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Translation of the original instructions

Machine control System for grinding machines SB-6500 Gauge module SB-6571 Instruction manual

ACCRETECH

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Contents

Contents 3
Read This Manual Carefully 5
Introduction 5
Copyright and Liability 5
Warning Indications in This Manual 6
Signal word 6
Symbols 6
Cautions about power supply 7
Cautions about usage 7
Cautions to Note when Transporting This Unit out of Japan 9

1. BEFORE GETTING STARTED 10
1.1 Name 11
1.2 Outline 11
1.3 Features 11

2. INSTALLATION AND CONNECTION 12
2.1 Configuration 13
2.2 Layout 14
2.3 Functions 15
2.3.2 Zero set 15
2.3.9 Filter 16
2.3.15 Memory function 18
2.4 Input/output function 21
2.4.1 I/O signal 21
2.4.3 I/O input output signal assignment 24
2.4.4 I/O connector spec 26
2.5 Installation environment 27
2.6 Installing the unit 27
2.6.1 Installation 28
2.6.2 Preparing the power cable 29
2.7 Connection with each device 30
2.7.1 Connection flow 30
2.7.2 LVDT gauge connection 30
2.7.3 Connecting external devices 31
2.7.4 Timing Chart 35
2.7.5 Connecting the power cable 43

3. MEASUREMENT PREPARATION 44
3.1 Measurement preparation flow 46
3.2 Adjusting the gauge 47
3.2.1 Advance preparation 47
3.2.2 Setup flow 52
3.2.3 Perform both zero setting and magnification calibration 54
3.2.4 Only perform zero setting 60
3.2.5 Gauge Reset 60
3.3 Setting the correction value 61

3.3.1 Offset 61
3.4 Auto master (external signal) 62
3.4.1 Auto Master Error Handling 63
3.4.2 Auto Master Settings 63
3.5 Setting the grading point 64
3.5.1 Relationship between grading points and grading output signals 64
3.5.2 Signal Cut Function(S-CUT) 64
3.5.3 Setting the grading point (in-process measurement) 66

4. MEASUREMENT 68
4.1 Flow until measurement begins 69
4.2 Measurement screen selection 70
4.3 Start measurement 71

5. OPERATION DURING MACHINING (IN-PROCESS MEASUREMENT) 73
5.1 Changing the finished size 74
5.2 Size Error detection 75
5.3 Ideal data registration 77

6. SETTINGS AND VERIFICATION 78
6.1 Main screen 79
6.2 Setting screen 81
6.3 Gauge setting screen 88
6.4 Correction value setting screen 90
6.5 Log screen 91
6.6 CNC Setting screen 93
6.7 Dashboard screen 94

7. SPECIFICATION 95
7.1 Specifications 96
7.2 External view 97
7.3 Accessories 98

8. TROUBLESHOOTING 99
Product Warranty 108
Appendix 109

Read This Manual Carefully

Be sure to read this section before using this unit.

Introduction

Thank you very much for purchasing the SB-6500 Gauge module, a machine control system for grinding machines (hereafter referred to as “the unit”).

This Instruction Manual (hereafter referred to as “the manual”) provides important safety precautions and correct operation procedures to ensure the unit is used safely. All operators working around the unit should understand the contents of this manual to perform their duties safely.

However, it is not possible to predict all hazards due to the operating environment, human error, and others. Therefore, be sure to contact TOKYO SEIMITSU customer support before performing any procedure not described in this manual. In addition to the cautions stated in this manual, it is recommended that you take generally required safety measures.

This manual is based on standard specifications. When reading, please check your delivery specification to understand the exact specifications of your unit. If you have any questions or find any unclear points related to the specifications or contents described in this manual, contact TOKYO SEIMITSU customer support.

Copyright and Liability

The copyright for this manual is owned by TOKYO SEIMITSU CO., LTD (hereafter referred to as “Tokyo Seimitsu”). It is prohibited to reproduce, duplicate or translate this manual in part or in whole without the express permission of TOKYO SEIMITSU.

Please be aware that the contents of this manual are subject to change without notice.

The contents of this manual have been prepared to ensure accuracy with the utmost care. However, please understand that even if errors or omissions are found, it may not be possible to immediately correct them.

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Warning Indications in This Manual

Signal word

This manual uses warning indications (signal words) to indicate dangerous situations that may occur if the unit is used incorrectly. Ignoring these warnings could result in serious injuries or damage to the unit, optional devices, or surrounding facilities.

Be sure to follow the instructions in this manual and each warning indication that is displayed on the unit.

DANGER

This warning is displayed to indicate an imminently hazardous situation in which personnel may die or suffer serious injuries*1 while operating or performing maintenance of the unit.

*1. Injuries including impaired eyesight, wounds, burns, electric shock, bone fractures, poisoning and their subsequently displayed after-effects, as well as injuries requiring hospitalization for treatment or long-term outpatient care.

WARNING

This warning is displayed to indicate a potentially hazardous situation in which personnel may die or suffer serious injuries*1 while operating or performing maintenance of the unit.

CAUTION

This warning is displayed to indicate a situation in which personnel may suffer minor injuries*2 or moderate injuries*3 while operating or performing maintenance of the unit.

*2. Injuries that do not require hospitalization for treatment or long-term outpatient care.

*3. Injuries that require hospitalization for less than one month and cause minor aftereffects.

NOTICE

This warning is displayed to indicate a situation in which the unit, optional devices, and surrounding facilities may be subject to malfunction or damage while the unit is in operation or undergoing maintenance.

Symbols

This manual uses the following symbols in addition to the indications “DANGER”, “WARNING”, “CAUTION”, and “NOTICE” to express the details of the indications in an easy-to-understand manner.

	Indicates content that requires caution.		Indicates an action that must be performed.
	Indicates prohibited actions.		Indicates precautions to prevent finger pinching.

	Indicates the prohibition of contact with water.		Indicates the prohibition of touching with wet hands.
	Indicates the prohibition of disassembly.		Indicates requirement for grounding.

Cautions about power supply

WARNING	
	**Be sure to ground the unit.** Failure to do so can cause an electric shock or unit malfunction.
	**When connecting the earth (PE) conductor of the specified power cable, always connect it first, then link the power (24 V) and GND (0 V) cables to the external power supply device before attaching the power cable to this unit. When disconnecting the earth conductor, always disconnect the power cable from the unit first, and then disconnect the power (24 V) and GND (0 V) cables.** Failure to do so can cause an electric shock or unit malfunction.
	**If any abnormal condition is found, immediately turn off the unit and remove the power cable from the unit.** Continuing to use the unit while it is malfunctioning may lead to electric shock or fire.
	**Do not connect the unit to any outlet for a voltage other than the specified value.** Supplying an inappropriate voltage to the unit could cause the operator to experience an electric shock or cause a fire.

Cautions about usage

WARNING	
	**The unit is designed and manufactured for general industrial use. Do not use it for applications where there is a direct threat to human life and high safety levels are required.** Doing so may result in death or serious injury.
	**This unit is not designed to be explosion-proof. Do not use in environments where explosion-proof unit is required.** Doing so may result in a fire or explosion.
	**Do not insert foreign objects, especially conductive materials like metal, into the unit.** Doing so may result in an electric shock, fire, or failure.
	**Keep the unit away from water, oil, chemicals, or similar materials.** Doing so may result in an electric shock, fire, or failure.

WARNING	
	**Do not use the unit in a place described below.** Doing so could cause an electrical shock, a fire, a malfunction, or falling of the unit that leads to a physical injury. □ Outdoors □ Locations with high humidity □ Locations subject to sudden temperature change (Condensation must be avoided) □ Close to water □ Locations subject to vibration or shocks □ Locations exposed to direct sunlight □ Locations containing dust, particles, electromagnetic waves, magnetic fields, or lampblack □ Locations containing corrosive gases
	**Do not disassemble the unit.** Doing so may result in an electric shock, fire, or failure.
	**Do not touch the unit with wet hands.** Doing so may result in an electric shock.
	**Do not insert your fingers into a gap of the unit.** Doing so may pinch your fingers, causing injury.
	**Do not connect any cable other than those supplied with the unit.** Doing so may result in a malfunction.
	**Do not use a broken power cable.** Doing so may result in an electric shock, fire, failure, or malfunction.
	**Do not use bundled cables.** Doing so may result in an electric shock, fire, failure, or malfunction.
	**Do not step on, crush, or pull power cables and cables connected between the unit and other devices.** Doing so may damage the cables and lead to electric shock, fire, or unit malfunction.
	**When moving the unit or any devices connected to it or when installing or uninstalling the power cable, any cables connected between the unit and other devices, connection cabele and gauge cable, turn off all devices and remove their power cables from the unit.** Failure to do so may result in an electric shock, fire, or failure.
	**When unplugging cables, always hold the plug and do not pull forcefully.** You may break the cable by pulling it.
	**Before restarting the unit following an emergency stop, check that the cause of the emergency stop has been addressed.** Failure to do so may result in an electric shock, injury, fire, or failure.

CAUTION	
	**Use the unit within the specified operating temperature range of 0°C to 50°C.** The unit may malfunction if it is used outside the specified operating temperature range.
	**To clean the unit, gently wipe a soft well-wrung cloth dampened with a neutral detergent. Do not use organic solvents or alcohol.** Using such solvents or alcohol may damage the unit.

Cautions to Note when Transporting This Unit out of Japan

Contact our customer support before bringing the unit out of Japan. You might be prohibited from exporting or using the unit due to local regulations. While referring Japanese Export Control Order and Foreign Exchange Control Order, be sure to follow all relevant national and international legal requirements and procedures, including obtaining necessary export permits. Tokyo seimitsu is not responsible for any accidents involving unauthorized transport of the unit out of Japan.

1. Before Getting Started

This chapter provides a summary of the unit, its standard system configuration, and the names and functions of the components.

1.1 Name

Official name : Machine control system for grinding machines
Model : SB-6500

S B - 6 5 7 1
└──┘ └┘
(1) (2)

(1) Common model
(2) Module type

71: Gauge module

1.2 Outline

This device (SB-6571) is an in-process model of a sizing gauge for grinding machines. The dimensions of various workpieces during and after machining are measured using an electric micrometer detector, and data such as measurement results and calculation results are sent to a host computer via an Ethernet interface. Operation and setting of each module is done via dedicated software (Hereafter referred to as SB6500-Software) installed on a PC (including CNCs with Windows installed) or via the LCD module. It also has the function of output a signal to the outside at a preset size.

All operations and displays performed by humans in this document are assumed to be performed using this SB6500-Softwar or LCD module. Operation via protocols such as OPCUA is also possible. Regarding this operation, we only provide information and do not guarantee its operation.

1.3 Features

- A modular system with independent functions

- By making each module independent, the system configuration is more flexible and easier to maintain

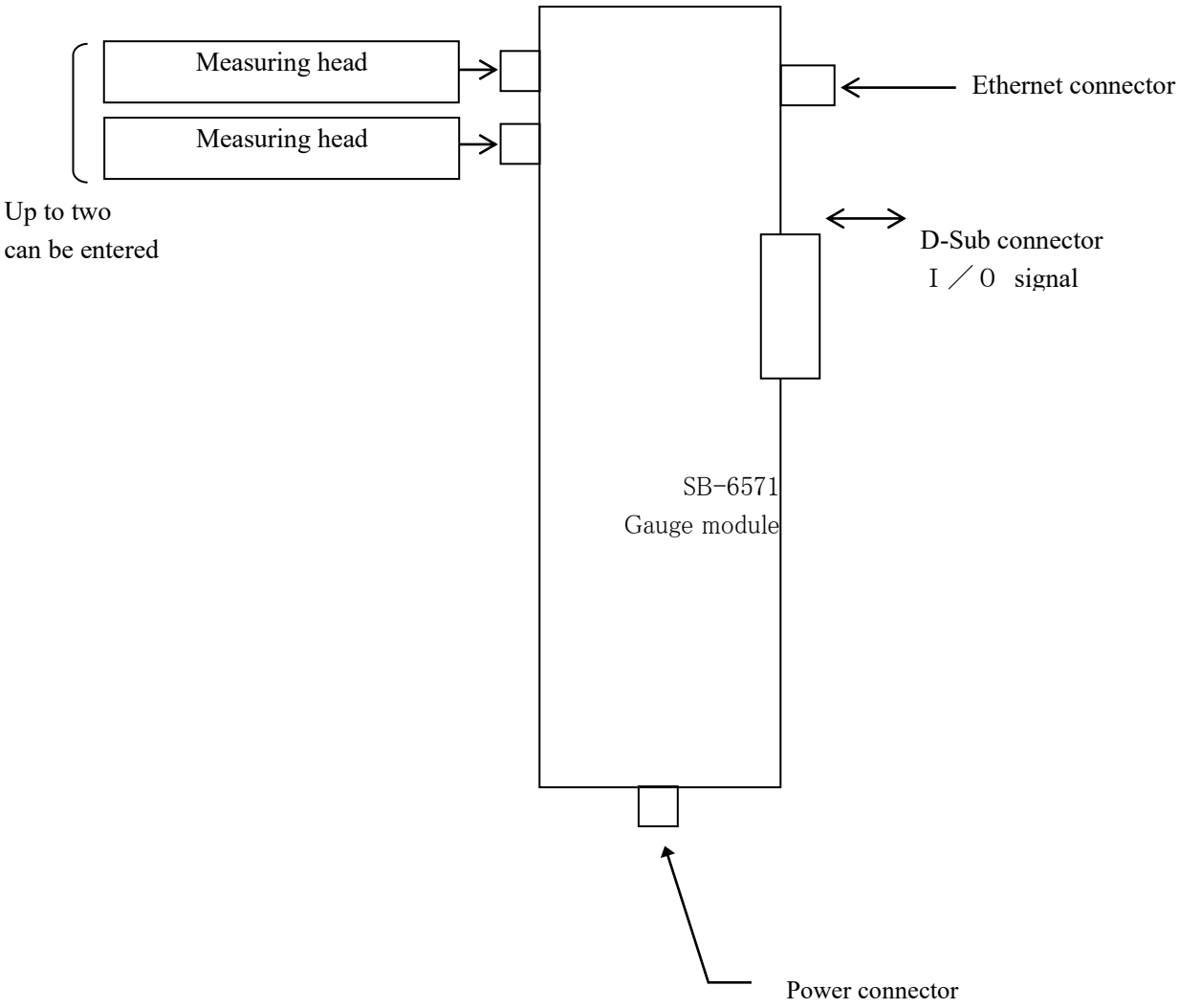
- Simple operation using the SB6500-Software or LCD module UI
  Intuitive operation

- OPC UA compatible
  Compliant with OPC UA, one of the standard communication standards in the EU

2. Installation and Connection

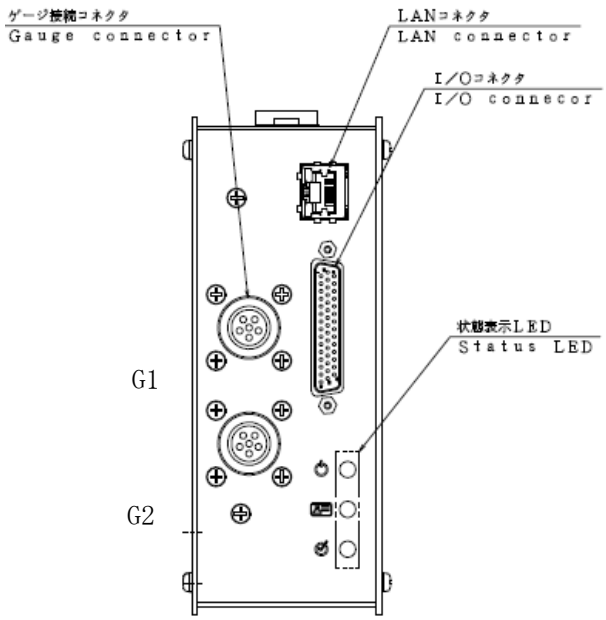
This explains how to install the device and how to connect it to various devices.

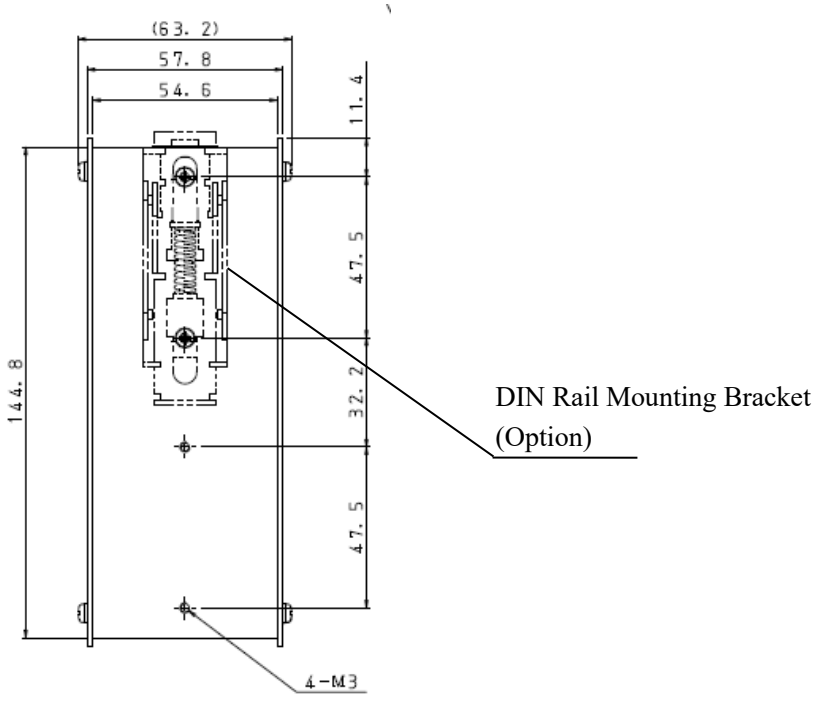
2.1 Configuration



2.2 Layout

SB-6571





2.3 Functions

2．3．1 Sizing function

It is possible to convert the signal from the LVDT gauge into a value and output a machine control signal according to the set signal point. The basic parameters and ranges are listed below.

Parameters	Setting range
Zero set	±125μm
Calibration	0.7～1.3
Judgment point	2~7
Measuring items	2
JOB number	6
Display	Select from μm, mm
Display resolution	Select from 1, 0.1, 0.01
Polarity	“+”or”-”
Retract direction	“+”or”-”
Offset	Available (with SB6500-Software)

2．3．2 Zero set

Sets the current measurement value as the zero value.

2．3．3 Calibration

This function calibrates the physical displacement of the detector and the measurement value. This is performed together with zero setting to maintain the accuracy of the measurement values.

2．3．4 Disconnection check

It monitors the connection status of the gauge and notifies an error if disconnection is detected.

2．3．5 Polarity setting

Set the displacement direction of the measurement value detected by the detector. Positive and negative directions can be set.

2．3．6 Retract Notification

When a gauge with a retract function is in the retracted state, it sends a retract OK signal.

2．3．7 Size shift

The size shift function makes it possible to register multiple zero points within the measuring range of the measuring head without having to perform mechanical adjustments such as rearranging the fingers or adjusting the contact position. (However, mechanical adjustment is required when using for the first time or when replacing the gauge.)

In addition, the registered zero point can be called up by an external signal, making it possible to automatically measure different types of workpieces or stepped workpieces with one measuring head.

2．3．8 Calculation

This unit can connect up to two detectors. (Some measuring heads have two connectors per measuring head, so in that case, only one measuring head can be connected.)

The calculation formula between gauges can be selected from G1,G2,G1+G2、G1-G2、(G1+G2)/2, (G1-G2)/2.

Number of gauges	Settable calculation formula
1	Only G1 or G2 *The calculation formula below can also be set, but the calculation result will be fixed at 0. G１＋G２ G1－G２ (G１＋G２)／２ (G１－G２)／２
2	G１ G２ G１＋G２ G1－G２ (G１＋G２)／２ (G１－G２)／２

2．3．9 Filter

Smoothing

Measurement data can be stabilized by calculating the moving average of measurement values over a certain period of time.

This function allows data to be stabilized when measuring using air or when measuring with high resolution.

The sampling time for calculating the moving average value can be set via SB6500-Software or OPC UA protocol.

The setting range is 0 to 9.99 seconds, and setting it to 0 turns off the smoothing function.

2．3．１０ Judgment output mode

The current measurement value is compared with the set judgment point (a set value for classifying measurement values) to determine the rank of the current measurement value.

The judgment mode can be switched as follows:

Y00

When the mode switches to AUTO, the judgment will begin.

Y10

When the mode switches to AUTO, and judgment start signal input, the judgment will begin.

2．3．11 Scale out

This function scales out the measured value to the positive or negative side when not measuring.

2．3．12 Judgment delay

Delays the output timing of the signal point by the set time.
Use this when you want to change the timing for process reasons.

2．3．13 RUN signal output

In in-process machining, the RUN signal is output during judgment.
(Except at signal cut)

2．3．14 Corrections

（1） Auto master correction

This unit can automatically perform master setting (setting the current measurement value to zero) by inputting an external "auto master command signal."

Auto master setting sets an auto master limit value to prevent the master setting from being significantly off and monitors the comparison value with the previous auto master (auto master adjacent value) to prevent the master setting from being performed at an incorrect value due to dust or other particles on the master or measuring head. For measurements that do not require auto master set, the auto master set function can be turned off by program.

（2） Offset (Grade) correction

Used as a general purpose correction.
The set value is simply added to the measurement.

（3） Immediate offset correction(+SHIFT、-SHIFT)

This function allows you to input corrections using +SHIFT and -SHIFT buttons on SB6500-Software when changing or correcting machining dimensions at in-process machining.

（4） External grade function

This function shifts the zero point by inputting a +/- shift signal as a pulse from I/O.

2．3．15 Memory function

If there is a notch in the workpiece during in-process machining, the output signal from the detector will be stepped. Generally, a function is required to obtain maximum value from this signal when measuring outer diameter (including height and thickness), and minimum value when measuring inner diameter. Also, since the workpiece is being machined, the dimensions change every moment, so it becomes necessary to update the data one after another at certain times. (Setting the synchronization time) There are three ways to set the timing (synchronization) as follows.

1） Internal synchronization
By entering a synchronization time in SB6500-Software, the required data will be updated at that interval. The setting value is 0.01 to 9.99 seconds.

2） AUTO synchronization
The required data is updated each time the detector reaches a certain specified dimension. The synchronization dimension level and detection direction can be freely set.

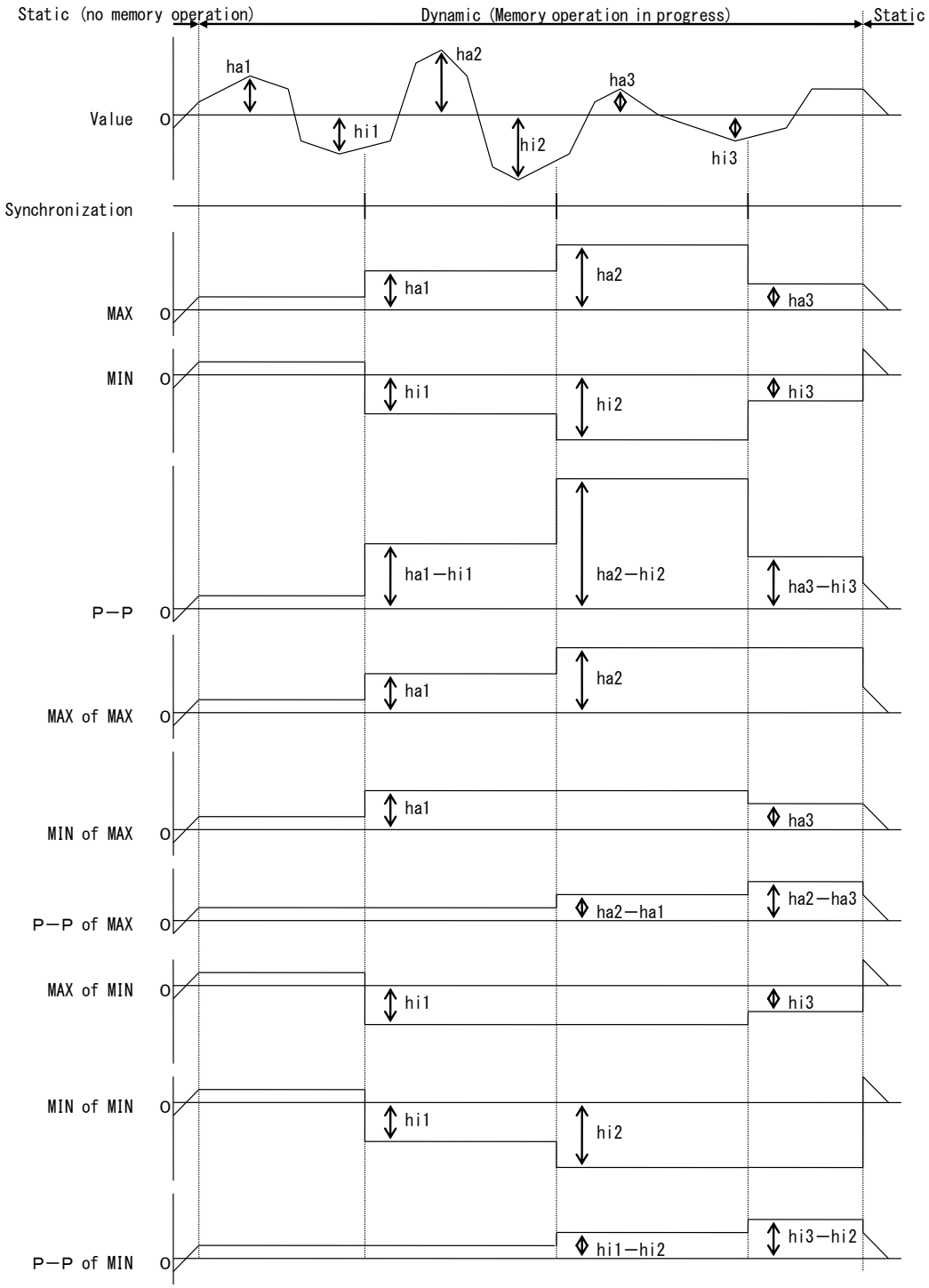
3） External synchronization
The required data is updated at every interval of the synchronization signal input from the I/O.

Memory methods are as follows:

MAX	Measure the max value for each synchronization occurrence
MIN	Measure the min value for each synchronization occurrence
P-P	Measure the P-P value for each synchronization occurrence
MAX of MAX	Measure the max value of the max values for each synchronization occurrence
MIN of MAX	Measure the min value of the max values for each synchronization occurrence
P-P of MAX	Measure the P-P value of the max values for each synchronization occurrence
MAX of MIN	Measure the max value of the min values for each synchronization occurrence
MIN of MIN	Measure the min value of the min values for each synchronization occurrence
P-P of MIN	Measure the P-P value of the min values for each synchronization occurrence

Memory control (reset input, external synchronization input) is performed on a measurement ite m basis.

＜Basic operation＞


Static (no memory operation)
Dynamic (Memory operation in progress)
Static
Value
O
ha1
hi1
ha2
hi2
ha3
hi3
Synchronization
MAX
MIN
P−P
MAX of MAX
MIN of MAX
P−P of MAX
MAX of MIN
MIN of MIN
P−P of MIN
ha1−hi1
ha2−hi2
ha3−hi3
ha2−ha1
ha2−ha3
hi1−hi2
hi3−hi2

2．3．16 In-process machining status display

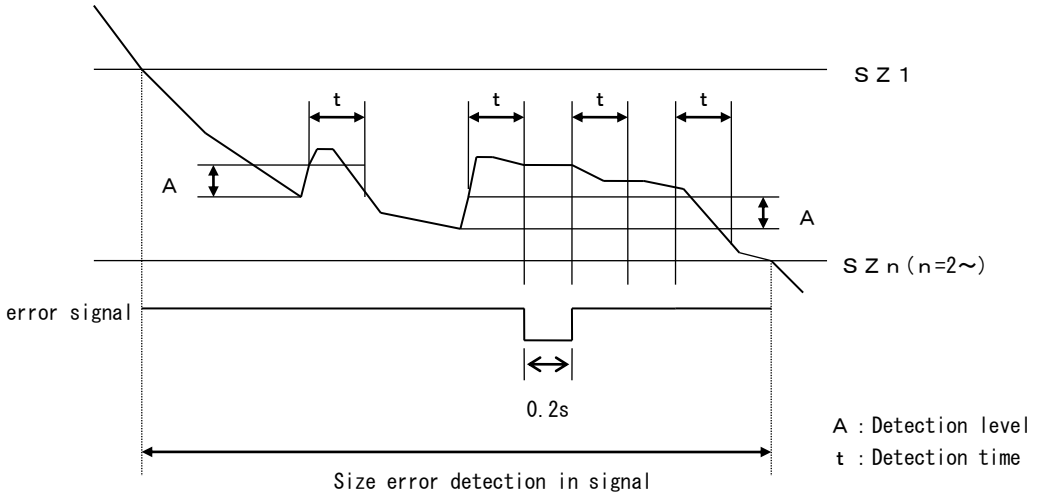
By displaying the status of in-process machining on a graph, you can judge the machining status.

1）Comparison with ideal data

By memorizing a graph of the ideal machining status and overlaying it on a graph of the current machining status, various problems in machining can be clearly identified.

2）Size error detection

This function automatically detects diameter abnormalities caused by remaining black scale and abrasive grains. If a value that is larger (smaller) than the smallest (largest) value obtained up to that point continues for a certain period of time during measurement, it is considered to be an abnormality and size error is displayed.



2．3．17 Log function

Execution history, such as parameter setting changes, and error history are kept, allowing you to trace them.

Up to 500 history items can be displayed. When obtaining data files, you can obtain up to 30 days' worth of data or a file size of 1G Byte, whichever is smaller.

2．3．18 CNC Setting function

It is possible to monitor the status of I/O and simulate its operation. The specific specifications of I/O are described in a separate section.

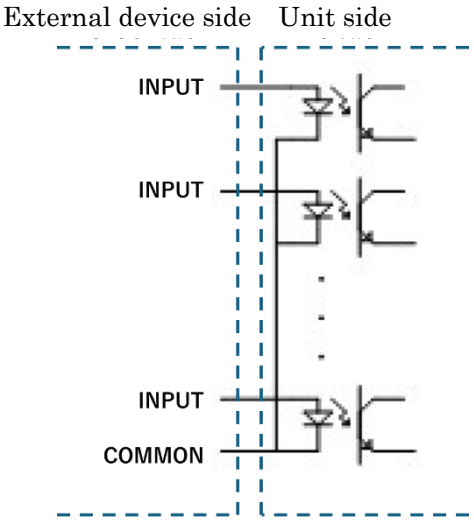
2.4 Input/output function

2.4.1 I/O signal

I/O Input/Output Circuit

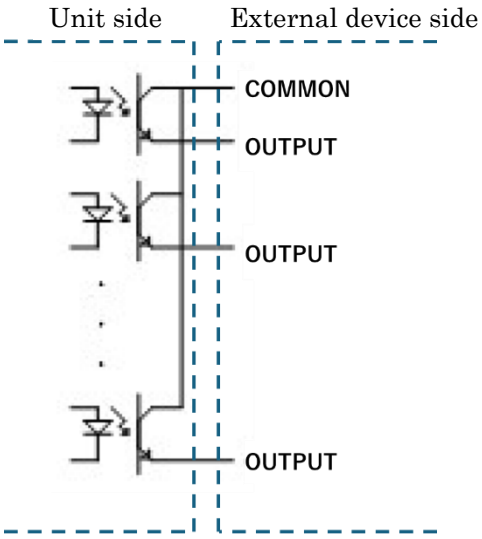
（1）Input interface (24V 5mA or less per signal)

Negative common　sink connection



（2）Output interface(DC24V, 40mA or less)

Positive common　source connection



2.4.2 I/O input output signal

（1） Input signal

1. BCD JOB selection

   Switches to the JOB number set in BCD format.

2. Measurement item number change

   Switches the measurement item number (M1, M2)

3. Grading start

   Starts judging the measurement item selected in "Measurement item number change".*

4. Auto master start

   Starts the auto-master function for the measurement item selected in "Measurement item number change".*

5. + Shift

   The measurement data of the measurement item selected in "Measurement item number change" is corrected to the positive side.*

   Input in pulses; the amount of correction per pulse can be changed.

6. - Shift

   The measurement data of the measurement item selected in "Measurement item number change" is corrected to the negative side.*

   Input in pulses; the amount of correction per pulse can be changed.

7. Memory reset

   Resets the stored data of the measurement item selected in "Measurement item number change"*.

   While this signal is ON, the measured value is updated in real time.

8. External synchronization

   This is an external synchronization signal for the memory function. It updates the memory data of the measurement item selected in "Measurement item number change."*

   Each time this signal is turned ON, the measured value is updated.

   * The Gr assigned to the measurement number selected in "Measurement item number change" also operates in the same way.

   Example) If you set it as M1-Gr1 and M2-Gr2, starting M1 will also start M2.

（2） Output signal

1. Grading result (SZx)

   The grading result is output based on the set grading point. If the signal cut function is set, all judgment output signals are cut when the grading point is exceeded and the S-CUT point is reached.

2. Retract OK

It turns ON when the gauge is in the retracted state. If the retract group contains multiple gauges, it turns ON when all gauges are in the retracted state.

3. External grade limit
   This signal turns ON when the total grade amount exceeds the external grade limit value.

4. Size error detection
   This is the output of size error detection in in-process measurement.

5. RUN
   This signal is ON during in-process measurement. However, if the signal cut function is enabled and the measured value reaches the S-CUT setting, it will be OFF even during in-process measurement.

6. Auto Master OK
   This signal turns ON when auto-mastering is performed normally for all measurement items set in the auto-master group. This signal turns OFF when an error such as a gauge disconnection occurs.

7. Auto Master NG
   This signal turns ON when an error occurs in a measurement item set in the Auto Master Gr. after Auto Master execution.

8. Auto Master completed
   This signal turns ON when the auto-master signal is input and auto-master processing is completed.

9. All auto master OK
   This signal turns ON when auto master is performed successfully for all measurement items set in auto master. This signal turns OFF when an error such as a gauge disconnection occurs.

10. All auto master NG
    This signal turns ON when there is an error in a measurement item set in Auto Master after Auto Master is executed.

11. All auto master complete
    This signal turns ON when auto-mastering is completed for all measurement items set in auto-master.

12. Gauge disconnection
    It turns ON when the gauge is disconnected.

13. Selected measure number 1
    Output when M1 is selected as the measurement item.

14. Selected measure number 2
    Output when M2 is selected as the measurement item.

15. READY

It turns ON when the following items are completed and automatic measurement is possible.

- All self-diagnostic results are normal
- Calibration for each gauge has been completed
- Set in AUTO mode

16. CPU RUN

It turns ON when the gauge module starts up.

2.4.3 I/O input output signal assignment

（1） Common signal

PinNo.	Common signal
33	I/O Common + (DC24V supply)
44	I/O Common - (0V)

（2）Input signal

PinNo.	Input signal
34	BCD JOB selection(1)
35	BCD JOB selection(2)
36	BCD JOB selection(4)
37	Measurement item number change
38	Grading start(measure no)
39	Auto master start(measure no)
40	'+' Shift(measure no)
41	'-' Shift(measure no)
42	Memory reset(measure no)
43	External synchronization(measure no)

（3）Output signal

The pin assignment for the output signal changes depending on the number of grading points set.

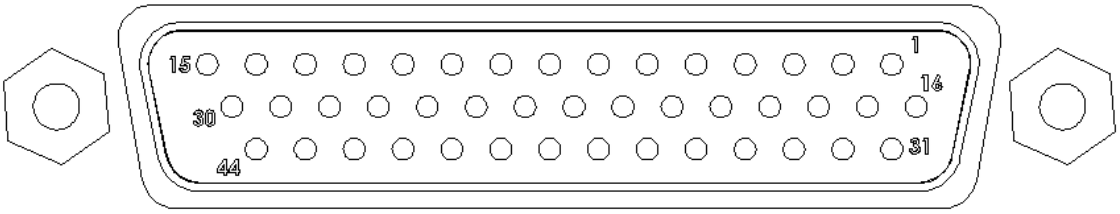
PinNo.	Output signal			
	Grading point:7	Grading point:6	Grading point:5	Grading point:4
1	Retract OK Gr.1	Retract OK Gr.1	Retract OK Gr.1	Retract OK Gr.1
2	Retract OK Gr.2	Retract OK Gr.2	Retract OK Gr.2	Retract OK Gr.2
3	External grade limit M1	External grade limit M1	External grade limit M1	External grade limit M1
4	External grade limit M2	External grade limit M2	External grade limit M2	External grade limit M2
5	Dimension error detection M1	Dimension error detection M1	Dimension error detection M1	Dimension error detection M1
6	Dimension error detection M2	Dimension error detection M2	Dimension error detection M2	Dimension error detection M2
7	RUN M1	RUN M1	RUN M1	RUN M1
8	RUN M2	RUN M2	RUN M2	RUN M2
9	Auto Master OK Gr.1	Auto Master OK Gr.1	Auto Master OK Gr.1	Auto Master OK Gr.1
10	Auto Master OK Gr.2	Auto Master OK Gr.2	Auto Master OK Gr.2	Auto Master OK Gr.2
11	Auto master NG Gr.1	Auto master NG Gr.1	Auto master NG Gr.1	Auto master NG Gr.1
12	Auto master NG Gr.2	Auto master NG Gr.2	Auto master NG Gr.2	Auto master NG Gr.2
13	Grading result M1(SZ0)	Auto Master completed Gr.1	Auto Master completed Gr.1	Auto Master completed Gr.1
14	Grading result M1(SZ1)	Auto Master completed Gr.2	Auto Master completed Gr.2	Auto Master completed Gr.2
15	Grading result M1(SZ2)	Grading result M1(SZ0)	All auto master OK	All auto master OK
16	Grading result M1(SZ3)	Grading result M1(SZ1)	All auto master NG	All auto master NG
17	Grading result M1(SZ4)	Grading result M1(SZ2)	Grading result M1(SZ0)	All auto master complete
18	Grading result M1(SZ5)	Grading result M1(SZ3)	Grading result M1(SZ1)	Gauge disconnection
19	Grading result M1(SZ6)	Grading result M1(SZ4)	Grading result M1(SZ2)	Grading result M1(SZ0)
20	Grading result M1(SZ7)	Grading result M1(SZ5)	Grading result M1(SZ3)	Grading result M1(SZ1)
21	Grading result M2(SZ0)	Grading result M1(SZ6)	Grading result M1(SZ4)	Grading result M1(SZ2)
22	Grading result M2(SZ1)	Grading result M2(SZ0)	Grading result M1(SZ5)	Grading result M1(SZ3)
23	Grading result M2(SZ2)	Grading result M2(SZ1)	Grading result M2(SZ0)	Grading result M1(SZ4)
24	Grading result M2(SZ3)	Grading result M2(SZ2)	Grading result M2(SZ1)	Grading result M2(SZ0)
25	Grading result M2(SZ4)	Grading result M2(SZ3)	Grading result M2(SZ2)	Grading result M2(SZ1)
26	Grading result M2(SZ5)	Grading result M2(SZ4)	Grading result M2(SZ3)	Grading result M2(SZ2)
27	Grading result M2(SZ6)	Grading result M2(SZ5)	Grading result M2(SZ4)	Grading result M2(SZ3)
28	Grading result M2(SZ7)	Grading result M2(SZ6)	Grading result M2(SZ5)	Grading result M2(SZ4)
29	Selected measure number 1	Selected measure number 1	Selected measure number 1	Selected measure number 1
30	Selected measure number 2	Selected measure number 2	Selected measure number 2	Selected measure number 2
31	READY	READY	READY	READY
32	CPU RUN	CPU RUN	CPU RUN	CPU RUN

*If the number of grading points differs between M1 and M2, the pin assignment with the higher number of grading points will be applied.

Example) If you set M1 with 7 grading points and M2 with 5, the pin assignment for grading point 7 will be used as the base, and SZ6 (27th pin) and SZ7 (28th pin) of M2 will be disabled.

2.4.4 I/O connector spec

Items	Specification
Connector Identification	DB-44S Socket Female
Connector fixing screw	Inch screws #4-40
Rated Input Voltage	DC 24V
Input Voltage Range	DC 24 V±10%



2.5 Installation environment

Install this unit in the following environment.

Operating temperature range	5℃ to 55℃
Operating humidity range	10 to 90% RH (No condensation)
Vibration	A place with little vibration
Overvoltage Category	Ⅱ
Pollution level	2

2.6 Installing the unit

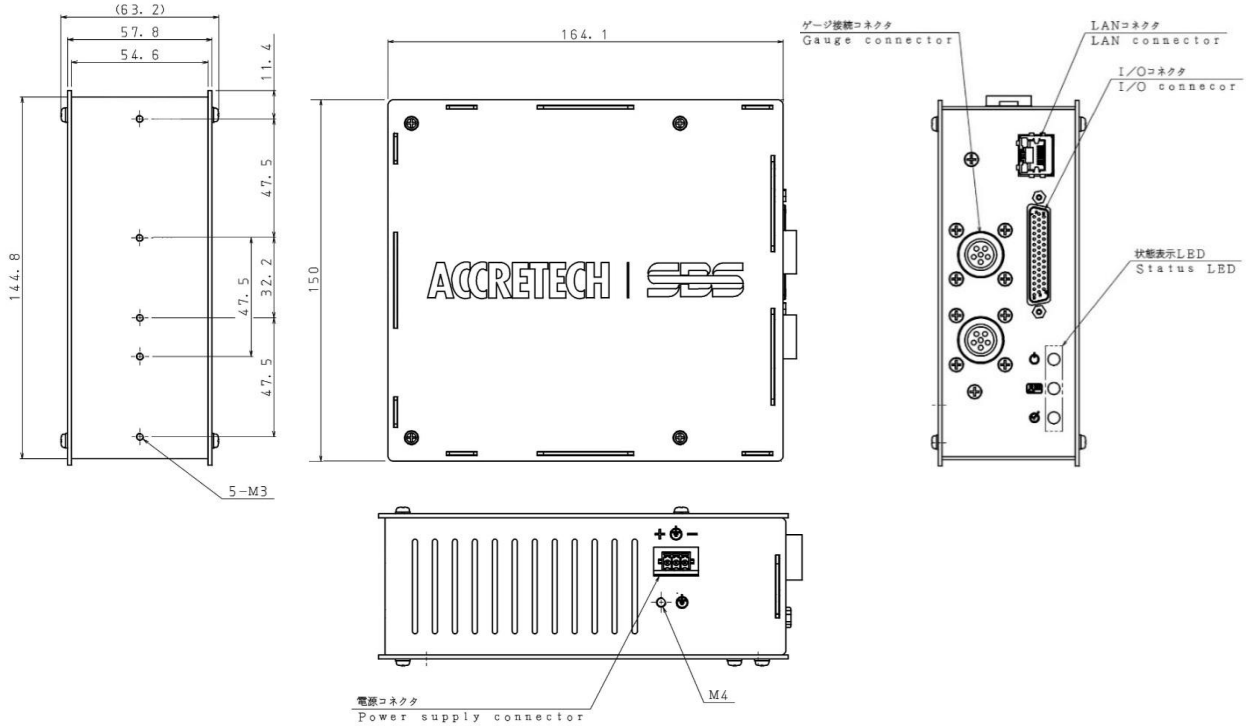
This section explains how to install the device. For the dimensions of the device, refer to "7.1 Specifications."

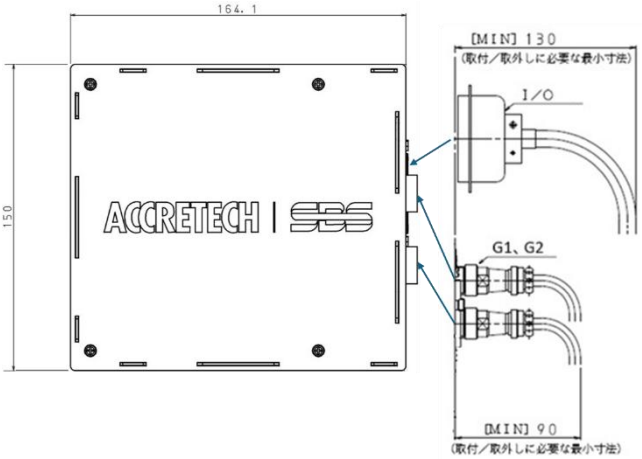
⚠ WARNING	
	**Use a stand to mount the device that can withstand the weight of the device.** If the device or stand falls over, it may cause electric shock, injury, fire, or malfunction.
	**Ensure that the stand on which the device is installed is stable.** If the device or stand falls over, it may cause electric shock, injury, fire, or malfunction.
	**When installing this device, be sure to turn off the power and remove the power cable from the device.** To avoid the risk of electric shock, fire, or malfunction.



2.6.1 Installation

Use the five mounting holes (M3) on the back of the unit to mount it on a wall or on a DIN rail using DIN brackets.





unit : mm

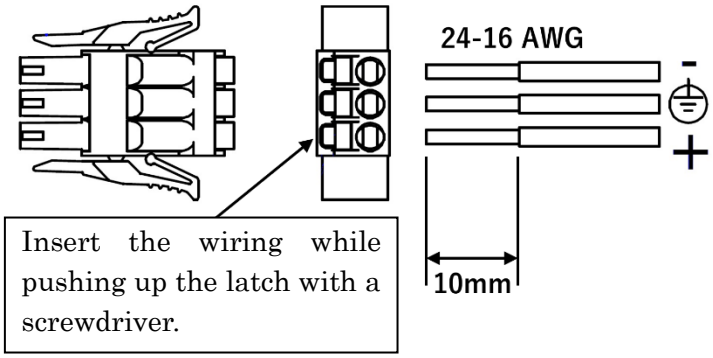
Please note the following regarding installation.

- This unit is not dustproof or waterproof.
- Leave the space shown in the drawing for the cable connection points on the front of the unit.
- Leave a space of 23mm plus the length of the wiring when connecting the power connector on the bottom of the unit.

- Do not install near a heat source.

2.6.2 Preparing the power cable

This unit includes a power supply connector. Please check the power supply specifications and prepare the cable accordingly.



Pin No.	Signal name
1	+24V
2	FG
3	0V

・Input Voltage Range：DC24V ± 10%

・Power consumption：24V, 2.0A

・Included connector：1952034　PHOENIX CONTACT　or equivalent

NOTE

Please prepare a power supply with a power rating equal to or greater than the rated power.

2.7 Connection with each device

This explains how to connect this unit to each device.

2.7.1 Connection flow

Connect this unit to each device in the following order. Before starting the connections, refer to the "Wiring Precautions" below.

1. Connect the gauge to the unit.

2. Connect external devices to the unit.

3. Connect optional devices as needed.

4. Connect the power cable to the unit.

NOTE

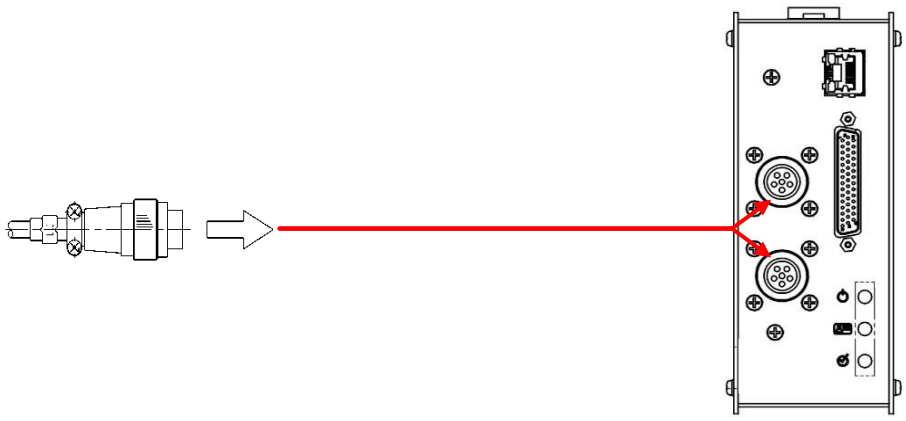
For details on connecting each device, see "2.7.2 Connecting an LVDT gauge," "2.7.3 Connecting external devices," and "2.7.5 Connecting the power cable."

Wiring Precautions

- Before wiring the I/O cable, turn off the power to the unit and external devices.
- When using other types of modules (balancer modules or AE sensor modules), there will be connectors with the same number of pins, so be careful not to mix up the connectors.
- The unit's power cable, I/O cable, gauge cable, and other power lines must be separated by at least 200 mm.
- Gauge cables must be stored in a separate duct.
- The connector attached to the cable has fixing screws, so be sure to tighten them firmly to prevent it from coming loose.
- Make sure that the gauge can be moved forward and backward and that the retraction can be released regardless of the output state of the device.

2.7.2 LVDT gauge connection

This section explains how to connect a gauge to this unit. Connect the gauge connector to [G1] to [G2] on the rear of the unit. Make sure to match the marking band on the gauge cable with the [G1] to [G2] markings on the rear of the unit. The SNS connector is finished with a matte nickel plating.



2.7.3 Connecting external devices

Connect this unit to external devices using an I/O cable.

Input Output signal specification

Input/Output	Content
Input signal	Sink input (Current sink) Negative common Use at 24V DC, 5mA per signal
Output signal	Source output (Current discharge) Positive common Use at 24V DC, 50mA or less per signal

Input Output signal connector specification

Items	Spec
Connector Identification	DB-44S Socket Female
Connector fixing screw	Inch screws #4-40
Rated Input Voltage	DC 24V
Input Voltage Range	DC 24 V±10%

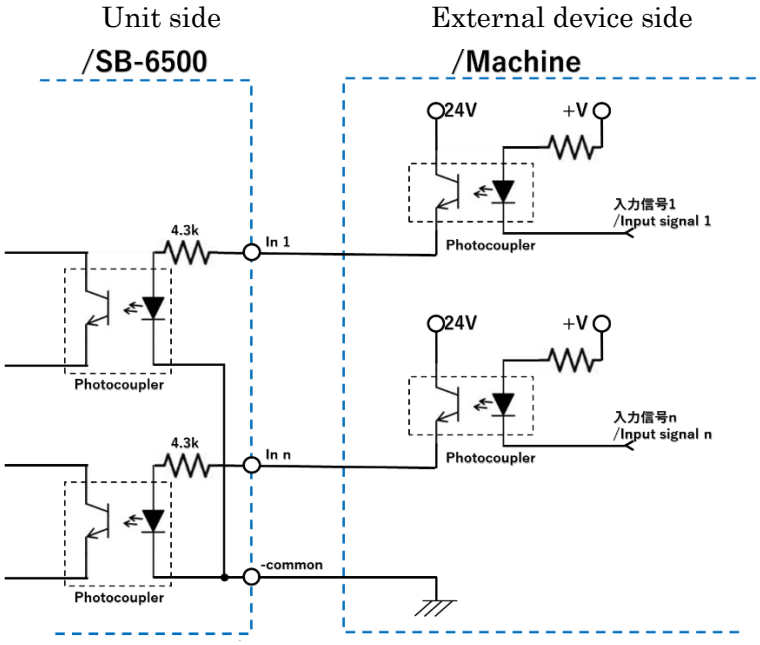
I/O Input/Output Interface Example

Below are examples of input interfaces common to each board, as well as examples of interfaces with various output formats.

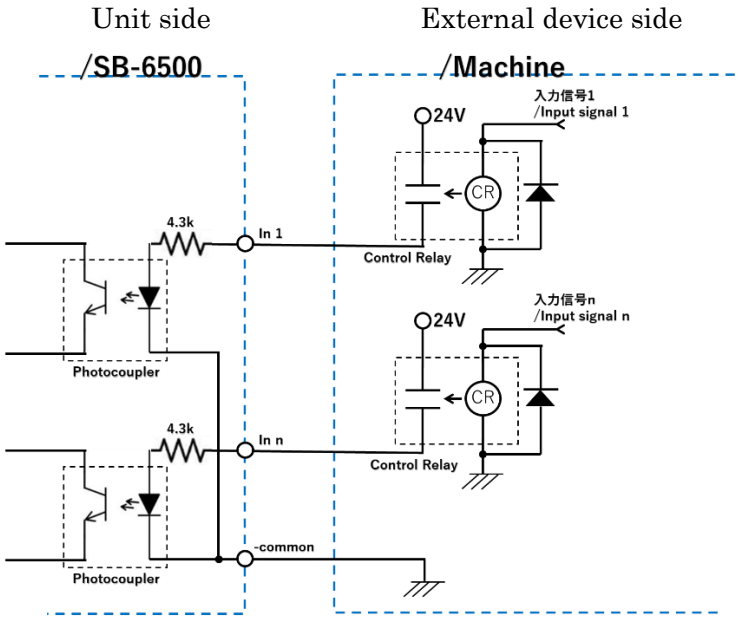
Input interfaces

Sink connection (Negative common)

Input circuit:
Photocoupler used



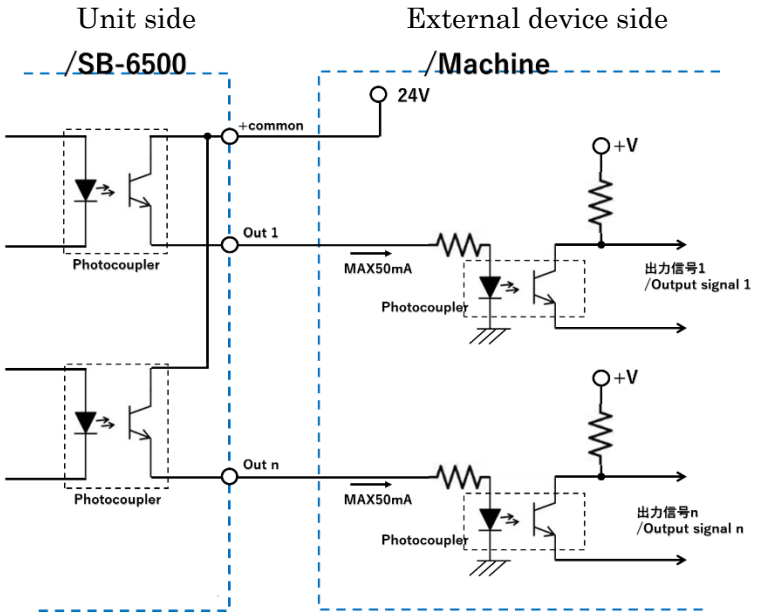
Input circuit:
Relay used



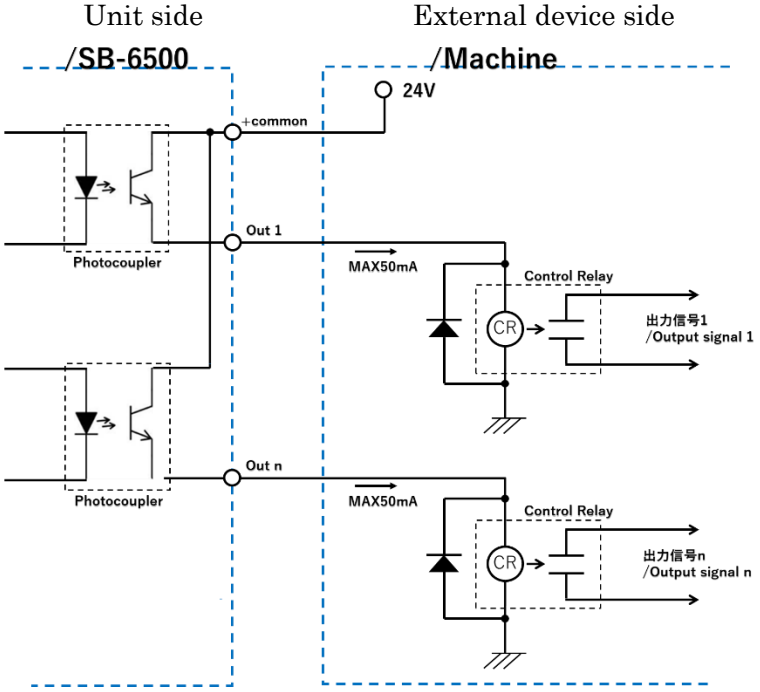
Output Interface

Source connection: (Positive common)

Output circuit:
Photocoupler used

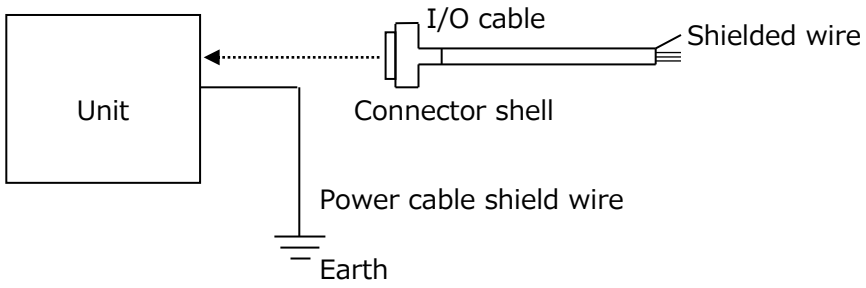


Output circuit:
Relay used



I/O cable shielding

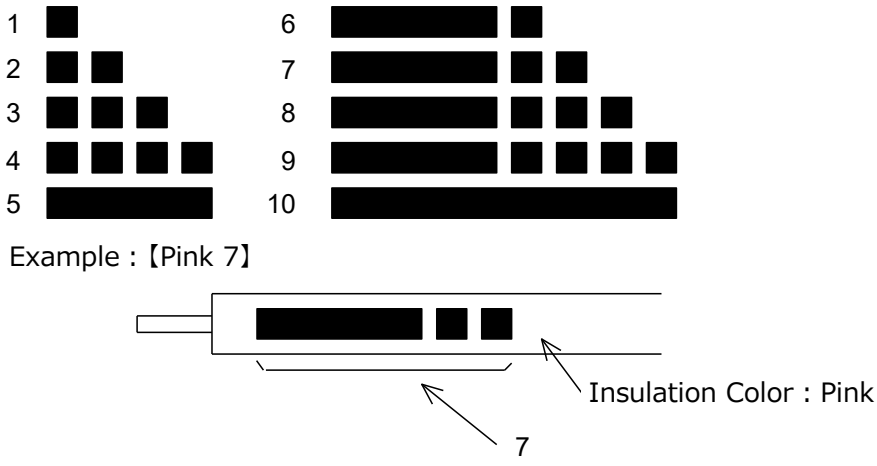
Use shielded I/O cables. This shield is connected to connector shell → unit → power cable shield → earth as shown in the diagram below. Normally, there is no problem if the shield wire is grounded at one point. However, if the unit's power cable is longer than 6 m, the shielding effect may decrease at the end. Therefore, be sure to also ground any control devices or external devices connected to the unit.



NOTE

Insulate unused cable ends (pins with no function assigned).

I/O Cable Identification (TSE provides)



2.7.4 Timing Chart

Regarding the input/output signal timing chart, the in-process judgment is explained below.

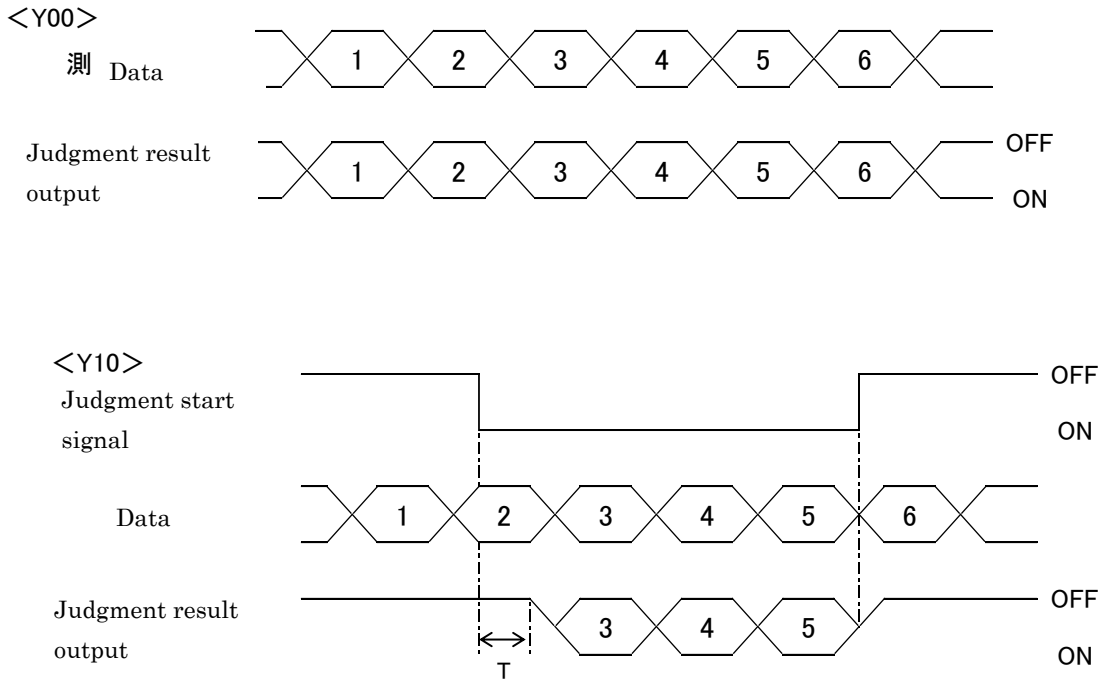
NOTE

- The control signals in the timing charts in this manual are negative logic.
- The device can recognize pulse widths of 8 msec or more.
- For information about the signal cut (S-CUT) mentioned in the description, see "3.5.2 Signal Cut Function (S-CUT)."

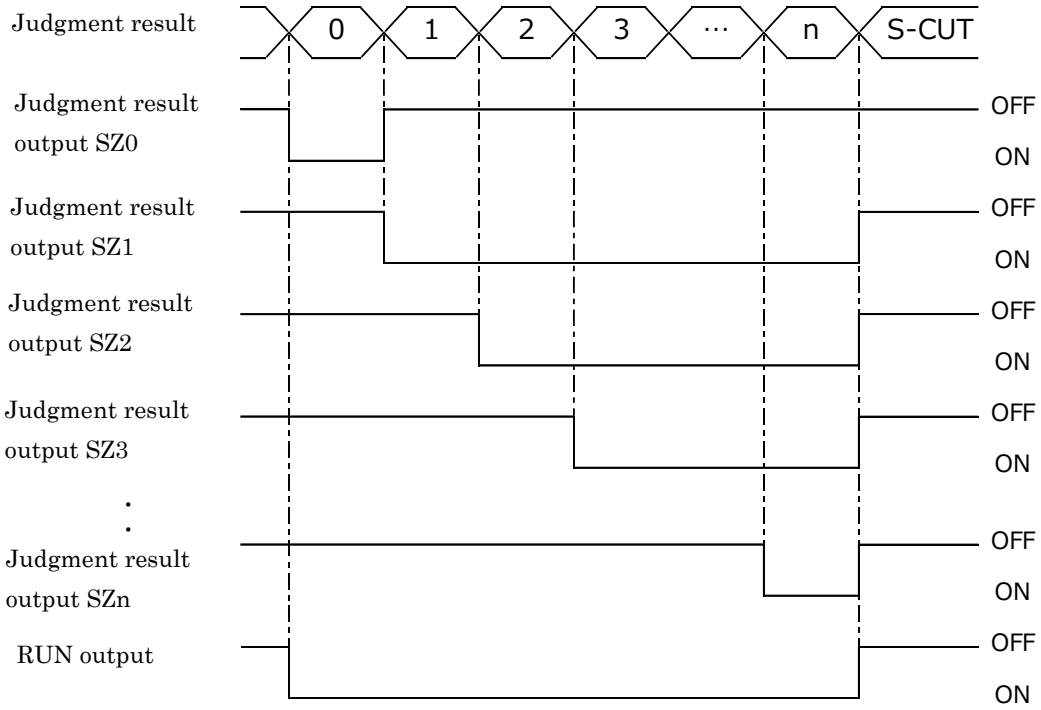
In-process judgment timing chart

In-process, two judgment output modes are available: Y00 and Y10. In either judgment output mode, the output is turned OFF in the signal cut (S-CUT) state.

- Y00 mode：The judgment result is always output.
- Y10 mode：The judgment result is output only while the judgment start command is being input.

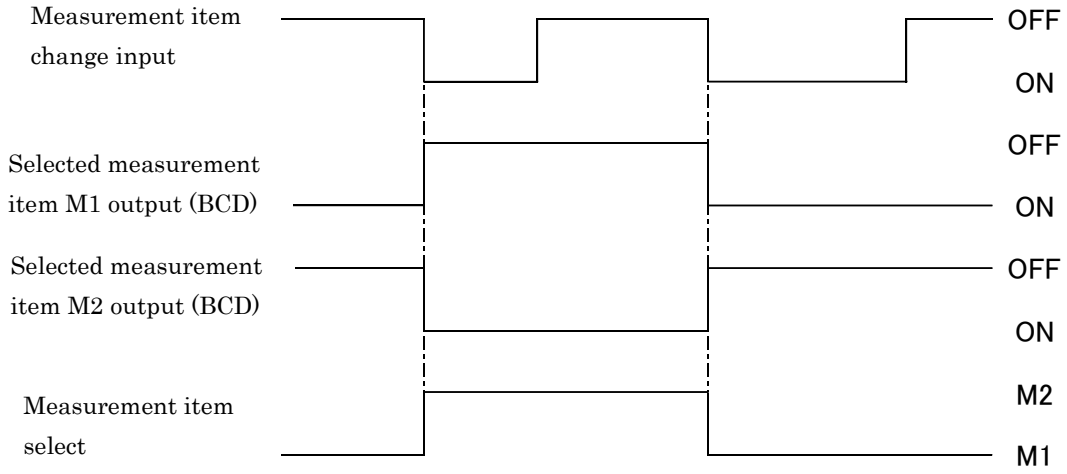


T: Delay time for judgment start (changeable)



Measurement item selection

This is written assuming that M1 is selected at the start.



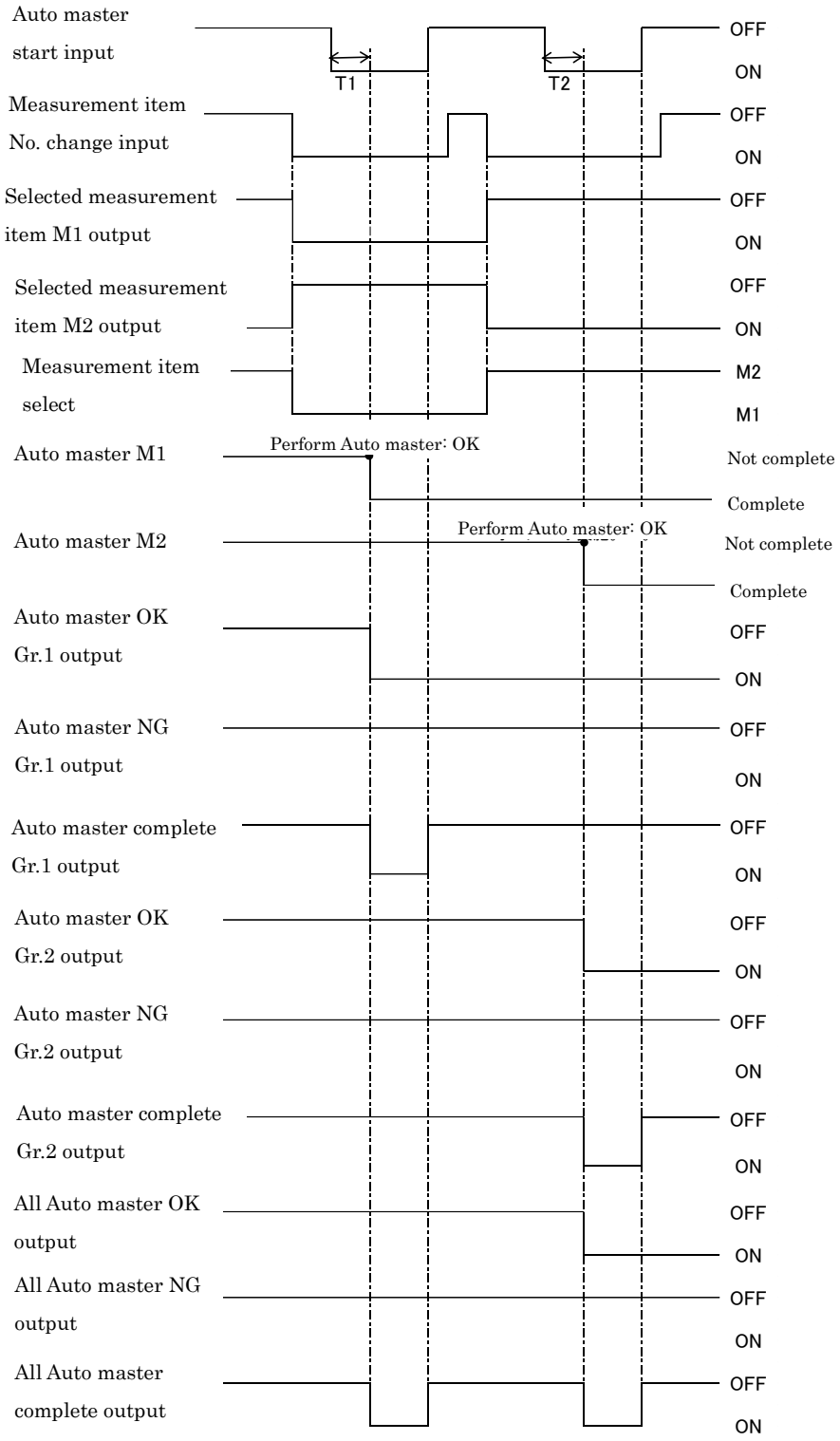
The Gr. No. set in the M "No." will operate simultaneously.

In the M1:Gr.1, M2:Gr.2 setting, selecting M1 will operate Gr.1.

When the setting is M1:Gr.1, M2:Gr.1, Gr.1 will operate regardless of whether M1 or M2 is selected.

Timing chart for auto master

・Timing chart for Gr.1 auto master: OK, Gr.2 auto master: OK
This is written assuming that M1: Gr.1 and M2: Gr.2 are set.



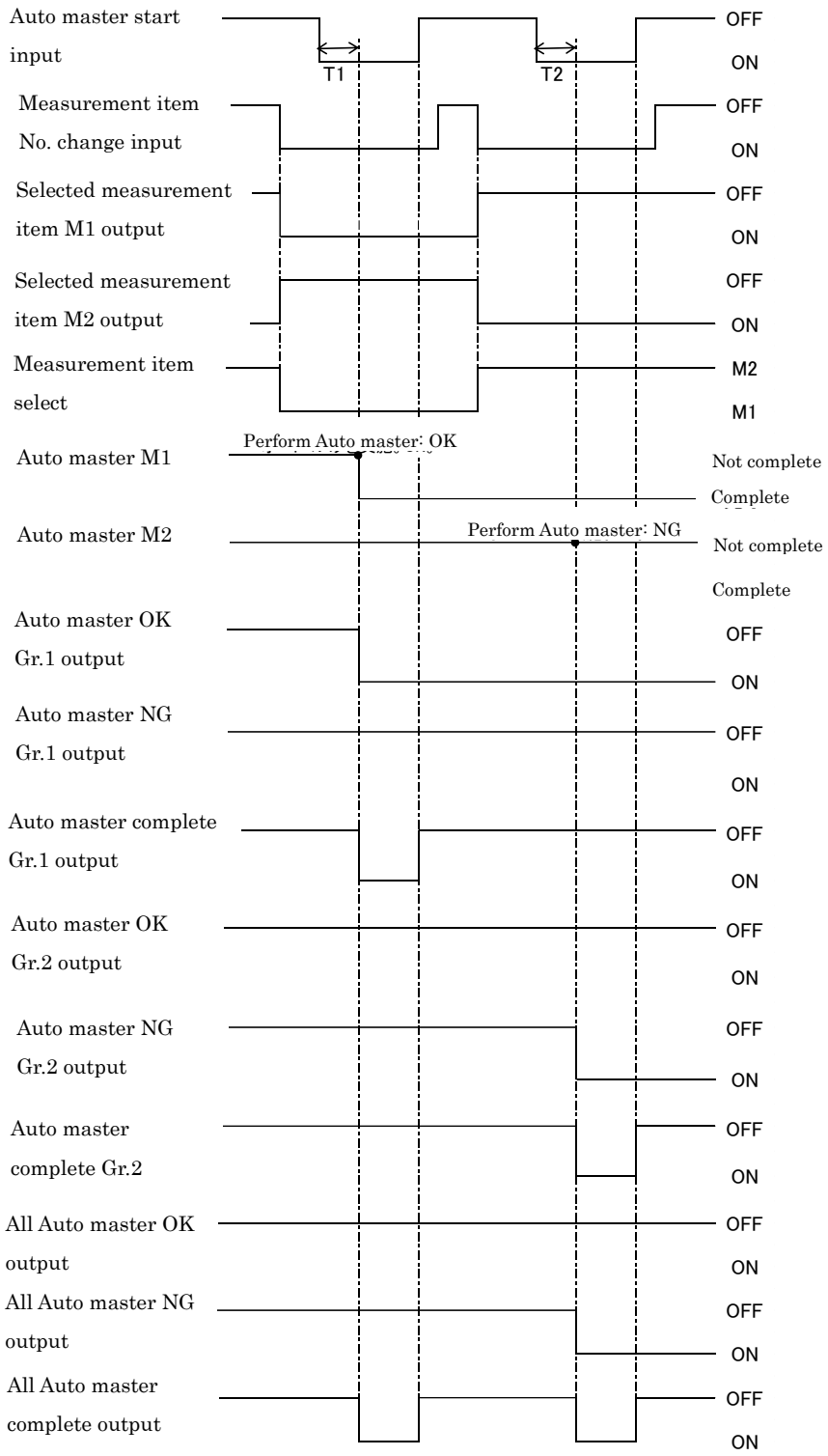
T1,T2:delay time changeable

Auto master start can be input in either AUTO or MANUAL mode.

When switching measurement item number, make sure that Auto Master start input is turned OFF.

Assume that when Auto Master Gr.2 has not been completed (such as when using the unit for the first time), an Auto Master Start Gr.1 command is input. In this case, even if the Auto master result of Auto master Gr.1 is OK, All Auto master OK output will not turn ON. All Auto master OK output will only turn ON when all Auto master Gr.1 and Gr.2 are OK. From then on, all auto master OK outputs will remain ON unless the result of auto master start result is NG. The auto master OK/NG state will remain as is even if you turn the power on/off.

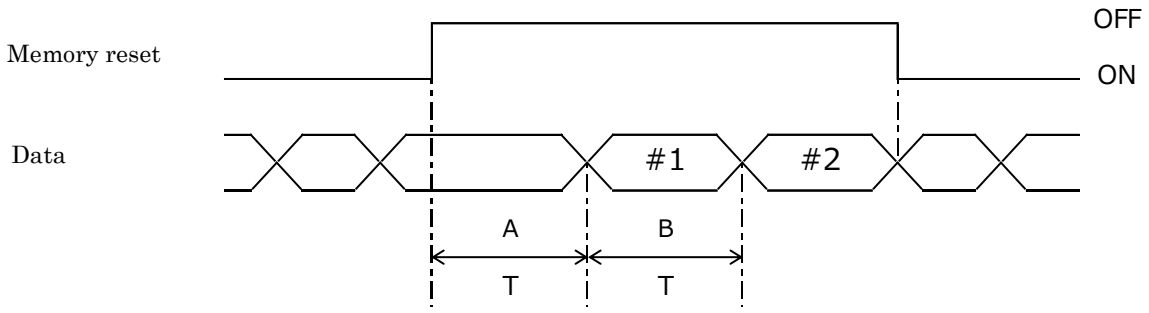
・Timing chart for Gr.1 auto master: OK, Gr.2 auto master: NG
This is written assuming that M1: Gr.1 and M2: Gr.2 are set.



T1,T2:delay time changeable

Internal sync. memory function

The case of judgment mode Y00 is described.

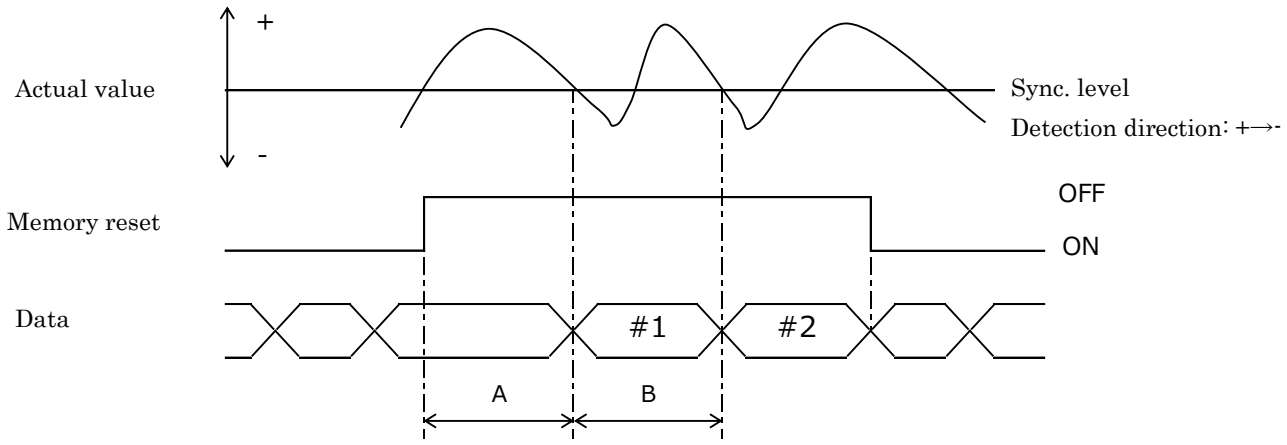


#1 = Memory result: Section A　　T: Internal synchronization time (Changeable)

#2 = Memory result: Section B

Auto sync. memory function

The case of judgment mode Y00 is described.

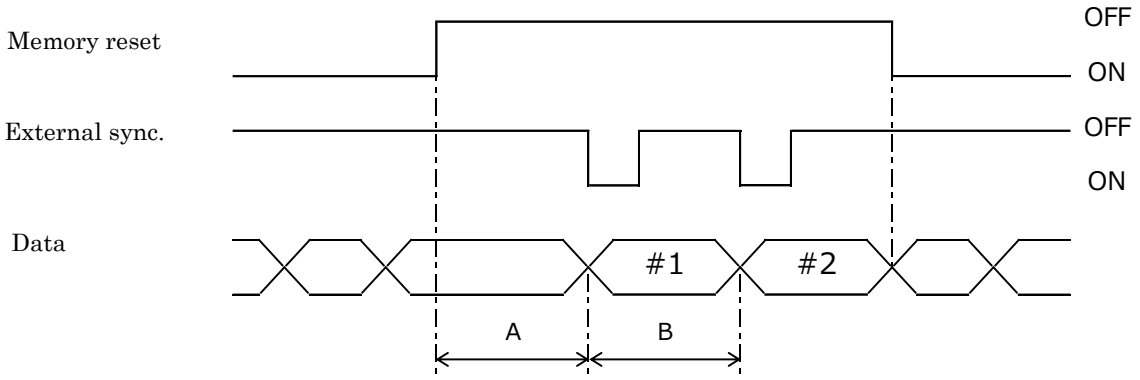


#1 = Memory result: Section A

#2 = Memory result: Section B

External sync. memory function

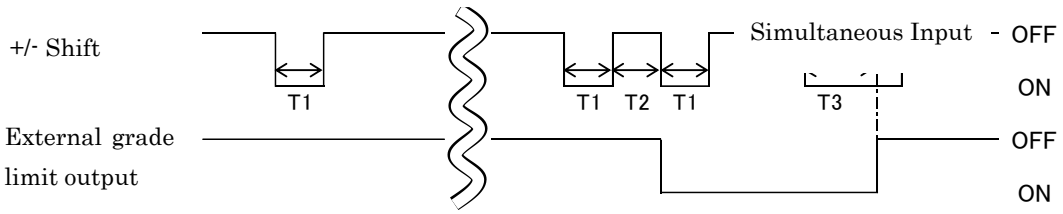
The case of judgment mode Y00 is described.



#1 = Memory result: Section A

#2 = Memory result: Section B

External grade function



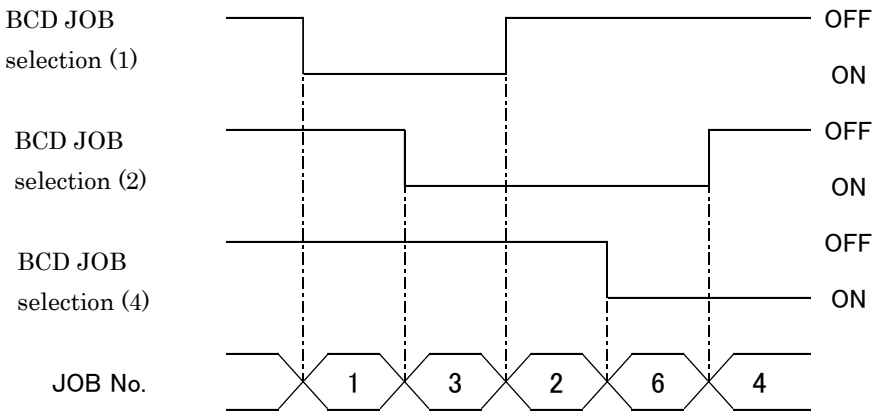
T1,T2 : 0.1sec. MIN
T3 : 0.04sec. MIN

When +shift or -soft is input, the measured value is corrected in plus or minus. The sign of the correction changes depending on the setting value of "Unit shift direction setting."

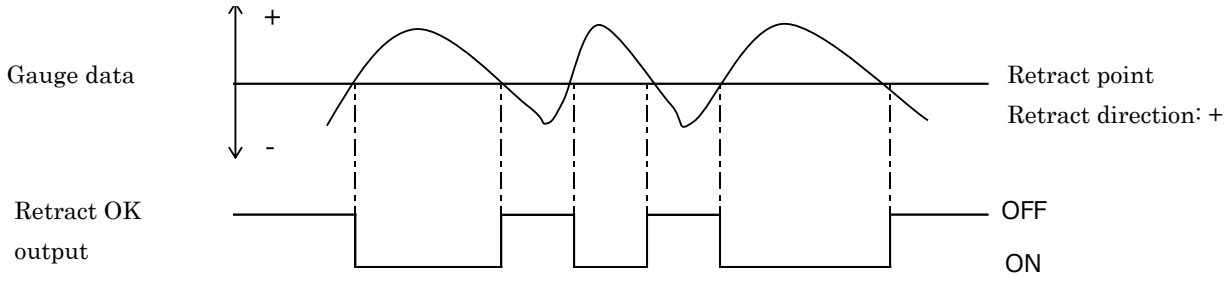
Inputting +shift and -shift simultaneously will clear the offset amount.

When the offset amount exceeds the external offset limit value, an external grate limit signal will be output.

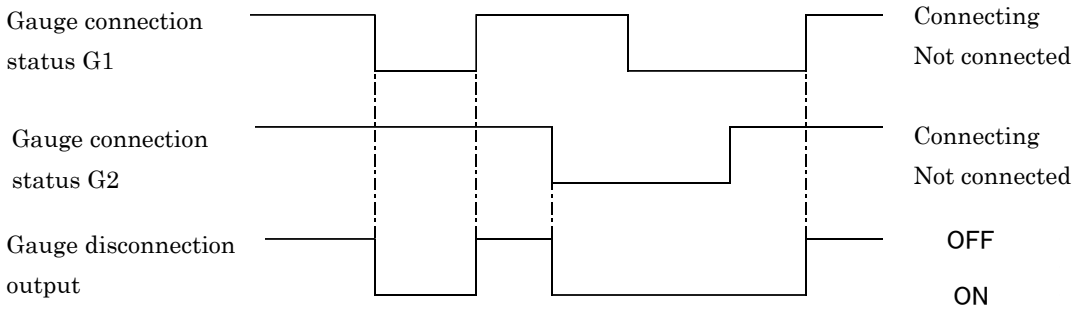
JOB select (BCD select)



Retract



Gauge disconnection



2.7.5 Connecting the power cable

Connect the connector side of the power cable to the power connector of this unit. Connect to a DC 24 V output power supply according to the table below.

NOTE

Please prepare a power supply exclusively for this unit.

Power cable and connector wiring table

Pin No.	Signal name
1	+24V
2	FG
3	0V

Power Specifications

Power supply voltage： DC 24 V±10%

Rated Power： DC 24 V 2.0A

NOTE

Please prepare a power supply with a power rating equal to or greater than the rated power.

3. Measurement preparation

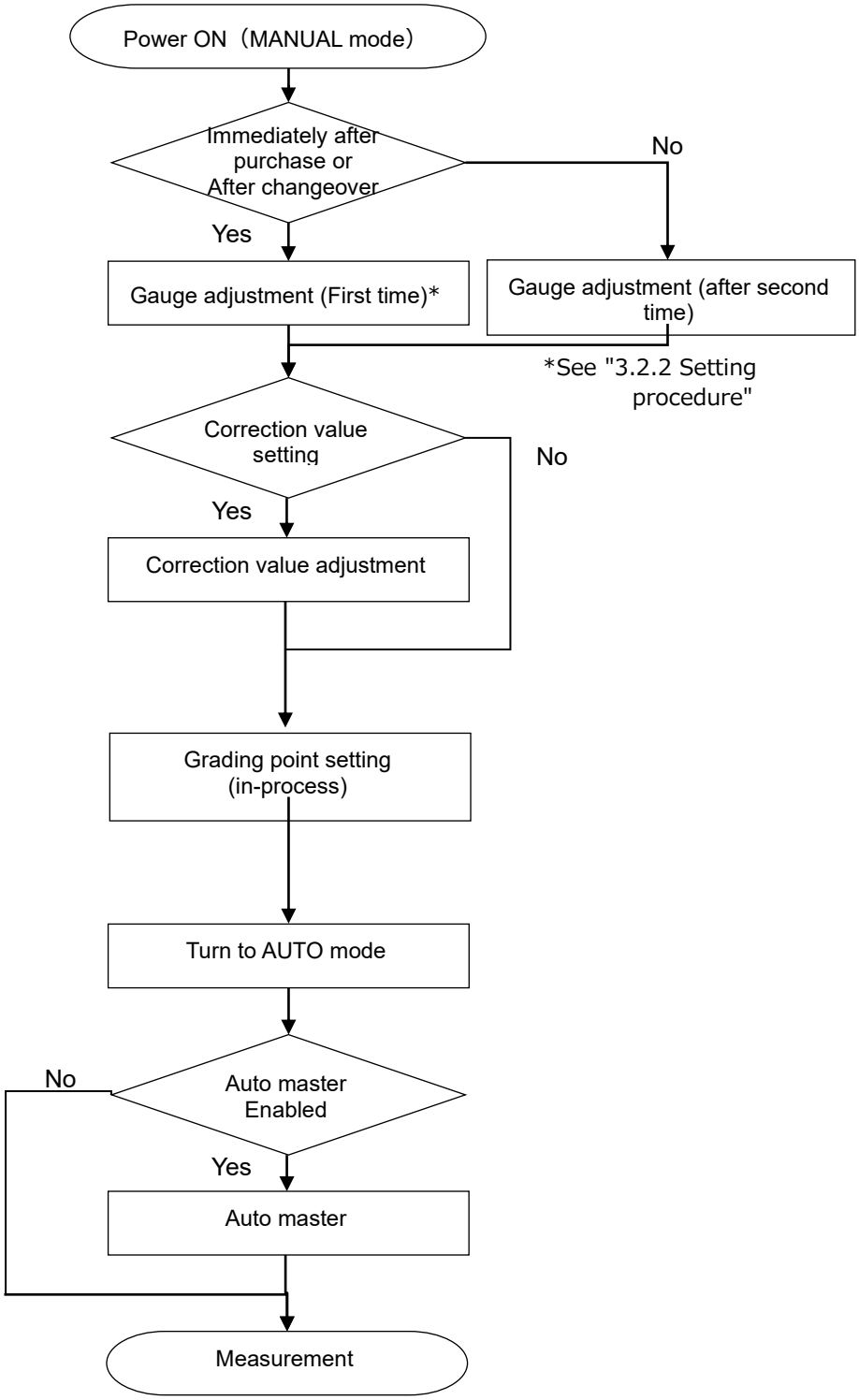
This explains the preparations required for measurement, such as adjusting the gauge (zero setting and magnification calibration), setting compensation values, auto master (external signal), and setting judgment points.

3.1 Measurement preparation flow

Follow the steps below to prepare for measurement. Prepare for measurement must be operated in MANUAL mode.

Measurement preparation flow

Follow the steps below to prepare for measurement. Prepare for measurement in MANUAL mode.



3.2 Adjusting the gauge

There are two ways to adjust the gauge: "Perform both zero setting and magnification calibration" and "Perform zero setting only."

Perform both zero setting and magnification calibration

This should be done immediately after purchase or when changeover. We also recommend that you do this during regular inspections.

Perform zero setting only

Used for routine calibration.

Zero setting is the process of memorizing the zero point of the gauge. It is done using a ZERO Master. Magnification calibration is the process of adjusting and memorizing the magnification of the gauge. It is done using a CAL Master or a calibrated block gauge.

3.2.1 Advance preparation

This describes the preparations to be made before adjusting the gauge.

Input units

This unit can be selected from μm and mm. Enter values in the selected unit. For information on setting units, see "6.2 Settings Screen."

NOTE

The explanations in this manual are based on the assumption that measurements will be taken in μm.

Selecting the gauge to use

The measurement range varies depending on the gauge used. By registering the type of gauge on this unit, you can set the optimum measurement range for the gauge you are using.

NOTE

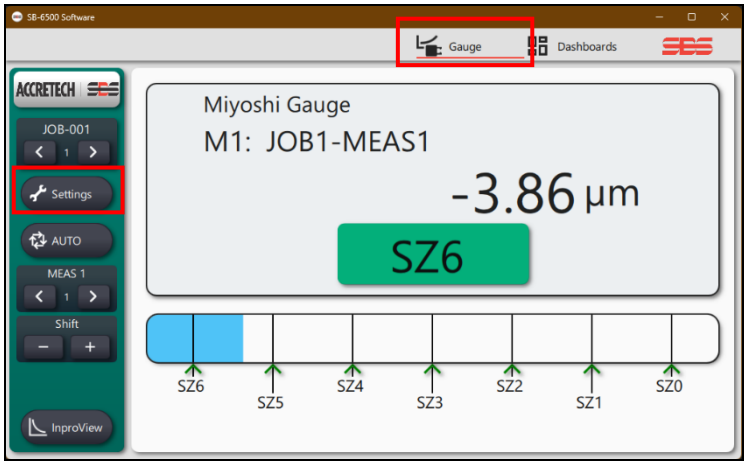
When you change the gauge type, the zero setting and magnification calibration will be initialized.

1 Show the gauge setting screen.

(1) Tap "Gauge" from the tabs at the top of the screen.

(2) On the gauge main screen, tap "Settings" in the sidebar.

On the gauge main screen, you can check the current gauge registration status.

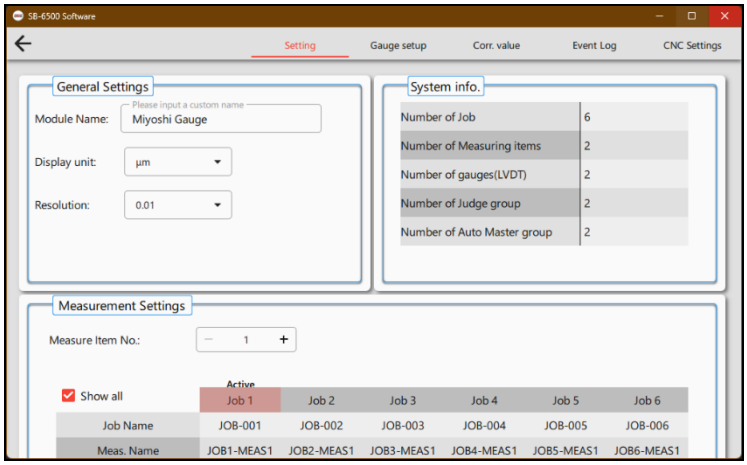


NOTE

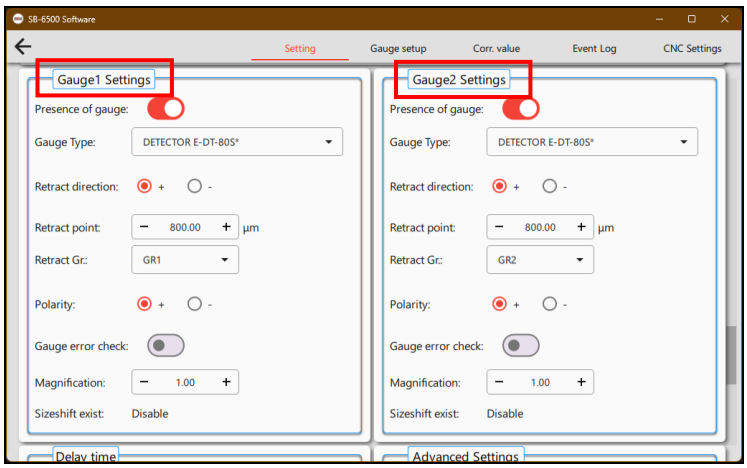
The operation button display area displayed on the gauge main screen can be switched to the left or right edge display by setting.

2 Show［Gauge1 Settings］ and ［Gauge2 Settings］.

Scroll down the Gauge Settings screen.



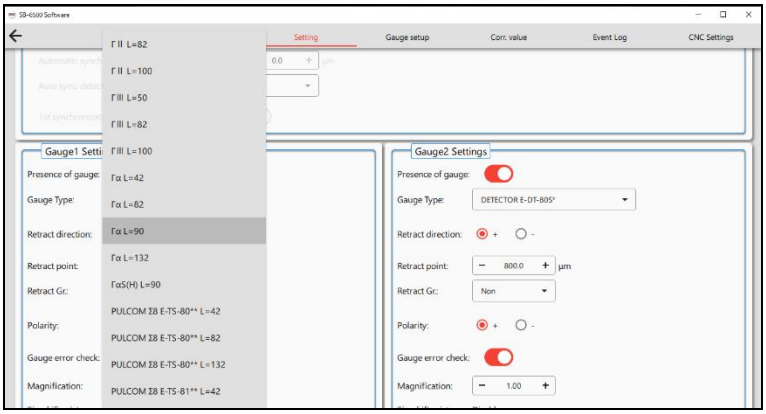
Scroll



3 Set the gauge to use.

(1) Tap［Gauge Type］box.

Selected gauge will be highlighted.



(2) Tap the gauge you want to set.

The gauge you tapped will be selected and displayed/set in the box.

NOTE

- If the gauge you want to set is not displayed, scroll through the list.
- If the gauge you want to set is not in the list, set the gauge type to [Other] (optional). In that case, you will need to select the software measurement range and magnification range appropriate for the gauge.

Notes when setting the gauge type to [Other] (optional)

On the gauge screen, you will need to set the soft measurement range and magnification range. Please refer to the following for optimal settings.

Software measurement range selection

Here, the soft measurement range means the measurement range of the gauge. There are nine switching ranges, so select the most appropriate range.（±5000、±3000、±2000、±800、±500、±100、±50、±20、±10）

NOTE

You can select a measurement range that exceeds the gauge's measurement range, but accuracy and linearity will be adversely affected.

Select magnification range

The magnification shown is when the magnification of our standard gauge E-DT-80S is set to "1".

Magnification setting range selection table
0.0040 ～ 1.0000
0.0079 ～ 1.9921
0.0157 ～ 3.9843
0.0313 ～ 7.9687
0.0782 ～ 19.9218
0.1563 ～ 39.8437
0.3125 ～ 79.6875

(3) Sets the lowest magnification range.

(4) Perform magnification calibration.

NOTE

For information on how to calibrate magnification, please refer to "3.2.2 Procedure for both zero setting and magnification calibration."

(5) If a CAL limit error occurs, set the next lowest magnification range.

(6) If the CAL limit error occurs again, adjust the magnification range from a lower range to a range where the CAL limit error no longer occurs.

NOTE

The setting range of an LVDT gauge depends on the set magnification range.

Mechanical Adjustment

When replacing the gauge or using the size shift function for the first time, mechanical adjustments such as rearranging the fingers and adjusting the contact positions are required. The mechanical adjustment procedure is shown below.

1 Show gauge adjustment screen.

(1) Tap "Gauge" from the tabs at the top of the screen.
(2) On the gauge main screen, tap "Settings" in the sidebar.
(3) Tap [Gauge setup] from the tabs at the top of the screen.
(4) Tap "Zero Set" from the tabs at the top of the Gauge Setup display area.

2 Tap [RAW] (no correction) from the "ZERO/RAW" check button.

3 Set the ZERO Master on the gauge.

4 Adjust the contact position of each gauge to a value close to "0".

NOTE

For details, refer to the instruction manual for each gauge.

3.2.2 Setup flow

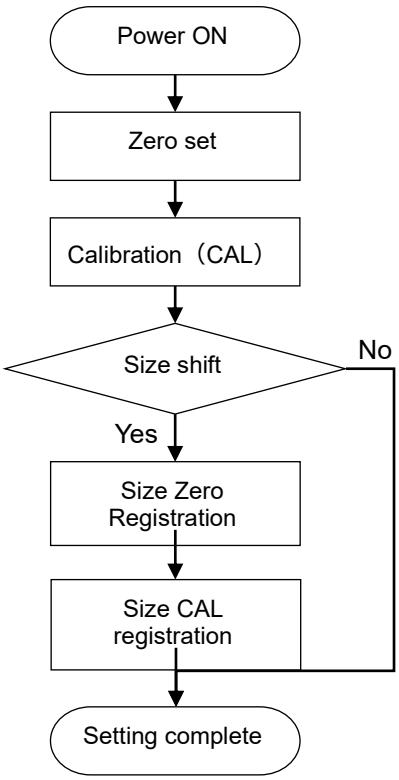
The setup procedure required for measurement will be explained separately for "first-time" and "after the second-time" gauge adjustments. The setup procedure differs depending on the gauge. Setup is performed in MANUAL mode.

Gauge adjustment (first time)

This should be done immediately after purchasing the device or after a changeover.

LVDT gauge

Zero setting and magnification calibration are required.



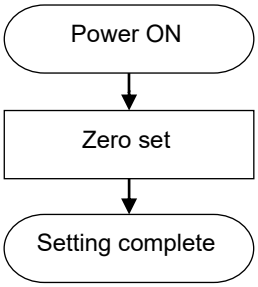
NOTE

You can switch to AUTO mode even if size CAL registration has not been performed.

Gauge adjustment (after the second time)

This is performed when the power is turned on after the initial gauge adjustment has been completed.

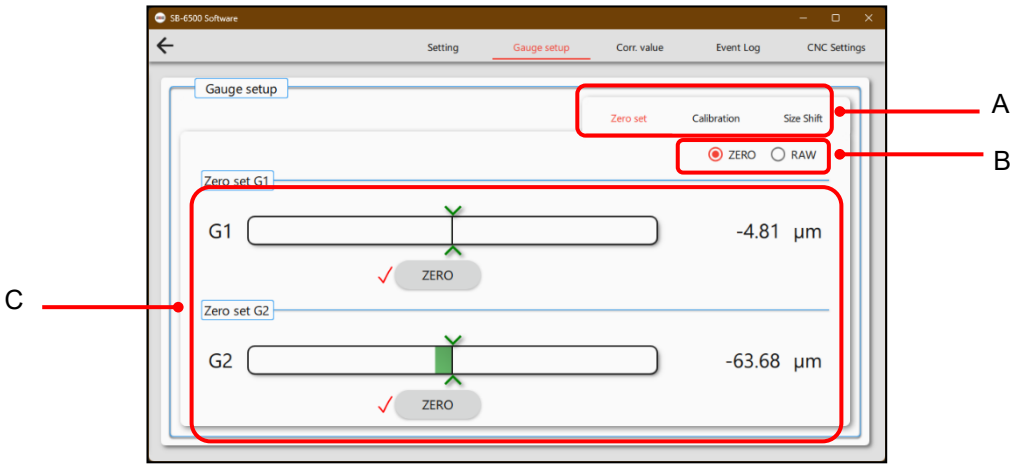
LVDT gauge



3.2.3 Perform both zero setting and magnification calibration

This will store the gauge's zero point and magnification in the instrument. This should be done immediately after purchase or when changing the gauge. It is also recommended to do this during regular inspections.

Gauge adjustment screen



	Items	Description
A	Switching the gauge adjustment screen	Switches the gauge adjustment screen. **ZERO set** Switch to the zero set screen. **Calibration** Switch to the calibration screen. **Shize Shift** Switches to the zero set/magnification calibration setting screen when using the size shift function.
B	Switching the D display value	Switches how data is displayed. **ZERO** This shows after zero setting. **RAW** This shows the raw (uncorrected data).

	Items	Description
C	Gauge	Perform zero setting to the connected gauge. **Gxx** xx stands for a number, which is the number of the connected gauge. **Bar graph** If the displacement exceeds 1.5 times the difference between the ZERO master value and the CAL master value, it will be displayed in red. **ZERO** Perform zero set. **Value** Shows the gauge displacement.

Perform zero setting.

1 Show the magnification calibration screen.

(1) Tap "Gauge" from the tabs at the top of the screen.

(2) On the gauge main screen, tap "Settings" in the sidebar.

(3) Tap [Gauge setup] from the tabs at the top of the screen.

(4) Tap "Calibration" from the tabs at the top of the Gauge Setup display area.

2 Enter the ZERO master value in the input field to the left of [ZERO].

This procedure will explain using an example where "0.0" is entered.

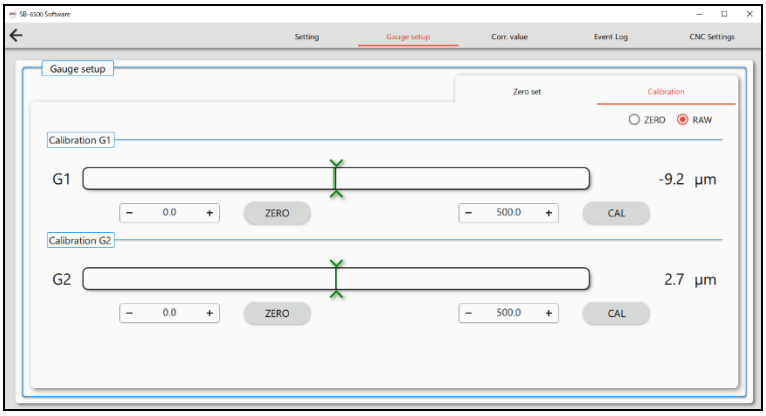
NOTE

There are two ways to input values: absolute and relative. Please refer to "3.2.3 Performing both zero setting and magnification calibration: absolute and relative values."

3 Tap [RAW] (no correction) from the [ZERO/RAW] check button.

4 Set the ZERO master, which will be the measurement standard, on the gauge.

5 Adjust the position of the gauge contact so that the number on the right side of the bar graph (gauge displacement) is near "0."



6 Tap［ZERO］.

The value will be set to zero and a check mark will appear next to [ZERO].

NOTE

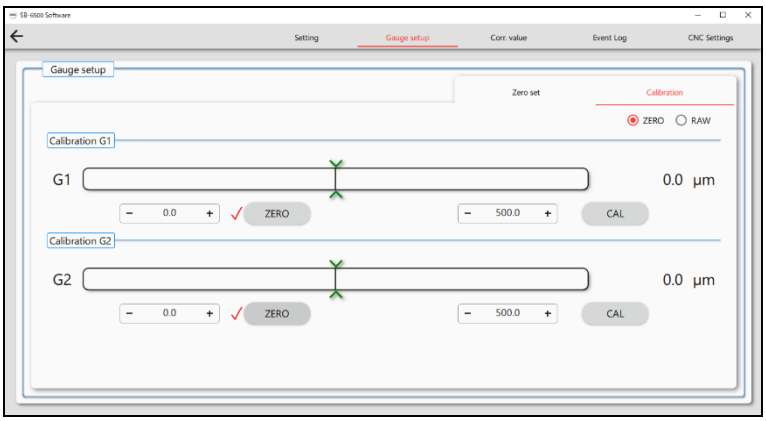
The settable range for the zero master value is [-999999.99 to 999999.99µm]. If a zero limit error occurs, refer to "8. Troubleshooting."

7 Perform zero setting on all gauges.

8 Display after zero and confirm that all gauges have been zeroed.

(1) Tap [ZERO/RAW] to switch to [ZERO].

(2) Verify that all gauge displacements display "0".



9 Remove the ZERO master from all gauges.

Calibrate the magnification

1 Enter the CAL master value in the entry field to the left of [CAL].

NOTE

CAL means Calibration. The difference between the CAL master value and the zero master value is treated as the target value for magnification calibration. There are two ways to enter values: absolute and relative. See "3.2.3 Performing both zero setting and magnification calibration: absolute and relative values."

2 Set the CAL master to the gauge.

3 Tap［CAL］.

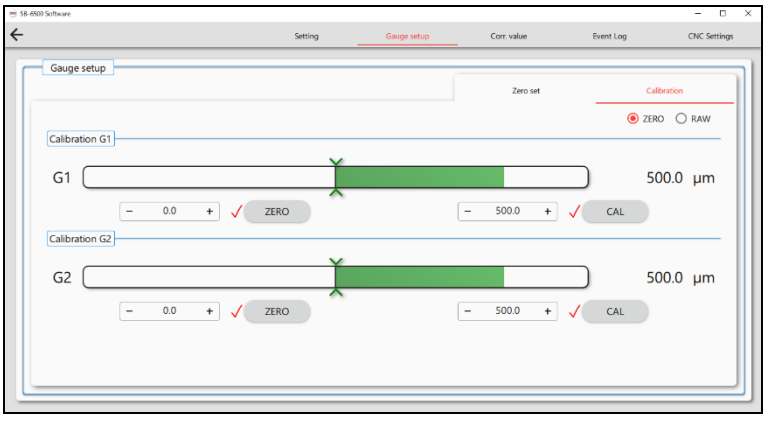
Magnification calibration is performed and a check mark appears next to the .

NOTE

The settable range for the CAL master value is [-999999.99 to 999999.99µm]. If a CAL limit error occurs, refer to "8. Troubleshooting."

4 Perform magnification calibration for all gauges.

5 Check that the displacement of all gauges is the difference between the ZERO master and the CAL master.



6 Remove the CAL Master from the gauge.

7 Set the ZERO Master again and check that all gauges have been adjusted correctly.

(1) Set the ZERO Master on the gauge.

(2) Check that the gauge displacement is near "0".

8 If the gauge displacement is deviated from near "0", adjust the gauge again using the following procedure.

(1) Set the ZERO Master on the gauge.

(2) Tap［ZERO］.

(3) Remove the ZERO Master from the gauge.

(4) Set the CAL master on the gauge.

(5) Tap［CAL］.

9 Zero setting and magnification calibration are performed for all gauges.

NOTE

If a CAL limit error occurs, please refer to "8. Troubleshooting."

Zero setting and magnification calibration are complete.

Absolute and Relative Values

Using the case where a master is used as an example, the ZERO master and CAL master values to be set for zero setting and magnification calibration are explained. It is assumed that the display unit is μm.

ZERO master： φ30.000 mm

CAL master： φ30.100 mm

When entering an absolute value

ZERO master： Input “30000.0”.

CAL master： Input “30100.0”.

When entering a relative value

Calculate and enter the difference between the ZERO master and the CAL master.

ZERO master： Input “0.0”.

CAL master： Input “100.0”.

The above is an example of measuring the diameter using only G1. If you want to measure the diameter using G1 and G2, please see below.

When entering an absolute value

ZERO master： Input "15000.0" for G1 and G2.

CAL master： Input "15050.0" for G1 and G2.

When entering a relative value

Calculate and enter the difference between the ZERO master and the CAL master.

ZERO master： Input "0.0" for G1 and G2.

CAL master： Input "50.0" for G1 and G2.

In either case, the instrument will recognize the difference between the ZERO master and the CAL master as 100 µm.

3.2.4 Only perform zero setting

This stores the gauge's zero point in the unit. It is used for daily calibration.

1 Show Zero set screen.

(1) Tap "Gauge" from the tabs at the top of the screen.

(2) On the gauge main screen, tap "Settings" in the sidebar.

(3) Tap [Gauge setup] from the tabs at the top of the screen.

(4) Tap "Zero set" from the tabs at the top of the Gauge Setup display area.

2 Set the ZERO master, which will be the measurement standard, on the gauge.

3 Perform zero setting for each gauge.

(1) Tap［ZERO］.

(2) Tap [ZERO/RAW] to switch to [ZERO].

(3) Check the gauge displacement.

4 Perform zero setting on all gauges.

Zero setting is complete.

3.2.5 Gauge Reset

Resets the gauge state stored in the unit. Use this when gauge adjustment cannot be performed properly. After resetting, be sure to adjust the gauge.

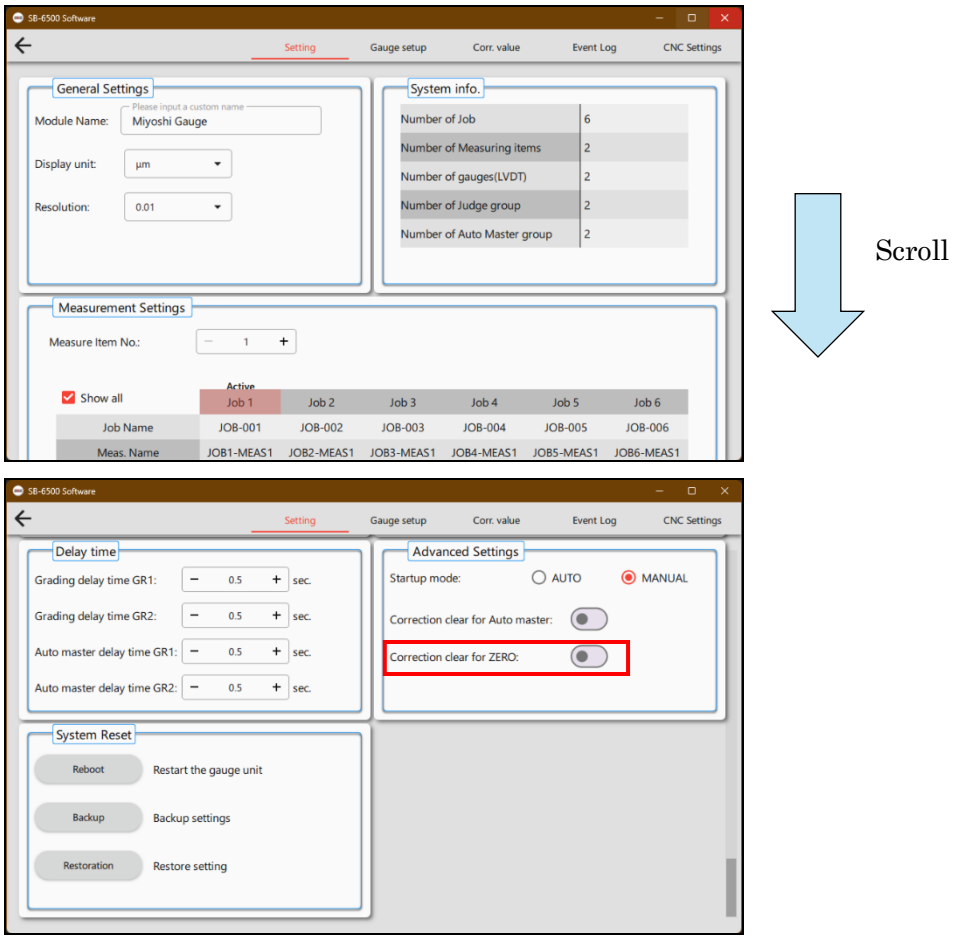
1 Show Setting screen.

(1) Tap "Gauge" from the tabs at the top of the screen.

(2) On the gauge main screen, tap "Settings" in the sidebar.

2 Tap the slide button for "Correction clear for ZERO" in "Advanced Settings."

Scroll down the Gauge Settings screen.



3.3 Setting the correction value

Set the master actual size and offset correction values.

3.3.1 Offset

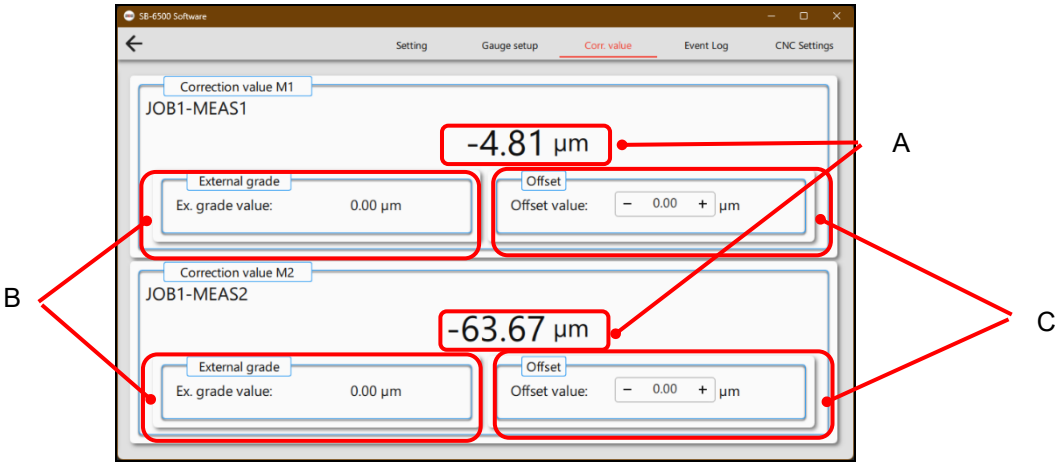
This is a general-purpose correction value (value for adjusting the finished diameter).

1 Show Corr. Value screen.

(1) Tap "Gauge" from the tabs at the top of the screen.

(2) On the gauge main screen, tap "Settings" in the sidebar.

(3) Tap [Corr.value] from the tabs at the top of the screen.



Items	Description
A: Measurement Data	It shows measurement data.
B: Ex. Grade value	Shows the offset value from the external signal.
C: Offset value and settings	Operations on the main screen sidebar are reflected in this value. Pressing the [+] or [-] button changes the value in the smallest increments. The setting range is [-999999.99 to 999999.99µm].

2 Using the measurement data as a reference, enter a value in the [offset] input field for each measurement item.

NOTE

On the gauge main screen, you can increase or decrease the value in the input field by tapping [+Shift]/[-Shift] on the sidebar. Tapping [+Shift]/[-Shift] on the sidebar will display the correction value screen in the measurement value display area on the main screen.

3.4 Auto master (external signal)

When the master is in measurement mode, if an Auto Master start command is input using an external signal, the measurement data of the measurement items belonging to the specified Auto Master group will be set to zero.

In SB-6571 Gauge module, M1 is set as Auto Master Gr.1, and M2 is set as Auto Master Gr.2.

For external signal timing and input/output signals, see "2.7.4 Timing Charts." The auto-master start command can be input in either AUTO or MANUAL mode.

NOTE

The value displayed as measurement data for the measurement item is the value that has been set to zero by executing Auto Master and the correction value (offset, master actual size correction value, etc.) added to it.

3.4.1 Auto Master Error Handling

When executing Auto Master, the following two checks are provided to prevent disturbances (errors) such as foreign objects adhering to the master.

Auto Master Adjacent Check

This function checks whether the measurement data from the latest Auto Master and the measurement data from the previous Auto Master are within a specified range. This is useful for preventing disturbances such as the adhesion of foreign matter. If an Auto Master adjacent error occurs, check that there is no foreign matter on the master and run Auto Master again. At that time, the unit will compare the measurement data before the Auto Master adjacent error occurred with the current measurement data and output an Auto Master OK/NG output according to the result.

Auto Master Limit Check

This function checks whether the measurement data during auto-master is within a certain range from the zero-set state. This function helps prevent drift that would not be detected as an error in the auto-master adjacent check. If an auto-master limit error occurs, set the ZERO master and perform zero-set. Then, run auto-master.

For information on zero setting, see "3.2 Adjusting the Gauge."

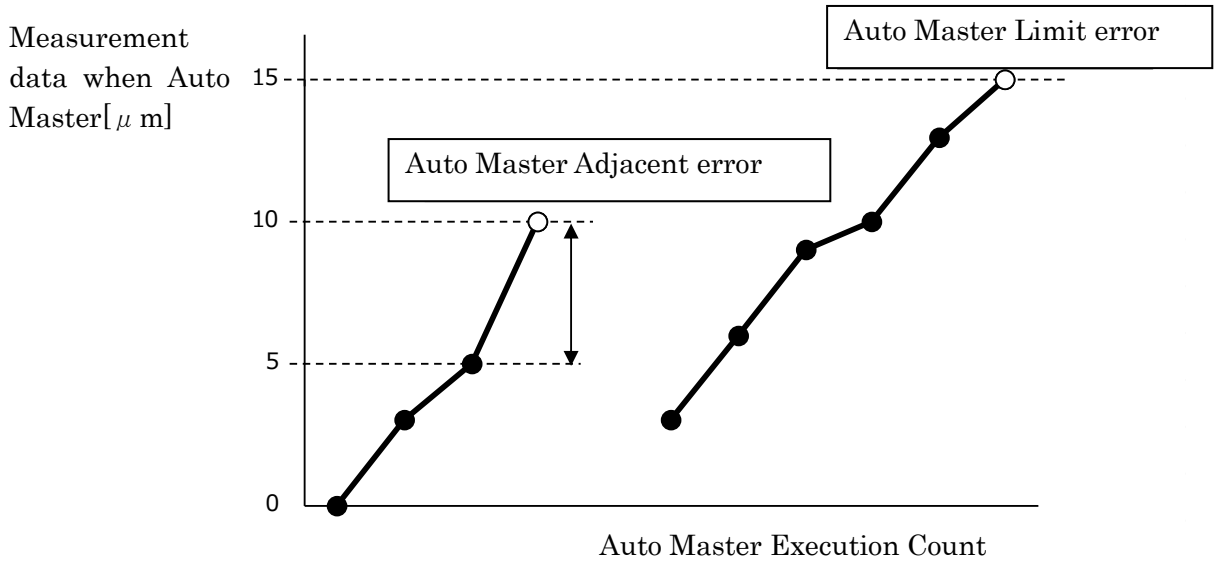
NOTE

For the cause of the error and how to deal with it, please refer to "8. Troubleshooting."

The graph below is an example with the following settings:

Auto Master Adjacent Value： 5 μm

Auto Master Limit Value ： 15 μm



3.4.2 Auto Master Settings

The adjacent and limit values of the auto master can be checked and set on the measurement item screen. For details on the measurement item screen, see "6.2 Setting Screen."

3.5 Setting the grading point

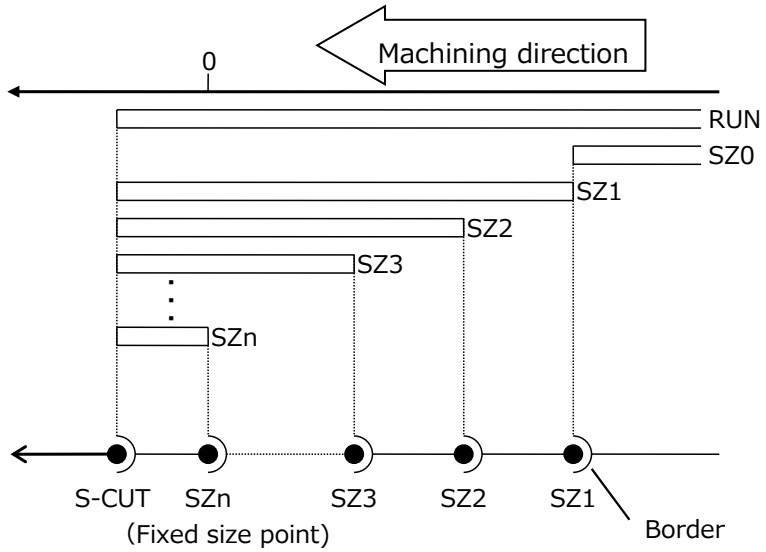
This explains how to set grading points for in-process measurement. Grading points can be set for each measurement item.

3.5.1 Relationship between grading points and grading output signals

The relationship between the in-process grading points and the grading output signals is explained below.

In-process

The timing for machining control is determined from measurement data that changes constantly during machining, and the machine tool is controlled in real time. Machining control timing (grading points) include switching from rough grinding to fine grinding, from fine grinding to spark out, and retracting the grinding head. SZ is the name of the signal that is output for each threshold value.



The polarity of the measurement data differs depending on whether the measurement item is set to inner diameter or outer diameter.

- In the case of outer diameter, machining reduces the diameter, so the measurement data changes from positive to negative.
- For the inner diameter, machining increases the diameter, so the measurement data changes from - to +.

The boundary line between the signal output value and the judgment point is included on the SZn (sizing point) side. The boundary line cannot be set to include the SZ1 side.

There is a hysteresis function that does not update the judgment results for 7 μm for measurement data in the machining direction and the opposite direction. The hysteresis function is useful for preventing changes in the judgment results when dust or other particles are attached to the workpiece.

NOTE

RUN signal: Indicates that processing is in progress.

3.5.2 Signal Cut Function(S-CUT)

This function turns off the sizing signal when the measurement data reaches the S-CUT point. Only in-process items can be set.

NOTE

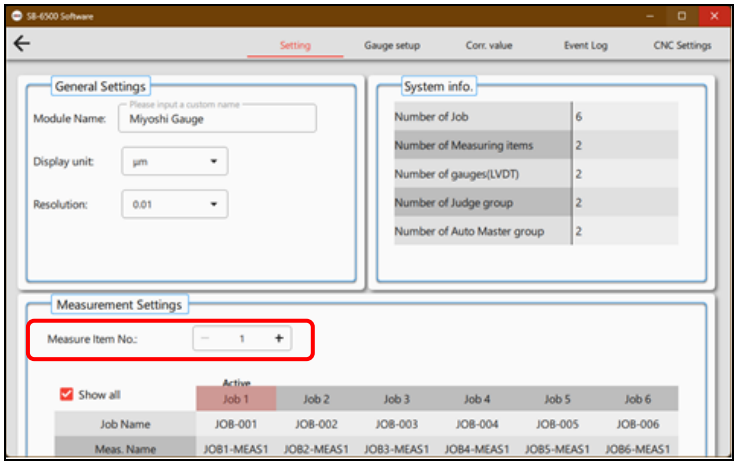
When the S-CUT point is reached, the RUN signal also turns OFF. For details, refer to the RUN signal in "2.3 Functions."

3.5.3 Setting the grading point (in-process measurement)

In in-process measurement, set the grading point value (threshold value) to determine the machining control timing from the measurement data. Set the judgment point for each measurement item. After selecting the measurement item to be set, set the judgment.

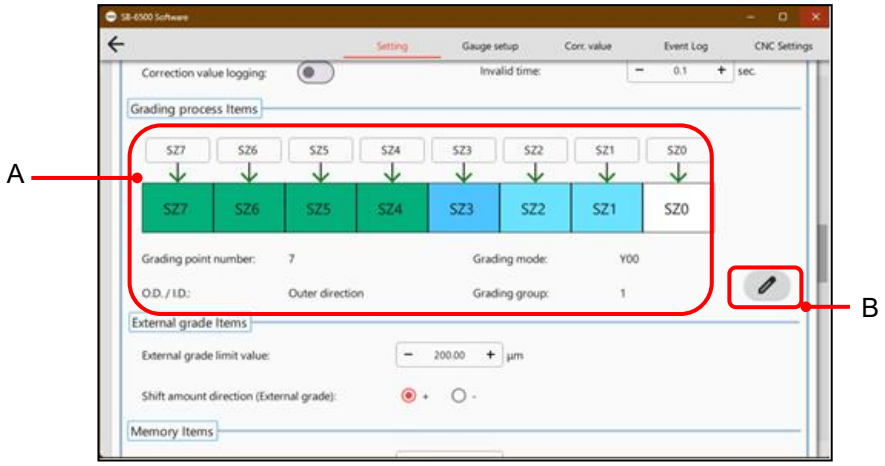
Measurement item setting screen

(1) Tap "Gauge" from the tabs at the top of the screen.
(2) On the gauge main screen, tap "Settings" in the sidebar.
(3) Tap "Settings" from the tabs at the top of the screen.



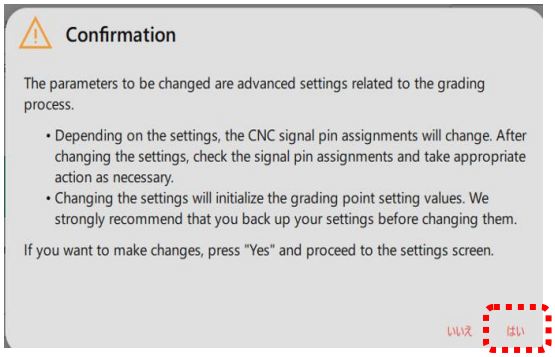
Grading point screen

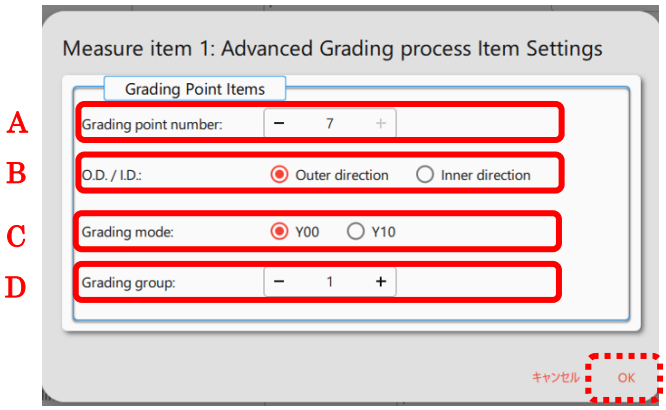
Scroll down from the measurement item setting screen to "Grading process Items," which is the area for displaying and setting grading points.



	Items	Description
A	Grading points	Displays the switching threshold value of each SZ signal, the number of grading points, grading mode, O.D/I.D, and grading group.
B	Edit button	The setting screen for the grading point is displayed.

Press the Edit button to display a warning message. If you want to change the settings, press "Yes."





	Items	Description
A	Grading point number	Set the number of switching thresholds for each SZ signal. The setting range is [2 to 7].
B	O.D./I.D.	Select [O.D./I.D.].
C	Grading mode	Select grading mode [Y00] or [Y10].
D	Grading group	Set the judgment group for the selected measurement item. The setting range is [1 to 2].

NOTE

- For the relationship between grading points and grading output signals, see "4.5.1 Relationship between Grading Points and Grading Output Signals."
- Enter grading points so that the following conditions are met. If the conditions are not met, an error will be displayed.

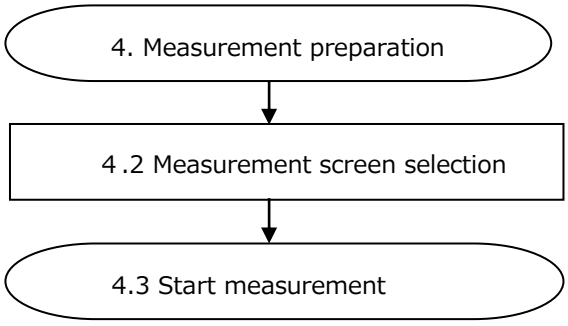
O.D. : SZ1 > SZ2 > SZ3 > … > SZn
I.D. : SZ1 < SZ2 < SZ3 < … < SZn

4. Measurement

This describes the steps to start measurement and each measurement screen.

4.1 Flow until measurement begins

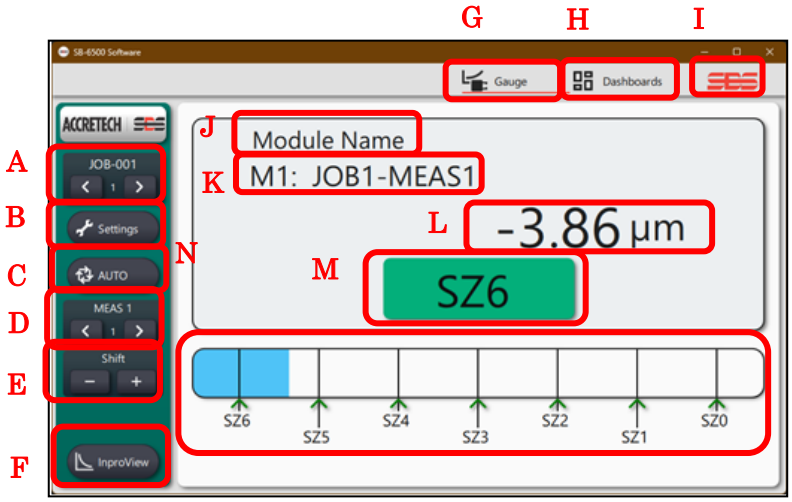
Start the measurement as follows:



4.2 Measurement screen selection

Select the measurement screen. If a gauge module exists in the set machine group, it can be displayed.

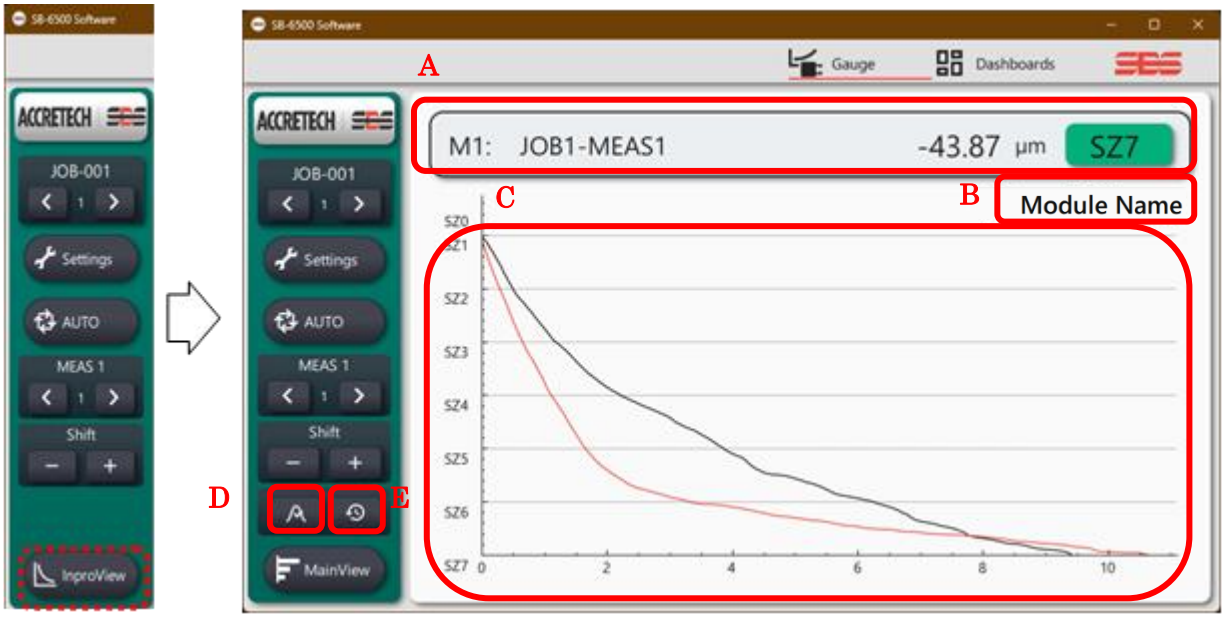
4.2.1 Main screen



	Items	Description
A	JOB number and Display switching	Switches the job.
B	Gauge module setting	Various setting screens will be displayed. Please refer to "6.2 Setting Screen" for instructions on how to use the screen.
C	AUTO button	Used to switch between AUTO and Manual modes. This mode change only affects the corresponding gauge module.
D	Measurement item selection	Select Measurement item（1 or 2）.
E	Shift button	Used when manually adjusting finished dimensions, etc. Pressing this will switch to the correction value input screen.
F	Inpro view button	The screen will change to the machining graph screen.
G	Module switching	Appears if a gauge module is present.
H	Dashboard View	This screen displays any combination of display screens. For instructions on how to use it, please refer to "6.7 Dashboard Screen".
I	Landing Page Button	Go to the landing page.
J	Module name	Display Module name.
K	Selected measurement item	Display measurement item.
L	Current Measurements	Displays the real-time measurement value of the selected measurement item.
M	Measurement result	Displays the real-time judgment results of the selected measurement item.
N	Bar graph	Displays the real-time measurement value of the selected measurement item in a bar graph.

4.2.2 Inpro View screen

It is displayed by pressing the [InproView] button on the main screen. It displays a graph of the machining status (changes in measurement data over time) in real time, as well as the elapsed time between each judgment point and the judgment results. Graph data for 50 data points is automatically saved and can be redisplayed. (The oldest data will be overwritten after the 51st data point.)
However, the graph data will be lost when the power is turned off.



	Items	Description
A	Result	Displays the measurement item, measurement item name, measurement value, and judgment result.
B	Module name	Displays Module name.
C	Plot Area	The registered ideal machining status and the current machining status are displayed in real time as a graph. The ideal data is displayed as a red line, and the machining data is displayed as a black line. 50 pieces of graph data are automatically saved and can be redisplayed. (The oldest data will be overwritten after the 51st data.)
D	Ideal data registration button	Record the ideal data to be displayed on the processing status display screen. When you press the ideal data registration button, the latest processing data at that time will be registered as ideal data.
E	Graph data history screen button	Check the previously recorded machining data.

4.3 Start measurement

Measurements are performed in AUTO mode.

1 Tap［AUTO］.

It will switch to AUTO mode.

The setup on the unit is complete.

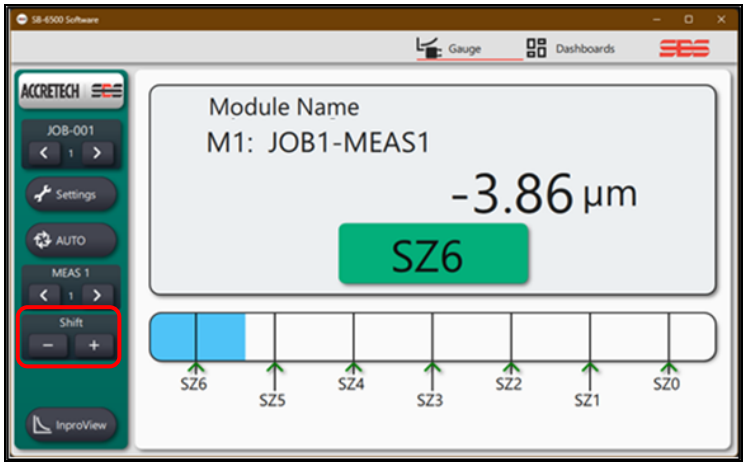
5. Operation during machining (In-process measurement)

It explains operations such as changing the finished size, measuring the elapsed time, detecting dimensional abnormalities, and registering ideal data.

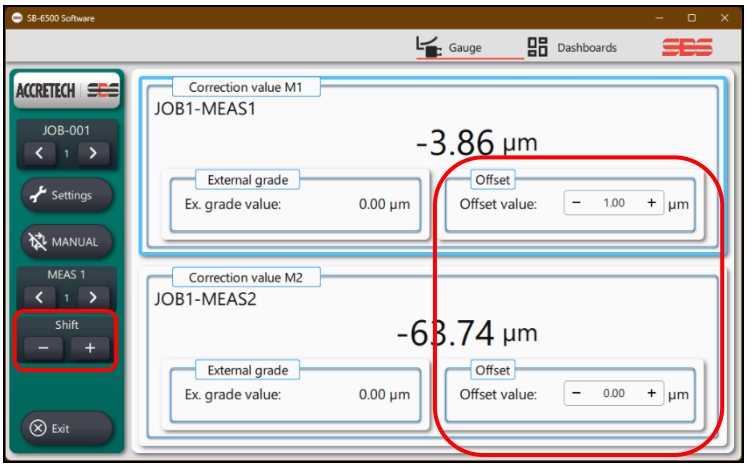
5.1 Changing the finished size

The offset value can be changed to change the finished dimensions. When measuring the finished dimensions after machining, adjustments may be necessary. This device can add an offset to the measurement data to adjust the finished dimensions.

1 Tap [+Shift]/[-Shift] displayed in the sidebar on the main screen.



The correction value screen will be displayed.

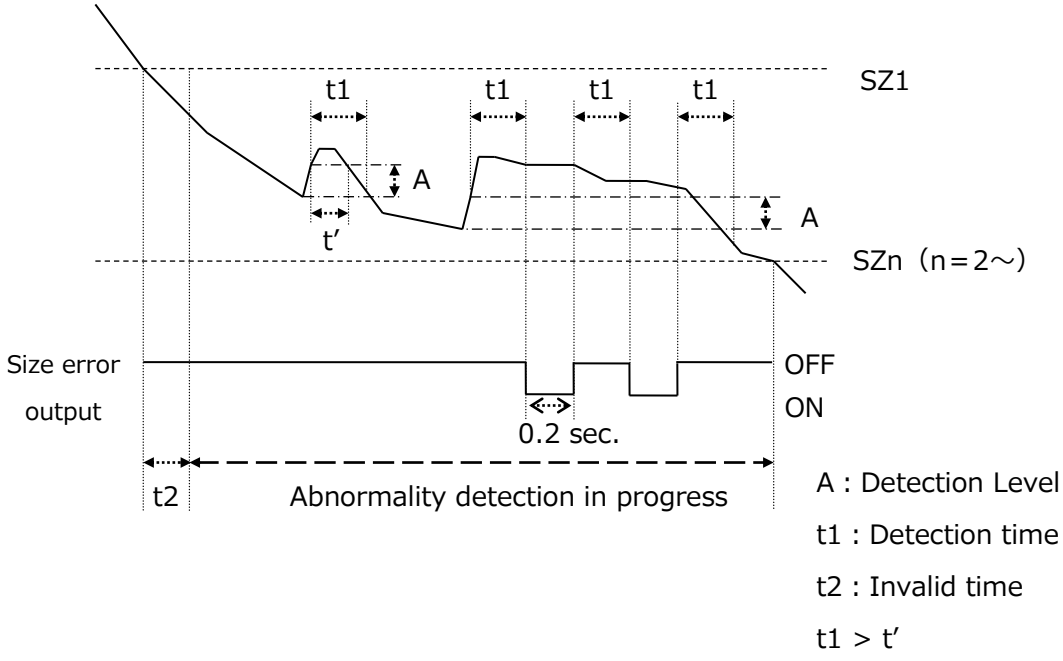


2 Set the offset value

Tap [+Shift]/[-Shift] on the sidebar, or enter the offset value manually.

5.2 Size Error detection

This function automatically detects diameter abnormalities caused by residual scale or abrasive grains during processing. If a value that is a certain level larger (smaller) than the minimum (largest) value obtained up to that point continues for a certain period of time during measurement, it is deemed to be an abnormality and a signal is output.



NOTE

The output time for size error is fixed at 0.2 seconds.

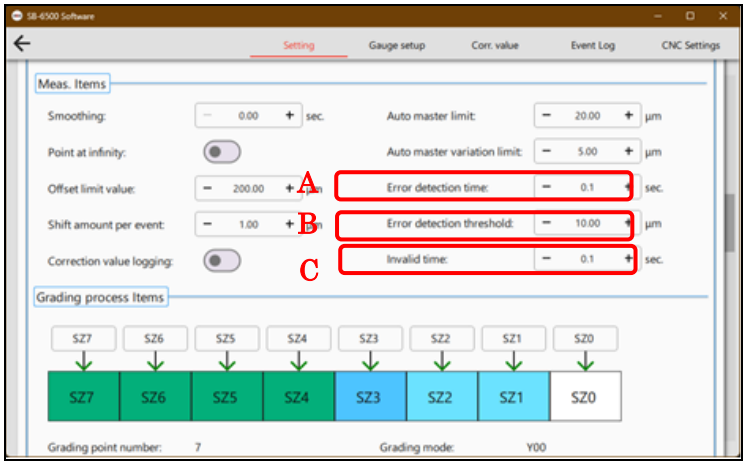
1 Displays the measurement item settings.

(1) Tap "Gauge" from the tabs at the top of the screen.

(2) On the gauge main screen, tap "Settings" in the sidebar.

(3) Tap "Settings" from the tabs at the top of the screen.

(4) Scroll down the screen to display the [Meas.Items] area.



	Items	Description
A	Detection time	Set the size error detection time. If the detection level is output continuously for more than the detection time, size error signal will be output. The setting range is [0.0 to 9.9 seconds].
B	Detection level	The threshold value for outputting a size error signal can be entered in the detection level. The setting range is [0.00 to 99.99 µm].
C	Invalid time	Set the invalid time. The invalid time corresponds to the delay time for the size error detection process. Use the arrow buttons to select from [0.1/0.2/0.5sec].

2 Enter each setting time.

5.3 Ideal data registration

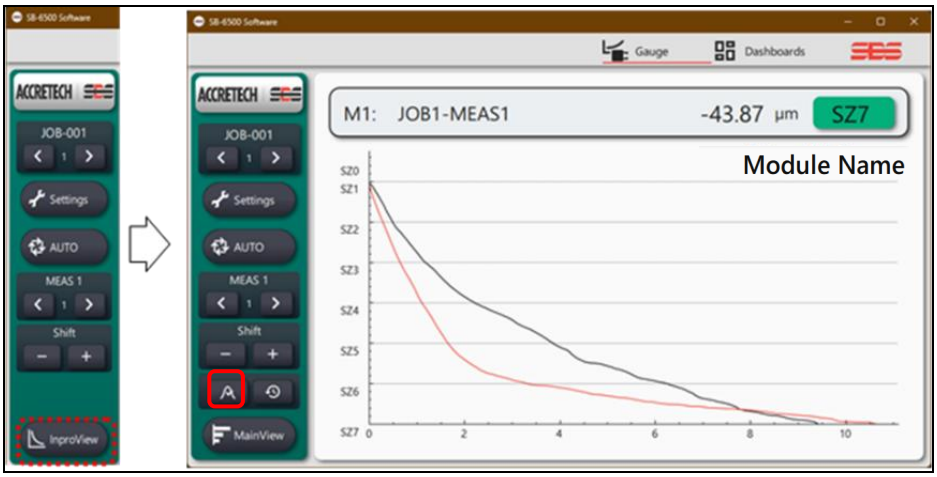
In the processing situation, the processing curve immediately after dressing is stored and the difference in processing situation due to grinding wheel wear, etc. can be compared.

1 Display inpro view screen.

(1) Tap [InperoView] on the sidebar.

(2) Tap the Ideal Registration button.

The displayed processing graph will be registered as the ideal data.



(3) Tap [Display] for the measurement item name for which you want to check the processing status.

The processing graph will be displayed.

2 Tap [Register Ideal].

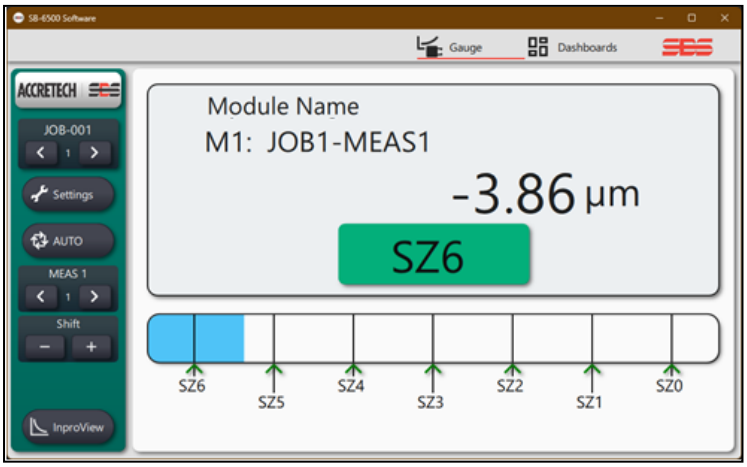
The displayed processing graph will be registered as the ideal data.

6. Settings and Verification

This explains how to make and check settings on the menu screen.

6.1 Main screen

It can be displayed if a gauge module exists in the set machine group.

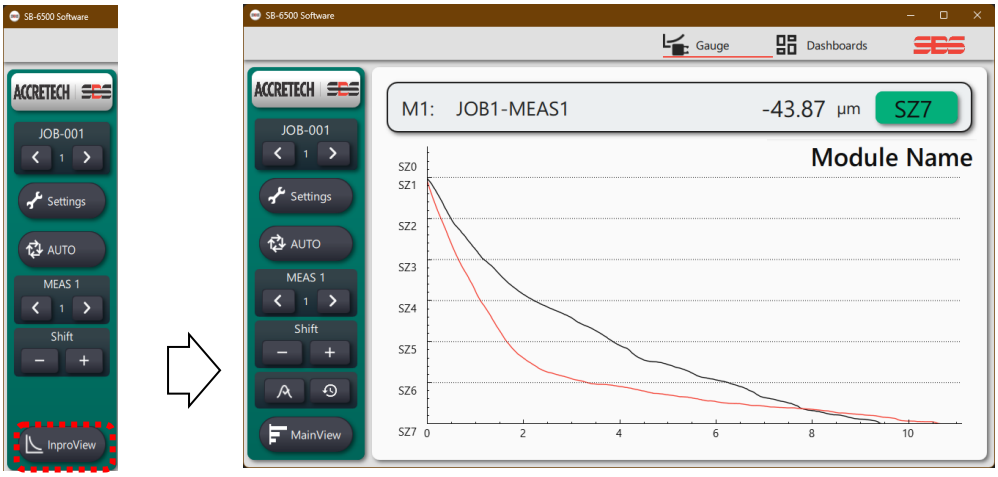


NOTE

For details, please refer to "4.2.1 Main Screen".

・Inpro view screen

It will be displayed when you press the [InproView] button on the main screen.

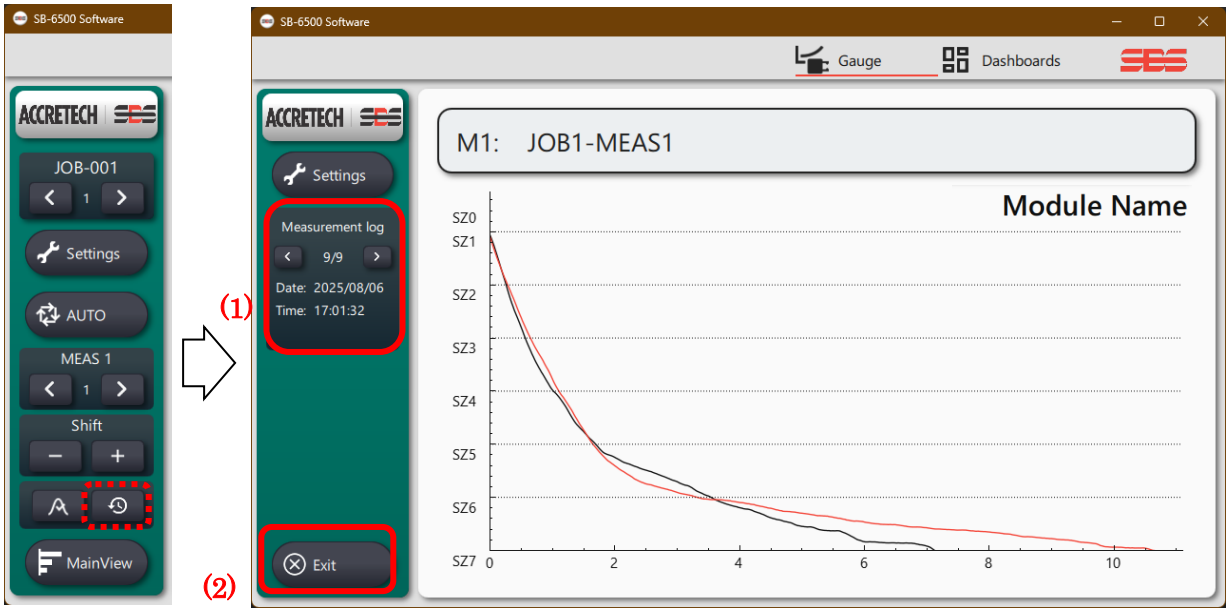


NOTE

For details, please refer to "4.2.2 Processing Graph Screen".

・Graph data history screen

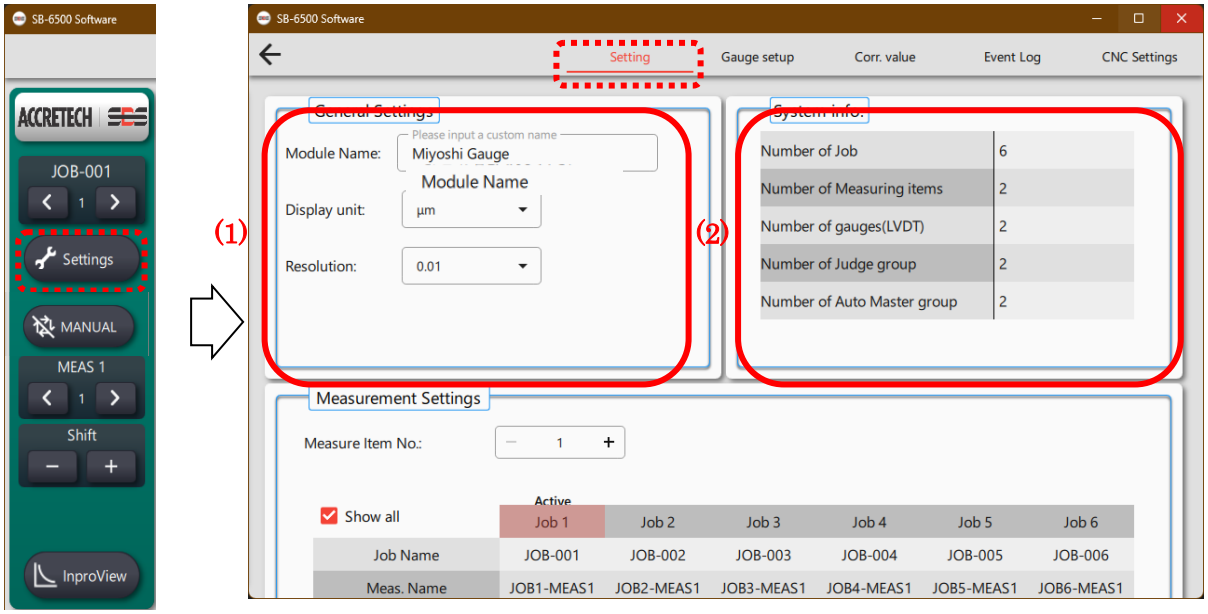
Press the graph data history screen button to display it.



Items	Description
(1) Measurement log	The processing graph switching button, history number, and date and time are displayed. Graphs can be selected from the past 50 for each measurement item.
(2) Exit button	The original machining graph screen will be displayed again.

6.2 Setting screen

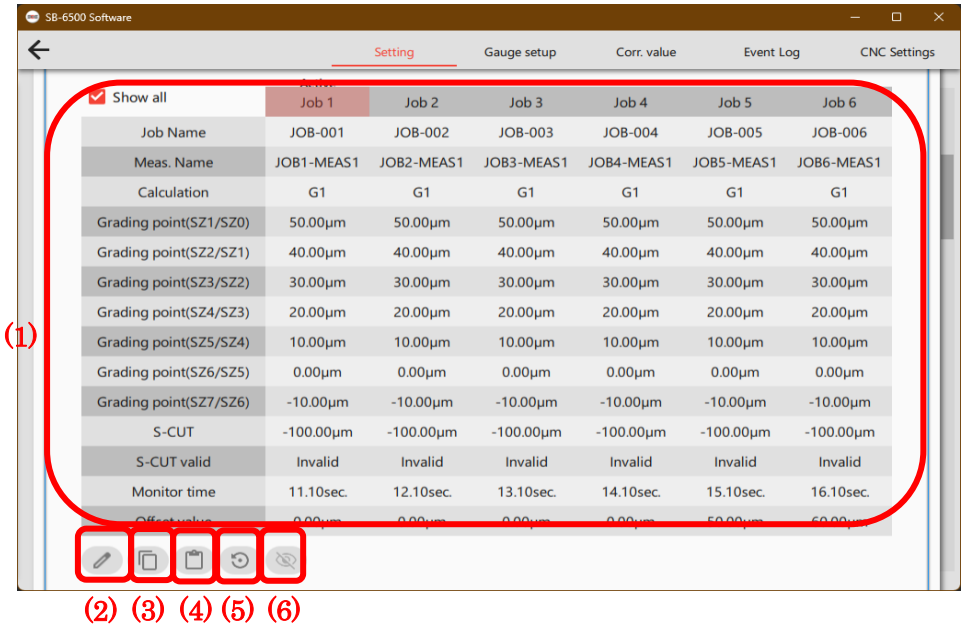
It will be displayed when you press the [Settings] button on the main screen. Settings can only be changed in Manual mode.



Items	Description
(1) General setting	Set the module name, display unit [µm/mm/mil], and resolution (1/0.1/0.01 for µm).
(2) System information	Displays the number of jobs, number of measurement items, number of gauges, maximum number of judgment groups, and maximum number of auto-master groups.

・Measurement item setting

Swipe down on the settings screen to display “Measurement Settings”.

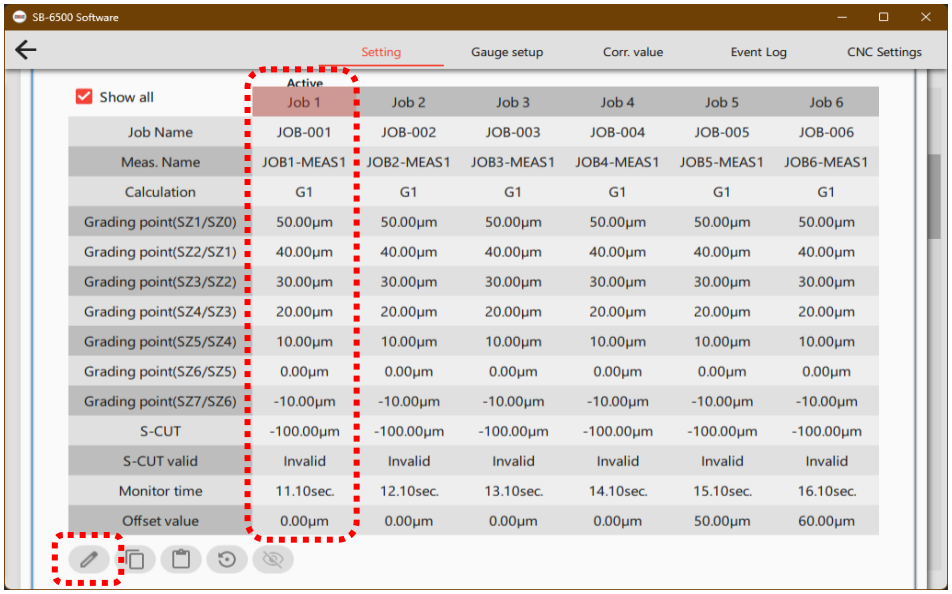


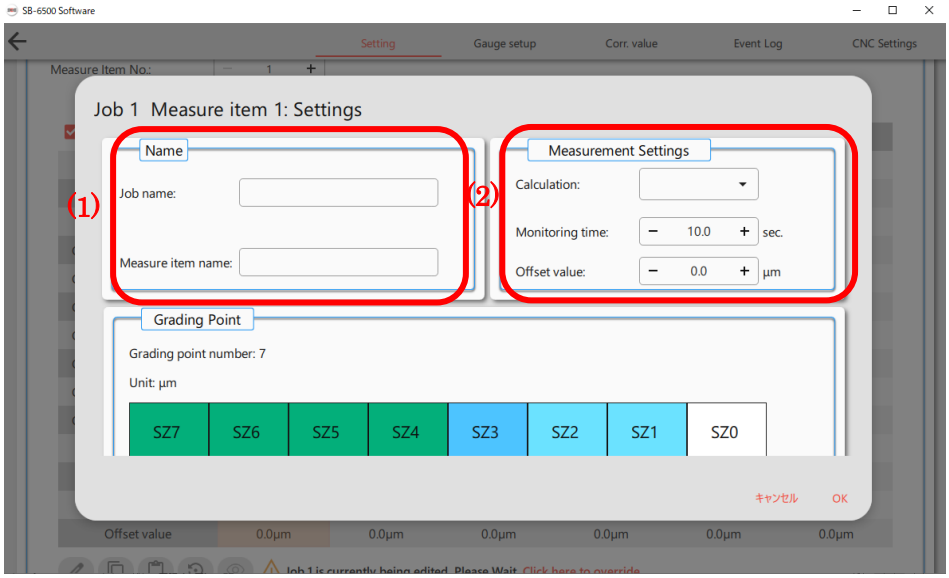
Items	Description
(1) Measurement item setting information	Displays the job name, measurement item name, calculation formula, judgment point, S-CUT setting value, S-CUT presence/absence, monitor time, and offset value.
(2) Edit button	Clicking this will take you to the edit screen.
(3) Copy button	Copies the selected job information.
(4) Paste button	Paste the job information copied in the selected job field.
(5) Initialize button	Initializes the selected job information.
(6) Invisible Button	Hides the selected Job information. If Show all is checked, the hidden columns will also be displayed as Hidden. *Job1 cannot be hidden.

There are two settings, M1 and M2, in one Job.

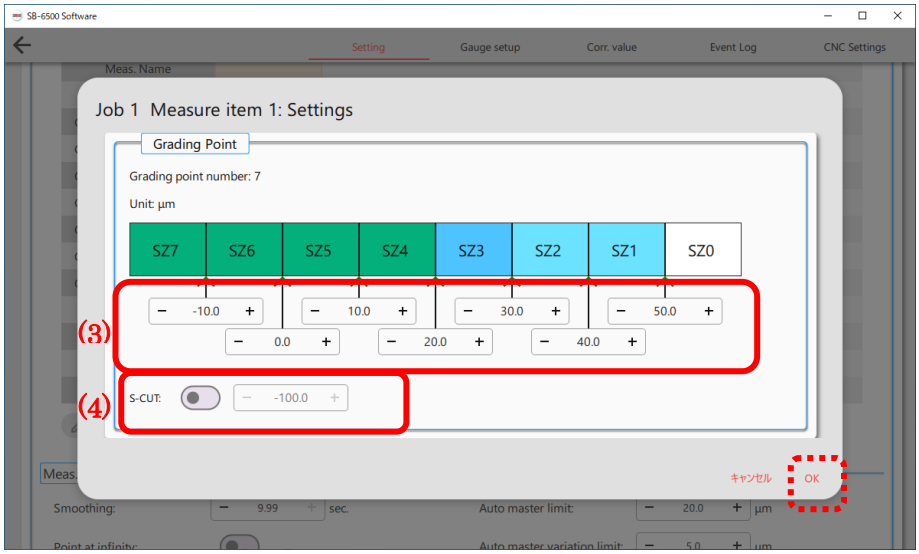
Job1		Job2		Job3		…	Job6	
M1	M2	M1	M2	M1	M2		M1	M2

To edit a job, click the job field to edit in “Measurement Settings” and then click the Edit button.





Swipe the displayed setting screen to display the decision point setting screen. If you want to update the settings, press "OK".



Items	Description
(1) Name setting	Set the job name and measurement item name.
(2) Measurement item setting	Set the calculation formula, monitor time, and offset value.
(3) Grading point setting	Set the switching boundary value for each SZ signal. Pressing the [+] or [-] button changes the value in the smallest increments. Be sure to set it so that SZ7 < SZ6 <...SZ0.
(4) S-CUT setting	Set the S-SUT function to [ON/OFF] and the setting value when enabled.

・Measurement item setting

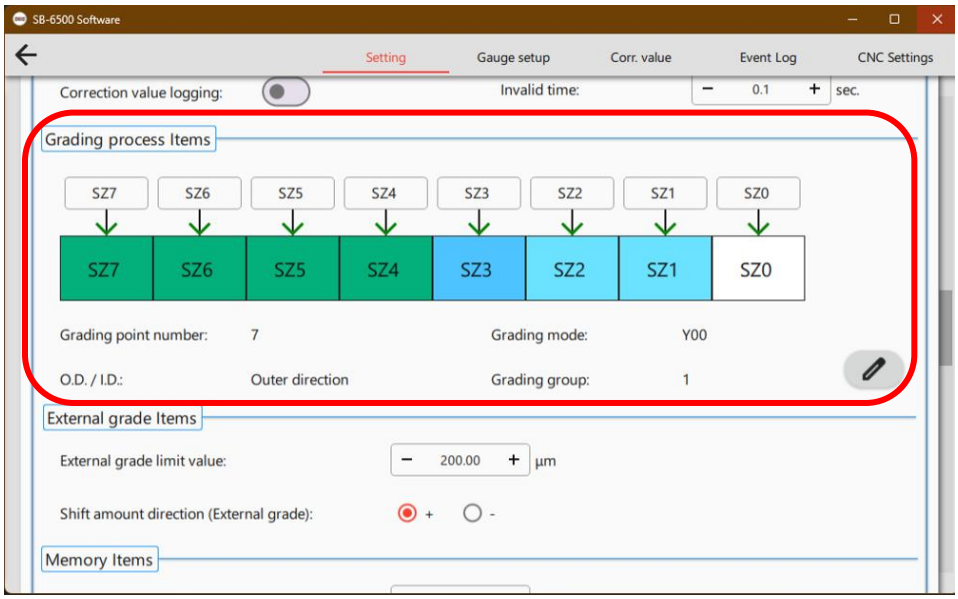
Swipe down on the settings screen to display "Meas.Items".



Items	Description
(1) Smoothing setting	Set the smoothing time. The setting range is [0 to 9.99 seconds]. Setting it to 0 turns off the smoothing function.
(2) Infinity point setting	Set the scale out [ON/OFF]. When ON, the measured value is scaled out to the plus or minus side when not measuring.
(3) Offset limit setting	Sets the offset limit.
(4) Shift amount per event setting	This is the amount of change in the correction value per press of the SHIFT [+]/[-] button, per signal during external grading, or per automatic shift correction.
(5) Correction value logging setting	Set logging [ON/OFF].
(6) Auto master limit value	It checks whether the data set in the master is within a certain range (initial setting is 20μm).
(7) Auto master adjacent value	It checks whether the data from the most recent master set and the data from the master set performed before that are within a certain range. This is mainly useful for preventing disturbances such as dust. (The default setting is 5 μm.)
(8) Detection time	Set the size error detection time. If the detection level is output continuously for more than the detection time, a size error signal will be output. The setting range is [0.0 to 9.9 seconds].
(9) Detection level	The threshold value for outputting a size error signal can be entered in the detection level. The setting range is [0.00 to 99.99 μm].
(10) Invalid time	Set the invalid time. The invalid time corresponds to the delay time for the size error detection process. Use the arrow buttons to select from [0.1/0.2/0.5sec].

・Grading point setting

Swipe down on the settings screen to display “Grading process Items.”

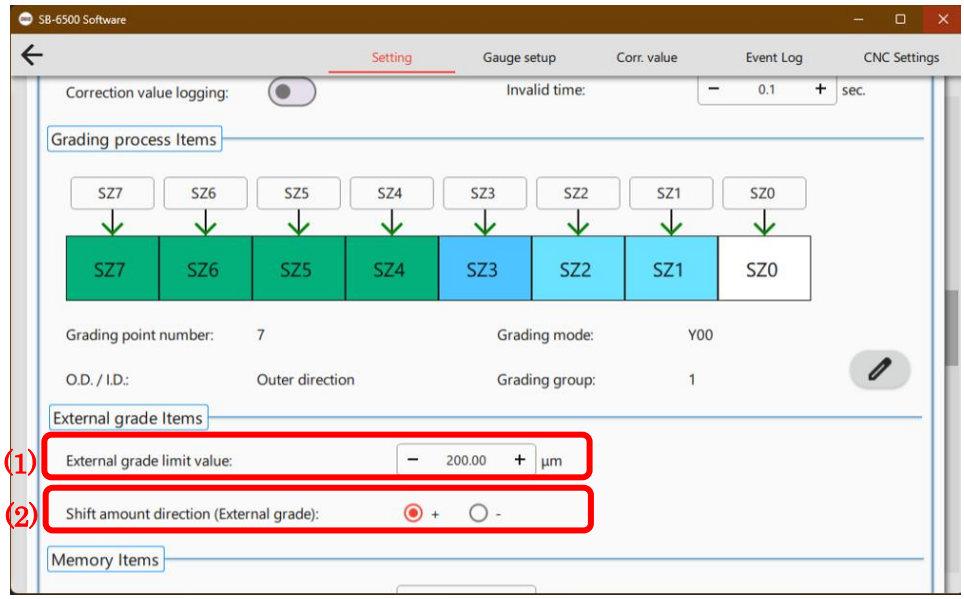


NOTE

For details, see "3.5.3 Setting the decision point (in-process measurement)."

・External grade setting

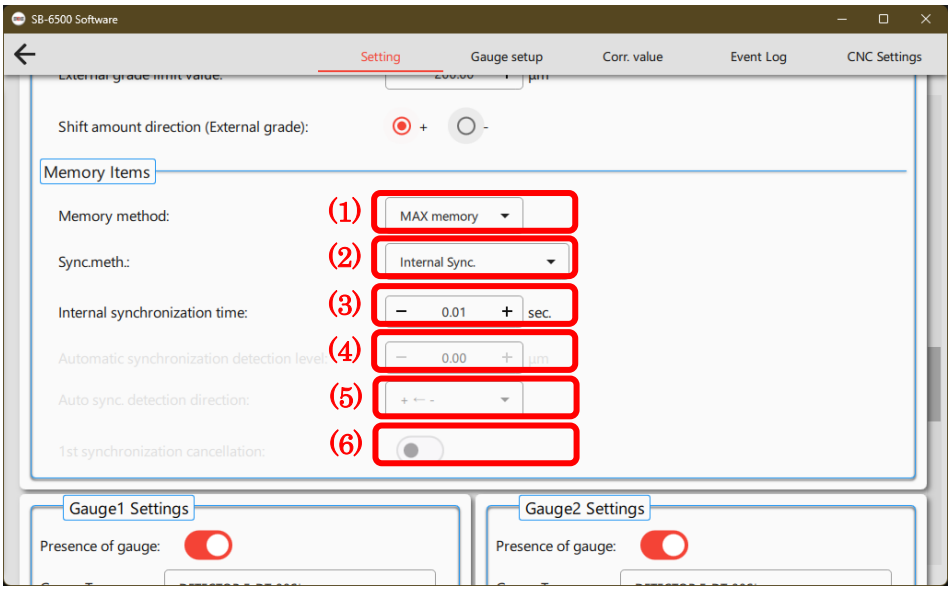
Swipe down on the settings screen to display "External grade Items."



Items	Description
(1) External grade limit value setting	Set the limit value for the external grade. The setting range is [0 to 999.99 µm].
(2) Shift amount direction setting	Set the external grade shift direction [+/-].

・Memory setting

Swipe down on the settings screen to display "Memory Items."



Items	Description
(1) Memory method setting	Choose one of seven storage methods.
(2) Sync. method setting	Select the synchronization method (internal synchronization, external synchronization, or automatic synchronization).
(3) Internal sync time setting	This setting is only possible when the synchronization method is internal. The setting range is [0.01 to 9.99 seconds].
(4) Automatic sync detection level setting	This setting is only possible when the synchronization method is automatic. The setting range for the automatic synchronization detection level is [-9999.99 to 9999.99μm].
(5) Automatic sync detection direction setting	This setting is only possible when the synchronization method is automatic. The automatic synchronization detection direction can be selected as [-→+] or [+→-].
(6) 1 st sync cancellation	Displays whether or not to discard data from the start of storage to the first synchronization during automatic synchronization.

・Gauge setting

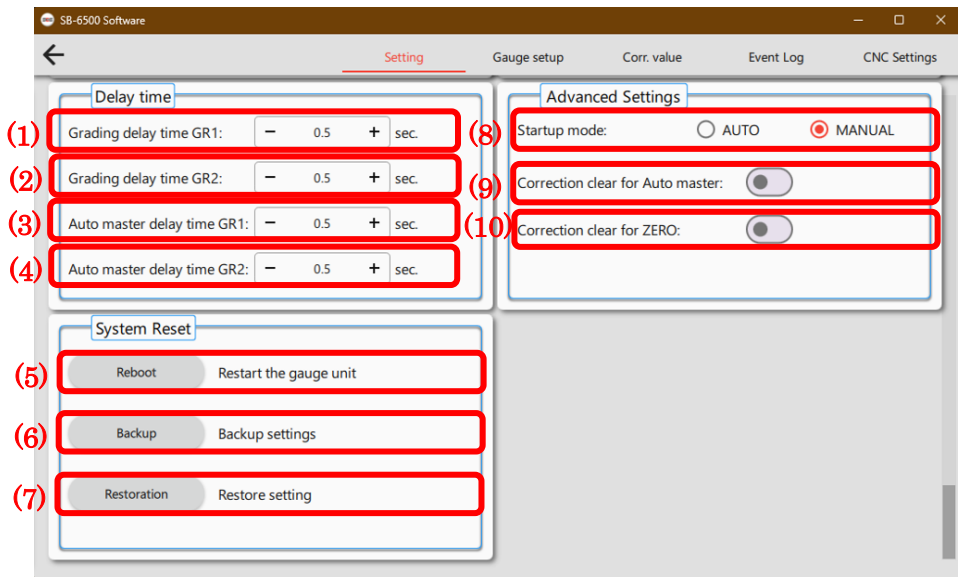
Swipe down on the settings screen to display "Gauge1 Settings" and "Gauge2 Settings".



Items	Description
(1) Presence of gauge	Set the gauge usage [ON/OFF].
(2) Gauge type	Select the gauge type to use.
(3) Retract direction	Select the retract direction from [+/-].
(4) Retract point	Set the value that determines retraction. The setting range is [-999999.99 to 999999.99 μm].
(5) Retract Gr.	Set the retract group. The setting range is [0 to 2], and setting it to 0 means that it will not belong to any group.
(6) Polarity	Select the polarity of the gauge from [+/-].
(7) Gauge error check	Set gauge error check [ON/OFF].
(8) Magnification	Sets the gauge magnification. The setting range is [0.05 to 99.99].
(9) Size shift exist	Displays whether size shift is enabled or disabled.

・Delay time, Advanced Settings, System Reset

Swipe down on the settings screen to display "Delay time", "Advanced Settings", and "System Reset".

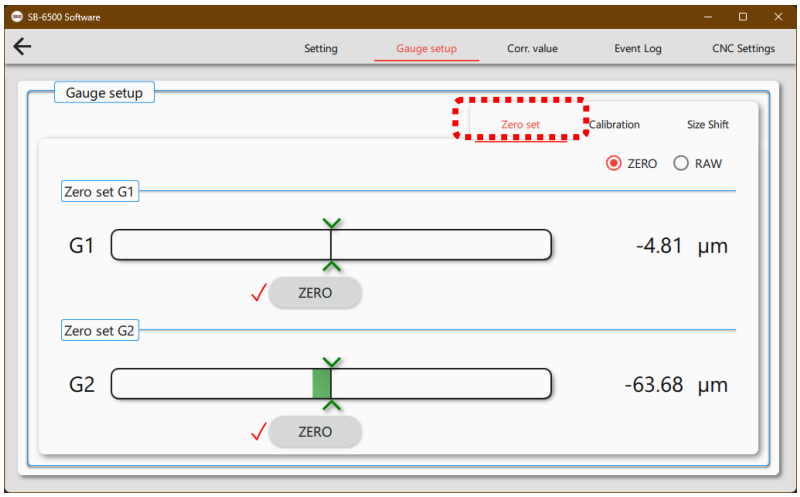


Items	Description
(1) Grading delay time Gr1 setting	Sets the grading delay time for Gr1. The setting range is [0.1 to 9.9 seconds].
(2) Grading delay time Gr2 setting	Sets the grading delay time for Gr2. The setting range is [0.1 to 9.9 seconds].
(3) Auto master delay time Gr1 setting	Sets the auto master delay time for Gr1. The setting range is [0.1 to 9.9 seconds].
(4) Auto master delay time Gr2 setting	Sets the auto master delay time for Gr2. The setting range is [0.1 to 9.9 seconds].
(5) Reboot button	Restart the gauge unit.
(6) Backup button	Backs up the settings and gauge adjustment status. Only one file can be saved. Please note that the saved file is stored inside the module and cannot be taken out of the module.
(7) Restoration button	Restores backed up settings and gauge adjustments. Please note that once loaded, they cannot be undone.
(8) Startup mode setting	Select the startup mode from [Auto/Manual].
(9) Correction clear for auto master	Set the auto master correction value clear [ON/OFF].
(10) Correction clear for zero	Set the zero correction value clear [ON/OFF].

6.3 Gauge setting screen

・Zero set screen

Press the [Settings] button on the main screen, then press the [Gauge setup] tab, then the [Zero set] tab to display the settings. Settings can only be changed in Manual mode. Be sure to set the zero setting, and perform it as frequently as possible to maintain accuracy. After setting it, a ✓ mark will appear to the left of the corresponding zero button.

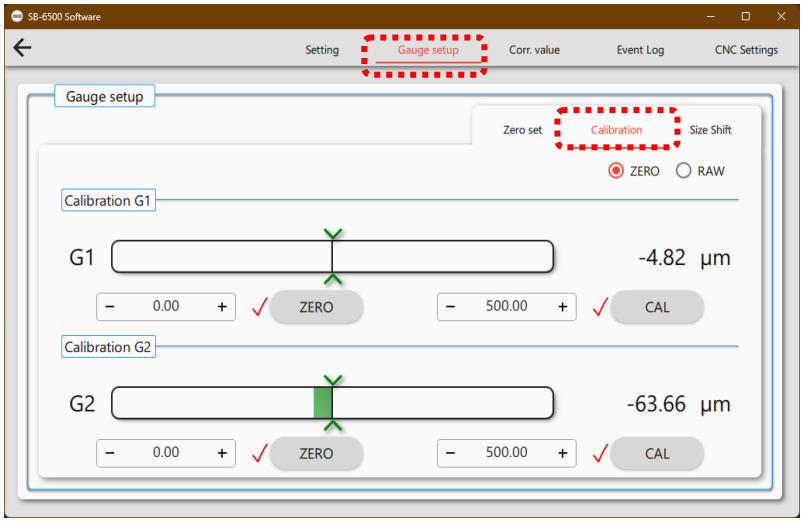


NOTE

For details, see "3.2.2 Performing both zero setting and magnification calibration."

・Calibration screen

After pressing the [Settings] button on the main screen, press the [Gauge setup] tab → [Calibration] tab on the settings screen to display it. Settings can only be changed in Manual mode. Be sure to set the magnification calibration and perform it as frequently as possible to maintain accuracy. After execution, a ✓ mark will appear to the left of the corresponding CAL button.

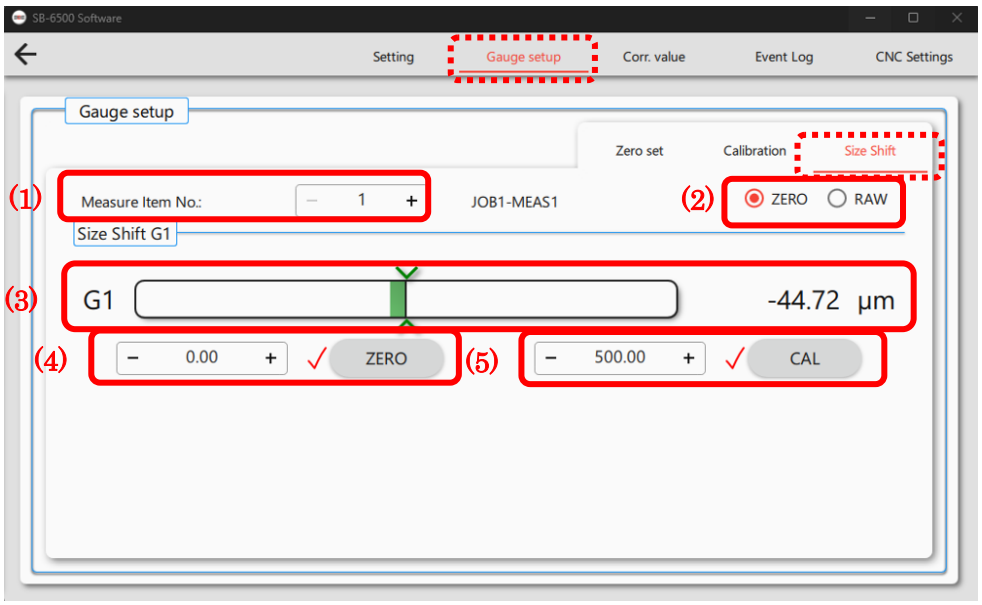


NOTE

For details, see "3.2.2 Performing both zero setting and magnification calibration."

・Size shift screen

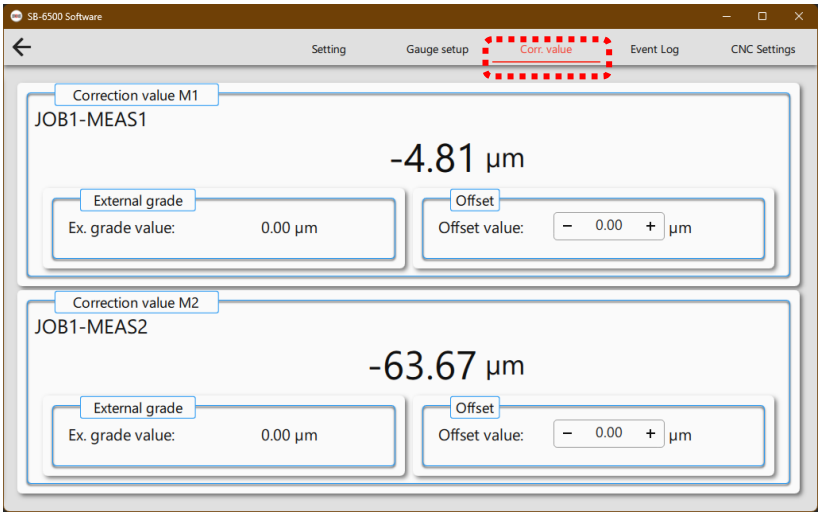
After pressing the [Settings] button on the main screen, press the [Guage setup] tab → [Size Shift] tab on the setting screen to display it. The setting can only be changed in Manual mode.



Items	Description
(1) **Measure item No.**	Switches the measurement items to be displayed.
(2) Zero／Raw switch button	Switches between displaying the value after zero setting and the raw value.
(3) Level bar and G1/G2 gauge value display	The current gauge value and its bar graph display are displayed according to the settings in (1).
(4) Zero button and zero master value input	Executes zero setting with the value when the button is pressed. The settable range for the zero master value is [-999999.99 to 999999.99µm].
(5) CAL button and CAL master value input	Magnification calibration is performed using the value when the button is pressed. The difference between the CAL master value and the zero master value is treated as the magnification calibration target value. The CAL master value can be set in the range [-999999.99 to 999999.99 µm].

6.4 Correction value setting screen

Press the [Settings] button on the main screen, then press the [Corr. value] tab on the settings screen to display this screen. The same screen can also be displayed by pressing the shift buttons [+] and [-] on the main screen sidebar.

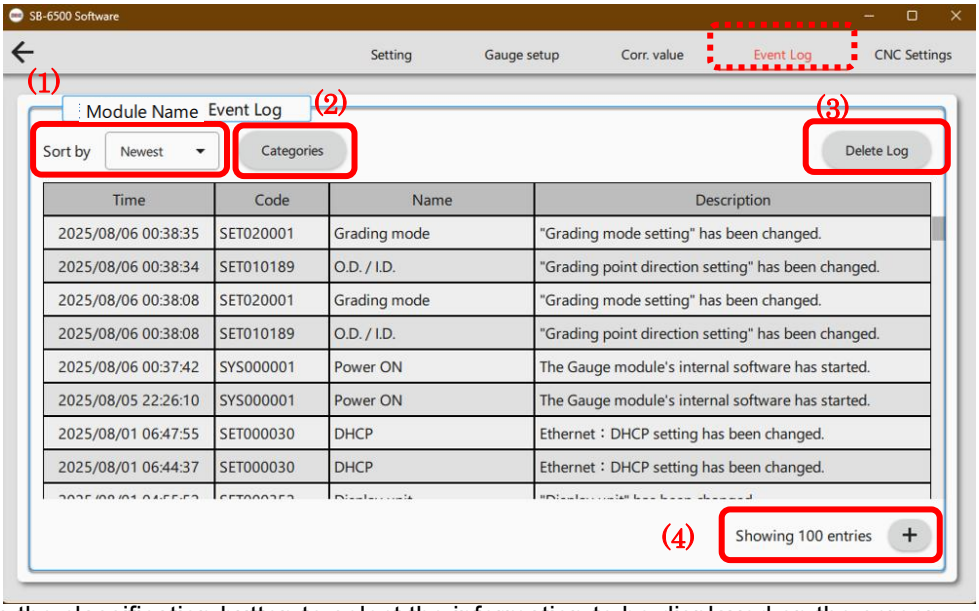


NOTE

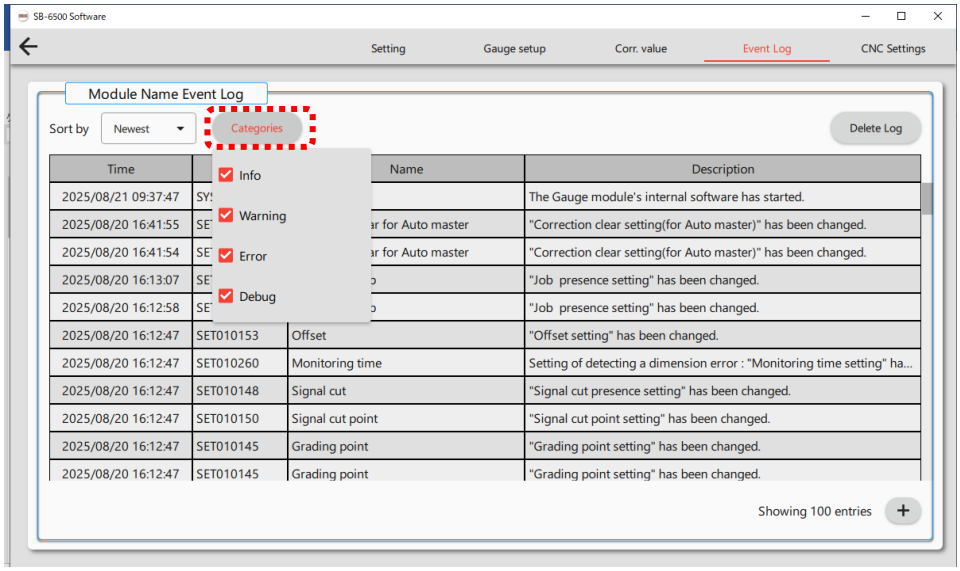
For details, see "3.3.1 Offset."

6.5 Log screen

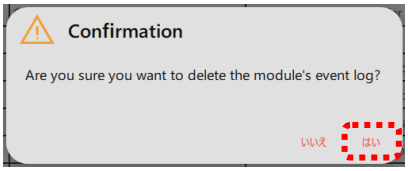
Click the [Settings] button on the main screen, then click the [Event Log] tab on the settings screen to display the event log. This displays the past log history for this module. You can check the history of setting changes and the date and time when errors occurred.



Press the classification button to select the information to be displayed on the screen.



Pressing the Delete button will display the following message. If you want to delete the history, press "Yes."

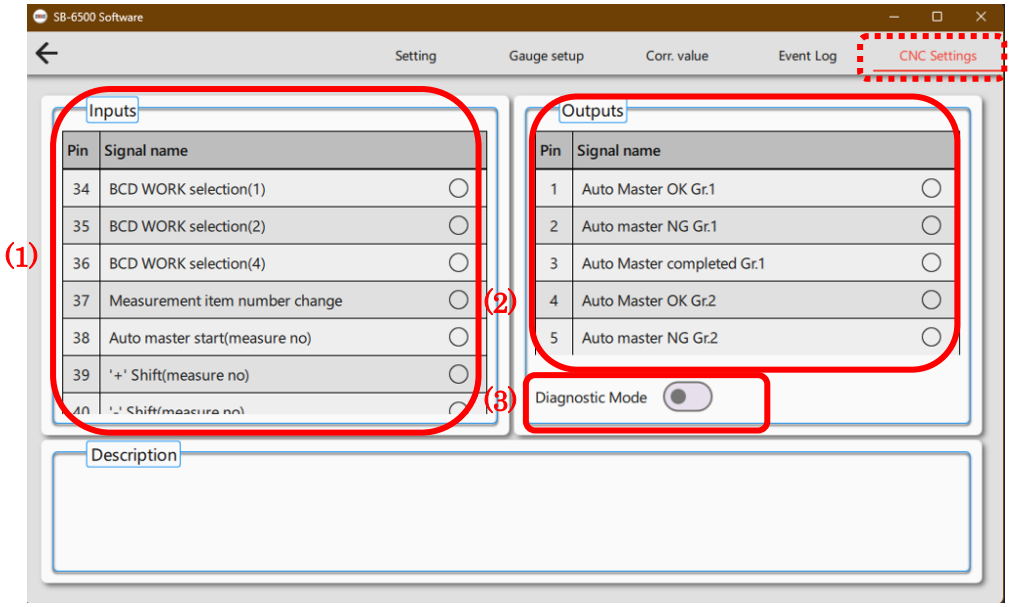


Items	Description

Items	Description
(1) Sort Settings	Select the display order from Newest or Oldest. A maximum of 500 items will be displayed. Set the display order for history logs. This will only be reflected in the history logs displayed on the screen. The default setting is Newest.
(2) Categories button	Select the content to display on the screen from [Information/Error]. Multiple selections are possible. *History will not be displayed even if you select Warning or Debug.
(3) Delete button	Deletes the history logs selected by category. Deletes the history logs of all categories, regardless of the history logs selected by category.
(4) ＋ button	The history log can display 100 items (1 to 100). Press the + button to display 100 more items (1 to 200). A maximum of 500 items can be displayed.

6.6 CNC Setting screen

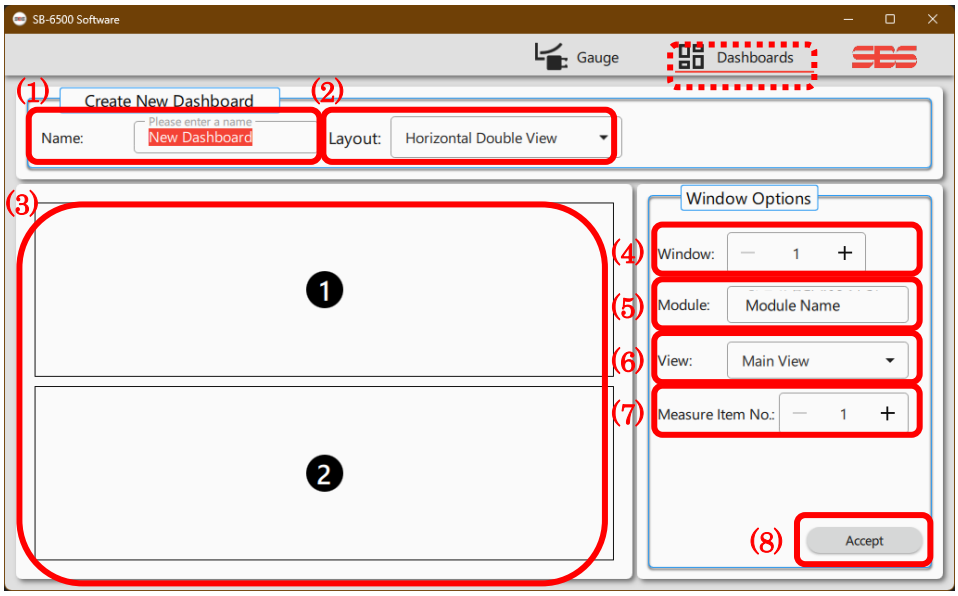
After pressing the [Settings] button on the main screen, press the [CNC Settings] tab on the settings screen to display the diagnostic mode. Diagnostic mode can only be used in Manual mode.



Items	Description
(1) Input	Displays the input status of the I/O signal.
(2) Output	Displays and sets the output status of the I/O signal.
(3) Diagnostic button	When set to ON, the output signal can be turned ON/OFF.

6.7 Dashboard screen

This machine allows you to select the display screen from any combination of multiple modules. Any combination of modules belonging to the machine group is possible.
If you click the [Dashboards] tab on the main screen and you have already created a dashboard, the name of the dashboard you created and a tab to create a new one will appear. First, select Create new.



Items	Description
(1) Layout name	Enter a layout name.
(2) Layout	Choose from 9 different display layouts.
(3) Image	The image of the display area set in (2) will be displayed.
(4) Screen selection	Select the display area number. Select the display area number with this setting, and select the module, screen, and measurement item to be displayed in this display area with (5) to (7).
(5) Module selection	Select the module you want to view.
(6) Screen selection	Select the screen you want to display.
(7) Measurement item selection	Select the measurement you want to display.
(8) Accept button	Confirms the settings entered in (1), (2), (4) to (7). If no settings are entered, the default will be entered.

7. Specification

The specifications of this device (basic specifications, software specifications, external interface) are listed here.

7.1 Specifications

Control unit basic specifications

●Basic specifications

Items	Specifications
Rated Input Voltage	DC 24V
Input Voltage Range	DC 24 V±10%
Power consumption	24V, 2.0A
Size	Width(W)57.8×Height(H)150×Depth (D)164mm (excluding protrusions)
Weight	Appx. 0.85 kg
Environmental protection structure	IP non-conformity
Operating temperature range	5℃～55℃
Operating humidity range	10～90% RH (No condensation)
Vibration resistance	JIS B 3502 Compliant
Overvoltage Category	Ⅱ
Pollution level	2
CE marking	CE Marking Standerd Compliant
EMC compliance standards	EN IEC 61000-6-2, EN IEC 61000-6-4

●Display

Items	Specifications
Display specification	No screen display as a module. Equipped with a status display LED. Red : 24V power supply（Lighting : 24V power supply, Lights out : 24V power supply OFF） Orange : For detecting and identifying connected modules It flashes according to instructions from SB6500-software. Green : System startup state（Lighting : System startup, Blink : The software inside the gauge module is not running properly.）

●Software specifications

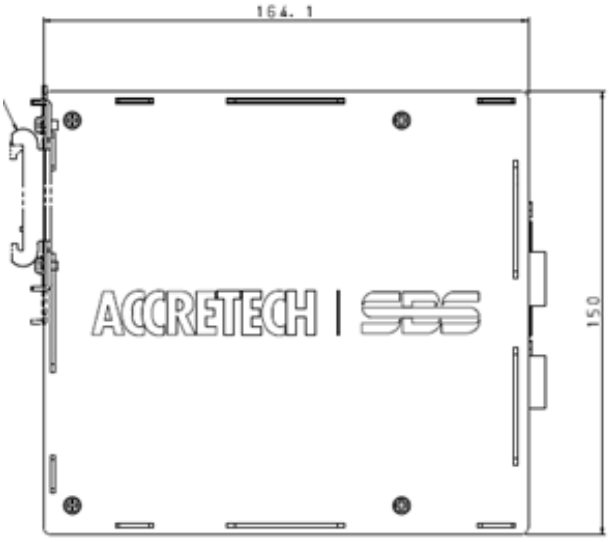
Items	Specifications
Display range	±999999.99 μm（Limited by gauge）
Resolution	1 / 0.1 / 0.01
Unit	μm, mm, mil
Connectable gauge	2
Measurement item	2
JOB number	6

●External IF

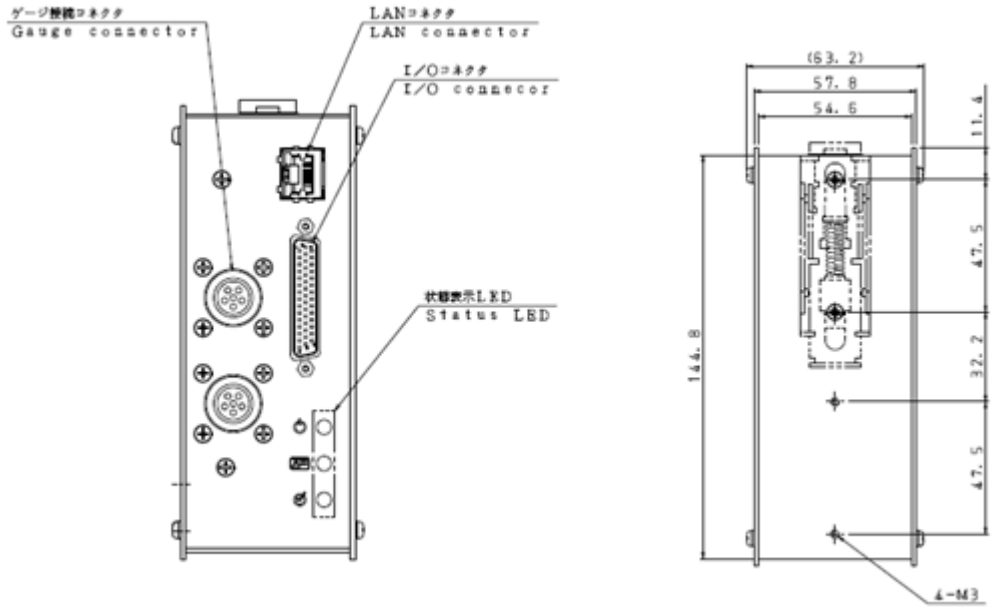
Items	Specifications
Control Input/Output	I/O, Ethernet（OPC UA）

7.2 External view

SB-6571



(a)Front



(b)Side

7.3 Accessories

Standard accessories

1） Power Connector（1952034/PHOENIX CONTACT or equivalent） : 1

8. Troubleshooting

It explains error messages and troubleshooting.

8.1 Troubleshooting

If an error occurs on the device, the following message will be displayed. If the error occurs repeatedly even after taking the measures described in the message, please contact customer support.

Motherboard

Error Message	Causes and solutions
ERR000002 An error was detected during startup.	**Cause** A hardware error has occurred. **Solution** Please restart the module by turning it off and then on. If the issue persists, please contact customer support.
ERR000013 An error has been detected on the motherboard.	

Storage

Error Message	Causes and solutions
ERR000064 There is a microSD repair error.	**Cause** The internal storage may be faulty. **Solution** Please contact customer support.
ERR000065 There is not enough free space on the microSD card.	**Cause** There is not enough free space in the internal storage to save the data. **Solution** Please delete any unnecessary measurement data or screen capture images.
ERR000066 A microSD access error has occurred.	**Cause** The internal storage may be faulty. **Solution** Please contact customer support.
ERR000068 There is a power problem with the microSD card.	

OS

Error Message	Causes and solutions
ERR000076 ～ ERR000084 A system error has occurred.	**Cause** An error occurred during application program operation. **Solution** Please contact customer support.

Program Start

Error Message	Causes and solutions
ERR000086 The update program could not be started.	**Cause** An error occurred while updating the application program. **Solution** Please run the update again.

Gauge connection error (disconnected)

Error Message	Causes and solutions
ERR00*089 A break in the gauge was detected. Check the connector connection or cable.	**Cause** The gauge connector is disconnected or the cable is broken. **Solution** Please make sure to insert the gauge connector all the way in and lock it in place. Note that the status may be cleared if the gauge is disconnected. Please perform setup again from the SETUP screen.

Gauge Standard Settings

Error Message	Causes and solutions
ERR00*115 Zero set is not completed. Please perform zero set.	**Cause** An attempt was made to switch to AUTO mode before the gauge had been zeroed. **Solution** After performing zero setting on the SETUP screen, switch to AUTO mode.
ERR00*116 Magnification calibration has not been completed. Please perform magnification calibration.	**Cause** An attempt was made to switch to AUTO mode before the gauge magnification calibration was completed. **Solution** After calibrating the magnification on the SETUP screen, switch to AUTO mode.
ERR00*117 A zero limit error has occurred. Check the status of the zero master and perform a mechanical adjustment of the gauge.	**Cause** Zero set was performed beyond the zero limit. **Solution** Adjust the gauge position so that the zero set is performed within the zero limit, and after displaying a value close to "0", perform the zero set again. The zero limit can be checked on the gauge information screen.

Error Message	Causes and solutions
ERR00*118 A CAL limit error has occurred. Check the settings and perform magnification calibration again.	**Cause** Magnification calibration was performed outside the magnification setting range. **Solution** Check the magnification setting range and calibrate the magnification again within the range. The magnification setting range can be checked on the gauge screen.

Auto Master Setting

Error Message	Causes and solutions
ERR000125 Auto Master is not complete. Please run Auto Master.	**Cause** Measurement was started before Auto master was completed. **Solution** Please start measurement after performing auto master.
ERR000126 Auto CAL has not been completed. Please perform Auto CAL. The Auto CAL function can be set to be used (ON) or not (OFF) in the measurement item settings.	**Cause** Measurement was started before Auto CAL was completed. **Solution** Please start measurement after performing auto CAL.
ERR0*0127 An Auto master limit error has occurred. Please run the gauge setup.	**Cause** Auto master was performed exceeding the auto-master limit value. **Solution** Please perform Auto Master after resetting the gauge to zero. For details on Auto Master limit values, see "7.8 Setting Measurement Items."
ERR0*0128 An auto CAL limit error has occurred. Check the settings and run auto CAL again.	**Cause** Auto CAL was performed beyond the magnification calibration range. **Solution** Check the magnification calibration range and perform auto CAL again.
ERR0*0129 An auto master neighbor error occurred. Please run auto-master again.	**Cause** The difference between the data from this Auto Master run and the data from the previous Auto Master run has exceeded the Auto Master adjacent value setting. **Solution** Remove any dust from the master or gauge and perform Auto Master again. For details on Auto Master adjacent values, see "7.8 Setting Measurement Items."

Size Shift Setting

Error Message	Causes and solutions
ERR0*0130 Size registration is not complete. Please execute size registration zero.	**Cause** An attempt was made to switch to AUTO mode before size zero registration was completed. **Solution** After performing size registration zero, switch to AUTO mode.
ERR0*0131 Size registration is not complete. Please perform size registration CAL.	**Cause** Size registration CAL has not been completed. **Solution** Please perform size registration CAL.
ERR0*0132 A size registration zero limit error has occurred. Check that the gauge and master are installed correctly.	**Cause** The limit was exceeded and size registration was zero. **Solution** Please check that the zero master for size registration is set correctly. If the problem persists even after setting it correctly, please start the gauge adjustment again from the beginning.
ERR0*0133 A size registration CAL limit error has occurred. Check the settings and run size registration CAL again.	**Cause** Size registration CAL was performed outside the magnification range. **Solution** Please check the settings of the zero master and CAL master for size registration. Also, please make sure that the CAL master for size registration is set correctly.

Offset

Error Message	Causes and solutions
ERR0*0138 An offset limit error has occurred. Please perform a gauge setup.	**Cause** The correction amount set by tapping [+Shift]/[-Shift] has exceeded the limit. **Solution** Check the correction amount or offset limit value setting.
ERR0*0139 An external grade limit error has occurred. Please run the gauge setup.	**Cause** The external grade amount has exceeded the limit. **Solution** Check the settings for the external grade amount or external grade limit.

Measurement Item Setting

Error Message	Causes and solutions
ERR0*0140 The magnitude relationship between the judgment points is invalid. Please correct it.	**Cause** An attempt was made to switch to AUTO mode when the magnitude relationship of the decision points was set incorrectly. **Solution** After correctly setting the magnitude relationship of the decision points, switch to AUTO mode.
ERR0*0141 The calculation formula is invalid. Please correct the setting.	**Cause** There is an error in the calculation formula. **Solution** Check the operation logic and setting rules and try again.

Memory Function

Error Message	Causes and solutions
ERR0*0144 There is an abnormality in the synchronization cycle of the memory function.	**Cause** Synchronization did not occur until more than half the configured maximum expected time. **Solution** Set the maximum estimated time to 2 to 3 times the synchronization interval. Also, review the conditions under which synchronization occurs.

Others

Error Message	Causes and solutions
ERR000146 A sizing error was detected.	**Cause** The value set for error detection has been exceeded. **Solution** Check the workpiece and the machining status. If no particular problems are found, check the error detection settings.
ERR000151 Backup data has been lost. All settings will be initialized.	**Cause** The contents of the backup memory were invalid at startup. **Solution** The internal storage may be faulty.

Error Message	Causes and solutions
ERR000152 A configuration change has been made that requires a reboot. Please reboot your system.	**Cause** A configuration change was made that requires a reboot. **Solution** Restart the system.
ERR000153 Log saving has been interrupted due to insufficient internal storage. If restarting the device does not resolve the issue, please contact customer support.	**Cause** There is not enough free space in the internal storage. **Solution** Restart the system.

Condition File

Error Message	Causes and solutions
ERR000154 The conditions file cannot be read. Please check the conditions file.	**Cause** The measurement conditions file is invalid and cannot be read. The file may also be corrupted. **Solution** The measurement condition file needs to be corrected. Please contact customer support.
ERR000155 The conditions file is encoded incorrectly and cannot be read. Please check the conditions file.	**Cause** An invalidly encoded measurement conditions file was read. **Solution** The measurement condition file needs to be corrected. Please contact customer support.
ERR000156 The condition file cannot be read because the line break code is invalid. Please check the condition file.	**Cause** A measurement conditions file with an invalid line break code was read. **Solution** The measurement condition file needs to be corrected. Please contact customer support.
ERR000157 The condition file does not have the correct specifications and cannot be read. Please check the condition file.	**Cause** A measurement conditions file for software with different specifications was read. **Solution** Use the appropriate measurement condition file.
ERR000158 Some settings have been initialized because they contained invalid values. Please check the condition file.	**Cause** A measurement conditions file containing an invalid value was read. **Solution** Use the appropriate measurement condition file.

Gauge Information File

Error Message	Causes and solutions
ERR000159 ～ ERR000162 Failed to read the gauge information file.	**Cause** The gauge information file does not exist, is corrupted, or has a different format. **Solution** If this occurs after a software update, please perform the update again.

Ethernet

Error Message	Causes and solutions
ERR000177 Ethernet communication has been disconnected. Check the connection status and the status of the connected device.	**Cause** Ethernet communication has been disconnected. **Solution** Check the connection status and the status of the connected device.
ERR000178 Ethernet communication has timed out. Check the connection status and the status of the connected device.	**Cause** Ethernet communication has been disconnected. **Solution** Check the connection status and the status of the connected device.
ERR000179 Failed to obtain an IP address automatically.	**Cause** Failed to obtain an IP address automatically. **Solution** Please check your Ethernet environment.
ERR000180 Ethernet communication failed. Check the connection status and the status of the connected device.	**Cause** Ethernet communication failed. **Solution** Check the connection status and the status of the connected device.
ERR000181、ERR000182 Failed to load Ethernet setting file. Settings have been initialized.	**Cause** The network settings file could not be loaded successfully. **Solution** The Ethernet settings have been initialized. If necessary, set up the Ethernet again.

Error Message	Causes and solutions
ERR000183 An error has occurred. If this occurs repeatedly, please contact customer support.	**Cause** An exception error occurred in Ethernet. **Solution** If this occurs repeatedly, please contact customer support.

State Mismatch

Error Message	Causes and solutions
ERR000210 Cannot be executed in AUTO mode.	**Cause** An attempt was made to change settings or perform processing while in AUTO mode. **Solution** Tap [AUTO] to change to MANUAL mode.

Product Warranty

Product Warranty

1) The free warranty period is one year after a receiving inspection. The failure of operation attributed to the program shall be repaired at no charge.

2) The charged warranty period is six years after expired the free warranty period.

This section does not apply if used outside of Japan.

Request

Please make arrangements to finish checking of incoming goods within 10 days after delivery.

Special mention

If this machine is established outside of Japan, warranty period and repairing operation conform to other regulations of our company.

An additional remark

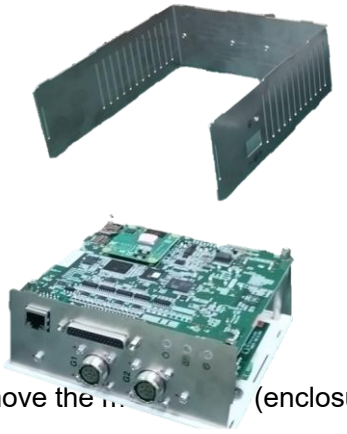
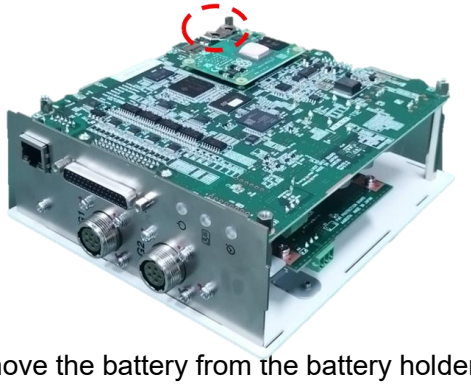
To improve products, we may make change in specifications described herein at any time.

Appendix

Battery Replacement Procedure

<table>
<tr>
<td>

1． Remove t… …ews on this side.
*Be careful of the surface you remove.</td>
<td>

2． Remove the white cover.</td>
</tr>
<tr>
<td>
3． Remove the i… (enclosure).</td>
<td>
4． Remove the battery from the battery holder and insert the replacement battery.
CR2032</td>
</tr>
</table>

ACCRETECH

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