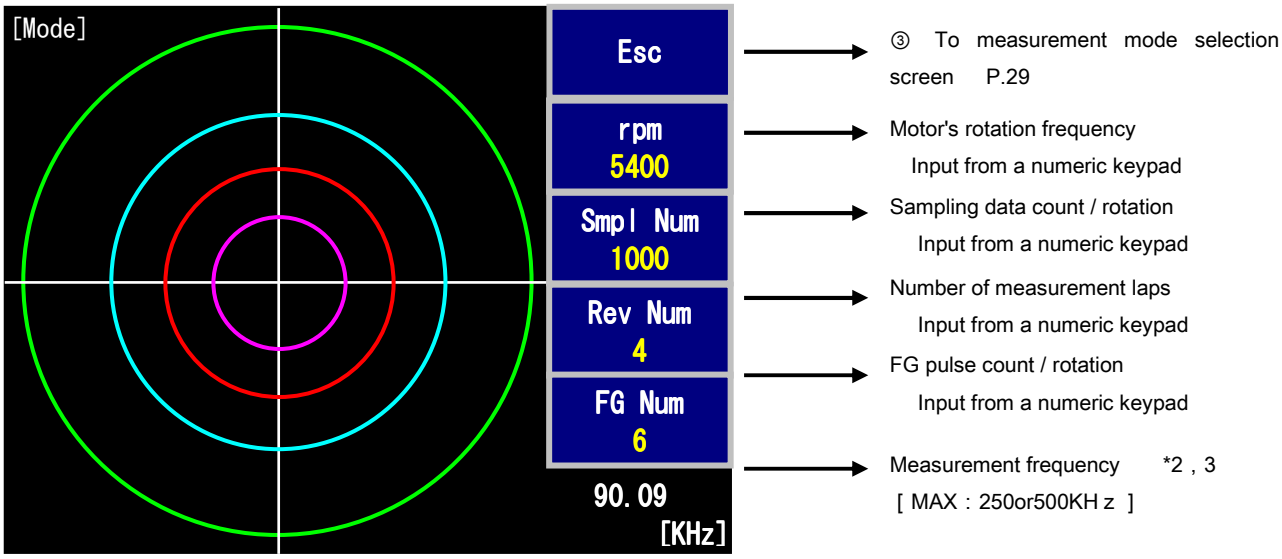
* The yellow characters in the lower part of the button indicate the present setting.

③ Measurement mode selection screen

Measurement mode (application) selection screen



③-1 Motor measurement setup screen



*1 The number of sampling data per measurement is up to 4096.

Carry out the setting so that it becomes Smpl Num x Rev Num ≤ 4096.

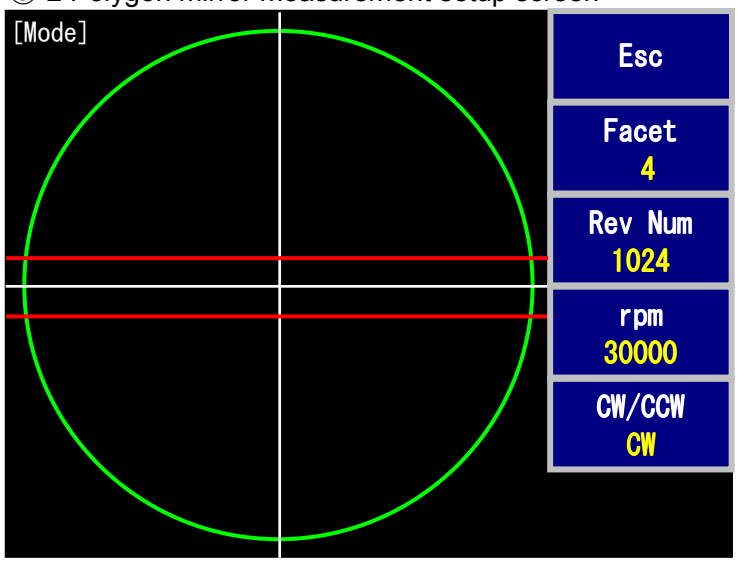
*2 To minimize the misalignment of sampling timing per lap, the number of sampling data per rotation is automatically corrected to a value near setting value. If the number of sampling data per rotation is not divisible by FG pulse count, it is automatically corrected to a divisible value.

*3 If it is set to a value exceeding the internal sampling frequency 250or500KHz, an error message is displayed.

*4 If FG pulse count is set to 0, the synchronous mode is set to internal synchronous mode (250 or 500KHz).

If it is set to 1 or more, it is set to external synchronous mode.

③-2 Polygon mirror measurement setup screen



→ ③ To measurement mode selection screen

→ Setting of number of faces (2 to 24)
Input from a numeric keypad

→ Setting of measurement lap *1
Input from a numeric keypad

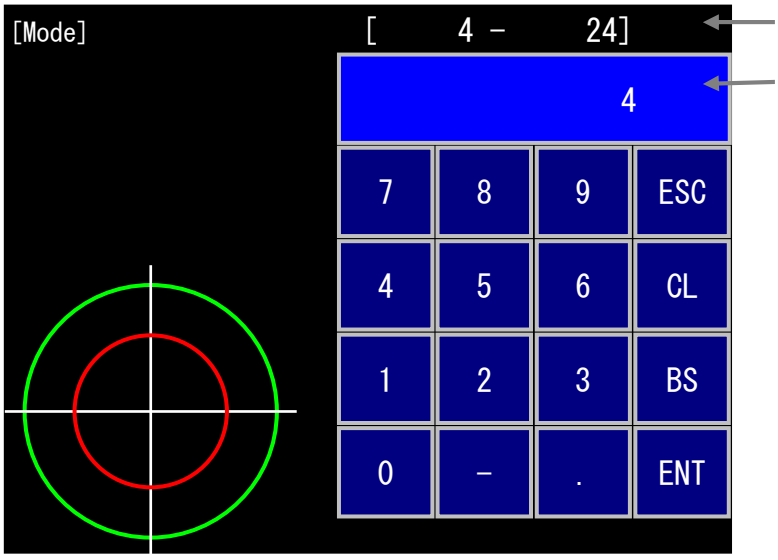
→ Motor rotation frequency setting *2
Input from a numeric keypad

→ Setting of motor's rotating direction *2
Input from a numeric keypad

*1 The number of sampling data per measurement is up to 4096.
Carry out the setting so that it becomes Facet x Rev Num ≤ 4096.
If the total number of data exceeds 4096 when Facet is changed, Rev Num is automatically corrected.

*2 Items rpm and CW/CCW are not related to the measurement conditions.
(They are added to the serial output data as setting information)

Input from a numeric keypad screen



→ Input range is displayed

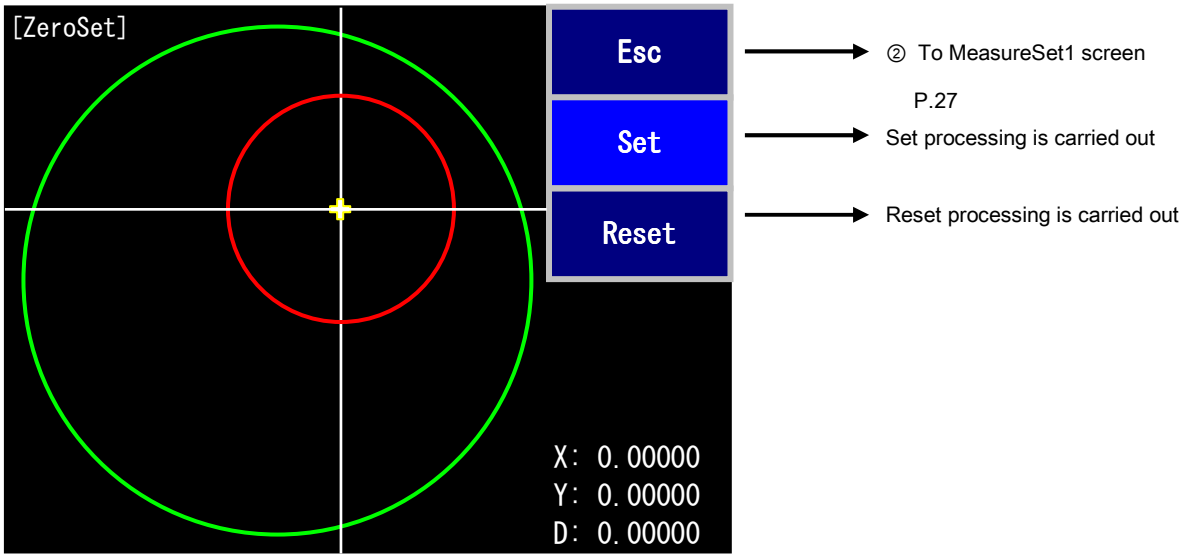
→ Input data display area

ESC: cancel
CL : clear
BS : backspace
ENT: enter

④ Zero set screen

Change the measurement standard (zero) point.

④-1 Set screen

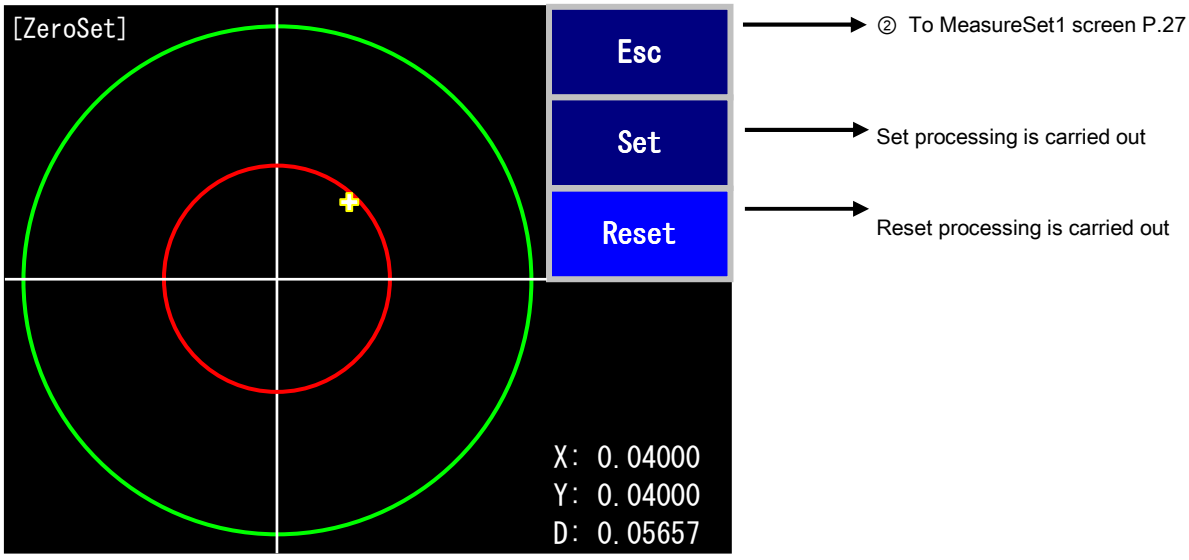


Set button: The present measurement value is forcibly reset to zero.

The measurement standard line (white) and the judgment range display move.

* If the light spot is out of area or the amount of received light is not normal value, Zero set cannot be executed.

④-2 Reset screen

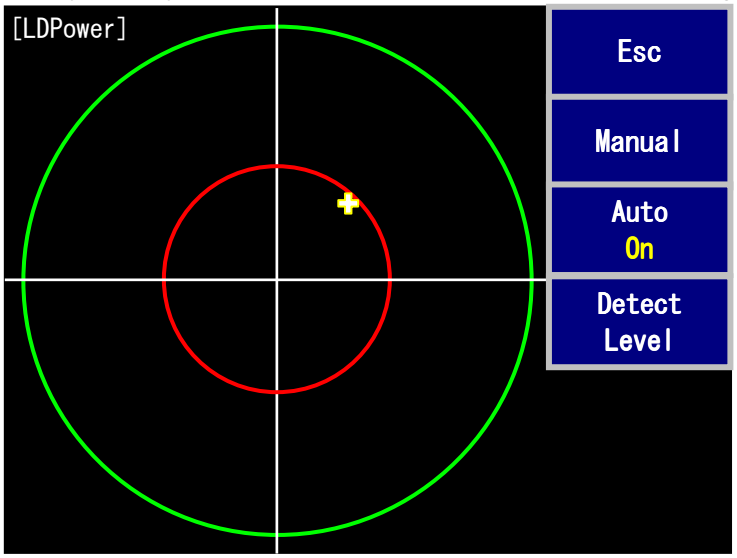


Reset button: The measurement standard is set to the measurement origin (center of screen).

The measurement standard line and the judgment range display are moved to the measurement origin (center of screen).

⑤ Laser power adjustment screen

Carry out adjustment of laser power and error level setting for amount of received light.



→ ② To MeasureSet1 screen P.27

→ To laser power manual adjustment screen P.33

→ Laser power automatic adjustment *1

→ Received light level setting
Input from a numeric keypad *2

*1 If the laser power automatic adjustment is set to ON, the adjustment is carried out automatically when the measurement is started.

However, the automatic adjustment is not carried out automatically in the repeat mode.

*2 The received light level becomes an error if the amount of received light becomes smaller than this value.

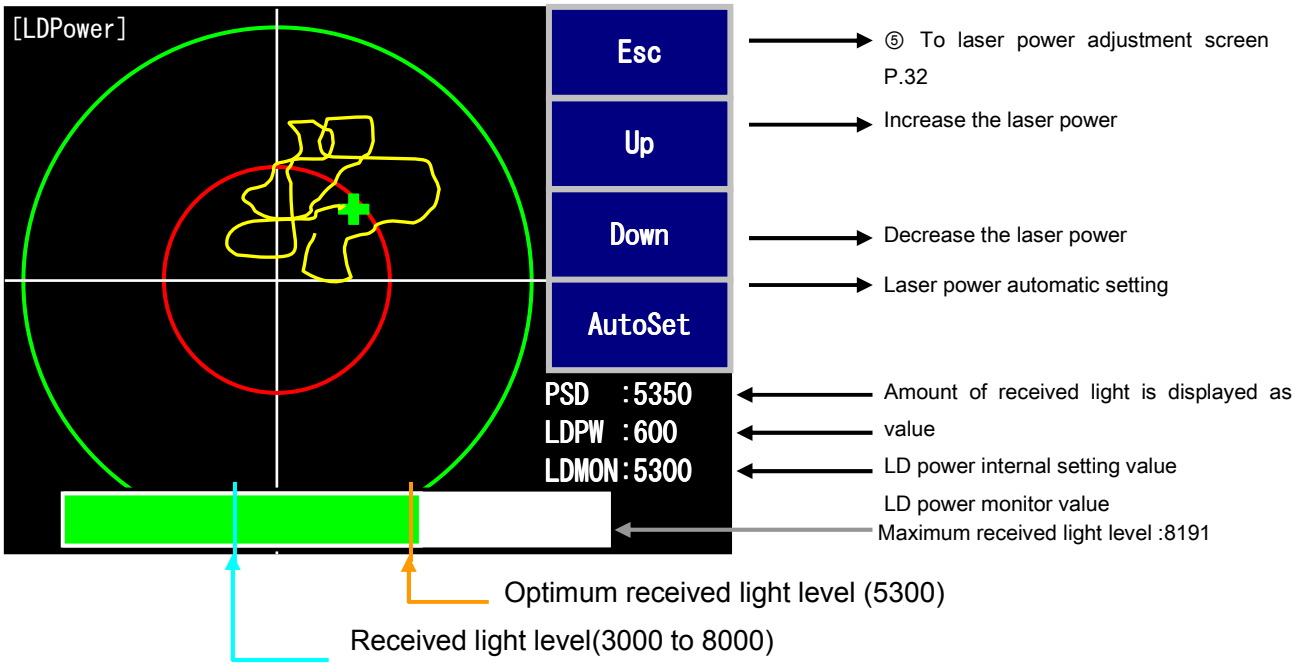
The setting range is 3000 to 8000 (default: 3000).

Manual setup screen

Adjust the laser power manually so that the amount of received light becomes the optimum value.

If the amount of received light becomes smaller than error level or exceeds the maximum amount of received light (8191), the level bar changes to red.

* In the polygon mirror measurement mode, set it while rotating the polygon motor.

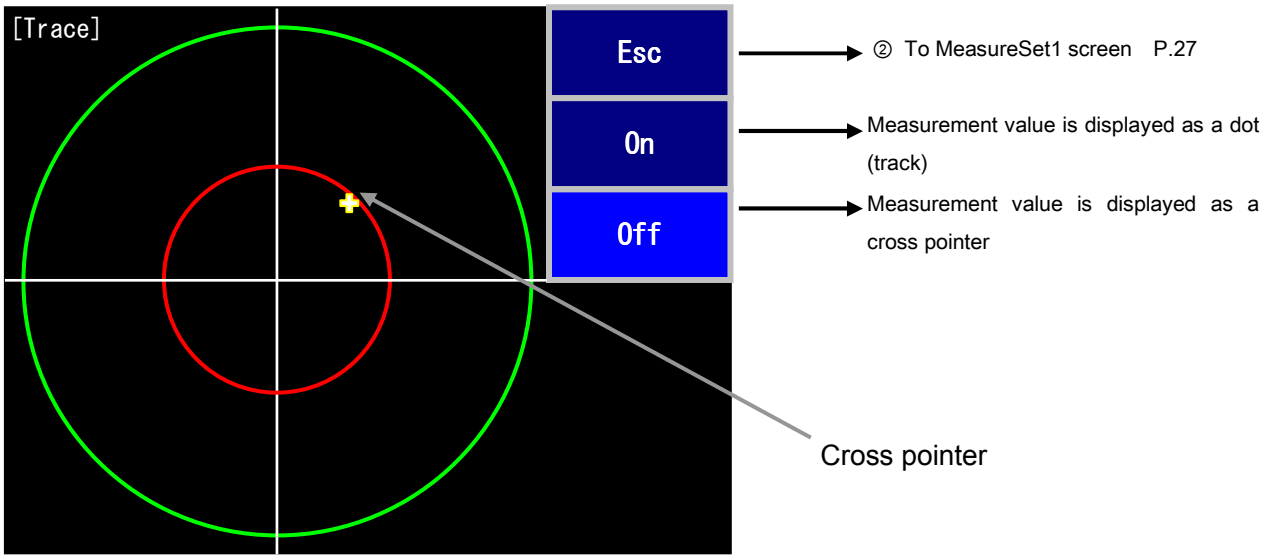


* The amount of received light can be measured if the level bar is green, however, set it to approximately 5300 as an optimum value (refer to the figure above).
* If AutoSet button is pressed, the laser power is automatically adjusted so that the received light level becomes within 5300±50. If the automatic adjustment cannot be carried out, an error message is displayed.
* On this screen, a track of cross pointer is left.

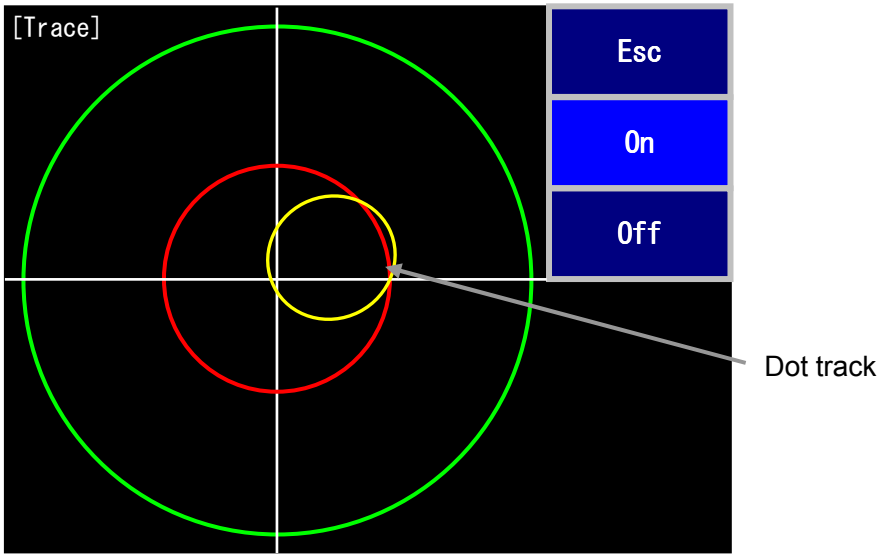
⑥ Trace (display method selection) screen

Set the method for displaying the measurement value (polygon mirror measurement mode is invalid).

e.g.: trace OFF



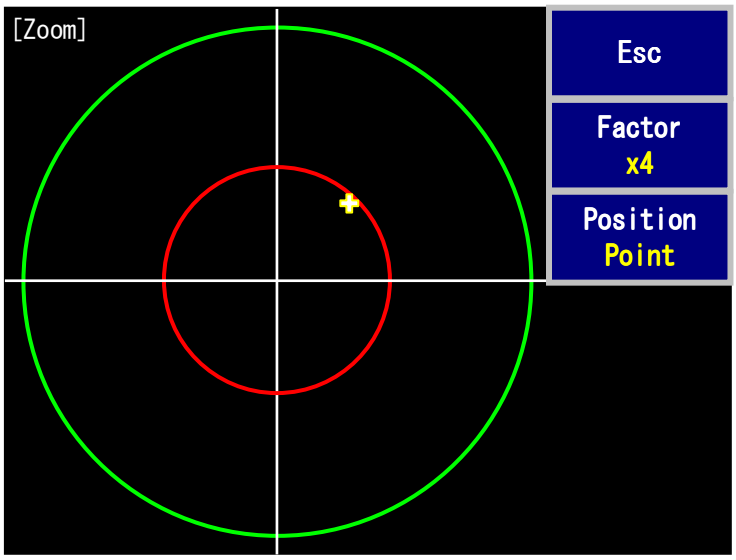
e.g.: trace ON



* If the standard measurement is changed to the motor measurement, the trace function is automatically set to On.

⑦ Zoom method selection screen

An image can be enlarged after the measurement is stopped by setting magnification and spreading center position.

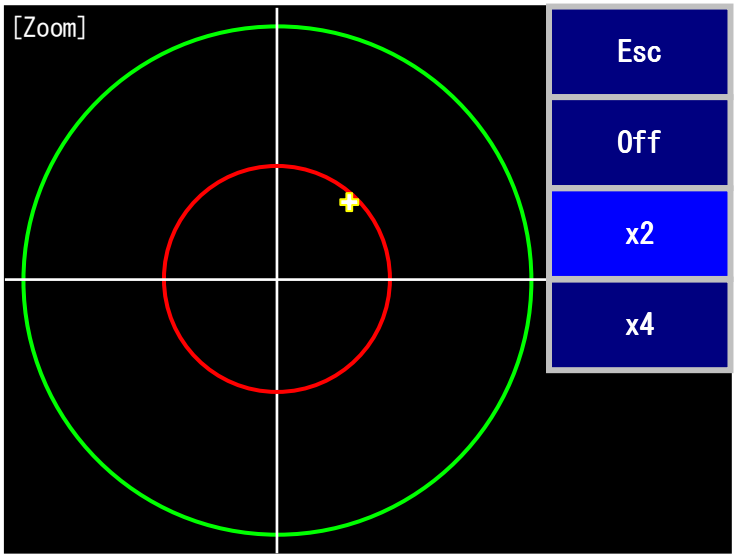


→ ② To MeasureSet1 screen P.27

→ To zoom magnification setup screen

→ TO spreading center position setup screen

⑦-1 Zoom magnification setup screen



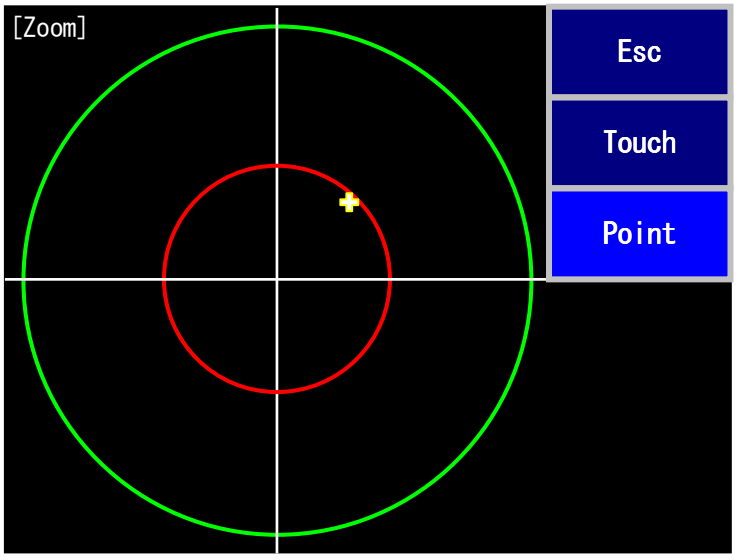
→ ⑦ To zoom method selection screen P.35

→ No zoom display (1x)

→ 2x display

→ 4x display

⑦-2 Spreading center position setup screen



→ ⑦ To zoom method selection screen P.35

→ Set the position touched in the screen is set to center

→ After the measurement is stopped, an image is automatically enlarged.
the center position is set depending on the measurement mode as shown below.

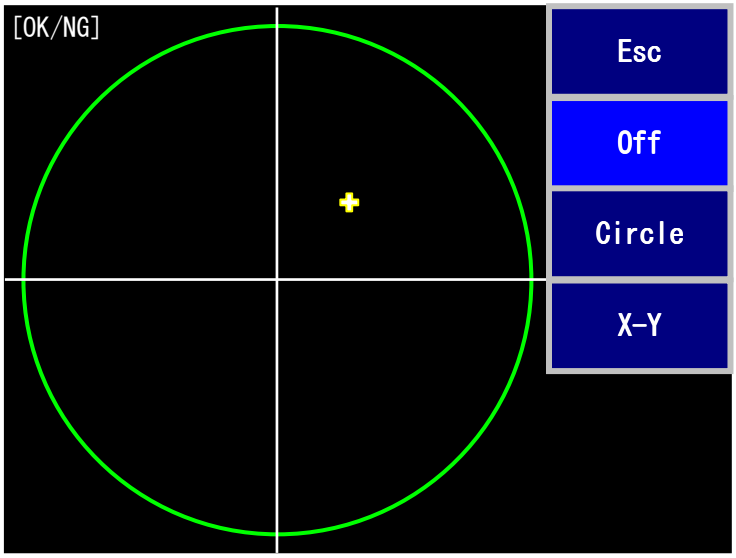
- Standard : final measurement value
- Motor : gravity center position
- Polygon : X, Y average value

⑧ Judgment range (OK/NG) screen

Set the judgment value for evaluating OK/NG.

⑧-1 OFF selection screen: standard measurement mode

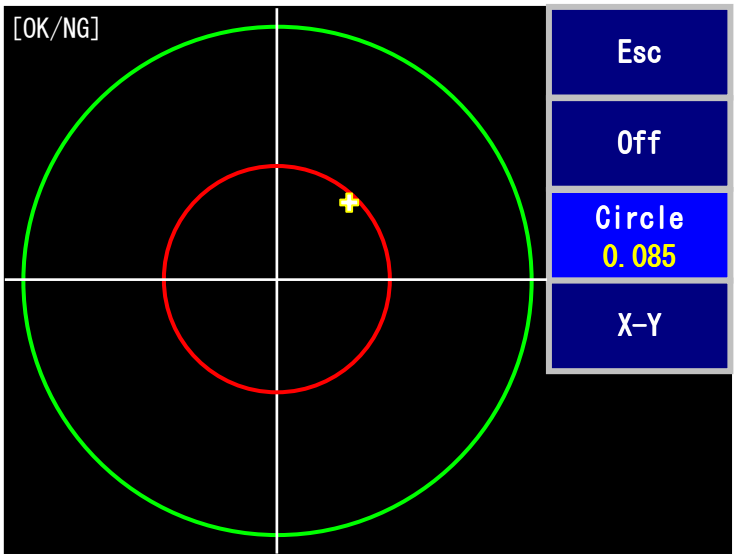
If Off is selected, the judgment processing is not carried out.



→ ② To MeasureSet2 screen P.28

⑧-2 Judgment circle setup screen: standard measurement mode

Set the judgment value within the range of circle.



→ ② To MeasureSet2 screen P.28

→ Select whether there is judgment range

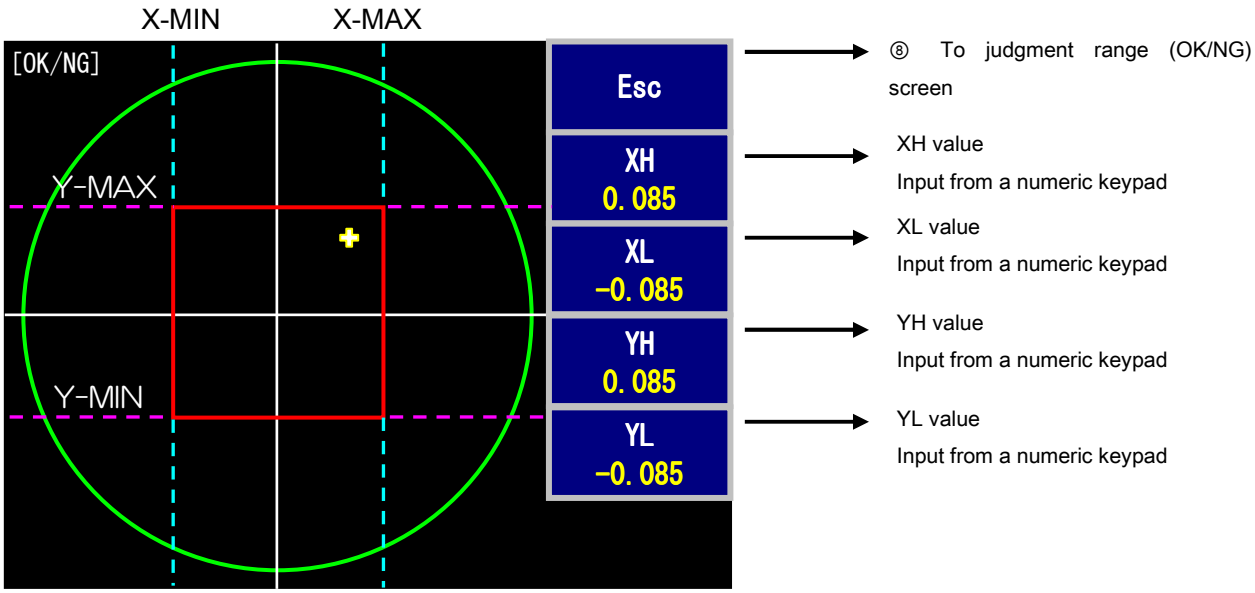
→ Input the angle equivalent to radius
Input from a numeric keypad

→ To rectangle setup screen

⑧-3 Rectangle (X-Y) setup screen: standard measurement mode

Set the judgment value within the range of rectangle.

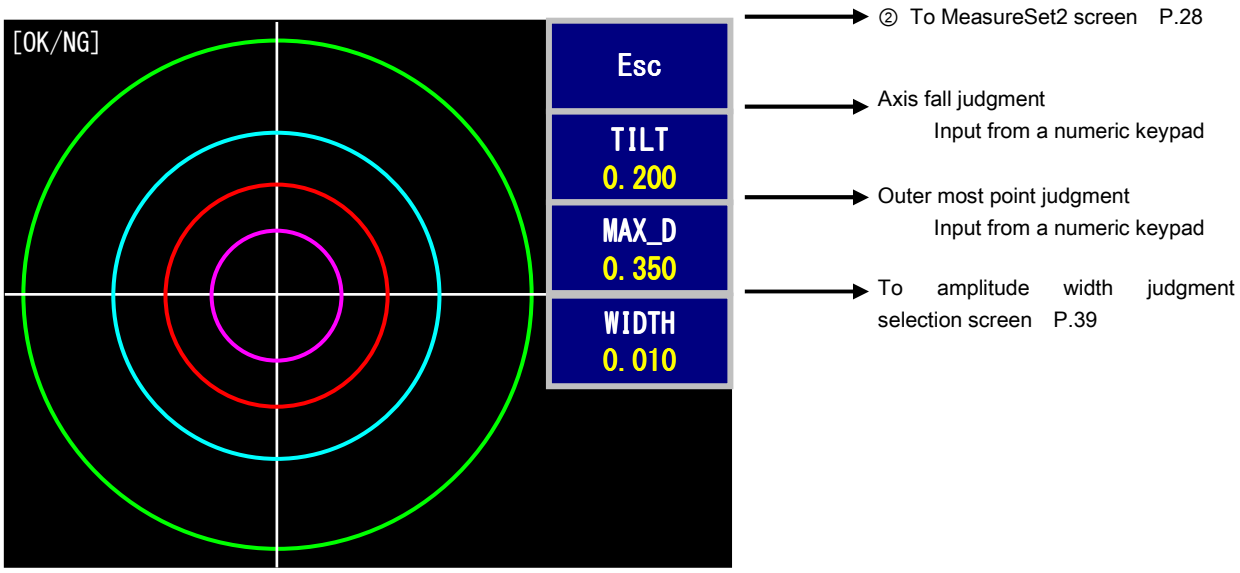
The positional relationship of XH (X upper limit), XL (X lower limit), YH (Y upper limit), and YL (Y lower limit) are shown in the figure below. The relationship is represented as XH> XL, YH > YL.



* The present setting value is displayed in the lower part in the button

⑧-4 Judgment range setup screen: motor measurement mode

In the motor measurement mode, total five types of judgment conditions in three patterns can be set.



Axis fallen judgment value:

The axis fallen (gravity center) angle is treated as a judgment value.

If the setting value is exceeded, it becomes NG.

Outermost point judgment value:

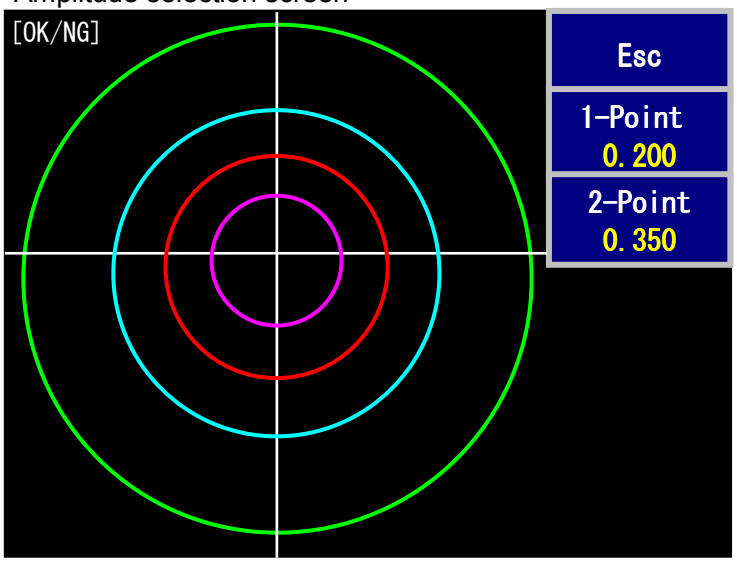
The maximum value (D) of measurement value is treated as a judgment value.

If the setting value is exceeded, it becomes NG.

⑧-5 Judgment range setup screen: motor measurement mode (amplitude selection screen)

When the amplitude is selected, the judgment condition for maximum value or width of amplitude can be selected.

Amplitude selection screen



⑧-4 To judgment range setup screen

P.38

Amplitude maximum value judgment
Input from a numeric keypad

Amplitude width judgment
Input from a numeric keypad

The amplitude judgment can be selected from two methods.

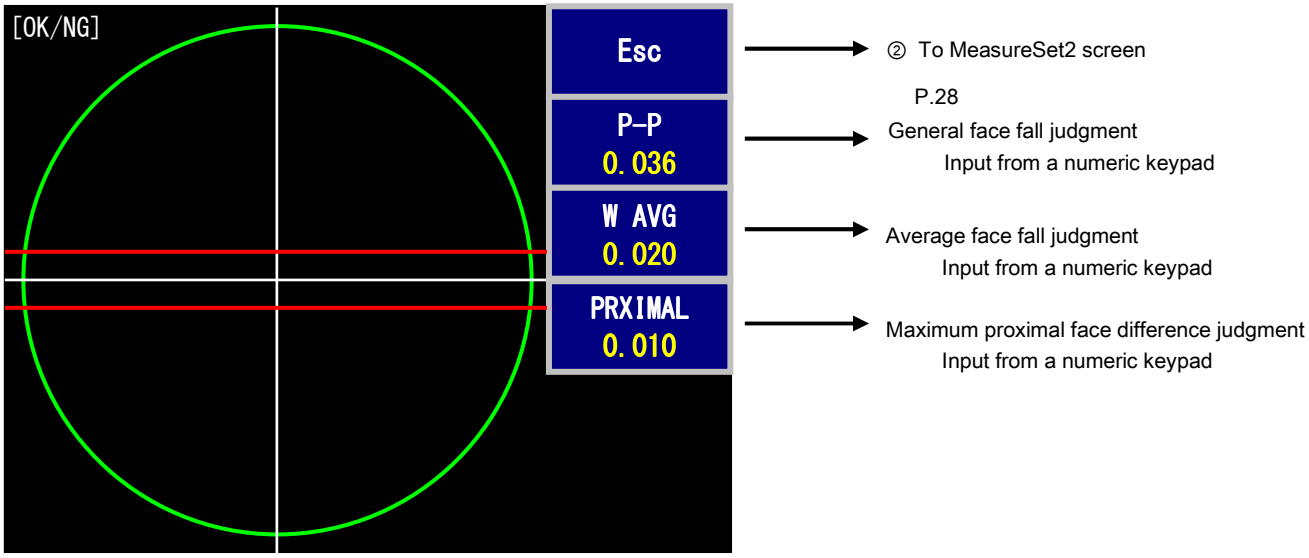
① Amplitude maximum value: The width between axis fallen (gravity center) and most distant measurement point is treated as a judgment value.

② Amplitude : The width between two points; most distant measurement point from axis fallen (gravity center) and most distant measurement point from this point is treated as a judgment value.

In each case, if the setting value is exceeded, it becomes NG.

⑧-5 Judgment range setup screen: polygon mirror measurement mode

In the polygon mirror measurement mode, three patterns of judgment method can be selected.



- General face tangle judgment:

  The width of sampling data value (maximum value - minimum value) is treated as a judgment value.

- Face average face tangle judgment:

  The width (maximum value - minimum value) of average value (average face value) of sampling data for each face is treated as a judgment value.

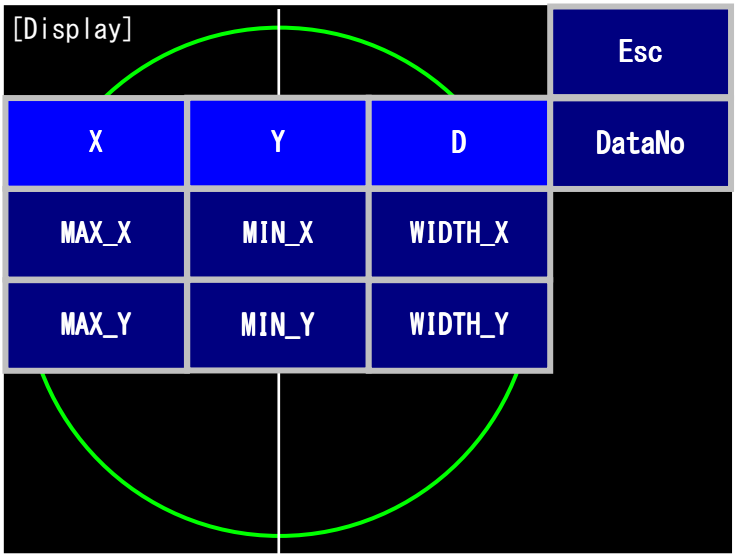
- Maximum proximal face difference judgment:

  The maximum value of proximal face difference depending on average face value is treated as a judgment value.

⑨ Measurement result item display setup screen

Up to 10 items to be displayed on the measurement screen can be selected. The content varies depending on the measurement mode.

Standard measurement mode



② To MeasureSet2 screen

P.28

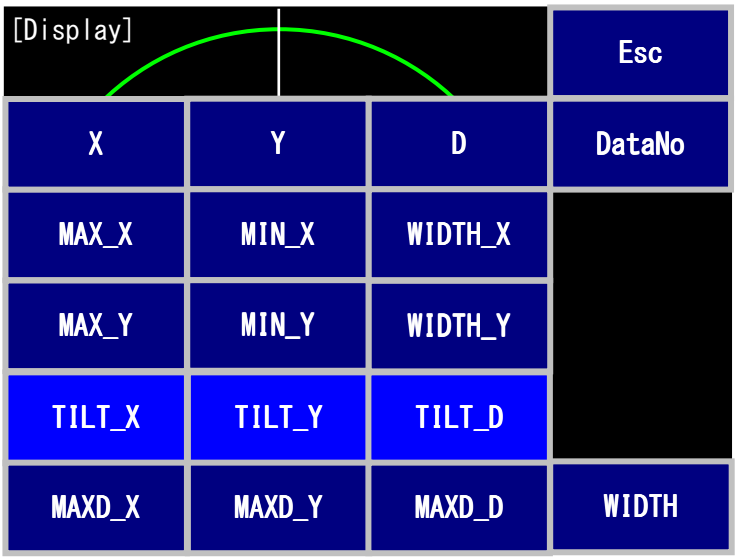
The item to be displayed at measurement is displayed in pressed status.

* The selected item on the left figure is the initially selected item

Content of all items

Name of item	Description	Name of item	Description
DataNo	Data number	MAX_Y	Maximum Y value
X	Measurement value (X-axis direction)	MIN_Y	Minimum Y value
Y	Measurement value (Y-axis direction)	WIDTH_Y	Y width (maximum Y value - minimum Y value)
D	Measurement value		
MAX_X	Maximum X value		
MIN_X	Minimum X value		
WIDTH_X	X width (maximum X value - minimum X value)		

Motor measurement mode



② To MeasureSet2 screen
P.28

The item to be displayed at measurement is displayed in pressed status.

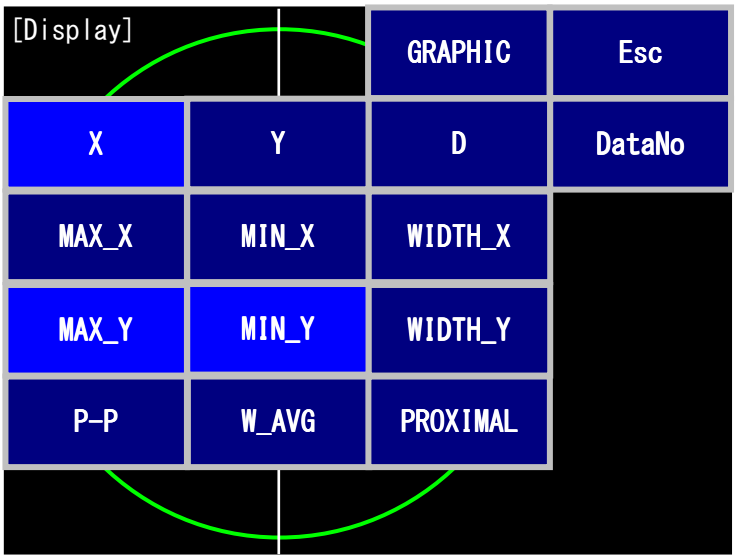
* The selected on the figure above is the initially selected item

Content of all items

Name of item	Description	Name of item	Description
DataNo	Data number	WIDTH_Y	Y width (maximum Y value - minimum Y value)
X	Measurement value (X-axis direction)	TILT_X	Axis fallen (X value at gravity center)
Y	Measurement value (Y-axis direction)	TILT_Y	Axis fallen (Y value at gravity center)
D	Measurement value	TILT_D	Axis fallen (D value at gravity center)
MAX_X	Maximum X value	MAXD_X	Outermost point (X value)
MIN_X	Minimum X value	MAXD_Y	Outermost point (Y value)
WIDTH_X	X width (maximum X value - minimum X value)	MAXD_D	Outermost point (D value)
MAX_Y	Maximum Y value	WIDTH *1	Maximum Amplitude
MIN_Y	Minimum Y value		

*1 The content is displayed following the amplitude judgment condition.

Polygon mirror measurement mode



② To MeasureSet2 screen
P.28

* The selected item in the figure above is the initially selected item

Content of all items

Name of item	Description	Name of item	Description
Data No	Data number	MAX_Y	Maximum Y value
X	Measurement value (X-axis direction)	MIN_Y	Minimum Y value
Y	Measurement value (Y-axis direction)	WIDTH_Y *1	Y width (maximum Y value - minimum Y value)
D	Measurement value	P-P *1	Y width (maximum Y value - minimum Y value)
MAX_X	Maximum X value	W_AVG	Width of average face value
MIN_X	Minimum X value	PROXIMAL	Maximum value of proximal face difference
WIDTH_X	X width (maximum X value - minimum X value)	GRAPHIC *2	Graph screen is preferentially displayed

*1 WIDTH_Y and P-P indicate the same value.

*2 If this button is set, the graph screen is displayed first when the result display screen is displayed.

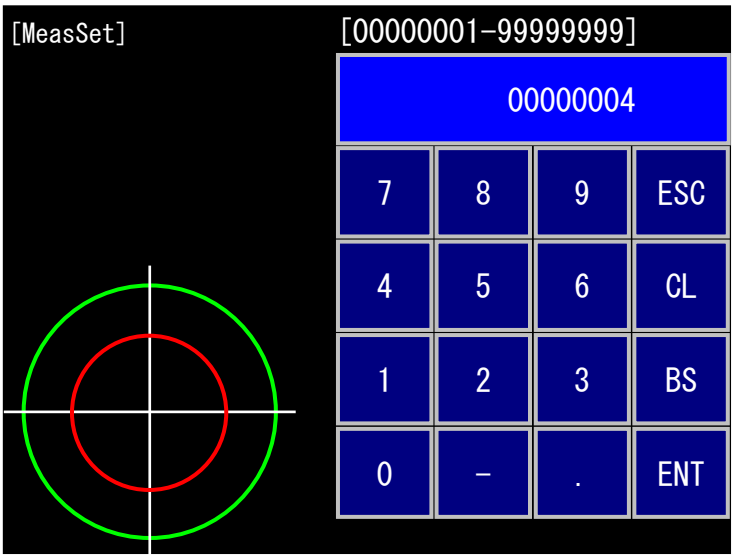
⑩ Data number setup screen

Set the data number to be added to the measurement data as measurement information.

(Input range: 00000001 - 99999999)

The data number is 8-digit number starting from 0.

e.g.: If 4 is input, the data number is set as 00000004.

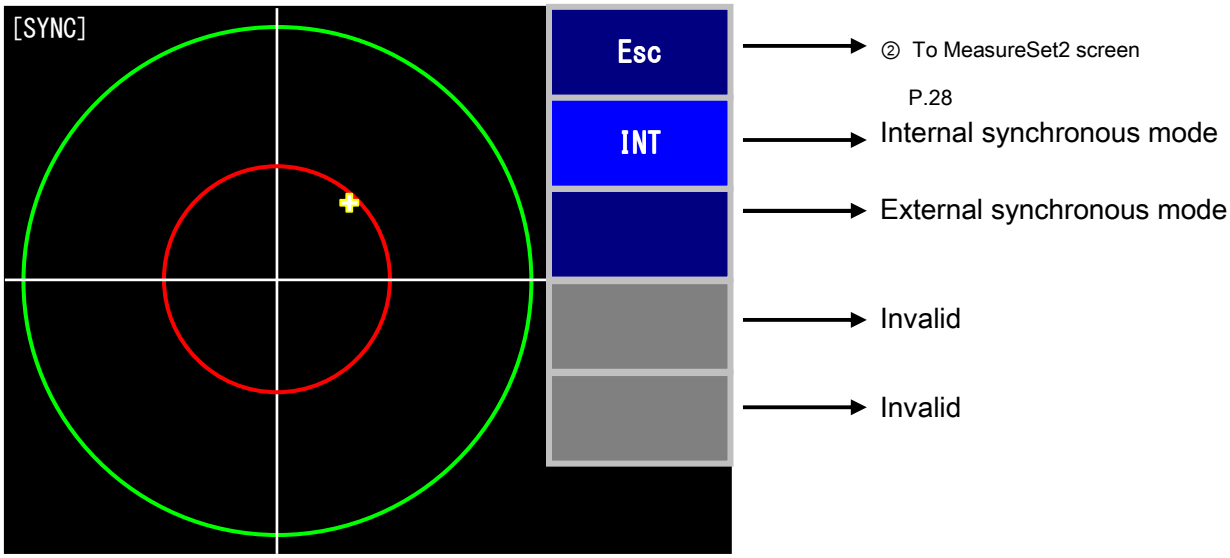


* The data number increases one at a time when the measurement is terminated.

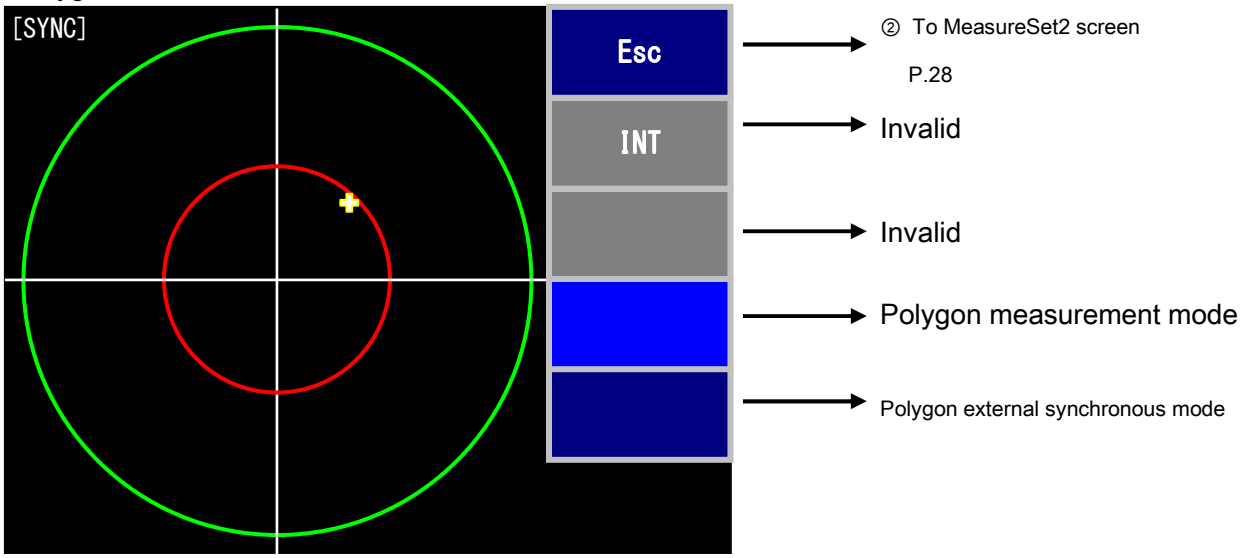
⑪ Synchronous mode selection screen

Select the synchronous mode for sampling timing at the measurement.

Standard measurement or motor measurement mode



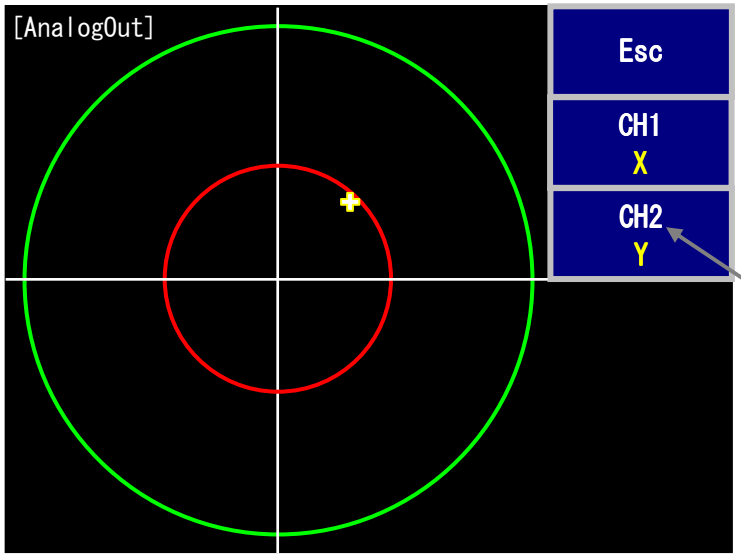
Polygon mirror measurement mode



* When the polygon measurement mode is selected, EXT2 (face detection signal) is automatically selected.

⑫ Analog output selection screen

Set the output corresponding to each channel for analog output.

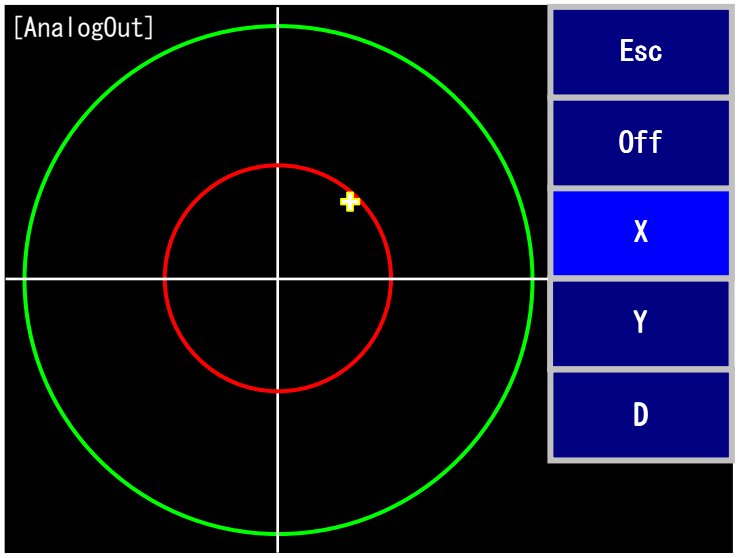


② To MeasureSet3 screen P.28

To output item selection screen of each CH

The present value is displayed in the lower part in the button.

Output content selection screen



⑫ To analog output selection screen P.46

No output

X value output

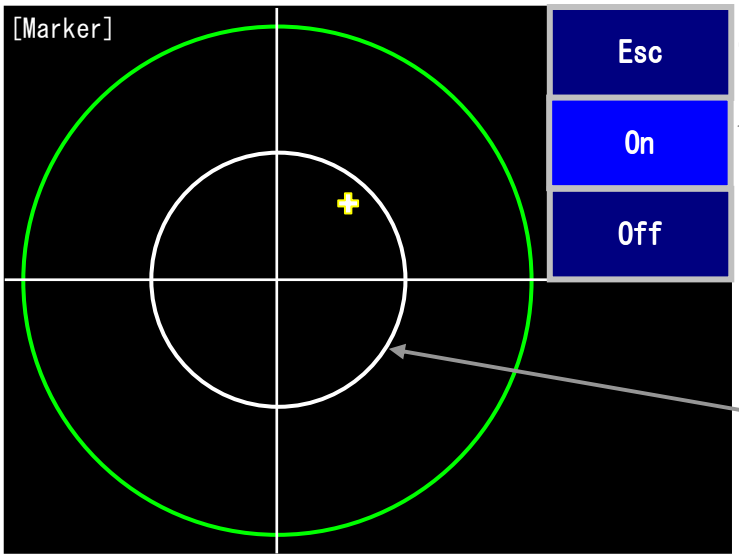
Y value output

D value output

* For the analog output, refer to page 64.

⑬ Marker setup screen

Carry out the setting if you want to display an arbitrary value (circle) on the screen from the measurement standard regardless of judgment.



② To MeasureSet3 screen
P.28

Marker display selection

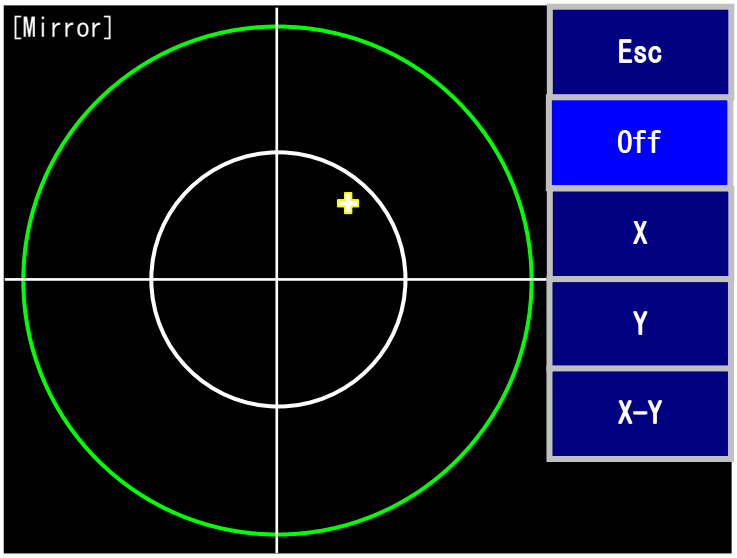
To numeric keypad input screen

Marker display

Display in arbitrary size within field circle is available

⑭ Mirror display method setup screen

Set the method for inverting video in X and Y directions.



②To SetUp screen
P.27

No reverse

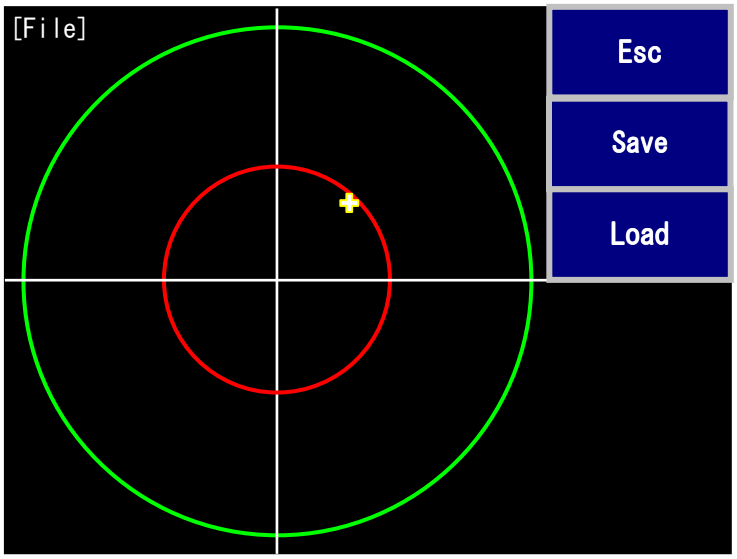
Reverse in X direction

Reverse in Y direction

Reverse in X-Y direction

⑮ File (setting saving / reading) screen

Execute saving or reading of various setting data.



→ ② To SetUp screen P.27

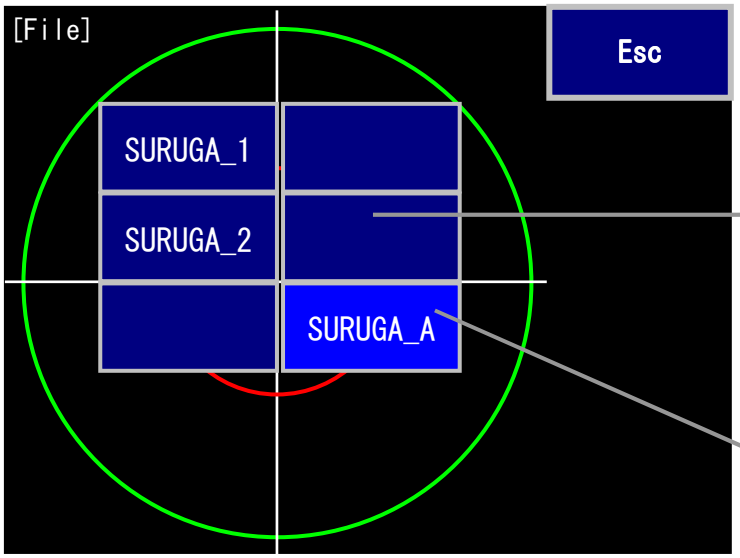
→ ⑯ To Save screen P.49

→ ⑰ To Load screen P.50

⑯ Save screen

The present setting can be saved in a file (maximum 6 items).

Press the button and specify the file name.



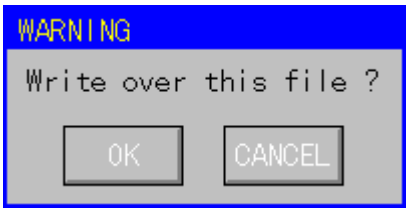
→ ⑮ To file screen
P.48

To file name input screen

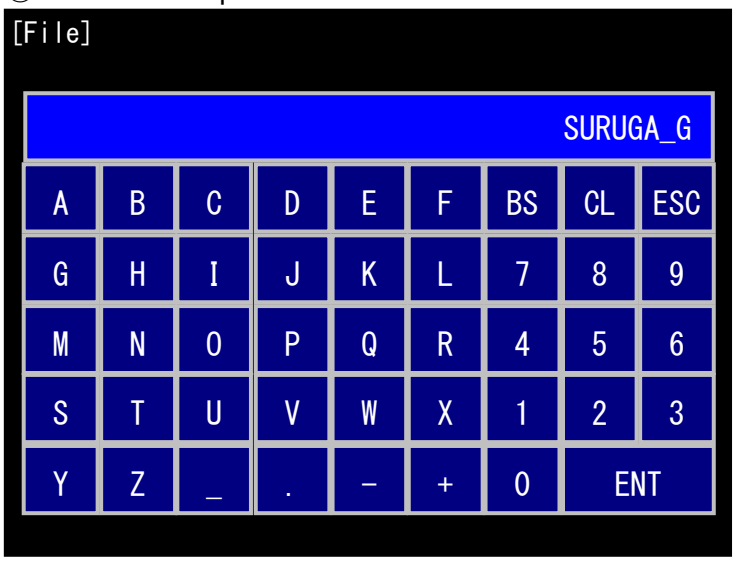
Specify the destination to save and go to character input screen
(A duplicative file name can be specified)

Finally, the button of saved or loaded file is displayed in pressed status.

* At the overwrite save, the confirmation message shown in the figure below is displayed.
When you carry out overwrite save, press OK button.



⑯-1 File name input screen

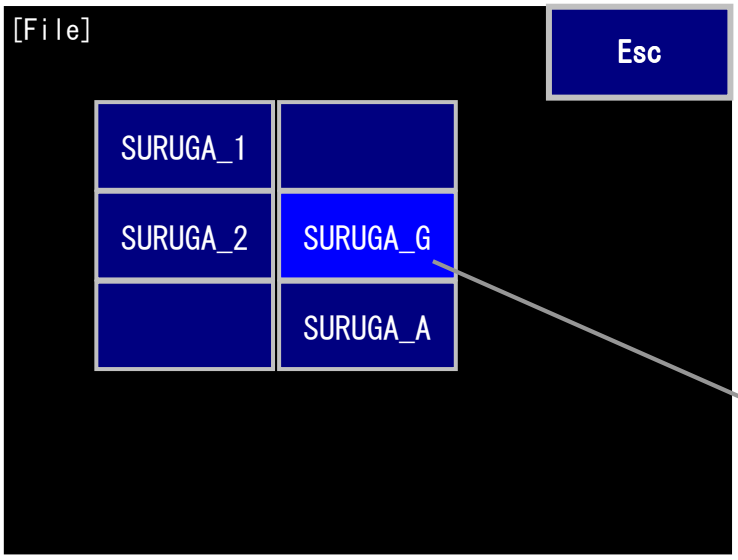


- Alphabet character string input
(maximum 8 characters)

ESC: cancel
CL: clear
BS: backspace
ENT: enter

⑰ Load screen

Select a saved file and read the setting data.



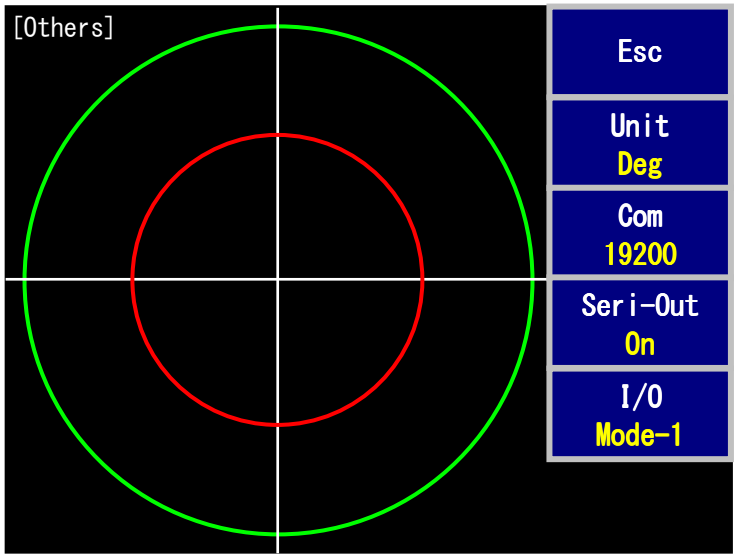
→ ⑮ To file screen
P.48

- Save character string button is displayed

The button of finally saved or loaded file is selected and displayed.

⑱ Other setup screen

Carry out the setting of display unit, communication speed, and data output.



→ ①To SetUp screen P.27

→ ⑲ To unit selection screen P.51

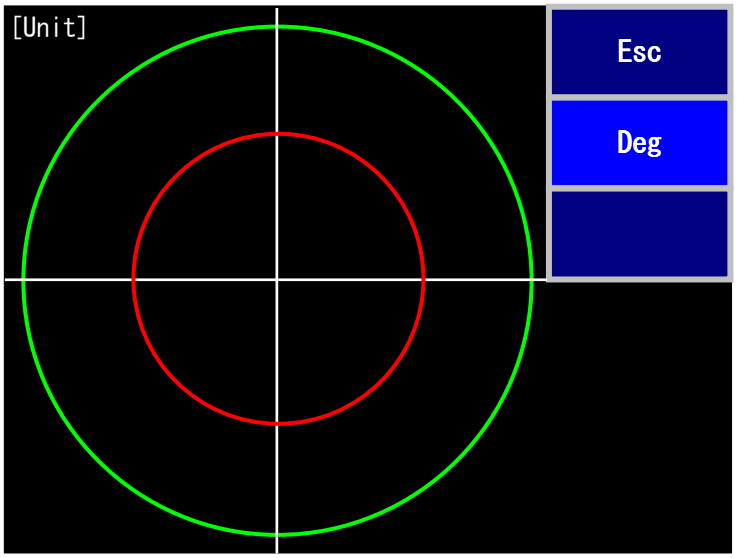
→ ⑳ To communication speed selection screen P.52

→ ㉑ To data output selection screen P.52

→ ㉒ To I/O mode selection screen P.53

⑲ Unit selection screen

Select the unit for displaying the measurement result.



→ ⑱ To other setup screen P.51

← Degree unit display

← Minute / second unit display

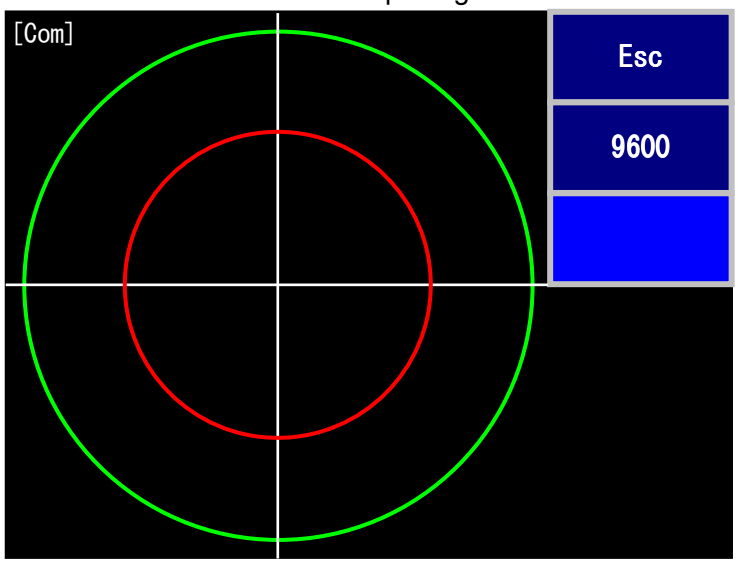
* The currently set button is pressed.

Degree unit: ±0. 00000 display

Minute / second unit: ±00'00. 0 display

⑳ Communication speed selection screen

Select the baud rate when outputting data.



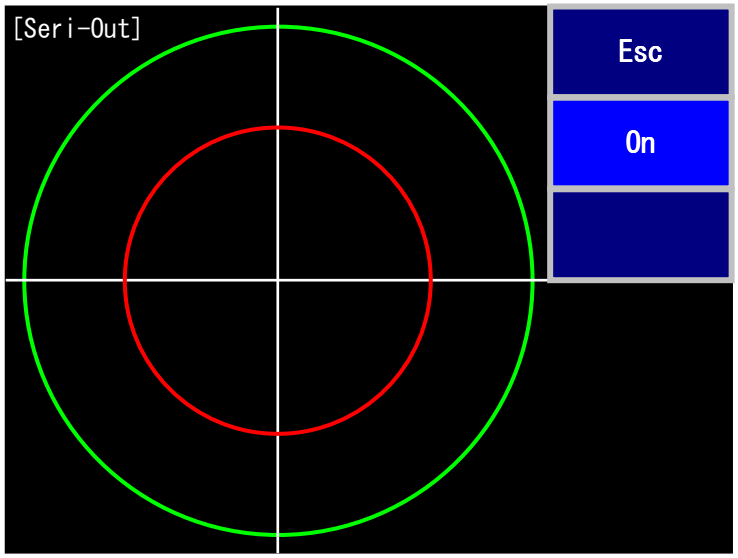
→ ⑱ To other setup screen P.51

← 9600bps

← 19200bps

㉑ Data output selection screen

Select whether the serial output of measurement data is executed when the measurement is stopped (terminated).



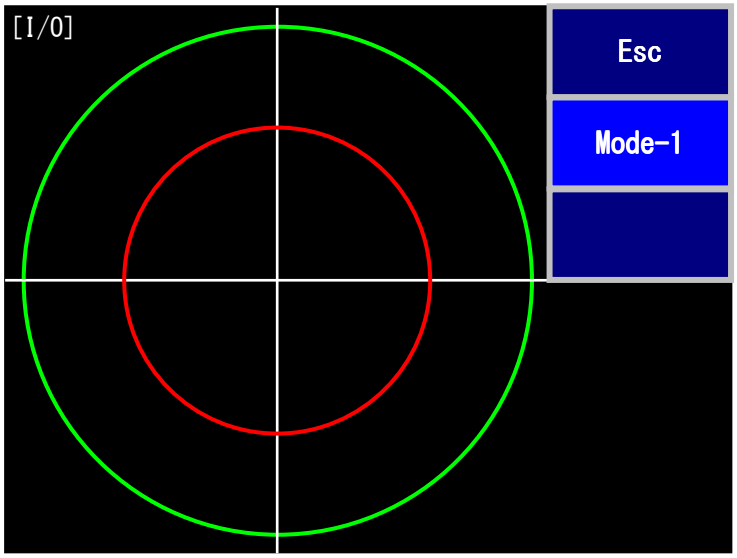
→ ⑱ To other setup screen P.51

* The currently set button is pressed.

On: The measurement result is sent once when the measurement is terminated.
For the sent data, refer to the communication interface manual.

Off: The serial data output is not carried out.

㉒ I/O mode selection screen

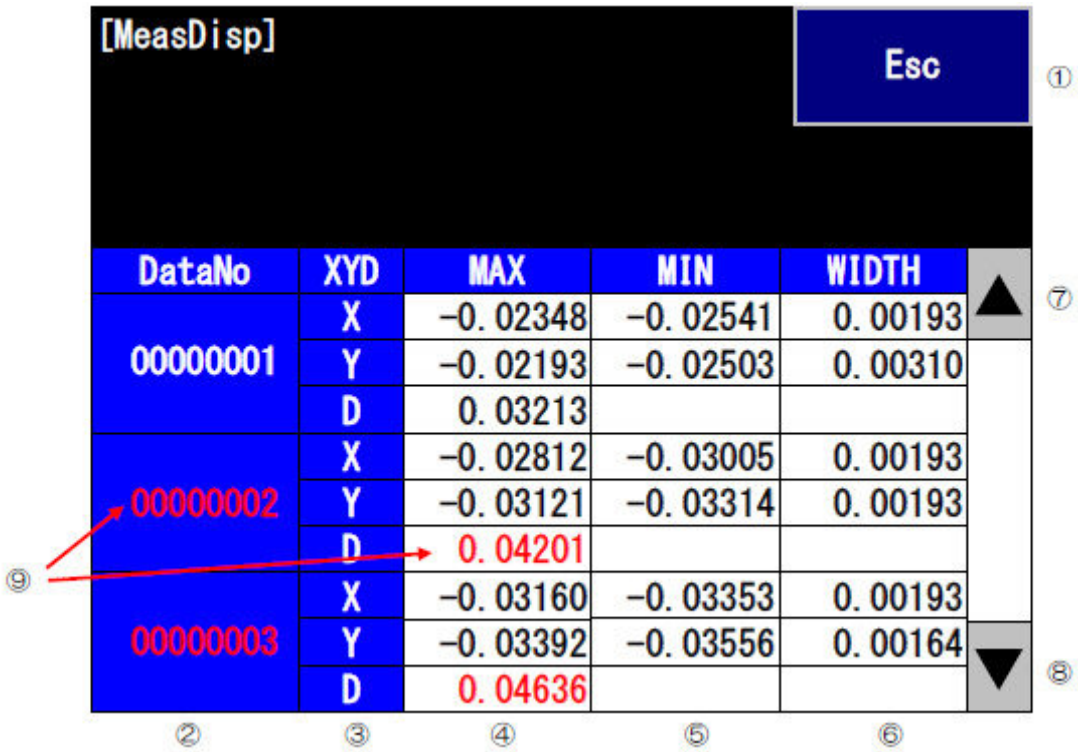


→ ⑱ To other setup screen
P.51
← Mode-1
P.59
← Mode-2
P.60

2-4 Measurement result screen

The data of up to 100 measurements (not sampling data) is collectively displayed.
However, the data is memorized in the volatile memory, so the data is cleared if the power supply is turned OFF.
If Esc button on the measurement result screen in each mode is pressed long for three seconds or more, the data clear confirmation message is displayed. If OK button is pressed, the data is cleared.
The display unit follows the unit setting (Deg or Sec).

1) Measurement result screen: standard measurement mode



①: The screen returns to the main menu.

②: The data number is displayed.

③: The item names of X, Y, and D are displayed.

④: The maximum values of X, Y, and D are displayed.

⑤: The maximum values of X and Y are displayed.

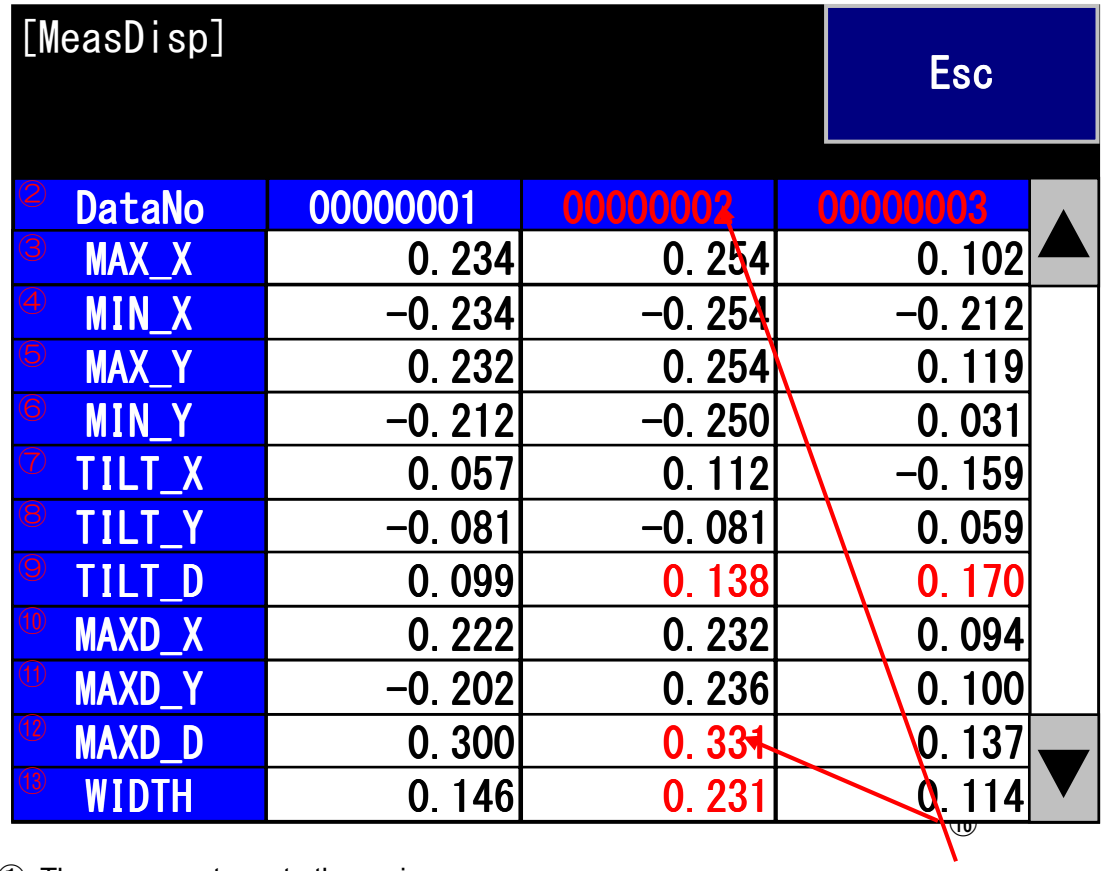
⑥: The widths of X and Y (maximum value - minimum value) are displayed.

⑦: The previous data is displayed.

⑧: The next data is displayed.

⑨: The data number and the measurement result that became NG in the judgment are displayed in red.

2) Measurement result screen: motor measurement mode



①: The screen returns to the main menu.

②: The data number is displayed.

③: The maximum value of X is displayed.

④: The minimum value of X is displayed.

⑤: The maximum value of Y is displayed.

⑥: The minimum value of Y is displayed.

⑦: Axis fallen (gravity center) X value is displayed.

⑧: Axis fallen (gravity center) Y value is displayed.

⑨: Axis fallen (gravity center) D value is displayed.

⑩: X value at outermost point is displayed.

⑪: Y value at outermost point is displayed.

⑫: D value at outermost point is displayed.

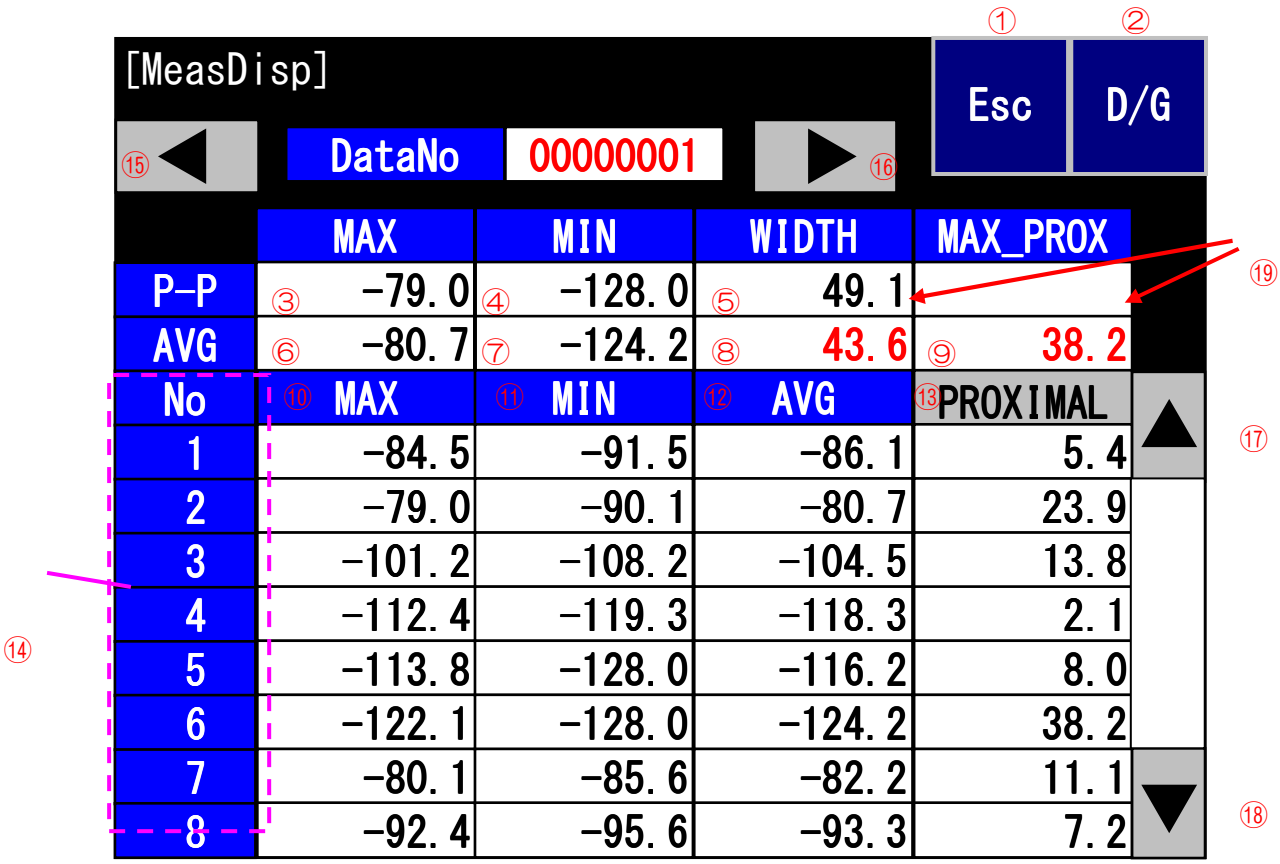
⑬: The maximum amplitude is displayed (following amplitude judgment condition).

⑭: The previous data is displayed.

⑮: The next data is displayed.

⑯: The data number and the measurement result that became NG in the judgment are displayed in red.

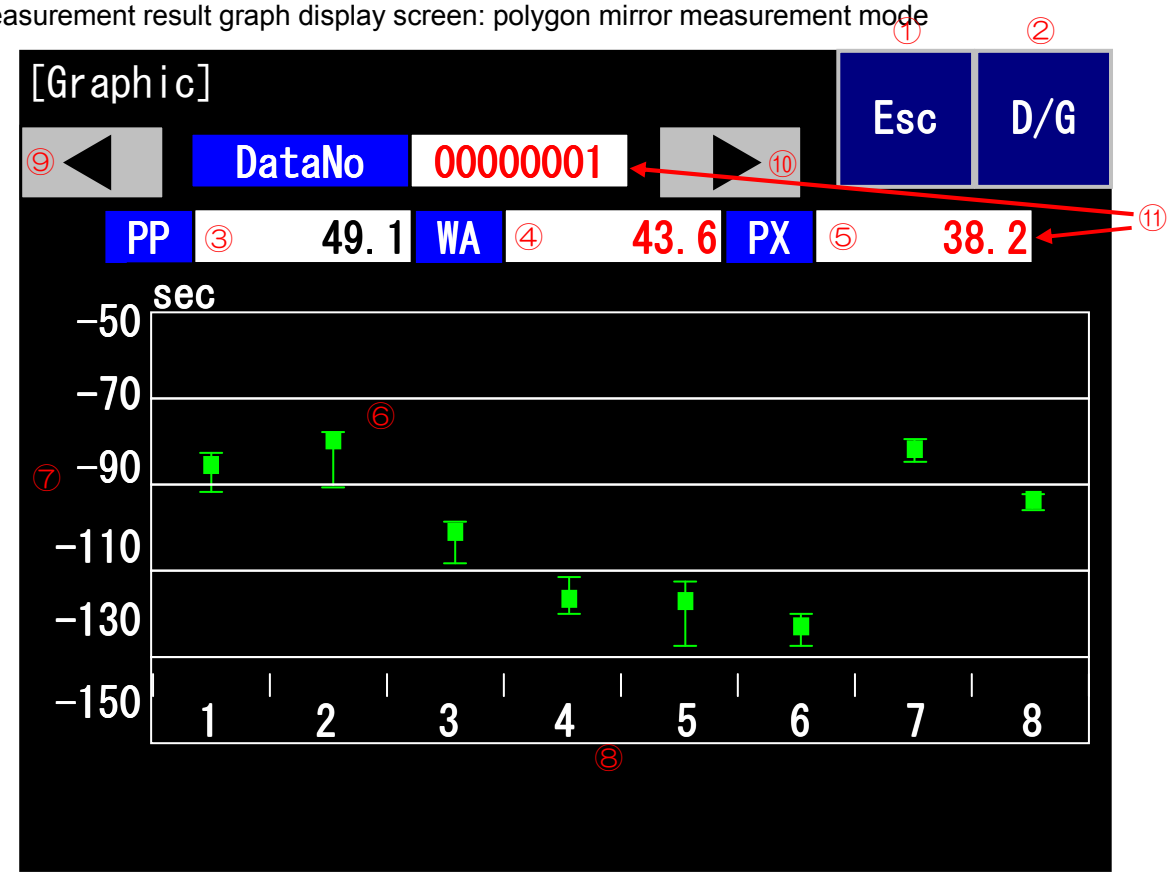
3) Measurement result screen: polygon mirror measurement mode (proximity difference: PROXIMAL display)



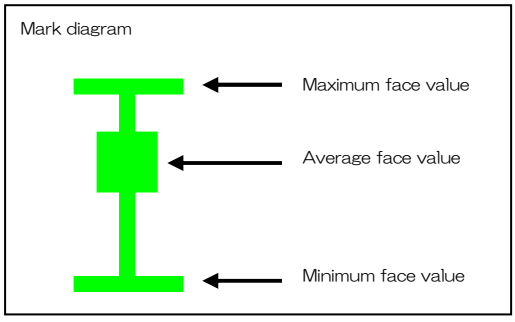
①: The screen returns to the main menu.
②: Data and graph are switched.
③: Maximum value of sampling data
④: Minimum value of sampling data
⑤: Width of sampling data (calculating formula ｜③-④｜) .....object to be judged (WIDTH P-P)
⑥: Maximum value of average face value
⑦: Minimum value of average face value
⑧: Width of average face value (calculating formula ｜⑥-⑦｜)..object to be judged (WIDTH AVE)
⑨: Maximum value of proximal face difference .....object to be judged (PROXIMAL)
⑩: Maximum value for each face
⑪: Minimum value for each face
⑫: Average value for each face (average face value)
⑬: Proximal face difference (calculating formula ｜⑫n - ⑫n+1｜)
⑭: Face number
⑮: Displays the previous measurement data
⑯: Displays the next measurement data
⑰: Displays the previous face number data
⑱: Displays the next face number data
⑲: The data number and the measurement value that became NG in the judgment are displayed in red.

* If you touch PROXIMAL item, the display is switched to SD (standard deviation).

4) Measurement result graph display screen: polygon mirror measurement mode



①: The screen returns to the main menu.
②: Data and graph are switched.
③: Width of sampling data (above-referenced)
④: Width of average face value (above-referenced)
⑤: Maximum value of proximal face difference
⑥: Face tangle result mark (refer to the figure shown below)
⑦: Y-axis item (face tangle value: second unit)
⑧: X-axis item (face number: 2 to 24 faces)
⑨: The previous data is displayed.
⑩: The next data is displayed.
⑪: The data number and the measurement result that became NG in the judgment are displayed in red.



* If the operation is stopped by pressing the button before the number reaches the set number of samples, the data number and the measurement result are displayed in red.
The mark on the graph is displayed in red purple.

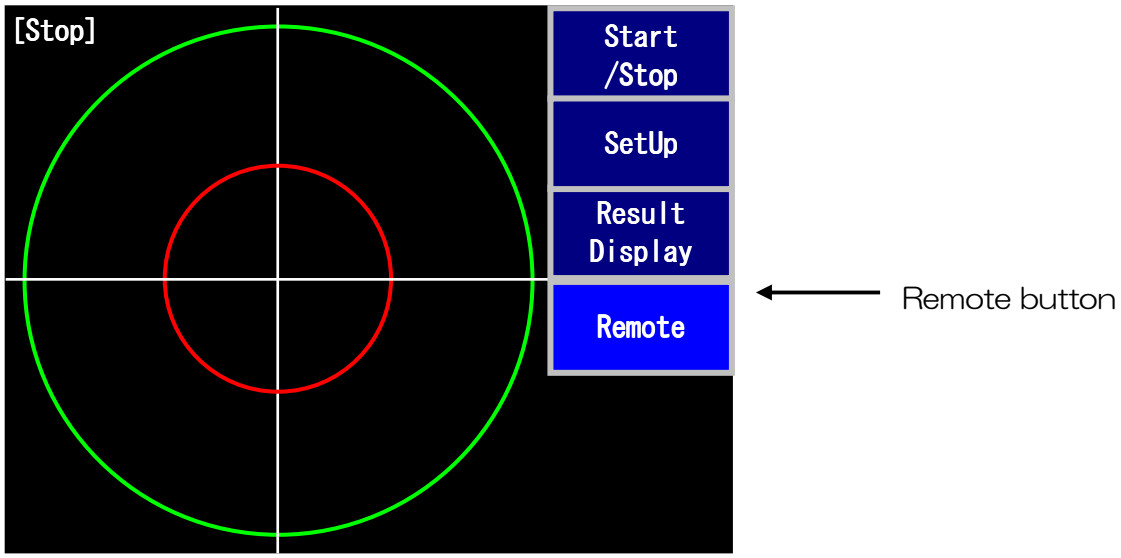
2-5 Other

2-5-1 Remote mode setting

If OK button is pressed for the confirmation message after the Remote button is pressed on the main screen, the system enters remote status. I/O interface input or communication command input is activated and the screen input from the touch panel is disabled.

("*" is added to the beginning of the title and the title characters changes to pale blue.)

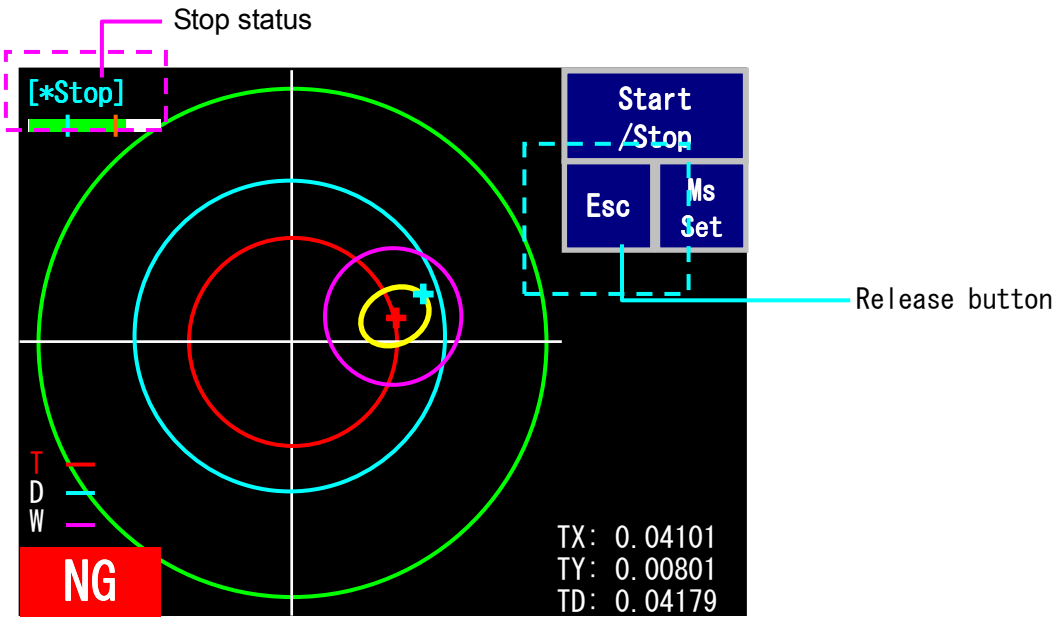
As the status in remote mode is memorized, the system is started up in remote mode when the power supply is turned ON next time.



2-5-2 Release of remote mode

Press Esc button on the screen long for four seconds or more while the measurement is stopped.

If the remote mode is released the screen returns to the main screen.



3. Connection of external device

3-1 I/O interface

The removable terminal block is equipped with control I/O and high-speed input shown in the table below. For the wiring, refer to the interface circuit diagram shown in page 63.

1) When mode 1 is selected

Signal name	Content of signal	Description	Remark (execution condition)
IN1	Measurement start	Switched to measurement screen	Executed only while the measurement is stopped
IN2	Measurement stop	Switched to measurement stop screen	Executed only during measurement
IN3	Data output	1 measurement result is output per input	Executed during measurement or while the measurement is stopped
IN4	Zero set	Equivalent processing to that of ZeroSet Set button The center of measurement is changed to light spot position	Executed only while the measurement is stopped If it is set to ON, the screen shifts to zero set screen If it is set to OFF, zero set processing is carried out
IN5	Zero reset	Equivalent processing to that of ZeroSet ReSet button The center of measurement is changed to center of screen	Executed only while the measurement is stopped If it is set to ON, the screen shifts to zero set screen If it is set to OFF, zero reset processing is carried out
OUT1	Output during measurement	Output only during measurement	
OUT2	NG output	Output while NG result is displayed (continued even while the measurement is stopped)	Synchronized with NG display on the screen
COM	Output common		
SYNC	External synchronous signal input	External sampling signal	High-speed input
GND	Internal GND		

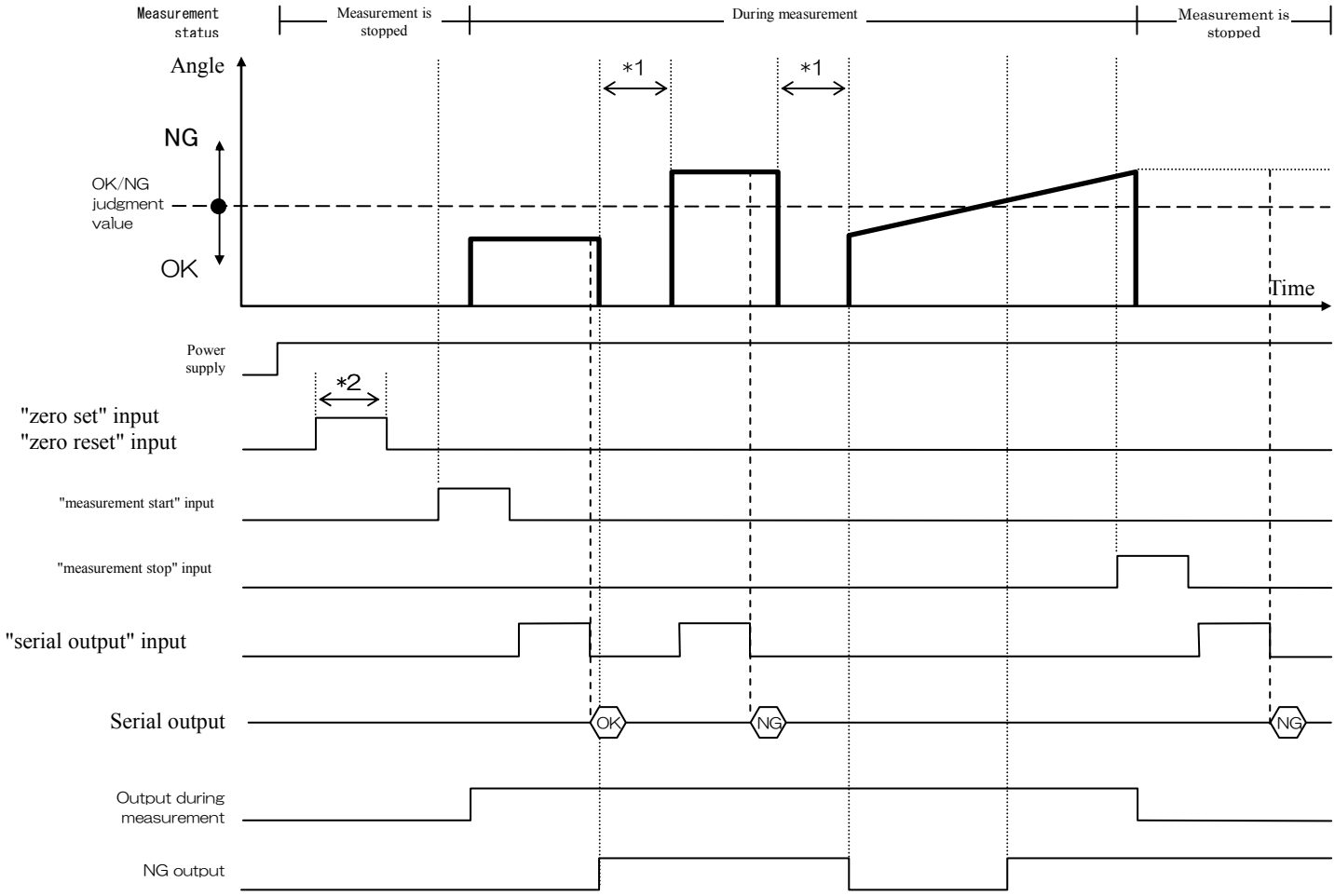
* The operation of I/O input (IN1 to IN5) is executed only in remote status.

2) When the mode 2 is selected

Signal name	Content of signal	Description	Remark (execution condition)
IN1	Measurement start / stop	During measurement >> switched to measurement stop screen During stop >> switched to measurement start screen	
IN2	Measurement stop	Switched to measurement stop screen	Executed only during measurement
IN3	Data output	1 measurement result is output for one input	Executed during measurement or while the measurement is stopped
IN4	Zero set	Equivalent processing to that of ZeroSet Set button The center of measurement is changed to light spot position	If it is set to ON, the screen shifts to zero set screen If it is set to OFF, zero set processing is carried out
IN5	Zero reset	Equivalent processing to that of ZeroSet ReSet button The center of measurement is changed to center of screen	Executed only while the measurement is stopped If it is set to ON, the screen shifts to zero set screen If it is set to OFF, zero reset processing is carried out
OUT1	Output during measurement	Output only during measurement	
OUT2	NG output	Output while NG result is displayed (continued while the measurement is stopped too)	Synchronized with NG display on the screen
COM	Output common		
SYNC	External synchronous signal input	External sampling signal	High-speed input
GND	Internal GND		

* The operation of I/O input (IN1 to IN5) is executed only in remote status.

- Control I/O operation timing chart (standard measurement mode)



*1: period without detected light *2: input signal is 0.2sec or more

Content of signal	Description
Measurement start (START)	If the input is set to ON while the measurement is stopped, the measurement is started
Measurement stop (STOP)	If the input is set to ON during measurement, the measurement is stopped
Data output	If the input is set to OFF during measurement or measurement stop, the data is output
Zero set	If the input is set to ON while the measurement is stopped, the screen shifts to zero set screen. If the input is set to OFF, zero set is fixed.
Zero reset	If the input is set to ON while the measurement is stopped, the screen shifts to zero set screen. If the input is set to OFF, zero reset is fixed.
Output during measurement	During measurement, the output is continued
NG output	This signal is output when the measurement result is NG. If the measurement result is NG while the measurement is stopped, NG output is continued even while the measurement is stopped

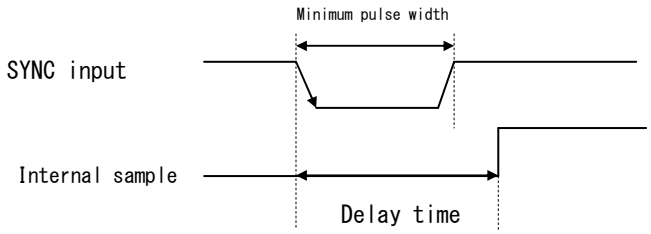
- SYNC input

If "EXT1" is selected for synchronous selection (Sync) in the standard measurement mode, the measurement and the data saving are carried out in the timing synchronized with the input signal.

In the measurement mode, the motor 1-rotation signal is input in this input terminal to use it as a trigger signal for starting the acquisition of 1-rotation data.

(Electric specifications)

Input level	: TTL (0-5V)
Minimum pulse width	: 500ns
Logic	: falling edge
Delay time	: (250ns+50ns) or less

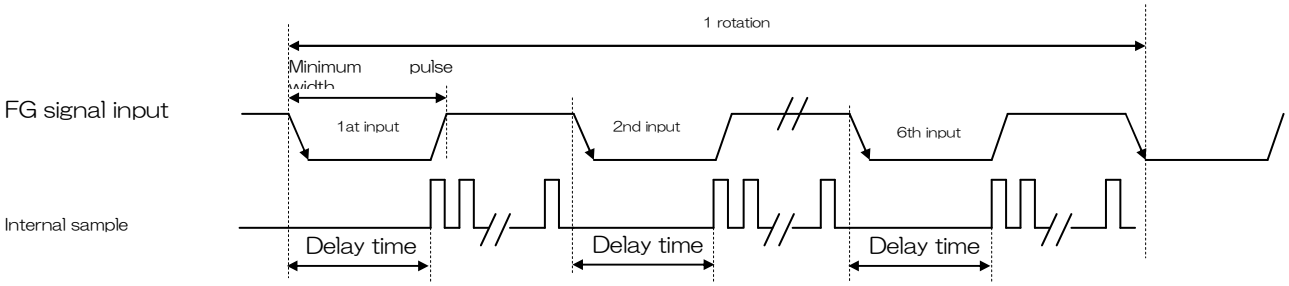


- Measurement external synchronization function

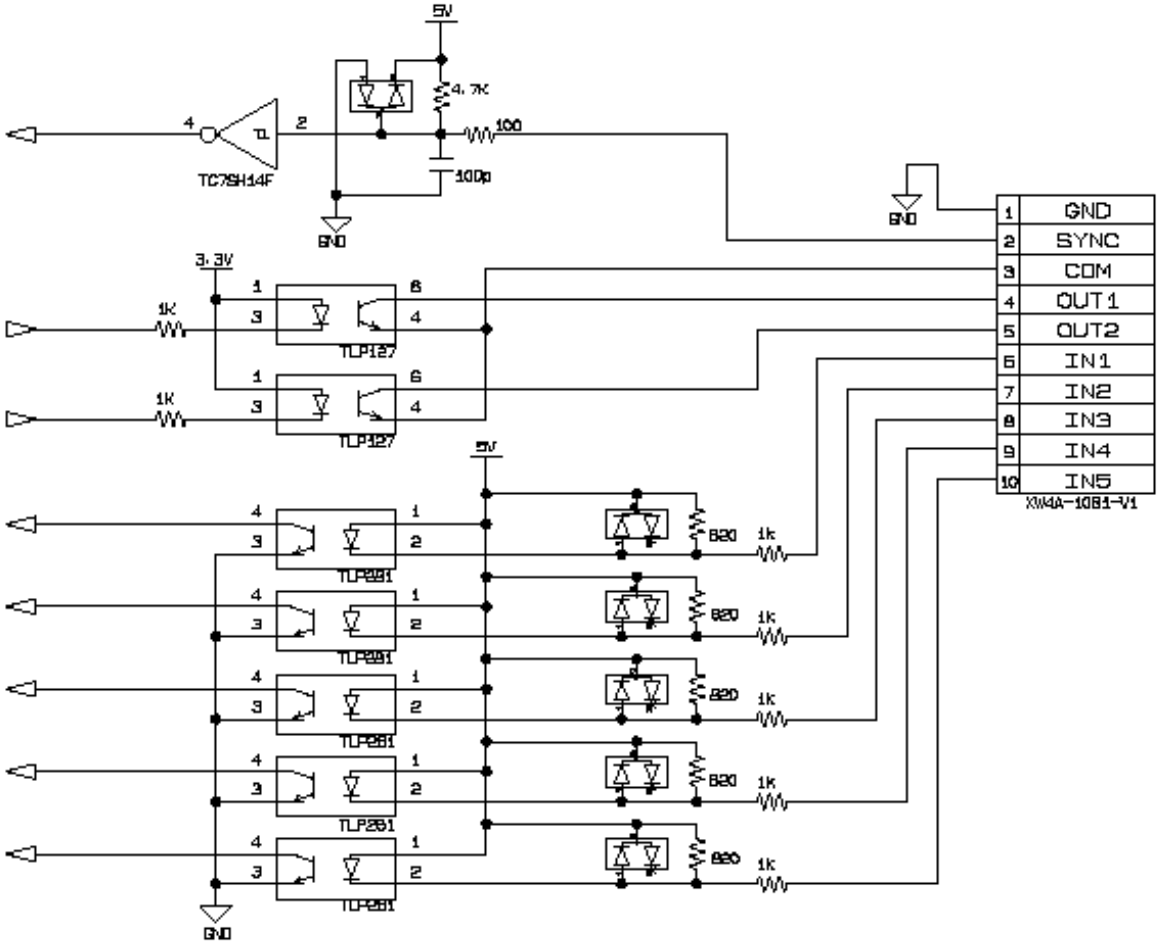
If FG output signal of motor driver IC is connected to SYNC terminal of I/O interface, the data can be sampled in synchronization with FG signal.

(Operation timing)

When FG Num = 6



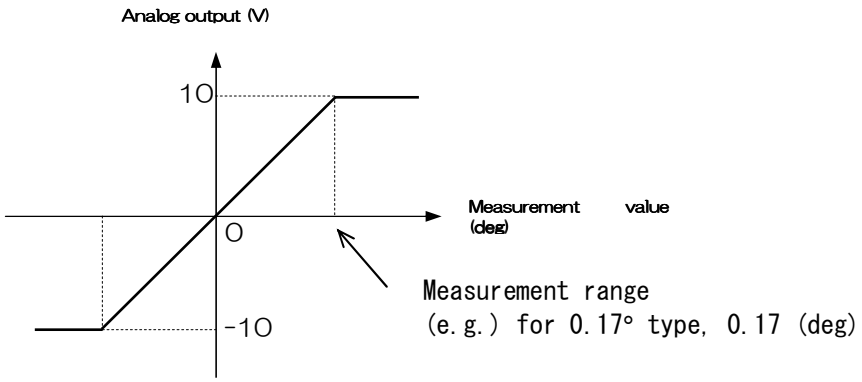
<Interface circuit>



* To turn ON the input of IN1 to 5, short-circuit each input terminal to GND terminal (1-pin) with no-voltage contact such as a switch.

3-2 Analog output

The analog voltage proportional to measurement value can be output from BNC connector (CH1, CH2). For the output item, X, Y, D or OFF for both of CH1 and 2 can be selected from the screen setting (refer to page 46).



Relationship between measurement value and output voltage

・ In the figure shown above, X or Y output is set. The output range when D output is selected is 0V to 10V.

・ The output is output only during the measurement period ([Start]). During measurement stop, ([Stop]), the output is held.

・ If "Zeroset" is set, the present output voltage is set to 0V.

3-3 Serial interface

3-3-1 Specifications

Specifications / complying with EIA and RS-232C

Communication method : start-stop system

Transmission code : ASCII

Data bit length : 8bit

Stop bit length : 1bit

Parity check : none

Baud rate : 9600, 19200 bit/sec selected

Flow control : none

Connector pin number

Pin number	Signal name	Remark
1	NC	
2	RXD	Received data
3	TXD	Sent data
4	DTR	Always ON
5	GND	
6	NC	
7	RTS	Always ON
8	NC	
9	NC	

* For the connection with PC, use DSub9-pin (female-female) cross cable.

3-3-2 Functions

1) Measurement data output (data is output once per measurement)

If it is set to ON in the serial output (Seri-Out) screen, the measurement data is output immediately after the measurement.

a) Standard measurement mode

R	A	,	①	,	②	,	③	,	④	,	⑤	,	⑥	,	⑦	,	⑧	,	⑨	,	⑩	,	⑪	,	⑫	CR	LF

Content of data

No.	Name of item	Description	Number of characters
①	Judgment result	OK >> O NG >> N ERROR (result incomplete) >> E All judgment settings are set to OFF >> *	1
②	Data number	Data number set on the data screen (or automatic increment value)	8
③	Present value X	During measurement, present X value (when the measurement is terminated, X value while the measurement is stopped)	8
④	Present value Y	During measurement, present Y value (when the measurement is terminated, Y value while the measurement is stopped)	8
⑤	Present value D	During measurement, present D value when the measurement is terminated, D value while the measurement is stopped)	8
⑥	Maximum X value	Maximum value of X	8
⑦	Minimum X value	Minimum value of X	8
⑧	X width	Width of X (| maximum X value - minimum X value |)	8
⑨	Maximum Y value	Maximum value of Y	8
⑩	Minimum Y value	Minimum value of Y	8
⑪	Y width	Width of Y (| maximum Y value - minimum Y value |)	8
⑫	Maximum D value	Maximum D value	8

b) Motor measurement mode

R	A	,	①	,	②	,	③	,	④	,	⑤	,	⑥	,	⑦	,	⑧	,	⑨	,	⑩	,	⑪	,	⑫	,	⑬	,	⑭	,	⑮	,	⑯	,	⑰	CR	LF

Content of data

No.	Name of item	Description	Number of characters
①	Judgment result	OK >> O NG >> N ERROR (result incomplete) >> E All judgment settings are set to OFF >> *	1
②	Rotation frequency	Rotation frequency of motor	5
③	Number of samples per rotation	Number of data samples that are obtained per rotation	4
④	Number of measurement cycles	Number of laps to be measured	4
⑤	FG pulse count	Number of index triggers	4
⑥	Data number	Data number set on the data screen (or automatic increment value)	8
⑦	Maximum X value	Maximum value of X	8
⑧	Minimum X value	Minimum value of X	8
⑨	Maximum Y value	Maximum value of Y	8
⑩	Minimum Y value	Minimum value of Y	8
⑪	Axial runout X value	Axis fallen (X value at gravity center)	8
⑫	Axial runout Y value	Axis fallen (Y value at gravity center)	8
⑬	Axial runout distance	Axis fallen (D value at gravity center)	8
⑭	Outermost point X value	Outermost point (X value)	8
⑮	Outermost point Y value	Outermost point (Y value)	8
⑯	Outermost point distance	Axis fallen (D value at gravity center)	8
⑰	Amplitude	Maximum amplitude	8

c) Polygon mirror measurement mode

R	A	,	①	,	②	,	③	,	④	,	⑤	,	⑥	,	⑦	,	⑧	,	⑨	,	⑩	,	⑪	,	⑫	,	⑬

,	⑭	,	⑮	,	⑯	,	⑰	,	⑱	C R	L F

* 1set (⑭ to ⑱) is repeated for the number of faces.

Content of data

No.	Name of item	Description	Number of characters
①	Judgment result	OK >> O NG >> N ERROR (result incomplete) >> E All judgment settings are set to OFF >> *	1
②	Rotation frequency	Rotation frequency setting value	5
③	Number of faces	Face count setting value	2
④	Number of measurements	Sampling data count (calculating formula: number of faces x lap)	4
⑤	Rotating direction	Rotating direction (CW/CCW)	3
⑥	Data number	Number set on DataNo screen (or automatic increment value)	8
⑦	Maximum value	Maximum value of sampling data Y value	8
⑧	Minimum value	Minimum value of sampling data Y value	8
⑨	General face tangle	Width of sampling data (calculating formula: ｜maximum value - minimum value｜)	8
⑩	Face average maximum value	Maximum value of average face value	8
⑪	Face average minimum value	Minimum value of average face value	8
⑫	Face average face tangle	Width of average face value (calculating formula: ｜maximum value of average face value - minimum value of average face value｜)	8
⑬	Maximum proximal face difference value	Maximum value of proximal face difference (calculating formula: MAX ｜proximal face difference｜)	8
⑭	Average face value	Average value for each face (average face value)	8
⑮	Maximum face value	Maximum value for each face	8
⑯	Minimum face value	Minimum value for each face	8
⑰	Proximal face difference	Proximity difference depending on average face value (calculating formula: ｜average face value (N) - average face value (N+1)｜)	8
⑱	Standard deviation of face	Standard deviation of sampling data Y value for each face	8

2) Remote control

If a communication command is sent from host equipment, readout of judgment result, setting content, change of setting content, and zero set etc. can be carried out.

(These operations can be carried out only in remote status when Remote button on the main screen is pressed.

To reset the remote status, press Esc button long (for four seconds or more) or send the remote reset command.)

* For details, refer to the exhibit, "Communication Interface Instruction Manual".

4. Other

4-1 List of error displays

If an error or warning is generated at measurement or setting, the code is displayed.

The content of main errors and warnings is displayed. Check the content and take measures.

Status	Code	Message	Description
Error	E1	Level Low	Received light level reduction error
	E2	Level Over	Received light level excess error
	E3	Area Out	Light spot area out error
	E5	Input Error	Input value range out error
	E6	10 Item Over	10 display items or more selection error
	E7	500KHz Over	Sample frequency excess error (MAX500)
	E8	Data Over	Obtained data count excess error
	E9	PW Set Error	LD power automatic adjustment error
Warning	W2	Level Over	Received light level excess
	W4	Level Over	Received light amount edge saturation

4-2 Troubleshooting

Symptom	Cause	Measure	Referential page
The power supply is not turned ON	The power cord is disconnected	Insert it in an outlet securely	-
The light spot pointer is not displayed on the monitor	The connection cable is disconnected	Connect the cable properly when the power supply of the controller is turned OFF	P. 7 to 16
	The distance to object to be measured is too long	Set the distance to object to be measured to 230±30mm or less	-
	An object with larger angular displacement than measurement range is measured	Measure the angular displacement within the measurement range (±0.17°, ±0.5°, ±0.9°)	-
	The laser output is low	Adjust the laser output with the setting menu LD POWER	P. 32
	Lifetime of laser	If the laser output fluctuates heavily or the output does not increase after setting LD POWER, please contact our company	-
The measurement result is unstable	The reflection rate of an object to be measured is low	An object to be measured of HRAD is specular object	-
	The laser output is low	Adjust the laser output with the setting menu LD POWER	P. 32
	There is vibration	Check reflection rate and laser output are proper and eliminate the cause of vibration	-
	There is ambient light	Eliminate the ambient light around HRAD head	-
There is no reaction to I/O input	IN1 to 5 and GND are not connected properly	Connect IN1 to 5 and GND properly	P. 59
	The system is not in remote status	Press Remote button from main menu and set the system to remote status	P. 58
I/O output is not carried out	OUT1, 2 and output common are not connected properly	Connect OUT1, 2 and output common properly	P. 59
There is no reaction to command	The serial cable is not connected properly	Connect the serial (cross) cable properly	P. 7
	The baud rate is mismatched	Set the baud rate properly	P. 52
	The system is not in remote status	Press Remote button from main menu and set the system to remote status	P. 58

4-3 System specifications

Measurement range	±0.17 degree (±10 minutes 12 seconds) ±0.5 degree (±30 minutes 00 second) ±0.9 degree (±54 minutes 00 second)
Measurement distance	230±30mm (0.17) 150±30mm (0.5, 0.9)
Resolution	±0.4 (0.17) ±1.0 (0.5) ±1.8 (0.9)
Sampling speed	250/500k sample/second
Light source	Semiconductor laser (wavelength 658nm)
Outgoing beam output	5.0mW or less (Typ2.5mW class 3R)
Laser beam diameter	Φ1.0mm or less (at beam window)
Display and setting part	5.7-inch TFT color liquid crystal display with touch panel
Measurement item	Standard measurement mode: X, Y, D, MAX_X, _Y, MIN_X, _Y, WIDTH_X, _Y Motor measurement mode: X, Y, D, MAX_X, _Y, MIN_X, _Y, WIDTH_X, _Y Center of gravity: AXTL_X, Y Outermost point: FMST_X, Y Amplitude: WIDTH Polygon mirror measurement mode: X, Y, D, MAX_X, _Y, MIN_X, _Y, WIDTH_X, _Y General: MAX, MIN, P-P Face tangle: MAX, MIN, W P-P Proximity: PROXIMAL, data of each face (AVE, MAX, MIN, tangle error difference)
Function	Relative origin, tolerance (upper and lower limits), unit switching (degree, minute second), setting value saving / reading Measurement data serial output, adjustment of amount of outgoing beam
Analog output	2CH: selected from X (±10V), Y (±10V), D (10V) Output impedance: 300Ω, offset ±20mV or less
External synchronous signal input	1CH (TTL level)
External control I/O	Photocoupler insulation input (5CH), Open collector output (2CH, 1CH is OK/NG output)
Serial I/F	RS-232C (measurement data I/O)
Power supply (power consumption)	AC100 - 240V±10% 50/60Hz (15w)

5. Appendix

5-1 Data collection sample program

This program is a macro of Excel that obtains the measurement of controller through serial communications.

PC requires the operating environment for Microsoft® Excel.

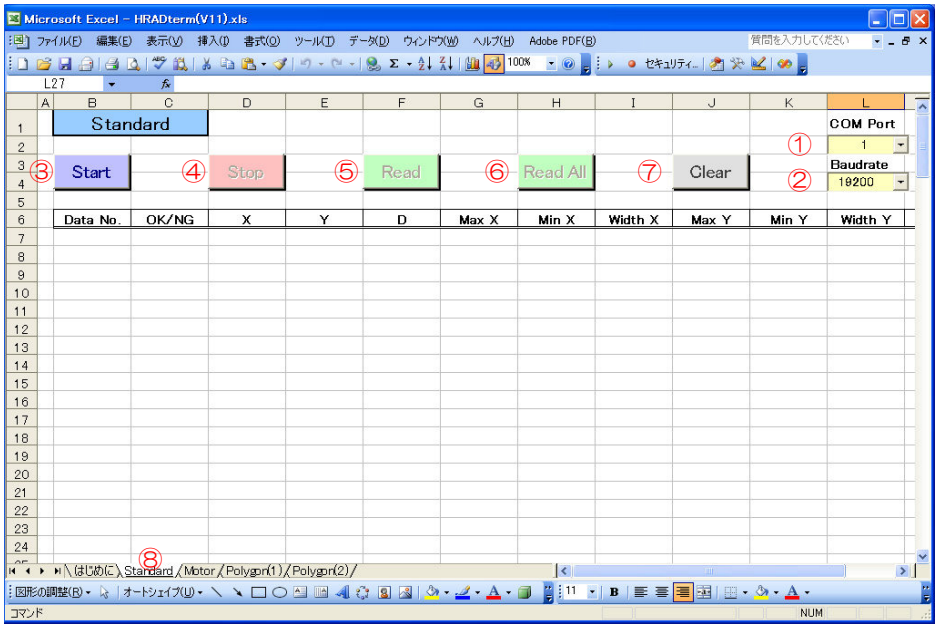
5-1-1 Description of operation

Connect the controller and the PC with DSub9-pin (female-female).

Execute "HRADterm.xls".

The work sheets are separated for each measurement mode (Standard, Motor, Polygon 1, 2). Select a sheet depending on the application of measurement.

(e.g.) Work sheet for Standard mode



No.	Name	Description
①	COM Port	Serial communication port number (COM1-8)
②	Baudrate	Set the communication baud rate (9600/19200) according to controller
③	Start button	The measurement is started
④	Stop button	The measurement is stopped
⑤	Read button	RA command is sent and 1 data of final measurement result is received
⑥	Read All button	RZ command is sent and max. 100 past data are received
⑦	Clear	The cell data on the screen is cleared
⑧	Sheet tab	The sheet of each measurement mode is selected

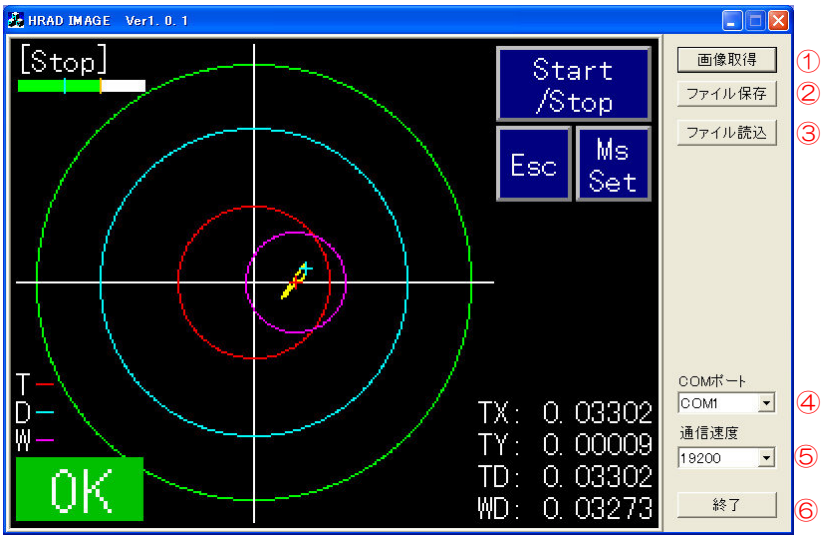
5-2 Screen image data acquisition program

This program can import the measurement screen image of the controller in PC to display it and save the image data as a file in BMP format. It can also read out the saved image data.

5-2-1 Startup

Before obtaining a screen, connect the controller and the PC with a serial cable.

Execute "Capture.exe" (the figure below shows the screen after an image is received).



5-2-2 Description and operation

① Screen acquisition button

Be sure to set the screen of the controller to the status after the measurement is terminated, and then press the image acquisition button. In other screen, an execution error is generated. If the image data is transferred properly, the hard copy of controller screen is displayed on the PC in approximately six seconds after the start (an image on the graph screen can be also obtained).

② File save button

An obtained image can be saved in BMP file format.

③ File read button

A saved image in BMP file format can be read.

④ COM port

Select a serial communication port number (COM1 to 9) of PC.

⑤ Communication speed

Select the communication speed with the controller.

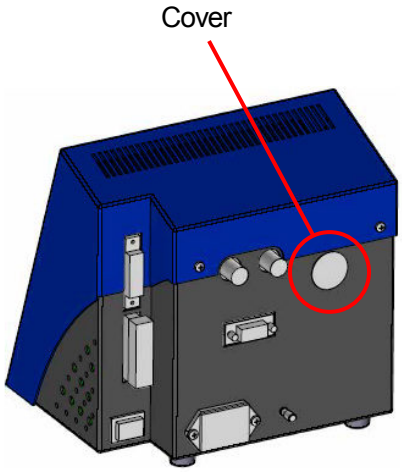
Select 19200bps or 9600bps and adjust it to the value of the controller.

⑥ Quit button

This software is quitted.

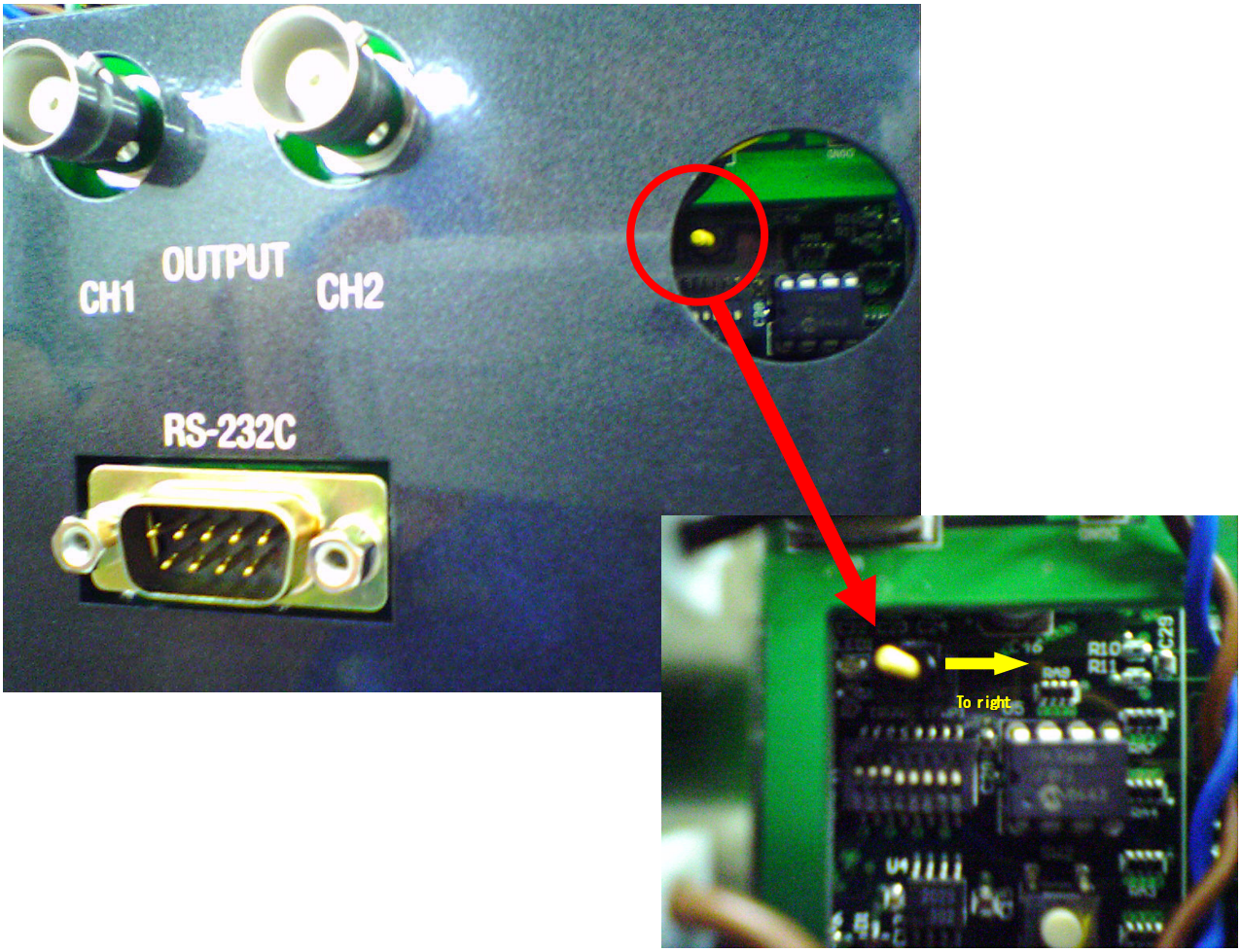
5-3 Procedure for updating the firmware

① Check the power supply is turned OFF and remove the cover on the rear surface of the controller.



Rear surface of controller

② Tilt the yellow pin in the back to the right side seen from the rear surface of the controller (photo shown below).

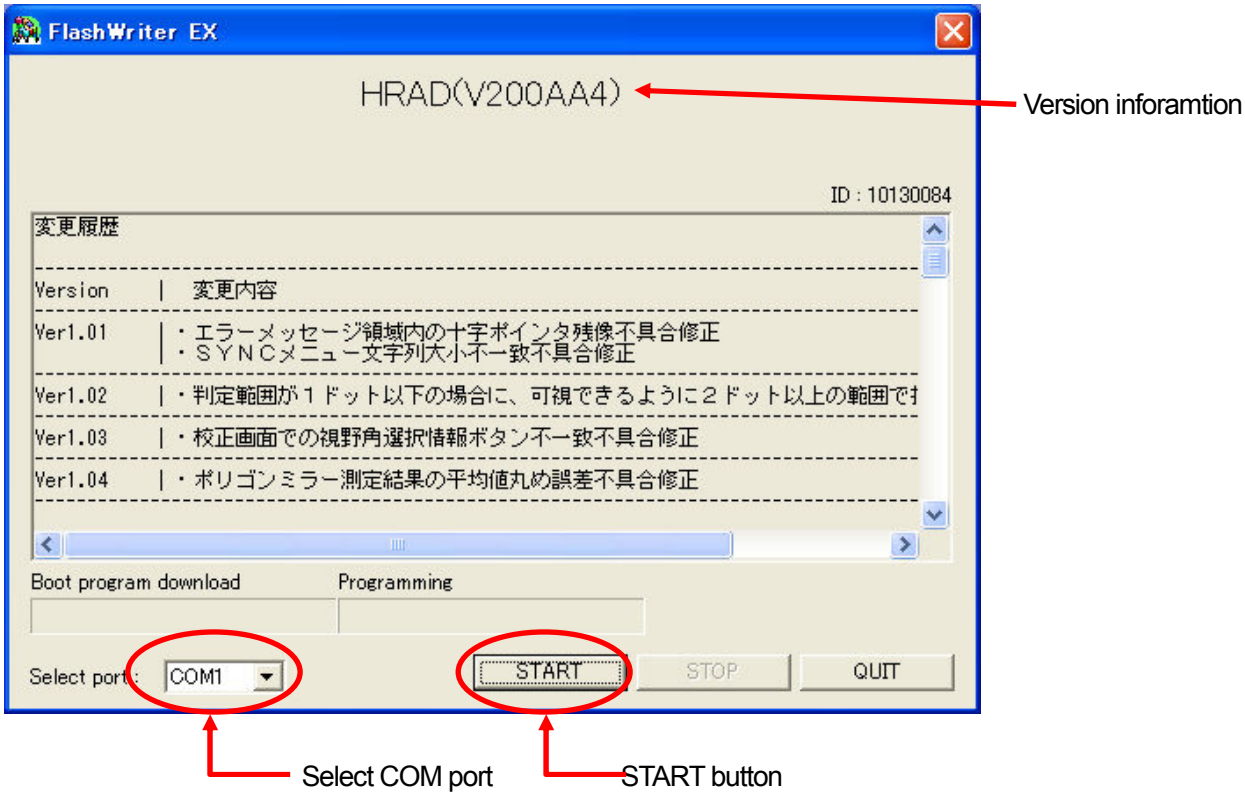


③ Connect the PC and the controller with RS-232C cross cable and turn ON the power supply of the controller.

④ Activate the rewriting software (HD_******.exe) of software to be upgraded displayed on PC.

e.g.:

⑤ After activating it, check the version to be rewritten and select the COM port of PC that is connected with the controller.



⑥ Press START button on the screen.

The rewriting of upgrade software is started.

* During the rewriting, do not turn OFF the power supply of the controller.

If an error message is displayed, check the following.

a) Is the COM port selected by rewriting software correct?

b) Isn't the COM port selected by rewriting software opened by other software?

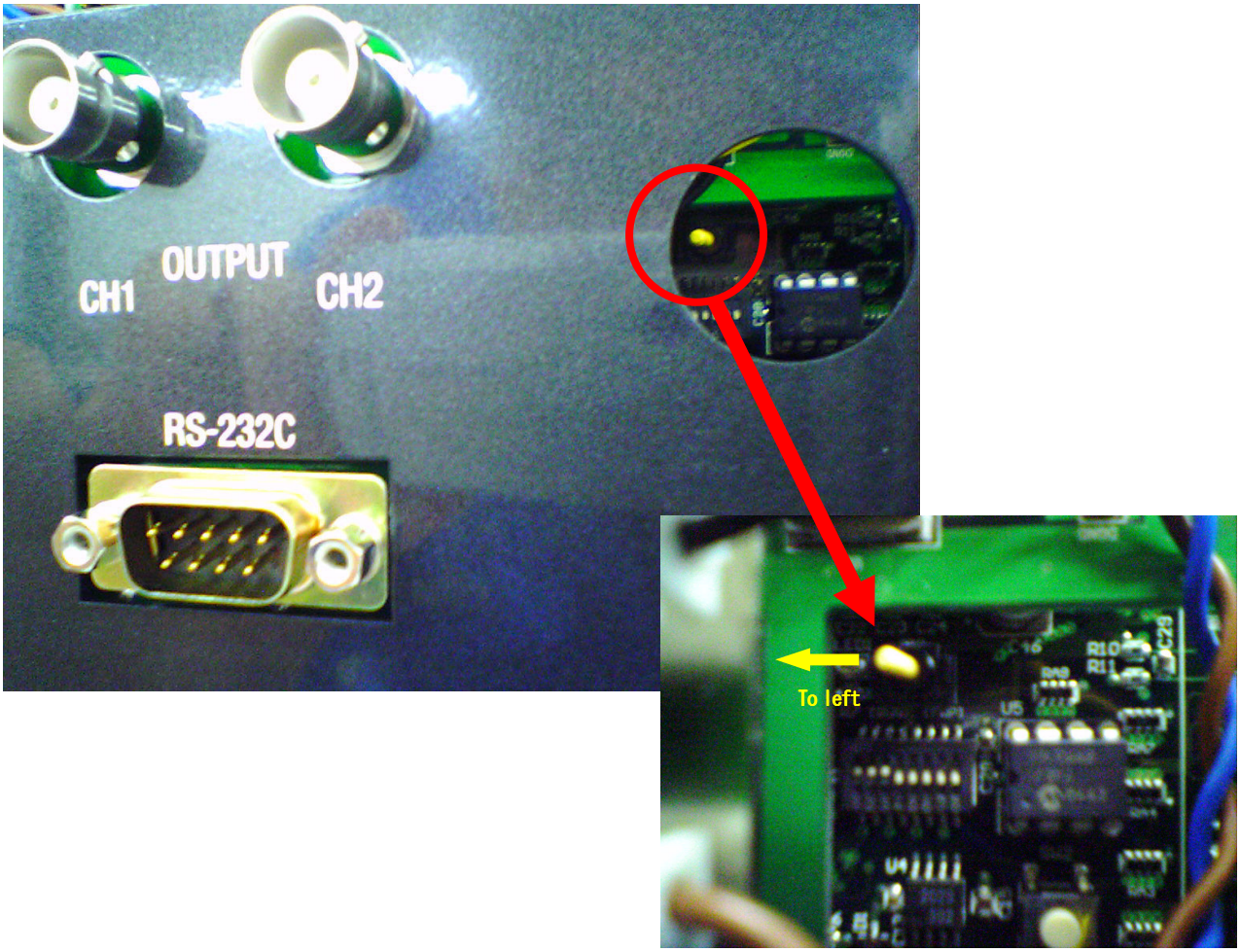
c) Are the controller and the PC connected with RS-232C cross cable?

d) Doesn't the connected cable cause breaking?

⑦ If the message shown in the figure below is displayed, the rewriting is terminated successfully.
Press QUIT button to quit the rewriting software.

⑧ Turn OFF the power supply of the controller once, and then reset the yellow pin you tilted in step ② (tilt it to left side).

* If you forget to reset it, nothing is displayed on the screen even if the power supply is turned ON.



⑨ Reset the removed cover on the rear surface. The upgrade is completed.

6. Guarantee and after-the-sale service

● Guarantee

When you contact our company, please inform us of serial number on the side surface of your product.

The guarantee period is one year after the delivery.

However, the following cases are excluded from the guarantee target. The product will be repaired with extra charge.

- A failure or damage is caused by wrong usage, modification or repair that is not carried out by our company's staff
- A failure or damage caused by improper handling such as falling during transportation or movement
- A failure or damage caused by fire, salt damage, gas damage, abnormal voltage, natural disaster such as earthquake, thunder, wind and flood damage
- A failure or damage caused by handling that goes against usage or precautions shown in the manual

● After-the-sale service

Before requesting the repair, please check the items shown in page 71.

If you have any inquiries, please contact the sales group, OST business division of or company.

<During guarantee period>

If a failure is caused in usual use status following precautions shown in the user's manual, the product will be repaired without charge.

For a failure out of guarantee range shown above, the product will be repaired with extra charge.

<After the guarantee period>

If the functions can be maintained by repair, we will repair the product as requested.

● Repair service period

The minimum holding period of this product's performance components for repair (parts requierd for maintaining the functions) is one year after the manufacturing is discontinued. This period is set as repair service period. Even after the component holding period, the product may be repaired. Please contact the sales group, OST business division of or company.

* For a failure generated in this product, our company does not accept any responsibility other than repair without charge based on this guarantee.

For More Information Call to us:

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